

Software Development Practices

Jeffrey Liu 2012/10/04

Agenda

- Part 1 : Agile Development Process
- Part 2 : Team Collaboration
- Part 3 : Continuous Integration

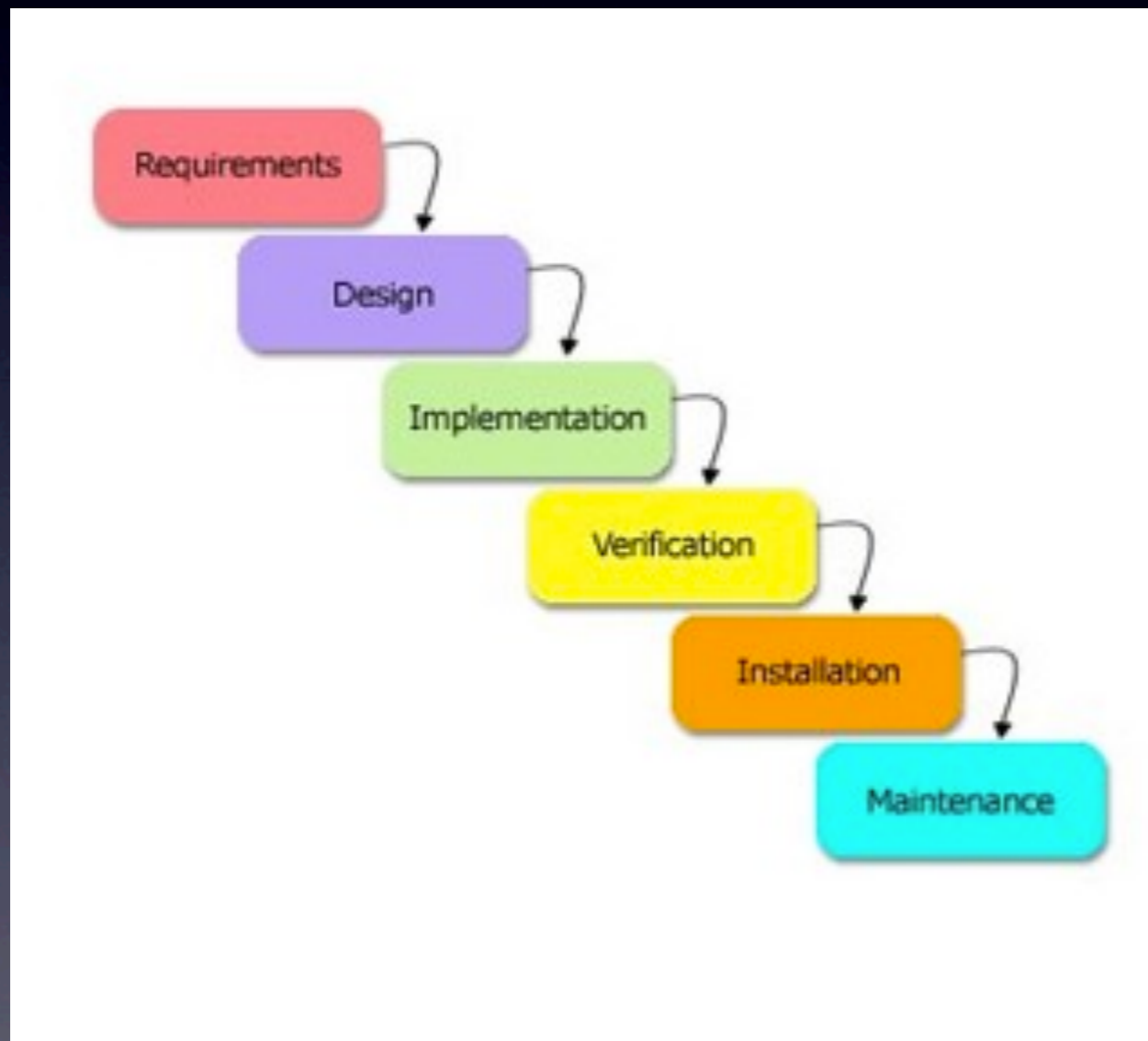
What I won't cover in this session

- Pair Programming
- Test-Driven Development
- Refactoring
- ...

Agile Development Process

What is Agile ?

What is the problem of waterfall development process

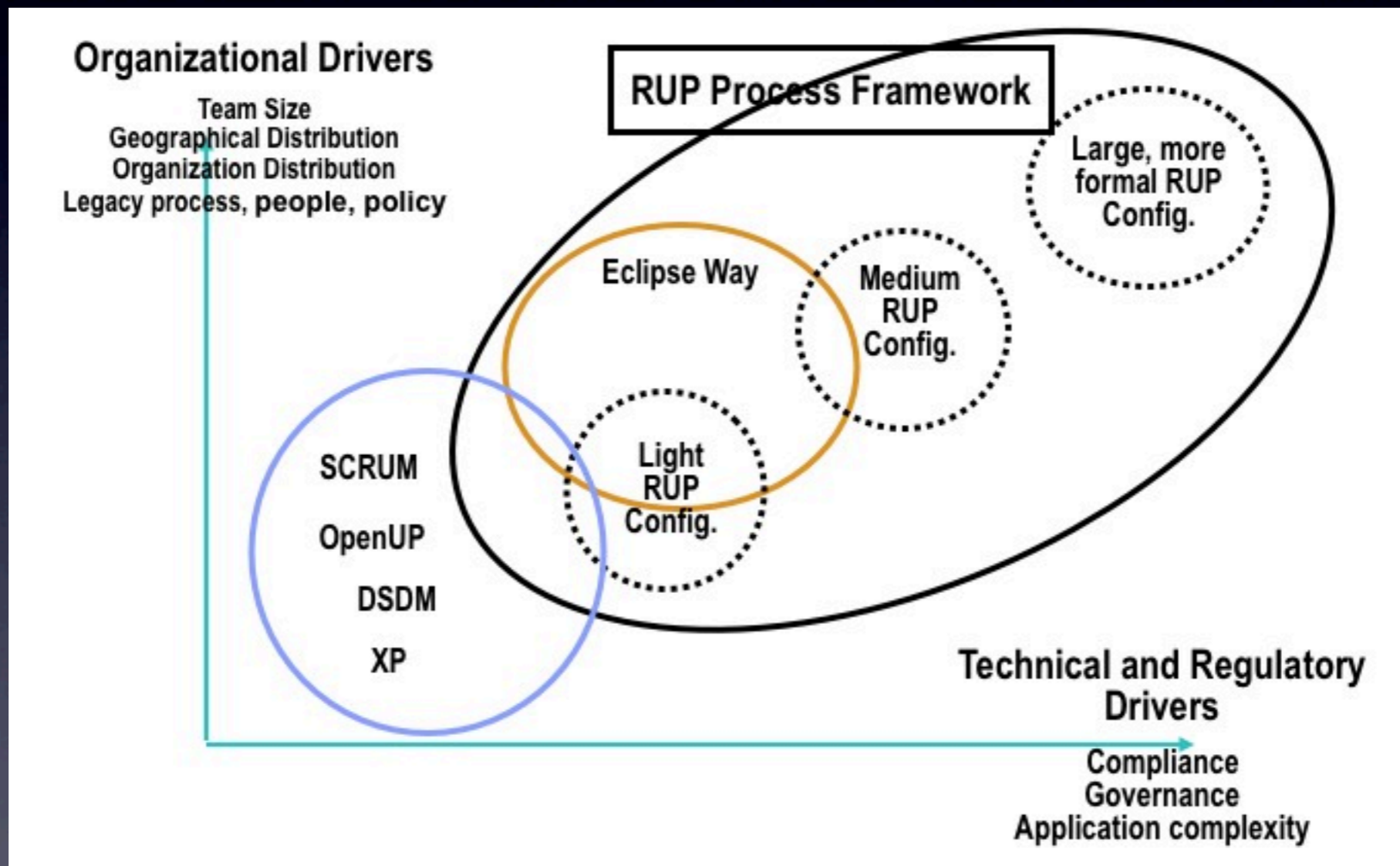


- Risk
- Cost
- **Satisfaction**

Agile in a Nutshell

- Not just a set of methodologies
- Not just a set of practices
- It feels like a set of goals, principles, or values
 - Do what you need to do to leverage instead of resist changes
 - Reduce Risk
 - Communication, Feedback, Simplicity, Teamwork

Difference Dev Process for different needs



Agile Development with Scrum

What is scrum ?



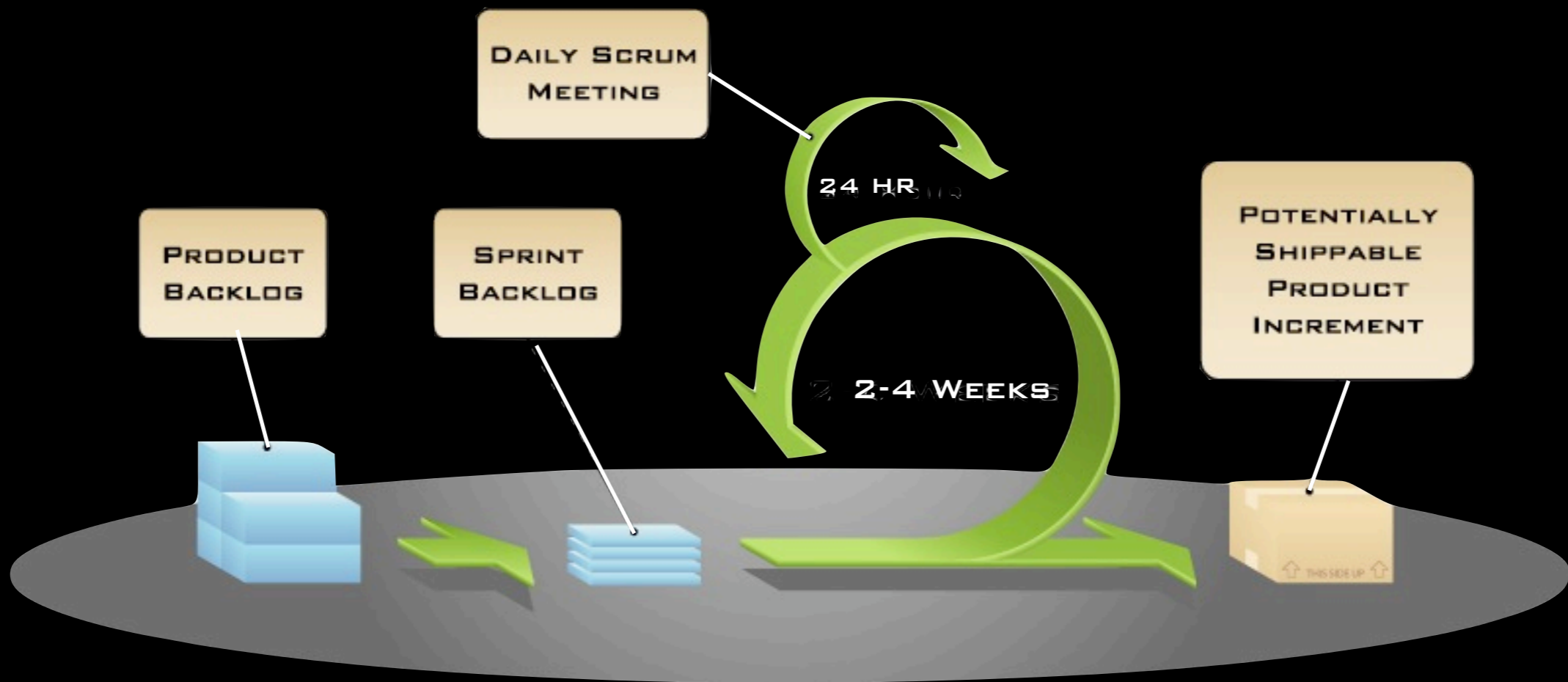
Fig. 6: The Scrum

The scrum is a pushing contest between two teams of eight players. The ball is fed in from the side by the scrumhalf and the team that drives their opponent backwards and hooks the ball out past the last foot of their own scrum wins possession. A scrum down is used to restart play after certain infractions such as a "knock on" or a forward pass.

<http://www.oberlin.edu/stuorg/womrugby>

Scrum in 10 minutes





ROLES

PRODUCT OWNER
 SCRUM MASTER
 TEAM MEMBER

CEREMONIES

SPRINT PLANNING
 DAILY SCRUM
 SCRUM REVIEW
 SCRUM RETROSPECTIVE

ARTIFACTS

PRODUCT BACKLOG
 SPRINT BACKLOG
 POTENTIALLY SHIPPABLE PRODUCT INCREMENT

Iteration Exit ?

- Exit Check List
- Done, Done, Done
- Stakeholder Demo/Review
- Time Boxed Iteration

What if we can't finish all the content planned for this iteration ?

Team Collaboration

The Value of Time Machine



Version Control

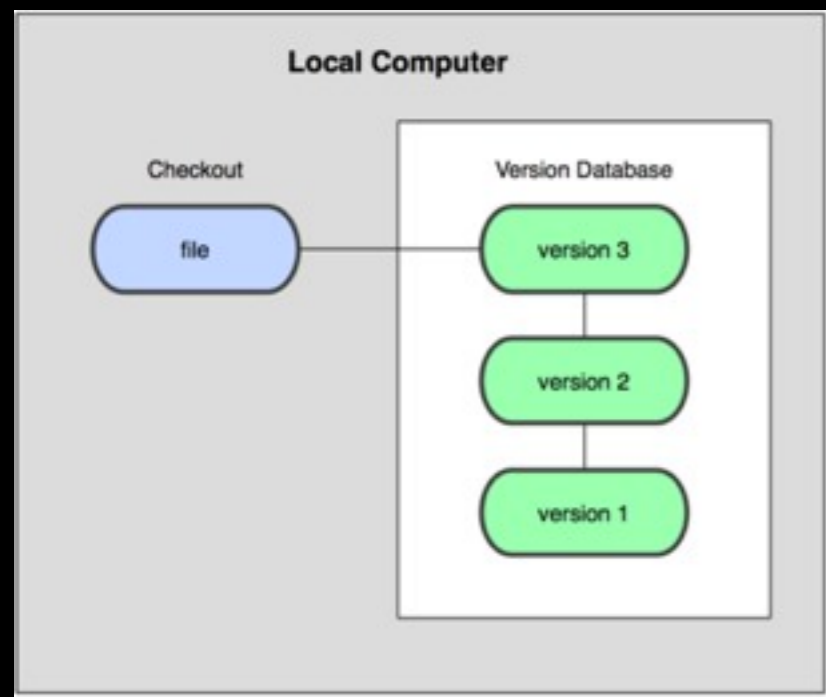
- Why Version Control ?
 - Backup and Restore
 - Source code sharing and synchronization
 - Merges
 - Branches

It is the very first thing you need to start a project

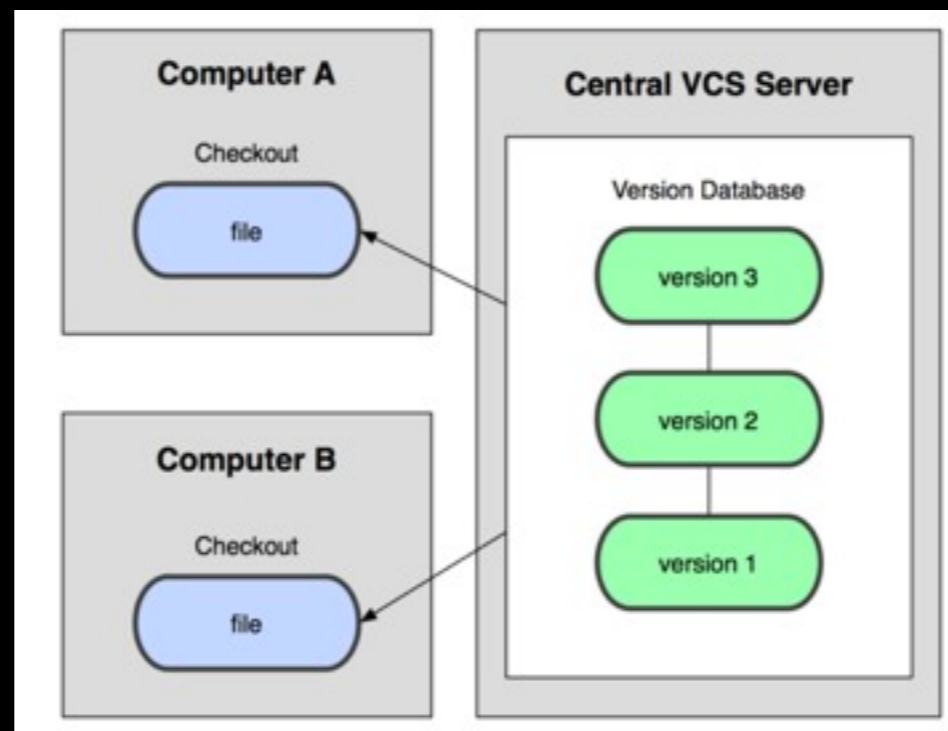
Version Control

- Tools available
 - CVS
 - Subversion
 - GIT
 - Mercurial
 - ClearCase
 - ...

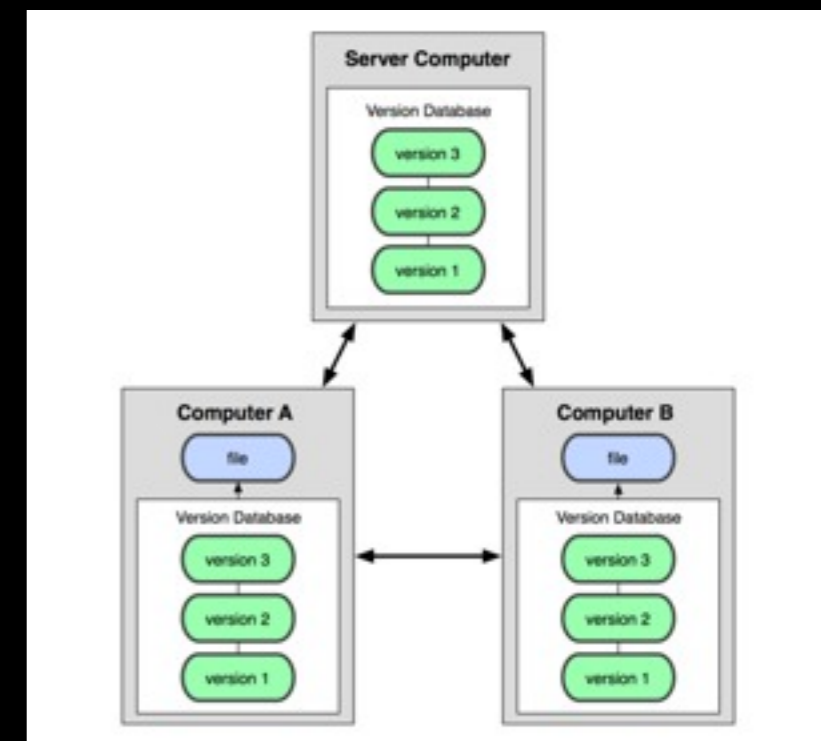
Different Topologies



Local

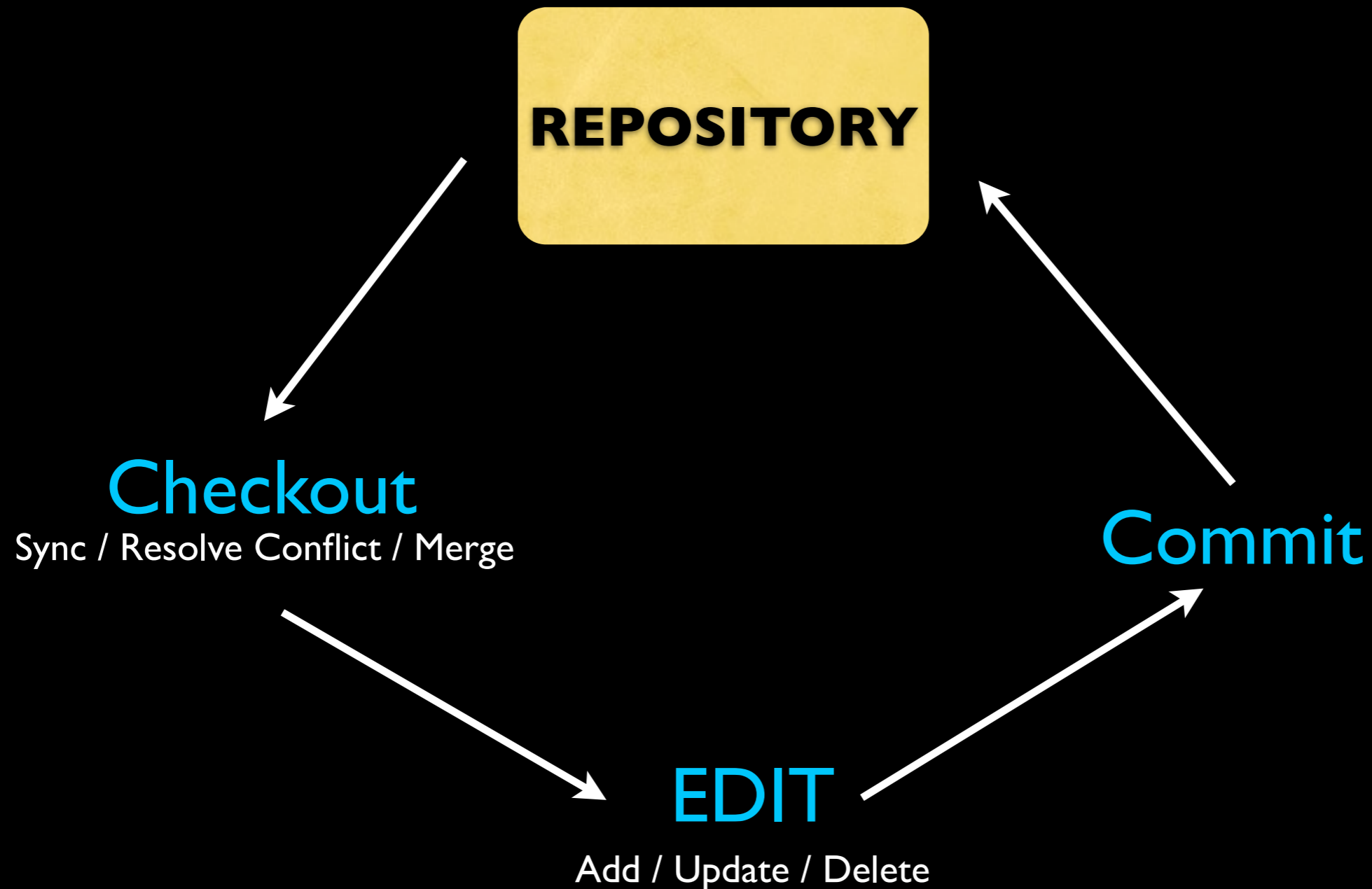


Centralized



Distributed

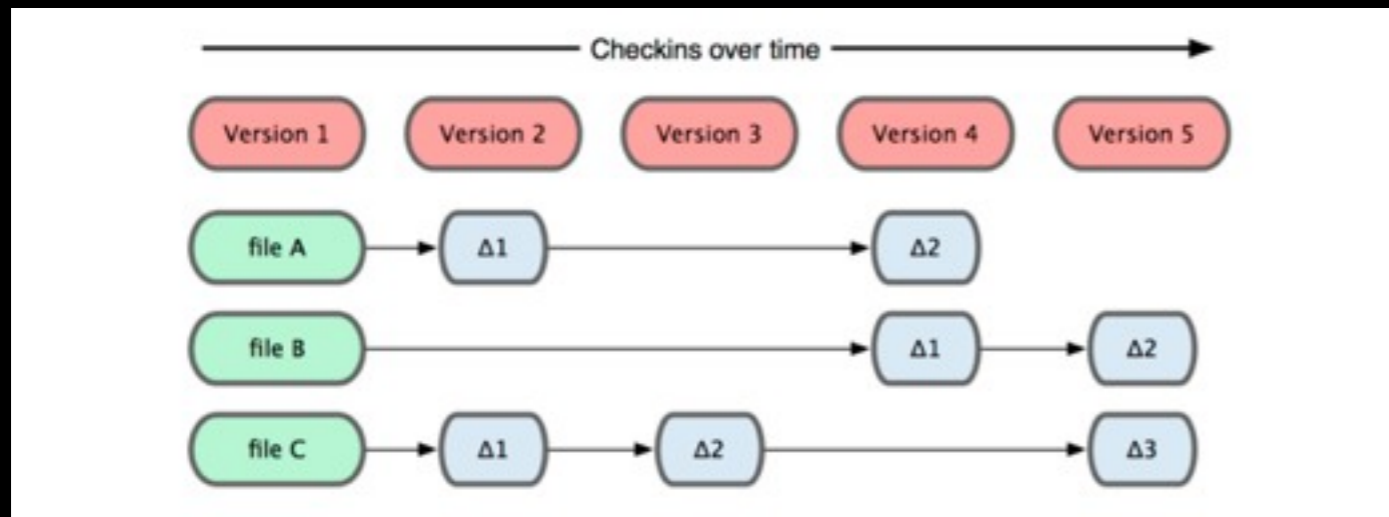
Common Usage Pattern



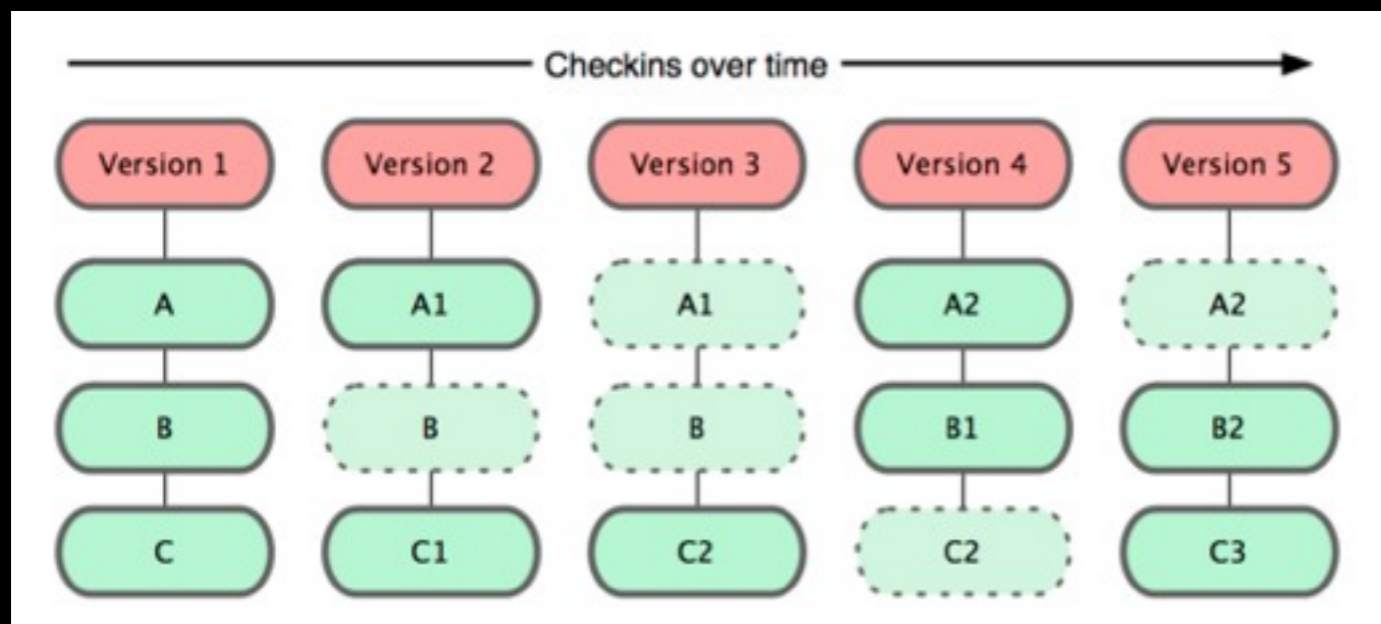
What is GIT ?

- The version control system used by Linux Kernel Development project
- Design Principle
 - Fast
 - Simple
 - Strong Support for non-linear development
 - Fully Distributed
 - Deal with large scope development projects

GIT Basics

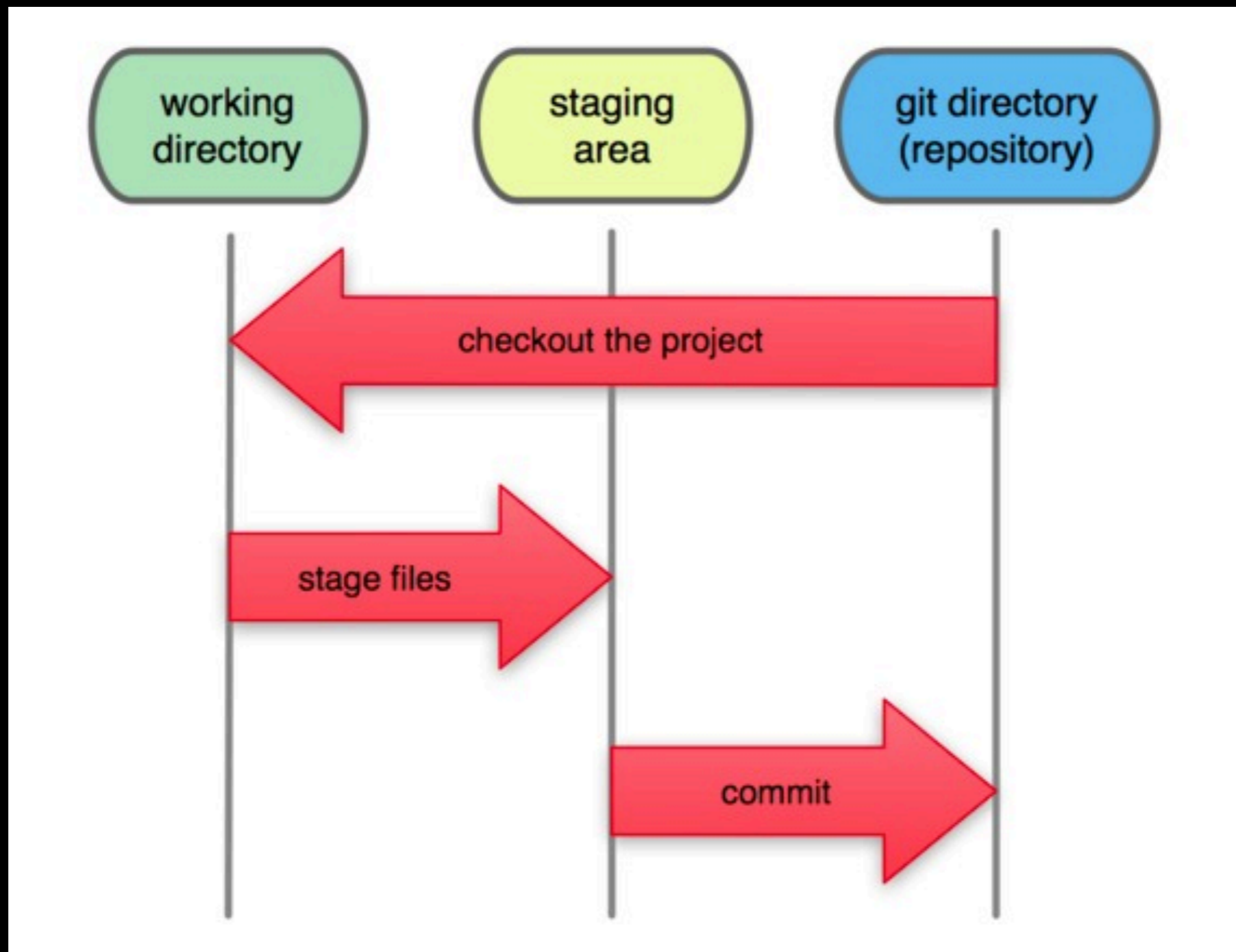


Traditional Version Control System keep track of “file changes”

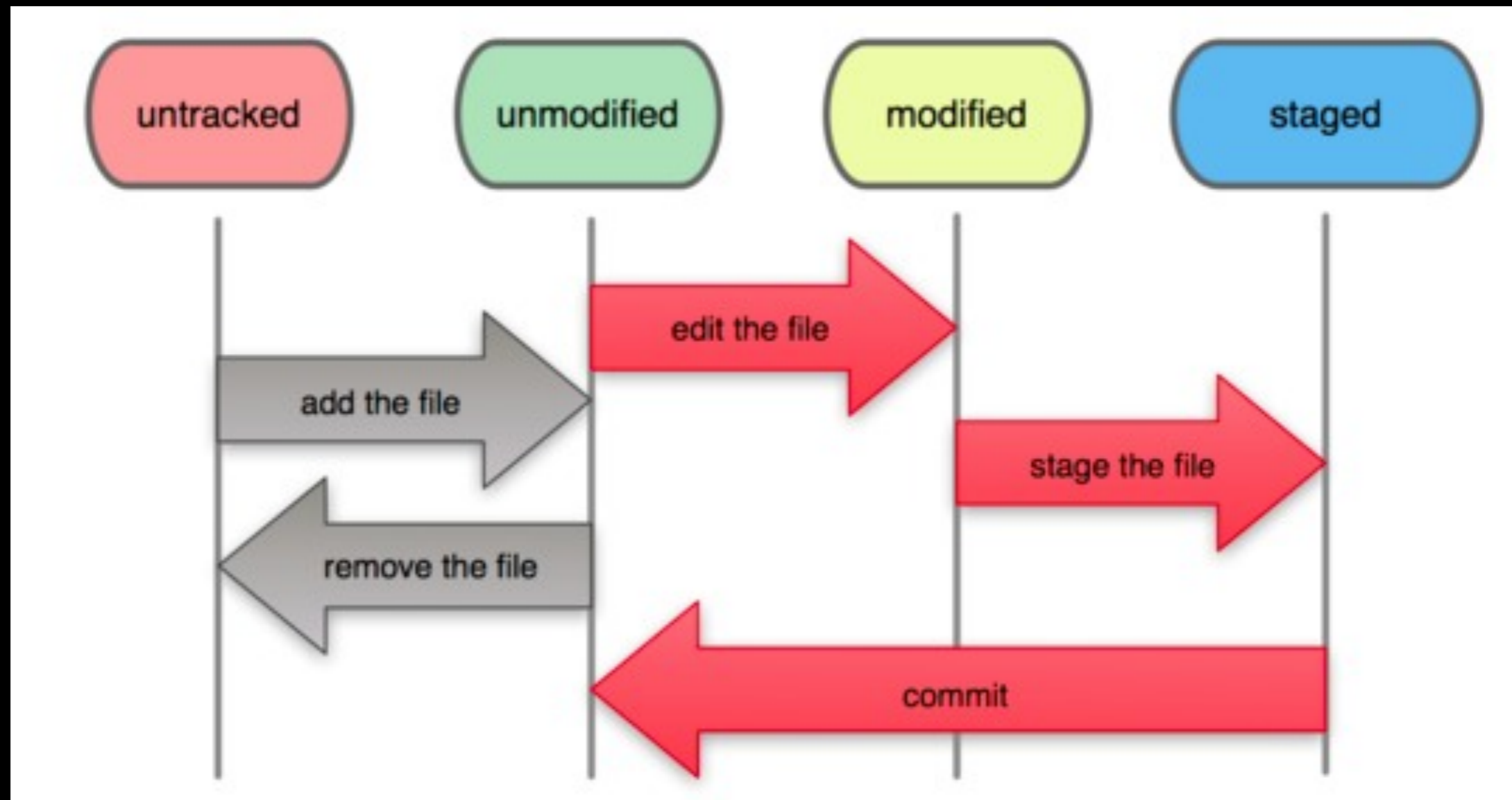


GIT keep track of Snapshots

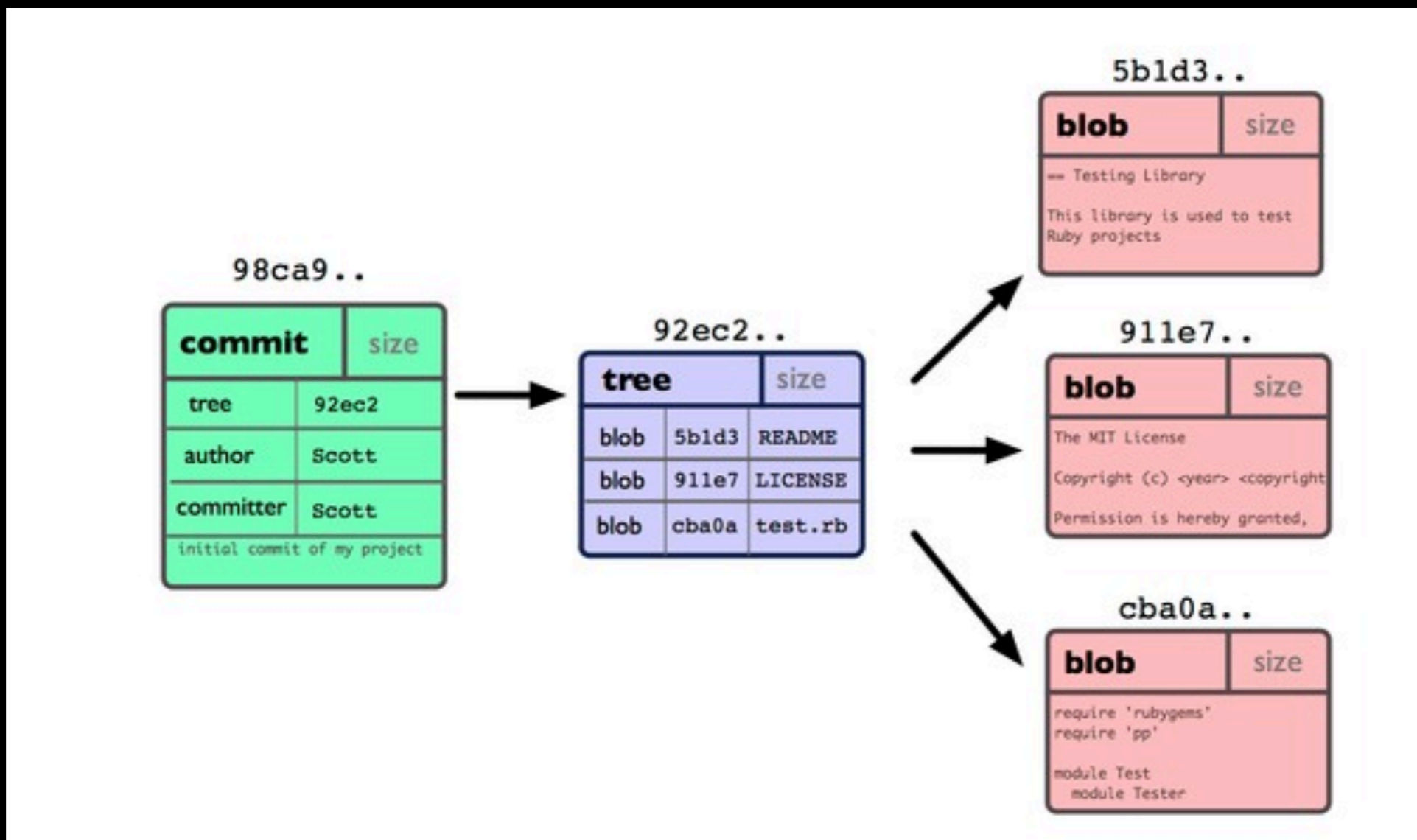
3 Basic States



File Status Life Cycle

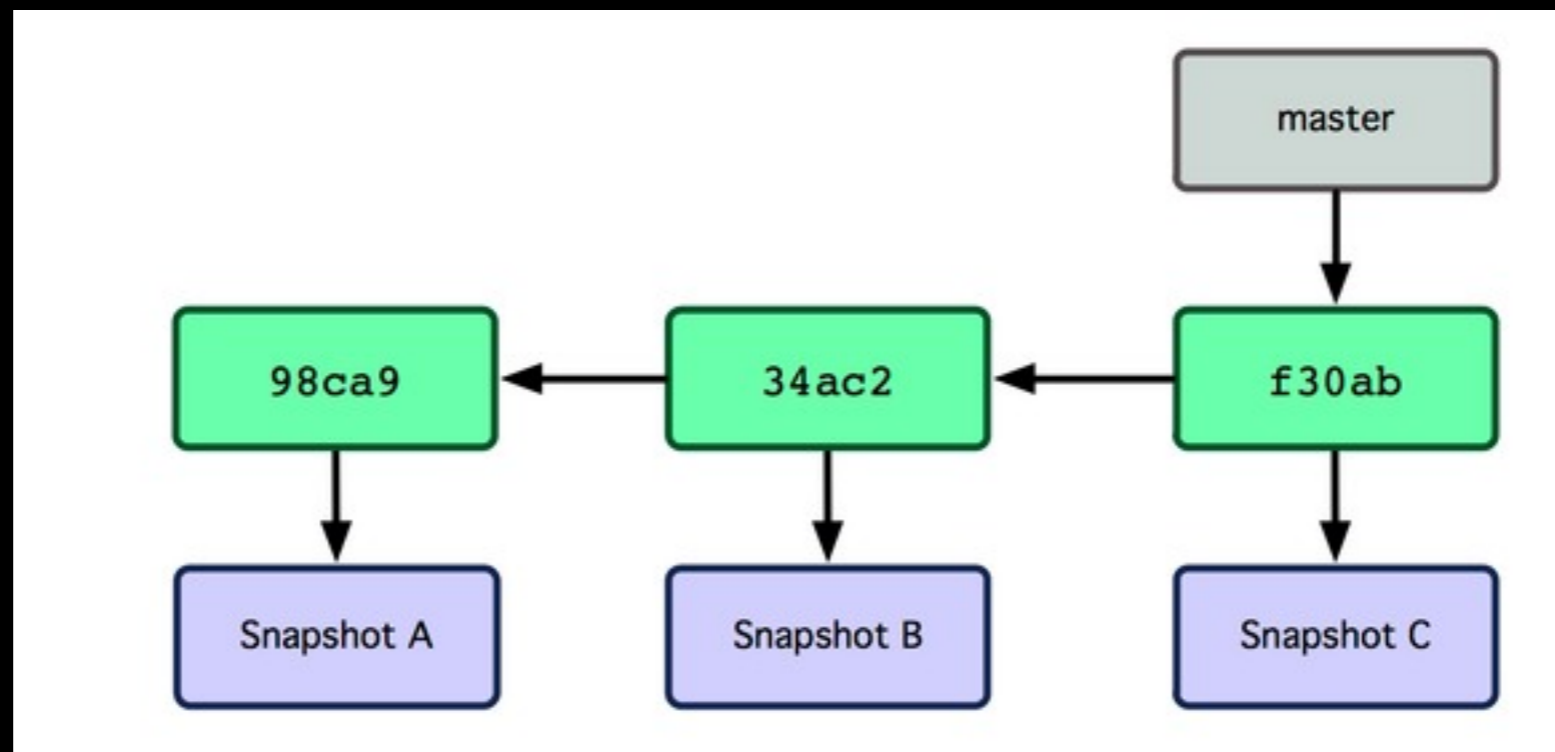


One Single Commit Repository Data



Commit Data History

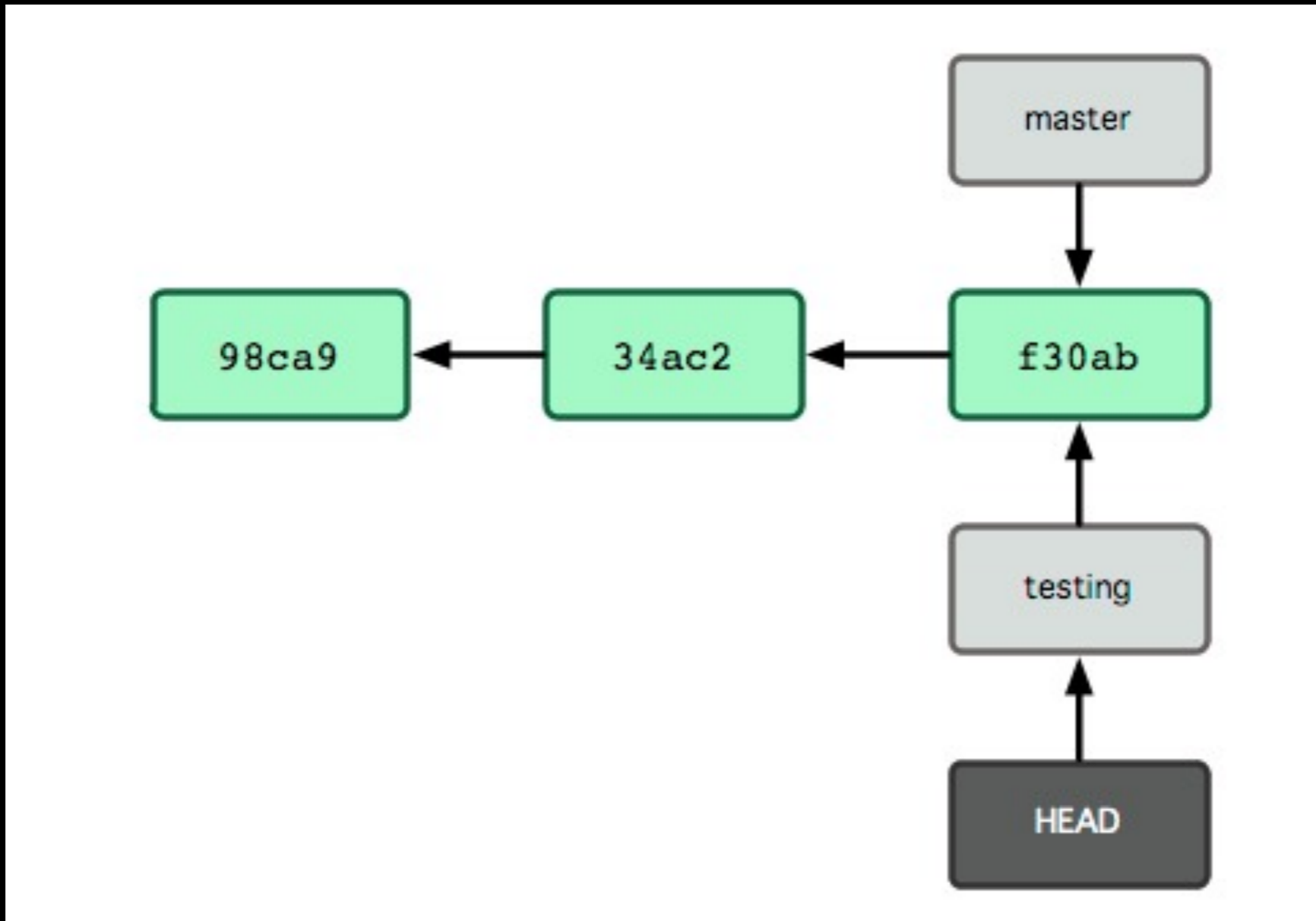
Default Branch Name



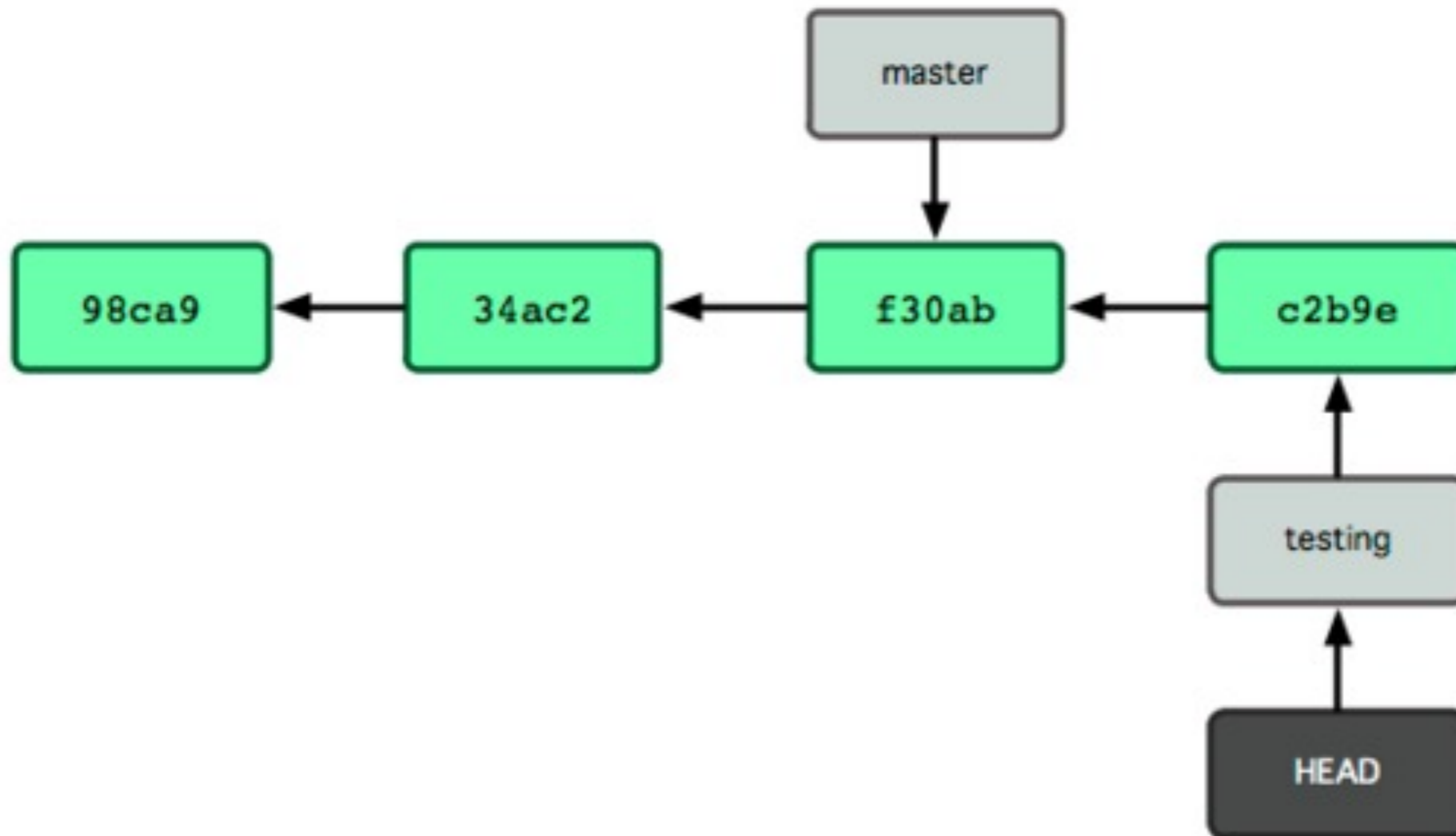
GIT Branches

- A branch is a new (virtual) workspace that allow you to work on a new task or issue
- A branch in GIT is simply a lightweight movable pointer

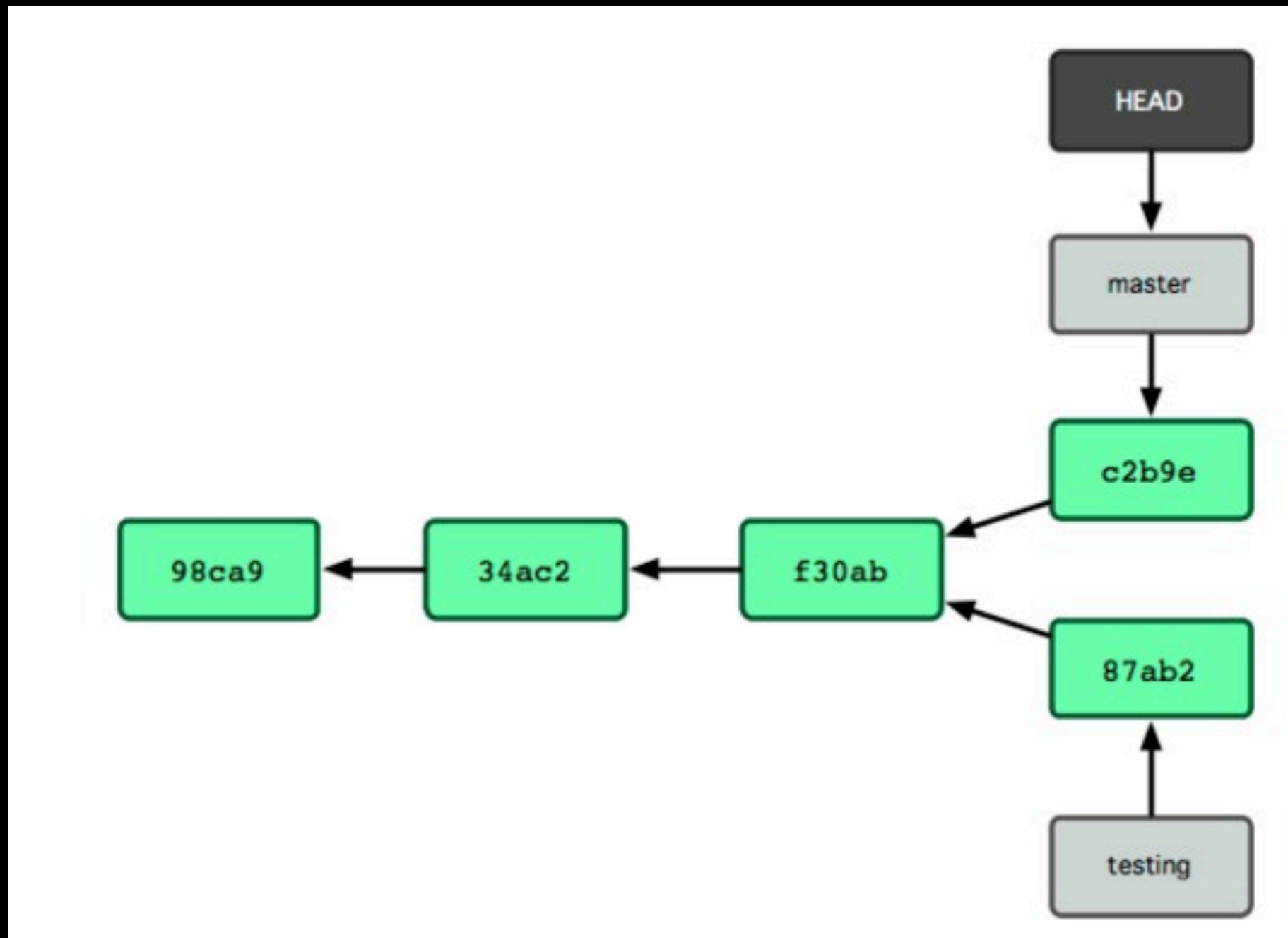
Create New Branch



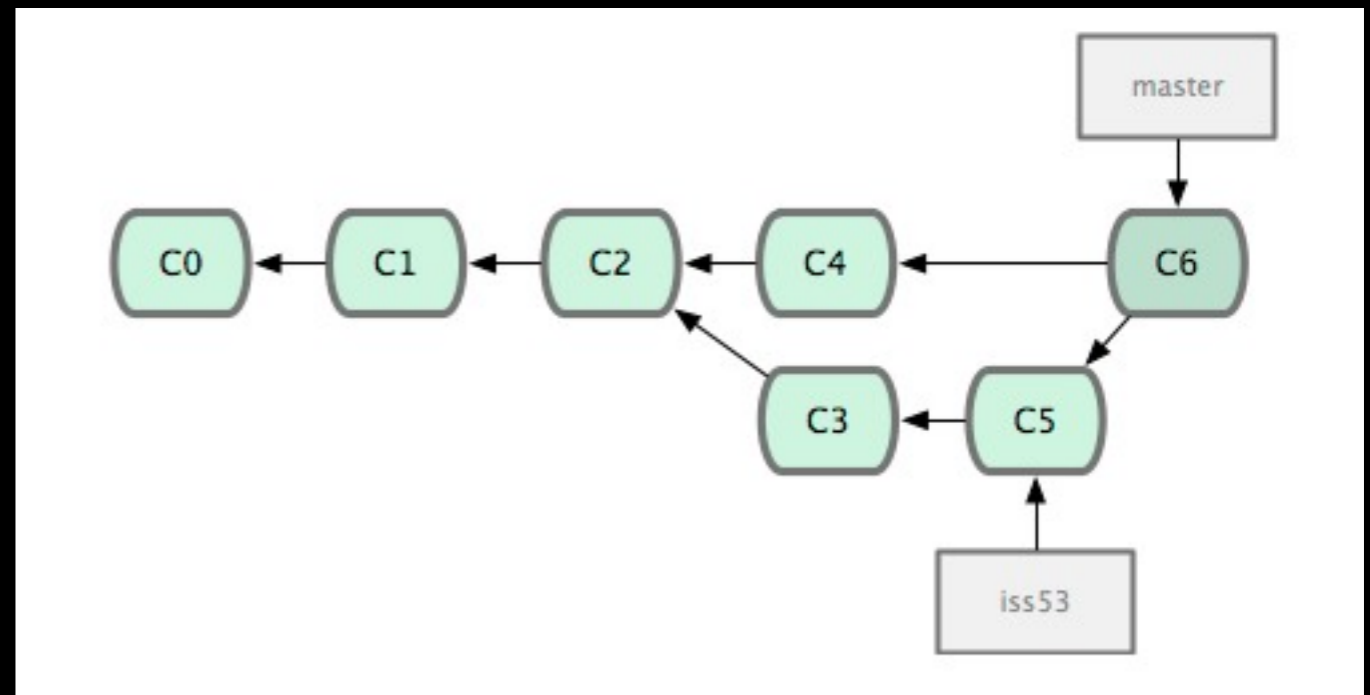
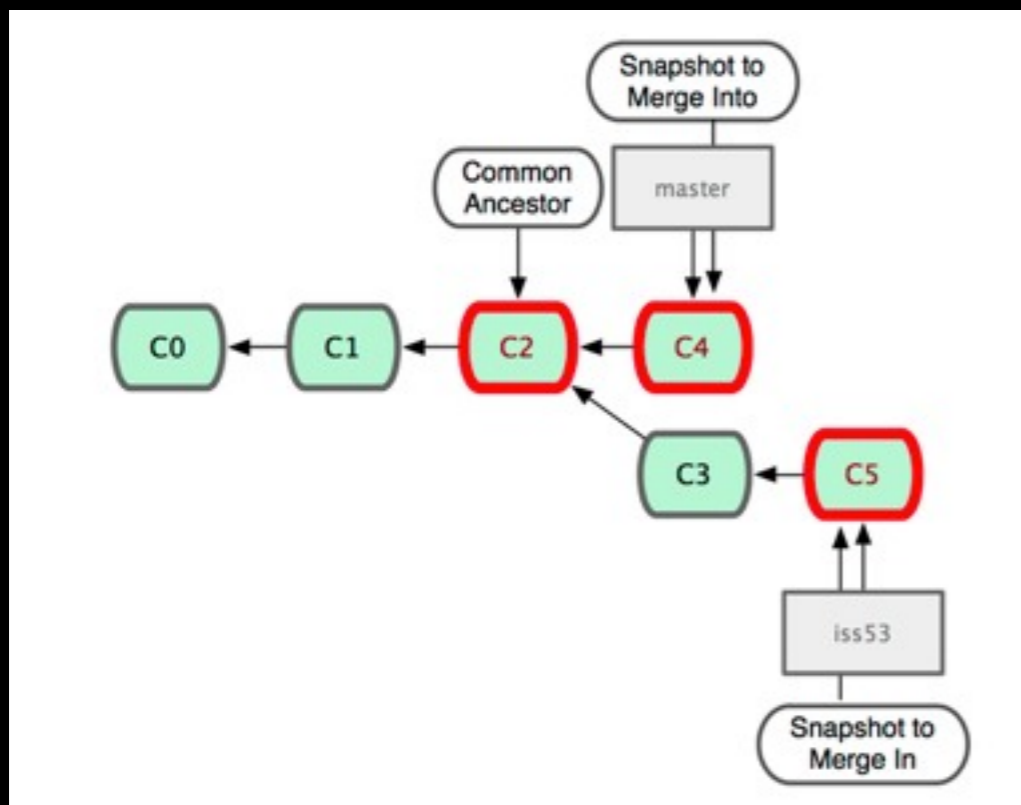
Add new changes



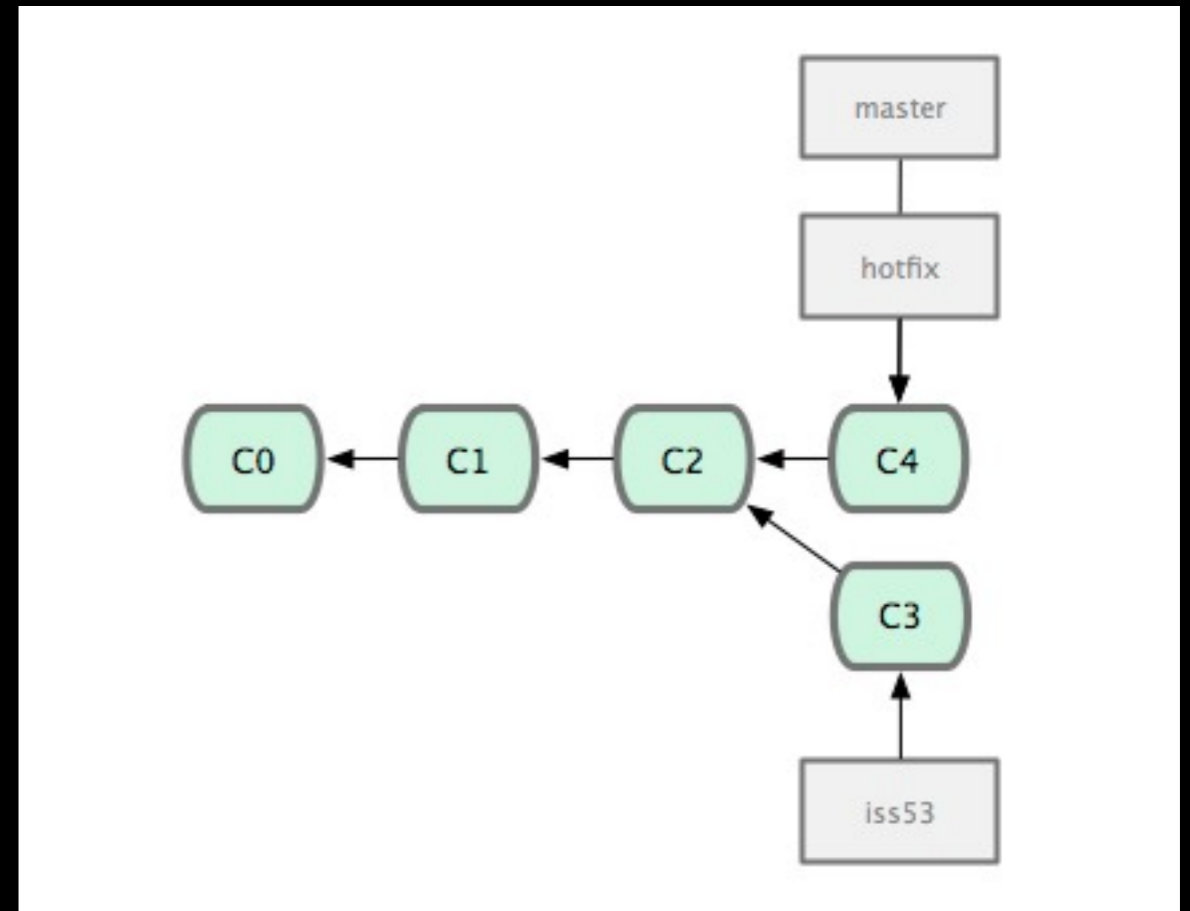
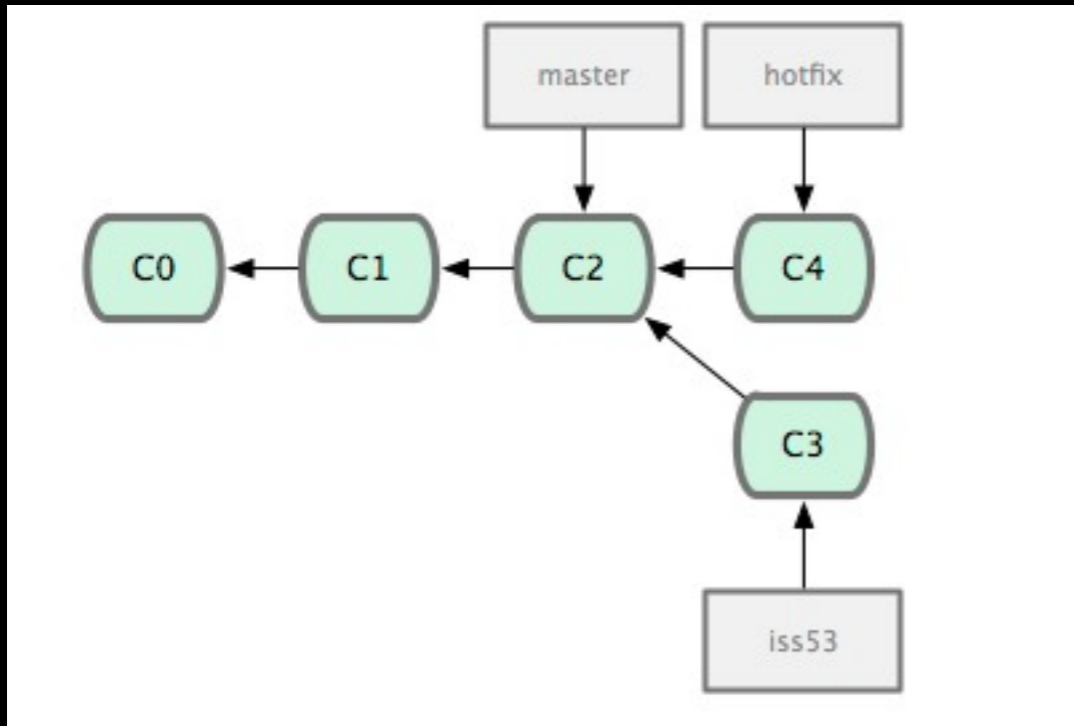
When two branches are diverged



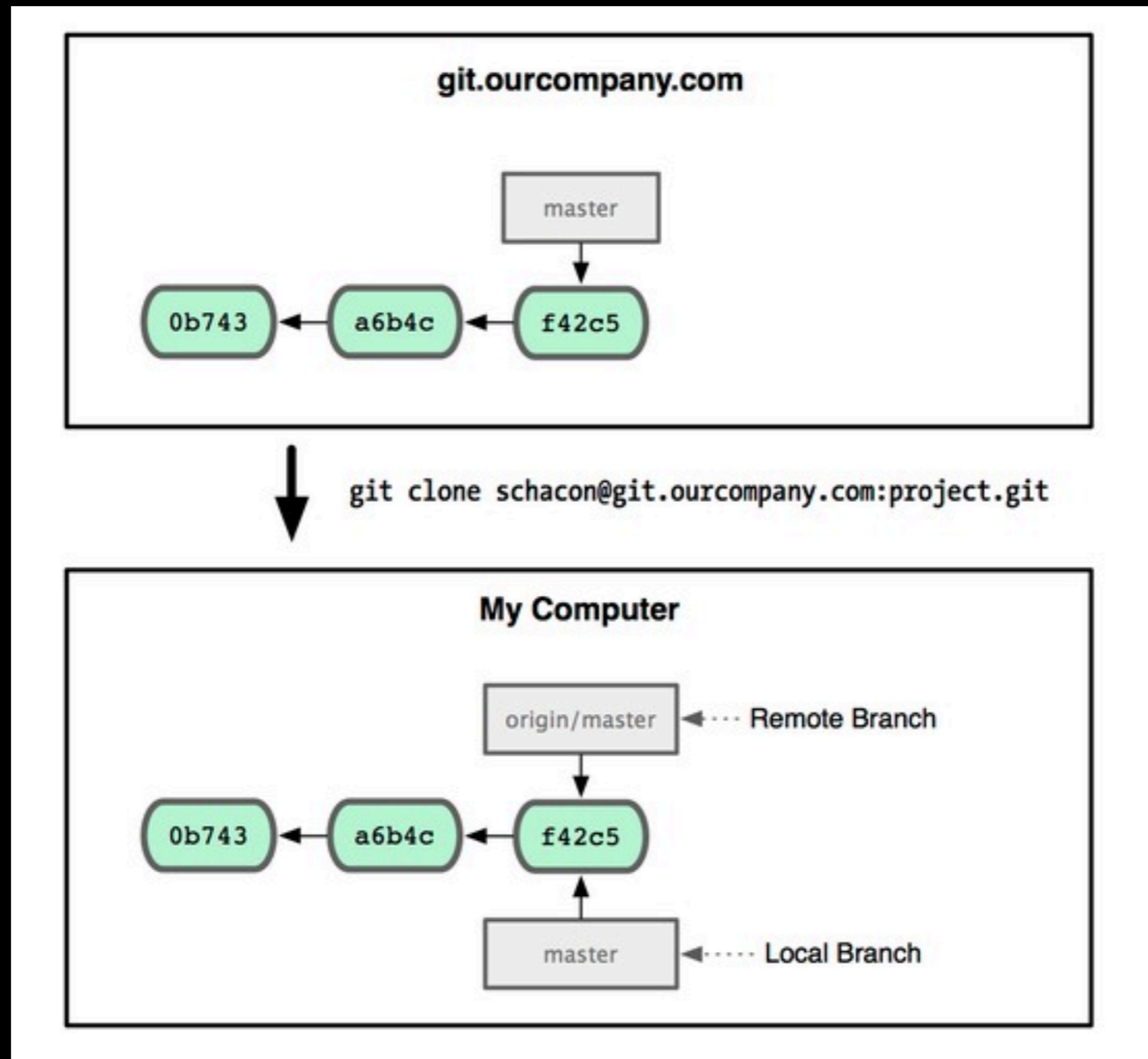
Merge Branches



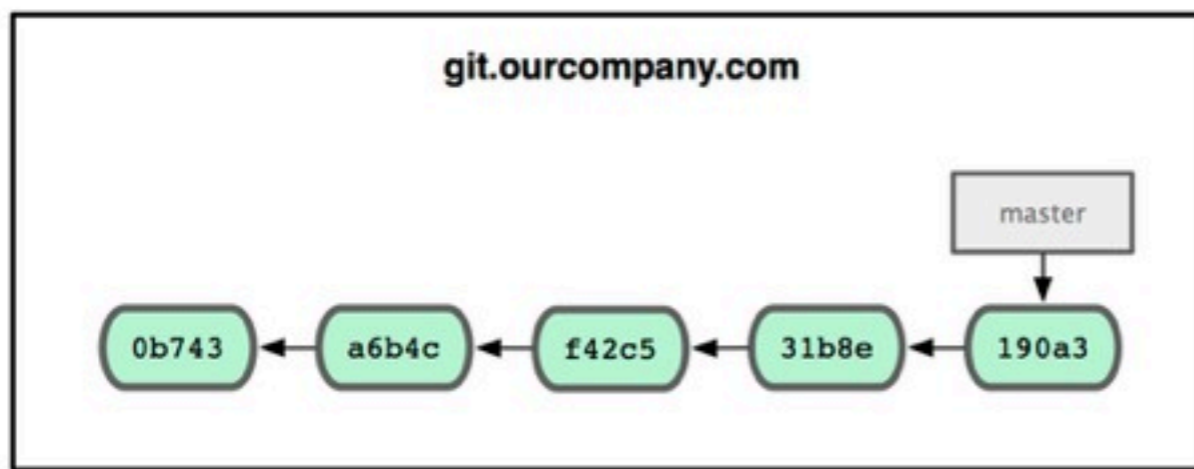
Merge Branches



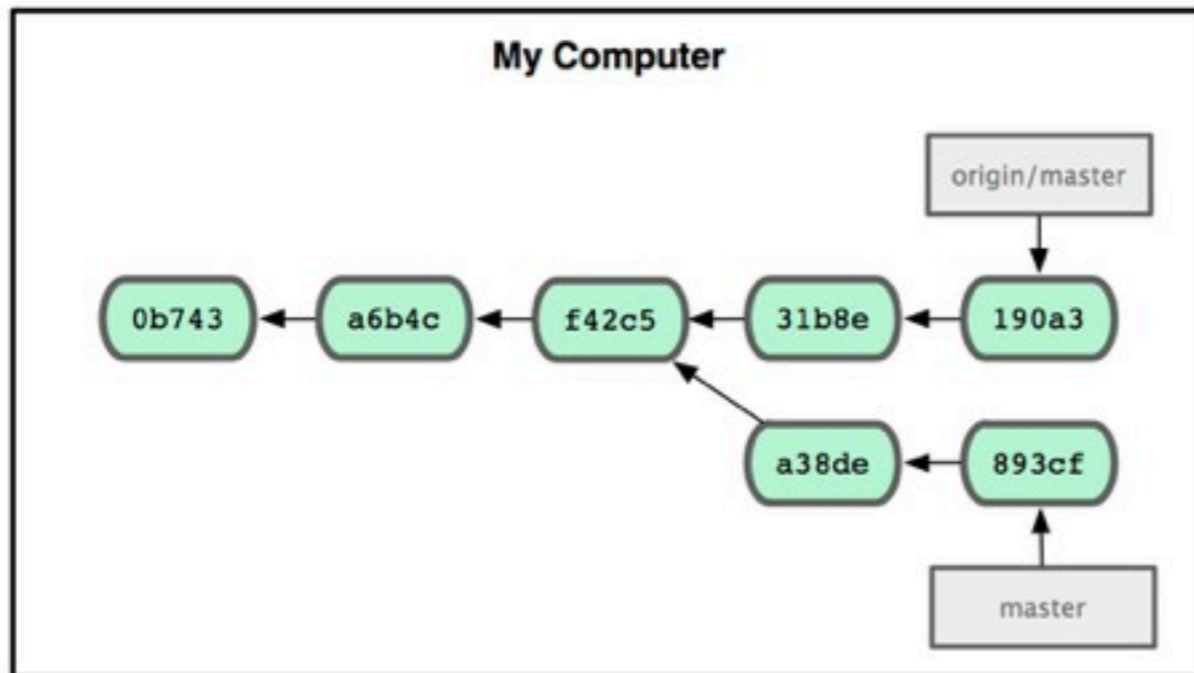
Remote Branch



Remote Branch



git fetch origin



Push

Submit the changes in local repository to server repository

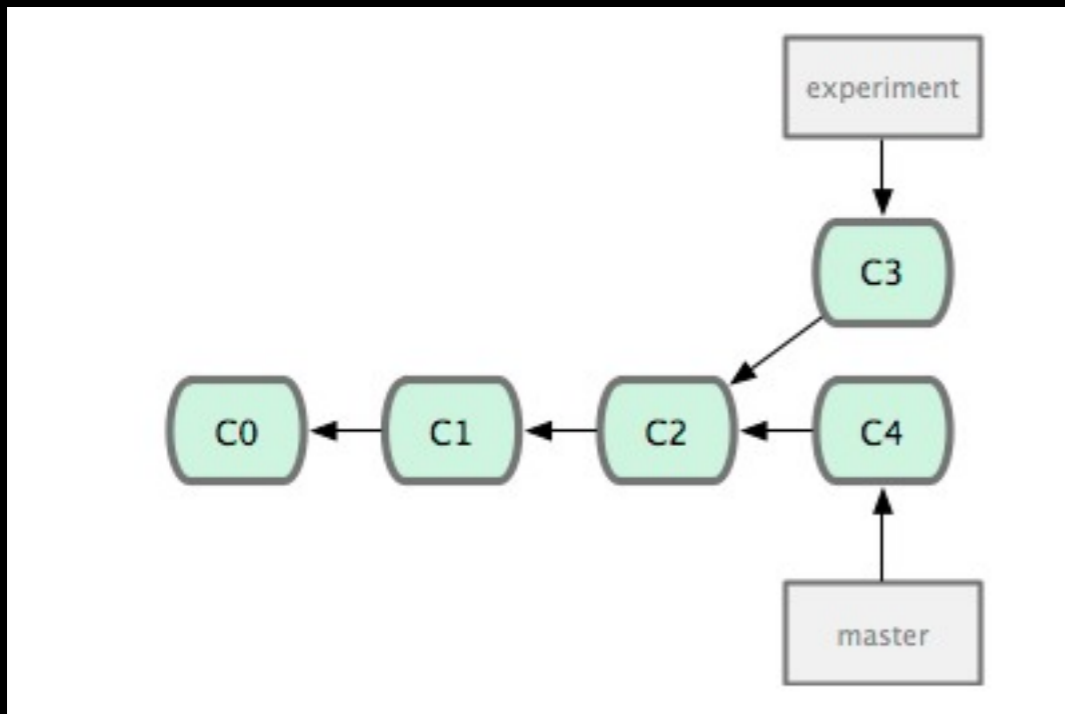
Pull

Retrieve the changes from server repository into local repository. The branch pointer also points to the current submit.

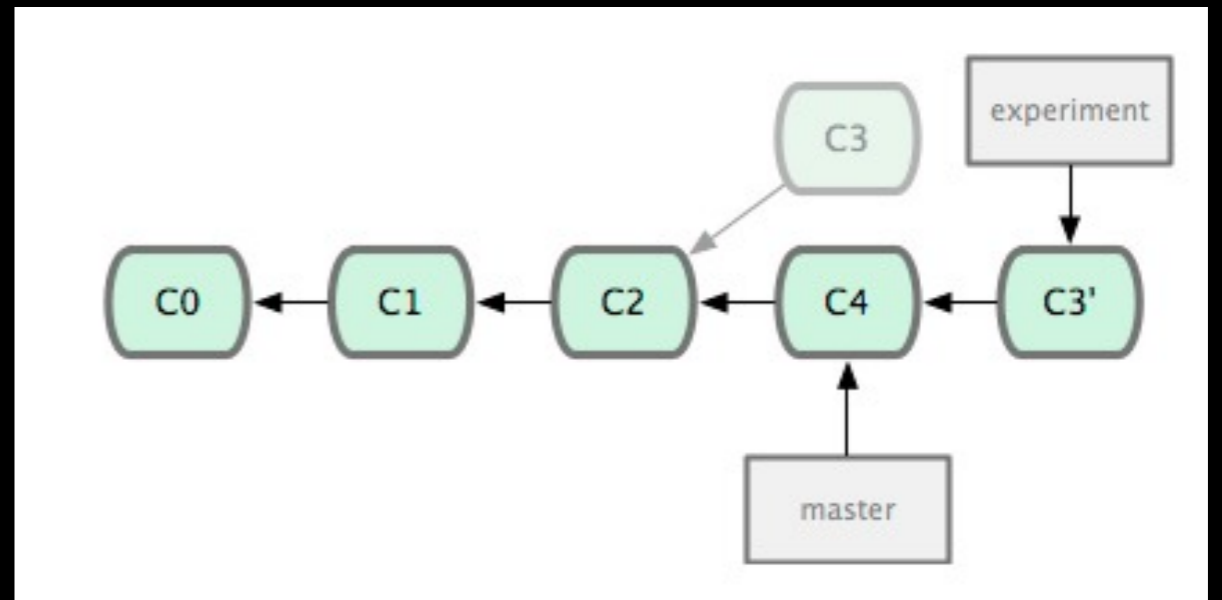
Tracking Branch

- A local branch that is connected to a remote branch
- When you pull or push on that branch, it automatically pushes or pulls to the remote branch

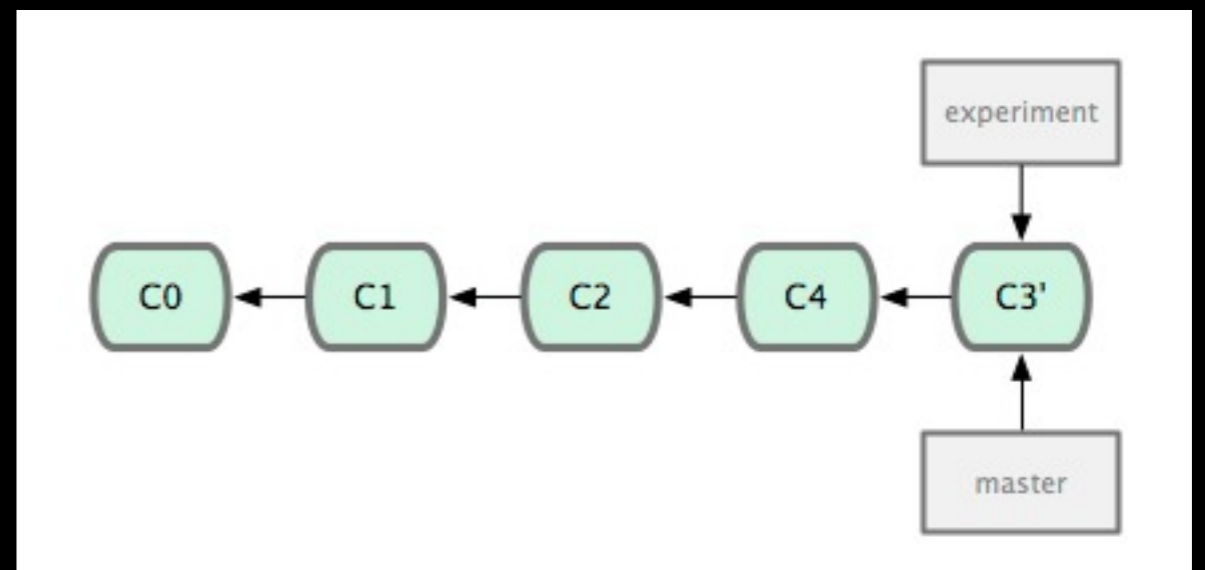
GIT Rebase



1. two diverged branches



2. Take the patch of C3, and apply it on top of C4 to generate C3'



3. Fast Forward Merge

GIT Rebase

- Replay the changes made in one branch onto another branch
- Rebasing make a cleaner history
- It looks like a linear history - it appears like all works happened in series, even when they originally happened in parallel

Basic Principles

- No build breaks
- Review your changes before submit
- Each submit should only deal with one task
- Make your submit comment clear

Issue Tracking System

- A centralized place to track all the “issues” that need to be followed up
 - Todos
 - Bugs
 - PMR
- The system maintain the life cycle of the issue, and provide the facilities for team members to collaborate on these issues

Rational Team Concert

What is RTC ?

- A collaboration framework that includes
 - Project Planning
 - Requirement Management
 - Issue Tracking
 - Version Control
 - Continuous Integration

MEMBER



Profile

Availability

Preference

TEAM



Team Members
Development Line
Process

PROJECT



Teams

Release

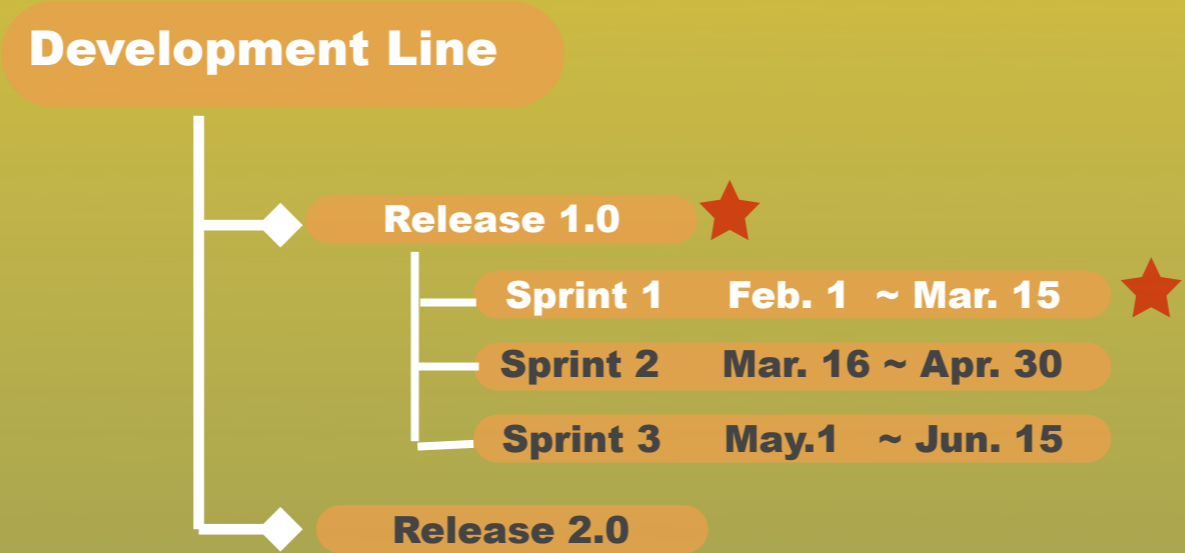
Process



Process

Naming	Product Backlog , Sprint
Roles	Scrum Master, Product Owner
Permissions	Only Scrum Mater Can create iteration plan
Precondition	All code must be code reviewed before checkin
Follow up	When bug fixed, QA will be notified to verify the fix

Release





WORK ITEM

- Each Work item will be associated with an **estimate**
- Along with team member's available resource, the progress and loading of each individual/team/iteration plan could be transparently tracked
- Supported notification mechanisms : mails , event views, RSS , pop-up

4.4 m1 Apr 19, 2008 - May 19, 2008		
Name	Team Area	Progress
JUnit Plan	JUnit Team	79 / 79 - h <input type="text" value="No Open Work Estimated"/> 0%

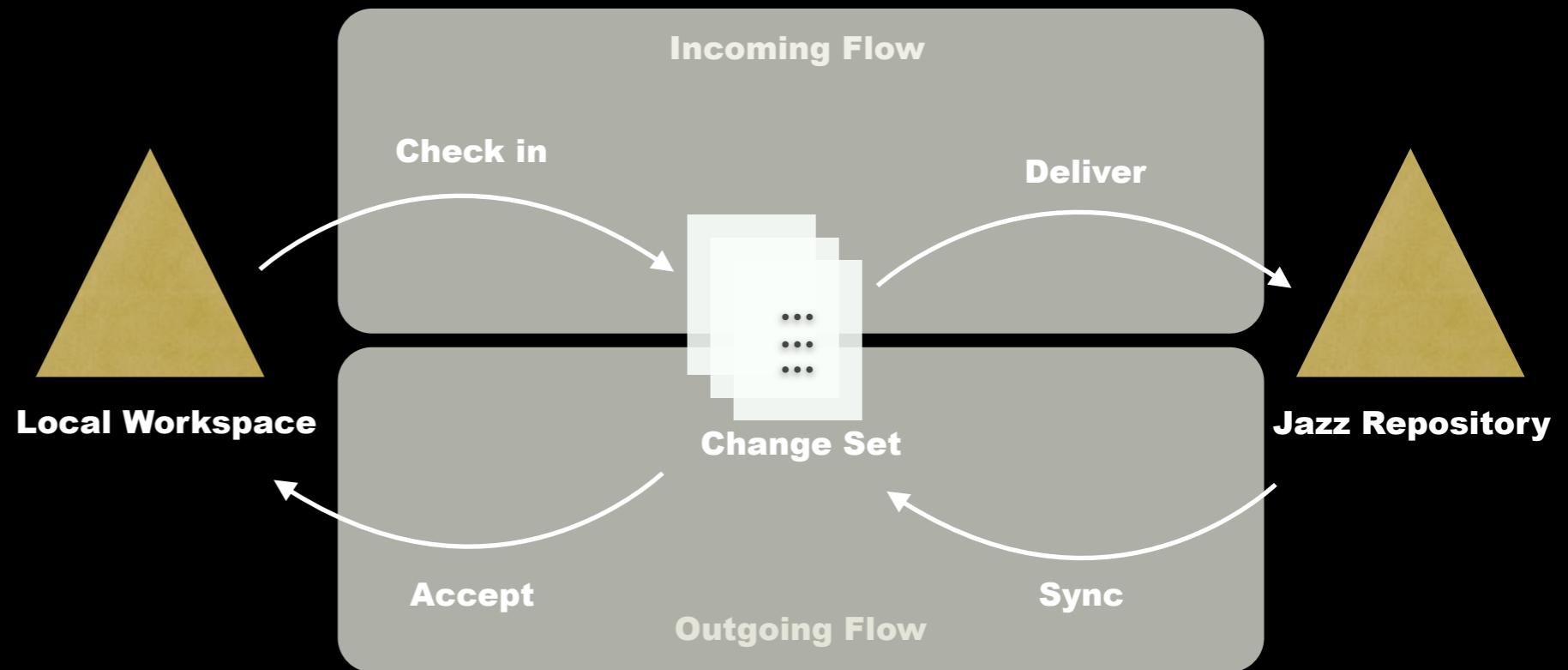
4.4 m2 May 19, 2008 - Jun 18, 2008		
Name	Team Area	Progress
JUnit Plan	JUnit Team	13 / 186 -47 h <input type="text" value="75%"/>

4.4 May 19, 2008 - no end date		
Name	Team Area	Progress
JUnit Release Plan	JUnit Team	0 / 0 h <input type="text"/>

	Bill Cassavelli Closed Items: 8 Open Items: 0	<input type="text" value="Progress: 25 / 25 - h"/> Estimated: -
	Jason Mitchell Closed Items: 1 Open Items: 0	<input type="text" value="Progress: 0 / 0 - h"/> Estimated: -
	Markus Kent Closed Items: 13 Open Items: 1	<input type="text" value="No Open Work Estimated"/> Progress: 54 / 54 - h Estimated: 0%

VERSION CONTROL

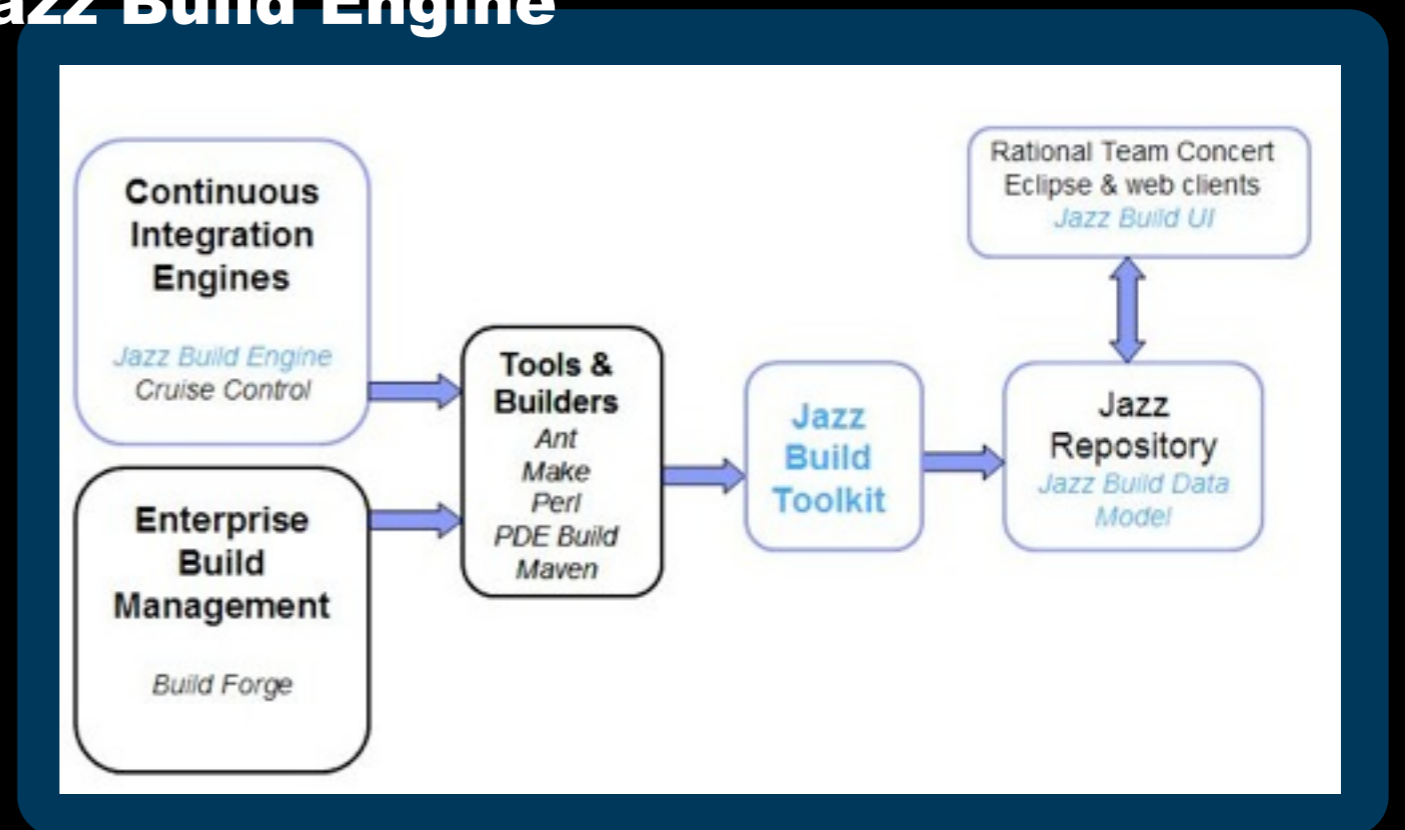
- Stream
- Component
- Change Set
- Baseline
- Snapshot



CONTINUOUS INTEGRATION

- **Build Scheduling**
- **Build Progress monitoring**
- **Build Alert**
- **Build Result Viewing**
- **Regression Testing**
- **Coverage Testing**
- **Linkage with other artifacts**
 - **Work items**
 - **Change Sets**

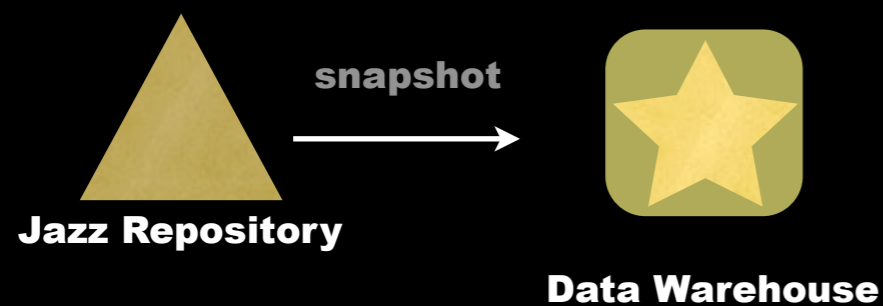
Jazz Build Engine



REPORT

Various project artifacts make it expensive to create report on-the-fly

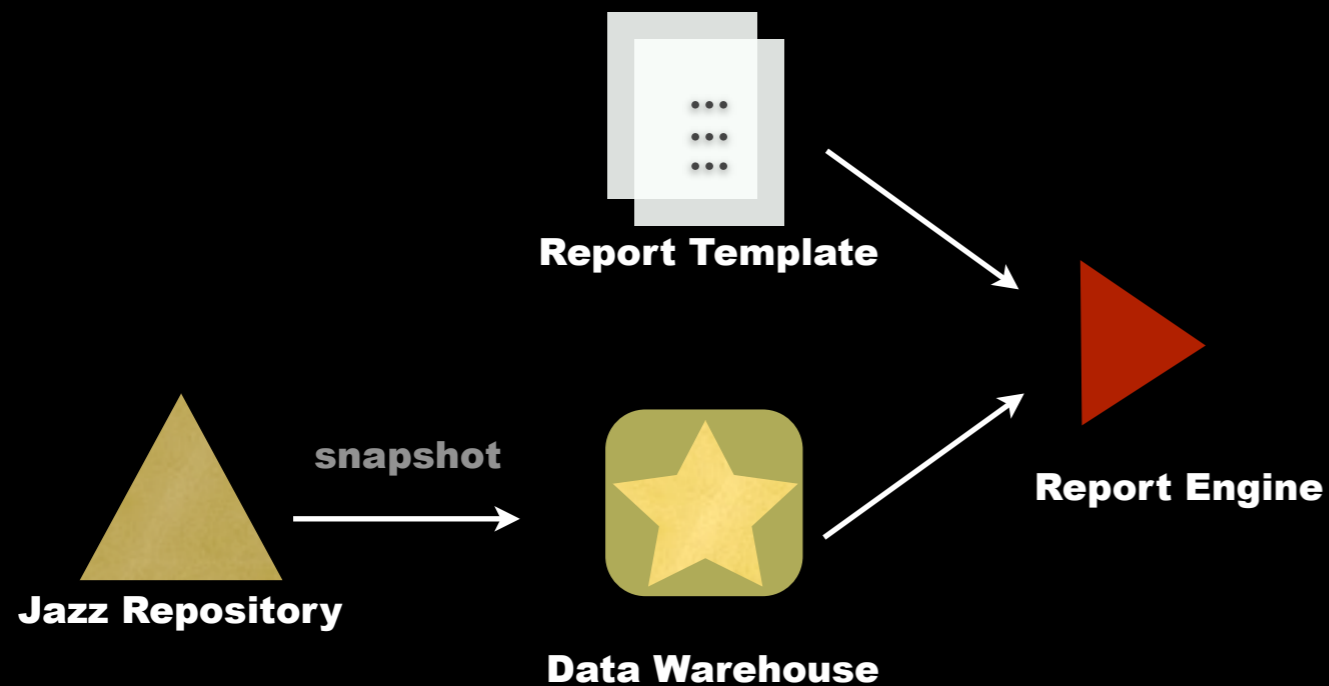
A **data warehouse is a storage facility for read-only, historical and aggregated data.**



REPORT

Various project artifacts make it expensive to create report on-the-fly

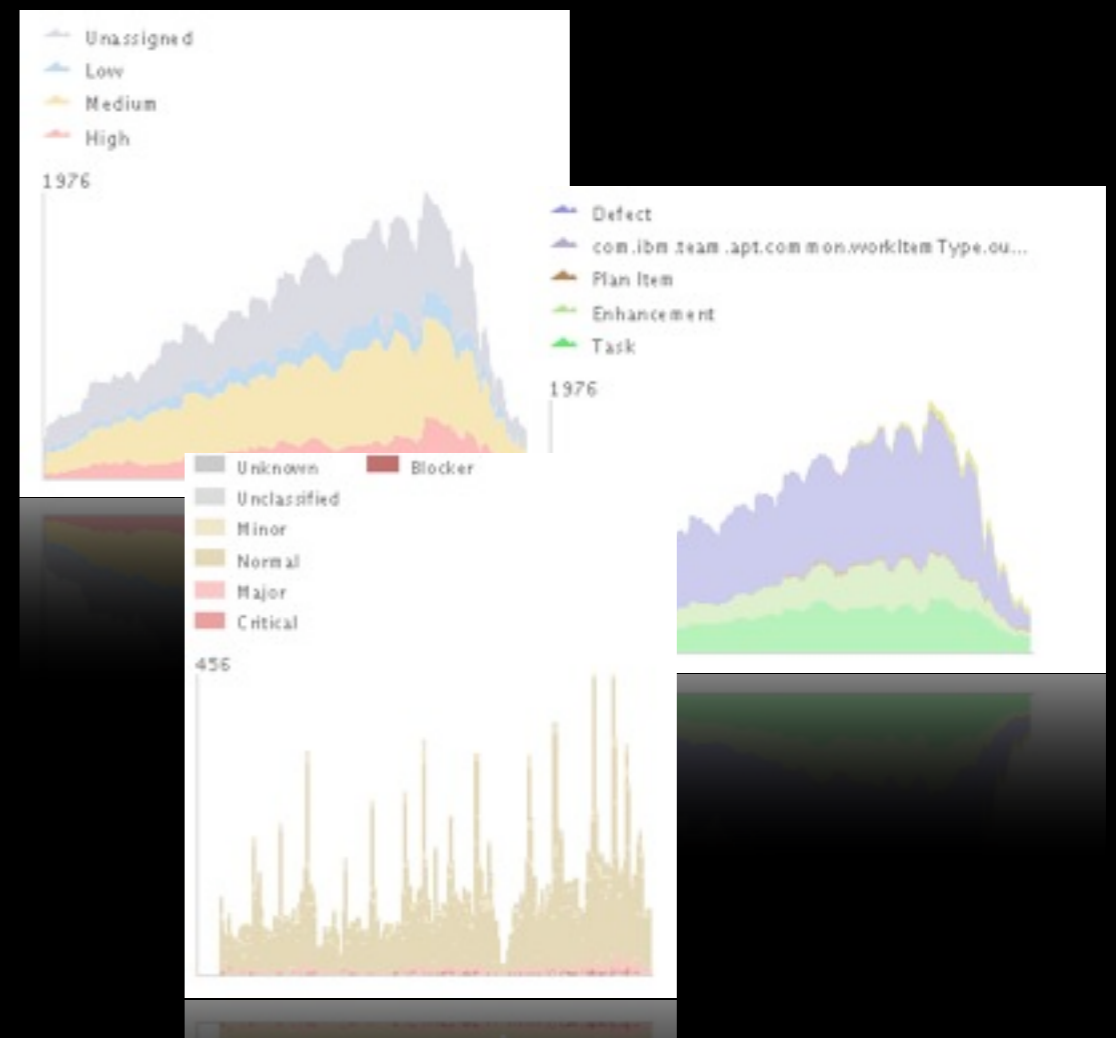
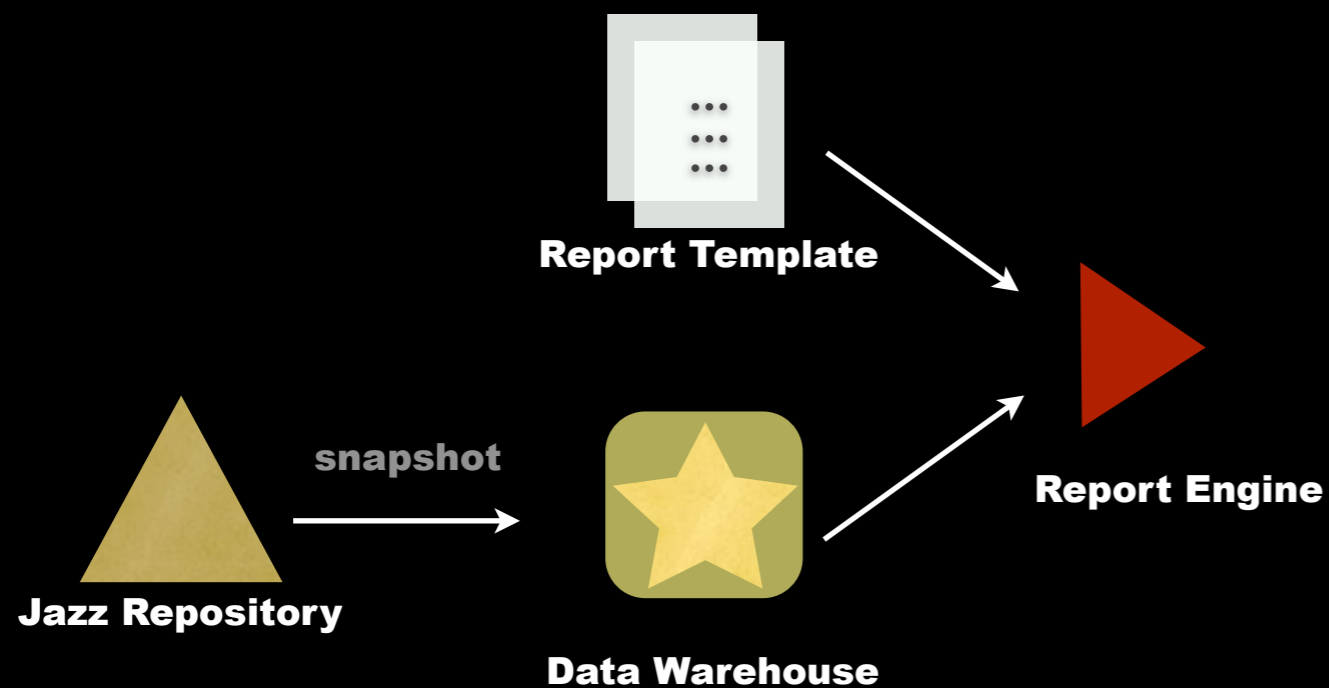
A **data warehouse is a storage facility for read-only, historical and aggregated data.**



REPORT

Various project artifacts make it expensive to create report on-the-fly

A **data warehouse** is a storage facility for read-only, historical and aggregated data.





Measurable **Productivity**



Work Assignments

Working Hours



People

Scheduled Absences

Priority

Release/Iteration

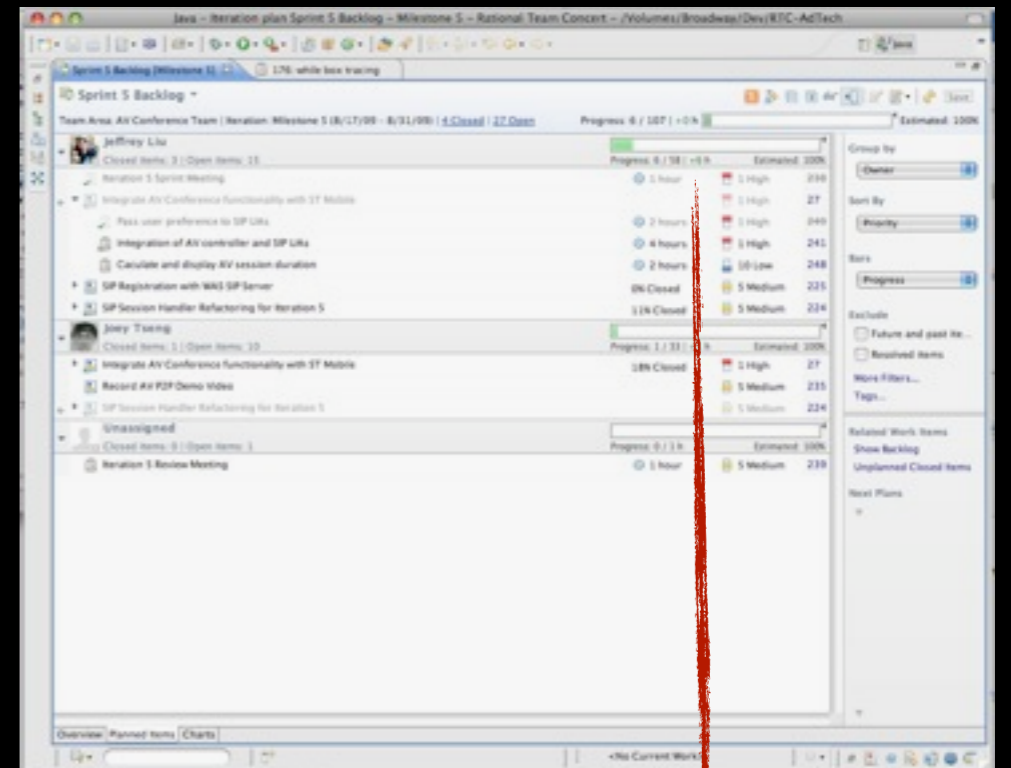
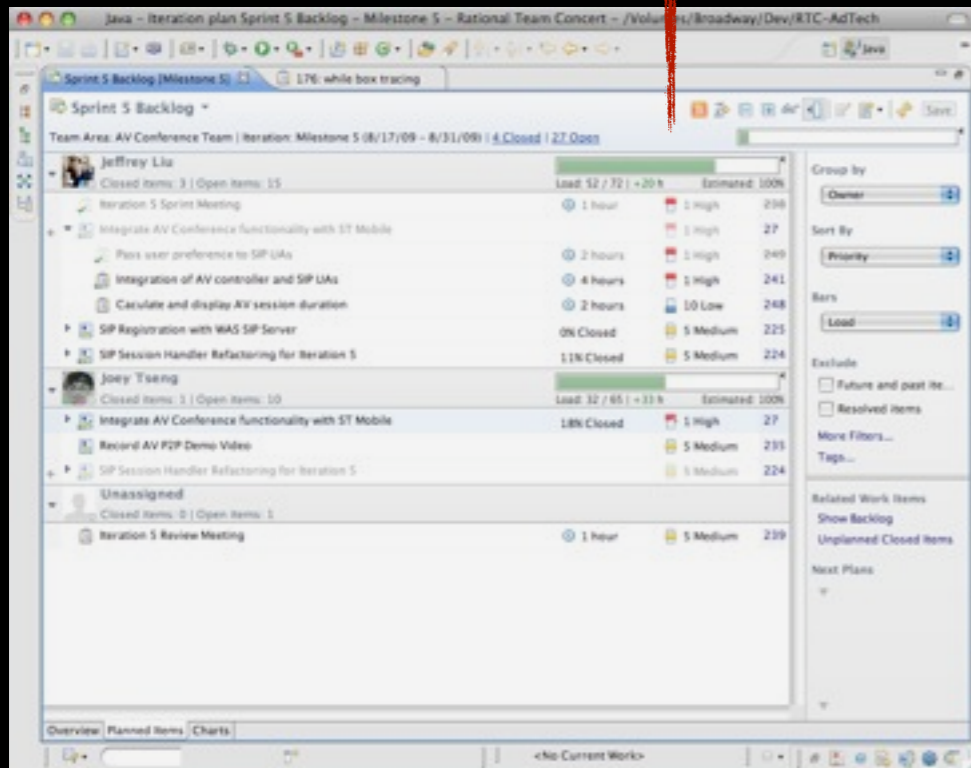
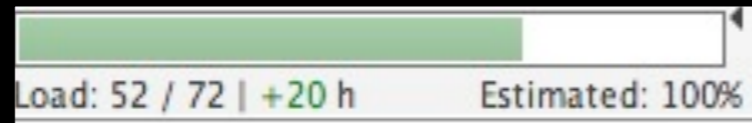


Work

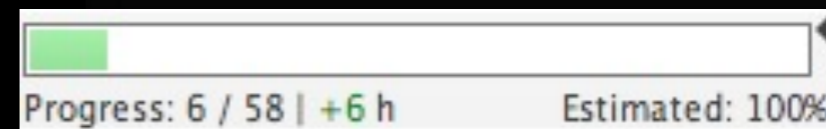
Estimate

Assignee

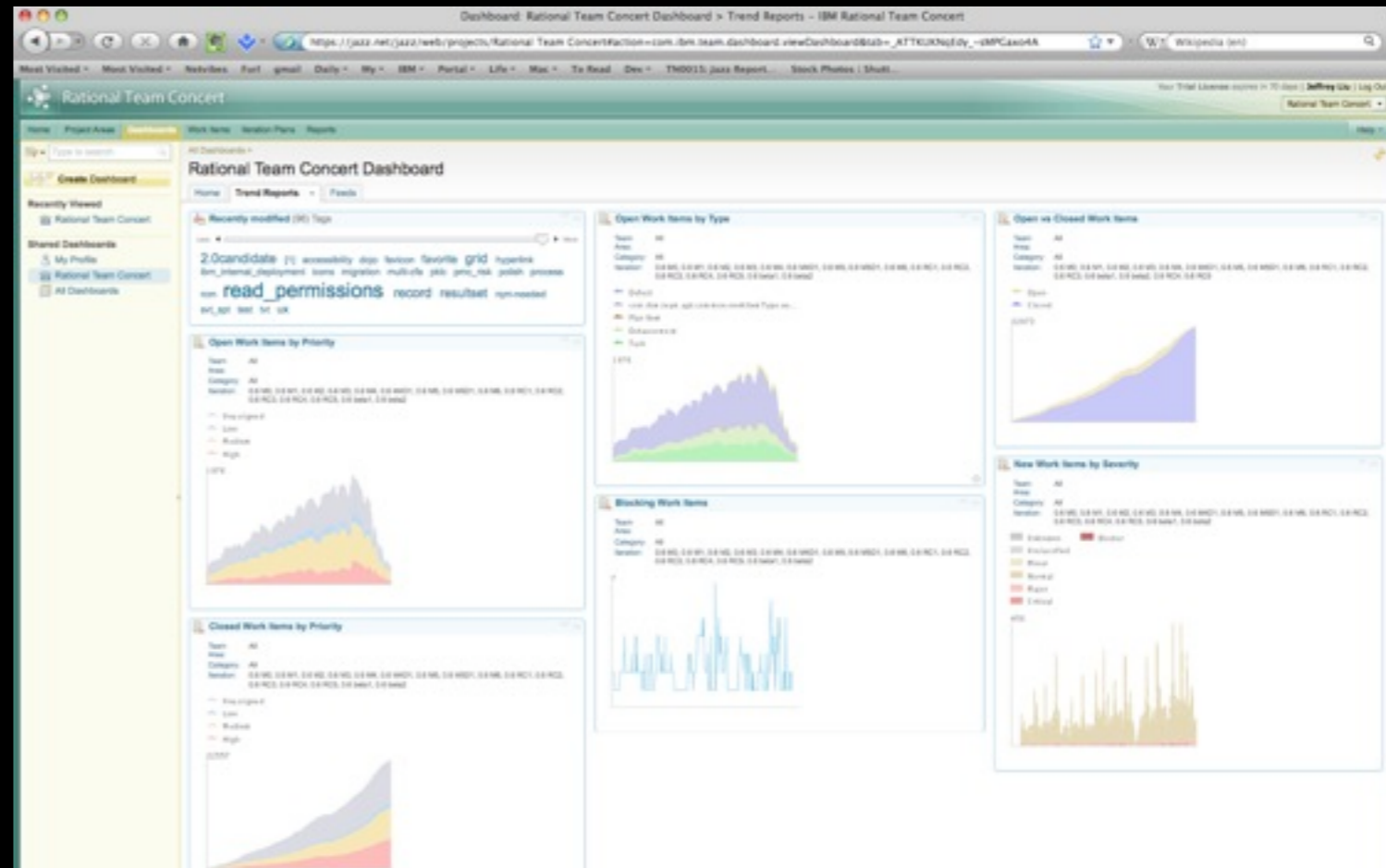
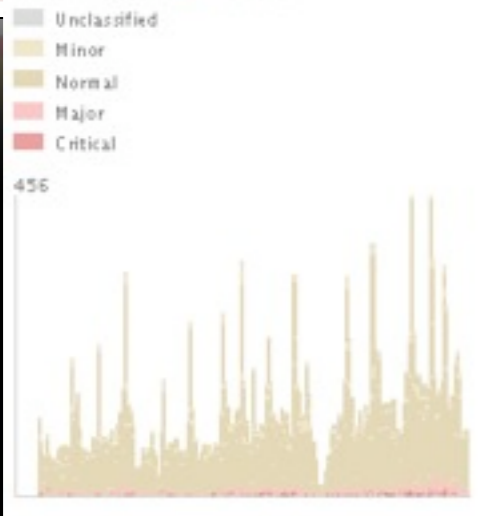
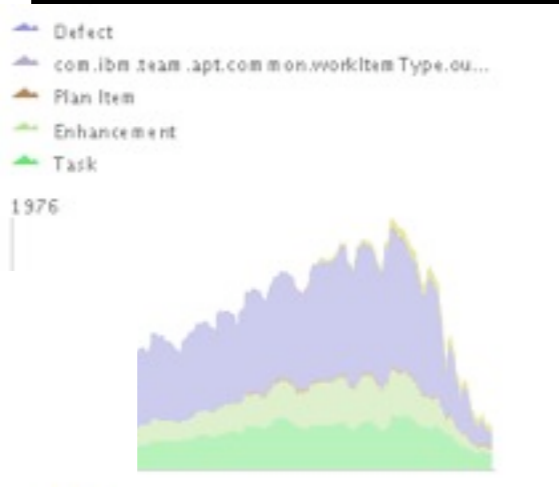
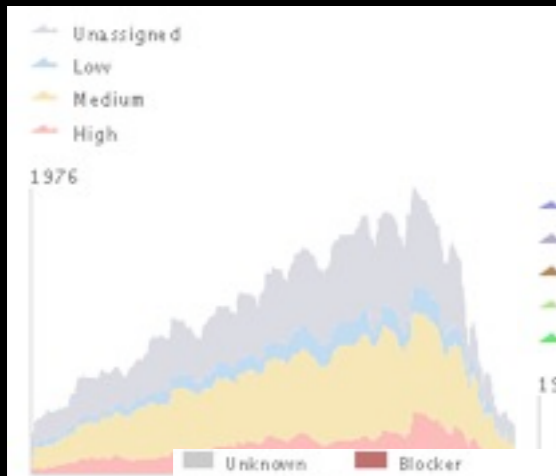
Work Load



Work Progress



Development Velocity



IBM Rational Team Concert

https://127.0.0.1:9443/jazz/web/projects/JUnit Project?debug=true#action=com.i

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Dashboards Project Areas Work Items **Plans** Source Control JUnit Project

My Current Plans >

Previous | 3 of 3 | Next

JUnit Product Backlog

Team Area: JUnit Team | Iteration: 4.4 | 1 Closed | 4 Open

Overview **Planned Items**

Progress: 2/11 pts Estimated: 100%

View As: **Iterations**

Iteration	Closed Items	Open Items	Progress	Estimated
4.4	1	4	2/11 pts	100%
4.4 s1	0	1	0/1 pts	100%
4.4 s2	1	1	2/7 pts	100%
4.4 s3	0	0	0/0 pts	—
4.4 s4	0	0	0/0 pts	—

Provide set of annotations to annotate tests **3 pts** 0/0 pts **Medium** 63

Improve documentation for 4.4 **1 pt** 0/0 pts **Medium** 55

Annotation processor to run tests at compile time **2 pts** 0/0 pts **High** 62

Provide improved Assertion syntax **5 pts** 0/0 pts **Low** 60

No Work

No Work

Done 127.0.0.1:9443

Feel The Rhythm 

JUnit Sprint Backlog [4.4 s2]

JUnit Sprint Backlog

Team Area: JUnit Team | Iteration: 4.4 s2 (6/8/09 - 7/8/09) | [10 Closed](#) | [13 Open](#)

Bill Cassavelli
 Closed items: 4 | Open items: 3
 Load: 3 / 44 | +41 h Estimated: 100%

- Provide improved Assertion syntax Medium 0/16 h 60
- Improve documentation for 4.4 Medium 1/4.25 h 55

Jason Mitchell
 Closed items: 1 | Open items: 5
 Load: 129 / 88 | -41 h Estimated: 80%

- assertEquals throws NPE while comparing null elements 3 weeks High -- 31
- Improve documentation for 4.4 Medium 1/4.25 h 55
- Typo in cookbook: wrong package for JUnitCore 15 mins Unassigned -- 20
- assertEquals array comparison doesn't handle null elements 30 mins Unassigned -- 33
- assertThat signature does not match Matcher 1 day Unassigned -- 9
- CompositeRunner.filter incorrect if child throws NoTestsRema - Unassigned -- 4

Markus Kent

View As

- Backlog
- Developer's Taskboard
- Planned Time
- Team Folders
- Work Breakdown

Edit | Copy

Actions

Re-sort

Exclude

- Assigned Items
- Empty Groups
- Estimated Items
- Execution Items

Overview Planned Items

Feel The Rhythm 

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https://127.0.0.1:9443/jazz/web/projects/JUnit Project?debug=true#action=com.i

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Dashboards Project Areas Work Items **Plans** Source Control

JUnit Project

My Current Plans >

Previous | 1 of 3 | Next

JUnit Sprint Backlog

Team Area: JUnit Team | Iteration: 4.4 s2 (08.06.09 - 08.07.09) | 10 Closed | 13 Open

Overview | **Planned Items**

Progress: 20.75/186.5 | -66.75 h Estimated: 77%

View As: **Developer's Taskboard**

Bill Cassavelli
Closed Items: 4 | Open Items: 4
Progress: 9/12 | +6.25 h Estimated: 100%

To Do	In Progress	Done
<ul style="list-style-type: none"> Improve documentation for 4.4 (55) 	<ul style="list-style-type: none"> javadoc updates for @Ignore in 4.3 (30) timeout doesn't work properly for >=2 cases in junit4.3? (13) 	<ul style="list-style-type: none"> Runner throws confusing exception "no runnable methods"... (44) [Docs] Cookbook Runner section incorrect (23)
<ul style="list-style-type: none"> Provide improved Assertion syntax (60) 	<ul style="list-style-type: none"> Based on the assertThat syntax we should provide assumptions and theories support (59) 	

Done 127.0.0.1:9443

Feel The Rhythm 

The screenshot shows a task management application window titled "My Work". It features a list of tasks organized into sections: "Inbox (JUnit Project)", "Current Work (JUnit Project)", "Later This Week (0 items)", and "Next Week (3 items)". A context menu is open over a task in the "Current Work" section, offering time estimates: "30 minutes", "1 hour", "2 hours", "4 hours", "1 day", "2 days", "3 days", and "1 week". The menu also includes "No Estimate" and "More...".

Section	Task Title	Time	Priority
Inbox (JUnit Project)	Who's responsible to deploy in maven central repository?	11	Low
Current Work (JUnit Project)	testCount hard-coded to 1 for childless Description	27	High
	assertArrayEquals mis differences		High
	Tests on protected me	4	Medium
	Based on the assertTha we should provide assi and theories support	9	Medium
Later This Week (0 items)	Vacation - A day at the op		Low
Next Week (3 items)	BaseTestRunner.getTe requires class to exten TestCase		High
	assertThat fails with Cl (documentation problem)	0	High

Feel The Rhythm 

New Work Item - IBM Rational Team Concert

https://127.0.0.1:9443/jazz/web/projects/JUnit Project#action=com.ibm.team.wor

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JUnit Project

Retrospective <11:26:53> *

Summary:

Overview Links History

Details

Filed Against: Planned For:

Project Area: JUnit Project

Team Area: JUnit Team

Owned By:

Quick Information

No Links.

Notes Preview

Discussion Add Comment

No Comments.

Add Comment

Transferring data from 127.0.0.1... 127.0.0.1:9443

Feel The Rhythm 

Other Tools ?

- Basecamp : Online Team Collaboration tool
- Trac : Open-Source Collaboration tool
- Dropbox : Cloud-based file sharing system
- Evernote : Cloud-based notes system

- ...



Continuous Integration

Life without CI ...

- Hard to pinpoint the root cause of failures
- Depending on project natures, it might take significant effort for integration
- It increase the testing efforts
- Low release quality

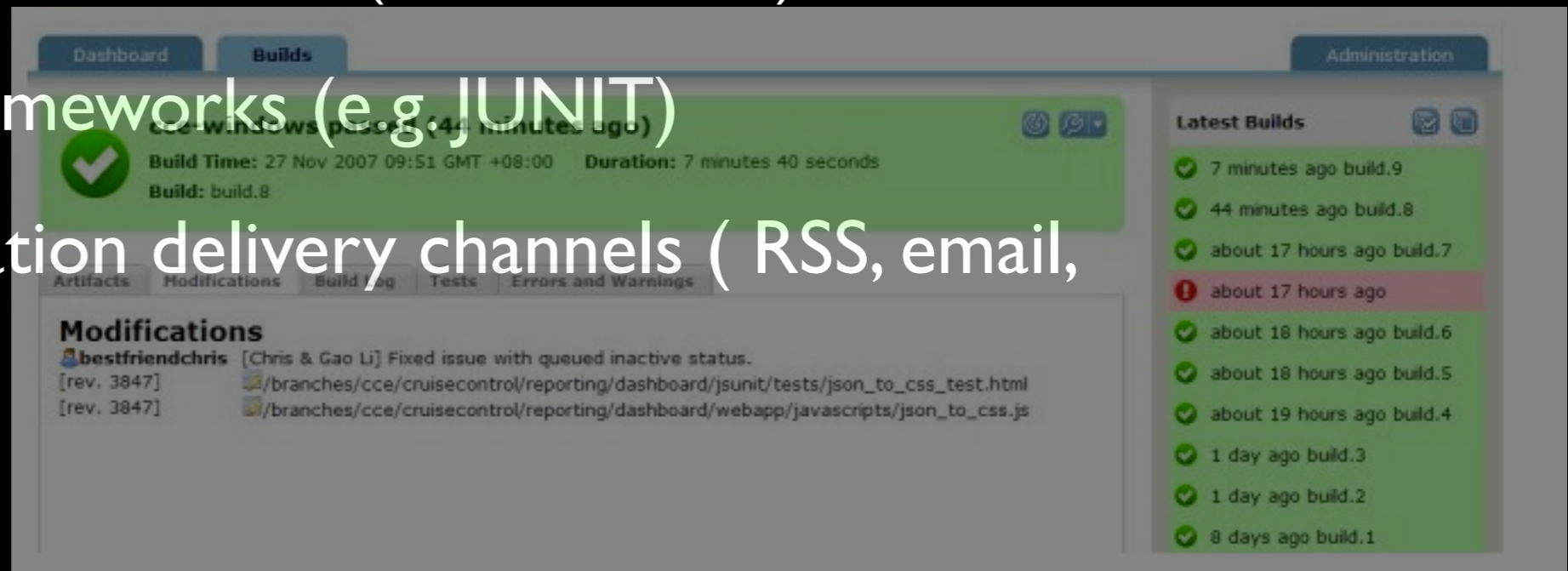
Practices of CI

- Single Source
- Automate the build
- Make your build self-testing
- Every commit should be built
- The status of the build and test is available to everyone in the team

Introduction to CruiseControl



- An open-sourced CI framework for continuous build process
- Supports most of the version control systems (Subversion, Perforce ...)
- Supports many build tools (ANT, Maven)
- Support UT frameworks (e.g. JUNIT)
- Various notification delivery channels (RSS, email, Blogs)



RTC Build History

Work Items - 20110928-0332 - Rational Team Concert

File Edit Navigate Search Project Run Window Help

Team Team Projec My Wo Team

All Project and Team Areas (11 of 12 areas selected)

- 0.5.3 build
- 0.5.4 build
- 0.5.5 build
- 0.5.6 build
- 0.5.7 build
- 2.0.0 build
- 3.0.0 build - MCP6 express - 9004
- 3.0.0 build - MCP6 express - 9005
- 3.0.0 build - MCP6 with the works 9004
- 3.0.0 build - MCP6 with the works 9005
- BVT only
- Trunk Integration MCP6 build express - 9004
- Trunk Integration MCP6 build express - 9005
- Trunk Integration MCP6 build express without protected-sr
- Trunk Integration MCP6 build with the works - 9004
- Trunk Integration MCP6 build with the works - 9005
- Trunk Integration MCP7 build express - 9004
- Trunk Integration MCP7 build express - 9005
- Trunk Integration MCP7 build express - Blade
- Trunk Integration MCP7 build express without protected-sr
- Trunk Integration MCP7 build with the works - 9004

Build Trunk Integration MCP7 build express - 9005 20110928-0332

✓ **Completed**

Duration: 1 hour, 30 minutes, 51 seconds
 Start Time: September 28, 2011 3:32:17 PM
 Completed: September 28, 2011 5:03:08 PM

Status Trend:

Contribution Summary

Changes: [Show changes](#)
 Downloads: [19 downloads](#)
 Logs: [7 logs](#)
 Repository Workspace: [Trunk Integration MCP7 express 9005 build workspace](#)
 Snapshot: [Trunk Integration MCP7 build express - 9005_20110928-0332](#)
 Tests: [293 tests, 0 failures, 0 errors](#)
 Work items: [1 included in build](#)

Reported Work Items
 Work items reported against this build to help stabilize i

- None reported against this build
- [Create a new work item](#)
- [Associate an existing work item](#)

General Information

Requested by: (scheduled build)
 Build Definition: [Trunk Integration MCP7 build express](#)
 Build Engine: [build2](#)
 Build History: [33 builds](#)
 Tags:
 Deletion allowed

Overview Activities Tests Downloads Logs Properties

Work Items Tag Cloud Problems Team Advisor Change Explorer Pending Changes Builds History Console Repository Files Search Properties

Trunk Integration MCP7 build express - 9005 - Found 33 Builds (8093 ms)

Build	Label	Progress	Estimated Completion	Start Time	Duration
Trunk Integration MCP7 build express - 9005 (personal build by CLEMENT SU)	20110928-0629	4% (Pre-build setup)	in 1 hour and 17 minu...	September 28, 2011 6:29:40 PM	23 seconds
Trunk Integration MCP7 build express - 9005 (personal build by Robert D. Callaway)	20110928-0628	8% (Fetching files)	in 1 hour and 16 minu...	September 28, 2011 6:28:52 PM	1 minute, 11 secc
Trunk Integration MCP7 build express - 9005	20110928-0332	Completed		September 28, 2011 3:32:17 PM	1 hour, 30 minute
Trunk Integration MCP7 build express - 9005 (personal build by Robert D. Callaway)	20110928-0144	Completed		September 28, 2011 1:44:52 PM	1 hour, 21 minute
Trunk Integration MCP7 build express - 9005 (personal build by CLEMENT SU)	20110928-0016	Completed		September 28, 2011 12:16:06 PM	1 hour, 29 minute

Search for ID or Text Bedrock Hub

<No Current Work>

Build Failed

Build Trunk Integration MCP7 build express - 9005 (personal build by CLEMENT SU) 20110927-2042

Completed

Duration: 1 hour, 29 minutes, 44 seconds
Start Time: September 28, 2011 8:42:22 AM
Completed: September 28, 2011 10:12:07 AM

Status Trend:

Contribution Summary

Downloads: [19 downloads](#)
Logs: [7 logs](#)
Repository Workspace: [Trunk Integration Workspace](#)
Tests: **293 tests, 10 failures, 0 errors**

Reported Work Items

Work items reported against this build to help stabilize it.

- None reported against this build
- [Create a new work item](#)
- [Associate an existing work item](#)

General Information

Requested by: CLEMENT SU
Build Definition: [Trunk Integration MCP7 build express - 9005](#)
Build Engine: [build3](#)
Build History: [34 builds](#)
Tags:
 Deletion allowed

Build	Label	Progress	Estimated Completion	Start Time	Duration
Trunk Integration MCP7 build express - 9005 (personal build by Jeannie K. Hawrysz)	20110927-2114	Completed		September 28, 2011 9:14:31 AM	1 hour, 34 minutes, 5...
Trunk Integration MCP7 build express - 9005 (personal build by Jeannie K. Hawrysz)	20110927-2043	Completed		September 28, 2011 8:43:55 AM	1 hour, 35 minutes, 3...
Trunk Integration MCP7 build express - 9005 (personal build by CLEMENT SU)	20110927-2042	Completed		September 28, 2011 8:42:22 AM	1 hour, 29 minutes, 4...

Failed Test Cases

Build Trunk Integration MCP7 build express - 9005 (personal build by CLEMENT SU) 20110927-2042

JUnit Tests

Name	Tests	Failures	Errors	Time Taken	Run ...
FVT-onbox-JUnit-remanufacture	245	10	0	23 m 44 s	
com.ibm.bedrock.fvt.suites.BedrockFvtFilteredTestSuite	245	10	0	23 m 44 s	
com.ibm.bedrock.fvt.LicenseAcceptanceCliTests	6	2	0	24 s	
testLicenseRejectSSH6	1	1	0	11 ms	5
testLicenseAcceptSSH6	1	1	0	2 ms	6
com.ibm.bedrock.fvt.FileGetPutCliTests	36	8	0	3 m 17 s	
testGetFileSCP6	1	1	0	2 ms	14

Details

Class name:

Method:

Time taken:

Overview Activities Tests Downloads Logs Properties

Build Logs

The screenshot displays a web-based build management interface. The top window shows a project titled "Build Trunk Integration MCP7 build express - 9005 (personal build by CLEMENT SU) 20110927-2042". Below this, a "Log Files" section contains a table with columns for "File Name", "Description", and "File Size".

File Name	Description	File Size
Build		
comple-3.9.7.0-mcp7-REL-20110927-2042.log	...Compiling lo	
virtual-20110927-2042.log	...Virtual imag	
Test		
beam-20110927-2042.log	Performing BEA	
bvtRun-20110927-2042.log	BVT Client serial	
smoketest-prepped-REL-20110927-2042.log	...Smoke test	
unittest-3.9.7.0-mcp7-REL-20110927-2042.log	...Running uni	
<no component>		
build-1317170540945.log	Full Build Log	

The second window shows the content of the selected log file, "build-1317170540945.log". The log text is as follows:

```
2011-09-27 20:42:21 [Jazz build engine] running on host: bedrock.rtp.raleigh.ibm.com
2011-09-27 20:42:21 [Jazz build engine] Should build occur?
2011-09-27 20:42:21 [Jazz build engine] Yes: Always build a user initiated request.
2011-09-27 20:42:23 [Jazz build engine] Invoking pre-build participant "com.ibm.team.build.jazzscm"
2011-09-27 20:42:27 [Jazz build engine] Deleting fetch destination "/home/build3/jazz/buildsystem/buildengine/c
2011-09-27 20:42:44 [Jazz build engine] Fetching files to fetch destination "/home/build3/jazz/buildsystem/bui
2011-09-27 20:45:02 [Jazz build engine] Invoking build participant "com.ibm.team.build.ant"
Buildfile: /home/build3/jazz/buildsystem/buildengine/eclipse/workspace/src/rtc-build.xml
[echo] bvt.pxeFirmwareFilename: build3.tar.gz

buildall:
[echo] bvt.pxeFirmwareFilename: build3.tar.gz

setup:
[echo] SDK version: 3.9.7.0
[echo] buildDefinitionId: Trunk Integration MCP7 build express - 9005
[echo] Personal build: [no]
[echo] buildLabel/RTCBUILDID: 20110927-2042
[echo] buildResultUUID: _revswOlqEeC8LpMKdz5Pgw
[echo] build userid: build3
[echo] BRDEVHOME: /home/build3/jazz/buildsystem/buildengine/eclipse/workspace
[echo] BRHOME: /home/build3/bedrock-sdk
[echo] MCP_CACHE_DIR: /home/mcp-cache-dir
[echo] JAVA_HOME (OK if unset): [unset]
[echo] mcp.env: mcp7
[echo] mcp64.env: mcp7_64
[echo] Ant version: Apache Ant version 1.7.1 compiled on June 27 2008
[echo] build cache hostname: bedrock.rtp.raleigh.ibm.com
```

Summary

- Before You Start your project
 - Decide the development process that works for your team
 - Identify the tools to use for team collaboration
 - Version Control, Issue Tracking, Information Sharing, Todo...
 - Identify your build tools, unit testing framework, and setup your continuous integration system.
 - Setup the development disciplines

Questions



Are You a Pig or a Chicken ?



Reference

- Continuous Integration, from Martin Fowler

<http://martinfowler.com/articles/continuousIntegration.html>

- Pro GIT

<http://progit.org/book/>