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ENGINEERING AND TECHNOLOGY
TECHNOLOGY MANAGEMENT

SPECIFICATION

Integrated Train Condition Monitoring System Interface Specification

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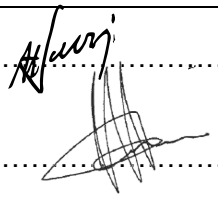
Approved:	Senior Technologist Technology Management	M. Savig	…….. 
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1 SCOPE

1.1 Identification

This document specifies the software and hardware interface requirements as well as the message requirements for Condition Assessment Systems (CAS) to communicate with the Integrated Train Condition Monitoring System (ITCMS). Protocol requirements are only specified for the transport, internet and link layers of the TCP/IP model.

1.2 System overview

The ITCMS interfaces with the various Condition Assessment Systems (CAS) to provide a single source of condition data, alarm information display and system health. TFR does not prescribe protocol requirements for protocol layers above the transport layer of the TCP/IP model, but the supplier of a train condition measurement system shall supply these protocols to TFR for the sole purpose of writing an Interface Control Document for the development of the interface between the CAS and the ITCMS. The CAS interface via the available telecommunication channels with the ITMCS component identified as the Field Concentration System (FCS). The FCS may be installed in the same room as the CAS in which case the CAS shall communicate to the FCS with an Ethernet network cable via an Ethernet switch or the FCS may be installed at the controlling Centralised Train control Centre (CTC) in which case the CAS shall either communicate with an Ethernet network cable via an Ethernet switch or with a GPRS modem.

1.3 Document overview

This document describes and specifies all the necessary interface requirements and messages between the CAS and ITCMS to ensure efficient and reliable communications. Any intellectual property provided to TFR that is essential to develop the interfaces shall not be distributed to any other 3rd parties without the written consent of the supplier.

1.4 Glossary

APN	Access Point Name
CAS	Condition Assessment System
CAT	Categorie
CTC	Centralised Train control Centre
ICASA	Independent Communications Authority of South Africa
ITCMS	Integrated Train Condition Monitoring System
FCS	Field Concentrator System
FTP	File Transfer Protocol
GPRS	General Packet Radio Services
GSM	Global System for Mobile communications
MTT	Manager Technician Terminal
OAT	Operational Alarm Terminal
OPS	Office Processing System
RFID	Radio-frequency identification
SIM	Subscriber Identification Module
SMS	Short Message Service
TBD	To be determined
TCP/IP	Transmission Control Protocol / Internet Protocol
TFR	Transnet Freight Rail
UDP	User Datagram Protocol
UTP	Unshielded Twisted Pair

2 REFERENCED DOCUMENTS

The following specifications, standards and drawings of the exact issue shown form a part of this specification to the extent shown herein. In the event of conflict between the referenced document and this specification, the contents of this specification shall be considered a superseding requirement.

236005-000000-416	Prime Item Product Specification For The Integrated Train Condition Monitoring System
236005-000000-805 Issue 4.0	User Manual for the FCS, OPS and MTT of the Integrated Train Condition Monitoring System
BBC 0659 Version 3	Guidelines for Using GSM Data Communication in Transnet Freight Rail
BBC1776 Version 3	Procedures for GSM Data Users in Transnet Freight Rail
BBF9193 version 1	GPRS failback between APN's for measurement systems
BBD6353 version 2	Radio Frequency Identification tag programming and Installation on Transnet Freight Rail Vehicles

3 REQUIREMENTS

3.1 Context Diagram

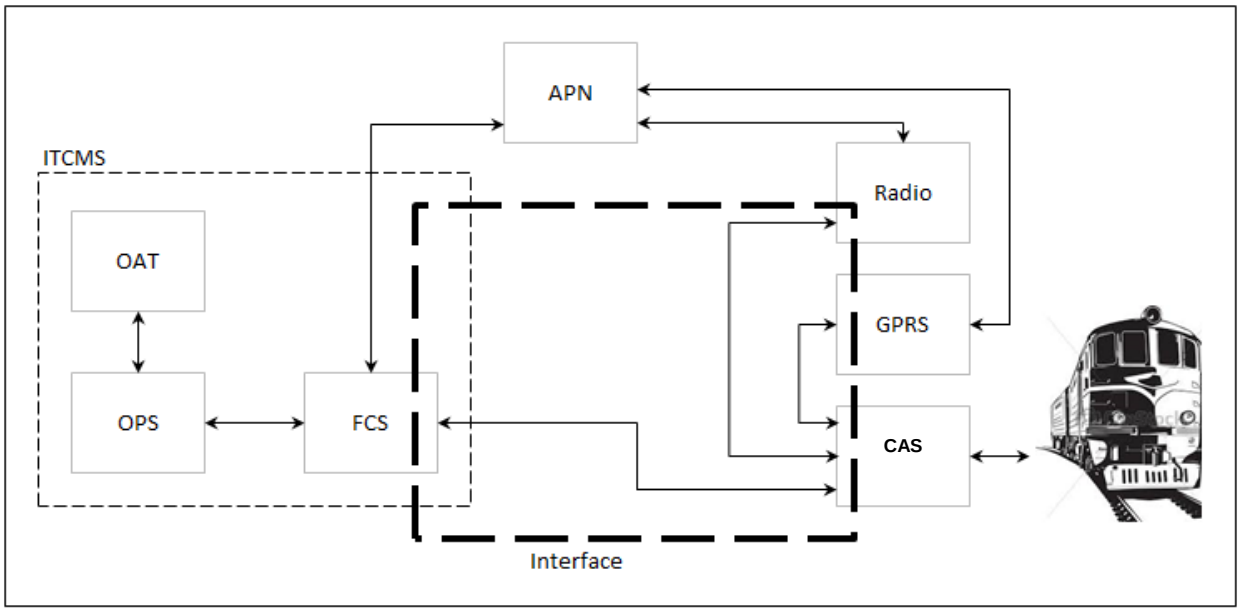

Figure 1 – Context Diagram

3.2 Physical characteristics

3.2.1 100BASE-TX Ethernet over CAT5 UTP terminated with RJ-45 connectors.

3.2.2 The telecommunication equipment on site shall determine if it shall be a straight or cross-over Ethernet network cable.

3.2.3 The length of the Ethernet network cable shall be determined for each site on installation by the appointed project manager.

3.3 Redundancy

3.3.1 The interface between the ITCMS and the CAS shall consist of two communication channels, a primary and a secondary channel.

3.3.2 The secondary communication channel shall be invoked (when configured) upon failure of the primary communication channel to connect to the ITCMS.

3.3.3 The CAS shall switch over to the secondary communication channel in the event of primary communication channel failure. This function shall be configurable. The CAS shall initiate the communication to the ITCMS. The messages and protocols shall change if necessary to match the secondary channel.

3.3.4 The CAS shall continuously check the primary channel, when in secondary mode to revert back when communications is re-established on the primary channel.

3.3.5 Specifications BBC 0659 Version 3 "Guidelines for Using GSM Data Communication in Transnet Freight Rail" and BBC1776 Version 3 "Procedures for GSM Data Users in Transnet Freight Rail" shall be used when GSM communication is employed.

3.3.6 The CAS shall employ APN fail over as specified in BBF9193 version 1 "GPRS failback between APN's for measurement systems" when GSM communication is employed.

3.4 Telecommunication channels

The supplier of the CAS shall enquire from the duly appointed project manager what telecommunication channels shall be available on the relevant sites.

3.4.1 10BASE-T Ethernet (or better) employing TCP/IP (Only TCP shall be used as transport layer and not UDP or any other protocol that does not employ error correction and data delivery guarantees).

3.4.2 GPRS Cellular Telephone Network with GPRS modems with Ethernet (TCP/IP) capabilities.

3.4.3 The interface shall have the capability to interface with the GPRS modems by using Hayes compatible AT commands to control the modems.

3.4.4 Radio modems (10BASE-T Ethernet (or better)).

3.4.5 The radio interface shall have the capability to interface with radio modems with Ethernet 10/100MB network employing TCP/IP and allow for the times to establish reception and transmission.

3.5 Performance characteristics

3.5.1 The interface shall have sufficient error detection and correction algorithms to ensure data integrity.

3.5.2 All communication channels that are active shall be monitored for correct working. The protocol employed shall generate a communications alarm if any of the communication channels failed, for example if data files are sent with FTP and they fail to arrive at the ITCMS although the self-check messages arrive correctly utilising a different communication methodology.

3.5.3 The CAS shall clear the memory of SIM cards on a regular basis to prevent SIM card memory becoming full with unread SMSs and resent call histories.

3.5.4 The CAS shall accommodate a message containing self-check configuration parameters from the ITCMS to the CAS. The message shall include the following configuration options:

3.5.4.1 Execute the self-check after the passage of the train

3.5.4.2 Execute the self-check after a certain period of time has elapsed. The duration between self-checks shall be configurable

3.5.4.3 A combination of the above

3.5.5 The interface shall accommodate a message from the ITCMS to the CAS requesting a self-check. The message shall at least contain the following information:

3.5.5.1 Site Identification to identify the unit

3.5.5.2 Self-check request identifier

3.5.6 The interface shall accommodate a message from the CAS to the ITCMS acknowledging that the self-check message has been received. The message shall at least contain the following information:

3.5.6.1 Site Identification to identify the unit

3.5.6.2 Acknowledgement identifier

3.5.6.3 System Status (Self-check in progress, System acquiring train information, System Idle)

3.5.6.4 System Condition (E.g. dirty lens, low voltage, out-of-calibration period)

3.5.7 The interface shall accommodate a message from the CAS to the ITCMS to transfer train condition alarm information. The message shall at minimum contain the following information:

3.5.7.1 Message Identifier

3.5.7.2 Site Identification to identify the unit

3.5.7.3 Alarm sequence number

3.5.7.4 Train Number, if available. If this information is not available this message field shall be updated with a unique identifier

3.5.7.5 Total number of vehicles on the train

3.5.7.6 Alarm Date and Time

3.5.7.7 Vehicle position in the train, from the front (in the direction of train travel), that has a condition alarm

3.5.7.8 Bogie or axle number applicable on the train, from the front (in the direction of train travel), that has a train condition alarm

3.5.7.9 Bogie or axle number applicable on the vehicle, if applicable, from the front (in the direction of train travel) that has a condition alarm

3.5.7.10 RFID tag data if the CAS is fitted with an RFID tag reader or if RFID tag data is available on site from the FCS

3.5.7.11 Side of the vehicle, if applicable, where the alarm occurred with reference in the direction of train travel

3.5.7.12 Side can be left, right, middle, top or bottom

3.5.7.13 Direction of travel, i.e. UP or DOWN

3.5.7.14 Type of alarm (which can be an absolute alarm level, differential alarm level, and average deviation alarm level etc., depending of the capability of the train condition measurement system)

3.5.7.15 Alarm level used for generating the alarm for the particular alarm type

3.5.7.16 Measured value if available

3.5.8 The interface shall accommodate a message from the ITCMS to the CAS acknowledging the successful transfer of train condition alarm information. The message shall also inform the train condition measurement system if the transfer was not successful. The message shall at least contain the following information:

3.5.8.1 Site Identification to identify the unit

3.5.8.2 Acknowledgement identifier

3.5.8.3 Result of the transfer

3.5.9 The interface shall accommodate a message from the CAS to the ITCMS to transfer train component condition information. The message shall at least contain the following information:

3.5.9.1 Message Identifier.

3.5.9.2 Site Identification to identify the unit

3.5.9.3 Date and time of the passage of the train

3.5.9.4 Train Number, if available. If this information is not available the message field shall be updated with a unique identifier

3.5.9.5 Direction of travel, i.e. UP or DOWN

3.5.9.6 Run-in speed of the train

3.5.9.7 Run-out speed of the train

3.5.9.8 Number of axles on the train

3.5.9.9 Number of vehicles on the train

3.5.9.10 Length of the train in metres

3.5.9.11 Speed of each vehicle

3.5.9.12 A condition entry for the train, each vehicle, bogie, wheel or axle (where applicable) containing the following information:

3.5.9.12.1 Vehicle, bogie or axle sequence number on the train from the front (in the direction of train travel)

3.5.9.12.2 The vehicle, bogie or axle number from the absolute front of the vehicle if the CAS fitted with a tag reader

3.5.9.12.3 Vehicle, bogie or axle sequence number on the train from the front (in the direction of train travel)

3.5.9.12.4 RFID tag data if the CAS is fitted with an RFID tag reader or if RFID tag data are available on site from the FCS

3.5.9.12.5 Vehicle Type (I.e. Locomotive or wagon)

3.5.9.12.6 Bogie or axle sequence number on the vehicle (in the direction of train travel)

3.5.9.12.7 Condition value for each measurement point on side one of the train as specified by the relevant CAS specification

3.5.9.12.8 Condition value for each measurement point on side two of the train as specified by the relevant CAS specification

3.5.9.12.9 Speed of each axle in km/h

3.5.9.12.10 Distance to the next axle

3.5.9.13 The mass of the train and each vehicle component measured, as specified in the relevant in-motion weigh bridge specifications, in the case of a weigh bridge.

3.5.10 The interface shall accommodate messages, which will allow for the transfer of the configuration parameters from the CAS to the ITCMS. The messages shall at least contain the following information:

3.5.10.1 Site Identification to identify the unit

3.5.10.2 Configuration parameter Identifier

3.5.10.3 Configuration values

3.5.11 The interface shall accommodate messages, which will allow for the transfer of the configuration parameters from the ITCMS to the CAS. The messages shall at least contain the following information:

3.5.11.1 Site Identification to identify the unit

3.5.11.2 Configuration parameter Identifier

3.5.11.3 Configuration values

3.5.12 The vehicle related messages shall contain the following when the train condition measurement system has an RFID tag reader:

(See latest version of specification BBD6353 “Radio Frequency Identification tag programming and Installation on Transnet Freight Rail Vehicles”)

3.5.12.1 Vehicle number

3.5.12.2 Owner code

3.5.12.3 Vehicle type

3.5.12.4 Orientation

3.5.13 The interface shall accommodate a time synchronisation message from the ITCMS to the train condition measurement system.

3.5.14 The supplier of the CAS shall provide a document, comprehensively describing any other messages not specified in the paragraphs above.

3.5.15 The ITCMS does not accommodate multimedia files. Multimedia files shall be sent to a database as specified by the relevant CAS functional specification