INDUSTRIAL INTERNET OF THINGS
Take Control of your own Digital Transformation

Authors:
Russell Byfield & Darren Wyllie
Presented by:
Darren Wyllie July 26th 2016

Presented to:
Society of Petroleum Engineers, Queensland
The Industrial Internet of Things – How IIoT could benefit the Oil & Gas Industry

The development of the Internet over the past three decades has led to connectivity between people, organizations, and businesses on a scale that would have been difficult to imagine when it first emerged in the 1980s. This ubiquitous connectivity is rapidly extending beyond people to “things” as all manner of devices, sensors, controllers and actuators become connected in what is now referred to as the Internet of Things, or IoT. However, simply connecting vast numbers of objects into an Internet of Things is not sufficient to enable interesting and useful new ways of doing business unless there are platforms, tools, algorithms and applications to analyze, distribute, and act on the huge amounts of data that result from this connectivity.

The Internet of Things (IoT), and specifically the Industrial Internet of Things (IIoT), has the promise and potential to be the most influential and disruptive influence on automation and business analytics systems since the advent of microprocessor based Distributed Control Systems and the digitisation of data.

Technologies utilising open information platforms and protocols are accelerating the convergence of Intelligent Oil Field technologies with increasingly advanced business analytics which in turn are further enhanced by the IIoT. This creates many opportunities for increased safety, increased production efficiency, lower operating costs, increased supply chain optimisation, better resource allocation and utilisation, more rapid decision making … the list goes on. Pretty much only limited by ones imagination. So how can we use IIoT to benefit the oil and gas industry?
Agenda

- A little history
- Industry challenges
- Solutions
Agenda

- A little history
- Industry Challenges
- Solutions
Evolution of Industrial Internet of Things

1970s
- Distributed Control System Introduced

1980s
- Internet of content
  - WWW
  - E-mail
  - Information
  - Entertainment

1990s
- Internet of services
  - Web 2.0
  - E-productivity
  - E-commerce

2000s
- Adoption of Windows in Process Control
- Adoption of Virtualization

2010s
- Internet of people
  - Social media
    - Skype
    - Facebook
    - YouTube
- Internet of things
  - Machine to machine
    - Identification, tracking, monitoring, etc.

Pre-internet
- Human to human
  - Fixed and mobile telephone
  - SMS
Terminology

- The Industrial Internet of Things
- Big Data
- The Cloud
- Mobility
- Augmented Reality
- Connectivity
Industrial Internet of Things (iiOT)

The Industrial Internet of Things is a network of networks that uses the internet to connect people, processes and assets enabling a new way to optimize business results.

…it leverages smart connected assets, enterprise integrated automation, secured cloud-based data, and advanced analytics.
Big Data

• Other peoples data Out There…..
• For O&G industry it’s My data.

Why the interest in Big Data?
• Analyse data to gain insight
The Cloud

Your WAN / Cloud

Our Cloud

The Web / Cloud

3rd Party Clouds
Mobility

• Stay connected to plant performance anywhere
• View plant data and information in real time
• Look for trends and upset conditions
• Identify problems as early as possible
• Many minds on the job, not just the operator’s.
• Enable a faster response to issues

Stay Connected to Your Enterprise – Wherever You Are
Augmented Reality
Connectivity

Communication between Devices

- Modbus
- Profibus
- Foundation Fieldbus
- DNP3
- OLE for PC
- ISA100
- AMQP
- MQTT
- Ethernet IP

- OPC UA
  - IEC61850
  - HART & Wireless HART
  - FBUS
  - Profinet
  - RTU
  - MDIS
  - FMC722

Unique Device Identification

- IPv4 (4.3 billion not enough)
- IPv6
How Does IIoT Work?

IIoT Elements

1. Smart & Connected Assets and Devices
2. Data Management and Onsite Control
3. Predictive Analytics
4. Smart and Secure Collaboration

IIoT Architecture

- Predictive Analytics
- Prescriptive Decision Making
- Smart Collaboration

Private, Public or Secure Cloud Provider

- Enterprise History
- Asset Management
- Operations Management
- Planning & Scheduling
- Mobility Solutions
- Enterprise Dashboards

Private, Public or Secure Cloud Provider

OPC UA

© 2016 by Honeywell International Inc. All rights reserved.
Agenda

- A little history
- Industry challenges
- Solutions
Addressing Core Industry Problems

Gains not possible with conventional methods used today

Production Efficiency
- Maximize production throughput
- Reduce OpEx

Process Reliability
- Run the plant at peak performance
- Eliminate unplanned downtime

Safety
- Reduce risks and direct costs of plant incidents
- Regulatory compliance

Proven impact $5-15M per site per year

Typical savings of $7-20M per year

Cost savings $1.6B per site per year

© 2016 by Honeywell International Inc. All rights reserved.
Oil & Gas Industry

CSG to LNG

© 2016 by Honeywell International Inc. All rights reserved.
Recent findings by The Economist Intelligence Unit & Accenture

1. More than half of the respondents to the 2016 Upstream Oil and Gas Digital and Technology Trends Survey said digital technologies have already added high to significant value.

2. An even larger group in the survey (72 per cent) said cost reduction is important or the most important challenge that digital can help address.

3. Field workers to executives are increasingly able to find information instantly at their fingertips to see how their well, an asset or the company is performing, right down to details of each oil well’s production.

4. The majority of the digital investments by upstream oil and gas companies will shift to focus on analytics and IoT.

5. As oil and gas companies gain insights from this data, they will find new ways to manage their operations and back office functions, and they will rethink how they are organised to leverage technology and how they partner with oilfield services companies.

6. Digital technologies open up the ability for unconventional oil and gas companies to collaborate much more effectively in a basin – this is a major source of value for them which to date has remained relatively untapped.

The next wave of innovation will now be driven by digital.

Implement your IIoT strategy securely:

7. A primary driver of success was the adoption of a proactive cyber-defence strategy. The 28% of firms that prioritised this approach were able to cut the growth of cyber-breaches by more than 50%.

8. Successful firms were also more than twice as likely to include security personnel in strategic planning, and 56% more likely to maintain a standing board committee on cyber-security.
CSG to LNG Challenges

Safety
Protect People, Assets &Processes

Reliability
Improve Availability, Reduce Downtime

Efficiency
Improve Productivity, Reduce Cost

Flexibility
Quickly Adapt to Change

critical business performance issues
Safety Challenges

- Reduce and mitigate incidents
- Comply with critical infrastructure protection (CIP) regulations
- Reduce human error
- Improve emergency response
- Reduce liability

Safety

Protect People, Assets & Processes

improve safety and achieve requirements
Reliability Challenges

Reliability

- Maximize asset availability
- Protect high capital cost equipment
- Enhance production facilities and field life
- Extend investment life

Improve Availability, Reduce Downtime
Efficiency Challenges

- Reduce operating costs
- Increase production rates
- Reduce energy consumption
- Extend well life & reduce work-overs
- Improve efficiency at variable capacity

Efficiency: Improve Productivity, Reduce Cost

more efficient asset utilization
Flexibility Requirements

- Increase agility to exploit market dynamics & opportunities
- Anticipate and manage changes in composition and volumes
- Adapt to regulatory requirements
- Reduce risk in volatile operating environments

assets adapt to dynamic changes
Agenda

- A little history
- Industry challenges
- Solutions
Solutions : Well Performance Monitoring

Well Performance Monitoring
- Equipment: Pump, power unit, comms link (proactive alerts)
- Control loop status (proactive alerts)
- Production monitoring and comparison
- Well category monitoring and comparison
Solutions: Field Maintenance Planning & Personnel Safety

- Production
- Field Compression & Transmission
- Processing

Safety
Reliability
Efficiency
Flexibility
Solutions: Automated Forecasting & Reserves Estimation

Live Reserves Monitoring
- Wells current production status
- Well locations cross referenced with reservoir model
- Well type (category allocated or calculated)
- Production profile / forecast (auto select type curve)
- Wells production status at last reserves calc time
- Current forecast/reserves estimate vs previous calculation
- Depletion vs Conversion rate P3 to P2 to P1
Solutions: Dynamic Line Pack, remaining runtime estimate

Dynamic Linepack (time to High limit / time to Low limit)
- Minimise flaring and venting
- Pipeline model running real time
- LNG plant scheduled demand
- Scenario / planning runs
Solutions: Field Compression and well optimisation with APC

- LNG Plant demand change
- Field Compression units rates changed (min fuel)
- Wells production rates changed (category/classification)
Summary

• IIoT
• Industry Challenges
• Some Specific Solutions

• Think Big, your long term vision
• Start small, by solving one problem at a time
• Be secure every step of the way
Questions