



Carrier Ethernet Switch Router

ECR-1000 Series



A Carrier Ethernet Solution for Next Generation Transport Networks
(Manufactured under license from IIT-Bombay)

Electronics Corporation of India Limited

ECR - 1000 Series CES Router - Tomorrow's Technology Today

ECIL's ECR-1000 series carrier Ethernet switch routers offer next generation networking solution in the Carrier Ethernet segment for transport network. Deploying an innovative technology developed by the Gigabit Networking laboratory at IIT Bombay, these series of Transport Switches and Routers are poised to set new price/performance benchmarks in the telecommunication industry.

Applications: ECR-1000 Series Switch Routers are tailored for optimum performance in the following applications:

- * Data-Center
- * Metropolitan/Wide Area Network
- * Carrier Ethernet Transport
- * Broadband Service
- * Metro/Core Transport
- * As a replacement to SDH/SONET

Technology:

The path-breaking technology of ECR-1000 Series Switch Routers conceptualized at the Gigabit Networking Laboratory at IIT Bombay collapses the lower three layers of the Internet protocol stack into a single layer. For backward compatibility with existing systems the transport switch/router uses the common denominator of Ethernet – while supporting carrier-class features and providing an ultra-fast routing fabric. The lower three layers of the protocol stack – namely the network, data-link and physical layer are collapsed into a smart Carrier Ethernet layer that facilitates layer-2 service provisioning, routing and transport functionality. The ECR-1000 Series Switch Routers provide inherent topological security feature thus positioning these products as the core components of any secure transport network.

Networks with ECR-1000 Series Switch Routers establish an end-to-end communication system that is based entirely on Ethernet - over fiber in



Fig. 1 EC Router ECR - 1000

3 Models

Access / edge switch router
- **ECR 100**

Metro / data-center / transport router

- **ECR-1000**

Core OTN / Carrier Ethernet cross - connect

- **ECR-1010**

the metro and copper in the local area network, facilitating support of services at the data layer. This ECR-1000 Series Switch Router solution takes into cognizance, network hierarchy and interconnection methodology in MANs/enterprises and advances in Carrier Ethernet technology (PBB-TE/MPLS-TP) and applies these two concepts to create a unique end-to-end high-speed communication system.

This solution also provides an all-Ethernet wide area networking framework that involves a unique addressing and routing mechanism, and leads to a scalable, hierarchical, easy upgradable, cost efficient and service-oriented transport network architecture. The network-wide requirements of

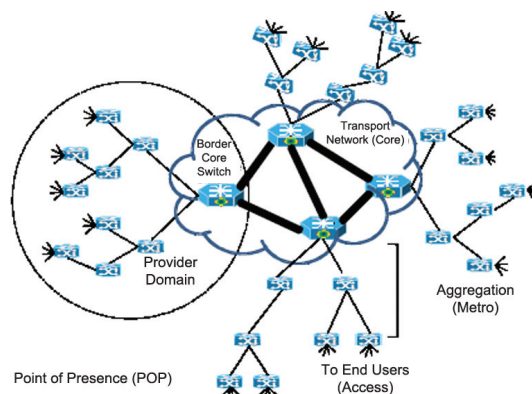


Fig. 2 The 3-tier hierarchy of networks.

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emerging services especially video, mobile backhaul and data-center, indicates a need to keep data in the lower layers—thereby conserving energy, lowering CAPEX and OPEX as well as providing better managed functionality. ECR-1000 Series Switch Router proposes a solution that addresses the problem of providing end-to-end

Optical networks are comprised of functionality providing transport, multiplexing, routing, supervision and survivability of client signals that are processed predominantly in the photonic domain. Supporting OTN, ECR-1000 Series Switch Router facilitates up to 1000km reach without regeneration of the optical signal.

Salient Features:

WDM fabric support: At layer 1, it supports WDM – hence facilitates excellent fiber utilization.

OTN support: supporting OTN facilitates up to 1000km reach without regeneration of the optical signal – making this technology connect the metropolitan cities in India using external transponder.

Carrier Ethernet support: Up to 12 interfaces, each of which support between 1 Gbps and 10 Gbps traffic with Carrier Ethernet services.

Service Support: Each interface supports a multitude of services with each service adopting granularity from 1Mbps to 10 Gbps in increments of 10Mbps.

Routing support: a proprietary routing mechanism facilitates fast routing in a network domain.

communication while keeping information in the data and optical layers.

Benefits:

The present version of the Internet with IP as the dominant network protocol, Ethernet as the MAC protocol and WDM at the physical layer is not cost-and-performance-wise efficient in meeting the challenges in emerging services particularly as energy sources plummet. With our proposed technology ECR-1000 Series Switch Router supports WDM fabric at layer 1 – hence facilitates excellent fiber utilization and minimizes energy consumption.

A proprietary yet compliant with standards, Carrier Ethernet based routing mechanism of ECR - 1000 Series Switch Router facilitates routing in a domain that supports end-to-end communication scheme, with low cost, low energy consumption, low latency and small foot print.

Managed Services:

ECR-1000 Series Switch Router facilitates layer 2 managed ESP support and layer 3 managed LSP support. ECR-1000 Series Switch Router facilitates reservation of bandwidth for sessions (deterministic behavior) as well as enables differentiation of frames into control, data and Both

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different traffic types (for QoS purposes). The ECR-1000 Series Switch Router can create ESPs and this is particularly important in the metro/access/core – by logically dividing a 1 GbE or a 10 GbE link into multiple tunnels like pseudo-wires. ECR-1000 Series Switch Router provides granularity of an ESP from 1 Mbps to 10 Gbps in increments of 10 Mbps.

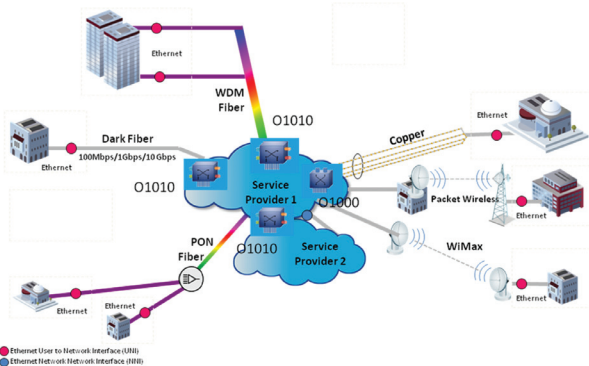


Fig. 3 EC Router connected over widest variety of access

Ethernet Line Service (E - Line Service) support of ECR-1000 Series Switch Router provides a point to point Ethernet virtual connection between two User to Network Interfaces (UNIs). The E-line service is used for Ethernet point-to-point connectivity. In the ECR-1000 Series Switch Router the E-Line service is configured through the “E-line Service” tab available on the NMS. The source and destination addresses (MAC or IP address), port details and the granularity for the E-line service are specified during configuration.

Low-cost: The technology is an order of magnitude lower in cost compared to similar products in the market.

Low energy consumption and small footprint: The technology consumes less power and has a smaller footprint than comparable solutions.

Low latency: being one of the fastest routers in the world, this solution makes the technology unique to data-center and other service oriented communication needs.

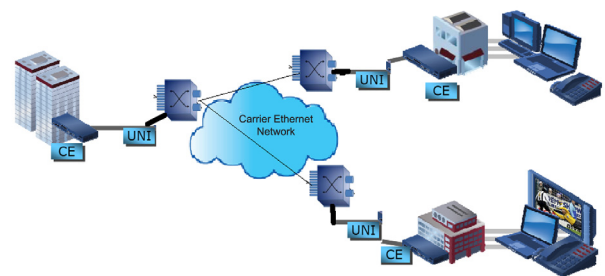


Fig. 4 E - Line Service

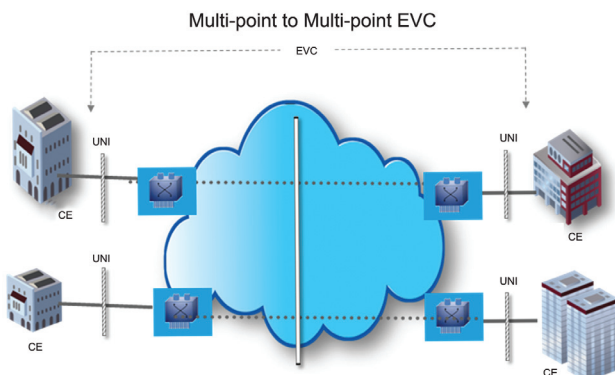


Fig. 5 E - LAN Service

Ethernet LAN service (E - LAN Service) provides multipoint connectivity i.e. it may connect two or more UNIs. Subscriber data from one UNI can be received at one or more of the other UNIs. Each UNI is connected to a multipoint EVC (Ethernet Virtual Connection). As new sites (UNIs) are added, they are connected to the same multipoint EVC thus simplifying the provisioning and service activation. In the ECR-1000 Series Switch Router E-LAN service is configured using the “Multicast/ELAN” service tab on the NMS.

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Both multicast and broadcast are supported under E-LAN service. In multicast service, flooding is restricted to the specified number of devices, whereas in broadcast the packets are forwarded to each and every end device.

Network Management System (NMS):

The network management system EC – Inter Networking Operating System (EC-INOS) is used for configuring the ECR-1000 Series Switch Routers in the network. In a running network with heterogeneous elements, all routers are detected by EC-INOS, thus providing full network view and planning. Network BOM, fiber planning, amplifier placement etc. can also be steered through the network management tools.

Salient Features

- * Point and click operation for service provisioning.
- Multicast group support : 256 per router
- Alarms
- QoS supported: 4 and 8 levels (future) user configurable
- RJ45 interface
- Up to 5 Mbps
- Scalable up to 2000 nodes

The other features supported by ECR-1000 Series Switch Routers which can be configured through EC - INOS are:

- * Unicast
- * Multicast
- * E-Line
- * E-LAN
- * Rate-limiting

EC-INOS opening menu can be used to navigate/ configure the ECR-1000 Series Switch Router as per the application requirement. They are:

- * Data-Center.

- * Metro Transport.
- * ROADM (Reconfigurable optical add-drop multiplexer).
- * CESR (Carrier Ethernet Switch Router).
- * VPN (Virtual Private Network).

Ports of a router are configured through EC-



Fig. 6 EC-INOS application tools

INOS. The ports towards the client side are configured as edge ports and the ports connecting to other ECR-1000 Series Switch Routers are configured as core ports. Options for edge port configuration, traffic granularity, committed burst size (CBS), priority of the incoming traffic, receive - transmit flow control, auto negotiation and port protocol support can also be configured.

The granularity can be selected as multiple of Mbps of traffic for the purpose of streamlining to a particular flow, thereby achieving tunneling behavior leading to better Quality of Service (QoS) and enhanced Quality of Experience (QoE). CBS is enabled only for the Edge ports with a value ranging from "1" to "10" Maximum Transmission Unit (MTU) and with four levels of priority for the incoming traffic. The port protocol support is also available with IPv4, IPv6, MAC, IPv4/MAC, IPv6/MAC, VLAN, VLAN/MAC options. Based on the option selected, the incoming traffic address lookup is created.

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[Refresh](#) [O Router](#) [J Router](#) [V Router](#) [Client \(Edge Port\)](#) If you are unable to view topology [Click Here](#).

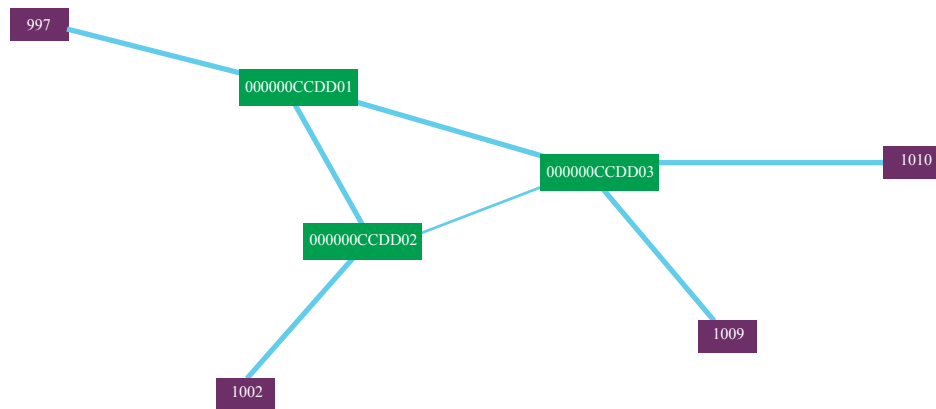


Fig. 7 EC-INOS network topology view

EC INOS

[Start NMS](#) [Modify Port Options](#) [Populate H/W Tables](#) [View](#) [Multicast/ELAN](#) [Configure Device Details](#) [Logout](#)

Device Details

Select a MAC Address: Select Port Number:

Port	Granularity	CBS	Def. Priority	Core/Edge Port	Enable Pause(RX)	Enable Pause(TX)	Enable Auto Neg.	Port Protocol Support	Status
0	5000	4	1	Edge/Ethernet	No	No	No	IPv4/MAC	0 Show
1	1000	3	0	Core	No	No	No	IPv4	0 Show
2	1000	3	0	Core	No	No	No	MAC	0 Show
3	1000	3	0	Core	No	No	No	MAC	0 Show
4	3000	3	0	Edge/Ethernet	No	No	No	IPv4	2 Show
5	1000	3	0	Core	No	No	No	MAC	0 Show
6	1000	3	0	Core	No	No	No	MAC	0 Show
7	1000	3	0	Core	No	No	No	MAC	0 Show
8	1000	3	0	Core	No	No	No	MAC	0 Show
9	1000	3	0	Core	No	No	No	MAC	0 Show
10	1000	3	0	Core	No	No	No	MAC	0 Show
11	1000	3	0	Core	No	No	No	MAC	0 Show

[Submit](#)

Fig 8 EC-INOS Port Configuration

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Product Matrix:

	Physical Interfaces	Port to port Routing (seconds)	Switching Fabric (Gbps)	Power Rating (Watt)	Power Consumption (Watt)	Height (RU)	RPS	Rack Mountable	NMS Support	Tag Based VPN Support	Multicast Support
1000	2X10Gbps, 10X1Gbps	1 micro	60	150	80	1	Yes	Yes	GUI	Yes	Yes
1010	4X10Gbps, 8X1Gbps	1 micro	96	250	180	2	Yes	Yes	GUI	Yes	Yes

Technical Parameters:

	Layer 1: Protocol support	Layer 2: Data Link support	Layer 3: Routing Specification	Hardware Security
ECR-1000	2x10GigE 10x1GigE Client side GigE	Carrier Ethernet Support. IEEE802.1Qay support/ Scalable to meet RFC 5317/5921/5654/5860 MPLS-TP. IEEE802.1ag Ethernet Connectivity Fault Management (CFM) support. ITU.T. Y.1731 compliant. ELINE and ELAN support	1 microsecond port to port routing for up to 50% load. <3 microseconds for 50-75% load. <9 microseconds for full load. 1000 unique entries for FEC. Intra-domain routing support. IPv4 and IPv6 support. L3 VPN support.	Single FPGA based. Control plane: integrated with NMS Memory to FPGA: with ECC. Granularity 10 Mbps to 10 Gbps in increments of 10 Mbps
ECR-1010	4x10GigE or 4xODU2 OTN G.709. 8x1GigE Client side GigE or ODU0 C-band 50 GHz and 100 GHz spacing.(O1100 module) L-band 50 GHz and 100 GHz spacing. (O1100 module) Laser chirp < ITU tolerance. Support for burst mode optics (client).	Carrier Ethernet Support. IEEE802.1Qay support/Scalable to meet RFC 5317/5921/5654/5860 MPLS-TP. IEEE802.1ag Ethernet Connectivity Fault Management (CFM) support. ITU.T. Y.1731 compliant. ELINE and ELAN support	1 microsecond port to port routing for up to 50% load. 1000 unique entries for FEC for each port. Intra-domain routing support. IPv4 and IPv6 support. BGP emulation for Inter-domain communication. (optional feature) IGMP group multicast support. L3 VPN support. L3 port queue: 20 MB (megabyte)	Single FPGA based. Control plane: integrated with NMS . Memory to FPGA: with ECC.

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ECR - 1000 Specifications

- Proprietary routing and switching mechanism.	- MAC Layer: 802.3ae, 802.3z.	- 10x1GigE
- Compatible with legacy/ current technology.	Security:	- Client side GigE
- Compatible interfaces.	- Inherent topological security	- Client side: Possible upgrade to ODU0
1GE Copper PHY, 1GE Fiber PHY.	- Cryptographic Authentication within 802.1x. (future release)	C-band 50 GHz and 100 GHz spacing.(with the external O1100 module)
10GE Copper PHY, 10GE Fiber PHY.	Connectivity Fault Management: provides 20 ms restoration	L-band 50 GHz and 100 GHz spacing. (with the external O1100 module)
- Online Network management system (NMS).	Power:	Laser chirp < ITU tolerance.
- NMS port.	- 230vAC/110vAC.	Support for burst mode optics (client).
- 0-50 degrees operating temperature.	- 150W max rating.	Layer 2: Data Link support:
- Redundant and hot swappable power supply.	Confirms to Standards below:	- Carrier Ethernet Support.
- Performs transport (layer 1), switching (layer 2), forwarding (layer 2.5), routing (layer 3) in a single fabric.	- EN 60825-1 Safety of Laser Products - Part 1	- IEEE802.1Qay support/ Scalable to meet RFC 5317/5921/5654/5860 MPLS-TP.
- Less foot-print of available systems.	- EMC: FCC Part 15 Class A (USA)	- IEEE802.1ag Ethernet Connectivity Fault Management (CFM) support.
- Energy Consumption of max 70 watts for 60 Gbps switching and routing fabric.	- GR-63-Core: NEBS, Physical Protection	- ITU.T. Y.1731 compliant.
- Physical layer: GigE, 10GigE, WDM, CWDM, PON	- EN 61000-3-2 Power Line Harmonics	- ELINE and ELAN support
- OTN: (Future Release) ODU0, ODU1, ODU2 and ODU-Flex using an external transponder.	- EN 61000-3-3 Voltage Fluctuations and Flicker	Layer 3: Routing Specification:
	- EN 61000-4-2 ESD	- 1 microsecond port to port routing for up to 50%load.
	- EN 61000-4-3 Radiated Immunity	- <3 microseconds for 50-75% load.
	- EN 61000-4-5 Surge	
	Layer 1 protocol support:	
	- 2x10GigE	

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- <9 microseconds for full load.
- 1000 unique entries for FEC.
- Intra-domain routing support.
- IPv4 and IPv6 support
- BGP emulation for Inter-domain communication. (optional feature - future release)

- L3 VPN support.

Physical & Environmental factors:

- Box size: 1 RU
- 300mm depth, 19" rack mountable
- Humidity: up to 80% @ condensation.

Hardware Security:

- Single FPGA based.
 - Control plane: integrated with NMS.
 - Granularity 10 Mbps to 10 Gbps in increments of 10 Mbps.
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For further information please contact:

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