Core routers’ architecture

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HUAWEI TECHNOLOGIES CO., LTD.
Huawei in numbers

Revenue (USD in billions)

- Ranked 352 in the Fortune Global 500
- 120,000 employees worldwide
- 44% of employees working in R&D
- Serving 45 of the world’s top 50 telecom operators
- Enterprise business is the strategic direction of Huawei in the coming years

2006: $8.5 B, Total
2007: $12.8 B
2008: $18.3 B
2009: $21.8 B
2010: $28 B
2011 (Target): $30.1 B

CAGR: 29%

HUAWEI TECHNOLOGIES CO., LTD.
Patent applications by country of origin

Source: World Intellectual Property Organization Indicators 2010
### Most Innovative Companies – 2010

<table>
<thead>
<tr>
<th>Rank</th>
<th>Company</th>
<th>Last Year</th>
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<tbody>
<tr>
<td>1</td>
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<td>New !</td>
</tr>
<tr>
<td>6</td>
<td>First Solar</td>
<td>18</td>
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<td>7</td>
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<tr>
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<td>Novartis</td>
<td>New !</td>
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<td>10</td>
<td>HP</td>
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Huawei - One-Stop Shop for IP Solutions

Security

WAN: IP + Optical

Data Center

IP + IT Unified Management

Carrier Network

Branch

Campus

Internet

iCache

OTN/ WDM/ ASON

Server Farm

Storage

3G/Wimax

xDLS/ Eth/ PON

Cluster S9300

Mobile Broadband

Fixed Broadband

NGN/IMS

Voice over IP

PC

Telepresence

Video Conference

WiFi

Campus Network

VolP

PC

S9300/ S5700

S3700/ S2700

Cluster S9300

HUAWEI TECHNOLOGIES CO., LTD.
Complete IP products portfolio

Router
- Access Router: AR 200, AR 1200, AR 2200, AR 3200
- Edge Router: NE 20E, NE40E-X1/X3/X8/X16, NE5000E
- Core Router: NE5000E

LAN & WLAN
- Core Switch: S9300
- 10GE DC Switch: S6700
- Aggregation and acces: S7700, S5700, S3700

FE Access
- S2700

SMB
- S1700

WLAN AP
- WA603
- WA633
- WA653

WLAN AC
- WS6603
- AC card in S9300
Complete IP products portfolio

Security service

Capability

- Botnet signature knowledge base
- Protocol knowledge base (DPI)
- Virus signature knowledge base
- Spam knowledge base
- URL signature knowledge base
- Intrusion signature knowledge base

Service

- Emergency Response
- On-line upgrade
- Credibility assessment
- Security Mgmt
- Security Mgmt service
- Security consulting

Deep Packet Inspection (DPI)

- SIG9810
- SIG9820

Anti-DDoS Solution

- Eudemon1000E (-X)
- Eudemon 8000E DDoS

Network and content security

Enterprise Gateway

- EGW2100/2200/3200

Firewall / UTM

- Eudemon 200E-X
- Eudemon 1000E-X
- Eudemon 8000E-X

SSL VPN

- SVN 3000

160K-1500KPPS

0.1~10G

0.1~10G

1-2G

10G-100G

Security Software

Endpoint Security Management

- TSM
- DSM

Security Management System

- eLog
- VSM

0.1~10G

10G-160G

2G-20G

10G-100G

0.1~10G

10G-100G

10G-100G

huawei technologies co., ltd.
Complete IP products portfolio

Transmission
- WDM
  - OSN1800
  - OSN6800
  - OSN8800
- MSTP
  - Metro1000/100
  - OSN1500/2500/3500/3500II/7500/9560
- Microwave
  - RTN 910
  - RTN950
  - RTN980

Access & Mobile
- WiMax
- GPON OLT
  - MA5600T
- GPON ONU
  - MA561x/2x/3x
- GSM-R
  - DBS 3900
Network Management

Unified Management, Visualized O&M:
- Unified Manage IP & Transport &Access Devices
- Visualized Service Management
- Service Based Authorization Management
- Multi-Protocols Northbound Interface
- Need install Client

IT Easy Care:
- IT & IP Unified management
- Other Vendors devices Unified management (CISCO, H3C)
- Devices Configuration in bulk
- Customized Report
- Open Redevelopment Platform
- Browser as the client
Huawei UC and IP Telephony

**Application Servers**
- Unified messaging
- Instant messaging
- Presence/group

**Voice conference**
- Web & Desk conference

**Portal server**
- OMS

**Communication Servers**
- SMB
  - SoftCo 5500 (300 Users)
  - SoftCo 5816 (800 users)

- Enterprise
  - SoftCo 9500 (10,000 users)

- Large Enterprise
  - SoftCo9800 (50,000 users)

**Gateways**
- EGW
  - EGW1500 (Office in One Box)

- IAD Series
  - IAD101/102 (1-2 POTS)
  - IAD104 (4 POTS)(8 POTS&8 FE) (32 POTS)
  - IAD208
  - IAD132 (224 POTS)
  - IAD1224 (280 POTS)

**IP Terminals**
- ET 3xx
- ET 5xx
- ET 6xx
- ET 7xxx
- ET 8xx
- IP Phone
- PC Client
- Mobile Client
  - For iPhone and Android
Huawei IP Contact Center

**Applications**
- Cloud management platform
- Cloud agent server
- HPS

**Middle ware**
- Smart CTI
- MRS
- ASR Server
- TTS Server
- IVR
- Recording
- Report

**ACD**
- SMB: UAP2100 20 agents
- Enterprise: UAP3300 240 agents
- Large Enterprise: UAP6600 1000 agents
- UAP8100 20000 agents

**Gateways**
- IAD Series
  - IAD101/102 (1-2 POTS)
  - IAD104 (4 POTS)
  - IAD208 (8 POTS&8 FE)
  - IAD132 (32 POTS)
  - IAD1224 (224 POTS)
  - IAD1280 (280 POTS)

**IP Terminals**
- IP Phone
  - ET 3xx
  - ET 5xx
  - ET 6xx
  - ET 8xx
- PC Client
  - Softphone
- Thin client
  - Wyse S10
# Huawei Video Communication

## Telepresence
- TP1002
- TP3006
- TP3016
- TP3106

## VC Endpoint
- VP903 ×
- VP806 ×
- VP803 ×
- MC850/1

## MCU & TP Server
- MCU8660
- MCU8650
- MCU8650C
- VP8066-M
- VP9039-M
- VP8039-M

## Mgmt. Suite
- vSwitch
- vBill
- GK&RM
- PC
- Server

## Accessories
- VP9039-M
- VP8066-M
- VP8039-M
- TP3016
- TP3006
- TP1002
Huawei IT Infrastructure Products

Cloud Products

VDI (Virtual Desktop Infrastructure)

Storage Products

N8300 N8500 S2300/S2600 S3900/S5900/S6900 S12000/S12300 VIS6000 VTL3500 VTL6000

NAS SAN VIS VTL

Server Products

RH1285 Rack server RH2285 RH5485 E6000 X6000

Rack server Blade server Cloud server
Core Routers’ Architecture

Marcin Mazur, CCIE #24210
IP Solutions Manager, CEE&Nordics
Solution Overview

- Cluster Feng Shui
- Back-to-back Capability
Huawei Cluster Router – NE5000E

- **Large Capacity and Scalability**
  - World’s first 100G End-to-End solution
  - 100G/200G flexible LPU
  - Unified B2B cluster router

- **Granular Carrier-Class Reliability**
  - Distributed module schedule in VRP
  - Virtual Router, Granular fault isolation
  - ISPM, ISHE

- **Sustainable Green Philosophy**
  - Lower power consumption, EER<3W/G
  - Bi-Direction compatible design
  - Simplify O&M, service deployed on demand
Cluster Components

Smooth Expansion

- 40G CCC smoothly expanded to 100G CCC
- Support full 100G cluster system
- Support hybrid 100G cluster with old CLC
- 40G cluster smoothly up to 100G cluster to protect carriers’ investment

Flexible Deployment

- SFUF-100-B supports flexible OFCs
- Flexible deployment based on requirements
- Smooth upgrade to 100G system
Leading Solar Self-Developed Chipset

Solar 2.0 Chipsets

Four Chipsets Included - PP2.0, TM&FIC2.0, SF2.0 and ASE2.0.
Designed for carrier routers, based on 65nm process technology.

- **PPP2.0(Packet Processor 2.0)** - High speed packet processing and forwarding ASIC, optimized for Ethernet/IP/MPLS, 100Gbps (up to 100Mpps) wire-speed throughput, integrated 29 programmable VUM cores.
- **TM&FIC2.0(Integrated TM and FIC 2.0)** - ASIC integrating traffic management and switching fabric buffering function, 100Gbps wire-speed throughput, 5-level Hierarchical scheduling (5-level H-QoS).
- **SF2.0(Switch Fabric 2.0)** - Exchange and arbitration ASIC for router and OTN system, 800Gbps wire-speed throughput.
  Supporting maximum 3.2T switching system with TM&FIC2.0.
- **ASE2.0(Algorithm Search Engine 2.0)** - High-speed algorithm searching ASIC, providing high performance and large capacity entries with PP2.0.
Flexible LR for Multi-Service Application

- Racks/LPUs/slots can be configured dynamically as LRs/VRs
- Dedicated control plane, service plane and data plane between Logical & Virtual Routers.
NE5000E Cluster Architecture

- Solution Overview
- Clustering Feng Shui
- Back-to-back Capability
Non-Blocking Switching Fabric of NE5000E-X16

Switching Capacity:
3.145Tbps per SFU
786Gbps per slot

4 pairs of SerDes links to each SFU
4 SFUs = 16 pairs of links from LPU
Each pair of SerDes links max. 6.336 Gbps.

Ingress LPU
0 ~ 15
Segmentation
Cell switching, Fixed length, based on Info in Cell Header

SFU

Reassembly
4 SFUs: 3+1 Load Sharing

Egress LPU
0 ~ 15

Switching capacity of each SFU is max 3.145Tbps, the whole system: 12.58Tbps.
Multistage Switch Fabric - CLOS

- Introduced by Charles Clos to address performance issues of telephone switching system.
- The theory of CLOS: C(n,m,r) model, S1 -> S2 -> S3.
- If In = Out (n=m) rearrangeably non-blocking. Multiple non-blocking paths.
- For S2, 64x64 switch chipset can be automatically divided into certain numbers of 32x32, 16x16, 8x8, 4x4 switching fabrics.
128 In X 128 Out - Single Stage vs Multistage

- Single Stage Switch Fabric: 128 In X 128 Out = **16384** crosspoints
- Multistage CLOS Switch Fabric: \(4 \times (32 \times 32) + 32 \times (4 \times 4) + 4 \times (32 \times 32) = 8704\) crosspoints
- It is difficult for single stage switch mode to realize non-blocking connections between input and output node.
- 3-stage switch mode is more flexible and reduces cluster’s crosspoint number.
Flexible Switching Matrix

- 4+16/8+32/16+64 mode
- 16x16/32x32/64x64 switching matrix
- Each chip has 4/2/1 switching plane.
- Each switching plane is connected to 16/32/64 CLCs.
- Each CCC has 4/2/1 switching planes.

- Flexible and on-demand configuration of OFCs
- Flexible adjustment of the switching chips’ switching modes
- Flexible adjustment of the switching chips’ switching matrixes
- Flexible expansion of the switching matrix without hardware replacement
Multi-plane Multistage Switching Fabric

- Multi-plane Multistage CLOS Switch Fabric – providing high reliability and huge capability.
- Each plane is the three-stage switch architecture – S1, S2 and S3.
- The LPU forwards packets to different planes and the data is only switched in each plane, no inter-planes.
NE5000E Cluster Architecture

- Solution Overview
- Cluster Feng Shui
- Back-to-back Capability
Innovative Huawei B2B Cluster

- Master and slave chassis connected via inter-chassis channels.
- 2048x2048 non-blocking switch distributed in 8 pcs of SFUF.
- 8 Switching Chipsets per CLC work in Pass mode.
- 8 Switching Chipsets per CLC work in 64X64 switch mode.
- 6.4Tbps switching Capacity.
Flexible and Dynamic Switch Mode

**Single Chassis:**
- Each SFU has 4 switch plane. 4 SFU have $4 \times 4 = 16$ switch plane.
- Switch mode of every plane configured to S2 mode.
- Every TM connect to all switch plane.

**B2B Cluster:**
- 2 CLC have 8 SFU, all SFU have $4 \times 8 = 32$ switch plane.
- Every CLC has 8 switch planes configured to S2 mode (switch granularity is $64 \times 64$), other 8 switch planes configured to S2 pass mode.
- 16 switch plane switch mode is S2 mode, 16 switch plane switch mode is S2 pass mode
- Every TM connect to all switch plane
Logical Topology of the Switching Network

- On a single CLC, each switching plane uses a 32x32 cross-connection matrix by default (16 slots, with 2 serdes buses in each slot).
- In a back-to-back system, however, there are 32 slots and 64 serdes buses, which require a 64x64 cross-connection matrix.
- Each switching chip uses hence 64x64 cross-connection matrix, which is used for data switching in 32 slots.

To ensure hardware consistency, exchange the S2 and S13 switching chips.
Hierarchical VR Deployment for B2B System

- VR is configured under LR and one LR must contain at least one VR, maybe more than one VR.
- VR has its own Routing Protocol and OM. Different VRs use the same software image and share all common resources.
- To validate the feasibility of the new business through deploying the new business in the virtual router.
- With this method the resource is utilized sufficiently and the main business which has already in running is not affected.
Thank you!!

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