

Insights into CDMA Testing

October 20, 2006

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Technical Marketing

Agenda

- Problem and Goal Statement
- CDMA 2000 Lab & IOT Test Services
- Q-Lab Test Service Purpose
- Getting a Product to Market
- Solution : Device Test Lab
- Test Lab Model and Capability
- Benefits
- Phase 2 – Test & Technology Roadmap
- Contacts

Problem & Goal Statement

- Problem

- CDMA device qualification process fragmented, lengthy, and costly
- Carrier acceptance and Certification of product takes long time / Lack of industry standardization
- Commercial automated test equipment and test processes are often unavailable for new functions and/or features
- Vendors often submit immature sets for Carrier evaluation particularly when new features are involved
- Software updates are sometimes left for the vendor to implement
- Operators
 - Some Carrier's are not well equipped to perform all test due to lack of test equipments, automations and space.
 - Some carrier do not have time to evaluate Device for final qualification
 - New carrier's may not have resources to execute test cases and not have clear idea what is needed
- Vendors
 - Are challenged by ill-defined, multiple, lengthy, redundant test processes
 - Sometimes due to late requirement changes or sets delivered prematurely to Carrier.
 - Lack of test capability, not enough resources to complete task on time.
 - Several software revisions required during qualification
 - Increased Device Test cost

- Qualcomm Goal

- Improve Time To Market (TTM)
- Reduce NRE cost of Test
- Increase handset lab and field performance
- Enable new technology test
- Improve coverage of testing so that set submitted for Carrier Certification will pass all basic tests.

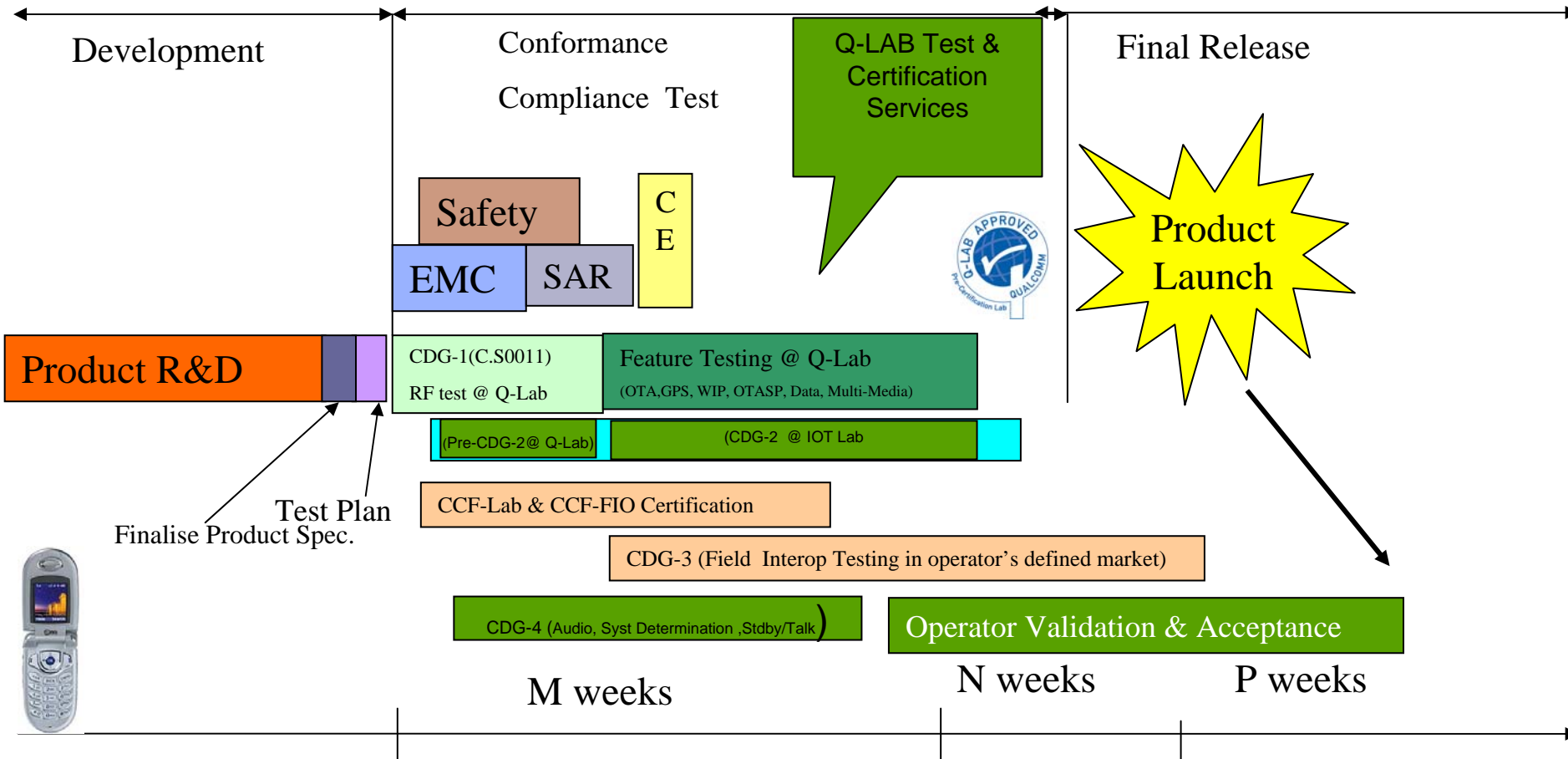
Device Test Lab Purpose

*Provide a turn-key test solution by **providing** pre-certification **test services** to OEMs and carriers to perform **device acceptance tests** as per carrier's and industry requirements for CDMA2000-1x/EV-DO devices.*

Applications for Test & Certification Lab :

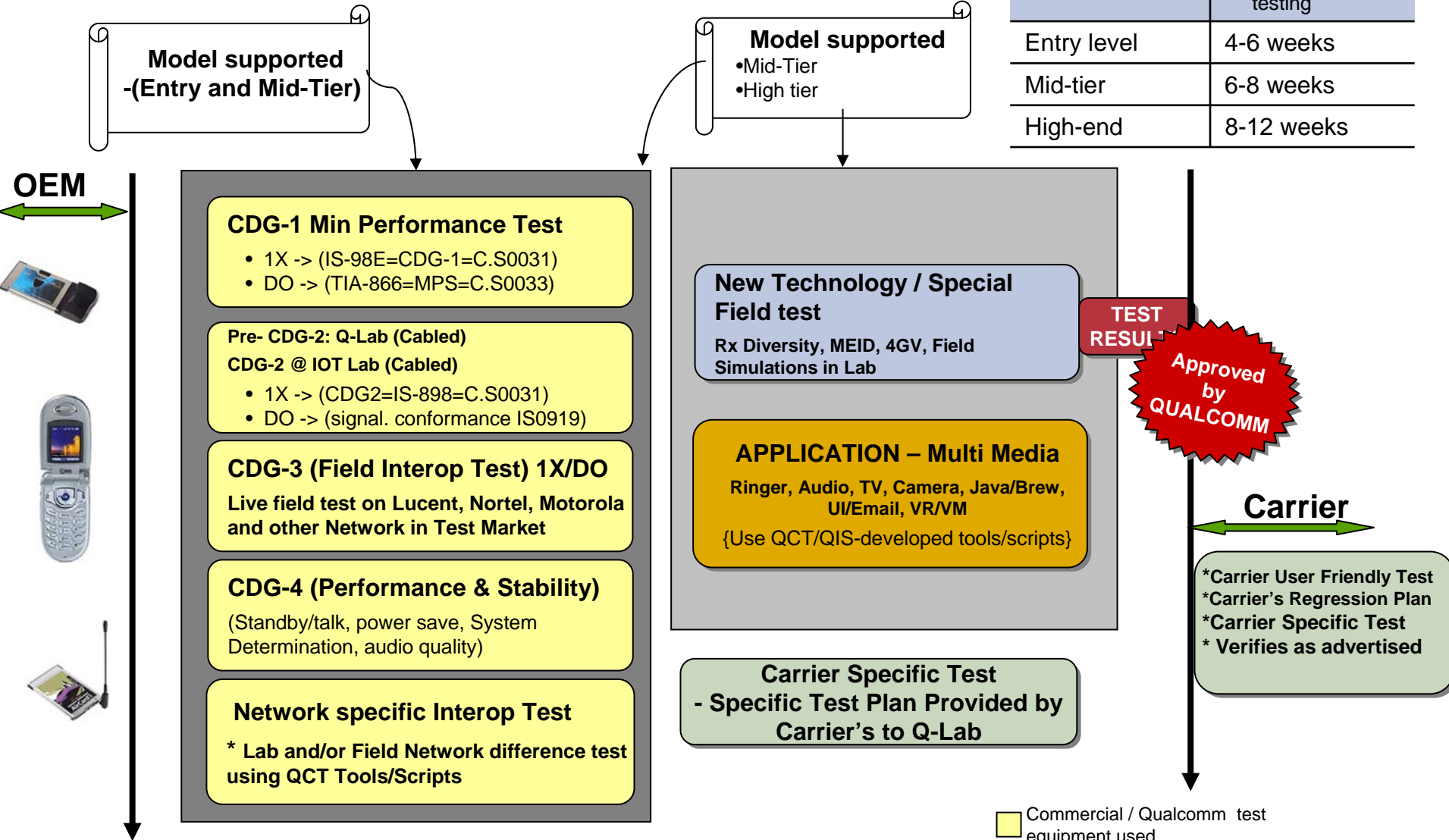
- Carrier's Acceptance : Full or Partial Certification
- Feature / Software Pre-Qualification
- Conformance/ Compliance Test
- Field Test in Operator's Approved Network
- Develop special field test scenario for particular market using Qualcomm tools

Getting a CDMA Product to Market – Example certification process



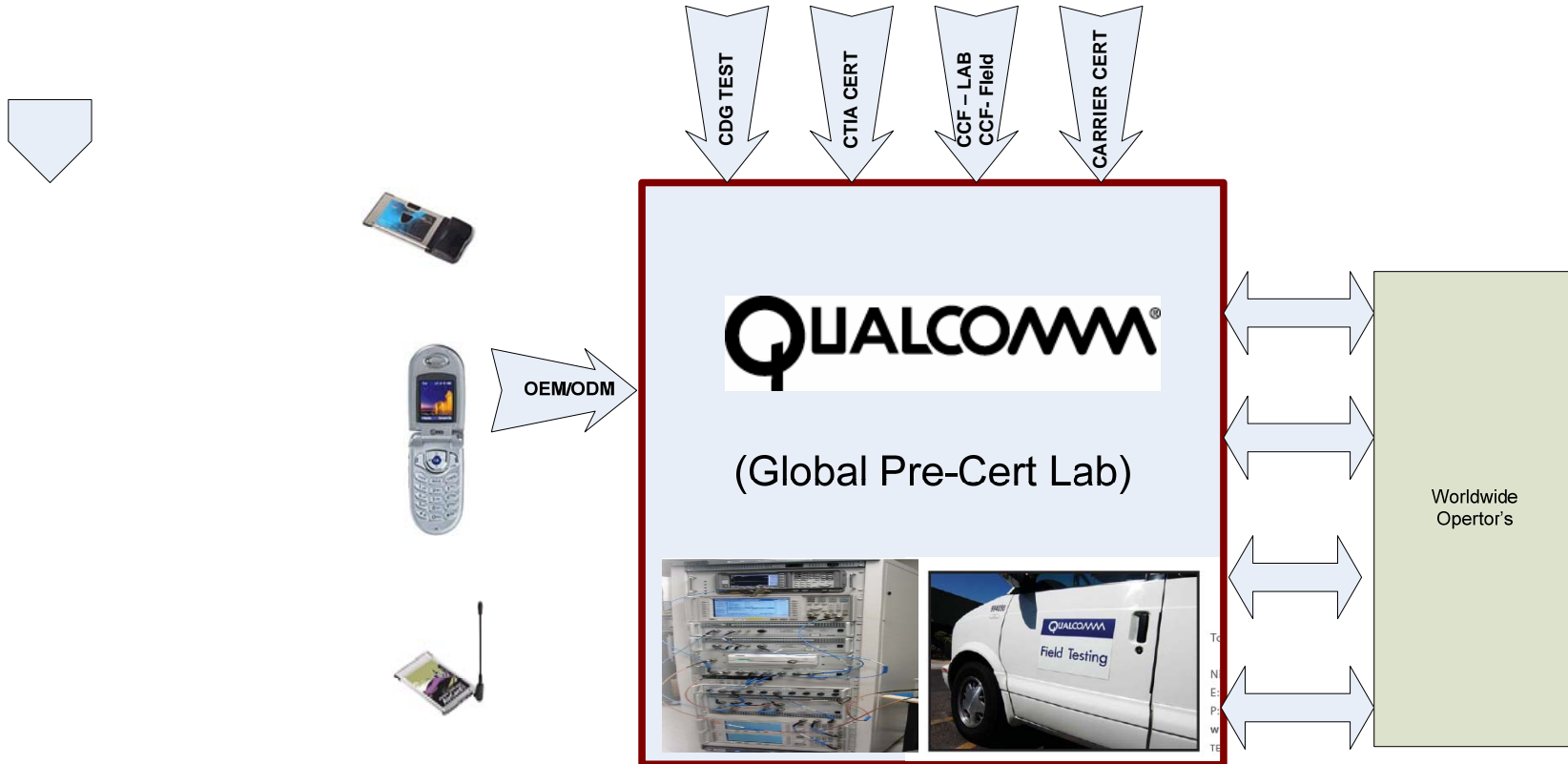
Device Test Lab Model

Device Segment*	Estimated Time required for testing
* Clean device	
Entry level	4-6 weeks
Mid-tier	6-8 weeks
High-end	8-12 weeks



- Commercial / Qualcomm test equipment used
- QCT/QIS developed tools, scripts, automations
- Customer-specific test defined by carriers

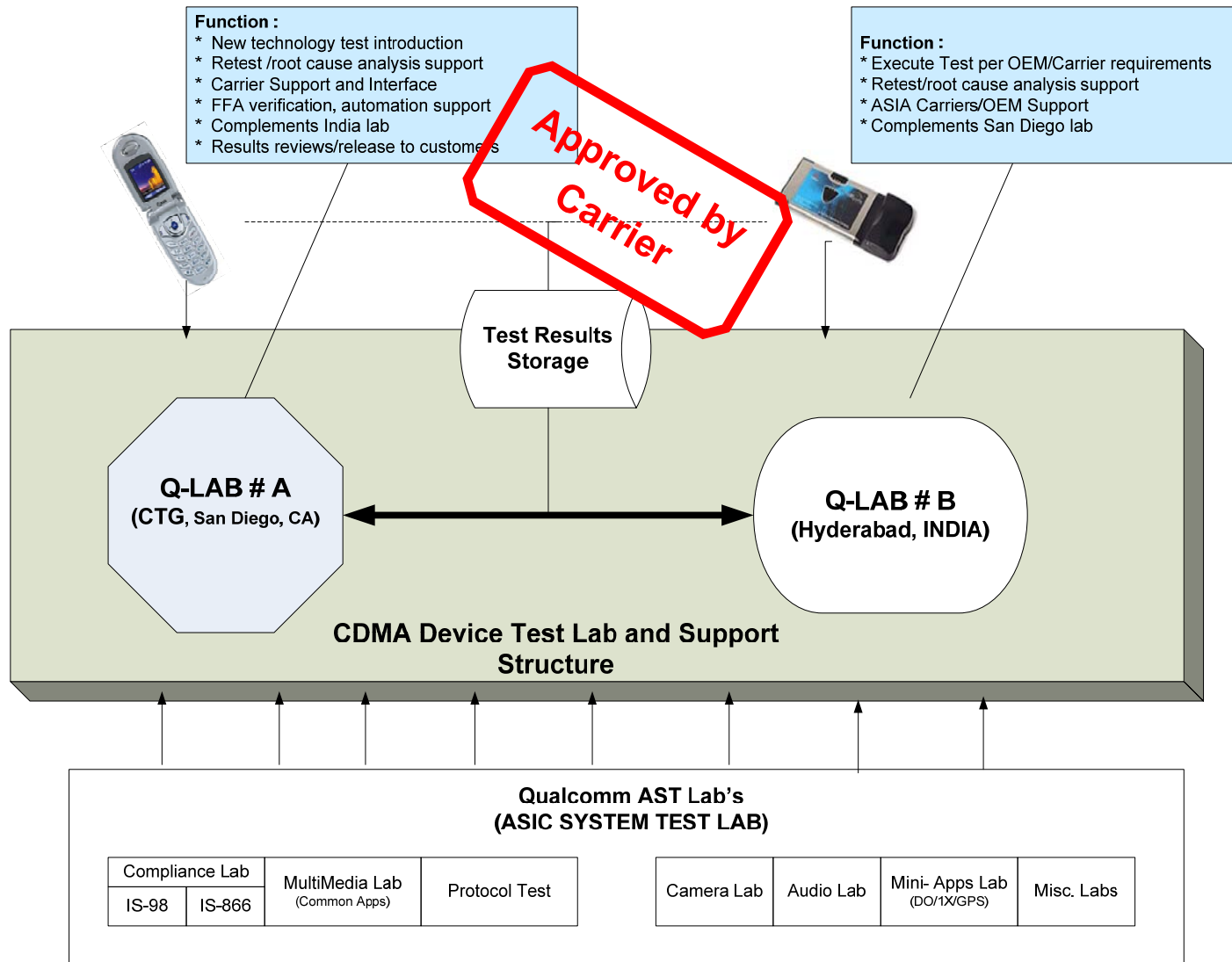
CDMA 2000 – Lab & Field IOT Test Services



Lab Accreditations

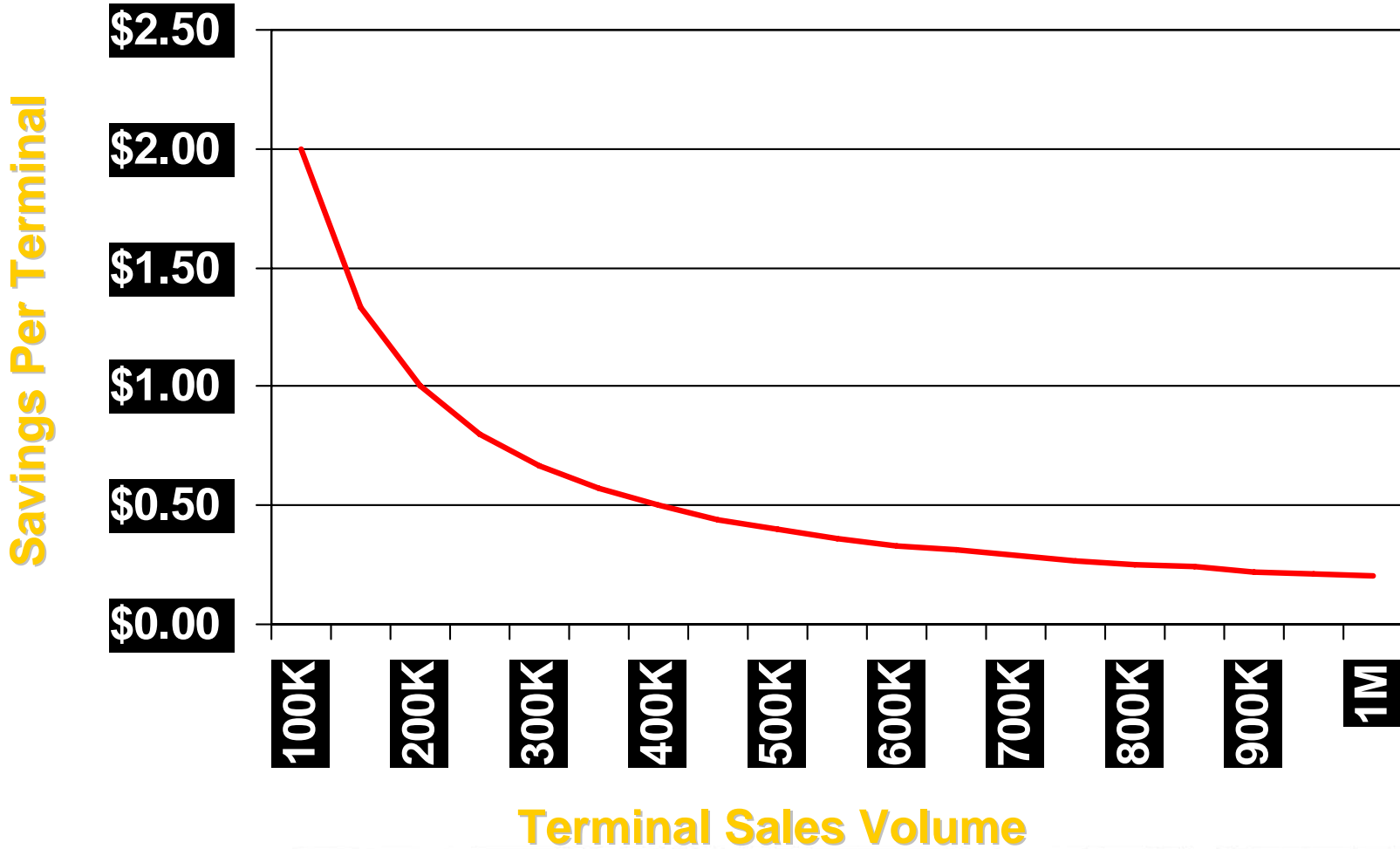


Pre-Certification Lab : San Diego, CA & Hyderabad, India



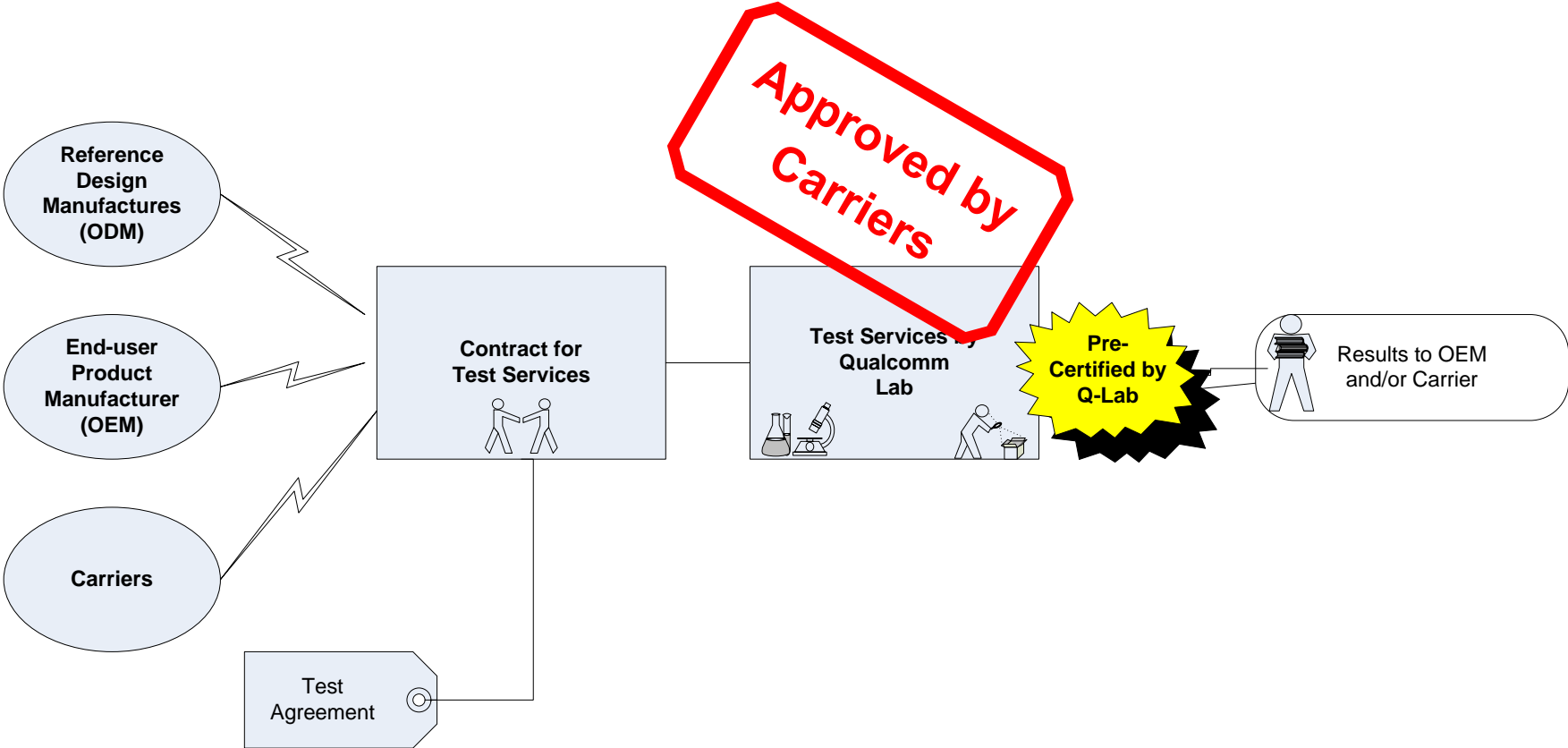
Approx. Cost Saving Per Device

Yields \$2 Savings / Device



Note: Cost savings may not be directly applied to the wholesale cost of the devices

Test Project Flow & Process



Operator and End-User Benefits

• Operator Benefits

- Reduced time to market for new terminals
- Confidence that CDMA modem issues are resolved
- Reduced terminal costs with improved test efficiencies
- Improved network interoperability
- Platform dependent verification
- Higher capacity process increases test volume
- Greater availability of commercial CDMA2000 devices
- Greater availability of new applications
- Reduced after sales support costs

• End-User Benefits

- Ownership of a stable, reliable and high quality CDMA2000 device
- Improved signal reception
- Improved user and application experience
- Improved network roaming experience
- Access to more features, functions and revenue-generating applications
- Reduced need for customer service
- Improved vendor and service provider loyalty



CTIA APPROVED PLAN

CTIA APPROVED PLAN by Q-LAB

CTIA: TIA/EIA IS-918 Wireless IP (EVDO)	This Group of Tests is performed IAW the Test Plan on the CTIA Web Site, and tests the performance of an EVDO Wireless Device' ability to handle proper interfacing to an IP network, including responses from and to the base station over the RF channel.	80-VD178-1
CTIA: TIA/EIA IS-916 (GPS)	This Group of Tests is performed IAW the Test Plan on the CTIA Web Site, and tests the performance of a Wireless Device' ability to accurately receive and demodulate GPS satellite signals, including position location. This is a Lab Test.	80-VD181-1
CTIA: TIA/EIA IS-898 (1x-Messaging)	This Group of Tests is performed IAW the Test Plan on the CTIA Web Site, and tests the Wireless Device' 1X messaging layer including responses from and to the base station over the RF channel.	80-VD182-1
CTIA: TIA/EIA IS-866 (EVDO-RF)	This Group of Tests is performed IAW the Test Plan on the CTIA Web Site, and measures the performance of the Wireless Device' EVDO physical (electronics) layer, including RF Receive and Transmit functionality, in EVDO Mode for rev. 0.	80-VD183-1
CTIA: TIA/EIA CDG-35	This Group of Tests is performed IAW the Test Plan on the CTIA Web Site, and tests the performance of the Wireless Device' for PRL System Determination, Standby & Talk Time, & Audio Performance.	80-VB662-1
CTIA: SAR Test Plan*	This Group of Tests is performed in accordance with FCC requirements as defined by CTIA.	80-VB828-1
CTIA: EMC Test Plan*	FCC EMC Part 22/24/15 IAW CTIA Test Plan from CTIA Web Site	80-VB829-1
CTIA: TIA/EIA IS-919 (EV-DO: Messaging)	This Group of Tests is performed IAW the Test Plan on the CTIA Web Site, and tests the performance of the Wireless Device' EVDO messaging layer including responses from and to the base station over the RF channel.	80-VD184-1
CTIA: TIA/EIA IS-918 Wireless IP (1X)	This Group of Tests is performed IAW the Test Plan on the CTIA Web Site, and tests the performance of a 1X Wireless Device' ability to handle proper interfacing to an IP network, including responses from and to the base station over the RF channel.	80-VD185-1
CTIA: OTA*	Radiated Antenna performance patterns as defined by the CTIA Website.	80-VB663-1
CTIA: TIA/EIA IS-98E Compliance Test Plan	This Group of Tests is performed IAW the Test Plan on the CTIA Web Site, and measures the performance of the Wireless Device' 1X physical (electronics) layer, including RF Receive and Transmit functionality.	80-VD186-1



Phase 2 Test Services (FY'07-08)

Q-Lab Technology Roadmap*: 2006-2007

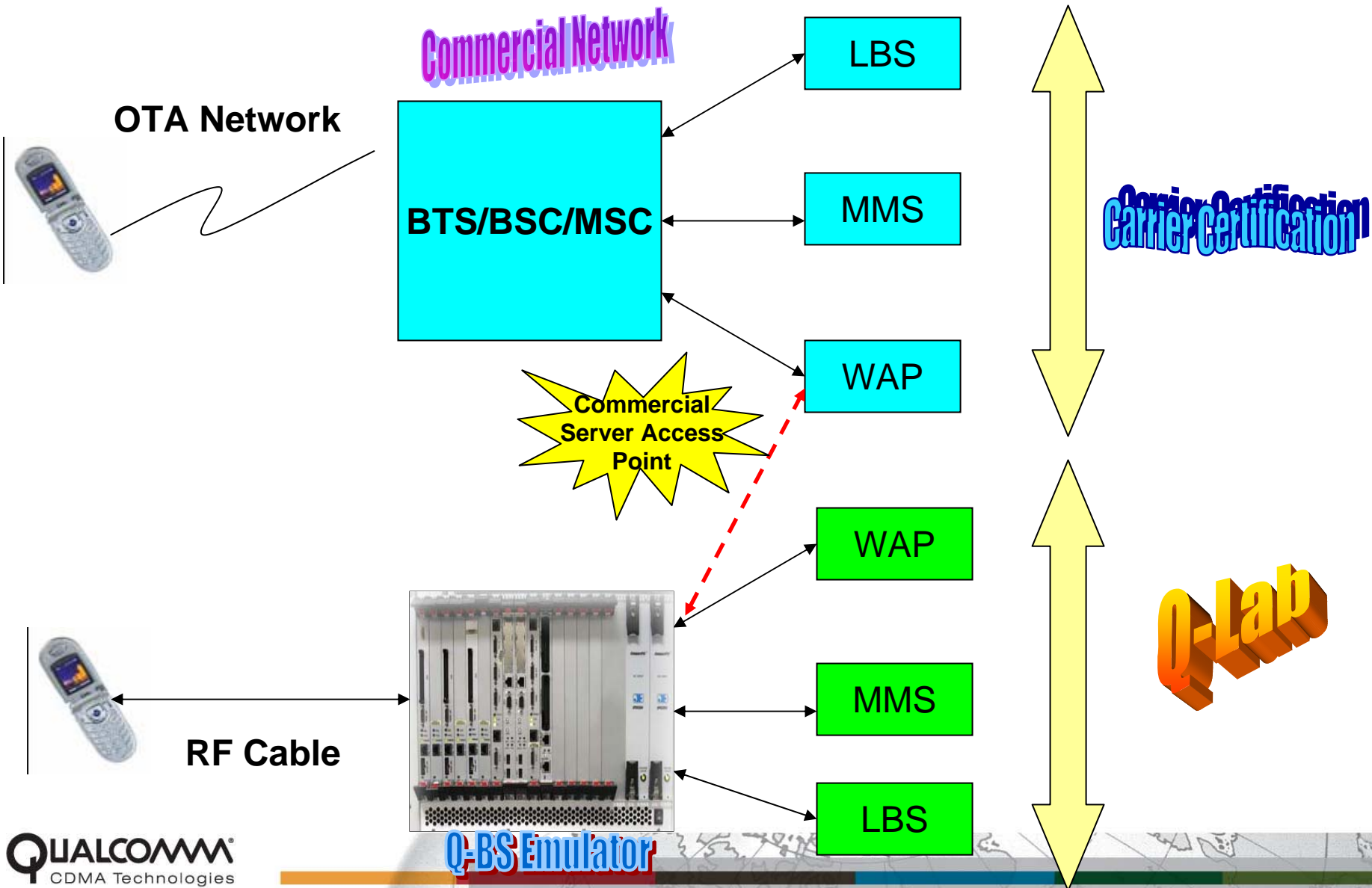
2006-2007*

(* Under Development and Subject to Change)

- Brew PEK
- 4GV Signaling
- 4GV Audio
- MMS
- Camera Test
- Gen. System Determination
- Data Connectivity
- DOrA MPS C.S0033-A/IS-866A
- TIA 918 WIP
- Pilot Pollution
- System Determination
- Remote Field Test (RFT)
- MEID
- Rx. Diversity
- Venturi Client
- VOD/MOD
- MIP/DMU Field Test
- DOrA Signaling C.S0038-A/IS919A
- LBS-Userplane
- CTIA OTA
- RFT (Contd.)
- Q-Lab MMS Server
- DVT
- MediaFLO/1x
MPS/Sig./Conc. (FLO3)
- Store PST
- Brew
- Data Re-try
- 1x/DO Rev A Data Perf
- VZW Phase-2
- Venturi Client
- VOD/MOD/Mail Pre-Load
- MIP/DMU Field Test
- MediaFLO MPS(FLO 1)
- MediaFLO Sig/Func (FLO2)
- IMS
- RFT (Contd.)
- Streaming Video (MOS)
- VoIP
- A12 Auth.
- Bluetooth
- WAP-Browser

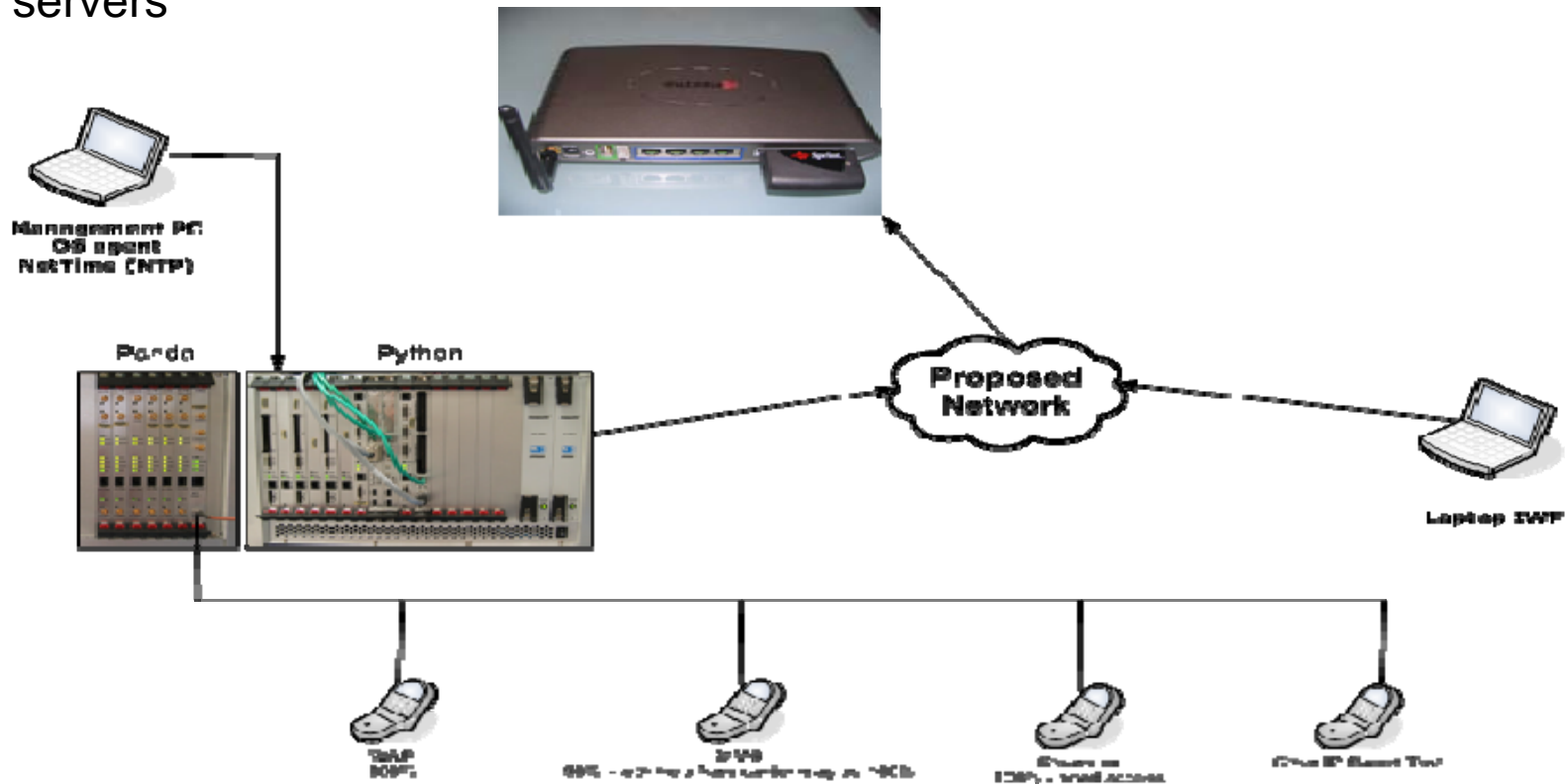
Improve TTM, Cost & Quality

Use Application Testing: Remote Field Test (RFT)

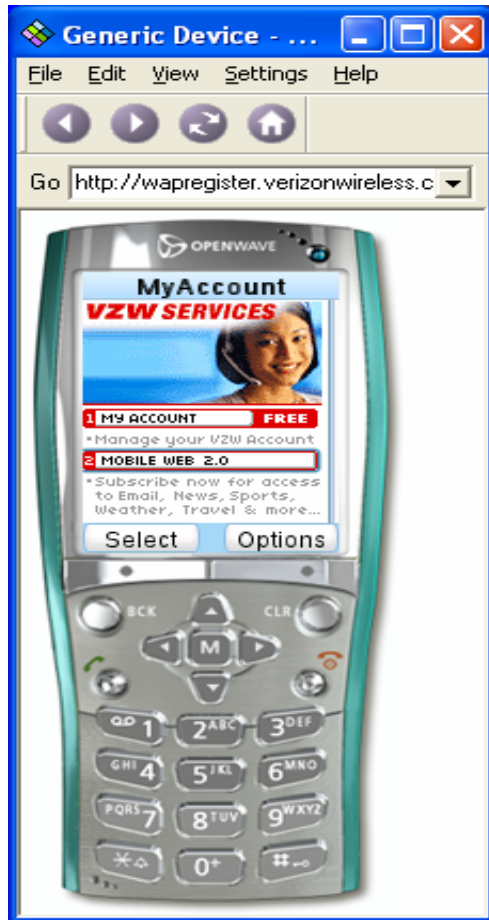


Save Field Test Time & Cost : Use Remote Field Test (RFT) Concept

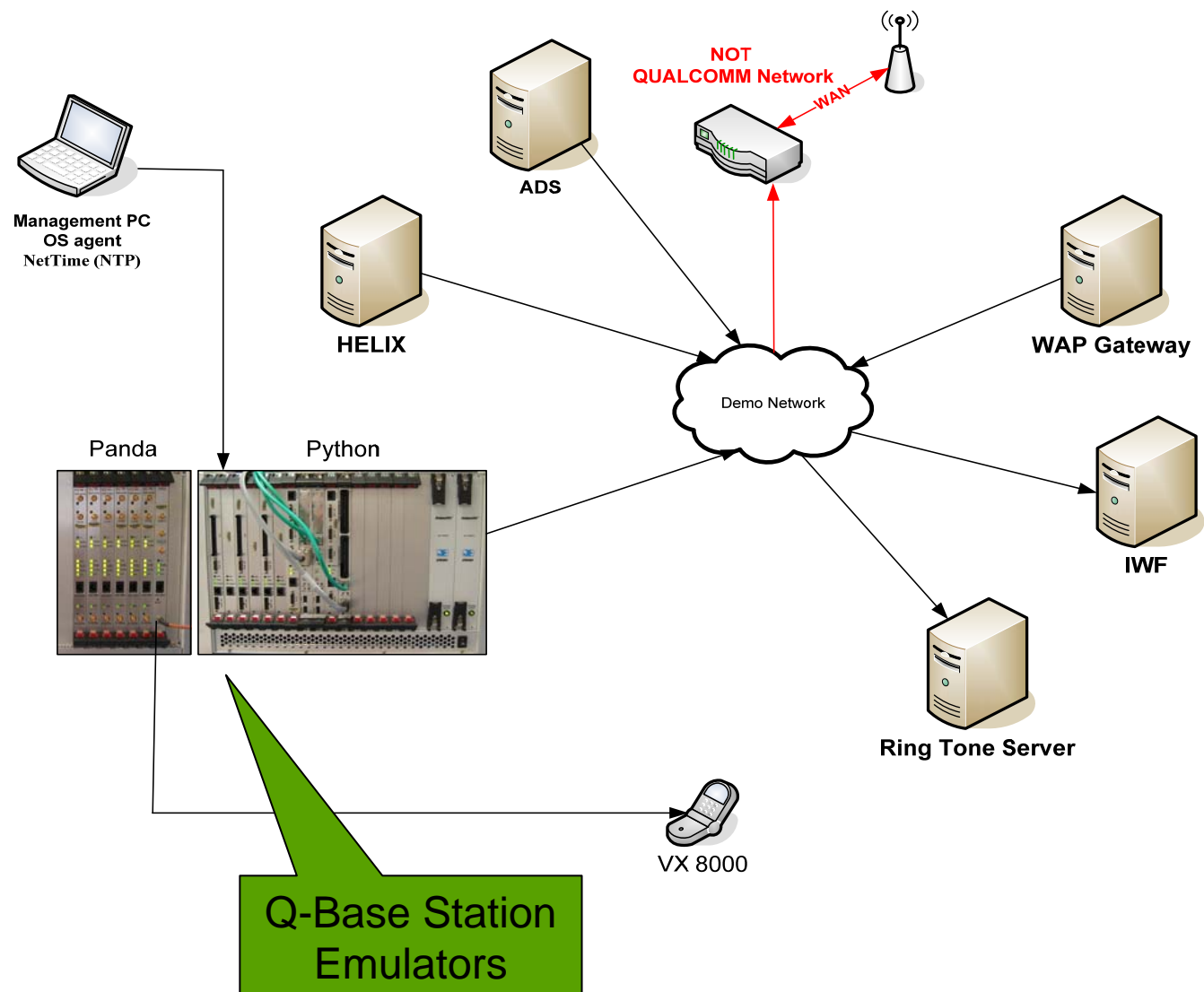
- Use EVDO or 1x service to perform WAP, MMS (MO), Streaming or Any IP based application testing on target carrier's network for handset certification test
- Conduct application testing thro remote network setup with commercial servers



Download Contents from Lab : Snapshot of Test Scenarios from Q-Lab RFT

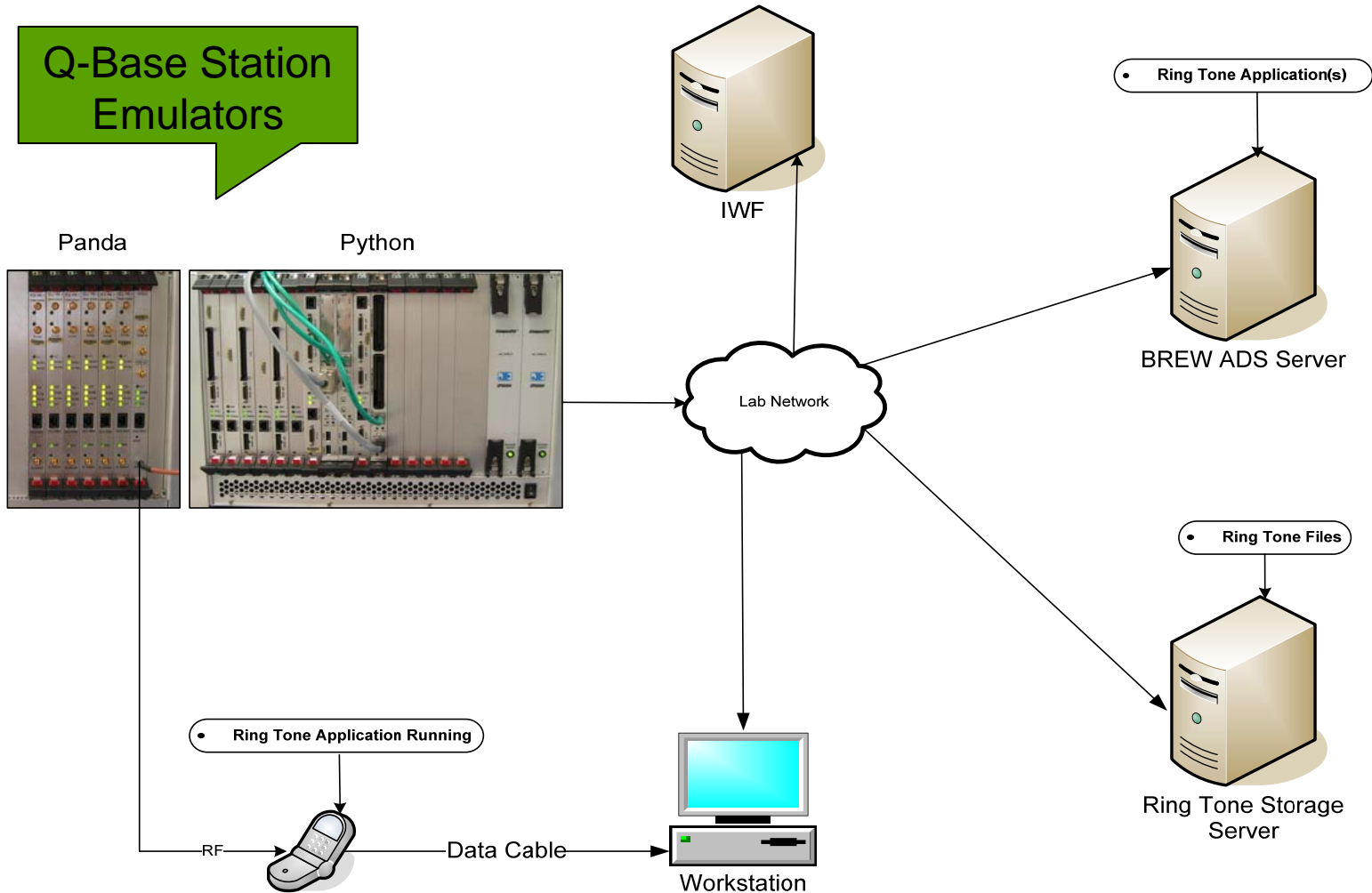


Demo Setup for Ring Tone, Browser, Streaming applications



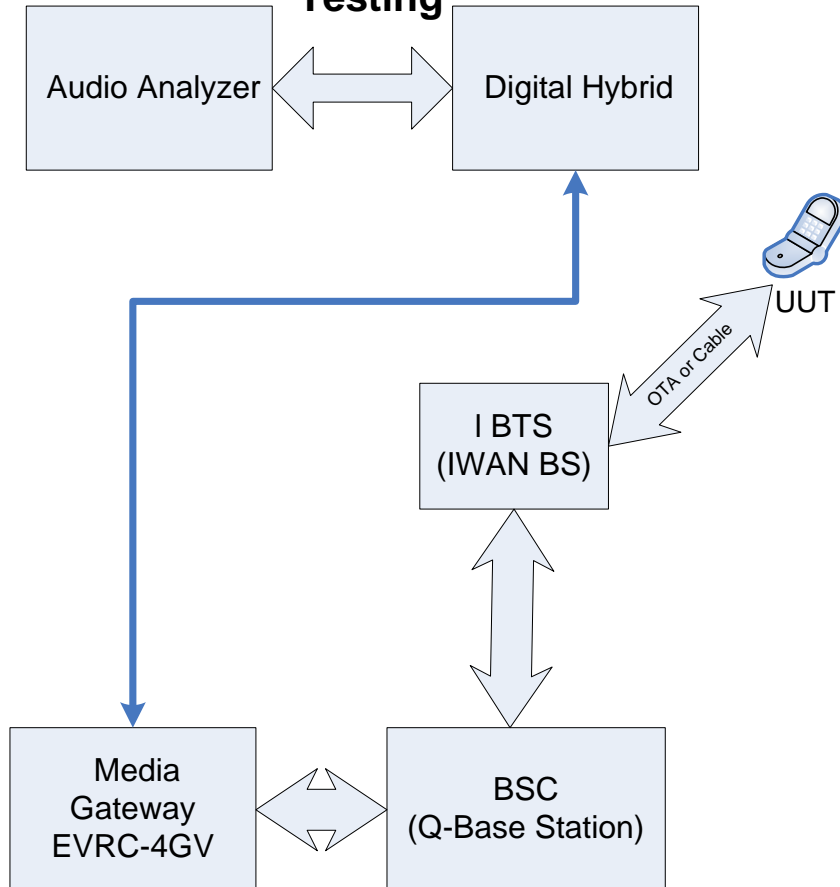
demo.vsd

Ring tone Testing-Server Setup Using Q-Base Station



4GV Acoustics & Signaling Test Services

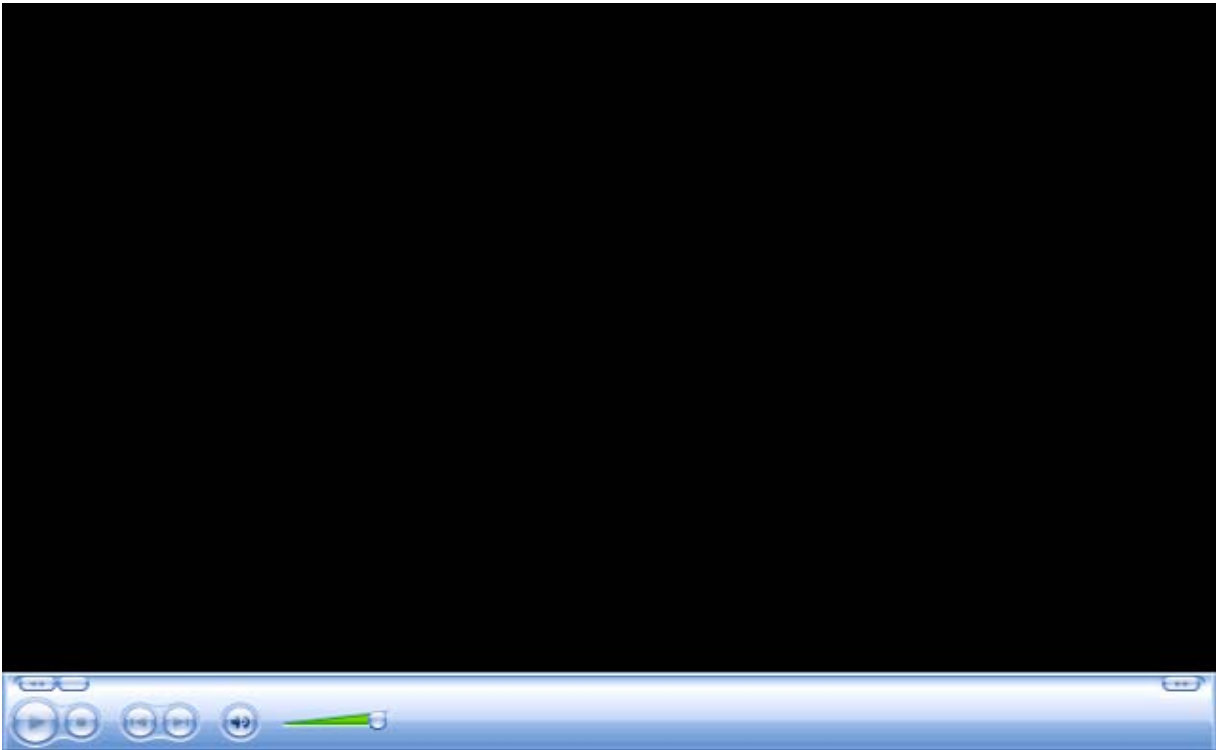
4GV (EVRC-B) Audio Testing



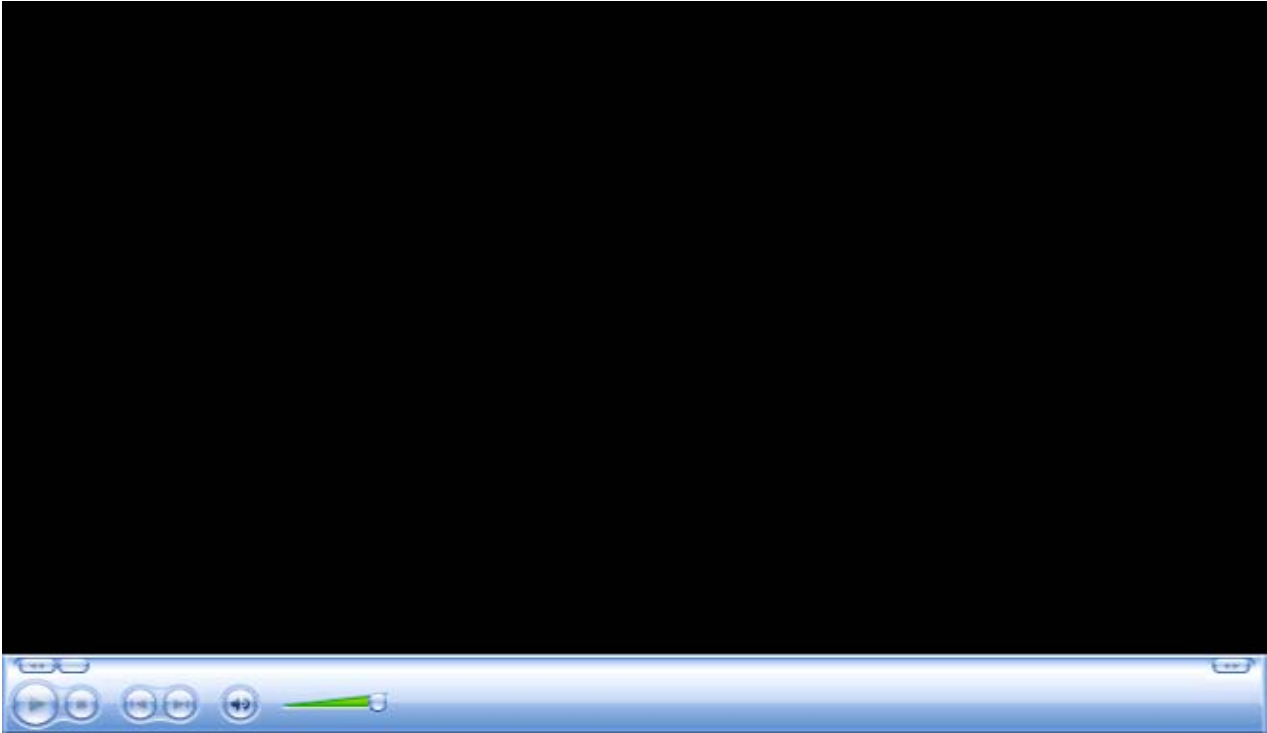
- EVRC-B (4GV) Signaling test suite:
 - Basic Voice Call Processing
 - Voice Privacy
 - SMS
 - Subscriber Calling Features
 - DTMF
 - Various Handoff Scenarios (soft/Softer/hard handoffs)
 - OTASP/OTAPA
 - Emergency Call
 - Mobile to Mobile Voice calls
 - Voice Calls with Different COP
- Applicable Test Specifications
 - TIA/EIA/IS-2000-2, TIA/EIA/IS-2000-A-2, TIA/EIA/IS-2000-C-1
 - C.S0031 (IS-898)
 - C.S0043, C.S0044, C.D0060 and C.S0061
- QC Pre-Cert Lab EVRC-B Test Documents
 - EVRC-B (4GV) Service Option Test Plan 80-VD124-1 Rev A
 - EVRC-B (4GV) Service Option Test Procedure 80-VD125-1 rev A

Ready for use Nov '06

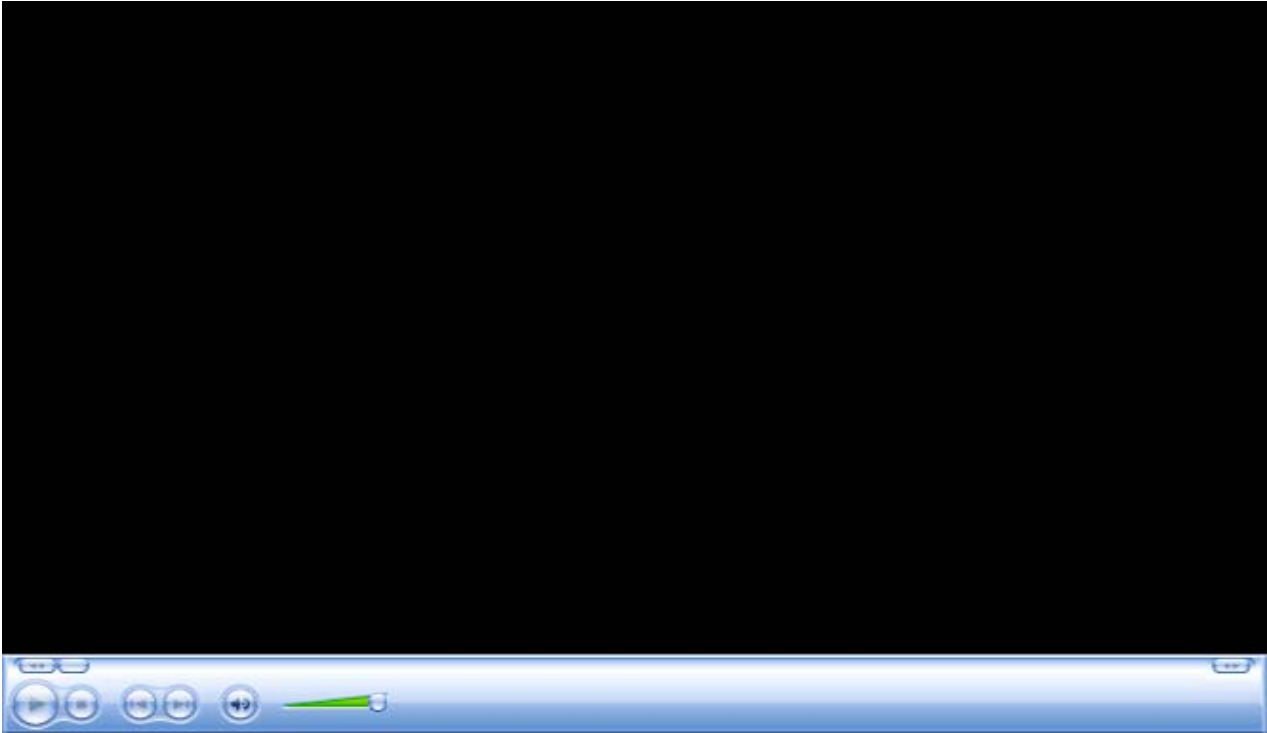
MMS Remote Field Test (RFT) Demo



Browser RFT Demo



Brew Download RFT Demo





How Qualcomm Lab Can Help ?

Q-Device Test Lab Philosophy

QUALCOMM Pre-certification lab, is offering a comprehensive range of Pre-certification Test services to manufacturers, network operators, distributors and service providers in the mobile communications industry.

For bringing new products successfully onto the market, we provide a **one-stop-shopping-service** including retest support, testing in accredited test laboratories, pre-certification services and customer approval handling. Being a member of numerous specialist bodies, Qualcomm is also actively involved in the development and standardizations of global specifications for future technologies and testing.

Our Pilot lab are located in San Diego, California and Pre-certification lab in Hyderabad, India are focused on providing state-of-the-art-services to pre-certify Mobile per Carrier's need such as CDG-1, CDG-2, CDG-3, CDG-4 and customer specific approval purposes with CDMA 2000 1X/DO test systems. We are planning to offer pre-certification services for Multi Media, MEID, Rx Diversity, DOrA and other new technology.

Why Qualcomm Pre-Cert Lab ?

- Big-name customers trust our competence and know-how.
- Global competition is becoming more and more intense and **product life shorter**; the **complexity of the technologies involved is increasing**. Demand for **economical, functional, reliable products and systems** is at the basis of any new developments today. Quick and direct access to the consumer (**time to market**) **is critical** to the success of a product.
- Our strengths are innovative power, long-standing experience, flexibility and a high degree of customer orientation. Our specialists are amongst the best in their respective fields. **We know that our customers' success is our success too!**
- Qualcomm Pre-Cert Lab is the **best partner to Improve time to Market** and **performance of devices**. Through our optimum resource management, which extends across the entire network, we are able to address the individual wishes of our customers. Worldwide Operator have appreciate our presence and our unique range of services. They can rely on our knowledge of the different markets.

Q-Device Test Lab Competence

- Technical know-how and improve time to market using commercial and internally developed tools and expertise are center areas of competence. We are the engine of technological progress and invest in the future of our customers. For this reason we have fine-tuned our testing needs to the specific Carrier and CDG test requirements. Our strengths are technical competence, flexibility, presence on relevant regional markets world-wide, immediate execution of orders and high reliability and quality of results
- Qualcomm Pre-Cert lab is shaping the future: We aim for long-term co-operation on a partnership basis with our customers, who are market leaders in their branches. In order to keep one technological step ahead of the present. Our team knowledge and experience is a guarantee for the success of our customers

Business & Technical Contacts

— Business Contacts:

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