



Requirements Engineering in the DevOps Era

UQÀM | Département d'informatique

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RE 21 - Notre Dame (US) / Virtual

Logistics



29th IEEE International
Requirements Engineering Conference
Notre Dame, South Bend, USA
September 20-24, 2021

• Introductory Course (45 minutes)

- DevOps in the context of RE
- User Stories
- Acceptance Testing
- Continuous Integration | Deployment

• Break (15 minutes)

• Exercises / Demonstration (120 minutes)

- Ordering drinks in a bar in a post-COVID-19 world?



Who are we?



Sébastien Mosser

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Jean-Michel Bruel

 Université
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Toulouse
Midi-Pyrénées

- 1 DevOps & RE
- 2 User Stories
- 3 Acceptance Testing
- 4 Continuous Int. & Depl.
- 5 Hands-on / Demonstration

DevOps in the context of RE

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Software...

Does the right **thing**

- Validation
- « Building the right system »



<https://www.canon.co.nz/software-solutions/iw-sam>

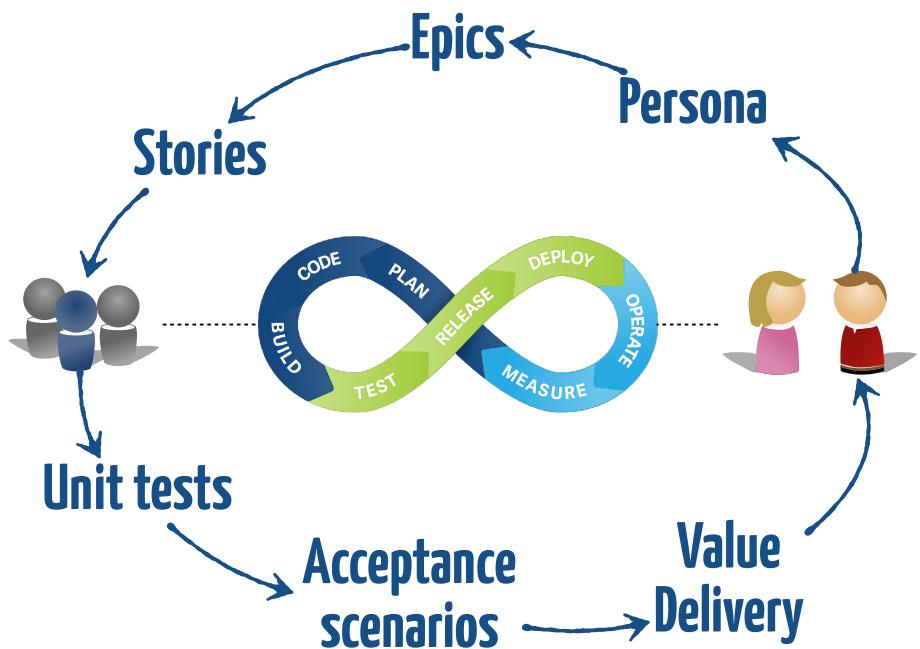
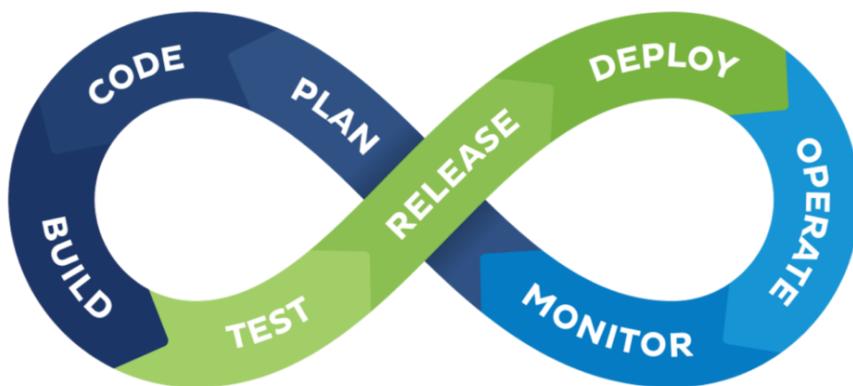
Does them right

- Verification
- « Building the system right »

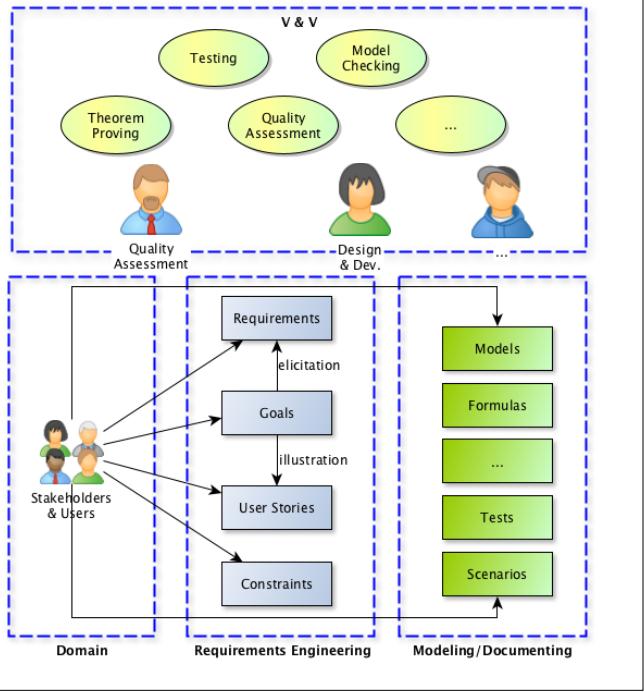


<https://www.techopedia.com>

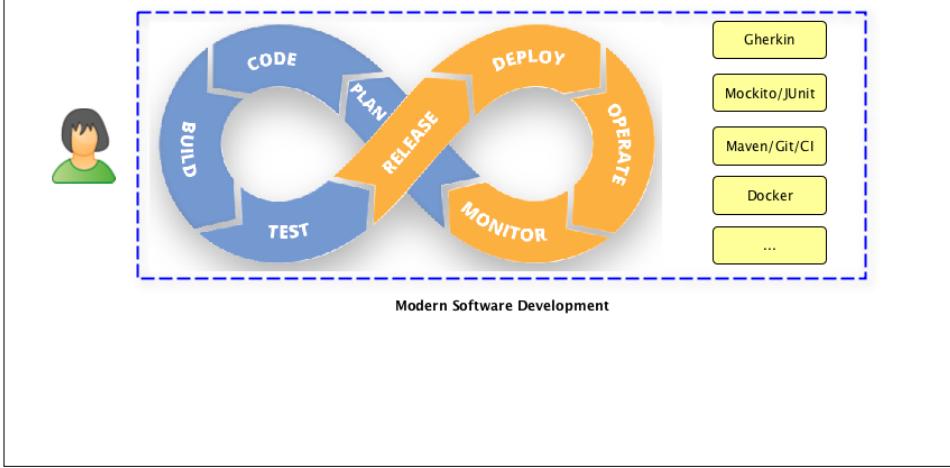
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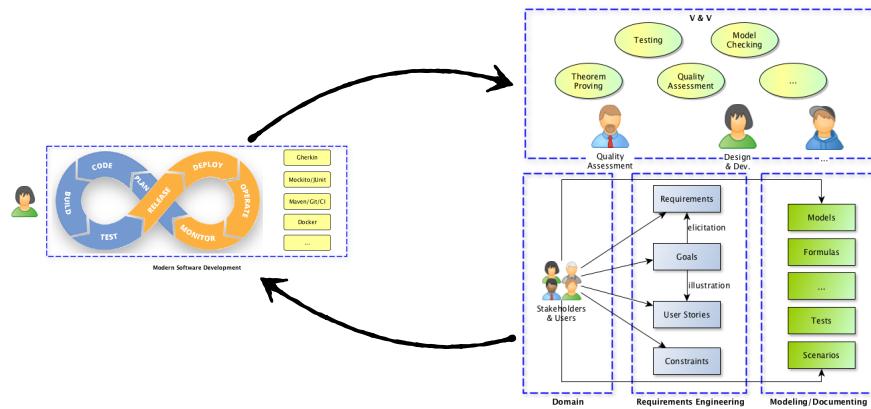
Big Picture



Tooling support

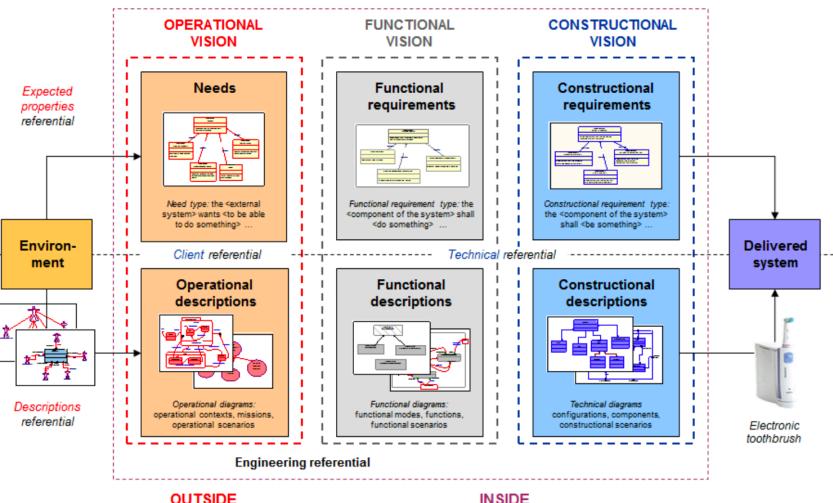


Apply good practice to RE



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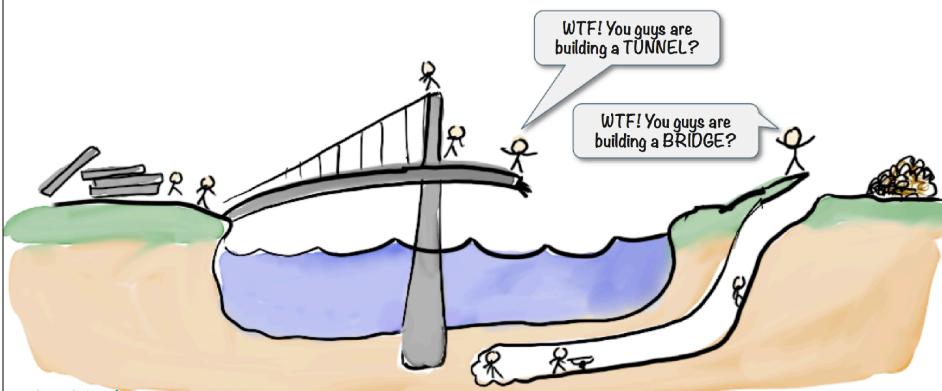
Expected properties vs. Descriptions



<http://www.cesames.net/wp-content/uploads/2017/05/CESAM-guide.pdf>

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Misalignment



Henrik Kniberg

Reducing Gaps (between dev & ops)

From **reqs** to **stories**

From **stories** to **acceptance scenarios**

From **acceptance scenarios** to **tests**

From **tests** to **code**

From **code** to **deployment**

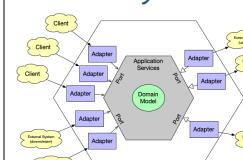
From **deployment** to **monitoring**
... and back!

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Can DevOps influence the way requirements are expressed?

Domain analysis



Behaviour & Tests

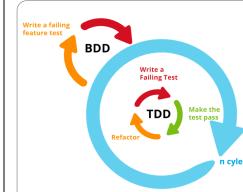


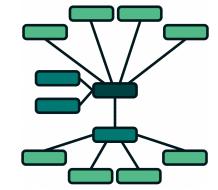
Photo credit:

<https://www.softarecome.com/>

https://yoodin.com/learn/tutorials/dddt/diddt/diddd_hexagonal

<https://www.yeddyru.com/library/yagc/omnipotent-for/981987284746/582c9888-74c3-4ee8-87d4-d429f447dc71.shtml>

Vocabulary alignment



Formal Requirements

Bad Requirements Good Requirements



User Stories

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Requirements lists

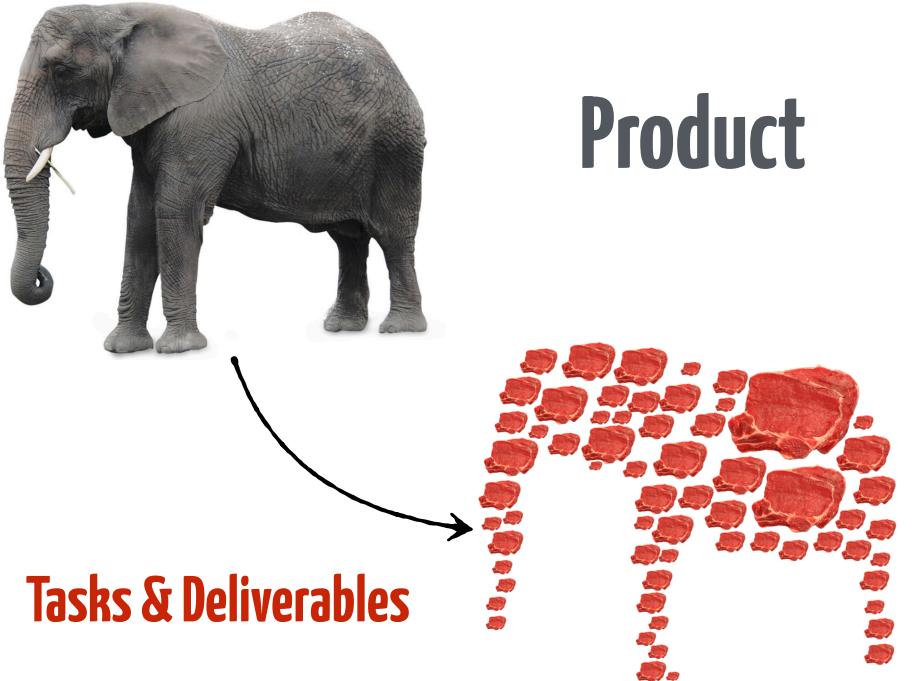
Reqs Priority / Stakeholders	Player 	Casino 	Exp. Player 
Must	Comparing Poker Hands	See Rules*	Comparing Poker Hands
Should	Create hands		Provide stats
Could	Provide stats		Select card games (style,...)
Will	Have an API for game plugin		Have the menu in French

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Evaluating risks

Reqs Priority / Stakeholders	Player 	Casino 	Exp. Player 
Must	Comparing Poker Hands	See Rules*	Comparing Poker Hands
Should	Create hands		Provide stats
Could	Provide stats		Select card games (style,...)
Will	Have an API for game plugin		Have the menu in French

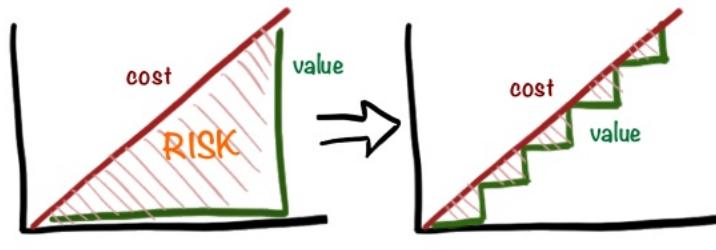
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Agile = Iterative + Incremental

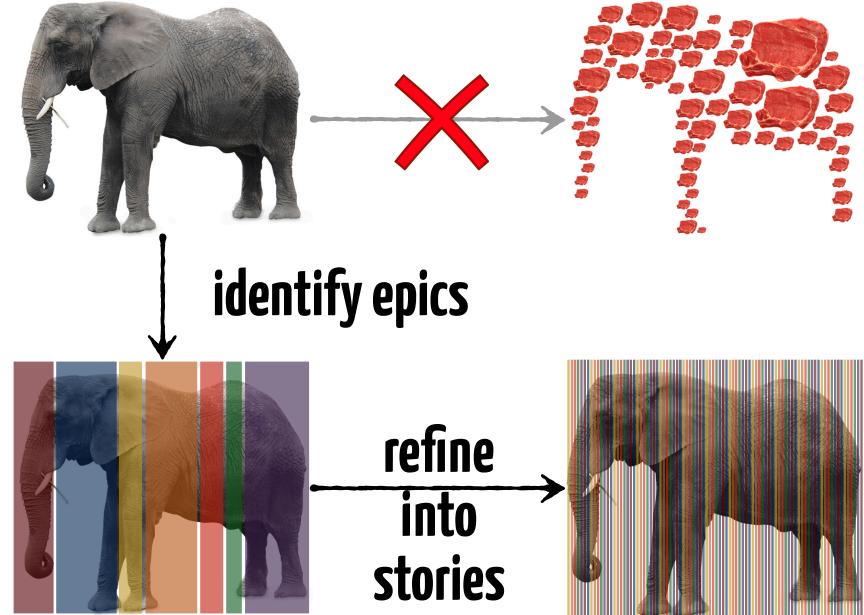
Don't try to get it all right
from the beginning

Don't build it all at once



Henrik Kniberg

identify epics



(Inspired by Alistair Cockburn's elephant carpaccio workshop)

A user story
is an
INVESTment

I
N
V
E
S
T
ndependent
negociable
valued
stimable
mall
estable

USER STORY #1
AS A USER, I'D LIKE TO
BE ABLE TO USE THE
ENTIRE FUNCTIONING
APPLICATION.

THIS IS HARDLY ACTIONABLE
OR TESTABLE. HAVE YOU EVER
HEARD OF "INVEST" USER STORIES?

WE JUST LIKE TO
KEEP THEM "VAGUE".
VAST, ARDUOUS,
GARGANTUAL, UNCLEAR
AND ETERNAL.

<https://sebiwi.github.io/comics/INVEST/>

@SEBIWICB

But first things first...



Who will use the product?

Persona = Name + Bio + Objectives

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<https://www.creativefabrica.com/product/ux-workflow-proto-persona-cards-vol-01/>

Meet Alice & Bob



- Alice, 32yo, croupier;
- Does not like poker, do prefer blackjack and roulette;
- Fears to make careless mistake when animating a poker game and to lose her job for such a mistake.



goal: secure her job



- Bob, 28yo, poker player (average plus);
- Plays poker at home with friends, and love to visit Las Vegas;
- Trains a lot on the Internet to prepare for a BIG tournament.

goal: improve his skills

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Duplicated Cards

Story name



Epic

As Alice

I want to identify cheaters who trick the card deck with extra cards

So that I can report to management



?



?



X



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Acceptance Criteria

One enters two overlapping hands (e.g. the two hands contains a QD). The game echoes an error stating that it encountered a cheat attempts.



Comments



icons by flaticon.com

Related to Epic #1 « Detect Cheaters »

Acceptance
Testing

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How to validate these 2 stories?



As Bob, I want to enter my hand on the command line so that the game knows the contents of my hand



As Alice, I want to identify cheaters that trick the card deck so that I can report cheating attempts to management



```
azrael:agile-tutorial mosser$ java -jar target/poker-game.jar
Enter 1st player hand: QD QH KC KH 3S
1st: [KING of HEARTS, QUEEN of DIAMONDS, THREE of SPADES, QUEEN of HEARTS, KING of CLUBS]
Enter 2nd player hand: 7S 6H 4S 3D 2C
2nd: [FOUR of SPADES, SEVEN of SPADES, TWO of CLUBS, SIX of HEARTS, THREE of DIAMONDS]
Exception in thread "main" java.lang.UnsupportedOperationException: Cannot determine winner!
        at re.poker.Game.declareWinner(Game.java:23)
        at re.poker.Main.main(Main.java:22)
```

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“

New code is **guilty**
until proven
innocent.

Test your code!



Can we write better tests?

```
@Test  
public void thisIsATest() {  
    Game theGame = new Game();  
    theGame.submit("Bob", new Hand("AC KC QC JC TC"));  
    CardValue v = CardValue.valueOf("ACE");  
    Suit s = Suit.valueOf("CLUBS");  
    Card theCard = new Card(v.getSymbol()+" "+s.getSymbol());  
    Card max = Collections.max(theGame.getByPlayer("Bob").getCards());  
    assertEquals(theCard, max);  
}
```

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What about this one?

Scenario: Identify the highest card in an hand

Given a new game

When Bob submits the following cards: AC KC QC JC TC

Then Bob's highest card is the ACE of CLUBS

```
@Test  
public void IdentifyTheHighestCardInAnHand() {  
    Game theGame = new Game();  
    theGame.submit("Bob", new Hand("AC KC QC JC TC"));  
    CardValue v = CardValue.valueOf("ACE");  
    Suit s = Suit.valueOf("CLUBS");  
    Card theCard = new Card(v.getSymbol()+" "+s.getSymbol());  
    Card max = Collections.max(theGame.getByPlayer("Bob").getCards());  
    assertEquals(theCard, max);  
}
```

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IDE Integration (IntelliJ example)

```
Run: Feature: ReadHands x  
Test Results  
Feature: Reading a Poker Hand 774 ms  
  Feature: Reading a regular hand 774 ms  
    ✓ Read a regular hand 759 ms  
      ✓ a new game 375 ms  
      ✓ Bob submits the following cards: QD TS 2C KD 3C 369 ms  
      ✓ Bob's hand contains 5 cards 3 ms  
      ✓ Bob's hand contains the QUEEN of DIAMONDS 2 ms  
      ✓ Bob's hand contains the TEN of SPADES 2 ms  
      ✓ Bob's hand contains the TWO of CLUBS 1 ms  
      ✓ Bob's hand contains the KING of DIAMONDS 4 ms  
      ✓ Bob's hand contains the THREE of CLUBS 3 ms  
    ✓ Reject an hand with a duplicated card 11 ms  
      ✓ a new game 1 ms  
      ✓ Bob submits the following cards: QD TS 2C KD QD 0 ms  
      ✓ a cheat attempt is detected! 10 ms  
    ✓ Detect cheaters when submitting duplicated cards 4 ms  
      ✓ a new game 0 ms  
      ✓ Bob submits the following cards: AC KC QC JC TC 3 ms  
      ✓ Alice submits the following cards: QD QH QS QC KD 1 ms  
      ✓ a cheat attempt is detected! 0 ms
```

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Steps auto-completion

```
Feature: Reading a Poker Hand  
  Scenario: Read a regular hand  
    Given a new game  
    When Bob submits the following cards: QD TS 2C KD 3C  
    Then Bob's hand contains 5 cards  
      And Bob's hand contains the QUEEN of DIAMONDS  
      And Bob's hand contains the TEN of SPADES  
      And Bob's hand contains the TWO of CLUBS  
      And Bob's hand contains the KING of DIAMONDS  
      And Bob's hand contains the THREE of CLUBS  
  Scenario: Reject an hand with a duplicated card  
    Given a new game  
    When Bob submits the following cards: QD TS 2C KD QD  
    Then <string>'s hand contains <number> cards  
      <string>'s hand contains the <string> of <string>  
      <string>'s highest card is the <string> of <string>  
      <string> submits the following cards: <string>  
      a cheat attempt is detected!  
    Use ⇧⌘⏎ to syntactically correct your code after completing (balance parentheses etc.) >> π
```

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Gherkin

To create a new requirement, we need to define the **Feature**, which gives us the name of the **Requirement Engineering** compatible **functionality**. Then, we go on defining the **Scenario**.

```
Feature: Logout from application
Scenario:
  Given I am logged in
  When I click "log out" button
  Then I am informed about successful logout
  And I am redirected to login page
```

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Regular expressions as binders

```
@Given("^a new game$")
public void startNewGame() {
    this.theGame = new Game();
}

@When("^(.*) submits the following cards: (.*)$")
public void enterPlayerHand(String thePlayer, String data){
    this.theGame.submit(thePlayer, new Hand(data));
}

@Then("^(.*)'s highest card is the (.*) of (.*)$")
public void checkHighestCard(String thePlayer, String value, String suit) {
    CardValue v = CardValue.valueOf(value.trim());
    Suit s = Suit.valueOf(suit.trim());
    Card theCard = new Card(v.getSymbol()+" "+s.getSymbol());
    Card max = Collections.max(theGame.getByPlayer(thePlayer).getCards());
    assertEquals(theCard, max);
}
```

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Continuous Integration & Deployment



“ Integration is a **long** and **unpredictable** process

- Martin Fowler

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When people **don't** see the value of CI

[http://itsadeliverything.com/five-things-to-do-when-people-don't-see-the-value-of-automation-more-5966](http://itsadeliverything.com/five-things-to-do-when-people-don-t-see-the-value-of-automation-more-5966)

- Get an technical Ally
- Build monitor
- Pair programming
- Training
- Change the team



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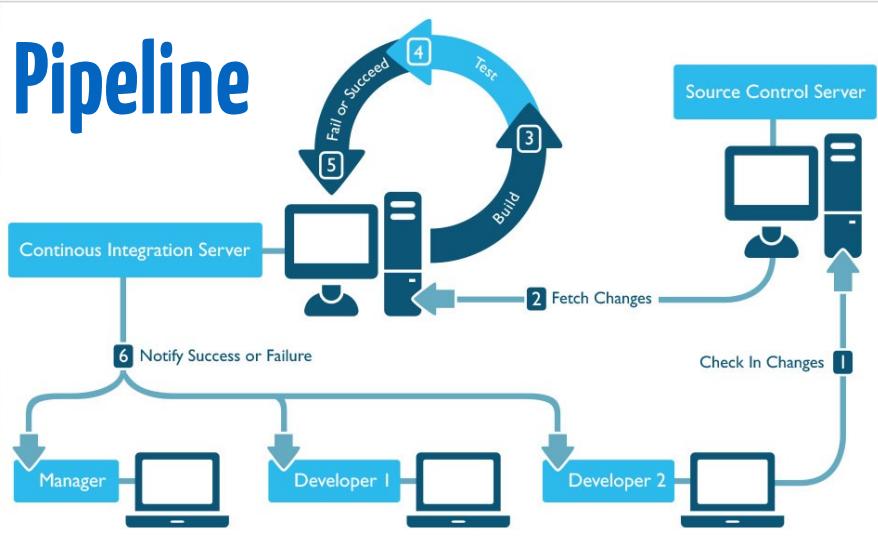
«Integrate **frequently**»

«Integrated system is
automatically build»

«**Build** triggers **Tests**»

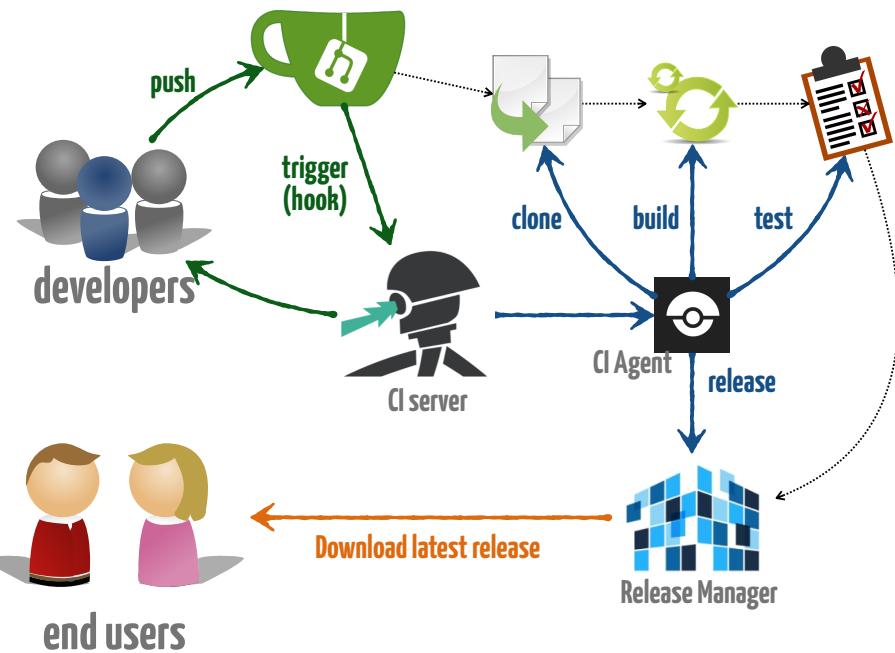
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Pipeline



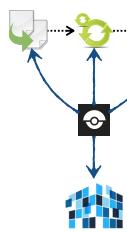
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<https://insights.sei.cmu.edu/devops/2015/04/continuous-integration-in-devops.html>



Build Pipeline model

(cloning is implicit, so can be omitted in the pipeline descriptor)

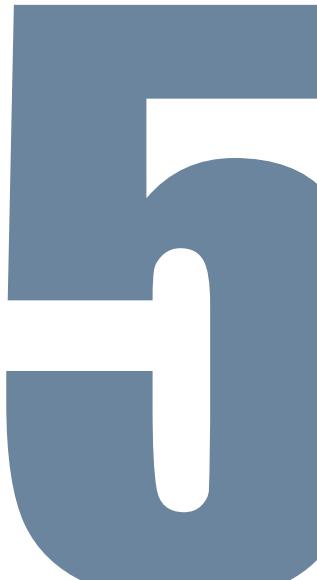


pipeline:

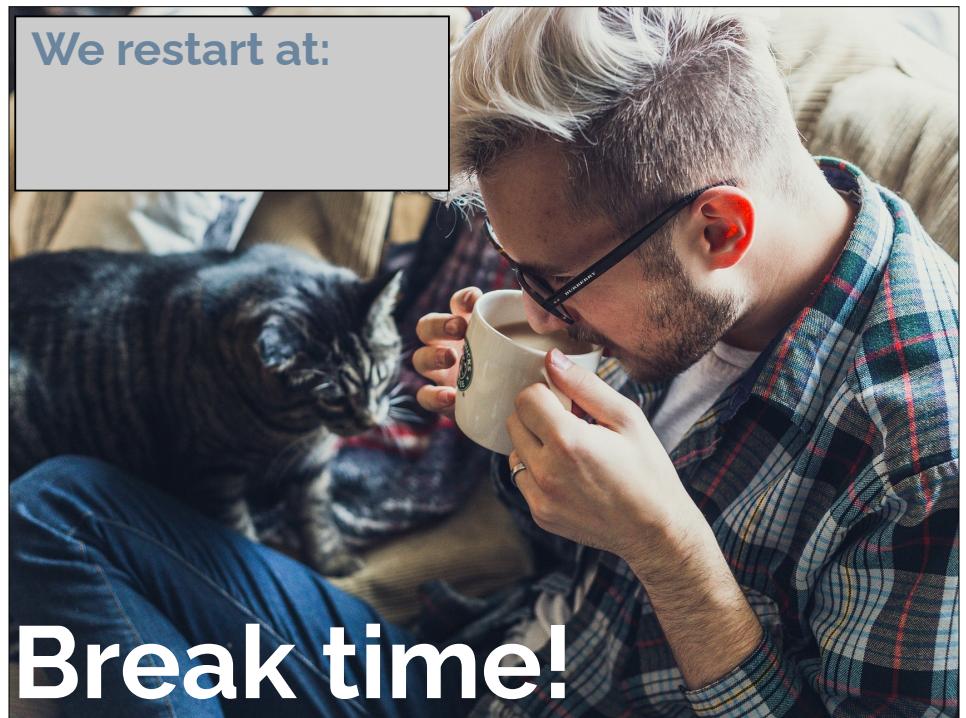
```
# Building the Poker Game using Maven
build:
  image: maven:3.5-alpine
  commands:
    - mvn -q clean package
    - mkdir releases
    - cp target/poker-game.jar releases/poker-game-r${DRONE_BUILD_NUMBER}.jar
      (build + tests thanks to Maven)

# Publishing the last release in the release manager
scp:
  group: releasing
  image: appleboy/drone-scp
  host: release-manager
  username: root # Don't do this at home (demonstration purpose only)
  password: re18 # Don't do this at home (use secret instead)
  port: 22
  target: /usr/share/nginx/html
  source: releases/poker-game-r${DRONE_BUILD_NUMBER}.jar
      .drone.yml
```

Hands-on Demonstration



We restart at:



GitHub repository

File	Commit	Time
.github/workflows	heroku deploy / typo	26 minutes ago
images	variable port	17 minutes ago
src	variable port	17 minutes ago
.gitignore	first workflow	1 hour ago
Dockerfile	variable port	17 minutes ago
LICENSE	Update LICENSE	11 hours ago
README.md	variable port	17 minutes ago
pom.xml	first workflow	1 hour ago