NDOT Smart Mobility Plan v1

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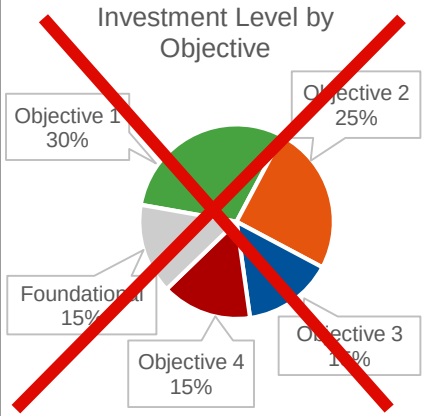
NDOT Smart Mobility Plan v1

NDOT Objectives	State Capabilities	Strategic Actions
Data-driven Decisions	Cloud-enabled Growth & Management Data-driven Decision Making	Hybrid Cloud Definition Cloud Cost Management Mobility Data Management
Efficient Workforce	Build Nimble Workforce	Align Staffing & TSMO Revise Education Program
Compliance & Safety	Reduce incidents & fatality rate Align with regulatory bodies	Develop federally-aligned policies
Mobility Platform	Deliver mobility communication platform	Develop shared communication infrastructure Delivery cost-effective 5G Strengthen ITS asset management Strengthen security for ITS

Strategic Initiatives Roadmap

1Q2021	2Q2021	3Q2021	4Q2021
Develop hybrid-cloud strategy	Develop cloud cost management & monitoring framework		
Align strategic direction edge computing		Develop mobility data business plan	
Define data strategy, governance, sharing		Define mobility data inventory & stewards	
Define data sharing formats			
Replace industrial network switching		Develop dashboards to enable decision making	
Analyze staffing procedures / TSMO		Fulfill TSMO smart mobility skill development	
Review professional education programs		Develop recruiting & training framework	
Develop CAV implementation policies		Implement IoT & TSMO CAV strategies	
Align With Federal, State, Industry Reporting Requirements			
Eliminate dial-up		Communication infrastructure sharing	
Define NDOT 5G Standards		Evaluate 5G cost models for deployment & data	
Improve ITS asset inventory accountability		ITS asset logging & reporting for maintenance	
Align with state security requirements		Multi-factor authentication for all ITS users	
Mobile device management solution			

Financial



- Interagency collaboration to define KPIs
- Develop framework for vendor selection

Key Assumptions

- Network performance costs will align with IoT use case

Metrics/KPIs

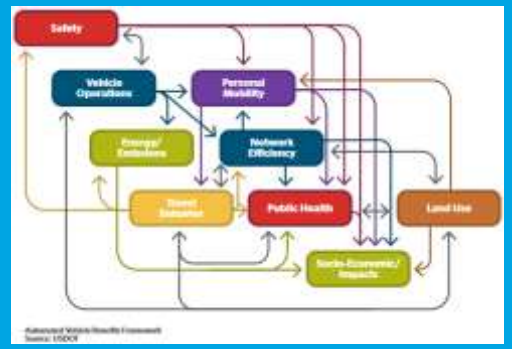
- Reduce time to make decisions
- Refine use of workforce
- Increase driver safety

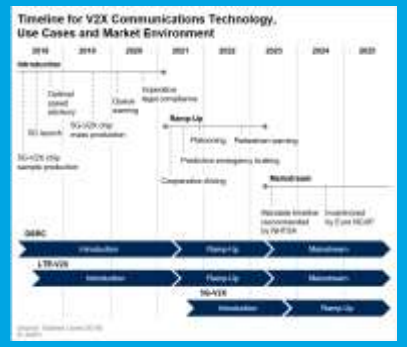
Key Dependencies, Risks, Assumptions

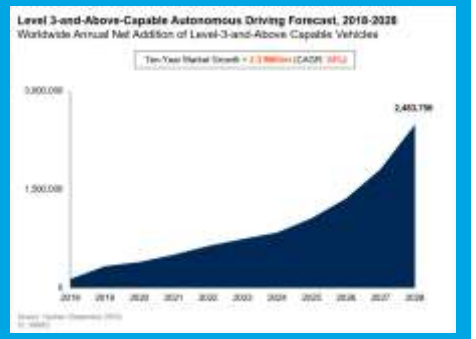
- Safety is top priority in Smart Mobility initiatives
- Requires Division/District/Agency Collaboration
- Agency MOUs required for data sharing
- Resources prioritized to complete initiatives
- Evolving needs require workforce training
- Central processing will be used until Edge is required
- Hybrid cloud strategy for IoT, not enterprise use
- Hybrid cloud will have increased security
- Funding prioritization to support Smart Mobility
- Demands on ITS network increasing
- Microwave will be necessary for backup comm.
- SPB will be used to handle traffic load increase
- MPLS deployments will be used
- Auto industry will select 5G, contingency plan needed
- ITS inventory mgmt. will reduce costs
- Common key in use on most cabinets

Sample of Industry Initiatives that Influence NDOT Smart Mobility Plan

Smart Mobility	
Driverless	Accessible Autonomy
Incremental	Vehicle Sharing







NDOT SMART MOBILITY PLAN

New Capabilities NDOT Will Need

Ecosystem development

Training

Safety

Road Network

Communications/IT Network, Small Cell (5G)

Devices, Edge

Staffing / Resources

Public / Private Transportation

ITS Asset Management

DATA

Infrastructure / Cloud

Security / Risk

Financial, RFP, Cost Optimization

REGULATORY

KPIs

ALL

Denise

Rod

Seth

Kandee

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One-Page Strategies

Smart Mobility Component: Financial, RFP

Statement of Strategy or Mission: Achieve COTS solution for Smart Mobility, providing consistent vendor selection process and cost-optimized decision making framework that fits within the Department's budget.

Current State

- Multiple initiatives to meet needs in a small silo
- Capability overlap across Divisions / Districts
- Duplicate and informally governed data, increasing costs
- Contracts are not performance based

Top 5-7 Initiatives

1. Data Strategy aligned across the Divisions/Districts
2. Spend-Decision Making Framework for Capabilities
3. Framework for vendor evaluation / selection
4. Contract evaluation/cost-effectiveness

Top 5-7 Underlying Beliefs and Assumptions

1. Divisions/Districts must use and extend the Smart Mobility initiative platforms; and must articulate how to extend the platforms

Future State

- A single Smart Mobility initiative that includes a number of platforms that is leveraged across the Divisions
- Reduce capability overlap and bring cost-effective solution
- Achieve economies scale in pricing
- Scaling the solution will be cost-effective because of the platforms
- Managed data drives cost-effective and efficient decision making [< 15%]
- Contracts are performance based, ROI

Smart Mobility Component: KPIs

Statement of Strategy or Mission: Achieve effective measurement & metrics of COTS solution for Smart Mobility. ROI...

Current State

- Work with specific Divisions to gather the baselines to support the future KPIs of:
  - Reduce time to Decision Making
  - Refine use of Workforce

Top 5-7 Initiatives

1. Implement (Departmental) Telematics initiative to learn their KPI needs (very workflow focused)
2. Implement cross-dept/interagency initiative to learn their KPI needs
3. Put in place process for continuous refinement of goals/measurements because of the fast-changing data availability
4. Initiative for automated, timely capture of KPIs

Top 5-7 Underlying Beliefs and Assumptions

1. …

Future State

- Support a cross-interagency view of measurements
- Provide a mechanism for continuous refinement of KPIs
- Integrate with and leverage the Data Strategic plan
- Potential KPIs for overall:
  - reduce time to decision making
  - refine use of the workforce

Reduce time to decision making
Refine use of workforce

Smart Mobility Component: Data

Statement of Strategy or Mission: Improved availability of mobility data to support planning, operations, and performance measure activities.

NDOT Data & Analytics Program (DAP) 2020

Describing Current State

- DAP established a Governance Committee and Strategic Data Plan
- Smart Mobility Data Business Plan integrated with Strategic Data Plan
- Performance Analysis Data integrated with Strategic Data Plan
- DAP established Projects and Action Report
- DAP developing a Roadmap, Priorities, Data Stewardship & Catalog, and a Communications Plan

Top Initiatives

1. Review and development of mobility data business plans and update current performance goals and baselines
2. Identify best practices for data strategy, governance, and sharing
3. Develop Mobility Regional Coordination Group that aligns with FHWA Mobility Data Business Plan and NDOT DAP.
4. Develop SWOT (Strengths, Weaknesses, Opportunities and Threats) flowchart of all existing mobility data
5. Develop Mobility Data Governance Core Groups and coordinators.
6. Develop mobility data inventory & stewards
7. Develop standard format for mobility data sharing across the region; including statewide GIS database
8. To provide quality, accessible mobility data for strategic decision making with targeted investments.
9. Develop performance measurement reports to support ROI / decision making

Top Underlying Beliefs and Assumptions

1.Coordination and alignment with the Strategic Data Plan

2.MOUs, agreements, policies are in place with agencies on data sharing

3.Appropriate resource prioritization to ensure timely completion of the Initiatives above

Smart Mobility Data Business Plan

Describing Desired Future State

- Data-based decisions that improve system operations, ROI and business case
- A forum for facilitating cross-organizational collaboration, data sharing, and integration of roadway travel mobility data within the region to address gaps and redundancies documented in the Mobility Data Business Plan
- Core Groups ensure compliance with Mobility Data Governance Plan
- The Data Stewards become the SMEs for Data Governance Program
- A formalized process that clearly identifies consistency of the data across all transportation agencies

Smart Mobility Component: Devices, Edge

Statement of Strategy or Mission: Implement technology solutions and strategies on Nevada roadways and collaborate within NDOT and partnering agencies to provide the department and the traveling public timely, reliable, and accurate information to facilitate safety and operational efficiency.

Current State

1. Enterprise network switching equipment with advanced routing functionality is being deployed statewide.
2. Edge computing requirements not known.
3. Antiquated protocols in use for many ITS edge devices.
4. Wrong Way Driver system uses edge computing.
5. Workforce is trained in many technologies to keep the network system functional. (Ex: protocols, security and various communication types)

Initiatives:

1. Continue replacement of all industrial network switching equipment.
2. Understand the strategic direction of establishing edge computing.
3. Vendor engagement to identify and replace antiquated protocols.
4. Align with state security data governance directives.

Underlying Beliefs and Assumptions:

1. Demands on ITS network are continually increasing becoming more dynamic.
2. The evolving needs will require more training and support for technicians related to the emerging needs, to keep the network system functional and responsive to demands.
3. Until requirements dictate otherwise central processing will be used instead of edge computing.

Future State

1. Enterprise network switching equipment has been deployed statewide.
2. ITS edge devices using modern protocols.
3. Edge computing needs are identified, and strategies have been determined.
4. Edge computing has been deployed as needed to satisfy emerging business needs.

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Smart Mobility Component: Infrastructure Cloud

Statement of Strategy or Mission: Implement technology solutions and strategies on Nevada roadways and collaborate within NDOT and partnering agencies to provide the department and the traveling public timely, reliable, and accurate information to facilitate safety and operational efficiency.

Current State

1. Cloud services are being used as needed based on vendor capabilities.
2. Majority of NDOT mobility data originates from our network and on prem devices which delivers high-performance at low cost.
3. Some ITS systems offer cloud hosting and cloud-based solutions.

Initiatives:

1. The development of a hybrid cloud strategy.
2. Development of hybrid cloud vendor-selection decision criteria.
3. Development of cloud migration strategy.
4. Development of cost-based decision criteria for specific IOT devices or other capabilities.
5. Development of cloud monitoring strategy (Financial and Operational).

Underlying Beliefs and Assumptions:

1. The hybrid cloud strategy will describe cloud usage for IOT or other devices and not for enterprise usage.
2. Cloud data should align with the ITS data strategy.
3. Hybrid cloud solution will have same level if not better security.
4. Network performance costs will be aligned to specific IOT use case.

Future State

1. A hybrid cloud strategy is in existence and it guides our cloud usage.
2. Vendor selection criteria includes cloud capabilities.
3. Organization is capable of monitoring financial and operational aspects.
4. Cloud data supports dashboarding and decision making.

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Smart Mobility Component: Staffing Resources

Statement of Strategy or Mission: Delivering a robust and sustainable TSMO Program with the appropriate staffing and resources founded by the TSMO knowledge, skills and abilities

NDOT TSMO Program 2020

Describing Current State

- Section 4.4 Resource Management includes both financial and staffing resources within that dimension:
- Emerging Technologies and Innovative Programs Management (such as CAV)
- Performance Planning and Management
- TSMO Strategies Management
- TSMO Program Engineer and Management
- Regional TSMO Coordination
- Data/Asset Management

Top Initiatives

1.Develop strategic management framework for recruiting and retaining TSMO related staff

2. Fulfill required skills and resource through staff, positions, and job elements to support implementation of TSMO Program for Smart Mobility

3. Career progression for TSMO staff

4. Provide TSMO & Smart Mobility training for staff

5. Reviews existing professional education and training programs

Top Underlying Beliefs and Assumptions

1. Funding prioritization to support Smart Mobility

2. FTEs as outlined in the TSMO plan to support the Smart Mobility Plan

Future State for TSMO

Describing Desired Future State

- Establish a TSMO Steering Committee to be efficient and integrate TSMO throughout NDOT
- Develop the TSMO Workforce Development Plan (WDP)
- Develop new TSMO positions, descriptions
- Plan to revise existing professional education and training programs
- Staff and resources which are trained to support TSMO / Smart Mobility
- A Strategic management framework developed for recruiting and retaining TSMO related staff

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Smart Mobility Component: Training

Statement of Strategy or Mission: Delivering a robust and sustainable TSMO Program is dependent on staffing and workforce with appropriate TSMO knowledge and skills.

TSMO Program Plan 2020

Describing Current State

- TSMO Program Plan has identified the Strategic, Programmatic and Tactical Elements for a Training Program
- NDOT has a well established TIM training program as part of the Business Process.
- NDOT Traffic Operations is actively working to develop more robust and successful ITS training programs to support construction activities.

Top Initiatives

1. Review of existing professional education and training programs.

2.Analysis of existing WPS, KSA's, staffing and recruitment procedures for staffing and workforce development regarding TSMO training.

3.Develop training and information programs to all internal and external staff.

4.Staffing and workforce development.

Top Underlying Beliefs and Assumptions

1. 2014 CMM assessment cited strengths in the following areas:
    1. Business Processes for TIM Coalition and SHRP2 training.
    2. Culture for construction regarding signals and operations.
    3. Organization and staffing as a model for state training. However, not a stellar program. No training program/matrix/plan. Need for training for generalization gap (aging staff). Need for more aggressive in-house and out-of-house training. Need for a mid-career Rotational Program.

Future State for TSMO

Describing Desired Future State

- Emerging Technologies and Innovative Programs Management (such as Connected and Automated Vehicles)
- TSMO Strategies and relationship to CAV
    - Arterial Management
    - Active Traffic Management
    - Congestion Pricing
    - Emergency Transportation Operations

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Smart Mobility Component: Regulatory

Statement of Strategy or Mission: Legislation established for a performance-based highway program funding transportation programs focused on national and local transportation goals and increased accountability and transparency.

MAP-21 and FAST

Describing Current State

- NDOT Certified TAMP 2019
- NDOT Strategic Plan 2020
- NDOT TSMO Program Plan 2020
  - NDOT ITS Asset Management Business Plan
  - FHWA (Asset Management Overview, 2017)

Top Initiatives

1. Alignment with federal, state & industry reporting requirements
2. Develop Smart Mobility Program policies and procedures
3. Develop Mobility Data Business Plan that aligns with FHWA Mobility Data Business Plan and NDOT DAP

Top Underlying Beliefs and Assumptions

1. MAP-21 and FAST do not have a specific focus on ITS.
2. Since NDOT had begun the implementation of asset management principles prior to the MAP-21 legislation, the agency in a good position to expand the scope of the TAMP beyond the minimum requirements outlined in the law.
3. Develop dashboarding to be able to tell the story

Smart Mobility Data Business Plan

Describing Desired Future State

- Development of ITS asset health reports and performance measurement
- Development of a framework that aligns with TSMO strategies to future proof NDOT's TSMO asset management system
- Two FTEs will ensure regulatory alignment

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Smart Mobility Component: Roadway Network

Statement of Strategy or Mission: Implement solutions on Nevada roadways and collaborate within NDOT and Partnering Agencies with the goal of improving transportation efficiency and safety. Traffic Operations having an interest in advancing Transportation Systems Management and Operations (TSMO) strategies with Connected and Automated Vehicle (CAV) focuses on how traffic can move more efficiently on the infrastructure.

TSMO Program Plan 2020

Describing Current State

- NDOT has established a new innovation office, IoT, with a focus on assisting with the development of an overarching strategy for the implementation and integration of emerging transportation technologies.
- NDOT is actively supporting connected and automated vehicle initiatives in both northern and southern Nevada.

Top Initiatives

1. Implementation of initiatives championed by the IoT and TSMO CAV strategies.
2. Development of CAV implementation policies and guidelines.
3. Coordination between the IoT office and the newly requested TSMO staff.
4. Staffing and workforce development.

Top Underlying Beliefs and Assumptions

1. safety 1st
2. Programs that consider opportunities to deploy Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) connectivity to improve safety, mobility, environmental performance, and organizational efficiency on major travel corridors.

1. Source: https://ops.fhwa.dot.gov/ publications/fhwahop17001/ch1.htm

Future State for TSMO

Describing Desired Future State

- Emerging Technologies and Innovative Programs Management (such as Connected and Automated Vehicles)
- TSMO Strategies and relationship to CAV
  - Arterial Management
  - Active Traffic Management
  - Congestion Pricing
  - Emergency Transportation Operations
  - Etc.

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Smart Mobility Component: Safety

Statement of Strategy or Mission: Implement solutions on Nevada roadways and collaborate within NDOT and Partnering Agencies to include TSMO strategies such as Traffic Incident Management, Work Zone Management, Special Event Management, and Road Weather Management.

TSMO Program Plan 2020

Describing Current State

- There were 331 traffic fatalities in 2018 in Nevada, the largest fatality count in the last decade (Safety O. o., 2019).
- Traffic crashes in Nevada imposed a total of $1.98 billion in economic costs in 2017 (Safety A. f., 2019).
- Motor vehicle crashes cost Nevada motorists $906 million per year in medical costs, lost productivity, travel delays, workplace costs, insurance costs, and legal costs. (Key Facts about Nevada Surface Transportation, 2017).

Top 3 Initiatives

1. Reduce the number of incidents.
2. Reduce the state's fatality rate.
3. Reduce the number of secondary incidents.

Top Underlying Beliefs and Assumptions

1. safety 1st
2. Communication and collaboration between internal and external agencies and stakeholders is an essential element for success of the TSMO Program. In addition, collaboration is one of the six CMM dimensions that NDOT intends to reinforce. TSMO activities need to be appropriately coordinated to deliver effective safety and mobility improvements.

Future State for TSMO

Describing Desired Future State

- Decrease the projected 5-year rolling average of traffic fatalities by at least 1
- Decrease the projected 5-year rolling average of serious injuries by at least 1
- Decrease the projected 5-year rolling average of fatalities per 100MVMT by at least 0.5
- Decrease the projected 5-year rolling average of non-motorized fatalities & serious injuries by 1

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Smart Mobility Component: Communications

Statement of Strategy or Mission: Implement technology solutions and strategies on Nevada roadways and collaborate within NDOT and partnering agencies to provide the department and the traveling public timely, reliable, and accurate information to facilitate safety and operational efficiency.

Current State

1. The department uses Fiber optics, microwave, cellular, and dial-up to provide for our communication needs.
2. ISO model Layers 2 and 3 are implemented for network service delivery.
3. Public safety radio system is at end of life.
4. Unequal distribution of communication types among different regions.
5. Data may not be in a usable and accessible format for department personnel.

Initiatives:

1. Moving to eliminate dial-up
2. Communication infrastructure sharing program.
3. Inclusion of communications infrastructure in ongoing capital highway projects.
4. Research new technologies such as 5G communications and edge computing.
5. Focus on curating communications data and building a performance measurement dashboard.
6. Adopt 5G for respective regions as soon as it becomes available.

Underlying Beliefs and Assumptions:

1. Microwave will be needed in urban and rural areas as multi-path and backup connectivity options are desirable.
2. Statewide Shortest Path Bridging (SPB) deployment to eliminate Spanning Tree to utilize all links as traffic loads increase.
3. Regional MultiProtocol Label Switching (MPLS) deployments to serve emerging higher bandwidth needs for NDOT and partnering agencies.
4. Available resources and training to support the initiatives are a limiting factor.

Future State

1. 1.Total TCP/IP compliant net-work for all communications.
2. Fiber optics deployed to the fullest extent possible.
3. Shortest Path Bridging (SPB) and MultiProtocol Label Switching (MPLS) for Layer 2 and 3 network service delivery for a multitenant environment.
4. Achieve 95% coverage for portable radio communications statewide.
5. Ability to have improved data on asset management, net-work traffic, better visibility on performance measured data.
6. Adopt 5G where appropriate.

Smart Mobility Component: Small Cell / 5G

Statement of Strategy or Mission: Implement technology solutions and strategies on Nevada roadways and collaborate within NDOT and partnering agencies to provide the department and the traveling public timely, reliable, and accurate information to facilitate safety and operational efficiency.

Current State

1. No small cell wireless communications installed on NDOT right of way.
2. No NDOT standards developed for installing small cell wireless communications.
3. No industry standards for CAV utilization.
4. Exploring partnerships with cellular providers.

Initiatives:

1. Determine NDOT standards and structure requirements to support 5G emerging needs.
2. Evaluate deployment of pilot program which aligns with auto manufacturer's method of communications.
3. Evaluate the cost models for 5G deployment and data collection.
4. Continue research of and input to regulatory requirements of CAV communications.
5. NDOT will provide data and build a communications dashboard.

Underlying Beliefs and Assumptions:

1. The auto industry will choose 5G.
2. If not, NDOT would deploy 5G in low-latency and/or high-bandwidth required scenarios.
3. Additional training and resources will need to be available for 5G deployment.

Future State

1. Finalize processes and NDOT standards for the installation of small cell devices in right of way.
2. Monitor project completion for compliance with industry standards for small cell wireless communications deployments.
3. Support communications in areas where low-latency and/or high-bandwidth is not available.

Smart Mobility Component: ITS Asset Management

Statement of Strategy or Mission: Implement technology solutions and strategies to effectively manage ITS infrastructure thereby facilitating performance-based planning, cost-estimating, reporting and accountability activities.

Current State

1. ITS Device Inventory is currently out of date.
2. Conduit Fiber Inventory is currently out of date.
3. Current system lacks logging of corrective and preventative maintenance measures.
4. ITS device performance measures is currently not being widely accessed.

Initiatives:

1. Reconcile/increase inventory accountability.
2. Logging and reporting creation for corrective and preventative maintenance measures.
3. ITS device performance measure data to be more available for all the Department staff.

Underlying Beliefs and Assumptions:

1. Accurate and updated inventory will allow the department to better realize ITS device life cycle replacement costs.
2. Some assets are not well maintained or replaced in a timely fashion.

Future State

1. Accurate inventory for all ITS assets will help planning and cost-estimate efforts.
2. ITS device corrective and preventative measures reporting and accountability.
3. ITS asset data is readily available to all department personnel.

Smart Mobility Component: Security Risk

Statement of Strategy or Mission: Implement technology solutions and strategies on Nevada roadways and collaborate within NDOT and partnering agencies to provide a secure solution for their information and service delivery requirements.

Current State

1. Security fabric created utilizing multiple products working in conjunction to secure and minimize the attack surface.
2. Compliance to currently published state security requirements.
3. Account Access Rights Management software used to monitor, query and report on all ITS users.
4. ITS roadside cabinet physical security concerns.
5. Switch port security not deployed on all network switching equipment.
6. Lack of mobile device management solution.
7. Firewall logging and reporting of security events not widely used.

Initiatives:

1. Multi-factor authentication for all ITS users.
2. Review and plan for changes to state security requirements.
3. Review ITS user accounts access and manage rights.
4. Smart locking solution proof of concept project.
5. Statewide review for switchport security applicability.
6. Review and selection of mobile device management solution.
7. Identify and create required security event data reports and determine the frequency of distribution.

Underlying Beliefs and Assumptions:

1. TOTS doesn't have a full accounting of all ITS user account access rights.
2. Edge security improvements will be an evolving need.
3. Common key in use on most cabinets nationwide.

Future State

1. In full compliance with newly published state security requirements.
2. Enforceable access rights policies have been created.
3. Smart locking solution provides a full accounting of access.
4. Switchport security applied to all edge equipment.
5. Robust mobile device management system is in place.
6. Security reporting available to the decision makers and information security officers.

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