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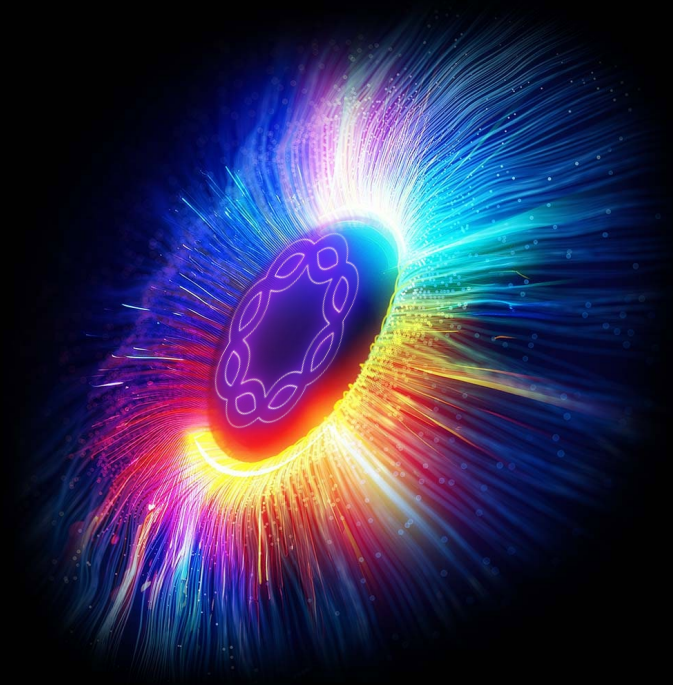
INSIGHTS



Dan Redington

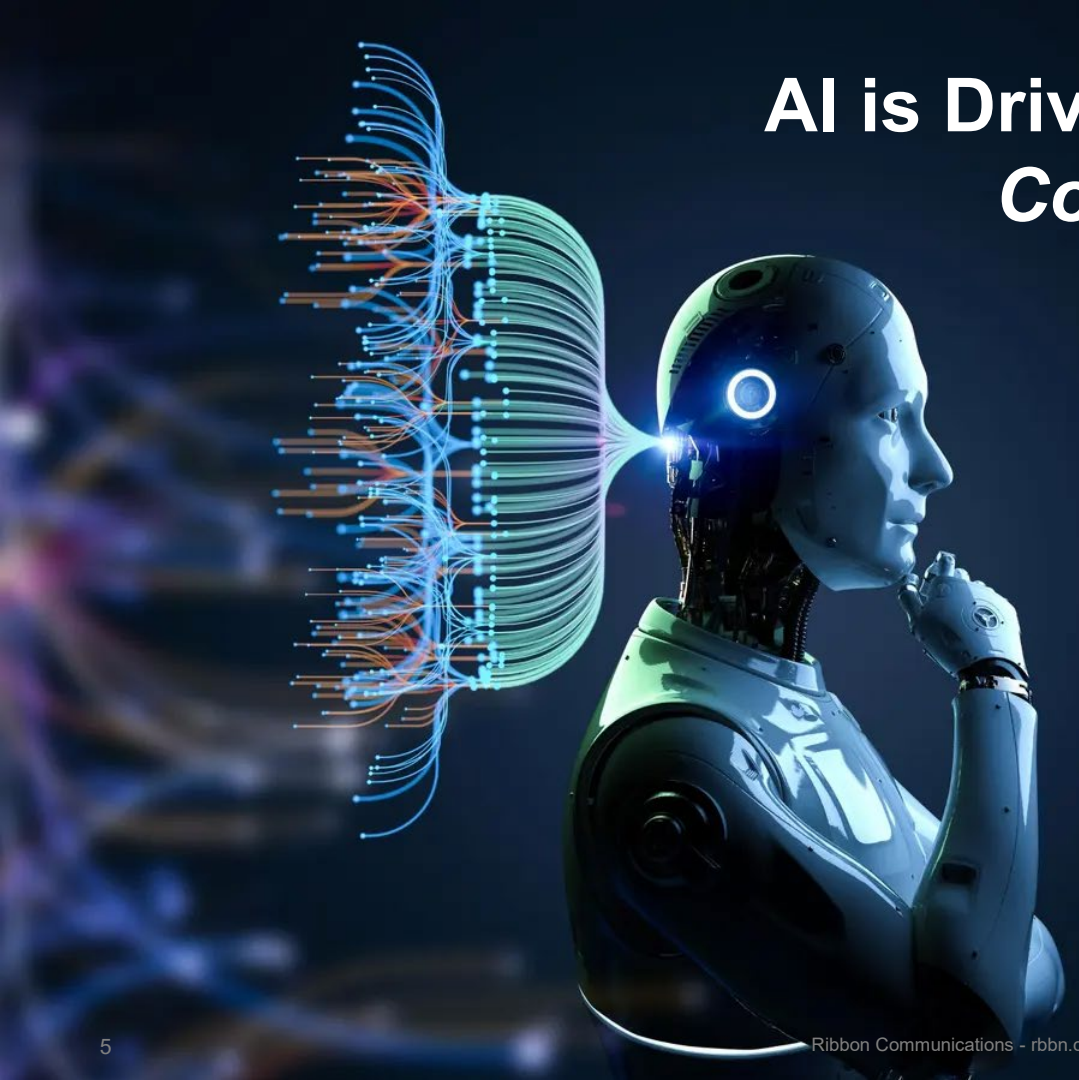
EVP of Global Sales

ribbon INSIGHTS

Welcome to Prague

You're Visiting a Hub of Innovation

AI is Driving Innovation & *Connectivity*



Dramatic increase in bandwidth for AI-based services

In-domain data centers (to control information access)

- Private & public

DCI is critical

ribbon

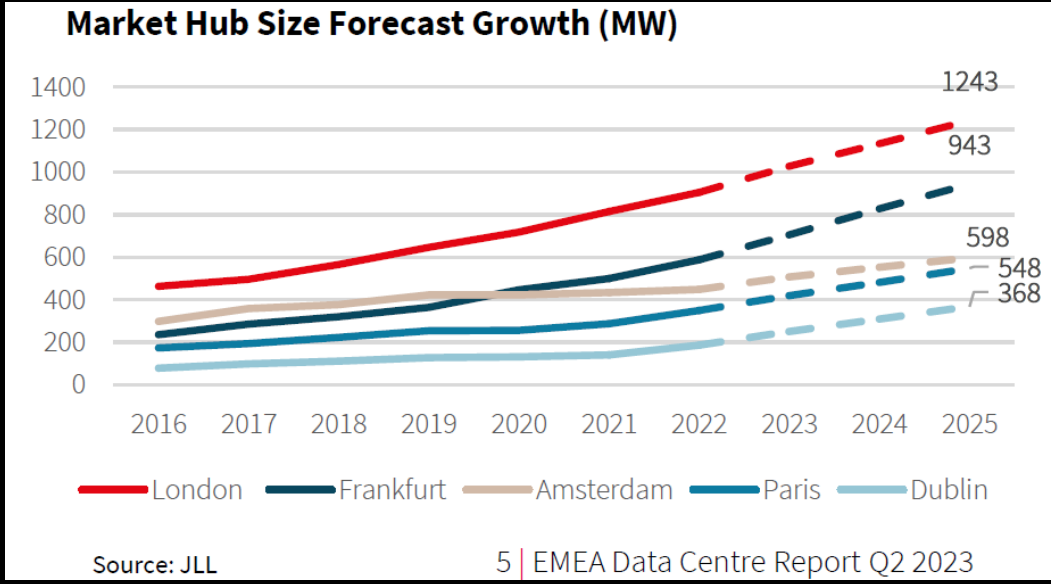
Datacenter Build-outs Are Accelerating

2024 --12.2K Megawatts (MW) of datacenter capacity

2029 -- Expected ~18K MW

~8% Annual growth rate (CAGR)

Source: Mordor Intelligence



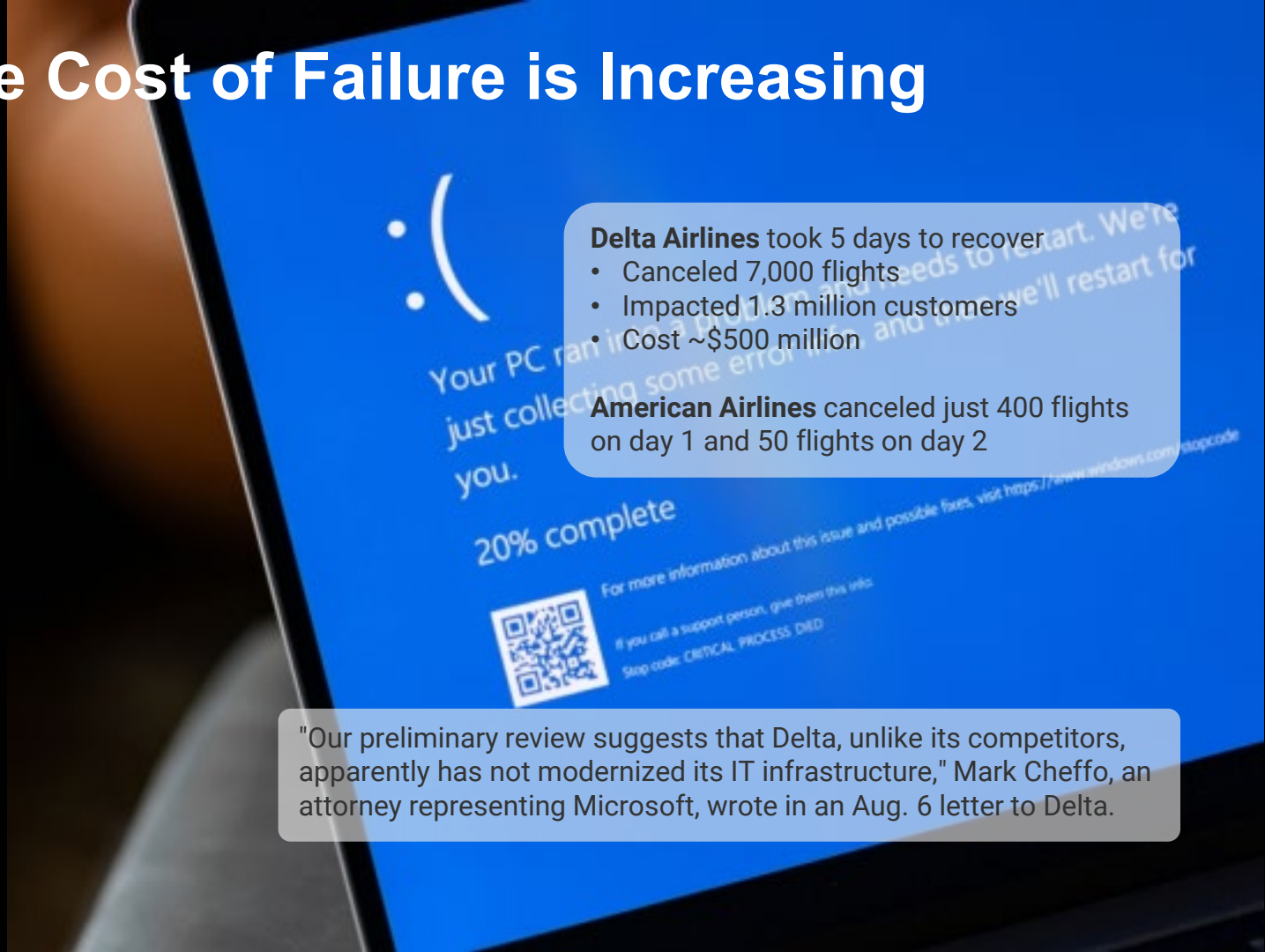
The Cost of Failure is Increasing

Brand damage

Financial damage

- Lost business
- Ransomware

Career damage



Delta Airlines took 5 days to recover

- Canceled 7,000 flights
- Impacted 1.3 million customers
- Cost ~$500 million

American Airlines canceled just 400 flights on day 1 and 50 flights on day 2

"Our preliminary review suggests that Delta, unlike its competitors, apparently has not modernized its IT infrastructure," Mark Cheffo, an attorney representing Microsoft, wrote in an Aug. 6 letter to Delta.

Networks Have to Get Better

Inherent Resiliency

- Both networks and applications

Cost Effective Scaling

Microservices - Automation

Security Has to Get Better

Zero Trust… Encryption Everywhere

Fraud Protection

Automated Upgrades

With Better Tools

End-to-end Observability

Intelligent Automation & Orchestration

Most Probable Cause

…And Trust is More Important

- We Must Operate on TRUST
- WE Commit to You
- YOU Commit to Us
- Work Together
- Share Risk

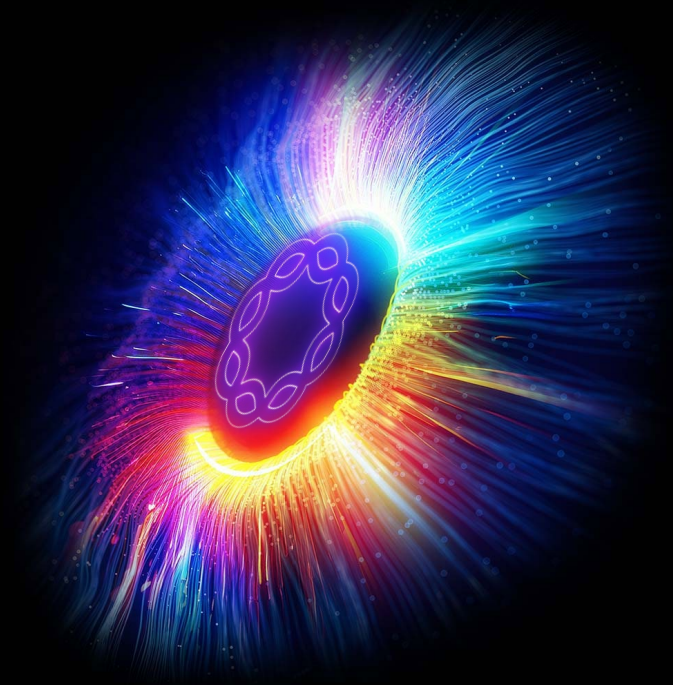
TIME TO ENGAGE

- SESSIONS
- NETWORKING
- DEMONSTRATIONS

Thank You

ribbon

INSIGHTS



MODERNIZING WITH RIBBON IN EMEA

Christian Erbe

VP of EMEA Sales

ribbon INSIGHTS

EMEA Market
Cost-Effective Network Modernization

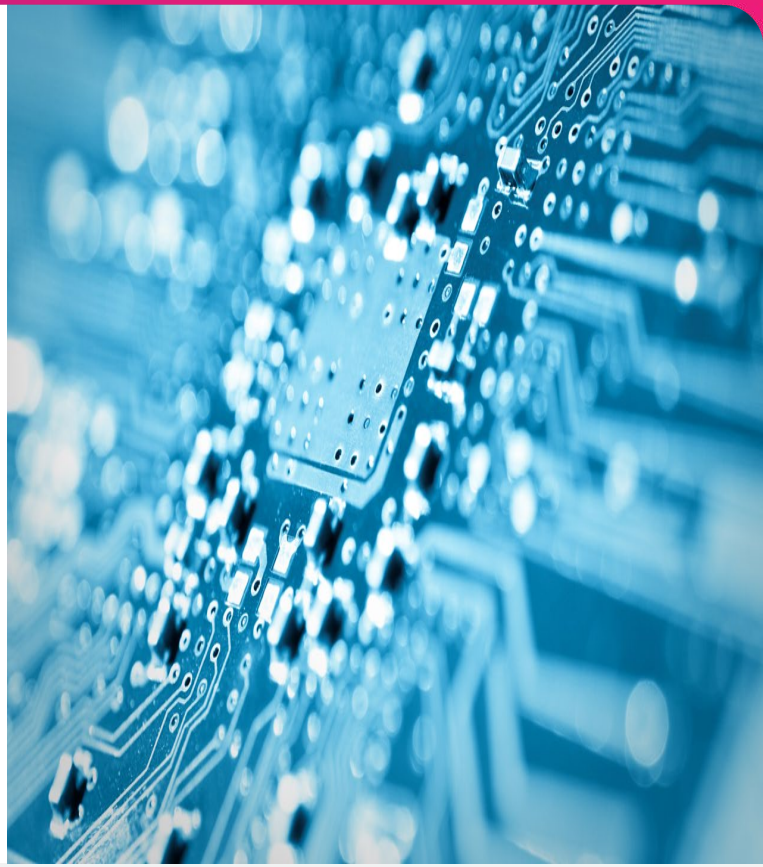
- **To Support Bandwidth Explosion**
  - Datacentres, Cloud Services, AI
- **To Reduce Costs**
- **To Meet Increasing Regulation**
- **To Make the Network Secure**
- **To Support Packet**
  - Service Provider, Mission Critical Enterprises, Government
  - Voice and data

EMEA Market
Rapidly Changing Ecosystem

- **Vendor Mergers and Acquisitions**
  - Adva/Adtran, Juniper/HPE, Infinera/Nokia, Meta/Microsoft
- **Impact of Chinese Bans**
  - Impact is starting to gather momentum, but not totally implemented across EMEA
- **Continuing Advance of the Cloud**
  - Cloud based infrastructure must stay regional in Europe, to address security concerns
- **Advance of the Data Center**
  - Datacentre build-outs are accelerating

Advances in Technology

- **Voice Evolution to the Cloud**
  - Containerized SBC and voice solutions are gaining momentum
- **IP Optical Innovation**
  - 5nm optical technology, deterministic packet transport, multi-layer IP Optical with Coherent Routing and domain management
- **Advanced Security**
  - MACsec, QKD, CC EAL4+
  - RoboCall Mitigation
- **Analytics, Automation and AI**
  - Introduction of automation, workflows, ML&AI across the network



TRUST RIBBON TO MODERNIZE YOUR NETWORK

Leader in moving customers to secure cloud communications

A proven leader in the Intelligent IP Optical Middle Mile Technology required for next generation Broadband and Mobile networks

Leader in delivering solutions for Business and Mission Critical Networks

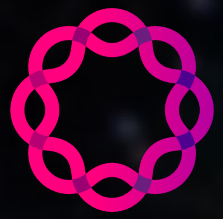
GAIN INSIGHTS FROM PEERS

- Talk to peers about How they modernized with Ribbon
- Talk to our experts about your modernization challenges

Thank You

How Joules and Lambdas Met

Presented at



ribbon® INSIGHTS

Prague, 10 September 2024

Helgo Müller

NamPower (Pty) Ltd

First…

Hello from Namibia!!

NamPower

We are Namibia's
National Power Utility...

. . .and we are also a network service provider

The Menu

Take Aways Welcome

Starters

History & Formation

Mains

A Significant Partnership

Network and Operations

Dessert

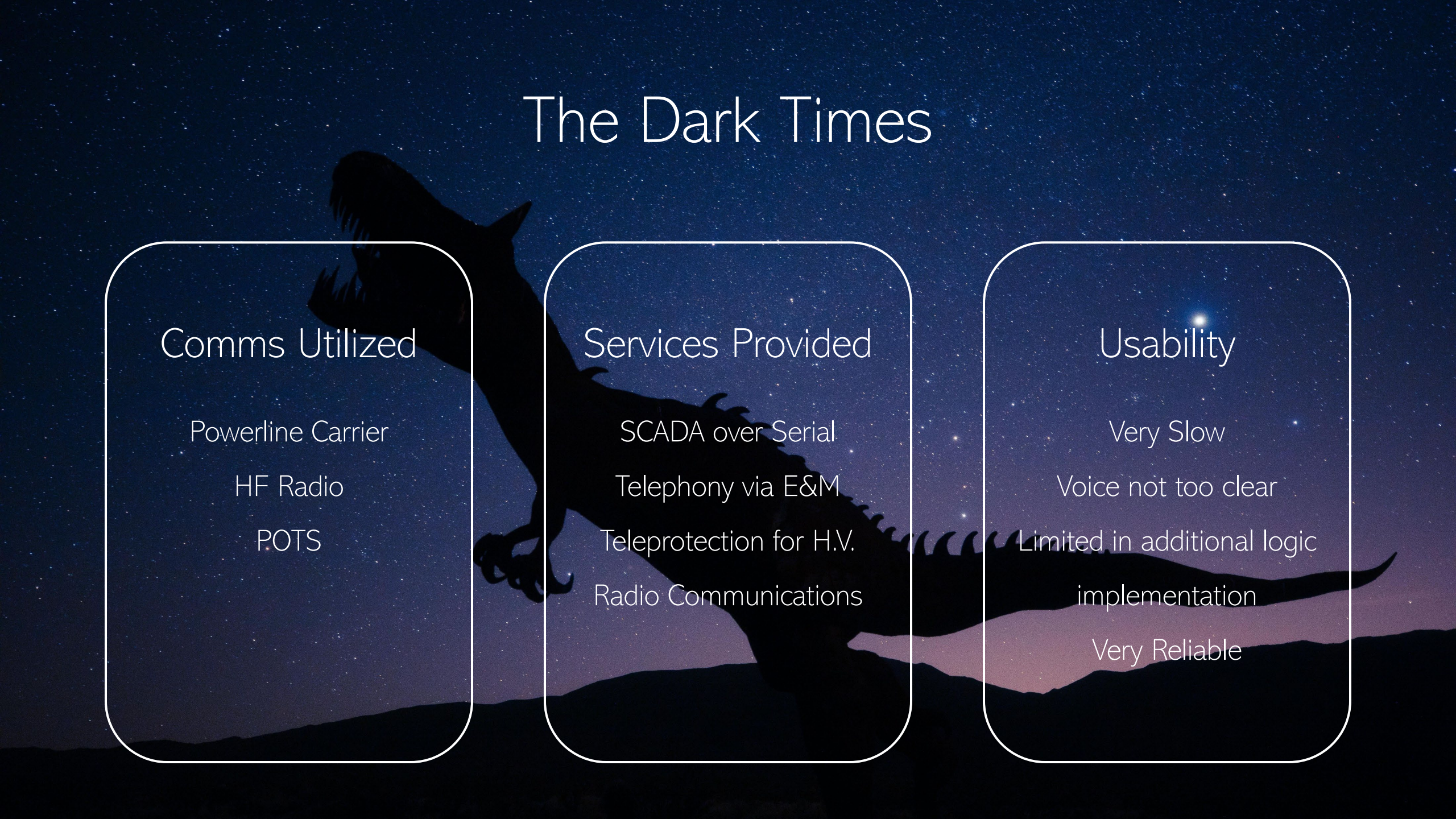
Inevitable Rewards

History Lesson

History Lesson

Not this kind of lesson…

The Dark Times



Comms Utilized

Powerline Carrier

HF Radio

POTS

Services Provided

SCADA over Serial

Telephony via E&M

Teleprotection for H.V.

Radio Communications

Usability

Very Slow

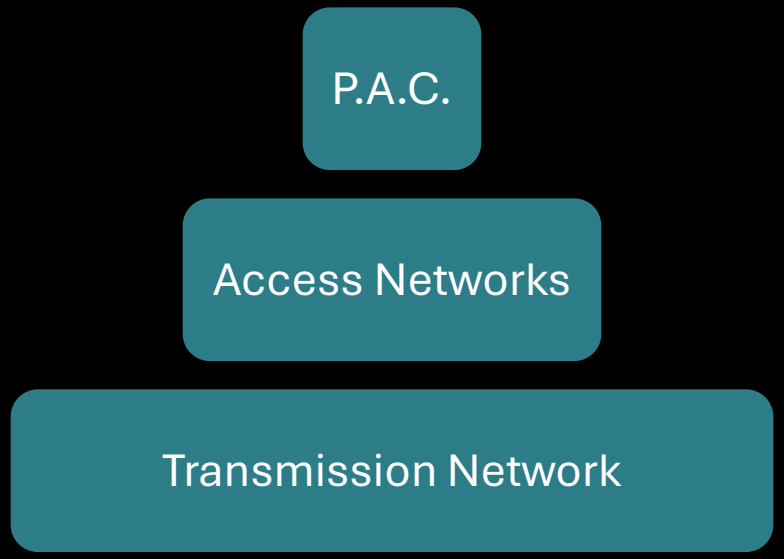
Voice not too clear

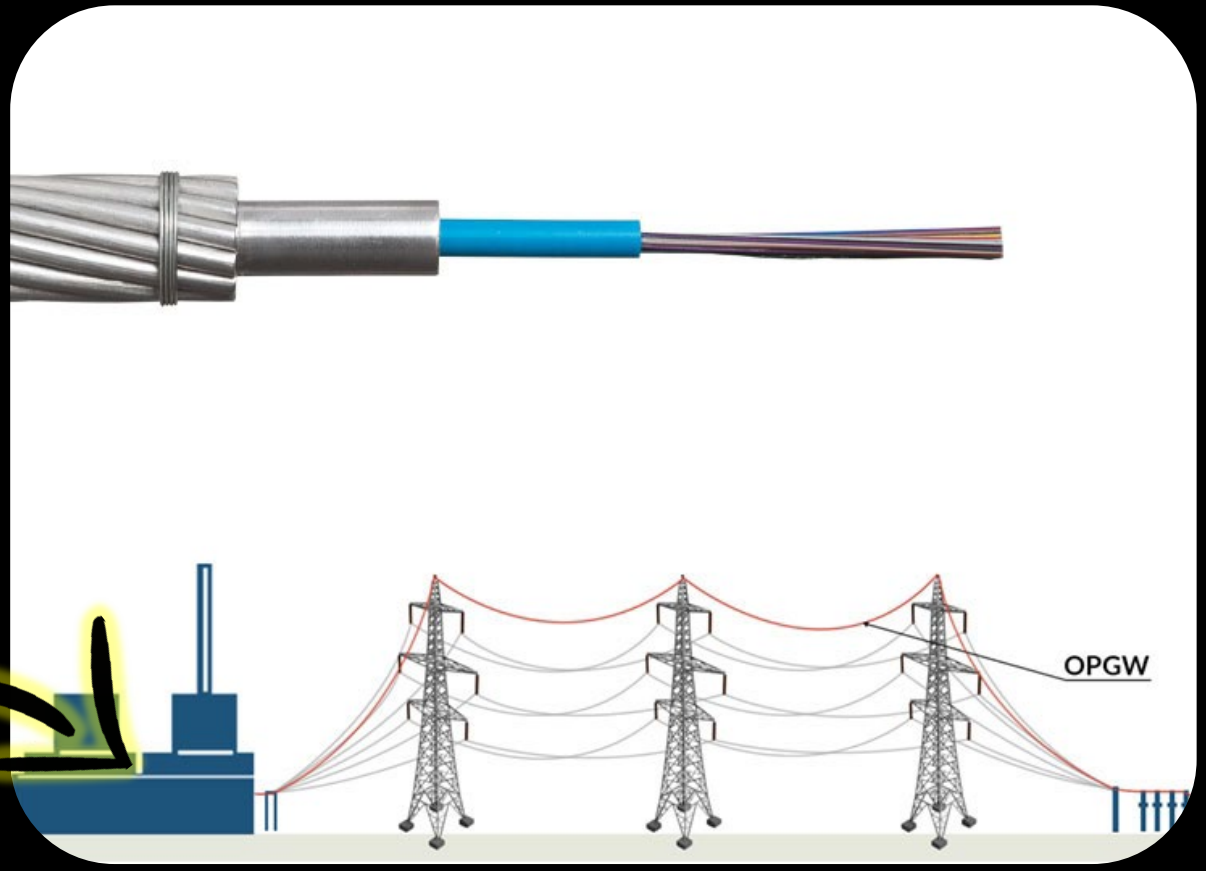
Limited in additional logic implementation

Very Reliable

NamPower's First Fibre

- First fibre was deployed in 1998
- Part of a new transmission line
- A layered approach was chosen:





A Binary Purpose

and

Excess Capacity

Own Requirements

- More than covered
- Always first priority
- Reason for existence

Commercialize

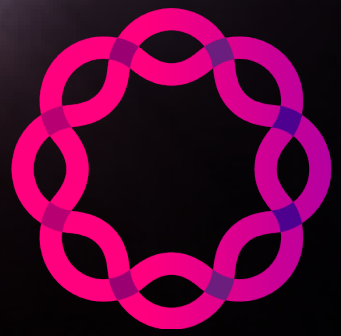
- Additional income
- Support ICT sector
- Boost national growth

A New Formation

Formation of The GridOnline

How was this made possible?

A Significant Partnership



ribbon®

and

THE GRID ONLINE

The Early Days

- Initial deployment started with tender 1998
- About 25 Syncom nodes commissioned
- SDH only – STM-4 and later STM-16
- Own use only, NamPower did all O&M

Last unit decommissioned: 2023

The First Upgrades

- Upgraded during middle 2010s
- NamPower upgraded to XDM platform
- Still only internal use
- This was still SDH:
  - NamPower trusted the technology
  - Very hesitant to move to any other tech
  - Fear factor from staff and protection suppliers

Despite sound advice: The client was king…

A Launch & Leap of Faith

- In 2019, The GridOnline officially launched.
- Initial offering was limited to certain routes & only STM-1 to 1 Gbps

- The plan was to go **much** bigger. We needed:
  - Advanced Technology
  - Design and Deployment Expertise
  - Frontline Support

We took the leap…

and were not disappointed!

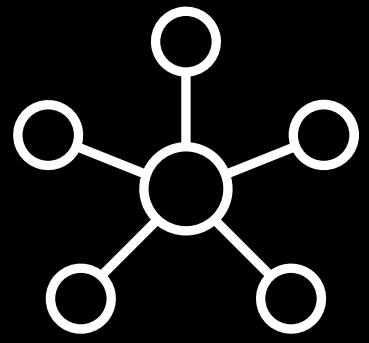
A Constructive Arrangement

THE GRID ONLINE

ribbon

Dreams
Plans
Requests
Obtains
Installs
Operates
Maintains

The Network

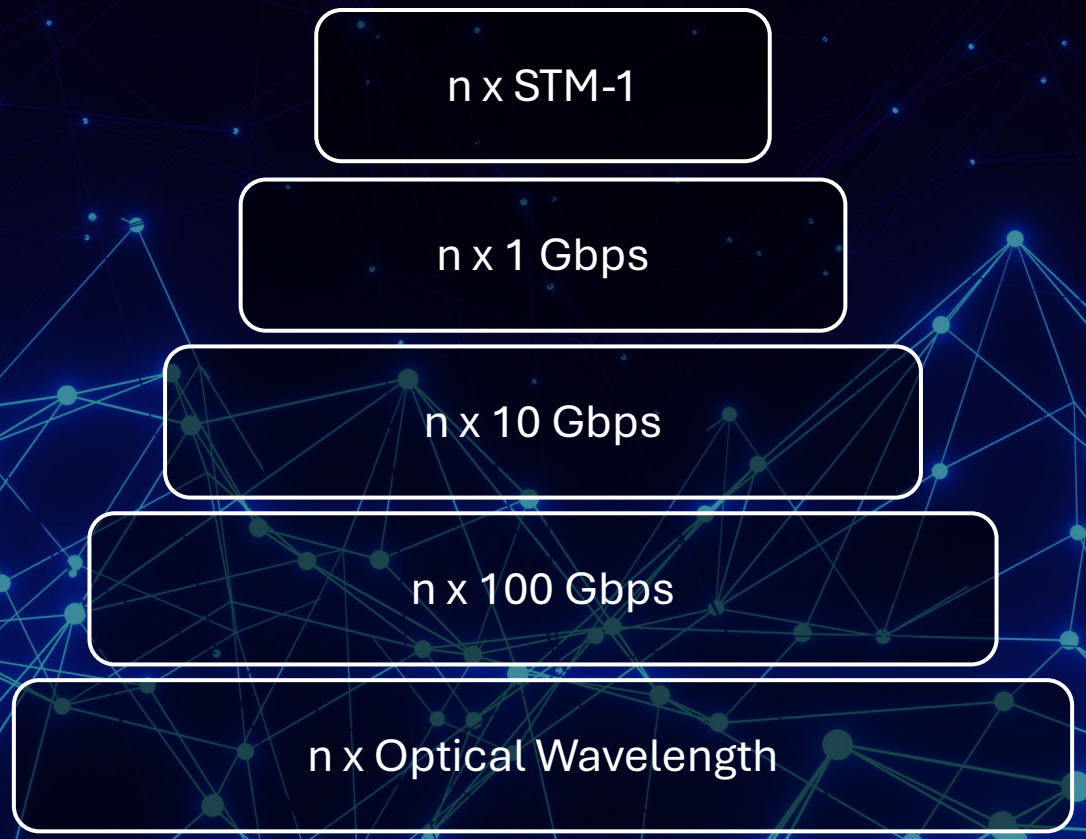


Plans
Advises
Designs
Builds
Delivers
Supports
Maintains

Partnership Achievement

- 90 PoPs
- Equipped exclusively with Ribbon **Apollo** and **Neptune** Platforms
- **Lightsoft** Management
- **LightInsight** Reporting
- ROADMs at all major nodes
- 100 | 200 | 400 Gbps channels
- About 7000 km fibre (mostly OPGW)

Services Offered



Structure & Operations

Team of 6 Colleagues

Steering
Strategizing
Client Engagement
Compliance
Projects
Administration
Procurement
Implementation
Operation
Support

+

Ribbon Resident Engineer Support

+

Ribbon Support Services

=

Service & Support

The Inevitable Rewards

The Inevitable Rewards

Network Highlights

Cross Border Connections

- Angola
- Zambia
- Botswana
- South Africa

- Path for Land-Locked Countries

Direct Subsea Connections

- WACS
- Equiano

Total Neutrality & Open Access

- Uniform pricing
- Serving even the smallest ISP
- Up to the largest multi-national carrier

Ability to Interconnect

- Data Centres
  - Armada
  - Teraco
  - Etc.
- Tier 1 Transit Providers

A New Income Stream

Capacity sold has been growing exponentially since inception

Operational overheads remain relatively constant in comparison

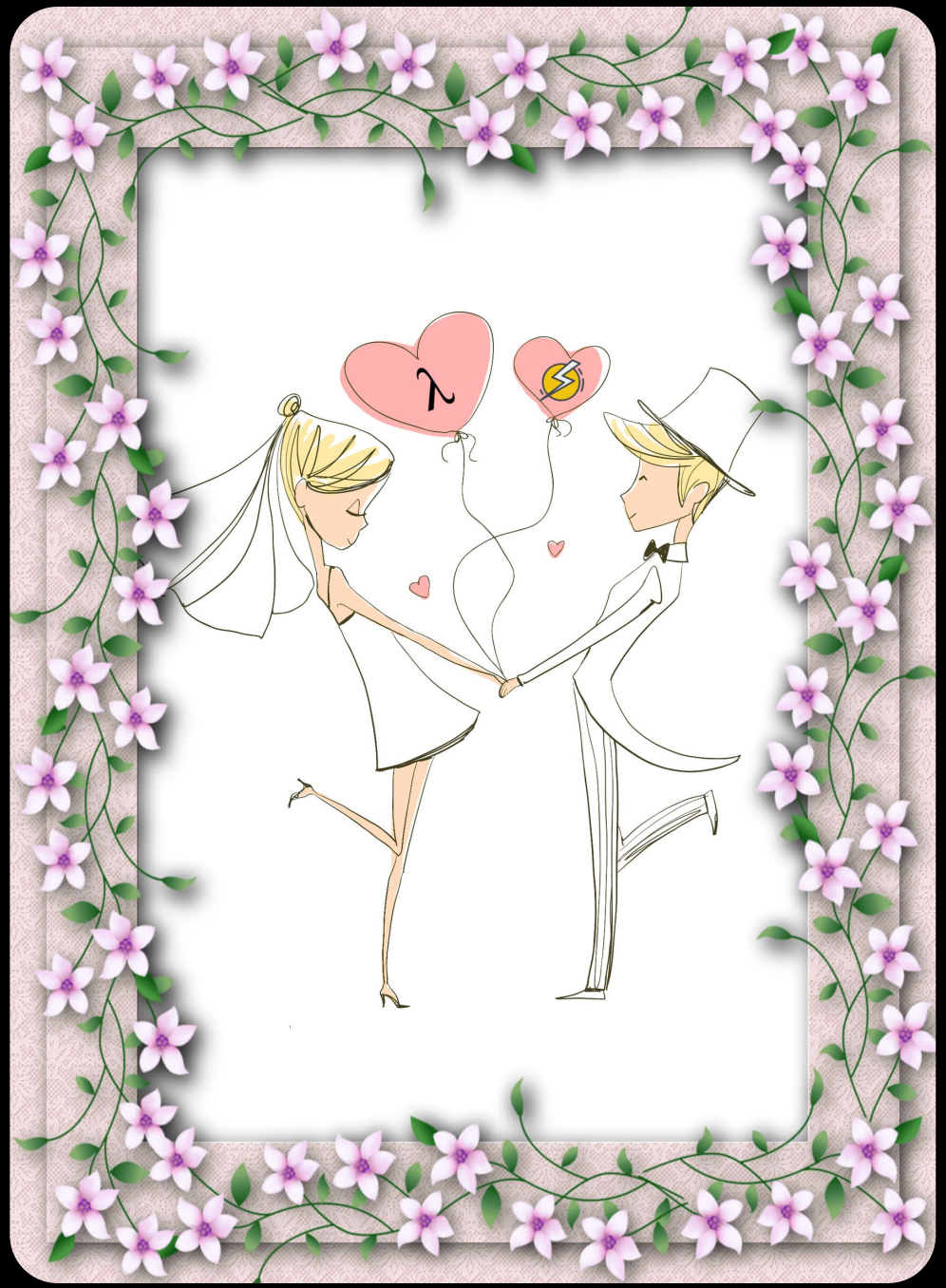
Primary infrastructure is a sunken cost

Active equipment investment carries a double benefit

Social Impact

- Playing field has been vastly leveled
- Backhauling costs drastically reduced
  - Many ISP startups formed
  - Connectivity for isolated communities
  - Internet costs decreasing
  - ICT regulator is happy
- Alternative routes for entire region established
- Foreign investment coming to Namibia
- Income is used to dampen rise in energy costs

In Conclusion



ANNOUNCEMENT:

Johnny Joule & Lady Lambda

got married and are living happily, ever since.

They had a competent matchmaker.

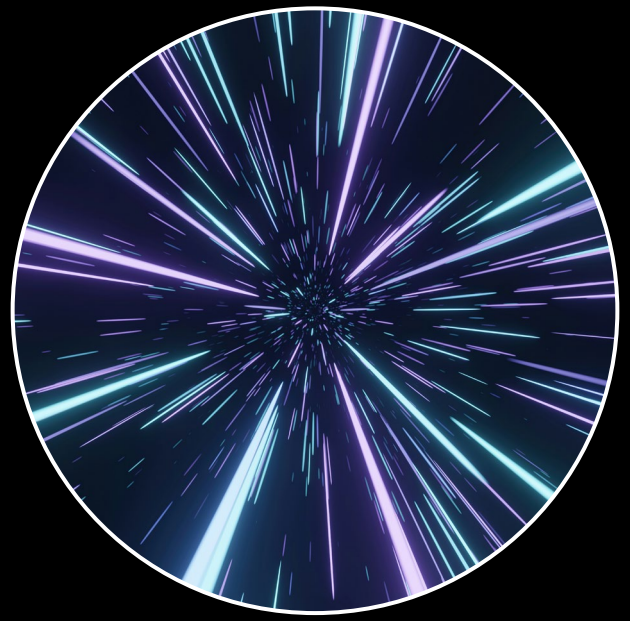
Lessons Learned

Be brave and do it!

You don’t need a technology supplier.

You need a competent technology partner.

You don’t have to reinvent the wheel.



But you can drive a superb vehicle.

The competition won’t like you…

But the results speak for themselves.

Finally...

Telecommunications Network *REN*ew

MPLS-TP

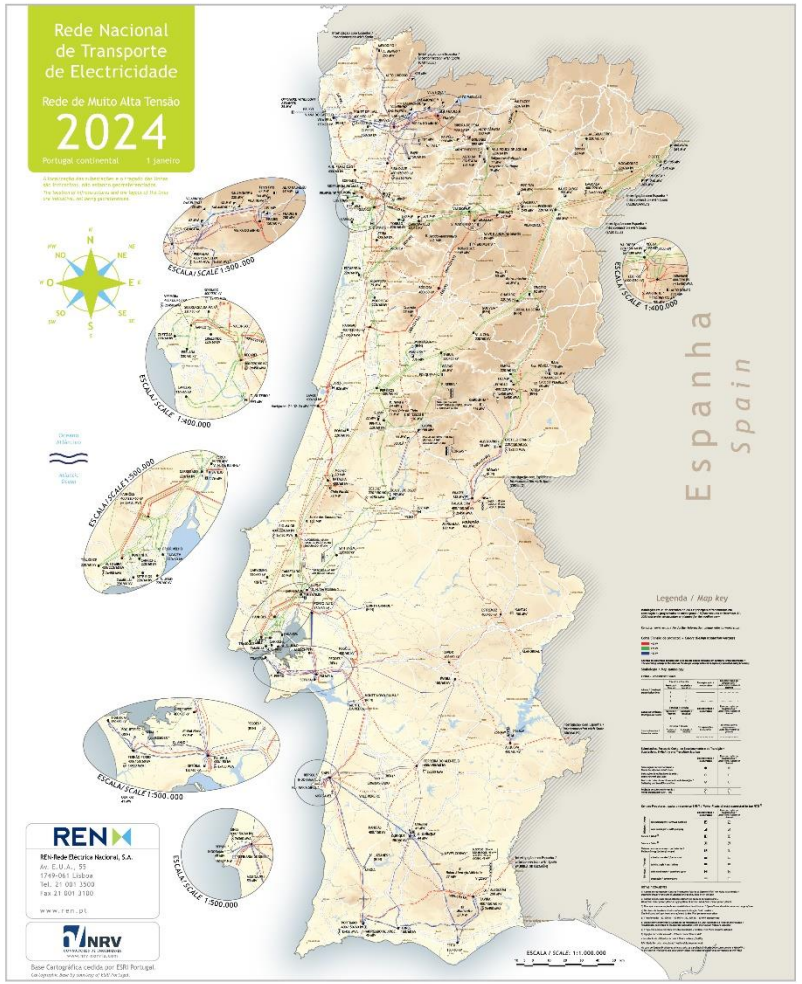
REN

"The network of all networks

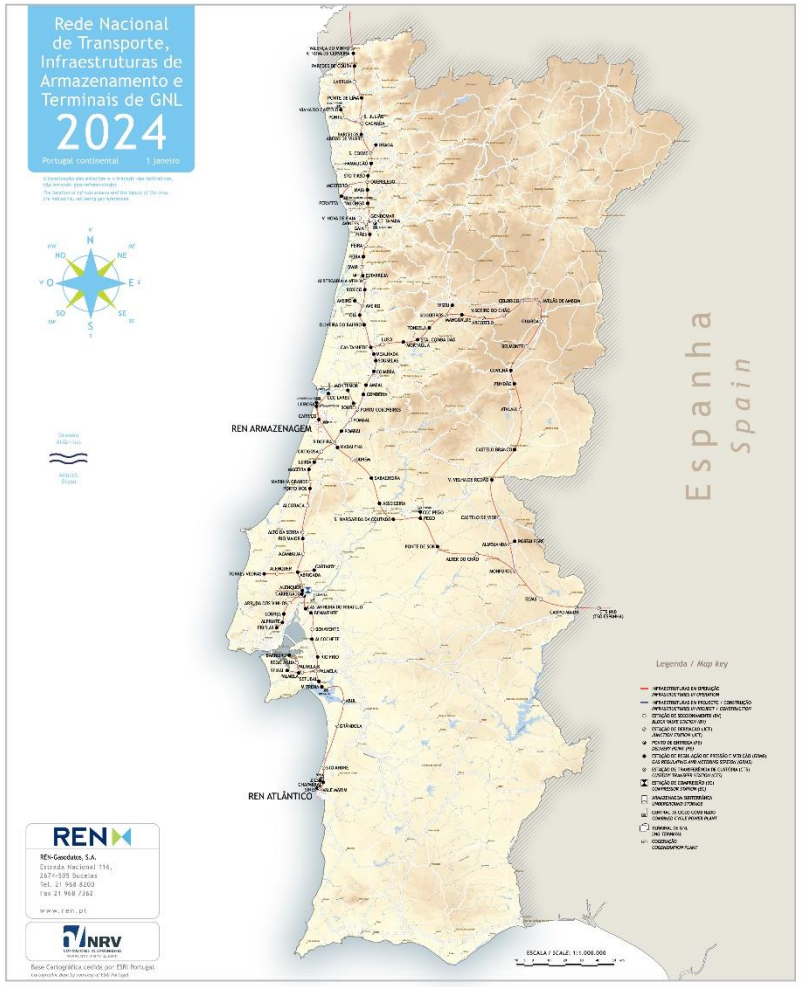
REN – Redes Energéticas Nacionais is the company responsible for the transmission of very-high voltage electricity and gas, the overall technical management of the Electricity System and of the Gas System, as well as for the reception, storage, and regasification of Liquefied Natural Gas and for the underground storage of natural gas."

https://www.ren.pt/en-gb

Electric Network



Gas Network



Telecommunications Network RENew

The project has the following main Drivers:

- SWAP of actual SDH network due to technology & equipments End of Life/End of Support
- One supplier for all network, uniformization of physical equipment configurations
- Update the network in terms of technology, features and functionalities
- Optimize the network for packet traffic, higher demand for Ethernet services
- Compatibility with actual network and services provided,
- Use of MPLS-TP as the “new standard” while maintaining SDH for mission critical low latency Protection Relay traffic (E1 and C37.94)

Project Methodology

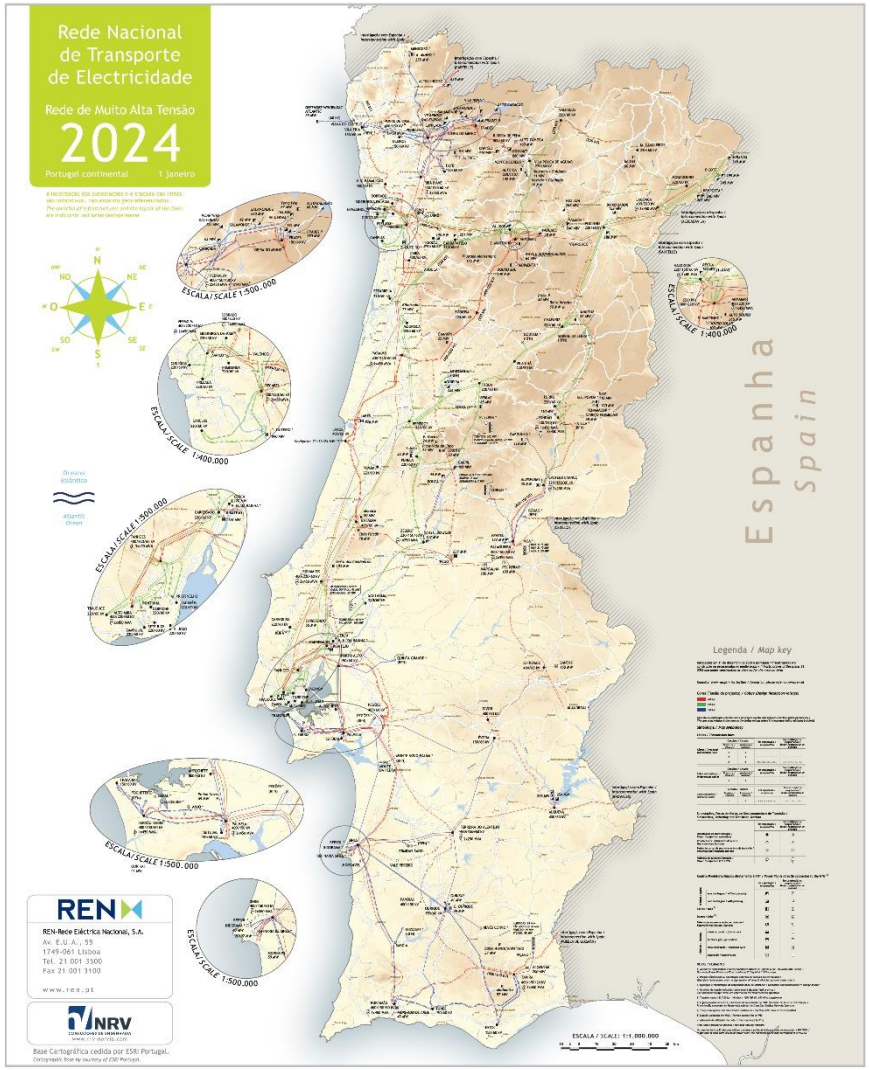
- Upgrade of Management System (NMS)
- Installation of MPLS-TP/SDH equipment in all RENs sites (~110 sites, ~370 equipments)
- Service Migration to the new network
- Physical removal of legacy equipments

Project timeline

- 36 months

Maintenance & support

- Included for entire network lifecycle



Solution

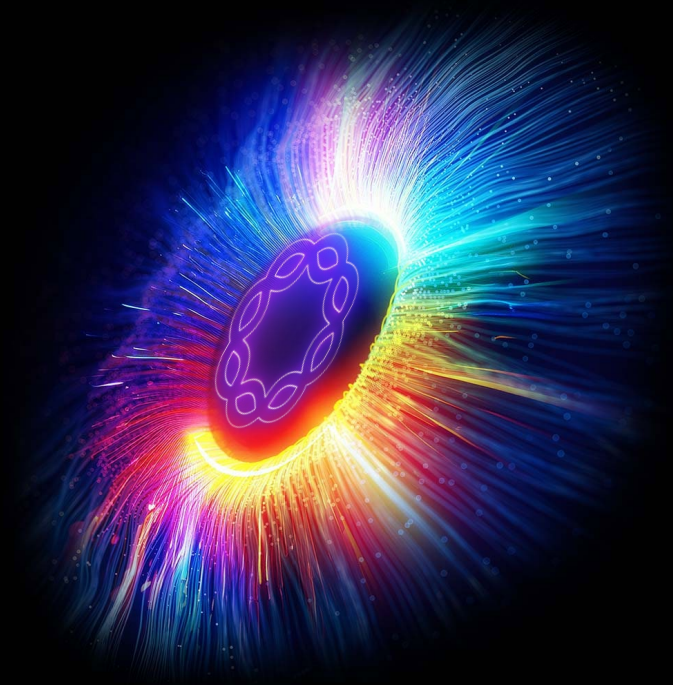
- MPLS-TP as future substitute of SDH because it has similar performance and security to TDM SDH
- SDH for mission critical low latency Protection Relay traffic
- ***RIBBON*** as the only supplier for all network and NEPTUNE platform as the most suitable for this purpose
  - Pure packet nodes (MPLS-TP)
  - Hybrid nodes (MPLS-TP / SDH)
- ***Omnitécnica*** as local partner for the deployment and maintenance services

Thank you!

Jorge Fonseca
jorge.fonseca@ren.pt

ribbon

INSIGHTS



Embracing AI In Your Network

Chip Boyle

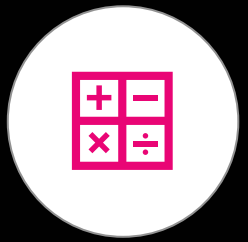
Head of Ribbon Research Labs

ribbon INSIGHTS

What Do These Terms Have In Common?

WORDS

IMAGES



NUMBERS

SOUNDS

Acronym for WINS Work representing tasks to industry-wide “Knowledge Work”

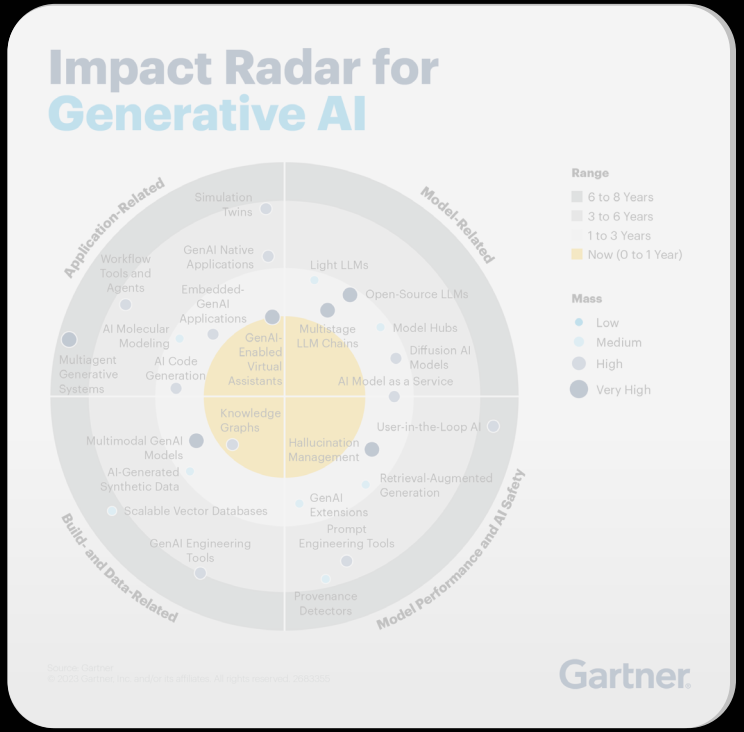
Take away: Understand your *Data*

Source: Harvard Business Review, “*Where Should Your Company Start with GenAI?*“

AI Landscape is Dynamic

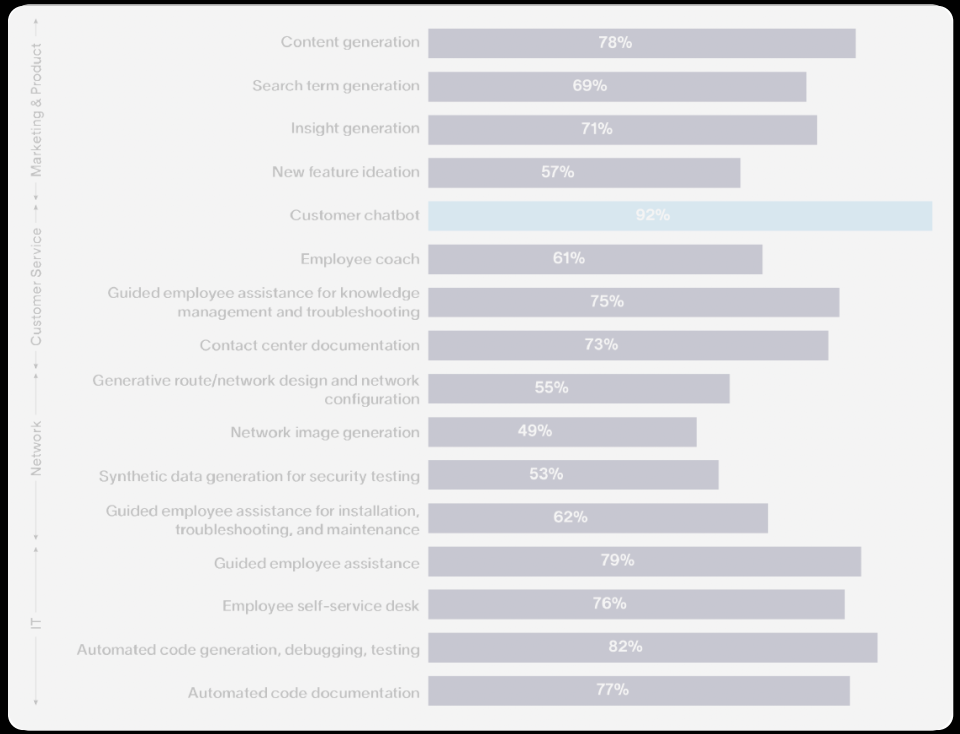
- Gartner's tech landscape at start of 2024
- World is moving fast - items thought to be further out are quite active now
  - Retrieval Augmented Generation (RAG)
  - Open LLMs
  - Multi-agents
  - Prompt Engineering Tools

What is the north star of GenAI? Building, optimizing and using *Models*



Source: Gartner "**Understand and Exploit GenAI With Gartner's New Impact Radar**"

Use Cases Aren’t Always Clear



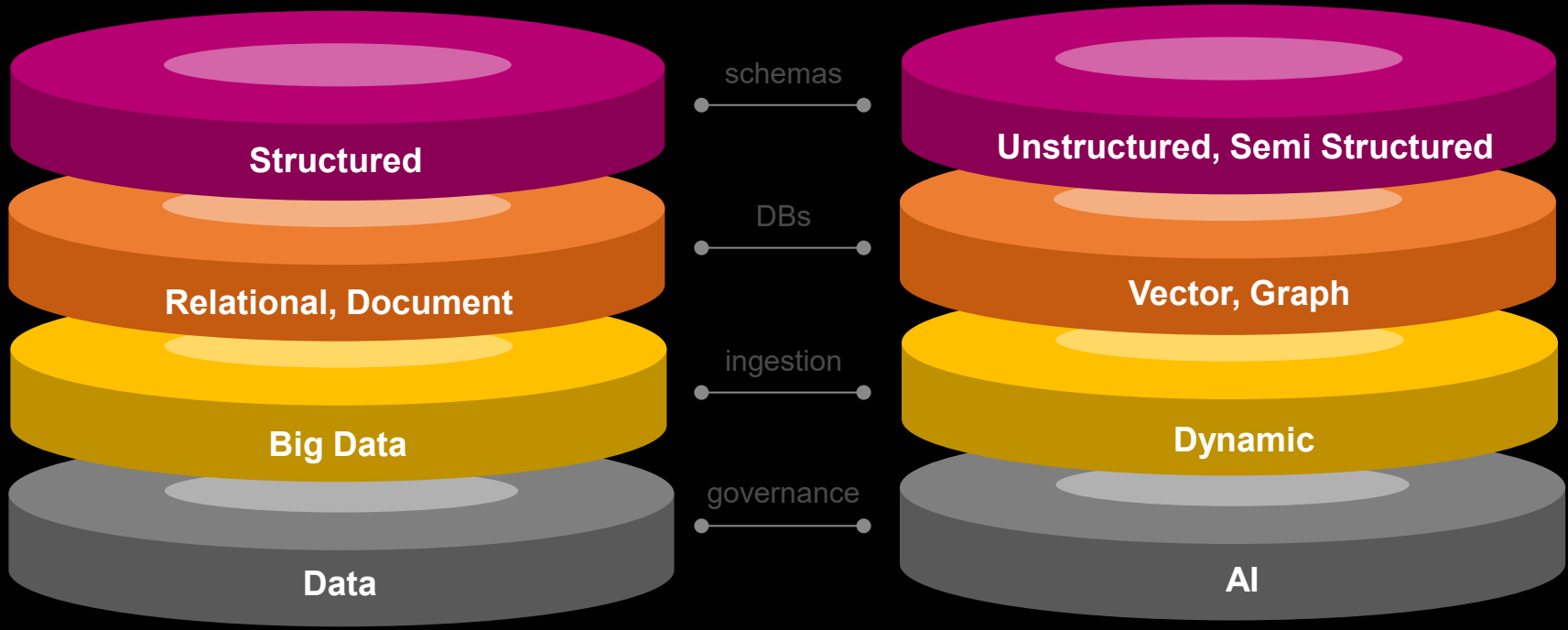
- Study geared to educate & sell AWS
- Majority focused on man-machine interface - can be applied from programmatic perspective
- Starts to scratch the surface of deeper “network” use cases

Trend: Broaden from use cases to any required *Action*

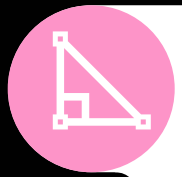
Source: Altman Solon commissioned by AWS, “Telecoms Generative AI Study”

The Iceberg Problem

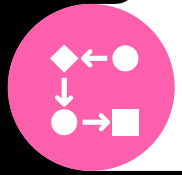
Data Complexities And Challenges



Models Complexities And Challenges



Feature Engineering + Prompt Engineering



Singular Models + Foundational to Fine-tuned Models

Manually Trained + Automatically Trained

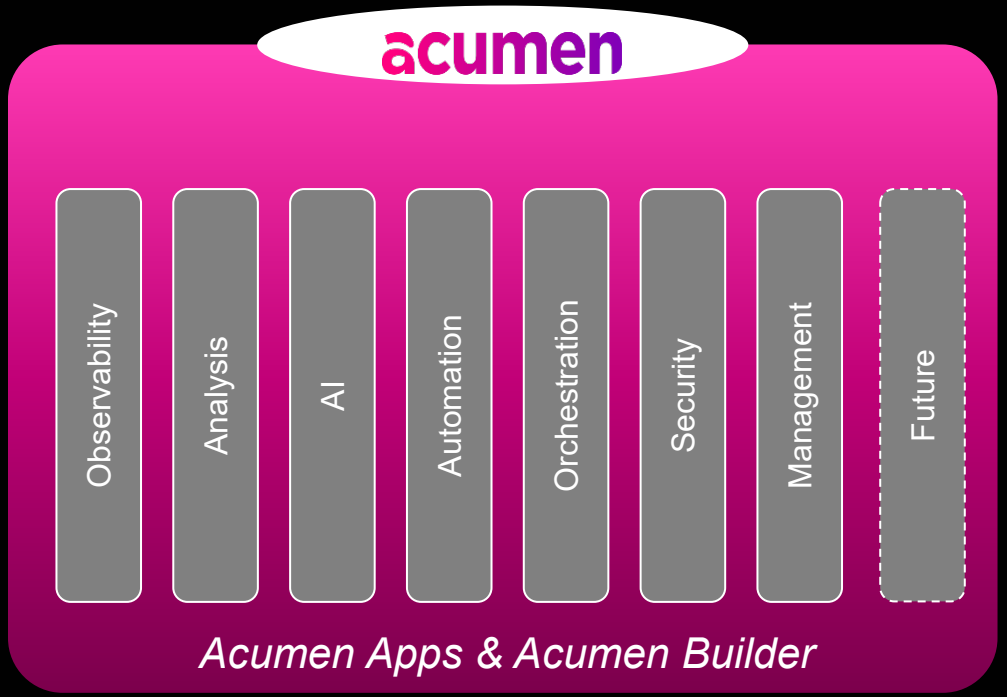
Model Evaluation + Trust and Transparency

Actions Complexities And Challenges

Simple Logic	Chained, Multi-agent
Single Pane of Glass	Human-in-the-Loop
MOPs	DevOps, AIOps
Predictive & Descriptive	Prescriptive & Generative

So How Do We *Embrace AI*?

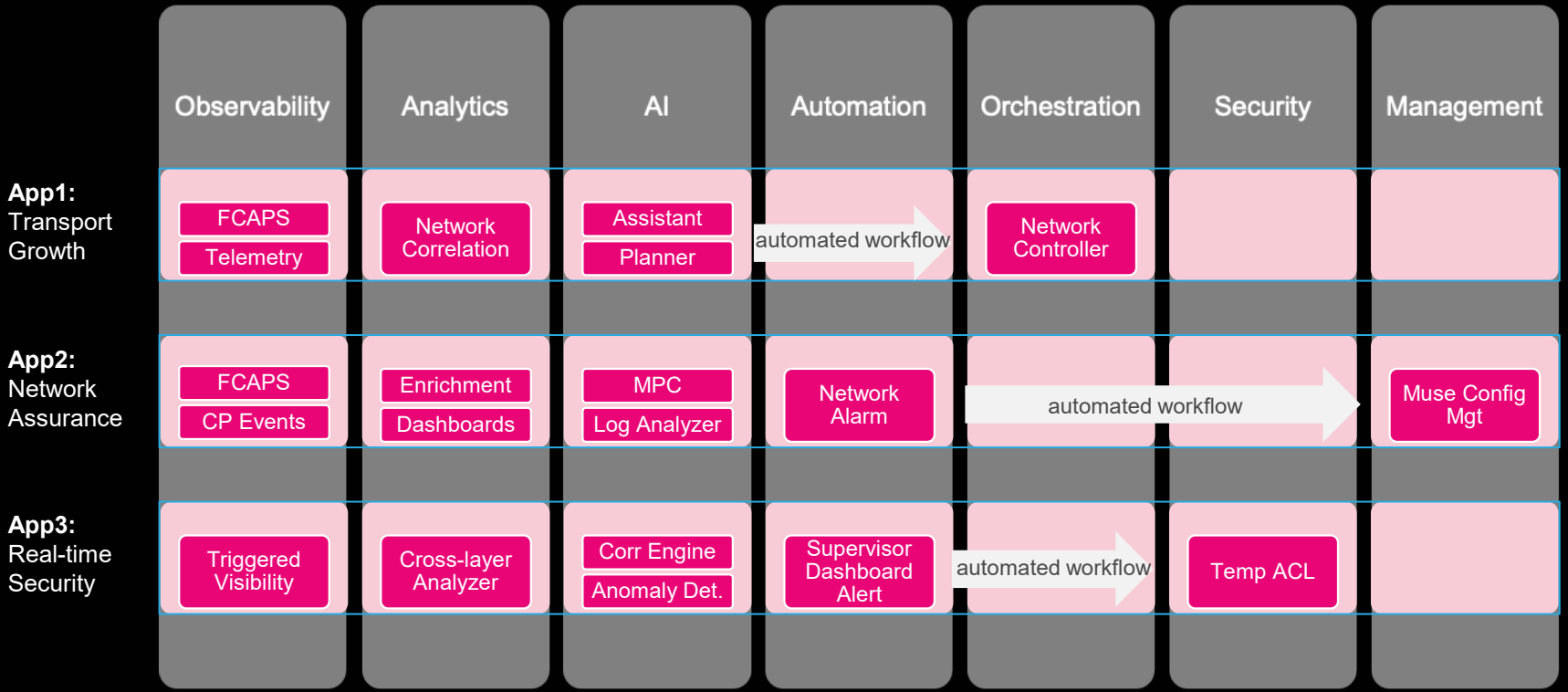
Create an Intelligent Automation Platform



Acumen Apps
- Out-of-the-box integration
  - ✓ Fully Cloud-native
  - ✓ Purpose-built for telecom

Acumen Builder
- Rapidly create new Apps
- Customize existing Apps
  - ✓ Low-Code / No Code
  - ✓ AI/ML models, new services
  - ✓ DevOps & AIOps lifecycles

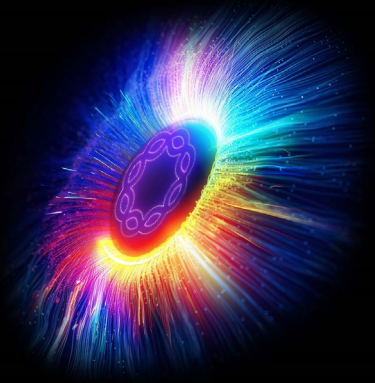
Unlock Infinite Opportunities



Transition Network Operations to xOps Applications

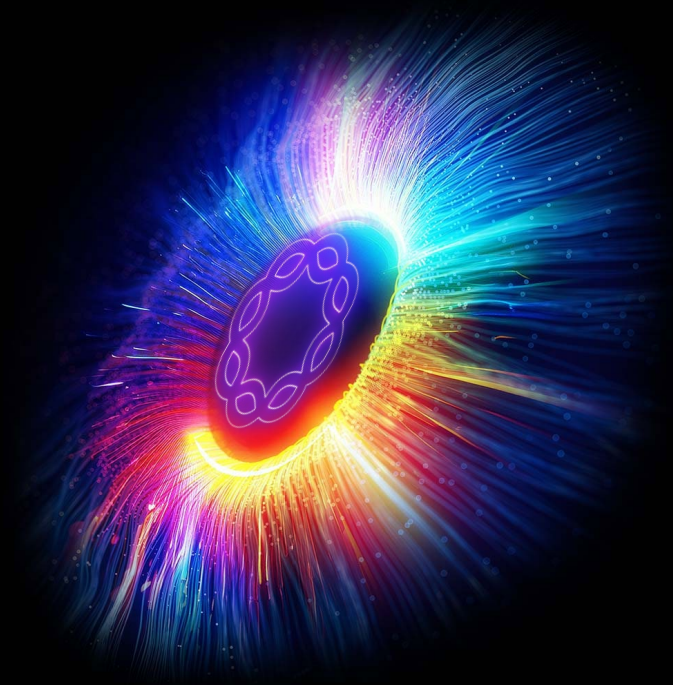
Come Talk To Us About Your AI Journey

ribbon INSIGHTS



ribbon

INSIGHTS



Coherent Optical Transmission in Ribbon's Intelligent Middle Mile

Jonathan Homa

Director IP Optical Solutions Marketing

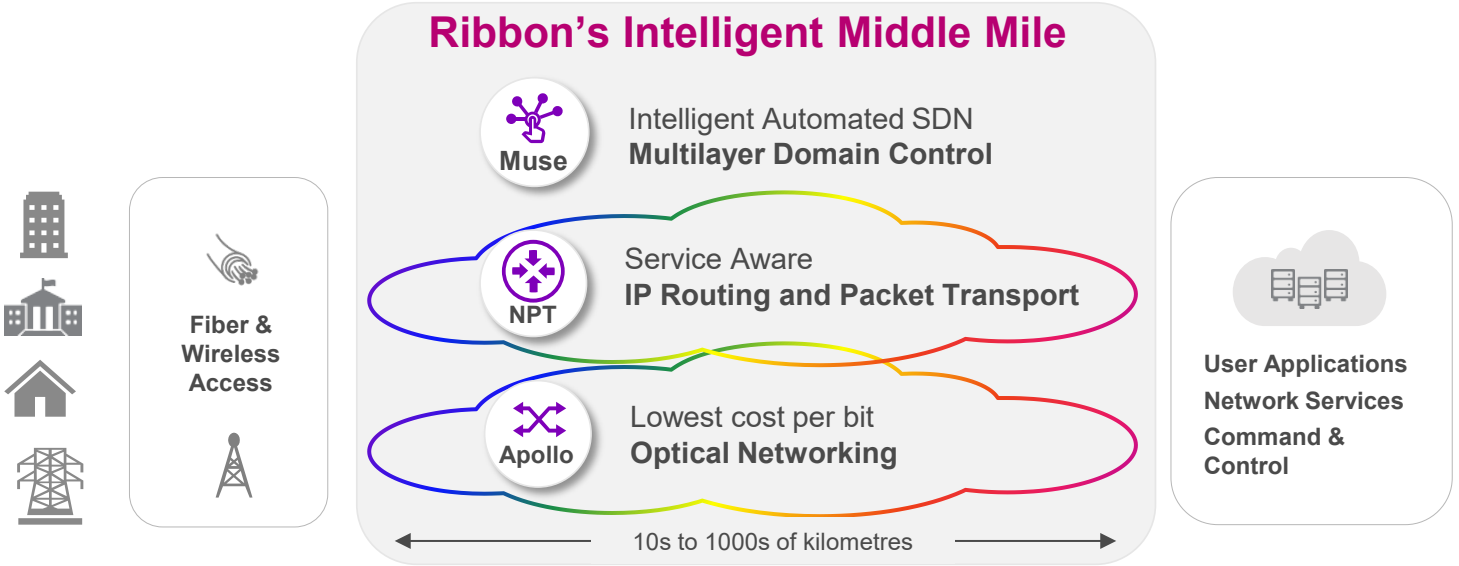
Fiber Optic Transmission

How **many times** can light circle the earth on a fiber optic cable in one second?

A. 1/2
B. 2
C. 5
D. 7
E. 10

ribbon INSIGHTS

Application to Ribbon's Intelligent Middle Mile



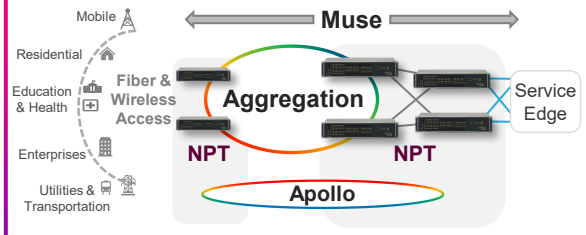
Service Aware
Forecast Tolerant
Intent Driven

OPTIMIZES

Revenues
Capex
TCO

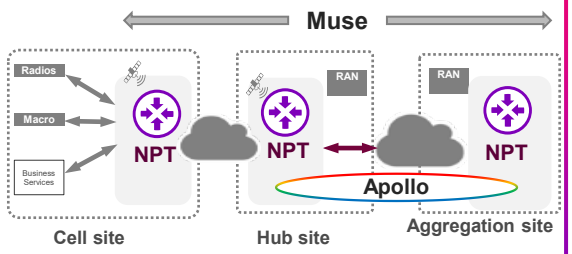
Ribbon – The Middle Mile Experts

Broadband Backhaul & Networking



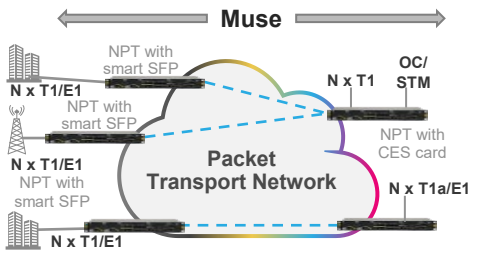
ISPs, Optical backbones, NRENs

5G xHaul



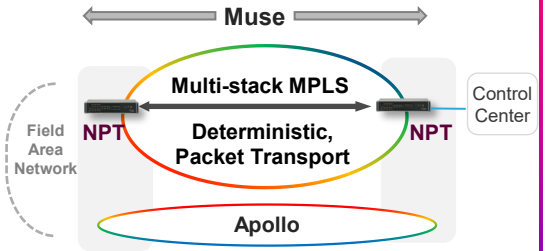
Mobile Operators, Backhaul Wholesalers

TDM to IP Migration



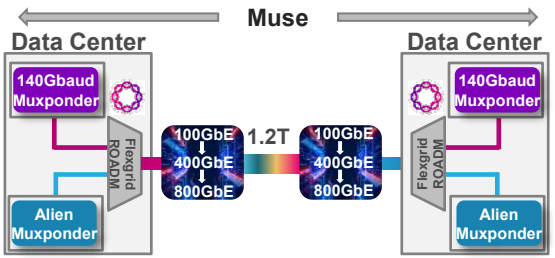
All Service Providers and Network Operators

Critical Infrastructure



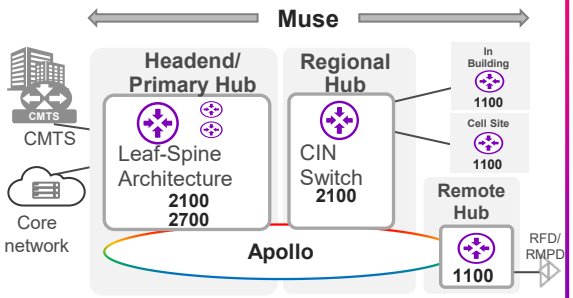
Defense, Utilities, Transportation

High-Capacity Interconnect



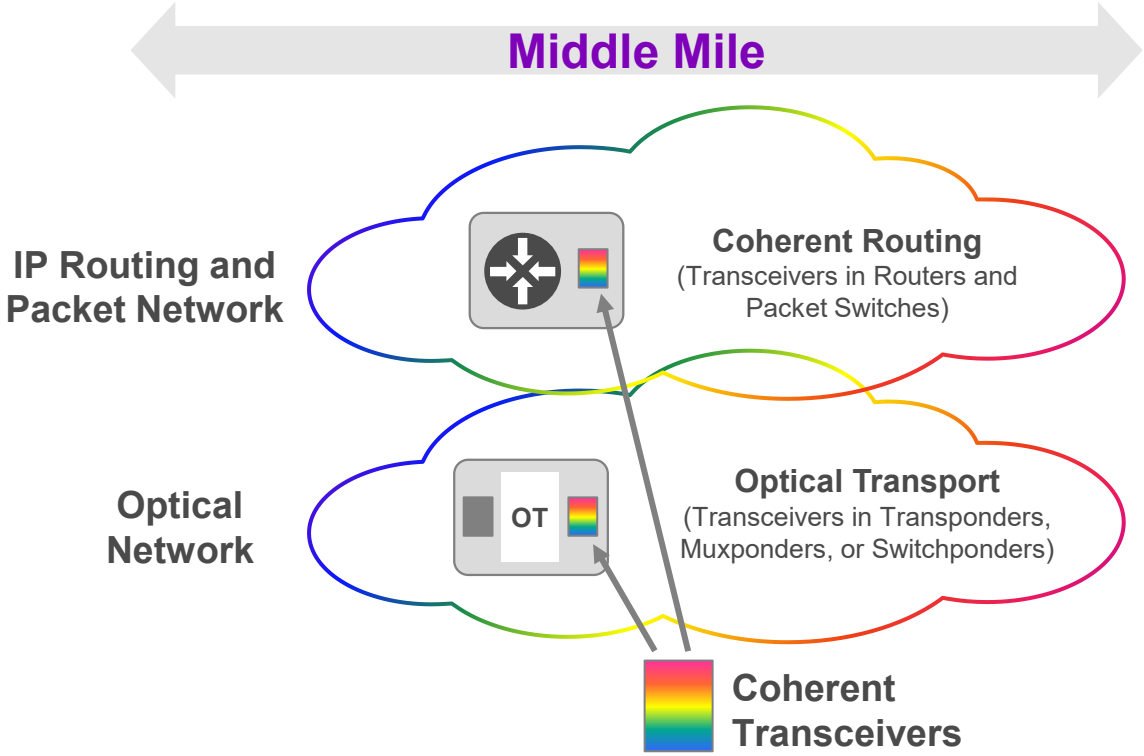
Data Center Interconnect, Submarine

Converged Interconnect Network



Cable Companies

Where Coherent Transceivers Go



Coherent Transceiver Optimizations

Capacity-Reach Optimized

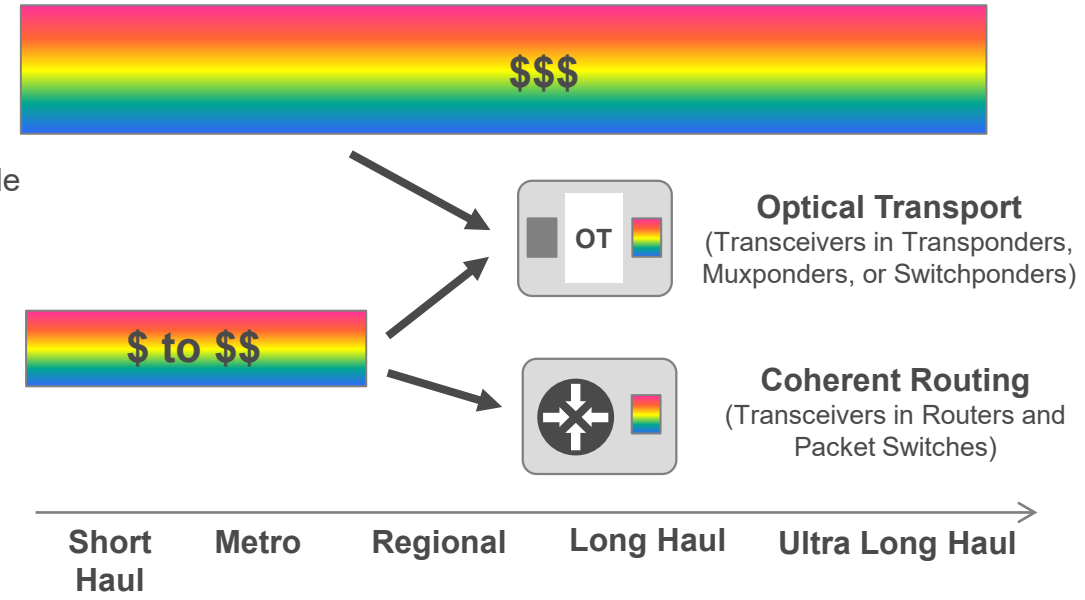
CIM 8

- Modules and large pluggables
- 400G to 1.2T
- Future 2.4T
- 80W to 120W
- OTN
- Proprietary (interoperable capable)

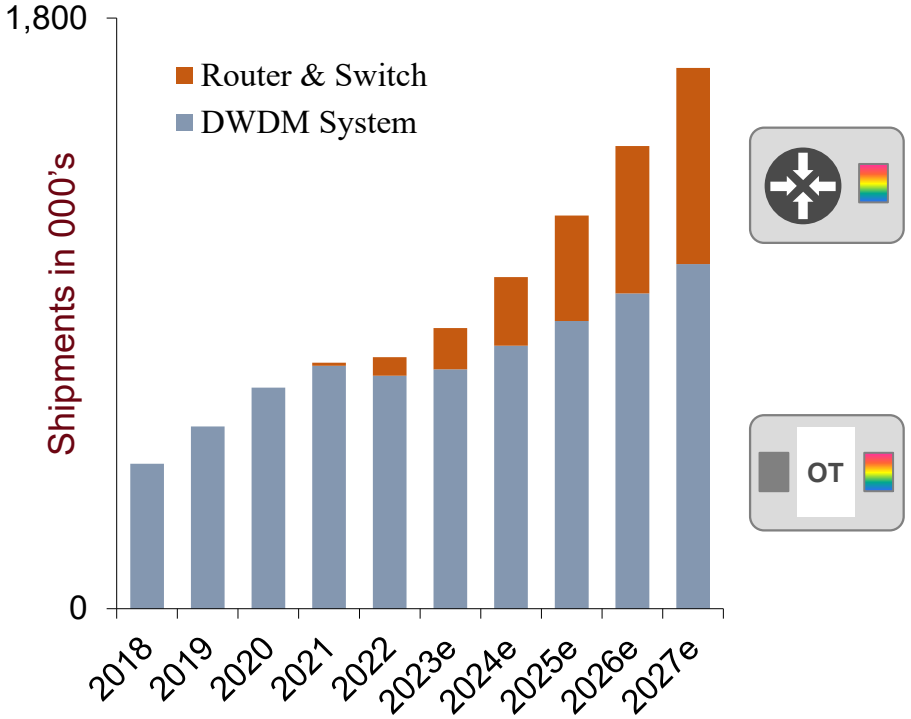
Power-Cost Optimized

QSFP-DD CFP2 DCO

- Small pluggables
- 100G, 400G
- Near future 800G
- 6W to 25W
- OIF, Open ZR+, OpenROADM (OTN)



Coherent Optics Market



Coherent Routing
(Transceivers in Routers and Packet Switches)

Optical Transport
(Transceivers in Transponders, Muxponders, or Switchponders)

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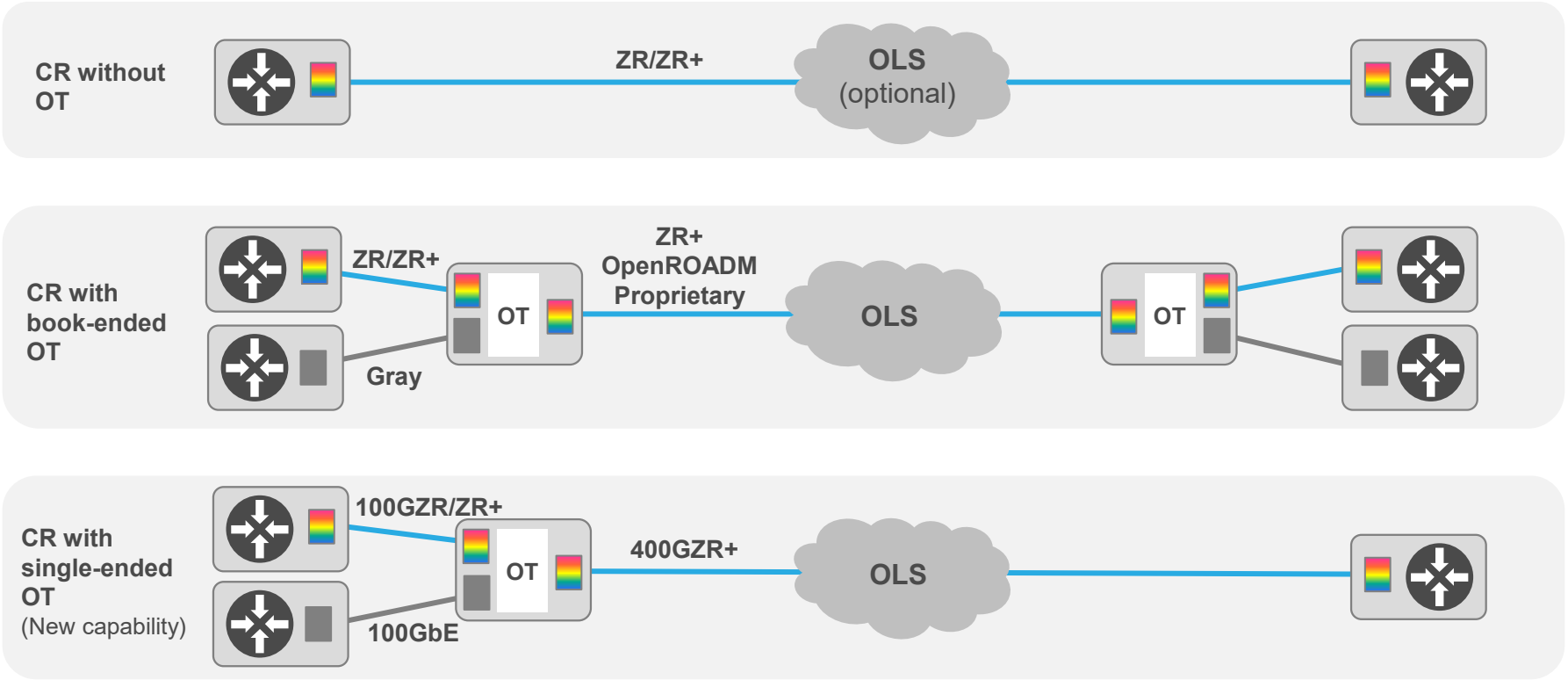
Coherent Routing (CR) with Optical Transport (OT) Configurations



Reasons to Consider Optical Transport versus IPoDWDM

Coherent Routing (IPoDWDM)

Most appropriate for point-to-point links and simpler networks where it has lower cost and complexity.

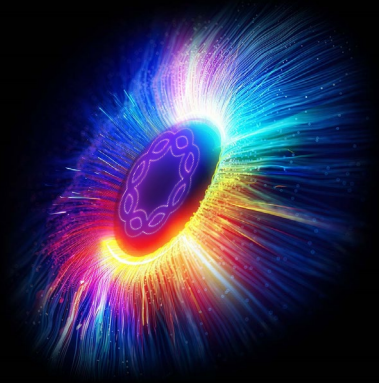
Optical Transport (muxponders)

- Optical **aggregation** of multiple high-speed ports onto a single wavelength, with full throughput and zero latency
- Substantial **OAM** over the optical path, which is particularly important when the path traverses multiple ROADM nodes

Each network must be considered in its **totality** to determine the **optimal** economics, performance, and functionality

Ribbon Products

ribbon
INSIGHTS



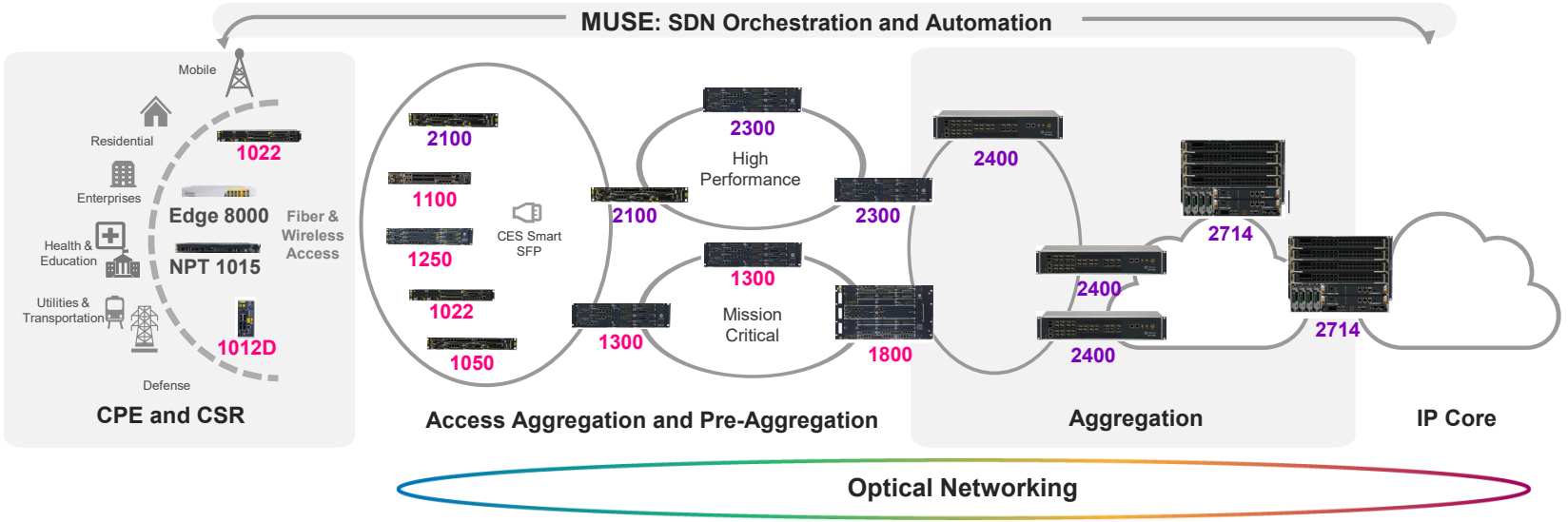
NPT Use of Power-Cost Optimized Coherent Transceivers

NPT **XDR** Family
High-Performance Routers

Supports 400G ZR/ZR+ using QSFP-DD

NPT **AR** Family
High Availability Routers

Supports 100G ZR/ZR+ using QSFP28

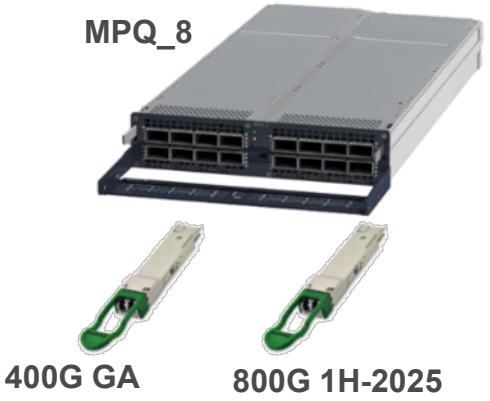


Apollo Options for 100GbE and 400GbE Transport

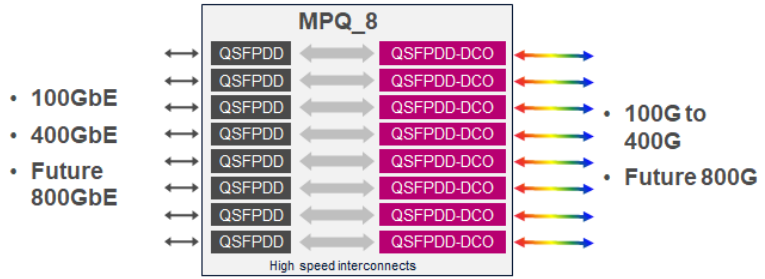
	Apollo 9408 High Density Applications	Apollo 9600 Series Modular Applications
	 Data Center 600mm deep F2B airflow	 Telco 300mm deep R2L airflow (9608D F2B airflow)
Capacity-Reach (Performance) Optimized	 MPJ1200_2 with 2 x CIM8 5nm-140Gbaud to 1.2T	TM800_2 with 2 x CIM8 5nm-140Gbaud to 800G
Power-Cost Optimized	MPQ_8 with 8 x QSFP-DD FPQ_2 for LR4 support 0dBM 400G Metro upgradeable to 800G	TM400_2 with 2 x CFP2-DCO • 0dBM 400G Metro • 0dbM 400G LH

Industry-Best 400G/800G Power-Space-Cost Optimized Ethernet DCI

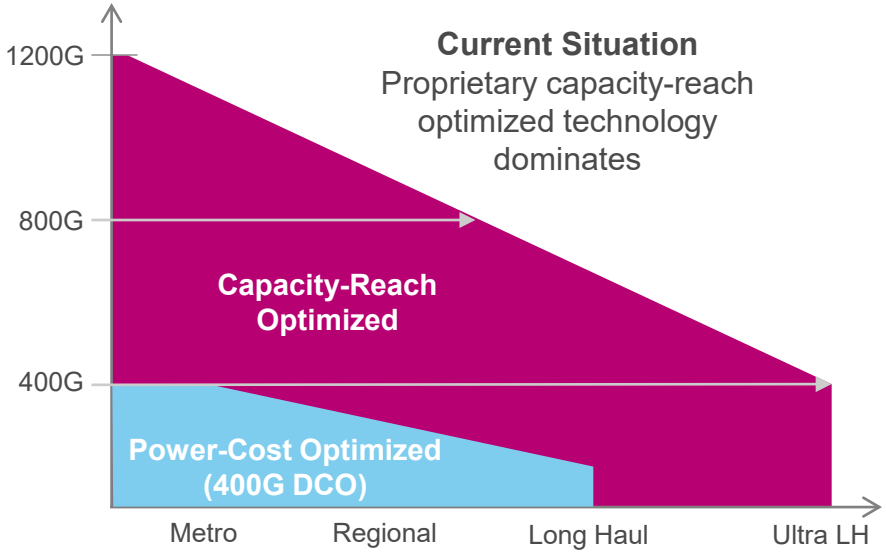
- **Unique Investment Protection:** 400G now with upgradability to 800G on the same blade
- Highest 2RU density:
  - 400G 12.8T
  - 800G 25.6T
- Lowest power consumption
  - 400G 0.09W/G
  - 800G 0.07W/G
- Can combine with pluggable QSFP amps, OLP and OTDR to dramatically lower TCO

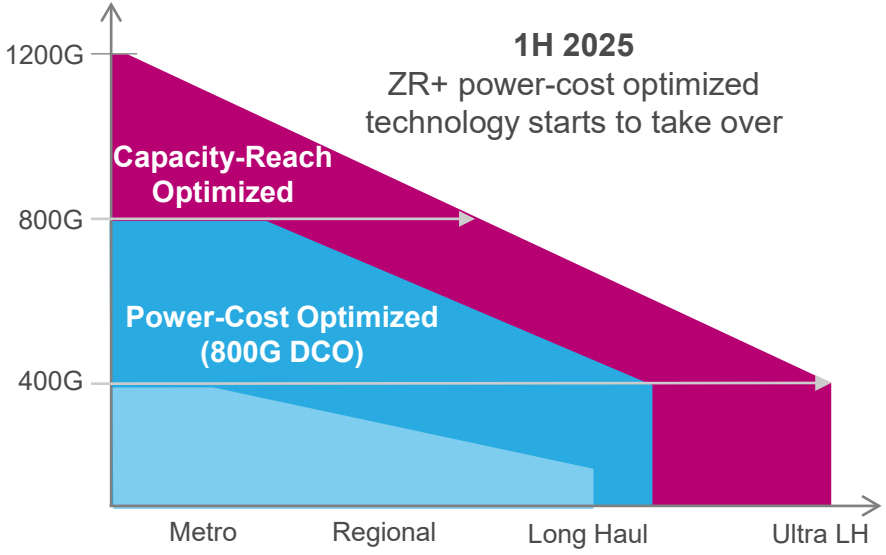


	ribbon	cisco	ciena	NOKIA	Infinera
800G Ready	**Yes**	No	No	No	No
2RU Density 400G	**12.8T**	12.8T	4.8T	3.2T	3.2T
2RU Density 800G	**25.6T**	N/A	N/A	N/A	N/A



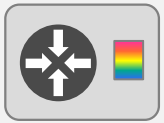
Changing Dynamics of Optical Transport





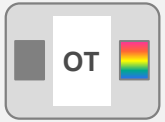
Coherent Optics Summary

Coherent Routing



- Lower cost in simpler networks
- Lower complexity

Optical Transport

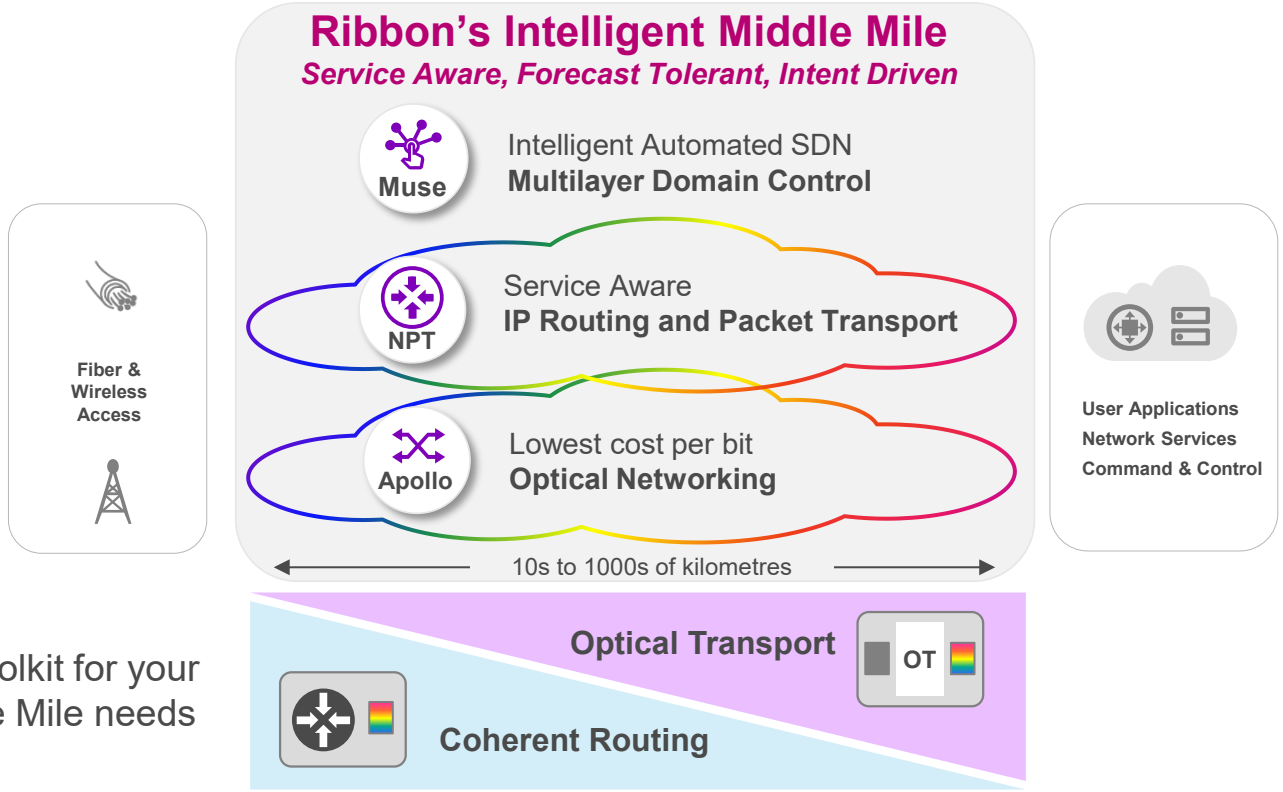


- Router ports aggregation
- OAM in more complex networks
- Regen and long haul

Mix

In many networks provides the best balance of cost and flexibility

Ribbon’s Intelligent Middle Mile



Full toolkit for your Middle Mile needs

Thank You

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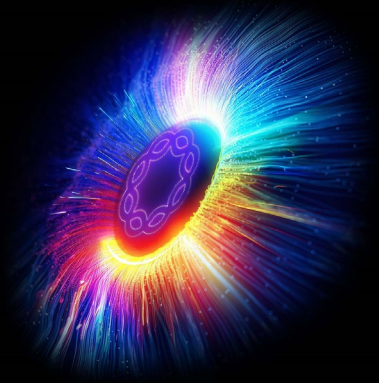
INSIGHTS



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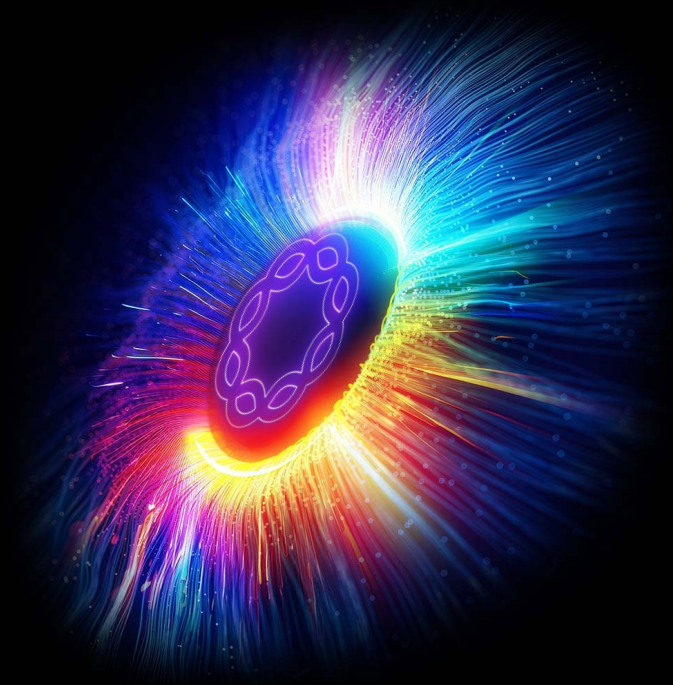
INSIGHTS



Automating Product Operations

David Tubb

Solution Architect

ribbon INSIGHTS

Planning a new product version…

We need a new product version to meet our new business requirements

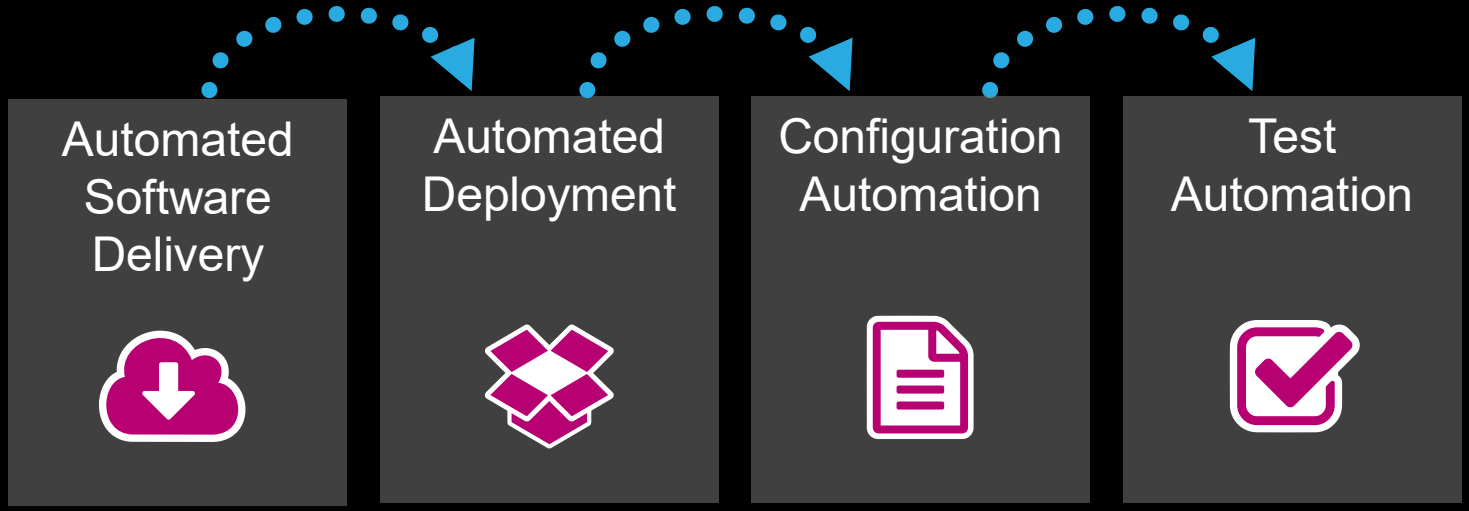
All the available versions have been through our test-suite in our integration lab

When can you do pre-production tests?

The automation suite will be triggered as soon as you provide the approval

When it’s done, we can start looking at resource allocation for production upgrade

…accelerated with Automation



Before a config change…

Are we confident that the configuration changes you're proposing will fix the issue?

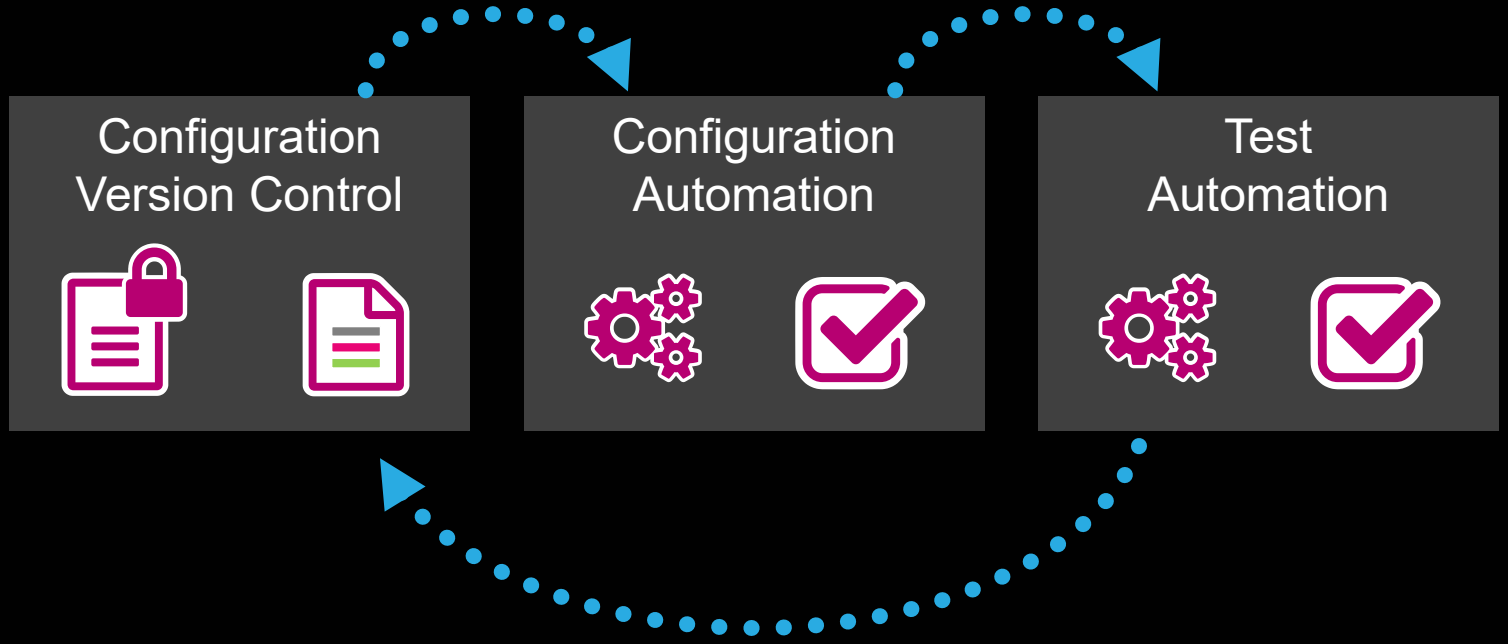
We've reviewed the changes, applied them in our lab and the tests have passed

And we're not going to break anything else?

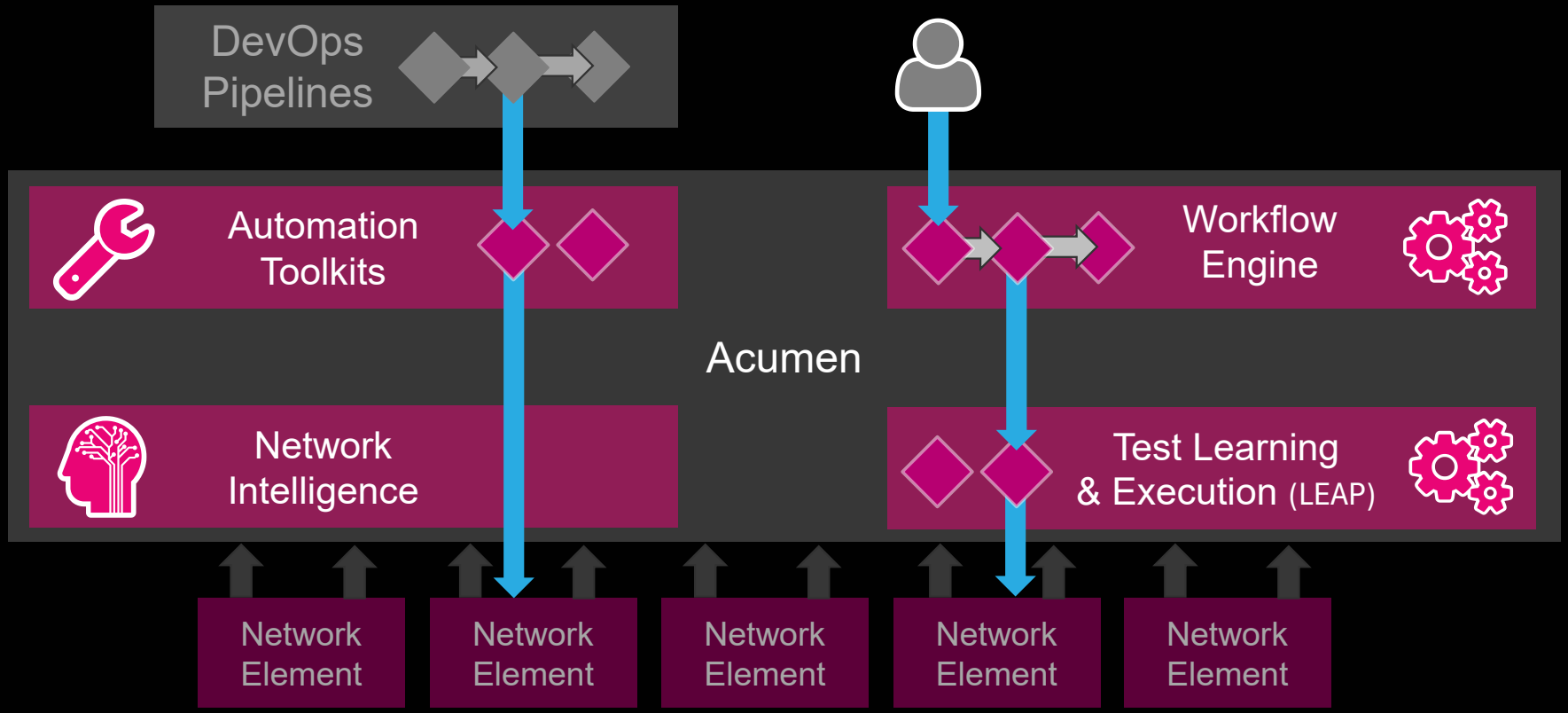
The production test-suite works fine with the production-config applied to our lab…

…and we've audited production configuration to make sure there are no surprises

…confidence comes with Automation



Automating Your Network with Acumen



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Delivery & Deployment Automation

Automated Software Delivery

- Subscribe for specific product codes and versions
- We will deliver updates to you
- Evolving to support registry function for containerised products

Automated Deployment

- Image templates for public and private clouds
- Automations to deploy or initialise according to requirements
- Fully automated container deployments with HELM

Configuration Automation

Version Controlled Configuration

- Definitive configuration is stored under version control
- Release management and branches, diffing, commits, reverts
- Use of templates to reduce duplication

Configuration Automation Modules

- Reach the declared state independent of current state
- Audit and optionally correct configuration
- Customised to meet business requirements

Test Automation

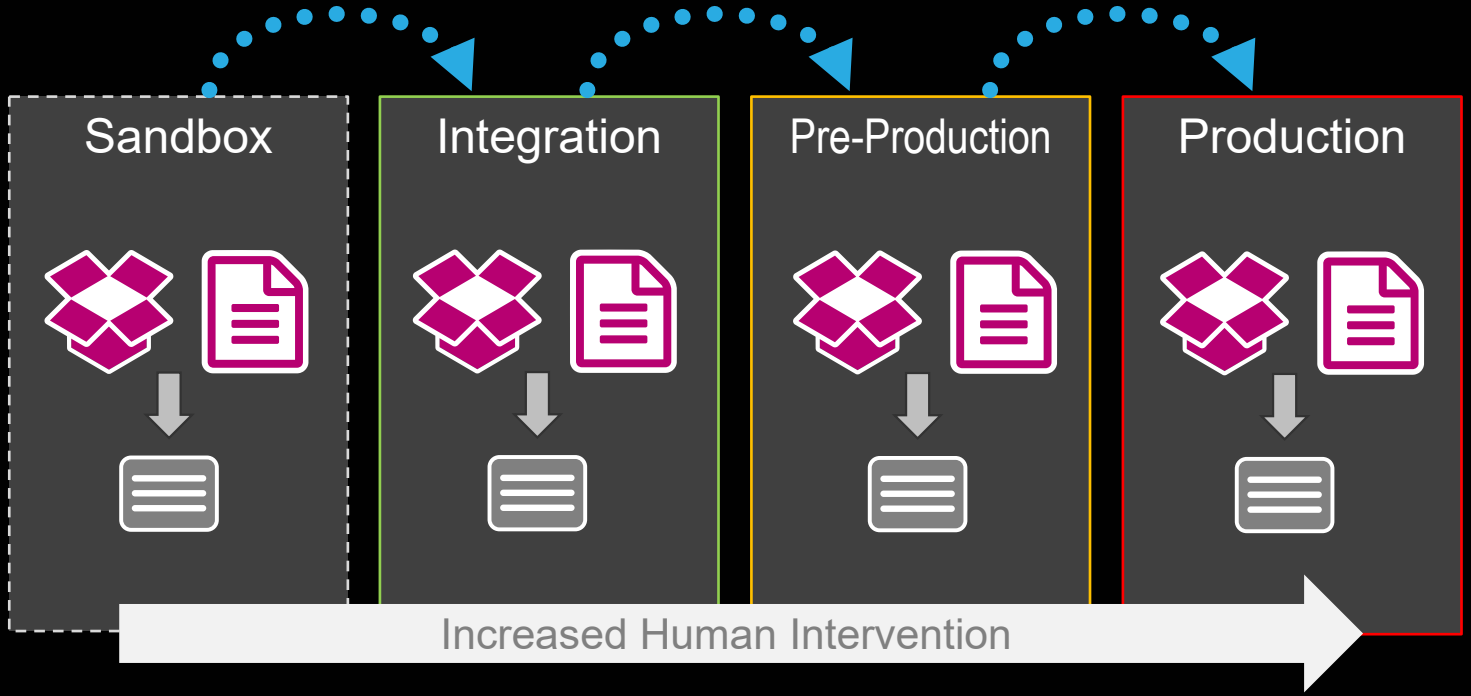
Test Learning

- Ingest session control sequences from production
- Categorise into common patterns of behaviour
- Generate test-suites for these patterns in a “twinned” lab environment

Test Execution and Auditing

- Test engine tuned for the target network element
- Execute learned suites and audit patterns against those measured in production
- Execute bespoke test suites for specific scenarios

Waterfall Product and Configuration Versions



Production Upgrades

Health-checks

- Automate version-specific pre- and post-upgrade health-checks
- Collect information and validate status
- Execute regularly in parallel across target nodes

Upgrade Automation

- Automation of individual upgrade steps
- Evolve towards greater automation with human oversight and control
- Increasingly follow automated “deploy” pattern

During an Audit…

How do we know that all the access-controls are correct?

They are automatically audited and updated every night by our automations

And I suppose you're going to tell me the version fixing the recent security vulnerability is ready for pre-production?

Yes, we received it yesterday and it was tested overnight with no issues.

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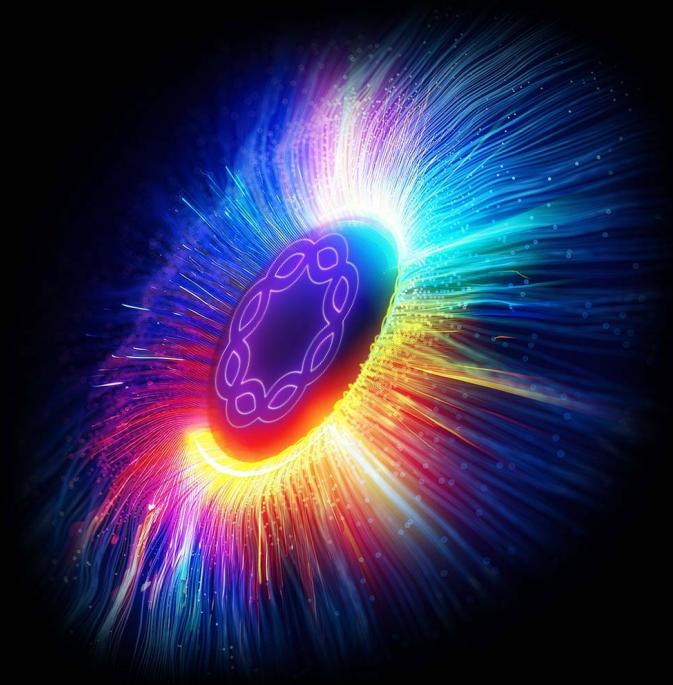


Cloud Native Solutions & Automation

Paul Clough

Chief Architect

ribbon INSIGHTS

Typical monolithic architecture

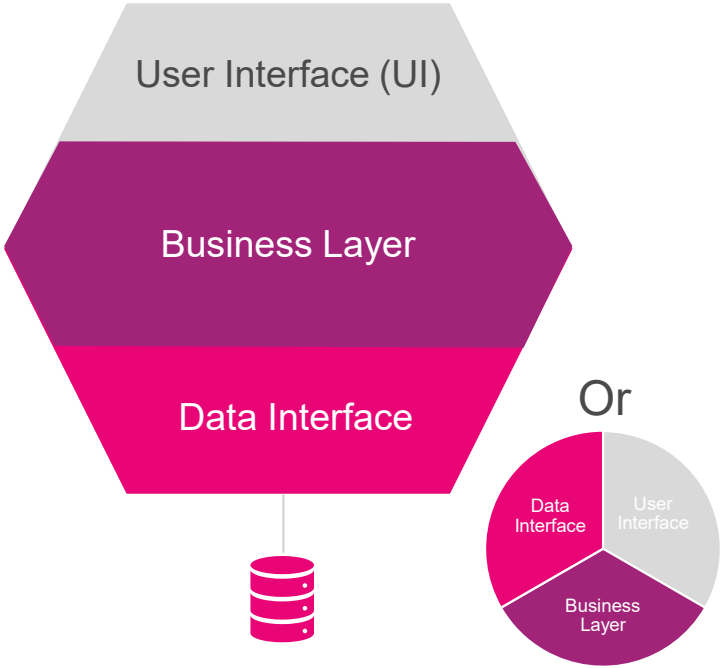
- Limited in size by underlying infrastructure.
- Less efficient 1+1 redundancy.
- Scalable though “racking-and-stacking”

Virtualization Overcomes Limitations

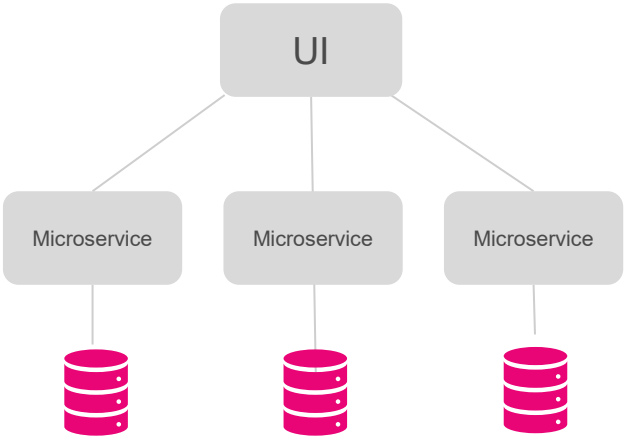
- Allows applications to scale horizontally
- No longer limited by underlying compute infrastructure
- More efficient N+1 redundancy
- Right-sized for workload

Architecture Evolution

Monolithic Architecture



Microservices Architecture

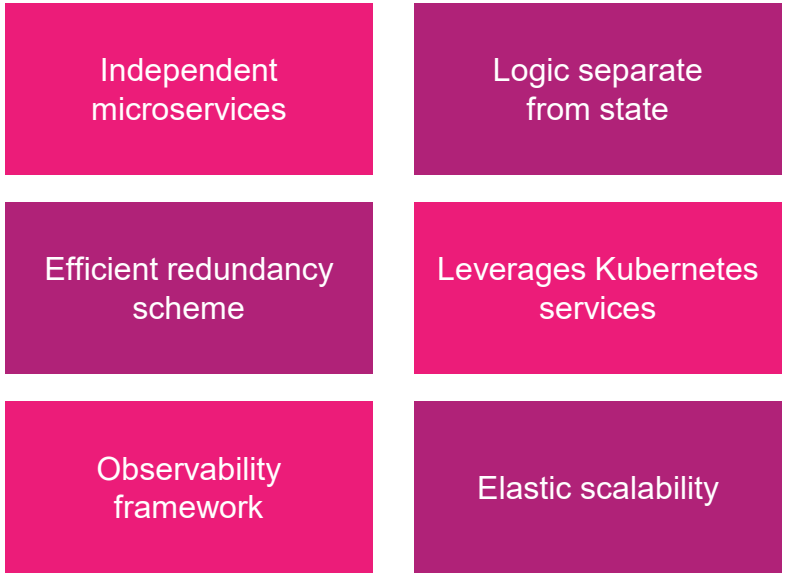


Microservices Architecture Unlocks Capacity Limits

- Discrete functions for greater scale and redundancy
- Separation of logic and state for more robust solutions
- Specific functions can be included or excluded

Architecture Aligned to Cloud Native Practices

- Applications re-architected to benefit from Cloud Native infrastructure
- Delivers more efficient solutions portable across private and public cloud



Benefits of Automation

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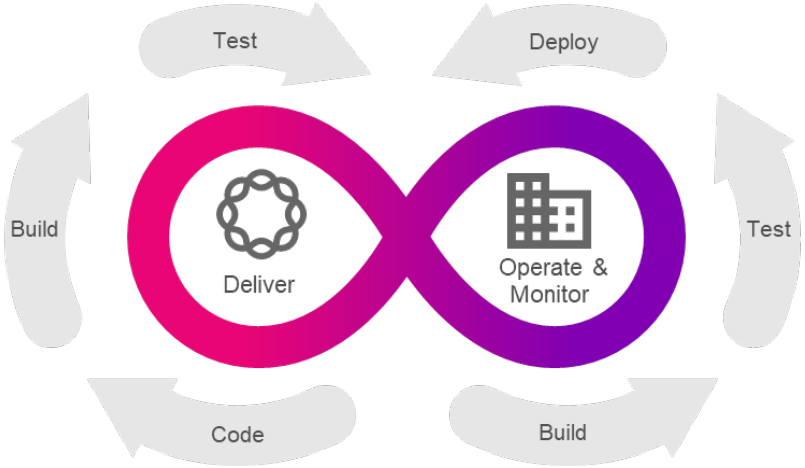
Continuous Integration / Continuous Delivery

- Software delivery aligned with Agile development
- Improve test cycles through automated testing
- Reduce software upgrade lifecycles



The Challenging Realities of Software Deployment

Competing resource demands

Slower rollout of new features

Manual, time consuming, and limited testing

Security vulnerabilities

LEAP Automates Testing and Enables Faster Software Upgrades

Speed up testing cycles and automate testing processes with Ribbon LEAP. LEAP's powerful automation simplifies and streamlines the entire software upgrade process.

Experience better business outcomes!

9x
Faster Software Rollouts

Automated Testing for Faster Upgrades

58%
Savings in Year One

Eliminates Resource-Intensive, Manual Testing

51%
Improvement in Test Coverage

Test Coverage for All Call Flows, Devices, and Connections

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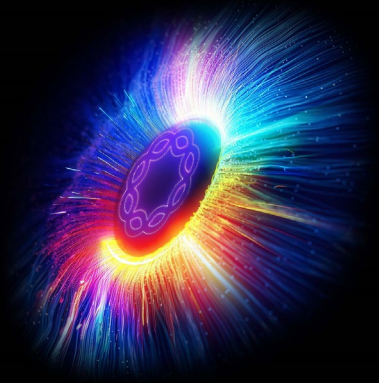

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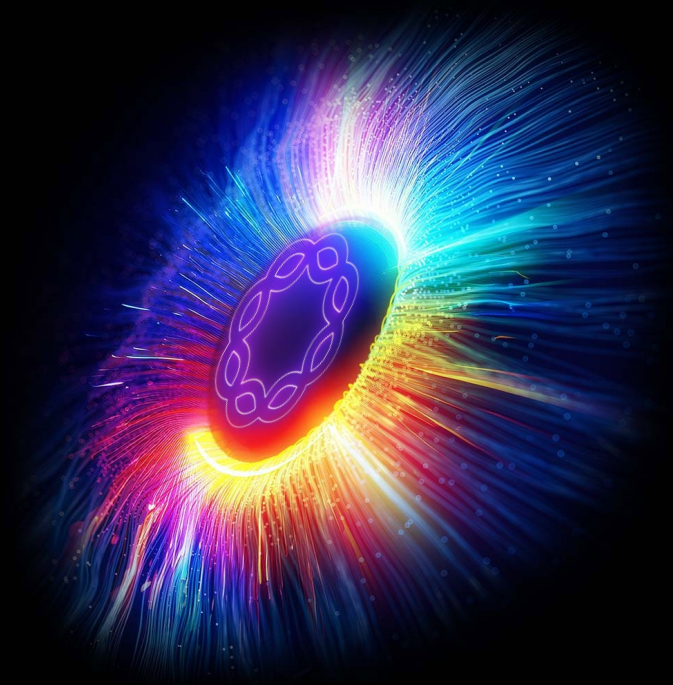

Your feedback is important to us –

Let us know how we did!

Take The Survey

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STAY
ENGAGED
• TRAINING
• NEWSLETTERS & PORTAL
• OUR TEAM
RBBN.COM

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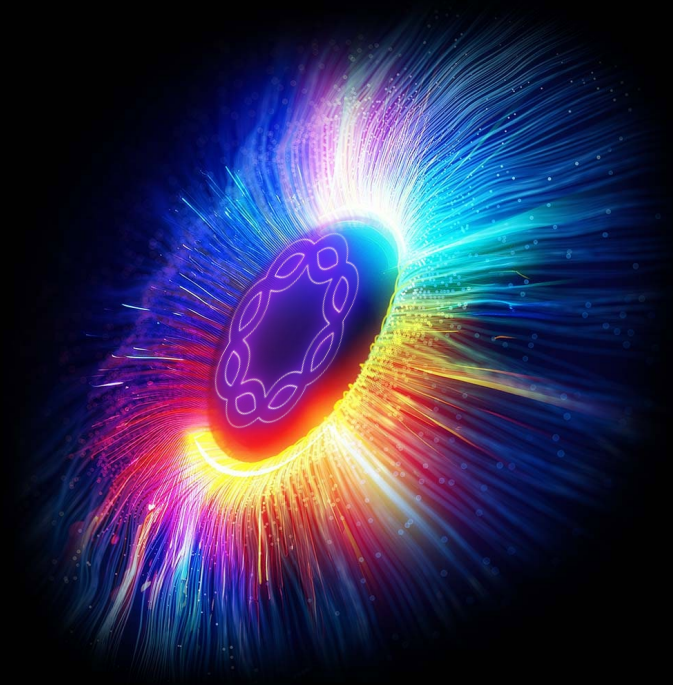


Ribbon Connect For Multi-UCaaS

Matt Hurst

Senior Director, Ribbon Global XaaS Solutions

ribbon INSIGHTS

Enterprise Requirements have Changed

Traditional PBX's mission was:

- To enable many users to share limited phone lines
- Provide live call answer and call routing (receptionist)
- Easily call across office/building/campus (intercom)
- Transfer internal calls across office/building/campus
- Redirect to a live user, if user is unavailable (call coverage tools like call park, call pick-up, camp-on, etc.)

Today's business environment requires:

- Anywhere access to employees
- Business Persona for employees
  - For compliance – regulated industries
  - Employees can separate personal/professional life
- Corporate control over contact info
- Integration with other productivity tools (CRM etc)

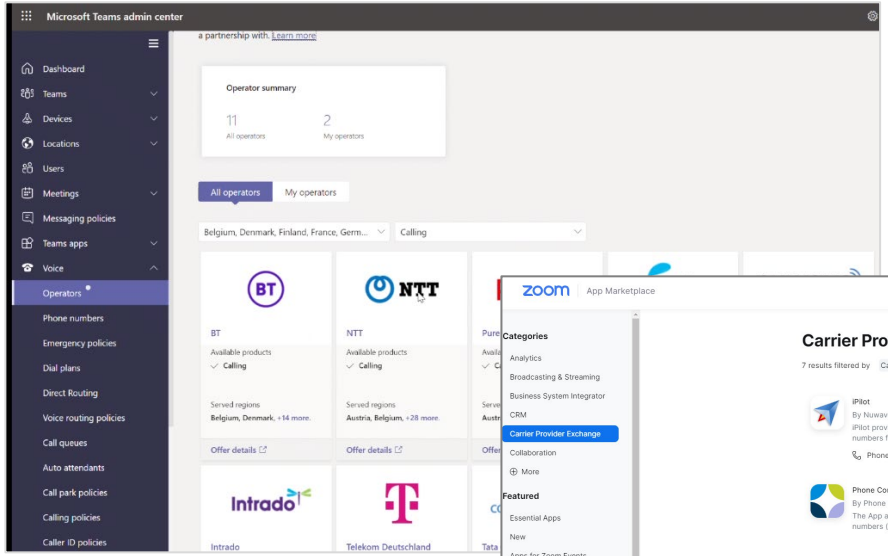
Cloud UCaaS Solutions are Dominating

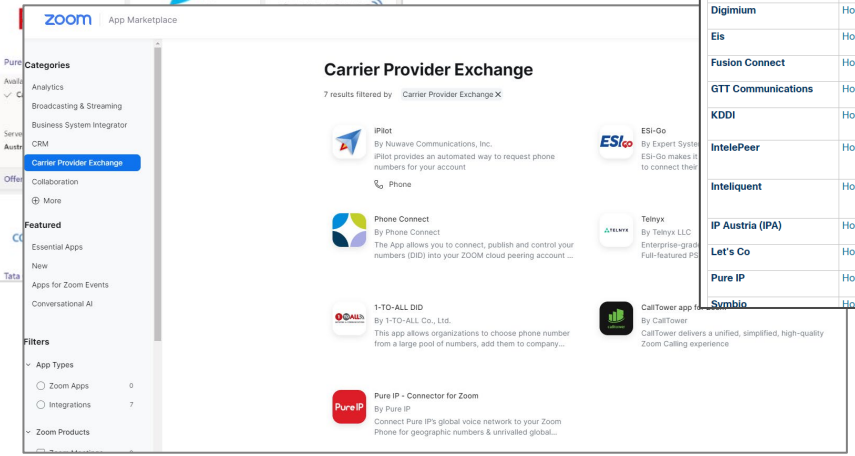
320 Million
Total Users

250 Million
Total Users

300 Million
Total Users

Telecom Providers… Need to be ‘In it, to Win it’





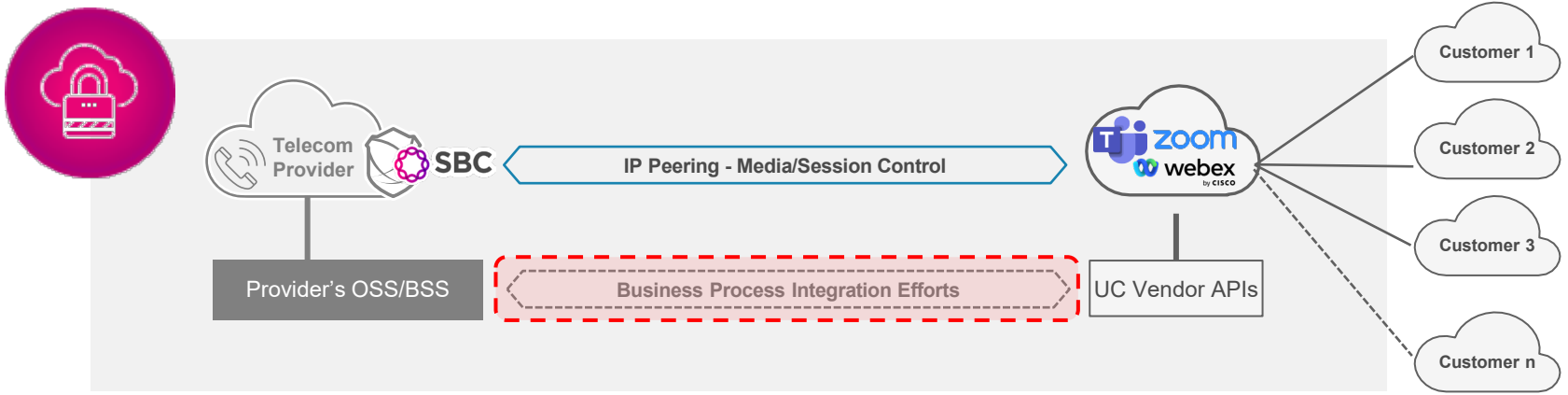
Cloud Connect for Webex Calling was formerly known as Cloud Connected PSTN

Learn: How to configure Cloud Connect for Webex Calling

Download a list of Cloud Connect for Webex Calling coverage by country and provider here

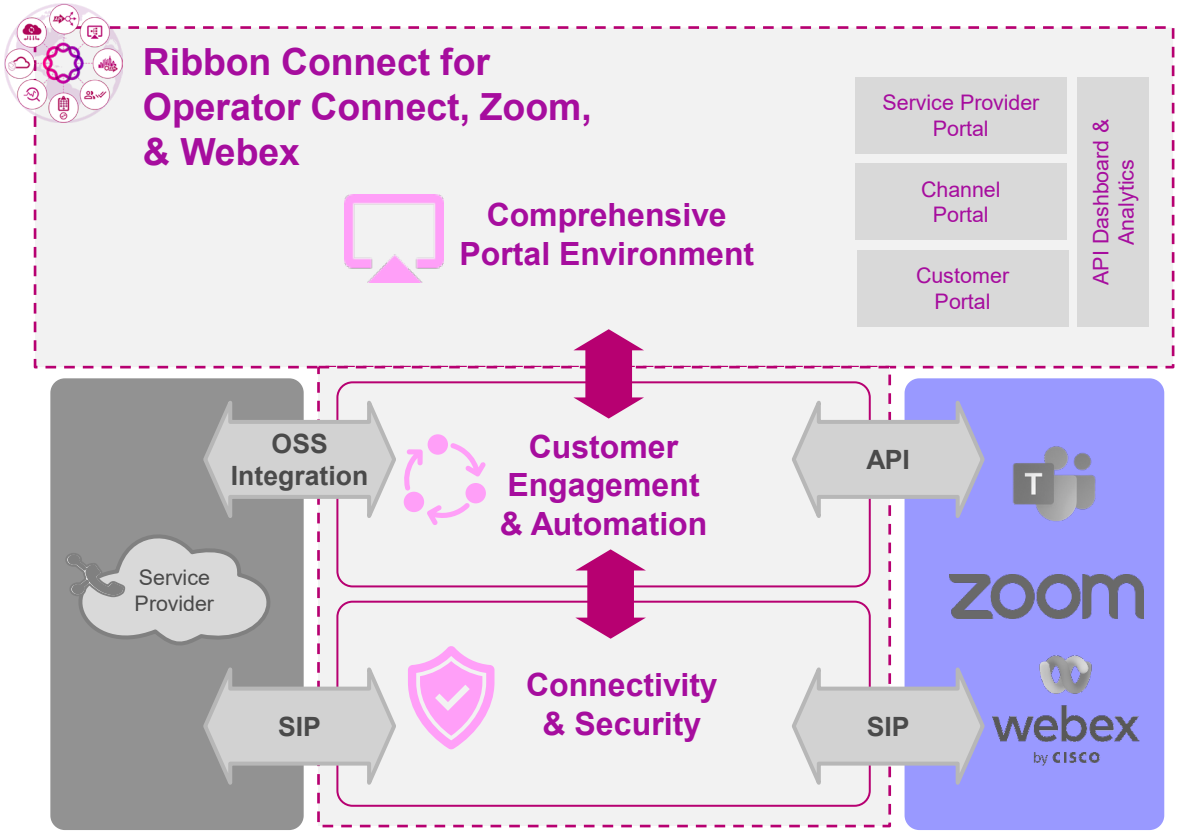
CCP Provider Name	Product Home Page Link	Countries Supported by Provider	Free Trial Link	Contact Provider Link
Allstream	Home	US and Canada		Contact Allstream
Alphalink	Home	FR & LU	Free Trial	Contact Alphalink
Bandwidth	Home	US and Canada	Free Trial	Contact Bandwidth
CallTower	Home	Country List		Contact CallTower
Digimium	Home	FR	Free Trial	Contact Digimium
Eis	Home	Italy	Free Trial	Contact Eis
Fusion Connect	Home	US	Free Trial	Contact Fusion
GTT Communications	Home	Country List	Free Trial	Contact GTT
KDDI	Home	Japan		Contact KDDI
IntelePeer	Home	US and Canada*	Free Trial	Contact IntelePeer
Inteliquent	Home	US and Canada	Free Trial	Contact Inteliquent
IP Austria (IPA)	Home	Country List	Free Trial	Contact IP Austria
Let's Co	Home	Country List	Free Trial	Contact Let's Co
Pure IP	Home	48 countries globally		Contact Pure IP
Symbio	Home	Australia, New Zealand	Free Trial	Contact Symbio

What's the Challenge?



More than a one-time effort – UC APIs are constantly evolving

Ribbon has One Solution to Extend UCaaS Market Opportunity



- ✓ Single Digital Workflow
- ✓ Integrate **Once**
- ✓ Seamless Customer Experience regardless of UC platform

Service Provider Benefits Summary

Reduce Time to Market

No need for internal experts

Market availability in weeks

Immediate revenue opportunity

Immediate

Reach More Customers

Retain customer base on any UCaaS

Integrate voice services quickly and easily

Compelling

Minimise Risk

Interoperate with existing systems

Reduce operational cost

Easy

Future Proof

Take advantage of new capabilities immediately

Protect against API changes

Frictionless

Thank You

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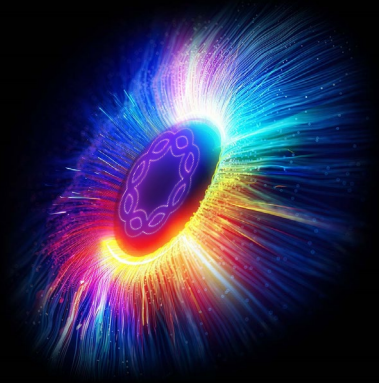
INSIGHTS



Converting a Utility to a UTELCO
NAMPOWER-GRIDONLINE

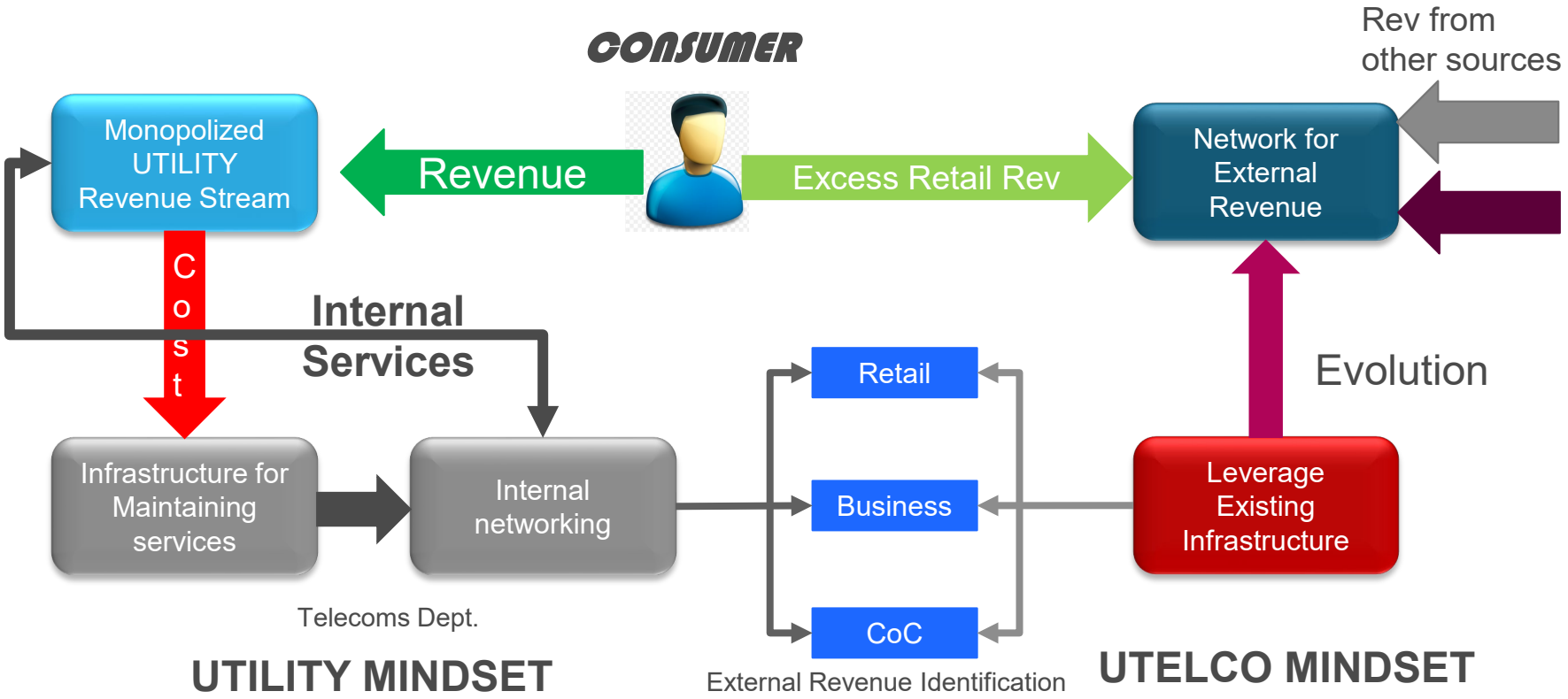
Kalyan Mukherjee

Senior Manager – Sales Engineering

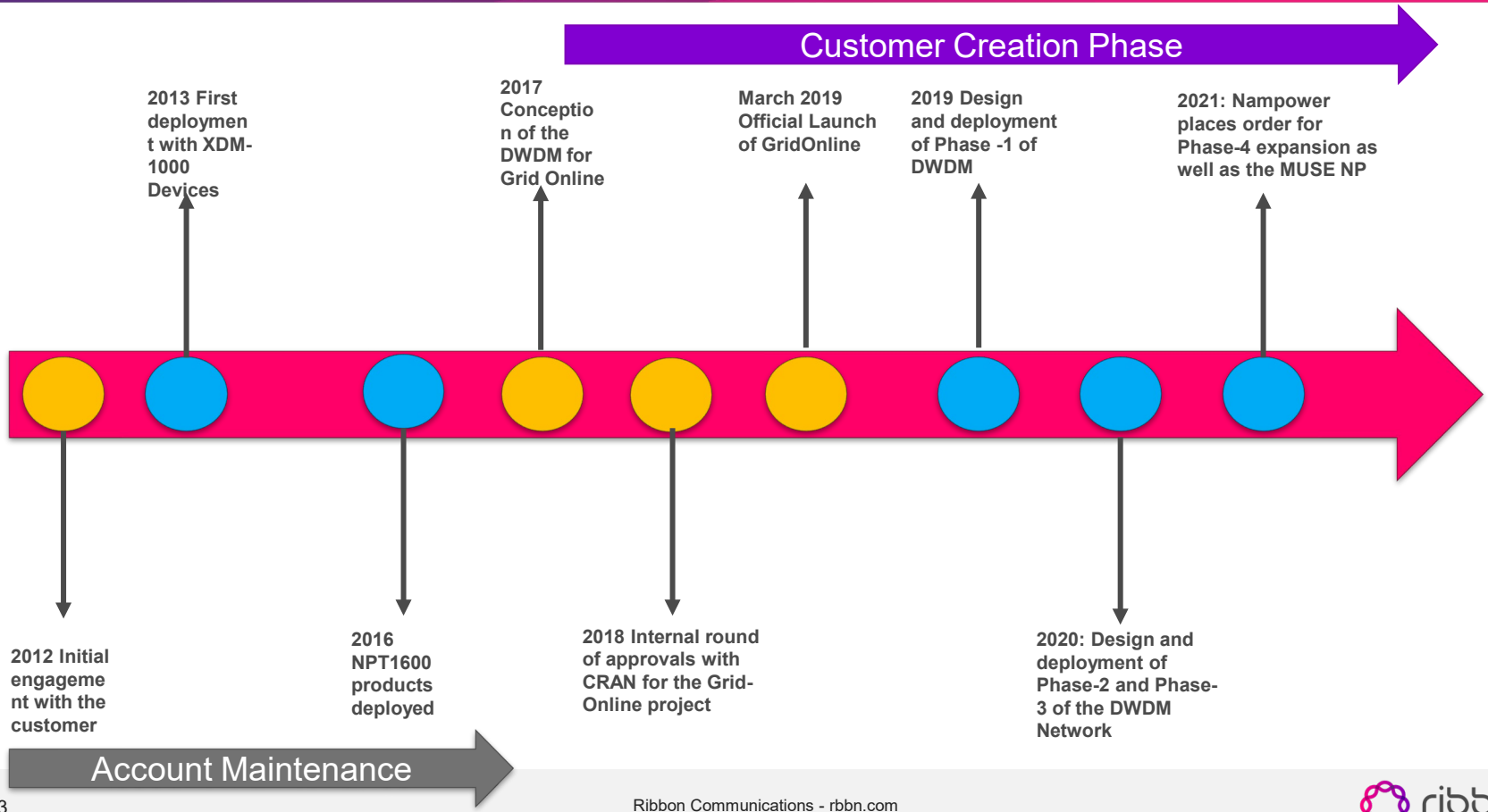
(MEA)

ribbon INSIGHTS

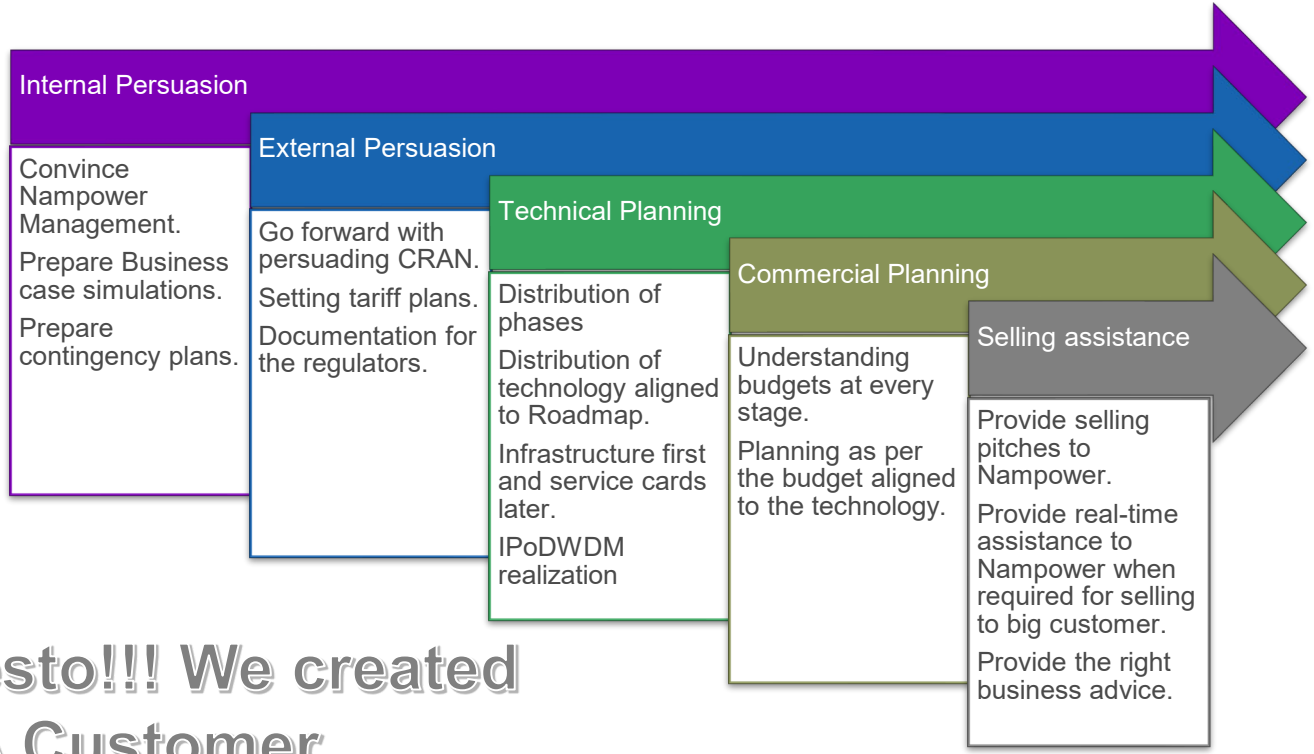
Evolution of a Utility company to a UTELCO



Time – Line (Key Milestones)



Process of Making Nampower a successful UTELCO



And presto!!! We created A Customer

Key effort points to make “Grid-Online”

Constant engagement

- Nampower is an account that is an example of constant engagement with the customer.

Trusted Partnership

- In order for them to get evolved to a UTELCO there was a lot of trust gained from them.

Continuous endeavors

- Ribbon was continuously involved in conceptualizing the UTELCO network and anticipating all problems while also preparing solutions for them.

Proper techno-commercial planning

- The phase-by-phase planning of the network and then getting it in shape.

IPoDWDM network of Grid Online

Topology

Highlights

- Optics is with Fix grid ROADM_4FS.
- 48 Channel simulation with 100G/200G/400G capabilities.
- Services on
  - CMR100M
  - TR200_2
  - NPT (1800/1300/1100/1022/1250)
- IP-MPLS with L3 VPN capability.
  - NPT 1250, NPT 1100, NPT 1800
- MUSE Network Planner

What Grid-Online has brought to Nampower

- Extra source of Revenue
- No Dark fiber lease so more pro
- They are a key wholesale player in the industry.
- They are a key player in the active bandwidth infrastructure market

Key points to note

NAMPOWER was not a typical Customer acquisition. It is **Customer creation**.

NAMPOWER is a case where we **transform the business** of an existing customer to yield more business for Ribbon as well as for the end customer.

NAMPOWER is a case where we are totally involved in not only the selling process but the entire **business building** process of the customer.

NAMPOWER is a case where we **empower the customer** and convince them for a greater business model from the scratch.

NAMPOWER is a case of **constant engagement and constant improvisations** in order to keep the business intact and growing.

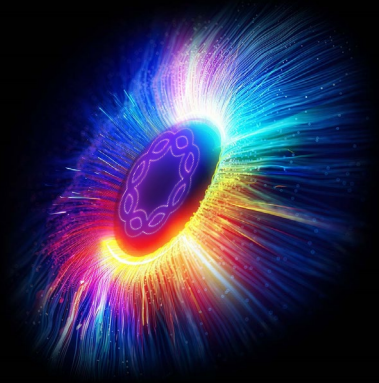
WE GROW
WHEN OUR CUSTOMERS GROW

KEY TAKEAWAYS

- Educate your customer
- Be the **Doctor** of the network
- Remember the key motto **“Your partner for growth”**
- See how business of customers can be increased.
- Stay engaged always.

Thank You

ribbon
INSIGHTS



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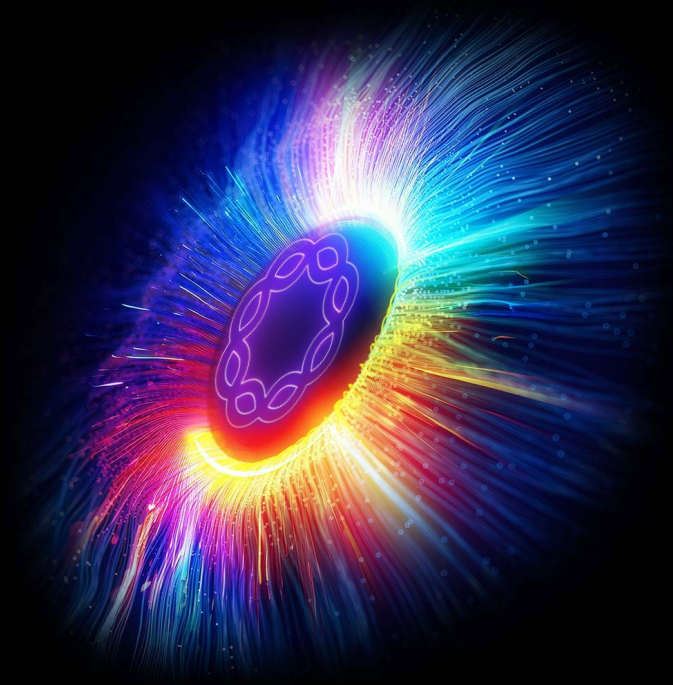
INSIGHTS



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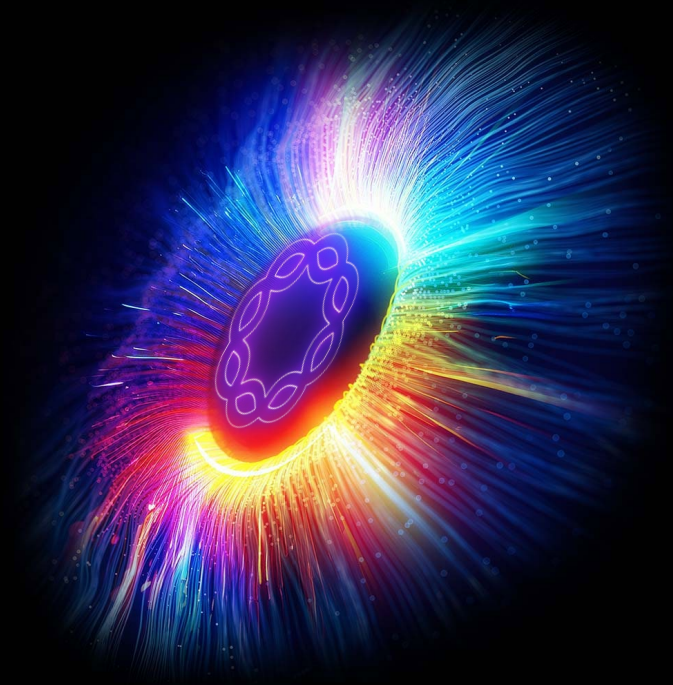
INSIGHTS



Enabling the Future

Legacy Network Migration

Oezguer Ucar

Senior Sales Manager

Ribbon Communications Germany

ribbon INSIGHTS

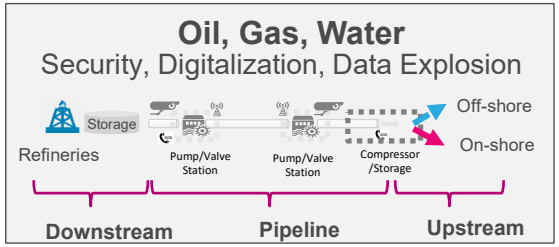
The Obvious

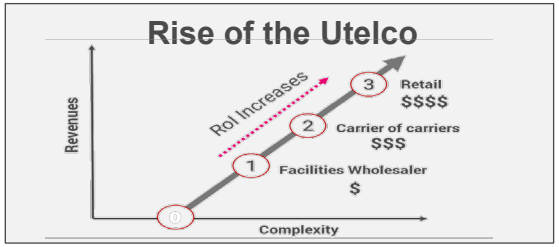
Urgent need for Network Operators to modernize networks

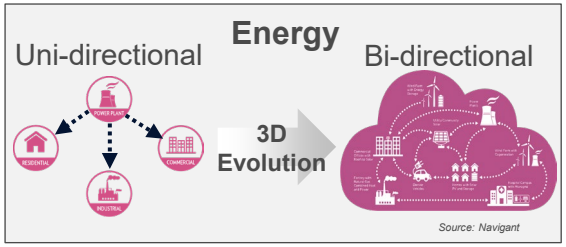
- EOL Technologies
- EOL equipment
- Regulatory Requirements (audits, adding security measures, removing security threats..)
- And enabling new services and new revenue streams..
- ..while reducing TCO

And there is no: “One Size Fits All”!

IT and OT Modernization





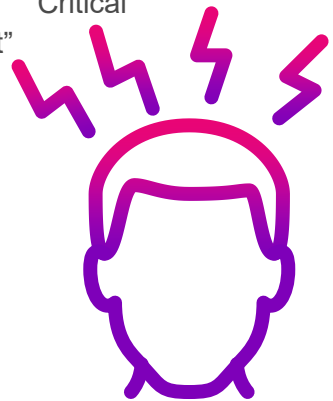


Need to become "Smart"

Mission Critical

Reliable and secure

Deterministic low, latency



IT network:

Manages the services applications used by the enterprise:

- For customer management, process efficiency, energy trading, office and information platforms
- Uses dynamic IP Transport (IP/MPLS).

OT Network:

Manages the infrastructure, much of which is mission critical.

- SDH: End of Life and not suitable for modernized needs
- IP/MPLS does not meet requirements
- Highly Reliable and deterministic behaviour

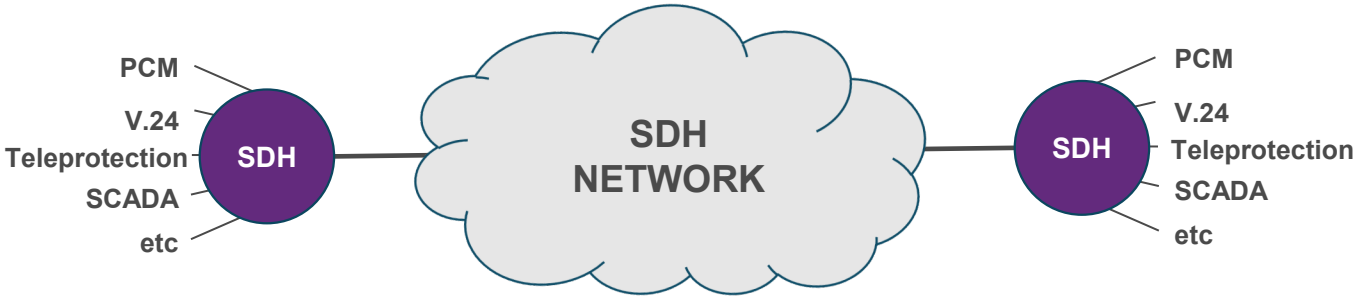
Risk-free migration - Initial Starting Point Can Be Different..

Migration Strategy Considerations:

- Phased Transition or Hybrid/Dual Stack operations
- Interop and Integration (Compatibility Assurance, Technology/Protocol Mapping, Timing, Protection Schemes etc.)
- Capacity Planning and Performance Optimization for the new network (Links BW, QoS, Latencies, etc..)
- Automation and Orchestration Strategy (Automated Workflows and Tasks, Cloud Based Operations of NMS) - SDN
- Security and Risk Mitigation Strategy (Security by Design, Encryption, Need-to-Know, Resiliency, Audit Reporting etc.)
- Cost and Resource Management (TCO planning, Re-Use of existing infrastructure etc.)
- Customer and Service Assurance Strategy (Service Continuity and Monitoring)
- Training and Knowledge Transfer
- Testing and Validation Phase (PoC, Pilot Network, Interop Tests etc..)

LEGACY SDH NETWORK

- End of Life
- Not optimized for transporting new packet-based OT service and applications

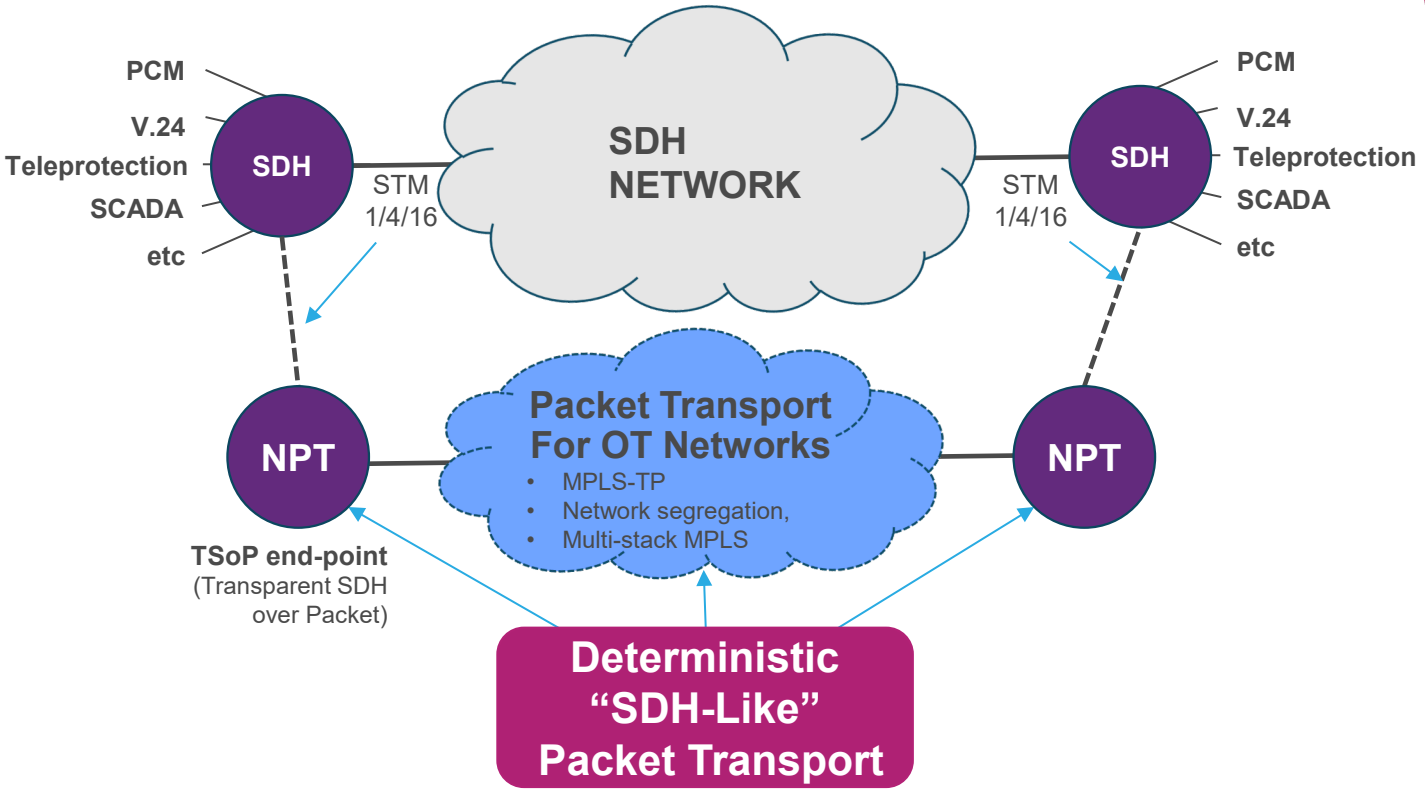


Risk-free migration - STEP 1: Underlay Packet Transport Network

UNDERLAY NETWORK

1. Build new PTN underlay infrastructure.*
2. NPT supports SDH Endpoints (STM-1/4/16)
3. Create Transparent HO-CES Services on MPLS-TP Network
4. Test TSoP bearer services.
5. Physically migrate the WAN Service End-Points onto the new Transport network keeping the SDH OH information for DCN connectivity etc.

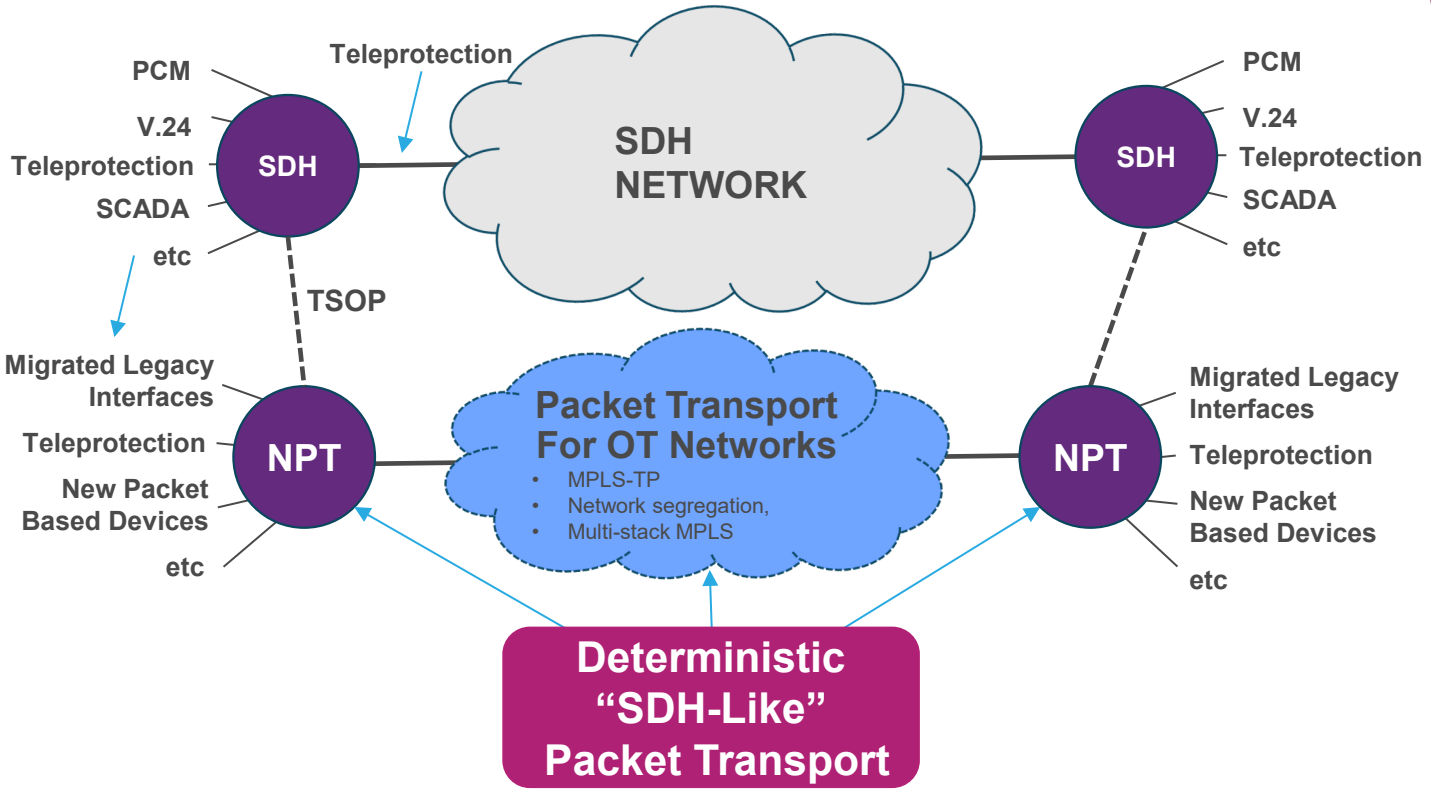
*e.g. BiDi SFPs possible, if fibers are limited



Risk-free migration - STEP 2: Move Client End-Points

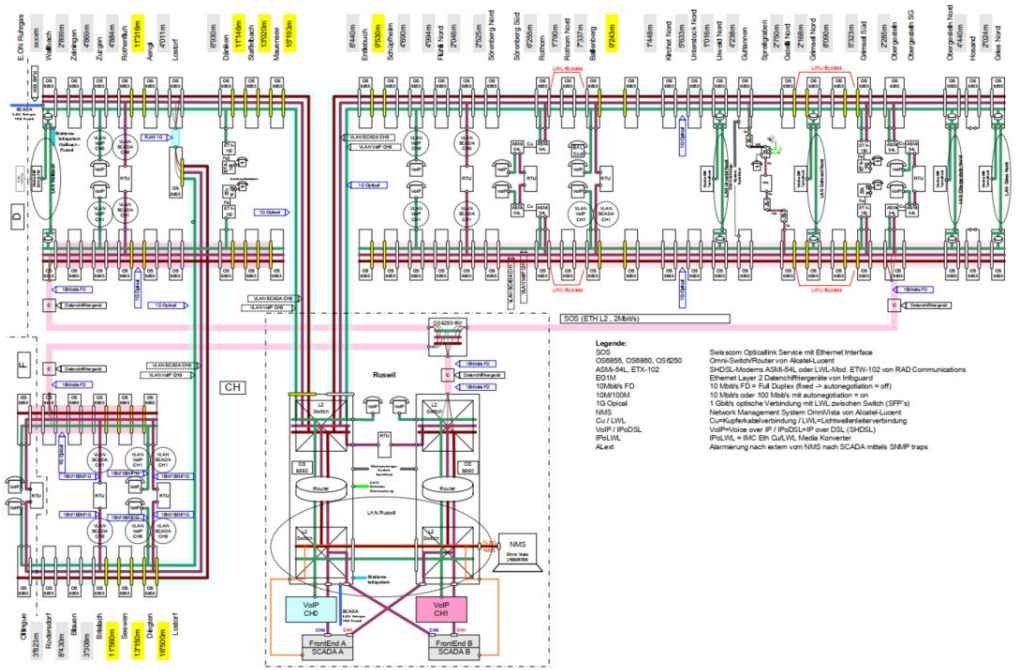
RISK-FREE TAILORED MIGRATION

- Migrate End Points from legacy to new Packet Transport Network (PTN). At rate you want.
- Support new packet-based end points
- **Teleprotection remains on SDH until confident** to move to MPLS-TP



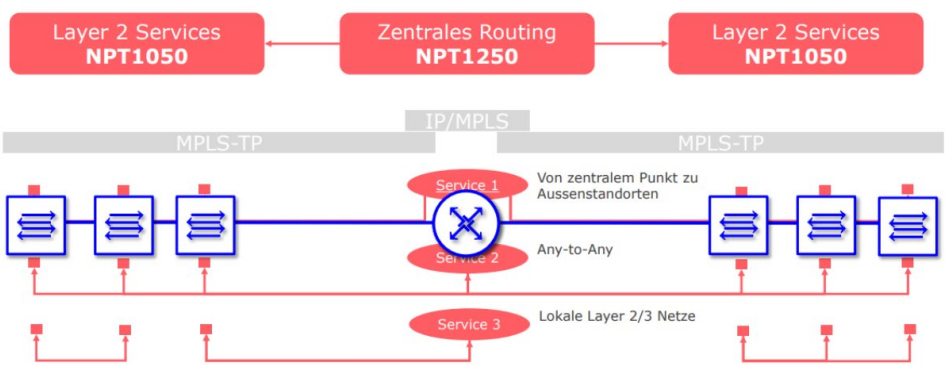
Gas Operator – DACH Area

- Old network pure IP/MPLS
- EOL HW (not carrier class)
- >10 different service types (next page)
- New network:
  - Highly reliable and predictable
  - New Dual stack MPLS
    - IP/MPLS for L2/L3vpns
    - MPLS-TP for L2vpns and CES services
  - NPT-1050 and 1250



Gas Operator – DACH Area

Zentrales Routing / MPLS Dual Stack



Service Types		
MEF	**Lightsoft**	**Services**
E-Line	P2P	THT SCADA (WAL)
E-LAN	MP2MP	Voice ?
E-Tree	P2MP	SCADA Büro-LAN Funk Video Voice ?

Services using IP/MPLS:
- Video,
- Threatscan,
- Remote Access
- VoIP
- Office LAN

Services using MPLS-TP
- Tunnel Radio
- Funk (PHT)
- SCADA
- THT (PHT)
- Telemetry

Services															
	VoIP		SCADA		BüroLAN		THT	Video		Funk		SCADA (extern)		THREATS CAN	ander e
Kürzel	CH0	CH1	CH0	CH1	CH0	CH1	CH0	CH0	CH1	CH0	CH1	CH0	CH1	CH0	
Total pro Channel	44	43	41	41	8	5	3	2	0	4	4	3	0	2	1
Total pro Service	87		82		13		3	2		8		3		2	1

Brownfield Deployment – German Service Provider

Task:

- Replace Chinese vendor from their network
- Testing and qualifying a new CPE for their B2B customers
- IP/MPLS brownfield network with strong requirements for adapting to existing services and protocol schemes (OSFP, RSVP-TE, FRR, LLDP, L2/L3vpns etc..)
- Result: Successful PoC/Interop and new happy customer ☺

Migration Strategy Considerations:

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- Interop and Integration (Compatibility Assurance, Technology/Protocol Mapping, Protection Schemes etc.)
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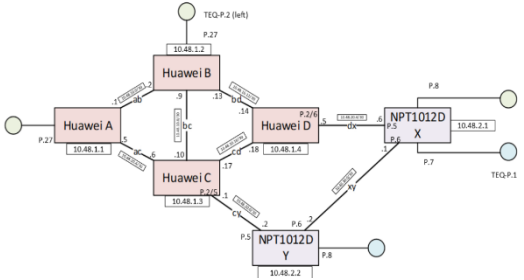


3.1.4.2 RSVP-TE Tunnels

Test Procedure

#	Action	Expected Results	Results
1	• Configure RSVP-TE tunnels according to below guidelines, we have 3 types of tunnels: - R0 (Dynamic) – Protection by Convergence - R1 (Statics) – FRR Protection (will use Auto) - R2 (Protected) – LSP Protection	Configured Successfully	**Pass**
2	• Use the following command to verify RSVP Tunnel: show mpls rsvp tunnels	RSVP Tunnels and LSPs are Up.	**pass**

VPLS Service Template

```
set interfaces <AC Interface> unit <Same as VLAN> vlan-id-list <VLAN>
set interfaces <AC Interface> unit <Same as VLAN> family vpls
set switching-instances vpls <Name> l2vpn-id <ID>
set switching-instances vpls <Name> l2-service-mtu 1500
set switching-instances vpls <Name> pw-type ethernet
set switching-instances vpls <Name> interface <Above Logical Interface>
set switching-instances vpls <Name> remote-tpe <Peer Address> tunnel-policy <Policy Name>
```

Don´t be shy, talk to our experts!

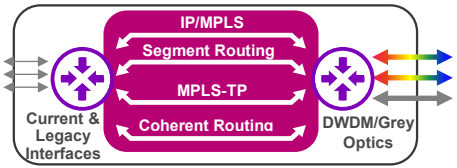
Your trusted Partner for Transition – You Win, We Win

ribbon

Multi-layer Automated Network
Control, Health and Security

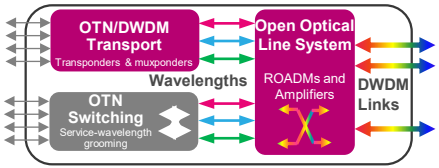
Muse

Dynamic and deterministic
Packet Transport



NPT

Scalable
Optical Transport

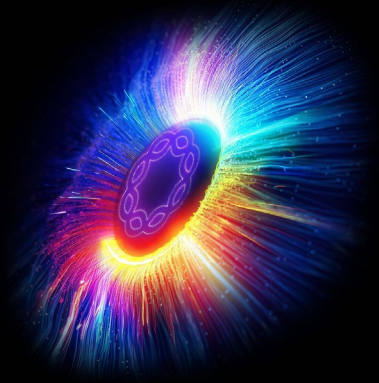


Apollo

- Proven Expertise, Experience and Processes for migration.
- Critical Infrastructure is a key focus for Ribbon.
- Technology for mission–critical class communications
- Local support and expertise
- Large vendor capability with startup agility

ribbon

INSIGHTS



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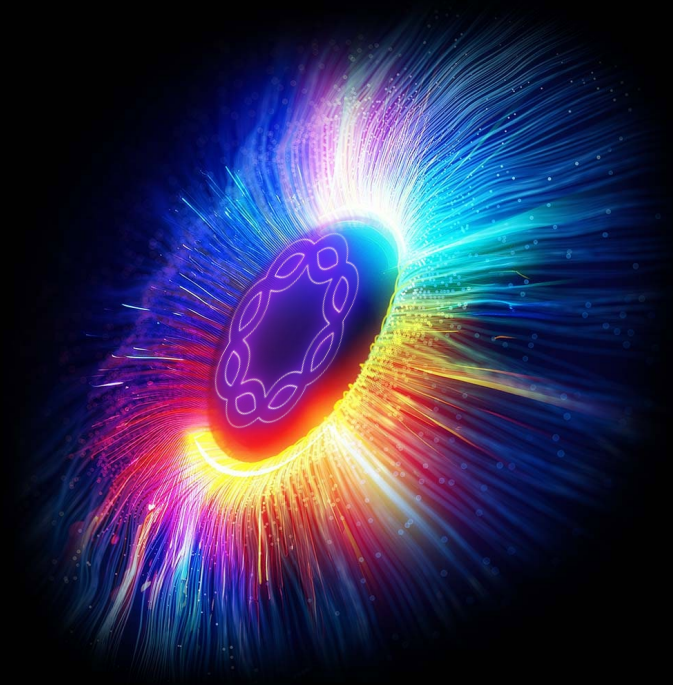
INSIGHTS

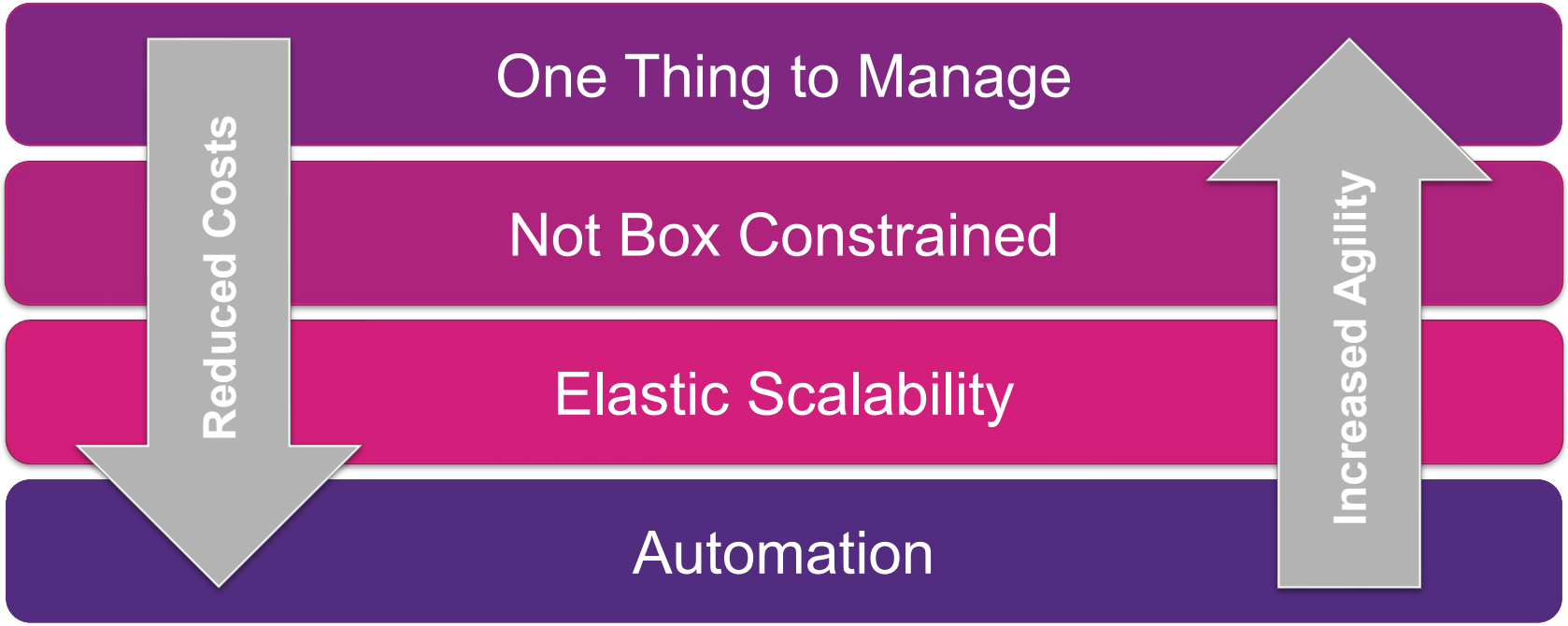


TCO Matters
The Business Case for Cloud Native Solutions

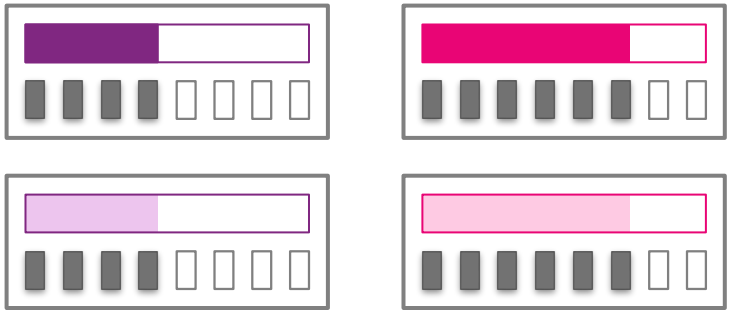
Paul Clough

Chief Architect

ribbon INSIGHTS



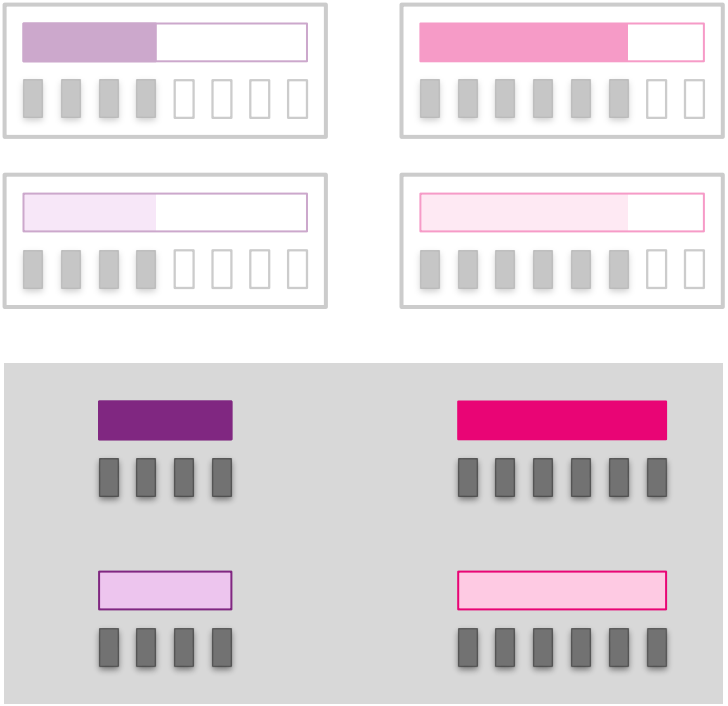
KVM vmware openstack kubernetes Google Cloud aws Azure



Dedicating servers to monolithic tasks is inefficient

Resources stranded and cannot be used for other tasks.

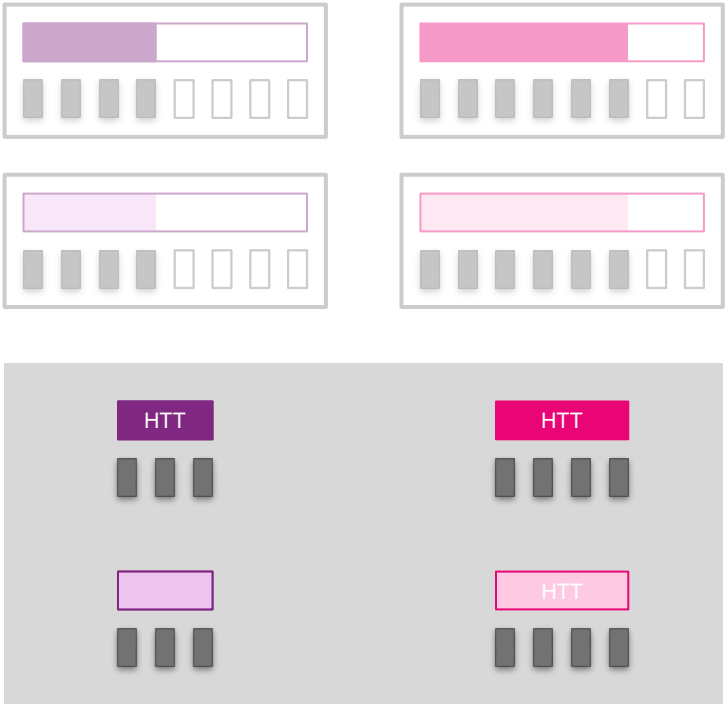
Multiple hardware types add management overhead.



Shared infrastructure improves efficiency

Sharing servers across functions can lead to a 30% reduction in infrastructure required.

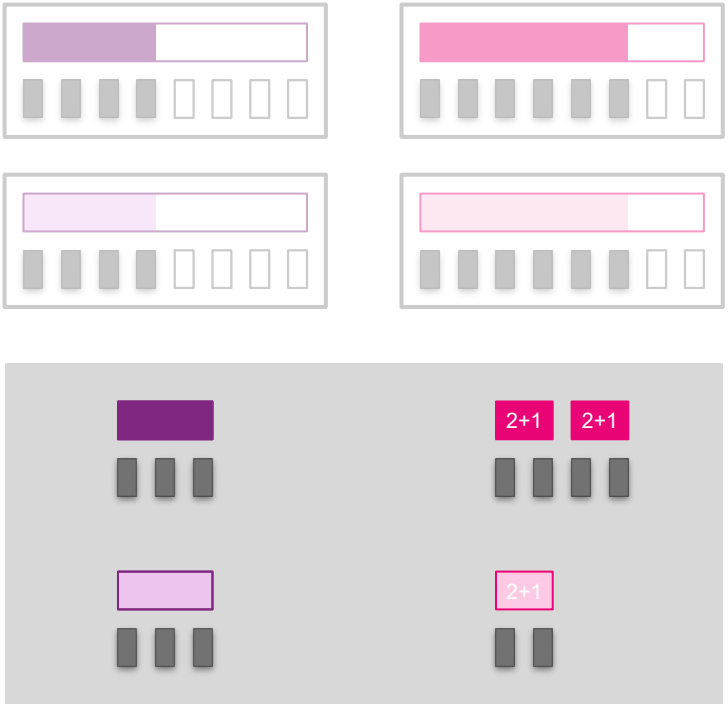
Corresponding reduction in TCO: fewer servers, less space need, lower power consumption, fewer maintenance tasks.



Hyperthreading delivers greater efficiency

Enabling Intel HTT can further improve processor utilization up to 50% with no impact on performance.

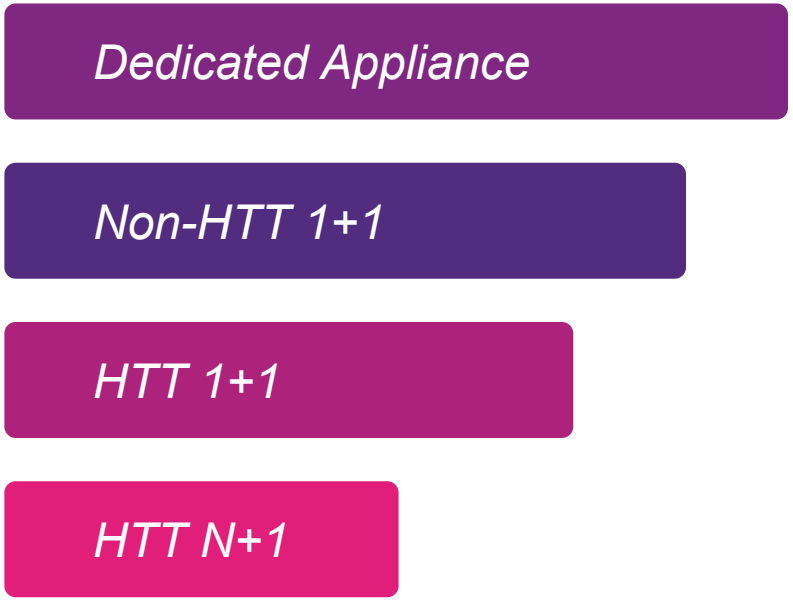
Additional reduction in TCO can be achieved.



Superior resiliency scheme for greater savings

Moving from 1+1 to N+k redundancy reduces the infrastructure needed for standby systems.

Solution architecture ensures no impact to system availability.

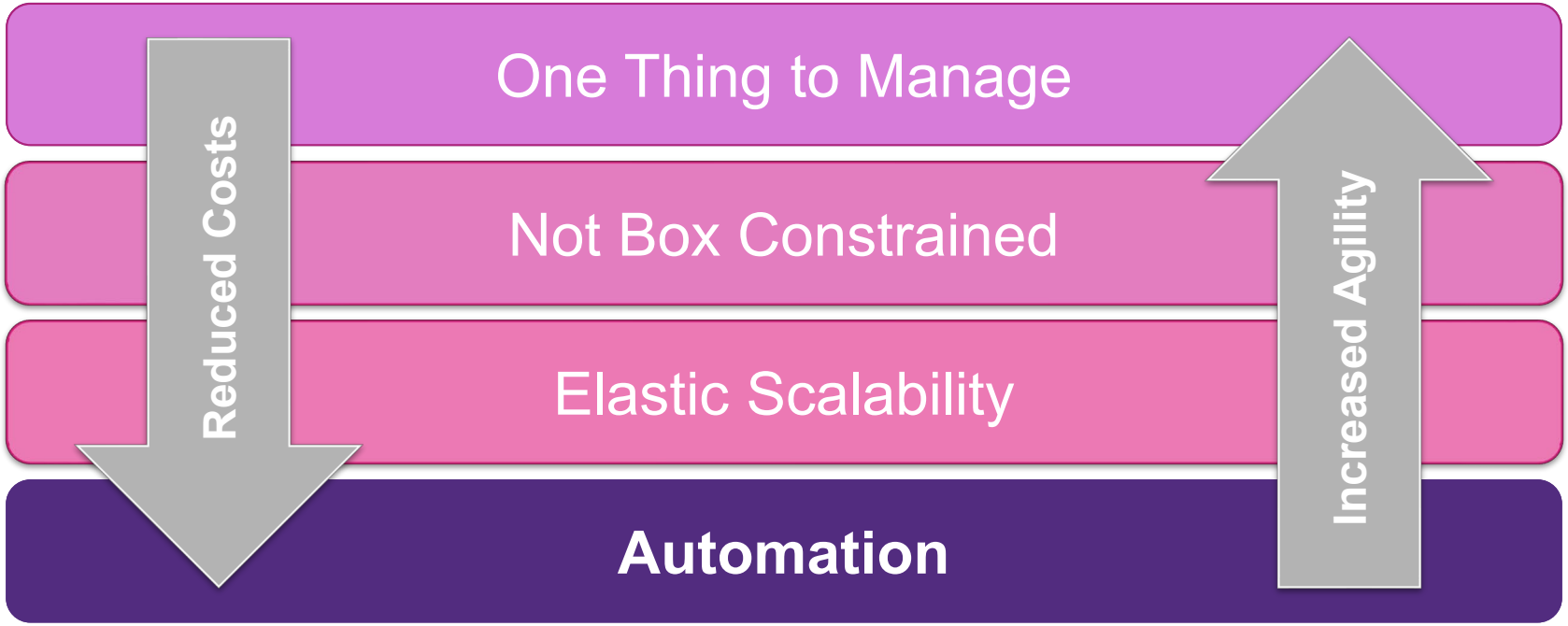


Adopting Cloud Native principles reduces TCO

Virtualization started on the path to TCO reduction

Intel HTT increases capacity without impacting performance.

N+k resilience improves efficiency without impact.



KVM vmware openstack kubernetes Google Cloud aws Azure

The Challenging Realities of Software Deployment

Competing resource demands

Slower rollout of new features

Manual, time consuming, and limited testing

Security vulnerabilities

LEAP Automates Testing and Enables Faster Software Upgrades

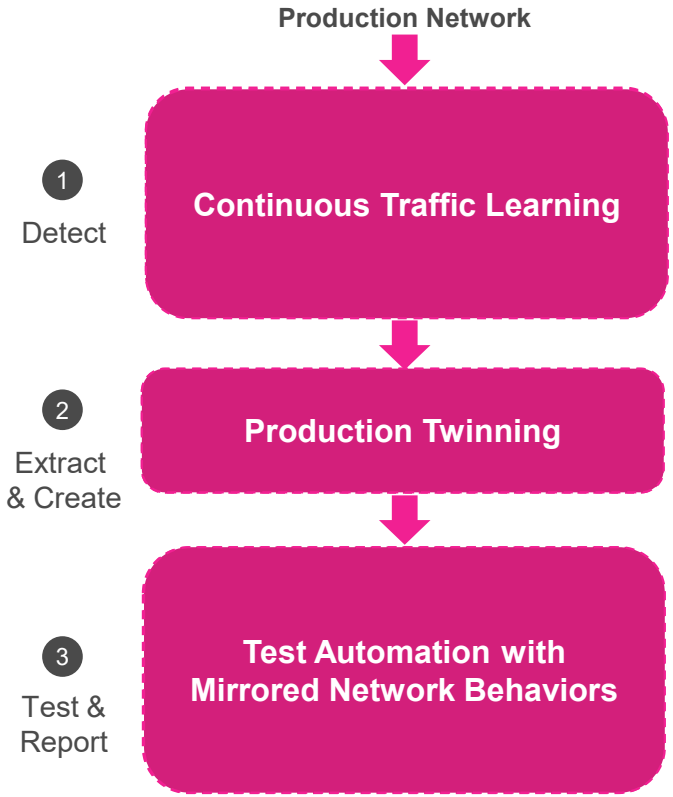
Speed up testing cycles and automate testing processes with Ribbon LEAP.

LEAP's powerful automation simplifies and streamlines the entire software upgrade process.

How does LEAP enable faster upgrades?

LEAP Automates Testing Processes to Ensure Worry-Free Deployments

Leveraging AI and Automation, LEAP monitors networks, detecting network call flows. It builds and executes test scripts, broadening test coverage and mirroring networks to ensure production-ready deployment.



What savings can LEAP deliver?

1. **Reduce Resources, Effort, Testing Tools**
   Eliminate months of resource-intensive, manual testing
2. **Faster Issue Detection and Resolution**
   Reduce time spent identifying and resolving software issues
3. **Reduced Software Upgrade Time**
   Get access to the newest features faster
4. **Reduced Risk of Downtime**
   Safeguard networks from downtime / security vulnerabilities
5. **Minimized Software / Upgrade Assurance Costs**
   Reduce software upgrade / support costs with active maintenance

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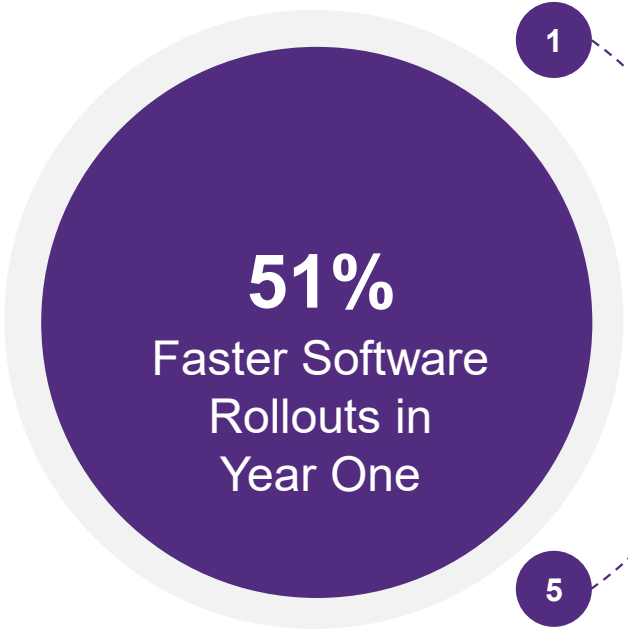

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What are the Benefits of LEAP Test Automation?

Save costs, time, and resources, while ensuring security and network compatibility with LEAP's AI / automated delivery, testing, configuration, and management.

- Faster, more efficient software upgrades
- Reduces security vulnerabilities
- AI / Automation reduces strain on resources
- Automated test scripts generation and execution
- Enhanced defect avoidances
- Reduces manual efforts and risk
- Huge operational savings and ROI
- Fewer errors and proactive detection of network issues

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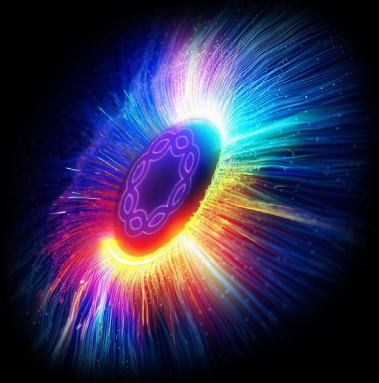
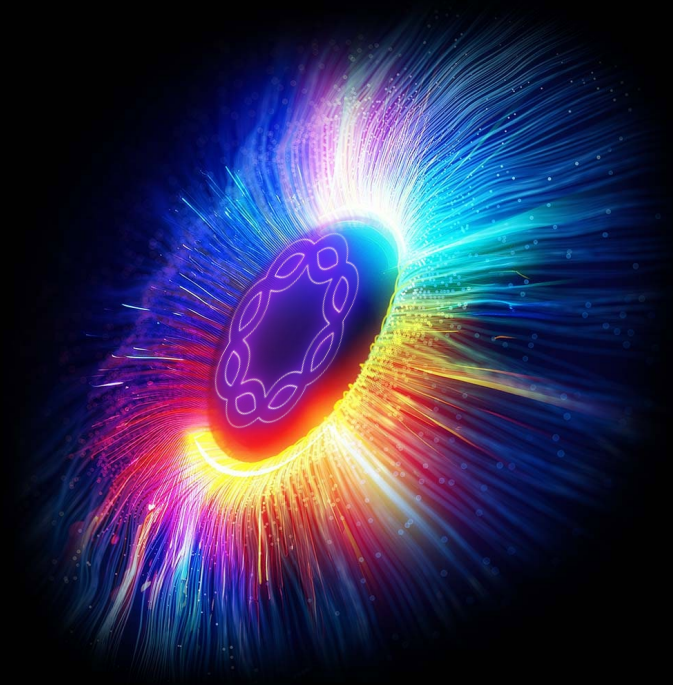
INSIGHTS



ribbon

INSIGHTS



Coherent Optical Transmission in Ribbon's Intelligent Middle Mile

Jonathan Homa

Director IP Optical Solutions Marketing

Fiber Optic Transmission

How **many times** can light circle the earth on a fiber optic cable in one second?

A. 1/2
B. 2
C. 5
D. 7
E. 10

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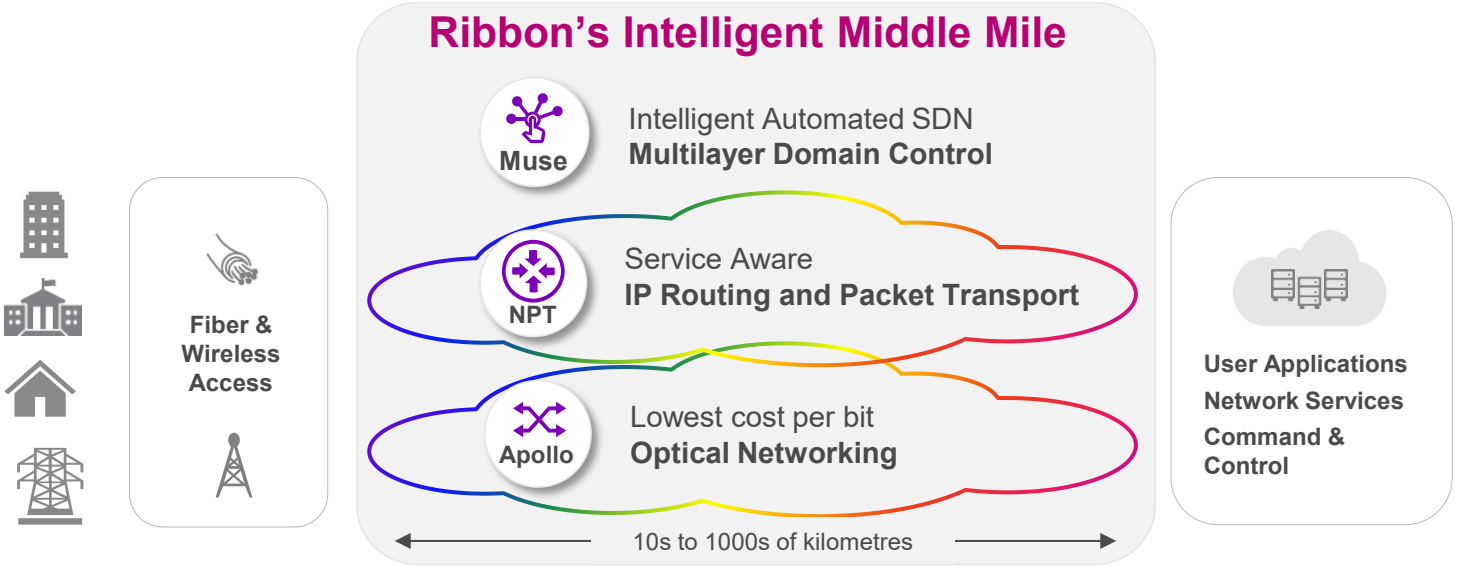
Application to Ribbon's Intelligent Middle Mile



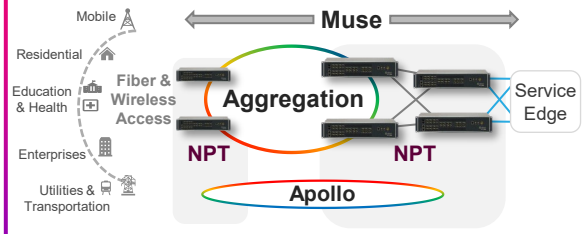
Service Aware
Forecast Tolerant
Intent Driven

OPTIMIZES

Revenues
Capex
TCO

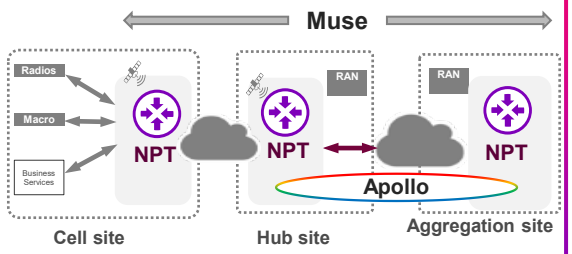
Ribbon – The Middle Mile Experts

Broadband Backhaul & Networking



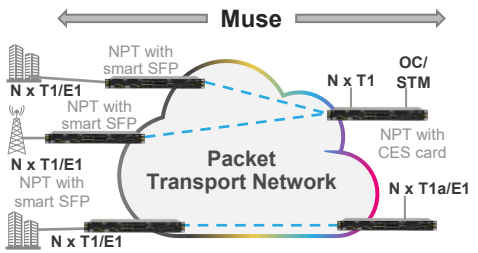
ISPs, Optical backbones, NRENs

5G xHaul



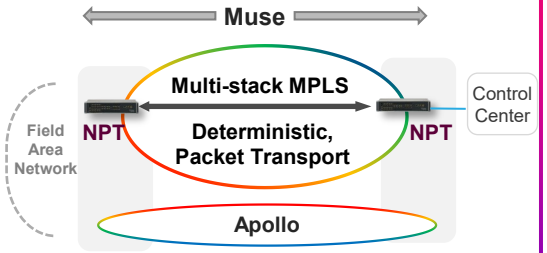
Mobile Operators, Backhaul Wholesalers

TDM to IP Migration



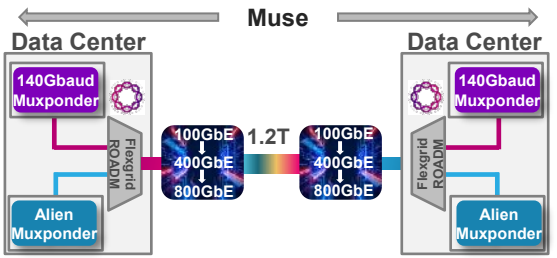
All Service Providers and Network Operators

Critical Infrastructure



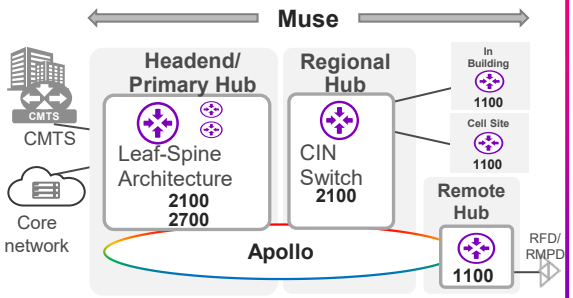
Defense, Utilities, Transportation

High-Capacity Interconnect



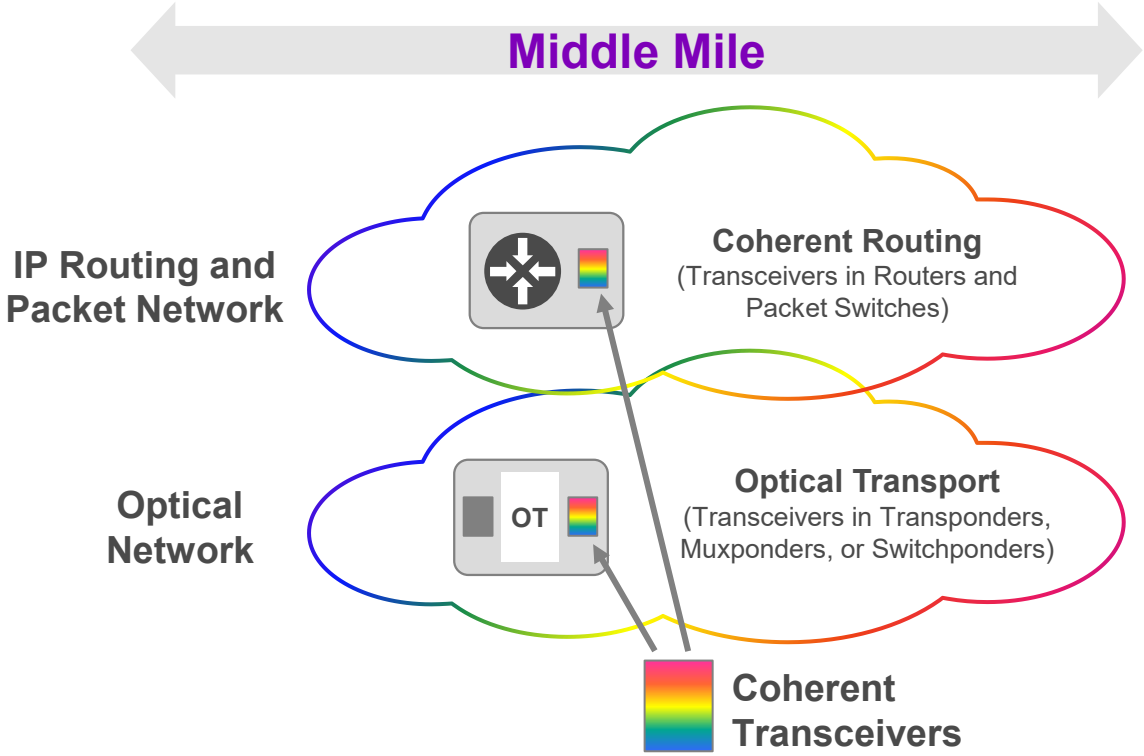
Data Center Interconnect, Submarine

Converged Interconnect Network



Cable Companies

Where Coherent Transceivers Go



Coherent Transceiver Optimizations

Capacity-Reach Optimized

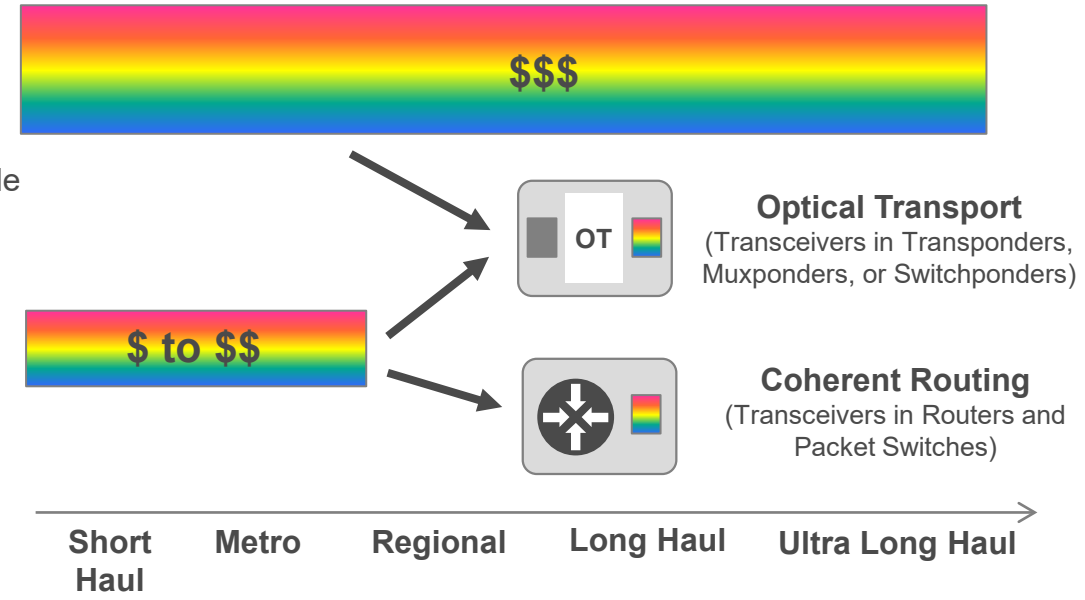
CIM 8

- Modules and large pluggables
- 400G to 1.2T
- Future 2.4T
- 80W to 120W
- OTN
- Proprietary (interoperable capable)

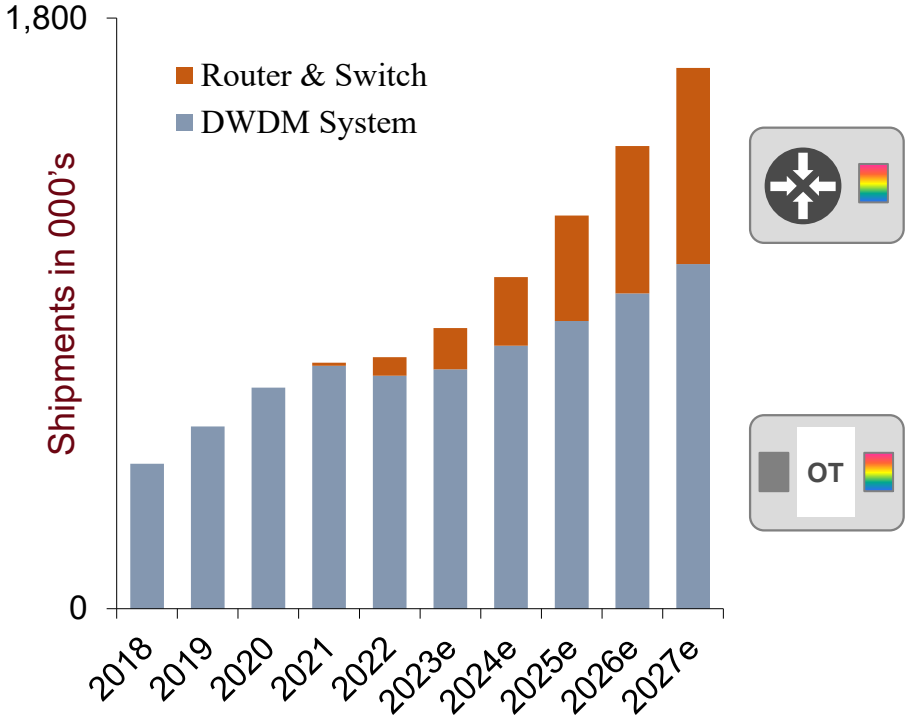
Power-Cost Optimized

QSFP-DD CFP2 DCO

- Small pluggables
- 100G, 400G
- Near future 800G
- 6W to 25W
- OIF, Open ZR+, OpenROADM (OTN)



Coherent Optics Market



Coherent Routing
(Transceivers in Routers and Packet Switches)

Optical Transport
(Transceivers in Transponders, Muxponders, or Switchponders)

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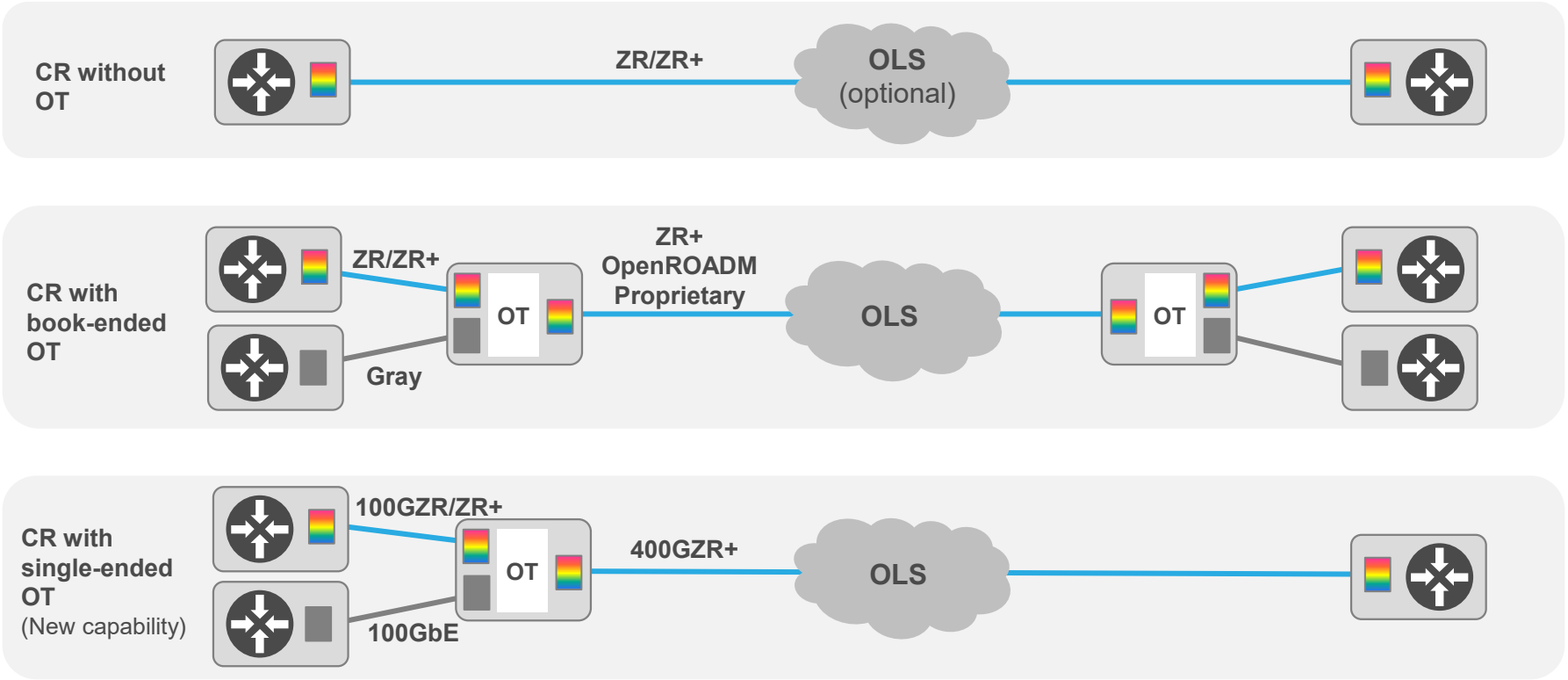
Coherent Routing (CR) with Optical Transport (OT) Configurations



Reasons to Consider Optical Transport versus IPoDWDM

Coherent Routing (IPoDWDM)

Most appropriate for point-to-point links and simpler networks where it has lower cost and complexity.

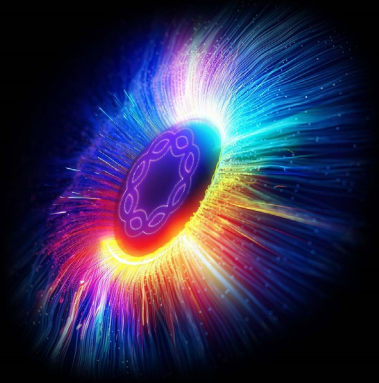
Optical Transport (muxponders)

- Optical **aggregation** of multiple high-speed ports onto a single wavelength, with full throughput and zero latency
- Substantial **OAM** over the optical path, which is particularly important when the path traverses multiple ROADM nodes

Each network must be considered in its **totality** to determine the **optimal** economics, performance, and functionality

Ribbon Products

ribbon
INSIGHTS



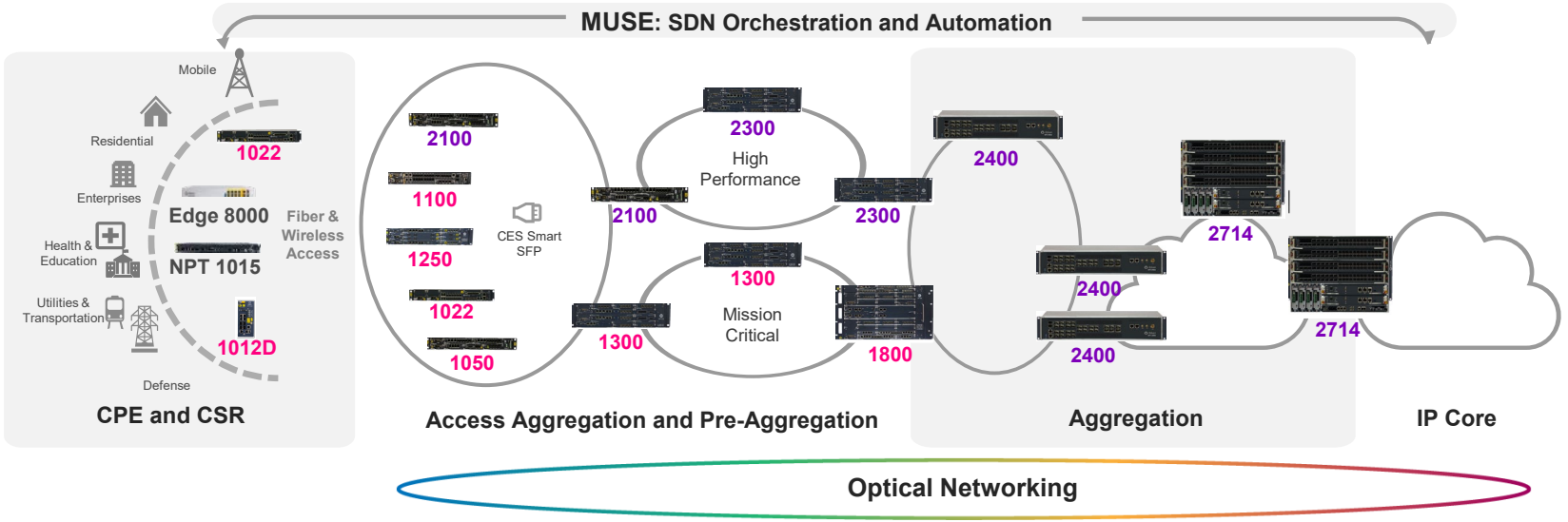
NPT Use of Power-Cost Optimized Coherent Transceivers

NPT **XDR** Family
High-Performance Routers

Supports 400G ZR/ZR+ using QSFP-DD

NPT **AR** Family
High Availability Routers

Supports 100G ZR/ZR+ using QSFP28

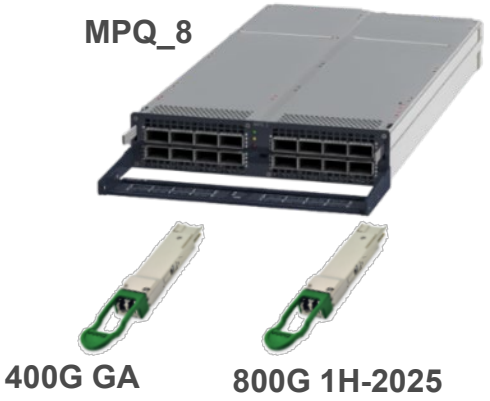


Apollo Options for 100GbE and 400GbE Transport

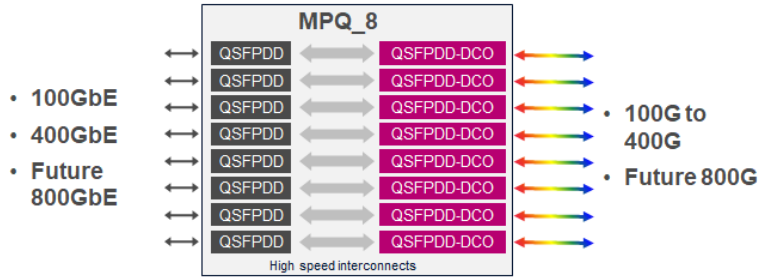
	Apollo 9408 High Density Applications	Apollo 9600 Series Modular Applications
	 Data Center 600mm deep F2B airflow	 Telco 300mm deep R2L airflow (9608D F2B airflow)
Capacity-Reach (Performance) Optimized	 MPJ1200_2 with 2 x CIM8 5nm-140Gbaud to 1.2T	TM800_2 with 2 x CIM8 5nm-140Gbaud to 800G
Power-Cost Optimized	MPQ_8 with 8 x QSFP-DD FPQ_2 for LR4 support 0dBM 400G Metro upgradeable to 800G	TM400_2 with 2 x CFP2-DCO • 0dBM 400G Metro • 0dbM 400G LH

Industry-Best 400G/800G Power-Space-Cost Optimized Ethernet DCI

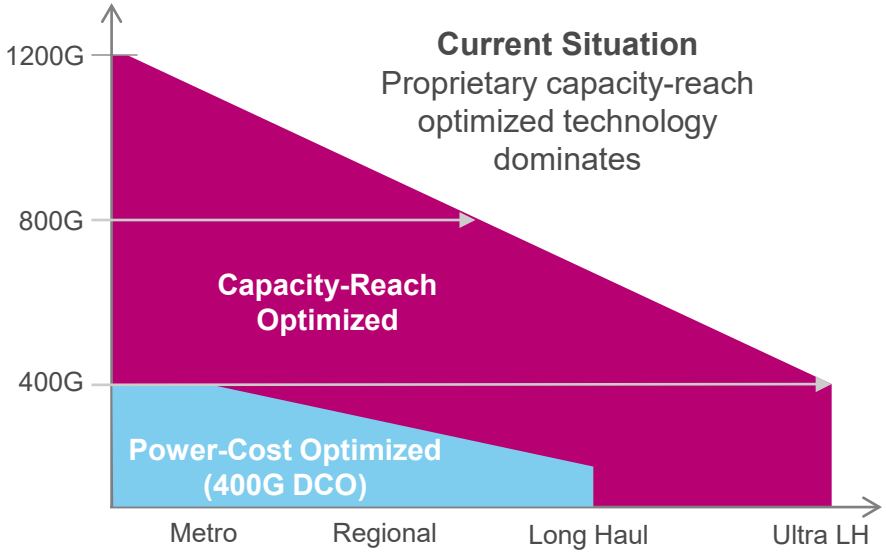
- **Unique Investment Protection:** 400G now with upgradability to 800G on the same blade
- Highest 2RU density:
  - 400G 12.8T
  - 800G 25.6T
- Lowest power consumption
  - 400G 0.09W/G
  - 800G 0.07W/G
- Can combine with pluggable QSFP amps, OLP and OTDR to dramatically lower TCO

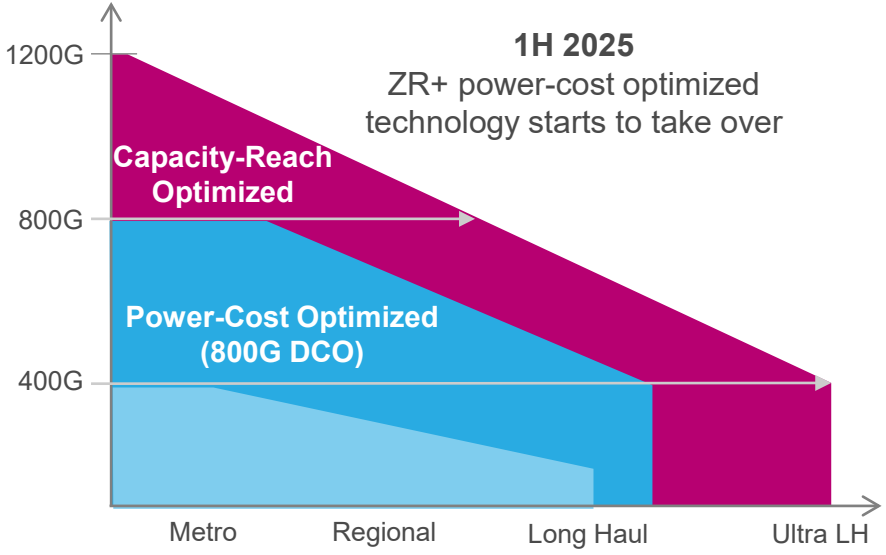


	ribbon	cisco	ciena	NOKIA	Infinera
800G Ready	**Yes**	No	No	No	No
2RU Density 400G	**12.8T**	12.8T	4.8T	3.2T	3.2T
2RU Density 800G	**25.6T**	N/A	N/A	N/A	N/A



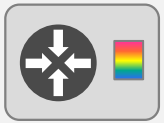
Changing Dynamics of Optical Transport





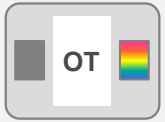
Coherent Optics Summary

Coherent Routing



- Lower cost in simpler networks
- Lower complexity

Optical Transport

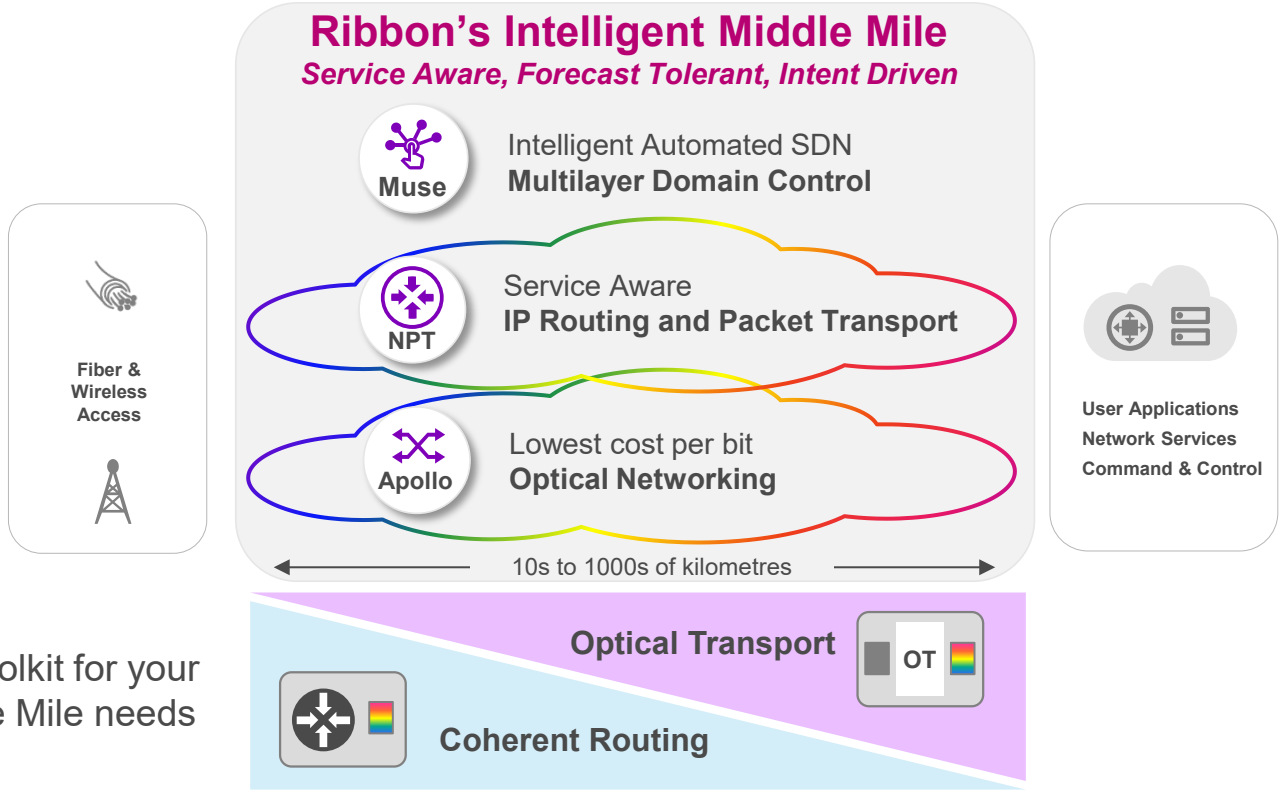


- Router ports aggregation
- OAM in more complex networks
- Regen and long haul

Mix

In many networks provides the best balance of cost and flexibility

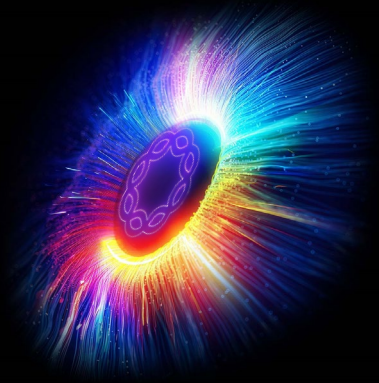
Ribbon’s Intelligent Middle Mile



Full toolkit for your Middle Mile needs

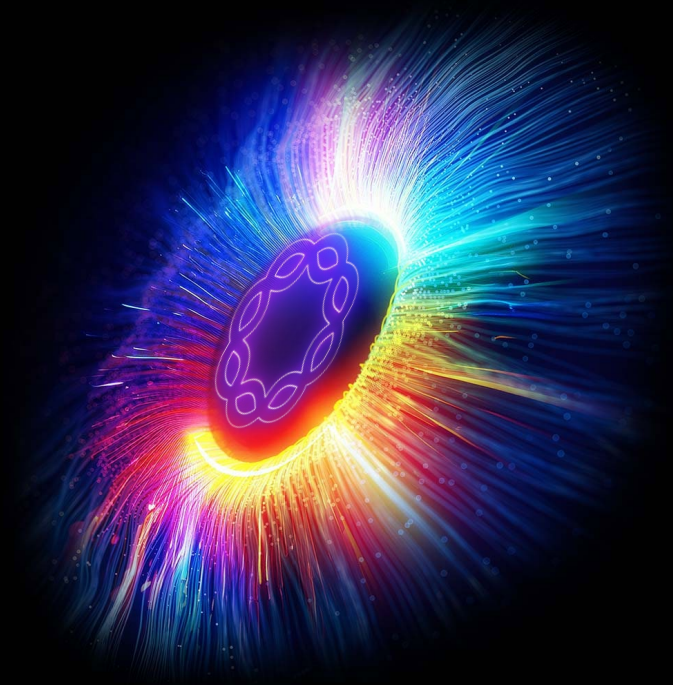
Thank You

ribbon
INSIGHTS



ribbon

INSIGHTS



Flexibility to Optimize Solution Offerings

Universal Edge and Synergies with Transport

Gordon Eddy

Senior Director, Product Line Management Enterprise Strategy and SBC Edge

ribbon INSIGHTS

Common Edge Challenges

Need More Bandwidth for Cloud-based Apps

- Cloud-based business apps require more bandwidth
- Storage is also in the cloud
- Employee productivity is tied to speed of access

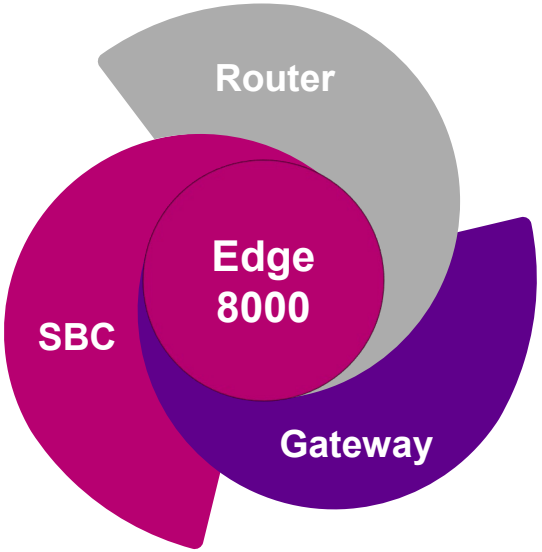
Need to Secure Communications

- Firewalls don't protect voice well
- DoS attacks are increasing
- Threat vectors are growing

Need to Integrate Legacy Assets

- Business processes still tied to analog phones, etc.
- May need to keep legacy PBX or contact center running
- Globally, not all countries/ sites support SIP trunks

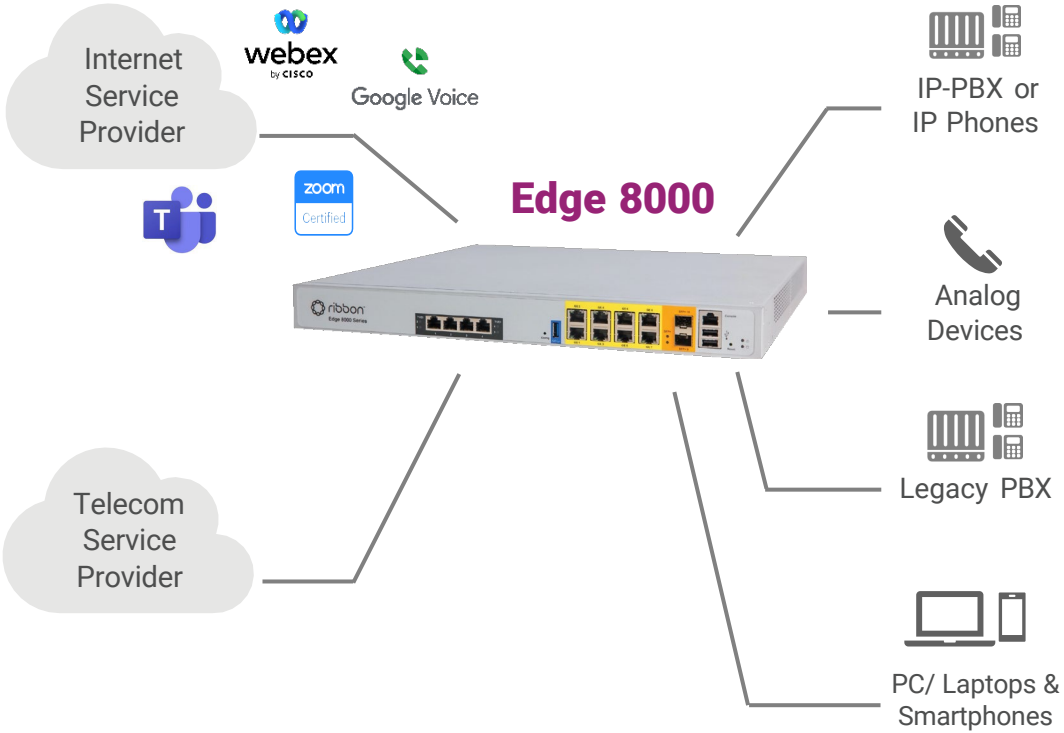
Modern Edge Platform



- Single integrated, one-box solution
- UC and Contact Center certified and ready
- Simplifies operations, streamlines training, and enhances efficiency in network edge implementations
- Addresses growing demand for bandwidth (10G support), secure connectivity in UC and cloud-based architectures and legacy architecture migration

Edge 8000 - Designed for Cloud First Organizations

Edge 8000 Next Generation Edge



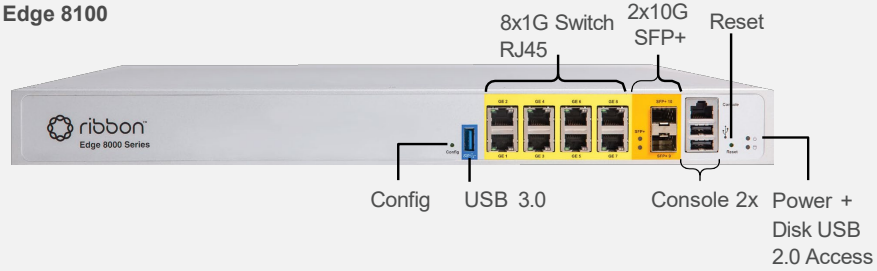
Edge 8100: SBC & Routing

Edge 8300: SBC, Routing, & Gateways

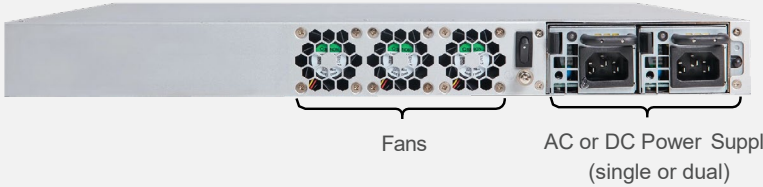
Edge 8500: SBC, Routing, & Gateways (higher capacity) - Available Q1'2025

2 Edge 8000 Options – Edge 8100 & Edge 8300

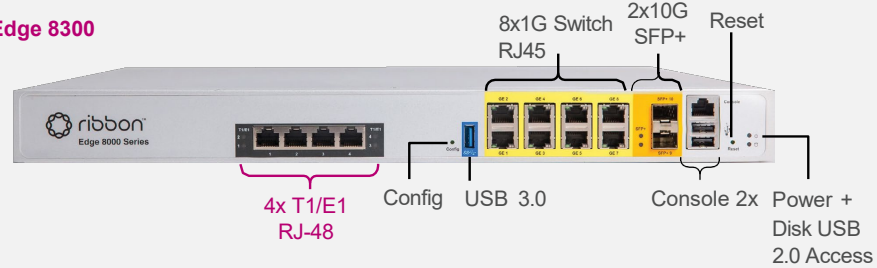
Edge 8100



Edge 8100



Edge 8300



Edge 8300

Physical

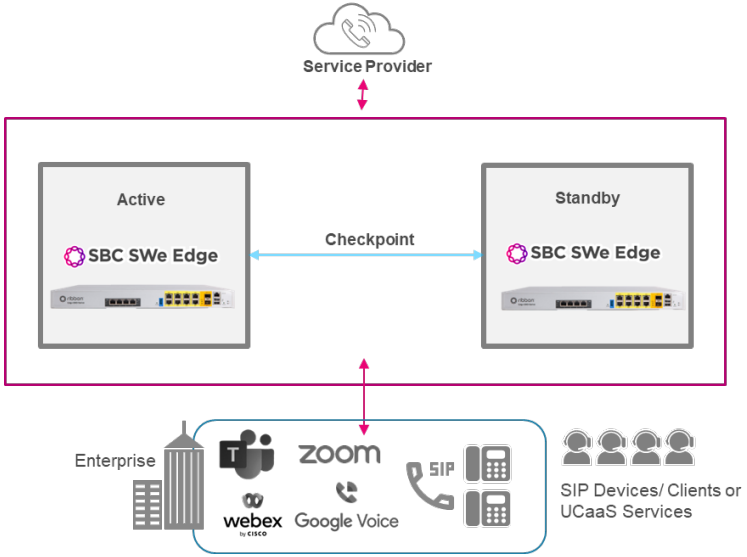
- 1U high
- CPU: C3758, 8-core, Onboard Atom® C3000

Regulatory

- IECEE/UL, US, IC, EU

High Availability (HA) for SWe Edge on Edge 8000

- Service and session continuity – mitigates software and hardware faults
- SWe Edge HA
  - SIP Only
  - Routing HA in subsequent release
- SWe Edge leverages the SBC Core HA framework, which is been in production for years
- HA expands breadth of solution

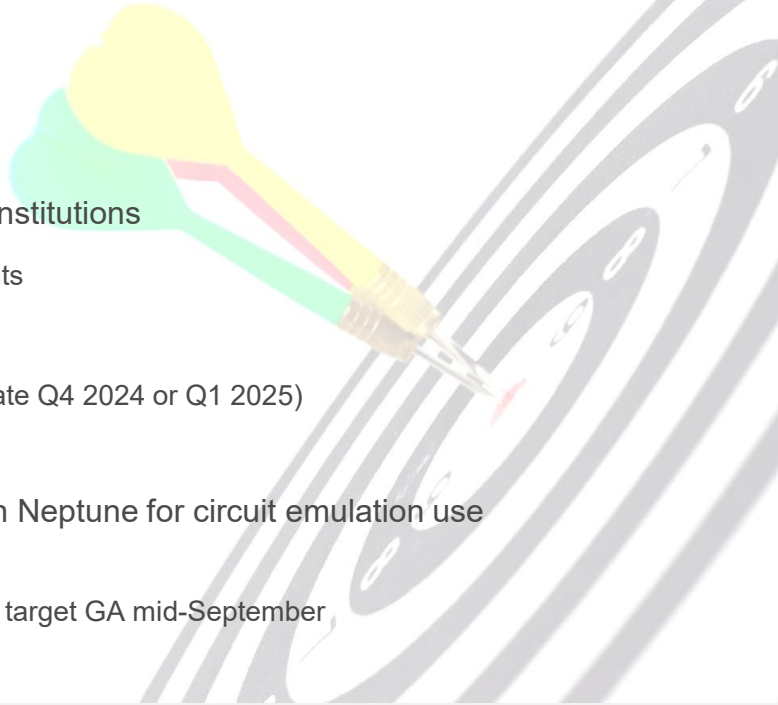


Edge 8000 – Three Target Markets

1. **Modern Alternative to SBC 2000 and Associated Use Cases**
   - Greater scale – + 400 sessions capacity on SBC
   - SBC High Availability
   - Addition of a full edge router

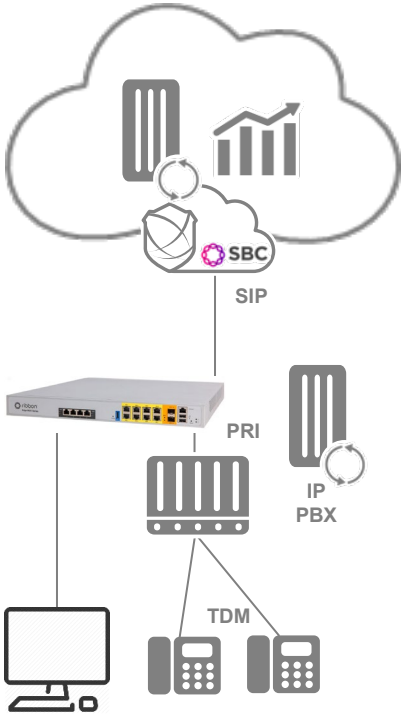
2. **Critical Infrastructure** – Utilities, Govt Agencies, Defense, Financial Institutions
   - Created hardened RedHat variant of Edge 8300 for highly secure deployments
   - Added VTP & V.150 support
   - Beginning process for US Military “JITC” certification (expect completion in late Q4 2024 or Q1 2025)

3. **Edge Router** - complementary multiservice edge router packaged with Neptune for circuit emulation use cases
   - Adding support for Edge 8000 for network topology and alarms in Muse 9.0-- target GA mid-September



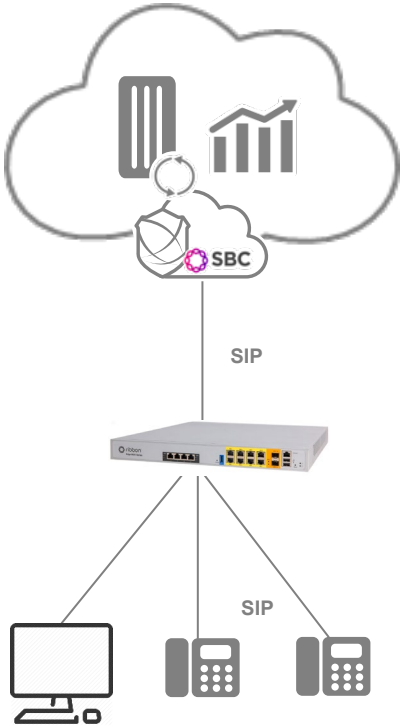
Edge 8000: Enterprise Use Case - eSBC

SIP Trunking – TDM PBX



- Edge 8000 supports circuit speeds of 10Gbps bidirectional
- Edge 8300 provides Ethernet, Optical, T1, FXS and FXO in every device

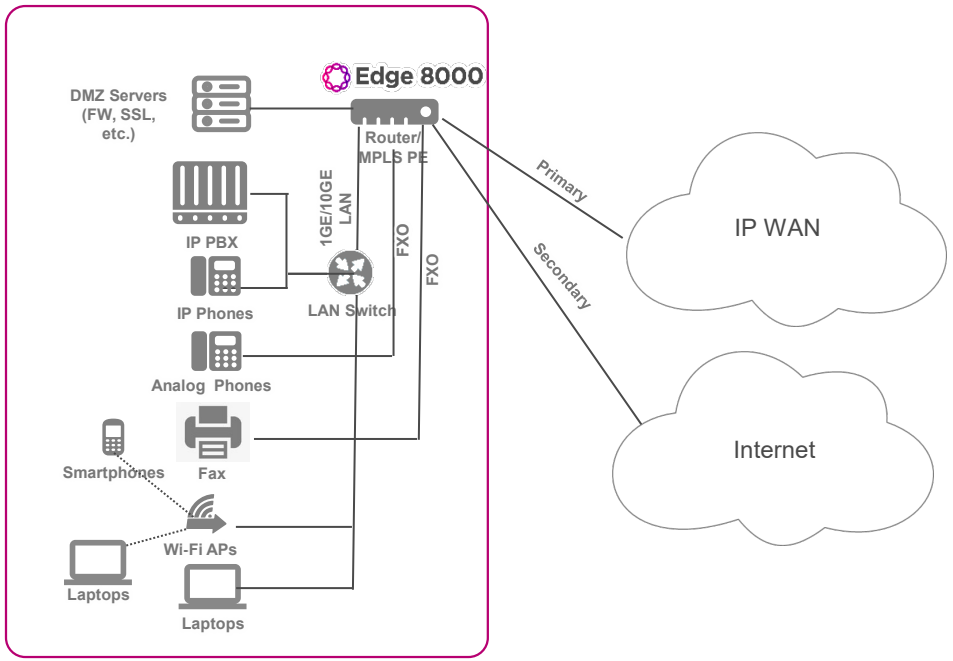
UCaaS and Hosted PBX



- Hardened SWe Edge => Fully interop testing to insure trunk/PBX compatibility
- SWe Edge VNF provides Teams, Zoom, Webex and Google Voice certifications

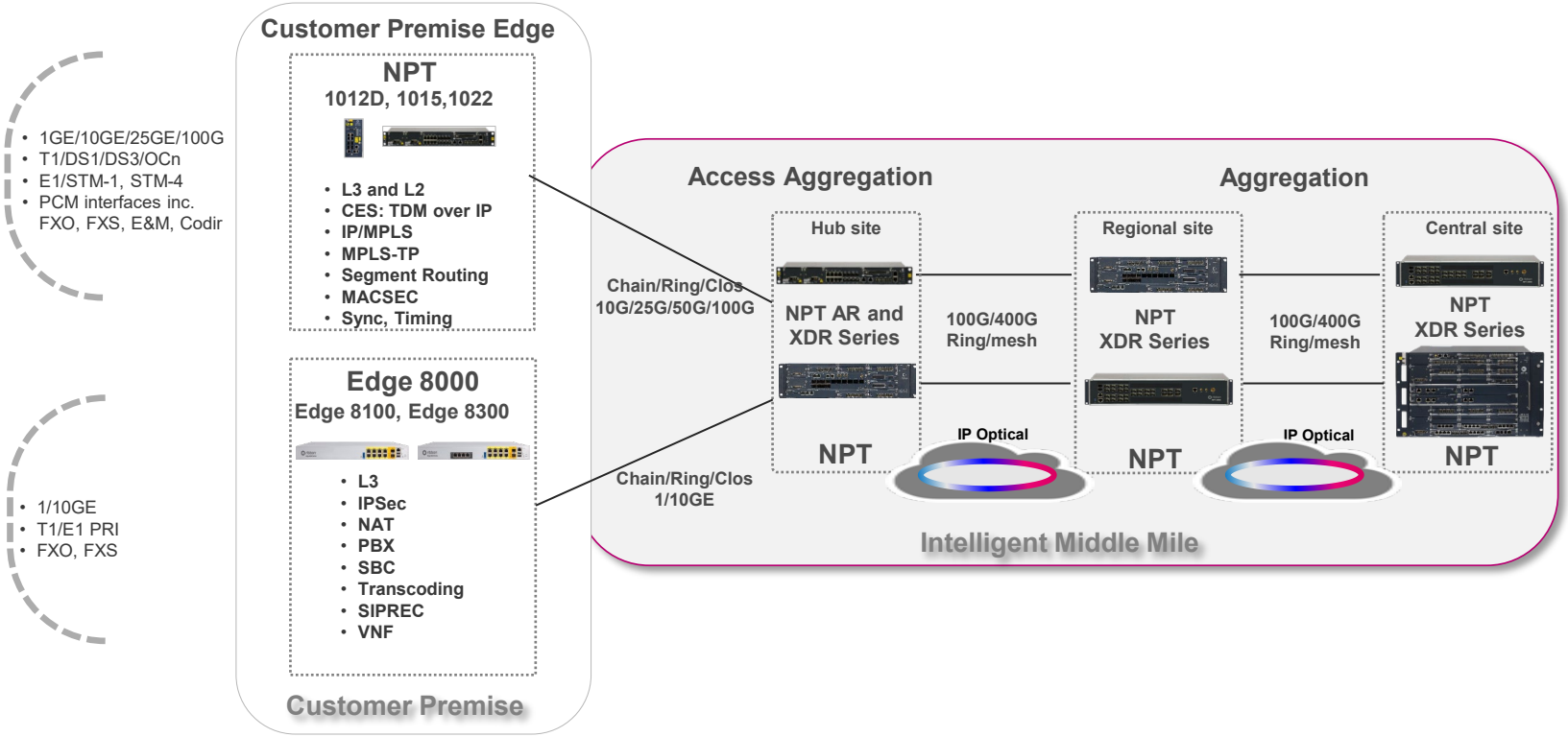
Edge 8000: Enterprise Use Case – Branch Office

Branch Office



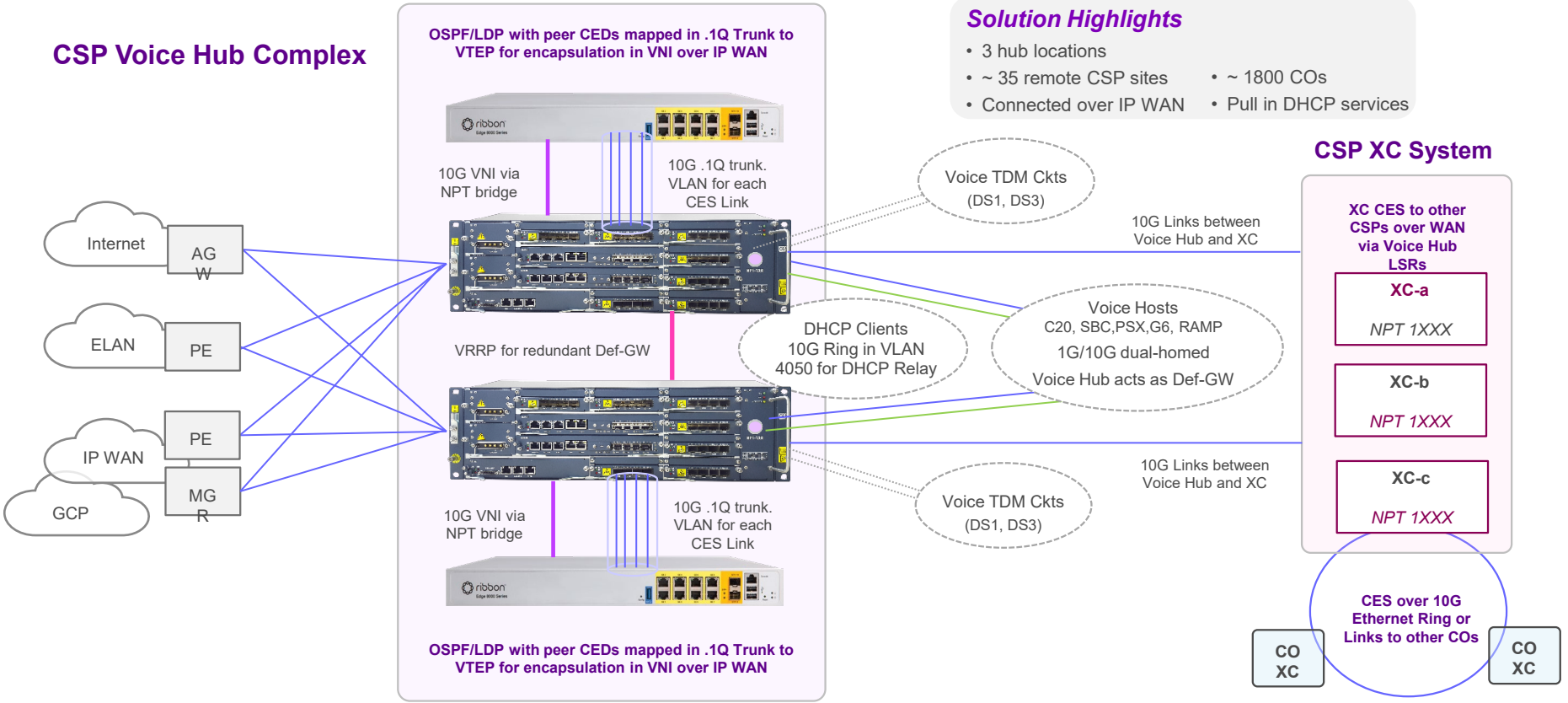
- Multi-services gateway router that combines voice security, routing, traffic shaping, media management, with up to10 Gbps
- WAN/LAN interface flexibility
- Optional FXS, FXO, PRI interfaces
- Easy Config Wizard for SWe Edge VNF

Complimentary Customer Premise Edge Capabilities: Edge 8000 and Neptune



Edge 8000 and Neptune: TDM/DACS Replacement Use Case

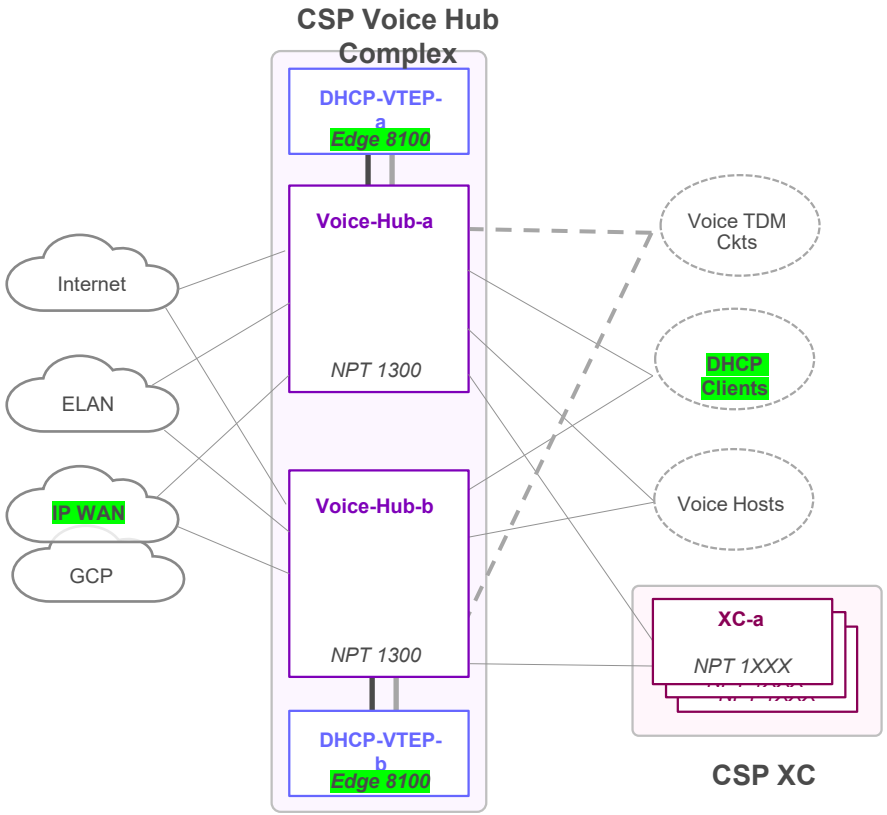
CSP Voice Hub Complex



Solution Highlights

- 3 hub locations
- ~ 35 remote CSP sites
- ~ 1800 COs
- Connected over IP WAN
- Pull in DHCP services

CSP Voice Hub Complex – DHCP-VTEP and TDM-XC Services



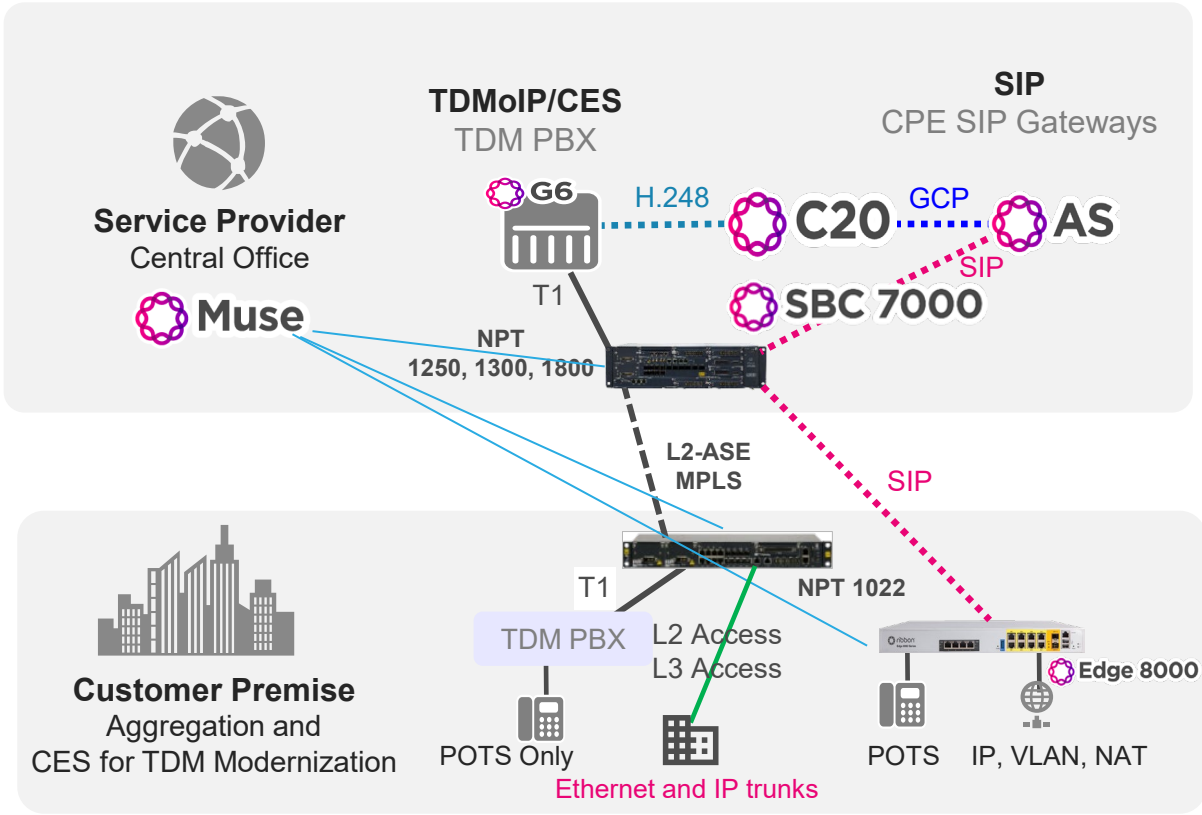
TDM XC Services on NPT

1. Local device cross-connect
   - TDM XC over MPLS-TP “hairpin” LSP
2. Intra-CSP cross-connect
   - CES between CEDs within CSP
3. Remote CO cross-connect
   - CES between CSP and remote COs over fiber facilities
   - Replace SONET rings with Ethernet-based CES
4. Remote CSP/CO cross-connect
   - CES to other CSPs or COs over WAN (IP WAN or ELAN)

DHCP-VTEP Services on Edge 8100

1. VXLAN tunnel end-point (VTEP)
   - VNIs to CSP destinations reached over IP WAN
   - Map CES VLANs (CES p2p sessions) to appropriate VNI
2. DHCP Server
   - IP address assignment for local ASM clients
   - Allocation range split across dual DHCP servers
   - May need to support multiple VLANs in future

Edge 8000 and Neptune: TDM/POTS Modernization Use Case



Neptune	MPLS Transport Performs CES Services
Edge 8300	Intelligent Edge Gateway

TDMoIP/MPLS
GCP
H.248
API, SNMP, Syslog

Thank You

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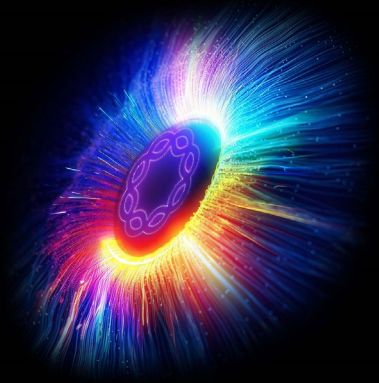
INSIGHTS



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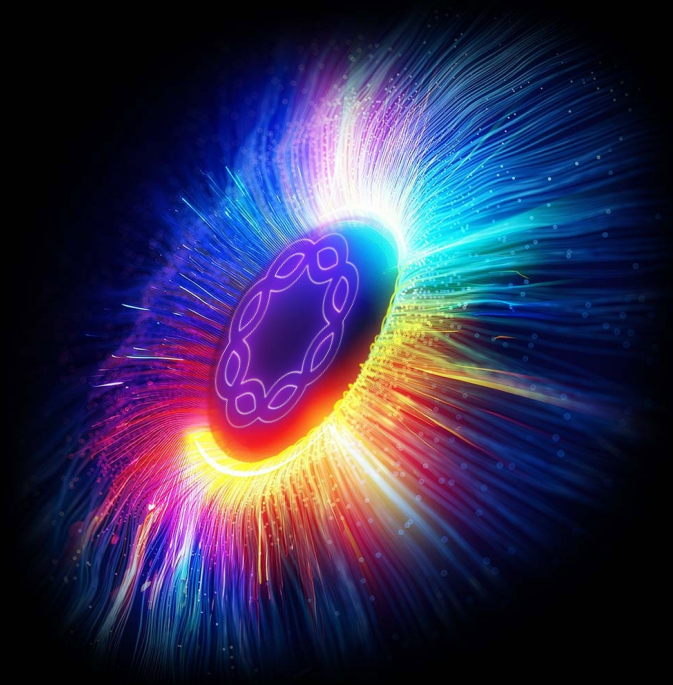
INSIGHTS



Security of Networks All Layer and Trends

Rich Krizan

Director Product Management

Analytics, Automation, Management

ribbon INSIGHTS

Security Domains

Ribbon Communications Confidential and Proprietary - rbbn.com

Potential For Huge Damage From Security Attacks

User	**8.4B passwords**	**June 2021** – Biggest leak of passwords published in the RockYou2021 compilation
Platform	**Estimate $7.3B to fix**	**2017** – WannaCry Ransomware attack affected approximately 250 - 300K computers in over 150 countries
Network	**300M requests/sec**	**Sept 2023** - Largest DDoS attack ever recorded, 5x bigger than peak of last year's largest attack
Environment	**Estimate $3B - $15B**	**July 2024** – Global outage of Windows machines due to Security update

User Access Security

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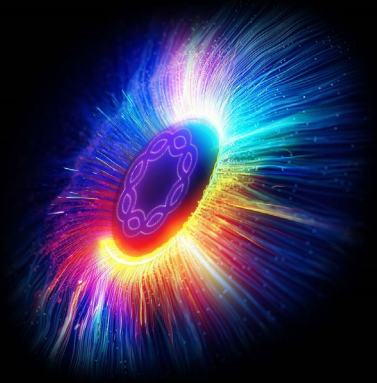
INSIGHTS



User Access Security Threats

Unauthorized access

False representation to pass authentication

Improper or incomplete configuration of user roles/privileges

Exposed vulnerabilities allowing access to restricted capabilities

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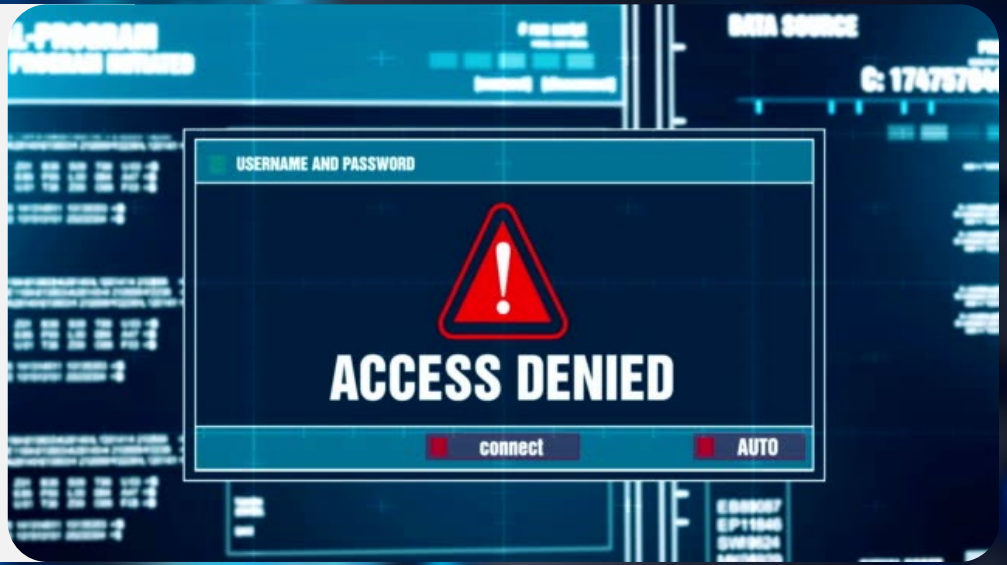
Ribbon Solutions - User Access Security

Authorization & authentication of users to restrict access to management and control systems

Two Factor Authentication adds layers of authentication for higher validation

Role-based access controls for user privileges and capabilities

Continuous activity monitoring



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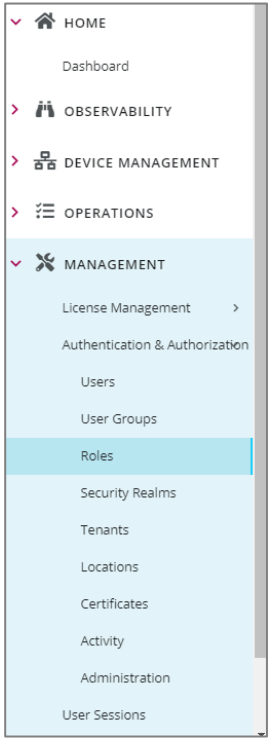
User Security – Ribbon Application Management Platform

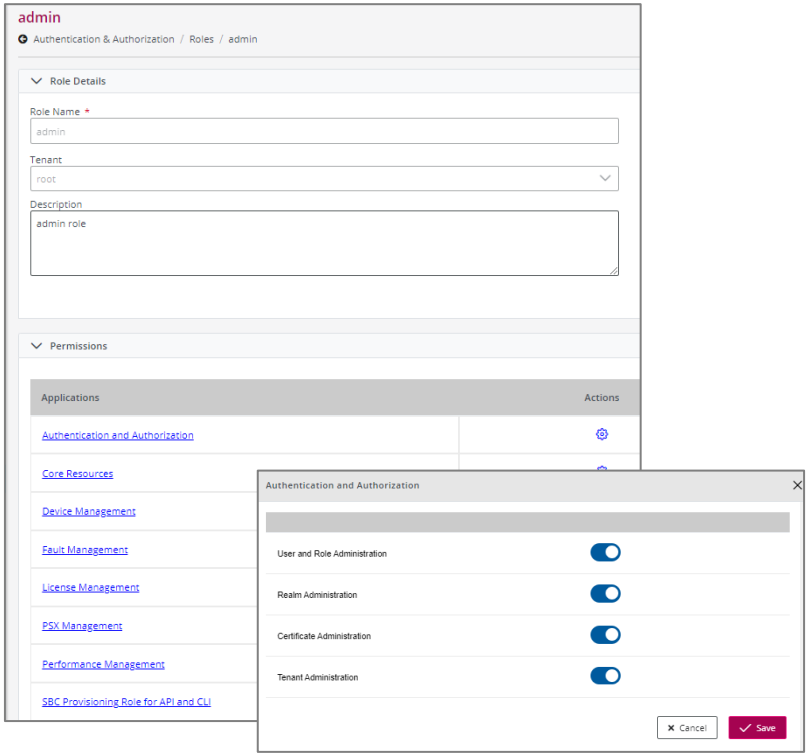
(4) Authentication Methods

- Local
- LDAP
- SAMLv2.0
- RADIUS

Authorization Model

- Roles
- Resource Groups
- User Groups
- Multi-tenant





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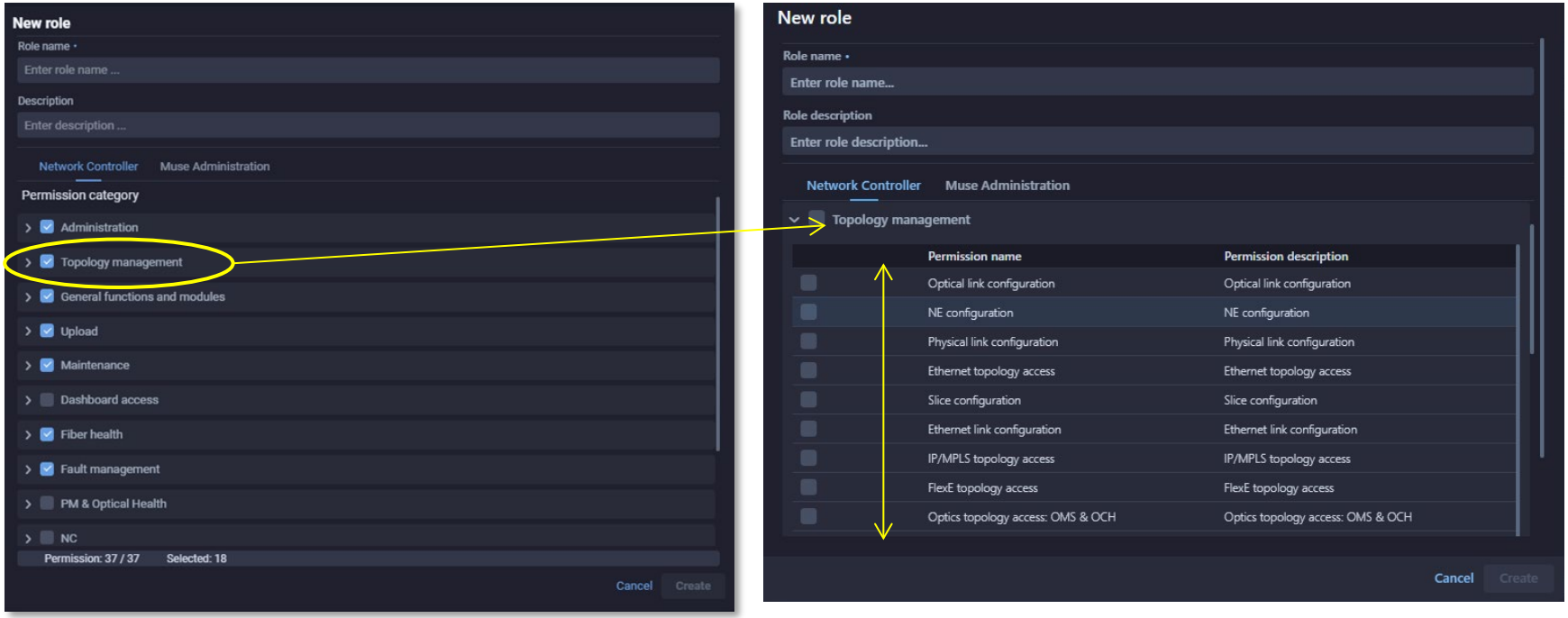
User Security – Muse Multi-Level Role Based Access Control



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Platform / Software Security

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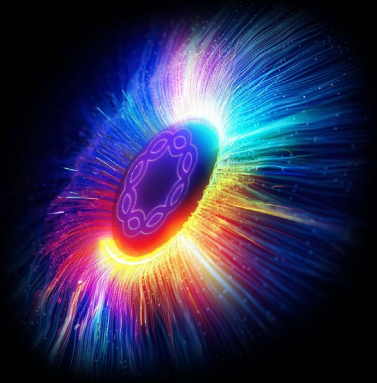

Platform/Software Security Threats

System level risks independent of users

Software version software outdated, behind on upgrades, updates for OS, CVEs…

Vulnerabilities due to poor design or implementation:

- Poorly secured communication links and/or APIs
- Lack of database security and hardened operating systems
- Insufficient focus on security in the complete development lifecycle

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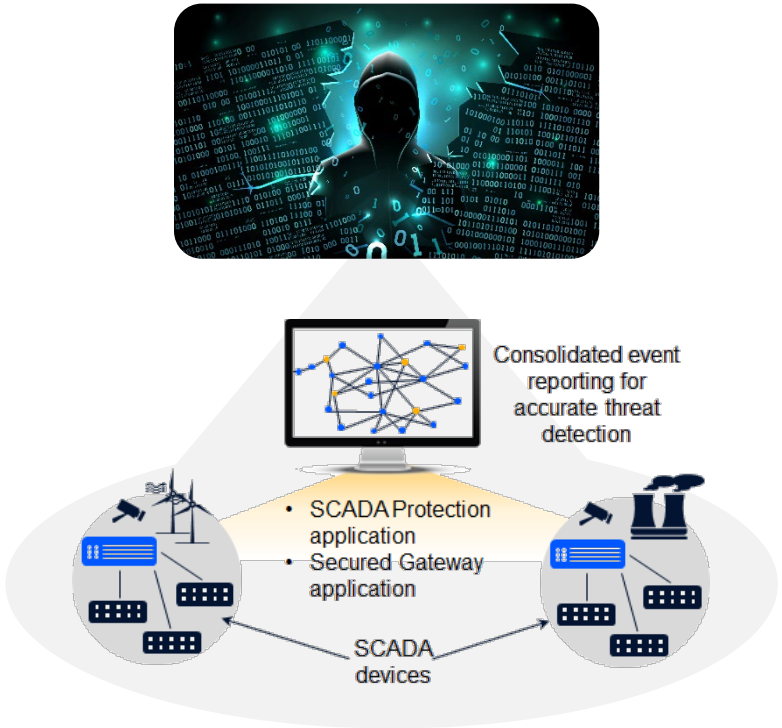
Platform Security – Malware Attack On A Ribbon Customer

- A multi-vector malware attack on an Eastern European utility
- Seized control SCADA and switched off substations
- Resulted in over 200K customers without power for several hours
- Lead to programs to modernize infrastructure and deploy SIEM applications for SCADA protection



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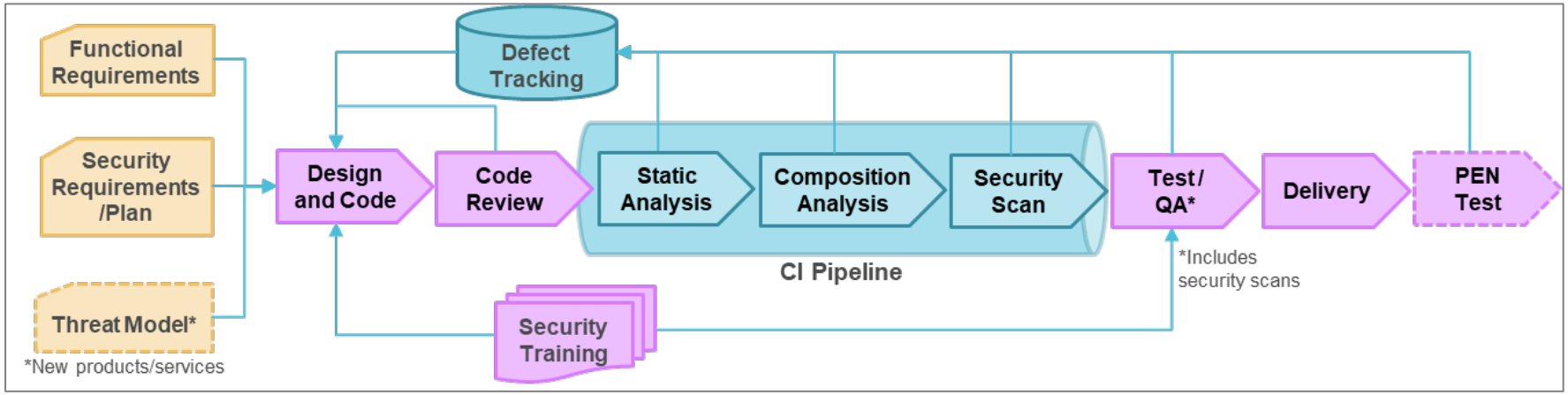
Ribbon Solutions - Platform / Software Security



- Security Vulnerability Policy
- Security Issue Resolution Policy
- Aligned with external requirements

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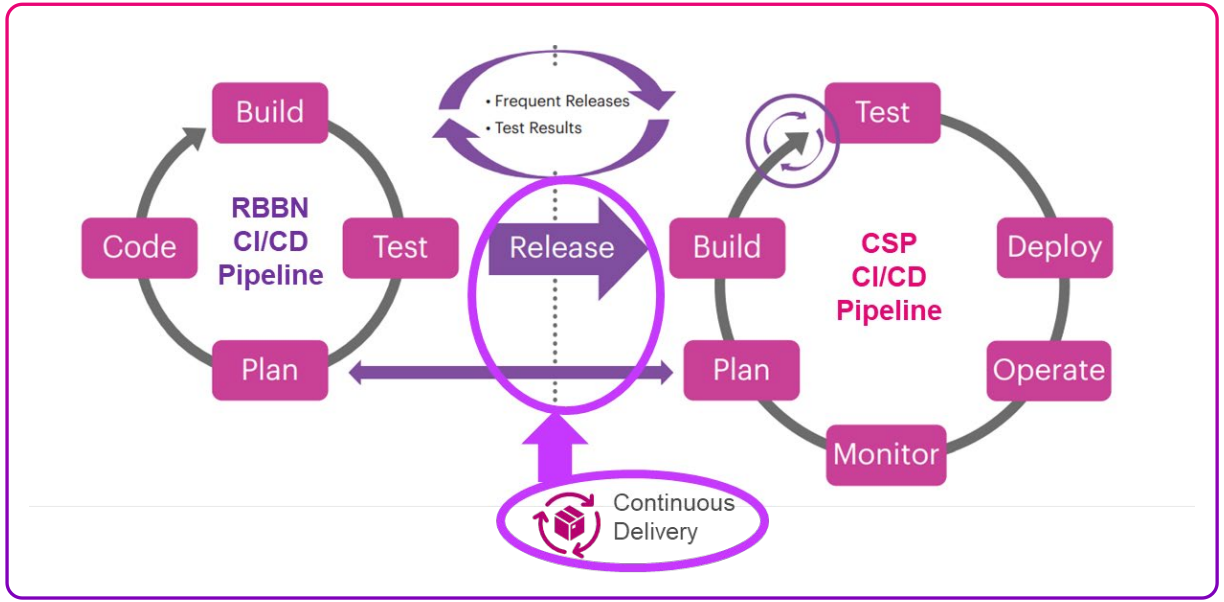
Ribbon Solutions – Software delivery and Security Updates

- Software delivery methods transition towards CI/CD
  - Pull from GSC
  - Push from GSC
  - Ribbon Repository (coming 2025)



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Network Security

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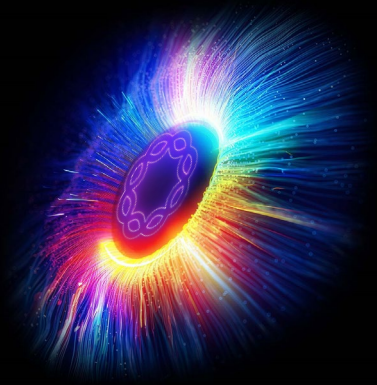

Network Security Threats

Multi-vector Adaptive & Concurrent Attacks

- Application Attacks
- DDoS Volumetric Attacks
- Data Interception Attacks

Network Security – A DDoS Attack On A Ribbon Customer

Sept 2021: target of **volumetric DDoS** attack

What happened:

- Over **300Gb/s** of traffic
- **Multi-layer** attack at both Application and Network/Transport layers
- Bad actors **adapted** attack in real-time and included ransom demands

Mitigation procedures largely worked: **Less than 10%** of inbound calls were affected

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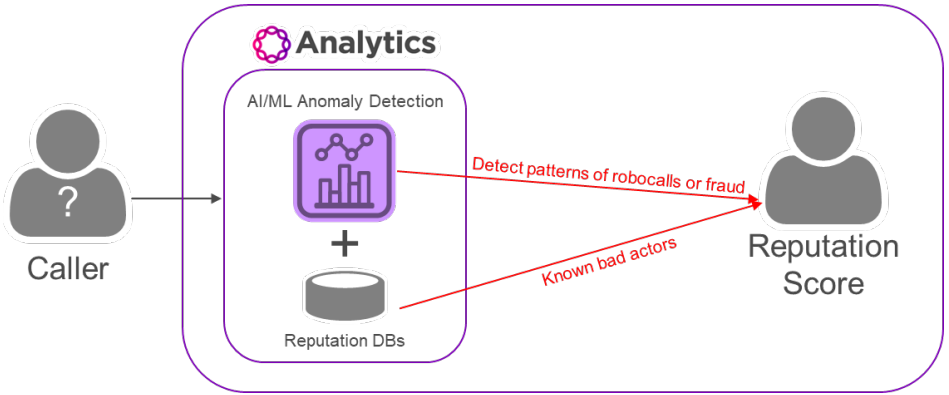
Network Security - Analytics to Identify Security Risks



Identifying bad actors & malicious attacks

- Analytics establishes baselines by ***learning*** network behavior and *building* ***normative*** traffic models
- Compared to the baselines to **identify anomalies** and determine **reputation score** of each call
- **Reputation score and policies** determine mitigation actions (eg. log & alert, automatic call rejection, route to announcement, modify caller Id = SPAM)

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Network security - SBC mitigates voip security threats

Session Border Controller

Application Attacks

+

DDoS Volumetric Attacks

- Network topology hiding
- Call state awareness and call admission control
- Support for encryption for signaling and media
- Detection of malformed packets
- DDoS/TDoS recognition and mitigation

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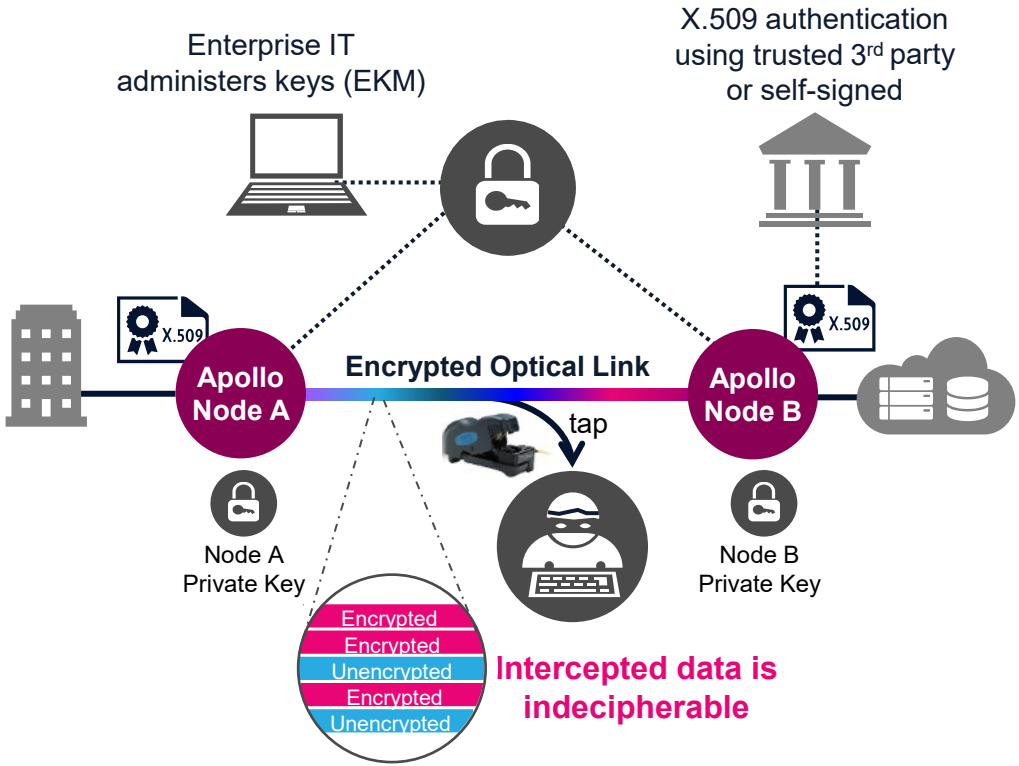
Network Security – Future Proof Layer 1 Optical Encryption

- Highest-level AES-256 encoding
- Choice of key exchanges mechanisms provides future-proofing against quantum computing attacks
  - Standard Diffie-Hellman
  - Quantum Key Distribution (QKD)



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Environmental

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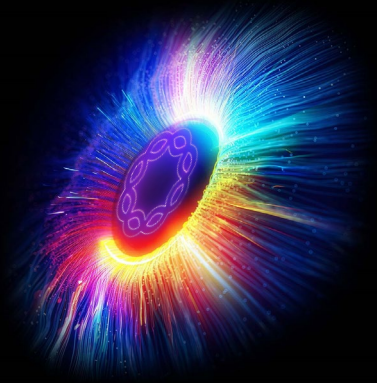

Environmental Threats

Physical risks outside operations control:

- Tractor events (cut fiber rings)
- Acts of nature (Flooding,…)
- Infrastructure failures (power outages, Internet links down)
- Widespread Security events
- Evolving Threat Security

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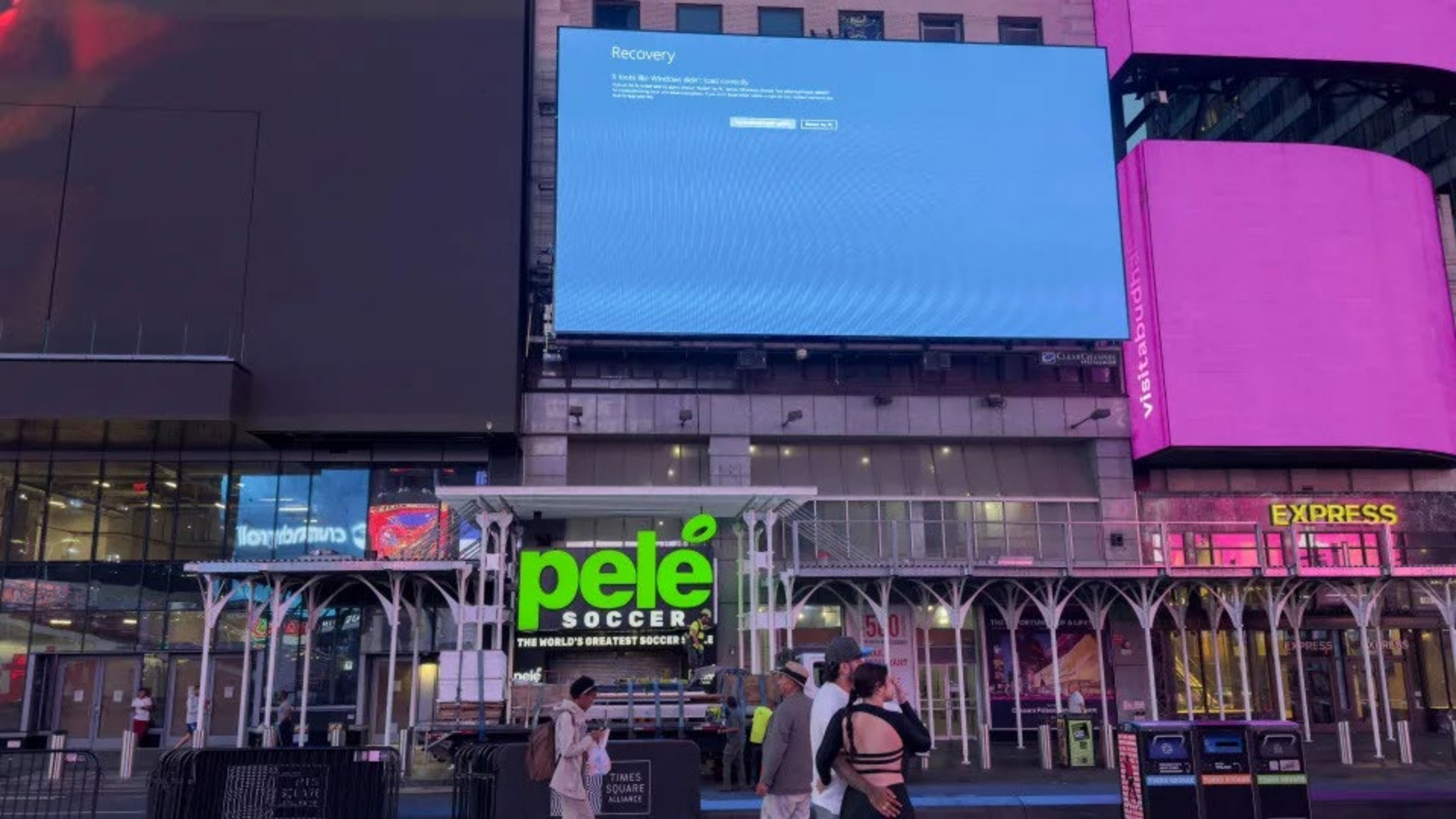
Recovery
It looks like Windows didn't load correctly
If you'd like to restart and try again, choose "Restart my PC" below.
troubleshooting tools and advanced options. If you don't know

Recovery
S2 Federal Tri
80 Fort Totten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Recovery
It looks like Windows didn't load correctly
Recovery
It looks like Windows didn't load correctly
Recovery
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Pay
Double-click
Tap to pay
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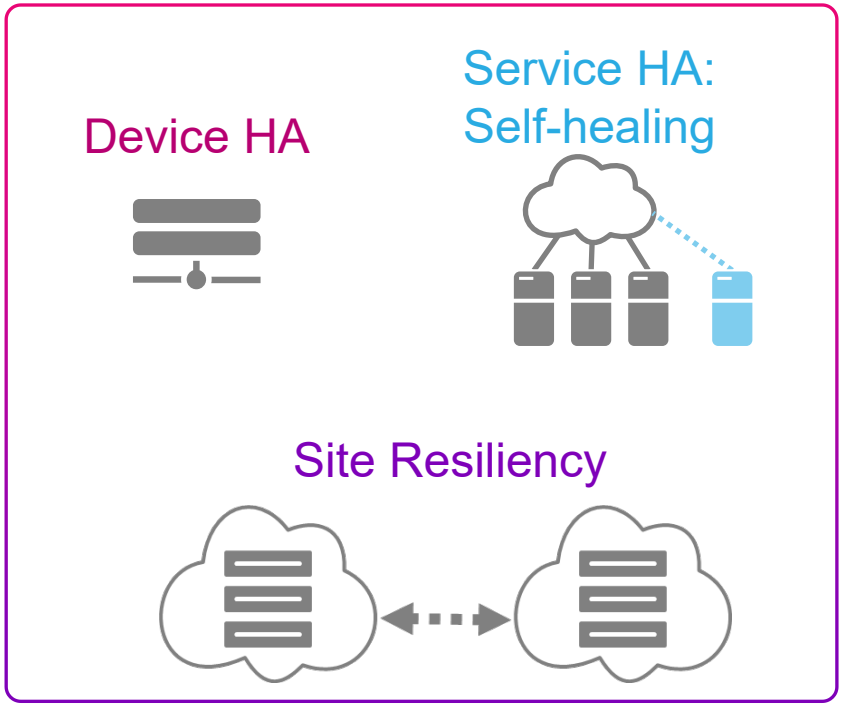
Notice
You may notice recycling symbols and information on some product packaging including 'Return to store'.
Unfortunately, soft plastics are not currently being collected in store or recycled following the closure of the REDcycle Program.
We are currently working as part of the Soft Plastics Taskforce to develop a new solution.
We apologise for any inconvenience.

Recovery
Recovery
Recovery

RadioFreeEurope
RadioLiberty
Balkan Nations Work To Restore Electrical Supplies Following Major Power Outage

Ribbon Solution - Resiliency and Geographical Deployments

- High availably deployments
  - HA: 1+1 | N+1
- Service recovery
  - Self-healing CNF
  - Redeployment CNF
- Geographical resilient deployments



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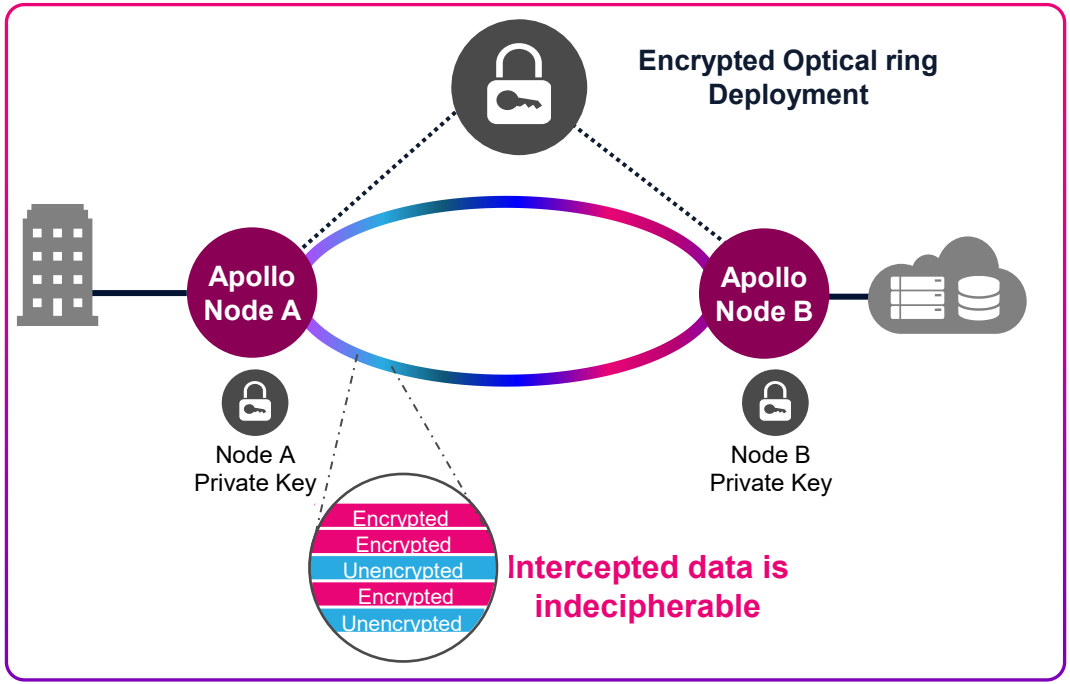
Future Security Technology – Future Proof Layer 1

- Network Protect/Restoration
  - Optical rings
  - Multi node availability
  - Chassis redundancy
- Next Generation Post Quantum Cryptography (PQC)



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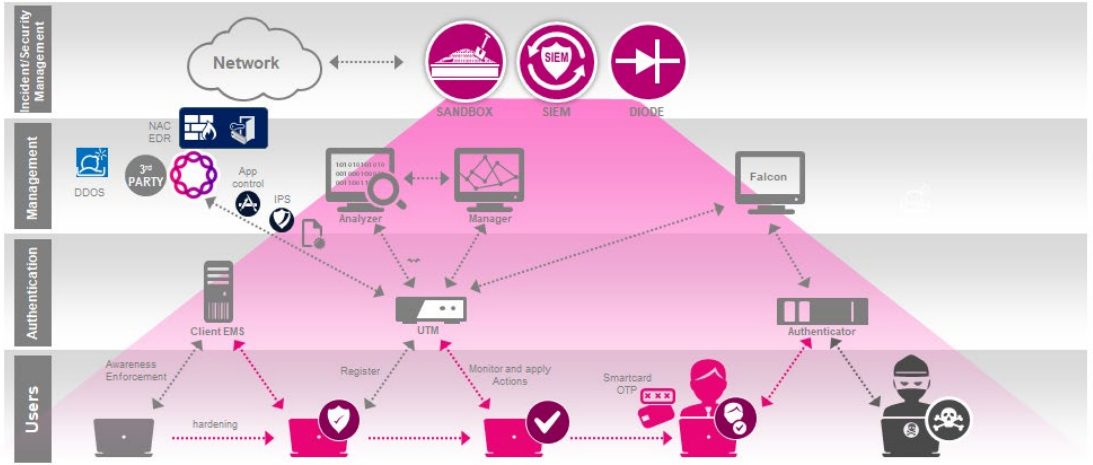
Ribbon Integrated Security Solutions

Service Provider DCNs
Setup and security

Critical Infrastructure
Converged IT, OT security, deployment planning



Employs best-of-breed solutions

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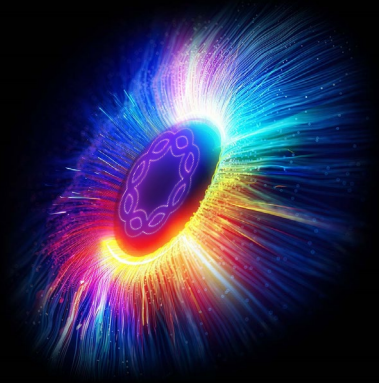
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