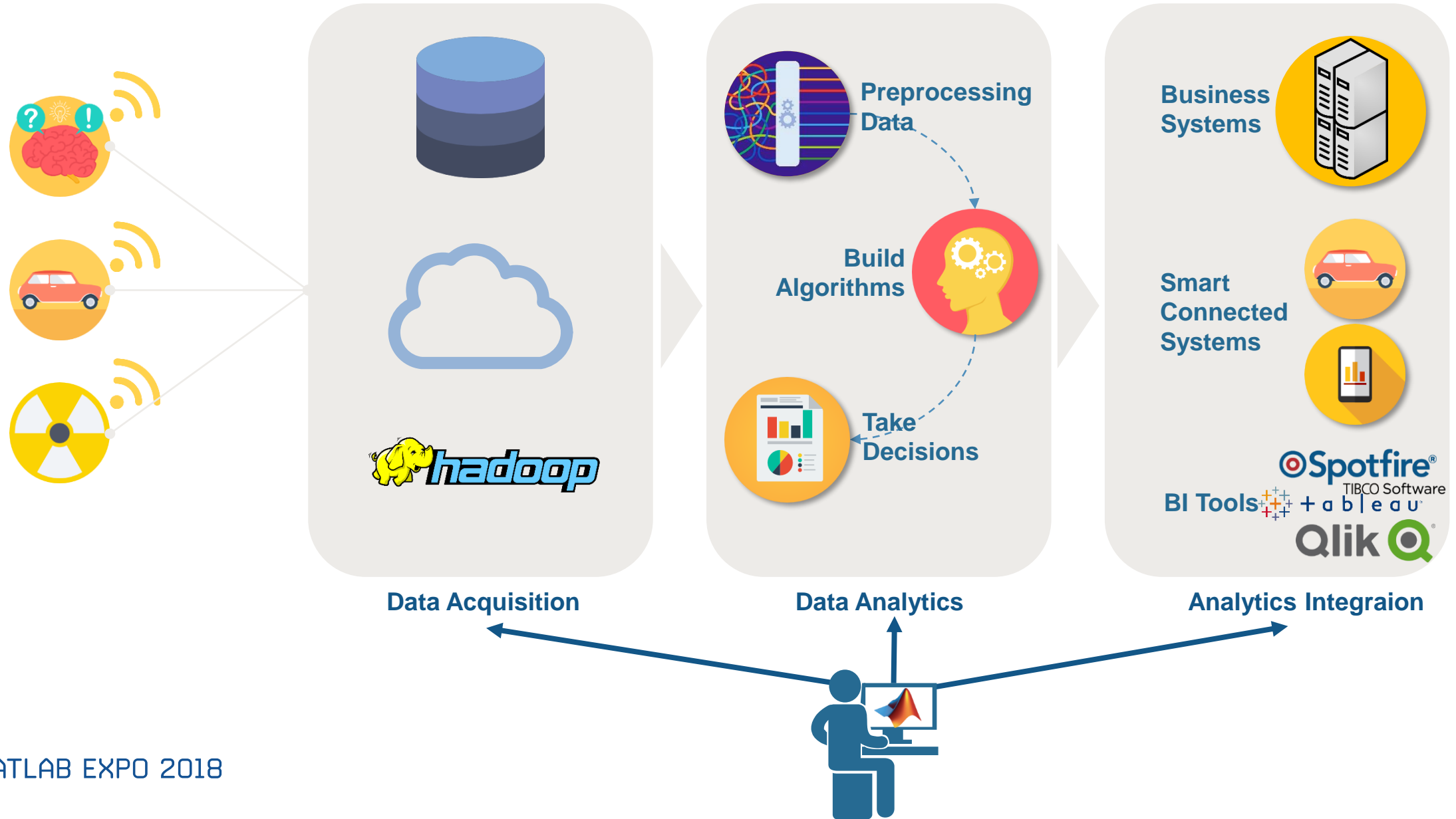# MATLAB EXPO 2018

Integrate MATLAB Analytics into Enterprise Applications

Lyamine Hedjazi

Data Analytics Workflow

Data Acquisition

Data Analytics

Analytics Integraion

Preprocessing Data

Build Algorithms

Take Decisions

Business Systems

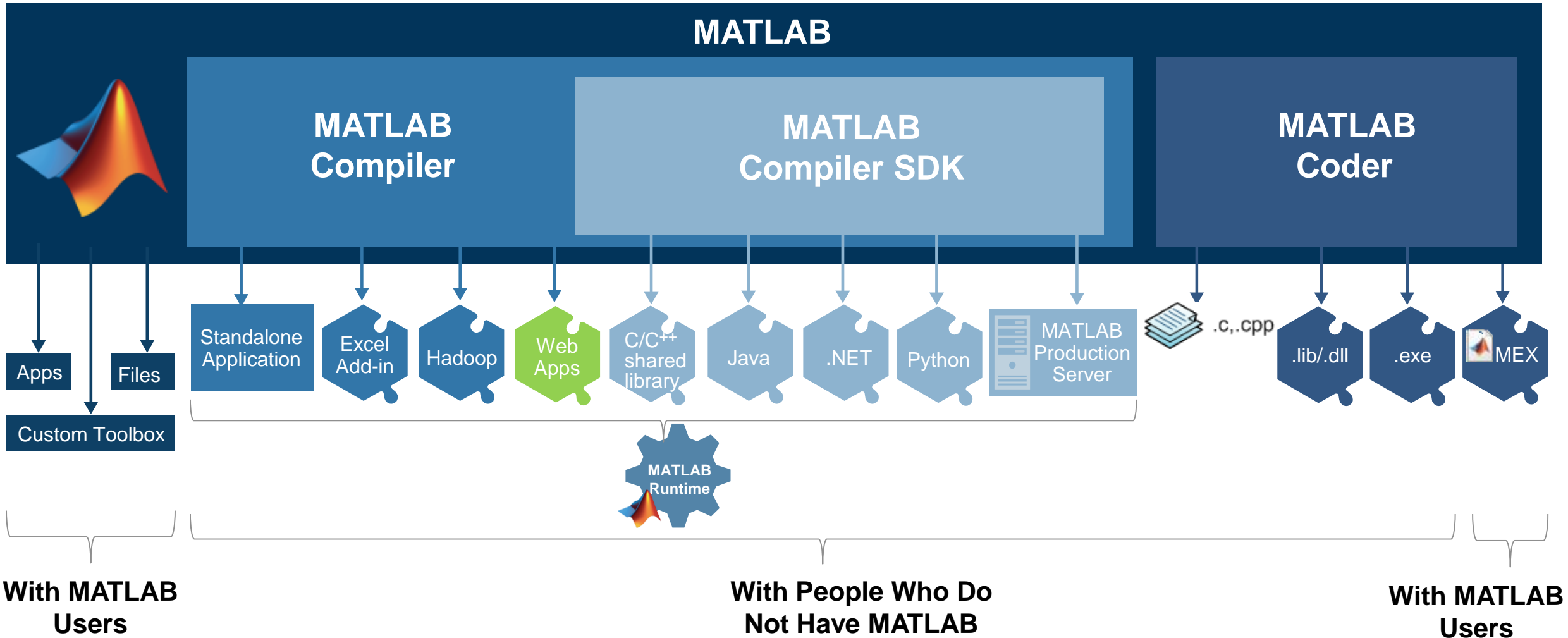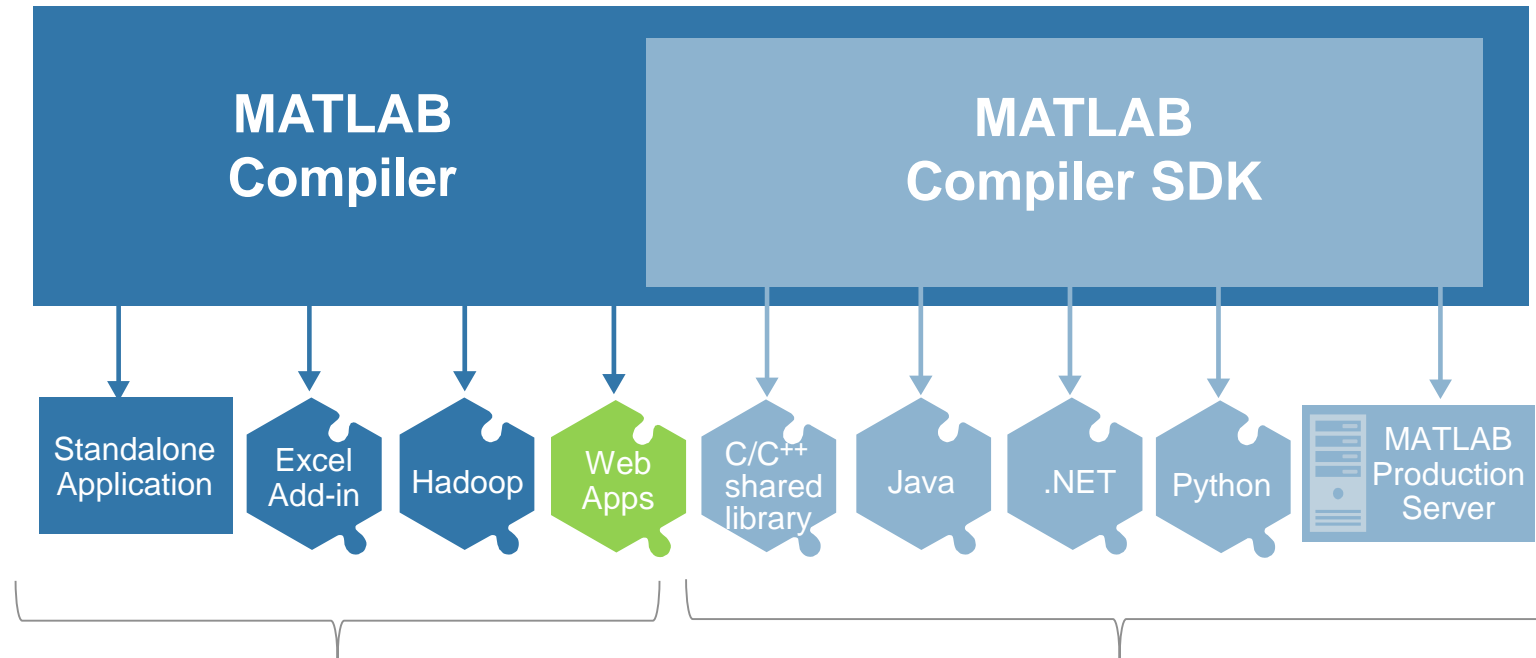Smart Connected Systems

BI Tools

Challenges

- How to share MATLAB algorithms with multiple internal and external consumers

- Challenging and time consuming to re-code MATLAB algorithms for integration into IT frameworks

- Difficult to migrate solutions to enterprise scale web or cloud frameworks

- How to deliver fast results with large volumes of data

Sharing and Deploying MATLAB Applications
Write Your Programs Once Then Share to Different Targets

MATLAB

MATLAB Compiler

MATLAB Compiler SDK

MATLAB Coder

Apps

Files

Custom Toolbox

Standalone Application

Excel Add-in

Hadoop

Web Apps

C/C++ shared library

Java

.NET

Python

MATLAB Production Server

.c, .cpp

.lib/.dll

.exe

MEX

MATLAB Runtime

With MATLAB Users

With People Who Do Not Have MATLAB

With MATLAB Users

Share with People Who Do Not Have MATLAB

MATLAB Compiler

MATLAB Compiler SDK

Standalone Application

Excel Add-in

Hadoop

Web Apps

C/C++ shared library

Java

.NET

Python

MATLAB Production Server

Share Applications with No Additional Programming

Integrate MATLAB-based Components With Your Own Software

MATLAB Runtime

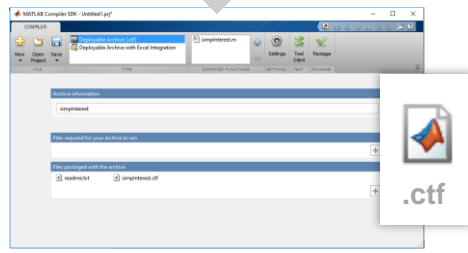- Royalty-free Sharing
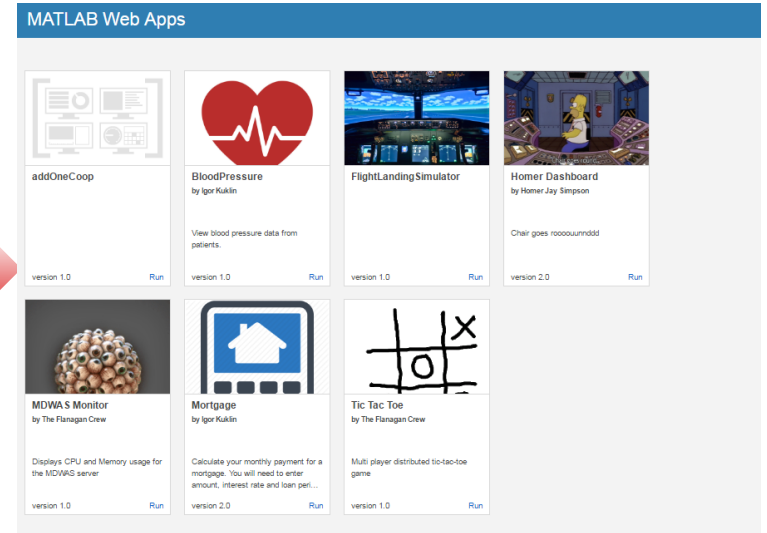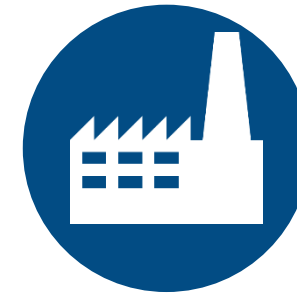- IP Protection via Encryption

Creating and Sharing MATLAB Web Apps

MATLAB *and MATLAB Production Server*
is the easiest and most productive environment to *take your enterprise analytics* or *IoT solution* from idea to production

Idea

Production

Why MATLAB Production Server Matters to You

Domain Expert

- ✓ No need to learn another programming language

- ✓ Reliably service large numbers of concurrent requests with low latency

- ✓ Platform independence (win, mac, linux)
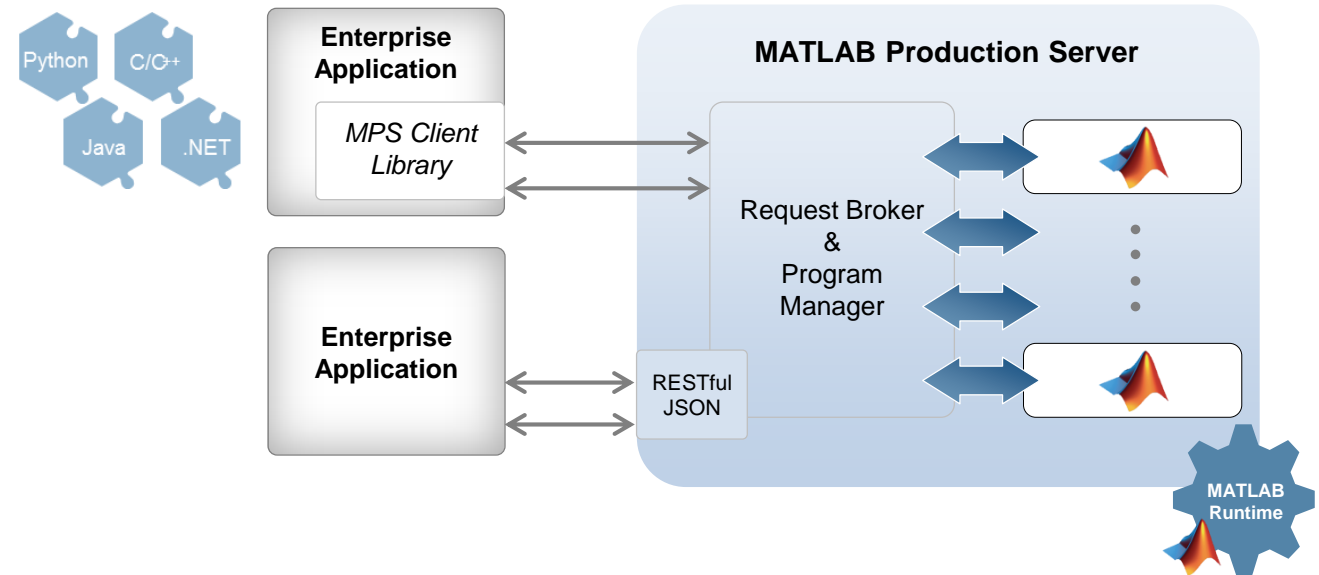
Solution Architect

- ✓ Web and cloud friendly architecture

- ✓ Client connections can be protected with SSL encryption

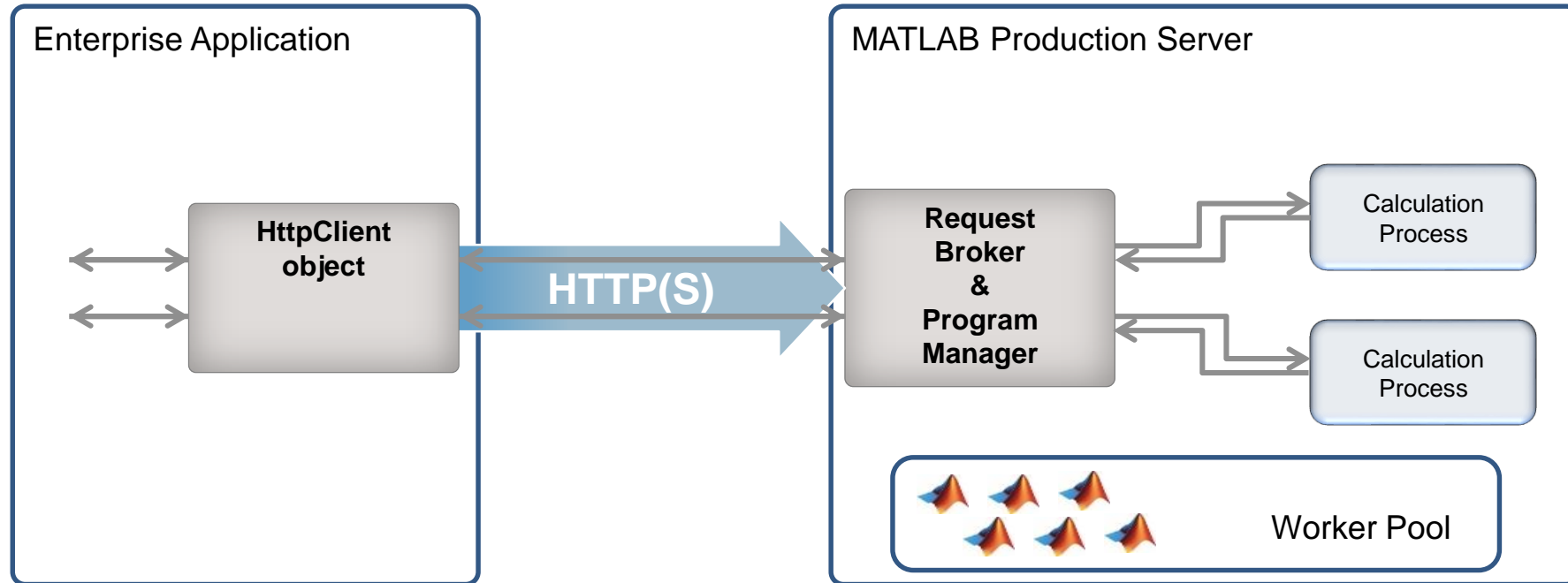- ✓ Automatically deploy updates without server restart

MATLAB Production Server
Enterprise Class Framework For Running Packaged MATLAB Programs

- Server software
  - Manages packaged MATLAB programs and worker pool

- MATLAB Runtime libraries
  - Single server can use runtimes from different releases

- RESTful JSON interface and lightweight client library (C/C++, .NET, Python, and Java)

Python C/C++

Java   .NET

Enterprise Application

MPS Client Library

Enterprise Application

RESTful JSON

MATLAB Production Server

Request Broker
&
Program Manager

MATLAB Runtime

Calling Functions

Example - Integrating with IT systems
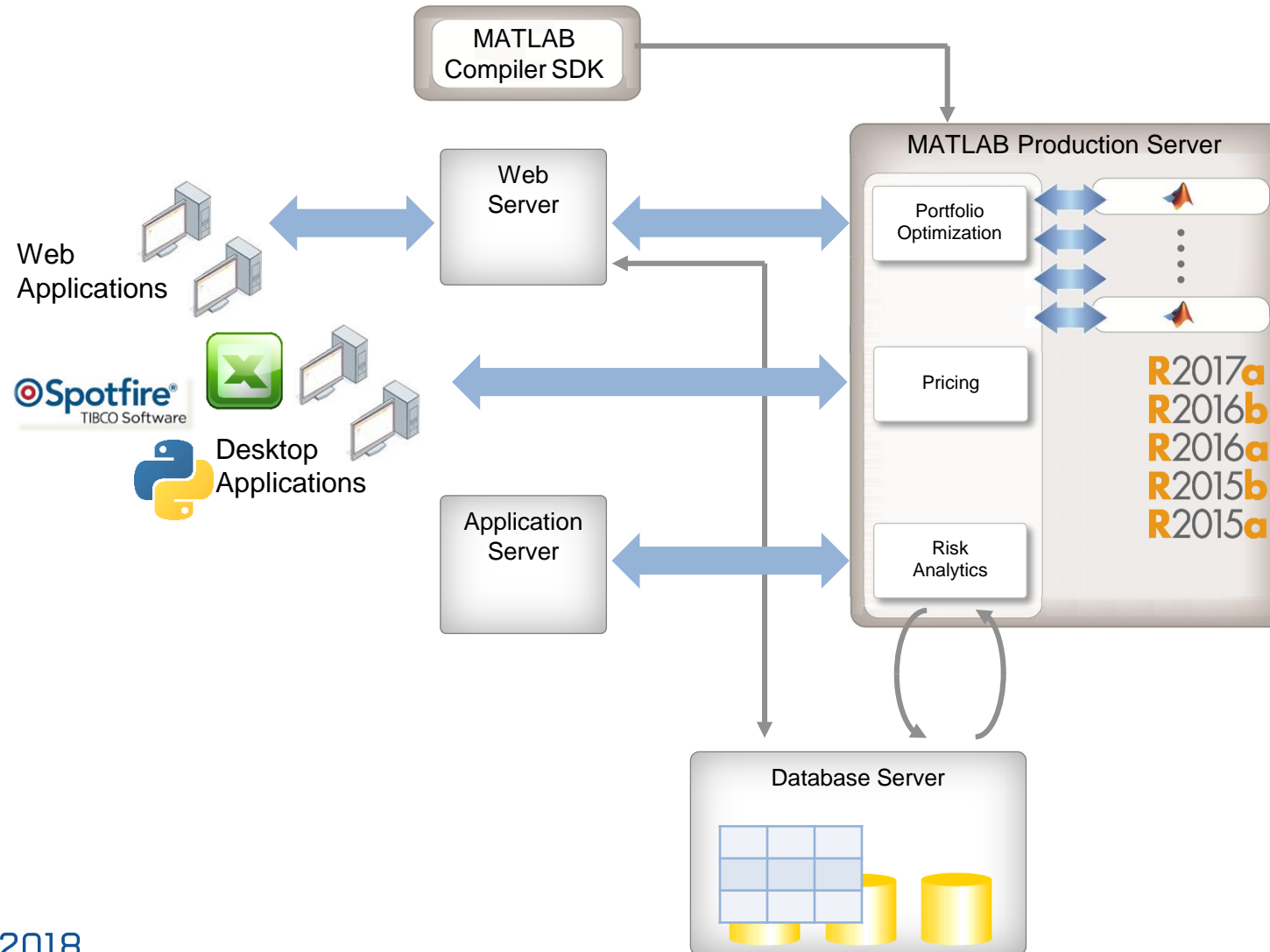
Customer examples: Financial customer advisory service

Algorithm Developers

MATLAB Compiler SDK

MATLAB

MATLAB Production Server

Request Broker

Request Broker

Request Broker
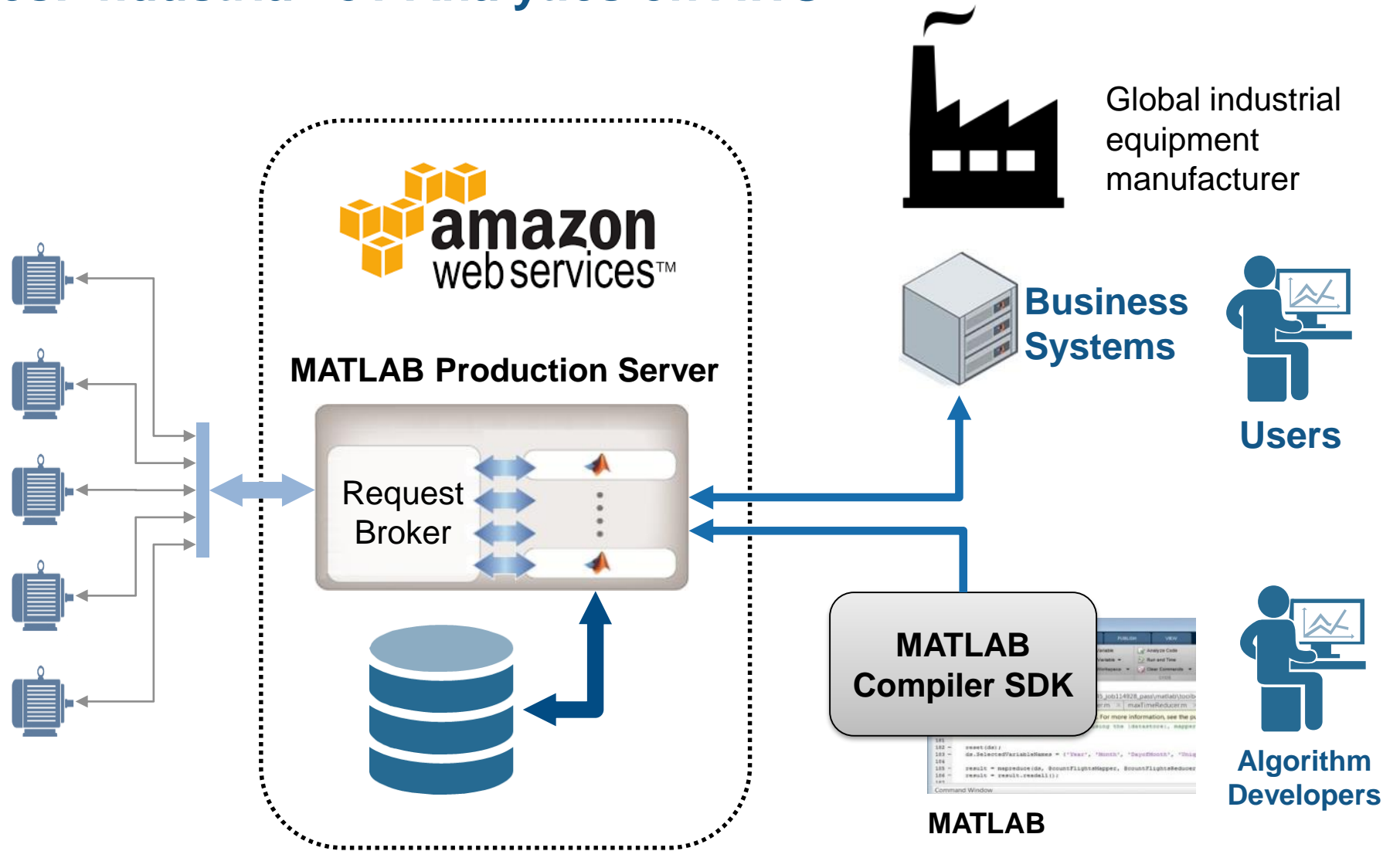
Global financial institution with European HQ
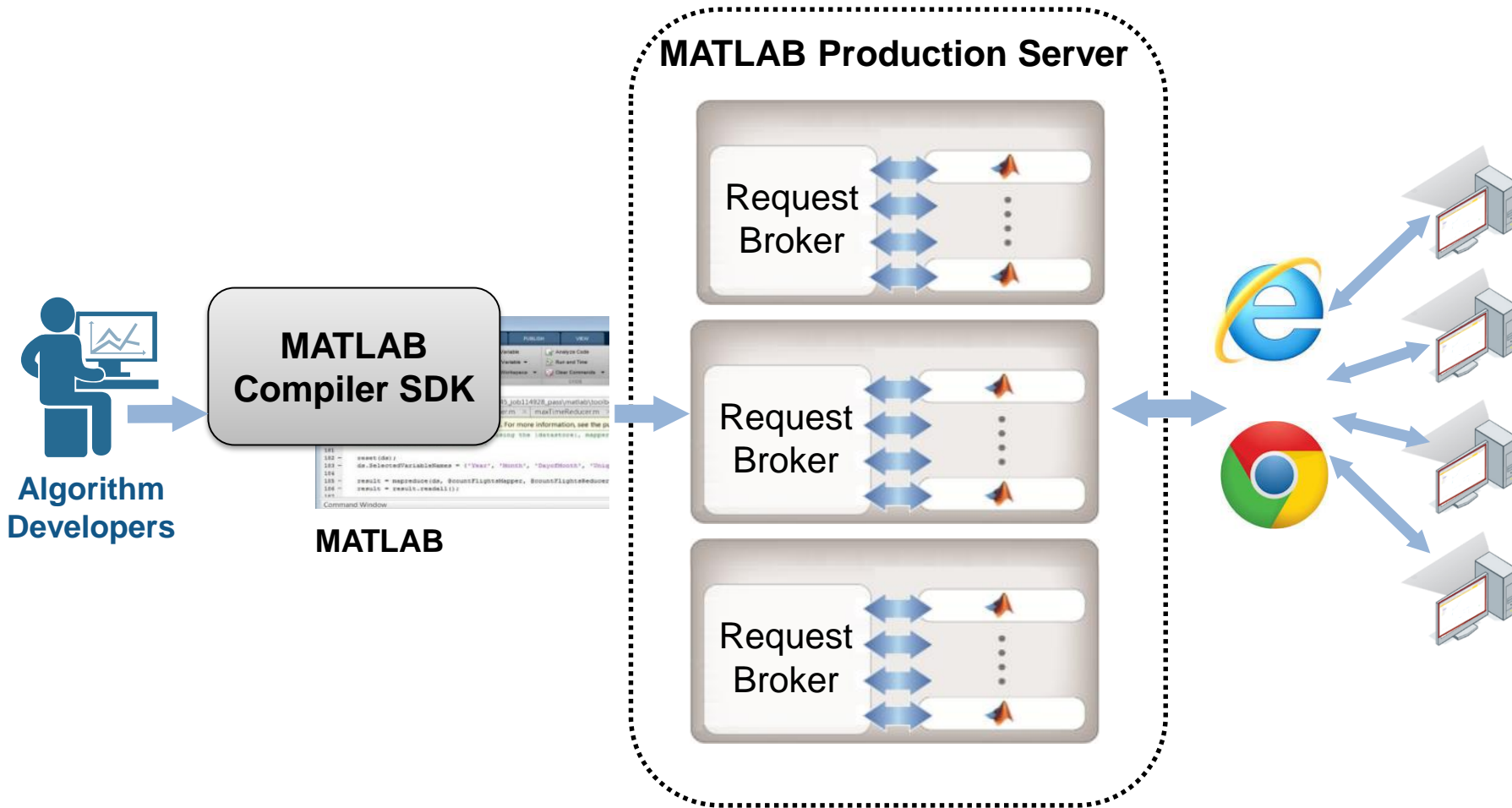
Customer examples: Industrial IoT Analytics on AWS

Global industrial equipment manufacturer
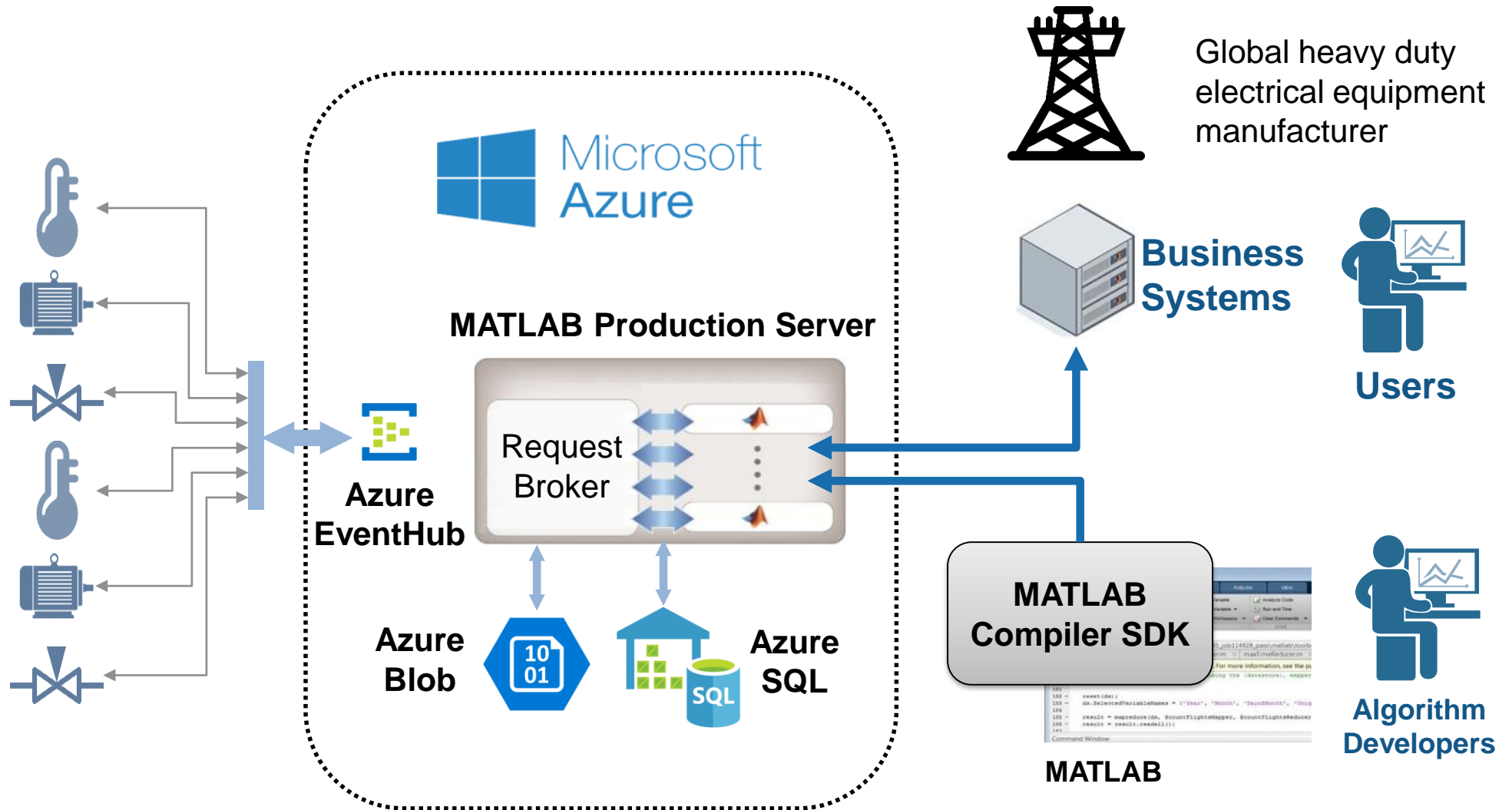
MATLAB Production Server

Request Broker

Industrial Equipment
- Networked communication
- Embedded sensors
- Data reduction

Business Systems

Users

MATLAB Compiler SDK

MATLAB

Algorithm Developers

Customer examples: Building Automation IoT Analytics on Azure

Building/HVAC automation control system

- Variety of sensors and controls
- Networked communication
- Data reduction

Microsoft Azure

Global heavy duty electrical equipment manufacturer

Azure EventHub

MATLAB Production Server

Request Broker

Azure Blob

Azure SQL

Business Systems

Users

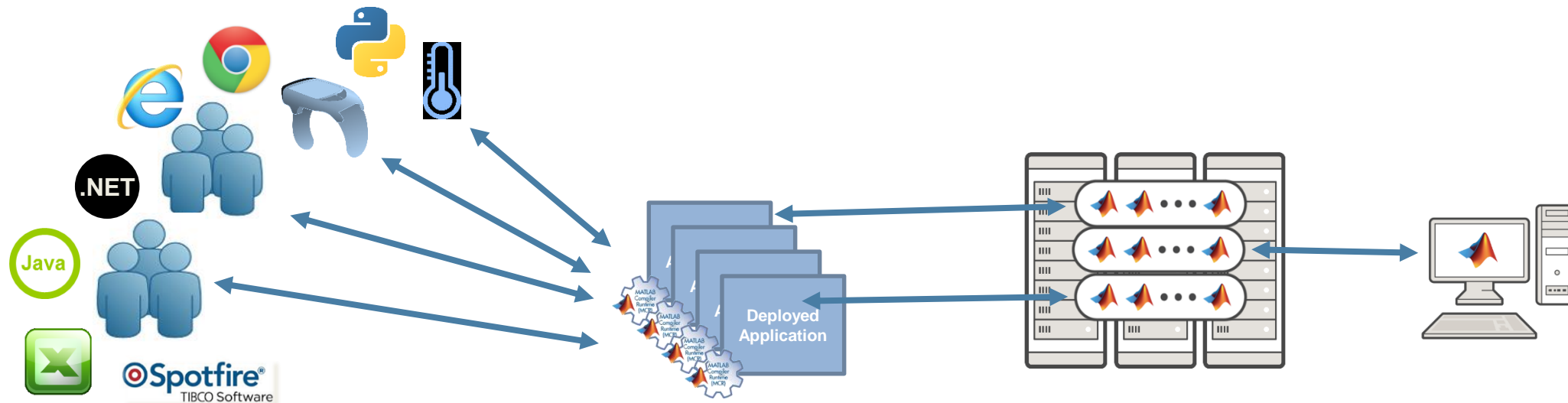**MATLAB Compiler SDK**

MATLAB
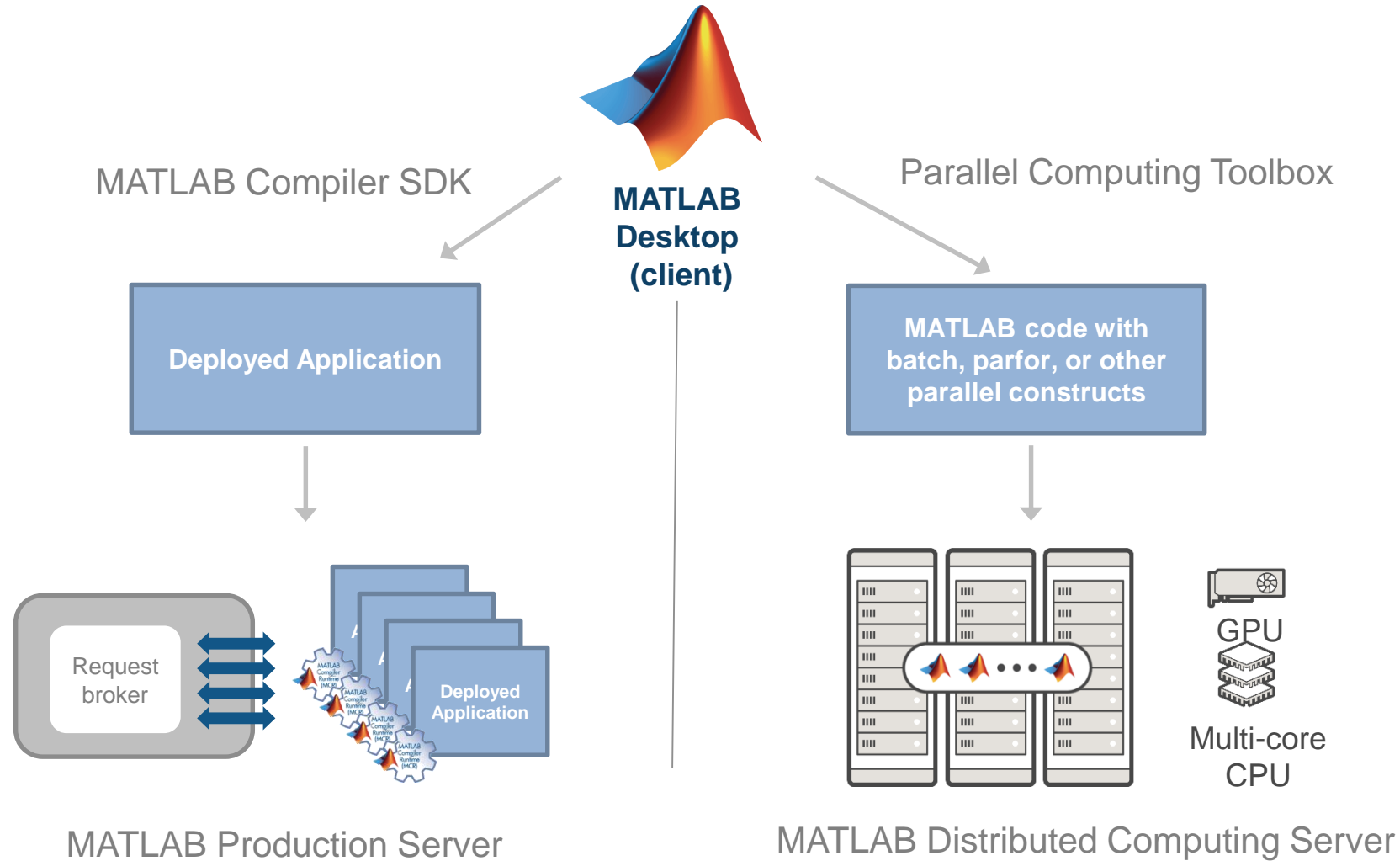
Algorithm Developers

Front-end scalability

- MATLAB Production Server
  - Application server for MATLAB

- Manage large numbers of requests to run short-running deployed MATLAB programs

Back-end scalability

- MATLAB Distributed Computing Server
  - Cluster framework for MATLAB/Simulink

- Speed up computationally intensive programs on computer clusters, clouds, and grids

Scaling Application Access and Computation

MATLAB Compiler SDK

MATLAB Desktop (client)

Parallel Computing Toolbox

Deployed Application

MATLAB code with batch, parfor, or other parallel constructs

Request broker

Deployed Application

GPU

Multi-core CPU

MATLAB Production Server

MATLAB Distributed Computing Server

Scaling Application Access and Computation

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Deployed Application

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Multi-core CPU

MATLAB Production Server

MATLAB Distributed Computing Server

Parallel workers on remote hardware

![MathWorks logo]

MATLAB and MATLAB Distributed Computing Server allow you to

speedup your computations on multiple CPUs and GPUs
overcome memory limitations and
offload computations to **clusters and clouds**.

Desktop   **Clusters and Clouds**

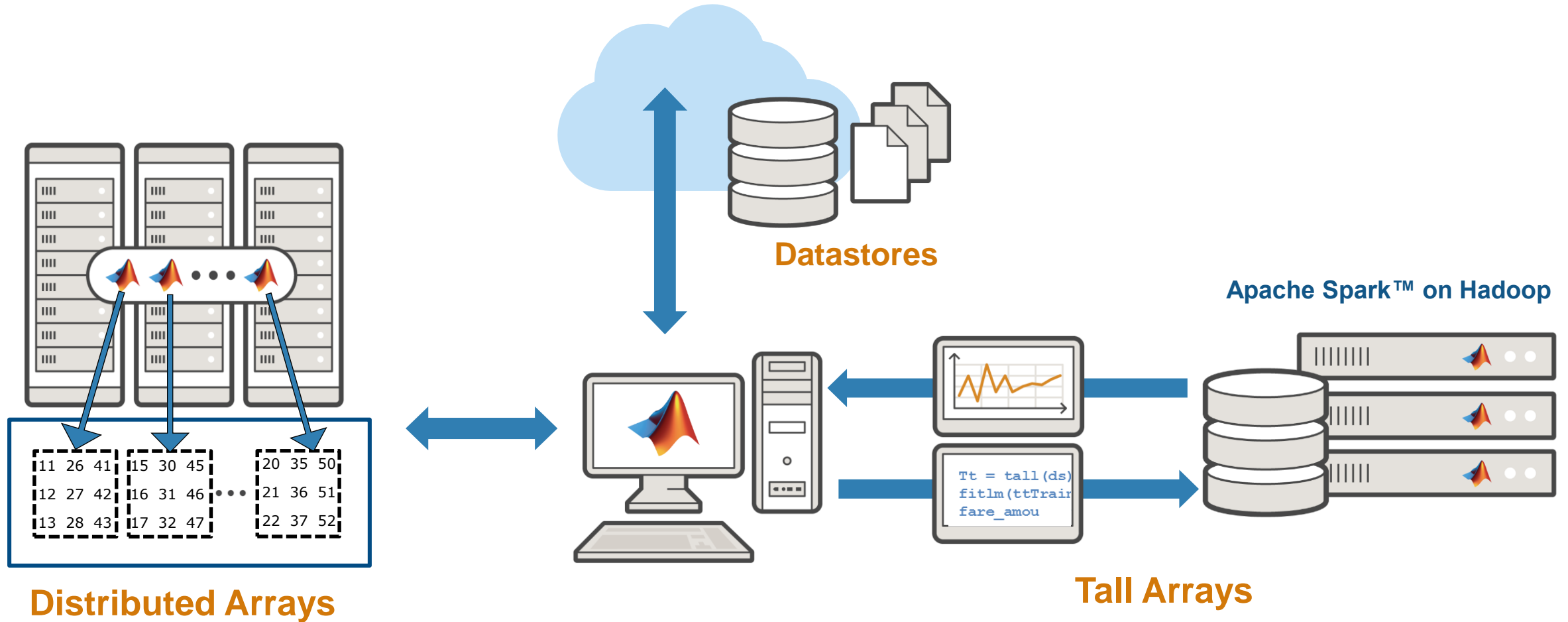# MATLAB Distributed Computing Server Benefits

Domain Expert

Solution Architect

✓ Transparently get access to more workers on a cluster.

✓ Get access to advanced parallel workflows directly through their MATLAB desktop.
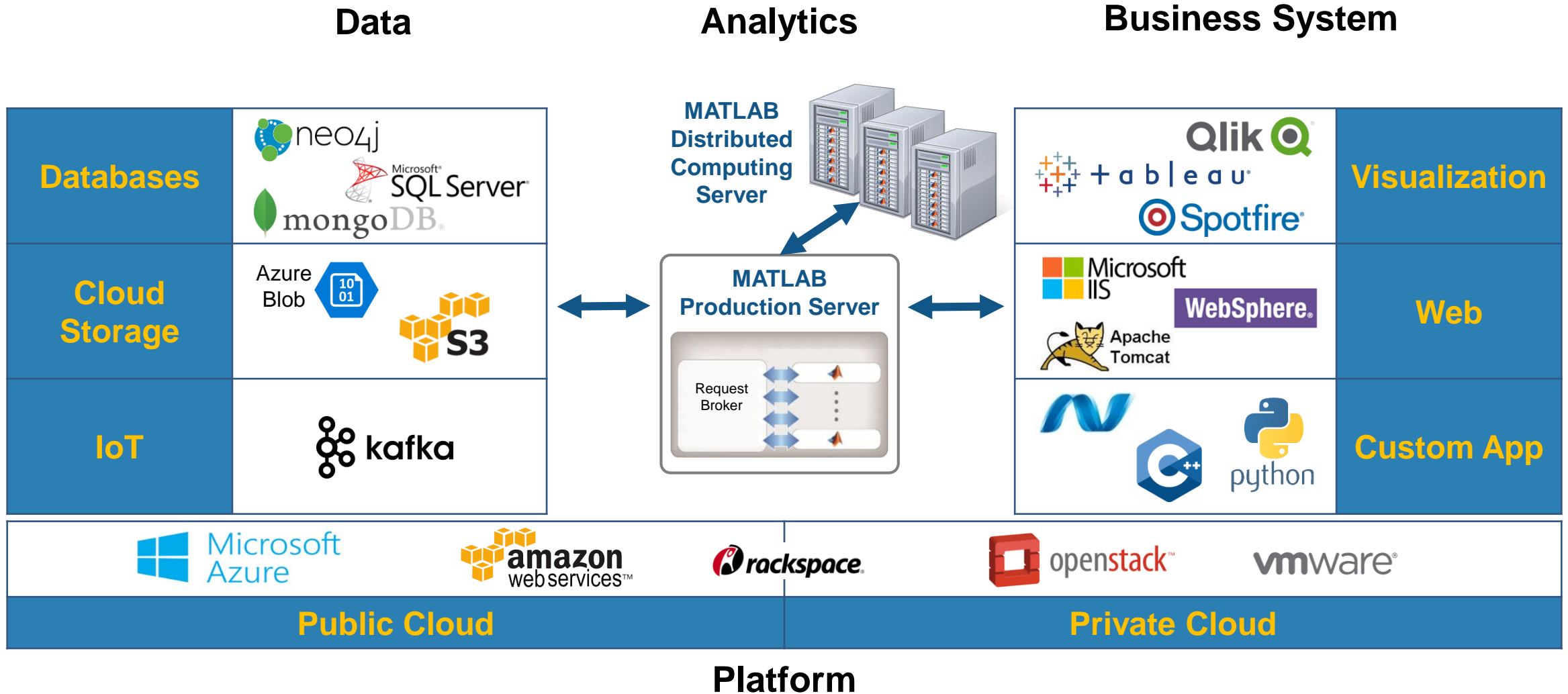
✓ Platform independence (win, mac, linux)

✓ Don't need to build a framework for submission and retrieval.

✓ Can easily scale up with more workers

✓ Client connections can be protected with SSL encryption
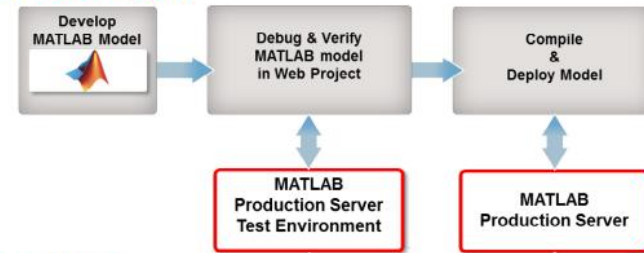
Data Intensive: Big Data support in MATLAB

Datastores

Apache Spark™ on Hadoop

```
Tt = tall(ds)
fitlm(ttTrain
fare_amou
```

Distributed Arrays

11	26	41		15	30	45		20	35	50
12	27	42		16	31	46		21	36	51
13	28	43		17	32	47		22	37	52

Tall Arrays

Technology Stack

Data **Analytics** **Business System**

| Databases | Cloud Storage | IoT | | Visualization | Web | Custom App |

Online Resources

- Documentation – [Create and Share Toolboxes](#)

- Website – [Desktop and Web Deployment](#)

- Free White Paper – [Building a Website with MATLAB Analytics](#)

- Website – [Using MATLAB With Other Programming Languages](#)