

Environment Canada

Functional Requirements Specification

Weather Broadcast System

Version 1.0

June 26, 2012

TABLE OF CONTENTS

1. INTRODUCTION 5

2. OVERVIEW AND OPERATIONAL CONCEPT 5

3. FUNCTIONAL REQUIREMENTS 7

 3.1. General Functional Requirements..... 7

 3.1.1. Commercial-Off-The-Shelf (COTS)..... 7

 3.1.2. General Architecture..... 7

 3.1.3. IT Security 7

 3.1.4. Environment..... 7

 3.2. EC-WBS External Interfaces 9

 3.2.1. Input Interface..... 9

 3.2.2. Output – Station and Transmitter Interface 9

 3.2.3. Transmitter Station Audio Output Monitoring..... 9

 3.3. EC-WBS Message & Broadcast Processing..... 9

 3.3.1. Message Format 9

 3.3.1.1. Message Type Attribute..... 9

 3.3.1.2. Effective Date/Time Attribute 10

 3.3.1.3. Interrupt Flag Attribute..... 10

 3.3.1.4. Alert Tone Attribute..... 10

 3.3.1.5. Polygon Information Attribute..... 10

 3.3.1.6. Listening Area Codes Attribute 10

 3.3.1.7. Expiration Date/Time Attribute 11

 3.3.1.8. Messages Periodicity Attribute..... 11

 3.3.2. Message Scheduling..... 11

 3.3.2.1. Broadcast Program Operational Concept..... 11

 3.3.2.2. Broadcast Program..... 13

 3.3.2.2.1. Broadcast Suites 13

 3.3.2.3. Time Inserted Message Scheduling 14

 3.3.2.4. Message Association Table..... 14

 3.3.2.5. Interrupt Messages 14

 3.3.2.5.1. Interrupt Messages Rules 14

 3.3.2.6. Trigger Messages 14

- 3.3.2.7. Emergency Override Message 15
- 3.3.3. Message and Live Voice Broadcast Management 15
 - 3.3.3.1. Broadcast Output 15
 - 3.3.3.2. Broadcast Modes: Normal Mode 15
 - 3.3.3.3. Broadcast Modes: Emergency Override Mode..... 15
 - 3.3.3.4. Broadcast Modes: Emergency Action Notification 16
 - 3.3.3.5. Broadcast Modes: Broadcast Live Mode 16
 - 3.3.3.6. Broadcast Modes: Operator Training and Practice Mode..... 16
- 3.3.4. Voice Processing..... 17
 - 3.3.4.1. Text-to-Speech Conversion 17
 - 3.3.4.2. Silence Insertion..... 17
 - 3.3.4.3. Phonetic Redefinition..... 17
 - 3.3.4.4. Substitution Dictionary 17
 - 3.3.4.5. Vocabulary Filter Function..... 17
- 3.3.5. Message and Live Voice Broadcast 18
 - 3.3.5.1. Message Output Format 18
 - 3.3.5.2. Tone and Code Support 18
 - 3.3.5.2.1. NWRSAME Tone Generation 18
 - 3.3.5.2.2. NWRSAME Message Length Restriction 18
 - 3.3.5.2.3. Alert Tone Generation..... 18
 - 3.3.5.2.4. Tone Configuration 18
 - 3.3.5.2.5. Tone Generation Delay 18
- 3.4. EC-WBS System Management..... 19
 - 3.4.1. Message Management..... 19
 - 3.4.1.1. Create Text Message..... 19
 - 3.4.1.2. Message Creation Macros..... 19
 - 3.4.1.3. Voice Record and Playback 19
 - 3.4.1.4. Voice Message Creation 19
 - 3.4.1.5. Voice Record Functions..... 20
 - 3.4.1.6. Voice Recording Support..... 20
 - 3.4.1.7. Automatic Audio Level Control 20
 - 3.4.1.8. Message Error Checking..... 20
 - 3.4.1.9. Defining Watch and Warning Areas..... 20

3.4.1.10.	Message Playback.....	21
3.4.2.	Logging & Data Storage	21
3.4.2.1.	Message Storage/Retrieval.....	21
3.4.2.2.	Message Log.....	21
3.4.2.3.	Error Log.....	21
3.4.2.4.	System Log	21
3.4.2.5.	Log Availability	22
3.4.2.6.	Reports	22
3.4.2.7.	Database Backup and Maintenance	22
3.4.3.	System Configuration	22
3.4.3.1.	Broadcast Program Definition	22
3.4.3.2.	Message Types.....	22
3.4.3.2.1.	SAME Originator Field.....	22
3.4.3.2.2.	Tone Generation Delay Field.....	22
3.4.3.2.3.	Voice Type Field.....	22
3.4.3.3.	Broadcast Suites.....	23
3.4.3.4.	Geographic Location Mapping	23
3.4.3.5.	Latitude and Longitude Location Mapping	23
3.4.3.6.	EC Transmitter Station Groups.....	23
3.4.3.7.	Message Association Table.....	23
3.4.4.	System Status	23
3.4.4.1.	Monitor and Control	23
3.4.4.1.1.	Broadcast Monitoring.....	23
3.4.4.1.2.	Transmitter Station Status	24
3.4.4.1.3.	Transmitter Station Silence Alarm.....	24
3.4.4.1.4.	Audio Level Output Control	24
3.4.4.2.	System Administration.....	24
3.4.4.2.1.	Account Management, Access Control and Identification and Authentication.....	24
3.5.	Operator Interfaces.....	24
3.6.	Performance Requirements.....	25
3.6.1.	Message Delivery Time	25
3.6.1.1.	Synthesized Voice Message Delivery Time	25

3.6.1.2.	Live Voice Latency.....	25
3.6.2.	Message Delivery Reliability.....	26
3.6.3.	Single Point of Failure	26

1. INTRODUCTION

... Denis to write ...

2. OVERVIEW AND OPERATIONAL CONCEPT

The primary function of the Environment Canada (EC) Weather Broadcast System (EC-WBS) is to deliver effective weather/warning messages directly to people at risk in a timely manner. EC-WBS is intended to replace components of the current system with more effective technology in an architecture that will make the delivery of emergency messages more reliable, effective, and cost efficient.

EC-WBS will provide a highly reliable, scalable, and manageable system with high overall availability and low mean down time.

EC-WBS will have enhanced monitor and control, configuration management, and system administration capabilities that will allow control/monitoring from any location.

The primary functions of the EC-WBS include:

- Interfacing to external systems for receipt of text and audio messages for distribution over the Environment Canada (EC) transmitter network.
- Conversion of text messages to audio in the NWRSAME message format
- Message scheduling and generation of continuous audio and data streams for each EC transmitter station.
- Integration of live and digitally recorded voice into audio broadcast streams
- Distribution of audio and data to the network of EC transmitter stations.
- Configuration management and control of the EC transmitter station components

Weather/warning information is input to the EC-WBS in the form of messages. An input message has two parts – Message Attributes and Message Content – that identify the who, what, when, where, and how of the message broadcast; i.e., what information is to be broadcast to the public, at what time(s), and on which transmitter(s). Messages are input to the EC-WBS either as ASCII text, complete with attributes, or as voice with EC-WBS operator defined attributes. Messages input from a microphone are processed as digitized voice and may be output immediately or stored for later broadcast, or both. Messages input as ASCII text, from external systems or the EC-WBS operator may be converted from text-to-speech and output immediately or stored for later broadcast, or both.

The EC-WBS automatically processes incoming messages, interprets and processes the Message Attributes, and produces an output stream to EC transmitter stations. Special configuration information for each EC transmitter station controls how and when messages and data are broadcast.

The EC-WBS has unique features which allow EC to fulfill its mission. It broadcasts special alert tones and NOAA Weather Radio Specific Area Message Encoding (NWRSAME) tones that activate special receivers which alert listeners to impending severe weather or emergency situations.

The EC-WBS shall broadcast the relevant information pertaining to a particular EC transmitter's broadcast area. The data to be broadcast shall be configured by the EC-WBS operator, who will be able to choose what information to broadcast to what transmitter. This configuration will allow information to be automatically broadcast to the correct effective transmitter.

3. FUNCTIONAL REQUIREMENTS

This section defines the functional requirements for the Environment Canada (EC) Weather Broadcast System (EC-WBS).

3.1. General Functional Requirements

This section defines general requirements that apply to the EC-WBS System.

3.1.1. Commercial-Off-The-Shelf (COTS)

The EC-WBS shall be a COTS system to the greatest extent possible. Development shall be limited to minor modifications required to fulfill specific Canadian processing requirements.

As part of the evaluation process, the offeror shall be willing to perform a demonstration of the proposed system at the offeror's location. Two weeks notice will be given.

3.1.2. General Architecture

The system shall provide a centralized processing component that receives weather/warning messages and disseminates them to the applicable transmitter sites for broadcast.

The system shall have a backup centralized processing component that can take over all processing in the event of a failure in the primary centralized processing component.

The system shall have a text-to-speech component at each transmitter site that can receive text messages from the centralized processing component, convert the text to speech, and incorporate the resulting audio file into the broadcast program for transmission via the co-located transmitter.

Operator consoles shall allow full access to all EC-WBS equipment and functions for command and control.

3.1.3. IT Security

The EC-WBS system shall implement all applicable security controls noted in NIST SP 800-53, *Recommended Security Controls for Federal Information Systems* (RD15) for a security categorization of:

SC = Confidentiality (**LOW**); Integrity (**HIGH**); Availability (**HIGH**)

3.1.4. Environment

The EC-WBS equipment shall be designed to minimize impact on EC facilities and shall conform to the following specifications:

Non-transmitter Site Equipment

Any indoor equipment (non-transmitters sites) provided as part of the EC-WBS system shall be able to operate in compliance with all requirements of this specification when exposed to the following conditions:

- Temperature: 0 C° to 50 C°
- Humidity: 10% to 92% R.H.

- Combined Temperature and Humidity: 90 F°/55% R.H.
- Altitude: Sea level to 7,000 feet
- Dust: Typical of light industrial areas.
- Fungus: Typical of inland and coastal areas.

Any indoor equipment provided as part of the communications network at EC facilities shall be capable of operating without necessitating any modification/addition to existing air conditioning/ventilation systems and should be Energy Star compliant to the greatest extent possible.

Transmitter Site Equipment

Any indoor equipment located at EC transmitters provided as part of the EC-WBS system shall be able to operate in compliance with all requirements of this specification when exposed to the following conditions:

- Continuous operation in an ambient condition from -30° to +50°C (-22°to +122°F) in salt laden air.
- Humidity: 10% to 95% R.H.
- Combined Temperature and Humidity: 90 F°/55% R.H.
- Altitude: Sea level to 7,000 feet
- Dust: Typical of light industrial areas.
- Fungus: Typical of inland and coastal areas.

Any indoor equipment provided as part of the communications network at EC facilities shall be capable of operating without necessitating any modification/addition to existing air conditioning/ventilation systems and should be Energy Star compliant to the greatest extent possible.

3.2. EC-WBS External Interfaces

The EC-WBS shall support the following external interfaces.

3.2.1. Input Interface

The EC-WBS shall be capable of receiving XML formatted weather/warning messages at the central processing site from multiple systems.

The EC-WBS shall also be capable of receiving XML formatted weather/warning messages created via the EC-WBS operator console.

All received messages shall be validated for syntactical correctness. Any erred messages shall be rejected and not ingested into the system.

3.2.2. Output – Station and Transmitter Interface

EC-WBS shall interface to existing EC transmitter equipment using an analog audio channel for NWRSAME frequency shift keying (FSK) and analog voice (voice broadcast). The EC transmitter requires a 600 Ohm balanced analog input with bandwidth of 200 Hz to 5 KHz.

All communications with EC transmitter stations shall comply with EC approved analog and digital signal format specifications.

All communications to EC transmitter stations shall comply with EC approved format and protocol specifications.

All EC-WBS equipment at the transmitter site shall be addressable via TCP/IP.

3.2.3. Transmitter Station Audio Output Monitoring

EC-WBS shall be configurable to receive an “off air” audio stream from a weather radio within the transmitter shelter and make this audio stream available to the remote EC-WBS operator for monitoring purposes.

EC-WBS shall also support operator monitoring of the audio stream generated directly from the EC-WBS transmitter site equipment.

3.3. EC-WBS Message & Broadcast Processing

This section defines the message and broadcast processing functional requirements for the EC-WBS.

3.3.1. Message Format

The XML messages to be ingested by EC-WBS shall contain the following types of information, all of which shall be interpreted and processed accordingly.

3.3.1.1. Message Type Attribute

The Message Type Attribute associates the message with a defined category which in turn, defines the attributes required for message scheduling.

EC-WBS shall support the concept of a STATION_ID Message Type, which allows each unique EC transmitter station to periodically broadcast the name and location of the EC transmitter station.

EC-WBS shall support the concept of a TIME Message Type, which allows each EC transmitter station to broadcast the current local time.

To the maximum extent possible, the broadcast time from all EC transmitter stations should be synchronized to a single time source.

3.3.1.2. Effective Date/Time Attribute

The Effective Date/Time attribute shall be used to determine the earliest time which the message can be broadcast.

3.3.1.3. Interrupt Flag Attribute

The Interrupt Flag attribute shall be used to determine whether or not the message is an Interrupt Message which is qualified to interrupt a current broadcast.

3.3.1.4. Alert Tone Attribute

The Alert Tone attribute is used to determine whether or not an alert and/or NWRSAME tones should be transmitted prior to the first broadcast of the message.

Each NWRSAME message can support up to 31 listening areas. Messages with one or more group addresses that translate to more than 31 listening areas per transmitter shall require multiple discrete identical messages, except for the listening areas, if a transmission of NWRSAME tones is required.

3.3.1.5. Polygon Information Attribute

The Polygon Information (if present) shall be used to determine which transmitters are in the geographical area covered by the warning message. The Polygon Information attribute is an optional field that will define a warning polygon with up to 20 vertices.

EC-WBS shall only broadcast the message on transmitters within the specified polygon, if one is present in the message attributes. Otherwise, the conventional listening area codes shall be used to decide the effective transmitters.

If the Polygon Information is contained in a message flagged for SAME encoding, the Listening Area Codes Attribute (described below) shall be used to derive the SAME encoded geographical areas.

3.3.1.6. Listening Area Codes Attribute

The Listening Area Codes attribute shall be used to determine which transmitters are in the geographical area covered by the message (using the geographical mapping between transmitters and geo-locations that exists in the system).

3.3.1.7. Expiration Date/Time Attribute

The Expiration Date/Time attribute shall be used to determine the time after which the EC-WBS should no longer broadcast the message.

3.3.1.8. Messages Periodicity Attribute

EC-WBS shall schedule messages to repeat according to the Message Periodicity attribute. The periodicity may vary based on the Broadcast Program type in effect at the time. For example, a standard forecast message that repeats with a specific periodicity (defined relative to time or broadcast cycle) during a routine weather situation may have a different periodicity during a warning situation. Please see Section 3.3.2.3 for further information on message periodicity.

3.3.2. Message Scheduling

This section defines the functional requirements for message scheduling by the EC-WBS. In general, the EC-WBS shall schedule messages according to the Broadcast Program defined by an EC-WBS operator. The message scheduling function shall support the concepts of broadcast suites, broadcast cycles, and trigger/interrupt messages as described below. It shall also be capable of scheduling time-inserted messages.

3.3.2.1. Broadcast Program Operational Concept

A Broadcast Program is interpreted as a set of rules that the EC-WBS uses to place an incoming message into the sequence of messages scheduled to be broadcast by each transmitter or group of transmitters. The sequence of messages to be broadcast to a transmitter is known as the Broadcast Cycle. Broadcast Programs are initially configured by an EC-WBS operator and later modified as necessary to meet changing requirements. There is a unique Broadcast Program for each EC transmitter station.

Each Broadcast Program consists of ordered sets of Message Types. Sets of Message Types are contained in Broadcast Suite definitions. At any point in time, the set of Broadcast Suites and programming information for an EC transmitter station is referred to as its Broadcast Program.

Error! Reference source not found.1 provides an operational concept of the Broadcast Program.

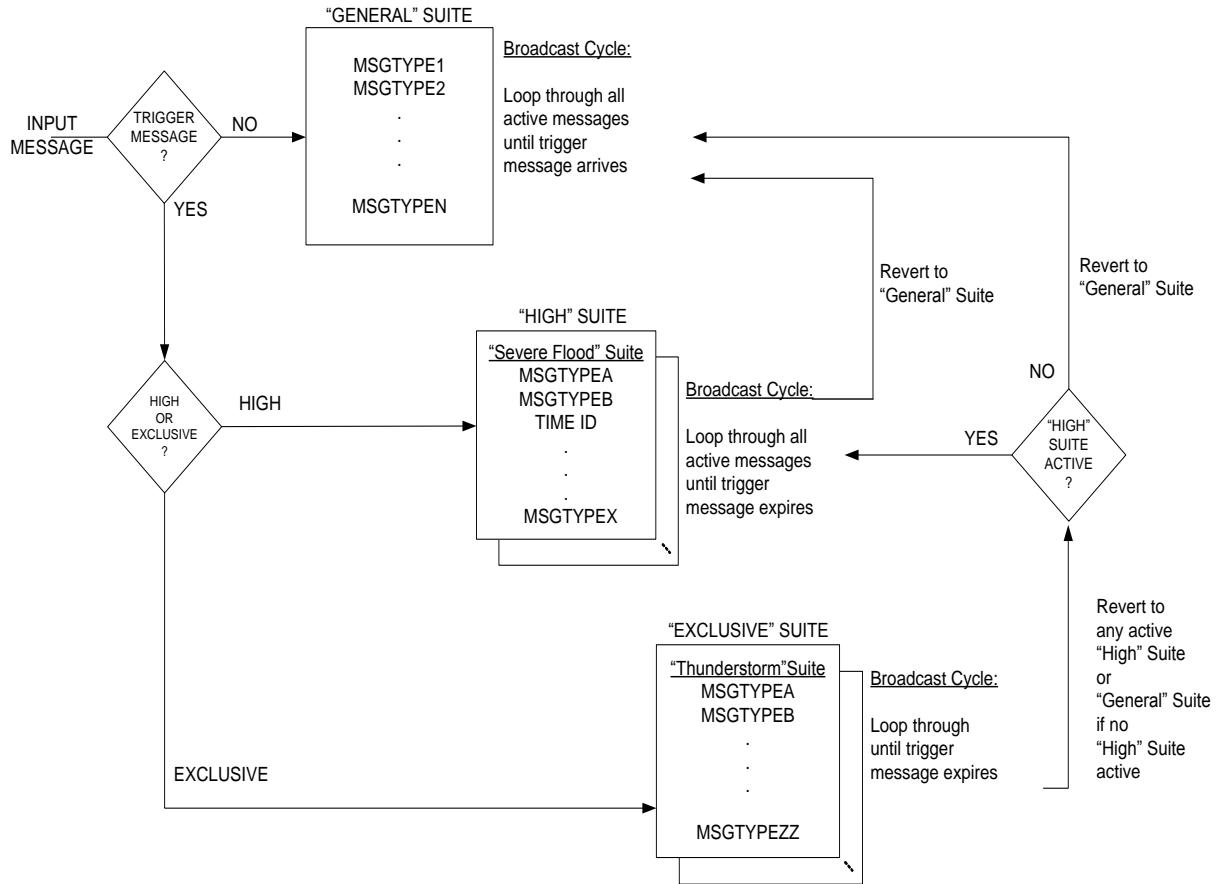


Figure 1: Broadcast Program Operational Concept

In each Broadcast Program there is a Broadcast Cycle for the transmitter that, barring outside intervention, will be continuously repeated. In this normal, “steady state”, operational mode, the EC-WBS continuously examines the current Broadcast Program (programming “rules”) for each transmitter. It determines which active messages are to be broadcast and in what order. Finally it outputs the audio message, complete with either (or both) required tone(s), or additional information, to the EC transmitter station. The EC-WBS determines which EC transmitter station(s) a message is to be broadcast based on either the EC-WBS operator command or automatically via the Listening Area Codes (LAC) or Polygon Information message attribute.

Broadcast Suites within a Broadcast Program are classified hierarchically in Exclusive, High, or General Category. Within each of these categories, Broadcast Suites for an EC transmitter station have different priority. The current Broadcast Suite may be changed manually by an EC-WBS operator, or the system may automatically switch to a different Broadcast Suite under certain conditions.

The current broadcast suite for an EC transmitter station, and consequently the “steady state” Broadcast Cycle, may change due to several types of intervention:

- Initiation of an Emergency Override message by the EC-WBS Operator

- Broadcast Program modification by the EC-WBS Operator
- Receipt of a Trigger Message or Interrupt Message which causes an automatic switch to a different Broadcast Suite
- Expiration of Trigger Message which causes an automatic switch to a different Broadcast Suite

The lowest level suite, the General suite, will be the default suite used by the EC-WBS to build the Broadcast Cycle when no Trigger Messages are active.

When a Trigger Message becomes active in the system, the current Broadcast Suite will be suspended and the Broadcast Suite corresponding to the Trigger Message will become current. That Broadcast Suite will continue to be used by the EC-WBS to build the Broadcast Cycle until the Trigger Message expires or a trigger message with a higher priority is received.

Upon expiration of the Trigger Message, the system will revert to the next highest level Broadcast Suite, and continue the Broadcast Cycle from where it was left off prior to being suspended by the incoming Trigger Message. Or it may build a new Broadcast Cycle depending on the status of active messages in the system.

This process continues until the system reverts to the lowest level, General, suite. The General suite, shall be the default suite used by the EC-WBS to build the broadcast cycle when no trigger messages are active.

The WC-WBS shall support the operational concept of the Broadcast Program as illustrated in **Error! Reference source not found..**

3.3.2.2. Broadcast Program

EC-WBS shall allow an operator to develop and store unique Broadcast Program scheduling rules for each EC transmitter station.

The scheduling rules are defined by the definitions of Broadcast Suites, Trigger Messages and Interrupt Messages as described in this section.

3.3.2.2.1. Broadcast Suites

EC-WBS shall support the concept of broadcast suites. Each broadcast suite defines the set of message types to be broadcast when that suite is active, and the order in which to broadcast the messages.

Broadcast Suites are EC transmitter station specific.

Broadcast suite definitions shall include messages types, broadcast sequence of messages, trigger messages, and a logical name for the suite.

EC-WBS shall support a minimum of 3 levels of broadcast suites, such as “General”, “High”, and “Exclusive”. The broadcast suites shall form a hierarchical method for building broadcast cycles depending on type and severity of active messages in the system.

There can only be one instance of a general category.

Higher level suites, such as High or Exclusive, can have multiple instances, each triggered by non-overlapping sets of trigger messages.

3.3.2.3. Time Inserted Message Scheduling

EC-WBS shall be able to schedule time inserted messages based on the Effective Date/Time message attribute and the Periodicity attribute. Time insertion shall be supported either as a fixed time period and/or particular clock time (e.g., “*every 15 minutes beginning at 5 minutes past the hour*”).

Periodic messages will be inserted into the Broadcast Cycle on or after the specified time; messages will not be interrupted to precisely maintain the Periodicity.

EC-WBS shall allow an operator to schedule individual messages for inclusion in non-sequential Broadcast Cycles, i.e., shall provide message periodicity based on Broadcast Cycle (e.g., “every second broadcast cycle”).

3.3.2.4. Message Association Table

EC-WBS shall replace existing messages in the Broadcast Cycle with new incoming messages according to the Message Association Table, only if they have identical Listening Area Codes (LACs).

3.3.2.5. Interrupt Messages

EC-WBS shall be able to process interrupt messages that, when received, shall immediately supersede the currently scheduled message according to an interrupt flag and priority defined by the Broadcast Suite definitions. The EC-WBS operator shall have the option to play an interrupt announcement preceding the interruption message.

Interrupt messages play only once, and then drop into the new broadcast cycle or suite as defined by Broadcast Suites and message scheduling rules.

When the interrupt message is complete, the EC-WBS shall resume the broadcast cycle in effect prior to receiving the interrupt message, or shall implement a new Broadcast Suite if the Interrupt Message is also a trigger for a higher category suite.

3.3.2.5.1. Interrupt Messages Rules

An Interrupt Message shall not interrupt the output of any of the following:

- a) Another Interrupt Message;
- b) A watch or warning message that has not yet played at least once;
- c) An Emergency Override message.

3.3.2.6. Trigger Messages

EC-WBS shall accommodate Trigger Messages that serve to suspend the current broadcast suite and initiate a new broadcast suite. A Trigger Message is a message that is pre-configured by EC-WBS operators to set in motion a new “High” or “Exclusive” broadcast suite.

A trigger message cannot trigger more than one broadcast suite.

3.3.2.7. Emergency Override Message

EC-WBS shall accommodate Emergency Override messages that take precedence over all active messages in a station's broadcast program, including Trigger Messages. Emergency Override messages consist of "live" messages from a microphone that immediately interrupt broadcasting in progress at a specified EC transmitter station(s).

3.3.3. Message and Live Voice Broadcast Management

This section defines the functional requirements for message and live voice broadcast management by the EC-WBS. In general, EC-WBS should provide continuous analog audio output to all EC transmitter stations. It should be capable of providing unique program streams for each EC transmitter station. EC-WBS should provide Broadcast Management functions that support the transition between the broadcast modes described.

3.3.3.1. Broadcast Output

EC-WBS shall provide continuous, high quality speech output of weather and warning information to all EC transmitter stations.

EC-WBS shall be configurable to control the generation of broadcast output for individual EC transmitter stations or groups of stations based on various combinations of synthesized, live, and digitized speech.

EC-WBS shall allow a single broadcast output to drive each EC transmitter station or multiple EC transmitter stations in a group as appropriate.

3.3.3.2. Broadcast Modes: Normal Mode

EC-WBS shall support Normal Mode in which input messages are converted to voice (synthesized voice) and local human voice inputs (digitized voice) are recorded and stored. Voice messages are then assembled into broadcast cycles and distributed automatically according to Broadcast Program definitions with no direct human intervention.

3.3.3.3. Broadcast Modes: Emergency Override Mode

EC-WBS shall support Emergency Override Mode in which the EC-WBS operator can broadcast on the air, in near real-time, messages containing voice input via microphone. The EC-WBS operator shall be able to direct these messages to one, any combination of, or all EC transmitter stations (subject to the particular EC-WBS operator's authorization). All other automatic operations shall stay active during Emergency Override Mode including system logging.

When entering Emergency Override Mode, EC-WBS shall prompt the EC-WBS operator to select the Message Type, Listening Area Codes and tones to be associated with the message.

To prevent inadvertent issuance of alert tones or SAME tones, the EC-WBS operator shall be prompted to positively confirm that tones should be issued whenever the Emergency Override Mode message would result in alert tones or SAME tones to be broadcast. Without this confirmation, no alert tones or SAME tones shall be issued.

When in Emergency Override Mode, EC-WBS shall record the live voice broadcast as a digitized voice message. A 2-minute maximum shall be imposed on the recording session.

When recording voice in Emergency Override Mode, EC-WBS shall direct the digitized voice obtained to system storage.

EC-WBS system shall log messages and tones generated for each EC transmitter station while in Emergency Override Mode.

3.3.3.4. Broadcast Modes: Emergency Action Notification

The Emergency Action Notification (EAN) capability shall be considered a subset of the Emergency Override capability.

The EAN messages are designed to provide a high ranking government official with a means to address the Canadian people in the event of a national emergency. The EAN messages shall be carried live and shall have no time limit.

3.3.3.5. Broadcast Modes: Broadcast Live Mode

EC-WBS shall support Broadcast Live Mode (“disc jockey mode”) in which an authorized user can broadcast live voice to any or all EC transmitter stations in real-time. In this mode, automatically generated broadcast cycles are bypassed and the live voice feed is broadcast to the EC transmitter stations.

EC-WBS system shall suspend the current Broadcast Cycle for stations placed into Broadcast Live Mode. The system shall resume the Broadcast Cycle when the system is returned to Normal Mode.

Upon entering Broadcast Live Mode, the system shall prompt the EC-WBS operator to select the Listening Area Codes or EC transmitter stations to receive the Live Broadcast.

Broadcast Live messages shall not be recorded.

Alert tones shall be broadcast while in Broadcast Live Mode, but no NWRSAME tones shall be broadcast.

EC-WBS system shall log the start time and affected stations upon entering Broadcast Live mode.

In the event the system is in Broadcast Live Mode when a high priority message is due to be broadcast on any of the channels affected by the Broadcast Live Mode, an audible alarm shall be generated to the EC-WBS operator. The EC-WBS operator shall have the option to terminate the live broadcast to allow the warning message to be distributed.

3.3.3.6. Broadcast Modes: Operator Training and Practice Mode

EC-WBS shall support Operator Training and Practice Mode in which EC-WBS operators can use as a training and practice system. While in Operator Training and Practice mode, the system shall not send any of training and practice associated output (including voice, alert tones, and NWRSAME tones) to any operational EC transmitter stations for broadcast. All training and practice output shall direct to a pseudo EC transmitter station which will then broadcast or play back the output only to the trainee.

The Operator Training mode shall provide the following training and practice abilities, at a minimum:

- Create text messages to broadcast in the Normal mode,
- Create voice messages to broadcast in the Emergency Override Mode, and
- Live voice broadcast in the Broadcast Live Mode.

3.3.4. Voice Processing

This section defines the functional requirements for voice processing by the EC-WBS. In general, EC-WBS should create high-quality, clear, understandable speech from text input files.

3.3.4.1. Text-to-Speech Conversion

EC-WBS shall provide a text-to-speech conversion function that creates high-quality, clear, understandable speech from text input files.

EC-WBS shall generate synthesized speech in English and Canadian French.

3.3.4.2. Silence Insertion

EC-WBS shall insert one second of silence after each discrete message having non-null content. EC-WBS shall produce no output for messages with null content and shall not insert the one second of silence.

3.3.4.3. Phonetic Redefinition

EC-WBS shall incorporate a phonetic redefinition function whereby EC-WBS operators at each WFO can configure multiple pronunciation dictionaries, anticipated to be one per voice, to customize pronunciation of specific words by the voice synthesis subsystem.

No manual reconfiguration of pronunciation dictionaries shall be required for system hardware or software upgrades.

3.3.4.4. Substitution Dictionary

EC-WBS shall incorporate a substitution dictionary at each WFO, which provides for replacement of certain alphanumeric strings with other alphanumeric strings. This can be used to expand abbreviations and acronyms, etc. It is anticipated there will be one substitution dictionary per language/voice.

No manual reconfiguration of substitution dictionaries shall be required for system hardware or software upgrades.

3.3.4.5. Vocabulary Filter Function

EC-WBS shall incorporate a vocabulary filter function that shall scan each message and compare words to a database of unacceptable words. When an unacceptable word is detected, the EC-WBS system shall delay the subject message within the Broadcast Cycle and notify the EC-WBS operator that the message requires editing.

3.3.5. Message and Live Voice Broadcast

This section defines the functional requirements for message and live voice broadcast by the EC-WBS. In general, EC-WBS should interface with the EC system by delivering an audio output channel to each EC transmitter station, consisting of audio messages in pre-defined order. EC-WBS should be capable of generating NWRSAME alert tones of predefined characteristics for alert messages and weather warning messages.

3.3.5.1. Message Output Format

EC-WBS output messages shall consist of the following ordered components:

- a) a preface which can consist of any of: NWRSAME start of message tone, Alert Tone, interrupt announcement;
- b) a user-selectable audio lead-in sentence;
- c) audio message content (from text-to-speech synthesis, from the digital-to-analog conversion of previously stored voice input, or live voice broadcast);
- d) end of message NWRSAME tones, if required.

3.3.5.2. Tone and Code Support

3.3.5.2.1. NWRSAME Tone Generation

EC-WBS shall be capable of generating NOAA Weather Radio Specific Area Message Encoding (NWRSAME) tones and codes of predefined characteristics for All Hazards alert messages and weather warning messages.

EC-WBS shall deliver alert tones and/or NWRSAME tones for inclusion with all appropriate EC broadcast messages.

EC-WBS shall be capable of generating NWRSAME all hazards coded tones/messages, which shall precede and succeed the first output of a message to a particular station or group of stations.

3.3.5.2.2. NWRSAME Message Length Restriction

All NWRSAME encoded messages, except EAN messages, shall be limited to two minutes in duration.

3.3.5.2.3. Alert Tone Generation

EC-WBS shall be capable of generating 1050 Hz alert tones for messages.

3.3.5.2.4. Tone Configuration

EC-WBS shall allow EC-WBS operators to configure whether SAME and/or alert tones are played for specific message types at specific times.

3.3.5.2.5. Tone Generation Delay

EC-WBS shall have the ability to hold the tones (NWRSAME and 1050 Hz WAT) for certain long-fuse watch/warning messages issued during the middle of the night until daylight hours.

The specific terms of when and how this is done shall be locally configurable by EC-WBS operator.

The tone generation delay capability shall be site configurable as part of the Message Type settings.

The initial broadcast shall include only the message contents. The tones shall be suppressed until the blackout period has expired, at which time the tones shall be played automatically.

3.4. EC-WBS System Management

This section defines the functional requirements for system management by the EC-WBS. In general, EC-WBS system management should include all system functions that are not directly in the Broadcast Program generation path. These functions include, but should not be limited to: message management, system configuration, system status, and system administration.

3.4.1. Message Management

3.4.1.1. Create Text Message

EC-WBS shall allow the EC-WBS operator to create and edit Text Messages and enter all applicable message attributes.

To prevent inadvertent issuance of alert tones or SAME tones, the EC-WBS operator shall be prompted to positively confirm that tones should be issued for any EC-WBS-operator created message which will result in alert tones or SAME tones to be broadcast. No EC-WBS-operator created message shall be disseminated without this positive confirmation.

3.4.1.2. Message Creation Macros

The system shall provide a means to quickly insert text macros to facilitate the rapid generation of messages. They would comprise standardized/approved warning statements and could be used to rapidly create messages.

3.4.1.3. Voice Record and Playback

This section defines the functional requirements for voice record and playback by the EC-WBS. In general, EC-WBS should support the ability of EC-WBS operators to generate digitized voice messages by speaking into a microphone. The EC-WBS operator should be able to preview recorded voice messages and synthesized voice messages prior to scheduling them for broadcast.

3.4.1.4. Voice Message Creation

EC-WBS shall allow EC-WBS operators to create audio voice messages for subsequent dissemination.

When creating a voice message, the system shall allow the EC-WBS operator to input required message and scheduling attributes for the message, including Message Type, Listening Area Codes, alert tones and SAME tones.

To prevent inadvertent issuance of alert tones or SAME tones, the EC-WBS operator shall be prompted to positively confirm that tones should be issued for any EC-WBS-operator created message which will result in alert tones or SAME tones to be broadcast. No EC-WBS-operator created message shall be disseminated without this positive confirmation.

3.4.1.5. Voice Record Functions

EC-WBS shall support the ability of a EC-WBS operator to generate digitized voice messages by speaking into a microphone.

EC-WBS shall support the ability of EC-WBS operators to preview recorded voice messages and synthesized voice messages prior to scheduling them for broadcast.

3.4.1.6. Voice Recording Support

EC-WBS shall provide EC-WBS operators with monitoring, display, and control functions required to support voice-recording sessions. Some of the functionality required of a recording session are:

- Start recording;
- Stop recording;
- Start playback;
- Stop playback;

Recording level control, with display showing the recording level in graphic logarithmic form with selectable slow and fast time constants;

Recording time - the duration of digitally stored voice message shall be displayed, in minutes and seconds during recording;

EC-WBS operator inputs of required message and scheduling attributes for the message, including alerts and alert messages for the message.

3.4.1.7. Automatic Audio Level Control

EC-WBS shall provide automatic audio level control for use when recording voice messages from a local microphone.

3.4.1.8. Message Error Checking

EC-WBS shall provide the EC-WBS operator with automatic error monitoring and shall alert the EC-WBS operator of errors including, but not limited to, messages requiring additional data in order to be transmitted, errors in EC-WBS operator entries resulting in invalid message data, and communications failures.

3.4.1.9. Defining Watch and Warning Areas

EC-WBS shall allow the EC-WBS operator to define graphical watch and warning areas for messages using polygon representations, latitude/longitude information, and/or county and sub-county geographic data.

3.4.1.10. Message Playback

EC-WBS shall provide the option to playback audio content of weather and other messages prior to transmission to an EC transmitter station.

3.4.2. Logging & Data Storage

3.4.2.1. Message Storage/Retrieval

EC-WBS shall be capable of storing messages and files for future dissemination. Text and digitized voice (human voice recordings) messages shall be stored for a configurable period up to 30 days.

The EC-WBS system shall provide a warning when allocated storage volume reaches the organization-defined percentage of maximum storage capacity; this function is to be configurable by the system administrator.

3.4.2.2. Message Log

EC-WBS shall automatically create a message log to record all message activity. Activity to be logged includes: broadcast time of all messages, automatic or manual message replacement and creation, and activation and identification of all alert and NWRSAME and all hazards alerts/message tones. Log entries shall include date/time of activity or event, message identifier, appropriate station identification, and message expiration time if appropriate.

3.4.2.3. Error Log

EC-WBS shall automatically create an error log to record all message errors and to capture sufficient information to establish what events occurred, the sources of the events, and the outcomes of the events. Log entries shall include: (i) date and time of the event when an error occurred; (ii) message identifier, (iii) the appropriate station identification and component of the information system (e.g., software component, hardware component) where the event occurred; (iv) type of event or nature of error; (v) subject identity; and (vi) the outcome (success or failure) of the event.

3.4.2.4. System Log

EC-WBS shall maintain a system log that records system activity such as EC-WBS operator actions, system configuration changes, system (hardware and software) error and alarm messages, and other pertinent system events. Log items shall be assigned a level, with a minimum of 5 severity levels, based on the severity of the event, action, or error.

Logs shall be filterable based on activity type and severity, with the ability to generate logs based on activity type and severity criteria.

The EC-WBS system log shall record changes in the broadcasting mode of each EC transmitter station and indicate the contents of the suspended Broadcast Cycles during Normal Mode, Emergency Override Mode, and Broadcast Live Mode.

3.4.2.5. Log Availability

EC-WBS shall provide immediate access to the Message and Error logs through the EC-WBS user interface to support review of message activity at any time and in particular after a severe weather event. The logs should be retained for a site configurable period of time up to 62 days.

3.4.2.6. Reports

EC-WBS shall provide a report generation capability as part of the database and logging functions allowing users and system administrators to generate various reports on system performance statistics, database contents, message logs, system logs and other pertinent areas.

3.4.2.7. Database Backup and Maintenance

EC-WBS shall provide for periodic automatic and manual backup and maintenance of system database files and tables.

EC-WBS shall provide a selectable database restore function that restores databases and configuration information .

3.4.3. System Configuration

EC-WBS shall maintain data consisting of all EC transmitter station configuration data, broadcast programs, and all other required system information, as further defined below. This system shall allow the EC-WBS operator to view and update the configuration information.

3.4.3.1. Broadcast Program Definition

EC-WBS shall allow EC-WBS operators to flexibly define Broadcast Programs for each EC transmitter station. A Broadcast Program consists of Message Types and Broadcast Suites.

3.4.3.2. Message Types

EC-WBS shall provide a method for EC-WBS operators to define valid message types for each EC transmitter station.

3.4.3.2.1. SAME Originator Field

The Message Type capability shall support the configuration of a SAME Originator Field. The SAME Originator Field shall determine whether SAME “ORG” encoding is set to “WXR” or “CIV”.

3.4.3.2.2. Tone Generation Delay Field

The Message Type capability shall support the configuration of a Tone Generation Delay Field. The Tone Generation Delay Field shall establish the start/end times of the tone generation blackout period.

3.4.3.2.3. Voice Type Field

The Message Type capability shall support the configuration of a Voice Type Field. The Voice Type Field shall determine whether the message is generated with the male or female voice (as supported by the current language).

3.4.3.3. Broadcast Suites

EC-WBS should provide a method for EC-WBS operators to define and edit Broadcast Suites. Broadcast Suites comprise lists of message types to be played in the suite, and the trigger message that initiates the suite.

3.4.3.4. Geographic Location Mapping

The EC-WBS shall provide a means for EC-WBS operators to define UGC (Universal Geographic Codes) to EC transmitter station mapping.

3.4.3.5. Latitude and Longitude Location Mapping

The EC-WBS shall provide a means for EC-WBS operators to define latitude/longitude to EC transmitter station mapping.

3.4.3.6. EC Transmitter Station Groups

EC-WBS shall support EC group addressing.

EC-WBS shall allow EC-WBS operators the ability to define EC transmitter station groups.

A unique group address shall correspond to a predefined group of any number of EC transmitter stations.

A message may be sent to any number of group addresses.

EC-WBS shall provide the capability to add new transmitter stations.

3.4.3.7. Message Association Table

EC-WBS shall support creation and configuration of a Message Association Table which defines which message types are replaced by other Message Types, but only if their Listening Area Codes are identical.

3.4.4. System Status

3.4.4.1. Monitor and Control

EC-WBS shall accept and report alarms and alerts from all EC-WBS equipment and software modules and report these visibly and audibly to EC-WBS operators and system administrators.

3.4.4.1.1. Broadcast Monitoring

EC-WBS shall provide a status display to the EC-WBS operator for each transmitter output channel. The status display shall include:

1. Graphical indication of channel status;
2. Current active messages;
3. Corresponding EC transmitter station;
4. Broadcast cycle pending message queue and cycle time.

3.4.4.1.2. Transmitter Station Status

EC-WBS shall provide a status display to the monitor and control system operator, including graphical indication of the status of each EC transmitter station, the geographical locations of the EC transmitter stations, call sign, frequency, and operational status of each station.

3.4.4.1.3. Transmitter Station Silence Alarm

EC-WBS shall include a silence detection and alarm function that detects and reports any situation where the EC-WBS' audio signal for any EC transmitter station is silent for ten consecutive seconds. The EC-WBS operator shall be given override and reset capability for EC transmitter stations, for use in Normal and Emergency Override Modes of operation.

3.4.4.1.4. Audio Level Output Control

EC-WBS shall provide the ability for the EC maintenance technician to adjust the audio levels of the voice, alert tones, NWRSAME tones, and transmitter transfer tones that are output to each EC transmitter.

3.4.4.2. System Administration

3.4.4.2.1. Account Management, Access Control and Identification and Authentication

EC-WBS shall include a tiered account system. For each account type, EC-WBS operator functions applicable to that account type can be authorized.

EC-WBS shall allow the System Administrator the ability to manage information system accounts, including establishing, activating, modifying, reviewing, disabling, and removing accounts with varying levels of permission.

In response to unsuccessful login attempts, the EC-WBS system shall enforce a configurable limit of consecutive invalid access attempts by a user during a configurable time period; currently the standard is five (5) invalid access attempts in a fifteen (15) minute time period.

The EC-WBS system shall automatically lock the account/node for a configurable time period, or until released by an administrator, when the maximum number of unsuccessful attempts is exceeded; currently that period is fifteen (15) minutes.

The EC-WBS system shall display an approved, system use notification message before granting system access. The system use notification message shall be configurable by the system owner.

The EC-WBS system shall support Canadian requirements for password strength.

3.5. Operator Interfaces

EC-WBS shall support a Graphical User Interface (GUI) to provide the EC-WBS operator with user friendly, menu driven, interactive access to EC-WBS operator, administrative and management functions as described throughout this document.

EC-WBS shall present the EC-WBS operator with a responsive, intuitive GUI, which shall allow the EC-WBS operators to perform system management without disturbing the continuous operation of the broadcast function.

The EC-WBS shall support the Section 508 requirements of the Rehabilitation Act as amended in 1998 and of Section 255 of the Telecommunications Act as amended in 1996 to allow for operation by people with disabilities.

3.6. Performance Requirements

This section defines the performance requirements for the EC-WBS.

3.6.1. Message Delivery Time

Message delivery time is defined as the total time from when the message is available to the EC-WBS from the external interface, until the message is delivered to the EC transmitter for broadcast.

3.6.1.1. Synthesized Voice Message Delivery Time

Delivery time specified in this section only applies to nominal size text messages. In case of large size, e.g. 2000 bytes, text messages, additional message delivery time shall be allowed due to their longer text-to-speech synthesized voice conversion time. For interrupt messages, delivery time shall be when the message is broadcast. For non-interrupt messages, delivery time shall be when the message is placed in the Broadcast Cycle.

EC-WBS shall deliver 98% of high priority messages (warnings, watches, civil emergency alerts) in less than 30 seconds, for any site over any 48-hour period.

EC-WBS shall deliver 99.8% of high priority messages (warnings, watches, civil emergency alerts) in less than 60 seconds, for any site over any 48-hour period.

EC-WBS shall deliver 98% of non high priority messages in less than 90 seconds. EC-WBS operational concept is based on broadcast cycle, suite, and program. Normally, the number of messages qualified to broadcast in general (or non high priority) broadcast suites shall be larger than the numbers in high or exclusive categories of broadcast suites. Therefore, the size of broadcast cycles for general (or non high priority) broadcast suites may grow accordingly large. In case of large broadcast cycles, additional message delivery time shall be allowed due to their longer queue waiting time.

3.6.1.2. Live Voice Latency

The maximum delay from the time a live broadcast is initiated from an internal or external user until delivery to the EC transmitter station interface shall be less than 15 seconds.

3.6.2. Message Delivery Reliability

EC-WBS shall successfully deliver 99.9% of all messages to the designated EC transmitter station(s).

The EC-WBS shall report all undelivered messages to the EC-WBS operator interface as well as the Message Logs.

3.6.3. Single Point of Failure

The EC-WBS architecture shall provide geographical redundancy to eliminate critical locations as single points of failure.

Failovers shall complete within 5 minutes of initiation.

GLOSSARY

ASCII – American Standard Code for Information Interchange

EAS – Emergency Alert System

EC – Environment Canada

EC-WBS – Environment Canada Broadcast Management System

FIPS - Federal Information Processing Standard

FSK – Frequency Shift Keying

FRS – Functional Requirements Specification

GUI – Graphical User Interface

LAC – Listening Area Codes

NIST – National Institute of Standards and Technology

NOAA - National Oceanic and Atmospheric Administration

NWRSAME – NOAA Weather Radio Specific Area Message Encoding

RF – Radio Frequency

SAME – Specific Area Message Encoding

TTS – Text-to-Speech

UGC – Universal Generic Codes

UHF - Ultra High Frequency

VHF – Very High Frequency

WAT – Warning Alert Tone