



Application Note

UniPRO MGig1

Carrier-grade Ethernet tester

UniPRO SEL1

Intelligent loopback device

For use in Enterprise, Utilities and Industrial Ethernet testing





Installation Test and Troubleshooting Private Network Ethernet Links

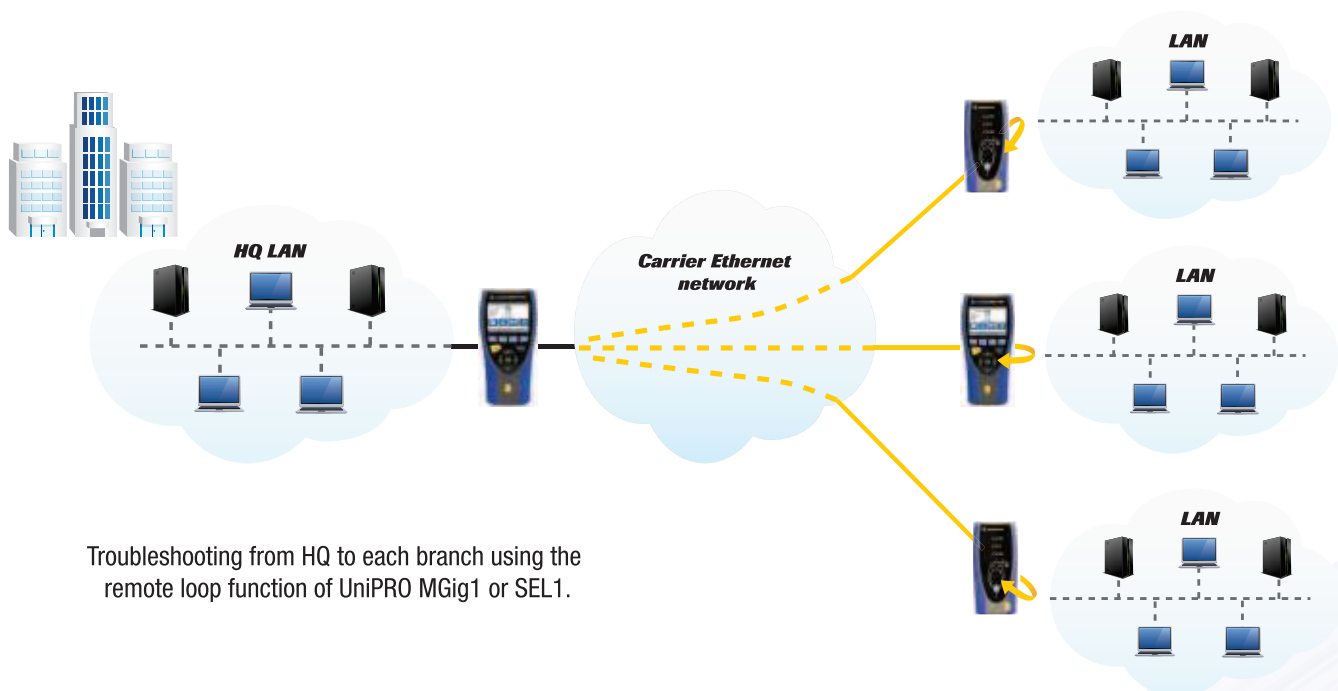
Many large Enterprises operate private networks using dark-fibre and ADSL/VDSL over copper, or radio-links to interconnect between head-office and multiple branches or between multiple LAN-islands – for example in railway system, large retail operations, multi-site Universities, Primary Health Trusts and Petrochemical companies.

These private networks are often complex and have the same stringent testing requirements as Telco operator networks – frequently over several different transmission media.

UniPRO MGig1 is the ideal affordable and easy to use Carrier-Grade Ethernet tester for private networks applications.

One-man link testing

When Engineers are a scarce resource, UniPRO MGig1 is designed to allow full-scale carrier-grade testing with a single man.

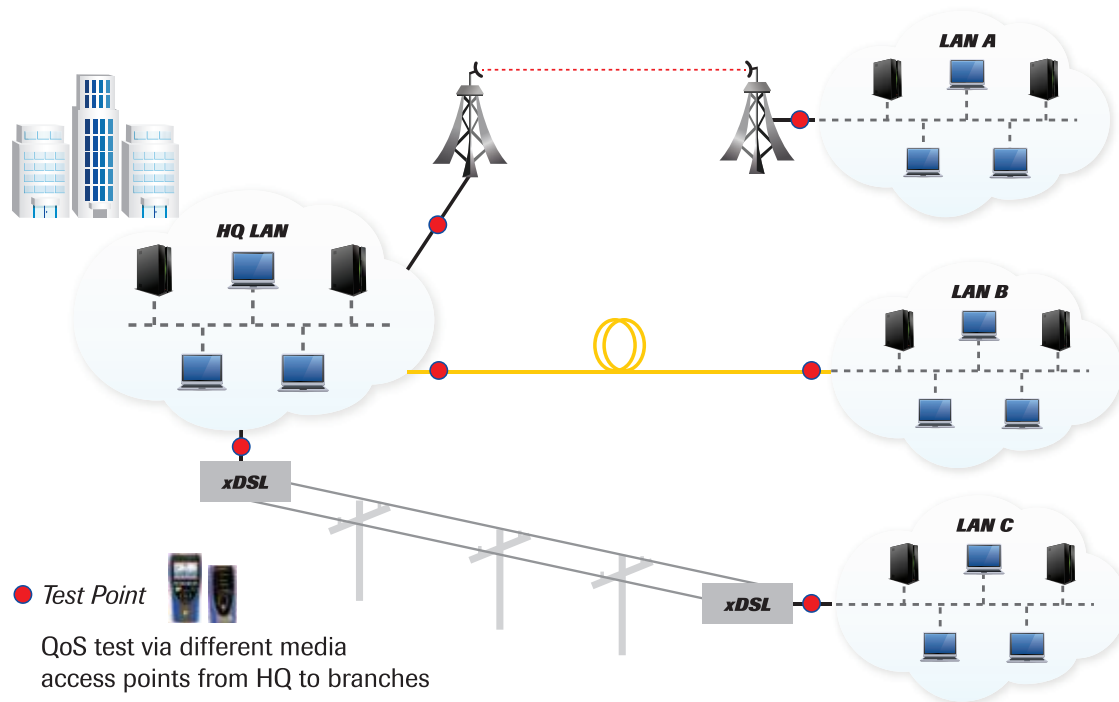


With a UniPRO SEL1 intelligent remote controlled loop-back permanently installed into a head-office switch port, the field engineer can simply 'bridge' any external link to the loop-back unit by issuing the necessary commands to the switch through its web interface.

Alternatively a UniPRO SEL1 unit can simply be mailed to the far-end branch office allowing testing to be performed at the head office location.

Whichever of these approaches is used, the Engineer can then conduct single-ended testing of the entire link (including through any active equipment) and perform carrier-grade tests such as RFC2544, SLA-Tick, NetSAM (Y.1564) and BERT to isolate the root cause of the WAN link problems and fully test out parameters such as:

- Layer 1 Cable test of copper links for short circuits, crossed wires and open circuits etc.
- Layer 1 - Optical receive power level measurement on fibre link.
- Layer 1 BERT (bit error ratio test) for copper and fibre link connection test.
- Multi-service (stream) committed information rate (CIR)
- Excess information rate (EIR)
- Frame loss percentage
- Delay or latency
- Jitter or delay variation
- Service disruption time (SDT)



For ADSL/VDSL links bi-directional testing is frequently needed instead of loop-back due to the asymmetrical nature of these links.

One-man testing is still possible. Thanks to the UniPRO MGig1's Bi-Directional test function. A second UniPRO MGig1 tester is needed at the far end – but no engineer is needed. Anyone can plug it into the demarcation point (or user network interface point – UNI) and switch it on. From there-on it is completely controlled by the Engineer's local UniPRO MGig1 throughout all of the testing.

Patching problems

More often than most of us care to admit – network problems are caused by mis-patching of the link as it goes through multiple patching frames. Cable-tracing to correct this can take hours.

A simple function, but unique amongst carrier-grade Ethernet testers on UniPRO MGig1 is 'Hub-Blink' - the ability to flash the Ethernet LEDs on distant network equipment to rapidly (and without hours of cable tracing) determine whether or not the link under test is connected to the correct active equipment port.

For managed switches, UniPRO MGig1 can also detect LLDP/CDP/EDP protocols to indicate the port number to which the link is connected..

UniPRO MGig1 will also identify POTS, BPX and ISDN and PoE enabled circuits that may be inadvertently connected instead of an ADSL or Ethernet link.

Testing and Troubleshooting Carrier-Grade Ethernet in Utilities, Railway and Metro, Petrochemical and many other Industries

UniPRO MGig1 for testing and troubleshooting every critical Ethernet application

Love it or hate it, Ethernet really is taking over communications globally. It has transformed itself from the simple office-LAN of the 1990s to a highly complex and capable industrial and critical applications transport mechanism – capable of transporting older and specialised protocols like the various forms of industrial and process Fieldbus for SCADA and command-and-control, voice and video and other high bandwidth or sensitive applications. M2M or machine-to-machine Ethernet communications is the next revolution and it has already begun.

There are far too many applications – all of which need Carrier-Grade test instruments for installation, service turn-up and SLA policing – to cover in this short brochure.

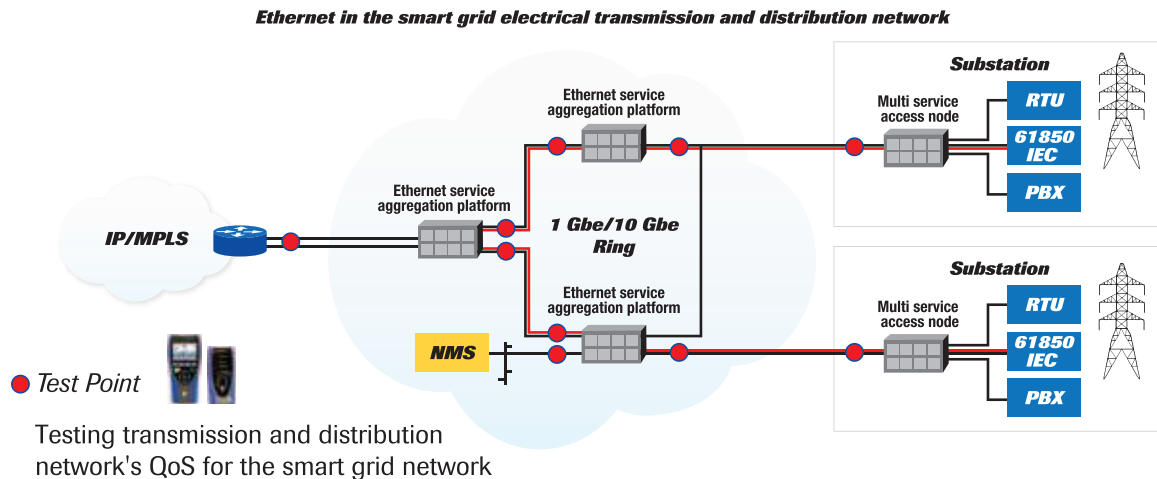
But you can be sure that whatever your Industrial or Carrier-Grade Ethernet application UniPRO MGig1 is the idea test and troubleshooting instrument.



Let's just look at a few example applications:

Utility Distribution Networks

Power, gas, and water utility distribution networks today are undergoing a transformation: SDH/SONET infrastructure and legacy substation devices are being phased out to make way for Ethernet and IP/packet-based networks.



In the example illustrated, the key driver is the move towards Smart Grids, as packet transport's high capacity and lower OpEx are required to handle the amount of bursty traffic generated by the advanced grid applications envisioned in intelligent power networks.

IP SCADA systems, wide area situation awareness (WASA) synchrophasor measurements and recent developments in substation automation (SA), are examples of new applications that mandate the use of packet switched networks and Ethernet capabilities throughout the transmission and distribution (T&D) grids.

Almost every utility around the globe is either planning or has already begun the transformation of its T&D grid into an intelligent, packet-based network that can efficiently and reliably handle massive amounts of bi-directional or even multi-directional data communications between various devices and locations.

With this move to carrier-grade Ethernet comes of course the need to test and troubleshoot wide-area Ethernet links be they utility owned or leased fro service providers.

In the latter case the need to be able to check and challenge delivery against the SLA is paraount.



Rail and Metro Trackside

Many rail systems such as IP CCTV, signaling, power distribution and general data transfer use a high reliability redundant LAN topology based on a trackside Ethernet backbone. This backbone also enables train-to-trackside and trackside to WAN communication. Fibre-optic cabling is typically used as the physical media thanks to its electrical noise immunity and transmission distances.

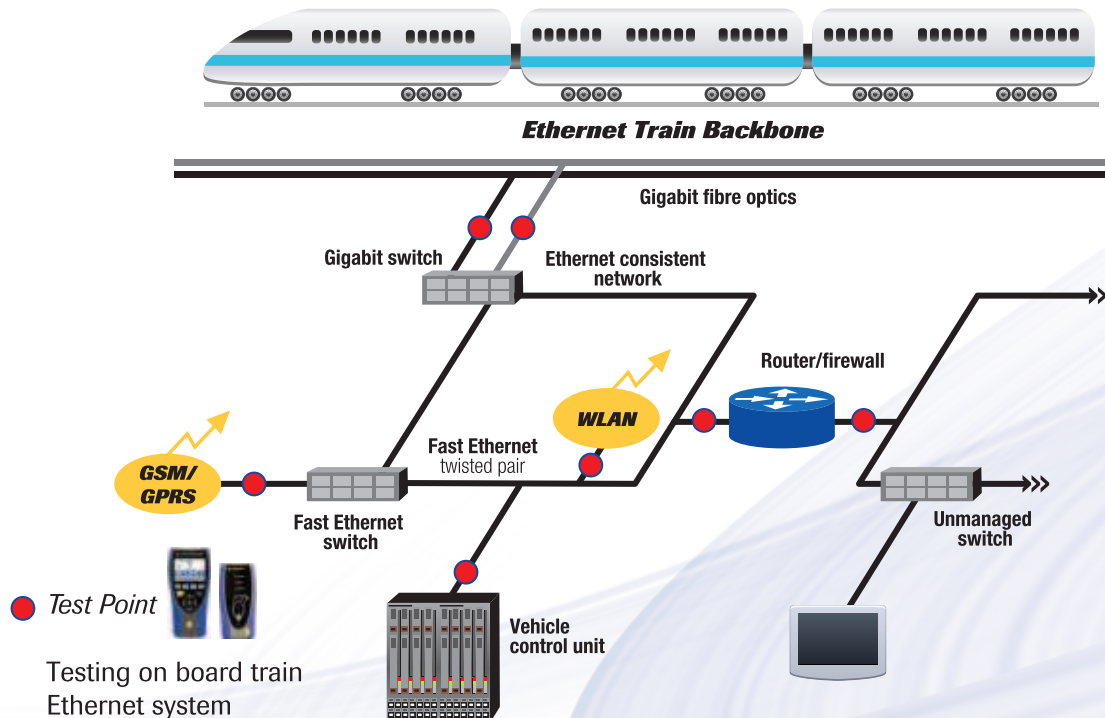
Carrier-grade Ethernet is deployed throughout and of course carrier-grade testers such as UniPRO MGig1 are essential tools for service turn-up and for troubleshooting.

On-Train/Metro

Ethernet is now the accepted transmission system for command-and-control of modern trains and metros. It is also used to deliver a wide range of other services and functions

- Propulsion
- Brakes
- Anti-skid
- Door control
- Lighting control
- Environmental control (heating, air-con and ventilation)
- Security CCTV cameras, recorders and upload to the central office via WLAN
- Passenger Wi-Fi
- Electronic signage
- Ingress/Egress passenger counting cameras
- On-train communications
- Public address
- Auto announcement servers
- GPS receivers
- Passenger infotainment

And due to the critical nature of some of these functions, the segregation of traffic into different 'priorities' is vital requiring multiple VLANs and QoS (quality of service) marking and policing.



Acceptance testing of on-train Ethernet is far from simple and both train builders and operating company acceptance testers need Carrier-Grade Ethernet testers to ensure that the Gigabit optical Train Ethernet Backbone and the many Ethernet switches (with both optical and copper connections) perform as required.

It is essential to use modern concurrent-service testing which simulates the true working conditions that the systems must function under.



UniPRO MGig1 PRO is exactly that tester providing single-ended loop-back and full bi-directional testing with the latest SLA-Tick and NetSAM (Y.1564) tests in addition to old favourites BERT and RFC2544. For acceptance testing these can be easily pre-set to be single-button Autotests.

Unique to UniPRO MGig1 is the ability to sense and test PoE (power over Ethernet) used to power many Wi-Fi access points and IP-CCTV cameras.

Railway and Metro Signalling

Railway signalling is also starting to convert to Industrial Ethernet.

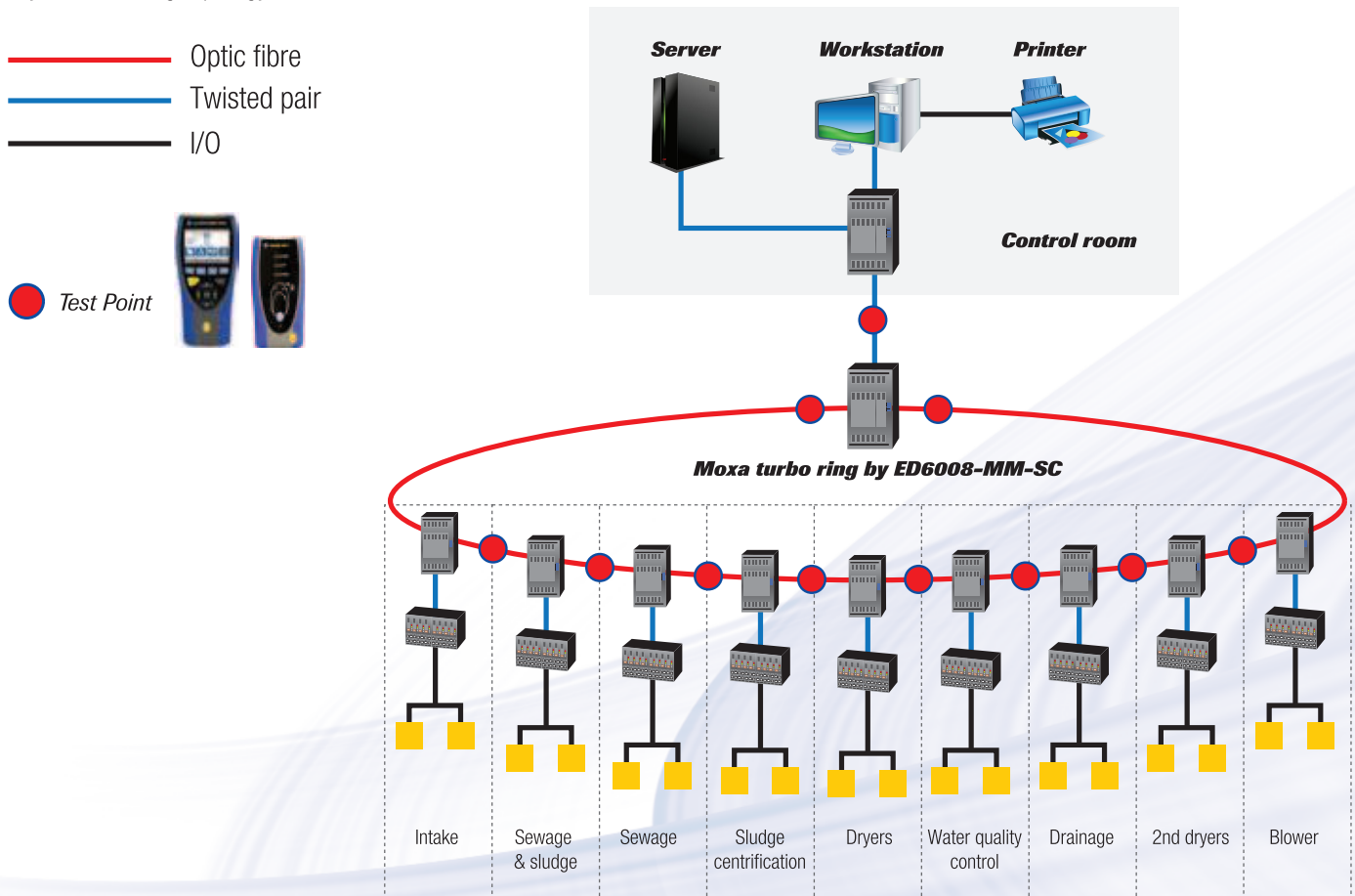
Existing serial based communications networks have limitations on the amount of nodes on the network, restrictions on topologies and offer relatively poor communications performance. Whereas Ethernet offers high performance and almost no limitations on network nodes or various topologies.

Existing Fieldbus protocols like Modbus, DeviceNet, LonWorks, Profibus, DNP3 and the like can now be integrated easily into Ethernet systems and newer equipment is natively Ethernet based. The use of Ethernet also allows newer technologies and emerging technologies to be integrated far more easily into the network and systems.

Whether signalling is incorporated into a general trackside LAN, using VLAN segregation and QoS management, or maintains its physical segregation in separate LANs, the same rigorous testing at carrier-grade industrial Ethernet levels is essential to ensure correct installation and maintenance. UniPRO MGig1 is the ideal test and troubleshooting instrument.

Industrial Ethernet

In Industrial use of Ethernet, distances tend to be long compared to office and data centre usage and many switches are deployed either in daisy-chain or ring topology.



Checking Ethernet link QoS over long distance interconnection (WAN) network for the Industrial Ethernet



Dirt ingress into copper data connectors and fibre optic couplers is a constant worry. When intermittent faults occur, Engineers need a Carrier-Grade Ethernet tester to rapidly troubleshoot the problems.

It's not sufficient to have a go/no go type of tester for these situations, Carrier-grade testing allows proper testing of all operational parameters such as:

- Layer 1 Cable test of copper links for short circuit, crossed wires and open circuits
- Layer 1 - Optical receive power level measurement of fibre link.
- Layer 1 BERT (bit error ratio test) for copper and fibre link connection test.
- Multi-service (stream) committed information rate (CIR)
- Excess information rate (EIR)
- Frame loss percentage
- Delay or latency
- Jitter or delay variation
- Service disruption time (SDT)
- PoE (power over Ethernet) voltage and available power

The same tests are important for network acceptance testing where they can be pre-set and operated as a single-button Autotest.



With today's 'Ethernet of Things', Ethernet transmission problems can (and do) happen almost everywhere. Above are just a few examples - to give you an idea of some of the many different and diverse applications for which an affordable carrier-grade Ethernet transmission tester is essential in today's technicians' and Engineers' tool kits.

Whatever your application - whether it's one of the those shown in this application note or one of the hundreds that aren't - you can be sure that there is a model within the UniPRO MGig1 family that will be the perfect, practical, easy-to-use and affordable tester for you.