



Once **mobile backhaul** has migrated to Ethernet/ IP / MPLS a bunch of synchronization alternatives are available including: a) **TDM** based signals such as E1/T1, b) satellite based **GPS** and c) packet based solutions such as **SyncE** and **PTP**. **Ether.Genius** is suitable for testing all this three environments and also those hybrid architectures on packet not totally replaced legacy circuit switching.

## Market Analysis

Updated on 23/10/15

# Advanced C37.94 testing

| Ether.Genius  | Ether10.Genius   | NetProbe 2000   |
|---|--|---|
|  |  |  |
| ALBEDO  | ALBEDO   | Network Research  |

CONFIDENTIAL

| PLATFORM                     |   |   |   |
|------------------------------|---|---|---|
| <b>Size</b>                  | <ul style="list-style-type: none"> <li>• 210 x 110 x 60 mm</li> <li>• Volume: 1,386.0 cc</li> <li>• 1 kg</li> </ul>   | <ul style="list-style-type: none"> <li>• 210 x 110 x 60 mm</li> <li>• Volume: 1,386 cc</li> <li>• 1.1 kg</li> </ul>   | <ul style="list-style-type: none"> <li>• 210 x 100 x 42 mm</li> <li>• Volume: 900 cc</li> </ul>   |
| <b>Architecture</b>          | • No modules, all interfaces included   | • All interfaces included   | • No modules, all interfaces included   |
| <b>Display</b>               | <ul style="list-style-type: none"> <li>• 480 x 272 pixels (4.3 inch)</li> <li>• Touchscreen</li> <li>• Keyboard</li> <li>• Mouse</li> </ul>   | <ul style="list-style-type: none"> <li>• 480 x 272 pixels (4.3")</li> <li>• Touchscreen</li> <li>• Keyboard</li> <li>• Mouse</li> </ul>   | <ul style="list-style-type: none"> <li>• 320 x 240 pixels (3.5 inch)</li> <li>• Touchscreen</li> <li>• 5-way keypad</li> </ul>                    |
| <b>Ruggedness</b>            | • 1,5 meters drop   | • 1,5 meters drop   | • (?)   |
| <b>Remote Control</b>        | <ul style="list-style-type: none"> <li>• Standard VNC</li> <li>• SNMP</li> </ul>  | <ul style="list-style-type: none"> <li>• Standard VNC</li> <li>• SNMP</li> </ul>  | • Standard VNC  |
| <b>Batteries</b>             | <ul style="list-style-type: none"> <li>• 2 x Li-Po</li> <li>• 8h in GbE</li> <li>• 24h in E1</li> </ul>   | <ul style="list-style-type: none"> <li>• 2 x Li-Po</li> <li>• 8 hours in 10 GbE</li> <li>• 24 hours in E1</li> </ul>  | <ul style="list-style-type: none"> <li>• Li-Po</li> <li>• 4-8 h. operation</li> </ul>   |
| <b>Auxiliar Ports</b>        | <ul style="list-style-type: none"> <li>• SD card (configuration, results)</li> <li>• RJ45 (remote control)</li> <li>• 2 x USB (upgrades, configuration, results)</li> </ul>                   | <ul style="list-style-type: none"> <li>• SD card (configuration, results)</li> <li>• RJ45 (remote control)</li> <li>• 2 x USB (upgrades, configuration, results)</li> </ul>                   | <ul style="list-style-type: none"> <li>• RJ45 (remote control)</li> <li>• mini USB</li> </ul>   |
| <b>GNSS receiver</b>         | • GPS / GLONASS antenna   | • GPS / GLONASS antenna   | • No  |
| <b>Optical Interfaces</b>    | <ul style="list-style-type: none"> <li>• 2 x SFP</li> <li>• C37.94</li> </ul>   | <ul style="list-style-type: none"> <li>• 2 x SFP+</li> <li>• C37.94</li> </ul>  | <ul style="list-style-type: none"> <li>• SFP (one)</li> <li>• C37.94</li> </ul>   |
| <b>Electrical Interfaces</b> | <ul style="list-style-type: none"> <li>• 2 x RJ-45</li> <li>• 2 x BNC</li> <li>• 2 x RJ45-balun</li> <li>• External Clock input</li> <li>• VF input</li> <li>• 2 x Datacom DTE/DCE</li> </ul> | <ul style="list-style-type: none"> <li>• 2 x RJ-45</li> <li>• 2 x BNC</li> <li>• 2 x RJ45-balun</li> <li>• External Clock input</li> <li>• VF input</li> <li>• 2 x Datacom DTE/DCE</li> </ul> | <ul style="list-style-type: none"> <li>• Bantam</li> <li>• BNC</li> <li>• 2 x RJ45</li> <li>• External Clock input</li> <li>• VF input</li> </ul> |

|                              | Ether.Genius   | Ether10.Genius  | NetProbe 2000   |
|------------------------------|--|---|---|
| <b>CLOCKS</b>                |  |   |   |
| <b>Internal Clock</b>        | <ul style="list-style-type: none"> <li>GPS built-in receiver</li> <li>OCXO <math>\pm 0.1</math> ppm</li> <li>Default better than <math>\pm 2.0</math> ppm</li> </ul> | <ul style="list-style-type: none"> <li>GPS built-in receiver</li> <li>OCXO <math>\pm 0.1</math> ppm</li> <li>Default better <math>\pm 2.0</math> ppm</li> </ul> | <ul style="list-style-type: none"> <li>(?)</li> </ul> |
| <b>External Clocks Input</b> | <ul style="list-style-type: none"> <li>Antenna to GPS/GLONASS</li> <li>1.5, 2Mb/s,</li> <li>1.5, 2, 10 MHz</li> <li>1 pps</li> </ul>                                 | <ul style="list-style-type: none"> <li>DS1, E1</li> <li>1.5, 2, 10 MHz</li> <li>1 pps</li> </ul>  | <ul style="list-style-type: none"> <li>No</li> </ul>  |
| <b>Clock outputs</b>         | <ul style="list-style-type: none"> <li>1 pps</li> <li>2Mb/s, 2.0 MHz</li> </ul>  | <ul style="list-style-type: none"> <li>1 pps</li> <li>2Mb/s,</li> <li>2.0, 10 MHz</li> </ul>  | <ul style="list-style-type: none"> <li>No</li> </ul>  |

| <b>C 3 7 . 9 4</b>  |  |  |  |
|---------------------|--|--|--|
| <b>SFP</b>          | <ul style="list-style-type: none"> <li>Enhanced SFPs for industry connectivity</li> <li>SFP developed with manufacturers</li> </ul>          | <ul style="list-style-type: none"> <li>Enhanced SFPs for industry connectivity</li> <li>SFP developed with manufacturers</li> </ul>          | <ul style="list-style-type: none"> <li>Normal SFP</li> </ul>   |
| <b>Settings</b>     | <ul style="list-style-type: none"> <li>Unframed or framed operation</li> <li>Bit-rate from 64 kb/s to 768 kb/s</li> </ul>                    | <ul style="list-style-type: none"> <li>Unframed or framed operation</li> <li>Bit-rate from 64 kb/s to 768 kb/s</li> </ul>                    | <ul style="list-style-type: none"> <li>Bit-rate from 64 kb/s to 768 kb/s</li> </ul>                                    |
| <b>Clock</b>        | <ul style="list-style-type: none"> <li>Recovered and Internal clock</li> </ul>   | <ul style="list-style-type: none"> <li>Recovered and Internal clock</li> </ul>   | <ul style="list-style-type: none"> <li>(?)</li> </ul>  |
| <b>Tests</b>        | <ul style="list-style-type: none"> <li>BER and ITU-T G.821</li> <li>Pass / fail indications</li> <li>Alarms Detection / Insertion</li> </ul> | <ul style="list-style-type: none"> <li>BER and ITU-T G.821</li> <li>Pass / fail indications</li> <li>Alarms Detection / Insertion</li> </ul> | <ul style="list-style-type: none"> <li>BER and ITU-T G.821</li> <li>Alarms</li> <li>SFP may fail to connect</li> </ul> |
| <b>Measurements</b> | <ul style="list-style-type: none"> <li>Optical Power meter</li> <li>Frequency, Freq. Deviation</li> <li>Data rate</li> </ul>                 | <ul style="list-style-type: none"> <li>Optical Power meter</li> <li>Frequency, Deviation, Data rate</li> </ul>                               | <ul style="list-style-type: none"> <li>Optical Power meter</li> </ul>  |
| <b>Latency</b>      | <ul style="list-style-type: none"> <li>Round Trip Delay (RTD)</li> <li>One-Way Delay (OWD) with GPS</li> </ul>                               | <ul style="list-style-type: none"> <li>Round Trip Delay (RTD)</li> <li>One-Way Delay (OWD) with GPS</li> </ul>                               | <ul style="list-style-type: none"> <li>No</li> </ul>   |

| <b>ETHERNET - IP</b>   |   |   |   |
|------------------------|---|---|---|
| <b>Frames</b>          | <ul style="list-style-type: none"> <li>IEEE 802.3 / DIX</li> <li>VLAN</li> <li>IEEE 802.1ad / Q-in-Q</li> <li>FCS error insertion</li> </ul>  | <ul style="list-style-type: none"> <li>IEEE 802.3 / DIX</li> <li>VLAN, 802.1ad / Q-in-Q</li> <li>MPLS</li> <li>FCS error insertion</li> <li>IPv4 and IPv6</li> </ul>  | <ul style="list-style-type: none"> <li>IEEE 802.3 / DIX</li> <li>VLAN</li> <li>IEEE 802.1ad / Q-in-Q</li> </ul> |
| <b>PoE Plus</b>        | <ul style="list-style-type: none"> <li>Yes</li> </ul>   | <ul style="list-style-type: none"> <li>Yes</li> </ul>   | <ul style="list-style-type: none"> <li>No</li> </ul>  |
| <b>Cable test</b>      | <ul style="list-style-type: none"> <li>TDR: Open, Short distance fault</li> <li>Active links: MDI / MDIX status</li> <li>Wiremap: Open, Short, Straight, Crossed, Polarity, Pair skew, Crosstalk</li> </ul> | <ul style="list-style-type: none"> <li>TDR: Open, Short distance fault</li> <li>Active links: MDI / MDIX status</li> <li>Wiremap: Open, Short, Straight, Crossed, Polarity, Pair skew, Crosstalk</li> </ul> | <ul style="list-style-type: none"> <li>Wiremap: open, short, crosstalk, length impedance</li> </ul>             |
| <b>Operation Modes</b> | <ul style="list-style-type: none"> <li>Pass through</li> <li>End point: IP, Ethernet, LI</li> <li>Monitor</li> <li>Loop-back</li> </ul>   | <ul style="list-style-type: none"> <li>Pass through</li> <li>End point: IP, Ethernet, LI</li> <li>Monitor</li> <li>Loop-back</li> </ul>   | <ul style="list-style-type: none"> <li>End point</li> <li>Monitor</li> <li>Loop-back</li> </ul>                 |
| <b>Latency</b>         | <ul style="list-style-type: none"> <li>One-way delay with GPS</li> <li>Round Trip Delay (RTD)</li> </ul>  | <ul style="list-style-type: none"> <li>One-way delay with GPS</li> <li>Round Trip Delay (RTD)</li> </ul>  | <ul style="list-style-type: none"> <li>RTD</li> </ul>   |
| <b>Measurements</b>    | <ul style="list-style-type: none"> <li>BERT (Single Stream, Framed, Unframed)</li> <li>Alarm Detection</li> <li>Round Trip Delay</li> <li>Service Disruption Time??</li> </ul>                              | <ul style="list-style-type: none"> <li>BERT (Single Stream, Framed, Unframed)</li> <li>Alarm Detection</li> <li>Round Trip Delay</li> <li>Service Disruption Time??</li> </ul>                              | <ul style="list-style-type: none"> <li>BERT</li> </ul>  |
| <b>Protocols</b>       | <ul style="list-style-type: none"> <li>DHCP, ARP, DNS</li> <li>Ping, Traceroute</li> </ul>  | <ul style="list-style-type: none"> <li>DHCP, ARP, DNS</li> <li>Ping, Traceroute</li> </ul>  | <ul style="list-style-type: none"> <li>DHCP, ARP, DNS, FTP</li> <li>Ping, Traceroute</li> </ul>                 |

|                            | Ether.Genius   | Ether10.Genius   | NetProbe 2000   |
|----------------------------|--|--|---|
| <b>IP</b>                  | <ul style="list-style-type: none"> <li>IPv4 and IPv6</li> <li>CoS / DSCP</li> </ul>  | <ul style="list-style-type: none"> <li>IPv4 and IPv6</li> <li>CoS / DSCP</li> </ul>  | <ul style="list-style-type: none"> <li>IPv4</li> <li>IPTV</li> </ul>  |
| <b>BW Profiles</b>         | <ul style="list-style-type: none"> <li>Constant, burst, ramp, random</li> </ul>  | <ul style="list-style-type: none"> <li>Constant, burst, ramp, random</li> </ul>  | <ul style="list-style-type: none"> <li>Constant, burst, ramp</li> </ul>   |
| <b>Network Search</b>      | <ul style="list-style-type: none"> <li>Yes</li> </ul>  | <ul style="list-style-type: none"> <li>Yes</li> </ul>  | <ul style="list-style-type: none"> <li>No</li> </ul>  |
| <b>RFC-2544</b>            | <ul style="list-style-type: none"> <li>Symmetric / Asymmetric</li> <li>Throughput, Back-to-back, Frame loss, Latency, System recovery</li> </ul> | <ul style="list-style-type: none"> <li>Symmetric / Asymmetric</li> <li>Throughput, Back-to-back, Frame loss, Latency, System recovery</li> </ul> | <ul style="list-style-type: none"> <li>Symmetric / Asymmetric</li> <li>Throughput, Back-to-back, Frame loss, Latency</li> </ul> |
| <b>eSAM (ITU-T Y.1564)</b> | <ul style="list-style-type: none"> <li>Symmetric</li> <li>Asymmetric</li> </ul>  | <ul style="list-style-type: none"> <li>Symmetric</li> <li>Asymmetric</li> </ul>  | <ul style="list-style-type: none"> <li>Symmetric</li> </ul>   |

| E1 - T1             |   |   |   |
|---------------------|---|---|---|
| <b>TDM Frames</b>   | <ul style="list-style-type: none"> <li>E1 (PCM-30/C, PCM-31/C)</li> <li>DS1 (Q4-2015)</li> </ul>                        | <ul style="list-style-type: none"> <li>E1 (PCM-30/C, PCM-31/C)</li> <li>DS1 (Q4-2015)</li> </ul>                        | <ul style="list-style-type: none"> <li>E1</li> <li>DS3</li> </ul>                         |
| <b>Measurements</b> | <ul style="list-style-type: none"> <li>Attenuation</li> <li>Frequency, Freq. deviation</li> </ul>                       | <ul style="list-style-type: none"> <li>Attenuation</li> <li>Frequency, Freq. deviation</li> </ul>                       | <ul style="list-style-type: none"> <li>Frequency</li> </ul>                               |
| <b>Analysis</b>     | <ul style="list-style-type: none"> <li>G821, G826, M2100</li> <li>CAS, G711</li> </ul>                                  | <ul style="list-style-type: none"> <li>G821, G826, M2100</li> <li>CAS, G711</li> </ul>                                  | <ul style="list-style-type: none"> <li>G.821, G.826, M.2100</li> <li>CAS, G711</li> </ul> |
| <b>Latency</b>      | <ul style="list-style-type: none"> <li>Round Trip Delay (RTD)</li> <li>One-Way Delay (OWD) with GPS</li> </ul>          | <ul style="list-style-type: none"> <li>Round Trip Delay (RTD)</li> <li>One-Way Delay (OWD) with GPS</li> </ul>          | <ul style="list-style-type: none"> <li>Round Trip Delay (RTD)</li> </ul>                  |
| <b>Pulse Mask</b>   | <ul style="list-style-type: none"> <li>Yes</li> </ul>   | <ul style="list-style-type: none"> <li>Yes</li> </ul>   | <ul style="list-style-type: none"> <li>Yes</li> </ul>                                     |
| <b>Voice Freq.</b>  | <ul style="list-style-type: none"> <li>Add/drop</li> </ul>  | <ul style="list-style-type: none"> <li>Add/drop</li> </ul>  | <ul style="list-style-type: none"> <li>Yes</li> </ul>                                     |
| <b>E1/T1 Jitter</b> | <ul style="list-style-type: none"> <li>Analysis</li> <li>Jitter Generation</li> </ul>                                   | <ul style="list-style-type: none"> <li>Analysis</li> <li>Jitter Generation</li> </ul>                                   | <ul style="list-style-type: none"> <li>No</li> </ul>                                      |
| <b>E1/T1 Wander</b> | <ul style="list-style-type: none"> <li>Built-in TIE, MTIE, TDEV analysis</li> <li>Built-in Wander Generation</li> </ul> | <ul style="list-style-type: none"> <li>Built-in TIE, MTIE, TDEV analysis</li> <li>Built-in Wander Generation</li> </ul> | <ul style="list-style-type: none"> <li>No</li> </ul>                                      |

| ITU-T G.703 / E0 (codirectional) |  |  |  |
|----------------------------------|--|--|--|
| <b>Functions</b>                 | <ul style="list-style-type: none"> <li>BER</li> <li>Anomalies insertion and analysis</li> <li>Defects insertion and analysis</li> <li>G.821 performance</li> </ul> | <ul style="list-style-type: none"> <li>BER</li> <li>Anomalies insertion and analysis</li> <li>Defects insertion and analysis</li> <li>G.821 performance</li> </ul> | <ul style="list-style-type: none"> <li>Yes</li> </ul>                    |
| <b>Latency</b>                   | <ul style="list-style-type: none"> <li>Round Trip Delay (RTD)</li> <li>One-Way Delay (OWD) with GPS</li> </ul>   | <ul style="list-style-type: none"> <li>Round Trip Delay (RTD)</li> <li>One-Way Delay (OWD) with GPS</li> </ul>   | <ul style="list-style-type: none"> <li>Round Trip Delay (RTD)</li> </ul> |

| DATACOM                |   |   |  |
|------------------------|---|---|--|
| <b>Operation Modes</b> | <ul style="list-style-type: none"> <li>Terminal, Monitor, Passthrough</li> </ul>  | <ul style="list-style-type: none"> <li>Terminal, Monitor, Passthrough</li> </ul>  | <ul style="list-style-type: none"> <li>Terminal</li> </ul>   |
| <b>Datacom</b>         | <ul style="list-style-type: none"> <li>Standard cables (CISCO)</li> <li>From 50 b/s to 2048 kb/s</li> <li>V.24/V.28 (RS-232), X.21/V.11</li> <li>V.35, V.36 (RS-449)</li> <li>EIA-530 / EIA-530A</li> </ul>                                     | <ul style="list-style-type: none"> <li>Standard cables (CISCO)</li> <li>From 50 b/s to 2048 kb/s</li> <li>V.24/V.28 (RS-232), X.21/V.11</li> <li>V.35, V.36 (RS-449)</li> <li>EIA-530 / EIA-530A</li> </ul>                                     | <ul style="list-style-type: none"> <li>Cables NP2000-DCOM</li> <li>V.24/V.28 (RS-232), X.21/V.11</li> <li>V.35</li> <li>EIA-530</li> </ul> |
| <b>Analysis</b>        | <ul style="list-style-type: none"> <li>BER and ITU-T G.821 performance</li> <li>Logic analyser capability</li> <li>Defects LOC, AIS, LSS, All 0, All 1</li> <li>Anomalies: TSE, Slip</li> <li>Line attenuation, frequency, deviation</li> </ul> | <ul style="list-style-type: none"> <li>BER and ITU-T G.821 performance</li> <li>Logic analyser capability</li> <li>Defects LOC, AIS, LSS, All 0, All 1</li> <li>Anomalies: TSE, Slip</li> <li>Line attenuation, frequency, deviation</li> </ul> | <ul style="list-style-type: none"> <li>No</li> </ul>   |
| <b>Latency</b>         | <ul style="list-style-type: none"> <li>Round Trip Delay (RTD)</li> <li>One-Way Delay (OWD) with GPS</li> </ul>  | <ul style="list-style-type: none"> <li>Round Trip Delay (RTD)</li> <li>One-Way Delay (OWD) with GPS</li> </ul>  | <ul style="list-style-type: none"> <li>No</li> </ul>   |