

Analyze | Assure | Accelerate™

SPIRENT™

UMTS Diagnostic Monitor and Test Automation Tools

Diagnostic Monitor Overview

- Diagnostic Monitors (DMs) are used to monitor UMTS User Equipment (UE) and network performance.
 - Communicate to the UE device under test via device serial interface and device-specific cable.
- DMs monitor and record parametric data as well as Common Air Interface (CAI) messages.
 - Parametric data, such as power levels, rake receiver, and UE status, is presented to the user in tabular and graphical formats.
 - CAI messages are decoded and recorded for real-time or later analysis by the user.

Why Use Diagnostic Monitors?

- UE Manufacturers

- Use DMs throughout the development cycle for testing and analysis of new and existing products.
 - By Software Developers to verify control algorithms for power, UE state, CAI messaging response and decoding etc.
 - By Hardware Developers to monitor and verify hardware RF performance and stability.
 - By Deployment/Field Test Teams as portable logging devices for Drive and Field Testing.

- Network Operators

- Field and Drive Test Teams use DMs to verify proper UE and network performance

Why Use Diagnostic Monitors? (cont'd)

- Chipset Manufacturers

- Use DMs to verify prototype designs
- Supply DMs as development tools to their UE manufacturer customers
 - By using a commercial DM, chipset manufacturers can concentrate on developing products rather than support tools.

- UE Test Labs

- DMs enable Automation
 - Give conformance test labs high levels of automation by allowing simultaneous UE control and monitoring.

Why Spirent?

- Spirent is the Automation Standard in CDMA
 - Adopted by Carriers, Test Labs, Handset and Chipset Mfgs.

Network Operators	Test Labs	Handset Mfgs	Chipset Mfgs
Verizon Wireless	ITS	Nokia	QUALCOMM
Sprint PCS	News IQ	Motorola	VIA
U.S. Cellular	PC Test	Sony-Ericsson	PrarieComm
Alltel	Lucent	Kyocera	
AT&T Wireless	Motorola	LG	
	Nortel	Samsung	

- Industry Leading Features
 - Common and uniform method with which to monitor and automate all UE devices

UDM Overview

Rake Receiver (Fingers) and BER

Tx, Rx Power and RRC State

Chipset/UE Independent

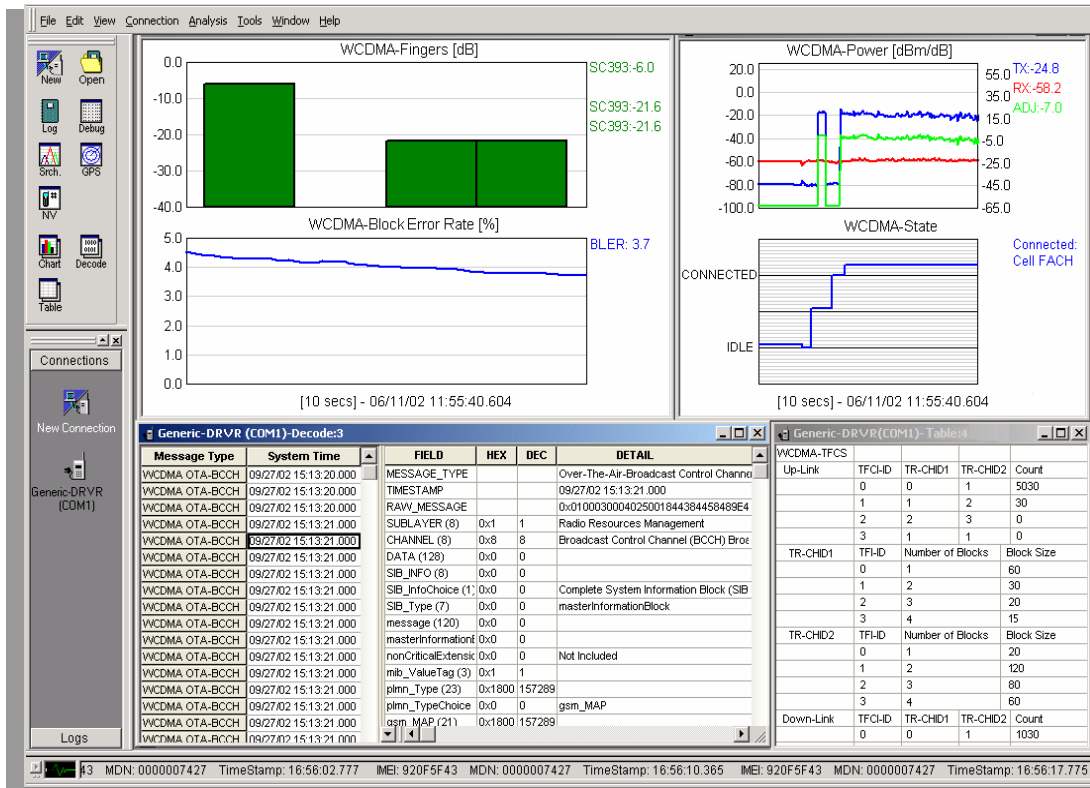
Monitor Multiple UEs Simultaneously

CAI message logging with real-time XML decoder

Real-time displays with playback

Embedded Data Testing

Powerful Automation & Scripting Environment



CAI message decoding

TFCS Table

UDM V2 - Data Logging

XML decoder engine provides flexibility and protection against specification volatility

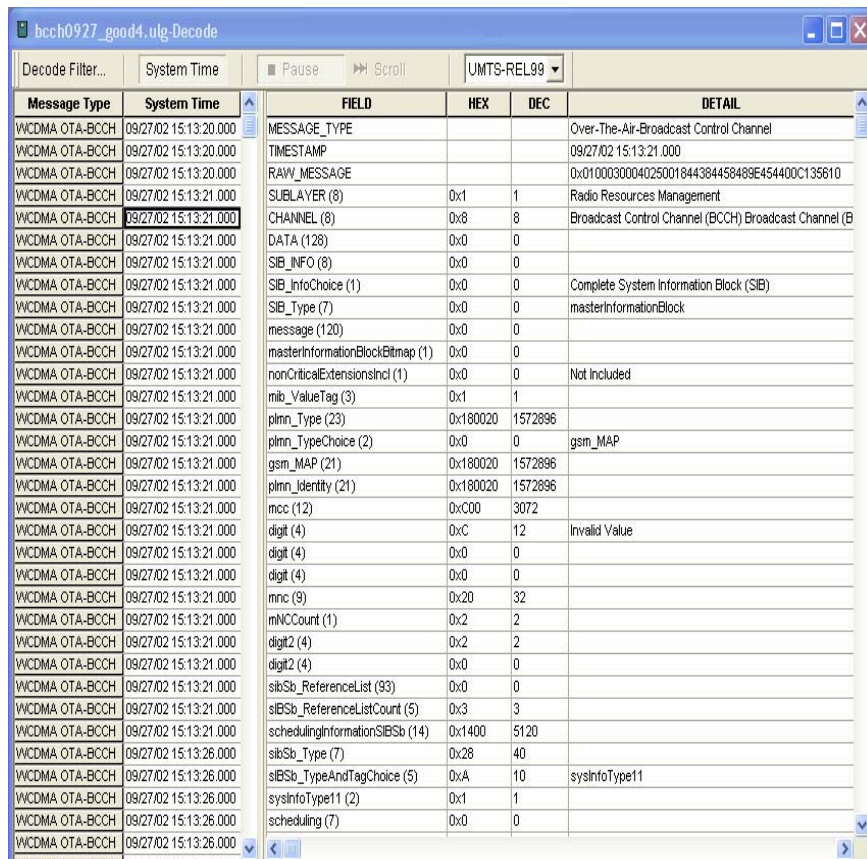
Powerful real-time data logging

Display, logging, decoding and playback of:

- CAI Layer 3 messages
- W-CDMA parameters
- Unique UE messages

Comprehensive Log Masks ensure only pertinent data is displayed and logged

Enhanced Find and Filtering to simplify Log File analysis

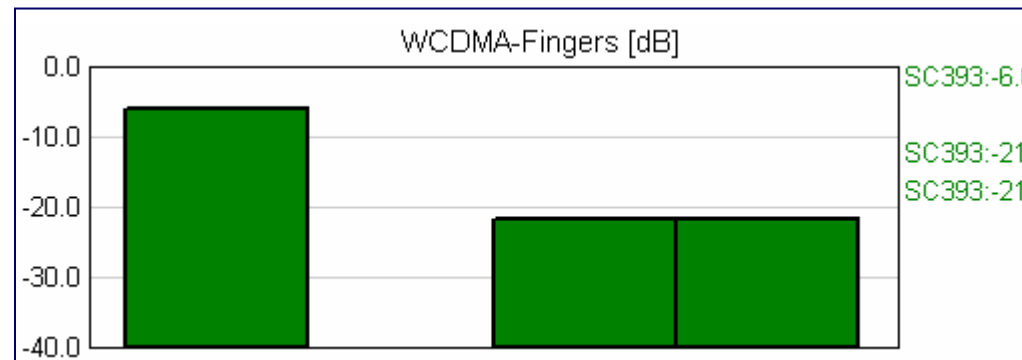
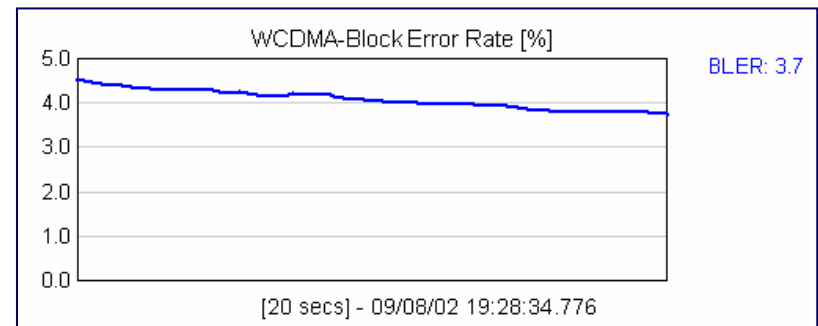
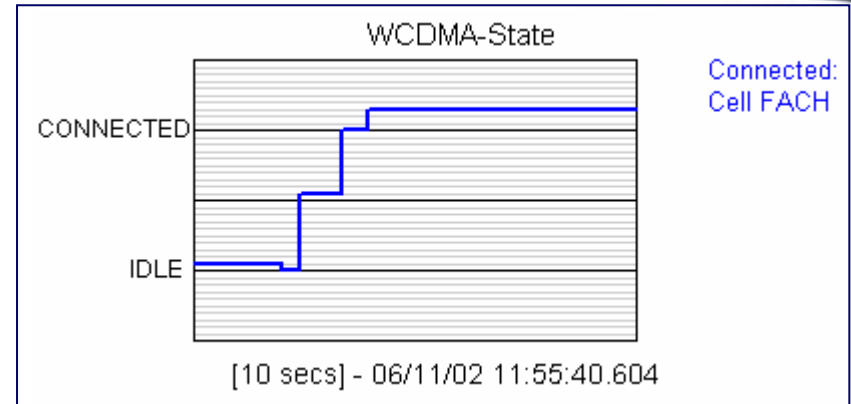


The screenshot shows the 'bcch0927_good4_ulg.Decode' window. It features a 'Decode Filter...' field, a 'System Time' field, and a 'UMTS-REL99' dropdown menu. The main area is a table with columns for 'Message Type', 'System Time', 'FIELD', 'HEX', 'DEC', and 'DETAIL'. The table lists various WCDMA OTA-BCCH messages with their corresponding fields and values.

Message Type	System Time	FIELD	HEX	DEC	DETAIL
WCDMA OTA-BCCH	09/27/02 15:13:20.000	MESSAGE_TYPE			Over-The-Air-Broadcast Control Channel
WCDMA OTA-BCCH	09/27/02 15:13:20.000	TIMESTAMP			09/27/02 15:13:21.000
WCDMA OTA-BCCH	09/27/02 15:13:20.000	RAW_MESSAGE			0x0100030004025001844384458489E454400C135610
WCDMA OTA-BCCH	09/27/02 15:13:21.000	SUBLAYER (8)	0x1	1	Radio Resources Management
WCDMA OTA-BCCH	09/27/02 15:13:21.000	CHANNEL (8)	0x8	8	Broadcast Control Channel (BCCH) Broadcast Channel (B
WCDMA OTA-BCCH	09/27/02 15:13:21.000	DATA (128)	0x0	0	
WCDMA OTA-BCCH	09/27/02 15:13:21.000	SIB_INFO (8)	0x0	0	
WCDMA OTA-BCCH	09/27/02 15:13:21.000	SIB_InfoChoice (1)	0x0	0	Complete System Information Block (SIB)
WCDMA OTA-BCCH	09/27/02 15:13:21.000	SIB_Type (7)	0x0	0	masterInformationBlock
WCDMA OTA-BCCH	09/27/02 15:13:21.000	message (120)	0x0	0	
WCDMA OTA-BCCH	09/27/02 15:13:21.000	masterInformationBlockBitmap (1)	0x0	0	
WCDMA OTA-BCCH	09/27/02 15:13:21.000	nonCriticalExtensionsIncl (1)	0x0	0	Not Included
WCDMA OTA-BCCH	09/27/02 15:13:21.000	mib_ValueTag (3)	0x1	1	
WCDMA OTA-BCCH	09/27/02 15:13:21.000	plmn_Type (23)	0x180020	1572896	
WCDMA OTA-BCCH	09/27/02 15:13:21.000	plmn_TypeChoice (2)	0x0	0	gsm_MAP
WCDMA OTA-BCCH	09/27/02 15:13:21.000	gsm_MAP (21)	0x180020	1572896	
WCDMA OTA-BCCH	09/27/02 15:13:21.000	plmn_Identity (21)	0x180020	1572896	
WCDMA OTA-BCCH	09/27/02 15:13:21.000	mcc (12)	0xC00	3072	
WCDMA OTA-BCCH	09/27/02 15:13:21.000	digit (4)	0xC	12	Invalid Value
WCDMA OTA-BCCH	09/27/02 15:13:21.000	digit (4)	0x0	0	
WCDMA OTA-BCCH	09/27/02 15:13:21.000	digit (4)	0x0	0	
WCDMA OTA-BCCH	09/27/02 15:13:21.000	mnc (9)	0x20	32	
WCDMA OTA-BCCH	09/27/02 15:13:21.000	mNCCount (1)	0x2	2	
WCDMA OTA-BCCH	09/27/02 15:13:21.000	digit2 (4)	0x2	2	
WCDMA OTA-BCCH	09/27/02 15:13:21.000	digit2 (4)	0x0	0	
WCDMA OTA-BCCH	09/27/02 15:13:21.000	sibSb_ReferenceList (93)	0x0	0	
WCDMA OTA-BCCH	09/27/02 15:13:21.000	sibSb_ReferenceListCount (5)	0x3	3	
WCDMA OTA-BCCH	09/27/02 15:13:21.000	schedulingInformationSIBSb (14)	0x1400	5120	
WCDMA OTA-BCCH	09/27/02 15:13:26.000	sibSb_Type (7)	0x28	40	
WCDMA OTA-BCCH	09/27/02 15:13:26.000	sibSb_TypeAndTagChoice (5)	0xA	10	sysInfoType11
WCDMA OTA-BCCH	09/27/02 15:13:26.000	sysInfoType11 (2)	0x1	1	
WCDMA OTA-BCCH	09/27/02 15:13:26.000	scheduling (7)	0x0	0	

Real-Time Charting

- User Configurable
 - Over Time
 - Instantaneous
- Logging and Playback of chart data
- View charts from multiple UEs simultaneously
- Charts
 - RF Power (Tx, Rx, Pwr Cntl)
 - Rake Receiver Fingers
 - UE RRC State
 - Block Error Rate
 - Handset Throughput (Tx,Rx)



Customizable Table Views

- Windows uniquely filtered
- View tables from multiple UEs simultaneously
- Logging and Playback of table data
- Table data
 - Handset Status Information
 - IMEI, State, HW/SW Version...
 - W-CDMA Parameters
 - Channel, Pilot Set, TFCS,...

Generic-DDSimulator (COM1)-Table:4

Table Filter... Auto Protocol

Handset-Hardware Version:	DD-Sim-HW 0.0
Handset-International Mobile Equipment Identity:	1223456789
Handset-Software Version:	UMTS-REL 99
WCDMA-Block Error Rate:	
	GOOD_BLOCKS 100
	TOTAL_BLOCKS 300
	BLER 66.7 %
WCDMA-State:	Connected/Cell PCH
WCDMA-Timestamp:	16:01:12.000

Generic-DDSimulator (COM1)-Table:6

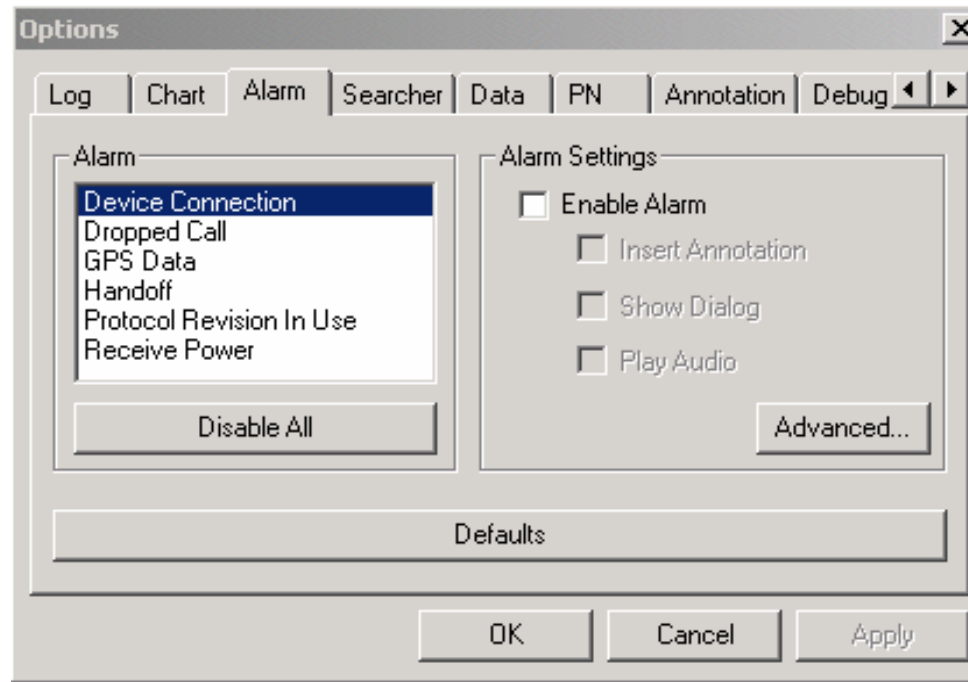
Table Filter... Auto Protocol

WCDMA-Fingers:						
	FINGER	SC	POS	ECIO (dB)	LOCK	
	F1	26	0x65	2.500000	Locked	
	F2	27	0x66	3.500000	Not Locked	
	F3	278	0x68	4.500000	Locked	
Pilot Set						
Active Set:	PSC	SSC	DIV	FREQ (MHz)	TPC	ECIO (dB)
	1	1	1		1	1.000000
	2	2	0		2	2.000000
Monitored Set:	PSC	SSC	DIV	FREQ (MHz)	TPC	ECIO (dB)
	1		1	2.000000		3.000000
	2		0	2.800000		3.400000
Detected Set:	PSC	SSC	DIV	FREQ (MHz)	TPC	ECIO (dB)
	1		1			1.000000
	2		0			2.100000
WCDMA-Power:						
	TX			0.500000 dBm		
	RX			1.000000 dBm		
	ADJ			2.000000 dB		

Real-Time Analysis

Individually configurable alarms reduce workload and post processing

- Automatic log file annotation for post analysis
- Plays customizable WAV file for audible alert
- Customizable Pop-up dialog for visual alert
- Alerts
 - Call Start/End
 - Dropped Call
 - Call Failed
 - Hard/Soft Handovers
 - Low Rx Power Level
 - Loss of UE Connection
 - Loss of GPS Data



Automated Call Generation

- Voice call generation
 - UE Originated or Terminated calls
 - Real-time Call Statistics
 - Support multiple UEs simultaneously
 - Run synchronized or independent
 - Customizable call alarms
- Data call generation
 - Embedded Data Services:
 - FTP
 - HTTP
 - Log File Annotations
 - Transfer start
 - Transfer complete
 - Relative throughput

The screenshot shows the 'Voice Call Generator' application window. It has a control bar with 'Start', 'Stop', 'Pause', and 'Configure...' buttons. The main area displays a tree view of two UEs, both identified as 'Generic-MSM5xxx (COM1)'. The first UE is in 'Idle/Awake' state with 'Completed' call generator state. Its statistics show 5 calls, 1 failed (20%), 0 dropped, and 5 attempted. The second UE is in 'Traffic/Conversation' state with 'Conversation' call generator state. Its statistics show 1 call, 0 failed, 0 dropped, and 1 attempted.

UE	Device State	Voice Call Generator State	Call	Failed Calls	Dropped Calls	Attempted Calls
Generic-MSM5xxx (COM1)	Idle/Awake	Completed	5 of 5	1 (20 %)	0 (0 %)	5
Generic-MSM5xxx (COM4)	Traffic/Conversation	Conversation	1 of 5	0 (0 %)	0 (0 %)	1

The screenshot shows the 'Data Call' application window with the 'FTP' tab selected. It contains fields for 'FTP Server' (seds.lpl.arizona.edu), 'User Name', 'Password', and 'Remote File' (/ls-IR.Z). There are 'Download' and 'Upload' buttons, each with a file selection icon. Checkboxes for 'Annotate' and 'Loop' are present. A 'Status' field is at the bottom.

Field	Value
FTP Server	seds.lpl.arizona.edu
User Name	
Password	
Remote File	/ls-IR.Z
Local File	

Bulk Call Demonstration

- Bulk Call Generation using VBScript
 - Remotely launch UDM to initiate logging of 16 phones simultaneously
 - Originates 32 calls simultaneously

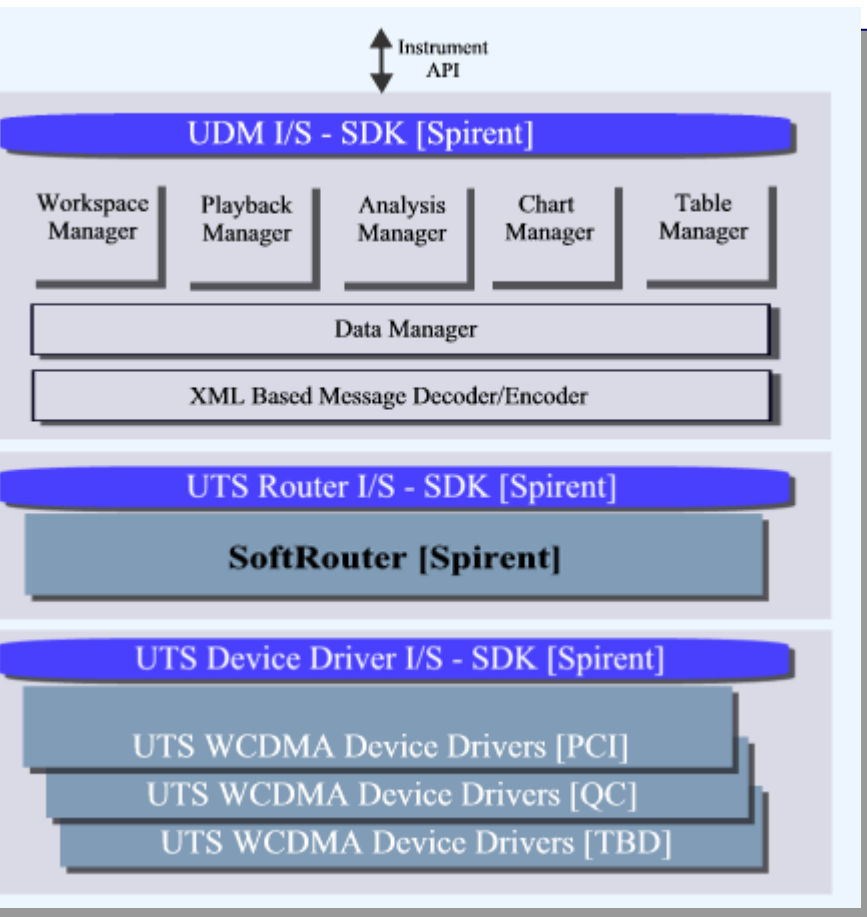


A screenshot of a data table with multiple columns and rows. The columns include 'Source', 'Destination', 'Duration', 'Status', and 'Total'. The rows represent individual call records, with some cells highlighted in green. The table is displayed in a windowed application environment.

Source	Destination	Duration	Status	Total
10041	10041	0.0000	Success	0.0000
10042	10042	0.0000	Success	0.0000
10043	10043	0.0000	Success	0.0000
10044	10044	0.0000	Success	0.0000
10045	10045	0.0000	Success	0.0000
10046	10046	0.0000	Success	0.0000
10047	10047	0.0000	Success	0.0000
10048	10048	0.0000	Success	0.0000
10049	10049	0.0000	Success	0.0000
10050	10050	0.0000	Success	0.0000
10051	10051	0.0000	Success	0.0000
10052	10052	0.0000	Success	0.0000
10053	10053	0.0000	Success	0.0000
10054	10054	0.0000	Success	0.0000
10055	10055	0.0000	Success	0.0000
10056	10056	0.0000	Success	0.0000
10057	10057	0.0000	Success	0.0000
10058	10058	0.0000	Success	0.0000
10059	10059	0.0000	Success	0.0000
10060	10060	0.0000	Success	0.0000
10061	10061	0.0000	Success	0.0000
10062	10062	0.0000	Success	0.0000
10063	10063	0.0000	Success	0.0000
10064	10064	0.0000	Success	0.0000
10065	10065	0.0000	Success	0.0000
10066	10066	0.0000	Success	0.0000
10067	10067	0.0000	Success	0.0000
10068	10068	0.0000	Success	0.0000
10069	10069	0.0000	Success	0.0000
10070	10070	0.0000	Success	0.0000
10071	10071	0.0000	Success	0.0000
10072	10072	0.0000	Success	0.0000
10073	10073	0.0000	Success	0.0000
10074	10074	0.0000	Success	0.0000
10075	10075	0.0000	Success	0.0000
10076	10076	0.0000	Success	0.0000
10077	10077	0.0000	Success	0.0000
10078	10078	0.0000	Success	0.0000
10079	10079	0.0000	Success	0.0000
10080	10080	0.0000	Success	0.0000

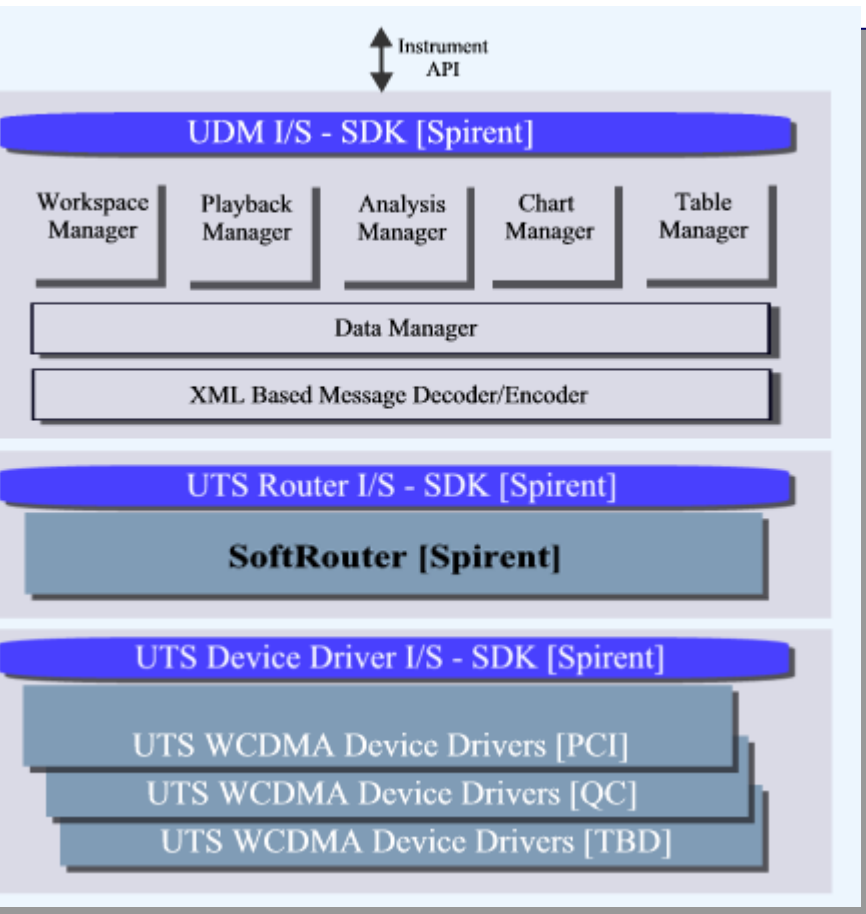


UDM Architecture Overview



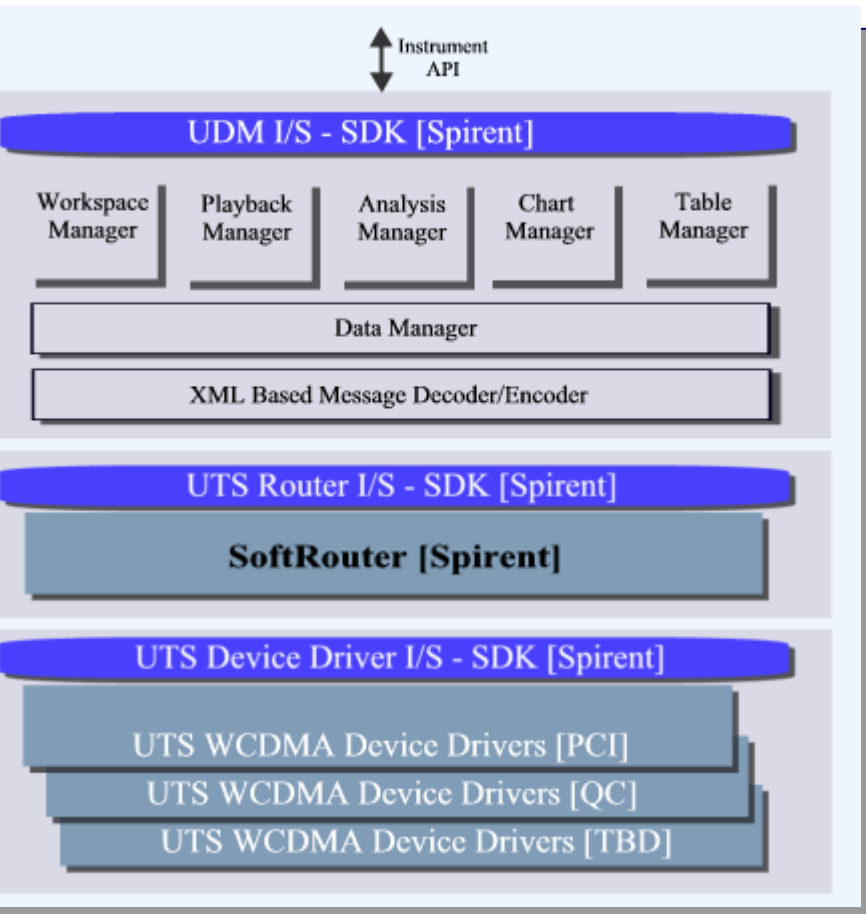
- Universal Tool Suite (UTS)
 - Core Architecture of UDM
 - Manufacturer and Chipset independent
 - Components
 - UTS Applications (e.g. UDM)
 - UTS Router
 - UTS Device Drivers
 - UTS Software Developers Kit (SDK)
- UDM-UMTS Application
 - Builds on CDMA Platform
 - Utilizes XML based Message Decoder for rapid adaptation to Standard changes
 - W-CDMA Specific Diagnostics

UDM Architecture Overview (cont'd.)



- UTS W-CDMA Device Drivers
 - Interface Between UE and UTS Router
 - Generic Drivers Developed by Spirent
 - Qualcomm – 1Q03 Deployment
 - PrairieComm – 2Q03 Deployment
 - Others – TBD (TI, National,...)
 - UTS Driver Development Pack
 - Complete package to help manufacturers develop custom drivers
 - Source Code
 - Training
 - Verification Testing

UDM Architecture Overview (cont'd.)

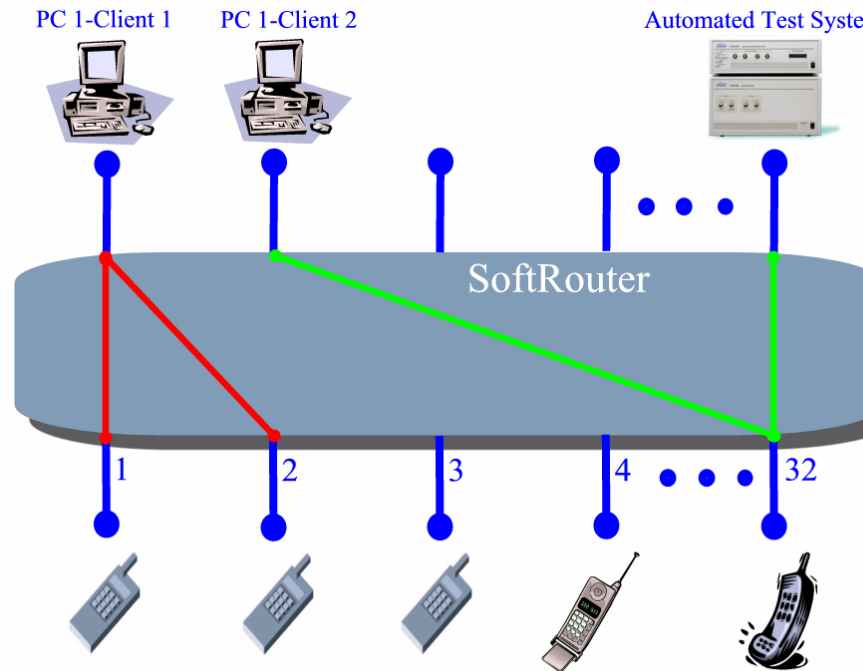


- UTS Software Development Kit (SDK)
 - UTS Interface Specifications
 - Used to Develop UTS Drivers
 - UTS Client Interface Specification
 - Defines API for Automated control of UDM
 - Defines Scripting Interfaces
 - Test Client
 - Used to Test UTS Device Drivers

SoftRouter™ Technology

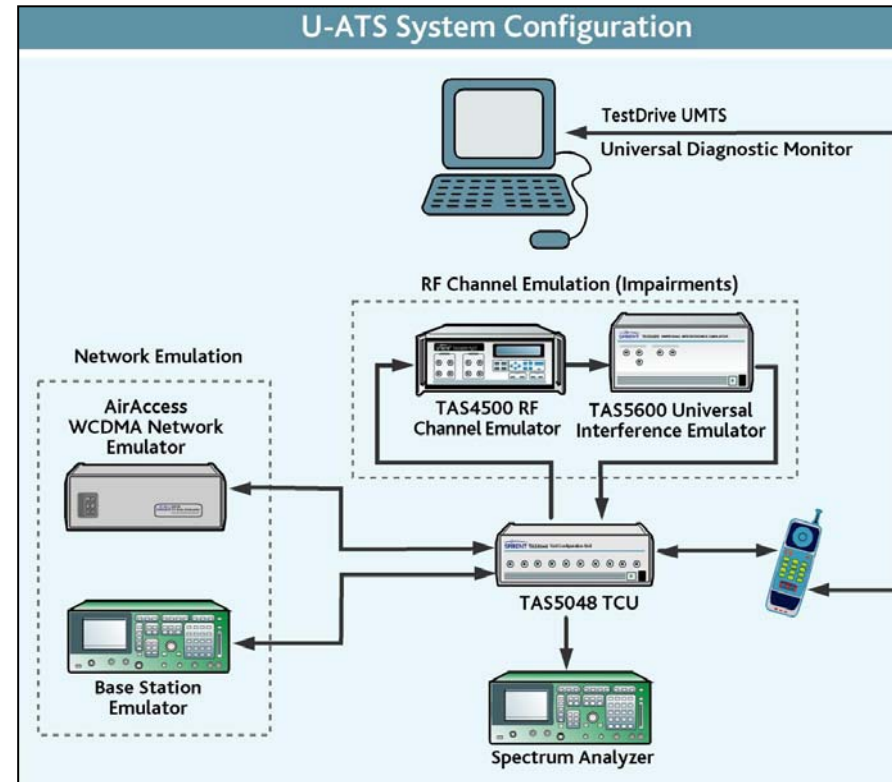
SoftRouter™ Benefits

- Allows a single client to access multiple UEs
(Drive test, one UDM with reference UE and test UE(s), for Side-by-Side comparisons)
- Allows multiple clients to access a single UE
(Provides Test Automation such as custom Automation Software and UDM)
- Allows multiple clients to access multiple UEs
(Parallel testing)



Automation

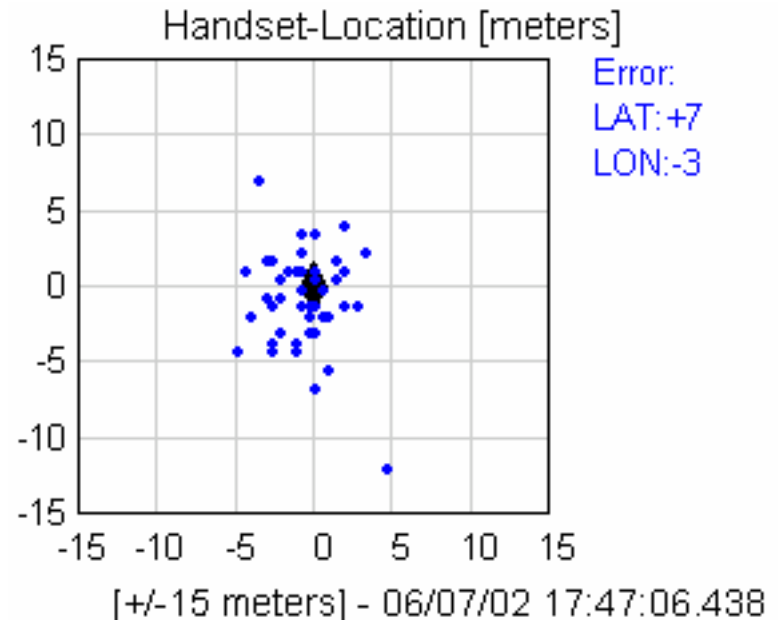
- UDM Enables Integrated Closed-Loop Test Systems e.g. Spirent U-ATS UMTS Automatic UE Test System
 - Integrates UDM diagnostics into the test process
- Scripting
 - Embedded and External scripting using VBScript



Additional Features

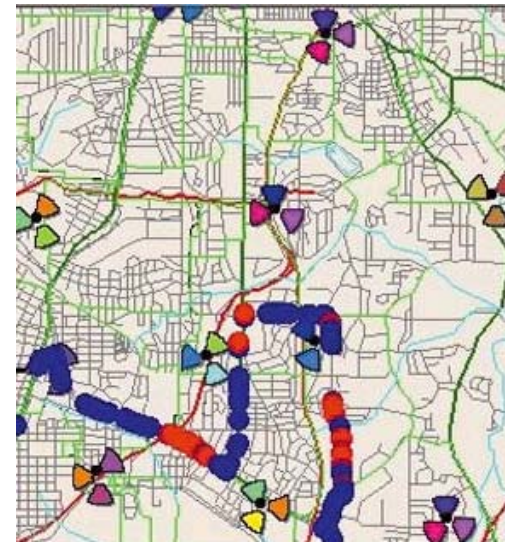
- UE SW debug messages
 - Troubleshoot handset performance/operation
- Position Location Ready
 - Advanced Charting and Analysis
- API for custom data
 - UE manufacturers can incorporate data structures for internal test/development

System Time	MESSAGE	LVL	MOD	LN
06/12/02 21:18:31.731	Sort Prio, 4 Neig, chps=256, win=80	1	srchzz.o	6774
06/12/02 21:18:31.735	Last Wakeup: Aset_eng=5645, Rx=-59dB	2	srchzz.o	11326
06/12/02 21:18:33.010	RF sleeping	0	rfmsm.o	7917
06/12/02 21:18:34.219	Enabled digital Rx power	0	rfmsm.o	5781
06/12/02 21:18:34.217	RF card in PCS mode	1	rfcs.o	611
06/12/02 21:18:34.219	Card mode: 1 - Chan: 150	0	rfcs.o	718
06/12/02 21:18:34.220	Digital initialized	0	rfmsm.o	6429
06/12/02 21:18:34.215	skipped=93,residual=28672,early=24576	1	srchzz.o	1565
06/12/02 21:18:34.209	Wakeup roll: SymbComb ph=1 offset=6144	2	srchint.o	659
06/12/02 21:18:34.209	RF warmup complete	0	rfmsm.o	6503
06/12/02 21:18:34.215	Rcq Lst: r1=441, r2=48	1	srchzz.o	6399
06/12/02 21:18:34.215	e1=173, e2=200	1	srchzz.o	6402



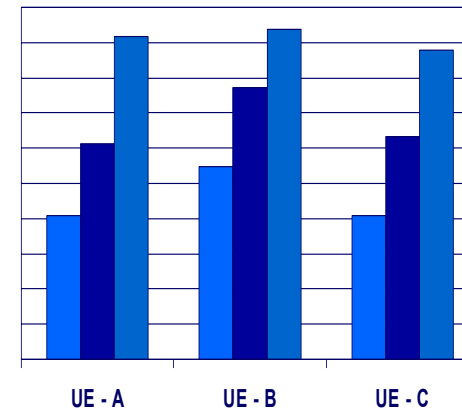
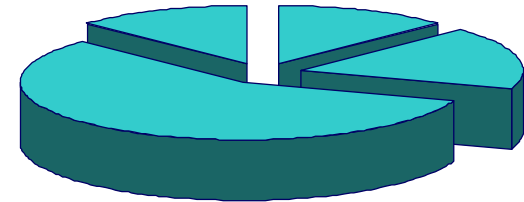
Product Roadmap

- Post Processing UE/Network Analysis Package for UDM
 - Mapping of user selected parameters
 - Standard and custom reports
 - Detailed Statistics reports
 - Pilot List Analysis (Pilot Pollution, Missing Pilots, ...)
 - Call Statistics (Dropped, Blocked, Set up time, duration,...)
 - Handover Statistics (Hard and Soft with completion statistics)
 - Statistical analysis of user selected variables
 - Analysis of multiple log files simultaneously
 - PN Scanner Support



Product Roadmap (cont.)

- Real-time UE/Network Analysis Package thru UDM
 - Real-time mapping of drive route
 - “Snapshot” summary reports of current tests
 - Call Statistics
 - Handovers
 - Pilot Pollution
- Advanced post-processing and Network Optimization through Actix tools
- GSM support for inter-generational handover analysis





Analyze | Assure | Accelerate™

SPIRENT™

Analyze | Assure | Accelerate™

Copyright © 2003 Spirent Communications Inc.