

FREdericksburg Regional Transit (FRED)

REAL-TIME SCHEDULING SOFTWARE, BUS STOP ANNUNCIATOR AND TRANSIT WEBSITE PROCUREMENT

Technical Memorandum and Concept of Operations

Prepared for:



Prepared by:



Kimley-Horn and Associates, Inc.

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1.0 INTRODUCTION

One of the initial tasks in procuring a transit technology application is the identification of User Needs and Requirements associated with the application. This technical memorandum presents the identification, development and processing of the User Needs and Requirements associated with the successful implementation of new transit technology applications for FRED.

The memorandum details the systems engineering approach for developing the User Needs and Requirements, and begins to generate specific content and information to be integrated with the final Scope of Work for inclusion in the formal Request for Proposal to be issued by FRED for the procurement of new transit technology applications.

The memorandum shall conclude with a final set of draft requirements. The draft requirements shall establish a platform, or starting point for stakeholder discussion and further evaluation prior to finalizing and integrating with the Request for Proposal.

Overview

FRED is seeking to redesign its website, convert its route maps and information from their current forms to Google Transit formats, add stop annunciators to their vehicle fleet and implement a real-time AVL/GPS-driven schedule information system.

FRED Transit operates a fleet of 30 buses over 21 routes in the George Washington Region of Central Virginia including the City of Fredericksburg and the counties of Spotsylvania, Stafford and Caroline. FRED provides regular route scheduled service and route deviation service; FRED does not provide demand response/paratransit service. FRED's service area extends approximately 42 miles from north to south from Aquia in Stafford County to Bowling Green in Caroline County. Approximately 550,000 trips are taken on FRED per year.

FRED has a website (www.rideFRED.com). There are a number of website issues that are anticipated to be fixed with the procurement of a new website; these include:

- Home page content
- Ease in editing
- Section 508 compliance (ADA)
- Route planning
- Accuracy and editing of mapping features
- Transfer information

FRED's vehicles are equipped with Motorola radios and GPS links to the dispatch office, permitting supervisory staff to track vehicle locations in real time. FRED is currently upgrading existing Motorola radios to digital Motorola radios. All buses are equipped with four cameras that are also linked to the dispatch office wirelessly and allow real-time frame capture video monitoring. All of FRED's routes and bus stop locations have been mapped in GIS and these maps are maintained by the City. The City uses ESRI ArcGIS 10 for GIS management. The FRED website is currently hosted by Verio. The FRED website is currently managed and updated using Adobe Contribute and Dreamweaver. The servers are housed in City Hall and FRED is connected via fiber optic cable.

The primary objective of this project is to prepare a formal Request for Proposal (RFP) that will redesign the FRED website and identify, procure and implement technology applications that

will provide FRED customers with real-time schedule information and FRED supervisors and planners with information that will help them better monitor system performance and plan for route adjustments as necessary. FRED will utilize the RFP package for advertisement, evaluation and selection of an application best suited for FRED's needs and requirements over the next 8-10 year period.

FRED has established a mission for the agency and goals to follow. It is important to recognize the mission and goals as part of this work. Ultimately the needs and requirements will need to relate back to the mission for the agency and the goals set forth.

Mission: *It is the mission of FRED to provide accessible, affordable, dependable, efficient, environmentally sound, and safe and secure transportation for people who reside or work or visit within the Fredericksburg, Virginia region (i.e., the City of Fredericksburg and the counties of Caroline, Spotsylvania and Stafford).*

The Goals of FRED are to:

- A. *Provide a widely accessible public transit service to the region.*
- B. *Provide an affordable public transit service to the region through funding by grants and contributions from local, state and federal funding entities and public/private partnerships.*
- C. *Provide dependable transit service within the region.*
- D. *Increase the efficiency of the movement of people.*
- E. *Promote safety and security in maintaining and operating the FRED system to include personnel, ridership and facilities within the Fredericksburg region.*
- F. *Comply with state and federal policies and regulations.*

The Goals of this project are to:

- A. *Provide accurate, timely and easily accessible information on the location, schedule and status of FRED transit vehicles.*
- B. *Provide an informative and user-friendly website.*

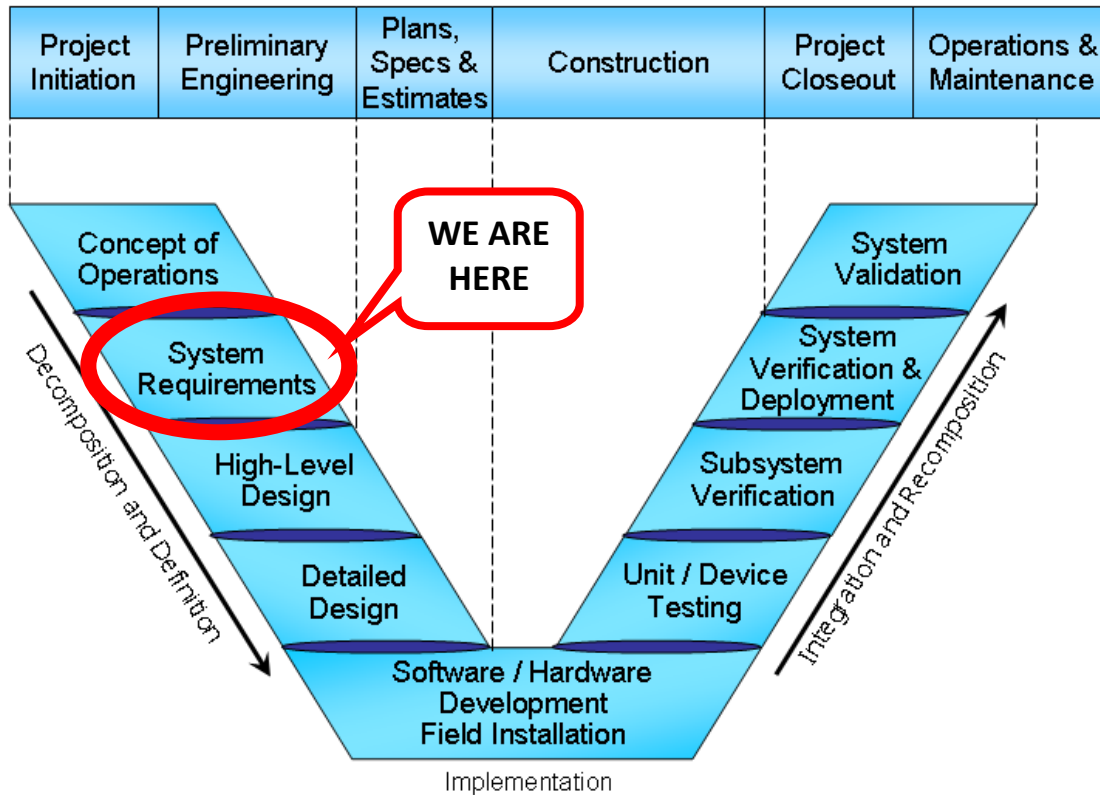
Project Approach

The project implements a systems engineering approach, to ultimately develop the Scope of Work for the Request for Proposals. Existing conditions data and information, as well as high-level needs were identified in a workshop held at FRED on November 28, 2012.

User needs were established as a result of the stakeholder workshop in combination with, stakeholder conversations and research of regional and local existing conditions and assessment of state-of-the-art technologies.

Systems engineering is an interdisciplinary approach to enable the realization of successful systems. It focuses on defining customer needs and required functionality early in the development cycle, documenting requirements, and then proceeding with design synthesis and system validation while considering the complete problem:

The Systems Engineering process is often shown through a graphical representation of the primary elements of the overall process, presented in the following graphic:



2.0 CONCEPT OF OPERATIONS

The Concept of Operations (ConOps) views the operational characteristics of a system or application. The ConOps is a description of how the system will be used. It is non-technical, and presented from the viewpoints of the various stakeholders. It provides a bridge between the needs that motivated the project to begin with and the specific application requirements. There are several reasons for developing a ConOps:

- Get stakeholder agreement identifying how the system is to be operated, who is responsible for what, and what the lines of communication are;
- Define the high-level system concept and justify that it is superior to the other alternatives;
- Define the environment in which the system will operate;
- Derive high-level requirements, especially user requirements; and
- Provide the criteria to be used for validation of the completed system.

A brief Concept of Operations was developed for this project in order to define general operations of the application and provide a vehicle for obtaining stakeholder consensus on the general operations of the application. This brief ConOps is intended to be a high level or “strategic” definition of operational characteristics of the technology applications. It is intended to assure understanding and represents a consensus among the major stakeholders interested in and/or affected by the implementation and operations of the new website, real-time scheduling information system and stop annunciator.

General Operations

The transit scheduling application will provide for transit vehicle scheduling and tasking required by FRED staff. The application will be accessible from transit staff personal computers and interface with existing operating systems currently deployed by FRED. The procured software system may have the flexibility to be run from in-house servers or from the internet (the cloud). The new transit website will be built and procured through the same procurement as the real-time scheduling system. The website will be easily updateable through a web based interface and will not require the user to be knowledgeable on website programming languages to update. The operations staff at FRED is anticipated to remain the same. Existing FRED staff is not anticipated to gain additional qualifications, however training on each new system will occur. The operation of the new real-time scheduling system and the new website is not anticipated to require new floor space, however if in house servers are required, space may be needed in existing server cabinets for the IT platform. New hardware may be required for FRED staff depending upon the selected provider platform.

Scheduling and Reporting

The real-time scheduling application shall provide a platform for developing automated and optimized route scheduling. The system will also provide a platform for planning day to day operations of transit vehicles and drivers. This scheduling system will apply to all local fixed-route public transportation operations. Through a graphical user interface, the user will be capable of defining optimal transit routing and routing schedules. Through integration of GPS data and automatic vehicle location data, FRED will be capable of assessing scheduling needs, modifying existing scheduling input files and generating updated, optimized routing and schedules for all individual bus trips assigned to each defined transit route. The scheduling software will provide a central application for aggregating trip data and transit route data. The application will provide a unified platform for developing and producing reports required by FRED staff. The system shall be integrated with existing GPS available on the vehicles from the video management system hardware. The onboard video management system can be integrated with all major scheduling and route management systems.

Website

The website would be redesigned to have enhanced functionality for both website visitors and FRED staff responsible for managing the website. The selected Contractor will design and build a new website for FRED that shares transit information with citizens, and is accessible, functional, and easy to update and maintain. All content on the website will be designed to be Section 508 compliant so that it may be accessible for people with visual/hearing disabilities. Users would have the option to use Google transit for route planning purposes. The website would be designed and optimized to be accessible for both desktop and mobile devices. The website would convey useful information and service updates. The following key concepts are envisioned for the website.

- Information-Rich: The website will have all original information that is not available elsewhere on the web
- Usefulness: The website does something of value and benefits its visitors. It is well organized, easy to use and loads quickly.

- Clearly and accurately describing content: The website will use original photos, descriptions and comments of the service and information offered. Pictures convey actions more than words can articulate in the same space

The following key elements will be included in the website:

- Trip planning (both dynamically online using Google Transit, and statically with downloadable FRED content)
- News Alerts (in real-time, updateable by staff from the FRED office)
- Link to the City of Fredericksburg website
- Calendar of events
- Social media integration
- FRED ridership information
- A mobile version
- About Us/FRED information

3.0 EXISTING CONDITIONS

Current Operations

FRED formed in 1996 to provide service to the City of Fredericksburg. FRED is owned and operated by the City of Fredericksburg and governed by the City Council. In addition to the City of Fredericksburg, FRED has several funding partners. Partner jurisdictions, which include Spotsylvania, Stafford and Caroline Counties, provide a local match based on the percentage of service received. Agreements with public partners are renewed regularly. Additionally, FRED has several private partners that provide monetary or in-kind support. The following is a list of partnering entities:

- City of Fredericksburg
- Stafford County
- University of Mary Washington
- George Washington Regional Commission
- The Free Lance-Star
- Germanna Community College
- Spotsylvania County
- Caroline County
- Federal Transit Administration
- Mary Washington Healthcare
- VA Department of Rail and Public Transportation
- WFLS Radio
- Spotsylvania Regional Medical Center

FRED service grew from four routes and five vehicles in its opening year to 23 routes and 31 vehicles in 2010. While FRED originated as City of Fredericksburg service, the system is now regional in scope. FRED provides fixed route transit service with deviations on Monday through Friday from 6:30 a.m. until 8:30 p.m. The service area includes five routes in the City of Fredericksburg, six Stafford County routes, three routes in Spotsylvania County and two routes in Caroline County. Because the fixed route service is deviation service, all of FRED's fixed routes can deviate within a $\frac{3}{4}$ mile radius or up to two minutes of the fixed route alignment with 24

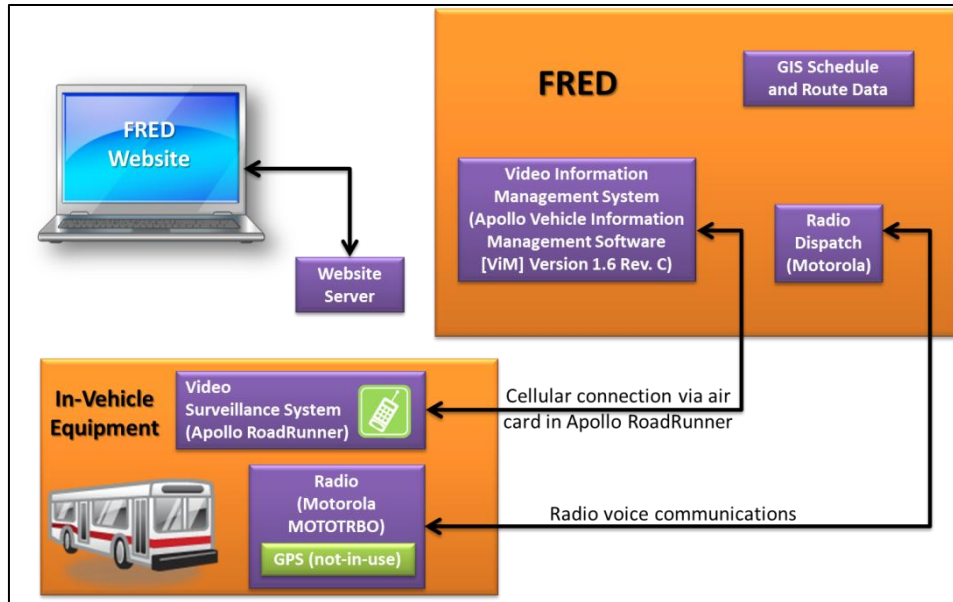
hours' notice. Eagle Express is limited service to the University of Mary Washington with three routes on Thursday and Friday nights as well as on Saturday and Sunday during the academic school year and is available to the public at large. FRED also provides feeder service to the VRE train station on weekdays during peak travel times via three routes. Partner jurisdictions provide funding for the local match based on the number of revenue hours of service they receive from FRED. FRED is also the local agent for Greyhound intercity bus service to and from Fredericksburg.

The Lawrence A. Davies Transit Center (FRED Central) on Jefferson Davis Highway houses FRED offices and also serves as a transit center. The new facility opened in 2007. The facility serves as the main transfer center and houses the customer service, administrative and dispatch functions for FRED. The maintenance facility is located in a portion of a building located approximately one mile north of FRED Central on Jefferson Davis Highway. A new maintenance facility is currently under construction, it is anticipated that the new maintenance facility will be ready by May 2013. As of December 2009, the average age of FRED's 31 transit vehicles was eight years old. A majority of FRED's fleet includes body-on-chassis buses with a useful life of five to seven years. Thus, many of FRED's vehicles are due for replacement. In April/May 2010, FRED received eight replacement vehicles and an additional four vehicles have been ordered. The remainder of the fleet will be due for replacement. FRED recently purchased and installed Global Positioning Systems (GPS) on FRED vehicles. The implementation of the GPS will eventually help provide FRED staff and passengers with real time arrival and departure information and allow for more efficient routing and scheduling.

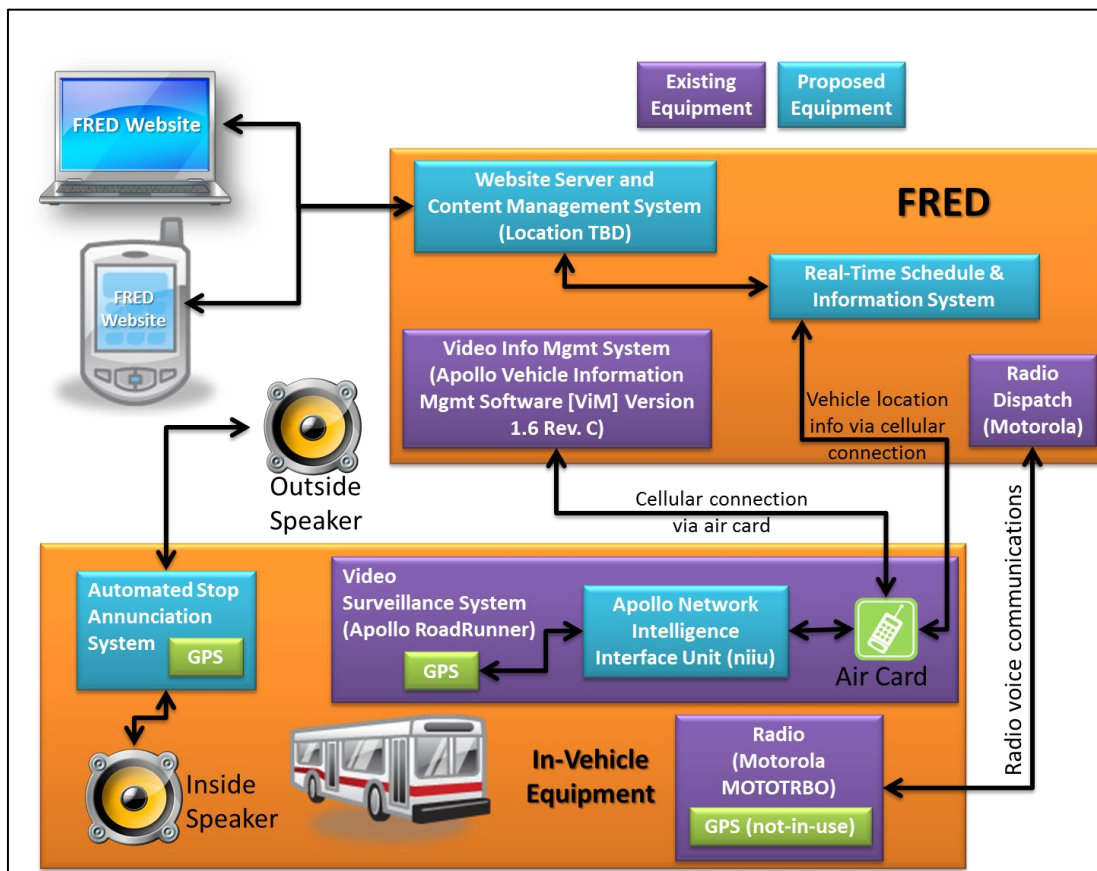
Current Transit ITS

The project was initiated with the preparation of an existing-conditions "baseline". The baseline is established through identification and examination of existing conditions pertinent to the project, or potentially interfacing with the real-time scheduling system, bus stop annunciator and website in some form. The diagram below illustrates existing general conditions for ITS technologies in FRED. All systems are separate and do not automatically interface with one another.

Existing ITS System

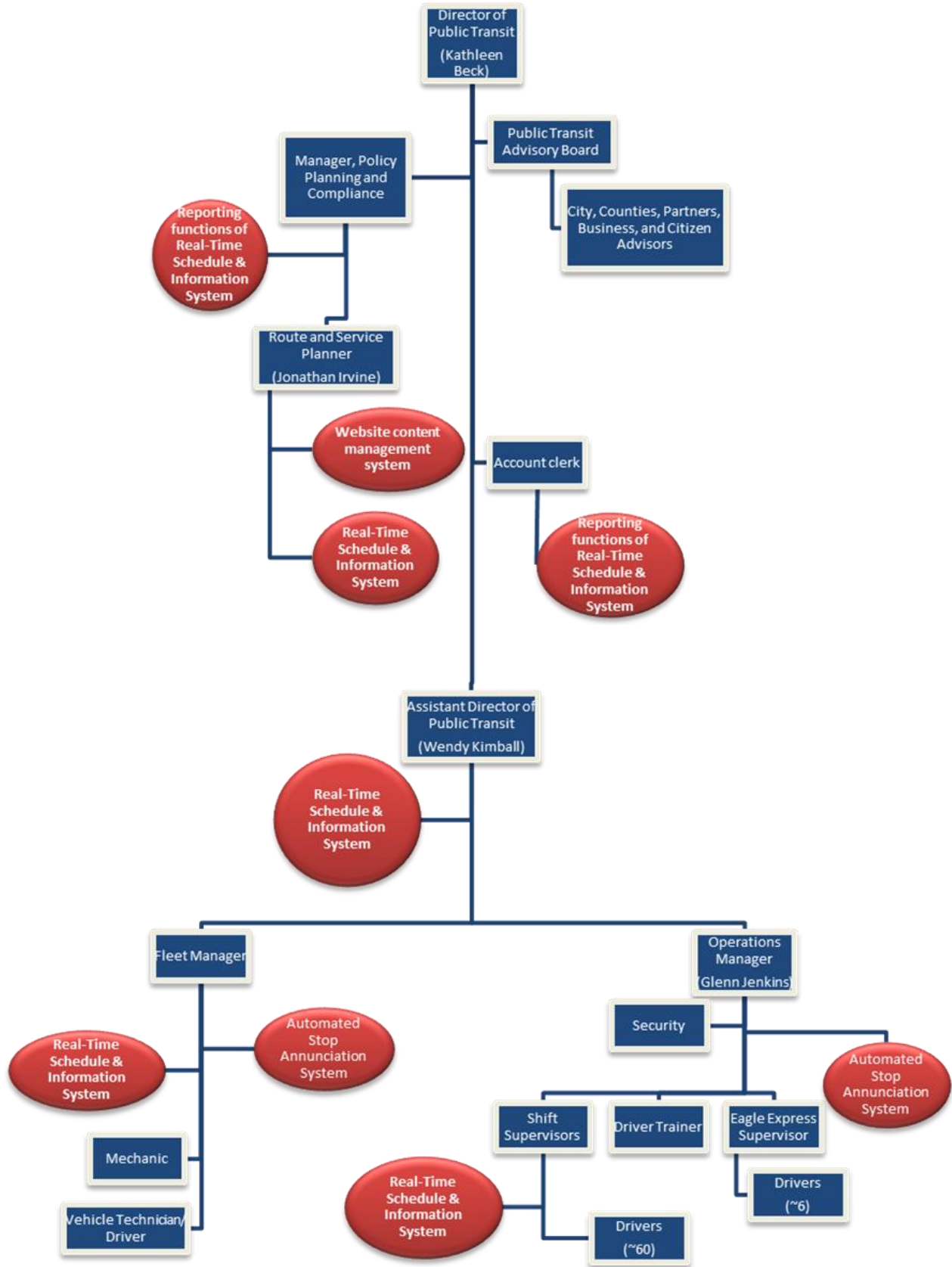


Proposed ITS System



5.0 STAKEHOLDER SYSTEM INTERACTION

The stakeholders and their various roles and responsibilities as they pertain to this project are presented in this section. Stakeholder interaction with proposed ITS systems is shown using the existing FRED organization chart which ties specific job titles to the proposed systems. Boxes are the current roles in the FRED organization chart and ovals represent the proposed systems that FRED personnel will have a role or responsibility towards.



6.0 USER NEEDS

FRED staff held a workshop to discuss in more detail the needs the agency has for transit technology. The workshop was held at FRED offices on November 28, 2012. From this workshop a number of needs were defined and described below. The needs were defined through discussion of the operation and activities conducted by FRED staff on a daily basis.

1. FRED Focus:

1.1. Reporting needs include:

- 1.1.1. NTD report (FTA)
- 1.1.2. DRPT Reports (OLGA)
- 1.1.3. Triennial review (FTA)
- 1.1.4. On time performance reports
- 1.1.5. Budgeting reports
- 1.1.6. Ridership reports
- 1.1.7. Maintenance activity reports
- 1.1.8. Nondiscrimination compliance reporting under Title 6
- 1.1.9. Revenue Miles, Revenue Hours, Deadhead Miles and Deadhead Hours, Maintenance/Training miles and Maintenance/Training Hours by urban zones.
- 1.1.10. System needs to generate schedules

1.2. Data and Information Management:

- 1.2.1. Data needs to be managed and stored properly
- 1.2.2. Data will be used for active analysis
- 1.2.3. Real time data will be used for route planning
- 1.2.4. AVL/GPS will be used for data input
- 1.2.5. Data will be owned by FRED
- 1.2.6. Software licenses will be owned by FRED

1.3. Real-Time Scheduling:

- 1.3.1. Need to know when bus arrives
- 1.3.2. Need to know where bus is
- 1.3.3. Need to know condition of bus
- 1.3.4. Possibility of integration with video system
- 1.3.5. Need to view multiple buses on a screen at one time
- 1.3.6. Need for integrated information with dispatch, customer interfaces and data management
- 1.3.7. FRED Staff need to know how to utilize the system
- 1.3.8. The system needs to be free from defects
- 1.3.9. The system needs to work with existing systems
- 1.3.10. The system needs to be easily installed

1.4. Automated Annunciation:

- 1.4.1. Need automated vehicle annunciation on all routes at all stops and on all buses

2. Customer Focus

2.1. Website:

- 2.1.1. Primary use for trip planning and news alerts
- 2.1.2. Secondary use for FRED and Fredericksburg information, calendar and social media integration
- 2.1.3. Need a trip planner (Google Transit integrated into website)

- 2.1.4. Need RSS feed
 - 2.1.5. Need service alerts on main page (FRED alert integration)
 - 2.1.6. Need for a route deviation request on main page
 - 2.1.7. Downloadable schedules
 - 2.1.8. Display of fare information
 - 2.1.9. New customer guide
 - 2.1.10. Rider profiles (news feature)
 - 2.1.11. ADA 508 compliance
 - 2.1.12. Language translators
 - 2.1.13. Google Analytics
 - 2.1.14. Mobile version of website with trip planning functionality
 - 2.1.15. Smartphone applications need to be available
 - 2.1.16. Website Contractor needs to follow FRED style guidelines
 - 2.1.17. Updates and Maintenance needs
 - 2.1.17.1. Simple dashboard and control panel of website
 - 2.1.17.2. Remote login for maintenance
 - 2.1.17.3. Training required
 - 2.1.17.4. Create a feedback function
 - 2.1.17.5. Free re-design in future years
 - 2.1.17.6. 2 years of operations/maintenance at no cost
- 2.2. Google Transit:
- 2.2.1. Automated trip planning, integrated with website