

MATLAB EXPO 2017

KOREA

4월 27일, 서울

등록 하기 matlabexpo.co.kr

Internet of Things (IoT)를 위한 애널리틱 개발 및 적용

성 호 현 차장

Senior Application Engineer

The MathWorks Korea

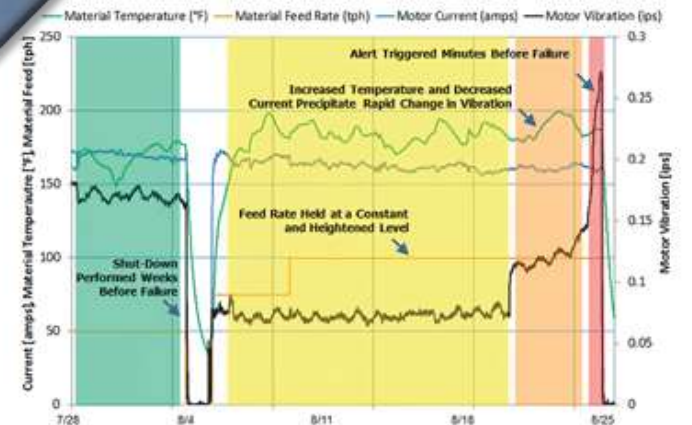
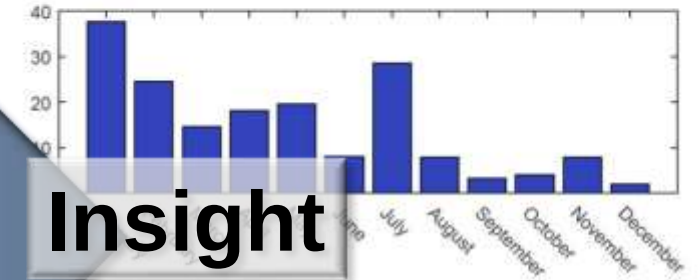
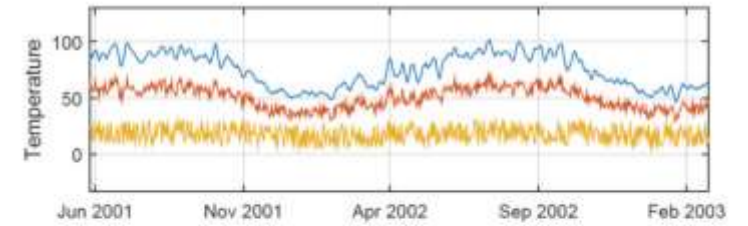
What is IoT?



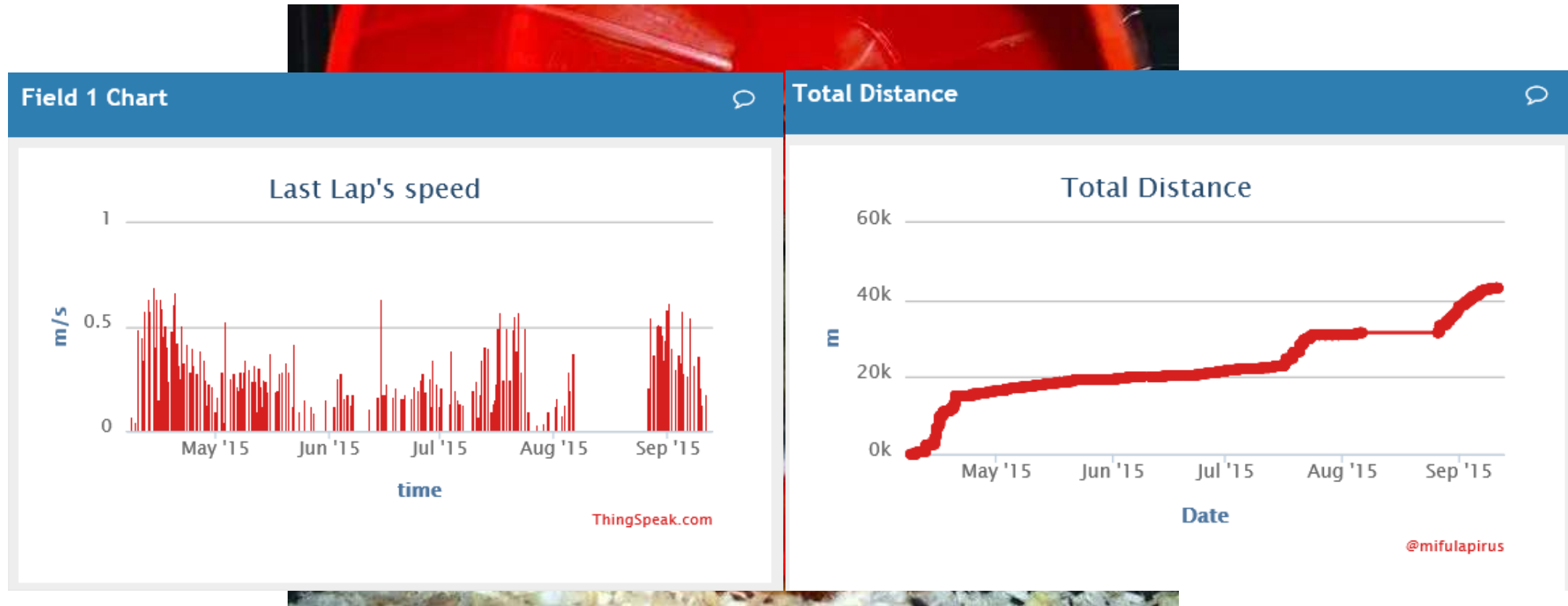
Devices

Analytics

Insight

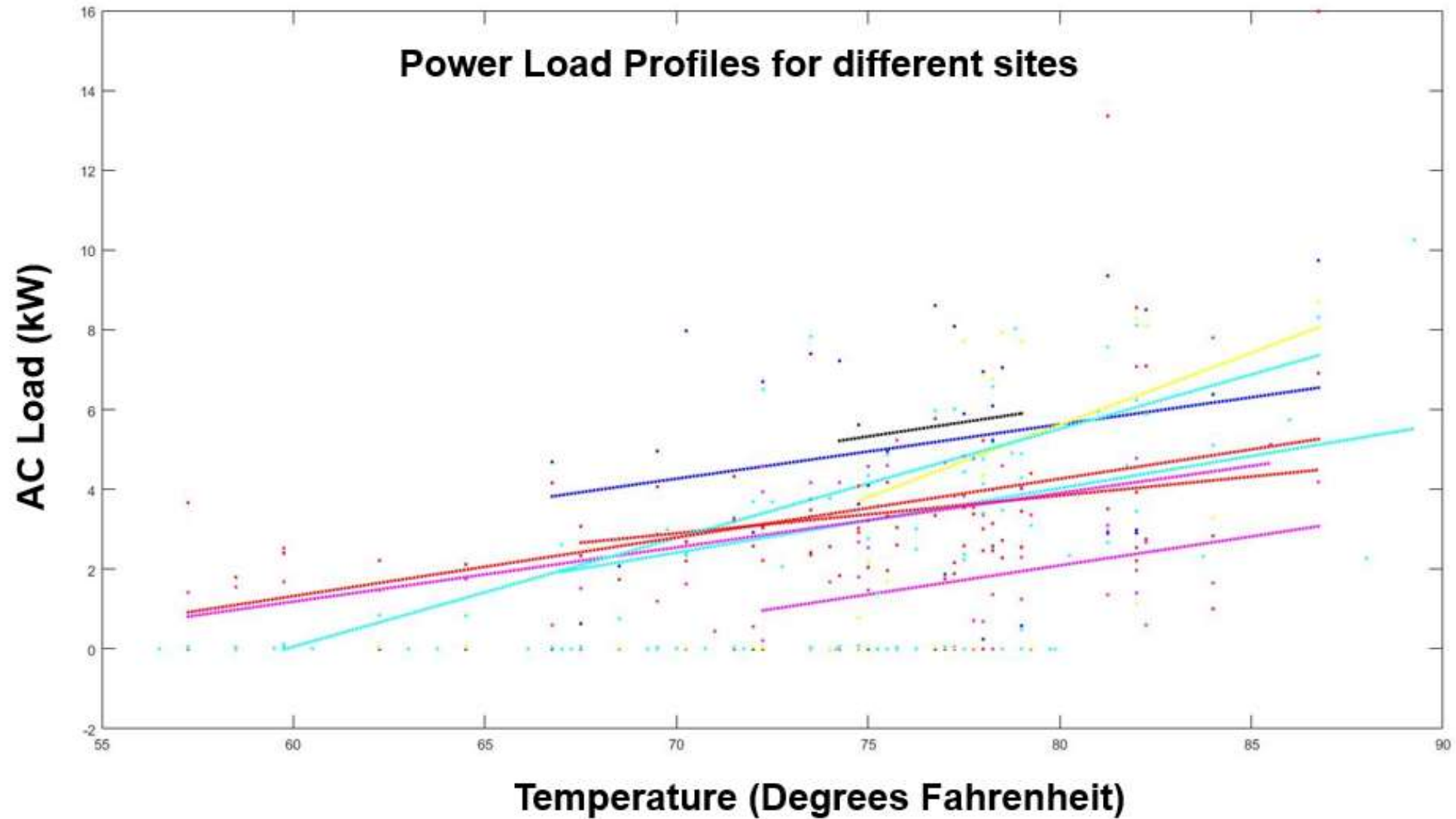


Fun Example from Michelle Leonhart



Do hamsters run a marathon every day?

Commercial Example from Cadmus



IoT Analytics

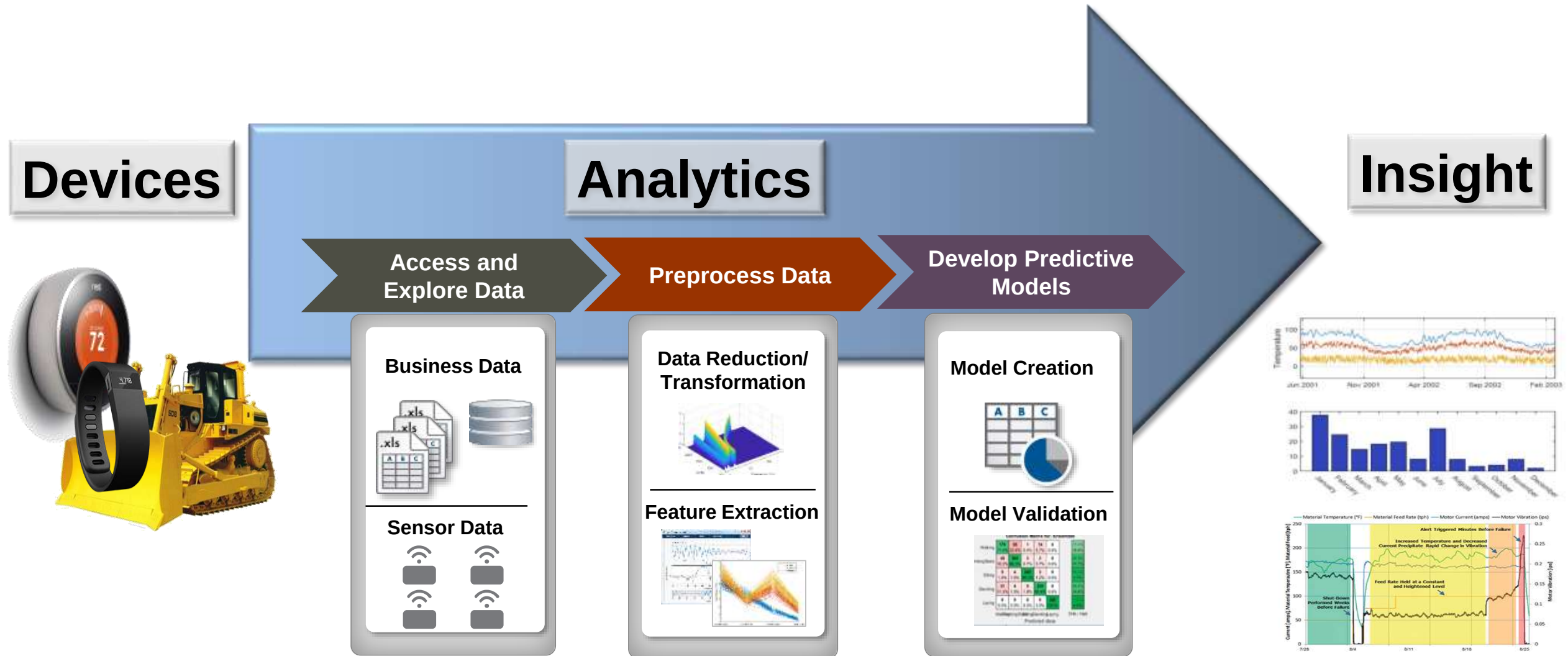


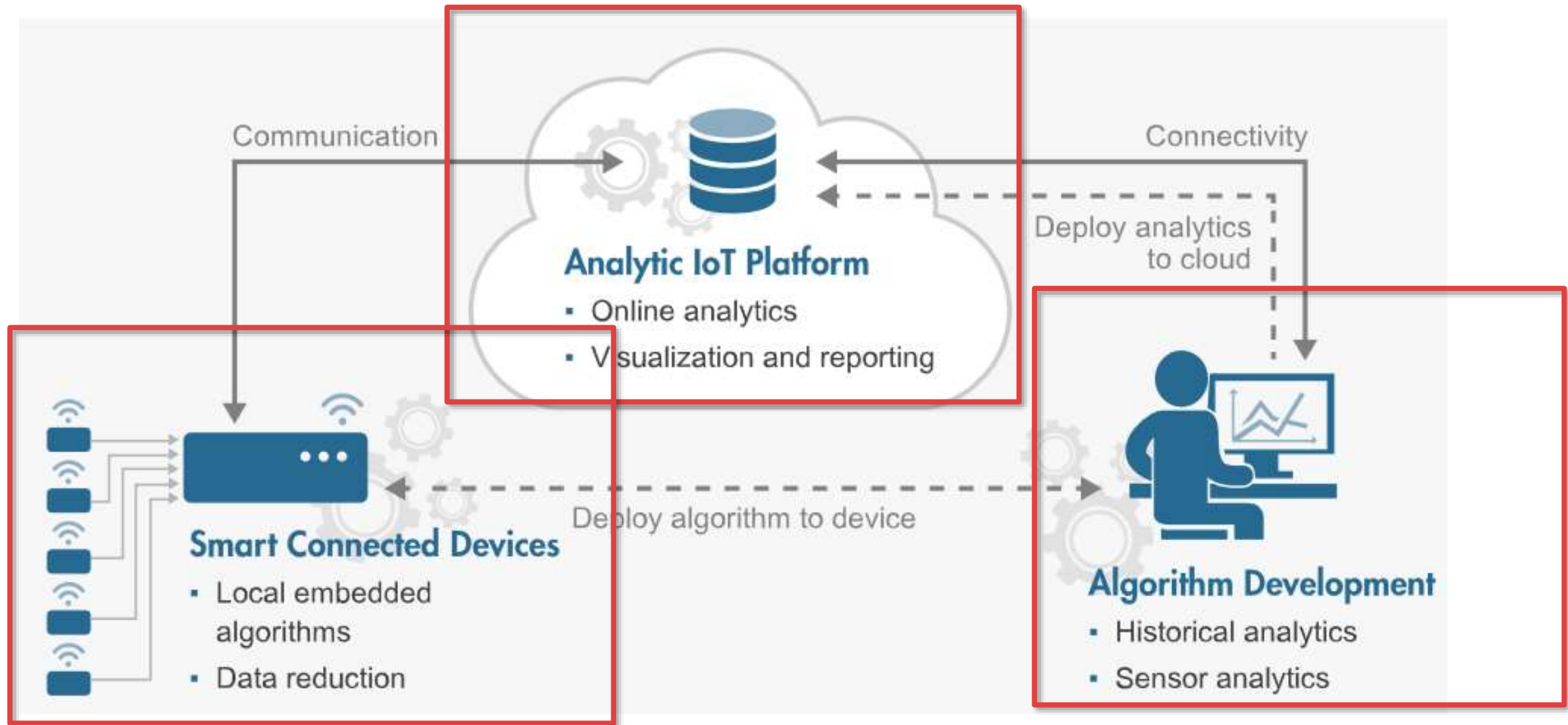
Figure 3. Vibration analysis: Data processed by the company's vibration analysis tool, and leading up to the fan's catastrophic failure, provides an ambiguous indication of the asset's degrading condition.

Algorithms are Key to IoT Systems and MATLAB Can Help

- Real data is messy and needs to be cleaned up.
- Features need to be detected and classified
- Missing data points need to be handled
- Predictions need to be made



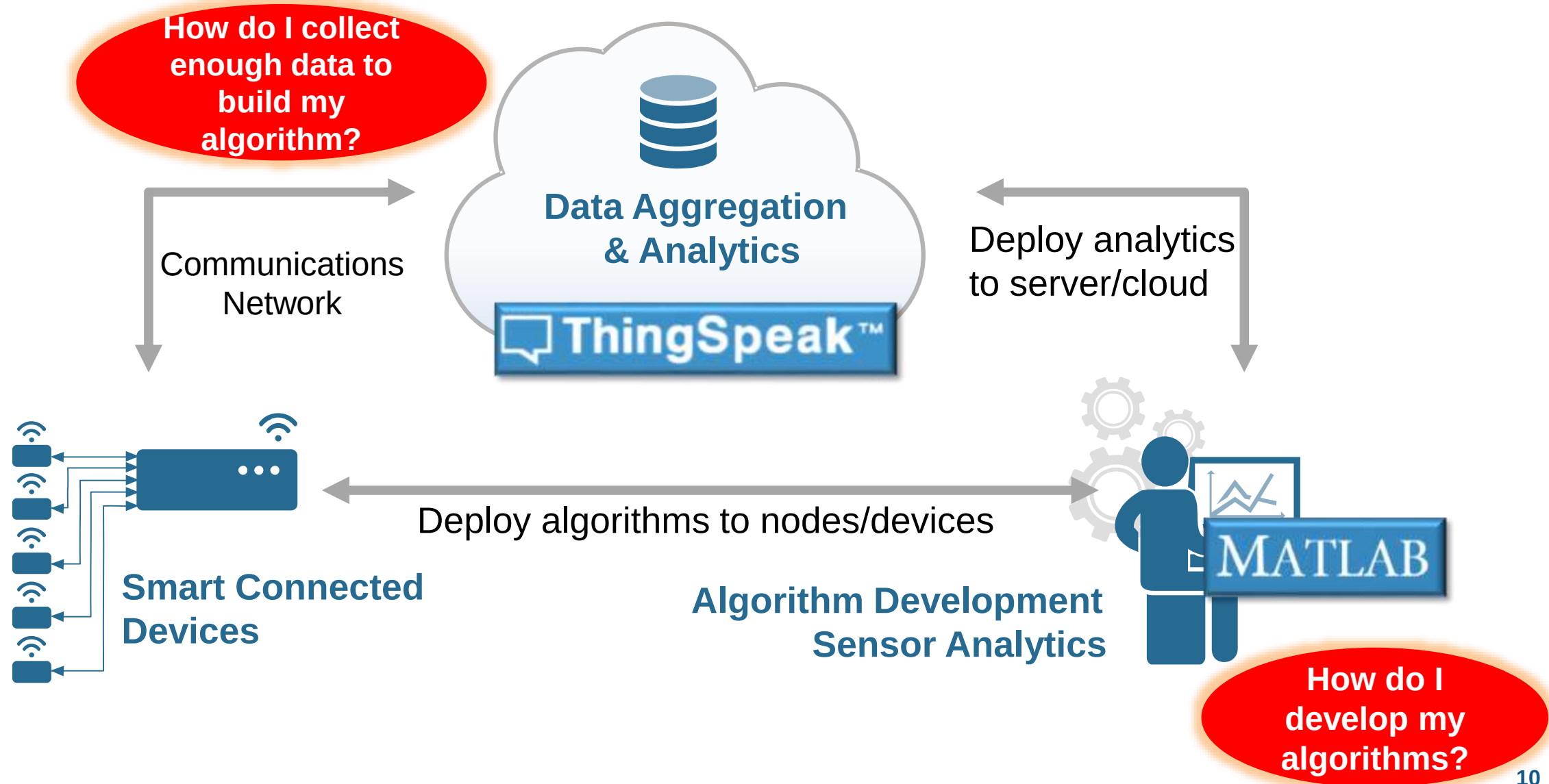
IoT Analytics Framework



IoT Analytics Challenges

- **How do I collect enough data to build my algorithm?**
- **How do I develop my algorithms?**
- **How do I deploy my algorithms on a smart device?**
- **How do I deploy my algorithms to the cloud?**

IoT Analytics Challenges



What Is ThingSpeak?

Web Site For People



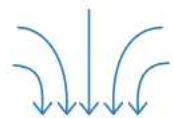
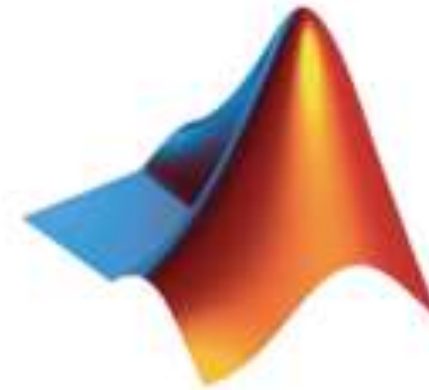
Web Service for Devices

```
{
  - channel: {
    id: 38629,
    name: "Car Counter",
    description: "Counting number of cars passing a reference line in 15 sec interval",
    latitude: "42.28",
    longitude: "-71.35",
    field1: "Number of Westbound Cars",
    field2: "Number of Eastbound Cars",
    created_at: "2015-05-19T20:14:03Z",
    updated_at: "2016-05-19T10:36:35Z",
    last_entry_id: 1477231
  },
  - feeds: [
    - {
      created_at: "2016-05-19T10:36:20Z",
      entry_id: 1477230,
      field1: "18.000000",
      field2: "8.000000"
    },
    - {
      created_at: "2016-05-19T10:36:35Z",
      entry_id: 1477231,
      field1: "18.000000",
      field2: "14.000000"
    }
  ]
}
```

ThingSpeak

- New MathWorks web service hosted on AWS
- Lets you collect, analyze and act on data from “things”
- Over **130,000** users worldwide
- It has **MATLAB** for IoT Analytics
- It's **free** to get started

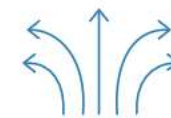
<https://thingspeak.com>



Collect



Analyze



Act

https://thingspeak.com/channels/12397

File Edit View Favorites Tools Help

ThingSpeak™ Channels Apps Community Support

How to Buy Account Sign Out

WeatherStation

Channel ID: 12397

Author: [hemdanw](#)

Access: Public

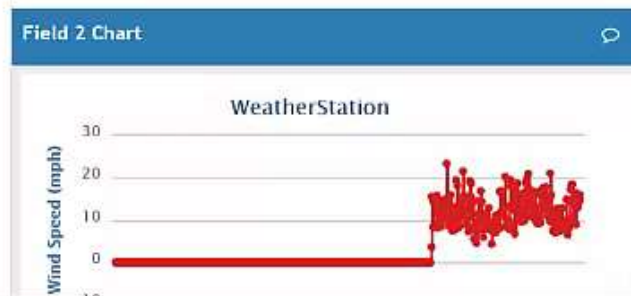
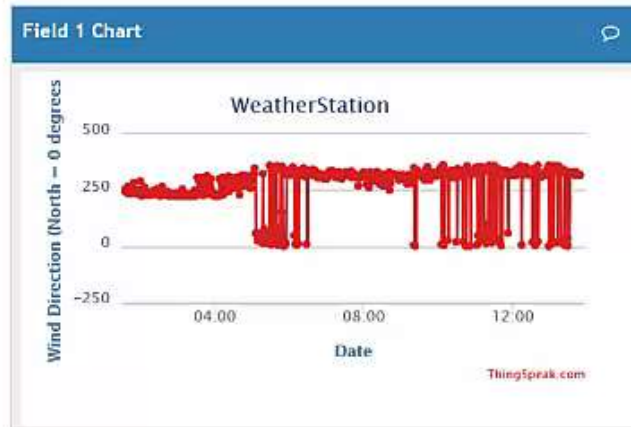
MathWorks Weather Station, West Garage, Natick,
MA 01760, USA

[MathWorks Weather Station, weather,](#)
[MathWorks](#)

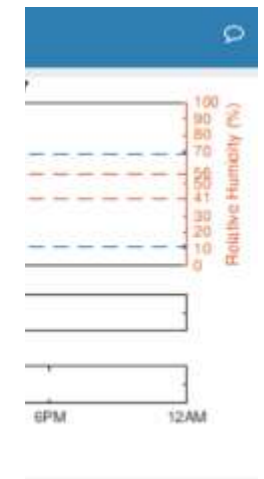
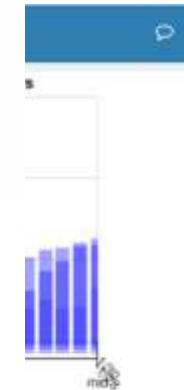
Data Export

MATLAB Analysis

MATLAB Visualization



Sample



Predictive Analytics Example with ThingSpeak

ThingSpeak™

Channels ▾

Apps

Community

Support ▾

How to Buy

Account ▾

Predicted and Measured Ockway Bay Tide Chart

Un-watch

Tweet

Like 0

Share



Channel ID: 137305

Author: mawrey

Access: Public

Tide measurement and forecasting with the effect of wind predicted using neural networks.

🔑 tide, wind surge, neural network

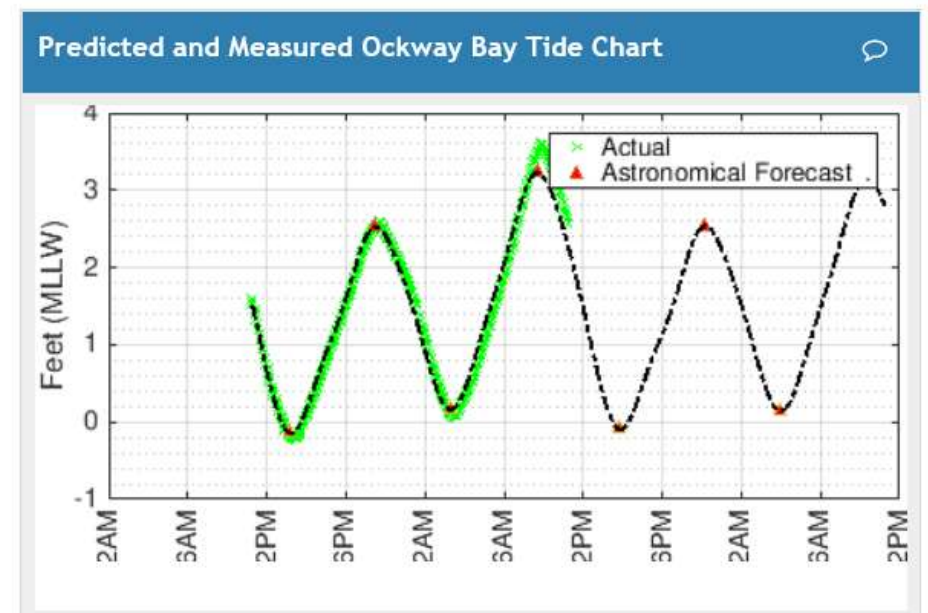
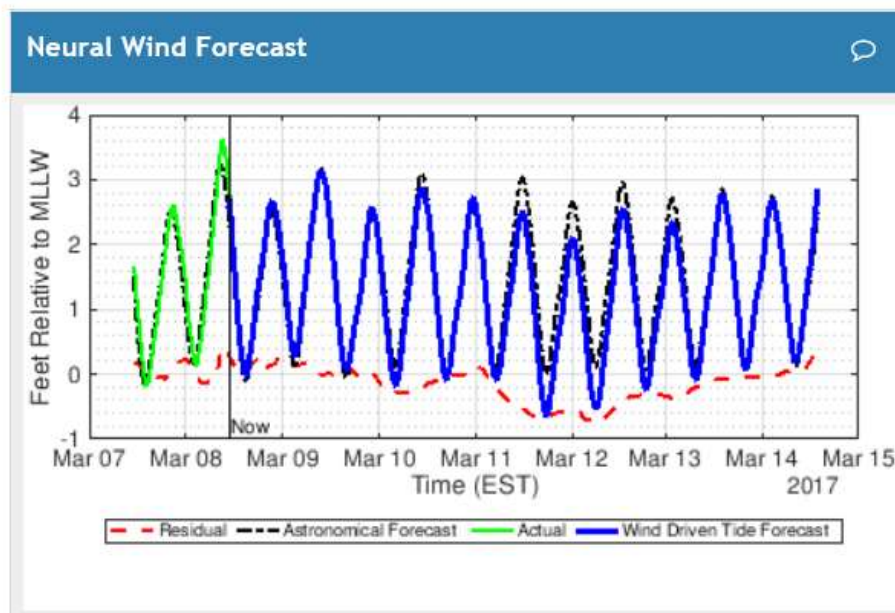
Data Export

More Information

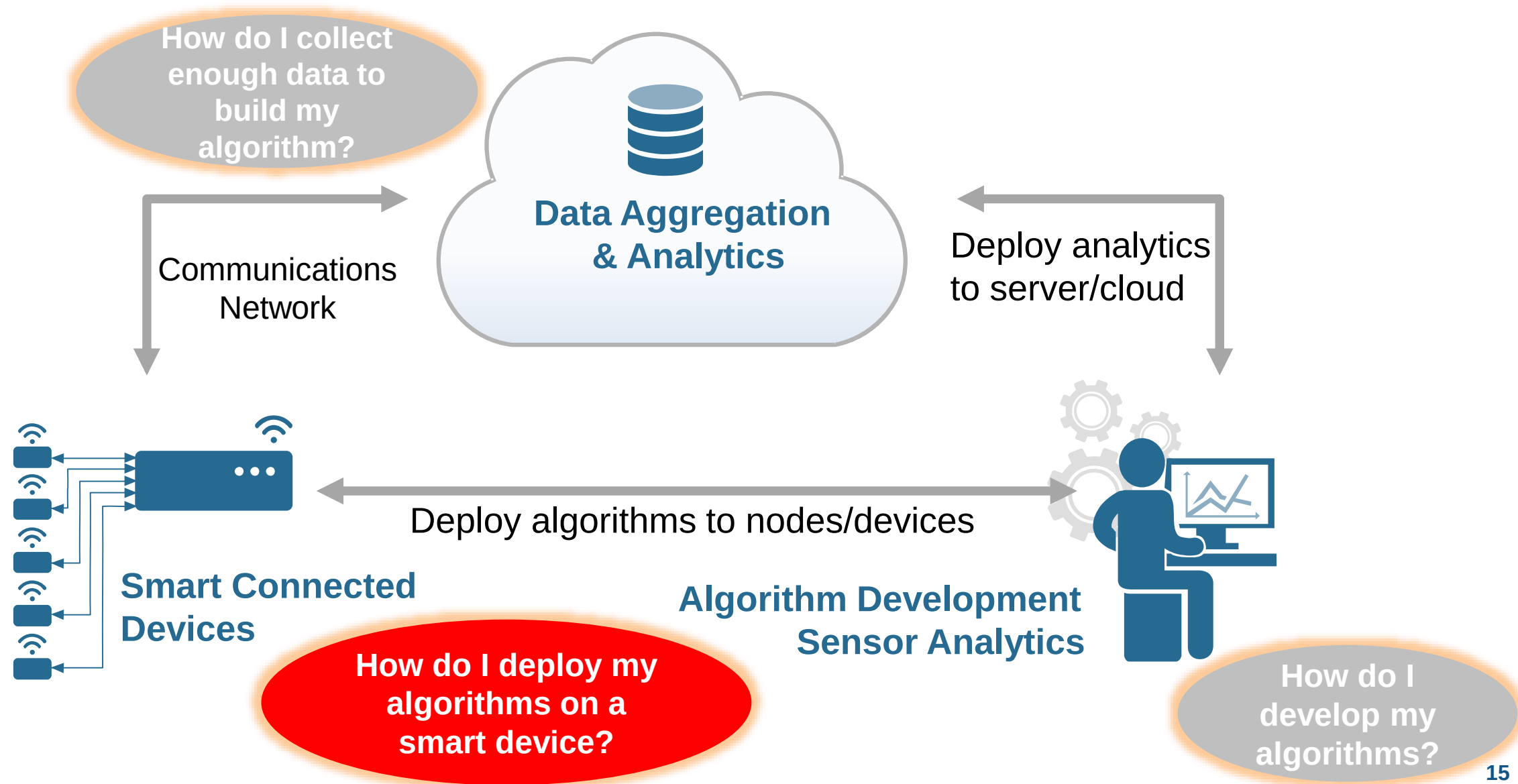
MATLAB Analysis

MATLAB Visualiz

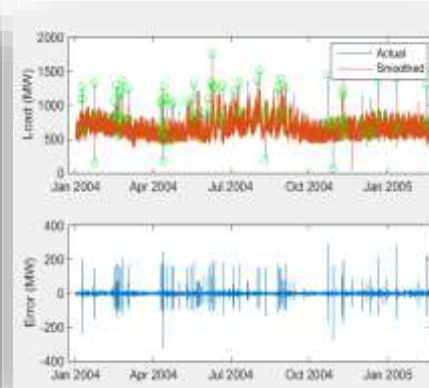
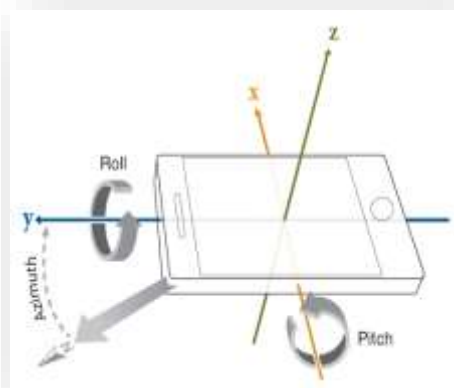
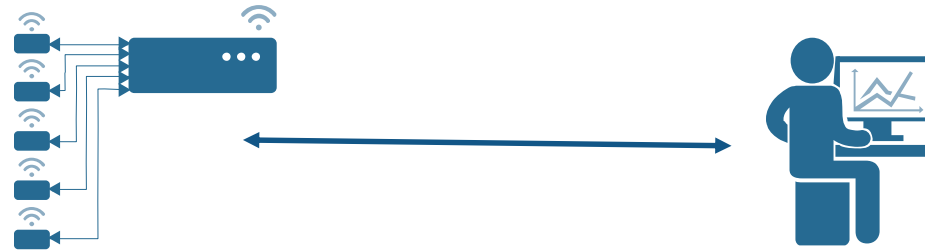
Historical Wind
and Tide Data



IoT Analytics Challenges



Sensor Analytics and Development of Smart Connected Devices



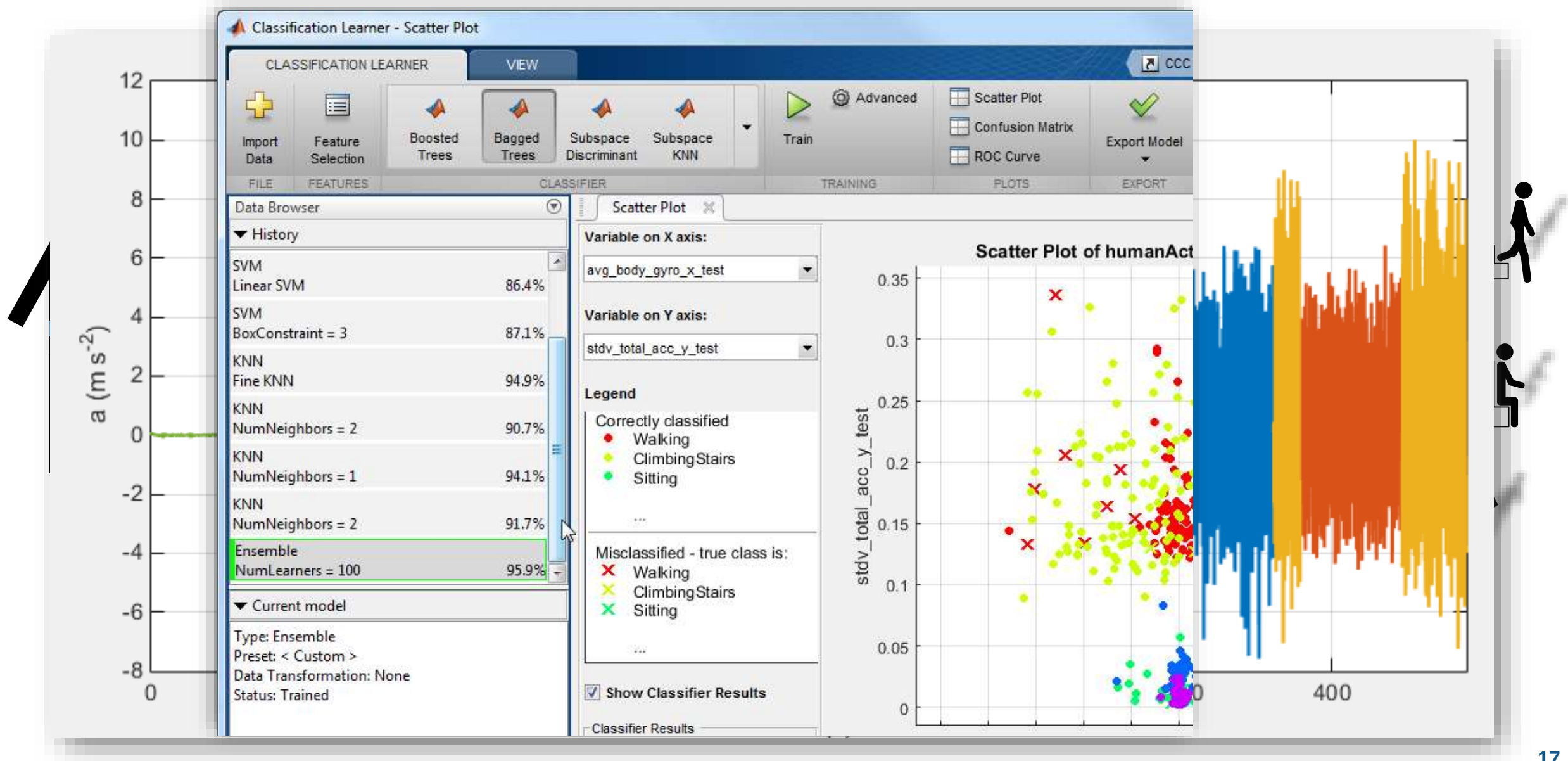
Connect and Acquire

Signal
Processing

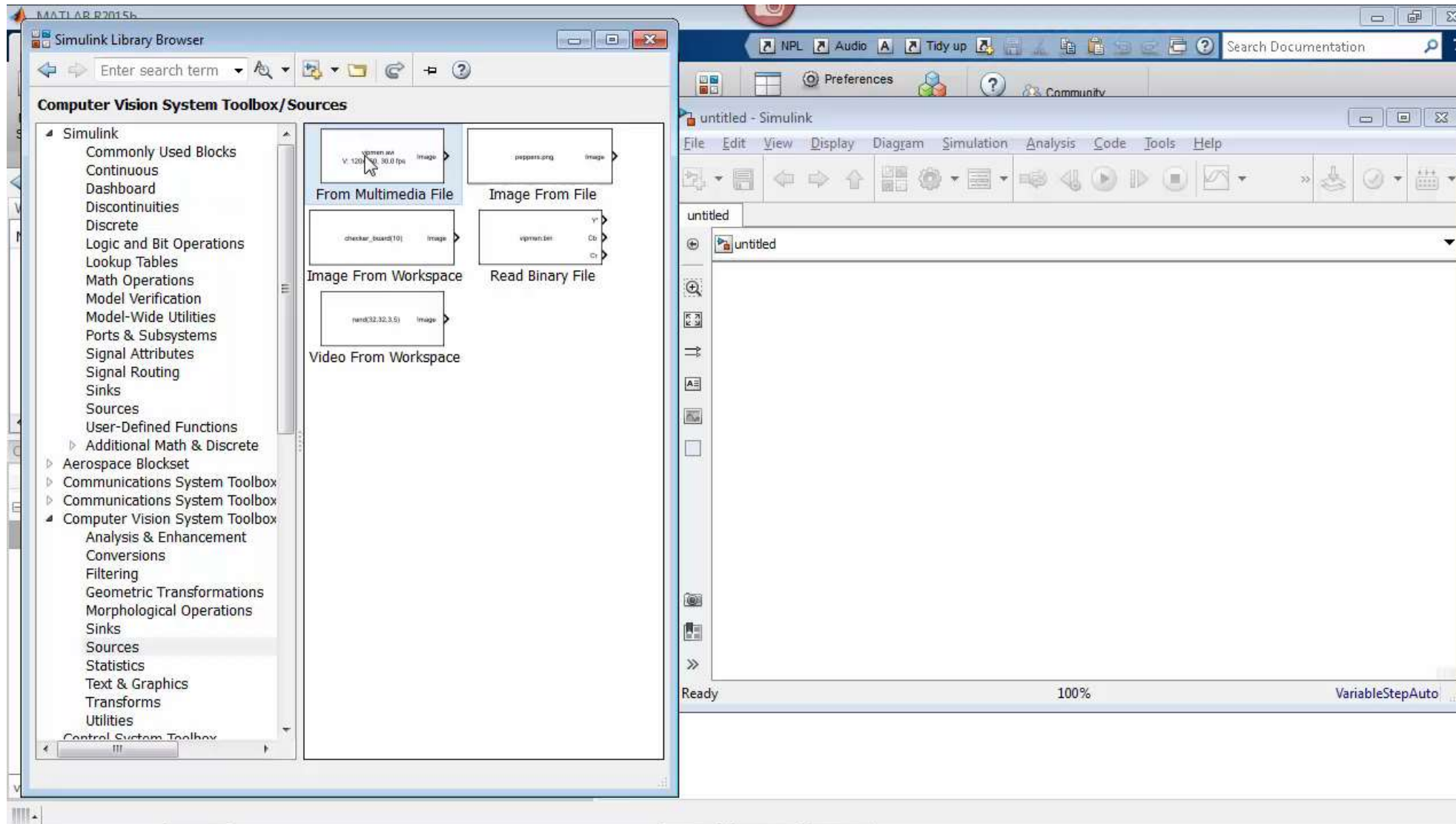
Machine
Learning

Embedded
Implementation

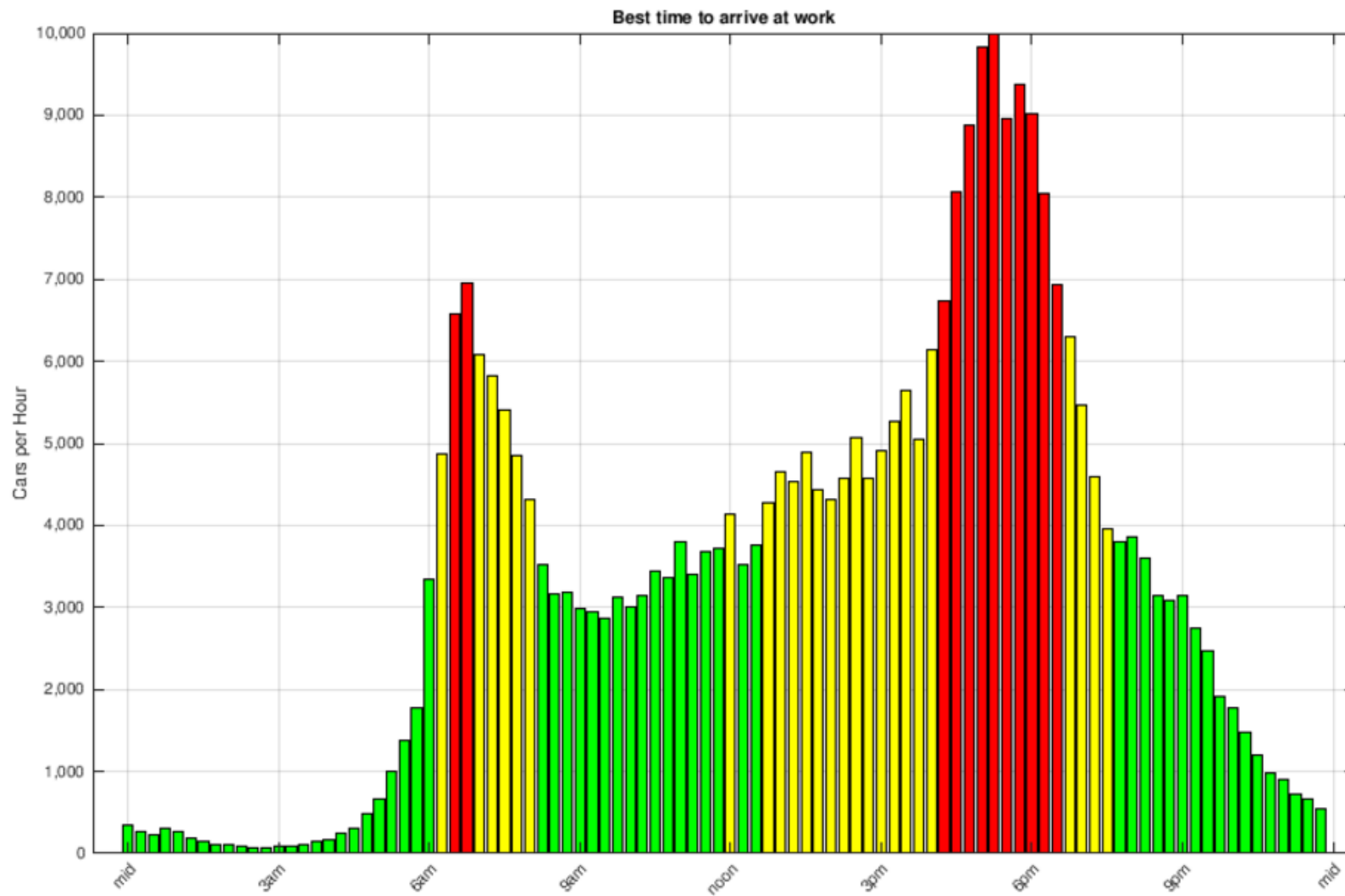
Example: Human Activity Analysis and Classification



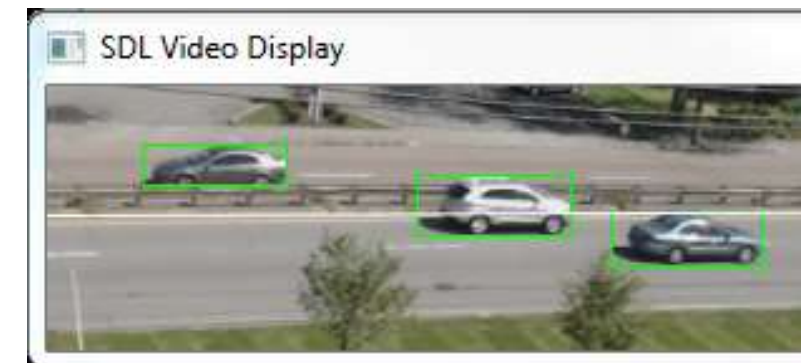
Example: Partitioning Algorithms Between Device and Cloud



From Data to Insight

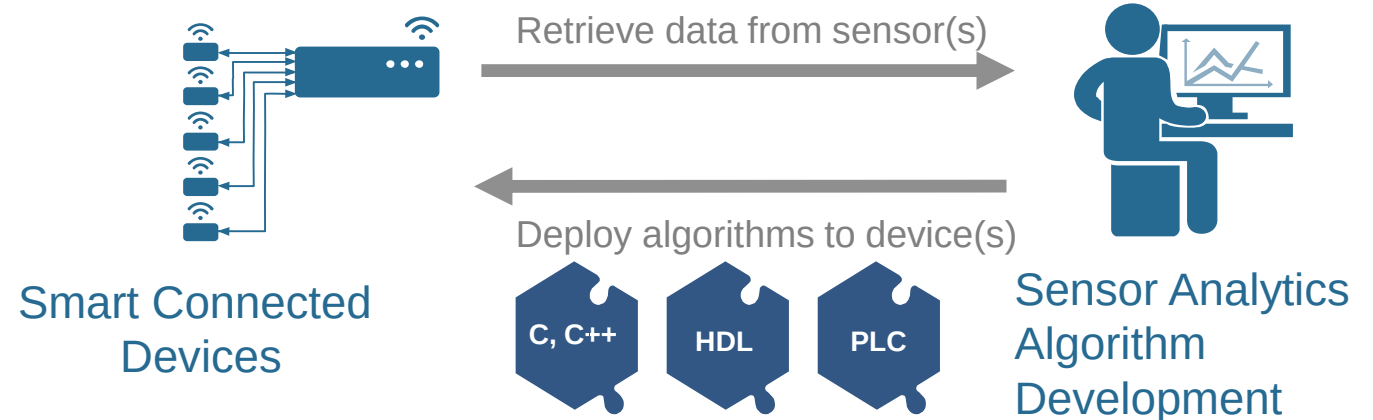
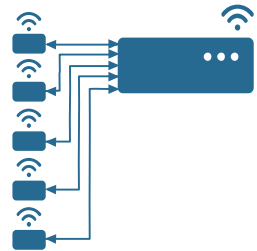


When should I go to work?

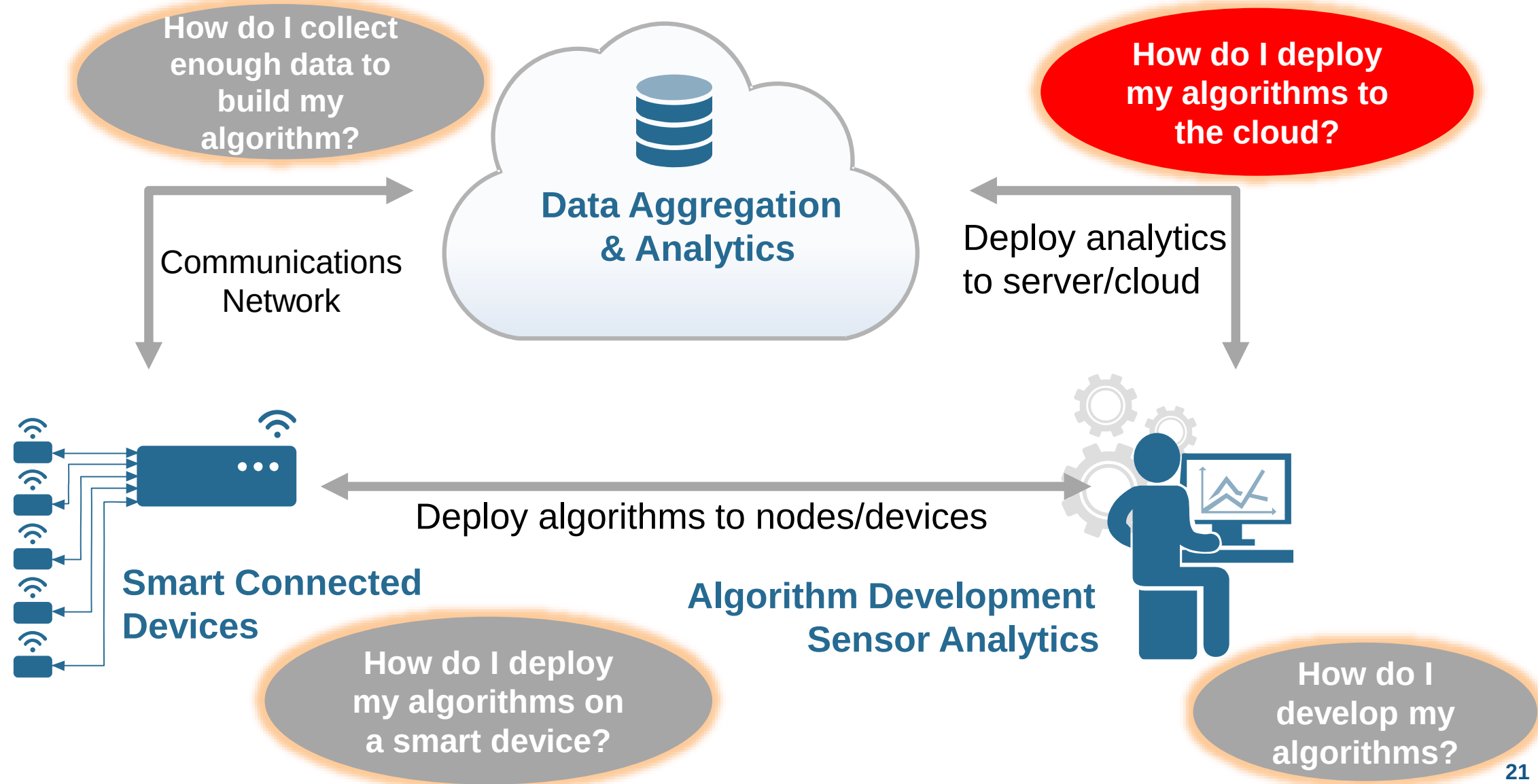


Designing Smart Connected Devices

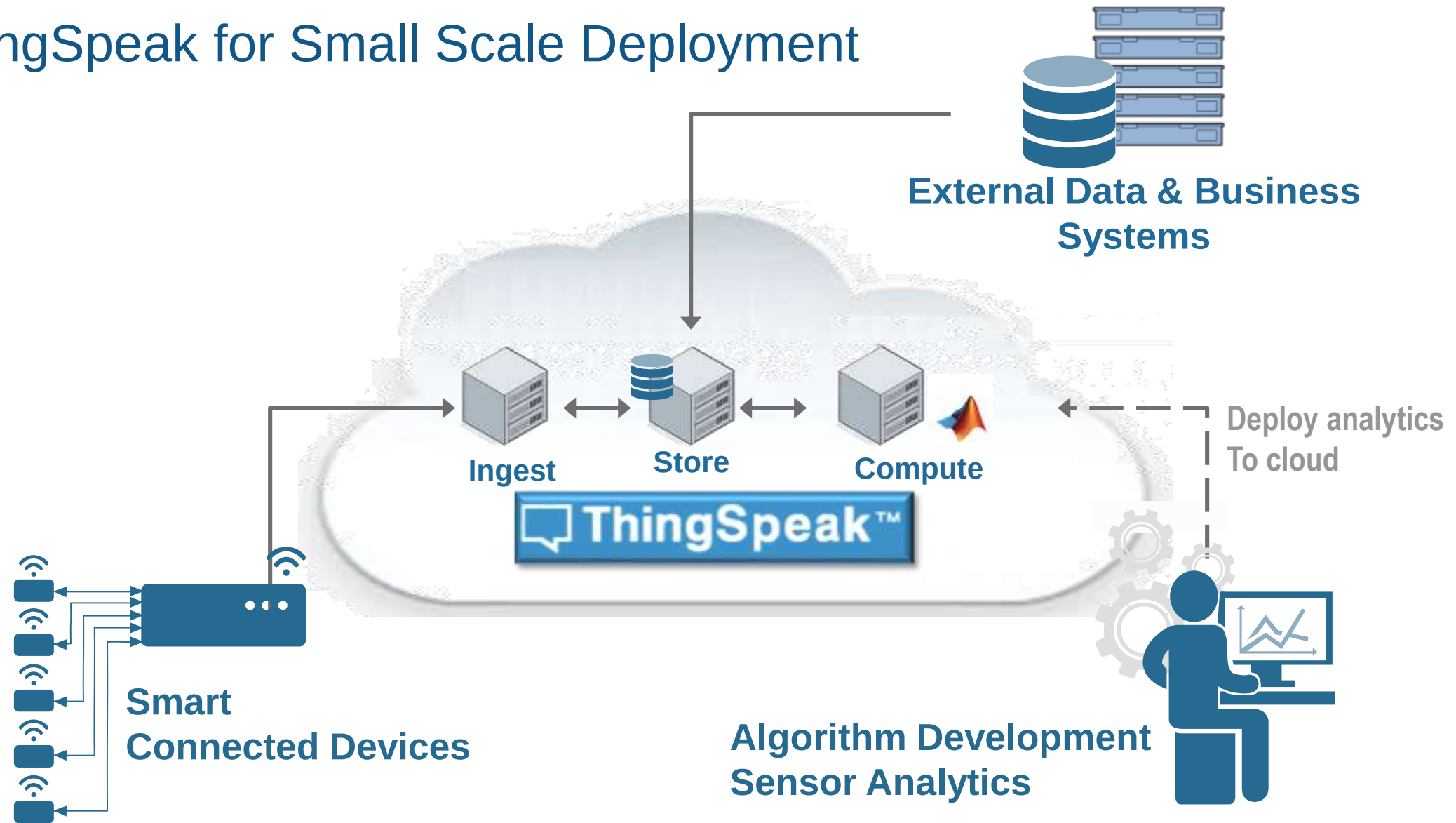
- Gather data from sensors using I2C/SPI and other interfaces
- Use pre-built libraries for signal processing , computer vision, machine learning and more
- Automatically generate C / C++ and HDL code
- Embedded targeting packages for a wide variety of hardware



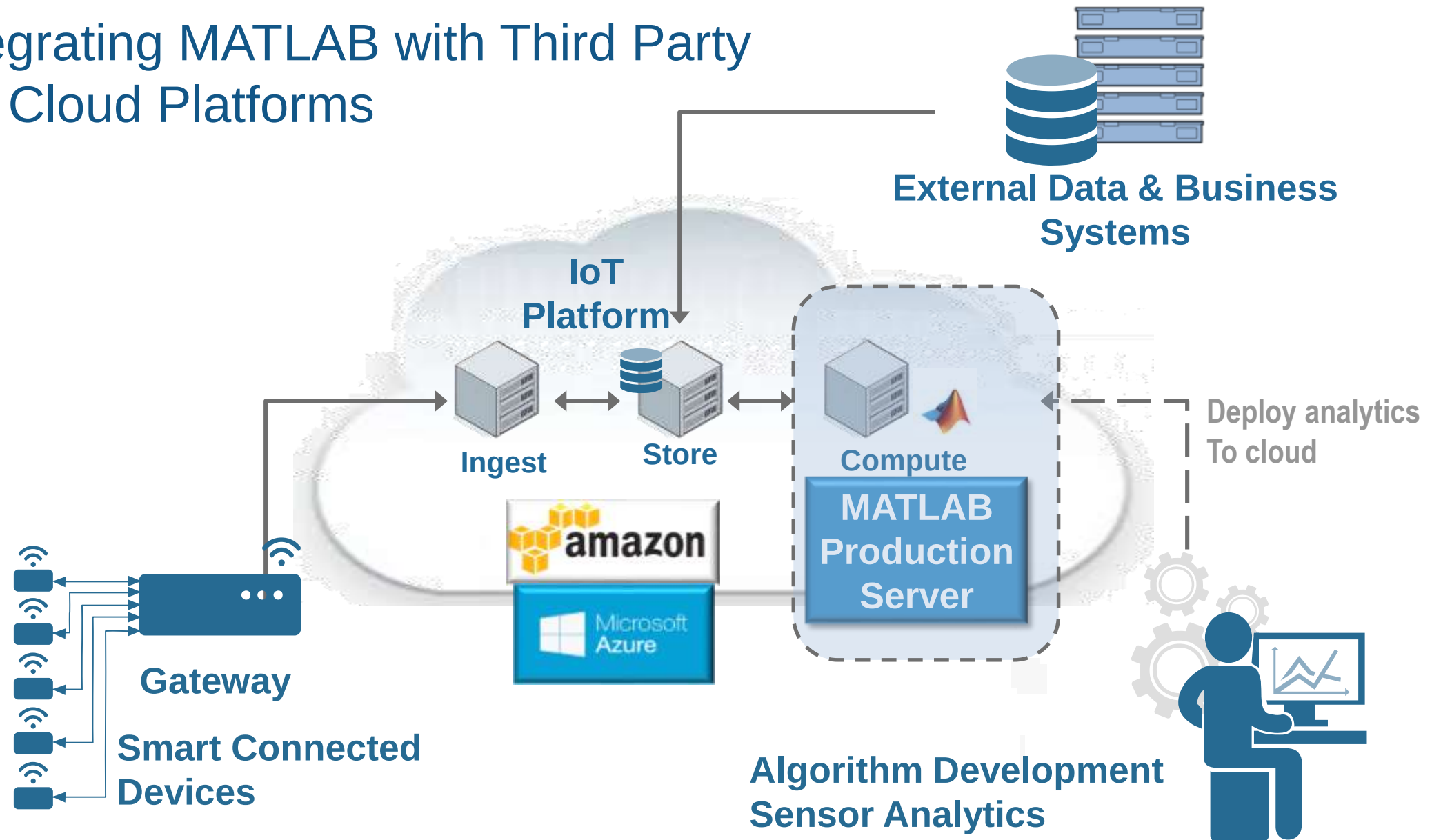
IoT Analytics Challenges



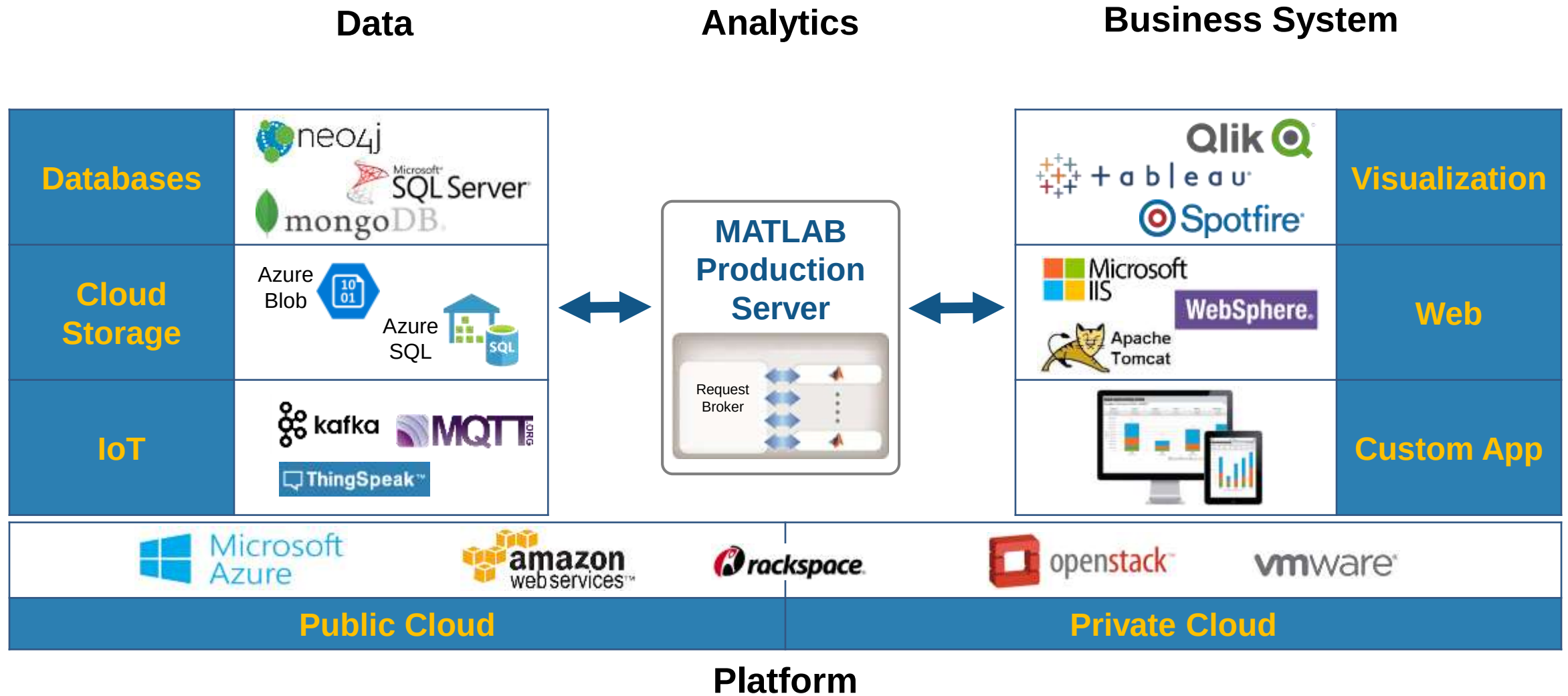
ThingSpeak for Small Scale Deployment



Integrating MATLAB with Third Party IoT Cloud Platforms

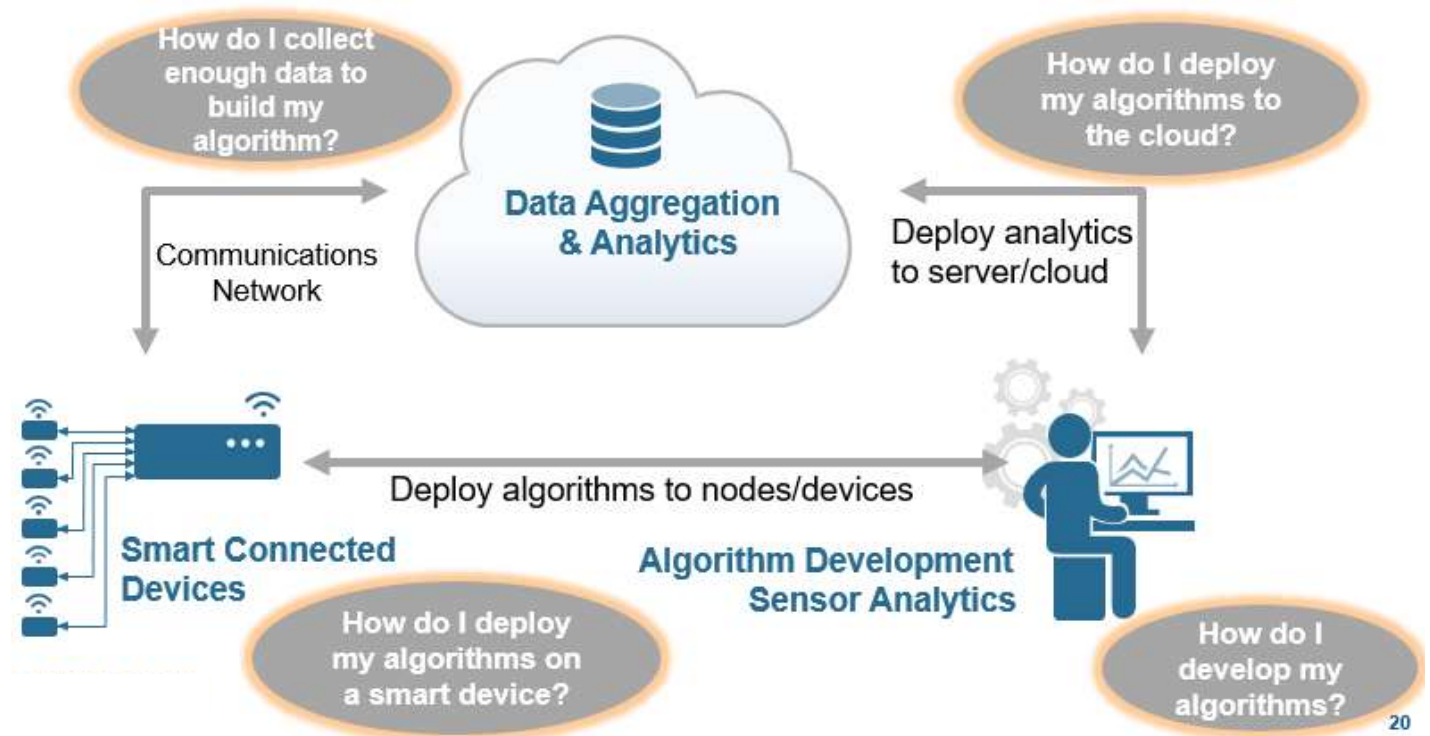


Integrating MATLAB in Large Scale Production Systems



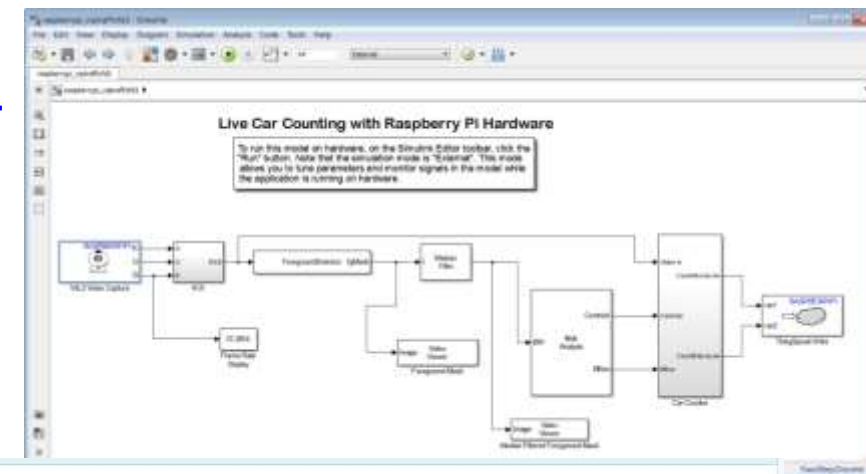
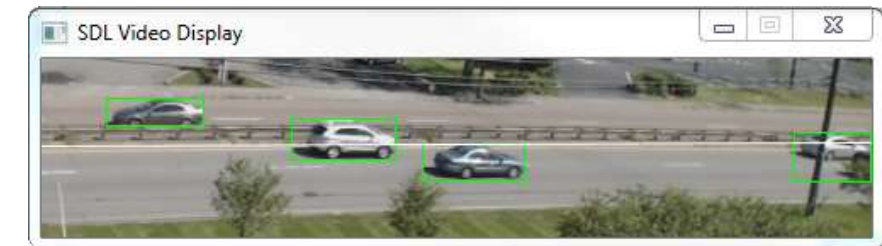
MathWorks Addresses IoT Analytics Challenges

- Quickly collect and analyze IoT data with ThingSpeak and MATLAB
- Develop analytics algorithms using MATLAB and toolboxes
- Deploy on smart devices using code generation and embedded target support
- Deploy on cloud using ThingSpeak and MATLAB Production Server



What You Can Do to Learn More

- [Log-in to ThingSpeak with your MathWorks account and explore](#)
- [View a webinar on Machine Learning with MATLAB](#)
- [Read a Technical Article on Forecasting Tides with MATLAB](#)
- [Read a tutorial on how to send data to ThingSpeak over MQTT](#)



Tide Alerts @TidalAlerts · 9h

Ockway Bay tide is 19.2 inches and falling.

Using the Corporate Template

- Avoid manually formatting whenever possible. Instead, use built-in styles, templates, layouts, and colors.
- When creating new presentations, select the slide layout that best suits your needs from the built-in theme, then add content.
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- When applying the new template to existing presentations, review your presentation carefully and manually adjust any formatting issues that have occurred. For additional help, contact Creative Services.

V17.0 *Delete this slide before finalizing your presentation.*

감사합니다.