Deploying a Backbone in APAC

How we failed,
What we learned,
What we changed

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Table of content

Who is F5
Backbone history
APAC deployment
Our experience

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Who is F5

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Who is F5

FROM HW/APPLIANCE

- You probably know F5 for the BIG IP
- F5 is often seen as a HW/Appliance company
- This was true a few years back but it’s no longer the case

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Who is F5

TO SAAS/SERVICES

F5 made multiple acquisitions (NGINX, Shape, Volterra, Silverline) to build a services portfolio (WAF, DDoS Protection, Edge computing…)

These services requires a strong underlying backbone to perform

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Backbone History

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Backbone History

- It all started as a small French network Start Up called Acorus Networks
- A few guys and a small network foot print, the goal was to be better at DDoS mitigation

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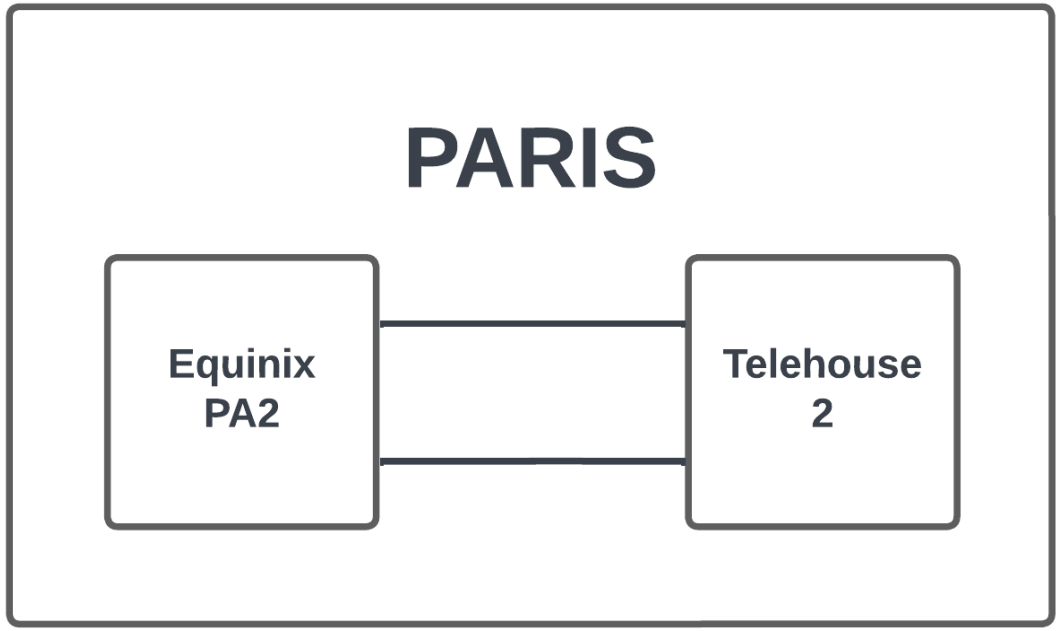
Backbone History

Started in France with the
2 main POPs in Paris



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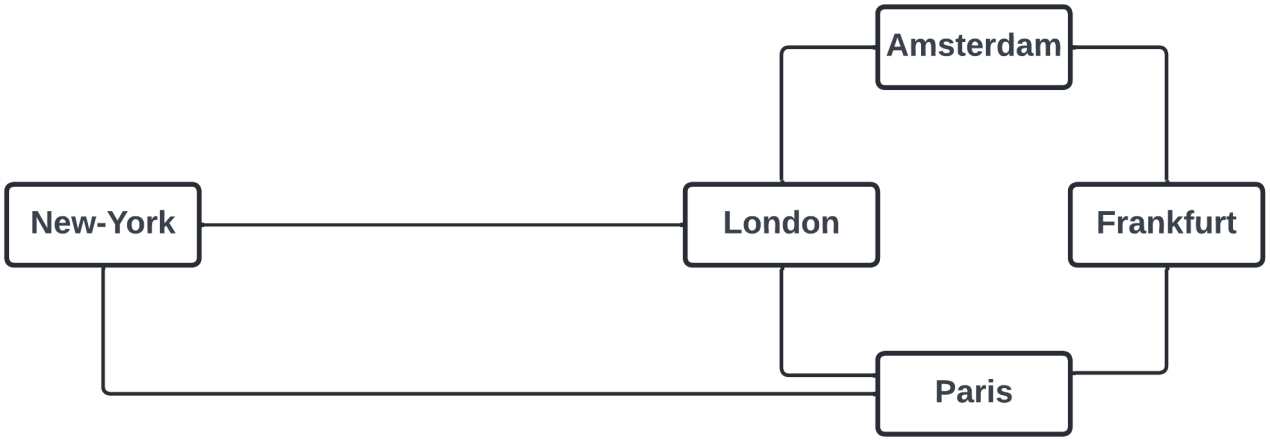
Backbone History



Expanded pretty fast to the main Europe locations and started to connect the US

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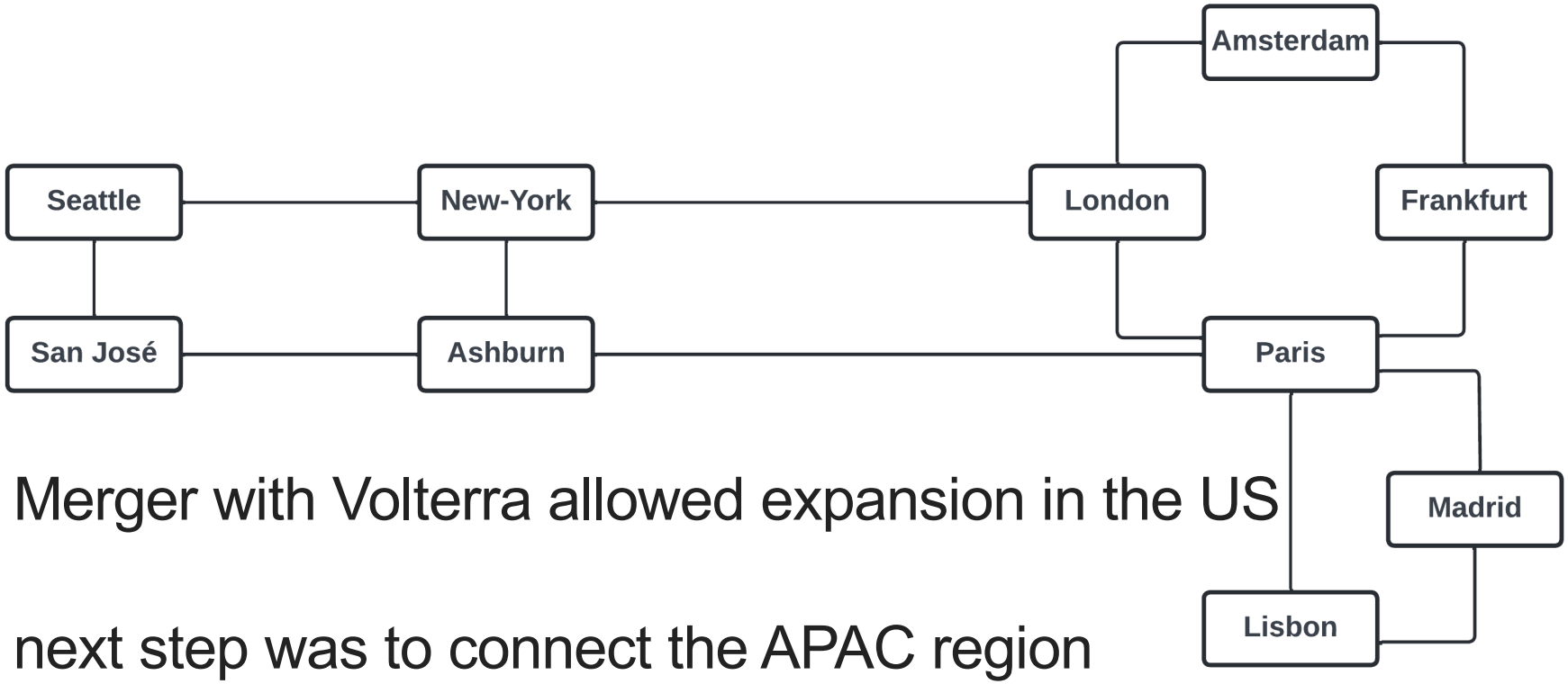
Backbone History



- The Merger with Volterra allowed expansion in the US
- The next step was to connect the APAC region

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APAC Deployment

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APAC Deployment

SEVERAL CHALLENGES

Distances / Latencies, Costs, Where do we start ?

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APAC Deployment

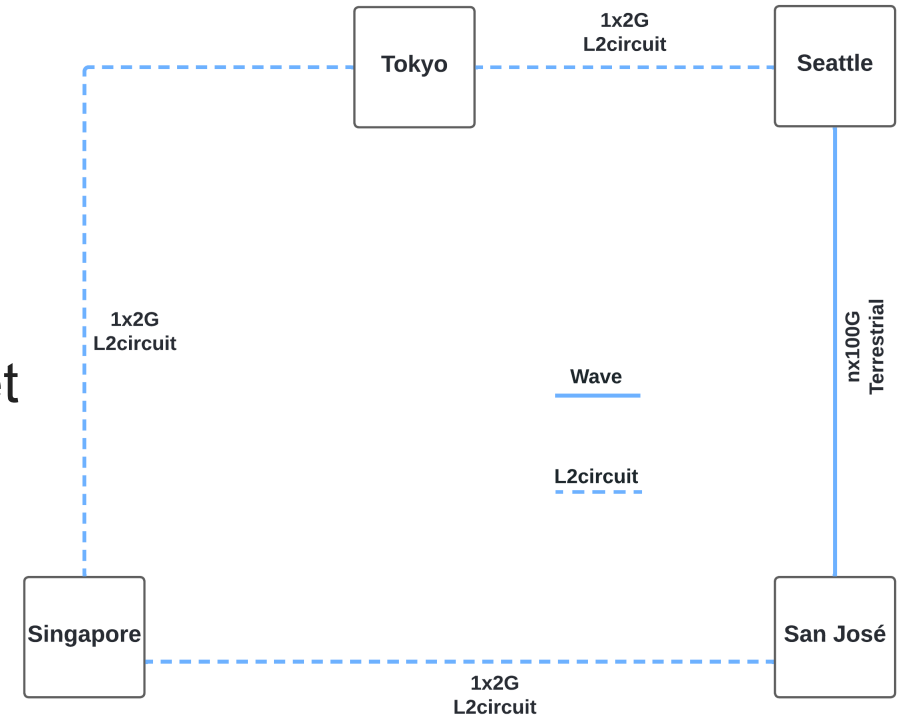
Q1-2020

Started with L2circuit with cost efficiency and resilience in mind

It was horrible : unreliable, frequent packet loss, hard down, latency increase etc

We worked with the provider to try to improve the situation with no results

After a few months we looked at other solutions



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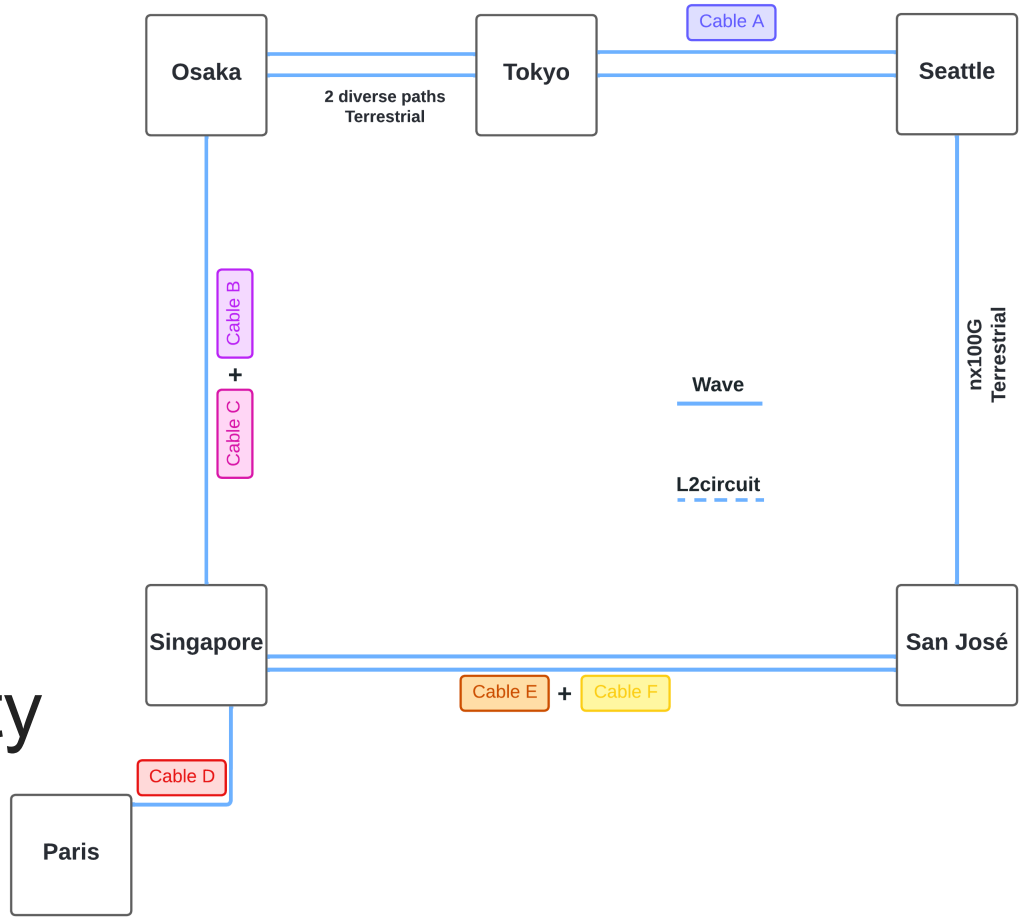
APAC Deployment

Q1-2021

- Ditched L2circuits
- Went with 10G Waves
- 3 Paths per POP
- Submarine cable diversity



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APAC Deployment

SINGAPORE TERRESTRIAL EXAMPLE

- We also studied terrestrial backhauls diversity between CLS* and POPs
- But it’s not enough
- Cuts happen frequently and can take several weeks until repaired
- Maintenances are more frequent than terrestrial cables in our experience

Singapore terrestrial backhauls

*CLS : Cable Landing Station

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Why so many issues ?

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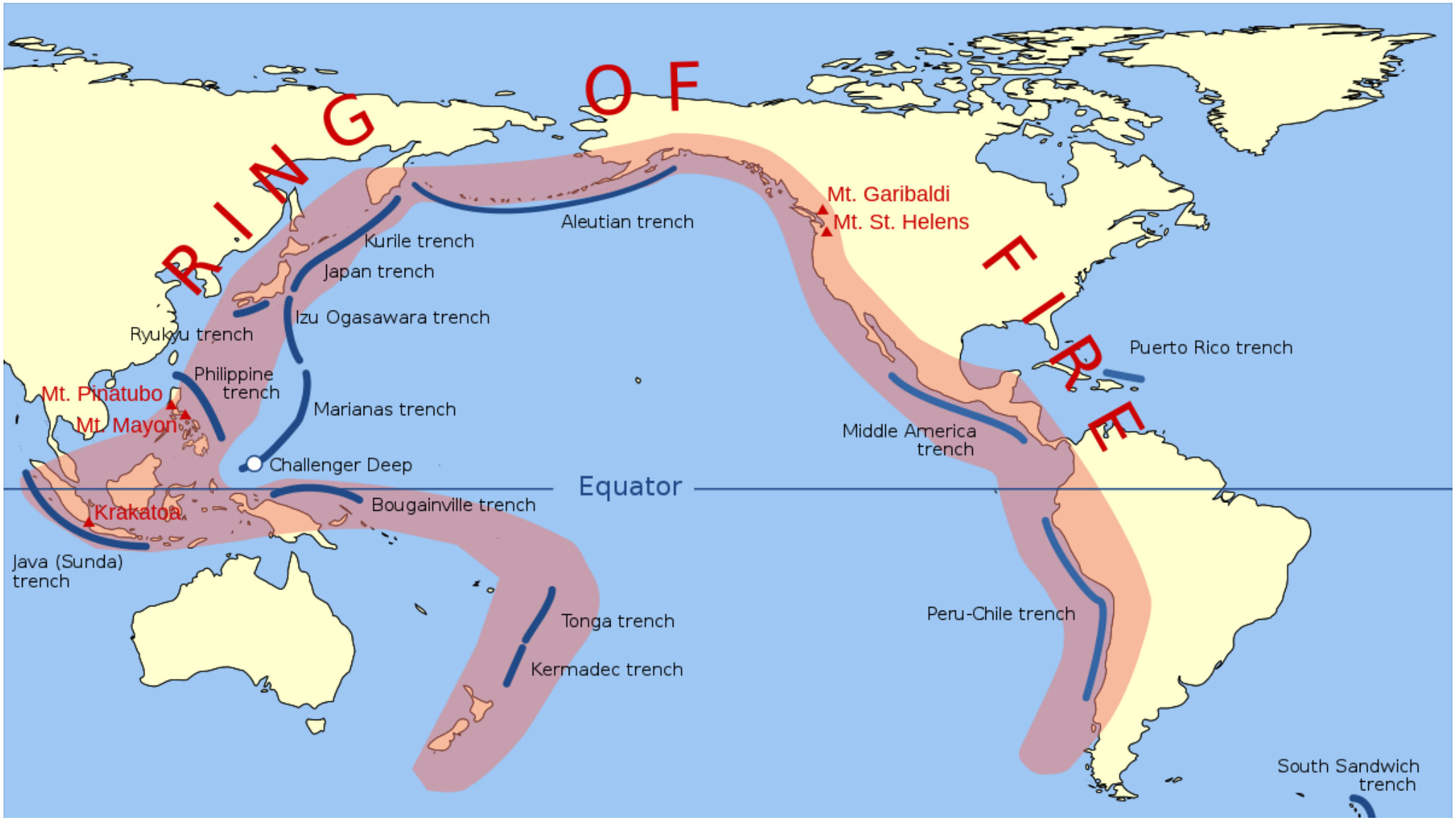
Singapore Harbor

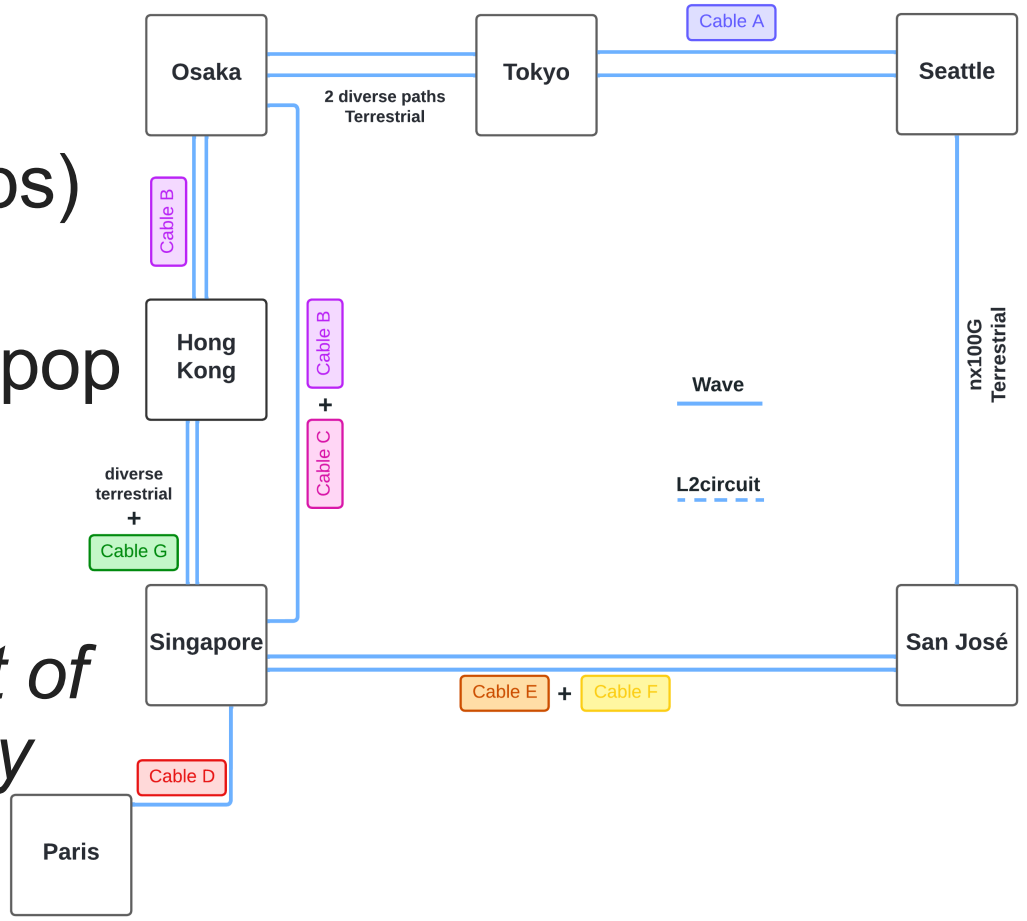

RING OF FIRE
Aleutian trench
Kurile trench
Japan trench
Izu Ogasawara trench
Ryukyu trench
Philippine trench
Mt. Pinatubo
Mt. Mayon
Marianas trench
Challenger Deep
Bougainville trench
Krakatoa
Java (Sunda) trench
Tonga trench
Kermadec trench
Mt. Garibaldi
Mt. St. Helens
Puerto Rico trench
Middle America trench
Equator
Peru-Chile trench
South Sandwich trench

APAC Deployment

Q3/Q4-2021

- Upgraded capacity (120 Gbps)
- Added more paths, new HK pop
- Still not enough

Now that the backbone is part of F5, as a global cloud company we have to and can do better



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Back to the drawing board

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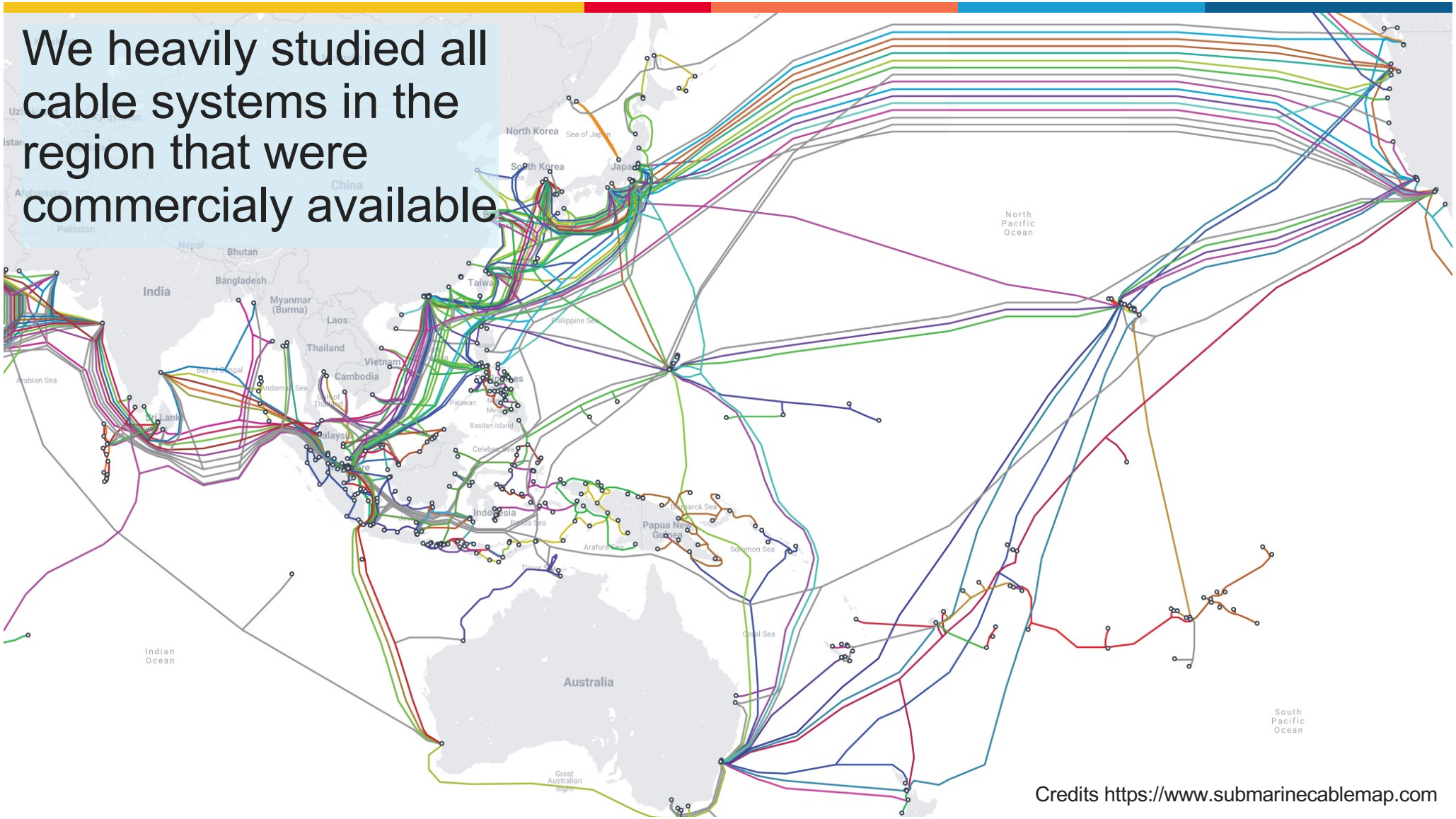
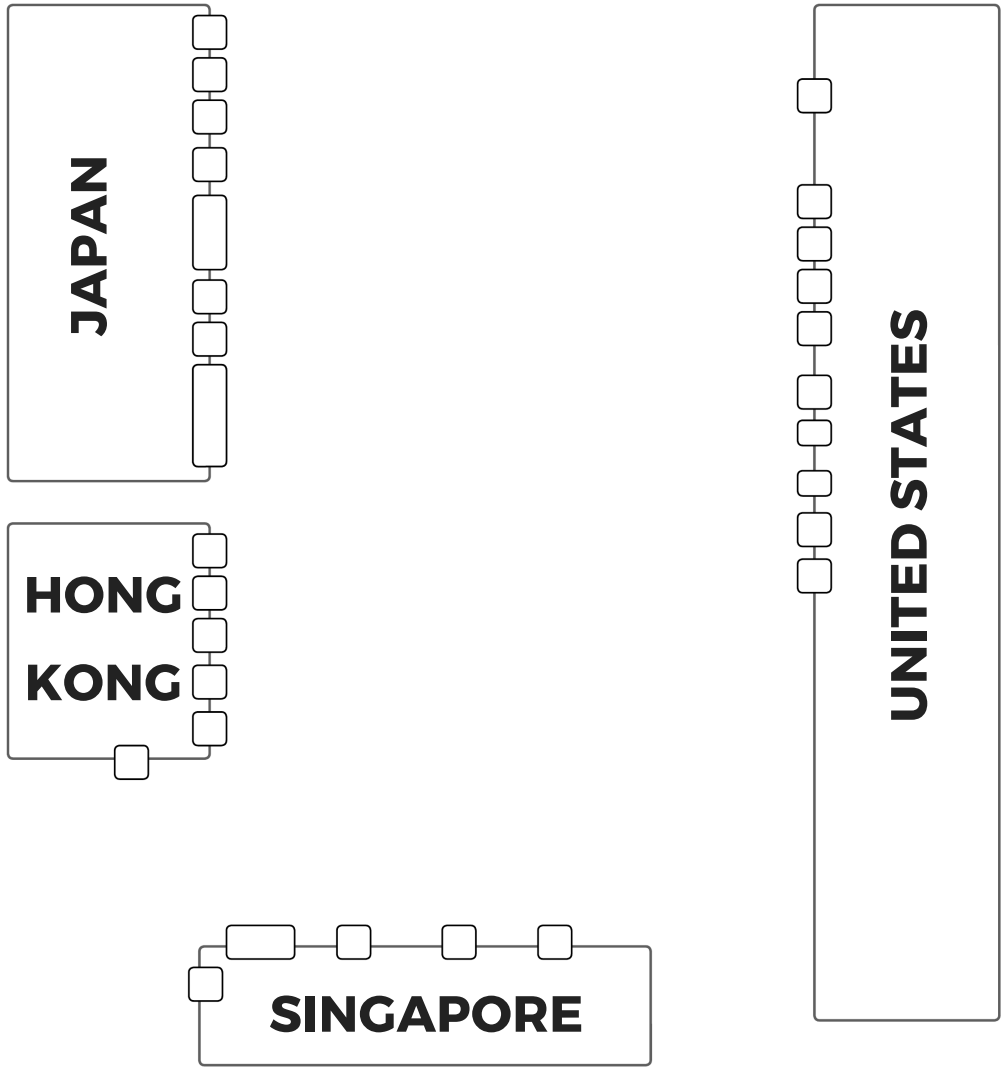
We heavily studied all cable systems in the region that were commercialy available



Credits https://www.submarinecablemap.com

Each small square/rectangle represent a CLS

(Cable Landing Station)



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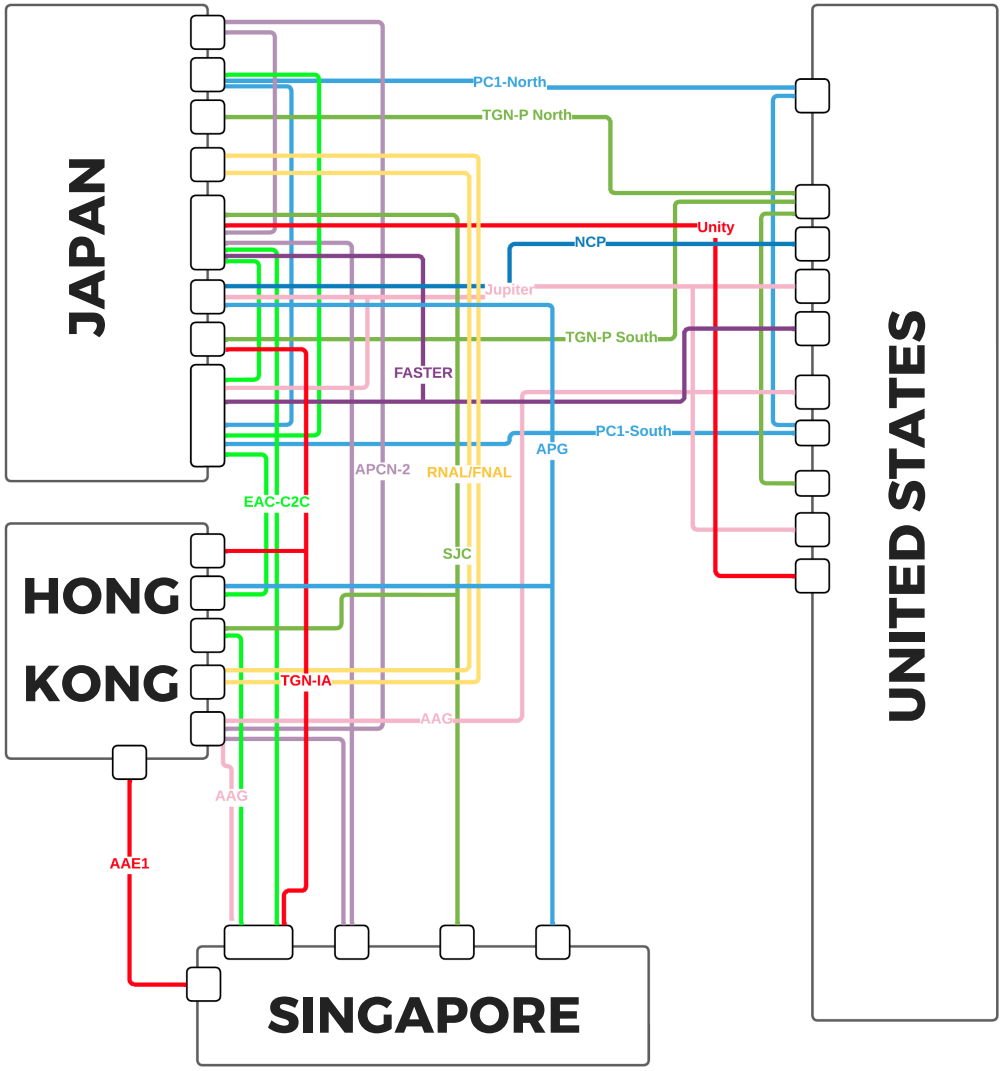
We mapped out most cable system we could get capacity on and studied the CLS diversity



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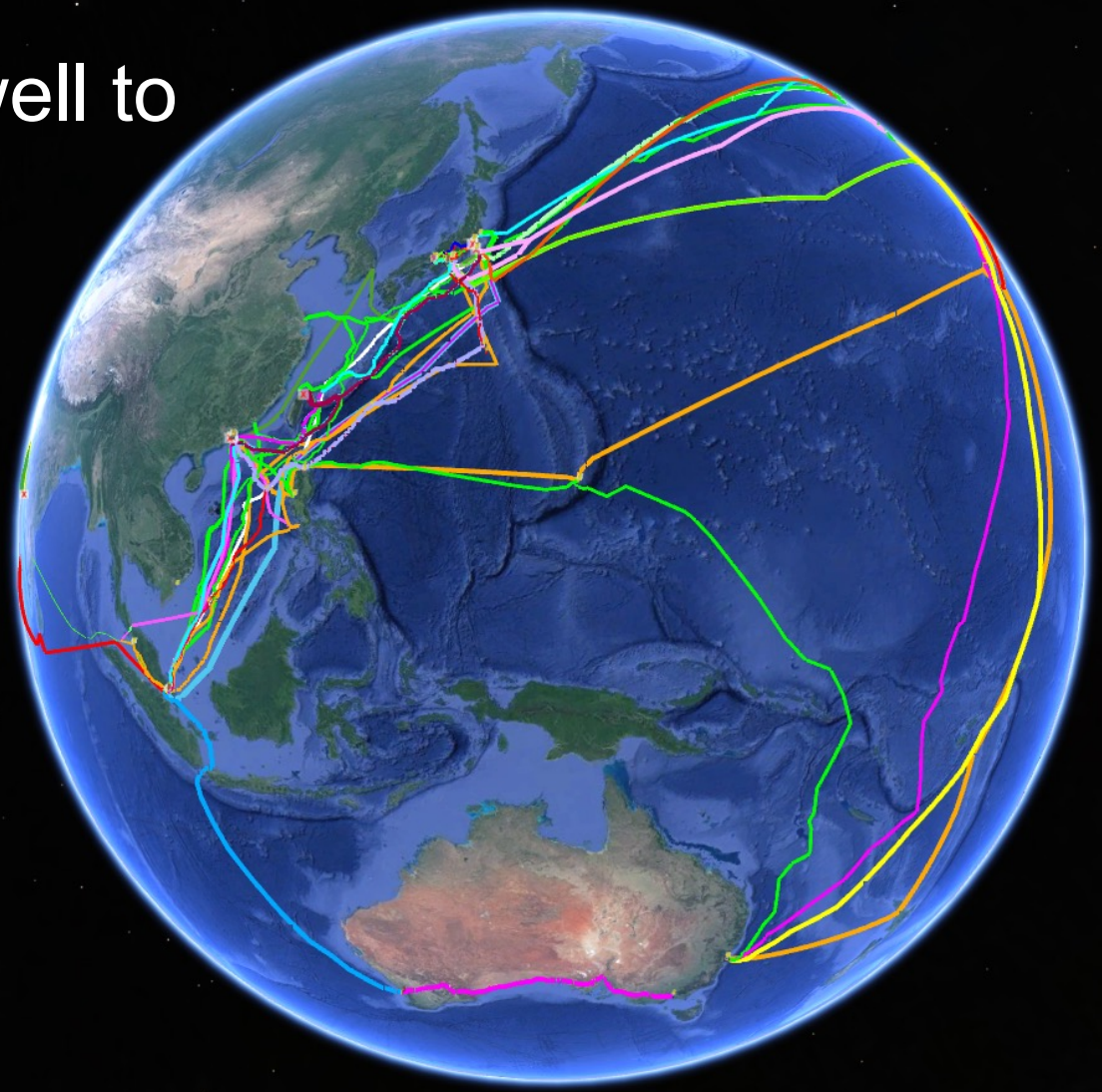
Mapping out all kmz as well to check diversity between CLS, BMH*, POPS

BMH : Beach Manhole, where the subsea cable meets terrestrial fiber to go to the CLS



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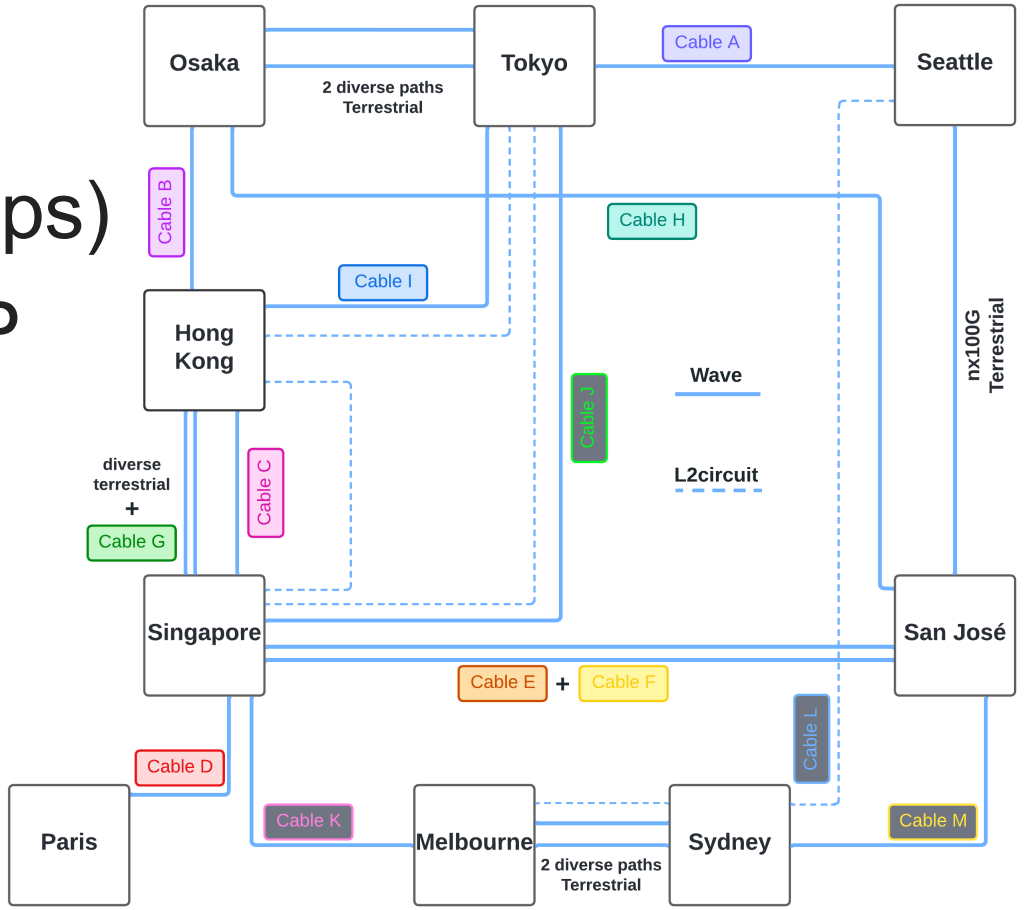
APAC Deployment

Q3-2022

- Upgraded capacity (1 Tbps)
- More paths (4+) per POP
- More cable diversity
- New POPs
- L2 as last resort backup

(not the same provider as last time)



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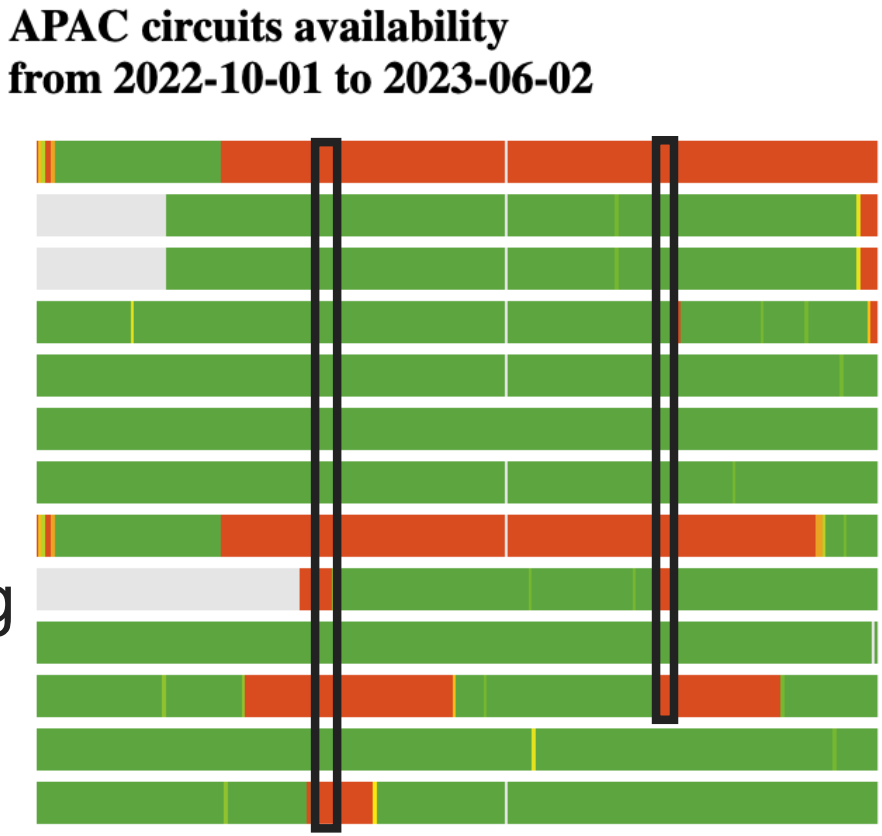
APAC Deployment

EXPERIENCE

- Like before, outages last for ever
- No POP downtime due to circuits availability issue …
- …But we had a close call (twice)
- 4 out of 5 circuits down (4 differents paths) were related to our Hong Kong POP



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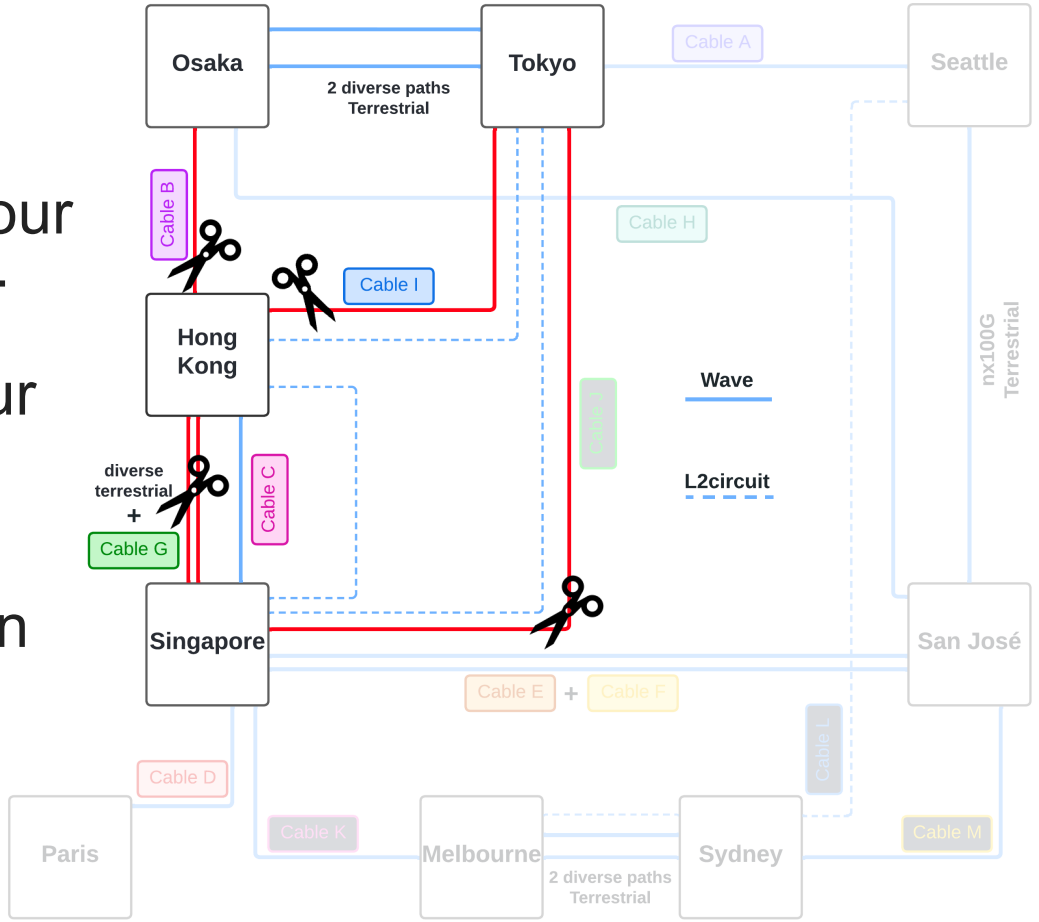
APAC Deployment

EXPERIENCE

- The last circuit connecting HK to our backbone had CRC errors on it …
- Thankfully we were able to use our Layer2 backup with some adjustments
- So far we're happy with our design
- How does this compare to other regions ?



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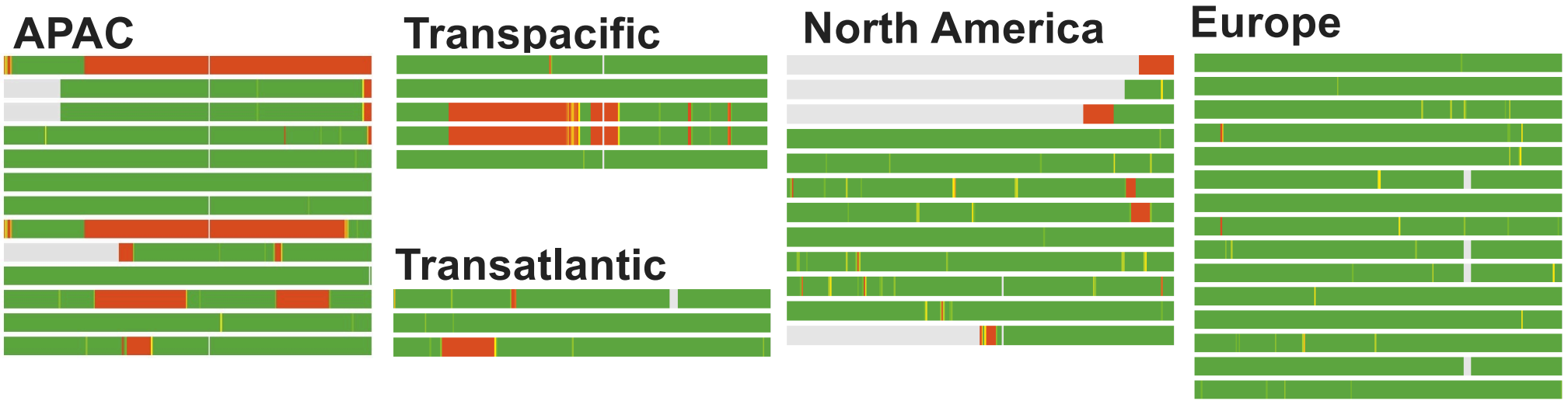
APAC Deployment

Last 8 months circuits availability Oct-22 to May-23



- No surprise here, submarine cables means longer outages
- APAC and Transpacific outages usually last longer than Transatlantic
- North America / Europe (mostly terrestrial) are obviously more reliable (and way cheaper)

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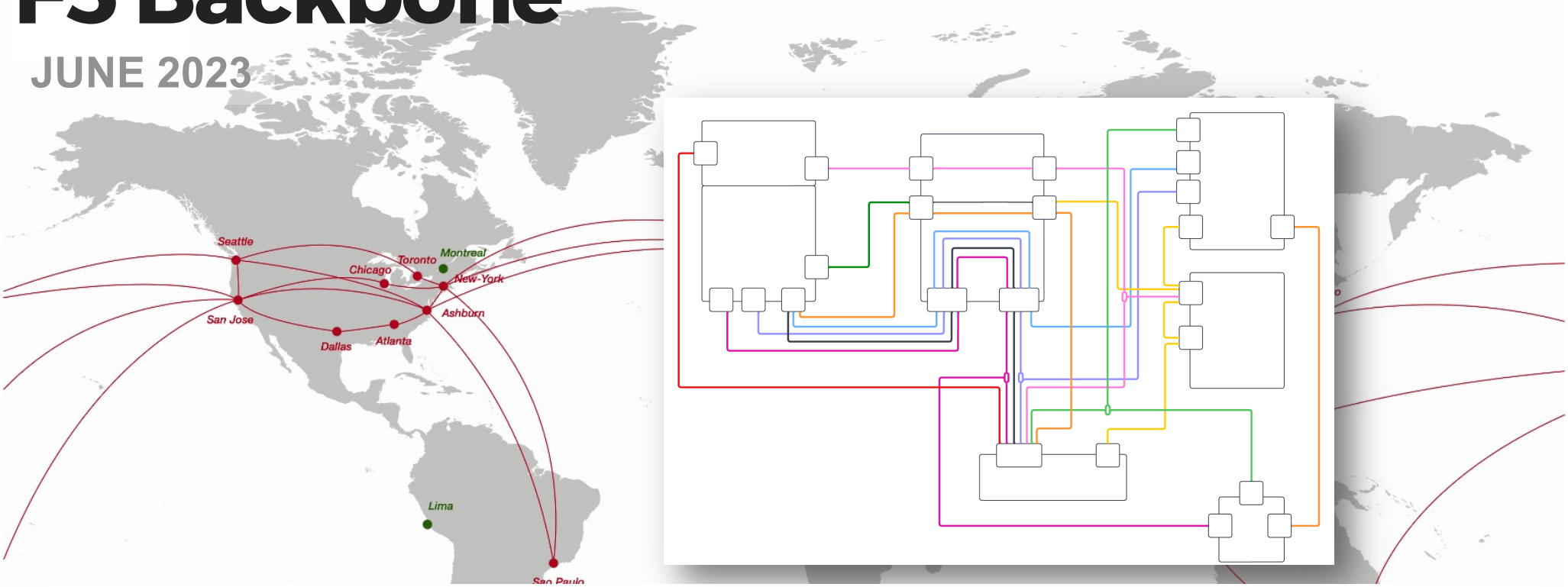
F5 Backbone

JUNE 2023



CLS study is on going for our deployment in Middle East like we did for APAC

*CLS : Cable Landing Station

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Our experience
What we've learned

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Our experience

WHAT WE'VE LEARNED

- APAC is expensive, it accounts for approx. 50% of all backbone costs (transit/peering/circuits)
- Submarine cables outages can last for months increasing the probability of having multiple cable cuts during the same time window
- Requires a lot of path diversity, 4+ paths per pop gets you close to 100% availability but things can still go sideways

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Our experience

WHAT WE'VE LEARNED

- We initially thought L2 backup was overkill with our diversity, turned out we used it multiple times
- It took a long time to study all routes (CLS+BMH+Terrestrial backhaul), but we think it was worth it
- Our circuits providers were always ready to help with backhaul modifications to increase terrestrial diversity
- Shipping hardware, dealing with customs is often difficult.

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Thank You !

Questions ?