NEW IEEE 1588™ CERTIFICATION PROGRAM FOR PHASE & TIME IN TELECOMMUNICATIONS

An IEEE-SA Conformity Assessment Program

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IEEE-SA Conformity Assessment Program for IEEE 1588™

New Phase & Time Certification Program

IEEE-SA Complete Business Lifecycle

IEEE-SA provides a framework of solutions to support rapid introduction of new technologies to market

ICAP – *What's Happening….*

> **Over 50 entities are presently engaged with IEEE in conformity program development**

- Six conformity program committees are in operation:
  - 1588 Telecom
  - SIEPON – IEEE 1904
  - Synchrophasors – IEEE C37.118.1
  - CPIQ – IEEE 1858
  - NPEC – IEEE 323
  - IEEE 1547 (Interconnect of Energy Resources)

IEEE-SA Conformity Assessment Program for IEEE 1588™

- IEEE-SA initiative

- First Conformity Assessment Program launched by IEEE-SA reaching its regular phase

- First vendors with compliant Packet Master Clock or Packet Slave Clock G.8265.1 implementations have been announced in June 2014

- Unique place where PTP protocol is tested in depth, essential for interoperability between vendors

- Next step: new G.8275.1 Certification Program

- Iometrix, officially authorized ICAP test lab

Path for phase/time ready networks

1- Understand needs & technologies	2- Develop standards	3- Qualify & procure equipment	4- Deploy solution in networks

1. Accurate phase/time synchronization requirements from current and next generation mobile networks to ensure quality of service for end users

2. G.8275.1 PTP Telecom Profile with full timing support from the network standard recently released (07/2014)

3. IEEE-SA launches today a call for participation for the Pilot Phase of the new phase/time IEEE 1588™ Certification Program to complete the standardization process with a <u>single and universally recognized</u> conformity assessment testing process based on industry-approved test plan
   - Simplified and rationalized testing both for equipment vendors and network operators
   - In-depth testing of IEEE 1588™ protocol and PTP options defined in the profile
   - Easier equipment sourcing for network operators

4. **<u>IEEE-certified equipment</u>** allows easier, faster and safer deployments thanks to enforced compliance to the standard

Business Motives and Rationale

For Service Providers

- Meets service provider requirements for compliant IEEE 1588™ telecom products

- Accelerates and eases equipment sourcing and selection process

- Requirement expected in service provider RFPs for mobile backhaul

For Vendors

- Replaces vendor need to undergo multiple service providers' internal test programs

- Demonstrates commitment to latest industry timing and synchronization standards

- High-level of interoperability once equipment is deployed, reduces issues in the field

Procuring IEEE-certified equipment

Upcoming ICAP webinar: March 17ᵗʰ

live interactive webinar

IEEE 1588™
from Standardization to Certification
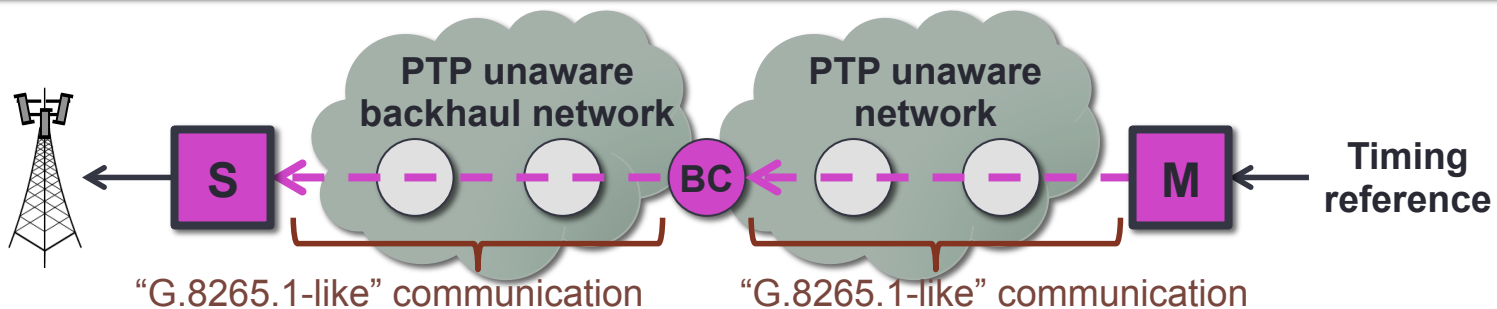the second in a series

Tuesday, 17 March 2015 @11:00 AM EST

- Phase and time synchronization as the next frontier for IEEE 1588™ telecom deployments
- Perspective of two network equipment manufacturers about the Certification Program
- Next steps of the Certification Program targeting the delivery of phase/time-ready mobile backhaul products to network operators

- Webinar registration:
  https://ieeemeetings.webex.com/ieeemeetings/onstage/g.php?MTID=ecc1f033f9c203ab9866054c017de7976

- IEEE 1588™ Certification Program official web site:
  http://standards.ieee.org/about/icap/active-programs.html

IEEE-SA Conformity Assessment Program for IEEE 1588™

Overview of Pilot Phase for Phase & Time

Status of IEEE 1588™ Certification Programs

LAUNCHED 2014

PTP unaware backhaul network

S

M

Timing reference

PTP in end-to-end mode, ITU-T G.8265.1 telecom profile

NEW 2015

PTP aware backhaul network

T-TSC   T-BC   T-BC   T-BC   T-BC   T-GM

Timing reference

PTP with full timing support from the network, ITU-T G.8275.1 telecom profile

PTP unaware backhaul network

PTP unaware network

S   BC   M

Timing reference

"G.8265.1-like" communication   "G.8265.1-like" communication

PTP with partial timing support from the network, ITU-T G.8275.2 telecom profile

Phase & Time Pilot Phase - Timeline & Process

March, 2015   April, 2015   June, 2015   November, 2015

REGISTRATION   **TEST PREPARATION**   **TESTING PHASE**   **FIRST IEEE CERTIFICATIONS TARGETED**

IEEE Certified IEEE 1588

March - April:
- Opening of program Pilot Phase
- Registration package made available to vendors (form, pricing…)
- Release of first technical testing documents
- Registration cut-off date: April 30th, 2015

April - June:
- Preparation and pre-qualification of products for testing
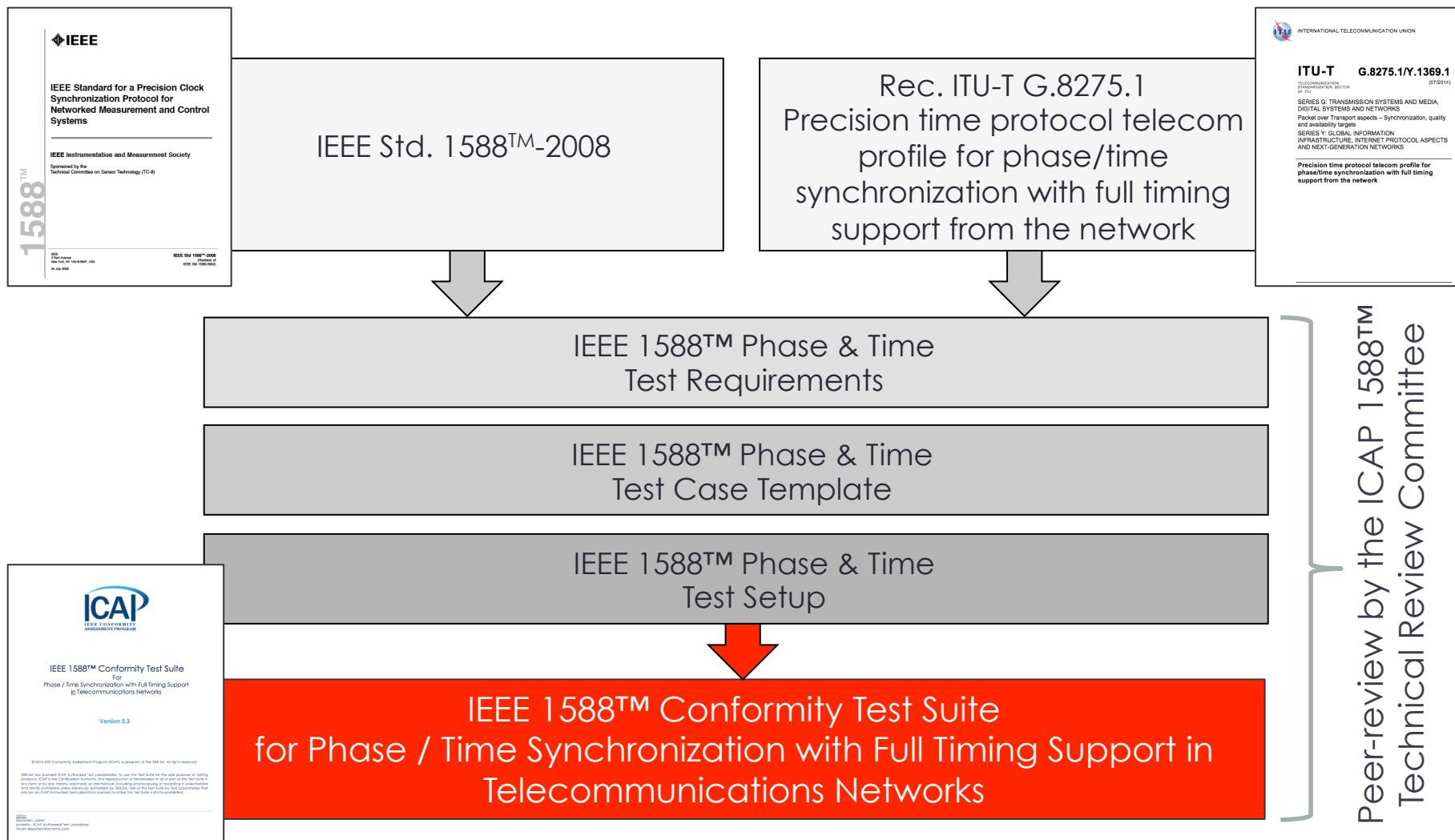- Paperwork and logistics

June - November:
- Testing conducted in Iometrix lab located in San Francisco, California USA
- Testing sessions organized per cycles and scheduled at agreed upon dates with vendors
- Vendor provides on-site or remote engineering support during testing sessions as required

November:
- Public announcement of first Phase & Time 'IEEE certified' vendors planned in Q4

IEEE 1588™ Conformity Test Suite for G.8275.1

IEEE Std. 1588™-2008

Rec. ITU-T G.8275.1
Precision time protocol telecom profile for phase/time synchronization with full timing support from the network

IEEE 1588™ Phase & Time
Test Requirements

IEEE 1588™ Phase & Time
Test Case Template

IEEE 1588™ Phase & Time
Test Setup

IEEE 1588™ Conformity Test Suite
for Phase / Time Synchronization with Full Timing Support in Telecommunications Networks

Peer-review by the ICAP 1588™ Technical Review Committee

IEEE 1588™ Pilot Phase Testing Cycles

IEEE 1588™ Phase/Time Full Timing Support

TELECOM GRANDMASTER (T-GM)	TELECOM BOUNDARY CLOCK (T-BC)	TELECOM TIME SLAVE CLOCK (T-TSC)

Pilot Phase Testing Cycle 1:
### PTP message format & generation
**150+ Test Cases**

- Announce Message Format
- Inter-message interval statistics for Announce Messages

- Sync and Follow_Up Message Format
- Inter-message interval statistics for Sync & Follow_Up Messages

- Delay_Req Message Format
- Inter-message interval statistics for Delay_Req Messages

- Delay_Resp Message Format
- Transmission of Delay_Resp Messages
- Tolerance to Delay_Req Messages rates

- One-Step / Two-Step Clock
- Forwardable / non-forwardable multicast addressing options

- Time Traceability / PTP clockClass values for frequency source Categories 1, 2, 3 and G.781 Options 1 and 2
- Holdover Timer
- Specific Cases Involving Multiple Messages

Pilot Phase Testing Cycle 2:
### BMCA and advanced options
150+ Test Cases (anticipated)

- Alternate Best Master Clock Algorithm and T-GM selection
- Compliance to State Decision Algorithm
- Network protection and rearrangements

- Compliance to Dataset Comparison Algorithm
- notSlave attribute
- localPriority attribute

- Compliance to per-port State Machine
- Transition events (e.g. announceReceiptTimeout)

- Specific Cases Involving Multiple Messages

Scope of the conformance program: PTP protocol communication between T-GM, T-BC, T-TSC

IEEE STANDARDS ASSOCIATION

Test bed for a T-GM

Test bed for a T-BC

Test bed for a T-TSC
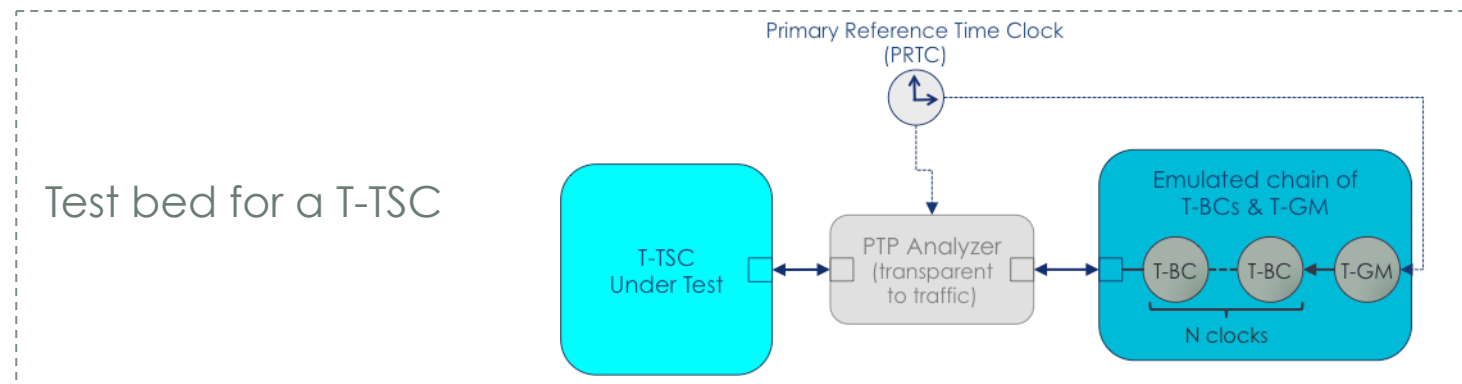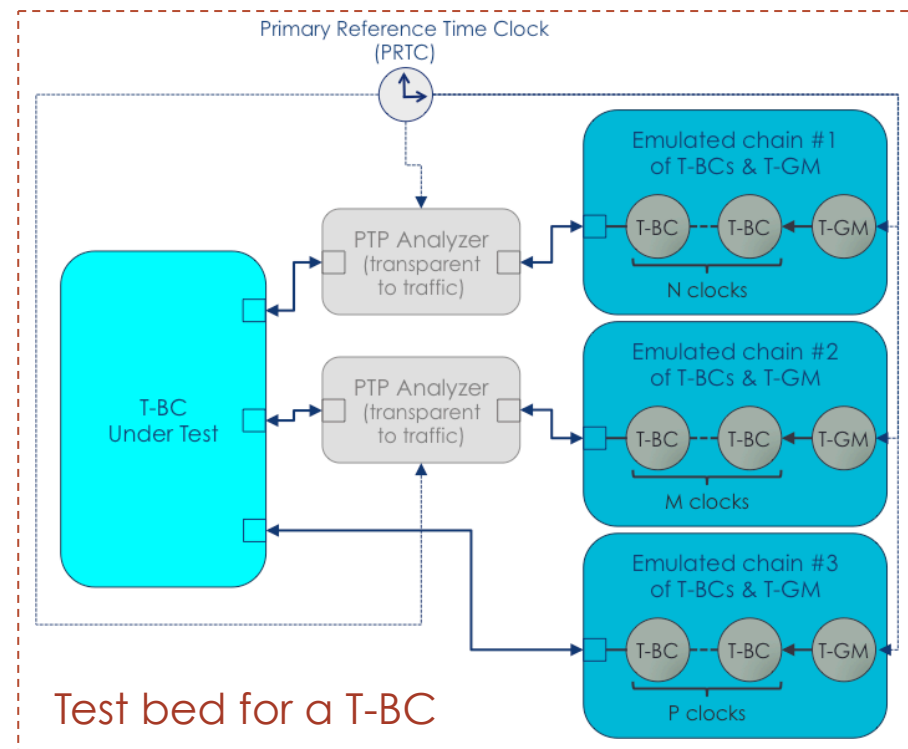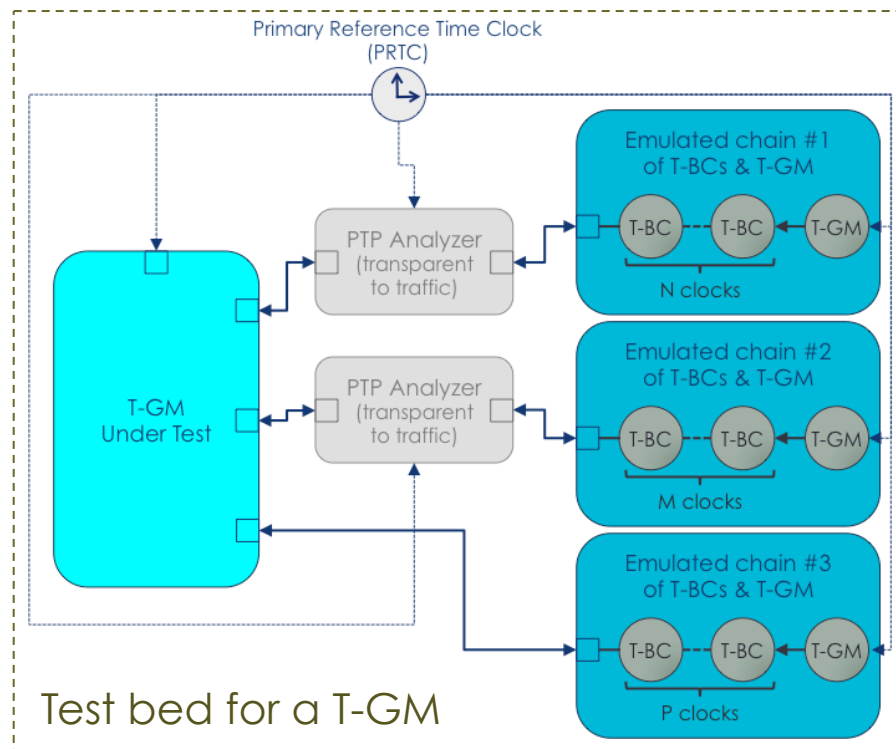
Reduced State Machine for BMCA testing
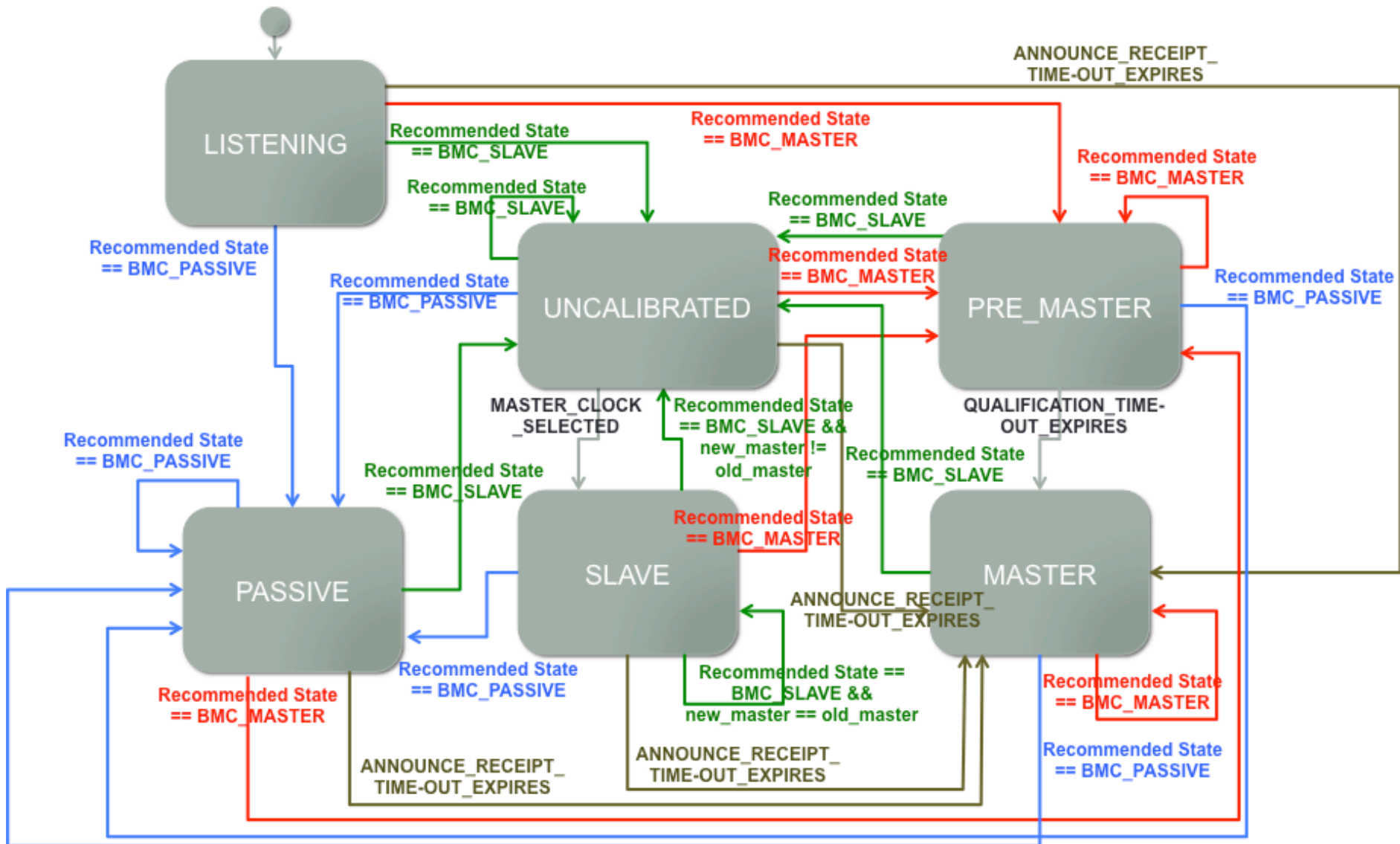
Registering to the Pilot Phase!

- Why?
  - Be in the first group of vendors announced by IEEE-SA
  - Demonstrate commitment to the new G.8275.1 standard
  - Deliver Phase/Time-ready mobile backhaul products to service providers to support LTE / LTE-A deployments

- How?
  - Contact Iometrix at info@iometrix.com
  - Registration open from March to April 30th, 2015

Thank You

Q&A

IEEE 1588™ Certification White Paper

http://standards.ieee.org/about/icap/active-programs.html

Iometrix: The Standard for Testing
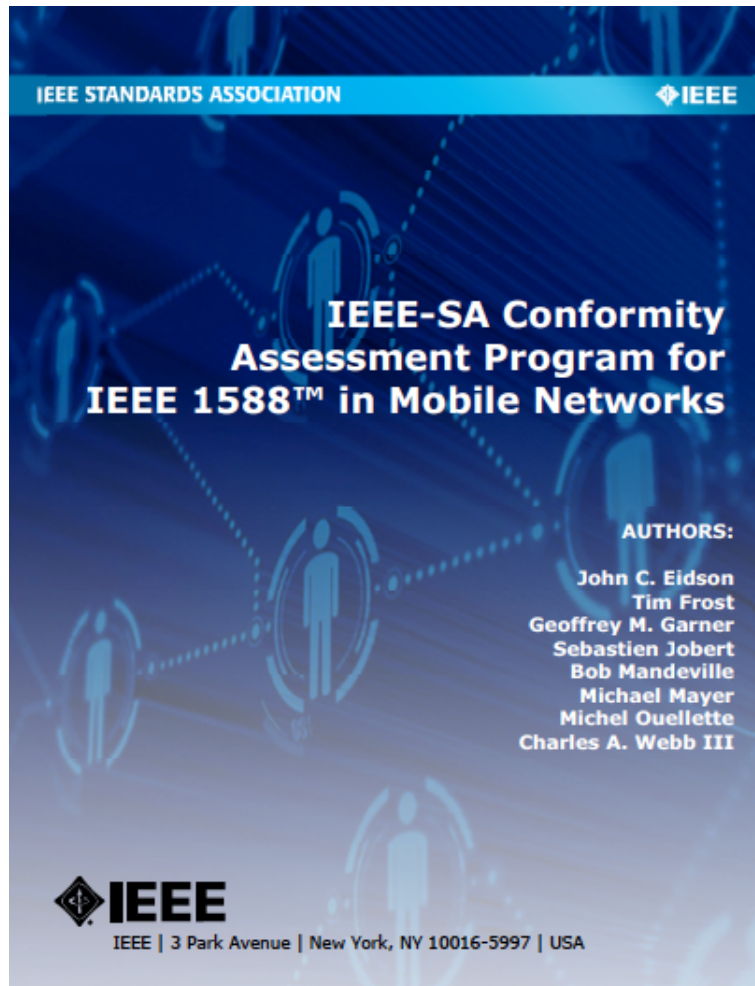
Official Testing Lab of:

IEEE 1588 Testing
First IEEE-sanctioned program for timing and synchronization in mobile networks

Carrier Ethernet Testing
Equipment & Services

OpenCloud Project
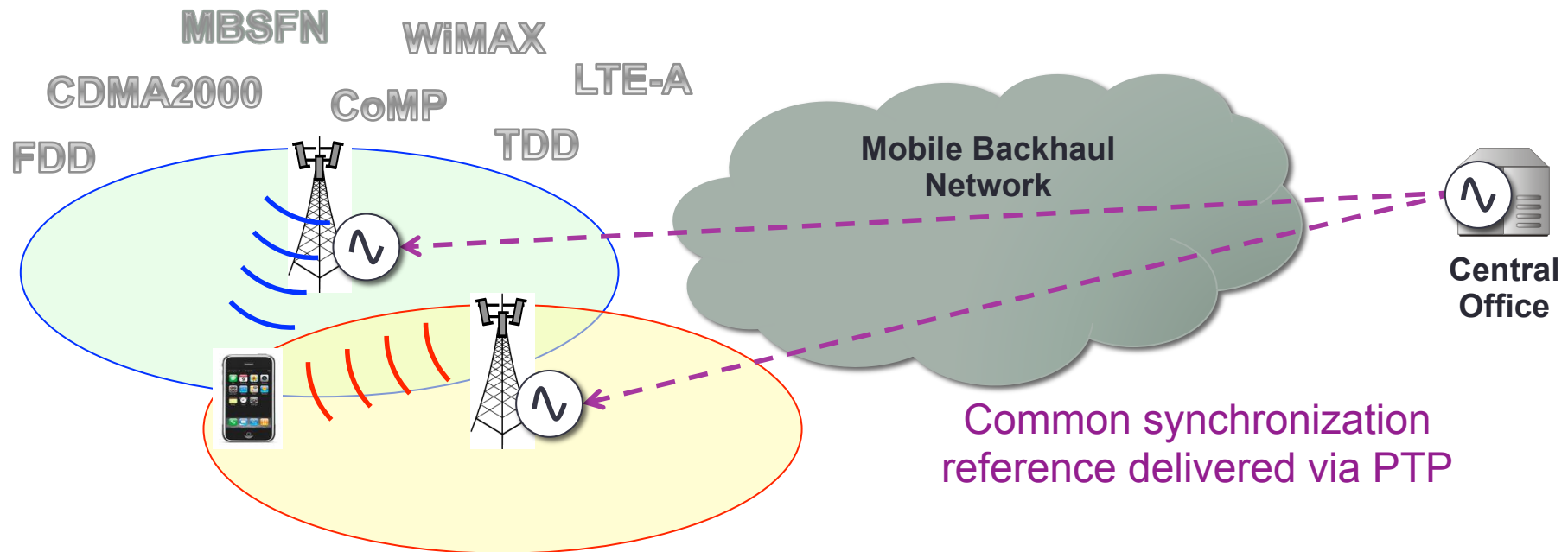*Reference test bed for Cloud Networks & Services*

- The networking industry's preeminent testing authority

- Official testing lab of major Standards Development Organizations

- Iometrix is an A2LA accredited ISO/IEC 17025 CAB (Conformity Assessment Body)

- Delivers conformance testing to a broad spectrum of telecom equipment manufacturers and service providers worldwide

- Focus on packet network protocols, technologies and services

- Editor of numerous test specifications in leading standards bodies including the ITU, BBF, IEEE, IETF, CEF and MEF

- Headquartered in Silicon Valley, California with operations and activities around the globe

Acronyms

- PTP: Precision Time Protocol
- M: Master
- S: Slave
- T-GM: Telecom-Grandmaster
- T-BC: Telecom-Boundary Clock
- T-TSC: Telecom-Time Slave Clock
- BC: Boundary Clock
- PRTC: Primary Reference Time Clock

Synchronization for mobile networks

MBSFN

WiMAX

LTE-A

CDMA2000

CoMP

TDD

FDD

Mobile Backhaul Network

Central Office

Common synchronization reference delivered via PTP

- Mobile base stations (2G, 3G, 4G or 5G) require accurate frequency and/or phase/time synchronization to avoid interferences and ensure successful handovers and efficient radio spectrum usage
- Poor synchronization results in poor user experience caused by dropped calls and erratic throughput

Definitions

Difference between frequency and phase/time synchronization
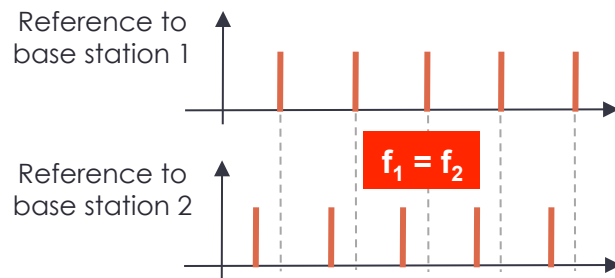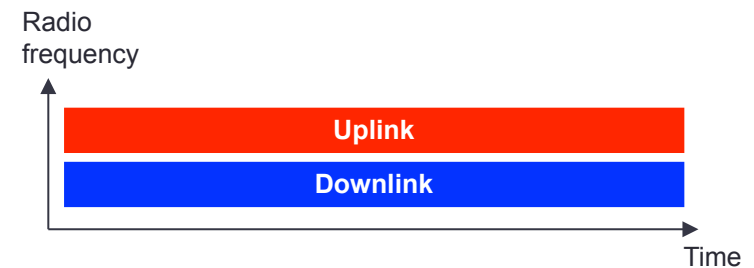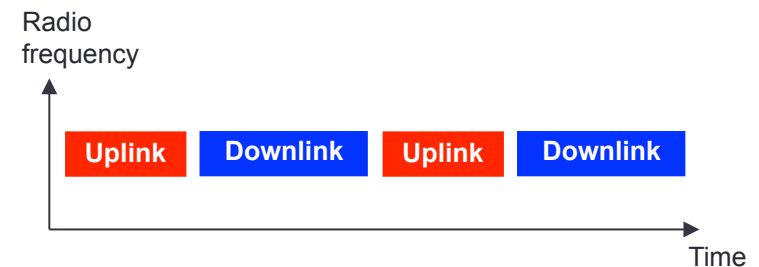
Frequency synchronization
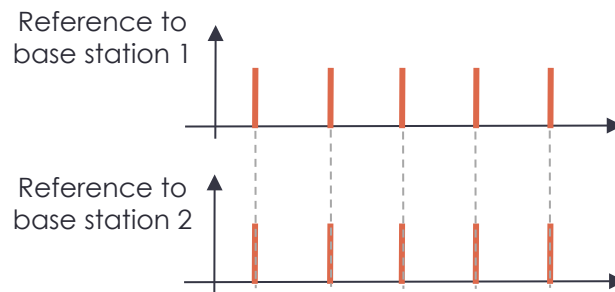
Phase/time synchronization

Difference between FDD and TDD mobile systems

Frequency Division Duplex (FDD)

Time Division Duplex (TDD)

Importance of conformance testing