

C2K-ATS DATA MODULES

Data Throughput Testing

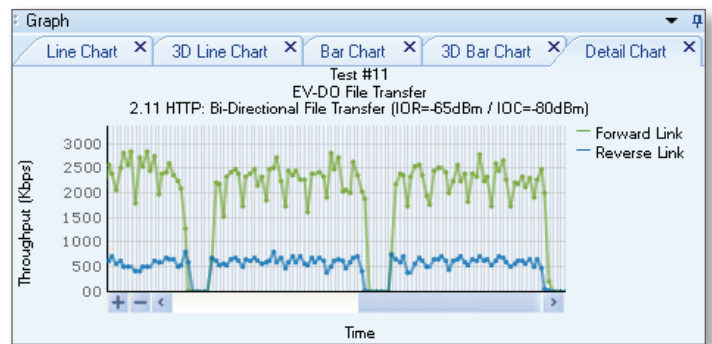
CDMA technology is constantly evolving to support applications such as video telephony, push-to-talk, and voice-over-IP. These applications require high data rates and diverse “Quality of Service” attributes. They also need to be deliverable under time-varying signal conditions and channel scenarios.

The relationship between data throughput and the user experience is neither simple nor easily predictable. Thorough testing is required to ensure the performance of the mobile device is maintained under degraded signal conditions and drastic channel impairments.

Lab-based device testing can shrink the cost and overhead associated with field testing on live networks. It can also dramatically decrease the time required to pass compliance testing. The ideal test system should be fully automated, easy to operate, flexible enough to cover a wide range of scenarios, highly accurate, and reliable.

Spirent’s C2K-ATS Data Throughput solution meets all these requirements and provides an industry-standard platform for customized data testing. It supports the ability to automate test execution and test results reporting through a single interface. Its flexibility allows the creation of several different test scenarios involving varied signal conditions, channel impairments, a selection of multiple IP protocols, and time intervals. Data Throughput testing can answer some key questions, including:

- How much time does the data call require to set up?
- How much time does it take to complete a transfer?
- Is the mobile well-behaved when using data services for a long period of time?
- What effect does RX Diversity have on service quality?



Results are presented in real-time to enable on-the-fly decisions.

Mobile IP (MIP) Testing

Wireless operators must deliver high-quality voice and data services independent of geographic boundaries. Internet connectivity available any time and any place is a necessity. Although new wireless technologies deliver the necessary high data rates, the new challenge is to make these services available across network borders with the least overhead. The Mobile IP (MIP) Protocol makes mobility possible by allowing each subscriber to maintain a single IP address that can be preserved across:

- Geographical changes
- Changes to point of Internet access
- Changes to the radio access technologies offered

Mobile IP requires careful testing of the interaction between devices and elements in the MIP network, such as the:

- Home Agent
- Foreign Agent
- Radius Server
- AAA Server

The 3GPP2 test standard C.S0037 (“Signaling Conformance Specification for CDMA2000 Wireless IP Networks”) defines the testing required to ensure proper interaction between the mobile device and MIP network elements. The primary functions tested include procedures for

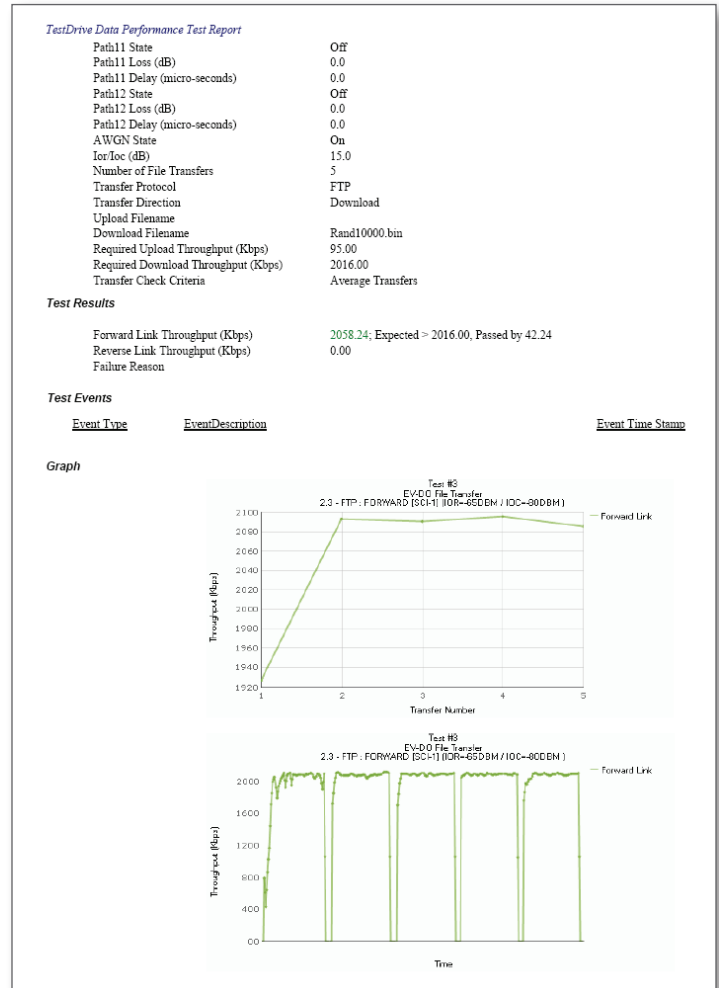
- Agent Discovery
- Registration/De-registration
- Authentication and IP Security Association Support
- Various hand-off scenarios within and between data networks

Setting up for this kind of testing can be time-consuming, error-prone, and expensive because of the number of network elements involved and the amount of mobile parameters that must be controlled.

Spirent’s Mobile IP test solution resolves this challenge. This turn-key system simulates IP network elements, as well as the radio access network and channel impairments. C2K-ATS automatically performs all the complex configuration, system control, DUT setup, test execution, and report generation required for confidence in the tested product. Testing becomes efficient and less prone to errors than otherwise possible.

A wireless MIP network can implement the Dynamic Mobile IP Key Update Procedure (DMU). DMU is a procedure that distributes cryptographic MIP keys on a CDMA2000/EV-DO network. The Mobile IP test solution supports the verification of DMU functionality, creating a complete environment for testing the critical functionality of a MIP-capable device.

Spirent’s Mobile IP solution is a fully automated lab-based test bed. It provides an economical, efficient, and accurate means for Mobile IP and DMU testing during various phases of the product development and test life cycle.



TestDrive Data Performance Test Report

Session/Test Statistics

<u>Session Start</u>	11/8/2007 3:19:54PM		
<u>Title / Description</u>	<u>Start</u>	<u>Duration</u>	
EV-DO File Transfer	11/8/2007 3:22:44PM	0 h 8 m 10 sec	
2.3 - FTP : FORWARD [SCI-1] (IOR=-65DBM / IOC=-80DBM)			
EV-DO File Transfer	11/8/2007 3:30:54PM	0 h 15 m 39 sec	
2.4 - FTP : REVERSE [SCI-1] (IOR=-65DBM / IOC=-80DBM)			
EV-DO File Transfer	11/8/2007 3:46:33PM	0 h 17 m 57 sec	
2.5 - FTP : BI-DIRECTIONAL [SCI-1] (IOR=-65DBM / IOC=-80DBM)			

Data is automatically collected, collated, and organized for efficient analysis.

DATA RETRY TESTING WITH THROTTLING

Data Retry testing ensures that wireless devices are safe for the network. Spirent's Data Retry test packs assure that handset applications (BREW, WAP, MMS, etc.) do not flood the network with access and application server retries.

Mobile-based applications generate data connection requests. Some connections are initiated by the subscriber, such as during web browsing. Others are generated in the background without the user's knowledge, such as when a Push-to-Talk over Cellular (PoC) client registers with a PoC server.

In both of these scenarios, application clients use packet data calls to request IP connections. Even though a mobile device platform may have been judged "safe for network," a new application can cause behavior detrimental to network performance.

What if the application becomes a "rogue" and goes into an infinite loop of Originations or Application Server Registration requests, flooding the network?

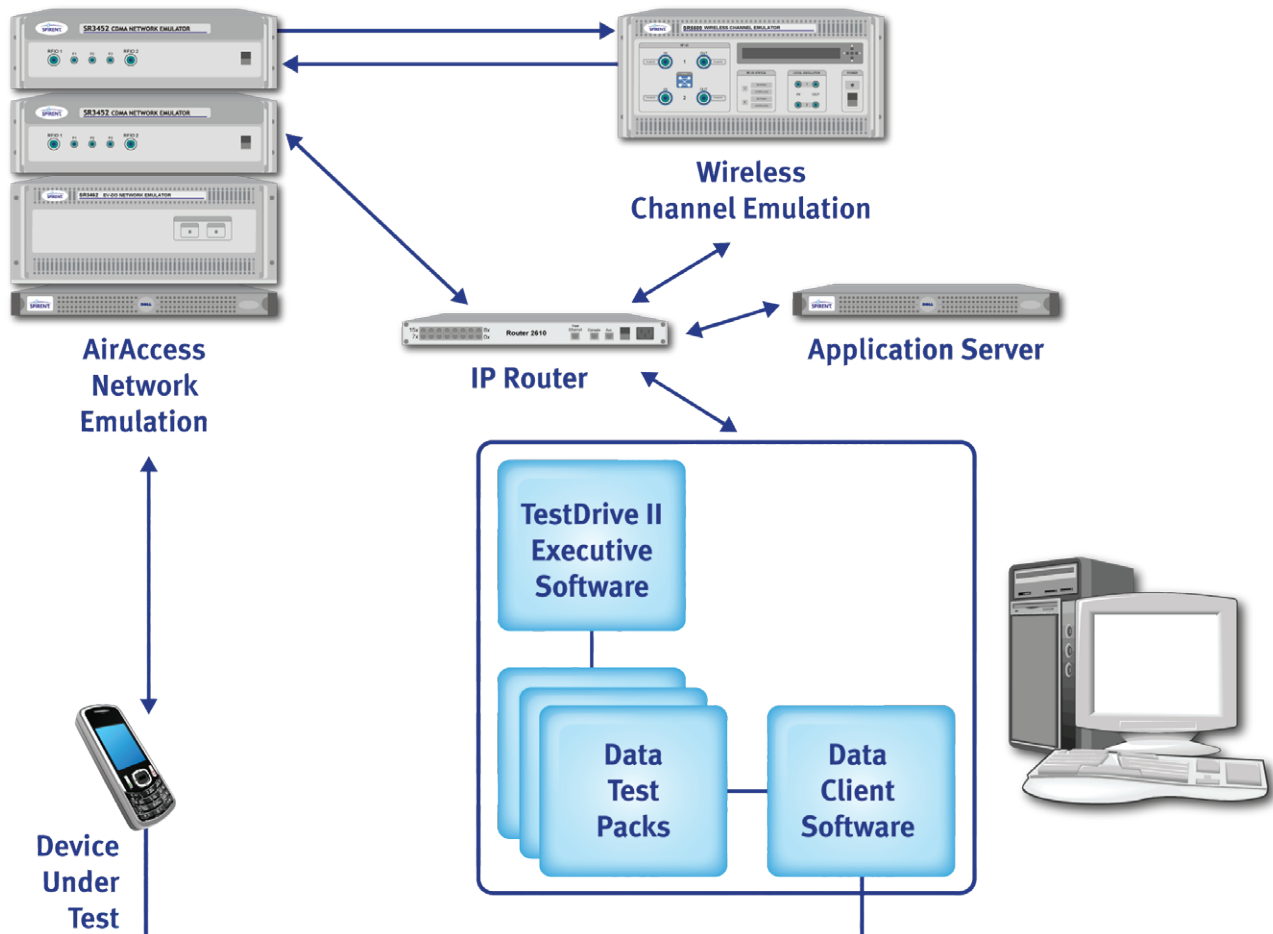
Multiple access attempts occur when an application continually tries to connect to the application server following a failed or disrupted attempt. Spirent's Data Retry test packs assure that handset applications (BREW, WAP, MMS, etc.) do not flood the network with access and application server retries. C2K-ATS provides automated control over adversarial conditions, such as:

- Origination failures
- Access attempts by invalid subscribers
- MIP and SIP Data Authentication failures
- Unavailable or out-of-service network elements

Some carriers define the time periods between retries; for example, the carrier may want the first retry to occur immediately upon failure, the next after 5 seconds, the third after a minute, and so on.

What if the device goes to sleep for an hour between connection attempts, failing to deliver service as promised?

While Spirent's C2K-ATS has long offered testing with throttling, the CDMA Certification Forum (CCF) has recognized its importance and has recently mandated throttling tests.



TECHNICAL SPECIFICATIONS

HARDWARE	
SR5500 Wireless Channel Emulator	
RF Channels	2 (Expandable to 8 under a single interface)
Bandwidth	26 MHz
RF Input	Frequency Range: 400 – 2700 MHz Level Range: 0 to -30 dBm
RF Input (with 6-GHz Option)	Frequency Range: 400 – 2700 MHz, 3350 – 3850 MHz, 4100 – 6000 MHz Level Range (0.1 dB resolution): 0.1 dB
RF Output	Level Range (0.1 dB resolution): -30 to -110 dBm Level Range (0.1 dB resolution): -30 to -110 dBm @ 400 to 2700 MHz -40 to -80 dBm @ 3350 to 3850 MHz -40 to -80 dBm @ 4100 to 6000 MHz
Independent Paths	24
Relative Path Delay	0 – 2000 ms, 0.1 ns resolution
Relative Path Loss	0 – 32 dB
Dynamic Power Delay Profiles	Birth-death, Sliding (moving propagation)
DEE-Controllable Parameters	State duration, channel output level, path delay, path status (on/off), relative path loss
Fading	Types: Rayleigh, Rician, freq shift, phase shift Doppler Range: 0.01 – 2000 Hz, 0.01 Hz resolution Repetition Interval: >1700 hours Relative Phase between Paths: 0 – 360 degrees, 0.1 degree resolution Rician K-factor: -30 to +30 dB
AWGN (optional)	C/N Ratio: -30 to +30 dB (dependent on O/P level) Bandwidth: 26, 13, 6.5, 3.25, 1.625 MHz Fidelity: Meets or exceeds all 3GPP, 3GPP2 and WLAN requirements Sequence Duration: >2 hours

TECHNICAL SPECIFICATIONS (CONT'D)

HARDWARE		
AirAccess® CDMA Network Emulator		
Pilot Relative Level	-63.0 to -0.1 dB (0.1 dB res)	
Sync Relative Level	-63.0 to -0.1 dB (0.1 dB res)	
Paging Relative Level	-63.0 to -0.1 dB (0.1 dB res)	
QPCH Relative Level	-63.0 to -0.1 dB (0.1 dB res)	
FCH Relative Level	-63.0 to -0.1 dB (0.1 dB res)	
SCH Relative Level	-63.0 to -0.1 dB (0.1 dB res)	
OCNS Walsh Code Length	Fixed to 64	
OCNS Relative Level Range	Calculated automatically from the relative levels of the other code channels to provide a composite power level that is equal to the programmed sector power	
CDMA Modulation	Modulation Type:	
	1X:	Parallel BPSK for Pilot, Sync and Paging channels; Complex QPSK for FHS and SCH channels
	EV-DO:	QPSK, 8-PSK, 16-QAM
Independent RF Carriers	1 RF output per SR3452 V2	
Frequency	Frequency Range:	Band Class 0 (869 MHz to 894 MHz)
		Band Class 1 (1930 MHz to 1990 MHz)
		Band Class 3 (832 MHz to 869 MHz)
		Band Class 4 (1840 MHz to 1870 MHz)
		Band Class 5 (421 MHz to 494 MHz)
		Band Class 6 (2110 MHz to 2170 MHz)
		Frequency Resolution: 500 Hz
	Frequency Setting: By channel number	
Amplitude	RF Output Level Range:	-100 dBm/1.23 MHz to -38 dBm/1.23 MHz
	RF Output Level Resolution:	0.1 dB
	<i>Absolute Output Level Accuracy:</i>	± 1 dB
CDMA Modulation Quality	Residual Rho > 0.99	

Italicized specifications are typical, not guaranteed parameters.

SOFTWARE	
TestDrive II	Test Executive software
Data Throughput testing with RX Diversity	Test Pack module
Mobile IP (MoIP) testing	Test Pack module
Data Retry testing with throttling	Test Pack module
Universal Diagnostic Monitor	Automates control of the Device Under Test
AirAccess C2K	Software GUI for AirAccess Network Emulator(s)
TestDrive 5500	Software GUI for SR5500 Wireless Channel Emulator

ORDERING INFORMATION

SYSTEMS	
P/N C2K-CFG10-SYS-03	C2K-ATS PLATFORM CONFIG 3 (SUPPORTS 1X/EV-DO Data plus 1X MP/SC)
P/N C2K-CFG11-SYS-03	C2K-ATS PLATFORM CONFIG 3 (SUPPORTS 1X/EV-DO MP, SC, and Data)
P/N C2K-CFG12-SYS-03	C2K-ATS PLATFORM CONFIG 3 (SUPPORTS 1X/EV-DO MP/Data plus 1X SC/LBS)
P/N C2K-CFG13-SYS-03	C2K-ATS PLATFORM CONFIG 3 (SUPPORTS 1X/EV-DO MP/SC/LBS/Data)
P/N C2K-CFG15-SYS	C2K-ATS PLATFORM CONFIG 3 (SUPPORTS 1X/EV-DO Data plus 1X SC)
P/N C2K-CFG16-SYS	C2K-ATS PLATFORM CONFIG 3 (SUPPORTS 1X/EV-DO SC/Data)

SPIRENT GLOBAL SERVICES

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