



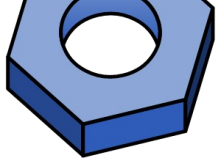

# 1. Strengthen your Yocto deployments with Autobuilder2 CI tool

**Marco Cavallini, KOAN**  
<https://koansoftware.com>

# Agenda

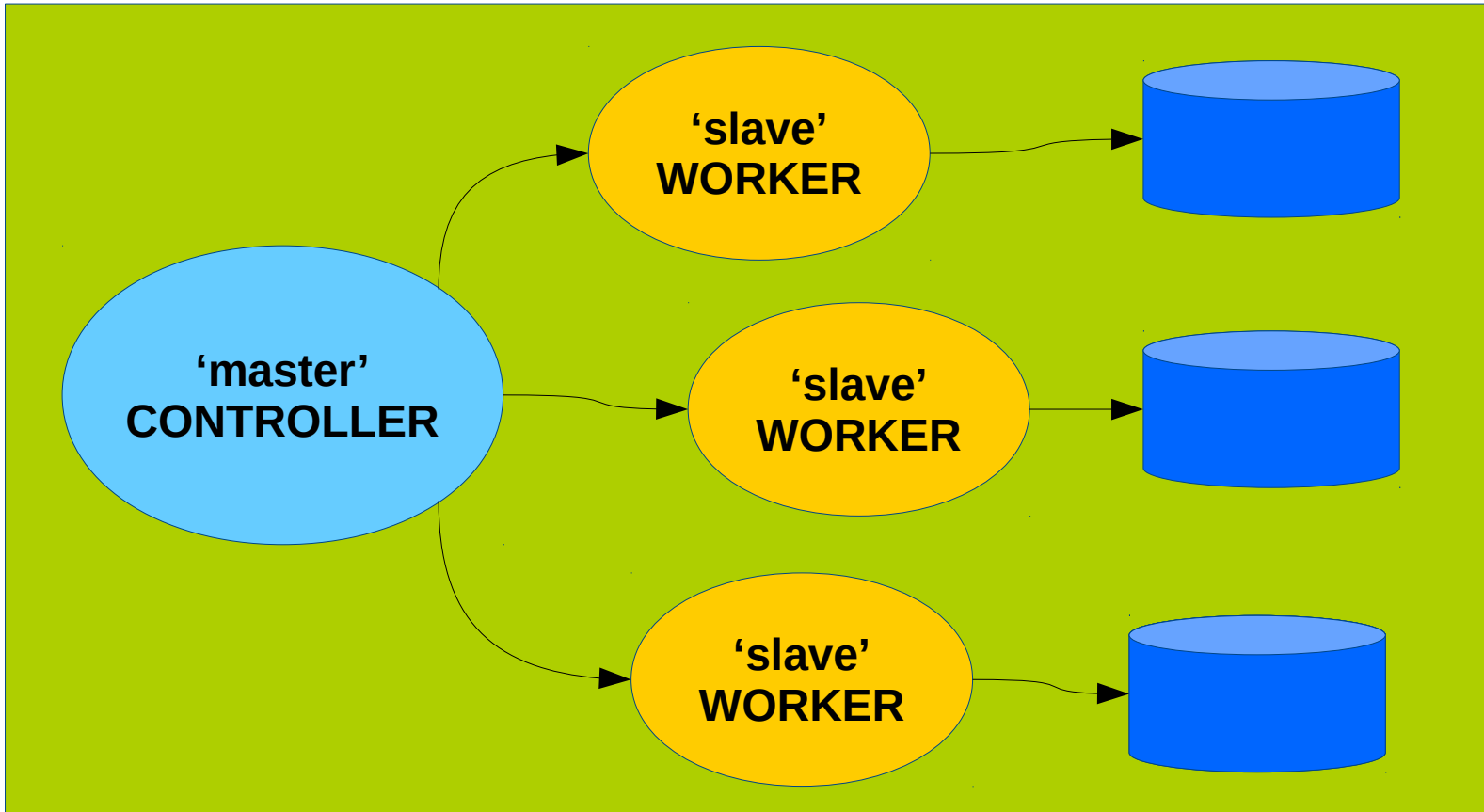
- **What is a Continuous Integration (CI) system**
- **Autobuilder2 History**
- **Buildbot, the foundations**
- **Buildbot mechanics**
- **Buildbot installation**
- **Autobuilder2 installation**
- **Autobuilder2 configuration**
- **Autobuilder2 usage (as-is)**
- **Autobuilder2 customization**
- **Autobuilder2 usage for CI on a single machine**

# What is Autobuilder

- **Autobuilder is a project based on Buildbot** 
- **Buildbot is a Python open-source application used to build, test, and release a wide variety of software.** 
- **Autobuilder and Buildbot are licensed under GPLv2**

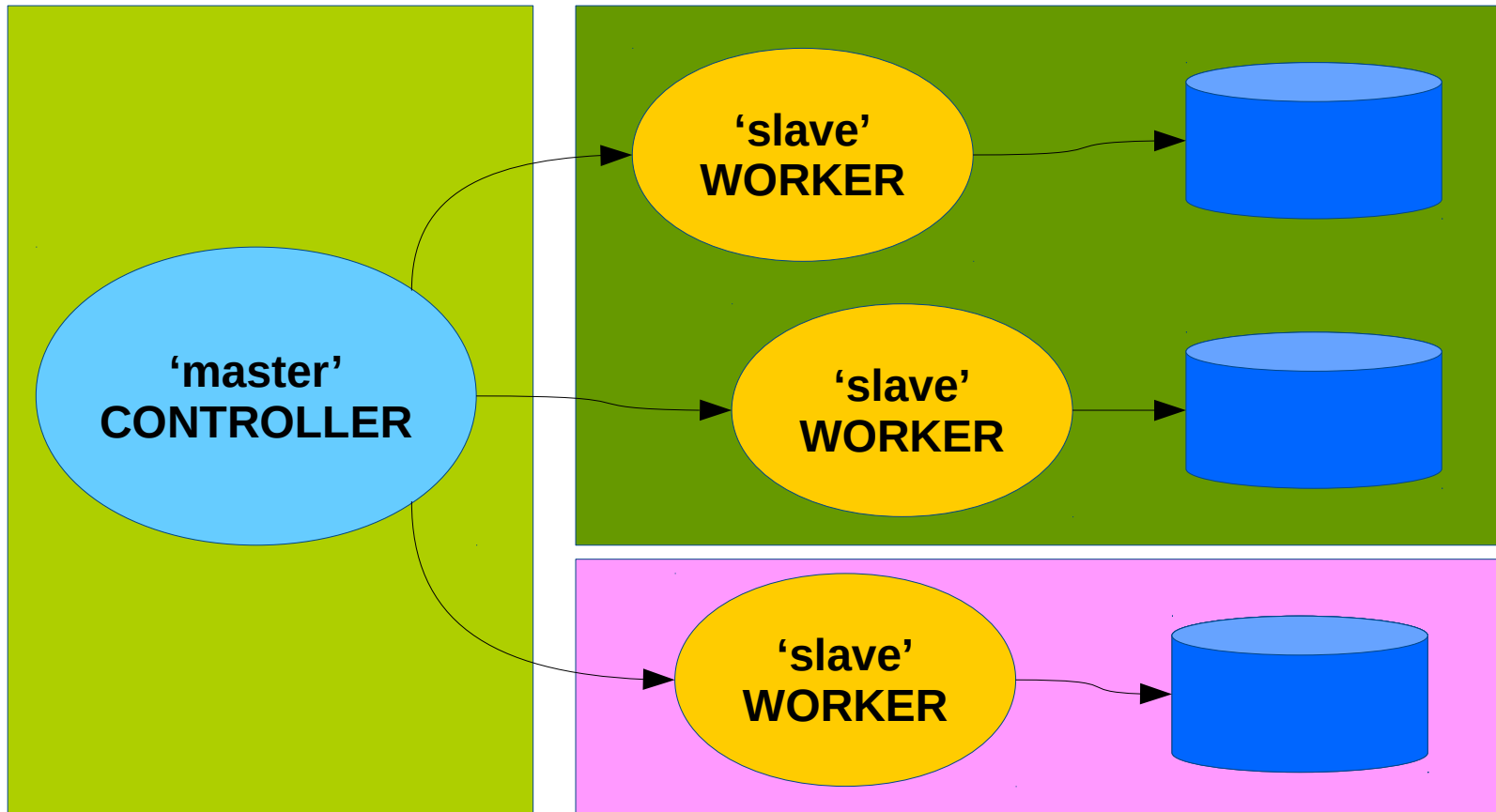
# CI overview

- Typical CI on a single machine



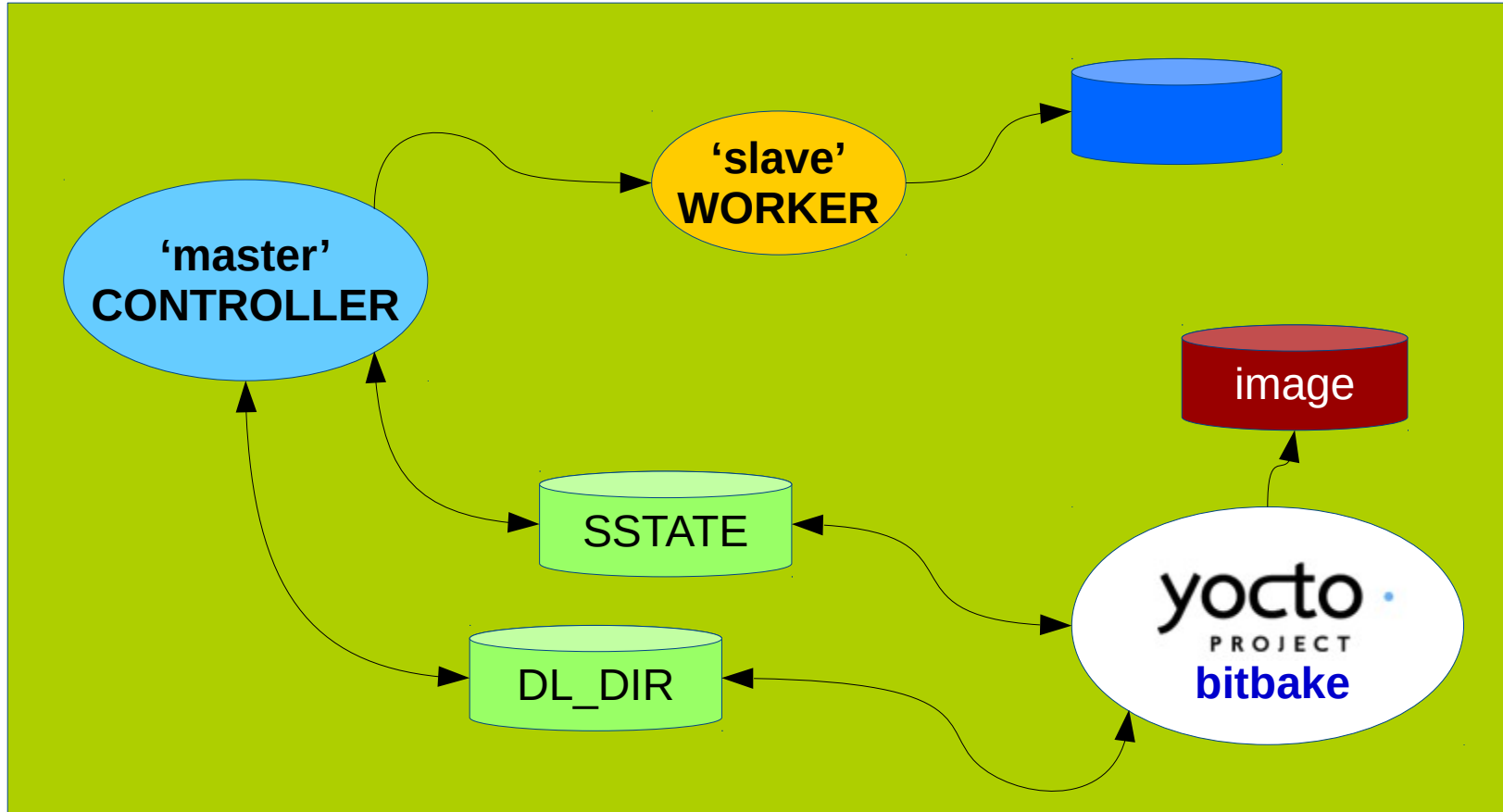
# CI overview

- Typical CI on a distributed system



## Our goal

- Speed Yocto builds by populating premirrors with Autobuilder2



# Autobuilder overview

**yocto-autobuilder2**



**yocto-autobuilder-helper**



# Autobuilder history \*

- **Creation of Autobuilder**

- The autobuilder started life as something OpenedHand used for testing Poky linux.



- **Yocto-autobuilder**

- It became "yocto-autobuilder" under Beth's stewardship in December 2012 when it was totally re-implemented.

- **Autobuilder2**

- In February 2018 it was rewritten again, in particular to move from the long obsolete "buildbot eight" codebase to the "buildbot nine" one but also to fix many long running issues and get back to using an upstream codebase.

*\* Thanks to Richard Purdie who provided these information*



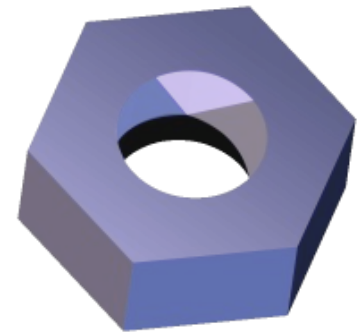
# People behind Autobuilder \*

- **Project Autobuilder**
  - Richard Purdie, Elizabeth Flanagan, Joshua Lock as well as contributions from Tracy Graydon, Anibal Limón and Bill Randle.
- **Project Autobuilder2**
  - Richard Purdie and Joshua Lock.
  - Michael Halstead is the project sysadmin who maintains the infrastructure it all runs on top of.

*\* Thanks to Richard Purdie who provided these information*

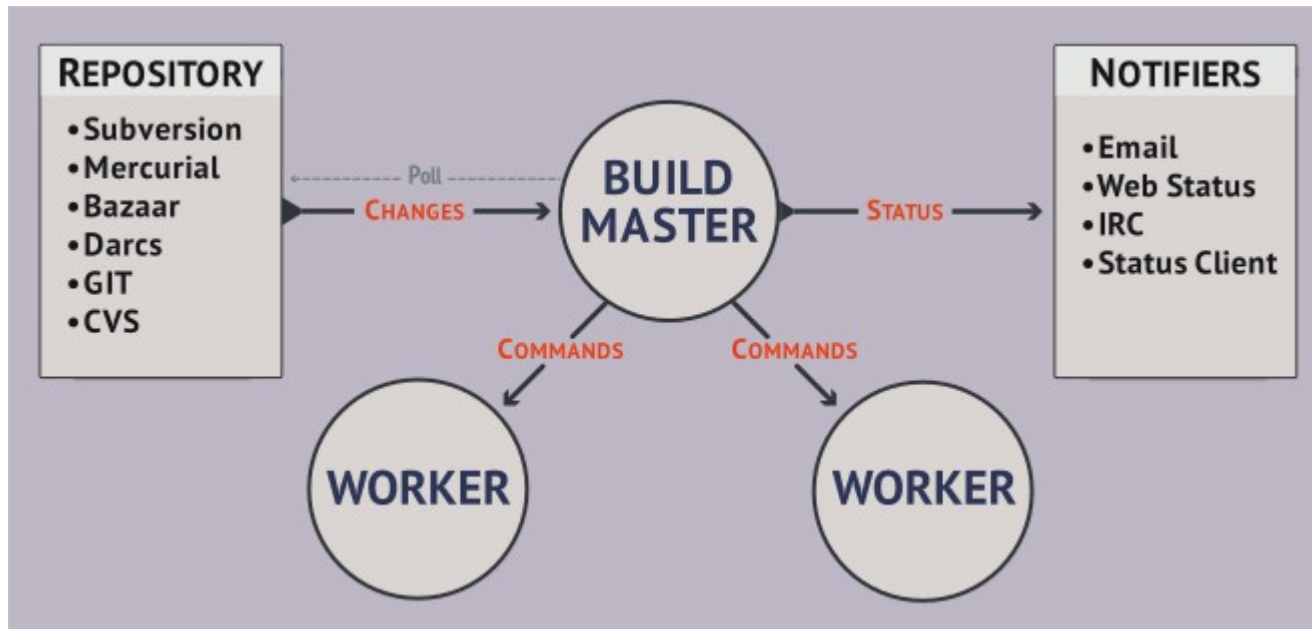
# Buildbot

**Buildbot, a CI  
framework for Python**



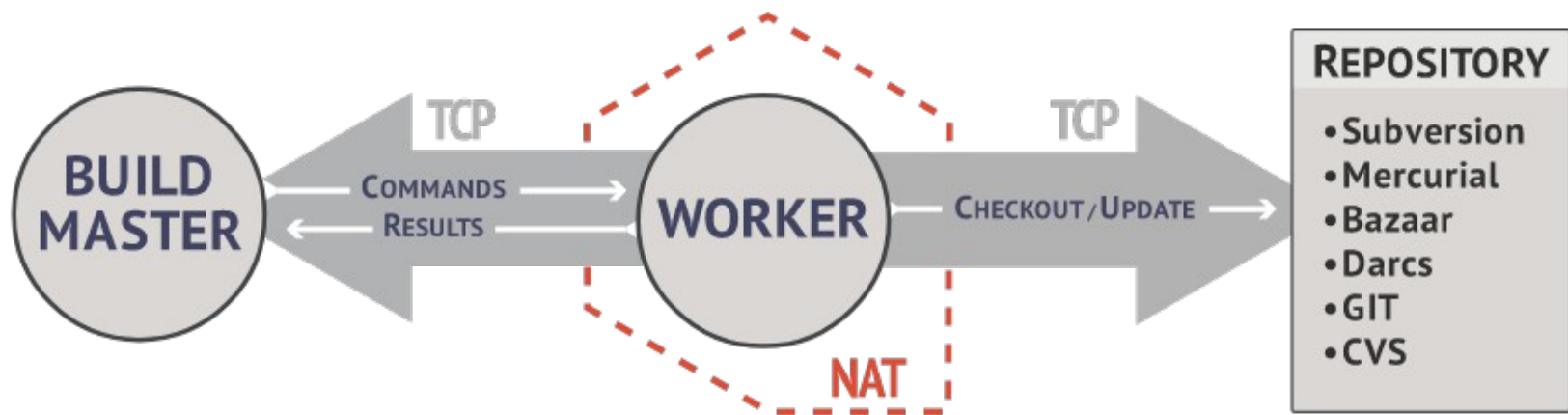
# Buildbot basics

- **Buildbot is a job scheduling system**
  - it queues jobs, executes the jobs when the required resources are available, and reports the results

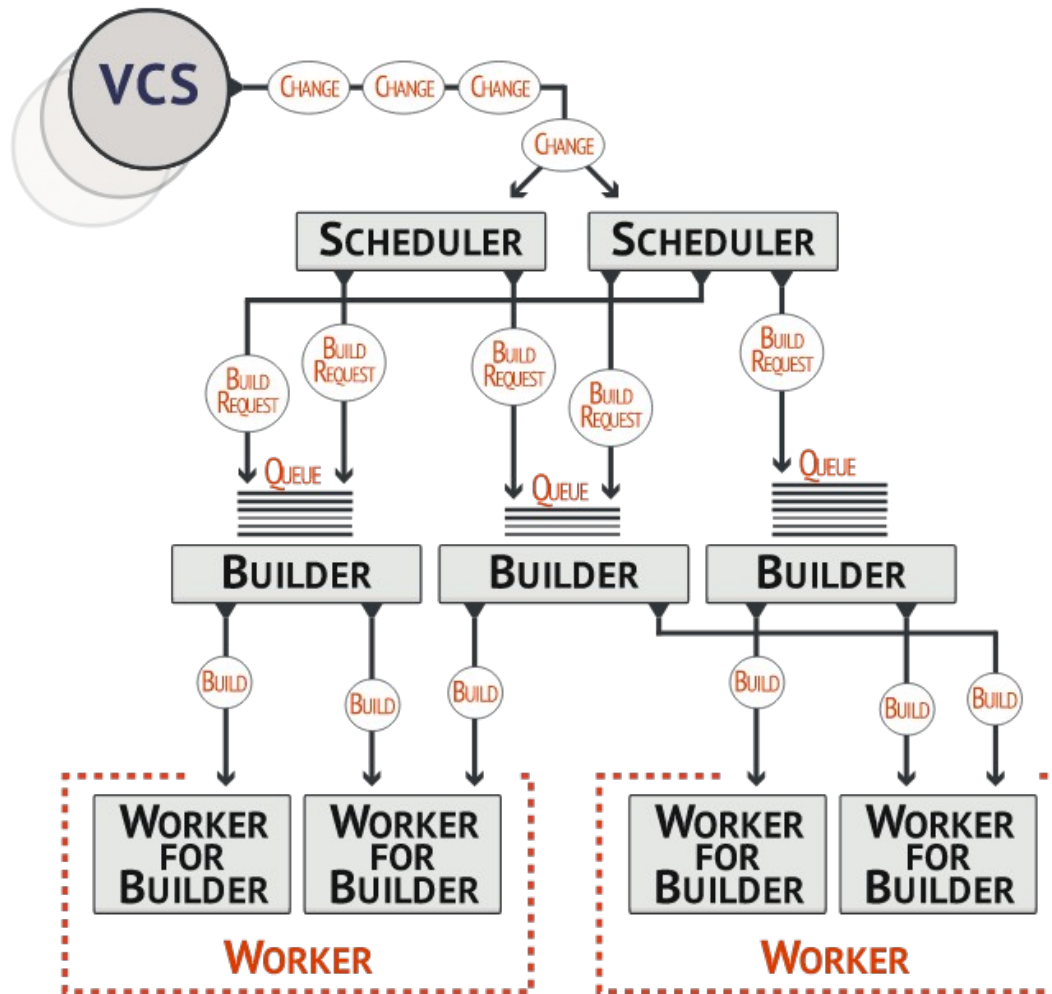


# Buildbot basics

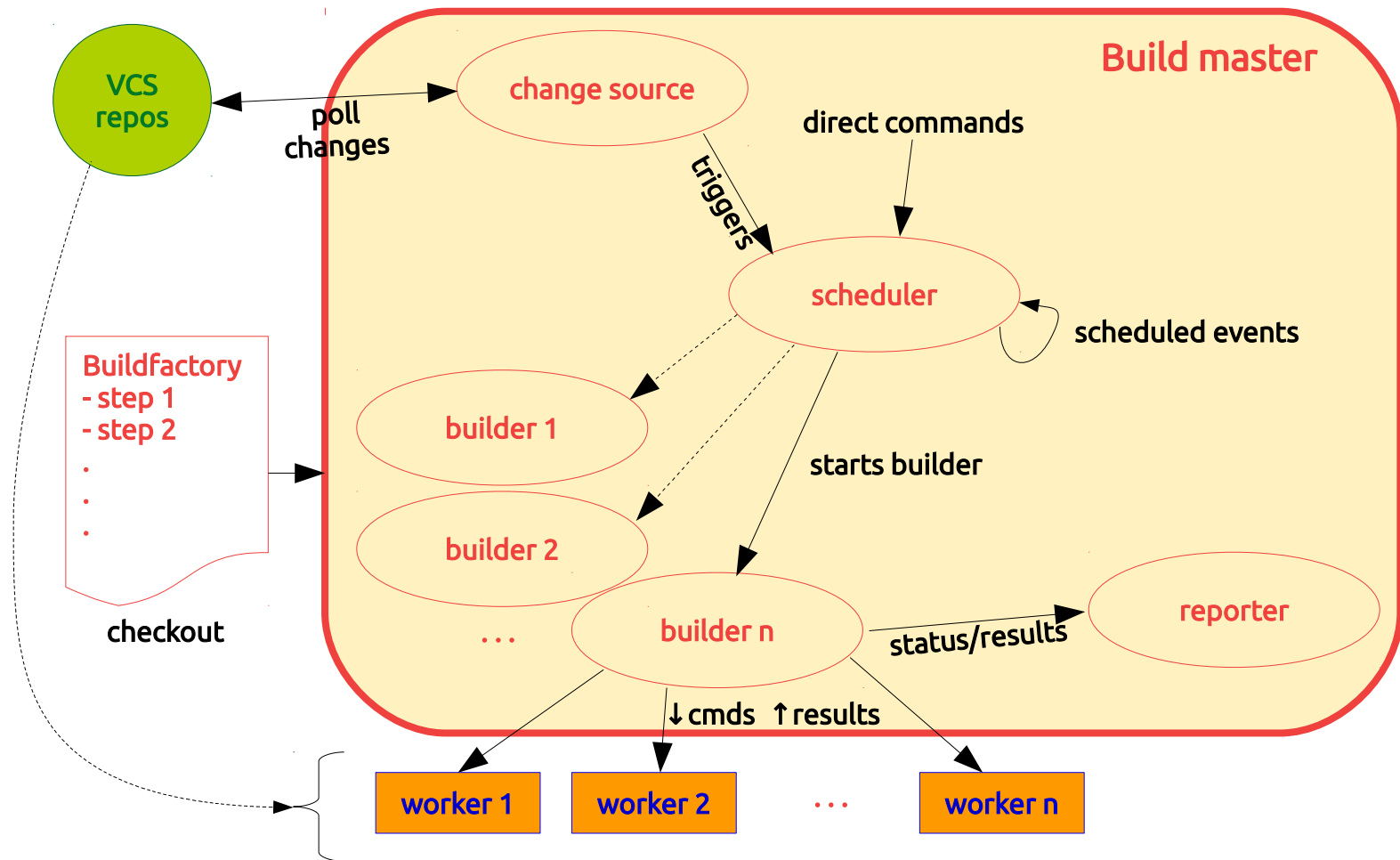
- Workers are typically run on separate machines



# Buildbot basics



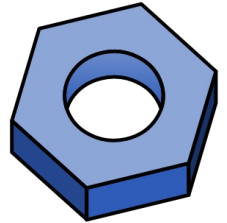
# What happens inside the master



\* artwork by Mauro Salvini

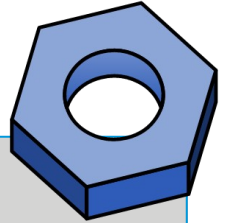
# Buildbot installation

- **On a native system**
  - Probably the fastest solution
- **In a Python sandbox**
  - Isolates it from the host system
  - Using *pip*
- **In a Docker container**
  - Isolates it from the host system



<https://docs.buildbot.net/2.4.0/full.html>

# Buildbot installation (in a Python sandbox) [1/3]



- **Create a sandbox**

```
mkdir abot-sandbox
cd abot-sandbox

python3 -m venv sandbox
source sandbox/bin/activate
```

- **Install master**

```
pip install --upgrade pip
pip install 'buildbot[bundle]'
```

- **Install worker**

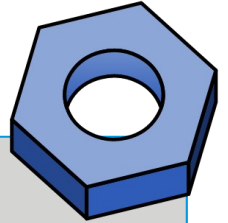
```
pip install --upgrade pip
pip install buildbot-worker
```



# Buildbot installation (in a Python sandbox) [2/3]

- **Create the master**

```
buildbot create-master master  
mv master/master.cfg.sample master/master.cfg
```

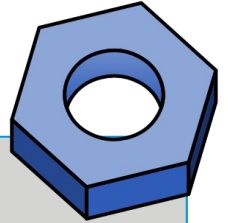


- **Create the worker**

```
pip install setuptools-trial  
buildbot-worker create-worker worker localhost example-worker pass
```

# Buildbot installation (in a Python sandbox) [3/3]

- Content of the sandbox



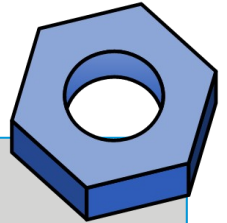
```
(sandbox) koan@amonra:~/abot-sandbox$ tree -L 2
.
├── master
│   ├── buildbot.tac
│   ├── master.cfg           → c['workers'] = [worker.Worker("example-worker", "pass")] (*)
│   └── state.sqlite
├── sandbox
│   ├── bin
│   ├── include
│   ├── lib
│   ├── lib64 -> lib
│   ├── pip-selfcheck.json
│   ├── pyvenv.cfg
│   └── share
└── worker
    ├── buildbot.tac       → workername = 'example-worker' (*)
    └── info
```

(\*) <ftp://ftp.koansoftware.com/public/opensource/buildbot/>

# Buildbot execution

- Execution of master

```
buildbot start master
```



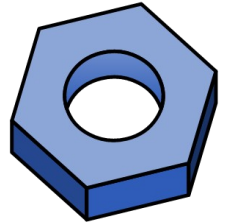
- Control of the build system (using your browser)

```
http://localhost:8010/
```

A screenshot of the Buildbot web interface. The browser address bar shows 'http://localhost:8010/'. The page title is 'Hello World CI'. A dark blue navigation sidebar is open, listing: Home, Grid View, Waterfall View, Console View, &gt; Builds, About, and Settings. The main content area shows 'Hello World CI Home' and a 'Welcome to buildbot' message with '0 builds running currently' and '0 recent builds'.

# Buildbot

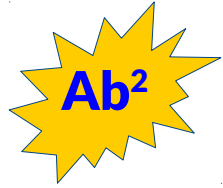
- To be continued in a dedicated session...
- Now let's have a look at Autobuilder



# Autobuilder2



# Buildbot vs. Autobuilder2 lexicon



<b>Buildbot</b>	<b>Autobuilder2</b>
<b>Master</b>	<b>Controller</b>
<b>Worker</b>	<b>Worker</b>

# Autobuilder2 installation



- After you created the sandbox
- Create the master and worker directories

```
buildbot create-master -r yocto-controller  
  
buildbot-worker create-worker -r /  
--umask=0o22 yocto-worker localhost example-worker pass
```

- **yocto-controller** is the directory for master
- **--umask** sets the proper permissions
- **yocto-worker** is the directory for worker
- **localhost** is the network address of the master
- **example-worker** is the name of the worker
- **pass** is the password (master.cfg)

# Autobuilder2 installation



- **Clone yocto-autobuilder2**

```
cd yocto-controller  
git clone https://git.yoctoproject.org/git/yocto-autobuilder2 yoctoabb  
ln -rs yoctoabb/master.cfg master.cfg
```

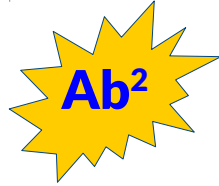
- **yoctoabb** is the mandatory Autobuilder2 directory name

- **Clone yocto-autobuilder-helper**

```
cd ..  
git clone https://git.yoctoproject.org/git/yocto-autobuilder-helper
```



# Autobuilder2 tree



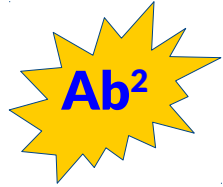
- Content of the Autobuilder2 sandbox

```
(sandbox) koan@amonra:~/ab2-sandbox$ tree -L 3
```

*\* Simplified tree list*

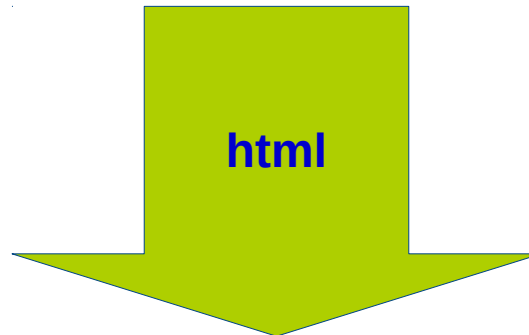
```
.
├── autobuilder
├── git
├── sandbox
├── yocto-autobuilder-helper
├── yocto-controller
│   ├── yoctoabb
│   │   └── master.cfg
├── yocto-worker
│   └── buildbot.tac
```

# Autobuilder2 installation



- Complete installation instructions

<http://git.yoctoproject.org/cgi/yocto-autobuilder2/tree/README-Guide.md>

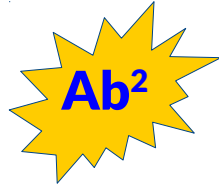


<ftp://ftp.koansoftware.com/public/talks/YoctoSummit-2019/autobuilder2/Autobuilder2-README-Guide.pdf>

# Autobuilder2

## Autobuilder default configuration

# Autobuilder2 configuration



- **Ab2 default configuration**
  - The default configuration of Ab2 uses a lot of **workers** to generate **images** for several **MACHINES**

```
# List of workers in the cluster
workers_ubuntu = ["ubuntu1904-ty-1", "ubuntu1804-ty-1", "ubuntu1804-ty-2", "ubuntu1804-ty-3", "ubuntu1604-ty-1"]
workers_centos = ["centos7-ty-1", "centos7-ty-2", "centos7-ty-3", "centos7-ty-4"]
workers_fedora = ["fedora29-ty-1", "fedora30-ty-1", "fedora30-ty-2"]
workers_debian = ["debian8-ty-1", "debian9-ty-2", "debian10-ty-1", "debian10-ty-2", "debian10-ty-3"]
workers_opensuse = ["tumbleweed-ty-1", "tumbleweed-ty-2", "tumbleweed-ty-3", "opensuse151-ty-1", "opensuse150-ty-1"]
```

# Autobuilder2 official website

The screenshot displays the Buildbot web interface. On the left is a dark blue sidebar with navigation options: Profiler, Home, Grid View, Yocto Console View, Waterfall View, Builds, About, and Settings. The main content area shows a 'Welcome to buildbot' message and a list of 11 builds in progress. A yellow callout box highlights the URL <https://autobuilder.yoctoproject.org/typhoon/>. The top right corner shows the user is 'Anonymous'.

Build Name	Status	Progress
buildperf-centos7/1415	building	1:38:17
buildperf-ubuntu1604/1409	building	1:53:20
qemumips64/1145	building	5:06:05
qemuarm64-ptest/237	building	5:06:06
qemuarm64-ltp/225	building	5:06:07
qa-extras/1150	building	5:06:10
oe-selftest-ubuntu/436	building	5:06:12
oe-selftest-fedora/440	building	5:06:13

# Autobuilder2 website navigation

Buildbot Yocto Console View

Skype [1]

NAVIGATION

- Profiler
- Home
- Grid View
- Yocto Console View**
- Waterfall View
- > Builds
- About
- Settings

	a-full	a-quick	beaglebone	beaglebone-alt	build-appliance	buildperf-centos7	buildperf-ubuntu1604	buildtools	check-layer	edgerouter	edgerouter-alt	genericx86	genericx86-64	genericx86-64-alt	meta-mingw	mpc8315e	mr
master		744	1159	51	1376	1408	1402	1387	1146	1145		1145	1151	49	49	1147	1144
Errors					1378	1409	1403	1389	1148	1147		1147	1153	51	51		1146
WikiLog					1411	1405											
(2 hours ago)					1412	1406											
					1413	1407											
					1415	1409											
master-next	431	1160	52		1379	1414	1408	1390	1149	1148	33	1148	1154	52	52	1148	1147
Errors																	
WikiLog																	
(6 hours ago)																	
master-next	430	1158	50		1377	1410	1404	1388	1147	1146	32	1146	1152	50	50	1146	1145
Errors																	
WikiLog																	
(a day ago)																	

# Autobuilder2 website navigation

Buildbot

NAVIGATION


- Profiler
- Home
- Grid View
- Yocto Console View
- Waterfall View
- Builds
- Builders**
- Pending Buildrequests
- Last Changes
- Build Masters
- Schedulers
- Workers
- About
- Settings

Buildbot Builds / Builders Anonymous

Builder Name	Builds	Tags	Workers
a-full	431 430		1 2 3 4 5 6 9 10 11 13 15 16 17 22 23 24 25 26 27 29 30 31
a-quick	744		1 2 3 4 5 6 9 10 11 13 15 16 17 22 23 24 25 26 27 29 30 31
beaglebone	1160 1159 1158		1 2 3 4 5 6 9 10 11 13 15 16 17 22 23 24 25 26 27 29 30 31
beaglebone-alt	52 51 50 49		1 2 3 4 5 6 9 10 11 13 15 16 17 22 23 24 25 26 27 29 30 31
bringup			1 2 3 4 5 6 9 10 11 13 15 16 17 22 23 24 25 26 27 29 30 31
build-appliance	1379 1378 1377 1376		1 2 3 4 5 6 9 10 11 13 15 16 17 22 23 24 25 26 27 29 30 31
buildperf-centos7	1415 1414 1413 1412 1411 1410 1409 1408		19
buildperf-ubuntu1604	1409 1408 1407 1406 1405 1404 1403 1402		20
buildtools	1390 1389 1388 1387		1 2 3 4 5 6 9 10 11 13 15 16 17 22 23 24 25 26 27 29 30 31
check-layer	1149 1148 1147 1146		1 2 3 4 5 6 9 10 11 13 15 16 17 22 23 24 25 26 27 29 30 31

# Autobuilder2 - builds

beaglebone



1160 1159 1158

genericx86

1148 1147 1146 1145

genericx86-64

1154 1153 1152 1151



# Autobuilder2 - workers



# Autobuilder2 – worker details

Buildbot Workers / ubuntu1804-ty-1 Actions... Anonymous

State	Masters	WorkerName	Recent Builds	Admin	Host	Version
😊	1	ubuntu1804-ty-1	qemux86-64-alt/52 no-x11/1148 meta-mingw/1145	Michael Halstead <mhalstead at linuxfoundation.org>	Ubuntu 18.04 LTS worker 1	2019.07.19

Builds:

Builder	#	Started At	Duration	Owners	Worker	Status
qemux86-64-alt	52	5 hours ago	2 hours			build successful
pkgman-rpm-non-rpm	1144	5 hours ago	an hour			build successful
no-x11	1148	13 hours ago	9 minutes			build successful
meta-mingw	1147	13 hours ago	12 minutes			build successful
non-gpl3	1144	a day ago	20 minutes			build successful
meta-mingw	1145	2 days ago	13 minutes			build successful

# Autobuilder2 – build details

## Build summary



All	beaglebone/1160	2:57:18 build successful <b>SUCCESS</b>
0	worker_preparation	5 s worker ready
1	Clobber build dir	2 s '/home/pokybuild/yocto-autobuilder-helper/janitor/clobberdir /home/pokybuild/yocto-worker/beaglebone/'
2	Fetch yocto-autobuilder-helper	3 s update
3	SetProperties	1 s Properties Set
4	Write main layerinfo.json	1 s 'printf '{ ...'
5	5 s '/home/pokybuild/yocto-worker/beaglebone/yocto-autobuilder-helper/scripts/shared-repo-unpack /home/pokybuild/yocto-worker/beaglebone/layerinfo.json ...'	
	Unpack shared repositories	
6	Set build revision	1 s property 'yp_build_revision' set
7	Set build branch	1 s property 'yp_build_branch' set
8	run-config	2:56:56 '/home/pokybuild/yocto-worker/beaglebone/yocto-autobuilder-helper/scripts/run-config beaglebone ...'

# Autobuilder2 – build details

8 run-config

2:56:56 '/home/pokybuild/yocto-worker/beaglebone/yocto-autobuilder-helper/scripts/run-config beaglebone ...'

stdio

[view all 145 lines](#) [download](#)

step1b

[view all 24868 lines](#) [download](#)

step1c

[view all 74 lines](#) [download](#)

step2b

[view all 1764 lines](#) [download](#)

warnings

[view all 0 line](#) [download](#)

errors


[view all 0 line](#) [download](#)

# Autobuilder2 – build details









Buildbot Builders / beaglebone / 1160 / run-config / step1b

```
24830 NOTE: Running task 9599 of 9611 (/home/pokybuild/yocto-worker/beaglebone/build/meta/recipes-sato/images/
24831 NOTE: Running task 9600 of 9611 (/home/pokybuild/yocto-worker/beaglebone/build/meta/recipes-sato/images/
24832 NOTE: recipe core-image-sato-sdk-ptest-1.0-r0: task do_image_qa: Started
24833 NOTE: recipe core-image-sato-sdk-ptest-1.0-r0: task do_image_qa: Succeeded
24834 NOTE: recipe core-image-sato-sdk-ptest-1.0-r0: task do_write_qemuboot_conf: Started
24835 NOTE: recipe core-image-sato-sdk-ptest-1.0-r0: task do_write_qemuboot_conf: Succeeded
24836 NOTE: Running task 9601 of 9611 (/home/pokybuild/yocto-worker/beaglebone/build/meta/recipes-sato/images/
24837 NOTE: recipe core-image-sato-sdk-ptest-1.0-r0: task do_image: Started
24838 NOTE: recipe core-image-sato-sdk-1.0-r0: task do_image_jffs2: Succeeded
24839 NOTE: Running task 9602 of 9611 (/home/pokybuild/yocto-worker/beaglebone/build/meta/recipes-sato/images/
24840 NOTE: recipe core-image-sato-sdk-1.0-r0: task do_image_complete: Started
24841 NOTE: recipe core-image-sato-1.0-r0: task do_populate_sdk: Succeeded
24842 NOTE: recipe core-image-sato-sdk-1.0-r0: task do_image_complete: Succeeded
24843 NOTE: Running task 9603 of 9611 (/home/pokybuild/yocto-worker/beaglebone/build/meta/recipes-sato/images/
24844 NOTE: recipe core-image-sato-sdk-1.0-r0: task do_populate_lic_deploy: Started
24845 NOTE: recipe core-image-sato-sdk-1.0-r0: task do_populate_lic_deploy: Succeeded
24846 NOTE: Running noexec task 9604 of 9611 (/home/pokybuild/yocto-worker/beaglebone/build/meta/recipes-sato/
24847 NOTE: recipe core-image-sato-sdk-ptest-1.0-r0: task do_image: Succeeded
24848 NOTE: Running task 9605 of 9611 (/home/pokybuild/yocto-worker/beaglebone/build/meta/recipes-sato/images/
24849 NOTE: Running task 9606 of 9611 (/home/pokybuild/yocto-worker/beaglebone/build/meta/recipes-sato/images/
24850 NOTE: recipe core-image-sato-sdk-ptest-1.0-r0: task do_rootfs_wicenv: Started
24851 NOTE: Running task 9607 of 9611 (/home/pokybuild/yocto-worker/beaglebone/build/meta/recipes-sato/images/
24852 NOTE: recipe core-image-sato-sdk-ptest-1.0-r0: task do_rootfs_wicenv: Succeeded
24853 NOTE: recipe core-image-sato-sdk-ptest-1.0-r0: task do_image_jffs2: Started
24854 NOTE: Running task 9608 of 9611 (/home/pokybuild/yocto-worker/beaglebone/build/meta/recipes-sato/images/
24855 NOTE: recipe core-image-sato-sdk-ptest-1.0-r0: task do_image_tar: Started
24856 NOTE: recipe core-image-sato-sdk-ptest-1.0-r0: task do_image_wic: Started
24857 NOTE: recipe core-image-sato-sdk-ptest-1.0-r0: task do_image_tar: Succeeded
24858 NOTE: recipe core-image-sato-sdk-ptest-1.0-r0: task do_image_wic: Succeeded
24859 NOTE: recipe core-image-sato-sdk-ptest-1.0-r0: task do_image_jffs2: Succeeded
24860 NOTE: Running task 9609 of 9611 (/home/pokybuild/yocto-worker/beaglebone/build/meta/recipes-sato/images/
24861 NOTE: recipe core-image-sato-sdk-ptest-1.0-r0: task do_image_complete: Started
24862 NOTE: recipe core-image-sato-sdk-ptest-1.0-r0: task do_image_complete: Succeeded
24863 NOTE: Running task 9610 of 9611 (/home/pokybuild/yocto-worker/beaglebone/build/meta/recipes-sato/images/
24864 NOTE: recipe core-image-sato-sdk-ptest-1.0-r0: task do_populate_lic_deploy: Started
24865 NOTE: recipe core-image-sato-sdk-ptest-1.0-r0: task do_populate_lic_deploy: Succeeded
24866 NOTE: Running noexec task 9611 of 9611 (/home/pokybuild/yocto-worker/beaglebone/build/meta/recipes-sato/
24867 NOTE: Tasks Summary: Attempted 9611 tasks of which 1901 didn't need to be rerun and all succeeded.
```


# Autobuilder2 – build details

Buildbot 

NAVIGATION

- Profiler 
- Home 
- Grid View 
- Yocto Console View 
- Waterfall View 
- > Builds 
- About 
- Settings 







Buildbot [About](#)

 About this [buildbot](#) running for [Yocto Autobuilder: typhoon](#)

- Python version: 3.5.3
- Buildbot version: 2.3.1
- Twisted version: 19.2.1

## Configuration

buildbot-www is configured using

- auth** 
- user** 
- buildbotURL** `https://autobuilder.yoctoproject.org/typhoon/`
- avatar\_methods** 
- port** `8010`
- multiMaster** `false`
- authz** 
- plugins** 
- logfileName** `http.log`
- titleURL** `https://autobuilder.yoctoproject.org/typhoon/`
- title** `Yocto Autobuilder: typhoon`
- versions**  `[["Python", "3.5.3"], ["Buildbot", "2.3.1"], ["Twisted", "19.2.1"]]`

# Autobuilder2

## Autobuilder custom 'lighter' configuration

# Autobuilder2 reduced configuration



- **Reduce complexity**
  - The goal is to setup a configuration for an **image** for a single **MACHINE** only
  - This will help yo strenghten the deployments thanks to recurring builds, typically nightly



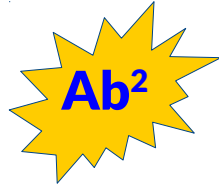
# Autobuilder2 reduced configuration



- Files to be modified

```
.
├── yocto-autobuilder-helper
│   └── config.json
├── yocto-controller
│   └── yoctoabb
│       ├── builders.py
│       ├── config.py
│       ├── master.cfg
│       └── schedulers.py
└── yocto-worker
    └── buildbot.tac
```

# Autobuilder2 configuration



- In **yocto-autobuilder-helper**
  - Edit `yocto-autobuilder-helper/config.json`

```
"BASE_HOMEDIR" : "/home/koan/ab2-sandbox",  
"BASE_SHAREDDIR" : "${BASE_HOMEDIR}/autobuilder",  
"BASE_PUBLISHDIR" : "${BASE_HOMEDIR}/downloads",
```

- In **yocto-controller**
  - Edit `yocto-controller/yoctoabb/master.cfg`

```
c['title'] = "KOAN lite Yocto Autobuilder"  
c['titleURL'] = "http://localhost:8010/"  
c['buildbotURL'] = "http://localhost:8010/"
```

# Autobuilder2 configuration



- In yocto-controller (again)
  - Edit `yocto-controller/yoctoabb/config.py`

```
workers_koan = ["example-worker"]
workers = workers_koan
all_workers = workers,
```


```
sharedreporid = "/home/koan/ab2-sandbox/repos"
publish_dest = "/home/koan/ab2-sandbox/pub"
```

- Specify the helper directory








```
repos = {
    "yocto-autobuilder-helper":
        ["file:///home/koan/ab2-sandbox/yocto-autobuilder-helper",
         "master"],
```

# Autobuilder2 'lite' customized

http://localhost:8010/

Buildbot 

NAVIGATION

- Home 
- Grid View 
- Waterfall View 
- Yocto Console View 
- > Builds 
- About 
- Settings 

Buildbot Builders / koanbuilder / 2

## Welcome to buildbot

1 build running currently

koanbuilder/2  
building

1 recent builds

koanbuilder

koanbuilder/1 **FAILURE**  
failed '/home/koan/ab2-sandbox/yocto-... 3:26

# Autobuilder2 'lite' customized

The screenshot shows the Buildbot web interface. On the left is a dark blue navigation sidebar with the following items: Buildbot (with a pin icon), NAVIGATION, Home (with a house icon), Grid View (with a grid icon), Waterfall View (with a waterfall icon), Yocto Console View (with an info icon), > Builds (with a gear icon), Builders, Pending Buildrequests, Last Changes, Build Masters, Schedulers, Workers, About (with an info icon), and Settings (with a list icon).

The main content area has a breadcrumb trail: Buildbot / Builders / koanbuilder / 2. Below this is a search box labeled "Search for builders" and a pagination control showing "Previous 1 Next".

The main content area displays a table with the following columns: Builder Name, Builds, Tags, and Workers. The table contains three rows: 'a-full' with 1 worker, 'a-quick' with 1 worker, and 'koanbuilder' with 2 builds (one yellow, one red) and 1 worker. The 'koanbuilder' row is circled in red. Below the table is a checkbox labeled "Show old builders".

Builder Name	Builds	Tags	Workers
a-full			1
a-quick			1
koanbuilder	2 1		1

# Autobuilder2 to speed up Yocto build



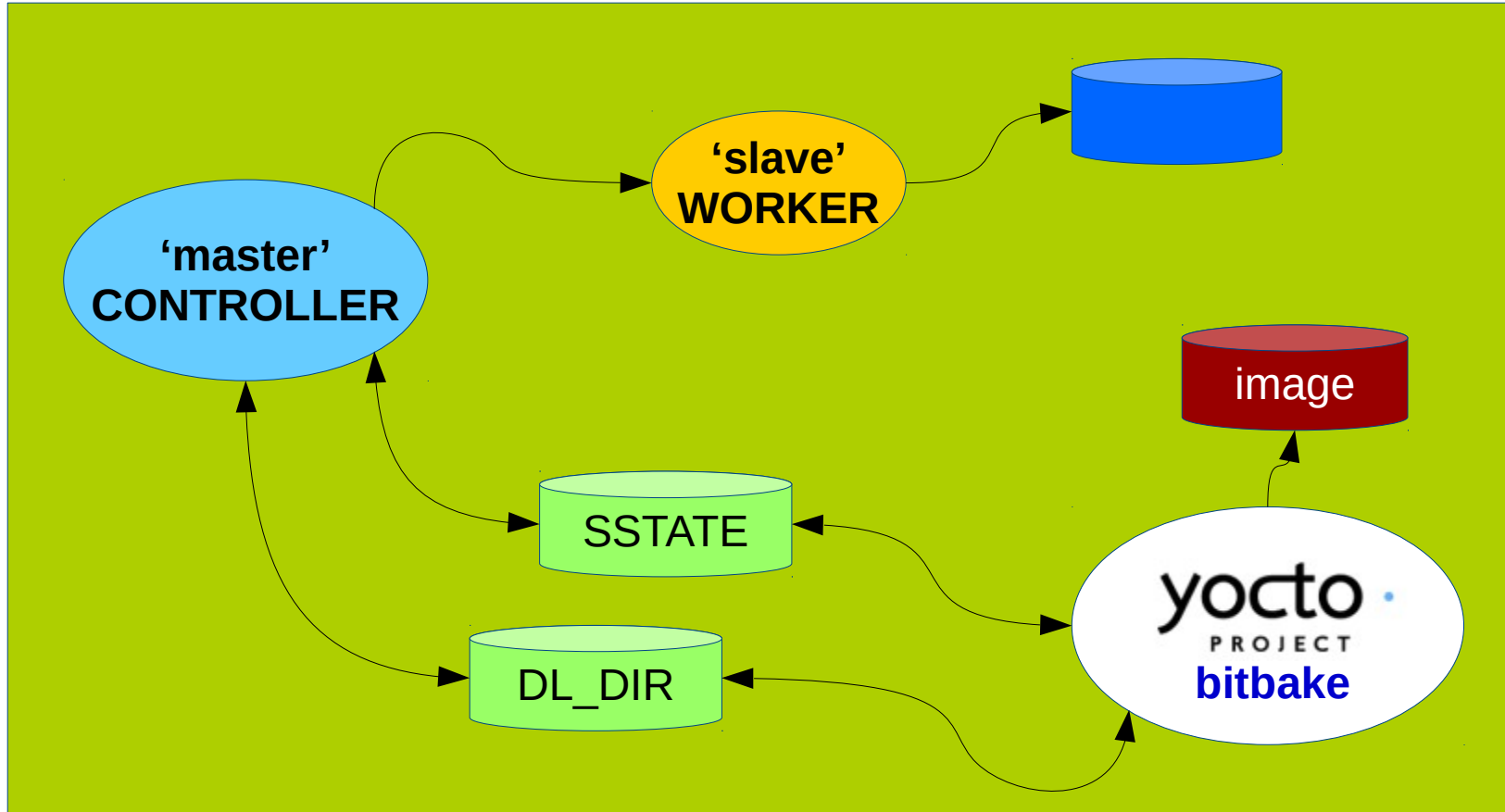
- Share the artefacts with Yocto
  - Edit `local.conf`
  - Share downloads

```
PREMIRRORS_prepend = "\
git://.*/*. * file:///home/koan/ab2-sandbox/autobuilder/current_sources/ \n \
ftp://.*/*. * file:///home/koan/ab2-sandbox/autobuilder/current_sources/ \n \
http://.*/*. * file:///home/koan/ab2-sandbox/autobuilder/current_sources/ \n \
https://.*/*. * file:///home/koan/ab2-sandbox/autobuilder/current_sources/ \n \
"
```

- Share `SSTATE`

```
SSTATE_MIRRORS = "file://.* \
file:///home/koan/ab2-sandbox/autobuilder/pub/sstate/PATH"
```

# Autobuilder2 to speed up Yocto build



# Questions?



<https://yoctoproject.org>



K O A N

<https://koansoftware.com>