INEX Operations Update December 2022

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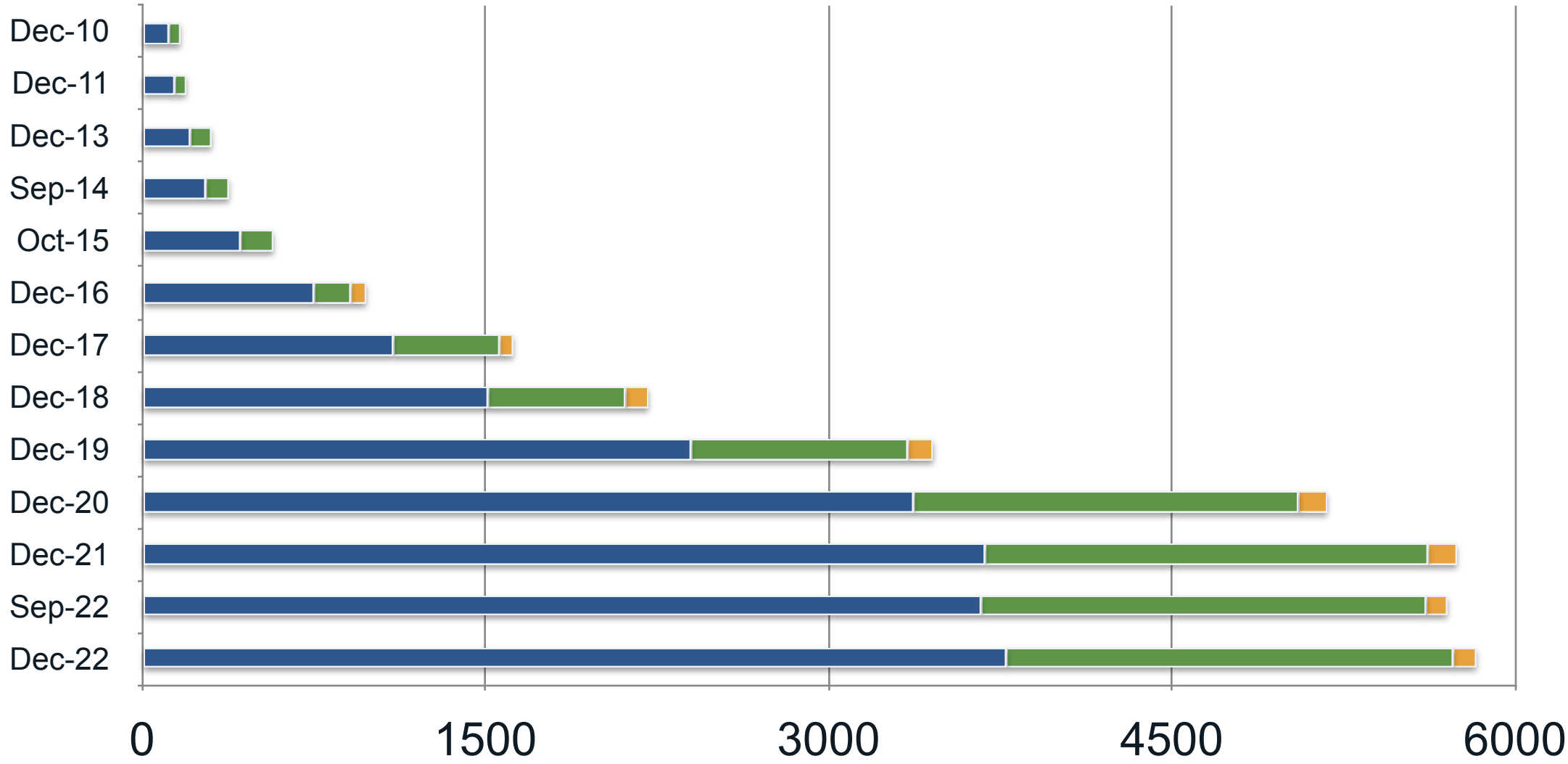
INEX Members' Meeting

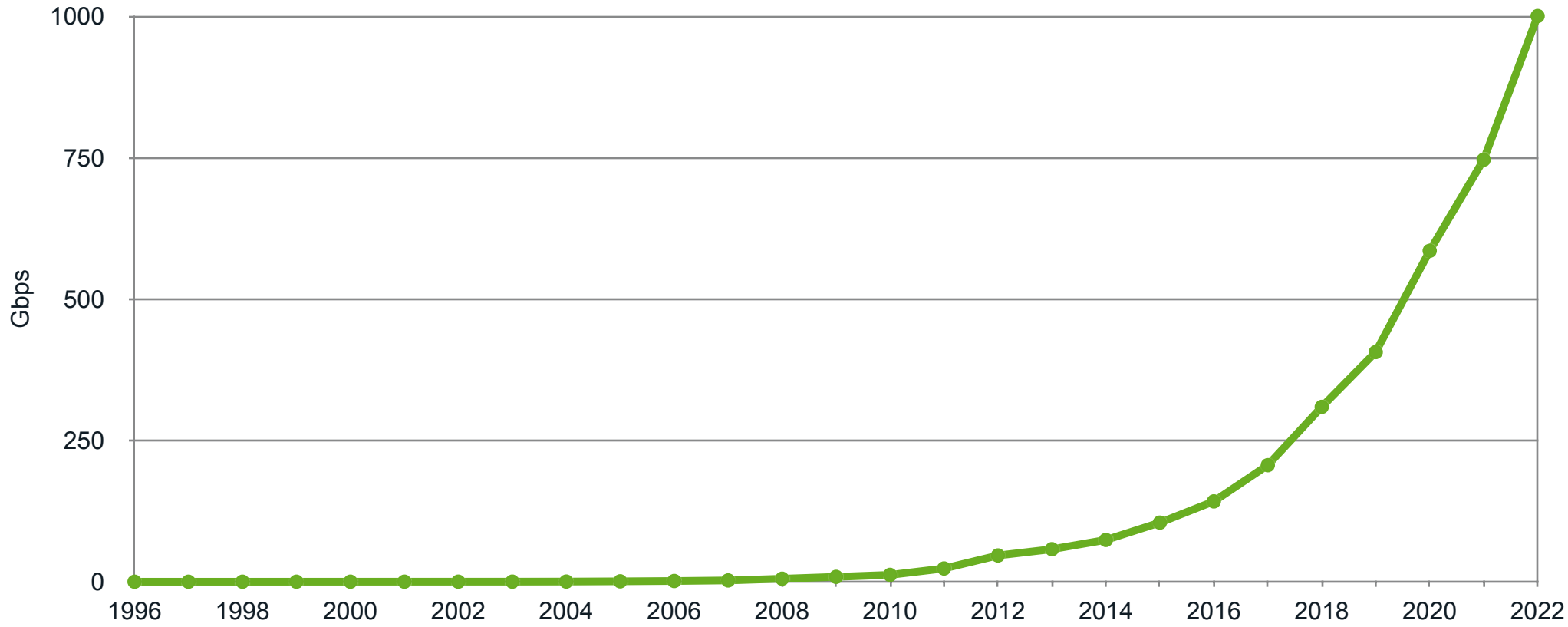
December 15th, 2022, Dublin

INEX
Traffic & Trends

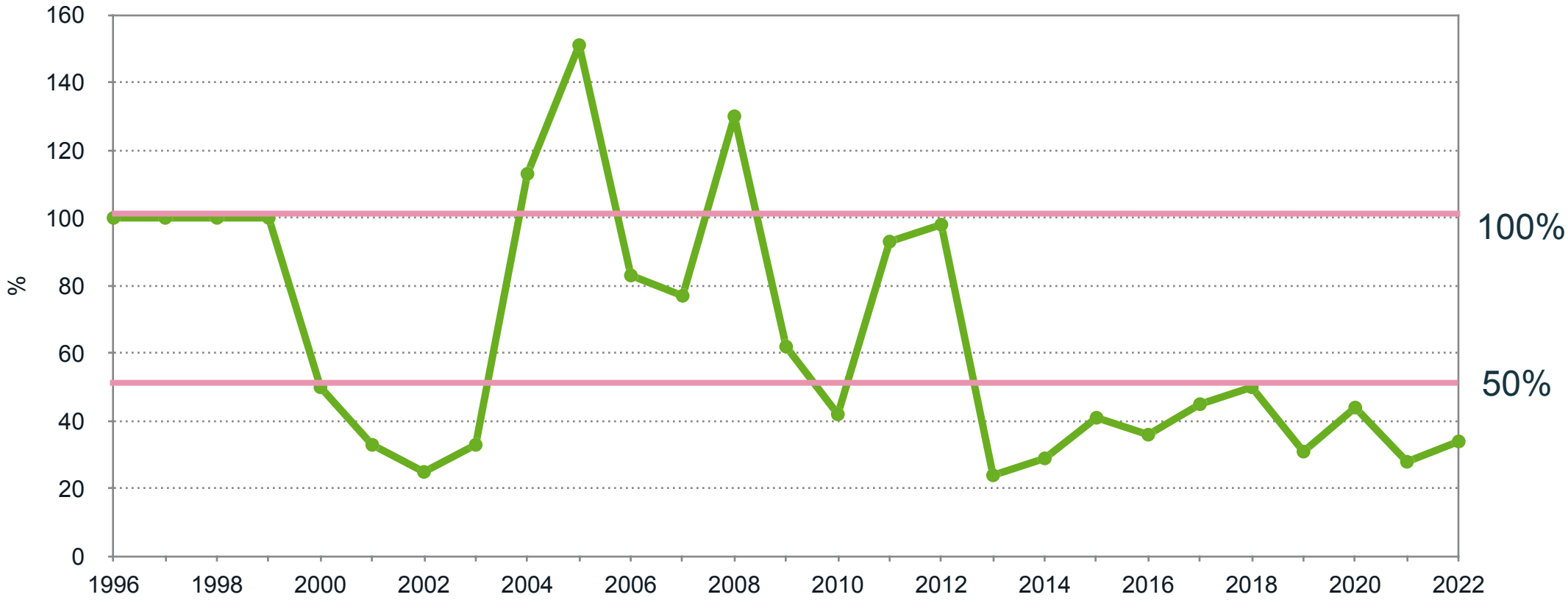
Connected Edge Capacity



Traffic Peaks :: 1996 - Now

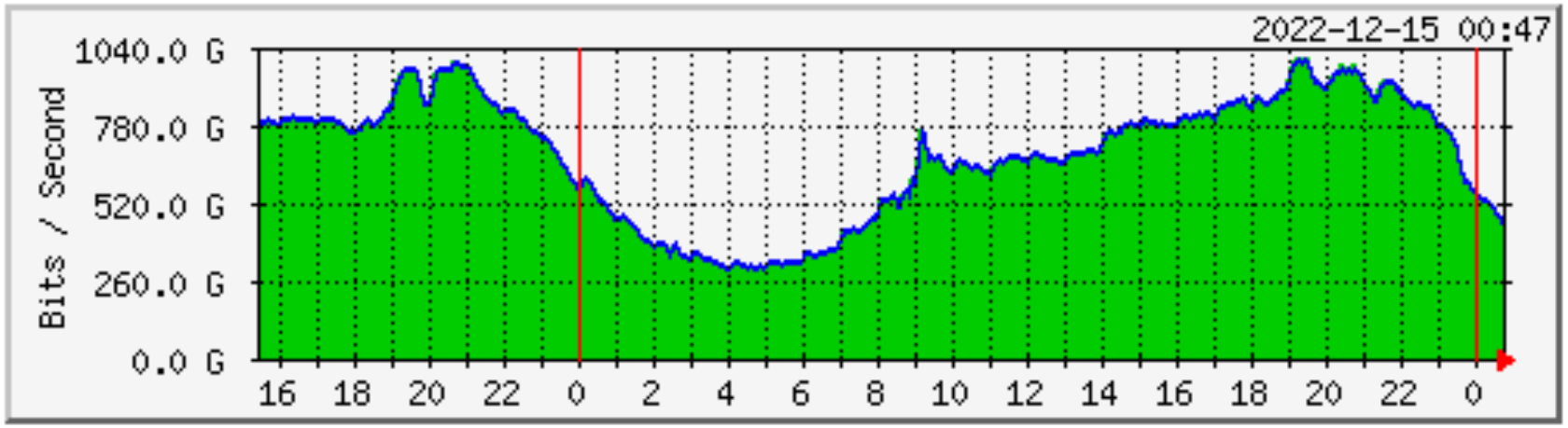


Traffic Peaks :: 1996 - Now - YoY Growth



Annual Trend / Growth - INEX

Day Graph

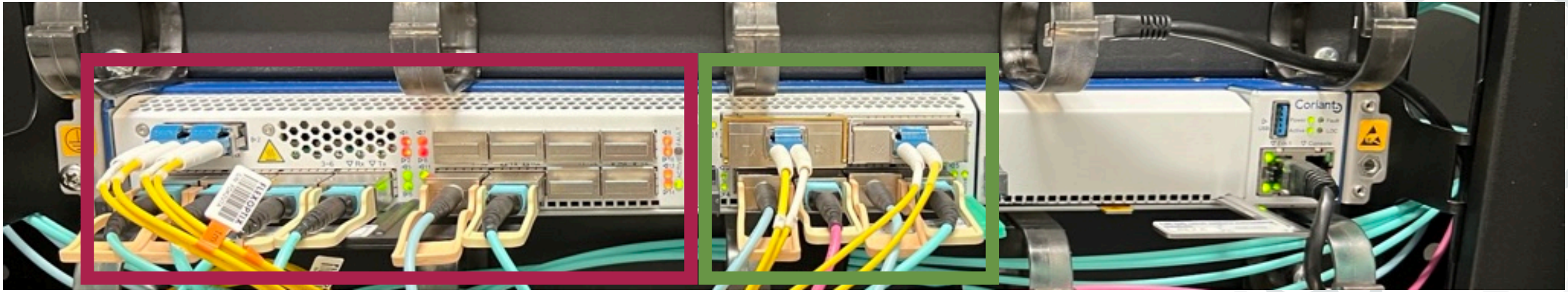


	Max	Average	Current
In	1.035 Tbits	678.955 Gbits	429.351 Gbits
Out	1.020 Tbits	677.840 Gbits	429.337 Gbits

Operations Update

Core Network

Optical Line Equipment - Infinera GX G30



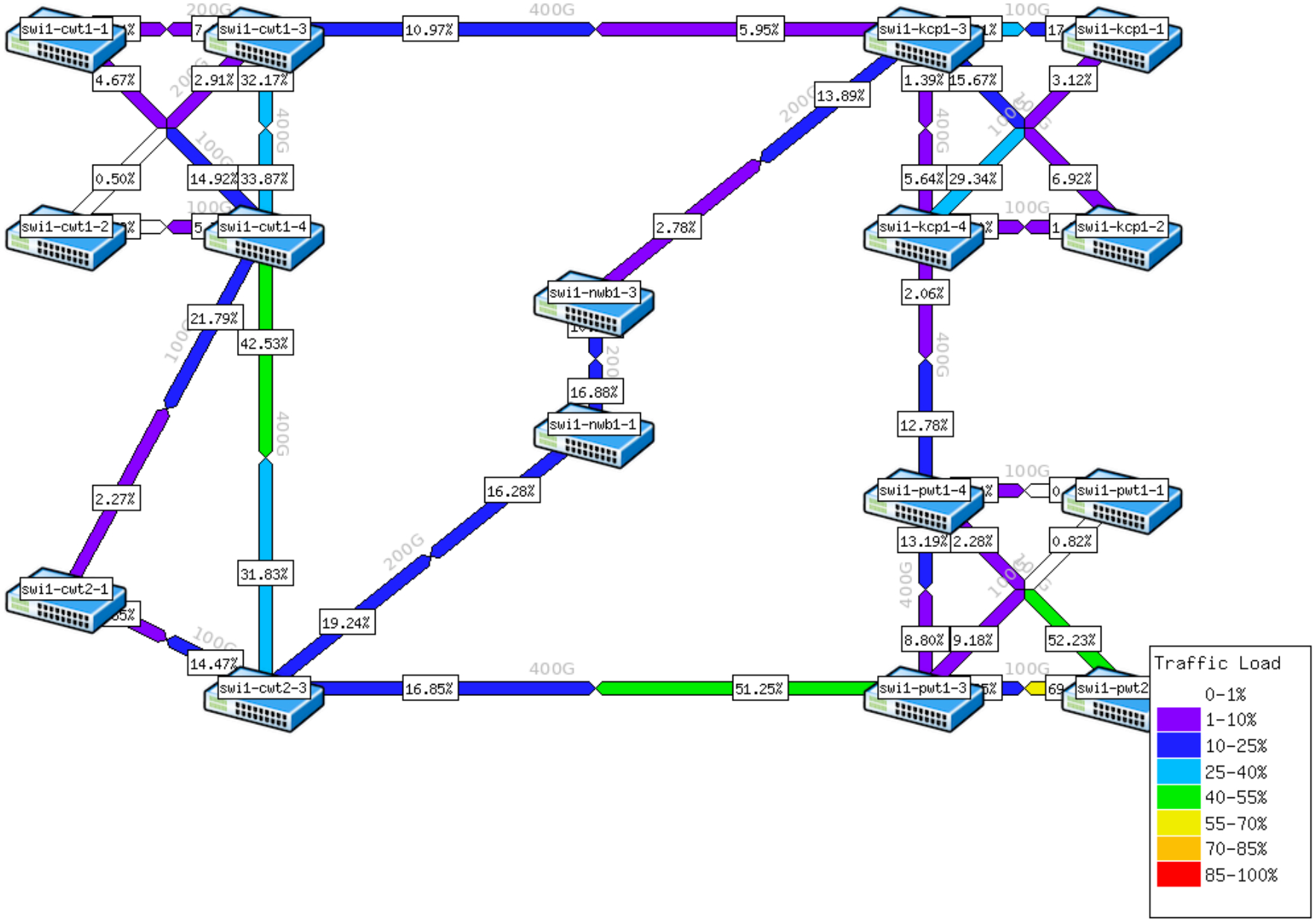
CHM2T

Line: 2 x 600Gb
Client: 12 x 100Gb
Or 3 x 400Gb

CHM1G

Line: 2 x 200Gb
Client: 4 x 100Gb

INEX LAN1 - Weathermap



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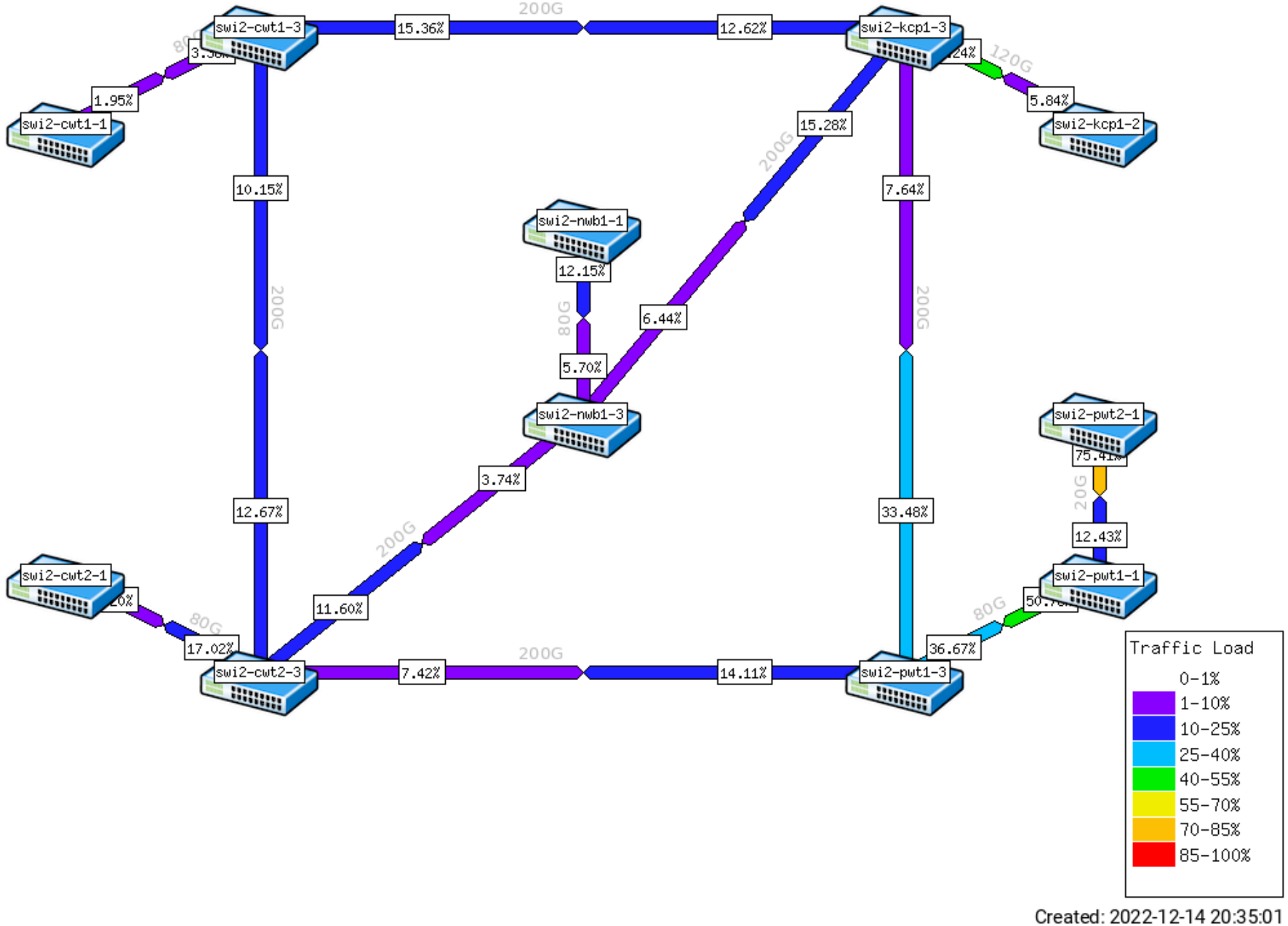
INEX LAN2 - Weathermap



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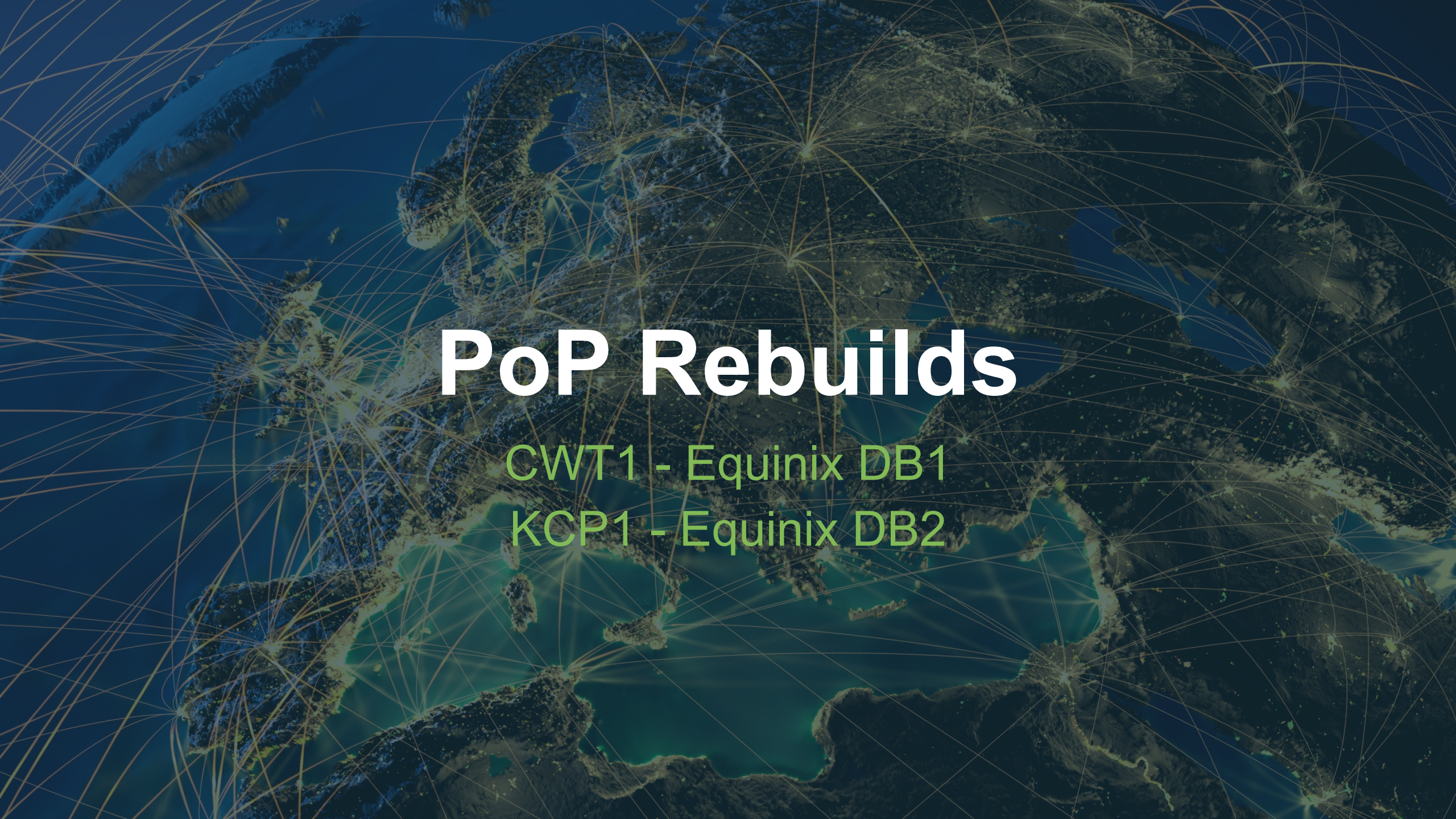
Core Network Upgrades in 2023

- Increase core capacity of LAN1 to 600Gb
  - Mostly optics and RTU licences
- Augment PWT1/PWT2 LAN1 capacity to 2 x [2 x 100Gb LAGs]
- Augment PWT1/PWT2 LAN2 capacity to [4 x 10Gb LAG]
- Estimate LAN2 core to 400Gb not required until 2024



PoP Rebuilds

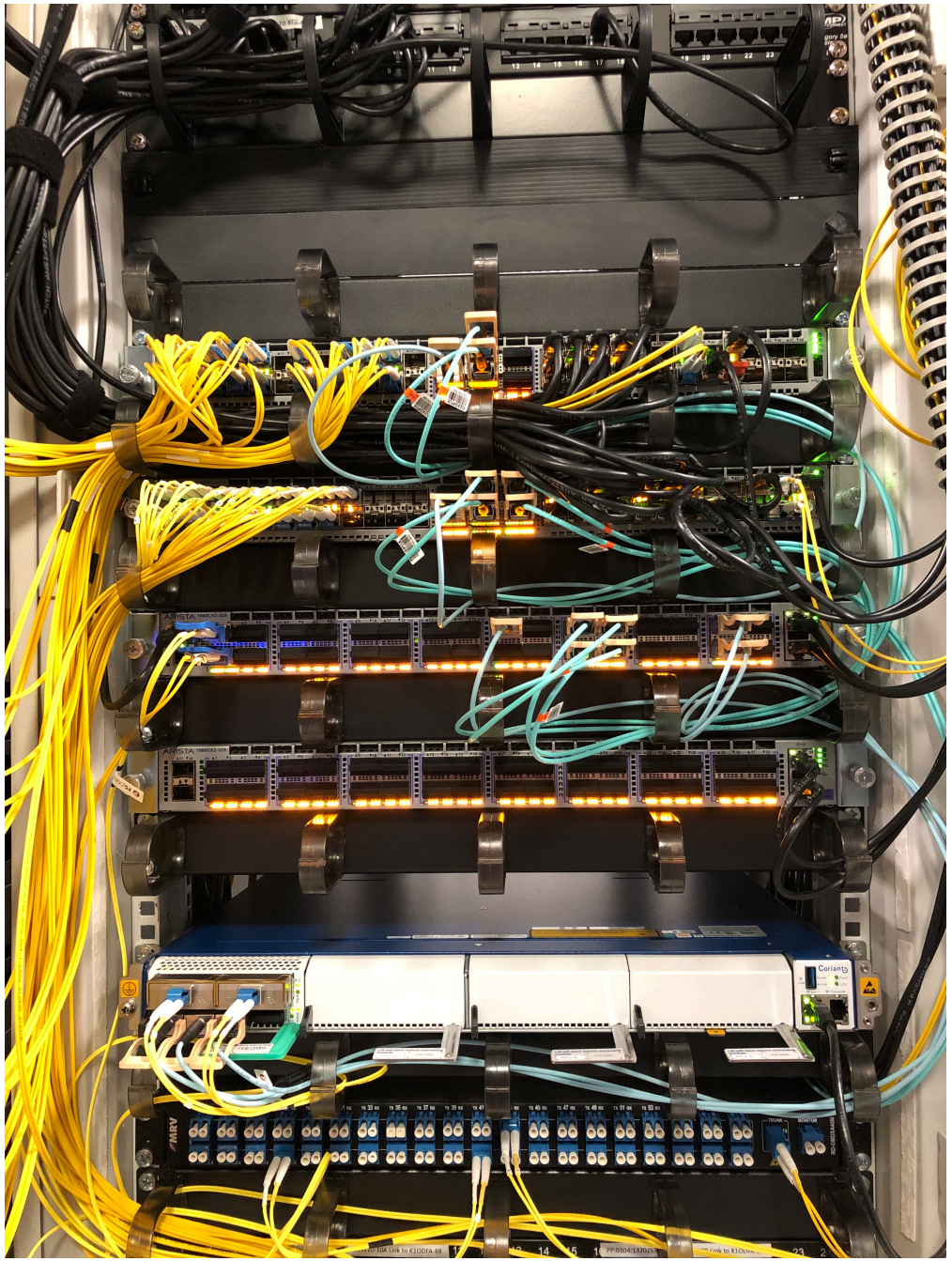
CWT1 - Equinix DB1

KCP1 - Equinix DB2

PoP Rebuilds

- Existing cabinets are not fit for purpose
  - Old style 1990s telco design
  - 600/800mm; solid doors; bottom-to-top ventilation.
  - No possibility of vertical cable management
  - Zero-U PDUs impede racked kit
  - No top of rack access for structured cabling

- Structured cabling shows measurable degradation due to age
  - Physical wear and tear; deplasticisation; ferrule degradation



BTCW1347 TO MMR1 ODF1
BTCW2059
BTCW2060
SR3 A45 PP UHD 1U BT1
FirstLight.UHD
BTCW1348 TO MMR2 ODF1
SR3 A45 PP UHD 1U BT2
FirstLight.UHD

PoP Rebuilds

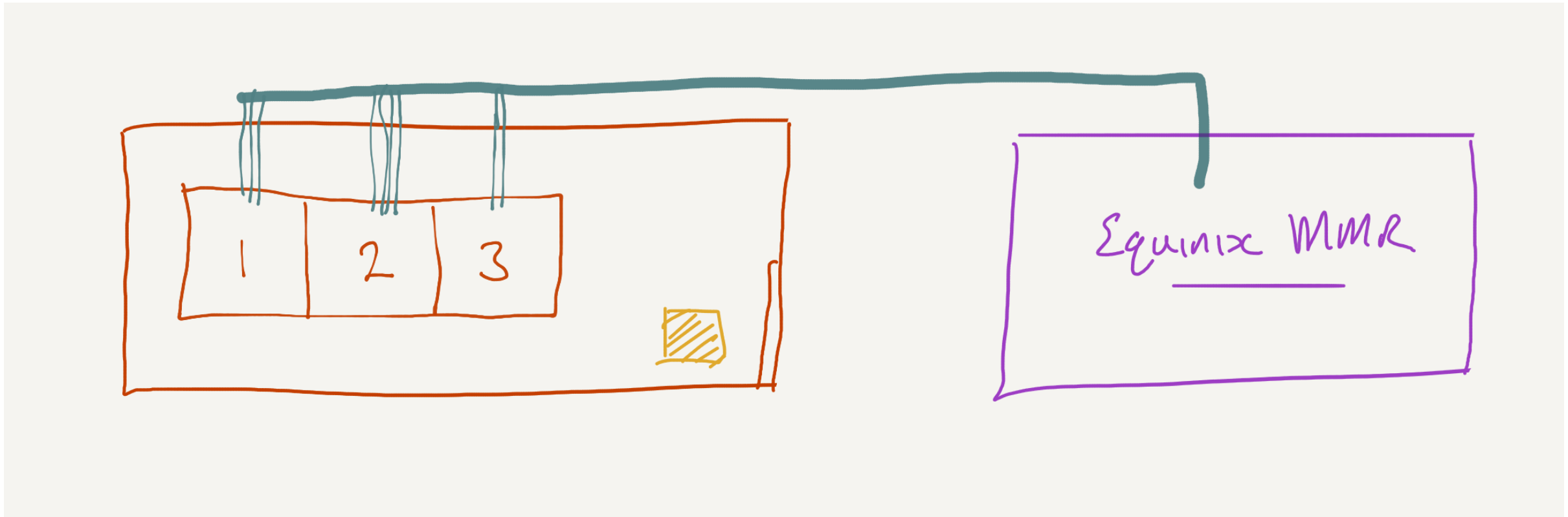
- In place cabinet replacement?
  - Insufficient physical space in DB2 to accommodate
  - Not supported by Equinix
  - Carries greater risk and potential down time

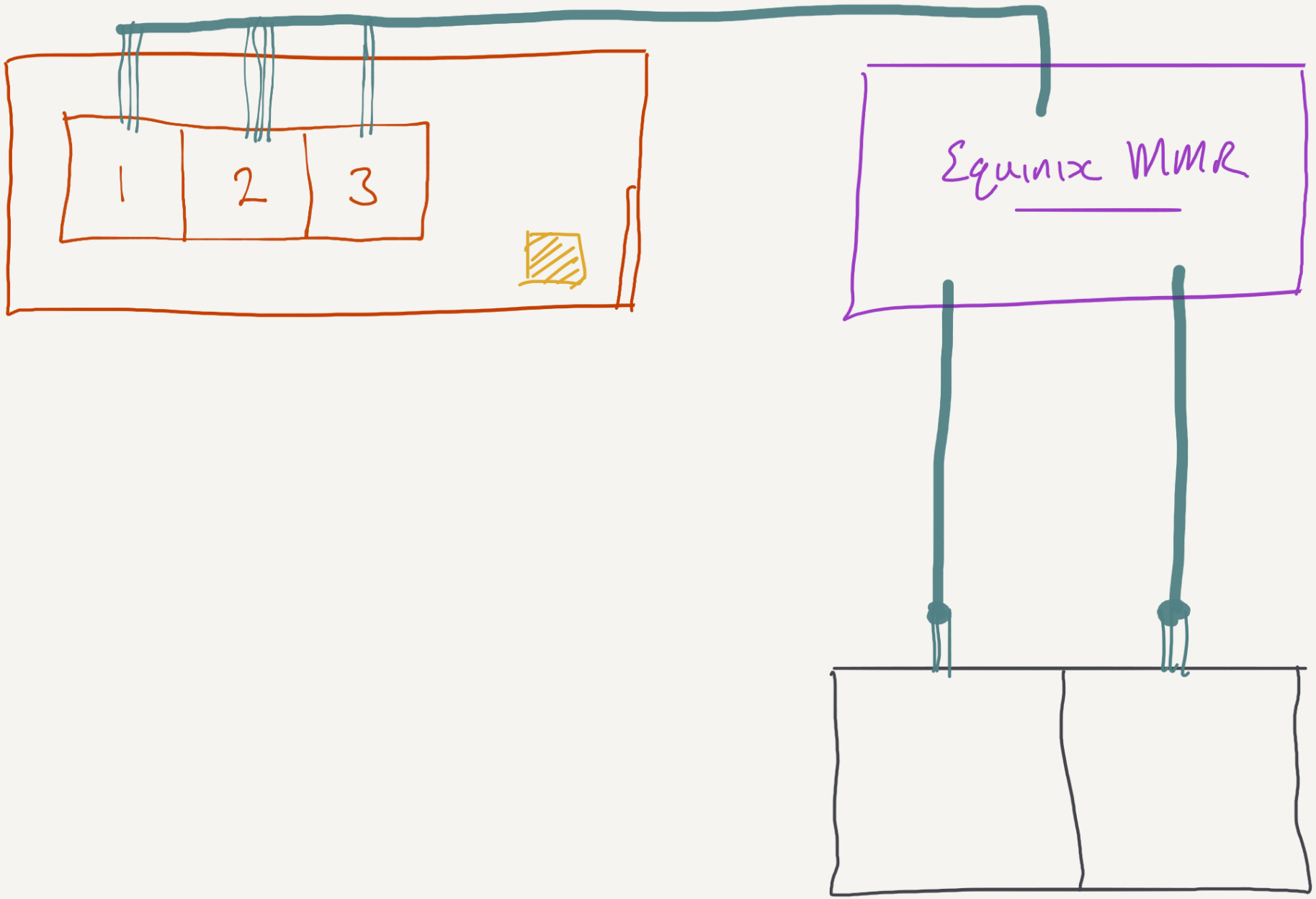
- Equinix DB1
  - New cabinet alongside existing two
  - No requirement for temporary structured cabling
  - Ultimately reducing two cabinets to one

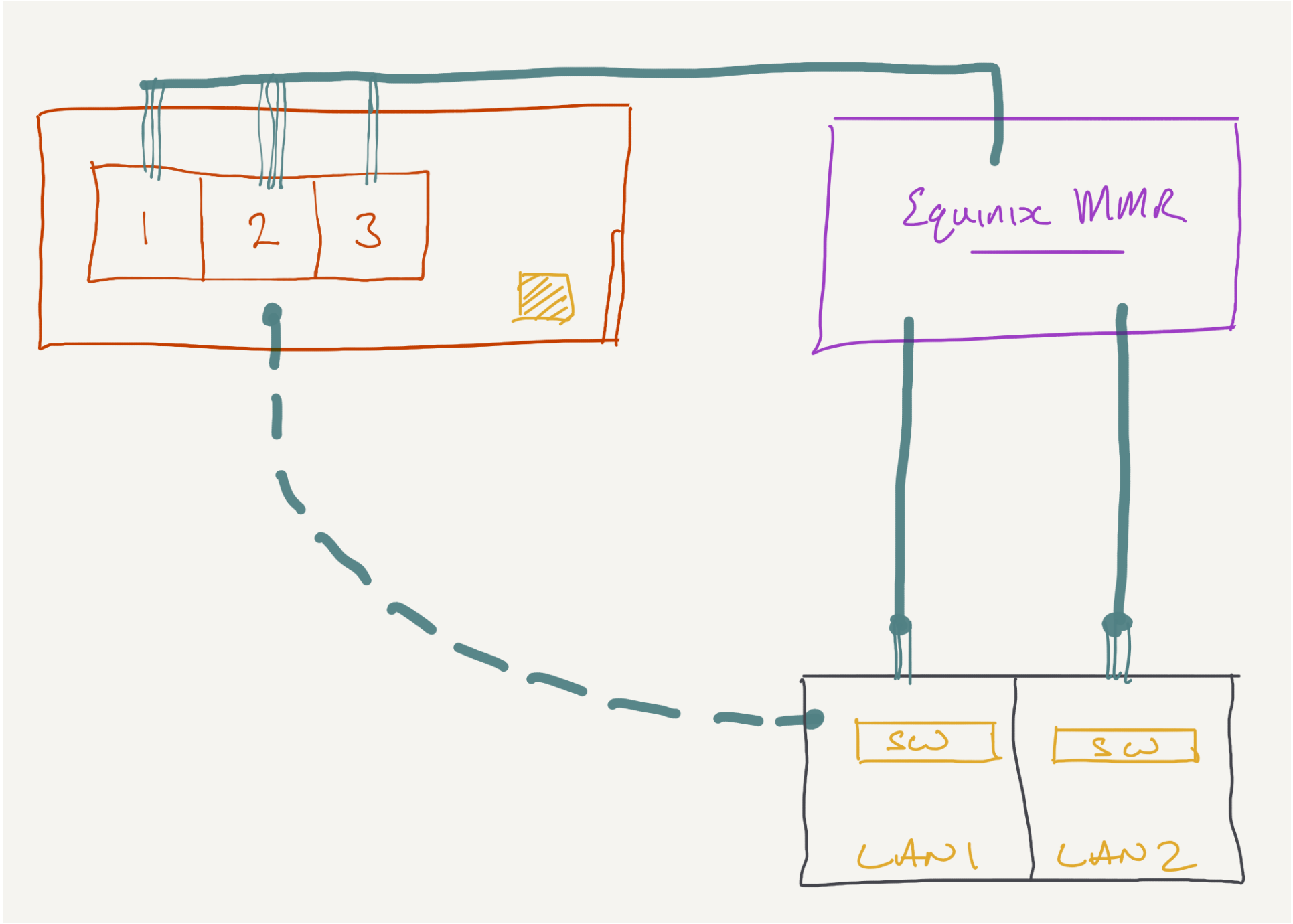
PoP Rebuilds

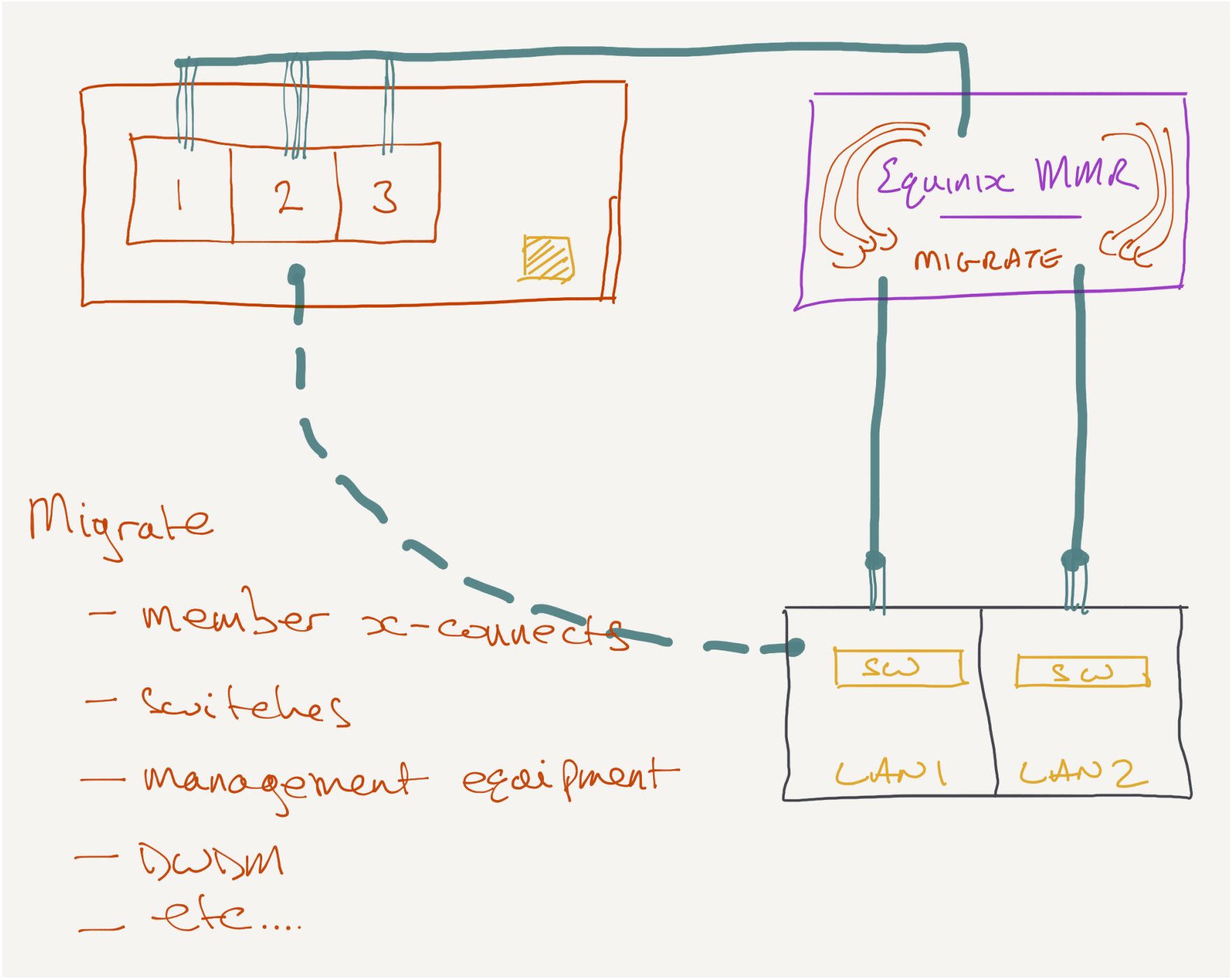
- Equinix DB2
  - Two new cabinets in a new location, side by side
  - Requirement for temporary structured cabling
  - Ultimately reducing three cabinets to two

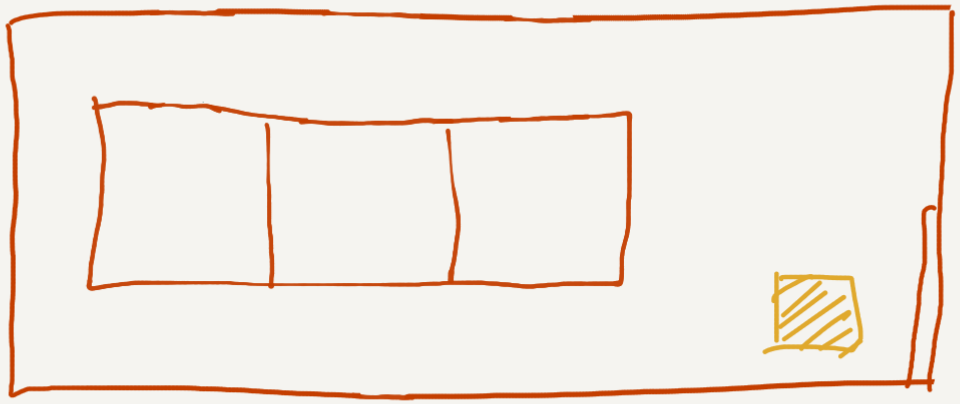
- Plan agreed and supported by Equinix teams
  - PoPs migrated consecutively (single point of focus)
  - Supported by Equinix Migrations Team for cross connects
  - Service-affecting components during weekend daytime hours

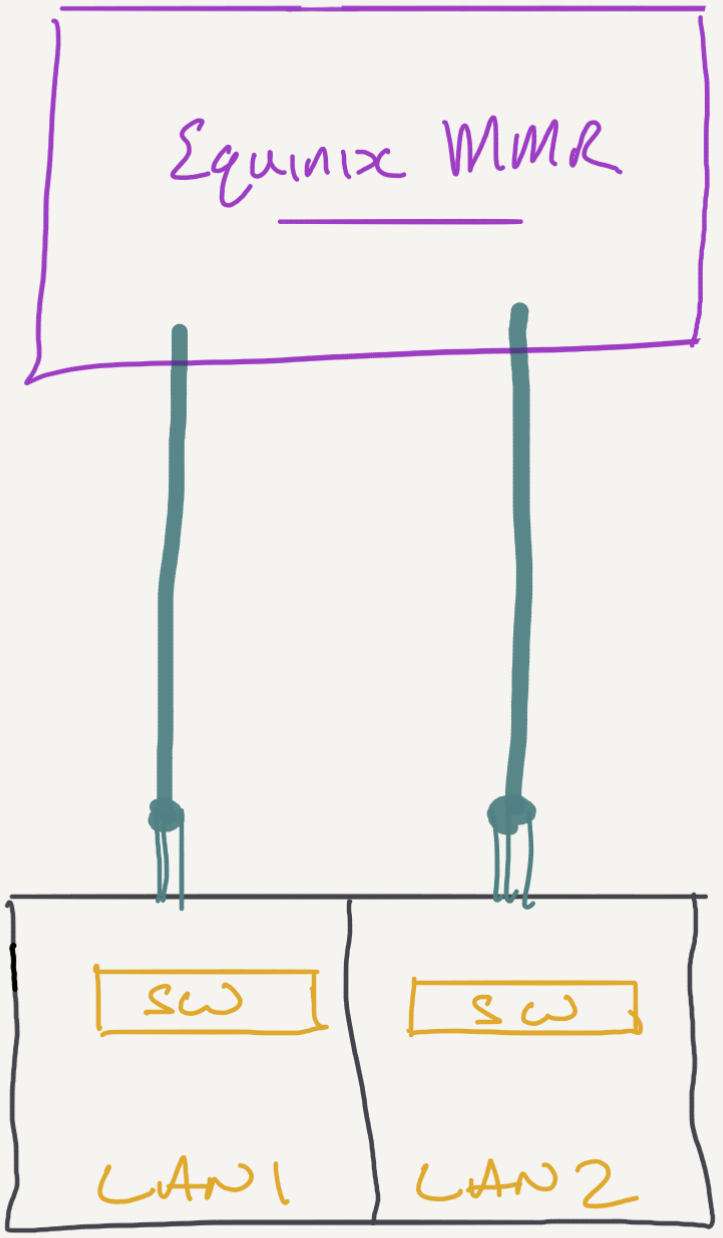

1
2
3
Equinix MMR


1
2
3
Equinix MMR


1
2
3
Equinix MMR
SW
SW
LAN1
LAN2

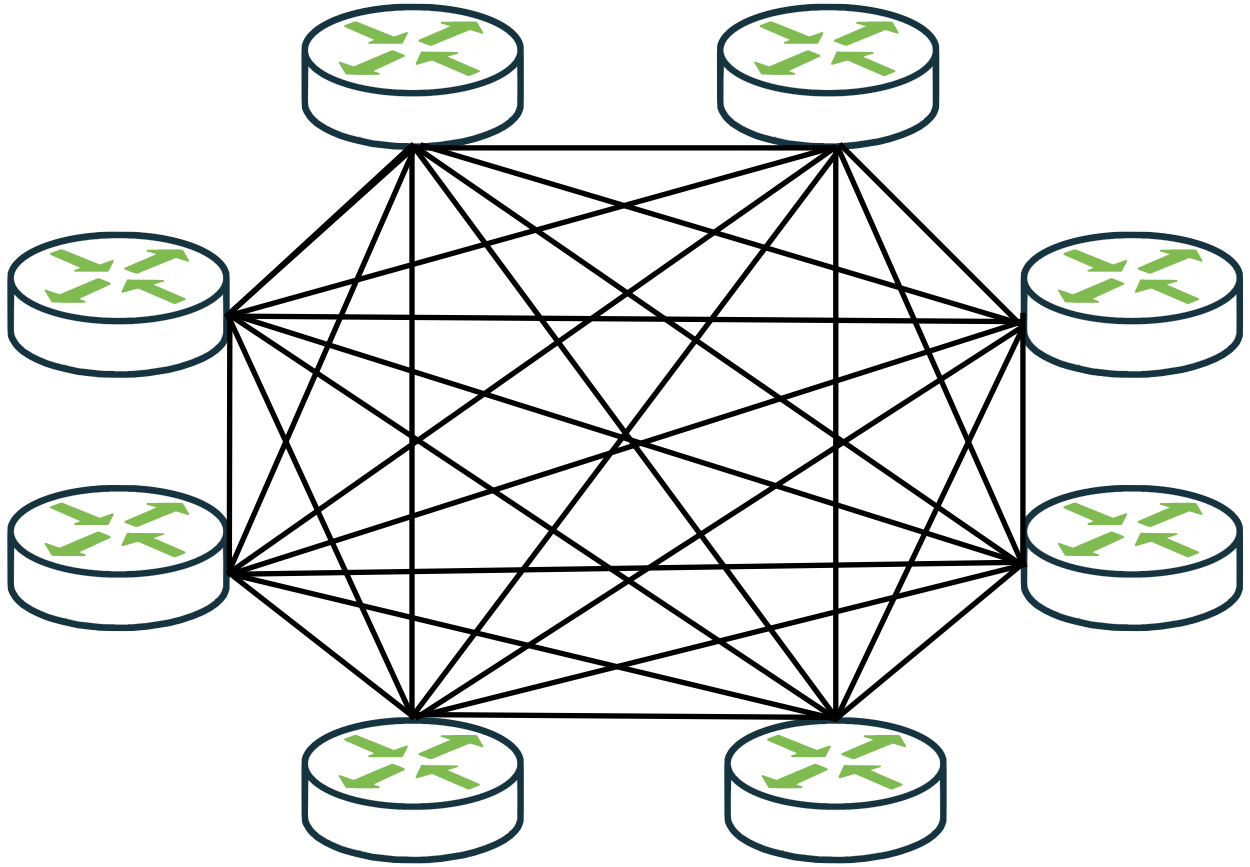

1
2
3
Equinix MMR
MIGRATE
SW
SW
LAN1
LAN2
Migrate
- member x-connects
- switches
- management equipment
- DWDM
- etc....




Equinix MMR
SW
SW
LAN1
LAN2

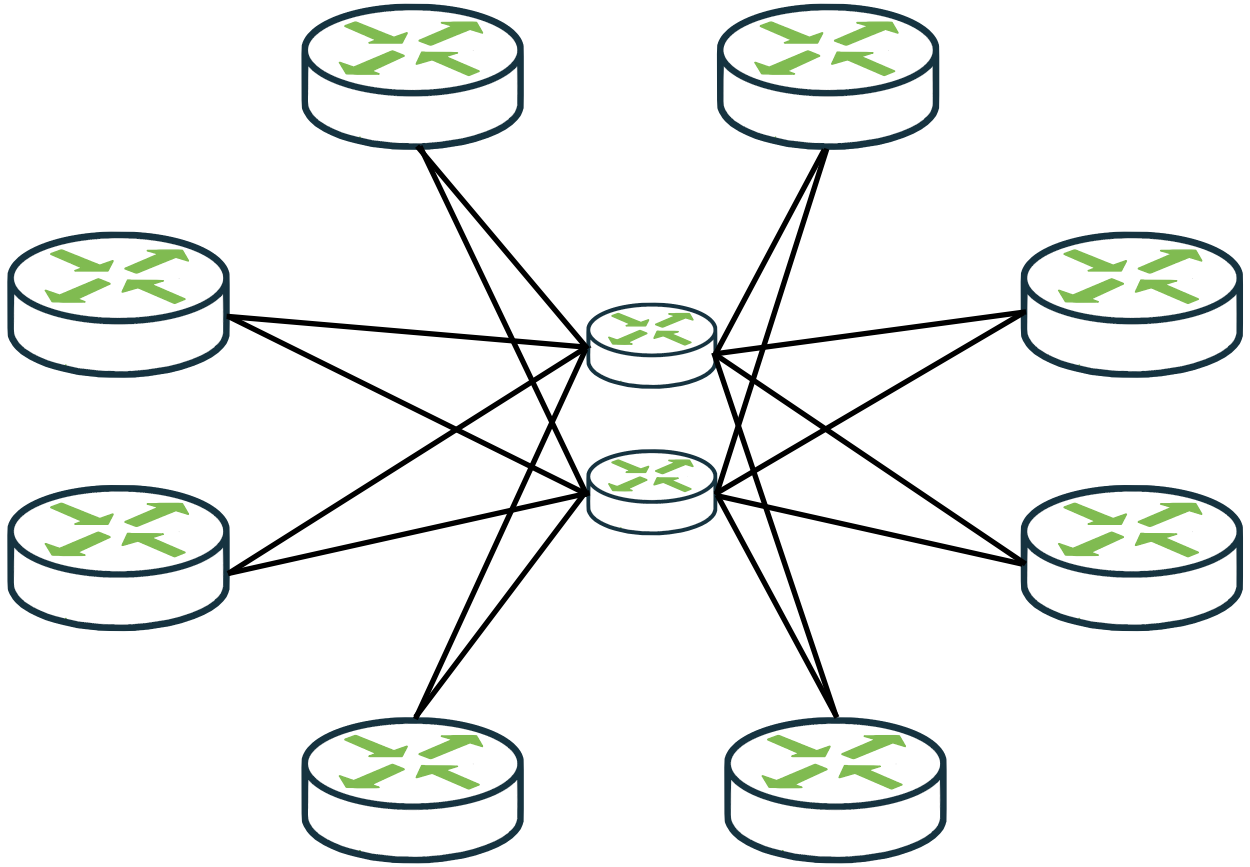
Route Servers & Filtering

An IXP Without Route Servers



- $\frac{n(n-1)}{2}$ bilateral sessions
- 8 members - 28 sessions
- 100 members - 4,950 sessions

An IXP Without Route Servers



- RFC7947 - *multilateral interconnection using a third-party brokering system.*
- Unlike route reflectors, route servers operate with EBGP.
- Attribute and AS path transparency - ‘acts as if it’s doesn’t exist’.
- Critical infrastructure at an IXP.

The Need for Route Server Filtering

- You are essentially “outsourcing” your routing policy
  - Usually fine - most networks peer openly at an IXP
- “I want to peer with everyone except X”
  - Route servers need some knobs to allow this
- Mostly standardised BGP community schema provides this
  - https://github.com/euro-ix/rs-workshop-july-2017/wiki/Route-Server-BGP-Community-usage
- Certainly standardised at over 200 exchanges using IXP Manager

(Large) Community Based Filtering

Action	Community
Prevent announcement of a prefix to a peer	`43760:0:peer-as`
Announce a route to a certain peer	`43760:1:peer-as`
Prevent announcement of a prefix to all peers	`43760:0:0`
Announce a prefix to all peers *(default)*	`43760:1:0`

NAMESPACE : ACTION : TARGET

Extra Filtering Options Large Communities

Action	Community
Prepend to peer AS once	`43760:101:peer-as`
Prepend to peer AS twice	`43760:102:peer-as`
Prepend to peer AS thrice	`43760:103:peer-as`

peer-as == 0 ===> ALL PEERS

NAMESPACE : ACTION : TARGET

Community Based Filtering in Practice

- Difficult at both ends of the network-size scale:
  - Small networks rarely touch their border routers
  - Large networks need cumbersome change control procedures

- Very complicated in a pinch
  - Community filtering is only half the story!
    - Still need to filter the routes you learn from the route servers

- DDoS events of Q2 2021
  - INEX Operations implemented route server filtering on an emergency basis for a number of members.

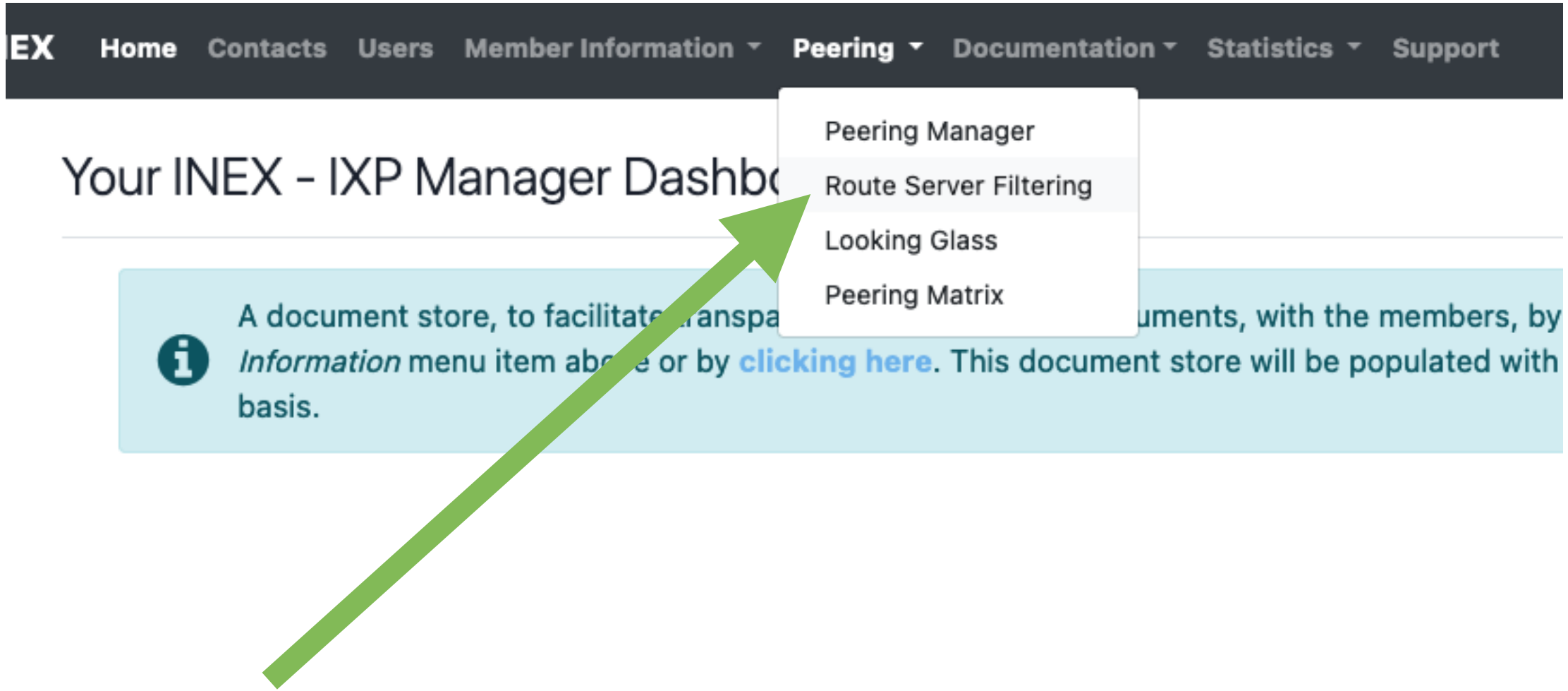
UI Based Filtering in IXP Manager

UI Based Filtering in IXP Manager

- Purpose: move the complexity from member router to route server (RS)

- Mechanism is unchanged - just where it happens moves:
  - RS tags your routes in ingress rather than you doing it on egress
  - RS filters routes to be advertised to you on egress rather than you on ingress

1. Intended for relatively simple routing policies
2. Consider how you order your rules
3. **If in doubt, just contact INEX Operations**


EX
Home
Contacts
Users
Member Information
Peering
Documentation
Statistics
Support
Peering Manager
Route Server Filtering
Looking Glass
Peering Matrix
Your INEX - IXP Manager Dashbo
A document store, to facilitate transpa uments, with the members, by
Information menu item abo e or by clicking here. This document store will be populated with
basis.

Route Server Filtering for AS112

Your filters are not in sync with our production configuration. You can continue editing or: Revert Commit

Staged Rules (Deploy via Commit above)

Peer	LAN	Protocol	Advertised Prefix	Advertise Action	Received Prefix	Receive Action	Enabled	Order	Actions
HEAnet	Peering LAN 1	Both	*	Do Not Advertise	*	Do Not Receive (Drop)	Yes	1	

Rules in Production

There are no filters in production.

Route Server Resilience

Background

- Route servers considered a critical production service
  - Deployed in pairs on each LAN

- Run on Dell hypervisors treated as production network appliances
  - No other function
  - Dual PSU, hardware RAID, iDRAC
  - Deployed in different PoPs
  - Full array of monitoring / checks

Previous Configuration Update Method

- Via script ~4 times per day, offset against its resilient route server

- Sanity check - don't install a rs2 config on rs1 ('rs1-lan1-ipv4')
- Check retval for curl api call for config
- Check downloaded file exists and is non-zero size
- Check there are member BGP config stanzas in file (grep)
- Use Bird to parse the config file and check retval
- Backup old config file and replace with new
- Is Bird running? Either start or reconfigure as appropriate
- If reconfiguring and it fails, revert to old configuration file
- API call to IXP Manager to signal update complete

New Configuration Update Method

- On demand and no longer offset. Script augmented:

- IXP Manager database updated so that all routers now have named pairs
- Script now obtains a lock before starting the update process
  - A locked router prevents its pair from updating
- Additionally, old config and new config are diff'd
  - Bird only reloaded if configuration has actually changed
- API signal to mark update as complete also releases lock

- I.e. A failed update run will prevent the paired router from updating
- Stress tested/ing on the route collectors

Handle	Name	Vlan	Pair	Peering IP	ASN	Last Updated	Actions
rs1-cork-ipv4	RS1 - Cork - IPv4	INEX Cork	rs2-cork-ipv4	185.1.69.8	43760	5 minutes ago	
rs1-cork-ipv6	RS1 - Cork - IPv6	INEX Cork	rs2-cork-ipv6	2001:7f8:18:210::8	43760	3 minutes ago	
rs1-lan1-ipv4	RS1 - LAN1 - IPv4	INEX LAN1	rs2-lan1-ipv4	185.6.36.8	43760	36 minutes ago	
rs1-lan1-ipv6	RS1 - LAN1 - IPv6	INEX LAN1	rs2-lan1-ipv6	2001:7f8:18::8	43760	36 minutes ago	
rs1-lan2-ipv4	RS1 - LAN2 - IPv4	INEX LAN2	rs2-lan2-ipv4	194.88.240.8	43760	36 minutes ago	
rs1-lan2-ipv6	RS1 - LAN2 - IPv6	INEX LAN2	rs2-lan2-ipv6	2001:7f8:18:12::8	43760	36 minutes ago	

IXP Manager

IXP Manager

- www.ixpmanager.org -> Community -> Statistics
  - 126 of 205 IXPs using their IX-F Member Export API.
  - A further 72 IXPs using PeeringDB.
  - The remaining 7 are not currently polled.

- Provided with a NCC Group security audit of IXP Manager
  - Fixes in v6.3.

- Release v6.4 will include the route server filtering feature.

Thank you
INEX
INTERCONNECTING NETWORKS
AND PEOPLE FOR OVER 25 YEARS