

## **2025 Water and Wastewater Workshop**

**Gander NL, Canada**

Presenter:

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National Sales Manager



# Welcome!

## Today's Agenda

1. Data/Cybersecurity 10,000Ft View
2. SCADA — What is it?
3. Types of SCADA Systems
4. Water and Wastewater Applications



# Data/Cybersecurity

## A Basic Understanding

- Time – How much can you dedicate
- The Who , What, & Why
- Common Sense – Password Habits
- Network Architecture
- Wrap it up – Put a bow on it

# Is Your Information Safe?



# Juggling too much already?

**Service Calls  
Personnel  
Maintenance  
Budgets ... etc.**

**You don't have time to worry  
about IT security and your data!**



# Why Hackers Hack

## Financial Gain

- Banks, Credit Card Companies

## Personal Reasons

- Disgruntled Employee
- Relationship Gone Bad

## Geopolitical

- Election interference

## Fame

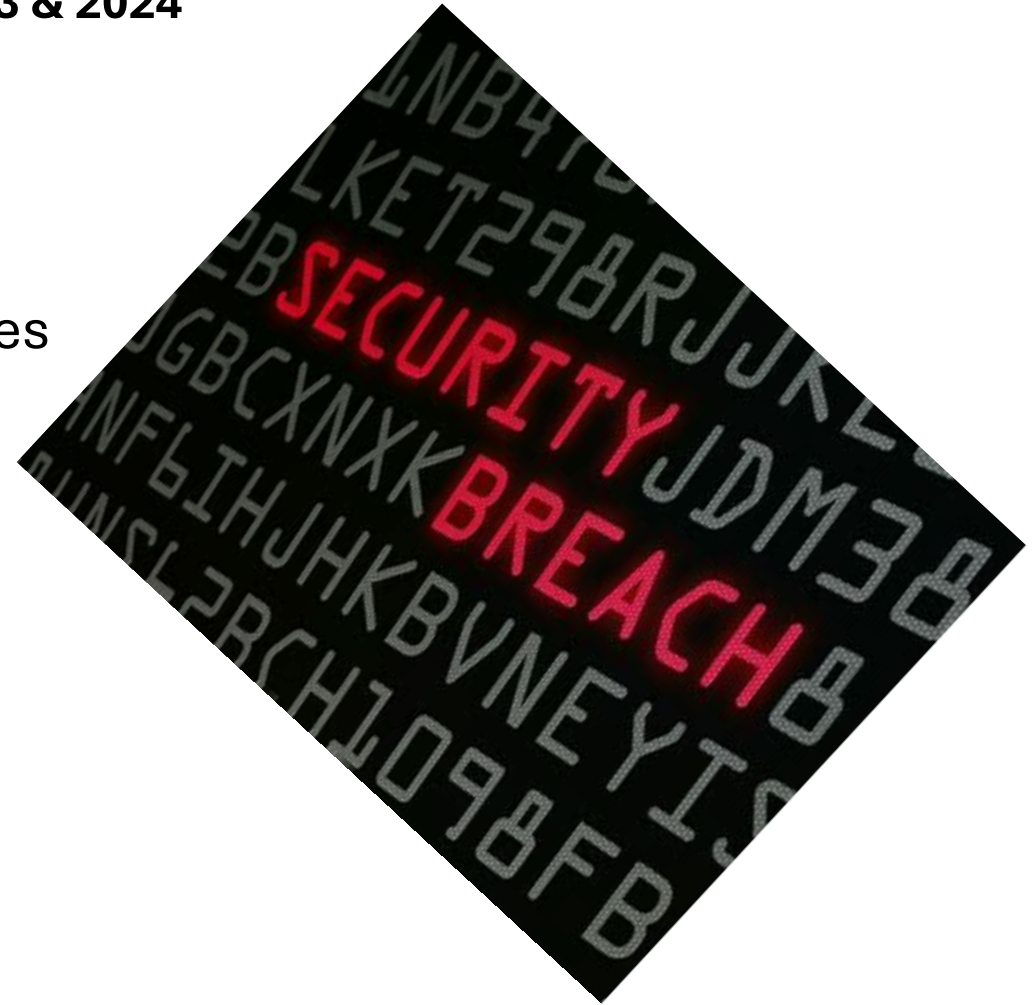
- 15 Minutes in the spotlight



# Who Got Hacked

## Security Breaches in 2023 & 2024

- 40% of the targets were Businesses
- 35% of the targets were Medical & Healthcare facilities
- 8% of the targets were Government or Military
- 7% of the targets were Educational Institutions
- **Human error is the cause 62% of the time**
  - <http://www.idtheftcenter.org>





# Common Sense

POOR PASSWORD HABITS CAN ENDANGER BUSINESS

## Most Breaches Abuse Passwords

63% of breaches in 2016 used weak, default or stolen passwords, so companies should urge employees to create strong, unique passwords with a minimum of 12 to 14 characters that include numbers, letters and symbols.



CIO INSIGHT

- Don't Use The Same Password
- Don't Share Passwords
- Is "Password" your Password
- Do Not Write Them Down
- Long Phrases-
  - GeauxTigersLSU
  - RollHomeCrimsonTide



# Password Facts

Time it takes a Hacker to Brute Force your password					
@coders.bro					
Numbers of Character	Numbers Only	Lowercase Letters	Upper and Lowercase Letters	Numbers, Upper and Lowercase Letters	Numbers, Upper and Lowercase Letters, Symbols
4	Instantly	Instantly	Instantly	Instantly	Instantly
5	Instantly	Instantly	Instantly	Instantly	Instantly
6	Instantly	Instantly	Instantly	1 sec	5 secs
7	Instantly	Instantly	25 secs	1 min	6 mins
8	Instantly	5 Secs	22 mins	1 hour	8 hours
9	Instantly	2 mins	19 hours	3 days	3 weeks
10	Instantly	58 mins	1 month	7 months	5 years
11	2 secs	1 day	5 years	41 years	400 years
12	25 secs	3 weeks	300 years	2k years	34k years
13	4 mins	1 year	16k years	100k years	2m years
14	41 mins	51 years	800k years	9m years	200m years
15	6 hours	1k years	43m years	600m years	15bn years
16	2 days	34k years	2bn years	37bn years	1tn years
17	4 weeks	800k years	100bn years	2tn years	93tn years
18	9 months	23m years	6tn years	100tn years	7qd years
Are you in green zone?					

Rank	Password	Change from 2015
1	123456	No Change
2	password	No Change
3	12345	Up 17
4	12345678	Down 1
5	qwerty	Down 1
6	123456789	No Change
7	1234	Up 9
8	baseball	New
9	dragon	New
10	football	New
11	1234567	Down 4
12	monkey	Up 5
13	letmein	Up 1
14	abc123	Down 9
15	111111	Down 8
16	mustang	New
17	access	New
18	shadow	Unchanged
19	master	New
20	michael	New
21	superman	New
22	696969	New
23	123123	Down 12
24	batman	New
25	trustno1	Down 1

# Network Architecture

Computer – Password/Phrase Protected, “Up to Date” Security Suite Software,

and Firewalls...which can reside within your PC

Router – Between Computer & Modem (Password/Phrase Protected)

Protocols= WPA2 or WPA3 (Wi-Fi Protected Access

“Legacy Protocols”= WEP (Wire Equivalent Privacy)

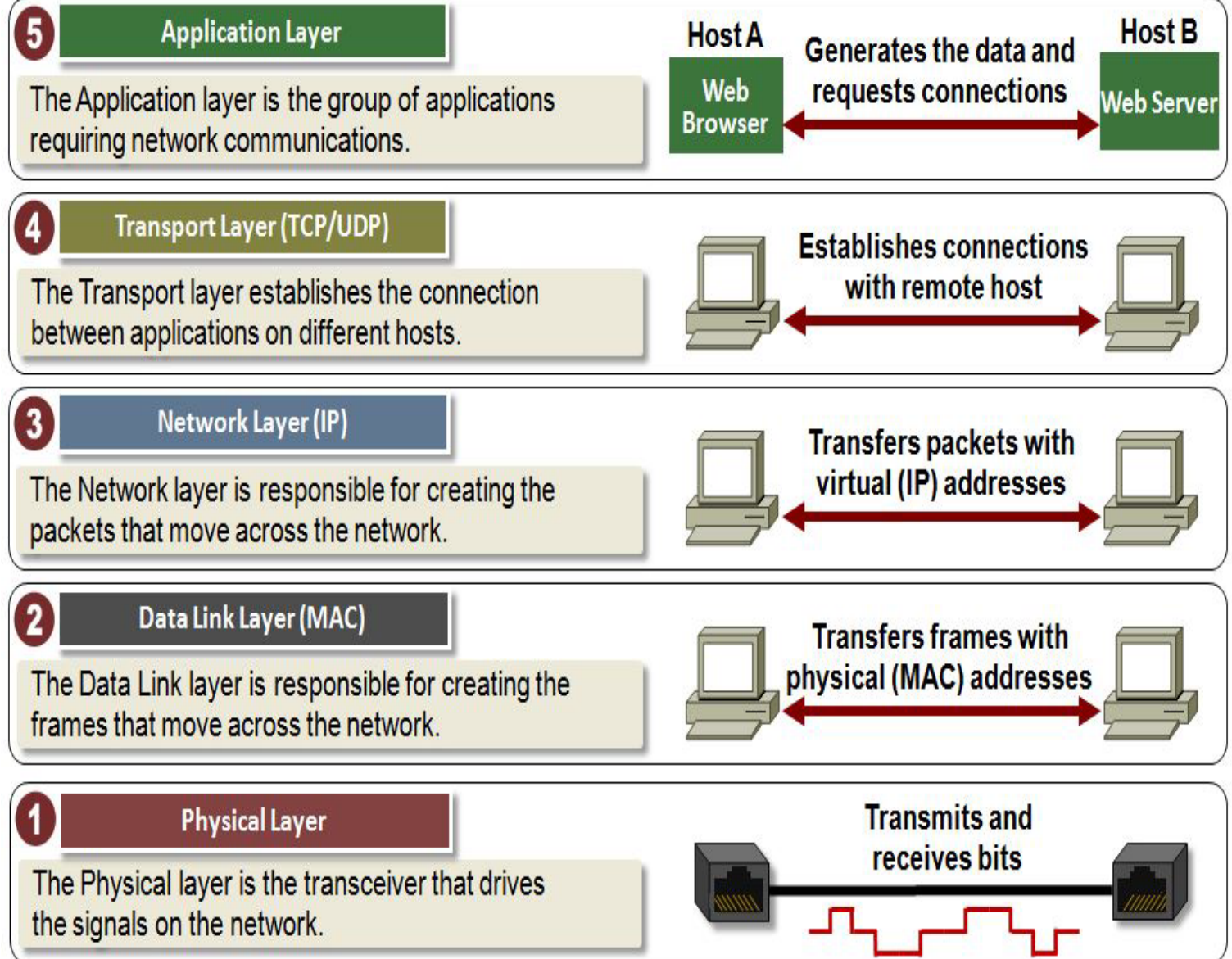
Protected Access)

Modem – Password, Firewall

Internet – Secure or Not ???



# TCP/IP & The Internet





# TCP/IP, Ports & Sockets

## How TCP/IP Works

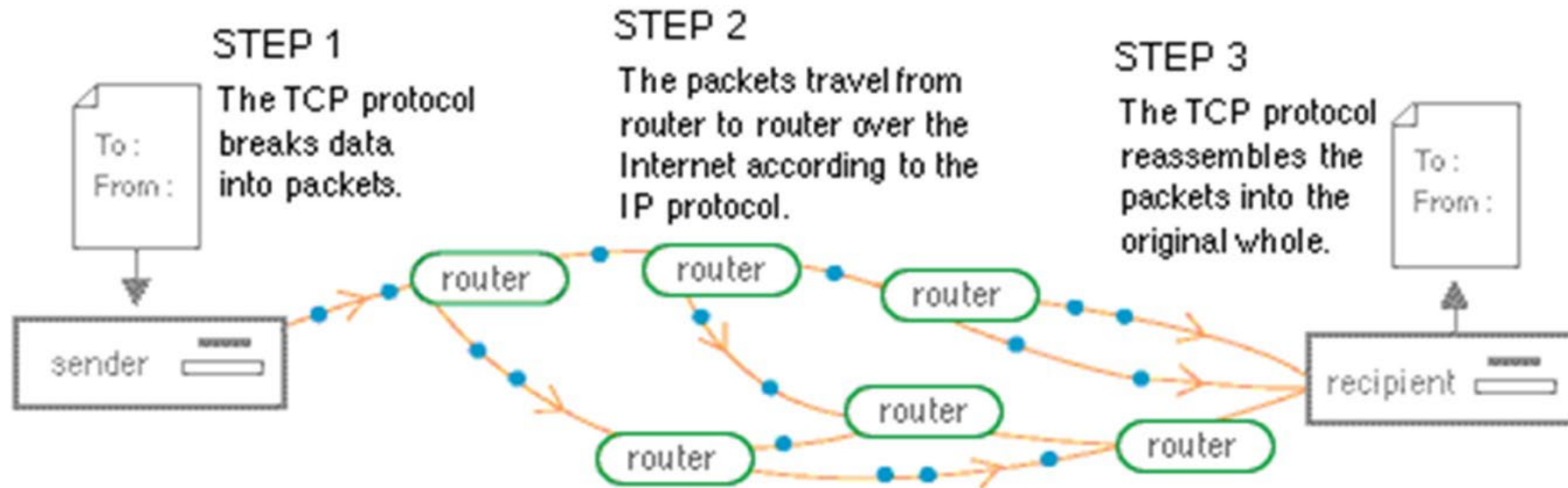


Figure 2. How data travels over the Net.

# Welcome!

## Today's Agenda

1. DATA/Cybersecurity 10,000Ft View
- 2. SCADA — What is it?**
3. Types of SCADA Systems
4. Water and Wastewater Applications



# What is SCADA?



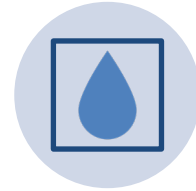
**Various types of SCADA systems**



**Differences between systems**



**Why the need for monitoring?**



**How SCADA applies to Water and Wastewater**



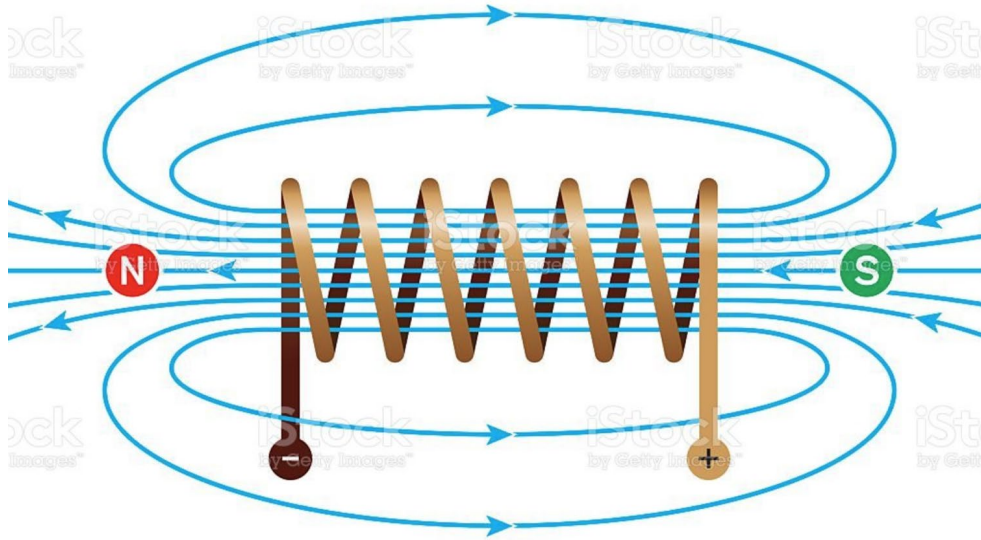
**Managed SCADA**



# What is SCADA?

***Supervisory  
Control  
And  
Data  
Acquisition***

# What is SCADA?



Alessandro Volta's invention and  
Hans Oersted's research

1970s railway re-signaling and  
electrification



# What is SCADA?

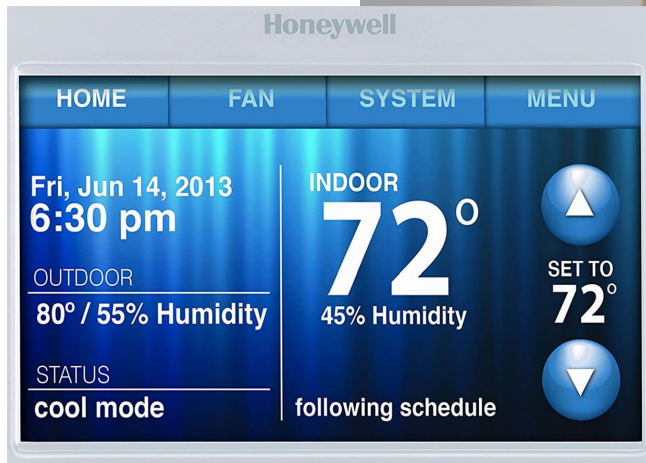
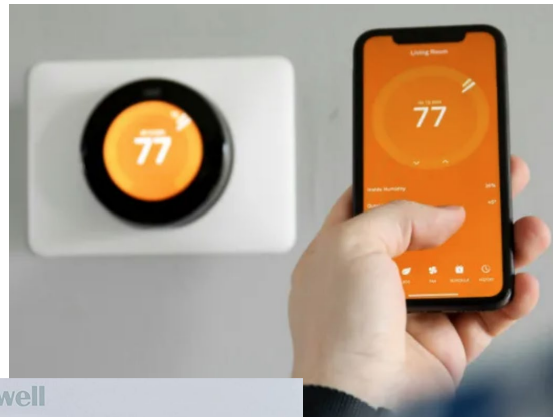
SCADA systems are used to monitor and control plant or equipment in industries such as:

<ul style="list-style-type: none"><li>• Telecommunications</li></ul>	<ul style="list-style-type: none"><li>• Transportation</li></ul>
<ul style="list-style-type: none"><li>• Oil and Gas</li></ul>	<ul style="list-style-type: none"><li>• Power Distribution and Control</li></ul>
<ul style="list-style-type: none"><li>• Renewable Energy</li></ul>	<ul style="list-style-type: none"><li>• Water and Wastewater monitoring and control</li></ul>



# What is SCADA?

Simple



Complex

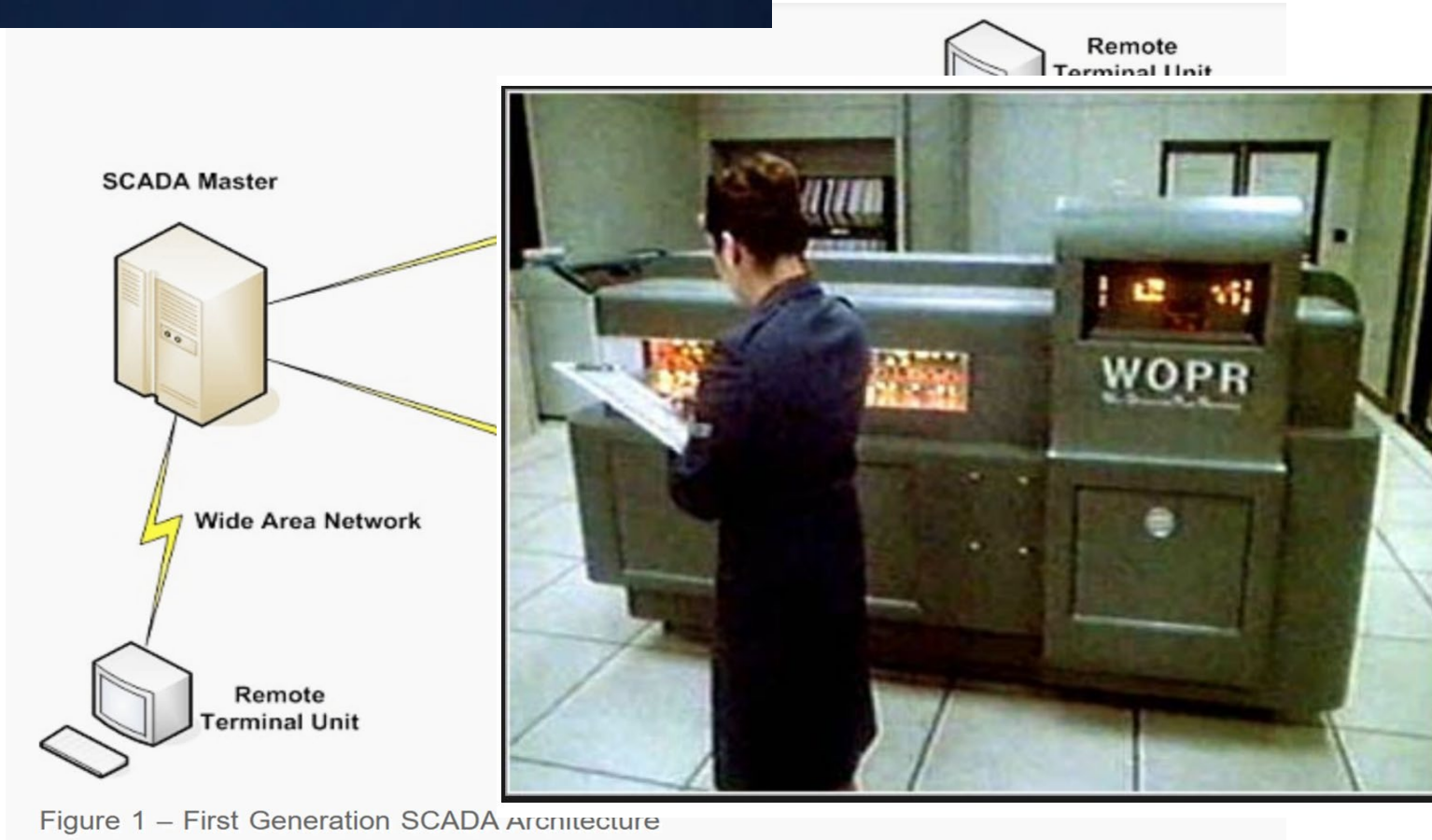




# What is SCADA?

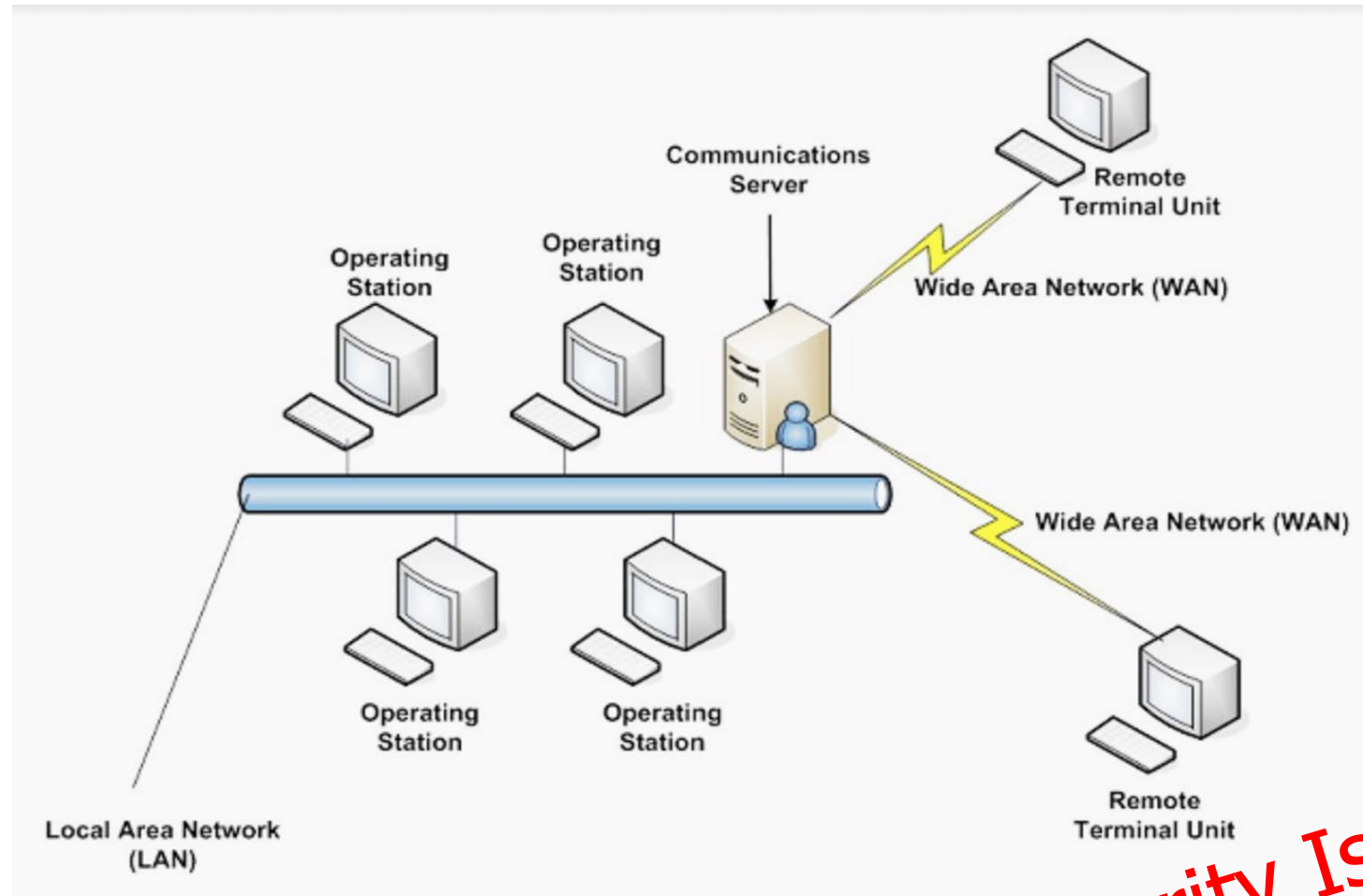
- 1st Generation of SCADA system architecture
- Monolithic (Large independent Mainframe)

SHALL HE PLAY A GAME?



# What is SCADA?

## 2nd Generations of SCADA system architecture

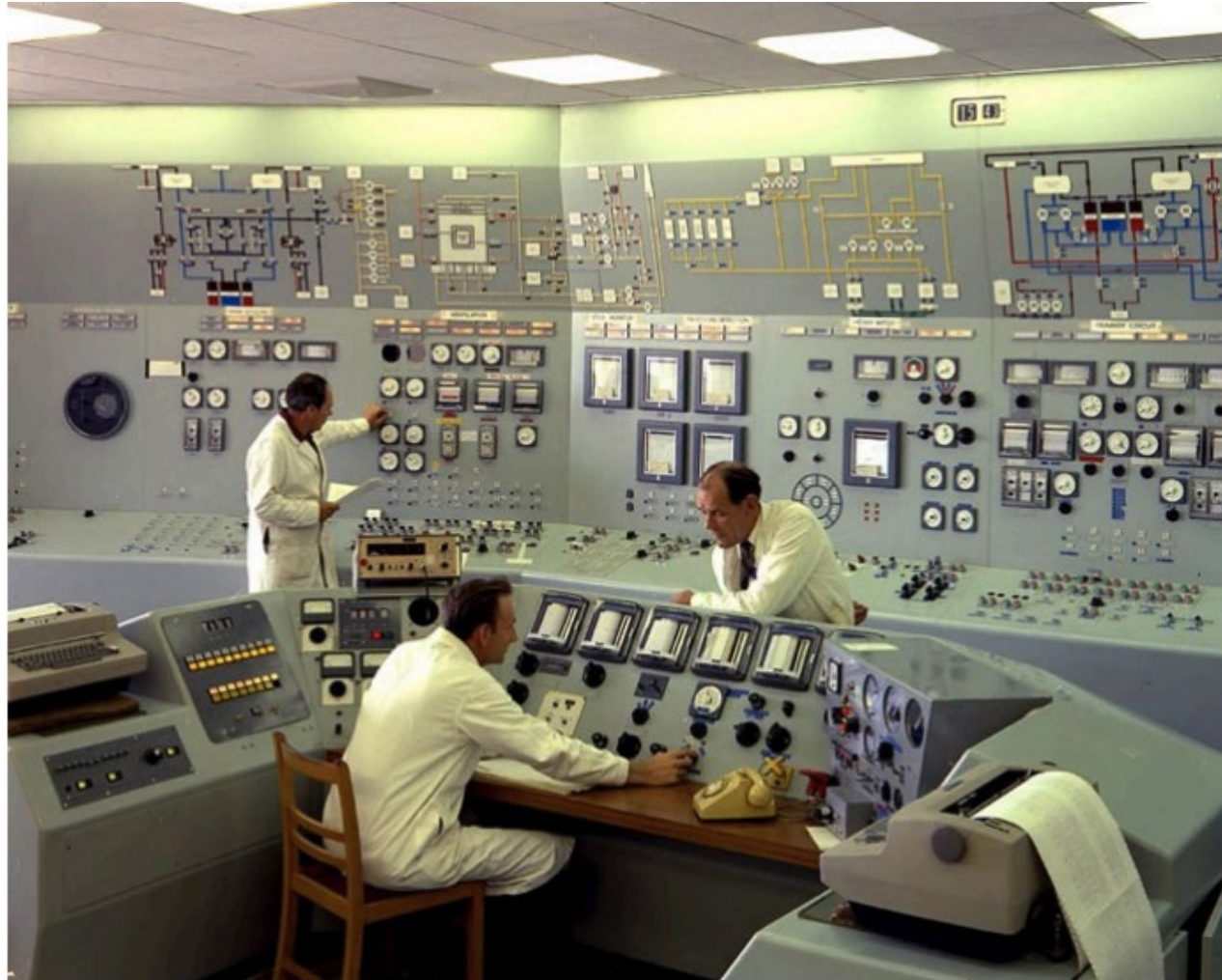


**Security Issues**



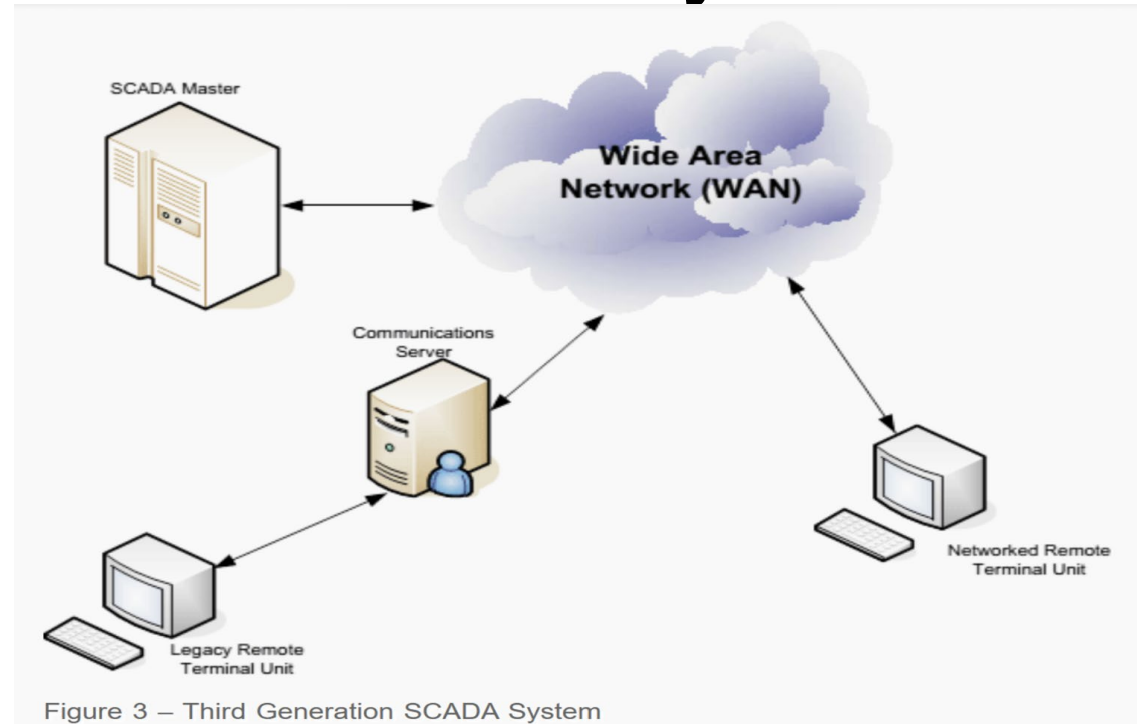
# What is SCADA?

**1970s**



# What is SCADA?

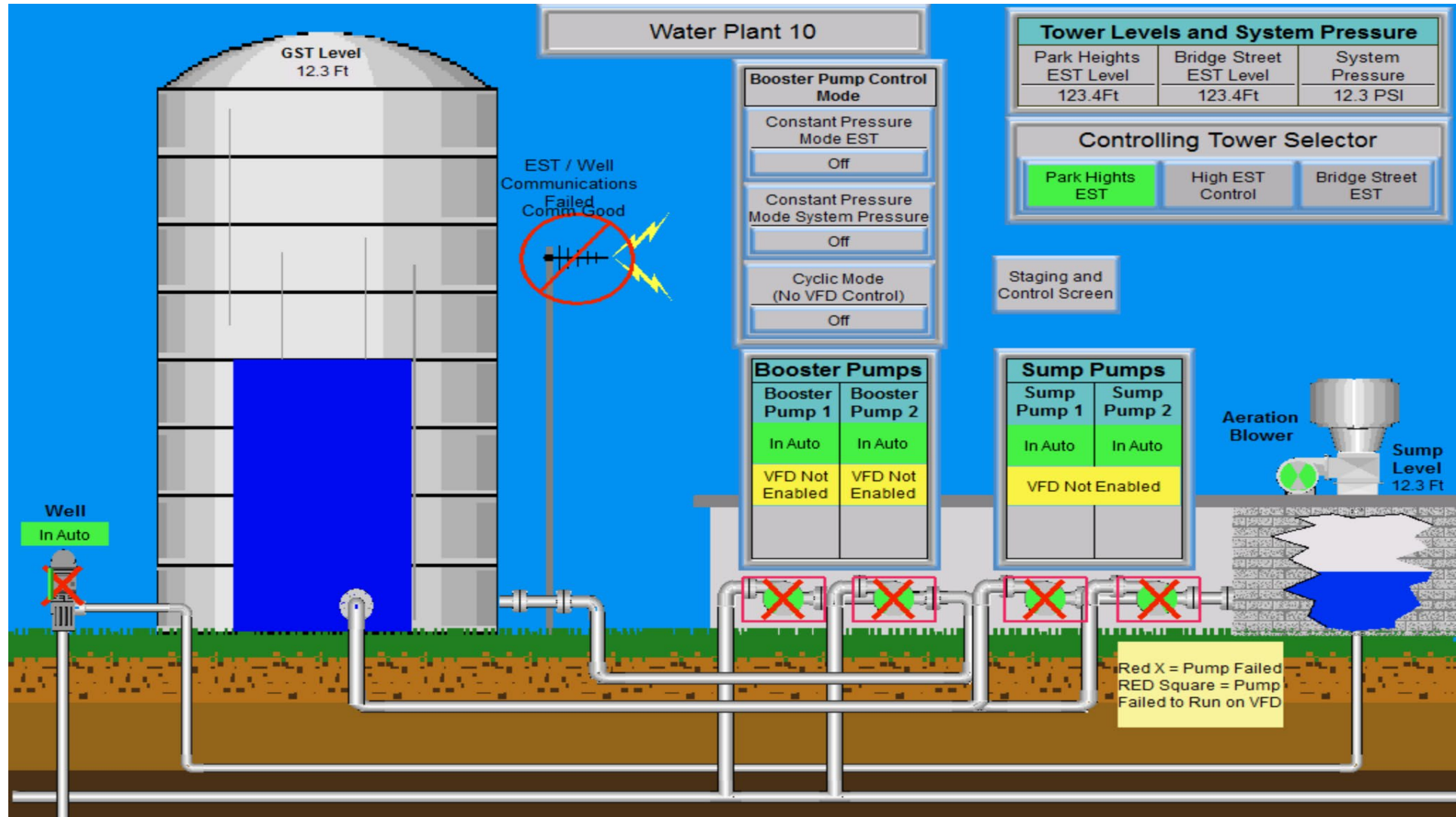
## 3rd Generations of SCADA system architecture



Very Secure with today's Standards and Protocols)

# *"What is SCADA?"*

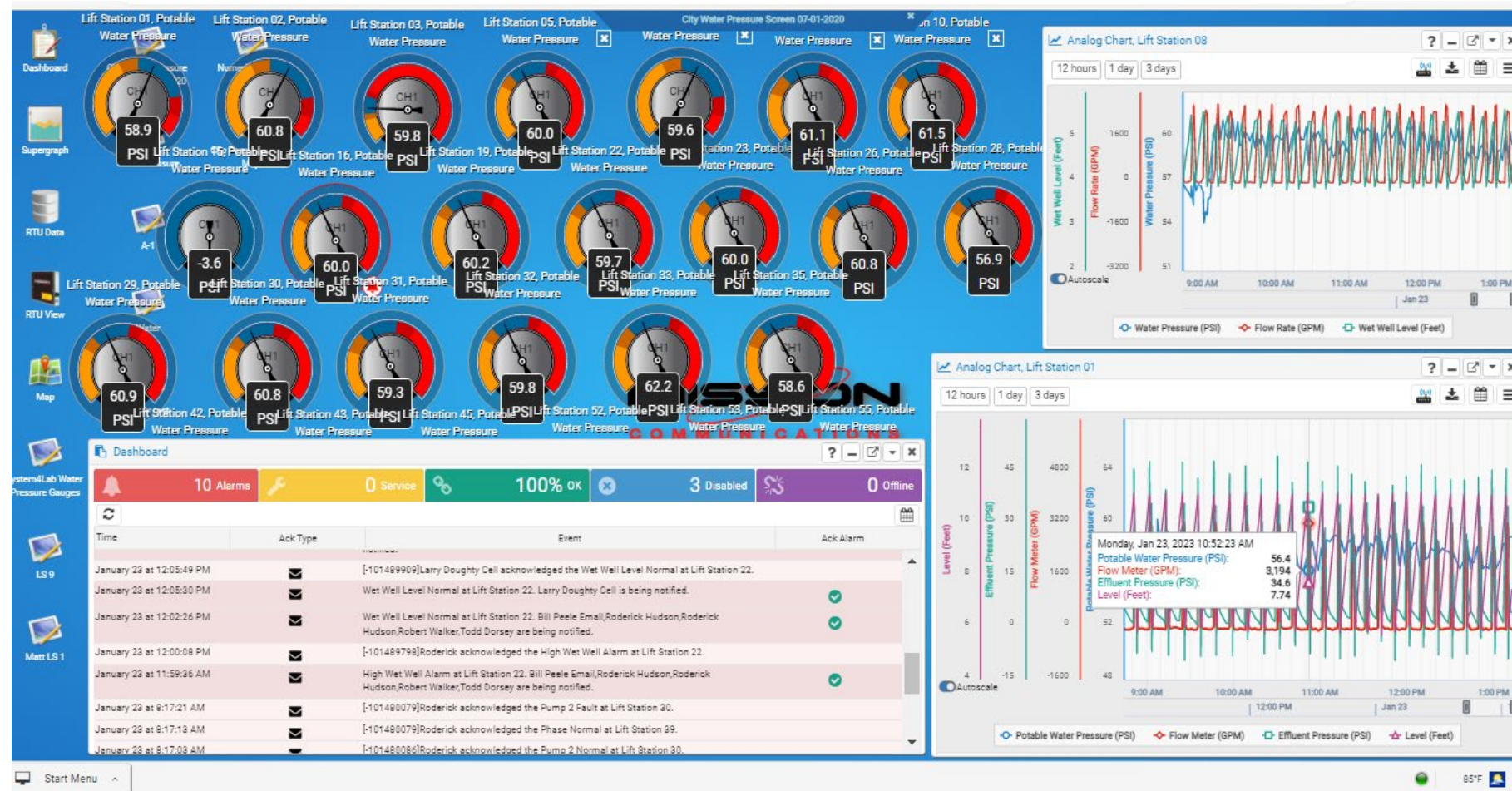
## 1980/90s





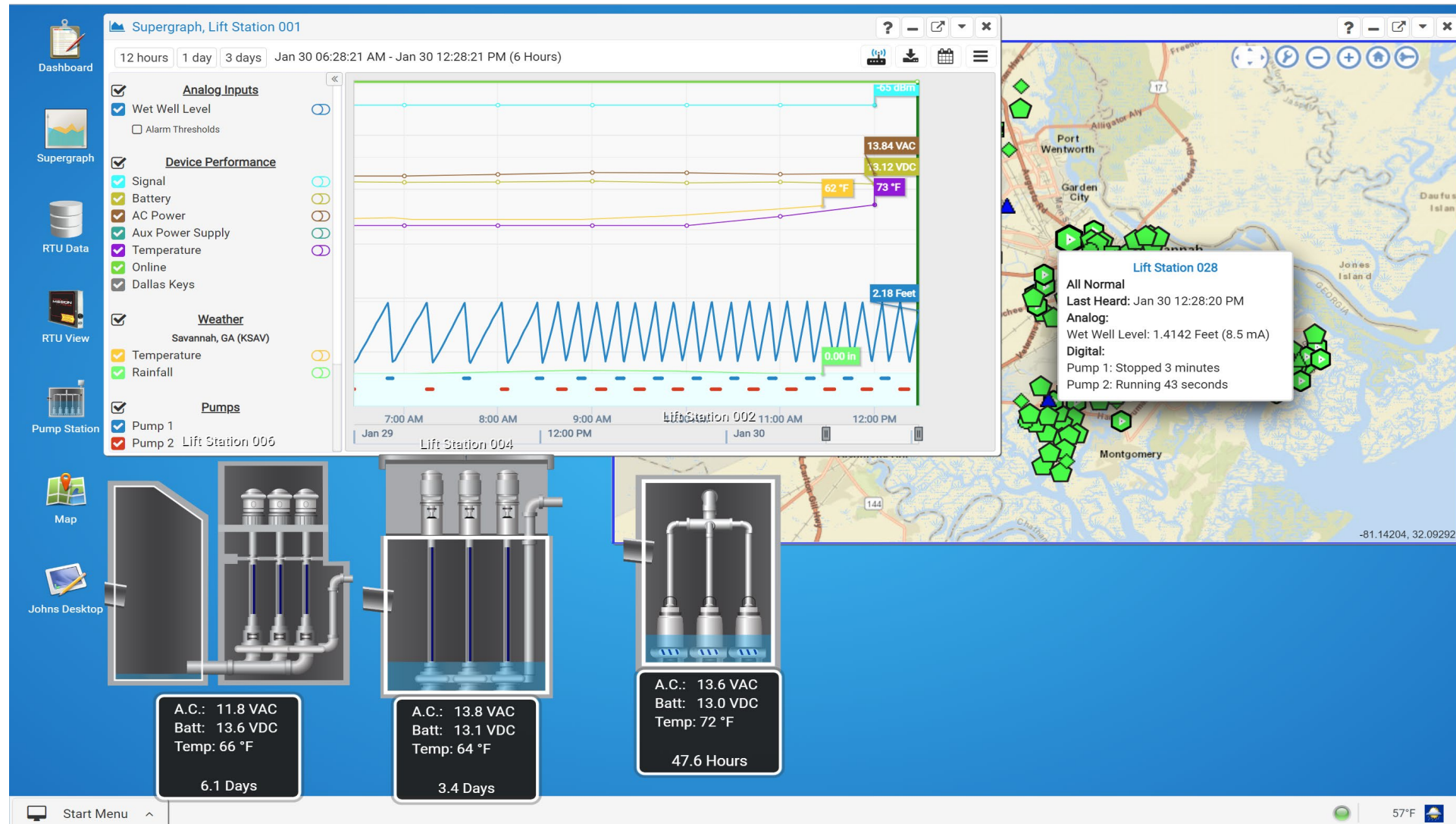
# What is SCADA?

## Build your own Desktop with Managed SCADA



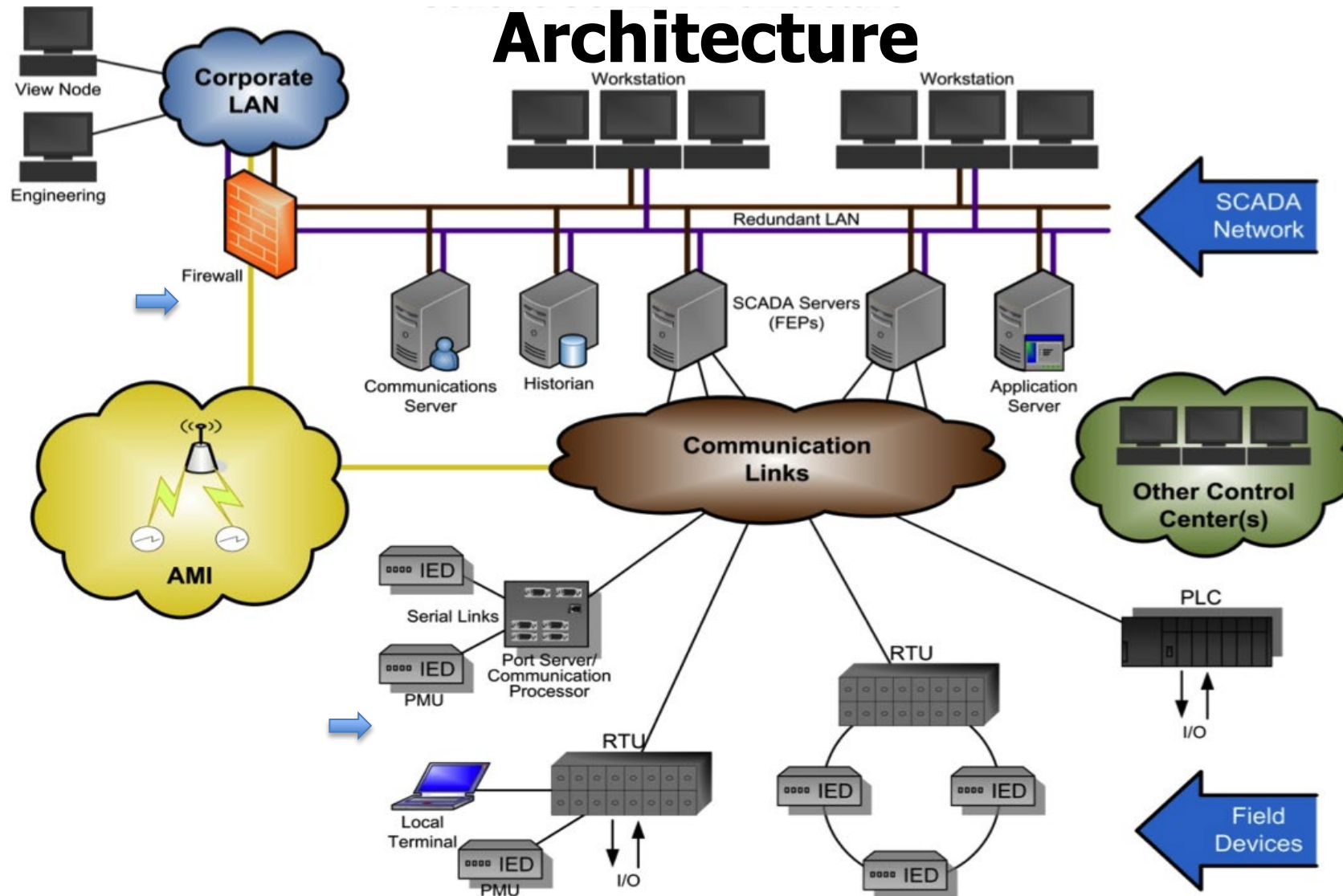
# What is SCADA?

## Build your own Desktop with Managed SCADA



# What is SCADA?

## Traditional SCADA Architecture



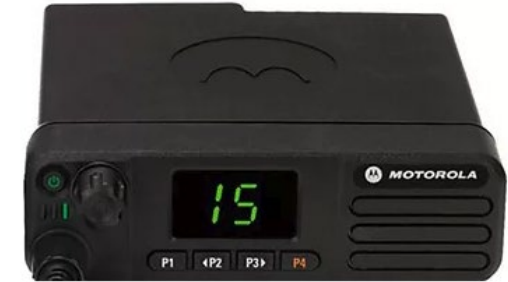


# What is SCADA?

## SCADA Components for Data Collection

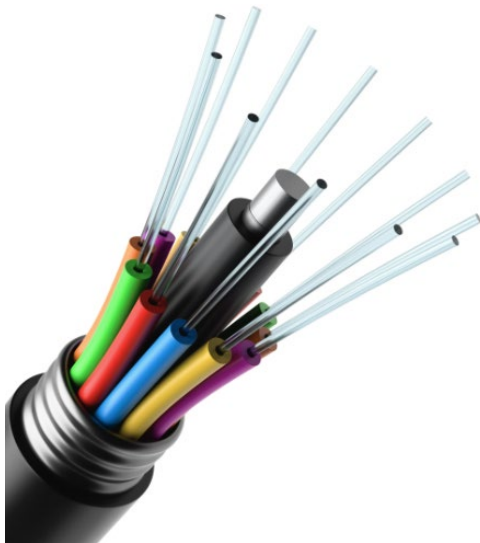


PLC  
RTU  
Radios  
Gateway



# What is SCADA?

## SCADA Methods of Communication



Cellular  
Fiber Optic  
Wi-Fi  
LoRa  
Wireless  
Satellite



# What is SCADA?

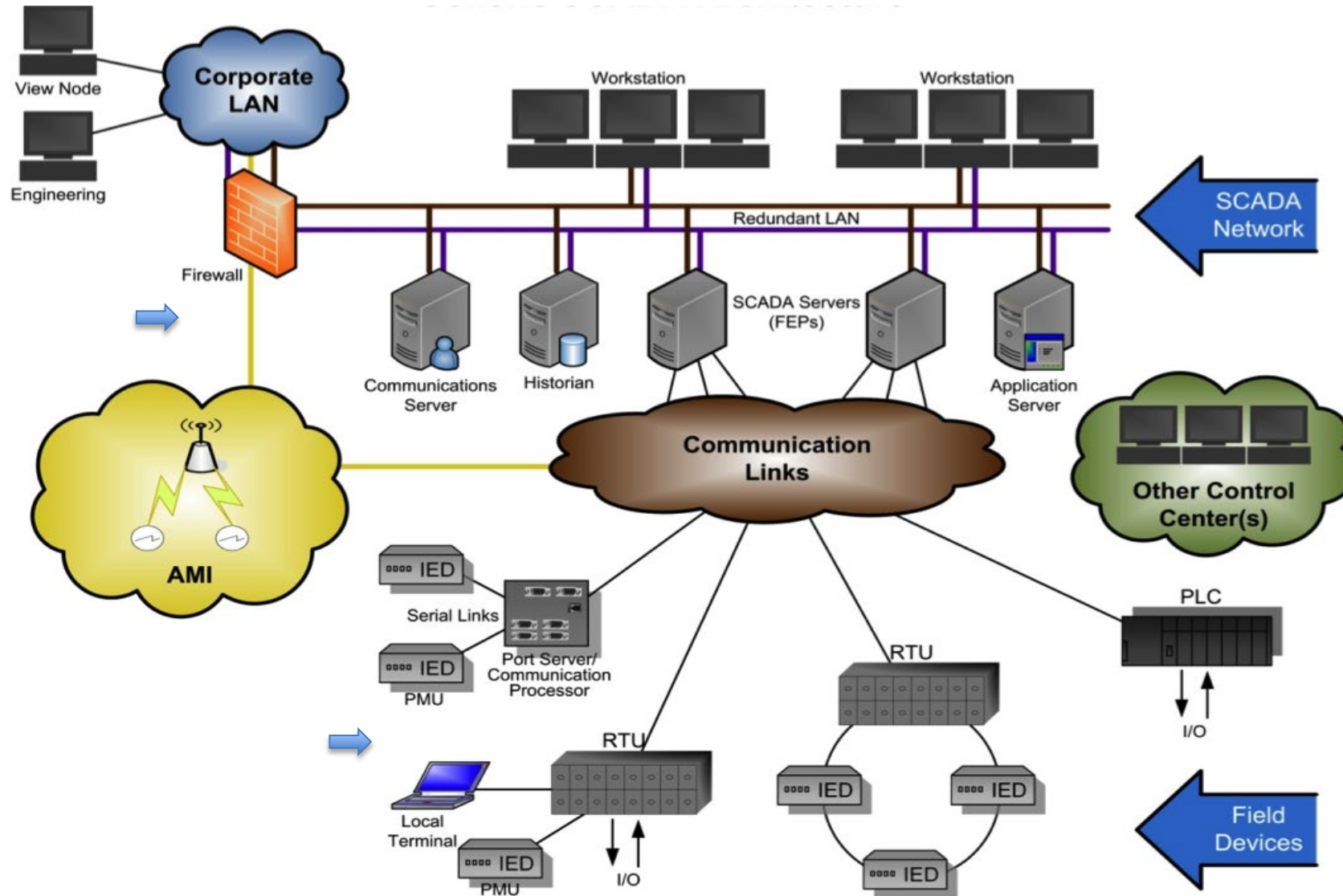
## Data Storage/Graphical Representation



Server Historian...part of which is the software and the Security!

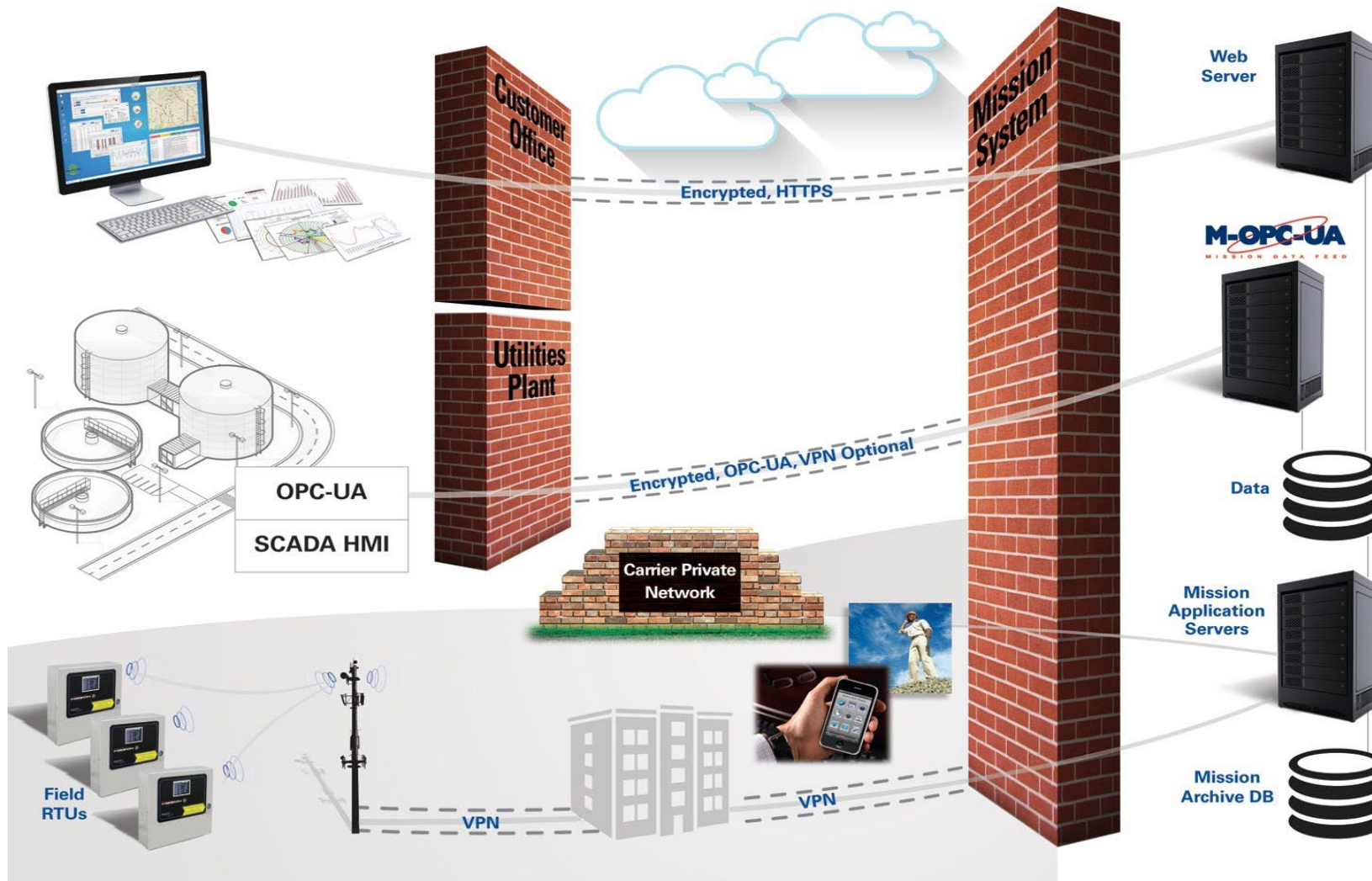
# What is SCADA?

## Traditional SCADA Architecture



# What is SCADA?

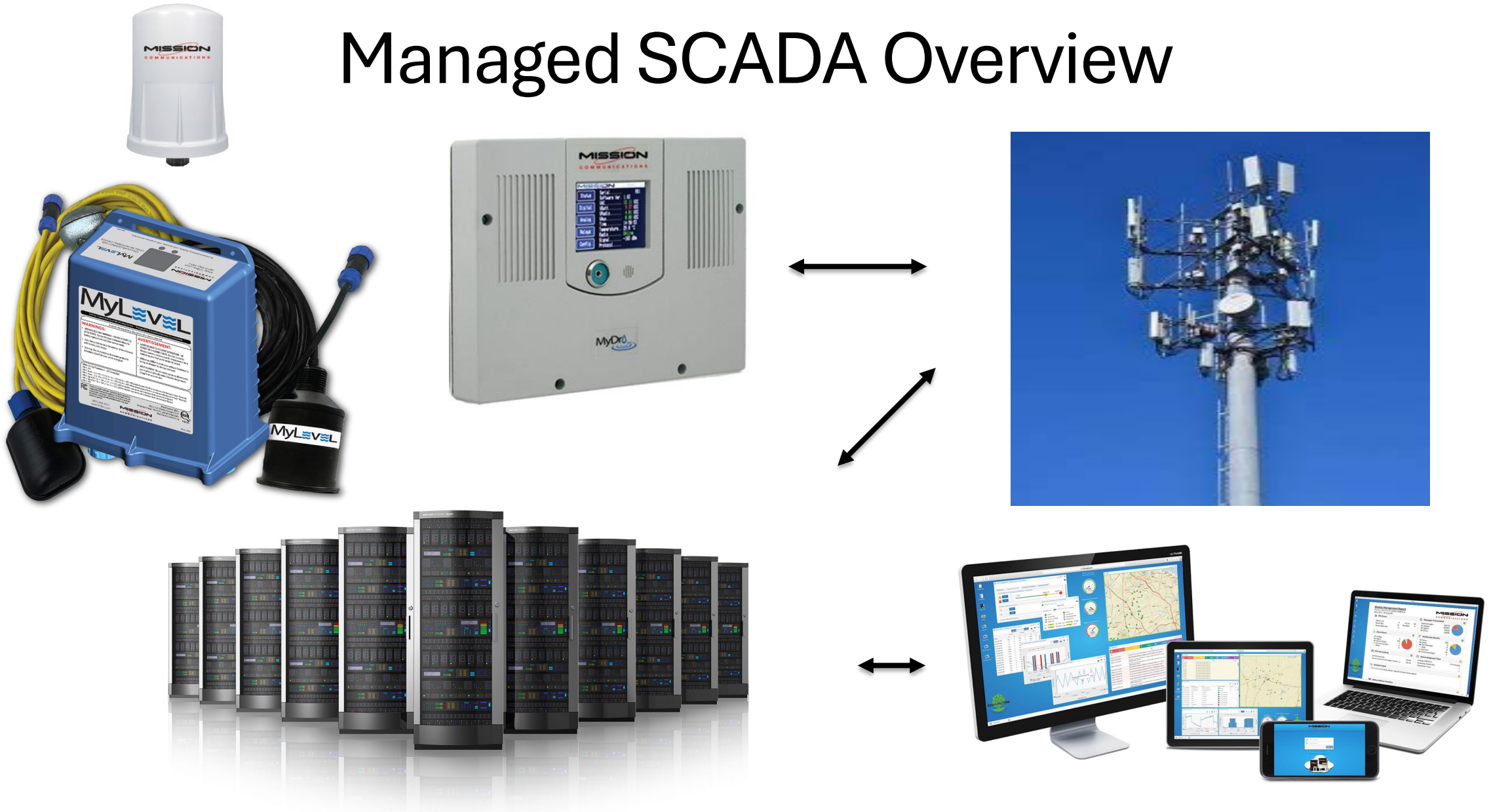
## Managed SCADA Architecture





# What is SCADA?

## Managed SCADA Overview





# What is SCADA?

SCADA systems gather information such as:



- Pump Runtimes
- Water Levels
- Amperage
- Total/Free Chlorine
- Flow
- Pressure
- Temperature
- Water Quality



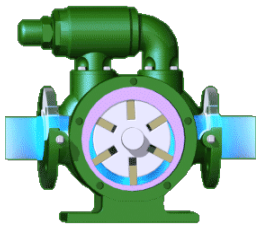
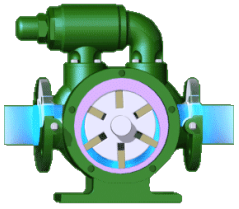
...and transfer the information back to a central site (computer) where it is stored for alarming and reporting purposes



# What is SCADA?

SCADA systems can monitor specific conditions such as:

- High or Low Level
- Pump Failure
- Intrusion
- Power Loss
- Generator Running
- Phase Loss
- High Temperature
- Excess Pump Starts
- Analog Thresholds



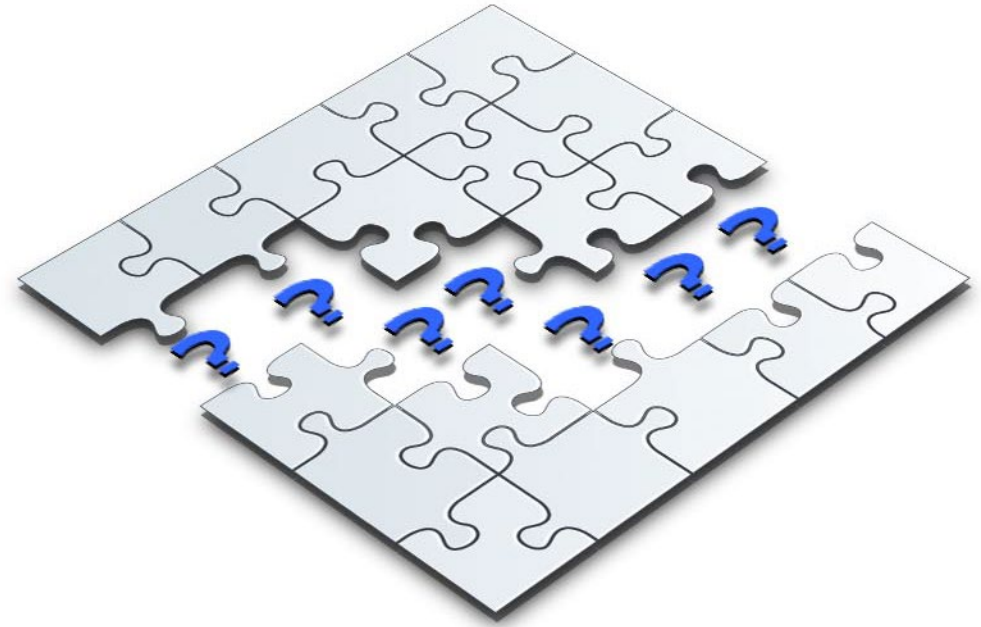
Thresholds can be set to cause alarms when readings are out of the norm



# What is SCADA

## Sound Familiar?

- Missing reports
- Incomplete data
- Unexplained failures
- High pump runtimes
- Flooding
- Back-ups
- Excessive starts



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# **Types of SCADA Systems**

## **Used in the Water and Wastewater Industry**

- Auto Dialers
- Client/ Server (traditional)
- LEO Satellite Systems
- Cellular/Cloud based Systems
- Managed SCADA

# Differences Between Systems

- Method of transmitting data
- How often the data is transmitted
- Amount of data transmitted
- Where data is stored
- On going maintenance & support
- Cost!!!

# Auto Dialers



- Good solution for basic alarms

Need a dedicated phone line

- You have to deal with the phone company if you want to move it!
- Cost of the phone line \$30-\$60 per month
- Lengthy time to re-establish service when natural disasters occur

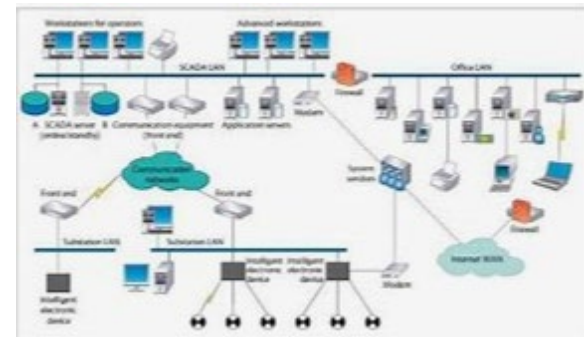
Minimal data storage for reporting purposes

- Limited features and functionality



# Client/ Server (traditional)

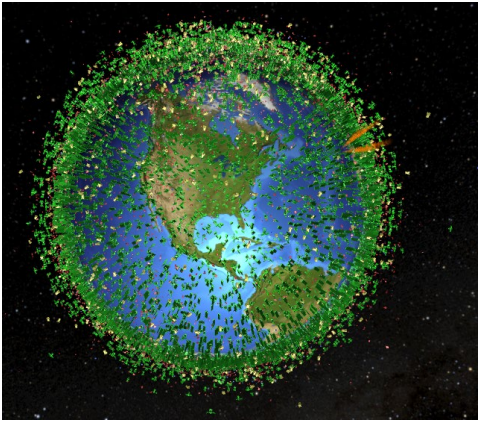
- Optimal for advanced applications, i.e. oil, gas, electric, certain controlling applications
- High number of inputs and outputs
- Generally custom designed
- Costly software
- Setup is time-consuming and requires specialized skills
- Reliability is dependent on private towers, or physical connections
- On going maintenance costs





# LEO Satellite

- Several of Mission's competitors have chosen ORBCOMM as their data transmission partner.
  - ORBCOMM service has worldwide coverage
  - ORBCOMM is designed for very short messages.
  - ORBCOMM hardware is inexpensive
  - ORBCOMM antennas are unobtrusive
- Sounds great. Why would someone not use satellite and not the more common 900MHZ/Cellular/LoRA



# Cellular/Cloud Based SCADA

- Most Server hardware and software maintained by 3<sup>rd</sup> party (M2M, Kore Technology, AWS)
- Some data is accessed on an unsecure website
- Say they can operate water systems
- Multiple vendors for hardware, cellular connectivity and the presentation of the data
- New features are hard to have deployed?
- Hardware has to be returned to the manufacturer to change radio technology
- Radio upgrades cost the customer

# Managed SCADA

- Server hardware and software maintained by Single Manufacturer.
- Clients access data with a standard web browser from any computer or mobile device with internet access
- Economies of scale allow low cost
- One vendor for the entire system including hardware, connectivity, and the presentation of the data
- New features that benefit one client can be provided to all clients with no upgrade hassles or costs
- Very fast deployment, self enrolling hardware.



123SCADA Web Portal



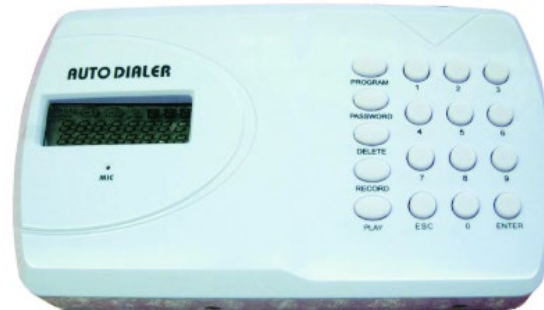
# Methods of Transmitting

- Auto Dialers
- Client/ Server (traditional)
- LEO Satellite Systems
- Cellular Systems
- Managed SCADA



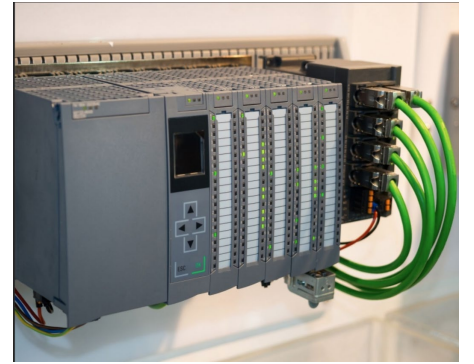
# Methods of Transmitting **Auto Dialers**

- Simple (Phone lines, wired/wireless Modems)
- No redundancy or watchdog for communication failures
- Have to rely on the phone company to reestablish connections

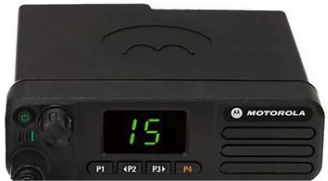


## Methods of Transmitting

# **Client/ Server**



- Often proprietary software installed on user workstations (servers/clients)
- Can be hard-wired between server and monitored location (Ethernet Radio, Serial, RTU)
- Optimal for advanced applications, i.e. oil, gas, electric, certain controlling applications
- IT department generally maintains servers
- Highly customizable but slow and costly to deploy
- 900MHz bleed over from other industries!



# Methods of Transmitting **LEO Satellite Systems**

- Any rocket scientists in the crowd?
- Two primary orbits for satellites:
  - Geosynchronous like DIRECTV dish
    - 22,500 miles up
    - Dish always points same direction
    - Satellite "footprint" covers whole earth
  - LEO (Low Earth Orbit) like the space shuttle or ORBCOMM
    - 100 to 500 miles above the Earth's surface
    - Satellites appear to move around
    - Radio footprint only covers a small area
      - New technologies available
        - StarLink/StarLink Direct to Cell



## Methods of Transmitting **Cellular/Cloud Based Systems**

- AWWA and Homeland Security minimum 1024-Bit SSL
- Single Carrier Options (\$250 adder) for different
  - National coverage ???
- LTE CAT1 vs CAT M1 radios
- Uses UDP (User Datagram Protocol)
- Doesn't use "Socket Connections"
- Not an option for Control....Missed Data!!!





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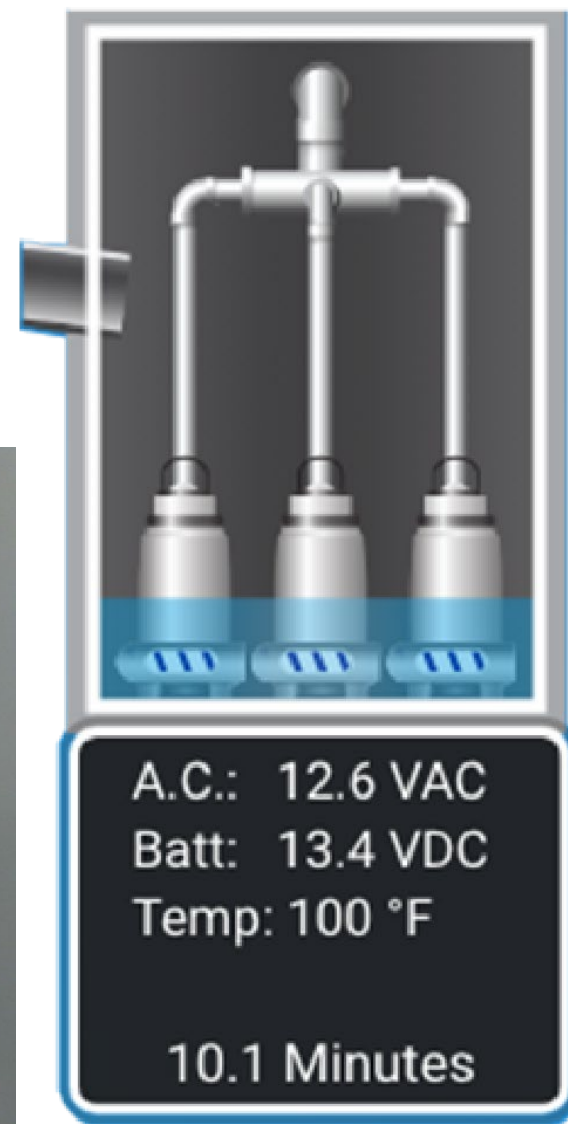
# The Primary Applications



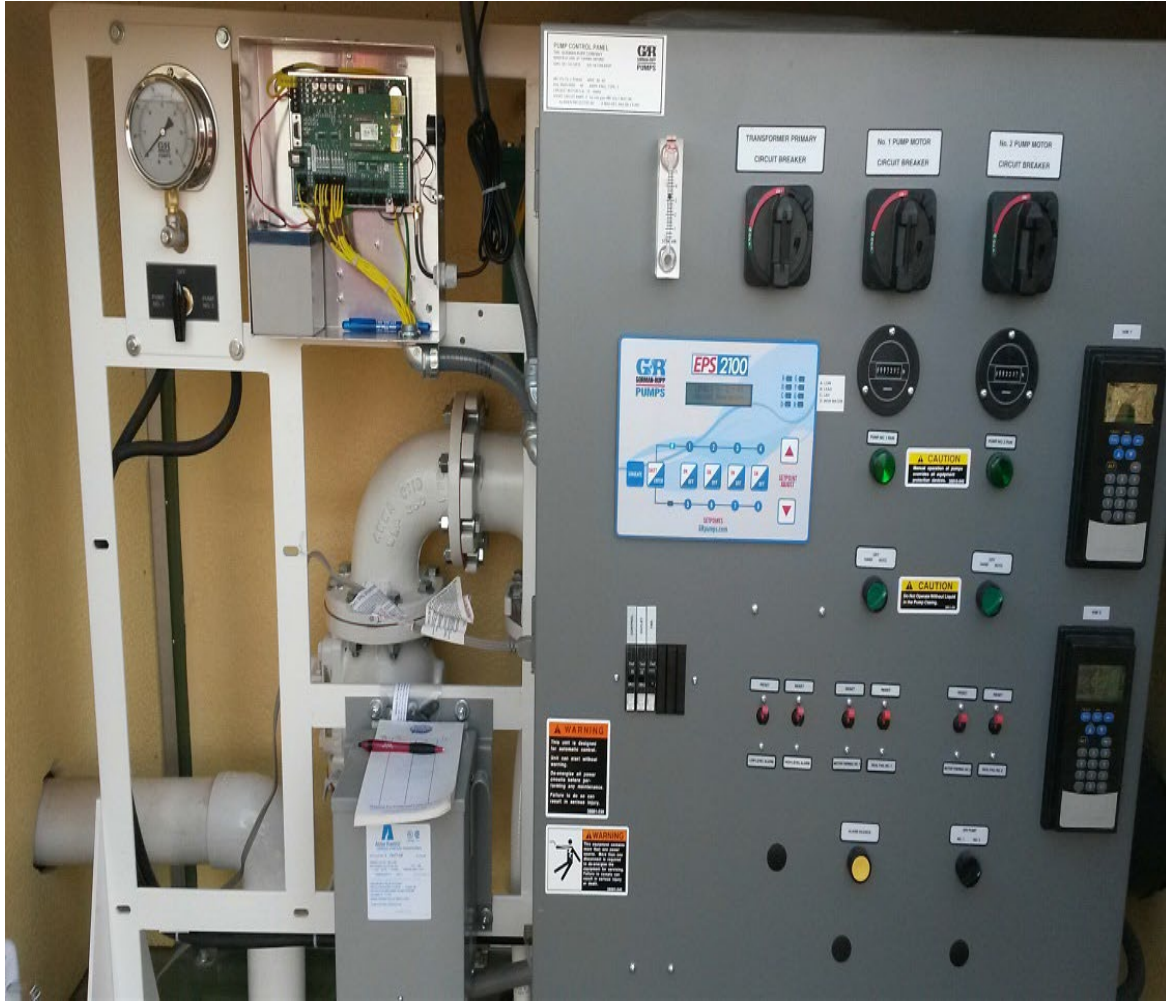




## Applications



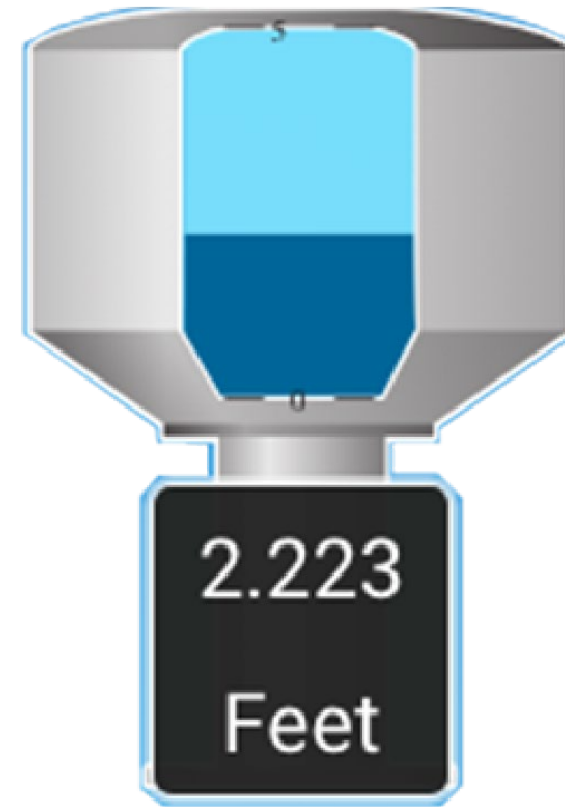








# Water Tower Monitoring





Elevated Storage





Standpipes





# Well Pumps





## Solar Applications







Ground Storage Tanks







# Solar Controlled Valve



# Monitor Portable Pumps

- All the reasons you monitor fixed pumps
- PLUS Portables have more variables
  - Generators
  - Diesel motors
  - Additional stake holders



*“People tend to overlook the importance of pumps, except when they're in trouble,”  
Jim Gorman, Chairman, Gorman-Rupp*







# Manhole Monitoring



