IAP Metro Solution

Challenges

Internet access providers (IAPs) provide broadband, voice, video, and leased line services for residential and commercial users. With the rapid development of the Internet, the traditional IAP bearer network faces the following challenges:
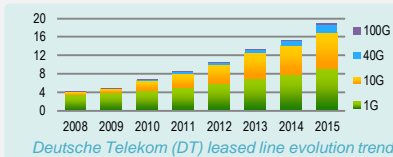
1 How to cope with sharp bandwidth increases?

With the flourishing of new technologies such as 4K video, live video, virtual reality (VR), and Internet of Things (IoT), network traffic, especially video traffic, is increasing exponentially, creating a high bar for network bandwidth.

Bandwidth required by videos of different resolutions

SP	Video quality	Bandwidth
Netflix	1280 x 720	5 Mbit/s
YouTube	1920 x 1080	10 Mbit/s
Hulu	1280 x 720	2.5 Mbit/s
Vudu	1920 x 1080	9 Mbit/s
BBC iPlayer	1280 x 720	4 Mbit/s

With cloudification of enterprises, bandwidth of leased lines is growing rapidly, the demand for GE/10GE leased lines is increasing, and ultra-broadband has emerged.

Deutsche Telekom (DT) leased line evolution trend

2 How to satisfy increasingly strict users' SLA requirements and prevent user deregistration?

Broadband users focus on the experience of game and 4K services, and have high requirements for network latency, jitter, and stability.

Network requirements of 4K videos

	Bandwidth	Packet loss rate	Delay	Frame buffer
SD	> 10 Mbit/s	rate < 10^{-5}	< 50 ms	> 10M
4K	> 60 Mbit/s	$< 5 \times 10^{-7}$	< 35 ms	> 30M
	6x	20x	1.4x	3x
	High bandwidth	Low packet loss rate	Low delay	Fast unicast

From Huawei iLab

In addition, with the development of enterprise services, fiber resources are becoming more scarce. The coarse-grained leasing form of physical bandwidth or bare fibers does not comply with the IAP's interests. Ethernet-based or IP-based leased lines have become the general trend. How can you build enterprise leased lines that meet strict SLA requirements for the IP network? This has become a key issue.
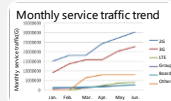
3 How to meet requirements for efficient management and O&M?

With the continuous expansion of the network scale, the scale of devices and policy-based routes keeps increasing, and manual O&M is becoming more difficult. As a result, the requirement for simplified O&M is more urgent.

Automated configuration management

Visualized O&M

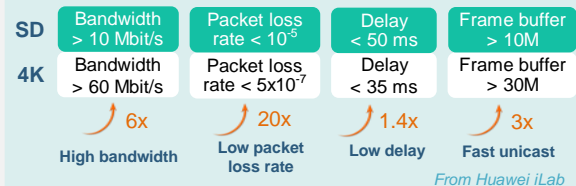Service flow-based performance monitoring

Rapid fault demarcation and diagnosis

4 How to deal with IPv4 address exhaustion?

Emerging industries, such as IoT, Safe City, and AI, require a substantial number of IP addresses.


However,

- The Internet Assigned Numbers Authority (IANA) announced in 2011 that public IPv4 addresses had been exhausted.
- Continuous large IPv4 address segments are insufficient and difficult to apply for, and IPv4 addresses are expensive.
- Use of IPv6 addresses is becoming inevitable. The Chinese and US governments have issued their IPv6 deployment plans.
- At present, the IPv6 industry chain is not mature and is incompatible with IPv4. The IPv4-to-IPv6 evolution must be performed gradually.

Solution

To meet IAP customer requirements, Huawei launches the IAP Metro E2E MPLS solution, which helps build a flat, high-bandwidth, high-reliability, low-cost, and future-oriented IAP metro network.
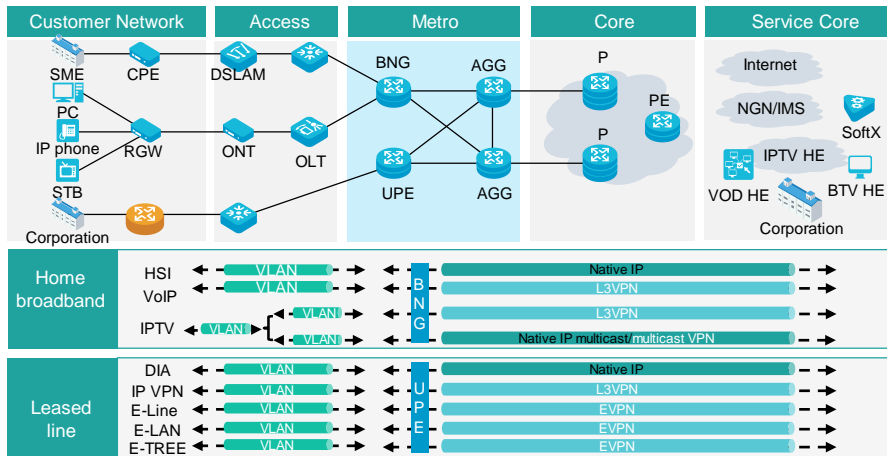
- Home broadband services (such as HSI, VoIP, and IPTV) and leased line services are all carried on an IP/MPLS Ethernet MAN.
- The service router (SR) and broadband network gateway (BNG) are integrated into one node (called a mini BNG) at the MAN edge. The multicast replication point is deployed on the mini BNG.
- Broadband services are accessed in PPPoE or IPoE mode, and the services are terminated on the BNG. On the upstream network connected to the BNG, L3VPN is used to carry VoIP or VOD services, whereas native IP multicast or multicast VPN is used to carry BTV traffic.
- Leased line services, including dedicated internet access (DIA) and interconnection between branches and the headquarters, are transparently transmitted through the MPLS VPN, and different enterprise services are isolated from each other.
- To support IPv6 services, CGN boards can be deployed on the BNG to translate IPv4 addresses to IPv6 addresses.

Benefits

High bandwidth and good service experience
- Uses GE/10GE/100GE interfaces to provide high bandwidth for customer services.
- Supports 5-level HQoS scheduling to ensure the SLA of each service.

Simplified deployment, O&M, and management
- Services need to be configured only on edge nodes. If a BNG goes faulty, only users connected to the BNG are affected. EVPN is applied and supports automated configuration.
- U2000 functions as a unified NMS, simplifying O&M. With the help of Y.1731 and Two-Way Active Measurement Protocol (TWAMP), SLA visualization is implemented.
- RFC 2544 is supported. No meter is required to test the provisioning of leased line services.

High scalability and future-oriented evolution
- Capacity expansion or new services do not involve re-planning of VLAN and VPN at other sites.
- Supports multiple IPv6 bearer solutions.
- Supports SDN to build a future-oriented network.

Reducing network construction costs
- The integration of SRs and BNGs saves device and optical fiber resources.
- Multicast replication points are deployed downstream to save MAN bandwidth resources.
- A BNG is only 300 mm deep and shares a cabinet with access and aggregation devices.

Key Technologies

EVPN

Ethernet VPN (EVPN) is a VPN technology based on the IP/MPLS and Ethernet technologies.
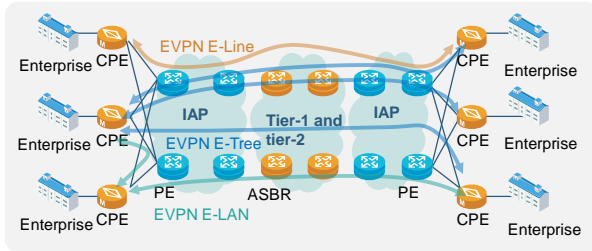

EVPN has the following advantages:
- **Flexible networking**: Uses BGP on the control plane to advertise and learn MAC addresses; supports multi-path load balancing, flexible filtering policies, and inter-domain solutions.
- **Reduced resource consumption**: With the BGP route reflector (RR) function, PEs do not need to be fully meshed.
- **High reliability**: Supports flexible deployment of redundancy groups to group devices in multiple equipment rooms (especially suitable for the disaster recovery solution).
- **Automated deployment**: Uses BGP Auto-Discovery (AD) to automatically discover other member information and implement automated configuration.

Chip-based BFD Detection

Chip-based BFD is used to monitor any type of channel between devices. Supports a minimum packet sending interval of 3.3 ms and fault detection period of 10 ms. Triggers fast protection switching and facilitates automated fault rectification, providing carrier-class reliability.
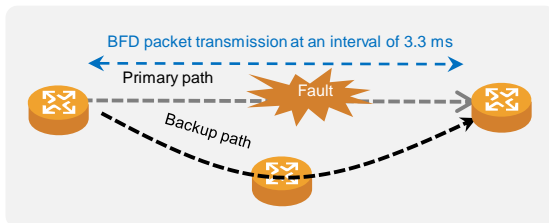
BFD packets are processed by the NP of a line card so that CPU performance is not affected. The size of BFD packets does not exceed 100 bytes, just a small amount of network bandwidth.

Full-service bearer and refined operation management

- Provides various service access capabilities and flexible authentication and accounting policies.
- Supports IPv4/IPv6 dual stack and IPv4/IPv6 separate accounting, and provides diverse IPv6 smooth transition solutions.
- Provides standard and open RADIUS interfaces to meet personalized requirements.

Dual-Device Hot Backup

Two BNGs work in active/standby or load balancing mode. TCP can be used to back up user information in real time only if network routes are reachable.

If the master BNG or a link fails, services are rapidly switched to the backup BNG. Traffic is not interrupted. There is no need for re-dialup, re-connection, or re-authentication. This minimizes the impact of single points of failure and improves user experience.
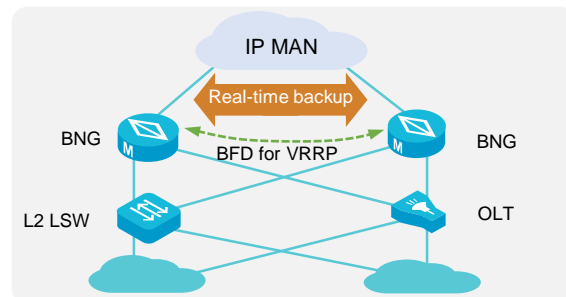
Recommended Products

Metro aggregation/core layer — NE40E Series Service Routers

| NE40E-X3 | NE40E-X3A | NE40E-X8 | NE40E-X8A | NE40E-X16 | NE40E-X16A |

Mini BNG — NE20E Series Service Aggregation Routers

| NE20E-S2F | NE20E-S4 | NE20E-S8 | NE20E-S8A | NE20E-S16 | NE20E-S16A |

Product Highlights

Huawei NE routers feature powerful performance, advanced architecture, and continuous innovation, increasing the input-to-output ratio for customers.

Huawei has extensive experience in MAN and can be your long-term trusted strategic partner.

Market share

NO.1
globally

Since 2010, the BNG sale has ranked No.1 in the global market share.

Global service

230+
Application networks

Featured with easy O&M, high reliability, and attack mitigation.
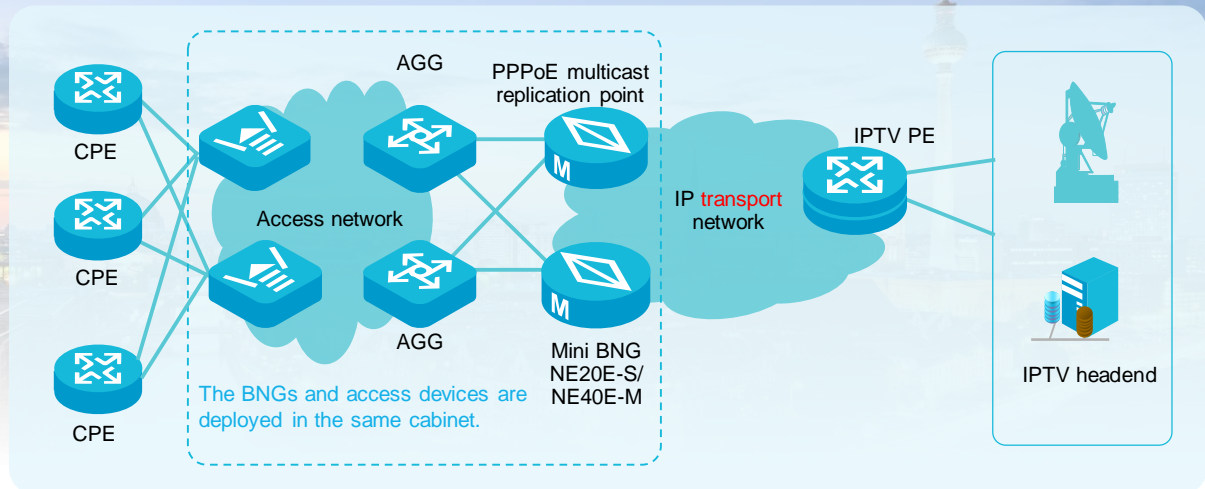
Peripheral interconnection

6 types of
peripheral systems

Applied to the portal, AAA, policy, NMS, DHCP, and log servers.

Experience accumulation

260+ types of
interconnected terminals

Requirements on BNGs vary according to different terminals.

Germany's Versatel Transport Network

versatel
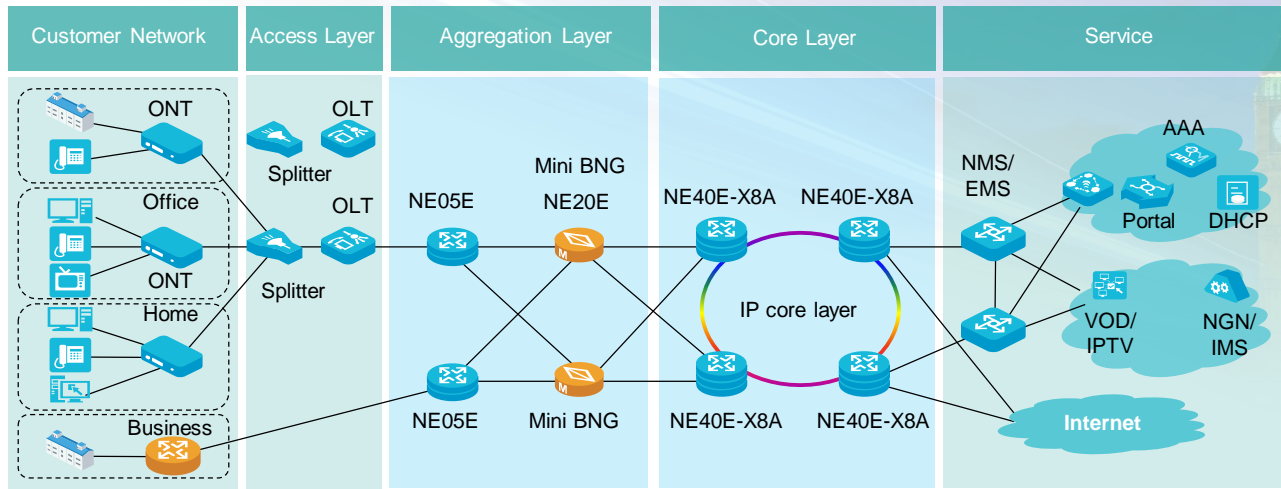Leading ISP in Germany

Requirements

▪The Versatel live network has covered a large number of enterprise users throughout Germany. In the future, millions of DSL subscribers will be added. The MAN is expected to have powerful performance and functions.

▪The IPTV multicast service will be provided for subscribers. It is expected that the MAN bandwidth will support a large number of multicast services.

▪A 300 mm-deep access cabinet was being rented from Deutsche Telekom, and the rental fees are paid based on device height and power consumption. The customer wanted to save costs.

▪Edge devices on the transport network needed to dynamically identify users and support dynamic QinQ actions, such as SWAP, Offset, and POP.

Solution

▪The mini BNG solution enables a BNG to be deployed downstream of the MAN edge.

▪The BRAS and SR are integrated into one node to carry both enterprise and individual services.

▪A 300 mm-deep NE20E-S/NE40E-M functions as a BNG, which shares a cabinet with an access device.
▪The multicast replication point is deployed on the BNG.

Benefits

▪The integration of the SR and BNG saves device and optical fiber resources and reduces network investment costs.

▪The downstream deployment of the multicast replication point effectively saves MAN bandwidth and reduces bandwidth investment costs.

▪Equipment with small size and low power consumption is deployed in the same cabinet as the access equipment, saving equipment room leasing costs.

▪The NE series provides a sound QinQ/EVC solution, which meets the customer's requirement for flexible VLAN planning.

FibreNest Network by Persimmon in UK

HORSEBRIDGE NETWORKS

One of the three largest builders in the UK

Customer Network	Access Layer	Aggregation Layer	Core Layer	Service

Requirements

▪Persimmon has abundant optical fiber resources and provides broadband and VoIP services for residential users.

▪The newly deployed FibreNest network is mainly used for broadband and voice services for residential users. IPTV and leased line services will be available in the future.

▪The customer wants to construct a simple and O&M-friendly network at low costs, implement quick service provisioning, and provide good user experience.

Solution

▪A simple and flat network is constructed, which is divided into the core layer, BRAS aggregation service layer, and fiber to the home (FTTH) user access layer, reducing E2E network delay.

▪The FTTH solution is used at the service access layer, and multiple OLTs are aggregated to an NE05E, reducing network construction costs.

▪An L3-to-edge network is deployed with distributed mini BNG solution, reducing network complexity and ramping down network maintenance costs.

▪U2000, a unified O&M and management system, is provided to implement E2E management of devices network wide.

Benefits

▪The customer enjoys the clear network layers, simple service deployment, easy maintenance, and reduced OPEX.

▪Distributed BNGs are deployed to seamlessly provide multicast VPN services, reducing the network CAPEX.