Cognitive IoT: What is Watson IoT?

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IoT is driving Digital Disruption of the Physical World

Accelerating advances in technology

- Advanced analytics
- Cloud computing
- Pervasive connectivity
- Product Lifecycle Management
- Embedded sensors

Are transforming every part of business

- Improving operations and lowering costs
- Creating new products and business models
- Driving engagement and customer experience
IoT represents enormous scale and impact

25 Billion
Installed IoT Devices\(^2\) by 2020

$3.6 Trillion
Potential economic impact\(^1\) per year by 2020

70% B2B
IoT value created in B2B use cases\(^3\)

Connected devices are growing at an exponential rate

Value derived from this connectivity drives massive monetary opportunity

Majority of value will be in B2B and B2B2C use cases

With IoT, companies are becoming more competitive with new ways to drive better business engagement

- Can I reduce maintenance costs by doing condition repairs instead of time-based maintenance?
- How can I best support our organization's environmental sustainability objectives?
- We need to create multiple variants of our products for different markets.
- I need to reduce risk developing this complex device.
- I have assets deployed all over the place that need a repair process.
- How can I increase the utilization of my assets?
- How much more revenue can I generate from my current assets?
- How much energy cost can I reduce?
- I need help managing complex development projects.
- I need to reduce/eliminate my factory downtime due to unplanned outages.
- I have to prove we met regulatory specs to an auditor!
- I need to find new sources of revenue by moving to new service-business models.
- I need to reduce the cost of running my building.
- How can my business deliver better client experience or better outcomes with IoT?
With IoT, Clients are looking to…

✓ Rapidly and securely connect devices

✓ Optimize operations

✓ Enable new business models

✓ Engage with clients and markets in new ways
IoT represents substantial market opportunity

IBM Market Opportunity

- **2013**
  - $5B
  - CAGR: 12%
  - $15B

- **2018**
  - $55B
  - CAGR: 9.6%
  - $70B
  - CAGR: 10.9%
  - $117B

- **CAGR**
  - **2013**
  - **2018**

**Watson IoT Platform**

- **Operations**
  - Asset Performance
  - Health & Safety
  - Facilities Mgmt
  - Connected Products
  - Work Mgmt

**IoT Solutions**

- **Facilities**
- **Vehicles**
- **Home**
- **Health**
- **Transport**
- **Factories**

**Product Development**
Is your client looking to connect... Devices? Equipment? People?

Start with the IoT Cloud Platform

Connect
- Connect to...
- Secure connectivity
- Manage devices

Information Management
- Store and archive data
- Organize and transform
- Structure and unstructured

Analytics
- Real time
- Predictive
- Cognitive

Risk Management
- Data protection
- Security analytics
- Key and cert management

Watson IoT Platform

Facilities  Vehicles  Home  Health  Transport  Factories
IoT Client Value Strategy

Is your client looking to optimize... Assets? Product Development? Safety?

Start with the IoT Applications

- **Facility & Space**
  - Improve space utilization
  - Reduce energy usage
- **Real Estate**
  - Reduce time to value
  - Improve lease mgmt
- **Product Development**
  - Optimize resources
  - Increase ‘re-use’
- **Health & Safety**
  - Operational risk
  - Enable safety culture
- **Asset Management**
  - Life cycle mgmt
  - Configuration mgmt

Watson IoT Platform

- **Operations**
- **Asset Performance**
- **Health & Safety**
- **Connected Products**
- **Facilities Mgmt**
- **Work Mgmt**

IBM Watson IoT
IoT Client Value Strategy

Is your client looking to transform traditional business with IoT...

• Invent new business models
• Develop differentiated solutions
• Improve operational efficiency
• Drive better customer engagement
• Utilize IBM innovation and a Consult to Run partnership
“Cognitive computing refers to systems that learn at scale, reason with purpose and interact with humans naturally. Rather than being explicitly programmed, they learn and reason from their interactions with us and from their experiences with their environment.”

John E. Kelly III
IBM Watson IoT Solution

Applications
Optimizing operations for business impact

Solutions
Enabling new business models with integrated solutions for industry

Powered by IBM Watson

Platform
Everything you need to innovate with IoT

Local Deployment

Business Transformation

Connecting Data
via ecosystem and partner relationships

Enabling new business models with integrated solutions for industry

Optimizing operations for business impact

Connecting Data
via ecosystem and partner relationships
Cognitive IoT

Cognitive IoT enables us to learn from, and infuse intelligence into, the physical world to transform business and enhance the human experience.
What is “Dark Data”? 

Structured Data
20% of all WW data

Unstructured Data
(a.k.a. “Dark Data”)
80% of all WW data
How does it work?

1. Defining the Field of Knowledge
2. Defining Corpus of Knowledge
3. Curating the Content (Humans)
4. Ingestion – Indexes, metadata and knowledge graphs
5. Training (via Machine Learning)
6. Building a Reasoning Model
7. Further training and fine tuning by user interaction
8. Cognitive System
From Jeopardy! to APIs

Natural Language Processing (NLP)
- AlchemyLanguage
- Dialog
- Natural Language Classifier
- Personality Insights
- Tone Analyzer
- Concept Insights

Machine Learning
- IBM SPSS Modeler
- Predictive Analytics
- IBM Watson Analytics

Video and Image Analytics
- AlchemyVision
- Visual Insights
- Visual Recognition

Text Analytics
- Document Conversion
- Language Translation
Bluemix + Watson + IoT: a developers ‘candy store’!

New Watson APIs
That can apply to IoT

Natural language processing
Machine learning

Video and image analytics
Text analytics
System behavior (relationship between inputs and outputs) can be determined. Analytics models the equation or encodes the algorithm in software.

Things & Ensemble of Things
- Known laws govern system behavior
- A mathematical equation

Network of Things
- Mathematical equations become complex
- Computer algorithms can model system behavior

Why IoT needs machine learning?
Why IoT needs machine learning?

as systems become more complex, generate more data, and integrate more data sources, we need machine learning to process & understand the extreme volumes of data

Large Network of Smart Things Interacting with Each Other

Complex relations that are different under different contexts – and may be different at different times

Scale, diversity and complexity make the relationships between inputs and outputs hard to determine

Best option → determine correlations between input and output to learn the relationship

Machine learning finds relationships between inputs and outputs — when it is hard to build a model.
Why IoT needs machine learning?

**Analyzed Model**
- “White Box” with quantifiable relationship
- Suitable for systems governed by hard laws of nature

**Computed Model**
- “White Box” with computable relationship
- Suitable for systems where computational models can be determined

**Learned Model**
- “Black Box” with learned relationship
- Suitable for large scale complex networked systems with context-dependent and dynamically changing relationships
Case Study: Cognitive IoT for Pipeline Corrosion Prediction

**QUESTION**
Does the pipeline need to be repaired/inspected?

**ANSWERS**
Yes/No?

**Business value of cognitive pipeline analysis**
Total corrosion-induced cost in the US pipeline sector is $8.6B/year*. Improved corrosion predictions reduce maintenance and inspection costs.

- $12,000 corrosion-induced cost per mile of pipeline
- $2,000 per mile of inspection costs
- 2 million miles of pipelines world-wide

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* NACE Report 2015; National Association of Corrosion Engineers
Weather data for time and location
‘Chances of stormy weather in Detroit tomorrow is 20%’

Stores DB
Job site #123 is in Detroit MI

(Class, Location, Time)
(‘Tomorrow’)

Question’s class (e.g. temp, rain, snow, wind etc.)
Class= ‘weather’
Class= ‘snow’

IBM Bluemix

Relationship Extraction

IBM

Natural Language Classifier

Speech To Text

Text to Speech

Internet of Things Foundation

WAV files over MQTT

WAV files over MQTT

Question as a string
“Will the storm hit job site #123 tomorrow?”

Insights for Weather

Case Study: Open Cognitive Interface with Harman
Case Study: Voice commands to Ricoh Interactive Board

- User speaks commands to whiteboard
- Upload speech commands to Watson IoT
- Watson interprets speech into command
- WIoTP sends command to IWB for saving content
- IWB sends content of Whiteboard to cloud
- IoT platform saves document to cloud
Case Study: Text Analytics for Technical Proposal/Documentation

Conflicting values in similar requirements

Subsystem budgets exceed system budget

Missing budget for a subsystem

Conflict due to different units (cf. Mars Climate Orbiter)
Cognitive IoT

The Watson APIs for IoT help accelerate the development of cognitive IoT solutions and services on IBM Watson IoT Platform.

- Interact to with humans naturally by using both text and voice
- Understand images and recognize scenes
- Learn from sensory inputs to find meaningful patterns
- Correlate data with external data sources, such as weather or Twitter

Deploy
a secure, scalable and open platform

Solve
business problems with expertise and applications

Build
your cognitive strategy
Thank you