BNG

TPSDA …IPV6 CHALLENGE

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Alcatel·Lucent

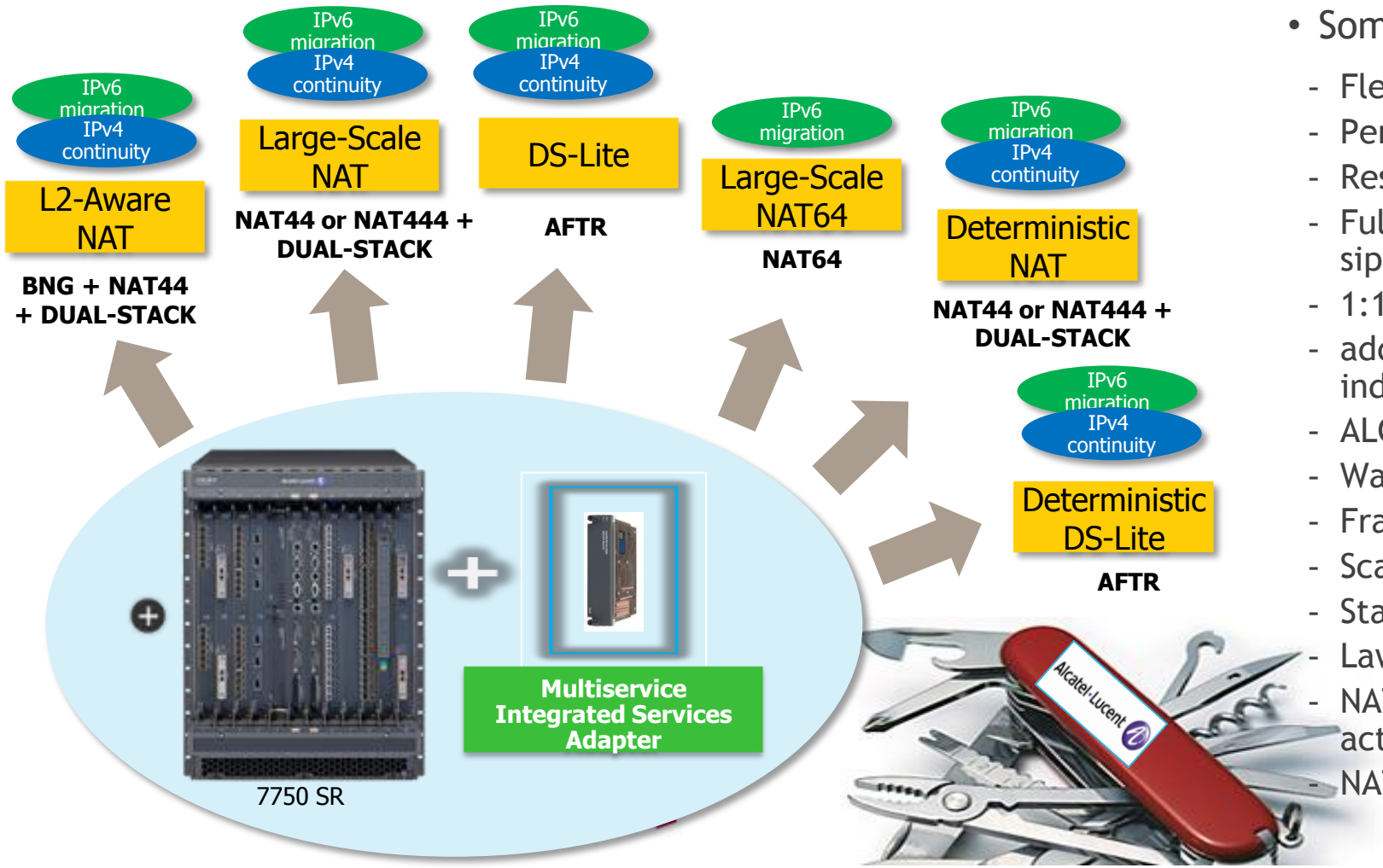
IPV4 EXHAUSTION
SITUATION UPDATE

http://inetcore.com/project/ipv4ec/index_en.html

- IANA exhausted the IPv4 available pool on January 31, 2011
  - The final /8 policies went into effect and each RIR received a single /8 prefix
  - Some RIRs will reserve the whole or part of this /8 for IPv6 transition needs

- The RIRs will exhaust their free IPv4 pools over the course of the next few years[1]
  - APNIC exhausted April 15, 2011
  - RIPE NCC exhausted September 14, 2012
  - ARIN has only 2.29 /8's remaining
  - LACNIC has only 2.49 /8's remaining
  - AfriNIC has only 3.76 /8's remaining

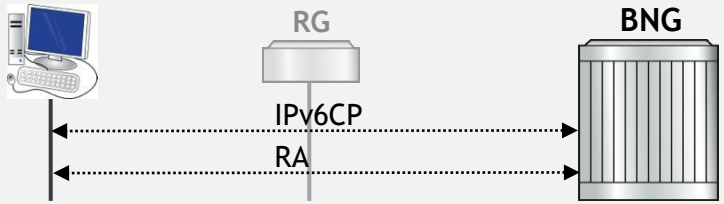
7750SR IPV4 CONTINUITY SOLUTIONS
INTRODUCTION



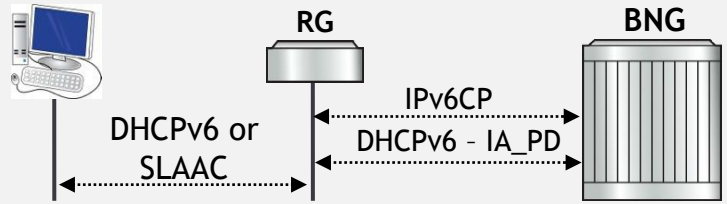
- 10 MS-ISAs per chassis (10 active + 2 standby)
  - 100 Gbps iMIX, 2.5M subscribers, 60M flows
- Some key features
  - Flexible deployment model
  - Per-subscriber dynamic port ranges
  - Reserved ports for prioritized services
  - Fully configurable NAT timers (tcp, udp, dns, sip, retention,…)
  - 1:1 NAT versus NAPT
  - address-and-port-dependent or endpoint-independent filtering
  - ALGs – FTP/SIP/RTSP/PPTP
  - Watermarks for resource monitoring
  - Fragmentation support + TCP MSS
  - Scalable NAT logging (Syslog, Radius, IPFIX)
  - Static port forwards: CLI, SNMP or PCP
  - Lawful Intercept based on outside IP & port
  - NAT intra-chassis resiliency (N:M active/standby)
  - NAT inter-chassis resiliency

PPPOE ACCESS MODELS - SUMMARY

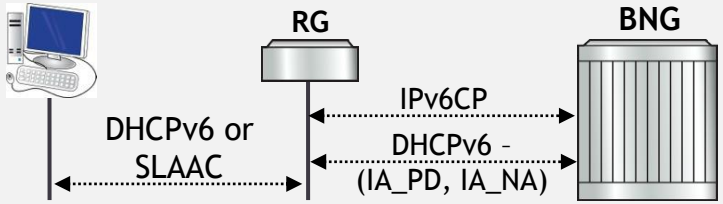
- Bridged residential gateway
  - IPv6CP negotiates interface-id
  - SLAAC for prefix allocation. Linked to PPPoE session



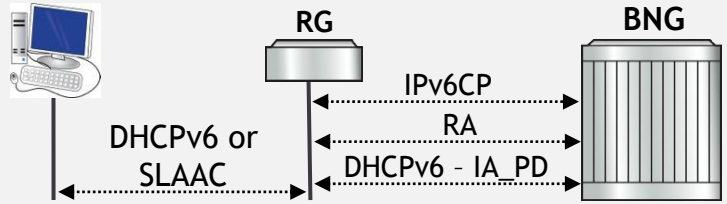
- Routed residential gateway – No WAN IP
  - IPv6CP negotiates interface-id
  - DHCPv6 assigns 'delegated prefix'



- Routed residential gateway – DHCPv6 WAN IP
  - IPv6CP negotiates interface-id
  - DHCPv6 assigns 'delegated prefix' and 'non-temporary address' /128 address



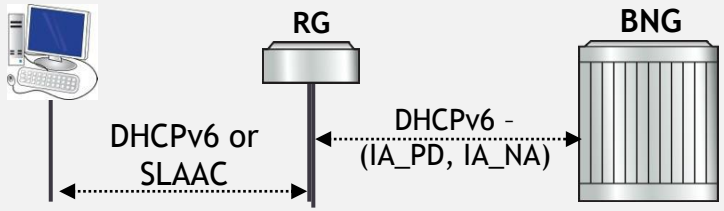
- Routed residential gateway – SLAAC WAN IP
  - IPv6CP negotiates interface-id
  - DHCPv6 assigns 'delegated prefix'
  - SLAAC for WAN IP allocation. Linked to PPPoE session.



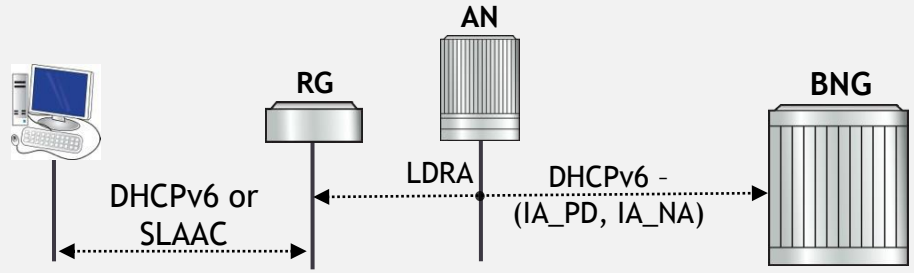
* Only IPv6 operation shown. Regular IPCP for IPv4 allocation

DHCP ROUTED ACCESS MODELS - SUMMARY

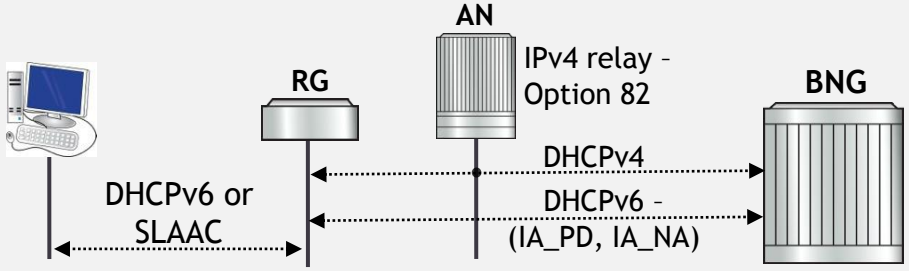
- Routed GW with DHCPv6, 1:1 VLAN
  - DHCPv6 IA_PD, IA_NA (optional)



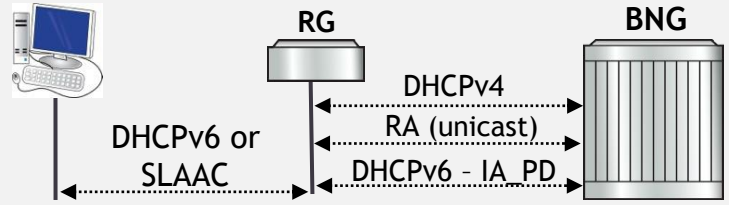
- Routed GW with DHCPv6, N:1 VLAN
  - DHCPv6 IA_PD, IA_NA (optional)
  - LDRA adding DHCPv6 option 18,37 for line-identification



- Routed GW with DHCPv6, N:1, no LDRA
  - DHCPv6 IA_PD, IA_NA (optional)
  - Linked DHCPv4 relay for line-identification



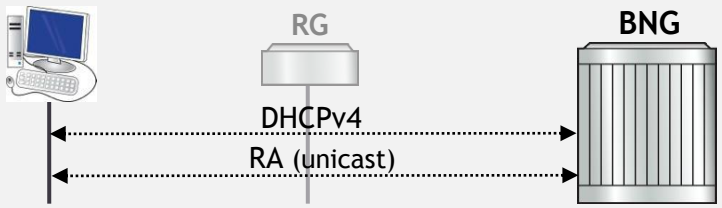
- Routed GW with DHCPv6, SLAAC WAN IP
  - DHCPv6 IA_PD
  - Linked RA for WAN IP allocation



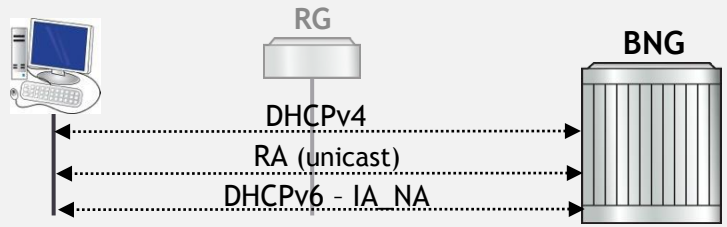
* Only IPv6 operation shown. Regular DHCPv4 for IPv4 allocation

DHCP BRIDGED ACCESS MODELS - SUMMARY

- Bridged GW with SLAAC, 1:1/N:1 VLAN
  - DHCPv4 and SLAAC RA linking

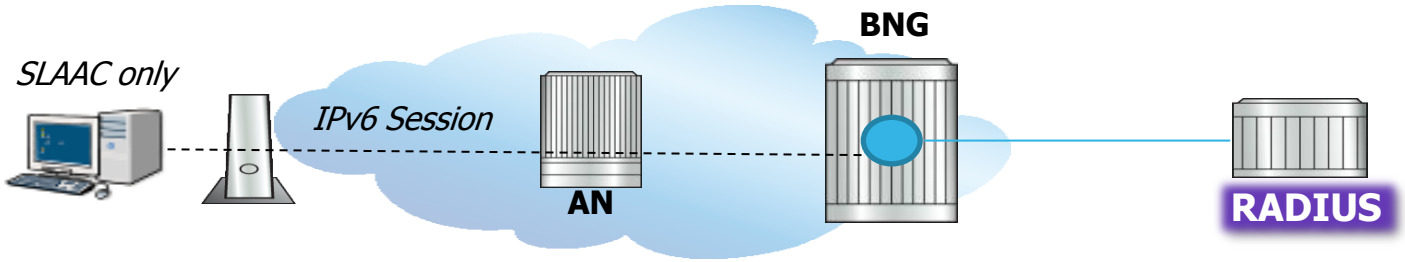


- Bridged GW with DHCPv6, N:1 VLAN
  - DHCPv4 and SLAAC RA linking (needed to trigger DHCPv6 for some clients)
  - DHCPv6 fo IA_NA allocation



- For bridged models
  - 'ipoe-bridged-mode' enables same /64 for hosts in the same home, and enforces as clients either all SLAAC or DHCPv6 IA_NA
  - 'interface-id-mapping' allows local DHCPv6 server to allocated from same /64 for hosts on the same interface-id

SLAAC ENHANCEMENTS



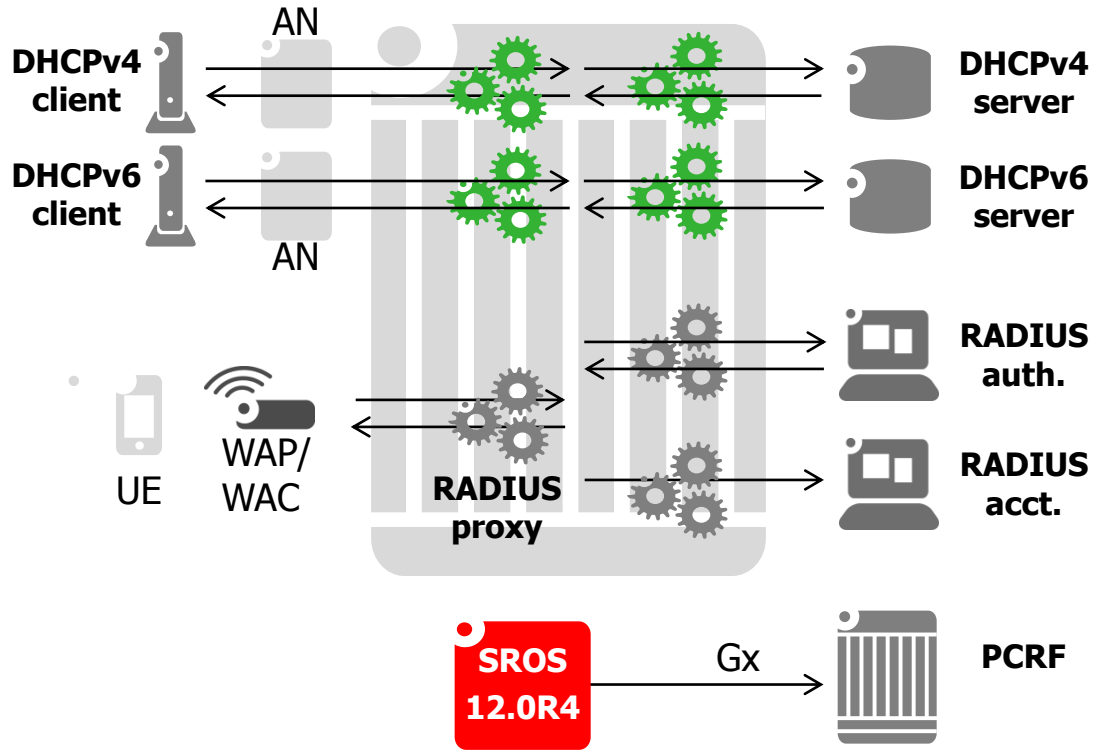
- Support for SLAAC only pure IPv6 clients
  - Authentication on Router-Solicitation
  - MSAP creation based on Router-solicitation

```
vpls 1 customer 1 vpn 1 create
        sap pw-11:* capture-sap create
        trigger-packet arp dhcp dhcp6 pppoe rtr-solicit
```

  - SLAAC prefix per MSAP (i.e. per-home) from RADIUS or from local prefix-pools
  - SLAAC host created on authentication

PYTHON FOR DHCPV4/DHCPV6

- In residential networks, a variety of DHCPv4/v6 message options with customized formats are used for authentication and policy control
- Python for DHCP enables the manipulation of all DHCPv4/v6 message types received from or sent to client and server:
  - Access to all header fields and options
  - Change the value of header fields
  - Add or remove an option and change an option value
  - Drop the packet
- Support for Lightweight DHCPv6 Relay Agent (LDRA) between DHCPv6 client and BNG



Python scripting capability for highly customizable Auth & policy control for BNG and WLAN applications

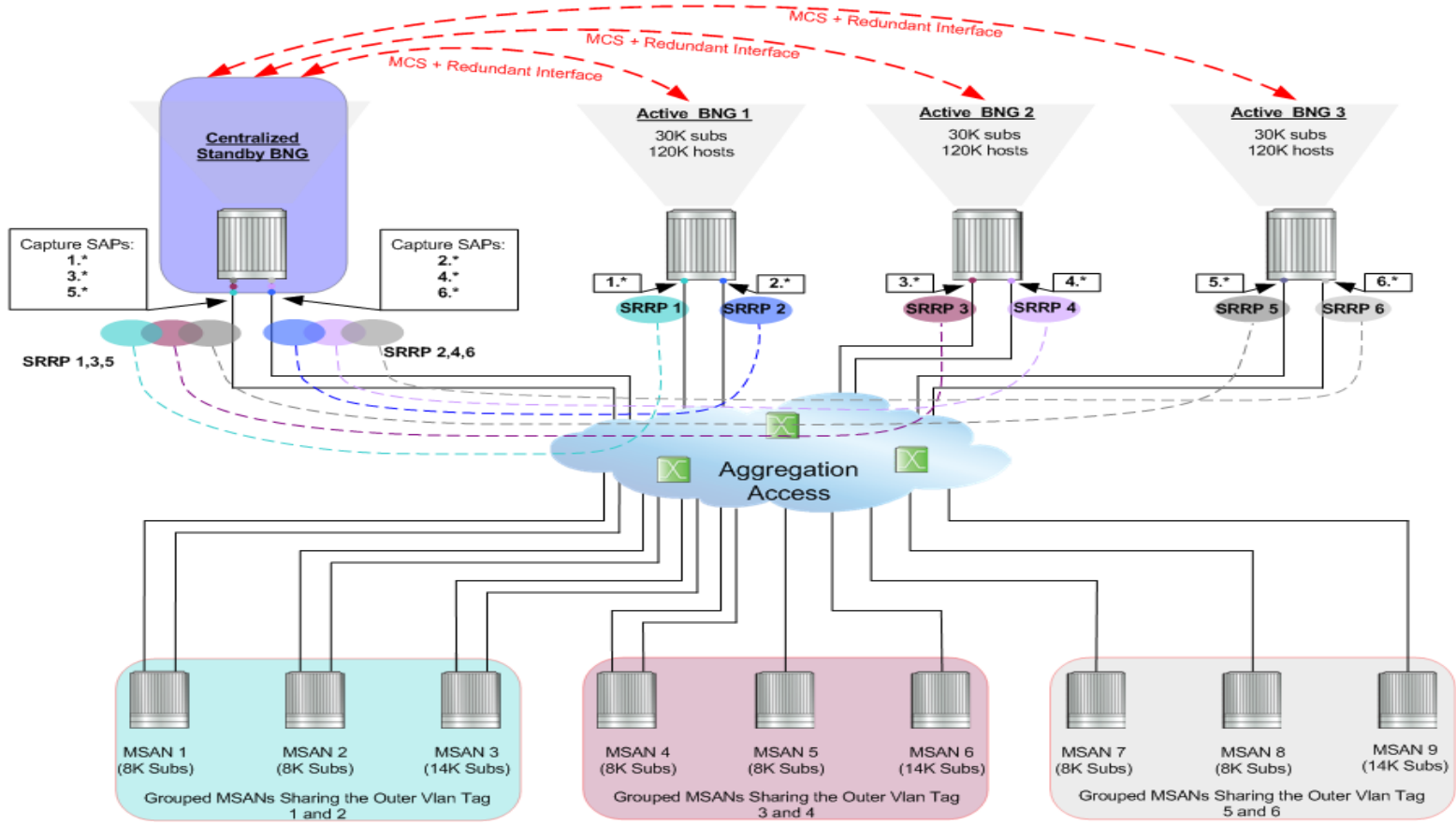
SCALING AND PERFORMANCE
SUBSCRIBER HOST SCALING

	SROS 11.0	SROS 12.0
Subscribers per system	128k	256k single stack *(IPv4 or IPv6)* 128k dual stack *(IPv4 + IPv6 wan + IPv6 PD)*
Subscriber hosts per line card	64k	64k
Subscriber hosts per system	200,000	256k
DHCP server leases per system	156k	512k
# of vPorts per line card/system	1023/10230	5k/40k

64 bit SROS in 12.0 enables future scale increase

N:1 IPOE OVERSUBSCRIBED MULTI CHASSIS REDUNDANCY (OMCR)

- +500,000 subscriber-hosts over multiple BNG nodes are backed up by a single centralized standby BNG
- Failover is SRRP driven
- Upon failover, the subscriber state on the standby node is uncompressed on the CPM and downloaded to the forwarding plane (not as fast as 1:1 backup, thus no plan to extend to PPPoE)
- Host instantiation on standby BNG node is subject to resource availability in IOMs



- Subscriber route advertisement on the network side is SRRP aware: the subscriber routes will be advertized only from the master SRRP nodes.

ADVANCED 7750SR BNG CAPABILITIES

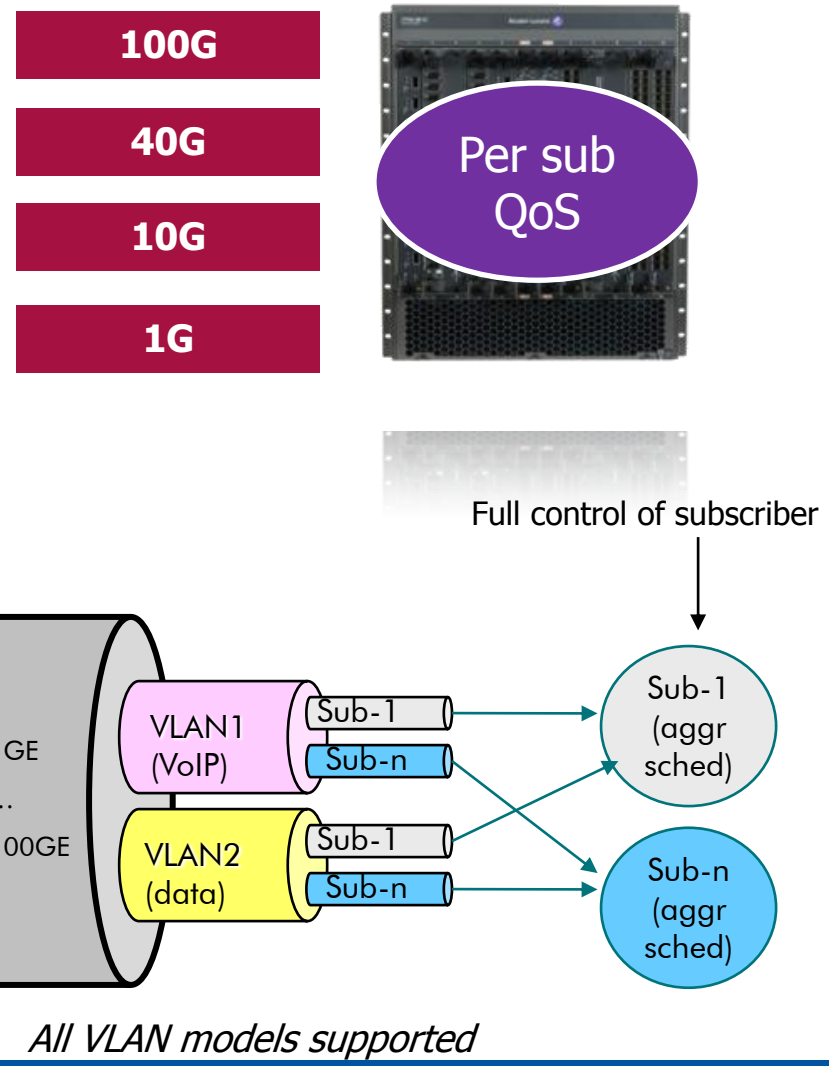
No BNG functional compromise due to speed !
Full functional on 1G/10G/40G/100G

Full support for PPPoE/PPPoA/PPPoEoA/LAC/LNS/DHCP IPv4/IPv6

Full flexible QoS with N:1 VLAN and 1:1 VLAN; ETH or MPLS/PW

Unique Solution for full state-full resilience for PPPoE/DHCP for optimal availability

Value added service without compromises:
AA, Security, NAT, Video



All VLAN models supported

Mission : From BRAS (Better Replace As soon as Possible) ***to BNG*** (Better, Newer and Greater) ***!***

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