



Upper St. Johns River Basin SCADA System

John Richmond





Introduction

- The SJRWMD operated its Water Control Structures manually within the region.
- During previous hurricane seasons and other threatening conditions, manual operations put field staff at risk for necessary gate changes.
- The District was looking to eliminate this safety issue by establishing a secure and reliable remote control and monitoring system, to operate 18 gates on 9 flood control structures
- The District initiated the SCADA (Supervisory Control and Data Acquisition) project.



Objectives and Requirements

- **Real-time monitoring and controlling** of 18 gate structures with Motorola Remote Terminal Units (RTUs).
 - **Monitoring requirements** - stage levels (head/tail); gates positions; power system; door
 - **Controlling requirements** - move the gates to a desired height; Generator; Power Transfer Switch
- **Multiple Remote control locations** - Operable via laptop computer from ANYWHERE
- **Availability** - SJRWMD required redundant RF links; prime link is the Data Radio VHF dedicated channel and secondary link uses the cellular public network, based on EDGE technology.



Objectives and Requirements (Cont.)

- Capability of **operation under conditions of duress** (Storm events, subsystems failures). Availability of contingency operation plans.
- **Reliability** - Using proven, tested technology with high-reliability products.
- **Safety** - Using a secure, trusted system with high level of security, avoiding false information, controls, and thwarting unauthorized usage.
- Considerations for **future expansion**. Additions of future gates structures and/or additional items for monitoring and control

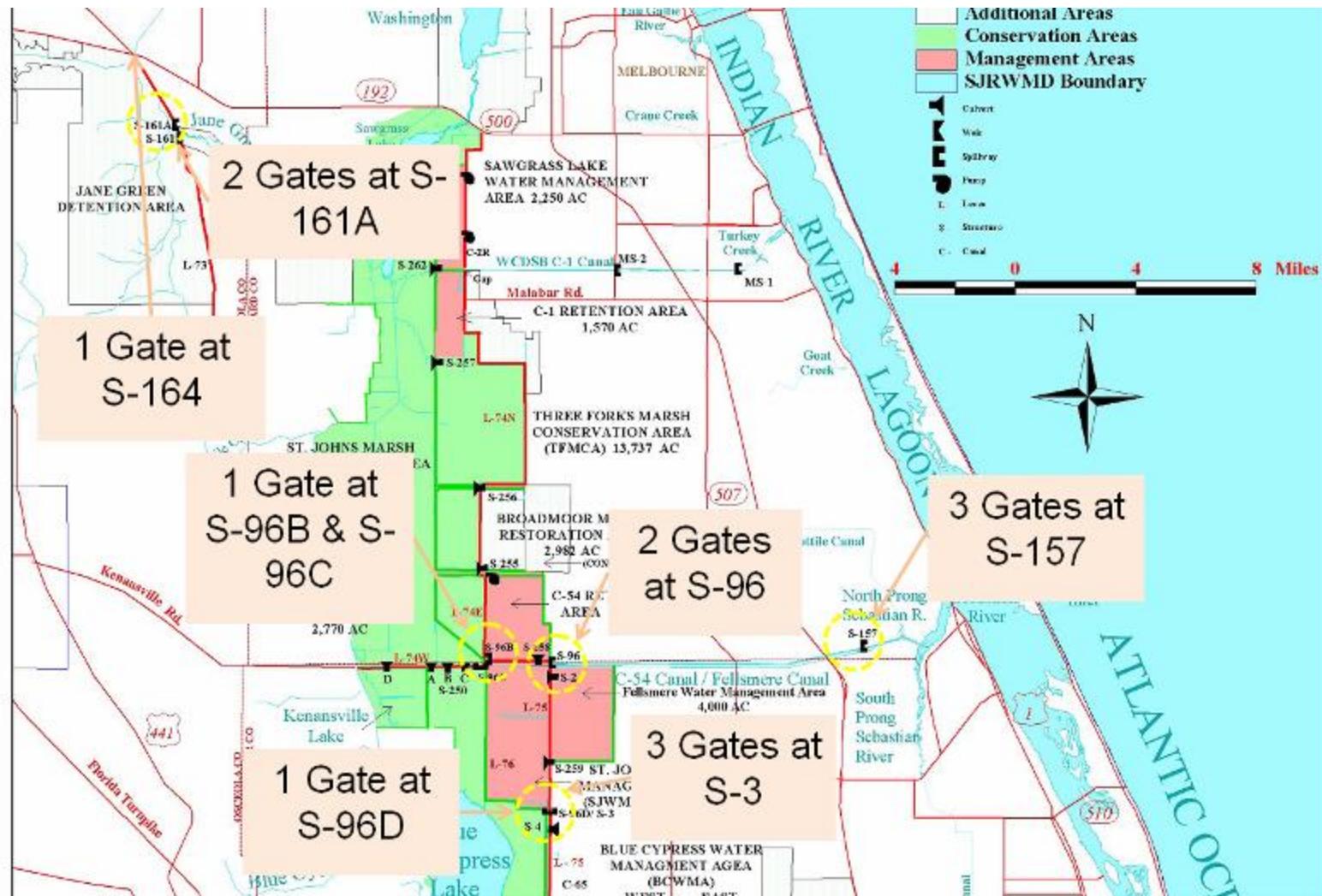


Challenges

- **Site Integration** - The gate structures were installed more than 30 years ago by the U.S. Corps of Army Engineers. Thus, engineering documentation was not updated; In fact, a majority of the sites were not documented, e.g. gate logic control drawings. In addition, some of the electrical components were fatigued.
- **Civil Work** - The project required extensive infrastructure development.
- **Communication** - RF links a challenge due to the distances between the sites and the control centers.
- **Geographical Spread** - The sites were both physically isolated and quite distant from one another. Extensive travel and a major degree of onsite resourcefulness would be needed in order to solve unexpected tribulations.



Geographical Coverage





Gate Structures S-96B & 96C





Gates Structure S-96D and S-3

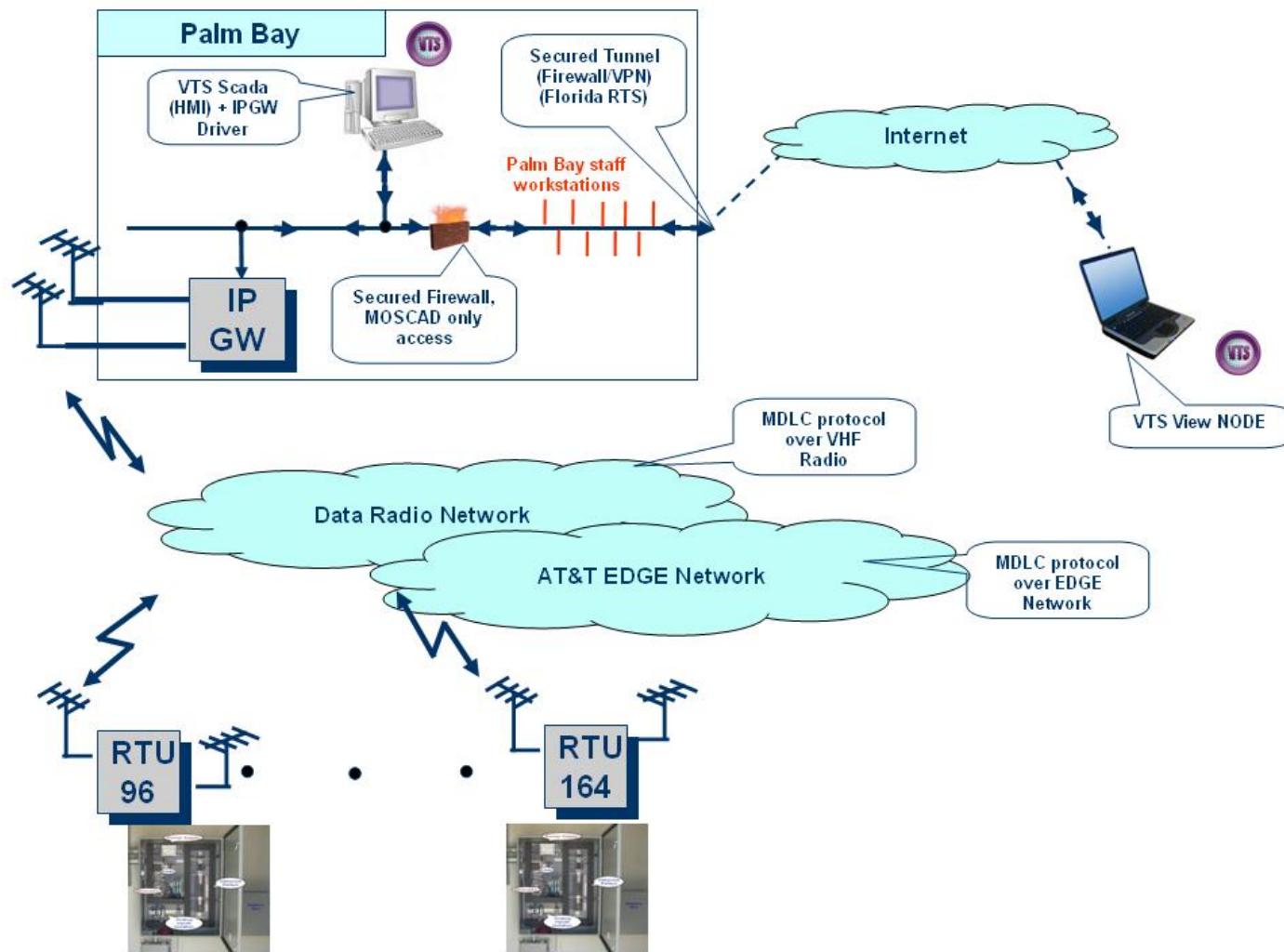


Gate Structure S-164





System Architecture



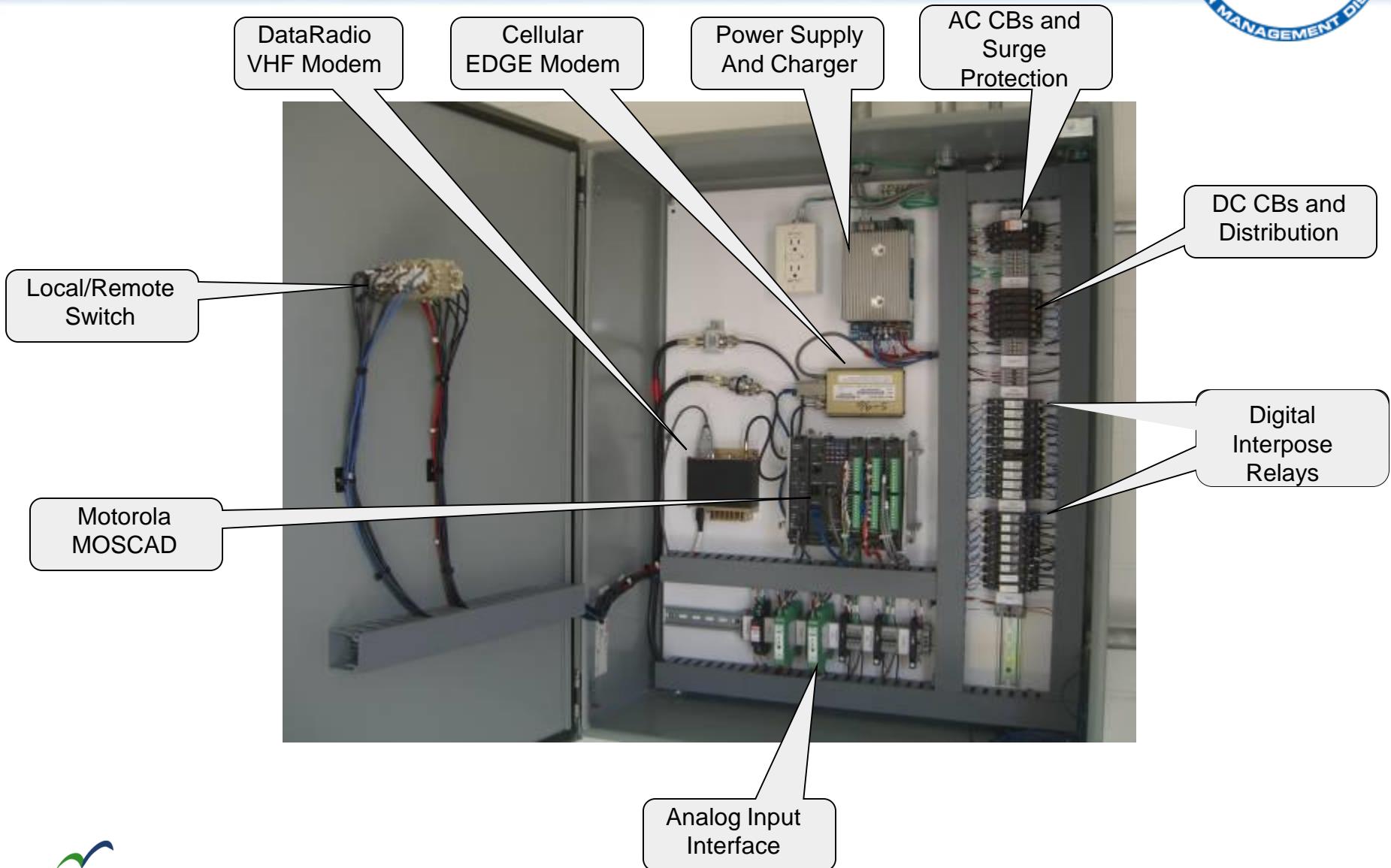


SCADA Software and Communications

- The RTU communicates through **DataRadio Integra** VHF radio to the Gateway at Palm Bay Service Center.
- The RTUs or the Gateway switch automatically to a redundant cellular data link (EDGE) in case the main VHF link is not accessible.
- It is also possible to access the RTUs directly via the cellular data link virtually from **any** location. This mode of operation is very basic, and is intended for manual, basic operation of the system using the Motorola Toolbox Basic software.
- The **VTScada** gathers and stores the data from RTUs. The software includes many visual capabilities for comprehensive real-time and historical data viewing. Additionally, the software includes an alarm managers, security manager, and data exporting.



Remote Terminal Unit



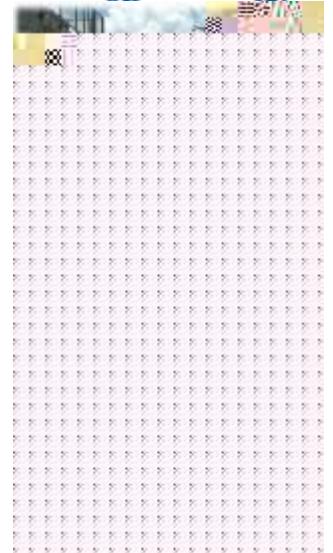
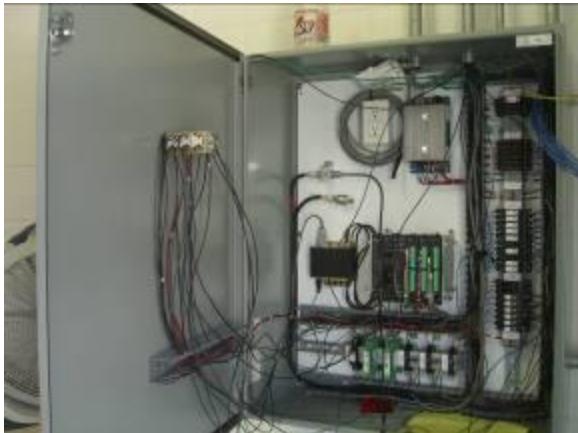


RTU Operations

- Normal Mode
 - The RTU application continuously monitors the local conditions via the wired I/O. Whenever data items (status, alarm, analog measurements) changes are detected, the MOSCAD RTU transmits a short message containing only the new data to the Central Computer, with VTScada.
 - The RTU also stores a history of events. The data is stored in case of communications failure and troubleshooting.
- Emergency Mode
 - The system is designed for mission-critical operations during emergency conditions (weather, communication failure, power failure, etc). Contingencies are built into every part of the system.
 - This mode of operation is independent of any system communication and/or availability of the central computer system.



Work in Progress



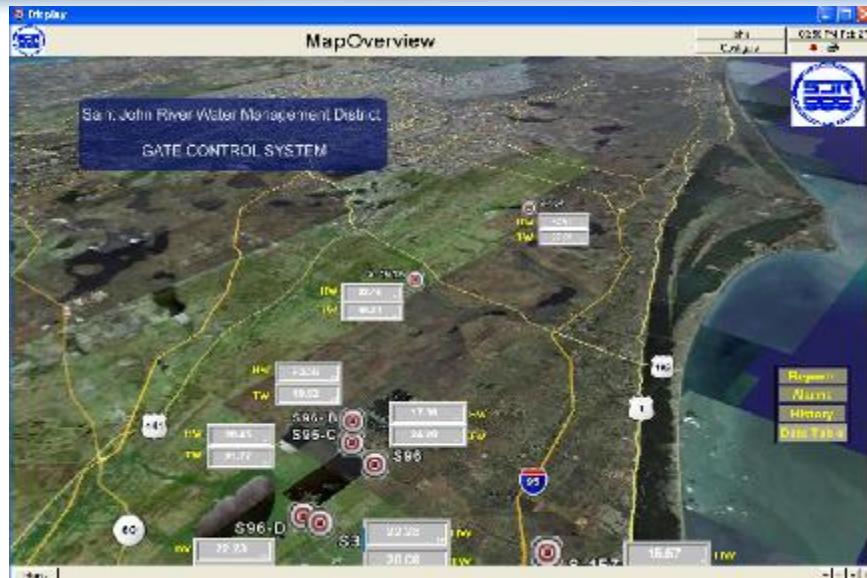


Work in Progress (Cont.)





Work in Progress





Accomplishments and Future Expansions

• Accomplishments

- Implementation started on July 07 and the system was in production on December 07
- SJRWMD and Star Controls worked as one team, which was essential to overcome challenges.
- Developments beyond the original SOW:
 - Change in gate logic to improve operations
 - Modifications of logic for emergency power to improve safety
 - Change original design of S-3, including replacement of actuators to Smart type
- Smart use of Error Logging information from the RTUs and wireless devices to debug the system and improve performance
- Accomplished Availability, Resiliency and Flexibility goals

• Potential Expansion

- Add RTU to gate structure S-161
- Water quality monitoring
- Use RTUs and SCADA for site access management
- Improve the emergency power system, i.e. generator, solar system
- Offer the use of RTUs to monitor consumption (i.e. quota) by the cities.
- Low cost solar powered gate structure



St. Johns River Water Management District

Kirby B. Green II, Director • David W. Fish, Assistant Executive Director

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March 3, 2011

Attention: Mr. Tzvi Magril

Dear Tzvi,

This message is to confirm that in 2007 Star Controls commissioned the Motorola RTU (MOSCAD) based SCADA system, to monitor and control our District's Mission Critical gate structures. Star Controls was involved in the design of the instrumentation, and after winning the integration contract you delivered a fully operational system on time. During the integration work Star Controls provided creative ideas for improvement, including enhancement of system availability through redundant wireless communications.

Since the system has been in production, Star Controls has supported us through annual maintenance contracts. The system has demonstrated unparalleled availability, and most importantly during rainy seasons and hurricanes. As part of our annual maintenance contract, Star Controls is constantly improving the system and responds to new operational requirements that are raised by the District.

I'll be more than happy to share with Motorola NYC my experience with Star Controls.

Best Regards,

A handwritten signature in black ink, appearing to read "John E. Richmond".

John E. Richmond, P.E.
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