Software Defined Access (SD-Access)

Real-World Success Stories Powered by Cisco SD-Access!

Kanu Gupta | *Product Manager, Cisco*
Jacxine Fernandez | *VP Information Security, BIAL*
Joshua Hornig | *Network Administrator, Blum*
Ricardo Pinheiro | *Team Manager Infrastructure, Ikea Industry*

BRKENS-1803

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Webex App

Questions?

Use the Webex app to chat with the speaker after the session

How

1. Find this session in the Cisco Events mobile app
2. Click “Join the Discussion”
3. Install the Webex app or go directly to the Webex space
4. Enter messages/questions in the Webex space

Webex spaces will be moderated by the speaker until February 28, 2025.

Agenda

Success Stories

- Bangalore International Airport *Aviation*
- Blum *Manufacturing*
- IKEA Industry *Manufacturing*

My profile

Mr. Jacxine Fernandez is currently the Vice President – Information Security, ICT Governance and ICT Revenue at Bangalore International Airport Ltd., the leading airport in South India.

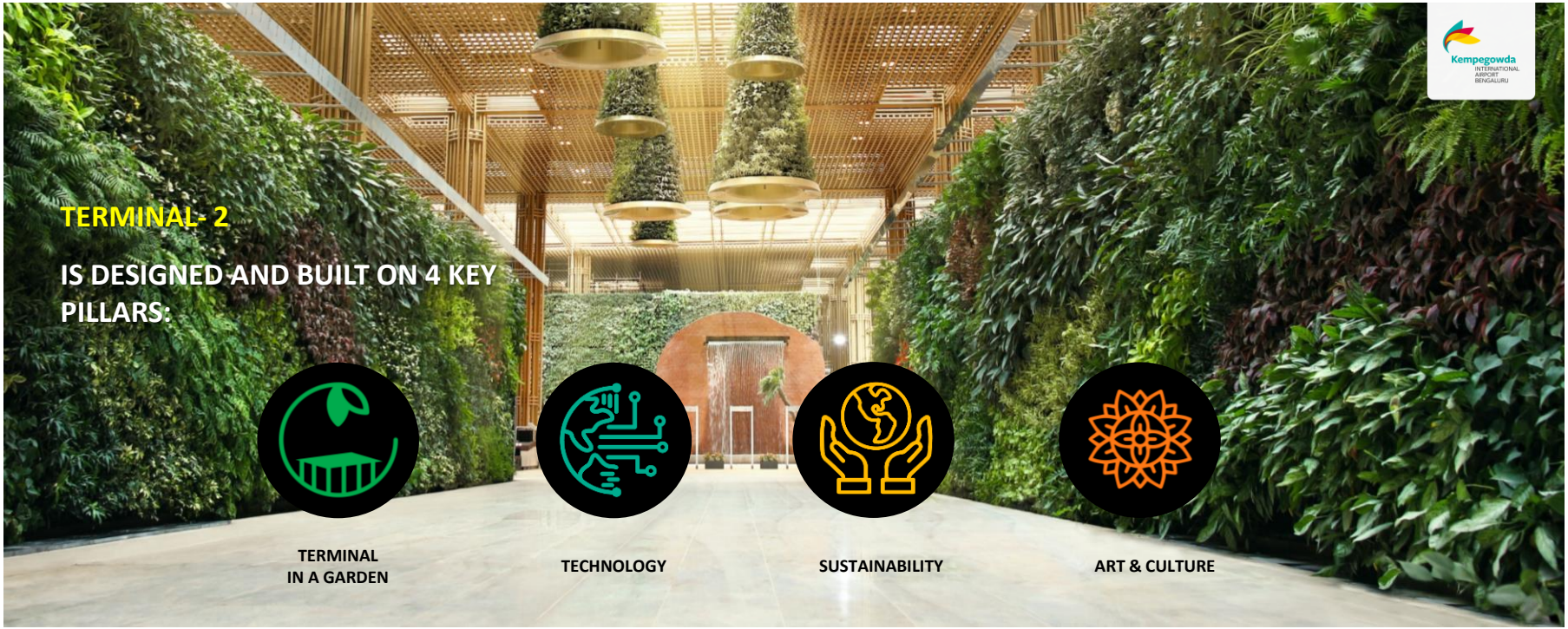
In this role, he is responsible for the enterprise cybersecurity program across IT, OT and IoT, ICT governance, partner management and budgeting and ICT revenue from various stakeholders at the airport.

He is an experienced cybersecurity and enterprise risk management senior executive with multi-geography experience across Asia, Middle East, and Africa. He has held previous roles as the Group CISO, Adani (Group) Enterprises, Group Enterprise Risk Director at Zain, a leading Middle East telecommunications service provider spread across 8 volatile markets and Group Head of Security and Compliance for airtel Africa (with operations in 17 countries), among others.

His expertise spans diverse industry sectors including aviation, telecommunications, ports & logistics, power, Oil & Gas, Defence, Public Utility and Media Communications.

KIAB

Kempegowda INTERNATIONAL AIRPORT BENGALURU



BLR Airport : India's 3rd busiest airport

Kempegowda INTERNATIONAL AIRPORT BENGALURU

FY 2019

33.3 mn passengers

380k MT Cargo

1 Terminal

CY 2024

40.7 mn passengers

496k MT Cargo

2 Terminals

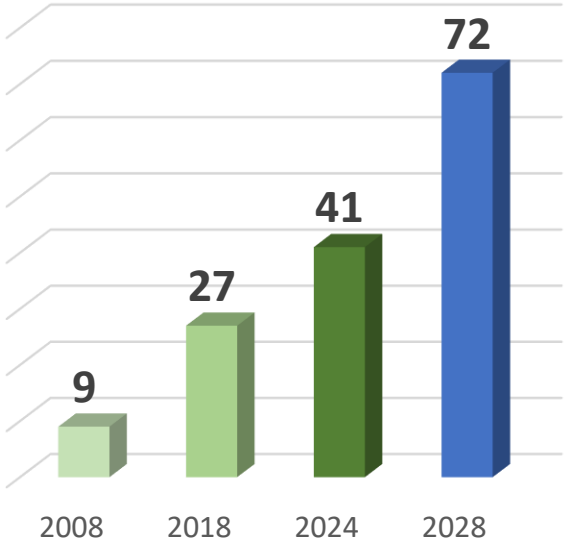
36 Airlines

13 Freighters

73 Domestic Destinations

31 International Destinations

Passenger Growth (in millions)



An ecosystem of ecosystems

Kempegowda INTERNATIONAL AIRPORT BENGALURU

Stakeholders

- Airlines
- Manufacturers, System Suppliers, Service Providers
- Governments and Regulators
- Passengers / Customers
- Other business units, cross border stakeholders
- Financial Institutions and other stakeholders

Airport Operations

- Air Traffic Control (ATC)
- Physical Premises Management
- Technology (Data Centers, applications, systems)
- Supply Chain

2 Datacenters and **150+** Telecom/ IT Rooms

22,000+ Endpoints (incl. servers, user machines, CCTVs, ACS, etc.)

Users of IT **~30,000**

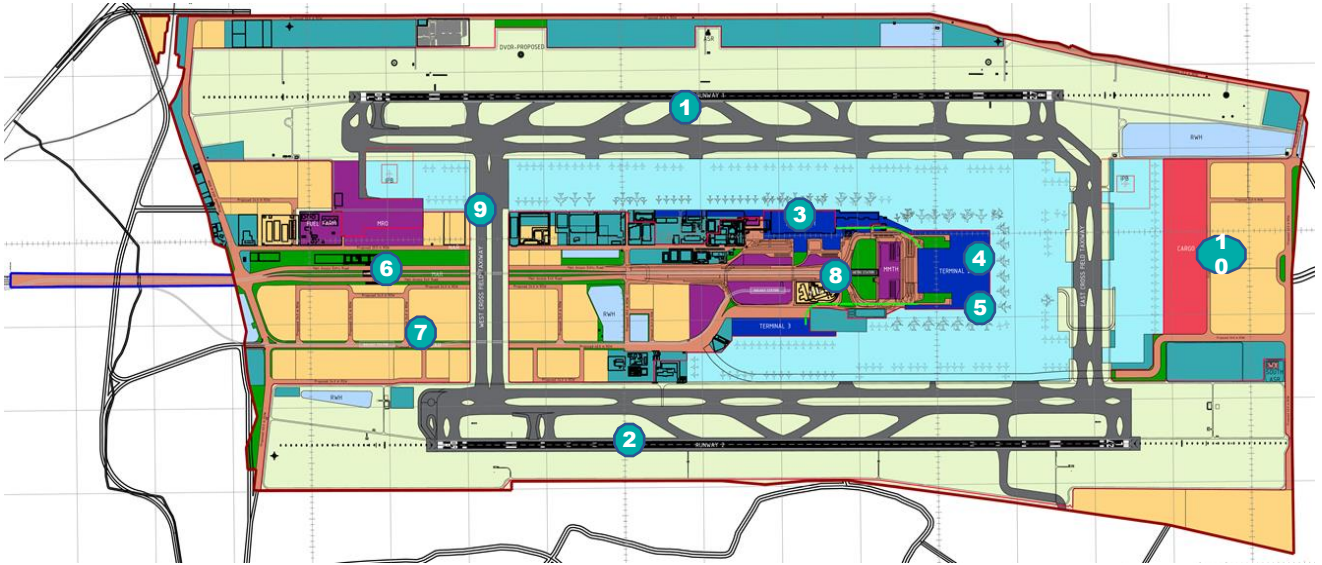
70+ Applications
4 mobile apps

10+ Security Solutions

150+
Concessionaires

16 OT-Subsystems

Future Expansion Plans



1. Existing North Runway 09-27
2. New South Parallel Runway (NSPR)
3. Existing Terminal 1
4. Terminal 2 / Phase 1
5. Terminal 2 / Phase 2
6. Terminal Boulevard
7. South Secondary Access Road
8. Future Metro Station / MMTH
9. Future Western Cross-taxiway
10. Future Terminal 3 (T3)

Migration Accomplishments

WIRED

SD-ACCESS

AIRPORT NETWORK – A NET
50 SWITCHES – 40 BOARDING/CHECK-IN GATES, 400 FIDS, AOCC

BUSINESS NETWORK – B NET
320 SWITCHES - BIAL Corporate, WLAN, Airline Backoffice, Cargo, Concessionaires

SECURITY NETWORK – C NET
220 SWITCHES – 2300 CAMERAS, 500 Access Control Systems, SOCC

PUBLIC ANNOUNCEMENT – PA NET
40 SWITCHES – Public Addressing,
Paging Stations & Speakers

SECURITY

FIREWALL

11 FIREWALLS
5 PHYSICAL, 6 VIRTUAL FIREWALLS

2 FIREWALLS
11 FIREWALLS MIGRATED TO 2 PAIRS OF FIREWALLS

POLICY CONSOLIDATION
1000+ Policies -> 100's of Policies

DATACENTER

ACI

SD DATACENTER
284 Physical & Virtual Servers migrated including AODB

DC INFRA
4 SPINES, 41 LEAF SWITCHES Deployed across NDC & MCR

RESILIENT DATACENTER
Application High Availability with automation, security, and resiliency.

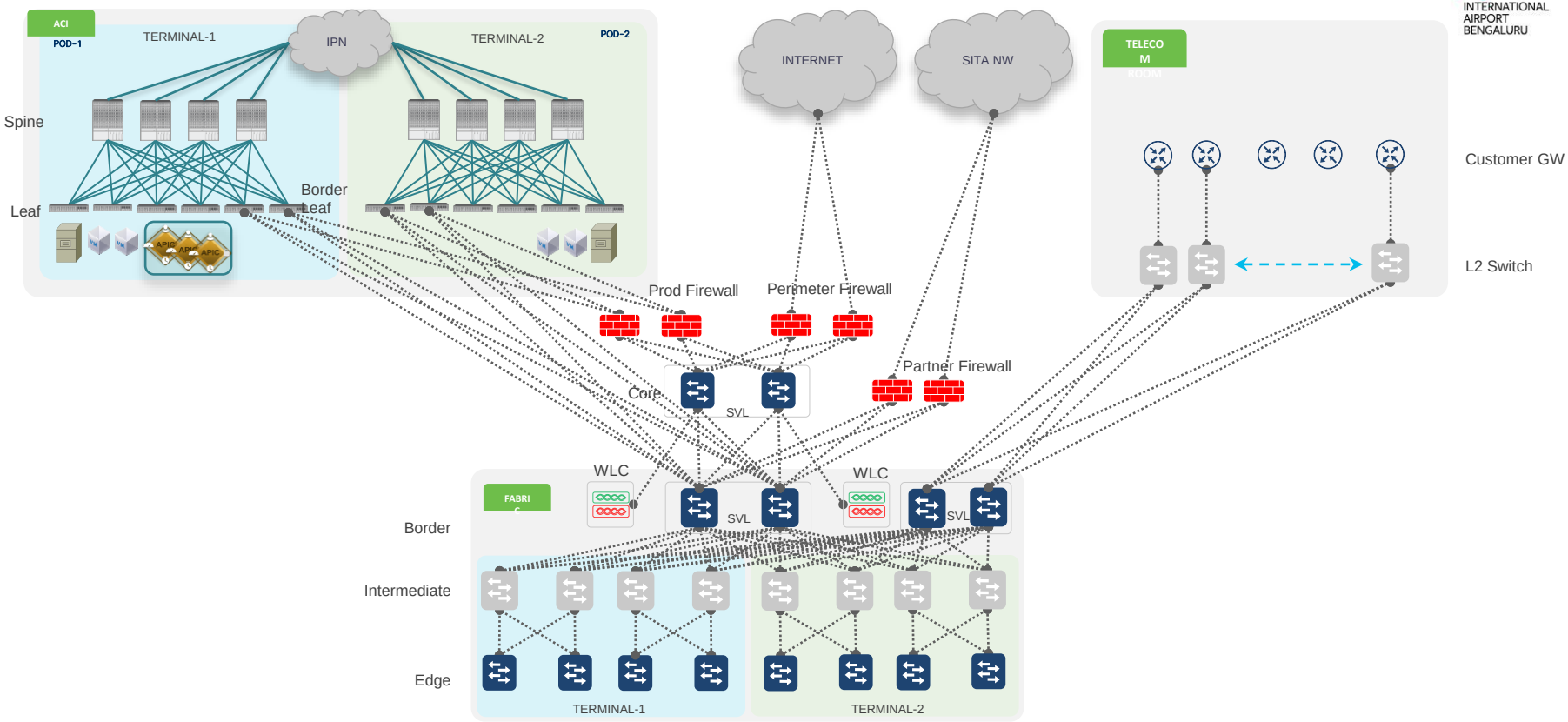
WIRELESS

WIRELESS & ISE

360 Access Points
Seamless Migration of 360 Aruba AP to Cisco

Identity Services Engine
44K Endpoints Authenticated on the Network

BIAL Indicative Network Architecture & Design



Operational Gains

Category	Traditional Network (Pre-SDA)	Software-Defined Access (Post-SDA)	Improvement Metrics
Network Management	Manual VLAN management, complex configurations, high admin overhead	Automated policy-based network segmentation, centralized management via Cisco DNA Center	50%+ reduction in admin effort & network configuration time
	Manual device configuration, inconsistent policies across network domains, decentralized management	End-to-end automation with Cisco DNA Center, consistent policy enforcement, unified network visibility	50%+ reduction in manual network operations, faster policy updates, enhanced network agility .
Operational Efficiency	Time-consuming onboarding, slow troubleshooting	Automated device onboarding, AI-driven network analytics for proactive issue resolution	40% faster service provisioning & incident resolution . AI-driven network analytics for proactive issue resolution partially used.
	Reactive troubleshooting with limited network visibility, high Mean Time to Resolve (MTTR), manual ticket handling	AI-driven analytics for predictive maintenance, automated ticket resolution, real-time network health insights	50%+ reduction in troubleshooting time, 70% improvement in network issue detection
User Experience	Inconsistent connectivity, high latency, service disruptions	Seamless, secure access with optimized bandwidth, improved QoS for critical apps	30%+ improvement in network uptime & performance.
Sustainability & Cost Savings	Higher power consumption, extensive cabling, high cooling costs	Reduced hardware footprint, lower cooling and energy consumption, optimized infrastructure	

Airport Systems

Digi Yatra & Self Check-in Kiosks

Kempegowda INTERNATIONAL AIRPORT BENGALURU

Concept:

DigiYatra, core concept, 'My Face is my ID – **seamless single token**'

Technology:

Biometric technology for paperless, Contactless and Digital travel experience at the Airport.

Central identity management system to facilitate DigiYatra enrolment, authentication, consented and limited profile sharing by passenger

Need not show tickets, boarding passes or physical Identity cards at various check points at the Airport

Kerb to Boarding gate journey with automated passenger validation across various touch points through "Biometric Framework"

Reduced queue waiting times, faster processing times, Contact-less, safer and simpler processes

DY App

Entry Gate

Self Bag Drop

Pre-Security

Boarding

Digiyatra

Biometric

Airport Systems

Next-generation endpoint visibility with Cisco AI End Point analytics powered by network driven deep packet inspection

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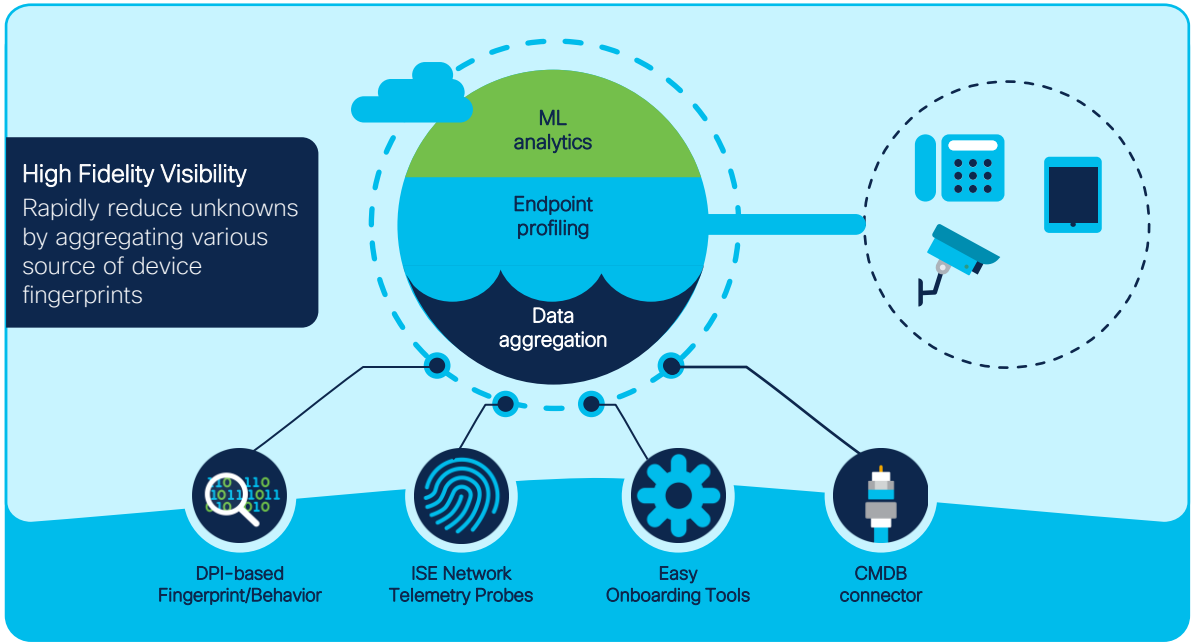
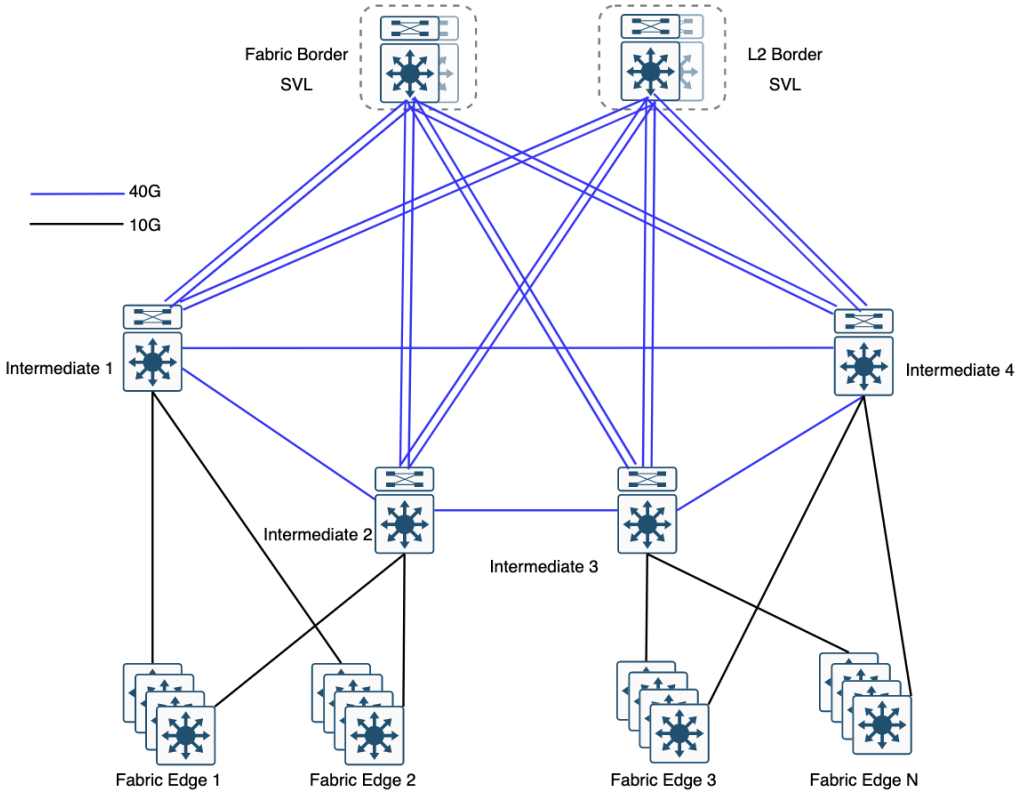


Using machine learning, DPI, and integrations, Cisco AI Endpoint Analytics provides **fine-grained endpoint identification** and labelling not previously possible.

L2 VNI Network for External Connectivity



Multicast for CCTV Network

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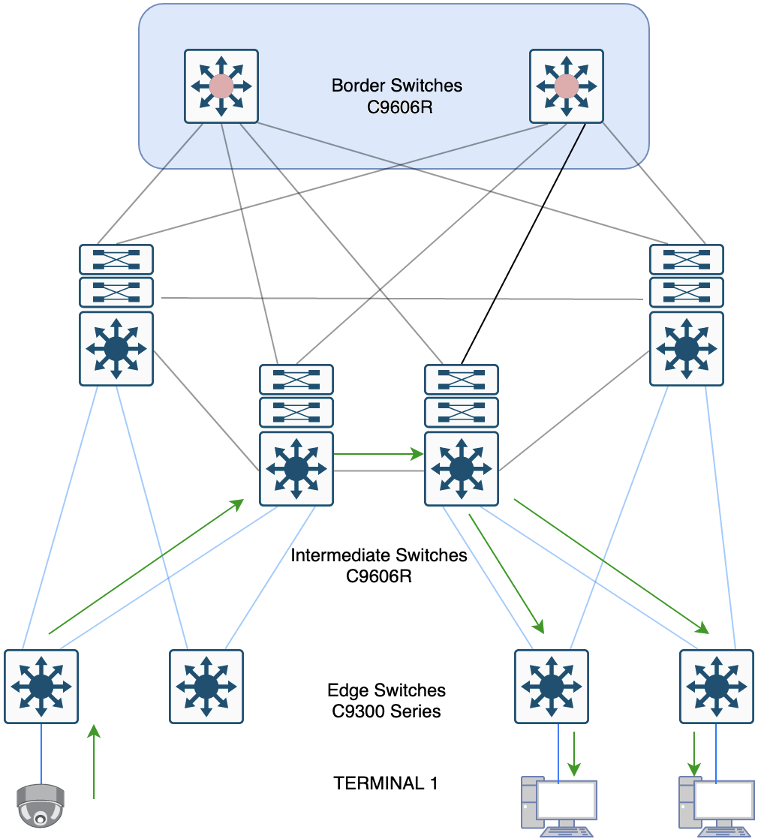

Cisco SD-Access @ Blum

Joshua Hornig
Network Administrator

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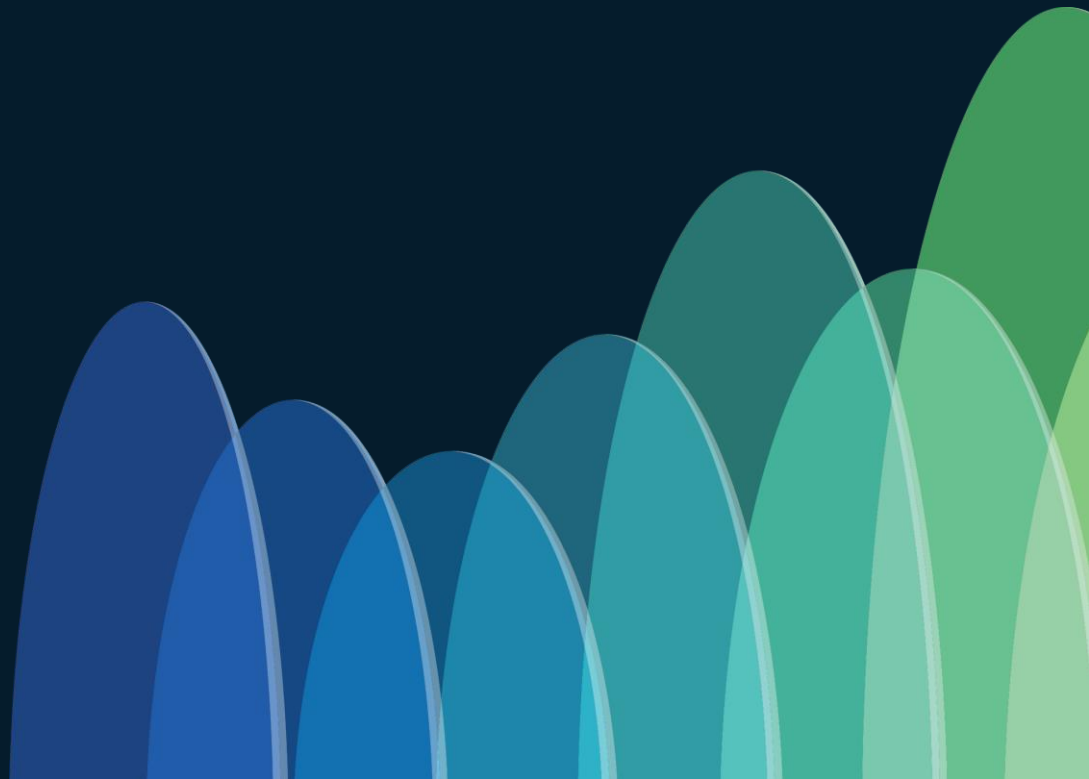
Agenda

- Who is Blum
- Our network before SD-Access
- SD-Access Project Overview
- Deploying SD-Access
- Conclusion

Who is Blum



Blum employees

9300

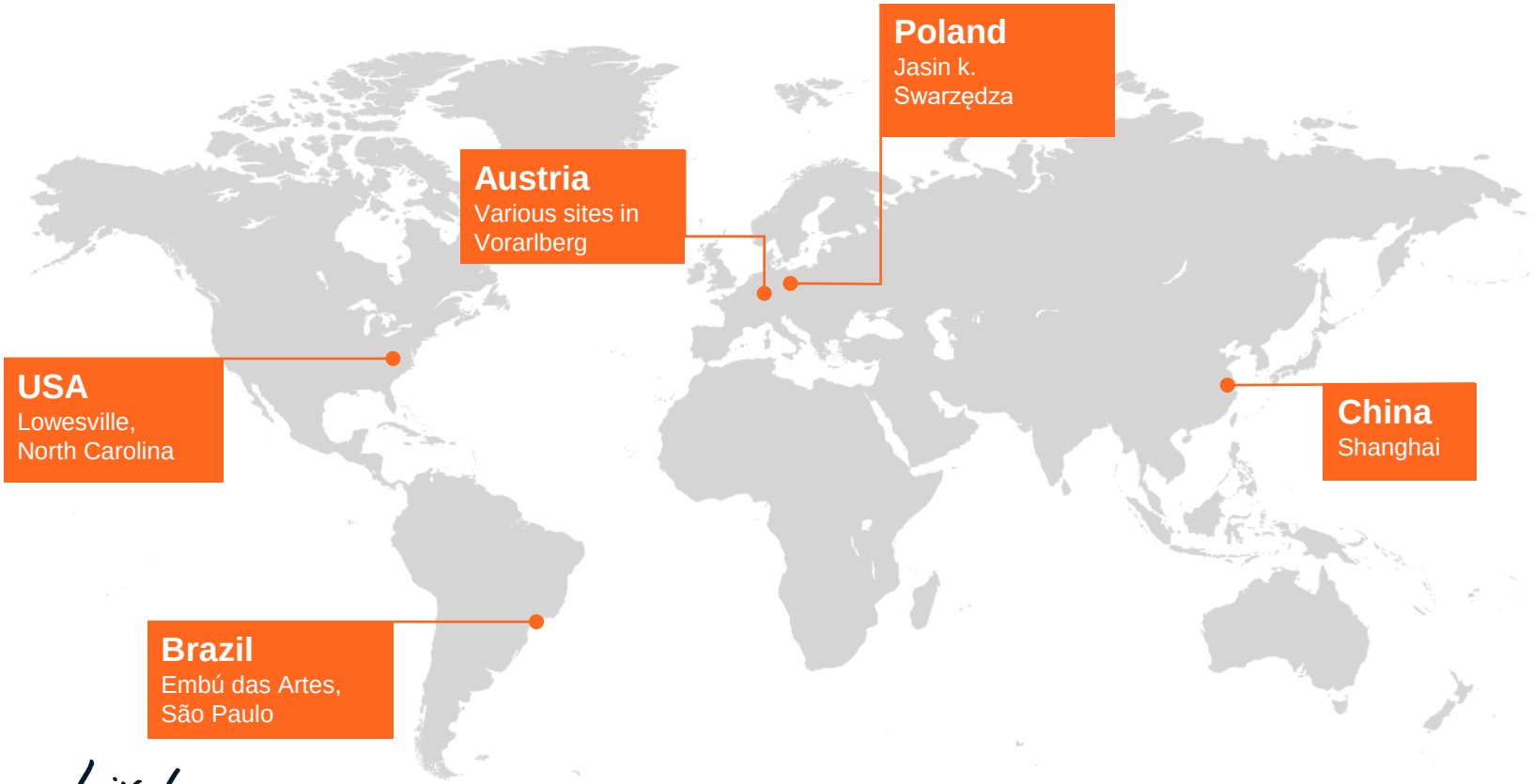
employees in the
Blum Group

6600

of these employees are based
in **Austria**

(As of 1 July 2024)

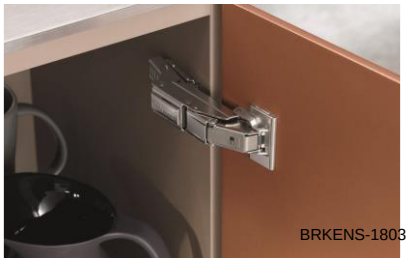
Our production sites



Hinges

For a wide range of applications

- Wood, glass and aluminium frame doors
- Thin or thick doors
- Special solutions such as blind corner and angled applications
- Hinges in onyx black



Lift systems

AVENTOS HKi

Exceptional design
is a given with the AVENTOS HKi
integrated lift system.

AVENTOS HF top

AVENTOS HS top

AVENTOS HL top

AVENTOS HK top

Be it for fronts that fold up, swing up and over, lift up or pivot up – enhanced ease of use is guaranteed.

AVENTOS HK-S

AVENTOS HK-XS

We have the right solution, even for the smallest of cabinets.

Box systems

LEGRABOX

Turn your inspiration
into a reality

MERIVOBOX

Let's create –
The box platform
for your ideas

TANDEMBOX

Efficient and simple

Plants in Austria

Plant 1
in Höchst

Plant 3
in Höchst

Plant 5
in Fussach

Plant 7
in Dornbirn

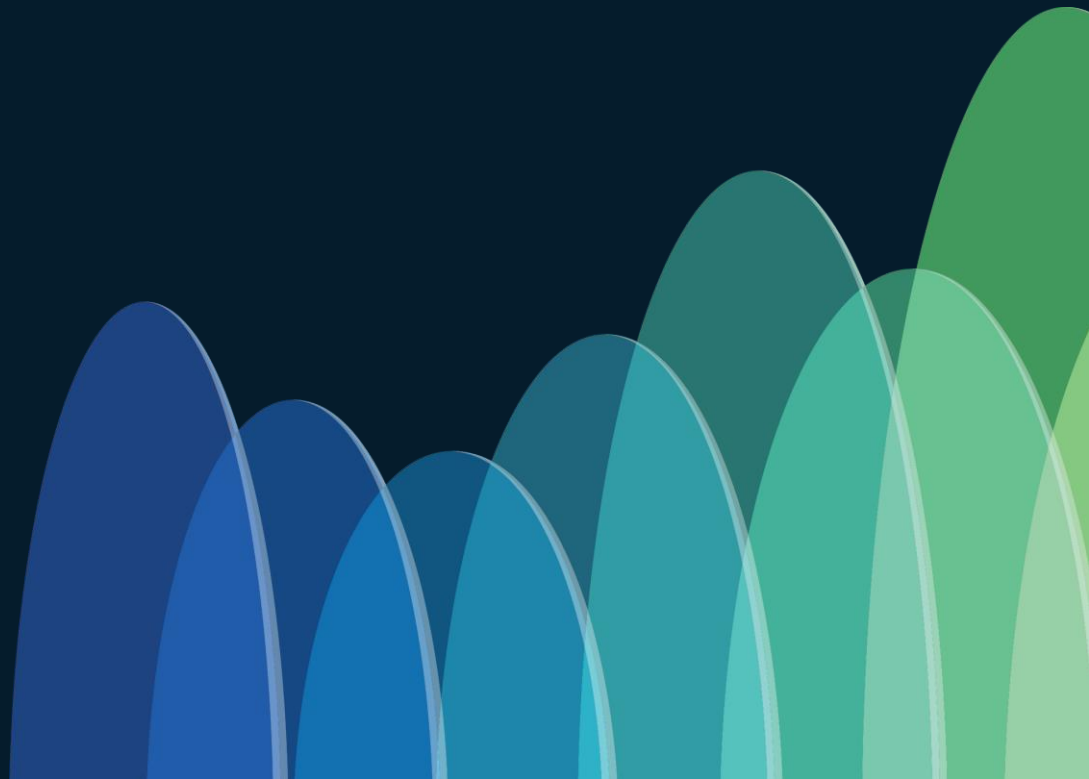
Plant 2
in Höchst

Plant 4
in Bregenz

Plant 6
in Gaissau

Plant 8
in Dornbirn

Our network before SD-Access



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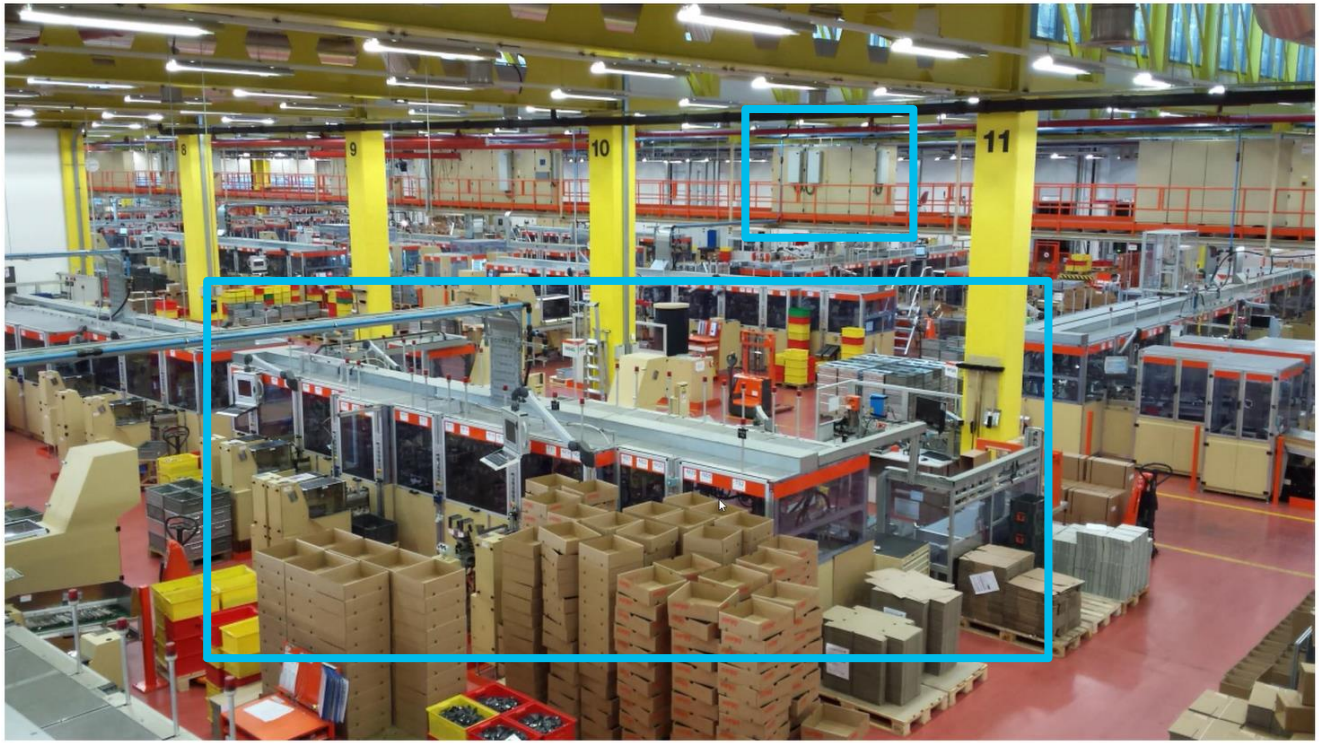
Our Environment

70+ Sites	432 Switches	1683 AP‘s
6 WLC	7 ISE Nodes	10,000 Managed MAC Addresses
16,500 Active Wired Clients	7,500 Active Wireless Clients	4 Network Engineers

Clients in the Network

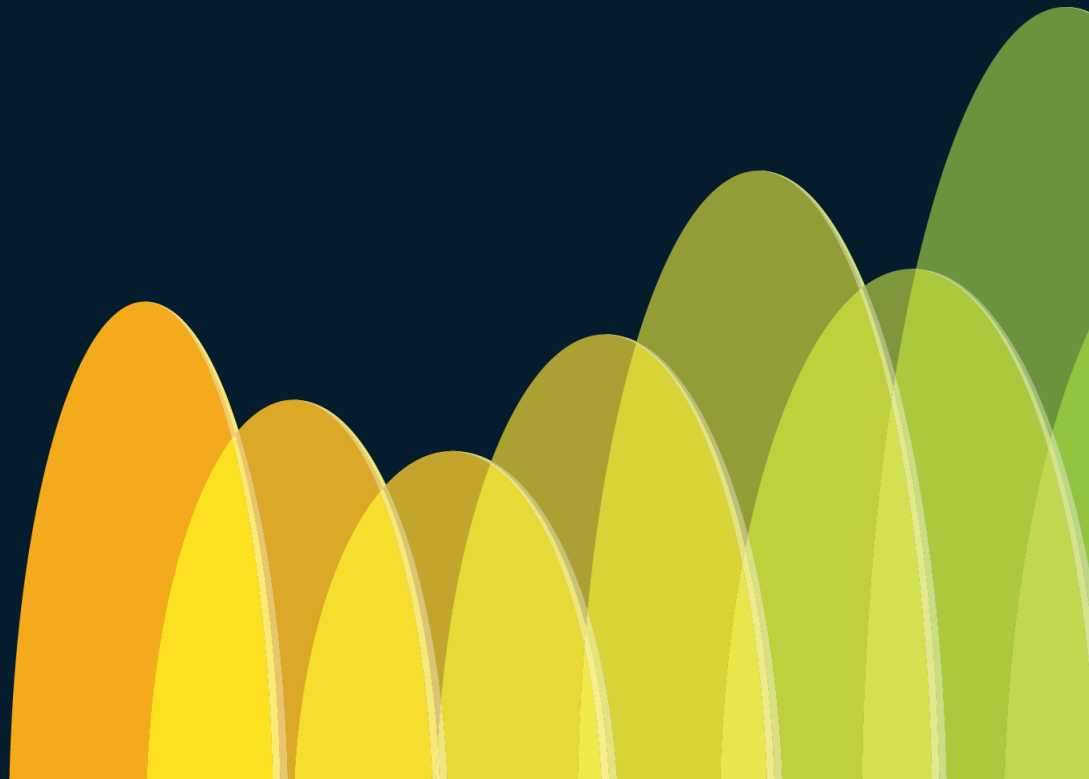
10,000 Windows Clients	1,000 Zero Clients	650 Production Machines
6,000 Industrial Clients	850 Warehouse Clients	80 Machine Movements per Year
MAB/dot1x	11 Firewall Clusters	850 Networks

Clients in the Network – Machines



Clients in the Network – Machines

SD-Access Project Overview



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Review: 802.1x/MAB Project

Enabled ~ 25000 Ports with Open Authentication

2 Months of collecting data from:

- ISE Endpoints (Profiler enabled)
- Nedi (Open Source Network Inventory)
- Catalyst Center
- Hard and Software Management

Review: 802.1x/MAB Project

1 Excel with all the Data

Grouped Clients

Find a Responsible Person for the Group of Devices

Details in an easy-to-use GUI that uses API of ISE

Recreate Excel

If all clients are managed or no information is found change to closed mode

Why SD-Access

Simplify Operation

- Mobility of Machines
- Simple onboarding
- Safe stretching of Prefixes across all plants

Automation

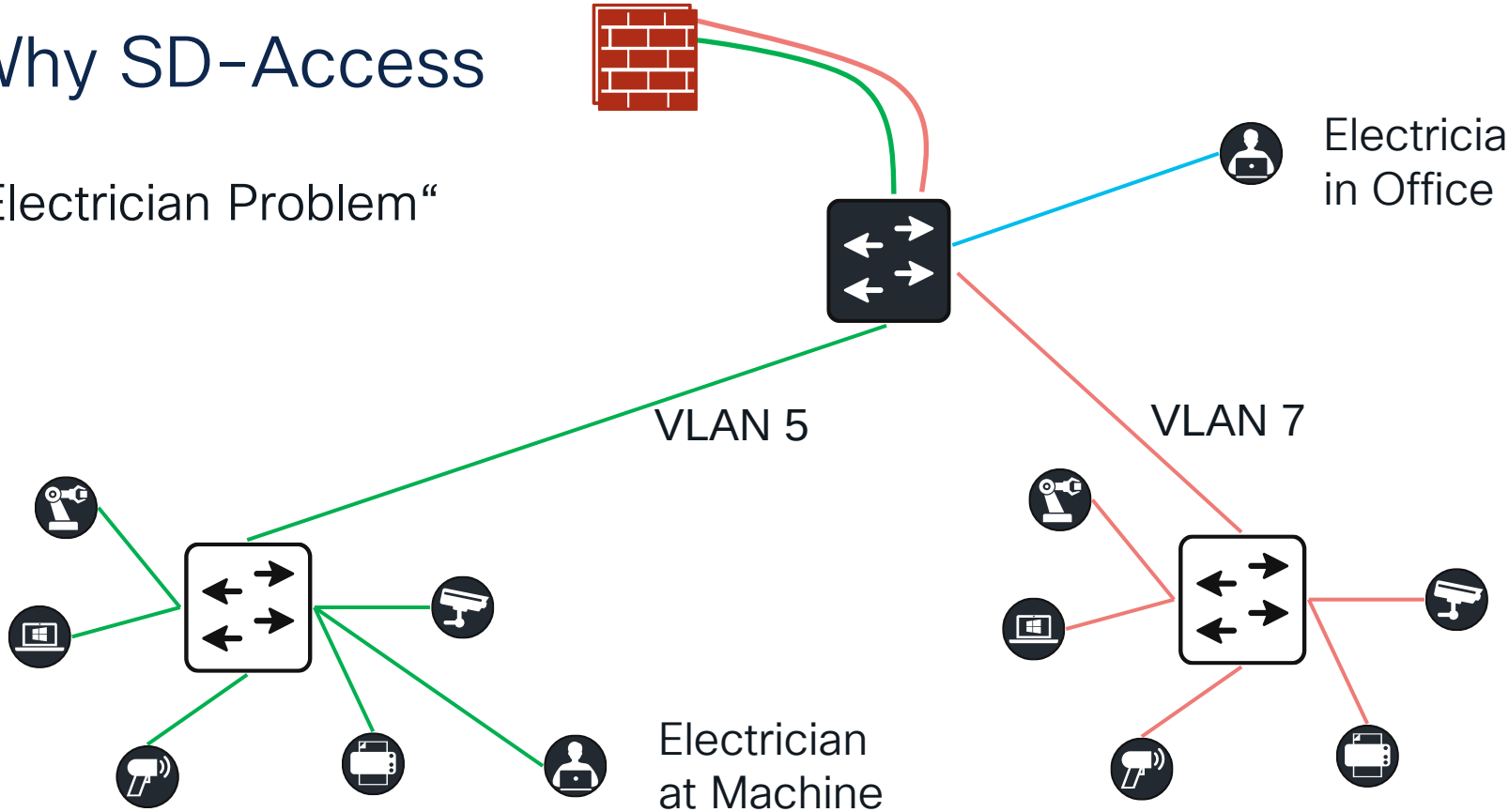
- Automating VLAN's is very hard
- With SD-Access full automation via IPAM/DCIM

Segmentation

- Easy Introduction of VRF‘s
- Plattform for Microsegmentation
- Solve the „Electrician Problem“

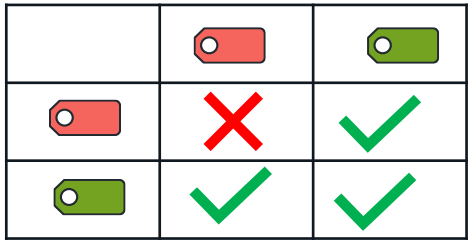
Why SD-Access

„Electrician Problem“



Why SD-Access

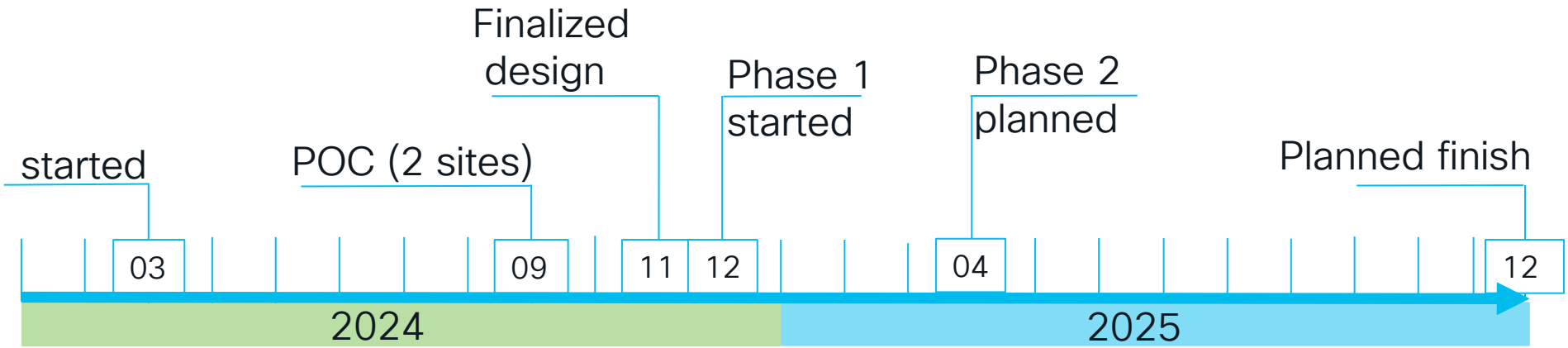
- „Electrician Problem“



SD-Access Project

This is my Second SD-Access Project

Idea started when I moved to Blum



SD-Access Project

Discussions and Design together with Peter Fuchs (Cisco) and Evelyn Riha (NTS, Cisco Partner)

5 Days Workshop onsite

Status Update calls Every 2 Weeks

Active Webex space between all parties for quick questions

Implementation done by Blum Network Team

SD-Access Project

- 7 Plants in SD-Access 3 Sites in SD-Access
- 160 Anycast Gateways
- 553 L2VN‘s
- 23 Fabric Devices

80 % Finished of Phase 1

Migrating to SD-Access

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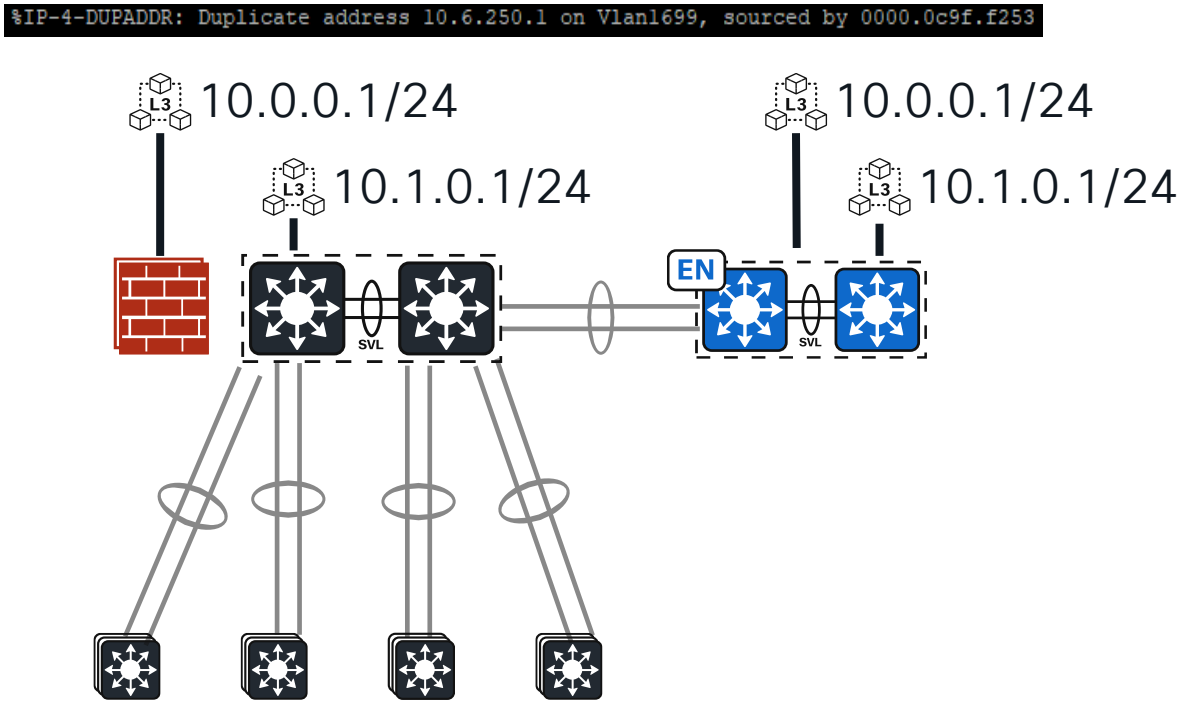
SD-Access Project

Phase 1



Downtime 4-6 Seconds, depends on client (ARP cache)

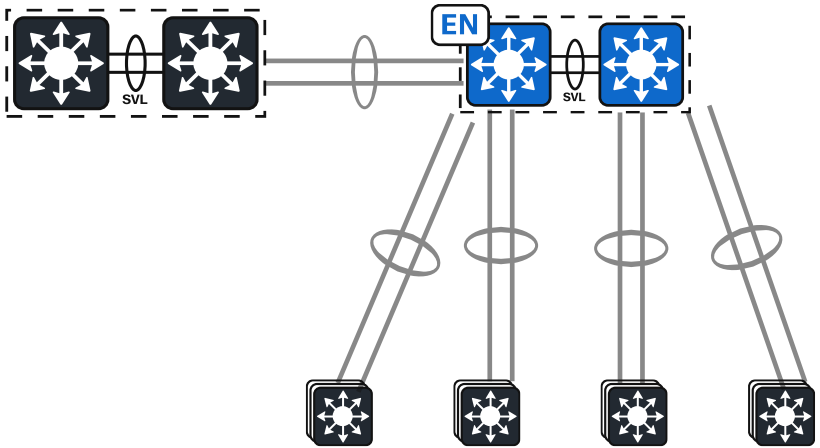
Faster is Possible

Done without Maintenance Window for 95%

Automated Warehouses With Maintenance Window

SD-Access Project

Phase 1



Relocate Portchannels to Edge Node

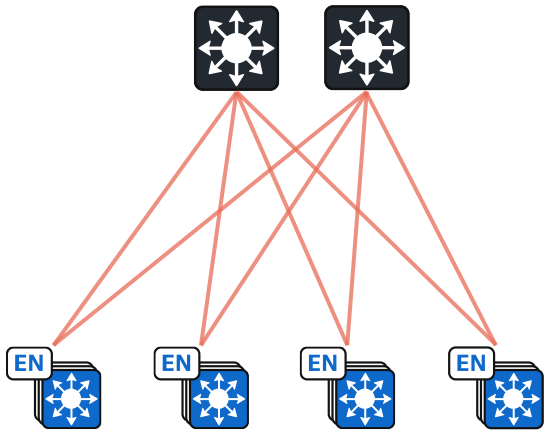
Reconnect half of the Ports

Shutdown second half

Reconnect interface will come up ~ 1 sec.

SD-Access Project

Phase 2 - Future



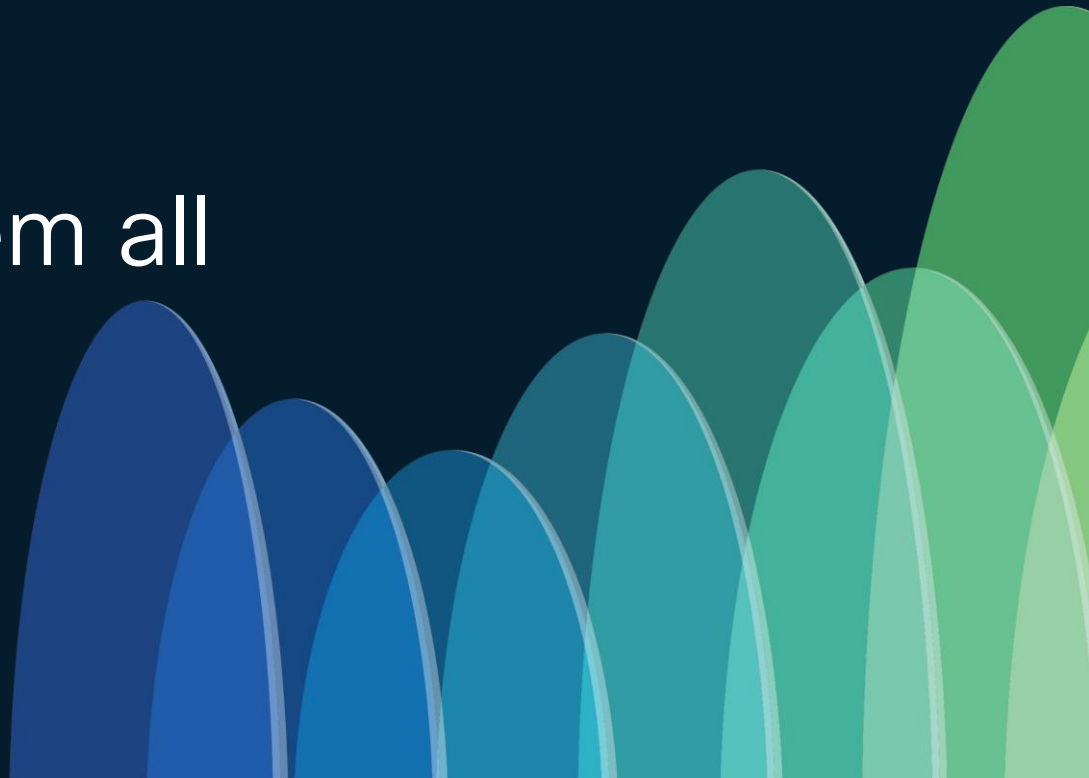
Factory Default Accessswitches

LAN Automate and onboard as Edge Node

Remove Edge Node Role from Distribution Layer

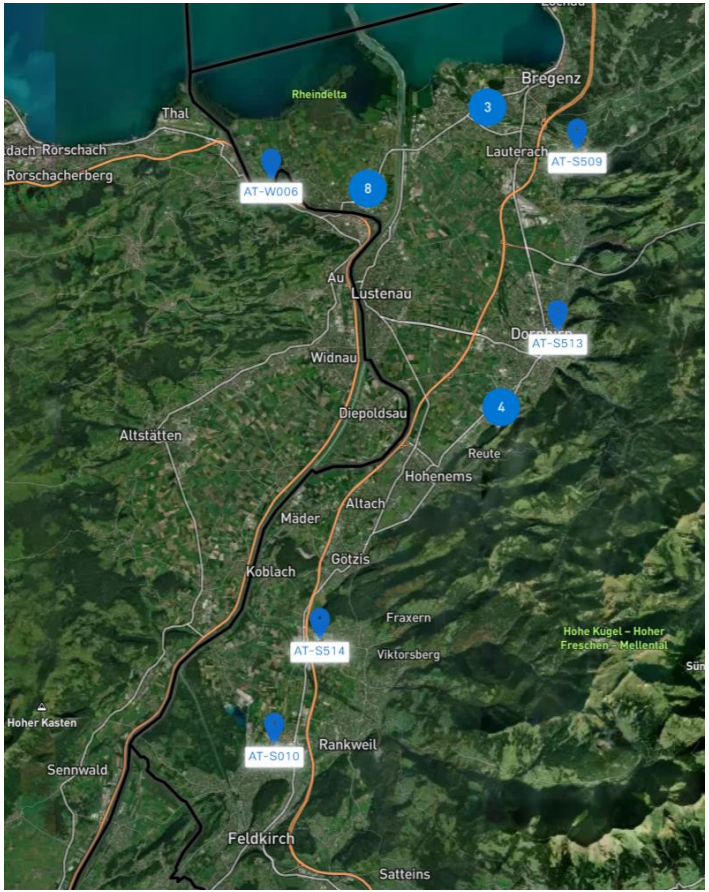
Split Stackwise Virtual

1 Site to rule them all

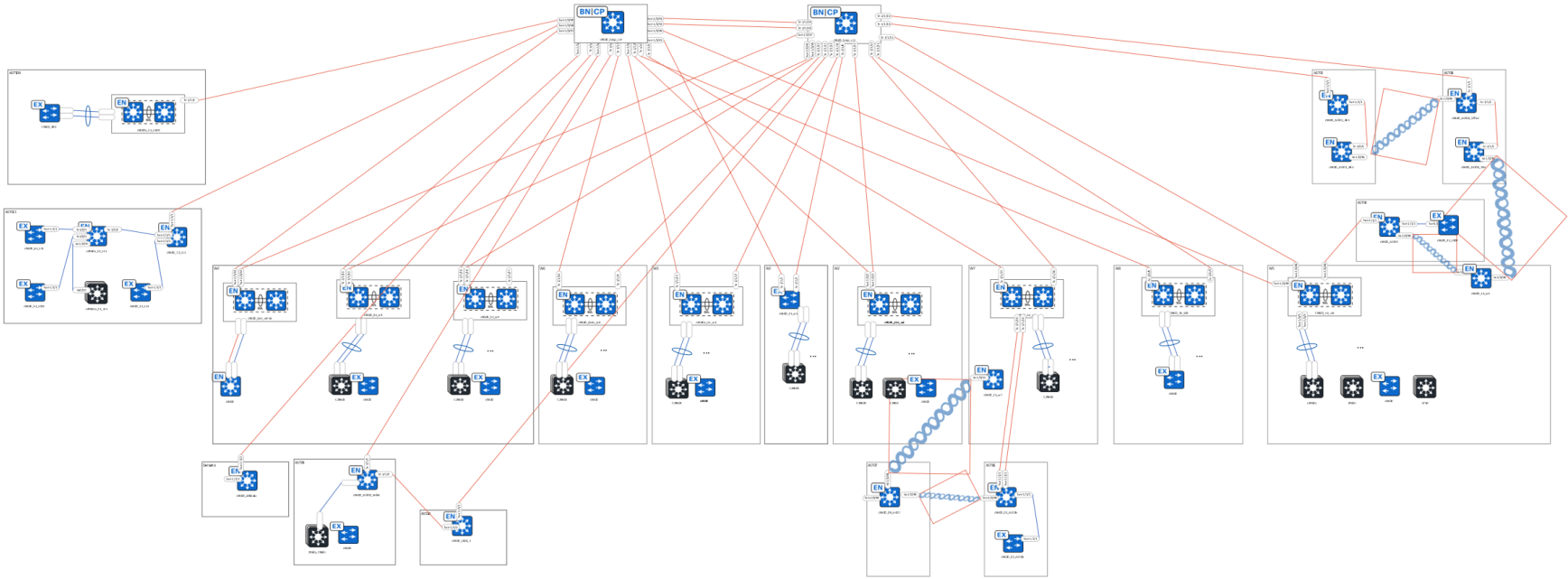


Multiple Physical Locations in Single SD-Access Site

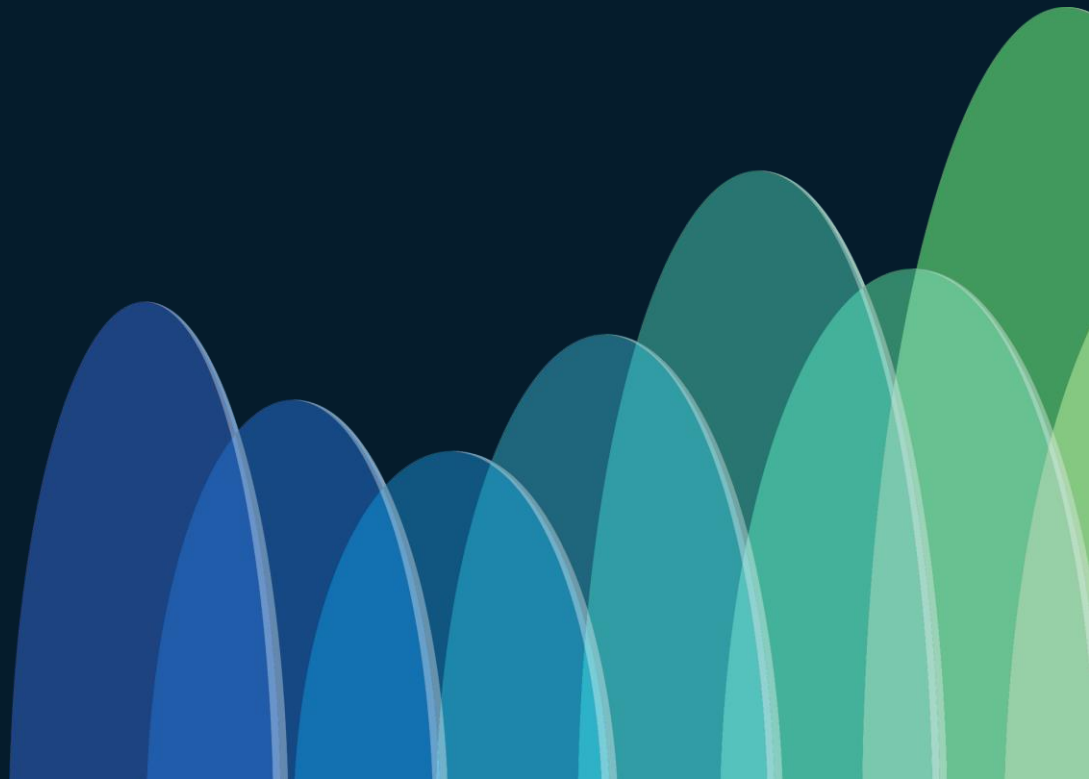
- 10 Bigger Production Plants
- 10 Smaller Sites
- All redundant connected via Darkfiber+DWDM and directional Radio
- Distances of 25km inside of the Fabric



Multiple Physical Locations in Single SD-Access Site



Automation



Our Base

Netbox is used as documentation

Started to use its webhooks for automation via Microsoft System Center Orchestrator

Using custom Powershell scripts and modules

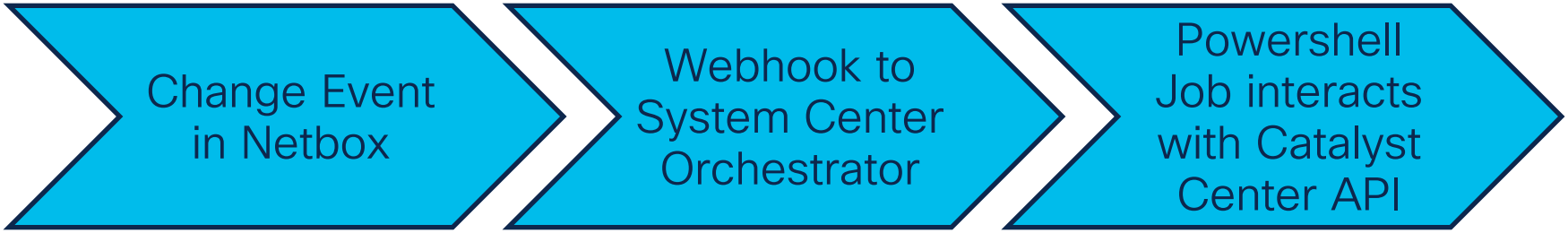
Automation: past, presence, ...

- DHCP Reservations
- Static DNS
- DHCP Scopes (Firewall and Windows Server)
- Firewall Objects, Interfaces, Groups
- Switch SVI Config
- Switch OSPF announcements
- Switch Access Interface

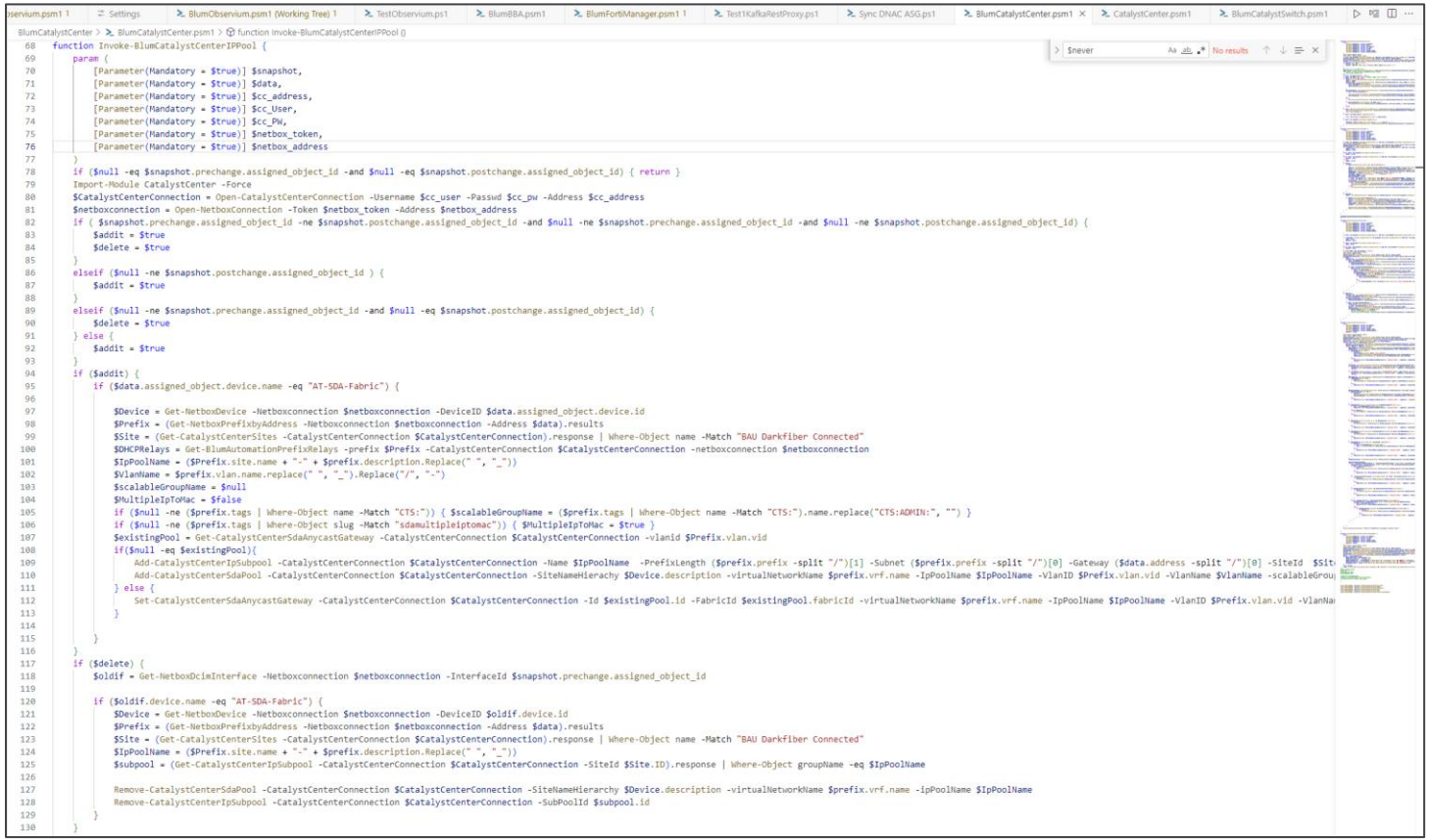
- Handover including Fusion Devices
- Underlay
- SD-Access Anycast Gateway
- SD-Access L2VN
- Portchannel towards Access Switches

Automation

Example of IP Address

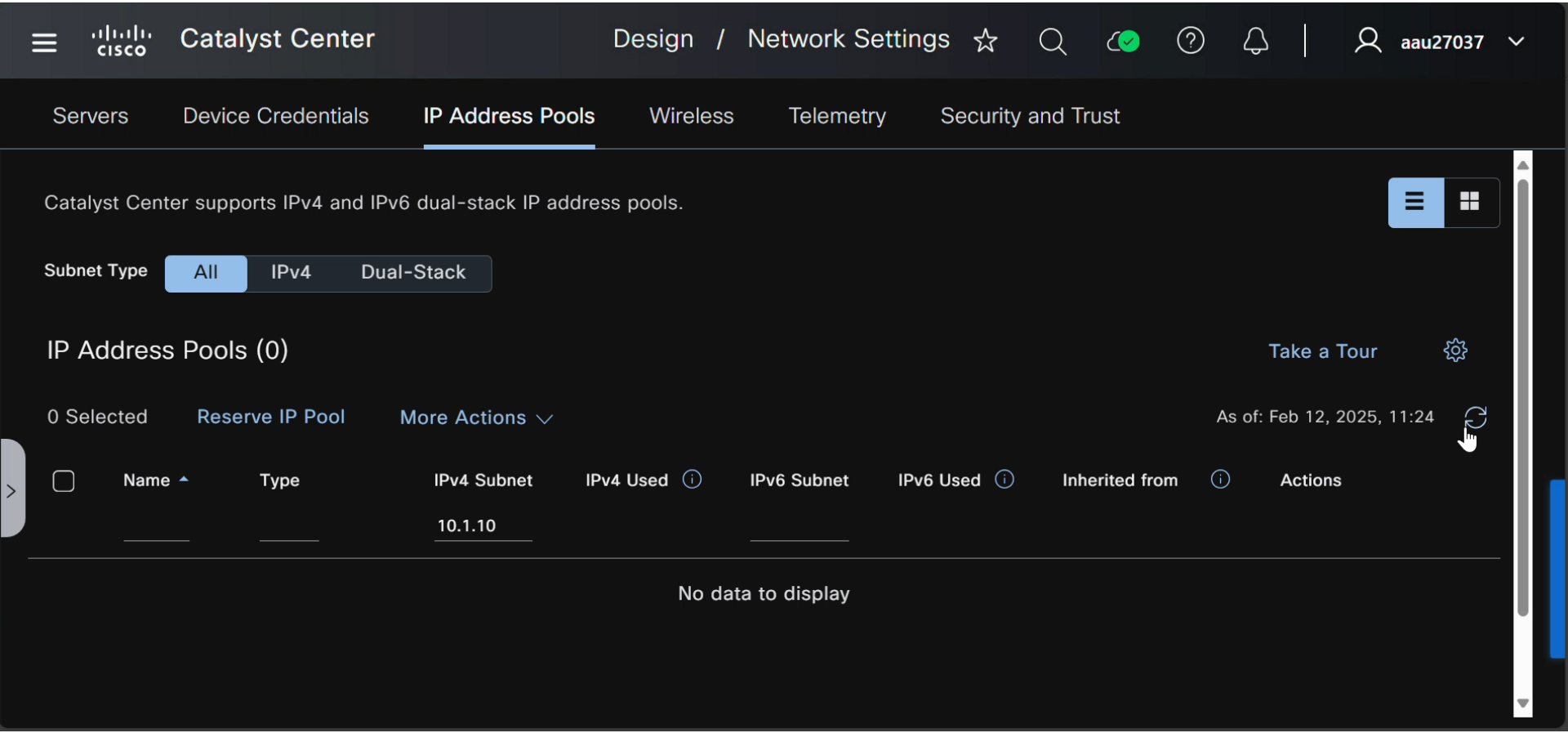


Powershell Snippet



```powershell
function Invoke-BlumCatalystCenterIPPool {
    param (
        [Parameter(Mandatory = $true)] $snapshot,
        [Parameter(Mandatory = $true)] $data,
        [Parameter(Mandatory = $true)] $cc_address,
        [Parameter(Mandatory = $true)] $cc_User,
        [Parameter(Mandatory = $true)] $cc_Pw,
        [Parameter(Mandatory = $true)] $netbox_token,
        [Parameter(Mandatory = $true)] $netbox_address
    )
    if ($null -eq $snapshot.prechange.assigned_object_id -and $null -eq $snapshot.postchange.assigned_object_id) { return }
    Import-Module CatalystCenter -Force
    $CatalystCenterConnection = Open-CatalystCenterConnection -Username $cc_user -Passwd $cc_pw -Address $cc_address
    $netboxconnection = Open-NetboxConnection -Token $netbox_token -Address $netbox_address
    if ( $snapshot.prechange.assigned_object_id -ne $snapshot.postchange.assigned_object_id -and $null -ne $snapshot.prechange.assigned_object_id -and $null -ne $snapshot.postchange.assigned_object_id) {
        $addit = $true
        $delete = $true
    }
    elseif ($null -ne $snapshot.postchange.assigned_object_id ) {
        $addit = $true
    }
    elseif ($null -ne $snapshot.prechange.assigned_object_id -and $null -eq $snapshot.postchange.assigned_object_id) {
        $delete = $true
    } else {
        $addit = $true
    }
    if ($addit) {
        if ($data.assigned_object.device.name -eq "AT-SDA-Fabric") {

            $Device = Get-NetboxDevice -Netboxconnection $netboxconnection -DeviceID $data.assigned_object.device.id
            $Prefix = (Get-NetboxPrefixbyAddress -Netboxconnection $netboxconnection -Address $data).results
            $Site = (Get-CatalystCenterSites -CatalystCenterConnection $CatalystCenterConnection).response | Where-Object name -Match "BAU Darkfiber Connected"
            $DHCPRelays = Get-BlumAutomationPrefixRelays -prefix $Prefix -CatalystCenterConnection $CatalystCenterConnection -netboxconnection $netboxconnection
            $IpPoolName = ($Prefix.site.name + "-" + $Prefix.description.Replace(" ", "_"))
            $VlanName = $prefix.vlan.name.replace(" ", "_").Replace("/", "-")
            $scalableGroupName = $null
            $MultipleIpToMac = $false
            if ($null -ne ($prefix.tags | Where-Object name -Match "CTS:")) { $scalableGroupName = ($prefix.tags | Where-Object name -Match "CTS:").name.replace("CTS:ADMIN:", "") }
            if ($null -ne ($prefix.tags | Where-Object slug -Match "sdamultipleiptomac")) { $MultipleIpToMac = $true }
            $existingPool = Get-CatalystCenterSdaAnycastGateway -CatalystCenterConnection $CatalystCenterConnection -vlanid $Prefix.vlan.vid
            if($null -eq $existingPool){
                Add-CatalystCenterIpSubpool -CatalystCenterConnection $CatalystCenterConnection -Name $IpPoolName  -PrefixLength ($prefix.prefix -split "/")[1] -Subnet ($prefix.prefix -split "/")[0] -Gateway ($data.address -split "/")[0] -SiteId  $Site
                Add-CatalystCenterSdaPool -CatalystCenterConnection $CatalystCenterConnection -SiteNameHierachy $Device.description -virtualNetworkName $prefix.vrf.name -IpPoolName $IpPoolName -VlanID $Prefix.vlan.vid -VlanName $VlanName -scalableGrou
            } else {
                Set-CatalystCenterSdaAnycastGateway -CatalystCenterConnection $CatalystCenterConnection -Id $existingPool.Id -FabricId $existingPool.fabricId -virtualNetworkName $prefix.vrf.name -IpPoolName $IpPoolName -VlanID $Prefix.vlan.vid -VlanNa
                }

        }
    }
    if ($delete) {
        $oldif = Get-NetboxDcimInterface -Netboxconnection $netboxconnection -InterfaceId $snapshot.prechange.assigned_object_id

        if ($oldif.device.name -eq "AT-SDA-Fabric") {
            $Device = Get-NetboxDevice -Netboxconnection $netboxconnection -DeviceID $oldif.device.id
            $Prefix = (Get-NetboxPrefixbyAddress -Netboxconnection $netboxconnection -Address $data).results
            $Site = (Get-CatalystCenterSites -CatalystCenterConnection $CatalystCenterConnection).response | Where-Object name -Match "BAU Darkfiber Connected"
            $IpPoolName = ($Prefix.site.name + "-" + $prefix.description.Replace(" ", "_"))
            $subpool = (Get-CatalystCenterIpSubpool -CatalystCenterConnection $CatalystCenterConnection -SiteId $Site.ID).response | Where-Object groupName -eq $IpPoolName

            Remove-CatalystCenterSdaPool -CatalystCenterConnection $CatalystCenterConnection -SiteNameHierachy $Device.description -virtualNetworkName $prefix.vrf.name -IpPoolName $IpPoolName
            Remove-CatalystCenterIpSubpool -CatalystCenterConnection $CatalystCenterConnection -SubPoolId $subpool.id
        }
    }
```

Automation



Conclusion

Challenges

- Identify if SD-Access is a suitable Solution
- Adapt Machine Network Design to SD-Access
- Migration without Maintenance Windows

Success Factors

- Collaboration between NTS (Cisco Partner), Cisco and Blum
- Collaboration between Blum IT and Industrial IT

SD-Access network design challenges

Not all Machines are in a /24 -> ongoing Project	One /13 for all machines will be created in parallel
SD-Access supports only 1000 IP Pools	Cisco extends IP-Pool amount to 1500 in a future release
~1500 Machines statically configured	Clients will be migrated to DHCP
Mobility to China, Poland and US without changing IP's is still required	When moving to different country a /24 mask will be provided

Journey with Cisco SD-Access

Ricardo Pinheiro, Infrastructure Manager

IKEA Industry

To create a better everyday life for the many people

As an IKEA in-house manufacturing business, we create competitive advantages that move and challenge the total IKEA value chain.

Sawmills, boards, furniture components and furniture production

~15,000 co-workers
30 production units,
in 7 countries

>100 M pcs. produced/year

Business oriented

- **Security**
- **Scalability**
- **Reduced OPEX**
- **Reduced time to production**

Micro segmentation
With SD-Access we were able to fulfill the security requirement of hundreds of production segments per unit.

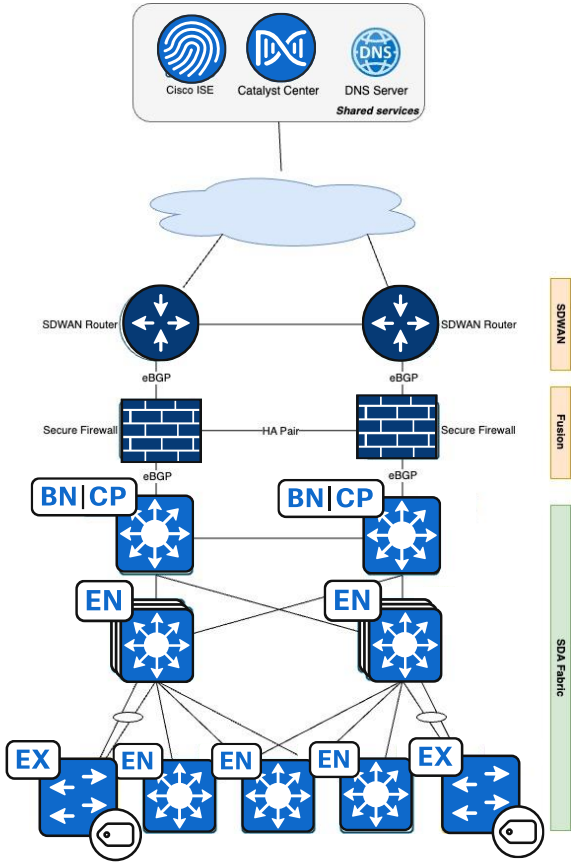
No *subnetting* needed
It can be become very hard to manage/predict subnet sizes. With Security Group Tags this issue is solved.

Self service
SGTs allow the easy automation and makes network management widely available in the organization, eg. Maintenance Technician.

Simplified connection
Maintenance technician is fully sufficient to commission any new devices and/or production lines. No need to involve any network personal.

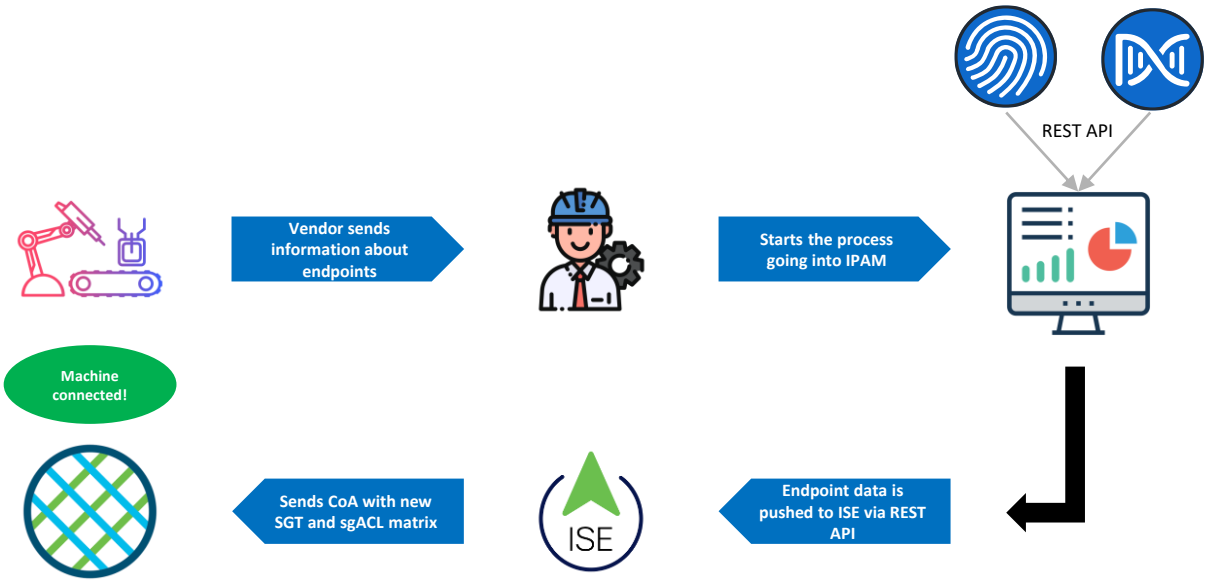
High level design

- Traditional SD-Access Fabric with Catalyst 9K hardware:
  - 9500 as Border and Control Plane
  - 9300 as Edge
  - IE3400 as Policy Extended Nodes
- eBGP towards different vendor SDWAN solution
- Cisco Secure Firewall HA pair as fusion router
- Intermediate nodes (distribution) with Edge role
- Cisco IE 3400 for the OT Cells as Policy Extended Nodes
- Local workloads running also with eBGP for low latency access for OT systems



Real use case

OT engineer receives task to connect new production line in shopfloor:



No network technician involvement!

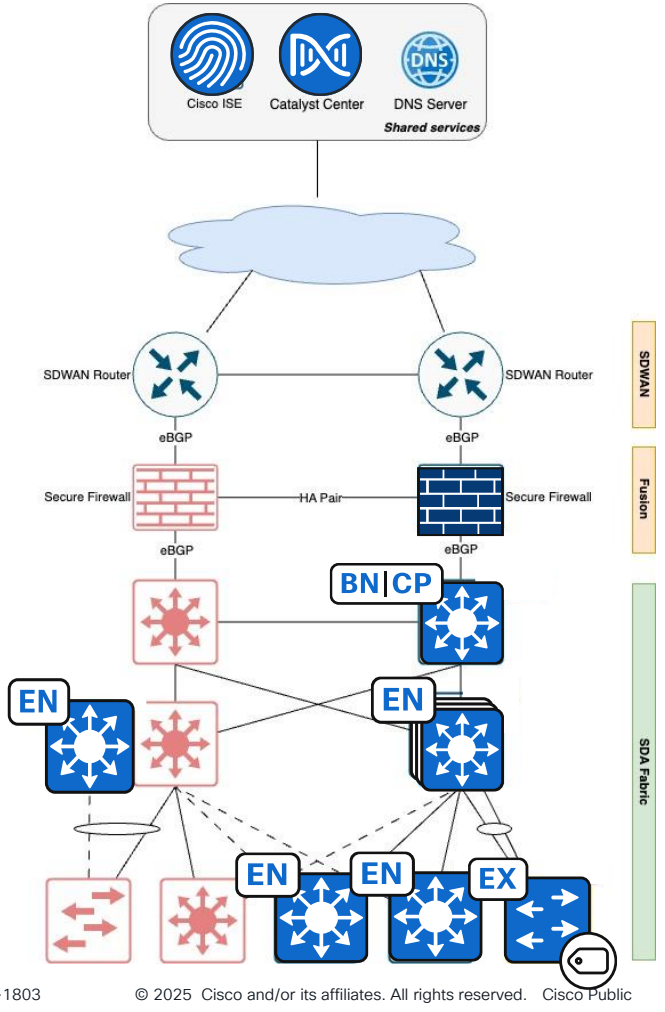
The same process is possible on a replacement as well.

Brownfield implementation

- **Step 1 – Preparation**
  - Underlay IP information prepared
  - All IP space added in CatC
  - All SVIs were migrated from Core to FW
  - Confirmation that whole devices are supported SKUs, in our case - 9300, 9500 and IE3400 (PEN)
- **Step 2 – Split brain the core**
  - Core 2 and DIS SVL secondary switch were erased
  - All devices added to CatC
  - Fabric was built assigning proper roles
  - All legacy VLANs were created as L2VNs and added to L2 Handoff

At this moment, the fabric is up and running and all the devices continue to operate since all access layer is still connected to active "legacy" network.

- **Step 3 – Flap traffic to fabric side**
  - An empty Edge switch was brought up and connected to the fabric to validate everything is operational
  - At this moment we flapped all interfaces between DIS SVL Stack members to move the traffic from non Fabric DIS to Fabric DIS.
- **Step 4 – Convert the whole core layer to SD-Access fabric**
  - Core 1 and other DIS Stack were converted to SD-Access devices with proper roles
  - All access layer is now connected over SD-Access fabric as L2 switches with
- **Step 5 – Convert Access switches to Edges**
  - All access switches were converted according to agreed maintenance windows and production lunch breaks
  - All these Edges still run a mix of L2VNs from the legacy network, and some endpoints already in Anycast Gateways



Journey and future

Feb 2023	*Oct 2023*	*Jun 2024*	*2025+*	
Cisco CPoC	**PoC**	**First Production site**	**Rollout**	**Future**
• Business intent presentation • Requirements set • Sales and CX collaboration • Initial design agreed • Customer Proof-of-Concept Lab	• Dedicated hardware order • Discussion with internal OT teams • Replication of CPoC in manufacturing dev. Center in Poland • First SD-Access fabric in IKEA Industry	• Agree with Cisco CX on dates for on site migration • Design/plan all possible migration scenarios • Fully enabled SD-Access (all Edges converted) • First site running SD-Access for 6+ months	• Next two sites with priority due to business need are defined • Migration plans are being created for those two sites • Full IKEA Industry network running on Cisco SD-Access	• *Migrate from Wireless OTT to fabric enabled wireless* • *Common policy across domains (Cisco SSE, Cisco SDWAN)* • *Leverage the new segment type (SGTs) on many other tools*

IKEA Industry

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