SCADA: Supervisory Control and Data Acquisition.

IT’S EVERYWHERE, AND YOU SHOULD KNOW WHAT IT IS
WHAT DOES IT ACTUALLY MEAN?

SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) IS A SYSTEM FOR REMOTE MONITORING AND CONTROL THAT OPERATES WITH CODED SIGNALS OVER COMMUNICATION CHANNELS.

THE CONTROL SYSTEM MAY BE COMBINED WITH A DATA ACQUISITION SYSTEM BY ADDING THE USE OF CODED SIGNALS OVER COMMUNICATION CHANNELS TO ACQUIRE INFORMATION ABOUT THE STATUS OF THE REMOTE EQUIPMENT FOR DISPLAY OR FOR RECORDING FUNCTIONS. WIKIPEDIA

• S = SUPERVISORY – OVERSIGHT, MANAGERIAL, BIRDS-EYE VIEW
• C = CONTROL – ORDER, LIMIT, OR GUIDE SOMETHING OR SOMEONE’S ACTIONS OR BEHAVIOR
• A = AND – TIES EVERYTHING TOGETHER
• D = DATA – MOMENTARY INFORMATION TO BE COLLECTED AND STORED PERMANENTLY
• A = ACQUISITION – COLLECT MEANINGFUL INFORMATION (DATA) ABOUT PROCESSES AND USE IT TO MAKE BETTER DECISIONS, CONTINUOUS IMPROVEMENT
Why Should I Care What SCADA is???

- INCREASE OVERALL OPERATING EFFICIENCY / IMPROVE DECISION MAKING
- LACK OF QUALIFIED [MOTIVATED] EMPLOYEE POOL
- HELPS TO CULTIVATE ORGANIZATIONAL PLANNING / VISUALIZATION
- CAN HELP BREAK MANAGERIAL TUNNEL VISION (COMPLACENCY)
- INVESTMENT – SYSTEM CAN GROW WITH THE COMPANY, IN WHICHEVER DIRECTION IS MOST PROFITABLE
THE TERM "TYPICAL" IS A LOOSE INTERPRETATION – GENERIC

• **PLC**: PROGRAMMABLE LOGIC CONTROLLER – WIRES TO MACHINE

• **HMI**: OPERATOR INTERFACE – INPUT PARAMETERS, RECEIVE STATUS INFORMATION

• **SCADA SERVER**: PRIMARY SOFTWARE FOR COLLECTION AND DISSEMINATING INFORMATION

• **DATABASE**: PRIMARY (OR ONE OF MANY) DATA STORAGE POINTS
ALMOST ANY COMPANY — FROM A SMALL MANUFACTURER OF HAND-MADE CLOTHING, TO A LARGE MINING OPERATION — CAN BENEFIT FROM A SCADA SYSTEM.

HERE ARE A FEW DIFFERENT ARCHITECTURE POSSIBILITIES:

### Small – few to no machines. Manual data entry

- **Down to the Nitty-Gritty**

### Small to Medium – A few machines. Collect data from PLC’s and operators

- **PLCs**
  - Connect to or PLC through OPC
- **Central Server**
  - Connect to the central server through network
- **Database**
  - Connect to the database through network
- **Network**
  - Connect to LAN through OPC
- **Mobile Devices**
  - Access the centralized system through network
- **Web-launched Clients**
  - Access the system through web clients
- **Web-launched Designers**
  - Design projects remotely with multiple clients

### Medium to Large – Many machines. Collect data from PLC’s and operators. Shared corporate wide
The How, Who, What,....

HOW – CONSULT WITH INTERNAL MAINTENANCE AND IT STAFF, THEN A REPUTABLE AUTOMATION/CONTROLS COMPANY.

WHO – ALMOST ANY COMPANY (MC DONALDS KIOSKS, ANYONE??). IF YOUR COMPANY UTILIZES ANY FORM OF MACHINERY, OR HAS A CONTROLLABLE PROCESS (MACHINES NOT NECESSARY), THEN A SCADA SYSTEM OF THE APPROPRIATE ARCHITECTURE CAN BE SETUP.

WHAT - PLC BASED MACHINE CONTROL, WEIGHT DATA, TEMPERATURE CONTROL, SAFETY, RECIPE DEVELOPMENT, WORKER PRODUCTION EFFICIENCY, SECURITY, QUALITY CONTROL, ETC.

WHERE – EVERYWHERE. INSIDE A PRODUCTION FACILITY, TO THE FRONT OFFICE. SOME OF THE MOST PROLIFIC SCADA USERS ARE INDUSTRIES WITH FAR-REACHING LOCATIONS, SUCH AS THE OIL & GAS, WATER/WASTE WATER, AND UTILITY INDUSTRIES.

WHEN – WHEN THREE CONDITIONS ARE MET; 1) A LEGITIMATE NEED IS OBSERVED, 2) MANAGEMENT IS COMMITTED TO THE SYSTEM’S SUCCESS, AND 3) INVESTMENT CAPITAL CAN/WILL BE APPROPRIATED FOR THE INITIAL BASIC SYSTEM INFRASTRUCTURE.

WHY - SCADA SYSTEMS ARE AN INTEGRAL PART OF ANY MODERN MANUFACTURING FACILITY. (CUSTOMER/MARKET DEMANDS OFTEN REQUIRE SCADA SYSTEMS).
Answers to Nagging Questions

A. DO I ALWAYS HAVE TO BUY NEW SYSTEMS AS MY COMPANY GROWS?
• NO – A WELL PLANNED SCADA SYSTEM WILL GROW WITH A COMPANY. YOU WILL HAVE TO ADD MODULES, DATABASE TABLES, ETC., BUT NO RE-INVENTING THE WHEEL EVERY TIME YOU WANT TO EXPAND.

B. CAN I IMPLEMENT OUR PLAN IN PHASES?
• YES – IT IS RECOMMENDED THAT YOU IMPLEMENT A LARGER SYSTEM IN PHASES. BUT ANY SIZE, EVEN SMALL, CAN BE BUILT IN SMALL INCREMENTS.

C. WHAT ARE THE MAINTENANCE COSTS, AND WHO WILL MAINTAIN IT?
• MAINTENANCE COSTS DEPEND ON THE COMPLEXITY OF THE SYSTEM. MOST MAINTENANCE REVOLVES AROUND BACKUPS, SMALL SYSTEM ADDITIONS, AND PC, SERVER OR DB CRASHES. THEY CAN BE MAINTAINED IN-HOUSE, OR BY A CONTRACTOR.
Specific Montana Challenges

- **SMALL POPULATION**
- **WIDELY DISBURSED**
- **LIMITED RESOURCES**
- **UNCERTAIN INTERNET**
- **FEW LOCAL [VENDOR/CUSTOMER] RESOURCES**

So.....Is there a link between these challenges and SCADA systems? And what can a SCADA system do for my Montana business???
Yes, There Is. So, Where Do We Start?

1. **DEVELOP A PLAN BASED ON NEEDS AND FUTURE GOALS**

2. ***GET EMPLOYEES – FROM PLANT FLOOR UP TO MANAGEMENT – ON BOARD WITH THE NEED FOR A SYSTEM, AND INVOLVED IN THE PLANNING***

3. **PUT TOGETHER A TEAM (SYSTEM SIZE DEPENDENT) TO OVERSEE THE DEVELOPMENT, OR DIRECTLY IMPLEMENT THE NEW SCADA SYSTEM**

4. **CHECK AND MODIFY SYSTEM PLAN AS NECESSARY, DURING DEVELOPMENT**

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Operator Entry  
PLC  
Machine  
SCADA Database  
Reports
Scenario: A single checkweigher accepting/rejecting widgets

As a widget is weighed by the checkweigher, the SCADA system reads the data (weight) from the checkweigher and logs it* into the database.

Result:

Every time a log entry is made, the SCADA system logs; Weight, Max Weight, Min. Weight, Product Code, Operator, Machine #, Shift, Customer, Date, Time.
LEVERAGE YOUR INPUTS TO SQUEEZE AS MUCH DATA (USEFUL INFORMATION) OUT AS POSSIBLE. MORE INFORMED = BETTER DECISIONS
LARGER APPLICATIONS DON’T ALWAYS START OUT THAT WAY. OFTEN, THEY BUILD ON THE FOUNDATION OF A PREVIOUSLY SMALLER APPLICATION.
Make Your System Work For You!

• PREDICT INVENTORY REQUIREMENTS BASED ON SALES
• VIEW TRANSACTION HISTORY
• CUSTOMIZE REPORTS FOR: ➢ MONTH-END
  ➢ AUDITING
  ➢ ANTICIPATED PRODUCT THROUGHPUT
  ➢ TYPE AND QUANTITY OF OWNED/STORED PRODUCT
• SCHEDULE PRODUCTION RUNS
• RUN DYNAMIC REPORTS ON PLANT AND EQUIPMENT UTILIZATION
• EMPLOYEE / SHIFT OVERSIGHT*
• CUSTOMER / VENDOR INPUT TO YOUR SYSTEM
A MONTANA BASED VENDOR CAN HELP SECURE CONSISTENT BUSINESS BY BEING CONTINUOUSLY CONNECTED WITH A CUSTOMER’S BUSINESS.

I.E. – A CUSTOMER NEEDS A CONTINUOUS SUPPLY OF PRODUCT, LET THEM RELY ON YOU TO MONITOR AND PROVIDE THAT FOR THEM!  

*ASSOCIATED RISKS*  

Ex: Delta, BC
IOT = INTERNET OF THINGS = CONNECTIVITY OF EVERYDAY THINGS: SMART WATCH, REFRIGERATOR, HOME SECURITY, VEHICLES, ETC.

IIoT = INDUSTRIAL INTERNET OF THINGS = CONNECTIVITY OF THINGS USED IN AN INDUSTRIAL ENVIRONMENT: SENSORS, INSULIN PUMPS, WORKER SAFETY DEVICES, PICK-AND-PLACE ROBOTS, ETC.

THE BIGGEST ISSUE FACING I/IOT = SECURITY. THE SECOND WOULD BE CONNECTIVITY. HOW AND WHO WOULD BE RESPONSIBLE FOR SECURITY?? CONNECTIVITY NEEDS STANDARDS BY WHICH ITEMS WILL CONNECT WITH ONE ANOTHER. OMG-OBJECT MANAGEMENT GROUP, IIC-INDUSTRIAL INTERNET CONSORTIUM
Last, But Not Least: SCADA Cost Justification

SCADA systems are not easily justified by developing a spreadsheet and calculating the estimated ROI, as would be done for many other types of capital investments.

Quite often, SCADA systems are justified using risk analysis, or by evaluating costs associated by *not* having a SCADA system in place.

**WATER / WASTE WATER – HOW OTHERWISE TO OPERATE GEOGRAPHICALLY DISBURSED PUMPING STATIONS? WHAT ARE THE RISKS OF NOT MONITORING WASTE LEAKAGE OR DRINKING WATER CONTAMINATION?**

**FOOD INDUSTRY – FSMA – RECORDS ACCESS AND AVAILABILITY? COST BURDEN TO ADD REPORTING FOR NEW PROCESSES?**

**UNPLANNED DOWNTIME – ONE OF MANUFACTURING’S GREATEST ENEMIES (RISK ANALYSIS). HOW MUCH DOES IT COST TO IMPLEMENT SCADA LEVEL MONITORING FOR YOUR PROCESS (PREVENTIVE MAINTENANCE), VS. UNPLANNED DOWNTIME IN THE MIDDLE OF A PRODUCTION RUN, AND RESULTING IN UNHAPPY CUSTOMERS.**
SCADA Summary

• A SCADA SYSTEM CAN BE SMALL OR LARGE, AND USEFUL TO ALMOST ANY MANUFACTURING OPERATION
• DEVELOP A PLAN
• BUILD A TRUSTWORTHY TEAM TO HELP WITH IMPLEMENTATION
• COMMIT!, COMMIT!, COMMIT!
• SCADA SYSTEMS, TO ONE DEGREE OR ANOTHER, ARE A BASIC REQUIREMENT FOR MOST PRODUCTION FACILITIES TO REMAIN COMPETITIVE IN TODAY’S, AND TOMORROW’S MANUFACTURING ENVIRONMENT

The greatest sign of intelligence, is one’s willingness to accept what they know to be true.

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