SWISS IPv6 COUNCIL

IPv6 highlights in Enterprise

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Rules and house keepings

- Your participation is mandatory. Try to avoid being involved in customer meetings or other things on this day!
- Do not use your laptop or phone during the meeting
  → use the free time after lunch
- Breaks: coffee break, lunch, afternoon brack (short)

PLEASE RESPECT THESE RULES!

IPv6 transition for Enterprise

- Etat de l'art (State of the art):
- Why IPv6 transition is needed today? Why you must think about it today?
  - Public address space allocation : IPv4 exhaustion, ISP point of view
  - Understand what are the application issues in the DataCenter
  - Network Core/Aggregation & Access issues
    - Routing issues
    - Internet connection issues
    - WAN and ISP issues
    - Security issues
    - Multicast issues
    - Mobility issues for Voice & Video : Qos.
  - Understand what are the transition/migration techniques
  - How and when preparing these migration or transition steps

IPv6 highlights

- Who knows what equipments are running in production environment with potential old equipments?
- Who knows exactly what kind of protocol and applications that are running in your network?

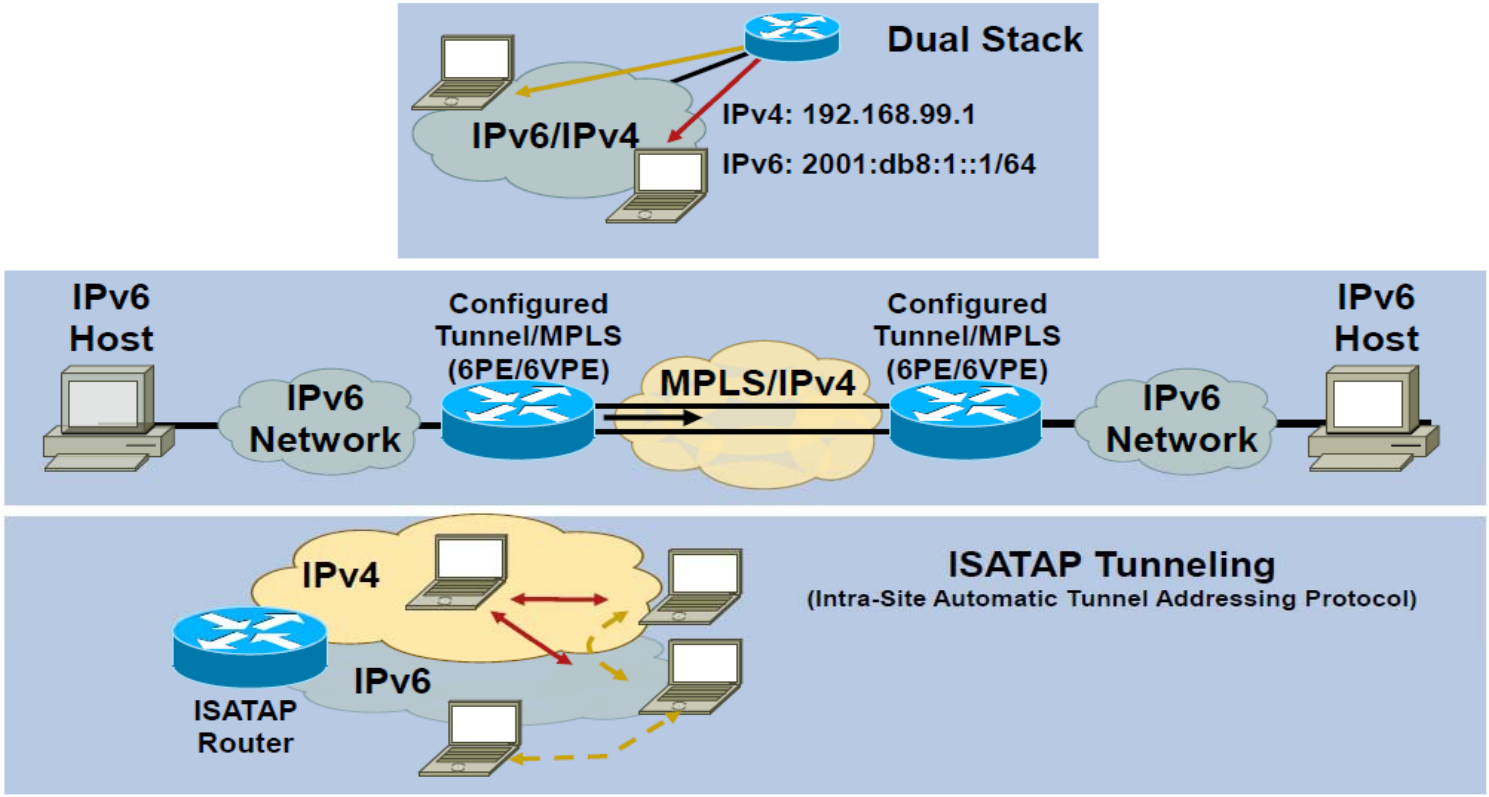
IPv6 highlights

- IP v6 OS awareness?
  - OS issues
    - MS Windows 2008 : Dual stack & IPv6 by default
    - MS Windows 7: Dual stack & IPv6 by default
    - Apple MAC OS, iOS Dual stack
    - Linux Dual stack?
    - Order of TCP/IP request : IPv6 before IPv4 in RFC
    - Which technique ? Dual-Stack, Tunnelling (6to4, 6rd, ISATAP*, Teredo**, Miredo**), Translation (NAT64, NAT46...)?

- *** IntraSite Automatic Tunnel Address Protocol (**RFC 4214). Difficult to implement, secure and troubleshoot
- ** Teredo : IPv6 stack tunnel with IPv4 NAT emulation for MS XP/Vista, Windows 2003 SP1... Complex!
- *** Miredo: like Toredo for Linux, BSD, MAC OS

IPv6 highlights

- IP v4 & v6 – Which scenario? It depends ☺ !



IPv6 highlights

- What is Transition in IP v6 :
  - Application issues
    - How to deal with Address Management Mapping (IPAM)
    - Is my application based on Layer 4 to 7 ?
    - Example : MS DirectAccess need IPv6 to work!!!
  - Questions for the migration/transition:
    - Dual stack, tunnel, translation ?
    - Are my applications home-made ?
    - What are the development or new version cost ?
    - Response time, delay ?
    - Remember the old days (90's)

IPv6 highlights

- Applications IP v6 awareness ?
  - Applications and servers in Data Center
    - Growing DC complexity
    - Virtualization should make large DCs simpler and more flexible
    - Lack of robust DC/Application management is often the root cause of all evil
    - Ensure management systems support IPv6 as well as the devices being managed

IPv6 highlights

- IP v6 in Campus?
  - Core/Aggregation & Access issues
    - Network assessment of all the equipment
    - Capability of the Core
    - Where will I begin the migration? Core or Access?
    - IPAM & NDP issues
    - Migration scenarios (dual stack, tunnel, translation...)
    - Monitoring tools

IPv6 highlights

- Routing with IP v6 ?
  - Routing issues (for IPv6)
    - RIPv2 to RIPng
    - EIGRP to EIGRP v6 or for IPv6
    - OSFP v2 to OSPF v3
    - BGP v3 to BGP v4 (Multiprotocol Extensions for BGP)
    - IS-IS v2to IS-IS for IPv6
  - Required modeling & planning
    - Awareness of the equipments (hardware or software support)
    - Performance issue (CPU, RAM...)
    - Convergence time issue

IPv6 highlights

- Security issues with IPv6
  - Is IPv6 running in my network ?
    - Protocol 41 : IPv6 over IPv4 or 6to4 tunnels
    - IPv4 address and 6to4 anycast server
    - Teredo : UDP 3544 (public gateway)

  - Be aware of the IPv6 latent threat: **Your IPv4-only network may be vulnerable to IPv6 attacks NOW!!!**

  - Example about ICMP issues : redirect and DOD attacks
    - Neighbor Discovery (Advertisement & Solicitation, DAD (Duplicate Address Detection...)
    - Router Discovery (Advertisement & Solicitations and Rogue Router)

IPv6 highlights

- Security with IPv6 ?
  - IPSec implemented natively in via SEnD.
  - Remote site tunnel encapsulation on MPLS IPv4?
  - NAT: how to deal with?
  - Compatibility with Global Sites and Local Site Load-Balancers, Network Optimizer, SSL-Offload, application monitoring (probes)? Need to be rewrite?
  - HSRP, GLBP, VRRP for IPv6
  - IPv6 ACL, more complex ?

IPv6 highlights

- Firewall and others ACL in IP v6 ?
  - Security
    - IPv6 ACL, more complex? In major case, you need two ACL!

Data Center—IPv6 on FWSM

Routed Firewall Mode—Example

```
FWSM Version 3.1(3) <context>
!
hostname WEBAPP
!
interface inside
 nameif inside
 security-level 100
 ipv6 address 2001:db8:cafe:10::f00d:1/64
!
interface outside
 nameif outside
 security-level 0
 ipv6 address 2001:db8:cafe:101::f00d:1/64
!
ipv6 route outside ::/0 2001:db8:cafe:101::1
ipv6 access-list IPv6_1 permit icmp6 any 2001:db8:cafe:10::/64
ipv6 access-list IPv6_1 permit tcp 2001:db8:cafe:2::/64 host 2001:db8:cafe:10::7 eq www
access-group IPv6_1 in interface outside
```

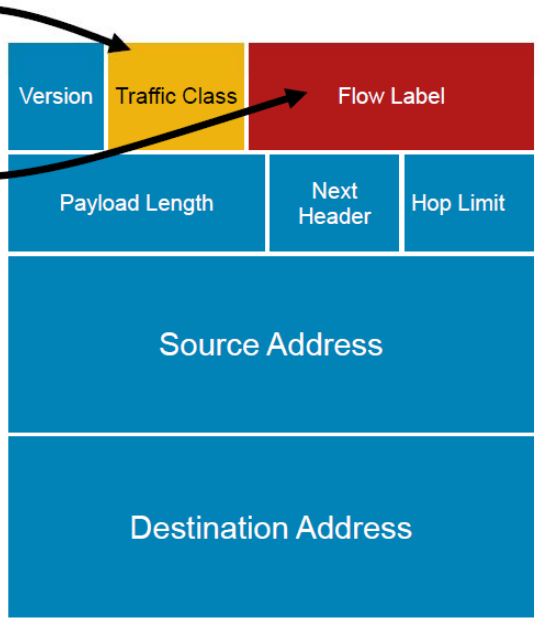
GW to MSFC outside VLAN intf.

IPv6 highlights

- QoS in IP v6 ?
  - Mobility issues for Voice & Video
    - QoS syntax change
    - Not enough broadcasting, just Multicast for IPv6

IPv6 QoS: Header Fields

- IPv6 traffic class
  - Exactly the same as TOS field in IPv4
- IPv6 Flow Label (RFC 3697)
  - A new 20-bit field in the IPv6 basic header which:
    - Labels packets belonging to particular flows
    - Can be used for special sender requests
  - Per RFC, Flow Label must not be modified by intermediate routers
- Keep an eye out for work being doing to leverage the flow label



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Simple QoS Example: IPv4 and IPv6

```
class-map match-any BRANCH-BULK-DATA
 match access-group name BULK-DATA-IPV6
 match access-group name BULK-DATA
class-map match-all BULK-DATA
 match  dscp af11
!
policy-map RBR-WAN-EDGE
 class BULK-DATA
  bandwidth percent 4
  random-detect
!
policy-map RBR-LAN-EDGE-IN
 class BRANCH-BULK-DATA
  set dscp af11
!
ip access-list extended BULK-DATA
 permit tcp any any eq ftp
 permit tcp any any eq ftp-data
!
ipv6 access-list BULK-DATA-IPV6
 permit tcp any any eq ftp
 permit tcp any any eq ftp-data
```

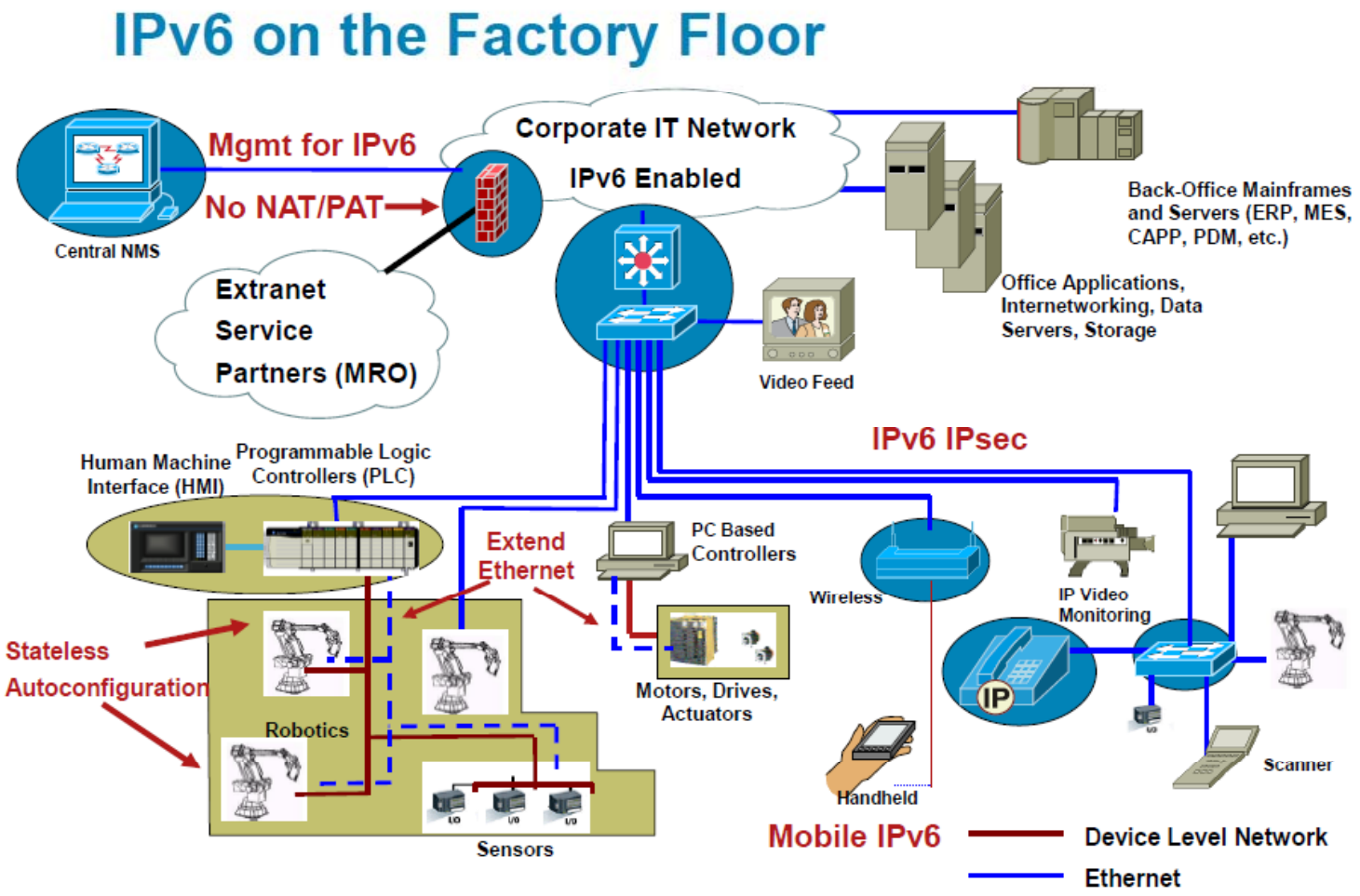
ACL Match To Set DSCP
(If Packets Are Not Already Marked)

```
service-policy input RBR-LAN-EDGE-IN
```

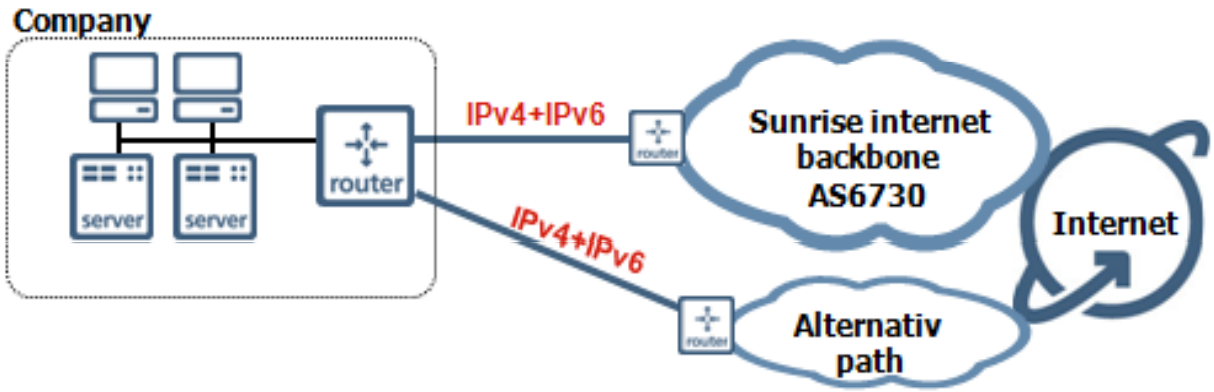
```
service-policy output RBR-WAN-EDGE
```

ACLs to Match for Both
IPv4 and IPv6 Packets

IPv6 highlights



IPv6 Internet Access for Business Customers



Business internet direct (managed):

- Faster Internet access with 2Mbps … 10 Gbps (Copper or Fiber)
- Support of all standard Routing Protocols (RIP, OSPF, BGP, EIGPR), based on dualstack Access
- SNMP Management Access (over IPv4) and Service Monitor (SBA)
- Dual homing with dual PE- and dual ISP Support
- IPv6-DNS Services Option
- PA- (or PI-) /48 Prefix, segmentable up to 64k Subnets

IPv6 Products

Business internet direct, available options

Optionen	IPv4	IPv6
Routing mit Sunrise Access	●	●
Routing mit Leased Line Access	●	●
Business Dual Homing (with BGP)	●	●
Business Network Management (over IPv4)	●	●
Business Secure Access	●	●
DSL Backup	●	●
Sunrise Backup	●	●
Business DDOS Protection	●	●
Option DHCP ab Router (Neighbor Discovery)	●	●

●	Beinhaltet in dieser Version (V1.0)
●	Geplant in der nächsten Version

Business Sunrise
Customers with IPv6 Connectivity

Typical Connectivity with:

- Speed > 50Mb/s FO
- Dual-homed or ULL-Backup
- DNS Support
- Routers:
  - Cisco29xx for Enterprise customers
  - Cisco88x for SME customers

IPv6 highlights

- IPv6 today – Summary
  - Public address space allocation : no IPv4 block available
  - ISP, Government project has become (CH, US, FR...)
  - Which migration/transition plan for:
    - OS & Application issues
    - Address Management Mapping (IPAM) and IPv6 ISPs support
    - Core/Aggregation & Access
    - Routing natively, dual stack, tunneling IPv6 over IPv4 MPLS support by ISPs over WAN
    - Security equipments support of IPv6 (ACL, NAT64...)
    - Multicast and mobility for Voice & Video, WLANs
    - Industrial equipments & applications, “Internet of things”

IPv6 highlights

- IP v6 highlights - Summary
  - Remember:
    - Not only a network story
    - Talk, Inform, Train, Explain... at CxO level
    - Review with all the IT staffs (Infrastructure, DC, PC, Servers, Phones, Applications... people) -> Create a Taskforce
    - Must be planned before migrating
    - Do a lab before any live implementation
    - Do an assessment of all your network equipment (LAN, WAN, WLAN, DC, remote access, end-user equipments...)

IPv6 transition summary

- IP v6 questions
  - Where are you?
  - What's your knowledge?
  - How to migrate?
  - When to migrate?
  - What are the next steps?
  - Where to begin?
  - What kind of people can be addressing first?
  - What are the best practices, the guidelines?
  - Others???
  - Easy???

When beginning thinking about IPv6?

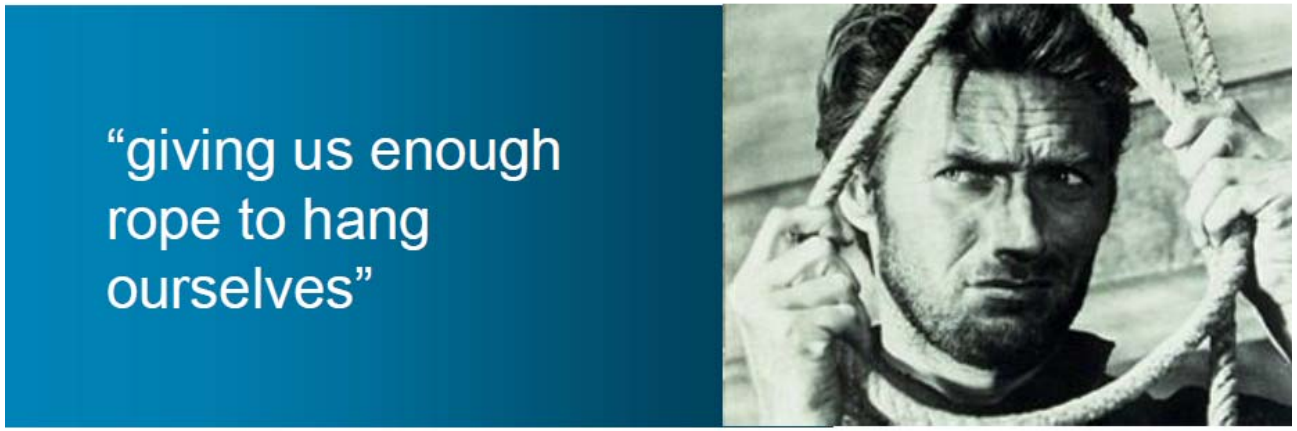
IPv6 transition summary

- Keep in mind:
  - Dual stack (always and when ever you can)
  - Tunneling (when really needed)
  - Translation (when no other possibilities)

  - Learn, Train, Educate
  - Create a task force, involve all business units and plan the transition
  - Do Lab, Proof of Concept

  - **NEVER GO LIVE WITHOUT TESTING, ASSESSING, PLANNING A GLOBAL MIGRATION PLAN DEEPLY**

IPv6 transition summary



THANK YOU!

SWISS IPv6 COUNCIL

Business Sunrise