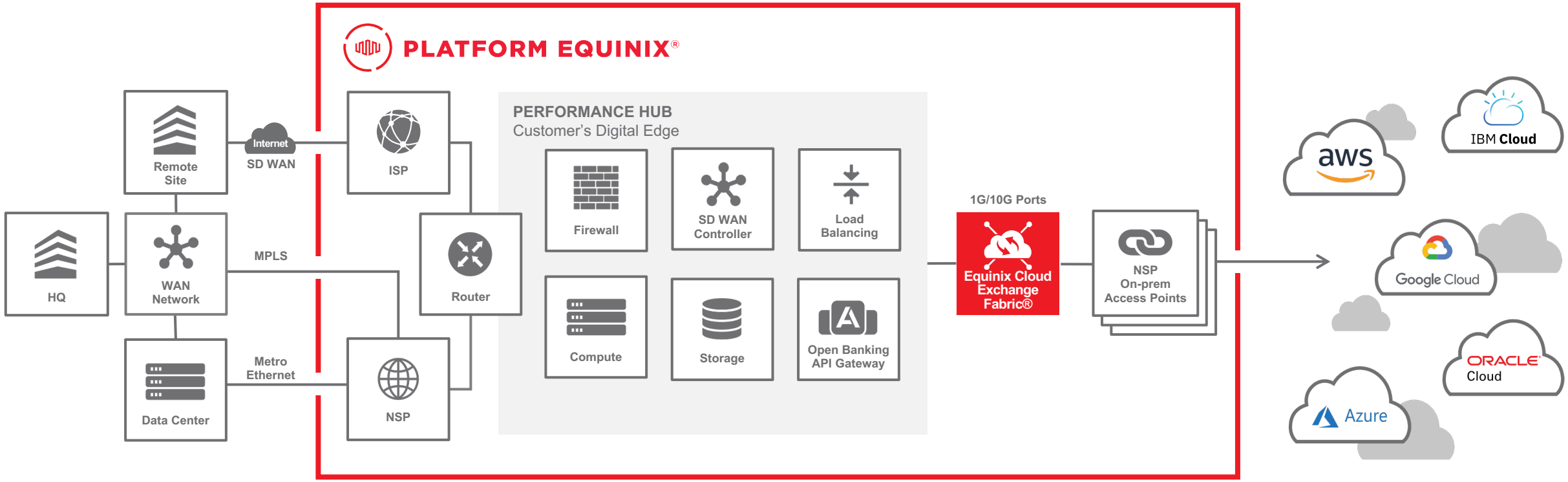
Precise Time Synchronization over Interconnected Data-Centers

WSTS 2021 – 03/31/2021

Hybrid Clouds and Interconnected Data Center Networks

Connecting private clouds, public clouds and enterprises globally



Data Center Trends…

Future of IT infrastructure is everywhere…
… the role of the corporate data center is shrinking

It's a hybrid world, blending cloud and edge…
… core workloads are shifting to the edge

Future infrastructure is an ecosystem of partners…
…cloud is not the end game, it's part of the conversation

These ecosystems are locally and privately interconnecting…
… achieving differentiated advantage and efficiency

Precise Time Synchronization Requirements over Data-Center Networks

Precise Time is Critical In Data Center Environment

The level of accuracy depends on industry use case and application

Financial Services

Banks need highly accurate time (in the order of single digit µs and better) to maintain an ordered sequence of transactions

M&E – Broadcasting

Broadcasting industry requires accurate synchronicity between audio and video feeds to prevent “lip-sync” errors.

Enterprise Applications

A narrow drift offset is needed for distributed transactional apps/DBs, accurate ordering of logs, preventing online attacks (sequence of events)

Manufacturing

Robotics and automated operations on the manufacturing floor require precise time synchronization across different digital systems and IT infrastructure

M&E – Gaming, Sports Streaming

E-Sports and gaming require precise time sync to ensure the chronological order of play in multi-player games (e.g. bullet hitting a target)

Data Center Customers' Approach Today

Free Time-Internet

Pros:
- Easy to connect
- Free (ntp.org, other time services)

Cons:
- Accuracy levels
- Unreliable – No guaranteed SLA
- Security – easily susceptible to attacks

Do-It-Yourself (GNSS Antenna + Colocation)

Pros:
- Sub-microsecond precision at the receiver
- Control and ownership

Cons:
- Procure, setup and operate
- Security and redundancy
- Build and train staff
- Scale and support across locations

Third Party Time as-a-Service

Pros:
- Microsecond-level accuracy
- Easier than DIY

Cons:
- Only available in specific locations
- Scalability, multiple dependencies
- Reliability and SLA levels

Expectations and Demands

Time and Synchronization in Data Centers

Accurate and Precise
- Precise time globally 24x7
- Average Accuracies between 1-100 microseconds

Traceable and Compliance
- Traceability to national labs
- Meet HIPAA, FINRA, MIFID II standards

Standard Protocol Support
- PTP, NTP

Security and Reliability
- Low-jitter, secure networks
- Bypass Internet
- GNSS backups, anti spoofing/jamming
- Multi-tenancy, authenticated.

As-a-Service
- Fully managed service, requiring no maintenance.
- Single click installation and service dashboard
- Fully automated provisioning with SLA

Monitoring-enabled
- UI-based monitoring service
- Alerting capabilities

Highly Available
- Multiple levels of service redundancy

EQUINIX

Precise Time Synchronization over Data-Center Networks

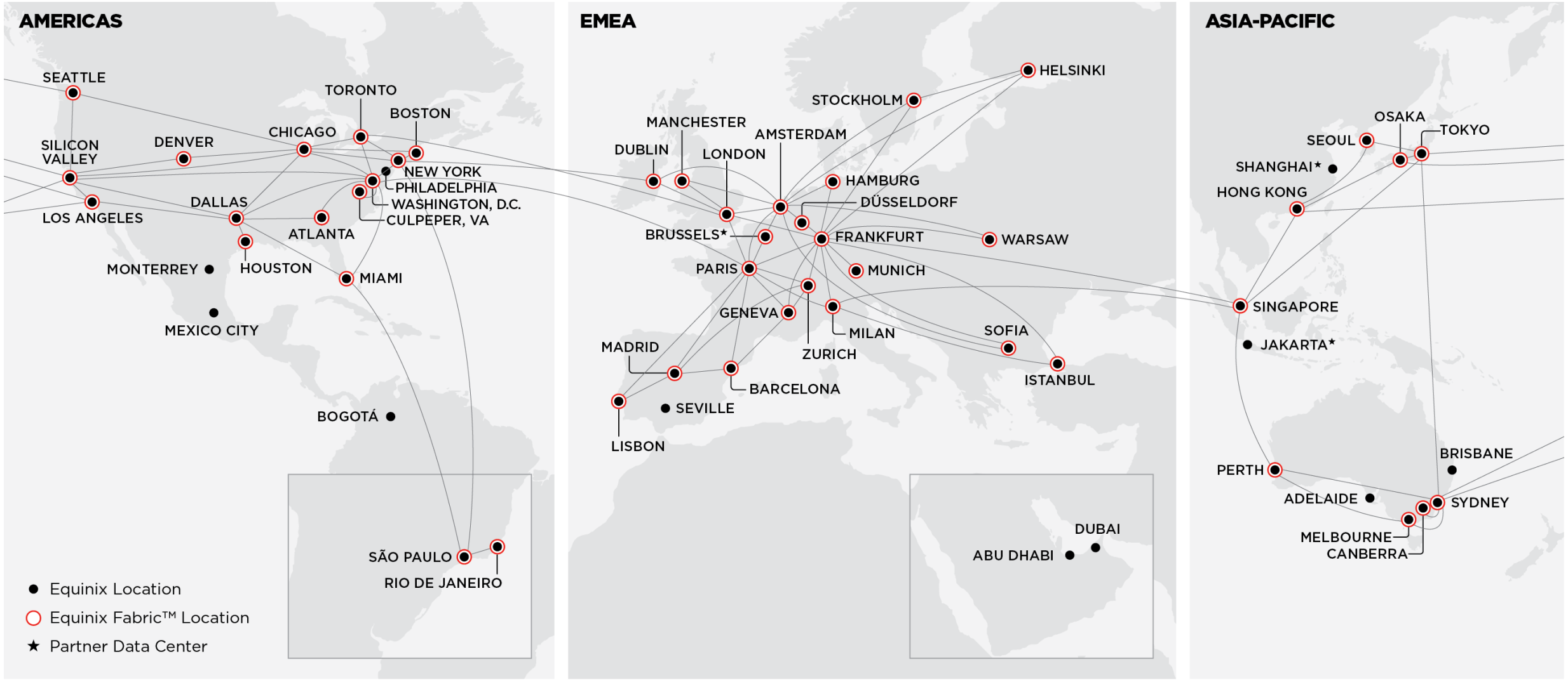
How Networks contribute to Precise Time Synchronization

Predictable Reliable Observable Controllable Secured

*As measured from January 1 - December 31, 2019, for IBX Operations.

Equinix Fabric

Low-Jitter, Secure, Global, Direct, Dynamic



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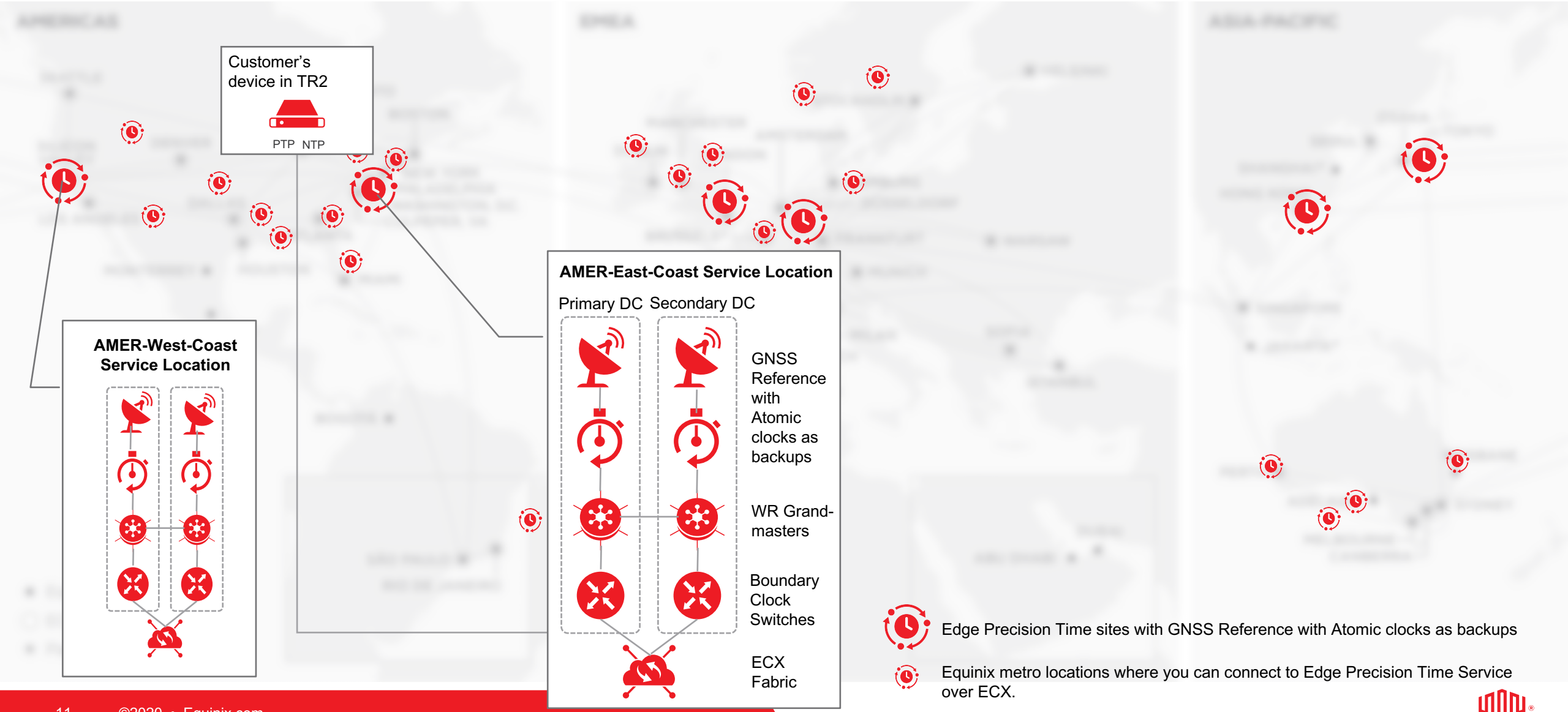
Deploying Reliable and Highly-Available Timing Architecture

Example deployments at scale

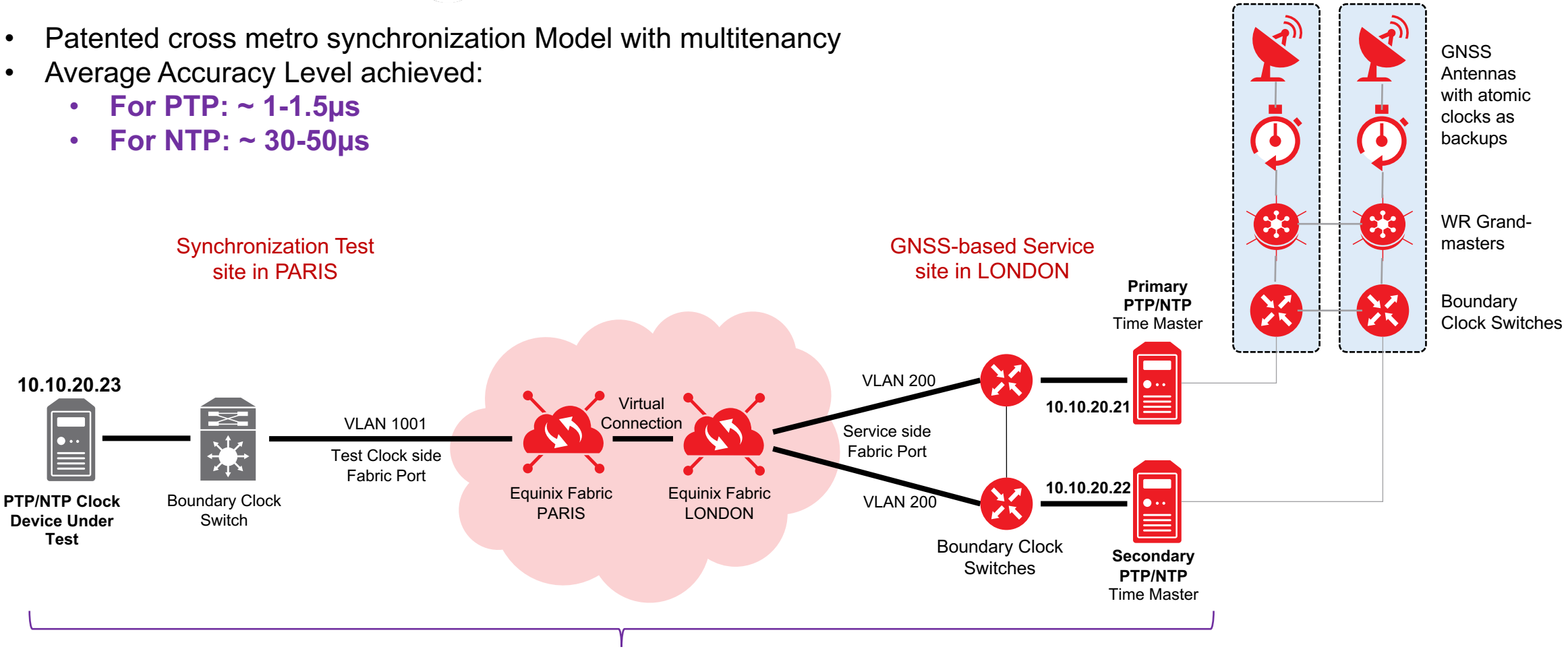


Synchronization Test Bed Details

Framework to test offset, one-way-delay, etc. for both PTP/NTP

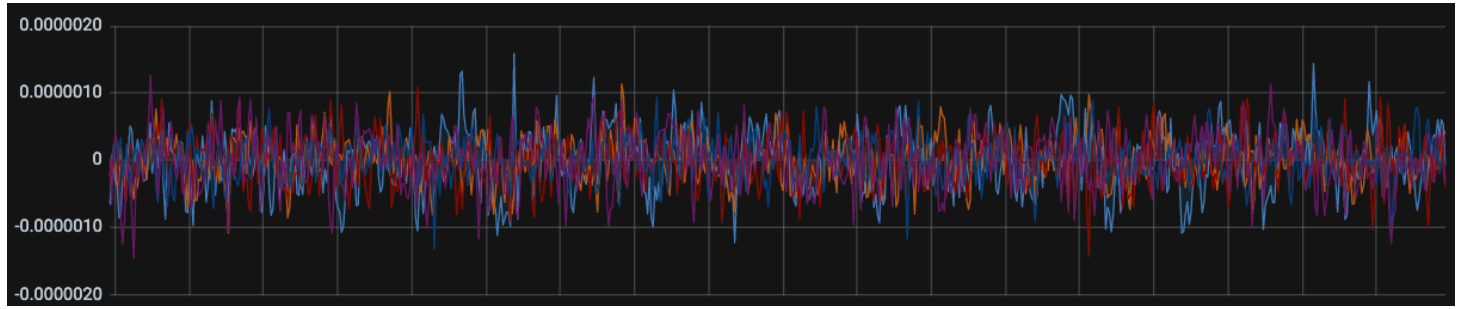
PLATFORM EQUINIX®

- Patented cross metro synchronization Model with multitenancy
- Average Accuracy Level achieved:
  - **For PTP: ~ 1-1.5µs**
  - **For NTP: ~ 30-50µs**

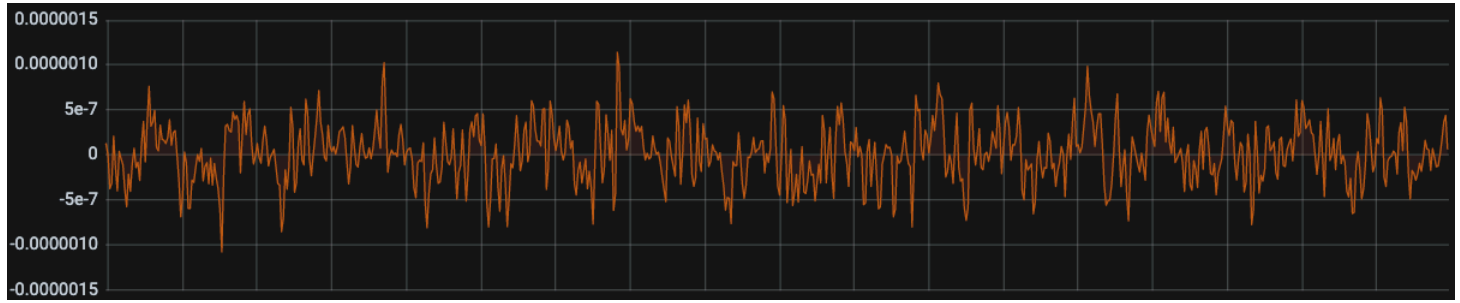


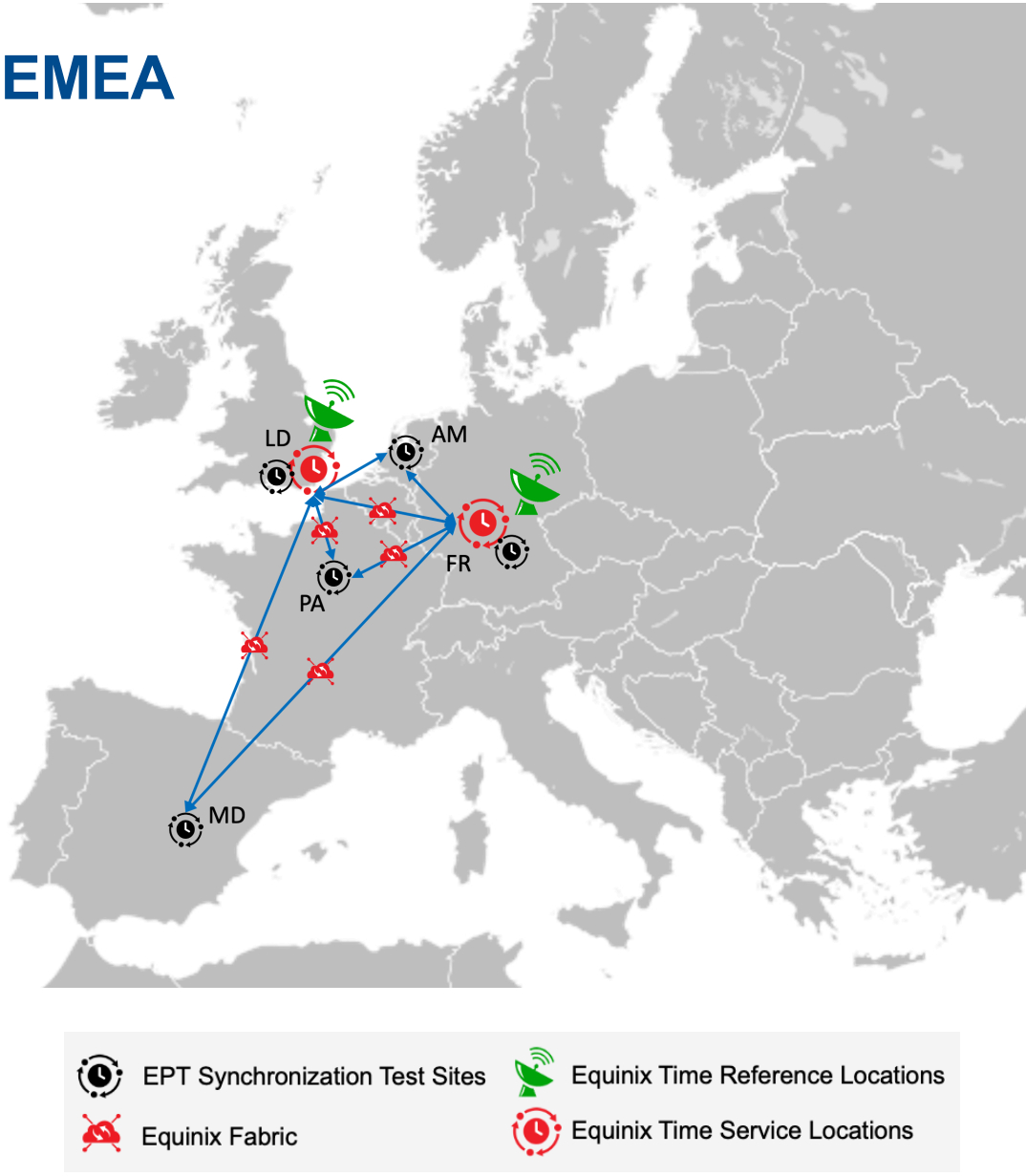
Edge Precision Time Accuracy – PTP Protocol - EMEA

- Typical cross metro, PTP accuracy observed is **~1.5µs** over Equinix Fabric

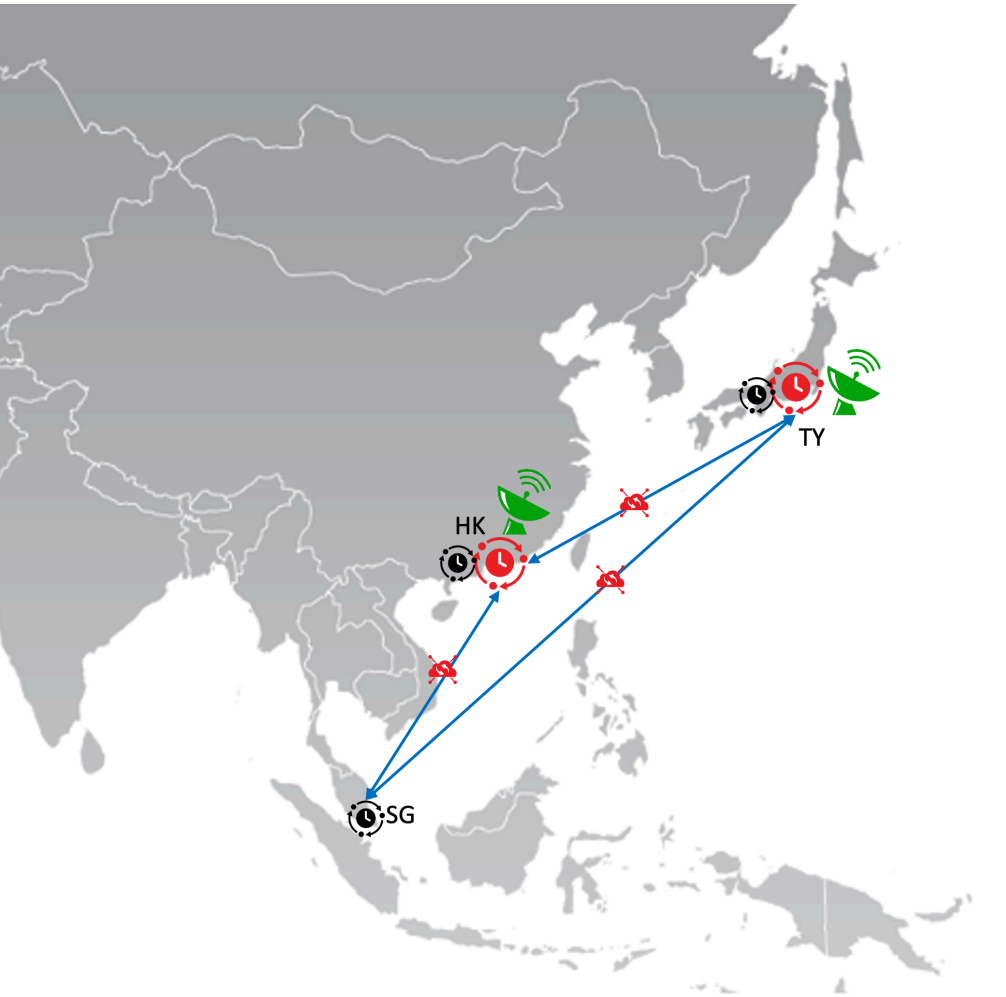


- Achieved **~1µs** within the metro over Equinix Fabric





Edge Precision Time Accuracy – PTP Protocol - APAC



EPT Synchronization Test Sites
Equinix Time Reference Locations
Equinix Fabric
Equinix Time Service Locations

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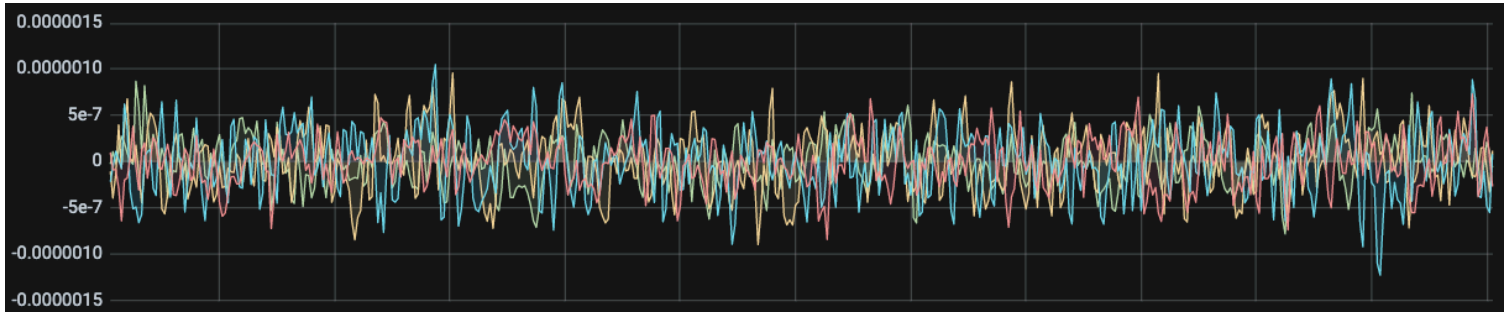

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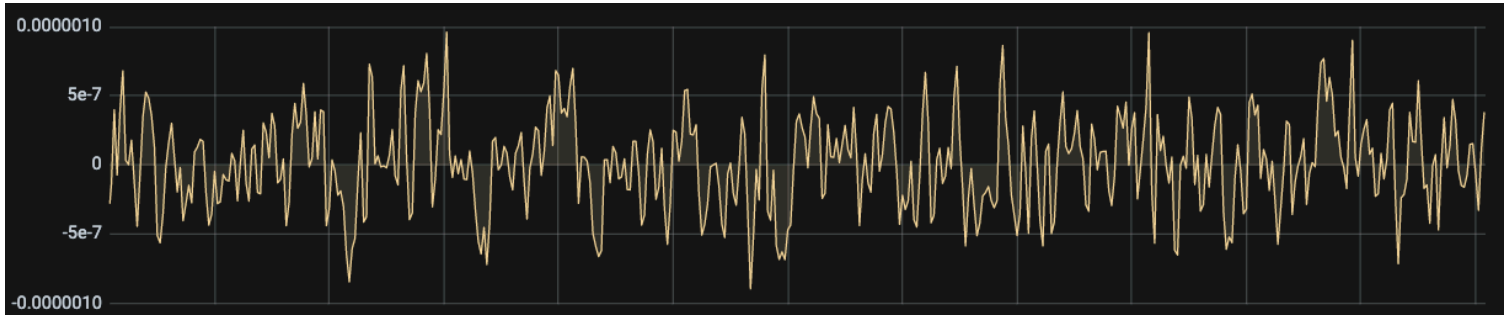
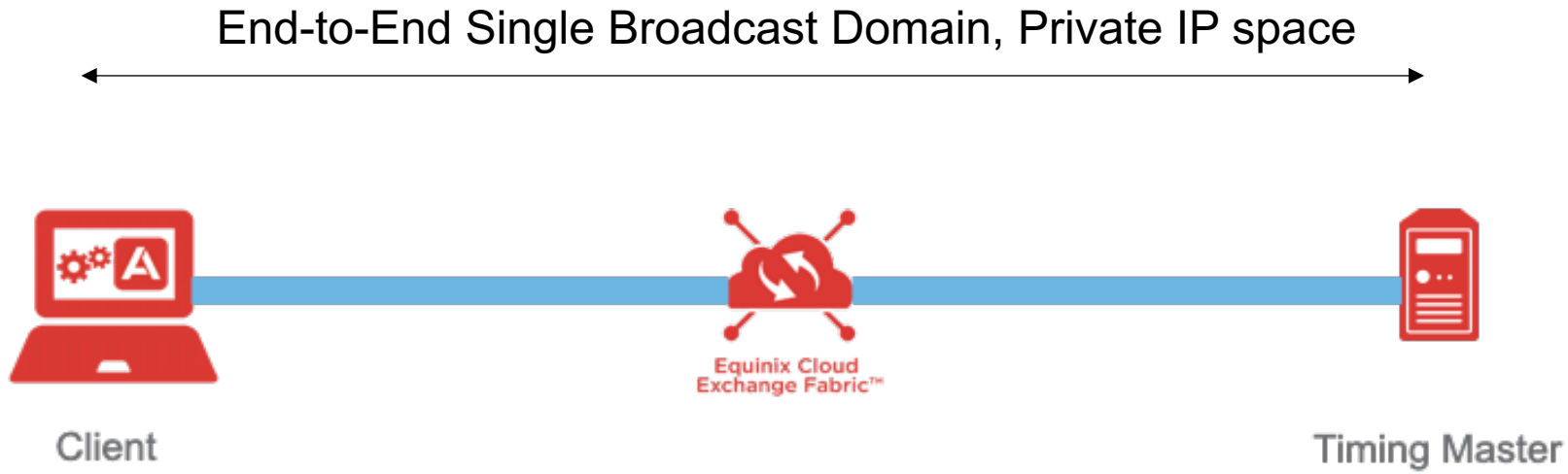


Ensuring Secure and Reliable Time Synchronization

Benefits from a generalized architectures – Security, Reliability, Enterprise-Class Service/Delivery

- Private Connectivity
- No exposure to internet
- Authenticated Provisioning and Synchronization
- Secured end-to-end connectivity over private network
- Multitenancy
- Private IP spaces can be used
- Software-enabled and controlled time distribution
- Predictability, meeting SLAs



Thank You

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