Information Technology

and

Intelligent Transportation Systems

2003–2008

Strategic Plan

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Miami-Dade Transit

By
The Palisades Group USA

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Administrative planning and support were provided by **Michelle Abaunza** of MDT, **Joel Volinski**, **Rob Gregg**, and **Fabian Cevallos** of the University of South Florida's Center for Urban Transportation Research (CUTR), and **Ellen Thompson** and **Lawrence Xiang** of Palisades Group USA.

The Project Team from Palisades Group USA worked collaboratively to plan and produce the strategic planning effort and this report. The team members, with their primary areas of expertise noted, included **Eric Heimall** (Technical Architect), **Mimi Hwang** (Project Manager, Systems Architect), **Bill Kronenberger** (Onboard Engineer), **Eva Lerner-Lam** (Executive Program Manager), **Robert McGoff** (Network Engineer), **Nancy Neuerburg** (Business and ITS Architect), **Paula Okunieff** (Data/Application and ITS Architect), and **Audrey White** (Data Modeler). This report was originally created by the Palisades Project Team members unless otherwise noted.

IT/ITS 2003–2008 STRATEGIC PLAN DOCUMENTS

Three final reports were produced in this strategic planning process:

1. Volume I: *IT/ITS 2003–2008 Strategic Plan Summary* provides a summary for all audiences, including executive management.
2. Volume II: *IT/ITS 2003–2008 Strategic Plan Detail* provides details and technical documentation on the IT/ITS Strategic Plan. The primary audience for Volume II is Information Technology Services staff.
3. *Intelligent Transportation Systems (ITS) 2003–2008 Strategic Plan* is intended for staff working on ITS projects and other interested audiences. This report describes MDT's intelligent transportation system strategies, initiatives, and issues.

Several other interim reports were generated as supporting documentation for the IT/ITS Strategic Plan:

- The Current or "As-Is" Architecture is described in the *Final Interim Report, July 15, 2003*.
- IT/ITS 2003–2008 Strategic Planning Process *Technical Memorandum: Areas for Architecture Enhancement*.
- The process and components used to develop the future or Target Architecture are described in the *Logical Target Architecture Workshop Report, August 28, 2003,* and the *Target Physical/Technical Architecture Workshop Report, September 2, 2003*.

Purpose of this Volume
The ITS 2003–2008 Strategic Plan describes MDT's intelligent transportation system strategies, initiatives, and issues.

Intended Audience
The intended audience is staff working on intelligent transportation system projects and other interested audiences.

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1 OVERVIEW/BACKGROUND

Rapid information technology advancements have dramatically altered the options available to organizations to develop and deliver more effective and efficient products. Information Technology (IT) and Intelligent Transportation Systems (ITS) are becoming increasingly critical to the transit industry in attaining its strategic and tactical business goals, affecting virtually every business process and organization.

Current advances in hardware and software capabilities, design and development tools, and communication technologies can provide the transit industry with opportunities to improve and grow the business more effectively than ever before. ITS systems, such as Automated Vehicle Location (AVL) and Automatic Passenger Counters (APC), are being used to improve transit service delivery, safety, reliability, customer convenience, efficiency, responsiveness, and regional service integration.

This ITS Strategic Plan was developed within the context of the Miami-Dade Transit's (MDT) 2003–2008 IT/ITS Strategic Planning effort. The Strategic Plan will be used to guide the investment of transit resources in information technology and ITS systems for MDT over the next five years. The plan will build upon the prior "Fiscal Years 2000 through 2002 Information Technology Strategic Plan."

The IT/ITS strategic planning effort was conducted by the Palisades Consulting Group in conjunction with the management and staff of MDT and under contract to the Center for Urban Transportation Research (CUTR).

1.1 Miami-Dade Transit

MDT is currently the 16th largest public transit system in the nation, and the largest transit agency in the state of Florida. The agency carried over 83,619,000 passenger trips in 2002. It operates three transit modes: bus, rail, and monorail. After the implementation of the People's Transportation Plan, MDT will likely be the 9th or 10th largest transit property in the United States.

- **Metrobus.** Metrobus offers countywide service from Miami Beach to west Miami-Dade and from the Middle Keys to the southern portion of Broward County. With over 900 buses, 94 Metrobus routes travel over 29 million miles per year.

- **Metrorail.** Miami-Dade County's 22-mile elevated rapid transit system runs from Kendall through South Miami, Coral Gables, and downtown Miami; to the Civic Center/Jackson Memorial Hospital area; and to Brownsville, Liberty City, Hialeah, and Medley in northwest Miami-Dade, with connections to Broward and Palm Beach counties at the Tri-Rail/Metrorail transfer station.

- **Metromover.** Monorail system that operates as a free, automated people-mover serving downtown Miami.

South Florida, where MDT operates, is in a sustained period of substantial population growth that has created a range of transportation problems in the region. The recent passage of the People's Transportation Plan (PTP) provides funding and a plan for beginning to mitigate some of the transportation issues. MDT now has the capital and operating financial support to significantly grow transit services, and as a necessity, grow the transit organization to support the service growth. Transit's high-level PTP goals are to expand transit service and to promote its increased utilization.

To effectively support the planning, implementation, and operation of the expanded and new services, Transit will need new and improved tools, including technology tools, to develop, analyze, manage, and present information critical to stakeholders, such as Transit customers, MDT staff, elected officials, and new citizen oversight groups. In addition, the quality of Transit services, including on-time performance, information, and safety/ security, need to be maintained or improved during the period of service expansion. As the PTP and new services are implemented, Transit will need to:

- Understand where resources are going
- Know if new services and resources are effective
- Assess how to fine-tune implementation efforts.

Technology advances in wireless, data, Internet, GIS, electronic commerce, and ITS on-board and back office technologies have all been significant in the last five years, providing MDT with a number of new opportunities for service-level improvements based on those advances in technology.

1.2 Strategic Methodology

The Palisades IT/ITS Strategic Planning approach is based on the best practices outlined in IBM's structured IT methodology and guidelines, and consists of the following seven major steps:

1. Initiation
2. Business Model
3. Current IT Environment
4. Target Data and Application Architecture
5. Target Technology Architecture
6. IT Organization
7. IT/ITS Strategic Plan

Embedded in this methodology is the use of a highly regarded planning process known as Enterprise Architecture Planning.[1] Enterprise Architecture Planning (EAP) has been approved by the Federal CIO Council (1998) to promote shared development, interoperability, and sharing of information for Federal agencies and other government entities.[2] (The term "enterprise," while understood in terms of the overall transit

[1] From Steven H. Spewak and Steven C. Hill, *Enterprise Architecture Planning: Developing a Blueprint for Data, Applications, and Technology*, 1995.
[2] From *A Practical Guide to Enterprise Architecture Version 1.0, Federal Council of Chief Information Officers*, John Wiley (February 2001).

organization, transcends the established organizational boundaries to include external stakeholders.) EAP is a method for defining an organization's current (baseline) or desired (target) environment, and is essential for evolving information systems and inserting emerging technologies such as ITS that optimize mission value.

In general, the reason for using the EAP process to define the Strategic Plan is to align IT system plans with business needs for integration, change, time-to-market, and appropriate service model for implementation as follows:

- Integration — EAP supports business rules, which must be consistent across the organization. Data, its use, interfaces, and information flow are standardized, and the interoperability and connectivity are managed across the enterprise.
- Change — Assist in the facilitation and management of change to any area of the enterprise.
- Time-to-market — Reduce the cost and effort of systems development, modernization time frames, and resource requirements.
- Service model — The disciplined evolvement of standard and quality IT services.

The recommendations that follow establish an agency-wide roadmap to achieve MDT's mission through supporting optimal performance of its core business processes within an efficient information technology (IT) environment consisting of Data, Applications, and Technology.

A more detailed explanation of the strategic planning methodology is contained in the 2003–2008 IT/ITS Strategic Plan.

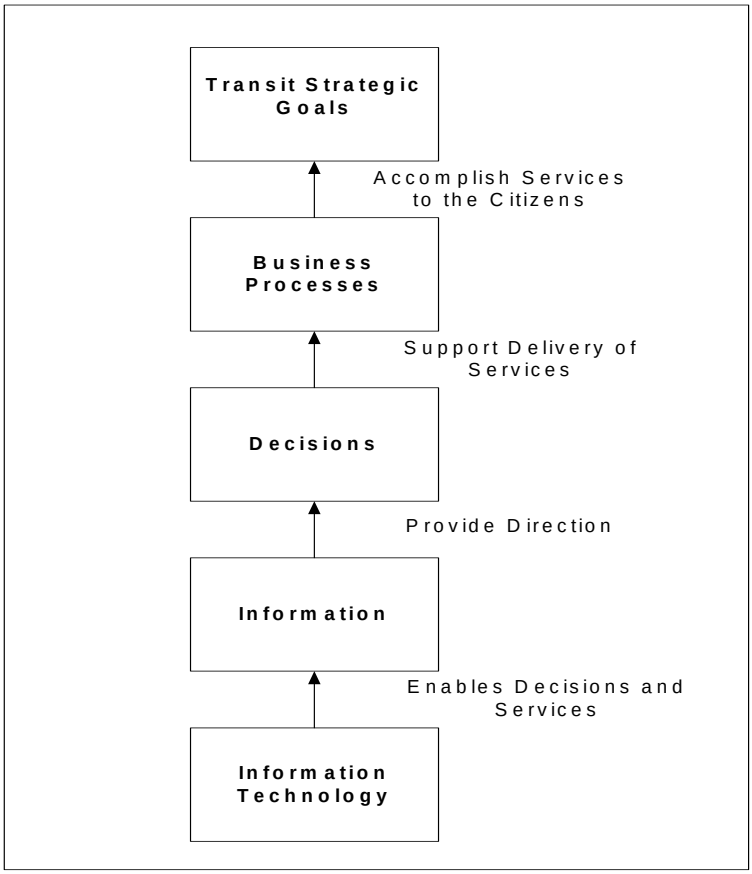
1.3 Role of ITS Technologies

The transit industry and MDT have many challenges in delivering safe, reliable, and efficient transportation that meets the needs of the public. More and more, the transit industry is using technology to improve safety, security, reliability, efficiency, customer convenience, responsiveness, and regional integration. Advanced systems have enabled transit agencies to respond more quickly and efficiently to customer requests, maintain or improve service reliability, support ridesharing, improve preventive maintenance programs, restructure existing bus routes, and more rapidly deploy new service.

Key to the successful deployment of technology is to have the agency's goals drive the information and technology investments. Figure 1-1 shows a Strategic Framework that identifies the relationship of an agency's goals to its business processes, decision-making, information resources, and information technology. Figure 1-1 shows the following:

- An agency's mission and goals drive the technology investments
- Information technology provides the support for effective decision-making and achieving business goals

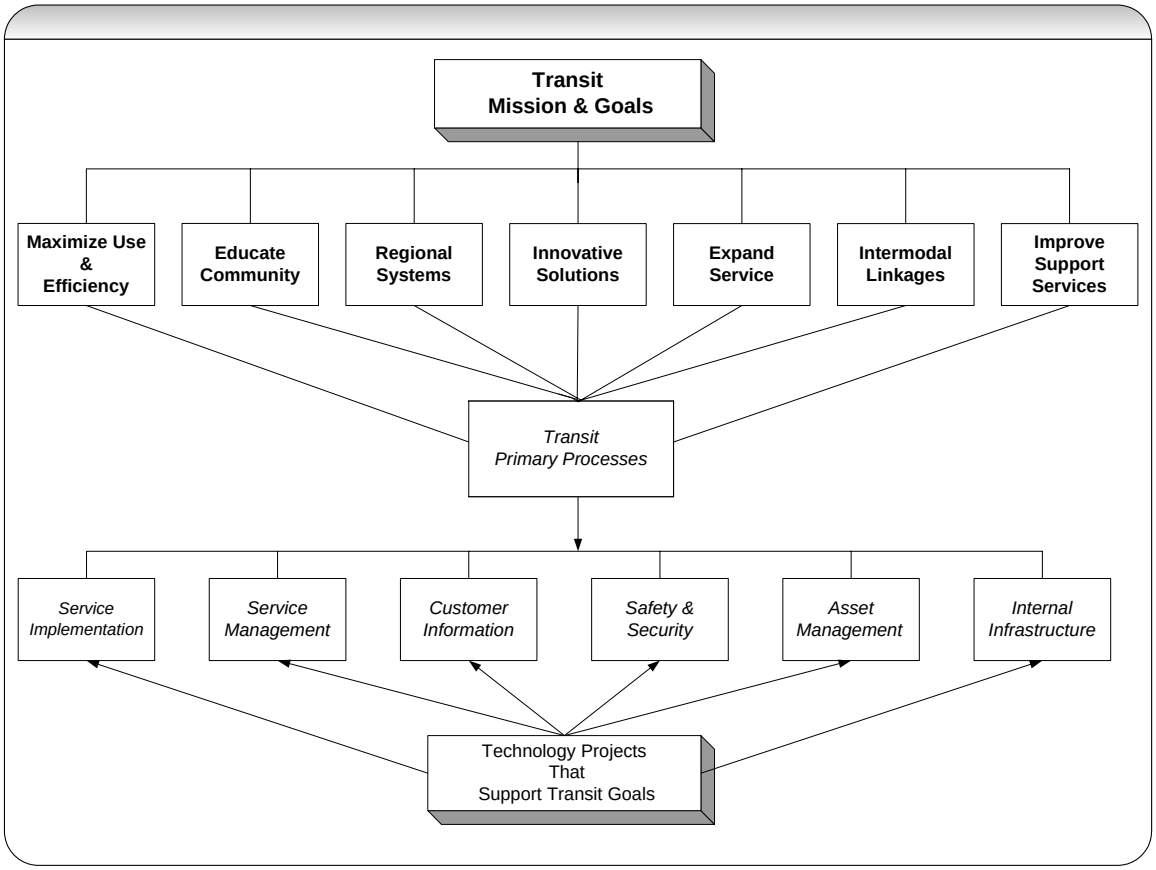
Figure 1-1 Strategic Framework



The general concepts displayed in Figure 1-1 are customized and expanded in Figure 1-3 to provide a strategic overview for MDT. In Figure 1-2, under the Transit Mission and Goals box, are the titles for the seven Transit goals developed in the MDT strategic planning process. These goals are listed in Section 2.2.2. Six primary transit processes support the goals. The processes are, in turn, supported by appropriate technology projects. This strategic overview for MDT, which links technology investments to Transit's mission, goals, and primary processes is designed to facilitate the prioritization of technology investments. In addition, it helps in categorizing and understanding the diverse set of business processes and technology systems that are used to run Transit.

The role of ITS technology, and how it can help Transit meet business goals, is briefly discussed with respect to the six primary Transit processes: *Service Implementation, Service Management, Customer Information, Safety and Security, Asset Management, and Internal Infrastructure.*

Figure 1-2 Strategic Overview for MDT



1.3.1 Service Implementation

Understanding the service needs of current and potential customers, developing a service plan, and translating the service plan into deliverable service is a complex process. Many of the functional areas in the transit industry, including rail, bus, and paratransit rely on the information generated in this process. In particular, schedule information is used in a wide range of operational, customer information, and on-board applications.

The Service Implementation Process can benefit from advances in ITS technology options and from integration improvements. Implementing an integrated scheduling system can provide major gains in transit efficiency and productivity. Policy analysis and management information can become qualitatively better with the implementation of new analysis and reporting methods, such as geographically based reporting tools. Also helpful are improved methods for evaluating transit system performance, the ability to run planning scenarios, improved data management, and the integration of core operations and planning data elements. With the implementation of the People's Transportation Plan, performance measures such as ridership and on-time performance will assume more importance as the impacts of service changes are assessed.

1.3.2 Service Management

The transit industry is always looking for ways to gain efficiency improvements in the process of managing daily operations. In particular, bus and paratransit operations can benefit if system applications streamline or eliminate manual processes. A new generation of transit operator support systems can provide increased flexibility in the assignment of resources and improved reporting capabilities. Service reliability and efficiencies can be improved through the effective use of CAD/AVL and/or APC systems.

Since the passage of the Americans with Disabilities Act, paratransit services have experienced a steep growth curve. At MDT, a new paratransit scheduling and communications tool is being implemented that allows better control of operating costs and more effective management of call requests, cancellations, vehicle dispatching, and contractor performance for Medicaid and Special Transportation Services (STS).

1.3.3 Customer Information

Many transit agencies spend significant resources in the process of providing customer information. Information is developed and distributed via paper timetables, bus stop signs, on-board signage, customer information operators, the Web, etc. With the explosion of technology options available to the public, there is an increase in demand for new ways of receiving customer information from Transit. Increased use of electronic communications, including wireless systems and the World Wide Web is already a reality.

Similarly, Transit is receiving input from its customers in new ways. Previously, almost all customer comments about Transit service arrived in paper form or by telephone. The ease and speed of electronic mail has significantly increased the number of electronic communications received by Transit.

The transit industry continues to develop new customer information system applications such as automatic e-mail notification of adverse weather reroutes and road closures, real-time bus arrival information, web-based trip planning, customizable maps, and ride-matching tools that customers can use directly. These developments are important in attracting new customers.

1.3.4 Safety and Security

Protecting the safety and security of employees and passengers is extremely important for many reasons. Public perceptions of safety and security at Transit stops and on Transit vehicles affect the likelihood of attracting and retaining customers. Both passengers and operators like to know that help is close at hand in the event of an unsafe situation on a vehicle. Applications such as CAD/AVL, security cameras, emergency alarms, and better communications will enhance actual, as well as perceived, safety and security. Safety and security incident tracking systems help prevent incidents and deploy resources more effectively.

1.3.5 Asset Management

Managing and maintaining MDT's investments in assets such as facilities, vehicles, and spare parts and ensuring their functionality is an ongoing management priority. Work order and inventory systems are crucial to maintenance efficiency and controlling costs. More recently ITS applications are being used to prolong the life of assets such as buses. AVL/CAD systems can support better preventive maintenance programs and can facilitate access to real-time information about the status of a vehicle. Effective management of asset replacement programs ensures that information, systems, and infrastructure can be replaced at the end of their useful life without interrupting service and reliability.

1.3.6 Internal Infrastructure

The higher level internal infrastructure process includes functions such as human resources, finance, payroll, risk management, procurement, and managing information technologies and core data. Without effectively managed internal infrastructure processes, the delivery of products and services cannot be optimized. Both legacy systems and newer information management and ITS applications are available to improve the functioning of the internal infrastructure of a transit agency.

A number of Advanced Public Transportation Systems (APTS) can be deployed on board Metrobus, Metrorail, Metromover, and Paratransit vehicles such as annunciators, AVL, Automatic Passenger Counting (APC), and Electronic Fare Boxes (smart card readers). These systems are important to many aspects of transit management and operations, providing basic operator communications and emergency notification, and gathering data on ridership, fare payment, and on-time performance. By building a common on-board infrastructure that allows for integration of on-board systems, system performance and overall data quality can be improved through sharing common data elements and eliminating unnecessary processing. Integrated systems also reduce life-cycle costs for system procurement, maintenance, and training. The current federal objectives for the development of national standards for integrated system design and communications support the objective of integrated on-board systems.

These six higher level transit processes provide the framework for subsequent discussions of the sub-processes under them and their related data and information technology systems.

2 MDT BUSINESS ENVIRONMENT AND GOALS

Based on the EAP methodology previously described, business goals and needs should drive the implementation of ITS technologies. Therefore, an understanding of the transit business environment is necessary to properly align the ITS Strategic Plan to the business. Elements of the business environment that drive the technology investment include the mission, goals, and guiding principles. In addition, factors in MDT's internal and external operating environment can affect MDT's business and technology decisions.

Several findings from MDT's 2003 environmental scan are discussed that impact the implementation of ITS projects. In addition, this section presents the transit mission, goals, and guiding principles that provide a strategic framework to guide MDT's ITS investments.

2.1 Environmental Scan: Stakeholders, PTP and Federal ITS Policy Changes

The environmental scan conducted by Transit, CUTR, and Palisades in a January 2003 Senior Management Retreat provided an overview of the challenges and opportunities facing Transit. Rising customer expectations, funding issues, and budget pressures help drive the need for technology solutions for improving service and operating efficiency. This section highlights three of the findings from the environmental scan that need to be considered when implementing ITS projects. For more information about the environmental scan, please see the *Final Report – 2002 Transit Strategic Planning Retreat*, dated May 29, 2003.

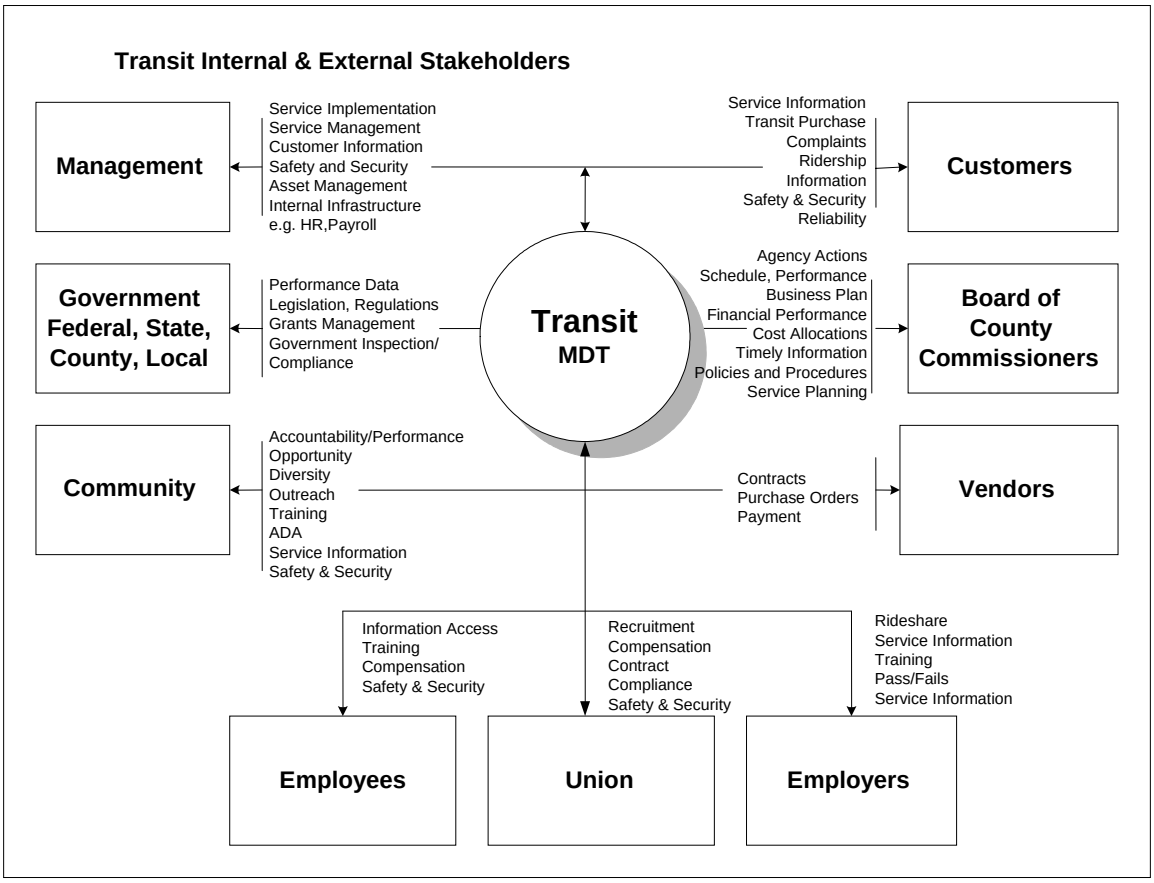
Transit Stakeholders. An understanding of MDT's stakeholders and their high level needs, as shown in Figure 2-1, helped set the context for the environmental scan and Transit goals. In addition, an understanding of MDT's stakeholders and their needs is critical during the planning, specification, and implementation of ITS projects.

2.1.1 People's Transportation Plan (PTP)

The passage of the People's Transportation Plan (PTP) in Miami-Dade County will result in a huge transit service expansion and the development of new products and services over the next five years. As a result, the organizational structures and processes to produce transit service in the Miami-Dade Transit service area will be increasingly challenged. For example, more vehicles, operators, mechanics, repair parts, and work orders will have to be efficiently tracked and managed. Some of the existing systems, such as Automated Vehicle Location (AVL)/Radio, will need upgrades or replacements to handle the larger service volumes. IT and ITS technology play a critical role in facilitating service provision and management, as well as supporting the other information needs of MDT.

More public oversight of MDT will likely occur as the PTP is implemented. As a government agency, MDT must be a responsible steward of public resources and assets. MDT will need efficient ways of judging performance and being able to inform the public of progress. Technology improvements and the IT Division can assist MDT in meeting those needs.

Figure 2-1 Transit Internal and External Stakeholders



The U.S. Department of Transportation has put policies and programs in place that affect the implementation of technology in the transit industry. They promote the use of advanced technologies as an alternative to building more roads and highways. In addition, they advocate the integration of applications and data within a region, the use of standards, and the use of systems engineering principles to improve the effectiveness of ITS projects and reduce the costs of implementation.

The FTA National ITS Architecture Policy on Transit Projects provides that "All ITS projects funded with Mass Transit Funds from the Highway Trust Fund shall be based on a systems engineering analysis." Systems engineering is defined as "…an interdisciplinary collaborative approach to derive, evolve, and verify a life cycle balanced system solution that satisfies customer expectations and meets public acceptability."

FTA is assessing conformance with the policy and an agency's level of conformance may impact the timing and flow of grant funds.

2.2 Transit Mission, Goals, and Guiding Principles

At the core of the business architecture that guides technology investments are the mission, vision, goals, and critical success factors of the agency. This section also identifies Transit's Guiding Principles or Values. The Guiding Principles should also influence the selection and implementation approach of technology initiatives.

2.2.1 Transit Mission

The Transit mission statement is included below.

MDT MISSION STATEMENT: *"To meet the needs of the public for the highest quality transit service: Safe, reliable, efficient, and courteous."*

2.2.2 Transit Goals

The goals listed below for MDT were developed by MDT management and are based on the strategic goals of Miami-Dade County, input from a Transit management retreat in January 2003 and the MDT strategic planning process.

- **Goal 1: Maximize Use and Efficiency**. Maximize the use and efficiency of the existing transportation system on a neighborhood, county, and regional basis.
  (E.g., improve frequency of Transit service, maintenance, and reliability of Transit vehicles, Transit routing performance and supervision, and user convenience.)

- **Goal 2: Educate Community**. Educate the community regarding transportation issues and opportunities.
  (E.g., public education, advertising, marketing, route schedules, and signage.)

- **Goal 3: Regional Systems.** Develop and implement regional systems to promote improved mobility of people and commerce to capitalize on South Florida's advantages.
  (E.g., regional coordination and equitable allocation of resources.)

- **Goal 4: Innovative Solutions.** Encourage and promote innovative solutions to transportation challenges, including incentive plans.
  (E.g., urban design solutions, incentive plans, re-use of abandoned infrastructure, traffic relief alternatives such as dedicated bus lanes, and reversible lanes.)

- **Goal 5: Expand Service.** Improve mass transit along major corridors and between major origin and destination locations.
  (New and expanded rail projects, expand bus fleet, and integrate transportation infrastructure expansion with land use planning)

- **Goal 6: Intermodal Linkages**. Enhance the ease of movement of people and goods to, from, and through the airport, the seaport, and other centers through new and improved intermodal linkages.
  (Develop intermodal facilities and alternatives, address expansion needs at MIA and Seaport, and integrate movement of cargo/baggage/people between ports)

- **Goal 7: Improve Support Services**. Expand and improve the delivery of support services to achieve goals such as:
  - Ensuring the financial viability of the county through sound financial management practices;
  - Attracting, developing, and retaining an effective, diverse, and dedicated team of employees;
  - Ensuring the timely acquisition of "best value" goods and services while maintaining integrity and inclusion.
    (E.g., improve hiring, budget, training, procurement, information technology, etc. to meet the needs of MDT and the PTP.)

2.2.3 Transit Guiding Principles

Guiding principles are but one more piece of the business architecture that may influence the choice and timing of technology investments. Guiding principles do not carry as much weight as the goals in determining project priorities, but they should influence how projects are managed. For example, they provide a reminder to be customer focused when determining project requirements and specifications. The guiding principles adopted by MDT senior management are included in Table 2-1 and are based on the guiding principles for Miami-Dade County.

Table 2-1 Transit Guiding Principles

1.	Customer-Focused and Customer-Driven
2.	Honest, Ethical, and Fair to All
3.	Accountable and Responsive to the Public
4.	Diverse and Sensitive
5.	Efficient and Effective
6.	Committed to Development of Leadership in Public Service
7.	Innovative
8.	Valuing and Respectful of Each Other
9.	Action-Oriented
10.	Foster Teamwork
11.	Full, Open Communication
12.	Promote Safety
13.	Support Professional Skill Development

3 INFORMATION TECHNOLOGY SERVICES

The Information Technology Services Division (IT Division) provides IT services to all of the business areas of MDT. Many of the projects for which it is responsible are ITS projects. For some of the larger, more complex ITS projects, the IT Division partners with the primary business client and with other areas of MDT to accomplish the projects (e.g., Field Engineering).

This section identifies the mission, values, vision, guiding principles, goals, and objectives for the IT Division. These elements play a significant role in how ITS projects are planned, implemented, and operated at MDT. A key point is that IT and ITS projects share and impact a common Technology Architecture, that much of the data is shared, and that the systems and data often need to be integrated to best serve the internal and external customers that rely on the ITS systems.

3.1 IT Mission, Values, and Vision

As a part of this strategic planning effort, the IT Division updated its mission, values, visions, and guiding principles after an assessment of the business needs of MDT and the current operating environment.

IT DIVISION MISSION: *Promote the improvement of Transit's performance through the application of technology and technical support services.*

The values of the IT Division, shown below, reflect the commitment of the IT staff to a customer and business focus, teamwork, and accountability, among other values.

IT DIVISION VALUES:
- ✓ *We understand and enhance our clients' business operations*
- ✓ *We proactively make things happen and seek opportunities for improvement*
- ✓ *We cooperate and work well with teammates, clients, and business partners*
- ✓ *We progressively innovate while maintaining a stable operating environment*
- ✓ *We are dependable and follow through on commitments*
- ✓ *We accept accountability to educate ourselves and maintain superior technical skills*

The five-year vision statement was also developed by the IT Division management and senior staff in July 2003. It is included below.

IT DIVISION VISION:
- ✓ *The five-year vision of the Information Technology Services Division is to provide reliable, cost-effective services that meet customer expectations*
- ✓ *Key services to be provided include:*
  - *Systems and tools to solve the customer's business needs*
  - *Easy to access data that is accurate, secure, and integrated enterprise-wide*
  - *Fast access to customer information, including real-time data, via multiple modes*

- ✓ *The team will implement integrated systems and data, using standards, to improve data access, usability, maintainability, and costs*
- ✓ *The team will operate using good guiding principles and business practices*
- ✓ *The services will be provided by motivated, happy, innovative employees who are skilled, caring, and customer oriented*

3.2 IT Guiding Principles

The IT Guiding Principles were developed to support the goals and five-year vision of the IT Division. The guiding principles should be employed when evaluating technology options and implementing technology solutions. IT Technology Guiding Principles provide a common understanding needed by the IT Division group to assist the decision-making process for:

- Technical strategies for distributing data and applications
- Strategies for designing and implementing systems
- Build versus buy
- Defining conceptual configuration or vision of the technology environment using principles and platforms agreed upon, i.e., mainframe as enterprise server, 2-tier, 3-tier, and N-tier models
- Defining conceptual locations for storing data and executing applications, e.g., conceptual distribution models
- Support for current and future business locations
- Implementation of vendor technology platforms

MDT's IT Guiding Principles are presented in Table 3-1 below.

Table 3-1 Technology Guiding Principles

1. *Data will be owned, shared, and controlled as a Transit asset*
2. *Applications will be developed using a cooperative process*
3. *Application initiatives will be guided by an established methodology using a systems engineering approach*
4. *A technology infrastructure will be developed to facilitate integration of data and systems*
5. *Secure network architectures will be employed*
6. *IT will focus on and be measured by the value of solutions delivered to internal and external stakeholders and Transit customers*
7. *IT will be a partner in reengineering and improving business processes*
8. *IT will adhere to national and regional standards for Transit architecture*
9. *IT will ensure recoverability to protect the continuation of the business*
10. *Apply open systems concepts to insure portability, scalability, interoperability and compatibility of information technology systems*

3.3 IT Goals and Objectives

The Information Technology Services Division adopted the following seven goals, with their objectives, to guide the division over the 2003 to 2008 time period. Each year the goals and objectives will be refined to reflect changes in business needs and the operating environment.

Goal #1: Enhance Customer Information through Technology
Objectives:

- Expand access to passenger information (e.g., through wireless technology, kiosks)
- Allow Transit customers to purchase fare media through Web technology
- Improve the provision of regional trip planning information
- Provide on-board transit information and integrated stop announcements
- Provide Transit customers with real-time next bus/train information
- Provide Paratransit customers with enhanced trip and routing information

Goal #2: Improve Business Tools and Access to Information for Management and Staff
Objectives:

- Expand functionality and accessibility of profession-specific hardware/software, such as the Transit Operating System (TOS)
- Deploy state-of-the-art document control center and related tools
- Deploy state-of-the-art data management tools and improve data collection, storage, access, integration, analysis, and reporting
- Develop enterprise-wide summary data warehouse(s), including an agency-wide source of geographical data

Goal #3: Upgrade and Standardize Transit's Information Technology Environment
Objectives:

- Implement ongoing maintenance and enhancements
- Develop an enterprise data model and ITS architecture
- Implement a standardized database environment and application architecture
- Refine and adopt an electronic communication policy and standard for Transit
- Provide enhanced voice and data communication services across Transit, including adoption of browser-based technology
- Upgrade and standardize equipment agency-wide
- Implement an improved application infrastructure and environment

Goal #4: Improve the Management of IT Resources and Processes, Including Communications with Business Functions
Objectives:

- Be a valuable partner in reengineering and improving business processes as systems are improved
- Institute a formal approach to the creation of all Information Technology projects
- Increase Transit's reporting tools, including the development of tracking systems to assist management with employee performance
- Improve IT quality assurance function
- Improve performance measures for IT services and deliverables

- Implement improved cost control measures
- Adopt standardized business analysis and cost-benefit analysis procedures

Goal #5: Improve Services and Operating Efficiency through On-Board Vehicle Technology Improvements

Objectives:

- Implement on-board architecture, on-board systems, and necessary modifications in partnership with other stakeholders to support Transit needs
- Enhance field communications to central control through technology
- Improve quality and availability of real-time information
- Support integration between on-board ITS applications, field equipment, and central computers for increased information and reduction of costs

Goal #6: Enhance Safety and Security through Technology

Objectives

- Improve passenger safety and security through on-board video surveillance and real-time information capabilities
- Enhance systems that capture incident and accident information for more accurate reporting
- Provide enhanced analysis and reporting tools to improve and ensure customer safety
- Integrate voice annunciation with digital display to comply with ADA requirements

Goal #7: Improve Skills and Effectiveness of Staff through Training Program Enhancements

Objectives:

- Provide project management and needed technical training for IT Services staff
- Support training for business area staff and system users when a new system is implemented
- Support agency-wide training efforts, such as creating a web-based Training Program for MDT employees

4 ITS STRATEGIC INITIATIVES

4.1 Overview

Fourteen ITS Data and Application initiatives, and one ITS On-Board Technology Architecture, were developed in the IT/ITS Strategic Planning Process. Table 4-1 lists the ITS specific strategic initiatives that are proposed in this ITS Strategic Plan. The Data and Application initiatives are described in more detail in Section 4.2, and the On-Board initiative is described in Section 4.3.

The data initiatives (Core Data Management and Decision Support Tool) support all units and divisions across Transit. These initiatives provide for a single approach to report generation, data access, timeliness, and availability. Most other applications depend on the data initiatives being "in place" prior to their effective deployment. Many transit agencies deploy information-driven applications only to wait or turn off their systems because the data sets that drive the applications are not ready or cannot be maintained. These initiatives are critical to the success of the other initiatives and to meeting MDT mission and goals.

Table 4-1 ITS Specific Strategic Initiatives

Number*	ITS Data and Application Strategic Initiatives
SI-01-DA	On-Board Bus Infrastructure and Replacement
SI-02-DA	Automated Passenger Counting
SI-03-DA	Customer Information Network
SI-04-DA	Real-Time Information
SI-05-DA	Bus Traffic Control Management
SI-06-DA	E-commerce
SI-07-DA	Fare Collection
SI-08-DA	Paratransit
SI-09-DA	Safety and Security
SI-10-DA	Traffic Signal Prioritization (TSP)
SI-11-DA	Scheduling Enhancements and Planning Tools
SI-12-DA	Workforce Management (TOS Replacement)
SI-18-DA	Core Data Management
SI-19-DA	Decision Support Tool/Datamart (includes ITS National Architecture User Service 7.1, Archived Data)
	ITS On-Board Technology Architecture Strategic Initiative
SI-27-T	On-Board Communications/Integration with Back-End Systems

*SI = Strategic Initiative; DA = Data and Application; T = Technology; O = Organizational

4.2 ITS Data and Application Initiatives

4.2.1 Initiative: SI-01-DA On-Board Bus Infrastructure and Replacement

Description: The On-Board Bus Infrastructure and Replacement Initiative will replace the existing automatic vehicle location and monitoring system and integrate other on-board systems such as CCTV/video surveillance, annunciators/signage, destination signs, and automated fare collection into an integrated environment. This initiative should be developed in a number of phases:

Phase 1: Develop approach and processes for backbone (e.g., vehicle area network), key functions (e.g., location determination, logon, operator display) and replacement versus upgrade (technology trade-off study). Prioritize functions, gather user requirements, and develop migration strategy.
Phase 2: Develop user requirements and system specifications, including links to CAD, AFC, APC, upload/download data files, etc.

Primary Process(es): Service Management (primary); Safety and Security; Service Implementation

Item	Description
Transit Goals Supported:	Goal 1: Maximize Use and Efficiency Goal 4: Innovative Solutions Goal 7: Improve Support Services
IT Division Goals Supported:	Goal 1: Enhance Customer Information Goal 2: Improve Business Tools and Information Goal 3: Upgrade IT Environment Goal 5: On-Board Vehicle Improvements Goal 6: Enhance Safety and Security

Issues and Considerations:	• Primary Metrobus; may include some Metrorail and Metromover projects (e.g., video surveillance, fare collection)
	  • Plan System Replacement Approach; this includes migration approach (how much is turnkey; prioritize functions)
	  • Include single operator display and logon process
	  • Integration with CAD [SI-05-DA], APC [SI-02-DA], GPS, electronic Fare Collection [SI-07-DA], maintenance diagnostics, etc.
	• Dependencies on VAN, wireless short range (wayside), and radio communications initiatives [SI-27-T]

	• Explore service and configuration loading and performance data off-loading requirements. Dependencies on Core Data Management [SI-18-DA] • (See discussions in Sections 4.3 and 5.3)

MDT Architecture Subsystem:	• Technology
	  o Radio
	  o Wayside (short range)
	  o VAN
	• Data and Application
	  o Vehicle Logic Unit (VLU)
	  o Automated Passenger Counting (APC)
	  o Manage on-board customer information
	  o Automate Fare Collection System
	  o Operator Console
	  o Video Surveillance
	  o Transit Signal Priority (TSP)
	  o Vehicle ID
	  o TV

National ITS Architecture User Service Bundles (optional):	2.1 Public Transportation Management 2.2 En-Route Transit Information
Related Projects and Initiatives:	See current IT business plan

4.2.2 Initiative: SI-02-DA Automated Passenger Counting (APC)

Description: The Automated Passenger Counting Initiative is targeted at collecting information to support planning functions. The initiative involves installing sensors on board revenue vehicles (Metrobus, Metrorail, and Metromover) to count the number of passengers who board and alight the vehicle at stops along trips/routes during different times of day and days of week. The APC initiative may also collect schedule adherence (e.g., running times, dwell times, and other performance measures) of the vehicle as it traverses the assigned vehicle path.

Phase 1: Gather requirements and develop prototype specification and RFP Phase 2: Deploy prototype and assess results, identify data integration (loading) and data collection (off-loading) issues. Develop strategies for processing and using datasets. Phase 3: Perform systems engineering analysis (including technology trade-offs based on dependent initiatives (e.g., SI-01-DA, SI-11-DA, SI-18-DA).	
Primary Process(es): Service Implementation (primary); Service Management	
Item	**Description**
Transit Goals Supported:	Goal 1: Maximize Use and Efficiency Goal 4: Innovative Solutions Goal 5: Expand Services Goal 6: Intermodal Linkages *(if APCs are installed on Metrorail and Metromover vehicles)* Goal 7: Improve Support Services
IT Division Goals Supported:	Goal 2: Improve Business Tools and Information Goal 5: On-Board Vehicle Improvements
Issues and Considerations:	• Plan pilot deployment prior to procuring system to determine data quality and integration needs. • Dependencies on integration of vehicle assignments (trips), patterns and bus stop data; requires rigorous and timely procedures for managing the bus stop inventory. • If APCs are not system-wide, then assigning vehicles to routes will impact Metrobus maintenance, dispatch, and garage parking. Procedures for coordinating assignments among these stakeholders will be necessary. • Develop strategies for "cleaning" and validating APC data prior to installation; this may require reconciliation with Fare Collection data [SI-07-DA] and AVL/Schedule Adherence data (from On-Board Infrastructure and Replacement Initiative, SI-01-DA). • Interface to off-load the data should be interoperable with the Scheduling Enhancements and Planning Tools [SI-11-DA] initiative, the acquisition of software analysis, and visualization and reporting tools to review APC data sets. If additional data sets such as demographics, land use, etc. are used, then consistent geo-coding to the MDT base map may become an obstacle. • If the APC implementation is fully integrated into the on-board infrastructure and replacement approach, deployment issues may be significantly impacted. Phase 3 of this initiative should be closely coordinated with the On-Board Bus Infrastructure and Replacement Initiative [SI-01-DA].
MDT Architecture Subsystem:	• Planning • Fixed Route Scheduling

	• On-Board: Automated Passenger Counting (APC)
National ITS Architecture User Service Bundles (optional):	2.1 Public Transportation Management
Related Projects and Initiatives:	See current IT business plan

4.2.3 Initiative: SI-03-DA Customer Information Network (CIN)

Description: A regional initiative for which MDT is the lead agency, the CIN will include the following functions:

- Provide regional trip itinerary
- Provide fare information
- Provide Transit information and publications
- Process commendations and complaints
- Provide special events, evacuation, and detour information
- Process subscription services
- Provide real-time service status
- Provide en-route information
- Provide exceptions/service disruptions

A vendor solution has already been selected, and so the major effort will be to

1. Provide MDT service information
2. Develop a strategy to coordinate procedures in the region, including integrating and updating Transit information data such as a (single) regional base map, bus stop numbering, and transfer locations; fare data; and coordination of messages among participating agencies related to exceptions and disruptions

Internal Phases

Phase 1: Plan operational strategies, including management and update of service information needed to meet functional requirements; this may require adoption and transformation of data to conform to a regional base map. Identify distribution channels (e.g., kiosk, web, IVR, call center) and special requirements for each; phase deployment of distribution channels.

Phase 2: Development and testing: develop and test applications and data sets to meet requirements (coordinate with Real-Time

Information Initiative [SI-04-DA]). This phase is based on the phased deployment strategy developed in Phase 1. Phase 3: Implement and operate (includes on-going data and system maintenance). Coordination Phases Phase 1: Develop strategy to coordinate management processes for CIN; develop data coordination and update requirements for service information. Phase 2: Develop coordinating group to oversee and implement operating and data integration strategies.	
Primary Process(es): Customer Information	
Item	**Description**
Transit Goals Supported:	Goal 1: Maximize Use and Efficiency Goal 3: Regional Systems Goal 4: Innovative Solutions Goal 5: Expand Services Goal 6: Intermodal Linkages
IT Division Goals Supported:	Goal 1: Enhance Customer Information Goal 2: Improve Business Tools and Information Goal 6: Enhance Safety and Security
Issues and Considerations:	• Regional base map • Data dependencies include fare structure, service (bus stop, route by pattern, time tables, service types) • Regional coordination and maintenance of data sets, particularly intermodal and inter-agency transfer points • Multi-agency operating procedures will impact data integration and distribution, privacy and security policies, and licensing issues
MDT Architecture Subsystem:	• Customer Information
National ITS Architecture User Service Bundles (optional):	1.1 Pre-Trip Travel Information 2.1 Public Transportation Management 2.2 En-Route Transit Information
Related Projects and Initiatives:	See current IT business plan

4.2.4 Initiative: SI-04-DA Real-Time Information

Description: This initiative offers real-time status information for Metrobus, Metrorail, and Metromover using different methods of user access, such as active bus stop or station signs, web maps, pagers/PDAs using WIFI, voice-XML, and other communications technologies.

Primary Process(es): Customer Information

Item	Description
Transit Goals Supported:	Goal 1: Maximize Use and Efficiency Goal 4: Innovative Solutions Goal 5: Expand Services Goal 6: Intermodal Linkages Goal 7: Improve Support Services
IT Division Goals Supported:	Goal 1: Enhance Customer Information Goal 2: Improve Business Tools and Information Goal 5: On-Board Vehicle Improvements Goal 6: Enhance Safety and Security
Issues and Considerations:	• Develop internal policies on presenting real-time service status and disruption information • (see FTA "Guidance for Developing and Deploying Real-Time Information Systems for Transit" http://www.fta.dot.gov/research/fleet/its/rtist/index.htm) • Develop different strategies for Metrobus, Metrorail, and Metromover

MDT Architecture Subsystem:	• On-Board Subsystems
	  ▪ VLU (AVL, Schedule Adherence)
	• Customer Information
	  ▪ Process subscription services (includes subscription and translation to different distribution channels)
	  ▪ Provide real-time service status
	  ▪ Provide en-route information
	  ▪ Provide exceptions/service disruptions

National ITS Architecture User Service Bundles (optional):	1.1 Pre-Trip Travel Information 2.1 Public Transportation Management 2.2 En-Route Transit Information

Related Projects and Initiatives:	See current IT business plan

4.2.5 Initiative: SI-05-DA Bus Traffic Control Management

Description: This initiative is a replacement project for the existing Computer Aided Dispatch (CAD) system. This replacement will combine operations management functions including operator and service information lookup, incident management (and reporting), fleet management, and supervisor/maintenance dispatch and management. The interfaces will eliminate the need to interface with TOS and rely on the Census format for updating the map database. Further, the effort will extend the CAD operations into the supervisor vehicle through the use of a laptop CAD.

Primary Process(es): Service Management

Item	Description
Transit Goals Supported:	Goal 1: Maximize Use and Efficiency Goal 4: Innovative Solutions Goal 5: Expand Services Goal 6: Intermodal Linkages Goal 7: Improve Support Services
IT Division Goals Supported:	Goal 2: Improve Business Tools and Information Goal 3: Upgrade IT Environment Goal 6: Enhance Safety and Security
Issues and Considerations:	• Impacts from and dependencies on the radio system [SI-27-T], associated on-board vehicle systems [SI-01-DA]; TOS Replacement [SI-12-DA] • Linkages to rail and other transit management centers may be established to coordinate transfers • Linkages to traffic management centers, including traffic condition messages and CCTV feeds to BTC, may be helpful
MDT Architecture Subsystem:	• Metrobus Operations • Incident Management
National ITS Architecture User Service Bundles (optional):	2.1 Public Transportation Management

Related Projects and Initiatives:	See current IT business plan

4.2.6 Initiative: SI-06-DA E-commerce

Description: Develop an E-commerce capability to sell fare media via the Web (and possibly kiosks)

Primary Process(es): Customer Information (primary); Internal Infrastructure (Finance)

Item	Description
Transit Goals Supported:	Goal 1: Maximize Use and Efficiency Goal 4: Innovative Solutions Goal 5: Expand Services
IT Division Goals Supported:	Goal 1: Enhance Customer Information Goal 2: Improve Business Tools and Information
Issues and Considerations:	• Coordinate with Finance on financial reporting and fare media distribution issues.
MDT Architecture Subsystem:	• Customer Information o Provide fare information/sell media
National ITS Architecture User Service Bundles (optional):	1.1 Pre-Trip Travel Information
Related Projects and Initiatives:	See current IT business plan

4.2.7 Initiative: SI-07-DA Fare Collection

Description: The Fare Collection Initiative includes on-board, gate, back office, Ticket Vending Machines (TVM) and Ticket Dispensing Machines. The fare collection system includes fare transaction processing, point of sales, gated entry or on-board equipment, and fare processing functions. Back-office functions include revenue and ridership/usage reconciliation. The transaction unit processes financial transactions (e.g., collects fares, adds/deducts value, reads fare instruments) and the fare processing unit calculates the fares (based on fare tables and policies). The fare collection system will use cash, magnetic tickets, and smart cards. The smart cards will be managed by a regional consortium. Although all financial transaction information is processed through the revenue reconciliation process (see Internal Infrastructure primary process), the smart card and magnetic ticket transaction data is provided to the Regional Smart Card Consortium.

Primary Process(es): Internal Infrastructure (primary); Customer Information; Service Management

Item	Description
Transit Goals Supported:	Goal 1: Maximize Use and Efficiency Goal 3: Regional Systems Goal 4: Innovative Solutions Goal 5: Expand Services Goal 6: Intermodal Linkages Goal 7: Improve Support Services
IT Division Goals Supported:	Goal 2: Improve Business Tools and Information Goal 5: On-Board Vehicle Improvements Goal 6: Enhance Safety and Security
Issues and Considerations:	• Institutional issues between regional stakeholders are key to ensure smooth deployment. • Coordinate with HR on employee ID and Facilities for access security. • Coordinate with Operations to use cards for operator assignments and login procedures. • Coordinate on-board farebox equipment with AVL; impacts logon, operator control head, interface with VLU for real-time alarms, etc. [MDT-AD-001] • Engage vendor on fare table configuration requirements. • Engage vendor on revenue reconciliation procedures and data descriptions/interfaces of the downloads; the downloaded data will impact Planning as well as Finance.
MDT Architecture Subsystem:	• Revenue Reconciliation • Smart Card

	• Fare Vending Machine/Fare Dispensing Machine • Fare Transaction Unit (on-board and gate)
National ITS Architecture User Service Bundles (optional):	2.1 Public Transportation Management (smart card; fare payment)
Related Projects and Initiatives:	See current IT business plan

4.2.8 Initiative: SI-08-DA Paratransit

Description: The Paratransit Initiative will implement the various functions necessary to support the following functions: provide certification; manage Medicaid service (reservations and dispatch); manage ADA service; manage complaints and commendations; manage county billing; manage state billing for Medicaid and Special Transportation Services (STS) service providers. The vendor solution has already been selected. Phases for deployment are listed below:

Phase 1: Medicaid Implementation

- Implement Trapeze PASS, COM, Cert with interfaces to verify eligibility and to submit billing to Consultec. This implementation provides for Medicaid reservations, scheduling/routing, dispatching, and complaint resolution. It also provides for certification and eligibility checking for Medicaid, STS, and MetroPass clients.

Phase 2: STS Implementation

- Implement PASS and COM at STS contractor and service provider sites for reservations, scheduling/routing, dispatching, complaints and commendations.

Phase 3: Implement Trapeze PASS-IVR

- Implement PASS-IVR for client trip confirmation and cancellation over the phone

Phase 4: Implement Trapeze PASS-WEB

- Implement PASS-WEB for client trip confirmation and cancellation over the internet

Phase 5: Implement On-Board Equipment (Mobile Data Terminals)

- This service will be implemented following confirmation of new STS contract. Implement Mobile Data Terminals in STS service provider vehicles to monitor vehicle location and on-time performance. Driver manifests and changes to schedules may be automatically sent to drivers via the MDT units, thus reducing voice communications.

Primary Process(es): Service Implementation (primary); Service Management	
Item	**Description**
Transit Goals Supported:	Goal 1: Maximize Use and Efficiency Goal 4: Innovative Solutions Goal 5: Expand Services
IT Division Goals Supported:	Goal 1: Enhance Customer Information Goal 2: Improve Business Tools and Information Goal 5: On-Board Vehicle Improvements
Issues and Considerations:	• Coordinate this deployment with Customer Information (particularly distribution channels such as web and IVR)
MDT Architecture Subsystem:	• Paratransit
National ITS Architecture User Service Bundles (optional):	2.1 Public Transportation Management
Related Projects and Initiatives:	See current IT business plan

4.2.9 Initiative: SI-09-DA Safety and Security

Description: The Safety and Security Initiative is intended to improve safety and security for employees and customers through a set of coordinated technology projects. One component involves safety and security improvements on the revenue vehicles, such as the maintenance and replacement of the Video Surveillance and On-Board CCTV systems. The initiative also includes upgrade or replacement of the incident tracking logs into an incident management system (with potential of tracking incidents in real-time).

The goal of the initiative is to:

- Improve the analysis, reporting, and understanding of safety and security incident data
- Identify and resolve problems more quickly

• Better deploy safety and security resources • Efficiently and accurately comply with reporting requirements • Improve safety and security • Increase ridership, as a secondary benefit, when customers feel more secure	
Primary Process(es): Safety and Security (primary); Service Management; Customer Information	
Item	**Description**
Transit Goals Supported:	Goal 1: Maximize Use and Efficiency Goal 4: Innovative Solutions Goal 5: Expand Services Goal 7: Improve Support Services
IT Division Goals Supported:	Goal 1: Enhance Customer Information Goal 2: Improve Business Tools and Information Goal 5: On-Board Vehicle Improvements Goal 6: Enhance Safety and Security
Issues and Considerations:	• Define categories of incidents for all the stakeholder groups. • Scrutiny and strict procedures on access to incident tracking and database will need to be enforced. • Include long-term strategic goal to standardize and combine, where possible, ID cards with a wireless communication component, such as Security access ID cards, contactless smart cards, operator sign-in cards and cards for paying tolls on the expressways.
MDT Architecture Subsystem:	• Surveillance Systems (on-board and at stations) • Incident Management System
National ITS Architecture User Service Bundles (optional):	2.1 Public Transportation Management 5.1 Emergency Notification and Personal Security 5.2 Emergency Security Management
Related Projects and Initiatives:	See current IT business plan

4.2.10 Initiative: SI-10-DA Traffic Signal Prioritization (TSP)

Description: Traffic Signal Prioritization (TSP) initiative involves coordination between MDT and regional traffic control operations efforts. This is a project designated by the Southeastern Florida Regional ITS Architecture.

Phase 1: Coordinate with Service Planning/Implementation and Planning and regional Traffic Operations agencies on corridors, intersections, and priority strategies. Discuss equipment and standards related to implementation. Complete phase with an MOU.
Phase 2: Procure and install on-board equipment for test phase.
Phase 3: Deploy on vehicles assigned to the route/run or corridor.

Primary Process(es): Service Management

Item	Description
Transit Goals Supported:	Goal 1: Maximize Use and Efficiency Goal 3: Regional Systems Goal 4: Innovative Solutions
IT Division Goals Supported:	Goal 2: Improve Business Tools and Information Goal 5: On-Board Vehicle Improvements
Issues and Considerations:	• Review emerging standards in this area for requirements for On-Board and signal coordination control (NTCIP 1211). • Understand the difference between preemption and priority and determine which method is more amenable to the signal control organizations. • Target the corridors or intersection with the most need.
MDT Architecture Subsystem:	• On-Board Transit Signal Priority
National ITS Architecture User Service Bundles (optional):	1.6 Traffic Control 2.1 Public Transportation Management
Related Projects and Initiatives:	See current IT business plan

4.2.11 Initiative: SI-11-DA Scheduling Enhancements and Planning Tools

Description: With better on-board data collection techniques, the performance data extracted, and the service data needed to configure these on-board systems, better tools are needed to manage and analyze the data. Additional tools are available from the existing scheduling software vendor to perform these tasks. Alternative tools may be available from other vendors that will not require significant effort. This initiative is designed to select, procure, prepare the data sets, implement, train end-users, and operate the scheduling enhancement and planning tools.

Primary Process(es): Service Implementation

Item	Description
Transit Goals Supported:	Goal 1: Maximize Use and Efficiency Goal 4: Innovative Solutions Goal 6: Intermodal Linkages Goal 7: Improve Support Services
IT Division Goals Supported:	Goal 1: Enhance Customer Information Goal 2: Improve Business Tools and Information Goal 3: Upgrade IT Environment
Issues and Considerations:	• Additional requirements will emerge when new data sets are acquired through on-board and operations management system replacements and upgrades. Procurement should include a provision that allows MDT to manage the back-end data sets so that new information may be displayed and analyzed.
MDT Architecture Subsystem:	• Planning • Scheduling • Core data/GIS
National ITS Architecture User Service Bundles (optional):	2.1 Public Transportation Management
Related Projects and Initiatives:	See current IT business plan

4.2.12 Initiative: SI-12-DA Workforce Management (TOS Replacement)

Description: Operator/maintenance workforce management initiative entails tracking performance of operators and maintenance personnel, including tracking their work assignments, vacations, seniority, and credentials as well as their absences and tardiness, incidents and complaints, and medical (physical) and drug tests needed to comply with legal and contractual requirements.

Primary Process(es): Service Management

Item	Description
Transit Goals Supported:	Goal 1: Maximize Use and Efficiency Goal 4: Innovative Solutions Goal 5: Expand Services Goal 7: Improve Support Services
IT Division Goals Supported:	Goal 2: Improve Business Tools and Information Goal 3: Upgrade IT Environment Goal 5: On-Board Vehicle Improvements Goal 6: Enhance Safety and Security
Issues and Considerations:	• TOS, which this system will replace, was used to configure and load data to the AVL system. TOS is currently responsible for generating and managing incident reports on operators. Many of these functions should be decoupled from the next generation workforce management system or built as middleware or data sets that are not tightly coupled to the workforce management software. • Impacts from operator/maintenance pick/shakeup and operator dispatch processes • Impacts from the Incident Management System [MDT-AD-009]
MDT Architecture Subsystem:	• Workforce Management System
National ITS Architecture User Service Bundles (optional):	2.1 Public Transportation Management
Related Projects and Initiatives:	See current IT business plan

4.2.13 Initiative: SI-18-DA Core Data Management

Description: Develop a plan to construct core data sets that serve as the system of record (or authority) throughout the organization. This initiative helps coordinate various data management projects and activities, including:

- Bus Stop Inventory
- GIS (development of transit features on county base map; develop linkages to other systems)
- Data configuration for on-board systems
- Performance data management (from on-board systems and other back-office systems)
- Data preparation for planning tools
- Data preparation for CIN [SI-3-DA]

Phase 1: Develop a plan that includes a core data dictionary (format, description, rules, owner, etc.), data relationships (or relational data model), and strategy to populate database by allocating responsibility to specific application procurements; define and implement configuration management approach and procedures, and other core data practices and procedures (see Volume 1, Section 6.1).

Phase 2: Manage core database and interfaces. Update data model based on changing requirements. Manage and document data and interface metadata for ongoing projects.

Primary Process(es): All

Item	Description
Transit Goals Supported:	Goal 1: Maximize Use and Efficiency Goal 4: Innovative Solutions Goal 7: Improve Support Services
IT Division Goals Supported:	Goal 1: Enhance Customer Information Goal 2: Improve Business Tools and Information Goal 3: Upgrade IT Environment
Issues and Considerations:	
MDT Architecture Subsystem:	• Core Data
National ITS Architecture User	2.1 Public Transportation Management 7.1 Archived Data

Service Bundles (optional):	
Related Projects and Initiatives:	See current IT business plan

4.2.14 Initiative: SI-19-DA Decision Support Tool/Datamart

Description: Develop datamart(s) and decision support tools to allow easy data access, analyses, and reporting. For example, agency performance data should be included in a manner that allows monthly, quarterly, and annual aggregation. In addition, the ability should be provided to easily make comparisons between reporting periods, such as year-to-year. Other appropriate data sets include ridership, National Transit Database, etc.

Primary Process(es): All

Item	Description
Transit Goals Supported:	Goal 1: Maximize Use and Efficiency Goal 4: Innovative Solutions Goal 7: Improve Support Services
IT Division Goals Supported:	Goal 1: Enhance Customer Information Goal 2: Improve Business Tools and Information Goal 3: Upgrade IT Environment Goal 4: Improve Management of IT Goal 6: Enhance Safety and Security Goal 7: Improve Skills and Training Program
Issues and Considerations:	• Must be coordinated with the Core Data Management Initiative
MDT Architecture Subsystem:	• Datamart/Archive
National ITS Architecture User Service Bundles (optional):	2.1 Public Transportation Management 7.1 Archived Data

Related Projects and Initiatives:	See current IT business plan

4.3 On-Board Technology Architecture Initiative

The On-Board Technology Architecture Initiative deals with the various communication technologies that support communication with the transit vehicle. Although the initiative deals primarily with communications, it is closely coupled with SI-01-DA, On-Board Bus Infrastructure and Replacement. Marrying these two strategic initiatives is critical to the successful implementation of ITS applications with on-board components such as AVL, APC, and annunciators. Consequently, this initiative is called On-Board Communications/Integration with Back-End Systems (SI-27-T); MDT must vigilantly coordinate the implementations of on-board ITS applications with communications systems that enable these applications and data sets.

One of the goals of this initiative is to minimize the number of different variations on a technology that are implemented and then need to be maintained. For example, choices about on-board wireless technologies should be considered within a larger technology context that includes wayside and back-office wireless needs. An enterprise-wide perspective, rather than a project-centric perspective, is critical to success.

4.3.1 Initiative: SI-27-T On-Board Communications/Integration with Back-End Systems

Description: This initiative provides design, coordination, and integration support to ensure that on-board vehicle digital radio communications, Vehicle-Area-Networks (VAN), and wireless networks support the ITS and information needs of MDT. The intent is to enable the successful implementation and integration of on-board ITS applications such as AVL, APC, annunciators, and electronic fare collection. The VAN, radio communications, and wireless networks should support the collection of large volumes of on-board information in real-time and batch mode. Critical related initiatives to the On-Board Communications Initiative include any On-Board ITS applications and the on-board Bus Infrastructure and Replacement Initiative (SI-01-DA).

The On-Board Communication/Integration with Back-End Systems Initiative will also support transparency of passing data defined by published standards (i.e., SAE-J1587, TCIP) and management of wireless standards both on-vehicle and off the vehicle. The coordination efforts will begin at procurement to include requirements for systems integration at the data level. The data and metadata interface requirements will leverage ITS TCIP Data Standards for data content and message sets, as well as forms of security software. Wireless communications and digitally enhanced radio communications will be tested to enable the secure and manageable real-time transfer of the massive amounts of data required by subsystems on the vehicle, as well as large amounts of performance data collected on the vehicle, which are normally transferred as batch data at the end of the day.

Item	Description
Transit Goals Supported:	Goal 1: Maximize Use and Efficiency Goal 2: Educate the Community Goal 4: Innovative Solutions
IT Division Goals Supported:	Goal 1: Enhance Customer Information Goal 2: Improve Business Tools and Information Goal 3: Upgrade and Standardize Goal 5: On-Board Vehicle Improvements
Issues and Considerations:	• Migration plan may require dual platform operations to facilitate transition testing, migration, and historical reporting • User experience expectations may need to be managed due to client/server performance characteristics, particularly when deployed over a WAN • Network capacity planning will be increasingly important to ensure consistent application responsiveness

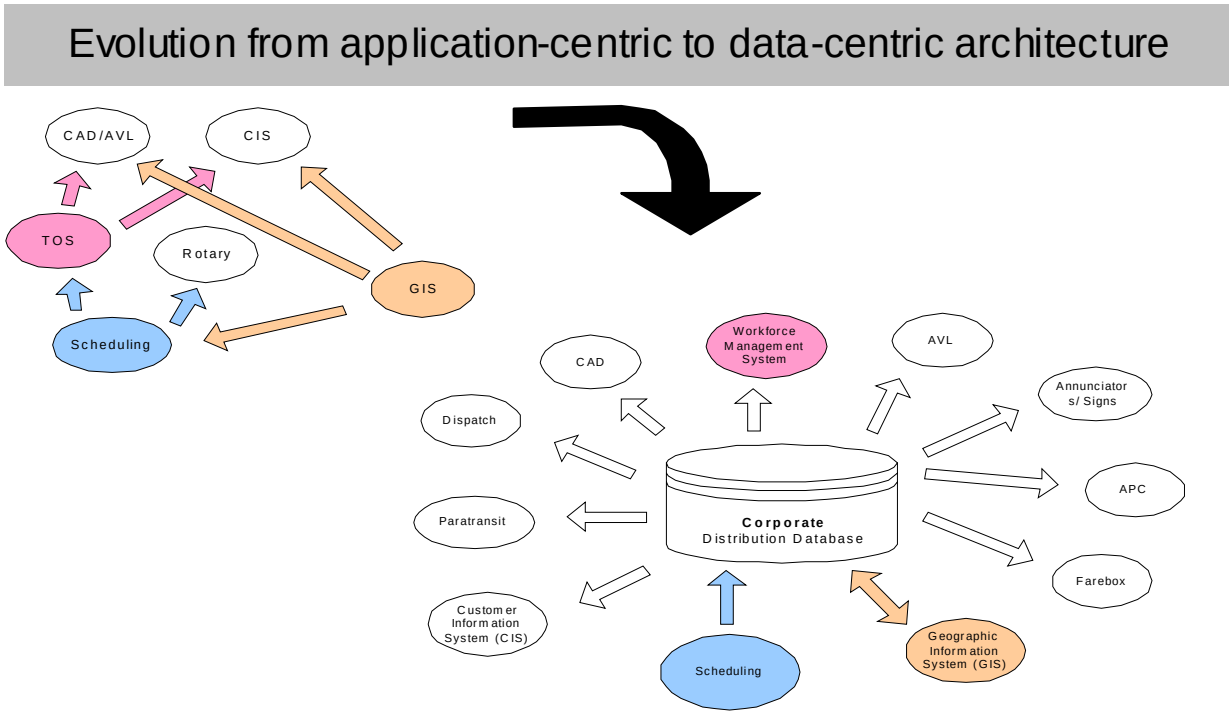
MDT Architecture Subsystem:	• Internal Infrastructure o Platforms and Servers o Business Systems
Related Projects and Initiatives:	• See current IT business plan

5 ENTERPRISE ARCHITECTURE CONTEXT FOR ITS

The IT Division will move forward over the 2003–2008 planning horizon to direct ITS project initiatives within the framework of the Target Enterprise Architecture. For a more detailed explanation of the Target Architecture and its benefits, please refer to the IT/ITS Strategic Plan listed in the References chapter. Some key points from the Target Enterprise Architecture discussion that directly relate to ITS project planning and implementation efforts are highlighted in this chapter. Elements of the Data and Application Architecture and the On-Board Architecture that are particularly relevant to ITS projects will be included with more details.

One positive consequence of implementing the Target Enterprise Architecture is that IT will evolve from an application-centric to a data-centric architecture, as illustrated in Figure 5-1. This means that integration and coordination requirements for ITS projects will increase during the planning and development phase, but the longer lasting maintenance and operations phases will be easier.

Figure 5-1 Migration Strategy for MDT IT Division



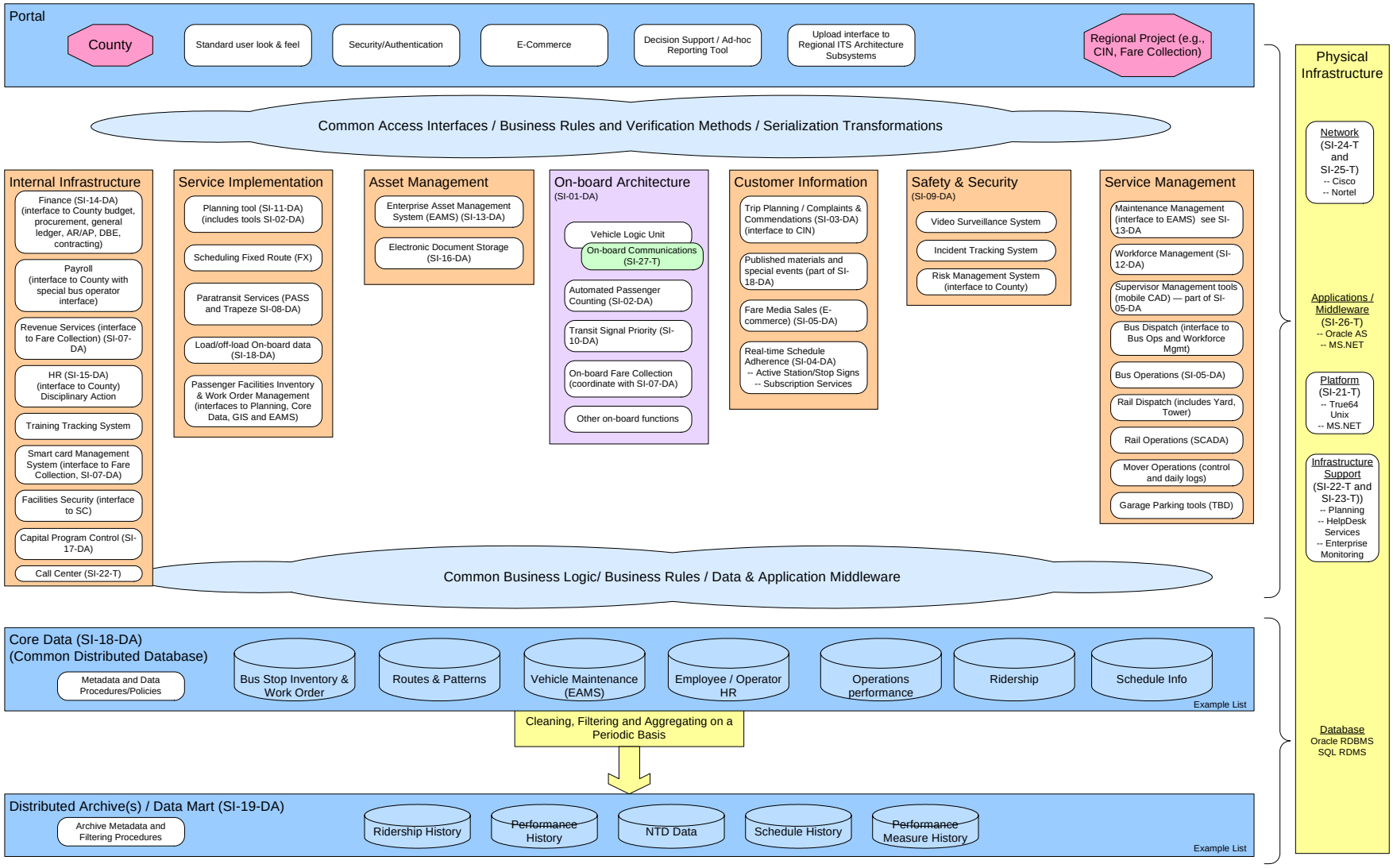
Graphic developed at
Seattle King County Metro

5.1 Target Enterprise Architecture — The Roadmap Ahead

The Target Enterprise Architecture provides the initial concept of information systems, including ITS, and the linkages between them. It is made up of key information systems, systems boundaries, enterprise data hubs, data flows, and data standards that integrate those information systems and the surrounding hardware/software and networks.

The conceptual view of the overall MDT Target 2003–2008 Enterprise Architecture is depicted in Figure 5-2. It is further broken down into the 3 layers (Data, Application, and Technology). The Data and Application initiatives are supported and contained within the Technology initiatives. This is depicted by the vertical bar listed as "Physical Infrastructure." The "Portal" includes key stakeholder access and dissemination methods, including policies and security related to information. For example, a report generator supports all the "transit enterprise" and provides access to data created, analyzed, and aggregated to all transit users (people and other applications).

Figure 5-2 MDT Target 2003–2008 Enterprise Architecture



5.2 Data and Application Architecture

5.2.1 Overview of Data and Application Architecture

The MDT Data and Application Architecture is a tool for people who are designing and building systems to meet MDT business goals and deliver Transit services. The architecture does not prescribe technologies, designs, or policies; rather it provides a framework to illustrate the data and applications, and their relationship to each other and within the Miami-Dade and southeastern Florida transportation network. Particularly since the operating environment at MDT is constantly changing, the framework will also need to evolve and grow to meet the continuing demands of the organization.

The Data and Application Architecture addresses the question of what applications and data management systems should be in place to support MDT's business goals and vision. As a centerpiece of its goals, MDT must engage in an aggressive plan to meet the PTP over the next three to five years. Many data and application subsystems will need upgrade, migration, or replacement in order to achieve the productivity from staff and resources, provide effective tools to plan and assess performance, and grow customer and stakeholder services to meet these goals. The Data and Application Architecture touches every unit, division, garage, pickup point, and vehicle within MDT; its scope is the enterprise.

The architecture also includes regional, county, and state stakeholders who share data and coordinate services with MDT. Decisions by these organizations will impact MDT; in particular, their influence will affect data and application dependencies and links between MDT and the aforementioned stakeholders.

Presented below are three strategic approaches pertaining to the Data and Application Architecture that are helpful to ITS project managers and technical teams.

Strategic Approach #1: Centralize and manage core data
Significant obstacles arise when systems are built independently, without consideration of how an application fits into the overall information enterprise, what data it shares with other systems and applications, and how it supports business processes. Core data, such as bus stops or operator ID numbers, are used by a wide variety of systems and business functions. Core data becomes an enterprise asset, and as such, principles should be established to manage that asset.

The six key principles are:

1. Avoid duplicating the development and maintenance of data and data sets
2. For a core data element, establish a single point of management, collection, and "cleaning," and define an authority or "a system of record" to ensure data consistency and completeness throughout the organization
3. Create enterprise awareness of critical data (understand processes that depend on data)
4. Create an awareness of the value and cost of data throughout the organization

5. When creating core data, determine priority order based on overall criticality to application, operations, and the number of users
6. Consider security, including access requirements and restrictions

Strategic Approach #2: Develop corporate-wide data and interface policies prior to building the "enterprise information infrastructure"
MDT identified data management procedures and practices that should be implemented as part of building an enterprise information infrastructure. These procedures and practices follow from the principles of core data and help fill in the gap.

- Identify and implement standard data access methods
- Develop a data dictionary of core data definitions (including standard naming conventions)
- Develop and document Metadata for core data sets
- Manage data life cycle
  - Identify life cycle processes, update frequencies, etc.
  - Archive old versions of data
  - Document transformation rules for data sets
  - Synchronize schedule data updates and configuration management procedures
- Develop and disseminate standard code lists (e.g., incident classifications)
- Document relationships (dependencies) among data sets
- Assign data stewards for core data from among line staff
- Standardize on a set of file formats (e.g., JPG, doc, XML, etc.)
- Manage user access and security
- Develop GUI style standards and reporting formats
- Define and manage security requirements

Implementation of these procedures and practices will support MDT's goal to move to purchasing commercial off-the-shelf (COTS) tools. The adoption of standard methods and procedures will support implementing a quality process. Incorporation of transit industry and information technology standards for data such as Transit Communications Interface Profiles (TCIP) and XML will minimize customization requirements needed by new transit software and enable integration with existing applications and data management systems. Development of a standard data dictionary that supports areas not covered by TCIP will support internal data integration needs.

Strategic Approach #3: Enforce a strong systems engineering approach to applications acquisitions
In addition to being mandated as part of the FTA National ITS Architecture Policy on Transit Projects, a systems engineering approach benefits effective deployment of information technologies. Systems engineering is defined by FTA as "…an interdisciplinary collaborative approach to derive, evolve, and verify a life cycle balanced system solution that satisfies customer expectations and meets public acceptability." The policy describes the following systems engineering process elements [per www.its.dot.gov/aconform/Arch2a.htm]:

- Identification of applicable [internal and] regional architecture portions

- Identification of agencies and roles (key stakeholders)
- Requirements analysis and specification
- Identification of relevant ITS [and IT] standards and test procedures
- Alternatives analysis to meet requirements
- Procurement options
- System operations and management procedures and resources
- Maintenance and update procedures and resources

ITS initiatives tend to be interdisciplinary and multifaceted. A systems engineering approach provides for a step-by-step approach that helps eliminate potential schedule delays and cost overruns that often occur with complex ITS projects.

5.3 On-Board Architecture

The On-Board Architecture is presented here separately for emphasis, because in many transit agencies, the planning and integration that are needed to ensure the necessary and efficient flow of data between the on-board ITS components and the back-office environments have not occurred. Often, they have fallen between the cracks of the IT organization, the bus procurement group, or vehicle maintenance and engineering. A well-planned and integrated on-board architecture is critical to the successful operation and maintenance of ITS applications on board the vehicle.

The On-Board Architecture should be tied to both the Data and Application and the Technology architectures. To this end, the on-board initiatives are divided into data and application and technology initiatives. The On-Board Infrastructure and Replacement Initiative (SI-01-DA) is grouped with the Application and Data initiatives and the wireless and communications efforts are grouped into a technology initiative called On-Board Communication/Integration with Back-End Systems (SI-27-T). The rationale behind this approach is to ensure close coordination with the on-board and back-office applications and data management systems. The communication technologies, like technology in general, are an enabler of these data and application subsystems.

The on-board architecture and initiatives must be driven by an enterprise-wide perspective and not by the "first ITS project on the bus." Above all, multi-disciplinary and cross-organization coordination and skills are needed for the success of ITS applications with on-board components.

5.3.1 On-Board Introduction

The On-Board Vehicle Data and Application Architecture describes applications and data supported on-board the transit vehicle. The subsystems supported by the On-Board Vehicle are listed in Table 5-1.

In principle, the logical processes supported by the on-board Metrobus functions should be similar if not identical to ones described for the Metrorail and Metromover. Because the various vehicle modes employ different operating procedures, control, and physical environment, implementation of the physical devices and components will not be identical. In procuring the actual systems, MDT may wish to procure systems that are similar in

functionality, although they may not be similar in the technologies supported by their environments.

Table 5-1 On-Board Vehicle Subsystem Architecture

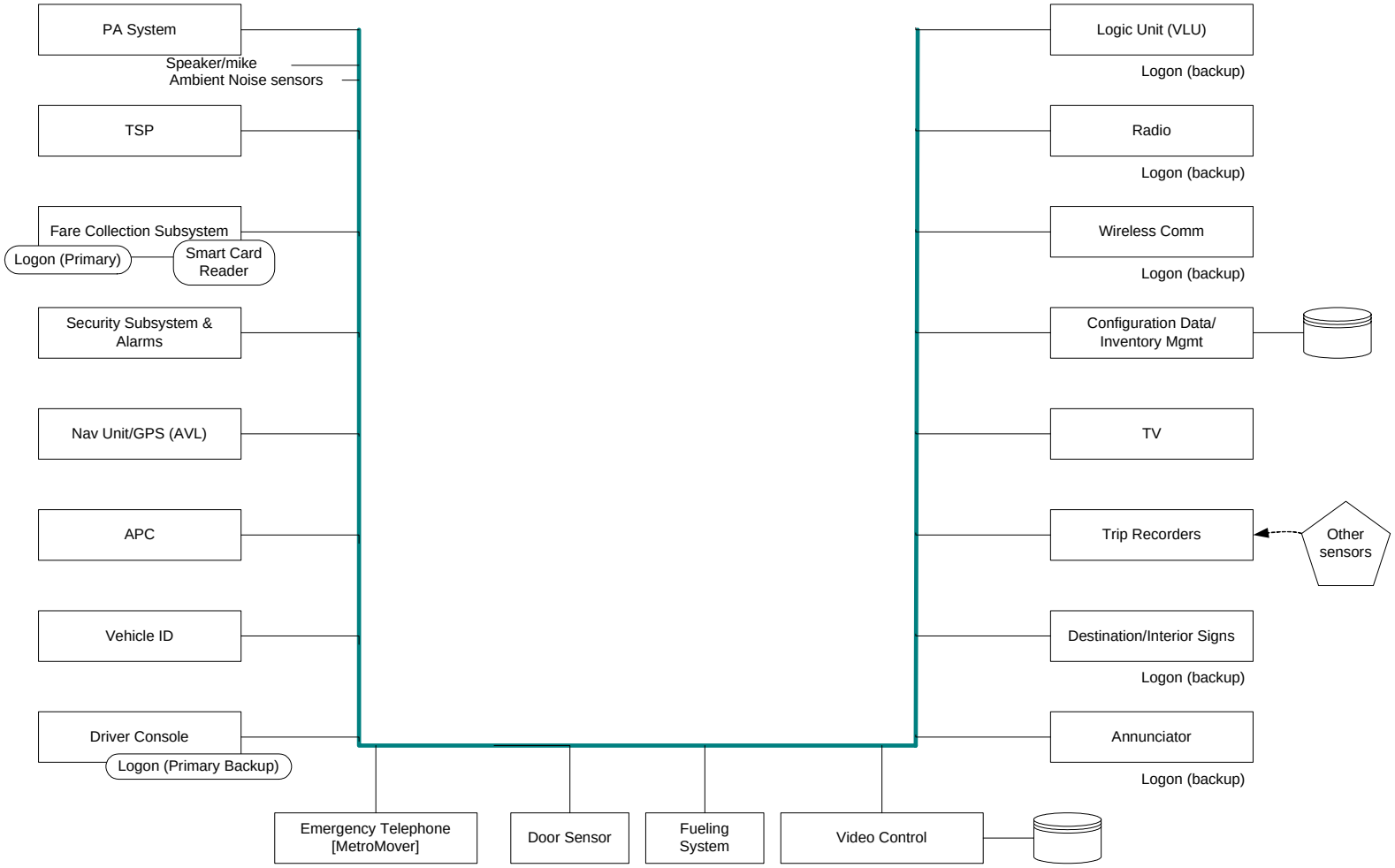
On-Board Subsystems	Processes Supported	Devices
Vehicle Logic Unit (VLU)	Manage security subsystems and alarms (includes AVM) Determine location (AVL) Manage schedule and route adherence Log health/performance data Load/manage component configuration and service data Manage communications (radio/wayside)	Processor Navigation unit (including GPS) Storage device Silent alarm VAN connector Radio connector Wayside (short range communications) connector Trip recorder(s) with connectors to drive train and/or I/O controller
Automated Passenger Counting (APC)	Monitor ridership	Door sensors Processor (may be co-located in VLU) VAN connector
Manage On-Board customer information	Interior/exterior announcements Interior/exterior signs Headsigns Manage PA system	(Interior and external) PA system (speakers, sensors, microphone) Headsign Interior and exterior signs VAN connector Storage Processor (may be co-located on VLU)
Automate Fare Collection System	Manage fare collection Manage smart card reader Manage operator logon	Smart Card reader Control head (console) Cash box Fare Collection Unit VAN connector
Operator Console	Manage Operator Interface (driver display)	Console Keyboard and touch screen VAN connector
Video Surveillance	Record Video Surveillance	Surveillance system 4-5 video cameras Storage VAN connector Wayside connector
Transit Signal Priority (TSP)	Manage Transit Signal Priority (TSP)	TSP transceiver or wayside connector (depends on Traffic Operator equipment requirements)
Vehicle ID		Vehicle ID
TV	Manage On-Board TV	TV console and subsystem VAN connector

The On-Board Technology Architecture deals with communications technologies that connect the on-board vehicle subsystem to the fixed-end back office systems. The design and implementation of these communications technologies must be coordinated with the IT Division to meet the data and information needs of the IT systems.

5.3.2 On-Board Concept of Operations

It is the intent of the IT Division to provide for nonproprietary architecture and standards for on- and off-vehicle devices and systems. In this architecture, configuration, service, and performance information can be accurately and unambiguously collected, transported, received, and understood by all subsystems, devices, and fixed-end systems. Further, vehicle subsystems would be modular, expandable, and vendor independent; the enhancements would not require the discarding of previous technology investments. The interconnection diagram, as illustrated in Figure 5-3, shows a single nonproprietary communications network that integrates multiple physical devices on board the vehicle.

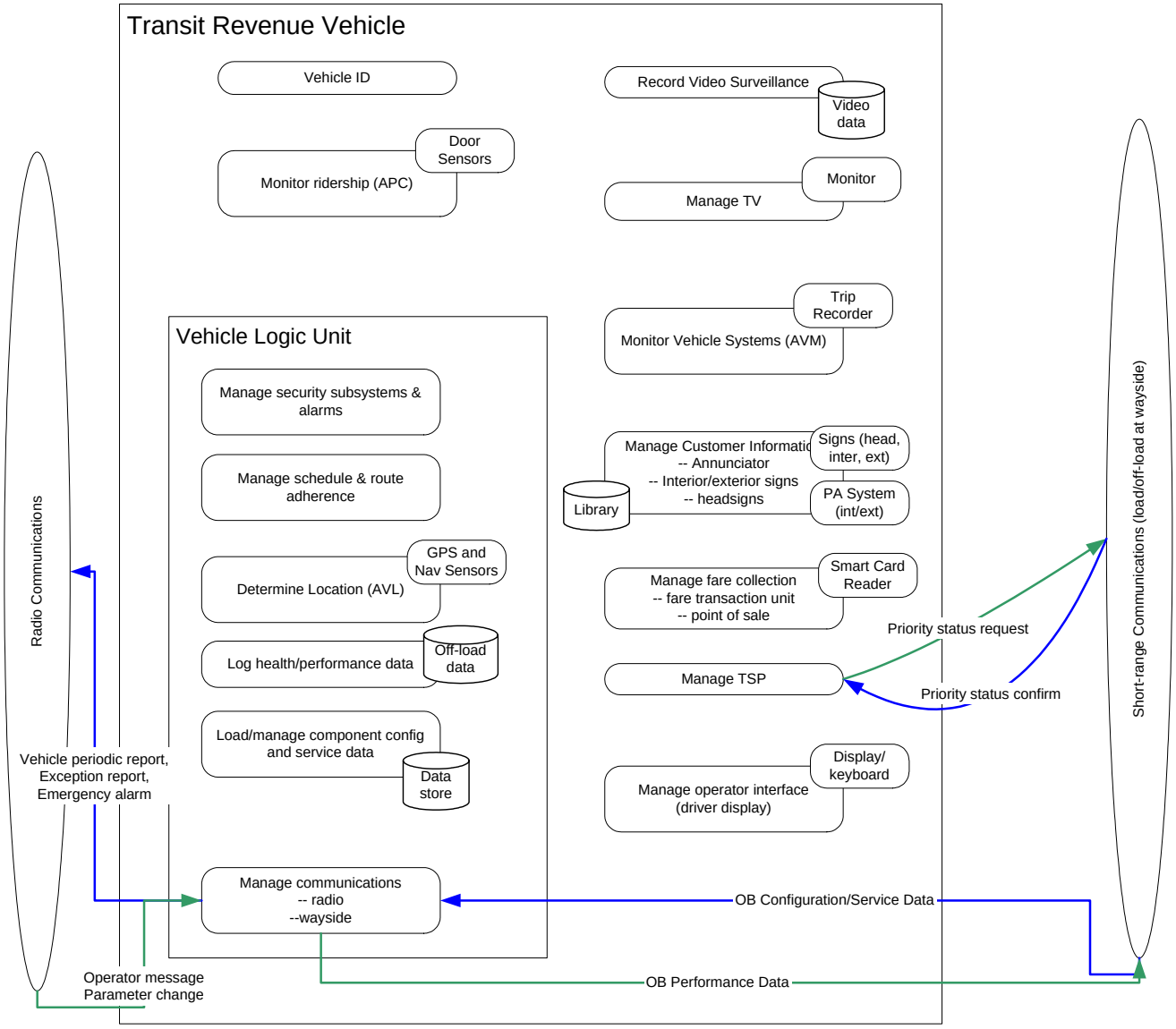
Figure 5-3 On-Board Interconnection Diagram



The interconnection diagram shows the communication connections required by the logical components. Manufacturer models may integrate several components into a single product such as the VLU and radio system, or driver console and Fare Collection Subsystem. This interconnection diagram shows a multicast/unicast network.

In the architecture described by Figure 5-3, various "processes" are accomplished by subsystem elements. The subsystems may be separate physical devices, or they may be integrated into "multiple process" physical devices. For example, the door sensors and the Automatic Passenger Counting System may be two separate subsystems or they may be combined into a turn-key system. The APC will then report the counts of boardings and alightings per occurrence (door open) to the VLU for storage along with GPS data, time, and confirming farebox receipts. As long as all of the described "functions" communicate with the VAN, the physical implementation is transparent. For example, if the GPS sensor is an integral component of the VLU and communicates with all other physical devices on the vehicle, then location data is available to Annunciators, Fare Collection, and other subsystems on the vehicle. This transparent sharing of information, and subsystem control, is contained in the SAE family of VAN specifications.

Figure 5-4 On-Board Subsystem Diagram



5.3.3 On-Board Vehicle Discussion

MDT has begun the process of defining and implementing an updated and enhanced On-Board Architecture for its revenue vehicles with the objectives of:

- Reducing capital costs
- Reducing ongoing operating costs
- Reducing the time required to troubleshoot and repair on-board equipment
- Enabling a modular, evolutionary design for deploying on-board systems that supports standards and open (nonproprietary) systems
- Ensuring that the configuration, service, and performance information can be accurately collected, transported, received, and understood by all on-board subsystems, devices, and fixed-end systems
- Improving the management and integration of data between the vehicle and the back office

Currently, on-board systems are dependent on legacy equipment and back-office processes, redundant devices, and proprietary interfaces on the vehicles that make it more difficult for MDT to achieve the objectives listed above. Examples include the following:

- Legacy Vehicle Logic Unit (VLU), Automated Vehicle Location (AVL), and control head units
- Redundant control heads and GPS units for every new subsystem
- Limited storage for annunciators and signage systems
- Limited strategy for migrating new on-board systems using SAE J-1708 Vehicle Area Network (VAN) standards

The overall approach for the on-board physical architecture, including some desirable solutions, is summarized below:

- A single VLU with open architecture
- A single driver console (excepting the farebox control head)
- A single on-board information network (VAN) standard which all devices use to communicate
- Data integration of all information created by on-vehicle devices
- Elimination of redundant wireless communications technologies, sensors, and devices
- Improved maintenance access to information and drive train levels
- An integrated solution with data associated by a synchronized (common) time, location (transit related), and event
- Single login point (with backup login points)
- Seamless integration with fixed-end systems and data
- Solution for the radio system coverage and functionality (must be coordinated with the county)

The VLU that currently drives the annunciator has the capacity to become the desired single VLU on the vehicle, but it lacks the software to interface with the existing radio network. It

does appear to have all the hardware resources necessary to interface with other key on-board subsystems if additional software were added to it.

5.4 Technology Architecture

The Target Technology Architecture defines the major kinds of technologies needed to provide a reliable and secure environment for MDT's IT and ITS applications and data. The Target Technology Architecture consists of the physical infrastructure (hardware, software, and networking). The MDT Technology Architecture will define strategic platforms, provide direction (based on standards) for fixed-end and on-board infrastructures, and provide the technical basis for further design and configuration detail.

ITS project teams need to work closely with the IT staff responsible for the Technology Architecture to ensure that the ITS project infrastructure needs are met and that the IT staff understands the implications of the ITS project on the Technology Architecture and infrastructure. For example, many of the ITS applications have huge data storage and data communications requirements that may impact the design and operation of hardware, e-mail systems, and communications networks.

Coordination is particularly important over the next five years as IT migrates to the Target Technology Architecture. Four of the new technology architecture initiatives proposed in the 2003–2008 IT/ITS Strategic Plan, to improve the capacity and capabilities of the MDT systems environment, contribute directly to the success of the ITS initiatives. The four technology initiatives that will most benefit ITS applications and that need to understand ITS requirements are the following:

- Data Center Systems Environment Modernization (SI-21-T)
- Distributed Network Design (SI-24-T)
- Network and System Management (SI-25-T)
- Quality Assurance/Application Development Environment (SI-26-T)

6 ORGANIZATIONAL SUPPORT OF ITS STRATEGIC INITIATIVES

Eight strategic initiative areas were identified in the IT/ITS Strategic Plan to improve the organization and operation of the IT Division. Two components of the Administrative Planning Initiative (SI-31-O) are included below because they most directly contribute to the success of an ITS project.

6.1 ITS Capital Project Approval Process

Figure 6-1 presents a recommended ITS capital project approval process that involves MDT managers at key points in an ITS project's life cycle. This approval process is designed to involve key decision-makers at critical points, for informed decision-making and obtaining the benefits of management leadership and support. Some of the benefits of the approval process include:

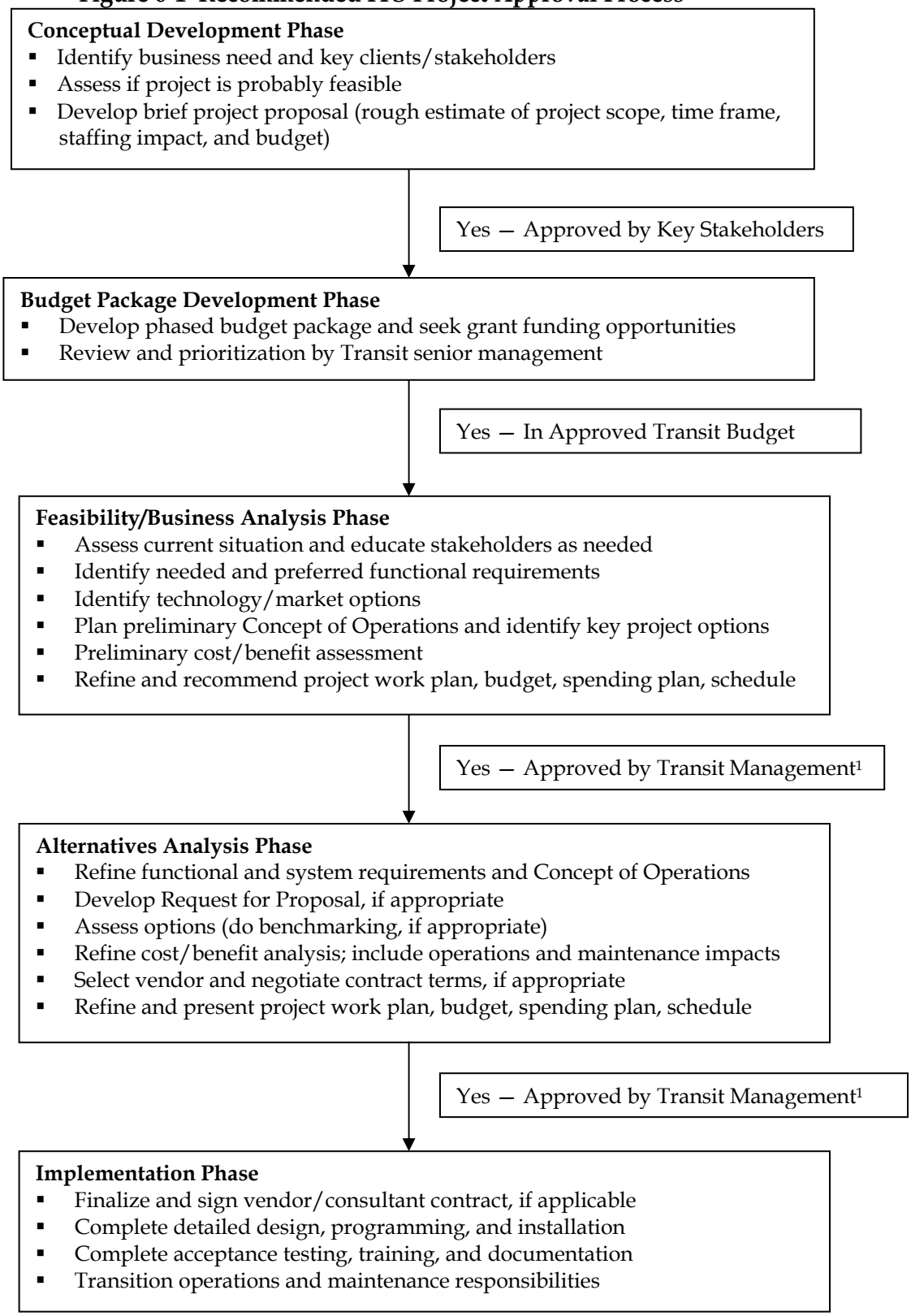
- Improved agency-wide knowledge of Transit's technology investments
- Priority setting from an agency-wide perspective
- Improved opportunity for identifying additional stakeholders and project impacts
- Agency-wide consensus and support of the IT/ITS capital project priorities
- Reduction in project and budget risks by using a phased approach that refines the project scope, schedule, and budget at each phase before proceeding to the next phase.

The project approval process in Figure 6-1 shows five project phases where formal approval is appropriate. After the project has been approved in the Transit budget, the two additional approval points are very important for larger, more complex projects, such as an AVL or fare collection system. If the project is not large or complex, fewer additional approval steps may be needed. The number of approval steps can be decided in the budget phase.

In developing IT/ITS projects for Transit management approval, possible criteria for prioritizing projects include the following: project is required legally, meets business goals, ensures one or more critical success factors, has an excellent cost/benefit analysis, provides required infrastructure support, meets a critical safety need, etc.

Section 6.2 expands the ITS Project Approval Process to identify some more of the project steps that should occur while implementing an ITS project.

Figure 6-1 Recommended ITS Project Approval Process



[1] The senior management team or, at a minimum, the directors for all the affected business areas.

6.2 ITS Project Development Stage Considerations

This section, ITS Project Development Stage Considerations, highlights seven possible stages in an ITS project's development and some of the key activities within each stage. To obtain maximal buy-in and support of the business area clients, they should be partners in all the stages. The use of "walk-throughs" in many of the stages and prototyping, where appropriate, help ensure educated and supportive clients. Depending on the size and complexity of the project, the various stages of the project may be grouped into a number of project budget phases. For larger and more complex projects, Transit management approval to proceed should be obtained after key budget phases, such as the Feasibility and Alternatives Analysis Phases. For small and noncomplex projects, one budget phase may be all that is needed.

Conceptual Development Stage

- Identify business need and key clients/stakeholders
- Determine possible regional partners and regional ITS architecture considerations
- Assess if project is likely to be feasible
- Develop brief project proposal (rough estimate of project scope, time frame, staffing impact, and budget)
- Present project concept and proposal to key stakeholders to obtain their feedback and approval

Budget Package Development Stage

- Develop a budget package that proposes that the project will be developed in phases, most commonly a Feasibility/Business Analysis Phase, an Alternatives Analysis Phase, and an Implementation Phase. The number of phases proposed would be determined by the size of the project, the probable risks, and the ability to accurately project a scope, schedule, and budget that can be met. Use each phase as an opportunity to refine the scope, schedule, and budget.
- Seek grant funding opportunities
- Review and prioritization of capital IT project budget proposals by Transit senior management

Project Initiation and Preliminary Planning Stage

- Begin preliminary project planning
- Define the project team and their responsibilities
- Identify the Management Oversight Steering Committee
- Develop a preliminary project plan, considering systems engineering principles and FTA policy requirements
- Develop project charters that the various stakeholder groups sign, accepting their roles and responsibilities on the project
- Refine scope, schedule, and budget

Feasibility/Business Analysis Stage

- Assess current situation and educate stakeholders, as needed, about issues, technology options, and business needs of other parts of the organization that are relevant to them and to the project
- Identify needed and preferred functional requirements
- Identify technology and market options
- Plan preliminary Concept of Operations that concisely states what the system should do from a user's perspective
- Identify key project options
- Assess risks
- Document high-level functional requirements
- Complete a preliminary cost/benefit assessment report, including life-cycle costs
- Determine if the project makes business sense. Is it feasible and likely to be cost effective?
- Develop a recommended work plan, budget, spending plan, and schedule
- Produce a Business Analysis/Feasibility Report and present the findings and recommendations to Transit senior management for approval
- Refine project work plan, budget, spending plan, and schedule based on management input

Alternatives Analysis Stage

- Refine functional and system requirements and Concept of Operations
- Develop request for proposal, if appropriate, that also identifies architecture and standards requirements and protects intellectual property issues
- Assess options (do benchmarking, if appropriate)
- Refine cost/benefit analysis; include operations and maintenance impacts
- Select vendor and negotiate contract terms, if appropriate
- Refine project work plan, budget, spending plan, and schedule
- Recommend the preferred alternative to Transit senior management and obtain approval to proceed to the next phase
- Incorporate management changes and recommendations

Implementation Stage

- Finalize and sign vendor/consultant contract, if applicable
- Revise stakeholder charters and other internal or regional project agreements
- Finalize detailed project plan
- Complete detailed design, programming, and installation
- Request and review systems and user documentation throughout the implementation of the project as components are completed, rather than at the end of the project
- Follow up to ensure operations and maintenance resources will be available when needed
- Complete acceptance testing and training of users and system support staff
- Determine if a warranty/transition period is needed
- Transition operations and maintenance responsibilities

Project Closeout Stage

- Resolve any outstanding items
- Obtain final sign-off and approval of the project by the clients
- Conduct a facilitated session with the project team and key stakeholders to determine what went well during the capital project and what lessons were learned

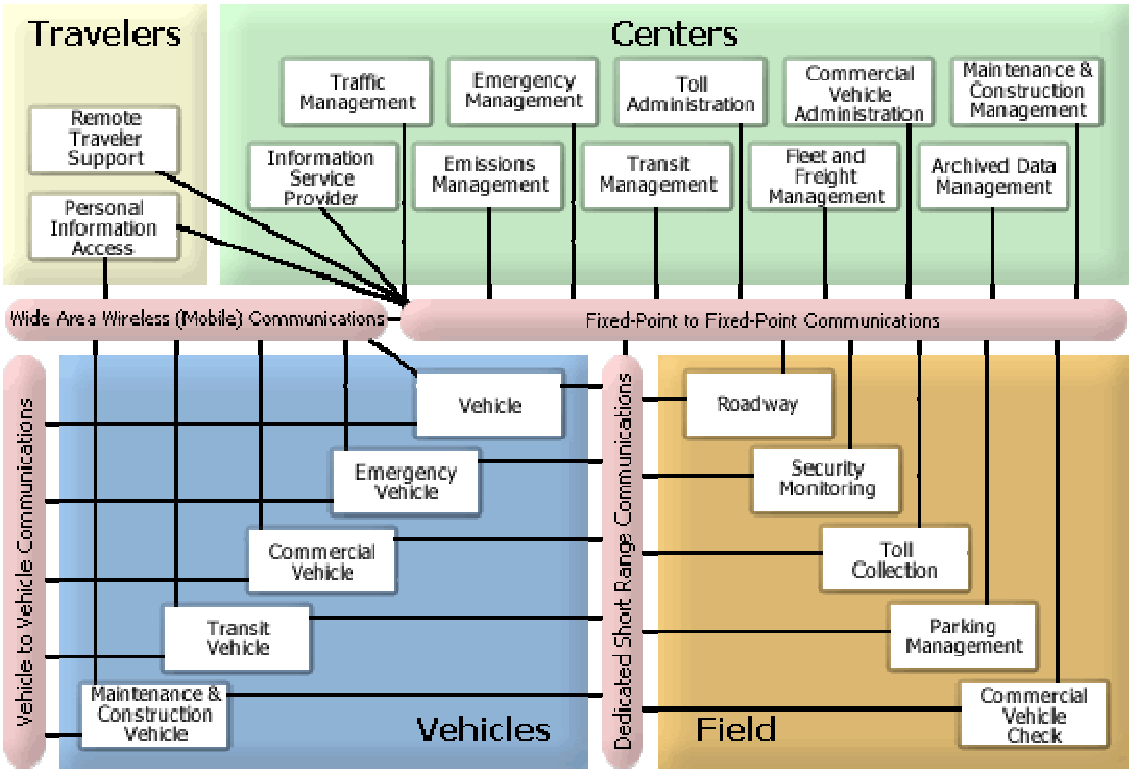
7 ITS CONSIDERATIONS

7.1 ITS Policy Considerations

The FTA National ITS Architecture Policy on Transit Projects stipulates a number of requirements for ITS projects that receive funding from the Federal Highway Trust Funds (including the Transit Account). The two of the most significant requirements are participating in a Regional ITS Architecture and using systems engineering principles, as discussed in Section 5.2.1. For additional details on the policy see the following web site: www.its.dot.gov/aconform/aconform.htm. FTA monitors conformance with the ITS Architecture policy and noncompliance can impact the timing and flow of a project's grant funding, if applicable.

The Data and Application Architecture provided in this strategic plan provides linkages to the Regional ITS Architecture that was developed in response to the FTA Policy and is based on user services and market packages as defined by the National ITS Architecture. Figure 7-1 shows an overview of the major components of the National ITS Architecture, which includes travelers, centers, vehicles, and roadside. The National ITS Architecture also identifies participants, describes functions and activities, describes data flow options, and provides a framework for identifying, planning, and integrating ITS system.

Figure 7-1 National ITS Architecture



7.2 Other ITS Considerations

ITS applications often involve components that are dispersed in a more complex manner than with traditional IT systems. The components can be located on different transportation modes such as bus, rail and paratransit, in different offices and control centers, and in wayside locations. Having components in so many different types of locations can cause integration and communication challenges.

ITS applications are very information-driven, dependent on accurate, consistent, and current information. In addition, the applications produce huge amounts of data that cannot be interpreted without robust decision support tools to store, filter, aggregate, and monitor the information.

Implementing ITS applications, because of the cross-functional nature of the systems, requires involvement and coordination of a variety of end-users and stakeholders such as the primary business client, IT, engineering, bus procurement, and other stakeholder groups. Regional partnerships are also a frequent component of ITS applications, given the need to create more seamless travel across modes, jurisdictional boundaries, and transportation providers. The FTA National ITS Architecture Policy on Transit Projects also encourages regional partnerships on ITS initiatives. The Consumer Information Network project that is being led by MDT is an example of a regional partnership that the FTA is encouraging.

Unlike traditional applications acquired by Transit in the past, these applications widely impact the information enterprise, not just a single division or group. These applications are frequently costly to acquire and may be costly to operate and maintain if technology alternatives and integration options are not identified and assessed prior to acquisition.

FTA and ITS America provide many resources and research reports to help the transit industry become more successful through the implementation of ITS projects. Based on practical experience, the transit industry has learned how critical it is to build and maintain the strong linkages between IT and ITS projects and their operating environment.

In MDT's IT/ITS Strategic Plan, most of the Technology Architecture Strategic Initiatives and the Organizational Strategic Initiatives support the successful implementation and operation of ITS applications and initiatives.

The ITS strategic planning for 2003–2008 was conducted in conjunction with the IT planning effort to produce a joint IT/ITS Strategic Plan for MDT. Although this summary report focuses on ITS, IT and ITS should be considered together because they <u>both</u>:

- Are driven by the business goals, objectives, and other aspects of the Business Architecture
- Use and impact the Technology Architecture and infrastructure
- Need to be integrated together to receive and send needed data
- Drive the design and use of the Data and Application Architecture

- Should be planned, designed, implemented, and operated using the same IT goals, guiding principles, standards, and quality assurance procedures
- Have users who would like to learn and use the same graphical user interface, data query, analysis, and reporting tools, whether they are querying a traditional IT data set or an ITS-derived real-time data set.

Through the implementation of this ITS Strategic Plan, as a part of the 2003–2008 IT/ITS Strategic Plan, MDT and its customers will benefit from improved customer information, more reliable service, and other improvements.

APPENDIX A: LIST OF ACRONYMS

ADA	Americans with Disabilities Act
AD/ADS	Active Directory Services
AFC	Automated Fare Collection
APC	Automatic Passenger Counter
APTS	Advanced Public Transportation Systems
ATIS	Advanced Traveler Information System
AVL	Automatic Vehicle Location
BSI	Bus Stop Inventory
CAD	Computer Aided Dispatch
CIN	Consumer Information Network
CIS	Customer Information System
COTS	Commercial Off-The-Shelf [software]
CSF	Critical Success Factors
CSR	Customer Service Representative
CUTR	Center for Urban Transportation Research
DBMS	Data Base Management System
DSL	Digital Subscriber Line
EA	Enterprise Architecture
EAP	Enterprise Architecture Planning
FDOT	Florida Department of Transportation
FEIS	Final Environmental Impact Study
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
FTP	File Transfer Protocol
FEP	Front End Processor
GDF	Geographic Data File
GIS	Geographic Information System
GPS	Global Positioning System
IR	Incident Report
IT	Information Technology
ITD	Information Technology Department (Miami-Dade County Department)
IT Division	Information Technology Services Division (MDT Division)
ITS	Intelligent Transportation System
IVR	Interactive Voice Response
ISO	International Standards Organization
ITSS	MDT Office of Information Technology and Support Services
LAN	Local Area Network
MDX	MDT Expressway Authority
MDT	Miami-Dade Transit
MIA	Miami International Airport
NTCIP	National Transportation Communications for Intelligent Transportation Systems Protocols
OS	Operating System

PC	Personal Computer
PLC	Programmable Logic Controller
RT	Real-Time
RTS	Real-Time System
SNMP	Simple Network Management Protocol
SAE	Society of Automotive Engineers
SAN	Storage Area Network
SCO	Santa Cruz Operating System
SNMP	Simple Network Management Protocol
SQL	Structured Query Language
STS	Special Transportation Services
TCH	Transit Control Head
TCIP	Transit Communications Interface Profiles
TCO	Total Cost of Ownership
TOS	Transit Operation System
TrMS	Transit Management Subsystem
TrVS	Transit Vehicle Subsystem
TSC	Transit Standards Consortium
TSP	Transit Signal Priority
VPN	Virtual Private Network
VRU	Voice Response Unit
WAN	Wide Area Network

APPENDIX B: REFERENCES

Bus Stop Inventory Guidebook
Bus Stop Inventory Best Practices and Recommended Procedures. Bus Stop Inventory Task Force, Transit Standards Consortium, 19 September 2001. Available from: www.tsconsortium.org

Enterprise Architecture Planning
Steven H. Spewak and Steven C. Hill. *Enterprise Architecture Planning: Developing a Blueprint for Data, Applications, and Technology*. Paperback, January 1995.

Federal CIO Council's website providing a number of architectural framework documents. www.cio.gov.

Functional Requirement Analysis
http://www.itsdocs.fhwa.dot.gov/JPODOCS/REPTS_TE/13621.html, or
http://www.its.dot.gov/aconform/docs/systems_engineering.doc

GIS and Location Referencing
Best Practices for Using Geographic Data in Transit: A Location Referencing Guidebook – Defining Geographic Locations of Bus Stops, Routes and other Map Data for ITS, GIS and Operational Efficiencies. (October 2003 draft, final available from FTA, fourth quarter 2003) Available from Transit Standards Consortium: www.tsconsortium.org

ITS Architecture and FTA Related Policy
National ITS Architecture. This site contains the National ITS Architecture, outreach, deployments, and other technical and programmatic information on the National ITS Architecture. www.iteris.com/itsarch/

ITS Architecture and Standards Conformity (USDOT)
This site offers information on how to meet the conformity directive issued by the FTA. The site includes links to online training, guidance, and sample documentation: www.its.dot.gov/aconform/aconform.htm

ITS Standards
For more information on ITS standards, see the US DOT Standards Program website: www.its-standards.net

Other MDT IT/ITS Strategic Planning Documents
2003 Transit Strategic Planning Retreat for the Management Staffs of Miami-Dade Transit Agency and the Office of Public Transportation Management. The Palisades Group USA, May 29, 2003.

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