Powerful Platform for Testing CDMA Applications

Testing emphasis is shifting as CDMA mobile devices mature. While evaluating minimum parametric performance and signaling conformance of a mobile device is always important, an increased amount of tests are focused on verifying the operation of resident applications and advanced features. The performance of these software-based features often directly impacts the end user's experience.
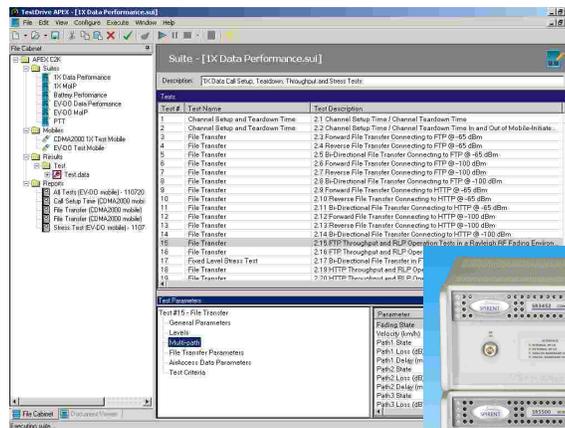
APEX C2K is an expandable testing platform designed to grow with these evolving testing needs. Its advanced automation capability specifically addresses a key weakness in present testing methodology: current feature testing is largely a manual and time-consuming process. While test solutions exist to perform pieces of applications and features testing, APEX C2K is the first integrated platform to automate this analysis. As the number of CDMA devices with advanced functionality grows, automatic feature regression testing will directly impact the success of launching new products and services. The TestDrive Data test executive software automates test execution to enable a large number of test cases to be run in a relatively short time, reducing the amount of valuable engineering resource dedicated to test strategy execution.

The APEX C2K core platform consists of the AirAccess 3452rf CDMA Network Emulator, the SR5500 Wireless Channel Emulator and the TestDrive Data test executive. TestDrive test packs are added to this core platform to automate application specific test scenarios. The SR5500 generates accurate and repeatable impairments to determine device performance in realistic RF environments.

APEX C2K allows mobile device manufacturers and service providers to:

- Determine performance of resident or downloaded applications
- Differentiate one product from another based on performance
- Validate end user experience of new services offered on mobile devices
- Automate feature testing to reduce the overall test cycle
- Regression test software builds to verify consistent performance

APEX C2K is an expandable test platform designed to automate applications and features testing requirements of today and tomorrow

Major Features:

- Integrated platform automates and accelerates essential application and performance testing, including 1X data performance, Mobile IP and EV-DO data performance
- Scaleable to support emerging applications with the addition of new automation test packs
- IP interconnect via Ethernet enables testing of almost an unlimited host of new applications
- RF impairments create realistic performance environments
- Determines mobile device's actual performance, not just conformance
- Powerful test executive drives test procedure automation
- Enhanced GUI provides full control over test parameters
- Integrated data collection and results reporting

Applications:

- Product Development
- Design Verification
- Competitive Analysis
- Performance Analysis
- Application Verification
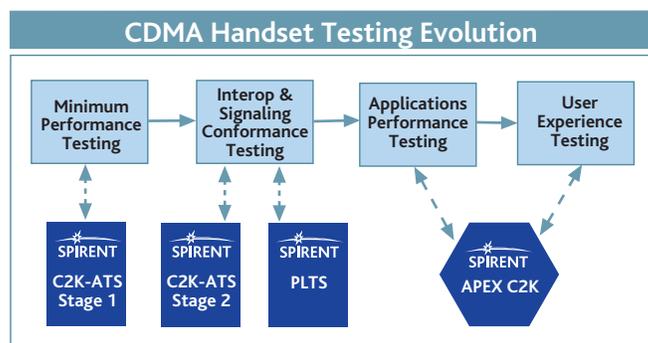- User Experience Evaluation

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CDMA Testing Phases

The process of testing CDMA handsets has evolved to include minimum performance testing, interoperability and signaling conformance testing, and ultimately applications performance testing. A typical handset might go through the following phases of test:

- **Minimum Performance Testing**
  Does my handset implementation meet established minimum criteria such that its transmitter and receiver can function in a typical CDMA RF environment? Is my handset capable of making the necessary measurements from base stations to determine a position fix?

- **Signaling Conformance Testing**
  Now that the receiver and transmitter are tested, can my handset exchange Layer 2 and Layer 3 messaging with a CDMA network, and act appropriately based on the contents of those messages? Can my handset make the necessary measurements from base stations and/or satellites to perform location services?

- **Applications Performance Testing**
  Now that the underlying CDMA functionality of the handset is tested, do the applications that use CDMA as a transport work, how well do they work, and do they meet the expectations of the end user?
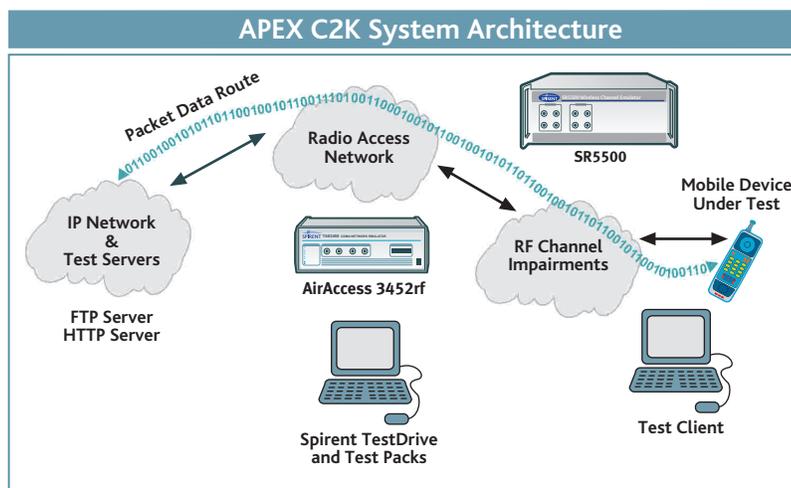
With APEX C2K, Spirent now provides the complete range of solutions for CDMA handset performance evaluation. APEX C2K provides a core platform that includes the key components necessary for this emerging mobile applications testing.

CDMA Handset Testing Evolution

APEX C2K is a new platform optimized for applications performance testing

APEX C2K System Architecture

The APEX C2K core platform consists of the following components:

- **TestDrive Data Test Executive**
  Application software configures all of the system components, executes test procedures, collects test results and generates reports

- **AirAccess 3452rf**
  Provides the emulation of an entire CDMA network required to communicate with the mobile under test. This includes emulation of the core network data component functionality essential for establishing the packet-switched data calls necessary to test many of the data-centric applications now being developed on mobile devices

- **SR5500 with AWGN Option**
  Provides RF channel impairments so real-world performance characteristics can be evaluated in a lab environment.

TestDrive software automation test packs are added to this core platform to implement application specific test scenarios. The platform architecture also allows for the addition of other hardware components, as needed, to address specific application requirement. This includes the ability to add external data servers via a built-in Ethernet interface.

APEX C2K System Architecture

APEX C2K includes all of the key components for mobile device feature testing

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1X Data Performance and EV-DO Data Performance Test Packs

A wide range of new applications are being introduced on CDMA 1X and EV-DO mobile devices, almost all of which are data-centric. The end user's perceived performance of data services will differentiate one device from another. The **1X Data Performance Test Pack** and the **EV-DO Data Performance Test Pack** automate test cases to answer questions such as:

How long do I have to wait for my data call to setup or teardown?

- From null state? From dormant state?

RLP statistics are a key metric in evaluating the data performance of a mobile device

How much time does it take to complete my transfer?

- Uni-directional and Bi-directional
- FTP and HTTP
- Baseline (without RF impairments) and with RF impairments

What does my mobile device do if I exercise data service over a long period of time and in varying conditions?

- Changing power levels
- Changing data rates (multiplex options)

The key to these data performance test packs is analyzing the performance of the mobile device and correlating key metrics to unexpected data performance. For example, RLP statistics are captured, so a drop in data rates could be linked to RLP Resets/Retransmits or an increase in RLP Fill or Idle frames; or over-the-air message logs allow an unusually long call setup time to be traced to an inefficient service negotiation algorithm.

1X and EV-DO Mobile IP Test Packs

Carriers are aggressively pursuing a transition to Mobile IP (MoIP) on their packet data networks. MoIP facilitates mobility while a user is on a data call on a carrier's network, whether that mobility is across large geographical areas or across technologies (for example, 1X to 1xEV-DO transitions). The **1X Mobile IP Test Pack** and the **EV-DO Mobile Test Pack** verify the MoIP performance of the device under test, including validating the following:

Detailed MoIP message decoding is an essential tool in verifying MoIP performance

- Can the mobile device discover the presence of a Foreign Agent (either via solicitation or advertisement) and subsequently register with that agent?
- Does the mobile device de-register when appropriate?
- Will the mobile device handle error conditions properly? Will it perform retries when appropriate or fallback to Simple IP when necessary?
- Can the mobile device move within a MoIP network? As it moves from one PDSN to another, does it properly handoff from its original Foreign Agent to the new Foreign Agent?
- Can the mobile device successfully exchange keys with the network using Dynamic Mobile IP Key Update (DMU)?

The MoIP server functionality embedded within APEX C2K enables fast and easy testing of a mobile device's MoIP functionality without the need for additional, external equipment. Internal, detailed decoding of MoIP messaging provides the necessary tool set required to troubleshoot problems with the device's MoIP implementation.

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Programmable Test Parameters Enable Custom Test Scenarios

In addition to providing standard test cases, TestDrive Data offers the user the ability to customize test conditions by exposing all key test parameters.

Performance conditions can be readily accessed and customized using TestDrive Data's GUI interface. TestDrive Data uses the same parameter labels specified in industry accepted test specifications. In addition to allowing these industry accepted test conditions to be customized, TestDrive Data permits an individual user to optimize test settings according to his own needs. All test parameter fields have range-checking, assuring that only valid values will be used during performance analysis.
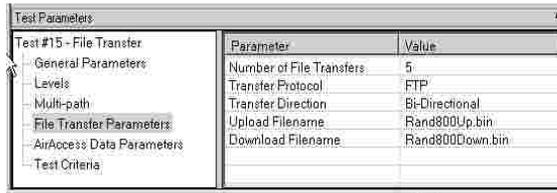
TestDrive Data allows test suite parameters to be modified for user test development
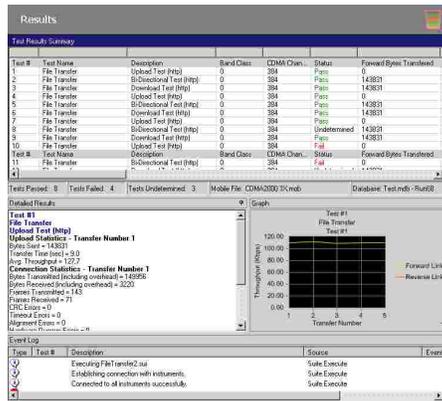
Comprehensive Test Results

TestDrive Data makes it easy to collect and analyze mobile device test results and over-the-air message logs. All test parameters and results are stored in an MS Access database for post processing. Storing a complete set of test data ensures the traceability of test results. This data includes detailed information describing the identity and characteristics of the device under test.

TestDrive Data is equipped with a flexible report generation feature that uses the data to deliver results in a variety of user-friendly meaningful formats. Results formats have been added to TestDrive Data that reflects those used by service providers and test labs to compare mobile device performance.

Since the data is archived with an industry standard tool, results can be exported to a host of third party formats such as MS Excel, MS Word, Crystal Reports, HTML and Adobe PDF. For measurements that benefit from a graphical results format, TestDrive Data generates and archives detailed measurement data.

TestDrive Data logs results for easy comparison against past performance

Ordering Information
APEX C2K Systems and Options

Name	Description
APEX C2K Systems	
APEX-C2K-AX	APEX C2K Single 1X Channel Test Platform
APEX-C2K-BX	APEX C2K Dual 1X Channel Test Platform
APEX-C2K-CX	APEX C2K Dual 1X and EV-DO Channel Test Platform
APEX C2K Software	
TD-APEX	TestDrive APEX Application Performance Test Executive
DATA-1X-TP1	1X Data Performance Test Pack 1
MIP-1X-TP1	1X Mobile IP Test Pack 1
DATA-DO-TP1	EV-DO Data Performance Test Pack 1
MIP-DO-TP1	EV-DO Mobile IP Test Pack 1

Spirent Communications
541 Industrial Way West
Eatontown, New Jersey
07724, U.S.A.
Tel: +1 732-544-8700
Fax: +1 732-544-8347
Sales: +1 800-927-2660
tas.sales@spirentcom.com

Sales Contacts:
North America
+1 800-927-2660
Europe, Middle East, Africa
+33-1-6137-2250
Asia Pacific
+852-2166-8382
All Other Regions
+1 818-676-2683

www.spirentcom.com

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