CISCO SYSTEMS

CISCO PERFORMANCE ROUTING ENGINE 2 FOR THE CISCO uBR10012 UNIVERSAL BROADBAND ROUTER

Cable operators are generating significant revenue and earnings growth with new service offerings that lead the market in terms of features and benefits, performance, service availability, and operational efficiency. The Cisco® Performance Routing Engine 2 (PRE-2) is the next-generation route processor for the Cisco uBR10012 Universal Broadband Router that addresses emerging service needs. It offers cable operators the combined advantages of high performance, an unmatched Layer 3 feature set, scalability, as well as high availability for their IP-centric cable modem and set-top based applications.

PRODUCT OVERVIEW

The Cisco PRE-2 (Figure 1) evolves the cable IP network with superior performance and reliability. The Cisco PRE-2 performs Layer 2 and Layer 3 packet processing, as well as routing and system management functions. It effectively doubles the bandwidth available to each slot on the Cisco uBR10012 as supported by cable interface line cards or Cisco broadband processing engines (BPEs). The Cisco PRE-2 introduces support for full-duplex Gigabit Ethernet ports and increases the supported connections to 1.6 Gbps in full duplex (each direction per half slot). Full-slot modules can now have up to 3.2 Gbps to and from the Cisco PRE-2—twice the connection rate of the Cisco PRE-1. Two Cisco PRE-2 modules can be installed for redundancy.

Figure 1
Cisco Performance Routing Engine 2 (PRE-2) for the Cisco uBR10012 Universal Broadband Router

The Cisco uBR10012 is a communications-grade cable modem termination system (CMTS) that offers an unmatched feature set for DOCSIS®-based cable modem and set-top box applications. With full Layer 3 routing capability and industry-leading capacity, the Cisco uBR10012 supports deployment of next-generation cable IP services that require a greater level of intelligence and processing power. With the Cisco PRE-2, the Cisco uBR10012 now supports a minimum of 64,000 subscribers.

The Cisco PRE-2 exploits the latest Cisco Parallel Express Forwarding (PXF) patented technology for unparalleled performance and scalability. Cisco PXF is a parallel multiprocessor architecture that helps enable deployment of multiple IP services while maintaining peak performance throughput.

The Cisco PRE-2 offers the following features:

- Processes up to 6.2 million packets per second (mpps) and eight concurrent flows in the Cisco uBR10012

- Supports up to 6.4-Gbps full duplex per WAN and 3.2-Gbps full duplex per RF slot

- Uses Cisco PXF patented technology to provide maximum IP services performance

- Supports processor redundancy, helping enable 99.999-percent network uptime

- Offers 500-MHz Reduced Instruction Set Computer (RISC) processor handling route and Simple Network Management Protocol (SNMP) processing

FEATURES AND BENEFITS

Table 1 gives more details about the features and benefits of the Cisco PRE-2.

Table 1. Features and Benefits of Cisco PRE-2

Features	Benefits
Up to 6.2 mpps of processing capability	This processing capability delivers line-rate performance, with a wide variety of features enabled. Customers providing DOCSIS-based high-speed data, PacketCable voice over IP (VoIP), DOCSIS Set-Top Gateway (DSG) video transport, and other leading-edge IP services require exceptional processing capability to support these new revenue-generating services.
Up to 6.4-Gbps full duplex per WAN and 3.2-Gbps full duplex per RF slot backplane support	This feature provides a balance packet flow between ingress and egress slot capacity, offering a total capacity of >24-Gbps full duplex.
Cisco PXF patented technology	Cisco PXF delivers increased performance and flexibility. Using Cisco PXF, the Cisco uBR10012 helps enable cable operators to turn on multiple services without experiencing performance degradation—crucial when operators deploy new types of services. Cisco PXF is a software-based technology that helps enable the Cisco uBR10012 to implement new services without upgrading hardware, thereby providing investment protection and saving customers time and money.
Processor redundancy	Processor redundancy helps enable 99.999-percent network uptime, particularly important when supporting primary line voice services. Each Cisco uBR10012 chassis supports up to 2 Cisco PRE-2 modules for redundancy. Architected to support 99.999-percent uptime and coupled with a superior set of high-availability features and functions, the Cisco uBR10012 is the industry's leading carrier-class CMTS.
500-MHz RISC processor handling route and SNMP processing	This feature offers co-processor (in addition to the 64 microcores in the Cisco PXF complex) capacity for managing thousands of routes and management requests.

PRODUCT SPECIFICATIONS

Hardware Features

- Hot-swappable (with redundant Cisco PRE-2 modules)

- 500-MHz RM7000 mips processor with integrated 16-KB data and 16-KB instruction Level 1 caches and integrated 256-KB Level 2 cache, as well as 4-MB Level 3 cache

- Two PC card slots (compatible with PC card interface on previous PREs)
  - Either PC card slot can be a memory or I/O device
  - Both PC card slots support Type I and Type II cards

- 64 MB of Flash memory

- 256-MB packet buffer

- 2 MB of NVRAM

- 1 GB of DRAM

- Support for route-processor main memory error checking and correction (ECC)

- One Ethernet 10-/100-Mbps network management interface with an RJ-45 connector

- Serial console port

- Auxiliary (modem) port

- Alarm contacts (critical, major, and minor)

- Push-button reset

CISCO PXF HARDWARE FEATURES

- Four Cisco PXF network processors (containing a total of 64 individual processors)

- Two independent 32-MB synchronous dynamic RAM (SDRAM) control memories on each processor set

- Cisco PXF configuration memory (per column): 128 MB

- Cisco PXF configuration memory (total): 1 GB

- Support for Cisco PXF column memory ECC

- Support for Cisco PXF packet buffer memory ECC

- Backplane interconnect application-specific integrated circuit (ASIC) for buffer management, flow control, management to the network processor, and interface to the Cisco uBR10012 backplane

SOFTWARE FEATURES

With Cisco PXF, the Cisco PRE-2 separates control-plane functions from data-plane functions. A general-purpose RISC processor (500 MHz RM7000 mips) supports control-plane functions of administration, route processing, management, and configuration. Multiple Cisco PXF network processors support data-plane functions—including high-performance Layer 3 forwarding. The combination of a general-purpose RISC processor with advanced programmable Cisco PXF network processors provides maximum flexibility while maintaining maximum throughput of essential IP services such as quality of service (QoS), Multiprotocol Label Switching (MPLS), and access policy filtering.

HIGH-AVAILABILITY FEATURES

- Online insertion and removal (OIR)

- Cisco IOS® Software Route Processor Redundancy Plus (RPR+)

- Hot Standby Connection-to-Connection Protocol (HCCP); N + 1 RF line-card redundancy and RF switch management

PRODUCT SPECIFICATIONS

Physical

- Dimensions (H x W x D): 16.0 x 1.91 x 9.97 in. (40.64 x 4.84 x 25.32 cm)

- Weight: 8.45 lb (3.84 kg)

Environmental

- Storage temperature: –38 to 150°F (–40 to 70°C)

- Operating temperature, nominal: 41 to 104°F (5 to 40°C)

- Operating temperature, short term: 23 to 131°F (–5 to 55°C)

- Storage relative humidity: 5 to 95 percent relative humidity (RH)

- Operating humidity, nominal: 5 to 85 percent RH

- Operating humidity, short term: 5 to 90 percent RH

- Operating altitude: –60 to 4000m

REGULATORY COMPLIANCE

Safety

- UL 60950/CAN/CSA-C22.2 No. 60950-00, third edition, dated December 1, 2000, with no deviation considered to be less stringent than IEC 60950

- EN 60950 with Amendments 1–4, for CE Marking to the LVD directive

- IEC 60950 third edition with Amendments 1–4, including all national and group deviations

- AS/NZS 60950:2000

- AS/NZS 3260-1993 with Amendments 1–4

- ACA TS001-1997

Electromagnetic Emissions Certification

- AS/NZ 3548: 1995 (including AMD I + II) Class B

- EN55022: 1998 Class B

- CISPR 22: 1997

- EN55022: 1994 (including AMD I + II)

- 47 CFR Part 15: 2000 (FCC) Class B

- VCCI V-3/01.4 Class 2

- CNS-13438: 1997 Class B

- GR1089: 1997 (including Rev. 1: 1999)

Immunity

- EN300386: 2000-TNE EMC requirements; product family standard; high priority of service; central-office and noncentral-office locations

- EN50082-1: 1992/1997

- EN50082-2: 1995-Generic Immunity Standard, Heavy Industrial

- CISPR24: 1997

- EN55024: 1998-Generic ITE immunity standard

- EN61000-4-2: 1995 + AMD I + II ESD, Level 4/8 kV contact, 15 kV air

- IEC-1000-4-3: 1995+AMD 1-Radiated Immunity, 10 V/m

- IEC-1000-4-4: 1995-Electrical Fast Transients, Level 4/4 kV/B

- IEC-1000-4-5: 1995+AMD 1-DC Surge-Class 3; AC Surge-Class 4

- EN61000-4-6: 1996+AMD 1-RF conducted immunity, 10 Vrms

- EN61000-4-11: 1995-Voltage Dips and Sags

- ETS300 132-2: 1996+corregendum, December 1996

- GR1089: 1997 (including Rev1: 1999)

Network Equipment Building Standards

- Level 3 compliant

- Telcordia SR-3580 Criteria Levels, issued November 1995

- GR-1089-CORE: Electromagnetic Compatibility & Electrical Safety, issued October 2002

- GR-63-CORE: Physical Protection Requirements, issued April 2002

- SBC equipment requirements: TP76200 MP and TP76400 MP

- Verizon equipment requirements: SIT.NEBS.TE.NPI.2002.010

European Telecommunications Standards Institute

- ETS 300 386-1—Levels for equipment with a "high priority of service" that is installed in "locations other than telecommunication centers"

- ETS 300 386-2:1997—Levels for equipment with a "high priority of service" that is installed in "locations other than telecommunication centers"

- ETSI 300 132-2: December 1994—Power supply interfaces at the input to telecommunications equipment Sections 4.8 and 4.9

LEDs

- Alarms: Critical/Major/Minor (yellow, three per card)
  – ON indicates an alarm condition
  – OFF indicates no alarm
- Fail (yellow, one per card)
  – ON indicates that a major failure has disabled the Cisco PRE-2
  – OFF indicates that the Cisco PRE-2 is operating properly
- Status (bicolor, one per card)
  – Flashing yellow indicates that the system is booting
  – Green indicates that the Cisco PRE-2 is active (as a primary)
  – Flashing green indicates that the Cisco PRE-2 is standby (as a secondary)
  – OFF indicates no power to the Cisco PRE-2
  – Activity—Green indicates packets are being transmitted and received
  – Link—Green indicates carrier detected; the port is able to port traffic
- PC card slot 0 (green—ON indicates slot 0 is active)
- PC card slot 1 (green—ON indicates slot 1 is active)

Network Management

- Network management through:
  – Telnet (command-line interface [CLI])
  – Console port (through the CLI)
  – SNMP
- RFC 2665
- MIBs: Cisco IOS Software Release 12.3(9)BC adds the following new MIB support for the Cisco uBR10012:
  – CISCO-CABLE-METERING-MIB
  – CISCO-CABLE-QOS-MONITOR MIB
  – CISCO-ENHANCED-MEMPOOL-MIB
  – CISCO-PROCESS-MIB
  – CISCO-CABLE-SPECTRUM-MIB
  – DOCS-QOS-MIB

For additional information about Cisco broadband cable MIBs for the Cisco CMTS, refer to the following resources on Cisco.com:

- Cisco CMTS Universal Broadband Router MIB Specifications Guide at: http://www.cisco.com/univercd/cc/td/doc/product/cable/cmtsmib/
- SNMP Object Navigator at: http://www.cisco.com/pcgi-bin/Support/Mibbrowser/unity.pl

Power Budget

Unit power: 200W

CISCO PRE-2 SYSTEM REQUIREMENTS AND COMPATIBILITY

Hardware Requirements

- The Cisco PRE-2 is supported in the Cisco uBR10012 and the Cisco 10000 Series Router.

- The Cisco PRE-2 is supported in combination with all line cards currently shipping on the Cisco uBR10012 in the software trains in which the Cisco PRE-2 is available.

Software Requirements

Cisco IOS Software Release 12.3(9)BC is the minimum release that supports the Cisco PRE-2 on the Cisco uBR10012.

Product Ordering Details

Visit http://www.cisco.com/public/ordering_info.shtml to place an order.

Product Ordering Details: Migration Program

A Cisco Technology Migration Plan (TMP) has been established for this product. The TMP is a sales program that allows customers to trade in Cisco Systems® products to receive a trade-in credit toward the purchase of any new Cisco product. The program underscores the Cisco commitment to the customer in terms of end-to-end product solutions as well as emphasizing the company's commitment to provide effective migration options for ever-changing network requirements.

More specific information about this program is available at: http://www.cisco.com/go/tradein. Table 2 gives part numbers for the Cisco PRE-2.

Table 2. Part Numbers for Cisco PRE-2

Part Number	Description
ESR-PRE2	Cisco Performance Routing Engine for the Cisco uBR10012 and Cisco 10000 Series, 1-GB DRAM and 64-MB Flash memory
ESR-PRE2=	Spare Cisco Performance Routing Engine for the Cisco uBR10012 and Cisco 10000 Series, 1-GB DRAM and 64-MB Flash memory
ESR-PREMEMFD64	Cisco Performance Routing Engine for the Cisco uBR10012 and Cisco 10000 Series, 64-MB Flash disk (default on Cisco PRE-2)
ESR-PREMEMFD64=	Spare Cisco Performance Routing Engine for the Cisco uBR10012 and Cisco 10000 Series, 64-MB Flash disk (default)
ESR-PRE-MEM-FD128	Cisco Performance Routing Engine for the Cisco uBR10012 and Cisco 10000 Series, 128-MB Flash disk
ESR-PRE-MEM-FD128=	Spare Cisco Performance Routing Engine for the Cisco uBR10012 and Cisco 10000 Series, 128-MB Flash disk

MORE INFORMATION

For more information about the Cisco PRE-2, refer to the following URLs:

- http://www.cisco.com/en/US/products/ps6045/index.html

- http://www.cisco.com/en/US/products/hw/cable/ps2209/prod_installation_guides_list.html

- http://www.cisco.com/en/US/products/hw/cable/ps2209/products_installation_and_configuration_guides_list.html

CISCO SYSTEMS

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 International BV
Haarlerbergpark
Haarlerbergweg 13-19
1101 CH Amsterdam
The Netherlands
www-europe.cisco.com
Tel: 31 0 20 357 1000
Fax: 31 0 20 357 1100

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.
168 Robinson Road
#28-01 Capital Tower
Singapore 068912
www.cisco.com
Tel: +65 6317 7777
Fax: +65 6317 7799

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