Data Sheet

Cisco Long-Reach Ethernet Solution

The Cisco Long-Reach Ethernet (LRE) networking solution delivers cost-effective, high-performance broadband access to multiunit (MxU) buildings (hotels, residential multidwelling units [MDUs], and multitenant unit [MTU] office buildings) and enterprise campus environments such as manufacturing, educational campuses, and medical facilities. Cisco LRE technology dramatically extends Ethernet over existing Category 1/2/3 wiring at speeds from 5 to 15 Mbps (full duplex) and distances up to 5,000 feet. (Actual achievable data rates depend on cable quality, noise and cross talk environment.) The Cisco LRE technology delivers broadband service on the same lines as Plain Old Telephone Service (POTS), digital telephone, and ISDN traffic. In addition, Cisco LRE supports modes compatible with asymmetric digital subscriber line (ADSL), allowing service providers to provision LRE to buildings where broadband services already exist.

The Cisco LRE solution includes Cisco Catalyst® 2900 LRE XL switches, the Cisco 575 LRE and 585 LRE Customer Premise Equipment (CPE) devices, and the Cisco LRE 48 POTS Splitter.

The Cisco Long-Reach Ethernet solution delivers everything needed to quickly deploy an Ethernet-based network with the performance required to deliver high-speed Internet access at much greater distances and drive services like IP telephony and audio/video streaming. With this technology, a broad range of customers can benefit from lower operating costs and rapid deployment. The LRE solution provides multicast, Layer 2 quality of service (QoS), security, and Web-based Cisco Switch Clustering network management.

Figure 1 Catalyst 2924 LRE XL Switch

Catalyst 2900 LRE XL Desktop Switches

Cisco Catalyst 2900 LRE XL switches are based on the Cisco market-leading Catalyst 2900 Series XL 3.2-Gbps switch architecture, and include all Enterprise- class features (all ports) available in Catalyst 2900 XL switches. Now, service providers can use the industry-leading Catalyst switch platform to address a broad range of wiring environments beyond Category 5 cabling. This gives users a low-cost, end-to-end solution and eliminates the need to train installation teams on multiple systems.

The Catalyst 2924 LRE XL has 24 Long-Reach Ethernet ports and four 10/100 Ethernet ports; the Catalyst 2912 LRE XL has 12 LRE ports and four 10/100 Ethernet ports. Both switches are one rack-unit (1RU) high, 13-inches deep, and can be either mounted on a wall or placed on a rack. In addition, Cisco LRE switches feature integrated LRE technology, which means that they do not require an external modem pool. The result is a compact, cost-effective form factor that allows service providers and building owners to build high densities with a minimum footprint.

Catalyst 2900 LRE XL switches deliver dedicated bandwidth per port at rates up to 15 Mbps. LRE transmissions coexist with POTS and ISDN, and can be compatible with ADSL traffic in the same building. The switches can be configured on a per-switch basis to support the following modes:

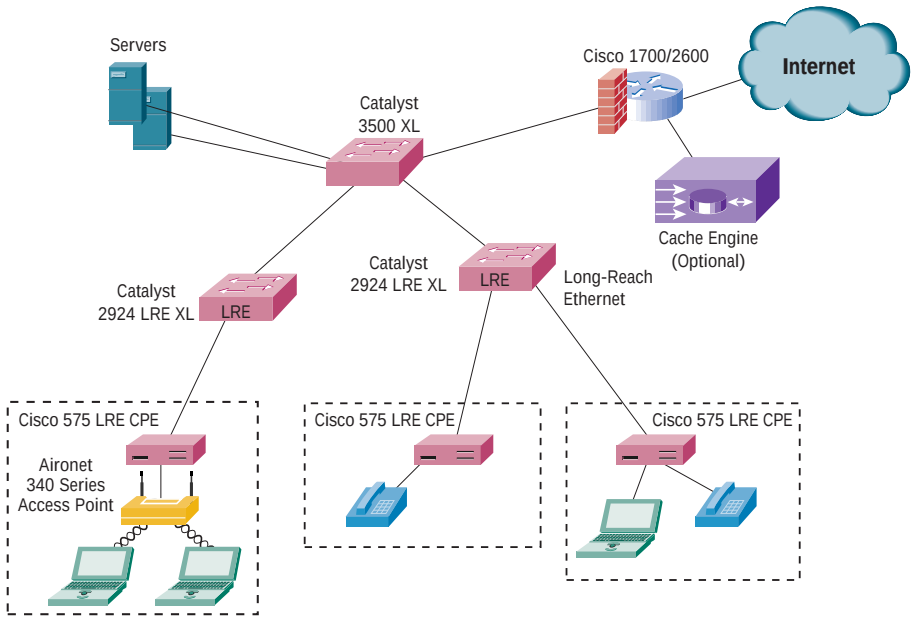
- 5 Mbps symmetrical rate (up to 5,000-feet distance)
- 10 Mbps symmetrical rate (up to 4,000 feet)
- 15 Mbps symmetrical rate (up to 3,500 feet)

The Catalyst 2924 LRE XL and 2912 LRE XL switches provide fast and easy connectivity into building patch panels with one RJ-21 telco connector. The 10/100 Ethernet ports can be used to connect servers, daisy-chain multiple LRE switches, or uplink to a Cisco Catalyst 3500 XL, 2900 XL, or 2948G-L3 10/100 Ethernet switch. These connectivity options provide multiple price/performance options to meet building and budget requirements.

The Cisco LRE switches provide the important features necessary for robust networks:

- Quality of Service: 802.1p QoS support. Provides high- and low-priority queuing on a per-port basis. Layer 3 QoS support—including DiffServe and application-based queuing—when Catalyst 2924 LRE XL and 2912 LRE XL switches are aggregated by a Layer 3 switch.
- Scalability: Up to 15-Mbps symmetric performance over single-pair wiring. Fast EtherChannel® port aggregation.
- Security: 802.1Q port-based virtual local-area network (VLAN) support. Cisco private VLAN access, assuring port security without requiring a VLAN per port. Access control list (ACL) security when a LRE switch is aggregated by a Cisco Layer 3 10/100 Ethernet switch.
- Network Management: Cisco Switch Clustering technology and the advanced, Web-based Cisco Cluster Management Suite (CMS) software deliver easy-to-use configuration and ongoing monitoring and management of up to 16 switches in multiple building sites from the point-of-presence (POP). This software is embedded in the Catalyst 2924 LRE XL and 2912 LRE XL switches and delivers remote, intuitive management of clustered switches and connected Cisco 575 LRE and 585 LRE CPE devices through a single IP address. Cisco Catalyst LRE switches also feature Cisco IOS® software and command-line interface (CLI), delivering common software support and CLI across both Cisco router and switch platforms.

Figure 2 Enterprise Campus Design



Cisco LRE switches are easy-to-configure and deploy, and offer a compelling option in terms of cost, performance, scalability and services compared to traditional ATM-based xDSL solutions and other hybrid DSL technologies, such as Home Phoneline Networking Alliance (HPNA).

Cisco 575 LRE CPE Device

Each LRE port is terminated in the room with the Cisco 575 LRE Customer Premise Equipment (CPE) device. This compact device bridges LRE and Ethernet, and provides one RJ-45 Ethernet connection and two RJ-11 connectors—one for the wall and one for a telephone. The Cisco 575 LRE CPE device can be mounted on or under a desk, or on a wall. It ships with a mount lock-in mechanism and clip-on Ethernet cable guard to discourage theft, as well as an Ethernet cord. The Cisco 575 LRE CPE device supports POTS traffic—including ISDN or digital phones—that coexists over the same LRE line by splitting LRE and POTS traffic at the CPE device. A POTS Splitter is required for connectivity to the PBX and LRE switch stack.

Figure 3 Cisco 575 LRE CPE Device

Cisco 585 LRE CPE Device

The CISCO585-LRE is a four-port CPE device for the LRE solution. The Cisco 585 CPE and the current 575 CPE are fully interoperable with the 2924-LRE-XL and 2912-LRE-XL switches. The Cisco 585 CPE shares the same basic form factor as the current 575 CPE and has four Fast Ethernet ports allowing customers to connect multiple devices simultaneously. The Cisco 585 CPE also has two RJ-11 connectors: one for an analog phone and one for the LRE link (same as the 575 LRE). A section of the top of the Cisco 585 CPE is indented to allow customers to place customized labels, and the mounting templates on both the Cisco 585 CPE and 575 CPE are identical allowing customers to easily replace existing 575 CPEs mounted under desks with Cisco 585 CPEs.

The Cisco 585 is targeted towards customers who intend to deliver converged voice, video, and data services to several devices such as computers, set-top boxes, IP phones, wireless access points, and so on. In order to support converged service such as video-on-demand, the Cisco 585 CPE supports 802.1p QoS with two priority queues allowing voice and video traffic to be prioritized over normal data traffic. The speed of the four Fast Ethernet ports is set to auto-negotiate, and the duplex is fixed at half.

Cisco LRE 48 POTS Splitter

The Cisco LRE 48 POTS Splitter is a high-density, low-cost device that is ideal for building deployments where the PBX system is on-site and POTS traffic must coexist over the same copper wiring as LRE traffic. The Cisco LRE 48 POTS Splitter enables the coexistence of LRE and POTS on the same telephone line. Unlike "splitterless" building broadband network solutions, the Cisco LRE 48 POTS Splitter ships as a separate, compact form factor to ensure that POTS service is separate, and never compromised by LRE switch reconfigurations or downtime.

The Cisco LRE 48 POTS Splitter supports 48 ports in a 1RU form factor. Each splitter has six RJ-21 connectors—two each for connectivity to the patch panel, the LRE switch(es), and the on-site PBX system.

Figure 4 Cisco LRE 48 POTS Splitter

Long-Reach Ethernet Technology

Long-Reach Ethernet provides an extension to the IEEE 802.3-compliant Ethernet standard network. LRE extends Ethernet over single-pair wiring at distances of up to 5,000 feet. Cisco LRE technology combines simple and standards-based LAN connectivity and extension over existing telephone wiring, while boasting several competitive advantages. The Cisco LRE technology provides a point-to-point link that can deliver half- or full-duplex Ethernet at up to a 15-Mbps data rate. Cisco LRE technology supports transmission of POTS, PBX, or ISDN signaling simultaneously with data over the standard telephone-grade wire infrastructure, and can be provisioned in the same wire bundle as ADSL.

The technology employs Quadrature Amplitude Modulation (QAM). QAM modulation uses both signal amplitude and phase to define each symbol. LRE uses the most sophisticated QAM technology with various QAM modulations (QAM-256, QAM-128, QAM-64, QAM-32, QAM-16, QAM-8, and QAM-4). The system administrator may choose profiles that use different modulations and frequency plans according to the line specification and rate definition. LRE is designed to support multiQAM in order to achieve performance as close to the physical limit as possible, while maintaining low cost and low power.

Cisco LRE facilitates the transport of symmetrical, bi-directional data over unshielded, copper twisted-pair telephone wires originally intended for the frequency band between 300 Hz and 3.4 KHz. The system employs Frequency Division Duplexing (FDD) to separate the downstream channel, the upstream channel, and POTS, ISDN, or PBX signaling services in the frequency domain. This enables service providers to overlay LRE on existing POTS, ISDN, or PBX signaling services without disruption. Both LRE and POTS/ISDN/PBX services may be transmitted over the same line without interfering with each other.

Key Features/Benefits

Exceptional Performance

- 12 or 24 LRE ports, each delivering dedicated per-port symmetric bandwidth up to 5 Mbps (up to 5,000 feet), 10 Mbps (up to 4,000 feet) or 15 Mbps (up to 3,500 feet) over Category 1, 2, or 3 single-pair copper wiring to support advanced network services.
- Four 10BaseT/100BaseTX autosensing ports, each delivering up to 200-Mbps bandwidth to individual users, servers, or workgroups to support LRE switch daisy-chaining, aggregation or server/router connectivity.
- Full-duplex operation on all ports, delivering up to 15 Mbps on LRE ports and up to 200 Mbps on 10/100 ports.
- 5-Gbps switching fabric and up to a 3.0-million-packets-per-second (Mpps) forwarding rate, ensuring high-performance forwarding to each LRE and 10BaseT/100BaseTX port.
- 4-MB shared memory architecture, ensuring the highest-possible throughput with a design that eliminates head-of-line blocking, minimizes packet loss, and delivers better overall performance in environments with extensive multicast and broadcast traffic.
- Dual-priority forwarding queues on each LRE and 10/100 port, enabling network traffic prioritization and seamless data, voice, and video integration through the IEEE 802.1p protocol.
- Bandwidth aggregation through Fast EtherChannel technology, enhancing fault tolerance and offering up to 400 Mbps (10/100 ports) of aggregated bandwidth between switches, and to routers and individual servers.
- Per-port broadcast storm control prevents faulty end stations from degrading overall system performance with broadcast storms.

Ease of Use and Ease of Deployment

- Cisco Switch Clustering technology allows users to remotely manage up to 16 interconnected Catalyst 3500 XL, 2900 XL, 2900 LRE XL, 1900 switches and the Cisco 575 LRE and Cisco 585 LRE CPE devices through a single IP address.
- In the rare event of command switch failure, cluster management is ensured via an automated fail-over scheme.
- The Cisco Cluster Management Suite (CMS) software allows the network manager to quickly and easily upgrade the system software on a group of Catalyst 2900 LRE XL switches.
- Autoconfiguration on each LRE switch port sets the Cisco 575 LRE CPE device at the corresponding performance mode.
- The speed of the Fast Ethernet ports on the Cisco 585 is set to set to negotiate, and the duplex is set to half.

- Autosensing on all 10/100 ports automatically selects half- or full-duplex transmission mode to optimize bandwidth.
- Autoconfiguration eases switch deployment in the network by automatically configuring multiple switches across a network via a boot server.
- Default configuration stored in Flash memory ensures that a switch can be quickly connected to the network, pass traffic with minimal user intervention, and preserve configuration in case of a power outage.

Integrated Cisco IOS Software Switching Solution

- Cisco Group Management Protocol (CGMP) enables a switch to selectively and dynamically forward routed IP multicast traffic to targeted multimedia end stations, reducing overall network traffic.
- CGMP Fast Leave allows end stations to quickly exit from a multicast session, reducing superfluous network traffic.
- Virtual LAN trunks can be created from any port using standards-based 802.1Q tagging.
- Private VLAN Access enables per port security, requiring only a VLAN on every switch, not every port. This feature greatly minimizes the number of VLANs required.
- IEEE 802.1p Layer 2 protocol for prioritization of mission-critical and time-sensitive traffic from data, video, voice, and IP telephony applications.
- Cisco Virtual Trunking Protocol (VTP) supports dynamic VLANs and trunk configuration across all switches.
- Cisco IOS command-line interface (CLI) support provides common user interface and command set across all Catalyst switches and Cisco routers.
- Cisco Discovery Protocol (CDP) enables a CiscoWorks network management station to automatically discover a switch in a network topology.

Superior Manageability

- Built-in, Web-based management interface provides easy-to-use management through a standard browser such as Netscape Navigator or Microsoft Explorer.
- Web-based, remote monitoring of the Cisco 575 LRE and 585 LRE CPE devices from a Catalyst 2900 LRE XL switch.
- Simple Network Management Protocol (SNMP) and Telnet interface support deliver comprehensive in-band management, and a CLI-based management console provides detailed out-of-band management.
- Manageable through CiscoWorks2000 network management software on a per-port and per-switch basis, providing a common management interface for Cisco routers, switches, and hubs.
- 8-MB DRAM and 4-MB Flash memory onboard, enabling the addition of a continuous stream of feature upgrades and maximizing customer investments.
- Configurable network port, supporting unlimited Media Access Control (MAC) addresses for backbone connectivity.
- Embedded Remote Monitoring (RMON) software agent supports four RMON groups (history, statistics, alarms, and events) for enhanced traffic management, monitoring, and analysis.
- Support for all nine RMON groups through use of a switch port analyzer (SPAN) port that permits traffic monitoring of a single port, a group of ports, or the entire switch from a single network analyzer or RMON probe.
- Domain Name System (DNS) client support provides IP address resolution with user-defined device names.
- Trivial File Transfer Protocol (TFTP) reduces the cost of administering software upgrades by downloading from a centralized location.
- Network Time Protocol (NTP) provides an accurate and consistent timestamp to all switches within the intranet.

- Multifunction LEDs for 10BaseT/100BaseTX port, LRE switch and CPE device port status. Indications include full/half duplex, 10/100 Mbps speed, Ethernet and LRE link status, as well as switch-level status LEDs for system, redundant power supply (RPS), and bandwidth utilization provide a comprehensive and convenient visual management system.

Security and Redundancy

- Cisco UplinkFast technology ensures quick fail-over recovery, enhancing overall network stability and reliability.
- Support for TACACS+ authentication enables centralized control of the switch and restricts unauthorized users from altering the configuration.
- MAC-based, port-level security prevents unauthorized stations from accessing the switch.
- User-selectable address learning mode simplifies configuration and enhances security.
- Multilevel security on console access prevents unauthorized users from altering switch configurations.
- IEEE 802.1D Spanning-Tree Protocol (STP) support for redundant backbone connections and loop-free networks simplifies network configuration and improves fault tolerance.
- Support for optional Cisco 600-watt redundant AC power system provides a backup power source for up to four units for improved fault tolerance and network uptime.

Cisco LRE Hardware Technical Specifications

Performance

- 5-Gbps switching fabric
- 3.0 Mpps wire-speed forwarding rate for 64-byte packets
- 4.2-Gbps maximum forwarding bandwidth
- 4-MB memory architecture shared by all ports
- 8 MB DRAM and 4 MB Flash memory
- 8192 MAC addresses

Management

- SNMP Management Information Base (MIB) II, SNMP MIB extensions, Bridging MIB (RFC 1493)

Standards

- IEEE 802.3x full duplex on 10BaseT, 100BaseTX ports
- IEEE 802.1D Spanning-Tree Protocol
- IEEE 802.1p Class of Service (CoS) Prioritization
- IEEE 802.1Q VLAN
- IEEE 802.3u 100BaseTX specification
- IEEE 802.3 10BaseT specification

Connectors and Cabling

- LRE ports: RJ-21 connector; one-pair Category 1, 2, or 3 unshielded twisted-pair (UTP) cabling
- 10BaseT ports: RJ-45 connectors; two-pair Category 3, 4, or 5 unshielded twisted-pair (UTP) cabling
- 100BaseTX ports: RJ-45 connectors; two-pair Category 5 UTP cabling
- Cisco 575 LRE CPE device: 10BaseT/10BaseTX port: RJ-45 connector; Telephony ports: Two RJ-11 connectors
- Cisco 585 LRE CPE device: Four 10BaseT/10BaseTX ports: RJ-45 connectors; Telephony ports: Two RJ-11 connectors

Indicators

- Per-port status LEDs—link integrity, disabled, activity, speed, and full-duplex indications
- System status LEDs—system, RPS, and bandwidth utilization indications

Y2K Compliance

- Y2K compliant

Dimensions and Weight (H x W x D)

Catalyst 2924 LRE XL, 2912 LRE XL switches

- 1.665 x 13.25 x 17.4 in.
- One rack unit (RU) high
- 10.5 lb. (Catalyst 2924 LRE XL); 9.5 lb. (Catalyst 2912 LRE XL)

Cisco 575 LRE CPE Device

- 1.7 x 5.0 x 6.2 in. (without cable guard)
- 1.7 x 5.0 x 6.7 in. (with cable guard)
- 0.5 lb. (with cable guard and no cables)

Cisco 585 LRE CPE Device

- 1.7 x 5.9 x 6.8 in. (43.2 x 150 x 173 mm) (without cable guard)
- 1.7" x 5.9 x 7.3 in. (43.2 x 150 x 185 mm) (with cable guard)
- 1 lb. (0.45 kg) (with cable guard and no cables)

Cisco LRE 48 POTS Splitter

- 1.665 x 13.25 x 17.4 in.
- One rack unit (RU) high
- 9.25 lb.

Environmental Conditions and Power Requirements

- Operating temperature: 32 to 113 F (0 to 45 C)
- Storage temperature: -13 to 158 F (-25 to 70 C)
- Operating relative humidity: 10% to 85% noncondensing
- Operating altitude: Up to 10,000 ft (3000 m)
- Power consumption: 70W maximum, 239 BTU per hour
- AC input voltage/frequency: 100 to 120 or 200 to 240 VAC (autoranging), 50 to 60 Hz
- MTBF 135,000 hours

Safety Certifications

- UL 1950
- CSA 22.2 No. 950
- EN 60950
- IEC 950
- AS/NZS 3260, TS001
- CE Marking
- TUV

Electromagnetic Emissions Certifications

- FCC Part 15 Class A (Cisco 575 LRE CPE: Class B)
- EN 55022b Class A (CISPR 22 Class A) (Cisco 575 LRE CPE: Class B)
- VCCI Class A (Cisco 575 LRE CPE: Class B)
- AS/NZS 3548 Class A (Cisco 575 LRE CPE: Class B)
- BCIQ
- CE Marking

Warranty

- Limited lifetime warranty

Ordering Information

Model Number	Description
WS-C2924-LRE-XL	Catalyst 2924 LRE XL switch: 24-port LRE + 4-port 10/100
WS-C2912-LRE-XL	Catalyst 2912 LRE XL switch: 12-port LRE + 4-port 10/100
CISCO575-LRE-6P	Cisco 575 LRE CPE device (6 pack): 1-port Ethernet + 2 RJ-11 connectors
CISCO575-LRE-24P	Cisco 575 LRE CPE device (24 pack): 1-port Ethernet + 2 RJ-11 connectors
CISCO585-LRE	Cisco 585 LRE CPE device: 4-port Ethernet + 2 RJ-11 connectors
CISCO585-LRE-6P	Cisco 585 LRE CPE device (6 racks): 4-port Ethernet + 2 RJ-11 connectors
CISCO585-LRE-24P	Cisco 585 LRE CPE device (24 racks): 4-port Ethernet + 2 RJ-11 connectors
PS-1M-LRE-48	Cisco LRE 48 POTS Splitter: 48 ports

For More Information on Cisco Products, Contact:

- US and Canada: 800 553-NETS (6387)
- Europe: 32 2 778 4242
- Australia: 612 9935 4107
- Other: 408 526-7209
- World Wide Web URL: http://www.cisco.com

Corporate Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 526-4100

European Headquarters
Cisco Systems Europe
11 Rue Camille Desmoulins
92782 Issy-les-Moulineaux
Cedex 9
France
www-europe.cisco.com
Tel: 33 1 58 04 60 00
Fax: 33 1 58 04 61 00

Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-7660
Fax: 408 527-0883

Asia Pacific Headquarters
Cisco Systems, Inc.
Capital Tower
168 Robinson Road
#22-01 to #29-01
Singapore 068912
www.cisco.com
Tel: +65 317 7777
Fax: +65 317 7799

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