

# EXAMPLE NETWORK ASSESSMENT

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# EXECUTIVE SUMMARY

*Contoso Ltd, like most other global enterprises, is experiencing a “stretching to the limit” of its existing network infrastructure due to the significant growth of applications, demand for collaboration / video and the utilization of cloud services. Investment in transforming its network, through centralization, standardization and optimization is essential to Contoso Ltd.'s future business growth and productivity.*

## Contoso's Current Strategic Goals

- Transform into one global network – managed globally to global standards – while continuing to meet ongoing business needs
- Develop consistent architectural designs and operational support
- Increase network agility to respond to growing business needs
- Evolve the network in light of future needs and changes in technology
- Derive savings throughout the transformation to help fund the needed investment

## Net Reply's Key Recommendations Include

- Achieve significant cost savings by utilizing regional access providers in lieu of a single global network provider (utilizing a 2-Tiered network architecture)
- Increase functionality and network flexibility while driving down costs by utilizing Software Defined Networking solutions such as Cisco SD-WAN, VMware Velo or others
- Develop a standardized site configuration for all sites, to drive down support costs
- Execute Data Center consolidation, implementing the appropriate Data Center network fabric design
- Develop the overall transformation strategy with an eye toward utilizing the agility and cost effectiveness provided by Software Defined Network (SDN) / Software Defined WAN (SDWAN) capabilities
- Improve security posture at the edge of the network
- Allow for decentralized access to the internet from each remote site and teleworkers instead forcing internet traffic through the hub sites
- Many network devices and firewalls are aging, and some are no longer supportable by the manufacturer



# ASSESSMENT RESULTS



# DATA CENTER ASSESSMENT

| Area               | Roadmap | Current state / Disruptive technology / Network trend   |
|--------------------|---------|---|
| Architecture       |         | <ul style="list-style-type: none"> <li>Implement traditional Layer design (core, aggregation / access). HA of Networking components at NA, single points of failure and geographic redundancy</li> <li>VSS extension and L2 stretching in with support for Virtualization mobility and geographic application clustering</li> <li>Layer 3 connectivity between DSs with Global Site Selector in North America</li> <li>Software Defined Data Center / SDN</li> <li>Multi-tenancy</li> </ul> |
| L3 Routing         |         | <ul style="list-style-type: none"> <li>Not harmonized routing solution (Internal Routing architecture differences between geographies: OSPF-EIGRP, BGP redistribution)</li> <li>Usage of proprietary protocols (EIGRP)</li> <li>Policy Based Routing</li> <li>Application Performance Aware Routing</li> </ul>  |
| L2 Switching       |         | <ul style="list-style-type: none"> <li>Multichassis Link-Aggregation Protocols (Virtual Port Channel Nexus 7K and VSS Cat 6500) are implemented at all levels</li> <li>Per VLAN Spanning Tree Protocol (PVSTP) as primary forwarding approach where required</li> <li>Fabric Extender with Top of Rack Nexus 2K Line Cards</li> <li>Virtual Switching at Hypervisor Level</li> <li>Spine – Leaf topologies, VXLAN, L3 over L2 technologies</li> </ul>                                       |
| WAN Optimization   |         | <ul style="list-style-type: none"> <li>WAN Optimization implementation based on Riverbed</li> <li>Deployment of 50+ Physical appliances</li> <li>Design configuration varies with in path / out path deployments</li> <li>Virtual appliances</li> <li>SD-WAN</li> </ul>   |
| Web Filter & Cache |         | <ul style="list-style-type: none"> <li>Internet Traffic Filtering and Cache based in Websense</li> <li>Regional deployment of 75+ boxes deployed around the world</li> <li>Cloud based SWG services (Zscaller or similar)</li> </ul>  |


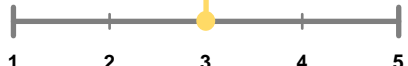


# WAN AND CLOUD CONNECTIVITY ASSESSMENT

| Area                 | Roadmap | Current state / Disruptive technology / Network trend   |
|----------------------|---------|---|
| Architecture         |         | <ul style="list-style-type: none"> <li>Scalable Global WAN designed over MPLS – VPN and Dynamic Multipoint VPN over Internet (back up / primary connection for small branch office)</li> <li>Redundancy at MPLS / Internet and DMVPN Router</li> <li>Regional WAN for site with no Direct Access with Backbone</li> <li>Replace MPLS with multiple DIA links</li> <li>SDI WAN / controller</li> </ul> |
| Quality of Service   |         | <ul style="list-style-type: none"> <li>End to End consistent QoS implementation with 5 different classes</li> <li>Classification, marking, and bandwidth allocations aligned to the service provider, treatment end to end</li> <li>Dynamic allocation of bandwidth resources by network programmability (SDN WAN)</li> </ul>   |
| Bandwidth            |         | <ul style="list-style-type: none"> <li>No current bandwidth issues (MS Azure)</li> <li>Bandwidth demand control (Riverbed)</li> <li>Internet offloading / Policy Based Routing / Performance Routing</li> </ul>   |
| Internet Access      |         | <ul style="list-style-type: none"> <li>Direct/Decentralized Internet Access not utilized</li> <li>Proxy and Cache implementation – Websense</li> <li>NGFW as part of SD-WAN</li> <li>Direct Internet Access</li> </ul>  |
| Connectivity Methods |         | <ul style="list-style-type: none"> <li>Public Internet Virtual instances in Public Cloud, Redundant design</li> <li>Cloud to Public</li> <li>Virtual instances in Public Cloud, Redundant design</li> <li>Implement SD-WAN controllers at the public cloud</li> <li>Direct Internet Access for SaaS / Amazon Cloud</li> </ul>   |



# LOCAL AREA NETWORKS

| Area                    | Roadmap   | Current state / Disruptive technology / Network trend  |
|-------------------------|---|--|
| <p>LAN Architecture</p> |  | <ul style="list-style-type: none"> <li>• LAN architecture based on site classification (#users). Analysis based on a few sites in scope</li> <li>• LAN architecture for major sites fully redundant at access and core layers (redundant core switches with VSS configuration)</li> <li>• LAN architecture for medium or small sites in scope provides a simplified but redundant configuration (e.g., only one core switch with redundant supervisor)</li> <li>• Cisco Software Defined Access</li> <li>• Cisco DNAC</li> </ul> |
| <p>Wireless LAN</p>     |  | <ul style="list-style-type: none"> <li>• Based on Cisco technology. Single, Double WLC and FlexConnect WLC deployment based on site classification</li> <li>• Performance issues in Real Time Communication and Video streaming requires deeper configuration and coverage analysis</li> <li>• New vendors with enhanced capabilities</li> </ul>   |



# **BUSINESS NEEDS**



# CHANGES IN CONTOSO'S BUSINESS NEEDS

## KEY BUSINESS REQUIREMENT

## BUSINESS IMPACT



### Consolidation

- Contoso Ltd is shifting from a regional structure, built through 10 years of targeted M&A activity, to One Global Contoso Ltd with focus on two key areas: Medicine and Behavioral Health. With launches of SAP, and Salesforce, application rationalization and consolidation is underway. In order to support this shift, Contoso Ltd must have a global approach and strategy to Network Infrastructure and Operations.

- Consolidation of
  - Application/Services
  - Data Center
- Consistent User Experience
- Global Operations



### Collaboration

- As the global workforce of 18k employees align under One Global Contoso Ltd, the need for collaboration is critical. Communication, mobility and access become crucial – whether in the office or on the road.
- External Partnerships, which represents 200 users across the globe, are key to Contoso's growth strategy. Such partnerships require online collaborative platforms and access to internal and external systems.

- Increased Demand on
  - Communication
  - Mobility
- Connecting to
  - Joint Venture
  - Trusted Partner



### SaaS & Cloud

- To meet changing business needs, Contoso Ltd is looking toward SaaS and Cloud for globalization and consolidation of their back office and customer facing applications.
- IT will need the ability provide private agile development environments to support the development and evolution of sensitive applications that demand global access.

- Application Consolidation
- Migration of workloads to Azure
- Increased reliance on O365



### Security

- Initiatives like SaaS and Azure cloud require a high volume of data feeds to and from Contoso's internal and externally hosted systems from the edge of the network including remote workforce. Due to change in the way the network is consumed, the security controls should be shifted towards the edge as opposed to centralized hub-and-spoke model that in use today.
- As Contoso Ltd expands its vision there will likely be specialized requests for more complex analytics from R&D and Marketing.

- Immediate need for improve security at the edge
- Future increase in need of more robust security posture





# CURRENT NETWORK INFOSTRUCTURE CHALLENGES

## BUSINESS IMPACT

## NETWORK GAPS



### Consolidation

- Consolidation of
  - Application/Services
  - Data Center
- Consistent User Experience
- Global Operations

- As applications shift from local to global the distance between them and the end users increases. Network latencies increase, which impacts application performance. In addition, the amount of traffic over the Global WAN will increase driving up bandwidth and cost.
- A single instance of SAP serving Contoso Ltd Global footprint will increase bandwidth demands.
- Routing protocols are not harmonized across geographies. There is a need for Global Network standards.



### Collaboration

- Increased Demand on
  - Communication
  - Mobility
- Connecting to
  - Joint Venture
  - Trusted Partner

- Growth of mobility, voice and video traffic are stressing the infrastructure. These higher density are placing high demand on endpoints and require infrastructure upgrades and better management of Real Time Communications with appropriate QoS, especially on the wide area network and wireless networks.
- The cost of traditional MPLS network provided by global players is high. Alternative approach to guarantee the delivery of sensitive data such as VoIP, Video and business critical applications should be considered.



### SaaS & Cloud

- Application Consolidation
- Migration of workloads to Azure
- Increased reliance on O365

- Requirements for SaaS and Cloud Services and mobility result in WAN/Internet playing equally important roles for enterprise connectivity. Contoso's current design positions Internet for casual connectivity as opposed to a permanent and integral part of the enterprise WAN to be leveraged for connectivity to corporate applications.
- Increased reliance on the cloud workloads at Azure will require additional bandwidth.



### Security

- Immediate need for improve security at the edge
- Future increase in need of more robust security posture

- The enterprise WAN is not engineered for to inspect traffic and enforce security policy at the edge of the network. All Internet bound traffic is currently routed through the hub sites.
- IDS/IPS are not currently employed at the strategic points in the network and on the remote access endpoints.



# NETWORK ARCHITECTURE



# CURRENT NETWORK STATE

## Network Readiness for SAP

- Need of ensure MPLS and Internet bandwidth to avoid poor user experience and lack of productivity

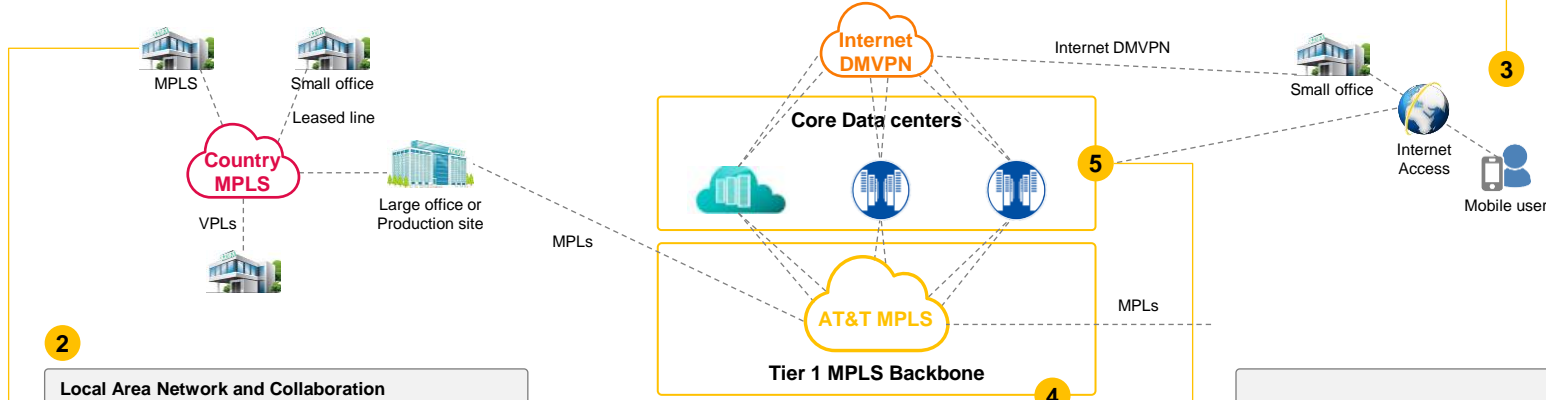
1



## Internet Connectivity

- Regionalized access in NA and Country level access elsewhere
- Flexibility and performance can be improved with optimization

3



2

## Local Area Network and Collaboration

- Obsolete hardware at some sites (switch, Wireless Controllers)
- Inconsistent configuration and obsolete wireless protocols (802.11b, WPA)
- Impaired Real Time Communications and video on demand

6

## WAN (Global and Regional)

- Global consolidated WAN service provider (AT&T). Regional WAN (MPLS, VPLS)
- Not harmonized solution (Interior Routing protocols)
- Constrained MPLS provider, inflexible deployment model

## Data Center Network

- Inconsistent DC Network design
- May require upgrades to support Applications and Data Center consolidation

Network Operations – Two different Network Operations Centers, network management toolset not unified.



# NEXT GENERATION NETWORK TRANSFORMATION

## Network Suitability for SAP and MS Azure

- Bandwidth augmentation to address short term requirements
- SD-WAN to improve Regional and Global WAN connectivity

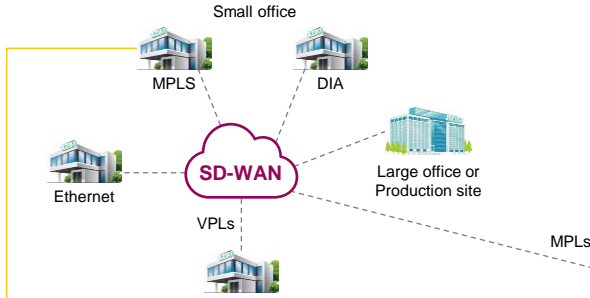
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## Internet Connectivity

- Harmonized design
- Direct Internet Access in critical branch offices to support SaaS and Public cloud application performance

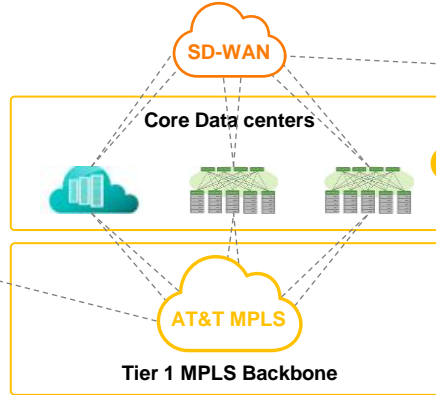
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2

## Local Area Network and Collaboration

- Harmonized design
- Short Term Improvements to support real time communications (configuration changes, update legacy infrastructure)



4

## WAN (Global and Regional)

- Enhanced WAN flexibility by utilizing SD-WAN
- Site categorization as means to manage network complexity
- Better utilization of links limits the need to augment capacities (SD WAN) and costs associated
- Simplified operations by automating network tasks

6

## Data Center Network

- DC Design standardization
- Improved DC scalability and performance
- Automation and orchestration of network provisioning
- Fast application provisioning

Network Operations – Integrated Network Operations Center  
Provide end-to-end inventory and financial visibility and end-user performance management



# RECOMMENDATIONS



# TERMS DEFINITION

## ISSUE

Presents one or more specific risks. Priority attention recommended.

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## UNDEFINED

Not available or provided.

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## LIMITED

Incomplete.

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## MATURE

Documented and functionally complete.



# NETWORK READINESS FOR THE PUBLIC CLOUD

Migration of the workloads to Azure requires adequate network bandwidth and minimized latencies to ensure consistent user experience. Some sites may require augmentation to meet design requirements.



## Proposed Functionality/Capabilities

- Bandwidth must be adequate so as not to degrade to application performance. Augments in progress for Canada to meet design requirements.
- Recommend a Regional WAN transformation enabled by SD-WAN and DIA to facilitate flexible BW growth and direct connection with Microsoft Azure.
- Install virtual SD-WAN controllers inside Azure.

## Timeline



## Initiative assumptions

- Contoso will initiate the POC for an SD-WAN vendor
- In many cases MPLS can be replaced with DIA Internet

## Finding Result

## Finding Category

LIMITED

Design / Capability

MATURE

Documentation

LIMITED

Standardization



## Key Dependencies, Risks, Issues

- Strong dependency on the migration of the workloads to MS Azure
- Dependency and Risks related to Service Provider delivery times



# LAN/WLAN AND COLLABORATION OPTIMIZATION

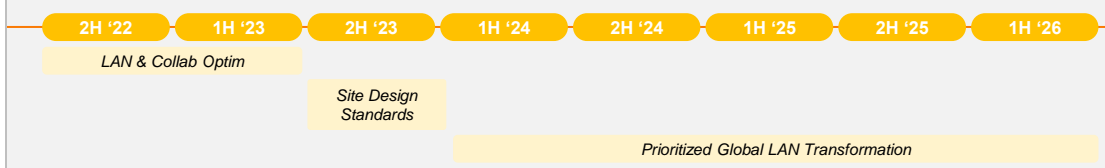
*Immediate WLAN refresh is recommended to update obsolete controllers and protocols and increase port bandwidth. Global Site Design standards must be derived and implemented.*



## Proposed Functionality/Capabilities

- WLAN refresh to replace obsolete controllers and to ensure access points are configured with appropriate BW.
- Remove protocols that impair performance (802.11b) or cause security risk (WPA).
- Explore strategy for Wireless as Primary and Managed WiFi for efficiencies and cost savings.
- Conduct a UCC evaluation to uncover potential issues in unified communications infrastructure / design (MS Teams).

## Timeline



## Initiative assumptions

- WLAN refresh may require upgrades to switch infrastructure.
- Root cause of real time communications performance issues may require improvements to LAN and wireless infrastructure as well as evaluation of upstream unified communications infrastructure .
- WLAN RF coverage was not analyzed as part of this assessment. Need to determine if it's a contributing factor where performance issues have been identified.

## Finding Result

LIMITED

## Finding Category

Design / Capability

MATURE

Documentation

ISSUE

Standardization



## Key Dependencies, Risks, Issues

- Legacy Campus and computer room equipment support mission critical factory production functions. Careful migration planning is required to minimize downtime.
- Access points with increased bandwidth switch ports may require switch replacement
- Replacement of obsolete Cisco Wireless controllers
- Legacy endpoints may not support upgraded protocols (802.11, WPA2 AES, CAPWAP)





# INTERNET CONNECTIVITY WORKSTREAM: INTERNET CONNECTIVITY OPTIMIZATION

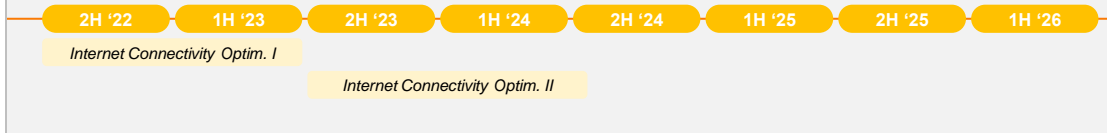
Support Cloud strategy by transforming the design of the Internet Connectivity to improve performance, reduce expense and utilize Internet access as an integral part Contoso Ltd's enterprise WAN.



## Functionality/Capabilities

- Improve external application and Internet performance through a combination of approaches including SD-WAN, Direct Cloud connection and Direct Internet Access.
- Short Term (Phase I): Analyze specific sites, with high density of users, criticality of cloud applications or greater latencies due to country or regional Internet access, to determine if a Direct Internet Connection is warranted.
- Long Term (Phase II): Plan in conjunction with SD-WAN rollout for the WAN. Direct Cloud Connection and Internet access should be provided.

## Timeline



## Initiative assumptions

- Internet bandwidth traffic increase will continue at an average rate of 30% driven primarily by Cloud, Mobility and Video.
- Current centralized design for Internet access impairs network latencies, user experience and productivity in some sites.
- Current network sourcing model can be enhanced with options available through diverse providers.

| Finding Result | Finding Category    |
|----------------|---------------------|
| LIMITED        | Design / Capability |
| MATURE         | Documentation       |
| ISSUE          | Standardization     |



## Key Dependencies, Risks, Issues

- Migration of site connectivity
- Sourcing Strategy
- SD-WAN vendors, partners, geographical footprint



# DATA CENTER NETWORK WORKSTREAM: DATA CENTER NETWORK TRANSFORMATION

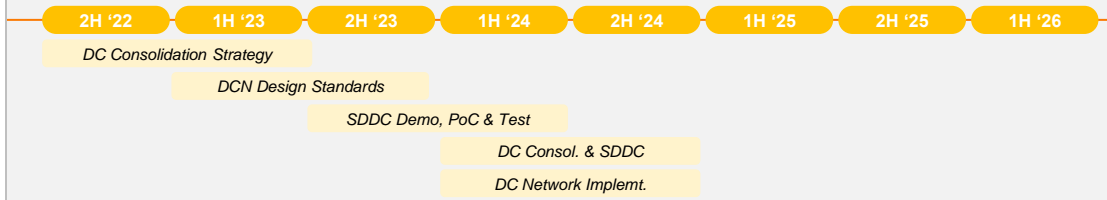
Derive and implement a Data Center consolidation strategy, utilizing Software Defined Data Center and spine-leaf network fabric design principles. Embed within this long-term strategy the further evolution of the Data Center (and WAN) network by taking Software Defined Network (SDN) into consideration.



## Functionality/Capabilities

- Ensures Data Center consolidation and oversubscription for high density of virtualized servers by spine – leaf switch topologies.
- Automate and orchestrate Data Center network operations and application network provisioning with Software Defined Networks.

## Timeline



## Initiative assumptions

- Need for development of in-house applications will continue due to country regulations and security concerns. Hence the ability to support agile development will be a core expectation.
- Data Center and application consolidation requires network ready for high density of virtualized servers.
- Network provisioning delivery times must support faster application deployment due to server infrastructure virtualization.

| Finding Result | Finding Category    |
|----------------|---------------------|
| LIMITED        | Design / Capability |
| LIMITED        | Documentation       |
| UNDEFINED      | Standardization     |

\* Spine-Leaf Transformation is typically cost neutral when tied to DCN Refresh



## Key Dependencies, Risks, Issues

- Data Center consolidation
- Application consolidation



# INVENTORY CHECK



# DEVICES UNSUPPORTED BY MANUFACTURER

| Operating System                    | Device Type  | Number     | Status         |
|-------------------------------------|--------------|------------|----------------|
| Cisco 3750                          | Switch       | X          | Out-of-support |
| Cisco 2960-C                        | Switch       | X          | Out-of-support |
| Cisco 6000                          | Switch       | X          | Out-of-support |
| Windows 6500                        | Switch       | X          | Out-of-support |
| Cisco 7206                          | Router       | X          | Out-of-support |
| Cisco C819                          | Router       | X          | Out-of-support |
| Cisco ASA 5515                      | Firewall     | X          | Out-of-support |
| Cisco Aironet 3700e                 | Access Point | X          | Out-of-support |
| Cisco Aironet 2600e                 | Access Point | X          | Out-of-support |
| <b>Total Devices Out of Support</b> |              | <b>xxx</b> |                |



# THANK YOU

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