Enterprise Case Study

The Future of Your WAN

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About Thomson Reuters

- We are the leading source of intelligent information for the world's businesses and professionals, providing customers with competitive advantage.

- Providing Trusted Answers in the following industries:
    - Financial
    - Legal
    - News & Media
    - Risk Management Solutions
    - Tax & Accounting
    - Automotive
    - Energy
    - Government
    - Technology

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Who We Are

- Financial and Risk
  - We connect 40,000 customers and 400,000 end users in over 150 countries
  - We track 2 million individuals and entities that can pose a potential risk to the international business community
  - We support $250B in bond trading and $200B in foreign exchange (FX) trading

- Enterprise Technology
  - 60,000 Terabytes of Data in our Data Centres
  - Our systems distribute up to 5 million price updates per second to the financial markets

- Tax & Accounting
  - More than 200,000 users and approximately 46,000 firms depend on our professional tax solutions.

- Reuters
  - Each year we deliver 2.3+ Million unique news stories and reach 1Billion People every day.
  - ~850,000 Pictures and Images. And 100,000+ Video stories

- Legal
  - 600,000 searches run each day on WestLaw
  - We print more than 30 Million Law Books each year

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# WAN Landscape Analysis (Circa 2010)

- Very old network and server infrastructure.

- Very expensive to scale, if even possible.

- Significant overhead on resources.

- Restrictive application software data model.

- End to End Latency did not meet the increasing demands of the financial markets.

- We were not fully recovering our network communications costs to provide services and market data to our customers.

Future WAN Requirements

- Achieve order of magnitude increase in throughput (update rates to double annually over the next 5-10 years).

- Significantly reduce latency (from ~250ms end-to-end (exchange to customer site) to ~5-7 ms for in-region data) – very low latency.

- Support proximity service for ultra low latency.

- Improve the time to market for new content and support more sophisticated content sets.

- Reduce WAN TCO compared to existing.

- Exploit new technology, the Internet and new commercially available WAN bandwidth prices.

- Improve our network communications recovery model to 100% recovery for last mile.

- Support a cross connect service for customers to order their own circuits into Thomson Reuters Network PoPs.
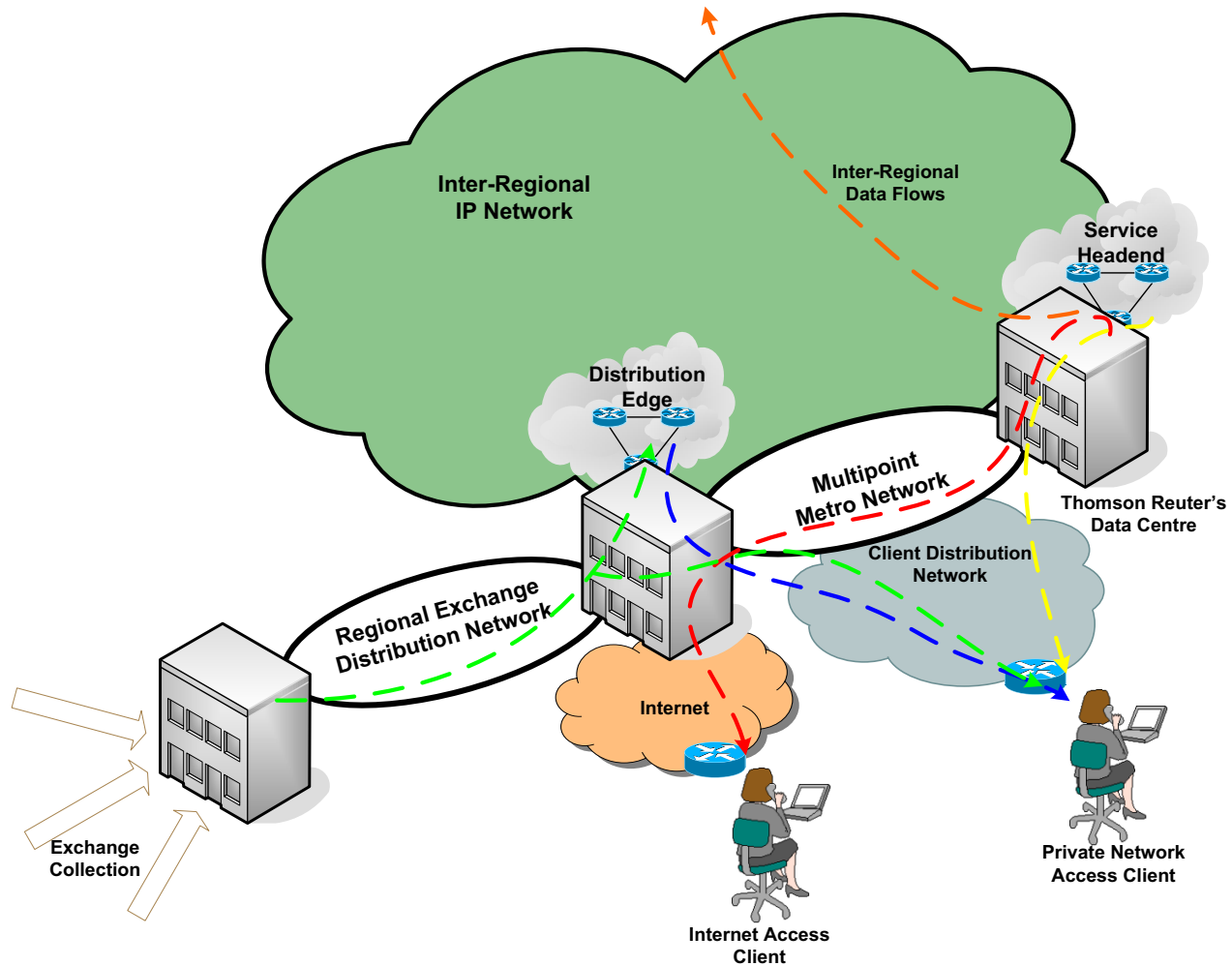
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Network Evolution
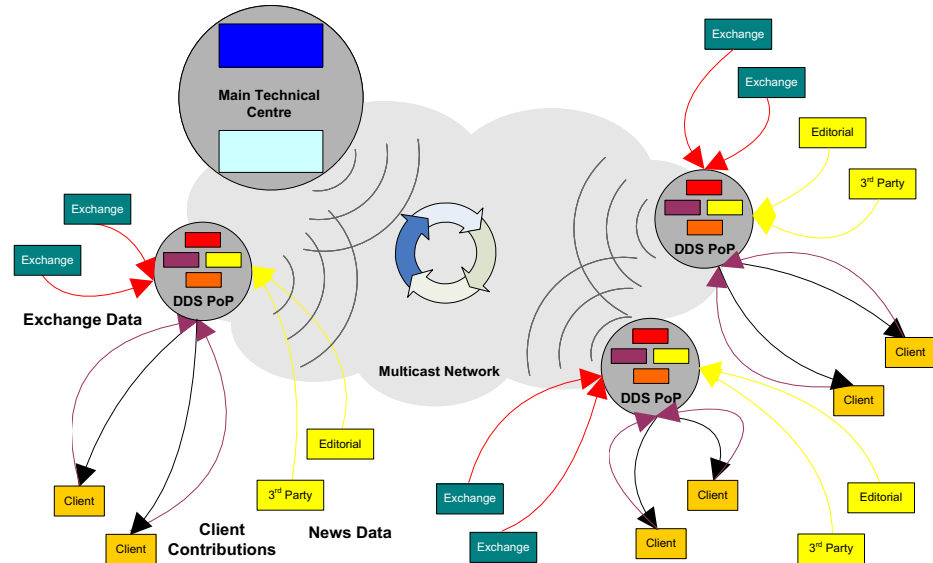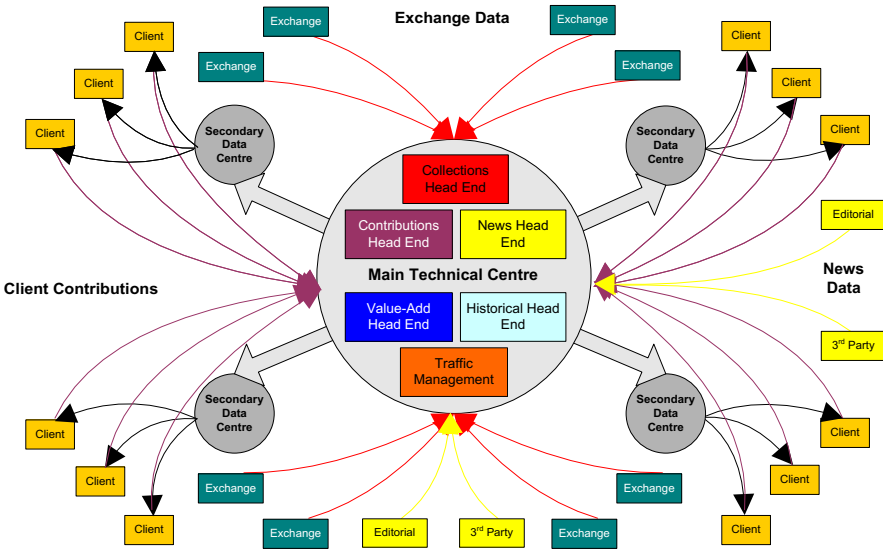
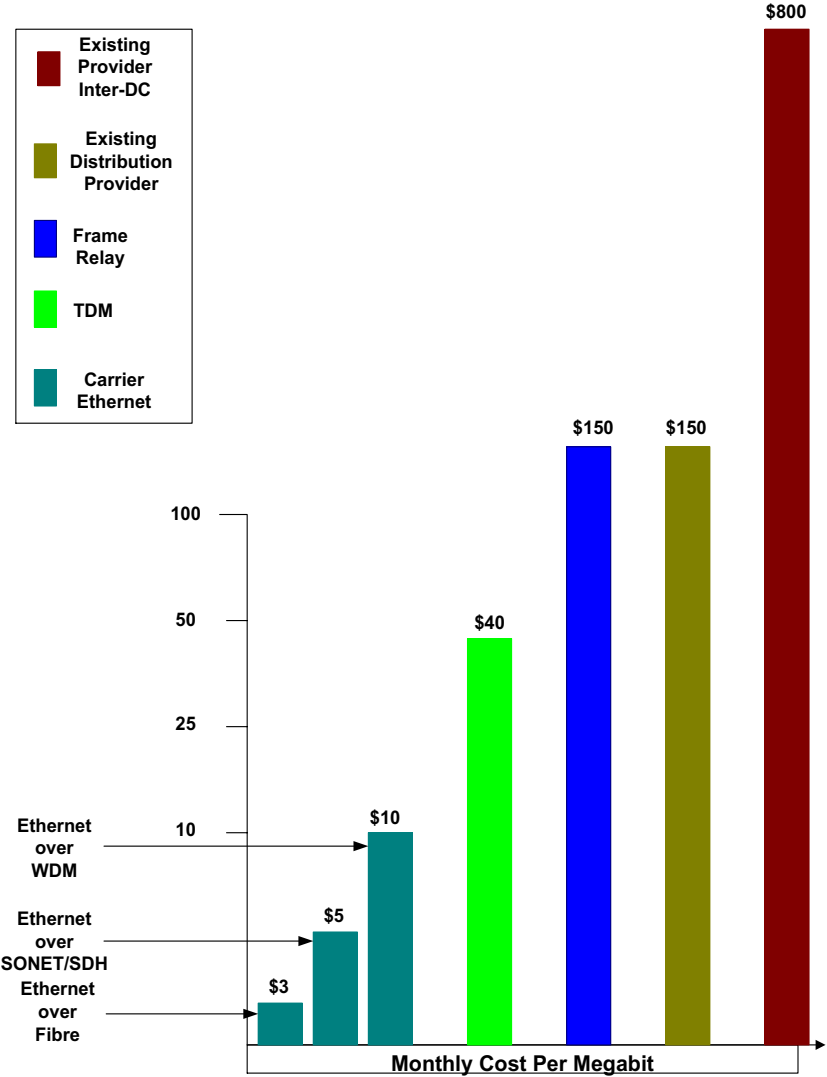

- 'Hub & Spoke' model adds latency
- Multiple collection networks
- Collection and distribution separate
- Vendor lock-in (both comms and hosting)
- Manual, site-level Live:Warm Standby resiliency model inadequate

- 'Distributed' model supports local data turn-around
- High-speed multicast core network used for both collection and distribution
- Opportunity to utilise multiple vendors
- Automated, feed-level Live:Hot Standby resiliency model

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Future Distribution Network Architecture

Cost Analysis

Legend:
- Existing Provider Inter-DC
- Existing Distribution Provider
- Frame Relay
- TDM
- Carrier Ethernet

$800

$150

$150

$40

100

50

$10

25

Ethernet over WDM

10

Ethernet over SONET/SDH

$5

Ethernet over Fibre
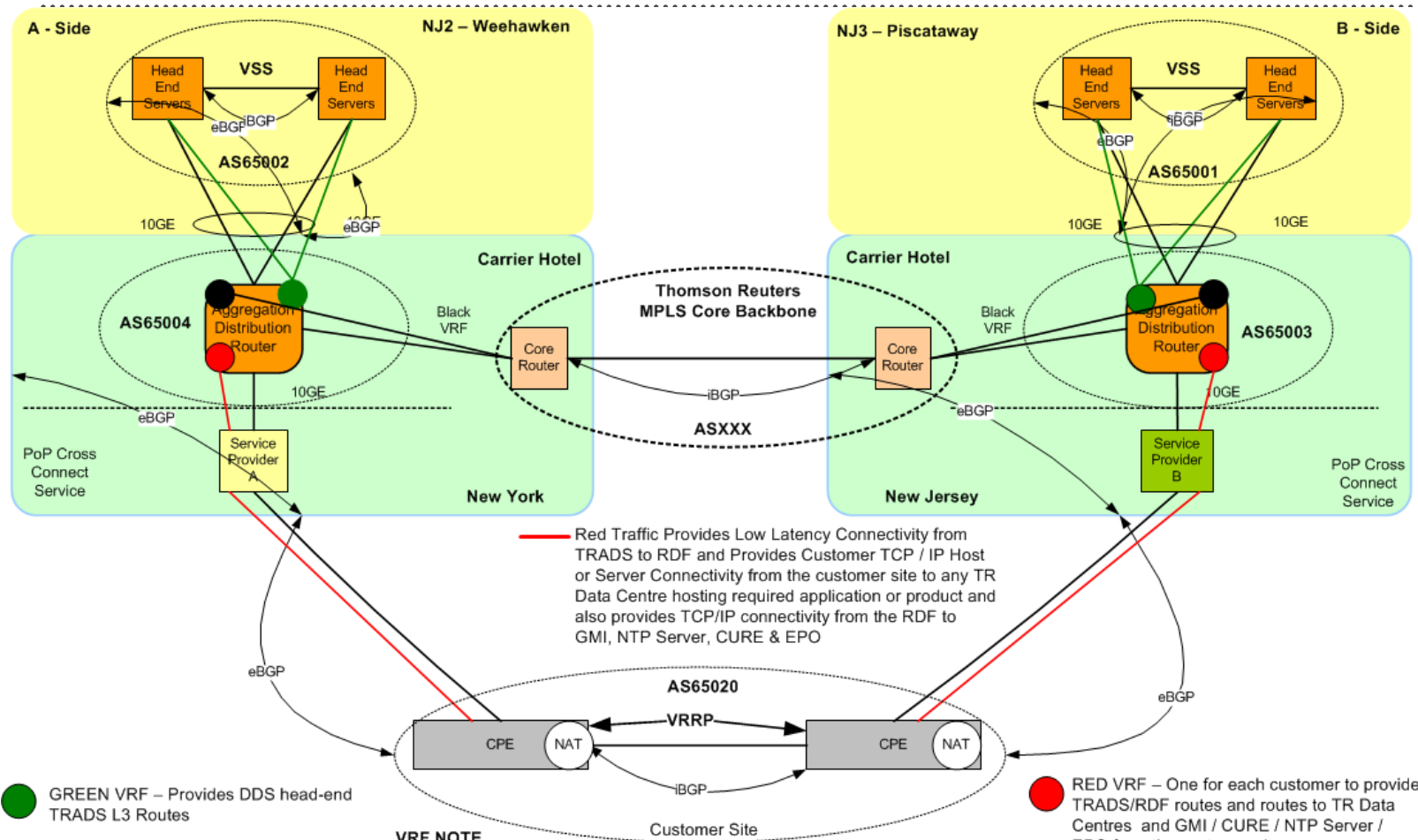
$3

Monthly Cost Per Megabit

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Ethernet

- Ethernet selected as preferred network transport method for data packet delivery in WAN and Metro Ethernet from our network PoP to the customer site.

- The main reasons for selecting Ethernet were:

  - High availability, low packet loss

  - Low cost

  - Flexibility

  - Standards Based

  - MEF Driving adoption and technical specification

  - Ubiquitous availability and support

  - Low latency

  - Seamless integration
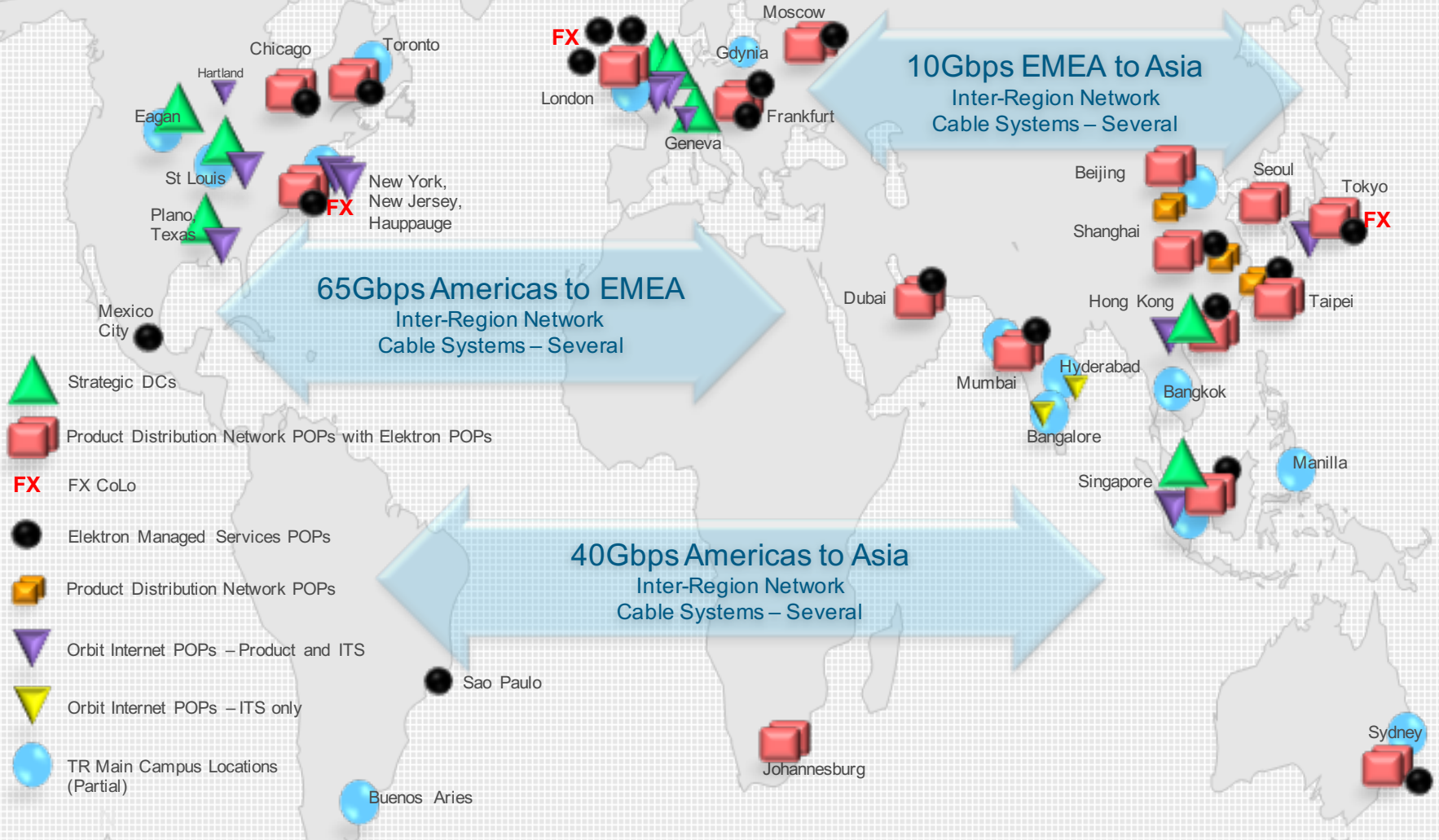
Future Ethernet Distribution Network

A - Side

NJ2 – Weehawken

VSS

Head End Servers

Head End Servers

eBGP iBGP

AS65002

10GE

eBGP

AS65004

Aggregation Distribution Router

Black VRF

Carrier Hotel

Thomson Reuters MPLS Core Backbone

Core Router

iBGP

ASXXX

PoP Cross Connect Service

eBGP

10GE

Service Provider A

New York

NJ3 – Piscataway

B - Side

VSS

Head End Servers

Head End Servers

iBGP

eBGP

AS65001

10GE   10GE

Carrier Hotel

Aggregation Distribution Router

AS65003

Black VRF

Core Router

eBGP

10GE

Service Provider B

New Jersey

PoP Cross Connect Service

Red Traffic Provides Low Latency Connectivity from TRADS to RDF and Provides Customer TCP / IP Host or Server Connectivity from the customer site to any TR Data Centre hosting required application or product and also provides TCP/IP connectivity from the RDF to GMI, NTP Server, CURE & EPO

eBGP

AS65020

VRRP

CPE   NAT

iBGP

CPE   NAT

eBGP

Customer Site

GREEN VRF – Provides DDS head-end TRADS L3 Routes

BLACK VRF – Provides routes to TR Data Centres and GMI / EPO / CURE

RED VRF – One for each customer to provide TRADS/RDF routes and routes to TR Data Centres and GMI / CURE / NTP Server / EPO from the customer site

VRF NOTE
- Each Customer will be assigned a unique VRF.
- Green VRF exports TRADS routes and imports all customer RDF routes
- Black VRF contains all TR DC prefixes obtained via Sigma and imports all routes and exports TR DC and GMI / Management routes.
- Red VRF will import TRADS, TR DC and GMI / Management routes and export RDF routes.

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Future WAN Landscape

Legend:
- Strategic DCs (green triangle)
- Product Distribution Network POPs with Elektron POPs (red box)
- FX — FX CoLo
- Elektron Managed Services POPs (black dot)
- Product Distribution Network POPs (orange box)
- Orbit Internet POPs – Product and ITS (purple triangle)
- Orbit Internet POPs – ITS only (yellow triangle)
- TR Main Campus Locations (Partial) (blue circle)

Map labels: Chicago, Toronto, Hartland, Eagan, St Louis, Plano Texas, Mexico City, New York New Jersey Hauppauge, FX, Sao Paulo, Buenos Aries, London, FX, Moscow, Gdynia, Frankfurt, Geneva, Johannesburg, Dubai, Mumbai, Hyderabad, Bangalore, Beijing, Shanghai, Hong Kong, Bangkok, Seoul, Tokyo, Taipei, Manilla, Singapore, Sydney

65Gbps Americas to EMEA
Inter-Region Network
Cable Systems – Several

40Gbps Americas to Asia
Inter-Region Network
Cable Systems – Several

10Gbps EMEA to Asia
Inter-Region Network
Cable Systems – Several

Americas
589Gbps Intra-Region Bandwidth

Europe, Mid East, Africa
469Gbps Intra-Region Bandwidth

Asia Pacific
244Gbps Intra-Region Bandwidth

Future Outcomes Realised Today

- 34 New Network PoPs built globally.

- Migrated 9000 global customers from single provider to in sourced WAN and Distribution Network supported by best in region network service providers.

- Delighting customers with more connectivity options and;
  - More bandwidth at lower cost;
  - Lower latency and overall improvement in performance;
  - Improved reliability;
  - Faster convergence;
  - Greater resiliency;
  - Scalability and reduction in time to market.

- Realized hundreds of millions of dollars in annual network communications savings.
  - Dollars that can be invested in people, innovation and customer service improvement programmes.

The Future is Yours

- Absolutely best time in the history of network communications to be architecting, designing and building your future WAN.

- Always keep your customers (they are the nucleus), both internal and external in mind; How can you best satisfy their requirements and build a reliable, scalable and cost effective WAN?

- Only you really know what the future of your WAN needs to look like.

- Leverage your internal talent while working with partners to explore and create you future WAN together.

- Influence standards industry, service providers and vendors to shape your future WAN.

- Don't ignore trends or flavour of the year, but do focus on your unique requirements and the technologies you need to exploit to satisfy them.

- Your business is unique and what differentiates you from competition, following others (or vendor suggestions) may not always help you establish or maintain a competitive advantage.