SCADA technology and the Internet of Things (IoT)

The iSCADA Platform

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Evolution and innovations in Supervisory Control And Data Acquisition (SCADA) Systems in the internet era
Radio telemetry or long distance phone calls

Data resides in RTUs & Monitoring Station

Remote User Monitoring Station

- Site 1
- Site 2
- Site N
Point-to-Point, Web Enabled

Data resides in RTUs & Monitoring Station

Separate web login to each remote site

Static Public IP address required for every site
Distributed, Point-to-Point

Management & Maintenance challenge for multi-tier, multi server system

Remote User Monitoring Station

Data Scattered over many locations
Distributed, Point-to-Point, Web Enabled

Internet

Users / Public

National

Management & Maintenance challenge for multi-tier, multi server system

Data Scattered over many locations

Region 1
  - Site 1
  - Site 2
  - Site n

Region 2
  - Site 1
  - Site 2
  - Site n

Region n
  - Site 1
  - Site 2
  - Site n

National Data Scattered over many locations

Management & Maintenance challenge for multi-tier, multi server system

Internet

Users / Public
Hosted Model Benefits

- No Capex for Software
- No Software upgrade cost
- No IT infrastructure issues
- No IT human resources issues
- Low Cost of Ownership

iSCADA Technology Platform
Product: Differentiation

High Concurrency & Scalability

- Front End Processors
  - Modem
  - RTU
  - Front End Processors
  - Modem
  - RTU
  - Modem
  - RTU
  - Modem
  - RTU
### Mesh

- iSCADA
- Internet
  - Monitored Station

### Party Line

- SCADA
  - Monitoring Station
    - Monitored Station
    - Monitored Station
    - Monitored Station

### Point-to-Point

- Telemetry
  - Monitoring Station
    - Monitored Station

- SMS
  - Monitoring Station
Product: Advantage

Lower Price / Higher Performance

Cost

Web Telemetry
Telemetry
SMS

Technology / Performance

SCADA

iSCADA
SCADA

Sensor
Meter
Switch

PLC
RTU

Sensor
Meter
Switch

PLC
RTU

Sensor
Meter
Switch

PLC
RTU

Internet

Event-driven
(Push)

Internet
Protocol (IP)

Data Resides
in the Internet
• Accepts data directly from device (sensor/switch/meters)
• Converts data into TCP-IP packet
• Secures data through encryption
• Transmits data into internet (via LAN, WAN, GPRS, etc.)
• Accepts user commands from user via internet link
• Executes command / provides feedback on execution
• ‘Virtual’ gateway can be configured to accept data directly from existing monitoring system (subject to development)
Temperature & Humidity Sensor: 4-20 mA
Magnetic Switch, Control Relays: Volt-Free Contact
Electrical Parameters: ModBus Protocol
The iSCADA system has a **auto-switch** over when the primary connectivity fails. The system accepts any GPRS SIM Card and any TCP/IP LAN (RJ45) cables.
**System Advantages**

**Internet Gateway**
- Event-driven (Push); accepts commands
- Internet Protocol (IP)

**Data Resides in the Internet**

**Gateway Interface**
- Data collection from iSCADA Gateway or existing 3rd party monitoring system
- Gateway device and sensor/meter/switch management
- Encryption/decryption and data integrity check
- Device and sensor control

**iSCADA Core Engine**
- Alert Management
  - SMS and Email
  - Recurrence/Escalation
  - Scheduling
- System Supervision
- Data Hosting / Data Processing

**User Interface**
- Data Control
  - Custom Monitoring Panel
  - Data Organisation/Processing
  - Data Security – Login & Encryption
- Monitoring Interface (KPI & Reports)
iSCADA Server & User Interface

Advanced multi BROWSER capability
Protocol: TCP/IP
Administration Module
Monitoring Module
Configuration
Alerts
Trending
Reporting Module

User PC
System Check Fail:

iSCADA Server is programmed to ensure that it hears from all iSCADA Gateways within a specified duration. This is regardless if there is new data or not. If it has failed for more than two of the programmed duration, the iSCADA Server will send out pre-programmed alerts.
• Mature and stable system (Launched in 2003 as complete end to end system)
• Widely deployed in many disparate usage environments
• Versatile, flexible and efficient in complementing existing SCADA systems
• Adaptable to meet disparate and diverse secure monitoring requirements
• Very cost effective as stand alone machine to machine monitoring and control solution
• Highly scalable to address data collection across multiple sites in geographically diverse locations
• Innovative Gateway-Server design engenders high data concurrency
• Very rapid implementation as server is already in place
This the Implementation of a complete Internet of Things (IoT) Solution using the iSCADA platform
Technology & Product Evolution

Server Version 1

Gateway 1000 Series

Server Version 2

Gateway 2000 Series

Gateway 3000 Series

Real time processing SW

System Evolution

2003

2006

2012
The iSCADA Technology Platform

Data Resides in the Internet

- Charts
- Reports
- Live Data
- Alerts
- Control
- BMS

Internet Gateway

- Air Quality
- RH
- °C
- Electricity
- Water Volume
- Water Flow
- Camera
- Valve / Switch / Relay

Charts
Reports
Live Data
Alerts
Control
BMS
The iSCADA Technology Platform

- Water Level
- Power Quality
- DC Meter
- Sub-meter
- Siren
- Lights
- Vibration
- Inclination
- Humidity
- Flow
- Temperature
- Battery

RMU
- Modbus RS 485
- RS 232
- Analogue 4-20mA
- 0-5V
- 0-10V

Dry Contact
Volte-Free Contact
Digital Signals

- 3G GPRS GSM
- TCP/IP
- VSAT Fiber LAN

- Output

iSCADA Servers

- Data
- TCP/IP
- Control

CCTV
- Air Cond
- Fuel Level
- Doors
- Fence
- Protection Relay
- Breakers
- GenSet
- Motion Detector
- Flood

DEVICES WORLD
Energy Monitoring

Efficiency, Cost Mitigation, Max. Demand & Automated Billing Technology
Facility Internal Energy Distribution Infrastructure

Monitored by Ind. Rev. Meters

Energy Distribution Infrastructure

- Hotels
  - Apartments or Residences: Individual Units
  - Office Towers: Individual Units
  - Shopping Complex: Individual Units
  - Large Tennants
    - Cooling & Lighting: Individual Circuits

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Existing Energy Billing Infrastructure

- Utility Revenue Meter
- Utility Revenue Meter

Hotels
- Cooling & Lighting
  - Individual Circuits

Office Towers

Large Tennants

KWh Meters

Hosted iSCADA Server

iHEPS

- iHEPS Gateway

iHEPS

- Existing Energy Billing Infrastructure
iSCADA (iHEPS) Gateway installed and connected to TNB revenue (KWh) meters (no supply interruption)
Data collection/presentation from existing utility meters using iSCADA Technology

Universal access

iSCADA Server

LAN, WAN, PSTN, GSM, GPRS, Radio, ACeS, or VSAT

Site 1: Energy Meters (Utility)

Site 2: Energy Meters (Utility)

User’s PC

10-Level Escalating Alerts
Demand reduced by 252 KW (2% Savings)  
MD savings of (252 x 23.93)  
RM 6,030.36
BV2 Max. Demand Profile (Jan & April 2011)

Jan 2011: 2054 KW

April 2011: 1802 KW

Demand reduced by 252 KW
Net savings of (252 x 23.93) RM6,030.36
Fire Safety

Remote Alerts & Failure Detection
Safety - Fire Alarms

Fire Alarm Panels

AC Fail
Charger Fail
Common Fault
Bell Fault
Zone Fault
Common Alarm

HOSE REEL
SPRINKLER
HYDRANT
CO₂ System
Fire Safety – National Fire Alarm Monitoring iBoSS Solution

Client Side Equipment

FAP

Fire Alarm
Signal

CMS

Telephone
exchange

Existing System

Bomba

CMS
H/W & S/W

iBoSS (iFSP1) System

False Alarm Tracking & Mitigation System

Client Side Equipment

FAP

Fire Alarm
Signal

Option 1

Location

Bomba Station

Bomba HQ

Client

Others
**Client Side Equipment**
- Fire Alarm Signal
- Option 1
- Option 2
- Sub Panels: Gas
- Sprinkler, Pumps
- Environment
- Water Levels

**Two ways communication**

**Server Side**
- iFSP$_2$
- iBoSS + SMS

**User Side Equipment**
- Bomba Station
- Bomba HQ
- Client
- Others

**Fire Alarm Signal**

**Option 1**

**Option 2**

**Sub Panels: Gas**

**Sprinkler, Pumps**

**Environment**

**Water Levels**

**BoSS Level 2 System**
Client Side Equipment – Real time addressable FAP

- Fire Alarm Signal
- Option 1
- Option 2
- Sub Panels : Gas
- Sprinkler, Pumps
- Water Levels
- Future Apps.

Server Side

iBoSS + SMS

User Side Equipment

- Bomba Station
- Bomba HQ
- Client
- Others

Energy Efficiency

Client Side Equipment – Real time addressable FAP

- Fire Alarm Signal
- Option 1
- Option 2
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- Water Levels

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Energy Efficiency
Water Supply Monitoring

&

Other applications
PUMP PANEL
GROUND TANK
SUCTION TANK
AC Fail
Pump Trip
Pump Run
Water Level
Over flow
Flow-rate
eMaintenance - Server Rooms

DATA CENTRE
Temperature
Humidity
AC Fail
Door Open
kWh Metering

PRECISSION
AIR-COND
Run / Stop
Trip

Room Temperature

Room Humidity
eMaintenance - Generators, UPS

GENERATOR & UPS

- Run / Stop
- Battery Fail
- Over-speed
- Oil Pressure
- High Temp
- Overload
- Trip

UPS
- Mains Fail
- Battery Fault
- Overload Fault
- Alarm
- Battery Low

![Graph showing Protection Relay Power Supply Voltage with DC Voltage (V) at 114.90](image)
Chiller Monitoring (Hydronics)

**CHILLER SYSTEM**

- Flow-rate
- Temperature
- Thermal Energy
- Chiller Energy
- Chiller Efficiency
- Phase Current
- Voltages
Vibration

Vibration Sensor Box in a Manhole
iNEST Components:

Junction

Master
Figure 20: Architecture of the final iNEST system as of August 2014 for period 3
The PANASONIC ECO Visualisation overall architecture
iSCADA facility operations solution

- TNB revenue meter - iHEPS;
- tenant meters - iTEMS;
  - Can work with any meters with pulse output; or with ModBus communications.
  - Ability to detect malfunctioning meters
  - Tenants can login to view their own data, on a real-time basis. This is to prevent bill disputes.
- chiller system monitoring/operations evaluation - iHVAC
- temperature and humidity of Mall
- Water (cost allocation); gas billing - iTEMS
- Water Reticulation system (pump status: run / stop / trip, water levels, flow rates) – iH2O
- Fire safety (direct connection to BOMBA) - iBoSS
- Server Room
Questions & Clarifications