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**Revision to a Request for Supply
Arrangement - Révision à une demande
pour un arrangement en matière
d'approvisionnement**

The referenced document is hereby revised; unless
otherwise indicated, all other terms and conditions of
the Solicitation remain the same.

Ce document est par la présente révisé; sauf
indication contraire, les modalités de l'invitation
demeurent les mêmes.

Comments - Commentaires

Vendor/Firm Name and Address

**Raison sociale et adresse du
fournisseur/de l'entrepreneur**

Issuing Office - Bureau de distribution

TPSGC/PWGSC
601-1550, Avenue d'Estimauville
Québec
Québec
G1J 0C7

Title - Sujet C4ISR Arrangement en matière d'approvisionnement C4ISR	
Solicitation No. - N° de l'invitation W7701-176500/C	Date 2023-01-27
Client Reference No. - N° de référence du client W7701-176500	Amendment No. - N° modif. 010
File No. - N° de dossier MTB-6-39387 (255)	CCC No./N° CCC - FMS No./N° VME
GETS Reference No. - N° de référence de SEAG PW-\$MTB-255-16185	
Date of Original Request for Supply Arrangement 2021-05-28 Date de demande pour un arrangement en matière d'app. originale	
Solicitation Closes - L'invitation prend fin at - à 02:00 PM Eastern Standard Time EST on - le 2027-07-30 Heure Normale de l'Est HNE	
Address Enquiries to: - Adresser toutes questions à: Desforges, Julie	Buyer Id - Id de l'acheteur mtb255
Telephone No. - N° de téléphone (514) 602-8307 ()	FAX No. - N° de FAX () -
Delivery Required - Livraison exigée	
Destination - of Goods, Services, and Construction: Destination - des biens, services et construction:	
Security - Sécurité This revision does not change the security requirements of the solicitation. Cette révision ne change pas les besoins en matière de sécurité de l'invitation.	

Instructions: See Herein

Instructions: Voir aux présentes

Acknowledgement copy required	Yes - Oui	No - Non
Accusé de réception requis	<input type="checkbox"/>	<input type="checkbox"/>
The Offeror hereby acknowledges this revision to its Offer. Le proposant constate, par la présente, cette révision à son offre.		
Signature	Date	
Name and title of person authorized to sign on behalf of offeror. (type or print) Nom et titre de la personne autorisée à signer au nom du proposant. (taper ou écrire en caractères d'imprimerie)		
For the Minister - Pour le Ministre		

AMENDMENT 010

The purpose of this amendment is to provide answers to the questions raised by the industry during the Request for Supply Arrangement period and replace the Annex B «Resource Category Description».

Question 1

Section 6.5 On-going Opportunity, the table provided indicates an opening date of August, closing date September (with a year), and Award date of December. Can the Crown confirm that if a vendor has not submitted a bid response yet that they will not be considered for a contract until 2023 (December)?

Answer 1

As mentioned in the schedule of evaluations, the next evaluation period will be in fall 2023.

Question 2

If a vendor submitted a bid in response to this solicitation prior to the next scheduled refresh, will the Crown evaluate their submission upon receipt or will it only be evaluated after the closing date of the next refresh period?

Answer 2

Arrangement will only be evaluated after closing date of each evaluation period.

Annex B «Resource Category Description»

Modifications are highlighted in the document attached.

All other terms, clauses and conditions remain unchanged

Annex B – Resource Category Description

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Annex B Description of resource category for this Request for Supply Arrangement

Numbering of resource category codes is used for compatibility purposes only, as follow:

- A : System and Software Development
- M : Project management
- S : Science and Technology
- E : Military Expertise
- G : Systems Engineering

Numbering of code « A - System and Software Development » comes from the resource numbering of Task-Based Informatics Professional Services (TBIPS) of Public Services and Procurement Canada.

In each RFP, the relevance of the dipomes will be evaluated by the evaluation team. To be considered acceptable by the Government of Canada, each diploma must be from a recognized Canadian university or college or by equivalent establishments recognized by a recognized Canadian credential-assessment service if the diploma or certificate was obtained abroad. The list of recognized organizations is posted on the website of the Canadian Information Centre for International Credentials at the following address: <http://cicic.ca>.

1. SYSTEM AND SOFTWARE DEVELOPMENT

This section comprises the resource categories required to perform comprehensive work in System and Software Development, as described in Annex C ST Fields and Topics:

1 - Architect

- A.1 - Software Architect
- A.2 - Enterprise Architect
- A.3 - Systems Architect
- A.4 - Data Architect

2 - Analyst

- A.5 - Software Analyst
- A.6 - Business Analyst
- A.7 - Data Modeling Analyst
- A.8 - Data Administration Analyst
- A.9 - Security Analyst
- A.10 - Network Analyst
- A.11 - Test Coordinator Analyst
- A.12 - Geomatics Analyst

3 - Lead Developer

- A.13 - Software Lead Developer
- A.14 - Geomatics Lead Developer

4 - Programmer

- A.15 - Software Programmer
- A.16 - Database Programmer
- A.17 - Tester Programmer
- A.18 - System Administration Programmer

5 - Specialist

- A.19 - Scenario Developer Specialist
- A.20 - Training Developer Specialist

1.1 A.1 - Software Architect

Main role: The role of the *Software Architect* is to make high-level design choices, to dictate technical standards, including coding standards, tools, or platforms to advance business goals rather than to place arbitrary restrictions on the choices of developers. The *Software Architect* typically works at the solution level (focused on the solution by providing very detailed systems or component interactions with multiple teams using a detailed design) or at the application level (focused on the component re-use and maintainability, centered on a single application and a single project using very detailed design). The *Software Architect* is required to manage the constantly increasing development complexity of software systems especially for the development of multi-tier applications.

Experience Levels:

- Level 1:
 - At least 5 years of experience in the software system development, with
 - At least 1 year of experience as a Software Architect.

-
- Level 2:
 - At least 8 years of experience in the software system development, with
 - At least 3 years of experience as a Software Architect, and
 - Expertise in 3-Tier software architecture and Service-Oriented architecture.

 - Level 3:
 - At least 13 years of experience in the software system development, with
 - At least 6 years of experience as a Software Architect, and
 - Expertise in 3-Tier software architecture and Service-Oriented architecture.

The required services may include, but are not limited to the following:

- Break-down the high-level system architecture into detailed workflows, interface designs, report layouts, database diagrams and application diagrams.
- Limit the options available during development by choosing a standard for pursuing application development and by creating, defining or choosing a framework for the application.
- Subdivide a complex application, during the design phase, into smaller, more manageable pieces.
- Grasp the functions of each component within the application.
- Understand the interactions and dependencies among components.
- Communicate the concepts of components and their interactions and dependencies to the developers.
- Communicate ideas, both verbally and in writing, to executive staff, business sponsors, and technical resources in clear concise language that is the parlance of each group.
- Use UML in communicating the overall system design to developers and other team members.
- Survey market landscape for solution insights, direction, vendors, and methods.
- Analyze and evaluate alternative technology solutions to meet business problems.
- Provide information, direction and support for emerging technologies.
- Monitor industry trends to ensure that solutions align with government and industry directions for technology.
- Perform impact analysis of technology changes.
- Provide expertise to identify and translate system requirements into software design documentation.
- Work with Technical Writers to ensure quality of internal and external client-oriented documentation.
- Develop formalized solution methodologies.
- Interface and coordinate tasks with internal and external technical resources.
- Oversee aspects of project life cycle, from initial kickoff through requirements analysis, design and implementation phases for projects within solution area.
- Provide quality assurance for services within solution area.

Technical Expertise and Examples of Technical Solutions:

Level 1, Level 2 and Level 3	
Technical Specialties	Examples of Technical Solutions
Software architecture	Software architecture description, Use-cases storyboard, Navigation maps
Client design	Screen mock-ups, Application user interfaces design
Integration design	Data access layer, Integration design patterns
Object-Oriented Analysis and Design	UML, OO design pattern, CASE tools
TCP/IP networking	TCP/IP addresses, Sockets, Ports
Documentation framework	IEEE-12207, RUP
Configuration and change management	Source code control, Change requests
Testing	Integration testing, Acceptance testing, Performance testing
Level 2 and Level 3	
Technical Specialties	Examples of Technical Solutions
3-Tier software architecture and Service-Oriented Architecture	Web services architecture, UDDI, 3-Tier Java EE architecture, 3-Tier .NET architecture, RESTful service architecture
Client Tier design	Web browser user interface design, RIA, Portable devices user interaction design
Presentation Tier design	SSO, Session management, Access control
Business Logic Tier design	Software interface design description, Web services design, Business logic design

1.2 A.2 - Enterprise Architect

Main role: The role of the *Enterprise Architect* is to work with stakeholders, to build a holistic view of the organization's strategy, processes, information, and information technology assets. The *Enterprise Architect* takes this knowledge and ensures that the business and IT are in alignment. The enterprise architect links the business mission, strategy, and processes of an organization to its IT strategy, and documents this using multiple architectural models or views that show how the current and future needs of an organization will be met in an efficient, sustainable, agile, and adaptable manner.

Experience Levels:

- Level 2:
 - At least 8 years experience in the software system development, and
 - 2 to 4 years experience as an Enterprise Architect.
- Level 3:
 - At least 13 years experience in the software system development, and
 - At least 5 years experience as an Enterprise Architect.

The required services may include, but are not limited to the following:

- Operate across organizational and computing "silos" to drive common approaches and expose information assets and processes across the enterprise.
- Deliver an architecture that supports the most efficient and secure IT environment meeting a company's business needs.
- Evaluate the enterprise's business/ICT architecture, determine its consistency and integration with the DND's business/ICT strategies, assess the degree of its alignment with DND Enterprise Architecture and recommend changes to the business/ICT architecture to improve its alignment with these external factors.
- Identify future business/ICT requirements against the current enterprise architecture, perform gaps analyses, develop Requirements for Technology Architectures (RTA), and prepare migration strategies.
- Assess the feasibility of migrating from the current state to the target business architecture and enabling technologies and identify the risks associated with migrating to the target business architecture and technologies and make recommendations for risk mitigation.
- Identify business and technology trends that create opportunities for business improvement, advise business and ICT Senior Executives on ICT trends and emerging technologies and the impact on the organization's and government ICT architectures and business strategies, model "What if" scenarios and recommend appropriate changes to the existing architecture and ICT infrastructure, and recommend alternative solutions, methodologies and strategies.
- Produce an architectural evolution plan, recommend prioritization of architecture evolution initiatives, and develop and/or implement an architecture evolution plan.
- Develop strategies that allow an organization to carry out its mandate and functional responsibilities, and that govern the organization's actual and planned capabilities in terms of computers, data, information, human resources, communication facilities, software and management responsibilities.
- Identify and evaluate critical success parameters, factors and performance measurements.
- Manage the development and implementation of an architectural improvement plan;
- Provide training to enable any of the above.
- Advise regarding business strategy and processes in support of transformation and change management activities.
- Create presentations and present to various stakeholders, and facilitate meetings and discussions.

Technical Expertise and Examples of Technical Solutions:

Level 2 and Level 3	
Technical Specialties	Examples of Technical Solutions
Enterprise architecture	The Open Group TOGAF, Zachman framework, DNDAF, Sparx Systems Enterprise Architect CASE tool, Oracle Designer CASE tool, BPWin, SAP, Oracle PeopleSoft
System architecture	System definition use-cases

1.3 A.3 - Systems Architect

Main role: The role of the *Systems Architect* is to produce the high-level design of the system to be implemented by establishing the basic structure of the system, defining the essential core design features and elements that provide the framework for all that follows, and are the hardest to change later. The *Systems Architect* provides the system view of the users' vision for what the system needs to be and do, and the paths along which it must be able to evolve, and strives to maintain the integrity of that vision as it evolves during detailed design and implementation.

Experience Levels:

- Level 2:
 - At least 8 years experience in the software system development, and
 - 2 to 4 years experience as a Systems Architect.
- Level 3:
 - At least 13 years experience in the software system development, and
 - At least 5 years experience as a Systems Architect.

The required services may include, but are not limited to the following:

- Develop system architectures frameworks and strategies, either for an organization or for a major application area, to meet the system.
- Define the system architecture to be used in the projects.
- Identify the policies and system requirements that drive out a particular solution.
- Analyze and evaluate alternative technology solutions to meet business problems.
- Perform cost-benefit analyses to determine whether requirements are best met by manual, software, or hardware functions, making maximum use of commercial off-the-shelf or already developed components.
- Sub-allocate the system requirements to major components or subsystems that are within the scope of a single Lead Developer.
- Layer the architecture for keeping the architecture sufficiently simple at each layer so that it remains comprehensible to a single mind.
- Ensures the integration of all aspects of technology solutions.
- Monitor industry trends to ensure that solutions fit with government and industry directions for technology.

- Analyze and document functional requirements to identify information, procedures and decision flows.
- Define and document interfaces of manual to automated operations within application sub-systems, to external systems and between new and existing systems.
- Define input/output sources, including detailed plan for technical design phase, and obtain approval of the system proposal.
- Identify and document system specific standards relating to programming, documentation and testing, covering program libraries, data dictionaries, naming conventions, etc.
- Perform system architectural modeling to ensure consistency of the design with existing work.
- Select the development language to be used for the project.
- Assess the impact of the new requirements on existing applications.
- Monitor the need for architectural changes as the project progresses.
- Develop test plans for testing the system.
- Ensure functionalities have been implemented according to specifications.
- Define assumptions and constraints of architecture with regard to physical structure and data collection.
- Develop post-implementation plan for monitoring/tracking architecture stability.

Technical Expertise and Examples of Technical Solutions:

Level 2 and Level 3	
Technical Specialties	Examples of Technical Solutions
Software system architecture	System architecture description, System definition use-cases, System requirements
Functional architecture	IDEF methodology, UML/EUML, EFD
Software architecture	Software architecture description, Use-cases storyboard, Navigation maps
Documentation framework	IEEE-12207, RUP
Integration Design	Data access layer design, Integration design patterns
Testing	Integration testing, Acceptance testing, Performance testing.
High performance computing	Beowulf clusters, Windows HPC, Rocks Clusters
Private cloud computing	VMware vSphere, Ubuntu Enterprise Cloud

1.4 A.4 - Data Architect

Main role: The role of the *Data Architect* is to assume both strategic and tactical responsibility for developing and maintaining the Architecture and Data Models for corporate and project specific initiatives. This responsibility includes the identification of data most valuable to the department, the integration of this data, and the development of core relating data models. The resulting data models will be based on data architecture and modeling design principles and tenets.

Experience Levels:

- Level 2:
 - At least 8 years experience in the software system development, and
 - At least 2 years experience as a Data Architect.
- Level 3:
 - At least 13 years experience in the software system development, and
 - At least 5 years experience as a Data Architect.

The required services may include, but are not limited to the following:

- Comply with corporate data architectures, strategies and frameworks, including enterprise data warehouse activities.
- Analyze and evaluate alternative data architecture solutions to meet business problems/requirements to be incorporated into the corporate data architecture.
- Review corporate architecture strategies and directions, data requirements, and business information needs and devise data structures to support them.
- Apply data warehouse design principles and tenets.
- Provide expertise relating to data issues associated with multi-users, multi-dimensional analysis and multi-level access.
- Assume responsibility to maintain data coherence and persistence.
- Set up a metadata registry that will allow the domain-specific stakeholders to maintain their own data elements.
- Perform the logical data modeling.
- Perform the physical data modling.
- Develop a data strategy and associated policies.

Technical Expertise and Examples of Technical Solutions:

Level 2 and Level 3	
Technical Specialties	Examples of Technical Solutions
Relational Database Modeling and design	UML, Sparx Systems Enterprise Architect CASE tool, ERWin, ORACLE designer CASE tool
Data Integration design	ETL tools

Data analysis design	Data Warehouse, OLAP, Crystal Reports
Data trends design	Data mining, Business intelligence
Integration design	Data access layer design, Integration design patterns
Testing	Integration testing, Acceptance testing, Performance testing.
Documentation framework	IEEE-12207, RUP
Configuration and change management	Source code control, Change requests

1.5 A.5 - Software Analyst

Main role: The role of the *Software Analyst* is to research problems, to recommend and plan software solutions, and to coordinate development to meet requirements.

Experience Levels:

- Level 1:
 - At least 5 years of experience in the software system development, with
 - At least 2 years of experience as a Software Analyst.
- Level 2:
 - At least 7 years of experience in the software system development, with
 - At least 4 years of experience as a Software Analyst, and
 - Expertise in 3-Tier software analysis and Service-Oriented architecture_
- Level 3:
 - At least 10 years of experience in the software system development, with
 - At least 6 years of experience as a Software Analyst, and
 - Expertise in 3-Tier software analysis and Service-Oriented architecture_

The required services may include, but are not limited to the following:

- Write user requests into technical specifications.
- Write technical requirements from the business requirements document.
- Plan a system flow from the ground up.
- Provide multiple approaches to problem-solving.
- Develop cost analysis, design considerations, and implementation timeline.
- Interact with the Lead Developer to understand software limitations.
- Provide use cases and flowcharts during system development.
- Document requirements
- Contribute to user manuals.
- Develop and document screen, report, and interface requirements.
- Gather and analyze information to establish the functional needs of a system or project.

Technical Expertise and Examples of Technical Solutions:

Level 1, Level 2, and Level 3	
Technical Specialties	Examples of Technical Solutions
Client design	Screen mock-ups, Application user interfaces design
Integration design	Data access layer, Integration design patterns
Object-Oriented Analysis and Design	UML, OO design pattern, CASE tools
TCP/IP networking	TCP/IP addresses, Sockets, Ports
Documentation framework	IEEE-12207, RUP
Configuration and change management	Source code control, Change requests
Testing	Unit testing, Integration testing, Acceptance testing, Performance testing
Object-Oriented programming	Java, C#, C++
Integrated Development Environment	Eclipse, MS Visual Studio .NET
Level 2 and Level 3	
Technical Specialties	Examples of Technical Solutions
3-Tier software architecture and Service-Oriented Architecture	Web services architecture, UDDI, 3-Tier Java EE architecture, 3-Tier ASP.NET architecture, RESTful service architecture
Client Tier design	Web browser user interface design, RIA, Portable devices user interaction design
Presentation Tier design	SSO, Session management, Access control
Business Logic Tier design	Software interface design description, Web services design, Business logic design
Client Tier programming	HTML, JavaScript, DHTML, RIA Ajax
Presentation Tier programming	JSP, Servlet, ASP
Business Logic Tier programming	EJB, Session and entity beans, .NET enterprise services, SOAP, WSDL
Web Application programming	J2EE/JEE, ASP.NET
Application server programming	Red Hat JBOSS, Microsoft IIS, Microsoft .NET framework

1.6 A.6 - Business Analyst

Main role: The role of the *Business Analyst* is to analyze business processes and models and their integration with technology.

Experience Levels:

- Level 2:
 - At least 7 years experience in the software system development, and
 - 3 to 5 years experience as a Business Analyst.
- Level 3:
 - At least 10 years experience in the software system development, and
 - At least 6 years experience as a Business Analyst.

The required services may include, but are not limited to the following:

- Analyse existing capabilities and requirements, develop redesigned frameworks and recommend areas for improved capability and integration.
- Provide advice in defining new requirements and opportunities for applying efficient and effective solutions; identify and provide preliminary costs of potential options.
- Provide expert advice on key initiatives that enable the organization to deploy high-impact business processes that are focused, accountable and measurable.
- Provide expert advice on developing and integrating and/or assist in implementing process and information models between processes to eliminate information and process redundancies.
- Analyze business functional requirements to identify information, procedures and decision flows;
- Review existing work processes and organizational structure and identify and recommend new processes and organizational structures.
- Evaluate existing procedures and methods, identify and document items such as database content, structure, application subsystems and develop data dictionary.
- Develop and document detailed statements of requirements.
- Analysis and development of business success “critical success factors”.
- Identify candidate processes for re-design; prototype potential solutions, provide trade-off information and suggest a recommended course of action.
- Evaluate existing procedures and methods, identify and document database content, structure, and application subsystems, and develop data dictionary.
- Define and document interfaces of manual to automated operations within application subsystems, to external systems, and between new and existing systems.
- Perform information modelling in support of BPR implementation.
- Perform cost/benefit analysis of implementing new processes and solutions.
- Create presentations and present to various stakeholders, and facilitate meetings and discussions.
- Participate in change impact analysis and change management activities.
- Participate in organizational realignment (job re-design organizational re-structuring).
- Establish acceptance test criteria with client.

- Coordinate development of training and coordination with other stakeholders.
- Use business, workflow and organizational software tools.

Technical Expertise and Examples of Technical Solutions:

Level 2 and Level 3	
Technical Specialties	Examples of Technical Solutions
Enterprise architecture	The Open Group TOGAF, Zachman framework, DNDAF, Sparx Systems Enterprise Architect CASE tool, Oracle Designer CASE tool, BPWin, SAP, Oracle PeopleSoft
System architecture	System definition use-cases
Software architecture	Software architecture description, Use-cases storyboard, Navigation maps
Documentation framework	IEEE-12207, RUP
Testing	Integration testing, Acceptance testing, Performance testing.

1.7 A.7 - Data Modeling Analyst

Main role: The role of the *Data Modeling Analyst* is to define and analyze data requirements needed to support the business processes of an organization by producing conceptual data models with associated data definitions and by implementing the conceptual model in a logical data model.

Experience Levels:

- Level 2:
 - At least 7 years experience in the software system development, and
 - 3 to 5 years experience as a Data Modeling Analyst.
- Level 3:
 - At least 10 years experience in the software system development, and
 - At least 6 years experience as a Data Modeling Analyst.

The required services may include, but are not limited to the following:

- Design, develop and maintain Logical Data Models.
- Analyze proposed changes to databases from the context of the Logical Data Model.
- Provide technical expertise in the use and optimization of data modeling techniques to team members.
- Provide technical assistance, guidance and direction in terms of data analysis and modeling to team members.
- Provide assistance to project team and business users relating to data issues and data analysis concepts.
- Participate in the development of data modeling and metadata policies and procedures.
- Participate in data analysis as a result of new/updated requirements.
- Apply approved changes to logical data models.

- Improve modeling efficiency through recommendations on how to better utilize current metadata repositories.
- Comply with corporate repository metadata directions.
- Provide input to refinement of data architectures.
- Participate in data architecture refinement.
- Define access strategies.
- Construct, monitor and report on work plans and schedules.

Technical Expertise and Examples of Technical Solutions:

Level 2 and Level 3	
Technical Specialties	Examples of Technical Solutions
Relational database modeling and design	UML, Sparx Systems Enterprise Architect CASE tool, ERWin, ORACLE designer CASE tool
Relational database programming	SQL, PL/SQL, Oracle DB, SQL Server DB, PostgreSQL DB, pgAdmin, SQL Server Management Studio, Memcached
Testing	Unit testing, Integration testing, Acceptance testing, Performance testing.
Documentation framework	IEEE-12207, RUP
Configuration and change management	Source code control, Change requests

1.8 A.8 - Data Administration Analyst

Main role: The role of the *Data Administration Analyst* is to ensure that data systems such as databases are available at all to the users and programs that need them, to monitor and improve data systems performance and capacity, to plan for future expansion requirements, and to co-ordinate and implement security measures to safeguard the data systems.

Experience Levels:

- Level 2:
 - At least 7 years experience in the software system development, and
 - 3 to 5 years experience as a Data Administration Analyst.
- Level 3:
 - At least 10 years experience in the software system development, and
 - At least 6 years experience as a Data Administration Analyst.

The required services may include, but are not limited to the following:

- Keep data systems such as databases and datawarehouses alive, healthy, and recoverable in case of disasters.
- Define new database structures.
- Define data conversion strategy.
- Define database conversion specifications.
- Customize database conversion routines.

- Finalize Conversion Strategy.
- Collaborate with the users in order to maintain and safeguard the database.
- Identify requirements for improvements to existing databases by determining users' information requirements and system performance and functional requirements.
- Maintain data dictionaries.
- Develop and implement procedures that will ensure the accuracy, completeness, and timeliness of data stored in the database.
- Mediates and resolves conflicts among users' needs for data.
- Develop and implement security procedures for the database, including access and user account management.
- Advise programmers, analysts, and users about the efficient use of data.
- Maintain configuration control of the database.
- Perform and/or coordinate updates to the database design.
- Control and coordinate changes to the database, including the deletion of records, changes to the existing records, additions to the database.
- Develop and coordinate back-up, disaster recovery and virus protection procedures regarding the data systems.

Technical Expertise and Examples of Technical Solutions:

Level 2 and Level 3	
Technical Specialties	Examples of Technical Solutions
Database Administration	PostgreSQL DBA tools, Oracle DBA tools, SQL Server DBA tools
Relational database programming	SQL, PL/SQL, Oracle DB, SQL Server DB, PostgreSQL DB, pgAdmin, SQL Server Management Studio, Memcached
Testing	Acceptance testing, Performance testing.

1.9 A.9 - Security Analyst

Main role: The role of the *Security Analyst* is to analyze the organization's enterprise system in order to recommend, develop and advice on various security levels such as the authentication, the authorization, the integrity and the auditing of the systems in order to provide the required level of protection to the information technology assets (e.g., data in a database or on the file system, or a system resource) of the organization.

Experience Levels:

- Level 2:
 - At least 7 years experience in the software system development, and
 - 3 to 5 years experience as a Security Analyst.
- Level 3:
 - At least 10 years experience in the software system development, and
 - At least 6 years experience as a Security Analyst.

The required services may include, but are not limited to the following:

- Develop IT security policies, standards, guidelines and procedures.
- Review existing security policies, standards, guidelines and procedures and provide advice as to their appropriateness and effectiveness.
- Conduct compliance audits of IT operations, application systems and infrastructure.
- Conduct security threat and risk assessments of IT facilities, application systems and communications.
- Conduct reviews of backup and recovery plans.
- Investigate security incidents and report cause and related weaknesses and recommend remedies.
- Design the security framework and implementing the security components of IT infrastructure required to protect assets and to support application systems.
- Provide advice on the security aspects of application systems under development.
- Develop and deliver IT Security awareness and training programs.

Technical Expertise and Examples of Technical Solutions:

Level 2 and Level 3	
Technical Specialties	Examples of Technical Solutions
Authentication design	SSO, digital certificates, HTTPS
Authorization design	LDAP, ACL
Integrity design	Digital signatures
Auditing design	Logging and monitoring the system
Security attacks design	IP spoofing, DNS spoofing, Trapdoors, Logic Bombs, Worms, Trojan Horses, Ciphers and Keys, SSL/TLS protocols, Botnets, Rootkits
Penetration testing	Nmap, Nessus, Wireshark
Forensics	Structured investigation, computer crimes, password cracking, MFT investigation
Hacker techniques and incident handling	Cracking packages on the Web

1.10 A.10 - Network Analyst

Main role: The role of the *Network Analyst* is to design, implement and troubleshoot computer networks and its associated security, and to solve network-related problems.

Experience Levels:

- Level 2:
 - At least 7 years experience in the software system development, and
 - 3 to 5 years experience as a Network Analyst.

- Level 3:
 - At least 10 years experience in the software system development, and
 - At least 6 years experience as a Network Analyst.

The required services may include, but are not limited to the following:

- Analyze the targeted system and network infrastructure and publish design guidelines and recommendations to guide any solution design and implementation.
- Advise on the procurement of system and network equipment to support the growing needs of the systems under development.
- Coordinate installation, operation, maintenance, resolution of hardware and software problems, monitoring of traffic, capacity planning, system backup and user training for a Local Area Network.
- Evaluate and recommend new data communication hardware and software.
- Maintain interface with vendor representatives and other computing resources to resolve hardware and software problems.
- Coordinate installation of network hardware, software for use with personal computers and mainframe/personal computer interaction, and network upgrades according to vendor instructions.
- Prepare procedure manuals and documentation for internal use.
- Develop a network disaster recovery plan.
- Develop techniques to improve system throughput and optimize hardware utilization.

Technical Expertise and Examples of Technical Solutions:

Level 2 and Level 3	
Technical Specialties	Examples of Technical Solutions
System Administration	Windows 2003 Server, Windows 2008 Server, Ubuntu, Windows 7, Windows XP, Cisco devices, SNMP, Syslog, Nagios
Network protocols	OSI model with layers protocol
Configuration of Network equipment	Routers, Switches, Hubs, Gateways, Access points, Network Interface Cards, Networking cables, Network bridges, Modems, ISDN adapters, Firewalls
Network traffic analysis	Wireshark, Ethereal, NetFlow analyzer
WAN/LAN configuration	Mixed 10Gb and 1Gb Ethernet networks, network topology, fiber optic networks, SAN networks
VPN configuration	CISCO devices, OpenVPN

1.11 A.11 - Test Coordinator Analyst

Main role: The role of the *Test Coordinator Analyst* is to provide the planning and the coordination of the testing activities throughout the duration of the system development by managing and monitoring test plans for all levels of testing.

Experience Levels:

- Level 2:
 - At least 7 years experience in the software system development, and
 - 3 to 5 years experience as a Test Coordinator Analyst.
- Level 3:
 - At least 10 years experience in the software system development, and
 - At least 6 years experience as a Test Coordinator Analyst.

The required services may include, but are not limited to the following:

- Manage walkthroughs and reviews related to testing and implementation readiness.
- Develop and implement an overall testing strategy, plans and activities.
- Provide subject matter expertise regarding testing tools and techniques.
- Develop standards and processes to follow regarding system integration testing, and system readiness assessment.
- Ensure that the standards established by the Quality Assurance plans are applied by reviewing work plans and interim deliverables.
- Develop test scenarios and test scripts.
- Establish software testing procedures for unit test, integration testing and regression testing with the emphasis on automating the testing procedures.
- Establish software testing procedures for user acceptance testing.
- Establish a validation and verification capability which assumes functional and performance compliance.

Technical Expertise and Examples of Technical Solutions:

Level 2 and Level 3	
Technical Specialties	Examples of Technical Solutions
Master test planning	IEEE 829-1998 format test plan outline
System testing design	Unit and integration testing
Acceptance testing design	Elaboration of test cases
Performance testing design	Web performance load test
Test automation design	Code-driven testing

1.12 A.12 - Geomatics Analyst

Main role: the role of the Geomatics Analyst is to design, develop, and operate systems for collecting and analyzing spatial information about the land, the oceans, natural resources, and manmade features. Geomatics analyst applications include integrating science and technology from both new and traditional disciplines such as geodesy, Global Positioning System (GPS), Global Navigation Satellite Systems (GNSS), surveying (including land, cadastral, aerial, mining and engineering surveying), cartograph (computer and digital mapping), Geographic Information Systems (GIS), computer-aided design (CAD), computer aided visualization, hydrography computing, navigation computing, topographic computing, spatial computing, remote sensing, photogrammetry and image understanding.

Experience Levels:

- Level 2:
 - At least 7 years experience in the software system development, and
 - 3 to 5 years experience as a Geomatics Analyst.
- Level 3:
 - At least 10 years experience in the software system development, and
 - At least 6 years experience as a Geomatics Analyst.

The required services may include, but are not limited to the following:

- Provide guidance and advice in the field of applied geomatics. This includes knowledge of earth positioning principles and technologies (e.g. GPS), satellite and airborne imagery acquisition and processing, three-dimensional terrain modelling techniques and usage as well as general principles in digital cartography.
- Provide guidance and advice in the implementation of COTS and FOSS geospatial technologies.
- Provide guidance and advice in the implementation of standards-based geospatial technologies such as contained in the OGC and ISO set of standards.
- Provide guidance and advice in the cataloguing, exchange and exploitation of commercial and military data formats.
- Provide guidance and advice in the storage, access and retrieval of geospatial data, whether these come from vector or raster sources.
- Develop and document detailed statements of requirement.
- Analyze functional requirements to identify information, procedures and decision flows.
- Evaluate existing procedures and methods, identify and document database content, structure and application sub-systems, and develop data dictionary.
- Define and document interfaces of manual to automated operations within sub-systems, to external systems and between new and existing systems.
- Define input/output sources, including a detailed plan for technical design phases.
- Design and document in detail all system components, their interfaces and operational environment.
- Design data structures and files, sub-systems and modules, programs, batch, on line, and production monitoring procedures, testing strategy and systems.
- Document system design, concepts and facilities, and present them for approval.
- Produce an operational system including all forms, manuals, programs, data files and procedures.
- Perform analysis and modeling.
- Restructure data from various sources and in diverse formats.
- Create, update and maintain procedures and standards.
- Create, update, revise and documents data sets.

Technical Expertise and Examples of Technical Solutions:

Level 2 and Level 3	
Technical Specialties	Examples of Technical Solutions
Applied geomatics orientations and design	GPS, Earth positioning, Satellite imagery, Airborn imagery, 3-D terrain, Digital cartography
Standards-based geospatial applications orientations and design	OGC standards (WMS, WMTS, WFS, WCS, CSW, GML, KML, SLD, SWE), ISO standards (ISO-19115, ISO-19139, ISO-19119, ISO-19136, ISO-19111), Commercial GIS formats (ESRI, Intergraph, MapInfo, Erdas, DigitalGlobe, GeoEye, Radarsat, Adobe, Autodesk, Oracle, Microsoft), DIGEST military formats (VPF, RPF, DTED), Open-source GIS data formats (GML,KML, OSM, Postgres)
Orientations and design for the implementation of geospatial technologies	Commercial GIS systems (ESRI, Intergraph, MapInfo, Google, Microsoft), Web-Mapping Servers (Minessota MapServer, ArcGIS Server, Google Earth Server, Deegree), Web-Mapping Client APIs (Google Maps 2D/3D, OpenLayers, ArcGIS APIs)

1.13 A.13 - Software Lead Developer

Main role: The role of the *Software Lead Developer* is to ensure the implementation feasibility of the overall architecture and design of the system to be developed, to provide directives to the team of programmers for implementing the targeted system solution and the associated components.

Experience Levels:

- Level 1:
 - At least 5 years of experience in the software system development, with
 - At least 1 year of experience as a Software Lead Developer.
-
- Level 2:
 - At least 7 years of experience in the software system development, with
 - At least 3 years of experience as a Software Lead Developer, and
 - Expertise in 3-Tier software architecture and Service-Oriented architecture.
-
- Level 3:
 - At least 10 of years experience in the software system development, with
 - At least 6 years of experience as a Software Lead Developer, and
 - Expertise in 3-Tier software architecture and Service-Oriented architecture.

The required services may include, but are not limited to the following:

- Ensure a proper design for the software program to be developed.
- Oversee other Contractor software programmers working on the development of the software system.
- Act as a mentor for all the members on the development team.
- Serve as an interface between the Contractor programmers and management.
- Work with the system users to determine what data will be used.

- Supervise the Contractor personnel to ensure that software projects come in time and under budget.
- Provide technical advice to the management.
- Provide programmatic perspectives on requirements.
- Support the deployment and the experimentation of the software system to fulfil the needs of the experimentations such as providing logging/tracking mechanisms, storing experimentation data and producing results to be analyzed by the researchers.
- Select and use the best available Web development tools for linking the Internet based client to the departmental “back end” information delivery programs and databases.
- Develop and prepare diagrammatic plans for Web based service delivery over the Internet.
- Analyze the problems outlined by the architects and analysts in terms of factors such as style and extent of information to be transferred across the Internet.
- Design and code high-usability Web pages to meet requirements.

Technical Expertise and Examples of Technical Solutions:

Level 1, Level 2, and Level 3	
Technical Specialties	Examples of Technical Solutions
Client design	Screen mock-ups, Application user interfaces design
Integration design	Data access layer, Integration design patterns
Object-Oriented Analysis and Design	UML, OO design pattern, CASE tools
TCP/IP networking	TCP/IP addresses, Sockets, Ports
Documentation framework	IEEE-12207, RUP
Configuration and change management	Source code control, Change requests, Production of builds, Ant build tool, Packaging of applications
Testing	Integration testing, Acceptance testing, Performance testing, JUnit, NUnit
Living documentation	JavaDoc, Microsoft .NET Sandcastle
Integrated Development Environment	Eclipse, MS Visual Studio .NET
Object-Oriented programming	Java, C#, VC, C++
Scripting programming	Perl, PHP, Ruby
Level 2 and Level 3	
Technical Specialties	Examples of Technical Solutions
3-Tier software architecture and Service-Oriented Architecture	Web services architecture, UDDI, 3-Tier Java EE architecture, 3-Tier .NET architecture, RESTful service architecture

Level 1, Level 2, and Level 3	
Technical Specialties	Examples of Technical Solutions
Client Tier design	Web browser user interface design, RIA, Portable devices user interaction design
Presentation Tier design	SSO, Session management, Access control
Business Logic Tier design	Software interface design description, Web services design, Business logic design
Client Tier programming	HTML, JavaScript, DHTML, XML, RIA Adobe flex Builder, RIA Microsoft Silverlight, RIA Ajax
Presentation Tier programming	JSP, Servlet, ASP.NET Web form, ASP.NET MVC
Business Logic Tier programming	EJB, Session beans, Entity beans, .NET Enterprise Services, Web services coding, SOAP, WSDL, HTTP, JMS
Integration Tier programming	Data access object, DLL, JDBC, JMS, RMI, JNDI, ODBC, ADO.NET
Web application programming	J2EE/JSE, ASP.NET
Application server programming	Red Hat JBOSS, Microsoft IIS, Microsoft .NET framework, Apache Tomcat

1.14 A.14 - Geomatics Lead Developer

Main role: The role of the *Geomatics Lead Developer* is to ensure the feasibility of implementing the overall architecture and design of the Geomatics system to be developed, to provide directives to the team of programmers for implementing and programming the targeted Geomatics system solution and to implement and program the system solution and the associated components.

Experience Levels:

- Level 2:
 - At least 5 years experience in the software system development, and
 - At least 2 years experience as a Geomatics Lead Developer.
- Level 3:
 - At least 8 years experience in the software system development, and
 - At least 4 years experience as a Geomatics Lead Developer.

The required services may include, but are not limited to the following:

- Ensure a proper underlying design for the Geomatic software program to be developed.
- Oversee the work being done by any other Contractor software programmers working on the the development of the Geomatic software system.
- Act as a mentor for new or lower-level Contractor software programmers, as well as for all the members on the Geomatic development team.
- Serve as an interface between the programmers and management.
- Work with the system users to determine what data will be used.

- Have supervisory responsibilities of Contractor personnel in delegating work and ensuring that software projects come in on time and under budget.
- Provide technical advice to the management.
- Provide programmatic perspectives on requirements.
- Support the deployment and the experimentation of the Geomatic system to fulfil the needs of the experimentations such as providing logging/tracking mechanisms, storing experimentation data and producing results to be analyzed by the researchers.
- Develop and document detailed statements of requirement.
- Design the overall target architecture of the IT system to meet the formally established requirements (functional and non-functional) of a project.
- Ensure the preservation of strategic data assets as applications and technologies evolve.
- Set Data Policy and the technical solution for the management, storage, access, navigation, movement, and transformation of geospatial data.
- Specify recommended DBMS and ETL tools and technologies for structured and unstructured content and specificities of geospatial data.
- Design and develop applications based on the implementation of COTS and FOSS geospatial technologies.
- Design and develop applications based on the implementation of standards-based geospatial technologies such as contained in the OGC and ISO set of standards.
- Design and develop applications based on the state-of-the-art in cataloguing, exchange and exploitation of commercial and military geospatial data formats.
- Design and develop applications which involve the storage, access and retrieval of geospatial data, whether these come from vector or raster sources.
- Monitor and support the development of the system to ensure it is compliant with the target architecture and refining the target architecture as required.
- Ensure the integration of the system's geospatial component architectures – data, application, infrastructure, etc., into the overall target system architecture.

Technical Expertise and Examples of Technical Solutions:

Level 2 and Level 3	
Technical Specialties	Examples of Technical Solutions
Applied geomatics design and programming	GPS, Earth positioning, Satellite imagery, Airborn imagery, 3-D terrain, Digital cartography
Standards-based geospatial applications design and programming	OGC standards (WMS, WMTS, WFS, WCS, CSW, GML, KML, SLD, SWE), ISO standards (ISO-19115, ISO-19139, ISO-19119, ISO-19136, ISO-19111), Commercial GIS formats (ESRI, Intergraph, MapInfo, Erdas, DigitalGlobe, GeoEye, Radarsat, Adobe, Autodesk, Oracle, Microsoft), DIGEST military formats (VPF, RPF, DTED), Open-source GIS data formats (GML,KML, OSM, Postgres)

Level 2 and Level 3	
Technical Specialties	Examples of Technical Solutions
Design for the implementation of geospatial technologies	Commercial GIS systems (ESRI, Intergraph, MapInfo, Google, Microsoft), Web-Mapping Servers (Minnesota MapServer, ArcGIS Server, Google Earth Server, Deegree), Web-Mapping Client APIs (Google Maps 2D/3D, OpenLayers, ArcGIS APIs)
Client design	Screen mock-ups, Application user interfaces design
Integration design	Data access layer, Integration design patterns
Object-Oriented Analysis and Design	UML, OO design pattern, CASE tools
TCP/IP networking	TCP/IP addresses, Sockets, Ports
Documentation framework	IEEE-12207, RUP
Configuration and change management	Source code control, Change requests, Production of builds, Ant build tool, Packaging of applications
Testing	Integration testing, Acceptance testing, Performance testing, JUnit, NUnit
Living documentation	JavaDoc, Microsoft .NET Sandcastle
Integrated Development Environment	Eclipse, MS Visual Studio .NET
Object-Oriented programming	Java, C#, VC, C++
Scripting programming	Perl, PHP, Ruby

1.15 A.15 - Software Programmer

Main role: The role of the *Software Programmer* is to plan, develop, test and document computer programs, while applying knowledge of programming techniques and computer systems.

Experience Levels:

- Level 1:
 - At least 1 year of experience as a Software Programmer.
- Level 2:
 - At least 3 years of experience as a Software Programmer, and
 - Expertise in programming 3-Tier software architecture and Service-Oriented architecture.
- Level 3:
 - At least 6 years of experience as a Software Programmer, and

- Expertise in programming 3-Tier software architecture and Service-Oriented architecture.

The required services may include, but are not limited to the following:

- Evaluate user requests for new or modified programs.
- Determine the feasibility of programming a solution according to cost and time required, the compatibility with current system, and computer capabilities.
- Advise on best courses of action related to low-level implementation details.
- Analyze, review, and alter programs to increase operating efficiency or to adapt to new requirements.
- Write documentation to describe program development, logic, coding, and corrections.
- Install and test program at user site.
- Monitor the program performance after implementation.
- Perform system, unit and integration tests, and report on results obtained.
- Verify accuracy and completeness of programs by preparing sample data and testing them by means of system test runs performed by various project participants.
- Provide and implement strategies to replicate sources of information that can not be directly accessed by the system.
- Code high-usability Web pages to meet requirements.

Technical Expertise and Examples of Technical Solutions:

Level 1, Level 2, and Level 3	
Technical Specialties	Examples of Technical Solutions
Object-Oriented Analysis and Design	UML, OO design pattern, CASE tools
TCP/IP networking	TCP/IP addresses, Sockets, Ports
Configuration and change management	Source code control, Change requests, Production of builds, Ant build tool, Packaging of applications
Testing	Integration testing, Acceptance testing, Performance testing, JUnit, NUnit
Living documentation	JavaDoc, Microsoft .NET Sandcastle
Integrated Development Environment	Eclipse, MS Visual Studio .NET
Object-Oriented programming	Java, C#, VC, C++
Scripting programming	Perl, PHP, Ruby
Level 2 and Level 3	
Technical Specialties	Examples of Technical Solutions
3-Tier software architecture and Service-Oriented Architecture	Web services architecture, UDDI, 3-Tier Java EE architecture, 3-Tier .NET architecture, RESTful service architecture

Client Tier design	Web browser user interface design, RIA, Portable devices user interaction design
Presentation Tier design	SSO, Session management, Access control
Business Logic Tier design	Software interface design description, Web services design, Business logic design
Client Tier programming	HTML, JavaScript, DHTML, XML, RIA Adobe flex Builder, RIA Microsoft Silverlight, RIA Ajax
Presentation Tier programming	JSP, Servlet, ASP.NET Web form, ASP.NET MVC
Business Logic Tier programming	EJB, Session beans, Entity beans, .NET Enterprise Services, Web services coding, SOAP, WSDL, HTTP, JMS
Integration Tier programming	Data access object, DLL, JDBC, JMS, RMI, JNDI, ODBC, ADO.NET
Web application programming	J2EE/JSE, ASP.NET
Application server programming	Red Hat JBOSS, Microsoft IIS, Microsoft .NET framework, Apache Tomcat

1.16 A.16 - Database Programmer

Main role: The role of the Database Programmer is to write and modify databases, to create management systems for providing effective and efficient access to information stored in databases, and to determine the way the filing systems will be organized and accessed.

Experience Levels:

- Level 1:
 - 1 to 2 years experience as a Database Programmer.
- Level 2:
 - 3 to 5 years experience as a Database Programmer.
- Level 3:
 - Expertise in programming data integration, analysis and trends, and
 - At least 6 years experience as a Database Programmer.

The required services may include, but are not limited to the following:

- Define data system requirements by consulting Data Administration Analysts and system users about the types of information needed.
- Determine how data should be organized based on the data models produced by the Data Modeling Analysts.
- Construct, install and test the database system.
- Modify existing databases, as user needs change.
- Write manuals or explain database's function.
- Consult with others to assess the system performance and make modifications as required.
- Prepare reports on databases.

- Customize databases for specific needs.
- Troubleshoot problems with existing data systems.

Technical Expertise and Examples of Technical Solutions:

Level 1, Level 2 and Level 3	
Technical Specialties	Examples of Technical Solutions
Relational database programming	SQL, PL/SQL, Oracle DB, SQL Server DB, PostgreSQL DB, pgAdmin, SQL Server Management Studio, Oracle Forms, Oracle Report, MySQL DB, Memcached
Testing	Unit testing, Integration testing, Acceptance testing, Performance testing
Configuration and change management	Source code control, Change requests
Level 3	
Technical Specialties	Examples of Technical Solutions
Data Integration programming	ETL tools
Data Analysis programming	Data Warehouse, OLAP, Crystal Reports
Data Trends programming	Data mining, Business intelligence

1.17 A.17 - Tester Programmer

Main role: The role of the *Tester Programmer* is to establish and operate software testing procedures for unit test, integration test, regression testing and performance testing with emphasis on automating the testing procedures.

Experience Levels:

- Level 1:
 - At least 2 years experience in the software system development, and
 - 0.5 to 1 year experience as a Tester Programmer.
- Level 2:
 - At least 5 years experience in the software system development, and
 - More than 1 year experience as a Tester Programmer.

The required services may include, but are not limited to the following:

- Establish and operate interoperability testing procedures to ensure that the interaction and coexistence of various software elements conform to appropriate departmental standards and have no unforeseen detrimental effects on the shared infrastructure.
- Establish departmental benchmarks and the tools to assess system performance.
- Establish a validation and verification capability which assumes functional and performance compliance of delivered or proposed solutions with defined user requirements.

Technical Expertise and Examples of Technical Solutions:

Level 1 and Level 2	
Technical Specialties	Examples of Technical Solutions
Testing	Integration testing, Acceptance testing, Performance testing, JUnit, NUnit
Object-Oriented programming	Java, C#, VC, C++

1.18 A.18 - System Administration Programmer

Main role: The role of the *System Administration Programmer* is to assume the responsibility to monitor, manage and support system architecture, hardware, servers, operating systems, network and application software including timely and reliable system administration procedures, setting up user access, user profiles, back-up and recovery and day-to-day computer system operations.

Experience Levels:

- Level 2:
 - At least 2 years experience as a System Administration Programmer.
- Level 3:
 - At least 5 years experience as a System Administration Programmer.

The required services may include, but are not limited to the following:

- Perform and provide installation, configuration, maintenance and troubleshooting services in support of server communication architecture, server to workstation and hardware/software, peripherals and related equipment.
- Deploy, configure, maintain and monitor active network equipment.
- Maintain user access and IT security practices and policies enforced by the department.
- Develop and maintain system backup strategies.
- Develop and maintain operating guidelines, procedures and standards in support of existing systems or newly introduced hardware, software or application releases.
- Provide advice and cost estimates to management on the purchase of new IT hardware and software to optimize the use of computer systems.
- Install, monitor, upgrade and maintain hardware and software including operating systems and application programs.
- Analyze system performance and recommend improvements.

Technical Expertise and Examples of Technical Solutions:

Level 2 and Level 3	
Technical Specialties	Examples of Technical Solutions
System Administration	Windows 2003 Server, Windows 2008 Server, Ubuntu, Windows 7, Windows XP, Cisco devices, SNMP, Syslog, Nagios
Network protocols	OSI model with layers protocol
Configuration of Network equipment	Routers, Switches, Hubs, Gateways, Access points, Network Interface Cards, Networking cables, Network bridges, Modems, ISDN adapters, Firewalls
VPN configuration	CISCO devices, OpenVPN

1.19 A.19 - Scenario Developer Specialist

Main role: The role of the *Scenario Developer Specialist* is to develop scenarios using techniques such as business storyboards where each application within a system or a system of systems would be invoked in a realistic manner in order to evaluate its business value for the organization when considered both as a standalone application or as a component interacting with the other components of the system.

Experience Levels:

- Level 2:
 - 1 to 2 years experience as a Scenario Developer Specialist.
- Level 3:
 - More than 2 years experience as a Scenario Developer Specialist.

The required services may include, but are not limited to the following:

- Using a multidisciplinary approach, get the participants to "think outside their particular box" and to learn about the convergence of the key trends that they will be most powerfully influenced by and must prepare for.
- Provide the research necessary to identify and monitor key trends, wildcard factors, predetermined events and critical uncertainties.
- Identify trends and events likely to influence the future of the organization using systems thinking and creativity.
- Explore the cross-impact of the various trends or factors on any particular organization.
- Invent scenarios to develop "all-weather" robust strategies.
- Review and update scenarios.
- Develop Master Scenario Events List (MSEL).

1.20 A.20 - Training Developer Specialist

Main role: The role of the *Training Developer Specialist* is to develop training material based on the capability provided by a system or a system of systems, and to provide the training to the systems' end users by means of the developed training material.

Experience Levels:

- Level 2:
 - 1 to 2 years experience as a Training Developer Specialist.
- Level 3:
 - More than 2 years experience as a Training Developer Specialist.

The required services may include, but are not limited to the following:

- Perform needs assessment/analysis for training purposes.
- Plan and monitor training projects.
- Perform job, task, and/or content analysis.
- Write criterion-referenced, performance-based objectives.
- Recommend instructional media and strategies.
- Develop performance measurement standards.
- Assess the relevant characteristics of a target audience.
- Prepare end-users for implementation of courseware materials.
- Develop training materials.
- Conduct training courses.
- Communicate effectively by visual, oral, and written form with individuals, small groups, and in front of large audiences.

2. MANAGEMENT

This section comprises the resource categories required to perform comprehensive management and support work in science and technology :

M.1 - Project Manager

2.1 M.1 - Project Manager

The role of the Project Manager (PM) is to plan, execute, control, and finalize Contract tasks according to strict deadlines and budget. This includes acquiring resources and coordinating the efforts of contractor team members and third-party contractors or consultants to produce deliverables according to the plan. The PM is the main point of contact between the Contractor's team and the DRDC representatives or Government authorities.

The PM must have at least a relevant Bachelor diploma in any of the following disciplines or another relevant discipline:

- Business and/or Management Science
- Operations Research
- Decision Support Systems
- Applied Mathematics
- Engineering
- Computer Science.

Experience Levels

- Level 2:
 - At least 5 years of experience as PM.
- Level 3:
 - At least 10 years of experience as PM, or
 - at least 8 years of experience as PM with a recognized professional certification, e.g., PMI Project Management Professional (PMP).

The required services may include, but are not limited to the following:

- Provide project management services related to one or many of the following knowledge areas:
 - Project Integration Management
 - Project Scope Management
 - Project Schedule Management
 - Project Cost Management
 - Project Quality Management
 - Project Human Resource Management
 - Project Communications Management
 - Project Risk Management
 - Project Procurement Management
- Prepare formal Statement of Work, work breakdown structure and compliance charts.
- Define and document the objectives for the project; determine budgetary requirements, the composition, roles and responsibilities and terms of reference for the project team.
- Prepare draft evaluation plans, criteria, and evaluation schedules.
- Plan and coordinate project management activities including financial and planning aspects.
- Plan and coordinate the activities of Contractor project personnel, external customers, Contractors, and other support providers.
- Produce draft plans and sections for incorporation into the Project Implementation Plan.

-
- Manage the project during the development, implementation, and operations startup by ensuring that resources are made available and that the project is developed and is fully operational within previously agreed time, cost, and performance parameters.
 - Formulate statements of problems; establish procedures for the development and implementation of significant new or modified project elements to solve these problems and obtain approval thereof.
 - Prepare plans, charts, tables, and diagrams to assist in analyzing or displaying problems.
 - Work with a variety of project management tools.
 - Coordinate and prepare documentation in response to scheduled and unscheduled reports, returns and observations to update management on project progress.
 - Give briefings on progress and concerns of project on an ongoing basis and at scheduled points in the life cycle.
 - Meet stakeholders and other project managers, state problems and present decision points.
 - Record lessons learned.
 - Execute Project Close Out.

Required specialties may include but are not limited to:

- Microsoft Project

3. SCIENCE AND TECHNOLOGY

This section comprises the following resource categories:

- S.1 - Sensemaking Specialist
- S.2 - Sensemaking Analyst
- S.3 - Sensemaking Lead Developer
- S.4 - Information/Knowledge Management Specialist
- S.5 - Information/Knowledge Management Analyst
- S.6 - Information/Knowledge Management Lead Developer
- S.7 - Human-Computer Interaction and Visualisation Specialist
- S.9 - Human-Computer Interaction and Visualisation Lead Developer
- S.10 - Cognitive Engineering Specialist
- S.11 - Operations Research Analyst
- S.12 - Operations Research Lead Developer
- S.13 - Decision Support Specialist
- S.14 - Command and Control Specialist
- S.15 - Experimentation Manager
- S.16 - Data Scientist

3.1 S.1 - Sensemaking Specialist

The Sensemaking Specialist focuses on novel concepts and approaches to develop situational awareness and understanding in ambiguous situations of high complexity or uncertainty and make decisions.

This category is for work required to perform comprehensive analysis in Sensemaking, as described in Annex C ST Fields and Topics.

Experience Levels

- **Level 3:**
 - 10+ years of experience, or
 - 5+ years of experience with a relevant Ph.D.

The required services may include, but are not limited to the following:

- Design individual and collective processes by which tacit knowledge (e.g., experience, expertise, and culture) is combined with real-time information to identify, form, and articulate appropriate models of the situation.
- Design capabilities to extract meaningful activities and patterns from the battlespace / operational environment picture and to share this awareness across the network with appropriate participants.
- Design capabilities to temporally project activities and patterns into alternative futures so as to identify emerging opportunities and threats.
- Design approaches to generate options, predict adversary actions and reactions, and understand the direct and indirect effects of particular courses of action in their social, political, and economic contexts.
- Design and implement information fusion systems based on related fields like artificial intelligence and data/information fusion.

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- Design and implement expert systems.
 - Develop decision analysis studies in one of several areas, including information imperfection modelling theories (e.g., probability, possibility and fuzzy sets theories), information correlation, data fusion theory, information fusion (including fusion models, e.g., JDL), classification theories, pattern recognition.
 - Design and implementation of systems based on fields like artificial intelligence, optimisation, business intelligence and decision support and analysis.

3.2 S.2 - Sensemaking Analyst

The Sensemaking Analyst focuses on the processes and technologies to develop situational awareness and understanding in ambiguous situations of high complexity or uncertainty and make decisions.

This category is for work required to perform comprehensive development in Sensemaking, as described in Annex C ST Fields and Topics.

Experience Levels

- Level 2: + than 5 and – than 10 years of experience
- Level 3: 10+ years of experience

The required services may include, but are not limited to the following:

- Design and develop individual and collective processes by which tacit knowledge (e.g., experience, expertise, and culture) is combined with real-time information to identify, form, and articulate appropriate models of the situation.
- Develop decision analysis studies in one of several areas, collaboration tools and synchronization tools, distributed environments, adaptive intelligent interfaces, multi-agent systems, knowledge-based systems, coordination approaches, case-based reasoning, constraint satisfaction problem, distributed constraint satisfaction problem, reinforcement learning, evolutionary computation (co-evolution), pattern recognition.

3.3 S.3 - Sensemaking Lead Developer

The Sensemaking Lead Developer focuses on the processes and technologies to develop and implement situational awareness systems.

This category is for work required to perform comprehensive development in Sensemaking, as described in Annex C ST Fields and Topics.

Experience Levels

- Level 2: + than 5 and – than 10 years of experience
- Level 3: 10+ years of experience, or 5+ years of experience with a relevant Ph.D.

The required services may include, but are not limited to the following:

- Develop individual and collective processes by which tacit knowledge (e.g., experience, expertise, and culture) is combined with real-time information to identify, form, and articulate appropriate models of the situation.
- Develop decision analysis studies in one of several areas, collaboration tools and synchronization tools, distributed environments, adaptive intelligent interfaces, multi-agent systems, knowledge-based systems, coordination approaches, case-based reasoning, constraint satisfaction problem, distributed constraint satisfaction problem, reinforcement learning, evolutionary computation (co-evolution), pattern recognition.

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- Oversee the work being done by any other software programmers working on the development of situational awareness systems.
 - Act as a mentor for new or lower-level Contractor software programmers, as well as for all the members on the Contractor development team.
 - Serve as an interface between the programmers and management.

3.4 S.4 - Information/Knowledge Management Specialist

The Information/Knowledge Management (IKM) Specialist focuses on novel concepts and approaches to support the discovery, creation, and dissemination of knowledge in the organization.

This category is for work required to perform comprehensive analysis in IKM, as described in Annex C ST Fields and Topics. The IKM Specialist must have experience and expertise in Information Management and Decision Support in a R&D environment in the following S&T topics:

- Knowledge Representation – Formalisms;
- Data Management;
- Information Management Services;
- Data Quality;
- Natural Language Processing;
- Multimedia;
- Document / Content management;
- Collaboration;
- Security / Privacy;
- Web Information Services.

The IKM Specialist must have at least a relevant Bachelor, Master or Ph.D. diploma in any of the following disciplines or another relevant discipline:

- Management Science;
- Management Information Systems;
- Knowledge Engineering;
- Computer Science;
- Computing and Information Systems;
- Computer Engineering;
- Computational Linguistics;
- Artificial Intelligence.

Experience Levels

- Level 1:
 - At least one (1) year of experience as a IKM Specialist with a relevant Bachelor diploma; or
 - a relevant Master or Ph.D. diploma.
- Level 2:
 - At least seven (7) years of experience as a IKM Specialist with a relevant Bachelor diploma; or

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- at least five (5) years of experience as IKM Specialist with a relevant Master diploma; or
 - at least three (3) years of experience as a IKM Specialist with a relevant Ph.D. diploma.
 - Level 3:
 - At least twelve (12) years of experience as a IKM Specialist with a relevant Master diploma, or
 - at least ten (10) years of experience with a relevant Ph.D.

The required services may include, but are not limited to the following:

- Investigate mechanisms to facilitate information/knowledge sharing among users in order to develop shared situation awareness.
- Investigate different ways to search and retrieve information from large information sources (both structured and unstructured), with interactive capabilities;
- Investigate different ways to facilitate collaboration in the building of collective intelligence.
- Investigate different ways to organise and manage information and provide a contextual support.
- Exploit structures such as semantic networks, ontologies, and meta-data to establish links between domain models and information sources.
- Develop research and implementation strategies for knowledge management, information management, document and records management and data management. This includes project management of knowledge initiatives and retrieval of critical archived information.
- Investigate knowledge discovery techniques, including data and text mining, intelligent searches, document categorisation and summarisation.
- Analyse NLP systems and capabilities.

Required specialties may include but are not limited to:

- Knowledge representation languages, e.g., OWL, RDF, SPARQL, etc.
- Query languages (e.g., SPARQL);
- Conceptual modeling software tools;
- Data modeling software tools

3.5 S.5 - Information/Knowledge Management Analyst

The Information/Knowledge Management (IKM) Analyst focuses on the knowledge management processes and technologies to support the discovery, creation, and dissemination of knowledge in the organization.

This category is for work required to perform comprehensive development in IKM, as described in Annex C ST Fields and Topics.

Experience Levels

- Level 2: + than 5 and – than 10 years of experience
- Level 3: 10+ years of experience or 5+ years of experience with a relevant Ph.D.

The required services may include, but are not limited to the following:

- Design and develop conceptual and knowledge models.
- Design and develop ontologies, taxonomies and meta-data.

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- Design knowledge mapping/cartography.
 - Design information and knowledge representation.
 - Organize information and knowledge artefacts, including use of related languages and tools (e.g. semantic indexing).
 - Design electronic document management systems and information portals.
 - Analyse knowledge discovery applications, including data and text mining, intelligent searches, document categorisation and summarisation.
 - Design peer-to-peer and Web 2.0 information systems.
 - Design information and knowledge management capabilities.
 - Design, evaluate or test and implement NLP algorithms and processes.

Technologies could include but are not limited to:

- Knowledge representation languages (e.g., OWL, RDF, SPARQL), Metadata standards, Semantic web, Web services, Conceptual modeling software tools, Data modeling software tools.

3.6 S.6 - Information/Knowledge Management Lead Developer

The Information/Knowledge Management (IKM) Lead Developer focuses on the development of knowledge management processes and technologies to support the discovery, creation, and dissemination of knowledge in the organization.

This category is for work required to perform comprehensive development in IKM, as described in Annex C ST Fields and Topics.

Experience Levels

- Level 2: + than 5 and – than 10 years of experience
- Level 3: 10+ years of experience

The required services may include, but are not limited to the following:

- Develop conceptual and knowledge models.
- Develop ontologies, taxonomies and meta-data.
- Develop electronic document management systems and information portals.
- Develop knowledge discovery applications, including data and text mining, intelligent searches, document categorisation and summarisation.
- Develop peer-to-peer and Web 2.0 information systems.
- Develop information and knowledge management capabilities.
- Develop linguistic technologies including processing text and modeling language.
- Develop, test and implement NLP algorithms and processes.
- Oversee the work being done by any other Contractor software programmers working on the development of Information/Knowledge Management systems.
- Act as a mentor for new or lower-level Contractor software programmers, as well as for all the members on the development team.
- Serve as an interface between the Contractor's programmers and management.

Technologies could include but are not limited to:

- Knowledge representation languages (e.g., OWL, RDF, SPARQL), Metadata standards, Semantic web, Web services, Conceptual modeling software tools, Data modeling software tools.

3.7 S.7 - Human-Computer Interaction and Visualisation Specialist

The role of the Human-Computer Interaction (HCI)^[1] and Visualisation^[2] Specialist is to study, design, evaluate and implement interactive visual representations of abstract data on computing systems to reinforce human cognition. The abstract data include both numerical and non-numerical data, such as text and geographic information.

This category is for work required to perform comprehensive analysis in HCI and Visualisation, as described in Annex C ST Fields and Topics. The HCI and Visualisation Specialist must have experience and expertise in a R&D environment in the following S&T topics:

- Information Visualization;
- Visual Analytics;
- Scientific Visualisation;
- Interaction Technology;
- Virtual /Augmented/Mixed Reality;
- Intelligent User Interfaces Smart Room Environments;
- Display Technology;
- Collaborative Working Technologies;
- Cognitive Engineering.

The HCI and Visualisation Specialist must have at least a relevant Bachelor, Master or Ph.D. diploma in any of the following disciplines or another relevant discipline:

- Computer Science;
- Computer Engineering;
- Electrical Engineering;
- Software Engineering
- School of Information;
- School of Computing.

Experience Levels

- Level 1:
 - At least one (1) year of experience as a HCI and Visualisation Specialist with a relevant Bachelor diploma; or
 - a relevant Master or Ph.D. diploma.
- Level 2:
 - At least seven (7) years of experience as a HCI and Visualisation Specialist with a relevant Bachelor diploma; or

¹ [Human-Computer Interaction \(Wikipedia, accessed April 2013\)](#)

² [Information visualization \(Wikipedia, accessed April 2013\)](#)

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- at least five (5) years of experience as HCI and Visualisation Specialist with a relevant Master diploma; or
 - at least three (3) years of experience as a HCI and Visualisation Specialist with a relevant Ph.D. diploma.
 - Level 3:
 - At least twelve (12) years of experience as a HCI and Visualisation Specialist with a relevant Master diploma, or
 - at least ten (10) years of experience as a HCI and Visualisation Specialist with a relevant Ph.D. diploma.

The required services may include, but are not limited to the following:

At level 3:

- Conduct state-of-the-art studies and trend analysis on HCI and Visualization S&T.
- Formulate / explore innovative HCI and Visualization concepts, including Visual Analytics and Intelligent user interfaces.
- Design highly-interactive, complex visualisation tools and interfaces.
- Design collaborative user interfaces to support colocated and distributed groups of people, working in a synchronous or asynchronous mode.
- Conduct cognitive evaluation of highly-interactive, complex interfaces; including automated measurement of user performance and usability.
- Develop and document requirements specification and visual design for highly-interactive visualisation tools to improve situation awareness, collaboration and decision making capabilities.
- Use of Rapid Application Development (RAD) tools in the design of sketches, mock-ups or exploratory prototypes for displays, based on the analysis of user requirements.
- Design and implement information systems according to Human-Computer Interaction (HCI) and Visualisation factors.
- Define input/output sources, including a detailed plan for technical design phases.
- Provide guidance and advice in the field of HCI and visualization S&T including interface guidelines and standards.
- Analyze functional requirements to identify information, procedures and decision flows related to HCI and visualization.

At level 1 and 2:

- Design and implement highly-interactive, complex visualisation tools and interfaces.
- Use requirements specifications to implement proof-of-concept prototypes.
- Use Rapid Application Development (RAD) tools in the design of sketches, mock-ups or exploratory prototypes for displays, based on the analysis of user requirements.
- Design and implement information systems according to HCI and visualisation factors.
- Design, develop and document in detail all system components, their interfaces and operational environment.
- Design, develop and document highly visual and interactive applications.

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- Design, develop and document applications intended for large displays down to mobile devices, and using novel interaction devices, such as surface computing or gesture-based interaction.
 - Integrate non-traditional input/output devices.
 - Design data structures and files, sub-systems and modules, programs, batch, on line, and production monitoring procedures, testing strategy and systems.
 - Document system design, concepts and facilities, and present them for approval.
 - Restructure data from various sources and in diverse formats.
 - Create, update and maintain procedures and standards.
 - Obtain, create, update, revise, manage and document (large) collections of data.

Without being restricted, the required specialities could include:

At level 3:

- Graphic & Visual design tools;
- Input/Output devices;
- Visual Analytics applications;
- Virtual reality software.

At level 1 and 2:

- Input/output devices,
- Visual Analytics applications,
- Virtual reality software,
- Open source visualization software,
- Wiki technologies,
- Flex, Silverlight, Ajax, ActiveX, C++, Delphi, HTML, XML, J2EE, Java, JavaScript, JDBC, JSP, .NET, OLAP, Oracle Spatial, Python, Perl, PowerBuilder , SQL Server (2005, 2008 Spatial and over), Visual Basic, Visual C++, Google Earth Server.

3.8 S.9 - Human-Computer Interaction and Visualisation Lead Developer

This category is for work required to perform comprehensive development in HCI and Visualisation, as described in Annex C ST Fields and Topics.

Experience Levels

- Level 2: more than 5 and less than 10 years of experience
- Level 3: 10+ years of experience

The required services may include, but are not limited to the following:

- Develop and implement highly-interactive, complex visualisation tools and interfaces.
- Use requirements specifications to implement proof-of-concept prototypes.
- Use Rapid Application Development (RAD) tools in the design of sketches, mock-ups or exploratory prototypes for displays, based on the analysis of user requirements.
- Implement information systems according to Human-Computer Interaction (HCI) and Visualisation factors.

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- Develop and document in detail all system components, their interfaces and operational environment.
 - Develop and document highly visual and interactive applications.
 - Develop and document applications intended for large displays down to mobile devices, and using novel interaction devices, such as surface computing or gesture-based interaction.
 - Integrate non-traditional input/output devices.
 - Develop data structures and files, sub-systems and modules, programs, batch, on line, and production monitoring procedures, testing strategy and systems.
 - Document system design, concepts and facilities, and present them for approval.
 - Restructure data from various sources and in diverse formats.
 - Create, update and maintain procedures and standards.
 - Obtain, create, update, revise, manage and document (large) collections of data.
 - Oversee the work being done by any other Contractor software programmers working on the development of HCI systems.
 - Act as a mentor for new or lower-level Contractor software programmers, as well as for all the members of the Contractor development team.
 - Serve as an interface between the programmers and management.

Required specialties could include but are not limited to:

- Input / Output devices, Flex, Silverlight, Ajax, ActiveX, C++, Delphi, HTML, XML, J2EE, Java, JavaScript, JDBC, JSP, .NET, OLAP, Oracle Spatial, Python, Perl, PowerBuilder , SQL Server (2005, 2008 Spatial and over), Visual Basic, Visual C++, Google Earth Server, Open source visualization software, Visual Analytics software, Group Ware, wiki technologies , virtual reality software.

3.9 S.10 - Cognitive Engineering Specialist

Cognitive Engineering is an interdisciplinary approach to designing computerized systems intended to support human performance. It encompasses the fields of human factors, human-computer interaction, cognitive psychology, computer science, artificial intelligence, and other related fields.

The Cognitive Engineering Specialist must have at least a relevant Master or Ph.D. diploma in any of the following disciplines or another relevant discipline:

- Cognitive science
- Cognitive systems
- Human-computer interaction
- Cognitive psychology
- Computer science
- Artificial intelligence

Experience Level

- Level 3: At least 10 years of experience with a Master relevant discipline, or at least 5 years of experience with a Ph.D. in a relevant discipline.

The required services may include, but are not limited to the following:

- Develop, administer, and analyse questionnaires and interviewing personnel.
- Conduct on-site studies using configurable laboratory or military testbeds or in a field environment under operational conditions.

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- Compile, analyse and interpret the results of the studies including any limitations of the results.
 - Apply Human Factors related standards and handbooks, e.g., MIL-STD-1472F, MIL-HBK-759C, MIL-HBK-46855.
 - Gather and organize artefacts.
 - Apply concept of System-of-Systems (SoS), human systems integration (HSI) and experience in applying HSI principles.
 - Conduct risk assessment and perform risk modelling.
 - Conduct research and development in artificial intelligence and apply the results in areas such as cognitive modeling, training, and decision support for complex systems, human behaviour simulation, intelligent-agent technologies, and interfaces.
 - Conduct Social Network Analysis.
 - Develop intelligent training technologies, advanced human-computer interaction technologies, and human behavioural models.
 - Conduct cognitive task analysis and develop executable human behavioural models.
 - Manage and provide technical leadership for cognitive engineering projects.
 - Design, conduct, and analyse a broad range of defence and security experiments, including specific psychological, and/or social-psychological and/or organizational issues in individual and team performance.
 - Identify and decompose high-level MOEs and MOPs and propose means of obtaining data for MOE and MOP measurement.
 - Design and develop models in support of experiment design including competence working with software development tools.

3.10 S.11 - Operations Research Analyst

The Operations Research (OR) Analyst focuses on novel concepts, approaches and techniques to develop operations research and decision support solutions for complex situations under uncertainty.

This category is for work required to perform comprehensive analysis in OR and decision support, as described in Annex C ST Fields and Topics.

Experience Levels

- Level 2: more than 5 and less than 10 years of experience
- Level 3: 10+ years of experience, or 5+ years of experience with a relevant Ph.D.

The required services may include, but are not limited to the following:

- Develop approaches, techniques, algorithms for resource management and resource allocation, planning and scheduling, and operations management.
- Investigate multi-objective programming, multi-criteria analysis and operational research optimisation methods, to evaluate and compare options and to solve optimization problems.
- Formulate and apply mathematical modeling for the intelligence activities and processes that support decision making.
- Provide recommendations on how to improve mathematical algorithms.
- Develop collaboration and coordination approaches and tools.
- Design decision support systems and group decision support systems based on concepts and techniques from fields like artificial intelligence, optimisation and decision analysis.
- Develop operations research studies using mathematical programming, dynamic and stochastic programming, heuristics and meta-heuristics, robustness analysis, constraint satisfaction problem, distributed constraint satisfaction problem, network theory.

Required specialities may include but are not limited to:

- Expertise in any or all of the following,: resource allocation, resource scheduling, planning, bayesian networks, multi-criteria analysis, multi-objective programming, optimization approaches/techniques/algorithms (mathematical programming, dynamic and stochastic programming, heuristics and meta-heuristics), networks, neural networks, planning, robustness analysis, searching, constraint satisfaction problems, fuzzy sets and systems, modeling and simulation, collaboration and synchronization tools, coordination approaches, group decision support systems.

3.11 S.12 - Operations Research Lead Developer

The Operations Research Lead Developer focuses on the development and implementation of algorithms to develop operations research and decision support solutions for complex situations under uncertainty.

This category is for work required to perform comprehensive development in OR and decision support, as described in Annex C ST Fields and Topics.

Experience Levels

- Level 2: more than 5 and less than 10 years of experience
- Level 3: 10+ years of experience

The required services may include, but are not limited to the following:

- Develop and implement mathematical algorithms, optimisation algorithms and multi-criteria methods.
- Develop and implement collaboration and coordination tools.
- Design and implement decision support systems and group decision support systems.
- Oversee the work being done by any other Contractor software programmers working on the development of decision support software systems.
- Act as a mentor for new or lower-level Contractor software programmers, as well as the Contractor development team.
- Serve as an interface between the programmers and management.

Required specialties could include but are not limited to:

- Matlab, MATHEMATICA, C++, JAVA, CPLEX.

3.12 S.13 - Decision Support Specialist

The Decision Support Specialist studies novel concepts and approaches to situation analysis and decision making. He/she is responsible for collecting, consolidating, analyzing, benchmarking, and disseminating information to support situation understanding and decision-making in C2 to maximize effectiveness of military operations.

The Decision Support Specialist must have experience and expertise in a R&D environment in one of more of the following S&T topics:

- Automation
- Human-Autonomy Teaming
- Machine Learning
- Adaptive Intelligent Interfaces
- Decision Oriented Displays
- Intelligent Agents and Multi-agent Systems
- Dashboard and Business Intelligence Systems, Self-regulated Systems, Control Systems

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- Collaboration and Coordination
 - Planning and Scheduling
 - Decision Making
 - Search Theory
 - Graph Theory
 - Heuristics, Meta-heuristics
 - Knowledge-based Systems
 - Mathematical Modeling & Optimisation
 - Modeling and Simulation
 - Multi-Criteria Analysis
 - Network Analysis
 - Resource Allocation
 - Resource Management and Logistics
 - Resource Visibility
 - Data Fusion
 - Reasoning under Uncertainty
 - Games Theory

The Decision Support Specialist must have a relevant Bachelor, Master, or Ph.D. diploma in any of the following disciplines or another relevant discipline:

- Business and/or Management Science
- Operations Research
- Decision Support Systems
- Simulation and Modelling
- Logistics Management
- Statistics
- Applied Mathematics
- Computer Science

Experience Level:

- Level 1:
 - At least 3 years of experience as a Decision Support Specialist with a Bachelor in a relevant discipline; or a Master or Ph.D. in a relevant discipline.
- Level 2:
 - At least 7 years of experience as a Decision Support Specialist with a Bachelor in a relevant discipline; or
 - at least 5 years of experience as a Decision Support Specialist with a Master in a relevant discipline; or
 - at least 2 years of experience as a Decision Support Specialist with a Ph.D. in a relevant discipline.
- Level 3:
 - At least 10 years of experience as a Decision Support Specialist with a Master in a relevant discipline; or at least 7 years of experience as a Decision Support Specialist with a Ph.D. in a relevant discipline.

Without being restricted, the required services could include:

- Conduct state-of-the-art studies and trend analysis on topics related to Decision Support.
- Formulate/explore innovative decision support concepts and solutions.
- Apply analytical and problem-solving approaches, and creative critical thinking approaches.
- Design highly interactive, complex visualisation tools and interfaces.
- Conduct extensive data management and analysis studies.

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- Create data models and database structures.
 - Apply performance improvement approaches used in Command and Control.
 - Analyze user requirements and create decision support concepts and solutions.
 - Document user requirements.
 - Develop approaches, techniques, algorithms for resource management and resource allocation, planning and scheduling, and operations management.
 - Investigate multi-objective programming, multi-criteria analysis, and operational research optimisation methods, to evaluate and compare options and to solve decision/optimization problems.
 - Formulate and apply mathematical modeling for C2 activities and processes to support decision making.
 - Provide recommendations on how develop, improve, or implement algorithms related to decision support.
 - Develop collaboration and coordination approaches and tools.
 - Design and implement decision support systems and group decision support systems based on concepts and techniques from fields like artificial intelligence, optimisation, and decision analysis.
 - Develop operations research studies using mathematical programming, dynamic and stochastic programming, heuristics and meta-heuristics, robustness analysis, constraint satisfaction problem, distributed constraint satisfaction problem, network theory.

3.13 S.14 - Command and Control Specialist

Command and Control (C2) is the exercise of authority and direction by a properly designated commanding officer over assigned and attached forces in the accomplishment of the mission. C2 functions are performed through an arrangement of personnel, equipment, communications, facilities, and procedures employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission.

The C2 Specialist must have a relevant Bachelor, Master or Ph.D. diploma in an engineering or science discipline with experience and expertise, in a R&D environment, in one or more of the following topics:

- C2 Organization
- C2 Concepts
- C2 Processes
- C2 Tasks
- C2 Systems and Solutions

Experience Levels:

- Level 1:
 - At least 3 years of experience as a Decision Support Specialist with a Bachelor in a relevant discipline; or a Master or Ph.D. in a relevant discipline.
- Level 2:
 - At least 7 years of experience as a C2 Specialist with a Bachelor in a relevant discipline; or at least 5 years of experience as a C2 Specialist with a Master in a relevant discipline; or at least 2 years of experience as a C2 Specialist with a Ph.D. in a relevant discipline.
- Level 3:
 - At least 10 years of experience as a C2 Specialist with a Master in a relevant discipline; or at least 7 years of experience as a C2 Specialist with a Ph.D. in a relevant discipline.

Without being restricted, the required services could include:

- Review and synthesize the military literature and relevant open literature on C2 concepts and solutions.

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- Investigate, analyse, design, or develop techniques and solutions to address current deficiencies in operational C2 systems.
 - Interview key DND/CAF stakeholders on requirements for future C2 capabilities.
 - Document the concepts, requirements and challenges and enabling solutions for future C2 capabilities.
 - Prepare and conduct sessions to validate results with the appropriate C2 stakeholders.
 - Conduct state-of-the-art studies on optimizing C2 structures.
 - Provide guidance and advice in the field of C2 in dynamic engagements.
 - Design, develop and document applications intended for better use of technology.

3.14 S.15 - Experimentation Manager

The role of the Experimentation Manager is to design, plan, conduct, manage, coordinate and support whole or parts of appropriate deployments, demonstrations and experiments.

For the purpose of this SOW, the Experimentation Manager must have experience and expertise in Experimentation in a R&D environment in the following S&T topics, as described in Annex C ST Fields and Topics:

- Military Exercises;
- Experimental Environments;
- Experimental Plan.

The Experimentation Manager must have a relevant Bachelor, Master or Ph.D. diploma in any of the following disciplines or another relevant discipline:

- Operations Research;
- Human-Computer Interaction;
- Cognitive Systems Engineering;
- Human Factors (or Ergonomics);
- Psychology (Cognitive / Social / Organization / Experimental);
- Military and Strategic Studies.

Experience Levels:

- Level 1:
 - At least one (1) year of experience as Experimentation Manager with a relevant Bachelor diploma; or
 - a relevant Master or Ph.D. diploma.
- Level 2:
 - At least seven (7) years of experience as Experimentation Manager with a relevant Bachelor diploma; or
 - at least five (5) years of experience as Experimentation Manager with a relevant Master diploma; or
 - at least three (3) years of experience as Experimentation Manager with a relevant Ph.D. diploma.
- Level 3:
 - At least twelve (12) years of experience as Experimentation Manager with a relevant Master diploma; or
 - at least ten (10) years of experience in experimentation with a relevant Ph.D. diploma.

Without being restricted, the required services could include:

At all levels:

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- Support the deployment of any solution at system and network levels for testing, experimentation and deployment purposes.
 - Support the deployment and the experimentation of test-beds to fulfil the needs of the experimentations such as managing logging and tracking mechanisms, storage of experimentation, production of results to be analyzed by the researchers.
 - Provide technical assistance during the set-up and implementation phases of the experiments.
 - Put in place the technical infrastructure to support the experimentation design.
 - Populate databases with data pertaining to the scenarios;
 - Gather and organize artifacts.
 - Collect data and analyze results.
 - Design and develop models in support of experiment design using software development tools.

At levels 2 and 3:

- Identify experimentation requirements at the conceptual and system levels.
- Design, conduct, and analyze a broad range of defence, security demonstrations or experiments, including specific psychological, social-psychological or organizational issues in individual and team performance.
- Design experimentation at the conceptual and system levels.
- Design Measures Of Effectiveness (MOEs) and Performance (MOPs).
- Identify and decompose high level MOEs and MOPs and propose means of obtaining data for MOE and MOP measurement.
- Manage experiments.
- Manage the deployment of any solution at system and network levels for testing, experimentation and deployment purposes.
- Manage the deployment and the experimentation of test-beds to fulfil the needs of the experimentations such as managing logging and tracking mechanisms, storage of experimentation, production of results to be analyzed by the researchers.
- Develops training methods and materials, such as curriculums and lectures.
- Develop scenarios.
- Advise on techniques (including installation of software and system tools) to capture the data necessary for analysis.
- Prepare experiment participants (in particular, training).
- Provide comprehensive post-experiment results and after action reports.
- Oversee the work being done by lower-level resources working on the same task.
- Participate in exercises as Subject Matter Expert.

3.15 S.16 - Data Scientist

The role of the Data Scientist is to analyze, design, deliver and implement analytics development projects.

For the purpose of this work, the Data Scientist must have experience and expertise in a R&D environment in the following S&T topics, as described in Annex C ST Fields and Topics:

- Data analytics;
- Statistics;
- Data analysis.;
- Artificial Intelligence and machine learning.

The Data Scientist must have a relevant Bachelor, Master or PhD concentrated on quantitative analysis (Mathematics, Science, Engineering, Computing) in data analytics, computer science, mathematics, statistics, economics, operations research, computational social science, quantitative finance, engineering or other data analysis fields, or another relevant discipline, or equivalent industry experience.

Experience Levels

- Level 1:
 - At least one (1) year of experience as Data Scientist with a relevant Bachelor diploma; or
 - a relevant Master or Ph.D. diploma.
- Level 2:
 - At least five (5) years of experience as Data Scientist with a relevant Bachelor diploma; or
 - at least five (3) years of experience as Data Scientist with a relevant Master diploma; or
 - at least three (2) years of experience as Data Scientist with a relevant Ph.D. diploma.
- Level 3:
 - At least ten (10) years of experience as Data Scientist with a relevant relevant Bachelor; or
 - At least eight (8) years of experience as Data Scientist with a relevant Master diploma; or
 - at least five (5) years of experience as Data Scientist with a relevant Ph.D. diploma.

Responsibilities could include but are not limited to:

- Analyze, design, deliver and implement analytics development projects.
- Understand the project objectives and requirements, then convert this knowledge into a data mining problem.
- Conduct research and experiments to solve complex problems using large volumes of data.
- Drive an initial data collection and proceed with activities in order to get familiar with the data, identify data quality problems, discover first insights into the data or detect interesting subsets to form hypotheses for hidden information.
- Manipulate complex datasets and work effectively with different data sources.
- Perform big data analytics on large volumes and wide varieties of data.
- Work with advanced hardware, software, and techniques to develop computational algorithms and statistical methods that find patterns and relationships in large volumes of data.
- Select and train appropriate predictive models.
- Thoroughly evaluate the model and review the steps executed to construct the model to be certain it properly achieves the objectives.

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- Write code to automate testing, analytics, data collection, and data processing
 - Take charge for data preparation phase that covers all activities to construct the final dataset (data that will be fed into the modeling tool(s)) from the initial raw data.
 - Conduct root cause analysis to proactively analyze findings and identify opportunities.
 - Conduct ad hoc analyses to support key R&D initiatives.
 - Explore data to discover insights and use analytics to derive actionable recommendations.
 - Conduct research needed to support high level decision making.
 - Produce, communicate, and present data driven insights.
 - Actively participate in meetings and effectively produce and communicate analysis, recommendations, risks and opportunities.
 - Ensure that meaningful analysis and reports are prepared to support various levels of reviews and presentations.
 - Simplify and communicate complex ideas to general audiences.
 - To help develop proposals and feasibility studies for small to medium projects.
 - Participate in Proof of Concept or Proof of Technology projects.
 - Conduct technology research, evaluate analytics tools and produce strategy/direction papers.
 - Provide expertise & training to users.

Specialties could include but are not limited to:

- Big Data Analytics technologies: Hadoop – HDFS, Pig, Hive, Oozie, Storm, Spark, Flume, Sqoop, Hbase, MapReduce
- Strong knowledge of design, development, and implementation experience utilizing Analytics technologies.
- Some knowledge in Analytics technology integration and architecture.
- Hadoop administration, analyzing cluster performance and bottlenecks, and capacity planning.
- Working experience in frontend web development using Javascript frameworks (Angular, Backbone, JQuery, etc.)
- Programming framework for data analysis (Python, R, SPSS, SAS)
- Data visualization skills
- Strong communication and presentation skills
- Experience collaborating with software developers
- Web technologies: JavaScript, CSS, HTML

4. MILITARY EXPERTISE

This section comprises the following resource categories:

E.1 - Intelligence Subject Matter Expert

E.2 - C2 Subject Matter Expert

4.1 E.1 - Intelligence Subject Matter Expert

Experience Levels

- Level 2: more than 5 and less than 10 years of practical operational experience in Intelligence
- Level 3: 10+ years of practical operational experience in Intelligence

Responsibilities could include but are not limited to:

- Extracting key information for military strategic and operational decision making, e.g., situation awareness, Counter Insurgency Operations (COIN), IPB/IPOE (Intelligence Preparation of the Battlefield / Intelligence Preparation of the Operating Environment), organizational and team factors, individual factors, exploitation of information and actionable knowledge.
- Development of representative military scenarios for evaluating Intelligence in a broad range of operational settings.
- Development of systems and/or processes related to military intelligence (CAN-US-NATO).
- Planning, design and management of Intelligence military exercises, wargames and experiments.
- Provide advice with respect to the military processes for intelligence production and analysis, joint intelligence and the use of intelligence products.
- Support transition activities.
- Provide advice with respect to military requirements.
- Develop training materials.
- Conduct training courses.

Specialties could include but are not limited to:

- Intelligence for Royal Canadian Air Force, Canadian Army, Royal Canadian Navy and Joint Canadian Forces .

4.2 E.2 - Command & Control Subject Matter Expert

Command and Control (C2) is the exercise of authority and direction by a properly designated commanding officer over assigned and attached forces in the accomplishment of the mission. C2 functions are performed through an arrangement of personnel, equipment, communications, facilities, and procedures employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission.

The C2 Subject Matter Expert (SME) must have experience and expertise in one or more of the following topics:

- Military C2 Organizations
- C2 Doctrine
- C2 Concepts

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- C2 Processes
 - C2 Tasks
 - C2 Systems and Applications.

Experience Levels

- Level 2: At least 7 years of practical operational experience in C2-related functions.
- Level 3: At least 14 years of practical operational experience in C2-related functions.

Responsibilities could include but are not limited to:

- Extract key factors in military situation analysis and decision making, e.g., cognitive sub-processes; organizational and team factors; individual factors; exploitation of information and actionable knowledge.
- Develop representative military scenarios for developing and evaluating C2 concepts and solutions in a broad range of operational settings.
- Support the development of concepts and solutions related to military C2.
- Plan, design and manage military C2 exercises, wargames, and experiments.
- Support transition activities.
- Provide advice with respect to military C2 requirements.
- Develop military C2 training materials.
- Conduct military C2 training courses.

Specialties could include but are not limited to:

- Royal Canadian Air Force
- Canadian Army
- Royal Canadian Navy, and
- Joint Canadian Forces.

5. SYSTEMS ENGINEERING

This Section comprises the resource categories required to perform comprehensive work in Systems Engineering, as described:

G.1 - Systems Engineering Specialist

G.2 - Hardware Engineer

G.3 - Modelling and Simulation Specialist

G.4 - Network Engineer

G.5 - Communications Systems Specialist

G.6 - Electronic Warfare Specialist

5.1 G.1 - Systems Engineering Specialist

The role of the Systems Engineering Specialist is to required to provide a range of systems engineering support, at both the system and capability levels. He may be required to develop, modify and upgrade various Concepts of Operations (CONOPS), functional decompositions and architectures describing the DRDC R&D C2I Integration laboratories and various experiments and organizations working within the Information Systems Sector. He may provide the technical support required to support experimentation, operate, expand, build, modify and upgrade the DRDC R&D C2I Integration laboratories, and he may be required to support the design, development, testing and building of DRDC's C2I prototype software in a R&D Integration laboratory environment.

The Systems Engineering Specialist must have at least a relevant Bachelor diploma in any of following disciplines or in another similar discipline; or equivalent combination of education and experience:

- Artificial Intelligence;
- Computer Engineering;
- Computer Science or computer-related field;
- Computer Systems;
- Engineering;
- Electrical, Electronic Systems Engineering;
- Software Engineering;
- Software Systems Engineering.

Experience Levels:

- Level 1: At least one (1) year of experience as a Systems Engineering Specialist.
- Level 2: At least five (5) years of experience as a Systems Engineering Specialist.
- Level 3: At least ten (10) years of experience as a Systems Engineering Specialist.

Without being restricted, the required services could include:

- Create and maintain a System of Systems design of R&D C2I Integration laboratories and create variants for each experiment and training event;
- Document the System of Systems in both DoDAF and DNDAF views;
- Conduct functional analysis and functional modelling of systems and capabilities;
- Conduct requirements analysis of both systems and capabilities;
- Establish requirements in management processes for specific projects;

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- Design and develop schema for the (ingration and interoperability) of data between systems;
 - Define tools that may enhance the execution and operational utility of the R&D C2I Integration laboratories;
 - Support the development of the metrics (MOE's, MOP's) required to continuously evaluate the R&D C2I Integrtion laboratories architectural options against the present capability;
 - From a systems engineering perspective, complete assessments of the future architectural options along each of the Personnel, R&D, mainly in the C2I domain, Infrastructure; Concepts, Doctrine & Experiments, Information Technology; and Hardware Infrastructures;
 - Document how the R&D C2I Integration laboratoriesfits with the other services Command and Sense Functions;
 - Develop system architecture, system design, software prototyping, testing and integration of various M&S or C4ISR systems;
 - Install and integrate new hardware and software (COTS, GOTS) into the current R&D C2I Integration laboratories;
 - Create, update or maintain the R&D C2I Integration laboratoriesConcept of Operations document and Libraries;
 - Update and maintain the maintenance procedures for the hardware and network items of the R&D C2I Integration laboratories;
 - Support the updating and maintaining the Configuration Control Management plan and ressources documentation; and
 - Update and maintain networks protocol architecture for the test bed.

5.2 G.2 - Hardware Engineer

The role of the Hardware Engineer is to support the integration and interoperability of the R&D C4ISR Integration laboratories, Network, and M&S infrastructure and may need to produce various DoDAF and DNDAF products.

The Hardware Engineer must have at least a relevant Bachelor Engineering diploma in any of following disciplines or in another similar discipline:

- Computer Engineering;
- Computer hardware engineering;
- Computer Science;
- Computer Systems;
- Computer Science or computer-related field;
- Engineering;
- Electrical, Electronic Systems Engineering;
- Hardware Engineering.

Experience Levels:

- Level 1: At least one (1) year of experience as a Hardware Engineer.
- Level 2: At least five (5) years of experience as a Hardware Engineer.
- Level 3: At least ten (10) years of experience as a Hardware Engineer.

Without being restricted, the required services could include:

- Install and integrate new hardware into R&D C2I Integration laboratories;
- Update and maintain the R&D C2I Integration laboratories Concept of Operations document;
- Update and maintain the maintenance procedures for the hardware and network items of the R&D C2I Integration laboratories;
- Update and maintain the Configuration Control Management Board documentation;
- Update and maintain the Internet Protocol architecture for the test bed;
- Define tools that may enhance the execution and operational utility of R&D C2I Integration laboratories;
- Support the development of the metrics required to continuously evaluate R&D C2I Integration laboratories architectural options against the present capability;
- Apply standard engineering methods and techniques for solving problems, and implement, test, and validate designs from developers and designers;
- Support developers and designers in carrying out application development analysis and design, to provide extensive user support for application usage such as scenario development and generation;
- Install and configure application architecture and provide first line debug support, and provide programming support towards developing new applications or prototypes
- Integrate GFE, GOTS or COTS software or systems;
- Support the design of new tools to be integrated into the test bed, as well as provide integration recommendations for bringing GOTS and COTS tools into the test bed;
- Perform integration of new hardware elements into the architecture;
- Provide subject matter expertise regarding protocols, standards and guidelines with regards to integration of components and tools into R&D C2I Integration laboratories;
- Provide support to the technical staff for the deployment of R&D C2I Integration laboratories;
- Provide recommendations on the options for additional hardware and network equipment to ensure a successful deployment of the R&D C2I Integration laboratories;
- Define and assemble the experimentation infrastructure, develop tools to manage and inject information into the experiments, and capture transaction data through the experiment;
- Implement designs according to specifications;
- Develop and review unit and integrated test plan(s), and create test environment(s) and test sub-systems;
- Develop design specifications for new hardware according to project requirements;
- Resolve deficiencies and maintain required documentation;
- Provide the Technical Authority or designates with technical solutions, designs and applications following sets of predefined requirements;
- Develop data capture and inject tools for experiments;
- Determine how various tools will be integrated;

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- Oversee the testing of the tools and writing test reports; and
 - Provide technical support to R&D C2I Integration laboratories in a live exercise or human-in-the-loop simulations, or both.

5.3 G.3 – Modelling and Simulation Specialist

The role of the Modelling and Simulation (M&S) Specialist is to develop and maintain models, create terrain databases and other tasks necessary to enable the synthetic world to support concepts and solutions development, experimentation and training activities. The M&S Specialist role also includes the identification of new capabilities for M&S and verification of models with respect to the scenario (vignettes) and task objectives. The M&S Specialist may also need to produce training guides and acceptance test guides.

The M&S Specialist must have at least a relevant Bachelor diploma in any of following disciplines or in another similar discipline; or equivalent combination of education and experience:

- Artificial Intelligence
- Computer Engineering
- Computer Science
- Computer Systems
- Computer Science or computer-related field
- Modelling and Simulation Engineering
- Software Systems Engineering

Experience Levels:

- Level 1: At least 1 year of experience as a M&S Specialist.
- Level 2: At least 5 years of experience as a M&S Specialist.
- Level 3: At least 10 years of experience as a M&S Specialist.

Without being restricted, the required services could include:

- Maintain the synthetic environments of the DRDC laboratories.
- Develop a consistent and cohesive synthetic environment for all the different Computer-Generated Forces (CGFs) and for the real systems utilizing the same area.
- Develop models for CAF entities within selected CGFs.
- Integrate behavioral models.
- Ensure that the simulation functions correctly during experimentation and training events.
- Identify and document lessons learned.
- Identify tools to convert or interface models to be High Level Architecture (HLA) or Distributed Interactive Simulation (DIS) compliant and to manage these models within the repository and any simulations that will use them.
- Conduct HLA or DIS conversion activities.
- Resolve any HLA or DIS or Real Time Infrastructure (RTI) issues detected during experimentation.
- Create and maintain Object Model Templates, Simulation Object Models (SOM) and Federations Object Models (FOM) and related processes for the testbed.
- Develop and maintain models, create terrain databases, and other tasks necessary to enable the synthetic world to interface with the C2 systems and support the experimentation and training activities.
- Facilitate geospatial data requirements for experimentation.
- Validate geospatial information coming in from own and coalition partner sources.
- Organize the structure of the Theatre Geospatial Data Store (TGDS).
- Ensure the presence of authoritative M&S assets in the repository by developing a user-friendly Verification, Validation and Accreditation (VV&A) or Technical Certification Inspection (TCI) process, and implement in the Capability Components (Navy, Army, Air Force, Joint).

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- Federate M&S software such as OneSAF as may be required.
 - Provide technical support to DRDC laboratories in exercises and experiments.

Without being restricted, the required specialities and technologies could include:

- STAGE, SADM, OneSAF, HLA, DIS, SIMDIS.

5.4 G.4 - Network Engineer

The role of the Network Engineer is to provide administration, technical and engineering support to distributed network (CFXNet, CFBLNet, R&DNet, CANARI) and implement hardware and software access controls to ensure the integrity and security of the systems. The Network Engineer may also be required to provide network support to the R&D C2I Integration laboratories for experimentation, training, demonstration and for C4ISR requirements. The Network Engineer may need to produce various Scripts and Networks schemas. The Network Engineer will not be in possession of, or work with crypto or any keyed material.

The Network Engineer must have at least a relevant Bachelor diploma in any of following disciplines or in another similar discipline:

- Computer Engineering;
- Communications Systems Engineering;
- Computer Science or computer-related field;
- Electrical, Electronic Systems Engineering;
- Network Engineering;
- Software Systems Engineering.

Experience Levels:

- Level 1: At least one (1) year of experience as Network Engineer.
- Level 2: At least five (5) years of experience as Network Engineer.
- Level 3: At least ten (10) years of experience as Network Engineer.

Without being restricted, the required services could include:

- Provide administration, technical and engineering support to distributed network capabilities (CFXNet, CFBLNet, R&DNet, CANARI);
- Implement hardware and software access controls to ensure the integrity and security of the networks and C4ISR systems;
- Provide network support to the LIDS for experimentation, training, demonstration, and integration of C4ISR requirements;
- Support the installation of networks across Canada;
- Produce various DoDAF and DNDAF products;
- Prepare network designs;
- Prepare site accreditation documentation;
- Develop IP mapping schema;
- Work with the application SMS to define the applications, ports and protocols requiring access to the network;
- Monitor network performance and provide recommendations for improvements

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- Test networks and systems to identify vulnerabilities;
 - Research security and software devices as directed in security related projects;
 - Provide cryptographic security support for IP networks using crypto tools installed in the LIDS;
 - Execute tasks related to network security and WAN or LAN security administration including, but not necessarily limited to, VLANs, TACACS, access lists, IP subnetting, OSPF, GRE Tunnels, configure or reconfigure routing protocols, preventive maintenance to include router optimization, Cisco VoIP Phones, creating documentation and Visio diagrams;
 - Troubleshoot connectivity and hardware issues for initiatives being developed and conducted in the labs;
 - Ensure technical solutions are communicated with other JIIM staff in support of multiple and concurrent experiments, development campaigns and training sessions;
 - Create, maintain and review documentation of designs, configurations and operations, and provide recommendations on the Network and Joint Synthetic Environment Laboratory or Joint Battle Laboratory support documentation;
 - Provide support to the development of SOP documentation.

5.5 G.5 - Communications Systems Specialist

The role of the Communications Systems Specialist is to design, install and maintain communications/telecommunications devices, networks and systems within an organisation or between organisations.

The Communications Systems Specialist must have at least a relevant Bachelor diploma in any of following disciplines or in another similar discipline:

- Communications Systems Engineering;
- Computer Engineering;
- Computer Science or computer-related field;
- Engineering;
- Electrical Engineering;
- Electronic Systems Engineering;
- Telecommunications Technologies Engineering.

Experience Levels:

- Level 1: At least one (1) year of experience as Communications Systems Specialist.
- Level 2: At least five (5) years of experience as Communications Systems Specialist.
- Level 3: At least ten (10) years of experience as Communications Systems Specialist.

Without being restricted, the required services could include:

- Plan network installations by studying technical specifications; preparing an installation schematic;
- Design video, data, and voice communication systems;
- Design, install and maintain telecommunications devices and networks;
- Establishes voice and data networks by programming features;

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- Establish interfaces and integrations; following industry standards; activating remote access tools;
 - Verify service by testing and re-programming circuits, equipment, and alarms; identifying and correcting problems; conferring with engineers;
 - Establish and test network back-up procedures;
 - Document network by recording configuration diagrams and programming;
 - Maintain network including testing, troubleshooting and repairing outages;
 - Maintain a secure communication environment by following military standards and policies;
 - Update communications system documentation;
 - Provides support for network and communications hardware or software systems;
 - Monitors and controls systems configuration and technology upgrades;
 - Advises on latest technologies available and compatibility with current systems.

Without being restricted, the required specialities and technologies could include:

- Radio and antenna systems.
- Computer systems.
- Radio, satellite and microwave broadband technology.
- Fibre and copper broadband.
- Voice and Data delivery services.
- Radio communications and information security.
- Installation and operation of communication and information systems.
- Maintenance and operation of power generating systems.
- Communication and information systems maintenance and repair techniques.
- Installation and maintenance of fibre and copper systems.

5.6 G.6 - Electronic Warfare Specialist

The role of the Electronic Warfare Specialist is to advise, design, install and maintain Electronic Warfare (EW) devices, networks and systems for electronic warfare operations involving the use of the electromagnetic spectrum or directed energy to control the spectrum, attack of an enemy, or impede enemy assaults via the spectrum. This is not limited to radio or radar frequencies but includes infrared (IR), visible, ultraviolet, and other less used portions of the EM spectrum.

The Electronic Warfare Specialist must have at least a relevant Bachelor diploma in any of following disciplines or in another similar discipline; or equivalent combination of education and experience:

- Computer Engineering;
- Computer Systems;
- Computer Science or computer-related field;
- Electrical Engineering;
- Electronic Systems Engineering;
- Military Science;
- Physics or Physical Engineering.

Experience Levels:

- Level 1: At least one (1) year of experience as Electronic Warfare Specialist.
- Level 2: At least five (5) years of experience as Electronic Warfare Specialist.
- Level 3: At least ten (10) years of experience as Electronic Warfare Specialist.

Without being restricted, the required services could include:

- Provide requirement specifications of simulation of real-time EO/IR, RF and Avionics environment for testing EW systems.
- Design software in connection with devices, networks and systems for electronic warfare operations;
- Support the development, production and maintenance of systems of systems and avionics in connection devices, networks and systems for electronic warfare operations;
- Plan, coordinate and execute electronic attacks, electronic support and electronic protection;
- Lead research projects in Electronic Warfare and Avionics Systems Hardware in the loop test environments.

Without being restricted, the required specialities and technologies could include:

- Test equipment requirements, technical analysis, design electronic equipment and usage;
- Training and instruction on topics such as radar, electronic warfare, and relevant tactics;
- Common interface protocols such as MIL-STD-1553, Ethernet, serial, discrete and analog interfaces;
- HW/SW system debug/troubleshooting;
- Radar systems, particularly airborne surveillance systems.