White Paper

Rovenet Technology Services Mobile Platform
Meeting the needs of the 1st Quarter Mile of Computerization

Introduction

For over a decade, Rovenet Technology Services (RTS), a small and agile software development company based on Long Island NY, has been building mobile application capabilities that have been used by corporations worldwide. These companies have ranged from small businesses to through the deployment of systems for thousands of users in multiple locations across the enterprise. This paper describes these systems and identifies opportunities for new clients to benefit from this experience.

The Rovenet Technology Services Mobile Platform (RTSMP) is a suite of systems and methods that can be quickly integrated into projects and products across a variety of hardware platforms. They are focused around what we have termed the ""1st Quarter Mile of Computerization", the data collection and access needs of mobile field forces. Through the use of the RTSMP, clients can increase the efficiency and effectiveness of their businesses through the deployment of mobile applications on handheld wireless computers.

System Overview

RTSMP is a capabilities suite rather than a singular product. It has been designed to help fast track the development of singularly functional mobile applications for clients that meet very specific, very individual business requirements. Our experience has been that there is a high degree of variability between the field service operations of many corporations that make it very difficult to deliver "off the shelf" programs or apps. Rather than forcing field services personnel into a limited range of predefined operations it is often possible and more advantageous to built individualized systems. Utilizing RTSMP the Rovenet Team can deliver systems quickly and cost effectively.

Rovenet Technology Services Mobile Platform deployments share these components

1. Mobile Application Layer
2. Messaging Layer
3. Communications Layer
4. Intermediate Server Processing Layer
5. Diagnostic Layer

Mobile Application Layer

Mobile field service applications must be carefully crafted to ensure their effective use. Often these systems are customer facing and may even be passed off to customers for entry of signatures and other critical information.

In the "1st Quarter Mile of Computerization" it is often likely that the operators of these systems will lack key technology and computerization skills. The expectation is that their training on these systems, if at all, will be short. It is not uncommon that temporary employees are employed in these positions at least during holidays and other crunch periods. This creates an environment where systems need to be incredibly easy to learn, highly intuitive and rock solid.

These mobile applications can also take advantage of a variety of input strategies that can dramatically improve the quality of data gathered by integrating technologies including 1-dimensional bar code entry, 2-dimensional bar code entry, Radio Frequency ID Tags and digital imaging. Connection to peripherals such as portable printers is also possible.

Below is a list of types of corporate personnel that have used 1st Quarter Mile mobile applications based upon the Rovenet Technology Services Mobility Platform:

- o Delivery personnel for major multinational delivery companies
- o Warehouse personnel for major multinational delivery companies
- o Engineering field staff at Superfund and nuclear cleanup sites
- o Delivery personnel for home health care companies
- o Sales personnel for lighting distributor
- o Automotive insurance claims adjusters
- o First response disaster relief team members
- o Telecom retail chain quality control inspectors
- o Public water system geologists and engineers
- o Geologists characterizing soil and taking samples at well drilling sites
- o Truck drivers loading containers onto freight trains at transportation yards
- o Inventory personnel at hardware stores
- o Nurses distributing drugs at clinical locations
- o Designers determining efficacy of next generation weapons systems on Navy ships
- o Field personnel operating asphalt milling equipment along roadways
- o Managers reviewing maintenance conditions at hotel locations
- o Nursing students running systems that simulate work functions on hospital floors

Messaging Layer

RTSMP uses formatted messages to transport data between deployed mobile device and communications servers. Depending on the application and the needs of the client, messages may use a custom binary format, XML or delimited-text tabular formats. In addition to standard text serialization for scalar data, base-64 encoding of binary image data (such as captured signatures or photographs taken by the mobile device) are often embedded in the messages.

For complicated messaging scenarios, SOAP web services is sometimes used as the messaging format. Web service functions on the mobile device are leveraged to quickly create a messaging service that reflects the application's communication model.

Communications Layer

RTSMP provides a number of methods for data communication between a mobile device and a communications server. Most of the time this communication operate on wireless networks including WIFI, BlueTooth, GPRS and other cellular platforms. Multiple levels of security are available based upon the client's needs.

Sometimes a wired communication environment is employed using Microsoft ActiveSync or Palm Conduit technology. A PC-resident control module, called a "Connector", manages two-way transfer of tabular data between the mobile device and a PC, which then forwards the data.

Communications protocols supported include Microsoft MSMQ, IBM WebSphereMQ, HTTP and FTP web protocols. Very flexible communication suites have also been built using Web Services hosted by ASP.NET.

Typically on the mobile device, an event-driven, background communication module manages the channel and handles signal dropout and other conditions without disturbing the UI layer. In cases where communications limitations may require it, logical messages may be divided into chunks of a more manageable size, to be reconstructed at the other end.

The PC communication server is connected to a WIFI hub or cellular network and may host, or may be connected via LAN, with a database server application. Depending on the technique used for transfer, PC-based messaging will include web services (receiving via HTTP) or monitor programs examining data queues or files.

Intermediate Server Processing Layer

The intermediate server is responsible for communicating with mobile devices, generally supporting such functions as log in, log out, transmitting application data tables to the mobile client (e.g., customer lists, inventory data, parts lists) and receiving captured data from the mobile client (e.g., parcel scans, survey results). A common scenario has intermediate server software interacting with a resident database to perform these functions.

Often, the communication server must also act as an intermediate between the mobile client and existing IT infrastructure. In this case, appropriate data massaging and forwarding is implemented between the communication server and existing network data systems.

A related function of an intermediate server is posting data via SMTP message or HTTP transmission to an external receiver on the Internet. The email messages may be simple text or may require fairly elaborate pre-formatting. HTTP messages may be as GET or POST to a URI, or as an XML document.

Diagnostic Layer

In real world, multi-part systems involving mobile devices, using standard debuggers is generally not feasible. RTSMP applications employ a sophisticated, customizable diagnostic logging module to aid in diagnosis of problems. The following features support the logging function:

- o Configurable severity filtering (Error, Warning, Info, Debug)
- o Plug-in log line formatting
- o Thread-based log context for multiple thread applications
- o Configurable log listeners (file, system event log or communication channel)
- o "Lazy write" uses worker thread to post data to log files, speeds up throughput of main thread.

Both mobile device and PC versions of this module are used for all parts of the RTSMP. The generated log files are used both for routine tracing and validation of functions and for flagging error or exceptional conditions. By using thread-linked log context, complex multi-threaded applications can be traced with log contributions from separate threads clearly distinguishable, yet combined in a single timeline in a log file.

Rovenet Technology Services

Rovenet Wireless 1st Quarter Mile Computer Projects List

This document lists examples of handheld computing projects that Rovenet has undertaken for major clients

- Project Management and Software Design of Pen Based Soil Sampling System, Hanford Nuclear Reservation, Westinghouse Hanford Company, Richland, Washington

- Project Planning and Management for Radiological Sampling System, Public Service Gas and Electric Company, Newark, New Jersey

- Consultant for Pen Based Computerization Pilot Study - E.G. and G. Florida, Kennedy Space Center, Florida

- Project Management and Software Design for Tank Farm Inspection System for Citgo Petroleum, Linden, New Jersey

- Consultant on Development of Pen Computer Based Field Inspection System for New York City Transit Authority, New York, New York

- Project Management for Hazardous Waste Inspection System for Monsanto Chemical Corp., Bridgeport, New Jersey

- Project Management and Software Development for Hazardous Waste Drum Logging System for OHM Remediation Corp., Trenton, New Jersey

- Consultant for the Development of Statistical Data Management Systems for Eastman Kodak Company, Healthcare Business and Imaging Group, Rochester, New York

- Consultant for Software Integration and Testing of New Pen Computer Hardware Products, Symbol Technologies, Bohemia, New York

- Consultant for Wireless Pen Computer Based Railway Yard Management System for C.P. Rail Company, Toronto Canada

- Consultant for Handheld Computer Delivery Tracking System for Pitney Bowes Corporation, Bridgeport, Connecticut

- Software Development, Software Architect, Project Management and Implementation Consultant for Handheld Computer Based Package Delivery System for DHL Worldwide Carriers, Brampton, Ontario, Canada

- Consultant and Software Development for Handheld Computer Based Delivery System for General Electric Appliance, Louisville, Kentucky

- Consultant and Software Development for Handheld Computer Based Store Conversion System for Ace Hardware Inc., Oak Brook Illinois

- Consulting and Software Development for PalmOS Based Handheld Terminal product for Pitney Bowes Transcape, Shelton , Connecticut

- Training program on handheld computer software development for FedEx Ground, Pittsburg, Pennsylvania

- Consulting and Software Development Project for Parceline Couriers, United Kingdom

- Consulting and Route Accounting Software Development Project on SPT 1500 Palm Terminal for Nassau Candy, Hicksville, New York

- Software Development of Cost Accounting Software Development Project on Symbol Handheld Computer system for Au-Ve-Co Corp, Cleveland, Ohio

- Software Development of Inventory Tracking Software Development Project for Fastrack Corp, Plainview, New York

- Software Development and Project Management of Handheld Computer Based Package Delivery Track and Trace application for Toll Brothers Logistics Group, Victoria, Australia

- Project Management of Disaster Recovery Assessment System for US Aid in conjunction with International Resources Group, Washington, DC.

- Software Development of a Mobile Route Management system for Pressed4Time, Inc., Sudbury, Massachusetts

- Project Management of Emergency medical data management systems for FEMA Urban Search and Rescue contractor, Raleigh, NC

- Consultant and Project Management of Aids Drug use recordkeeping system for Voxiva, Washington DC

- Software Architect and Project Management of Wrist Scanner based Load Containerization system for DHL Express, Missisauga, Ontario

- Project Management of Sales and marketing tracking system for Rogers Wireless, Toronto, Ontario

- Software Development and Project Management of Wireless Medicine management and tracking system for LTC Services, Richmond, VA

- Software Development and Project Management of Wireless Load Entry and Balancing System for Fastrack Healthcare Systems, Plainview NY

- Software Development and Project Management of Wireless Route Delivery System for Fastrack Healthcare Systems, Plainview NY

- Project Management of Research and Development Projects for DHL Express, Scottsdale, Arizona

- Project Management of Handheld weapons tracking system for US Navy, Bethesda Maryland

- Project Management of Wireless Patient Intake System for New Passages Inc., Detroit, Michigan

- Co-Developer of "Document Driven Programming" invention that was utilized in Rovenet Portable Forms systemz

- Software Development and Project Management of Smartphone based Truck Unload Accounting system Belmar Loading, Dallas Texas

- Project Management of Blackberry based Job Accounting system for East Coast Milling Corp, Orlando Florida

- Project Management of Microbrower based Delivery Tracking System for DHL US, Scottsdale, AZ

- Software Development and Project Management of Handheld computer based bin tracking system for Pitney Bowes Management Systems

- Project Management of Blackberry based Hotel Room Inspection System for Royco Hotels, Calgary, Canada

- Project Management of Wireless Sales Order Entry System for Satco Lighting, Deer Park NY

- Software Development and Project Management of Laboratory Training System for Nursing Students operating on Wireless Handheld computers for SUNY Suffolk, Sayville, NY

- Project Management of Wireless Quotation Management System for Southern Index Corp, Atlanta GA