INNOVATIONS IN ITS PROCUREMENT

TECHNOLOGY, SOFTWARE, & SERVICE

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Operations Technology

Information Technology VDOT

Field Devices

- Cameras
- Message Boards
- Mobile signs
- Weather Stations
- Traffic Detectors
- Traffic Controllers
- Traffic Signals
- ITS cabinets
- Ramp meters
- HOV gate systems
- HARs
- Overhead detectors
- Fog detection/alert systems
- Tolling gantries
- Tolling technologies
- LPRs

Cameras

Message Signs

- ATMS
- ATM
- Traffic Signals & systems
- Lane Control
- Ramp Metering
- Fog Lights
- Tolling Systems
- Hardware/ Software
- Communications Equipment
- Field Devices
- etc.

10,000+ field devices
75,000 ip addresses
6,500 control cabinets
Several hundred servers
Network switches
2 tier-3 data centers
5 communication hubs
4,600 miles of fiber

Portable Message Signs

Weather Stations

Shoulder/Lane Control

Traffic Detectors

Ramp Meters

HOV Gates

Overheight Detection

Highway Advisory Radio (HAR)

Various Flavors of Cloud Services

Various Flavors of End User Devices + Hundreds of Applications, Data Services, Networks

VDOT

VDOT's Operations Technology consists of Traffic Operations Centers, Communications, Field Devices, Software and Turnkey Solutions

Traffic Operations Centers (TOCs)

- 5 Regional Operations Centers & communication hubs
- PaaS (NRO data center, additional CRO data center in 2019)
- Statewide ATMS
- Lane control systems
- Incident management
- Ramp metering
- Traffic Signaling System
- PSAP//CAD interfaces
- Inventory management systems
- Emergency management systems
- Tolling management systems
- Emerging tech solutions for CAV
- I-66 & I-64 expansion systems

Communications

- VDOT fiber
- VDOT RSA fiber
- Leased lines
- Wireless
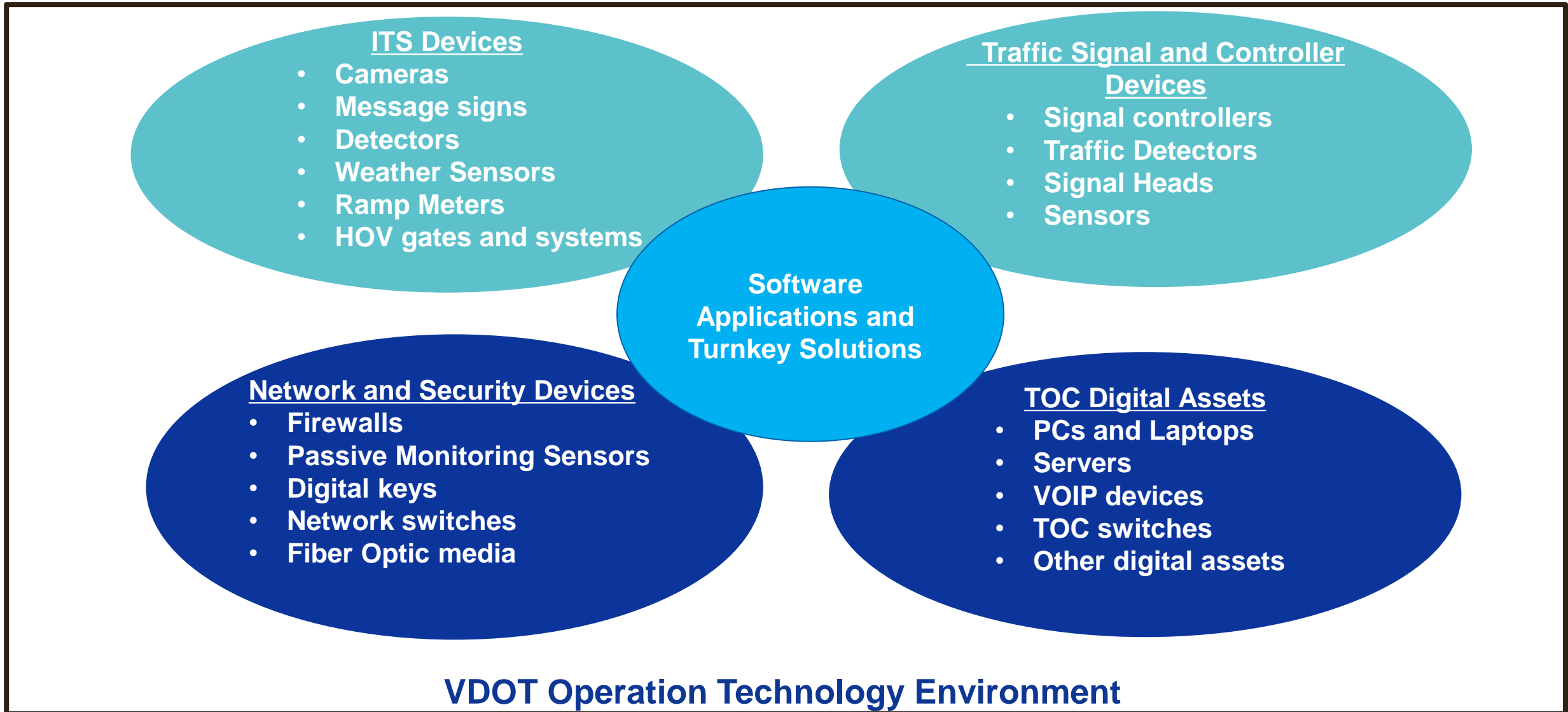- Dial-up
- Satellite
- Radio

Operations Technology Network Operations Center (OTNOC)

- 24 x 7 x 365 Monitor, Analyze, Respond
- Asset Inventory Management
- Asset Service Management
- Configuration and Change Management
- Tier 2 Support

Field Devices

- Cameras
- Dynamic Message Signs (DMS)
- Traffic sensors
- Control cabinets
- Loop detectors
- Traffic signals
- Tolling technologies (LPR, VDS, etc.)
- Gates
- Lane controls
- Ramp meters
- Fog lights
- Smart Roadway Lighting Solutions

Operations Technology is a set of Industrial Control Systems Using Hardened/Secure Information Technology components and Intelligent Edge Devices
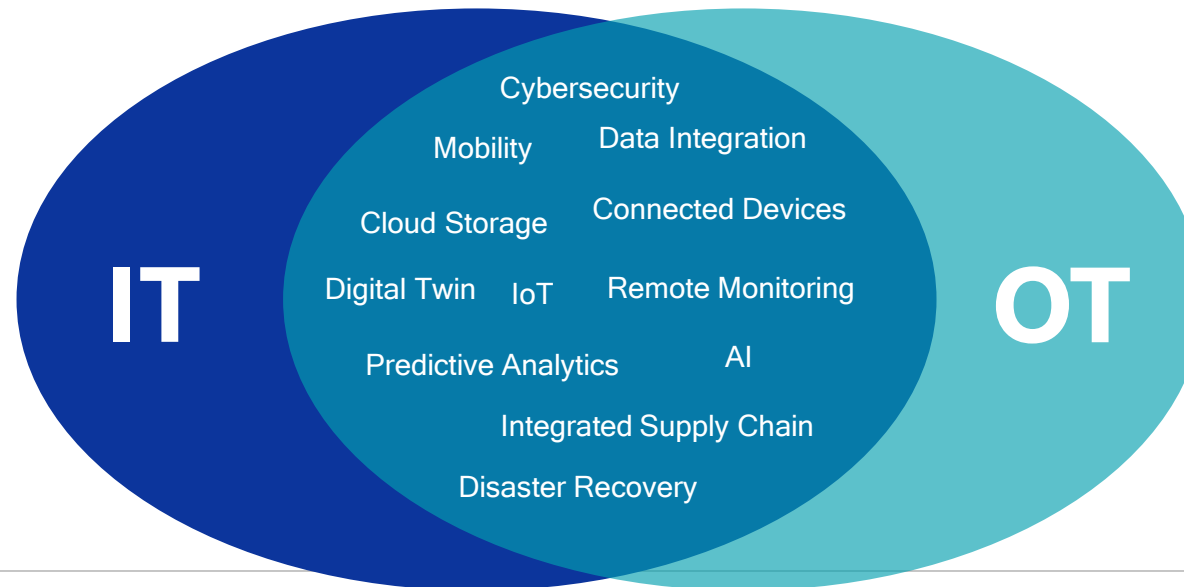

ITS Devices
- Cameras
- Message signs
- Detectors
- Weather Sensors
- Ramp Meters
- HOV gates and systems

Traffic Signal and Controller Devices
- Signal controllers
- Traffic Detectors
- Signal Heads
- Sensors

Software Applications and Turnkey Solutions

Network and Security Devices
- Firewalls
- Passive Monitoring Sensors
- Digital keys
- Network switches
- Fiber Optic media

TOC Digital Assets
- PCs and Laptops
- Servers
- VOIP devices
- TOC switches
- Other digital assets

VDOT Operation Technology Environment

Unlike the past, many new technologies fall under both IT and OT, further driving the need for convergence between the two

VDOT

The Past

IT

OT

The Future

IT

OT

Cybersecurity

Mobility

Data Integration

Cloud Storage

Connected Devices

Digital Twin   IoT

Remote Monitoring

Predictive Analytics

AI

Integrated Supply Chain

Disaster Recovery

Types of Technology Procurements for ITS and TOC Environments

Types of Technology Procurements	Technology Procurement Vehicles
• **Design and Engineering Consulting Services**	• **On-call services**
• **Program and Project Management Services**	• **Technologies included as part of Construction projects**
• **Operations and Maintenance Services**	• **Invitation for Bid (low bid)**
• **Software, Tools, and Technology Equipment**	• **Request for Proposals (RFP)**
• **Field Devices**	• **Pre-qualified statewide contracts for software goods**
• **Systems and Turnkey Solutions**	• **Staff Augmentation Services (labor only)**
• **"Cloud" services (private, public, etc.), SaaS services**	

IT Procurements and OT Influences

Traditional IT Procurements	Additional OT Influences on ITS Procurement
• Central IT State Agency procurement processes	• OT is Industrial Control System, requiring additional hardening
• Established state contracts	• Agency APL (Approved Product List) creation and maintenance
• One step RFP style or two step pre-qualification followed by limited competition	• Road and Bridge specification
	• Civil construction coordination
• Sole Source justified Contracts	• High voltage power considerations
• Emergency Contracts	• Acceptance testing, burn-in period (parallel operation), transition to production
	• Service contractors must be familiar with MUTCD and Work Area Safety Manual

Considering life cycle and flexible asset management in contracting

Themes in Procurement	Themes in Financing Procurements
• **Take a long term view based on desired outcomes – technology/devices supporting ITS are here to stay**	• **Life cycle cost management – Consider contract terms that require periodic upgrades and with annualized payments**
• **Develop long term vendor partnerships and contracts**	• **Statewide Consistency – allows for volume pricing to improve buying leverage**
• **Consider a lifecycle Management approach – including obsolescence management and sustainability**	• **Build lifecycle and obsolescence funding model, requiring annual investments**
• **Assess the current situation:** 　• **What is in place now – type, age, function, supportability** 　• **What new relevant functions and features are available in the market place** 　• **What new product functions are we seeking/influencing**	• **Various funding sources come with "strings" attached – need to make sure project scope aligns with funding requirements**
• **Agency Approved Product List for OT devices and solutions**	

Innovation in Acquisition Management

Pre-Procurement Activities

- Industry Day for large RFP style procurements
- RFI style information gathering
- Loaner equipment for "live" suitability testing and proof of concept - product viability in VDOT OT environment
- Vendor "pre-sales" technical expertise on evaluation and best fit product and options selection
- Pre-sales solution engineering

Post Procurement Activities

- O & M Support terms
- Obsolescence management (technology refresh)
- Spare parts management
- Influencing product development roadmaps
- Asset inventory – licenses, seats, etc.

During Active Procurement Activities

- Parts and Services BOM
- Negotiated terms – volume (maximum) discounts, flexible return/exchange policies
- Consider Agile approach for Software and Systems development activities
- Ensure process is built in to test product enhancement inclusion before operational release

Procuring ITS Solutions through Construction Contracts

Pros	Cons
• **Ensures good specifications are developed through the PE process**	• **Construction contractors have difficulty dealing with technology items, often an electrical engineer is asked to decide and not on OT expert**
• **Educate TSMO role in overall PE and Construction process**	• **When cost overruns take place ITS and technology services are cut first**
• **Corridor improvement initiatives have large investments – building in ITS expenses would not be burdensome**	• **Construction contracts are based on traditional civil infrastructure rules – including technology is often difficult, especially considering Federal desire for competition where marketplace may not exist**
• **Contractors are required to expand their service to include technology**	
• **Construction projects often deal with Roadside technologies, not TOC technologies**	
• **Technology becomes part of all construction PE processes – scoping, environmental, safety, financing, etc.**	

Lessons Learned & Best Practice Recommendations

Lessons Learned

- Developing and maintaining an APL is absolutely necessary

- Plans to transitioning out of contracts must be part of the contract deliverables

- Vendors must become solution and delivery partners, and must be vested until their product is no longer in service

- Priority support services, firmware upgrades, and spare parts must be part of the contract

- Roadside device service providers often deal with high voltage 240v/480v circuits

Best Practice Recommendations

- Ensure qualified PM is on board that understand current processes and practices

- Road and Bridge specification must be kept updated

- Contracting language must keep up with changing technology landscape

- Cyber Security considerations must be foundational in specifications, not an after thought or "bolt-on" addition

- Traffic volumes and work zone restrictions must be considered while attempting to service a technology component on the road

- Training is required for ITS SMEs and ITS procurement specialists

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