IBM Research
Marine Acoustics Workshop

Mark Purcell
*Marine Analytics, IoT and Cloud*
7th February 2018.
IBM’s global research capability
IBM’s global research capability

3,000 researchers

Almaden
- Big Data
- Cognitive Cloud
- Nanomaterials
- Neurosynaptics

Austin
- POWER
- Mobile
- Aging

Watson

Ireland
- Cognitive IoT
- AI for Healthcare
- Edge Computing

Zurich
- Security
- Analytics
- Nanotechnology
- Exascale

Haifa

China
- Blockchain
- Cognitive Fashion
- Education & Skilling
- Cognitive Financial Services

India
- Industry Cloud
- IoT
- Blockchain

Africa
- Healthcare
- Industry Cloud
- IoT
- Blockchain

Tokyo
- Cognitive Robotics
- Financial Services
- Accessibility

Australia
- IBM Acoustic Monitoring

IBM’s locations:
- Almaden
- Austin
- Watson
- Ireland
- Zurich
- Haifa
- China
- India
- Africa
- Tokyo
- Australia

IBM’s research areas:
- Big Data & Cognitive Cloud
- Healthcare / Life Sciences
- Quantum Computing
- Security
- Analytics
- Nanotechnology
- Exascale
- Cognitive IoT
- AI for Healthcare
- Edge Computing
- Big Data & Cognitive Cloud
- Nanomaterials
- Neurosynaptics
- POWER
- Mobile
- Aging
- Healthcare
- Industry Cloud
- IoT
- Blockchain
- Cognitive
- Healthcare
- IoT & Mobile
- Security
- Cognitive Oil & Gas
- Insurance Analytics
- Industry Cloud
- Green Horizon Energy
- OpenPOWER Cloud
- Cognitive Health
- Cognitive
- Health
- IoT & Mobile
- Security
- Cognitive
- IoT
- AI for Healthcare
- Edge Computing
- Big Data & Cognitive Cloud
- Nanomaterials
- Neurosynaptics
- POWER
- Mobile
- Aging
- Healthcare
- Industry Cloud
- IoT
- Blockchain
- Cognitive
- Healthcare
- IoT & Mobile
- Security
- Cognitive
- IoT
- AI for Healthcare
- Edge Computing

IBM’s global research capability

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Ireland Research Focus Areas

Cognitive IoT
Buildings, Digital Twin, Automotive, IoT Edge Platform, Blockchain

Interactive Reasoning
Debater, Cognitive Sales

Cognitive Healthcare
Human Behavior Change, Cognitive Care Management, Health Data Privacy
H2020 Projects
Acoustic Monitoring Project

Monitor underwater acoustics
- at the ¼ scale OE test site
- gather a large acoustic data set
- from a wireless offshore platform
- live data streaming
- high sampling rate (250kHz)
- ½ million data points per second
- 90 GB per day in all weather conditions
- research robust acquisition techniques
- for real-time data capture
- investigate real-time analytics
IBM Cloud  https://console.bluemix.net/

On demand scaling of resources
- Serverless (OpenWhisk)
- Kubernetes (containers)
- More sensors = more containers
IoT Offshore

Single board computer (1.25 Watts)
Linux operating system
Buffer network traffic (A/D <-> radio)
½ million data points per second
Investigate the effect on data quality
Data Acquisition

440 days of operation
14 TB of data
~60% compression
35 TB uncompressed

3,023 DVD’s
20,782 CD’s

Real-time QoS analysis
Live buoy streaming

<table>
<thead>
<tr>
<th>Month</th>
<th>Good Data</th>
<th>Corrupt Data</th>
<th>Network Outages</th>
</tr>
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<tbody>
<tr>
<td>2013</td>
<td>81.03%</td>
<td>5.48%</td>
<td>13.49%</td>
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<tr>
<td>2014</td>
<td>96.24%</td>
<td>0.81%</td>
<td>2.96%</td>
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</table>
Acoustic Analytics

- Decibel Levels
- Octave Analysis
- Spectrograms
- Live Dashboards

<table>
<thead>
<tr>
<th>Date</th>
<th>SPL dB</th>
<th>Max SPL dB</th>
<th>Min SPL dB</th>
<th>63 Hz dB</th>
<th>125 Hz dB</th>
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<tbody>
<tr>
<td>Aug 2013</td>
<td>88.37</td>
<td>105.01</td>
<td>83.53</td>
<td>72.45</td>
<td>80.97</td>
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</tbody>
</table>

“Measurement of Particle Velocity Levels at Ocean Energy Sites”, European Conference on Underwater Acoustics (ECUA), 2012

“The design and deployment of a real-time wide spectrum acoustic monitoring system for the ocean energy industry”, Marine Technological Society/IEEE OCEANS, Bergen, 2013


“A vector-sensor based approach to noise monitoring in Galway Bay”, Marine Technological Society/IEEE Oceans, St. John's, 2014
