Cox Automation HOPS (NSO & BPA)

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Cox Business Profile

Cox is a Media Company, Automotive Lifecycle Enterprise and is the third largest Cable Company. Residential/Business operator in the United States

- Revenue: ~$21 billion
- 60,000 Employees

Cox Communications

- Revenue: ~$11 billion (+4.4% Y/Y)
  - $2B in Cox Business
- Res/Bus Customers: >6 million
- ~10M homes passed / 3rd Largest US MSO
- Adjacent growth oppty deployed – Cox Home Security, Cox Tech Solutions

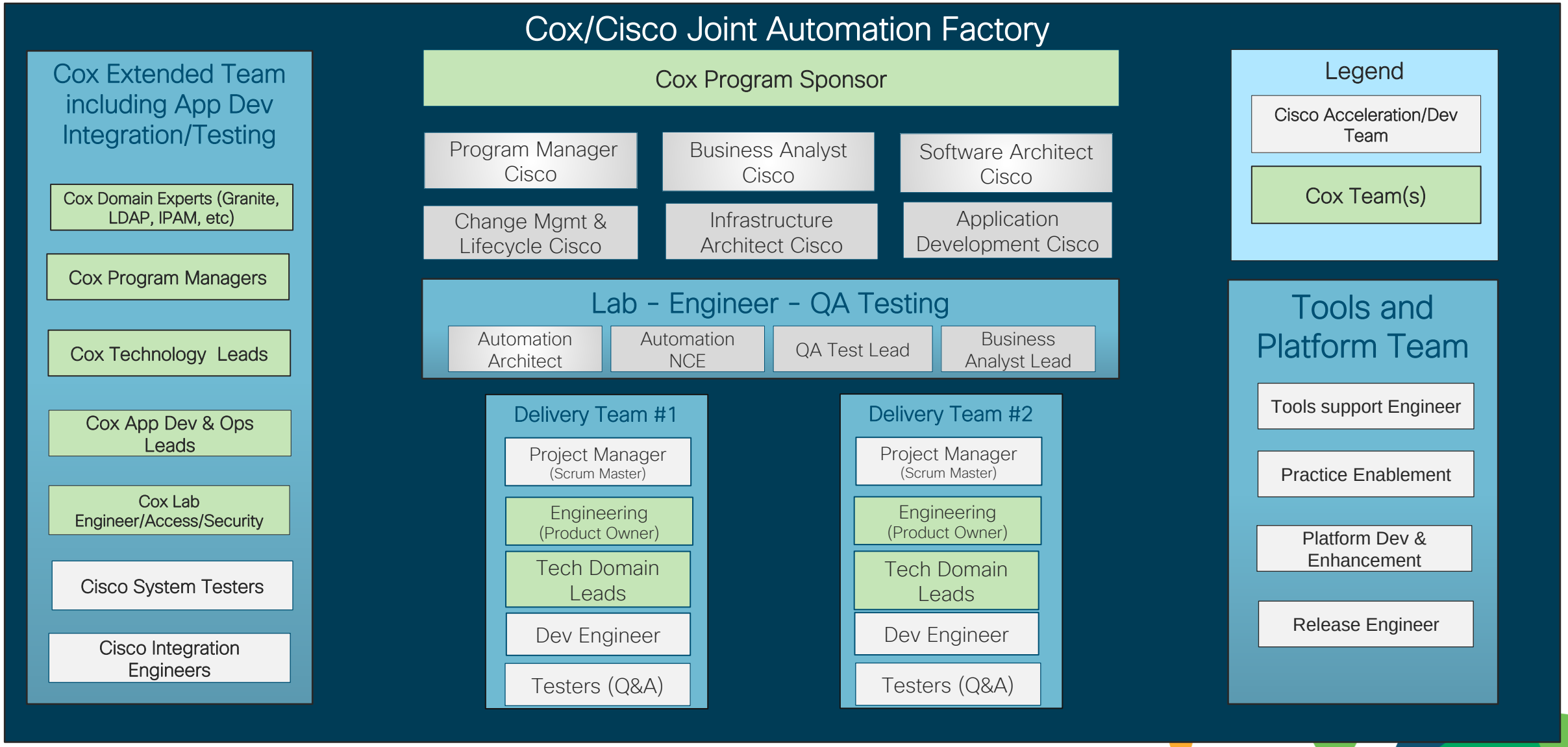
Cox Media Group

- Revenue: ~$2 billion
- Daily/Non-Daily Newspapers: 7/12+
- Television Markets: 14 stations/1 local cable
- Radio Markets: 59 stations
- 20+ Markets Reaching ~52M Weekly
  - 30M+ via TV
  - 3.5M+ Print/Online
  - 14M+ Radio

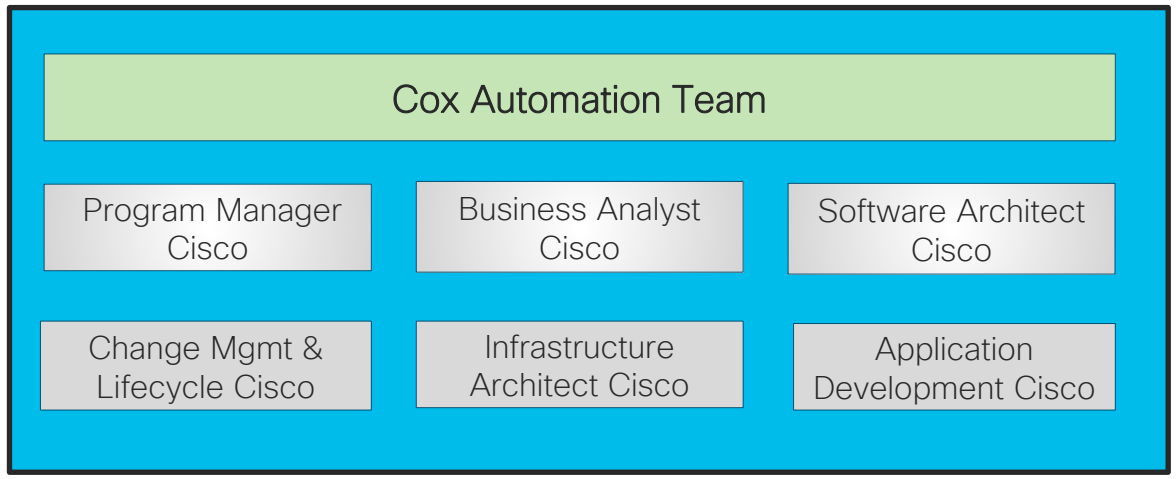
Cox Automotive

- Revenue: ~$8 billion
- Annual CAPEX: ~$1.2B
- $4 billion acquisition of DealerTrack in 2016
- Major Brands:
  - Autotrader
  - Kelley Blue Book
  - Manheim Auction
- >4.2M Avg Dailey Vehicle Listings
- 100+ million cars sold

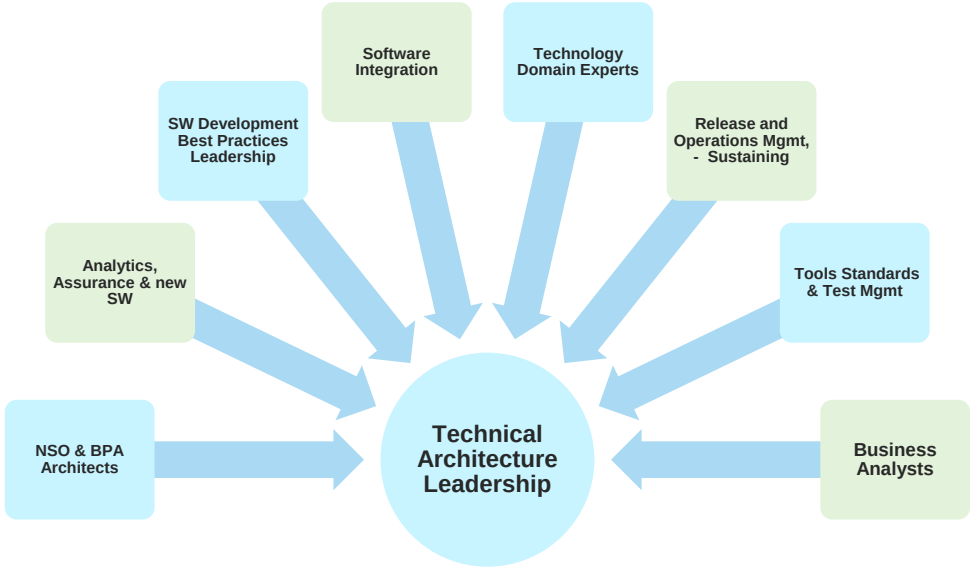
Cox Automation Dev/Factory Model



Cox Governance and Architecture teams



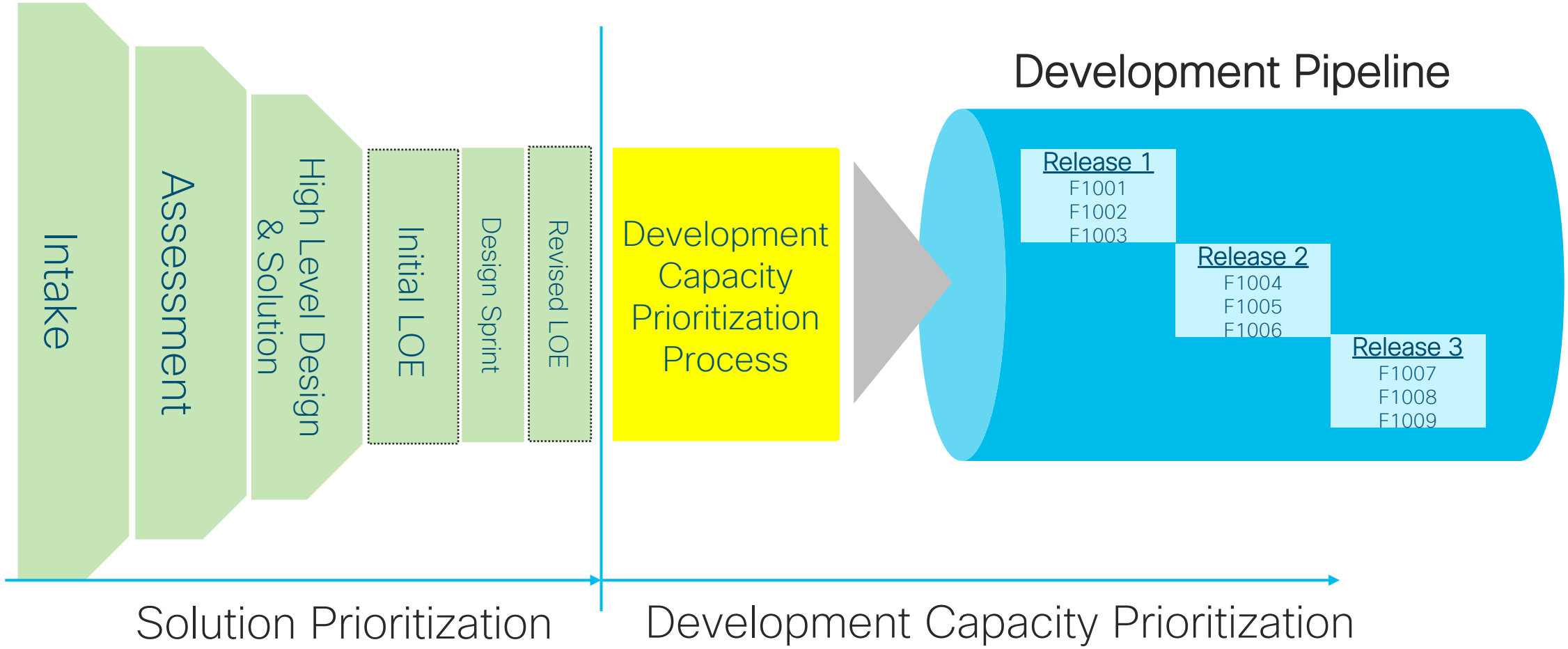
Technical Architecture & Design Experts



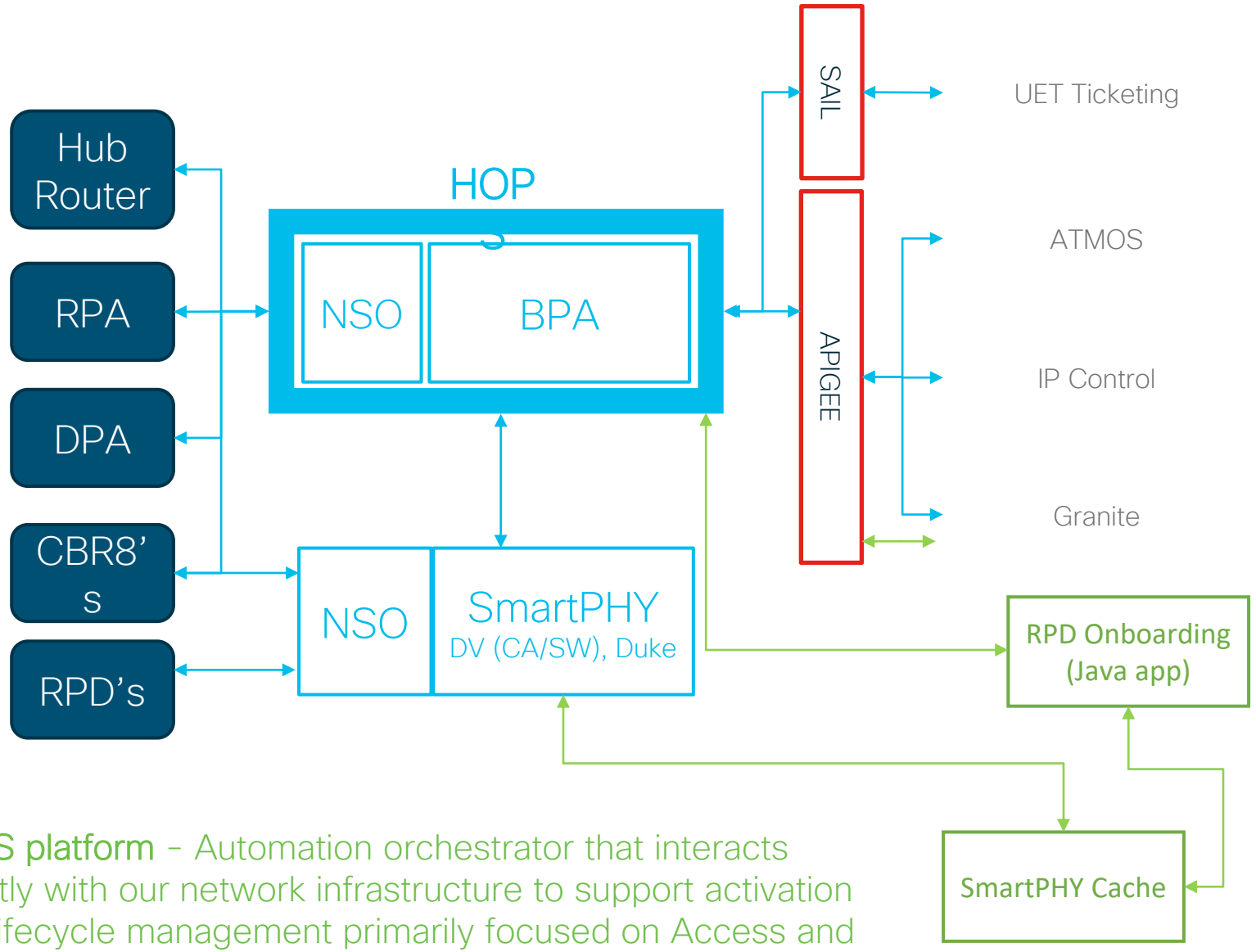
- Automation solution for delivery to Cox Business/Product/Technology owners
- Create simple, modular, scalable and repeatable architecture patterns and roadmaps – empowering Cox tech domains
- Deliver standardized Cox automation architecture
- Build an API resource domain container – Cisco has existing out of the box API's for Cisco platforms – both North and South bound
- Platform use cases, development all vendor agnostic

- Keep alignment of E2E vision across Cox Engineering and Ops teams and provide governance
- Capture requirements/user stories and conceptualize solution and create BPA work packages – microservices
- Standardize the tools and processes enforcing adoption
- Monitor and manage compute and application availability, capacity and utilization via Cisco managed services tools (NSO, BPA and SmartPhy)
- Communicate metrics and performance

Cox Automation Software Factory Methodology



HOPS Logical Architecture



HOPS platform – Automation orchestrator that interacts directly with our network infrastructure to support activation and lifecycle management primarily focused on Access and Metro

Processes

- ***BPA for Multiple SmartPHY*** *= A single BPA instance connects to multiple instances of SmartPhy in support of scaled launch*
- ***SmartPhy Cache*** = Solution developed to centralize SmartPhy data across the enterprise to serve 3rd Parties looking to access/read SmartPhy
- ***RPD Onboarding*** = Solution developed to synchronize and reconcile RPD data between SmartPhy and BPA
- ***Batch Staging*** = Feature of BPA that allows up to 25 RPD's to be staged via csv file
- ***RPD Swaps*** = Feature of BPA that will allow swapping of MAC addresses (RPD devices) for existing Node ID
- ***RPD Onboarding*** *= Solution to synchronize BPA with SmartPhy that will allow BPA full automation utilization by seeing all provisioned RPD's to date*
- ***SmartPhy Cache*** = Solution developed to centralize SmartPhy data across the enterprise to serve 3rd Party request

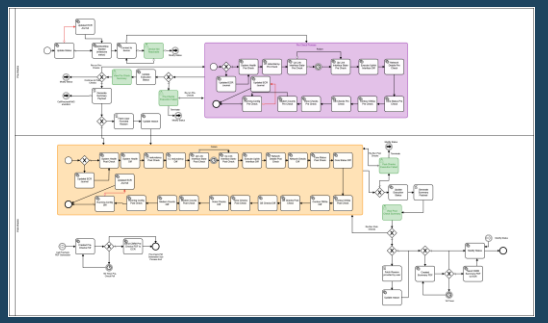
Features Delivered to Date

Apr 2020

Pre/Post

CBR8 & Hub Router

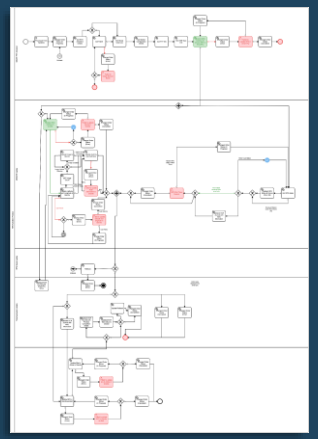
Standalone Pre/Post for Device Maintenance and OS Upgrade



Provisioning

RPD

Staging, Activation and Swapping of RPD's Integration with ATMOS Mobile App, Granite, and UET/ECR

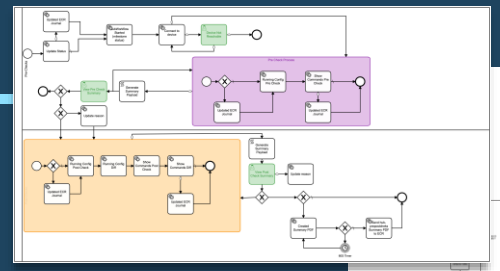


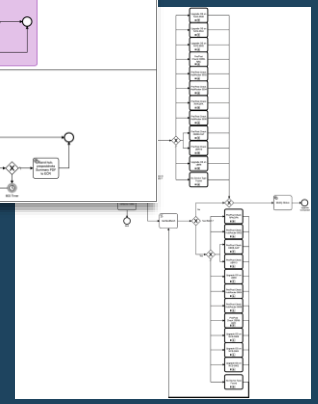
OS Upgrade

cBR8

NCS

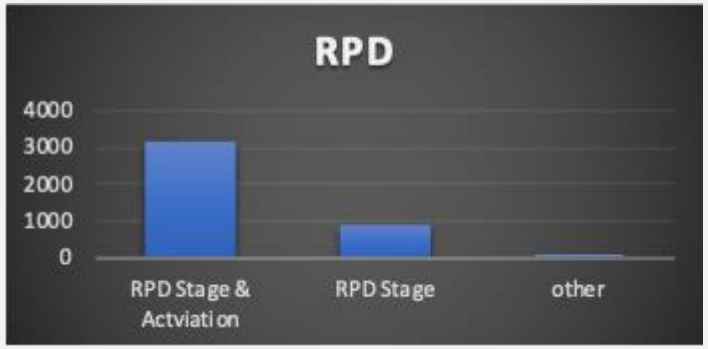
Analog CBR8 Hub Router with Deep Analytics





Deployment Metrics

Below are the current metrics of RPD stage and activations, Pre-Post executions and NCS/cBR8 Upgrades to date

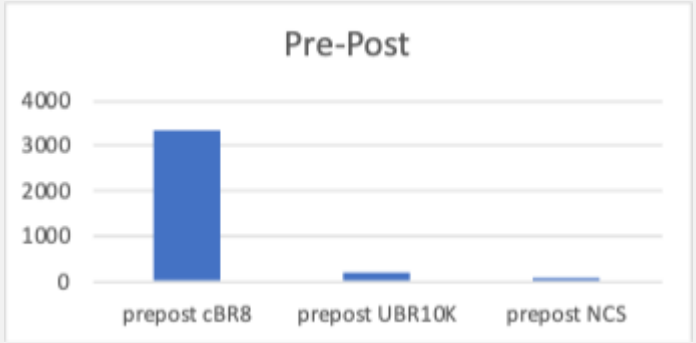


RPD Stage & Activation

3159

RPD Staged

899



cBR8 Pre/Post

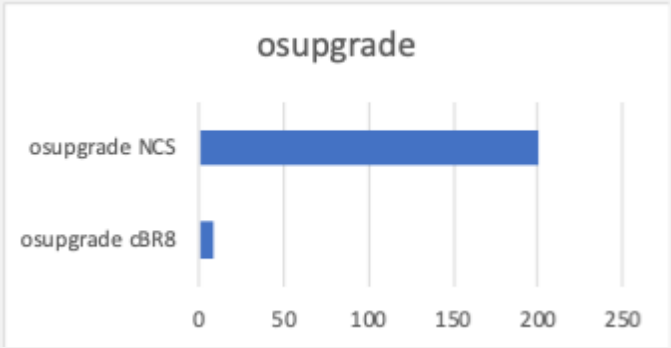
3338

UBR10K Pre/Post

212

NCS Pre/Post

2



OS Upgrade – cBR8

8

OS Upgrade – NCS

201

On the Horizon

2020

Vecima RPD Provisioning

RPD Mid-Split Config Automation

Beginning to deliver with Internal Team

DOCSIS Expansion

CBR8 OS Upgrade 16.10.1z

Node Segmentation (1x2/2x2/2x4)

Zero Touch Provisioning RPA/DPA's

XGSPON OLT Provisioning

RPD Password Change

Smart Provisioner (Intraway Integration)

- Machine to machine (API) provisioning
- Bulk Staging
- Bulk Swap/Change
- Decommission
- Pre/Post

Work continues through the HOPS pipeline as we continue to try and align with the business priorities through continual engagement with our stakeholders

Cox HOPS Automation Journey

Service and Device Provisioning

- Business Internet
- Metro Ethernet
- CMTS

In Prod/QA Environment

Completed Use Cases

- Device/Service Turnup (Multiple device types)
- Device onboarding (Multiple device types)
- Established New BPA Production Platform
- OS Upgrade CMTS
- Optimize Pre-post checks
- IP/Config change mgmt
- Market variances
- Multi-SmartPhy
- RPD Batch Staging
- NCS 5500 OS upgrade
- CBR8 OS upgrade
- ZTP for RPA/DPA
- Vecima RPD Activation

Deeper Integration

- Granite
- IPAM
- Ticketing
- SmartPhy manager
- Mobile App integration
- Apigee API gateway

Current and In process Expansion

- RPD Swap
- Turn up checks for RPD staging & Activation Workflows
- RPD Onboarding Capability
- RPD Decommission
- Device Replacement
- RPD Activation
- Align RPD Location Desc with ATMOS-BPA-Granite
- Mid-Split Phase 1
- RPD SSH Password change
- BPA 3.0 Upgrade
- Intraway API
- SLR Pre/Post (Ansible)

Strategy

- Witbe Service Group Testing
- SmartPhy Cache migration
- GNIS Web Services Migration
- Node/Mid-Split Pase 2-3
- RPD Firmware Upgrade
- Alarm triage and other troubleshooting activities – RPD 1588/Prov logs
- GPON
- SLR OS Upgrade
- Closed Loop Automation

Measuring Benefits

RPD Activation

Shown here is the analysis done on the RPD Activation Feature Deployed in Dec 2019

Sourcing Data

Held interviews with boundary partners to determine timing of current process and savings from the new process

Increasing Maturity

We'll look to gain more sophistication and maturity in this area with partnerships with Finance

	Tool	Activity	Current Process Time Spent (min)	Using BPA/ATMOS (Min)	Comments
Design		5 or less RPDs ...creates a PDS file	20	20	- The local eng team fills info into the PDS and takes apprximately 20 minutes to do a design of 5 or less RPDs. (with plenty of experience) - other groups may need to add data to the design sheet before it is considered complete.
Provisioning	*Bulk staging*		25	25	- the provisioning step is taking the pertinent data from the completed PDS, making decisions on where to provision the RPD, transferring that data from the PDS to a CSV in the format BPA expects, and uploading it into BPA. - Manual provision into SmartPHY or manual provision into BPA is identical - Kraig - Nearly all time spent is processing the PDS to a CSV file which then needs to be imported into either SmartPHY or BPA - Furture potential savings when we deploy the automated provision platform which will then interface into BPA (Gale Shallow's team is targeting 2020 Q1)
		Totals	45	45	Assume 5 RPDs
		Per RPD	9	9	Per RPD
Activation	*ATMOS*	Upfront Activation			
		Go through PDS sheets for nodes and determine how many RPDs and make sure GPS locations are added to PDS	30	30	30 minutes for the 10 RPDs
		Drive to contractor to pick up RPDs	60	0	Contractors will be given access to ATMOS.
		Program SFPs, scan serial numbers and MAC addresses to PDS, and upload to share point for provisioning	60	0	
		Do firmware update	240	0	4 hours of doing firmware updates (this was eliminated recently since new versions of SW are being pushed down to the RPD). Note that the firmware upgrade is no longer needed, there it has bee eliminated from the savings. (not included with the estimate to Fred)
		Return RPDs to contractor	60	0	Not needed since contractors will have ATMOS
		Totals	450	30	This activity has to be done upfront but can be eliminated with ATMOS use by the Contractors With the contractors having access to ATMOS it would save around 8.5 hours for the 10 RPDs....however not all are done in batches of 10
		Per RPD	45	3	
Granite	MAC Address	Getting MAC Addresses from SmartPHY Server to input into Granite	240	0	Mark Geiger's team to check and sync each delta load - 1/2 day - 4 hours average of about 25 nodes
		Per RPD	9.6	0	
Replace	Swap and Replace		60	0	Don't have to provision a secondary RPD. Aproximately 1 hour of savings per RPD - Swap/Replace will be used in two primary scenarios that i am aware of. 1) OSP M team will use when a physical RPD device needs replacing but the node is staying in place. example is a damaged RPD. 2) OSP C will use it potentially during an activation if there is an issue during the install/activation with a physical device and they need to swap in a new one. example, the device was activated but didn't power up due to some issue with the unit, they would pull another from the truck and swap it.
	Decomission		10	10	10 minutes savings per RPD to decomission. Filling out a form to remove it and submitting it. Decommission = this will be used for parent/child node cuts when the parent is no longer needed. this is one example i know of. i know there is other examples. but to be clear the difference is that this is a RPD Node/Name/ID being removed altogether and it also removes it (changes status) from Granite and SmartPhy (therefore CBR8). Furthermore this function is necessary for staging process if there are any issues with bulk staging for example and a device needs to be removed and redone. Kraig and the Sustaining team have called this out as a pre-requisite for pushing Batch Staging in BPA to the field because the field (FE&O) will need a way to remove/delete and RPD node (RPD Name/ID) from all the systems so it can be redone for staging.
			70	10	
		Per RPD	7	1	1 out of every 10 RPDs would get swapped out (Major assumption)
		Minutes/RPD	70.60	13.00	
		Hours /RPD	1.18	0.22	
		Cost @ $85/hr	$ 100.02	$ 18.42	
		Cost based on 55K RPDs	$ 5,500,916.67	$ 1,012,917	
		Savings per RPD	$ 81.60		
		Savings based on 55,000 RPDs	$ 4,488,000.00		


CISCO