MATLAB EXPO 2017
Integrate MATLAB Analytics into Enterprise Applications

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Data Analytics Workflow

Access and Explore Data
- Business Data
- Sensor Data

Preprocess Data
- Data Reduction/Transformation
- Feature Extraction

Develop Predictive Models
- Model Creation
- Model Validation

Integrate Analytics with Systems
- 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

Manual translation

with automated deployment

Solution Architect

Enterprise solution

C/C++ shared library
Java
.NET
Python
Sharing and Deploying MATLAB Applications
Write Your Programs Once, Then Share to Different Targets

MATLAB

Compilers

Coders

MATLAB Runtime

With MATLAB Users

With People Who Do Not Have MATLAB
Share with People Who Do Not Have MATLAB

- Share Applications with No Additional Programming
- Integrate MATLAB-based Components With Your Own Software

- MATLAB Compiler
- MATLAB Compiler SDK
- Standalone Application
- Excel Add-in
- Hadoop Spark
- C/C++ shared library
- Java
- .NET
- Python
- MATLAB Production Server

- MATLAB Runtime

- Royalty-free Sharing
- IP Protection via Encryption
Integrate MATLAB-based Components With Your Own Software

MATLAB
Toolboxes

1. Application Author

2. MATLAB Compiler SDK
   - C/C++
   - .NET
   - Python
   - Java
   - MATLAB Production Server

3. Software Developer

4. MATLAB Runtime

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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

Plattsburgh International Airport
Station ID: KPBG
Contributes to zones: NYISO D-North (100%), NYISO F-Cap (5%)
Weather forecast

Comparison
Energy Load Forecast

MATLAB Desktop
Train in MATLAB

MATLAB Runtime
LIBRARY

Web Application Server
Apache Tomcat
Web Server/Webservice

Predictive Models

Energy Data
Weather Data
Energy Load Forecast

MATLAB Desktop
  Train in MATLAB

MATLAB Runtime
  Library
  Energy Data
  Weather Data

Web Application Server
  Apache Tomcat
  Web Server/Webservice

Multiple users
Energy Load Forecast

MATLAB Desktop
- Train in MATLAB

MATLAB Production Server
- Predictive Models
- LIBRARY
- MATLAB Production Server
- Request Broker

Web Application Server
- Energy Data
- Weather Data
- Apache Tomcat
- Web Server/Webservice
- LIBRARY

Multiple users

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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

Request Broker

Azure EventHub

Azure Blob

Azure SQL

MATLAB Compiler SDK

MATLAB

Business Systems

Users

Algorithm Developers
Technology Stack

Data

Databases
- neo4j
- MongoDB

Cloud Storage
- Azure Blob
- S3

IoT

Analytics

MATLAB Distributed Computing Server

MATLAB Production Server

Request Broker

Business System

Visualization

Qlik

Web

Microsoft IIS

Custom App

Python

Public Cloud

Private Cloud

Platform

Microsoft Azure

OpenStack

VMware

Amazon Web Services
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.
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

Serial computation
Parallel computation on 12 workers

Computation time 79.28 seconds
Computation time 13.85 seconds
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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</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>
</tr>
<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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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

Customer Example: Financial Customer Advisory Service

- Algorithm Developers
- MATLAB
- MATLAB Compiler SDK
- MATLAB Production Server
- Request Broker
- Request Broker
- Request Broker
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