What are the needs? How do we collaborate?
Today’s Presenter Is …

Martin Bragg

Chief Engineer (Global Architecture)
Honeywell Process Solutions

- 27+ years’ experience in the Oil & Gas and General Process Measurement Industries
- Responsible for the Research and Development of Process Metering and associated Controls
- 2016 / 2015 Technology Integration Leader (HPS) for the Elster Group - Honeywell Acquisition $5.1B
- 2015 / 2013 Chief Technology Officer Honeywell Engineered Field Solutions
- 2013 / 2006 Vice President of the Elster Group; previously with General Electric Measurement & Sensing
- Holds both an MSc and an MBA awarded by United Kingdom Universities, where the MSc was sponsored by The Royal Academy of Engineering (RAEng), Westminster, London
- Sponsored a Five-Year Duration Research Chair at Warwick University, and Five Individual PhD's within the UK
- Actively supporting and contributing to BSI, ISO, and AGA Standards for Metering (Measurement)
- Member of the IoD, MIET, FIMMM
- Office Based in Bracknell, Berkshire, UK
Honeywell Today - 2016

$38.6B
in sales for 2015

53%
of sales outside U.S.

- ~1,300 sites, ~70 countries
- More than 129,000 employees
- Morris Plains, N.J.
  headquarters
- Fortune 100
- NYSE: HON (Market Cap. $100.24B)

Aerospace

Home and Building Technologies

Performance Materials and Technologies

Safety and Productivity Solutions
Honeywell Today - 2016

~22,800 engineers worldwide

~50% engineers focused on software

118 research and engineering facilities

37,000 patents granted or pending

Developing solutions for the world’s toughest challenges

Strong Engineering Focus and Growing

100% Compatible with CMMI Maturity Level 5
Honeywell is building a smarter, safer, and more sustainable world

THAT’S THE POWER OF CONNECTED
THAT’S THE POWER OF HONEYWELL

Connected Aircraft · Connected Automobile · Connected Home · Connected Building
Connected Plant · Connected Supply Chain · Connected Worker
AGENDA

• The Industrial-Internet-of-Things
  - What Is Required?

• Process Measurement and Controls
  - Materials Science
  - Production Methods
  - Energy Harvesting

• How to Collaborate?
  - Right-and-Fast
  - Intellectual Property
  - Contracts / Agreements

• End
The Industrial-Internet-of-Things
What We Need Is …

- Novel Approach for Data Scientists to **Data Analytics**
  - Big Data Analytics

- Modelling of Real-Time Sensors (“Things”) in a Digital-Twin Environment
  - Novel Approaches to **Mathematical Modelling**

- Novel Approaches to the **Digital Ecosystem** within Big Data Analytics

- To Continue to Develop Our **Sentience™** Platform
  - A Continuous Evolution in the Digital Transformation Age

- **Honeywell Venture Capital LLC**
  - Launched May, 2017
  - Initial Fund Size $100M
  - Investing in Emerging or Disruptive Technologies
Technology Interests …
# Sentience™ IIoT Platform Details

## Insight Delivery
- Dashboards | Reporting | API

## Predictive Science
- Predictive Modeling | Correlation | Clustering

## Data Science
- Data Discovery | Data Modeling | Data Analysis

## Decision Science
- Math & Stat | Optimization

## Analytic Platform: Algorithm & Analytic Deployment and Delivery
- Batch | Stream | Math & Stat | Analytic Life Cycle Management | Algorithm Implementation | Algorithm Run Time

## Asset Platform
- Connect | Provision | Manage | Control | Monitor

## Data Platform
- Aggregate | Integrate | Prepare | Store | Query | Protect

## Data Management
- Data Lake | Data Unification | MDM

## Cloud Infrastructure
- Compute | Network | Storage

## Communications
- Web API | Mobile API | Cloud API | Notification API

## Edge Applications
- Edge Analytics

## Edge Analytics
- Alarms
- Actions
- Backup / Recovery

## Device
- Hardware | Firmware

## Dashboards
- Reporting
- API
Solving Key Customer Challenges

Underperforming Assets
• Sub-optimal operations
• Performance vs peers

Unplanned Downtime
• Process issues
• Equipment failures

Human Capital Challenges
• Knowledge gaps
• Operational excellence

Energy and Emissions
• Emission standards
• Energy reduction

Connected Performance Services (CPS) Architecture

Proactive, ongoing dialogue and recommendations. UOP expert review
Ongoing capture of plant (process/lab) data

Customer Site
Secure UOP Cloud

DATA COLLECTION

Unplanned Downtime
Data Cleansing
Advanced Computation

Data Reconciliation

Gross Error Detection

Purity
Production Energy Capacity

VISUALISATION

CPS solution-specific calculations and models UOP expert reviews

Customer value of $0.30 - $0.50/bbl in refining and $10 - $20/MT in Petrochemicals

• Analyse plant performance to reveal full potential through a cloud-based service
  – Around-the-clock monitoring of plant data and rigorous simulations
  – Provides on-going, operational recommendations to close performance gaps
  – Leveraging UOP Process Models & longstanding experience in operational support and troubleshooting

Delivering the Connected Plant with Honeywell UOP CPS
Sensors Example of a Runtime Analytics Platform

- Connect measurement intelligence to business (process) KPIs (see: HCP)
- Apply powerful analytics to detect and predict issues
- Organise and visualise data in asset context
- Capture real-time measurement sensor and event data

Visualisation
- Ad-hoc Analysis
- Notifications
- KPI Dashboard

Maintenance and Reliability
- Engineering
- Collaboration Across Functions
- Operations
- Management

SECURED DATA

Optimise Your Operations with Real-Time Digital Intelligence

SECURE Collaboration

Honeywell Confidential - © 2017 by Honeywell International Inc. All rights reserved.
Process Measurement and Controls
What We Need Is …

• Material Science
  - Natural Gas Measurement & Control Devices Manufactured in “Advanced Composites”
  - Novel Approach to Coupling Ultrasound into Air under Extreme Pressures and Temperatures
    ▪ Active with Prof. Steve Dixon - Centre for Industrial Ultrasonics

• Production Methods
  - Novel Approaches to Manufacturing Ultrasonic Transducers
    ▪ EngD active in the WMG

• One Area of General Interest is Energy Harvesting Techniques
  - Approaches to Industrial Measurements (sensors)
  - Novel Power Management of Multiple-Harvesting Technologies
How To Collaborate?
How To Collaborate?

• Right-and-Fast
  • Speed in Delivery without compromising on Quality ("rightness")
  • Each and every individual day counts (there is a limited "time-window of opportunity")
  • Keep the number of decision makers between the parties as small as possible!
  • Create One-Template for all interconnected departments so that industrialists do not have to keep re-negotiating contracts each time there is an opportunity (see: Honeywell’s HPS example)

• Intellectual Property
  • Address soonest and ensure a way forward
    • Licence Agreement - “Licensed-Out”
    • One-off Royalty Payment
  • Disclosures should be “soonest and to the appropriate person(s)” long before any form of publication or sharing with a wider audience
  • Do not over-value the IP in the initial stages
    • Novel IP is unlikely to have a clear future value - avoid the “hype”
    • Consider an “Earn-Out” clause frequently utilised within businesses - future time and revenue based
How To Collaborate?

• Intellectual Property
  • Do not over-value the IP in the initial stages
    • Consider a Typical IP Valuation and Royalty Determination Model
How To Collaborate?

• Contracts / Agreements
  • Start with the Party Requesting a Collaboration
    • They will have “boiler templates” readily available
  • Change as little as possible (minimum) going straight to the “deal-breakers”
    • Do not “make a career out of negotiating on every sentence” throughout the document
How To Collaborate?

• Maintain Days Such as This One - Integration is Key
  • Departmental “Silos” are Fast Disappearing Within the Private Sector
  • Present “Capabilities Across Multi-Interconnected-Disciplines”
    • Bringing together departments to meet “industrial needs”
    • Overview of Research (Newsletter, Target Mailshot)
    • Promote “Summer Student Work-Packages” to Industry via the Appropriate Channels
THE END

martin.bragg@Honeywell.com

08701 149880 (BT SmartNumber)