MATLAB EXPO 2017
Integrate MATLAB Analytics into Enterprise Applications

Dr. Roland Michaely
Data Analytics Workflow

Access and Explore Data

Preprocess Data

Develop Predictive Models

Integrate Analytics with Systems

Business Data

Sensor Data

Data Reduction/Transformation

Feature Extraction

Model Creation

Model Validation

Enterprise Systems

Embedded Devices

MATLAB: Single Platform
Challenges

▪ Bridging the gap between multiple disciplines

▪ Integrate solutions to enterprise scale frameworks

▪ Deliver fast results with large volumes of data
Bridging the Gap between...

Application

Domain Expert

C/C++ shared library

Java

.NET

Python

Manual translation

with automated deployment

Enterprise solution

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

MATLAB

Compilers

Coders

With MATLAB Users

With People Who Do Not Have MATLAB

MATLAB Runtime
Share with People Who Do Not Have MATLAB

- Share Applications with No Additional Programming

MATLAB Compiler

- Standalone Application
- Excel Add-in
- Hadoop Spark
- C/C++ shared library
- Java
- .NET
- Python

MATLAB Compiler SDK

- MATLAB Production Server

Integrate MATLAB-based Components With Your Own Software

- Royalty-free Sharing
- IP Protection via Encryption

MATLAB Runtime
Integrate MATLAB-based Components With Your Own Software

MATLAB

Toolboxes

MATLAB Compiler SDK

1. Application Author

2. Software Developer

3. MATLAB Production Server

4. MATLAB Runtime

Integrate MATLAB-based Components With Your Own Software
Using MATLAB Compiler SDK to create Java Classes
Using MATLAB Compiler SDK to create Java Classes
MATLAB and MATLAB Production Server is the easiest and most productive environment to take your enterprise analytics or IoT solution from idea to production.
Energy Load Forecast

Select Zone

Forecast

Comparison

Plattsburgh International Airport
Station ID: KBPG
Contributes to zones: NYISO D-North(100%)/NYISO F-Capitol(5%)
Weather forecast

Forecast
Normal

Forecast
10% Confidence Bands

Temperature °F
40 50 60 70 80

6p 9a 12p 3p 6p 9a 12p 3p
Energy Load Forecast

MATLAB Desktop
- Train in MATLAB
  - Predictive Models

MATLAB Runtime
- LIBRARY
  - Energy Data
  - Weather Data

Web Application Server
- Apache Tomcat
  - Web Server/Webservice

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- Web Application
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Energy Load Forecast

MATLAB Desktop
Train in MATLAB
Predictive Models

MATLAB Runtime
LIBRARY

Web Application Server
Apache Tomcat
Web Server/Webservice

Energy Data
Weather Data

Multiple users
Energy Load Forecast

MATLAB Desktop
- Train in MATLAB

Predictive Models

MATLAB Production Server
- MATLAB Production Server
- Request Broker
- LIBRARY

Energy Data
- Weather Data

Web Application Server
- Apache Tomcat
- Web Server/Webservice

Multiple users
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)
Manage Your Server Instances Using a Dashboard Interface
Building Automation IoT Analytics on Azure

Building/HVAC automation control system
- Variety of sensors and controls
- Networked communication
- Data reduction

Global heavy duty electrical equipment manufacturer

MATLAB Production Server
- Azure EventHub
- Azure Blob
- Azure SQL
- MATLAB Compiler SDK

Microsoft Azure

Business Systems
- Users
- Algorithm Developers

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Technology Stack

Data
- Databases
  - neo4j
  - MongoDB
  - SQL Server
- Cloud Storage
  - Azure Blob
  - S3
- IoT

Analytics
- MATLAB Distributed Computing Server
- MATLAB Production Server
- Request Broker

Business System
- Visualization
  - Qlik
  - Tableau
  - Spotfire
- Web
  - Microsoft IIS
  - WebSphere
- Custom App
  - Apache Tomcat
  - Python

Platform
- Public Cloud
- Private Cloud

Cloud
- Azure
- AWS
- OpenStack
- VMware
MATLAB and MATLAB Distributed Computing Server allow you to **speed up** your computations on multiple CPUs and GPUs, **overcome** memory limitations, and **offload** computations to clusters and clouds.
Front-end Scalability

**MATLAB Production Server**
- Application server for MATLAB
  
  - Manage large numbers of requests to run 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
Parallel Computing Paradigm

Clusters
Speed-up using Multiple Cores on the Cloud
High Resolution Image Processing
Big Data Workflow

Process out-of-memory data on your Desktop to explore, analyze, gain insights and to develop analytics.

Use Parallel Computing Toolbox for increased performance.

Run on Compute Clusters or Spark + Hadoop (HDFS), for large scale analysis.

MATLAB Distributed Computing Server, Spark+Hadoop.
Scale your Applications Beyond the Desktop

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>Explicit desktop scaling</td>
<td>Single-user, basic scaling to cloud</td>
<td>Scale to EC2 with some customization</td>
<td>Scale to custom cloud</td>
<td>Scale to clusters</td>
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<tr>
<td><strong>Maximum workers</strong></td>
<td>No limit</td>
<td>16</td>
<td>256</td>
<td>No limit</td>
<td>No limit</td>
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<tr>
<td><strong>Hardware</strong></td>
<td>Desktop</td>
<td>MathWorks Compute Cloud</td>
<td>Amazon EC2</td>
<td>Amazon EC2, Microsoft Azure, Others</td>
<td>Any</td>
</tr>
<tr>
<td><strong>Availability</strong></td>
<td>Worldwide</td>
<td>United States and Canada</td>
<td>United States, Canada and other select countries in Europe</td>
<td>Worldwide</td>
<td>Worldwide</td>
</tr>
</tbody>
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Learn More: [Parallel Computing on the Cloud](https://www.mathworks.com)
Customer Example: Financial Customer Advisory Service

Global financial institution with European HQ

- Saved **€ 2 million annually** for an external system
- Quicker implementation of adjustments in source code by the quantitative analysts
- Knowledge + MATLAB = Build your own systems
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