

Lecture 11: hosting&monitoring

Kari Systä, 16.11.2021

Agenda

- Course matters
- Left-over about the automation
- Hosting and monitoring
- Summary of the pipeline

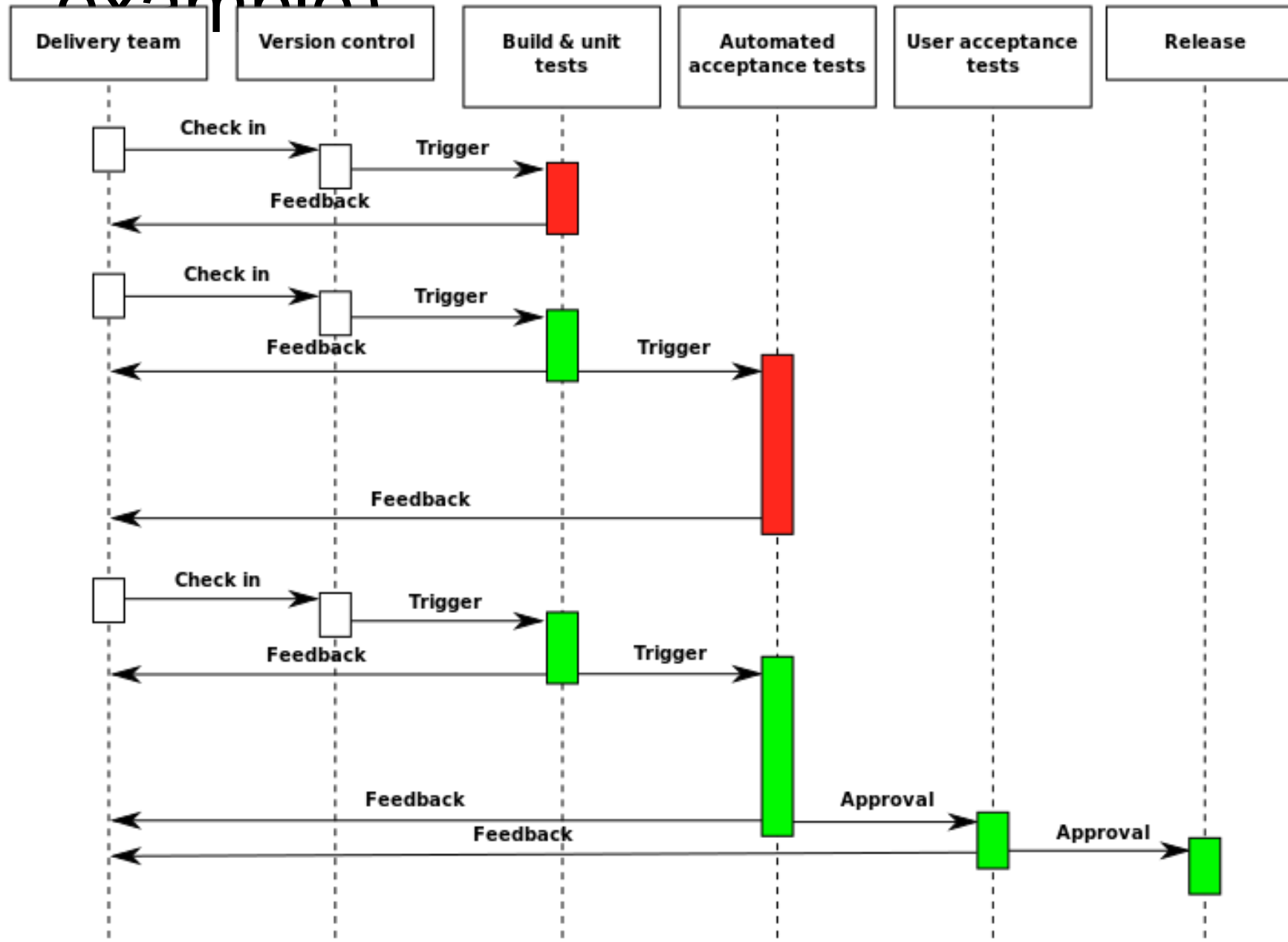
Course matters

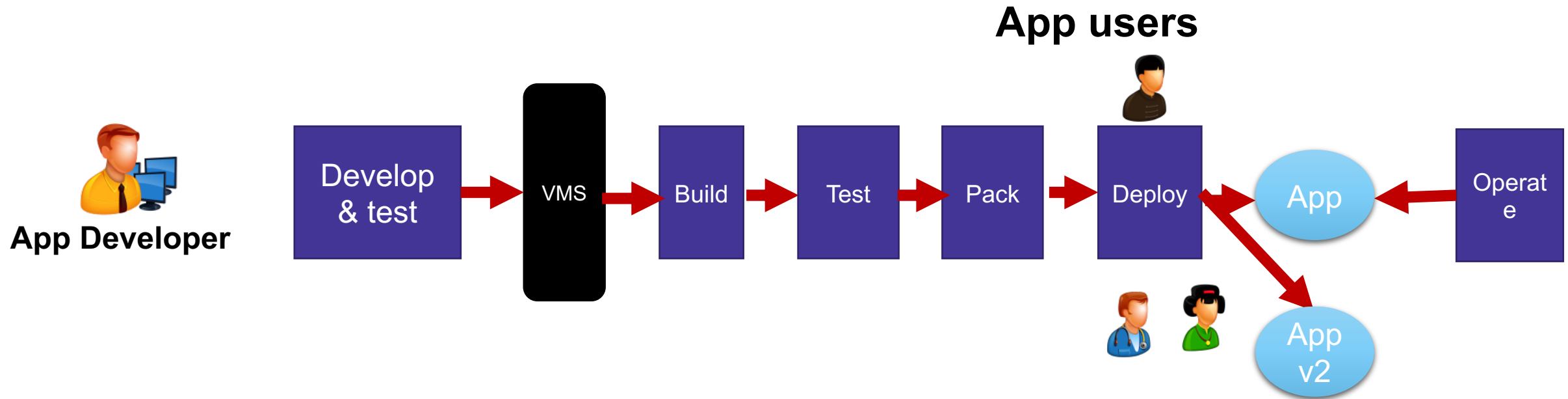
- Weekly exercises so far
 - Docker basics: 59
 - Docker compose: 54
 - Message queue: 37
 - Ansible: 9
- We have now initially scheduled three guest lectures:
 - 23.11: Polarsquad, Knowit
 - 30.11: Unikiestay tuned for the details
- Exam time window will be 13-20.12. Signup's are accepted

Job opportunities (e.g. master thesis)

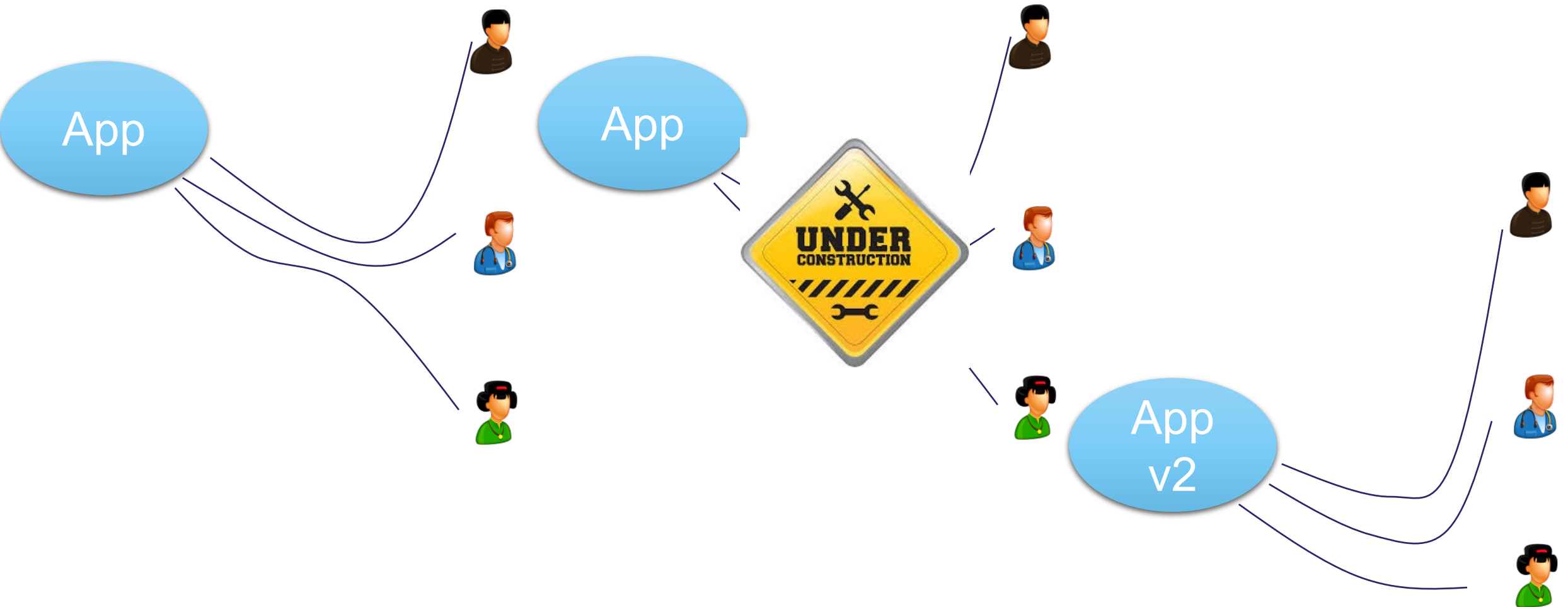
- Sweco OY
 - Automation of design tasks.
 - jarkko.heikura@sweco.fi
- University
 - web programming / Production Automation group
 - Niko.siltala@tuni.fi

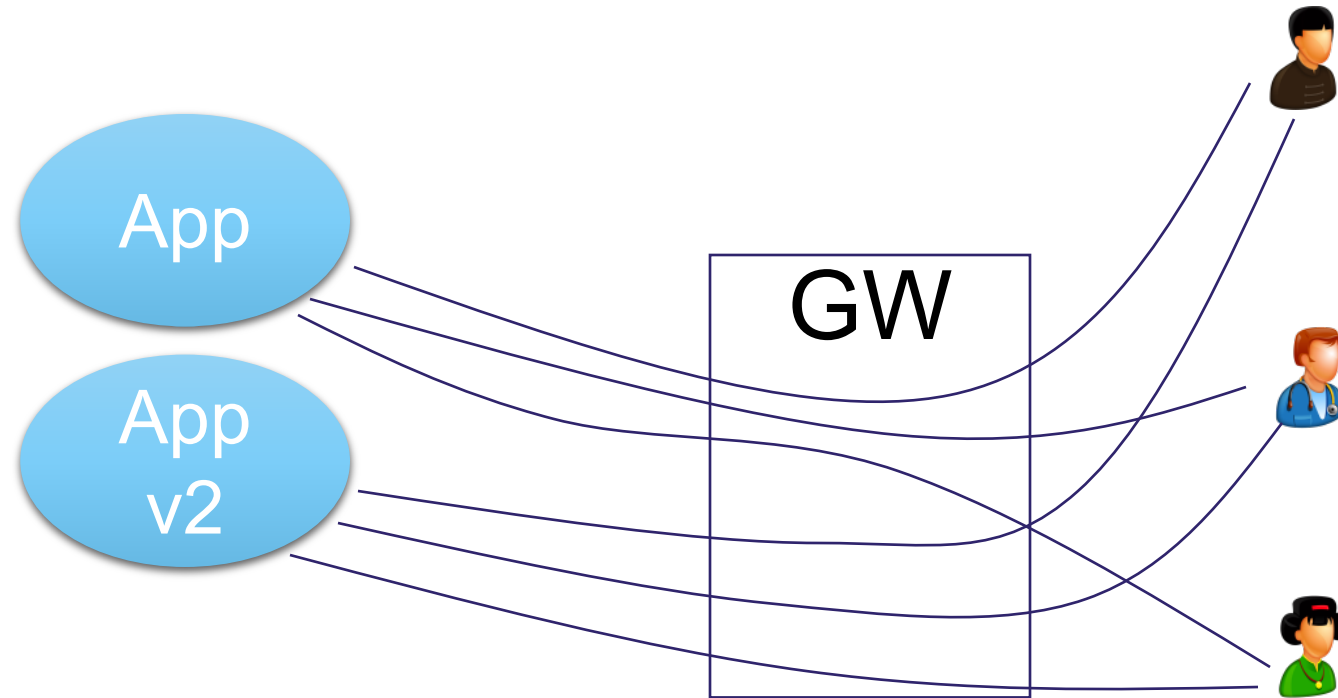
Deployment pipeline (a possible example)





A possible strategy to deploy a new version?





Problems & issues?

Deployment strategies

Basic Deployment (aka Suicide)
(<https://harness.io/2018/02/deployment-strategies-continuous-delivery/>) all nodes are updated at the same time

Before

Live



V1.0

After

Live



V2.0

or

Live



V2.0

Rolling Deployment (<https://harness.io/2018/02/deployment-strategies-continuous-delivery/>) nodes are updated incrementally,

Before

Live



V1.1

After

1 Node



OK?

2 Nodes



OK?

3 Nodes



4 Nodes



OK?

5 Nodes



OK?

6 Nodes



V1.2

Window Size = 1 node

(<http://martinfowler.com/bliki/BlueGreenDeployment.html>) the new version (called green) is set up in parallel with the current (blue). When new (green) is ready, the router is switched to new (green) and blue is left as a backup. If something goes wrong with new, the router can be switched back to old - that means easy “rollback”.



Canary Releases (<http://martinfowler.com/bliki/CanaryRelease.html>) implements the deployment incrementally. In this case the router first directs only part of the customers to the new version. If feedback is good, the other customers are moved to new version, too

Before

Live



V1.1

After

Live Phase 1



V1.2 V1.1

verification



Live Phase 2



V1.2 V1.1

verification

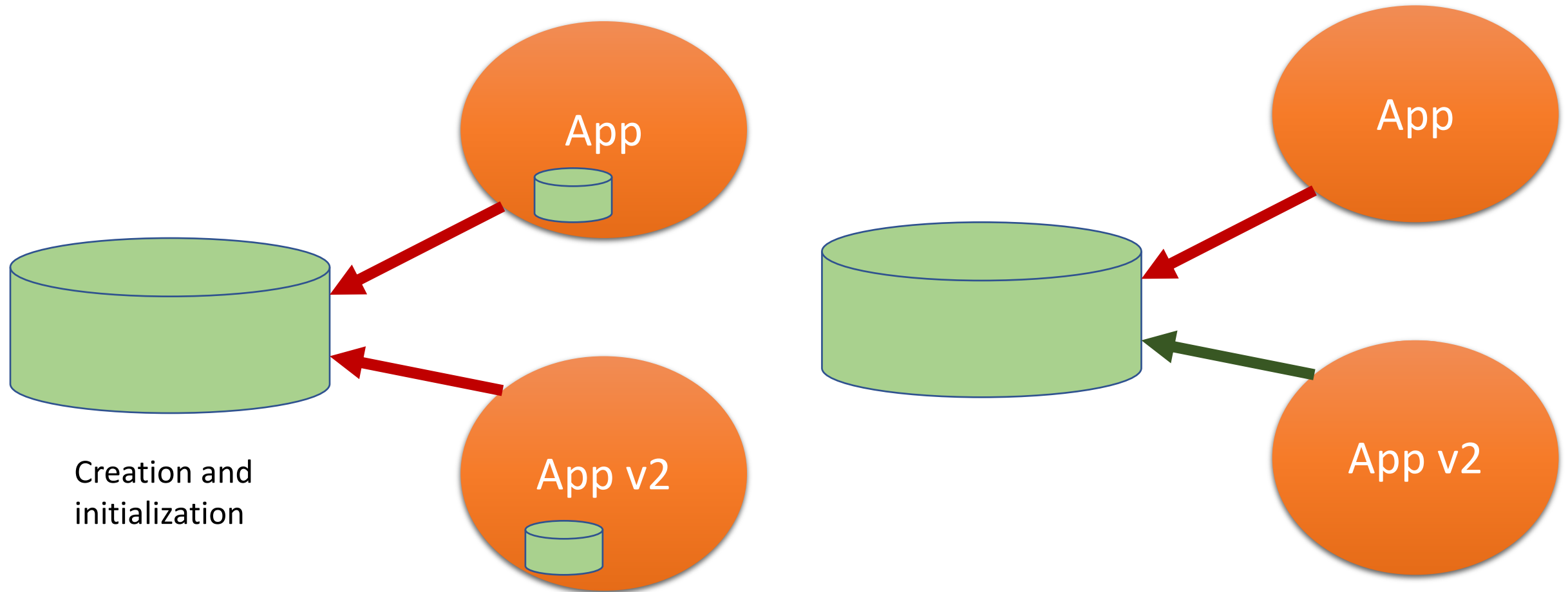


Live Phase 3



V1.2

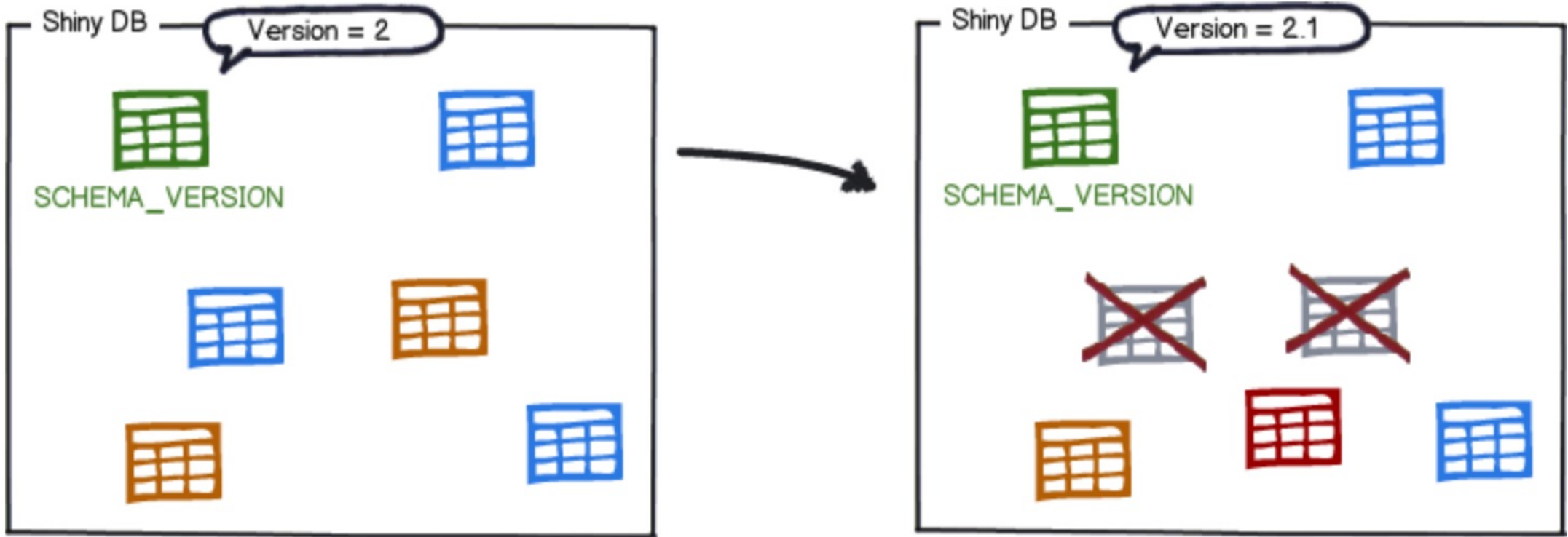
How about the data?



Data migration

- Versions of the data bases
- Data migration scripts are needed.
- Rollback need to be possible

They are then **sorted by version number** and **executed in order**:



The **schema history table** is **updated** accordingly:

flyway_schema_history

installed_rank	version	description	type	script	checksum	installed_by	installed_on	execution_time	success
1	1	Initial Setup	SQL	V1__Initial_Setup.sql	1996767037	axel	2016-02-04 22:23:00.0	546	true
2	2	First Changes	SQL	V2__First_Changes.sql	1279644856	axel	2016-02-06 09:18:00.0	127	true
3	2.1	Refactoring	JDBC	V2_1__Refactoring		axel	2016-02-10 17:45:05.4	251	true

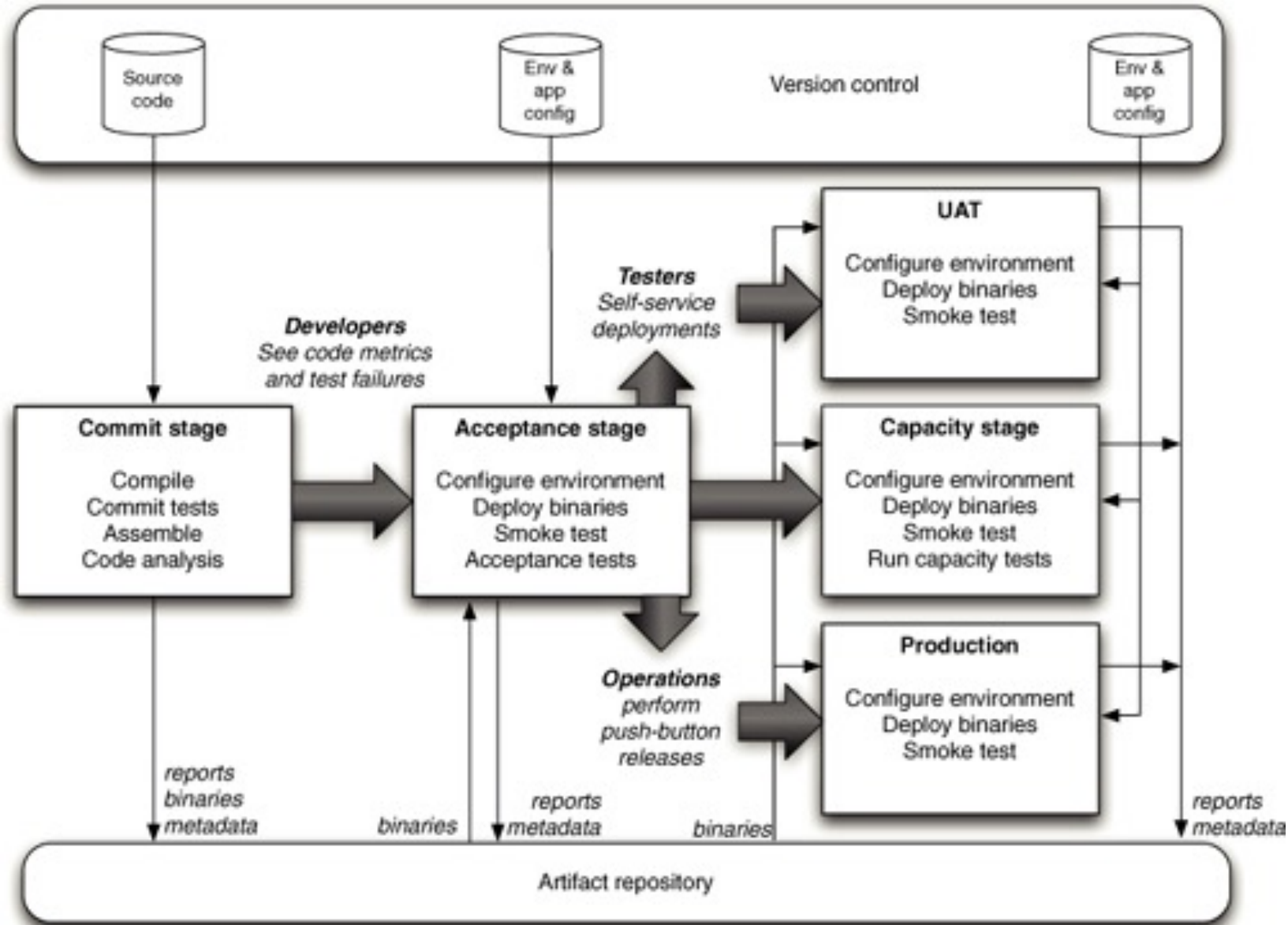
Example of data base automation

<https://flywaydb.org>

” Flyway is an open-source database migration tool. It strongly favors simplicity and convention over configuration. It is based around just 6 basic commands: Migrate, Clean, Info, Validate, Baseline and Repair. Migrations can be written in SQL (database-specific syntax (such as PL/SQL, T-SQL, ...) is supported) or Java (for advanced data transformations or dealing with LOBs).”

Automation challenges

- "...provisioning scripts were considered error-prone and, according to developers, they did not work in some environments..."
- "...automation of the network in was said to be difficult in addition to dealing with legacy system..."
- "Networks are pretty hard. Some of the databases are pretty hard too because the old relational databases haven't been designed to be clustered..."



Huge number of tools available

- <https://digital.ai/periodic-table-of-devops-tools>
- <https://landscape.cncf.io>

PERIODIC TABLE OF DEVOPS TOOLS (V3)

Os	Open Source		Source Control Mgmt.		Deployment		Analytics
Fr	Free		Database Automation		Containers		Monitoring
Fm	Freemium		Continuous Integration		Release Orchestration		Security
Pd	Paid		Testing		Cloud		Collaboration
En	Enterprise		Configuration		AIOps		

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Database automation

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Enterprise

Source Control Mgmt.

Database Automation

Continuous Integration

Testing

Configuration

Deployment

Containers

Release Orchestration

Cloud

AIOps

Analytics

Monitoring

Security

Collaboration



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Continuous Integration



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1Os

Gl

GitLab

2En

Sp

Splunk

3Fm

Gh

GitHub

4En

Dt

Datical

5En

XLr

XebiaLabs
XL Release

6Fm

Aws

AWS

7Pd

Az

Azure

8En

Gc

Google Cloud

9Fm

Op

OpenShift

10Fm

Sg

Sumo Logic

11Os

Sv

Subversion

12En

Db

DBMaestro

13Os

Dk

Docker

14En

Ur

UrbanCode
Release

15Pd

Af

Azure
Functions

16Pd

Ld

Lambda

17Fm

Ic

IBM Cloud

18Os

Fd

Fluentd

19En

Cw

ISPW

20En

Dp

Delphix

21Os

Jn

Jenkins

22Fm

Cs

Codeship

23Os

Fn

FitNesse

24Fr

Ju

JUnit

25Fr

Ka

Karma

26Fm

Su

SoapUI

27En

Ch

Chef

28Fr

Tf

Terraform

29En

XLd

XebiaLabs
XL Deploy

30En

Ud

UrbanCode
Deploy

31Os

Ku

Kubernetes

32Fm

Cc

CA CD
Director

33En

Pr

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34Pd

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35Os

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36Os

Ps

Prometheus

37Pd

At

Artifactory

38Fm

Rg

Redgate

39Pd

Ba

Bamboo

40Fm

Vs

VSTS

41Fr

Se

Selenium

42Fr

Jm

JMeter

43Os

Ja

Jasmine

44Pd

Sl

Sauce Labs

45En

An

Ansible

46Os

Ru

Rudder

47En

Oc

Octopus
Deploy

48Os

Go

GoCD

49Os

Ms

Mesos

50Pd

Gke

GKE

51Fm

Om

OpenMake

52Pd

Cp

AWS
CodePipeline

53Pd

Cy

Cloud
Foundry

54En

It

ITRS

55Pd

Nx

Nexus

56Os

Fw

Flyway

57Os

Tr

Travis CI

58Fm

Tc

TeamCity

59Os

Ga

Gatling

60Fr

Tn

TestNG

61Fm

Tt

Tricentis
Tosca

62Pd

Pe

Perfecto

63En

Pu

Puppet

64Os

Pa

Packer

65Fm

Cd

AWS
CodeDeploy

66En

Ec

ElectricCloud

67Os

Ra

Rancher

68Pd

Aks

AKS

69Os

Rk

Rkt

70Os

Sp

Spinnaker

71Pd

Ir

Iron.io

72Pd

Mg

Moogsoft

73Fm

Bb

BitBucket

74En

Pf

Perforce

75Fm

Cr

Circle CI

76Pd

Cb

AWS
CodeBuild

77Fr

Cu

Cucumber

78Os

Mc

Mocha

79Os

Lo

Locust.io

80En

Mf

Micro Focus
UFT

81Os

Sa

Salt

82Os

83En

84En

85En

86Pd

Ae

AWS ECS

87Fm

Cf

Codefresh

88Os

Hm

Helm

89Os

Aw

Apache
OpenWhisk

90Os

Ls

Logstash

Os

Open Source

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Free

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Enterprise

Source Control Mgmt.

Database Automation

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Configuration

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Release Orchestration

Cloud

AIOps

Analytics

Monitoring

Security

Collaboration

Testing



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91En	92Os	93Fm	94En	95En	96Fm	97Os	98Os	99Os	100En	101En	102En	103En	104Os	105Os
XLi XebiaLabs XL Impact	Ki Kibana	Nr New Relic	Dt Dynatrace	Dd Datadog	Ad AppDynamics	El ElasticSearch	Ni Nagios	Zb Zabbix	Zn Zenoss	Cx Checkmarx SAST	Sg Signal Sciences	Bd BlackDuck	Sr SonarQube	Hv HashiCorp Vault
106En	107Pd	108Fm	109Fm	110Fm	111En	112En	113En	114Pd	115Pd	116Os	117Fm	118En	119En	120En
Sw ServiceNow	Jr Jira	Tl Trello	Sk Slack	St Stride	Cn CollabNet VersionOne	Ry Remedy	Ac Agile Central	Og OpsGenie	Pd Pagerduty	Sn Snort	Tw Tripwire	Ck CyberArk	Vc Veracode	Ff Fortify SCA

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Fm

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Deployment



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55 Nx Nexus	56 Fw Flyway	57 Tr Travis CI	58 Tc TeamCity	59 Ga Gatling	60 Tn TestNG	61 Tt Tricentis Tosca	62 Pe Perfecto	63 Pu Puppet	64 Pa Packer	65 Cd AWS CodeDeploy	66 Ec ElectricCloud	67 Ra Rancher	68 Aks AKS	69 Rk Rkt	70 Sp Spinnaker	71 Ir Iron.io	72 Mg Moogsoft					72 Pd
73 Bb BitBucket	74 Pf Perforce	75 Cr Circle CI	76 Cb AWS CodeBuild	77 Cu Cucumber	78 Mc Mocha	79 Lo Locust.io	80 Mf Micro Focus UFT	81 Sa Salt	82 Ce CFEngine	83 Eb Elastic Beanstalk	84 Ca CA Automate	85 De Docker Enterprise	86 Ae AWS ECS	87 Cf Codefresh	88 Hm Helm	89 Aw Apache OpenWhisk	90 Ls Logstash					90 Os

Containers



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91 XLi XebiaLabs XL Impact	92 Ki Kibana	93 Nr New Relic	94 Dt Dynatrace	95 Dd Datadog	96 Ad AppDynamics	97 El ElasticSearch	98 Ni Nagios	99 Zb Zabbix	100 Zn Zenoss	101 Cx Checkmarx SAST	102 Sg Signal Sciences	103 Bd BlackDuck	104 Sr SonarQube	105 Hv HashiCorp Vault					
106 Sw ServiceNow	107 Jr Jira	108 Tl Trello	109 Sk Slack	110 St Stride	111 Cn CollabNet VersionOne	112 Ry Remedy	113 Ac Agile Central	114 Og OpsGenie	115 Pd Pagerduty	116 Sn Snort	117 Tw Tripwire	118 Ck CyberArk	119 Vc Veracode	120 Ff Fortify SCA					

PERIODIC TABLE OF DEVOPS TOOLS (V3)

Os	Open Source	Source Control Mgmt.	Deployment	Analytics
Fr	Free	Database Automation	Containers	Monitoring
Fm	Freemium	Continuous Integration	Release Orchestration	Security
Pd	Paid	Testing	Cloud	Collaboration
En	Enterprise	Configuration	AIOps	

PERIODIC TABLE OF DEVOPS TOOLS (V3)																									
1 GI GitLab																			2 Sp Splunk						
3 Gh GitHub	4 Dt Datical																			5 XLr XebiaLabs XL Release	6 Aws AWS	7 Az Azure	8 Gc Google Cloud	9 Op OpenShift	10 Sg Sumo Logic
11 Sv Subversion	12 Db DBMaestro																			13 Dk Docker	14 Ur UrbanCode Release	15 Af Azure Functions	16 Ld Lambda	17 Ic IBM Cloud	18 Fd Fluentd
19 Cw ISPW	20 Dp Delphix	21 Jn Jenkins	22 Cs Codeship	23 Fn FitNesse	24 Ju JUnit	25 Ka Karma	26 Su SoapUI	27 Ch Chef	28 Tf Terraform	29 XLd XebiaLabs	30 Ud UrbanCode	31 Dk Docker	32 Ur UrbanCode Release	33 Pr Plutora Release	34 Al Alibaba Cloud	35 Os OpenStack	36 Ps Prometheus								
37 At Artifactory	38 Rg Redgate	39 Ba Bamboo	40 Vs VSTS	41 Se Selenium	42 Jm JMeter	43 Ja Jasmine	44 Sl Sauce Labs	45 An Ansible	46 Ru Rundeck	Release orchestration				50 Gke GKE	51 Om OpenMake	52 Cp AWS CodePipeline	53 Cy Cloud Foundry	54 It ITRS							
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Cloud



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AIOps



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91 En XLi XebiaLabs XL Impact	92 Os Ki Kibana	93 Fm Nr New Relic	94 En Dt Dynatrace	95 En Dd Datadog	96 Fm Ad AppDynamics	97 Os El ElasticSearch	98 Os Ni Nagios	99 Os Zb Zabbix	100 En Zn Zenoss	101 En Cx Checkmarx SAST	102 En Sg Signal Sciences	103 En Bd BlackDuck	104 Os Sr SonarQube	105 Os Hv HashiCorp Vault	
		Pd	108 Fm Tl Trello	109 Fm Sk Slack	110 Fm St Stride	111 En Cn CollabNet VersionOne	112 En Ry Remedy	113 En Ac Agile Central	114 Pd Og OpsGenie	115 Pd Pd Pagerduty	116 Os Sn Snort	117 Fm Tw Tripwire	118 En Ck CyberArk	119 En Vc Veracode	120 En Ff Fortify SCA

Analytics

PERIODIC TABLE OF DEVOPS TOOLS (V3)

1Os

2En

3Fm

4En

5En

6Fm

7Pd

8En

9Fm

10Fm

11Os

12En

13Os

14En

15Pd

16Pd

17Fm

18Os

19En

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21Os

22Fm

23Os

24Fr

25Fr

26Fm

27En

28Fr

29En

30En

31Os

32Fm

33En

34Pd

35Os

36Os

37Pd

38Fm

39Pd

40Fm

41Fr

42Fr

43Os

44Pd

45En

46Os

47En

48Os

49Os

50Pd

51Fm

52Pd

53Pd

54En

55Pd

56Os

57Os

58Fm

59Os

60Fr

61Fm

62Pd

63En

64Os

65Fm

66En

67Os

68Pd

69Os

70Os

71Pd

72Pd

73Fm

74En

75Fm

76Pd

77Fr

78Os

79Os

80En

81Os

82Os

83En

84En

85En

86Pd

87Fm

88Os

89Os

90Os

Gl
GitLab

Gh
GitHub

Sv
Subversion

Cw
ISPW

At
Artifactory

Nx
Nexus

Bb
BitBucket

Sp
Splunk

Sg
Sumo Logic

Fd
Fluentd

Ps
Prometheus

It
ITRS

Mg
Moogsoft

Ls
Logstash

Dt
Datical

Db
DBMaestro

Dp
Delphix

Rg
Redgate

Fw
Flyway

Pf
Perforce

Jn
Jenkins

Ba
Bamboo

Tr
Travis CI

Cr
Circle CI

Cs
Codeship

Vs
VSTS

Tc
TeamCity

Cb
AWS CodeBuild

Fn
FitNesse

Se
Selenium

Ga
Gatling

Cu
Cucumber

Ju
JUnit

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JMeter

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TestNG

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Sl
Sauce Labs

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Locust.io

Su
SoapUI

Ch
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Ansible

Pu
Puppet

Sa
Salt

Tf
Terraform

Ru
Rudder

Pa
Packer

Ce
CFEngine

XLd
XebiaLabs
XL Deploy

Oc
Octopus
Deploy

Cd
AWS
CodeDeploy

Eb
ElasticBox

Ud
UrbanCode
Deploy

Go
GoCD

Ec
ElectricCloud

Ca
CA Automic

Ku
Kubernetes

Cc
CA CD
Director

Pr
Plutora
Release

Al
Alibaba Cloud

Os
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Cy
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Foundry

Ir
Iron.io

Aw
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OpenWhisk

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Monitoring

91En	92Os	Monitoring					97Os	98Os	99Os	100En	101En	102En	103En	104Os	105Os
XLi XebiaLabs XL Impact	Ki Kibana	Nr New Relic	Dt Dynatrace	Dd Datadog	Ad AppDynamics	El ElasticSearch	Ni Nagios	Zb Zabbix	Zn Zenoss	Cx Checkmarx SAST	Sg Signal Sciences	Bd BlackDuck	Sr SonarQube	Hv HashiCorp Vault	
106En	107Pd	108Fm	109Fm	110Fm	111En	112En	113En	114Pd	115Pd	116Os	117Fm	118En	119En	120En	
Sw ServiceNow	Jr Jira	Tl Trello	Sk Slack	St Stride	Cn CollabNet VersionOne	Ry Remedy	Ac Agile Central	Og OpsGenie	Pd Pagerduty	Sn Snort	Tw Tripwire	Ck CyberArk	Vc Veracode	Ff Fortify SCA	



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19 En Cw ISPW	20 En Dp Delphix	21 Os Jn Jenkins	22 Fm Cs Codeship	23 Os Fn FitNesse	24 Fr Ju JUnit	25 Fr Ka Karma	26 Fm Su SoapUI	27 En Ch Chef	28 Fr Tf Terraform	29 En XLd XebiaLabs XL Deploy	30 En Ud UrbanCode Deploy	31 Os Ku Kubernetes	32 Fm Cc CA CD Director	33 En Pr Plutora Release	34 Pd Al Alibaba Cloud	35 Os Os OpenStack	36 Os Ps Prometheus						
37 Pd At Artifactory	38 Fm Rg Redgate	39 Pd Ba Bamboo	40 Fm Vs VSTS	41 Fr Se Selenium	42 Fr Jm JMeter	43 Os Ja Jasmine	44 Pd Sl Sauce Labs	45 En An Ansible	46 Os Ru Rudder	47 En Oc Octopus Deploy	48 Os Go GoCD	49 Os Ms Mesos	50 Pd Gke GKE	51 Fm Om OpenMake	52 Pd Cp AWS CodePipeline	53 Pd Cy Cloud Foundry	54 En It ITRS						
55 Pd Nx Nexus	56 Os Fw Flyway	57 Os Tr Travis CI	58 Fm Tc TeamCity	59 Os Ga Gatling	60 Fr Tn TestNG	61 Fm Tt Tricentis Tosca	62 Pd Pe Perfecto	63 En Pu Puppet	64 Os Pa Packer	65 Fm Cd AWS CodeDeploy	66 En Ec ElectricCloud	67 Os Ra Rancher	68 Pd Aks AKS	69 Os Rk Rkt	70 Os Sp Spinnaker	71 Pd Ir Iron.io	72 Pd Mg Moogsoft						
73 Fm Bb BitBucket	74 En Pf Perforce	75 Fm Cr Circle CI	76 Pd Cb AWS CodeBuild	77 Fr Cu Cucumber	78 Os Mc Mocha	79 Os Lo Locust.io	80 En Mf Micro Focus UFT	81 Os Sa Salt	82 Os Ce CFEngine	83 En Eb ElasticBox	84 En Ca CA Automic	85 En De Docker Enterprise	86 Pd Ae AWS ECS	87 Fm Cf Codefresh	88 Os Hm Helm	89 Os Aw Apache OpenWhisk	90 Os Ls Logstash						

Security

91En	92Os	93Fm	94En	95En	Security					99En	100En	101En	102En	103En	104Os	105Os
XLi XebiaLabs XL Impact	Ki Kibana	Nr New Relic	Dt Dynatrace	Dd Datadog	Ad AppDynamics	Es ElasticSearch	Nagios	Zabbix	Zn Zenoss	Cx Checkmarx SAST	Sg Signal Sciences	Bd BlackDuck	Sr SonarQube	Hv HashiCorp Vault		
106En	107Pd	108Fm	109Fm	110Fm	111En	112En	113En	114Pd	115Pd	116Os	117Fm	118En	119En	120En		
Sw ServiceNow	Jr Jira	Tl Trello	Sk Slack	St Stride	Cn CollabNet VersionOne	Ry Remedy	Ac Agile Central	Og OpsGenie	Pd Pagerduty	Sn Snort	Tw Tripwire	Ck CyberArk	Vc Veracode	Ff Fortify SCA		



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PERIODIC TABLE OF DEVOPS TOOLS (V3)

1 GI GitLab	2 Sp Splunk																					2 En
3 Gh GitHub	4 Dt Datical																					2 En
11 Sv Subversion	12 Db DBMaestro																					2 En
19 Cw ISPW	20 Dp Delphix	21 Jn Jenkins	22 Cs Codeship	23 Fn FitNesse	24 Ju JUnit	25 Ka Karma	26 Su SoapUI	27 Ch Chef	28 Tf Terraform	29 XLd XebiaLabs XL Deploy	30 Ud UrbanCode Deploy	31 Ku Kubernetes	32 Cc CA CD Director	33 Pr Plutora Release	34 Al Alibaba Cloud	35 Os OpenStack	36 Ps Prometheus					2 En
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Source Control mgmt

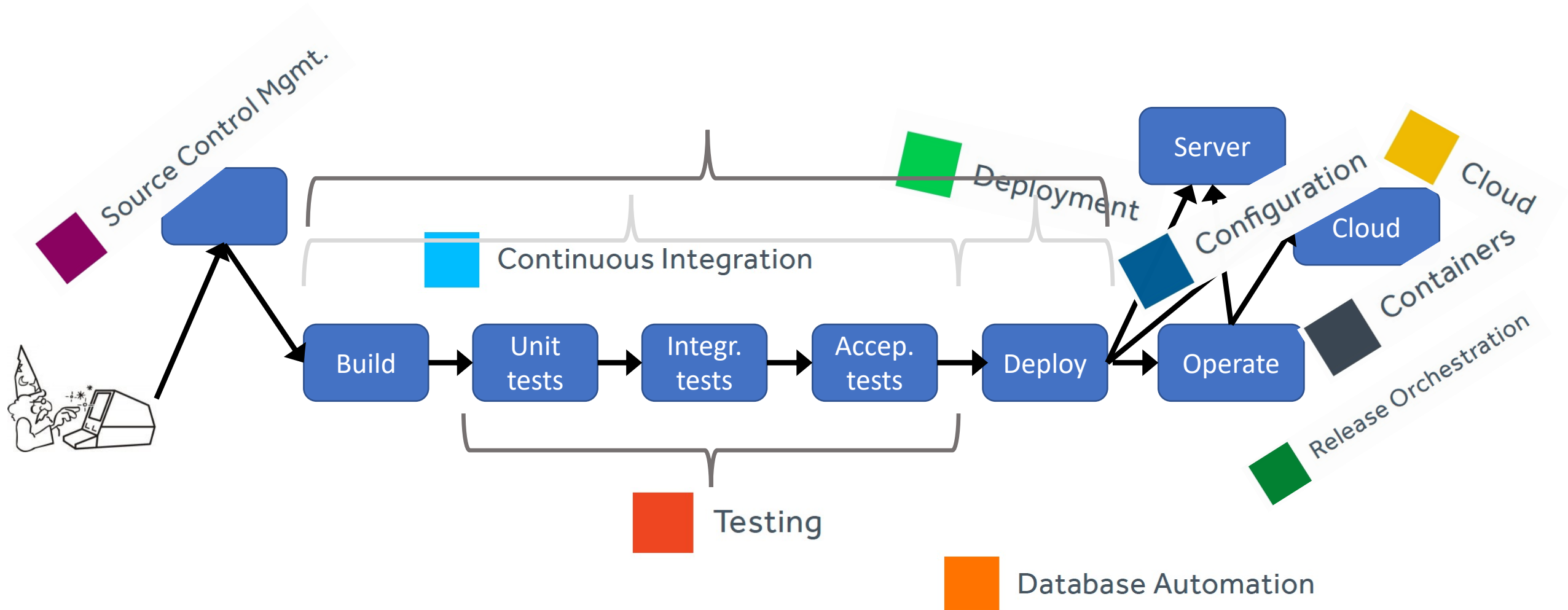
Collaboration

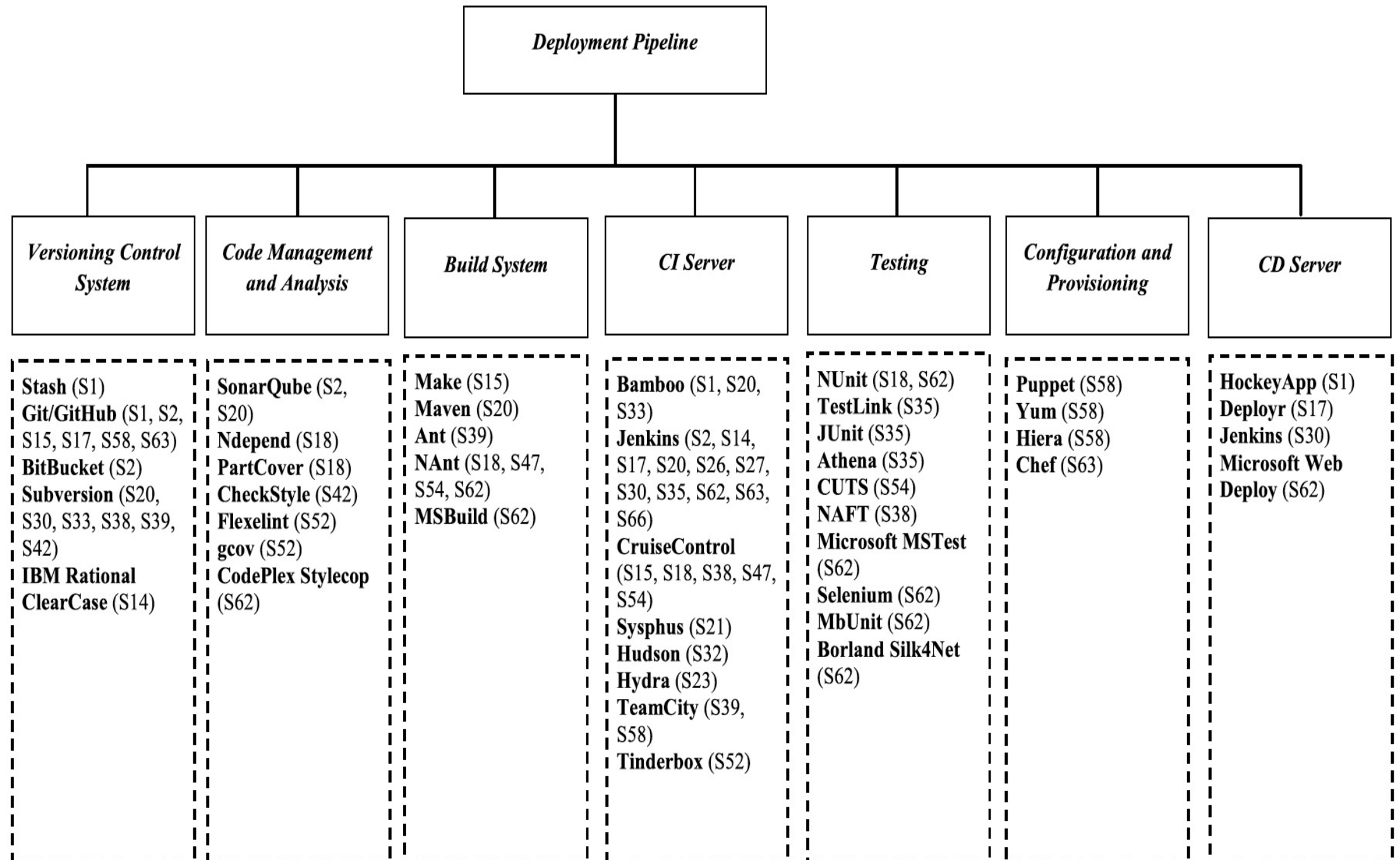


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Pipeline & periodic table





Implications to developers

<https://cloudrumblings.io/cloud-farm-pets-cattle-unicorns-and-horses-85271d915260>



Pets

Legacy Infrastructure

Pets are given names like grumpycat.petsstore.com They are unique, lovingly hand raised and cared for When they get ill, you nurse them back to health	
Infrastructure is a permanent fixture in the data center	
Infrastructure takes days to create, are serviced weekly, maintained for years, and requires migration projects to move	
Infrastructure is modified during maintenance hours and generally requires special privileges such as root access	
Infrastructure requires several different teams to coordinate and provision the full environment	
Infrastructure is static, requiring excess capacity to be dormant for use during peak periods of demands	
Infrastructure is an capital expenditure that charges a fix amount regardless of usage patterns	

Cattle

Cloud-Friendly Infrastructure



Cattle are given numbers like 10200713.cattlerancher.com They are almost identical to other cattle When they get ill, you replace them and get another	
Infrastructure is stateless, ephemeral, and transient	
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When your servers get sick, do you nurse them back to health or shoot them?

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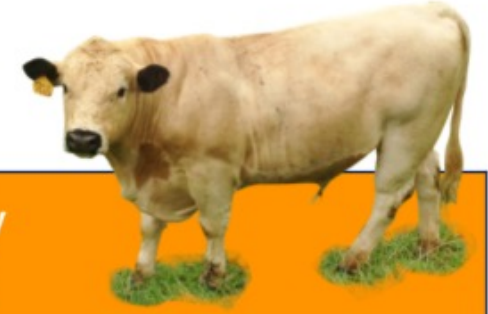
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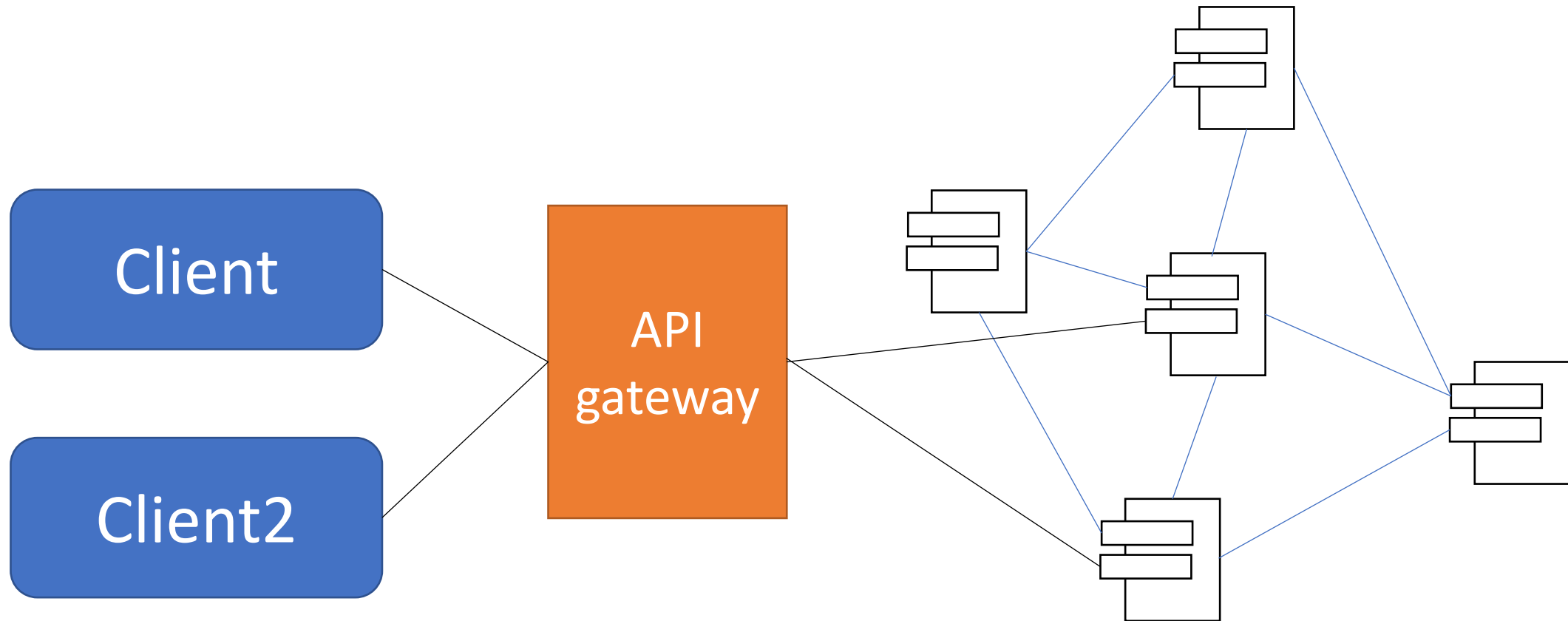
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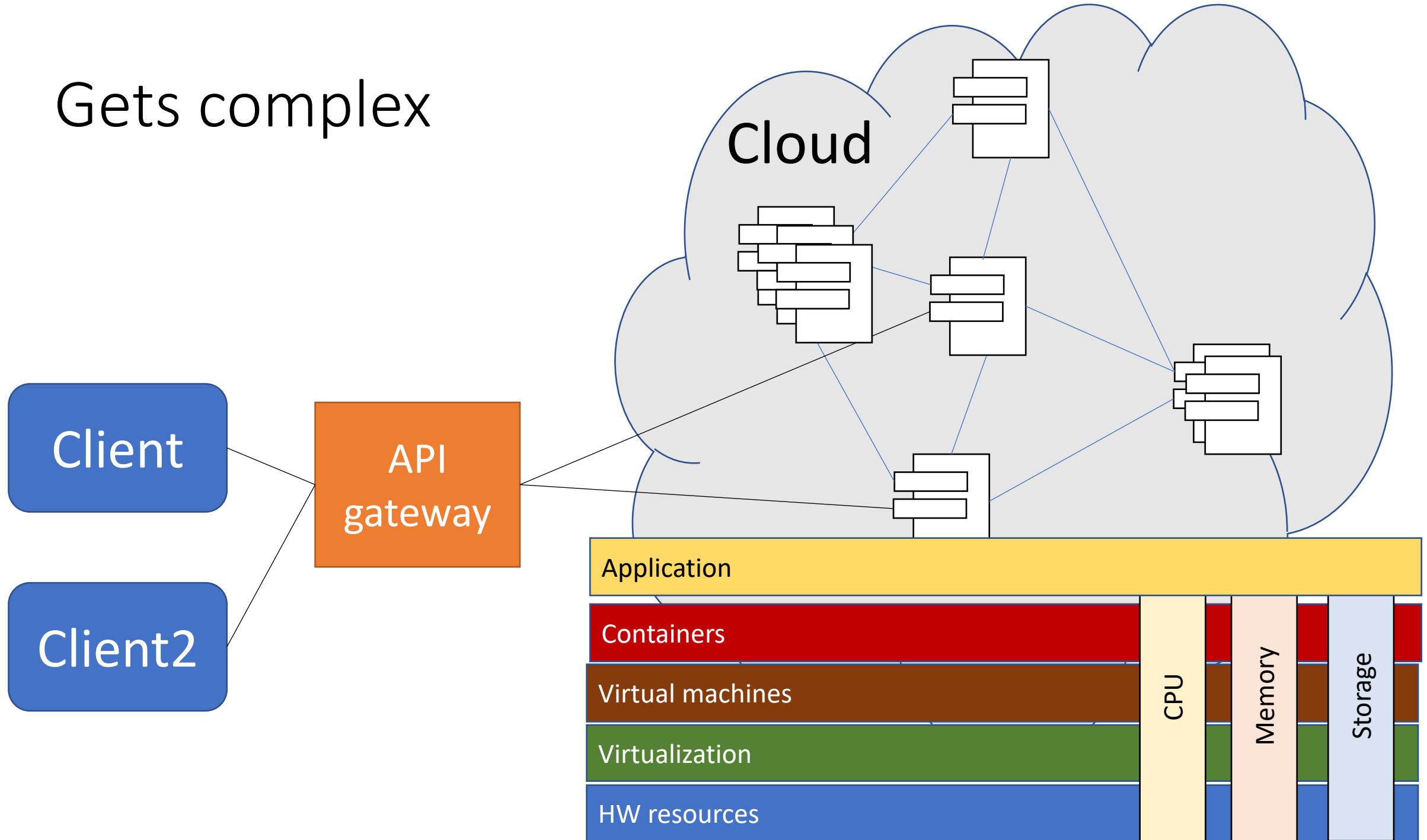
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How to monitor

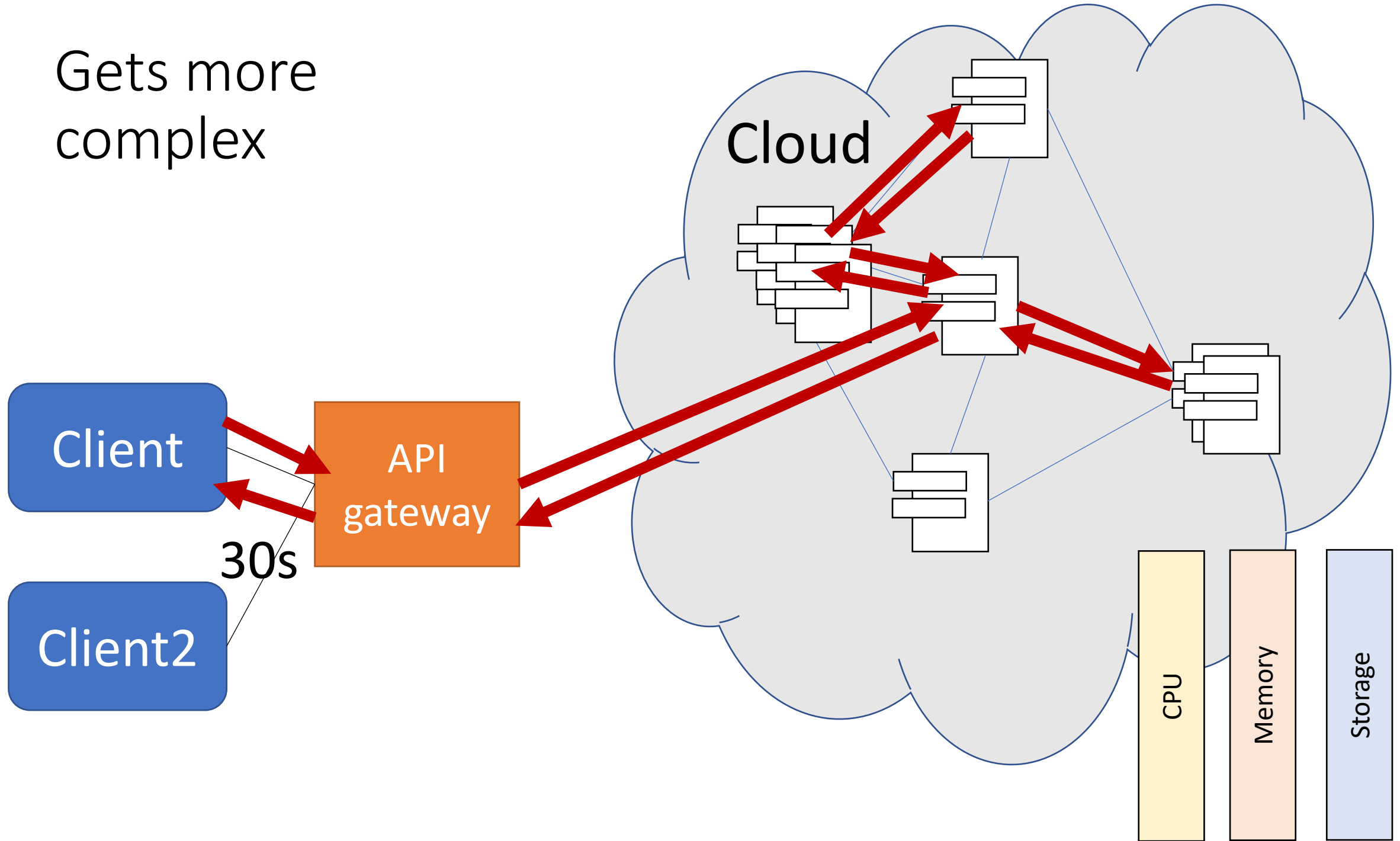
Recall a possible microservice architecture



Gets complex



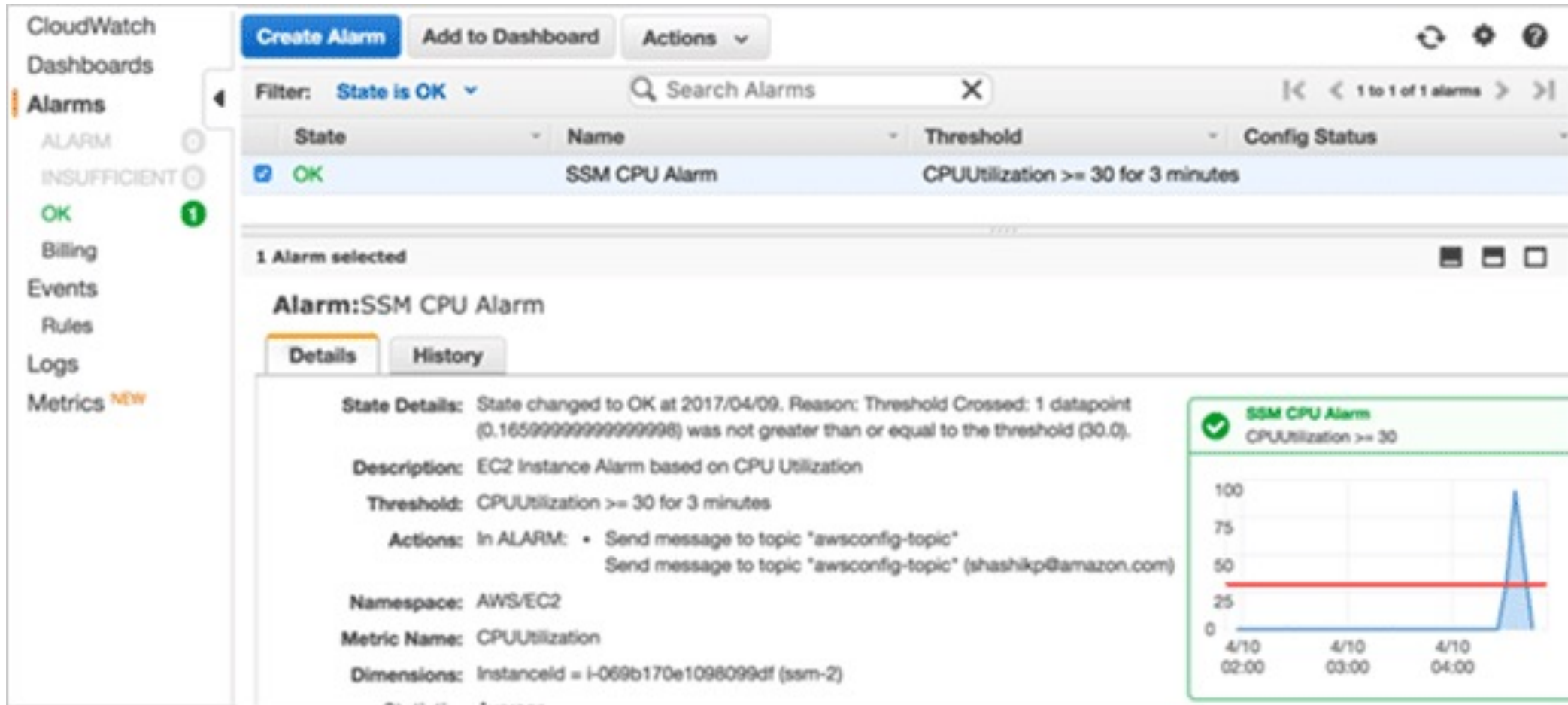
Gets more
complex



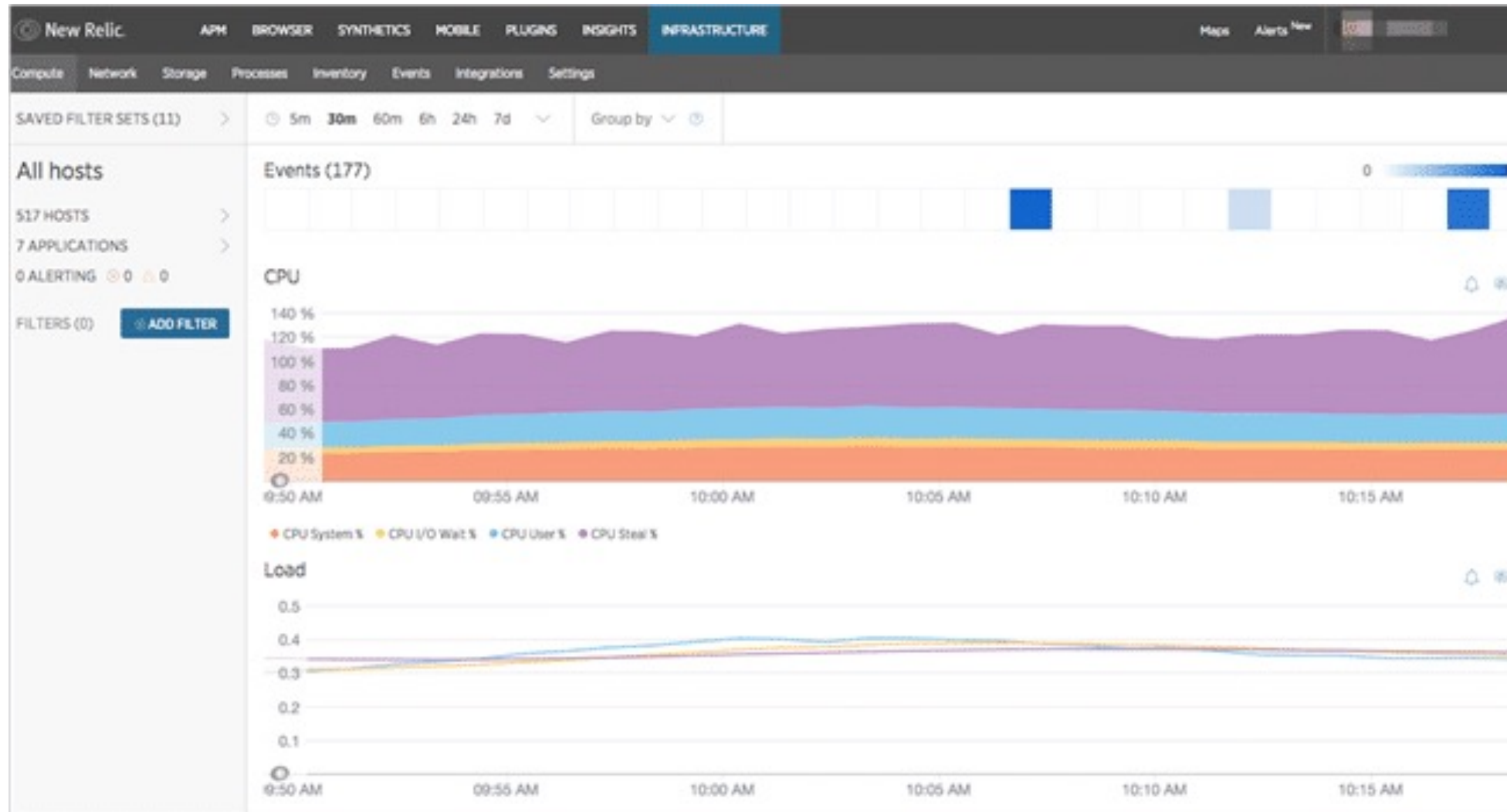
Is the problem

- In your application code?
- In your infrastructure code?

Example: Amazon CloudWatch



Example: New Relic





Sometimes
separated

Client

Client2

API
gateway

Containers

Virtual Machines

Virtualization

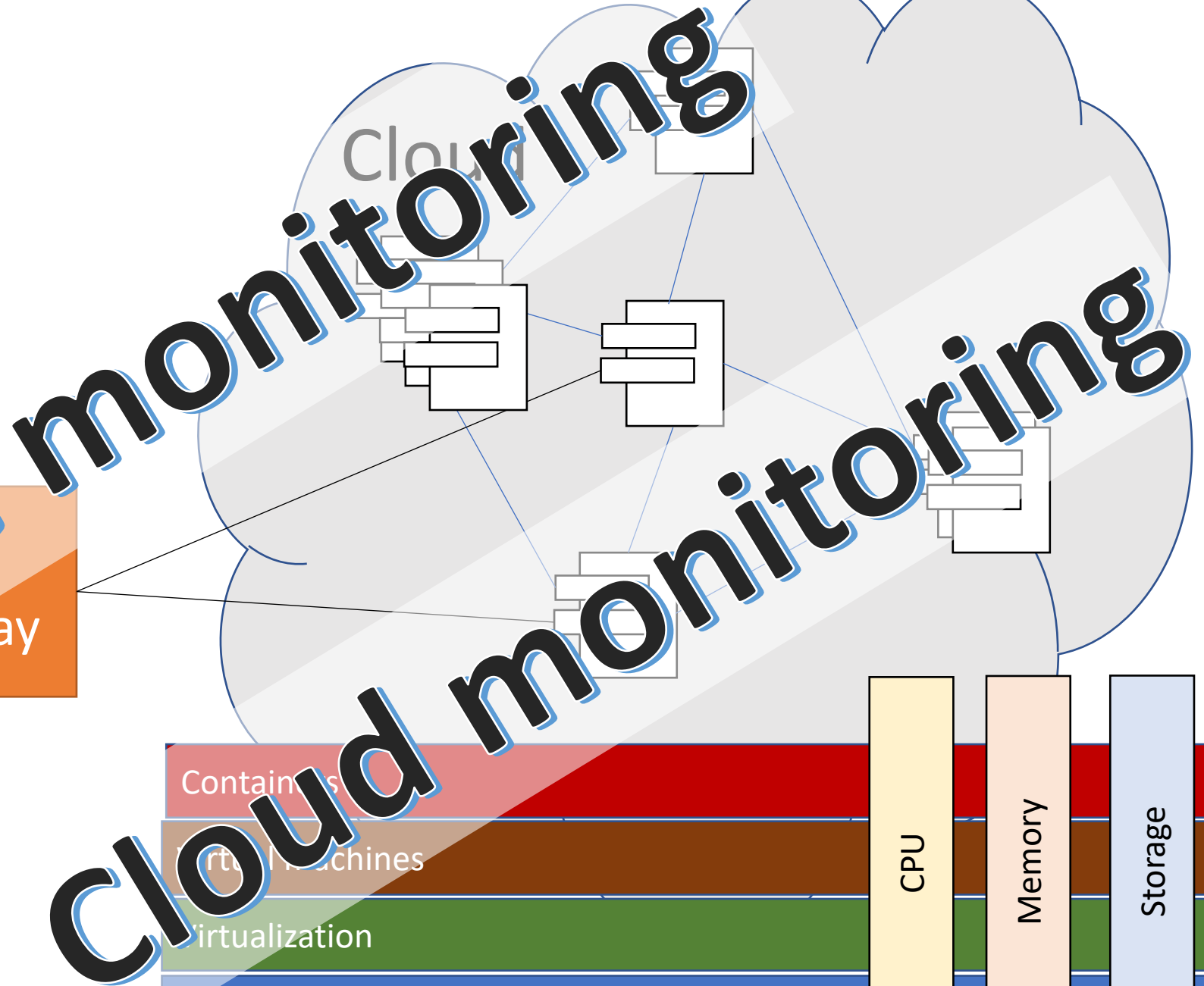
HW resources

CPU

Memory

Storage

Cloud



What might be monitored

- Availability
- MTBF (mean time between failures)
- Throughput
- Response time
- Latency
- Security threats
- Scalability
- Cost per customer
- Usage (recall A/B testing)
- Application specific measures

In your project

- *(Optional)* implement monitoring and logging for troubleshooting. This should be a separate service that the user can use through browser. It should show at least start time of the service, number of requests it has received after start.
- Waiting for creative solutions !

Couple of cloud quality "terms"

- QoS (Quality of Service): measure of capacity, performance etc.
- SLA (Service Level Agreement): an agreement between provider client about capacity, performance etc.
 - Or at least promise

<https://www.wired.com/insights/2011/12/service-level-agreements-in-the-cloud-who-cares/>

(Thomas J. Trappler; “If It’s in the Cloud, Get it on Paper: Cloud Computing Contract Issues”

<https://er.educause.edu/articles/2010/6/if-its-in-the-cloud-get-it-on-paper-cloud-computing-contract-issues.>)

- Codifies the specific parameters and minimum levels required for each element of the service, as well as remedies for failure to meet those requirements.
- Affirms your institution’s ownership of its data stored on the service provider’s system, and specifies your rights to get it back.
- Details the system infrastructure and security standards to be maintained by the service provider, along with your rights to audit their compliance.
- Specifies your rights and cost to continue and discontinue using the service.

- Availability (e.g. 99.99% during work days, 99.9% for nights/weekends)
- Performance (e.g. maximum response times)
- Security / privacy of the data (e.g. encrypting all stored and transmitted data)
- Disaster Recovery expectations (e.g. worse case recovery commitment)
- Location of the data (e.g. consistent with local legislation)
- Access to the data (e.g. data retrievable from provider in readable format)
- Portability of the data (e.g. ability to move data to a different provider)
- Process to identify problems and resolution expectations (e.g. call center)
- Change Management process (e.g. changes – updates or new services)
- Dispute mediation process (e.g. escalation process, consequences)
- Exit Strategy with expectations on the provider to ensure smooth transition

Rest of the course

- 23.11: Two guest lectures
 - PolarSquad
 - Knowit (ex Cybercom)
- 30.11: Guest lecture (Unikie) + Kubernetes
- 07.12: Recap