

# Ether.Sync Ether.Genius Ether10.Genius

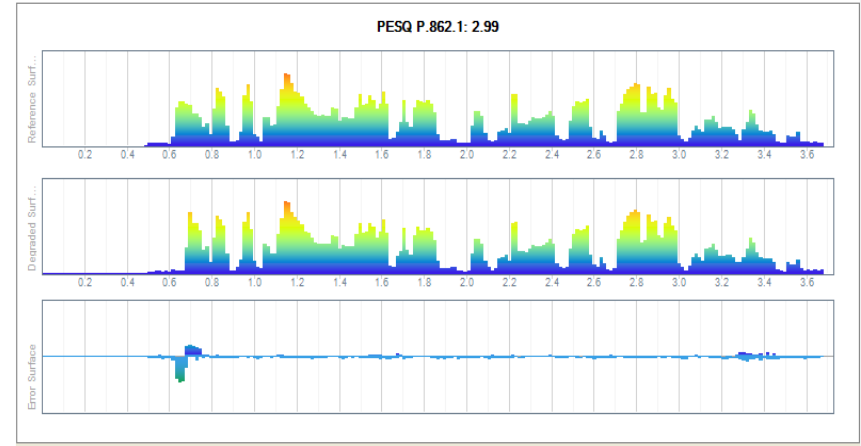


Multitechnology testers 10GbE GbE + PTP + SynE + T1/E1 + Datacom + Jitter/Wander



**ALBEDO**  
Telecom  
*the Path to Excellence*

# Global Manufacturer telecom nodes & instruments



# ALBEDO Ethernet testers

	10GbE	One-way	T1/E1	Ethernet	SyncE	PTP	Wander	C37.94	Datacom
Ether.Genius		★	★	★	★	★	★	★	★
Ether10.Genius	★	★	★	★	★	★	★	★	★
Ether.Giga				★					
Ether.Sync		★		★	★	★	★		

# Ether.Sync: Synchronous Ethernet tester



- ◆ **Ether.Giga:** GbE, RFC2544, eSAM, BER tester
- ◆ **Ether.Sync:** Ether.Giga + PTP + SyncE

# Ether.Genius: multitechnology tester



**Ether.Genius: Ether.Sync + AT.2048 + C37.94 + One-way**

- ◆ **AT.One:** E1 and Datacom tester
- ◆ **Ether.Giga:** GbE, RFC2544, eSAM, BER tester
- ◆ **Ether.Sync:** Ether.Giga + PTP + SyncE

# Ether10.Genius: 4-in-1 tester

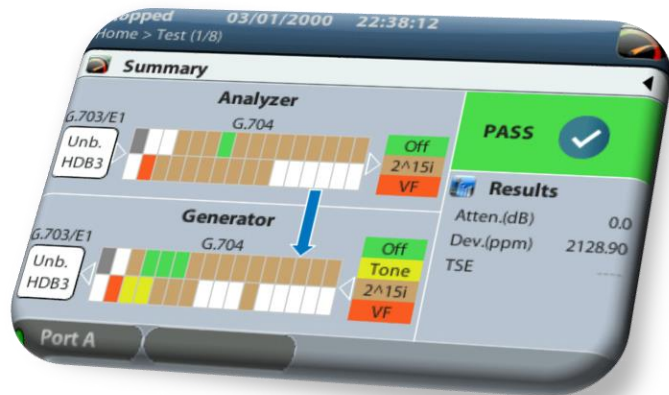


**Ether10.Genius: Ether.Genius + 10Gb/s Ethernet (2 x Ports)**

- ◆ **AT.One:** T1 / E1 and Datacom tester
- ◆ **Ether.Giga:** GbE, RFC2544, eSAM, BER tester
- ◆ **Ether.Sync:** Ether.Giga + PTP + SyncE
- ◆ **Ether.Genius:** Ether.Sync + AT.2048 + C37.94 + One-way

# Small, smart, nice, & **FULL** equipped

- 1 kg weight
- Battery
- Keyboard + Mouse
- TouchScreen

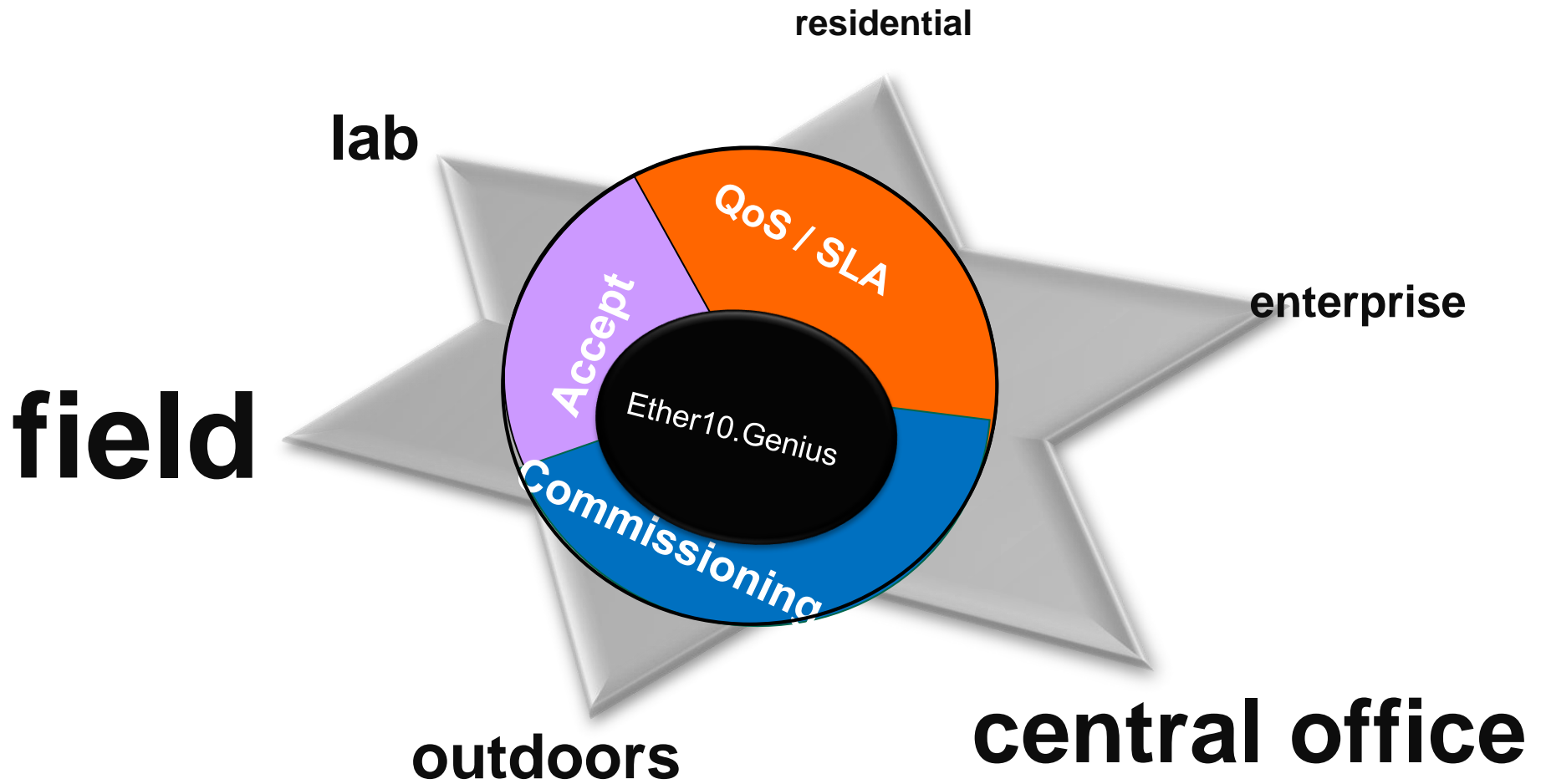


2xSFP+  
2xRJ45 GbE  
2xBNC  
1xRJ45 (E1)  
SF card



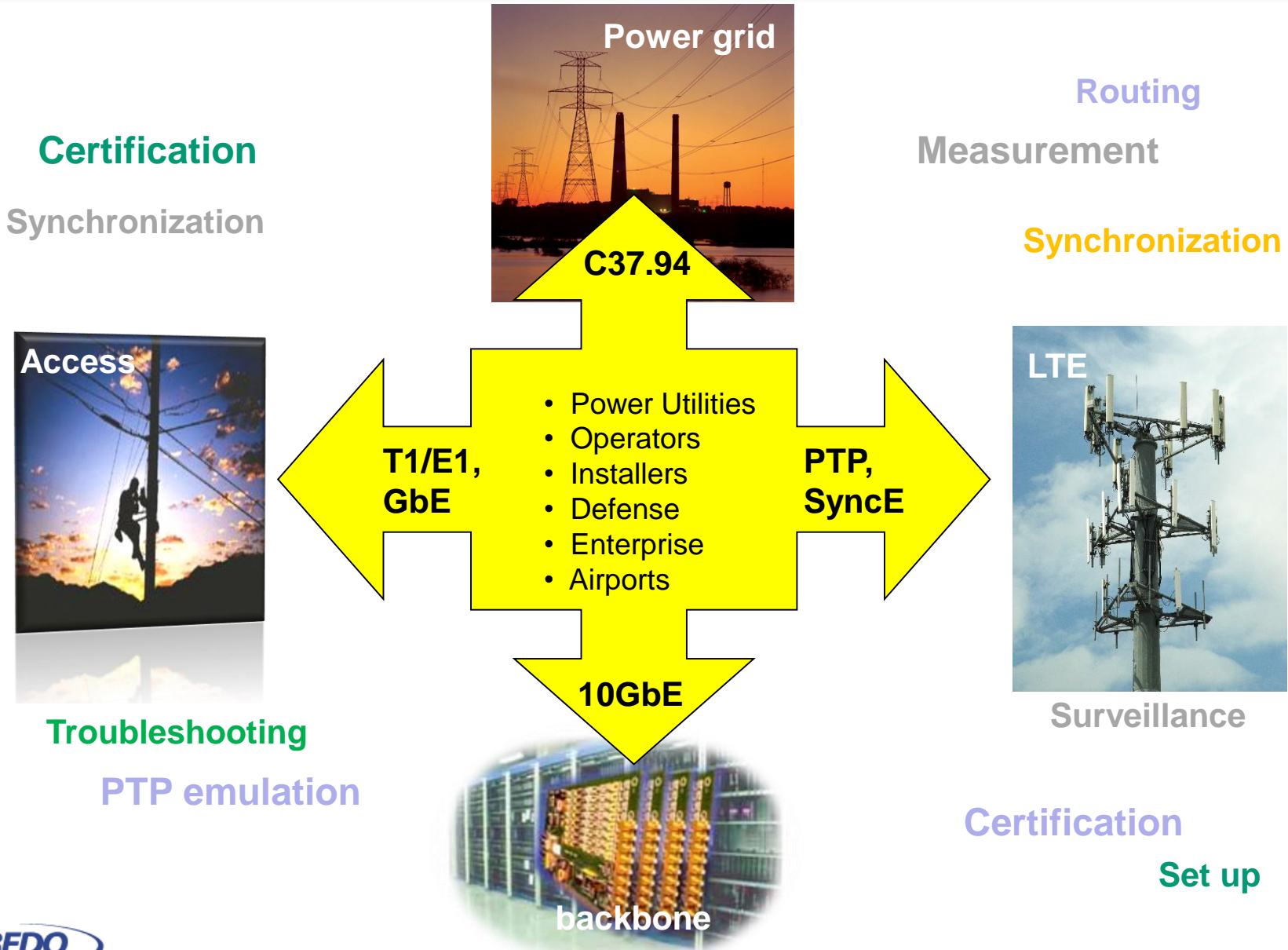
DTE/DCE  
RJ45  
2xUSB  
Printer  
Datacom  
Voice Port

# Heavy duty field **Multitechnology** tester





# Ether.Genius markets

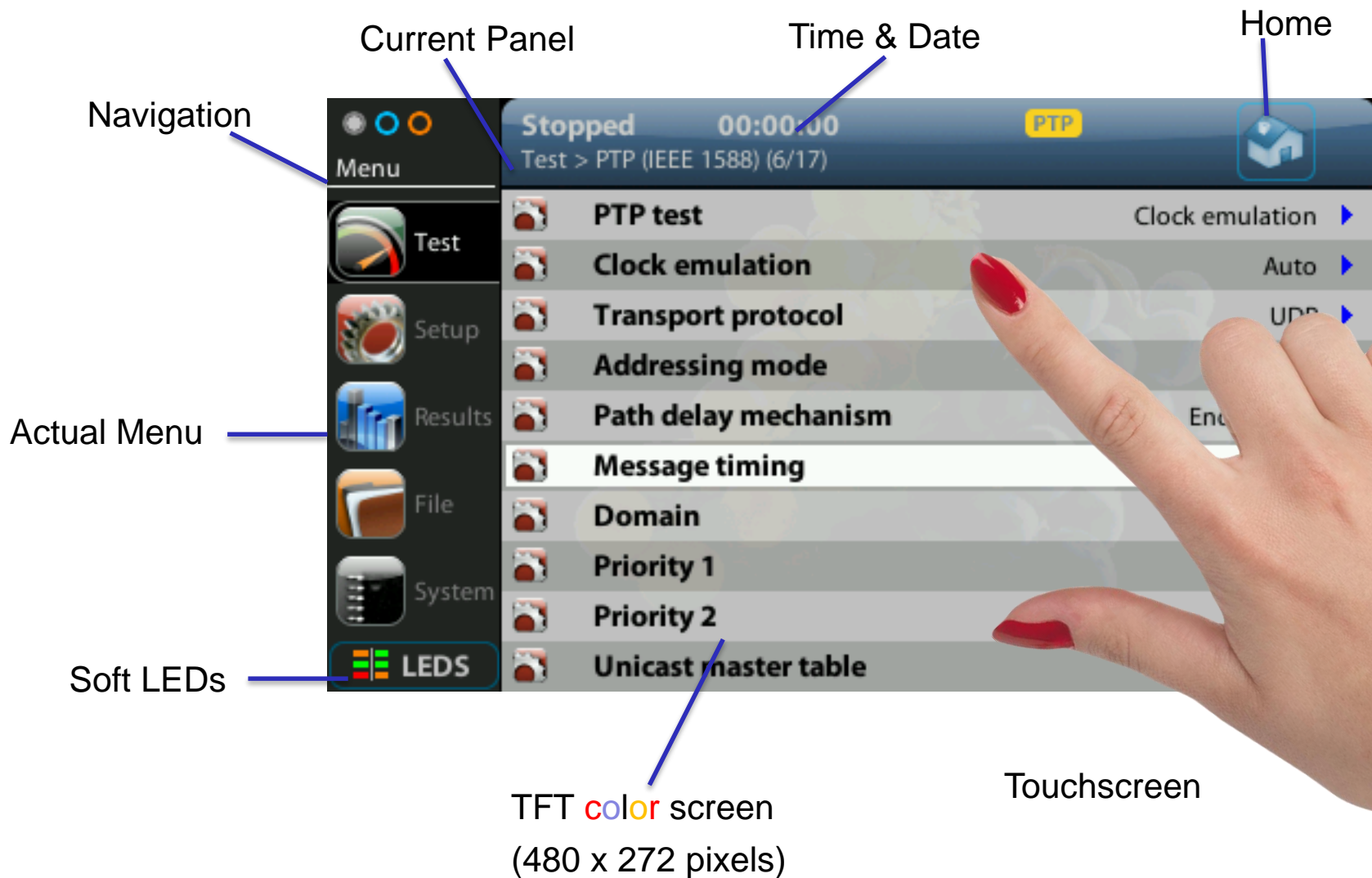


# Test Professional Markets

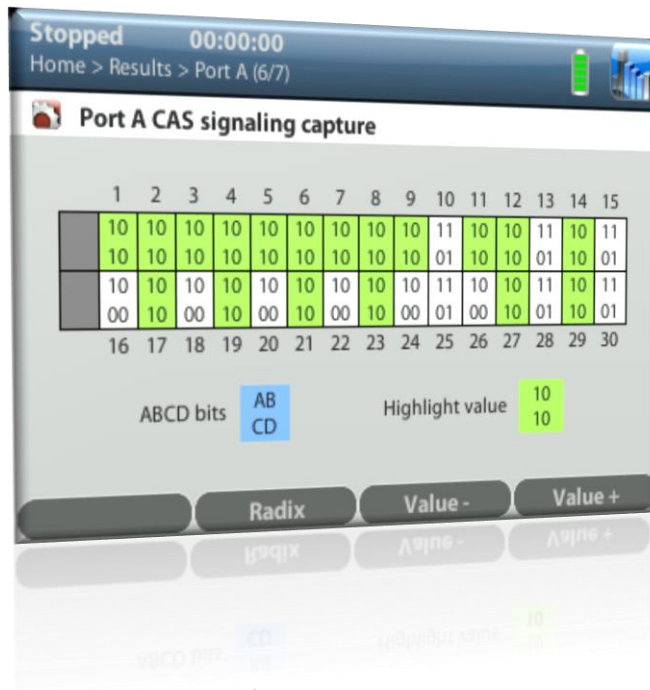
- ◆ Installers and Telecom Operators of 3G and LTE
- ◆ PTP power and telecom profiles
- ◆ Synchronization Networks, 1pps, Jitter/Wander test
- ◆ Commissioning / Maintenance T1/E1, GbE, PTP, SyncE
- ◆ C37.94 support for High Voltage protection



# Touch-screen GUI

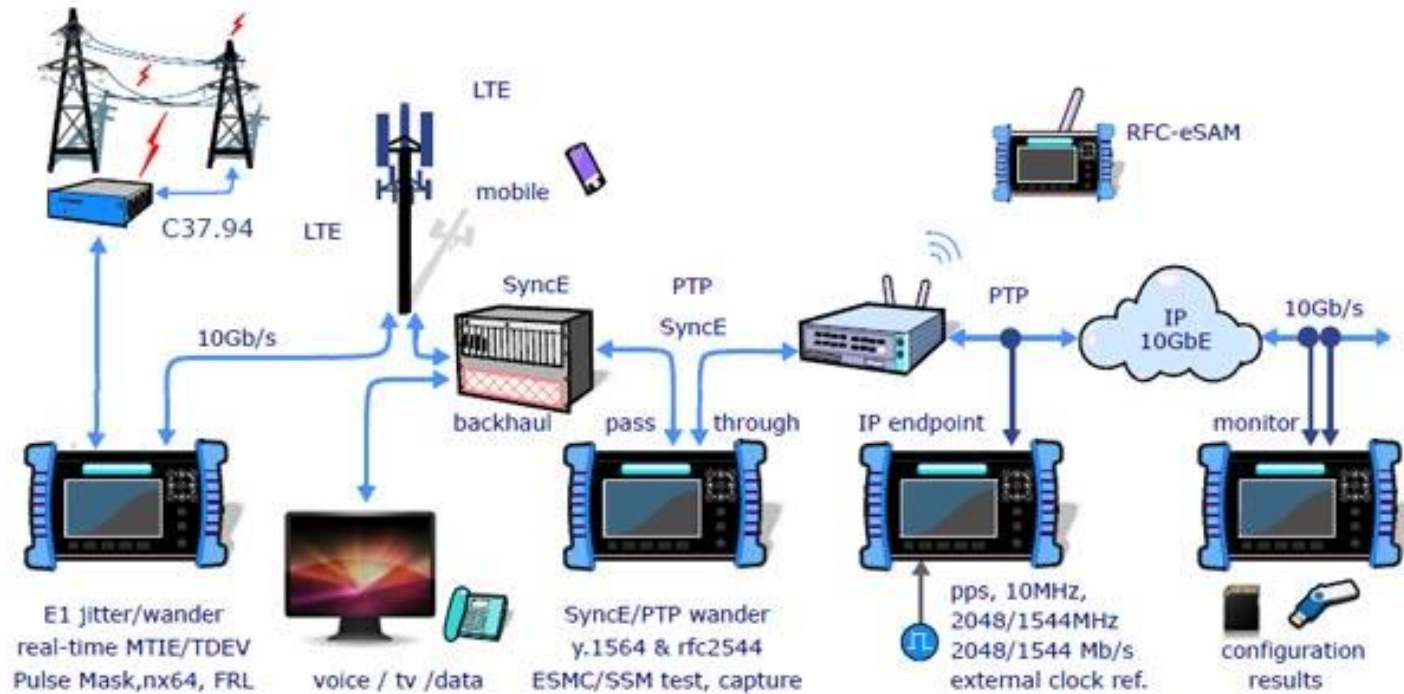


# intuitive while effective GUI



- ◆ Touch screen, keyboard or mouse
- ◆ Limited Navigation deep
- ◆ SoftLEDs © all events at a glance
- ◆ Functional navigation keys
- ◆ Landscape ergonomic
- ◆ PASS / FAIL
- ◆ Enhanced File System

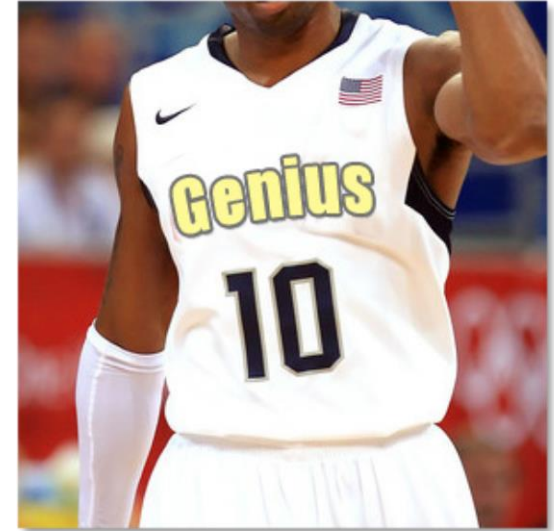
# The value of Innovation



- ◆ 100% Compact, no external modules, built-in GPS & Rubidium
- ◆ 2 x SFP+, WIS, 2xRJ-45, 2xBNC, DTE/DCE ports
- ◆ Long operation batteries (24h E1/T1, 12h. GbE, 5h. 10GbE)
- ◆ SNMP / MIB support
- ◆ C37.94 support

# world **BEST** testing features

- ◆ Built-in **rubidium clock**
- ◆ **Multistreams** for IPTV, VoIP, Critical Data
- ◆ RFC2544 **e-SAM** (Symmetric & Asymmetric)
- ◆ **Ethernet OWD** (One-way-Delay)
- ◆ **Q-in-Q** for demarcation tests
- ◆ **T1 / E1, Datacom** support
- ◆ **Scan MAC/IP/VLAN/QinQ**
- ◆ **Advanced Counts:** Up to 8 MAC, IP, TCP/UDP filters
- ◆ **C37.94** N x 64 kbit/s; BER; ITU-T G.821, Freq (Hz), (ppm), dev.
- ◆ Round Trip Delay (ms), **One-way** Delay with GPS
- ◆ **Wander** Analysis & Generation (E1/T1, PTP, SyncE)
- ◆ **PTP full support**, master and slave emulation
- ◆ **Time Error** (TE), max|TE|, constant/dynamic TE



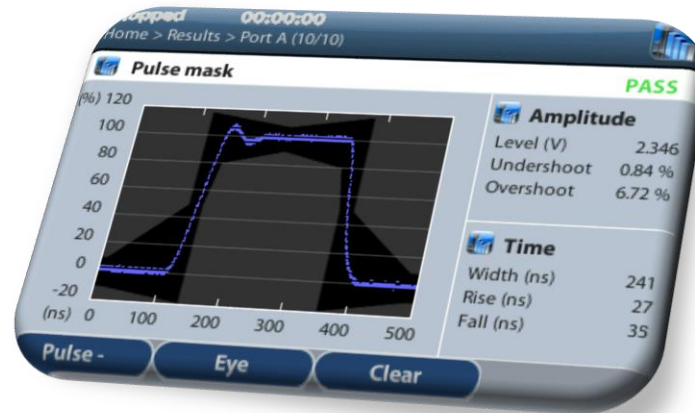
# GbE Automatic QoS test

Compliant with latest standards for advanced services such as IPTV, VoIP or VoD:

- ◆ **Traffic Scan and Discovering**
  - Find selected flows
  - Monitor or execute test
  - No more difficult set up
  
- ◆ **Improved RFC 2544 (Asym/Sym)**
  - throughput,
  - frame-loss,
  - latency,
  - back-to-back
  - recovery time tests
  
- ◆ **ITU-T Y.1564 (Asym/Sym)**
  - Service Configuration
  - Service Conformance



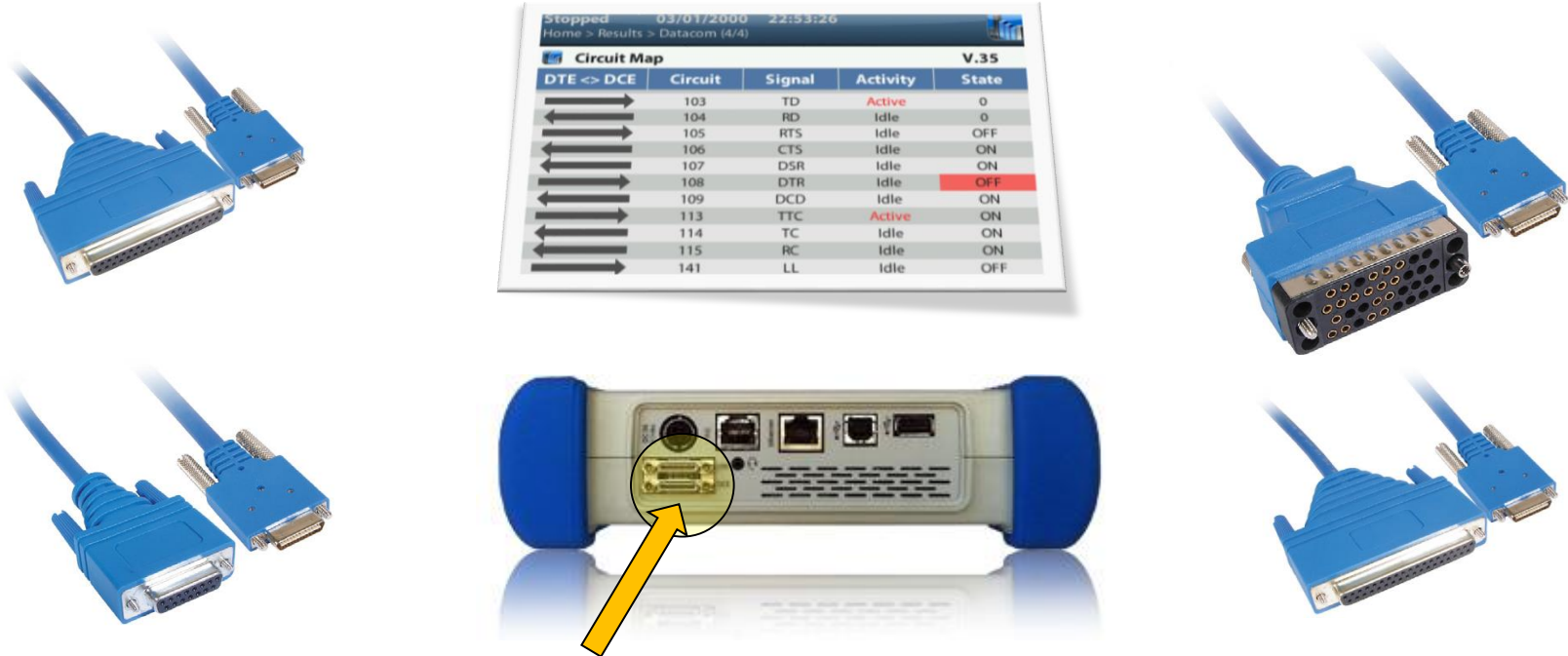
# ALL the features in **T1 / E1 / Datacom** (Ether.Genius)



- ◆ Full T1/ E1 testing
- ◆ Jitter and Wander measurements
- ◆ Pulse Mask
- ◆ Datacom
- ◆ Frame Relay
- ◆ Voice Frequency
- ◆ Codirectional
- ◆ Contradirectional

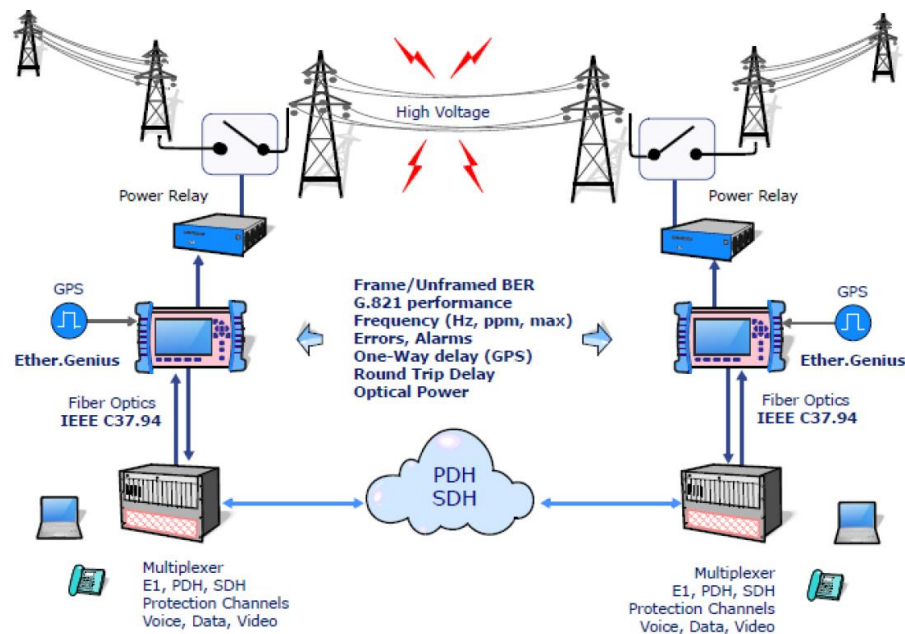


# Datacom: CISCO cables (EtherX.Genius only)



- ◆ Standard CISCO cables: easy replacement
- ◆ No extra hardware or adapters required
- ◆ DTE +DCE for all operation modes

# Power Utilities features (Ether.Genius only)

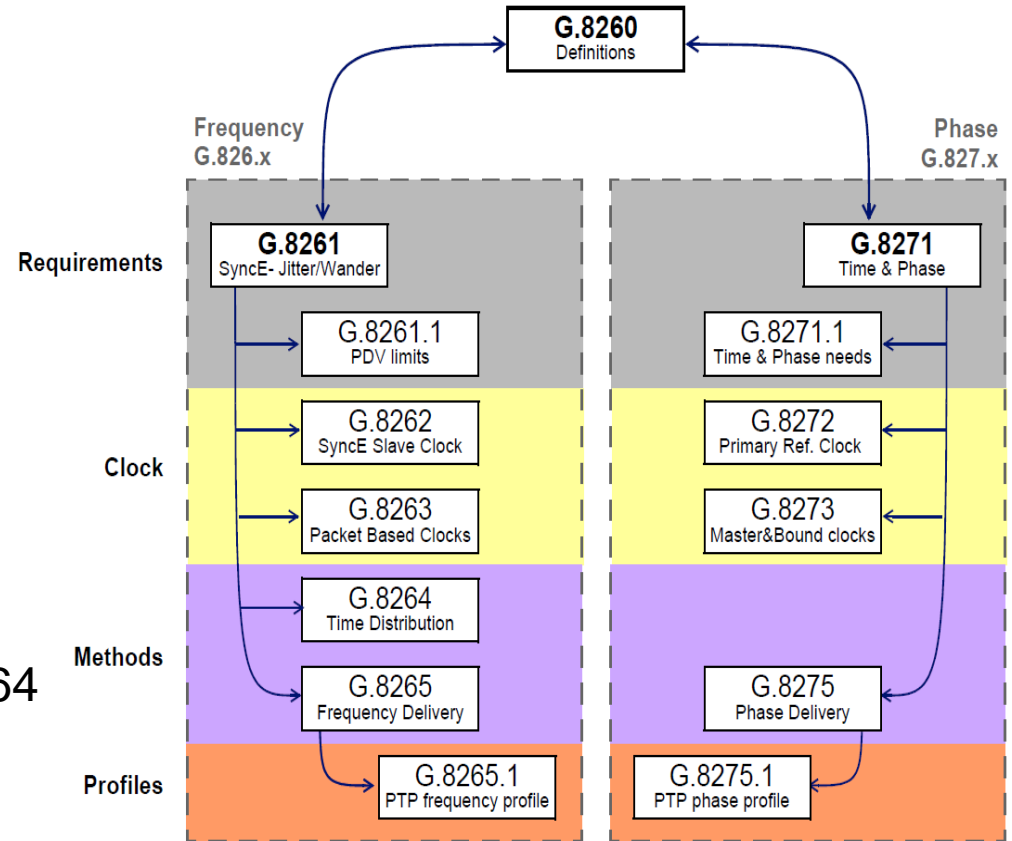


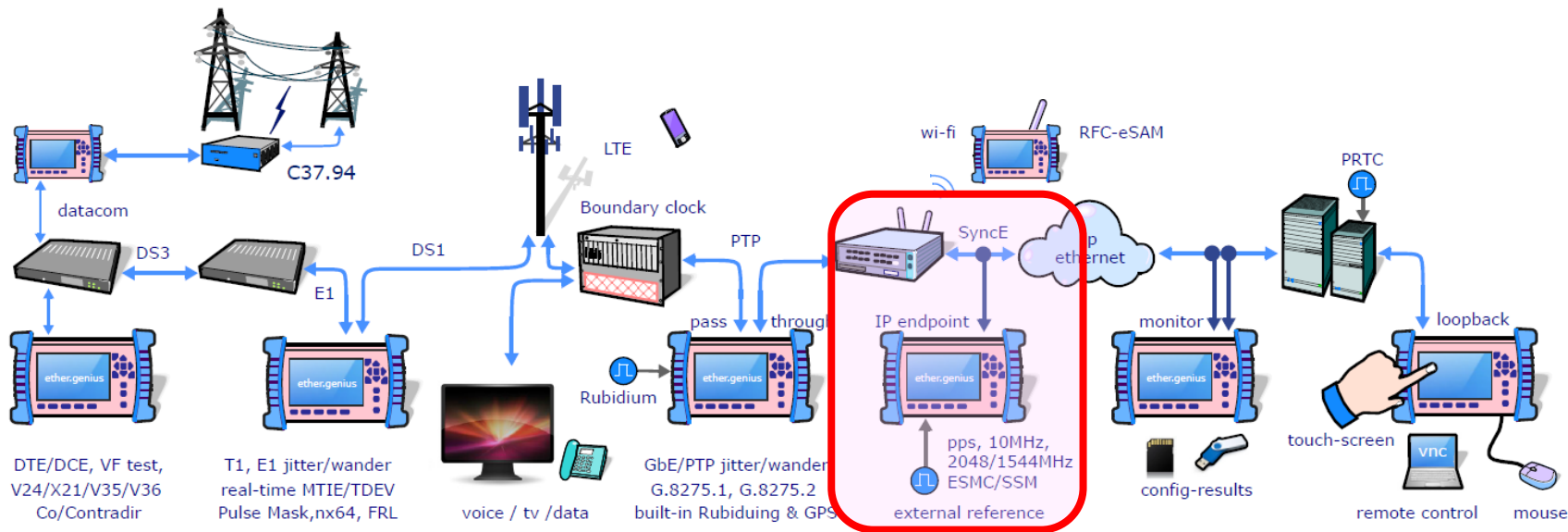
Ether10.Genius support in one device multiples features including:

- ◆ **IEEE C37.94** it is 2Mb/s over fiber, becoming popular because and are immune to the interferences caused by electrical noise.
- ◆ **One-way-delay**: which is used to verify asymmetric delays to avoid perturbations on the phase power Synchronization.
- ◆ **Power Profile** in PTP analysis / generation and testing

# Synchronous Ethernet functionalities

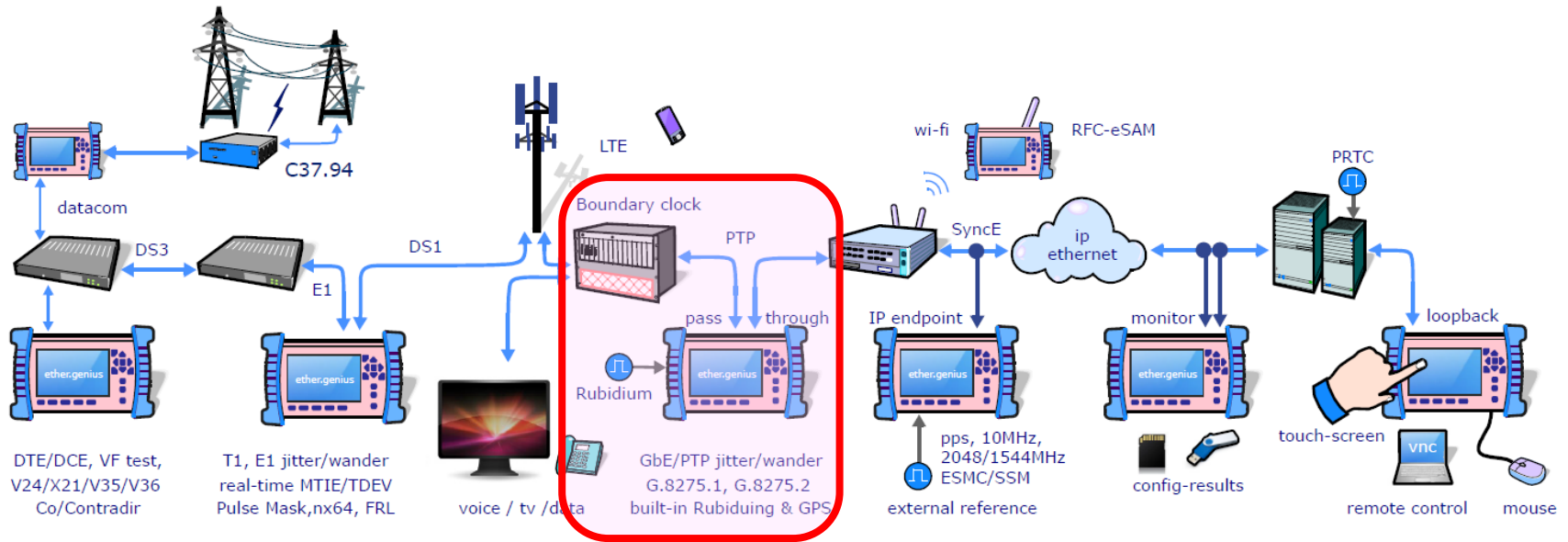
- ◆ Internal Clock
  - Rubidium
  - GPS/GLONASS
  - OCXO
- ◆ External Clock
  - SyncE
  - T1 / E1 / pps
  - 1,5 / 2 / 10 MHz
- ◆ Support of G8261, G8262, G8264
- ◆ Line Freq, offset, drift
- ◆ SSM count and rate
- ◆ SyncE MTIE / TDEV measurement
- ◆ Generation / Decoding ESMC and SSM





- ◆ Synchronization according G8261, G8262, G8264
- ◆ Ethernet Line frequency (MHz), offset (ppm), drift (ppm/s)
- ◆ Analysis / Generation ESMC messages
- ◆ SSM count & rate
- ◆ SyncE MTIE / TDEV measurement
- ◆ SyncE Wander analysis/generation

# PTP - 1588v2 support



- ◆ Built-in atomic Rubidium / OCXO clock and GPS / GLONASS receiver
- ◆ External: SyncE, 1544, 2048 Mb/s, 1544, 2048, 10 MHz, 1 pps
- ◆ PTP / IEEE 1588v2 support decoding
- ◆ PTP support / generation as master or slave
- ◆ Master Clock operation on each port using internal/external ref
- ◆ Frequency: TIE, MTIE, TDEV, FPP, FPR
- ◆ Phase: Time Error, max |TE|, dynamic and constant TE
- ◆ C37.94: nx64, BER, One-way-delay with GPS, Freq. Dev, Events, OPM

# Time Error (TE)

Reference clock  
( $T_{ref}$ )



Network clock  
( $T_{net}$ )



error = -5



error = +5

- Time error (TE) is the difference to the reference clock
- It is a relative measure: does not make sense without reference
- Defined by the ITU-T G.810

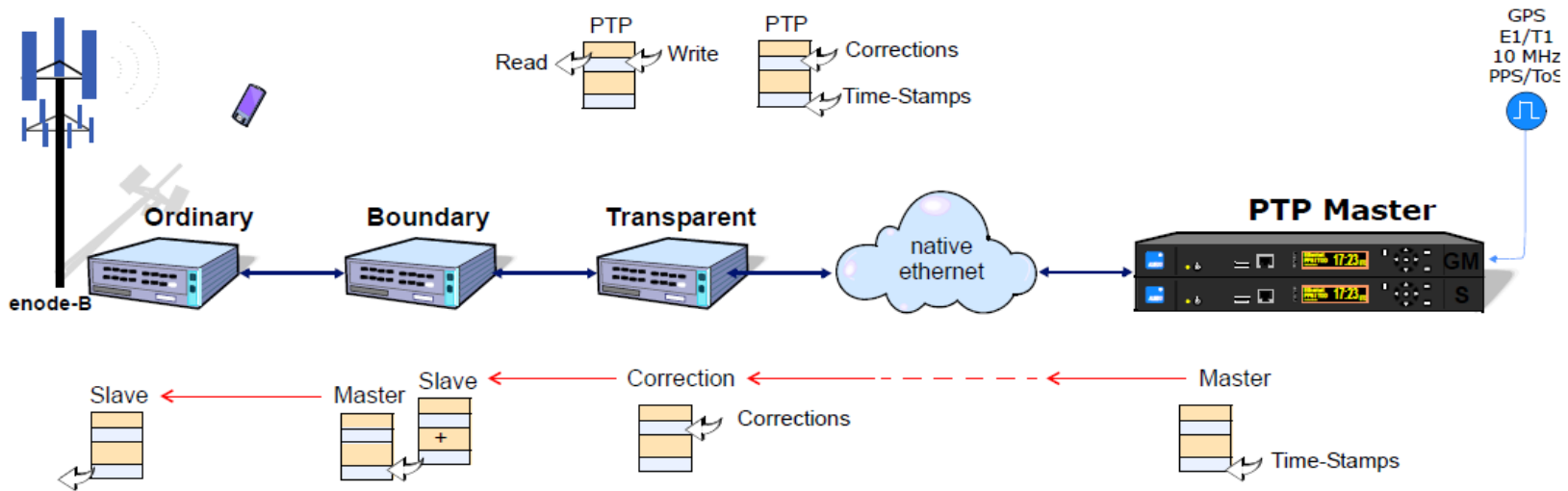
$$x(t) = T_{net}(t) - T_{ref}(t)$$

$x(t)$ : error

$T_{net}(t)$ : time on the clock

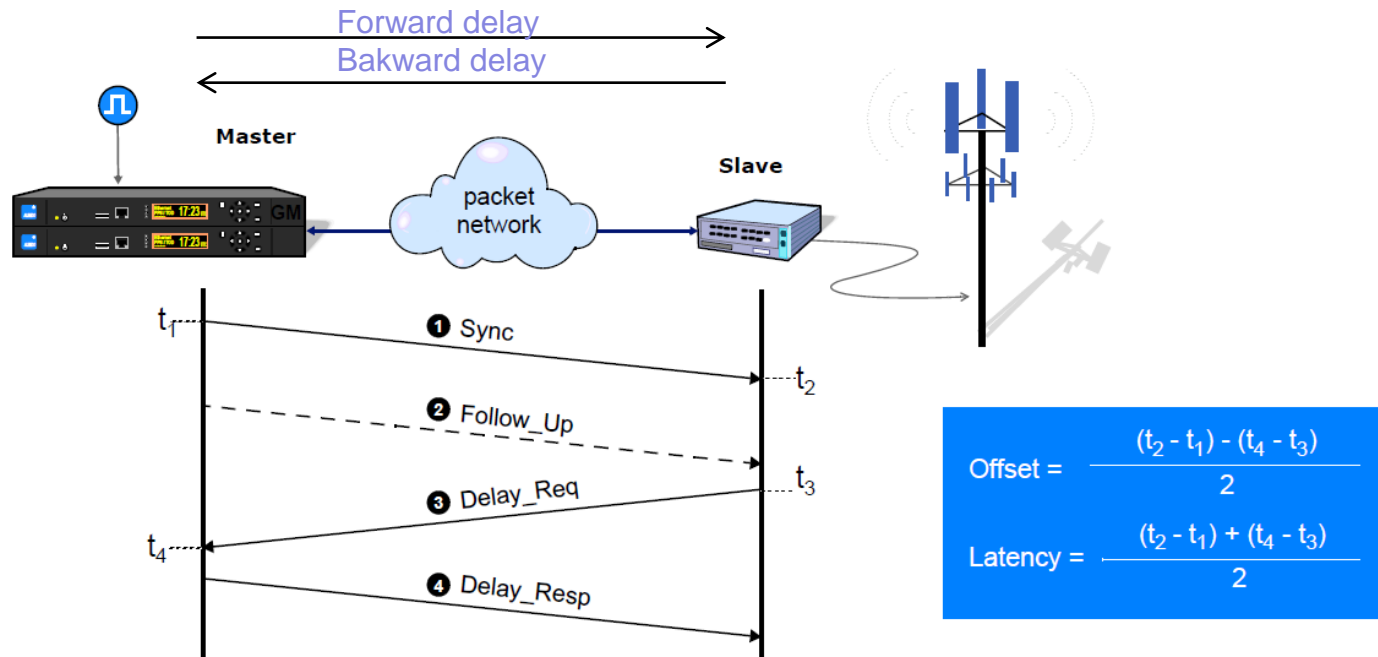
$T_{ref}(t)$ : the absolute reference time

# Time Error in EtherX.Genius



- ◆ TE is the offset between PTP time and a ref. clock such as GPS
  - G.8271.1 specifies the limit for the maximum TE to 1.1 microseconds
- ◆ Ether.Genius includes TE results including max, constant, dynamic
  - This test tells how suitable is the network for phase time / delivery

# Asymmetry tests with Ether.Genius

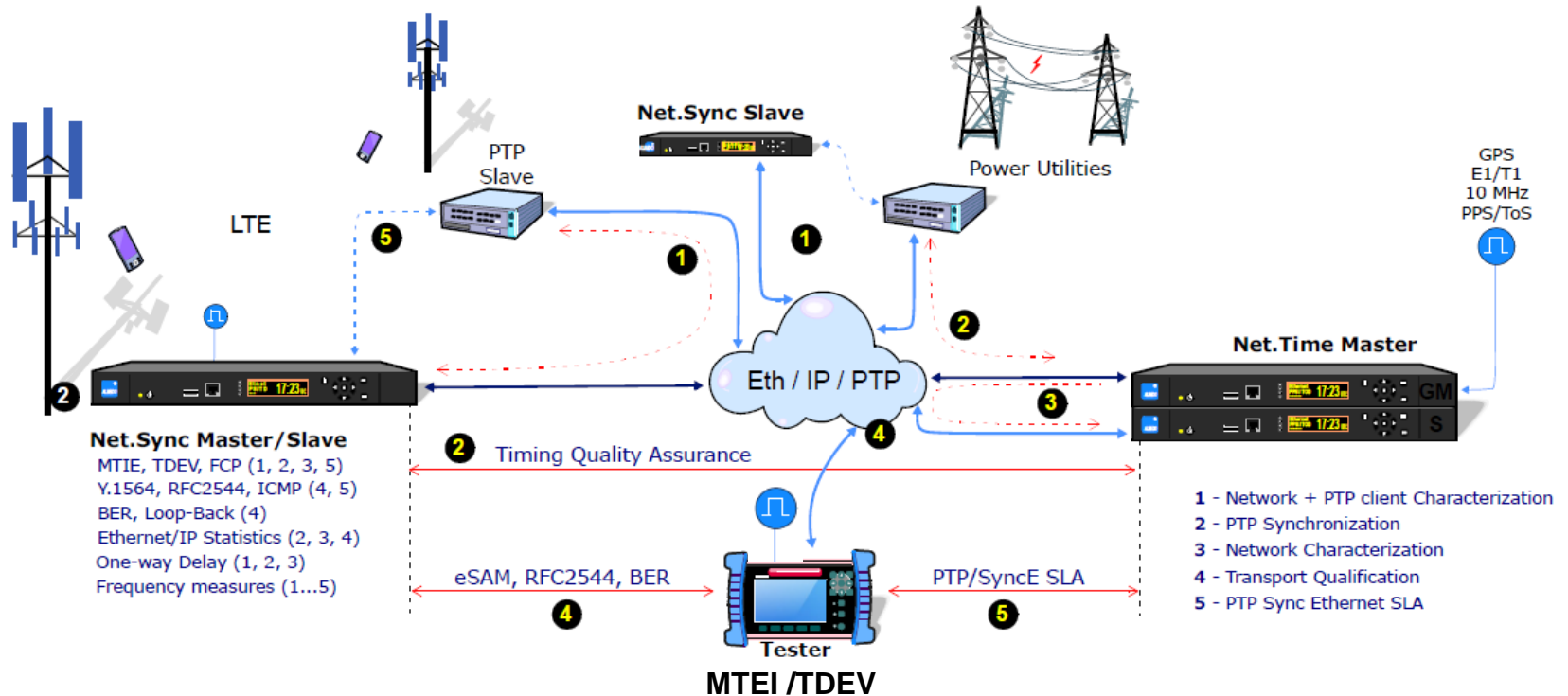


Asymmetry generates a time offset in PTP slaves >> it is essential to keep this parameter under control in phase / time delivery applications

- ◆ Ether.Genius measurements
  - Forward vs. Backward path delay
  - Difference of delays



# MTIE / TDEV measurements



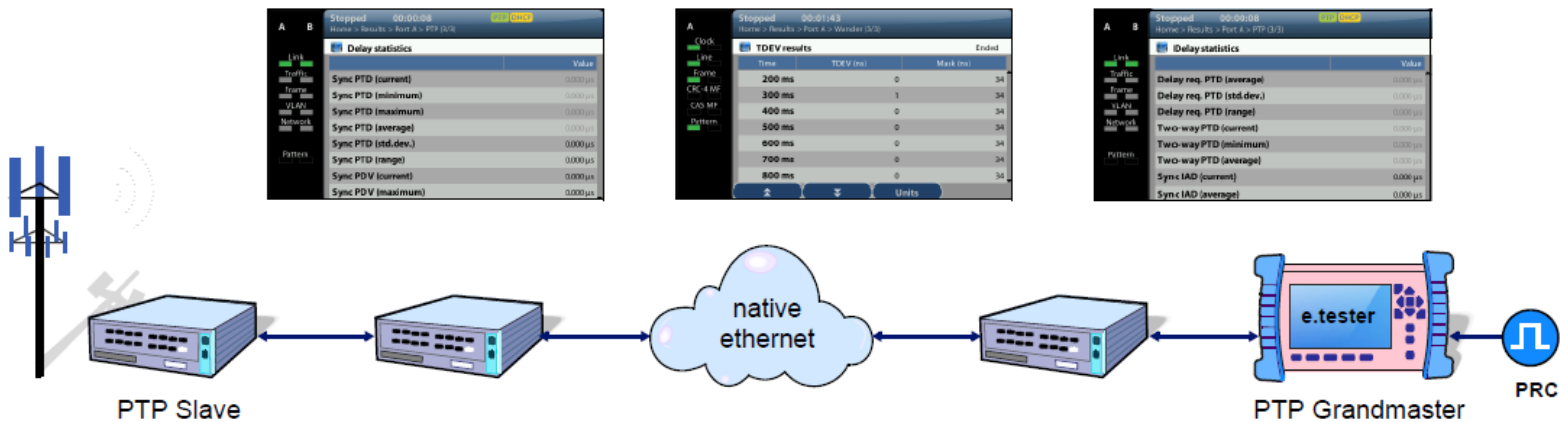
## MTIE / TDEV in Ether.Genius

- ◆ Measured in the PTP interface
- ◆ Measured in a 1 pps output from the slave

This is the correct way to check compliance with ITU-T G.8271.1 mask  
This is the correct way to check to rate slave operation.

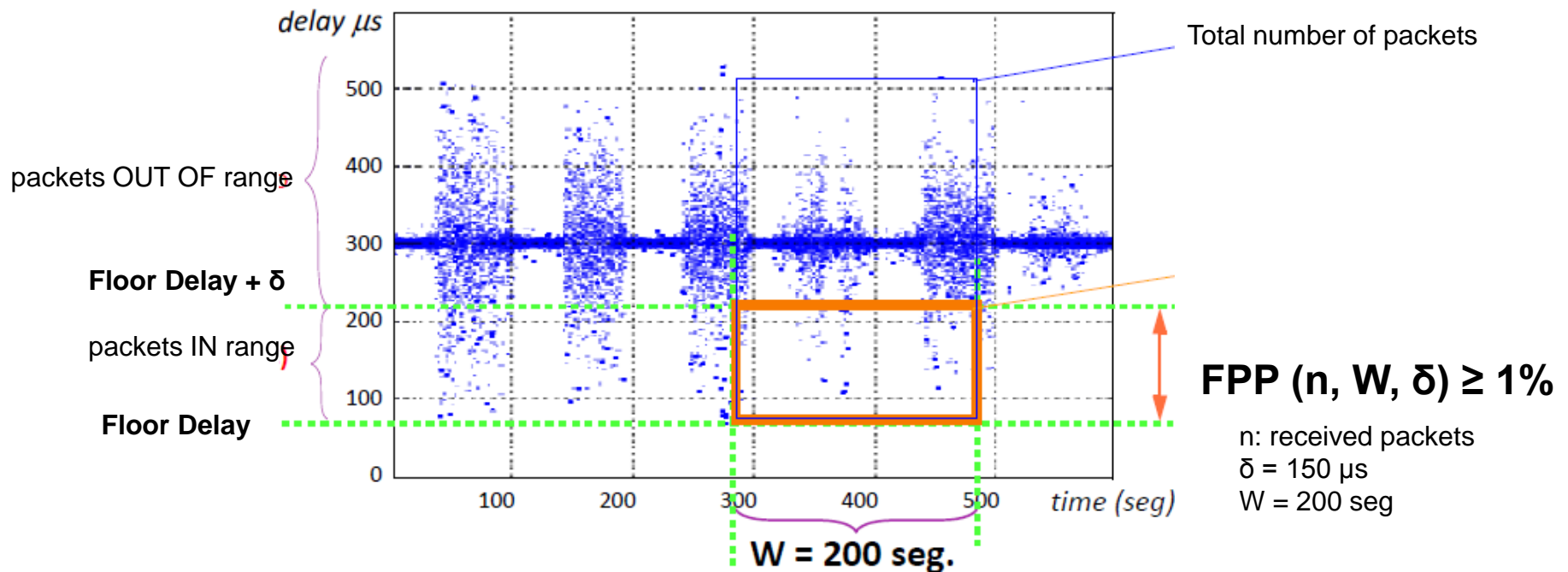
(Q3: graphic representation included )

# Ether.Genius as Master Emulation mode



- ◆ In master emulation mode there are many parameters to tune
  - Message rates
  - Time properties to configure flags and fields of the PTP messages
  - Time scales
  - Number of leap seconds
- ◆ How the slave clock responds when the time scale is not TAI
  - When the number of leap seconds is wrong
  - When the time from the grandmaster is not traceable to PRTC

# Floor Packet Measurements (ITU G.8271.1)



Packages suffer a variable delay (PDV) This metric try to ensure that there comes a minimum percentage PTP packet time (at least 1%)

- ◆ Floor Packet Count (FPC): total number of valid packages PTP
- ◆ Floor Percent Packet (FPP) percentage within the valid range (G.8261.1)
- ◆ Floor Packet Rate (FPR): valid PTP packet / second
- ◆ **Ether.Genius** has all the Floor Packet measurements

# Unique: Wander test in PTP / SyncE / E1



Overpass 0.172

- ◆ Jitter Generation and Measurements
  - Jitter level, tolerance, transfer and event detection
  - 100% digital based generation and analyzer
  
- ◆ Wander Generation and Measurements (in PTP, SYNC E and E1)
  - TIE, MTIE, and TDEV
  - Sync floor delay population FPC, FPR, FPP
  - Wander results from 20 to 100 000s

# Market analysis in Synchronization testing



# VIAVI vs. ALBEDO



**MTS 5800**

- ◆ No built-in Rubidium
- ◆ No PTP MTIE / TDEV
- ◆ Only 1 PPS MTIE / TDEV
- ◆ No Wander Generation
- ◆ No Floor metrics (FTP)
- ◆ No real-time Wander



**Ether.Genius / Ether10.Genius**

- ◆ Built-in Rubidium clock
- ◆ Built-in GPS
- ◆ Real time Wander on PTP
- ◆ Wander Generation
- ◆ Built-in and real-time
- ◆ TIE, MTIE, TDEV
- ◆ 1-step and 2-step

# EXFO vs. ALBEDO



**NetBlazer V2**

- ◆ No PTP profiles
- ◆ No Wander Analysis
- ◆ No Wander Generation
- ◆ No Floor metrics (FTP)
- ◆ No 1pps



**Ether.Genius**

- ◆ Built-in Rubidium clock
- ◆ Real time Wander on PTP
- ◆ Wander Generation
- ◆ PTP profiles

# VEEX vs. ALBEDO



**VePAL TX320s**

- ◆ No Rubidium (CSAC only)
- ◆ No Wander Generation
- ◆ No Floor metrics (FTP)

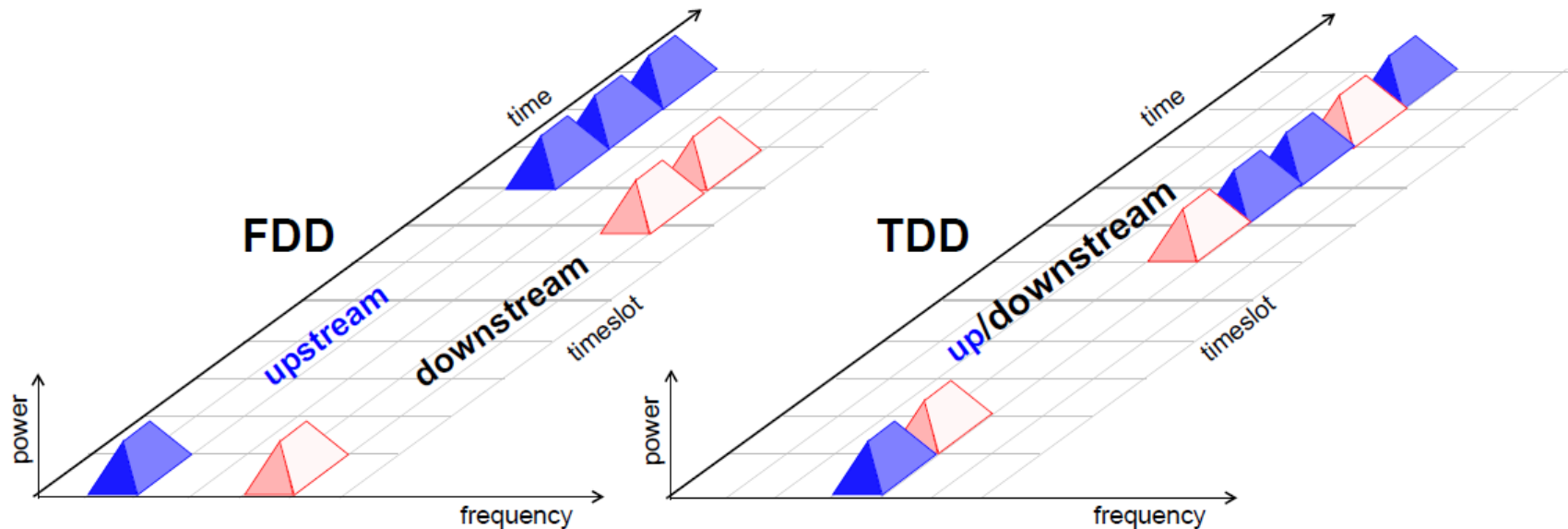


**Ether.Genius**

- ◆ Built-in Rubidium clock
- ◆ Real time Wander on PTP
- ◆ Wander Generation
- ◆ PTP profiles

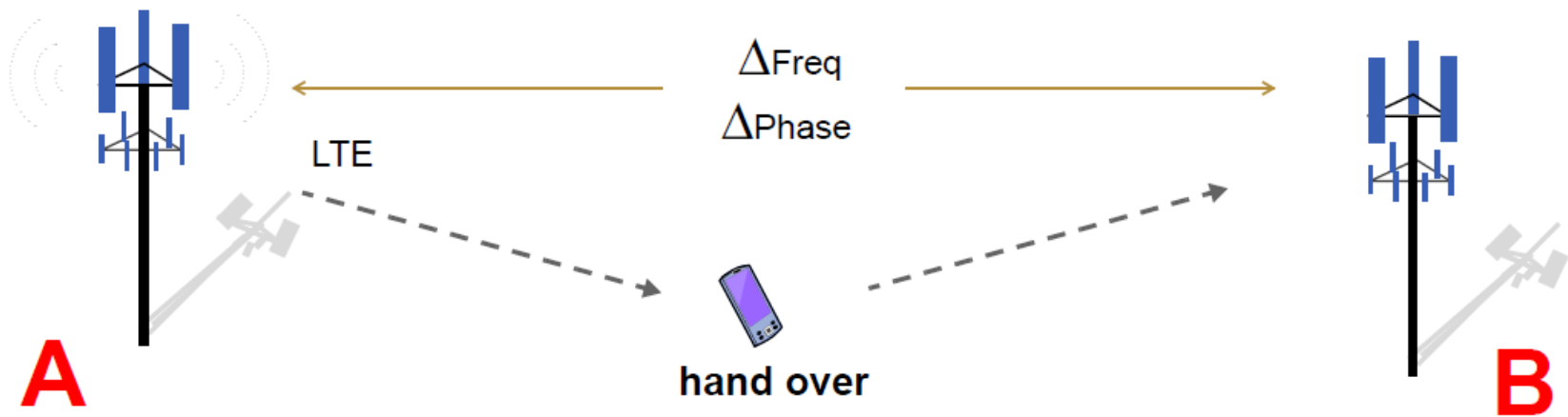


# Mobile LTE applications



- ◆ In FDD duplexing upstream and downstream use separate frequencies
- ◆ TDD upstream and downstream share the frequency (more efficient)
- ◆ Then FDD requires only Syntonization (frequency)
- ◆ TDD requires Phase Synchronization (phase and frequency)

# Timing Alignment in mobile networks



- ◆ When hand-over occurs, the mobile must reacquire carrier frequency
  - Large  $D_f$  compromises the reliability of hand-over; 50 ppb typical requirement
- ◆ TDD networks require time/phase alignment between A & B
  - To control interference between uplink and downlink
  - Requirement in the microsecond range
  - To avoid time overlapping requires phase synchronization 1.5  $\mu\text{s}$
- ◆ TDD networks require time/phase alignment between A & B
  - To control interference between uplink and downlink
  - Requirement in the microsecond range

# Why Ether10.Genius / Ether.Genius / Ether.Sync?



- ◆ LATEST ELECTRONICS: very fast, powerful, long operation
- ◆ MULTITECHNOLOGY: hand-held (up to 20h operation with batteries)
- ◆ BUILT-IN GPS FOR PERFECT SYNCRONIZATION
- ◆ INCLUDES SYNCE, PTP: ready for the new LTE technology
- ◆ NO MODULES: no problems.
- ◆ 1 / 10GBE DOUBLE PORT
- ◆ T1 / E1, DATACOM to facilitate migration from legacy installations
- ◆ Easy NAVIGATION: TOUCH-SCREEN, MOUSE & KEYBOARD

That's all



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