Intro to Infrastructure as Code

Introduction to Chef

All Things Open – October 2014

https://github.com/nathenharvey/ato-2014

CHEF

Nathen Harvey

- Community Director at Chef
- Co-host of the Food Fight Show
- Co-organizer of DevOpsDC meetup
- Occasional farmer – http://bit.ly/farmer-nathen

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- nharvey@getchef.com

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Hello!

- System Administrator?

Hello!

- System Administrator?
- Developer?

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- Developer?
  - Ruby developer?

Hello!

- System Administrator?
- Developer?
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- DevOp?

Hello!

- System Administrator?
- Developer?
  - Ruby developer?
- DevOp?
- Business Person?

Are you experienced?

- Experience with Infrastructure as Code or Configuration Management?

Are you experienced?

- Experience with Infrastructure as Code or Configuration Management?
- Experience with Chef?

Which version control system do your use?

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- `cp foo foo.bak`

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- `cp foo foo.bak`
- `cp foo{,.`date +%Y%m%d%H%M`}`

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Which version control system do your use?

- `cp foo foo.bak`
- `cp foo{,.`date +%Y%m%d%H%M`}`
- `cp foo{,.`date +%Y%m%d%H%M`-`$USER`}`

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Infrastructure as Code

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The Sys Admin's Journey

- ssh

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- Store notes in `~/server.txt`

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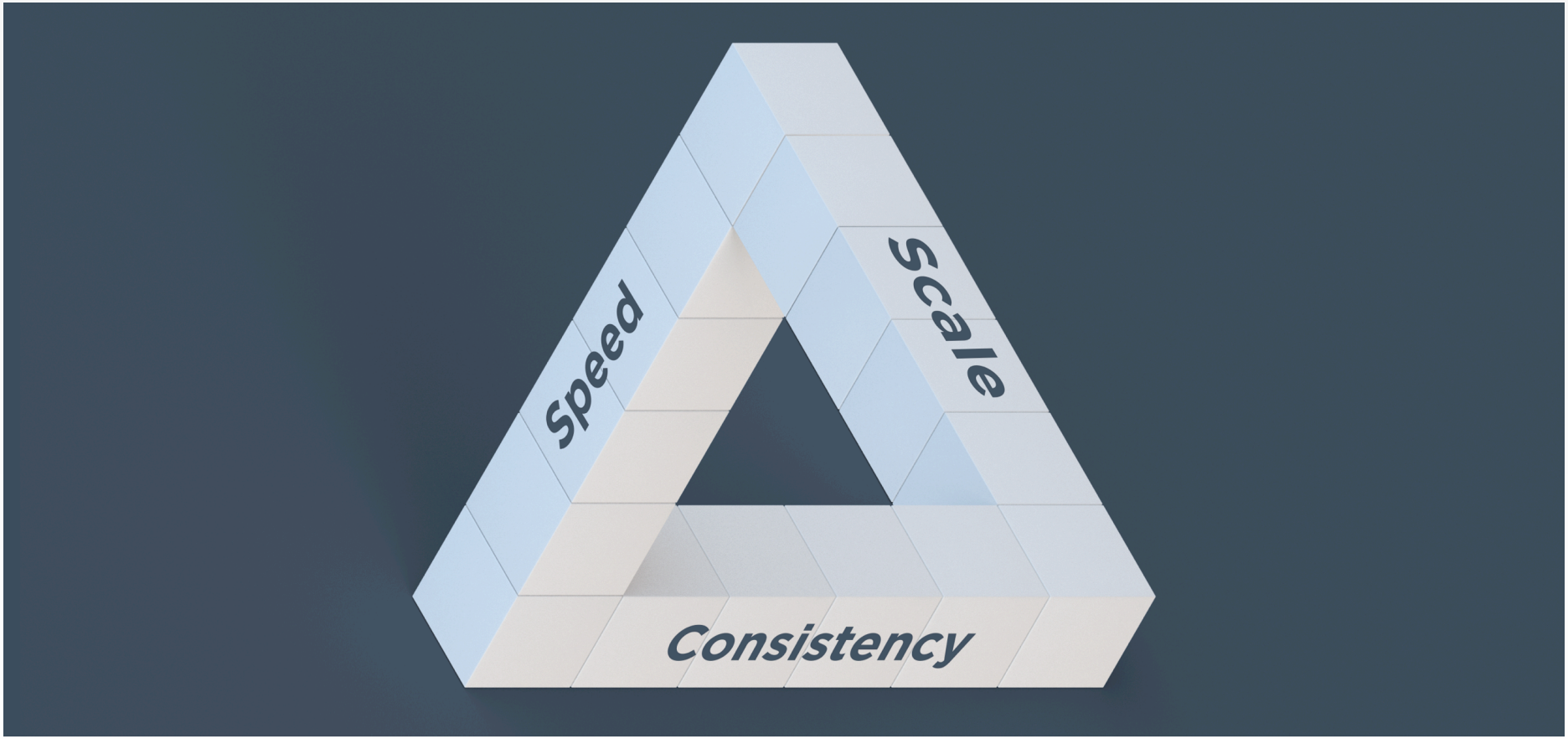
The Sys Admin's Journey

- ssh
- Store notes in `~/server.txt`
- Move notes to the wiki
- Write some scripts (`setup.sh`, `fixit.sh`, etc.)
- Golden images and snapshots
- Policy-driven configuration management

Benefits of Automation



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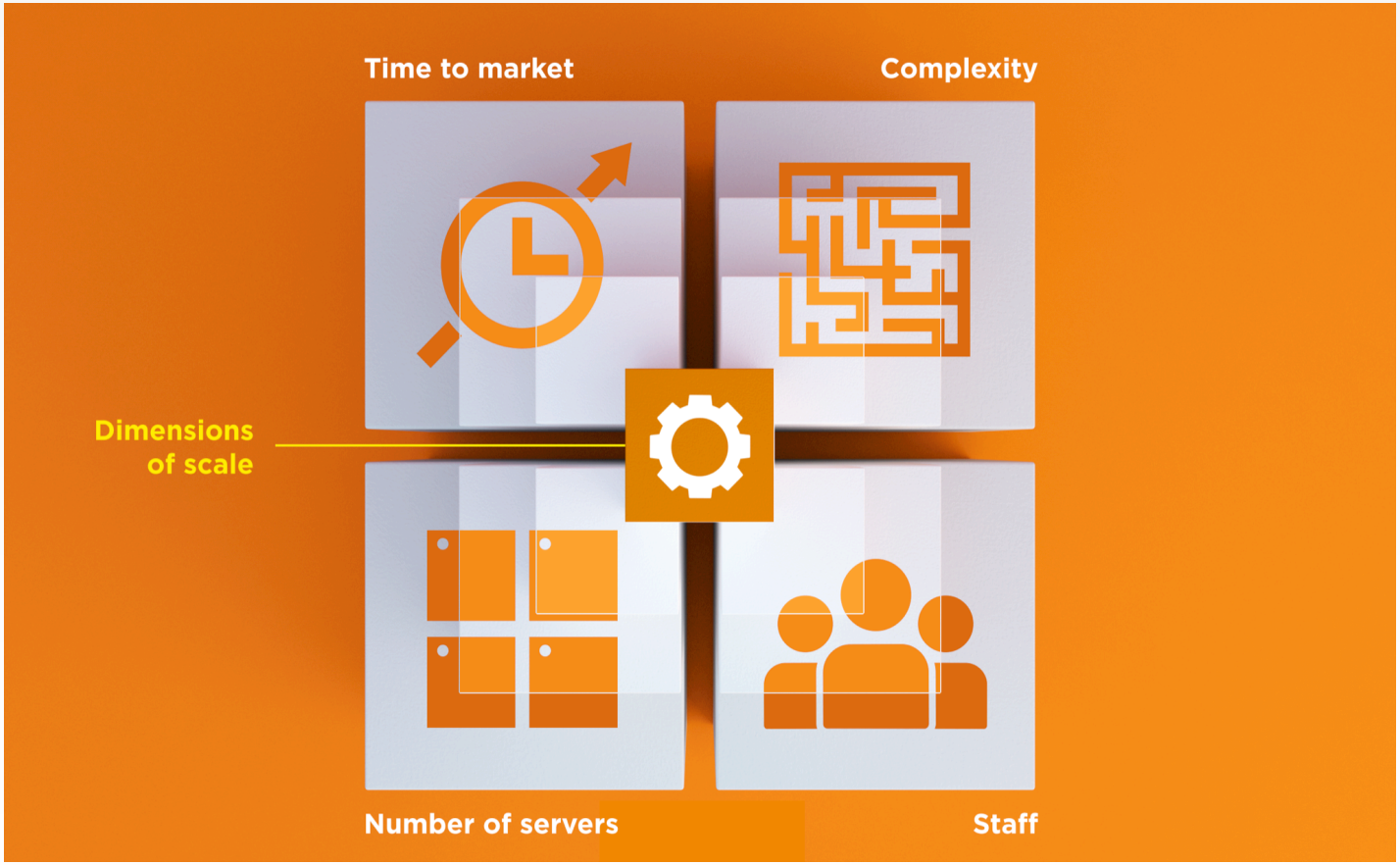
Dimensions of Scale



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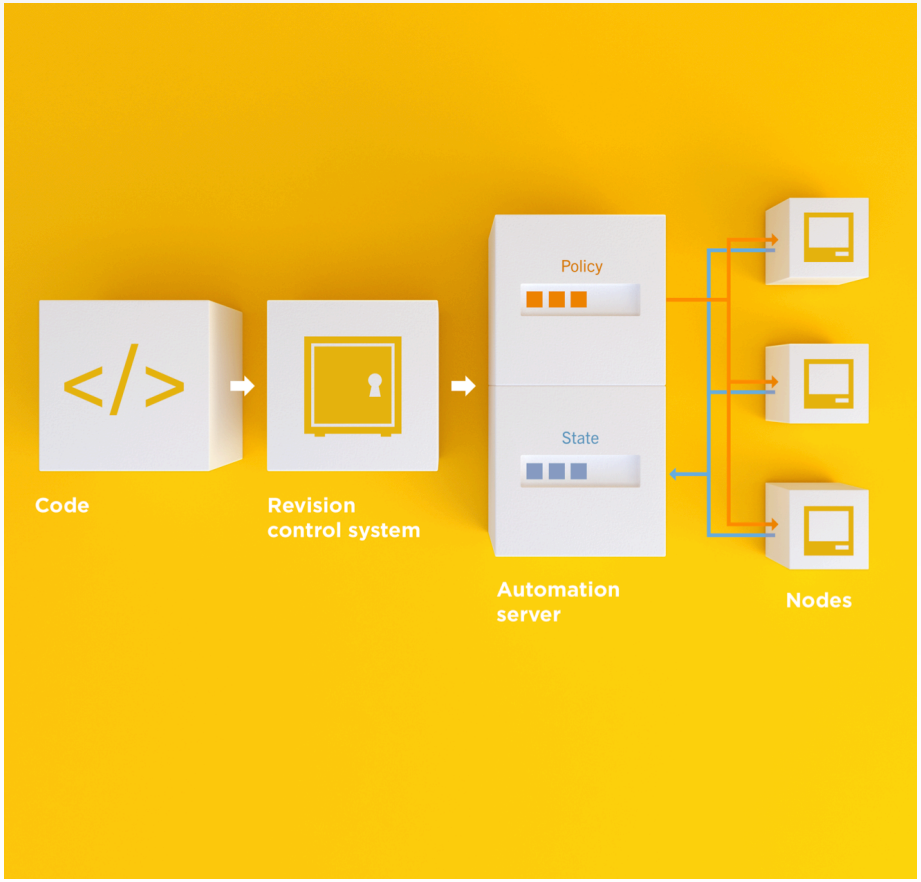
Automation Platform

- Creates a dependable view of your entire network's state.
- Can handle complex dependencies among the nodes of your network.
- Is fault tolerant.
- Is secure.
- Can handle multiple platforms
- Can manage cloud resources
- Provides a foundation for innovation

Infrastructure as Code



- Programmatically provision and configure components

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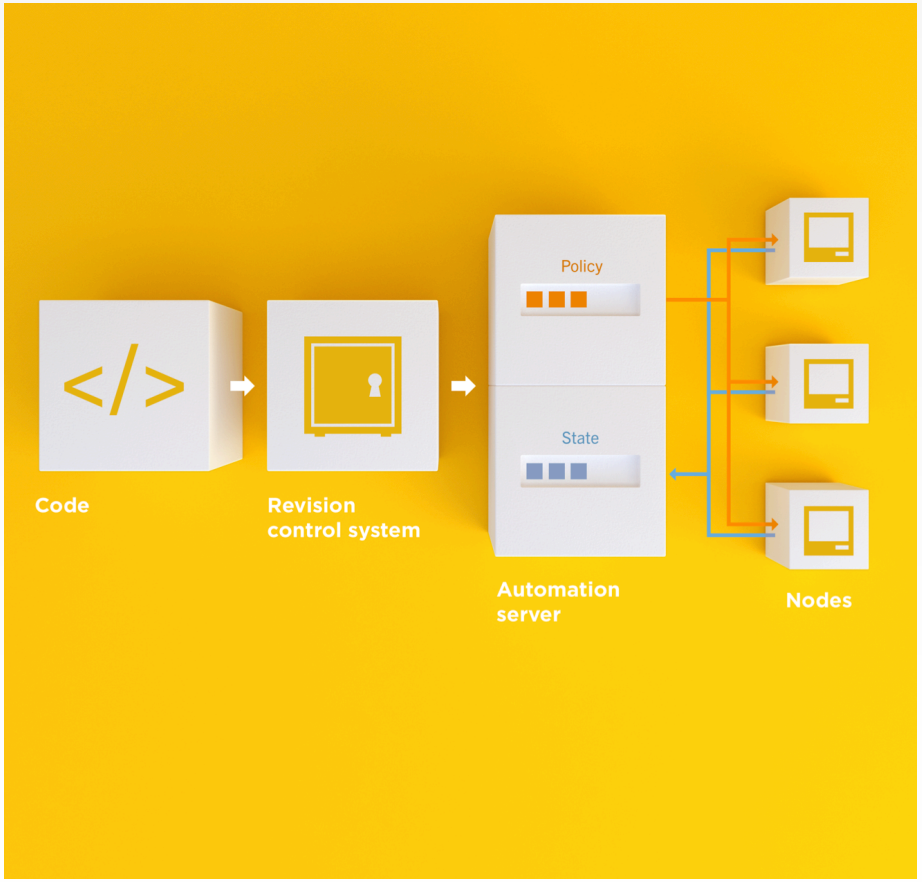
Infrastructure as Code



- Treat like any other code base

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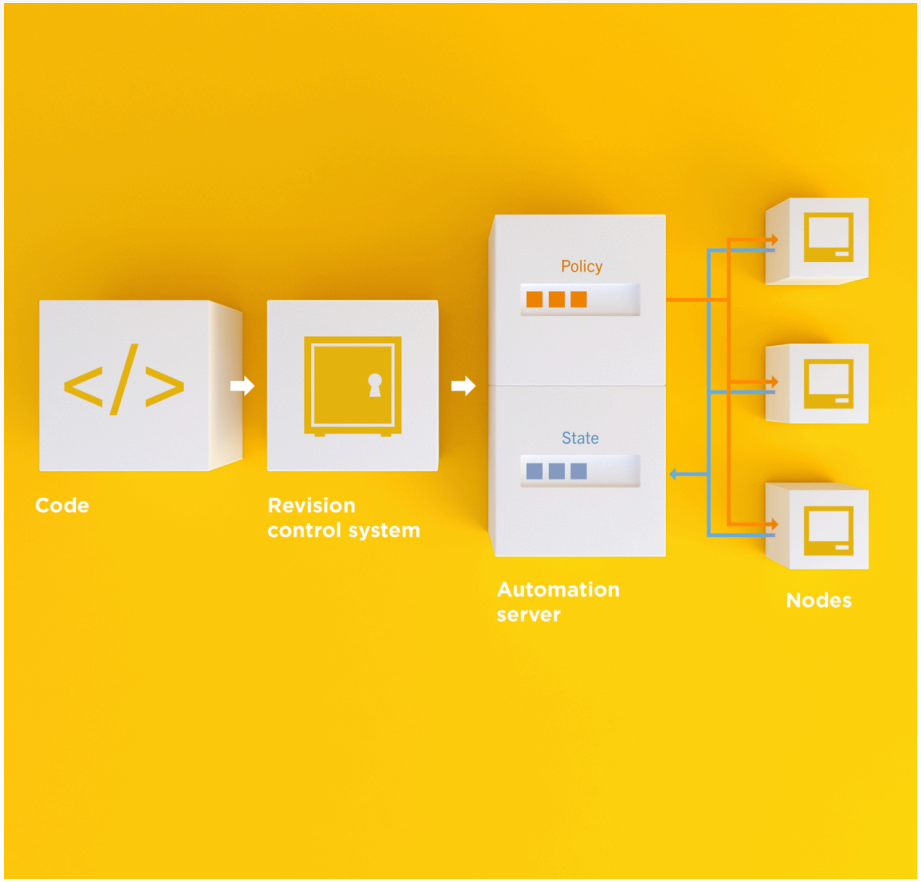
Infrastructure as Code



- Reconstruct business from code repository, data backup, and compute resources

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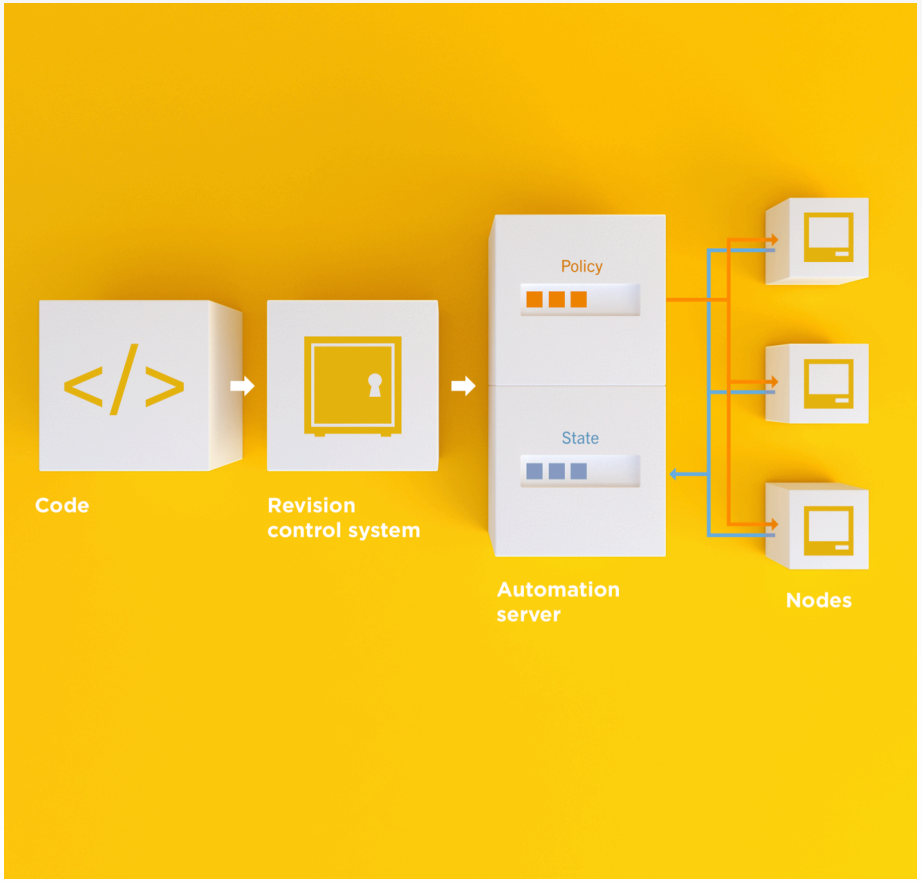
Infrastructure as Code



- Programmatically provision and configure components
- Treat like any other code base
- Reconstruct business from code repository, data backup, and compute resources

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Policy-based

- You capture the policy for your infrastructure in code
- A program ensures each node in your infrastructure complies with the policy
- A control loop keeps the system stable and allows for change when policy is updated

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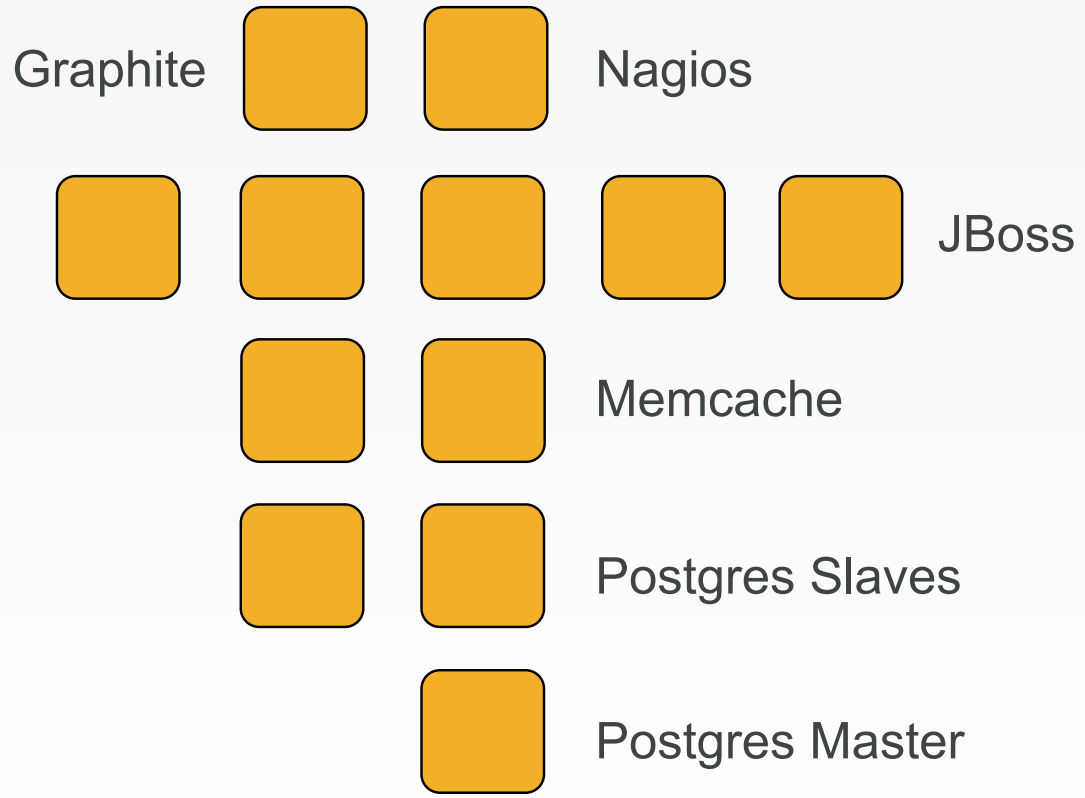
Sample Infrastructure



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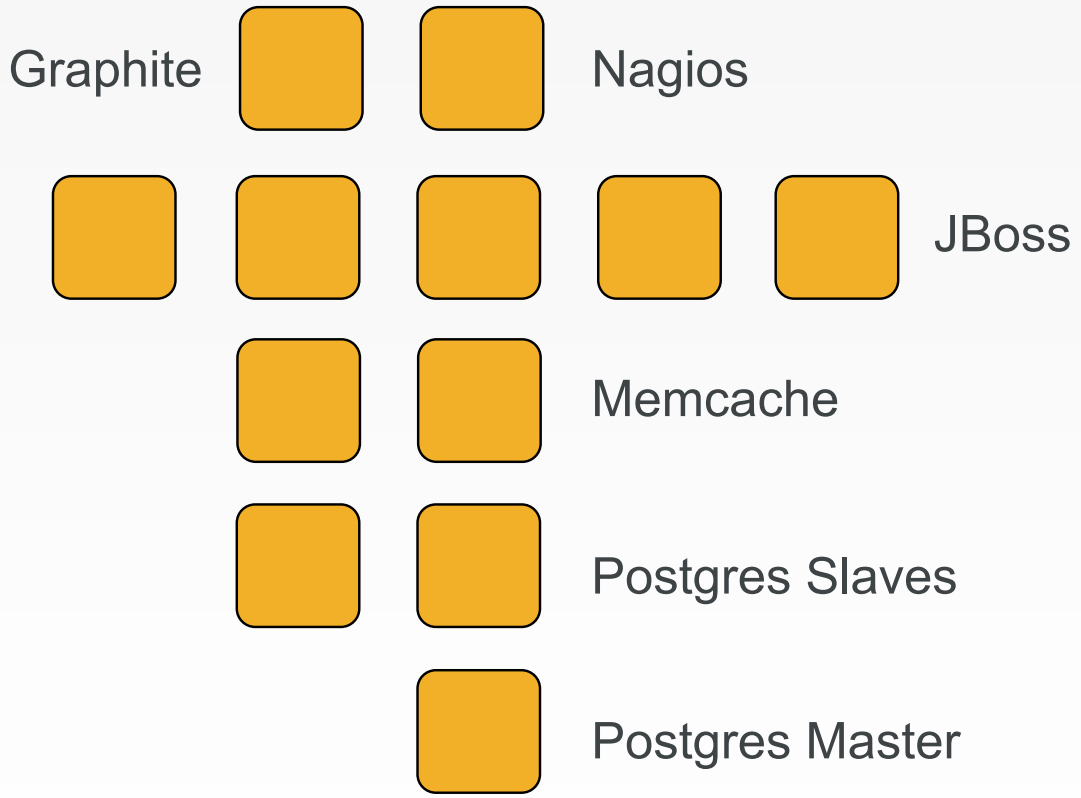
New Compliance Mandate!



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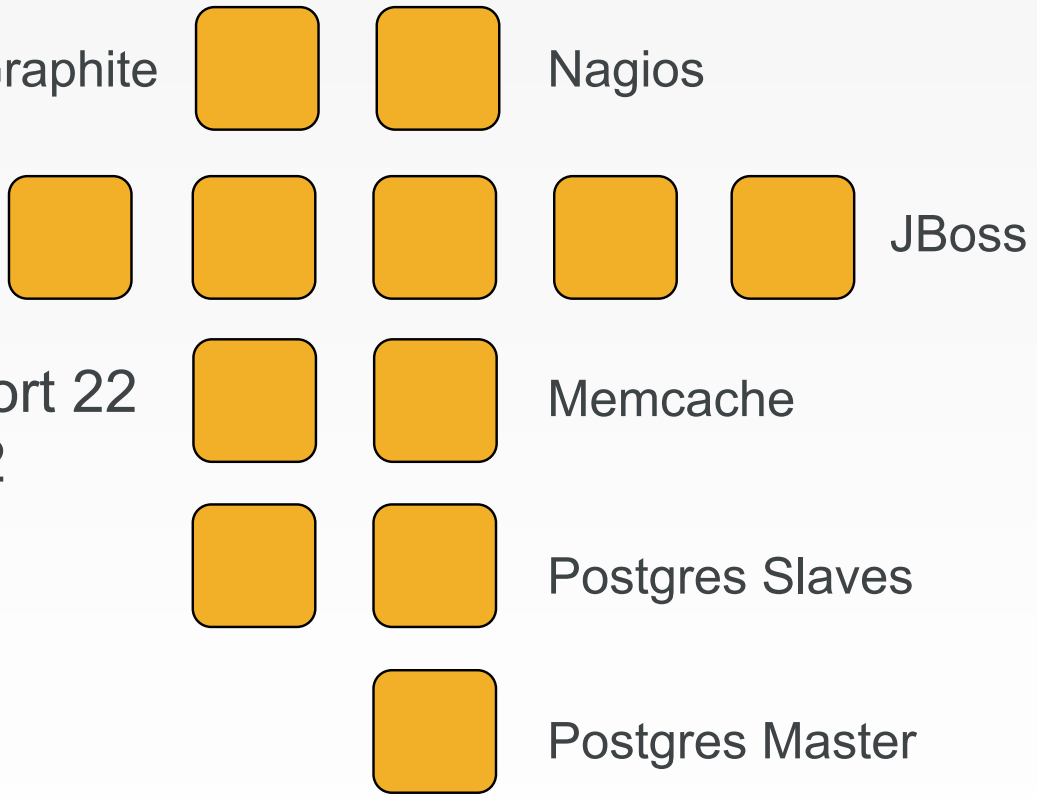
New Compliance Mandate!

- Move SSH off of port 22
- Let's put it on 2022



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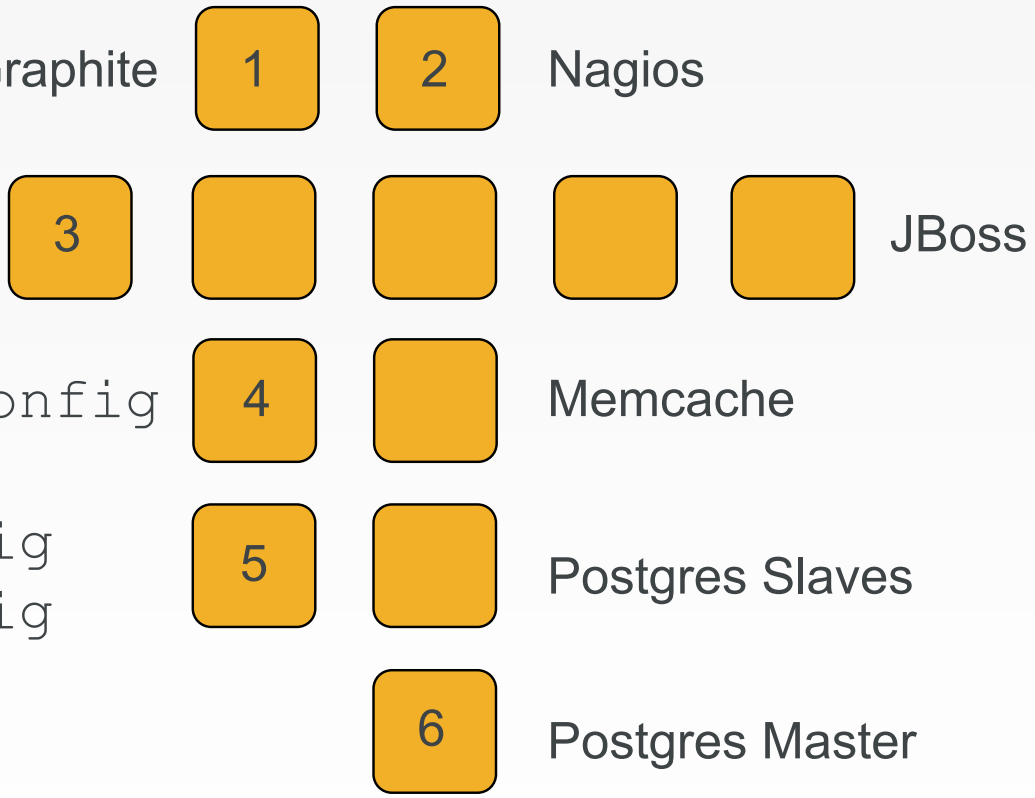
6 Golden Images to Update




```
/etc/ssh/sshd_config

--- a/sshd_config
+++ b/sshd_config

-Port 22
+Port 2202
```

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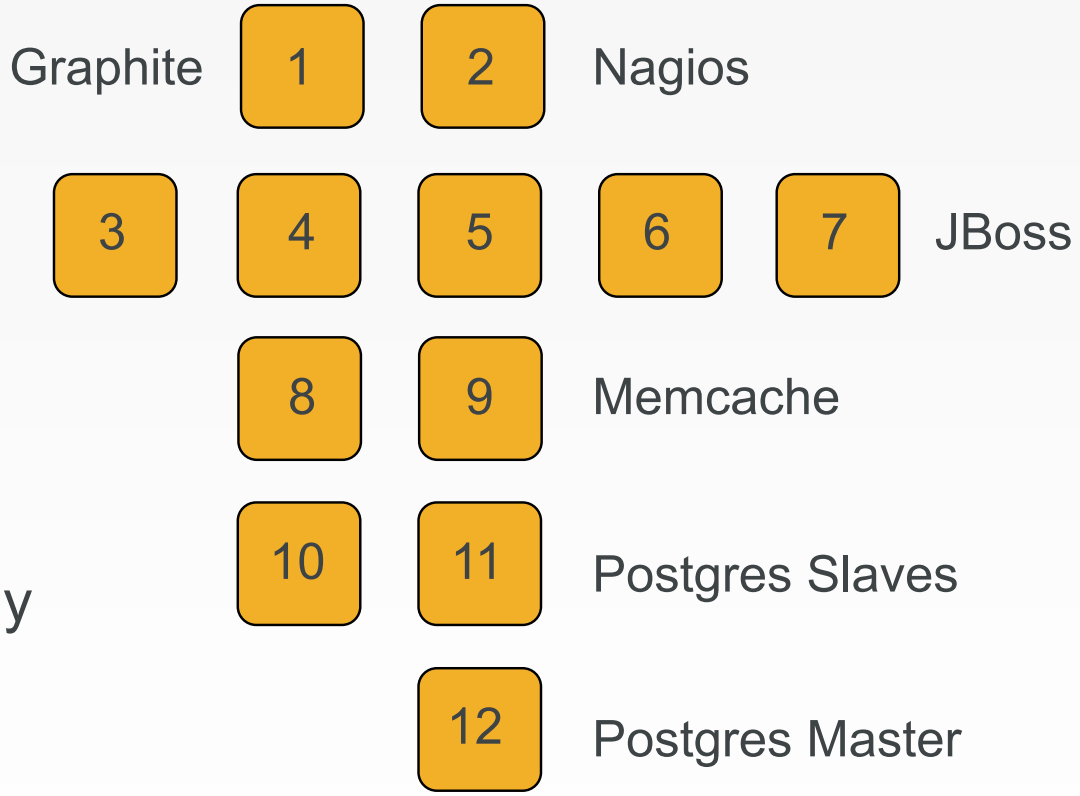
12 Instances to replace



- Launch
- Delete
- Repeat
- Typically manually

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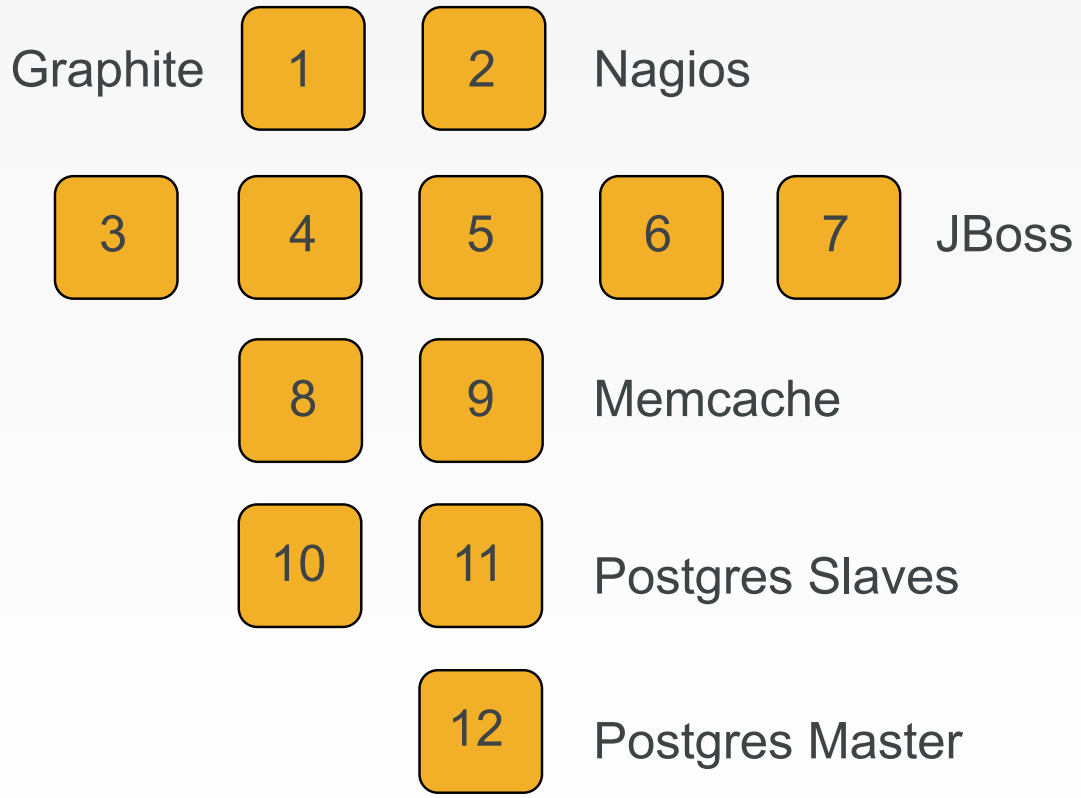
Done in maintenance window

- High stakes
- Late hours
- Risky change



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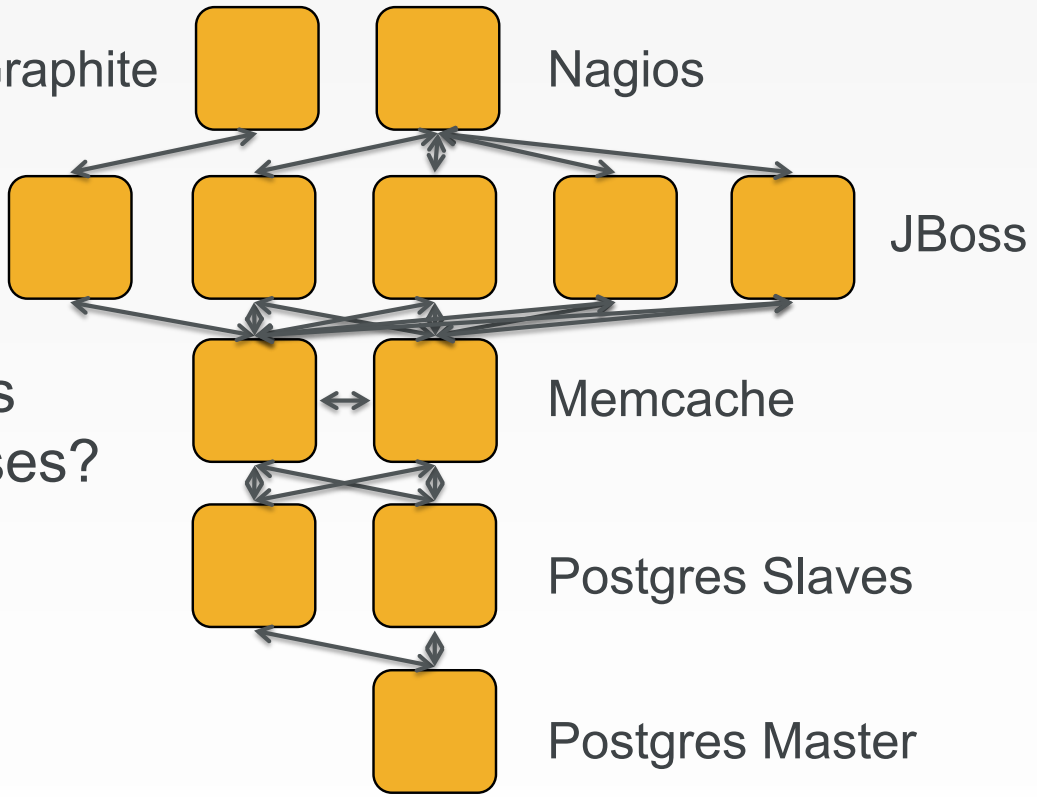
New configurations required?



Do the new instances have new IP Addresses?

* Not all connections shown

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Chef

Fast, scalable, flexible IT automation

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What is Chef

- Open source framework for managing complexity in your infrastructure through policy-driven automation code
- A community of professionals
- A company

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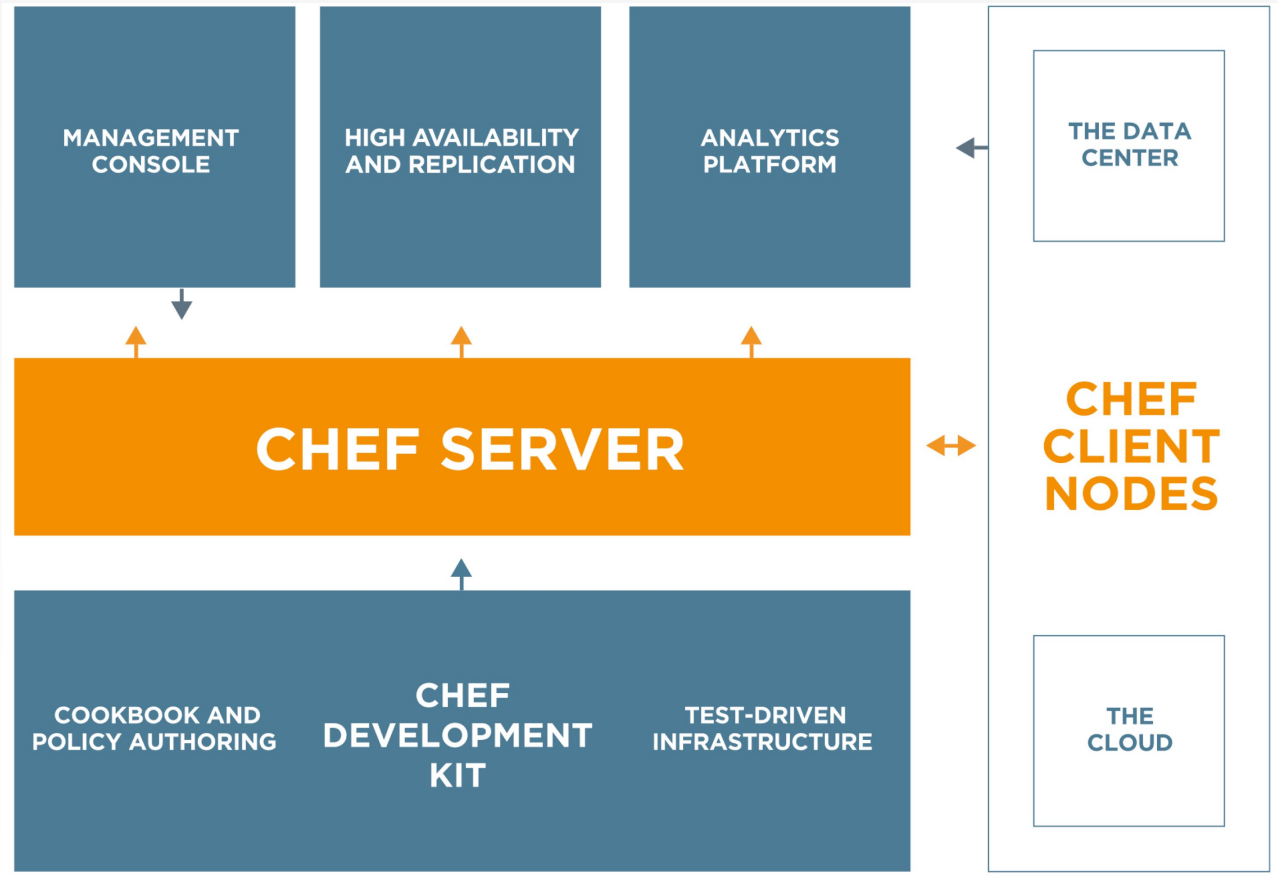

https://www.getchef.com/chef/

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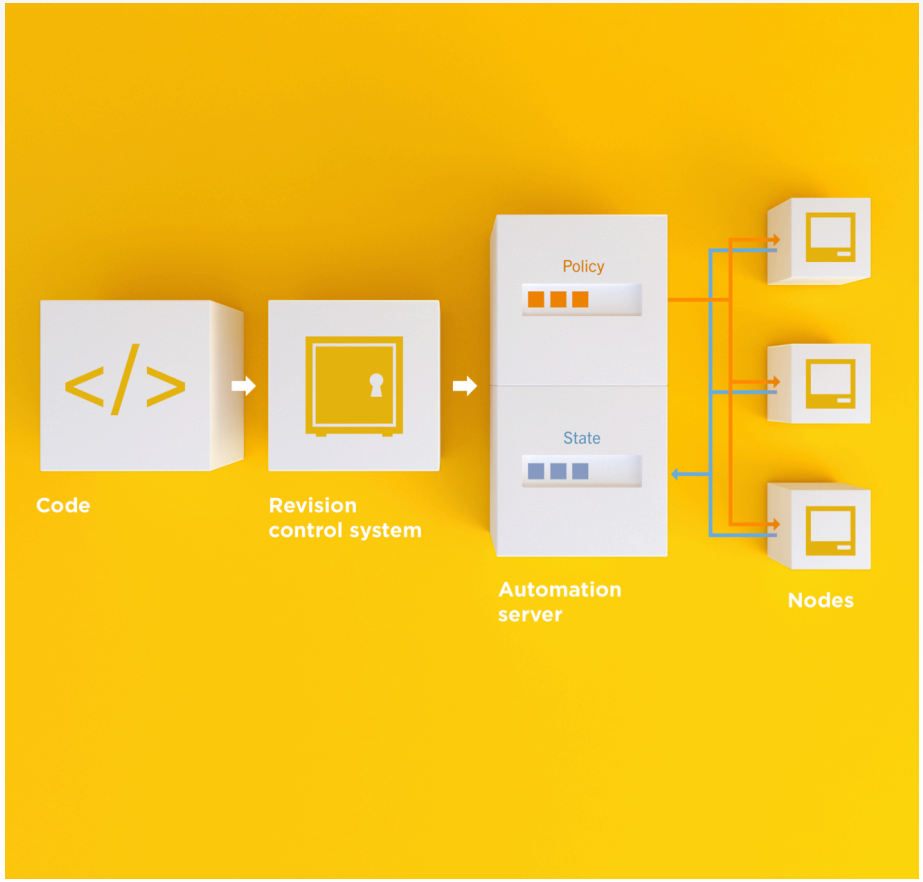
Chef Server – Policy & State



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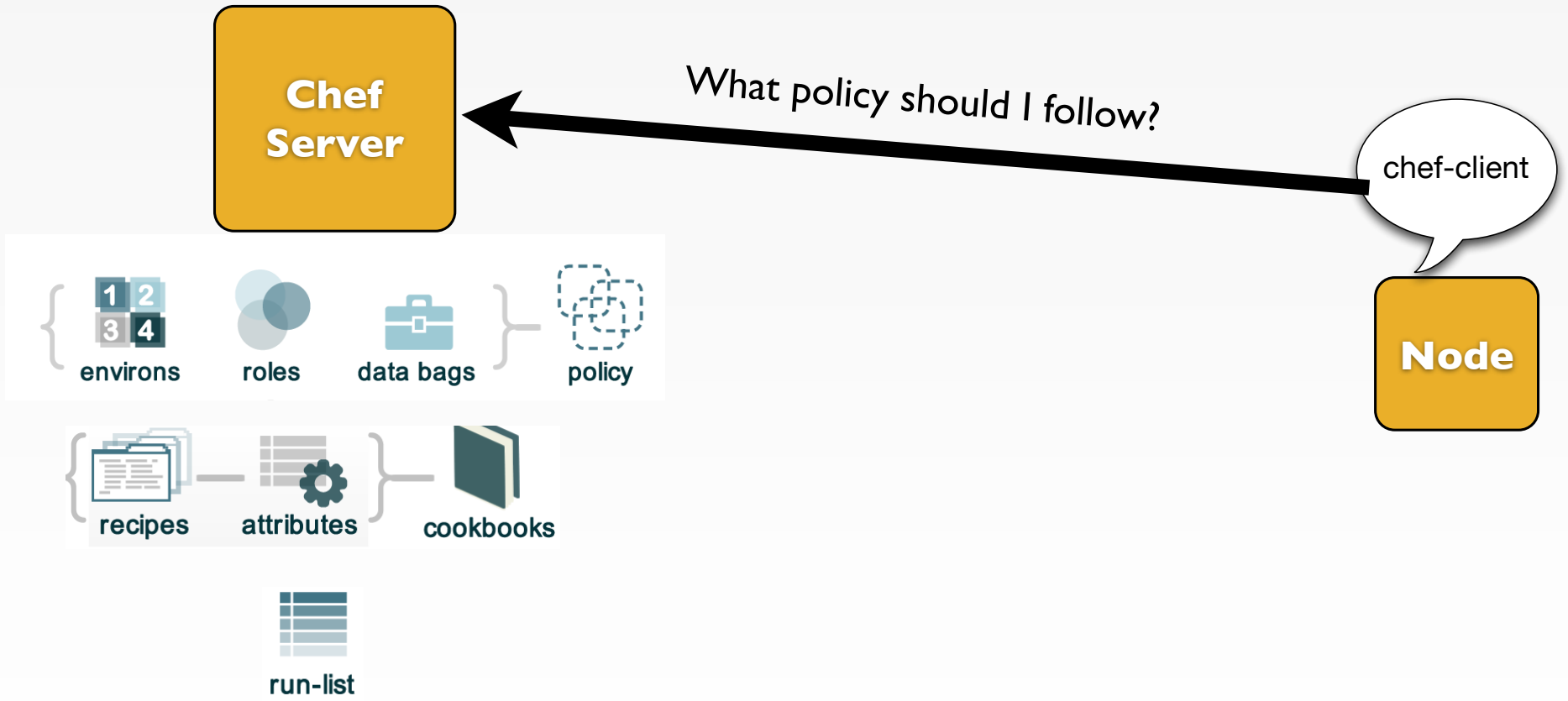
Desired Configuration



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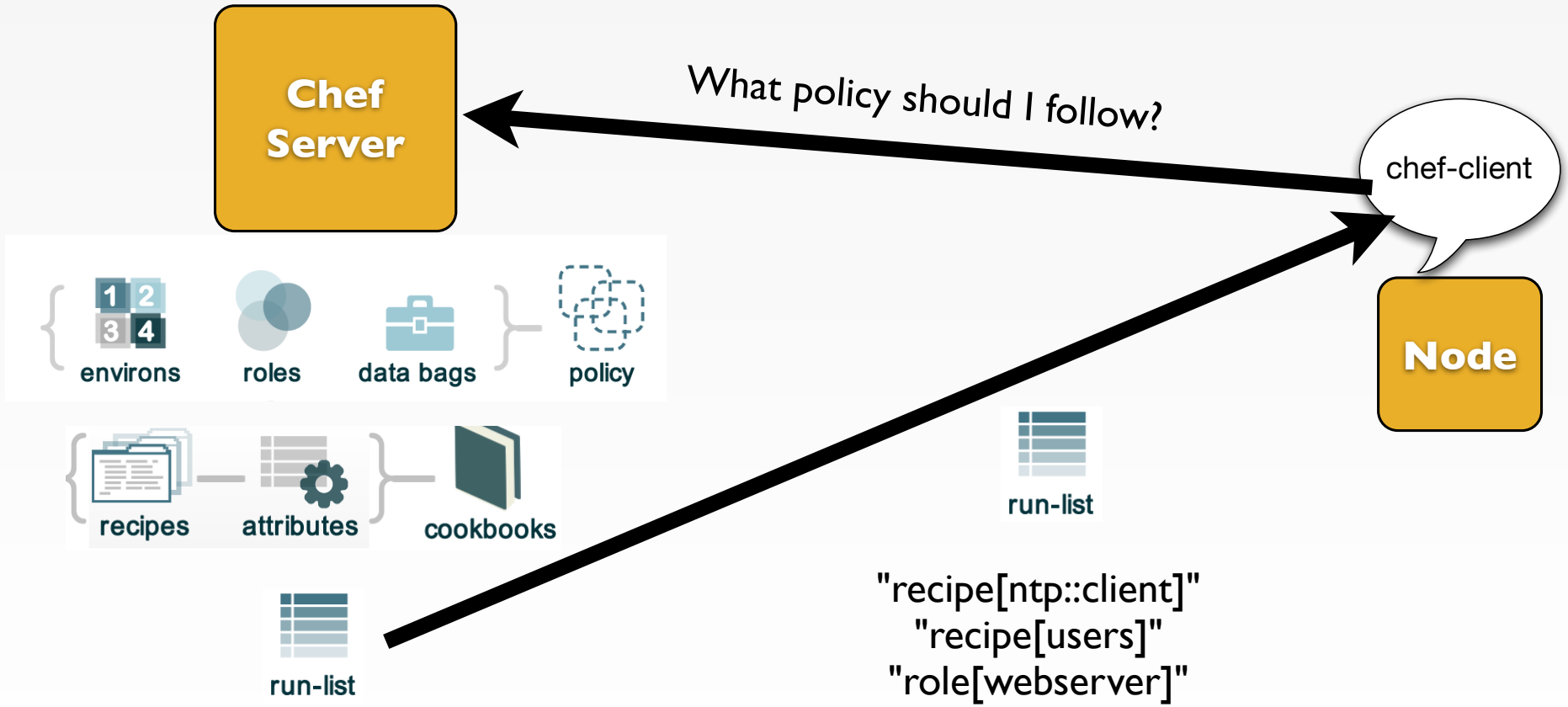

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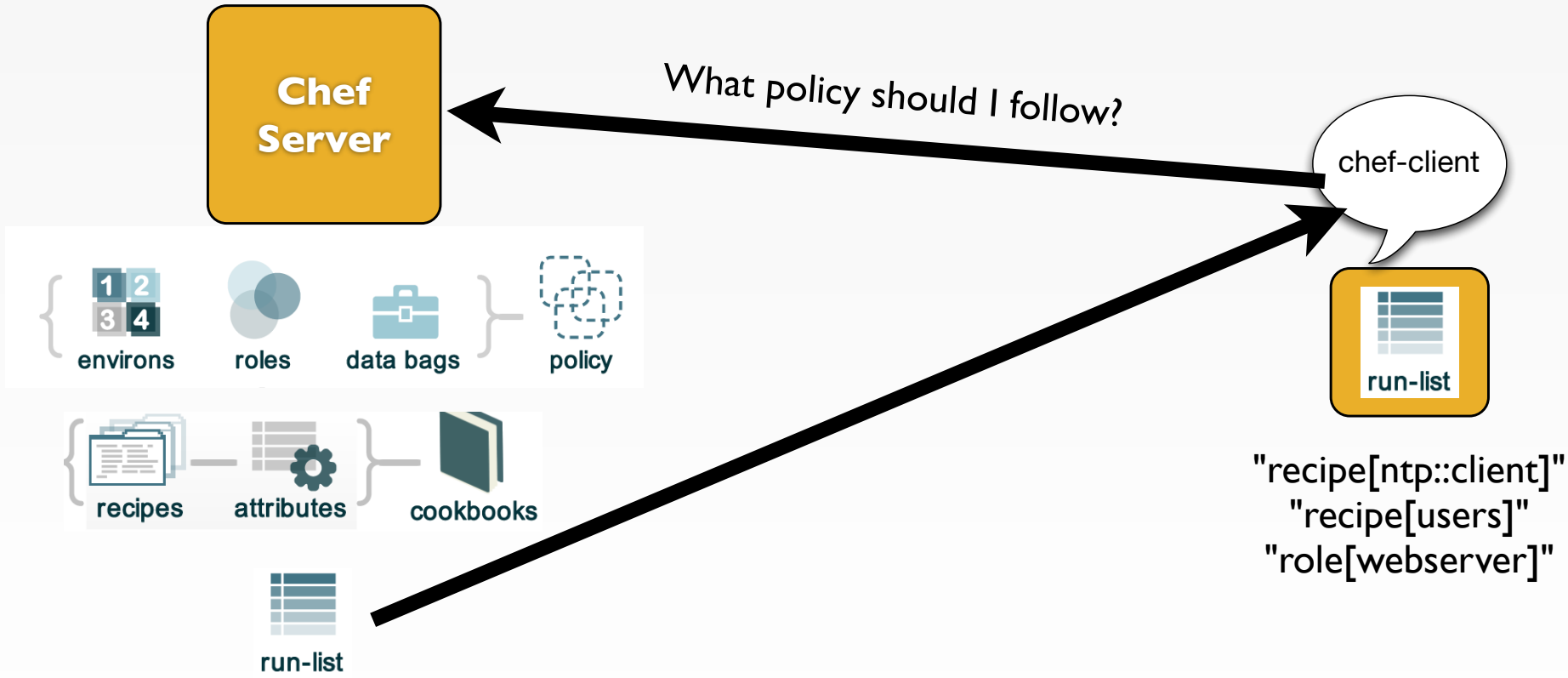

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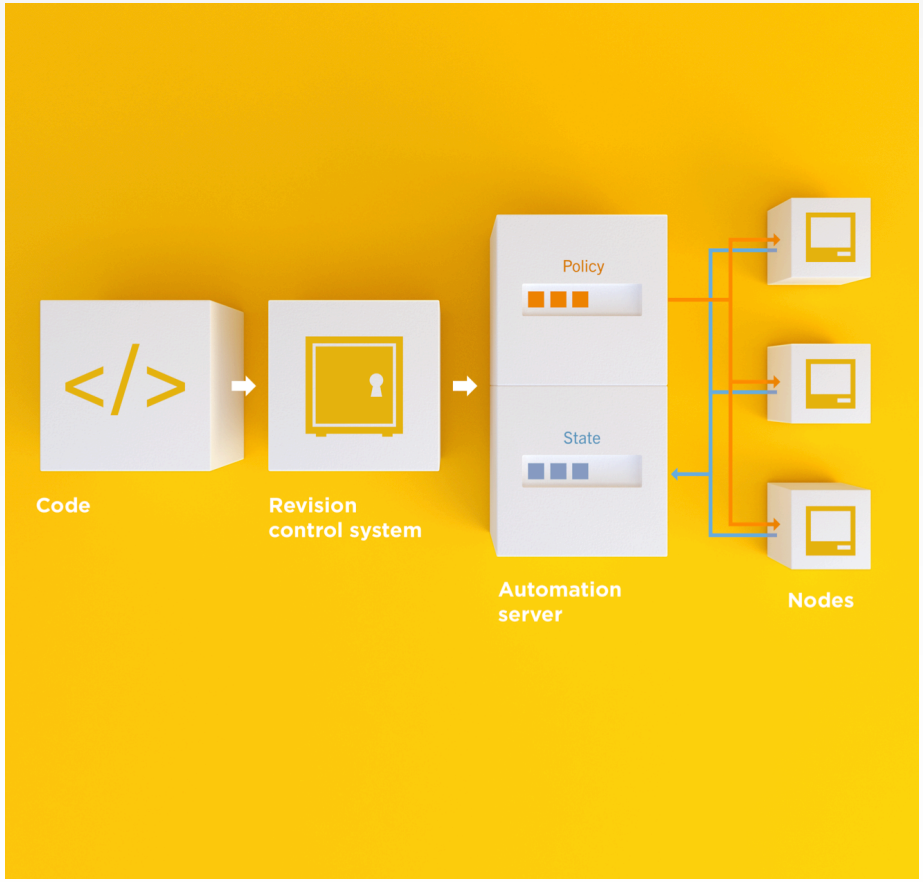
Chef Server – Policy & State



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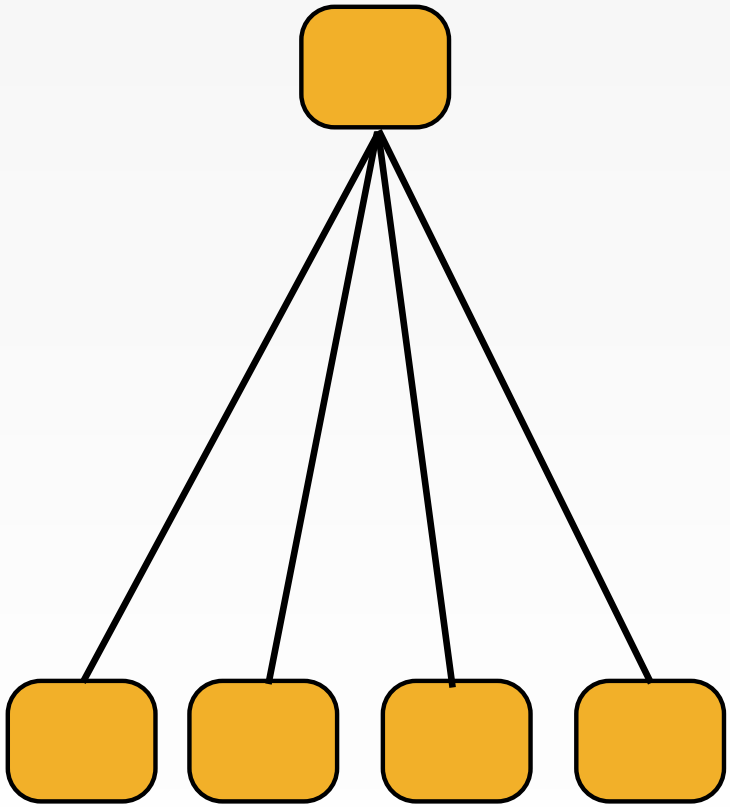
HA Proxy Configuration



HA Proxy

Webservers

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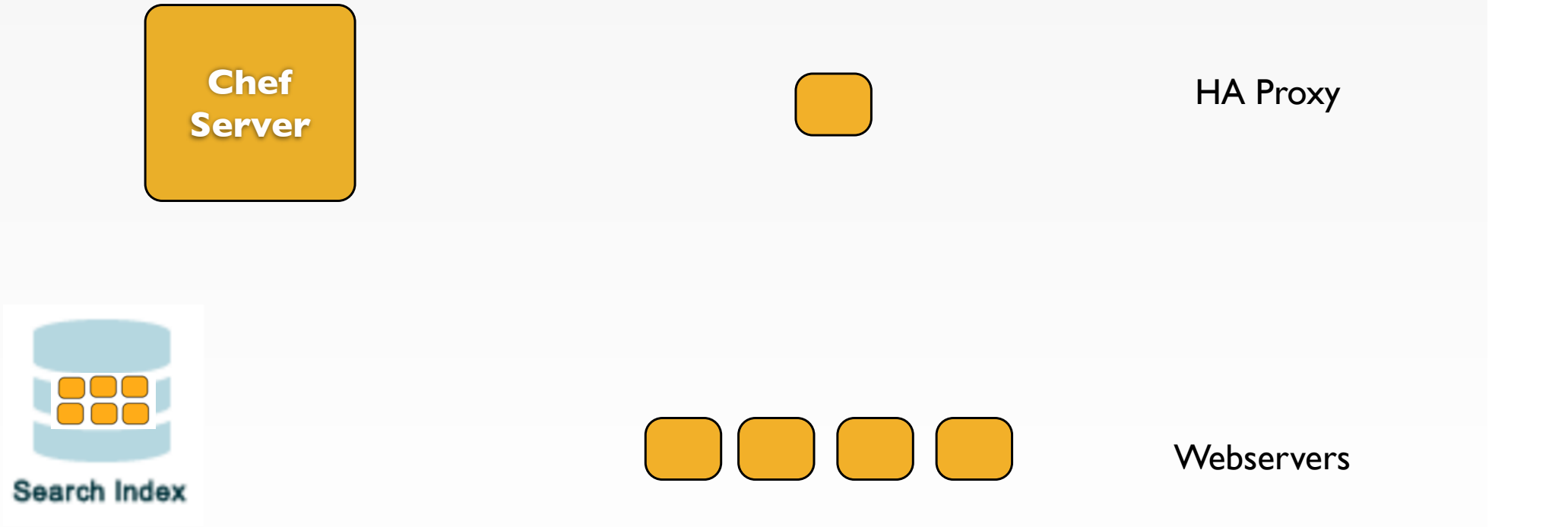

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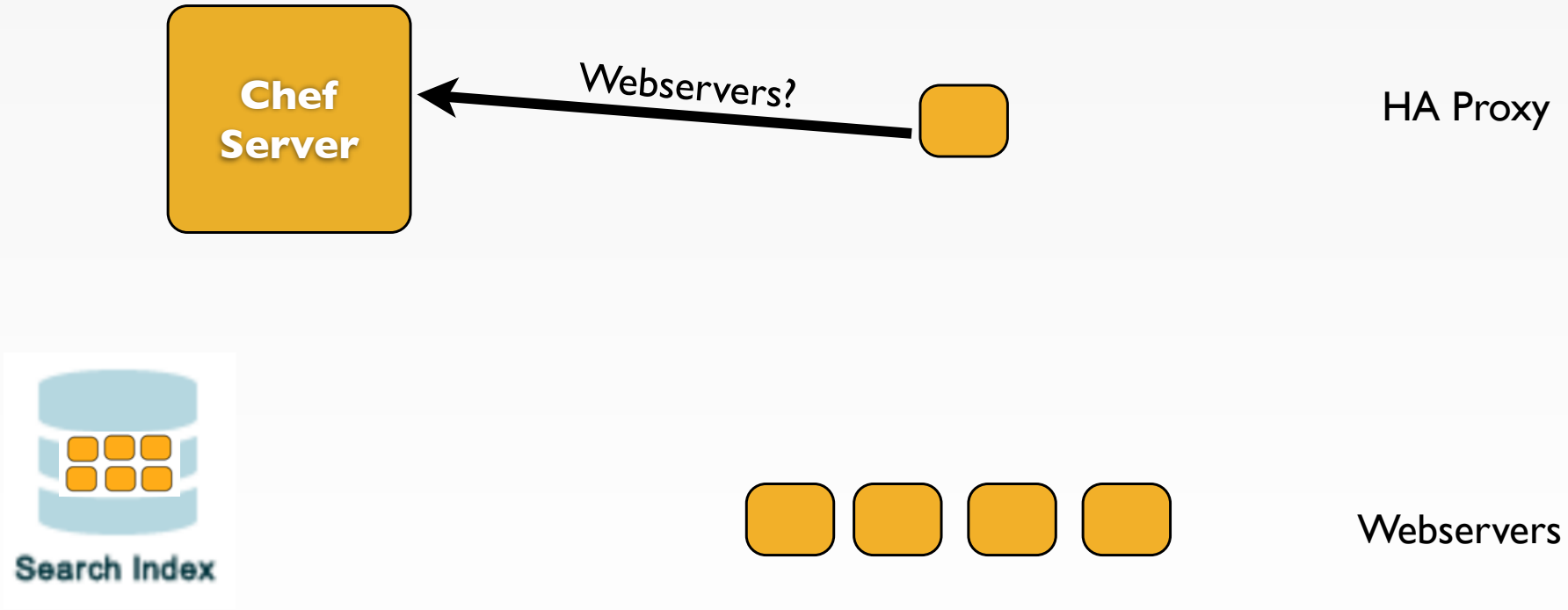

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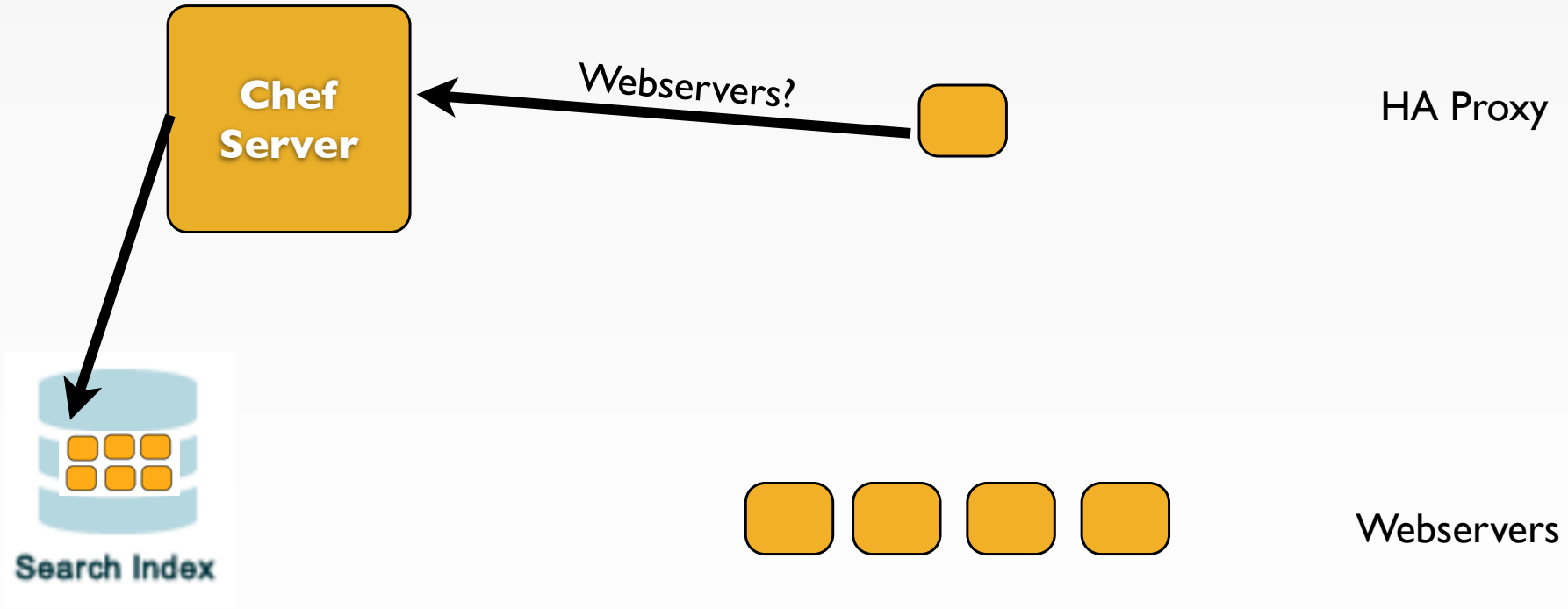

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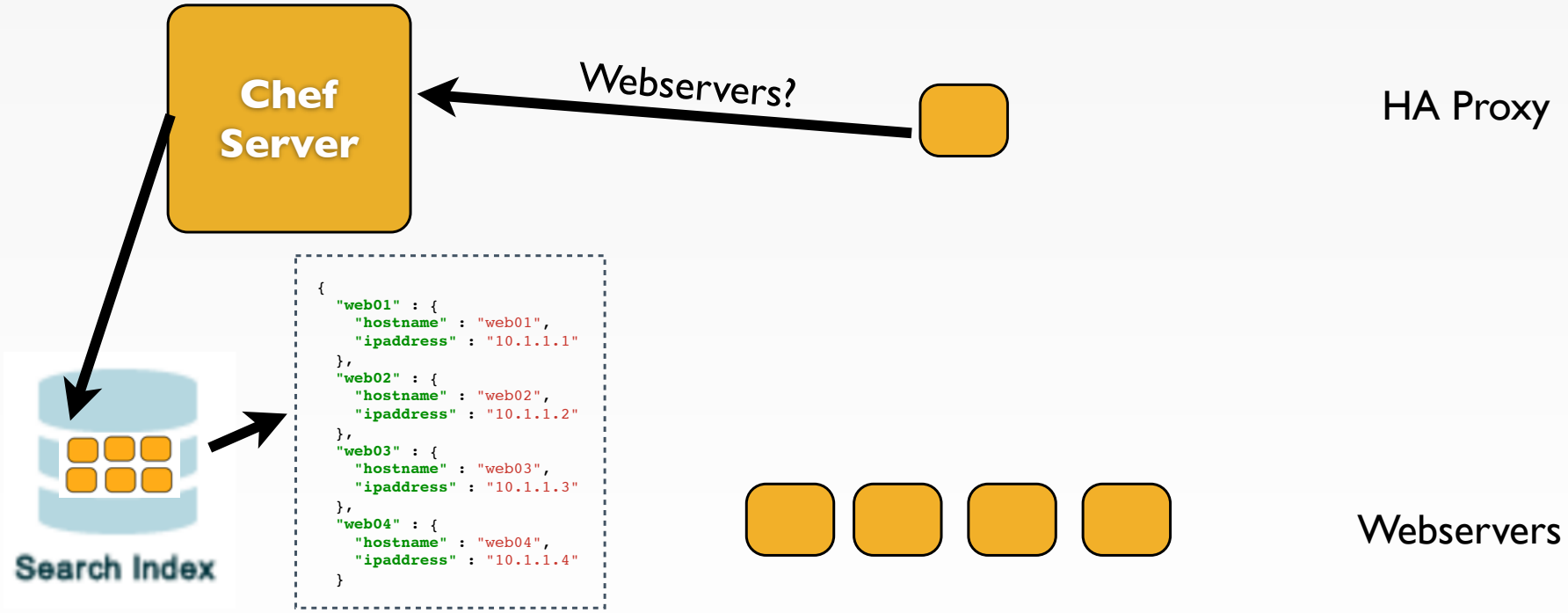

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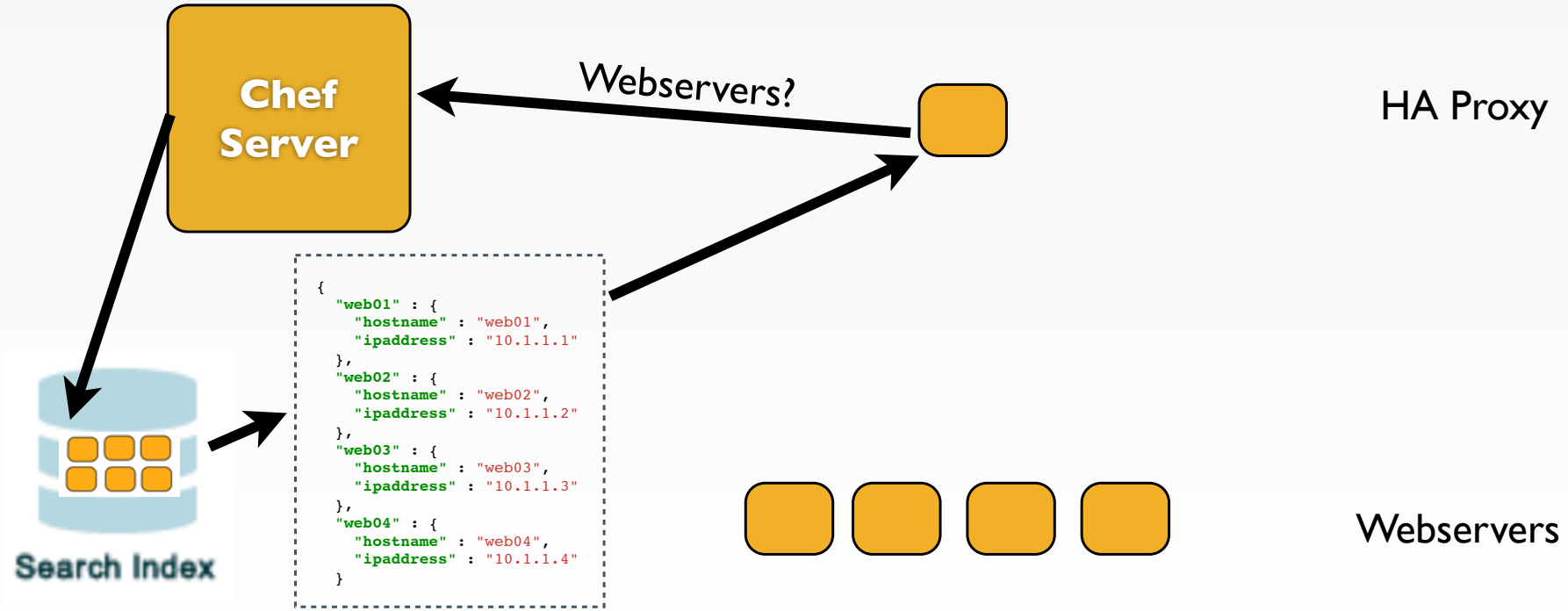

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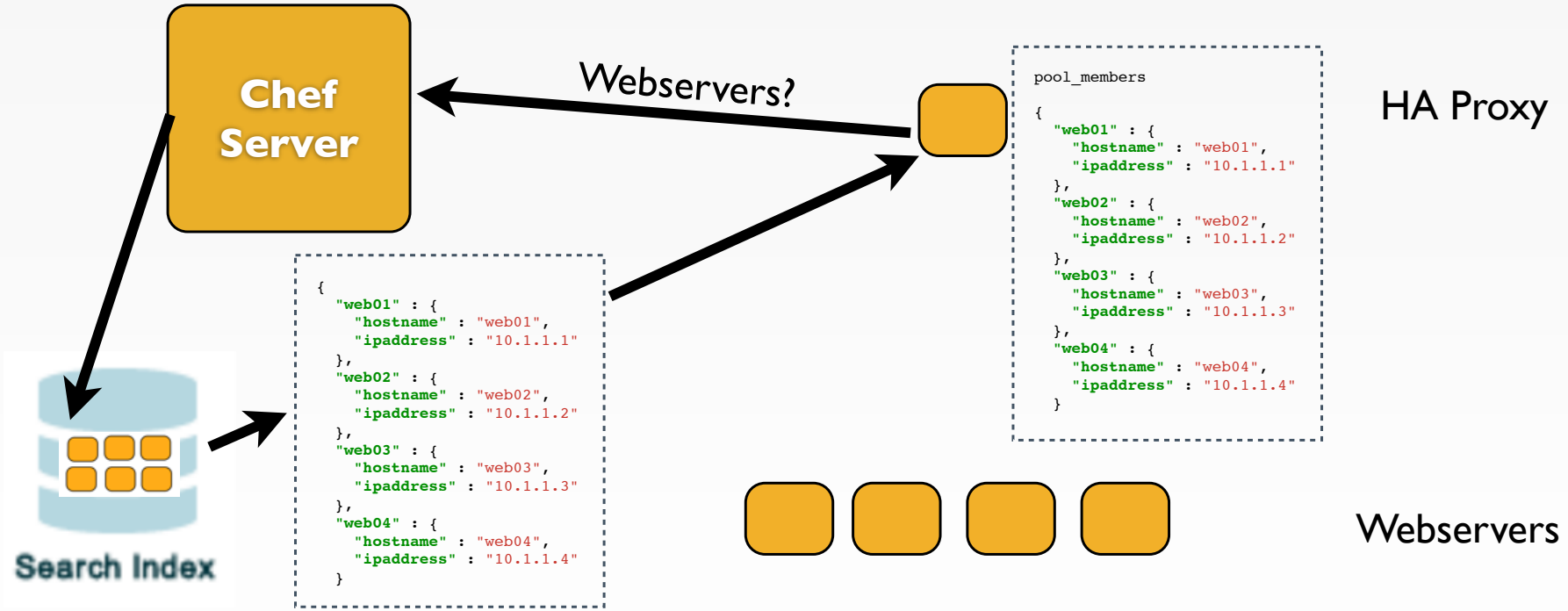

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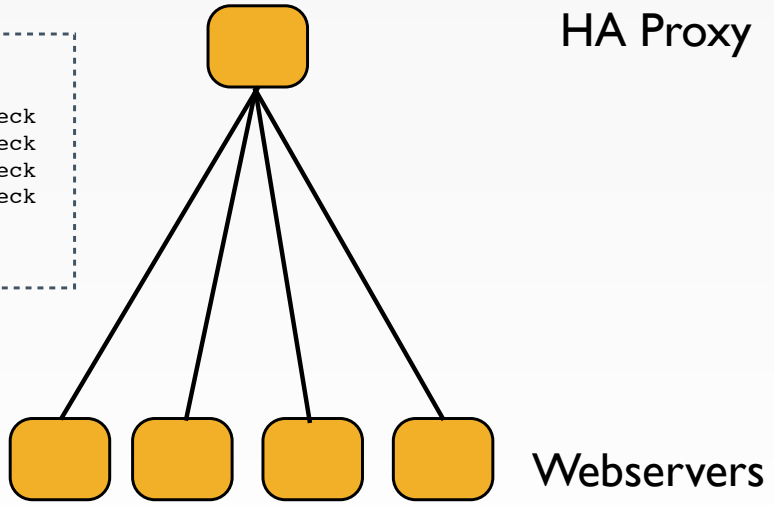
HA Proxy Configuration

```
pool_members

{
  "web01" : {
    "hostname" : "web01",
    "ipaddress" : "10.1.1.1"
  },
  "web02" : {
    "hostname" : "web02",
    "ipaddress" : "10.1.1.2"
  },
  "web03" : {
    "hostname" : "web03",
    "ipaddress" : "10.1.1.3"
  },
  "web04" : {
    "hostname" : "web04",
    "ipaddress" : "10.1.1.4"
  }
```

```
haproxy.cfg

server web01 10.1.1.1 weight 1 maxconn 1 check
server web02 10.1.1.2 weight 1 maxconn 1 check
server web03 10.1.1.3 weight 1 maxconn 1 check
server web04 10.1.1.4 weight 1 maxconn 1 check
```



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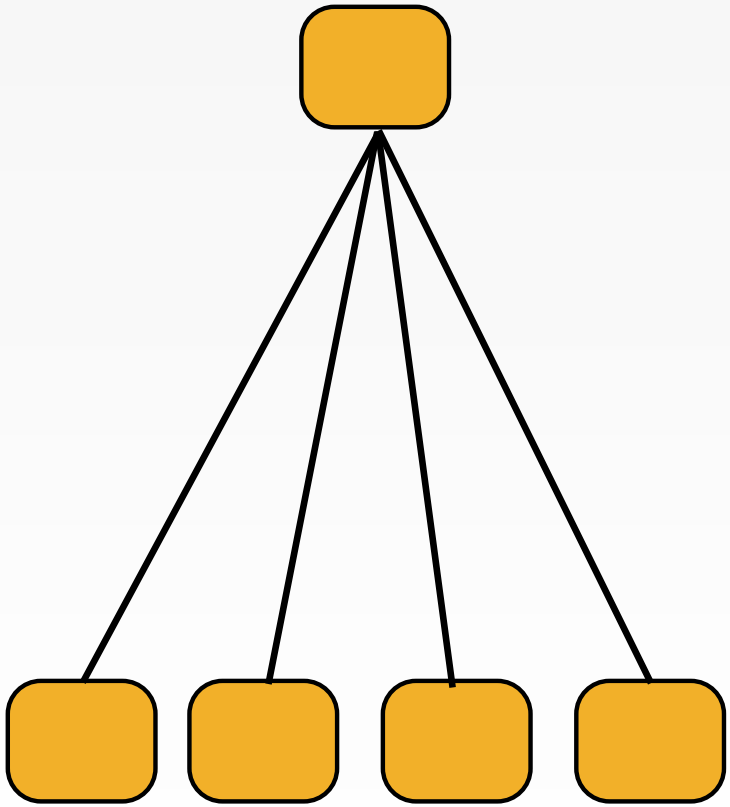

HA Proxy

Webservers

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Building your policy

Resources and Recipes

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Resources

- Piece of the system and its desired state
  - Package that should be installed
  - Service that should be running
  - File that should be generated
  - Cron job that should be configured
  - User that should be managed
  - And more
- docs.getchef.com/chef/resources.html

Hello, Chef!

OPEN IN EDITOR: ~/hello_chef.rb

```
file "/tmp/hello_chef.txt" do
  content "Hello, Chef"
  mode "0777"
end
```

SAVE FILE!

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Apply the policy

```
$ sudo chef-apply hello_chef.rb
```

```
Recipe: (chef-apply cookbook)::(chef-apply recipe)
  * file[/tmp/hello_chef.txt] action create
    - create new file /tmp/hello_chef.txt
    - update content in file /tmp/hello_chef.txt from none to 79c290
    --- /tmp/hello_chef.txt     2014-10-22 19:59:04.000000000 -0400
    +++ /tmp/.hello_chef.txt20141022-23075-19aelx1      2014-10-22
19:59:04.000000000 -0400
    @@ -1 +1,2 @@
    +Hello, Chef
    - change mode from '' to '0777'
```

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Resources

- Describe the desired state
- Do not need to tell Chef how to get there

- What happens when you re-apply the policy?

Apply the policy

```
$ sudo chef-apply hello_chef.rb
```

```
Recipe: (chef-apply cookbook)::(chef-apply recipe)
  * file[/tmp/hello_chef.txt] action create (up to date)
```

Resources

- A piece of the system
- Its desired state

```
file "/tmp/hello_chef.txt" do
  content "Hello, Chef"
  mode "0777"
end
```

Change the state of the system

```
$ echo "Hello, #ato2014" > /tmp/hello_chef.txt
```

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Apply the policy

```
$ sudo chef-apply hello_chef.rb
```

```
Recipe: (chef-apply cookbook)::(chef-apply recipe)
  * file[/tmp/hello_chef.txt] action create
    - update content in file /tmp/hello_chef.txt from e453df to 79c290
    --- /tmp/hello_chef.txt     2014-10-22 20:00:20.000000000 -0400
    +++ /tmp/.hello_chef.txt20141022-23340-17a7m5t      2014-10-22
20:00:50.000000000 -0400
    @@ -1,2 +1,2 @@
    -"Hello, #ato2014"
    +Hello, Chef
```

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Resources – Test and Repair

- Resources use a test and repair model

- Resource currently in the desired state?
  - Yes – Do nothing
  - No – Bring the resource into the desired state (repair)

Built-in Resources

- package
- template
- service
- cron
- directory
- mount
- user
- group
- registry_key
- remote_directory
- route
- and many more…

docs.getchef.com/chef/resources.html

Recipes

- Policy is defined as a collection of **resources** in **recipes**. There are lots of abstractions on top of this but **resources** are the basic building blocks.

Sample Recipe

```
package "httpd"

template "/etc/httpd/conf/httpd.conf" do
  source "httpd.conf.erb"
  owner  "root"
  group  "root"
  mode   "0644"
  notifies :restart, "service[httpd]"
end

service "httpd" do
  action [:start, :enable]
end

file "/var/www/html/index.html" do
  content "Hello, ATO!"
end
```

Test-driven Infrastructure

Change policy with confidence

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New policy mandate

- Apache should listen on port 81, not the default port!

- Verify policy changes BEFORE applying the changes to production

Questions to ask when testing

- Did chef-client complete successfully?
- Did the recipe put the node in the desired state?
- Are the resources properly defined?
- Does the code following our style guide?

Chef client success status

- Requirements to verify chef-client success:
  - A place to store the cookbook artifact

Chef client success status

- Requirements to verify chef-client success:
  - A place to store the cookbook artifact
  - A chef-client with access to the cookbook

Chef client success status

- Requirements to verify chef-client success:
  - A place to store the cookbook artifact
  - A chef-client with access to the cookbook
  - A target server running the same OS as production

Test Kitchen

- Test harness to execute code on one or more platforms
- Driver plugins to allow your code to run on various cloud and virtualization providers
- Includes support for many testing frameworks
- Included with ChefDK

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Test Kitchen Lifecycle

- kitchen create
- kitchen list
- kitchen converge
- kitchen login
- kitchen destroy

Questions to ask when testing

- ✓ Did chef-client complete successfully?
- Did the recipe put the node in the desired state?
- Are the resources properly defined?
- Does the code following our style guide?

Manually Inspect with kitchen login

```
$ kitchen login
```

```
kitchen@localhost's password:
```

Manually Inspect with kitchen login

```
$ kitchen login
```

```
kitchen@localhost's password: kitchen
```

CHEF

Manually Inspect with kitchen login

```
$ kitchen login
```

```
kitchen@localhost's password: kitchen
Last login: Wed Sep 24 04:30:29 2014 from 172.17.42.1
```

Manually Inspect with kitchen login

```
$ curl http://localhost
```

```
Hello, ATO!
```

Serverspec

- Write RSpec tests to verify your servers
- Not dependent on Chef
- Defines many resource types
  - package, service, user, etc.
- Works well with Test Kitchen
- http://serverspec.org/

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Serverspec Test

OPEN IN EDITOR: test/integration/default/serverspec/default_spec.rb

```
require 'serverspec'
set :backend, :exec

describe "apahce" do
  it "has httpd package installed" do
    expect(package('httpd')).to be_installed
  end

  it "is listening on port 80" do
    expect(port(80)).to be_listening
  end

  it "displays our home page" do
    expect(command("curl http://localhost").stdout).to match /ATO/
  end
end
```

SAVE FILE!

CHEF

Verify the kitchen

```
$ kitchen verify
```

```
-----> Setting up Busser
       Creating BUSSER_ROOT in /tmp/busser
       Creating busser binstub
       Plugin serverspec installed (version 0.2.6)
-----> Running postinstall for serverspec plugin
       Finished setting up <default-centos-64> (0m32.59s).
-----> Verifying <default-centos-64>...
       Suite path directory /tmp/busser/suites does not exist, skipping.
       Uploading /tmp/busser/suites/serverspec/default_spec.rb (mode=0664)
-----> Running serverspec test suite
       /opt/chef/embedded/bin/ruby -I/tmp/busser/suites/serverspec -S /opt/chef/embedded/bin/rspec /tmp/busser/suites/serverspec/default_spec.rb
--color --format documentation

       apache
         is installed

       Finished in 0.29547 seconds
       1 example, 0 failures
       Finished verifying <default-centos-64> (0m4.44s).
-----> Kitchen is finished. (1m25.74s)
```

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Questions to ask when testing

- ✓ Did chef-client complete successfully?
- ✓ Did the recipe put the node in the desired state?
- Are the resources properly defined?
- Does the code following our style guide?

Now for our new mandate

- Update the tests
- Watch them fail
- Update the policy
- See tests pass
- Roll-out changes to production

Wrapping Up

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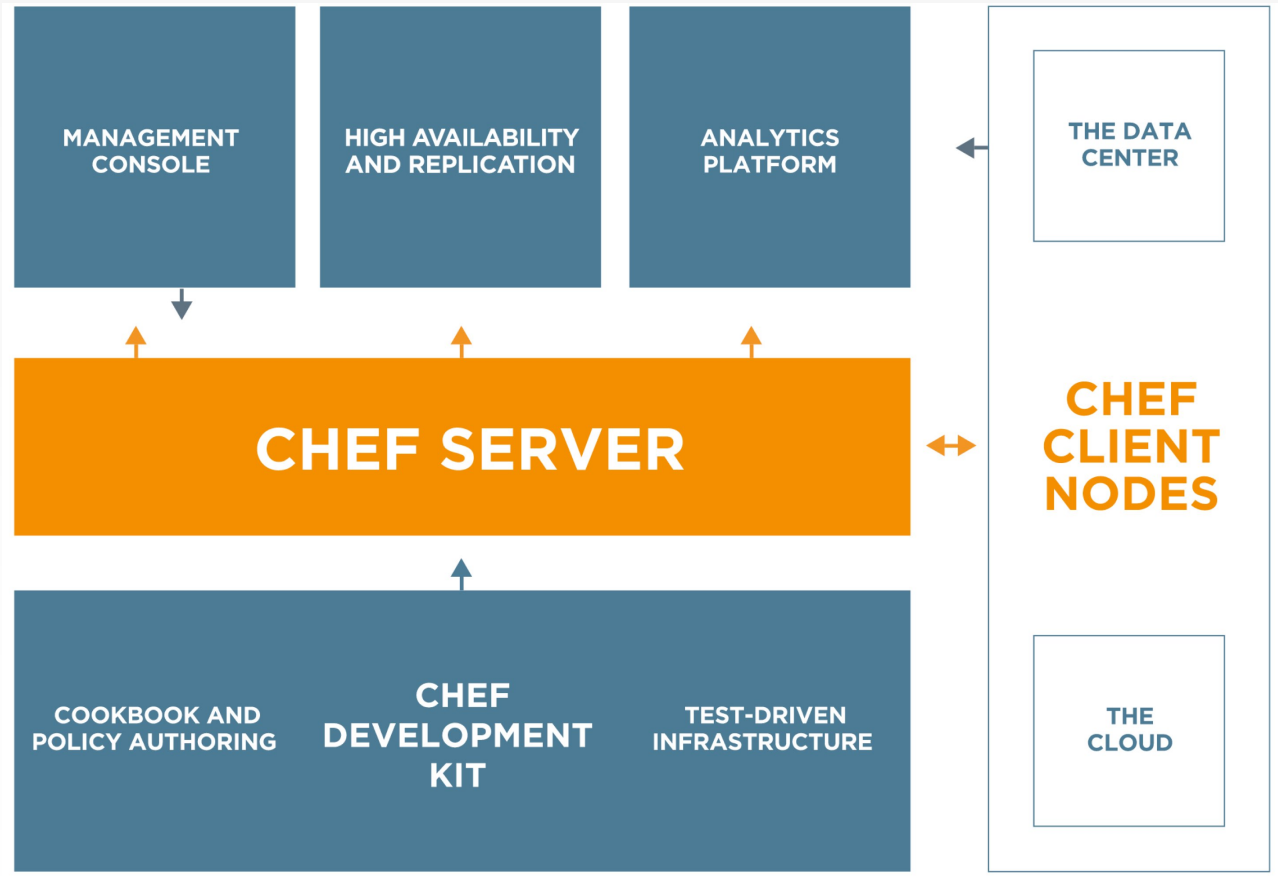
We've only scratched the surface



https://www.getchef.com/chef/

CHEF

Build Anything

- Simple internal applications
- Complex external applications
- Workstations
- Hadoop clusters
- IaaS infrastructure
- PaaS infrastructure
- SaaS applications
- Storage systems
- You name it

http://www.flickr.com/photos/hyku/245010680/

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And Manage it Simply

http://www.flickr.com/photos/helico/404640681/

- Automatically reconfigure everything
- Linux, Windows, Unixes, BSDs
- Load balancers
- Metrics collection systems
- Monitoring systems
- Cloud migrations become trivial

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What questions do you have?

- Ask me anything!

- @nathenharvey
- nharvey@getchef.com

- Thank you!

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