Providing LAN Extension

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Solutions for extending Local Area Networks (LANs) over Copper, Dedicated Optical Fiber or Leased lines. Includes extension of LANs over Railways Shared OFC Backbone accessed via Cable Huts, or over a Fiber Optic Ring.

Local Area Networks (LANs) are typically limited to a maximum span of 100 metres. Since LANs are ubiquitous today, and 100 metres is a major limitation, extension of LANs to larger distances is a very important requirement. There are various ways of extending LANs – and all of them have their utility. LAN extension may be done over a few hundered meters or a few kilometers or even over a few hundred kilometers. Extension may only be from one point to another, or to several geographically distributed locations. Different communication technologies may be used to achieve LAN extension based on user requirements, cost, geographic spread and versatility.

Keeping this in view Cygnus offers a number of solution for extending Local Area Networks which are described in the following sections with the help of diagrams.

A. LAN extension over copper wires

Cygnus offers two types of LAN Extenders for extending LANs over copper pair using G.SHDSL technologies. The latest G.SHDSL *bis* technology allows higher speeds than G.SHDSL over short distances.

CYGNUS 815 High Throughput LAN Extender (HTLE) exploits this feature of G.SHDSL *bis* to offer a LAN Extension at speeds in excess of 10 Mbps on 0.5 mm diameter copper pairs at distances up to 1 km. Such high speeds are useful in applications such as high volume file transfers, high speed internet access, etc. Making full use of G.SHDSL/G.SHDSL *bis technology,* the distance can be increased to as much as 10 km at a reduced speed, using the rate-range feature of CYGNUS 815. A 4-port Ethernet switch is built-in, allowing multiple user devices to connect to CYGNUS 815. Fig. 1 illustrates a typical application - providing high speed Railnet connectivity at a location.

A lower cost optimized LAN Extender - CYGNUS 812 - is also available. Its maximum speed is 2 Mbps. The driving range on 0.5 mm diameter copper pair is 10 km at 64 kbps, and up to 6 km at 2 Mbps. It also has a built-in 4 port Ethernet switch.

Both CYGNUS 815 and CYGNUS 812 can be optionally ordered with SNMP/TELNET management feature, and with AC, DC or both power supplies.

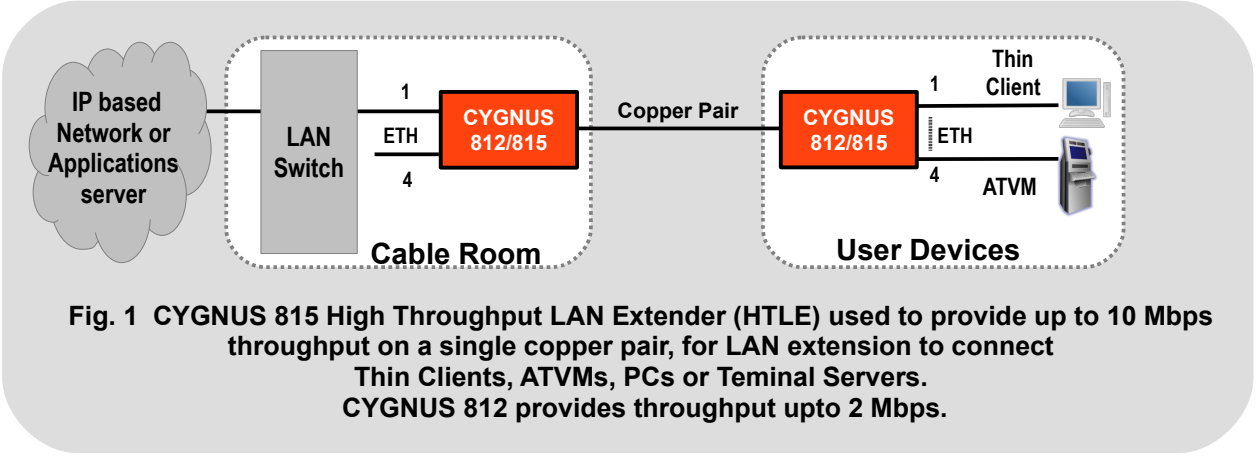

Fig. 1 CYGNUS 815 High Throughput LAN Extender (HTLE) used to provide up to 10 Mbps throughput on a single copper pair, for LAN extension to connect Thin Clients, ATVMs, PCs or Teminal Servers. CYGNUS 812 provides throughput upto 2 Mbps.

B. LAN Extension over a WAN Links up to 2 Mbps

Cygnus also offer a LAN Extender using its CYGNUS 850 Modular G.SHDSL Modem platform. This platform consists of a modular G.SHDSL chassis in which multiple DTE cards can be plugged in depending on the requirement. Available DTE cards include Ethernet, E1, V.35, 64 kbps Codirectional, etc. A CYGNUS 850 unit with Ethernet DTE PCB functions as a LAN Extender.

The ability of CYGNUS 850 models with different DTE interfaces to interwork with each other allows some innovative applications. Fig. 2 shows one such application. It takes the idea of LAN extension, which is normally considered possible only up to a few kilometres, across a long distance leased line – thus making it possible to provide LAN extension over virtually any distance. Modems with 4-port Ethernet DTE modules are used at user premises, and G.703 modems (64 kbps or 2 Mbps) are used at the cable hut/exchange, as part of the leased line. Ethernet user devices can be cost-effectively extended from a central LAN, without requiring routers. A typical application could be to connect ATVMs, Thin Clients, or even Terminal Servers at a remote location, to a Switch at an upstream site.

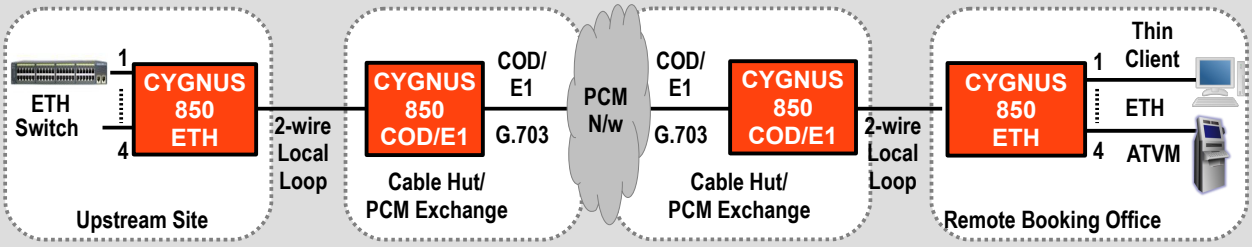

Fig. 2 CYGNUS 850 ETH-G.703 pairs used to extend up to four Ethernet devices to a remote booking office over a 64 kbps or 2 Mbps Leased Line

A simplified scheme of LAN extension over WAN link may be employed if access to the WAN link is through a locally available E1 interface (this is the case in several Railway applications where the cable hut that provides access to E1 circuit is near the user access point). Fig 3 illustrates this solution. Two CYGNUS 805 Ethernet to E1 mappers are shown – one at each end of an E1 link. The length of the copper circuit between the CYGNUS 805 and the E1 network access point should be less than a few hundred meters to avoid E1 signal deterioration.

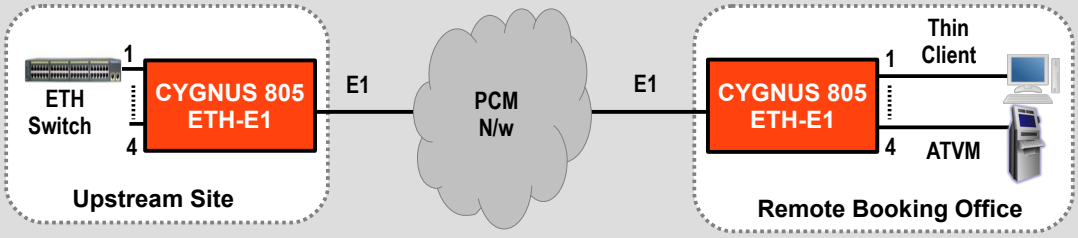

Fig. 3 LAN Extension over E1 circuit using two CYGNUS 805 Ethernet to E1 bridge units. Note that the length of copper circuit that carries E1 between the converter and the PCM network (exchange) should not exceed few hundred meters.

It may be noted that it is possible to have CYGNUS 805 on one side of the circuit, and a pair of CYGNUS 850 G.703/EThernet modems at the other end. This is useful when at one end the distance from user equipment to E1 access point is large.

C. LAN Extension over Point-to-point Optical Fiber Link

While a media converter is a simple solution to extend LANs over optical fiber, CYGNUS provides alternative solutions using CYGNUS 855 2 Mbps Fiber Optic Modems, which offer some unique features. Fig. 4 shows a pair of directly connected CYGNUS 855 units with Ethernet interface used for LAN extension over Optic Fiber. The integrated 4-port Ethernet switch in these units allows multiple devices to be connected to them.

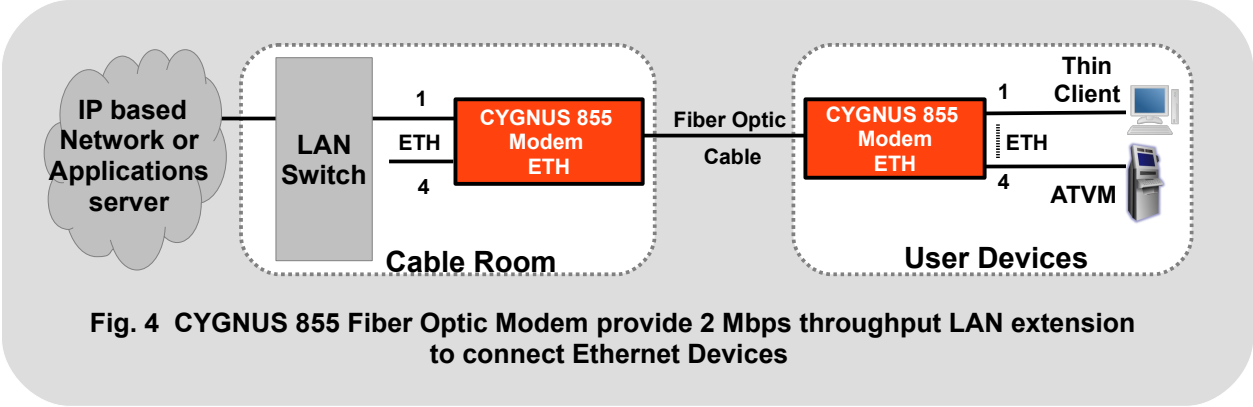

Fig. 4 CYGNUS 855 Fiber Optic Modem provide 2 Mbps throughput LAN extension to connect Ethernet Devices

In Fig. 5, the CYGNUS 855 Fiber Optic Modem is shown in the local loop of a long distance 64 kbps or 2 Mbps leased line used for extending a LAN over the leased line. It is possible that one end of this arrangement uses CYGNUS 855 in the local loop, while the other end uses a pair of CYGNUS 850 G.SHDSL Modem over Copper, or even a CYGNUS 805 Converter described above.

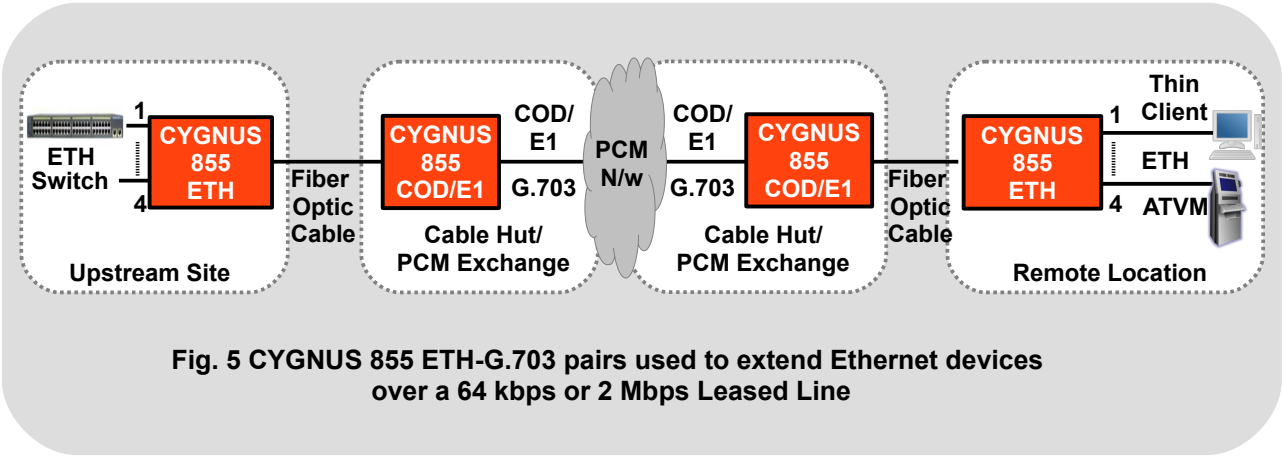

Fig. 5 CYGNUS 855 ETH-G.703 pairs used to extend Ethernet devices over a 64 kbps or 2 Mbps Leased Line

D. LAN Extension over Fiber Optic Ring

It may sometimes be required to provide reliable, LAN connectivity to ethernet devices distributed over a geographic area of a few kilometers, with the scheme being reliable enough to ensure connectivity even if there is break in the physical medium. Railway premises are a site where reliable access to Ethernet devices spread over several platforms may need to be provided in the presence of electromagnetic interference from high tension traction wires and other sources. CYGNUS 894 Fiber Optic Ring provides an ideal solution in such cases. It can be used to extend ethernet connectivity from a central server to up to eight locations in a manner which can tolerate a break in the fiber medium. Applications that can benefit from this solution include distributing ATVMs, connecting Terminal Servers and other Ethernet devices, etc.

The solution shown in Fig 6 consists of one CYGNUS 894C central hub that connects to a application server or upstream switch, and up to eight CYGNUS 894R remote nodes each of which can be used to connect up to four ethernet devices. All these are connected in a ring-like fashion using optical fiber segments which

can be anywhere from a few hundred meters to few kilometers in length. The ring-like structure provides protection against breakage of a single path by re-routing data in opposite direction in case of a break in the fiber. The LAN throughput available is 10 Mbps for each remote node.

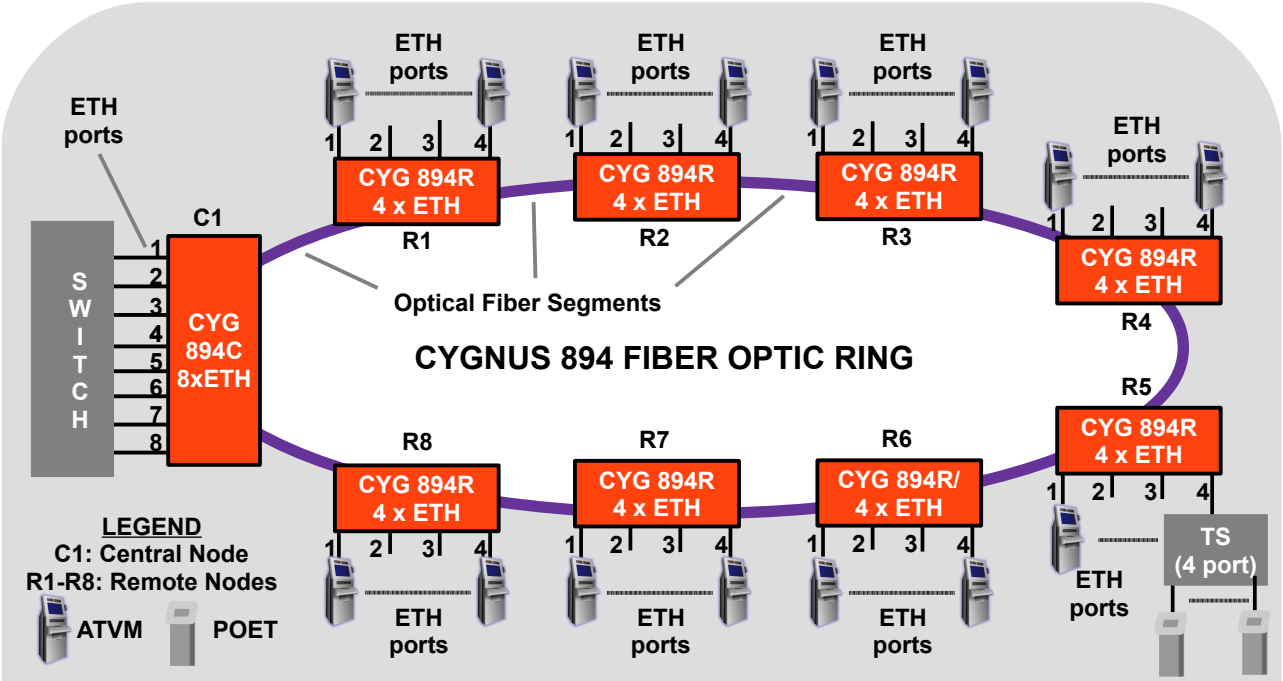

Fig. 6 Distributing ATVMs and Terminal Servers at various places in a station premises on a fiber optic ring. One CYGNUS 894C Central Node is used at the central location, whereas upto eight CYGNUS 894R Remote Nodes are provided at the remote sites. Each Remote Node shown above has 4 Ethernet ports to which ATVMs or other Ethernet devices may be connected

A simplified use of the above consists use of two CYGNUS 894R units to provide a ring of just 2 nodes. This is shown in Fig 7. The LAN throughput available at the remote end in this arrangement is still 10 Mbps. The unique feature is that of link redundancy and hence this arrangement can be used for providing reliable connectivity to a single point which may be as much as a few kilometers away.

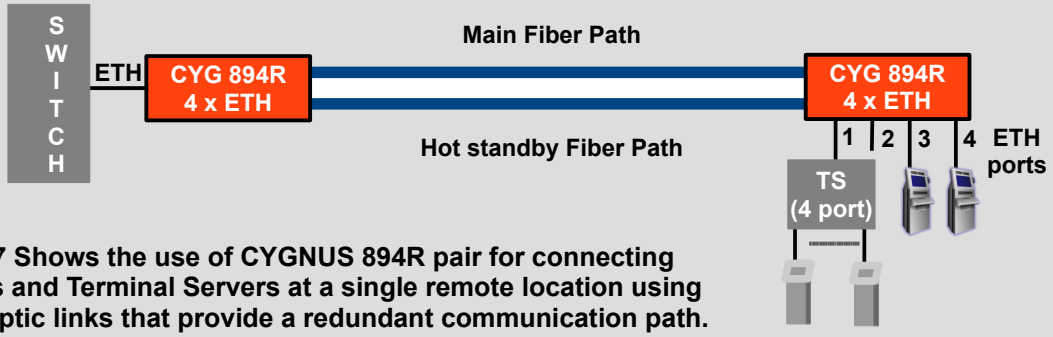

Fig. 7 Shows the use of CYGNUS 894R pair for connecting ATVMs and Terminal Servers at a single remote location using fiber optic links that provide a redundant communication path.

Contact Cygnus today for further information

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