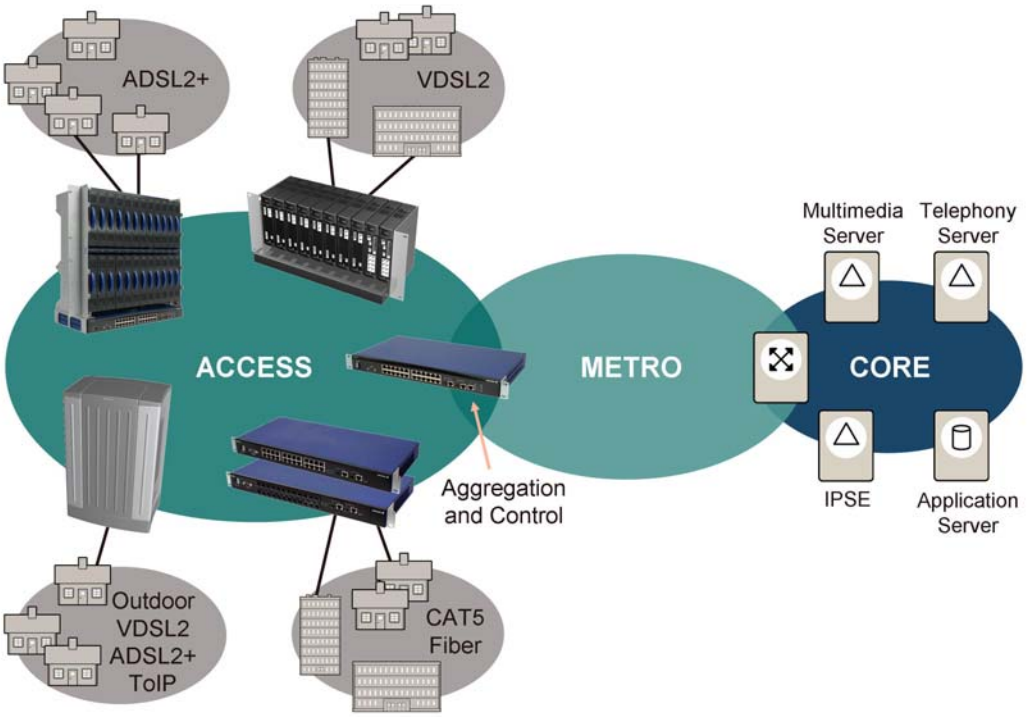
SOLUTION DESCRIPTION

EDA 1200 4.0

ERICSSON



Introduction

Broadband access is known to be the fastest growing technology in the telecommunications history.

With the EDA broadband access concept, Ericsson has for several years demonstrated technology leadership on the broadband market – First, by introducing the world's first Ethernet-based IP DSLAM, then by constantly adding new and innovative features to secure an optimal end-to-end solution.

Now Ericsson takes the next step by introducing a cost-efficient, environmentally hardened VDSL2 solution. Ideal for fiber-deep deployment close to the end-user and perfectly suited for migration on existing installations, as well as for new customers.

Since the early EDA 1200 days, Ericsson has been shaping and promoting the IP and Ethernet-based architecture. The Ethernet-based architecture (TR-101) has been standardized by DSL Forum, and is seen as the future architecture for telecom operators for years to come.

Market shares have been constantly growing with EDA 1200 and leading European customers have selected EDA 1200 as their preferred technology.

Main features

- Modular access node structure
  - Unique scalability in steps of 12 lines reduces sleeping investments to an absolute minimum
  - Flexible combination of VDSL2 and ADSL/ADSL2/ADSL2+ on remote sites
  - Multimode IP DSLAM
  - Support of all VDSL2 profiles in the same Hardware (30a not supported)

- Flexible topology support
  - Efficient management of remote sites
  - Easy deployment close to the end-user
  - Migration/upgrade path for VDSL2
  - Fiber and copper access

- Environmentally hardened VDSL2 solution
  - Extended temperature range -40°C to +75°C without any additional protection.
  - Withstand contaminant, solid objects and humidity
  - Robust IP44 compatible design
  - Ideal for remote application in outdoor cabinet
  - Reduced cost of outdoor cabinets

- Intelligent access node
  - Advanced service mapping and quality of service features
  - Offering bridged and routed service connectivity

- Cost effective solution

EDA 1200 overview

The EDA 1200 solution (previously called EDA Box) deploys an access network with switched Ethernet and a number of access drop technologies. The following sections describe the components of the EDA 1200 solution with emphasis on the cornerstone of the system - the IP DSLAM.

EDA components

The EDA solution comprises a number of components that allows telecom operators to offer a full-featured access solution:

- 12, 96, 144 and 288-line ADSL/ADSL2/ADSL2+ IP DSLAMs (EDN312, EDN144 and EDN288)
- 24-port fiber access nodes (EFN324f, EFN324df and EFN324c)
- 24-port Ethernet Controller Node (ECN330)
- 8-port and 24-port Ethernet switches with power over Ethernet (ESN108 and ECN330 in switch mode)
- 12 port Gigabit Ethernet aggregation switch (ESN410)
- 2-port Ethernet Power Nodes (EPN102)
- Fast Ethernet to E1/T1 converter (EXN104)

EDA 1200 4.0 introduces a new generation specialized for VDSL2 rollout. The new EDA 1200 is environmental hardened and presents a new look and feel as well as new broadband features:

- 12-line VDSL2 IP DSLAM (EDN612)
- 12 port Gigabit Ethernet aggregation switch (ESN212)
- 10-port Ethernet Power Node (EPN210)
- 24-port cat5 access node (EFN324c)
- 24-port fiber access node for multimode/dual fiber (EFN324df)

IP DSLAM EDN312x (left) of the existing EDA 1200 product line (the “blue box“) next to the new generation of EDA 1200, the environmental hardened IP DSLAM EDN612 (right).

IP DSLAM with high functionality

The EDA 1200 IP DSLAM is available as a complete all-in-one system with a unique scalability from 12 to 288 lines. The IP DSLAM is built on Ethernet technology (TR-101). In essence, the IP DSLAM terminates the DSL line, and aggregates the traffic into the access network using standard Ethernet uplink connections.

The limited physical dimensions of the EDA 1200 IP DSLAMs are secured without compromising functionality. On the contrary, the IP DSLAM is fully functional and designed using state-of-the-art components, enabling easy SW updates for new functionality support.

The IP DSLAM complies with all relevant DSL standards, and interoperability is constantly verified against the world’s leading CPE modem and chipset vendors. All the DSL line coding is included in one software package, making updates easy to administrate. EDA 1200 supports VDSL2 as well as asymmetric ADSL, ADSL2, and ADSL2+ including:

- VDSL2 Annex A for North America (POTS and ISDN)
- VDSL2 Annex B for Europe (POTS and ISDN)
- ADSL Annex A for POTS support
- ADSL Annex B for ISDN support
- ADSL Annex M for support of enhanced upstream
- ADSL Annex L for Reach Extended

EDA 1200 provides an option for enabling L2 power down per line, which makes it possible for the operator to save up to 25% on the power budget for a complete IP DSLAM. The most significant benefit is obtained when the lines are trained to maximum speed and the CPE is at a distance of 10,000 feet from the IP DSLAM.

EDA 1200 allows PSD shaping to optimize the power distributed from the IP DSLAM. This option is used when an operator has both central-based equipment and remote-based equipment in the network. The solution offers six fixed options: two for standard, two for central-based, and two for remote-based equipment. Radio frequency interference notching makes it possible to restrict parts of the frequency band when training the DSLAM for the requested bandwidth.

The IP DSLAM is an environmentally friendly product, designed in accordance with the ISO14001 standard and produced with regards to a minimum use of lead and halogens in the product. The IP DSLAM conforms to the rigid Bellcore GR-63-core.

Solutions with IP DSLAM EDN612

The 12-line IP DSLAM EDN612 is the cornerstone of the new EDA 1200 product line specialized for VDSL2 rollout with a fallback option for ADSL/ADSL2/ADSL2+. EDN612 is supported by the 12-port Gigabit aggregation switch ESN212; and together they form an unmatched scalability and deployment opportunity. This new generation of EDA 1200 is environmental hardened and designed for cost-effective installation close to the end-users in remote outside plants, where it demands very little protection against weather and rough environments.

12-line VDSL2 IP DSLAM EDN612

EDN612 has 12 fully flexible lines capable of running VDSL2, ADSL, ADSL2 or ADSL2+. EDN612 is available with POTS front-end (EDN612p) or ISDN front-end (EDN612i). Underlying POTS or ISDN services are available with external splitter, and EDN612 is also prepared for built-in splitter. Two electrical Gigabit uplink connections that can be used for redundancy ensure non-contention operation. EDN612 has a separate connector for -48 V powering (Power over Ethernet is not included in this product line). EDN612 is rail mounted like the existing EDA 1200 product line.

Environmental aspects

The new generation of EDA 1200 is designed for operation under extreme conditions (ETSI EN 300 019-1-3 Class 3.3 and GR-3108 CORE class 3) in order to meet the requirement for VDSL2 equipment to be pushed even closer to the end-user than ever before. Hence, EDA 1200 can be placed in non-controlled road-side cabinets and other locations with high humidity, dust and dirt, as well as the operating temperature range cover temperatures from -40°C to +75°C, thanks to an optimized cooling channel that easily transports dissipated heat out of the box. In fact, the only protection needed is shelter against rain, direct sunlight, and objects of 1 mm and greater.

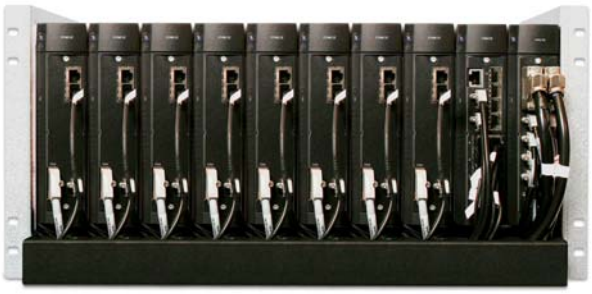
POTS and ISDN services

For the support of underlying telephony services POTS and ISDN a external splitter solution is available as well, compliant to the EDA installation method.

Subrack solutions with EDN612

Both 19” and ETSI (21”) wide subracks are available for up to 96 subscriber lines per subrack. Subracks include built-in cable management and air guides and it is possible to mix EDN612 IP DSLAMs, ESN212 switches, and external splitters. An optional Power Distribution Node EPN210 is also available, which also opens the possibility of aggregating EDN312 IP DSLAMs for a cost-efficient ADSL2+/VDSL2 upgrade of a remote site.

Below is shown a fully equipped 96-line ETSI subrack solution without splitters equipped with eight EDN612 IP DSLAMs, one ESN212 switch, and one EPN210 power distribution node.



96-line ETSI subrack with EDN612, ESN212 and EPN210

Migration from existing installed base

EDA 1200 meets the operator’s need for smooth VDSL2 rollout on remote outside plants. The new EDA 1200 designed for VDSL2 rollout is not only a stand-alone product line; it also goes nicely in line with the existing installed base of EDA 1200. The illustration below shows the existing EDA 1200 on the left next to the new generation EDA with front cabling.

Coexistence between the existing and the new EDA 1200 showing EDN312x on the left and EDN612 on the right

Solutions with IP DSLAM EDN312

The 12-line IP DSLAM EDN312x is the cornerstone of the existing EDA 1200 product line (the “blue Box”) and it provides full support for ADSL, ADSL2 and ADSL2+. The 12-line IP DSLAM EDN312x aggregates all the incoming ADSL links onto one or two 100Base-T Ethernet connections depending of the bandwidth demand.

One innovative aspect of IP DSLAM EDN312x is the power feeding over Ethernet (PoE). Another innovative feature of the EDN312x is the built-in Central Office (CO) base-band filter, available in both POTS (cost-effective POTS, ETSI POTS, and ANSI POTS) and ISDN versions. EDN312x is also available in a version with ISDN high pass filter and no low pass filter. The integrated base-band filter enables base-band telephony.

IP DSLAM EDN312x allows bonding of up to six lines in order to provide high bandwidth to end-users, even to end-users located at distances above 1.6 km. Line bonding is a technique that allows the use of several physical twisted copper pairs as if they form one single line, provided that this is also supported in the CPE.

12-line IP DSLAM EDN312x with built-in base-band filter.

The front end of IP DSLAM EDN312x is well integrated with standard building practice in the sense that it has built-in Gas Discharge Tube (GDT) and Over Voltage Protection (OVP), which means that the IP DSLAM can operate as the primary protection.

Pre-configured solutions with EDN312

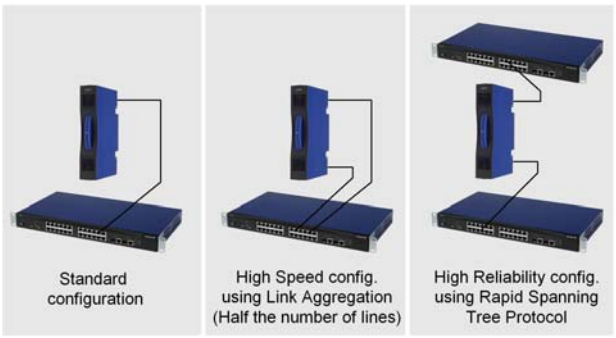
EDA 1200 is available as a pre-configured solution. Ordered, delivered, installed, and commissioned as one fully assembled unit, the system ensures easy and trouble-free installation.

The scalable IP DSLAM concept is built from a combination of the 12-line IP DSLAMs and the Ethernet Controller Nodes – with the possibility of using the 8-port switch ESN108 for aggregation in between.

The system can be configured in various ways:

- EDN144x:
  144-line IP DSLAM built from one ECN330 and 12 EDN312x IP DSLAMs (link aggregated configuration using both uplinks from the IP DSLAM)
- EDN288x:
  288-line IP DSLAM built from one ECN330 and 24 EDN312x IP DSLAMs. For redundancy, the 288-line IP DSLAM can be expanded with an additional Ethernet Controller Node (ECN330), as shown below.

288-line IP DSLAM EDN288x - one fully assembled unit.



Different IP DSLAM Configurations

Solutions for fiber and Cat5

EFN324 is the cornerstone of Ericsson's fiber access portfolio, targeting residential end-users, small offices/home offices (SOHO), and small to medium enterprises (SME).

EFN324 is a multi-functional, optical fiber access node that supports triple play services, including multicast video streaming with IGMP snooping.

EFN324 provides 24 x 100 Mbps Fast Ethernet downlink ports and two combo GbE uplink ports. EFN324 is prepared for 19” rack mounting.

EFN324 is available in three variants:

- Single mode single fiber (EFN324f)
- Multi mode dual fiber (EFN324df)
- Cat5 (EFN324c)

EFN324f with 24 optical ports

Combined with the Ethernet aggregation switch ESN410, a large scale, cost-efficient fiber node is easily built, supporting Single Mode/Single Fiber (SM/SF), Multi Mode/Dual Fiber (MM/DF) and Cat5.

Controller Nodes and Ethernet switches

The EDA solution offers a unique suite of 1st and 2nd level Ethernet aggregation switches and Controller Nodes. The Ethernet Controller Nodes are equipped with EDA Management Proxy (EMP) for local management of subtended nodes. The Ethernet switches and Controller Nodes are all managed by the Public Ethernet Manager (PEM), using the Ethernet connection for both user traffic and management traffic.

The portfolio comprises the following products:

- ECN330; 24-port electrical Ethernet Controller Node with two combo GbE uplinks and one electrical GbE uplink. Includes standard switch functionality when EMP is disabled.
- ESN212; 12 port Gigabit Ethernet switch with 8 electrical GbE ports and 4 SFP ports.
- ESN410; 12-port Gigabit Ethernet switch with 8 SFP and 4 combo ports
- ESN108; 8-port electrical Ethernet switch with optical uplink (FE/GbE)

ECN330 and ESN108 include integrated Power over Ethernet (PoE) functionality for powering the connected IP DSLAMs.

For installations, where the IP DSLAM is not connected to a switch with built-in Power over Ethernet (PoE), a separate Ethernet Power Node, (EPN210 or EPN102) can be used, however, the VDSL2 IP DSLAM (EDN612) may also be powered separately.

Ethernet Controller Node ECN330

The Ethernet Controller Node ECN330 is a combined management and traffic aggregation nodes. On the outside, the Ethernet Controller Node looks like an ordinary Ethernet switch, however, as the name indicates, it includes more functionality.

Ethernet Controller Node ECN330

The most significant feature is the integrated EDA Management Proxy (EMP) functionality. EMP enables the Ethernet Controller Node to reduce management of IP addresses to just one management IP address per Ethernet Controller Node, independent of the number of subtended IP DSLAMs.

Ethernet Controller Node ECN330 is a natural aggregation point for the EDA 1200 series of IP DSLAMs based on EDN312x, as it contains 24 100 Mbps Fast Ethernet downlink ports.

Combined with ESN410/ESN212 for traffic aggregation, ECN330 may also be used for management of VDSL2 nodes or combined ADSL/VDSL nodes in fixed or flexible topology scenario.

ECN330 is equipped with the built-in EDA Management Proxy (EMP) that is capable of managing up to 250 embedded nodes or 2500 VDSL2/ADSL2+ lines.

ECN330 can also be used as a regular Ethernet switch, as it is possible to disable the EDA Management Proxy (EMP) by command either for all ports or on a per-port basis.

The Ethernet Controller Node offers the following functionality - all in one box:

- Aggregation switch
- 24 electrical Fast Ethernet ports
- Two combo uplink ports, either as
  - Two electrical 10/100/1000 Mbps or as
  - Two 100/1000 Mbps optical SFP
- One electrical 10/100/1000 Mbps uplink (ECN330)
- Built-in Power over Ethernet
- EDA Management Proxy (EMP) application designed to aggregate management traffic from all EDA elements attached
  - The EMP allows daisy-chaining of up to 7 ECN330 switches for increased management capacity
  - Management of up to 250 embedded nodes or 2500 VDSL2/ADSL2+ lines
  - One IP address
- Downgrading to basic switch functionality by disabling EMP
- L2MPLS (Martini draft) for tunneling (ECN330)
- Layer 3 routing features (ECN330)

Aggregation Ethernet switch ESN212

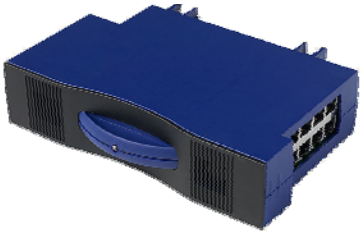
The 12-port Gigabit Ethernet aggregation switch ESN212 is part of the new generation EDA 1200 series – designed for installation in rough environments close to the end-user.

Ethernet switch ESN212 is a 1st level aggregation switch with eight electrical Gigabit Ethernet ports, four optical Gigabit SFP ports and two separate connectors for redundant -48V powering.

ESN212 is rail-mounted and hence ideal for placing in a remote cabinet aggregating up to eight IP DSLAMs (EDN612 as well as EDN312) on the electrical Gigabit ports, using one or more of the optical ports for uplink connection to the central office. ESN212 could, however, also be part of a fiber ring topology, utilizing 2 or more of the 4 optical SFP ports.

ESN212 is equipped with a DIP-switch that allows the telecom operator to assign a unique identifier to the switch for operation in a flexible topology setup with ECN330.

Aggregation Ethernet switch ESN108



Ethernet switch ESN108 is a 1st level aggregation switch with eight electrical Fast Ethernet ports and one optical uplink port. ESN108 will detect the uplink capacity from the SFP module installed and configure the uplink accordingly for 100 Mbps Fast Ethernet or 1 Gbps Ethernet.

ESN108 is especially designed for EDA 1200 series for deployment in areas with low subscriber penetration. The switch ESN108 has a built-in PoE for powering of the IP DSLAM. In connection with the IP DSLAM EDN312x, ESN108 makes it possible to build small remote sites of up to 96 end-users with 1 Gbps uplink. ESN108 can be installed directly on a LSA® PROFIL or U-shaped back mount frame.

2nd level aggregation switch ESN410

Ethernet switch ESN410 is a 2nd level aggregation switch with 12 optical SFP ports. Four of these ports are combo ports enabling RJ45 interface. ESN410 is designed for direct aggregation of Controller Nodes (ECN330) and Ethernet switch ESN108 with Gbps uplink, as well as ESN410 can be utilized to aggregate EDN612 traffic. ESN410 supports link aggregation for larger bandwidth.

Ethernet Switch ESN410

The Ethernet switch offers the following functionality:

- Aggregation switch
- Eight + four Ethernet ports
- Eight 1000Base-X optical SFP
- Four combo uplink ports, either as
  - electrical 10/100/1000Base-TX or as
  - 1000Base-X optical SFP
- 10/100/1000Base-TX ports that support auto-sensing, auto-negotiation.
- Supports Jumbo frame up to 9 KB
- Provides wire speed L2/L3 switch
- Supports up to 16,000 MAC address entries
- Flow Control supported:
  - Full duplex mode
  - Back pressure flow control half duplex mode
- Store-and-forward forwarding scheme
- Head of Line (HoL) blocking prevention
- Broadcast storm protection
- VLANs support, GVRP, IEEE802.1Q, IEEE802.1v
- Supports up to 4k VLAN
- Supports IGMP snooping
- Provides 8-level priority in switching
- Provides Spanning Tree (IEEE 802.1D)
- Fast forwarding mode supported (802.1s, 802.1w)
- Provides Link Aggregation (802.3ad with LACP)

Management

Utilizing the advanced management features of the Ethernet Controller Nodes (EMP), the EDA 1200 series constitute a largely scalable IP DSLAM covering up to 2,500 lines within a single management point. This is a truly unique feature that allows telecom operators to deploy and manage the access aggregation network in an efficient and powerful way.

Above the EMP functionality, PEM (Public Ethernet Manager) can be used as element manager, covering Fault, Configuration, Performance and Security management for the EDA 1200 solution.

Furthermore, Service on Access (SOA) can be used for telecom operators that require a complete telecom management solution covering end-to-end FCAPS (Fault, Configuration, Accounting, Performance and Security).

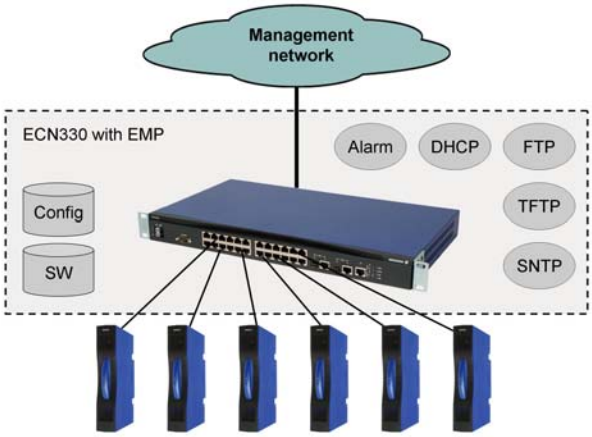
Please refer to separate documentation for a description of PEM and SOA features in relation to EDA 1200.

EDA Management Proxy (EMP)

EDA Management Proxy (EMP) is a series of functions and work processes that efficiently reduce the costs and time needed in relation to installation, operation, and maintenance of the access network.

ECN330 has built-in management functionality in terms of a mini Domain Server. This makes it possible to install, test, and provision a node without any external contact with the overall management system.

Once controlled by an overall management system, the Ethernet Controller Node and all embedded EDA equipment will appear as one node – one large logical IP DSLAM.



In this way, there is only one management interface and one static IP address. For provisioning, the EMP is managed via standard MIBs, and for system maintenance via EDA SNMP MIBs. All SW images and configurations are stored in local non-volatile memory to secure full operation, even if access to the management system is unavailable.

EMP secures a fast and safe installation process and low recovery time in case of a total power outage, returning the network into operation within a few seconds after the power has returned.

EDA Topologies

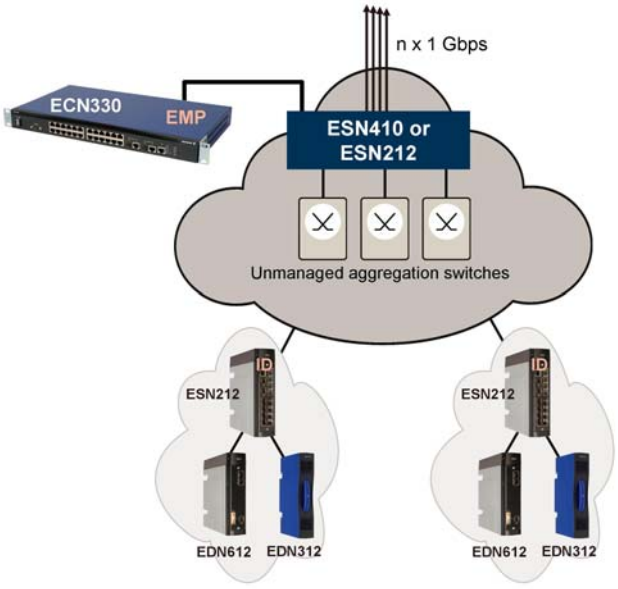
EDA 1200 support a number of topologies below the Ethernet Controller Node ECN330.

ECN330 EMP supports the “EDA legacy topologies” including ESN108-based scenarios, EXN104 and switch extension, as well as the ESN212 and EDN612 are supported for VDSL2 deployment.

In order to increase the uplink capacity for VDSL2, one or more ESN410 may be used for traffic aggregation for the VDSL2 nodes. Typically a VDSL2 node will be remote a cabinet consisting of an ESN212 and EDN612/EDN312 IP DSLAMs.

Flexible topology

Ethernet Controller Node ECN330 also supports flexible topologies together with ESN212, which allows unmanaged – or even 3rd party – switches between the EMP and the ESN212 aggregation switch.



The flexible topology support is particularly powerful for VDSL2 deployment in scenarios where telecom operators already have access aggregation switches in place, with non-Ericsson equipment.

L2CP BRAS controlled provisioning

Using the L2CP protocol makes it possible for an operator to use a management system independent of PEM. The nodes that can be accessed are the Controller Nodes ECN330.

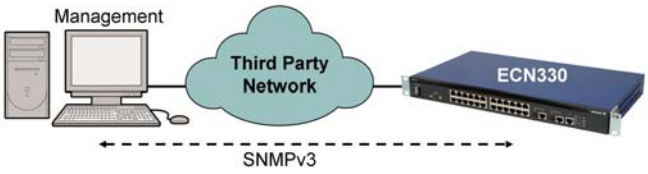
Disabling EMP on port basis

By disabling EMP on a specific port on ECN330, makes it possible to add third party equipment such as alarm boxes in the same Ethernet connection.

SNMPv2 and SNMPv3

All EDA elements support SNMPv2 for provisioning, monitoring and traps sending. For obtaining security in the network all management commands are encapsulated in a management VLAN securing unauthorized access to any element in the EDA network.

SNMPv3 is implemented in ECN330 adding an additional element of security to the VLAN security. Adding SNMPv3 to the management an even more secure connection can be established, e.g. if management is done over a third party network.



Local Craft Tool

A Local Craft Tool (LCT) is partly built-in the ECN330 Controller Node, making it possible to use a standard laptop as tool.

The LCT is used for:

- Installation of software images on ECN330
- Line Test; testing and line training on all ADSL lines
- Provisioning of end-users using scripts

Traffic mapping

End-user traffic is mapped to service VLANs. These VLANs may be end-user specific or common to multiple end-users. Through such VLANs a single or multiple application services, e.g. voice, video or data, may be accessible.

The traffic mapping to service VLAN may be based on:

- PVC or PVC bundle
- VLAN
- Line
- Ethertype

On each end-user line, EDA 1200 allows for configuration of up to eight individual PVC or VLAN based traffic mapping definitions (maximum 72 PVC based mapping definitions in total per EDN312).

Quality of Service

In order to provide the required Quality of Service (QoS) for the various triple play service classes (voice, video and data), all EDA nodes support prioritization of Ethernet frames in accordance with the IEEE 802.1Q specification.

The EDA 1200 IP DSLAMs also supports a number of advanced QoS and scheduling features for fine-tuning the network performance:

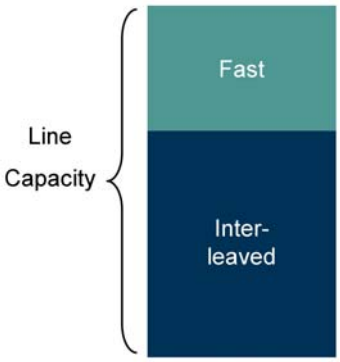
- Packet-based QoS
  - Queuing and scheduling
  - PTM principles
  - PTM QoS mapping downstream traffic
- ATM-based QoS for ADSL2+/ADSL2/ADSL
  - Separation of traffic classes into PVCs
  - Traffic processing according to priority (packet based queuing)
  - EDN312 overload protection; ensuing high priority traffic handling during high load situations

Packet based queuing and scheduling

IEEE 802.1 p-bit based traffic distribution is performed towards a structure of queues (per end-user). Scheduling from these queues can be performed as strict priority, deficit round-robin or modified deficit round-robin. Using these scheduling methods enables optimization towards high priority traffic and/or fair bandwidth division between traffic classes.

PTM for VDSL2 - Principles

With VDLS2 on the EDN612 Packet Transmission Mode (PTM) is introduced instead of ATM. In short, PTM allows direct transmission of Ethernet packets on the DSL line, by segmenting the line capacity into two latency paths – a fast path and an interleaved path. The two paths are individually configured and will typically be utilized for separation of different types of services.



In addition to a somewhat simplified operation compared to ATM, PTM will also reduce transmission overhead by up to10%.

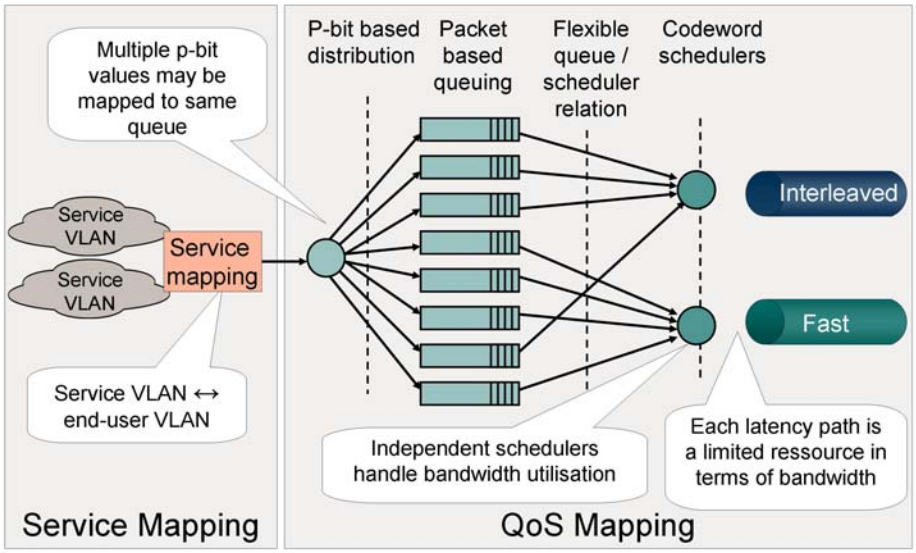
PTM QoS mapping

Upstream PTM Quality of Service mapping can be based on:

- P-bit
- DSCP
- VLAN

The service mapping function keeps the relationship between service VLANs and end-user VLANs, replacing the VLAN from the end-user with the corresponding service VLAN in the upstream direction, and vice-versa in the downstream direction.

The Queuing and scheduling function uses the VLAN and Ethernet Class-of-Service (p-bit) setting to determine the appropriate queue and latency path for each specific packet. As each latency path (like PVCs in the ATM-world) is a limited resource in terms of bandwidth, the schedulers handle bandwidth utilization.



ATM-based QoS

The ATM-based QoS takes advantage of the fine-grained segmentation into ATM cells, further minimizing latency and jitter. This ATM-based QoS can be combined with packet-based QoS.

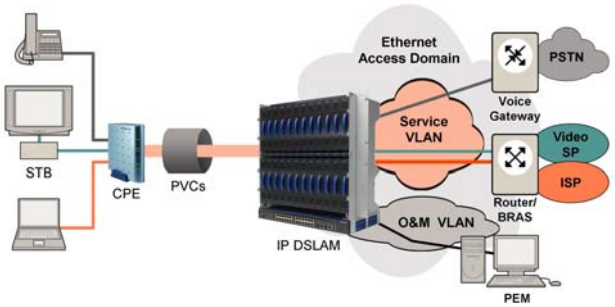
In the traditional setup, there is a fixed relation between PVCs and VLANs for traffic separation. The VLANs are differentiated by priority and the IP DSLAM is configured to map the traffic in a specific VLAN to specific PVC configured with the relevant service class.

Upstream traffic can be classified based on:

- End-user PVC
- DSCP

Downstream traffic is distributed to PVCs based on a combination of service VLANs and p-bit.

EDA 1200 thereby supports multiple services within a single service VLAN to be mapped into multiple PVCs based upon Ethernet Class-of-Service (p-bit).



QoS within single PVC (EDN312)

The IP DSLAM also supports multiple traffic classes (services) within the PVC, allowing the access provider to support multiple services from a single gateway.

Quality of Service within a single PVC is a highly flexible feature that can be supplemented with other PVCs for traffic separation, e.g. between company VPN and a private triple play access on the same DSL line.

Overload Protection (EDN312)

On the receiver side of the Ethernet and ADSL interfaces, the IP DSLAM implements mechanism to secure prioritized packet handling in situations where the traffic load exceeds the packet processing performance of the IP DSLAM. Ethernet Overload Protection (EOP) and ADSL Overload Protection (AOP) are common for all lines in the IP DSLAM, and secures that high prioritized traffic is processed (e.g. voice and video) before best-effort traffic such as Internet surf in a packet overload situation.

Multicasting

EDA supports the increasing demand for streaming and high quality broadcast video services by offering multicast for video streams both in the IP DSLAM (using IGMP Snooping) and in the aggregation layer.

With Internet Group Management Protocol (IGMP) multicast, parallel transmission of the same video stream is avoided. Snooping the streaming requests from one user and connecting them to an already active stream towards another user saves Ethernet bandwidth.

Advanced IGMP White List functionality inside the IP DSLAM allows the operator to specify content-differentiated services to be filtered in the IP DSLAM. The whitelist is end-user specific and is used to validate end-user IGMP reports (join requests). It can be updated with definitions of allowed multicast group addresses and address ranges, and with information about the VLAN, in which the multicast group is available.

IGMPv3 (EDN612)

EDA 1200 support IGMPv3 signaling without source specific routing.

Security

EDA bases security on four basic principles:

- Filtering of Ethernet frames in the IP DSLAM
- Forced Forwarding
- Virtual MAC address to prevent MAC spoofing
- Layer 2 separation of Ethernet services in virtual sub-networks or tunnels, using Virtual LAN (VLAN)

Filtering

By use of specific filtering, the IP DSLAM is able to control the traffic to and from the EDA end-user in order to restrict the types of frames/packets forwarded by the IP DSLAM. The filtering policy is based on a wide set of rules controlled by the access provider that can be updated on the fly if a security risk is discovered. The rules can also be configured individually per PVC. The filtering can be a mix of rules that cover broadcast, Source MAC/IP, Destination MAC/IP, Ethernet frame type, and IP port.

Forced Forwarding (RFC 4562)

Forced Forwarding is an EDA technique that prevents direct connections between end-users. This function separates the users on layer 2 and forces the end-user to use a router for all upstream traffic. The Layer 2 separation is achieved by an ARP proxy function in the IP DSLAM. Hence, End-user (1), who is trying to communicate with End-user (2) within the same VLAN, will issue an ARP request to get the destination MAC address. However, the ARP proxy will respond to the ARP request with the MAC address of the default gateway instead of the MAC address of End-user (2). In this way, the requesting End-user (1) will now send traffic via the default gateway, assuming that it is in fact End-user (2).

Virtual MAC address

To prevent MAC spoofing, and to provide access to multiple end-users with identical MAC addresses, the EDA solution offers the use of Virtual MAC address. Using virtual MAC for an end-user ensures that MAC addresses are unique within the EDA 1200 network, independent of the MAC address used on the end-user line. All traffic from the end-user line will have a specific MAC address, based upon the topology of the EDA 1200 network.

1:1 MAC address translation

EDA 1200 supports 1:1 MAC address translation. This feature translates each individual end-user MAC address to a unique VMAC address used within the network.

N:1 MAC address translation (EDN612)

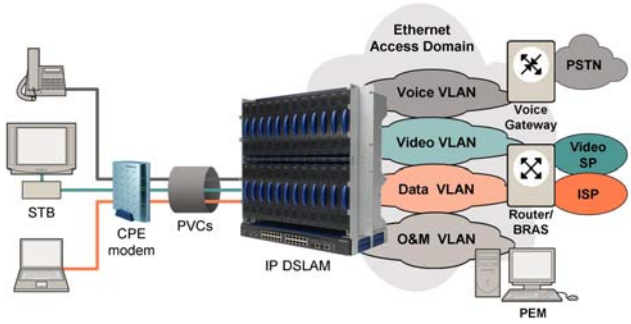
EDA 1200 supports N:1 MAC address translation. This feature translates multiple end-user MAC addresses to be represented by a single MAC address within the network. It can be used to save space in the MAC-tables of the switches in the access aggregation network.

VLANs

The Ethernet Access Domain traffic may be separated by use of different VLANs for different traffic types (VLAN per service). It is also possible to configure VLANs per node or even VLAN per end-user for e.g. business access. VLAN per end-user is commonly referred to as the 1:1 VLAN model while VLAN per service or per node is designated the N:1 VLAN model.

The following VLANs are depicted in the figure below, as an example of using VLANs per service:

- Voice VLAN for voice ToIP service
- Video VLAN for video broadcast
- Data VLAN for Internet access service
- Management VLAN used for all O&M



Access methods

Access methods are used to define rules suitable for specific end-user host configurations and behavior.

An access method provides the basic filter functions to enforce policies related to establishing and maintaining end-user sessions on a PVC or a VLAN. It is consequently a basic part of defining a traffic mapping definition. Traffic mapping definitions can be established using one of the following access methods:

- DHCP
- PPPoE
- Static IP address
- Transparent LAN/VLAN
- IPoA and PPPoA (EDN312)

Transparent LAN/VLAN services

Transparent LAN services provide VLAN transparency between home offices or connection of multiple offices. EDA provides the VLAN transparency by encapsulating en-user traffic using stacked VLAN. Up to five VLAN tags are supported, including up to two tags added by the IP DSLAM.

Business access

For business access, EDA offers ADSL, ADSL2, and ADSL2+ Annex M, a symmetrical service that enables the business solution to offer high capacity uplink and downlink traffic suited for business applications.

Provisioning

Combined with PEM, EDA 1200 provides a number of profiles and templates to create services in an easy way. By pre-defining service and line configuration profiles, end-user provisioning is easily created by choosing the desired template.

Profiles can also be incorporated within the Access Node. This feature can be used to automatically provide the configuration defined in a profile to all end-user lines (bulk pre-configuration) or to a group of lines.

In combination with PEM, EDA 1200 can make bulk configuration by use of XML files with the desired configurations. A GUI is provided to manage the execution of the XML file and the result will be presented in a log file.

Operational mode

EDA is highly versatile and can be deployed in any network configuration. The EDA system offers Ethernet connectivity to the end-user for any kind of service. Basically, the EDA system acts as an extension cord from the backbone network to the end-user, using DSL as drop technology.

The IP DSLAM creates an end-to-end virtual LAN architecture between the Ethernet access network and the CPE Ethernet, encapsulating the Ethernet frame over the ADSL connection between the IP DSLAM and the CPE. This architecture is also known as Bridged Ethernet. This applies to voice, video, and data services.

EDA supports DHCP Option 82 according to RFC 3046 on a PVC basis. For authentication by the service provider, a configurable identifier is attached to the DHCP request from the end-user.

DSL deployment and maintenance

EDA supports VDSL2 ITU 993.2, ADSL2+ ITU G.992.5, ADSL2 ITU G.992.3 and ADSL ITU G.992.1. VDSL2 opens for up to 100/50 Mbps downstream/upstream bandwidth that enables the possibility for bandwidth demanding services in the network. ADSL2+ also offers high bandwidth of up to 24 Mbps downstream.

Single Ended Line Test (SELT)

SELT is an EDA function supported by the EDN312 series of IP DSLAMs, improving the TTC of broadband access services for the operator. Using advanced frequency and time domain analysis, this tool estimates both the length and properties of the local loop and possible ADSL service that can be carried through the local loop. Results will be shown in PEM and all detailed data can be exported for further processes.

Loop Diagnostics

Loop diagnostics is an ADSL2 feature (ITU G.992.3) supported by EDN312 series of IP DSLAMs utilizing both the IP DSLAM and the Customer Premises Equipment (CPE) to measure the line quality.

Operation and Maintenance surveillance

Surveillance of end-to-end services is possible in two steps. It is always possible to monitor the service paths between the IP DSLAM and the CPE using standardized ATM AAL0 F5 cells. For services using the PPPoE, DHCP, or static IP access method it is possible to make link verification between the IP DSLAM and the service.

Furthermore, the EDN312-based system provides other useful information such as last estimated line length, attainable bit rate on the ADSL physical link, and CPE information such as chipset ID and dying gasp (CPE switched off).

Network migration

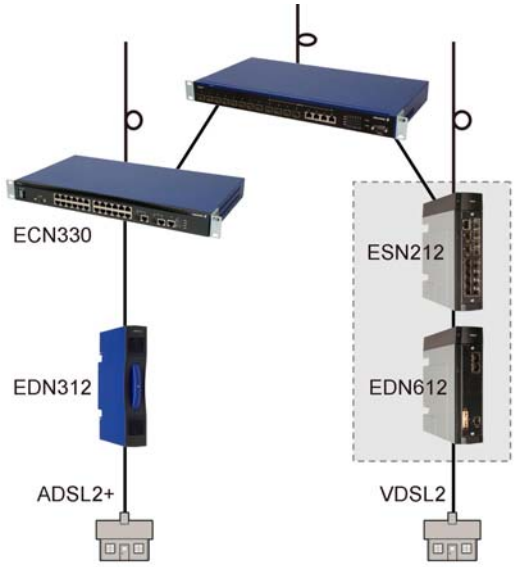
Operators can save investments by building on existing solutions – both in the access area as well as for the network infrastructure.

New technologies like VDSL2 often emerge rather slowly, and require only a relatively small penetration ratio compared to e.g. ADSL/ADSL2/ADSL2+. Very often it makes sense – financially as well as technically – to migrate already installed equipment into new and improved solutions. EDA offers a unique opportunity to upgrade already installed remote sites with VDSL2.

On the topic of network infrastructure the EDA Ethernet Aggregation and Transport products enable re-use of existing legacy networks, while preserving the key benefits of Ethernet aggregation and all-IP end-to-end solutions.

Adding VDSL2

Migration of existing equipment is an extremely important parameter for most telecom operators, in order to protect investments and secure stability for the end-users. This is, of course, also the case when introducing VDSL2.



In essence, VDSL2 can be added to an existing ECN330-based site. This is done by connecting an ESN410/ESN212 to an uplink port of the ECN330 and optionally adding additional fiber uplinks to the new switch for traffic aggregation. The IP DSLAMs below the ESN410/ESN212 will be handled by the EMP in the ECN330 and hence “piggy-bag” on the existing installation.

It is, of course, also possible to use flexible topologies when adding VDSL2 to an already existing site with ECN330. With EDA 1200 there is always an efficient upgrade path at hand when introducing new technologies and solutions.

Transport

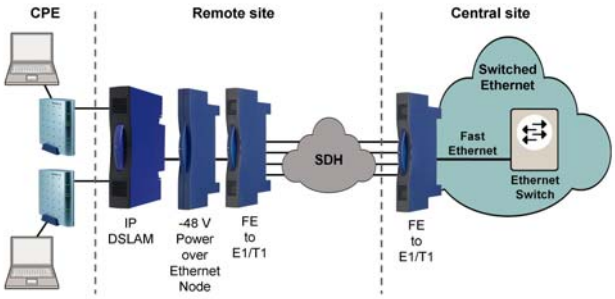
Ethernet over SDH

Operators with an Ethernet-based core network might still have an existing Sonet/SDH-based infrastructure, mostly to small and rural sites where the penetration of bandwidth demanding services is not yet high. These operators might wish to re-use spare capacity in the Sonet/SDH infrastructure to carry Ethernet frames. The Fast Ethernet to E1/T1 converter EXN104 makes this possible. Other products covering the range of different Sonet/SDH E3 and STM-1 interfaces are also available from Ericsson.

Fast Ethernet to E1/T1 converter

EDA provides a cost-effective solution for transporting Ethernet traffic via vacant E1/T1 lines, which is useful on small sites. The stand-alone design of the IP DSLAM removes the need for a back plane and subrack and sets new standards for scalability and costs. This is made possible by using the small, managed Fast Ethernet to 4xE1/T1 converter (EXN104). A small Power over Ethernet Node (EPN102) is available for power feeding of both the IP DSLAM (EDN312x) and the EXN104. All products provide a small scale ADSL solution for remote sites down to 12 lines.

The EXN104 is typically used in a back-to-back configuration as shown in the illustration below. But aggregation of a number of EXN104 E1/T1s into a single STM-1 is also possible using the implemented Cisco Framing variant.



EXN104 supports up to four 120 Ω E1/T1 ports each with a speed of 2 Mbps. EXN104 conforms to ITU-T G.703 on the LSA® interface and is fully manageable via SNMP from PEM.

Mechanical enclosures

The EDA solution offers a number of mechanical enclosures for easy and trouble-free installation. The enclosures are available in European and US variants. The US variants include Telco connectors and NEBS approved protection for the EDN312x.

The following enclosures are available:

- Subrack for up to 36 ADSL subscribers (EU)
- Subrack for up to 96 ADSL subscribers (EU/US)
- Subrack for up to 96 VDSL2/ADSL subscribers (EU)
- Subrack for up to 144 ADSL subscribers (EU/US)
- Subrack for up to 288 ADSL subscribers (EU)
- Cabinet for up to 1152 ADSL subscribers (EU)

36-line subrack

The 36-line subrack is a 2 Height Units (HU), ETSI/19” wide universal usage subrack for EDA units EDN312x, ESN108, EPN102, and EXN104. Utilizing a large number of different configurations, the micro subrack is intended for installation in places of limited available space.

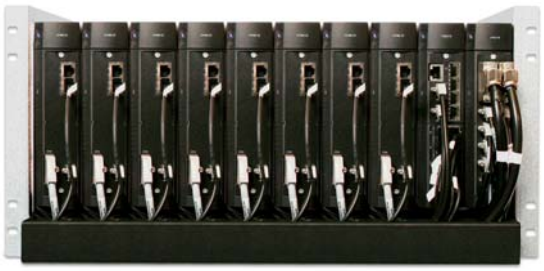
36-line subrack

96-line subrack

The 96-line subrack is available in three variants:

- Subrack for VDSL2 based on EDN612, optionally combined with ADSL/ADSL2/ADSL2+ based on EDN312
- EU subrack for ADSL/ADSL2/ADSL2+ based on EDN312
- US/NEBS subrack for ADSL/ADSL2/ADSL2+ based on EDN31296-line ETSI subrack with EDN612, ESN212 and EPN210

The 96-line VDSL2 subrack is available in both 19” and 21”/ETSI variants, with integrated cable holder and air-guide. The subrack can be mounted into new or existing cabinets with a free space of 250mm. The cabinet houses one ESN212 switch and up to 96 EDN612 VDSL2-lines. By using the EPN210 power node, the subrack may even be equipped with EDN312 ADSL/ADSL2/ADSL2+.



96-line subrack for VDSL2

The 96-line ADSL/ADSL2/ADSL2+ subracks based on EDN312 for EU/US houses one 8-port switch (ESN108) and up to eight 12-line IP DSLAMs (EDN312x). The subrack conforms to ETSI /19” cabinet standards and can be mounted into existing cabinets with a free space of minimum 6 HU. The unique scalability means that this subrack covers a range from a minimum of 12 to a maximum of 96 subscribers, ensuring a cost-efficient solution as starting point for small-sized sites.

96-line subrack for ADSL with backplane

144-line subrack

The 144-line subrack with backplane is available in EU and US variants, housing up to 12 IP DSLAMs (EDN312x). The height is 6.5 HU covering up to 144 lines. The subrack includes the 24-port Ethernet Controller Node ECN330.

144-line subrack with backplane

288-line subrack

The 288-line subrack is equipped with 24 12-line IP DSLAMs (EDN312x); the height is 11 HU covering up to 288 lines. The subrack includes the 24-port Ethernet Controller Node ECN330.

288-line subrack

1152-line cabinet solution

This solution consists of an Ericsson BYB501 cabinet. Housing up to four 288-line EDN288x IP DSLAMs, this cabinet solution offers up to 1152 ADSL lines. Cabinet dimensions are HxWxD: 2200 x 600 x 400 mm or 46 HU.

Cabinet with 1152 lines

If each EDN288x is expanded with one extra Ethernet Controller Node ECN330 for redundancy or doublet uplink capacity, the cabinet can house three END288x IP DSLAMs, which adds up to 864 lines.

Outdoor enclosure

The EDA 1200 solution is perfectly suited for outdoor installation, due to its environmentally hardened nature and unique scalability.

Environmental characteristics

EDA 1200 based on EDN612/ESN212/EPN210 are designed to meet ETSI EN 300 019-1-3 class 3.3 and as GR3108 CORE class 3 with the extended temperature range from -40 to +75 Celsius. Also the design is resistant to humidity, dust and dirt enabling the product line to be installed in an IP44 environment. These boxes can easily be placed in non-controlled road-side cabinets and other locations with high humidity, dust and dirt. This significantly reduces the requirements on the outdoor enclosure needed for EDA 1200 systems based on EDN612, and facilitates cost-efficient rollout of VDSL2 equipment close to the end-user.

The outdoor enclosure solution comes in two different variants:

- Environmental controlled cabinets, which are suited house 3rd party equipment that are not temperature hardened, alongside with EDA 1200 equipment.
- Non-environmental controlled cabinets, which are specifically designed to house temperature hardened EDA 1200 equipment.

Environmental controlled cabinet

The environmental controlled cabinet offers a complete solution for remote outdoor installation of EDA 1200:

- EDN312-based: Up to 96 ADSL/ADSL2/ADSL2+ lines with embedded filters and 100/1000 1000BaseFX optical uplink
- EDN612-based: Up to 48 lines VDSL2/ADSL2+ with external filters and up to four 100/1000BaseFX optical uplinks

The cabinet is designed for wall or pole mount with the advantage of additional installation cost savings. Its heat exchange unit and heat control allows third party non-hardened equipment to be installed in the cabinet. Subscriber and Local Exchange Connectivity MDF is part of the solution. Optional Remote Powering solution is available when including AC powered battery backup.

Outdoor cabinet with up to 96 subscribers

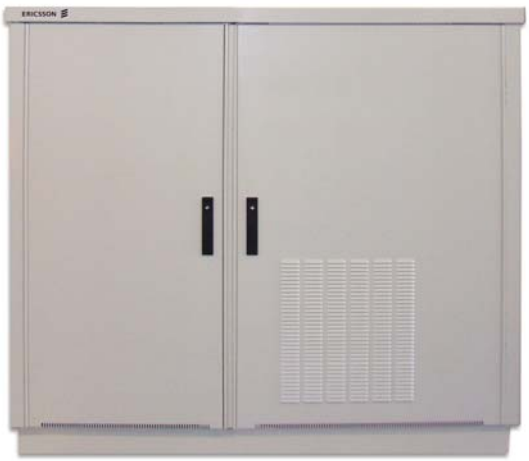
EDA RSC96m

The environmental controlled cabinet offers a complete solution for remote outdoor installation of EDA 1200:

- 12 to 96 line VDSL2/ADSL2+ based on EDN612, ESN212 and optional EPN210

The EDA RSC96m solution can use direct air cooling in the cabinet instead of the more traditional heat exchanger unit. This means no humming noise and cost savings of up to 35% compared to the more traditional cabinet solutions.

The cabinet is designed for curb side mount with the advantage of additional installation cost savings.



Outdoor cabinet with up to 96 subscribers

EDA RSC288m

The environmental controlled cabinet offers a complete solution for remote outdoor installation of EDA 1200:

- 12 to 288 line VDSL2/ADSL2+ based on EDN612, ESN212 and optional EPN210

The EDA RSC96m solution can use direct air cooling in the cabinet instead of the more traditional heat exchanger unit. This means no humming noise and cost savings of up to 35% compared to the more traditional cabinet solutions.

The cabinet is designed for curb side mount with the advantage of additional installation cost savings.

Outdoor cabinet with up to 288 subscribers

Non-environmental controlled cabinet EDA RSC24c

The EDA RSC24c solution is specifically designed to house temperature hardened EDA 1200 equipment. It uses direct air cooling in the cabinet instead of more traditional heat exchanger unit. This means lower environmental load regarding noise emission and power consumption.

The cabinet can be used in the following configurations:

- 12 to 24 line VDSL2/ADSL2+ based on EDN612, ESN212 and optional EPN210

Outdoor cabinet with up to 24 subscriber

EDA RSC96c

The EDA RSC96c is specifically designed to house temperature hardened EDA 1200 equipment. It uses direct air cooling in the cabinet instead of more traditional heat exchanger unit. This means lower environmental load regarding noise emission and power consumption.

The cabinet can be used in the following configurations:

- 12 to 96 line VDSL2/ADSL2+ based on EDN612, ESN212 and optional EPN210

Outdoor cabinet with up to 96 subscribers

Technical specifications

SUPPORTED STANDARDS

xDSL standards:

- ITU-T G.992.1 Annex A (ADSL over POTS)
- ITU-T G.992.1 Annex B (ADSL over ISDN)
- ITU-T G.992.3 Annex A (ADSL2 over POTS)
- ITU-T G.992.3 Annex B (ADSL2 over ISDN)
- ITU-T G.992.3 Annex L (ADSL2 Reach Extended)
- ITU-T G.992.3 Annex M (ADSL2 Symmetrical ADSL)
- ITU-T G.992.5 Annex A (ADSL2+ over POTS)
- ITU-T G.992.5 Annex B (ADSL2+ over ISDN)
- ITU-T G.992.5 Annex M (ADSL2+ Enhanced upstream)
- ITU-T G993.2 Annex A (VDSL2 American Region)
- ITU-T G993.2 Annex B (VDSL2 European Region)
- ITU-T G.994.1 (Handshake Procedures)
- ITU-T G.997.1 (Operation and Management)
- ETSI TS 101 388* (European requirements)
- ETSI ETR 328 (ADSL requirements and performance)
- TR-048 (Test specifications (DSL Forum))
- ANSI T1.413-1998
- ETSI TS 101-952-1-1 v.1.1.1 (2002-05) POTS
- ETSI TS 101-952-1-3 v.1.1.1 (2002-05) ISDN
- ILMI (DSL Forum TR-037 auto configuration)

ATM Attributes:

- ATM Cell over ADSL AAL5
- RFC2516 – PPP over Ethernet (PPPoE)
- RFC2364 – PPP over ATM (PPPoA)
- ATM Service Classes: UBR, CBR, VBR-nrt and VBR-rt
- RFC2684 - Multi-protocol Encapsulation over ATM Adaptation Layer 5
- RFC2684 – Routed Encapsulation

General switch functionality:

- IEEE 802.1D - Bridged Ethernet
- IEEE 802.1Q - VLAN and Frame prioritization (802.1p)
- IEEE 802.2 Ethernet V2
- IEEE 802.3 – 10/100 Mbps Ethernet RJ45 connector
- RFC1531 - Dynamic Host Configuration Protocol (DHCP)

MANAGEMENT SYSTEM:

- Ericsson's Public Ethernet Manager (PEM) is based on Hewlett Packard OpenView Network Node Manager for Intel® platform.
- Northbound Interfaces:
  - CORBA
  - SNMPv1/SNMPv2C

Supported standards:

- FTP, TFTP
- RFC2233 – The Interfaces Group MIB using SMIv2
- RFC2662 – definitions of Managed Objects for the ADSL Lines and ADSL MIBs extension
- RFC1213 – Management Information Base for Network Management of TCP/IP-based Internets: MIB-II
- ATIS T1.PP.427.01-2004 and ITU-T G.998.1 ATM-Based Multi-Pair Bonding

12-LINE IP DSLAM EDN612

- Mechanically compatible with KRONE PROFIL
- External connector: RJ-45 1000BaseT Ethernet
- Power consumption (12 lines):
- Idle: 33 watt
- Trained lines:
  - 39 watt @ 14.5 dBm
  - 45 watt @ 20.5 dBm
- MTBF EDN612i/p: 31.6 years
- External dimensions: HxWxD: 186 x 47 x 186 mm

12-LINE IP DSLAM EDN312X

- Mechanically compatible with KRONE PROFIL
- External connector: RJ45 100BaseT Ethernet
- Built-in filters for versions:
  - EDN312xp =Cost-effective POTS
  - EDN312xe = ETSI POTS
  - EDN312xa = ANSI POTS
  - EDN312xi = ISDN
  - EDN312x = ISDN high pass filter, no low pass filter
- Power consumption (12 lines): Cable length 1.3 m: Idle/Typical/Max = 5.0/17.1/19.8 W Cable length 100m: Idle/Typical/Max = 5.1/18.4/23.0 W
- MTBF EDN312xp/xi/xe/xa/x: 46/46/43/44/46 years, 25°C ambient
- External dimensions: (HxWxD) 185 x 35 x 157 mm
- Weight EDN312xp/xi/xe/xa/x: 589/636/661/710/532 g

288-LINE IP DSLAM EDN288X

- Fully assembled unit housed in 11 HU chassis
- Dual 10/100/1000 electrical or 100/1000 Mbps optical SFP uplinks and one 10/100/1000 Mbps electrical uplink
- Power consumption (288 lines; one ECN330): Cable length 1.3 m: Idle/Typical/Max = 170/472/545 W Cable length 100m: Idle/Typical/Max = 173/505/626 W
- Supports 19" and ETSI cabinets
- Weight: 25 kg
- External dimensions: (HxWxD) 490 x 480 x 300 mm

IP DSLAM EDN288X WITH EXTRA ECN330

- Additional ECN330 configured as switch on top of EDN288x
- Fully assembled unit housed in 12 HU chassis
- 2 x 10/100/1000 electrical or 2 x 100/1000 Mbps optical SFP uplinks and one additional electrical 10/100/1000 Mbps uplink for each ECN330-switch
- Power consumption (288 lines; two ECN330):
  Cable length 1.3 m:
  Idle/Typical/Max = 215/517/590 W
  Cable length 100 m:
  Idle/Typical/Max = 218/550/671 W
- Supports 19" and ETSI cabinets
- Weight: 30 kg
- External dimensions:
  (HxWxD) 535 x 480 x 300 mm

CONTROLLER NODE ECN330

- 24 x 10/100 Mbps ports electrical
- PoE for up to 24 IP DSLAMs or EXN104s
- Open slot for Fast or Gigabit SFP fiber ports
- Input voltage: –48 V DC
- Power consumption (24 ports):
  Cable length 1.3 m:
  Idle/Typical/Max: 50/62/70 W
  Cable length 100m:
  Idle/Typical/Max: 50/64/74 W
- MTBF: Minimum 15 years at 25°C ambient
- External dimensions:
  (HxWxD) 43 x 440 x 250 mm

ETHERNET SWITCH ESN212

- Installed directly on KRONE PROFIL
- 4 x 100/1000 Mbps optical uplink ports (SFP Fiber ports)
- 8 x 100/1000 Mbps electrical ports (RJ-45)
- Dual -48VDC power input
- IEEE 802.1w (RSTP) and IEEE 802.1s (MSTP)
- IEEE 802.1ad provider bridges
- IEEE 802.3ad Link aggregation
- 4k VLAN
- 16 k MAC
- 255 multicast groups
- Power consumption: Max 34 W
- MTBF: 32.7 years
- External dimensions:
  (HxWxD) 186 x 47 x 186 mm

ETHERNET SWITCH ESN108

- Installed directly on a KRONE LSA® and PROFIL
- 8 x 10/100 Mbps ports electrical
- One 100 Mbps / 1 Gbps uplink port (SFP Fiber Port)
- PoE for up to 8 IP DSLAMs or EXN104s
- Power consumption (8 ports):
  Idle, no IP DSLAMs attached: 18 W
  Max incl. PoE to 8xEDN312=217 W
- Input voltage: –48 V DC
- MTBF: 56 years at 25°C ambient
- External dimensions:
  (HxWxD) 186 x 42 x 133 mm

AGGREGATION SWITCH ESN410

- 12 x 1 Gbps SFP optical ports or
- 8 x 1 Gbps SFP and 4 x 10/100/1000 Mbps Base-TX
- Input voltage: –48 V DC
- Partly managed by the Public Ethernet Manager (PEM)
- Provides 8-level priority in switching
- Provides wire speed L2/L3 switch
- Supports up to 16K MAC address
- Supports up to 4k VLANs
- Provides IPv4 routing at wire speed
- Power consumption: Max. 34 W
- MTBF: 25 years at 25°C ambient
- External dimensions:
  (HxWxD) 44 x 440 x 230 mm

POWER DISTRIBUTION EPN210

- Installed directly on KRONE PROFIL
- Dual power inlet for -48VDC (-40.5 VDC to 60 VDC)
- 10 Power output terminals for powering EDN612/ESN212 or PoE for EDN312
- Output power: 500 W
- External dimensions:
  (HxWxD) 186 x 47 x 186 mm

POWER DISTRIBUTION EPN102

- PoE for one EXN104 and one IP DSLAM
- Mechanically compatible with KRONE LSA® 10 pair connector system
- Input voltage: two terminals for –48 V (-40.5 V DC to 60 V DC)
- Output power: 21 W per port (0.7 A)
- External port connectors: 2 x RJ45
- External dimensions:
  (HxWxD) 185 x 21 x 110 mm
- Supports one LAN data string (signal path internally crossed) and feeds both ports with PoE with an intelligent on/off function to protect non-PoE equipment.

FAST ETHERNET TO E1/T1 CONVERTER EXN104

- Mechanically compatible with KRONE LSA® 10 pair connector system
- 4 x G.703/G.704 120 Ω balanced E1/T1 interfaces at the LSA® connector
- Fast Ethernet 100 Mbps ports electrical
- Power consumption Nominal 5.4 W
- External dimensions:
  (HxWxD) 185 x 21 x 109 mm

CUSTOMER PREMISES EQUIPMENT

The EDA system fully supports open interfaces and complies with all relevant ADSL standards. This ensures that EDA is interoperable with any standardized ADSL CPE modem, Ericsson and non-Ericsson

ENVIRONMENTAL

- EN 300 386:2001 Class B
- Electro Magnetic Compatibility (EMC) requirements
- ETS 300 019-2-1 class 1.2
- Storage conditions
- ETS 300 019-2-2 class 2.3 Transport conditions
- ETS 300 019 –2-3 class 3.2 Partly Temperature controlled locations
- ETS 300 019 –2-3 class 3.3 Not Temperature controlled locations
- ETS 300 753 class 3.2
- Acoustical Environment
- ITU-T K.20, ITU-T K.21
- Resistibility of telecommunication equipment installed in a telecommunications center or premises to over-voltages and over-currents-currents

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