Zuul as a build system

lessons learned in the Tungsten Fabric infra

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Who we are

About

- admins of Tungsten Fabric CI/CB system
- started deploying Zuul v3 in November 2017
- we work at CodiLime
  - DevOps, SDN, NFV, Cloud-Native services
  - 200 engineers, 48 270 coffees/year*
- contacts:
  - diabelko: lukasz@codilime.com
  - jluk: jaroslaw.lukow@codilime.com

* at least the espresso machines say so

Agenda

- **about**
- build system
- reusing Zuul jobs
- testing jobs
- cool to see in Zuul

What is Tungsten Fabric

Intro

- formerly known as OpenContrail
- multicloud, multistack SDN solution
- integrates with OpenStack, Kubernetes, OpenShift, VMware

Project specifics

Intro

- C, Go, Python
- single build of all components (30 repos)
- Android Repo tool
- services deployed as containers
- platforms:
  - CentOS (mostly)
  - RHEL
  - Windows Server

Agenda

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- **build system**
- reusing Zuul jobs
- testing jobs
- cool to see in Zuul

The starting point - Jenkins CB system

Build system

- separate from CI (which was running on Zuul 2.5 at that time)
- different locations of dependencies
- different scripts
- different slave pool
- single-job pipeline

Then comes Zuul v3

Build system

- upgrade CI from 2.5
- accent on openness
- unify CI, build and release pipelines

The pipeline

Build system

- compile and package
- containerize
- publish

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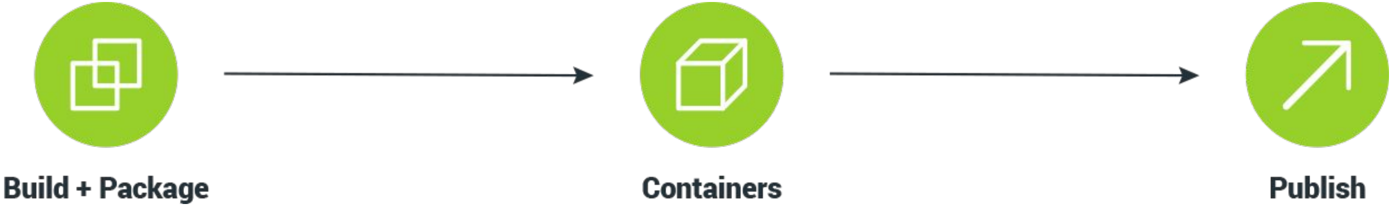


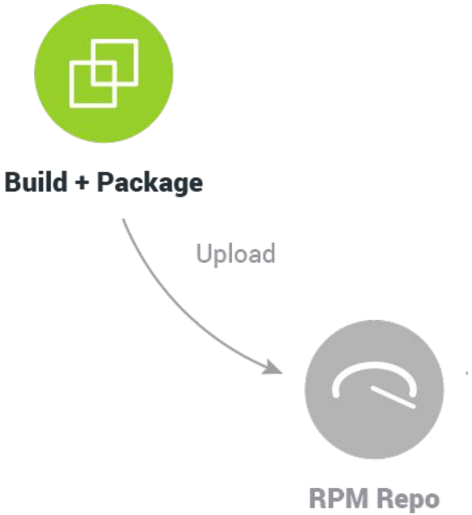
The pipeline

Build system

Build + Package

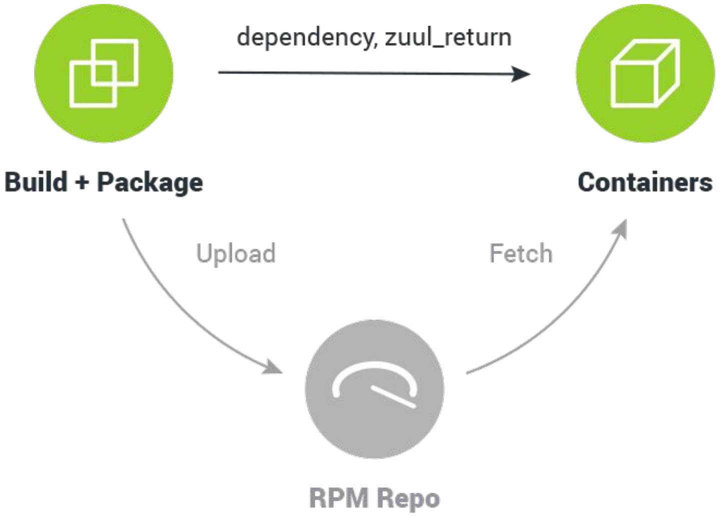
The pipeline

Build system



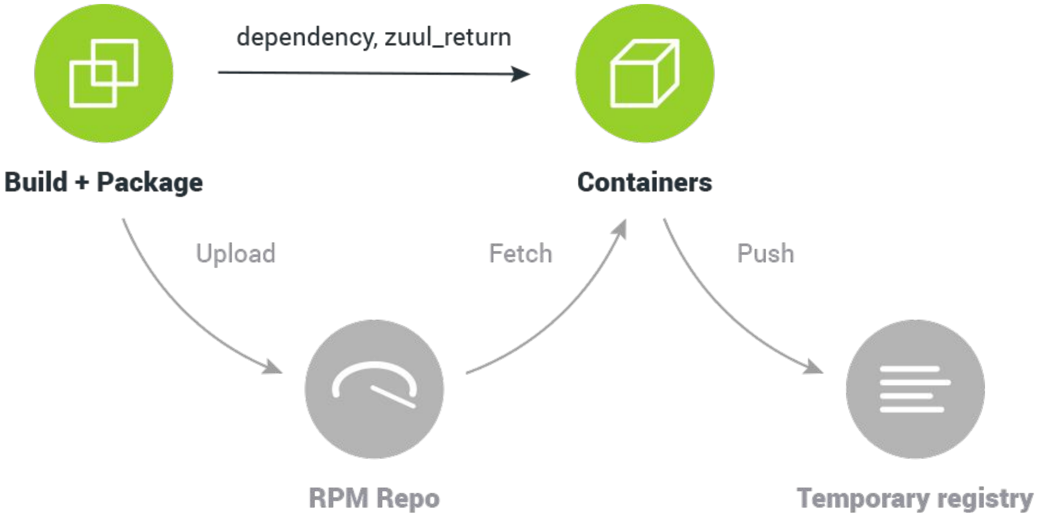
The pipeline

Build system



The pipeline

Build system



The pipeline

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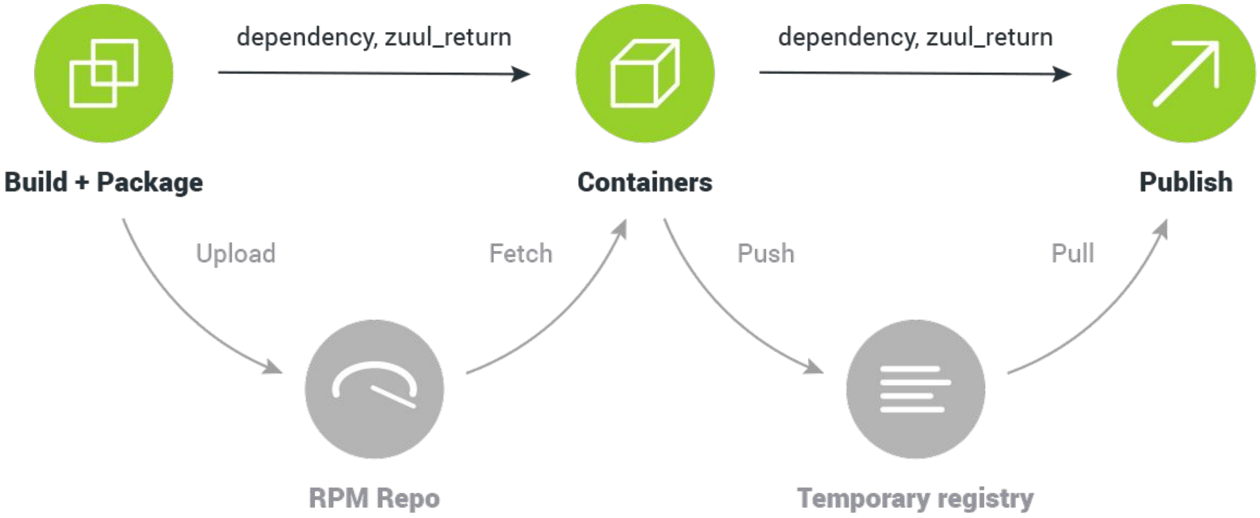
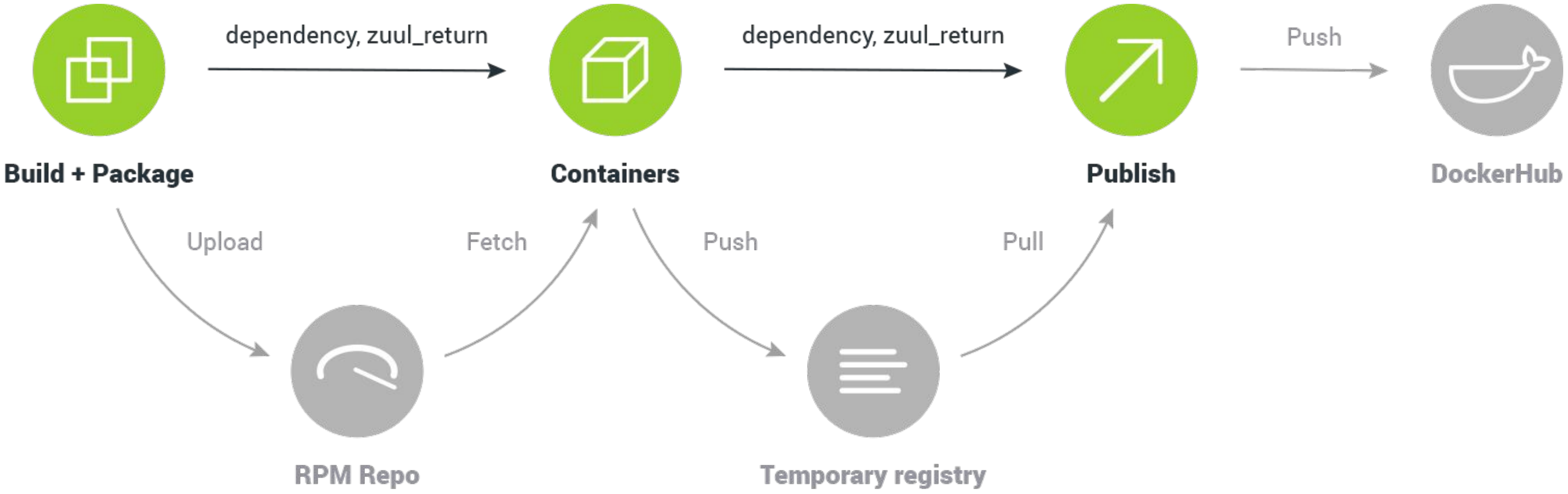


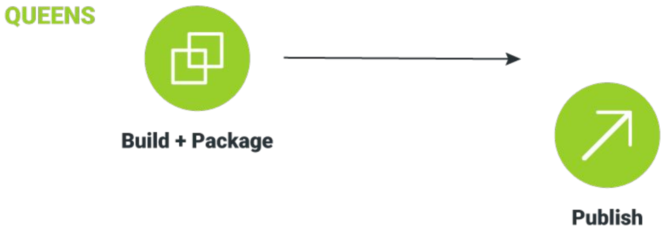
The pipeline

Build system



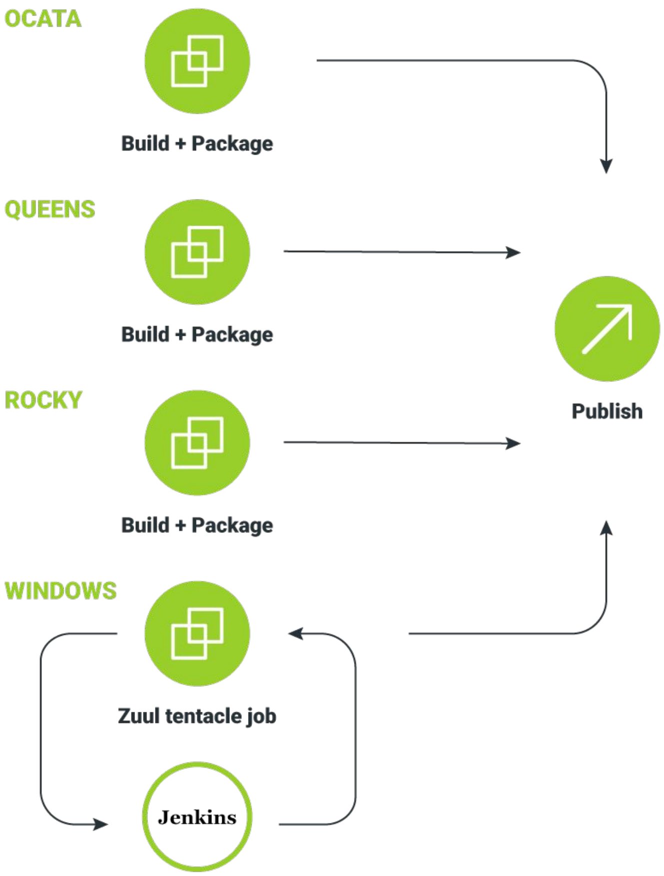
The pipeline

Build system



The pipeline

Build system



Surroundings

Build system

- mirrors
  - RPMs, DEBs
  - PyPI
  - Maven
- DockerHub cache

Builder VM images

Build system

- minimal approach
  - OS base
  - Zuul SSH key
- all the dependencies are installed during build
- the devs were disappointed with the fact that it's not a way to cache builds

Triggering

Build system

- scheduled (periodic)

```
trigger:
  timer:
    - time: "0 7 * * *"
```

- on every merge

```
trigger:
  gerrit:
    - event: ref-updated
```

- on-demand

```
zuul enqueue-ref --ref refs/heads/master ...
```

Triggering

Build system

- scheduled (periodic)

```
trigger:
  timer:
    - time: "0 7 * * *"
```

daily builds

- on every merge

```
trigger:
  gerrit:
    - event: ref-updated
```

docs, third party packages

- on-demand

```
zuul enqueue-ref --ref refs/heads/master ...
```

retrying builds

Our extensions

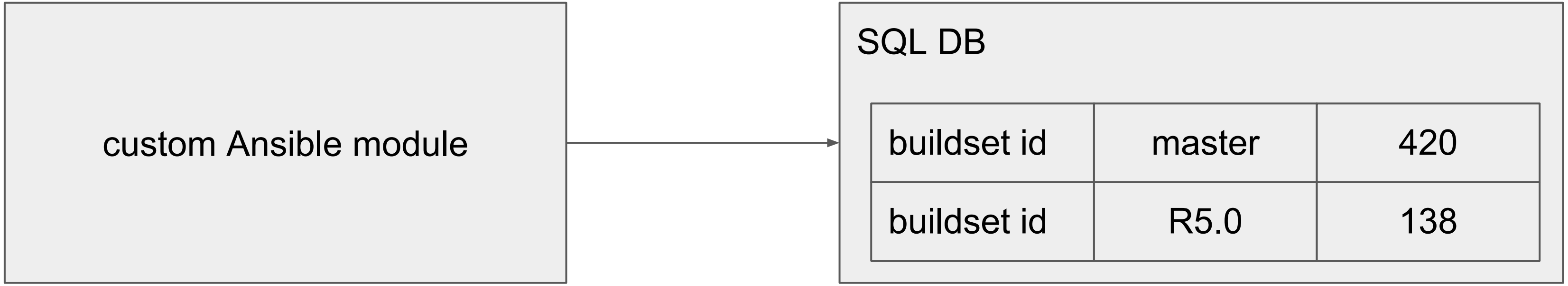
Build system

- consecutive build numbers
- dumping exact commit information
- dumping information about artifacts
- generating lists of changes included in builds (changelog)

Our extensions

Build system

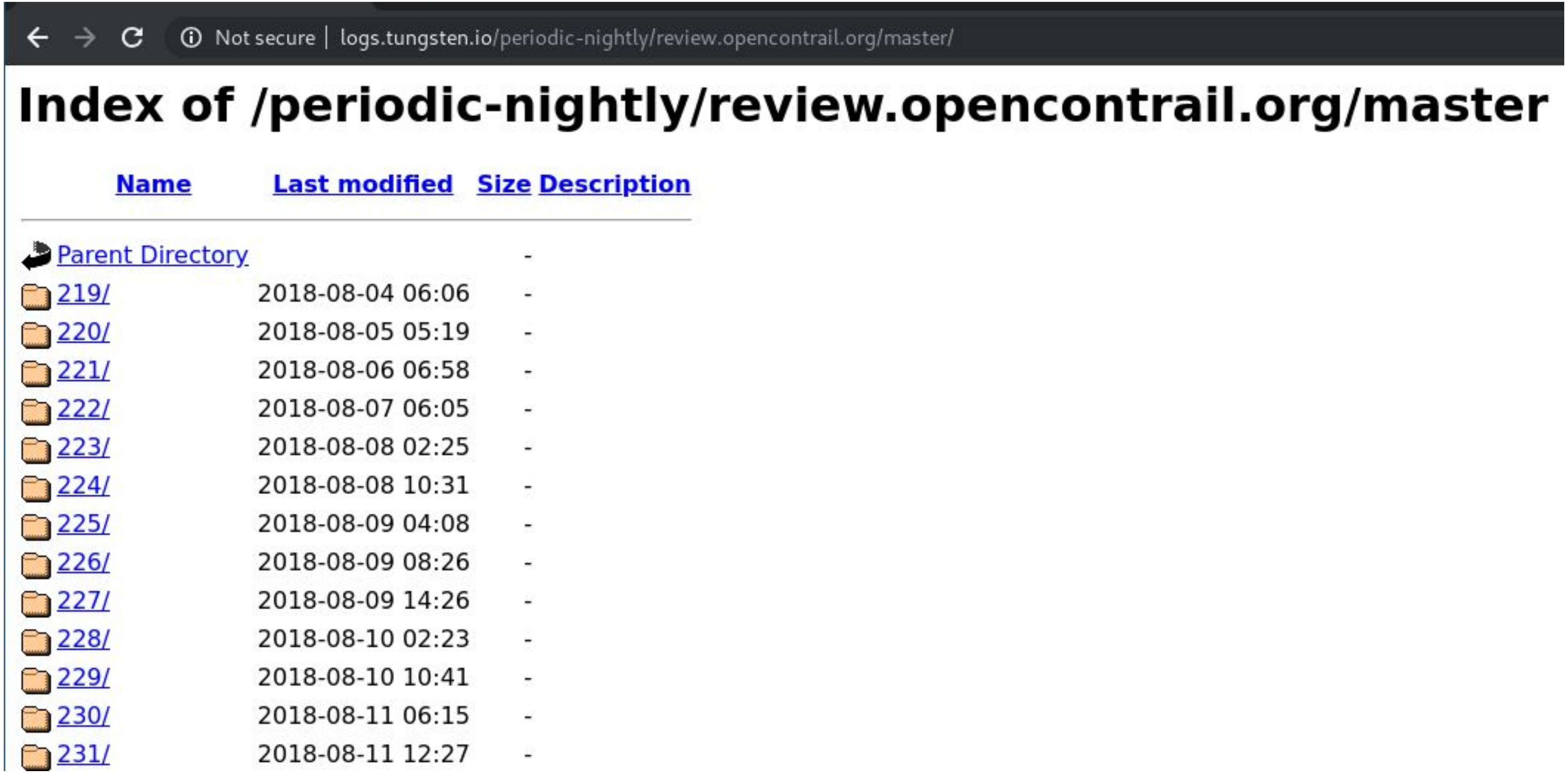
- consecutive build numbers



custom Ansible module

SQL DB

buildset id	master	420
buildset id	R5.0	138


Not secure | logs.tungsten.io/periodic-nightly/review.opencontrail.org/master/

Index of /periodic-nightly/review.opencontrail.org/master

Name	Last modified	Size	Description
Parent Directory		-	
219/	2018-08-04 06:06	-	
220/	2018-08-05 05:19	-	
221/	2018-08-06 06:58	-	
222/	2018-08-07 06:05	-	
223/	2018-08-08 02:25	-	
224/	2018-08-08 10:31	-	
225/	2018-08-09 04:08	-	
226/	2018-08-09 08:26	-	
227/	2018-08-09 14:26	-	
228/	2018-08-10 02:23	-	
229/	2018-08-10 10:41	-	
230/	2018-08-11 06:15	-	
231/	2018-08-11 12:27	-	

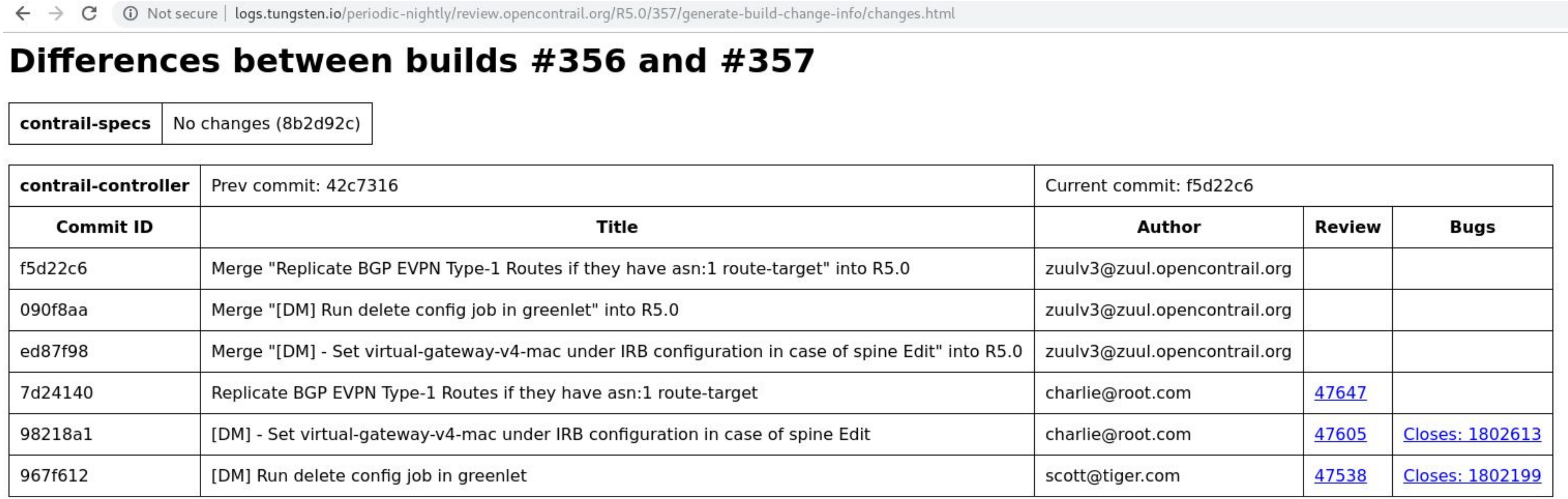
Our extensions

dumping exact commit information

```
{"review.opencontrail.org/Juniper/contrail-controller": {
        "revisions": {
            "current": "f5d22c6",
            "previous": "42c7316"
        }
        "changes": [{
                "title": "Replicate BGP EVPN Type-1 Routes...",
                "timestamp": 1542144758,
                "author": {...},
                "bugs": [],
                "sha": "7d24140f16b6d066f9802e0547b41deb2a846893",
                "message": "...",
                "change": {
                    "number": 47647,
                    "id": "I4387030ca62495afe949f78b5fc391049f4783d5"
                }
            },
...
```

Our extensions

Build system



logs.tungsten.io/periodic-nightly/review.opencontrail.org/R5.0/357/generate-build-change-info/changes.html

Differences between builds #356 and #357

contrail-specs	No changes (8b2d92c)

contrail-controller	Prev commit: 42c7316	Current commit: f5d22c6		
Commit ID	**Title**	**Author**	**Review**	**Bugs**
f5d22c6	Merge "Replicate BGP EVPN Type-1 Routes if they have asn:1 route-target" into R5.0	zuulv3@zuul.opencontrail.org		
090f8aa	Merge "[DM] Run delete config job in greenlet" into R5.0	zuulv3@zuul.opencontrail.org		
ed87f98	Merge "[DM] - Set virtual-gateway-v4-mac under IRB configuration in case of spine Edit" into R5.0	zuulv3@zuul.opencontrail.org		
7d24140	Replicate BGP EVPN Type-1 Routes if they have asn:1 route-target	charlie@root.com	47647	
98218a1	[DM] - Set virtual-gateway-v4-mac under IRB configuration in case of spine Edit	charlie@root.com	47605	Closes: 1802613
967f612	[DM] Run delete config job in greenlet	scott@tiger.com	47538	Closes: 1802199

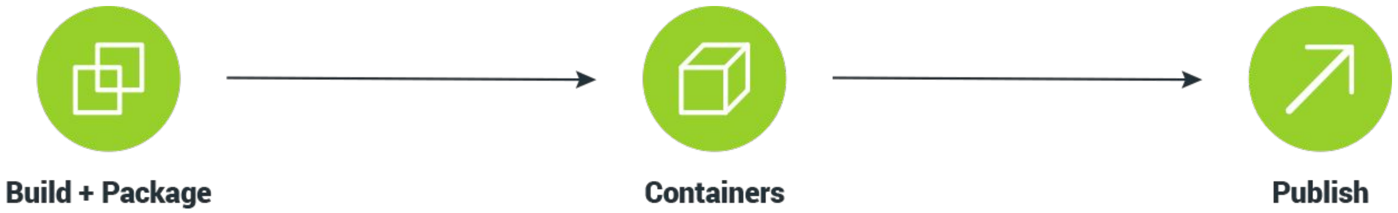
Build pipeline meets ‘check’

Build system

- uses the same jobs as periodic pipeline
- sanity jobs use containers built in previous jobs
- publishing artifacts at the end is not needed

Build pipeline meets ‘check’

Build system



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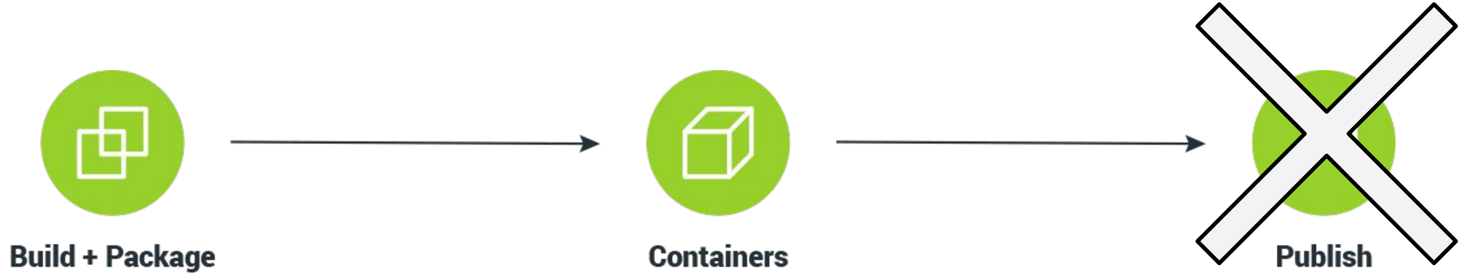

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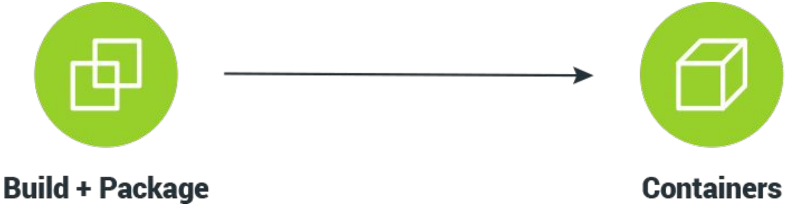

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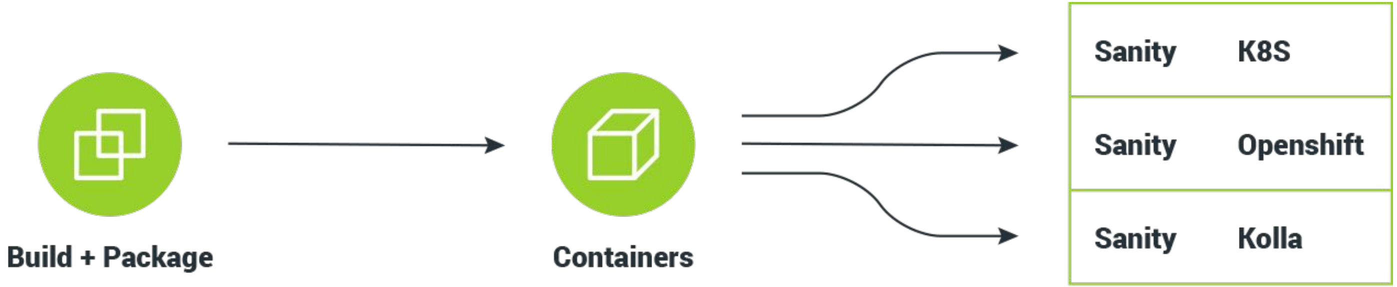


Build + Package

Containers

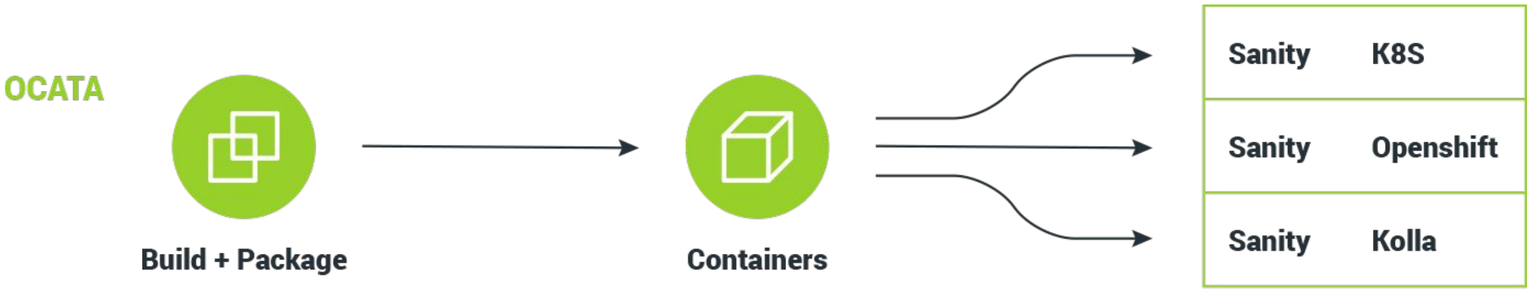
Sanity K8S

Sanity Openshift

Sanity Kolla

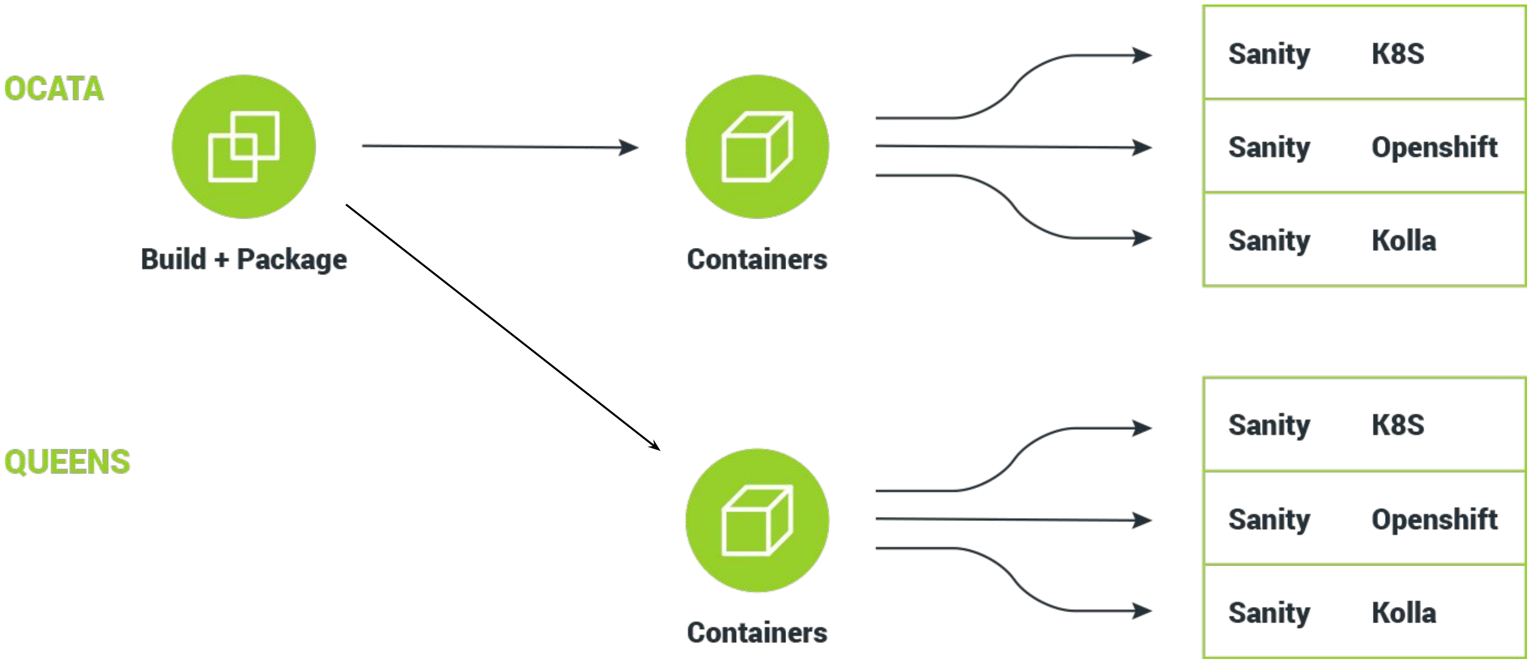
Build pipeline meets ‘check’

Build system



Build pipeline meets ‘check’

Build system



Agenda

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- build system
- **reusing Zuul playbooks**
- testing jobs
- cool to see in Zuul

Original idea

Reusing Zuul playbooks

- jobs are already shared by the CI and Build jobs
- perhaps they can also be used in developer environment
- so… let’s create Zuul-agnostic playbooks and roles

Why

Reusing Zuul playbooks

- so developers can reproduce the CI environment with ‘one-click’
- to save us some time
- because it’s cool to reuse stuff

The Zuul job dilemma

Reusing Zuul playbooks

- reusable playbooks vs. convenient usage of variables
- good ARA visibility vs. single "shell" entrypoint

Why it failed

Reusing Zuul playbooks

- run playbook has to do all the work
- can’t leverage pre- and post- playbooks
- too hard to draw a strict line between Ansible and Zuul
- too hard to mock Zuul outside of Zuul (you don't want to parse config on your own)

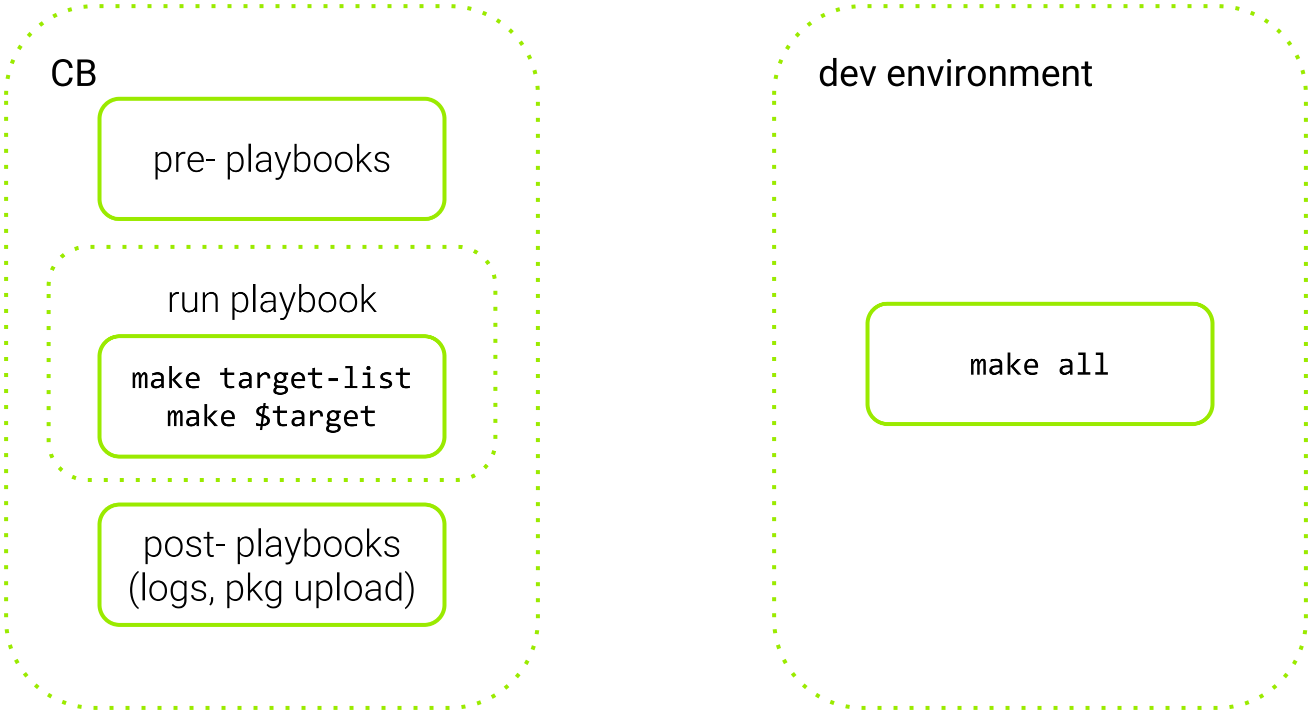
Aftermath

Reusing Zuul playbooks

- packaging/building logic inside the code, instead of the CI
- simple Makefiles
- still visible in ARA

Aftermath

Reusing Zuul playbooks



CB

pre- playbooks

run playbook

```
make target-list
make $target
```

post- playbooks
(logs, pkg upload)

dev environment

```
make all
```

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CI of CI

Testing jobs

- your CI jobs are stored in a repo as code, so…
- you should test them like everything else
- but, some things are not testable in Zuul (for a good reason)
- you can take the risk or...

Ideas for testing jobs

Testing jobs

- setting all pipelines as post-review (‘disable security’)
- separate development environment (Zuul, Gerrit, Nodepool)
- Zuul on a laptop
- unit testing roles
- running copies/mocks of jobs

Mocking your jobs

Testing jobs

- review to an untrusted repo
- secrets as variables (dummy values)
- changing Ansible host

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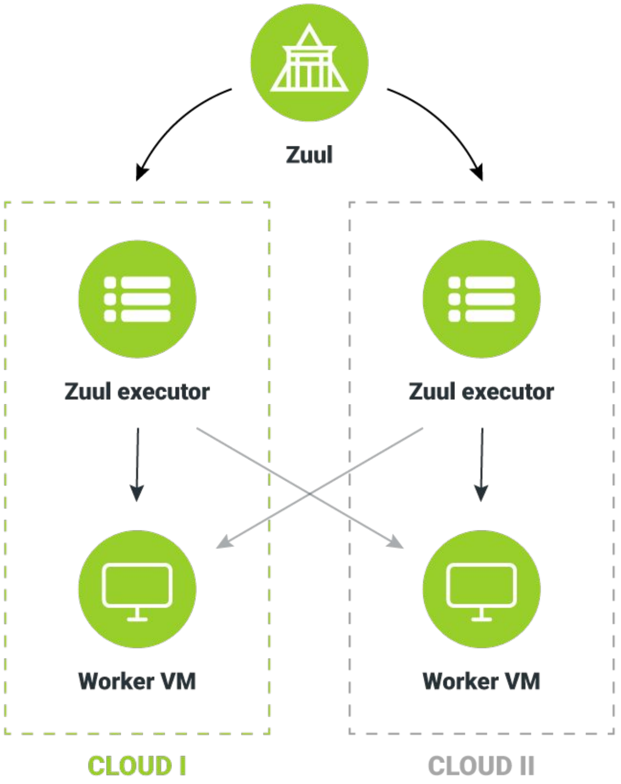
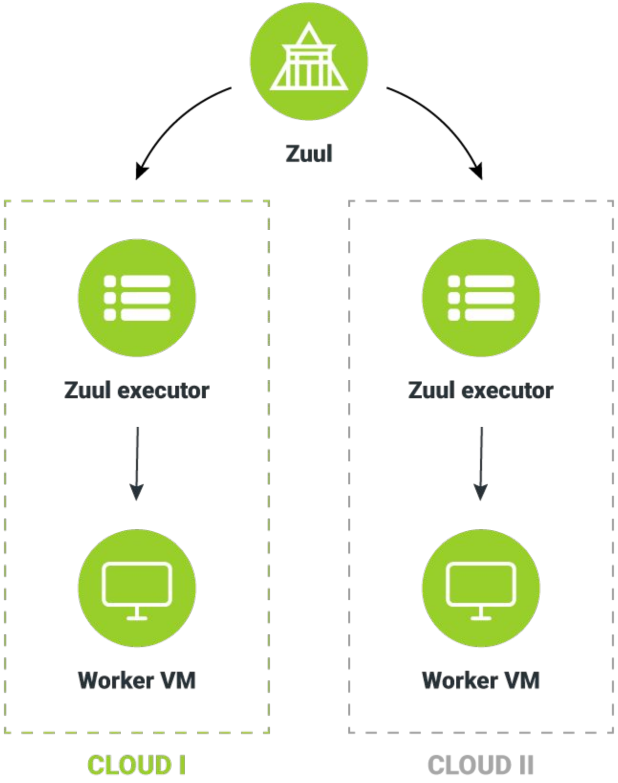
Matching executor with its cloud

Cool to see in Zuul



Matching executor with its cloud

Cool to see in Zuul



Matrix build definitions

Cool to see in Zuul

```
- job:
    name: contrail-build-containers-centos7-newton
    parent: contrail-build-containers-base
    vars:
      openstack_version: newton

- job:
    name: contrail-build-containers-centos7-ocata
    parent: contrail-build-containers-base
    vars:
      openstack_version: ocata

- job:
    name: contrail-build-containers-centos7-queens
    parent: contrail-build-containers-base
    vars:
      openstack_version: queens

- project:
    name: Juniper/contrail-analytics
    check:
      jobs:
        - contrail-build-containers-centos7-newton
        - contrail-build-containers-centos7-ocata
        - contrail-build-containers-centos7-queens
```

```
- job:
    name: contrail-build-containers-centos7-{openstack_version}
    parent: contrail-build-containers-base

- project:
    name: Juniper/contrail-analytics
    check:
      jobs:
        - contrail-build-containers-centos7-{openstack_version}:
            vars:
              openstack_version: newton
        - contrail-build-containers-centos7-{openstack_version}:
            vars:
              openstack_version: ocata
        - contrail-build-containers-centos7-{openstack_version}:
            vars:
               openstack_version: queens
```

Wrapping up

Takeaways

Zuul as a build system

- Tungsten Fabric has a cool CI/CB system
- how to handle build artifacts with Zuul
- reusing your jobs is the key
- you can test your jobs not-in-the-production

Future plans

Zuul as a build system

- continuous upgrade of Zuul
- running build and unittest jobs inside containers instead of VMs
- supercedent pipeline manager

Thank you

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