

MEETING AGENDA: CTB Innovation Subcommittee

DATE: Tuesday, December 6, 2022

TIME: 11:00 a.m.

LOCATION: Virginia Department of Transportation
Central Office Old Highway Building Computer Lab,
1221 East Broad Street
Richmond, Virginia 23219

MEETING LEADER: Cathy McGhee, email: cathy.mcghee@vdot.virginia.gov, phone: 804-916-9508

AGENDA:

- Welcome
Cathy McGhee, Chief Deputy Commissioner, VDOT
- Approval of October 2022 meeting minutes
Cathy McGhee
- CAV Data Mapping Initiative
Hari Sripathi, Office of Strategic Innovation, VTRC
- Topics for future discussion
Committee members
- Public Comments

MEETING NOTES: CTB Innovation Subcommittee

DATE: Tuesday, October 25, 2022

TIME: 8:00 a.m.

The meeting of the Commonwealth Transportation Board (CTB) Innovation Subcommittee was held at the DoubleTree by Hilton, 1900 Pavilion Drive, Virginia Beach, VA 23451. Chief Deputy Commissioner Cathy McGhee called the meeting to order at 8:00 a.m.

Approval of May 2022 minutes – *The minutes from the May meeting were approved without comment.*

Operations Technology Transformation and Future State - Dwayne Cook, Transportation Systems Strategy Office provided an update on changes to VDOT's organizational structure as it relates to Traffic Operations and Operations Technology. He also highlighted a number of accomplishments and future initiatives. A copy of his presentation is attached for reference.

During his presentation, the committee members asked a number of questions including:

- With respect to the buildout of the fiber network, is there a timeline for filling the gap that currently exists in the I-64/Rt. 29 Corridor as well as Rt. 13 on the Eastern Shore. *It was clarified that most of the fiber shown on the map has been obtained through resource sharing agreements (RSA). Those agreements are driven by private sector needs and business decisions. In some cases VDOT has installed fiber but those tend to be for short segments to fill limited gaps between other fiber deployments.*
- In discussions of information sharing and incident response, a question was asked regarding trigger points/notifications for snow events. *Significant works is underway with respect to communications for large scale events, including weather events. Procurement of an upgraded/enhanced 511 system is underway, the use of wireless emergency alert (WEA) systems to provide geo-fenced 2-way messaging will be incorporated, in-cab messaging to commercial motor vehicles will be deployed, and enhanced coordination and content for overall messages is now a part of our response strategy.*
- It was noted that traffic safety, and in particular pedestrian safety, should be added to the "Traffic Operations Transformation Strategy" slide.

Due to time constraints, the remainder of the agenda was deferred to the December meeting.

There were no public comments.



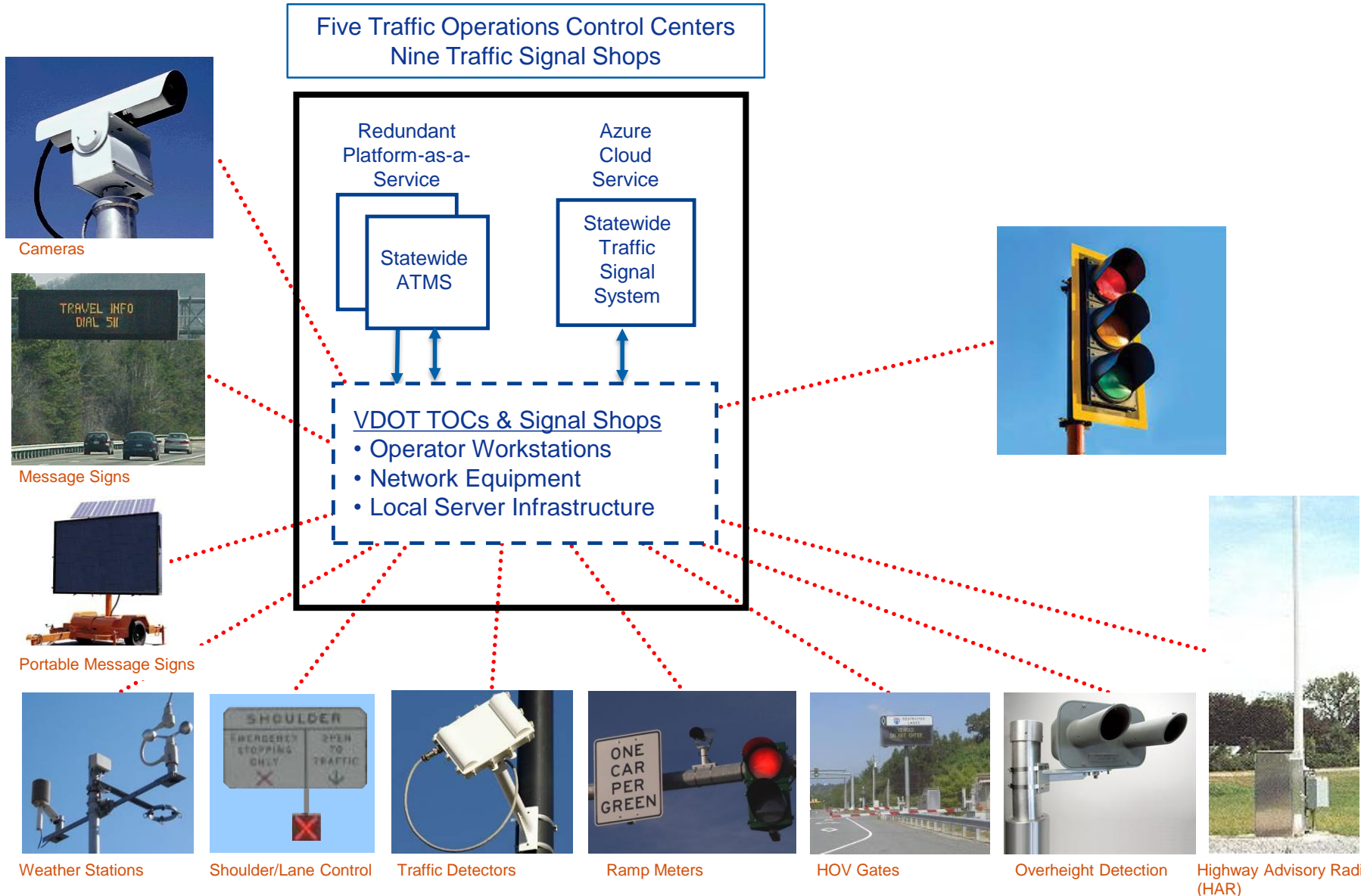
Traffic Operations Program Transformation

CTB Innovation Subcommittee Update

Transportation Systems Strategy Office
Dwayne Cook

October 25, 2022

Traffic Operations Technology Enabling Roadway Operations



Device/Component	Approx. #
IP addresses	30,000+
Total field devices	7,500+
Edge device control cabinets	6,000
Miles of fiber	5,500
Traffic signals	3,100+
Traffic detectors	1,500
Highway traffic cameras	1,150
Message boards	375
PaaS servers	200+
Weather stations	96
HOV gates	50
Ramp meters	21
Tier-3 data centers	3

Operations Technology Transformation

Statewide consistent Defense-in-Depth solutions have been implemented successfully



Operations Technology is secure, resilient, and compliant with applicable polices and standards

OT staff are fully trained and are using new tools and services effectively



VDOT has consistent responsiveness to VITA services for the OT environment



Approved product lists, Road & Bridge Specifications, and related artifacts have been updated



Statewide Fiber Network is secure, operational, and connected to the cloud

Organizational ownership, process sustainment, and accountability model has been designed



OT solutions are delivered using common platforms and services, increasing efficiency and reliability



OT Cybersecurity Focus Areas and Features



**Documentation
Plans &
Procedures**



**Physical/
Environmental &
Logical Security**



**Continuous
Monitoring**



**Third-Party
Management**



**Resource
Allocation**



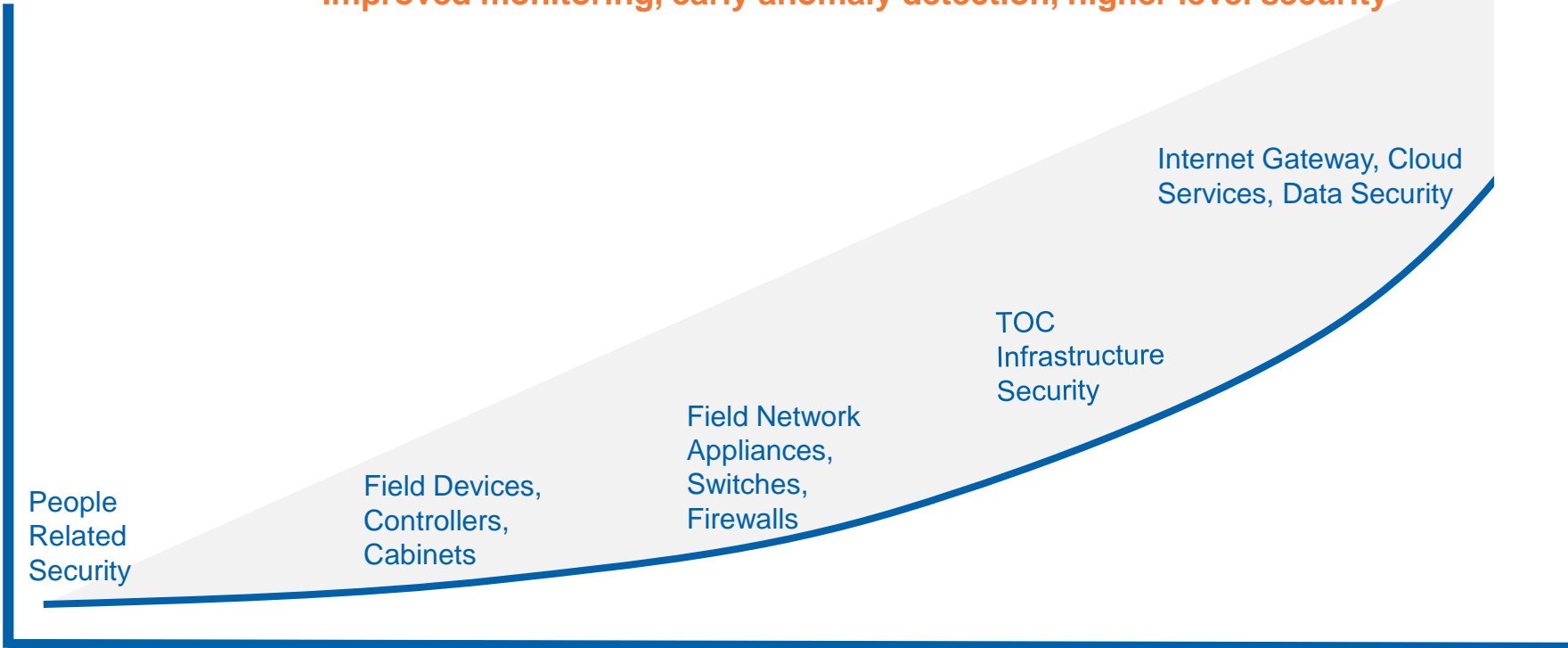
Network Security

- COV SEC 501 security controls compliant
- Defense in Depth framework
- Continuous Management of OT Security Environment through cyber security tools
 - Tools based Security – computers and servers, applications, network traffic monitoring, edge devices activity logs, internet and cloud gateway monitoring
 - People based security – robust credentialed access management, situation and tool based security training
 - Procedures based security: 24 x 7 x 365 monitoring at TOSC and TOCs
- Governance, Risk, and Compliance Driven Security
- Threat Intelligence Managements approach to Security (FY'23)

Cyber Security Defense in Depth

Improved monitoring, early anomaly detection, higher level security

Defense in Depth Increased Resiliency



Progressively Increasing Protection Against Cyber Attack

- Identity & Access Management
- Security SOP
- Governance, Risk, Compliance
- Specialized tools training
- Annual Refreshers

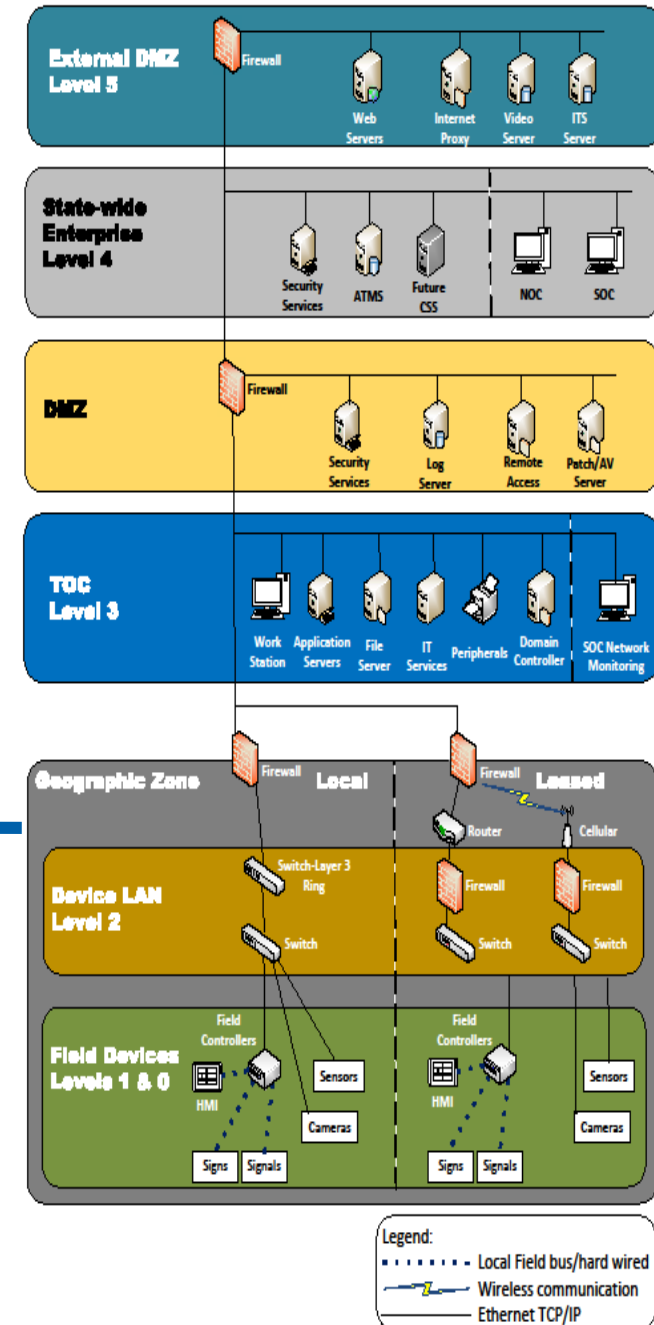
- Digital Locks
- Digital deterrents and controller status monitoring

- Network level monitoring for anomalous / malicious traffic

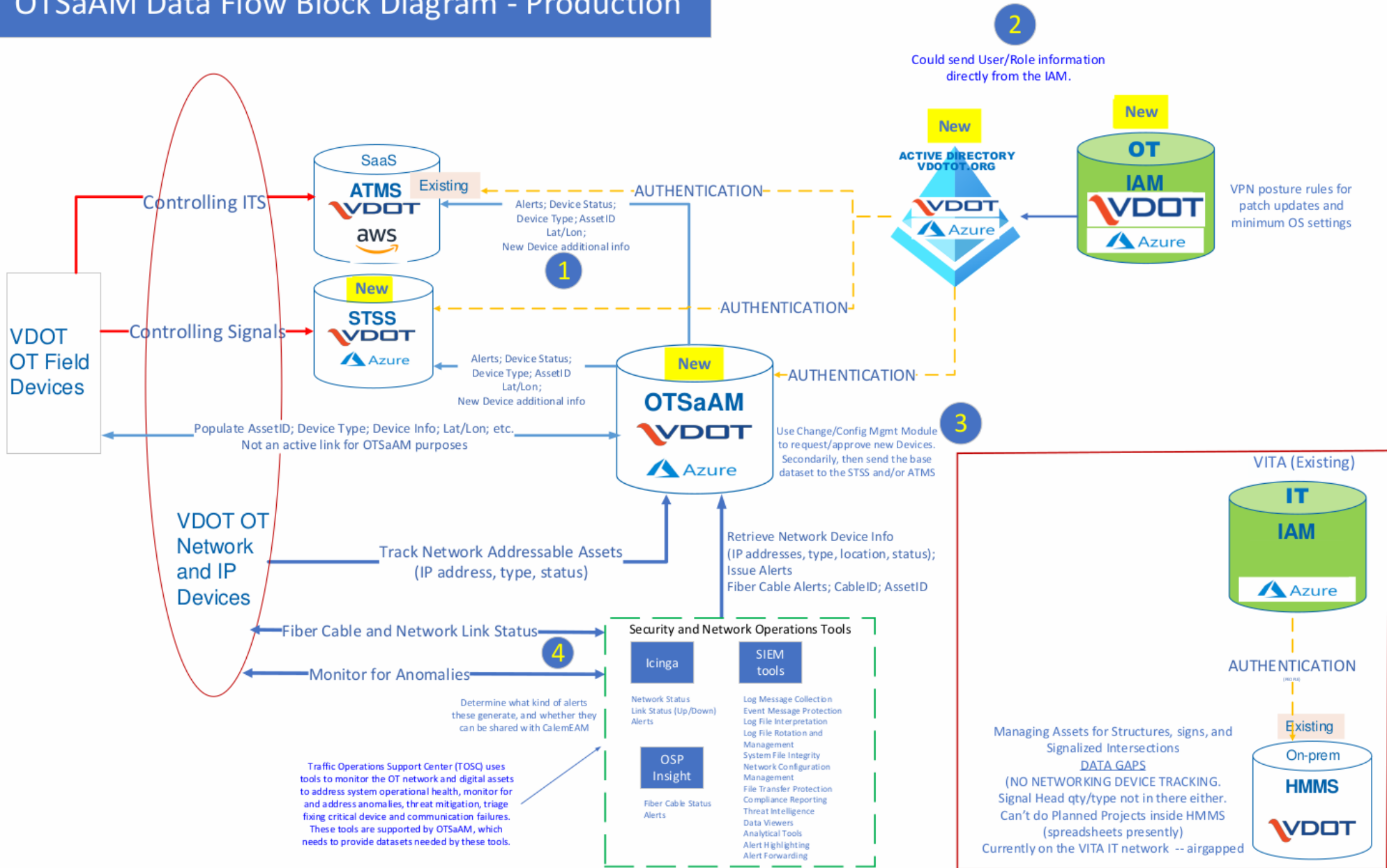
- Antivirus, anti-malware, internet access control
- Scans for compliance with security updates

- Scans logs from OT environment for indications of potential security breaches / malicious activity

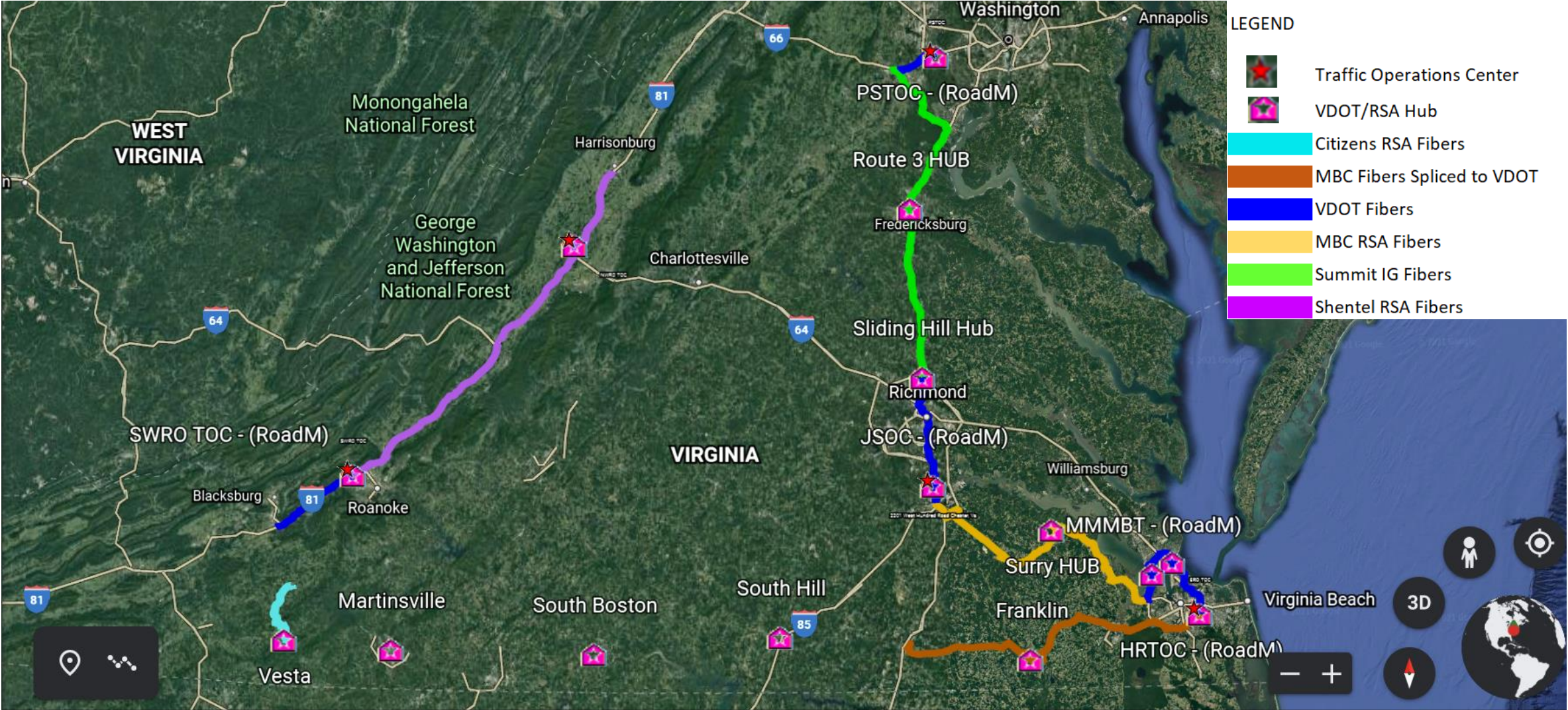
Purdue Security Framework



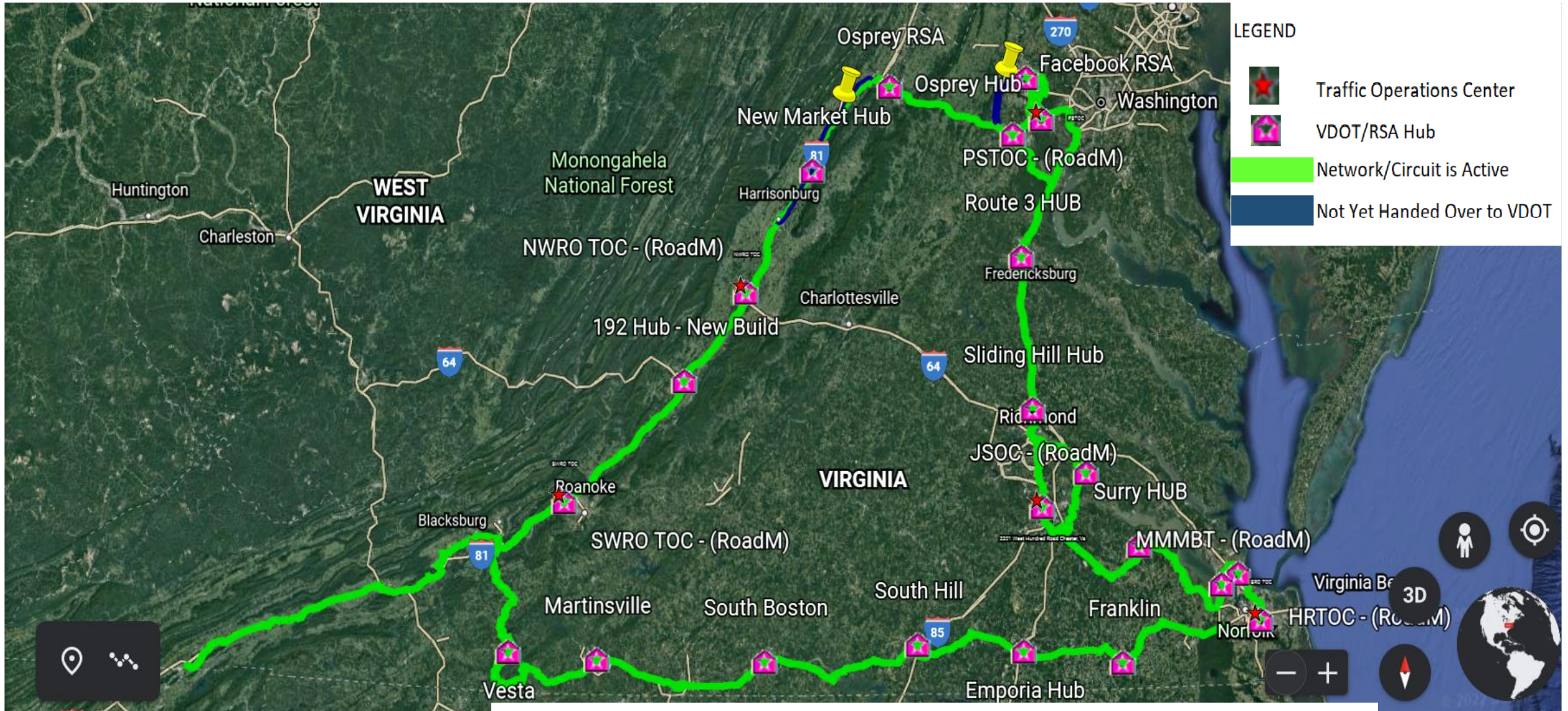
OTSaAM Data Flow Block Diagram - Production



Statewide Fiber Network - In The Beginning.....



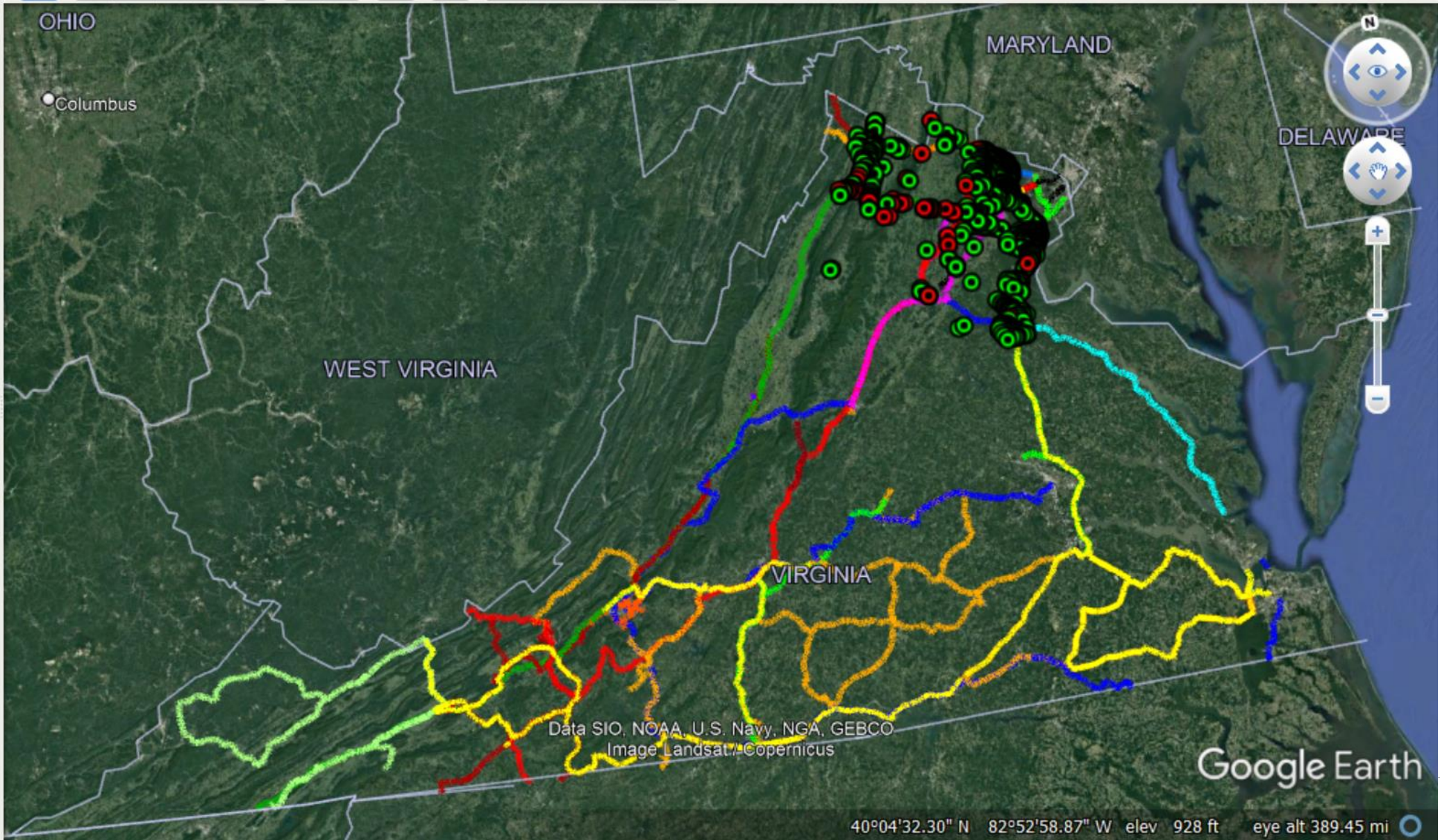
Statewide Fiber Network - Current



- 1,004 miles of in-ground fiber
- Fault tolerant design
- Fiber management tool, with route level and device connection by location details

- My Places
 - Sightseeing Tour
 - Make sure 3D Buildings layer is checked
- VDOT (presentation)_201...
 - VDOT
 - HMMS_TrafficSignals...
 - Signal Prioritization_...
 - Prioritization_ITS_Pro...
 - Regional Outlines
 - Proposed Fiber
 - Existing FORS Fibers
 - VDOT Owned

- Primary Database
- Announcements
- Borders and Labels
- Places
- Photos
- Roads
- 3D Buildings
- Weather
- Gallery
- More
- Terrain



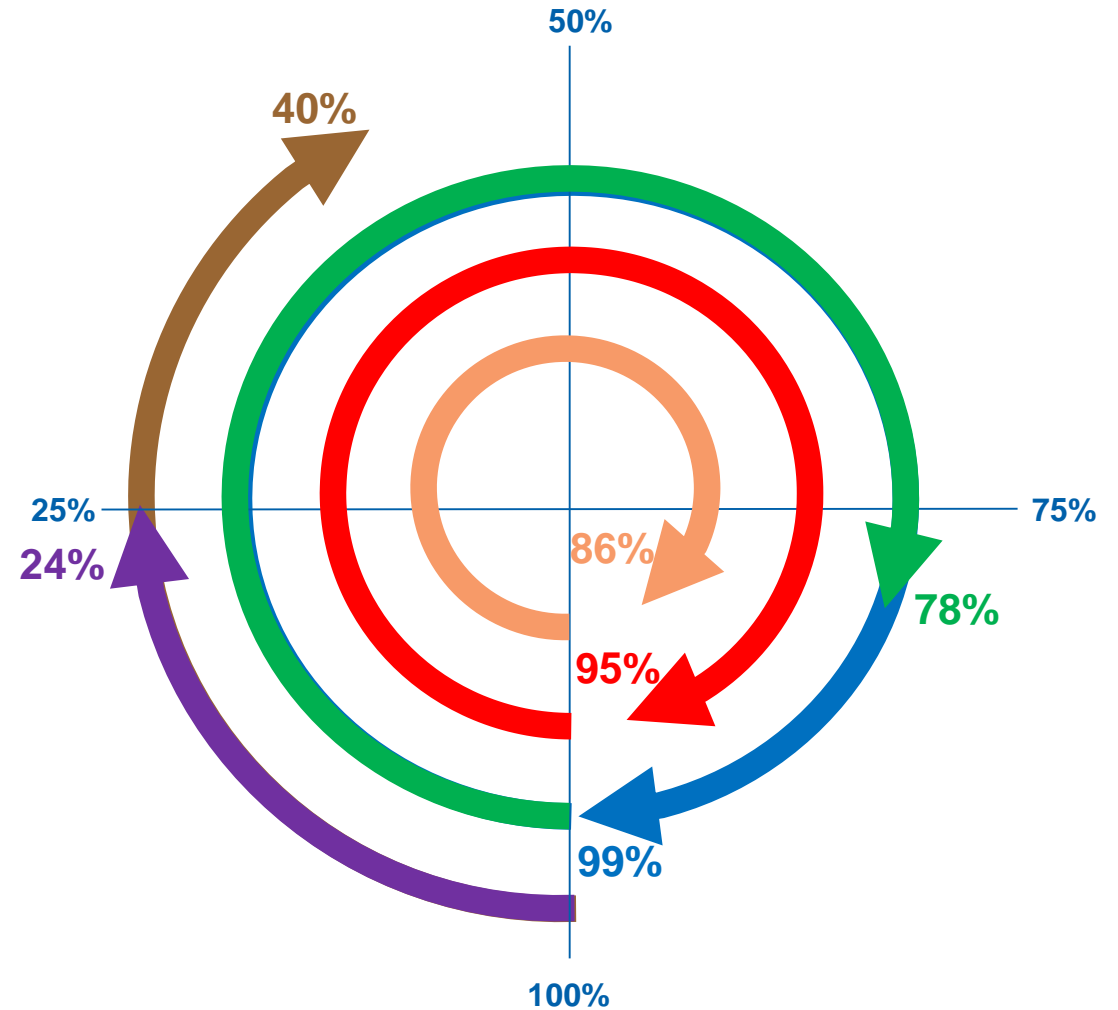
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat/Copernicus

Statewide Traffic Signal System Status

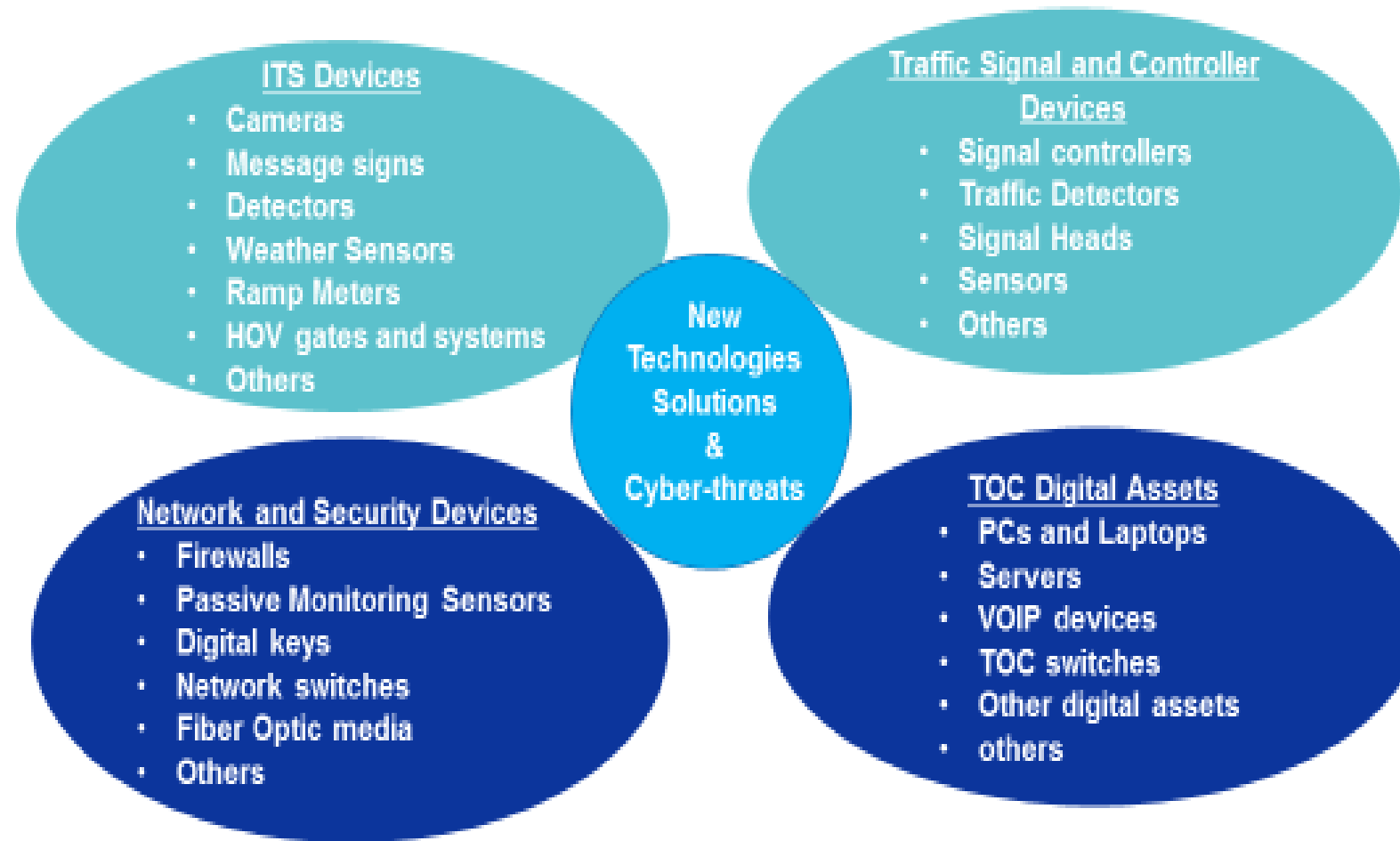
3,154 Traffic Signals Statewide

- High Speed Communications (2706 – 86%)
- ATC / D4 Migration (2999 – 95%)
- KITS Configured (3111 – 99%)
- KITS Live (2448 – 78%)
- ATSPM Configured (1253 – 40%)
- ATSPM Active (760 – 24%)

ATSPM will be configured/active to all high speed connected signals by end of calendar year 2022



OTSaAM – Operations Technology Service and Asset Management, to achieve statewide consistency



VDOT Operation Technology Environment

What is Complete:

- ClearAsset is the Software
- ITS data loaded
- Signals data loaded
- User accounts provisioned
- Integrated with IAM solution
- SOP developed
- Data quality check continues

What is next:

- End user training
- Operationalize Signal device management
- M & O system support

Traffic Operations Support Center & Dashboard

Traffic Operations Service Center (TOSC)
Integrated Network Operations 24 x 7 x 365
VDOT Security Operations Center



Traffic Operations Center (TOC)

**OT Network Operations
Center (NOC)**

**OT Security Operations
Center (SOC)**

**Traffic Operations
Center (TOC)**

- Tiered support: life-safety, operational integrity, security focus
- 24 x 7 x 365 NOC/SOC monitoring and alerts to TOC
- Assets monitoring and support:
 - ITS, signals, and TOC devices asset data
 - Communication network asset data
- Integrated Service Desk
- Business Unit Define
 - Streamlined support processes
 - Standard Operating Procedure playbook
 - Staffing and support plan
 - Funding and Investment management
- Applications and Technology Toolset
 - Common across all services
 - Security and compliance requirement

- 24 x 7 x 365 operations
- Situational Awareness
- Support District Leadership and Traffic Operations SMEs
- Support Travel / Incident management
- Assigned District / Corridor OT Services management.
 - Break fix coordination
 - Restoration of service

Operations Technology Device Dashboards

Purpose

- **Status of Operations Technology (OT) devices**
- **Statewide consistency**
- **Situational awareness from multiple perspectives**

Multiple Dashboards

- **Executive Level – widely available (Commissioner, DEs, DTODs, etc.)**
 - **Overall device availability / status**
- **Technical Level – limited availability to those within OT environment (TOC, TOSC, etc.)**
 - **Device availability / status along with detailed information for all connected OT devices**

OPERATIONS TECHNOLOGY DEVICES EXECUTIVE DASHBOARD



Bristol

Culpeper

Fredericksburg

Hampton Roads

Lynchburg

Northern Virginia

Richmond

Salem

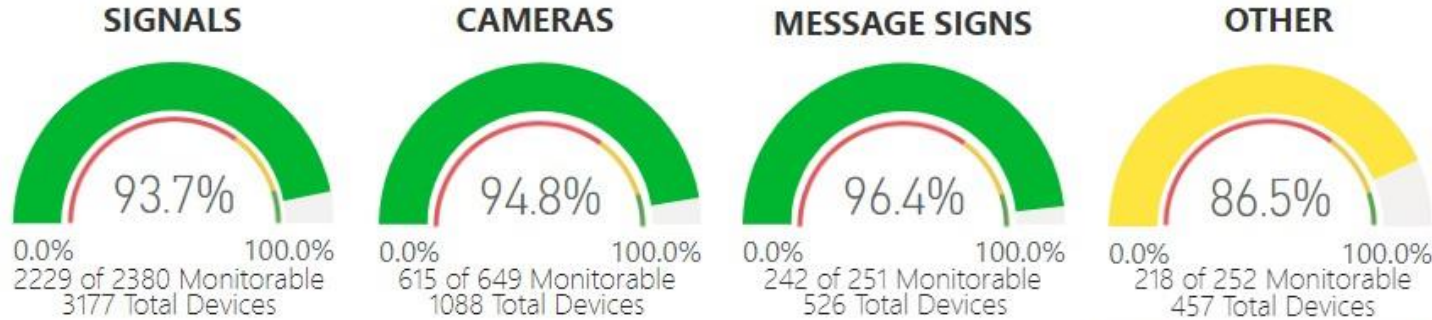
Staunton

Last Updated:
10/24/22 12:08
PM

Hover over to see definitions



% OF DEVICES CURRENTLY ONLINE



Make selections to filter the map and table:

Device Status

- Not Monitorable
- Offline
- Online

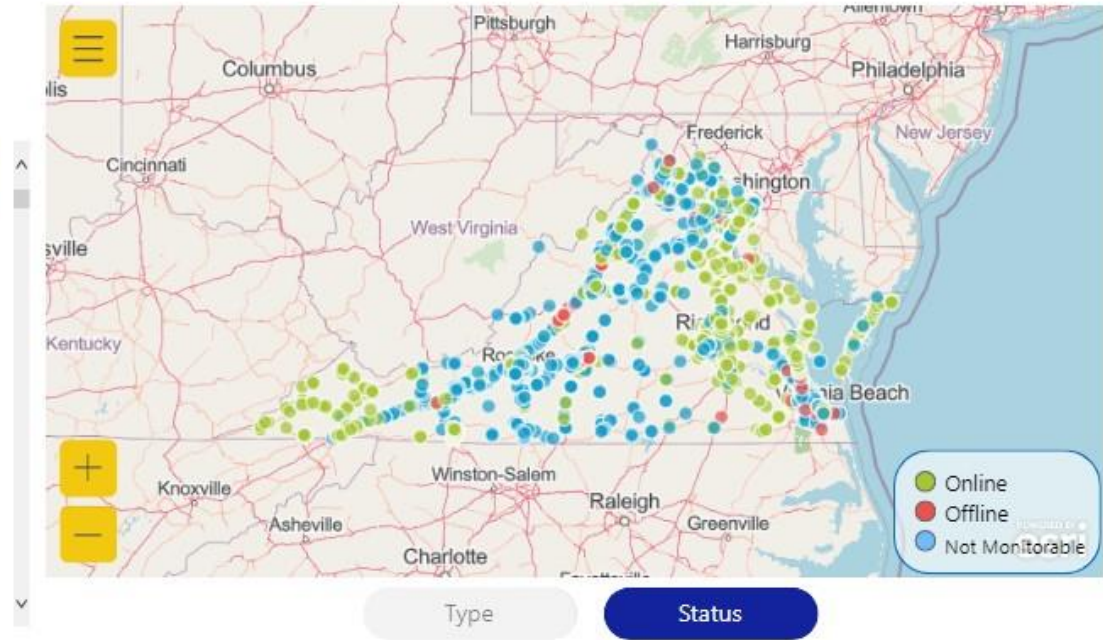
Device Group

All

DEVICE LIST

Device Name	Device Type	Location Description	Device Status
BRI-02-SIGCTRL-1001-2503	SIGCTRL	Rte 1001 (McClure Ave)	Online
BRI-02-SIGCTRL-11-8601	SIGCTRL	Rte 11 (Lee Hwy)	Online
BRI-02-SIGCTRL-11-9502	SIGCTRL	Lee Hwy (Rte 11)	Online
BRI-02-SIGCTRL-11-9505	SIGCTRL	Route 11/58 (Lee Hwy)	Online
BRI-02-SIGCTRL-11-9510	SIGCTRL	Rte 11 (Lee Hwy)	Online
BRI-02-SIGCTRL-11-9514	SIGCTRL	Route 11 (Lee Hwy)	Online
BRI-02-SIGCTRL-11-9515	SIGCTRL	Rte 11 (Lee Hwy)	Online
BRI-02-SIGCTRL-11-9516	SIGCTRL	Lee Hwy (Rte 11)	Online
BRI-02-SIGCTRL-11-9517	SIGCTRL	Rte 11 (Lee Hwy)	Online
BRI-02-SIGCTRL-11-9518	SIGCTRL	Rte 11/19 (Lee Hwy)	Online
BRI-02-SIGCTRL-11-9521	SIGCTRL	Rte 11/19 (Lee Hwy)	Online
BRI-02-SIGCTRL-11-9522	SIGCTRL	Rte 11/19 (Lee Hwy)	Online

MAP OF DEVICES BY STATUS



OT Device Maintenance Transformation

VDOT of Today

- **Device Specific Maintenance**
 - ITS devices use two similar, performance-based contracts
 - Traffic Signal Maintenance includes a mix of VDOT personnel and an assortment of contracts across all districts
 - Separate systems are used to track assets and work orders
- **Value of maintenance activities**
 - All ITS Maintenance and signals contracts are approximately \$30M per year
- **Integrated Service Desk**
 - Personnel respond to ITS asset failures and troubleshoot service requests
- **Traffic Signal Program Evolution**
 - A Statewide Traffic Signal System (STSS) provides remote management and monitoring of signals

VDOT of Tomorrow

- **Single approach to device maintenance**
 - Single statewide contract with multiple lots to support various geographies & vendors across VDOT
 - Single OTSaAM Operations Technology Service and Asset Management tool for all IP connected devices in the OT environment
- **Statewide Service Desk**
 - Statewide Transportation Operation Support Center (TOSC) will coordinate with device maintenance contractors and will monitor VDOT's network and provide level 1 support
- **Cloud Hosted Solutions**
 - VDOT is in the process of transitioning critical Operations Technology systems to the cloud
- **Statewide Fiber Network Backbone**
 - This deployment will connect VDOT's TOCs, devices, and other operational facilities to multiple data centers in VA

Current vs. future Operations Technology device maintenance contracts

Current

Future

Primary focus

ITS devices only



ITS & signal devices

Primary scope

Edge device restoration response time



Edge device operational availability

Payment model

Devices under contract



Device daily availability

SLA/Performance model

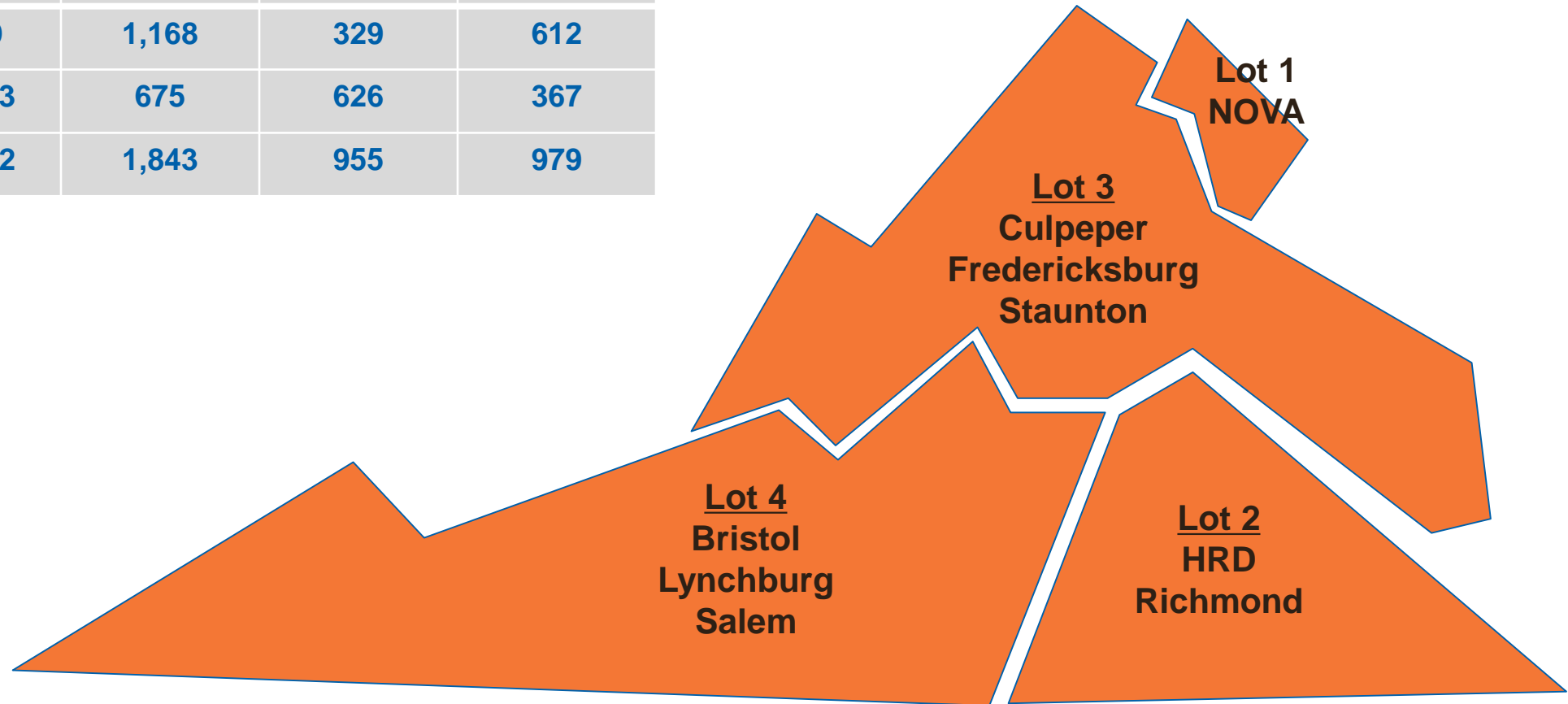
Incentive/disincentive for responsiveness



Incentive for better-than-expected availability
Disincentive for less than expected availability
Penalty for extended device downtime

Lot definition balances demand and capacity

	Lot 1	Lot 2	Lot 3	Lot 4
ITS devices	649	1,168	329	612
Signals	1,453	675	626	367
Total Edge Devices	2,102	1,843	955	979



Traffic Operations Transformation Strategy

- **Traffic Operations Program is customer focused and service oriented**
- **Address current demands and prepares for the future**
- **Use data and technology to improve roadway operations and incident responsiveness**
- **Partner with industry, leverage expertise, deliver high quality customer service**
- **Attract and empower highly skilled Subject Matter Experts to improve programs and processes**
- **Use Data Science and Process Automations to support agency personnel in all aspects of traffic and congestion management**
- **Improve locality coordination with consistent Memorandum of Understanding and secure technical network connections**

Discussion / Questions

Statewide Signal System Initiatives Overview

SIGNALS WITH HIGH SPEED COMMUNICATIONS				
DISTRICT REPORTING INFORMATION				
DISTRICT	TOTAL SIGNALS	HIGH SPEED COMMS	REMAINING	PERCENT COMPLETE
Bristol	100	99	1	99%
Salem	180	89	91	49%
Lynchburg	87	52	35	60%
Richmond	486	355	131	73%
Fredericksburg	270	270	0	100%
Staunton	221	89	132	40%
Culpeper	136	78	58	57%
Hampton Roads	189	189	0	100%
NoVA	1485	1485	0	100%
TOTAL	3154	2706	448	85.8%

SIGNALS OPERATING WITH D4 FIRMWARE				
DISTRICT REPORTING INFORMATION				
DISTRICT	TOTAL SIGNALS	D4 INSTALLED	REMAINING	PERCENT COMPLETE
Bristol	100	100	0	100%
Salem	180	180	0	100%
Lynchburg	87	87	0	100%
Richmond	486	331	155	68%
Fredericksburg	270	270	0	100%
Staunton	221	221	0	100%
Culpeper	136	136	0	100%
Hampton Roads	189	189	0	100%
NoVA	1485	1485	0	100%
TOTAL	3154	2999	155	95.1%

Statewide Signal System Initiatives Overview (cont)

SIGNALS OPERATING WITH KITS CENTRAL SIGNAL SYSTEM

DISTRICT REPORTING INFORMATION

DISTRICT	TOTAL SIGNALS	TOTAL CONFIGURED	TOTAL "LIVE"	CONFIGS REMAINING	"LIVE" REMAINING	PERCENT CONFIG	PERCENT "LIVE"
Bristol	100	100	99	0	1	100%	99%
Salem	180	180	78	0	102	100%	43%
Lynchburg	87	87	52	0	35	100%	60%
Richmond	486	443	256	43	230	91%	53%
Fredericksburg	270	270	123	0	147	100%	46%
Staunton	221	221	89	0	132	100%	40%
Culpeper	136	136	78	0	58	100%	57%
Hampton Roads	189	189	189	0	0	100%	100%
NoVA	1485	1485	1485	0	1	100%	100%
TOTAL	3154	3111	2449	51	706	98.6%	77.6%
		98.6%	77.6%				

SIGNALS OPERATING WITH ATSPM

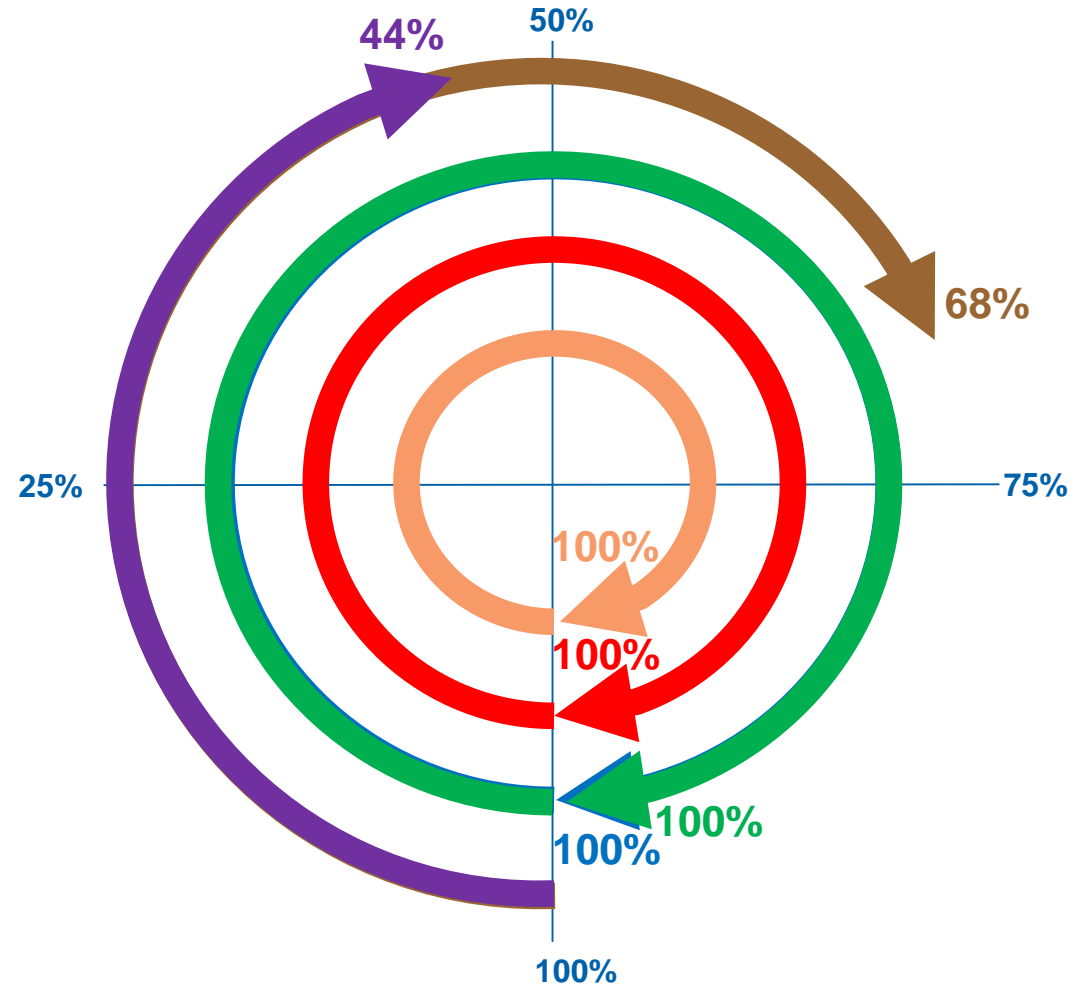
DISTRICT REPORTING INFORMATION

DISTRICT	TOTAL SIGNALS	ATSPM CONFIGURED	ATSPM ACTIVE	PERCENT ACTIVE
Bristol	100	0	0	0%
Salem	180	8	0	0%
Lynchburg	87	87	0	0%
Richmond	486	0	0	0%
Fredericksburg	270	31	0	0%
Staunton	221	69	61	28%
Culpeper	136	55	41	30%
Hampton Roads	189	0	0	0%
NoVA	1485	1003	658	44%
TOTAL	3154	1253	760	24.1%
		39.7%	24.1%	

NoVA District Signal System Initiatives Overview

1,485 Traffic Signals in NoVA District

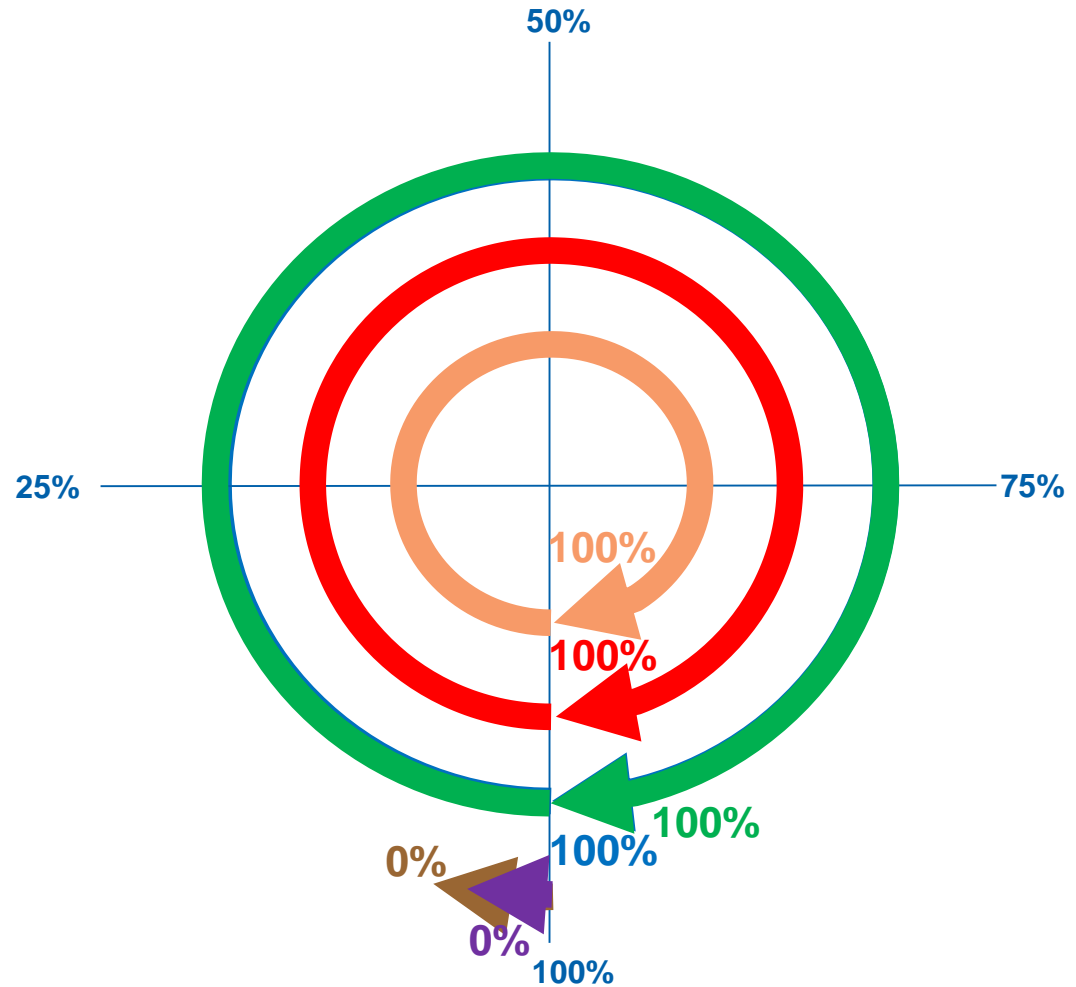
- High Speed Communications (1485)
- ATC / D4 Migration (1485)
- KITS Configured (1485)
- KITS Live (1485)
- ATSPM Configured (1003)
- ATSPM Active (658)



Hampton Roads District Signal System Initiatives Overview

189 Traffic Signals in Hampton Roads District

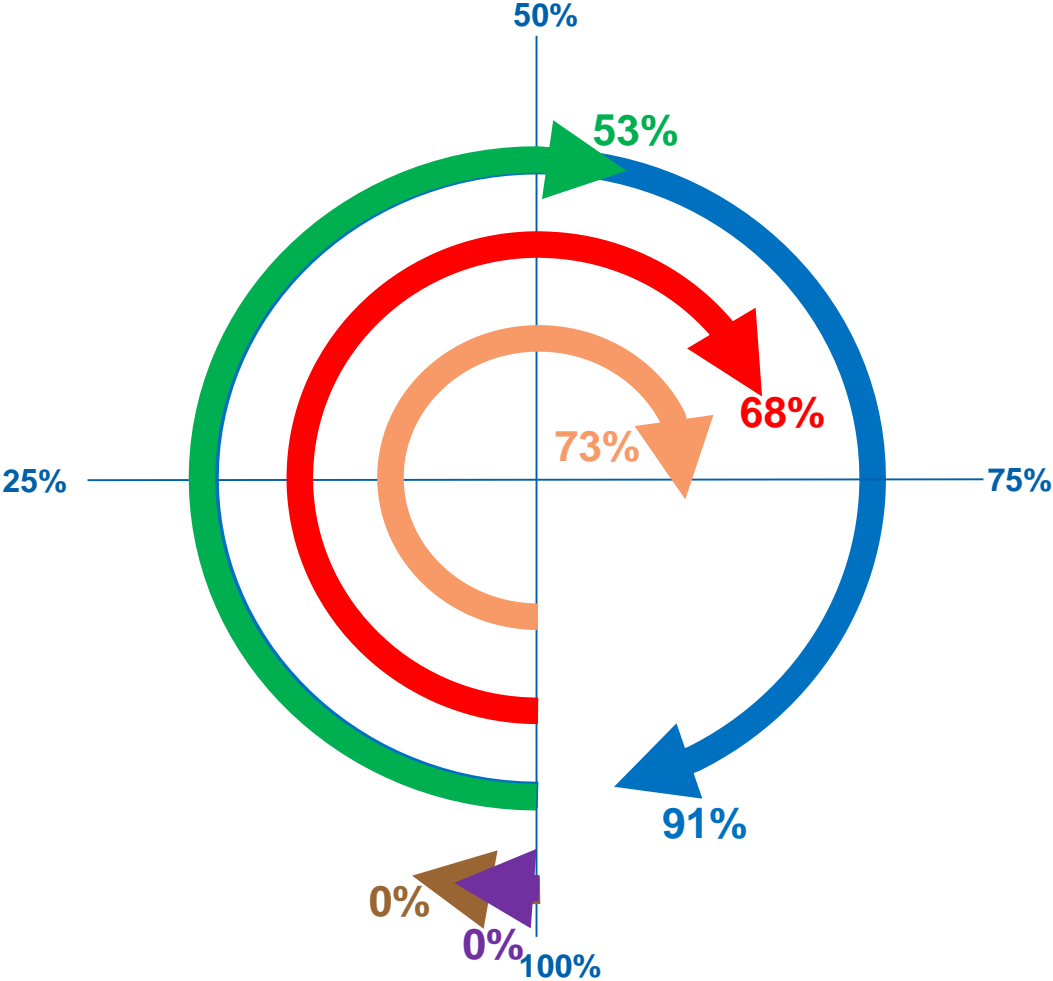
- High Speed Communications (189)
- ATC / D4 Migration (189)
- KITS Configured (189)
- KITS Live (189)
- ATSPM Configured (0)
- ATSPM Active (0)



Richmond District Signal System Initiatives Overview

486 Traffic Signals in Richmond District

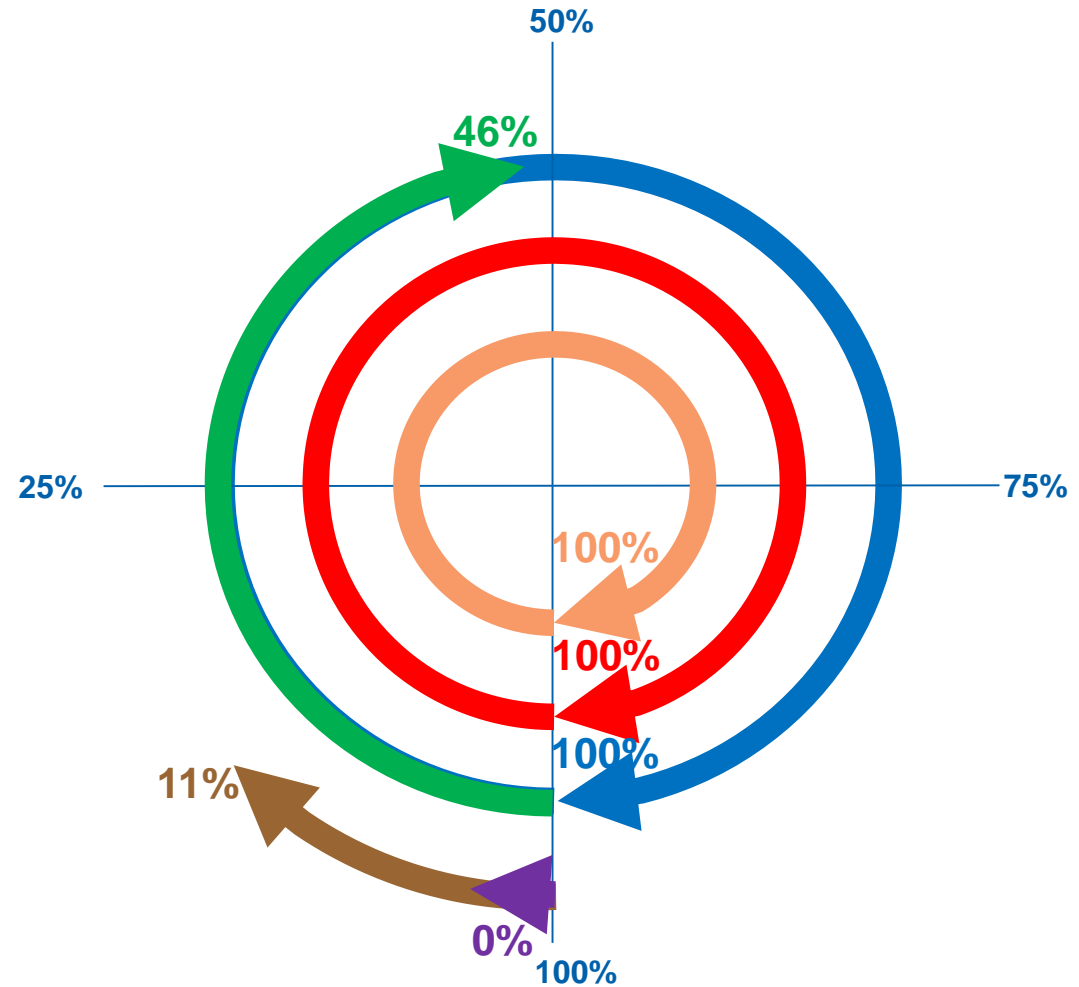
- High Speed Communications (355)
- ATC / D4 Migration (331)
- KITS Configured (443)
- KITS Live (256)
- ATSPM Configured (0)
- ATSPM Active (0)



Fredericksburg District Signal System Initiatives Overview

270 Traffic Signals in Fredericksburg District

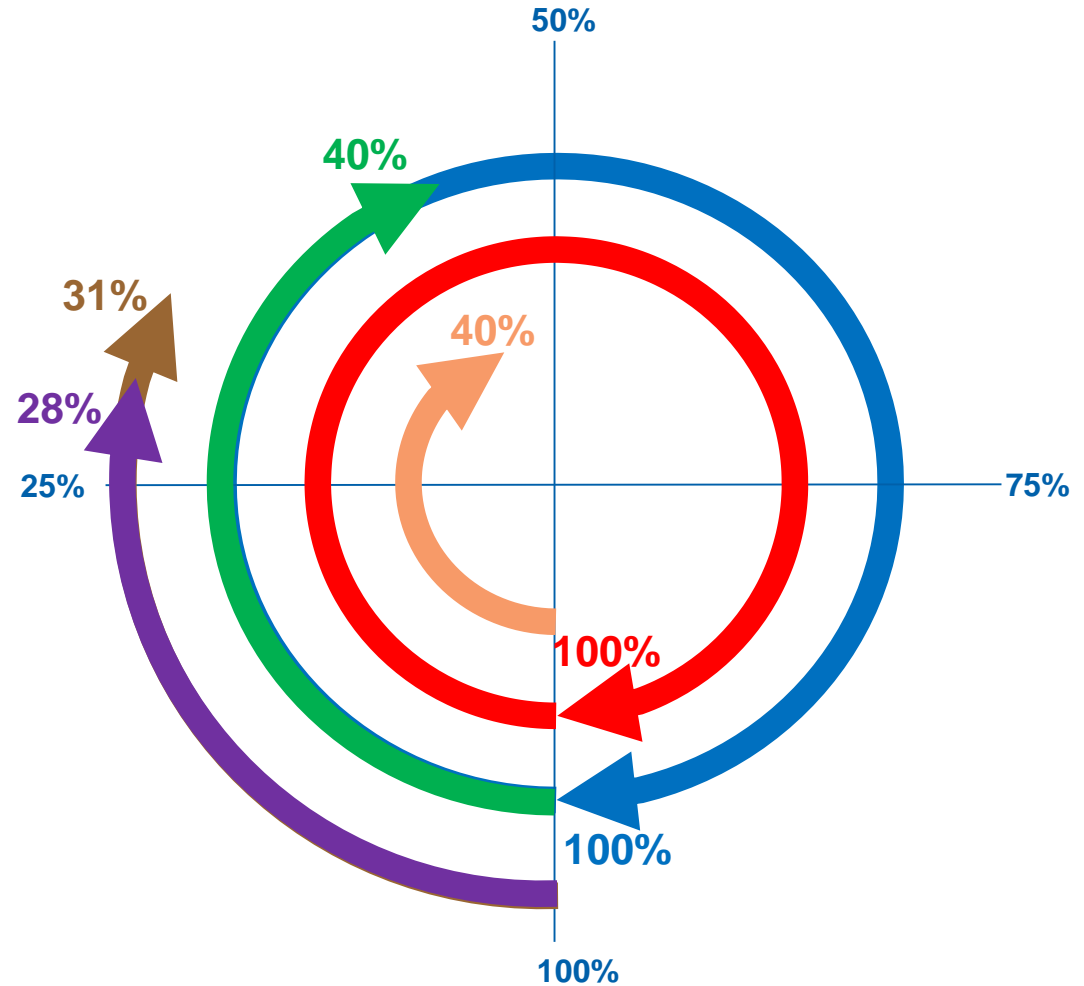
- High Speed Communications (270)
- ATC / D4 Migration (270)
- KITS Configured (270)
- KITS Live (123)
- ATSPM Configured (31)
- ATSPM Active (0)



Staunton District Signal System Initiatives Overview

221 Traffic Signals in Staunton District

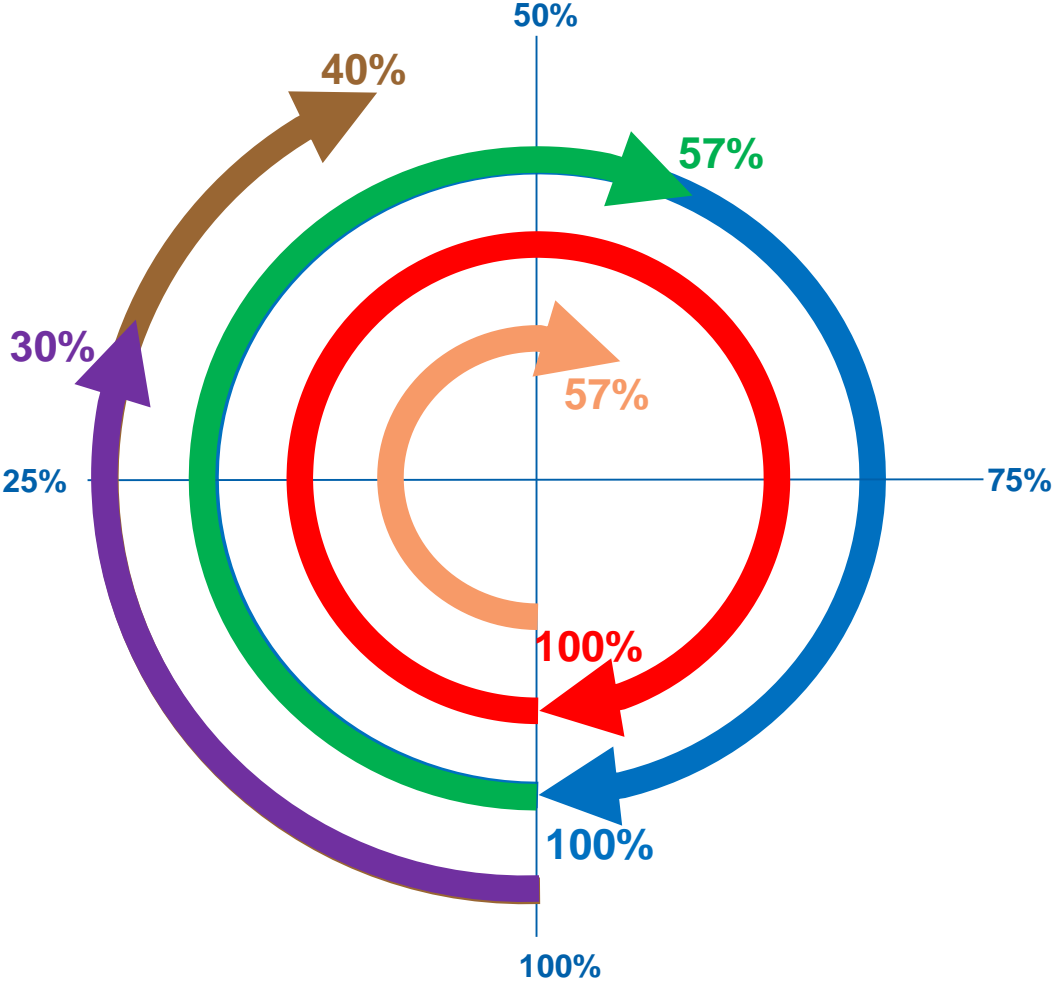
- High Speed Communications (89)
- ATC / D4 Migration (221)
- KITS Configured (221)
- KITS Live (89)
- ATSPM Configured (69)
- ATSPM Active (61)



Culpeper District Signal System Initiatives Overview

136 Traffic Signals in Culpeper District

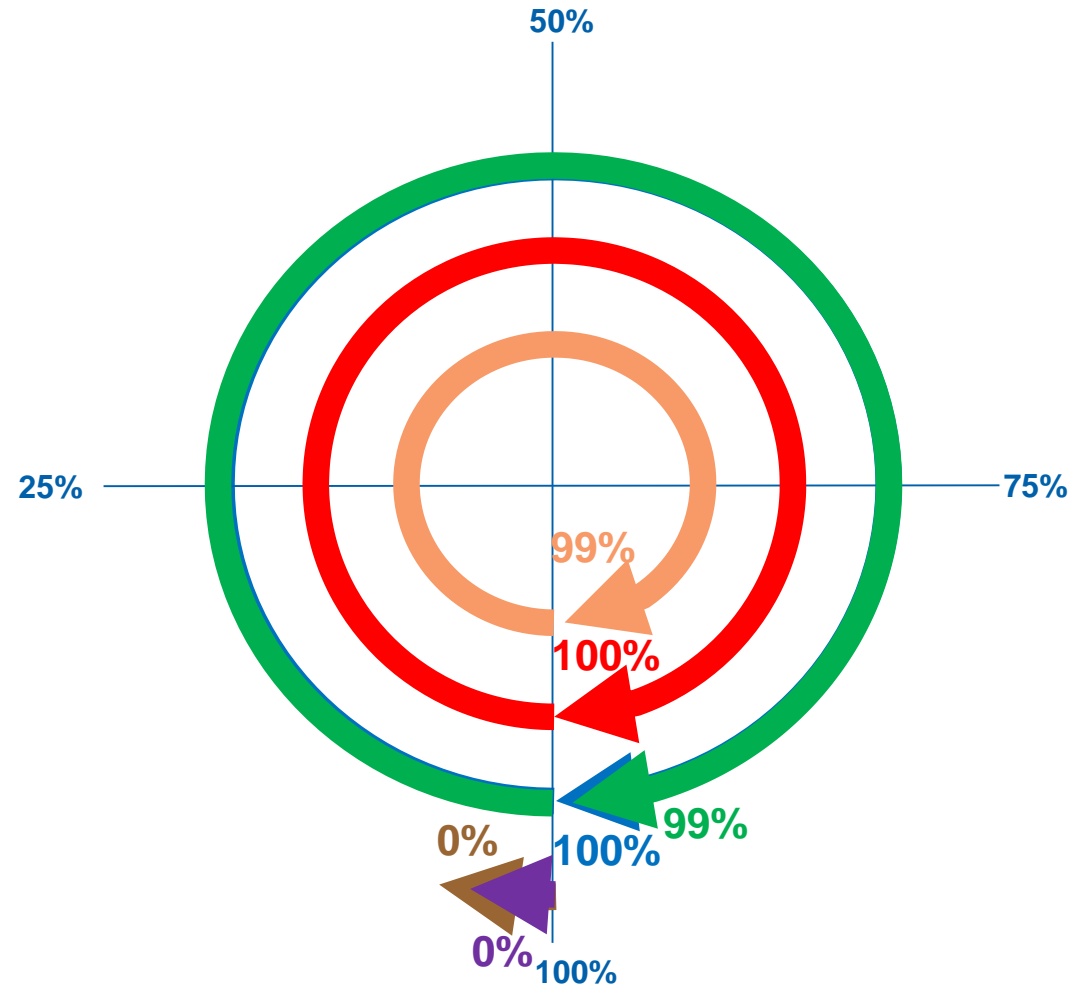
- High Speed Communications (78)
- ATC / D4 Migration (136)
- KITS Configured (136)
- KITS Live (78)
- ATSPM Configured (55)
- ATSPM Active (41)



Bristol District Signal System Initiatives Overview

100 Traffic Signals in Bristol District

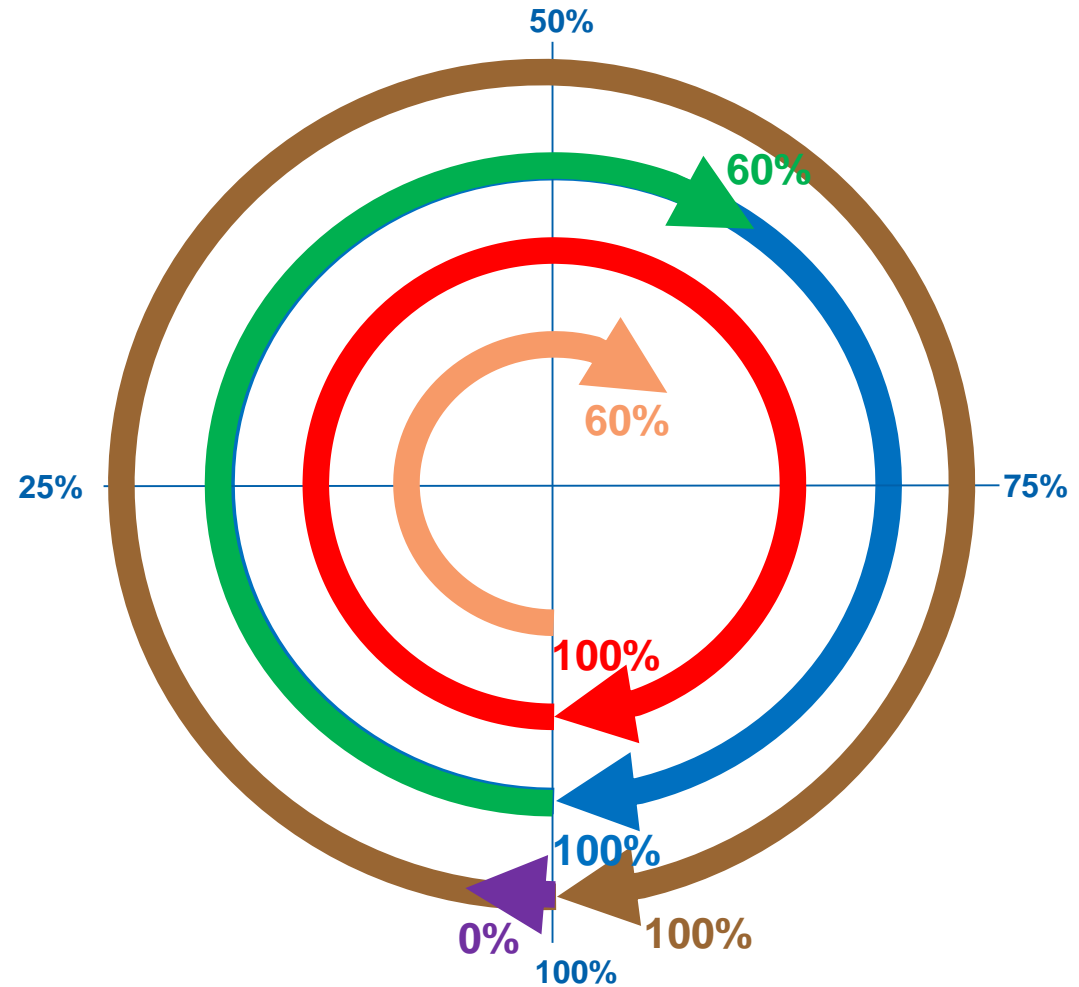
- High Speed Communications (99)
- ATC / D4 Migration (100)
- KITS Configured (100)
- KITS Live (99)
- ATSPM Configured (0)
- ATSPM Active (0)



Lynchburg District Signal System Initiatives Overview

87 Traffic Signals in Lynchburg District

- High Speed Communications (52)
- ATC / D4 Migration (87)
- KITS Configured (87)
- KITS Live (52)
- ATSPM Configured (87)
- ATSPM Active (0)



Salem District Signal System Initiatives Overview

180 Traffic Signals in Salem District

- High Speed Communications (89)
- ATC / D4 Migration (180)
- KITS Configured (180)
- KITS Live (78)
- ATSPM Configured (8)
- ATSPM Active (0)

