MATLAB EXPO 2016

Developing and Sharing MATLAB Apps and Toolboxes

David Sampson
MathWorks Consulting

MATLAB talks at EXPO today

"The Adoption of MATLAB Apps and Toolboxes at Jaguar Land Rover"

David Barry

1400

"Developing and Sharing MATLAB Apps and Toolboxes"

David Sampson

1430

"Developing Robust MATLAB Code and Apps"

Paul Peeling

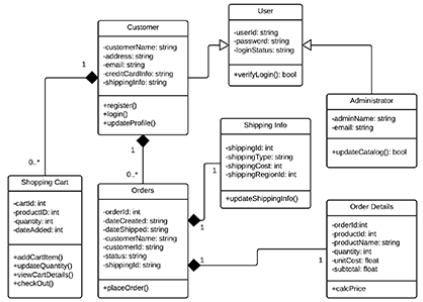
1545

This talk aims to help you…

Design

Organize

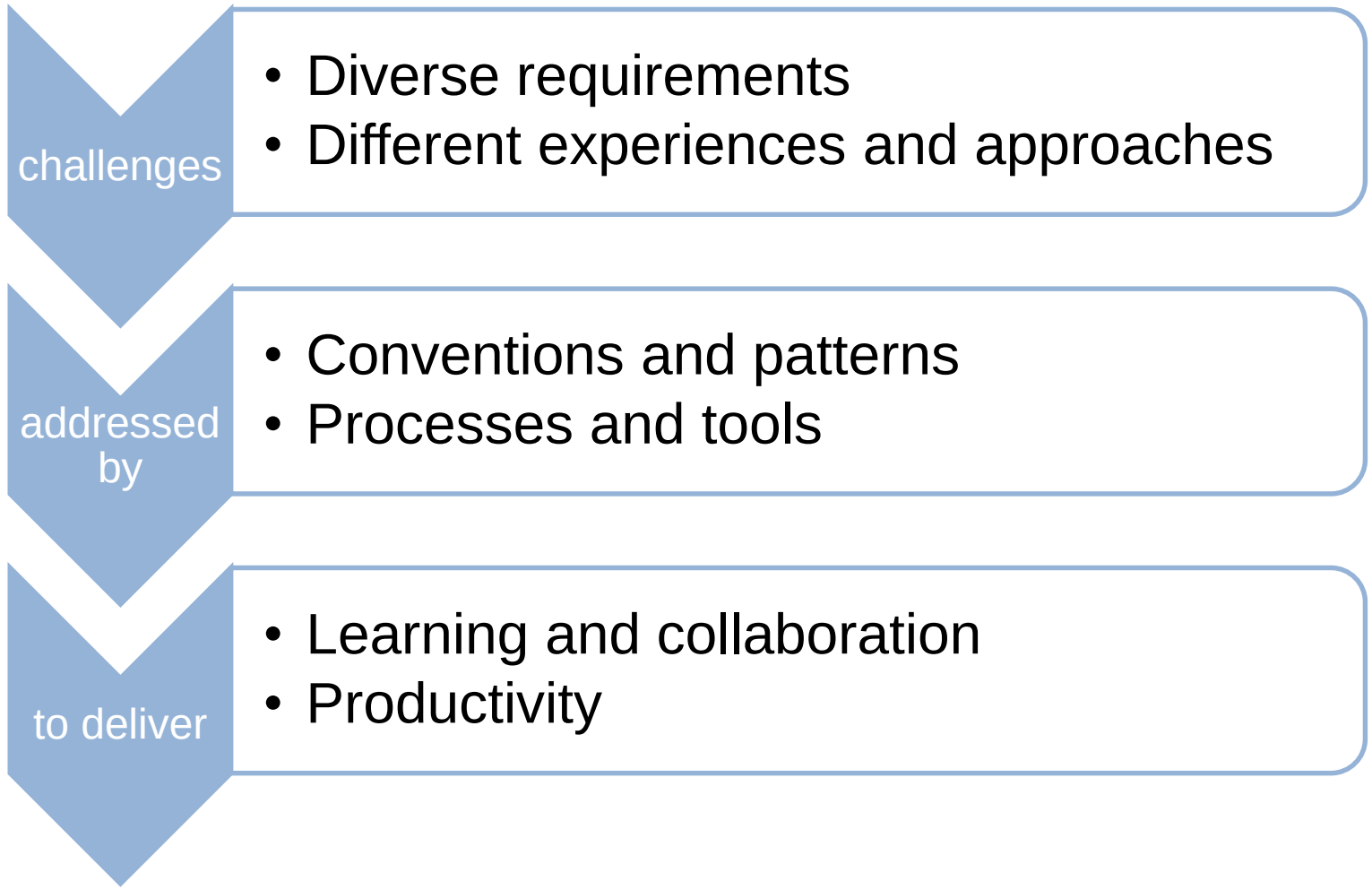
Share



…your MATLAB tools

Why is it difficult to develop and share tools?

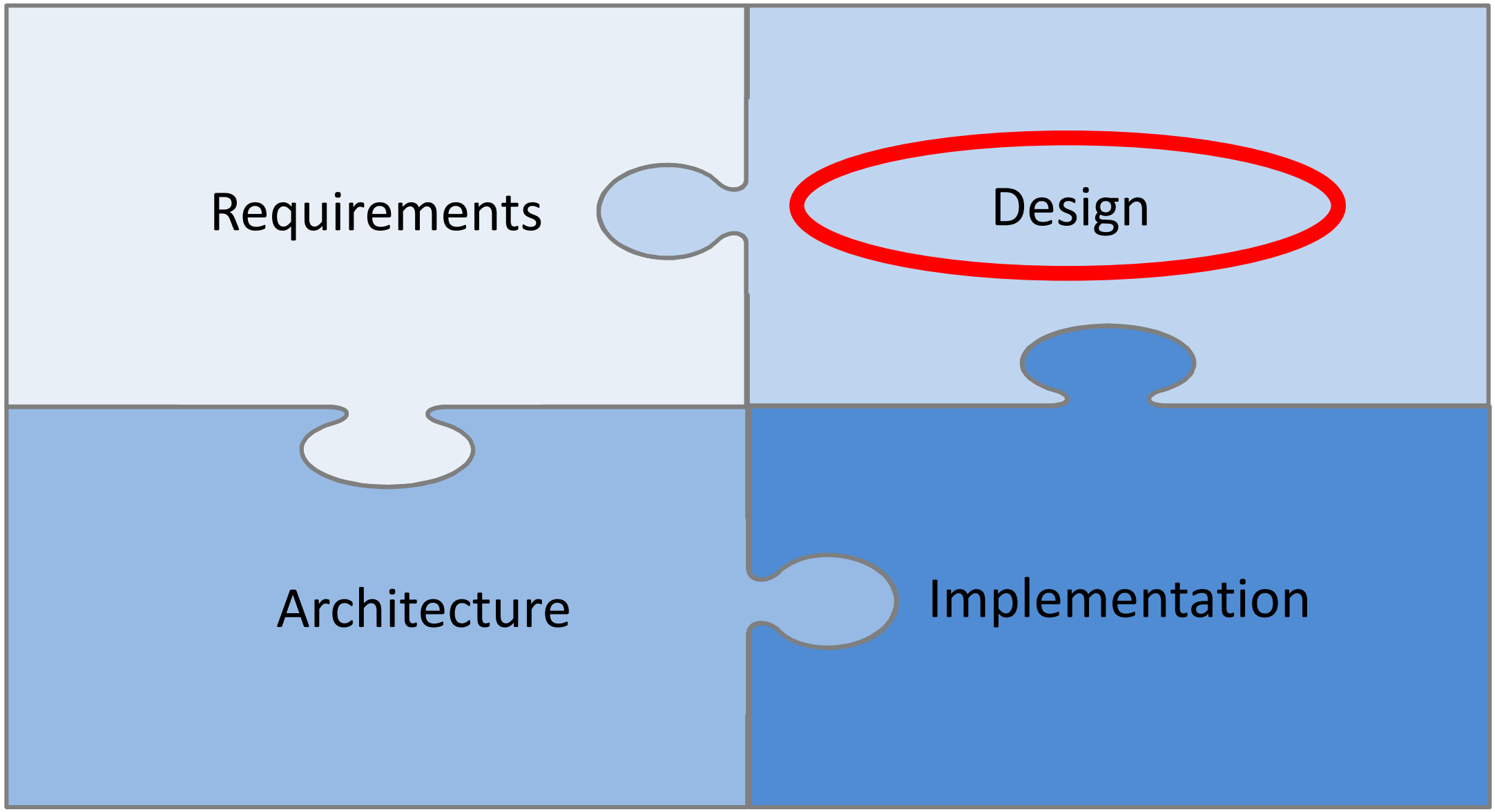
Real-world sharing



Before software can be reusable it first has to be usable.

– Ralph Johnson

Designing MATLAB software



Credit: www.presentationmagazine.com

What makes a good design?

- Easy to learn
- Easy to use
- Easy to read code that uses it
- Provides the required functionality

specific – familiar – concise – expressive

What's in a name? that which we call a rose
By any other name would smell as sweet

– Juliet Capulet

It's OK to figure out murder mysteries, but you shouldn't need to figure out code. You should be able to read it.

– Steve McConnell

There are only two hard things in Computer Science: cache invalidation and naming things.

– Phil Karlton

Naming functions and methods

- lowercase short or camelCase full names
- Verb, verb phrase (for actions)
  - ✓ delete, split
  - ✓ traverseGraph
- Noun, noun phrase (where the noun is the thing being returned)
  - ✓ eig, chebwin
- Avoid empty verbs: compute, get, display, perform, detect, retrieve, extract, return, do, does
  - × computeFFT
- Conversion functions take the form foo2bar or fooToBar
- Readers and writers take the form fooread, barwrite

Naming classes

- lowercase short or camelCase full or MixedCase full names
- Noun, noun phrase (for things)
  - ✓ tf, ss, sym
  - ✓ griddedInterpolant
  - ✓ matlab.ui.eventdata.MouseData
- Adjective, adjective phrase (for mixins)
  - ✓ Selectable
- Avoid prepending “Abstract”
- Avoid appending “Class”

Naming class properties

- MixedCase full names
- Noun, noun phrase
  - ✓ Connection
  - ✓ CornerThreshold
- Verb, verb phrase, adjective, adjective phrase (for logical-valued properties)
  - ✓ ShowLineNumbers
  - ✓ Visible
- Avoid appending qualifiers to denote property value type
  - ✗ ConnectionObject

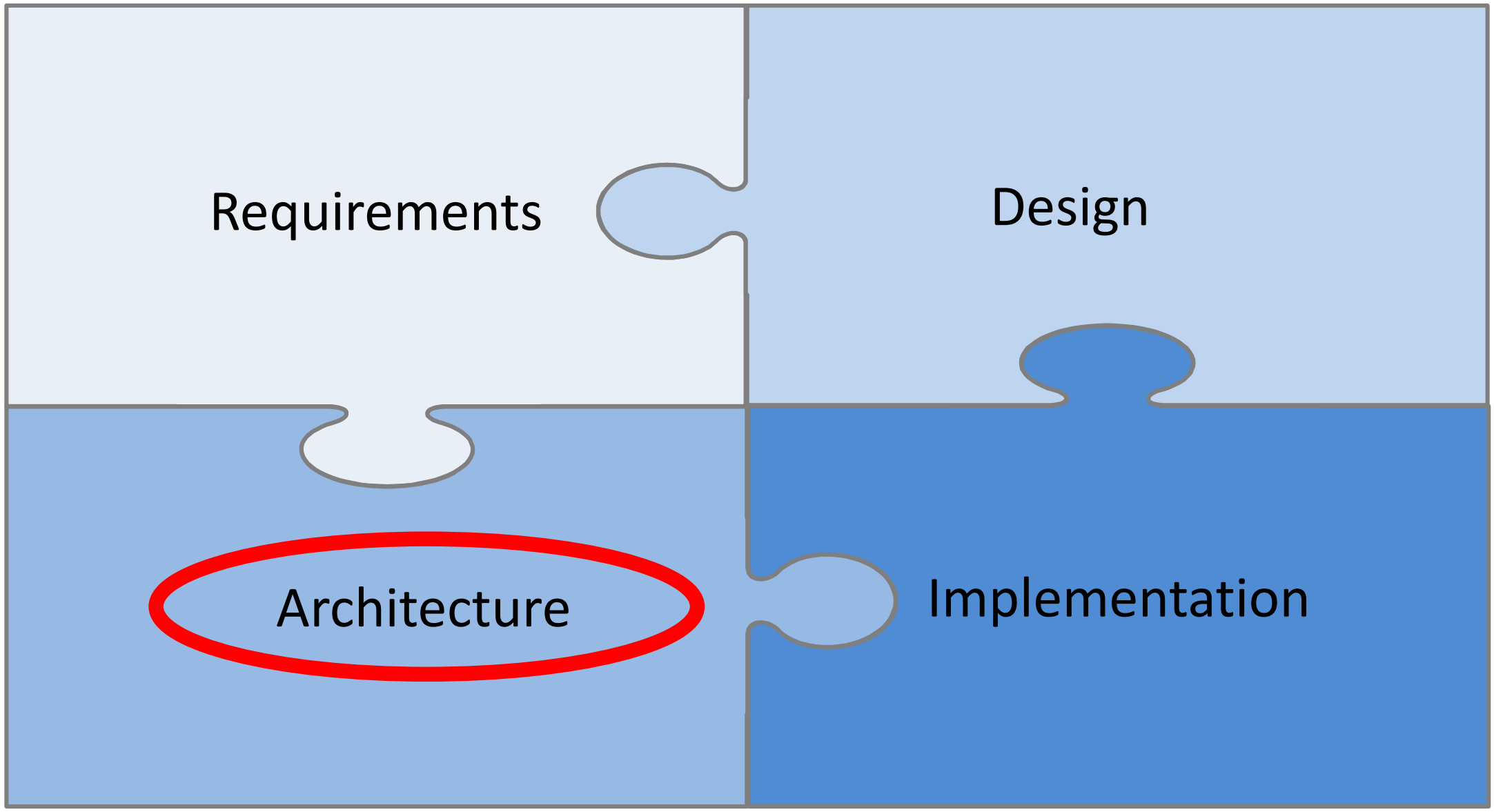
Naming packages

- lowercase short names
- Use root packages to represent “products”
- Use singular not plural
  - ✓ chart.Pie
- Avoid repeating a package name in a subpackage name
  - × foobar.foobarexamples
- Put private classes and functions in an “internal” subpackage

Naming events

- MixedCase full names
- Noun + participle
  - ✓ DeviceAdded
- Gerund + noun
  - ✓ AddingDevice
- Avoid including “to be”
  - ✗ DeviceBeingAdded

Architecting MATLAB software



Credit: www.presentationmagazine.com

… with proper design, the features come cheaply. This approach is arduous, but continues to succeed.

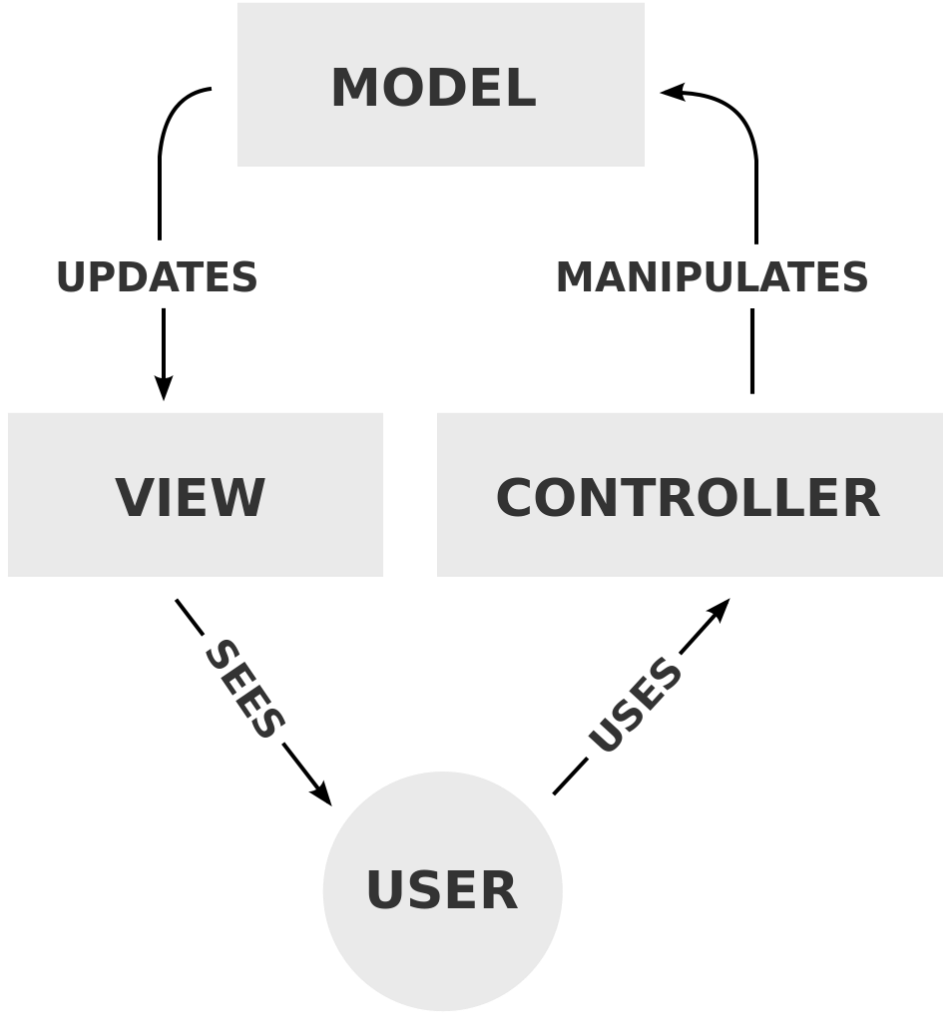
– Dennis Ritchie

If you think good architecture is expensive, try bad architecture.

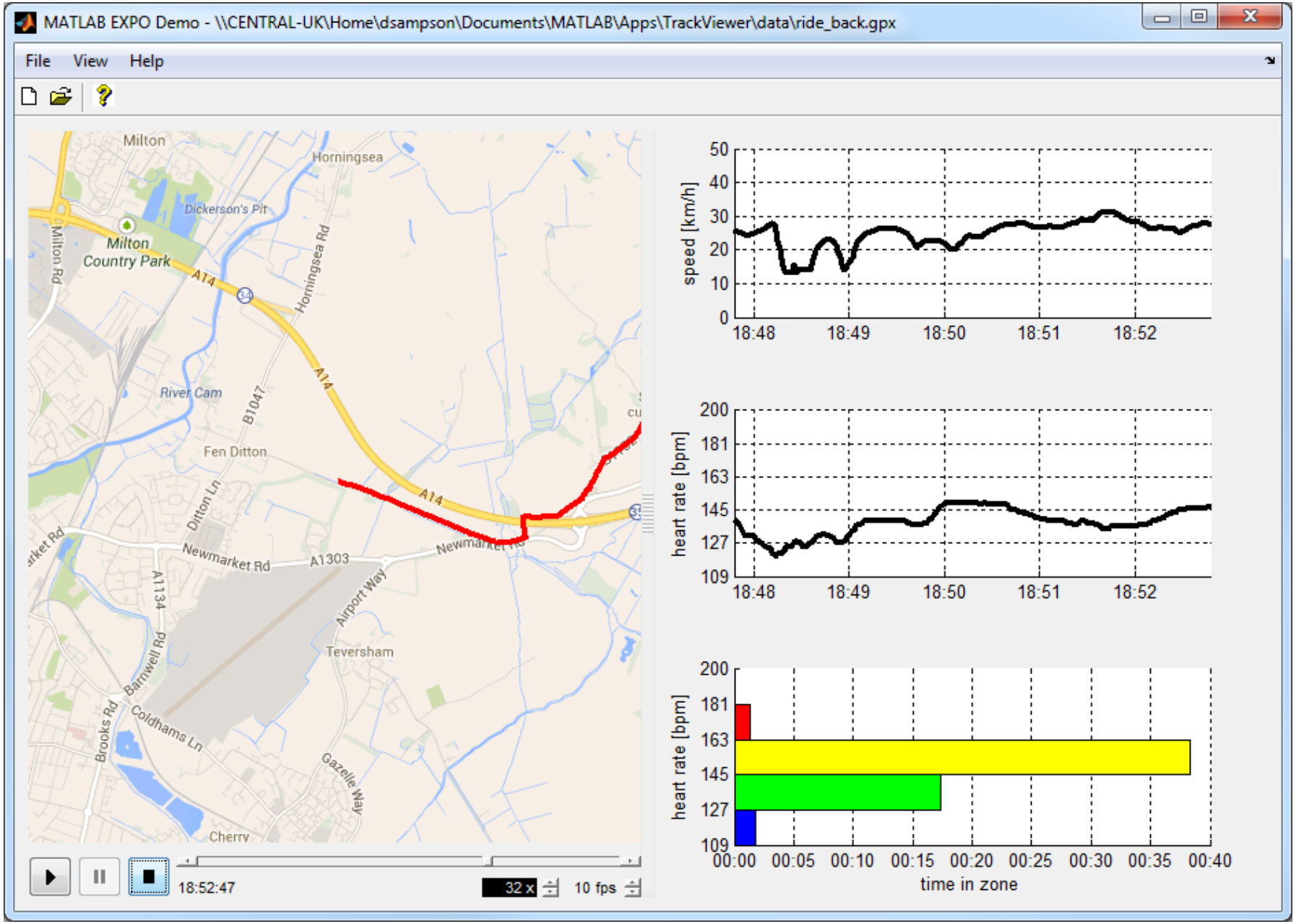
– Brian Foote & Joseph Yoder

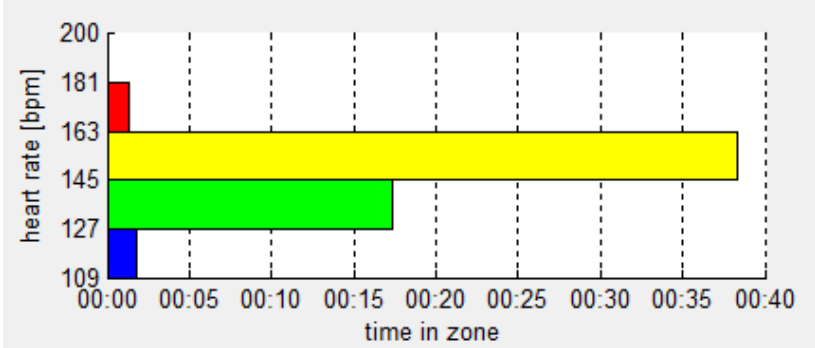
Credit: www.wordclouds.com

Model-view-controller pattern

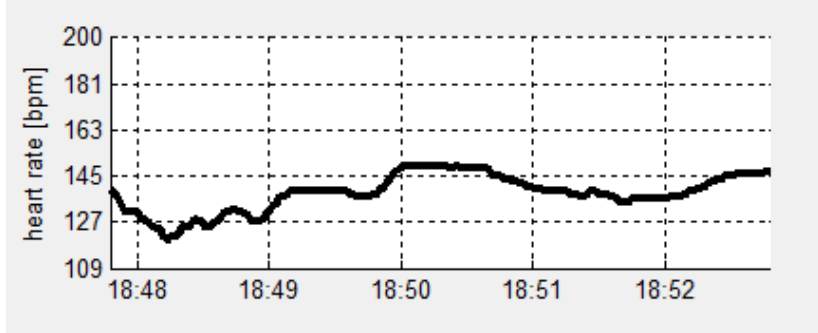


Credit: www.wikipedia.org

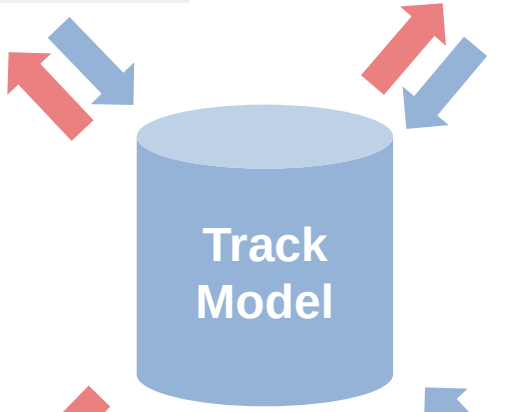

MATLAB EXPO Demo - \\CENTRAL-UK\Home\dsampson\Documents\MATLAB\Apps\TrackViewer\data\ride_back.gpx
File
View
Help
Milton
Horningsea
Dickerson's Pit
Milton Country Park
Milton Rd
A14
Horningsea Rd
River Cam
B1047
Fen Ditton
Ditton Ln
Newmarket Rd
A1303
A1134
Barnwell Rd
Airport Way
Teversham
Brooks Rd
Coldhams Ln
Gazelle Way
Cherry
18:52:47
32 x
10 fps
speed [km/h]
50
40
30
20
10
0
18:48
18:49
18:50
18:51
18:52
heart rate [bpm]
200
181
163
145
127
109
heart rate [bpm]
00:00
00:05
00:10
00:15
00:20
00:25
00:30
00:35
00:40
time in zone



HeartRateHistogramView



StripChartView



Player

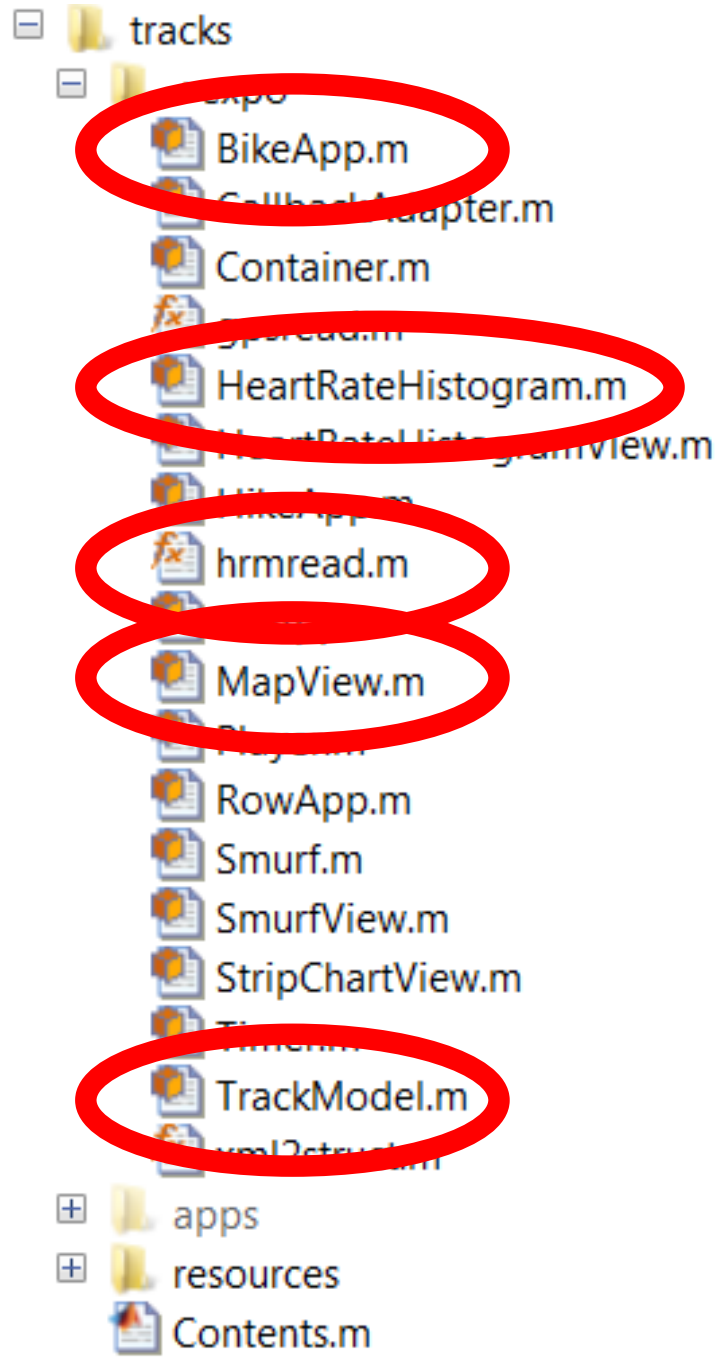
MapView

Event notification

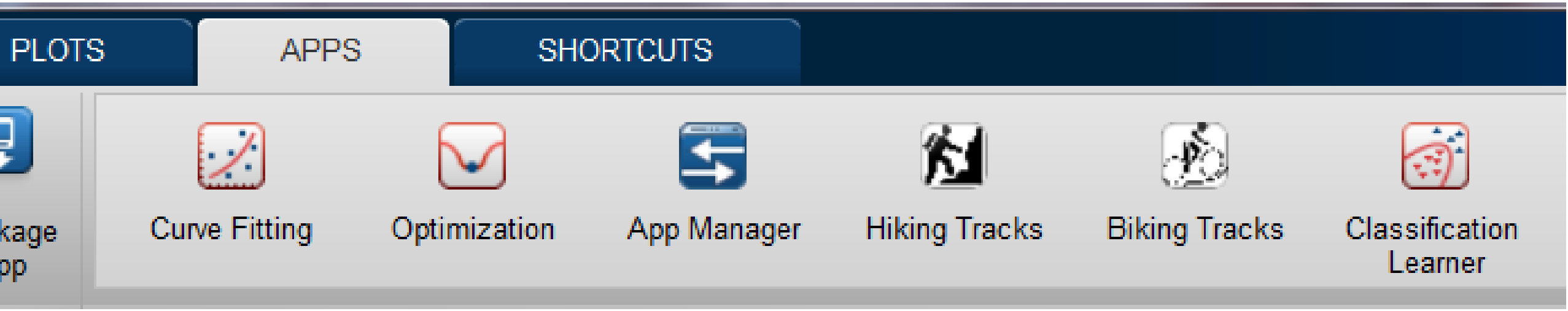
Property access, method call

Tests of an architecture

- Which part does what?
  - Reads data
  - Launches an app
  - Creates a chart
  - Holds the data and application state
  - Updates a chart when time changes
- Can you change the functionality?



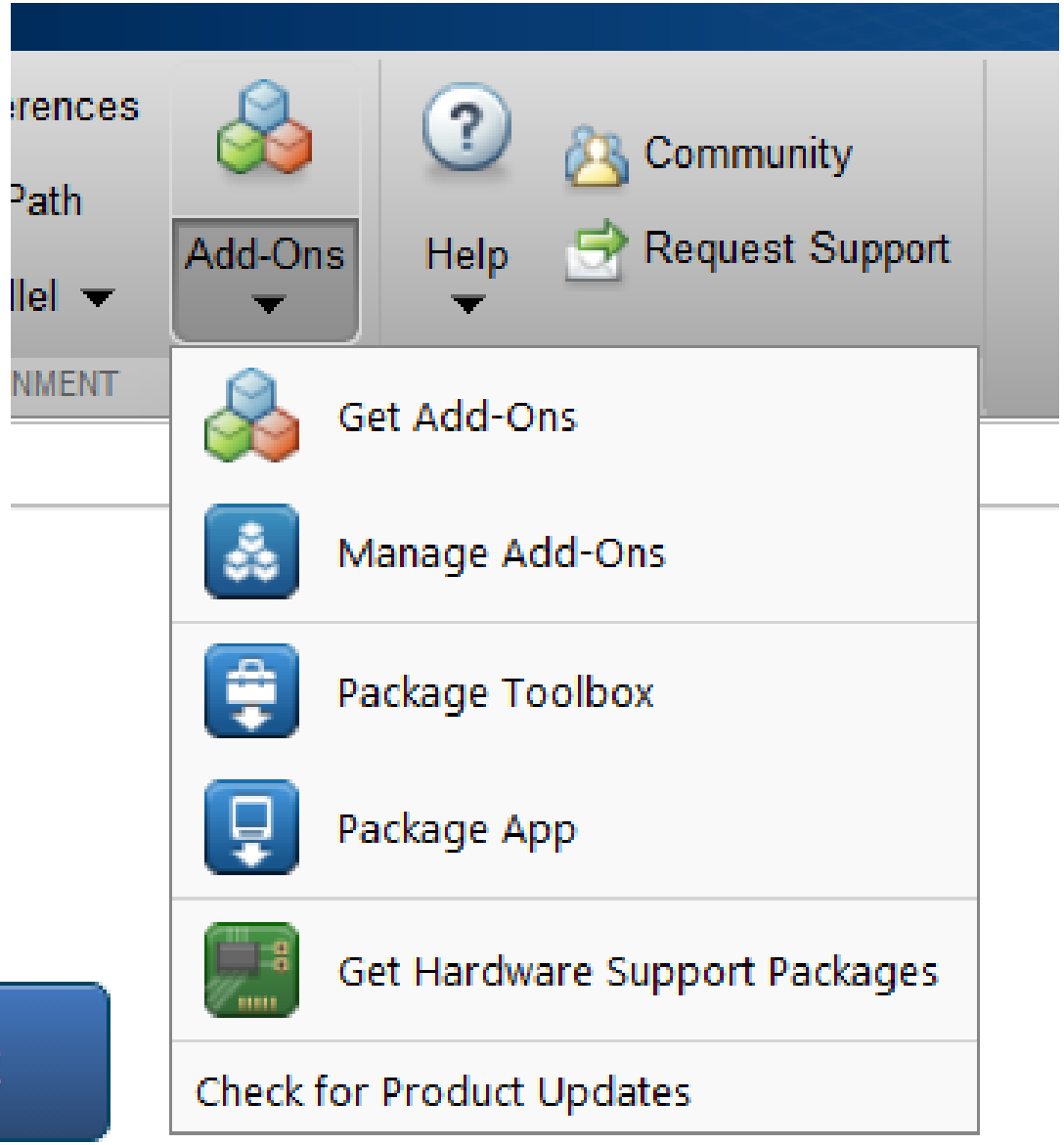
Packaging and distributing MATLAB software


PLOTS
APPS
SHORTCUTS
kage
pp
Curve Fitting
Optimization
App Manager
Hiking Tracks
Biking Tracks
Classification Learner

MATLAB app installer files (.mlappinstall)

- Available from R2012b
- Packs multiple files into a single file to be distributed
- Includes metadata and product dependencies
- Single step to install (or update)

http://www.mathworks.com/help/matlab/creating_guis/app-creation.html



Download Toolbox

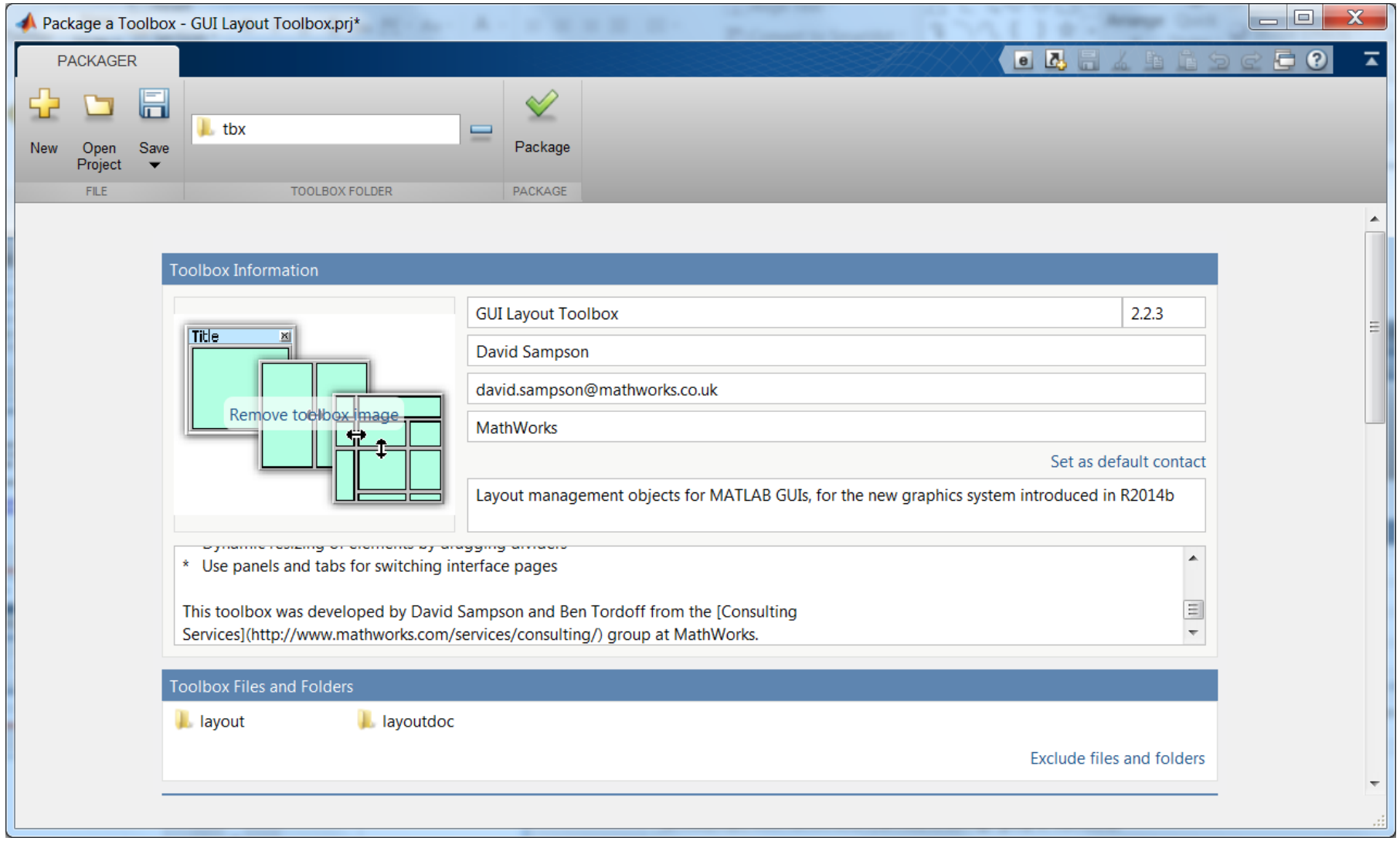
Requires R2014b or newer

MATLAB Toolbox files (.mltbx)

- Available from R2014b
- Packs multiple files into a single file to be distributed
- Includes metadata and product dependencies
- Single step to install (or update)
- Configures MATLAB path
- Registers apps and documentation

www.mathworks.com/help/matlab/matlab_prog/create-and-share-custom-matlab-toolboxes.html

Toolbox packaging dialog



Toolbox distribution functions

`matlab.addons.toolbox.packageToolbox`	Package a toolbox project
`matlab.addons.toolbox.toolboxVersion`	Query and modify the version of a toolbox file
`matlab.addons.toolbox.installToolbox`	Install a .mltbx file
`matlab.addons.toolbox.uninstallToolbox`	Uninstall an installed toolbox
`matlab.addons.toolbox.installedToolboxes`	Return information about installed toolboxes

A starter store – .mltbx files in a shared location

Updating:

- Query installed toolboxes
- Compare installed versions with versions available in the store
- Update if a newer version is available
- Can be automated

Browsing:

- Peruse an HTML view of store content

Demonstration:

Starter app store

MATLAB Store (demo)

Products Solutions Academia Support Community Events Company

Forklift Toolbox

Quisque eget erat tempor, sodales enim efficitur, malesuada ligula.

More info...

Aeroplane Toolbox

Ut sodales augue nec imperdiet fermentum.

More info...

Ship Toolbox

Integer auctor ultricies maximus.

More info...

Helicopter Toolbox

Maecenas euismod placerat euismod.

More info...

Wheel Toolbox

Suspendisse aliquam velit at urna consequat dapibus.

Drone Toolbox

Mauris commodo sapien tortor, id faucibus dolor pharetra nec.

Concrete Mixer Toolbox

Maecenas euismod placerat euismod.

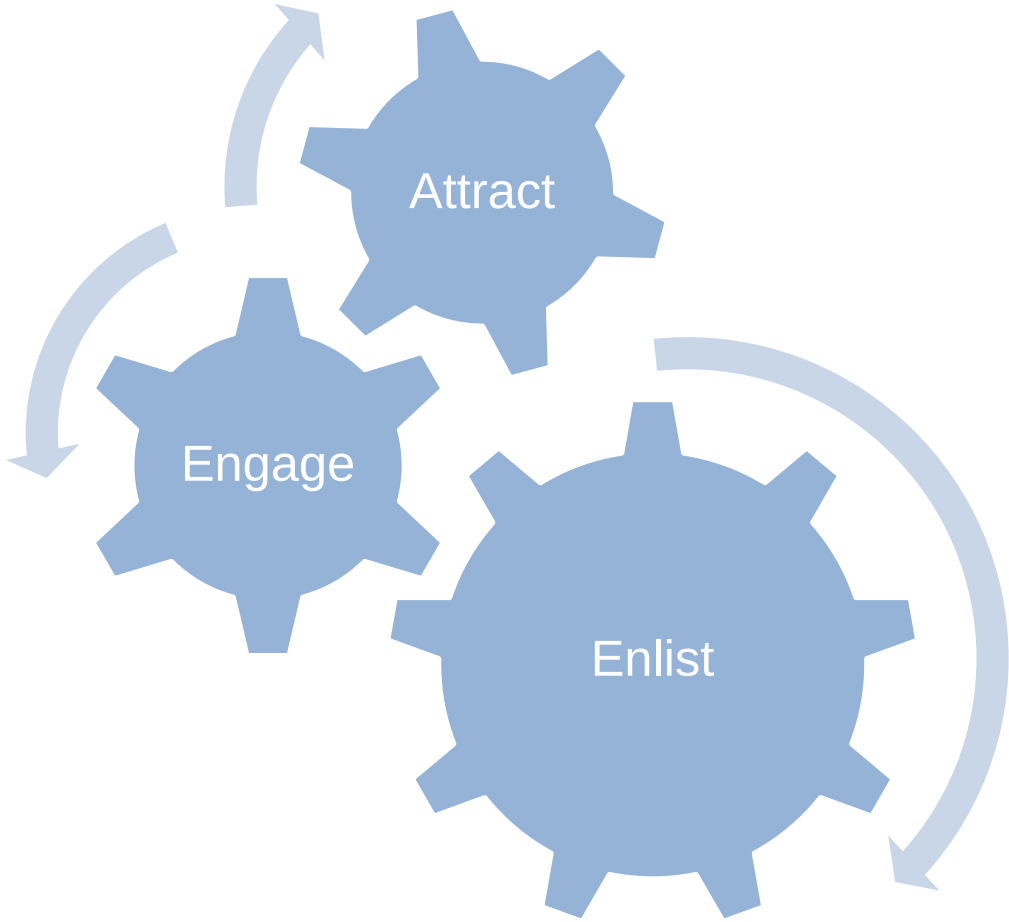
Dump Truck Toolbox

Fusce fermentum sem tellus, eget convallis tellus rhoncus eu.

Credit: www.flaticon.com

Closing remarks

Community effects



- Generate awareness and interest
- Build relationships
- Build advocacy

- Enhance skills
- Improve results and productivity

Key points

- Designing your code: names matter
- Organizing your code: patterns help
- Sharing your code: the right tools make it easy

To learn more…

- Master class “Developing Robust MATLAB Code and Apps” @ 1545
- Slides and code @ www.matlabexpo.com/uk
- MATLAB Developer Zone @ blogs.mathworks.com/developer
- Training courses, consulting workshops, coaching, …

Thank you.

Questions?