



Education Industry Solution

"Oriented to customer needs" and "the solo prerequisite for survival is to satisfy customer needs" are two mottos Huawei-3Com always bear in mind. As an operation planner and provider of network infrastructure in the education industry and with strong experience in the development and manufacturing of network devices, Huawei-3Com has focused enormous effort on resolving challenges and satisfying needs in education networks, offering high-reliability, high-security, manageable and value-added education information networks.

Characteristics of Campus Network Solution

To address these problems and needs in campus network construction, Huawei-3Com provides the right solution.

The campus network solution comprises two layers: Infrastructure layer and management & control layer. The infrastructure layer covers series of products of the core layer, convergence layer and access layer, depending on customer needs and the actual investment scale; the management & control layer offers not only the centralized NMS (Network Management System), but also CAMS (Comprehensive Access Management System) with stackable service logics. The CAMS system achieves service and user management and differentiates campus networks into two types: Simple access and service/user management.

Multiple exits: To cater to needs for multiple exits of campus networks, the solution provides multiple exits, such as CERNET and Internet, and can dynamically choose the right one according to the user domain name. Users can choose different egresses for Internet access. The solution can achieve accounting based on destination addresses: Free access to the campus network itself and CERNET, but charging based on a given tariff for Internet access.

User management: The solution supports Web, PPPoE and 802.1x authentication approaches and is characterized by dynamic service selection and interactive authentication. Users must be authenticated before being accessed. The combination of authenticated access and service selection facilitates adding new services. The authentication can also control user access bandwidth, link number and username number.

Diverse services: In terms of value-added services, the solution provides electronic library, online test, tele-education, distance learning, broadband prepaid card, portal service, customer self-service, Internet access and other similar services.

1. Portal service: Users are first accessed to the portal website for authentication and then can choose self-service type. Students and teachers are offered with flexible Web-based bandwidth options, accounting policy and balance inquiry and other services.

2. Card service: It is also known as campus 201 + prepaid card service. Its characteristics include:

- 1) Multiple broadband charging card types and abundant functions
- 2) Flexible accounting and varied discount types
- 3) Multiple authentication modes and ease of use
- 4) Balance alarming and credit limit
- 5) Web-based self management

Campus cards fall into three types: Postpaid cards, rechargeable prepaid cards and non-rechargeable prepaid cards. With personalized services attached, multiple practical broadband cards can be derived from these types:

- 1) Student card: telephone/dialup all-in-one card (requiring support from carriers). It supports post payment, rechargeable prepayment and non-rechargeable prepayment modes.
- 2) Teacher card: one card can have multiple card numbers and passwords. It can be used without restriction in work hours, but only those users with high preference can use it after work. Different cards have different bandwidth and payment policies.

3. Controlled multicasting: Multicast technology is required for multimedia teaching over the campus network, especially network live broadcast of courses. However, the standard multicast model currently prevailing in the industry cannot effectively control the multicast sources and multicast users, that is, it cannot prevent illegal users and illegal multicast sources. This is obviously harmful for security and management of tele-education. Aiming to change the current situation, Huawei-3Com presets authentication with device and service hybrid management system over multicast sources and multicast users.

4. Videoconferencing service: Interactive tele-education and multi-party conference both require videoconferencing service. Huawei-3Com provides a complete point-to-point videoconferencing service platform, including central

management platform and user videoconferencing terminals. All of them can work perfectly in harmony with the infrastructure.

High reliability: Dynamic or static binding of IP address, VLAN ID and MAC address can guarantee user information security. When combined with the user ACL, it can implement user-based management and protect students from accessing harmful websites. You can configure network segments which are inaccessible to some users, protect critical servers, configure access allowance or access denial between user groups. You can use the device to collect traffic, record complete user security log or Internet access log for later review and check over student access behaviors by the department concerned.

Guard against illegal proxy servers: By using monitoring software or setting access link number and access frequency, the solution can prevent users from using illegal proxy servers and protect the school from losing its due revenues.

Simple management: The campus network contains enormous information sites which are very dense in physical distribution, so lots of network devices, especially corridor switches for accessing end users are deployed. Huawei-3Com NM system supports management over network-wide devices and offers topology management, GUIs, real time audio and visible alarming and the appropriate operating system. Using HGMP (Huawei Group Management Protocol), the NM system can achieve dynamic detection, dynamic topology creation and auto-configuration for enormous corridor switches. This can improve efficiency and relieve the work of network administrative staff.

Multiple accounting policies: It provides three accounting policies: time-based accounting, traffic-based accounting and bandwidth-based accounting. Prepaid services and various discount policies are also available. Considering the special case of the school, respective accounting for different ISPs (Internet Service Providers) is also supported.

Overall service control layer: Besides complete interconnection solution, it also provides uniform NM platform, service management platform and videoconferencing platform. With this solution, you can start campus services immediately after hardware and software installation.

Powerful WLAN solution: It provides wireless connection for the places where wiring is difficult, for example, between two teaching buildings. It can achieve network coverage over a wide open space, such as on the playground and in the auditorium, and provides wireless information interface in teaching areas such as classrooms and the library. It offers complete WLAN access solution including AP, wireless NIC, antenna system, power amplifier (PA) system, wireless gateway and configuration software package.

Multiple access modes: Since the school may not choose Ethernet access mode but consider using the telephone line, electromagnetic wave and even cable TV wires as bearer media, Huawei-3Com also provides such optional

access modes as ADSL, VDSL, WLAN, cabled broadband frequency, in addition to the Ethernet access mode.

Characteristics of School-to-School and Education Backbone Network Solutions

The school-to-school network also needs user management and service provisioning and shares some features with the campus network. However, the school-to-school network and education backbone network involve WAN construction, for example, construction of education MAN and education backbone network, so such networks can be divided into a two-level architecture: Campus LAN and WAN interconnection. The campus LAN has a similar architecture to the campus network. For WAN interconnection, you can use gateway devices, such as routers and layer 3 switches to form a star network, or use RPP technology to create a ring network, or use transmission devices or WDM (Wavelength Division Multiplexing) devices to generate a ring network. Huawei-3Com can offer you with solution and required products to accomplish any of these approaches.

Education MAN RPR

High security, high performance and high reliability: It uses high-throughput wire speed forwarding core switches and layer 3 switches, provides redundancy for all key components, including main control boards, switch fabric cards, clocks and power supply units. The boards and cards are hot-swappable. The system also supports hot-patching and hot-upgrading of software smoothly without interrupting normal services. It supports VRRP (Virtual Router Redundant Protocol), multilink bundling and parallel route and offers high security. It supports RPR (resilient packet ring) and can implement fast convergence of ring networks. It presents the idea of point-to-point security network based on time, space and network and can use common firewall and network devices to construct secure education networks.

Powerful capacity: The DHCP relay and built-in server can achieve dynamic allocation and management of IP addresses. It uses large-capacity NAT and implements L4 load-balancing, L5/7 load-balancing and Web cache redirection with the built-in Web switch.

Perfect networking capacity and compatibility: It contains varied types of routers and Ethernet switches covering from the core layer, convergence layer to the access layer, and provides carrier-class, simple NM or even NM-free equipment, and can match different customer needs. The network devices provide abundant interconnecting interfaces and can be used in complicated environments. It offers wired and wireless integrated solution, supports LAN and WLAN access modes and can implement construction of portable computer classroom, wireless conference room and radio library. It is a stout supporter of international and national standards with powerful interworking and interconnection capabilities.

Advanced technologies: The core devices use the industry-leading fifth-generation router technology. The core of the integrated network processor uses micro-processing engine to achieve high-efficiency forwarding of loaded services. The dedicated network CPU can load new technologies and new functions.

Cost-effectiveness: The intelligent layer 3 switch tailored for the campus network adopts carrier-class advanced routing technology (packet-by-packet forwarding and route maximum matching) and very flexible system resource configuration. It can achieve subtle user management and is indeed cost-effective.

Multiple access modes: It provides flexible 10 Mbps, 100 Mbps and 1000 Mbps desktop access, as well as WLAN seamless access.

MPLS VPN feature: It supports MPLS VPN technology and can implement the integration of data, video and IP voice over school-to-school networks. It supports both layer 3 and layer 2 MPLS VPN, offers industry-leading HOPE technology, and achieves more intelligent hierarchy for MPLS VPN networks. It enables lower-capacity access devices to be used in network construction and is especially suitable for the deployment of school-to-school MPLS VPN service.

Powerful QoS: It implements traffic classification, traffic policing (CAR), congestion avoidance, queue scheduling and outbound traffic shaping. It provides a new optional congestion avoidance approach SA-RED, which can solve traffic jitter more smoothly than the conventional WRED. The powerful queuing and outbound traffic shaping can satisfy better various flow features. It provides perfect Diffserv/QoS support.

Education-specific Products and Technologies

In view of the specific needs for management, services and operation of education networks, Huawei-3Com has launched the high-reliability, high-security, manageable and value-added education information network. With "Management First and Application Oriented" as research and development guideline, it has presented education-specific products and technologies.

1. Advanced MPLS VPN technology:

As one of the few vendors which can provide network-wide MPLS technology, Huawei is engaged in providing MPLS VPN-based network integration technology over education WAN and even can provide bandwidth operation over MPLS. Based on its understanding and application experience with MPLS, it has presented first in China the data communication standard HOPE, which has been accepted by the ITU, as well as the MPLS VPN management software, to make MPLS service provisioning and management easier. These all contributes to Huawei-3Com's industry-leading position in MPLS.

2. Constant service transmission with RPR technology:

A university campus which contains branch areas and an education MAN may require MAN interconnection, and transmission technologies are often used in this case for purpose of high security of transmission links, quick recovery from faults and saving fiber resources. Due to its economy and advantages, RPR technology has excelled other transmission technologies and become the best choice in education networks. With powerful research and development capacity, Huawei-3Com provides complete RPR solutions and has serviced many users in the education industry.

3. Network scalability with XRN technology:

Considering that an education network may go through several stages in its development, Huawei-3Com presents industry-unique XRN (eXpandable Resilient Networking) technology. Users can eventually achieve their desired network performance by gradually adding switches which support XRN feature to expand the performance of the network core.

4. The fifth-generation router technology:

One of the main characteristics of education networks is that applications guide demands. Applications change continuously, and demands for devices also advance. In such a dynamic network, the service supporting capacity of network devices is very critical. Huawei-3Com presents the fifth-generation router technology to guarantee fast customization and support if there are special requirements for network forwarding in subsequent new services. This can protect users' existing investment on network devices.

5. Controlled multicasting:

Broadcast teaching over the network and network live broadcast definitely shall involve in the education network. But conventional multicast technologies cannot authenticate multicast sources and multicast users, that is, you cannot operate and manage broadcast teaching and network live broadcast. Huawei offers controlled multicasting technology to implement carrier-class and management-level multicasting service through interaction between network devices and the CAMS system.

6. CAMS system:

The further development of education networks requires controllable management and support for services, so Huawei-3Com provides the CAMS system based on international standard PARLAY 2.0. The CAMS system serves as the core of service management, supports networking with such network devices as routers, switches, VoIP gateways and access servers and implements authentication, authorization and accounting and rights management for end users. It also complete management and billing for such

value-added services which are applicable to education networks as tele-education, 201 + broadband prepaid card, portal service and controlled multicasting. The CAMS system adopts high ability (HA) design and is in dual-system backup structure, with 99.99% availability. You can choose and add service management modules depending on your needs, so it can protect your infrastructural investment. The CAMS system provides a reliable, flexible and powerful management & control layer.

7. All-inclusive WLAN products:

Huawei-3Com provides the most powerful and complete wireless NICs, wireless access points, wireless bridges, authentication control points (ACs), wireless server (AS) and other product series. It also offers optional PAs, antenna system and configuration software package to present a custom wireless solution in any environment.

8. Intelligent network devices:

Huawei-3Com provides a series of professional Broadband Access Server (BAS) and network switches and routers with built-in BAS, to achieve advanced user management and support for services and to match the network requirements for devices.

9. Mature tele-education system:

Distance learning is surely a significant result of education network development. Huawei-3Com provides a series of Viewpoint videoconferencing systems of cabinet type, chassis type and desktop type. When using large-scale application instances and perfect performance and combined with CAMS system, it surely can provide an individualized solution for distance learning.

Listening to customer needs and focusing on technology development is the prerequisite to provide high-quality solutions. To offer better technical support for education networks, we also present such industry-leading technologies and philosophy as the fifth router technology, controlled multicasting, hierarchical MPLS VPN technology and 3-latitude network wide security. In addition, we also emphasize on training for clients in the education industry: Besides our certified training system, we also have network colleges and network laboratories targeting to improve network knowledge for trainees. In short, posing good communication, establishing partnership and offering individualized solution with education industry clients is our ultimate goal.