Documenting and Configuring a Traffic Management System (TMS) Inventory

Transportation Management Center (TMC)

Pooled-Fund Study[1]

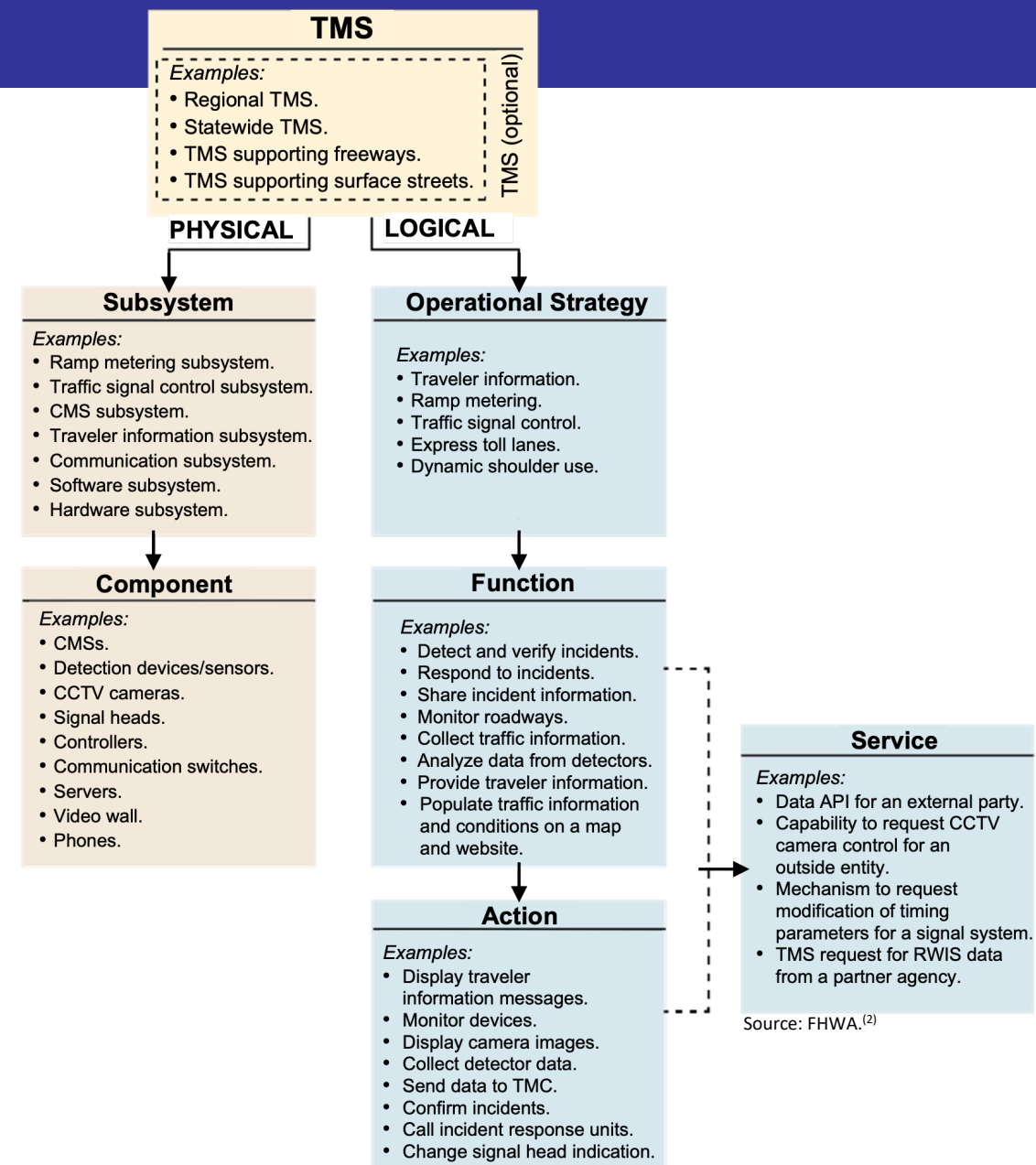**Federal Highway Administration (FHWA)**

November 2024

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TMS Elements

TMS design and structure can be broken down into physical elements and logical elements:

- Physical elements include the subsystem and components.

- Logical elements include the operational strategies, functions, actions, and services.

Source: FHWA.[2]

API = application programming interface; CCTV = closed-circuit television; CMS = changeable message sign; RWIS = road weather information system.

Note: The solid lines show the internal system hierarchy; the dashed lines show the need for connection to external systems.

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Managing TMS Assets

Activities conducted throughout the TMS's lifecycle to manage assets may include:

- Preparing to manage TMS assets.

- Managing TMS asset data, including identifying, classifying, and inventorying.

- Maintaining TMS asset data, including condition rating, data maintenance, asset spare management, and asset configuration management.

- Monitoring, evaluating, and reporting on TMS assets.

Source: FHWA.[3]

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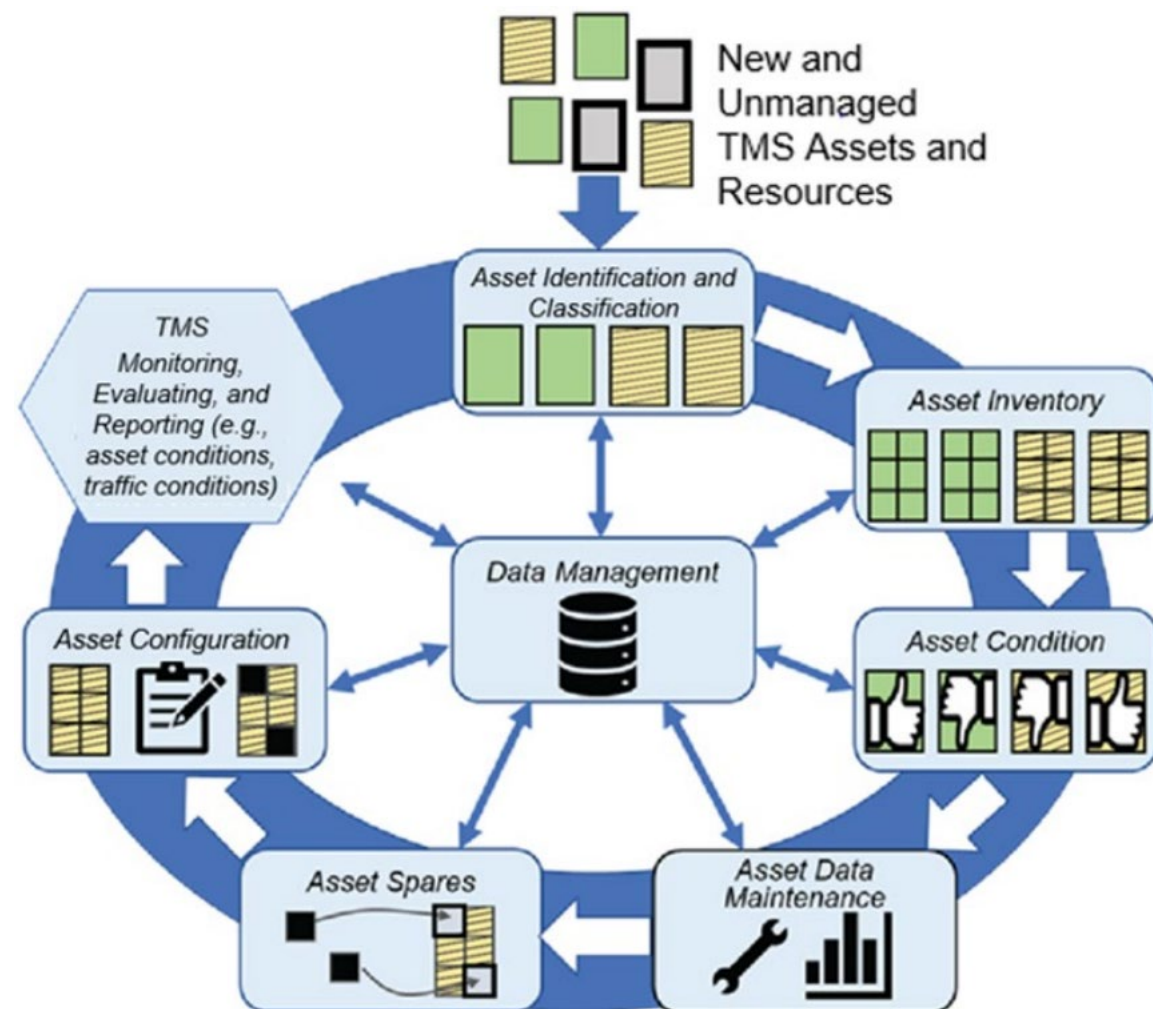
Benefits of Managing TMS Assets

- Monitoring, managing, and reporting on TMS asset condition.

- Achieving and sustaining a state of good repair for managed TMS assets.

- Managing TMS asset lifecycles to achieve desired performance with lower overall costs.

- Improving the performance of TMS assets and the overall TMS.

- Integrating the condition of TMS assets and resources into how they are managed, maintained, repaired, replaced, and operated.

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What Is a TMS Asset Inventory?

An inventory describes a TMS's assets and supports understanding asset condition, performance, and needs:

- Each asset is described by attributes, such as:

  - o Quantity.
  - o Make and model.
  - o Age.
  - o Location.
  - o Condition.

- An inventory is limited by the data that are available, can be collected, and have utility for managing assets:

  - o Not all available information has value for managing an asset.
  - o Too much information may make data management overly complicated.

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Value of a TMS Asset Inventory

- Provides accurate data for TMS monitoring, evaluating, and reporting processes.

- Yields information about TMS assets, such as status, condition, and performance.[4]

- Feeds into various TMS planning activities, plans, and other processes throughout the lifecycle of the TMS.

- Helps identify gaps in the current system and make decisions about asset maintenance and replacement.

- Supports procuring individual TMS elements.

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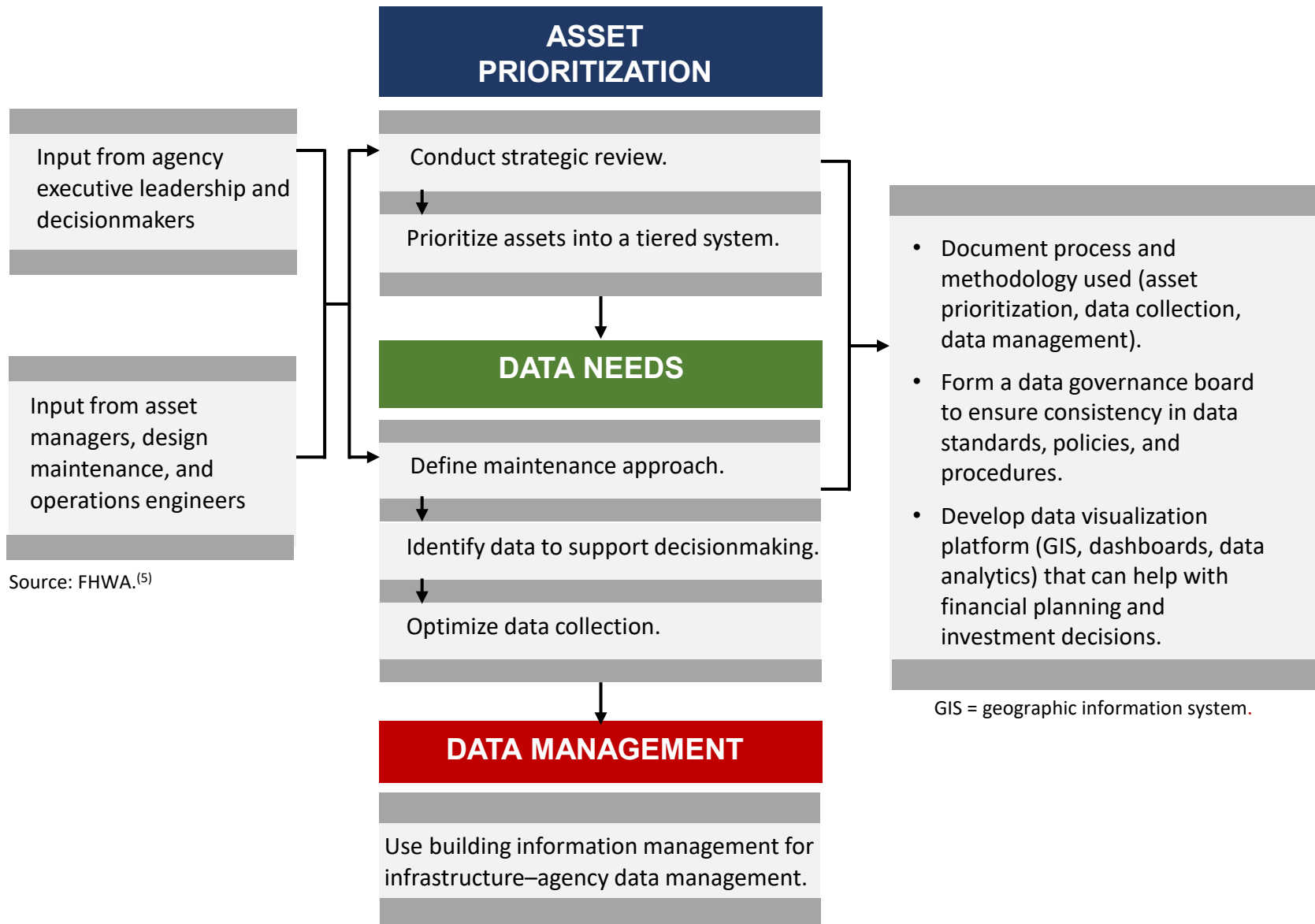# Initiating and Sustaining an Inventorying Effort

Initiating the effort:

- Review existing asset information or existing inventories.

- Determine inventory scope based on system size, complexity, and intended use.

- Select TMS assets and resources to inventory.

- Select TMS asset attributes to include.

- Determine how and where inventory information is collected and stored and what resources are needed.

Sustaining the effort:

- Maintain inventory accuracy.

- Analyze impact on agency resources.

- Integrate with existing processes.

- Ensure ongoing quality assurance processes.

- Leverage inventory information.

- Update inventory information during routine asset maintenance processes.
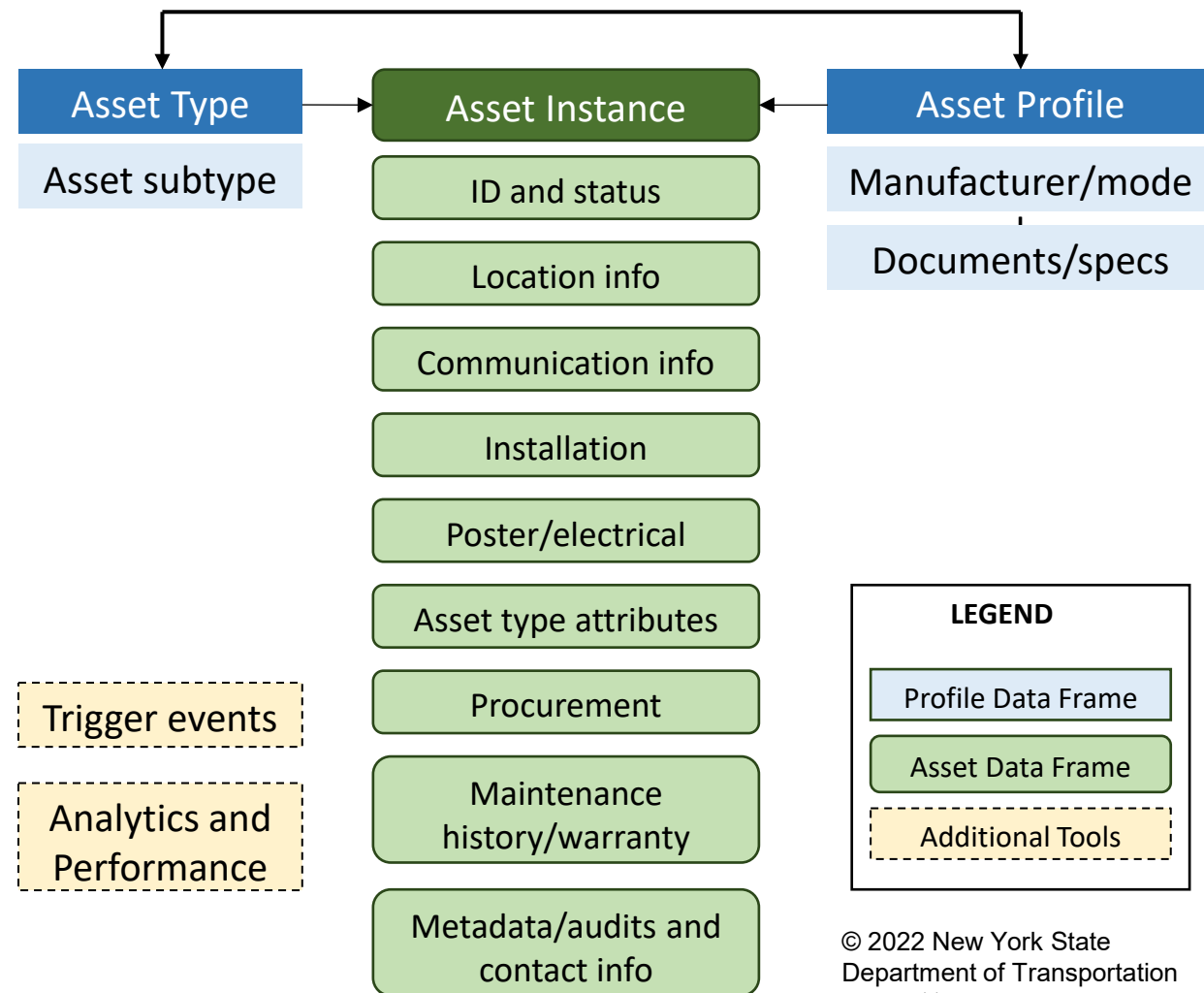
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Process To Select TMS Assets To Inventory: Example Flowchart

ASSET PRIORITIZATION

Conduct strategic review.

Prioritize assets into a tiered system.

DATA NEEDS

Define maintenance approach.

Identify data to support decisionmaking.

Optimize data collection.

DATA MANAGEMENT

Use building information management for infrastructure–agency data management.

Input from agency executive leadership and decisionmakers

Input from asset managers, design maintenance, and operations engineers

Source: FHWA.[5]

- Document process and methodology used (asset prioritization, data collection, data management).
- Form a data governance board to ensure consistency in data standards, policies, and procedures.
- Develop data visualization platform (GIS, dashboards, data analytics) that can help with financial planning and investment decisions.

GIS = geographic information system.

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Considerations in Selecting TMS Assets To Inventory

Example framework for defining asset inventory:

- Asset type—Correlates with subgroup and may define the type or class of the asset (e.g., camera, signal).

- Profile—Identifies information that may distinguish assets of a similar type (e.g., make and model).

- Instance—Includes attributes that uniquely describe each asset (e.g., location, condition, maintenance history).

Asset Type	Asset Instance	Asset Profile
Asset subtype	ID and status	Manufacturer/model
	Location info	Documents/specs
	Communication info	
	Installation	
	Poster/electrical	
	Asset type attributes	
	Procurement	
	Maintenance history/warranty	
	Metadata/audits and contact info	

Trigger events

Analytics and Performance

LEGEND

| Profile Data Frame |
| Asset Data Frame |
| Additional Tools |

© 2022 New York State Department of Transportation (DOT).[4]

ID = identification; info = information; specs = specifications.

Challenges in Inventorying TMS Assets

- Starting the inventorying effort and obtaining necessary resources.

- Updating or enhancing the inventory over time.

- Maintaining inventory information and keeping it current.

- Incorporating tasks to update the inventory as part of existing processes.

- Sustaining resources to support, manage, and maintain the TMS asset inventory.

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Documenting TMS Assets and Resources

Documenting is the capture, management, and maintenance of TMS asset information and resources. This process includes recording changes in the inventory as devices are:

- Maintained.
- Serviced.
- Upgraded.
- Reconfigured.
- Removed.

Benefits of Documenting TMS Assets

- Accessing and using documents (e.g., specifications, request for proposal, contract, plans, vendor or contractor warranty) for more informed decisionmaking.

- Accessing warranty support throughout the asset's lifecycle.

- Maintaining a centralized inventory of documentation to create better historical records and knowledge sharing.

- Accessing comprehensive documentation to improve processes for overall TMS performance.

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Examples of TMS Inventory Documentation

- Saving and inventorying requirements, specifications, and documents used for selecting, obtaining, and installing assets.

- Capturing delivery documentation, such as invoices, shipping information, and validation of the asset's condition on receipt.

- Recording installation details, including testing, acceptance, connections established, and postinstallation inspection.

- Documenting service orders or tickets to the asset inventory's historical record, including personnel involved, dates, actions taken, parts replaced, and photographs.

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Challenges in Documenting Inventory of TMS Assets (1/2)

- Designing and implementing processes and tools to add documented information to a TMS asset inventory.

- Establishing procedures for updating documentation as part of regular maintenance and upgrade activities.

- Coordinating with other sources and users of documentation.

- Managing varying practices and expectations or disparate storage locations.

- Handling inadequate integration between existing documentation storage and inventory systems.

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Challenges in Documenting Inventory of TMS Assets (2/2)

- Maintaining accurate work order logs and documentation.

- Supplementing insufficient documentation of practices or expectations.

- Finding alternative information when key documentation for TMS assets is missing.

- Providing documentation and version control to maintain integrity of asset information.

- Assigning clear roles and responsibilities for documentation tasks and providing adequate staff training.

- Incorporating access to TMS asset inventory across multiple systems and platforms to ensure documentation is accessible and consistent.

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Configuration Management To Support a TMS Asset Inventory

- Configuration management is a series of processes and procedures that support system integrity (configuration identification, change management, configuration status accounting (CSA), configuration audits).[5]

- Configuration management practices are directly applicable to establishing and maintaining a TMS asset inventory.

- Configuration management's integration into existing agency processes provides a framework for effective TMS asset inventory management.

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Benefits of Configuration Management for TMS Asset Inventories

- Improves inventory accuracy and reliability through well-defined processes.

- Enables unique identification and tracking of individual assets in the inventory.

- Creates uniform identifiers for assets across tools and resources.

- Provides historical record of asset changes.

- Verifies TMS assets are as expected or identifies how assets have changed.

- Enhances integration of asset information with other systems and processes.

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Configuring TMS Asset Information

- Hardware component versions (detectors, signal heads, communication devices).

- Software versions (date installed, warranty information, vendor or maintenance support, user manuals).

- Asset maintenance details (date installed, maintenance dates, repairs performed).

- Asset configuration history (change logs, version numbers, debugging information).

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TMS Asset Configuration Management Processes

- Having uniform identifiers for assets across tools and resources.

- Understanding when and why changes are made and by whom.

- Incorporating change documentation and verification into existing processes (e.g., maintenance activities).

- Tracking changes to assets in data management tools.
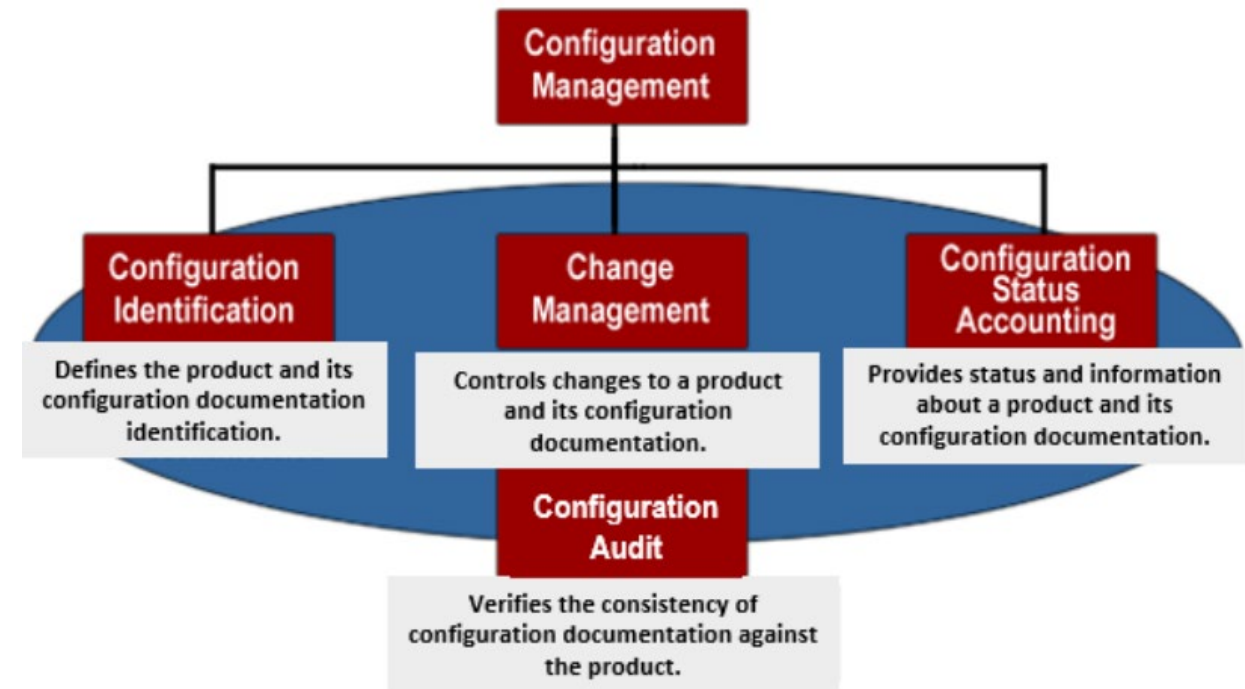
Source: FHWA.[3]

Uniquely Identifying Assets for Inventory Management

- Defining an asset identification scheme.

- Assigning unique identifiers to all assets to track all changes over time.

- Tracking inventory consistently.

- Linking all changes to specific assets.

Managing TMS Asset Configuration Changes

- Assessing the impact of a possible system change:

  o Affect on asset.
  o Affect on entire system.

- Deciding whether to approve a change (via change control board).

- Tracking and documenting changes made (configuration) if changes are approved.

- Documenting and tracking changes within the TMS asset inventory.

Asset Configuration Status Accounting

- Ensuring all documentation and change history information is up to date for the asset's entire lifecycle.

- Providing access to current configuration information.

- Improving TMS asset data quality and data governance by tracking changes to individual asset components.

- Enhancing the reliability of inventory information for TMS management activities.

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Configuration Audits To Verify a TMS Asset Inventory

- Analyzing and verifying asset configuration and documentation within the TMS asset inventory.

- Preventing and correcting inaccurate documentation.

- Verifying routine audits and any recent changes.

- Adding an additional layer of quality for inventory management.

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Benefits of Integrating Documentation Into TMS Operations

- Supports agency planning and allocation of resources.

- Enables routine system maintenance, repairs, and enhancements.

- Facilitates managing TMS assets and supporting activities.

- Helps establish and track asset performance measures and targets through data-driven insights.

- Enables more accurate preventive maintenance scheduling and deterioration modeling based on documented system history.

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Strategies for Keeping Documentation Current

- Use maintenance ticketing systems to update documentation.

- Integrate new device information automatically.

- Link TMS asset inventory to documentation.

- Adopt technologies that support easy updates.

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Integrating Configuration Management Into TMS Operations

- Develop a configuration management plan aligned with operational needs and procedures.

- Establish policies and procedures for controlling system changes.

- Define clear roles and responsibilities for configuration management.

- Integrate configuration management into system enhancement planning.

- Incorporate maintenance, repairs, and asset replacements into the configuration management process.

Leveraging Configuration Management in System Enhancements

- Incorporate configuration management into planning for potential TMS improvements.

- Document system changes and impacts on existing configurations.

- Capture configuration updates in centralized documentation.

- Verify configurations through audits after system changes.

- Integrate configuration management practices throughout the lifecycle of new assets and improvements.

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Asset Documentation Example

This screenshot shows a Georgia DOT (GDOT) graphical depiction of asset documentation displayed on a TMS dashboard.

© 2020 GDOT. Original map © 2020 Mapbox © OpenStreetMap. Modified by GDOT.[6,7]

Asset Configuration Example

This flowchart shows New York State DOT (NYSDOT) example asset attribute classifications. These classifications form a foundation for tracking asset configurations and changes over time, including any changes to:

- Location information.
- Maintenance history.
- Communication information.
- Metadata.

Asset Type
Asset subtype

Asset Instance
- ID and status
- Location info
- Communication info
- Installation
- Poster/electrical
- Asset type attributes
- Procurement
- Maintenance history/warranty
- Metadata/audits and contact info

Asset Profile
- Manufacturer/model
- Documents/specs

Trigger events

Analytics and Performance

LEGEND
Profile Data Frame
Asset Data Frame
Additional Tools

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TMS Asset Inventory Documentation and Configuration: Current Practices

- Focusing on essential assets and documentation only.

- Ensuring data quality and accuracy.

- Evolving and adapting procedures for continued relevance.

- Managing resources and tools.

- Communicating the importance and impact of these practices to staff.

- Incorporating these practices into the day-to-day activities of managing and operating a TMS.

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TMS Resources

- National Operations Center of Excellence (NOCoE) TMS portal.[8]

- TMC Pooled Fund Study website.[1]

- Managing Traffic Management System Assets. [3]

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Speaker's Notes

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Speaker's Notes (1/34)

This presentation aims to introduce the concepts of documenting and configuring an inventorying of TMS assets and resources.

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Speaker's Notes (2/34)

Table of contents with slide numbers for each topic covered in this presentation.

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Speaker's Notes (3/34)

TMSs are comprised of multiple subsystems.

A subsystem is a group of self-contained and interactive components that support one or more operational strategies as a part of a TMS.

The design or structure of a TMS can be broken down into its physical elements and its logical elements.

- The physical elements are the subsystem and the components.

- The logical elements are the operational strategies, functions, actions, and services.

Speaker's Notes (4/34)

This presentation focus on documenting and configuring assets. This focus relates to the activities on the graphic titled "Asset Configuration" and documentation which occurs in each of these other activities identified.

Managing TMS assets may involve the monitoring, management, evaluation, and maintenance that may be needed to ensure they meet the TMS and agency expectations. While asset management requires periodic assessment, managing specific assets typically may include daily activities such as maintenance and monitoring.

Range of activities an agency may consider in support of managing its TMS assets:

- Preparing to manage TMS assets

- Managing TMS asset data, which includes TMS asset identification, classification, and inventorying

- Maintaining TMS asset data, which includes TMS asset condition rating, data maintenance, asset spare management, and managing the configuration of assets

- Monitoring, evaluating, and reporting on TMS assets

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Speaker's Notes (5/34)

An inventory of TMS assets helps agencies keep track of, monitor, and use the information to manage and operate the assets effectively — including the benefits listed on this slide.

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Speaker's Notes (6/34)

A TMS asset inventory is a comprehensive collection of information about the assets and resources that make up a Transportation Management System.

This inventory is designed to be dynamic, reflecting the most current information about each asset throughout its lifecycle.

The specific information included in a TMS inventory can vary between agencies, as each organization has its own unique needs and priorities.

Typically, a TMS inventory includes data on a wide range of components and devices, such as CCTV cameras, changeable message signs, and vehicle detection devices.

In addition to physical assets, a TMS inventory may also include resources like designs, specifications, plans, warranty documents, licenses, and agreements.

Inventory defines what an agency has at a level that is appropriate for managing those assets. Agencies may benefit from not trying to capture all attributes, but determining the attributes that have value for managing the assets, and only collecting and managing data for those attributes.

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Speaker's Notes (7/34)

Value of establishing and maintaining a TMS inventory.

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Speaker's Notes (8/34)

When Initiating or sustaining (maintaining) an inventory effort, these are the items an agency may consider.

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Speaker's Notes (9/34)

Agencies may begin by reviewing what inventory data are already available, what additional information is needed, what additional assets and resources could be added, what information may be needed to manage a classification of assets, the resources needed to collect and maintain this information, and available resources to update or collect the needed data. This graphic presents a high-level framework for prioritizing what to include as part of an inventory of TMS assets and resources.

Speaker's Notes (10/34)

While ideally an agency would capture all of their TMS assets and resources in an inventory, resource constraints often necessitate prioritizing a subset of the total assets to inventory.

Agencies may benefit from focusing on covering the most critical assets to ensure the inventory data is accurate, complete and up-to-date. Trying to cover too many assets with limited resources risks compromising data quality.

The subset of assets selected for the inventory can include those that are essential to the active management and operation of the TMS. These are the assets where having readily available data in the inventory will be most beneficial day-to-day.

Additionally, assets can be captured where the inventory information will support key activities like system maintenance and repair. For example, including maintenance history on dynamic message signs.

To help with maintaining inventory accuracy over time, look for opportunities to incorporate inventory update tasks into existing agency processes, like adding it to maintenance work order closeout.

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Speaker's Notes (10/34) (continued)

For the selected assets, ensure there is a clear plan laid out for the initial data collection as well as the ongoing maintenance of that data. Assign roles and responsibilities to avoid data becoming stale.

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Potential or common challenges with inventorying TMS assets and suggested mitigations shown in notes:

Traditional relational databases are difficult to maintain, especially older versions

Consider using a multi-user asset management tool that leverages a modern backend database

Process for multiple jurisdictions to perform data entry into a common tool

Research potential tools that meet multi-user requirements to encourage tool sharing

Setting update schedule and following through/enforcement

Ensure data are kept accurate and up to date in a timely fashion

Data integrity, QA/QC

Establish QA/QC processes to verify data accuracy, and use drop-down menus for data entry where possible to standardize data entry

Incentivizing and prioritizing

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Speaker's Notes (11/34) (continued)

Emphasize the importance of data completeness and accuracy

Assigning responsibilities

Create ownership of each step of the process

Inconsistent definition of assets

Develop consistent and agreed-upon definitions

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Speaker's Notes (12/34)

Definition of documentation as it relates to TMS assets and a TMS inventory

It also includes the management of information agencies use to manage, operate, maintain, monitor, evaluate, and report on the performance of assets. Additionally, it includes the documentation of performance history to support lifecycle cost assessment and planning for future investment. Resources may include but are not limited to policies, procedures, agreements, procurement documents, design documents, product manuals, and other related types of products.

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Speaker's Notes (13/34)

Some benefits of documenting TMS assets

Informed decision-making: Comprehensive documentation provides agencies with insights for making decisions, planning, and implementing future improvements.

Warranty support: Detailed documentation of the procurement, delivery, and installation processes can support potential warranty claims that may arise during the asset's lifecycle.

Performance assessment: Documenting technical specifications, functional capabilities, and target performance measures allows agencies to assess how well they have managed the process and make necessary adjustments.

Troubleshooting and issue resolution: Capturing configuration details and maintaining historical records of maintenance, upgrades, and reconfigurations enables agencies to coordinate with vendors to troubleshoot and correct issues more effectively.

Lifecycle management: Documenting assets throughout their lifecycles, from procurement to replacement, helps agencies optimize performance, plan for future needs, and make informed decisions about next-generation assets.

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Speaker's Notes (13/34) (continued)

Process improvement: Maintaining comprehensive documentation allows agencies to identify and address gaps, improve internal processes, and enhance overall TMS performance.

Knowledge sharing and collaboration: A centralized inventory of documentation and resources enables better accessibility, knowledge sharing, and collaboration among various stakeholders within the agency.

Speaker's Notes (14/34)

Examples of activities, tasks for documenting within a TMS inventory:

Documenting the procurement process, including requirements, specifications, and evaluation criteria used for selecting the asset.

Capturing delivery documentation, such as invoices, shipping information, and validation of the asset's condition upon receipt.

Recording installation details, including the installer's information, installation method, connections established, functionality checks, and post-installation inspections.

Documenting configuration settings during and after installation to ensure optimal asset performance and facilitate troubleshooting.

Creating and saving an installation report that includes date, time, staff involved, photographs, schematics, and initial configuration settings.

Documenting acceptance testing and integration testing procedures, test equipment, personnel, and results for contractual compliance and future reference.

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Speaker's Notes (14/34) (continued)

Tracking preventative maintenance schedules, failures, and executed work orders to gain a comprehensive view of the asset's condition and maintain a historical record.

Linking service orders or tickets to the asset inventory's historical record, including details such as personnel involved, dates, actions taken, parts replaced, and photographs.

Collecting and reviewing data about an asset's lifecycle, such as procurement challenges, installation issues, operational inefficiencies, and maintenance gaps, to inform the selection of next-generation assets.

Conducting a gap analysis to identify missing or unrecoverable documents, such as maintenance manuals, as-built diagrams, testing procedures, and photographs, and updating the inventory accordingly.

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Speaker's Notes (15/34)

Example big picture issues an agency may consider with documentation practices

Designing and implementing processes and tools to add documented information to a TMS asset inventory.

- Developing a standardized approach for capturing and storing documentation

- Selecting appropriate tools to facilitate documentation management

Integrating documenting into daily TMS operations.

- Establishing procedures for updating documentation as part of regular maintenance and upgrade activities

- Training staff on documentation practices and ensuring adherence to standards

Coordinating with other sources and users of documentation.

- Identifying all stakeholders who contribute to or rely on TMS asset documentation

- Establishing clear communication channels and data sharing protocols

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Speaker's Notes (15/34) (continued)

Disparate storage locations and varying standards.

- Consolidating documentation into a centralized repository

- Developing and enforcing consistent documentation standards across the organization

Lack of integration between existing documentation storage and inventory systems.

- Assessing current systems and identifying integration opportunities

- Implementing solutions to enable seamless data exchange between systems

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Speaker's Notes (16/34)

More challenges to consider

Maintaining accurate work order logs and documentation: Ensuring that all maintenance, upgrade, and repair activities are properly documented and associated with the correct assets in the inventory.

Lack of documentation standards: Establishing and enforcing clear standards for what information should be captured, in what format, and where it should be stored.

Missing key asset documentation: Conducting a thorough inventory to identify any missing documentation and developing a plan to recover or recreate critical information.

Documentation control: Implementing version control and access control measures to ensure the integrity and security of asset documentation.

Staffing and clear responsibilities: Assigning clear roles and responsibilities for documentation tasks and providing adequate training and resources to staff.

Integration across multiple systems and platforms: Ensuring that documentation is accessible and consistent across all relevant systems and platforms used by the agency.

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Speaker's Notes (17/34)

Many existing agency processes are designed to support managing TMS assets. These processes range from daily activities such as device maintenance, device monitoring, and asset performance measurement to other long-term plans that may often include information related to managing TMS assets. Examples include feasibility studies, State transportation improvement plans, congestion management plans, transportation asset management plans (TAMPs), or TSMO plans. Considering the integration of CM into each existing process or plan associated with managing TMS assets could be beneficial to an agency. Incorporating CM into existing processes, procedures, techniques, and tasks enhances an agency's ability to plan for and implement specific improvements to the agency TMS. Many agencies have an existing CM process or program with the potential to provide benefits to managing TMS assets. However, an existing program might not include documenting the configuration and performing change control for TMS assets.

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Speaker's Notes (18/34)

Configuration management practices provide a structured approach to establishing and maintaining an accurate, up-to-date inventory of an agency's TMS assets. By integrating key CM processes like configuration identification, change control, auditing and documentation into inventory management, agencies can realize significant benefits.

CM enables each asset to be uniquely identified in the inventory, allowing changes to be tracked at a granular level over time. This improves overall inventory accuracy and provides a complete historical record for better traceability.

Having access to detailed asset configuration data through the CM process also facilitates integration with other agency systems, enhances performance assessments, and supports more efficient maintenance and procurement planning.

Ultimately, CM provides the necessary framework to develop a comprehensive, reliable TMS asset inventory that gives agencies the insights needed to effectively manage their TMS investments.

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Speaker's Notes (19/34)

Effective TMS asset inventory management requires capturing key configuration information. This includes hardware and software details, specific settings, and a historical record of changes. By documenting this information within a centralized inventory system and integrating it with CM processes, agencies establish a robust foundation for managing their TMS assets throughout the lifecycle. Standardizing how configuration information is captured and tracked is essential for inventory accuracy and reliability.

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Speaker's Notes (20/34)

Applying configuration management processes to TMS assets provides a structured approach to establishing and maintaining an accurate inventory. Key activities include uniquely identifying assets, managing changes, tracking historical information, and verifying accuracy through audits.

Integrating these CM processes into TMS asset management ensures changes are controlled, information stays current, and the inventory remains a reliable system management tool. Incorporating CM also facilitates impact assessments, asset lifecycle tracking, and integration with other agency systems and processes.

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Speaker's Notes (21/34)

A foundational element of configuration management and effective inventory practices is establishing a unique identification scheme for assets. By assigning identifiers and standardizing how assets are tracked, agencies create a consistent and accurate record of their TMS infrastructure.

Unique identification allows changes to be linked to specific assets, enabling full traceability and a clear configuration history. It also facilitates system expansions, upgrades and integration by providing a common reference scheme across different systems and processes.

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Change management, or change control, "is the process of assessing the impact of a possible change to a system, determining the fate of the proposed change, executing the approved changes, and ensuring that the change is carried through to the proper documentation." A change control board usually reviews and approves change requests. The objective of change management is to determine the effect of the change being proposed on the entire system and decide whether or not to proceed with the change. If the change is approved, it is important to document the change itself and reflect the changes to the configuration item's documentation.

A potential benefit of change management is the ability to evaluate each change in relation to its impact on the entire system, not just to the subsystem being changed. One example of a change management tool is a version control tool, which allows only one user at a time to check out a version and compare versions for incompatibilities. During implementation, it may be valuable to establish a change control board made up of representatives from different departments to ensure a diverse range of perspectives is considered.

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Speaker's Notes (23/34)

Configuration Status Accounting (CSA) is the process of ensuring that all documentation and change history information about the configuration items is up to date for the item's entire lifecycle. Potential benefits of CSA include creating the methodology needed to update the documentation to ensure the latest configuration is reflected in the configuration identification database. The aim of CSA is to provide stakeholders and decision makers the most up-to-date configuration information possible. Issue tracking tools are an example of tools used for CSA. This tool documents changes as the process moves from approval to completion. For TMS assets, CSA may be connected to TMS asset data quality and data governance. Many TMS assets are comprised of exchangeable components. Replacement of any individual component might have an impact on the performance or expected lifecycle of the asset. CSA, supported by data governance policies, can help guarantee the ability to collect and store accurate configuration statuses for each TMS asset.

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Speaker's Notes (24/34)

A configuration audit is the process of analyzing and verifying that the configuration item's documentation correctly reflects the current asset status. One of the process goals is to prevent the need to revisit inaccurate documentation caused by incorrect change documentation or a lack of prior change documentation. As a potential benefit, this process verifies that changes were executed as approved by the change control board and the item documentation reflects the current configuration. This provides the ability to make future changes to the system more efficiently and with more confidence. Examples of configuration audit tools are document management tools, which make archiving and locating files easier and quicker, and issue tracking tools. Key aspects during implementation include performing audits on a regular basis to ensure CM policies are being implemented.

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Speaker's Notes (25/34)

Well-maintained documentation provides numerous benefits when integrated into TMS operations. It supports effective planning, prioritization, and decision-making by providing a clear picture of the current system. Detailed documentation also enables proactive maintenance, enhances lifecycle management, and helps establish data-driven performance goals. By leveraging documentation in operational processes, agencies can optimize asset performance and make informed investment decisions.

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Speaker's Notes (26/34)

To realize the benefits of well-maintained documentation, agencies must employ strategies to keep information current as the system evolves. Key approaches include leveraging day-to-day operations to capture changes in real-time, automating updates where possible, analyzing asset relationships to understand impacts, and selecting technologies that support documentation goals. By institutionalizing these practices, agencies can sustainably maintain accurate documentation with less manual effort.

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Speaker's Notes (27/34)

To effectively control system changes and maintain accurate documentation, agencies can integrate configuration management practices into TMS operations.

Key steps include developing a configuration management plan tailored to the agency's unique needs, formalizing change control policies, assigning clear ownership for configuration management activities, and embedding these practices into system enhancement and upgrade projects.

By operationalizing configuration management, agencies can ensure changes are properly assessed, approved, and documented.

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Speaker's Notes (28/34)

Planned TMS enhancements and upgrades provide a key opportunity to apply configuration management practices.

By incorporating configuration management into project plans, agencies can systematically assess and control changes.

Analyzing system interdependencies helps identify potential impacts, while capturing configuration details in a centralized database keeps documentation current.

Conducting configuration audits after system changes verifies accuracy and ensures the continued integrity of the TMS. Over time, this approach results in more stable and reliable systems.

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Speaker's Notes (29/34)

GDOT presents a graphical depiction of asset documentation displayed on a dashboard. The figure presents documented information such as asset name, asset type, and asset status

The use of a dashboard function with direct linkages to asset attributes, documentation, and configuration information contained in the inventory can be a valuable tool in managing the inventory. It can improve the efficiency and timeliness of corrective actions.

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Speaker's Notes (30/34)

Asset attribute classification for New York State Department of Transportation's asset management system

New York State DOT example asset attribute classifications. These classifications form the foundation for tracking asset configurations and changes over time. Here's examples of how they support configuration management:

- Asset Type and Subtype: Enables categorization of changes by asset class

- ID and Status: Tracks the current state and historical status changes of each asset

- Location Info: Records any changes in asset placement or relocation

- Communication Info: Logs updates to connectivity or communication protocols

- Installation: Documents initial setup and subsequent modifications

- Power/Electrical: Tracks changes to power requirements or electrical configurations

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Speaker's Notes (30/34) (continued)

- Asset Type Attributes: Allows for monitoring of changes to specific asset characteristics

- Procurement: Records equipment upgrades or replacements

- Maintenance History/Warranty: Captures all maintenance activities and warranty updates

- Metadata/Audits: Provides a chronological record of all modifications and audits

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Speaker's Notes (31/34)

Several agencies were interviewed and indicated best practices listed on this slide

Caltrans, Lake County, IL, MDOT SHA, MARC, ODOT, and TDOT

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Speaker's Notes (32/34)

None.

Speaker's Notes (33/34)

None.

Speaker's Notes (34/34)

None.