IoT Based Pump Control and Monitoring System for DWASA

A joint venture by-
Royal IT Limited
Trovasys Limited

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Our Objective

The goal of our work is to deliver an in-house complete solution that will help -

1. Digitally monitor:
   - VFD Data
   - Power Consumption
   - Water Level
   - Pressure
   - Volume Flow
   - And all available key parameters that is involved in a DWASA Pump System

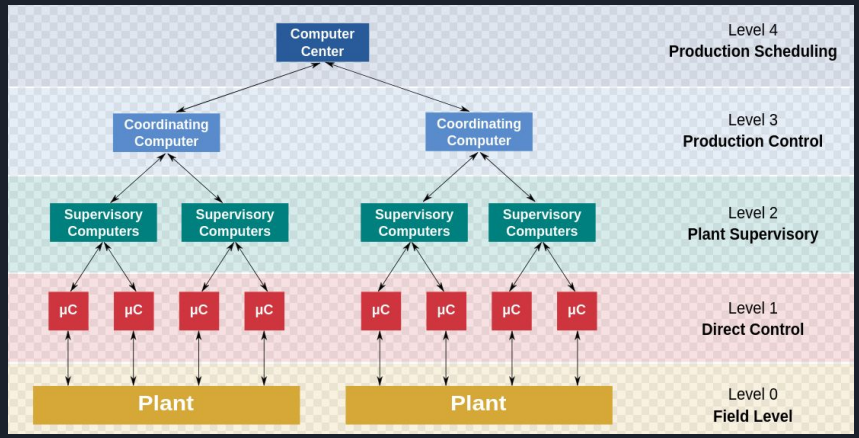
2. Provide interface based control both locally and remotely through:
   - Web portal
   - Android App

3. Introduce Machine Learning/ AI based automation for pump controls based on run-time

Why IoT ?

In general it is fairly common to go for SCADA based automation. **Which excludes**:

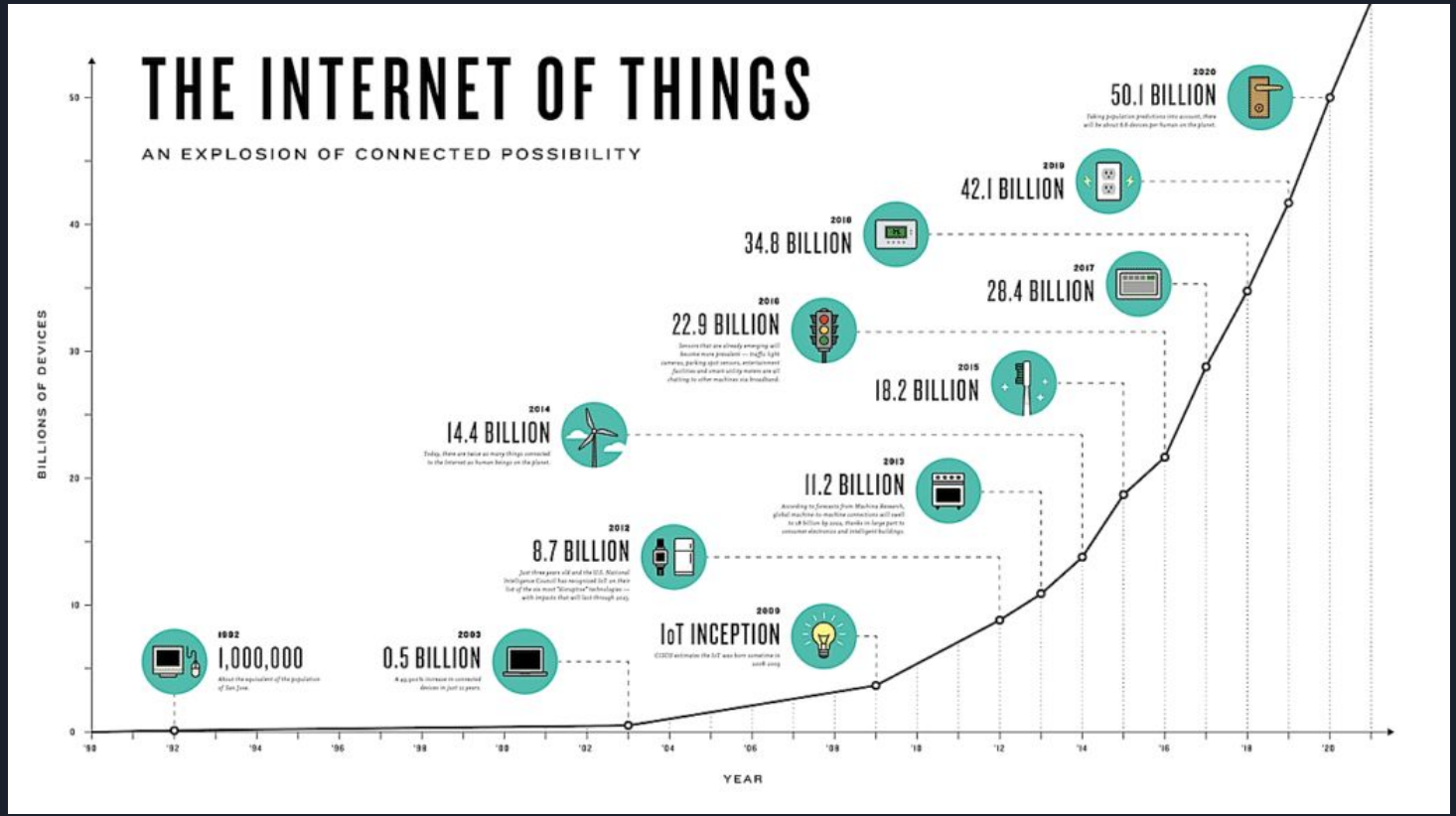
- Internet Protocol Based Control and Data Management



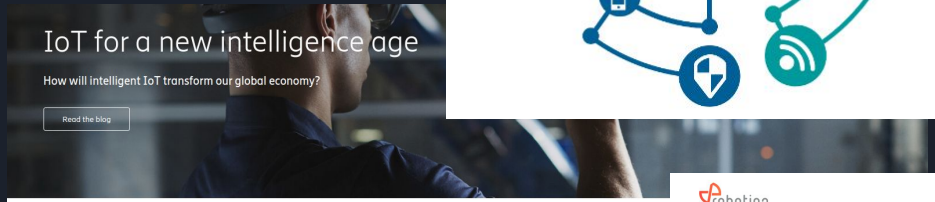
Example SCADA control Diagram

With the latest advancement of technology, a growing state-of-the-art automation process is to use ***IoT (Internet of Things)*** which is now being adopted worldwide for Robust,Modular and Scalable control.

Why IoT ?


THE INTERNET OF THINGS
AN EXPLOSION OF CONNECTED POSSIBILITY
BILLIONS OF DEVICES
YEAR
1992
1,000,000
2003
0.5 BILLION
2009
IoT INCEPTION
2012
8.7 BILLION
2013
11.2 BILLION
2014
14.4 BILLION
2015
18.2 BILLION
2016
22.9 BILLION
2017
28.4 BILLION
2018
34.8 BILLION
2019
42.1 BILLION
2020
50.1 BILLION

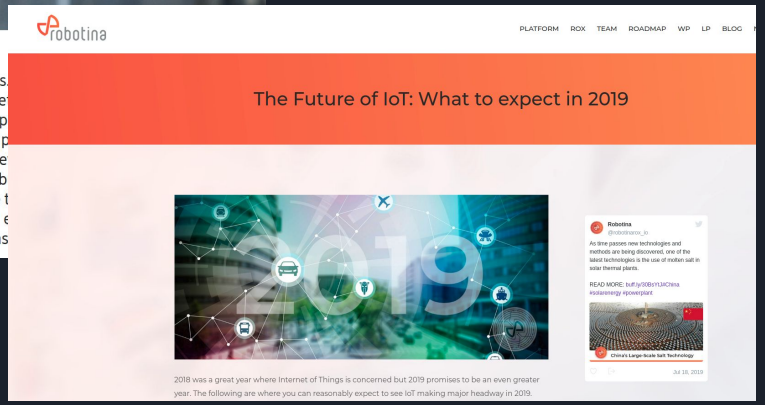
Why IoT ?



HOME > FUTURE TECHNOLOGIES FOR INTELL... > FUTURE IOT

Future IoT

The future of IoT has the potential to be limitless.
internet will be accelerated through increased ne
artificial intelligence (AI) and the capacity to dep
and secure diverse use cases at hyperscale. The p
enabling billions of devices simultaneously but le
of actionable data which can automate diverse b
networks and IoT platforms evolve to overcome t
increased capacity and AI, service providers will e
web scale markets – opening entire new streams



Why choose US?

01 Industry-grade Central Processor to ensure high reliability and high fault tolerance

02 Reliable communications device for near Real-time data collection

03 Isolated Systems Architecture for maximum redundancy in emergency operations control

04 Customised and feature-rich Control Panel and Server with enterprise-grade security and speed

Our Solution

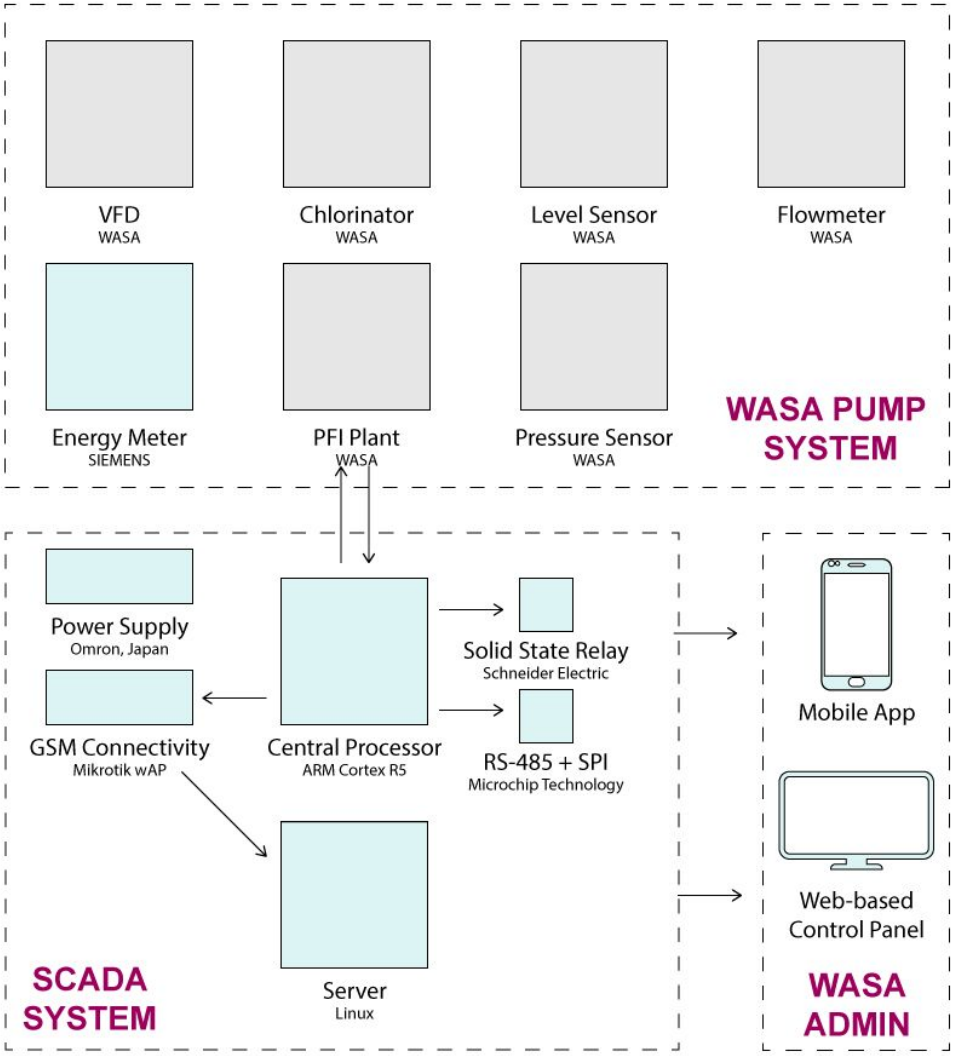
System Architecture

- Fully-functional SCADA installation

- 24x7 Real-time communication via mobile internet for optimal availability

- Includes mobile app and web-based control panel with different access control options

- 24x7 manufacturer-level service



Solution Details

1. Central Processor
Cortex ARM - R Series, Texas Instruments, USA

2. Power Supply
SMPS, Omron, Japan
Model: S8FS-G

3. Circuit Breaker
ComPact NSXm, Schneider Electric, Germany

4. Relay
Zelio Solid State Relay - Schneider Electric, Germany
Model: SSP1A4125BDS

5. GSM Wireless AP Kit
Mikrotik, Latvia

6. ENC28J60 Ethernet Controller
Microchip Instruments, USA

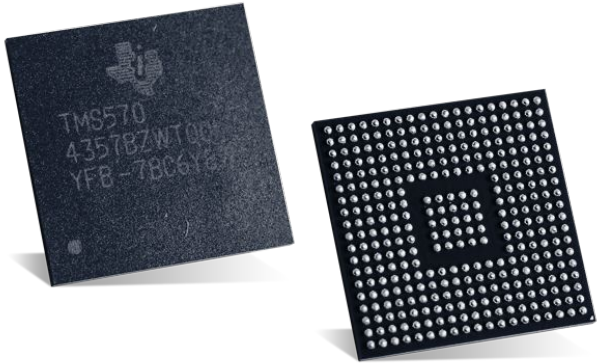
7. RS-485 & SPI Communications
Analog Devices, USA

8. Backup Battery

9. Energy Meter
SICAM P850, Siemens, Germany

Solution Details

1. Central Processor



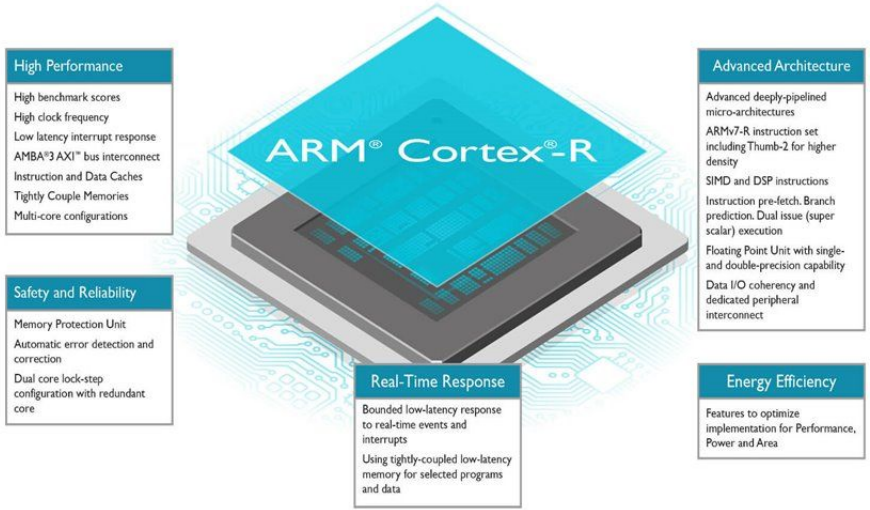
ARM Cortex R-5 SoC

Vendor: Texas Instruments, USA

- Industry-grade resistance and durability

- Hardware-enforced separation of software tasks to ensure safety-critical code is fully isolated

- Software compartmentalization ensures no single point of system failure



Solution Details

1. Central Processor (contd)

Where Cortex R-series chips are used -

- Industrial automation

- Automotive Engine Control for Self-driving cars

- Medical Applications such as robotic surgery

ISO 26262 Certification
> 99% fault integrity industrial compliance

Solution Details

2. Connectivity

Mikrotik wAP LTE kit
GSM Internet Modem & Router
Vendor: Mikrotik Wireless, Latvia

- Secure ethernet switch with weatherproof housing

- Built in cellular modem that supports continuous 2G, 3G and 4G (LTE) connectivity

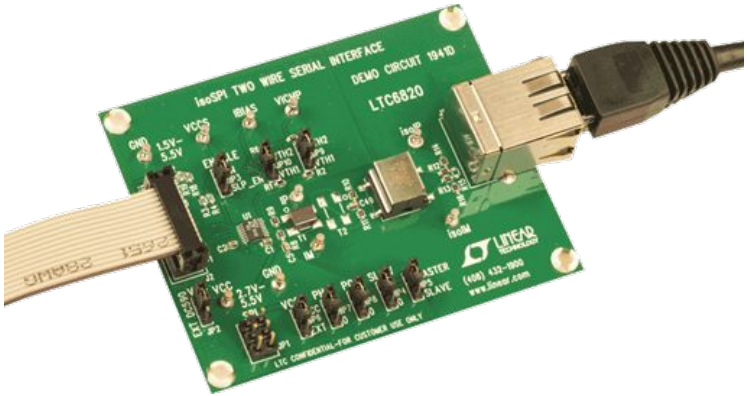
Solution Details

3. Communications

ENC28J60 Ethernet Controller
Microchip Instruments, USA

LTC6820 IsoSPI Communications Interface
Analog Devices, USA

ENC28J60 Ethernet Controller



IsoSPI Communications Interface

Solution Details

4. Control Systems & Protection

Zelio Solid State Relay
Schneider Electric, Germany
Model: SSP1A4125BDS
Rated current: 125 A
Solid-state output type: Zero voltage switching

ComPact NSXm Circuit Breaker
Schenider Electric, Germany
Five breaking capacities: 16, 25, 36, 50, 70 kA

Zelio Solid State Relay, Schneider Electric

ComPact NSXm Circuit Breaker, Schneider Electric

Solution Details

5. Power Supply

Switched-Mode Power Supply
Model: S8FS-C05024-302
Omron, Japan

- Over voltage protection, overload protection

- Isolated system to ensure reliable SCADA operation in case of a fault

- Included backup battery to ensure proper shut-down in case of power failure

S8FS-C05024-302

Solution Details

6. Energy Monitoring

ME96SSHA-MB Power Monitoring Module
Mitsubishi Electronics, Japan

- High-accuracy Power Measurement
- MODBUS® RTU communication
- Backup (on SD card)

ME96SSHA-MB Power Monitoring Module

Machine Learning Based Run-time Automation

Machine Learning and Artificial Intelligence can make our life much easier than we can imagine of. A practical deployable example could be ***automatic pump on-off decision.***

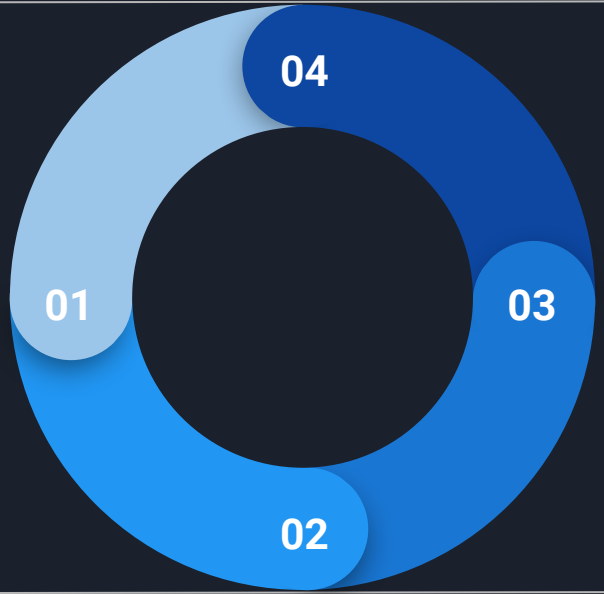
Advantages from hard coded/ Logic defined systems:

- Address Emergency Issues
- Learn through Expert Manual Intervention
- Reconfigurable
- Modular and Self-sufficient

Cycle Diagram (Machine Learning)

Collect

Train

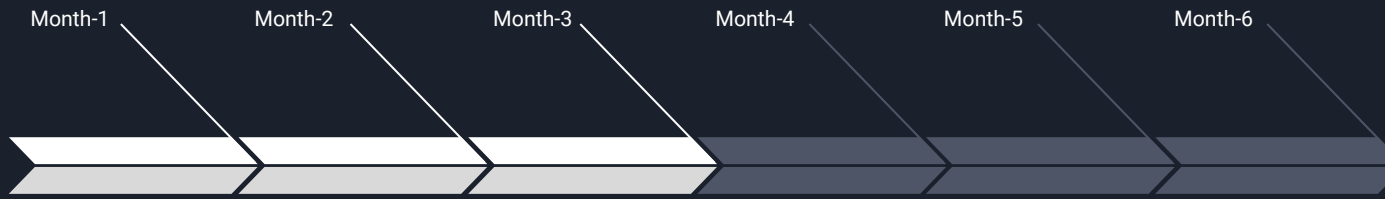


Refine

Get feedback

Project timeline

Base Time for Delivery after Work Order(Web,App and Hardware):
3 months



Month-1	Month-2	Month-3	Month-4	Month-5	Month-6
H/W acquisition and customization	Interfacing of H/W with S/W (Web and App)	Delivery of complete app, web and Hardware solution	Start Of Real-time data collection for Run-time AI	Data preprocessing and AI based Model Development	Deployment of AI/ML based solution

Financials (PILOT)

A Budget of Total ***6.92 Lakh*** is requested for completion of the pilot solution for **1 Pump for-**

Hardware programming / assembly :

- **Central Processor**
- **Power Supply**
- **Circuit Breaker**
- **Relay**
- **GSM Wireless AP Kit**
- **ENC28J60 Ethernet Controller**
- **RS-485 & SPI Communications** Analog
- **Backup Battery**
- **Energy Meter**

Software Level Development (With parity Module):

- **Control Panel**
- **Interfacing**
- **DBMS**

Financials

A Budget of Total ***68 Lakh*** is requested for completion of the total solution for **10 Pumps for-**

Hardware programming / assembly :

- **Central Processor**
- **Power Supply**
- **Circuit Breaker**
- **Relay**
- **GSM Wireless AP Kit**
- **ENC28J60 Ethernet Controller**
- **RS-485 & SPI Communications** Analog
- **Backup Battery**
- **Energy Meter**

Software Level Development (With parity Module):

- **Web Server**
- **Control Panel**
- **Android App**
- **Interfacing**

Thank YOU