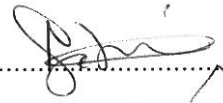**TRANSNEɾ**

freight rail

TECHNOLOGY MANAGEMENT

IMPLEMENTATION GUIDELINES

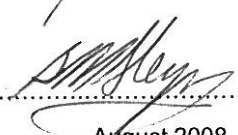# GUIDELINES FOR USING GPRS COMMUNICATION IN TRANSNET FREIGHT RAIL

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Transnet Freight Rail

Transnet and Relevant Third Parties

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1 SCOPE

The aim of this document is to present guidelines for the utilisation of GPRS for data communication at Transnet Freight Rail. These guidelines are presented with a set of procedures, methods and requirements. The document also describes an overview of possible GPRS applications at Transnet Freight Rail within a context presented in Appendix A.

2 BACKGROUND

The layout in Appendix A illustrates an overview of the Transnet Freight Rail GPRS configuration for different applications communicating to servers within the Transnet Freight Rail network. It can be noted that Transnet Freight Rail has a direct GPRS data communication link from field stations / units to servers on the Transnet Freight Rail WAN facilitated by Transnet Freight Rail's Wireless Data Providers and Internet Service Provider. Below is the operational description of the layout in Appendix A.

The field devices communicate GPRS data by means of GPRS enabled SIM cards in GSM/GPRS modems / devices. All allocated server and SIM IP addresses are static within the Transnet Freight Rail network. The field IP addresses are authenticated on the Transnet Freight Rail Access Point Name (APN) to allow access to the Transnet Freight Rail WAN. The SIM cards are registered on the Transnet Freight Rail APN that allows them access to the Transnet Freight Rail WAN irrespective of the type of application or the destination IP. Once the data is within the Transnet Freight Rail WAN it is routed to the correct address through processes at the Transnet Freight Rail Information Communication and Technology Management (IC&TM) office.

3 APPLICABLE DOCUMENTS

The following specifications and protocol documents of the exact issue 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.

- BBC4204   TRITON Data Communication Protocol

- BBC1776   Procedures for GPRS Users in Transnet Freight Rail

4 REQUIREMENTS

4.1 Track-side application

The implementation of a trackside GPRS application at Transnet Freight Rail requires the following:

1. IP stack enabled GSM/GPRS modem or compatible device.

2. Data enabled SIM card provisioned on the Transnet Freight Rail Access Point Name (APN)

3. Operational server hosting the application database / listener within the Transnet Freight Rail network with firewall access to the APN.

4. Sufficient GSM coverage and GPRS availability at the field stations or application locations.

5. Latest revisions of selected modem AT commands or low-level modem control instructions documents to control modem GPRS connectivity. The use of generic operating system modem control drivers is not allowed.

4.2 Locomotive application

The implementation of a locomotive GPRS application at Transnet Freight Rail requires the following:

1. TRITON communication protocol document (BBC4204) from Transnet Freight Rail.

2. Equipment with an Ethernet interface.

5 TFR GPRS COMMUNICATION PROCESS

The Transnet Freight Rail implementation of GPRS allows for communication using the full IP stack e.g. TCP/IP, UDP/IP, HTTP, and FTP etc. The Transnet Freight Rail network has been set up such that there is a direct communication link between field devices and Transnet Freight Rail WAN servers. It is however recommended that vendors employ messaging based communication protocols such as UDP where possible to minimise data throughput. File transfers and continuous connections over GPRS shall be kept to a minimum where they are not avoidable. New field systems shall incorporate the most efficient data compression methods in their communication modules designs..

Users of GPRS for field applications are strongly discouraged from using generic operating system drivers to control the GPRS connection on their selected GPRS modems / modules. TFR strongly recommends low-level control of GPRS devices at a stack or AT command level. The TFR GPRS communication link is not immune to idle connection timeouts and mobile operator infrastructure failures. Hence, the recommendation to use the lowest possible modem control instructions that allow for complete control and reset of the modems as well as complete detection of connection breaks and ability to automatically reinstate GPRS connections to WAN servers when unintentionally broken.

GPRS devices need to be configured with an APN parameter that routes the SIM card to the appropriate authentication point. The name that is used for the Transnet Freight Rail APN in field or trackside applications is ***its.spoornet.co.za***. The APN has been configured such that all SIM cards that have been defined obtain s*tatic IP addresses*, i.e. the same IP address shall be retained regardless of modem replacements as long as the SIM card is not replaced. Locomotive applications do not require individual GPRS modems but communicate via an onboard communication system called TRITON. The interfaces and protocols for these applications are described in document BBC4204.

5.1 GPRS communication from the Locomotive

Transnet Freight Rail has implemented a solution to integrate all communications from Transnet Freight Rail locomotives in an onboard communication system called TRITON. All devices in the locomotive can communicate to the specific servers on the TFR WAN. The interface to the TRITON system is Ethernet connection. This system contains a 10/100Mbps Ethernet switch that handles multiple Ethernet communications from locomotive devices to TFR WAN servers, one of which is configured to forward UDP/IP data messages to device specific servers or applications on the WAN. Furthermore,

TRITON provides full connectivity between onboard devices connected to it.

5.2 Establish connection from Field Application

Trackside field applications can establish connections to a server by initiating a GPRS session on a modem directly and executing the appropriate IP stack instructions to connect to a specific application running on a WAN server with a specific IP address listening on a known port. Once a connection has been made then communication is full duplex. An application on the server can acknowledge the connection and perform necessary actions. Communication can be initiated from a WAN server where a concise record of IP addresses is kept and the field application is switched on and has an active GPRS session.

5.3 Establish connection from Server

It is only possible to establish connection from a server to a field unit directly if the field unit has an active GPRS session and has an application listening and waiting for a connection. The field unit should then always be online/ in a ready state to accept connection requests from a server or any other device.

Locomotive devices that communicate via the TRITON communicate on specific ports. The TRITON WAN Switch routes incoming data messages to appropriate system specific WAN server applications. This TRITON WAN Switch also routes messages sent by WAN applications to specific onboard applications in specific locomotives using the protocols and processes defined in document BBC4204.

6 PROCEDURES

This section refers to the procedures that should be followed to obtain SIM cards, provision the SIM cards on the APN, obtain SIM IP addresses and define new servers for GPRS access. A Transnet Freight Rail document titled, "Procedures for GPRS Users in Transnet Freight Rail" (BBC1776), containing this information is available on request.

6.1 Device Approval

6.1.1 TFR shall at their discretion arrange for the Network Service Provider / Wireless Data Provider to approve any devices in which the SIM cards shall be inserted into.

6.1.2 All off-the-shelf modem devices shall be selected from an approved list of devices or submitted to TFR for approval.

6.1.3 The equipment suppliers shall guarantee all specialised non-standard equipment. This is important to ensure a high quality of service from the technical support service desk.

7 GLOSSARY OF TERMS

APN   :Access Point Name

GPRS   :General Radio Packet Service

IP   :Internet Protocol

NSP   :Network Service Provider

TCP   :Transmission Control Protocol

UDP   :Universal Datagram Protocol

HTTP   :Hypertext Terminal Protocol

FTP   :File Transfer Protocol

WDP   : Wireless Data Provider

WAN   : Wide Area Network
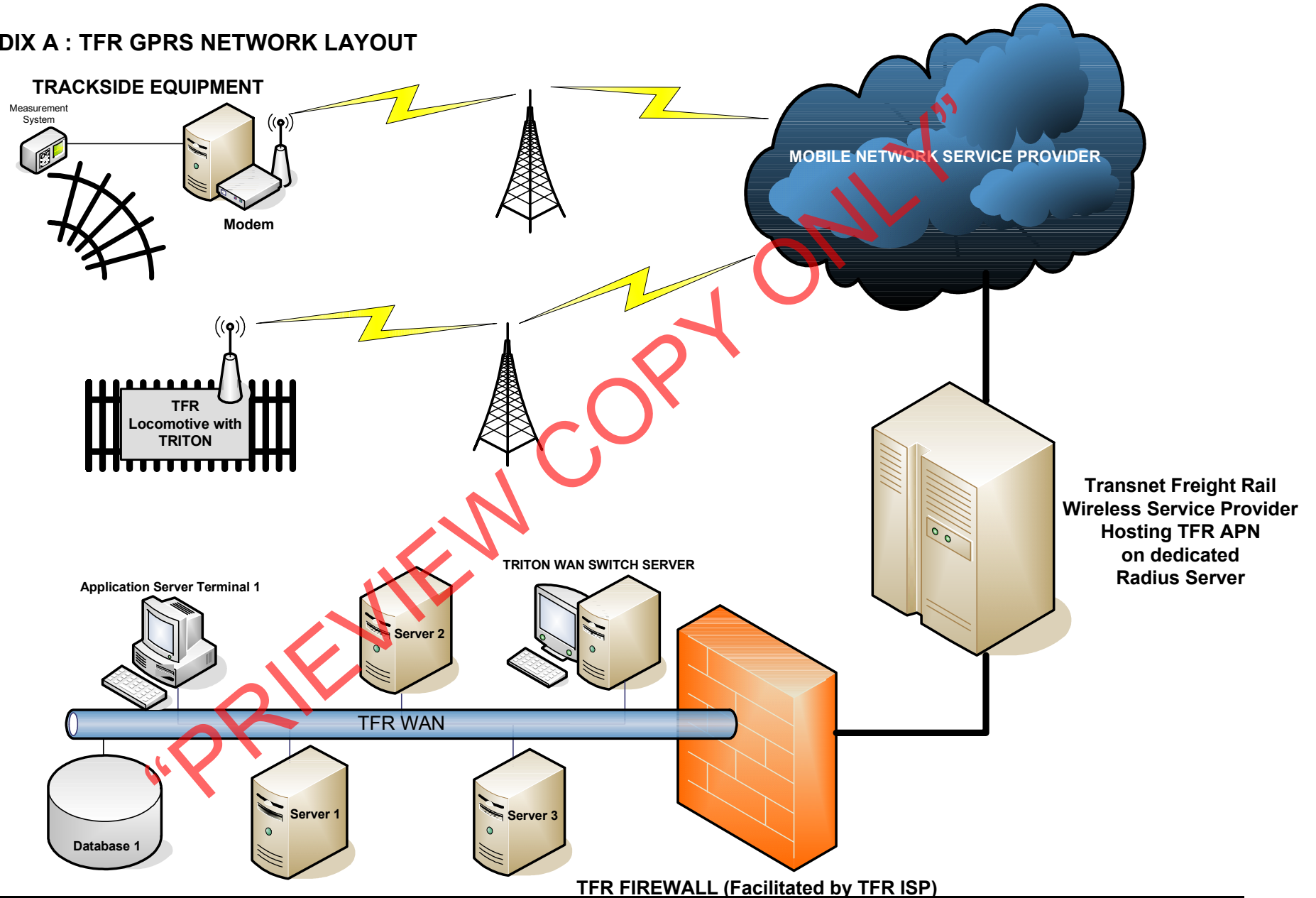
ISP   : Internet Service Provider

IC&TM   : Information Communication and Technology Management

8 APPENDIXES

9 APPENDIX A : TFR GPRS NETWORK LAYOUT

TRACKSIDE EQUIPMENT

Measurement System

Modem

MOBILE NETWORK SERVICE PROVIDER

TFR Locomotive with TRITON

Transnet Freight Rail Wireless Service Provider Hosting TFR APN on dedicated Radius Server

Application Server Terminal 1

TRITON WAN SWITCH SERVER

Server 2

TFR WAN

Database 1

Server 1

Server 3

TFR FIREWALL (Facilitated by TFR ISP)