

Internet of Things

Detecting Anomalous IoT Behaviors with Predictive Analytics

IBM WolfPack



Agenda

- 
- 1 • Sensing the World
 - 2 • Internet of Things (IoT)
 - 3 • Computing at the Edge
 - 4 • IoT Technologies
 - 5 • IBM Technologies

Sensing the World

Sensors are not a new concept

Sensing the World

SENSORS HAVE BEEN WITH US FOR A WHILE NOW



Temperature



Proximity



Gas



Pressure

**Mostly
Disconnected**

Sensing the World

NECESSITY IS THE MOTHER OF INVENTION



The First “Connected” Device

- Carnegie Mellon (1982)
- Computer Science Department
- Lazy Graduate Students
- Wired Coke Machine (can count, temp)
- Communication via ARPANET

Sensing the World

SENSORS ARE NOW SMART



Temperature



Accelerometer



Motion / IR



Optical

Sensing the World

SENSORS IN INDUSTRY



Self-Driving Cars



Electronic Nose & Manufacturing Factories



Asset Tracking

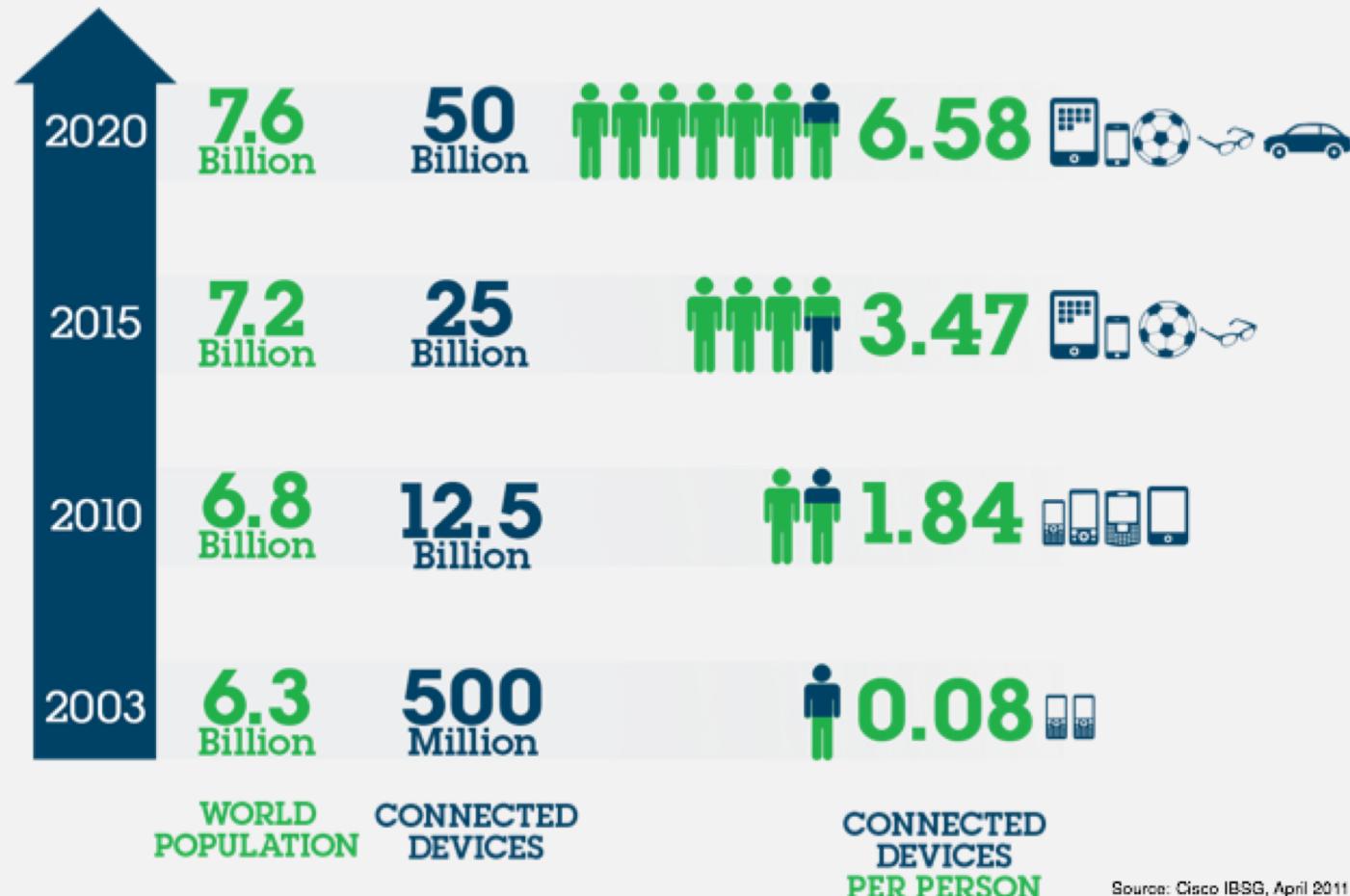


Acoustic Sensors & Train Wheels

**Mostly
Connected**

Sensing the World

BILLIONS OF CONNECTED DEVICES



Internet of Things (IoT)

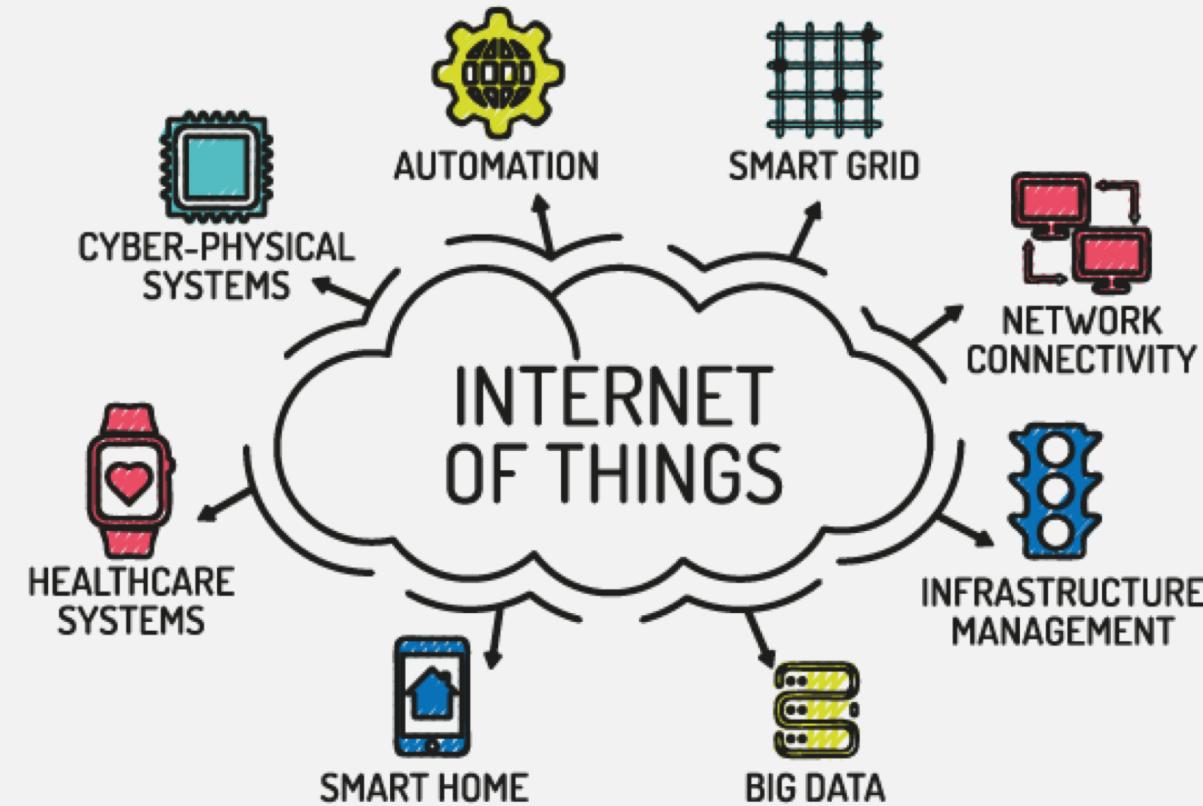
Internet of Things

A DEFINITION

“The **Internet of things (IoT)** is the **network of physical devices**, vehicles, home appliances and other items embedded with electronics, software, sensors, actuators, and **connectivity which enables** these objects to **connect and exchange data.**”

Internet of Things

IOT IN PERSPECTIVE



IoT is driving digital disruption of the physical world



Cloud Computing



Cognitive Analytics



Pervasive Connectivity



Embedded sensors

Boosting operational performance



Driving engagement and customer experience



Creating new business models



Advancing environmental leadership

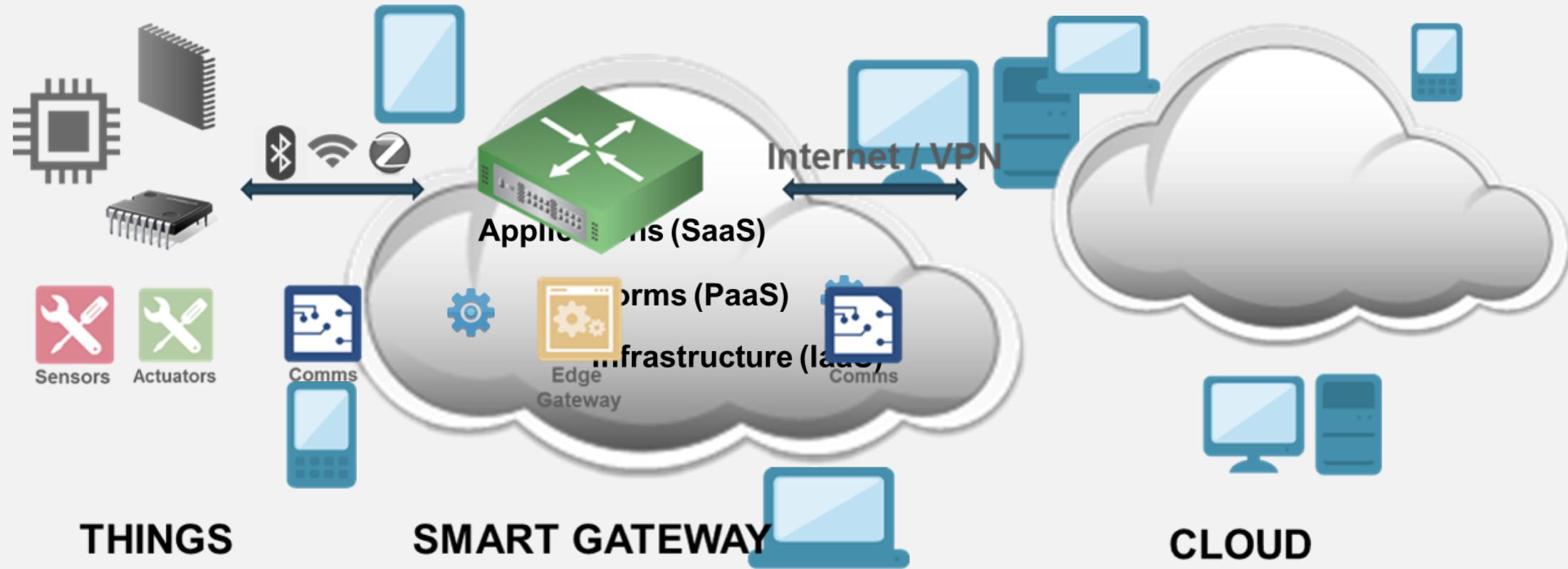




Computing At the Edge

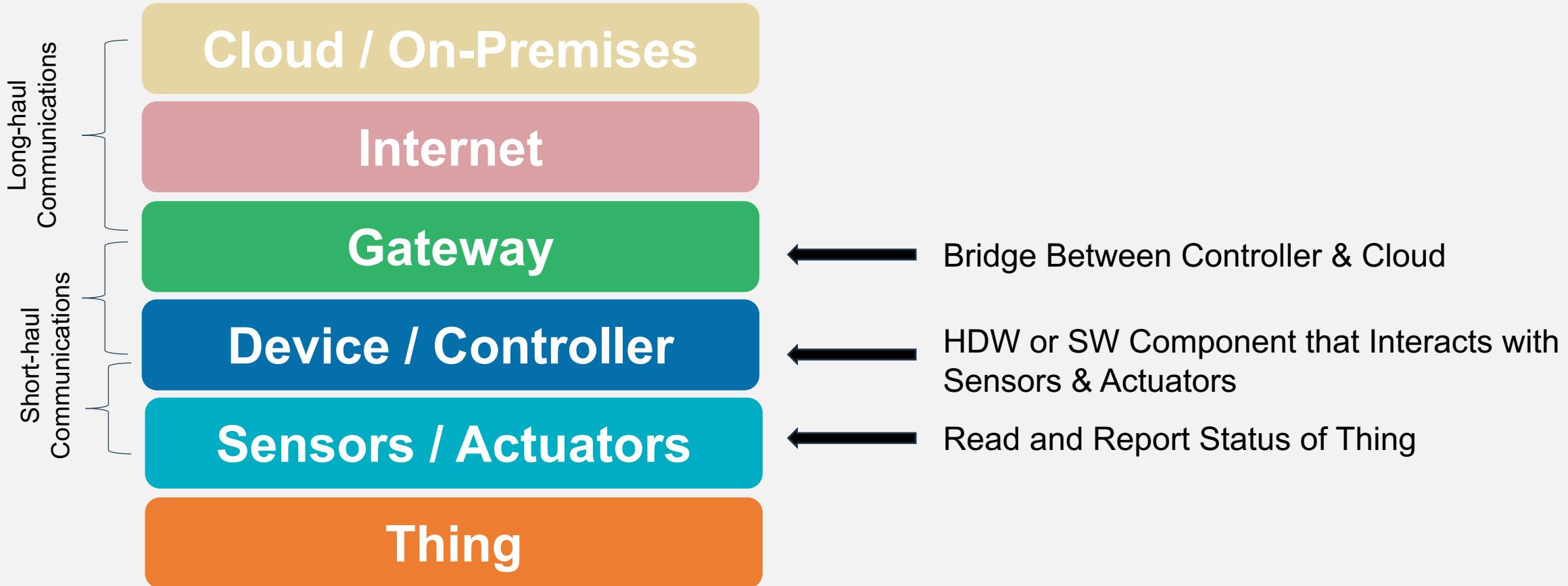
Computing at the Edge

WHAT IS THE EDGE?



Computing at the Edge

A REFERENCE ARCHITECTURE



Computing at the Edge

MOTIVATING FACTORS FOR EDGE COMPUTING

- Preserve Privacy
- Reduce Latency
- Minimize Network Traffic
- Localized Analytics and Decision Making
- Be Robust to Connectivity Issues



Technology

IoT Technology Examples

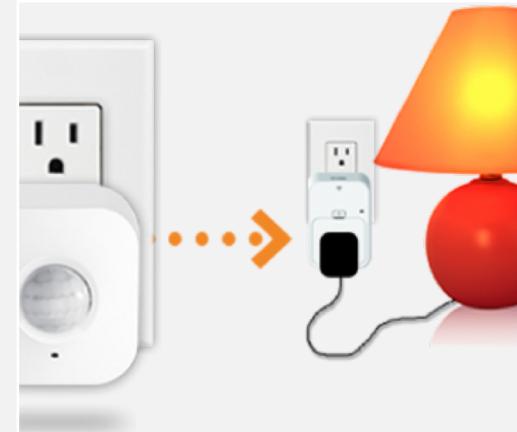
Sensors



TEXAS INSTRUMENTS

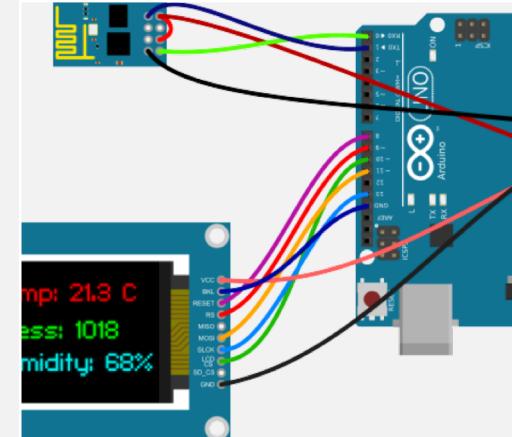
- Humidity
- Light
- Water Quality
- Chemical
- Smoke
- IR
- Level
- Image
- Motion

Actuators



- Lights
- Valves
- Motors

Controller



Arduino

Gateways



- Raspberry PI
- IBM Cloud Platform

Technology

IOT PROTOCOLS

- **Bluetooth Low Energy (BLE)**
 - Similar to Bluetooth but designed for significantly reduced power consumption.
- **Zigbee**
 - Used mostly in industrial settings. High security for M2M and IoT applications.
- **Z-Wave**
 - Low power RF communications technology used primarily in home automation products.
- **Cellular**
 - Good for low bandwidth data, especially due to cost.

IBM Watson IoT Platform

Make sense of data to optimize operations, manage assets, rethink products and services, and transform customer experience.

Connect

Connect and manage devices, networks and gateways.

Analytics

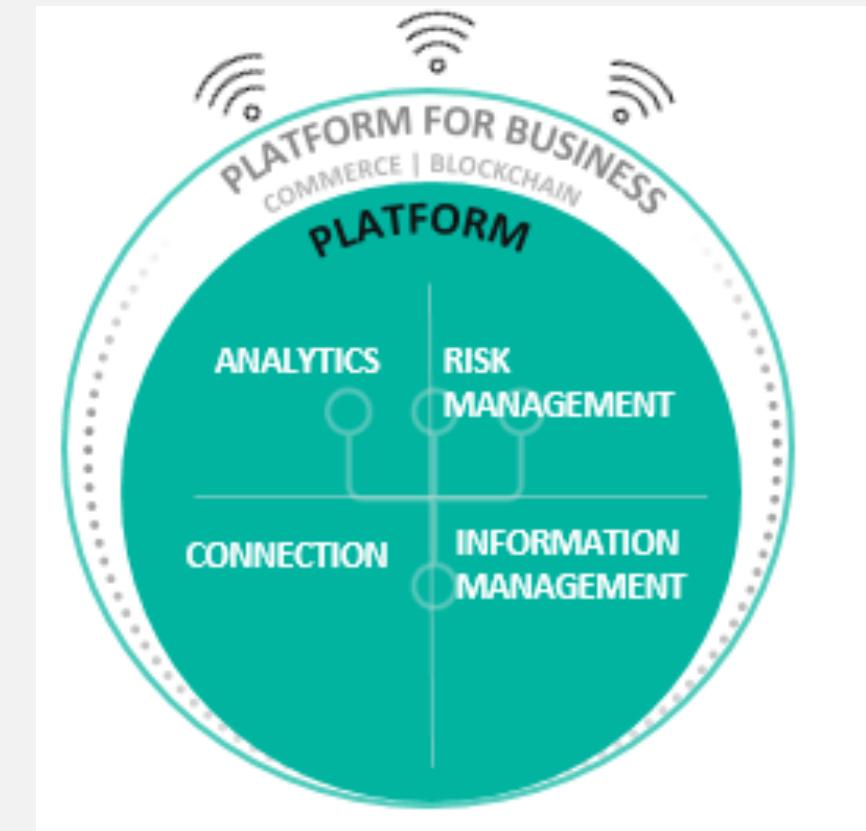
Gain insights from information using real-time streaming as well as machine learning and cognitive analytics in the cloud and at the edge.

Risk Management

Visualize the IoT landscape, manage risk, and build trusted sources of IoT data with innovative technology such as blockchain.

Information Management

Integrate information, structured and unstructured, from devices, people, the weather and the world around us.



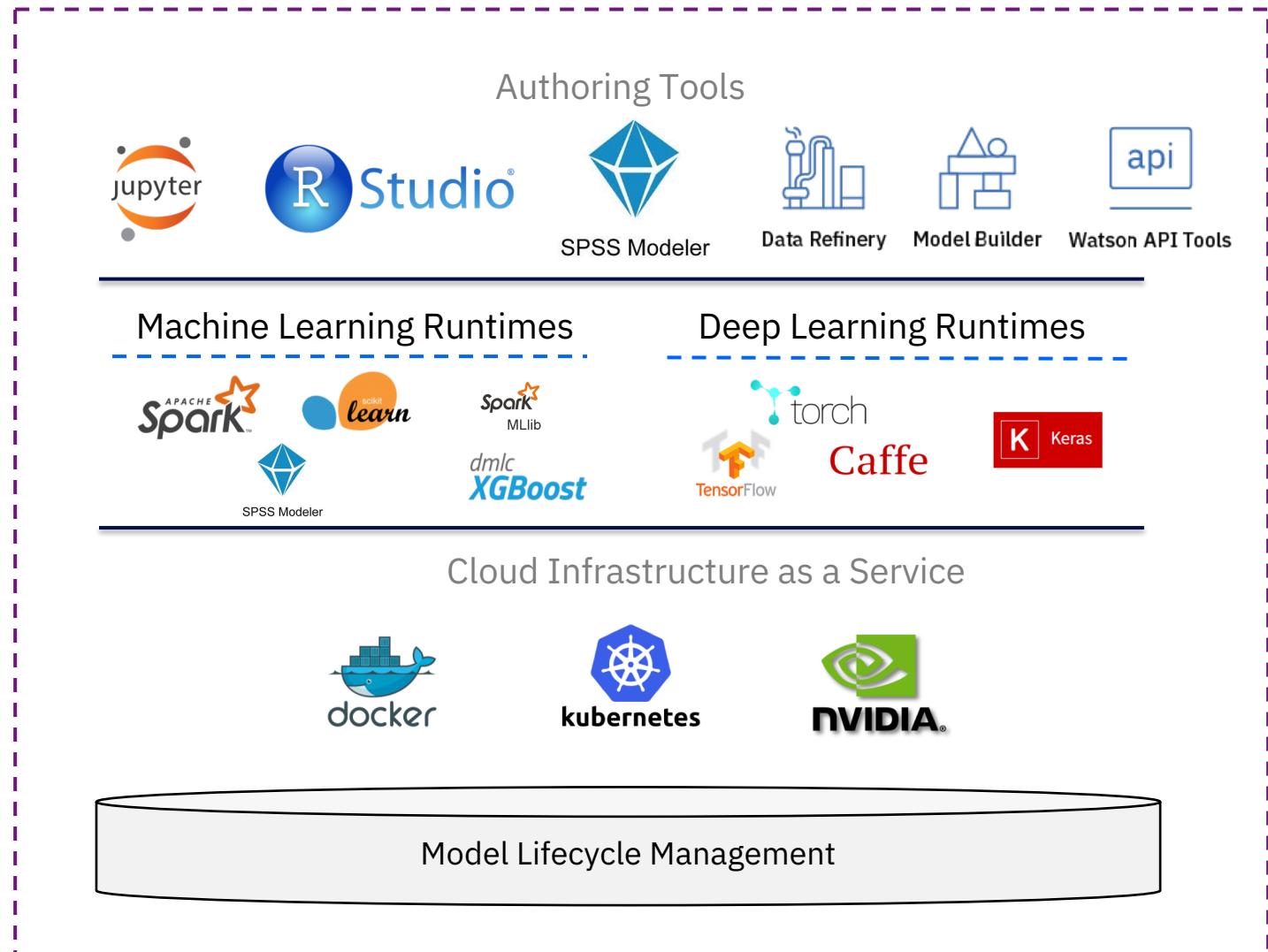
Watson Studio

Accelerating Value from AI for enterprises

- Tools for supporting the end-to-end AI workflow
- Create, collaborate, deploy, and monitor
- Best of breed open source & IBM tools
- Code (R, Python or Scala) and no-code/visual modeling tools

- Most popular open source frameworks
- IBM best-in-class frameworks

- Fully managed service
- Container-based resource management
- Elastic pay as you go cpu/gpu power



Watson Studio

Built for AI teams – enabling team productivity and collaboration



Tanya
Domain Expert

Her Job:

To transfer knowledge to Watson for a successful user experience.

What she does:

- Range of domain knowledge and uses that to teach Watson and develop a custom models
- As Tanya gains more experience she optimizes her knowledge to teach Watson to design better end-user experiences.

Sometimes known as:

Subject matter expert, content strategist.



Mike
Data Scientist

His Job:

Transform data into knowledge for solving business problems.

What he does:

- Runs experiments to build custom models that solve business problems.
- Use techniques such as Machine Learning or Deep Learning and works with Tanya to validate success of trained models.

Sometimes known as:

ML/DL engineer, Modeler, Data Miner



Ed
Data Engineer

His Job:

Architects how data is organized and ensures operability

What he does:

- Builds data infrastructure and ETL pipelines. Works with Spark, Hadoop, and HDFS.
- Works with data scientist to transform research models into production quality systems.

Sometimes known as:

Data infrastructure engineer



Deb
The Developer

Her Job:

Builds AI application that meet the requirements of the business.

What she does:

- Starts PoCs which includes gathering content, dialog building and model training
- Focus is on app building for the team or company to use. Will handle ML Ops as needed

Sometimes known as:

Front-end, back-end, full stack, mobile or low-code developer

Example IoT Workflow Using the IBM Cloud

WE WILL SEE THIS IN ACTION IN TODAY'S LAB

