Creating a single version of truth for handling emergencies

A case study from a utility company perspective

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1. PROJECTS: (Buildings, Roads, Highways & Drainage Network)

2. AA: RO&M Department

3. AA: DNO&M Department
3000+ km of foul water network 2000+ meters of surface water & 2000 km of treated water network

~ 1 million m3/day capacity of treating sewage & ground water with 06 full scale and 20 packaged treatment plants

126+ pumping stations with a capacity of 4 million m3/day. 2000+ flow monitoring chambers man-holes flow
Our Global Presence

+30 Years of commitment
+12 Key partners worldwide
+1,500 Medium & large-scale projects
+200 Government & blue-chip customers
+200 Employees
+9 Offices, 3 Operating Centers
+15 Industrial Segments Served
+70% Control System Engineers
+300K Man Hours

Worldwide Headquarters
North America
Regional Operations Center
Exton, PA, USA

Southeast Asia
Regional Operations Center
Lahore & Karachi

Middle East Operations
Saudi Arabia, UAE & Qatar

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Next Gen OT/IT Converged Control System & SCADA

Software
- Operational Technology
  - Change Management
    - JIRA, DevOps, Git
  - Historians
    - AVEVA, OSI PI, Rockwell
  - Workflows
    - IBM, AVEVA
- Business Intelligence
  - Power BI, Tableau
- Application Integration
  - .NET, JAVA
- Business Analysts Requirements management
- JIRA
- Data warehousing
  - SQL, ETL, Oracle

Information Technology
- Program Management
  - SCRUM, Agile, V-Life Cycle
- Virtualization
  - VMWARE, Hyper-V, Fusion Sphere
- Systems
- Networking
  - Core switches, Network and configuration management, Network Time Servers, MPLS, IPSEC, etc.
  - Cisco, Huawei, Rockwell, Moxa, Hirschmann
- Cyber Security
  - Next GEN firewalls, IEC 62443, Palo Alto, Fortinet, Nozomi, Semantic, Algosec, Imperva
- IoT
  - Smart Sensors, Schneider, Allen Bradley, Siemens, GE Honeywell, HIMA

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Digital Transformation

OmniConnect
Collects data from any source

MultiCloud
Ingests and pushes to any cloud

Data-lake
Stores data into any data-lake

KPIs
Computes and configures KPIs as required

Analytics
Publishes data on any visualization or analytics software

Machine Learning
Artificial Intelligence & Machine Learning

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When it rains... it pours

While it does not rain often, short storm bursts can stretch the limits of the networks and personnel involved in responding to such situations. Here is an example of what we mean.
Qatar’s rainy season
2018 rainfall event

Recorded Intensity up to 76 mm/h (preliminary analysis)
2018 rainfall event

Rainfall exceeded a 1 in 100 year event

Preliminary estimate is that the event was 3 times the design event capacity
The need for a system of systems to manage interactions across various platforms, define workflows that allow express interaction and build a BI layer to provide a single version of truth.
1. Verbal Instructions with no means to replay

2. Insufficient assets monitoring (tankers, mobile pumps)

3. A La Carte Systems are okay for BAU, but become inflexible in Emergencies

4. Many systems exist, but in silos. Interaction is manual & unrecorded
Earlier scenario: multiple silos

Multiple touchpoints and manual interactions

SCADA
Operator Detects a maintenance event

SCADA operator manually contacts concerned maintenance personnel

AMS
Maintenance crew executes the service order and decides possible engagement of other services.

Maintenance updates AMS with job closure evidence

Fleet Management
Fleet Management operator monitors location of crew

The scenario is an open loop
Developing a system of systems
Single touchpoint for all systems

AVEVA™ System Platform as the focal point

- SCADA: Live data of field assets
- Geographical Information System: Network, location of assets, boundaries of operation, other utility systems and base maps
- Asset Management: Asset details, asset preventive and corrective maintenance workflows
- Weather System: Getting live data from weather stations, satellite maps
- Customer Relationship Management: Customer complaints, work permits, new connections
- Other 3rd party Systems: Other outside SCADA systems
Single touchpoint for all systems

AVEVA System Platform as the focal point

- 690+ Remote sites connected over MPLS (50+ Operators)
- Full complement of Cyber Solutions
- 1.2 million assets with a history of 4.5 million work orders
- Integrated Communications (UHF/VHF/Mobile/Landline)
- History of 150,000 customer complaints
- Digital Operator Log
- 300+ Dashboards with playback and <1 min. update for ECC
- Workflows: Activities, Events, Integrated with SMS gateways
A BRIEF DEMO

Complaints Management Workflow

This demo will showcase the integration and workflow capabilities of the system in order to handle incidents and emergencies.
WHAT'S NEXT?

Cloud is the limit!

From building a disaster recovery site to creating a data lake & performing machine learning .. Cloud is the limit!
Disaster recovery

Full functionality disaster recovery on Azure Cloud -
Digital advisor

Reimagining the relationship between humans and technology

- Machine learning and NLP based AI digital advisor
- Will have access to all internal data stores and relevant third-party applications
- Will provide unprecedented decision support and predictive analysis capabilities.
Build a data lakehouse

Data – going places!
Lessons learned

Few things that can be better or we could have done in a better way. We often take pride in the robustness and availability. Sometimes it comes in the way of flexibility as well!
Stress Testing

- Stress testing is very important to understand how the system will behave when all users are operating it with full data load.
- SCADA systems often lack the capability of carrying out automated stress testing.
- Automated testing is also very limited.
System Reporting

• Certain parts of the application / functionalities do not render themselves to internal or external reporting.
• In IT applications, all data is kept in accessible databases. These can be used to generate reports such as user access metrics (e.g. user login / logout reports, how many times a specific user accessed each feature/graphics page, load times of individual graphics etc.)
GIS Performance

- SCADA based GIS systems are okay for limited GIS data.
- As the data set expands, the performance deteriorates.
- AVEVA GIS (GISIZE) has the capability of WMS and WFS (exceptional – no other SCADA vendor has this). However, the performance becomes a bottleneck at high loads.
- GISIZE is working on a web client that may address the performance issue, but it is not launched yet.
Business Process Modelling

• Creating a business process model in software is easy – defining the business process can be tricky!
• It usually requires extensive work with multiple stakeholders.
• Your model will never be perfect the first time – but it is important to role it out in production and implement improvements in next releases. Otherwise, you will never go-live!
• Consider implementing Agile principles in your project
Enhancements

• The concept of “maintenance” and “enhancement” is very different in such systems as compared to traditional IACS systems. In an IACS system, once it is put in operation, requirements for both maintenance and enhancements are fewer and far in between. In an integrated system, maintenance and enhancement is part of everyday life. Business Integrations are fragile no matter how well designed these are. As the business evolves, the definitions of KPIs and metrics evolve as well requiring new insights, which means enhancing the analytics layer. This additional burden of maintenance and enhancement should be kept in the project budget.
“For the first time, we were able to carry out effective live monitoring of the rain emergencies. Our contractor’s response time has improved by 42% for responding to these scenarios.”

Abdullah Shamsan, Section head Centralized Control Section, Ashghal.
"Working with Avanceon, we were able to build (phase01) the first fully functional OT disaster recovery (In Qatar) on Azure within 06 weeks and were delighted to see how well the system performed on cloud."

Aziz Hassan Abedrabuh Hassan, Ashghal, DNMC Head, Ashghal.
The AVEVA system platform engineered by Avanceon help us provide enhanced situational awareness across our roads and drainage assets.

Ahmed Mohamed Sh. Mohamed Al Ahmad, Director Asset Affairs Ashghal
Ashghal responds to emergencies 42% quicker with a single version of the truth across IT/OT

Challenge

- Qatar is a desert country. It rarely rains – but when it rains in pours!
- Handling rain emergencies entailed interacting with multiple systems with no combined workflow. The response to incidents was slow.
- SCADA operators were flooded with alarms in BAU & incidents.
- Report generation was manual and took considerable time.
- Trust on figures was low.

Solution

- All business and OT systems were integrated using GIS aware AVEVA™ System Platform.
- Express workflows were developed to interact with sub-systems for handling emergencies

Results

- 42% improvement in contractor response time for responding to incidents
- 68% reduction in active alarms due to re-design of alarms philosophy
- Post event comprehensive report generation duration reduced from 24 hours, down to 05 minutes!
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