

It Ain't Testable Until it's Tested

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These slides: <http://itake2017.testAutomationPatterns.com>

My Background

- Software developer

- Development manager

- Project Manager

Embedded
Telecom

- Software architect

- OOA/OOD Mentor

- Requirements (Use Case) Mentor

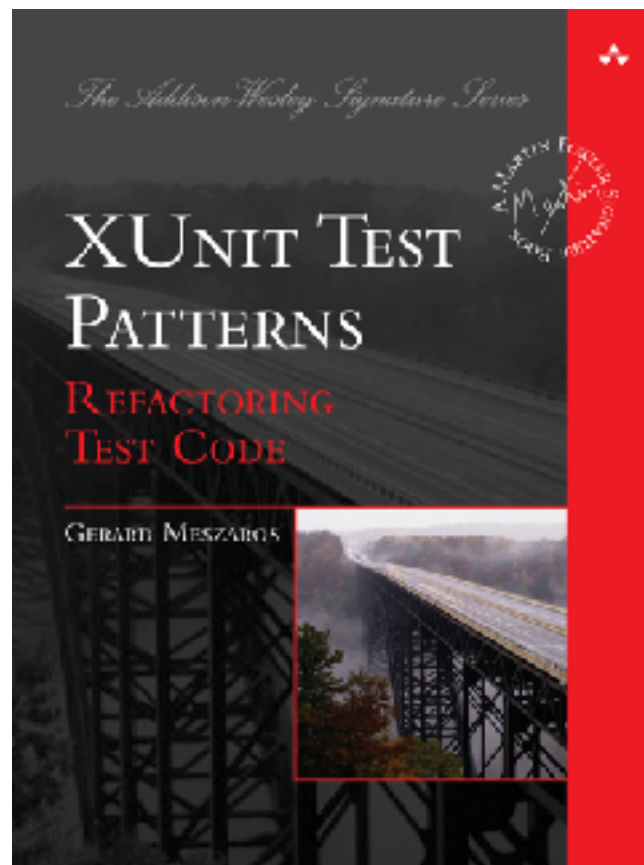
I.T.

- XP/TDD Mentor

- Agile PM Mentor

- Test Automation Consultant & Trainer

- Lean/Agile Coach/Consultant Product & I.T.



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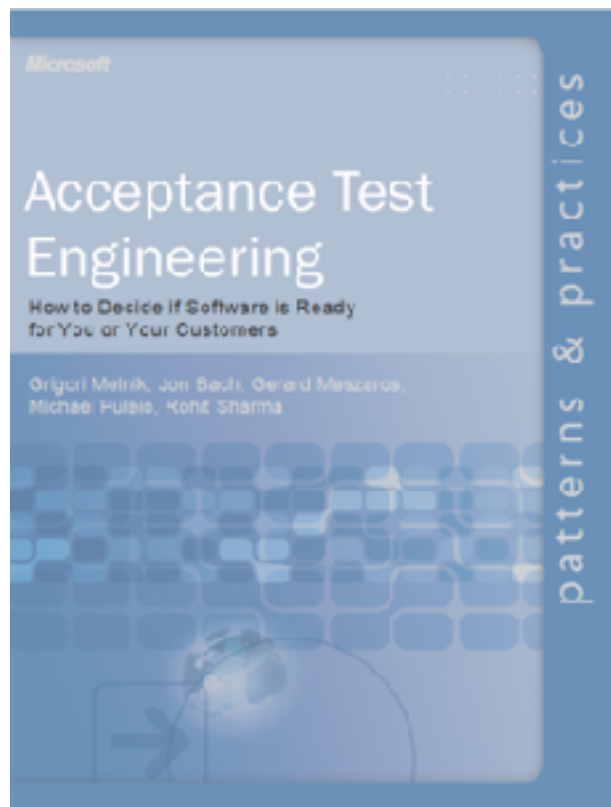
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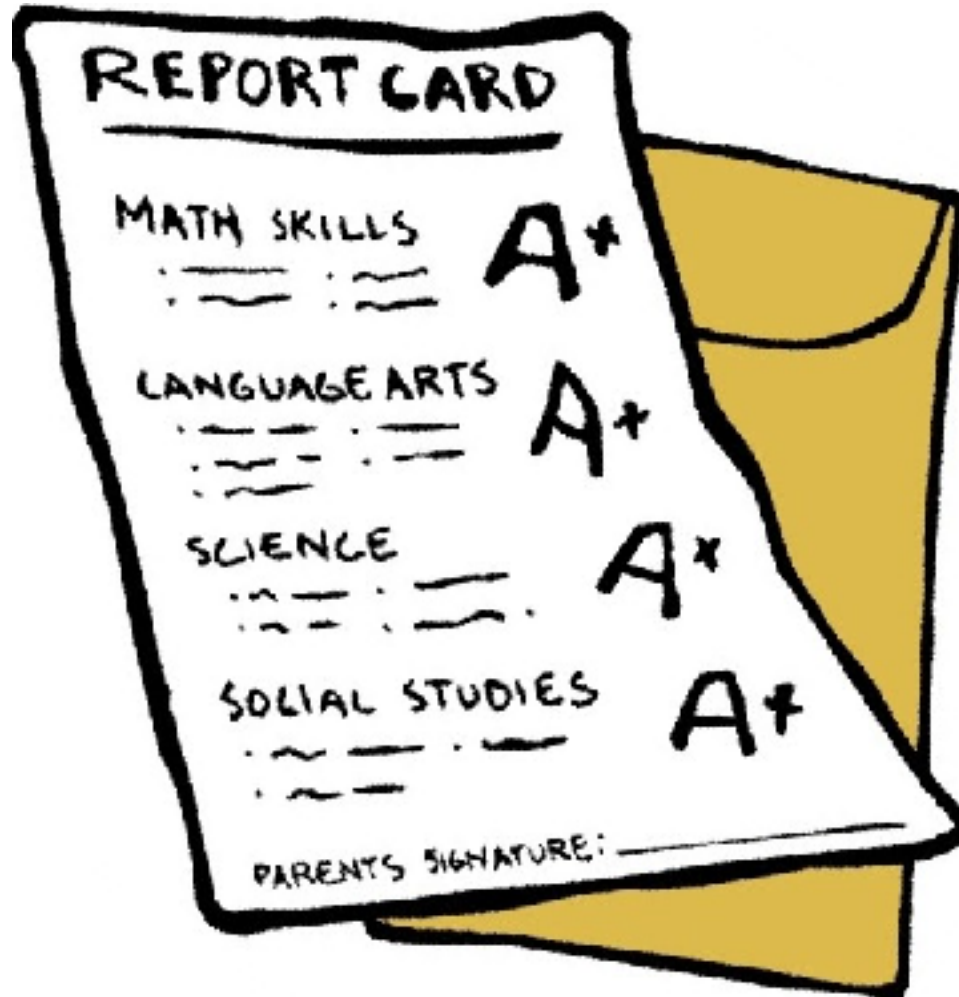
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Johnny's Report Card

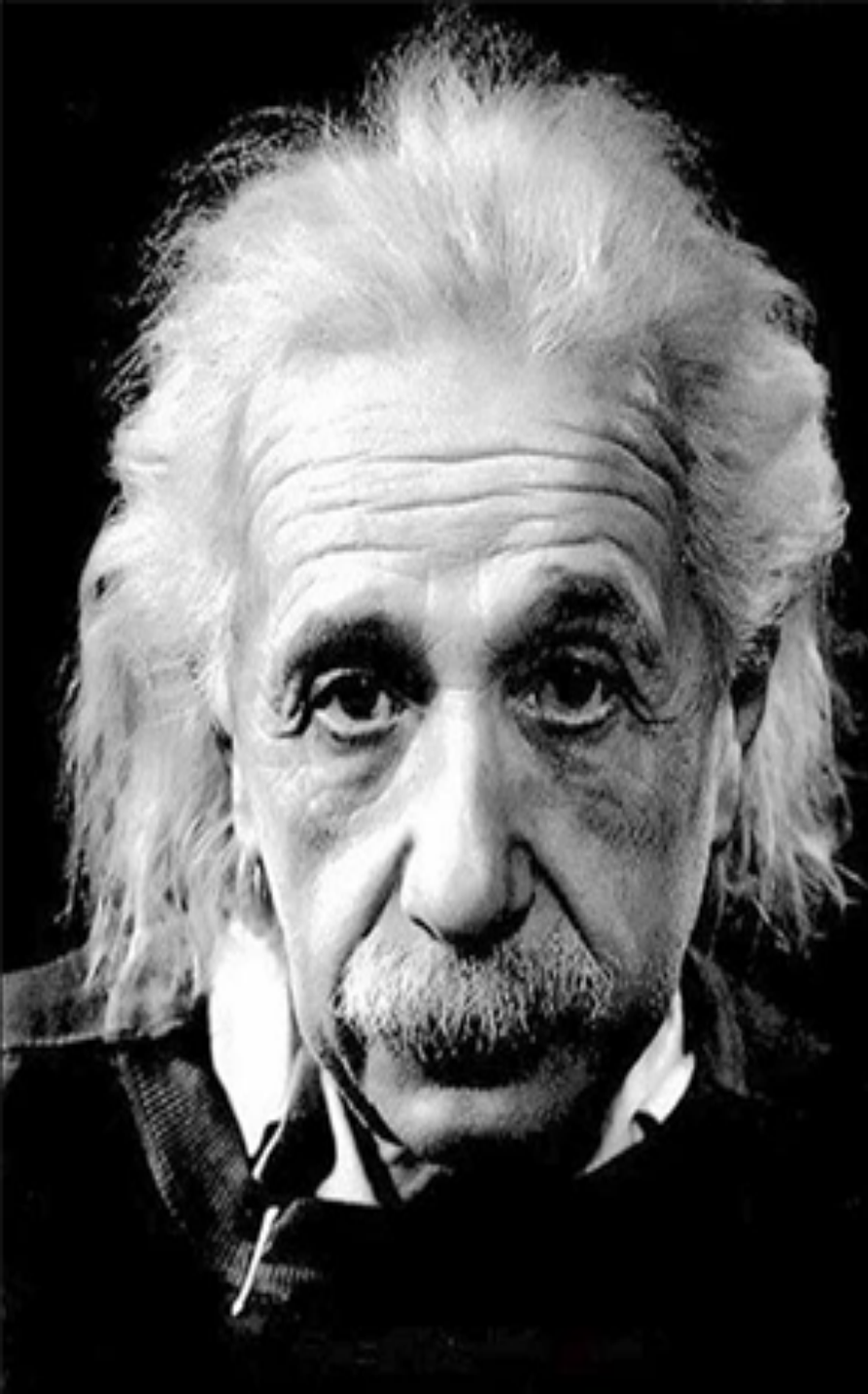


<http://fabulesslyfrugal.com/report-card-freebies-for-good-grades/>

Our Report Card



<http://fabulesslyfrugal.com/report-card-freebies-for-good-grades/>

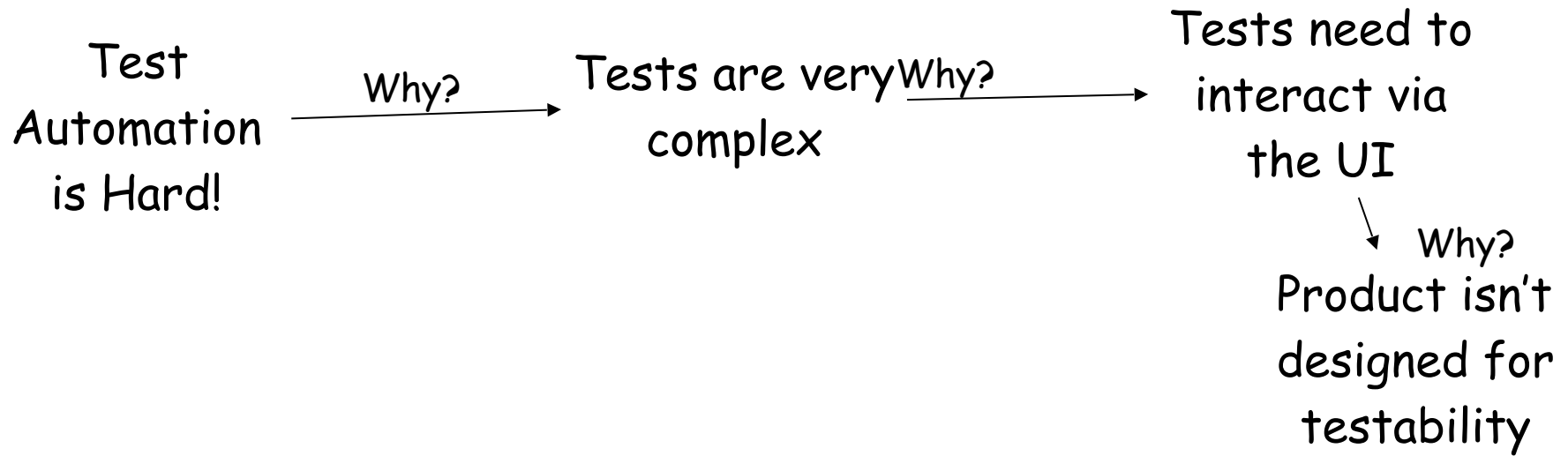


Insanity:

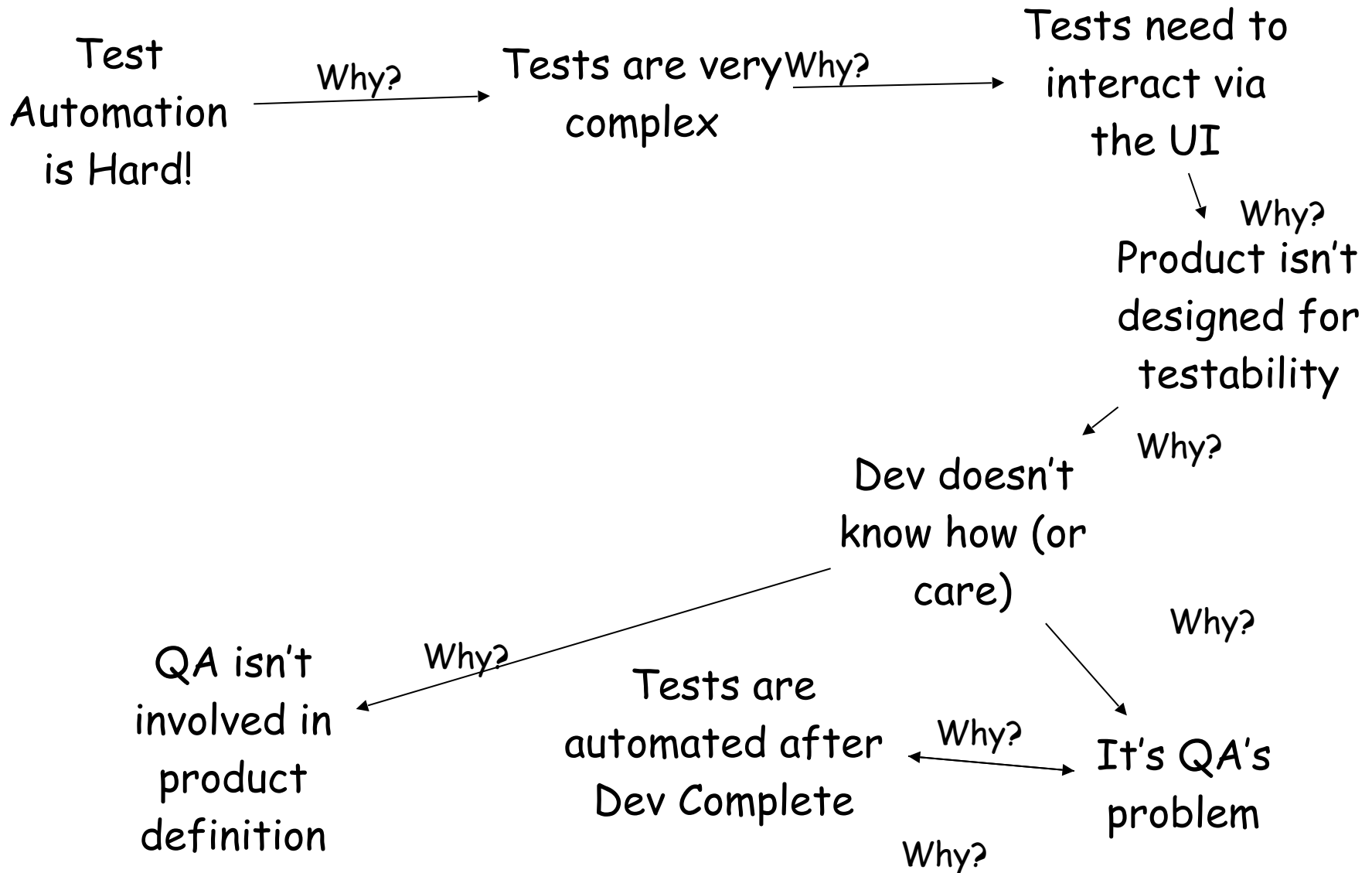
Doing the same
thing over and over
again and expecting
different results.

Albert Einstein

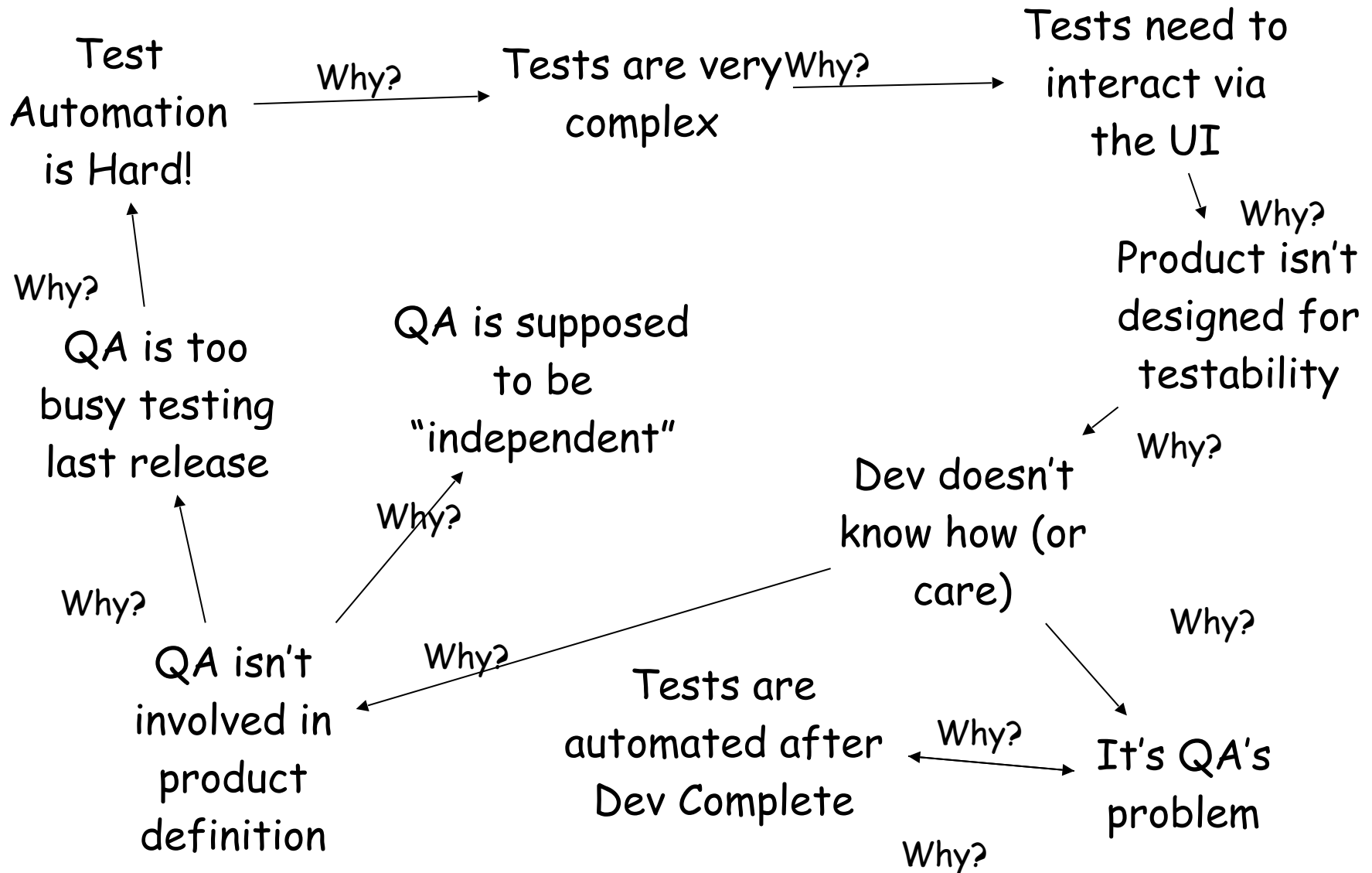
5 Why's of Test Automation Being Hard



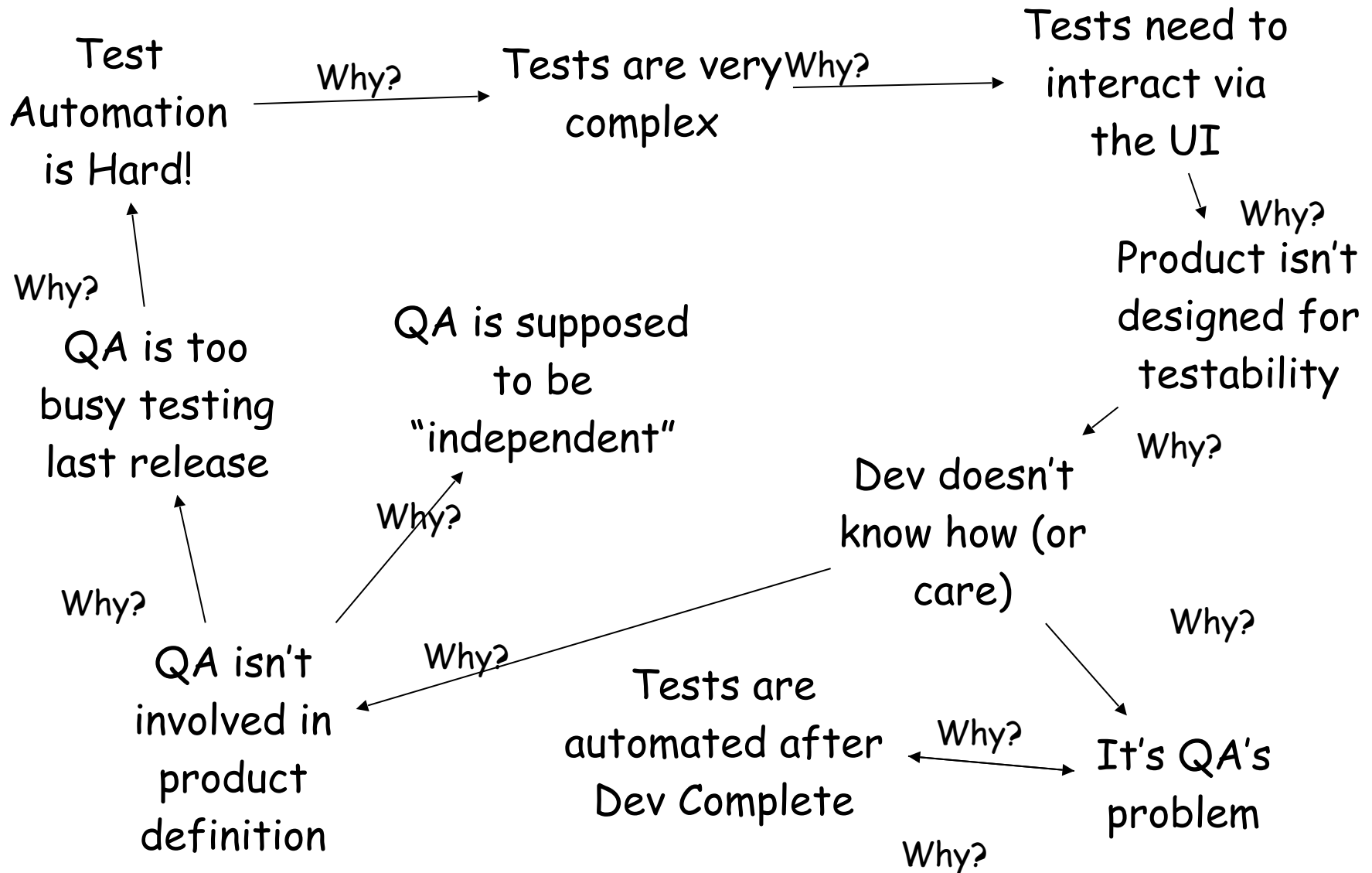
5 Why's of Test Automation Being Hard



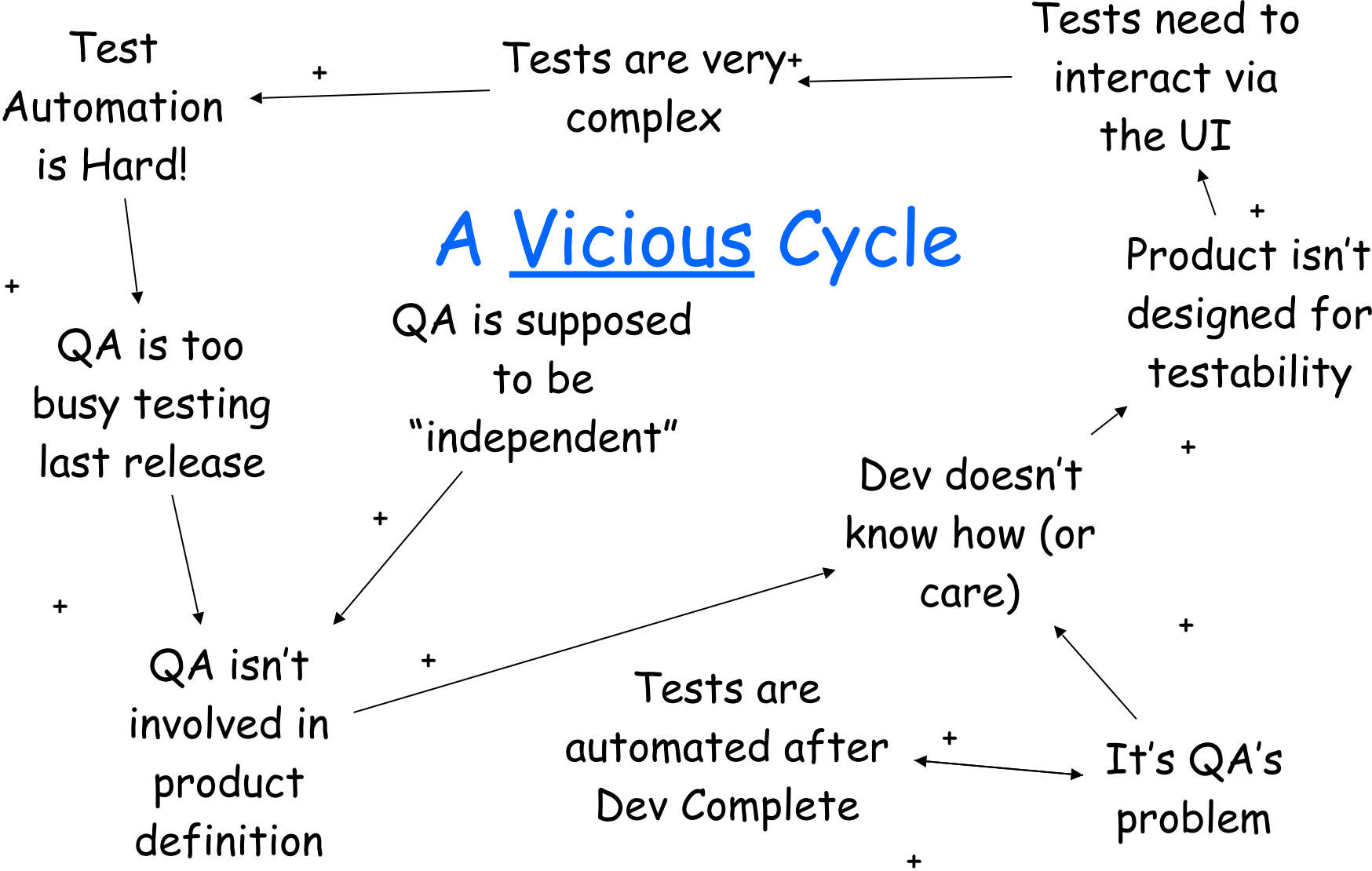
5 Why's of Test Automation Being Hard



5 Why's of Test Automation Being Hard

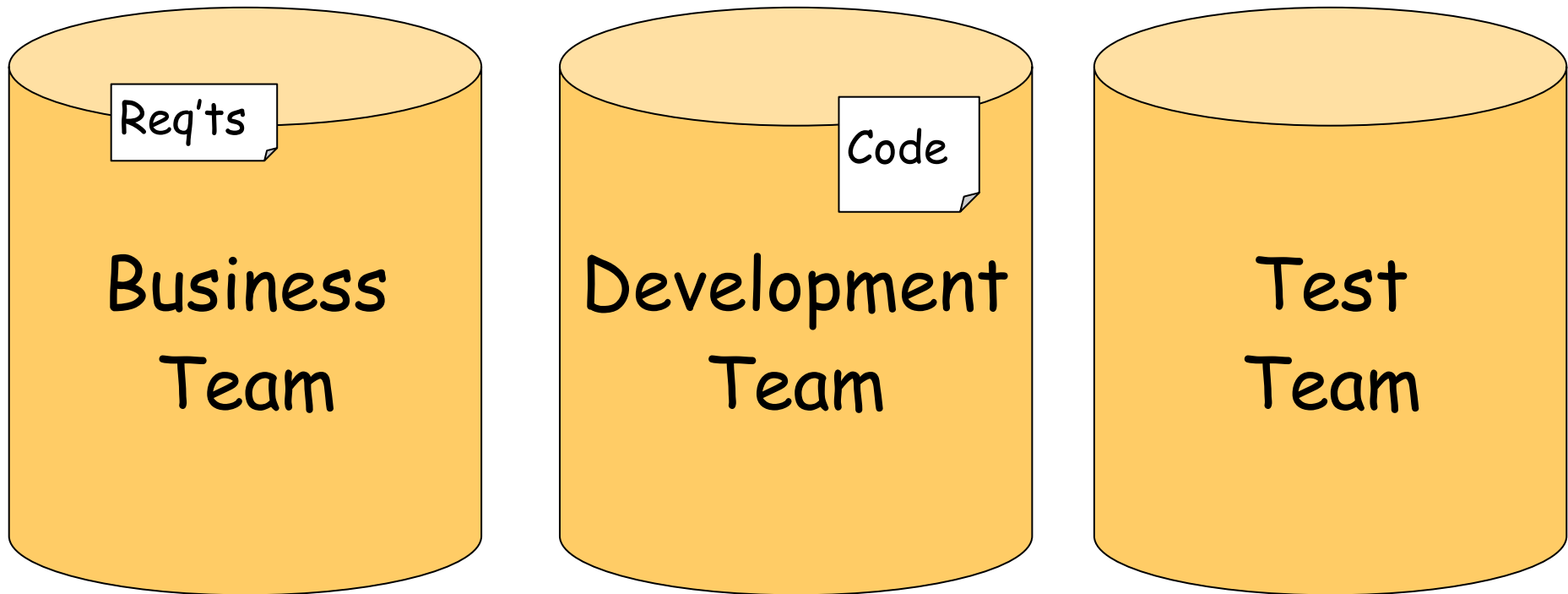


Test Automation – Systems Thinking Diagram

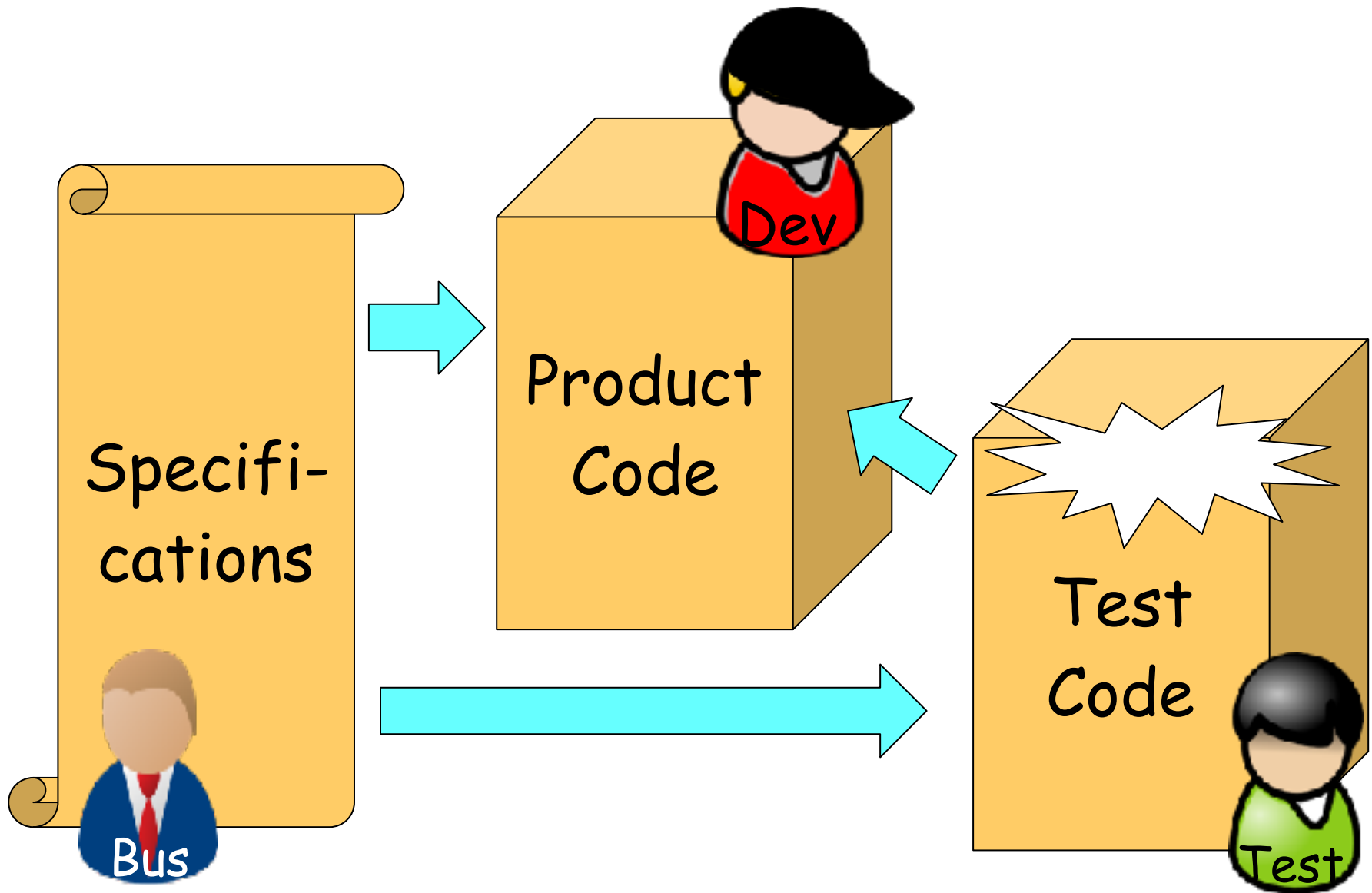


Root, Root Cause: Conway's Law

The Architecture of System will resemble the Organization that Built it.



Resulting Architecture



Automated Tests are Just Code That Tests Other Code



Who Tests This Code?
Who Should Write This Code?

TDD Is One Solution

But is hard to implement because:

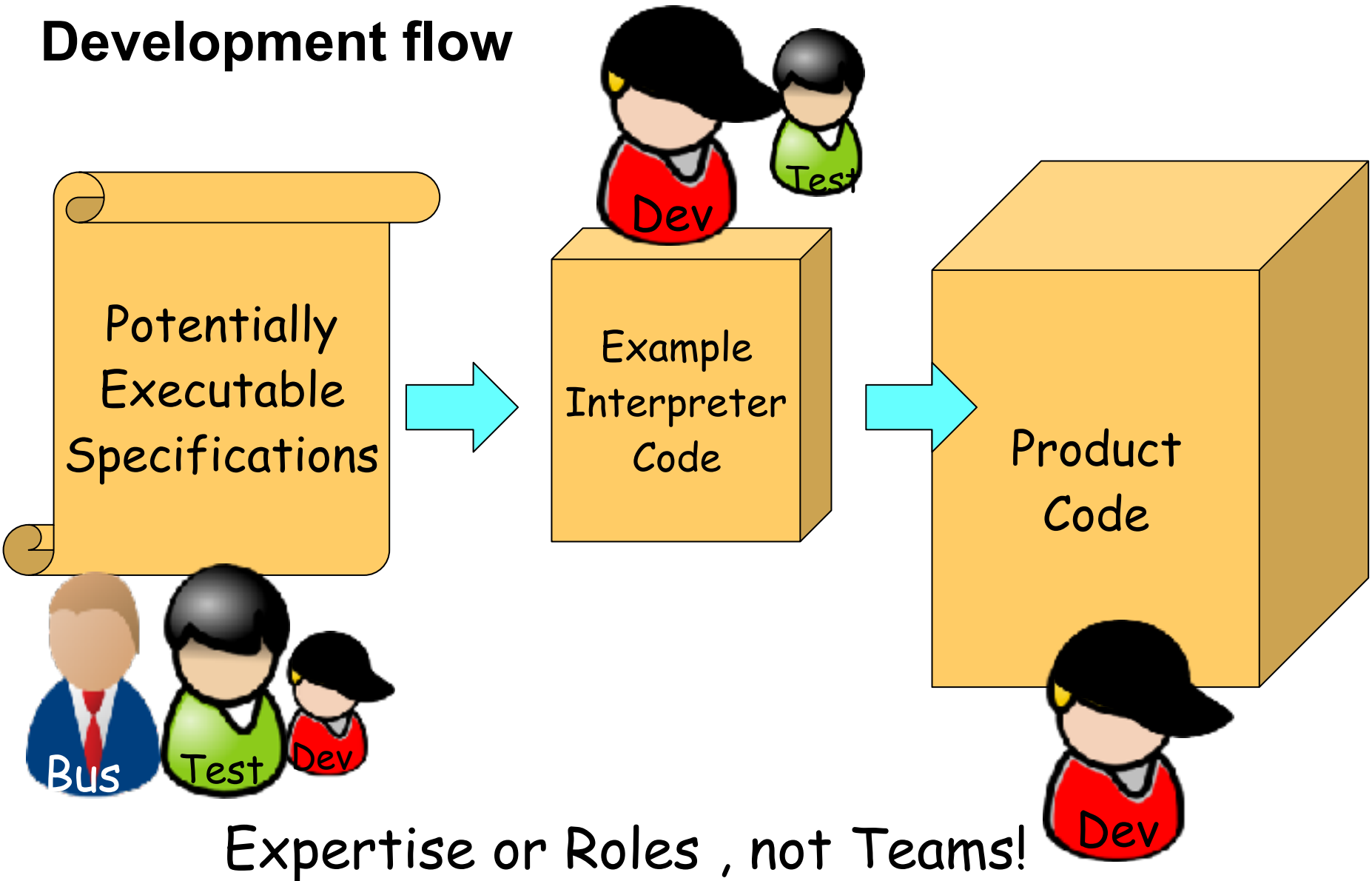
- **Requires everyone to do it**
- **all the time**
- **And is a large cultural change**

And it doesn't solve the whole problem:

- **Ensures “code quality” but not “product quality”**
- **Can build great software that doesn't work as a whole**

Example-Driven Development

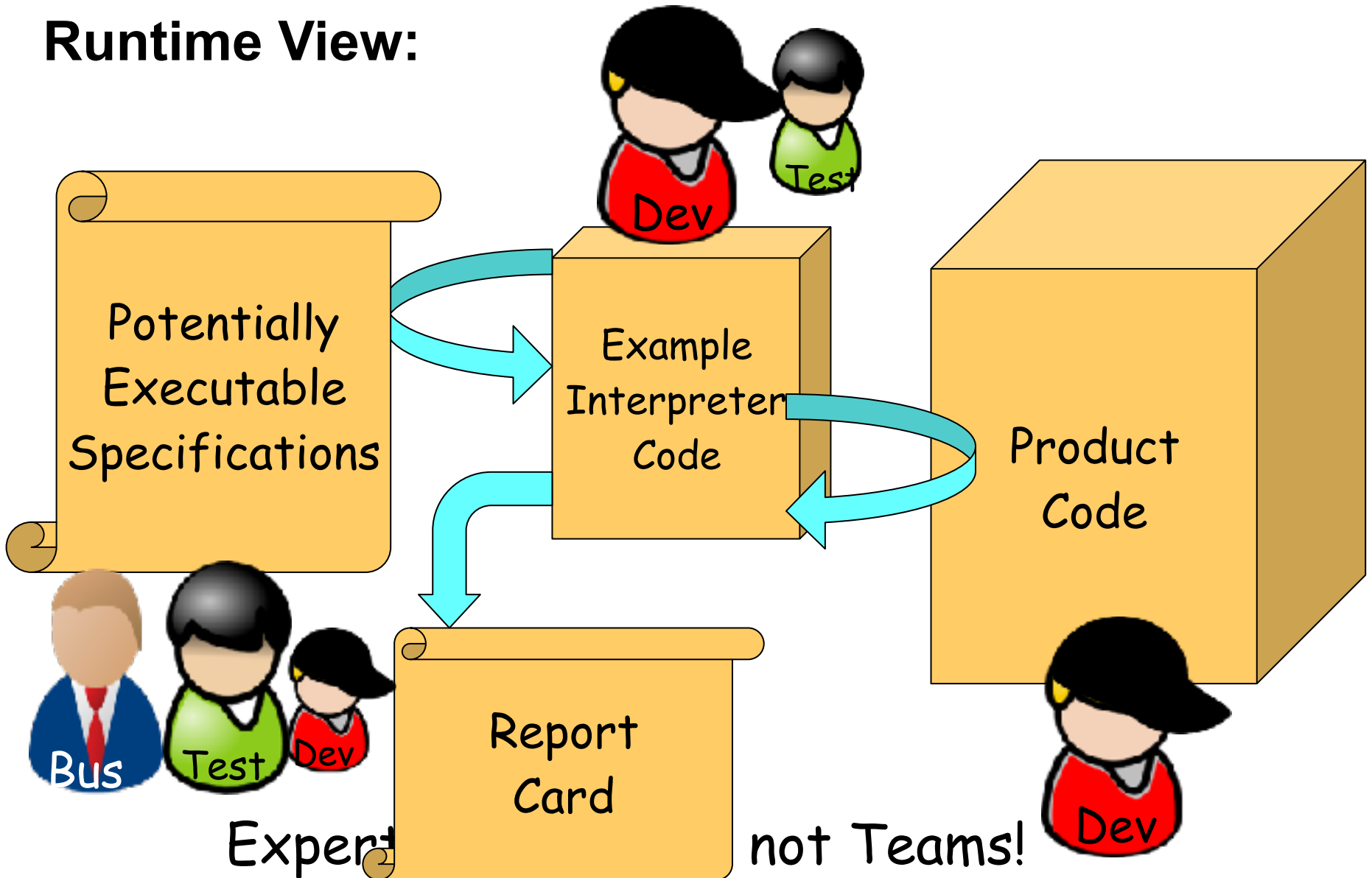
Development flow



Expertise or Roles , not Teams!

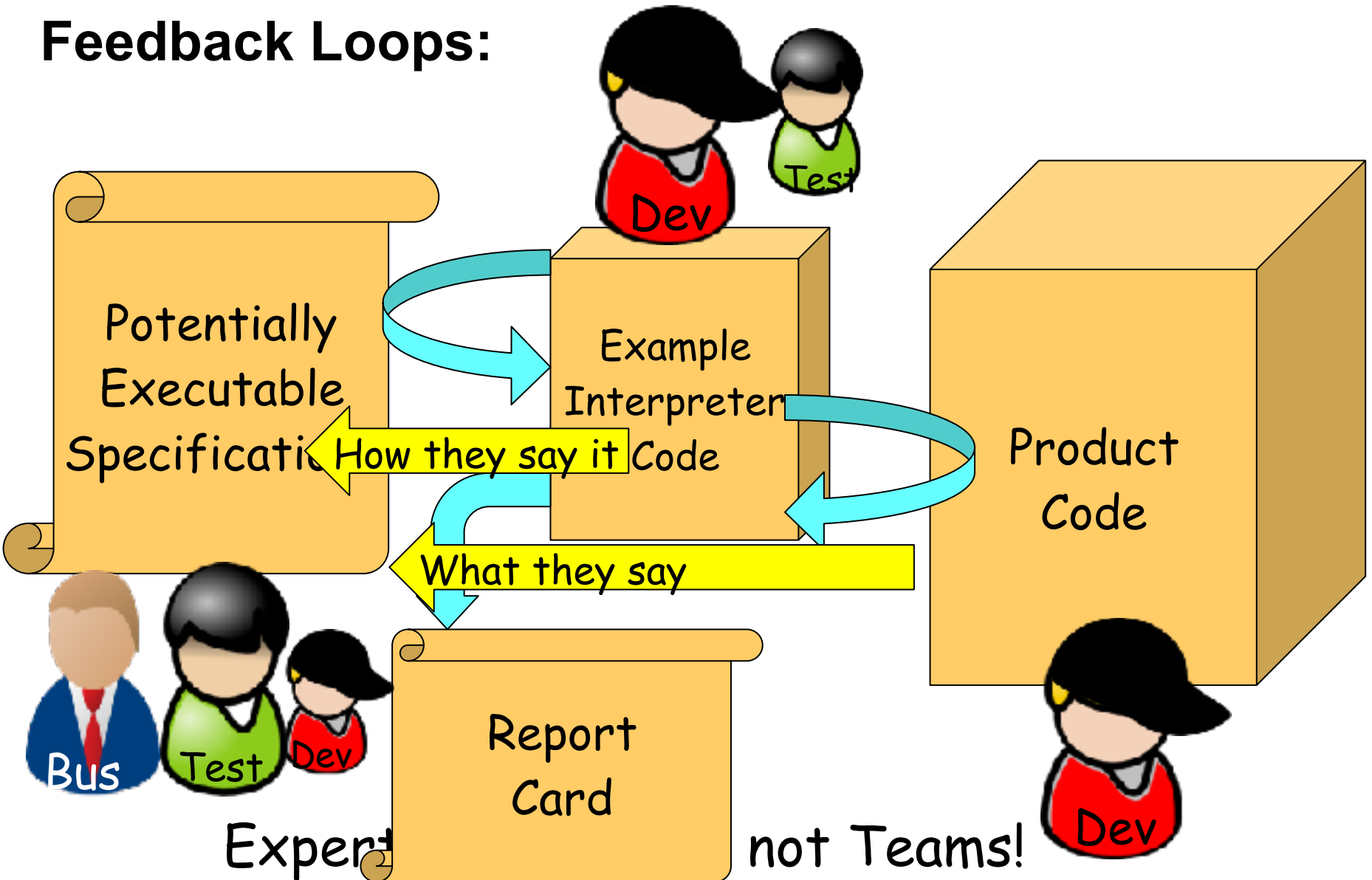
Example-Driven Development

Runtime View:



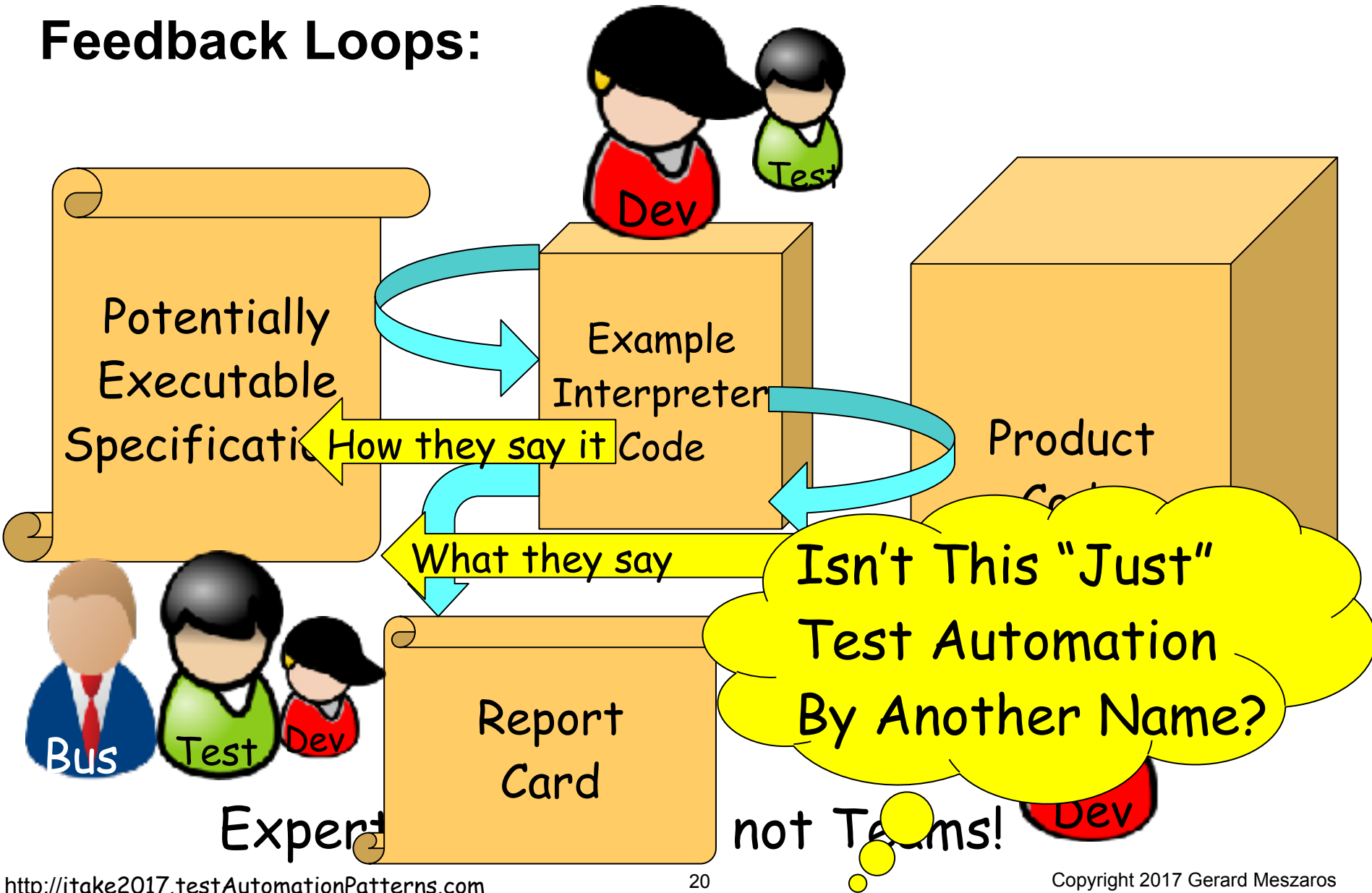
Example-Driven Development

Feedback Loops:

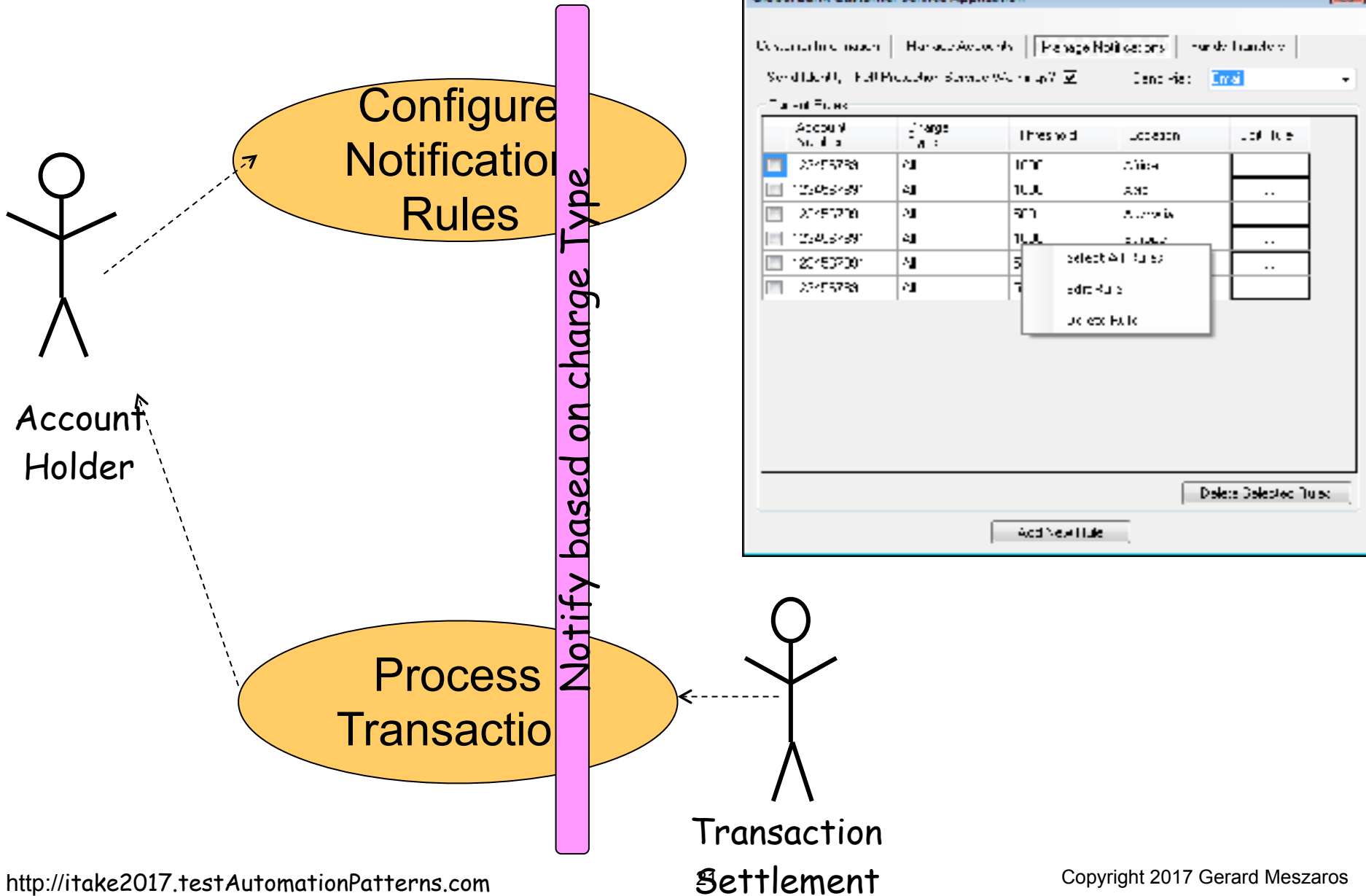


Example-Driven Development

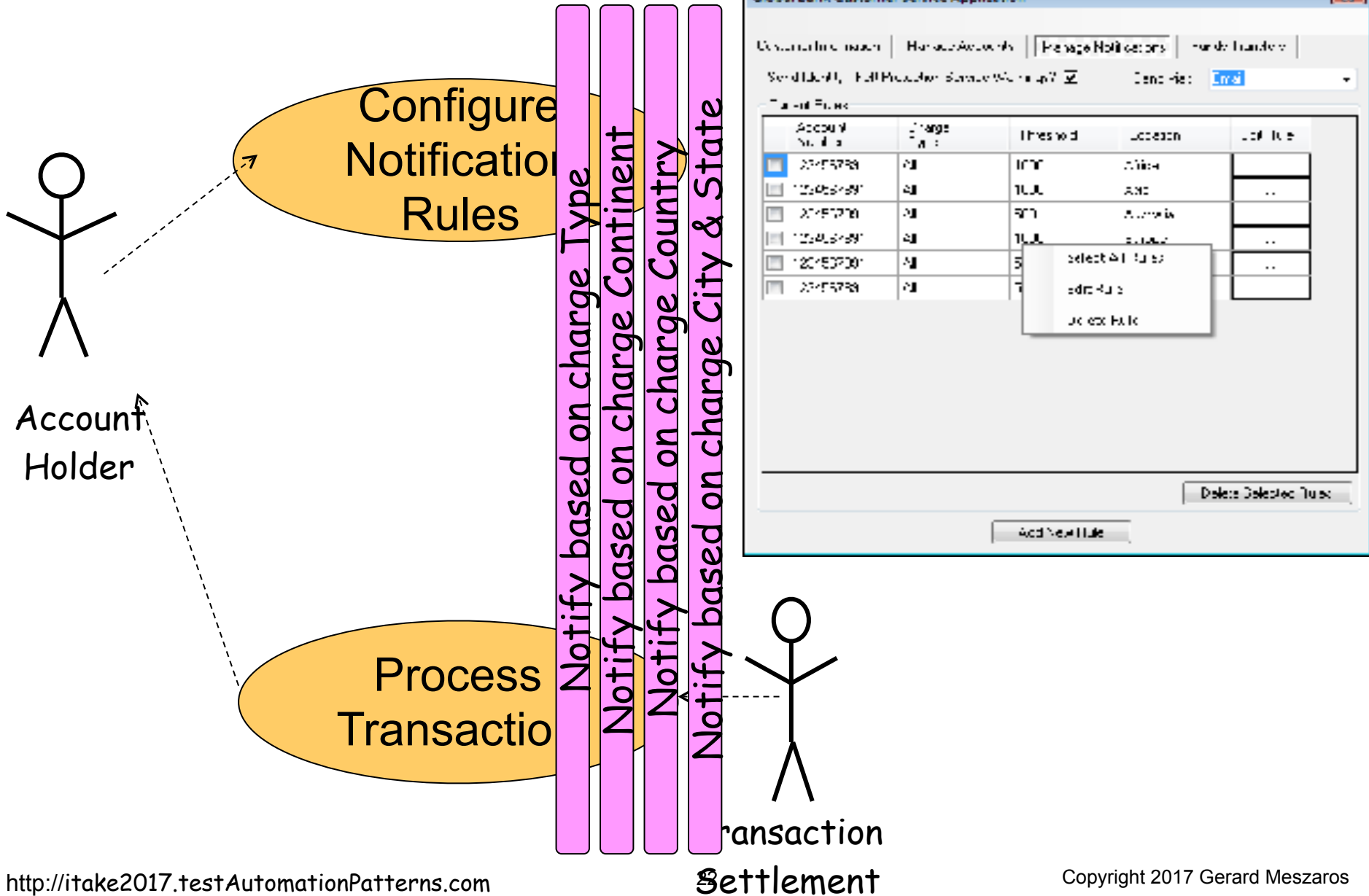
Feedback Loops:



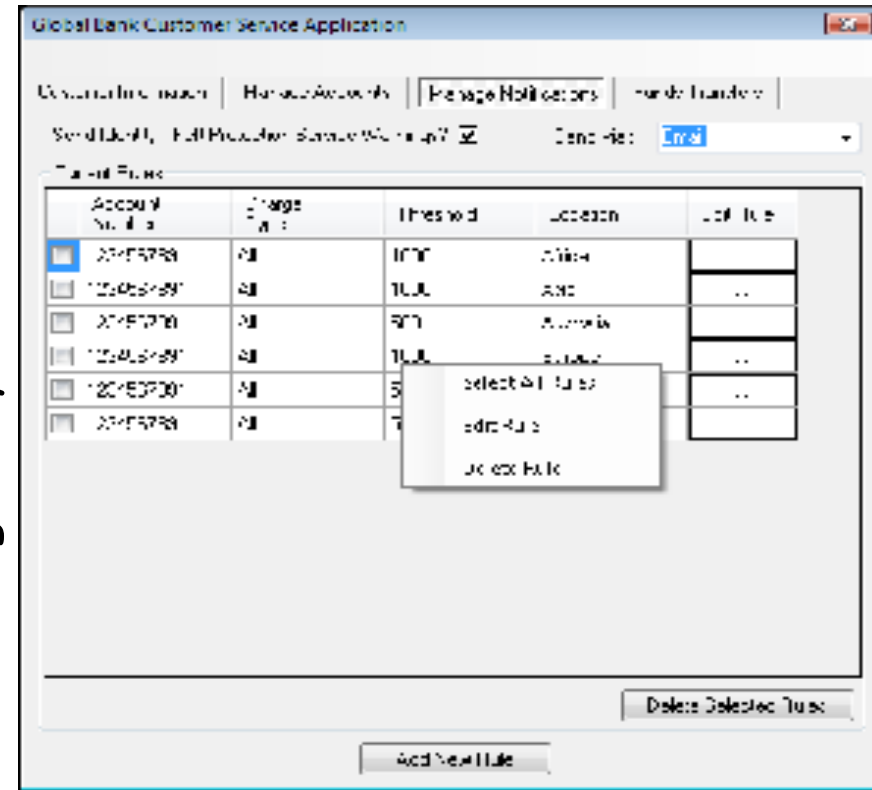
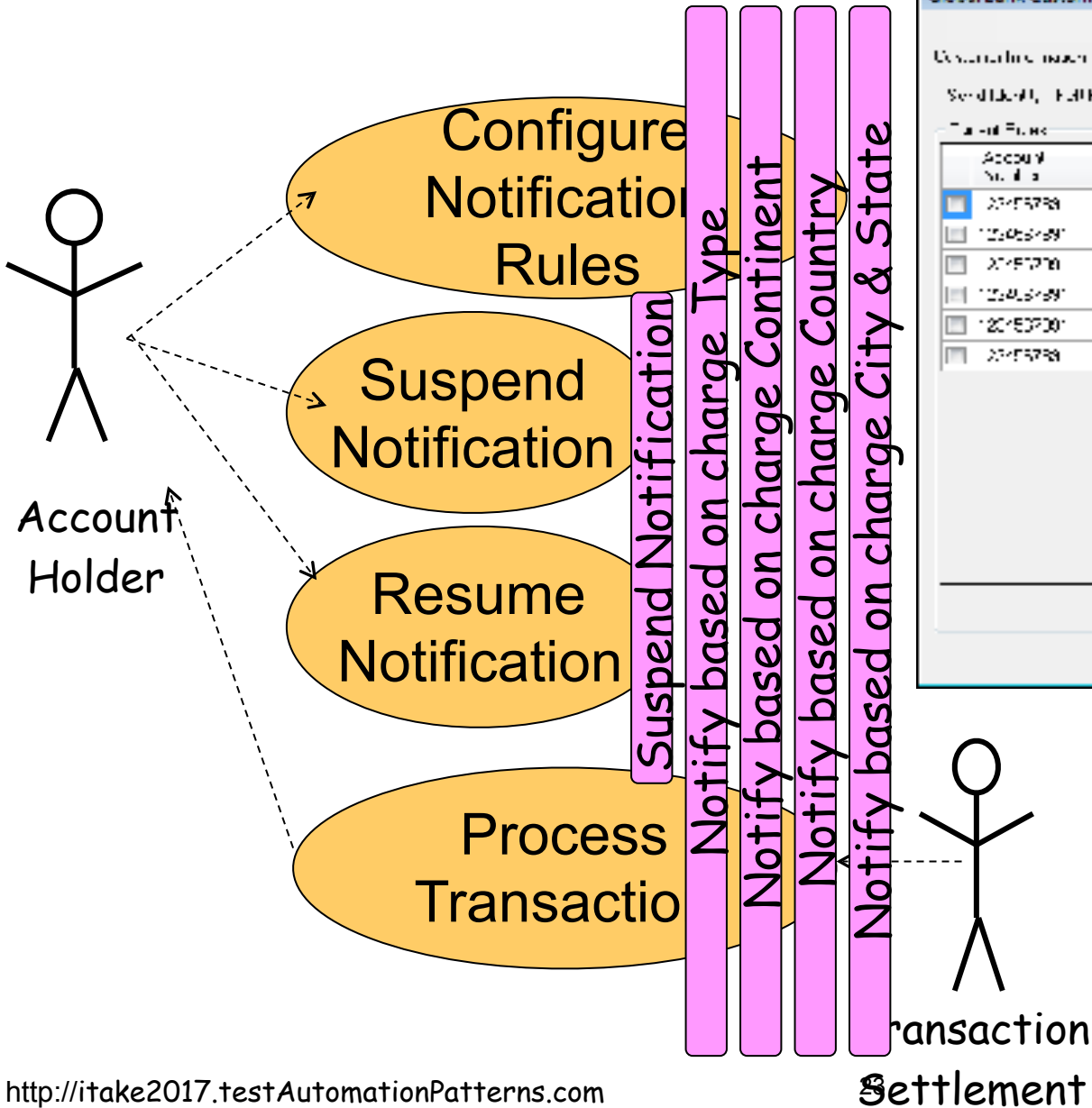
Example: Notifying of Bank Transactions



Example: Notifying of Bank Transactions



Example: Notifying of Bank Transactions



Checking Notifications

- **Open MegaBank app**
- **Log in as “BobMa” with password *******
- **Click on “Manage Notifications” tab**
- **Click on “Add New Rule” button**
- **Select account “10035692877”**
- **Type “Default Rule” into field “rule name”**
- **Type “1000” into field “threshold amount”**
- **Click on “all transaction types” radio button**
- **Click on “all locations” radio button**
- **Click on “save changes” button**
- **...**
- **...**

Another attempt:

Checking Notifications – 1/2

Customer	bobma	logs in
----------	-------	---------

System lists all available accounts for the authorized customer

account	type	notifications
10035692877	chequing	disabled
10035692890	savings	disabled
20010928892	credit line	disabled

Given:
User and Accounts

When:
Notification Rule is Configured

Customer sets notification threshold for all transactions from all locations to \$10,000.00 on account 10035692877 via email to bobma@live.com
--

ensure No system messages

ensure System log contains "Customer bobma set notification threshold for all transactions from all locations to \$10,000 on account 10035692877"

System lists all available accounts for the authorized customer

account	type	notifications
10035692877	chequing	enabled
10035692890	savings	disabled
20010928892	credit line	disabled

Then:
Notification Rule is Active

Notification settings for account 10035692877				
transaction type	location where initiated	threshold amount	via	address
all	all	\$10,000.00	email	bobma@live.com

Another attempt:

Checking Notifications – 2/2

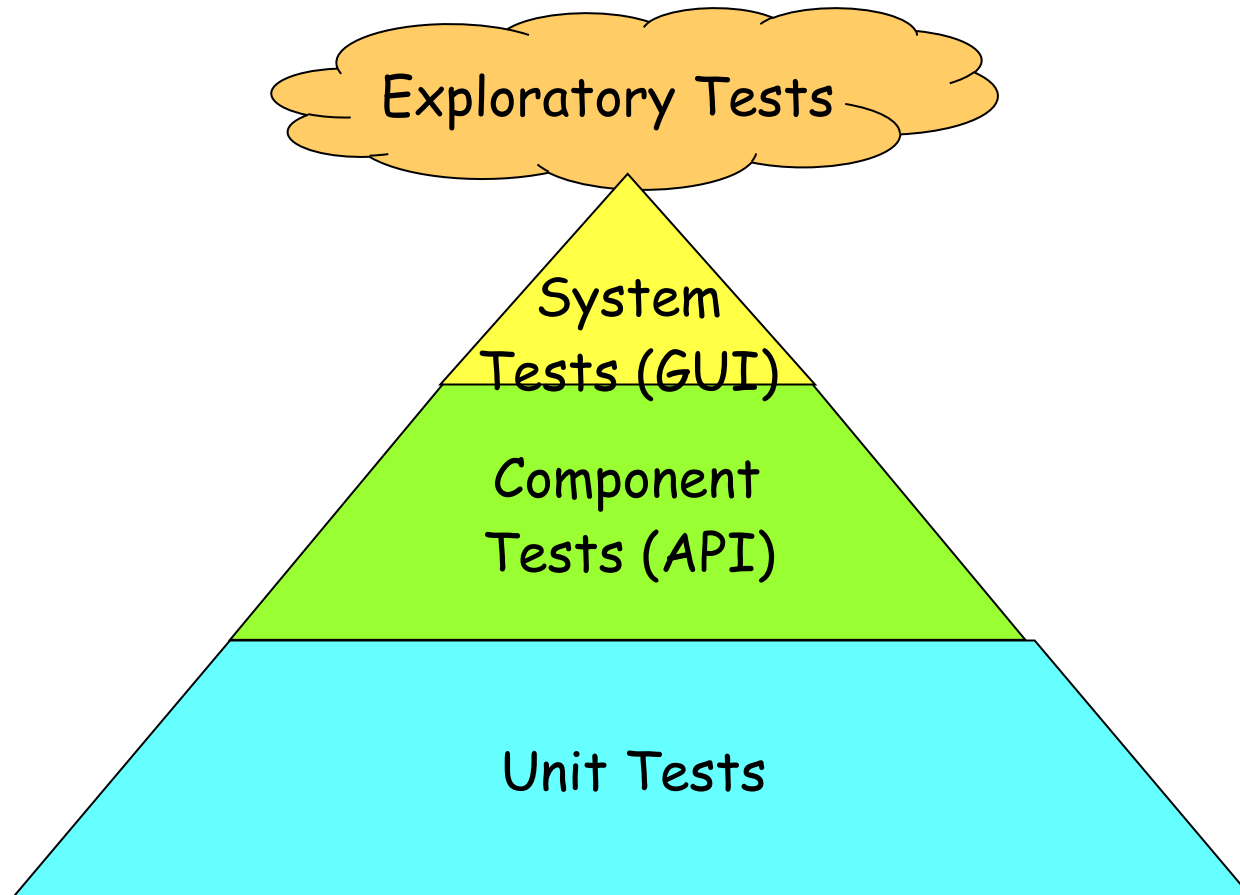
Time now is	9:30AM, 03/18/2008		
Bank processes	debit	to	10035692877 in the amount of \$15,000.00
Bank processes	debit	to	10035692877 in the amount of \$9,000.00
Bank processes	debit	to	10035692877 in the amount of \$11,000.00
Bank processes	debit	to	20010928892 in the amount of \$12,000.00
Bank processes	credit	to	10035692877 in the amount of \$13,000.00
Bank processes	credit	to	10035692877 in the amount of \$9,999.99
Bank processes	charge	to	10035692877 in the amount of \$9,999.99
Bank processes	charge	to	10035692877 in the amount of \$11,000.00

When: The Transactions to be processed

Then: Expected Notifications

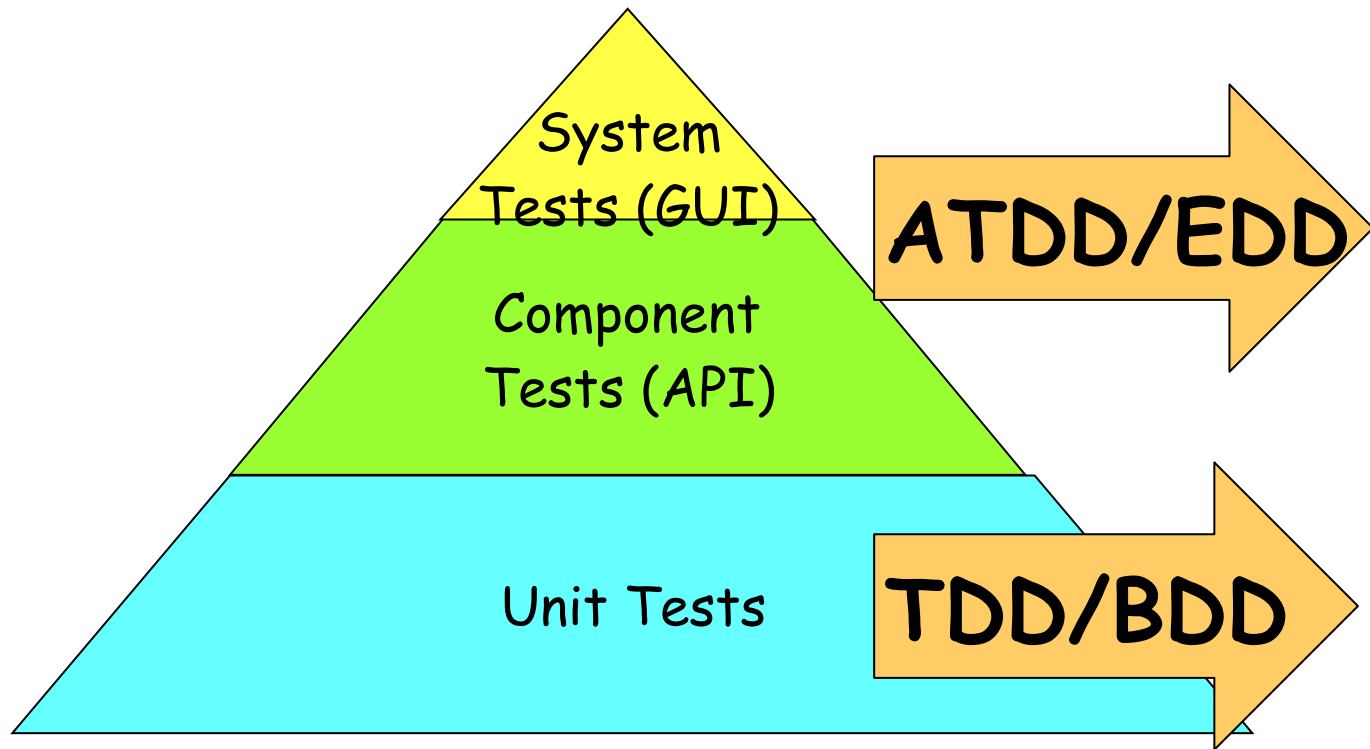
New notifications sent to customer	bobma				
type	account	timestamp	amount	via	address
debit	10035692877	9:30AM, 03/18/2012	\$15,000.00	email	bobma@live.com
debit	10035692877	9:30AM, 03/18/2012	\$11,000.00	email	bobma@live.com
credit	10035692877	9:30AM, 03/18/2012	\$13,000.00	email	bobma@live.com
charge	10035692877	9:30AM, 03/18/2012	\$11,000.00	email	bobma@live.com

Test Automation Pyramid

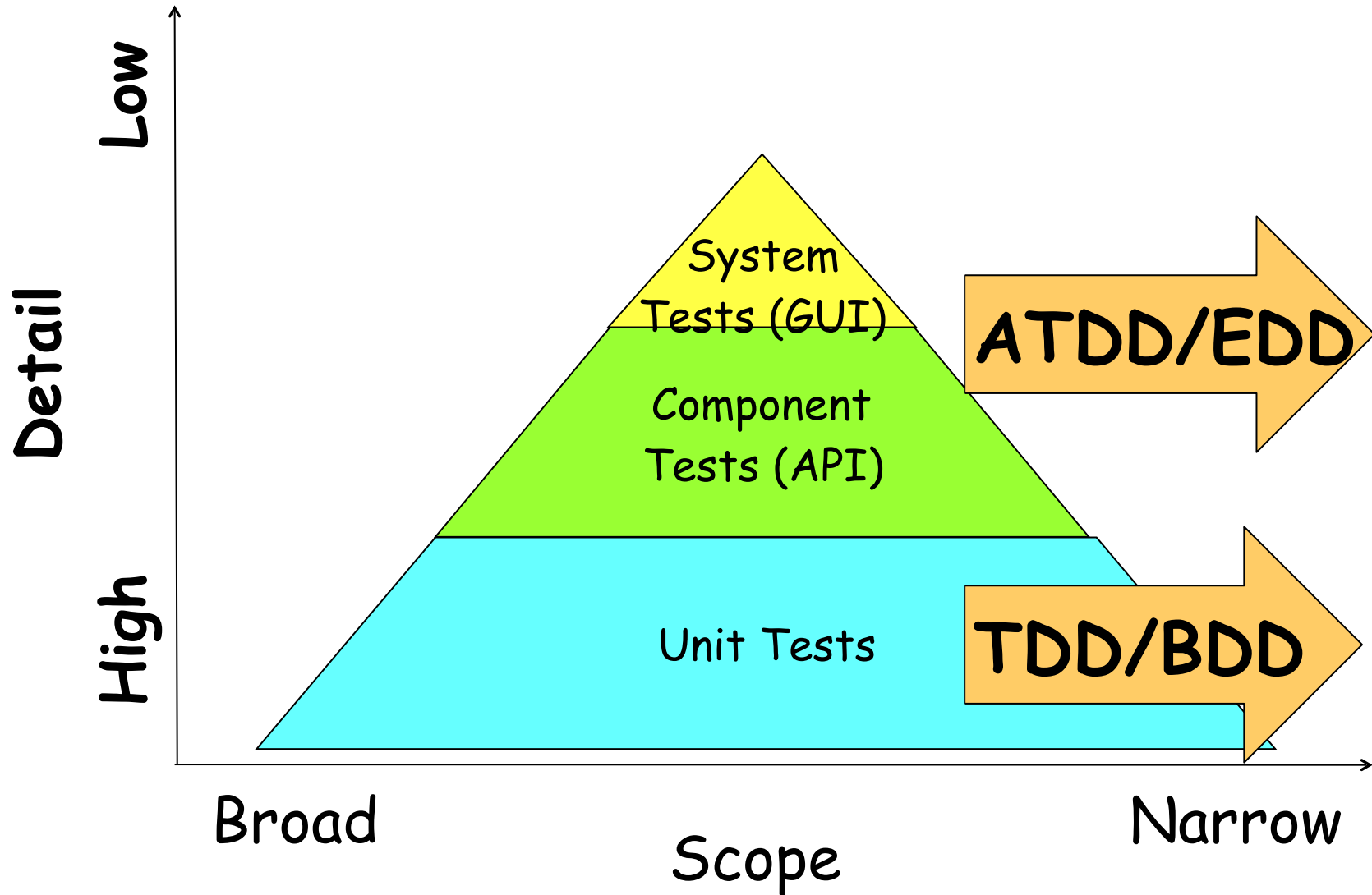


Pyramid originally proposed by Mike Cohn

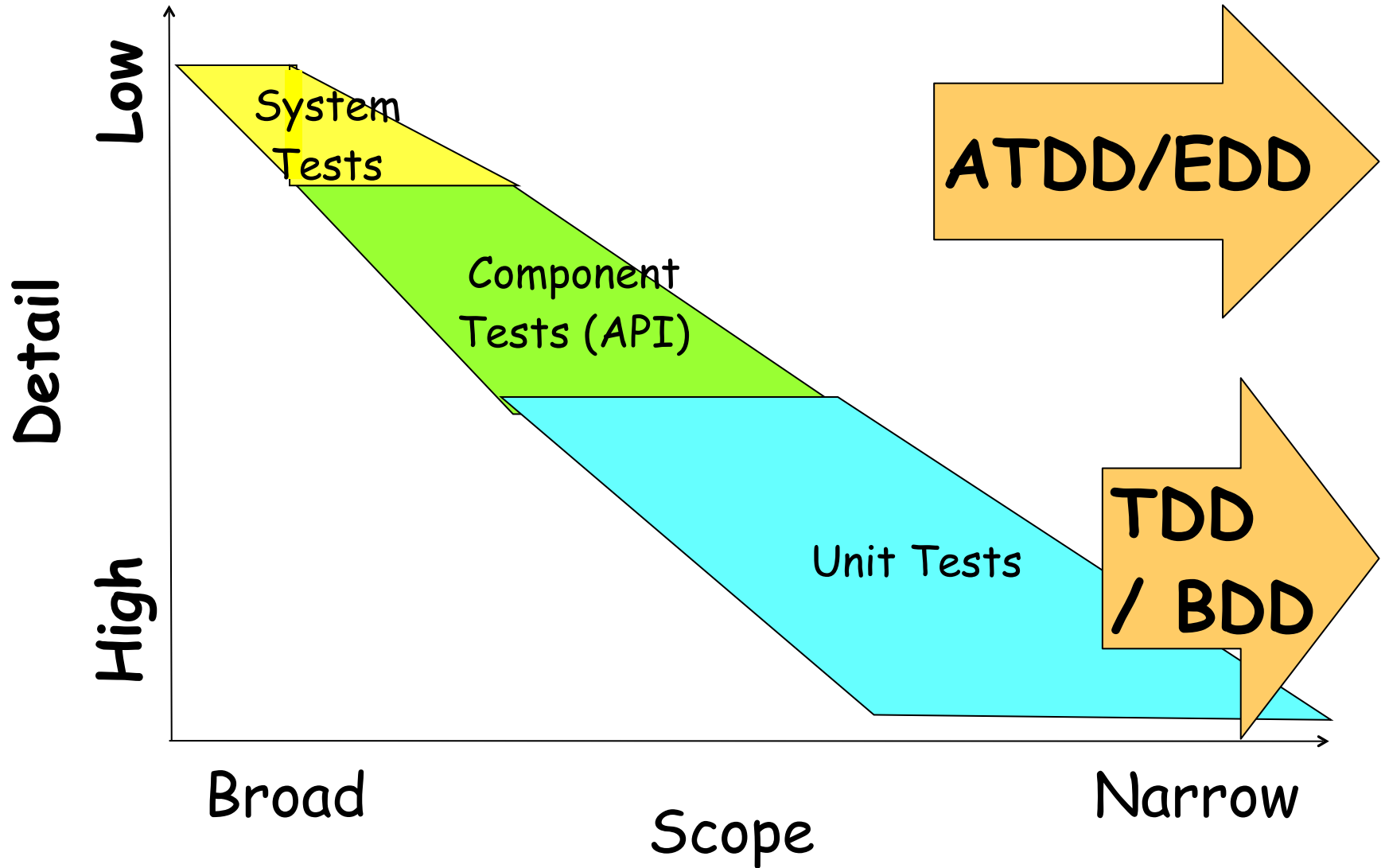
Behavior Specification at Right Level



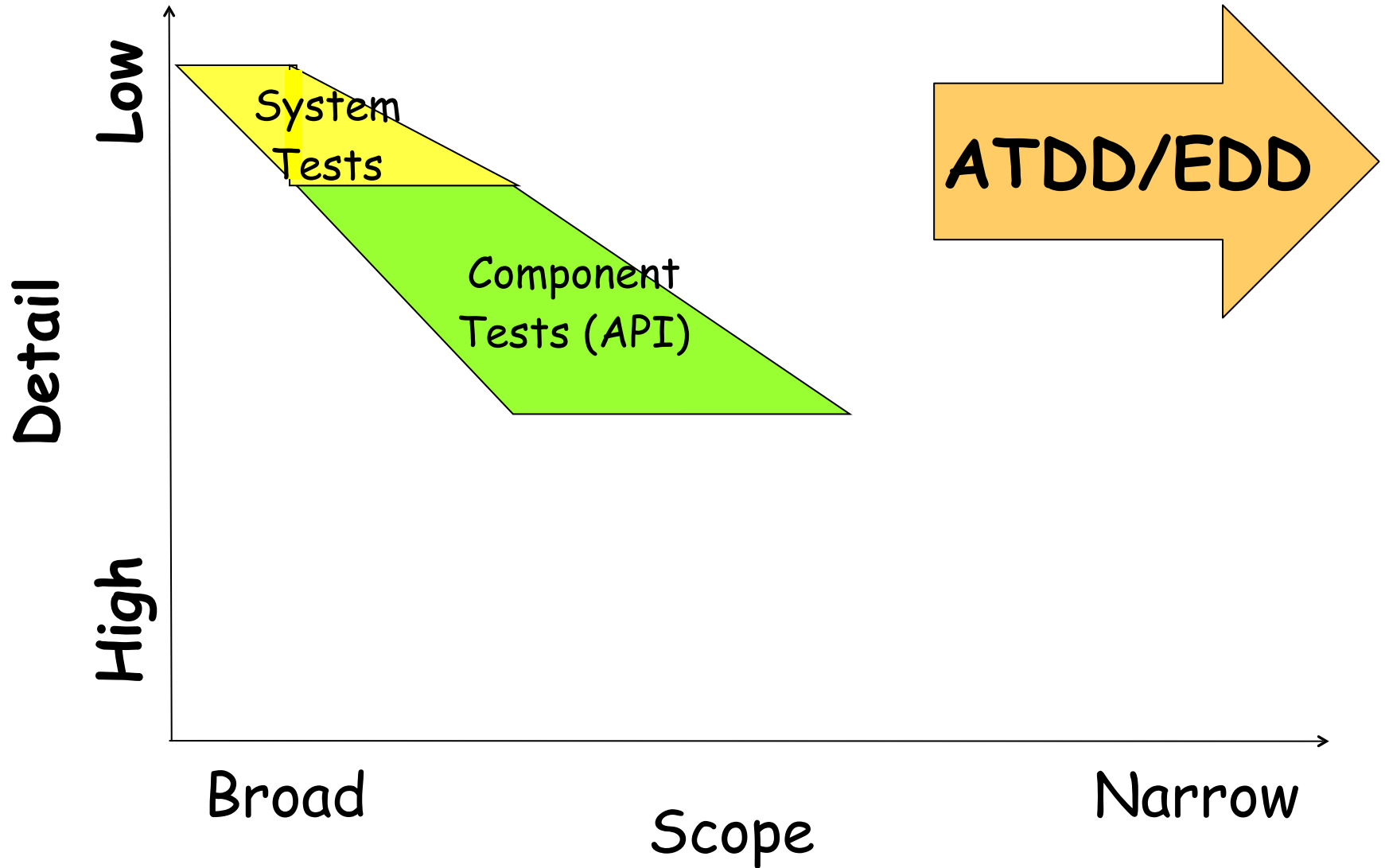
Behavior Specification at Right Level



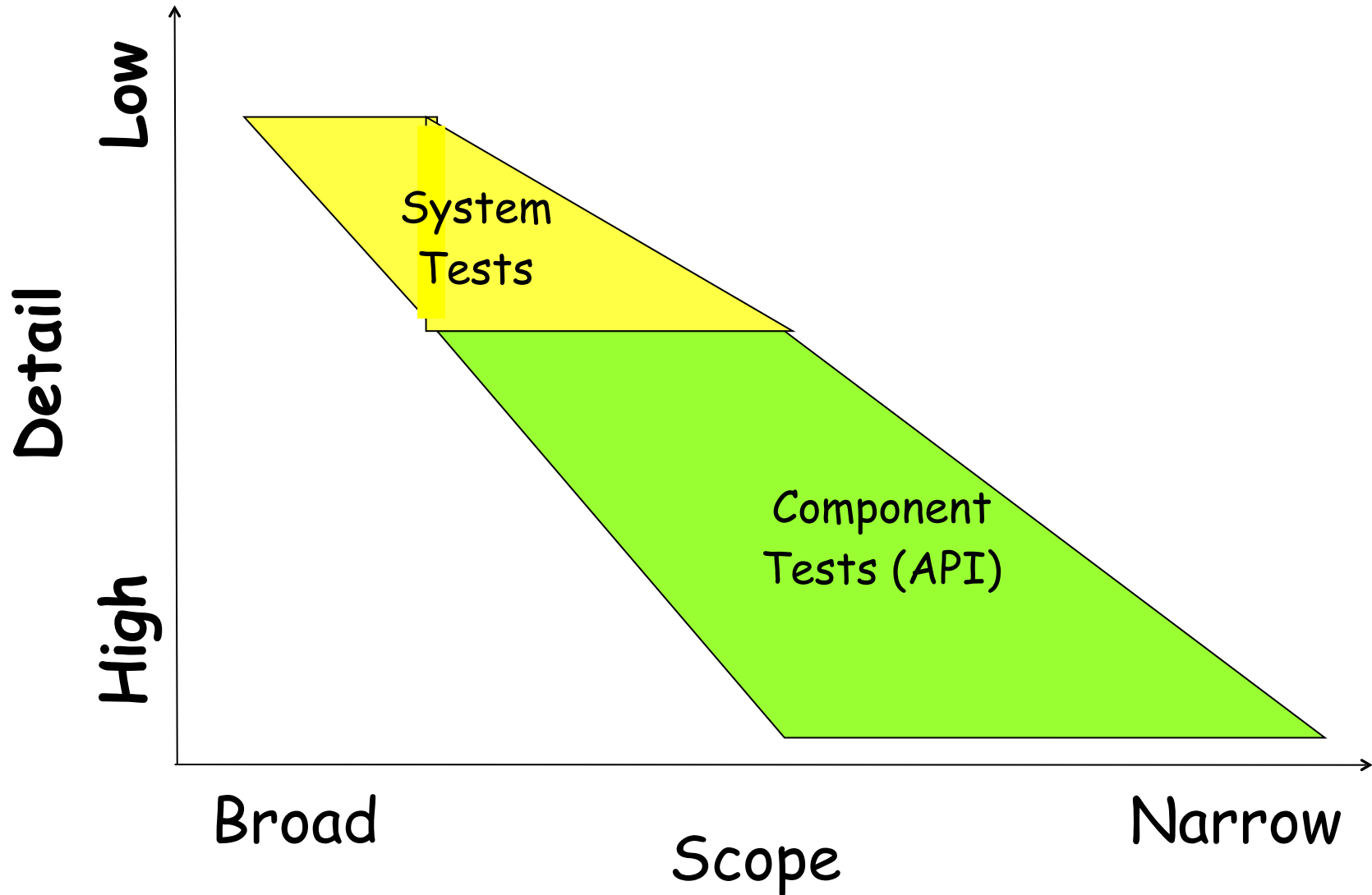
Test Automation Pyramid - Redrawn



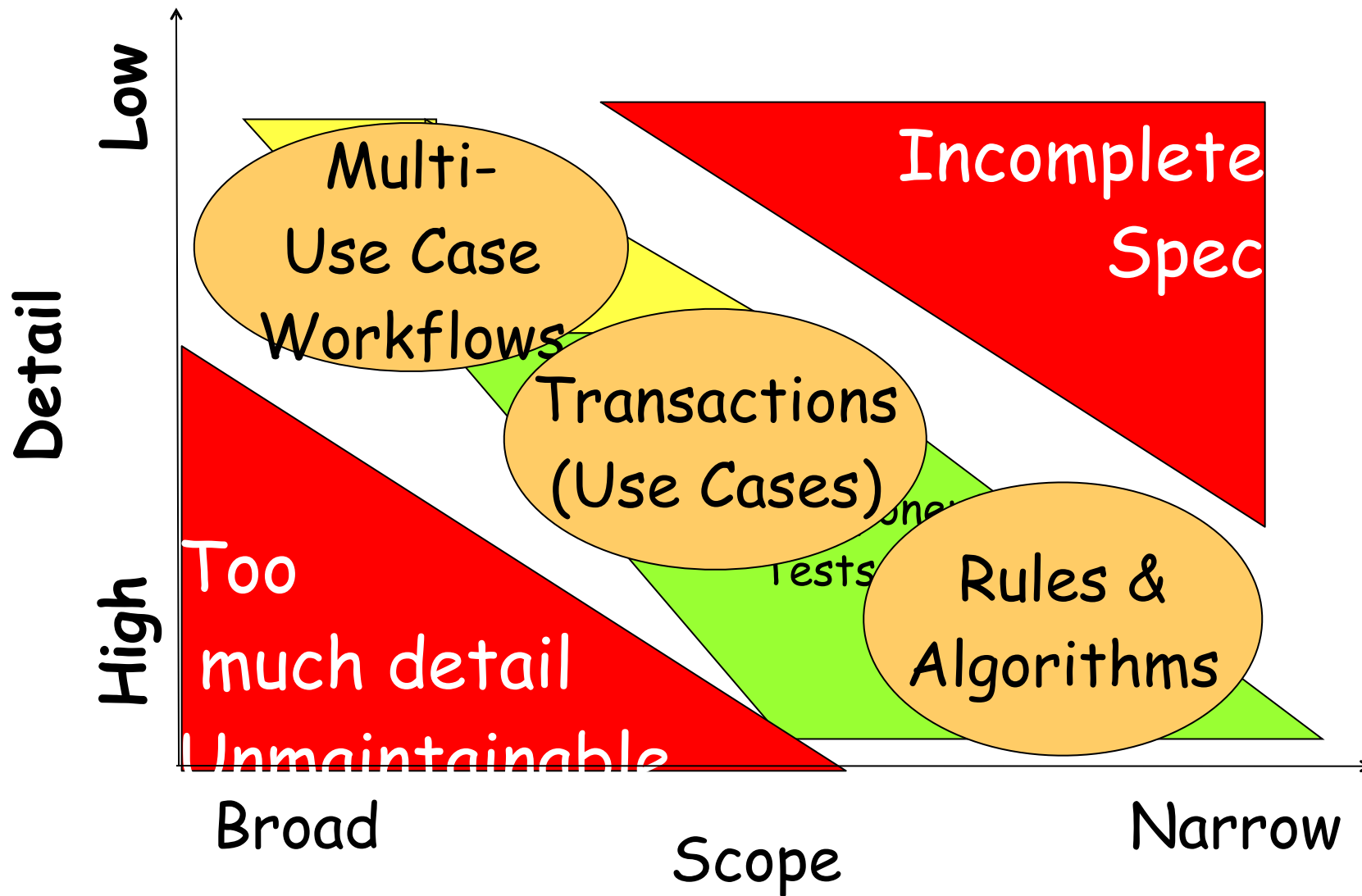
Test Automation Pyramid - Redrawn



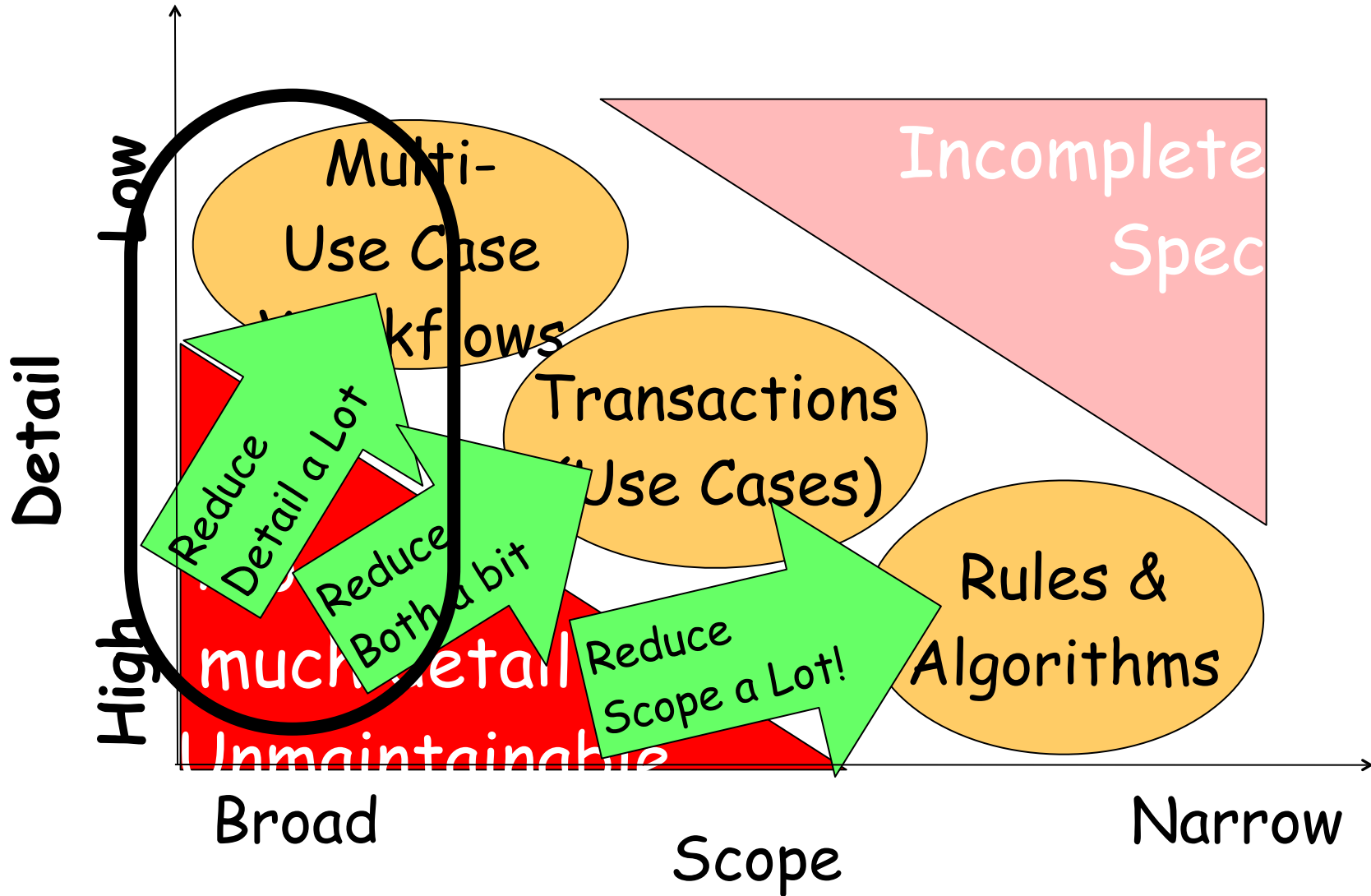
Behavior Specification at Right Level



Behavior Specification at Right Level



Changing Level of Abstraction/Detail



Refactoring Workflow Example

Customer bobma logs in

System lists all available accounts for the authorized customer

account	type	notifications
10035692877	chequing	disabled
10035692890	savings	disabled
20010928892	credit line	disabled

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Rule is Configured

Customer sets notification threshold for all transactions from all locations to \$10,000.00 on account 10035692877 via email to bobma@live.com

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System lists all available accounts for the authorized customer

account	type	notifications
10035692877	chequing	enabled
10035692890	savings	disabled
20010928892	credit line	disabled

Then:
Notification Rule
is Active

Notification settings for account 10035692877				
transaction type	location where initiated	threshold amount	via	address
all	all	\$10,000.00	email	bobma@live.com

Refactoring Workflow Example

Customer sets notification threshold for	all	transactions from	all locations to	\$10,000.00	on account	10035692877	via	email	to	bobma@live.com
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“If it isn't essential to conveying the essence of the behavior, it is essential to not include it.”

Refactoring Workflow Example

Time now is	9:30AM, 03/18/2008		
Bank processes	debit	to	10035692877 in the amount of \$15,000.00
Bank processes	debit	to	10035692877 in the amount of \$9,000.00
Bank processes	debit	to	10035692877 in the amount of \$11,000.00
Bank processes	debit	to	20010928892 in the amount of \$12,000.00
Bank processes	credit	to	10035692877 in the amount of \$13,000.00
Bank processes	credit	to	10035692877 in the amount of \$9,999.99
Bank processes	charge	to	10035692877 in the amount of \$9,999.99
Bank processes	charge	to	10035692877 in the amount of \$11,000.00

When: The Transactions to be processed

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New notifications sent to customer	bobma				
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debit	10035692877	9:30AM, 03/18/2012	\$11,000.00	email	bobma@live.com
credit	10035692877	9:30AM, 03/18/2012	\$13,000.00	email	bobma@live.com
charge	10035692877	9:30AM, 03/18/2012	\$11,000.00	email	bobma@live.com

Refactoring Workflow Example

Time now is	9:30AM, 03/18/2008			
Bank processes	debit	to	10035692877	in the amount of \$15,000.00
Bank processes	debit	to	10035692877	in the amount of \$9,000.00
Bank processes	debit	to	10035692877	in the amount of \$11,000.00

New notifications sent to customer	bobma				
type	account	timestamp	amount	via	address
debit	10035692877	9:30AM, 03/18/2012	\$15,000.00	email	bobma@live.com
debit	10035692877	9:30AM, 03/18/2012	\$11,000.00	email	bobma@live.com

Refactoring Workflow Example

Customer sets notification threshold for all transactions from ~~all~~ ~~transactions~~ to \$10,000.00 on account 10035692877 ~~via email to bobma~~

Time now is	9:30AM, 03/18/2008		
Bank processes	debit	to	10035692877 in the amount of \$15,000.00
Bank processes	debit	to	10035692877 in the amount of \$9,000.00
Bank processes	debit	to	10035692877 in the amount of \$11,000.00

New notifications sent to customer	bobma				
type	account	timestamp	amount	via	address
debit	10035692877	9:30AM, 03/18/2012	\$15,000.00	email	bobma@live.com
debit	10035692877	9:30AM, 03/18/2012	\$11,000.00	email	bobma@live.com

Refactoring Workflow Example

Given:
User &
Thresholds

Time now is	9:00AM, 03/18/2008				
Customer	bobma	sets notification threshold to	\$10,000.00	for all transactions.	to 10035692877

Time now is	9:30AM, 03/18/2008				
Bank processes	dedit	to	10035692877	in the amount of	\$15,000.00
Bank processes	debit	to	10035692877	in the amount of	\$9,000.00
Bank processes	dedit	to	10035692877	in the amount of	\$11,000.00

When:
Transactions
Are Processed

New notifications sent to customer	bobma		
type	account	timestamp	amount
dedit	10035692877	9:30AM, 03/18/2008	\$15,000.00
dedit	10035692877	9:30AM, 03/18/2008	\$11,000.00

Then:
We Expect
Notifications

Refactoring Workflow Example

Given:
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Time now is	9:00AM, 03/18/2008		
Customer	bobma	sets notification threshold to	\$10,000.00 for all transactions to 10035692877

Time now is	9:30AM, 03/18/2008		
Bank processes	debit	to 10035692877	in the amount of \$15,000.00
Bank processes	debit	to 10035692877	in the amount of \$9,000.00
Bank processes	credit	to 10035692877	in the amount of \$11,000.00
Bank processes	debit	to 9991113333	in the amount of \$11,000.00

When:
Transactions
Are Processed

New notifications sent to customer		bobma		
type	account	timestamp	amount	
debit	10035692877	9:30AM, 03/18/2008	\$15,000.00	
credit	10035692877	9:30AM, 03/18/2008	\$11,000.00	

Then:
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Notifications

Refactoring Workflow Example

Given:
User &
Thresholds

Time now is	9:00AM, 03/18/2008		
Customer	bobma	sets notification threshold to	\$10,000.00 for all transactions to
			10035692877

Time now is	9:30AM, 03/18/2008		
Bank processes	debit	to 10035692877	in the amount of \$15,000.00
Bank processes	debit	to 10035692877	in the amount of \$9,000.00
Bank processes	credit	to 10035692877	in the amount of \$11,000.00
Bank processes	debit	to 9991113333	in the amount of \$11,000.00

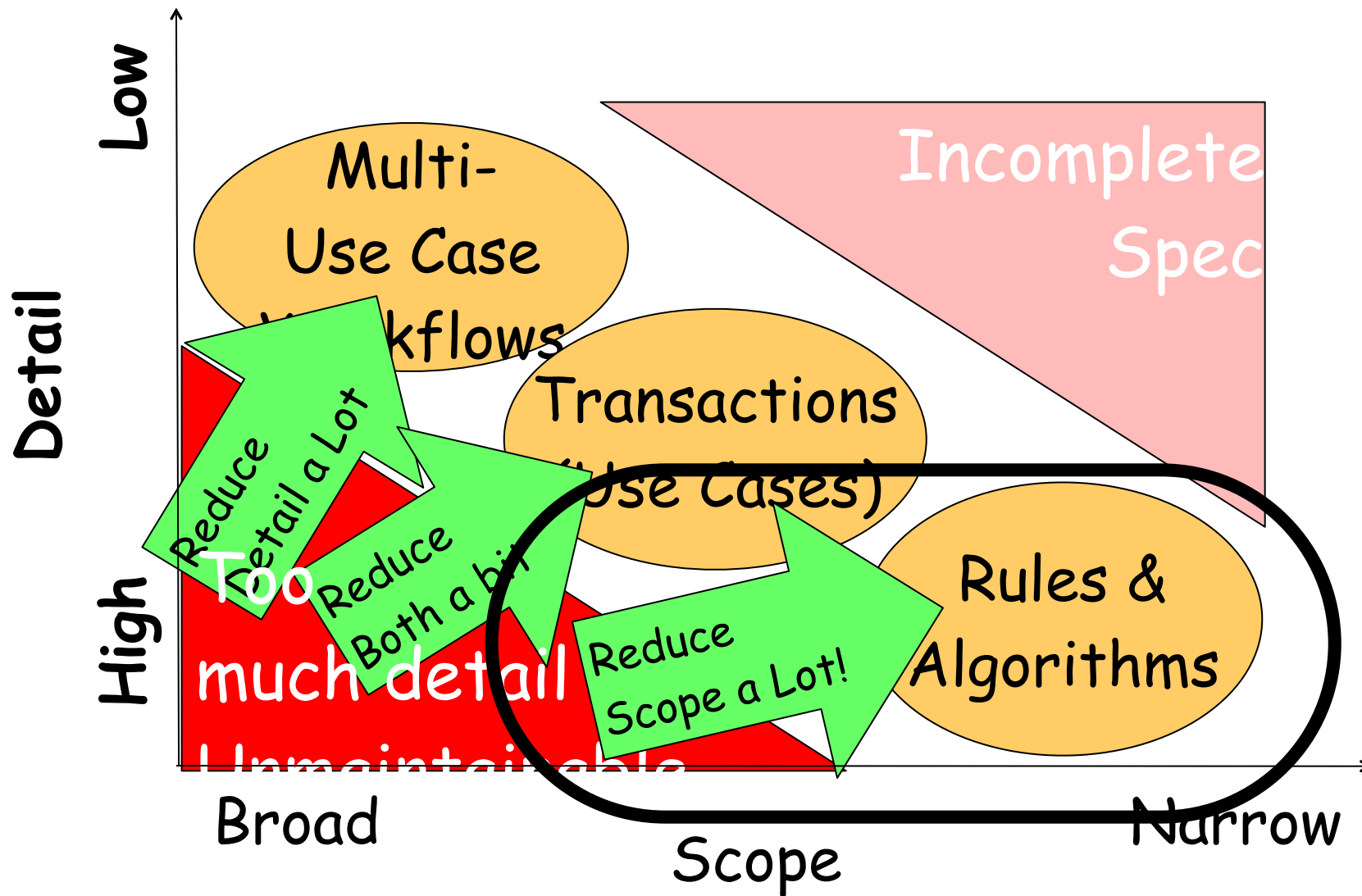
When:
Transactions
Are Processed

New notifications sent to customer		bobma		
type	account	timestamp	amount	
debit	10035692877	9:30AM, 03/18/2008	\$15,000.00	
credit	10035692877	9:30AM, 03/18/2008	\$11,000.00	

Then:
We Expect
Notifications

Broad Scope (Multi-Actor);
Minimum Detail (per Actor/Transaction);

Filling in the Details



Business Rule Example

Threshold per Charge Type

Configuration

CustomerAccounts			
Customer	Account	Label	Added()
bobma	100372	Checking	

CustomerThresholds				
Customer	Account	Charge Type	Threshold	Added()
bobma	100372	ALL	10,000	OK
bobma	100372	Travel	1,000	OK
bobma	100372	Restaurant	100	OK
bobma	100372	Groceries	264.23	OK

Process Transaction

NotificationRequired			
Account	Charge Type	Amount	Notify?
100372	Travel	999.99	No
100372	Travel	1,000.00	Yes
100372	Restaurant	99.99	No
100372	Restaurant	100.00	Yes
100372	Groceries	264.22	No
100372	Groceries	264.23	Yes
100372	Other	9.999.99	No
100372	Other	10,000.00	Yes

Example:

Business Rule Examp

Threshold per Charge Type

Configuration

Given these rules

CustomerAccounts			
Customer	Account	Label	Added()
bobma	100372	Checking	

CustomerThresholds				
Customer	Account	Charge Type	Threshold	Added()
bobma	100372	ALL	10,000	OK
bobma	100372	Travel	1,000	OK
bobma	100372	Restaurant	100	OK
bobma	100372	Groceries	264.23	OK

When we ask NotificationRequired? with this transaction:

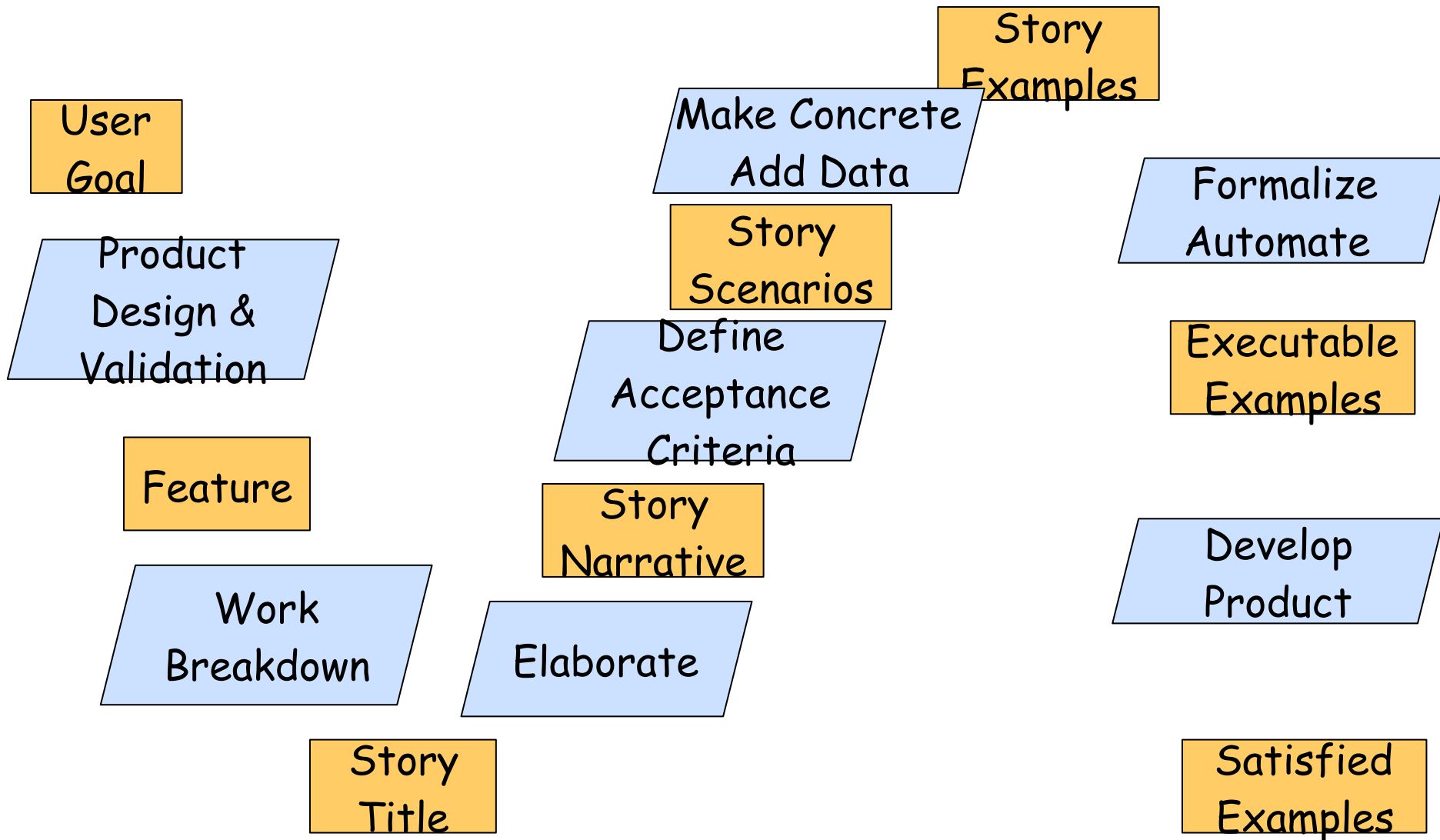
Process Transaction

NotificationRequired bobma			
Account	Charge Type	Amount	Notify?
100372	Travel	999.99	No
100372	Travel	1,000.00	Yes
100372	Restaurant	99.99	No
100372	Restaurant	100.00	Yes
100372	Groceries	264.22	No
100372	Groceries	264.23	No
100372	Other	9.999.99	No
100372	Other	10,000.00	No

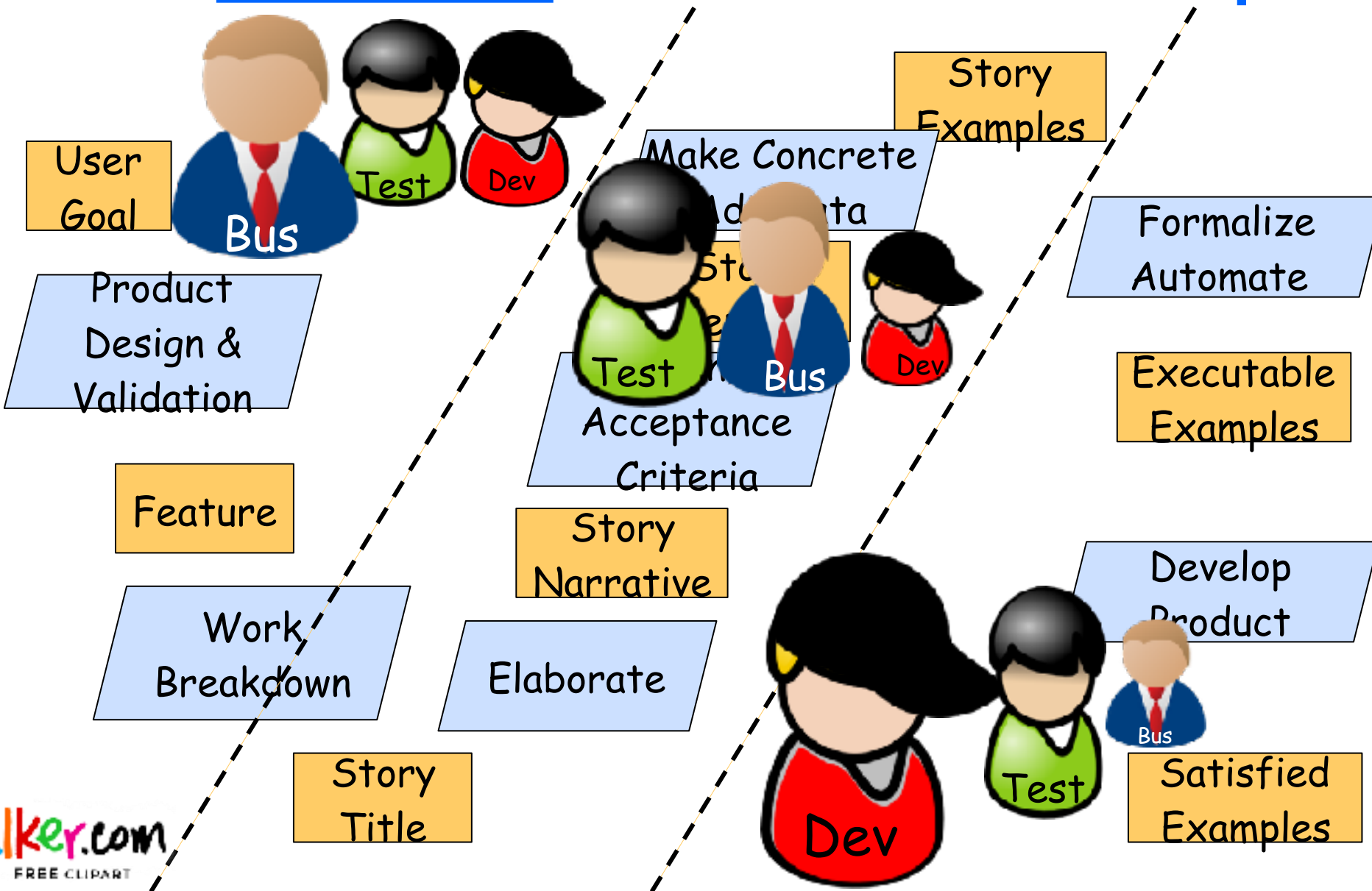
Narrow Scope (Single Rule)
High Detail (Everything that matters)

Then: The answer should be

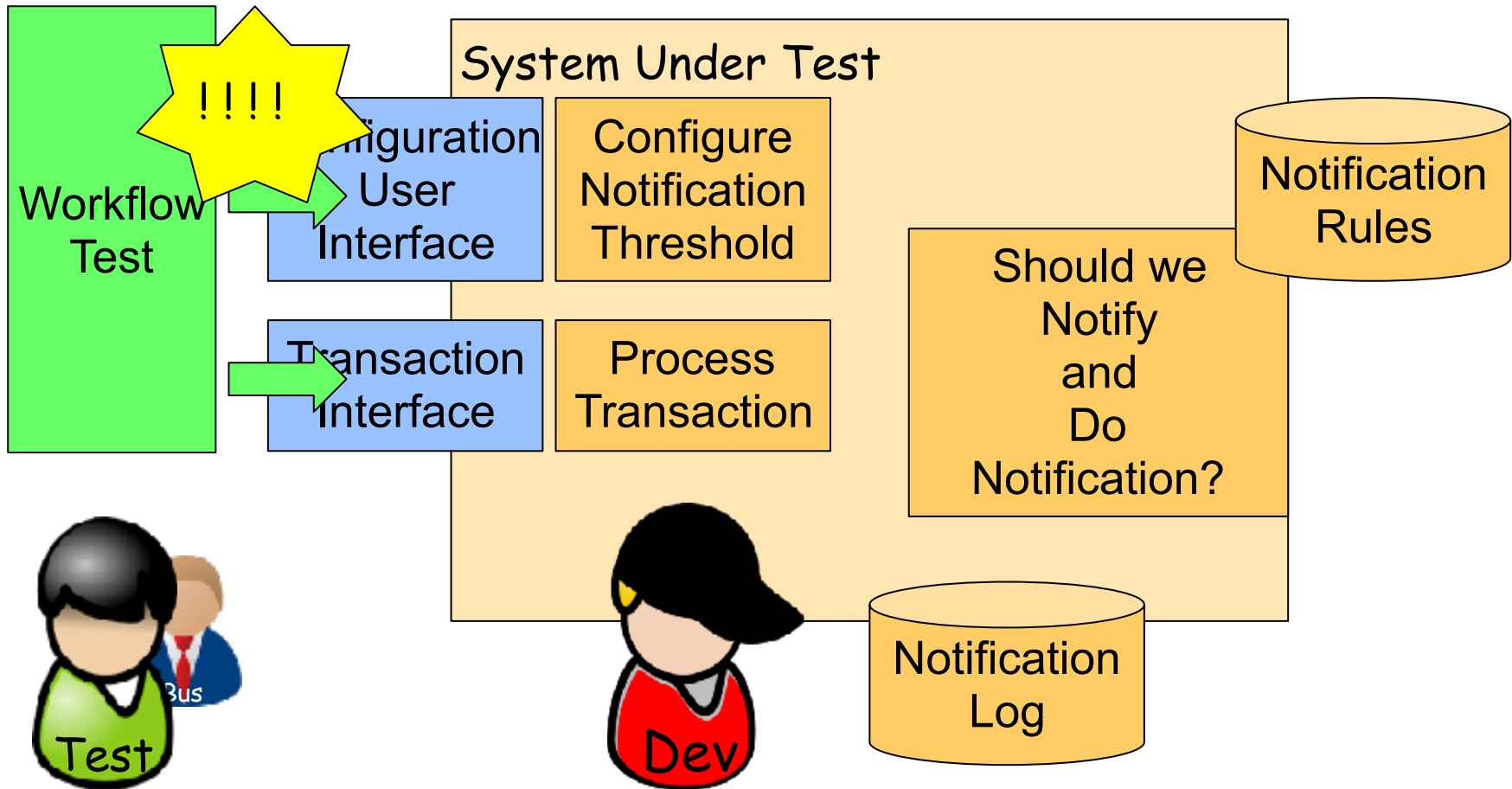
Each Life Cycle of an Example



Who Does Activities on an Example Each

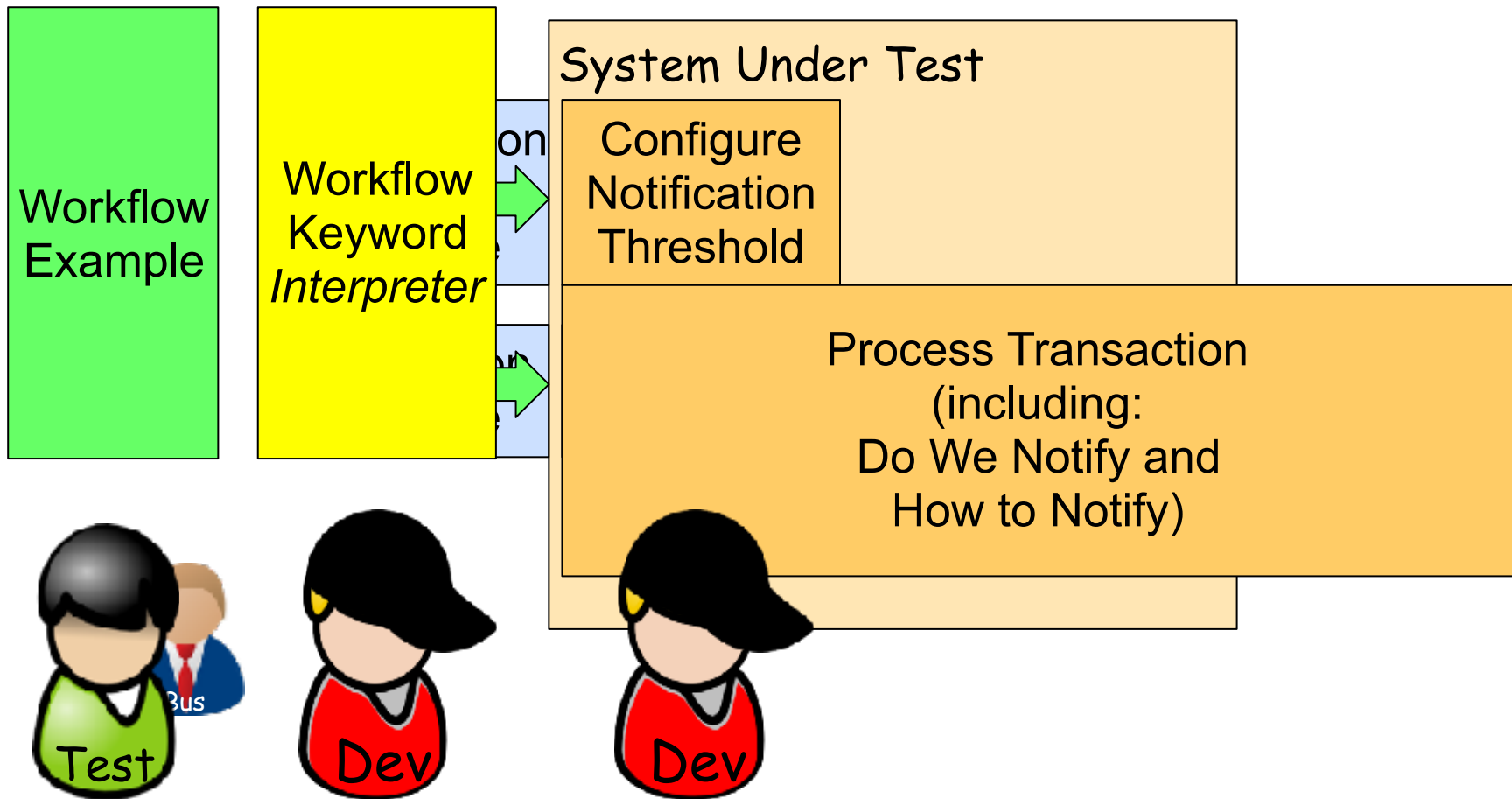


Test-After Architecture

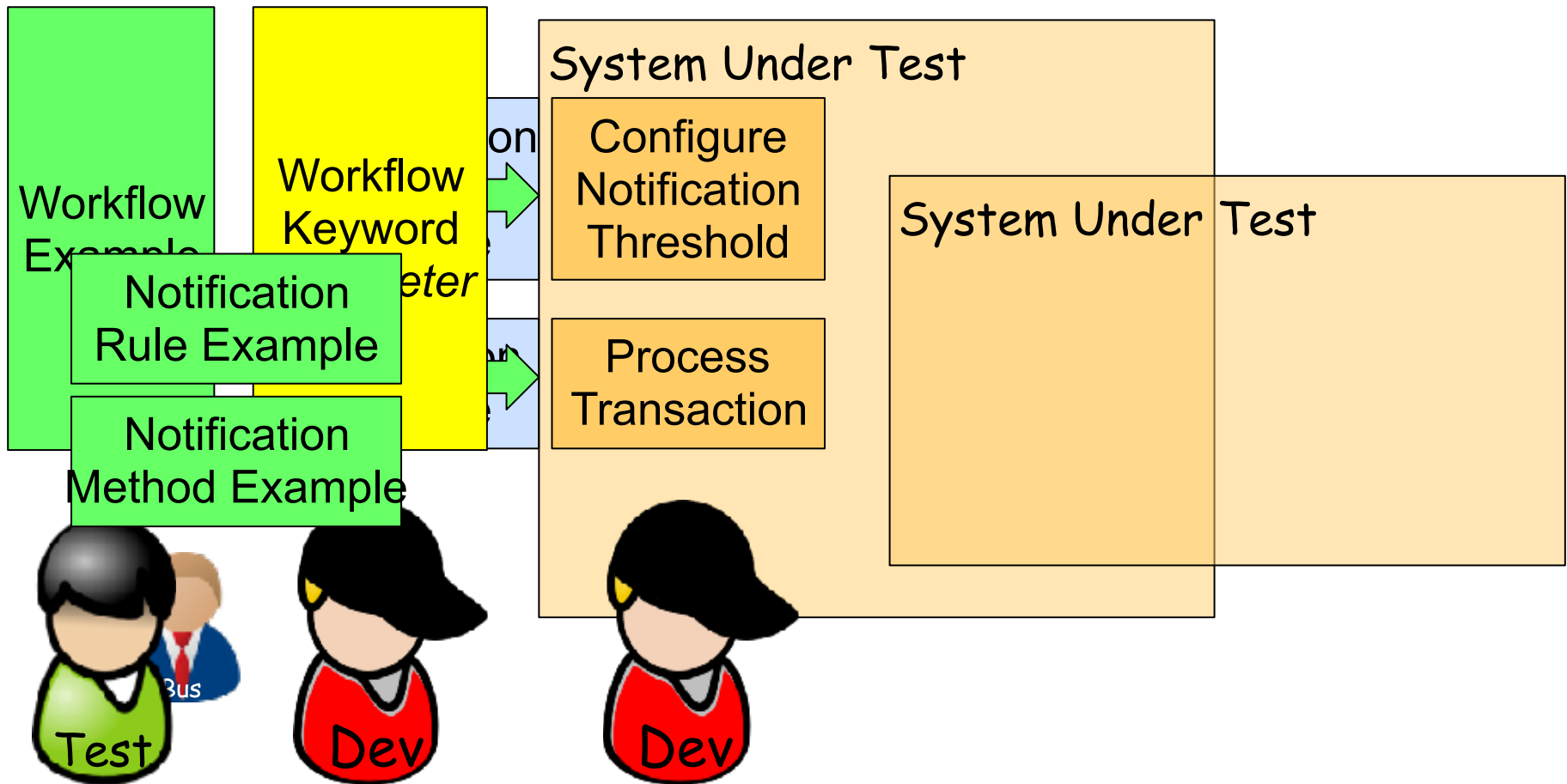


Example-Driven Architecture

Workflow Examples Drive API



Example-Driven Architecture ... but not Component Structure

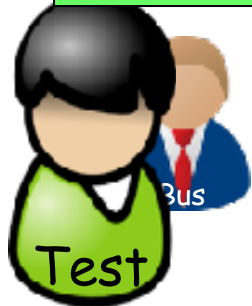


Example-Driven Architecture

Rules Examples Drive Component Dev't

Notification
Rule Example

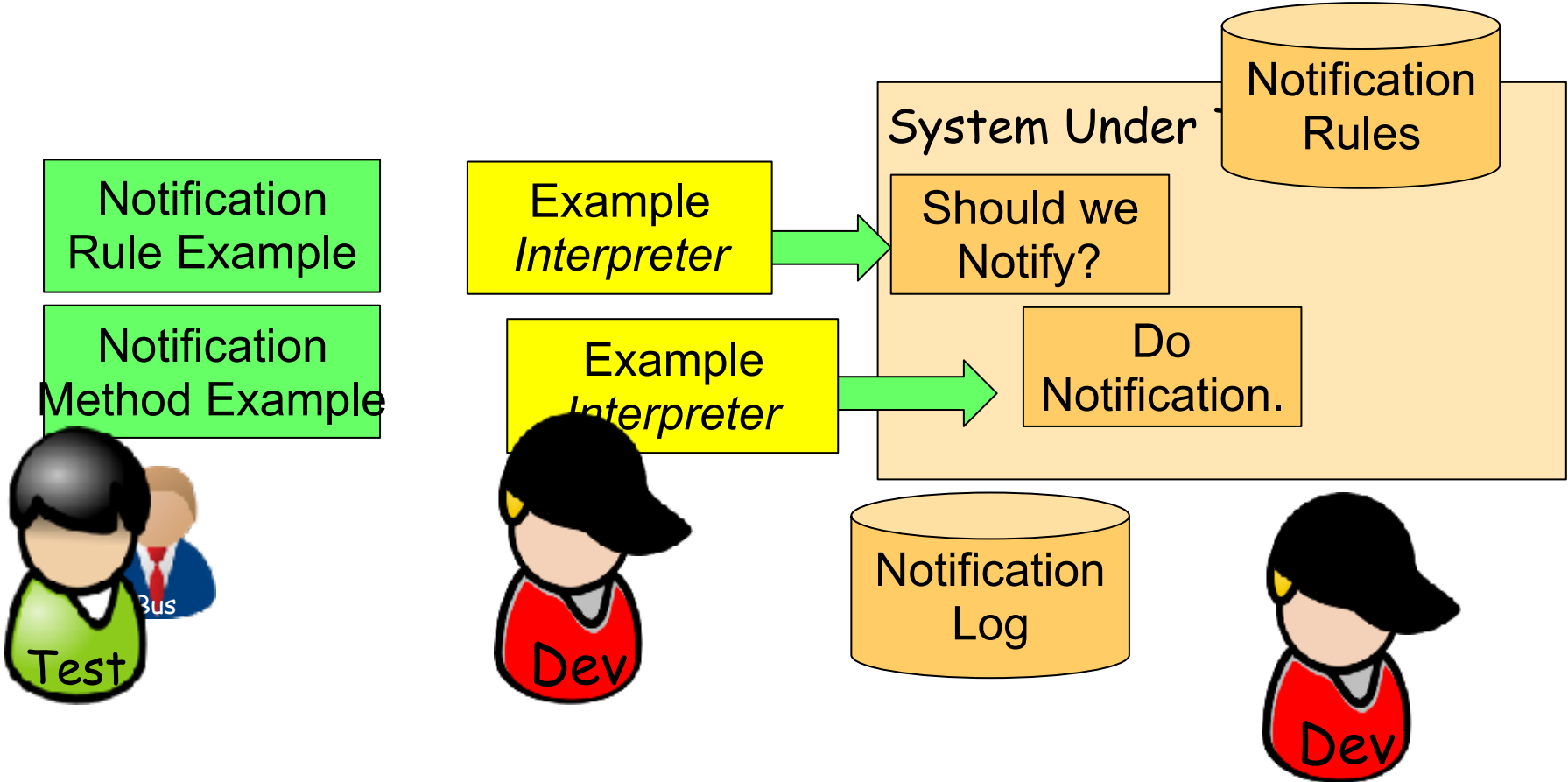
Notification
Method Example



System Under Test

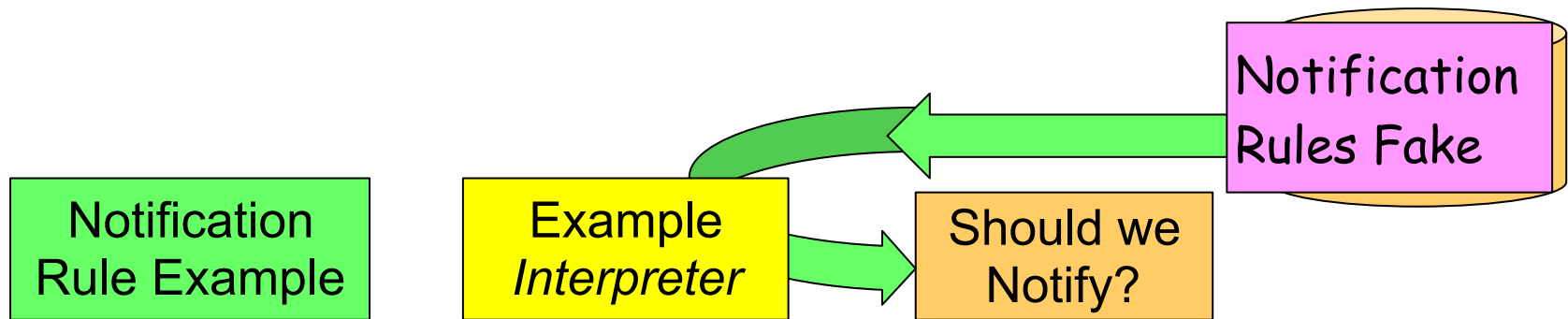
Example-Driven Architecture

Rules Examples Drive Component Dev't



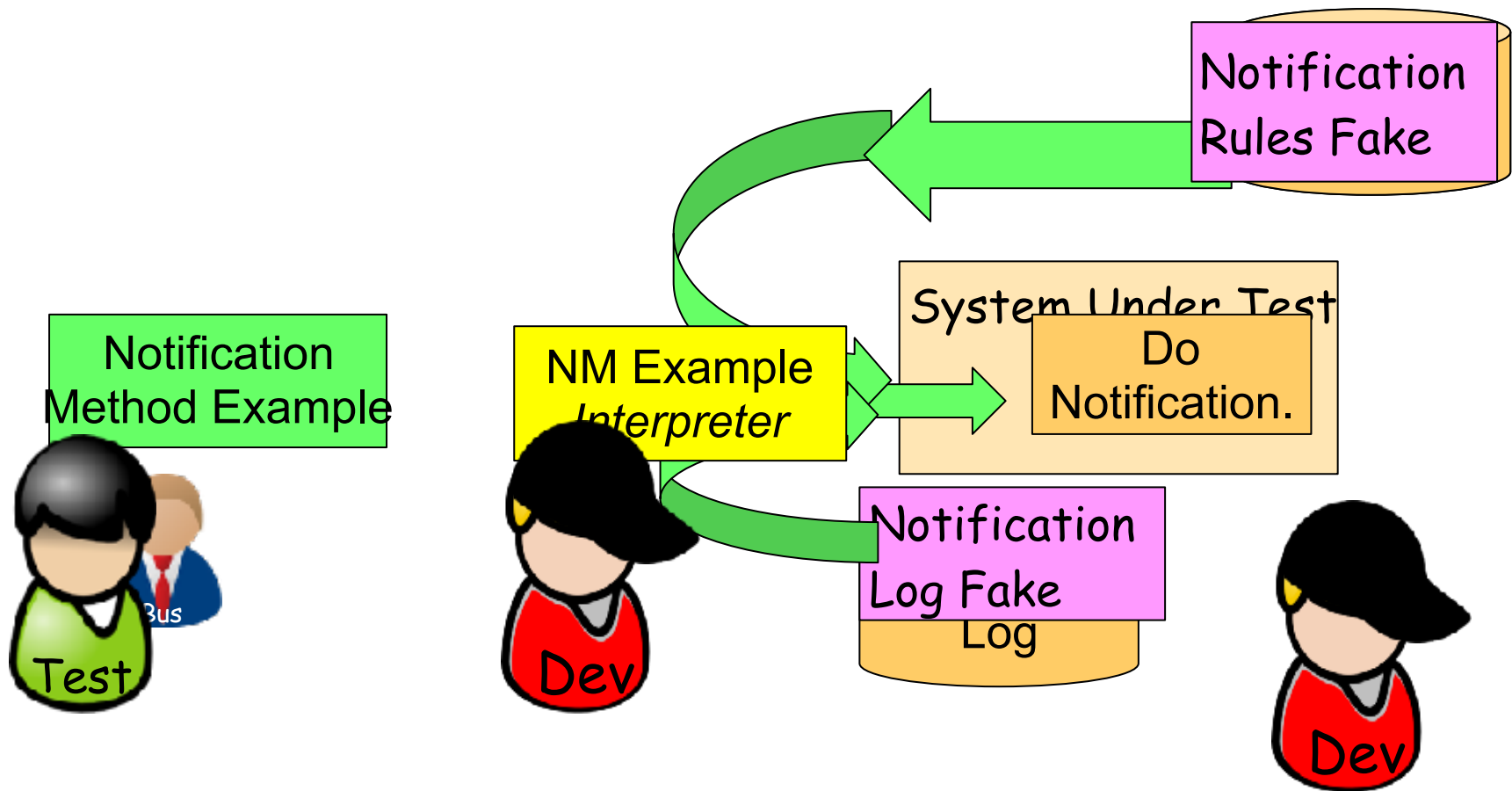
Example-Driven Architecture

Rules Examples Ensure Testability



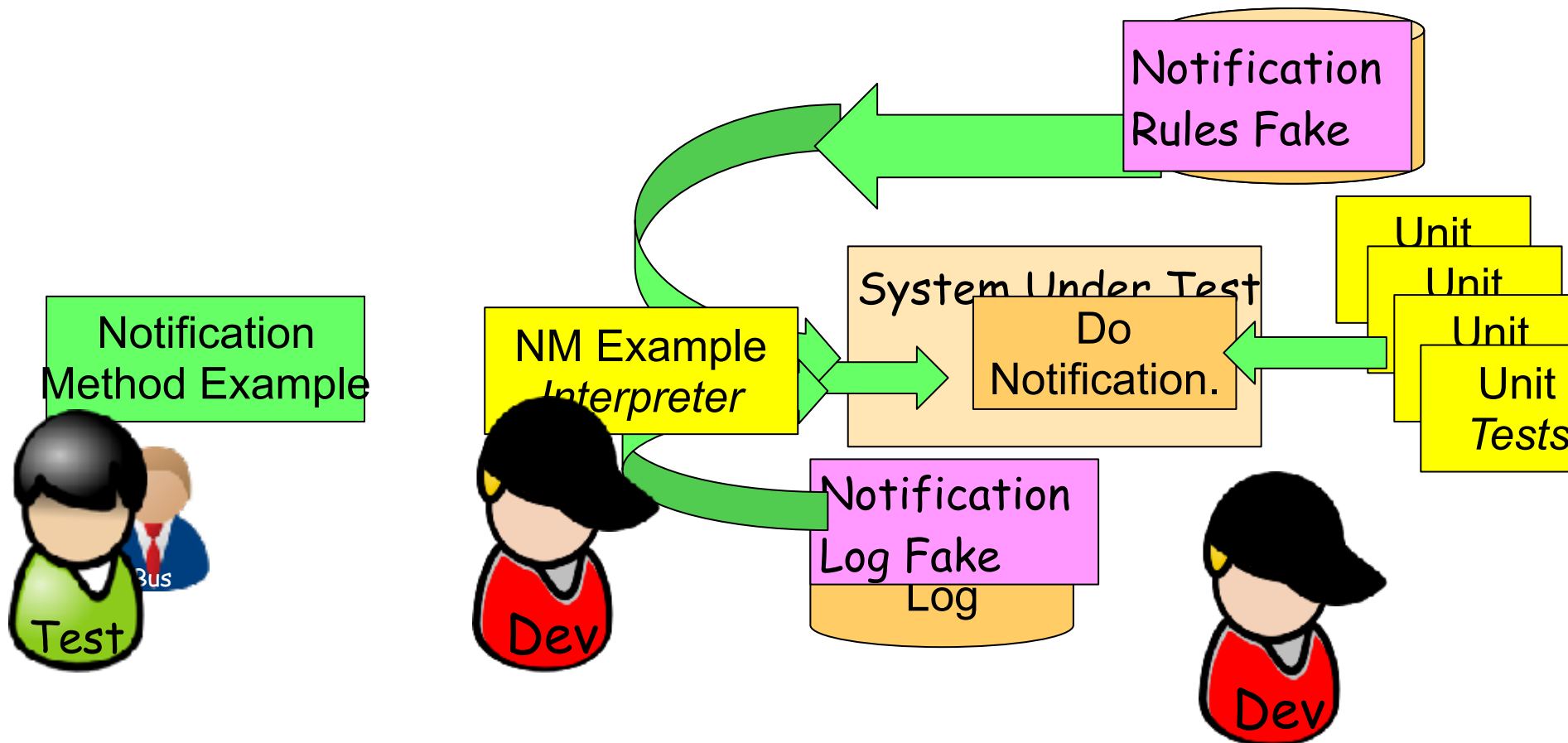
Example-Driven Architecture

Rules Examples Ensure Testability

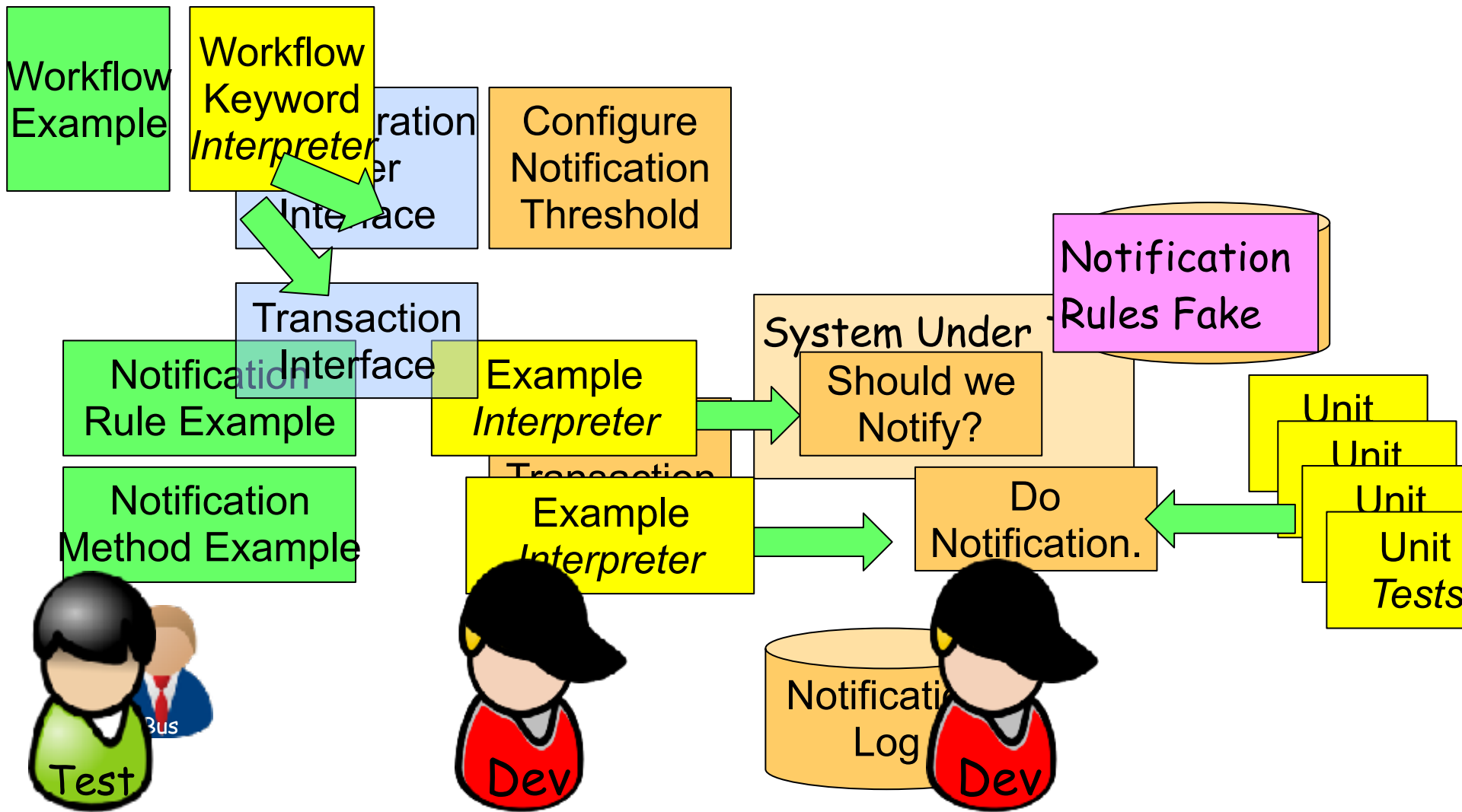


Example-Driven Architecture

Unit Tests Fill in Gaps in Coverage



Putting it All Together



*"Strategy without **tools** is
the slowest route to victory.*

***Tools** without Strategy is
the noise before defeat."*

Sun Tzu

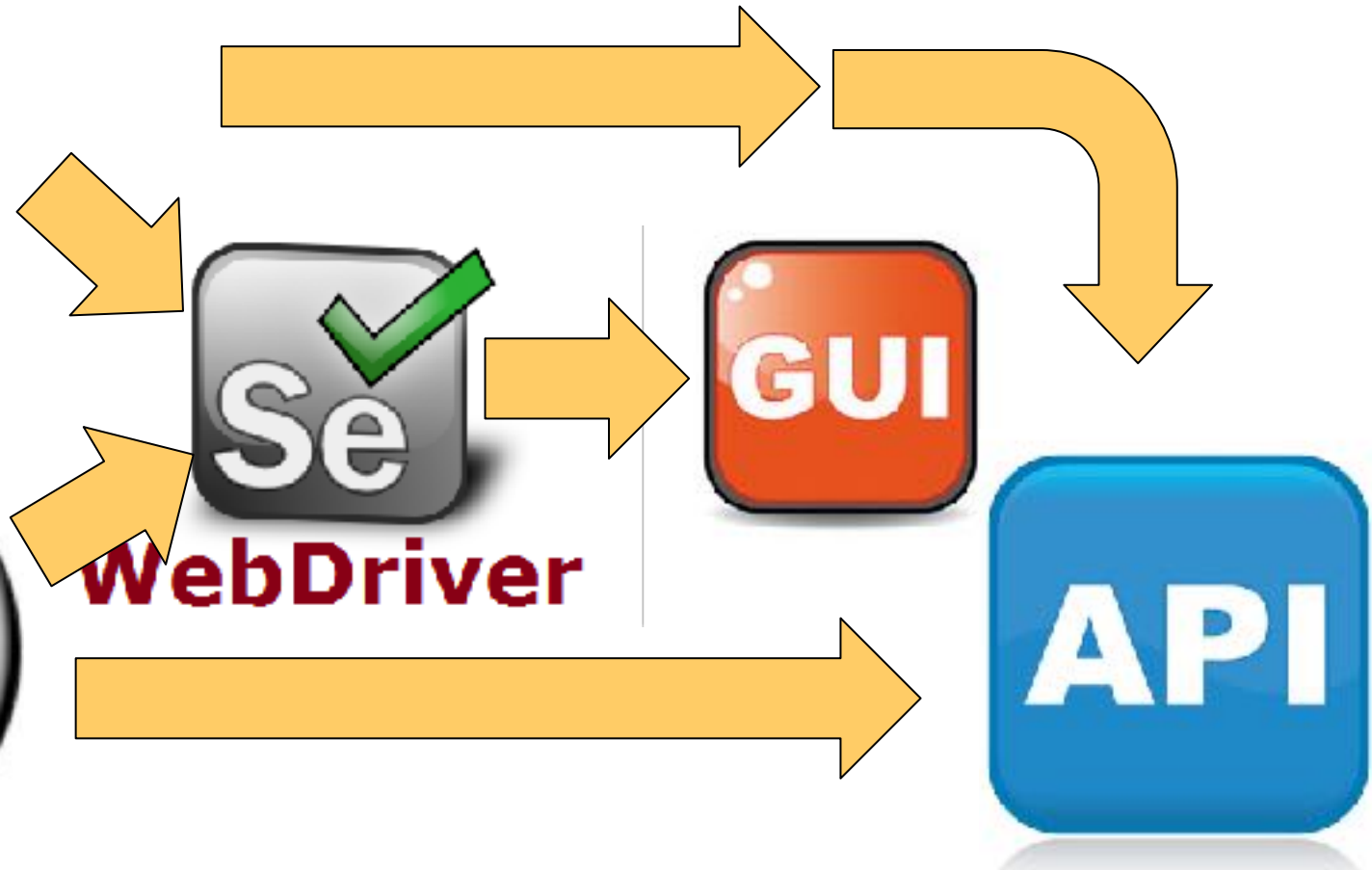
*As adapted by
Gerard Meszaros*



Tools (My Prefs Only)

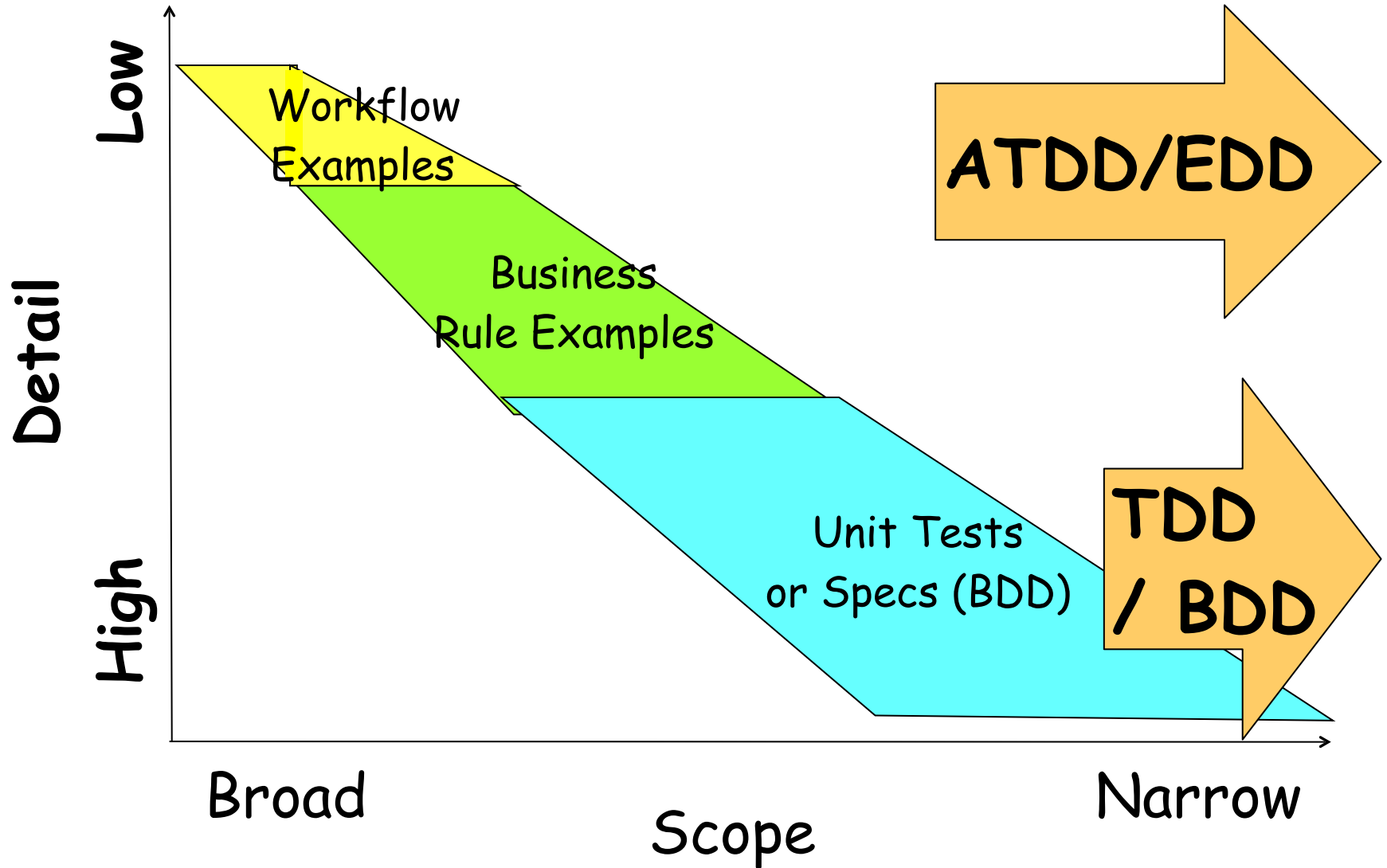
robotframework

A generic test automation framework

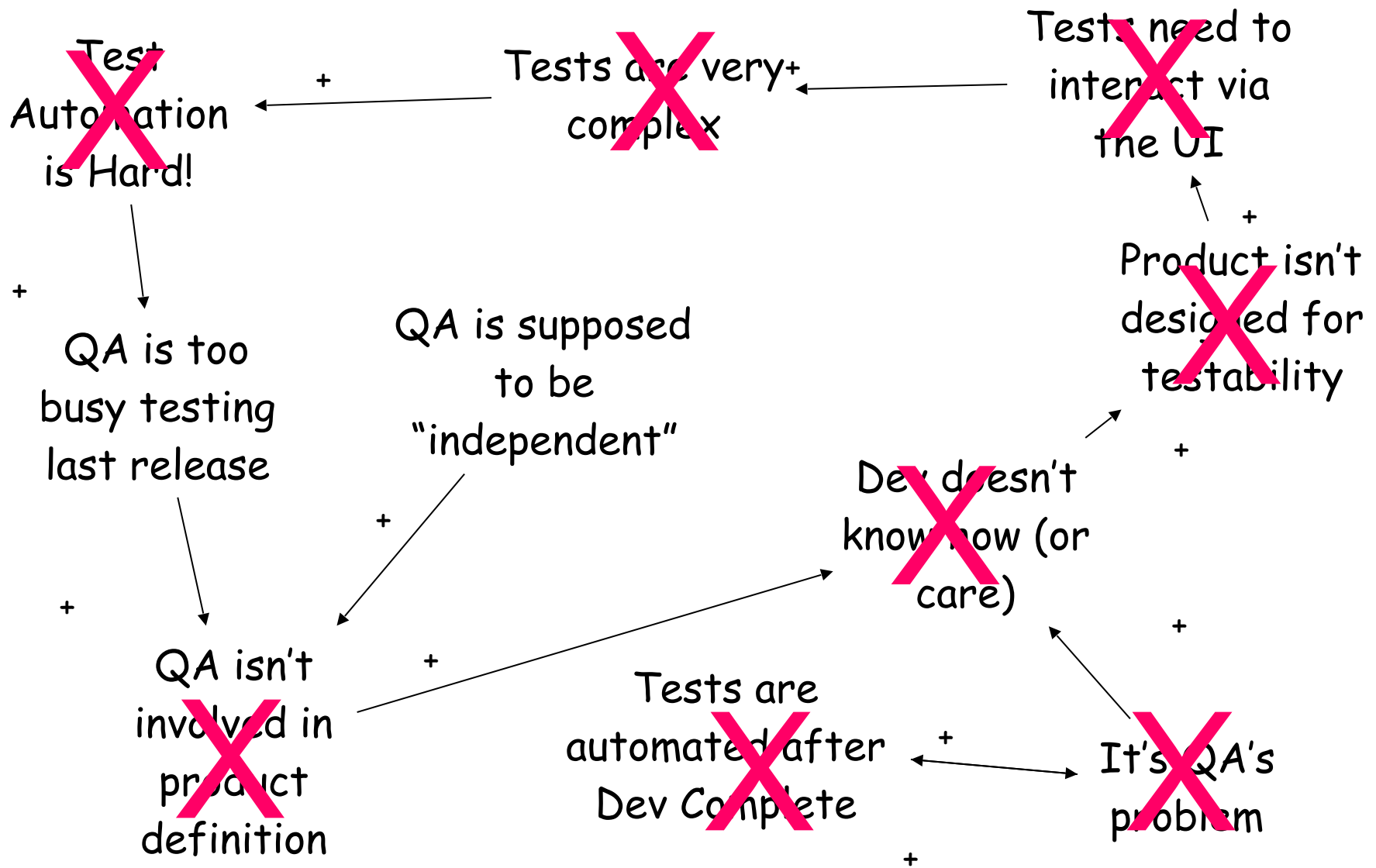


In Conclusion

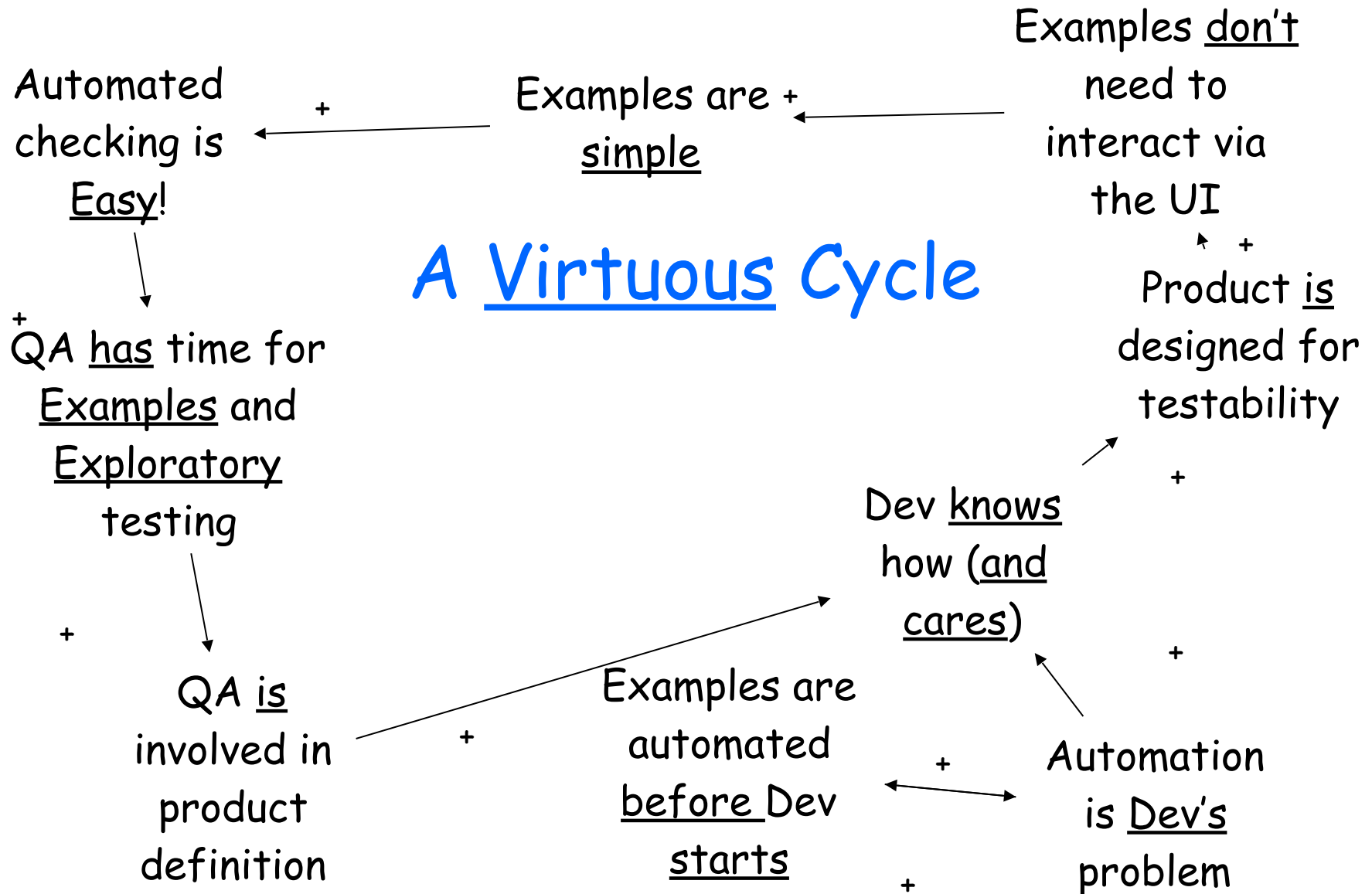
Test Automation Pyramid - Redrawn



After State – Back to Our Systems Diagram



After State – Back to Our Systems Diagram



Benefits

- **Defining Examples first helps us understand**
 - What the system should do
 - How it should be structured to ease testability
- **Using business language for examples**
 - Reduces opportunities for “lost in translation”
- **Developers responsible for automation**
 - Ensures the design is testable
 - Provides immediate feedback on function & testability.
 - Reduces duplication with unit tests
- **Applicable to new code *and* legacy code**
 - Start with Workflow or Component tests, not unit tests

Thank You!

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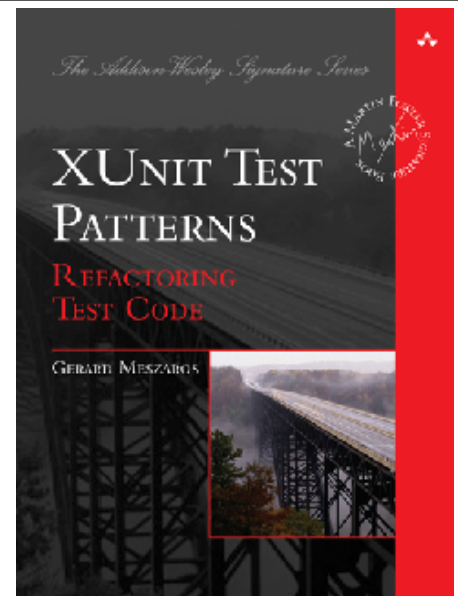
<http://www.xunitpatterns.com>

Slides:

<http://itake2017.testAutomationpatterns.com>

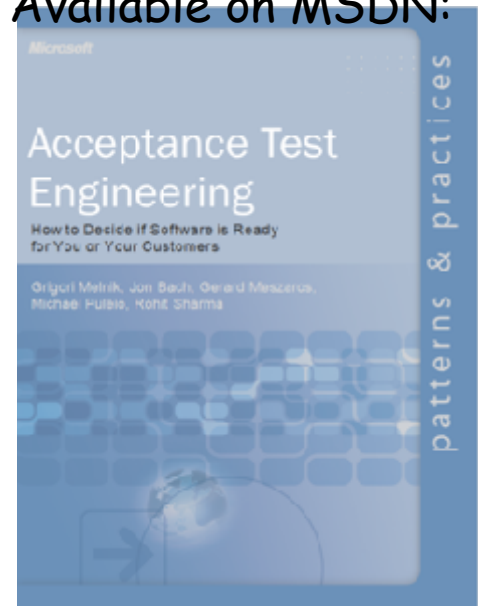
Call me when you:

- **Want to transition to Agile or Lean**
- **Want to do Agile or Lean better**
- **Want to teach developers how to test**
- **Need help with test automation strategy**
- **Want to improve your test automation**



**Jolt Productivity Award
winner - Technical Books**

Available on MSDN:



Tools Selection

- **Tools must support the strategy**
 - Support business/testers to write specs/tests in business language
 - » **More or less “natural” language**
 - Let them write specs *before* the specs are automated or the system is built
 - » **This disqualifies Capture & Replay tools**
 - Can be automated by technical people, later
 - » **Separation of business skills from technical skills**
 - » **e.g. Table or Keyword-based tools**
 - Can be run by anyone, especially developers
 - » **This disqualifies expensive tester-specific tools**

Business Rules Tools - A Sampling

- **Fit**
 - Column Fixture
- **SLIM (Fitness)**
 - Decision Table
- **Robot Framework**
 - Parameterized Testcase

Workflow Spec Tools (my fav's)

- **Gherkin (Given-When-Then terminology)**
 - Cucumber (various tech-specific implementations)
 - JBehave (Java/JVM specific)
 - SpecFlow (.Net)
- **Other GWT (Given-When-Then terminology)**
 - Robot Framework GWT
 - » <https://blog.codecentric.de/en/2009/11/givenwhenthen-and-example-tables-using-the-robot-framework/>
- **Robot Framework**
 - Keyword-based Testcases

Resource: Agile Alliance Functional Testing Tools program

More Complete Survey of Tools

- **Agile Alliance Functional Testing Tools program Yahoo! group**
 - <https://groups.yahoo.com/neo/groups/aa-fft/info>
- **Agile Alliance Functional Testing Tools spreadsheet**
 - https://docs.google.com/spreadsheet/ccc?key=0Apag_J97I3CTdHR0WS1sZGFVaFA0dEpXYWRqLXBxV3c#gid=1