



# Formation détaillée sur les architectures des STI

30 janvier 2024





## Conseils et protocoles de webinaire

- Vous pouvez poser des questions à n'importe quel moment en utilisant la boîte à questions et réponses. Nous répondrons au plus grand nombre de questions possible.
- Vous pouvez aussi lever la main pour posez des questions verbalement si le souhaitez.
- **Veillez garder votre ligne en sourdine.**
- Vous pouvez également envoyer vos questions par courriel à [ITSArchitecture-ArchitectureSTI@tc.gc.ca](mailto:ITSArchitecture-ArchitectureSTI@tc.gc.ca) pour obtenir une réponse plus tard.

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# Remerciements

Cet exposé se fonde sur des documents de formation élaborés par le Département des transports des États-Unis (USDOT).

Transports Canada tient à remercier le comité consultatif des intervenants sur l'architecture des STI pour le Canada ainsi que les autres personnes qui ont gracieusement examiné le matériel de formation et fourni des images, des graphiques et d'autres documents.

# Goals and Objectives

1

Plongez plus en profondeur dans les détails de l'architecture de référence nationale des STI aux États-Unis (ARC-IT)

2

Aperçu des ressources disponibles

3

Montrer où l'utilisation de l'architecture peut être intégrée dans les efforts de planification et de conception conventionnels

4

Visite guidée du site Web de l'ARC-IT

# Agenda

- Introduction de la structure et des éléments de l'ARC-IT
- Éléments canadiens accessibles par le biais de l'ARC-IT
- Visite guidée du site Web de l'ARC-IT



# Introduction de l'ARC-IT





## Qu'est-ce que les STI?

Les systèmes de transport intelligents (STI) intègrent différentes technologies de l'information et des communications dans l'infrastructure et les véhicules de transport routier, en vue d'aider à rendre le système de transport plus sûr et plus efficace.





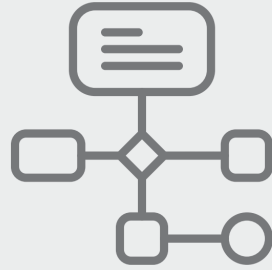
## Rôle des professionnels du transport

- Planifier et fournir des solutions aux besoins de transport

# Qu'est-ce qu'une architecture des STI?

- Cadre pour l'élaboration de systèmes de transport intégrés
- Détermine :
  - Les organismes
  - Les systèmes utilisés
  - Les fonctions exécutées
  - Les renseignements échangés
  - Les communications
- SANS entrer dans des technologies spécifiques
  - La neutralité technologique est essentielle

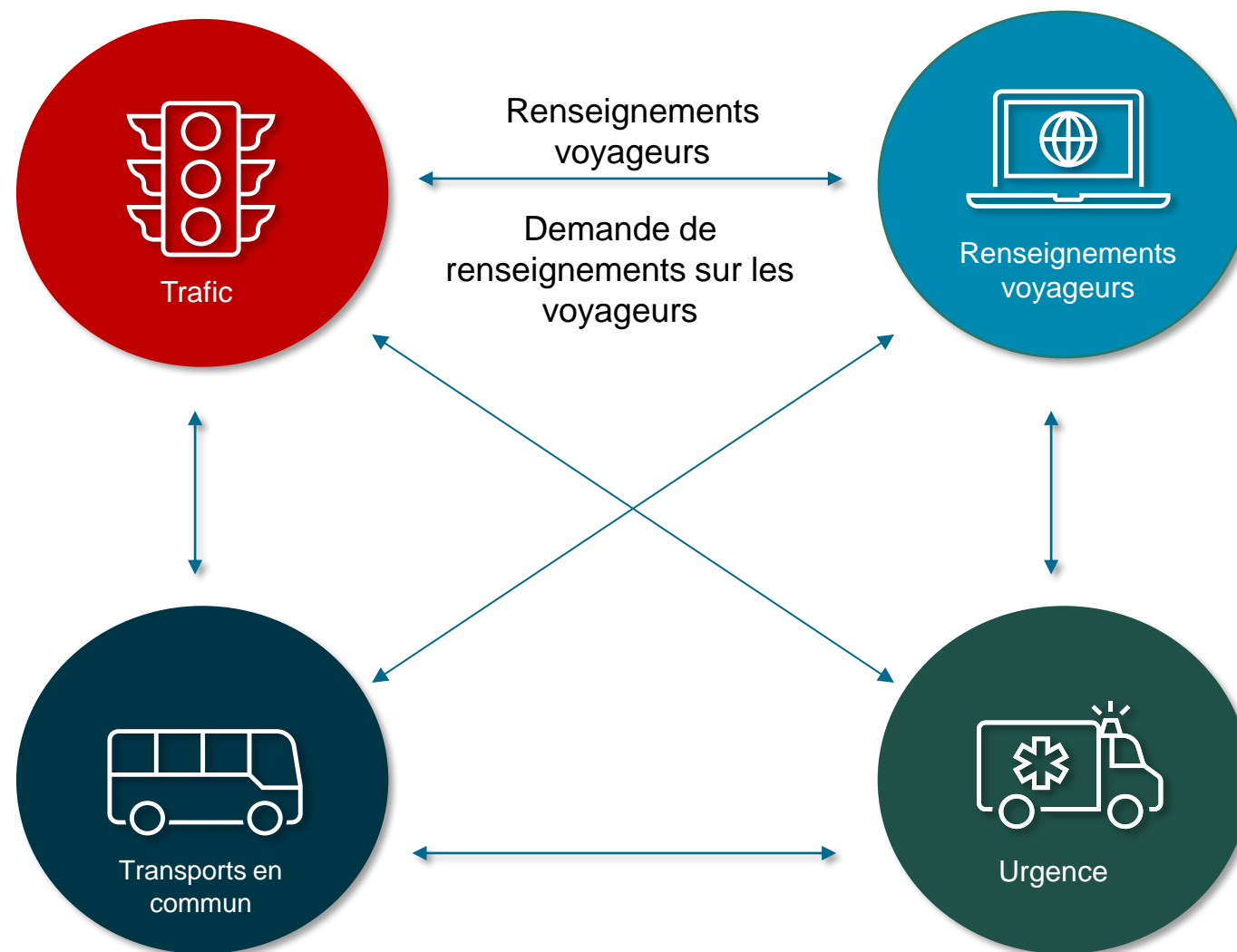




## Une architecture des STI n'est PAS...

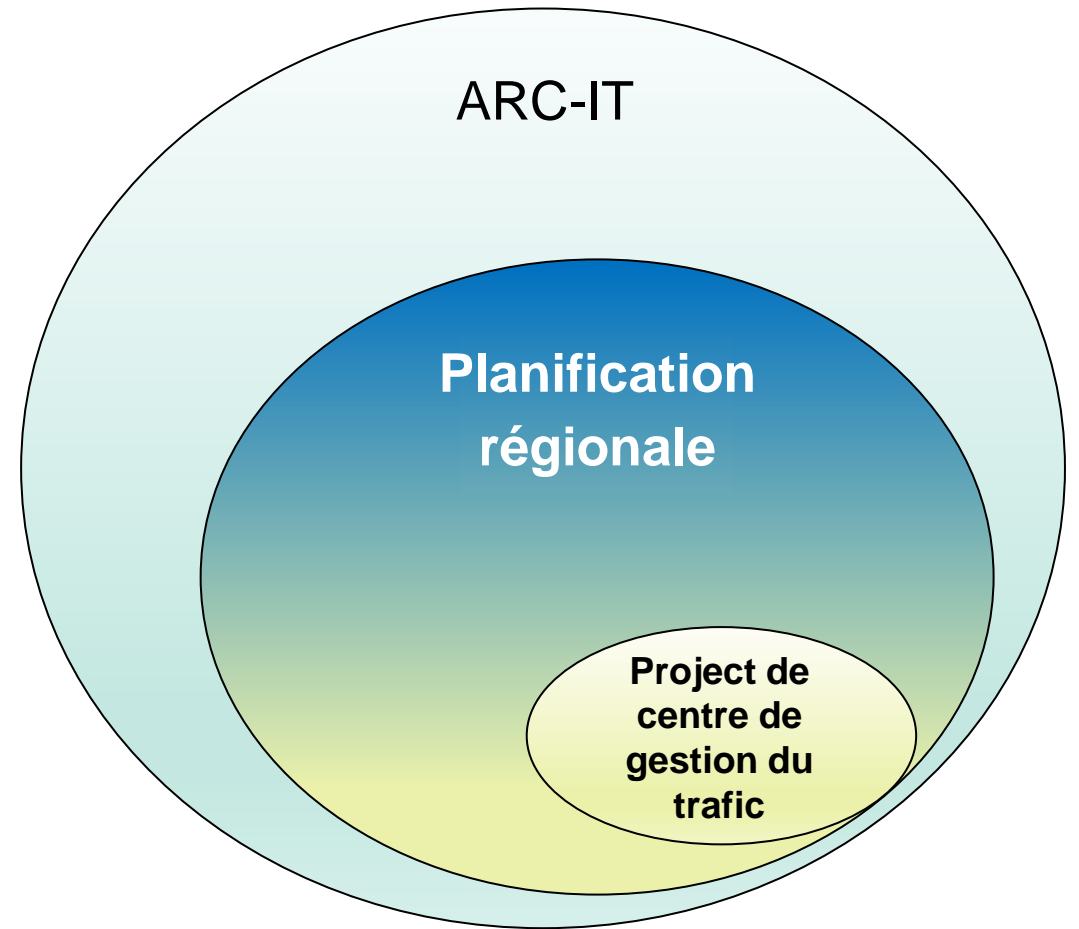
- Un document de conception
- Un processus institutionnel ou de développement
- Une technologie normative. . .

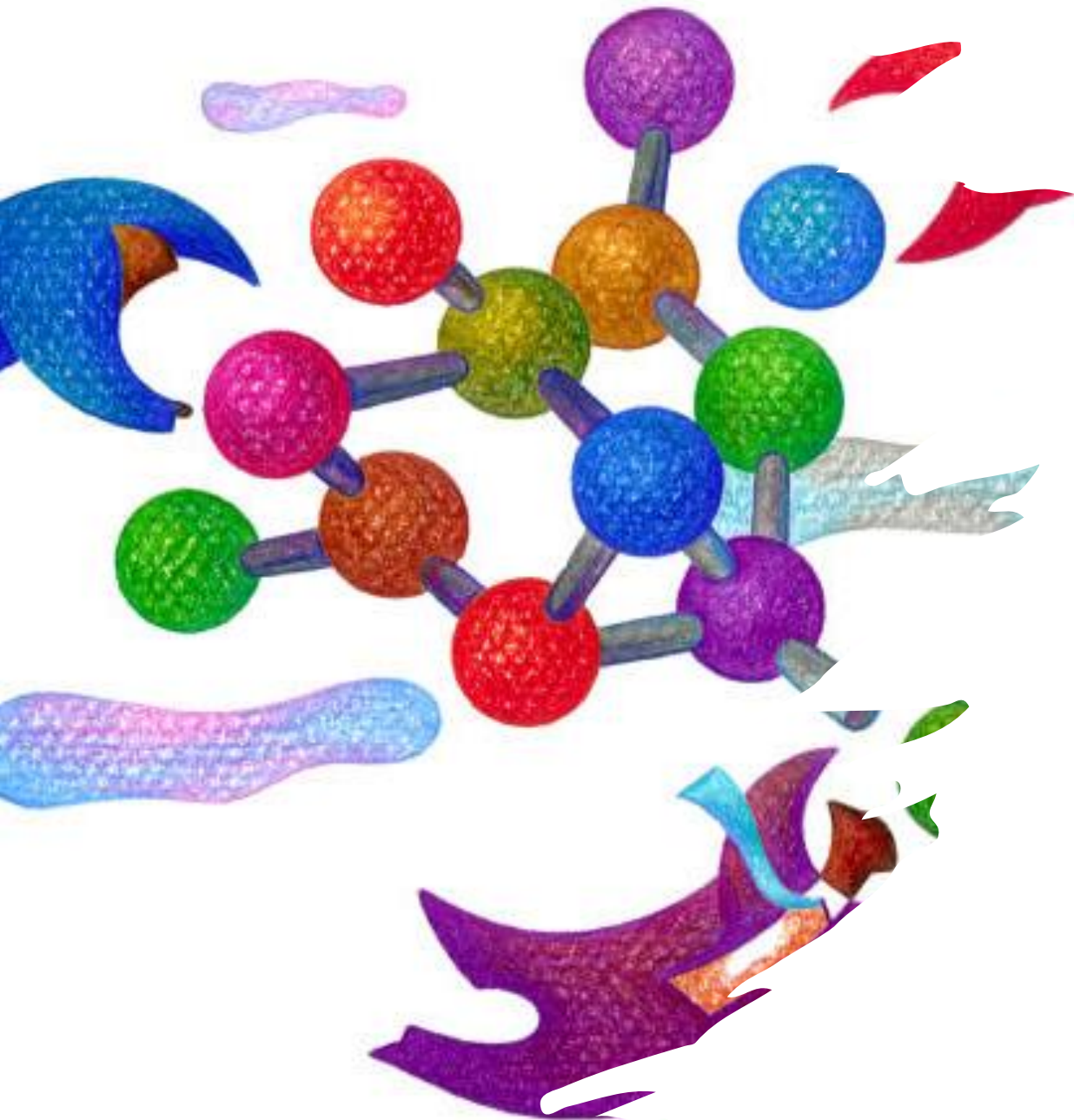
# Les architectures des STI fournissent un cadre d'intégration



# Types (ou niveaux) d'architectures des STI

- Référence
  - National/Ressource
- Régional
  - Utilisé pour la planification
- Projet
  - Utilisé pour la conception/le déploiement



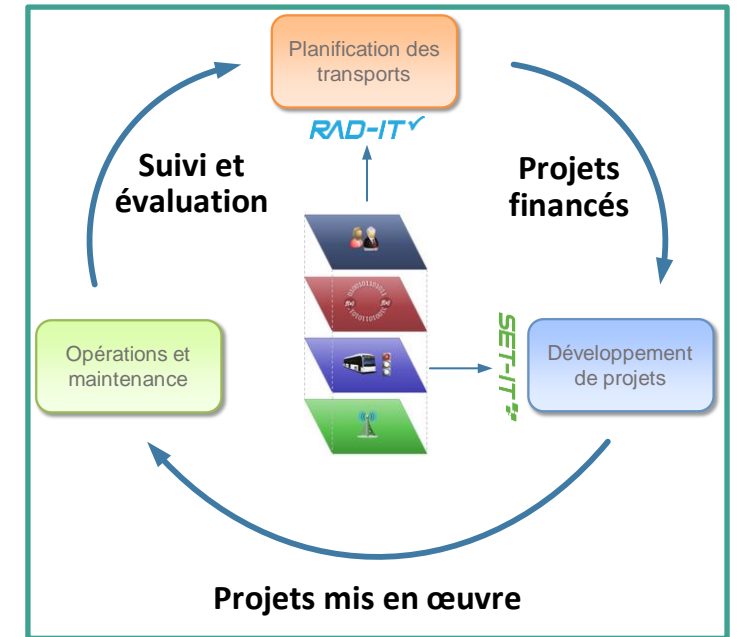
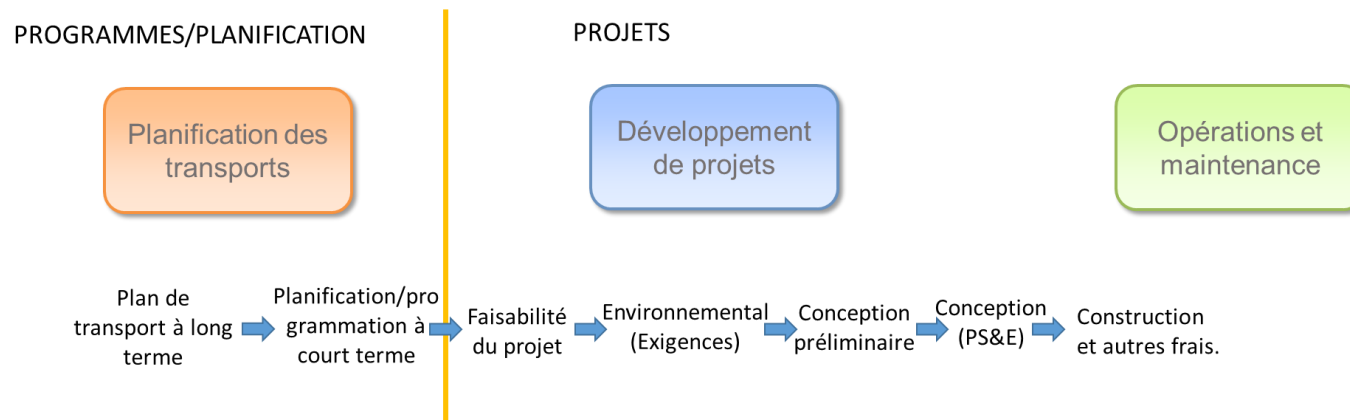


## Raisons pour utiliser l'Architecture lors de la planification

- L'Architecture représente une vision commune des intervenants en Opérations et Planification afin de déployer des systèmes STI
- Adresse les projets de courte durée et les stratégies à long terme

# Rendre l'architecture utile pour la programmation/la budgétisation

- Définir les projets à court terme avec plus de précision pour alimenter les processus de programmation et de budgétisation
- Promouvoir des projets d'intégration dans la région
- Établir un processus qui utilise l'architecture



Adapté de : Département des Transports (DOT) des É.-U.

# Avantages des architecture STI au niveau régionale et de projet

Centre de gestion de transport en commun



Véhicule de transport en commun

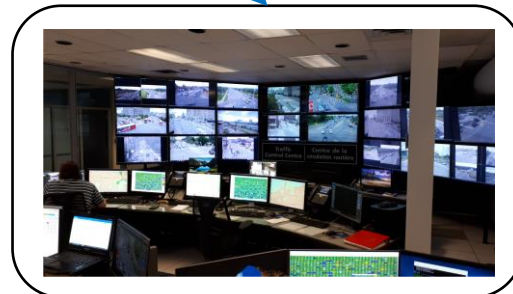


Communications



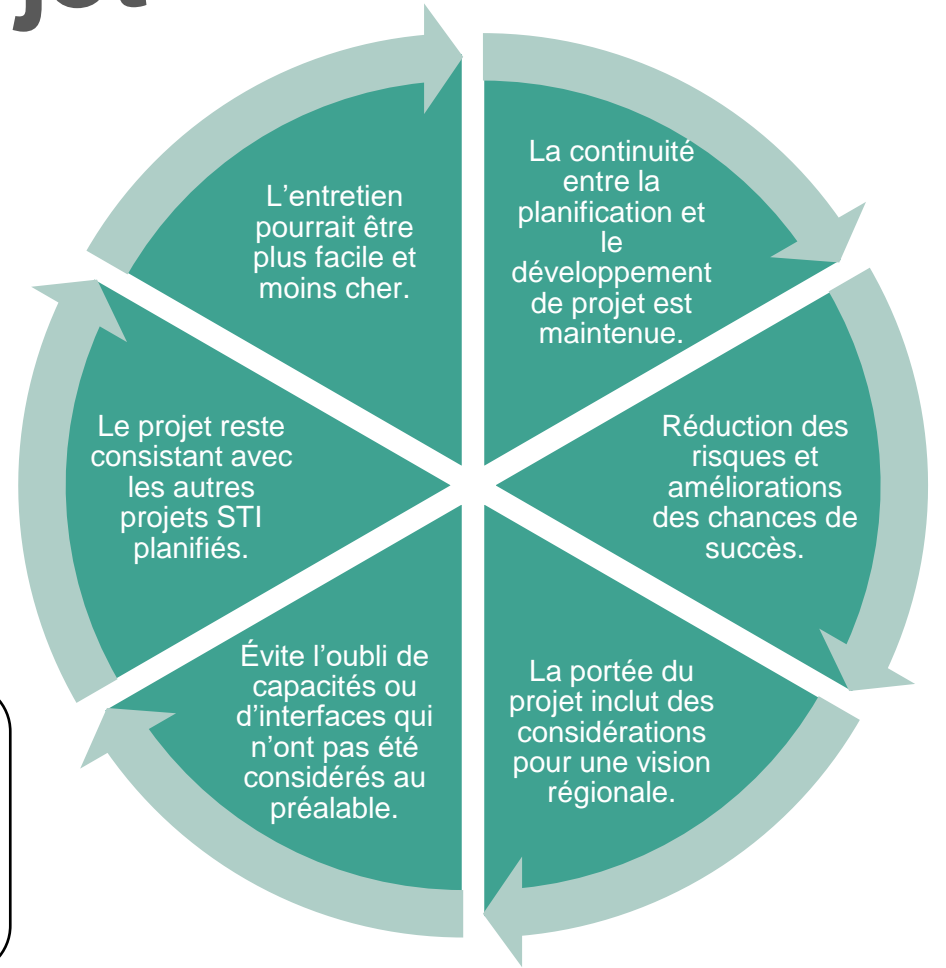
Sous-système routier

Mention de source : Société de transport de Montréal (STM)



Centre de gestion du trafic

Mention de source : ville d'Ottawa, OC Transpo

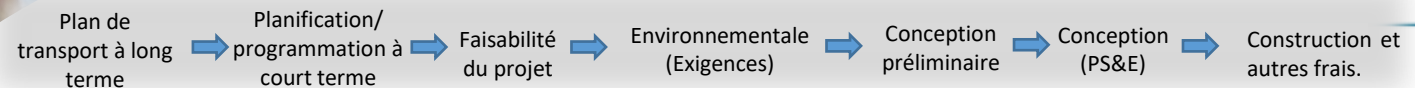




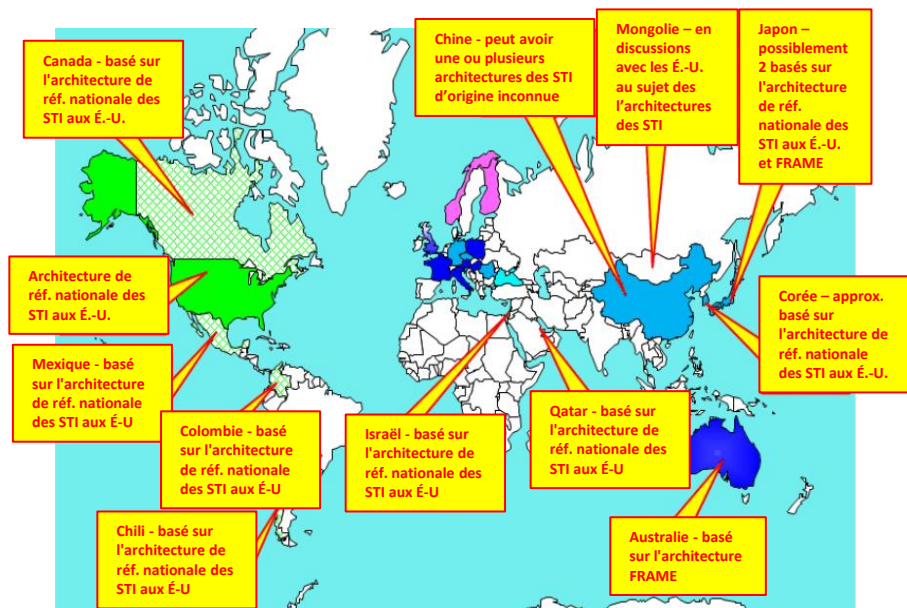


## L'engagement des intervenants est clé

- Le développement d'une architecture des STI est une excellente opportunité pour réunir vos intervenants du côté Opérations et Planifications, à la fois lors du développement mais aussi plus tard lors des activités de mise-à-jour ou d'entretien.
- Le comité qui a supporté le développement de l'architecture devrait aussi prendre un rôle de premier plan pour surveillée l'utilisation de l'architecture ainsi que son entretien.



# Architectures des STI de référence

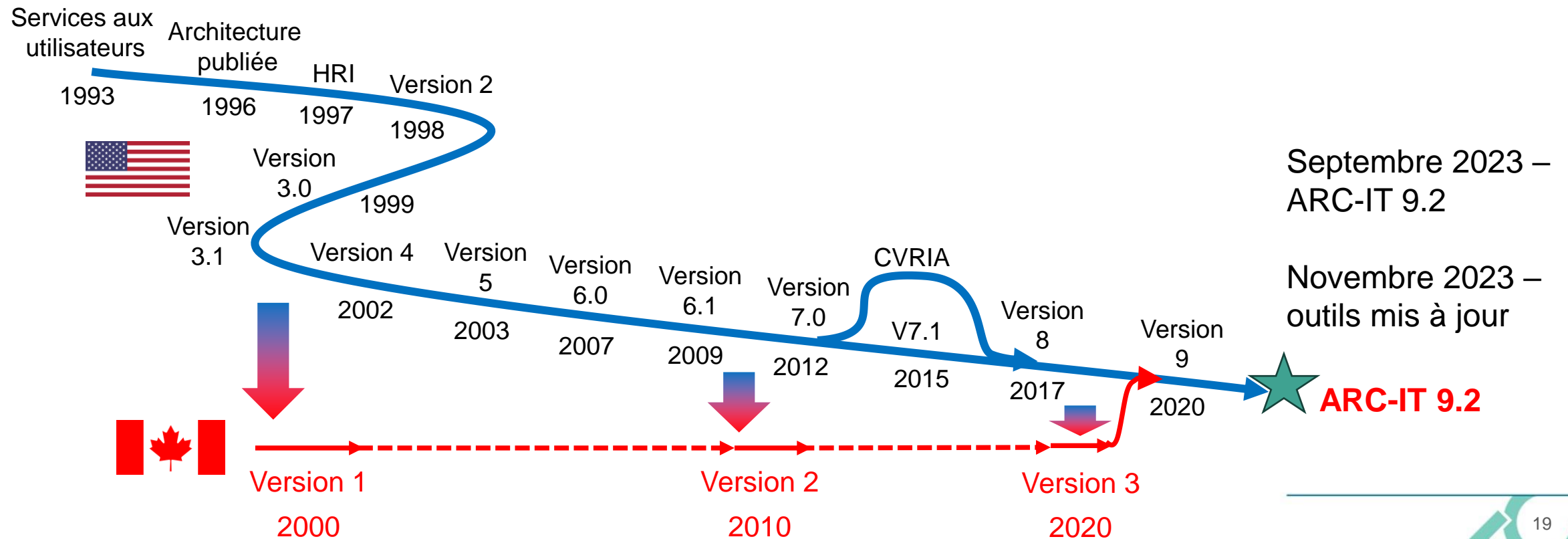


Mention de source : Webinaire sur l'utilisation des architectures dans les STI (11 juin 2020)

- Analyse juridictionnelle terminée
  - Plusieurs pays ont développé et/ou adopté des architectures des STI de référence
  - L'ARC-IT aux É.-U. peut facilement être considérée comme un étalon de référence
- L'ARC-IT est la plus étroitement alignée
  - Intègre quatre ensembles de services canadiens uniques
    - accessible par l'intermédiaire du site web et des outils de l'ARC-IT (RAD-IT / SET-IT)
  - Déplacements transfrontaliers
  - Industrie automobile commune et de nombreuses normes connexes
- L'approche actuelle de TC consiste à encourager l'utilisation de l'ARC-IT et à développer de nouveaux ensembles de services si nécessaire.

# Une route longue et venteuse

- Le programme US National ITS Architecture /ARC-IT a débuté dans les années 1990
  - S'est développé et a évolué au cours des 25 dernières années
  - Rebaptisé en 2017
- L'architecture des STI pour le Canada a évolué avec en même temps



# Nouveautés dans ARC-IT 9.2

- La version 9.2 de ARC-IT apporte de nombreuses améliorations pour mieux supporter les ensembles de services **Voyage accessible multimodal (*Multimodal Accessible Travel (MAT)*)**, **Gestion des règlements électronique de la route (*Management of Electronic Traffic Regulations (METR)*)** ainsi que d'autres concepts et raffinements. Les changements les plus significatifs sont :
- **Voyage accessible multimodal** : Concepts qui support des voyages complets, paiements intégrés, sécurité des URV ainsi que la navigation intérieure. Les ensembles de services les plus touchés par la mise à jour sont :
  - **SU15 : Support pour transitionner des dispositifs liés aux usagers de la route vulnérables**
  - **TI03 : Guidage routier autonome**
  - **TI04 : Paiement de services aux voyageurs et réservations**
  - **TI05 : Perception électronique de péage**
  - **TI06 : Covoiturage dynamique**
  - **TI08 : Orientation personnelle**
  - **VS12 : Sécurité des usagers de la route vulnérables**
  - **VS18 : Regroupement des usagers de la route vulnérables**
- Des améliorations majeures ont été faites à l'ensemble de service **VS17 Diffusion du code de la route** basé sur les développements des normes METR présentement en développement par ISO/TC 204. Ceci inclut des détails sur la façon dont les systèmes METR collectionneront, géreront et diffuseront les règlements de la route.
- D'autres améliorations sur les ensembles de services suivant:
  - **MC12: Conduite en convoi à sens unique** -- nouvel ensemble de services inspirés par des projets en Norvège et implémenté de façon similaire dans les états américain où il y a beaucoup de neige.
  - **ST05: Gestion des bornes de recharge électrique** -- modifié pour mieux accommoder le partage d'information et la gestion d'entité.
- Mise à jour de toutes les vues afin d'intégrer les changements récents inclus dans les technologies ou normes de l'industrie.
- Plusieurs nouveaux objets qui supportent MAT, METR et d'autres concepts, tels que **Équipement embarqué pour véhicule de micromobilité, Centre de gestion des bornes de recharge électriques et Centre de transport à usage partagé.**

# Nouveautés dans ARC-IT 9.2 (suite)

- **La version 9.2.1 de RAD-IT** inclut de nouvelles fonctionnalités et des améliorations :
  - Les paramètres des documents peuvent maintenant être sauvegarder par architecture, permettant aux utilisateurs de configurer et sauvegarder plusieurs documents à la fois au sein du même fichier. Par exemple, un document pour une architecture régionale et un autre pour une architecture de projet.
  - Nouveaux rapports d'extrant basé sur les flux et solutions de communication disponible assigné à chaque ensemble de services.
  - Performance améliorée sur l'onglet Interfaces pour la fonctionnalité *Build*.
  - Plusieurs corrections de bugs, incluant un bug relié au convertissement des assignements d'objet physique.
- **La version 9.2.1 de SET-IT** inclut de de nouvelles fonctionnalités et des améliorations :
  - La fonction de recherche avancé ouvre maintenant les champs pour inclure du texte concernant les ensembles de services, diagrammes et objet fonctionnels.
  - Correctifs reliés au crash occasionnel du logiciel
  - Plusieurs corrections de bugs, incluant des erreurs lors de la génération des documents et lié à la synchronisation des noms d'ensembles de services.

# État actuel

## ARC-IT

- « Plan directeur » mandaté par le Congrès pour les déploiements de STI financés par le gouvernement fédéral<sup>1</sup>
- Intègre 9 ensembles de services internationaux (dont 4 du Canada)
- Le site Web et les outils prennent entièrement en charge tous les ensembles de services

## Architecture des STI pour le Canada

- Aucune exigence législative ou politique similaire
- Met l'accent sur le soutien et l'encouragement de l'utilisation des architectures des STI (ARC-IT) plutôt que sur le maintien d'une architecture de référence parallèle
- Les bases de données hors ligne reflètent l'ARC-IT : facilite le développement d'ensembles de services supplémentaires si/quand cela est nécessaire

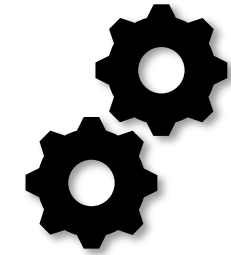


U.S. ARC-IT 9.0

Architecture Reference for Cooperative and Intelligent Transportation

RAD-IT  
SET-IT

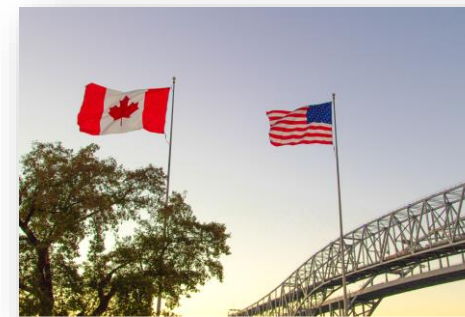
The graphic features the US flag at the top, followed by the text 'U.S. ARC-IT 9.0'. Below this is a screenshot of the 'Architecture Reference for Cooperative and Intelligent Transportation' website. To the left of the screenshot are icons for a database, a document, and a globe. At the bottom are icons for a wrench and a checkmark, with the text 'RAD-IT' and 'SET-IT' next to them.



Soutien de l'architecture des STI

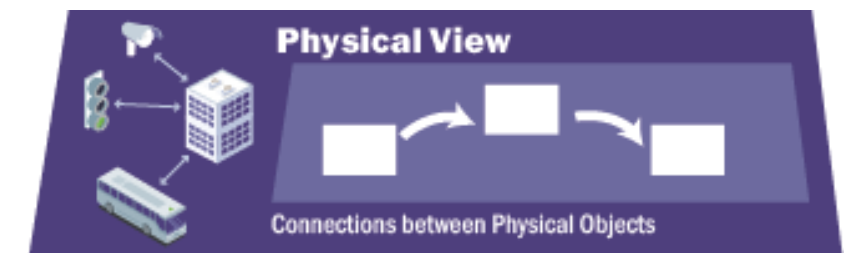
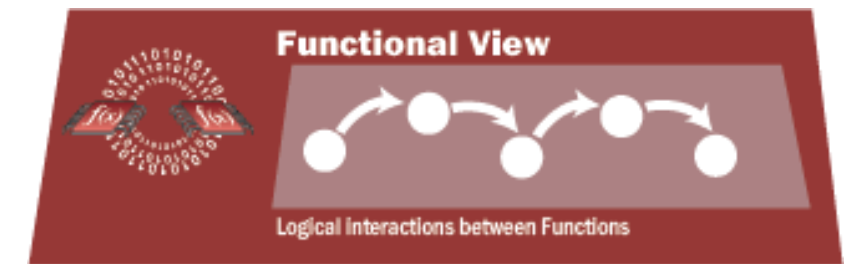
Architecture des STI

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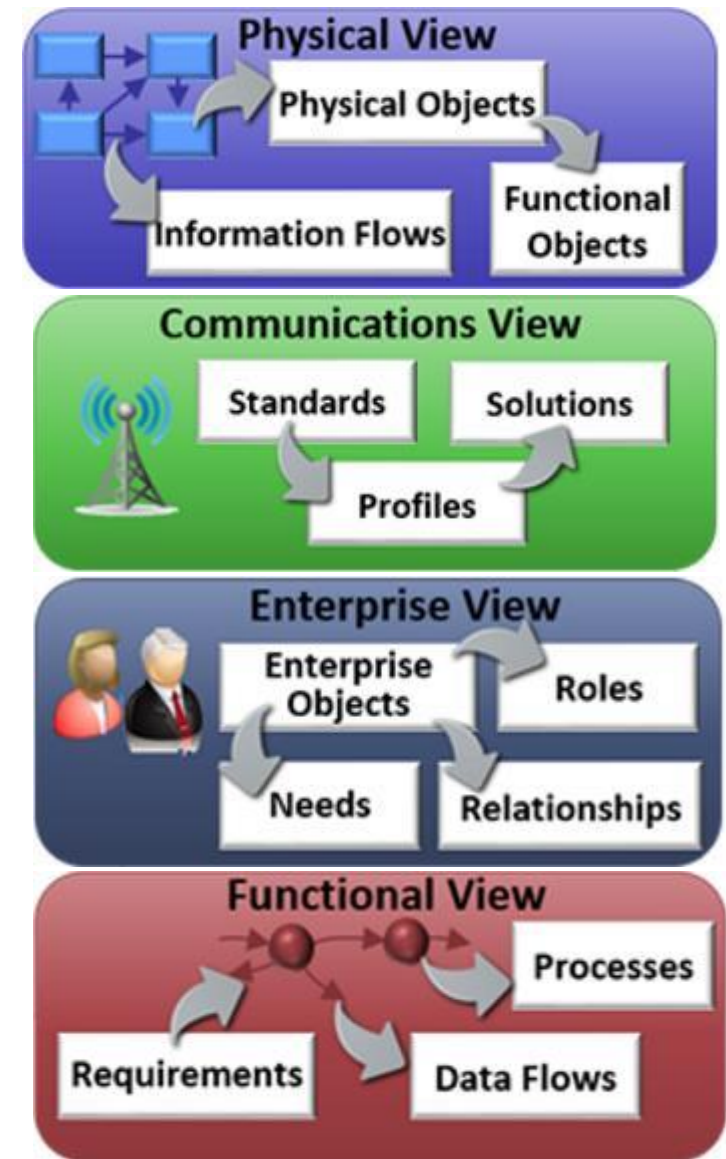
# Points de vue ARC-IT

- Le **point de vue de l'entreprise** examine les politiques, les incitations au financement, les modalités de travail et la structure juridictionnelle qui soutiennent les couches techniques de l'architecture.
- Le **point de vue fonctionnel** fournit une analyse des éléments fonctionnels abstraits et de leurs interactions logiques.
- Le **point de vue physique** représente les éléments physiques qui fonctionnent sur le terrain et dans le back-office, les fonctionnalités contenues dans ces éléments, les rôles que jouent les éléments dans la fourniture de services aux utilisateurs et les connexions entre ces éléments.
- Le **point de vue des communications** fournit un cadre pour définir les protocoles nécessaires à la mise en œuvre d'un flux d'informations entre les objets physiques (tels que définis dans la vue physique)



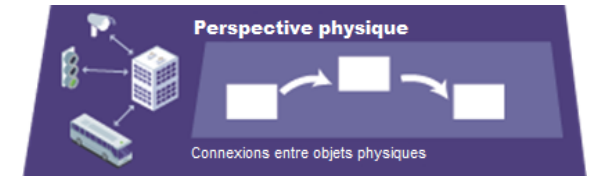
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# Perspective physique



## Décrit :

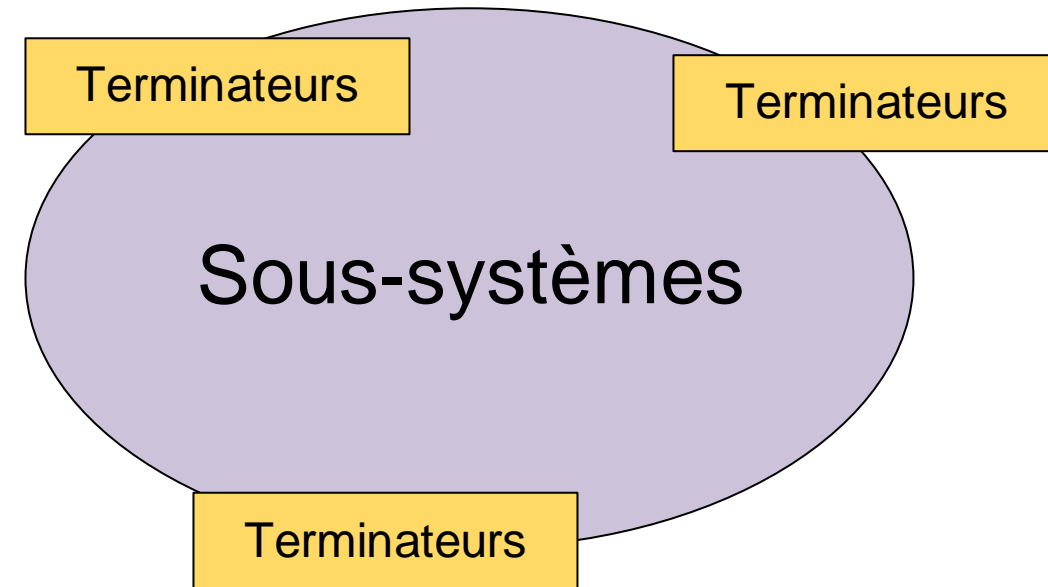
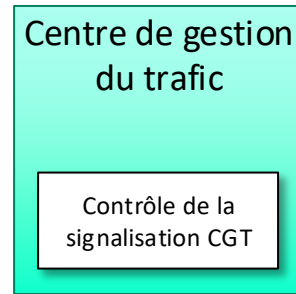
- Les objets physiques qui interagissent pour fournir des services
- Les interfaces et flux d'informations entre ces objets physiques

## Identifie les options pour...

- Quelles sont les interfaces visant à soutenir les services de STI?
- Quelle fonctionnalité est allouée aux objets physiques?
- Quels objets nécessitent des mesures de sécurité de l'information et quelles sont-elles?

# Perspective physique - Objets physiques

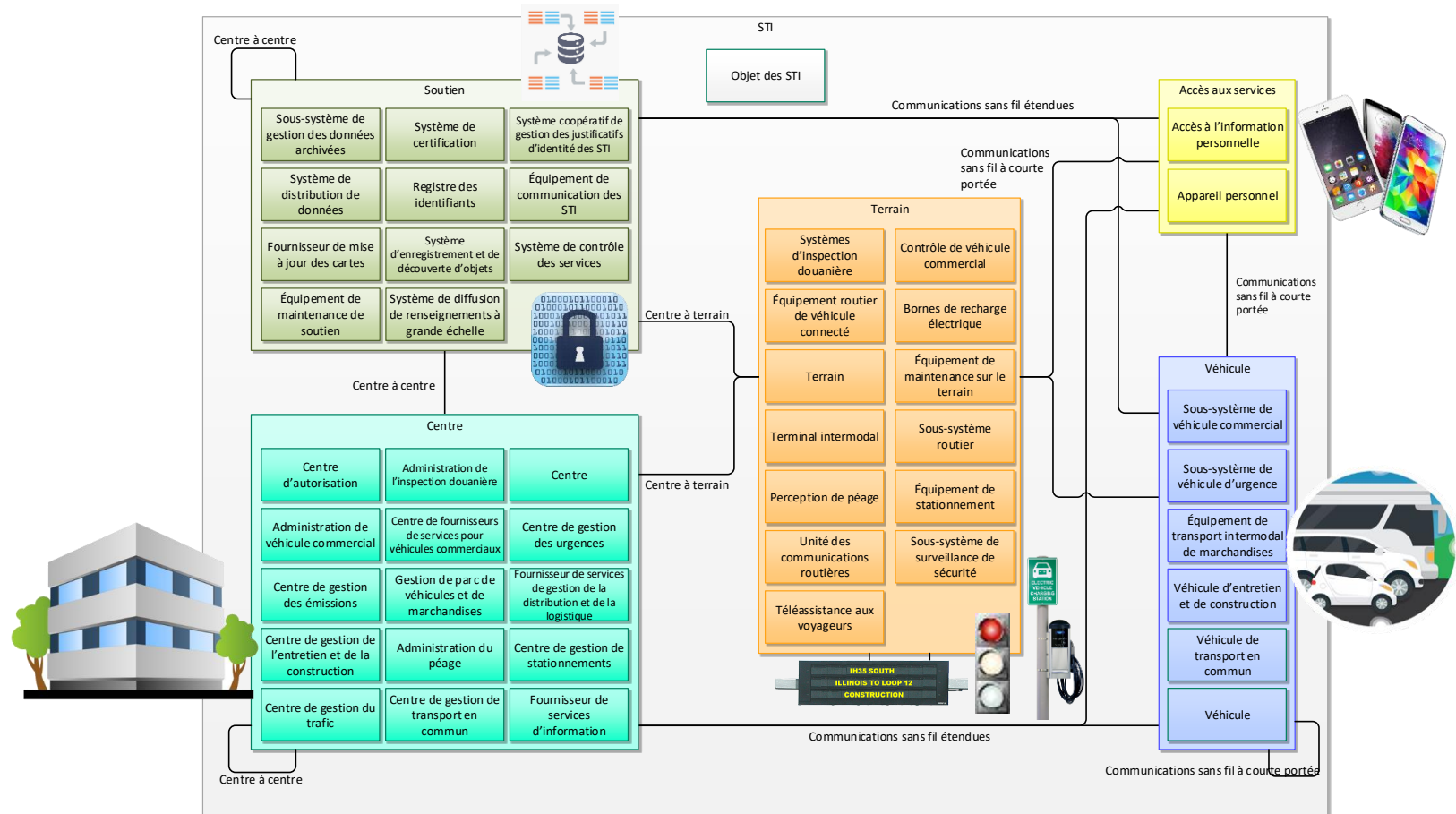
- Principaux « éléments de base » de la perspective physique
- Systèmes, appareils, véhicules ou personnes physiques qui fournissent des services de STI
- Deux types:
  - Sous-systèmes
    - Functionality defined
  - Terminateurs
    - No functionality



Adapté de : Département des Transports (DOT) des É.-U.

# Perspective physique - Objets physiques

- Organisé en six catégories
- Codé par couleur

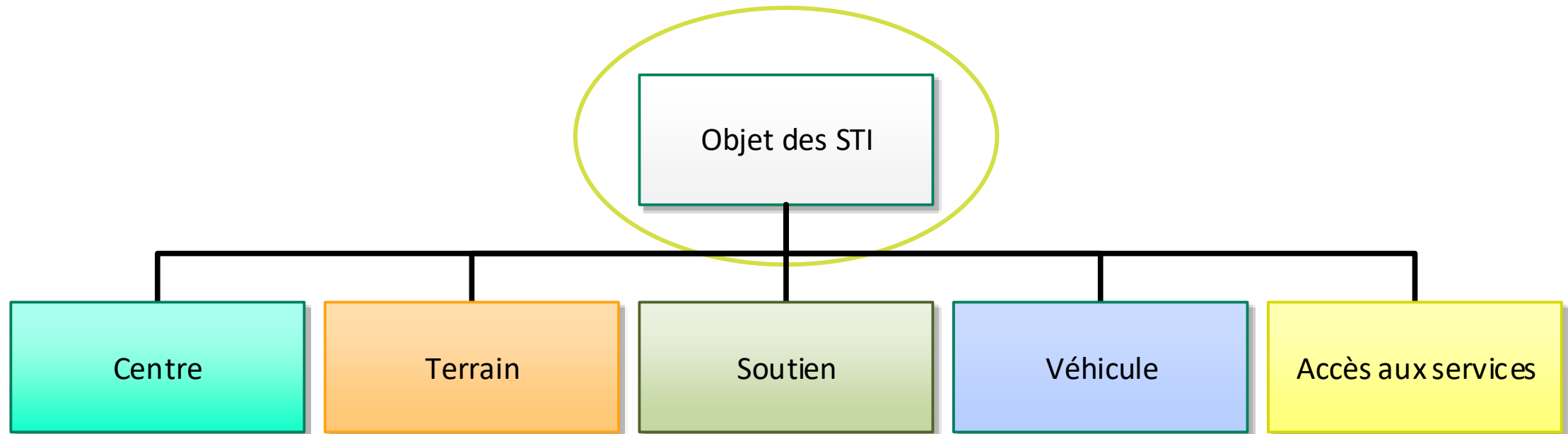


Traduit sur la base du matériel de : Département des Transports (DOT) des É.-U.

*Organisé en six catégories (et codé par couleur)*

# Vue physique - Objets physiques

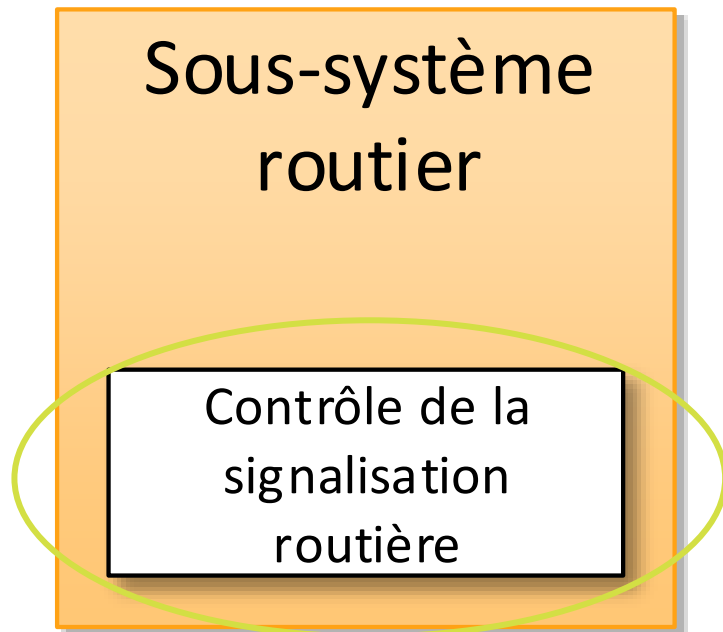
- Objet de STI
  - Inclut les fonctions de base et les interfaces qui peuvent être incluses dans n'importe quel système ou dispositif de STI



Mention de source : Département des Transports (DOT) des É.-U.

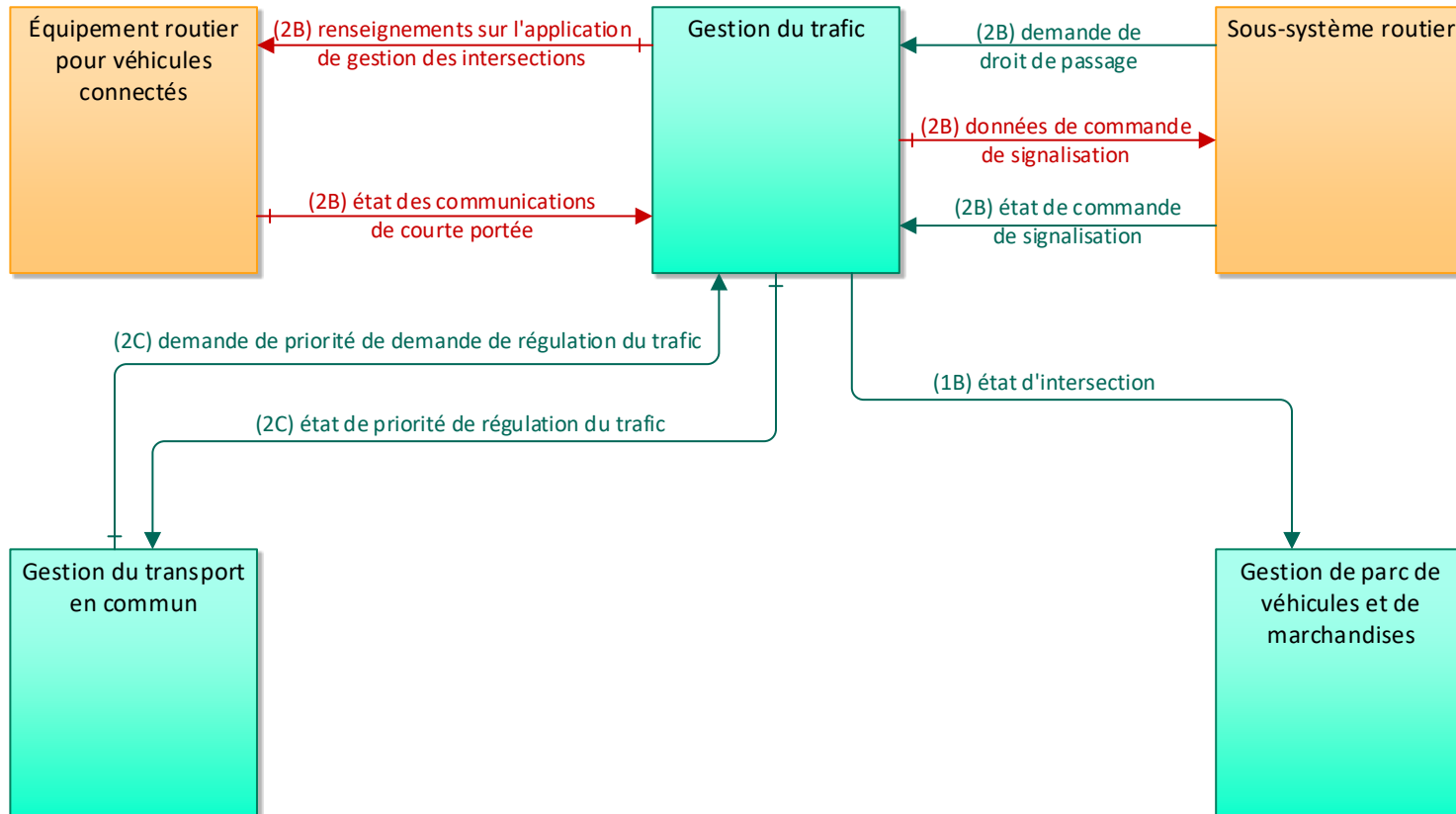
# Perspective physique - Objets fonctionnels

- Les objets fonctionnels sont des éléments de base fonctionnels de sous-systèmes
  - Définir les fonctions et les interfaces requises pour prendre en charge une partie « déployable » du sous-système
  - Les exigences fonctionnelles sont définies pour chaque objet fonctionnel



# Perspective physique – Flux d'informations

- Définir les interfaces entre les objets physiques



TRIPLET → 'Objet physique source - flux d'information - Destination de l'objet physique'  
ex. Gestion du trafic – données de commande de signalisation – Sous-système routier

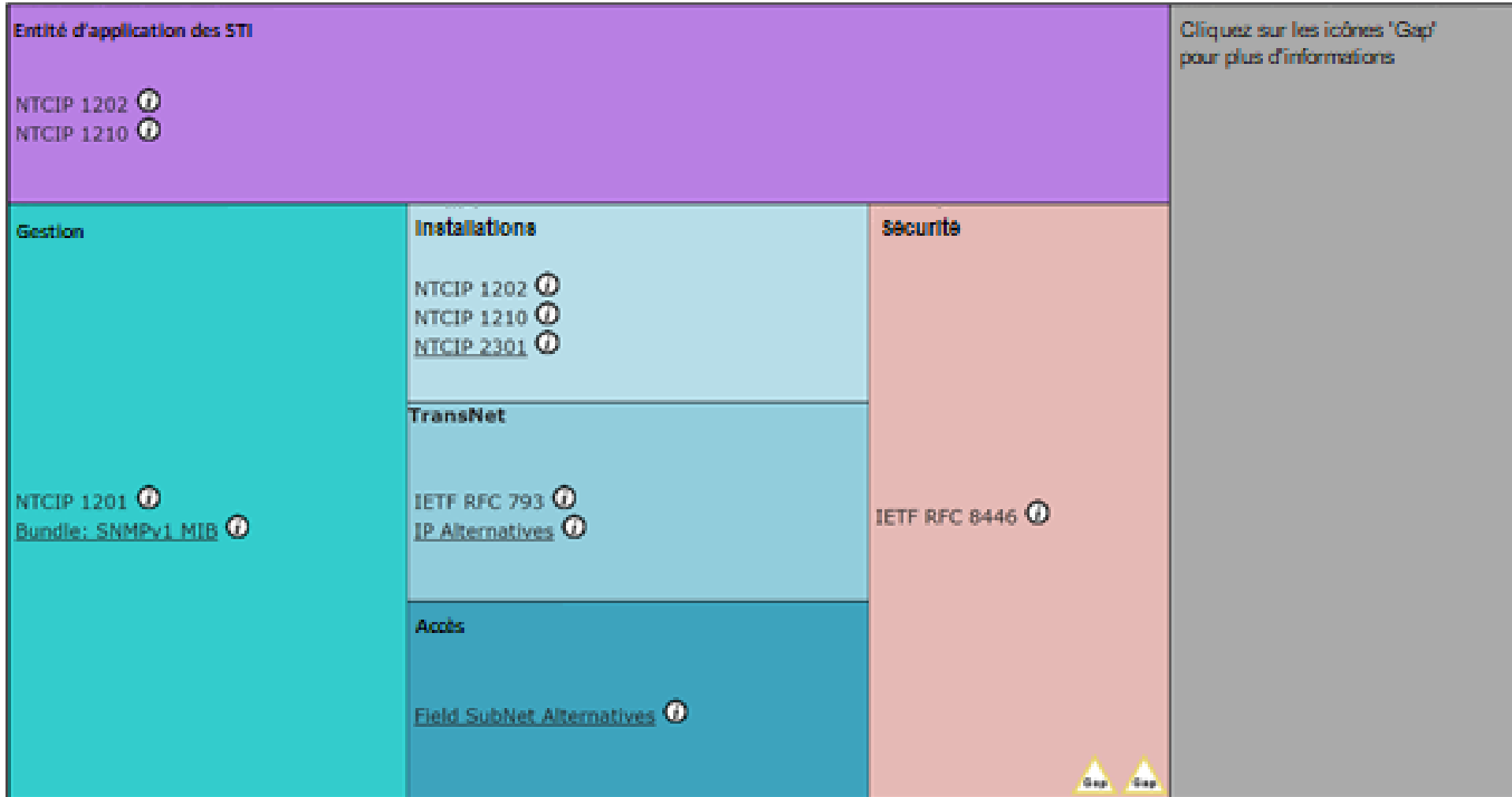
# Perspective des communications

- Dépeint :
  - Solutions de communication en couches prenant en charge les communications entre objets physiques
  - Les solutions incluent des groupes de normes appelés profils.
- Identifie les options pour chaque « triple »...
  - Identification et pertinence des protocoles à toutes les couches
  - Comment ces protocoles garantissent ou prennent en charge :
    - Sécurité
    - Protection des renseignements personnels
  - Pour chaque option, cerne les lacunes et les chevauchements pour chaque solution



Traduit sur la base du matériel de : Département des Transports (DOT) des É.-U.

# Perspective des communications





# Perspective d'entreprise



- Dépeint :
  - Relations entre les organisations
  - Rôles que jouent les organisations dans la prestation des services STI
- Organisé autour des **Objets d'entreprise**
  - Interagir pour échanger des renseignements
  - Gérer ou exploiter des systèmes

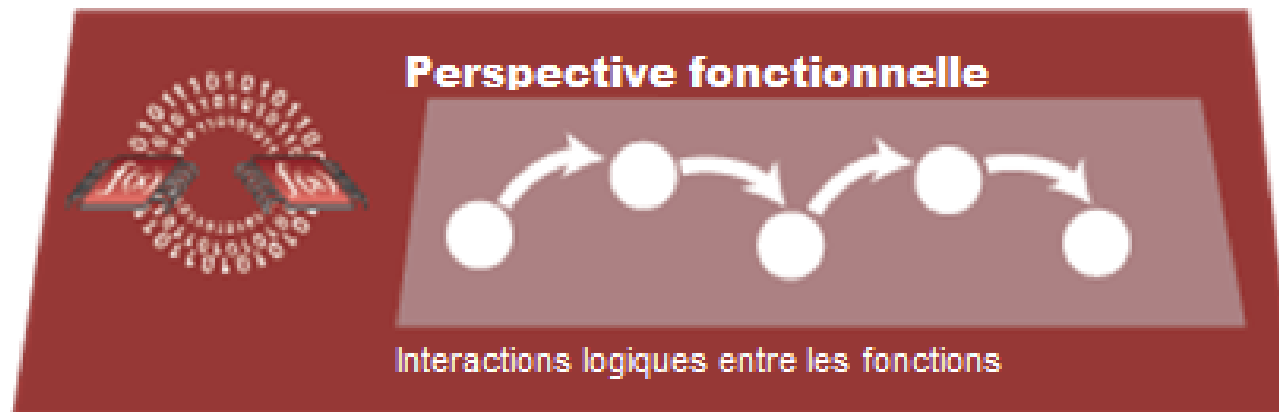


Mention de source : Département des Transports (DOT) des É.-U.

Objet d'entreprise		Rôle/Relation
Source	Destination	
Responsable de l'équipement en bordure de route pour véhicules connectés	Équipement en bordure de route pour véhicules connectés	<u>Gère</u>
Propriétaire d'équipement en bordure de route pour véhicules connectés	Équipement en bordure de route pour véhicules connectés	<u>Possède</u>
Propriétaire d'équipement en bordure de route pour véhicules connectés	Responsable de l'équipement en bordure de route pour véhicules connectés	<u>Accord d'exploitation</u>
Propriétaire d'équipement en bordure de route pour véhicules connectés	Propriétaire de matériel routier des STI	<u>Accord d'échange d'information et d'action</u>
Propriétaire d'équipement en bordure de route pour véhicules connectés	Propriétaire du centre de gestion du trafic	<u>Accord d'échange d'information</u>

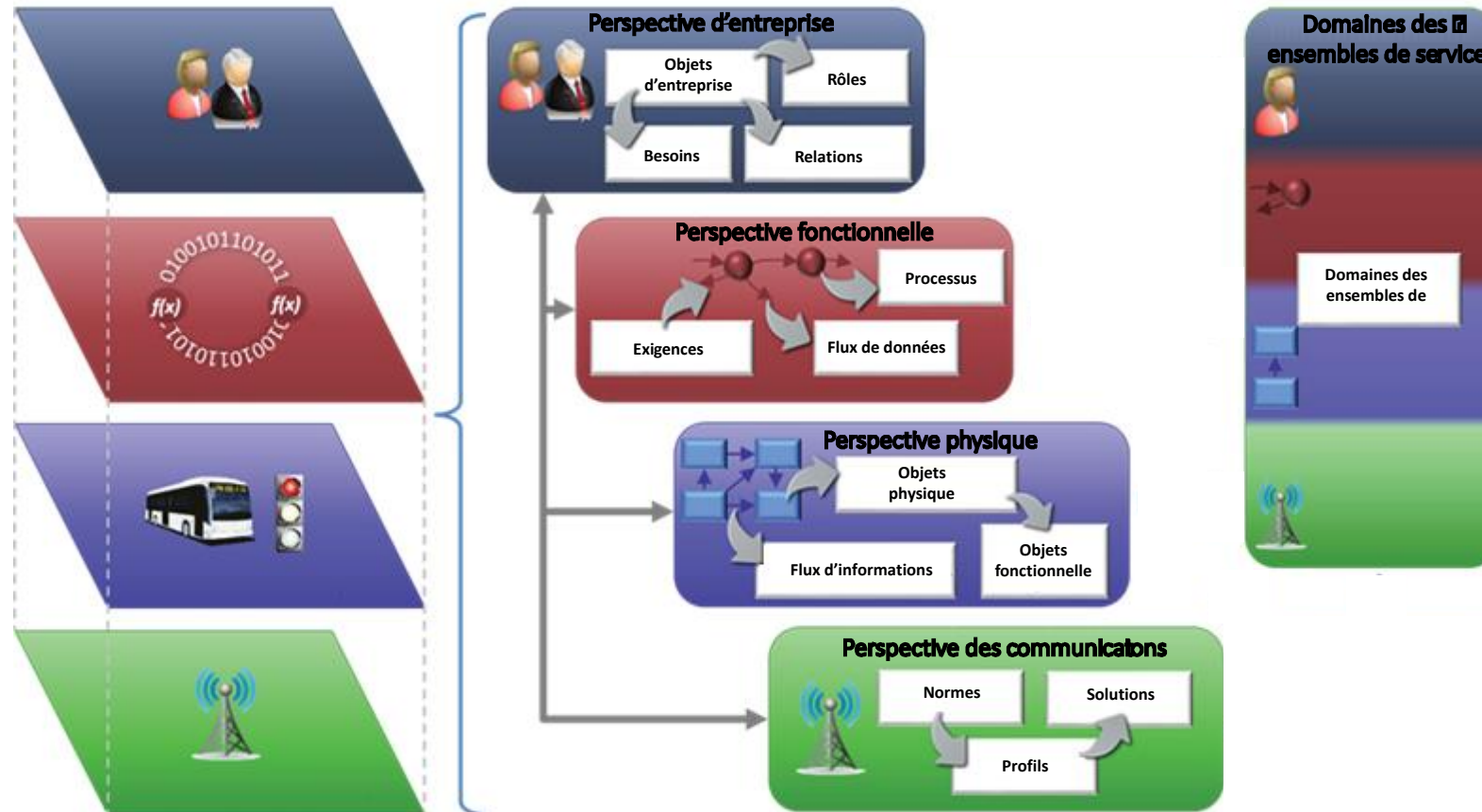
# Perspective fonctionnelle

- Dépeint :
  - Objets fonctionnels abstraits (processus)
  - Flux de données entre ces processus
- Détermine les options pour...
  - Quelle fonctionnalité trouve-t-on dans les objets physiques?
  - Quelles sont les interfaces entre les objets logiques?
  - Quelles données circulent entre ces objets logiques?

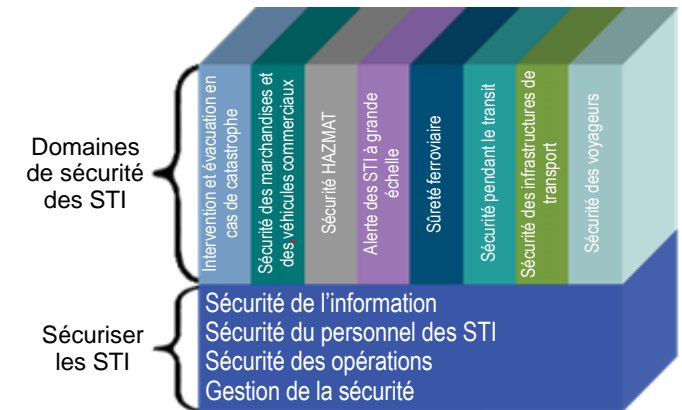


# Ensembles de services

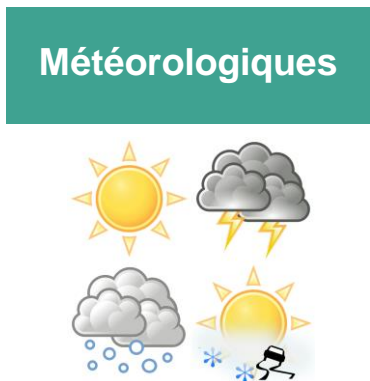
- Les ensembles de services compilent les éléments de l'ARC-IT qui fournissent un service de STI unique



- 156 ensembles de service
- Chaque ensemble inclut des aspects de toutes les perspectives

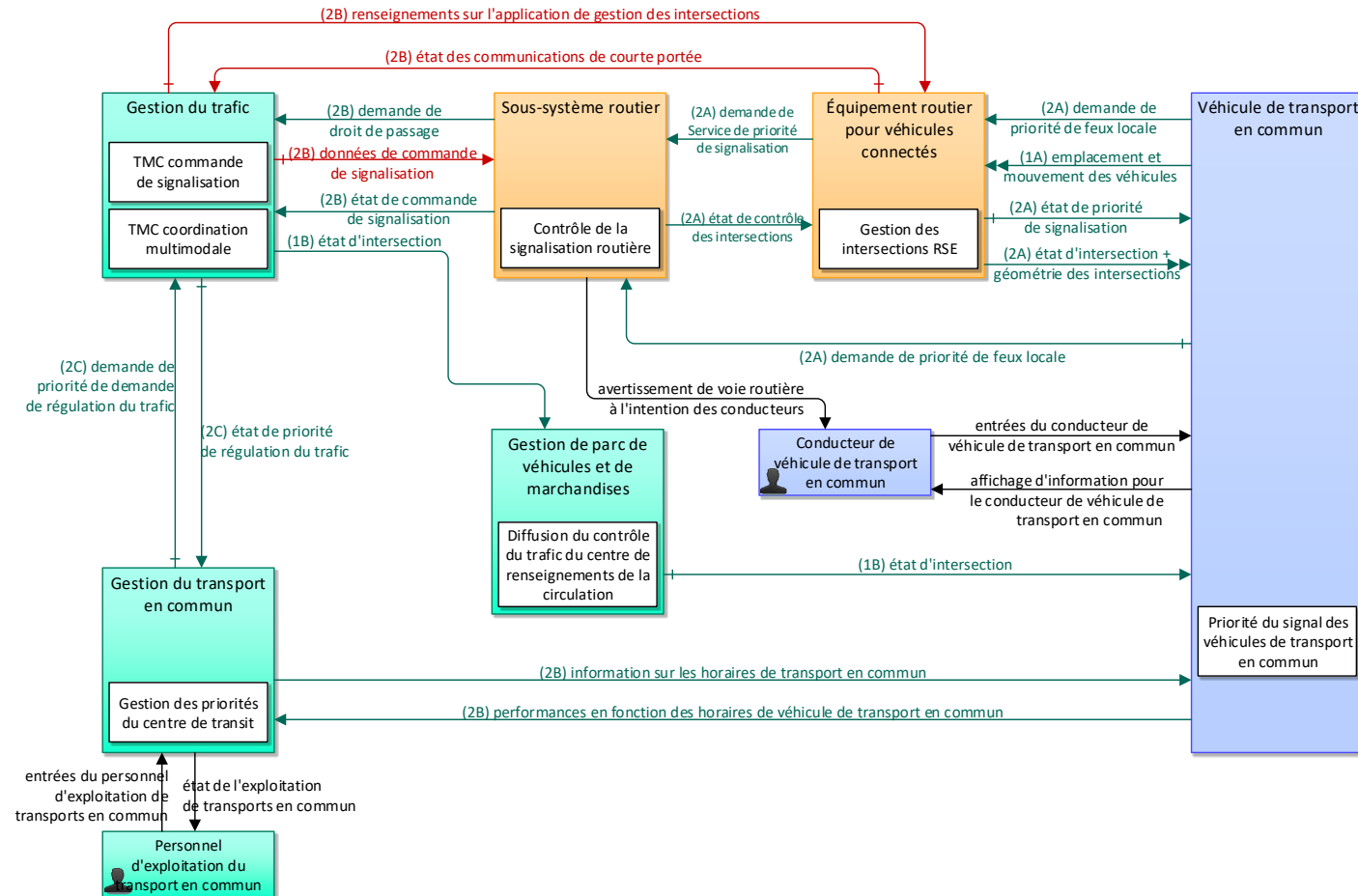


# Domaines des ensembles de service



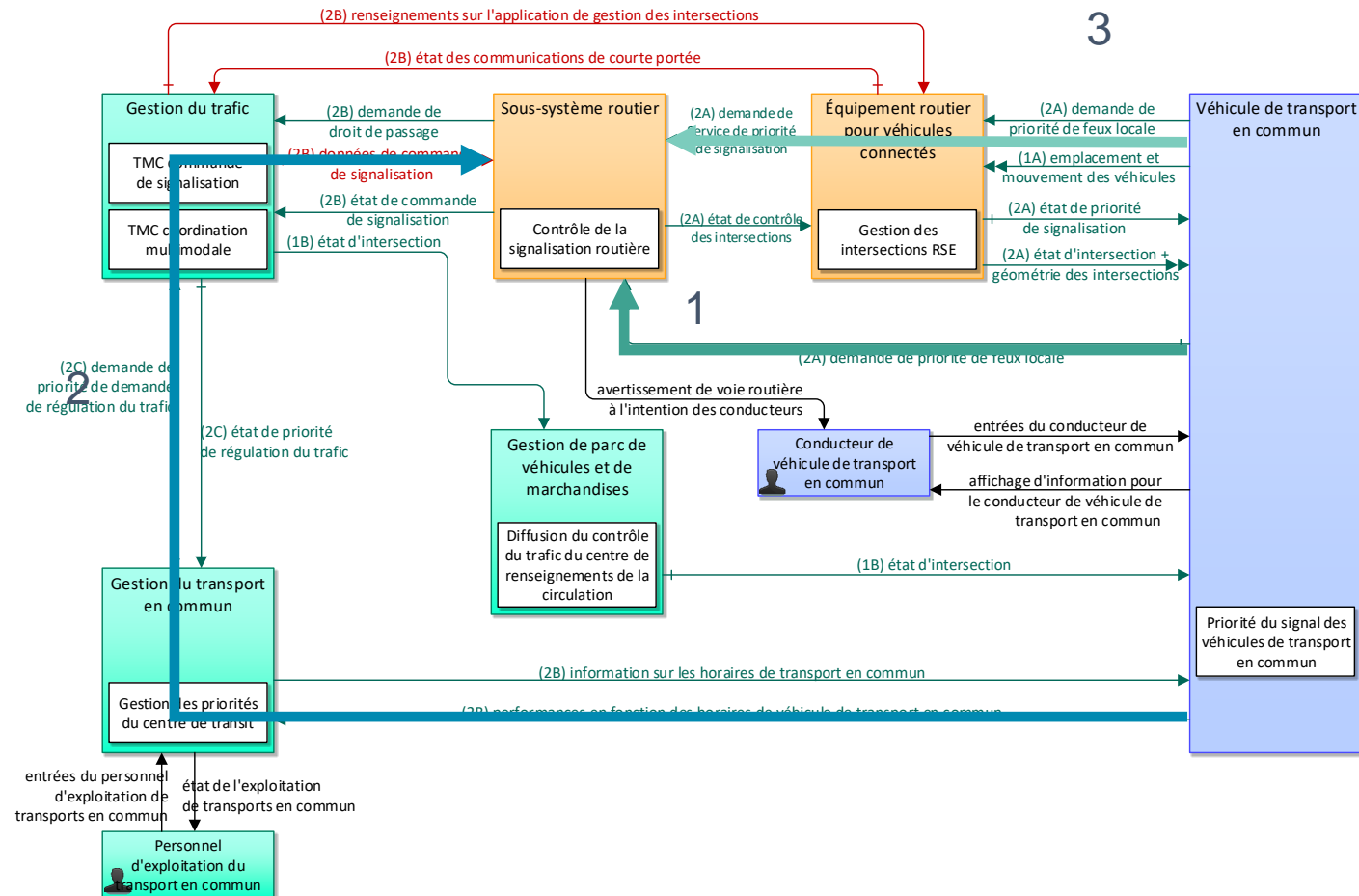
DM01	Dépôt de données des STI
DM02	Suivi du rendement
MC02	Entretien des véhicules d'entretien et de construction
MC03	Traitement automatisé de la route
MC04	Entretien hivernal
MC05	Entretien et construction des routes
MC06	Gestion des zones de travaux
MC07	Systèmes coopératifs de sécurité des véhicules
MC08	Coordination des activités d'entretien et de construction
MC09	Surveillance des infrastructures
MC10	Suivi des biens
PS11	Système d'alerte précoce
PS12	Intervention en cas de sinistre et rétablissement
PS13	Gestion des évacuations et des réintégrations
PS14	Information sur les sinistres à l'intention des voyageurs
PS15	Récupération de véhicule volé
PT13	transport en commun
PT14	Coordination intermodale
PT15	Demande d'arrêt de transport en commun
PT16	ID de route pour les malvoyants
PT17	Assurance de la correspondance intermodale
PT18	Perception électronique de péage
CV017	Programme d'accès intelligent
CV018	Programme d'accès intelligent - Surveillance du poids
CV019	Conformité intelligente de la vitesse
CV020	Enregistrement aux frontières internationales
CV021	Inspection à la frontière internationale
CV022	Coordination des frontières internationales

# Exemple d'ensemble de services – Signalisation prioritaire pour le transport en commun



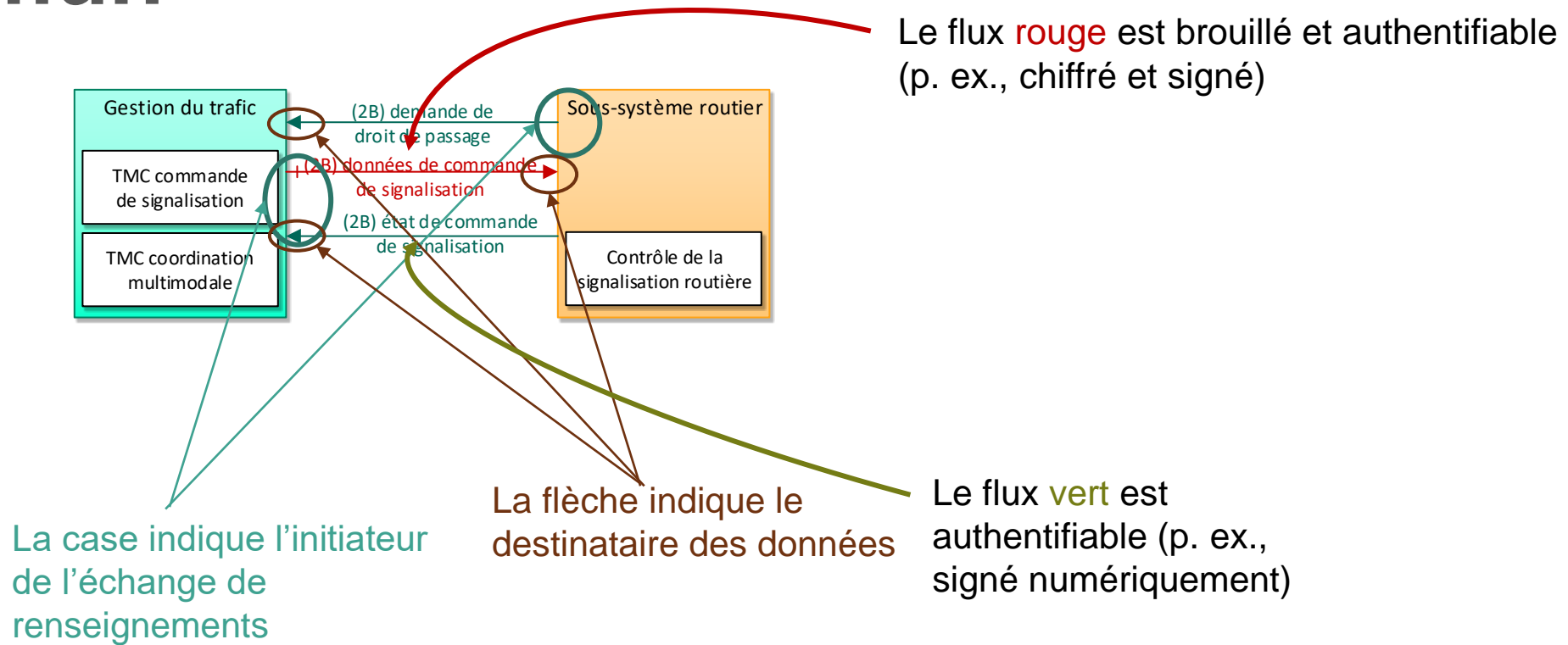
- Les ensembles de services représentent un point d'entrée commun aux architectures des STI
- Présentations graphiques simples et compréhensibles
- Basé sur des applications et des stratégies de STI livrables
- Utilise des éléments de base communs

# Exemple d'ensemble de services – Signalisation prioritaire pour le transport en commun



1. Activation locale à la demande du véhicule de transport en commun sur le terrain
2. Activation centrale à la demande du centre de gestion de transport en commun
3. Activation locale ou centrale basée sur la communication véhicule à infrastructure (V2I).

# Exemple d'ensemble de services – Signalisation prioritaire pour le transport en commun



Légende physique								
Contexte de la durée de mise en œuvre	Contexte spatial du flux	Routage du flux	État du flux	Cardinalité du flux	Contrôle du flux	Sécurité du flux	Éléments	Objets fonctionnels
1 - Maintenant	A - Adjacent	(c) - Acheminé par le biais d'un élément de communication	— Actuel —> - - Projets - ->	— Envoi individuel —> — Multidiffusion —>	— Receipt acknowledged —> □ Transaction initiated by left-hand party	— Clear text, No Authent. —> — Encrypted, No Authent. —> — Clear text, Authenticated —> — Encrypted, Authenticated —>	Centre Terrain Véhicule Personnel Soutien STI	Actuel Projets Futur Sans objet
2 - Récent	B - Local		- - - - Futur - - - ->	— Diffusion —>>				
3 - Historique	C - Régional	(d) - Acheminé par le biais d'un service de distribution de données	- - - - Sans objet - - - ->					
4 - Statique	D - National E - Continental							

Traduit sur la base du matériel de : Département des Transports (DOT) des É.-U.

# Résumé ARC-IT

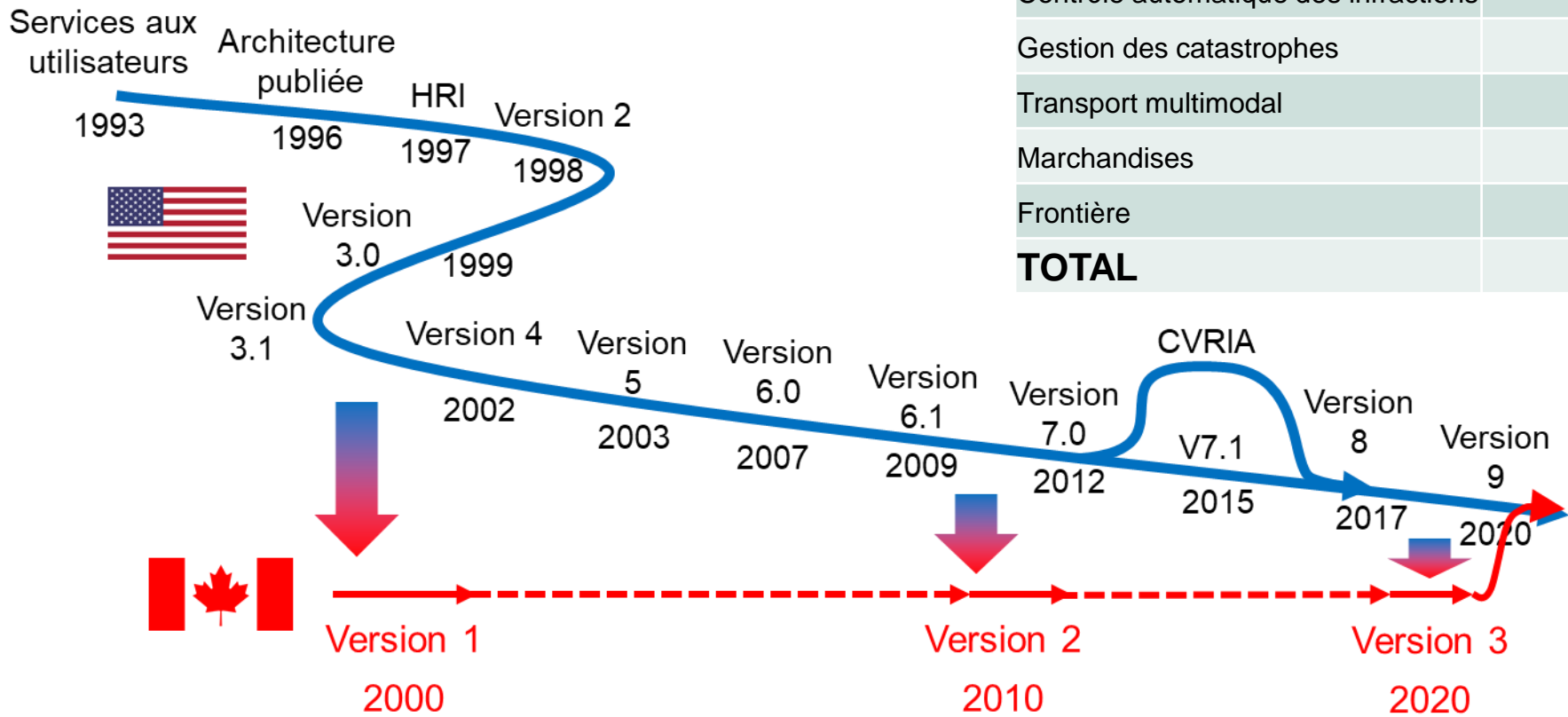
- Les architectures de STI fournissent des cadres pour l'élaboration de systèmes de transport intégrés
- Il y a 4 points de vue complémentaires sur ARC-IT
- Les ensembles de solutions applicatives incluent des aspects de tous les points de vue et sont facilement accessibles



# Éléments canadiens



# L'évolution des éléments canadiens



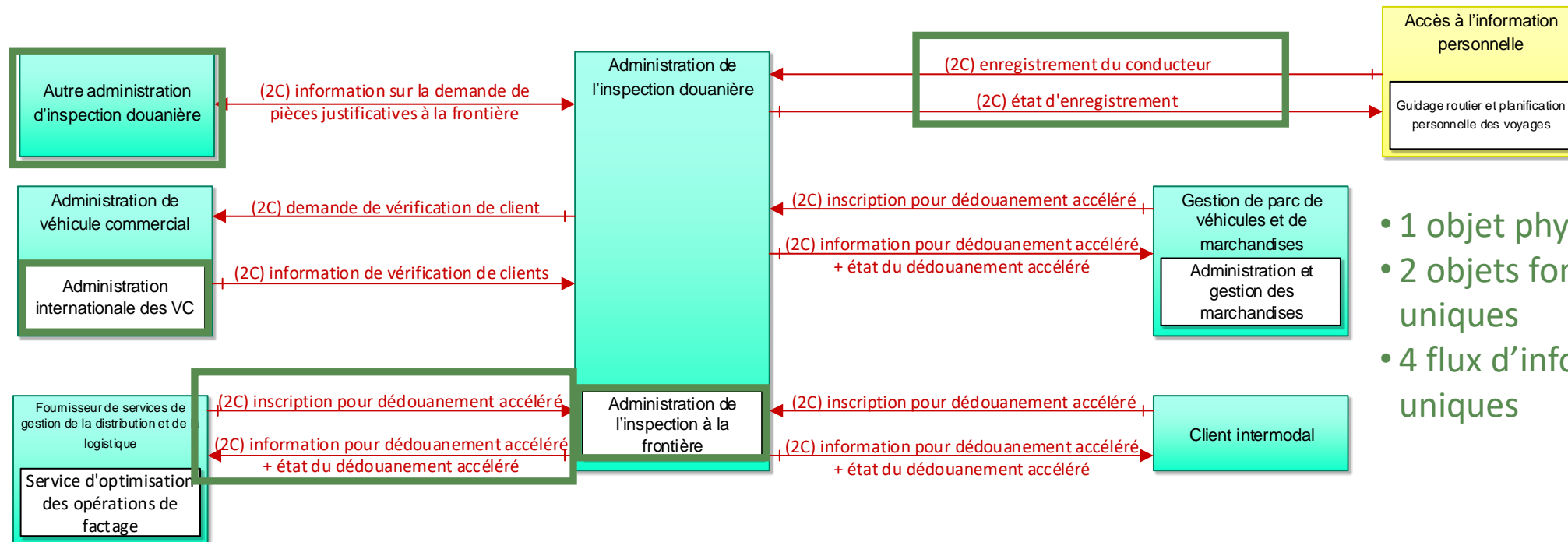
Zone de service priorisée	Version 1	Version 2	Version 3
Non liée aux véhicules	2	2	0
Maintenance	2	0	0
Conditions météorologiques	5	2	1
Contrôle automatique des infractions	2	1	1
Gestion des catastrophes	2	0	0
Transport multimodal	1	1	0
Marchandises	2	1	0
Frontière	0	3	2
<b>TOTAL</b>	<b>16</b>	<b>10</b>	<b>4</b>

- Intègre les 4 ensembles de service canadiens
  - Bases de données
  - Site Internet
  - RAD-IT
  - SET-IT

**ARC-IT 9**

# CVO20 : Enregistrement aux frontières internationales

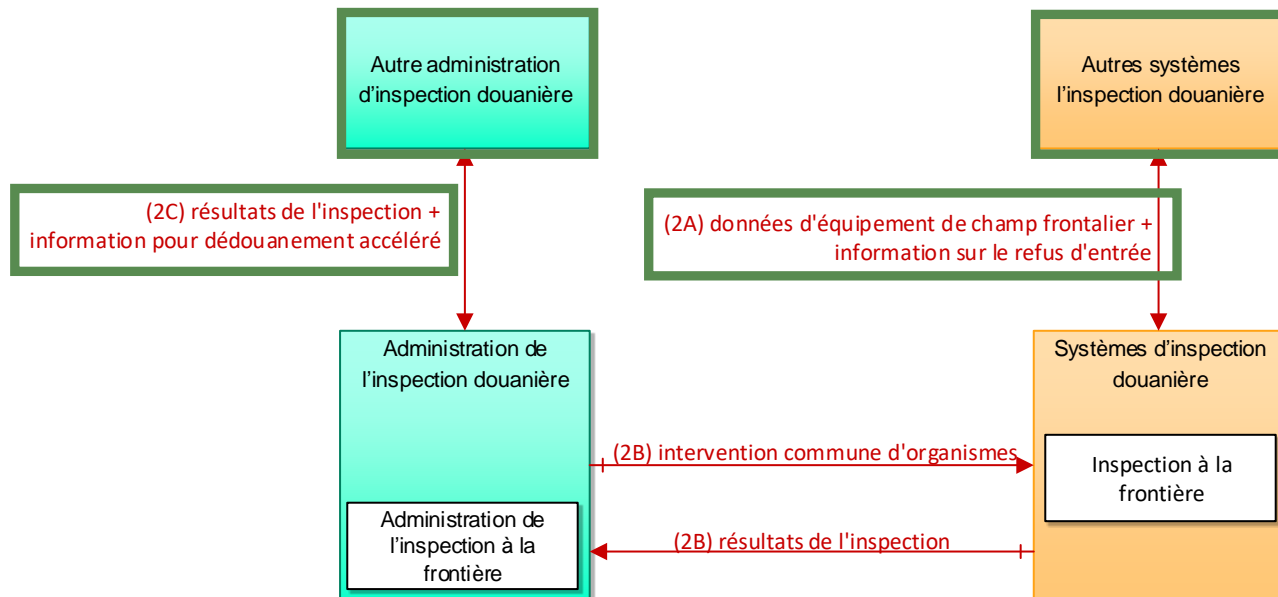
Cet ensemble de services couvre l'enregistrement des importateurs, des transporteurs, des moyens de transport et des chauffeurs pour un dédouanement accéléré à la frontière. Il représente l'inscription à des programmes tels que FAST, NEXUS, Customs Self Assessment, C-TPAT, PIP, ACI et ACE.



- 1 objet physique unique
- 2 objets fonctionnels uniques
- 4 flux d'informations uniques

# CVO22 : Coordination des frontières internationales

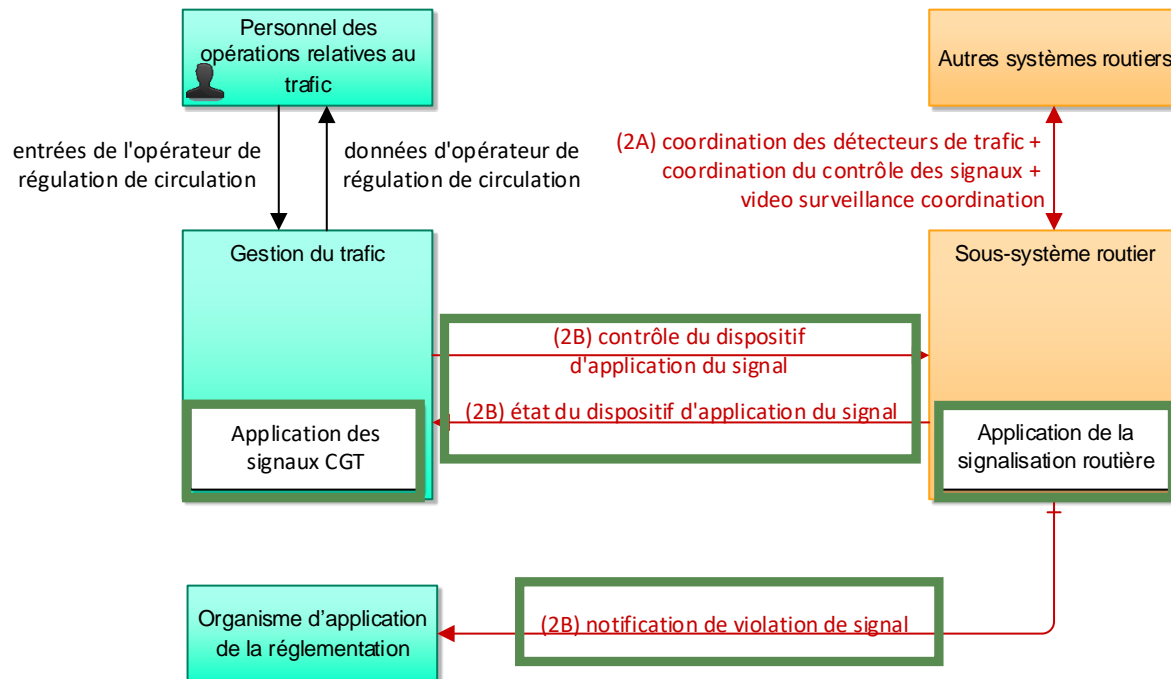
Cet ensemble de services couvre la coordination et le partage de renseignements entre les organismes pour accélérer le dédouanement, le prétraitement douanier et les inspections aux frontières.



- 2 objet physique unique
- 0 objets fonctionnels uniques
  - Mais il existe des besoins et des exigences uniques
- 4 flux d'informations uniques

# TM26 : Application des règlements de signalisation routière

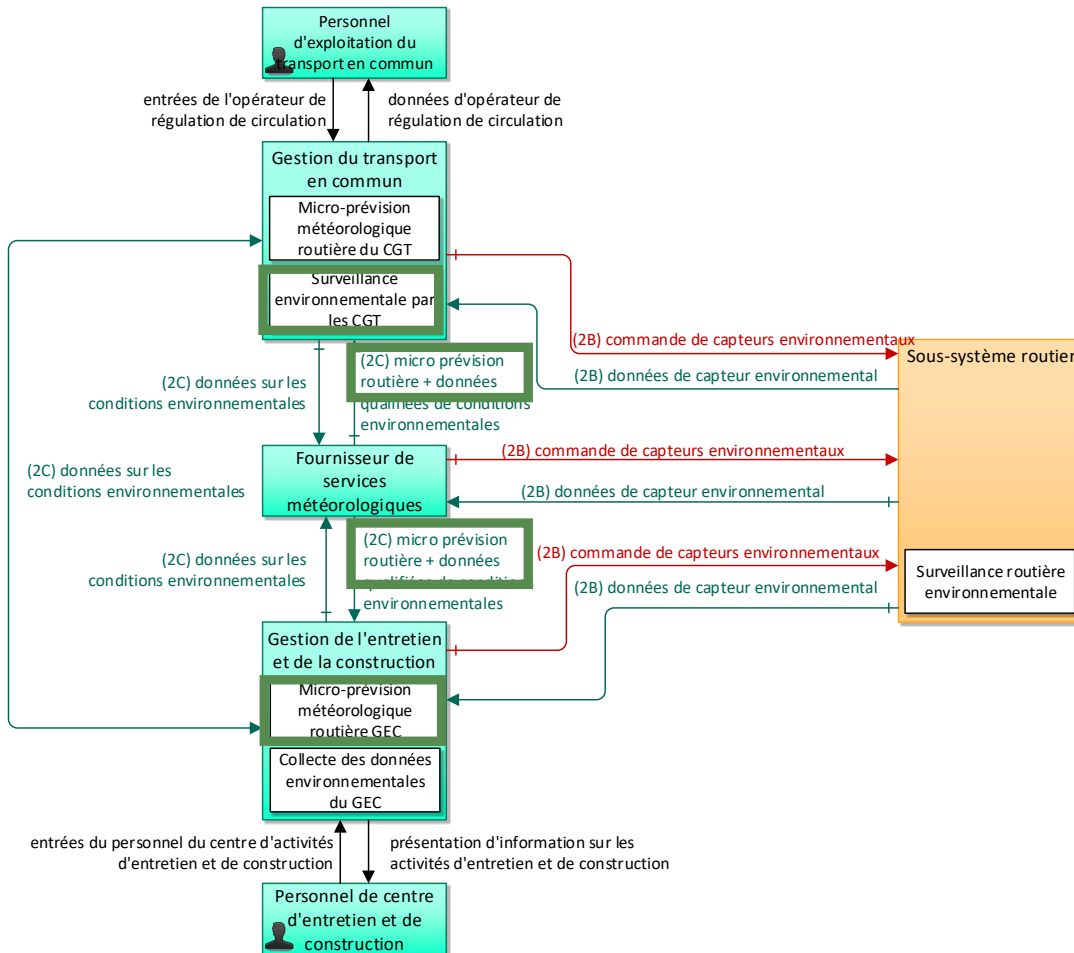
Cet ensemble de services prend en charge la détection et l'application des règlements de signalisation routière. Une mise en œuvre courante de cette capacité est le « contrôle des feux rouges » pour les intersections signalisées. Les renseignements documentant un véhicule entrant dans l'intersection lorsque le feu est rouge sont capturées et transmises à un organisme d'application de la loi.



- 0 objets physiques uniques
- 2 objets fonctionnels uniques
- 3 flux d'informations uniques

# WX04 : Micro-prédiction routière

Cet ensemble de services prend en charge des systèmes avancés qui utilisent les renseignements environnementaux collectés à partir du matériel routier des STI ou du service météorologique des transports de surface, ainsi que des algorithmes avancés, pour créer des micro-prédictions des conditions routières pouvant prendre en charge des avertissements de sécurité améliorés ainsi que la planification et la répartition de la maintenance.



- 0 objets physiques uniques
- 2 objets fonctionnels uniques
- 1 flux d'informations unique

# Résumé des éléments canadiens

- Le « degré d'unicité » diminue avec chaque version canadienne
- La version 3 comprenait 4 ensembles de services uniques
- Développer tous les éléments requis pour ces ensembles de services uniques
  - Pour toutes les perspectives
  - Aux normes USDOT
  - Coordination avec l'équipe de l'ARC-IT aux É.-U.
- La version 9 de l'ARC-IT intègre les 4 en tant qu'ensembles de services internationaux



# Pause







# Visite du site Web d'ARC-IT



# Site Web d'ARC-IT : <http://www.arc-it.net>

- Organise le contenu de l'architecture dans un format hypertexte en couches
- Permet un accès ciblé facile et rapide aux sujets d'intérêt

The screenshot shows the homepage of the ARC-IT website. At the top, there is a blue header with the United States Department of Transportation logo and the text 'ARC-IT Version 9.2 The National ITS Reference Architecture'. Below the header is a navigation menu with links for 'Architecture', 'Architecture Use', 'Architecture Resources', 'Architecture Terminology', and 'Contact The Architecture Team'. The main content area features the title 'Architecture Reference for Cooperative and Intelligent Transportation' and a paragraph explaining the purpose of ARC-IT. A sidebar on the right contains 'Latest News' and a section titled 'Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT)' with four sub-sections: 'Enterprise View', 'Functional View', 'Physical View', and 'Communications View'. Each sub-section includes a small diagram and a brief description.

United States Department of Transportation

ARC-IT Version 9.2  
The National ITS Reference Architecture

Architecture Use Architecture Resources Architecture Terminology Contact The Architecture Team

## Architecture Reference for Cooperative and Intelligent Transportation

The Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT) provides a common framework for planning, defining, and integrating intelligent transportation systems. It is a mature product that reflects the contributions of a broad cross-section of the ITS community (transportation practitioners, systems engineers, system developers, technology specialists, consultants, etc.).

ARC-IT is a reference architecture: it provides common basis for planners and engineers with differing concerns to conceive, design and implement systems using a common language as a basis for delivering ITS, but does not mandate any particular implementation. ARC-IT includes artifacts that answer **concerns** relevant to a large variety of **stakeholders**, and provides **tools** intended for transportation planners, regional architects and systems engineers to conceive of and develop regional architectures, and scope and develop projects.

To get started, begin with the menu bar above:

- **Architecture** contains links to all of the content inside the architecture, and describes the structure of the architecture. In particular:
  - **Service Packages** represent slices of the architecture that address a specific service like traffic signal control and provide the most straightforward entry into ARC-IT content.
  - **Views** and its sub-menus provide view-specific content; if for example you are looking for a particular **information flow**, or a particular **communications profile**, browse the relevant physical and communications sections here.
  - **Methodology** and its sub-menus describe the structure of the architecture: how it is built, how the artifacts within are inter-related.
  - The **Security** section describes how security is addressed throughout the architecture and provides links to cross-cutting security content.
- **Architecture Use** describes how to use ARC-IT, from the perspective of a regional architect, transportation planner or project systems engineer.
- **Architecture Resources** provides access to all ARC-IT content in user-downloadable forms. Notably this also includes access to our tools: RAD-IT and SET-IT, that provide you with means to manipulate the architecture according to models' rules, customizing the reference architecture to your regional or project needs.
- **Architecture Terminology** provides those definitions that permeate these pages.
- **Contact the Architecture Team** gives you a direct line to the source. We want to hear from you! If you have questions, concerns or find an error (say it isn't so!) we'd like to know about it!

**Latest News**

ARC-IT includes all views of the National ITS Reference Architecture - Enterprise, Functional, Physical and Communications views, as well as over 150 service packages that present slices of the architecture to show how ITS could be deployed to solve real transportation needs. Version 9.2 focuses on improvements that support Multimodal Accessible Travel (MAT), the Management of Electronic Traffic Regulations (METR), and other new concepts and refinements. [Read more...](#)

November 2023 - The ARC-IT website is updated with enhancements and bug fixes to the RAD-IT & SET-IT software. See [below](#) for details.

RAD-IT 9.2.1 includes new document output settings, a new Services Readiness output report, and corrects several performance issues while supporting conversion from previous versions. [Read more...](#)

SET-IT 9.2.1 includes enhancements to the search feature, fixes to the document generator, and fixes for occasional crashes, along with other fixes for known issues and to support conversion from previous versions. [Read more...](#)

### Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT)

- Enterprise View**
- Functional View**
- Physical View**
- Communications View**

# Site Web d'ARC-IT : Titre, barre de menus et dernière mise à jour

The screenshot shows the homepage of the ARC-IT website. At the top, the United States Department of Transportation logo is on the left, and navigation links for 'About DOT', 'Briefing Room', and 'Our Activities' are on the right. Below this is a blue header with the text 'ARC-IT Version 9.2 The National ITS Reference Architecture'. A yellow arrow points to this header. Below the header is a dark blue navigation bar with menu items: 'Architecture', 'Architecture Use', 'Architecture Resources', 'Architecture Terminology', and 'Contact The Architecture Team'. Another yellow arrow points to this menu bar. The main content area has a title 'Architecture Reference for Cooperative and Intelligent Transportation' and a descriptive paragraph. A 'Latest News' section on the right contains two news items. Below the news is a vertical stack of four colored boxes representing different views: 'Enterprise View' (blue), 'Functional View' (red), 'Physical View' (purple), and 'Communications View' (green). At the bottom left, the text 'Last Updated 11/20/2023' is displayed, with a yellow arrow pointing to it. A footer at the very bottom contains a disclaimer about the public domain status of the information.

United States Department of Transportation

ARC-IT Version 9.2  
The National ITS Reference Architecture

Architecture Use Architecture Resources Architecture Terminology Contact The Architecture Team

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**Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT)**

- Enterprise View
- Functional View
- Physical View
- Communications View

Last Updated 11/20/2023

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# Site Web d'ARC-IT : Page d'accueil



## Roles

The table below lists the Roles that comprise the Enterprise View of ARC-IT.

Role Name	Description
Advises	An Enterprise that can provide information about a Resource or Document.
Certifies	An Enterprise verifies that a target Resource meets relevant performance, functional, environmental and quality requirements. This could be an independent third party or it could be the same entity that has the Develops role. For instance, an automotive OEM practicing "self certification" would have this role with respect to the Basic Vehicle, whereas an independent certification body might have this role with respect to a Vehicle OBE (though of course the OEM could also fill this role).
Develops	An Enterprise creates the target Resource or Document. The Enterprise that engineers a traffic signal controller (ITS Roadway Equipment), or designs a vehicle (Basic Vehicle) or authors a technical standard will have the Develops role.
Installs	An Enterprise performs the initial delivery, integration and configuration of the target Resource. This might be a system integrator, a state DOT Enterprise performing its own installation, or a device supplier that performs on-site installation.
Maintains	An Enterprise administers the hardware and software that comprise the target Resource. The entity that takes the 'maintains' role typically is delegated authority by the entity with the "Owns" or "Manages" roles, depending on the environment. The maintainer interacts with the target Resource so as to keep that Resource in the Operational state.
Manages	The Enterprise that is accountable for performing actions with a Resource, typically in support of one of the key operations-related roles (operates, installs, maintains). This authority is typically delegated by the Enterprise with the "Owns" role, and commonly accomplished by delegation to Human E-Objects with the "operates", "installs" or "maintains" roles, depending on the context.
Operates	A Human that is accountable for performing actions with a Resource, typically in support of one of the key operations-related roles (operates, installs, maintains). This is the person at the console or behind the wheel.
Owns	An Enterprise has financial ownership and control over the Resource. An Enterprise that Owns a resource is considered accountable for the resource and all of its contents. The Owns role includes ownership during Operations and Maintenance and also Acquisition during the Installation phase. The entity that takes the "owns" role is ultimately responsible for ensuring the resource provides its promised functionality, and for securing data the resources holds and exchanges. The owner is similarly responsible for the facilities inherent to the resource that are used to exchange data with other systems. The owner is responsible for ensuring that any data stored by the resource and any data communicated by the resource are protected to the extent necessary considering the contents of the data and the consequences of its exposure or alteration.
Provides	The Enterprise that provides the basic service of a service package.
Supplies	The Enterprise that supplies a device or software product. The Supplier delivers the target resource to the Owner.
Uses	An Enterprise or Human that interacts with a Resource or Document in a way not captured by other roles. For instance, the person that reviews a document, or the agency informed of project status would have this role.
Verifies	The Enterprise that determines whether or not a target Resource meets documented requirements. This action is typically on behalf of the Owner.

# Site Web d'ARC-IT : Menu architecture

United States Department of Transportation

ARC-IT Version 9.2  
The National ITS Reference Architecture

Architecture Architecture Use Architecture Resources Architecture Terminology Contact The Architecture Team

Service Packages  
Views  
Enterprise  
Functional  
Physical  
Communications  
Methodology  
Architecture Structure  
Enterprise Viewpoint  
Functional Viewpoint  
Physical Viewpoint  
Communications Viewpoint  
Security

## Architecture Overview

for Cooperative and Intelligent Transportation (ARC-IT) includes a set of interconnected components that are organized into four views that focus on four different architecture perspectives. A variety of entry allow you to start with any of these components, though most people start with **Service Packages**. Once in, you can easily navigate from component to component to find what you need. This interconnected nature of the traceability that is maintained between each of the architecture components.

The diagram illustrates the Architecture Overview of ARC-IT. It features four main views: Enterprise View, Functional View, Physical View, and Communications View. Each view is represented by a colored box with icons and text. The Enterprise View (blue) includes Enterprise Objects, Needs, Relationships, and Rules. The Functional View (red) includes Requirements, Data Flows, and Processes. The Physical View (purple) includes Physical Objects, Information Flows, and Functional Objects. The Communications View (green) includes Standards, Profiles, and Solutions. A vertical stack of Service Packages (blue, red, green) is shown on the right, with arrows indicating relationships between the views and the packages. A Security box is also present at the bottom right. A yellow arrow points to the 'Views' section in the left-hand navigation menu.

ARC-IT is comprised of four views:

1. **Enterprise View** considers ITS from an organizational perspective. It identifies stakeholder organizations or **enterprise objects** - the people and organizations that plan, develop, operate, maintain, and use ITS. It defines stakeholder **roles** and the **relationships** between **stakeholders**. This is also the view where **needs** are defined since ARC-IT, and more broadly ITS, is driven by the needs of stakeholder organizations, their constituents, and customers.
2. **Functional View** looks at ITS from a functional perspective. Functional **requirements** are defined that support ITS user needs. **Processes** and **data flows** provide a structured presentation of functions and interactors that support the

# Site Web d'ARC-IT : Page ensembles de services

[CVO17](#)

[Intelligent Access Program](#)

## CVO20: International Border Registration

This service package covers registration of importers, carriers, conveyance, and drivers for expedited clearance at the border. It represents enrollment in programs such as FAST, NEXUS, Customs Self Assessment, C-TPAT, PIP, ACI, and ACE.

Origin: Canada

Relevant Regions: Australia, Canada, European Union, and United States

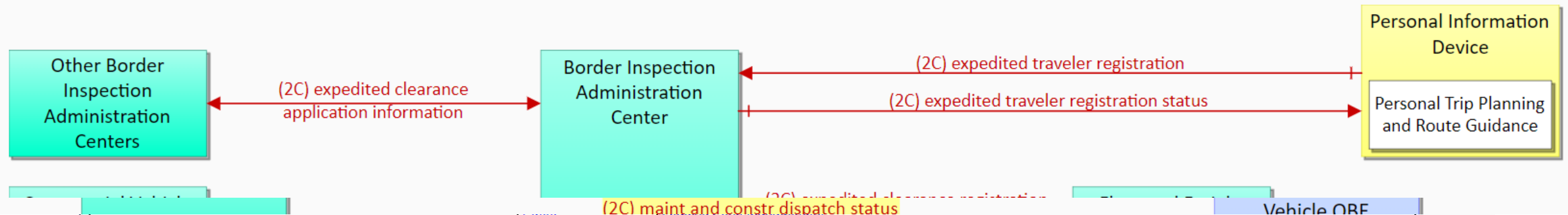
Enterprise Functional Physical Goals and Objectives Needs and Requirements Sources Security Standards System Requirements

### Physical

The physical diagram can be viewed in SVG or PNG format and the current format is SVG.

[SVG Diagram](#)

[PNG Diagram](#)



PS01	<a href="#">Emergency Call-Taking and Dispatch</a>
PS02	<a href="#">Emergency Response</a>
PS03	<a href="#">Emergency Vehicle Preemption (Implementations)</a>
PS04	<a href="#">Mayday Notification</a>
PS05	<a href="#">Vehicle Emergency Response</a>

# Site Web d'ARC-IT : Détails des ensembles de services

United States Department of Transportation

About DOT | Briefing Room | Our Activities

## ARC-IT Version 9.0

The National ITS Reference Architecture

Architecture ▼ Architecture Use ▼ Architecture Resources ▼ Architecture Terminology ▼ Contact The Architecture Team

ENHANCED ⓘ

Home > Service Packages > Queue Warning

<< VS07 : VS08 : VS09 >>

### VS08: Queue Warning

This service package utilizes connected vehicle technologies, including vehicle-to-infrastructure (V2I) and vehicle-to-vehicle (V2V) communications, to enable vehicles within the queue event to automatically broadcast their queued status information (e.g., rapid deceleration, disabled status, lane location) to nearby upstream vehicles and to centers (such as the TMC). The infrastructure will broadcast queue warnings to vehicles in order to minimize or prevent rear-end or other secondary collisions. This service package is not intended to operate as a crash avoidance system. In contrast to such systems, this service package will engage well in advance of any potential crash situation, providing messages and information to the driver in order to minimize the likelihood of his needing to take crash avoidance or mitigation actions later. It performs two essential tasks: queue determination (detection and/or prediction) and queue information dissemination using vehicle-based, infrastructure-based, or hybrid solutions.

Relevant Regions: Australia, Canada, European Union, and United States

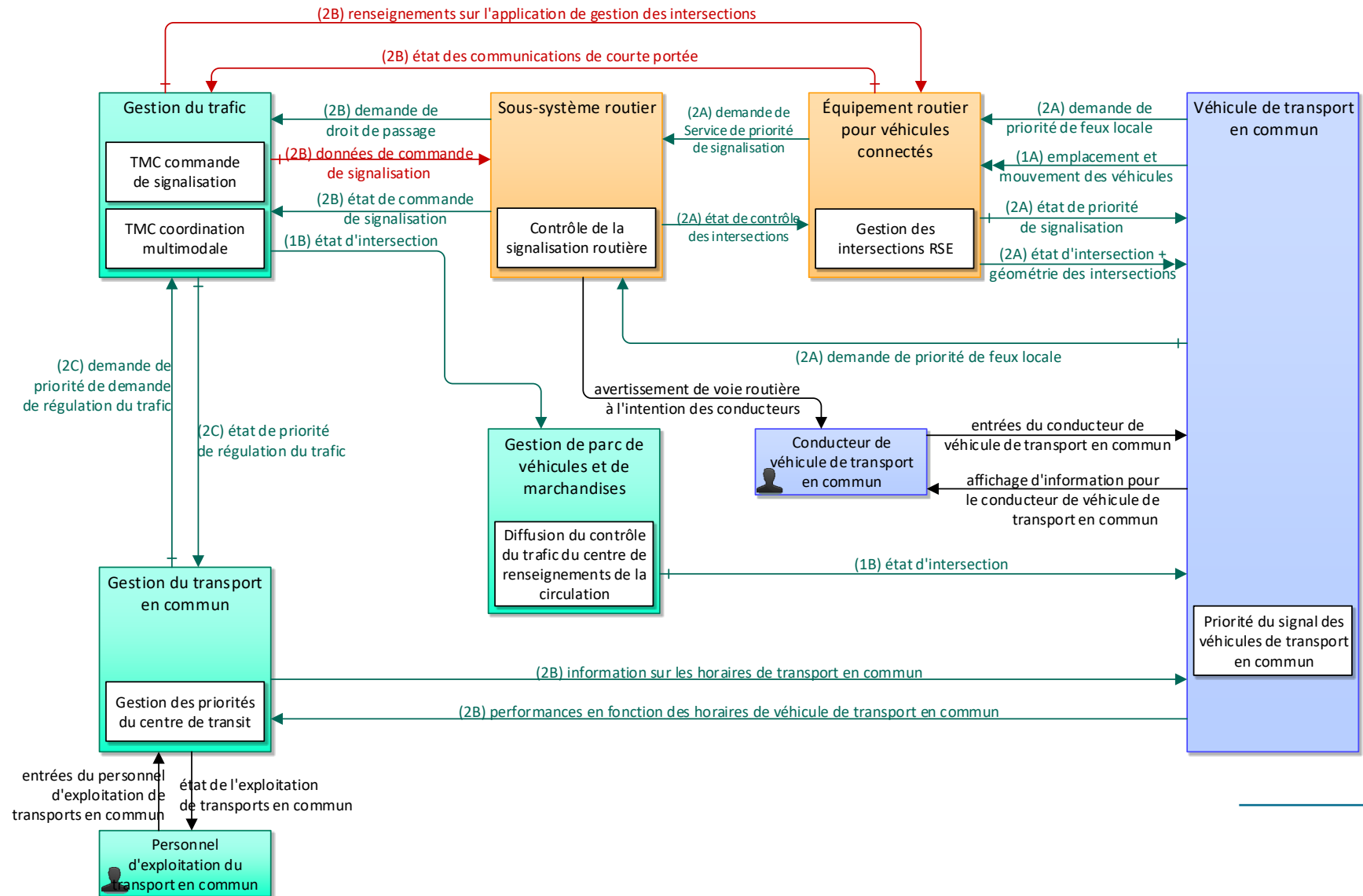
Enterprise Functional **Physical** Goals and Objectives Needs and Requirements Sources Security Standards

#### Physical

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[SVG Diagram](#)  
[PNG Diagram](#)

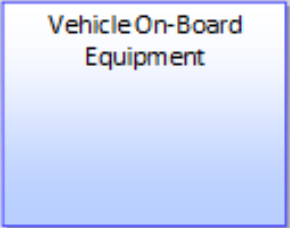

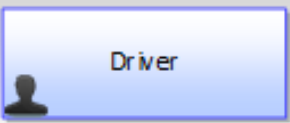
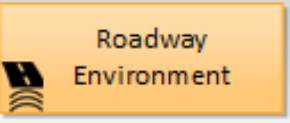
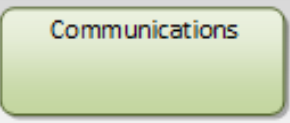
# Ensemble de services – Signalisation prioritaire pour le transport en commun

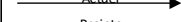



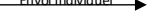
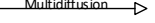
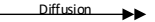
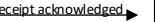

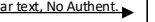

















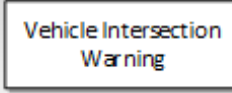
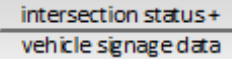
# Légende des ensembles de services – Objets physiques

The Physical View Service Package Diagrams show the subset of the ARC-IT Physical View that supports each service package. These diagrams identify the physical objects, functional objects, and information flows that support each service package.

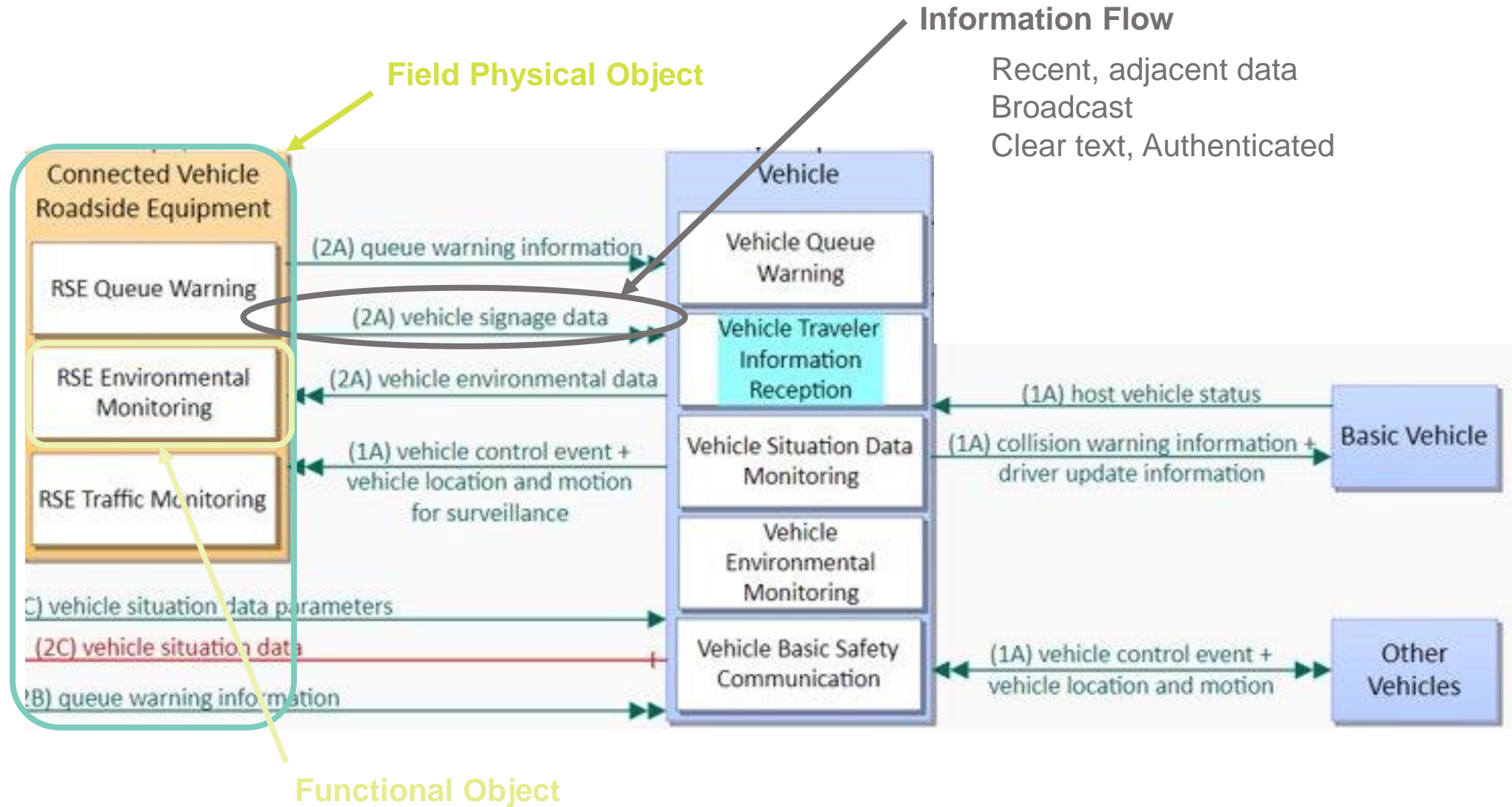
	<p>Physical objects are shown as colored rectangles. They represent the operational centers, field equipment, vehicle on-board equipment, personal devices, and support systems in the Intelligent Transportation Systems environment. They are color coded to identify which of these classes they belong to. Since they correspond closely with the physical transportation system, the interfaces between physical objects tend to be prime candidates for standardization.</p>
	
	<p>People also have an operational role in ITS. People are shown in the physical view as colored rectangles that include a human silhouette that distinguishes them from the other physical objects that represent man-made parts of the Connected Vehicle environment. Like the other physical objects, they are color coded to represent the environment where they primarily operate.</p>
	<p>ITS must work within an operational environment that includes things like the road surface and striping, vulnerable road users and other objects to be detected and avoided, and unequipped vehicles that must be sensed to be avoided. This operational environment is depicted in ARC-IT with physical objects that represent the environment; these objects represent what field and vehicle-based sensors sense. All of these objects have three 'sensor' curves in the lower left corner. They may be colored as Field, Vehicle, or Personal depending on the portion of the environment they represent.</p>
	<p>Some of the physical objects defined in ARC-IT primarily provide a communications capability that enables other physical objects to share information. These communications objects are not shown on every interface where they apply to keep the service package diagrams manageable, but when they are included, they are shown as physical objects with the support class color and rounded corners to distinguish them from other physical objects.</p>

Légende physique								
Contexte de la durée de mise en œuvre	Contexte spatial du flux	Routage du flux	État du flux	Cardinalité du flux	Contrôle du flux	Sécurité du flux	Éléments	Objets fonctionnels
1 - Maintenant	A - Adjacent	(c) - Acheminé par le biais d'un élément de communication	 Actuel  Projets  Futur  Sans objet	 Envoi individuel  Multidiffusion  Diffusion	 Receipt acknowledged  Transaction initiated by left-hand party	 Clear text, No Authen.  Encrypted, No Authen.  Clear text, Authenticated  Encrypted, Authenticated	 Centre  Terrain  Véhicule  Personnel  Soutien  STI	 Actuel  Projets  Futur  Sans objet
2 - Récent	B - Local							
3 - Historique	C - Régional	(d) - Acheminé par le biais d'un service de distribution de données						
4 - Statique	D - National E - Continental							

# Légende des ensembles de services – Flux d'informations

	<p>Functional objects are shown as smaller white rectangles that are contained within a physical object. Functional objects define the functionality that is required for each physical object to support one or more service packages. The functional objects serve as service-oriented containers for the functionality defined in the Functional View. Not all physical objects include functional objects since functionality that is peripheral to a particular service may not be shown on the service package diagram. Physical objects that are peripheral to ITS (e.g., a Financial Center or Weather Service Center) may not include functional objects in any of the service packages. The interfaces to these physical objects are important to ITS, but ITS will not add functionality to these broader systems.</p>
	<p>Information flows between physical objects are shown as solid lines that include arrowheads to indicate the direction the information is flowing. The flow is labeled with one or more flow names that identify the information that is transferred. The source physical object, destination physical object, and information flow together identify a "triple". The relationship between functional objects and information flows are not shown on the diagram. Consult the website or the database to view the specific functional objects that are associated with each information flow.</p>
<p><b>Flow Time Context</b></p> <p>1 - Now    3 - Historical 2 - Recent    4 - Static</p>	<p>Flow Time Context is represented as a number to the left of the flow name. This indicates the time sensitivity of the data contained within the information flow. The values are "Now", "Recent", "Historical", or "Static" for data that never or rarely ever changes.</p>
<p><b>Flow Spatial Context</b></p> <p>A - Adjacent    D - National B - Local    E - Continental C - Regional</p>	<p>Flow Spatial Context is represented by a letter to the left of the flow name. This indicates the spatial relevance of the data contained within the information flow. The values are "Adjacent", "Local", "Regional", "National", or "Continental".</p>
<p><b>Flow Cardinality</b></p> <p>Unicast → Multicast →▷ Broadcast →▷▷</p>	<p>Flow Cardinality shows whether a flow is unicast (sent to one destination), multicast (sent to multiple addressees), or broadcast (sent to anyone with the right equipment). It is represented by the arrowhead – single, closed; single, open; or double, closed.</p>
<p><b>Flow Control</b></p> <p>Receipt acknowledged → Transaction initiated by left-hand party →</p>	<p>A crossing line at the flow source indicates whether an information flow is acknowledged. Flows that are part of a transaction initiated by one side or the other are shown with a white box on the side that initiates the transaction. <i>(Note: the initiator boxes are only available in PNG format, the SVG drawings do not show the initiator boxes.)</i></p>
<p><b>Flow Security</b></p> <p>Clear text, No Authent. → Encrypted, No Authent. → Clear text, Authenticated → Encrypted, Authenticated →</p>	<p>Flow Security is used to indicate what mechanisms should be in place in order for the information to get to its destination securely and in support of the overall security and privacy requirements for the system and its users. Black indicates 'clear' or no security specified; Blue indicates it should be encrypted but the sender does not have to be authenticated as the source of the message; Green indicates the information can be sent without encryption but the sender should be authenticated; Red indicates flows that require both encryption of the information and authentication of the source. These characteristics are based on a FIPS-199 analysis that evaluates confidentiality, integrity, and availability requirements for each triple.</p>

# Composants des ensembles de services



# Exemple d'avertissement de file d'attente : Détails de la page perspective physique

## Includes Physical Objects:

Physical Object	Class	Description
<a href="#">Connected Vehicle Roadside Equipment</a>	Field	'Connected Vehicle Roadside Equipment' (CV RSE) represents the Connected Vehicle roadside devices that are used to send messages to, and receive messages from, nearby vehicles using Dedicated Short Range Communications (DSRC) or other alternative wireless communications technologies. Communications with adjacent field equipment and back office centers that monitor and control the RSE are also supported. This device operates from a fixed position and may be permanently deployed or a portable device that is located temporarily in the vicinity of a traffic incident, road construction, or a special event. It includes a processor, data storage, and communications capabilities that support secure communications with passing vehicles, other field equipment, and centers.

## Includes Functional Objects:

Functional Object	Description	Physical Object
<a href="#">RSE Queue Warning</a>	'RSE Queue Warning' provides V2I communications to support queue warning systems. It monitors connected vehicles to identify and monitor queues in real-time and provides information to vehicles about upcoming queues, including downstream queues that are reported by the Traffic Management Center.	<a href="#">Connected Vehicle Roadside Equipment</a>





## Includes Information Flows:

Information Flow	Description
<a href="#">queue warning information</a>	Information regarding formed or impending queues (location of the end of queue, estimated duration of the queue, and other descriptions of the queue condition) and recommendations for upstream vehicles including speed reduction, lane change, or diversion recommendations.

# Exemple d'avertissement de file d'attente – Objet fonctionnelle

Physical Object:  
Connected Vehicle  
Roadside Equipment


## RSE Queue Warning



OverviewRequirementsInformation FlowsStandards

### Overview

'RSE Queue Warning' provides V2I communications to support queue warning systems. It monitors connected vehicles to identify and monitor queues in real-time and provides information to vehicles about upcoming queues, including downstream queues that are reported by the Traffic Management Center.

This functional object is included in the "Connected Vehicle Roadside Equipment" physical object. 

This functional object is included in the following service packages:

- [VS08: Queue Warning](#)


# Exemple d'avertissement de file d'attente : Détails de la page perspective physique

## Includes Physical Objects:

Physical Object	Class	Description
<a href="#">Connected Vehicle Roadside Equipment</a>	Field	'Connected Vehicle Roadside Equipment' (CV RSE) represents the Connected Vehicle roadside devices that are used to send messages to, and receive messages from, nearby vehicles using Dedicated Short Range Communications (DSRC) or other alternative wireless communications technologies. Communications with adjacent field equipment and back office centers that monitor and control the RSE are also supported. This device operates from a fixed position and may be permanently deployed or a portable device that is located temporarily in the vicinity of a traffic incident, road construction, or a special event. It includes a processor, data storage, and communications capabilities that support secure communications with passing vehicles, other field equipment, and centers.

Functional Object	Description	Physical Object
<a href="#">RSE Queue Warning</a>	'RSE Queue Warning' provides V2I communications to support queue warning systems. It monitors connected vehicles to identify and monitor queues in real-time and provides information to vehicles about upcoming queues, including downstream queues that are reported by the Traffic Management Center.	<a href="#">Connected Vehicle Roadside Equipment</a>

## Includes Information Flows:

Information Flow	Description
 <a href="#">queue warning information</a>	Information regarding formed or impending queues (location of the end of queue, estimated duration of the queue, and other descriptions of the queue condition) and recommendations for upstream vehicles including speed reduction, lane change, or diversion recommendations.

# Exemple d'avertissement de file d'attente : Flux d'information

**ARC-IT** version **9.2**  
The National ITS Reference Architecture

Architecture ▾ Architecture Use ▾ Architecture Resources ▾ Architecture Terminology ▾ Contact The Architecture Team

[Home](#) > [Architecture](#) > [Views](#) > [Physical](#) > [Information Flows](#) > queue warning information

## queue warning information

Information regarding formed or impending queues (location of the end of queue, estimated duration of the queue, and other descriptions of the queue condition) and recommendations for upstream vehicles including speed reduction, lane change, or diversion recommendations.

Source	Flow	Destination
<a href="#">Connected Vehicle Roadside Equipment</a>	<a href="#">queue warning information</a>	<a href="#">Vehicle</a>

This Triple is in the following Service Packages:

- [V2X8\\_Queue Warning](#)

This Triple is in the following Functional Objects:

- [RSE\\_Queue Warning](#)
- [Vehicle\\_Queue Warning](#)

This Triple is described by the following Functional View Data Flows:

- [queue\\_warning\\_from\\_roadside](#)

# Exemple d'avertissement de file d'attente : Triplet de flux d'informations

United States Department of Transportation About DOT | Briefing Room | Our Activities

**ARC-IT** Version 9.2  
The National ITS Reference Architecture

Architecture Use ▼ Architecture Resources ▼ Architecture Terminology ▼ Contact The Architecture Team

Home > Views > Physical > Troles > Connected Vehicle Roadside Equipment --> Vehicle: queue warning information

## Connected Vehicle Roadside Equipment --> Vehicle: queue warning information

Definition | Included In | Communication Solutions | Characteristics | Security

### Definitions

**queue warning information (Information Flow):** Information regarding formed or impending queues (location of the end of queue, estimated duration of the queue, and other descriptions of the queue condition) and recommendations for upstream vehicles including speed reduction, lane change, or diversion recommendations.

**Connected Vehicle Roadside Equipment (Source Physical Object):** 'Connected Vehicle Roadside Equipment' (CV RSE) represents the Connected Vehicle roadside devices that are used to send messages to, and receive messages from, nearby vehicles using Dedicated Short Range Communications (DSRC) or other alternative wireless communications technologies. Communications with adjacent field equipment and back office centers that monitor and control the RSE are also supported. This device operates from a fixed position and may be permanently deployed or a portable device that is located temporarily in the vicinity of a traffic incident, road construction, or a special event. It includes a processor, data storage, and communications capabilities that support secure communications with passing vehicles, other field equipment, and centers.

**Vehicle (Destination Physical Object):** This 'Vehicle' physical object is used to model core capabilities that are common to more than one type of Vehicle. It provides the vehicle-based general sensory, processing, storage, and communications functions that support efficient, safe, and convenient travel. Many of these capabilities (e.g., see the Vehicle Safety service packages) apply to all vehicle types including personal vehicles, commercial vehicles, emergency vehicles, transit vehicles, and maintenance vehicles. From this perspective, the Vehicle includes the common interfaces and functions that apply to all motorized vehicles. The radio(s) supporting V2V and V2I communications are a key component of the Vehicle. Both one-way and two-way communications options support a spectrum of information services from basic broadcast to advanced personalized information services. Advanced sensors, processors, enhanced driver interfaces, and actuators complement the driver information services so that, in addition to making informed mode and route selections, the driver travels these routes in a safer and more consistent manner. This physical object supports all six levels of driving automation as defined in SAE J3016. Initial collision avoidance functions provide 'vigilant co-pilot' driver warning capabilities. More advanced functions assume limited control of the vehicle to maintain lane position and safe headways. In the most advanced implementations, this Physical Object supports full automation of all aspects of the driving task, aided by communications with other vehicles in the vicinity and in coordination with supporting infrastructure subsystems.



# Perspective des solutions de communication pour les triplets

Connected Vehicle Roadside Equipment --> Vehicle:  
queue warning information



Definition Included In **Communication Solutions** Characteristics Security

### Communication Solutions

-  EU: DEN Service - BTP/GeoNetworking/G5 (10)
-  US: SAE Traveler Info - LTE-V2X WSMP (21)
-  US: SAE Traveler Info - WAVE WSMP (23)

Solutions are sorted in ascending Gap Severity order. The Gap Severity is the parenthetical number at the end of the solution.

### Selected Solution

 EU: DEN Service - BTP/GeoNetworking/G5

### Solution Description

This solution is used within Australia and the E.U.. It combines standards associated with EU: DEN Service with those for V-X: BTP/GeoNetworking/G5. The EU: DEN Service standards include upper-layer standards required to implement V2x decentralized environmental notification information flows. The V-X: BTP/GeoNetworking/G5 standards include lower-layer standards that support broadcast, near constant, low latency vehicle-to-vehicle and vehicle-to-infrastructure communications using the ETSI GeoNetworking Bundle over the 5.9GHz spectrum.

# Solution de communication pour les triplets

[Connected Vehicle Roadside Equipment](#) --> [Vehicle OBE: queue warning information](#)

Link Type: Short Range  
Wireless

Definition | Included In | **Communication Solutions** | Characteristics | Security

**Communication Solutions**

Name: SAE J2945/4 Road Safety Applications

Long Name: Road Safety Applications

Doc #: SAE J2945/4

Version: -

Copy URL: <https://www.sae.org/standards/content/j2945/4/>

Description: This document revises and extends the existing SAE J2735 message elements in order to include additional travel and roadway information from the infrastructure to enhance safety awareness and promote the exchange and transfer of such messages types between vehicles and the infrastructure (V2I).

**ITS Application Gap**

SAE J2735 ⓘ  
SAE J2945/4 ⓘ

Name: Draft not available (Critical)

Gap Notes: SAE J2945/4 is still under development.

Type: Standardization Gap

Severity: High

Description: The standards development organization has established a work item for the subject standard but a draft is not available for this critical feature to enable the interface. The draft may be missing due to the work item being new or simply a lack of activity on the work item.

Mgmt	Facilities	Security
Addressed Elsewhere ⓘ	SAE J2945 ⓘ	Bundle: IEEE 1609.2 ⓘ
	TransNet	
	IEEE 1609.3 ⓘ	
	Access	
	Bundle: WAVE - Subnet ⓘ	

↓ GAP ↓

↓ GAP ↓

# Exemple d'avertissement de file d'attente : Besoins et exigences

- Chaque ensemble de service définit par ses besoins.
- Ch...

Architecture Use Architecture Resources Architecture Terminology Contact The Architecture Team ENHANCED E

Home > Service Packages > Queue Warning

<< VS07 VS08 VS09 >>

### VS08: Queue Warning

This service package utilizes connected vehicle technologies, including vehicle-to-infrastructure (V2I) and vehicle-to-vehicle (V2V) communications, to enable vehicles within the queue event to automatically broadcast their queued status information (e.g., rapid deceleration, disabled status, lane location) to nearby upstream vehicles and to centers (such as the TMC). The infrastructure will broadcast queue warnings to vehicles in order to minimize or prevent rear-end or other secondary collisions. This service package is not intended to operate as a crash avoidance system. In contrast to such systems, this service package will engage well in advance of any potential crash situation, providing messages and information to the driver in order to minimize the likelihood of his needing to take crash avoidance or mitigation actions later. It performs two essential tasks: queue determination (detection and/or prediction) and queue information dissemination using vehicle-based, infrastructure-based, or hybrid solutions.

Relevant Regions: Australia, Canada, European Union, and United States

Enterprise Functional Physical Goals and Objectives **Needs and Requirements** Sources Security Standards

#### Needs and Requirements

Need	Functional Object	Requirement
01 Traffic Operations needs to be able to detect a queue formation using both infrastructure and connected vehicle sources of information.	Roadway Basic Surveillance	01 The field element shall collect, process, digitize, and send traffic sensor data (speed, volume, and occupancy) to the center for further analysis and storage, under center control.
		02 The field element shall collect, process, and send traffic images to the center for further analysis and distribution.
		04 The field element shall return sensor and CCTV system operational status to the controlling center.
	Roadway Warning	01 The field element shall monitor for hazardous traffic conditions, including queues.
		05 The field element shall autonomously identify potentially hazardous conditions and activate warning signs to approaching motorists.
		07 The field element shall collect operational status of the warning system field equipment and report the operational status to the controlling center.
	RSE Environmental Monitoring	04 The field element shall provide application status to the center for monitoring.
	RSE Queue Warning	01 The field equipment shall communicate with the connected vehicles to gather real-time vehicle-collected data including vehicle speed, location and localized weather condition from the vehicle network.
	RSE Traffic Monitoring	01 The field element shall communicate with on-board equipment on passing vehicles to collect current vehicle position, speed, and heading and a record of previous events (e.g., starts and stops, link travel times) that can be used to determine current traffic conditions.
	TMC Basic Surveillance	01 The center shall monitor, analyze, and store traffic sensor data (speed, volume, occupancy) collected from field elements under remote control of the center.
		02 The center shall monitor, analyze, and distribute traffic images from CCTV systems under remote control of the center.
		04 The center shall distribute road network conditions data (raw or processed) based on collected and analyzed traffic sensor and surveillance data to other centers.
		05 The center shall respond to control data from center personnel regarding sensor and surveillance data collection, analysis, storage, and distribution.
		06 The center shall maintain a database of surveillance equipment and sensors and associated data (including the roadway on which they are located, the type of data collected, and the ownership of each).

# Exemple d'avertissement de file d'attente : Sources

Architecture ▾ Architecture Use ▾ Architecture Resources ▾ Architecture Terminology ▾ Contact The Architecture Team

ENHANCED E

[Home](#) > [Service Packages](#) > Queue Warning

<< [VS07](#) : VS08 : [VS09](#) >>

## VS08: Queue Warning

This service package utilizes connected vehicle technologies, including vehicle-to-infrastructure (V2I) and vehicle-to-vehicle (V2V) communications, to enable vehicles within the queue event to automatically broadcast their queued status information (e.g., rapid deceleration, disabled status, lane location) to nearby upstream vehicles and to centers (such as the TMC). The infrastructure will broadcast queue warnings to vehicles in order to minimize or prevent rear-end or other secondary collisions. This service package is not intended to operate as a crash avoidance system. In contrast to such systems, this service package will engage well in advance of any potential crash situation, providing messages and information to the driver in order to minimize the likelihood of his needing to take crash avoidance or mitigation actions later. It performs two essential tasks: queue determination (detection and/or prediction) and queue information dissemination using vehicle-based, infrastructure-based, or hybrid solutions.

Relevant Regions: Australia, Canada, European Union, and United States

Enterprise Functional Physical Goals and Objectives Needs and Requirements **Sources** Security Standards

### Related Sources

Document Name	Version	Publication Date
Concept Development and Needs Identification for INFLO: Functional and Performance Requirements, and High-Level Data and Communication Needs	Final	11/1/2012
Concept Development and Needs Identification for Intelligent Network Flow Optimization (INFLO), Functional and Performance Requirements, and High-Level Data and Communication Needs	Draft v5.0	11/1/2012
Report on Detailed Requirements for the INFLO Prototype	Final	12/27/2013
Report on Dynamic Speed Harmonization and Queue Warning Algorithm Design	Final	2/28/2014
System Design Document for the INFLO Prototype	Final	3/28/2014

# Exemple d'avertissement de file d'attente – Sécurité

Enterprise	Functional	Physical	Goals and Objectives	Needs and Requirements	Sources	Security	Standards
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## Security

In order to participate in this service package, each physical object should meet or exceed the following security levels.

Physical Object Security				
Physical Object	Confidentiality	Integrity	Availability	Security Class
Basic Vehicle				
Connected Vehicle Roadside Equipment	Moderate	Moderate	Moderate	Class 2
ITS Roadway Equipment	Moderate	Moderate	Moderate	Class 2
Other Traffic Management Centers	Low	Moderate	Moderate	Class 1
Other Vehicle OBEs	Low	High	Moderate	Class 3

In order to participate in this application, each information flow triple should meet or exceed the following security levels.

Information Flow Security					
Source	Destination	Information Flow	Confidentiality	Integrity	Availability
			Basis	Basis	Basis
Basic Vehicle	Vehicle OBE	host vehicle status	Low	Moderate	High
			Unlikely that this includes any information that could be used against the originator.	This can be MODERATE or HIGH, depending on the application: This is used later on to determine whether a vehicle is likely going to violate a red light or infringe a work zone. This needs to be correct in order for the application to work correctly.	Since this monitors the health and safety of the vehicle and that information is eventually reported to the driver, it should be available at all times as it directly affects vehicle and operator safety.

# Exemple d'avertissement de file d'attente – Normes

The screenshot displays a web interface for a service package. At the top, a navigation bar contains tabs for Enterprise, Functional, Physical, Goals and Objectives, Needs and Requirements, Sources, Security, and Standards. The Standards tab is selected. Below the navigation bar, a breadcrumb trail reads "Home > Service Packages > Queue Warning". A navigation link shows "<< VS07 : VS08 : VS09 >>". The main heading is "VS08: Queue Warning". The description text states: "This service package utilizes connected vehicle technologies, including vehicle-to-infrastructure (V2I) and vehicle-to-vehicle (V2V) communications, to enable vehicles within the queue event to automatically broadcast their queued status information (e.g., rapid deceleration, disabled status, lane location) to nearby upstream vehicles and to centers (such as the TMC). The infrastructure will broadcast queue warnings to vehicles in order to minimize or prevent rear-end or other secondary collisions. This service package is not intended to operate as a crash avoidance system. In contrast to such systems, this service package will engage well in advance of any potential crash situation, providing messages and information to the driver in order to minimize the likelihood of his needing to take crash avoidance or mitigation actions later. It performs two essential tasks: queue determination (detection and/or prediction) and queue information dissemination using vehicle-based, infrastructure-based, or hybrid solutions." Below the text, "Relevant Regions: Australia, Canada, European Union, and United States" is listed. A yellow arrow points to the "Physical" tab in the second navigation bar. This second navigation bar also includes tabs for Enterprise, Functional, Physical, Goals and Objectives, Needs and Requirements, Sources, Security, and Standards. The "Physical" tab is selected, and the content below it reads: "Physical", "The physical diagram can be viewed in SVG or PNG format and the current format is SVG.", "[SVG Diagram](#)", and "[PNG Diagram](#)".

# Site Web d'ARC-IT : Perspectives



The screenshot displays the website's navigation bar with the following items: Architecture, Architecture Use, Architecture Resources, Architecture Terminology, and Contact The Architecture Team. A search bar on the right contains the text "ENHANCED B". The "Views" menu is expanded, showing sub-items: Enterprise, Functional, Physical, Communications, Methodology, Architecture Structure, Enterprise Viewpoint, Functional Viewpoint, Physical Viewpoint, and Communications Viewpoint. The main content area features the title "Architecture Reference for Cooperative and Intelligent Transportation" and a "Latest News" section. The "Latest News" section includes three entries: "ARC-IT 9.0" (dated November 2020), "RAD-IT 9.0", and "SET-IT 9.0". To the right of the news is a vertical stack of five architectural views: Enterprise View (Relationships between Organizations), Functional View (Logical interactions between Functions), Physical View (Connections between Physical Objects), and Communications View (Layered protocols facilitating data exchange between Physical Objects). The Communications View is partially visible at the bottom.

Architecture Use Architecture Resources Architecture Terminology Contact The Architecture Team

ENHANCED B

Service Packages

Views

- Enterprise
- Functional
- Physical
- Communications
- Methodology
- Architecture Structure
- Enterprise Viewpoint
- Functional Viewpoint
- Physical Viewpoint
- Communications Viewpoint
- Security

## Architecture Reference for Cooperative and Intelligent Transportation

Cooperative and Intelligent Transportation (ARC-IT) provides a common framework for designing intelligent transportation systems. It is a mature product that reflects the consensus of the ITS community (transportation practitioners, systems engineers, system architects, consultants, etc.).

Architecture Structure: it provides common basis for planners and engineers with differing concerns to design intelligent transportation systems using a common language as a basis for delivering ITS, but does not include implementation. ARC-IT includes artifacts that answer [concerns](#) relevant to a large variety of users intended for transportation planners, regional architects and systems engineers to design architectures, and scope and develop projects.

Architecture Use menu bar above:

- Architecture Use: links to all of the content inside the architecture, and describes the structure of the architecture in perspective:
  - [Service Packages](#) represent slices of the architecture that address a specific service like traffic signal control and provide the most straightforward entry into ARC-IT content.
  - [Views](#) and its sub-menus provide view-specific content; if for example you are looking for a particular [information flow](#), or a particular [communications profile](#), browse the relevant physical and communications sections here.
  - [Methodology](#) and its sub-menus describe the structure of the architecture: how it is built, how the artifacts within are inter-related.
  - The [Security](#) section describes how security is addressed throughout the architecture and provides links to cross-cutting security content.
- [Architecture Use](#) describes how to use ARC-IT, from the perspective of a regional architect, transportation planner or project systems engineer.
- [Architecture Resources](#) provides access to all ARC-IT content in user-downloadable forms. Notably this also includes access to our tools: RAD-IT and SET-IT, that provide you with means to manipulate the architecture.

### Latest News

**ARC-IT 9.0** includes changes to all views of the National ITS Reference Architecture to incorporate a remodeled Communications view, new services, more detailed information exchanges, additional physical objects, and a revamped Architecture Use section. [Read more...](#)

November 2020 – Both **RAD-IT** and **SET-IT** have been updated with new communications view tools, auto-backup, bug fixes and performance improvements. See below for details.

**RAD-IT 9.0** replaces the Standards tab with a more complete Communications tab. RAD-IT has been updated to correct known issues and to support conversion from previous versions. [Read more...](#)

**SET-IT 9.0** includes a redesigned Communications view with tools to create and customize comm solutions as well as an improved Shape Properties tool. SET-IT has been updated to correct known issues and to support conversion from previous versions. [Read more...](#)

### Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT)

Relationships between Organizations  
**Enterprise View**

Logical interactions between Functions  
**Functional View**

Connections between Physical Objects  
**Physical View**

Layered protocols facilitating data exchange between Physical Objects  
**Communications View**

# Site Web d'ARC-IT : Page des perspectives

The screenshot shows the 'Views' page of the ARC-IT website. The navigation bar includes 'Architecture', 'Architecture Use', 'Architecture Resources', 'Architecture Terminology', and 'Contact The Architecture Team'. The breadcrumb trail is 'Home > Architecture > Views'. The main heading is 'Views'. Below it, a paragraph states: 'The Architecture Reference for Cooperative & Intelligent Transportation (ARC-IT) provides a framework for planning, programming, and implementing intelligent transportation systems. As shown in the figure, ARC-IT is comprised of 4 Views:'. A list of four views follows: Enterprise, Functional, Physical, and Communications. To the right, a diagram titled 'Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT)' illustrates these four views as stacked layers. A yellow arrow points from the top right of the page to the diagram, and another yellow arrow points from the diagram back to the text on the left.

Architecture ▾ Architecture Use ▾ Architecture Resources ▾ Architecture Terminology ▾ Contact The Architecture Team

Home > Architecture > Views

## Views

The Architecture Reference for Cooperative & Intelligent Transportation (ARC-IT) provides a framework for planning, programming, and implementing intelligent transportation systems. As shown in the figure, ARC-IT is comprised of 4 Views:

- [Enterprise](#) - Describes the relationships between organizations and the roles those organizations play within the connected vehicle environment
- [Functional](#) - Describes abstract functional elements (processes) and their logical interactions (data flows) that satisfy the system requirements
- [Physical](#) - Describes physical objects (systems and devices) and their functional objects as well as the high-level interfaces between those physical objects
- [Communications](#) - Describes the layered sets of communications protocols that are required to support communications among the physical objects that participate in the connected vehicle environment

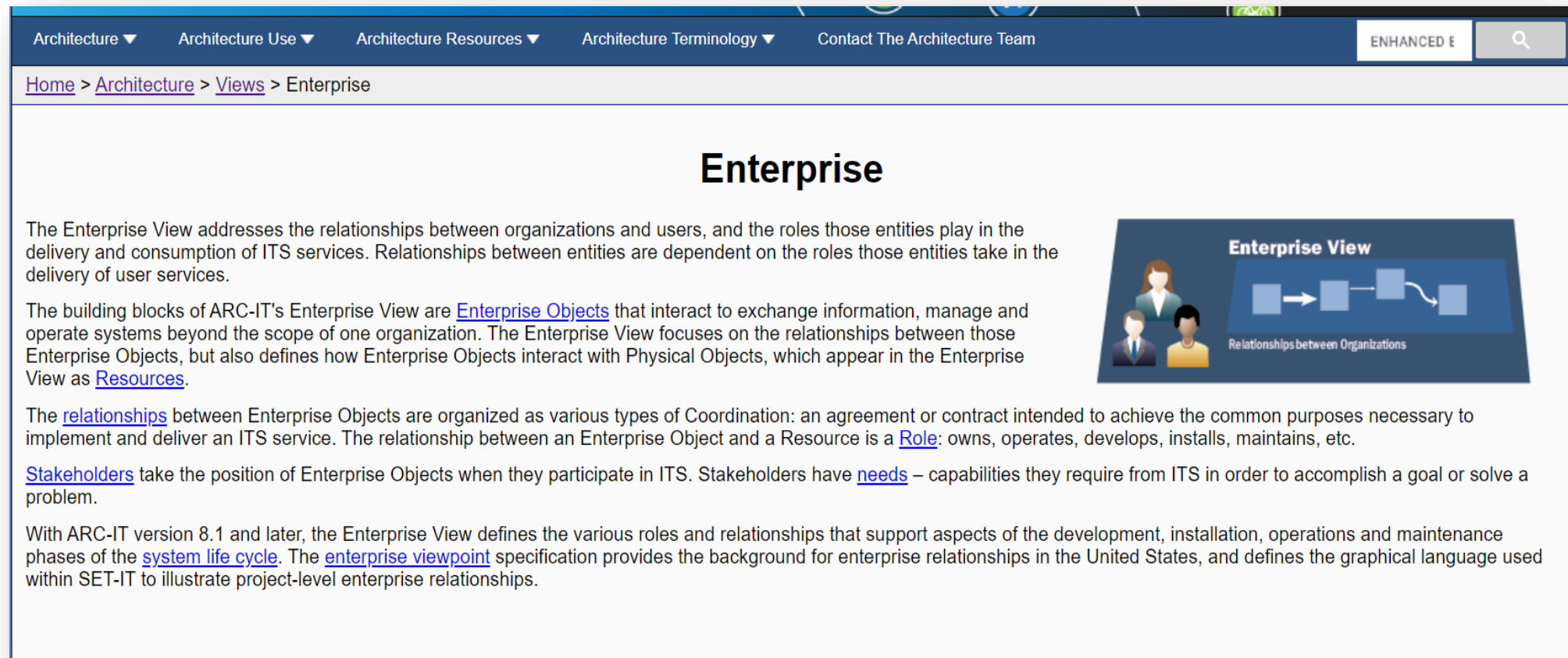
### Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT)

The diagram shows four stacked layers representing the views of ARC-IT:

- Enterprise View**: Relationships between Organizations. Illustration shows people icons and a flow diagram.
- Functional View**: Logical interactions between Functions. Illustration shows a circular flow diagram.
- Physical View**: Connections between Physical Objects. Illustration shows server racks and network cables.
- Communications View**: Layered protocols facilitating data exchange between Physical Objects. Illustration shows a layered protocol stack with wireless signals.



# Site Web d'ARC-IT : Page de la perspective d'entreprise



Architecture ▼ Architecture Use ▼ Architecture Resources ▼ Architecture Terminology ▼ Contact The Architecture Team

ENHANCED E

Home > Architecture > Views > Enterprise

## Enterprise


The Enterprise View addresses the relationships between organizations and users, and the roles those entities play in the delivery and consumption of ITS services. Relationships between entities are dependent on the roles those entities take in the delivery of user services.

The building blocks of ARC-IT's Enterprise View are [Enterprise Objects](#) that interact to exchange information, manage and operate systems beyond the scope of one organization. The Enterprise View focuses on the relationships between those Enterprise Objects, but also defines how Enterprise Objects interact with Physical Objects, which appear in the Enterprise View as [Resources](#).

The [relationships](#) between Enterprise Objects are organized as various types of Coordination: an agreement or contract intended to achieve the common purposes necessary to implement and deliver an ITS service. The relationship between an Enterprise Object and a Resource is a [Role](#): owns, operates, develops, installs, maintains, etc.

[Stakeholders](#) take the position of Enterprise Objects when they participate in ITS. Stakeholders have [needs](#) – capabilities they require from ITS in order to accomplish a goal or solve a problem.

With ARC-IT version 8.1 and later, the Enterprise View defines the various roles and relationships that support aspects of the development, installation, operations and maintenance phases of the [system life cycle](#). The [enterprise viewpoint](#) specification provides the background for enterprise relationships in the United States, and defines the graphical language used within SET-IT to illustrate project-level enterprise relationships.



# Site Web d'ARC-IT : Page de la perspective fonctionnelle

Architecture ▼ Architecture Use ▼ Architecture Resources ▼ Architecture Terminology ▼ Contact The Architecture Team

ENHANCED E

Home > Architecture > Views > Functional

## Functional

The Functional View addresses the analysis of abstract functional elements and their logical interactions. Here ARC-IT is depicted as a set of [Processes](#) organized hierarchically. These Processes (activities and functions) trace to a set of [Requirements](#) derived from source documents. The [data flows](#) that move between processes and the data stores where data may reside for longer periods are all defined in a Data Dictionary.

The behavior of a Function (aka Process) is the set of actions performed by this element to achieve an objective. A Process performs actions to achieve an application objective or to support actions of another Process. This may involve data collection, data transformation, data generation, data generation or processing in performing those actions. The Functional View defines Processes to control and manage system behavior, such as monitoring, and other active control elements that are part of describing the functional behavior of the system. It also describes data processing functions, data stores and the logical flows of information among these elements.

The Functional View is modeled using a Structure Analysis methodology. This uses the National ITS Architecture's Logical Architecture as the starting point that was based on the work of Hatley/Pirbhai and included Yourdon-Demarco Data Flow Diagrams (DFDs) to illustrate the flow of data between functional elements. For expedience in ARC-IT the diagrams are not included – just the collections of processes and their data flows. The reader should use the Physical view diagrams for graphical representations of system behavior.

For details on how the functional view is structured, see the [functional viewpoint](#) specification.

**Functional View**

Logical Interactions between Functions

# Site Web d'ARC-IT : Page de la perspective physique

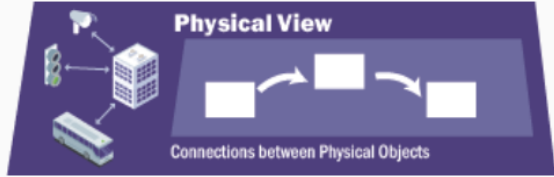
Architecture ▼ Architecture Use ▼ Architecture Resources ▼ Architecture Terminology ▼ Contact The Architecture Team

ENHANCED E

Home > Architecture > Views > Physical

## Physical

The physical view describes the transportation systems and the information exchanges that support ITS. In this view, the Architecture is depicted as a set of integrated [Physical Objects](#) (Subsystems and Terminators) that interact and exchange information to support the Architecture service packages. Physical Objects are defined to represent the major physical components of the ITS Architecture. Physical Objects include subsystems, and terminators that together provide a set of capabilities that are more than would be implemented at any one place or time. Subsystems are Physical Objects that are part of the overall Intelligent Transportation System and provide the functionality that is 'inside-the-boundary' of ITS. Terminators are Physical Objects that lie at the boundary of ITS and supply information needed by ITS' functions or receive information from ITS. [Functional Objects](#) break up the subsystems into deployment-sized pieces and define more specifically the functionality and interfaces that are required to support a particular Service Package. [Information Flows](#) depict the exchange of information that occurs between Physical Objects (Subsystems and Terminators). The information exchanges in the Physical View are identified by [Triples](#) that include the source and destination Physical Objects and the Information Flow that is exchanged.



The diagram, titled "Physical View", shows a central box with three smaller boxes connected to it by arrows, representing "Connections between Physical Objects". To the left of the main diagram are icons for a building, a server rack, and a network tower, representing physical components of the ITS architecture.

The Physical view is related to the other Architecture views. Each Functional Object is linked to the Functional View, which describes more precisely the functions that are performed and the details of the data that is exchanged by the object. Physical Objects and Functional Objects are also depicted as Resources in the Enterprise view, which describes the organizations that are involved and the roles they play in installing, operating, maintaining, and certifying all of the components of the Architecture.

At the heart of the physical view, the physical objects are organized into six different Classes that define ITS at the highest level of abstraction. A general "ITS" Class covers all of ITS while five more specific classes (Center, Support, Field, Vehicle, and Personal) are used to group physical objects based on where they reside and fundamentally how they behave and interact with other physical objects. Each of the classes is shown in the figure below.

ITS

# Site Web d'ARC-IT : Page de la perspective des communications

Architecture ▼ Architecture Use ▼ Architecture Resources ▼ Architecture Terminology ▼ Contact The Architecture Team

ENHANCED E

[Home](#) > [Architecture](#) > [Views](#) > Communications

## Communications

The Communications View identifies the protocol stacks needed to implement an information flow between a source and destination (e.g., information flow triple) in the Physical View. ARC-IT terms these protocol stacks as "solutions". [Solutions](#) are composed of a collection of industry [standards](#); usually formally developed standards produced by a standards development organization, but often a published specification such as an IETF RFC. Each triple from the Physical View is associated with one or more solutions. These solutions, their components and attributes can be examined from several different perspectives and from different places within ARC-IT.

Communications View

Layered protocols facilitating data exchange between Physical Objects

A typical triple solution is assembled according to the ARC-IT communications model, as defined by the [communications viewpoint](#). All solutions are built according to this model, and the components of the solution assigned to the various parts of the model depending on their role in the solution. Sometimes a standard satisfies multiple aspects of a solution, and so might appear more than once in an illustration of the solution. Triple solutions are accessible from several places, but are most commonly from the context of a [service package](#) by clicking on the flow or from the overall list of ARC-IT [triples](#).

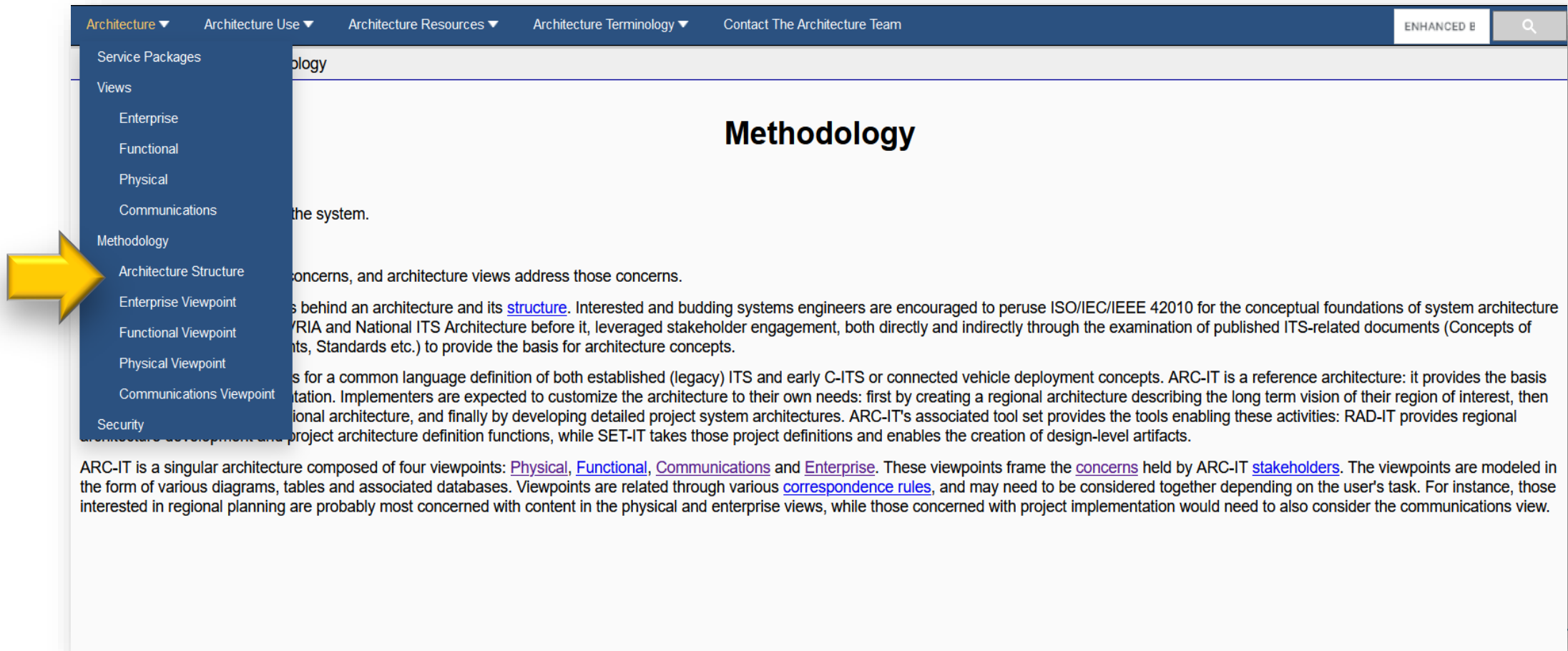
A sample triple solution is shown at right. Standards names are sometimes hyperlinked: this indicates the standard is actually part of a group of standards or one of several alternatives; clicking on the link will expand the bundle or explain the alternatives. 'Info' buttons next to standards generate pop-ups that provide some detail about the standard in question.

ITS Info

ITE TMDD Vol 2

Click gap icons for more info.

# Site Web d'ARC-IT : Méthodologie



The screenshot displays the ARC-IT website's navigation menu and the 'Methodology' page content. The navigation bar at the top includes 'Architecture', 'Architecture Use', 'Architecture Resources', 'Architecture Terminology', and 'Contact The Architecture Team'. A search bar with 'ENHANCED B' and a magnifying glass icon is on the right. The left sidebar menu lists 'Service Packages', 'Views' (with sub-items: Enterprise, Functional, Physical, Communications), 'Methodology', 'Architecture Structure', 'Enterprise Viewpoint', 'Functional Viewpoint', 'Physical Viewpoint', 'Communications Viewpoint', and 'Security'. A yellow arrow points to the 'Methodology' item. The main content area shows the title 'Methodology' and the beginning of a paragraph: '...ology' followed by 'the system.' and 'concerns, and architecture views address those concerns.' Below this, there are three paragraphs of text discussing the methodology, including references to ISO/IEC/IEEE 42010, NIRA, and National ITS Architecture. The text describes the process of creating a regional architecture and the role of RAD-IT and SET-IT tools.

# Site Web d'ARC-IT : Structure de l'architecture

Architecture ▼ Architecture Use ▼ Architecture Resources ▼ Architecture Terminology ▼ Contact The Architecture Team

ENHANCED B

[Home](#) > [Architecture](#) > [Methodology](#) > Architecture Structure

## Architecture Structure

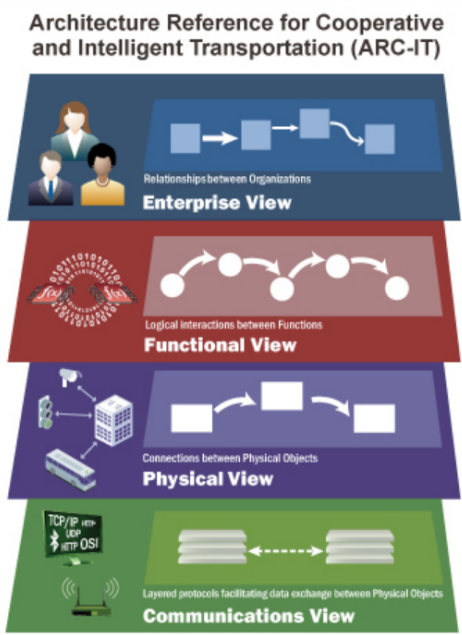
The diagram depicts ARC-IT as a set of layered viewpoints - each providing a different perspective to understand the architecture.

The approach to develop a System Architecture in this way is based on ISO/IEC/IEEE 42010:2011, a standard for "Systems and software engineering — Architecture description." This includes steps to define, not just data and messages, but the full environment in which the stakeholder concerns are satisfied. The figure to the right identifies the four Viewpoints used to describe ARC-IT: [Enterprise](#), [Functional](#), [Physical](#), and [Communication](#). While there is only one model per View, the models used result in a large number of diagrams per View. Only by considering all aspects of the model can one understand the scope of each Viewpoint and thus gain a complete picture the architecture.

Each Viewpoint includes a specification that describes the concerns addressed by that particular viewpoint. The accompanying viewpoint specifications also define the relevant model constructs, serving as a legend for the diagrams.

In addition to the four viewpoints, ARC-IT provides a fifth perspective: the ITS service package (formerly ITS application) perspective. This is not a viewpoint per se, but rather a way of looking at subsets of each view focused on a specific service or group of services. Service packages are derived from documentation like ConOps, System Requirements, standards, and other documents that have been written to describe parts of the Cooperative ITS environment. It should be noted that this is not an exhaustive list - new services will be developed over time and the architecture modified appropriately.

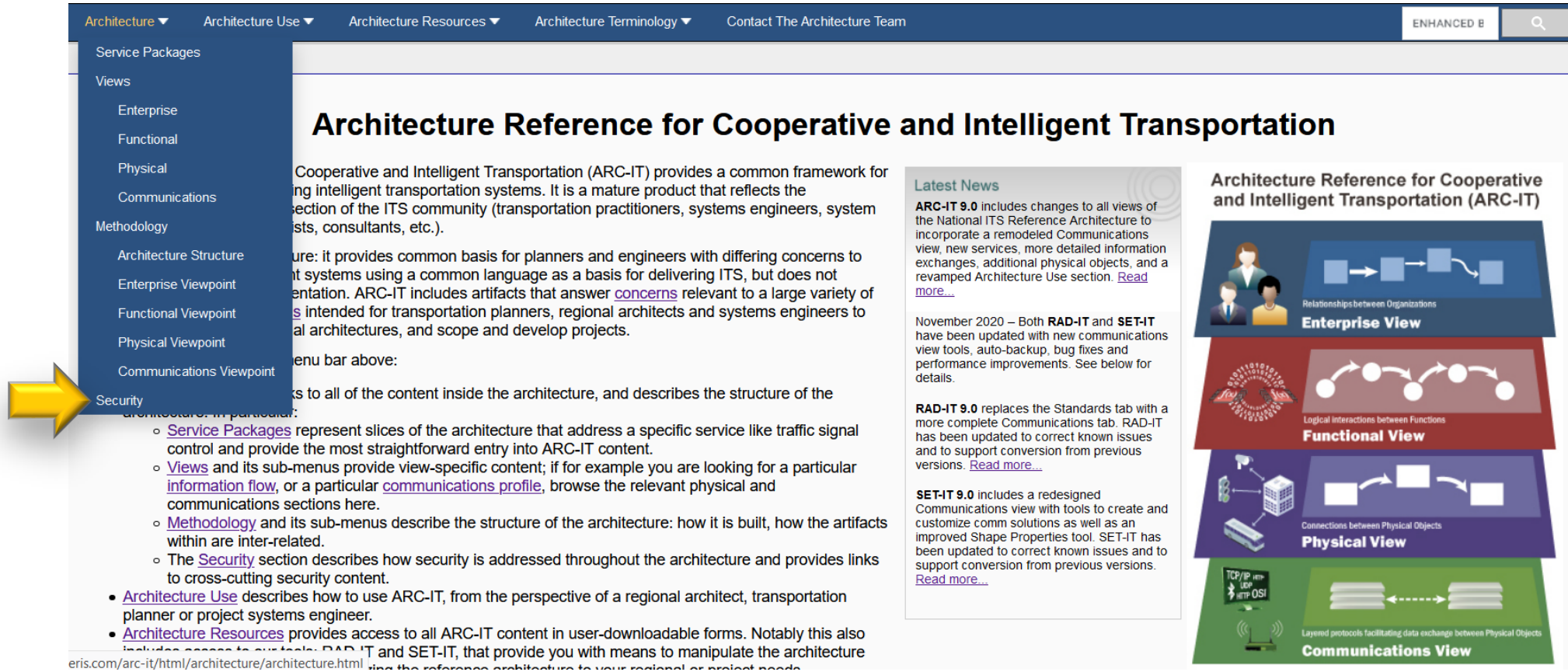
The Architecture Viewpoints are related through various [correspondence rules](#).



**Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT)**

- Enterprise View**: Relationships between Organizations
- Functional View**: Logical interactions between Functions
- Physical View**: Connections between Physical Objects
- Communications View**: Layered protocols facilitating data exchange between Physical Objects

# Site Web d'ARC-IT : Sécurité



The screenshot shows the top navigation bar of the ARC-IT website with the following items: Architecture, Architecture Use, Architecture Resources, Architecture Terminology, and Contact The Architecture Team. A search bar on the right contains the text "ENHANCED B". A dropdown menu is open under "Architecture", listing: Service Packages, Views, Enterprise, Functional, Physical, Communications, Methodology, Architecture Structure, Enterprise Viewpoint, Functional Viewpoint, Physical Viewpoint, and Communications Viewpoint. A yellow arrow points to the "Security" option in the dropdown menu.

## Architecture Reference for Cooperative and Intelligent Transportation

Cooperative and Intelligent Transportation (ARC-IT) provides a common framework for building intelligent transportation systems. It is a mature product that reflects the consensus of the ITS community (transportation practitioners, systems engineers, system architects, consultants, etc.).

ARC-IT provides a common basis for planners and engineers with differing concerns to deliver intelligent transportation systems using a common language as a basis for delivering ITS, but does not limit the scope of the architecture. ARC-IT includes artifacts that answer **concerns** relevant to a large variety of transportation systems intended for transportation planners, regional architects and systems engineers to develop regional architectures, and scope and develop projects.

The menu bar above:

- **Architecture Use** describes how to use ARC-IT, from the perspective of a regional architect, transportation planner or project systems engineer.
- **Architecture Resources** provides access to all ARC-IT content in user-downloadable forms. Notably this also includes access to our tools: RAD-IT and SET-IT, that provide you with means to manipulate the architecture using the reference architecture to your regional or project needs.

**Latest News**

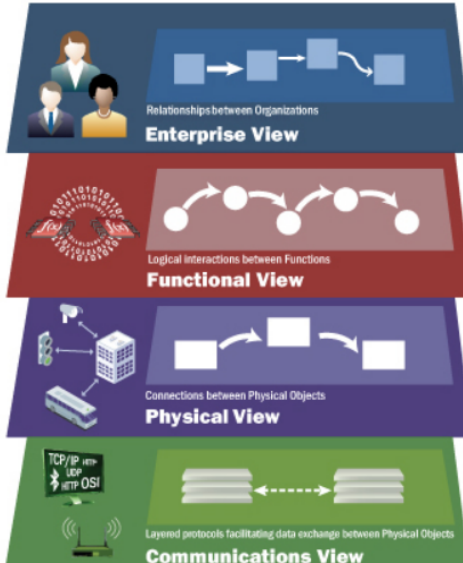
**ARC-IT 9.0** includes changes to all views of the National ITS Reference Architecture to incorporate a remodeled Communications view, new services, more detailed information exchanges, additional physical objects, and a revamped Architecture Use section. [Read more...](#)

November 2020 – Both **RAD-IT** and **SET-IT** have been updated with new communications view tools, auto-backup, bug fixes and performance improvements. See below for details.

**RAD-IT 9.0** replaces the Standards tab with a more complete Communications tab. RAD-IT has been updated to correct known issues and to support conversion from previous versions. [Read more...](#)

**SET-IT 9.0** includes a redesigned Communications view with tools to create and customize comm solutions as well as an improved Shape Properties tool. SET-IT has been updated to correct known issues and to support conversion from previous versions. [Read more...](#)

### Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT)



- Enterprise View**: Relationships between Organizations
- Functional View**: Logical interactions between Functions
- Physical View**: Connections between Physical Objects
- Communications View**: Layered protocols facilitating data exchange between Physical Objects

# Site Web d'ARC-IT : Sécurité

Architecture ▼ Architecture Use ▼ Architecture Resources ▼ Architecture Terminology ▼ Contact The Architecture Team ENHANCED


[Home](#) > Security

## Security

Security [concerns](#) related to ITS are focused on protection of surface transportation information and infrastructure. Surface transportation is now, more than ever, relying on information technologies to sense, collect, process and disseminate information to improve the efficiency of moving goods and people, improve the safety of our transportation system and provide travel alternatives.

Security concerns are addressed in the ITS Architecture in two ways:

1. [Securing ITS](#): ITS as an information system must be protected so that ITS applications are trusted, reliable and available when they are needed. This aspect of security applies to all the physical objects and information flows, impacts all enterprise objects, and affects the structure and content of communications profiles. "Securing ITS" provides the foundation for ITS and especially C-ITS, since ITS systems must be secure before they can reliably be used to improve the efficacy of the surface transportation system.
2. [ITS Security Areas](#): ITS can be used to enhance the security of the surface transportation system. Eight security areas define the ways that ITS can be used to detect, respond to, and recover from [threats](#) against the surface transportation system. These eight ITS security areas are shown at the top of the figure below, supported by the "Securing ITS" security services that make ITS secure. Specific subsystems, information flows, service packages, and supporting physical and logical architecture definitions have been defined for each ITS security area.



ITS Security Areas

- Disaster Response and Evacuation
- Freight and Commercial Vehicle Security
- ZMAT Security
- Wide Area Alert
- Rail Security
- Transit Security
- Transportation Infrastructure Security
- Traveler Security



# Site Web d'ARC-IT : Utilisation de l'architecture



Architecture ▾ Architecture Use ▾ Architecture Resources ▾ Architecture Terminology ▾ Contact The Architecture Team

ENHANCED B 🔍

Home > Architect

ARC-IT & Planning  
Regional Architecture Definition  
Regional Architecture Use  
Project Development

## Architecture Use

ARC-IT is a reference architecture that provides a common basis for planners and engineers with differing concerns to conceive, design and implement systems using a common language as a basis for delivering ITS, but does not mandate any particular implementation. The National ITS Architecture was developed over 25 years ago in order to:

- Provide a National "Vision" for ITS
- Guide Sound ITS Planning and Investments at the State and Local Level
- Identify and Scope Need for ITS Standards

In order to provide a connection between transportation planning and ARC-IT, the website provides a connection between planning attributes defined by the USDOT and the views of ARC-IT. This connection is described on the ARC-IT Connection to Planning pages. The planning attributes for which this connection is defined are:

- **Planning Factors:** There are seven planning factors defined by the most recent Transportation authorization bill, Fixing America's Surface Transportation (FAST), that metropolitan planning organizations (MPOs) and states should consider when developing their transportation plans.
- **Goals:** Transportation planning begins with a set of broad goals that reflect the desired outcomes and the transportation vision for the region. The representative goals included in the ARC-IT mapping to planning are closely tied to the planning factors.
- **Objectives:** Each of the goals in a metropolitan or statewide transportation plan is supported by one or more 'objectives' that define what needs to occur to accomplish the goals. A range of objectives are included in the ARC-IT mapping to planning, gathered from a variety of references and recent transportation plans, that reflect the spectrum of objectives that are used in current practice.

In order to guide the investments in ITS at the state and local level, 23 CFR 940 requires the creation of a Regional ITS Architecture, which is defined by the regulation as "a regional framework for ensuring institutional agreement and technical integration for the implementation of ITS projects or groups of projects". The definition of the components of a Regional ITS Architecture and an approach for the update or development of these architectures is provided [Regional ITS Architecture Definition and Development](#).

A regional ITS architecture can effectively bridge the gap between strategic planning for an integrated surface transportation system and the ITS projects that support that strategic vision. The principal value of a regional ITS architecture is that it provides a context for projects that include ITS so that each project can build a piece of a larger system. The regional ITS architecture can be used to visualize and articulate the overall ITS system for the region so that all the stakeholders in a region spend their money compatibly instead of competitively. A discussion of the ways to use a Regional ITS Architecture are found at [Regional ITS Architecture Use](#).

Additional information on how the components of ARC-IT support architecture use can be found at: [More on ARC-IT Use](#)

```
graph TD; TP[Transportation Planning] --> RAD-IT; RAD-IT --> PD[Project Development]; PD --> IP[Implemented Projects]; IP --> ME[Monitoring & Evaluation]; ME --> TP; IP --> OM[Operations & Maintenance]; OM --> TP; IP --> FP[Funded Projects]; FP --> PD;
```

# Site Web d'ARC-IT : Définition d'une architecture régionale des STI

Architecture ▾ Architecture Use ▾ Architecture Resources ▾ Architecture Terminology ▾ Contact The Architecture Team ENHANCED B

[Home](#) > [Architecture Use](#) > Regional ITS Architecture Definition

## Regional ITS Architecture Definition

Intelligent Transportation Systems (ITS) have been defined as: "the application of advanced sensor, computer, electronics, and communication technologies and management strategies—in an integrated manner—to improve the safety and efficiency of the surface transportation system". This definition encompasses a broad array of systems and information processing and communications technologies. In order to fully incorporate ITS into the surface transportation network, ITS must be "mainstreamed" into the overall transportation planning and project development processes that exist in each state and metropolitan region of the country.

To support that effort a Regional ITS Architecture is developed as "a regional framework for ensuring institutional agreement and technical integration for the implementation of ITS projects or groups of projects". Regional ITS Architectures can be and have been developed and maintained by state departments of Transportation (DOTs) or by Metropolitan Planning Organizations (MPOs) or Council of Governments (COGs) for a region, district, or state. The concept of a regional ITS architecture was first defined in 23 CFR 940 on *Intelligent Transportation System Architecture and Standards*. See ["US DOT Policy on Regional ITS Architecture"](#) below for more about the federal regulations dealing with ITS.

To support that effort a Regional ITS Architecture is developed as "a regional framework for ensuring institutional agreement and technical integration for the implementation of ITS projects or groups of projects". Regional ITS Architectures can be and have been developed and maintained by state departments of Transportation (DOTs) or by Metropolitan Planning Organizations (MPOs) or Council of Governments (COGs) for a region, district, or state.

Click one of the links below to learn more about Regional ITS Architectures:

- [Purpose](#) – describes the purpose of a regional ITS architecture
- [US DOT Policy](#) – describes the regulations behind the establishment of architectures in the US and how they are used
- [Components](#) – contains all the components of a regional ITS architecture and how they are developed
- [Approach](#) – describes different approaches to developing a regional ITS architecture either as an update to an existing architecture or as a new development effort

[Architecture Maintenance](#) will describe the effort to maintain an architecture and how

# Site Web d'ARC-IT : Utilisation d'une architecture régionale des STI

Architecture ▾ Architecture Use ▾ Architecture Resources ▾ Architecture Terminology ▾ Contact The Architecture Team ENHANCED B

[Home](#) > [Architecture Use](#) > [Regional ITS Architecture Definition](#) > Regional ITS Architecture Use

## Regional ITS Architecture Use

The implementation of transportation projects can be seen as a lifecycle as shown below and the regional ITS architecture can be used to support the planning, programming, and implementation of those projects, as described in this section.

```
graph TD; A[Long Range Planning] -- "Identified Project" --> B[Programming/Budgeting]; B -- "Funded Project" --> C[Implementation]; C -- "Implemented Project" --> D[Operations & Maintenance]; D -- "Monitoring & Evaluation" --> A;
```

= Regional Architecture Use

# Site Web d'ARC-IT : Utilisation dans l'élaboration de projets



Architecture ▼ Architecture Use ▼ Architecture Resources ▼ Architecture Terminology ▼ Contact The Architecture Team

ENHANCED E

Home > Architecture Use > Use in Project Development

## Use in Project Development

The [regional ITS architecture](#) provides context for ITS projects. By using the regional ITS architecture as a starting point, the steps taken by each project will be on the path to the larger objectives set forth in the long range transportation plan. The ARC-IT tools, RAD-IT and SET-IT, allow the transportation planner and project developer to use ARC-IT to create their own regional ITS architecture and project architectures, respectively. These tailored architectures are not just references: they are structured descriptions of services provided, relationships required, and items to be deployed, operated, maintained and managed. As responsibility shifts from the planner to the project developer, ARC-IT tool use shifts from RAD-IT to SET-IT.

### Architecture Use

A well-maintained regional architecture can provide a tool for making a strong initial start in doing the systems engineering for a project. Regional ITS architecture content such as the stakeholders, their roles and responsibilities (included in the operational concept), elements, service packages, and the list of agreements supports the project concept of operations. The functional requirements are high-level requirements that can support system requirements development, and the interfaces and ITS standards support project design. In addition to assisting project implementers in the preliminary engineering stage, planners may also benefit from participating in the conceptual development of projects and strategies prior to the start of the formal project development. These components can inform creation of project documents, including Requests for Proposals (RFPs), and architectural details can inform the project's scope of work.

The items from the regional ITS architecture that are used to jumpstart the systems engineering process are derived from ARC-IT using the Regional Architecture Development tool for Intelligent Transportation (RAD-IT), formerly known as Turbo Architecture. The subsystems and terminators used to define the inventory elements, functional objects and functional requirements, information flows used to define the interfaces, and related ITS standards are all derived from the ARC-IT definition. More information on how the regional ITS architecture can be used to start to support systems engineering is included in the [Systems Engineering for ITS Handbook](#), and the [Systems Engineering Guidebook for ITS](#).

The diagram illustrates the project development process as a funnel-shaped sequence of steps. At the top, 'Regional Architecture' and 'Feasibility Study / Concept Exploration' are grouped under a red oval labeled 'RAD-IT Scope'. Below this, 'Concept of Operations', 'System Requirements', 'High-Level Design', and 'Detailed Design' are grouped under a green oval labeled 'SET-IT Scope'. The funnel narrows as it descends, indicating increasing detail and specificity.

# Site Web d'ARC-IT : Ressources



Architecture ▾ Architecture Use ▾ Architecture Resources ▾ Architecture Terminology ▾ Contact The Architecture Team

ENHANCED B

[Home](#) > Resources

## Resources

This page provides links to various resources that will complement your understanding of ARC-IT.

- [ARC-IT Website Download](#) - provides the ARC-IT website to be viewed (VIEW-IT) offline.
- [Databases](#) - provides the Microsoft Access compatible databases that contain the source material for ARC-IT content
- [Documents](#) - provides a set of links to documents related to ARC-IT
- [Tools](#) - provides the links to download a copy of ARC-IT software tools: Regional Architecture Development for Intelligent Transportation (RAD-IT) and the Systems Engineering Tool for Intelligent Transportation (SET-IT)
- [Training](#) - provides on-line training material on ARC-IT, RAD-IT, and SET-IT
- [Presentations](#) - provides copies of presentation material from public workshops and webinars that have been conducted regarding the architecture



# Site Web d'ARC-IT : Terminologie



Architecture ▾ Architecture Use ▾ Architecture Resources ▾ Architecture Terminology ▾ Contact The Architecture Team ENHANCED I 🔍

[Home](#) > [Architecture Terminology](#) > Acronyms

## Acronyms

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

**AAA:** American Automobile Association

**AACN:** Advanced Automatic Crash Notification

Architecture ▾ Architecture Use ▾ Architecture Resources ▾ Architecture Terminology ▾ Contact The Architecture Team ENHANCED I 🔍

[Home](#) > [Architecture Terminology](#) > Glossary

## Glossary

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 0-9

**Access Control**

Refers to mechanisms and policies that restrict access to computer resources. An access control list (ACL), for example, specifies what operations different users can perform on specific files and directories.

# Site Web d'ARC-IT : Page contactez-nous

Architecture ▾ Architecture Use ▾ Architecture Resources ▾ Architecture Terminology ▾ Contact The Architecture Team

ENHANCED E 🔍

[Home](#) > Contact The Architecture Team

## Contact The Architecture Team

The ARC-IT Team is very interested in input that will help us improve the architecture. We encourage you to provide us with your suggestions or additions to ARC-IT, by filling out the form below with your suggestions or comments.

**\*Required fields**

\*Name:

Organization:

\*E-mail:

\*Comment:

# Résumé de la visite du site Web ARC-IT

- Fournit un accès à tous les principaux composants de l'architecture de référence
  - Les ensembles de solutions applicatives offrent un accès facile
  - Les points de vue offrent un accès de rechange
- Conseils pour l'utilisation de l'architecture
- Ressources supplémentaires
  - Guides
  - Entraînement enregistré
  - Téléchargements RAD-IT / SET-IT
  - Site Web téléchargeable
  - Base de données



# Planification de la formation

Séance	Description	Programme
<b>Formation détaillée sur l'Architecture des STI</b>	Assure une formation plus détaillée et complète sur les composants clés de l'Architecture et sur la façon d'y accéder par le site Web ARC-IT.	Aujourd'hui
<b>Élaboration d'une architecture régionale des STI</b>	Donne un aperçu de haut niveau du processus d'élaboration d'une architecture régionale des STI, en intégrant des exercices pratiques de démonstration au moyen de l'outil RAD-IT ARC-IT.	Le mardi 6 février 2023 13 h 30 - 16 h 00 HNE
<b>Formation sur l'ingénierie des systèmes</b>	Présente une introduction au concept d'ingénierie des systèmes, son importance pour le cycle de vie de la fourniture des STI et comment l'Architecture aide à soutenir le processus.	Le mardi 13 février 2024 13 h 30 - 16 h 00 HNE

- **Volet anglais: le 14 février, le 21 février et le 28 février.**



**Des questions  
ou des  
commentaires?**

**Personne-ressource (courriel) :**

- Soutien : [ITSArchitecture-ArchitectureSTI@tc.gc.ca](mailto:ITSArchitecture-ArchitectureSTI@tc.gc.ca)
- Jonathan Parent [Jonathan.Parent@tc.gc.ca](mailto:Jonathan.Parent@tc.gc.ca)  Transports Canada Transport Canada
- Philippe Morais [Philippe.Morais@wsp.com](mailto:Philippe.Morais@wsp.com) 

**Merci!**

# Élaboration d'une architecture régionale des STI

6 février 2024





## Conseils et protocoles de webinaire

- Vous pouvez poser des questions à n'importe quel moment en utilisant la boîte à questions et réponses. Nous répondrons au plus grand nombre de questions possible.
- Vous pouvez aussi lever la main pour posez des questions verbalement si le souhaitez.
- **Veillez garder votre ligne en sourdine.**
- Vous pouvez également envoyer vos questions par courriel à [ITSArchitecture-ArchitectureSTI@tc.gc.ca](mailto:ITSArchitecture-ArchitectureSTI@tc.gc.ca) pour obtenir une réponse plus tard.

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# Remerciements

Cette présentation se fonde sur des documents de formation élaborés par le Département des transports des États-Unis (USDOT).

Transports Canada tient à remercier le comité consultatif des intervenants sur l'architecture des STI pour le Canada ainsi que les autres personnes qui ont gracieusement examiné le matériel de formation et fourni des images, des graphiques et d'autres documents.

# Buts et objectifs

1

Comprendre le but des architectures régionales des STI

2

Comprendre le but et les rudiments du développement d'une architecture régionale des STI

3

Se familiariser avec l'outil RAD-IT et en connaître les bases

# Ordre du jour

- Examen de l'architecture des STI
- Introduction aux architectures régionales des STI
- Examen du processus de développement de l'architecture régionale des STI





# Examen de l'architecture des STI





## Qu'est-ce que les STI?

Les systèmes de transport intelligents (STI) intègrent différentes technologies de l'information et des communications dans l'infrastructure et les véhicules de transport routier, en vue d'aider à rendre le système de transport plus sûr et plus efficace.

# Qu'est-ce qu'une architecture des STI?

- Cadre pour l'élaboration de systèmes de transport intégrés
- Détermine :
  - Les organismes
  - Les systèmes utilisés
  - Les fonctions exécutées
  - Les renseignements échangés
  - Les communications
- SANS entrer dans des technologies spécifiques
  - La neutralité technologique est essentielle



# Où est-ce qu'une architecture des STI s'intègre-t-elle dans les cycles de vie de développement de projet traditionnels?

## PROGRAMMES/PLANIFICATION

Plan d'exploitation  
Problèmes et solutions, corridor par corridor  
Personnel, équipement, installations,  
programmes d'immobilisations



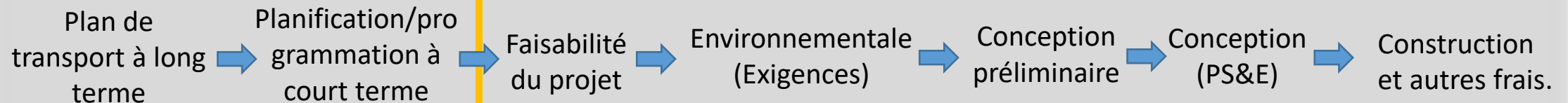
Plan d'infrastructure de STI  
Projets d'immobilisations



Architecture des STI  
Plan d'intégration régional

## PROJETS

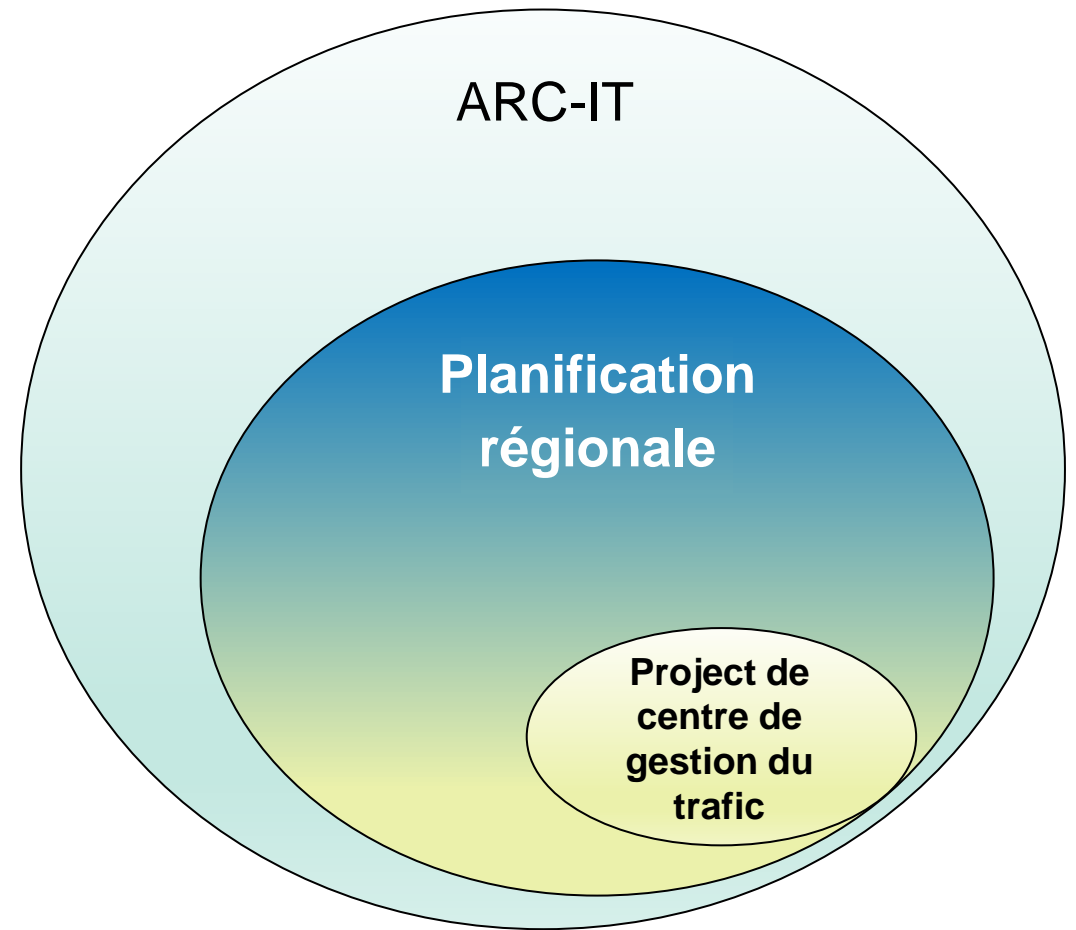
Architecture des STI  
Conception spécifique au projet



Adapté de : Département des Transports (DOT) des É.-U.

# Types (ou niveaux) d'architectures des STI

- Référence
  - Nationale/Ressource
- Régionale
  - Utilisé pour la planification
- Projet
  - Utilisé pour la conception/le déploiement

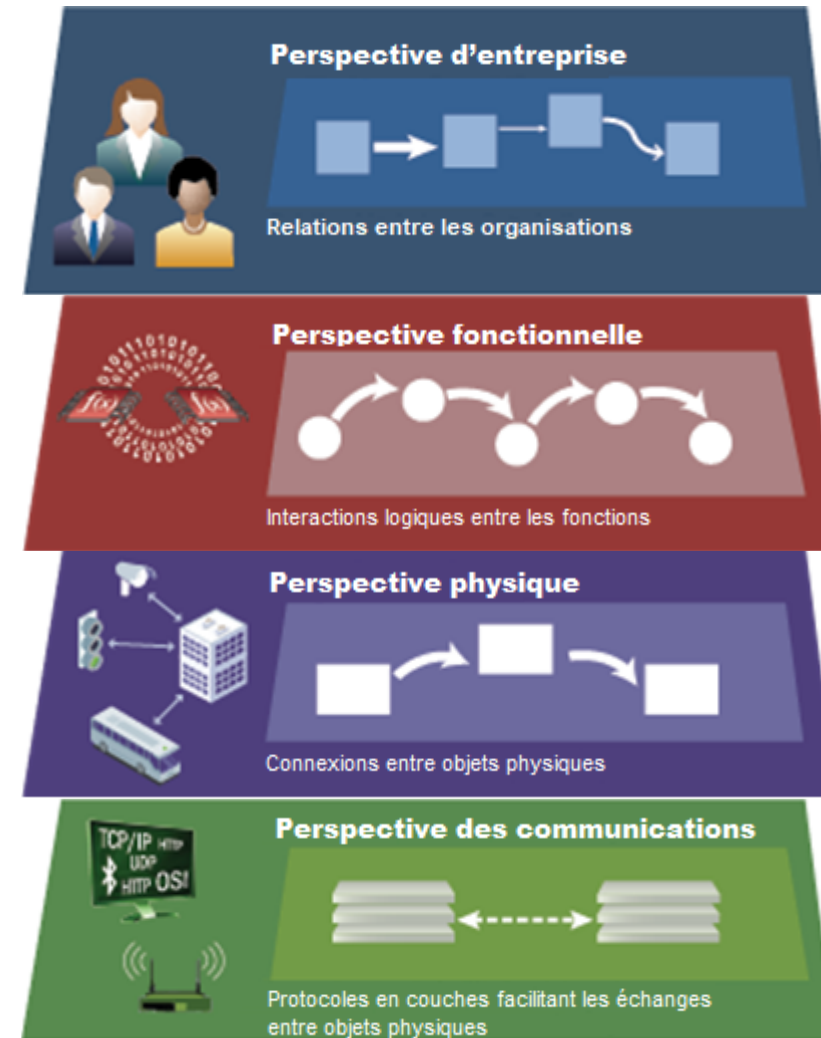


Adapté de : Département des Transports (DOT) des É.-U.

# Structure de l'ARC-IT (référence)

- Définie autour de 4 perspectives :
  - **Perspective d'entreprise:** Entreprises chargées de fournir des services
  - **Perspective fonctionnelle:** Fonctions de mise en œuvre des services
  - **Perspective physique:** Objets physiques nécessaires à la mise en œuvre de cette fonctionnalité
  - **Perspective des communications:** Solutions de communication nécessaires

## Référence d'architecture pour le transport coopératif et intelligent (ARC-IT)



Traduit sur la base du matériel de : Département des Transports (DOT) des É.-U.

# Physique

- Identifier les systèmes et les appareils
- Identifier les interfaces

Traduit sur la base du matériel de : Département des Transports (DOT) des É.-U.

Centre de gestion de transport en commun



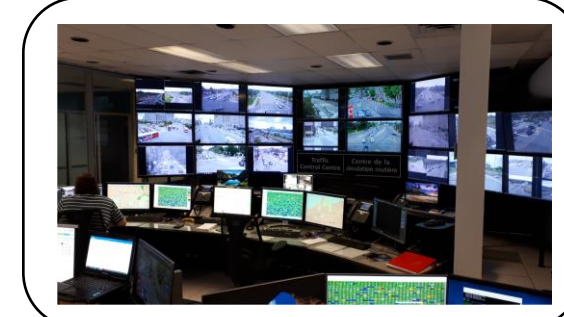
Véhicule de transport en commun



Communications



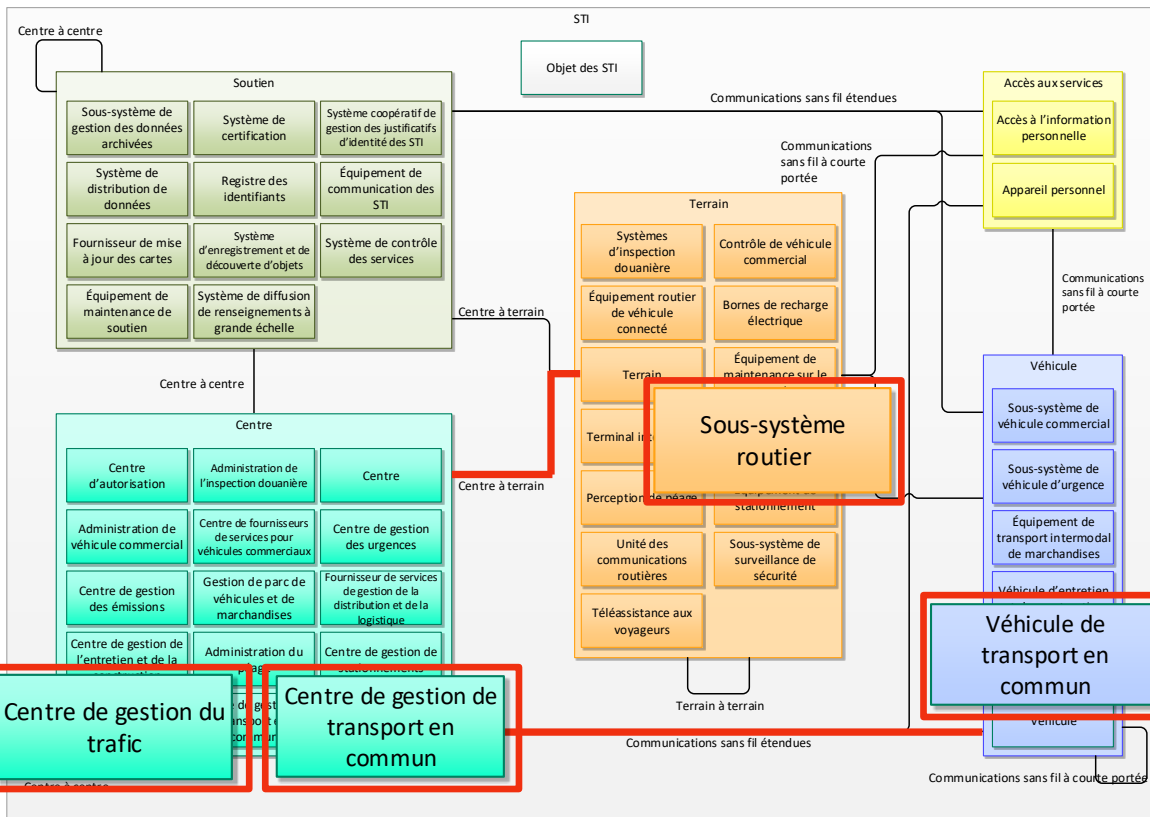
Sous-système routier



Centre de gestion du trafic

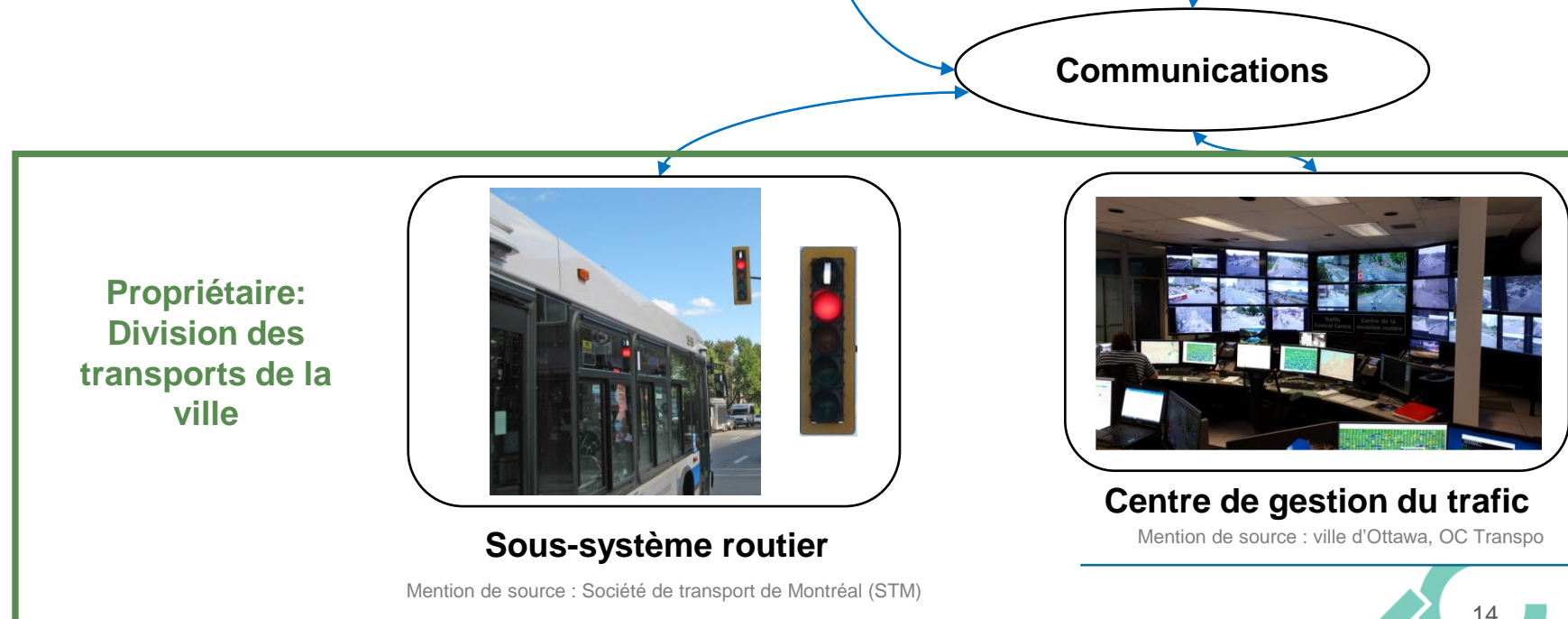
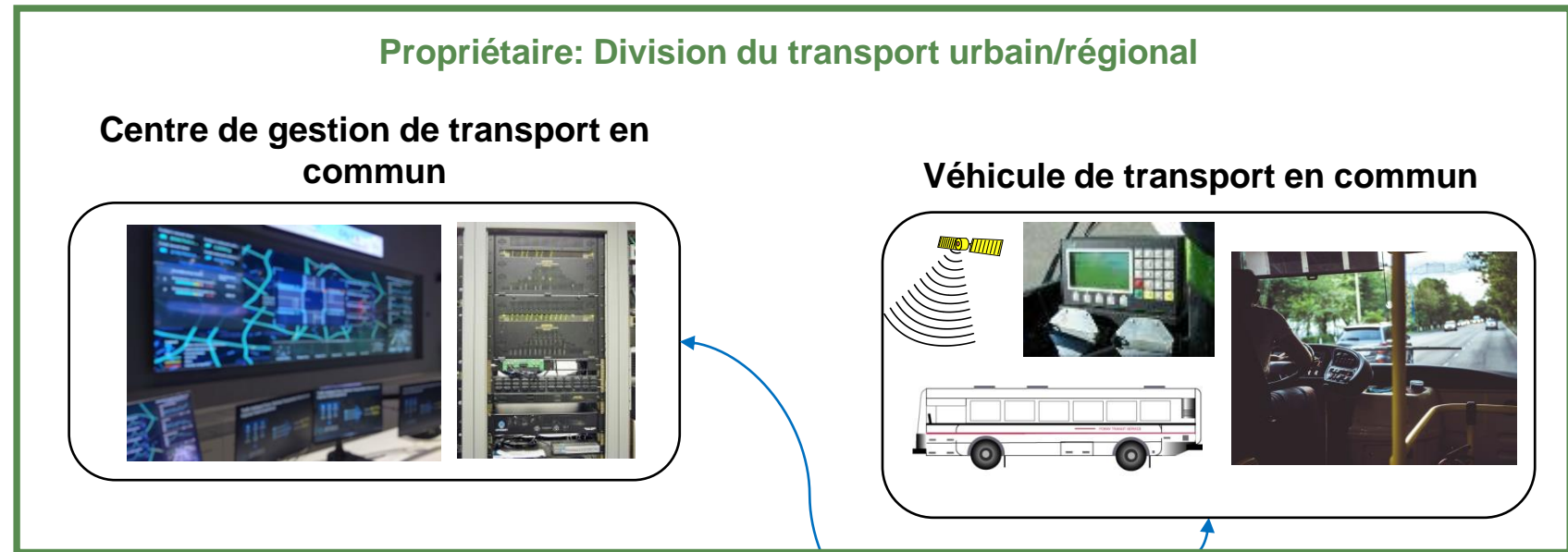
Mention de source : ville d'Ottawa, OC Transpo

Mention de source : Société de transport de Montréal (STM)



# Enterprise

- Identifier qui est impliqué
- Quels sont leurs rôles et responsabilités?
  - Propriétaire
  - Développement
  - Installation
  - Opérations
  - Maintenance





# Fonctionnel

- Identifier les fonctions de chaque appareil physique
- Identifier les exigences

Centre de gestion de transport en commun



Véhicule de transport en commun



Communications

Opérations de la station de gestion des routes sur le terrain



Sous-système routier



Centre de gestion du trafic

Mention de source : ville d'Ottawa, OC Transpo

Mention de source : Société de transport de Montréal (STM)

#	Exigence
1	L'élément sur le terrain contrôlera les feux de circulation sous le contrôle central.
2	L'élément de terrain doit répondre aux demandes de passage pour piétons en accommodant le passage pour piétons.
3	L'élément de terrain doit fournir la capacité d'informer le centre de gestion du trafic des appels de piétons et l'hébergement des piétons.
4	L'élément sur le terrain doit rapporter les informations de contrôle du signal actuel au centre.
5	L'élément de terrain doit signaler l'état actuel de la préemption au centre.
6	L'élément sur le terrain doit renvoyer l'état opérationnel du contrôleur des feux de circulation au centre.
7	L'élément sur le terrain renverra au centre les données de panne du contrôleur des feux de circulation.
8	L'élément sur le terrain doit signaler l'état de priorité de transit actuel au centre.
9	L'élément sur le terrain doit signaler les informations de synchronisation du signal d'intersection actuel à
10	L'élément de champ recevra la demande de priorité de signal de véhicule de transport en commun.
12	L'élément sur le terrain doit signaler au centre le statut actuel de priorité des véhicules utilitaires.
13	L'élément de terrain doit fournir à l'équipement en bordure de route la géométrie de l'intersection et les informations sur le mouvement de la phase du signal, y compris les informations sur la phase et la synchronisation, l'état de l'alarme et l'état de priorité/préemption.
14	L'élément de champ doit fournir des données à l'équipement routier du véhicule connecté.
15	L'élément de terrain doit recevoir les demandes de préemption des signaux des véhicules d'urgence.
16	L'élément de terrain doit recevoir une demande de changement de signal d'un dispositif de terrain d'émissions/environnemental.
17	L'élément sur le terrain doit signaler au centre l'état actuel des émissions/de la priorité environnementale.

# Communications

- Sélectionner les normes/protocoles de communication
- Traiter les vulnérabilités

Centre de gestion de transport en commun



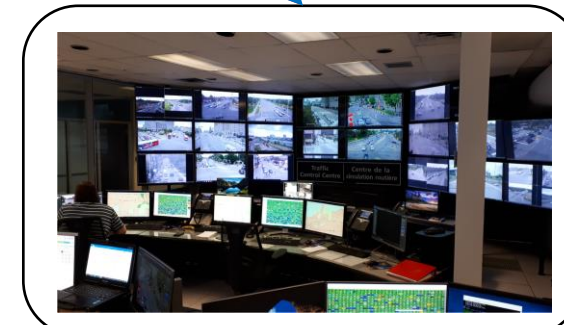
Véhicule de transport en commun



Communications



Sous-système routier



Centre de gestion du trafic

Mention de source : ville d'Ottawa, OC Transpo

Mention de source : Société de transport de Montréal (STM)

Entité d'application des STI		Cliquez sur les icônes "Gap" pour plus d'informations	
NTCIP 1202 ⓘ NTCIP 1210 ⓘ			
Gestion	Installations	Sécurité	
	TransNet		
	Accès		
NTCIP 1201 ⓘ Bundle: SNMPv1_MIB ⓘ	NTCIP 1202 ⓘ NTCIP 1210 ⓘ NTCIP 2301 ⓘ  IETF RFC 793 ⓘ IP Alternatives ⓘ  Field SubNet Alternatives ⓘ	IETF RFC 8446 ⓘ	



# Résumé de l'examen de l'architecture de STI

- Les architectures de STI fournissent des cadres pour le développement de systèmes de transport intégrés
- Les architectures de STI soutiennent la planification et le développement de projets de STI
- L'ARC-IT fournit des outils logiciels téléchargeables gratuitement



# Introduction aux architectures régionales des STI



---

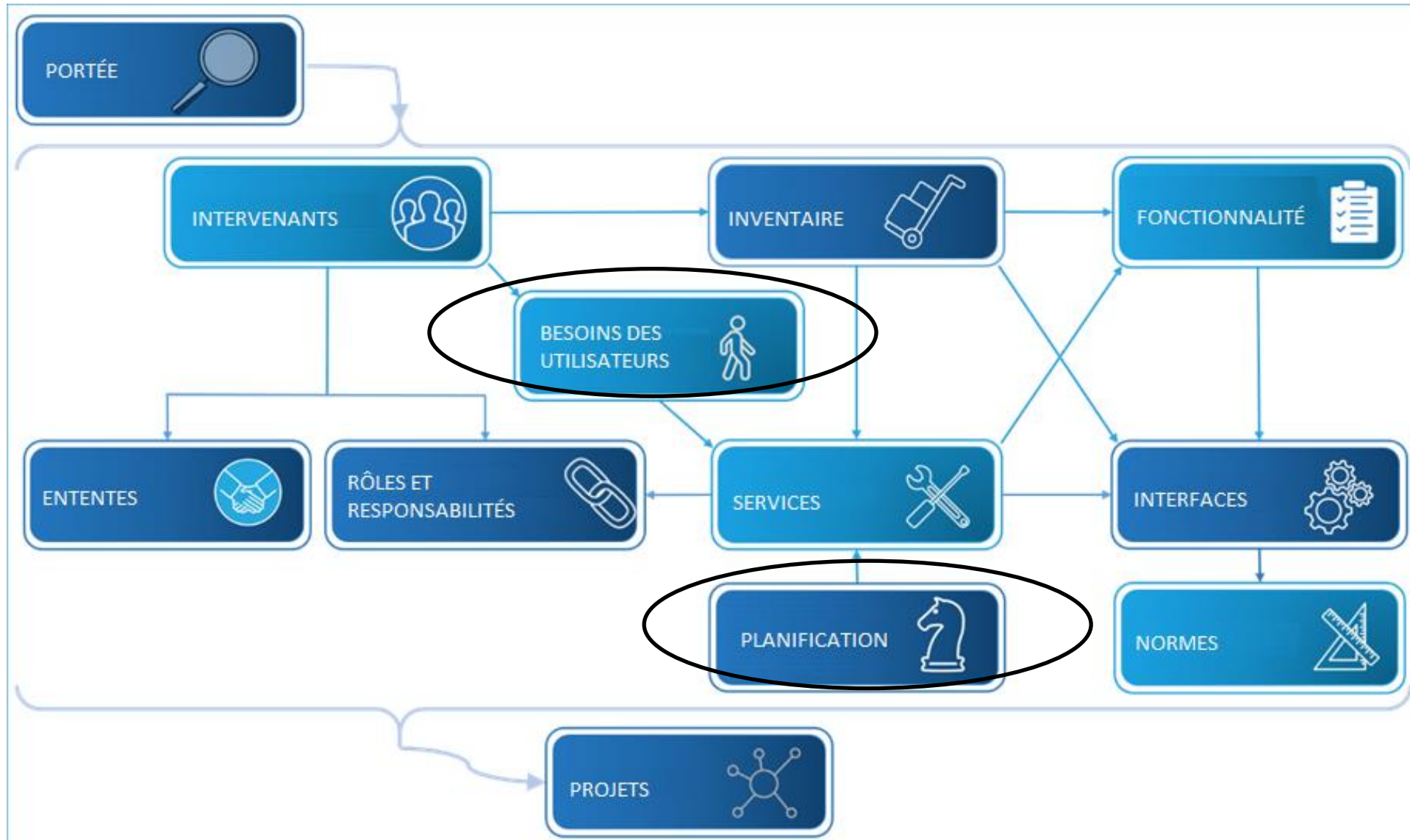
# Architecture régionale de STI

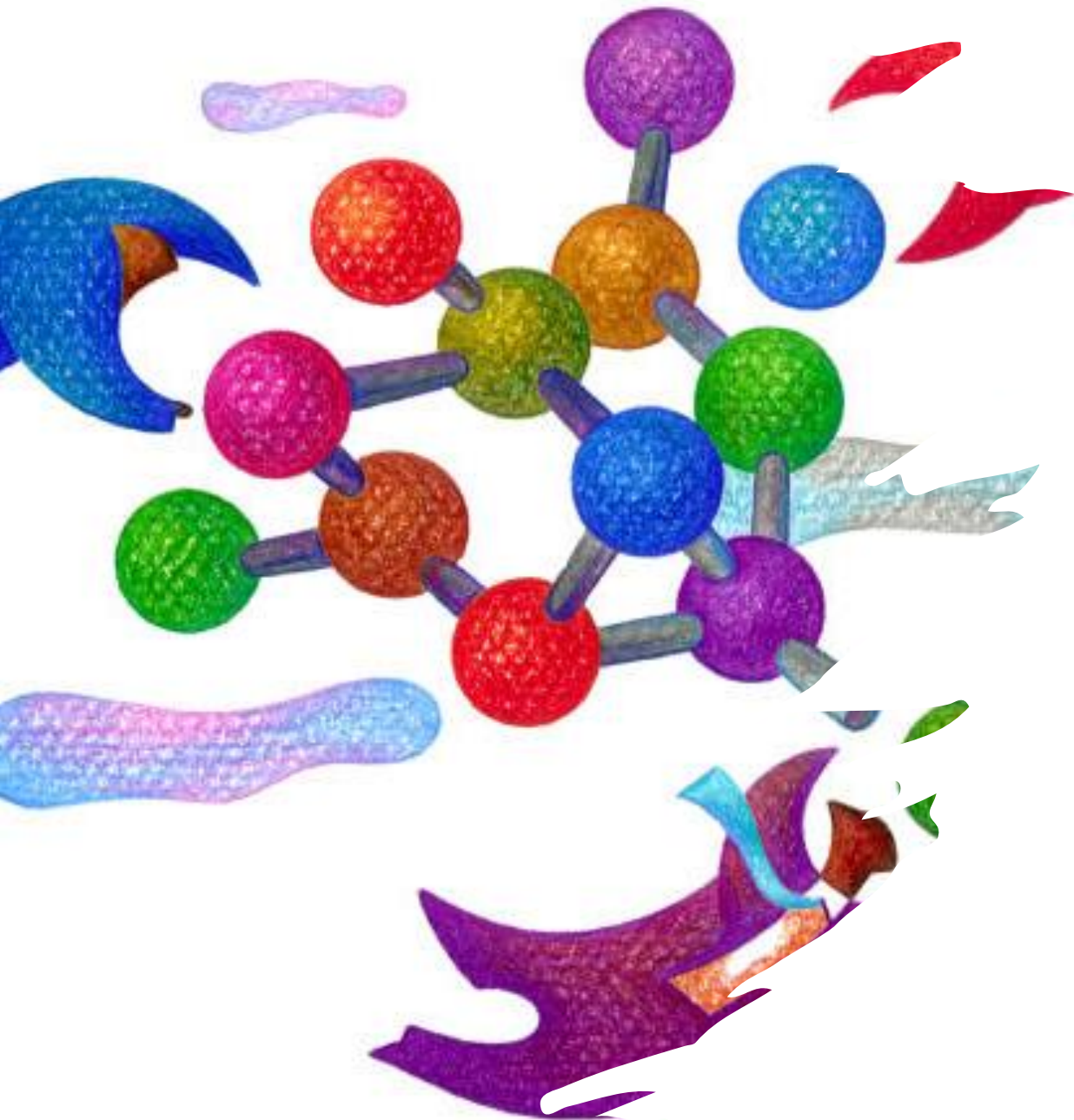
---

Cadre permettant d'assurer  
une entente institutionnelle  
et une intégration technique  
pour la mise en œuvre de  
projets de STI dans une  
région donnée



# Composants des architectures régionales des STI





## Raisons de l'utilisation de l'architecture dans la planification et la programmation des transports

- L'architecture représente une vision consensuelle des intervenants en matière d'exploitation et de planification du déploiement des STI
- Aborde à la fois les projets à court terme et les stratégies à long terme



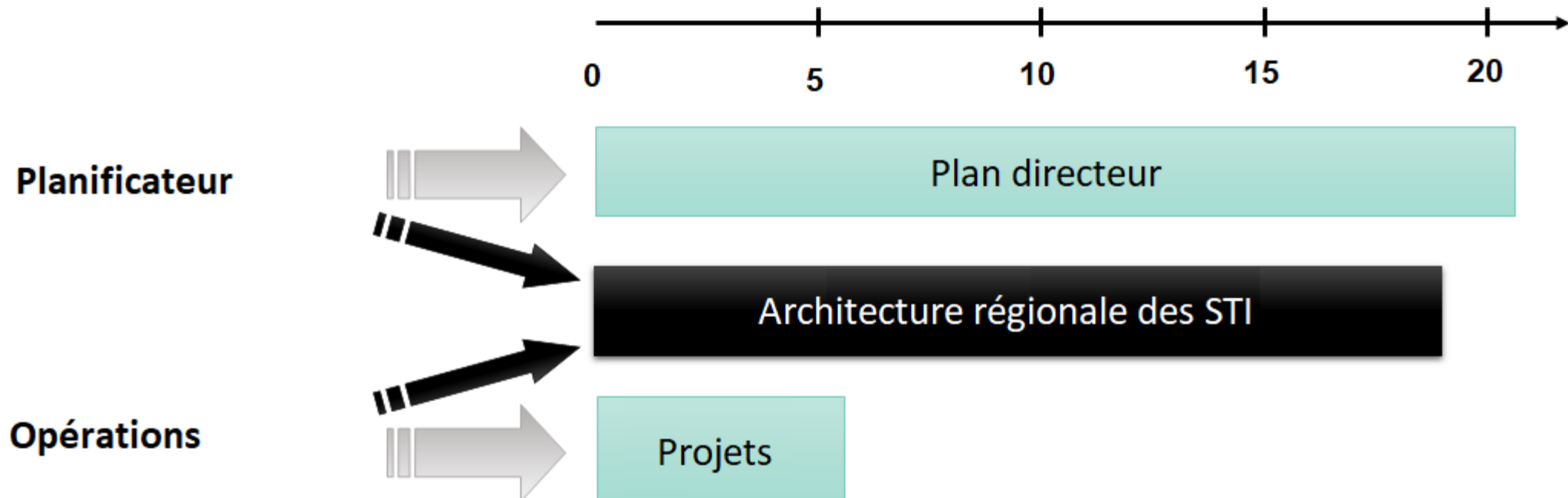
## L'implication des intervenants est essentielle

- Le développement de l'architecture des STI offre une excellente occasion de lier les intervenants en matière d'exploitation et de planification, pendant le développement et plus tard pendant les activités de maintenance ou de mise à jour
- Le comité qui a soutenu le développement de l'architecture devrait également jouer un rôle de premier plan dans la supervision de l'utilisation et de la maintenance de l'architecture



# Relier les visions des intervenants

- Le développement et la mise à jour de l'architecture régionale peuvent élargir l'interaction de la planification et des opérations



# Buts et objectifs en matière de transport

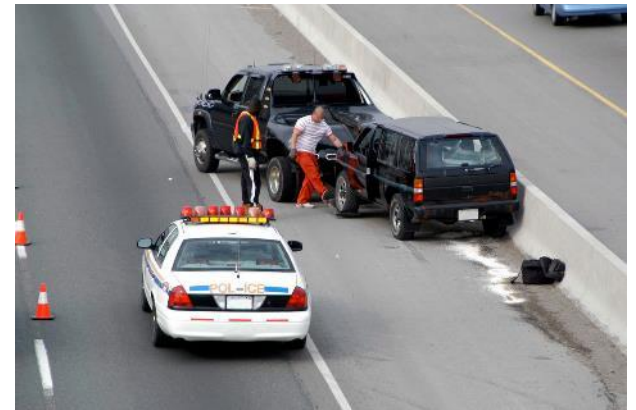
## Buts et objectifs régionaux

### Buts

- Un exemple de but est « Améliorer la sécurité pour tous les utilisateurs du système »

### Objectifs

- Un exemple d'objectif est « Réduire le nombre de décès et de blessures graves liés aux collisions pour tous les modes de transport grâce à des processus basés sur les données, innovants et proactifs ».



# Buts et objectifs en matière d'architecture



Buts et objectifs régionaux

Traduit sur la base du matériel de : Département des Transports (DOT) des É.-U.



- L'architecture doit être basée sur les buts et objectifs liés aux opérations
  - Inclure les objectifs dans l'architecture régionale de STI et les associer à des ensembles de services ou projets



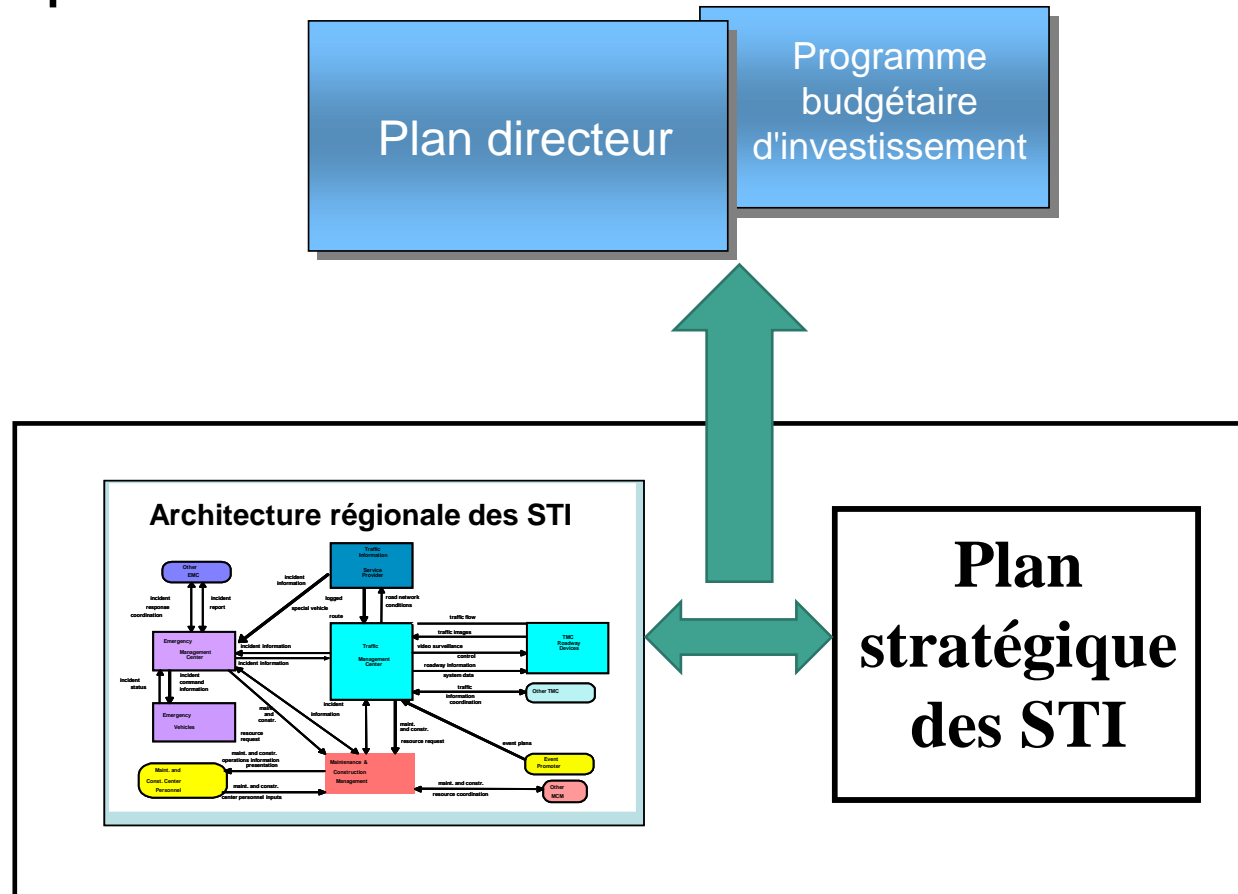
- Les services et les projets d'architecture peuvent soutenir le développement d'objectifs liés aux opérations
  - L'architecture contient un plan à long terme pour les STI par la définition de services et de projets

# Plan directeur et architecture

Plan directeur	Architecture régionale
Buts, objectifs, stratégies et projets pour y parvenir	Services et projets de STI
Couvre au moins les 20 prochaines années	Échéancier à long terme
Mène à un système intermodal	Couvre plusieurs modes
Contraintes fiscales	Pas de contraintes fiscales
Doit être mis à jour tous les 4 à 5 ans	Mise à jour selon le plan de maintenance

# Plan stratégique des STI

- Définit les besoins en STI d'une région et identifie un ensemble de capacités répondant aux besoins



# Plan stratégique des STI (suite)

- Peut contenir des éléments qui vont au-delà des exigences de l'architecture régionale
  - Vision, buts et objectifs
  - Stratégies de déploiement des STI
  - Considérations de financement
  - Définitions détaillées du projet
  - Lacunes dans les projets prévus
  - Analyse des avantages
  - Plan de communications



Mention de source : MTQ

# Rendre l'architecture utile pour la planification à long terme

- Relier explicitement les services et les projets d'architecture aux objectifs et aux stratégies
- Décrire les projets à moyen et long terme dans un langage adapté au plan (p. ex., en tant que « stratégies »)
- Créer des documents/graphiques de résumé dans le cadre de l'architecture qui serait appropriée pour un plan directeur
- Approuver formellement l'architecture

# Rendre l'architecture utile pour la programmation/la budgétisation

- Définir les projets à court terme avec plus de précision en vue d'alimenter les processus de programmation et de budgétisation
- Promouvoir des projets d'intégration dans la région
- Établir un processus qui utilise l'architecture

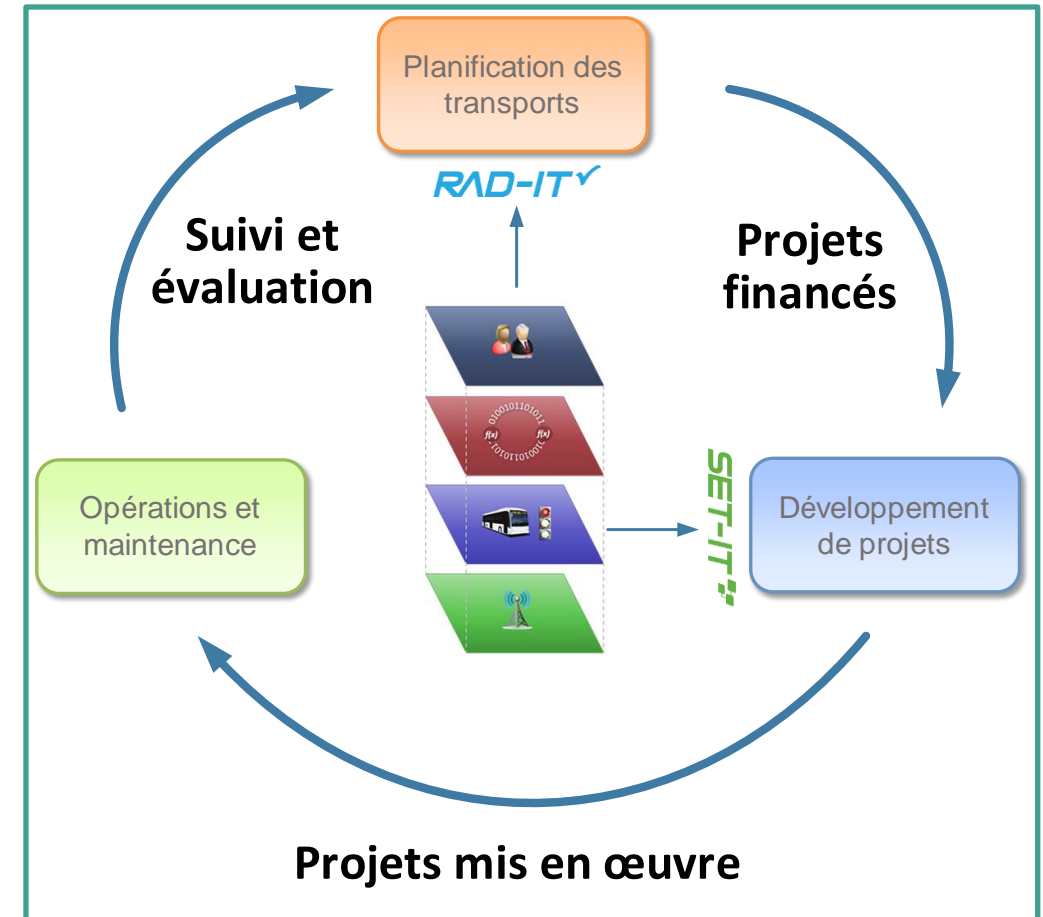




# Suite d'outils de l'ARC-IT

- Deux outils logiciels téléchargeables gratuitement sont disponibles pour appliquer l'ARC-IT aux régions et projets
  - Développement d'architecture régionale pour le transport intelligent (RAD-IT)
  - Outil d'ingénierie des systèmes pour le transport intelligent (SET-IT)

<https://www.arc-it.net/html/resources/tools.html>



Adapté de : Département des Transports (DOT) des É.-U.

# Intégration des outils de l'ARC-IT

- Fonction d'importation de SET-IT : permet de connecter la planification régionale à la définition de projet
  - Prendre le contenu de l'architecture régionale comme intrant pour un projet dans SET-IT
  - Réaliser une analyse plus poussée de l'ingénierie des systèmes à l'aide des exigences → des outils, des documents de contrôle d'interface, des normes de sécurité et de communication



Mention de source :  
Département des  
Transports (DOT)  
des É.-U.

- Fonction d'importation de RAD-IT : prend en charge la rétroaction d'un projet SET-IT dans l'architecture régionale

<https://www.arc-it.net/html/resources/tools.html>

# RAD-IT

United States Department of Transportation

## ARC-IT Version 9.2

The National ITS Reference Architecture

Architecture ▾ Architecture Use ▾ Architecture Resources ▾ Architecture Terminology ▾ Contact The Architecture Team

Home > Resources > Tools > RAD-IT

This sample architecture originated as an exercise in the National ITS Architecture Public Sector Training Course. It illustrates many of the Regional Architecture Development for Intelligent Transportation (RAD-IT) software features as well as parts of the Architecture Reference for Cooperative & Intelligent Transportation (ARC-IT) that merge traditional ITS concepts with connected vehicle technologies and supporting services. To this end, several minor extensions have been made to the basic Marinara County scenario so that features like user defined Physical Objects, Flows, and connected vehicle service packages can also be illustrated.

- Operational Concept (i.e. Agency Roles and Responsibilities)
- Functional Requirements Support
- Support for List of Agreements, selected based on interfaces between stakeholders' elements
- User Tailored List of Standards based Communications Solutions

The Marinara County transportation region encompasses rural and urban areas, including the rapidly expanding city of Saucelito. The regional boundary coincides with the metropolitan planning area. The total regional population of 675,000 is demographically diverse: 5% continue the traditional regional farming activities, 62% are Saucelito residents, and over 50% of the region's workers are in technology industries. Marinara's largest employer is Parma-John, a pharmaceuticals firm with a payroll of over 11,000 workers.

[ADE Steps page](#) for instructions.

Contact the Helpdesk if you have any questions.

Known Issues:

- Generating outputs, such as the web pages or batch diagrams, using a network file share may cause an error - set Synchroniz
- Following installation some users have reported an error that "Access is denied" when they try to launch the tool. This is due to installation and your anti-virus software. Try temporarily disabling your anti-virus software and reinstalling RAD-IT.

RAD-IT includes a Conversion facility that supports quick and easy conversion of existing Turbo and RAD-IT databases, providing a existing Turbo or RAD-IT users.

**Support Services:** Our customer support team is standing by to offer friendly, responsive technical support to RAD-IT users.

If you can't find what you need in the knowledge base, you can contact customer support via phone or email. To receive the best support information ready before contacting us:

- The version of RAD-IT that you are using.
- The version and name of your operating system and Office products.
- A brief description of your problem or issue.

RAD-IT - New - Marinara County

File Home Output

Filters Elements Selection Diagrams Tables Document Web Pages

Filtering Output

Start Planning Stakeholders Inventory Services Needs R & R Functions Interfaces Standards Agreements

Current Region: Marinara County

Architectures

Regional

Marinara County

Region to Project New Delete

Project

MCDOT Saucelito Traffic Coordination  
MCDOT Traffic Monitoring Expansion Project  
MCDOT V2I Safety Initiative  
TOMATO

Project to Region New Delete

Related

Alfredo County

New Delete

Regional Architecture Attributes

Name

Marinara County

Description

This sample architecture originated as an exercise in the National ITS Architecture Public Sector Training Course. It illustrates many of the Regional Architecture Development for Intelligent Transportation (RAD-IT) software features as well as parts of the Architecture Reference for Cooperative & Intelligent Transportation (ARC-IT) that merge traditional ITS concepts with connected vehicle technologies and supporting services. To this end, several minor extensions have been made to the basic Marinara County scenario so that features like user defined Physical Objects, Flows, and connected vehicle service packages can also be illustrated.

Timeframe

Through 2030 (Next 10 to 15 years)

Geographic Scope

The Marinara County transportation region encompasses rural and urban areas, including the rapidly expanding city of Saucelito. The regional boundary coincides with the metropolitan planning area. The total regional population of 675,000 is demographically diverse: 5% continue the traditional regional farming activities, 62% are Saucelito residents, and over 50% of the region's workers are in technology industries. Marinara's largest employer is Parma-John, a

Service Scope

The intelligent transportation system for the Marinara region consists of freeway management, surface street systems, and transit services that are managed by the county and local agencies. There is now a growing interest in traveler information systems that use new technologies to collect traffic data and develop traveler information concerning traffic as well as parking and event data for the region.

Developer

Bob Olley (MCDOT)

Maintainer

Will N Able (MCTPB)

Version

v2018-b

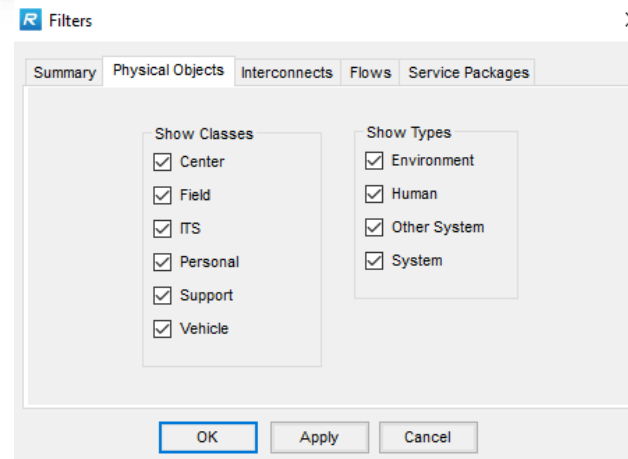
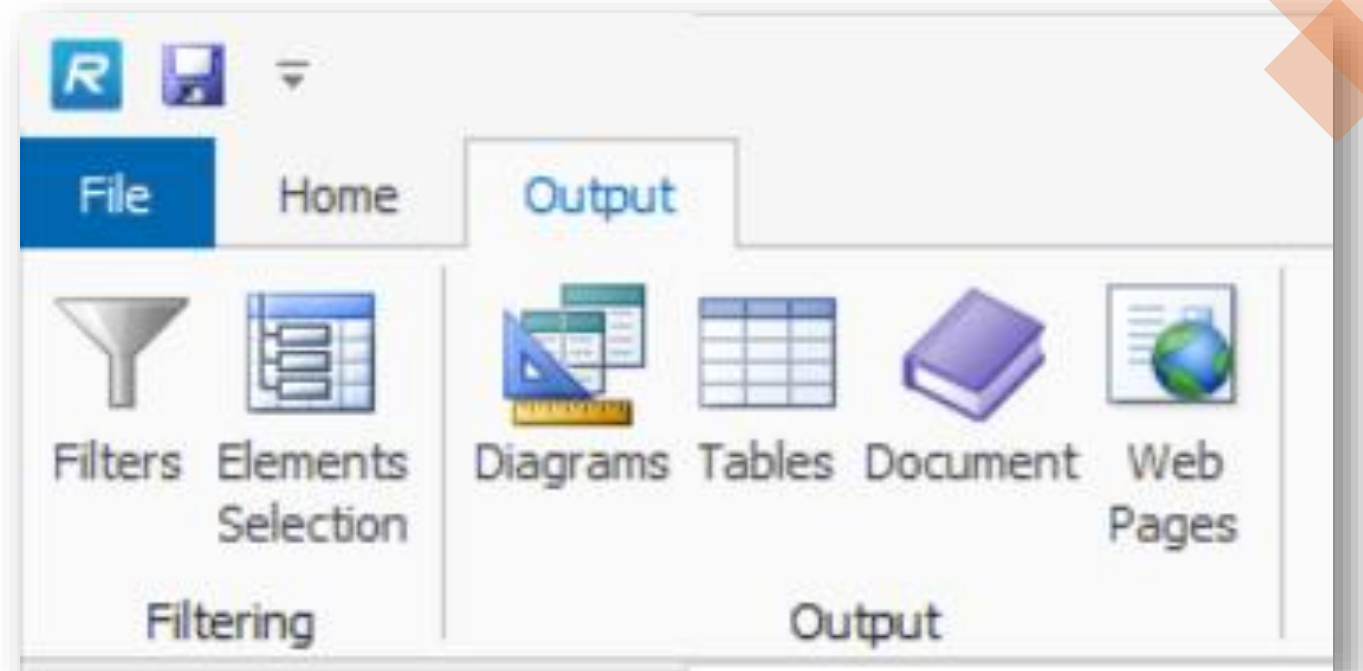
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6/13/2018 12:00:00 AM

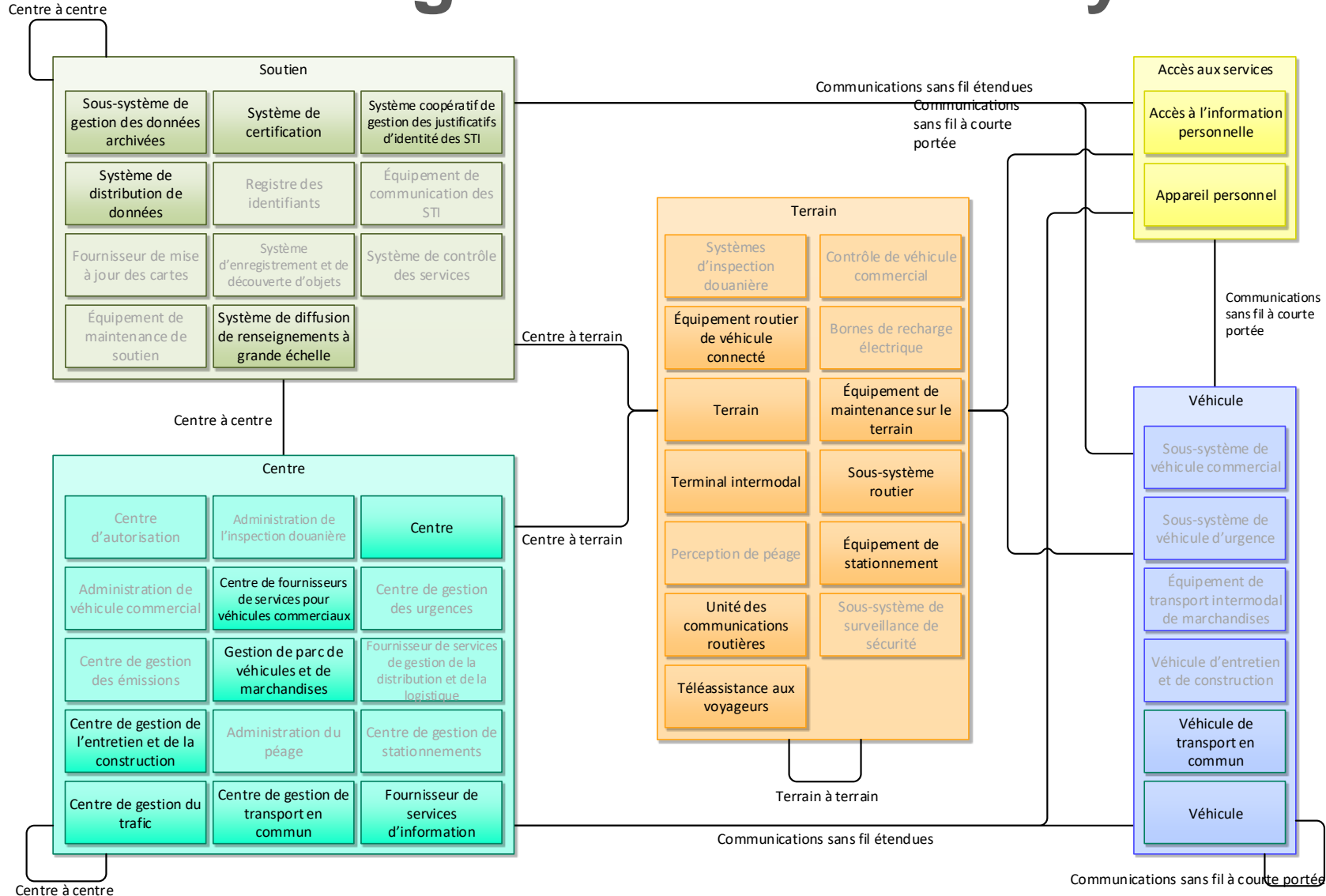
Change Log Apply Cancel

# Extrants RAD-IT

- Diagrammes
  - Résumé du sous-système
  - Interconnexion
  - Flux
  - Plus - Capacité de traitement par lots
- Tableaux
- Documents – régionaux et de projet
- Site Web personnalisé

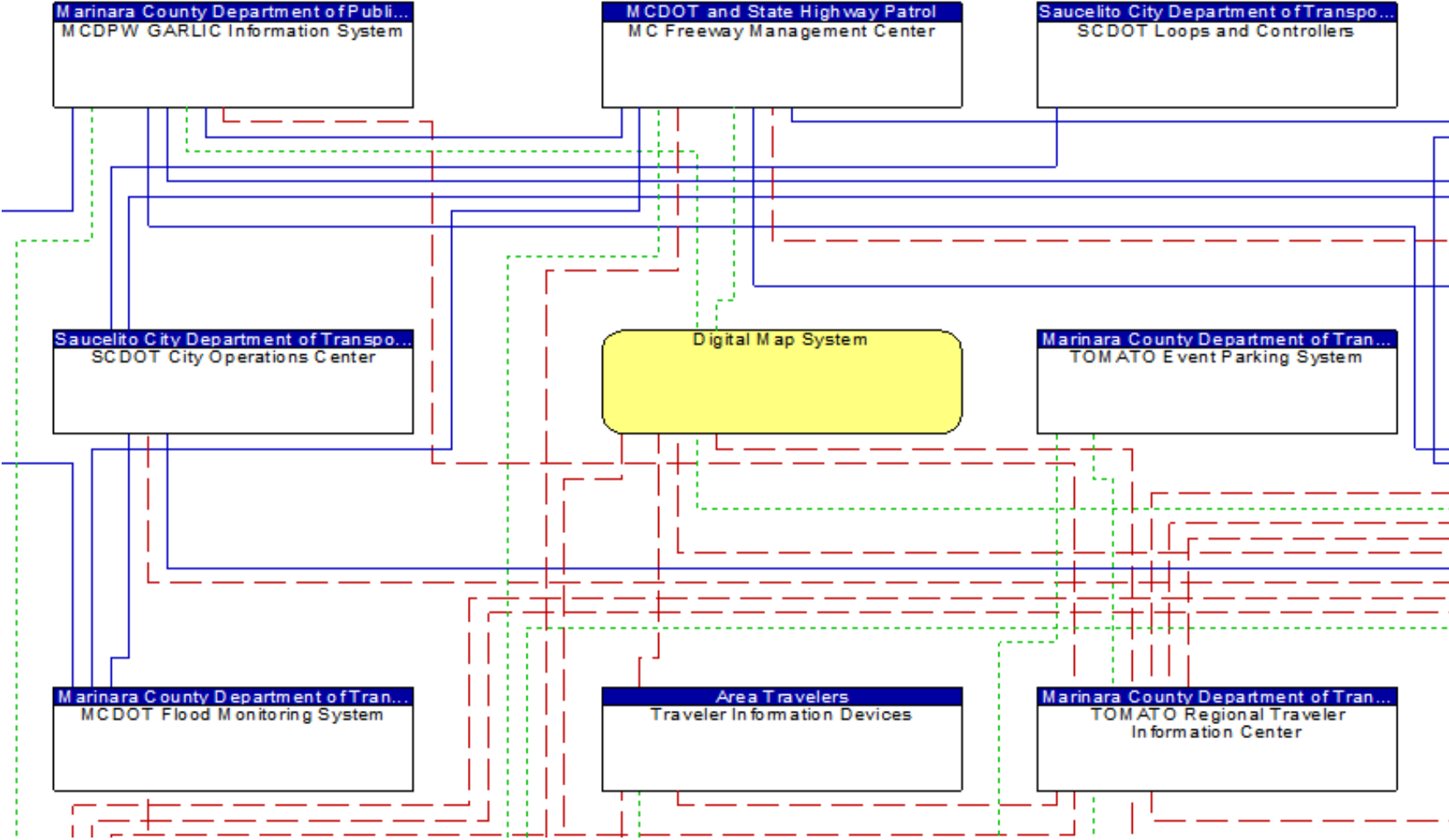


# Extrants RAD-IT : Diagramme du sous-système

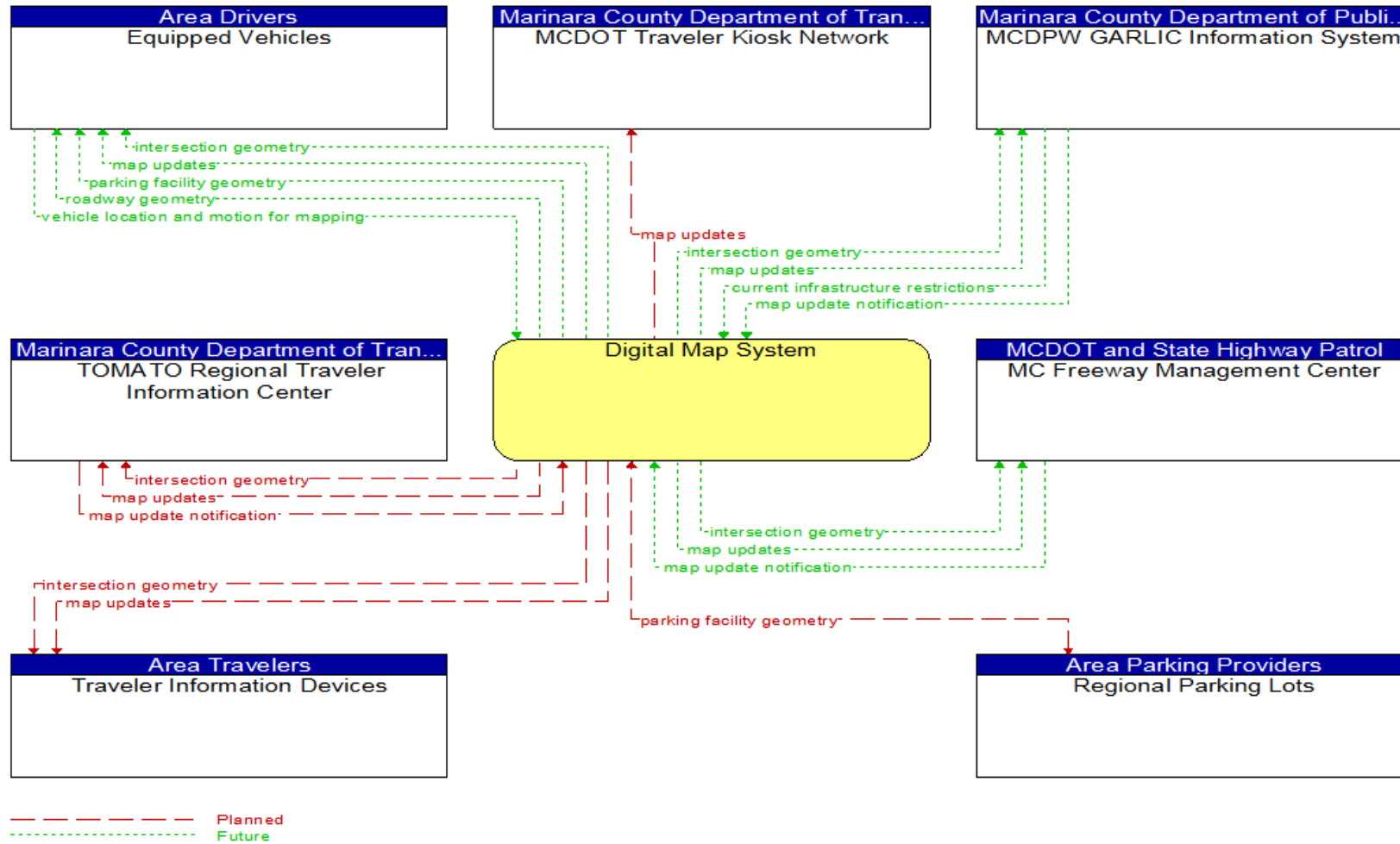


Mention de source : Département des Transports (DOT) des É.-U.

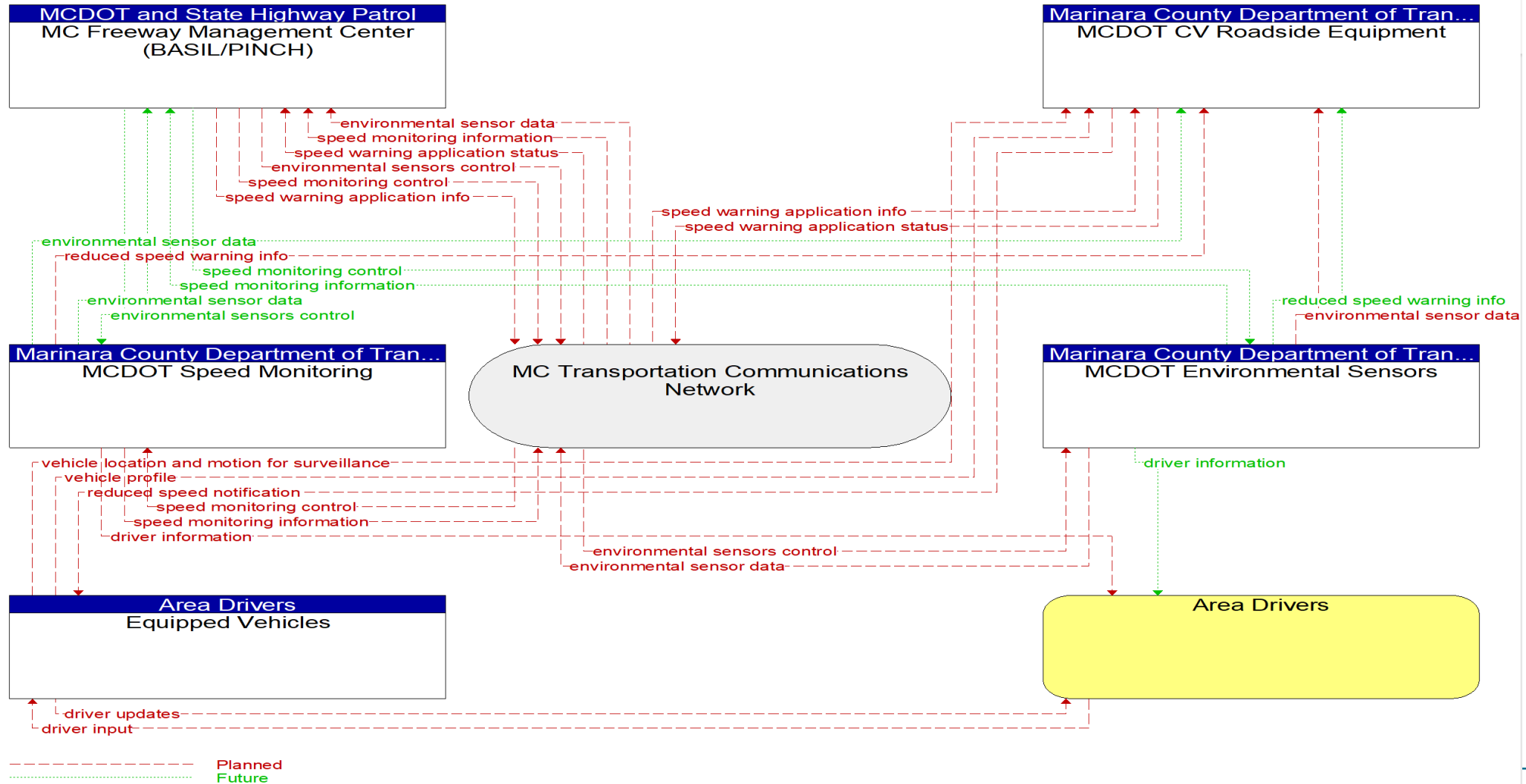
# Extrants RAD-IT : Diagramme d'interconnexion



# Extrants RAD-IT : Diagrammes contextuels



# Extrants RAD-IT : Diagrammes de services



VS09 : Avertissement de zone de limitation de vitesse /  
Fermeture de voie



# Extrants RAD-IT : Tableaux

## Services

Output Tables

1. Select Table

- Summary / File Info
- Stakeholder Topics
- Physical Components & Services
  - Inventory
  - Services
  - Needs
  - Requirements
  - Functional Objects
  - Physical Objects
  - Inventory to Service Package Comparison
  - Needs to Requirements

2. Select Columns

Available Columns

- Service Package
- Service Package Name
- Service Package Description
- Service Package Status
- Service Package Instance
- Included Elements
- Comment

Selected Columns

3. Select Action

Save to File  Open Application

4. Create Output

Roll up multiple rows into a single row

Word Excel Text

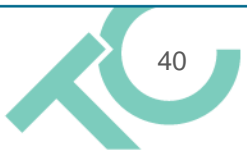
Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements	Comment
DM01	ITS Data Warehouse	This service package provides the same broad access to multimodal, multidimensional data from varied data sources as in the ITS Data Warehouse service package, but provides this access using enhanced interoperability between physically distributed ITS archives that are each locally managed. Requests for data that are satisfied by access to a single repository in the ITS Data Warehouse service package are parsed by the local archive and dynamically translated to requests to remote archives which relay the data necessary to satisfy the request.	Planned	No	MC Planning Data Warehouse	
PM04	Regional Parking Management	This service package supports communication and coordination between equipped parking facilities and also supports regional coordination between parking facilities and traffic and transit management systems. This service package also shares information with transit management systems and information service providers to support multimodal travel planning, including parking reservation capabilities. Information including current parking availability, system status, and operating strategies are shared to enable local parking facility management that supports regional transportation strategies.	Future	No	Regional Parking Lots	
PM04	Regional Parking Management	This service package supports communication and coordination between equipped parking facilities and also supports regional coordination between parking facilities and traffic and transit management systems. This service package also shares information with transit management systems and information service providers to support multimodal travel planning, including parking reservation capabilities. Information including current parking availability, system status, and operating strategies are shared to enable local parking facility management that supports regional transportation strategies.	Future	No	TOMATO Event Parking System	
PM04	Regional Parking Management	This service package supports communication and coordination between equipped parking facilities and also supports regional coordination between parking facilities and traffic and transit management systems. This service package also shares information with transit management systems and information service providers to support multimodal travel planning, including parking reservation capabilities. Information including current parking availability, system status, and operating strategies are shared to enable local parking facility management that supports regional transportation strategies.	Future	No	TOMATO Regional Traveler Information Center	

# Extrants RAD-IT : Documents

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3	RELATIONSHIP TO PLANNING.....	4
4	ITS STAKEHOLDERS.....	9
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Annexe B. Détails des interfaces .....	62



# Extrants RAD-IT : Site Web

**RAD-IT** Marinara

**Home**

- Scope
- Planning
- Stakeholders
- Inventory
  - By Physical Object
  - By Stakeholder
- Services
- Roles and Resp
- Needs
- Interfaces
- Standards
- Agreements
- Projects

## Welcome

This Regional ITS Architecture is a roadmap for transportation systems integration. The architecture was developed through a cooperative effort by the region's transportation agencies, covering all modes and all roads in the region. It represents a shared vision of how each agency's systems will work together in the future, sharing information and resources to provide a safer, more efficient, and more effective transportation system for travelers in the region. The architecture provides an overarching framework that spans all of the region's transportation organizations and individual transportation projects. Using the architecture, each transportation project can be viewed as an element of the overall transportation system, providing visibility into the relationship between individual transportation projects and ways to cost-effectively build an integrated transportation system over time. The purpose of this regional ITS architecture web site is to encourage use of the regional ITS architecture and gather feedback so that the architecture is used and continues to reflect the intelligent transportation system vision for the region. The menu bar at left provides access to the stakeholders, the transportation systems in the region (the Inventory), the transportation-related functions that are envisioned, and the existing and planned integration opportunities in the region.

# Résumé de l'architecture régionale de STI

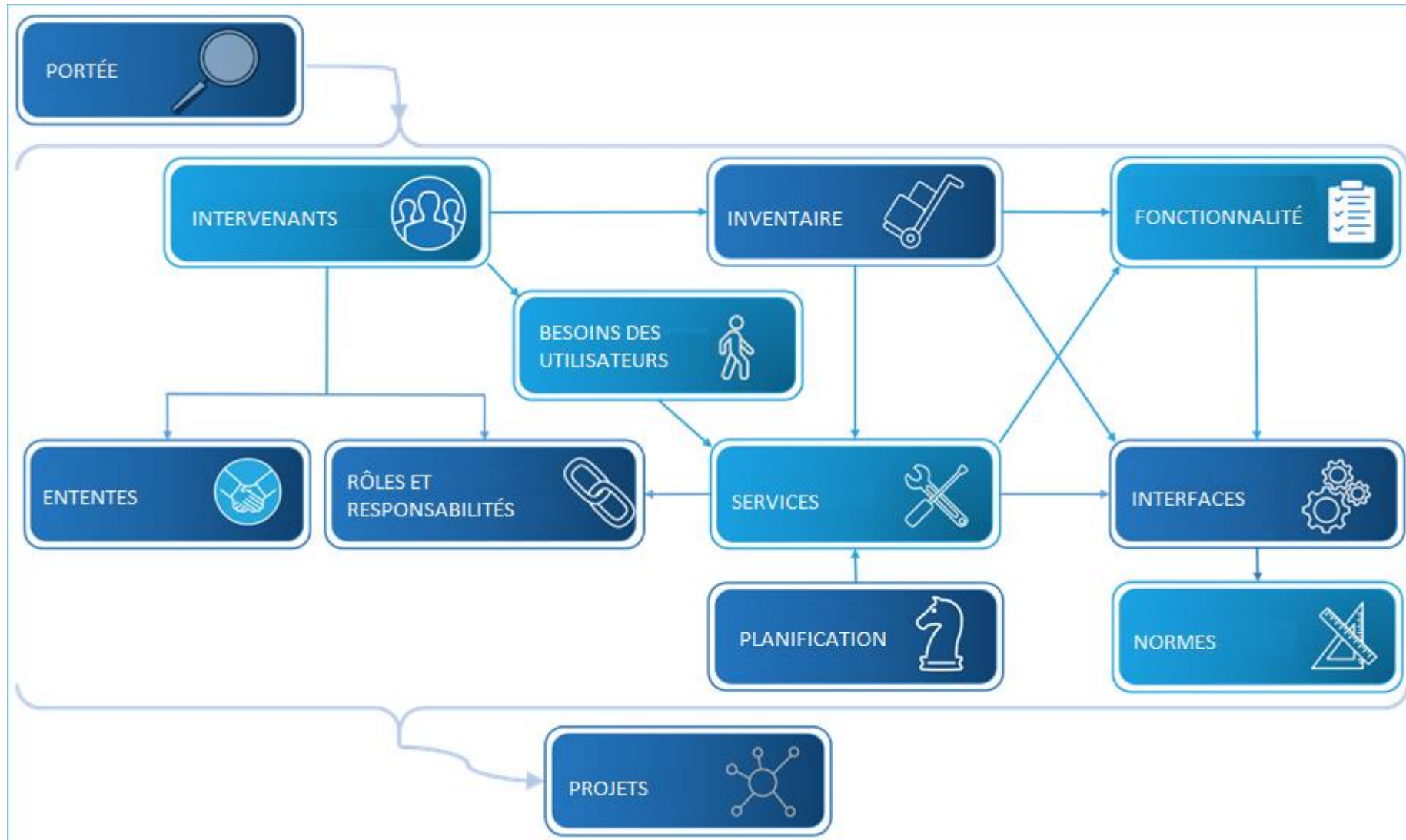
- Une architecture régionale de STI fournit un cadre permettant d'assurer l'entente institutionnelle et l'intégration technique pour la mise en œuvre de projets de STI dans une région donnée.
- Peut soutenir la planification
  - Plans de transport à long terme
    - Plans directeurs
  - Plans à court terme ou stratégiques
    - Plans ou programmes d'immobilisations



# Processus de développement de l'architecture régionale de STI



# Donc, comment développe-t-on une architecture régionale de STI?



## Guide du processus de développement

### REGIONAL ITS ARCHITECTURE GUIDE

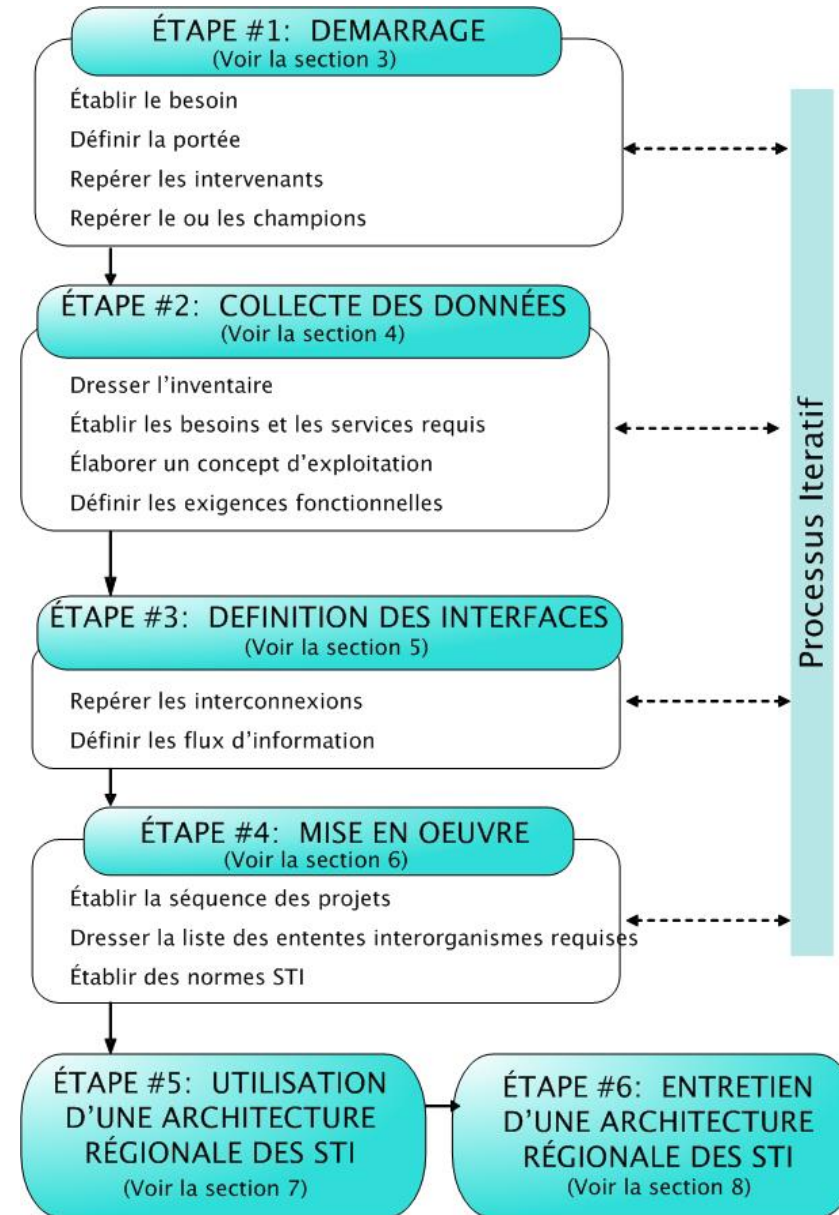
Prepared by the  
National ITS Architecture Team

Prepared for:  
Intelligent Transportation Systems Joint Program Office (ITS JPO)  
US Department of Transportation  
Washington, DC 20590

November 5, 2020

# Donc, comment développons-nous une architecture régionale de STI?

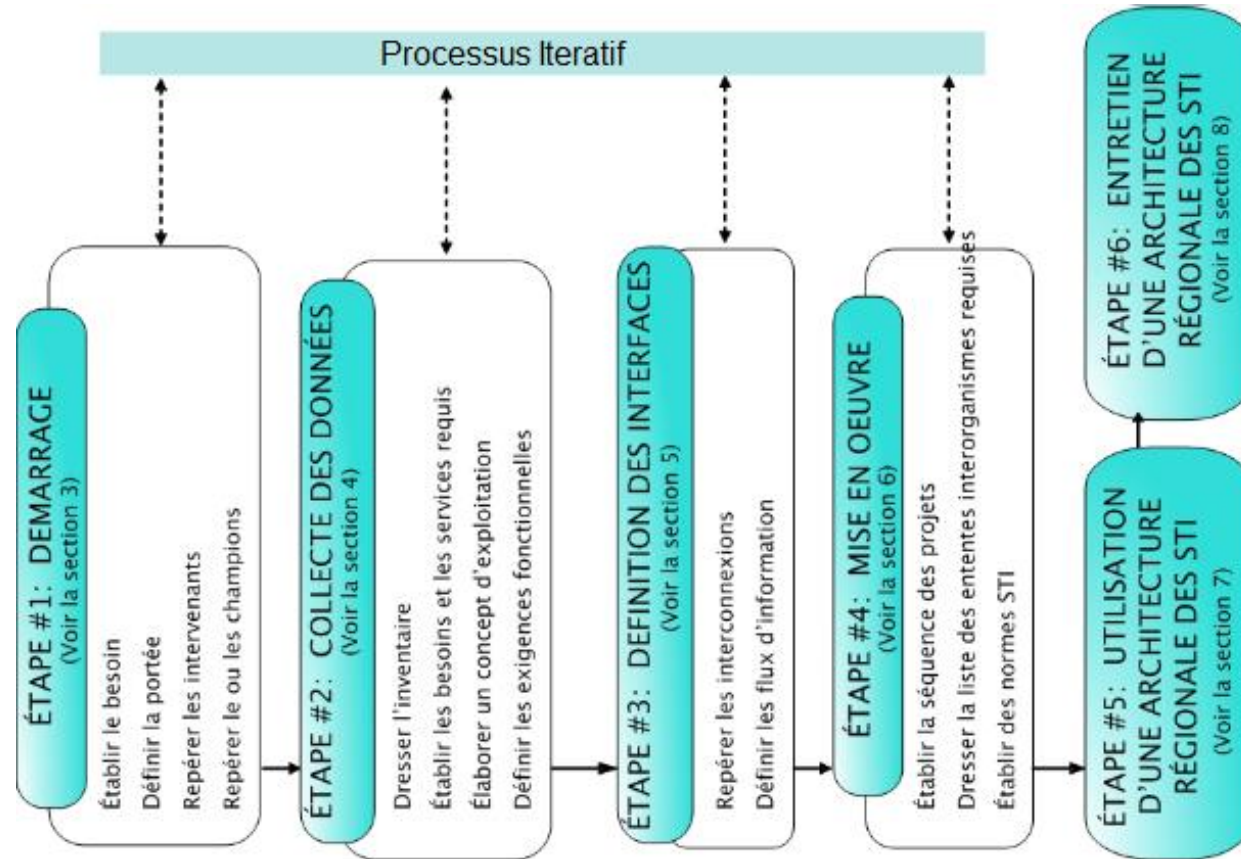
**RAD-IT vous guide tout au long du processus de développement**



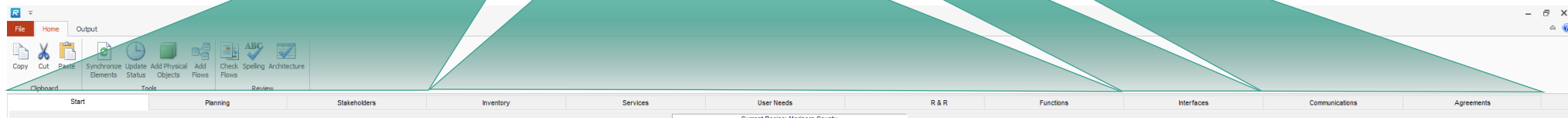
Mention de source : Guide de l'architecture régionale des STI (2010 – version précédente)

# Donc, comment développe-t-on une architecture régionale de STI?

RAD-IT vous guide tout au long du processus de développement

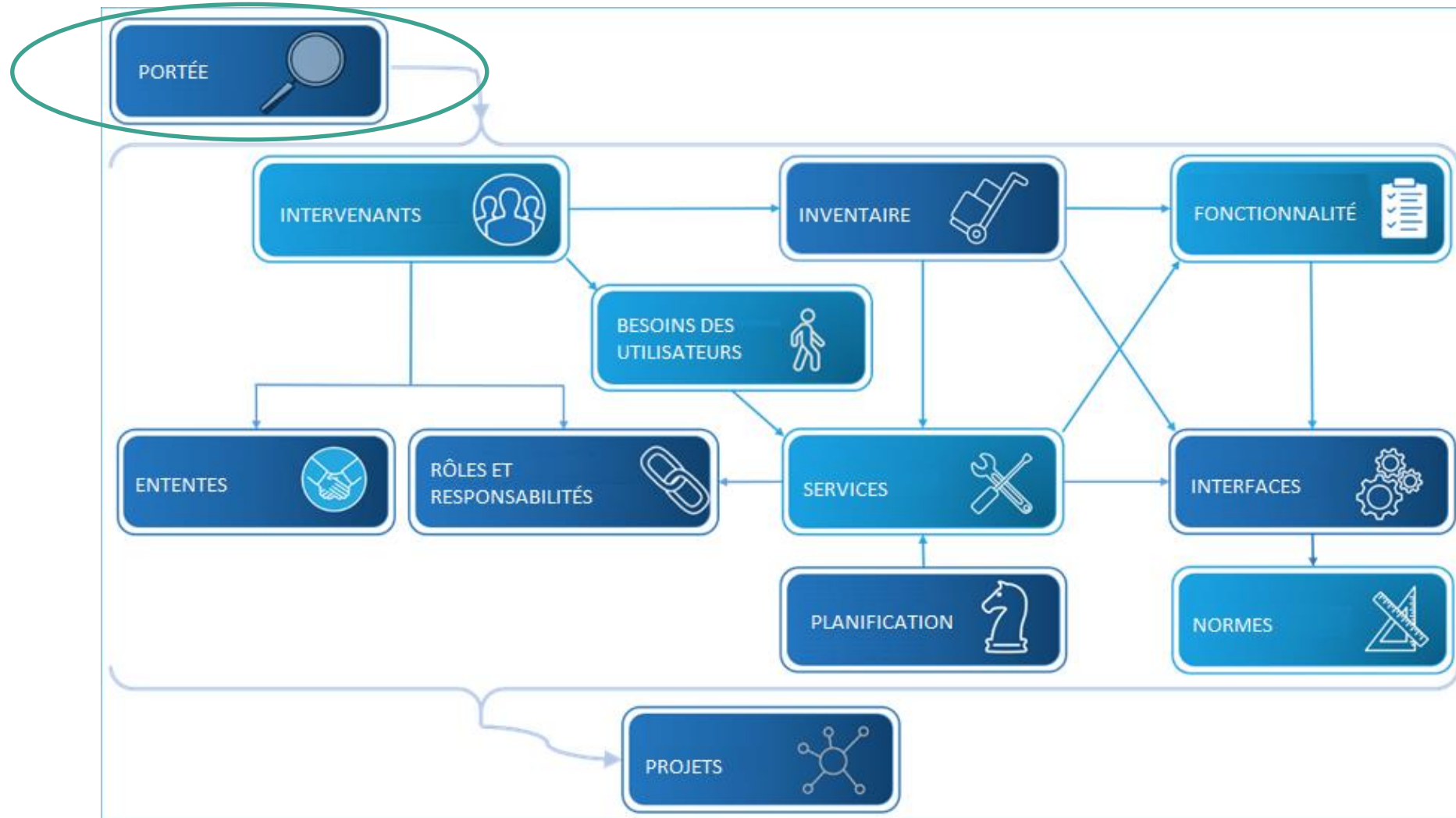


Mention de source : Guide de l'architecture régionale des STI (2010 – version précédente)





# Éléments de l'architecture régionale de STI



# Région - Portée de l'architecture



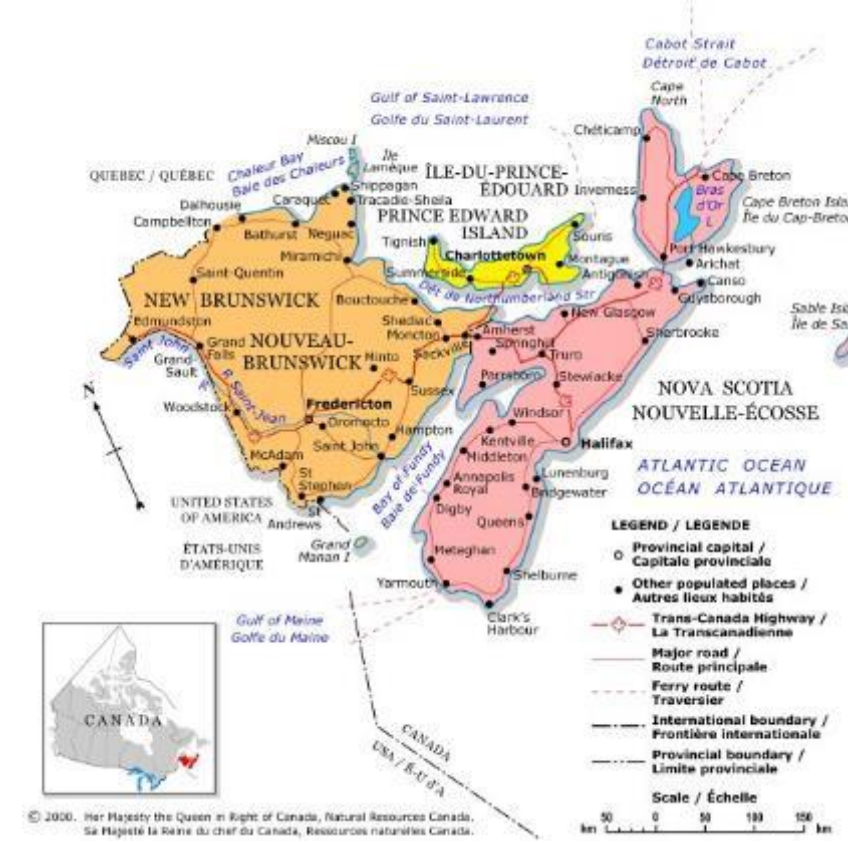
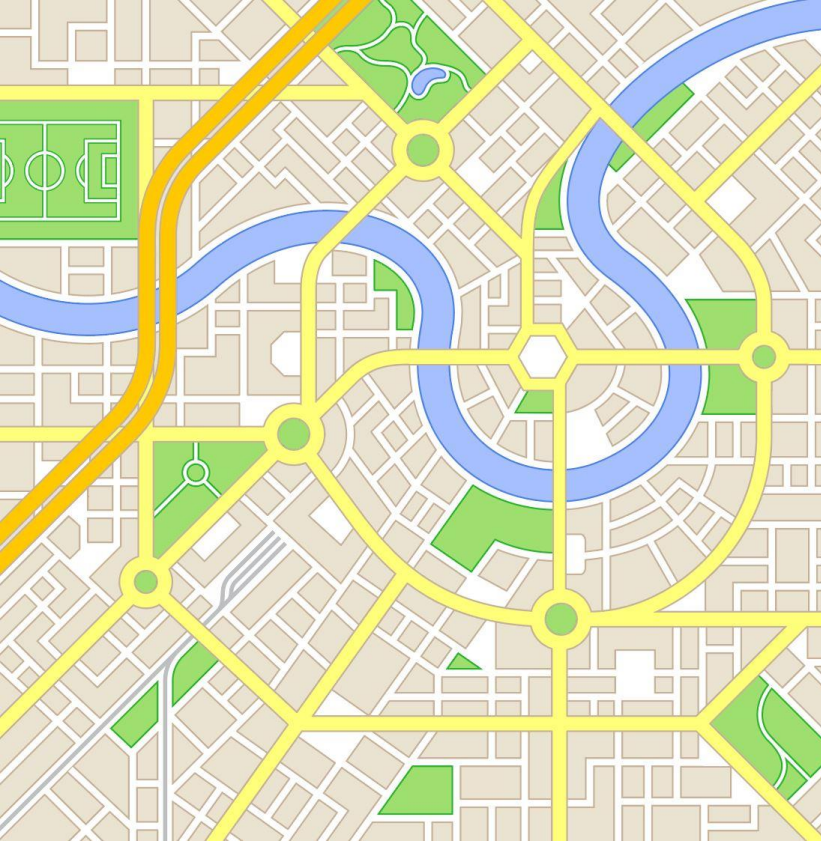
Zone géographique



Horizon temporel



Étendue des services de STI



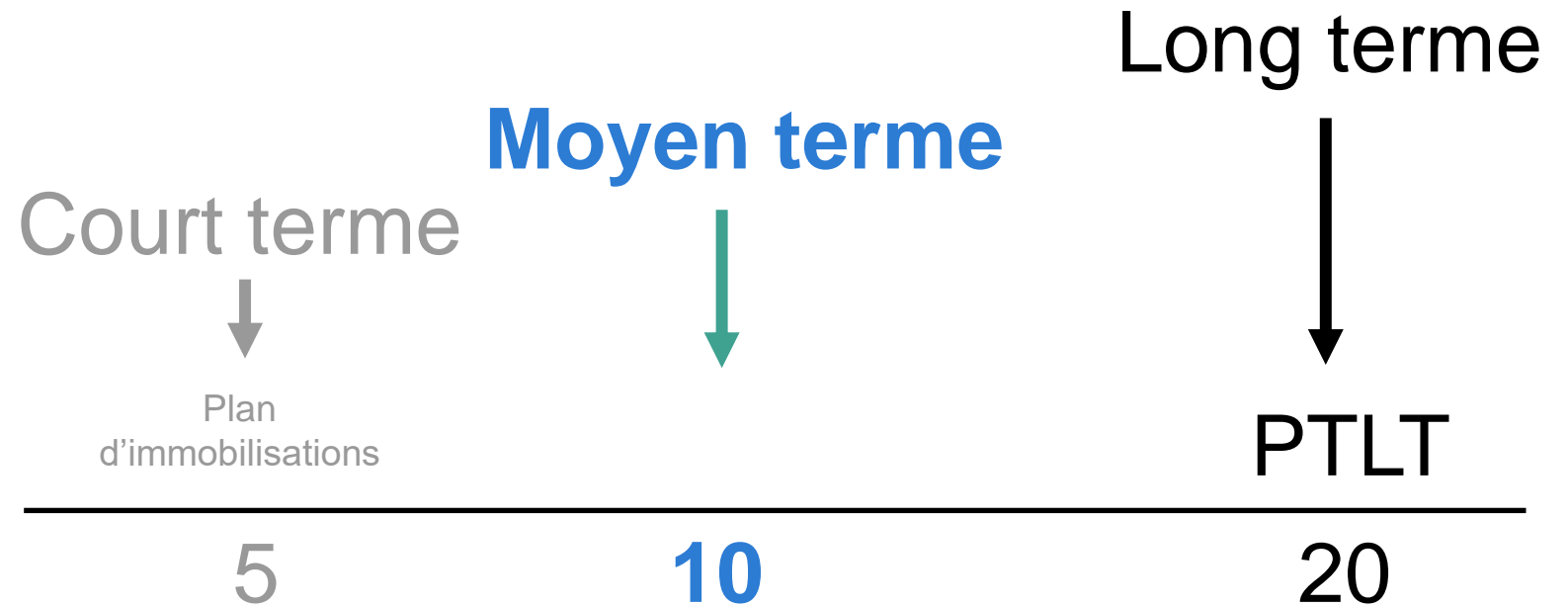
## Options de la zone géographique de l'architecture

- Municipalité (p. ex. ville ou région)
- Multi-municipalités (p. ex. RGTH)
- Province et multi-provinces
- Couloir des STI
- Limite de financement des projets de STI
- Zone de service

# Horizon temporel de l'architecture

- Jusqu'où se projeter?

**Correspond  
à l'horizon temporel :**

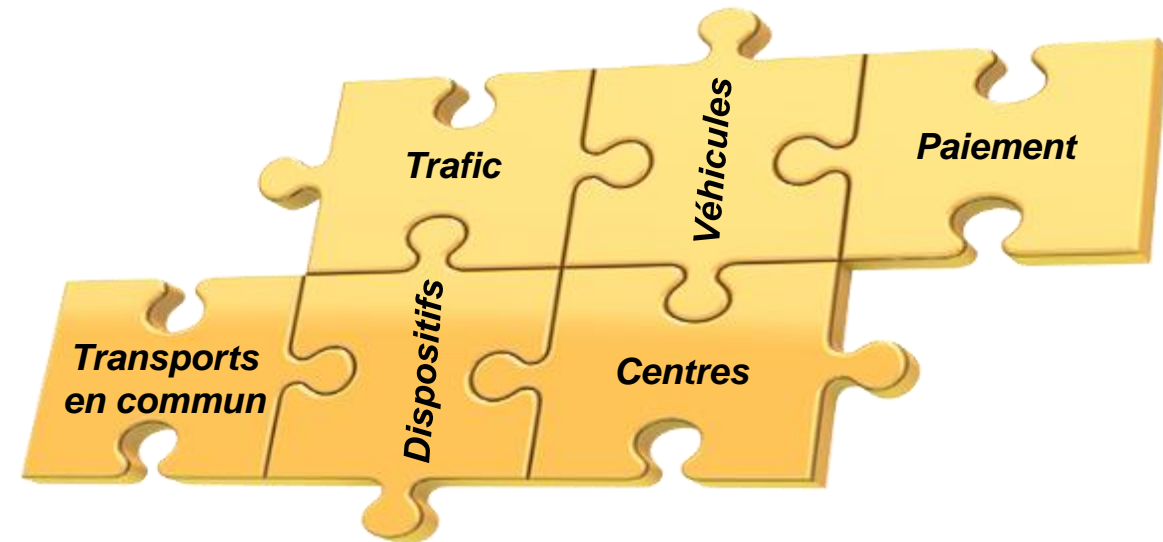


Mention de source : Département des Transports (DOT) des É.-U.

# Étendue des services de l'architecture



- Inclure des services à l'échelle de la province?
  - 511 renseignements voyageurs
  - Exploitation de véhicules commerciaux
- Inclure uniquement les services financés par le secteur public?
- Considérer d'autres architectures



Mention de source : Département des Transports (DOT) des É.-U.

# RAD-IT – Portée (Début)



RAD-IT - New - Marinara County

File Home Output

Filters Elements Selection Diagrams Tables Document Web Pages

Filtering Output

Start Planning Stakeholders Inventory Services User Needs R & R Functions Interfaces Communications Agreements

Current Region: Marinara County

Architectures

Regional

Marinara County

Region to Project New Delete

Project

MCDOT Saucelito Traffic Coordination  
MCDOT Traffic Monitoring Expansion Project  
MCDOT V2I Safety Initiative  
TOMATO

Project to Region New Delete

Related

Alfredo County

New Delete

Regional Architecture Attributes

Name  
Marinara County

Description  
This sample architecture originated as an exercise in the National ITS Architecture Public Sector Training Course. It illustrates many of the Regional Architecture Development for Intelligent Transportation (RAD-IT) software features as well as parts of the Architecture Reference for Cooperative & Intelligent Transportation (ARC-IT) that merge traditional ITS concepts with connected vehicle technologies and supporting services. To this end, several minor extensions have been made to the basic Marinara County scenario so that features like user defined Physical Objects, Flows, and connected vehicle service packages can also be illustrated.

Timeframe  
Through 2030 (Next 10 to 15 years)

Geographic Scope  
The Marinara County transportation region encompasses rural and urban areas, including the rapidly expanding city of Saucelito. The regional boundary coincides with the metropolitan planning area. The total regional population of 675,000 is demographically diverse: 5% continue the traditional regional farming activities, 62% are Saucelito residents, and over 50% of the region's workers are in technology industries. Marinara's largest employer is Parma-John, a pharmaceuticals firm with a payroll of over 11,000 workers.

Service Scope  
The intelligent transportation system for the Marinara region consists of freeway management, surface street systems, and transit services that are managed by the county and local agencies. There is now a growing interest in traveler information systems that use new technologies to collect traffic data and develop traveler information concerning traffic as well as parking and event data for the region.

Developer  
Bob Olley (MCDOT)

Maintainer  
Will N Able (MCTPB)

Version  
v2020-b

Date/Time  
11/16/2020 12:23:00 PM

Change Log Apply Cancel

# Extrant Web – Portée



## Marinara Regional ITS Architecture

- Home
- Scope**
- Planning
- Stakeholders
- Inventory
  - By Physical Object
  - By Stakeholder
- Services
- Roles and Resp
- Needs
- Functions
- Interfaces
- Communications
- Agreements
- Projects

### Architecture Scope

The scope of the Regional ITS Architecture can be described in terms of: 1) the size of the region and jurisdictions covered (geographic scope), 2) the planning or time horizon, and 3) the variety of transportation services that are covered. This scope is defined in the context of adjacent and overlapping Regional ITS Architectures.

### Description

This sample architecture originated as an exercise in the National ITS Architecture Public Sector Training Course. It illustrates many of the Regional Architecture Development for Intelligent Transportation (RAD-IT) software features as well as parts of the Architecture Reference for Cooperative & Intelligent Transportation (ARC-IT) that merge traditional ITS concepts with connected vehicle technologies and supporting services. To this end, several minor extensions have been made to the basic Marinara County scenario so that features like user defined Physical Objects, Flows, and connected vehicle service packages can also be illustrated.

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# Plan Québécois des STI (PQSTI) (~2018)



## PLAN QUÉBÉCOIS DES STI (PQSTI)

Home

**Scope**

Planning

Stakeholders

Inventory

By Physical Object

By Stakeholder

Services

Roles and Resp

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Functions

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#### Description

Architecture régionale en système de transports intelligents (STI) pour le territoire du Québec sous la responsabilité du Ministère des Transports, de la Mobilité durable et de l'Électrification des transports (MTMDET) et ses partenaires en transports

**Time Frame: Période d'application 2018 à 2028**

**Geographic Scope: Territoire du Québec**



# Buts, objectifs et stratégies au niveau régional



- Connecter les processus de planification des transports d'une région à l'architecture de STI
- Connecter aux attributs de planification définis dans :
  - Les plans à long terme
  - Le plan stratégique
  - Le plan de gestion et d'exploitation des systèmes de transport (TSMO)

# RAD-IT – Planification

Start | Planning | Stakeholders | Inventory | Services | User Needs | R & R | Functions | Interfaces | Communications | Agreements

Current Region: Marinara County

Objectives and Strategies

Objectives:  Regional  All Customize

- 1.1. Improve average on-time performance for primary designated PASTA routes by 15 percent.
- 1.1.1. Implement PASTA automated vehicle location system.
- 1.1.2. Upgrade PASTA fleet management system.
- 1.2. At least 95 percent of trips on PASTA can be made with no more than 1 transfer.
- 2.1. Develop 20,000 visitors annually to TOMATO traveler information website and kiosks in
- 2.2. Develop 8,000 annual uses of the TOMATO multimodal trip planning tool by year 2020.
- 3.1. Implement flexible payment mechanisms on 50 percent of publicly operated parking spa
- 4.1. Increase percentage of incident management agencies in the region that use the Marin
- 4.2. Decrease road departure crashes along MC highways
- 4.3. Decrease amount of time to warn travelers of dangerous conditions or emergency
- 5.1. Increase the percent of the primary highway system in which travel conditions can be
- 5.2. Maintain a program of evaluating 100 percent of signals for retiming every 5 years.
- 5.3. Reduce the daily hours of recurring congestion on major freeways by 7 percent by ye
- 5.4. Reduce time between incident verification and posting of traveler alert to dynamic mess
- 5.5. Increase the percent of transportation facilities whose owners share their traveler info
- 6.1. Enhance transportation planning with data from all modes.
- 7.1. Improve the efficiency of the surface transportation system

Objective/Strategy Attributes

Type: Objective Supports

Number: 1.1 Name: Improve average on-time performance for primary designated PASTA routes by 15

Description:

Source: Marinara County Long Range Transportation Plan (MC LRTP)

Performance Measures:  Selected  All Edit

- On-time performance of public transit routes.

Service Packages:  Selected  All Search

- PT02: Transit Fixed-Route Operations
- PT06: Transit Fleet Management

Projects:  Selected  All

New Delete Apply Cancel

# Extrant Web – Planification



**RAD-IT** **Marinara Regional ITS Architecture**

- Home
- Scope
- Planning**
- Stakeholders
- Inventory
  - By Physical Object
  - By Stakeholder
- Services
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- Functions
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- Projects

### Objective 1.1

**Statement**  
Improve average on-time performance for primary designated PASTA routes by 15 percent within 5 years.

**Source:** Marinara County Long Range Transportation Plan (MC LRTP)

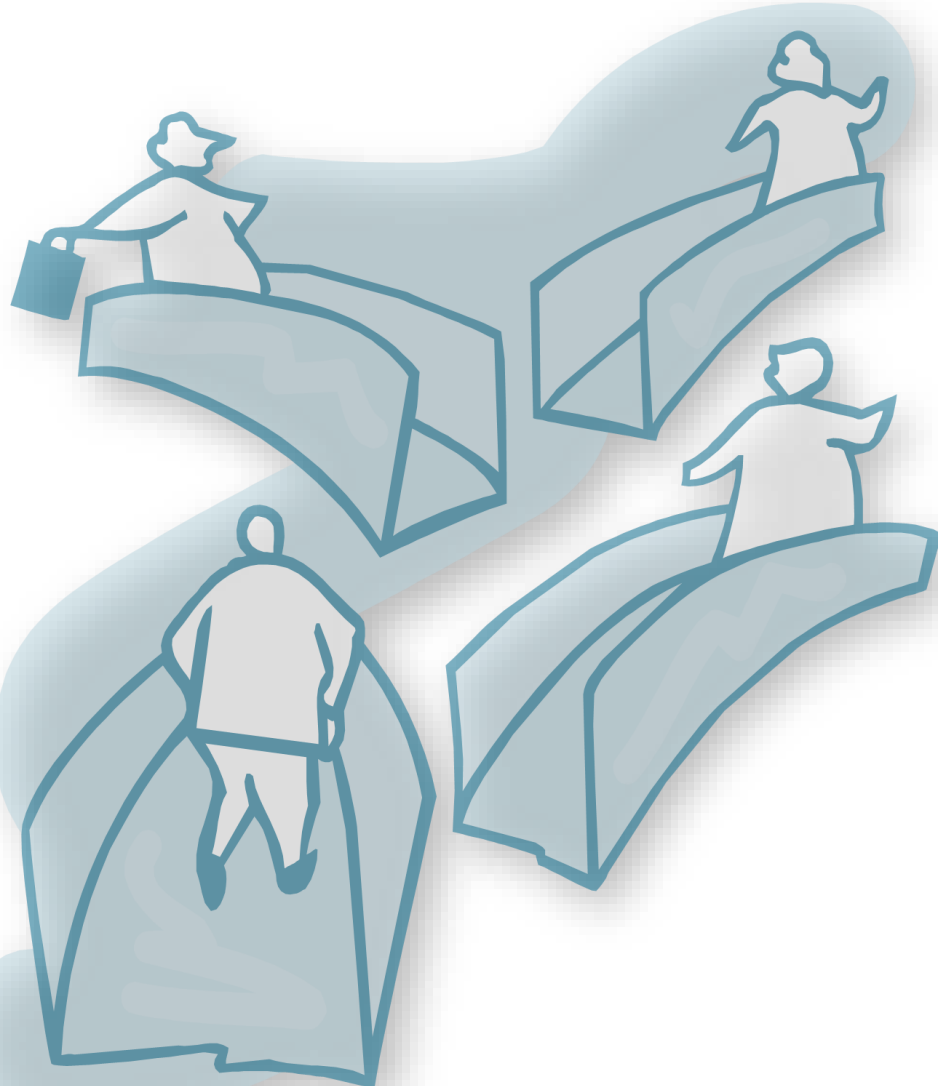
**Supported by**  
[Implement PASTA automated vehicle location system.](#)  
[Upgrade PASTA fleet management system.](#)

**Associated Performance Measures**

Category	Number	Performance Measure
Transit	1	On-time performance of public transit routes.

**Associated Service Packages**  
PT02: Transit Fixed-Route Operations  
PT06: Transit Fleet Management

# Intervenants



Quelqu'un qui déploie,  
possède, exploite,  
entretient ou est touché par  
un STI.

# RAD-IT – Intervenants

Start | Planning | Stakeholders | Inventory | Services | User Needs | R & R | Functions | Interfaces | Communications | Agreements

Current Region: Marinara County

Stakeholders


Stakeholders:  Regional  All

- Alfredo County Department of Transportation
- Area Drivers
- Area Parking Providers
- Area Travelers
- Business Advertisers
- IndyCert
- Marinara County Department of Public Works
- Marinara County Department of Transportation
- Marinara County Fairly Entertainment
- Marinara County Government Offices
- Marinara County IT Department
- Marinara County Law Enforcement
- Marinara County Sheriff's Department
- Marinara County Transportation Planning Board
- Marinara Port Authority
- MC Freeway Operators

Stakeholder Attributes

Name  
Alfredo County Department of Transportation

Description  
Alfredo County Department of Transportation (MCDOT) operates its own set of freeway and state roads within their county. Activities are coordinated through its Freeway Management Center.

Stakeholder Group 

# Extrant Web – Intervenants

RAD-IT <sup>✓</sup> Marinara Regional ITS Architecture													
<ul style="list-style-type: none"> <li>Home</li> <li>Scope</li> <li>Planning</li> <li><b>Stakeholders</b></li> <li>Inventory               <ul style="list-style-type: none"> <li>By Physical Object</li> <li>By Stakeholder</li> </ul> </li> <li>Services</li> <li>Roles and Resp</li> <li>Needs</li> <li>Functions</li> <li>Interfaces</li> <li>Communications</li> <li>Agreements</li> <li>Projects</li> </ul>	<h2>Stakeholders</h2> <p>The Regional ITS Architecture resulted from the consensus input of a diverse set of stakeholders, encompassing traffic, transit, public safety, and many other operating agencies at local, state, and national levels. It includes both public and private sectors and spans the organizations that manage, support, or are impacted by the surface transportation system, with particular focus on agencies that operate transportation systems in the region.</p> <table border="1"> <thead> <tr> <th>Stakeholder</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td><a href="#">Alfredo County Department of Transportation</a></td> <td>Alfredo County Department of Transportation (MCDOT) operates its own set of freeway and state roads within their county. Activities are coordinated through its Freeway Management Center.</td> </tr> <tr> <td><a href="#">Area Drivers</a></td> <td>The 'Driver' represents the person that operates a vehicle on the roadway. Included are operators of private, transit, commercial, and emergency vehicles where the interactions are not particular to the type of vehicle (e.g., interactions supporting vehicle safety applications). The Driver originates driver requests and receives driver information that reflects the interactions which might be useful to all drivers, regardless of vehicle classification. Information and interactions which are unique to drivers of a specific vehicle type (e.g., fleet interactions with transit, commercial, or emergency vehicle drivers) are covered by separate objects.</td> </tr> <tr> <td><a href="#">Area Parking Providers</a></td> <td>A group can also be used to identify multiple stakeholders that are associated with the same inventory element. The County Government Building in downtown Saucelito has a 1000 space lot and parking garage facility, dividing between monthly reserved spots and metered parking. The Fairground, located 10 miles northwest of downtown Saucelito, has the capacity to park 1200 vehicles for normal events. Under special conditions, the Fairgrounds staff have converted some of the Fairground field area into parking; this has the potential to provide an additional 800 spots. Sun-Dried Mall Partners (SDMP) operates the Sun-Dried Mall on the southeast edge of Saucelito. The Mall is a 200,000 sq. ft. enclosed pedestrian mall with parking for 2000 vehicles, plus PASTA bus service. The SDMP have indicated a willingness to offer some of their parking area for city events and are also interested in any traveler information services that could be offered in the Mall.</td> </tr> <tr> <td><a href="#">Area Travelers</a></td> <td>TOMATO will provide internet access to regional travel information. This service will synthesize map and route descriptions, real-time traffic data, static and dynamic transit information, parking availability, event schedules, and other relevant items into travel information products that will be displayed via the World Wide Web (WWW) or through connected vehicle's onboard equipment.</td> </tr> <tr> <td><a href="#">Business Advertisers</a></td> <td>We have not identified the specific advertisers at this time. This will be a mix of local merchants and national companies that provide products and services to the citizens of Marinara County and the typically affluent traveler who vacations here.</td> </tr> </tbody> </table>	Stakeholder	Description	<a href="#">Alfredo County Department of Transportation</a>	Alfredo County Department of Transportation (MCDOT) operates its own set of freeway and state roads within their county. 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# PLAN QUÉBÉCOIS DES STI (PQSTI) (~2018)

INTERVENANTS



RAD-ITV PLAN QUÉBÉCOIS DES STI (PQSTI)																									
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Le travail de l'ASFC comprend : traitement des produits commerciaux, des voyageurs et des différents moyens de transport; identification et refus d'accès aux personnes ou produits à risque élevé; inspections secondaires, aux aéroports, de produits alimentaires et agricoles importés par les voyageurs; travail de collecte de renseignements, par exemple le filtrage des visiteurs et des immigrants et la collaboration avec les organismes d'application de la loi pour des questions de sécurité nationale; activités d'application de la loi, par exemple les enquêtes, les détentions, les audiences et les expulsions. L'ASFC administre les aspects canadiens des programmes de dédouanement préalable comme le programme FAST (Free and Secure Trade) et le Programme d'autocotisation des douanes (PAD) pour les conducteurs commerciaux.</td> </tr> <tr> <td><a href="#">Agences de stationnement</a></td> <td>Propriétaires/exploitants et gestionnaires de parc de stationnements, y compris les parcs publics et privés.</td> </tr> <tr> <td><a href="#">AOT – Autorités organisatrices de transport en commun</a></td> <td>Ces organismes sont chargés de l'organisation du transport public sur son territoire. Ils sont responsable des mode d'exploitation des services, de la tarification applicable et du financement de ceux-ci. Ils voient aussi à la construction et à la gestion d'infrastructures ainsi qu'à la promotion de l'utilisation de ces services. Il s'assure de la mise en place d'un service public de transport et de son adéquation aux besoins de la clientèle desservie. 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La mission de l'Association s'articule autour des objectifs suivants :  * Représenter, soutenir et informer les transporteurs membres * Promouvoir des normes d'éthique, de sécurité et d'efficacité dans l'industrie du camionnage * Encourager et soutenir le perfectionnement professionnel * Sensibiliser les partenaires et le public à la contribution et à l'excellence des entreprises québécoises de transport routier</td> </tr> <tr> <td><a href="#">Autorité régionale de transport métropolitain (ARTM – Montréal)</a></td> <td>L'ARTM est responsable de la planification, de l'organisation et du financement des services de transport de plus de 80 municipalités dans la grande région de Montréal.  Avant le 1er juin 2017 : Agence de transport métropolitain (AMT)</td> </tr> <tr> <td><a href="#">Autorités aéroportuaires</a></td> <td>Exploitant d'aéroport chargé de l'administration des aéroports pour le transport des personnes ou de fret (marchandise)</td> </tr> <tr> <td><a href="#">Autres juridictions hors Québec (provinces ou états)</a></td> <td>Cette entité regroupe les autres juridictions hors Québec non explicitement identifiées dans l'architecture. Il peut s'agir de provinces canadiennes ou d'états américains</td> </tr> <tr> <td><a href="#">CargoM</a></td> <td>La mission de CargoM est de rassembler tous les acteurs de la logistique et du transport de marchandises du Grand Montréal, dont les activités favorisent la plaque tournante de Montréal, autour d'objectifs communs et d'actions concertées, en vue d'en accroître la cohésion, la compétitivité, la croissance et le rayonnement.</td> </tr> <tr> <td><a href="#">Centres et instituts de recherche</a></td> <td>Les centres et instituts de recherche sont des lieux de rencontre et d'échange appuyés conjointement par un vice-rectorat à la recherche et une faculté d'une université. Ils ont une structure de recherche identifiable et visible, une stratégie claire de recherche aux critères d'excellence, une gouvernance propre et un rayonnement important.</td> </tr> <tr> <td><a href="#">Consortium OPUS</a></td> <td>Un consortium mené par la Société de Transport de Montréal (STM) qui a développé et exploite la carte de paiements électroniques de voyageurs OPUS.</td> </tr> </tbody> </table>	Stakeholder	Description	<a href="#">Administrations portuaires</a>	Opérateur portuaire chargé de l'administration des ports de fret.	<a href="#">Agence des services frontaliers du Canada</a>	L'Agence des services frontaliers du Canada (ASFC) est chargée des services frontaliers, y compris la douane. 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Ces organismes municipaux ou régionaux de transport en commun exploitent à différents degrés des technologie STI dans ses services aux usagers.  Note(s) : Les organismes reconnus comme autorités organisatrices de transport en commun (AOT) du Québec sont : –les sociétés de transport en commun STM, STL, RTL, RTC, ARTM, RTM); – le Conseil régional de transport (CRT) de Lanaudière; – les conseils intermunicipaux de transport (CIT); – les organismes municipaux et intermunicipaux de transport (OMIT).	<a href="#">Association du camionnage du Québec (ACQ)</a>	Créée en 1951, l'Association du camionnage du Québec a pour mandat d'étudier, de défendre et de développer les intérêts économiques, sociaux et moraux des membres transporteurs qui lui sont affiliés.  La mission de l'Association s'articule autour des objectifs suivants :  * Représenter, soutenir et informer les transporteurs membres * Promouvoir des normes d'éthique, de sécurité et d'efficacité dans l'industrie du camionnage * Encourager et soutenir le perfectionnement professionnel * Sensibiliser les partenaires et le public à la contribution et à l'excellence des entreprises québécoises de transport routier	<a href="#">Autorité régionale de transport métropolitain (ARTM – Montréal)</a>	L'ARTM est responsable de la planification, de l'organisation et du financement des services de transport de plus de 80 municipalités dans la grande région de Montréal.  Avant le 1er juin 2017 : Agence de transport métropolitain (AMT)	<a href="#">Autorités aéroportuaires</a>	Exploitant d'aéroport chargé de l'administration des aéroports pour le transport des personnes ou de fret (marchandise)	<a href="#">Autres juridictions hors Québec (provinces ou états)</a>	Cette entité regroupe les autres juridictions hors Québec non explicitement identifiées dans l'architecture. Il peut s'agir de provinces canadiennes ou d'états américains	<a href="#">CargoM</a>	La mission de CargoM est de rassembler tous les acteurs de la logistique et du transport de marchandises du Grand Montréal, dont les activités favorisent la plaque tournante de Montréal, autour d'objectifs communs et d'actions concertées, en vue d'en accroître la cohésion, la compétitivité, la croissance et le rayonnement.	<a href="#">Centres et instituts de recherche</a>	Les centres et instituts de recherche sont des lieux de rencontre et d'échange appuyés conjointement par un vice-rectorat à la recherche et une faculté d'une université. Ils ont une structure de recherche identifiable et visible, une stratégie claire de recherche aux critères d'excellence, une gouvernance propre et un rayonnement important.	<a href="#">Consortium OPUS</a>	Un consortium mené par la Société de Transport de Montréal (STM) qui a développé et exploite la carte de paiements électroniques de voyageurs OPUS.
	Stakeholder	Description																							
	<a href="#">Administrations portuaires</a>	Opérateur portuaire chargé de l'administration des ports de fret.																							
	<a href="#">Agence des services frontaliers du Canada</a>	L'Agence des services frontaliers du Canada (ASFC) est chargée des services frontaliers, y compris la douane. Le travail de l'ASFC comprend : traitement des produits commerciaux, des voyageurs et des différents moyens de transport; identification et refus d'accès aux personnes ou produits à risque élevé; inspections secondaires, aux aéroports, de produits alimentaires et agricoles importés par les voyageurs; travail de collecte de renseignements, par exemple le filtrage des visiteurs et des immigrants et la collaboration avec les organismes d'application de la loi pour des questions de sécurité nationale; activités d'application de la loi, par exemple les enquêtes, les détentions, les audiences et les expulsions. L'ASFC administre les aspects canadiens des programmes de dédouanement préalable comme le programme FAST (Free and Secure Trade) et le Programme d'autocotisation des douanes (PAD) pour les conducteurs commerciaux.																							
	<a href="#">Agences de stationnement</a>	Propriétaires/exploitants et gestionnaires de parc de stationnements, y compris les parcs publics et privés.																							
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<a href="#">Consortium OPUS</a>	Un consortium mené par la Société de Transport de Montréal (STM) qui a développé et exploite la carte de paiements électroniques de voyageurs OPUS.																								

# Inventaire des éléments des STI

- Une liste des éléments des STI et des éléments qui leur sont reliés
- Un élément étant :
  - « Un STI ou une partie d'un système »

*Une architecture est construite autour d'un inventaire de STI existants et futurs*

- *Sachez ce que vous avez aujourd'hui*
- *Planifiez les futurs systèmes*



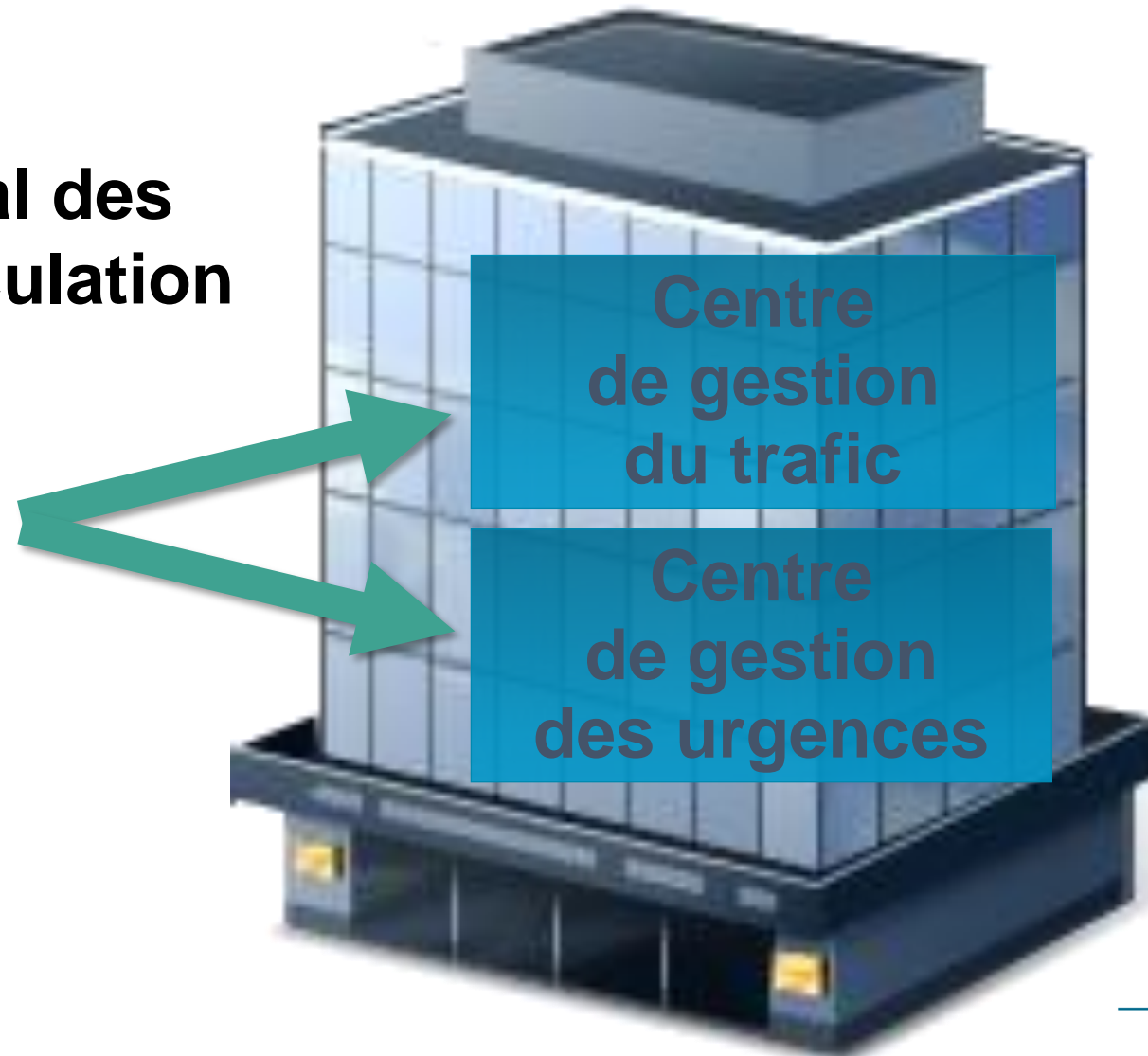
# Mise en correspondance des éléments avec les objets physiques



## Élément :

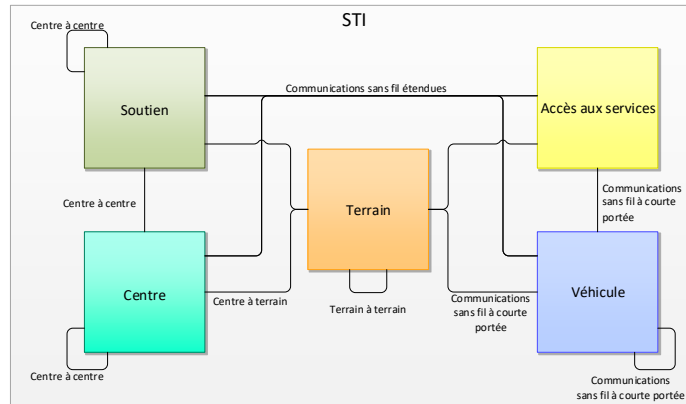
Centre provincial des opérations de circulation

## Objets physiques



# Importance de la mise en correspondance avec des objets physiques

INVENTAIRE



- Exigences
- Interfaces
- Normes

# RAD-IT – Inventaire



Start | Planning | Stakeholders | Inventory | Services | User Needs | R & R | Functions | Interfaces | Communications | Agreements

Current Region: Marinara County

Elements

Elements:  Regional  All

- Alfredo County Freeway Management Center
- Area Drivers
- Center Location and Time Source (LTS)
- Communications for Alfredo Networking and Operations Local Infrastructure
- Device and Application Certification Systems
- Digital Map System
- Equipped Vehicles
- Field Location and Time Source (LTS)
- Marinara County Data Sharing System
- Marinara Port Management System
- MC Field Maintenance Equipment
- MC Freeway Management Center (BASIL/PINCH)
- MC Freeway Operators
- MC IT Field Personnel
- MC Planning Data Warehouse
- MC Public Safety Communications and Dispatch Centers
- MC Transportation Communications Network
- MCDOT CV Roadside Equipment
- MCDOT Detectors
- MCDOT Dynamic Message Signs
- MCDOT Environmental Sensors
- MCDOT Field Equipment
- MCDOT Flood Monitoring System
- MCDOT Speed Monitoring

Element Attributes

Name: Alfredo County Freeway Management Center

Type: Transportation (Shared) | Class: Center

Status (Region): Existing | Related: Alfredo County

Stakeholder (Owner): Alfredo County Department of Transportati... | Details | Physical Standards

Description: This element is actually defined in the Alfredo County Regional ITS Architecture. It is included here to show interfaces between the Marinara County and Alfredo County centers.

Physical Objects:  Selected  Related  All

- Traffic Management Center (Subsystem)
- Archived Data System <Support> (Subsystem)
- Authorizing Center (Subsystem)
- Border Inspection Administration Center (Subsystem)

# Extrant Web – Inventaire

INVENTAIRE



RAD-IT<sup>✓</sup>

## Marinara Regional ITS Architecture

### Inventary

Each stakeholder agency, company, or group owns, operates, maintains or plans ITS systems in the region. The Regional ITS Architecture inventory is a list of "elements" that represent all existing and planned ITS systems in a region as well as non-ITS systems that provide information to or get information from the ITS systems.

Element	Description
<a href="#">Alfredo County Freeway Management Center</a>	This element is actually defined in the Alfredo County Regional ITS Architecture. It is included here to show interfaces between the Marinara County and Alfredo County centers.
<a href="#">Area Drivers</a>	The 'Driver' represents the person that operates a vehicle on the roadway. Included are operators of private, transit, commercial, and emergency vehicles where the interactions are not particular to the type of vehicle (e.g., interactions supporting vehicle safety applications). The Driver originates driver requests and receives driver information that reflects the interactions which might be useful to all drivers, regardless of vehicle classification. Information and interactions which are unique to drivers of a specific vehicle type (e.g., fleet interactions with transit, commercial, or emergency vehicle drivers) are covered by separate objects.

Inventaire – Liste alphabétique

# Extrant Web – Inventaire

INVENTAIRE



RAD-IT<sup>✓</sup>

## Marinara Regional ITS Architecture

Home  
Scope  
Planning  
Stakeholders  
Inventory  
**By Physical Object**  
By Stakeholder  
Services  
Roles and Resp  
Needs  
Functions  
Interfaces  
Communications  
Agreements  
Projects

### Inventory by Physical Object

The inventory is made up of the transportation and communications centers, the field equipment, the vehicles, and other systems in the regional transportation system. In ARC-IT, "Physical Objects" (PObjects) are the subsystems and terminators that generally represent the systems in ITS. The following table sorts the inventory by ARC-IT Pobject. This sorts elements that perform similar functions together, so elements of a particular type can be easily identified.

PObject	Element
Archived Data System	<a href="#">MC Planning Data Warehouse</a>
Center	<a href="#">Center Location and Time Source (LTS)</a>
Center Personnel	<a href="#">MC Freeway Operators</a>
	<a href="#">MCDPW Center Personnel</a>
Certification System	<a href="#">Device and Application Certification Systems</a>
Connected Vehicle Roadside Equipment	<a href="#">MCDOT CV Roadside Equipment</a>
Cooperative ITS Credentials Management System	<a href="#">Security Credentials Management System</a>
Data Distribution System	<a href="#">Marinara County Data Sharing System</a>

Par objet physique - Organisé par type d'objet physique de l'ARC-IT

# Extrant Web – Inventaire

INVENTAIRE



RAD-IT<sup>✓</sup>

## Marinara Regional ITS Architecture

- Home
- Scope
- Planning
- Stakeholders
- Inventories
  - By Physical Object
  - By Stakeholder
- Services
- Roles and Resp
- Needs
- Functions
- Interfaces
- Communications
- Agreements
- Projects

### Inventory by Stakeholder

Each stakeholder is associated with one or more systems or "elements" that make up the regional transportation system. This table sorts the inventory by stakeholder, so each stakeholder can easily identify and review the information for all elements that they own and operate.

Stakeholder	Role	Element
(No Stakeholder)		<a href="#">Vehicles</a>
<a href="#">Alfredo County Department of Transportation</a>	Manages	<a href="#">Alfredo County Freeway Management Center</a>
	Owens	<a href="#">Alfredo County Freeway Management Center</a>
	Owens	<a href="#">Communications for Alfredo Networking and Operations Local Infrastructure</a>
	Manages	<a href="#">Communications for Alfredo Networking and Operations Local Infrastructure</a>
<a href="#">Area Drivers</a>		<a href="#">Area Drivers</a>
	Owens	<a href="#">Equipped Vehicles</a>
	Operates	<a href="#">Equipped Vehicles</a>
<a href="#">Area Parking Providers</a>	Owens	<a href="#">Regional Parking Lots</a>
	Manages	<a href="#">Regional Parking Lots</a>
<a href="#">Area Travelers</a>	Owens	<a href="#">Traveler Information Devices</a>
	Operates	<a href="#">Traveler Information Devices</a>

Par intervenant – Organisé par l'intervenant du RAD-IT

# Extrant Web – Inventaire (détail)



RAD-IT<sup>Y</sup>
Marinara Regional ITS Architecture

- Home
- Scope
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- By Stakeholder
- Services
- Roles and Resp
- Needs
- Functions
- Interfaces
- Communications
- Agreements
- Projects

## MC Freeway Management Center (BASIL/PINCH)

**Status:** Existing

**Description**  
MCDOT has deployed two computer systems which monitor and record data from the sensors and operators. One is Bay Area Safety Information Logging (BASIL) system which provides detailed electronic records of incident histories and impacts. The other system is the Prediction of INCident Hazards (PINCH) system which uses BASIL data to provide warnings to the operators at times of high risk of incidents. MCDOT hopes eventually to use these systems to reduce incident severity and frequency.

**Stakeholders**

Stakeholder	Role	Role Status
<a href="#">MCDOT and State Highway Patrol</a>	Owns	Existing
<a href="#">MC Freeway Operators</a>	Operates	Existing

**Physical Objects**  
[Traffic Management Center](#)

**Functional Objects**

Functional Object	Description	User Defined
<b>Center Connected Vehicle Infrastructure Management</b>	'Center Connected Vehicle Infrastructure Management' is the back office application that supports monitoring and maintenance of the Connected Vehicle infrastructure (RSEs, support systems, and associated communications links). It monitors the performance and configuration of the infrastructure portion of the Connected Vehicle Environment. This includes tracking and management of the infrastructure configuration as well as detection, isolation, and correction of infrastructure service problems. The application also includes monitoring of performance of the infrastructure equipment, including RSEs and communications links.	False
<b>Center Data Collection</b>	'Center Data Collection' collects and stores information that is created in the course of center operations. This data can be used directly by operations personnel or it can be made available to other data users and archives in the region.	False

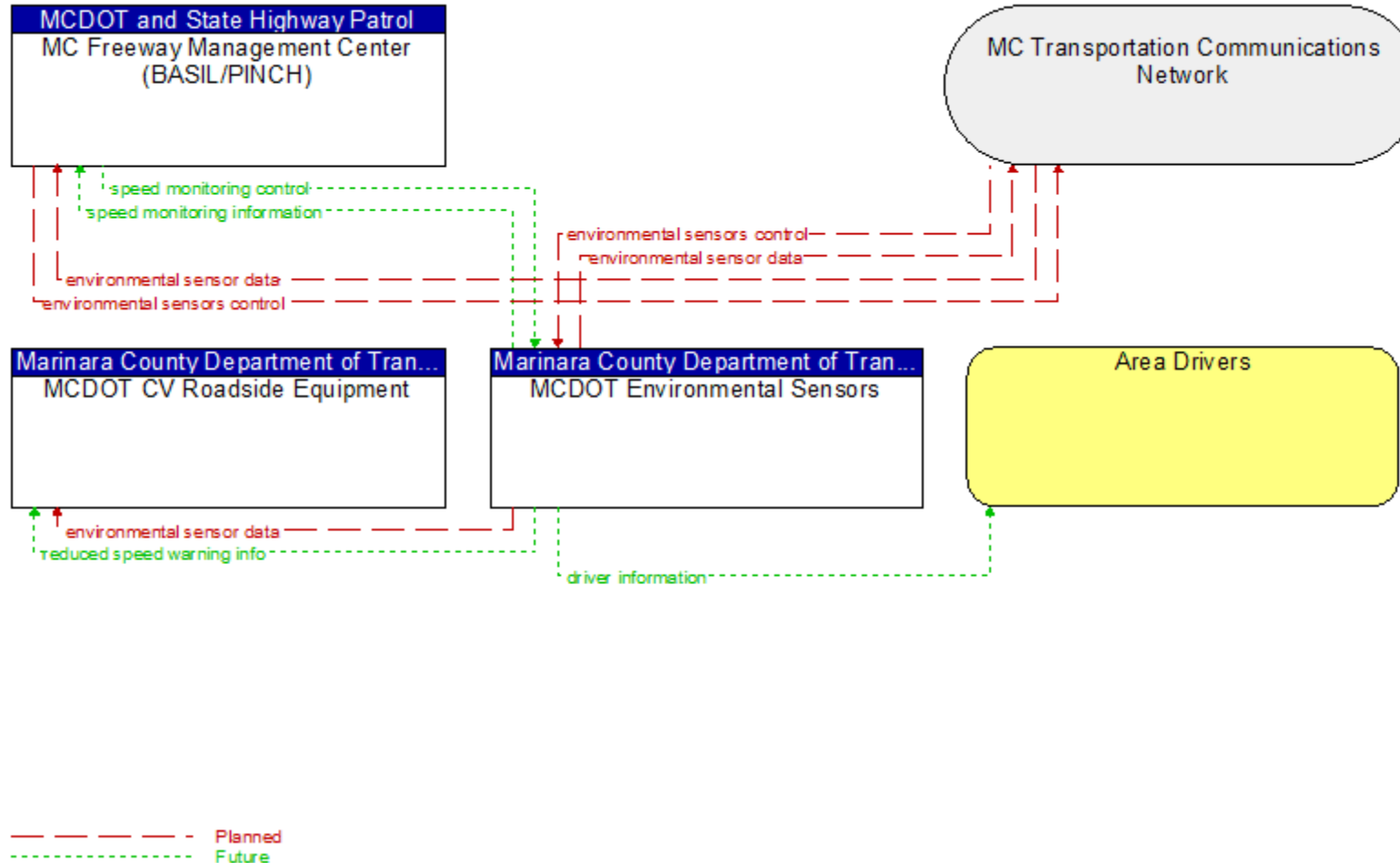
...

<b>TMC Variable Speed Limits</b>	'TMC Variable Speed Limits' provides center monitoring and control of variable speed limits systems. It monitors data on traffic and environmental conditions collected from sensors along the roadway. Based on the measured data, it calculates and sets suitable speed limits usually by lane. It controls equipment that posts the current speed limits and displays additional information such as basic safety rules and current traffic information to drivers.	False
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**Physical Standards**

Document Number	Title	Description
CEN ISO 24014-2	Public transport — Interoperable fare management system — Part 2: Business practices	ISO/TR 24014-2:2013 introduces a generic conceptual framework that can be applied to all Interoperable Fare Management Systems (IFMS) compliant with ISO 24014-1, as the basis for business practices relating to the conceptual framework for an IFMS, which is described in ISO 24014-1. This generic conceptual framework comprises three parts: 1) structure of the set of rules; 2) collaboration of functional models; and 3) integration of the set of rules.
ISO 21212	Intelligent transport systems — Communications access for land mobiles (CALM) — 2G Cellular systems	ISO 21212 determines the air interface for second generation (2G) cellular networks and 2G systems (e.g. using WAP and I-Mode type protocols) to be compliant to CALM, i.e., requirements that must be met before a 2G system can be incorporated into a CALM system. It specifies protocols and parameters that 2G systems shall include to support prolonged, long-range, high data rate wireless communication links in ITS environments where heterogeneous handovers or media independent handovers (MIH) are either necessary to maintain the link, or desirable as determined by media selection policies.
ISO 22179	Intelligent transport systems — Full speed range adaptive cruise control (FSRA) systems — Performance requirements and test procedures	THIS STANDARD HAS BEEN REVISED BY ISO 15622

# Extrant Web – Inventaire (Diagrammes contextuels)





# Ensembles de service de STI

- Capacités de STI utilisées pour atteindre les buts et objectifs opérationnels
- Exemples :
  - Ordre de priorité des véhicules d'urgence
  - Télépéage
  - Signalisation prioritaire pour les transports en commun
  - Gestion des incidents routiers



# Domaines des ensembles de service

- Ensembles de services

<p><b>Exploitation de véhicules commerciaux</b></p> 	<p><b>Gestion des données</b></p> 	<p><b>Entretien et construction</b></p> 	<p><b>Gestion du stationnement</b></p> 
<p><b>Sécurité publique</b></p> 	<p><b>Gestion du transport en commun</b></p> 	<p><b>Support</b></p> 	<p><b>Déplacements durables</b></p> 
<p><b>Gestion du trafic</b></p> 	<p><b>Informations voyageurs</b></p> 	<p><b>Sécurité des véhicules</b></p> 	<p><b>Météorologiques</b></p> 

# Ensembles de services et architecture régionale de STI

- Les ensembles de services fournissent un éventail de services de STI
  - Sélectionnez les ensembles de services qui vous intéressent
  - Faites correspondre et personnalisez selon votre inventaire



Gestion des places de stationnement	✓
Système intelligent de stationnement et de conduite	✓
Stationnement paiement électronique	✓
Gestion régionale du stationnement	
Réservations de stationnement	
Gestion des zones de chargement	✓

•  
•  
•

# RAD-IT – Services



Start | Planning | Stakeholders | Inventory | **Services** | User Needs | R & R | Functions | Interfaces | Communications | Agreements

Current Region: Marinara County

Service Packages

Service Packages:  Region  All

- DM01: ITS Data Warehouse
- PM01: Parking Space Management
- PM03: Parking Electronic Payment
- PM04: Regional Parking Management
- PM05: Parking Reservations
- PS10: Wide-Area Alert
- PT02: Transit Fixed-Route Operations
- PT06: Transit Fleet Management
- SU01: Connected Vehicle System Monitoring and Management
  - SP SU01: Connected Vehicle System Monitor
- SU03: Data Distribution
- SU04: Map Management
- SU05: Location and Time
- SU08: Security and Credentials Management
- SU09: Device Certification and Enrollment
- SU11: Field Equipment Maintenance
- TI01: Broadcast Traveler Information
- TI02: Personalized Traveler Information
- TI04: Infrastructure-Provided Trip Planning and Route Guidance
- TI05: Travel Services Information and Reservation
- TI07: In-Vehicle Signage
- TM01: Infrastructure-Based Traffic Surveillance
- TM03: Traffic Signal Control
- TM05: Traffic Metering
- TM06: Traffic Information Dissemination
- TM07: Regional Traffic Management
- TM08: Traffic Incident Management System
- TM12: Dynamic Roadway Warning

Service Package Attributes

ID:  Status (Region):

Name:

Description:

Elements:  Selected  Regional  All

- Marinara Port Management System
- MC Freeway Management Center (BASIL/PINCH)
- MC Planning Data Warehouse
- MC Public Safety Communications and Dispatch Centers
- MCDPW GARI IC Information System

Projects:  Selected  All

- MCDOT Saucelito Traffic Coordination
- MCDOT Traffic Monitoring Expansion Project
- MCDOT V2I Safety Initiative
- TOMATO

Comment:

# Extrant Web – Services

SERVICES



RAD-IT<sup>✓</sup>

## Marinara Regional ITS Architecture

### Service Packages

One of the first steps in developing an architecture is to identify the transportation services that are important to the Region. The following table lists each service package and its applicability to the Region. More information about each service package can be obtained by selecting the service package in the table below.

Service Package	Service Package Name	Status
DM01	<a href="#">ITS Data Warehouse</a>	Planned
PM01	<a href="#">Parking Space Management</a>	Planned
PM03	<a href="#">Parking Electronic Payment</a>	Planned
PM04	<a href="#">Regional Parking Management</a>	Planned
PM05	<a href="#">Parking Reservations</a>	Future
PS10	<a href="#">Wide-Area Alert</a>	Planned
PT02	<a href="#">Transit Fixed-Route Operations</a>	Existing

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  - By Stakeholder
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- Roles and Resp
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- Agreements
- Projects

# Besoins des utilisateurs



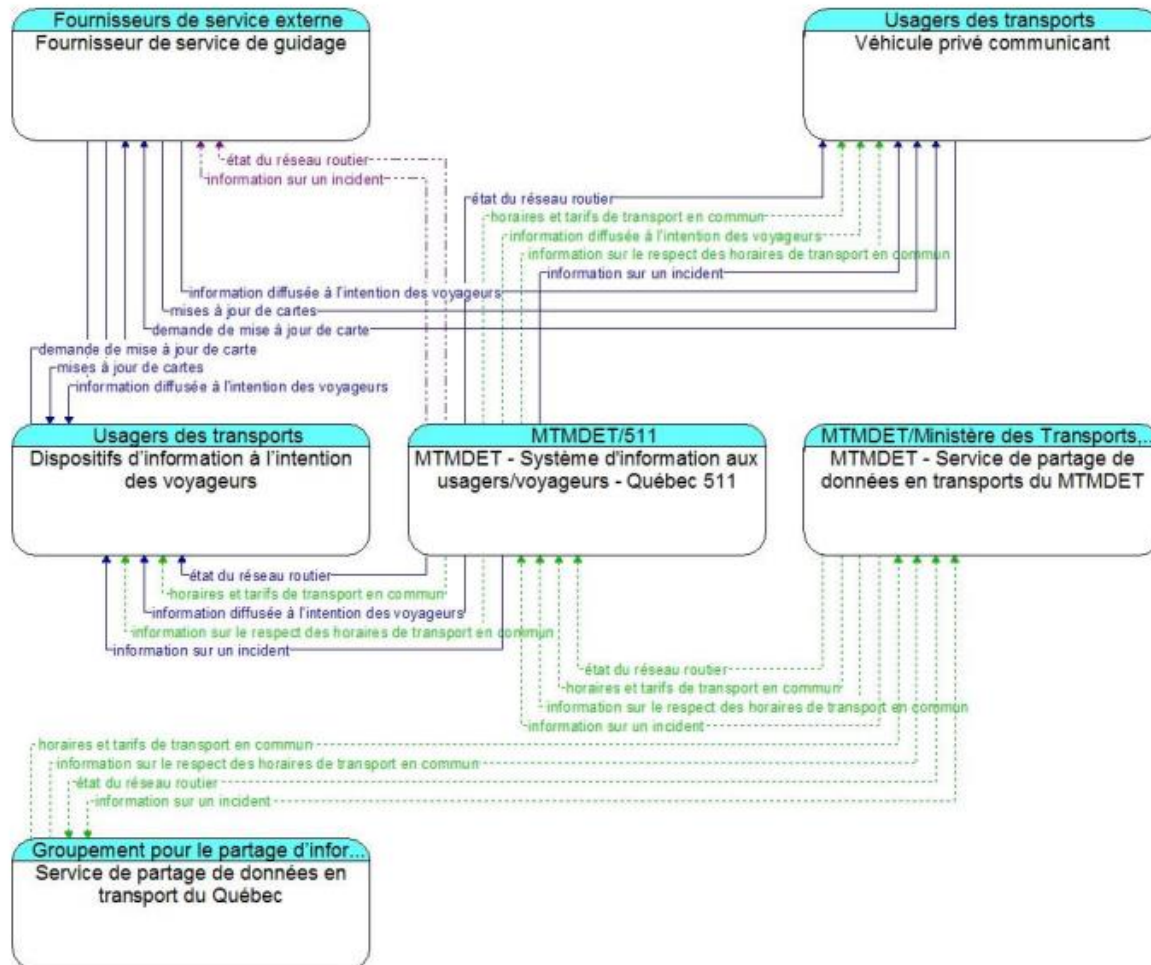
- Les besoins des utilisateurs fournissent un point de départ pour déterminer les exigences du système
- Besoins des utilisateurs définis dans l'ARC-IT pour chaque ensemble de services et pouvant être personnalisés dans une architecture régionale

# PLAN QUÉBÉCOIS DES STI (PQSTI) (~2018)

SERVICES



## ATIS04 - Guidage routier dynamique



### Accueil

Événements réalisés  
L'architecture STI  
Parties prenantes  
Inventaire  
Concept d'exploitation  
Services  
Interfaces  
Mise en œuvre  
Initiatives et projets  
Accords  
Documentation

### Services

Les « services aux usagers » sont organisés en grandes familles selon le rôle et l'objectif visé par l'intervenant concerné dans le cadre de ses opérations de transport. On dénombre les catégories de service suivantes toutes déjà couvertes par l'architecture canadienne des STI et l'outil Turbo architecture :

- Information à l'intention des voyageurs
- Gestion du trafic (circulation)
- Gestion des urgences
- Gestion de l'entretien et de la construction
- Gestion du transport en commun
- Paiement électronique
- Exploitation des véhicules commerciaux
- Système avancé de sécurité des véhicules
- Gestion des données archivées

Le rapport d'étape 3 (Concept fonctionnel) présente les services existants et planifiés dans le cadre du PQSTI et peut être consulté ici : [Rapport d'étape 3](#)

Les services aux usagers du PQSTI sont synthétisés sous la forme de schémas de haut niveau pour chacun des services aux usagers de l'architecture, qui peuvent être consultés ici : [Schémas concept d'exploitation](#)

2018-07-19

# RAD-IT – Besoins des utilisateurs



Start Planning Stakeholders Inventory Services **User Needs** R & R Functions Interfaces Communications Agreements

Current Region: Marinara County

Needs:  Regional  All Autoselect

- DM01: ITS Data Warehouse
  - N 01. System operators need to be able to store data for long term access by themselves and other operators.
  - N 02. System operators need to be able to query for and receive archive data products containing freeway data, arterial data, parking data, transit and ridesharing data, incident management data, safety-related data, environmental and weather data, vehicle and passenger data.
  - N 02. System operators need to be able to query for and receive archive data products containing freeway data, arterial data, parking data, transit and ridesharing data, incident management data, safety-related data, environmental and weather data, vehicle and passenger data.
  - N 03. System operators need to be able to manage data processing with regard to data archive functions, including data aggregation, data tagging (processed, edited, raw, transformed, etc.), data storage timing and longevity, data quality analysis, data formatting and metadata assignments.
- PM04: Regional Parking Management
- PS10: Wide-Area Alert
- PT02: Transit Fixed-Route Operations
- PT06: Transit Fleet Management
- SU01: Connected Vehicle System Monitor
- SU04: Map Management with Connected Vehicles
- SU08: Security and Credentials Management

**Need Attributes**

Associated Need Area: DM01: ITS Data Warehouse

Number: 02 Applicability: Applicable **User Defined**

**Need**

System operators need to be able to query for and receive archive data products containing freeway data, arterial data, parking data, transit and ridesharing data, incident management data, safety-related data, environmental and weather data, vehicle and passenger data.

RAD-IT <sup>Y</sup> Marinara Regional ITS Architecture			
Home	<b>Needs</b>		
Scope	The Stakeholders' Needs listed below are designed to answer two basic questions: – What does the System(s) need to do? – What do users need from the System(s)?		
Planning			
Stakeholders			
Inventory			
By Physical Object	They are written from the perspective of a system user or stakeholder in that system and are categorized by the Intelligent Transportation System (ITS) Service Packages that comprise the regional architecture. Service Packages provide an accessible, service-oriented perspective to the overall system architecture used to describe the region or project. They identify the pieces of the physical view that are required to implement a particular ITS service. Each of these service packages has a set of Needs associated with it that can be used as the basis for stakeholder validation, setting proper expectations, and eliciting requirements for the systems and devices to be implemented.		
By Stakeholder			
Services			
Roles and Resp			
<b>Needs</b>			
Functions			
Interfaces			
Communications			
Agreements			
Projects			
	Need Area	Need Number	Need
	DM01: ITS Data Warehouse	01	System operators need to be able to store data for long term access by themselves and other operators.
		02	System operators need to be able to query for and receive archive data products containing freeway data, arterial data, parking data, transit and ridesharing data, incident management data, safety-related data, environmental and weather data, vehicle and passenger data.
		03	System operators need to be able to manage data processing with regard to data archive functions, including data aggregation, data tagging (processed, edited, raw, transformed, etc.), data storage timing and longevity, data quality analysis, data formatting and metadata assignments.
	PM04: Regional Parking Management	01	Regional parking management needs to be able to share information with various transportation operations agencies in order to support multimodal travel planning, including parking reservation capabilities.
		02	Regional parking management needs to coordinate activities with other parking operations, including sharing of availability, hours, and other information to facilitate efficient regional transportation strategies.



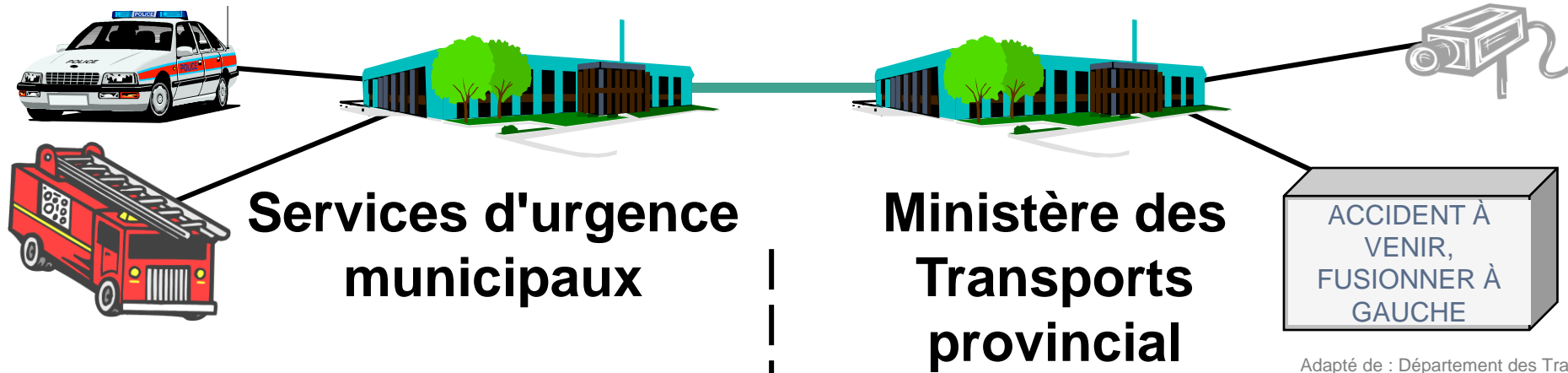
# Rôles et responsabilités

Identifie les rôles et responsabilités des intervenants dans l'exploitation, la mise en œuvre et la maintenance des STI

- Rôles – Fonctions des STI d'un intervenant
- Responsabilités – Devoirs ou obligations d'un intervenant dans la prestation d'un ou plusieurs services de STI dans une région



# Gestion des incidents (simplifié)



- Fournir des renseignements concernant l'incident au centre de gestion du trafic du ministère des Transports provincial
- Répartir les véhicules d'urgence sur les lieux de l'incident

- Surveiller les routes et fournir des renseignements concernant les incidents aux services d'urgence
- Partager des images de vidéosurveillance avec les services d'urgence

# RAD-IT -- Rôles et responsabilités



Start | Planning | Stakeholders | Inventory | Services | User Needs | **R & R** | Functions | Interfaces | Communications | Agreements

Current Region: Marinara County

Role and Responsibility Areas

Regional Areas:  Included  All Autoselect

- Amber Alert for Marinara County
- Data Management for Marinara County
- Freeway Management for Marinara County
- Incident Management for Marinara County
  - Marinara County Department of Public Works
  - Marinara County Department of Transportation**
  - Marinara County Sheriff's Department
  - Sausalito City Department of Transportation
  - Sausalito Fire Department
  - Sausalito Police Department
- MCDOT V2I Safety Initiative Roles and Responsibilities
- Parking Management for Marinara County
- Security for Marinara County
- Support Services for Marinara County
- Surface Street Management for Marinara County
- Transit Services for Marinara County
- Traveler Information for Marinara County
- Vehicle Safety for Marinara County

Stakeholder Roles and Responsibilities

Area: Incident Management for Marinara County

Stakeholder: Marinara County Department of Transportation

R&Rs:  Selected  All Editable

	Role and Responsibility	In Project	Status	Include
▶	Assess and address collateral damage to freeway facilities.	<input checked="" type="checkbox"/>	Planned	<input checked="" type="checkbox"/>
	Detect freeway incidents and coordinate with Highway Patrol	<input checked="" type="checkbox"/>	Planned	<input checked="" type="checkbox"/>
	Operate Pasta Helpers Freeway Service Patrol	<input type="checkbox"/>	Planned	<input checked="" type="checkbox"/>
	Provide CCTV image feeds to responding agencies.	<input type="checkbox"/>	Planned	<input checked="" type="checkbox"/>
	Provide resources to support closures, detours, and cleanup	<input type="checkbox"/>	Planned	<input checked="" type="checkbox"/>
*		<input type="checkbox"/>		<input type="checkbox"/>

# Extrant Web – Rôles et responsabilités

RÔLES ET  
RESPONSABILITÉS



**RAD-IT**

## Marinara Regional ITS Architecture

Home  
Scope  
Planning  
Stakeholders  
Inventory  
    By Physical Object  
    By Stakeholder  
Services  
**Roles and Resp**  
Needs  
Functions  
Interfaces  
Communications  
Agreements  
Projects

### Incident Management for Marinara County Roles and Responsibilities

Stakeholder	Role and Responsibility
<a href="#">Marinara County Department of Public Works</a>	Adapt traffic signal control to accommodate detours around the incident scene.
	Provide signal preemption for Saucelito and County fire.
	Provide traffic control resources including portable VMS, cones, sand, front loaders, etc.
<a href="#">Marinara County Department of Transportation</a>	Provide resources to support closures, detours, and cleanup
	Assess and address collateral damage to freeway facilities.
	Detect freeway incidents and coordinate with Highway Patrol
	Operate Pasta Helpers Freeway Service Patrol
	Provide CCTV image feeds to responding agencies.

# Exigences fonctionnelles

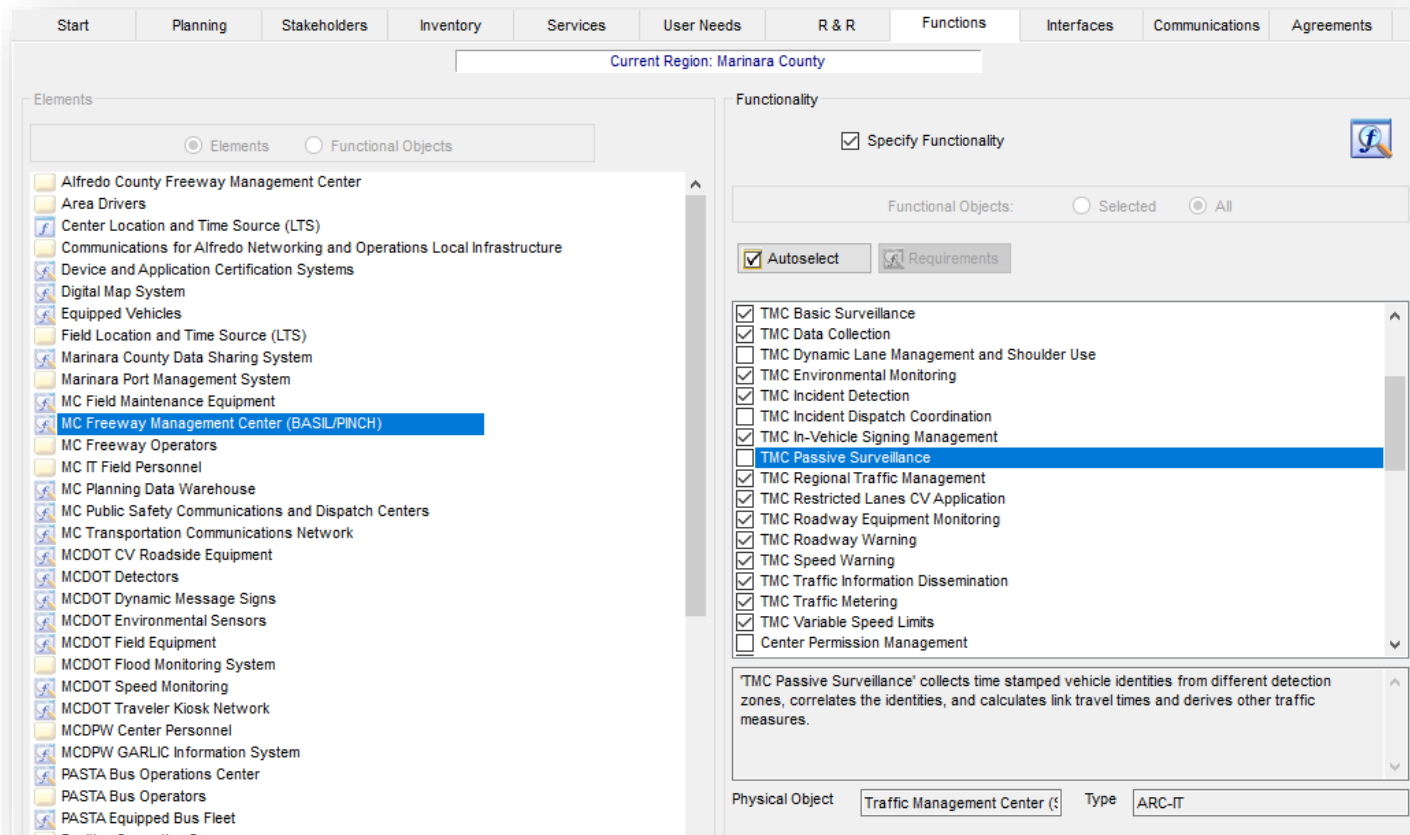
- Descriptions de haut niveau de ce que les éléments de STI feront dans la région
  - PAS d'exigences de conception détaillées
- Les objets fonctionnels fournissent cette perspective de haut niveau.



# RAD-IT – Fonctionnalité (étape 1)



- Dans l'ARC-IT, les exigences fonctionnelles sont définies pour chaque objet fonctionnel
- RAD-IT permet de sélectionner les objets fonctionnels pour chaque élément



# RAD-IT – Fonctionnalité (étape 2)



MC Freeway Management Center (BASIL/PINCH) | TMC Environmental Monitoring

Limit Details Needs Sort Present

**MC Freeway Management Center (BASIL/PINCH) - TMC Environmental Monitoring Requirements ( 7 Entries)**

Number	Requirement	Status	Include	User Defined
01	The traffic center shall remotely control environmental sensors that measure road surface conditions including temperature, moisture, icing, salinity, and other measures.	Planned	<input checked="" type="checkbox"/>	<input type="checkbox"/>
02	The traffic center shall remotely control environmental sensors that measure weather conditions including temperature, wind, humidity, precipitation, and visibility.	Planned	<input checked="" type="checkbox"/>	<input type="checkbox"/>
03	The traffic center shall assimilate current and forecast road conditions and surface weather information using a combination of weather service provider information (such as the National Weather Service and value-added sector specific meteorological services), data from roadway maintenance operations, and environmental data collected from sensors deployed on and about the roadway.	Planned	<input checked="" type="checkbox"/>	<input type="checkbox"/>
04	The traffic center shall be able to receive road condition information from weather service providers.	Not Applicable	<input type="checkbox"/>	<input type="checkbox"/>
05	The traffic center shall receive aggregated and processed vehicle environmental data collected from vehicle safety and convenience systems through the connected vehicle roadside equipment.	Planned	<input checked="" type="checkbox"/>	<input type="checkbox"/>
06	The traffic center shall be able to share the collected environmental data with Maintenance and construction operations.	Not Applicable	<input type="checkbox"/>	<input type="checkbox"/>
07	The traffic center shall provide drivers road weather advisories.	Not Applicable	<input type="checkbox"/>	<input type="checkbox"/>

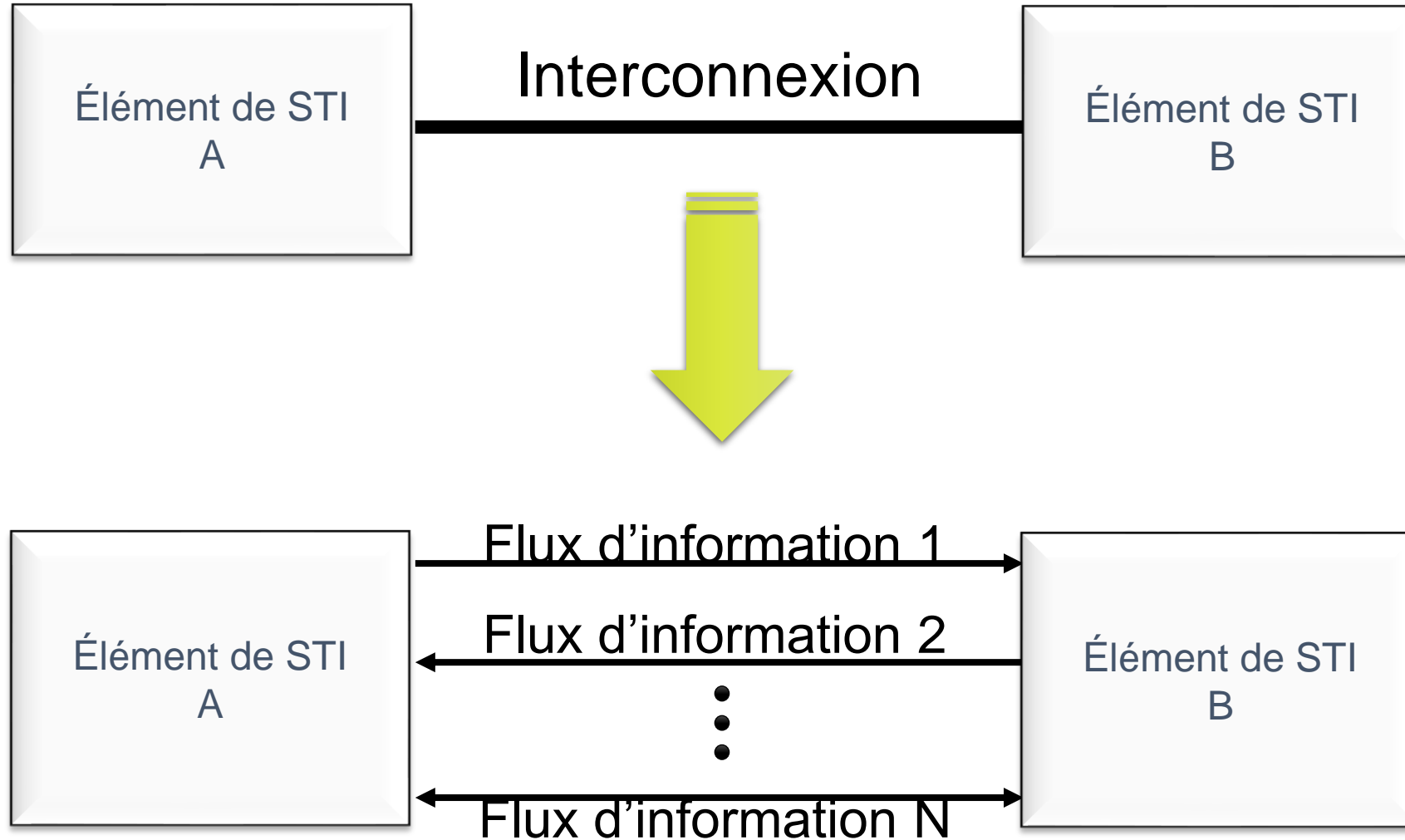
# Interfaces

- Repérer les interconnexions  
Quels systèmes partageront les renseignements?
- Définir les flux d'information  
Quels renseignements vont-ils partager?





# Les interconnexions sont constituées de flux d'information



# RAD-IT – Interfaces



Element:

Build   Connect   **Flows**   Group   Sort   Present   Filter   Elements   Limit   New Flows   Info

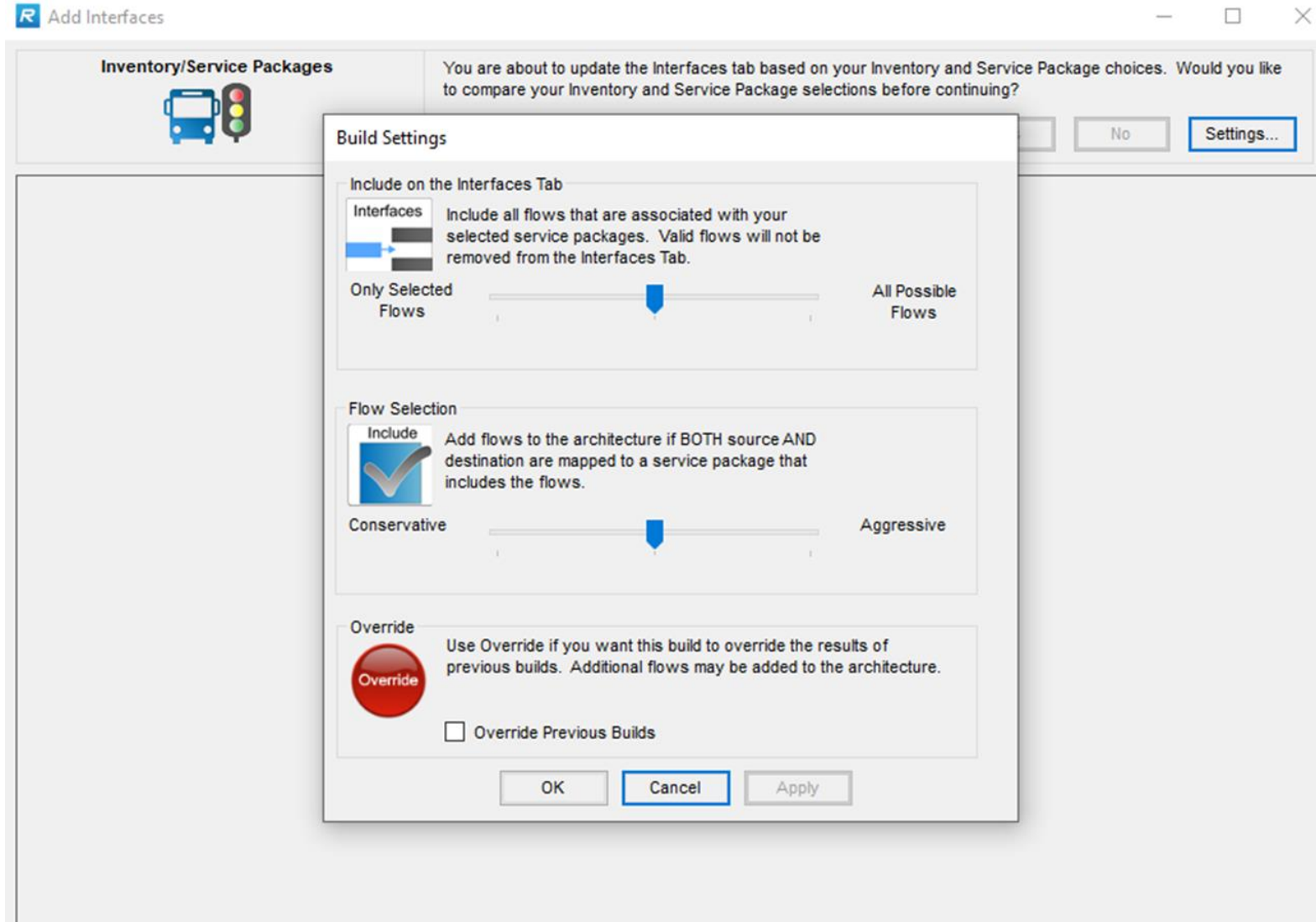
Element Selection   Build   Display   Style   Filters   Details

Start   Planning   Stakeholders   Inventory   Services   User Needs   R & R   Functions   **Interfaces**   Communications   Agreements

**Marinara County: All Information Flows ( 553 Entries)**

	Source Element	Flow Name	Destination Element	Status	Communications	DDS	Include
▶	Alfredo County Freeway Manag...	device control request	MC Freeway Management Cent...	Planned	Communications for Alfredo ...	Not Identified	<input checked="" type="checkbox"/>
	Alfredo County Freeway Manag...	traffic images	MC Freeway Management Cent...	Planned	Communications for Alfredo ...	Not Identified	<input checked="" type="checkbox"/>
	Alfredo County Freeway Manag...	road network conditions	MC Freeway Management Cent...	Planned	Communications for Alfredo ...	Not Identified	<input checked="" type="checkbox"/>
	Alfredo County Freeway Manag...	device data	MC Freeway Management Cent...	Planned	Communications for Alfredo ...	Not Identified	<input checked="" type="checkbox"/>
	Alfredo County Freeway Manag...	device status	MC Freeway Management Cent...	Planned	Communications for Alfredo ...	Not Identified	<input checked="" type="checkbox"/>
	Alfredo County Freeway Manag...	incident information	MC Freeway Management Cent...	Planned	Communications for Alfredo ...	Not Identified	<input checked="" type="checkbox"/>

# RAD-IT – Interfaces



- Inclure

- Uniquement les éléments sélectionnés
- Uniquement à partir des ensembles de services
- Tous

- Sélectionner

- Ajouter mais ne pas sélectionner comme dans l'architecture
- Ajouter/sélectionner si à la fois Source ET Destination
- Ajouter/sélectionner si Source OU Destination

# Extrant Web – Interfaces



### Interfaces

A primary purpose of the Regional ITS Architecture is to identify the integration opportunities among transportation systems (the "ITS elements") in the region. The following table identifies every interface defined for the Region. Each entry in the "Interfacing Element" column is a link to more detailed information about the particular interface.

Element	Interfacing Element	Status
<a href="#">Alfredo County Freeway Management Center</a>	<a href="#">MC Freeway Management Center (BASIL/PINCH)</a>	Planned
<a href="#">Area Drivers</a>	<a href="#">Equipped Vehicles</a>	Planned
	<a href="#">MCDOT Detectors</a>	Future
	<a href="#">MCDOT Dynamic Message Signs</a>	Existing
	<a href="#">MCDOT Environmental Sensors</a>	Future
	<a href="#">MCDOT Field Equipment</a>	Existing
	<a href="#">MCDOT Speed Monitoring</a>	Planned
<a href="#">Center Location and Time Source (LTS)</a>	<a href="#">Equipped Vehicles</a>	Planned
	<a href="#">Field Location and Time Source (LTS)</a>	Planned
	<a href="#">MC Freeway Management Center (BASIL/PINCH)</a>	Planned
	<a href="#">MCDOT CV Roadside Equipment</a>	Planned
	<a href="#">MCDOT Field Equipment</a>	Planned

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- Functions
- Interfaces**
- Communications
- Agreements
- Projects

# Normes en matière de STI

- Plus de 100 normes en matière de STI
- Couvre les transports en commun, le trafic, les véhicules commerciaux, les péages, les renseignements voyageurs, les véhicules connectés...



# RAD-IT – cadre des solutions de communication



- Présenté dans le cadre des solutions de communication par interface

Start	Planning	Stakeholders	Inventory	Services	User Needs	R & R	Functions	Interfaces	Communications	Agreements
<b>Marinara County Solutions by Interface (401 Entries)</b>										
Source Element	Flow Name	Destination Element	Solution	Readiness	Override					
Alfredo County Freeway Management Center	device control request	MC Freeway Management Center (BASL/PNCH)	US: TMDD - NTCP Messaging(Moderate)	✓ Moderate	<input type="checkbox"/>					
Alfredo County Freeway Management Center	device data	MC Freeway Management Center (BASL/PNCH)	US: TMDD - NTCP Messaging (Moderate)	✓ Moderate	<input type="checkbox"/>					
Alfredo County Freeway Management Center	device status	MC Freeway Management Center (BASL/PNCH)	US: TMDD - NTCP Messaging (Moderate)	✓ Moderate	<input type="checkbox"/>					
Alfredo County Freeway Management Center	incident information	MC Freeway Management Center (BASL/PNCH)	US: TMDD - NTCP Messaging (Moderate)	✓ Moderate...	<input type="checkbox"/>					
Alfredo County Freeway Management Center	road network conditions	MC Freeway Management Center (BASL/PNCH)	US: TMDD - NTCP Messaging(Moderate)	✓ Moderate	<input type="checkbox"/>					
Center Location and Time Source (LTS)	location and time	Equipped Vehicles	GNSS Data - GNSS serial interface(High-Moderate)	✓ High-Mod...	<input type="checkbox"/>					
Center Location and Time Source (LTS)	location and time	MC Freeway Management Center (BASL/PNCH)	GNSS Data - GNSS serial interface (High-Moderate)	✓ High-Mod...	<input type="checkbox"/>					
Center Location and Time Source (LTS)	location and time	MCDOT CV Roadside Equipment	GNSS Data - GNSS serial interface (High-Moderate)	✓ High-Mod...	<input type="checkbox"/>					
Center Location and Time Source (LTS)	location and time	MCDOT Field Equipment	GNSS Data - GNSS serial interface (High-Moderate)	✓ High-Mod...	<input type="checkbox"/>					
Center Location and Time Source (LTS)	location and time	MCDPW GARLIC Information System	GNSS Data - GNSS serial interface (High-Moderate)	✓ High-Mod...	<input type="checkbox"/>					
Center Location and Time Source (LTS)	location and time	PASTA Bus Operations Center	GNSS Data - GNSS serial interface (High-Moderate)	✓ High-Mod...	<input type="checkbox"/>					
Center Location and Time Source (LTS)	location and time	SCDOT City Operations Center	GNSS Data - GNSS serial interface (High-Moderate)	✓ High-Mod...	<input type="checkbox"/>					
Center Location and Time Source (LTS)	location and time	TOMATO Regional Traveler Information Center	GNSS Data - GNSS serial interface (High-Moderate)	✓ High-Mod...	<input type="checkbox"/>					
Center Location and Time Source (LTS)	location and time	Traveler Information Devices	GNSS Data - GNSS serial interface (High-Moderate)	✓ High-Mod...	<input type="checkbox"/>					
Device and Application Certification Systems	device enrollment information	Security Credentials Management System	US: Device enrollment - Secure Internet (ITS)(High-Moderate)	✓ High-Mod...	<input type="checkbox"/>					
▶ Digital Map System	intersection geometry	Equipped Vehicles	US: SAE Other J2735 - Secure Wireless Internet (ITS)(Moderate)	✓ Moderate	<input checked="" type="checkbox"/>					
Digital Map System	map updates	Equipped Vehicles	US: SAE Other J2735 - Secure Wireless Internet (ITS)(Moderate)	✓ Lowest	<input type="checkbox"/>					
Digital Map System	parking facility geometry	Equipped Vehicles	Data for Distribution (BD) - CNG DCS over Wireless(Lowest)	✓ Lowest	<input type="checkbox"/>					
Digital Map System	roadway geometry	Equipped Vehicles	(None Data) - Secure Wireless Internet (ITS)(Lowest)	✓ Lowest	<input type="checkbox"/>					
Digital Map System	roadway geometry	Equipped Vehicles	US: SAE Lane-Level Mapping - Secure Wireless Internet (ITS)(High-Moderate)	✓ High-Mod...	<input type="checkbox"/>					



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### US: NTCIP Transportation Sensors - SNMPv3/TLS

#### Description

This solution is used within the U.S.. It combines standards associated with US: NTCIP Transportation Sensors with those for I-F: SNMPv3/TLS. The US: NTCIP Transportation Sensors standards include upper-layer standards required to implement center-to-field transportation sensors (e.g., vehicle detectors) communications (e.g., real-time). The I-F: SNMPv3/TLS standards include lower-layer standards that support secure center-to-field and field-to-field communications using simple network management protocol (SNMPv3); implementations are strongly encouraged to use the TLS for SNMP security option for this solution to ensure adequate security.

#### Includes Standards

Level	DocNum	FullName	Description
Mgmt	NTCIP 1201	NTCIP Global Object (GO) Definitions	This standard defines SNMP objects (data elements) used by a wide range of field devices like time and versioning information.
Mgmt	IETF RFC 3411	An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks	This standard (RFC) defines the basic architecture for SNMPv3 and includes the definition of information objects for managing the SNMP entity's architecture.

#### Supports Interfaces

Source	Destination	Flow
MC Freeway Management Center (BASIL/PINCH)	MCDOT Detectors	traffic detector control
MC Freeway Management Center (BASIL/PINCH)	MCDOT Dynamic Message Signs	traffic detector control
MC Freeway Management Center (BASIL/PINCH)	MCDOT Field Equipment	traffic detector control
MCDOT CV Roadside Equipment	MC Freeway Management Center (BASIL/PINCH)	traffic situation data

# Ententes

- Documenter l'intégration institutionnelle dans la région
- Peut être requis pour les interfaces interterritoriales
- Définir :
  - les plans d'intégration
  - les plans de maintenance et d'exploitation
  - les responsabilités de financement





# Ententes de l'architecture régionale de STI de Marinara

## RAD-IT Marinara Regional ITS Architecture

- Home
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- Planning
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  - By Stakeholder
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- Communications
- Agreements**
- Projects

### Agreements

Agreements provide the institutional underpinnings for the technical integration identified in the Regional ITS Architecture. This page lists the agreements that support Intelligent Transportation Systems in the region.

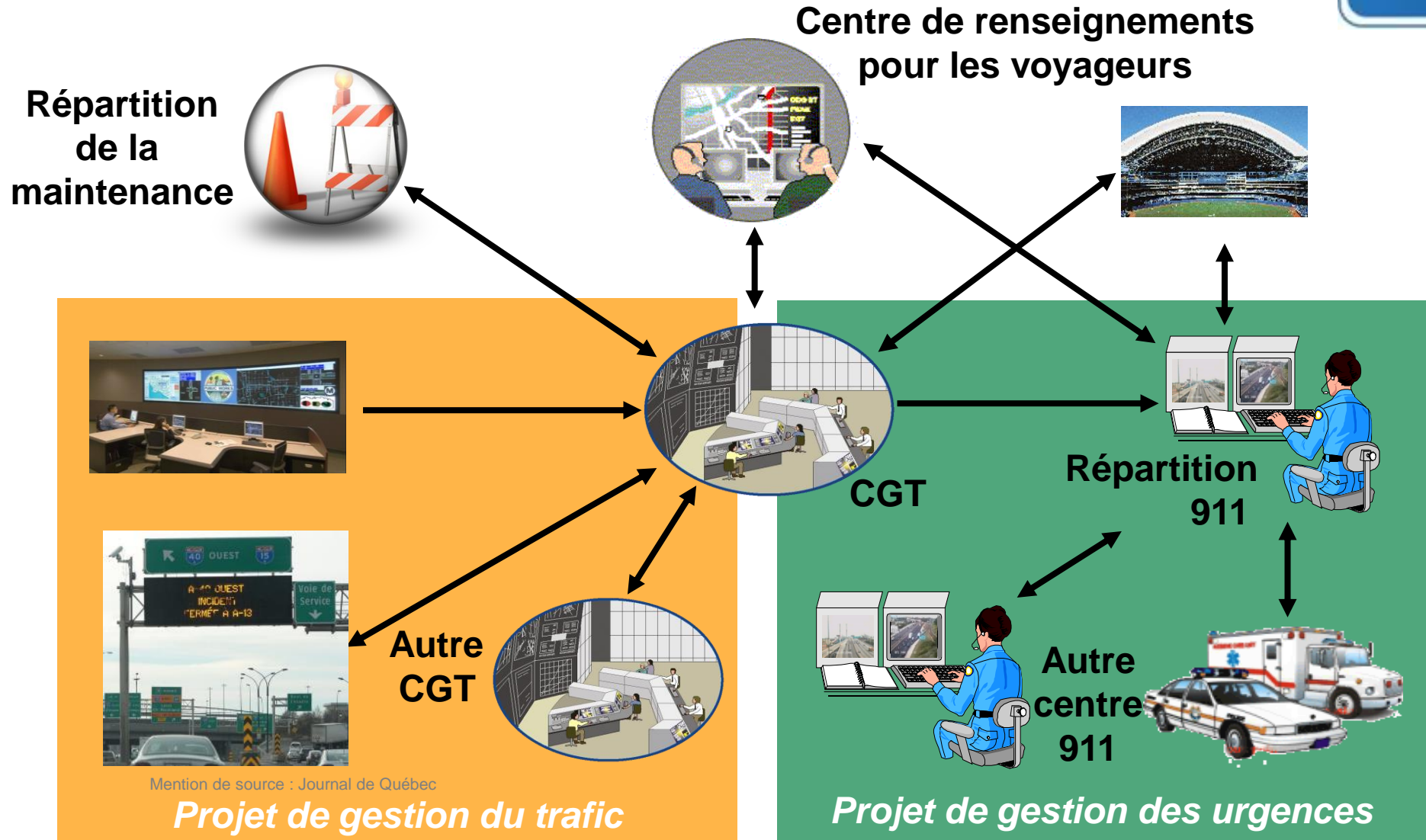
Number	Title	Status
11	<a href="#">Marinara County Department of Public Works Marinara County Department of Transportation Information Exchange and Action Agreement</a>	Planned
12	<a href="#">Marinara County Department of Public Works MCDOT and State Highway Patrol Information Exchange Agreement</a>	Planned
04	<a href="#">Marinara County Department of Public Works National Digital Traveler Information Exchange Agreement</a>	Planned
05	<a href="#">Marinara County Department of Public Works The Security Authority Information Exchange Agreement</a>	Planned
13	<a href="#">Marinara County Department of Transportation Area Drivers Information Provision Agreement</a>	Planned
14	<a href="#">Marinara County Department of Transportation Area Travelers Information Provision Agreement</a>	Planned
15	<a href="#">Marinara County Department of Transportation Marinara County IT Department Information Exchange and Action Agreement</a>	Planned
10001-04-15191	<a href="#">Marinara County FMC Joint Operations Agreement</a>	Planned
16	<a href="#">Marinara County IT Department Marinara County Department of Public Works Information Provision Agreement</a>	Planned
17	<a href="#">Marinara County IT Department MCDOT and State Highway Patrol Information Provision Agreement</a>	Planned
MCTPB-96-00321	<a href="#">Marinara County Regional Architecture Memorandum of Understanding</a>	Planned
06	<a href="#">MCDOT and State Highway Patrol Marinara County Department of Transportation Information Exchange and Action Agreement</a>	Planned



# Projets

- Les projets sont définis dans l'architecture régionale
- Une séquence de mise en œuvre est également définie

# Gestion des incidents



Mention de source : Journal de Québec

Adapté de : Département des Transports (DOT) des É.-U.



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### Projects

The Regional ITS Architecture provides a starting point for project definition. It provides an overall framework that shows how anticipated projects will integrate with each other and with existing systems. This page lists all the ITS projects that have been mapped to the regional ITS architecture.

Project	Status	Timeframe	Description
<a href="#">MCDOT Saucelito Traffic Coordination</a>	Planned	FY2020	Information about the MCDOT–Saucelito Traffic Coordination
<a href="#">MCDOT Traffic Monitoring Expansion Project</a>	Planned	FY 2021	This is a new project created to demonstrate a single agency (MCDOT) using RAD–IT to select the inventory and services from the region that are part a small ITS project. An instance of the region's parent ITS Roadway Equipment is used and an instance of the region's parent Traffic Monitoring service package. Just pass through each of the tabs and select the items that are part of the project by clicking on the checkboxes in the left hand lists.
<a href="#">MCDOT V2I Safety Initiative</a>	Planned	FY 2025	Marinara County is contemplating a new Vehicle to Infrastructure (V2I) project as part of the state's new push for Connected and Automated Vehicles (C/AV) technology. This project will demonstrate the use of connected vehicle roadside equipment to collect traffic conditions from passing equipped vehicles and, in turn, provide information to those equipped vehicles to inform them of traffic conditions ahead such as queues backing up or warning of dangerous curves or lane closures. The project was defined in RAD–IT to include the service packages necessary to meet the needs described above. Once the details of the project architecture were fleshed out using SET–IT, two additional service packages (SU01 and SU10) were added to address management and maintenance needs. The entire project was then re–imported to RAD–IT and the regional architecture updated to include those services.
<a href="#">TOMATO</a>	Planned	FY2022	TOMATO will provide regional traveler information of a general nature to tourists and personalized information to residents and businesses. This service will synthesize map and route descriptions, real–time traffic data, static and dynamic transit information, parking availability, event schedules, and other relevant items into traveler information products that will be provided to travelers through multiple mechanisms. The project will be built using city, county, state, and federal funds, but will be transferred to a public–private arrangement still under definition for long–term operation.

# Résumé du développement de l'architecture régionale de STI

- Cette séance a permis de passer rapidement en revue les éléments pouvant être documentés pour une architecture régionale de STI.
- Ne vous inquiétez pas, il existe des ressources supplémentaires
  - Formation RAD-IT enregistrée (y compris des exercices pratiques) :  
<https://www.arc-it.net/html/resources/training.html>
  - Site Web de l'ARC-IT :  
<https://www.arc-it.net/index.html>
  - Guide de l'architecture régionale de STI :  
<https://www.arc-it.net/documents/raguide/raguide.pdf>
  - Télécharger RAD-IT :  
<https://www.arc-it.net/html/forms/raditform.php>

Topic Area	Web-Based Training
ITS Architecture	<a href="#">ARC-IT Web Training</a>
	<a href="#">Use &amp; Maintenance Web</a>
Software Tools	<a href="#">RAD-IT Web Training</a>
	<a href="#">SET-IT Web Training</a>

# Planification de la formation

Séance	Description	Programme
<b>Formation détaillée sur l'Architecture des STI</b>	Assure une formation plus détaillée et complète sur les composants clés de l'Architecture et sur la façon d'y accéder par le site Web ARC-IT.	Complété
<b>Élaboration d'une architecture régionale des STI</b>	Donne un aperçu de haut niveau du processus d'élaboration d'une architecture régionale des STI, en intégrant des exercices pratiques de démonstration au moyen de l'outil RAD-IT ARC-IT.	Aujourd'hui
<b>Formation sur l'ingénierie des systèmes</b>	Présente une introduction au concept d'ingénierie des systèmes, son importance pour le cycle de vie de la fourniture des STI et comment l'Architecture aide à soutenir le processus.	Le mardi 13 février 2024 13 h 30 - 16 h 00 HNE

- **Volet anglais: le 14 février, le 21 février et le 28 février.**



**Des questions  
ou des  
commentaires?**

**Personne-ressource (courriel) :**

- Soutien : [ITSArchitecture-ArchitectureSTI@tc.gc.ca](mailto:ITSArchitecture-ArchitectureSTI@tc.gc.ca)
- Jonathan Parent [Jonathan.Parent@tc.gc.ca](mailto:Jonathan.Parent@tc.gc.ca)  Transports Canada 
- Philippe Morais [Philippe.Morais@wsp.com](mailto:Philippe.Morais@wsp.com) 

**Merci!**



# Formation sur l'ingénierie des systèmes

13 février 2024







## Conseils et protocoles de webinaire

- Vous pouvez poser des questions à n'importe quel moment en utilisant la boîte à questions et réponses. Nous répondrons au plus grand nombre de questions possible.
- Vous pouvez aussi lever la main pour posez des questions verbalement si le souhaitez.
- **Veillez garder votre ligne en sourdine.**
- Vous pouvez également envoyer vos questions par courriel à [ITSArchitecture-ArchitectureSTI@tc.gc.ca](mailto:ITSArchitecture-ArchitectureSTI@tc.gc.ca) pour obtenir une réponse plus tard.

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- Transports Canada n'est pas responsable des erreurs ou des omissions ayant pu se glisser dans ce document et ne garantit aucunement l'exactitude et l'intégralité des renseignements. Le contenu fourni par les sources externes n'est pas assujéti aux exigences sur les langues officielles, la protection des renseignements personnels et l'accessibilité.



# Remerciements

Cette présentation se fonde sur des documents de formation élaborés par le Département des transports des États-Unis (USDOT).

Transports Canada tient à remercier le comité consultatif des intervenants sur l'architecture des STI pour le Canada ainsi que les autres personnes qui ont gracieusement examiné le matériel de formation et fourni des images, des graphiques et d'autres documents.

# Buts et objectifs

1

Comprendre les objectifs et les utilisations de l'architecture et de l'ingénierie des systèmes pour les STI

2

Comprendre les fondamentaux de l'ingénierie des systèmes

3

Trouvez des opportunités où l'ingénierie des systèmes profitera à votre processus

# Ordre du jour

- Revue de l'architecture des STI
- Introduction à l'ingénierie des systèmes
- Examen du processus d'ingénierie des systèmes
- Établir l'ingénierie des systèmes dans votre organisation



# Examen de l'architecture des STI





## Qu'est-ce que les STI?

Les systèmes de transport intelligents (STI) intègrent différentes technologies de l'information et des communications dans l'infrastructure et les véhicules de transport routier, en vue d'aider à rendre le système de transport plus sûr et plus efficace.

# Qu'est-ce qu'une architecture des STI?

- Cadre pour l'élaboration de systèmes de transport intégrés
- Détermine :
  - Les organismes
  - Les systèmes utilisés
  - Les fonctions exécutées
  - Les renseignements échangés
  - Les communications
- SANS entrer dans des technologies spécifiques
  - La neutralité technologique est essentielle





# Où est-ce qu'une architecture des STI s'intègre-t-elle dans les cycles de vie de développement de projet traditionnels?

## PROGRAMMES/PLANIFICATION

Plan d'exploitation  
Problèmes et solutions, corridor par corridor  
Personnel, équipement, installations,  
programmes d'immobilisations



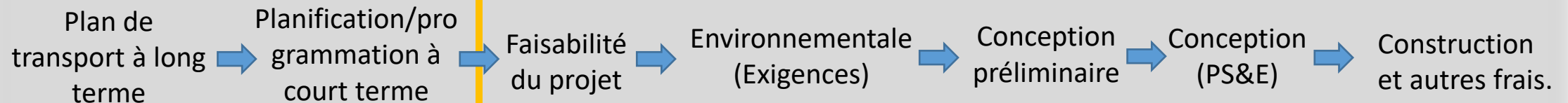
Plan d'infrastructure de STI  
Projets d'immobilisations



Architecture des STI  
Plan d'intégration régional

## PROJETS

Architecture des STI  
Conception spécifique au projet



Adapté de : Département des Transports (DOT) des É.-U.

# Résumé de l'examen de l'architecture de STI

- Les architectures de STI fournissent des cadres pour le développement de systèmes de transport intégrés
- Les architectures de STI soutiennent la planification et le développement de projets de STI
- L'ARC-IT fournit des outils logiciels téléchargeables gratuitement



# Introduction à l'ingénierie des systèmes



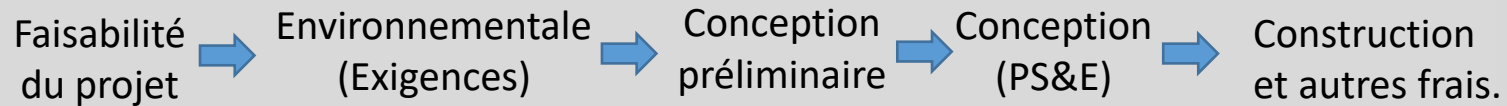


# Projets de transport – qu'est-ce qui a fonctionné?

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- Les autorités routières construisent des infrastructures routières depuis bien des années
- Ils ont établi des procédés de conception et de construction de routes et de ponts où :
  - Les rendements antérieurs sont bien compris
  - Les exigences sont bien définies et comprises
  - La technologie est éprouvée et bien comprise
  - Les dessins documentés sont éprouvés et bien connus
- Les projets ne sont pas réalisés sans suivre les procédés, documents et normes « approuvés »

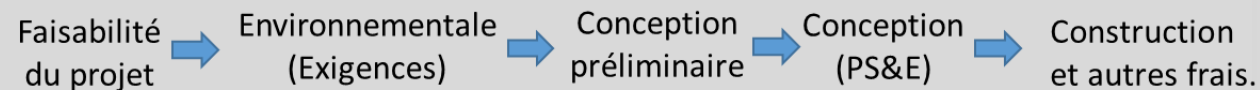
# Le procédé de développement de projet traditionnel a contribué à ce succès



## Le faible risque d'échec des projets de mise en œuvre!

- ✓ La performance des produits et des matériaux est bien comprise
- ✓ Les exigences sont bien définies et comprises
- ✓ La technologie est éprouvée et bien connue
- ✓ Les dessins sont documentés et éprouvés

Le développement de projet traditionnel fonctionne AUSSI pour l'expansion de l'infrastructure de STI



Expansion de l'infrastructure de STI :  
Faible risque d'échec des projets de mise en œuvre

Procédés et manuels approuvés ÉGALEMENT en place pour l'installation pratique de nombreuses technologies des STI

MAIS ce procédé traditionnel ne fonctionne PAS pour les projets des STI complexes



# En quoi la conception de systèmes complexes est-elle différente?

La présence de logiciels et de technologies informatiques!  
= Risque plus élevé

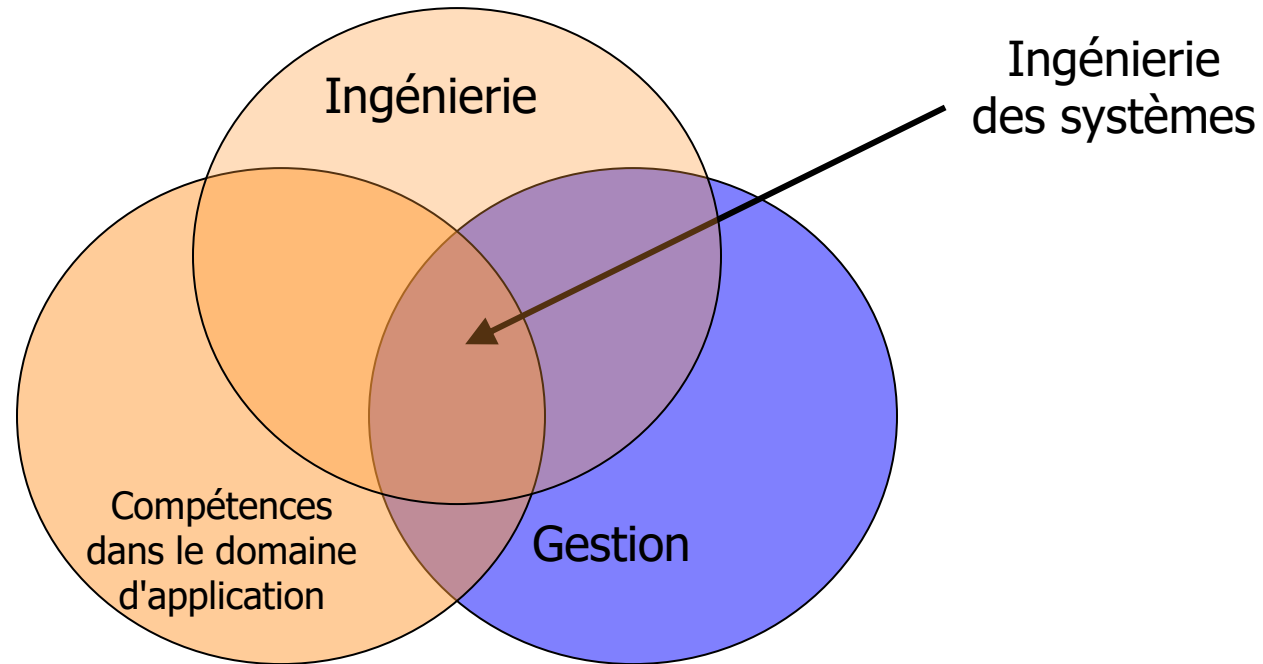
Alors, comment gérer le développement de systèmes lorsqu'il s'agit de logiciels ou d'intégration à d'autres systèmes?

En faisant appel à l'ingénierie des systèmes!



# Qu'est-ce que l'ingénierie des systèmes?

Une **approche interdisciplinaire essentielle** à la réalisation de systèmes avec succès<sup>1</sup>.



Mention de source : 1-EIA-731 Annexe B (Glossaire)

# Ingénierie des systèmes (suite)

- But :
  - Définir les besoins des clients et les fonctionnalités requises tôt dans le cycle de développement
  - Documenter les exigences
  - Procéder ensuite à la conception, à la mise en œuvre et à la validation du système tout en considérant le problème complet

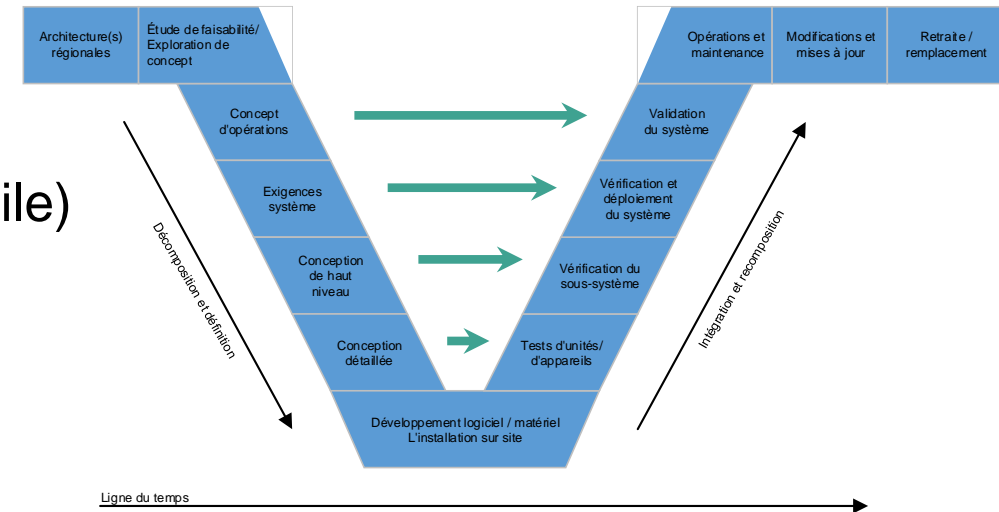
# Principes d'ingénierie des systèmes

- Commencer en gardant l'œil sur la ligne d'arrivée
- Mobiliser les parties prenantes est la clé
- Définir le problème avant de mettre en œuvre la solution
- Retarder les choix technologiques



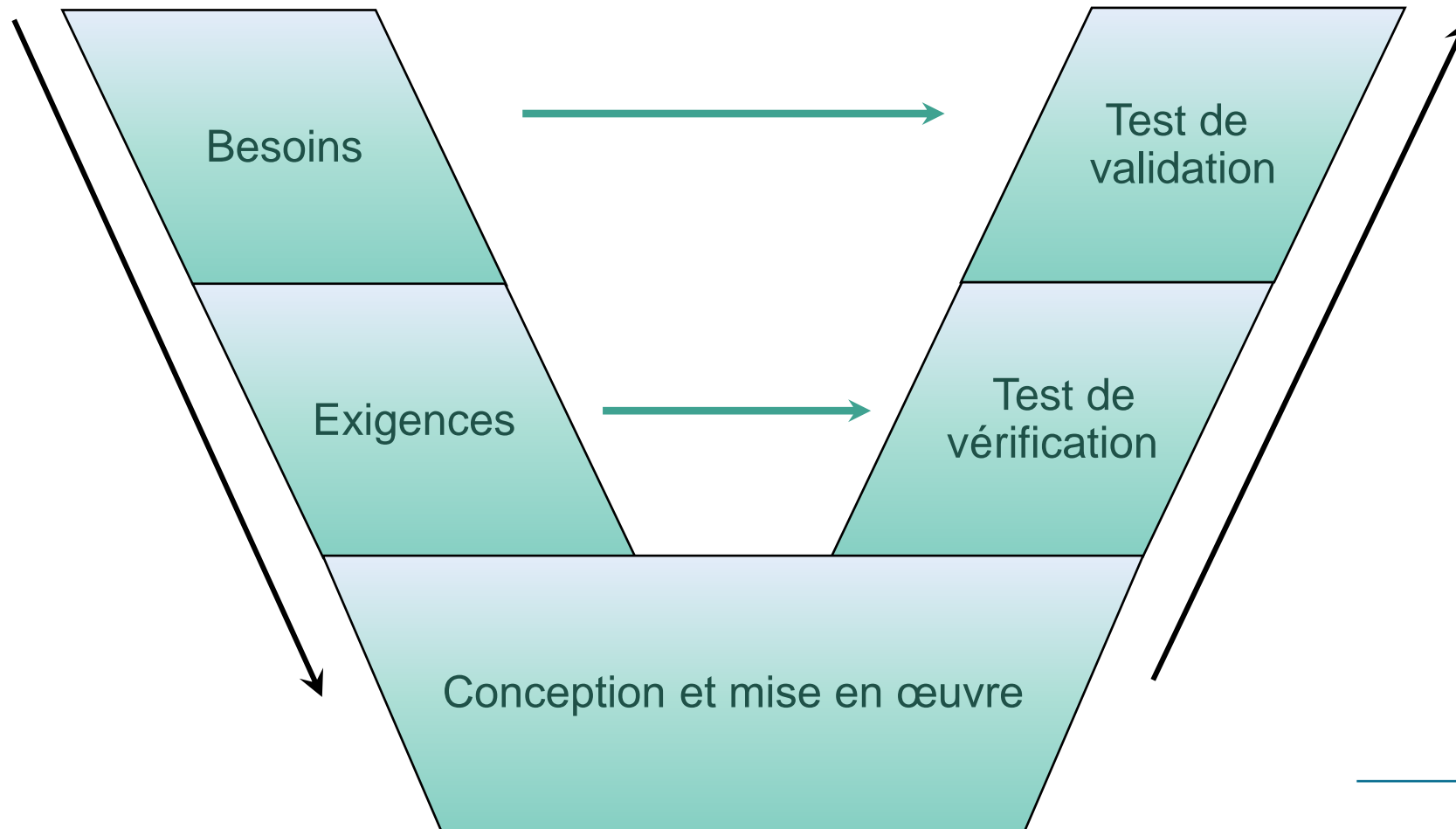
# Approches multiples, un objectif

- L'ingénierie des systèmes permet de multiples approches
  - Séquentiel / Cascade / « V »
  - Spirale
  - Évolutif / Agile
    - (similaire mais différent du développement Agile)
- Tous ont un but commun
  - Créer et livrer un système qui
    - Répond aux exigences
    - Répond aux besoins
    - *Est utilisé* (exploité/maintenu répondant aux objectifs de la mission)

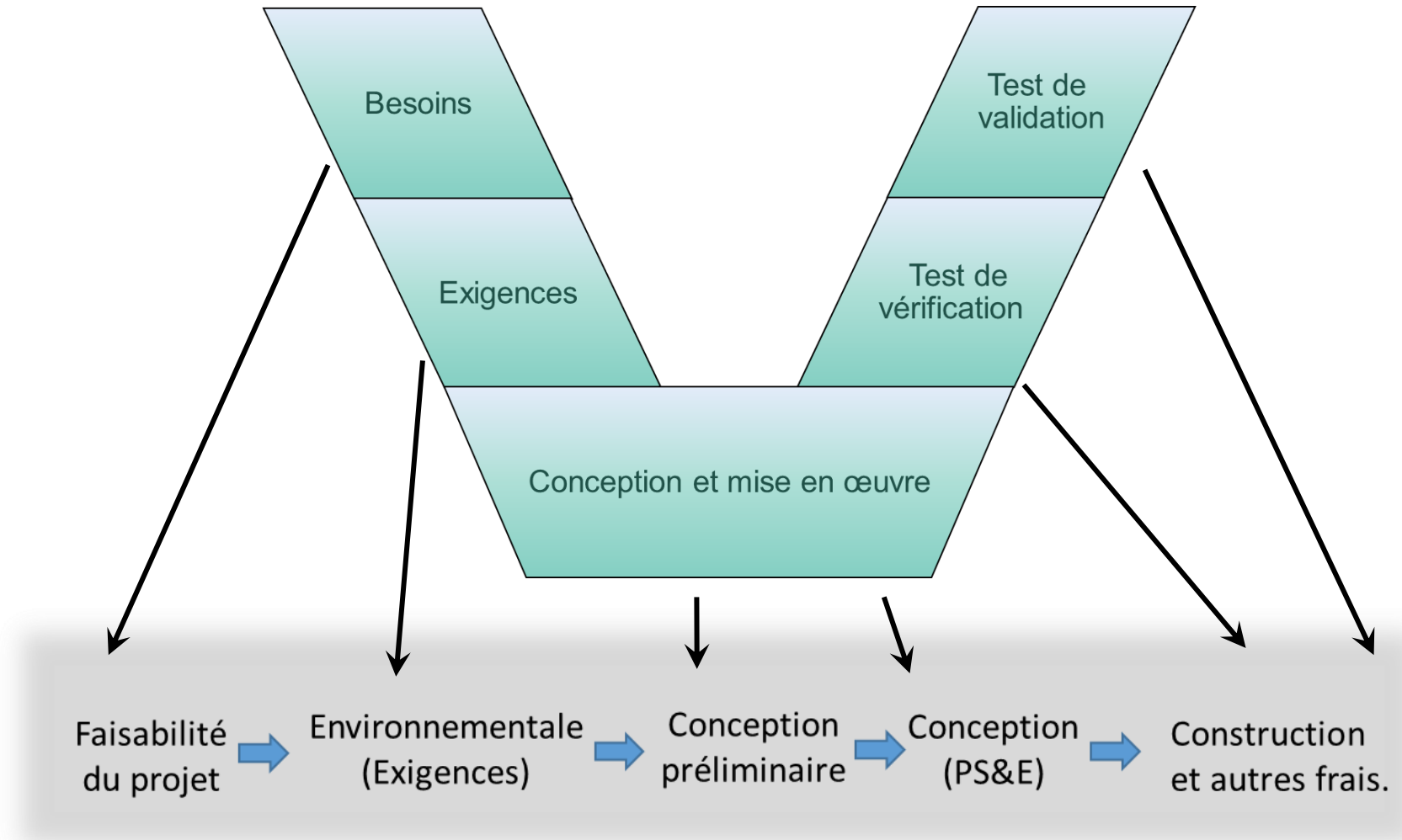


Adapté de : Département des Transports (DOT) des É.-U.

# Processus d'ingénierie des systèmes simplifié



# Processus d'ingénierie des systèmes simplifié



Adapté de : Département des Transports (DOT) des É.-U.

# À quoi ressemblent les documents d'ingénierie des systèmes?

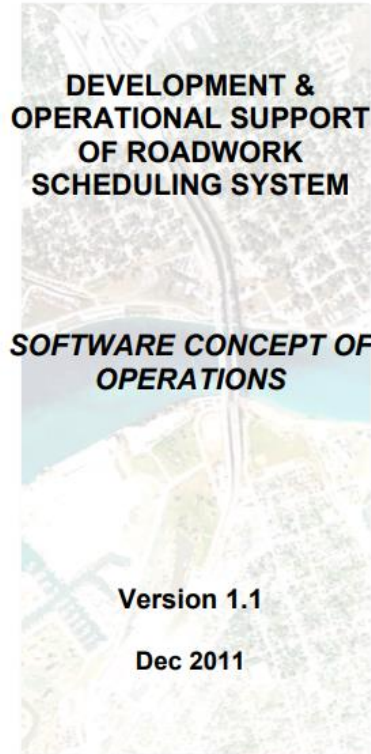
## Concentrez-vous sur ces documents :

- Concept de fonctionnement
- Exigences
- Vérification
- Validation

## Les documents devraient inclure

- Besoins correctement documentés
- Exigences de haut niveau reposant sur les besoins
- Traçabilité entre les besoins et les exigences

# Exemple : Système de planification des travaux routiers pour le MTO





# Exemple : Système de planification des travaux routiers pour le MTO

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## 5 CONCEPTS FOR THE PROPOSED SYSTEM

### 5.1 Background, Objectives, and Scope

Refer to Sections 3.1, 4.1 and 4.2 for background of the proposed system.

There are two major objectives of the project:

1. Develop and deploy a Roadwork Scheduling System (RSS) that allows multiple contractors / consultants to apply for roadway closures and Right-of-Way (ROW) usage, and for MTO RWSCU staff to review and either approve or deny the requests.
2. Prepare the RSS users for the transition to the new RSS system, including operational and technical support with a live Help Desk for 3 years.

### 5.2 Operational Policies and Constraints

From the Technical Workshop and review of existing documentation, the following operational policies and constraints shall be observed during system design:

1. **Notification:** the scope of each Notification should be limited to the same highway, closure start and end dates. If the closure involves multiple highways, multiple Notifications should be raised. Same consideration applies for the closure date range.
2. **Submission Time:** RWSCU requires certain time (2 business days) to process each Notification. The Contractors should observe the required lead time (configurable) for submission of Notifications. To maintain flexibility, the system should allow Contractors to submit a Notification even if not meeting the lead time requirements (but may provide warning). The RSS can sort the Notifications based on start time of the first closure to help RWSCU staff to set work priority.
3. **Revision:** From the existing MTO RWSCU protocol, only 1 revision is allowed per Notification (the limit will be configurable).
4. **Control of Creation of RSS Users and Contracts:** must be controlled by RWSCU staff, not by Contractor.
5. **Daily Occurrence:** maximum of 7 occurrences is allowed per Notification (the limit will be configurable).

# Exemple : Système de planification des travaux routiers pour le MTO

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## 3 SPECIFIC REQUIREMENTS

### 3.1 General

#### General

Req. Number	Description	Traceability
SR1.1	RSS shall be a stand-alone browser based application so that multiple contractors may concurrently enter roadwork closure applications directly.	RFP1.1
SR1.2	RSS shall be hosted from an external hosting service provider.	RFP1.2
SR1.3	RSS shall be running in an external host server (e.g. cloud computing) using running Linux Operating System. The choice of Linux shall be agreed during the design stage.	RFP1.6
SR1.4	Users shall access RSS from a website address that is visible from the Internet using https protocol.	RFP 2.1 RFP1.3
SR1.5	<i>Remarks:</i> The rules and mechanisms regarding access to the RSS system shall be presented to MTO for approval before committing the code.	RFP2.12
SR1.6	As users may not have Administrator rights to install software on their desktops, the usage of plug-in software shall be avoided.	RFP1.8
SR1.7	All data entry in the Notification form shall be stored in the RSS database that is hosted externally.	Operations Review
SR1.8	The database schema of RSS shall be presented to MTO (by allocating one full day workshop) for approval, highlighting the parent-child relationships of the various tables. The database schema shall include a dictionary describing all tables, the elements within the table and the allowable values for each element. (Note. This is a project requirement but not a software requirement but is included for reference)	RFP3.6

#### Modes of Operations

Req. Number	Description	Traceability
RS2.1	RSS shall have two operation modes which are Normal mode and Maintenance mode.	Operations Review

# Exemple : Traçabilité et intégration dans les documents relatifs aux essais

ACCEPTANCE TESTING (versus ConOps v1.6)					
Note that each Acceptance Test use case is tested in the following manner:					
1) All SRS Requirements related to the use case must have been tested during System Testing and found to PASS.					
2) The use case described works as expected in 'free-play' testing of the NGCS-Lite system.					
All use cases PASS, so the Acceptance Test is considered to be a PASS also.					
ConOps Section#	Use-Case Name	SRS Requirements	Package	ConOps Use Case Scenario	Use Case Pass / Fail?
6.1	Map Overview	R4.2.1-x	A (for static map elements only)	<p>This use case covers the embedded Google Maps functionality of the Map View. If it is not already displayed, choose Map View from the menu bar and verify that Google Maps is used to display a map of Ontario. Test enabling / disabling the icon overlays for DMS and CCTV devices, MTO crossings data, active events, and subsystem devices (DMS and ATC devices belonging to BAS, LMS and QWS subsystems.) Test the DMS Message overlay that shows the currently displayed DMS messages as a map layer. Test the Google traffic layer and the overlay for Central Region flow data. Test the Google Streetview function and the searching facility.</p> <p>Try Satellite View and Map View. Use the mouse, mousewheel and the embedded controls to pan around and to zoom in / out. Check that event declaration may be initiated by clicking on a crossing and choosing to declare one of the various types of event in the Crossing information dialog. Check that it is possible to access a Crossing Editor function from the Crossing information dialog. Click on each of the different types of device icons and check that suitable information dialogs are shown, with short-cuts to common functions. Click on the embedded Device Tree on the left hand side of the map pane to expand the nodes to show all field devices, and try out the functions to zoom the map to any given device.</p>	PASS
6.2	Communications Log	R4.2.2-x	A	<p>This use case relates to the CommLog database functions. Using the menu bar, select the CommLog function. Click the button to create a new CommLog and create a dummy entry and save it. Choose to append an additional entry to this existing commlog and check that it is not possible to modify entries that have already been saved. Test the sorting, filtering and searching functionality for finding existing CommLogs in the database. Test the functions for automatically copying information from an active event into a new CommLog and for linking Events and other CommLogs to CommLog entries.</p>	PASS
6.3	Event View	R4.2.3-x		<p>This use case focuses on the different types of events and their attributes. Verify that menu entries exist for creating each of the different types of event: Incident, Roadwork, Congestion, Amber Alert, Red Alert, Adverse Weather, Road Maintenance, Border Crossing Delay and Border Closure. Choose to declare each type of event in turn and inspect the Event Declaration window. Make sure all of the fields specified in the ConOps description of the events are present, and have the documented properties. Cancel event declaration without proceeding to Manage DMS Response.</p>	PASS
6.3.4	Amber Alert	R4.2.3.4-x		<p>This use case focuses on the special functionality provided for Amber Alert events. When an Amber alert is declared by</p>	PASS



## Objectif de l'ingénierie des systèmes

- Améliorer les chances de mettre en œuvre un système dans les délais et le budget qui répond aux besoins des utilisateurs
  - Réduire les risques pour une livraison réussie
  - Maîtriser les coûts et la planification
  - Répondre aux besoins des utilisateurs
  - Améliorer la qualité du système

# Résumé – Introduction à l'ingénierie des systèmes

- Suivre une approche d'ingénierie système peut améliorer les chances de mettre en œuvre un système dans les délais et dans les limites du budget qui répond aux besoins des utilisateurs
  - Réduire les risques
  - Maîtriser les coûts et la planification
  - Répondre aux besoins des utilisateurs
  - Améliorer la qualité du système



# Processus d'ingénierie des systems (Modèle en V)

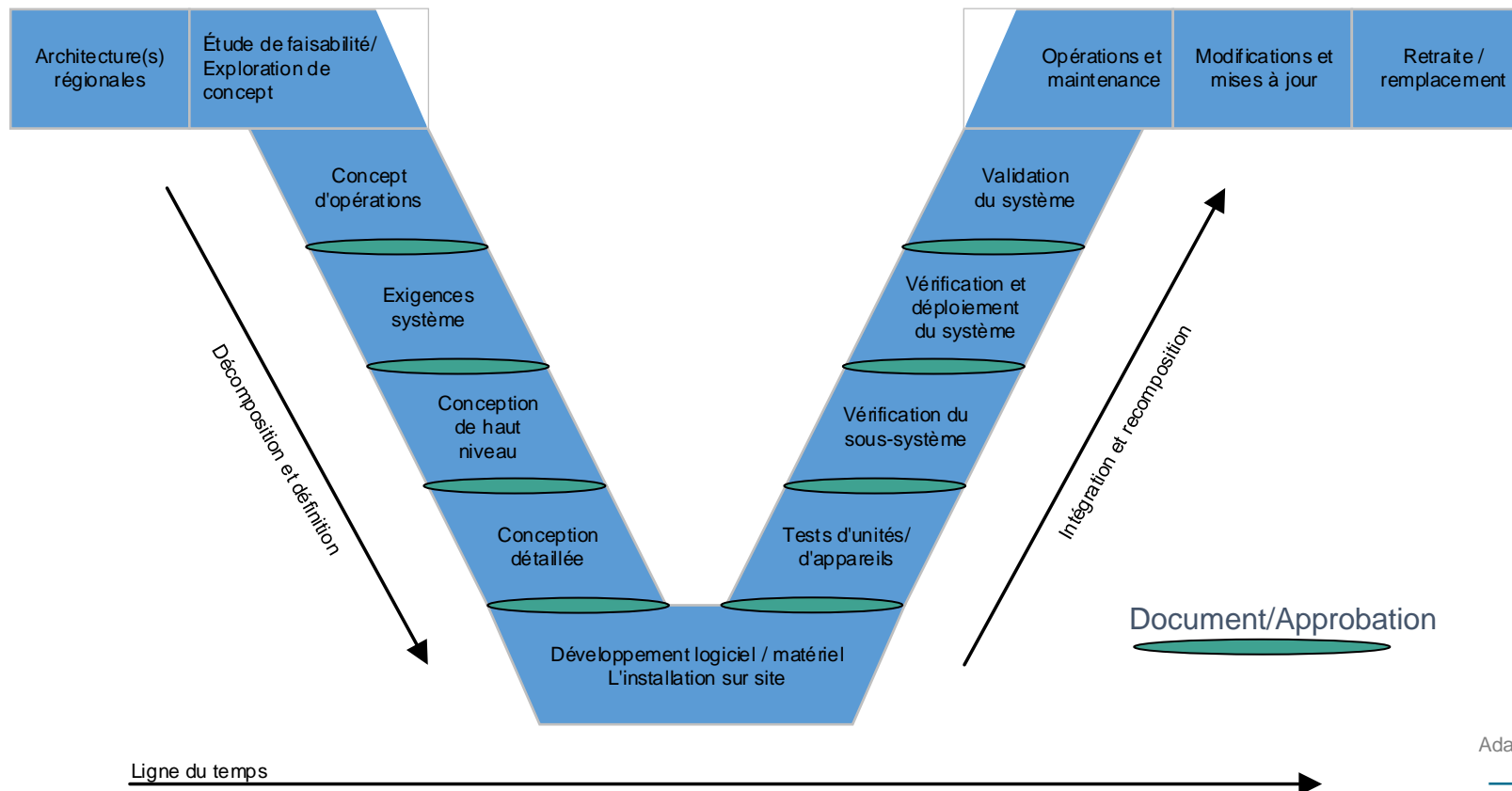


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# Modèle en V

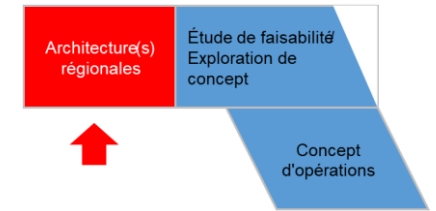
- Exemple d'ingénierie des systèmes séquentiels



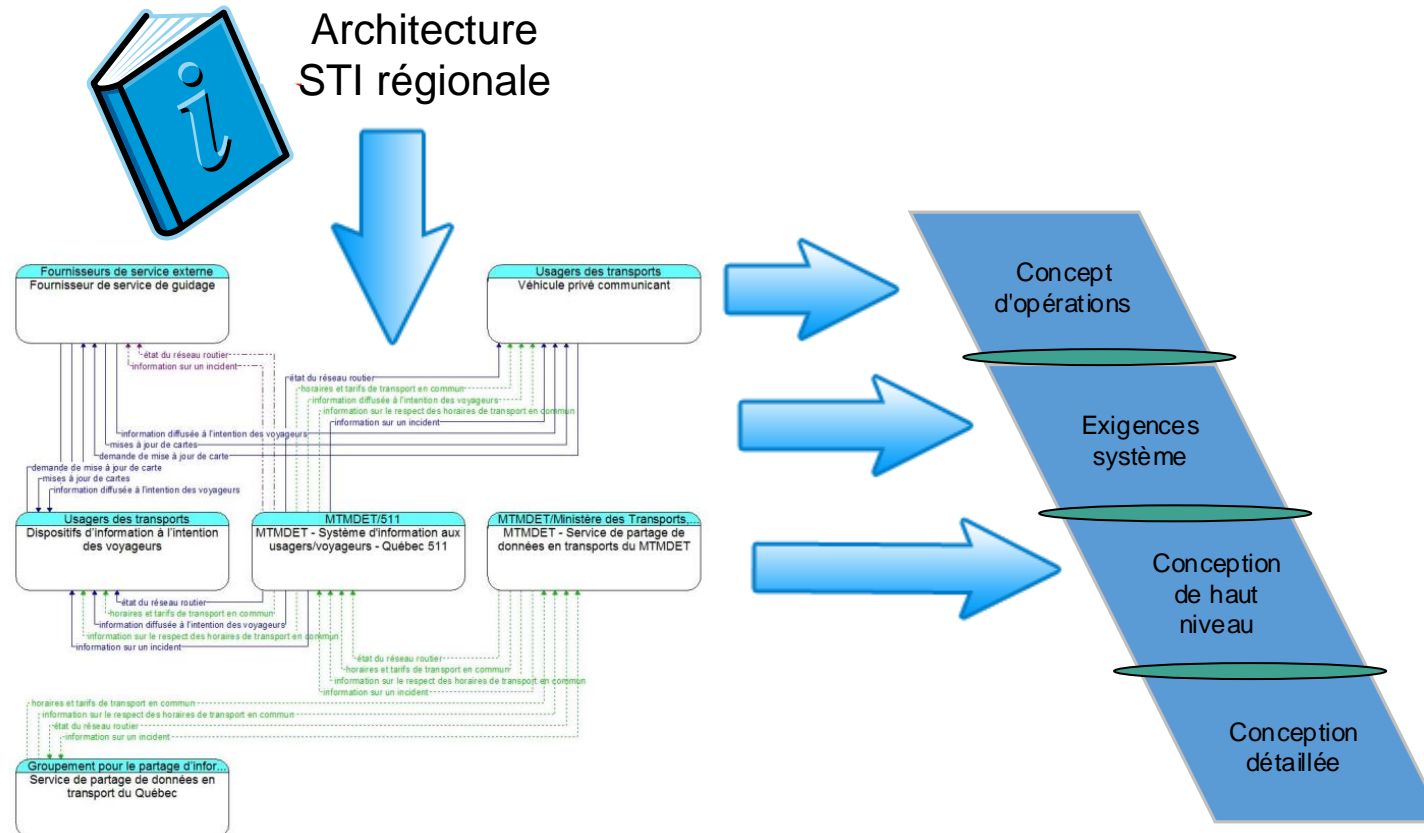
Adapté de : Département des Transports (DOT) des É.-U.



# Utilisation de l'architecture régionale dans l'élaboration de projets



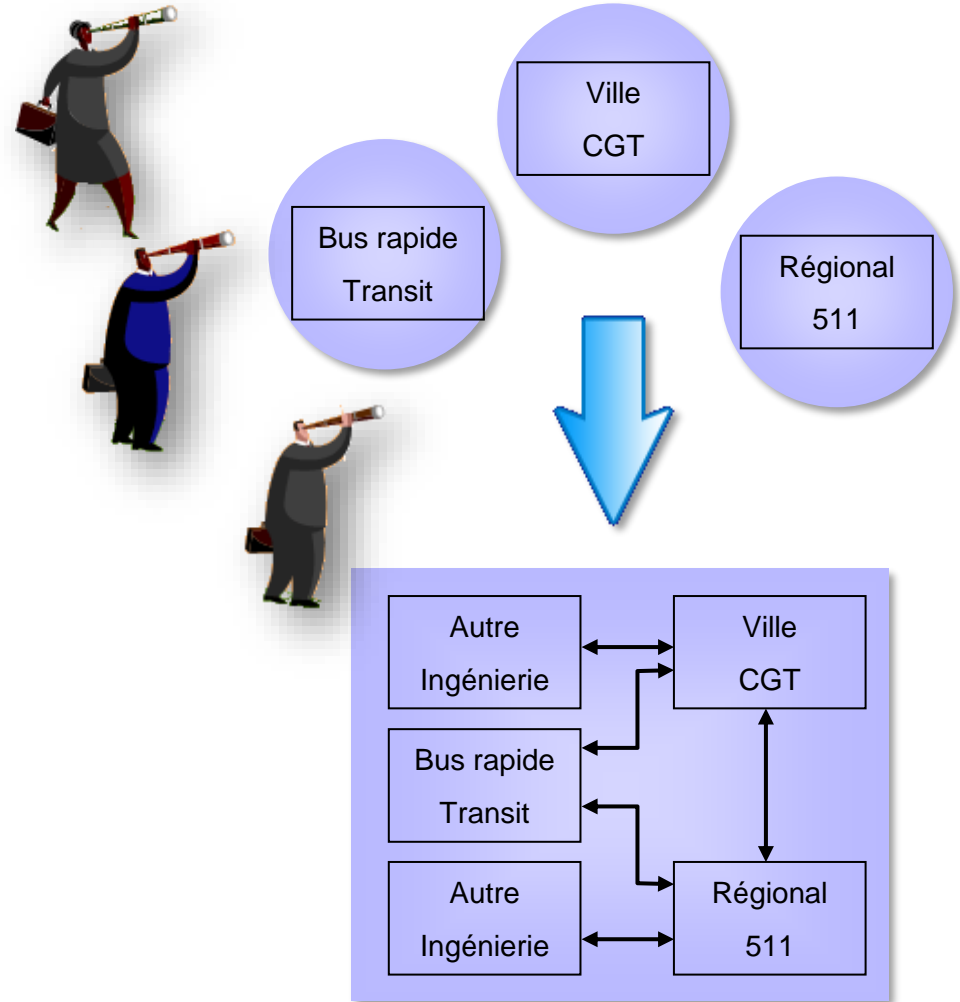
- Avant le démarrage d'un projet, utilisez l'architecture régionale pour aider à définir les aspects clés



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# Avantage d'une architecture régionale de STI

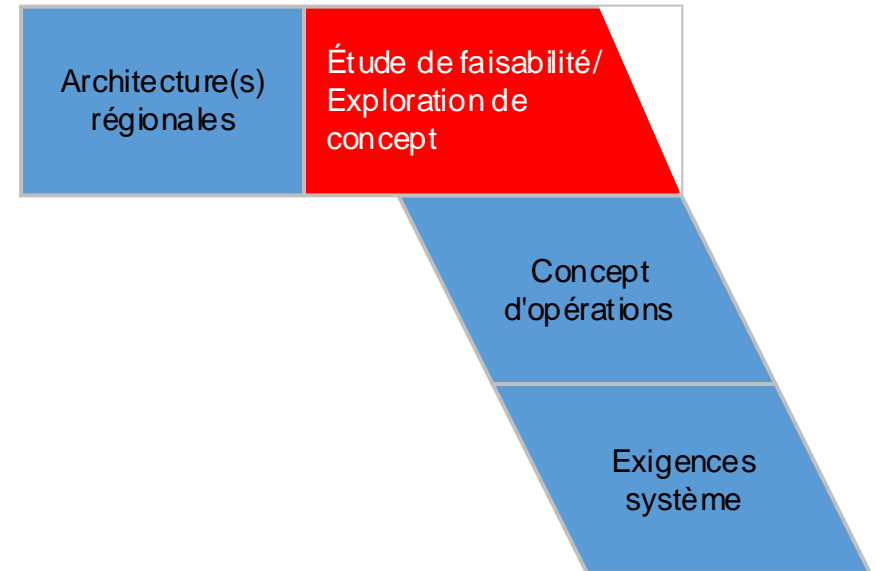
- La portée du projet tient compte de la vision régionale
- Permet d'éviter de négliger des fonctionnalités ou des interfaces qui n'avaient pas été prises en compte auparavant
- La cohérence du projet avec les autres projets STI est maximisée
- La continuité entre la planification et l'élaboration du projet est maintenue
- S'il existe une architecture régionale de STI, la vie en sera simplifiée



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# Étude de faisabilité / Exploration de concept

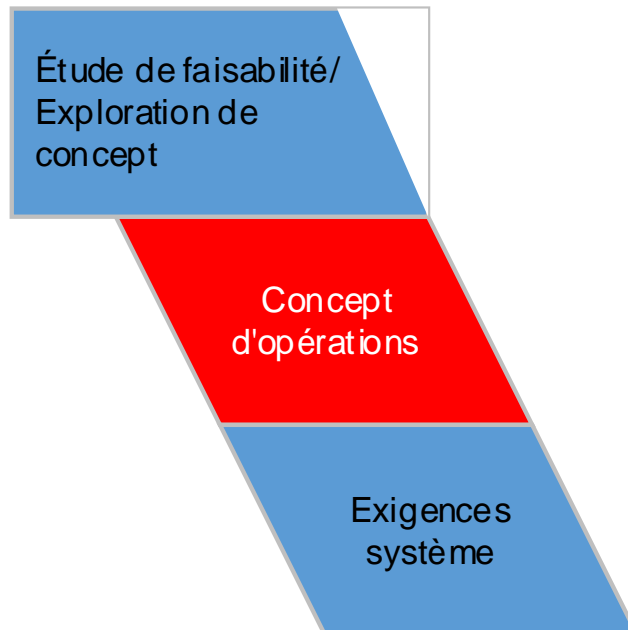
- Évaluer la faisabilité économique, politique et technique
- Évaluer d'autres concepts
- Procéder à l'analyse de rentabilisation
- Activités principales :
  - Définir les critères d'évaluation
  - Effectuer une première analyse des risques
  - Trouver d'autres concepts
  - Évaluer les solutions de rechange
  - Documenter les résultats



# Étude de faisabilité / Avantages de l'exploration de concepts

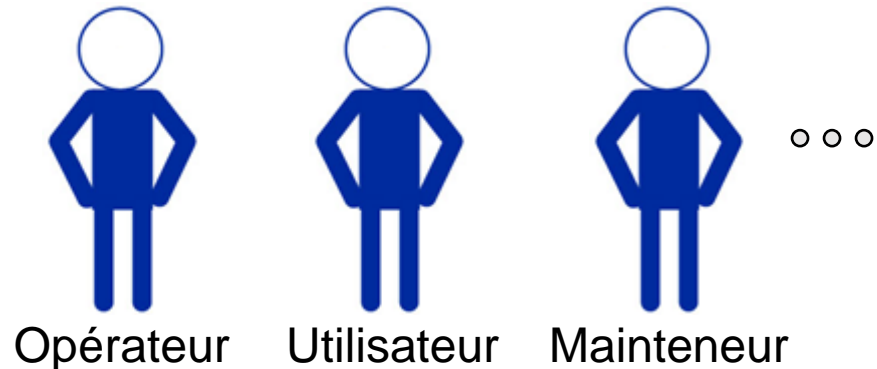
- Envisager des solutions de rechange avant un investissement important
- Réduire les risques de dépassement des coûts et des délais
  - La faisabilité du projet est vérifiée
  - Les risques inacceptables sont soulevés
- Utiliser où
  - La faisabilité est remise en question
  - Des solutions de rechange fondamentalement différentes existent

# Concept des opérations



- Définit :
  - **Qui** : Rôles et responsabilités des intervenants
  - **Quoi** : Besoins des intervenants, éléments du système et capacités de haut niveau
  - **Où** : Étendue géographique et physique
  - **Quand** : Séquence d'activités réalisées
  - **Comment** : Élaboration, exploitation et maintenance du système

# Concept des opérations (suite)



Adapté de : Département des Transports (DOT) des É.-U.

- Rédigé dans la langue des intervenants
- Montre un accord sur :
  - Buts, objectifs et attentes
  - Portée du projet
  - Responsabilités des intervenants
  - Besoins opérationnels
  - Comment le système fonctionnera
  - Environnement opérationnel et de support

# Concept des normes d'exploitation

- Normes de l'industrie suggérées pour les grandes lignes de ConOps

## Grandes lignes ANSI/AIAA-G-043

1. Portée
2. Documents de référence
3. Description opérationnelle axée sur l'utilisateur
4. Besoins opérationnels
5. Vue d'ensemble du système
6. Environnement opérationnel
7. Environnement de soutien
8. Scénarios d'exploitation

Prend en charge les  
développements de nouveaux  
systèmes

## Grandes lignes IEEE1362

1. Portée
2. Documents de référence
3. Système ou situation actuelle
4. Justification et nature des changements
5. Concepts du système proposé
6. Scénarios d'exploitation
7. Résumé des répercussions
8. Analyse du système proposé

Prend en charge les mises à  
niveau du système

Adapté de : Département des Transports (DOT) des É.-U.

# Avantages du développement d'un concept d'opérations

- Accord rapide des intervenants sur :
  - Capacités du système
  - Besoins des utilisateurs
  - Rôles et responsabilités
  - Mesures de rendement clés et plan de base pour la validation du système
- Gérer les attentes des intervenants



Commencer en gardant l'œil sur la ligne d'arrivée

Un ConOps aide l'équipe du projet à visualiser le système final au début du projet.

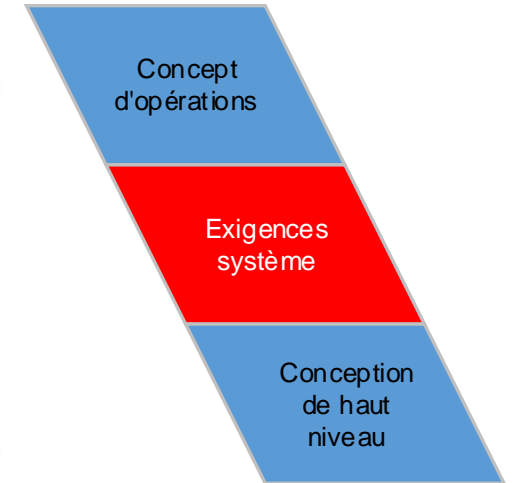


# Exigences système

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« Quelque chose qui gouverne *quoi*,  
*comment bien* et *sous quelles conditions* un  
produit atteindra un but donné »

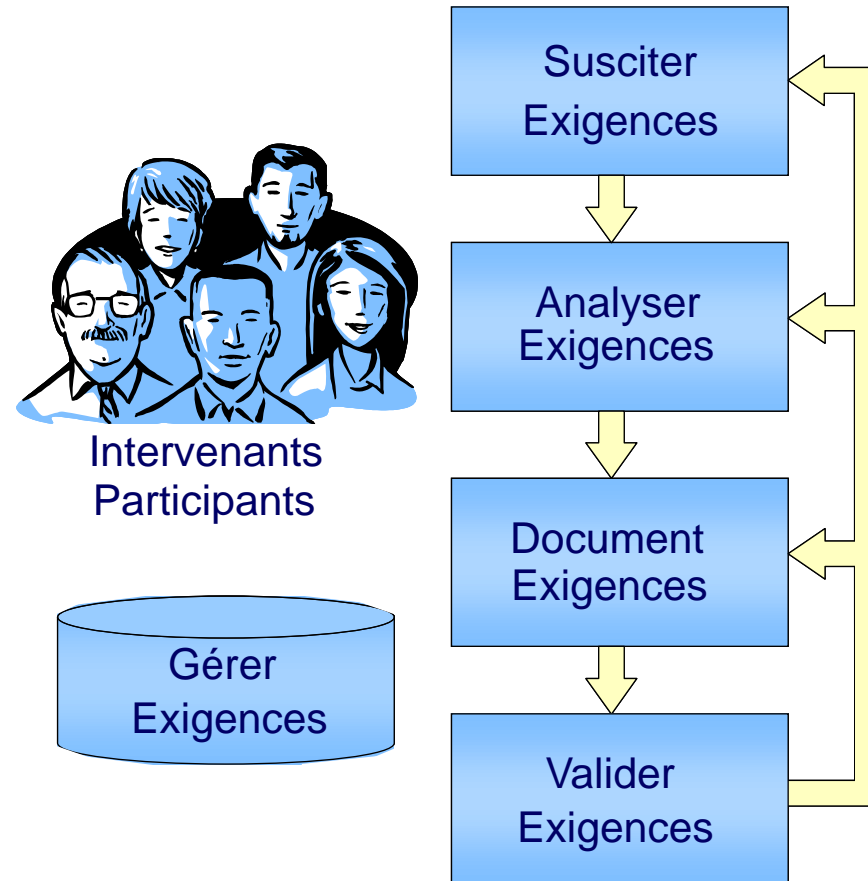
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EIA-632 – Norme de l'Electronics Industry Association – Processes for Engineering a System

# Exigences système

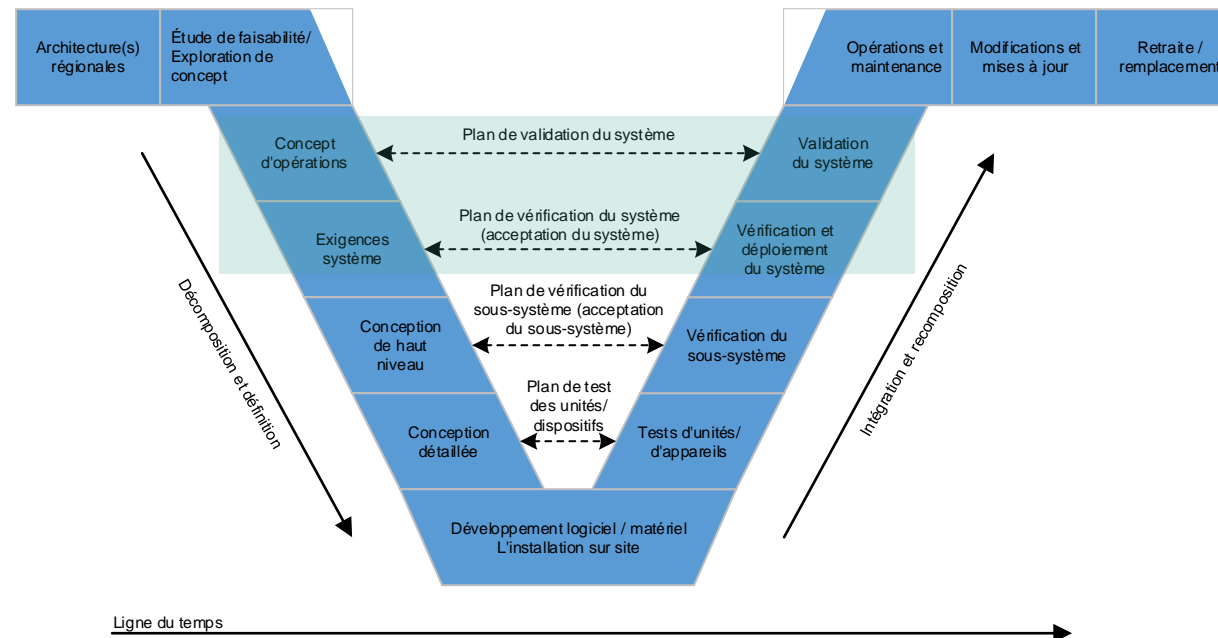
- Activités principales
  - Susciter les exigences
  - Connaître les exigences
  - Documents requis
  - Valider les exigences
  - Gérer les exigences



Adapté de : Département des Transports (DOT) des É.-U.

# Exigences système

- Plus d'activités principales
  - Créer un plan de vérification du système qui assure les essais, la démonstration, l'inspection et l'analyse par rapport à chaque exigence
  - Créer un plan d'acceptation du système qui décrit la fonctionnalité que le système doit afficher avant l'acceptation du client



Adapté de : Département des Transports (DOT) des É.-U.

# Style d'écriture pour les exigences

- Utiliser « doit » plutôt que « va » ou « devrait »
- Une exigence par phrase
- Éviter l'utilisation de pronoms
- Éviter les références vagues telles que « bon travail » et « technologie éprouvée »

# Exigences de qualité

Les exigences de qualité sont

- ★ Nécessaire
- ★ Sans ambiguïté
- ★ Complètes
- ★ Mesurables
- ★ Cohérentes
- ★ Réalisables
- ★ Testables
- ★ Indépendantes de la technologie



# Exemples de mauvaises exigences

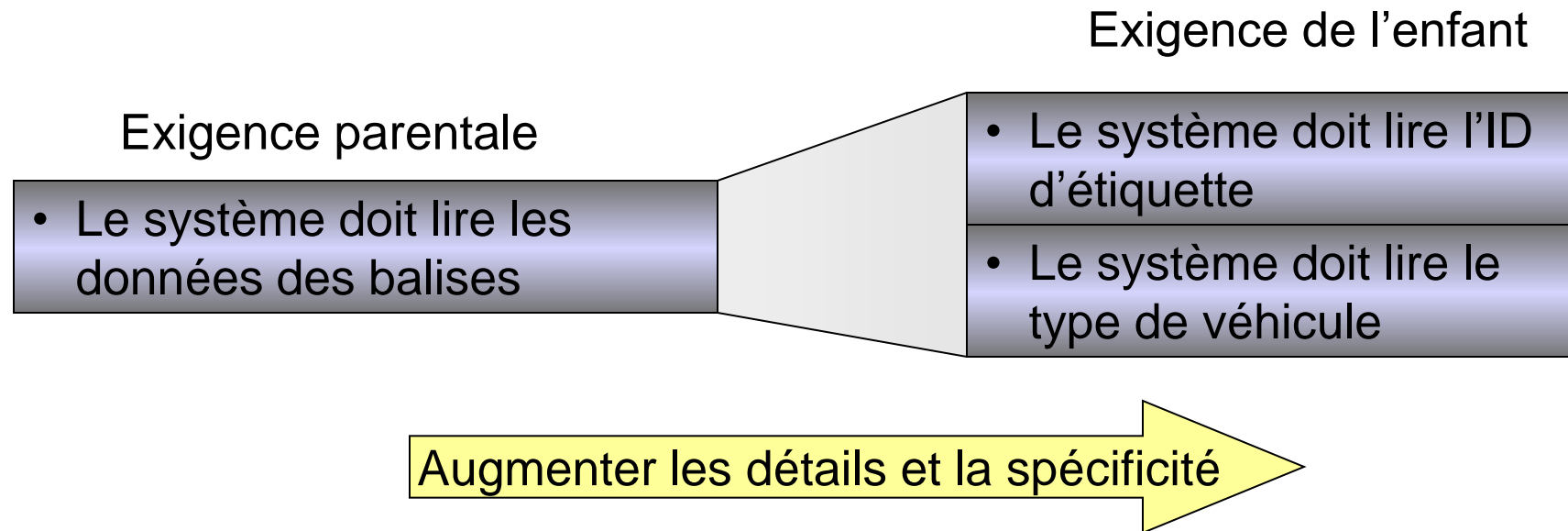
- « Le système doit utiliser des détecteurs de radar pour la surveillance de la circulation. »
- « Des ordinateurs à la pointe de la technologie doivent être utilisés. »
- « Le système doit gérer les incidents. »
- « Tous les travaux doivent être exécutés à la satisfaction de l'ingénieur. »
- « Les conceptions et les composants standard de l'industrie doivent être utilisés. »

# Exemples d'exigences (bonnes ou mauvaises ?) :

- « La récupération de tout état unique à partir de tout appareil de terrain ne doit pas dépasser 2 secondes suivant le lancement de la demande. »
- « La congestion doit être réduite. »
- « L'utilisateur du système doit être en mesure de vérifier l'état de la porte de voie réversible en haut, en bas, verrouillé et 15 °. »
- « Les gens doivent se sentir plus en sécurité dans le bus. »

# Exigences système

- Généralement défini dans une hiérarchie – par exemple :



Adapté de : Département des Transports (DOT) des É.-U.



# Utilisation de l'architecture régionale dans les exigences système (exemple)

- Exigences d'architecture régionale DMS

Élément	Domaine fonctionnel	l'ID	Exigence
Centre municipal de gestion de la circulation (CGT)	Diffusion d'informations sur la circulation CGT	1	Le centre contrôlera à distance les panneaux à messages dynamiques pour la diffusion des renseignements de circulation et autres aux conducteurs.

- Exigences du projet DMS

- Exigence parentale : Le centre doit contrôler à distance les panneaux à messages dynamiques...
- Ajouter des détails relatifs aux exigences de l'enfant pour :
  - Activer et afficher un message
  - Traiter les messages selon leur priorité
  - Définir un message (liste de sélection, correcteur orthographique)
  - Effacer les messages sur les panneaux de signalisation
  - Programmer des messages à afficher



# Avantages des exigences du système

- Un énoncé clair des exigences fournit :
  - Une compréhension partagée du problème à résoudre par le client et le développeur
  - Une base solide pour gérer la portée du projet
  - Le lien entre les besoins des utilisateurs et la conception du système
  - La base de la vérification/des tests du système

Problème

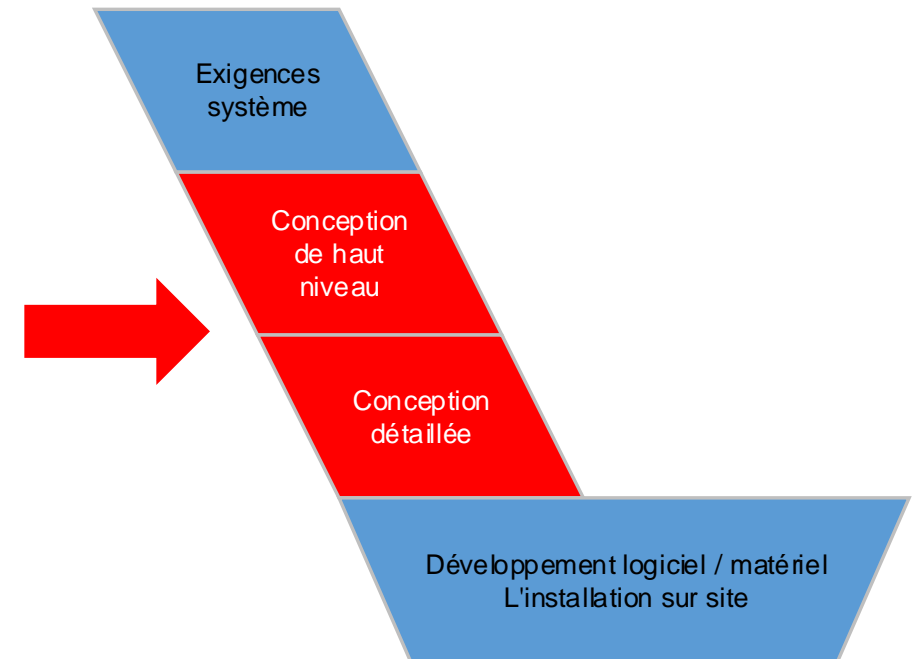


Solution

Un énoncé clair des exigences est souvent déterminé comme un facteur clé de la réussite des projets informatiques.

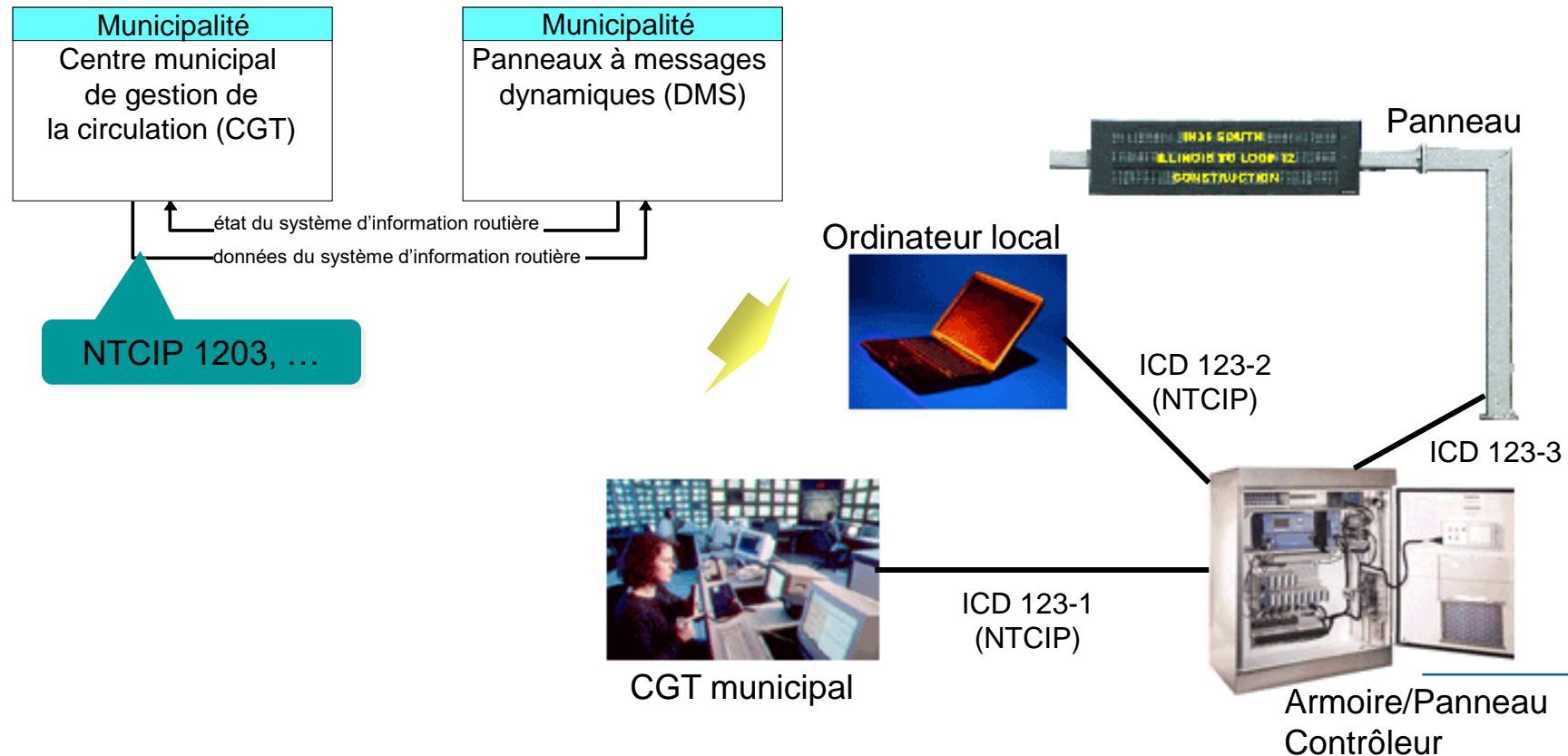
# Conception de système

- Le pont entre les exigences et la mise en œuvre
- Deux niveaux distincts
  - Conception de haut niveau :
    - Structure globale du système
      - sous-systèmes, composants et interfaces
  - Conception détaillée :
    - Spécification complète des composants matériels, logiciels et de communication



# Utilisation de l'architecture régionale dans la conception de système

- Les interfaces d'architecture sont le point de départ de la conception d'interfaces de projet



# Normes d'interface dans la conception de projet

- Solutions de communication de projet DMS

## Communication Solutions

- AU: DMS and RWIS data - DMS and RWIS Comms (1)
- US: NTCIP Message Sign - SNMPv3/TLS (1)
- US: NTCIP Message Sign - SNMPv1/TLS (1)
- EU: UTMIC Data - UTMIC (1)
- US: NTCIP Message Sign - SNMPv1 (32)

} Sélectionner et adapter au projet

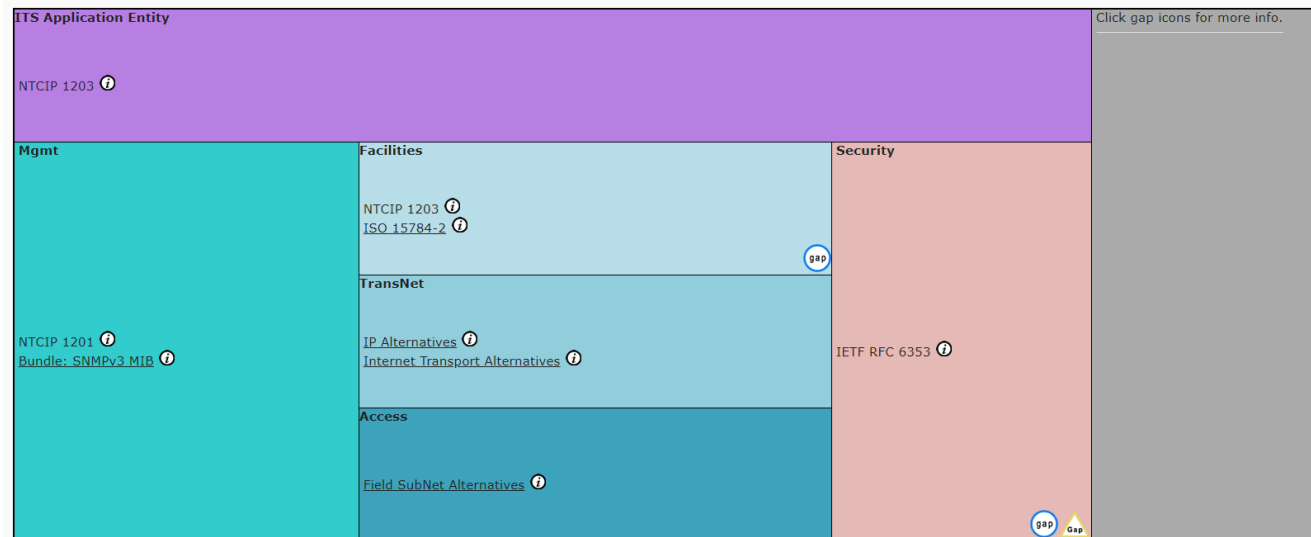
Solutions are sorted in ascending Gap Severity order. The Gap Severity is the parenthetical number at the end of the solution.

## Selected Solution

US: NTCIP Message Sign - SNMPv3/TLS

## Solution Description

This solution is used within the U.S.. It combines standards associated with US: NTCIP Message Sign with those for I-F: SNMPv3/TLS. The US: NTCIP Message Sign standards include upper-layer standards required to implement center-to-field message sign communications. The I-F: SNMPv3/TLS standards include lower-layer standards that support secure center-to-field and field-to-field communications using simple network management protocol (SNMPv3); implementations are strongly encouraged to use the TLS for SNMP security option for this solution to ensure adequate security.



Note that some layers might have alternatives, in which case all of the gap icons associated with every alternative may be shown on the diagram, but the solution severity calculations (and resulting ordering of solutions) includes only the issues associated with the default (i.e., best, least severe) alternative.

# Avantages de la conception de système

- Une bonne conception de système :
  - Relie les exigences aux spécifications du système
  - Définit des interfaces ouvertes prenant en charge différentes solutions de fournisseurs et produits prêts à l'emploi
  - Prend en charge le développement matériel et logiciel efficace
  - Fournit une feuille de route pour l'intégration et les tests du système
  - Facilite la maintenance, l'expansion et les mises à niveau futures du système

Une conception de système supérieure permet d'intégrer de nouvelles technologies de manière rentable.

# Mesures de succès



LES BONS BESOINS ET  
EXIGENCES SONT  
DÉTERMINÉS



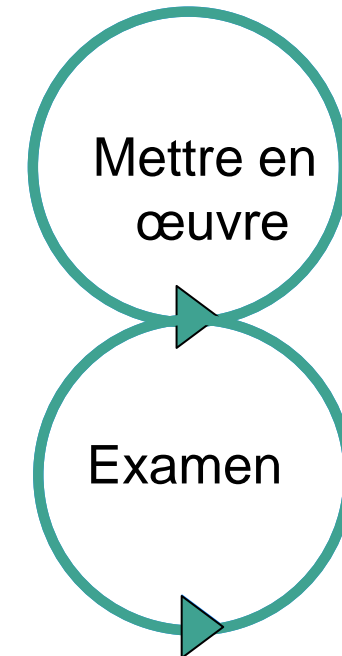
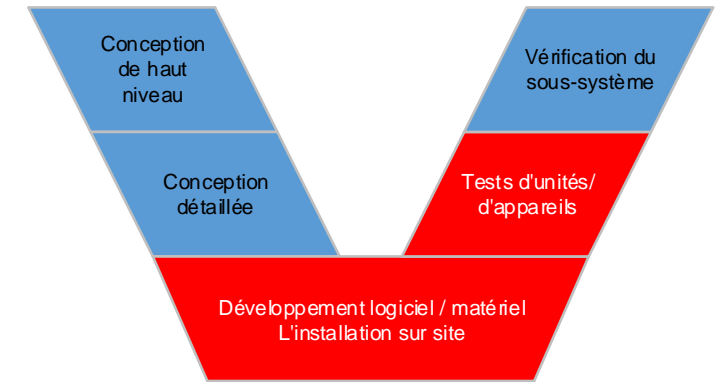
LE SYSTÈME RÉPOND À  
TOUS LES BESOINS ET  
EXIGENCES



MAIS COMMENT  
S'ASSURER QU'IL LE FAIT?

# Développement et test de logiciels/matériels

- Activités principales
  - Planifier le développement logiciel/matériel
  - Établir un environnement de développement
  - Acheter des produits prêts à l'emploi
  - Mettre au point des logiciels et du matériel
  - Effectuer des tests d'unité / d'appareil
- Réalisé par des spécialistes techniques
  - Les développeurs et les testeurs doivent être indépendants pour les efforts à plus haut risque
- L'ingénierie système joue un rôle de surveillance

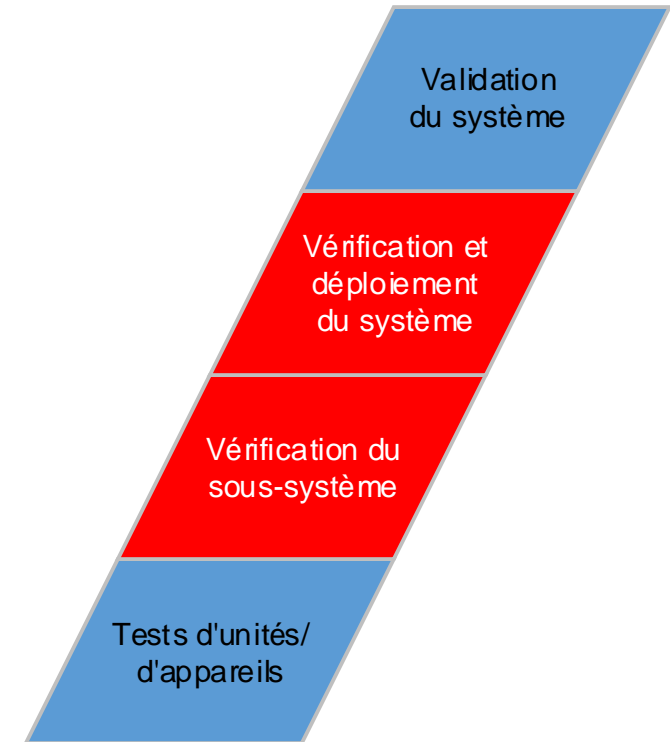


Adapté de : Département des Transports (DOT) des É.-U.



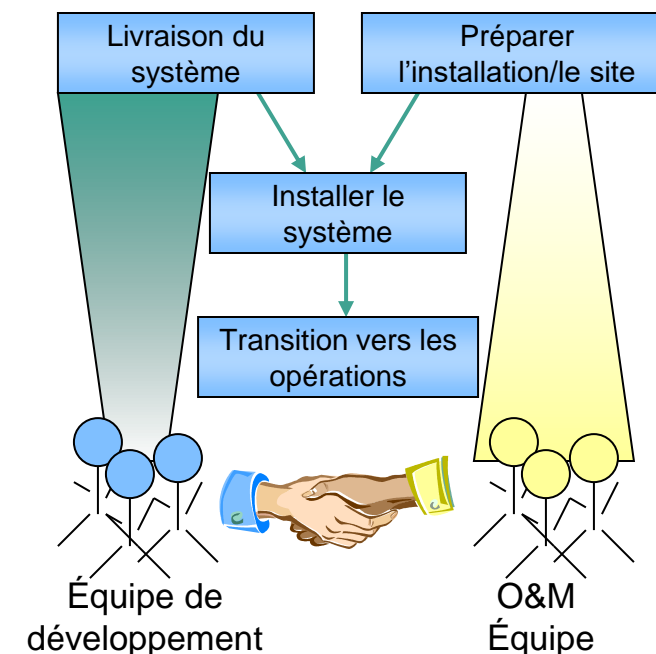
# Intégration et vérification

- Activités principales
  - Ajouter des détails aux plans d'intégration et de vérification
  - Établir un environnement d'intégration et de vérification
  - Effectuer l'intégration
  - Effectuer une vérification
  - Confirmer que le système répond aux exigences
- Vérification – le système a-t-il été correctement construit?



# Déploiement initial / Mise en œuvre

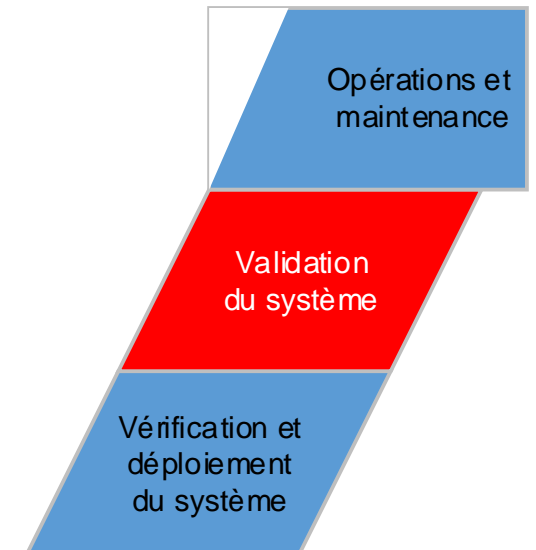
- Activités principales
  - Planifier l'installation et la transition du système
  - Préparer l'installation
  - Livrer le système
  - Installer le système.
  - Effectuer des tests d'acceptation
  - Examiner/accepter la documentation
  - Donner la formation
  - Passage à l'exploitation
- Facilite une transition en douceur vers les opérations



Adapté de : Département des Transports (DOT) des É.-U.

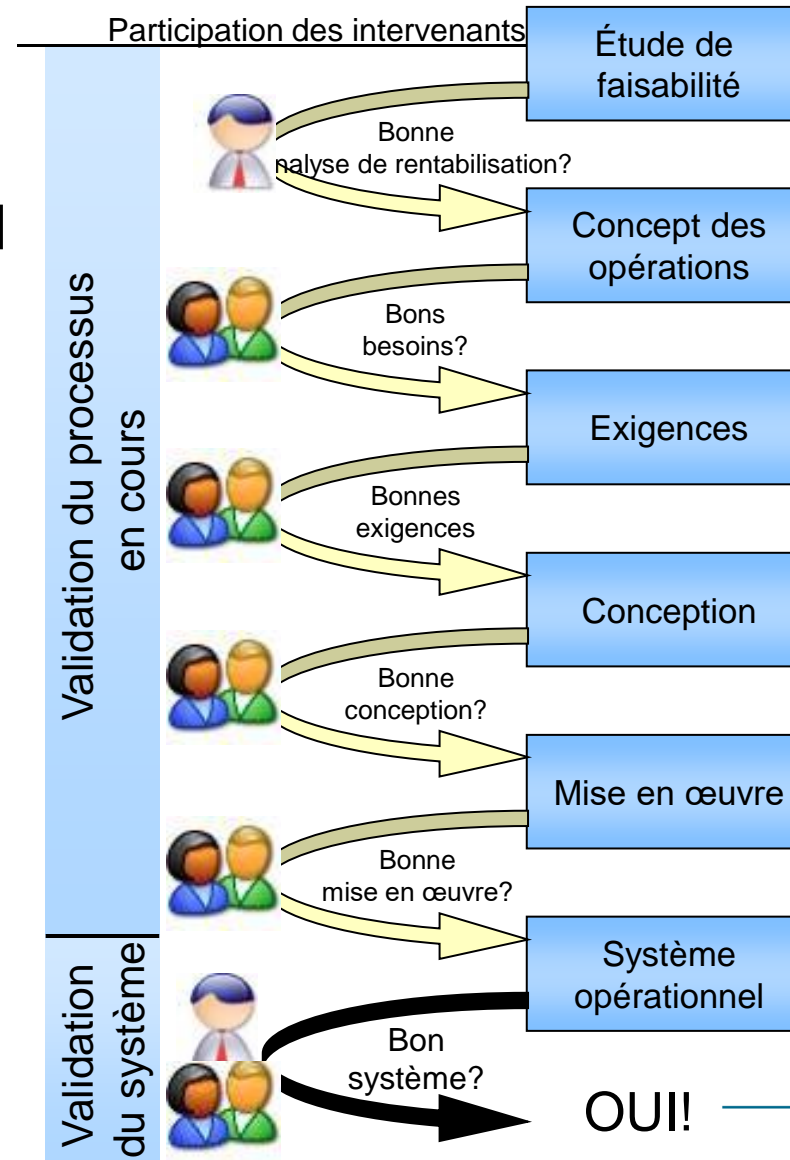
# Validation du système

- Validation – le bon système a-t-il été construit?
- Confirmer que les besoins des utilisateurs sont satisfaits par le système installé
- Activités principales
  - Mettre à jour le plan de validation si nécessaire et développer des procédures
  - Valider le système
  - Documenter les résultats de la validation, y compris les recommandations ou les actions correctives



# Validation du système

- La validation a lieu tout au long du processus d'ingénierie des systèmes



# Résumé – Processus d'ingénierie des systèmes

- Le modèle en V pour l'ingénierie des systèmes est un processus bien pensé et clair
  - Prend en compte le cycle de vie complet
  - S'appuie sur les besoins
  - Exigences clairement définies
  - Assure la traçabilité
  - Intègre la validation



# Établir l'ingénierie des systèmes dans votre organisation



# Améliorer la capacité d'ingénierie des systèmes

- Trois aspects doivent être examinés :
  - Personnes : Acquérir des connaissances en ingénierie des systèmes
  - Processus : Établir des processus d'ingénierie des systèmes pour votre organisation
  - Technologie : Utiliser les outils d'ingénierie des systèmes pour rendre les processus plus efficaces et efficaces

# Connaissances en ingénierie des systèmes de construction



Déterminer les spécialistes en ingénierie des systèmes dans votre organisation

Ne négligez pas le groupe des technologies de l'information



Offrir des possibilités de formation au personnel

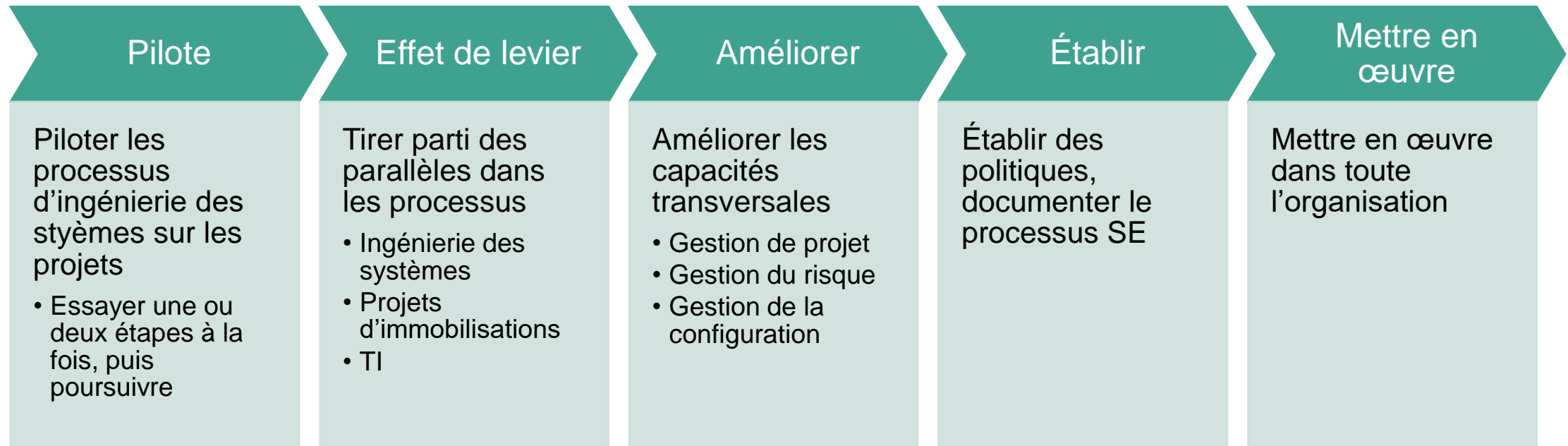
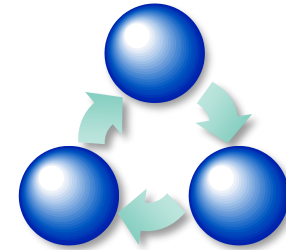


Tenir compte de l'expérience en ingénierie des systèmes lors de l'embauche de consultants

Vous avez toujours besoin de compétences en ingénierie système au sein de votre organisation

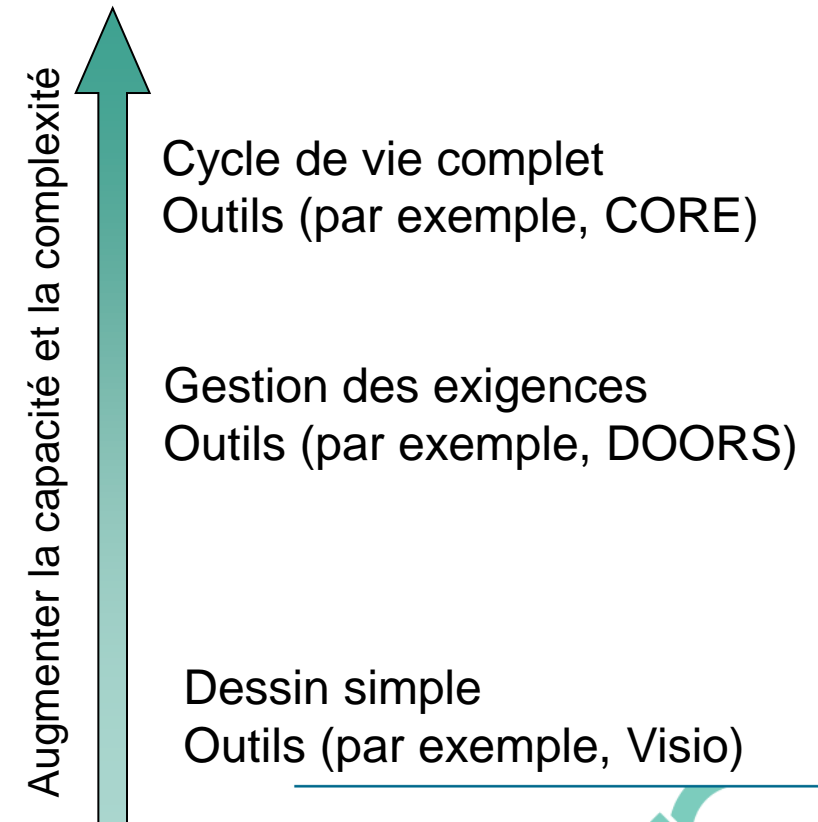


# Recommandations d'amélioration des processus



# Outils de l'ingénierie des systèmes

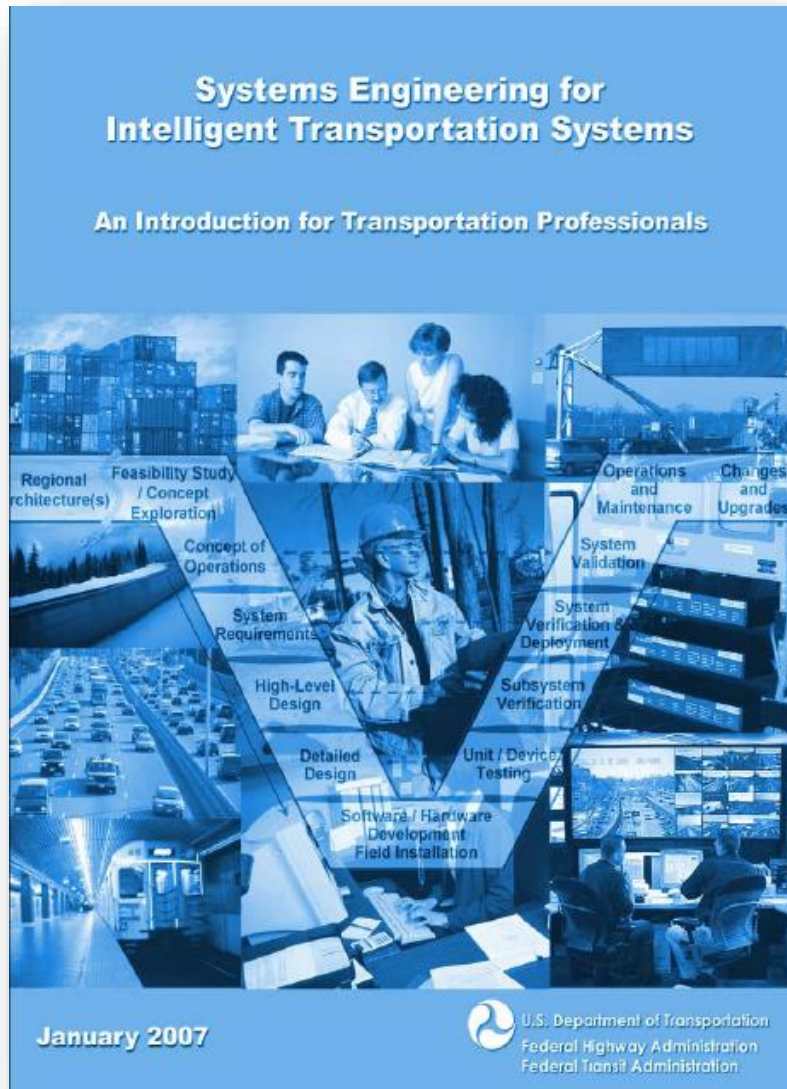
- Établir une bibliothèque SE (par exemple, des modèles, des meilleures pratiques, des outils d'aide à la décision)
- Prévoir une gamme d'outils SE à mesure que l'organisation acquiert de l'expérience
  - Gestion de projet
  - Gestion des exigences
  - Architecture des systèmes
  - Essai/Suivi des problèmes
- Utiliser des outils complexes en fonction des besoins du projet



# Ressources en ingénierie des systèmes

- Systems Engineering Handbook (anglais seulement)
- Systems Engineering Guidebook (anglais seulement)
- Guide de contractualisation des STI
- Base de données sur les leçons retenues

# Systems Engineering Handbook (anglais seulement)



<http://ops.fhwa.dot.gov/publications/seitsguide/index.htm>

# Systems Engineering Guidebook (anglais seulement)

U.S. Department of Transportation  
Federal Highway Administration

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Welcome to the Systems Engineering Guidebook for ITS

Challenges Lifecycle Tasks Version 3.0 Operations & Maintenance Change & Upgrade Performance Measurement Solutions



## Welcome

Welcome to [Version 3.0](#) of the Systems Engineering Guidebook for ITS Web Site. Co-sponsored by the Federal Highway Administration and the California Department of Transportation, this web site provides quick and easy access to information that will help you intelligently apply systems engineering to your Intelligent Transportation Systems projects. This resource is the culmination of decades of experience in applying these processes and capabilities in ITS and other industries. We are eager to add your lessons learned and experience in a continuing effort to provide a quality, relevant resource for ITS practitioners. Please send us your [feedback](#).

- [What is Systems Engineering?](#)
- [Why Use Systems Engineering on Your Project?](#)
- [Key Systems Engineering Principles](#)

**Testimonials**



## SE Guidebook Views

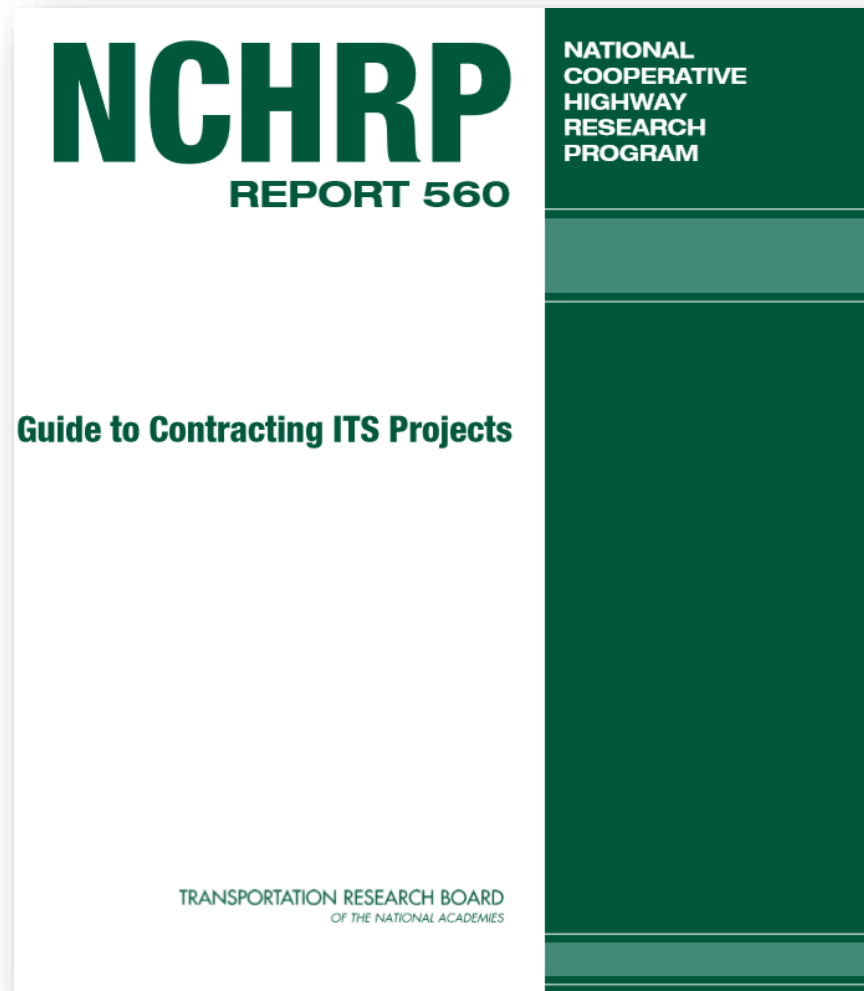
The Systems Engineering Guidebook content can be accessed through seven different views. Select the view on the right that best suits your needs.

**Views**

- [Process](#) 
- [Deliverable](#) 
- [Example](#) 
- [Checklist](#) 
- [Capability](#) 
- [Role](#) 

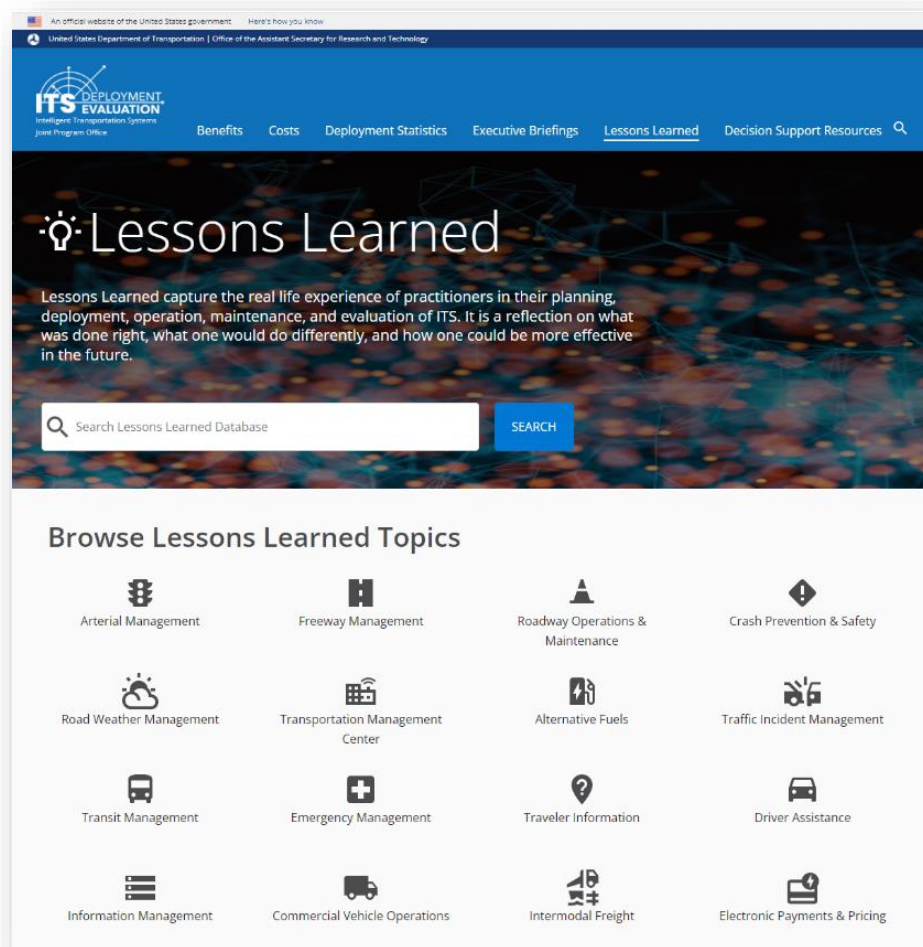
<http://www.fhwa.dot.gov/cadiv/segb/>

# Choisir la bonne approche contractuelle (anglais seulement)



[http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp\\_rpt\\_560.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_560.pdf)

# Base de données sur les leçons retenues (anglais seulement)



<https://www.itskrs.its.dot.gov/lessons>

# Résumé de l'intégration de l'ingénierie des systèmes

- L'ingénierie des systèmes et l'amélioration des processus devraient vous faciliter la tâche, et non la compliquer
  - Doit faire partie des principes de fonctionnement standard
  - L'intégration dans les pratiques opérationnelles prend du temps
  - C'est un investissement à long terme
- L'amélioration réelle des processus nécessite un réel engagement
  - De l'organisation
  - Les ingénieurs/gestionnaires individuels ne peuvent pas le faire seuls
- Il existe une multitude de ressources de formation et d'orientation



# Planification de la formation

Séance	Description	Programme
<b>Formation détaillée sur l'Architecture des STI</b>	Assure une formation plus détaillée et complète sur les composants clés de l'Architecture et sur la façon d'y accéder par le site Web ARC-IT.	Complété
<b>Élaboration d'une architecture régionale des STI</b>	Donne un aperçu de haut niveau du processus d'élaboration d'une architecture régionale des STI, en intégrant des exercices pratiques de démonstration au moyen de l'outil RAD-IT ARC-IT.	Complété
<b>Formation sur l'ingénierie des systèmes</b>	Présente une introduction au concept d'ingénierie des systèmes, son importance pour le cycle de vie de la fourniture des STI et comment l'Architecture aide à soutenir le processus.	Aujourd'hui

- **Volet anglais: le 14 février, le 21 février et le 28 février.**



**Personne-ressource (courriel) :**

- Soutien : [ITSArchitecture-ArchitectureSTI@tc.gc.ca](mailto:ITSArchitecture-ArchitectureSTI@tc.gc.ca)

- Jonathan Parent [Jonathan.Parent@tc.gc.ca](mailto:Jonathan.Parent@tc.gc.ca)  Transports Canada Transport Canada

- Philippe Morais [Philippe.Morais@wsp.com](mailto:Philippe.Morais@wsp.com) 

**Des questions  
ou des  
commentaires?**

**Merci!**