INDUSTRIAL WASHERS: REMOTE MONITORING

DEC1607: MITCHELL CONRAD | NEH BATWARA | KATELYN WOLTKAMP | BRYAN ADAMS | NICK CODUTO

PRESENTATION OUTLINE

- Project Scope, Goals, Deliverables
- Constraints and Limitations
- Background Knowledge
- Design Alternative
- Selected Solution
- Application
- Conclusion

PROJECT SCOPE

- Observe data from PLC from a remote location
- Varying atmospheres and size of systems

PROJECT GOALS

- Recommendations for one or two approaches with a proof of concept
- Develop a user interface that would be usable by client's engineers, service techs and sales representatives
- Develop specifications, vendor recommendations and cost estimates for a preferred system

DELIVERABLES

- Documentation and proof of concept demonstration of one or more alternative systems communicating over a simulated distance to illustrate the feasibility of the recommended approach.

CONSTRAINTS AND LIMITATIONS

- Limited PLC knowledge and experience
- Access to a remote network
- Simulated data instead of real data

WHAT IS A PLC?

- Programmable Logic Controller: Solid state programmable electrical interface that can manipulate, execute, and monitor data at a quick rate
- Performs control functions
- Widely used in industrial settings
  - Oil Refineries
  - Manufacturing Lines
  - Amusement Parks

HOW DO PLCS WORK

- Input Scan
  - Detects the state of all input devices that are recognized by the PLC
- Program Scan
  - Detects the state of all input devices that are connected to the PLC
- Output Scan
  - Energizes or de-energize all output devices that are connected to the PLC

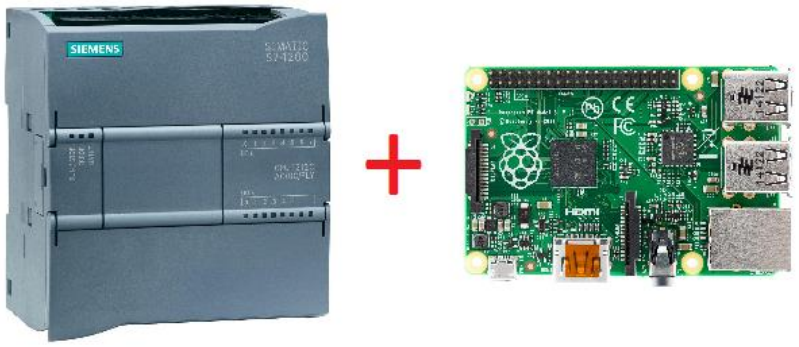
PLC VS RASPBERRY PI

PLC

- Built for Rough Environmental Conditions
- Ladder Logic Programming
- High Reliability
- Longer Service Warranty
- Shorter Development Time

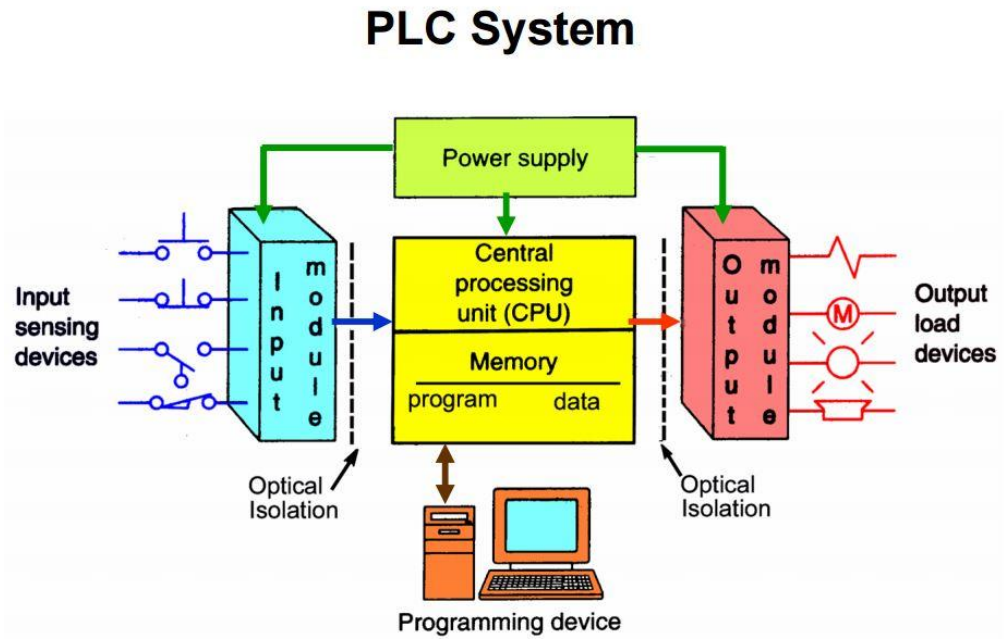
Raspberry Pi

- Meant for Handling only a few I/O points
- Not built for rough environmental conditions
- Uses Linux – not a Real time Operating System
- Initially Cheaper; Longer Development



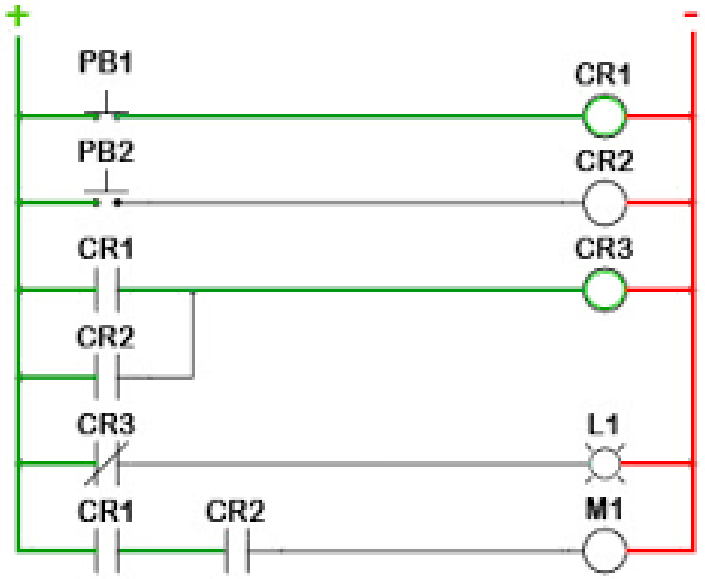
PARTS OF THE PLC

- Power Supply and Rack
  - Can take AC and DC power
  - Supplies power to processor and outputs
- CPU
  - Reads inputs, runs through program, sends commands to outputs
- Inputs and Outputs
  - Analog or Digital
  - Inputs: Switches, push buttons, sensors
  - Outputs: Valves, solenoids, motor starters, control relays



SOFTWARE

- Ladder Logic: acts as a power supply with positive on one end and negative on the other
- Small differences but mainly similar between different companies
- Allows user to force states and block devices
- Internal inputs and outputs can be used
- Scans from top down, left to right



SOFTWARE

ALTERNATIVE SOLUTIONS: ALLEN BRADLEY

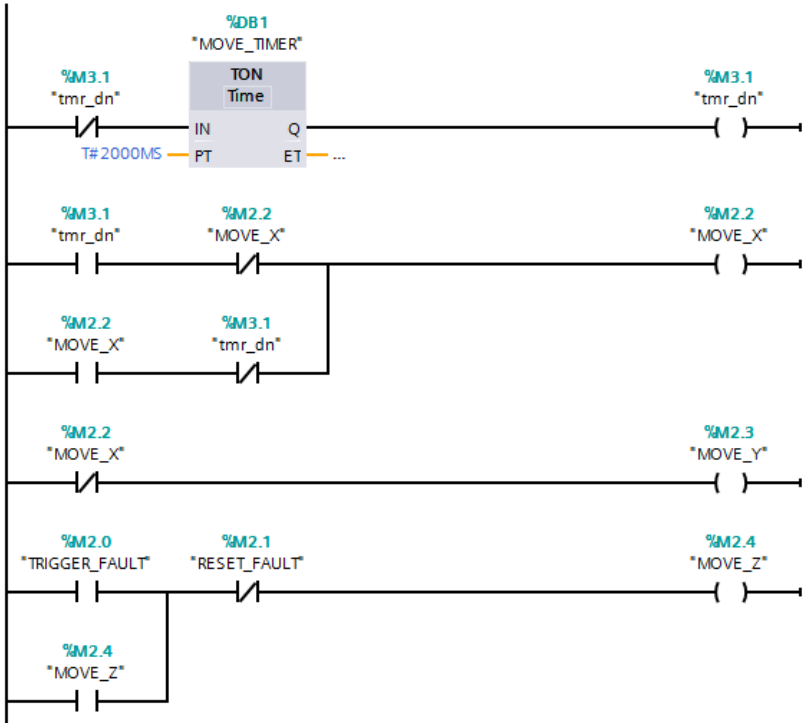
- Cellular Modem
  - Cost of using data to connect to PLC
  - Limited access to PLCS
- Virtual Private Network
  - Would need access to the manufacturing sites network, which can be difficult to obtain
  - If no access, could create individual private network
- Examples of products: Dameware Mini Remote Controller, eWON

SELECTED SOLUTION

- Seimens S7-1200
  - Mid-performance range PLC
  - Totally Integrated Automation (TIA) Portal
  - Lower cost
  - No third party necessary

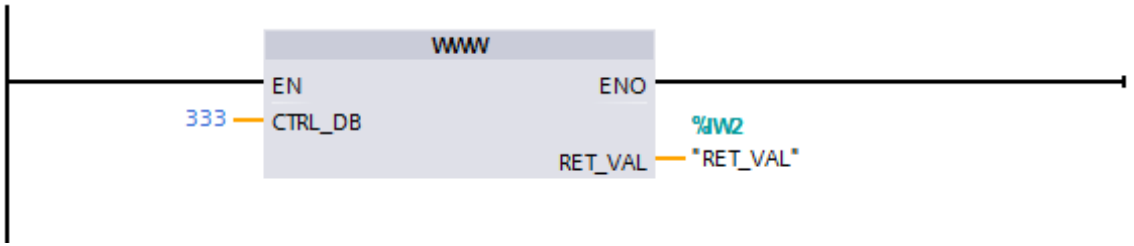
PROGRAM

- Timer
- Simulated data
  - Pressure transducer
  - Fault values
- Alarms
- Webpage
  - Siemens
  - User defined



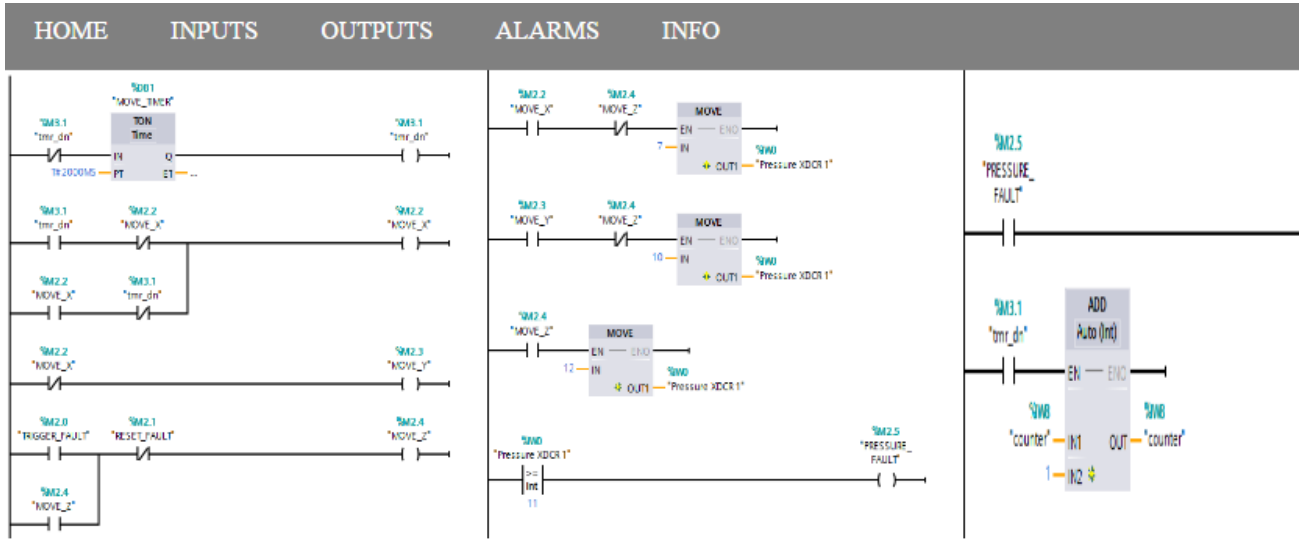
USER WEBPAGE: PORTAL SIDE

- Creation of data blocks
- User defined webpage function block
- Additional logic to the main program

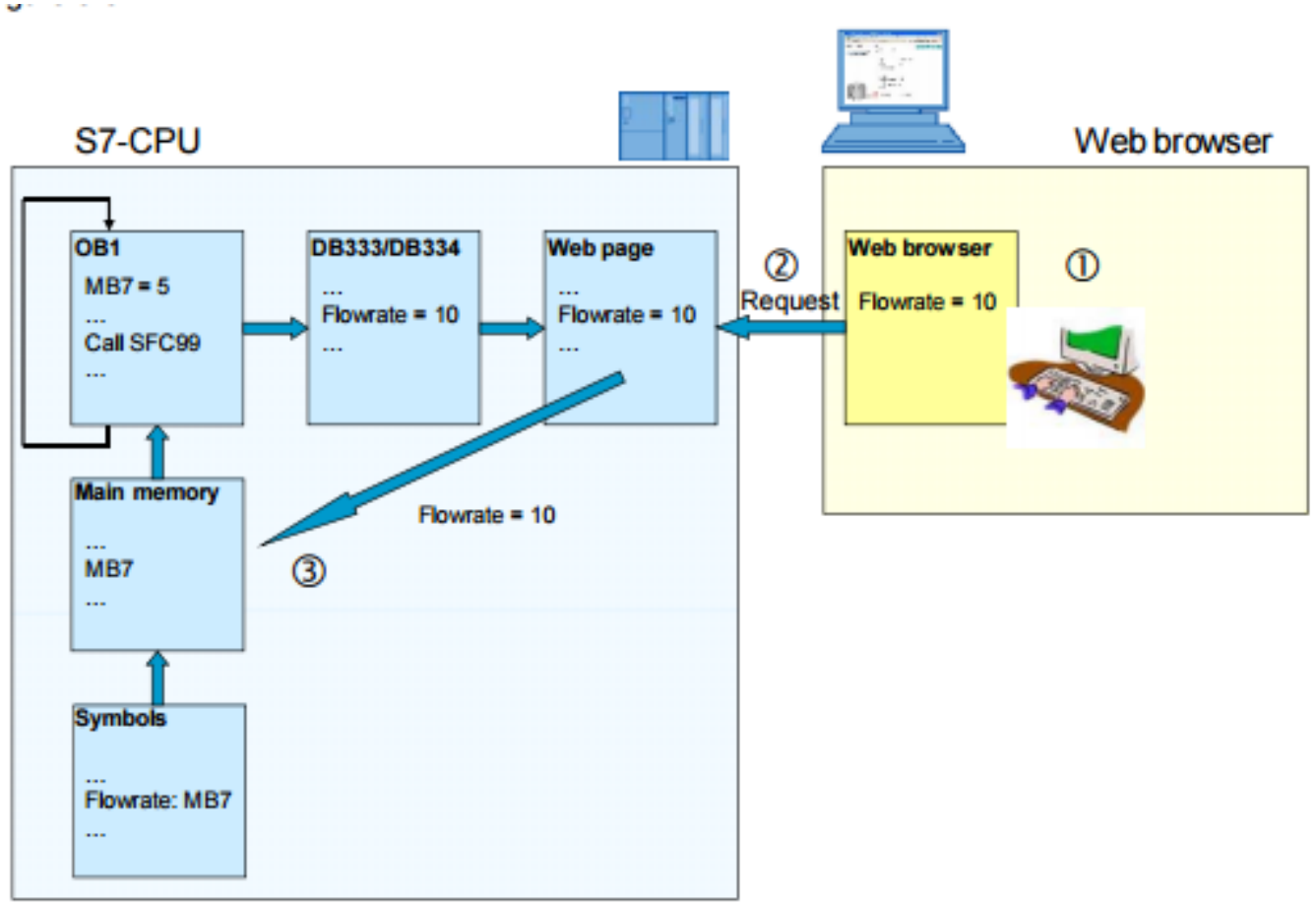


USER WEBPAGE

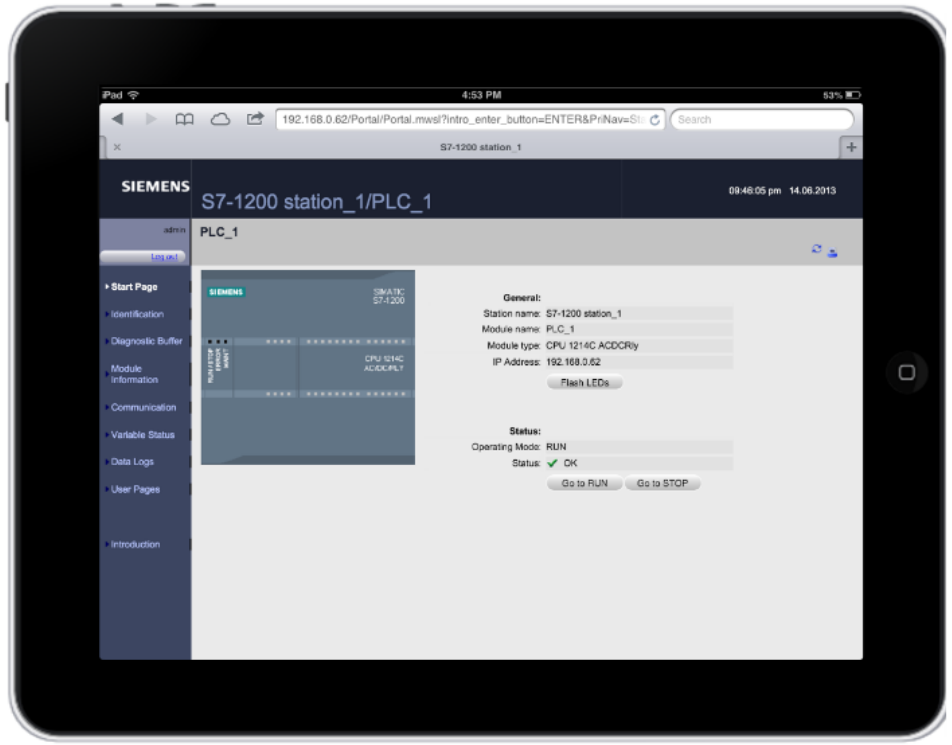
- Create User-Defined Webpages
- To enable the CPU to interpret the HTML file, it is stored in data blocks together with further required files.
- Status and control variables of the web page
- Error Information



USER WEBPAGE



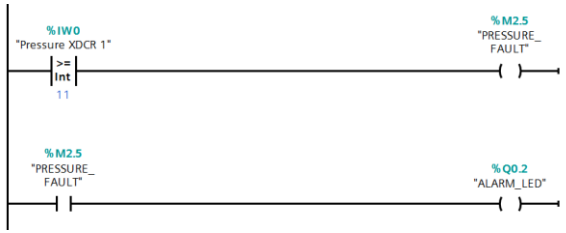
USER WEBPAGE: WIRELESS ACCESS

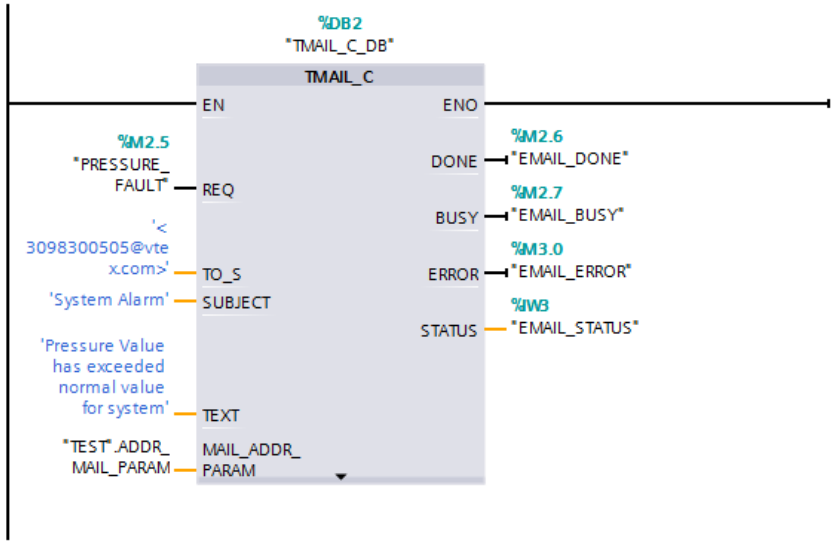


- Remote access to default Siemens page
- Remote access to User defined web pages
- Monitor PLC variable values

ADDITIONAL MONITORING ASPECTS

- PLC sending text messages and emails
- Alarm LED on Enclosure





CONCLUSION

- Provided multiple proposal options to client based on different PLCs
- Achieved remote location monitoring of PLC
- Provided a user interface for clients that can be easily usable and accessible

QUESTIONS?