



# Building Android with Buildbot

Pierre Tardy  
Software Engineer - UMG  
ABS, Feb 2011

# About the author

## Intel Employee since 2009

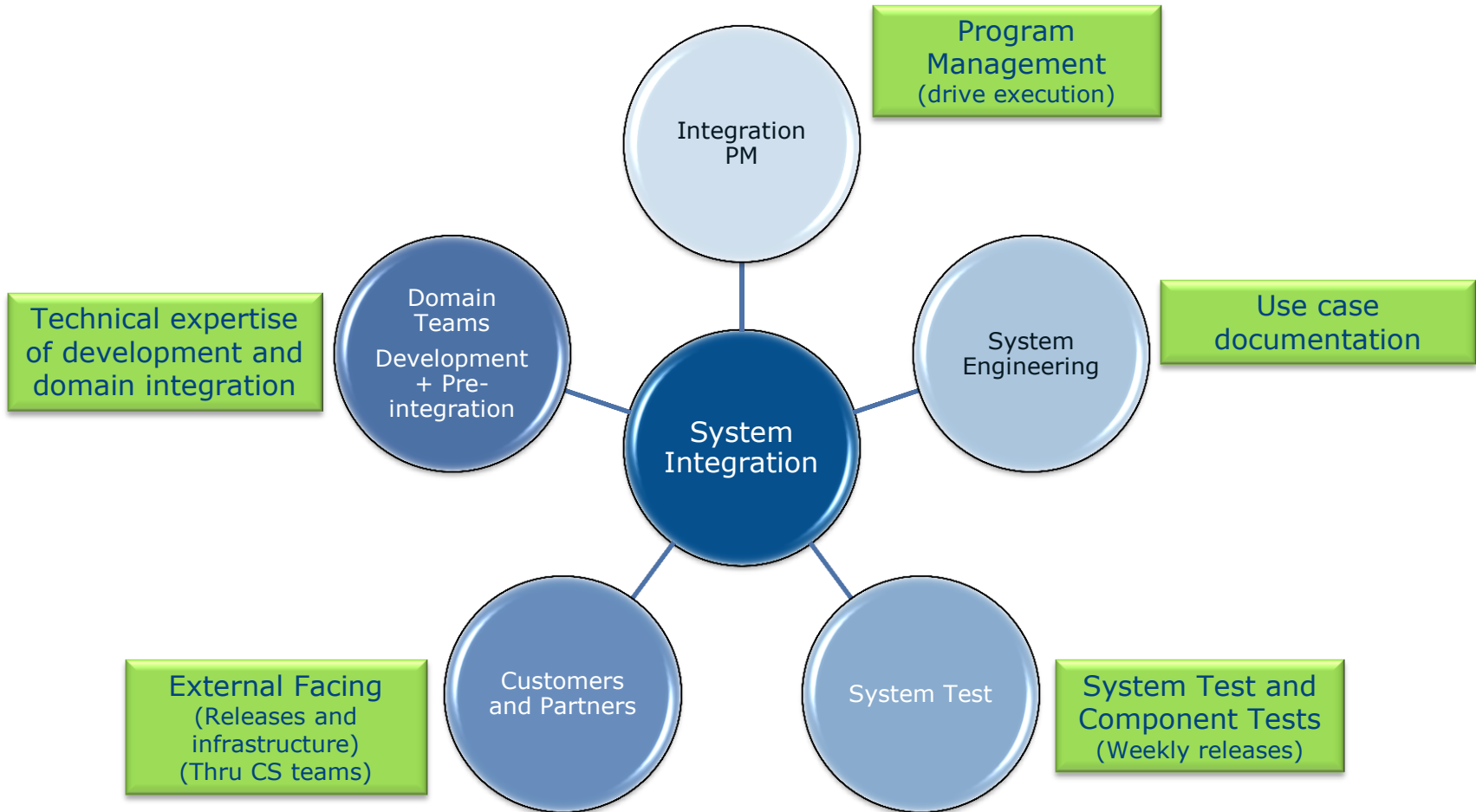
Working on Intel's phone platforms

- Meego
- Android
- Power Management
- Tools (pytimechart, buildbot)
- Open-Source expertise

## Formerly Freescale Employee

DVBH, LTE (gpe, oe, poky, cairo)

# System Integration... in the middle 😊



# Agenda

1. [Android Continuous Integration Process](#)
2. [Buildbot Continuous Integration Process](#)
3. [Automate boring parts of Android integration](#)
4. [Buildbot Centric Integration Process](#)
5. [Next Challenges](#)





Questions?

# Android CI Overview

All
My
Admin
Documentation

[Open](#)
[Merged](#)
[Abandoned](#)





Froyo/Gingerbread/ICS Development

### Change I59f8162e: trace/runtime\_pm: add runtime\_pm trace event

**Change-Id:** I59f8162e7129b98454752ca60c920c40ce4e8bd1

**Owner:** [Tardy, Pierre](#)

**Project:** [a/bsp/hardware/intel/linux-2.6](#)

**Branch:** [kernel/2.6.35.3/stable](#)

**Topic:**

**Uploaded:** Mar 10, 2011 12:21 PM

**Updated:** Mar 22, 2011 1:19 PM

**Status:** Merged

trace/runtime\_pm: add runtime\_pm trace event

based on the recent hook from Arjan for powertop statistics we add a tracepoint in order for pytimechart to display the runtime\_pm activity over time, and versus other events.

we also add a usage counter change tracer that will trace accountability of a runtime\_resume

change-Id: I59f8162e7129b98454752ca60c920c40ce4e8bd1  
Signed-off-by: Pierre Tardy <pierre.tardy@intel.com>

[Permalink](#)

Reviewer	Verified	Code Review	
<a href="#">Tardy, Pierre</a>		+1	Looks good to me, but someone else must approve
<a href="#">C...</a>		✓	Looks good to me, approved
<a href="#">P...</a>	✓	✓	Verified; Looks good to me, approved
<a href="#">P...</a>			

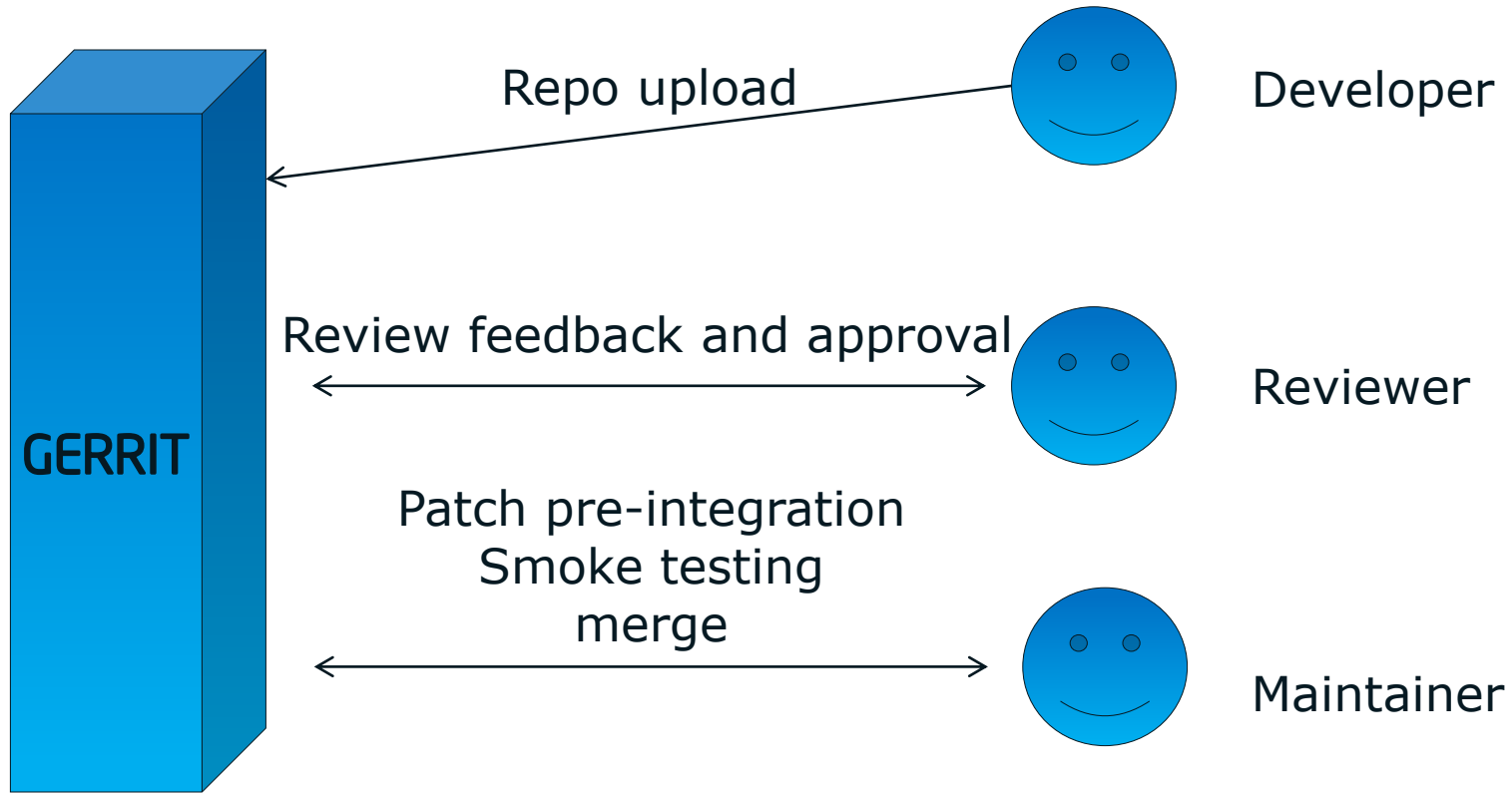
▶ Included in

▶ Dependencies

Old Version History: Base



- ▶ Patch Set 1 [59f8162e7129b98454752ca60c920c40ce4e8bd1](#) [\(gitweb\)](#)
- ▶ Patch Set 2 [621f9e321091c950364948ed435c92df72cac930](#) [\(gitweb\)](#)
- ▼ Patch Set 3 [5a7ecd9f9e471e799ea9a5c87b17299e0daf6ce5](#) [\(gitweb\)](#)

# Gerrit is Android's main tool for CI



# Gerrit example

All My Admin Documentation  
Open Merged Abandoned

  Froyo/Gingerbread/ICS Development

Change I59f8162e: trace/runtime\_pm: add runtime\_pm trace event

Change-Id:	I59f8162e7129b98454752ca60c920c40ce4e8bd1
Owner:	<a href="#">Tardy, Pierre</a>
Project:	<a href="#">a/bsp/hardware/intel/linux-2.6</a>
Branch:	<a href="#">kernel/2.6.35.3/stable</a>
Topic:	
Uploaded:	Mar 10, 2011 12:21 PM
Updated:	Mar 22, 2011 1:19 PM
Status:	Merged

[Permalink](#)

Reviewer	Verified	Code Review	
<a href="#">Tardy, Pierre</a>		+1	Looks good to me, but someone else must approve
<a href="#">G...</a>		✓	Looks good to me, approved
<a href="#">...</a>	✓	✓	Verified; Looks good to me, approved
<a href="#">P...</a>			

► Included in  
► Dependencies

Old Version History:

- Patch Set 1: [59f8162e7129b98454752ca60c920c40ce4e8bd1](#) ([gitweb](#))
- Patch Set 2: [621f9e321091c950364948ed435c92df72cac930](#) ([gitweb](#))
- ▼ Patch Set 3: [5a7ecd9f9e471e799ea9a5c87b17299e0daf6ce5](#) ([gitweb](#))

Developer

Submit the code, ping reviewers and maintainers



# Gerrit example

All My Admin Documentation  
Open Merged Abandoned

  Froyo/Gingerbread/ICS Development

## Change I59f8162e: trace/runtime\_pm: add runtime\_pm trace event

Change-Id:	I59f8162e7129b98454752ca60c920c40ce4e8bd1
Owner:	<a href="#">Tardy, Pierre</a>
Project:	<a href="#">a/bsp/hardware/intel/linux-2.6</a>
Branch:	<a href="#">kernel/2.6.35.3/stable</a>
Topic:	
Uploaded:	Mar 10, 2011 12:21 PM
Updated:	Mar 22, 2011 1:19 PM
Status:	Merged

trace/runtime\_pm: add runtime\_pm trace event

based on the recent hook from Arjan for powertop statistics we add a tracepoint in order for pytimechart to display the runtime\_pm activity over time, and versus other events.

we also add a usage counter change tracer that will trace accountability of a runtime\_resume

Change-Id: I59f8162e7129b98454752ca60c920c40ce4e8bd1  
Signed-off-by: Pierre Tardy <pierre.tardy@intel.com>

[Permalink](#)

Reviewer	Verified	Code Review	
<a href="#">Tardy, Pierre</a>		+1	Looks good to me, but someone else must approve
<a href="#">G...</a>		✓	Looks good to me, approved
<a href="#">...</a>	✓	✓	Verified; Looks good to me, approved
<a href="#">P...</a>			

Reviewer

- Included in
- Dependencies

Old Version History:

- Patch Set 1 [59f8162e7129b98454752ca60c920c40ce4e8bd1](#) ([gitweb](#))
- Patch Set 2 [621f9e321091c950364948ed435c92df72cac930](#) ([gitweb](#))
- ▼ Patch Set 3 [5a7ecd9f9e471e799ea9a5c87b17299e0daf6ce5](#) ([gitweb](#))

Ensures that the patch is doing what it claims in a clear and effective way

# Gerrit review UI

- Allow to compare between version of patch
- Comment inside the patch
- Show white space errors
- Configure number of context displayed

Change I59f8162e: drivers/base/power/runtime.c

▼ Patch History

	Old Version	New Version	Comments
Base	<input checked="" type="radio"/>	<input type="radio"/>	
Patch Set 1	<input type="radio"/>	<input type="radio"/>	
Patch Set 2	<input type="radio"/>	<input type="radio"/>	
Patch Set 3	<input type="radio"/>	<input checked="" type="radio"/>	

Ignore Whitespace:  Tab Width:   Syntax Coloring  Whitespace Errors  Skip Uncommented Files  Reviewed  
Context:  Columns:   Intra-line Difference  Show Tabs  Skip Deleted Files

[Commit Message](#) [Up to change](#) [pm\\_runtime.h](#)

Old Version (Download)	New Version (Download)
(... skipping 1 common line ...)	
2 * drivers/base/power/runtime.c - Helper functions for device run-time PM	2 * drivers/base/power/runtime.c - Helper functions for device run-time PM
3 *	3 *
4 * Copyright (c) 2009 Rafael J. Wysocki <rjw@sisk.pl>, Novell Inc.	4 * Copyright (c) 2009 Rafael J. Wysocki <rjw@sisk.pl>, Novell Inc.
5 * Copyright (c) 2010 Alan Stern <stern@rowland.harvard.edu>	5 * Copyright (c) 2010 Alan Stern <stern@rowland.harvard.edu>
6 *	6 *
7 * This file is released under the GPLv2.	7 * This file is released under the GPLv2.
8 */	8 */
9	9
10 #include <linux/sched.h>	10 #include <linux/sched.h>
11 #include <linux/pm_runtime.h>	11 #include <linux/pm_runtime.h>
12 #include "power.h"	12 #include <trace/events/power.h>
13	13 #include "power.h"
14	14
15 static int rpm_resume(struct device *dev, int rpmflags);	15 static int rpm_resume(struct device *dev, int rpmflags);
16 static int rpm_suspend(struct device *dev, int rpmflags);	16 static int rpm_suspend(struct device *dev, int rpmflags);
17 /**	17
18 * update_pm_runtime_accounting - Update the time accounting of power states	18 /**
19 * @dev: Device to update the accounting for	19 * update_pm_runtime_accounting - Update the time accounting of power states
20 *	20 * @dev: Device to update the accounting for
21 * In order to be able to have time accounting of the various power states	21 *
22	22 * In order to be able to have time accounting of the various power states
(... skipping 20 common lines ...)	
42	43
43 >> if (dev->power.runtime_status == RPM_SUSPENDED)	44 >> if (dev->power.runtime_status == RPM_SUSPENDED)
44 >> >> dev->power.suspended_jiffies += delta;	45 >> >> dev->power.suspended_jiffies += delta;
45 >> else	46 >> else
46 >> >> dev->power.active_jiffies += delta;	47 >> >> dev->power.active_jiffies += delta;
47 }	48 }
48	49

trace/runtime\_pm: add runtime\_pm trace event

based on the recent hook from Arjan for powertop statistics we add a tracepoint in order for pytimechart to display the runtime\_pm activity over time, and versus other events.

# Gerrit example

All My Admin Documentation  
Open Merged Abandoned

  Froyo/Gingerbread/ICS Development

## ★ Change I59f8162e: trace/runtime\_pm: add runtime\_pm trace event

Change-Id:	I59f8162e7129b98454752ca60c920c40ce4e8bd1
Owner:	<a href="#">Tardy, Pierre</a>
Project:	<a href="#">a/bsp/hardware/intel/linux-2.6</a>
Branch:	<a href="#">kernel/2.6.35.3/stable</a>
Topic:	
Uploaded:	Mar 10, 2011 12:21 PM
Updated:	Mar 22, 2011 1:19 PM
Status:	Merged

trace/runtime\_pm: add runtime\_pm trace event

based on the recent hook from Arjan for powertop statistics we add a tracepoint in order for pytimechart to display the runtime\_pm activity over time, and versus other events.

we also add a usage counter change tracer that will trace accountability of a runtime\_resume

Change-Id: I59f8162e7129b98454752ca60c920c40ce4e8bd1  
Signed-off-by: Pierre Tardy <pierre.tardy@intel.com>

[Permalink](#)

Reviewer	Verified	Code Review	
<a href="#">Tardy, Pierre</a>		+1	Looks good to me, but someone else must approve
<a href="#">G...</a>		✓	Looks good to me, approved
<a href="#">...</a>	✓	✓	← Verified, Looks good to me, approved
<a href="#">P...</a>			

Maintainer

- Included in
- Dependencies

Old Version History:

- Patch Set 1 [59f8162e7129b98454752ca60c920c40ce4e8bd1](#) ([gitweb](#))
- Patch Set 2 [621f9e321091c950364948ed435c92df72cac930](#) ([gitweb](#))
- ▼ Patch Set 3 [5a7ecd9f9e471e799ea9a5c87b17299e0daf6ce5](#) ([gitweb](#))

Integrate patches together, make a build, verify that the system still works.

# Notes meanings

- V+1: means the maintainer has tested the patch, it resolve the issue, and does not add any regression
- V-1: means the maintainer has tested the patch, it does not fully resolve the issue, or add a regression
- CR+2: means the reviewer approves the patch
- CR+1: means the reviewer agrees with the patch, but needs a senior reviewer to approve
- CR-1: the patch needs rework or explanation
- CR-2: the patch in its current form is not apt for integration, needs strong refactoring.

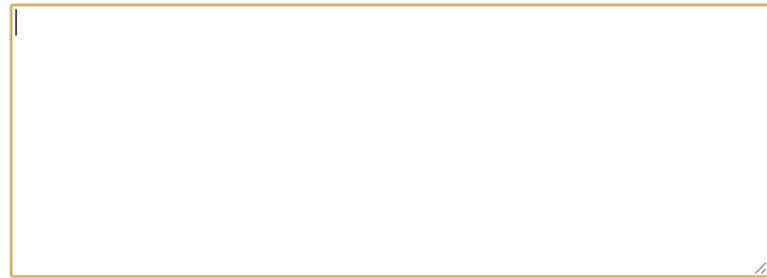
## Verified:

- +1 Verified
- 0 No score
- 1 Fails

## Code Review:

- +2 Looks good to me, approved
- +1 Looks good to me, but someone else must approve
- 0 No score
- 1 I would prefer that you didn't submit this
- 2 Do not submit

## Cover Message:



Publish Comments

Cancel

# Gerrit limits

- Reviewer is a very ungrateful job
  - Takes a lot of time to do correctly
  - Hard to fingerpoint other's job
  - Dev is often under pressure to submit a fix to the release gating bug.
  - Good reviewers often prefer to spend time writing code
- Embedded and especially phone market is all about time2market.
  - Review is often neglected over test.
    - Hey but this code works! Why won't you approve it?
  - Need to be careful of technical debt.

# Buildbot CI overview

Home - Waterfall Grid T-Grid Console Builders Recent Builds Buildslaves Changesources - JSON API - About

## Waterfall [waterfall help](#)

last build	db-postgres	py27-sam061	py24-tw0810
current activity	build successful	build successful	build successful
	idle	idle	idle
CET	changes	py27-sam061	py24-tw0810

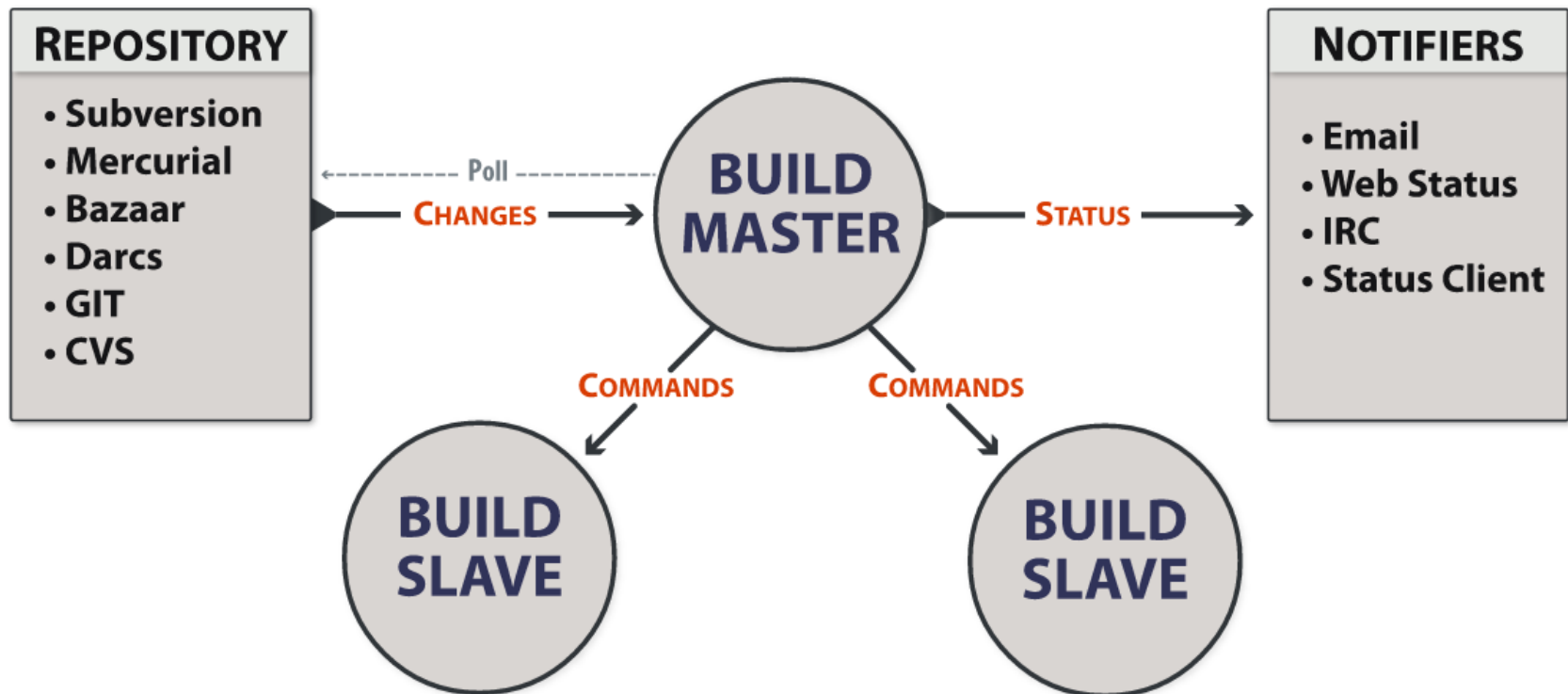
Mon 06 Feb 2012 16:56:19	db-postgres	py27-sam061	py24-tw0810
16:56:06			
16:55:13	1565 tests passed stdio test.log problems warnings	1565 tests passed 6 skips stdio test.log problems warnings	1565 tests passed 1 skip stdio test.log problems
16:54:58			157 tests passed 1 skip stdio test.log problems
16:54:43			versions stdio
16:54:18			'PYTHON=python2.4'; VE='./sandbox-python2.4-Twisted=8.1.0samigr-0.7.1'; ... stdio
		157 tests passed stdio test.log problems	update stdio
16:51:44	versions stdio 'PYTHON=python'; VE='./sandbox-python-twistedsamigr-0.7.1'; ... stdio	versions stdio 'PYTHON=python2.7'; VE='./sandbox-python2.7-twistedsamigr-0.6.1'; ... stdio	update stdio
16:51:27	Build 540	Build 303	Build 959
16:49:53	Dustin J. Mitchell		

# Buildbot overview

- Buildbot is a build and test automation framework
- Easy to customize. Configuration file is in python. Step Plugins are designed to be easy to override.
  - Very popular in many open source projects
  - No Configuration UI by default. Need to RTFM. Many prefer Jenkins in the Industry because of this.
- Based on python/twisted. Asynchronous programming to the extreme. Very powerful, but unusual. More complex to hack deeply.

# Buildbot overview

<http://buildbot.net/buildbot/docs/current/manual/introduction.html>

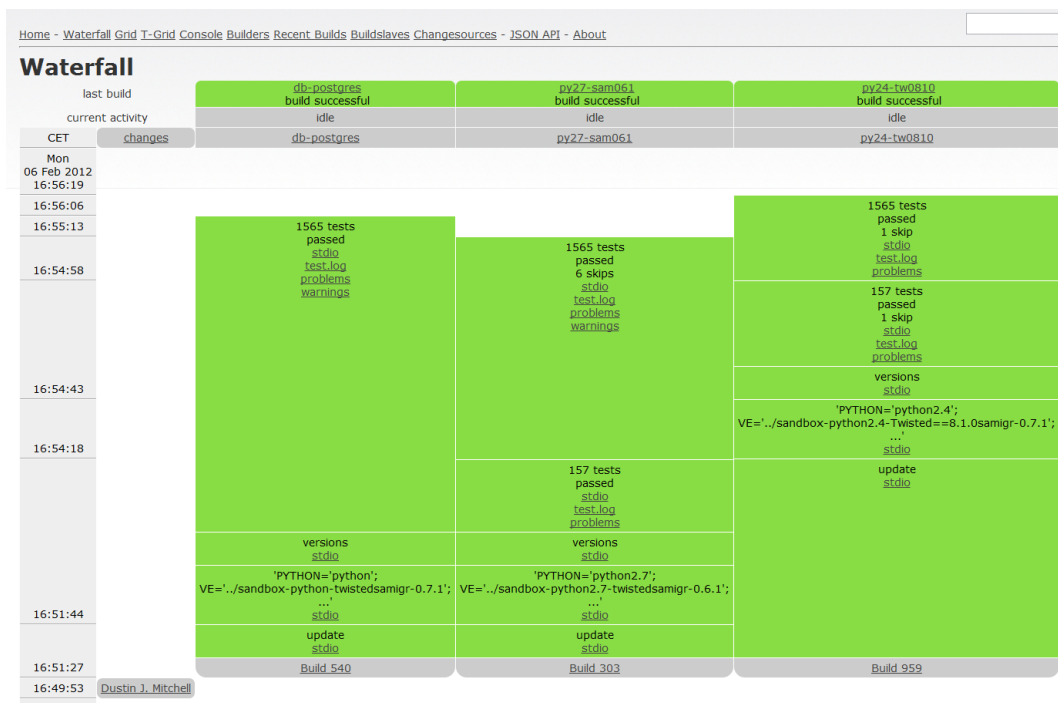
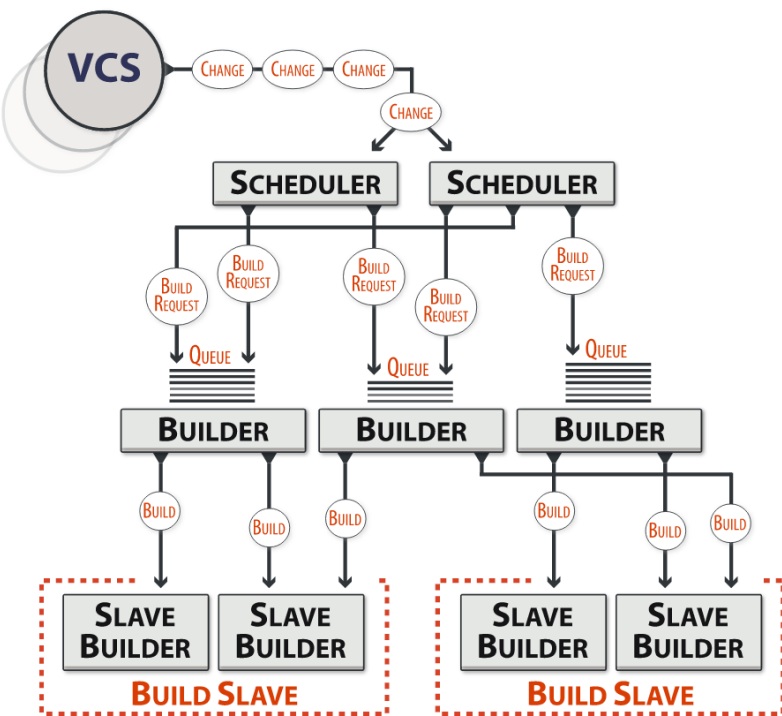




# Buildbot overview

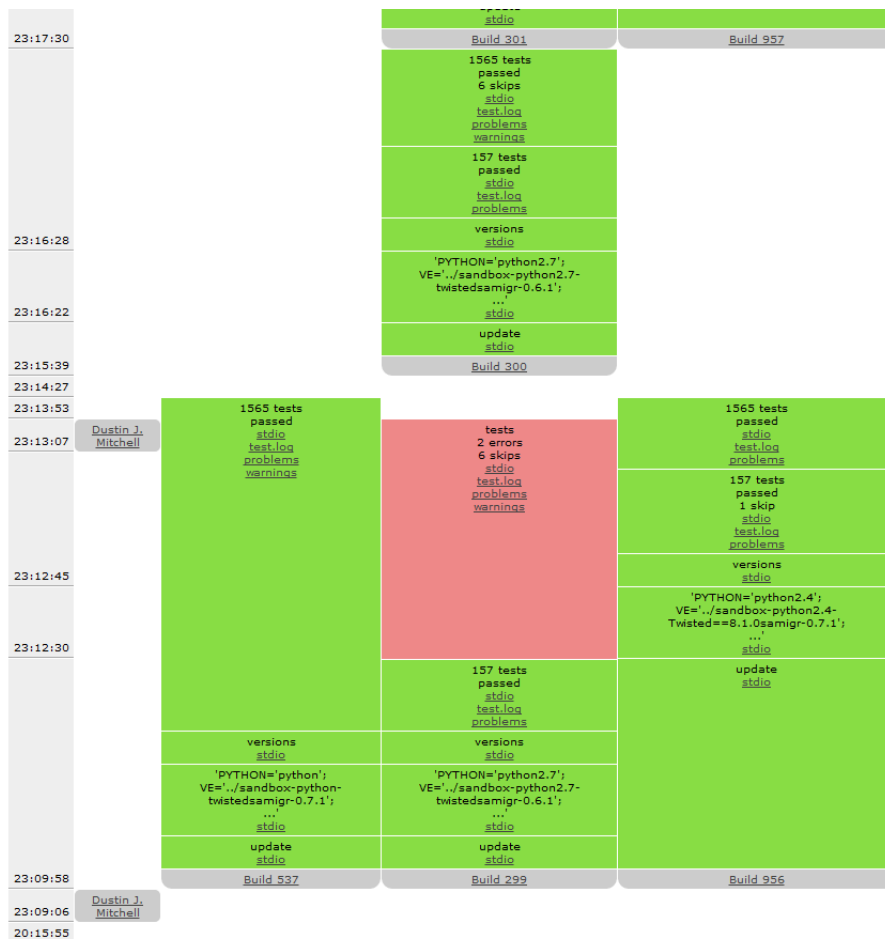
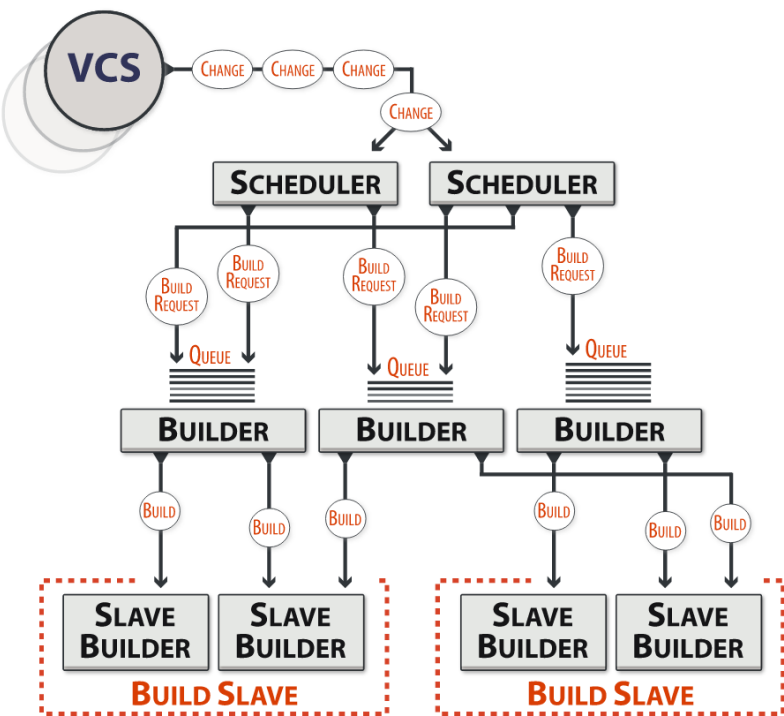
<http://buildbot.net/buildbot/docs/current/manual/introduction.html>

Upon branch update, build is created, and test suite is run



# Buildbot overview

Developer is alerted when a test fails, can submit fix, and re-launch test



# Classical buildbot CI process limits

## **Regression tests are done after integration**

This process is not ensuring the mainline is always stable, just that developers are alerted early

**Classical solution:** developers submit in their own branch

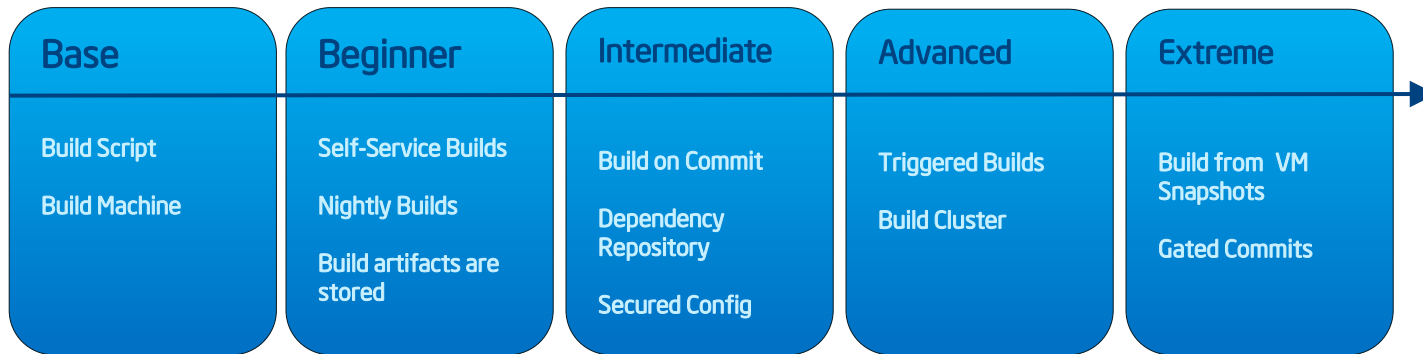
Submitting in dev branch triggers build + tests

When buildbot is happy with the branch, developers can merge in mainline.

**Problem:** hard to scale to 200 devs (too many branches)

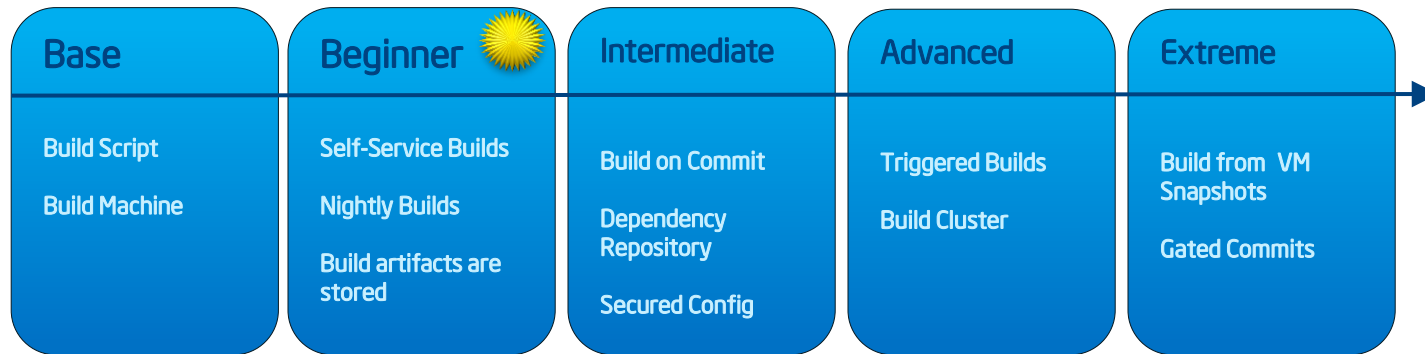
Does not integrate with Android's repo dev env.

# State of the Art



Source: [Urbancode](#)

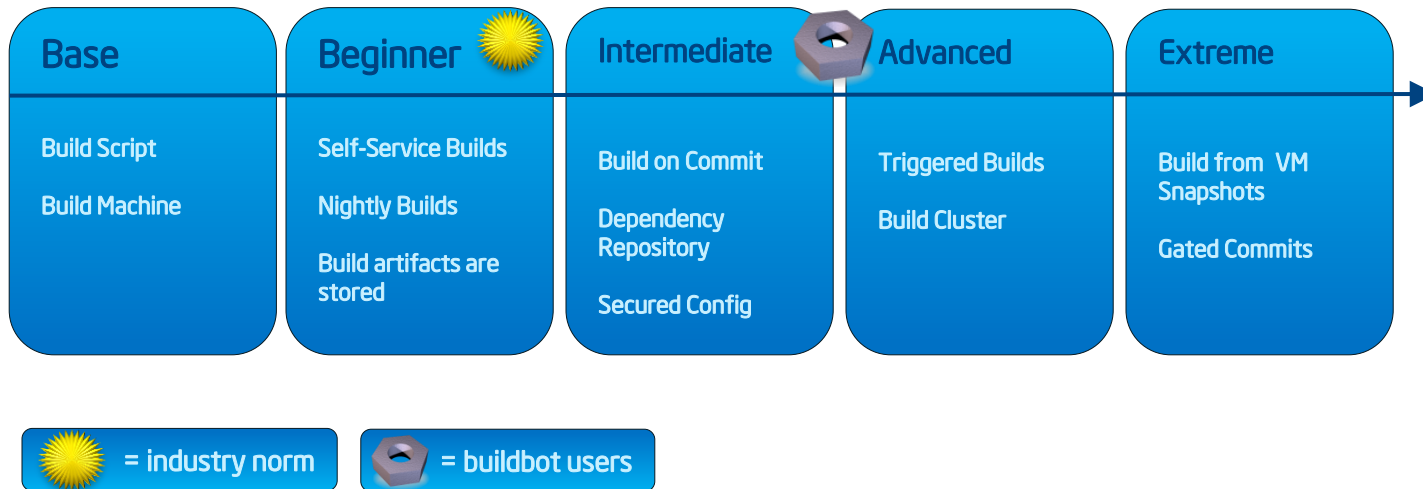
# State of the Art



 = industry norm

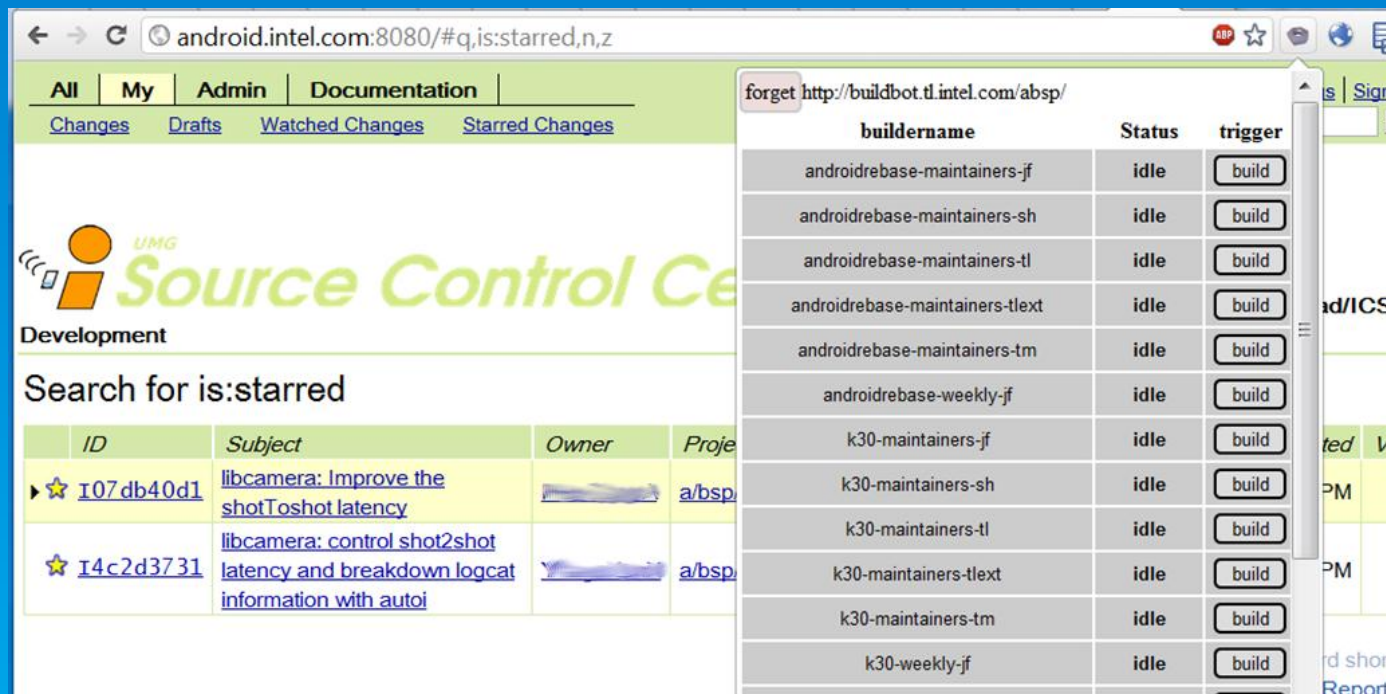
Source: [Urbancode](#)

# State of the Art



Source: [Urbancode](#)

# Automate boring parts of the process



The screenshot shows a web browser window at `android.intel.com:8080/#q,is:starred,n,z`. The page displays the Source Control Center interface with a search for `is:starred`. Below the search results, a table lists various build jobs with their status and a 'build' trigger button.

buildername	Status	trigger
androidrebase-maintainers-jf	idle	build
androidrebase-maintainers-sh	idle	build
androidrebase-maintainers-tl	idle	build
androidrebase-maintainers-ttext	idle	build
androidrebase-maintainers-tm	idle	build
androidrebase-weekly-jf	idle	build
k30-maintainers-jf	idle	build
k30-maintainers-sh	idle	build
k30-maintainers-tl	idle	build
k30-maintainers-ttext	idle	build
k30-maintainers-tm	idle	build
k30-weekly-jf	idle	build

# Downloading patches from gerrit


For each patches to integrate:

Cd to the proper directory

## ► Dependencies

Old Version History:  ▼

## ▼ Patch Set 1 6a57e8f355ff800d42bc3ef858465e53a316ba65 [\[gitweb\]](#)

Author	<a href="#">Pierre Tardy</a> <pierre.tardy@intel.com> Feb 3, 2012 6:23 PM
Committer	<a href="#">Pierre Tardy</a> <pierre.tardy@intel.com> Feb 3, 2012 6:23 PM
Parent(s)	2ac2d76915e0ad939052834d10cfe8b2598f054e [Buildbot][ACS] ACS update
Download	<a href="#">checkout</a>   <a href="#">pull</a>   <a href="#">cherry-pick</a>   <a href="#">patch</a>   <a href="#">Anonymous Git</a>   <a href="#">Anonymous HTTP</a>   <a href="#">SSH</a>   <a href="#">HTTP</a>
	<code>git fetch ssh://ptardy@android.intel.com:29418/a/bsp/vendor/intel/release refs/changes/55/33955/1 &amp;&amp; git cherry-pick FETCH_HEAD</code> 

Copy paste the cherry-pick command from the gerrit web UI



# Downloading patches from gerrit

## Chrome gerrit buildbot plugin

- Star the patches candidate for pre-integration
- Choose the type of build
- The plugin will create a build for you with those patches added

android.intel.com:8080/#q,is:starred,n,z

All My Admin Documentation

Changes Drafts Watched Changes Starred Changes

Source Control Center

Development

Search for is:starred

ID	Subject	Owner	Project
<a href="#">I07db40d1</a>	<a href="#">libcamera: Improve the shotToshot latency</a>	<a href="#">[redacted]</a>	<a href="#">a/bsp</a>
<a href="#">I4c2d3731</a>	<a href="#">libcamera: control shot2shot latency and breakdown logcat information with autoi</a>	<a href="#">[redacted]</a>	<a href="#">a/bsp</a>

forget http://buildbot.tl.intel.com/absp/

buildname	Status	trigger
androidrebase-maintainers-jf	idle	<input type="button" value="build"/>
androidrebase-maintainers-sh	idle	<input type="button" value="build"/>
androidrebase-maintainers-tl	idle	<input type="button" value="build"/>
androidrebase-maintainers-tltext	idle	<input type="button" value="build"/>
androidrebase-maintainers-tm	idle	<input type="button" value="build"/>
androidrebase-weekly-jf	idle	<input type="button" value="build"/>
k30-maintainers-jf	idle	<input type="button" value="build"/>
k30-maintainers-sh	idle	<input type="button" value="build"/>
k30-maintainers-tl	idle	<input type="button" value="build"/>
k30-maintainers-tltext	idle	<input type="button" value="build"/>
k30-maintainers-tm	idle	<input type="button" value="build"/>
k30-weekly-jf	idle	<input type="button" value="build"/>

# Downloading patches from gerrit

## Maintainer build:

- Provides a web form to configure the build
- Downloads the tip of the mainline
- Applies the given patches on top of it
- Builds given variants on given PRODUCT\_TARGETS
- Stores the result somewhere on the intranet near me.
- Run automated tests with the resulting build
- Sends a mail when it's done (for manual tests)

### Force build

To force a build, fill out the following fields and push the 'Force Build' button

reason:

camera improvements

force a fast incremental build (EXPERIMENTAL! dont use for now if you want reliability!)

force a complete build

how to compute cherry-pick list

reorder without downloading other patches

optionally select a manifest URL on which patches are applied:

gerrit cherry-picks

```
http://android.intel.com:8080/34190 #libcamera: Improve the shotToShot latency  
http://android.intel.com:8080/30077 #libcamera: control shot2shot latency and  
breakdown logcat information with autoi
```

Build variant

userdebug  
eng  
user

Build target

MFLD\_PR2

smoke test campaign to run

acs-m...staging-tl  
acs-m...staging-tl  
acs-m...staging-tl  
acs-m...2-staging-tl  
acs-m...1-campreint-tm  
acs-...b2bboot-tl  
acs-...b2bboot-tl  
acs-m...1-b2bboot-tl  
acs-m...b2bboot-tl  
acs-...b2bboot-tl

Force Build

# Behind the scene...

## Maintainer builder:

- Provides a web form to configure the build
  - ⇒ forced to be available in buildbot upstream since oct 2011
- Downloads the tip of the mainline
  - ⇒ repo plugin available in buildbot upstream since sept 2010
- Applies the given patches on top of it
  - ⇒ `repo download a/bsp/hardware/intel/libcamera 34190/3`
  - ⇒ repo download needs the directory of the patch
  - ⇒ Need to apply the patches in correct order
  - ⇒ May need to add more dependencies
  - ⇒ The web UI has all the information:

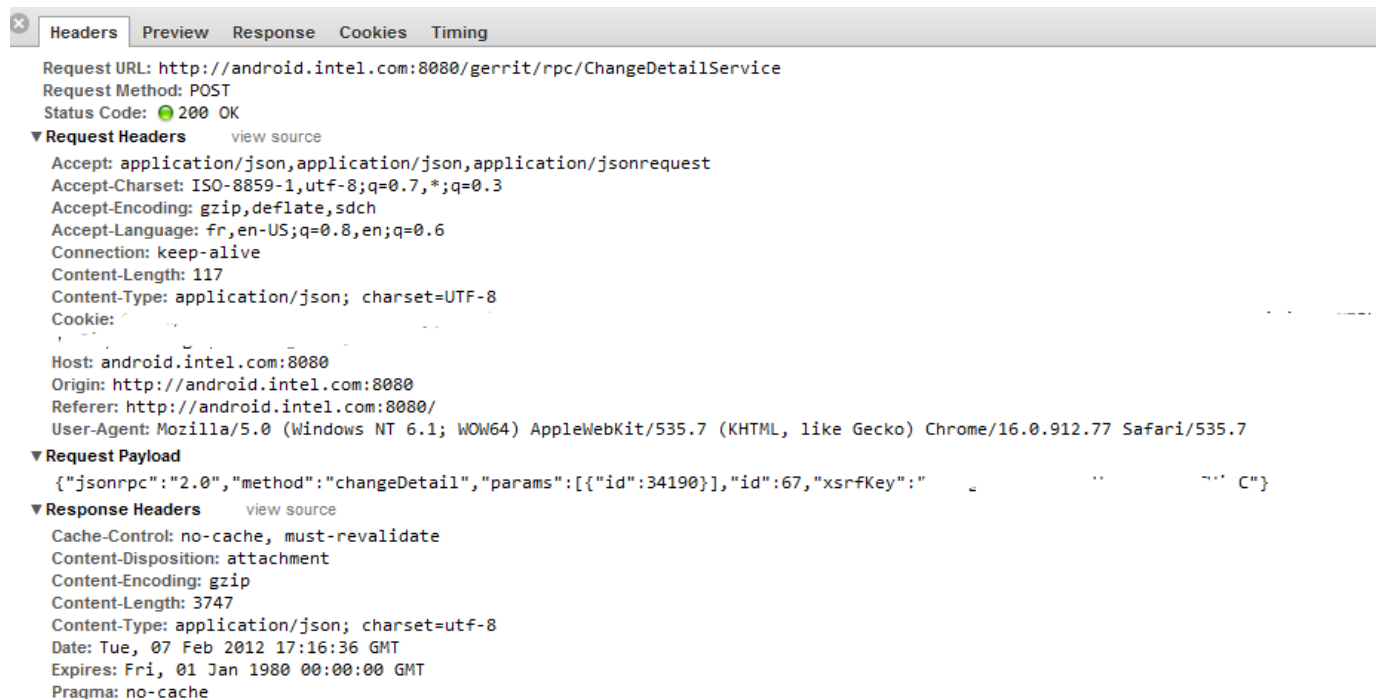
### ▼ Dependencies

ID	Subject	Owner	Project	Branch	Updated
<b>Depends On</b>					
<a href="#">Ieb9a67b1</a>	<a href="#">libcamera: Using local parameter to store some values</a>		<a href="#">a/bsp/hardware/intel/libcamera</a>	<a href="#">platform/android/r2-stable</a>	3:46 PM
<b>Needed By</b>					
<i>(None)</i>					

# Behind the scene...

## How does gerrit work?

- Json API between javascript and java server
- Use chrome debugger to figure out what



```
Headers Preview Response Cookies Timing
Request URL: http://android.intel.com:8080/gerrit/rpc/ChangeDetailService
Request Method: POST
Status Code: 200 OK

▼ Request Headers view source
Accept: application/json,application/json,application/jsonrequest
Accept-Charset: ISO-8859-1,utf-8;q=0.7,*;q=0.3
Accept-Encoding: gzip,deflate,sdch
Accept-Language: fr,en-US;q=0.8,en;q=0.6
Connection: keep-alive
Content-Length: 117
Content-Type: application/json; charset=UTF-8
Cookie:
Host: android.intel.com:8080
Origin: http://android.intel.com:8080
Referer: http://android.intel.com:8080/
User-Agent: Mozilla/5.0 (Windows NT 6.1; WOW64) AppleWebKit/535.7 (KHTML, like Gecko) Chrome/16.0.912.77 Safari/535.7

▼ Request Payload
{"jsonrpc": "2.0", "method": "changeDetail", "params": [{"id": "34190"}], "id": "67", "xsrifKey": "C"}

▼ Response Headers view source
Cache-Control: no-cache, must-revalidate
Content-Disposition: attachment
Content-Encoding: gzip
Content-Length: 3747
Content-Type: application/json; charset=utf-8
Date: Tue, 07 Feb 2012 17:16:36 GMT
Expires: Fri, 01 Jan 1980 00:00:00 GMT
Pragma: no-cache
```

# Behind the scene...

## How does gerrit work?

- Json API between javascript and java server
- All the information is available

```
Headers Preview Response Cookies Timing
▼ [jsonrpc:2.0, id:67,...]
  id: 67
  jsonrpc: "2.0"
  result: {accounts:{,...}, allowsAnonymous:true, canAbandon:true, canRestore:false, canRevert:false,...}
    ▶ accounts: {,...}
      allowsAnonymous: true
    ▶ approvals: [{account:{id:360},...}, {account:{id:280},...}, {account:{id:414},...}, {account:{id:366},...},...]
      canAbandon: true
      canRestore: false
      canRevert: false
    ▼ change: {changeId:{id:34190}, changeKey:{id:I07db40d15264598534a416750c6f5}, rowVersion:30,...}
      ▶ changeId: {id:34190}
      ▶ changeKey: {id:I07db40d15264598534a416750c6f5}
      createdOn: "2012-02-07 04:40:51.000000000"
      currentPatchSetId: 5
    ▼ dest: {projectName:{name:a/bsp/hardware/intel/libcamera}, branchName:refs/heads/platform/andro...}
      ▶ projectName: {name:a/bsp/hardware/intel/libcamera}
      lastUpdatedOn: "2012-02-07 17:02:27.000000000"
      nbrPatchSets: 5
      open: true
      ▶ owner: {id:360}
      rowVersion: 30
      sortKey: "001ae8fe0000858e"
      status: "n"
      subject: "libcamera: Improve the shotToshot latency"
      currentActions: []
    ▼ currentDetail: {,...}
      ▼ info: {key:{changeId:{id:34190}, patchSetId:5}, subject:libcamera: Improve the shotToshot latency,...}
        ▶ author: {name:Hu Gang, email:gang.a.hu@intel.com, when:2012-02-07 10:57:30.000000000, tz:480,...}
        ▶ committer: {name:Hu Gang, email:gang.a.hu@intel.com, when:2012-02-07 21:17:07.000000000, tz:480,...}
        ▶ key: {changeId:{id:34190}, patchSetId:5}
        message: "libcamera: Improve the shotToshot latency [BZ: 22626] Issues: When do the snapshot, camera HAL skip the fir"
        ▶ parents: [{id:{id:e6204ae74d04b4ee88fa219837093f9aeeb9d42f},...}]
        subject: "libcamera: Improve the shotToshot latency"
      ▼ patchSet: {id:{changeId:{id:34190}, patchSetId:5}, revision:{id:defe70984d1628120b32aefc696f5cc4bfad6669},...}
        createdOn: "2012-02-07 13:56:45.000000000"
        ▶ id: {changeId:{id:34190}, patchSetId:5}
        ▶ revision: {id:defe70984d1628120b32aefc696f5cc4bfad6669}
        ▶ uploader: {id:360}
        ▶ patches: [...]
        ▶ currentPatchSetId: {changeId:{id:34190}, patchSetId:5}
      ▼ dependsOn: [{id:{id:31961}, key:{id:Ieb9a67b1644e8ecbe9b969c5ca0ba3fadcf9821d}, owner:{id:360},...}]
        ▶ 0: {id:{id:31961}, key:{id:Ieb9a67b1644e8ecbe9b969c5ca0ba3fadcf9821d}, owner:{id:360},...}
        ▶ messages: [{key:{changeId:{id:34190}, uuid:AAAALH//dHs=}, author:{id:360},...}]
        ▶ missingApprovals: [{id:CRVW}, {id:VRIF}]
        neededBy: []
        ▶ patchSets: [{id:{changeId:{id:34190}, patchSetId:1}, revision:{id:1e4a9a5de44a81325a2ed756ab6ec4b77981c6a5},...},...]
        starred: true
```

Project name to pass to repo download



Dependencies on patches from the same project



# Behind the scene...

## txgerrit

- txgerrit is a python module that queries gerrit via the http/json API
- Asynchronous API for use with buildbot/twisted
- Use Proxy
- High performance:
  - Use http keep alive
  - Several connection at the same time
  - Not too many... serializes over *max\_conn* connections
- Data caching to avoid too many queries on the same patch
- Also has a synchronous API for easy scripting outside of buildbot
- Soon to be cleaned up and properly released...

# Behind the scene...

## Alternative: ssh API

- Gerrit already has an ssh API used for scripting

```
ssh -p 29418 review.example.com gerrit query --format=JSON status:open project:tools/gerrit limit:2
```

- Problem:
- Slow (need to do ssh key exchange at each query, or painfully configure ssh ControlMaster)
- Does not contain all the info (e.g. full commit message)

# Automated Checks

## autolint:

- When dev uploads a patch
- Downloads the tip of the mainline
- Applies this patch
- **Run check patch and other lint checkers**
- 10 min after submit, feedback is given to dev, who can fix on the fly

```
Comments Expand Recent | Expand All | Collapse All 7:07 AM  
buildbot  
Patch Set 1: I would prefer that you didn't submit this  
buildbot finished compiling your patchset  
on configuration main-autolint  
the result is failure  
more details, logs, and binaries: http://buildbot.tl.intel.com/absp/builders/main-autolint/builds/3164  
http://buildbot.tl.intel.com/absp/builders/main-autolint/builds/3164/steps/checkpatch/logs/stdio stderr:  
stdout:  
total: 44 errors, 99 warnings, 2679 lines checked  
NOTE: whitespace errors detected, you may wish to use scripts/cleanpatch or  
scripts/cleanfile  
Your patch has style problems, please review. If any of these errors are false positives report them to the maintainer, see CHECKPATCH in  
MAINTAINERS.  
more info at:http://umgwiki.intel.com/wiki/?title=Howto\_Buildbot\_for\_Developers
```



# Automated Checks

## autobuild:

- When dev upload a patch
- Downloads the tip of the mainline
- Applies those patches
- **Builds the full image on most variants**
- 1-2 hour after submit, feedback is given to dev, whether its patch breaks some other component's or variant's build

Comments	Expand Recent	Expand All	Collapse All
<b>Wu, Hao</b> Patch Set 1: Looks good to me, but someone else must approve			12:02 PM
<b>buildbot</b> Patch Set 1: Looks good to me, but someone else must approve buildbot ...			12:14 PM
<b>buildbot</b>			1:48 PM
Patch Set 1:			
buildbot finished compiling your patchset			
on configuration main-autobuild-tl			
the result is failure			
more details, logs, and binaries: <a href="http://buildbot.tl.intel.com/absp/builders/main-autobuild-tl/builds/2707">http://buildbot.tl.intel.com/absp/builders/main-autobuild-tl/builds/2707</a>			
<a href="http://buildbot.tl.intel.com/absp/builders/main-autobuild-tl/builds/2707/steps/build_all/logs/stdio">http://buildbot.tl.intel.com/absp/builders/main-autobuild-tl/builds/2707/steps/build_all/logs/stdio</a>			
^			
Note: build/tools/signapk/SignApk.java uses unchecked or unsafe operations.			
Note: Recompile with -Xlint:unchecked for details.			
22 warnings			
Note: Some input files use or override a deprecated API.			
Note: Recompile with -Xlint:deprecation for details.			
Note: Some input files use unchecked or unsafe operations.			
Note: Recompile with -Xlint:unchecked for details.			
make: *** [get_kernel_from_source] Error 1			
make: *** Waiting for unfinished jobs....			
more info at: <a href="http://umgwiki.intel.com/wiki/?title=Howto_Buildbot_for_Developers">http://umgwiki.intel.com/wiki/?title=Howto_Buildbot_for_Developers</a>			

# Challenges

## False positives

Developers start to ignore if too many

## Messages

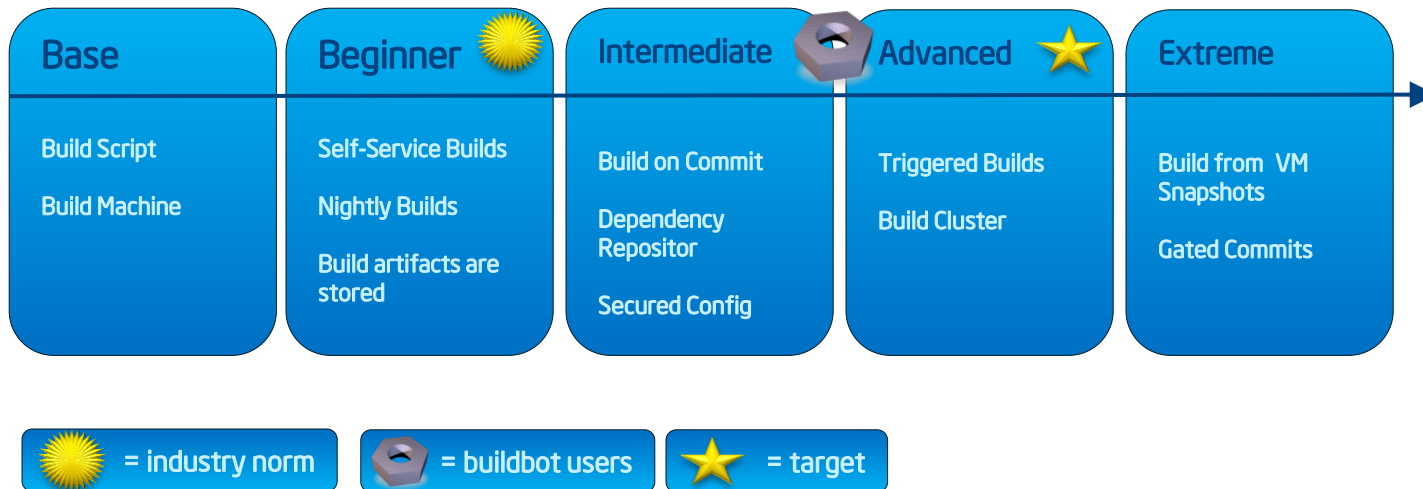
gerrit messages need to be clear or devs will start grunting

## Delays

People tend to commit at the end of the day. Need to absorb peaks. Small corei7 build slaves grid.

# State of the Art

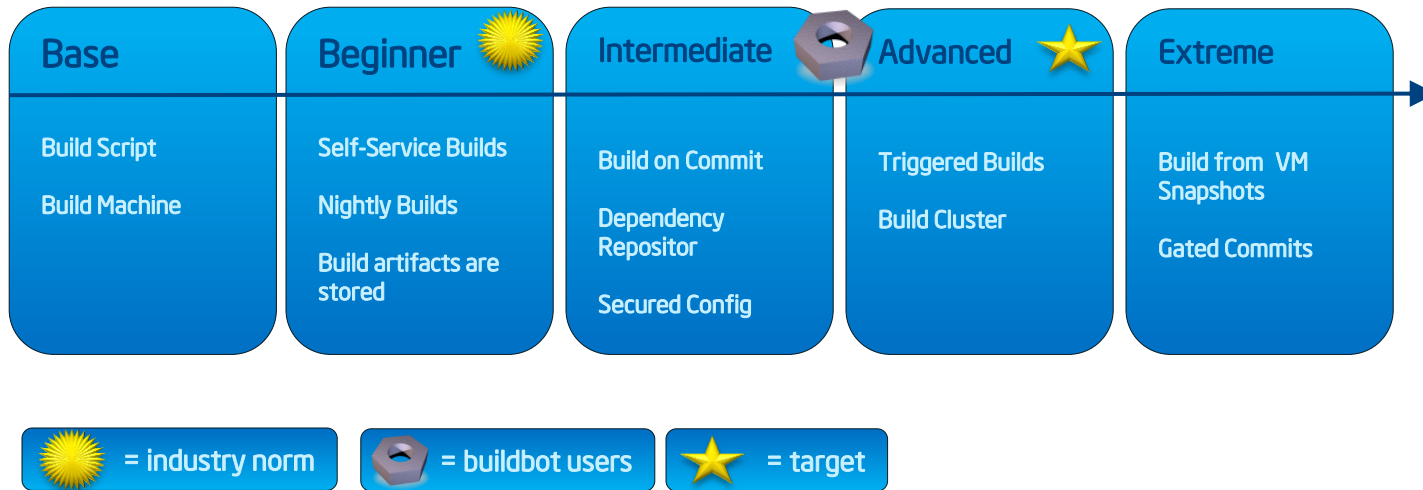
We are starting to become advanced continuous integrator



Source: [Urbancode](#)

# State of the Art

What's next?

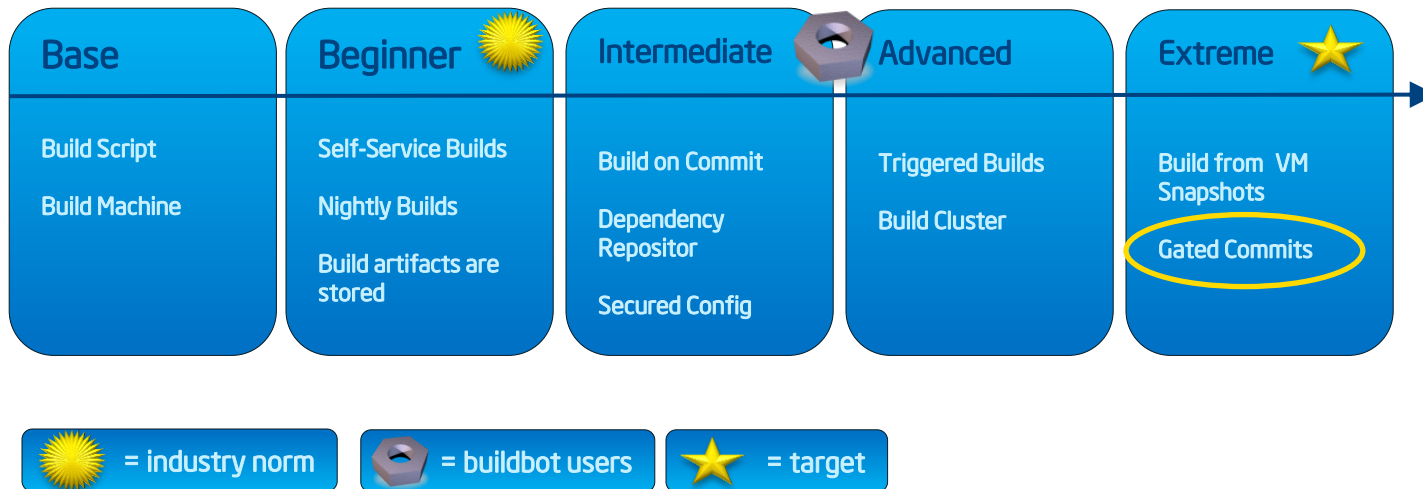


Source: [Urbancode](#)

# State of the Art

Need to prevent people committing bad stuff

*Always stable mainline*  
*Heavy test automation*



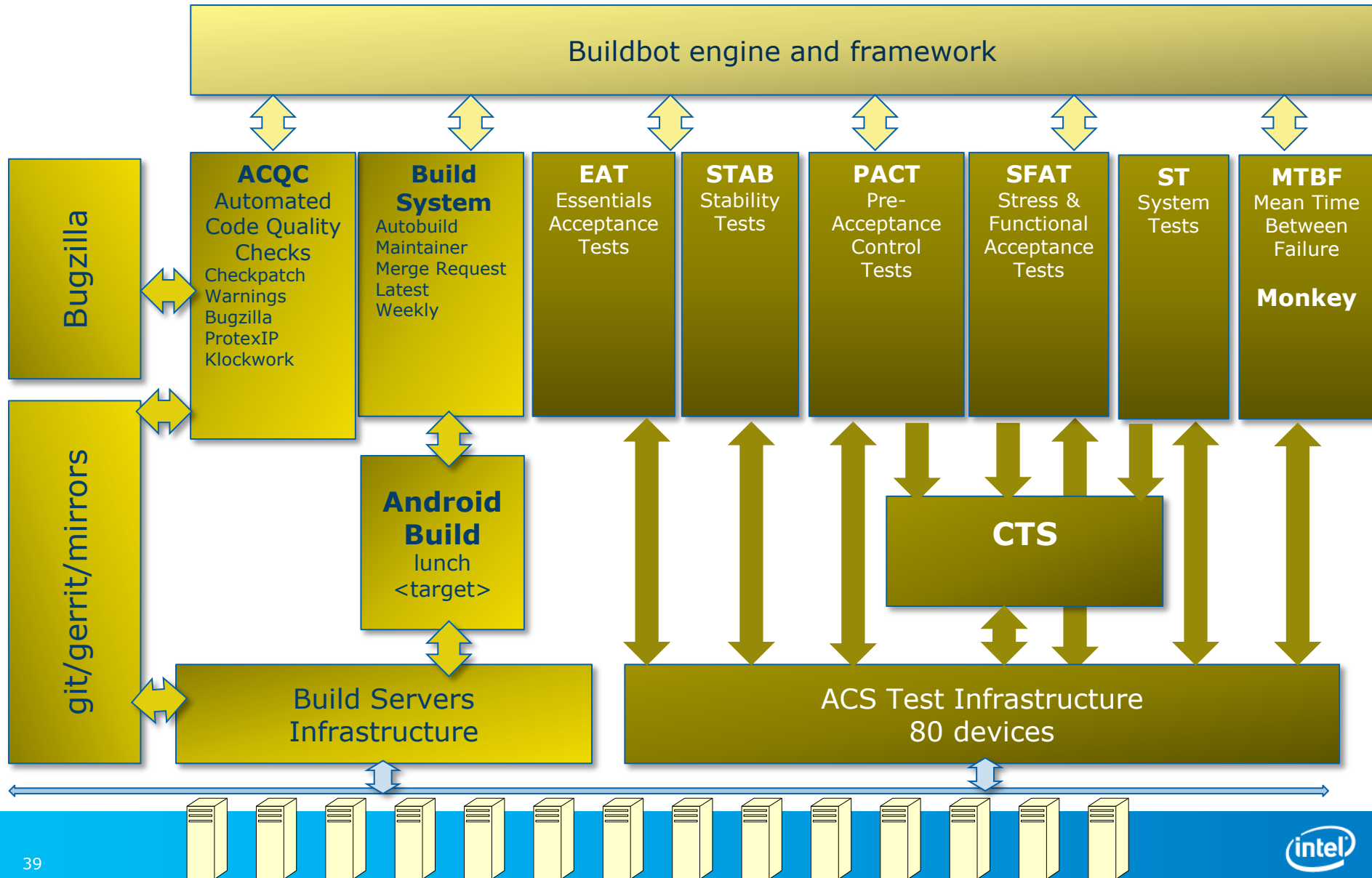
Source: [Urbancode](#)

# Buildbot Centric Integration Process



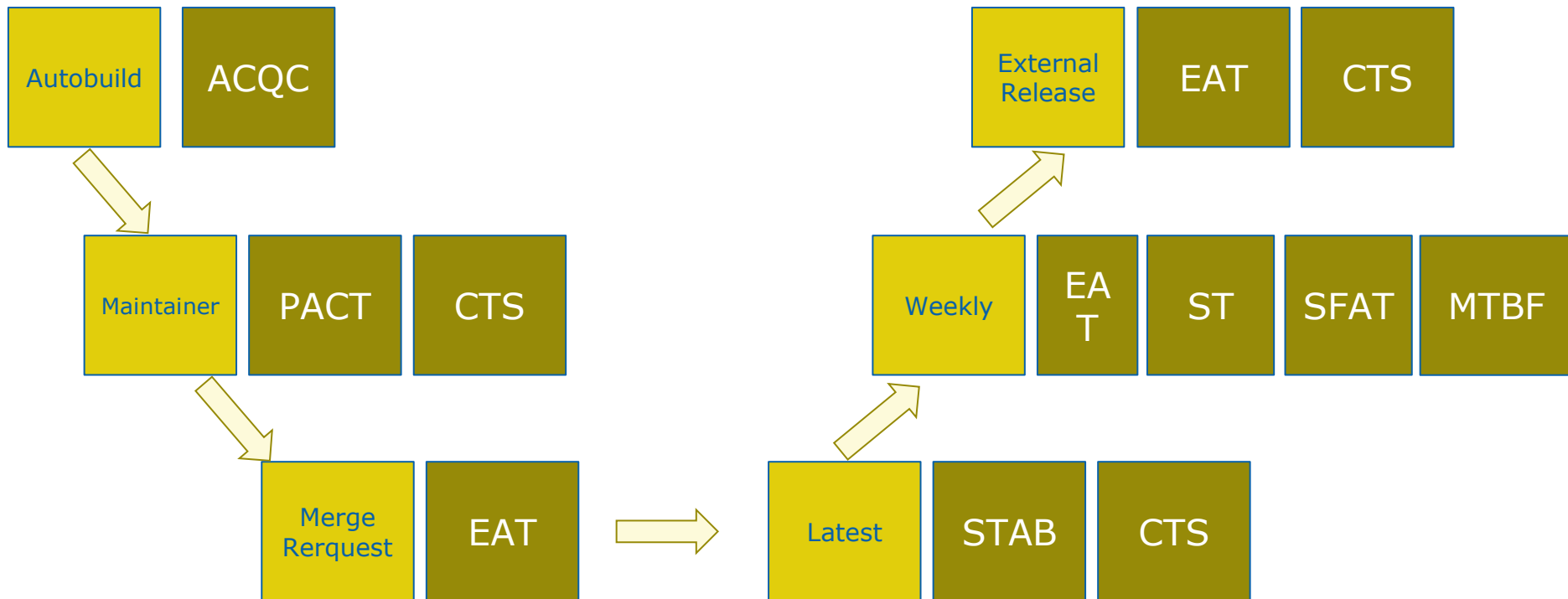
# CACTUS architecture

Continuous Automated Checks and Tests Unified System



# Builds and Tests Sequence

*Life cycle of a patch*



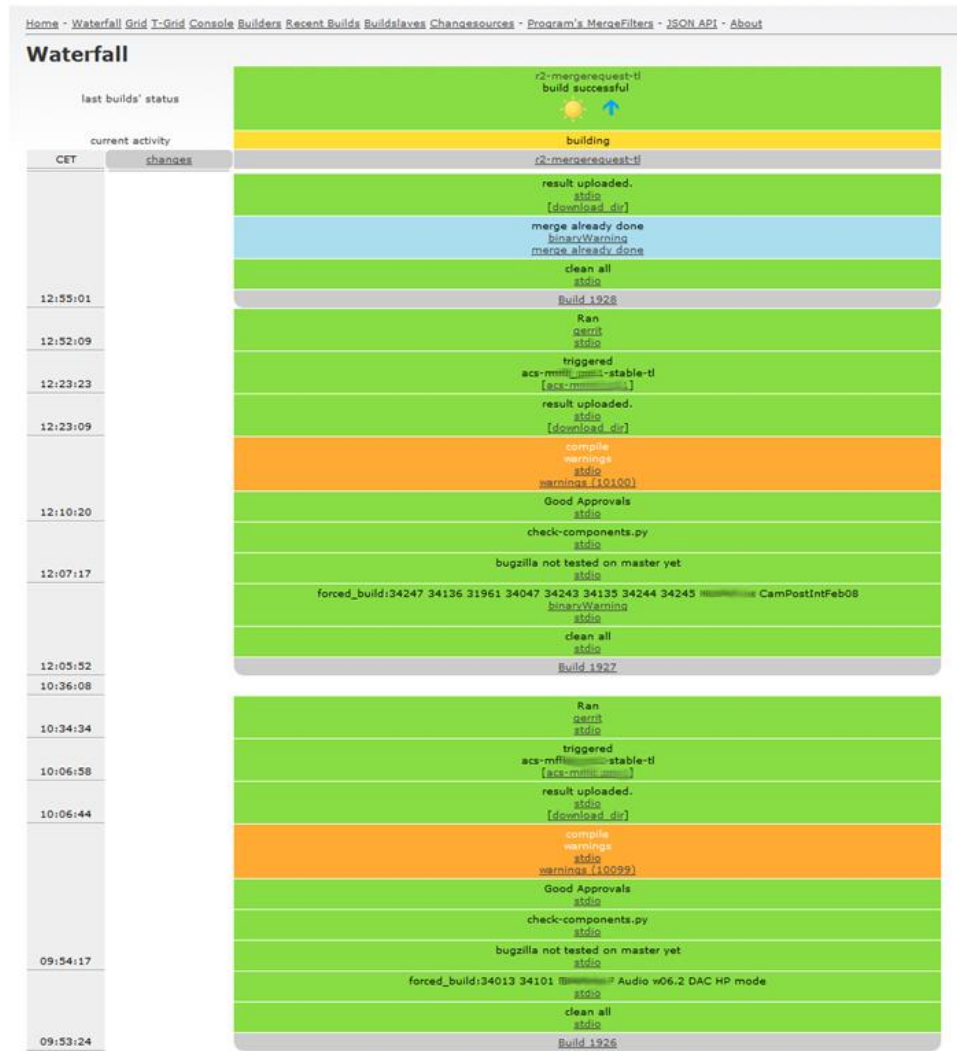


# Merge Request

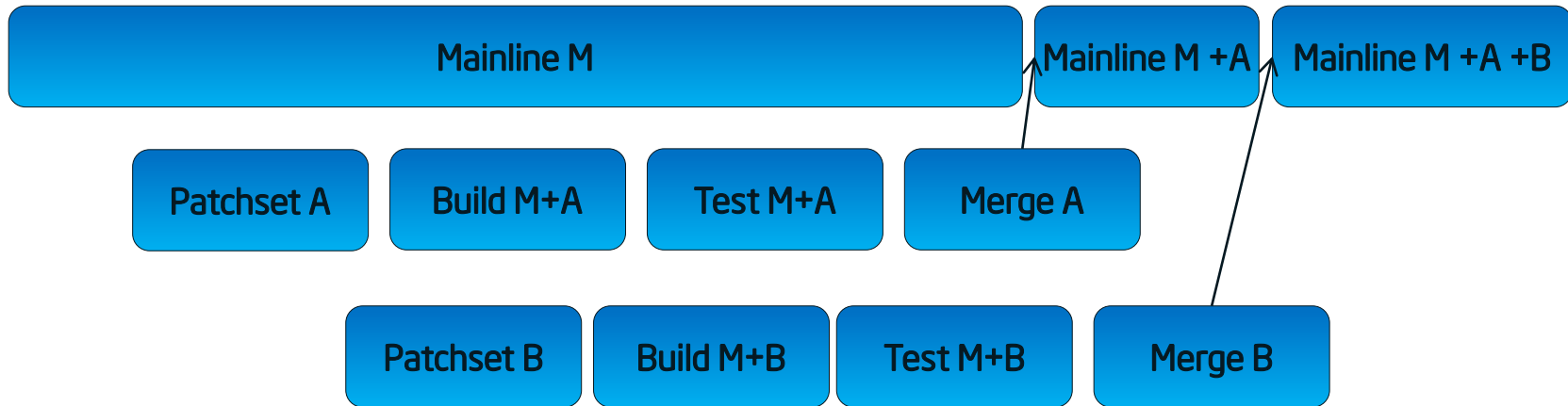
A maintainer build can be *promoted* to a merge request

Mergerequests are run in serial

- Re-Check lint
- Re-Check built
- Re-Test essential features
- All OK? Merge and update Bugzilla



# Why not parrallelizing merge requests?



- Was M+A+B tested ? No !!!
- Only M+A and M+B were tested.
- We could not ensure mainline stability ☹️

# EAT (Essential Acceptance Tests)

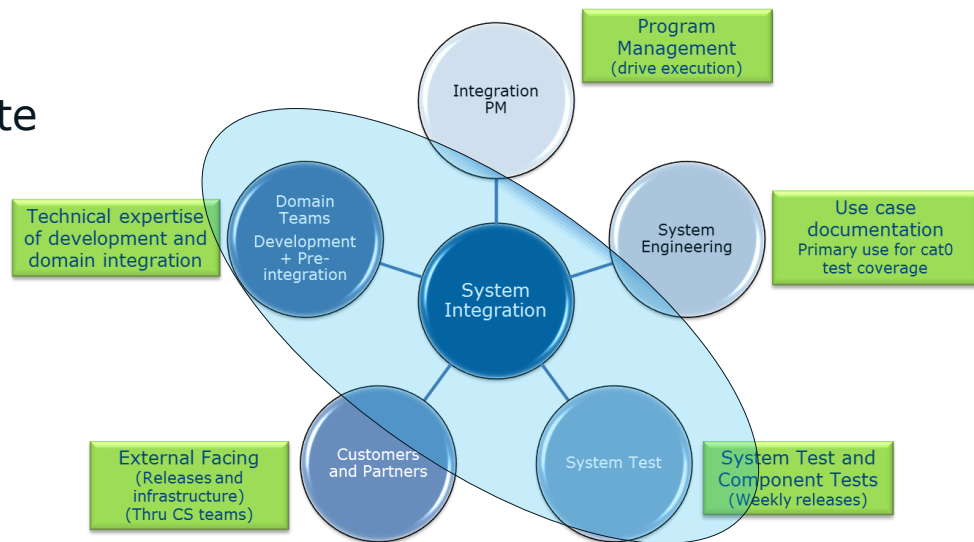
- Triggered by each merge request and maintainers' request.
- Merge requests executed in Toulouse, France.
- Maintainer's builds executed in Hilsboro, US, Toulouse, France and Shanghai, China.
- Today 11 tests/HW platform – 30 minutes to run
  - flash, boot, MP3 playback, MP4 playback, BT scan, WLAN WPA FTP DL, WLAN WPA2 FTP UL , Live MO/MR Voice Call, Live MO SMS, S3 mode, S0i3 mode.
- Target: at least 15 tests – Camera image capture, video recording, audio recording, FTP cellular DL/UL.

# MTBF (Mean Time Between Failure) Monkey

- Test the phone at the UI level.
- MTBF is the predicted elapsed time between inherent failures of the phone during a predefined sequence of tests.
- Replays records of UI events and logs when phone crashes
  - Lots of phones run test in parallel to minimize effective catch of a failure
  - 10 phones runs 10 hours: 1 failure -> MTBF = 100 hours
- Operators requires MTBF > target
- Monkey is an Android test suite which randomly stresses the UI.

# PACT– Pre-Acceptance Control Tests

- PACT is a new project targeting better regression testing before submission
- Context:
  - Domains teams have their own pre-integration test suite (manual and semi-scripted)
  - System Test have their own automated test grid
- Goal:
  - Share infrastructure
  - Help the domain teams to automate their tests
  - Integrate build and test
  - Have the whole organisation use common tools

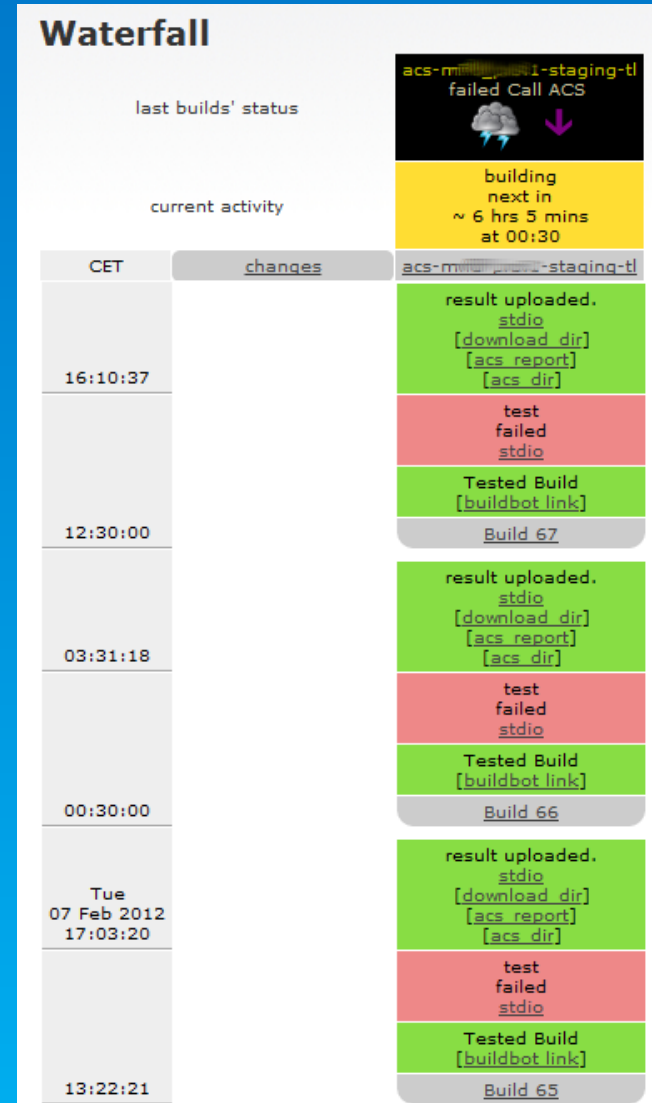


```
smoke test campaign to run
acs-m...staging-tl
acs-m...staging-tl
acs-m...staging-tl
acs-m...2-staging-tl
acs-m...1-campreint-tm
acs-m...b2bboot-tl
acs-m...b2bboot-tl
acs-m...1-b2bboot-tl
acs-m...b2bboot-tl
acs-m...b2bboot-tl
acs-m...b2bboot-tl
Force Build
```

# CTS (Compatibility Test Suite)

- The CTS is an Android automated testing harness. It ensures that Android interfaces are not broken.
- 5 hours to run on Gingerbread.
- Split the tests per domain and include them in the feature domains as part of PACT.

# Next Challenges



# Next Challenges

- Multisite infra structure
  - Inter site network bandwidth is very expensive (and so limited)
  - Where to store the output of the builds ?
  - Build Slaves need it -> near the build slaves ?
  - Test Slaves needs it -> near the test slaves ?
  - Maintainers needs it -> near the maintainers ?
- Test:
  - Automated tests are loooong, especially when the campaigns grow
  - Want to parallelize on multiple test slaves
  - Need to split campaign, send to several slaves, gather results, present report
  - Buildbot not adapted => use [OTS](#)
- A patch breaks stability: EAT fails  $\frac{3}{4}$  of the times
  - There is 1 chance out of 4 that the merge request passes
  - Then  $\frac{3}{4}$  of the merge request will fail!
  - System still needs human supervision



# Next Challenges

- Accelerate build
  - ccache already very useful 45min -> 10min per full build by increasing ccache maxsize to 20GB
  - Makefiles are not correctly managing dependencies, so incremental builds are dangerous
  - Use the idea of fabricate?
    - Strace trace *open* and *execv* syscalls
    - Build the effective dependancy tree
    - Compare with makefile generated dependancy tree
  - Use more PREBUILT ?
    - When to rebuild PREBUILT binaries?
    - Cannot use makefile deps as the build is distributed, and make is basing on timestamps
    - Make dependencies tree, and store hash of dependencies near to the binary?



Questions?



Thank You

