RIPE NCC
RIPE NETWORK COORDINATION CENTRE

IPv6 Addressing Plan

Webinar

RIPE NCC Learning & Development

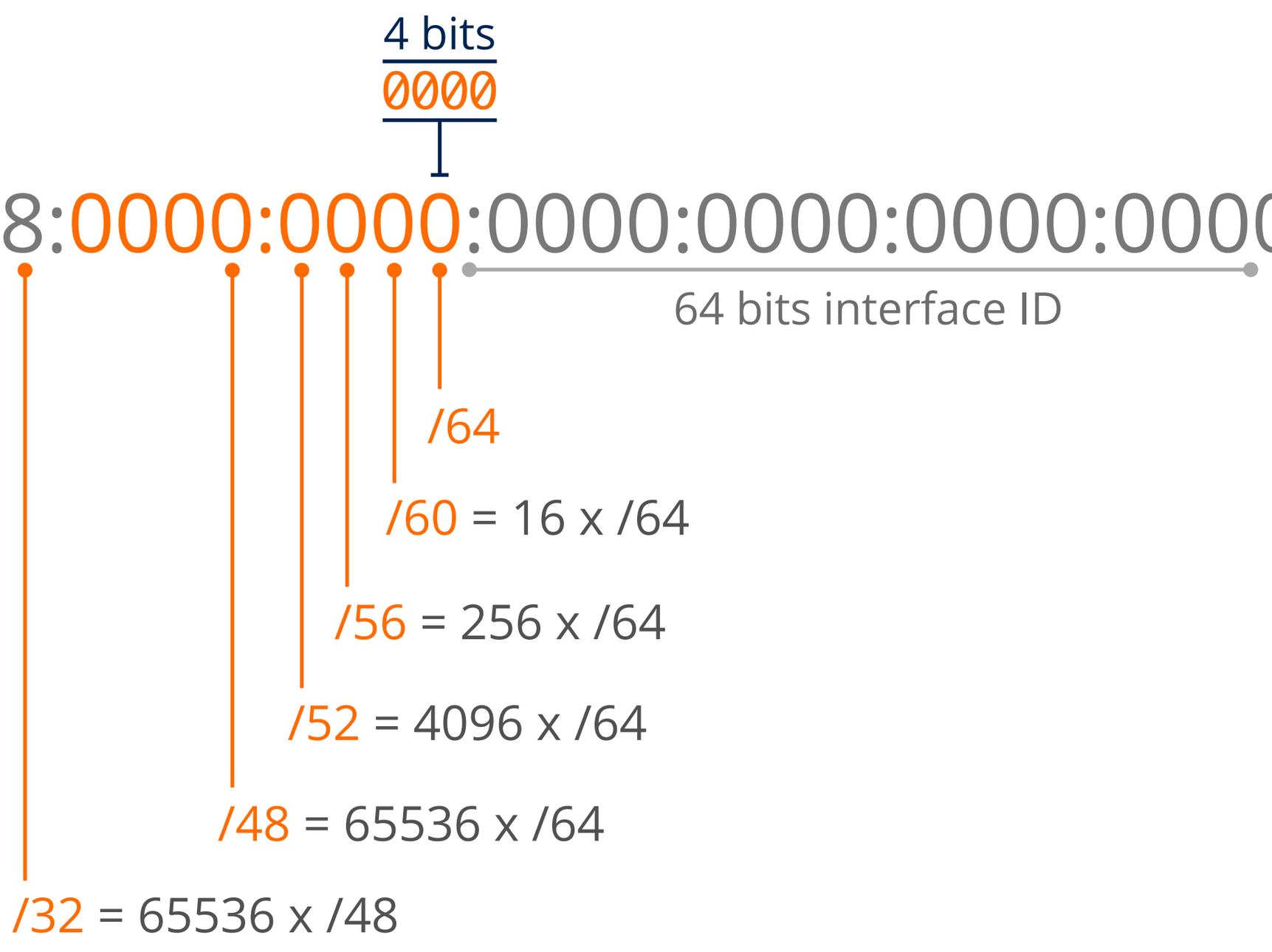
This webinar is being recorded

Why Create an Addressing Plan?

- **Benefits of an IPv6 addressing plan**
  - Mental health during implementation (!)
  - Easier implementation of security policies
  - Efficient addressing plans are scalable
  - More efficient route aggregation

4-bit Boundaries

- IPv6 offers flexibility with addressing plans
- Network addressing can be done on 4-bit boundaries



The /64 story

- “Every interface ID must be a /64” (RFC 4291)
- Because of SLAAC
- Other RFCs followed this
- The **only** exception is a /127 for point-to-point links

ISP Addressing Plan

- What should an ISP addressing plan contain?
  - Address space for internal use
  - Loopback interfaces
  - Point-to-point connections
  - Servers, routers and other infrastructure at POPs
- Use a /48 per POP
- Address space for customers

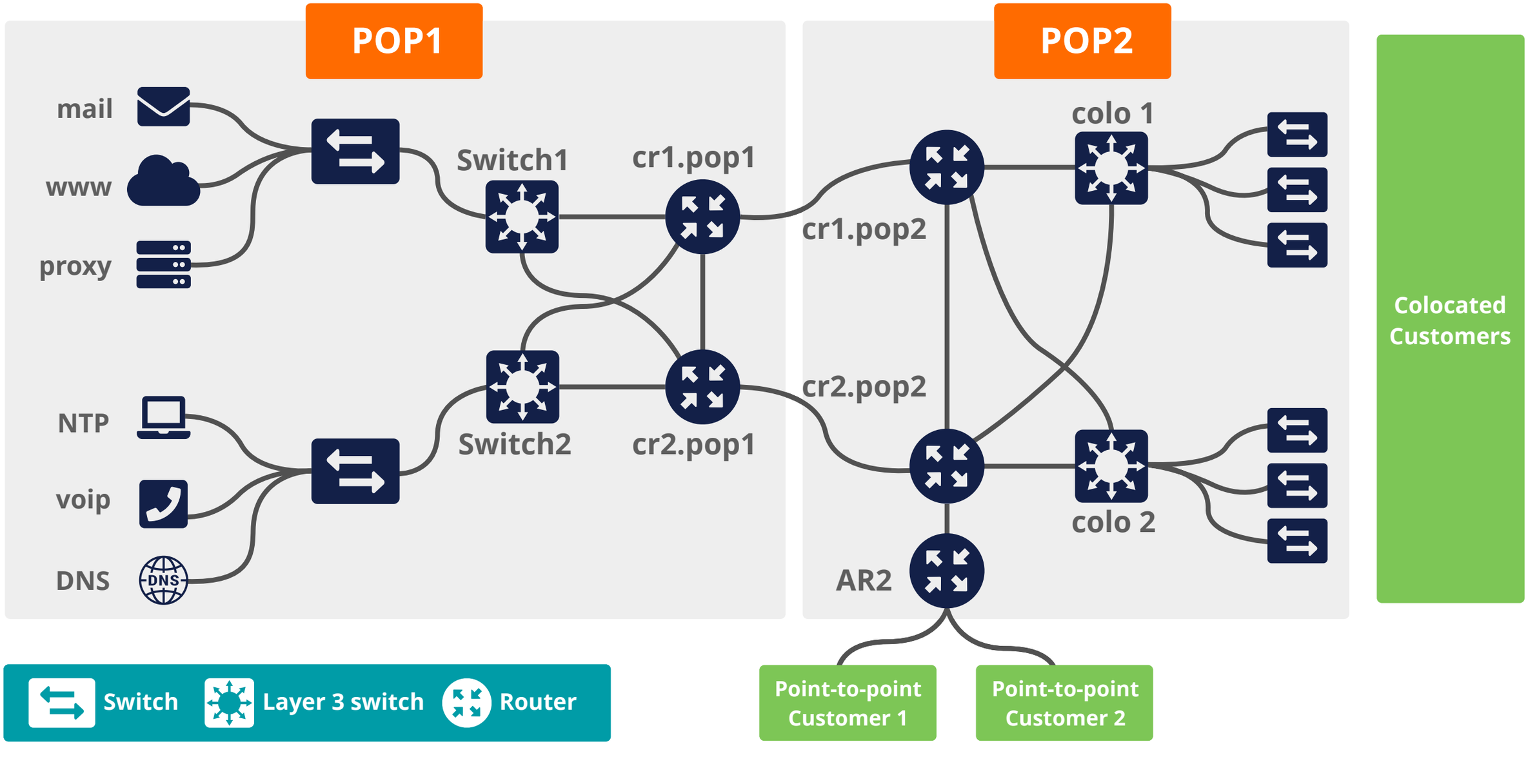
Loopback Interfaces

- **One /128 per device**
  - One /64 contains enough addresses for all your manually configured loopback addresses
- **Take an easy to remember block for loopback addresses**

Point-to-point Links

- **With old router operating software:**
  - One /64 per point-to-point connection
  - Reserve /64 per point-to-point link, but configure a /127
- **With new router operating software:**
  - Configure a /127 per point-to-point connection
  - You can group them under a single /64
- **Recommendation is reserving a separate /64 and configuring /127 per point-to-point link!**
  - Check **RFC 6164** for rationales of using /127

ISP Example


POP1
POP2
mail
www
proxy
Switch1
cr1.pop1
cr1.pop2
colo 1
Colocated Customers
NTP
voip
DNS
Switch2
cr2.pop1
cr2.pop2
colo 2
AR2
Switch
Layer 3 switch
Router
Point-to-point Customer 1
Point-to-point Customer 2

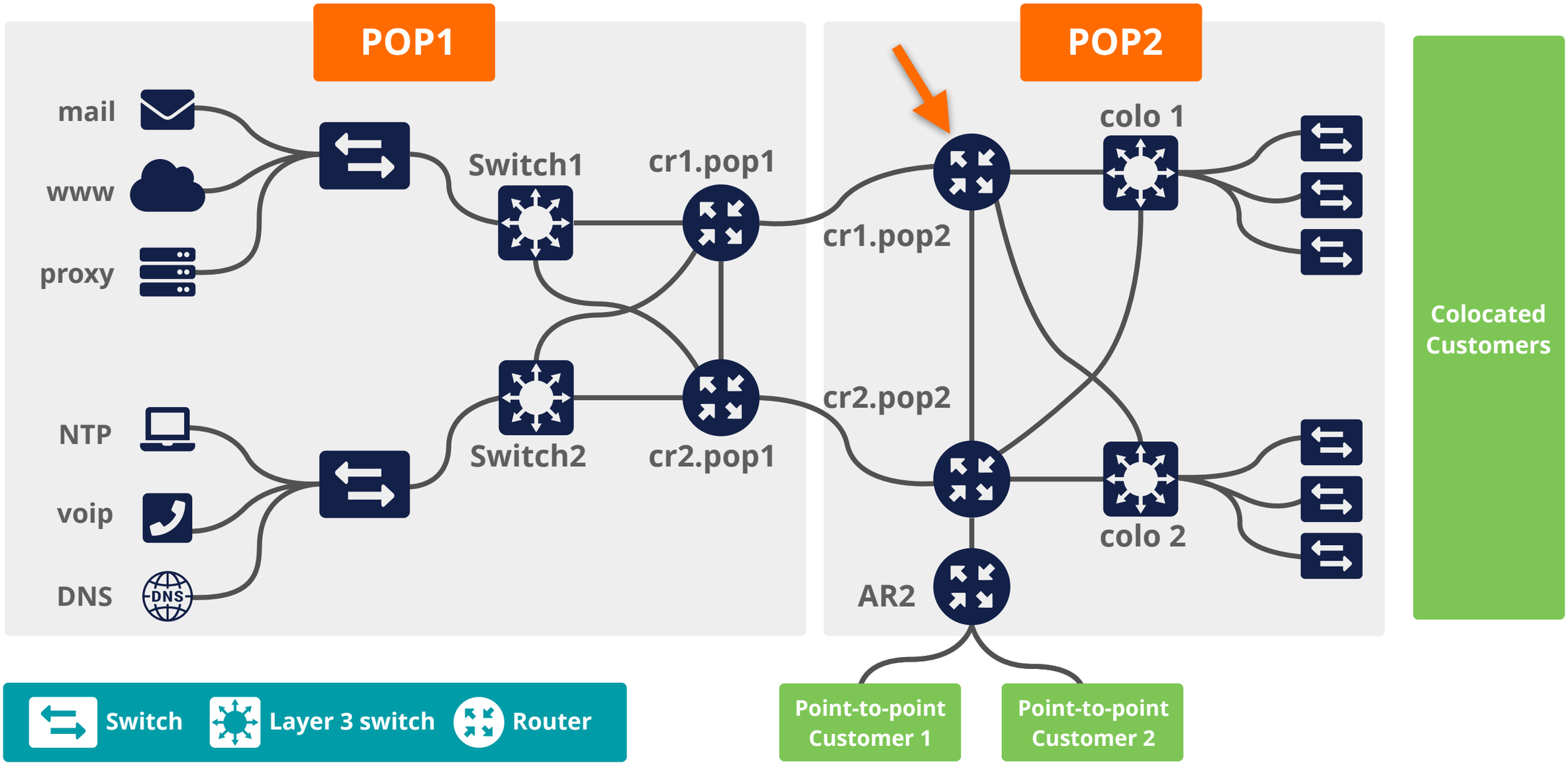
- We will assign a /48 per POP
- We will work on 4-bit boundary:

Prefix	Number of /64 subnets
/48	65 536
/52	4096
/56	256
/60	16
/64	1

- Look at the number of point-to-point links
- Just to be sure, we reserve a /64 per link!

Take the poll!

What prefix would you assign to cr1.pop2?



ISP Guidelines

- **In common cases:**
  - One /48 per POP
  - Calculate growth
  - Make it scalable

Customers

- Customers should get a large block of addresses
  - /48 for business customers
  - /48 or /56 for residential customers
- The current policy allows bigger than /48 but you might need to justify it if audited or if you request another allocation from the RIPE NCC
- Every assignment must be registered

Example Situation (Customers)

- **A customer has 6 functions**
  - Servers
  - Office PCs
  - Network Engineer PCs
  - Guests
  - VPN (remote workers)
  - Infrastructure (point-to-point and loopbacks)

Example Situation (Customers)

- **A customer has 3 locations**
  - Main building, floor 1
  - Main building, floor 2
  - Secondary office

Example Situation (Customers)

- A customer receives 2001:0db8:1a2b::/48

- Work on 4-bit boundary
  - 6 functions (leaves room for 10 more functions)
  - 3 locations (leaves room for 13 more locations)
  - We still have 8 bits left!
    - Room for 256 networks per function per location

Example Plan (Customers)

- Putting this in the address:

  2001:0db8:1a2b:FLXX::/64

  - F = Function (0=infrastructure, 1=servers, 2=office, 3=engineers, 4=VPN, f=guests)
  - L = Location (0=main building 1, 1=main building 2, 2=secondary office)
  - XX = Number of network of type + location

Example Plan (Customers)

- **2001:0db8:1a2b:1000::/64**
  - Servers in Main Building, floor 1, network 0
- **2001:0db8:1a2b:1200::/64**
  - Servers in the secondary office, network 0
- **2001:0db8:1a2b:f209::/64**
  - Guest in secondary office, network 9

Example Plan (Customers)

- **2001:0db8:1a2b:0000::1/128**
  - Loopback address (infrastructure, location doesn't apply)

- **2001:0db8:1a2b:0102::/127**
  - Point-to-point link (infrastructure, location doesn't apply)

- **2001:0db8:1a2b:41ab::/64**
  - VPN in main office, floor 1, user 171

Alternatives (Customers)

- The previous example is just an idea

  ✓ Adapt as necessary

- 2001:0db8:1a2b:FFLX::/64
  - 256 functions
  - 16 locations
  - 16 networks per function per location

Summary (Customers)

- **Tips:**
  - Work on 4-bit boundary
  - Group subnets by function
  - Group subnets by location
  - Make a scalable addressing plan

Exercise: Take the poll again!

What is the IPv6 address for an engineer's PC,

in the main building floor 2,

for computer number 2?

Example:

2001:0db8:1a2b:FLXX::/64

- **F = Function (0=infrastructure, 1=servers, 2=office, 3=engineers, 4=VPN, f=guests)**
- **L = Location (0=main building 1, 1=main building 2, 2=secondary office)**
- **XX = Number of network of type + location**

Customers And Their /48

- Customers have no idea how to handle **65,536 subnets**!
- Provide them with information!

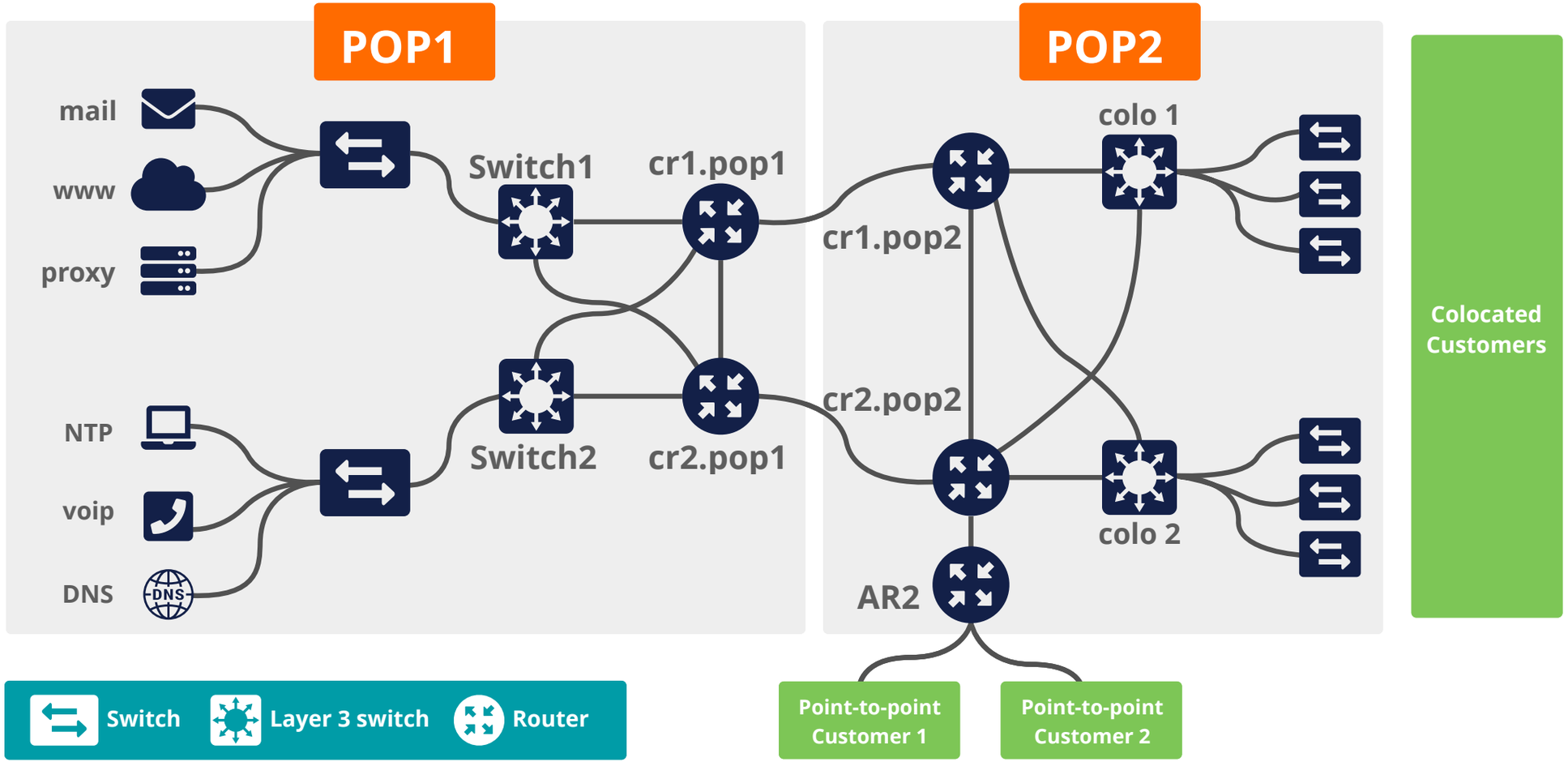
Link to the document:

https://www.ripe.net/support/training/material/basicipv6-addressing-plan-howto.pdf

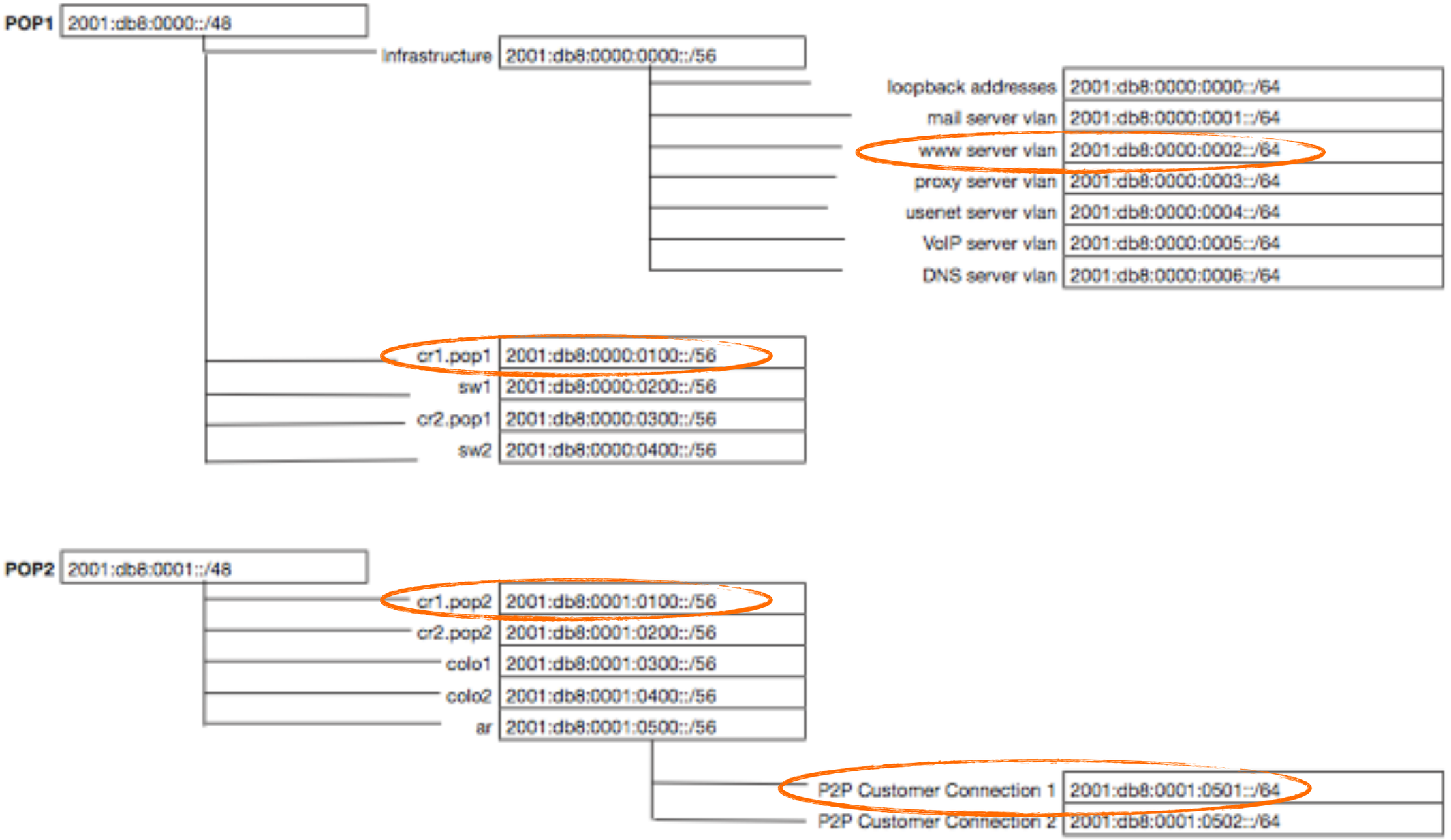
Exercise: Addressing Plan

Use the chat window to choose the assignments size to:

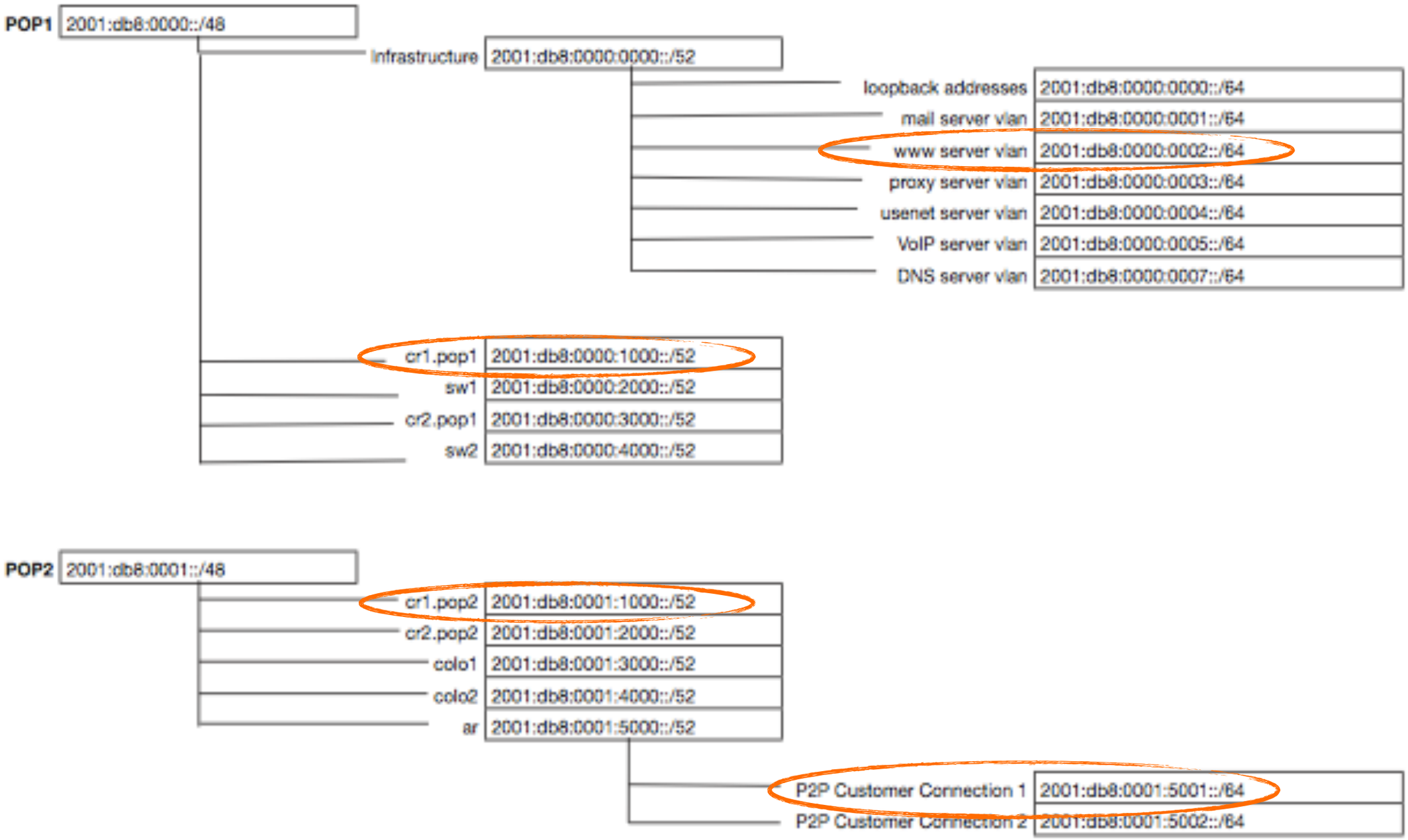
- www VLAN
- colo 1
- cr1.pop2 and cr1.pop1
- Point-to-Point customer 1



Addressing Plan: Solution 1



Addressing Plan: Solution 2



Questions

What's Next in IPv6

Webinars

Attend another webinar live wherever you are.

- Introduction to IPv6 (2 hrs)
- IPv6 Addressing Plan (1 hr)
- Basic IPv6 Protocol Security (2 hrs)
- IPv6 Associated Protocols (2 hrs)
- IPv6 Security Myths, Filtering and Tips (2 hrs)

For more info click the link below

learning.ripe.net

Face-to-face

Meet us at a location near you for a training session delivered in person.

- IPv6 Fundamentals (8.5 hrs)
- Advanced IPv6 (17 hrs)
- IPv6 Security (8.5 hrs)

E-learning

Learn at your own pace at our online Academy.

- IPv6 Fundamentals (15 hrs)
- IPv6 Security (24 hrs)

For more info click the link below

academy.ripe.net

Examinations

Learnt everything you needed? Get certified!

- IPv6 Fundamentals - Analyst
- IPv6 Security - Expert

For more info click the link below

getcertified.ripe.net

We want your feedback!

What did you think about this session? Take our survey at:

https://www.ripe.net/feedback/ipv6-addressing-plan/

RIPE NCC
Academy

Learn something new today!

academy.ripe.net

RIPE NCC Certified Professionals

https://getcertified.ripe.net/

Have more questions? Ask us!

academy@ripe.net


Ënn
Соңы
An Críoch
پایان
Y Diwedd
Vége
Endir
Finvezh
վերջ
Ende
Koniec
Son
დასასრული
הסוף
Кінець
Finis
Lõpp
Amaia
Tmiem
Liðugt
Kpaj
Sfârşit
Loppu
Slutt
Fund
Kraj
النهاية
Конец
Konec
Τέλος
Fin
Fine
Fí
Край
Einde
Pabaiga
Slut
Fim
Beigas
E1 N1 D2

Copyright Statement

[...]

The RIPE NCC Materials may be used for **private purposes, for public non-commercial purpose, for research, for educational or demonstration purposes**, or if the materials in question specifically state that use of the material is permissible, and provided the RIPE NCC Materials are not modified and are properly identified as RIPE NCC documents. Unless authorised by the RIPE NCC in writing, any use of the RIPE NCC Materials for advertising or marketing purposes is strictly forbidden and may be prosecuted. The RIPE NCC should be notified of any such activities or suspicions thereof.

[...]

Find the full copyright statement here:
https://www.ripe.net/about-us/legal/copyright-statement