

CDMA Data Application Simulator
Feature Description

Dyaptive SYSTEMS



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Table of Contents

- 1 Introduction 4
- 2 DMTS System Overview 4
- 3 Simulated Data Services 5
 - 3.1 File Transfer 6
 - 3.2 Web Browsing..... 6
 - 3.3 Real-time Bidirectional Service..... 7
- 4 Data Logging 8
- 5 CDMA Data Application Simulator License..... 9

1 Introduction

The Data Application Simulator allows the user to load a base station with a reproducible mixture of voice and data traffic patterns so that manufacturers and network operators can optimize and verify traffic scheduling and network performance. The Data Application Simulator can support traffic for real-time and non-real-time data services. It can be used to benchmark a network's key performance metrics such as data throughput, packet loss or latency.

It is important for equipment manufacturers:

- to verify and minimize latencies for data services
- to optimize scheduling algorithms for various packet sizes and transmission rates
- to verify the performance of different data applications during heavy voice traffic
- to create different real-time data call models and to verify their impact on voice services.

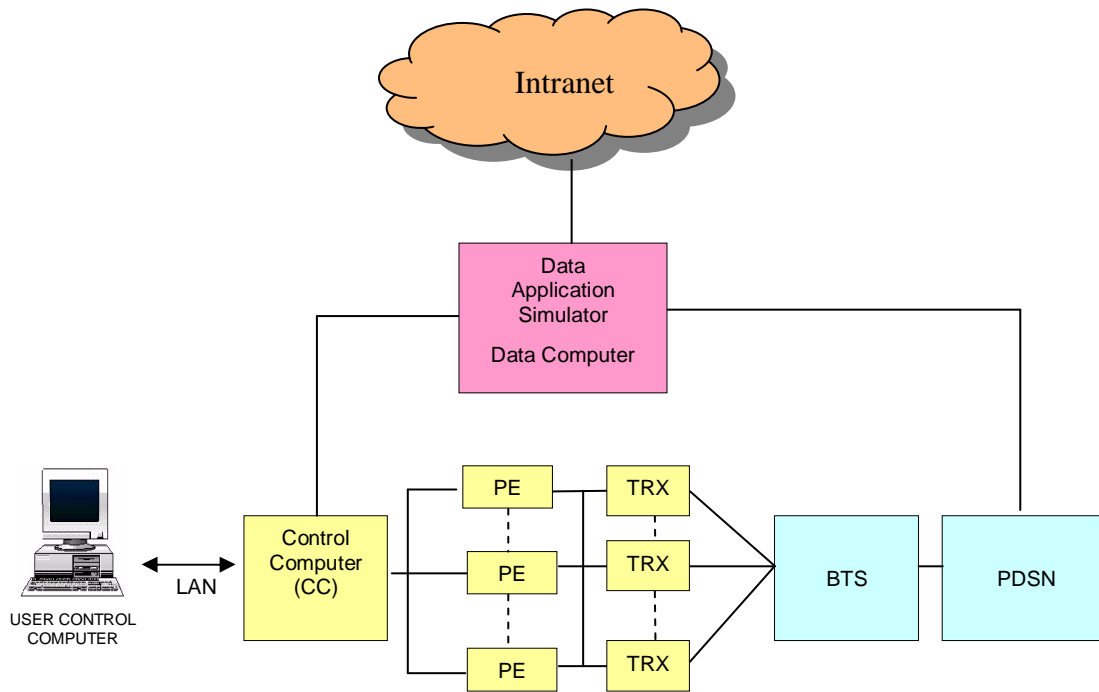
This Data Application Simulator allows the network operator to measure the impact that different classes of data service (e.g. web, file transfer, real-time) may have on existing services. The Data Application Simulator can provide metrics for answering questions like:

- how does a data service impact the latency or throughput or general quality of experience of existing services?
- what is the quality of experience for the data service?
- what is the cost impact of the data service, for example in terms of frequency, cell site or backhaul provisioning requirements?

2 DMTS System Overview

A DMTS-8000 data test system requires the following components:

- DMTS-8000, which generates voice calls and provides an interface for the Data Application Simulator to the RF network. It includes a Control Computer, one or more Processing Elements, and one or more Transceivers.
- A Data Computer and the Data Application Simulator application to control and monitor end-to-end data connections. The Data Application Simulator performs client side functions such as FTP put and FTP get, and requests URL downloads via HTTP or initiates the Push-To-Talk application. The Data Computer also supports network side activities such as FTP file serving, Web content for downloading by clients or PTT Server activities. For FTP and HTTP, the user has the option of using its own server in the network to fulfill the roles of a file and/or web server. For PTT, the multi-cast server portion of the PTT application must run on Dyaptive's Data Computer.
- The Data Application Simulator is controlled through the DMTS-8000 scripting interface and reports through the DMTS-8000 logging mechanism. The CDMA Performance Analyzer tool provides access to the data specific log entries through its graphical user interface.



3 Simulated Data Services

The Data Application Simulator supports the synthesis and generation of data traffic over the CDMA radio link interface for the following classes of data services:

- File download (e.g. FTP, ring-tone download, screensaver download)
- File upload (e.g. FTP, picture message)
- Web browsing (e.g. HTTP, WAP)
- Real-time, bidirectional service (e.g. Push-To-Talk, VoIP)

The file transfer and web browsing functionality are implemented using the FTP and HTTP protocols, resulting in a strong correlation with the real performance of these services over a CDMA network. The real-time, bidirectional service simulates services like PTT or VoIP in terms of traffic profiles but does not use real client and servers and the data flow is meant to be representative of the performance of an application of this class.

The DMTS-8000 allows for simultaneous data services for groups of VMTs using the forward and/or reverse channels.

The DMTS can monitor, process, and report the reliability and performance of the underlying data (SO33) calls in terms of the following GoS (Grade of Service) parameters:

- Data (SO33) group calls blocked
- Data (SO33) group calls dropped
- RLP frames in error i.e. FER
- SCH Rates

All of the data services can be mixed and added to existing voice and SMS traffic loads that are already available with the DMTS-8000 system.

3.1 File Transfer

The file transfer service functionality of the Data Application Simulator is designed to perform file transfers from a VMT Client to the Data Server (DS) or from the DS to the VMT. The transmitted file is initially stored on the target. Before a file transfer can occur, a VMT opens a PPP tunnel. This PPP tunnel can held open for the entire test session or regenerated for each file transfer.

The user can establish a specified number of parallel file transfer sessions in the forward and reverse direction, each employing a distinct SO33 connection. The user can specify different file transfer groups, each supporting one or more parallel transfers to/from the specified server. Each group can have its own configurable parameter set that determines:

- Target Server
- Transfer Size (or size distribution)
- Transfer Frequency (or frequency distribution)
- Transfer Direction

All groups are started and stopped with the DMTS-8000 test session. Groups cannot be interactively controlled.

The DMTS-8000 will monitor the performance of the file transfer sessions in terms of the following metrics for each group of data transfer mobiles:

- Number of attempted connections between data client and VMT port
- Number of successful connections between data client and VMT port
- Number of attempts at establishing a PPP tunnel to the PDSN
- Number of successful attempts at establishing a PPP tunnel to the PDSN
- Number of attempted file transfers
- Number of successful completed file transfers
- Cumulative bytes transferred
- Cumulative transfer time

3.2 Web Browsing

The user can specify different VMT groups, each containing one or more VMTs. Each group can have its own configurable parameter set that determines:

- URL of the web page
- Web Access Frequency (or frequency distribution)

The DMTS-8000 will monitor the performance of web transfers in terms of the following metrics for each group of web browsing mobiles:

- Number of attempted connections between data client and VMT port
- Number of successful connections between data client and VMT port
- Number of attempts at establishing a PPP tunnel to the PDSN

- Number of successfully attempts at establishing a PPP tunnel to the PDSN
- Number of attempted transfers
- Number of successfully completed transfers
- Number of objects transferred
- Cumulative bytes transferred
- Cumulative transfer time

3.3 Real-time Bidirectional Service

The service implementation is a simulation of a voice-like application. It can simulate SIP interactions and voice packet transfers among the members of a group of mobiles as realistically as possible. This implementation allows session setup signaling traffic to be transmitted as Short Data Burst, if supported by the network. The traffic packets over SO33 traffic channels using a connectionless protocol like UDP or RTP.

Each service participant first registers with the Server, hosted on either the Data Computer or on the dedicated Data Server. The Server then manages the list of service participants in each group and multicasts traffic amongst them. The Client and Server can simulate signaling exchanges for services like Push-to-Talk in a realistic manner. The listening participants log the QoE/QoS parameters at the end of each talk burst. The service session continues until the test session ends.

The DMTS-8000 monitors the performance of the service session in terms of the following metrics for each group of participants:

- Number of attempted connections between data client and VMT port
- Number of successful connections between data client and VMT port
- Number of attempts at establishing a PPP tunnel to the PDSN
- Number of successful attempts at establishing a PPP tunnel to the PDSN
- Cumulative Start-up time in seconds. It represents the time interval between sending the registration to the Server and receiving the right-to-speak indication.
- Cumulative End-to-End packet delay in seconds
- Cumulative count of traffic packets
- Cumulative count of lost traffic packets
- Cumulative count of Right-To-Speak indications

4 Data Logging

The Data Application Simulator application makes use of the standard DMTS-8000 logging libraries to write data to the OTA logs which are being recorded on the CC. Log entries include:

- Successful Connection to VMT Port
- Failed Connection to VMT Port
- Summary of messages received and transmitted during PPP negotiation
- Successful PPP Connection with allocated PPP session and IP
- Failed PPP Connection
- Data Transfer Start (file transfer or web transfer)
- Data Transfer Complete (file transfer or web transfer) with average data rate and total size for the transfer
- Data Transfer Failed (file transfer or web transfer)
- Data Service Registration Message
- Data Service Registration Acknowledgement Message
- Data Service Invite Message
- Data Service Invite Acknowledgement Message
- Data Service Completion Message
- Average end-to-end packet delay for each VMT
- Average packet loss for each VMT
- Average packet jitter for each VMT
- Total packets for each VMT
- Start-up time for each VMT

These log entries will be reported on a per VMT basis and can be viewed with the CDMA Performance Analyzer. This tool provides additional data analysis functions and a graphical representation of the collected information.

5 CDMA Data Application Simulator License

The CDMA Data Application Simulator is licensed for the

- DMTS-8000 per 100 IP Sessions
- DMTS-3200 per 50 IP Sessions, upgradeable to 100 IP sessions

Licensed IP Sessions can be applied across BPEs of a DTMS-8000 system and they can be used by up to 4 different users in groups of 25, 50, 75 or 100 sessions:

User 1	100	75	50	50	25
User 2	-	25	50	25	25
User 3	-	-	-	25	25
User 4	-	-	-	-	25

A license for the DMTS-8000 can be upgraded to add additional blocks of 100 IP Sessions.

The CDMA Data Application Simulator license for the DMTS-3200 can not be shared by different users and can support up to a maximum of 100 IP Sessions.

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