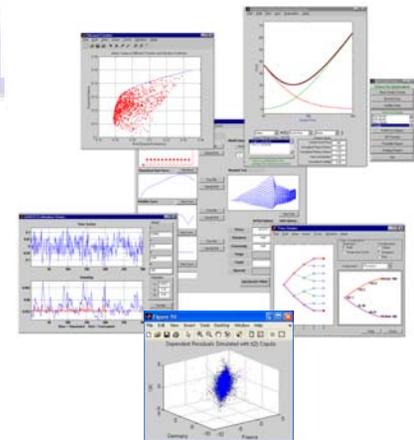


MATLAB & Financial Services

Eugene McGoldrick



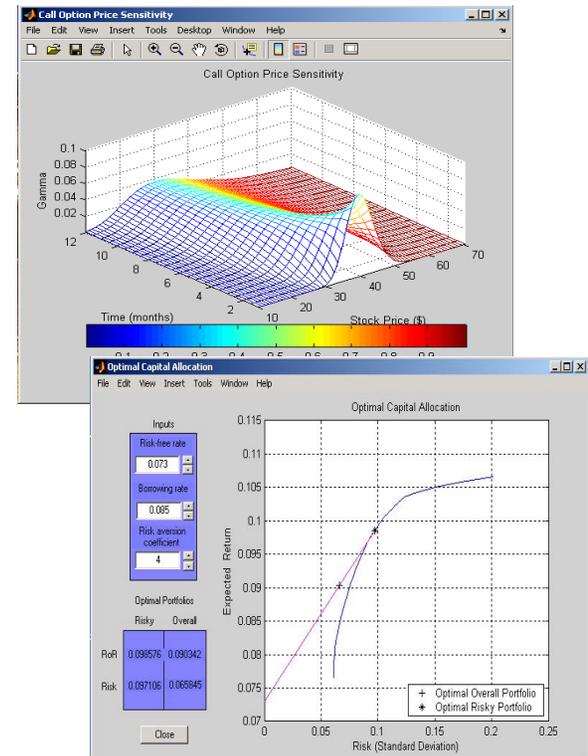
MATLAB & Finance

10 years ago

- Financial market was an incubation market for The MathWorks.
- MATLAB and The MathWorks did not have name recognition in the industry.
- Refocused the group and redirected the development efforts to establish the product line as a leading development environment for the financial services industry.

Today

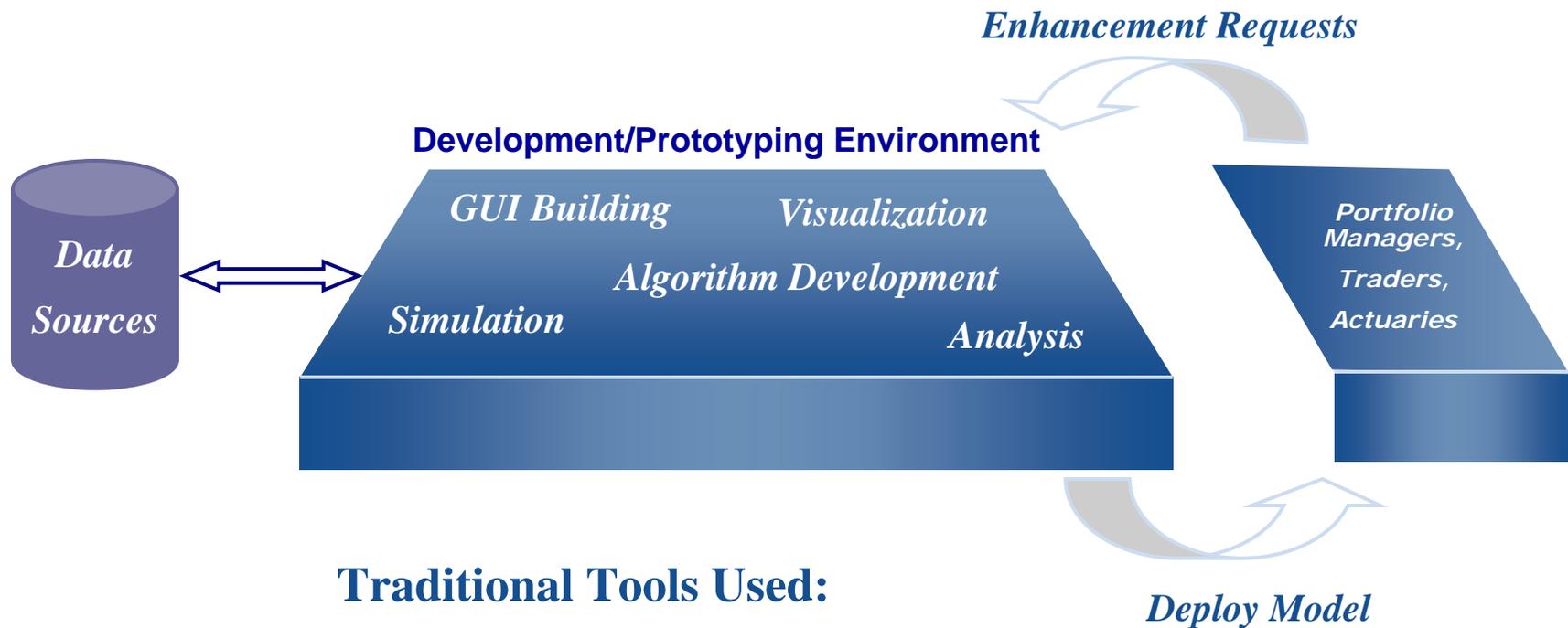
- Financial market is the 4th largest Industry for the MathWorks
- MATLAB is now recognized as one of the leading financial development platforms.
- 3rd party vendors constantly talk to us about integrating into the MATLAB platform.



Why MATLAB is used in Financial Industry

- **Faster model development in MATLAB.**
 - Large set of available functions enable the user to build models much more rapidly.
 - Viewable source code enables users to modify functions and include proprietary business rules.
- **Greater scalability with MATLAB.**
 - MATLAB can handle larger data sets than Excel.
- **Reuse their existing libraries within MATLAB.**
- **Migration path from the customers existing environment to MATLAB.**
- **Ability to integrate MATLAB models into production systems.**

Financial Model/Algorithm Development



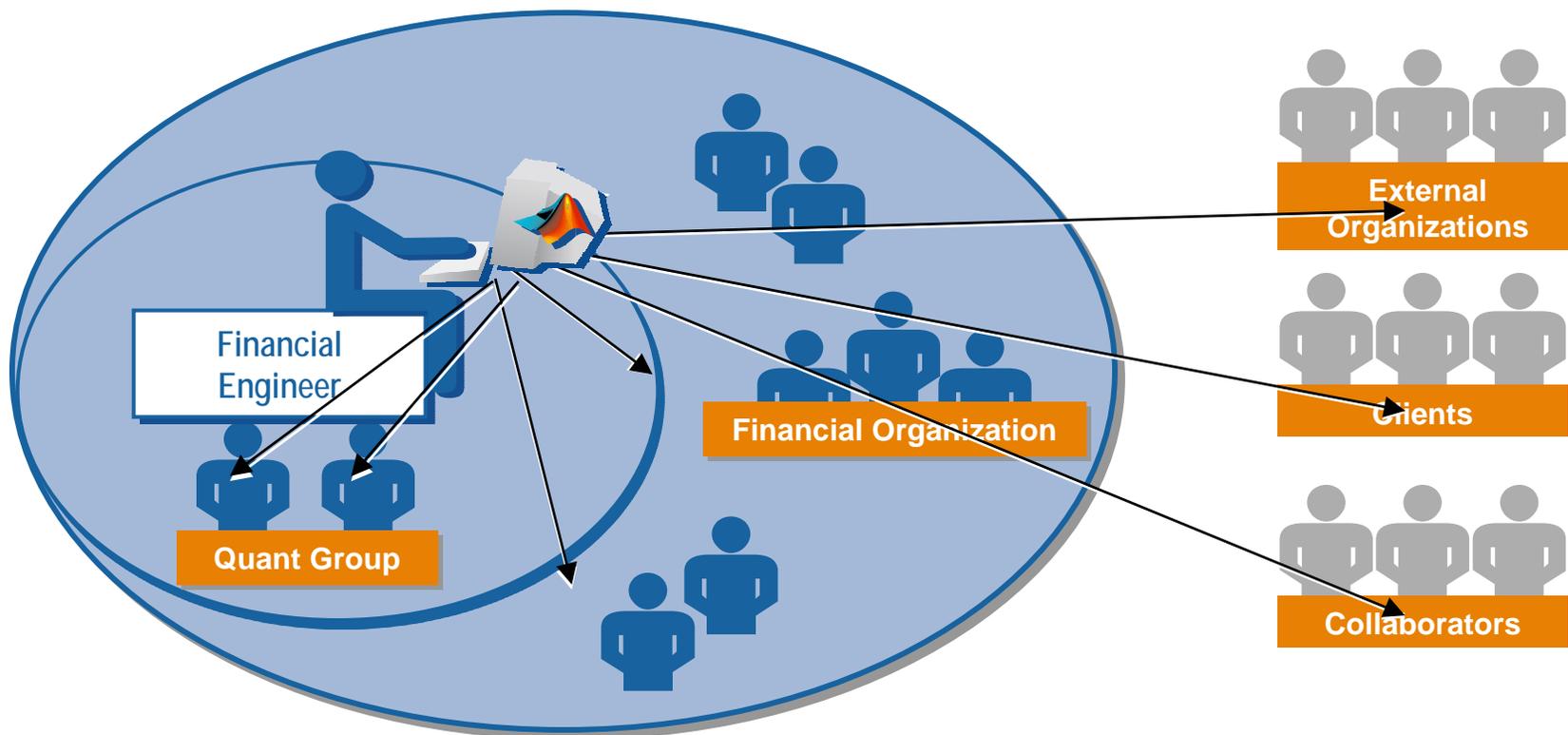
Traditional Tools Used:

- Excel
- VB
- C/C++
- Third Party Libraries

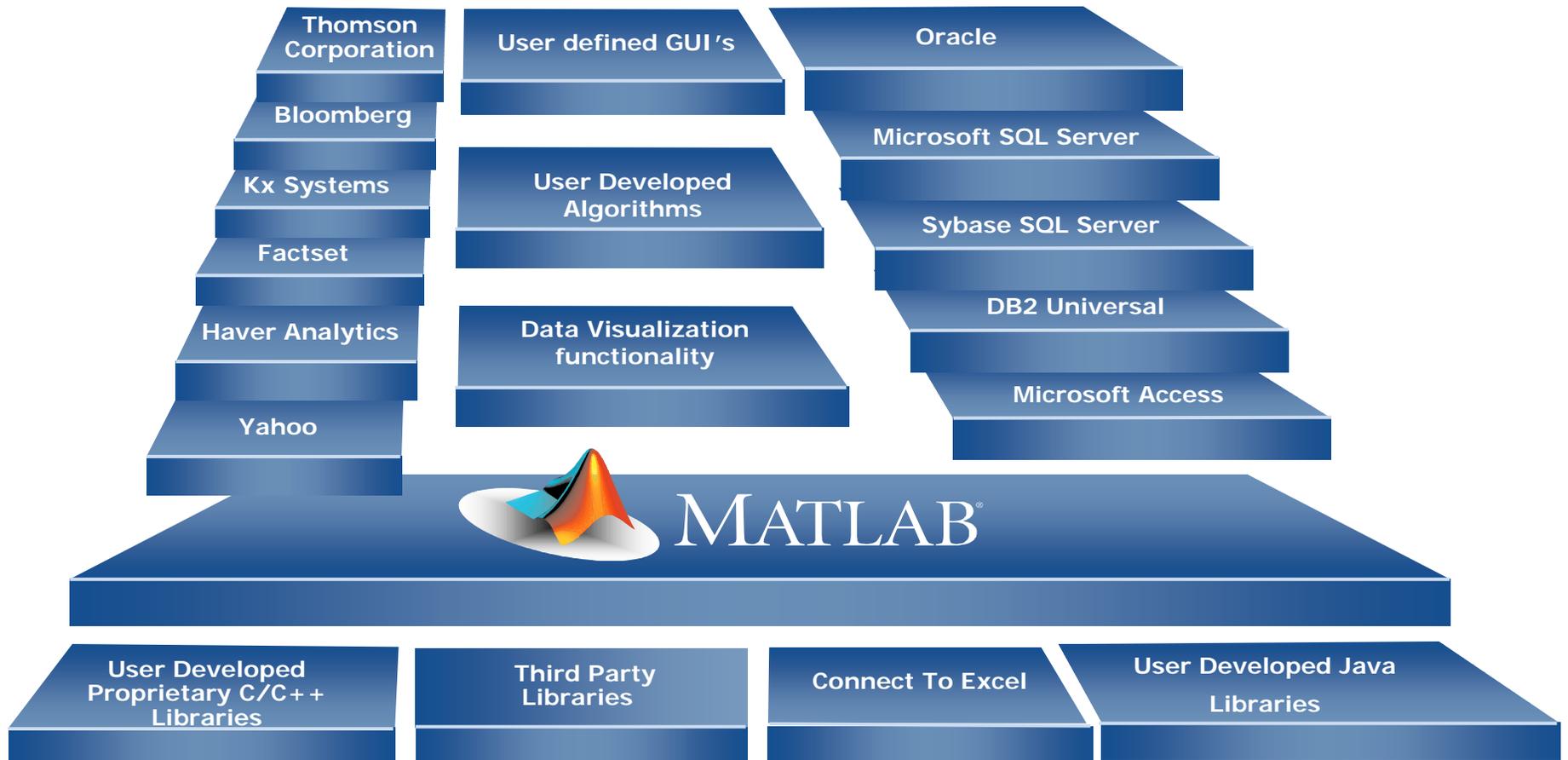
Building a Financial Modeling Platform

- **Goals:**
 - **Enable customers to rapidly develop and deploy MATLAB applications onto the desktop.**
 - **Seamlessly integrate MATLAB generated components into other languages, applications and production systems.**

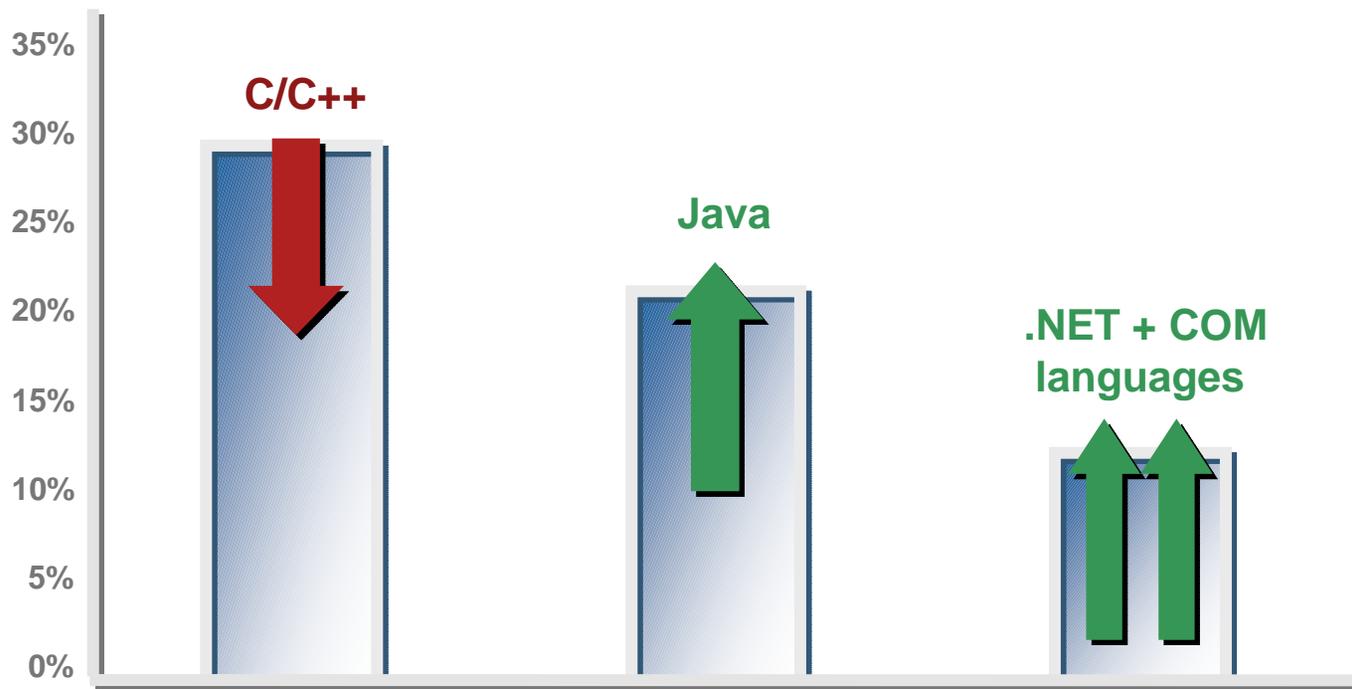
MATLAB: A Financial Engineering Platform



MATLAB: A Financial Engineering Platform

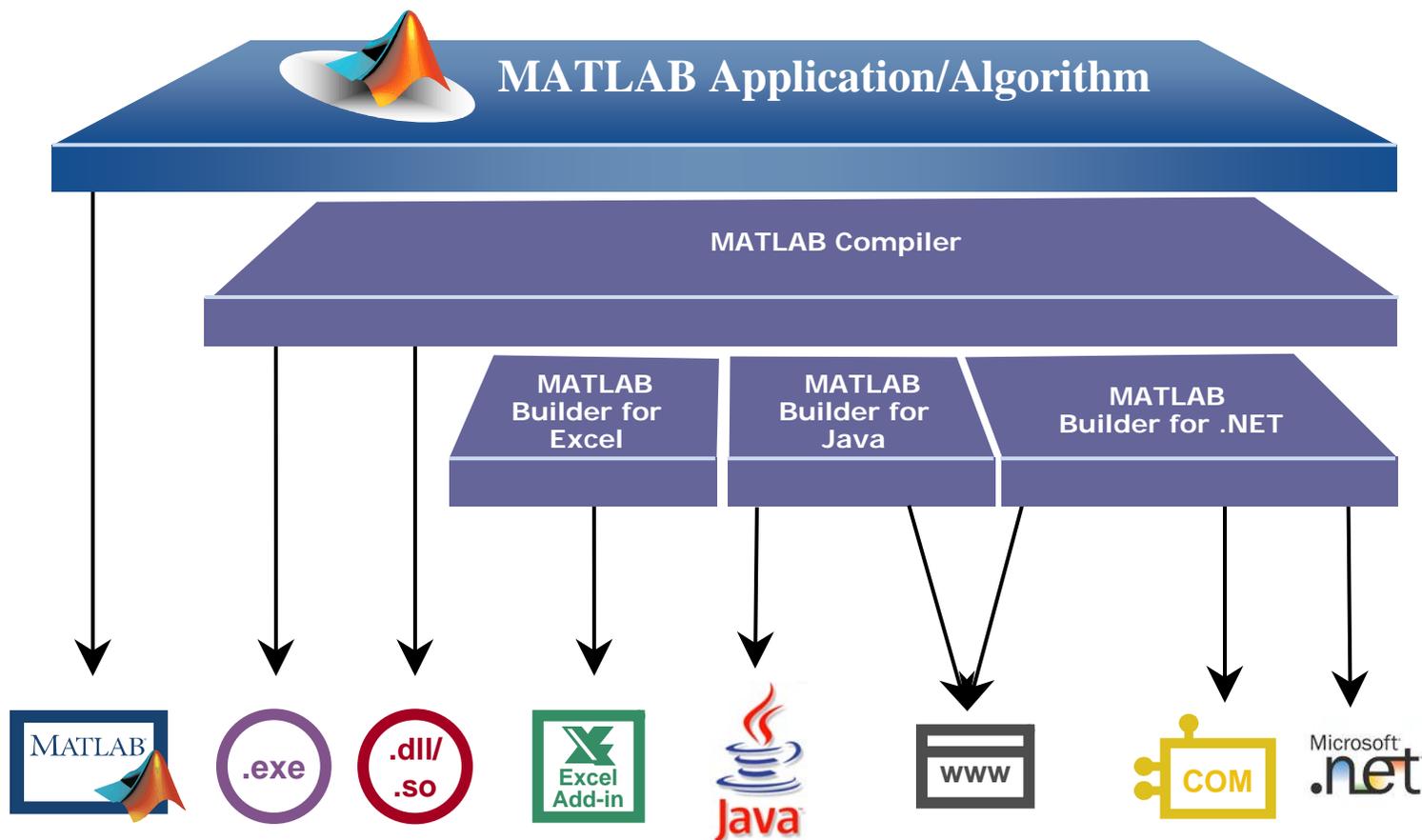


Programming Languages: C/C++ share declining while .NET and Java grow

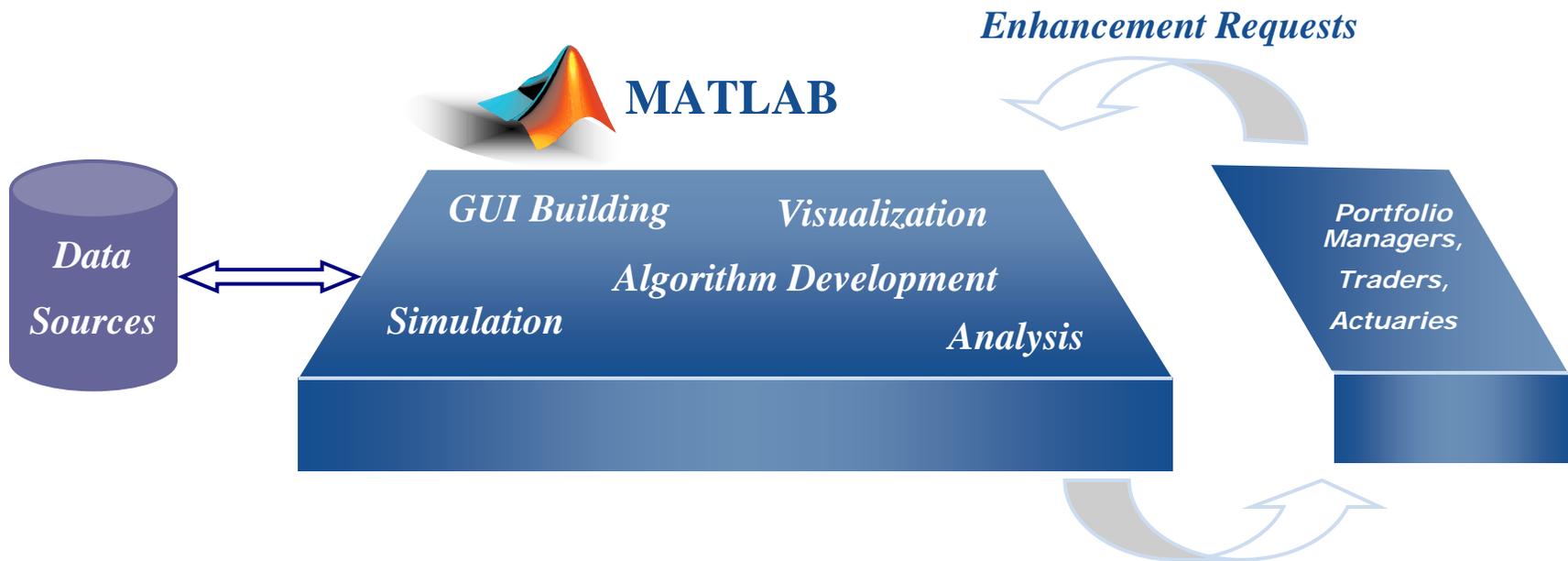


(Arrows Show Trend From 2004 to 2005)

Deploying to Multiple Targets

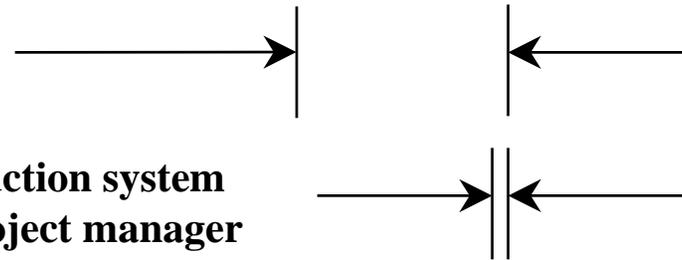


Deploying with MATLAB

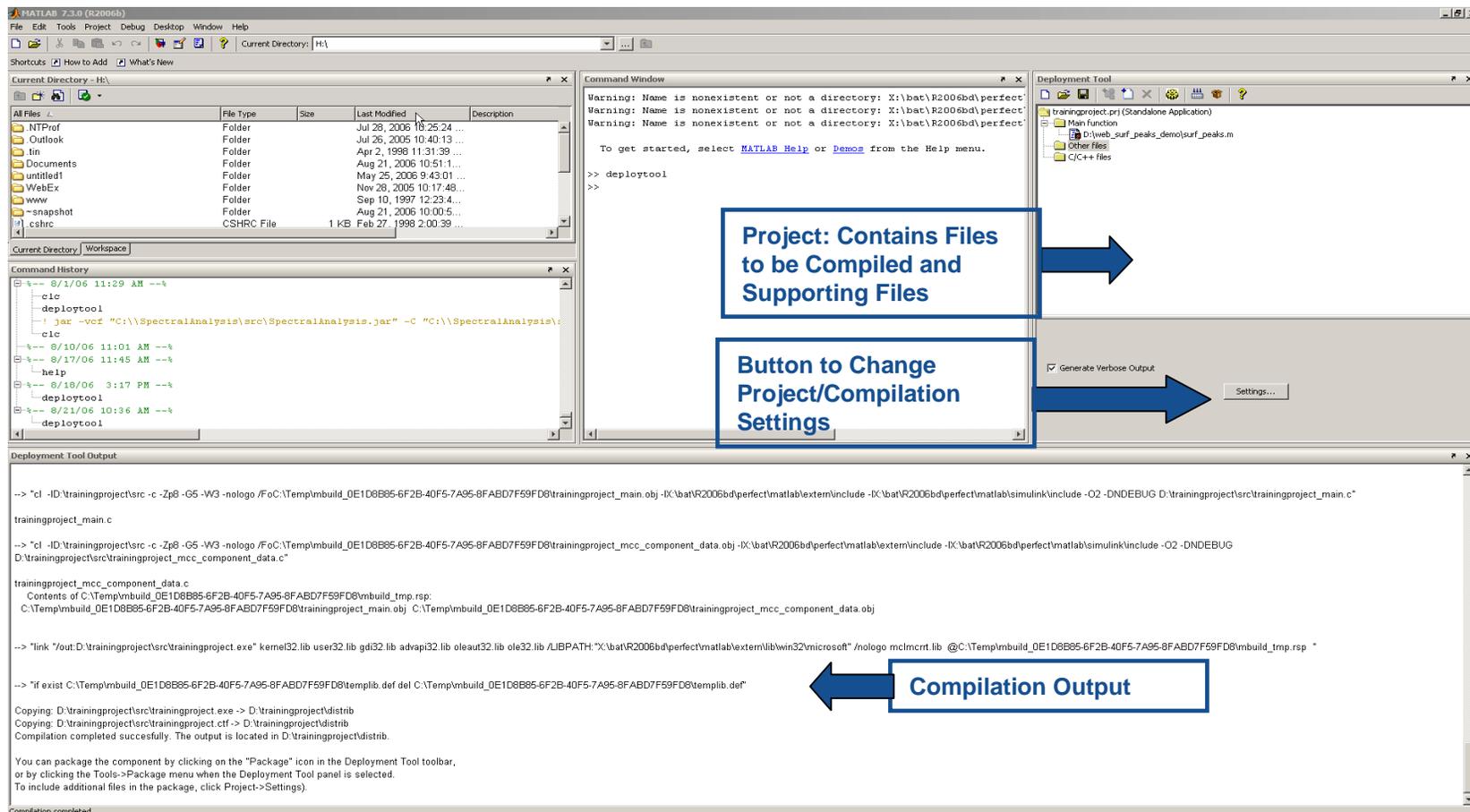


Traditional prototype to production system port
 ... development timeline **2 weeks ~ 6+ months**

MATLAB prototype to production system
 ... Push button in the new project manager



2006b: Compiler Project Files



The screenshot displays the MATLAB 7.3.0 (R2006b) environment. The **Deployment Tool** window is active, showing a project named 'trainingproject.pri (Standalone Application)'. The **Command Window** shows the execution of the `deploytool` command, which generates a compilation command. The **Deployment Tool Output** window shows the resulting compilation command and its successful execution.

Annotations:

- Project: Contains Files to be Compiled and Supporting Files**: Points to the project tree in the Deployment Tool.
- Button to Change Project/Compilation Settings**: Points to the `Settings...` button in the Deployment Tool.
- Compilation Output**: Points to the output text in the Deployment Tool Output window.

Command Window Output:

```
>> deploytool
>>
```

Deployment Tool Output:

```
--> "cl -ID:\trainingproject\src -c -Zp8 -G5 -W3 -nologo /Foc:\Temp\mbuild_0E1D8B85-6F2B-40F5-7A95-8FABD7F59FD8\trainingproject_main.obj -IK:\batR2006b\perfect\matlab\extern\include -IK:\batR2006b\perfect\matlab\simulink\include -O2 -DNDEBUG D:\trainingproject\src\trainingproject_main.c"
trainingproject_main.c
--> "cl -ID:\trainingproject\src -c -Zp8 -G5 -W3 -nologo /Foc:\Temp\mbuild_0E1D8B85-6F2B-40F5-7A95-8FABD7F59FD8\trainingproject_mcc_component_data.obj -IK:\batR2006b\perfect\matlab\extern\include -IK:\batR2006b\perfect\matlab\simulink\include -O2 -DNDEBUG D:\trainingproject\src\trainingproject_mcc_component_data.c"
trainingproject_mcc_component_data.c
Contents of C:\Temp\mbuild_0E1D8B85-6F2B-40F5-7A95-8FABD7F59FD8\mbuild_tmp_rsp:
C:\Temp\mbuild_0E1D8B85-6F2B-40F5-7A95-8FABD7F59FD8\trainingproject_main.obj C:\Temp\mbuild_0E1D8B85-6F2B-40F5-7A95-8FABD7F59FD8\trainingproject_mcc_component_data.obj
--> "link /out:D:\trainingproject\src\trainingproject.exe" kernel32.lib user32.lib gdi32.lib advapi32.lib oleaut32.lib ole32.lib /LIBPATH:"X:\batR2006b\perfect\matlab\extern\lib\win32\microsoft" /nologo mclmcrnt.lib @C:\Temp\mbuild_0E1D8B85-6F2B-40F5-7A95-8FABD7F59FD8\mbuild_tmp_rsp *
--> "if exist C:\Temp\mbuild_0E1D8B85-6F2B-40F5-7A95-8FABD7F59FD8\temp\lib.def del C:\Temp\mbuild_0E1D8B85-6F2B-40F5-7A95-8FABD7F59FD8\temp\lib.def"
Copying: D:\trainingproject\src\trainingproject.exe -> D:\trainingproject\distrib
Copying: D:\trainingproject\src\trainingproject.ctf -> D:\trainingproject\distrib
Compilation completed successfully. The output is located in D:\trainingproject\distrib.

You can package the component by clicking on the "Packages" icon in the Deployment Tool toolbar,
or by clicking the Tools->Package menu when the Deployment Tool panel is selected.
To include additional files in the package, click Project->Settings).

Compilation completed
```

Future Directions

- **Strengthen and improve financial products**
 - Incorporate the customer feedback over the next several product releases
 - New financial functionality
 - Data Sources

- **Compiler & Builder upgrades**
 - Continued focus on easier deployment
 - Java Builder
 - .Net Builder
 - Excel Builder

MATLAB: Building the Platform



Continued Development of the
Compiler Project Manager

Increasing number of data providers supported
Currently have 6 new vendors in process

Web Downloadable MCR's

Support for international trading schedules using
FinancialCalendar.com data

Builder Enhancements to enable
scalable web solutions

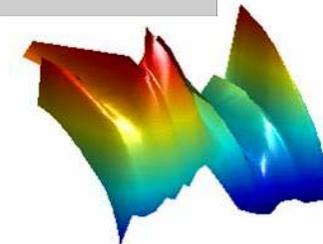
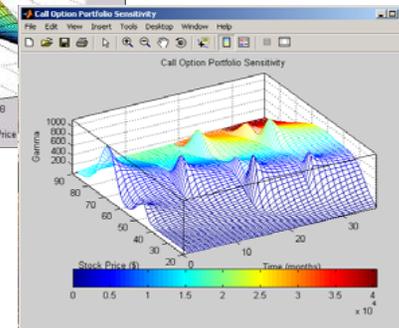
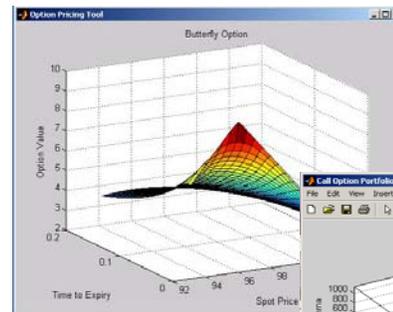
Increasing Derivatives coverage Swaptions, Digital
Options on the way with more to follow.

More Complex demos, examples and a
complete documentation rewrite

Increasing Fixed Income coverage
New Yield Curve Models,
CDO and CMO functionality to follow

Future Plans ... Customer Feedback

- **Developers attended marketing seminars and customer visits worldwide over the last ten years.**
- **The Financial Development Team held Customer Focus Group meetings in**
 - **2004**
 - **Boston**
 - **New York**
 - **London**
 - **2005**
 - **Zurich.**
 - **2007**
 - **Chicago.**
 - **2008**
 - **Europe (Venue TBD)**
- **Work with leading professors in business schools.**



Componentization .. Embed MATLAB algorithms Across the Enterprise

