

iPN201

The iPN201 is an intelligent Carrier Ethernet/MPLS demarcation device. It is designed with 2 GbE network interfaces, 4 combo GbE client interfaces and two expansion slots for clock signal input/output and PWE3 interfaces. It is highlighted with IEEE 1588-2008 and Synchronous Ethernet functions to provide PPS+ToD signals over Carrier Ethernet for 3G/4G/LTE Mobile Backhaul (MBH) application. Up to 8 E1/T1 interfaces are provided on PWE3 interface expansion card to connect legacy 2G BTS where E1/T1s are still dominant to carry voice traffic. 2Mbps/2MHz/10Mbps interfaces are provided to derive external clock synchronization from legacy E1 circuit or GPS.



iPN201

Highlights

Synchronization over Carrier Ethernet	ITU-T G.8262 Synchronous Ethernet for frequency synchronization; IEEE 1588-2008 (OC, TC and BC modes) for clock and frequency synchronization
Carrier Ethernet Resiliency and Protection	ITU-T G.8031 Ethernet Linear Protection Switching; ITU-T G.8032 Ethernet Ring Protection Switching; IEEE 802.3ad Link Aggregation; Proprietary Ethernet Ring protection technology
Standard Carrier Ethernet Management	IEEE 802.3ah Link OAM; IEEE 802.1ag End-to-end Connectivity OAM; ITU-T Y.1731 End-to-end Service and Performance Monitoring
Legacy TDM Service Compatibility	Support up to 8 E1/T1 interfaces for connecting legacy TDM services over Carrier Ethernet
External Clock Input/Output Interfaces	2Mbps/2MHz configurable frequency input interface; 2Mbps/2MHz configurable frequency output interface; 10MHz configurable frequency input/output interface; 1PPS+ToD configurable clock input/output interfaces
Static MPLS	Support static MPLS as a Provider Edge device
All Modular Design	All modular design for mother board, two expansion slots, dual redundant power supply units, and intelligent fan with monitoring.
Temperature Hardened	Temperature hardened version is available for deployment in harsh environment.
Fault Propagation	User configurable line to client fault propagation; Client side fault propagation.

Specification

Line Interface	2 x 100/1000M SFP connector
Client Interface	4 x 1000M combo (100/1000M SFP + 10/100/1000M RJ45); 2 x expansion slots
Clock Expansion Card	1 x 2Mbit/2MHz input, mini-BNC connector; 1 x 2Mbit/2MHz output, mini-BNC connector; 1 x 10MHz input/output, mini-BNC connector; 1 x 1PPS input/output; mini-BNC connector; 1 x TOD input/output, RJ45 connector
CES Expansion Card	8 x E1/T1 interfaces, RJ45 connector
Dimension	440(W)*44(H)*266(D) mm
Weight	< 5kg
Power Supply	2 x 100-240V AC or 2 x -48V DC hot-swappable
Power consumption	≤ 25W (at max load)
Working Environment	Normal version: 0-50 °C Hardened version: -25-50 °C Humidity: 10%-100% non condensing
Storage Environment	-25-60 °C
Lightening Proof	6kV

Highlights

MODULAR DESIGN

iPN201 is designed with 2 x 1000BaseX SFP-based network interfaces and 4 GbE combo client interfaces on the mother board. Two expansion slots are provided above the mother board for optional PWE3 service and clock input/output cards. Redundant PSUs and fan is also designed as hot-swappable modules for flexible installation and easy inventory management for reducing CapEx and OpEx purpose.

All modules are designed in only 1U 19-inch chassis with temperature hardened version option for industrial application environment.

QOS & SLA

iPN201 provides Service Level Agreement measurement tools for measuring and monitoring parameters such as Frame Loss, Frame Delay and Frame Delay Variation. In-service RFC2544 (2nd release) test is provided for the carrier to monitor the Carrier Ethernet service in real time.

On iPN201, the traffic policing, including rate limiting, mirroring, redirecting, VLAN rewriting and etc, is applied on flows or flow groups which are classified by L1 - L4 attributes such as port (UNI), source/destination MAC, VLAN, IP and etc. There are maximal 4K flows supported to describe the users service variety.

Service flows are processed and mapped into up to 8 output queues per port (UNI). Different scheduling modes such as SP, WRR, DRR, SP+WRR, and SP+DRR can be applied. WRED mechanism is also implemented to enable the customer configuring the queue's threshold according to the customer's requirements.

SYNCHRONIZATION OVER CARRIER ETHERNET

Both Synchronous Ethernet and IEEE 1588-2008 protocols are implemented on iPN201 in order to support newly emerged applications in which accurate synchronization is required over the Carrier Ethernet. On the clock expansion card, 2Mbps/2MHz/10MHz input/output interfaces are incorporated to support seamless upgrade of mobile backhaul from SDH to PSN while eliminating the risk of legacy 2G service disruption due to lacking of Ethernet uplinks on BTS. 1PPS+ToD input/output interface is also provided for applications where clock signal is necessary but the end equipment does not support SyncE or 1588-2008 protocols.

All iPN201 Ethernet interfaces support SSM-QL and ESMC to negotiate and pass over its clock quality level with neighbour equipment. iPN201 can be deployed as Ordinary Clock (OC, master and slave), Boundary Clock, and E-toE Transparent Clock mode.

STATIC MPLS

Static MPLS will be implemented in the second phase for deployment at the edge of MPLS networks.

CARRIER ETHERNET OAM

IEEE 802.3-2005 (802.3ah) Link OAM is supported to manage and diagnostic a single-hop link between iPN201 and its directly connected peer inside the network. Acting as either in active or passive mode, all standard functionalities such as Discovery, Link Fault, Remote Loopback, and MIB parameter retrieval etc are implemented. E-LMI is also supported for the carrier to simplify the service configuration work.

IEEE 802.1ag Connectivity OAM helps the carrier to manage and diagnostic an end-to-end connection between iPN201 and the other 1ag-competent peer on the other side of the network. A set of useful tools such as Continuity Check, Non-intrusive Loopback, and LinkTrace are provided for quick troubleshooting and fast response.

ITU-T Y.1731 Connectivity Fault Management defines a set of measuring parameters such as Frame Loss, Frame Delay and Frame Delay Variation to describe the quality of an end-to-end Carrier Ethernet link. By continuously and proactively monitoring these figures, the carrier is able to guarantee the SLA contract with the customer.

RESILIENCY & REDUNDANCY

ITU-T G.8031 Ethernet Line Protection Switching enables the iPN201 to work in a protected line topology. While G.8032 Ethernet Ring Protection Switching enables it to work in a protected ring topology. In either situation, iPN201 is capable of switch over between a primary and a secondary line in less than 50ms time, which is critical for real-time services such as voice and video. iPN201 can be deployed as an inter-ring device that connects multiple rings in a complicated network environment.

Raisecom proprietary Ethernet Ring protocol is also available as an alternative to G.8032. Within this protocol, max 128 devices are supported in one ring and up to 8 rings are supported on a single iPN201. Less than 50ms switchover time is guaranteed in a less than 25-devices ring.

The two network interfaces support Link Aggregation for simple 1+1 redundancy and dual homing applications.

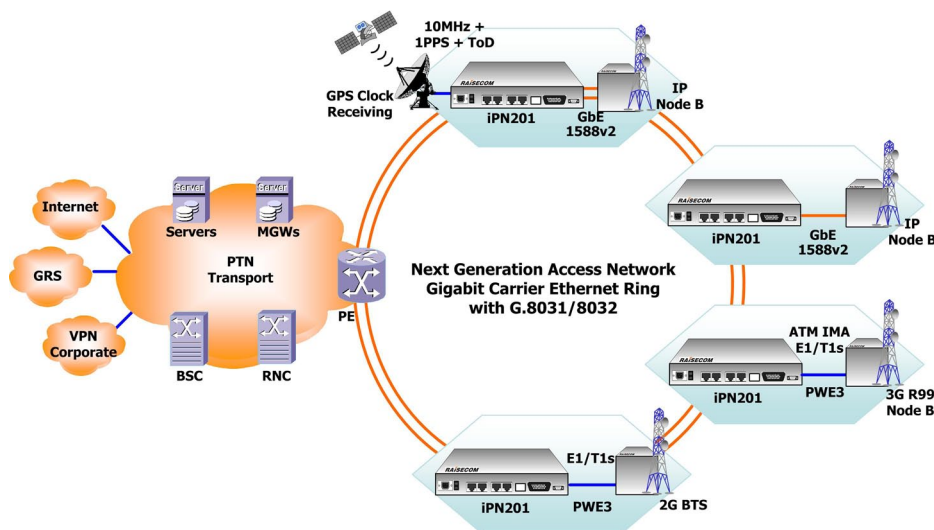
PSEUDOWIRE (2nd release)

A pseudowire expansion card with up to 8 E1/T1 interfaces is provided to ensure seamless upgrade from legacy SDH to PSN backhaul. SAToP and CESoPSN payload encapsulations are included for unframed and framed E1/T1 circuits respectively.

Main Features

Frame Forwarding	Store and forward, 16Mbit switching buffer; MTU up to 13K Bytes, by default 1526 Bytes; Support Jumbo Frame
MAC Address Table	MAC address learning/add/remove/searching; Up to 32K MAC addresses per port
VLAN	IEEE 802.1Q, 4K active VLAN; Q-in-Q, 1:1 VLAN translation, 2:1 VLAN translation (2nd release)
Bandwidth Profile	CIR/CBS, EIR/EBS configuration per port/EVC/COS
Link Aggregation	Up to 3 Link Aggregation group, with up to 4 ports in each group; Load balancing based on source/dest IP address and source/dest MAC address
Spanning Tree	IEEE 802.1d STP, 802.1w RSTP, and 802.1s MSTP; Support 64 instances
Carrier Ethernet Protection	ITU-T G.8031 Ethernet Line Protection Switching; ITU-T G.8032 Ethernet Ring Protection Switching; Port based Ethernet local loop detection
DHCP	DHCP server(2nd release)/client/relay; DHCP snooping; DHCP Option 61 & 82
Carrier Ethernet OAM	IEEE 802.3ah OAM Discovery, Link Fault, Remote Loopback, and MIB Retrieval; OAM active and passive mode support; Support Dying Gasp; E-LMI (MEF 16)
Carrier Ethernet CFM	IEEE 802.1ag and ITU-T Y.1731; Connectivity Check, Non-intrusive Loopback, Link-Trace, Performance Monitor; ETH-AIS/RDI/LCK/TEST(2nd release)/APS/LM/DM
ACL	Support ACL based on MAC, IP, and MAP based on L2-L4 bytes; Support user defined ACL; ACL combination based on VLAN/CoS/MAC/EtherType/IP/L4 protocol etc
QoS	Support port/CoS/DSCP mapping; Priority trust based on port/CoS(default)/DSCP; Support SP, WRR, DRR, SP+WRR, and SP+DRR scheduling; Up to 8 queues per port; Flow-based statistics/mirroring/rate-limiting/redirecting/VLAN-rewriting Rewriting of 802.1p CoS/DSCP/IP Precedence based on flow; Support Weighted Random Early Detection, weight 0-15
Fault Propagation	From line to client interface fault propagation (user configurable); Client interface fault propagation
Synchronization over Carrier Ethernet	Support IEEE 1588-2008 and Synchronous Ethernet; IEEE 1588-2008 one-step mode, OC, BC and TC mode support; Provide 1PPS+ToD interface when deployed as OC and BC; Clock synchronization performance according to ITU-T G.8261/8262
MPLS	Support static MPLS
IPv6	Support IPv6 address and management; IPv6 DHCP snooping/server/client/relay; DHCP Option 18 & 37
PWE3 (2nd release)	Up to 64 SAToP/CESoPSN/AAL1 PWs; Support PSN type UDP/IP, MPLS, and MEF; Configurable Jitter Buffer; Support up to 8 E1/T1 service ports to access legacy voice services

Typical Application



Compliance

Standards & Protocols

MEF 9 &14
 IEEE802.3
 IEEE802.3u
 IEEE802.1p
 IEEE802.1Q
 IEEE802.1D
 IEEE802.1x
 IEEE802.3ah
 IEEE802.1ag
 ITU-T Y.1731
 ITU-T G.8031
 ITU-T G.8032

CE marking
 UL compliance
 EMC Class B
 RoHS compliance

Ordering Information

iPN201-AC/D Universal Ethernet Fiber network terminal device, 2*GE SFP Line ports + 4*Combo Client ports, 2 Expansion slots, double AC power supply

iPN201-DC/D Universal Ethernet Fiber network terminal device, 2*GE SFP Line ports + 4*Combo Client ports, 2 Expansion slots, double DC power supply

iPN201-HD-AC/D Universal Ethernet Fiber network terminal device(Harden version), 2*GE SFP Line ports + 4*Combo Client ports, 2 Expansion slots, double AC power supply

iPN201-HD-DC/D Universal Ethernet Fiber network terminal device, 2*GE SFP Line ports + 4*Combo Client ports, 2 Expansion slots, double DC power supply

iPN201-PWE3-8E1T1 TDMoIP Expansion Module, 8E1(120Ω balanced, RJ45)/T1(100Ω balanced, RJ45) downlinks

iPN201-SyncE-PTP Clock Expansion Module, the interface for synchronize clock, 2MB(RJ45)/10MHz(BNC)/PPS(BNC)+TOD(RJ45)

iPN201-PWE3-8E1T1(HD) TDMoIP Expansion Module (Harden version), 8 E1 (120Ω balanced, RJ45)/T1(100Ω balanced, RJ45) downlinks