CFEngine

Distributed
Configuration
Management

Practical implementation of promise theory in CFEngine

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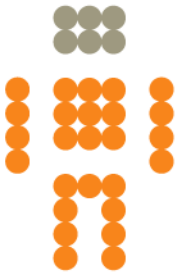

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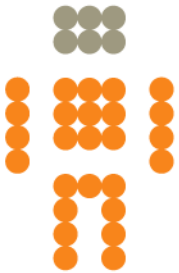
Contents

- Promise theory
- "reports"
- "processes"
- "packages"
- "variables"
- Summary



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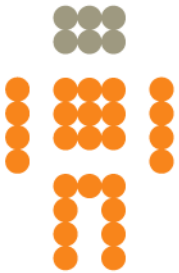
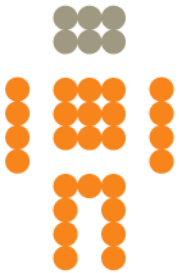
Promise theory

«Agent A promises
to agent B to fulfill C»



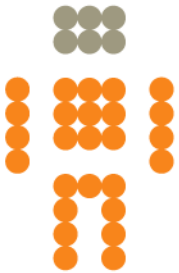
Software Implementation

- Convergency
  - Promise essence is the «desired state»
- Embracing errors
  - Promises may be kept occasionally
- Autonomy
  - Unable to rely on another agents



Real-world example: e-mail

- Convergency
  - Delivery to address
- Embracing errors
  - 4xx, 5xx errors
  - Multiple MXes
  - Mail queues
- Autonomy
  - Independent mail servers
  - Local routing decisions



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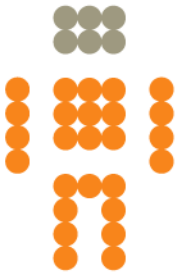
Reports

```
body common control {
 bundlesequence => {"mybundle"};
}
bundle agent mybundle {
reports:
 linux::
  "Hello world!";
}
```



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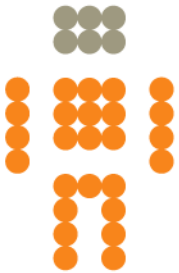

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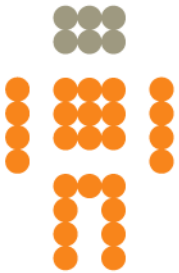

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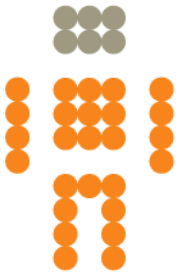

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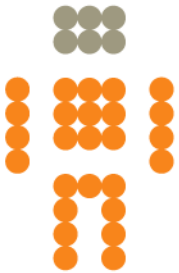

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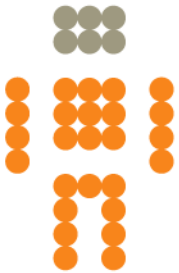

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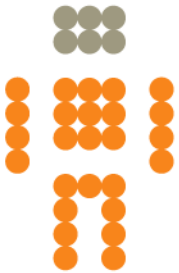
Reports (translated)

```
def mybundle() {
  if "linux" in
          global_contexts {
    report("Hello world!");
  }
}
mybundle()
```



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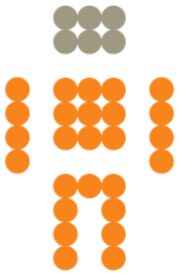
Reports (run)

```
$ cf-agent
R: Hello world!
$
```



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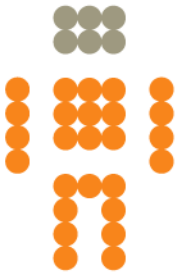

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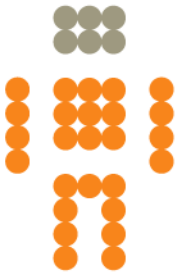

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Distributed
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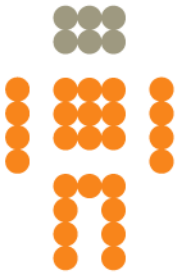
Management

Reports

```
bundle agent mybundle {
reports:
  linux::
    "Hello world!";
    "That's surprising";
}
```



CFEngine

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Configuration
Management

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R: Hello world!
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R: That's surprising
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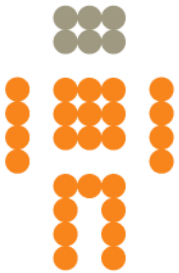

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R: Hello world!
$
```

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```
def mybundle() {
  promises.add(
    report("Hello world!",
           activate = λ:
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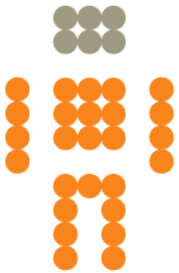
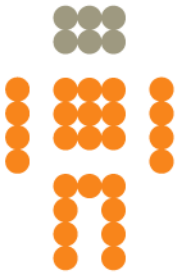
}
mybundle()
run_all_relevant_promises()
```

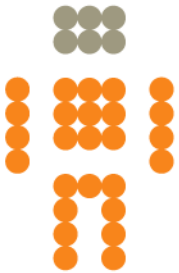


«Ensure that specified message is reported to sysadmin as soon as possible, but no more than once per 5 minutes to the sysadmin using the specified reporting mechanisms»



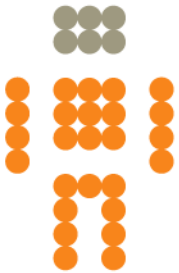
Convergence

«Ensure that specified message is **reported** to sysadmin as soon as possible, but no **more than once per 5 minutes** to the sysadmin using the specified reporting mechanisms»



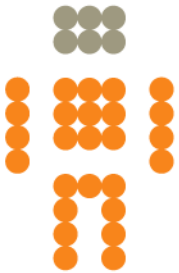
Embracing errors

«Ensure that specified message is reported to sysadmin **as soon as possible**, but no more than once per 5 minutes to the sysadmin using the specified reporting mechanisms»



Autonomy

«Ensure that specified message is reported to sysadmin as soon as possible, but no more than once per 5 minutes to the sysadmin **using the specified reporting mechanisms**»



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Distributed
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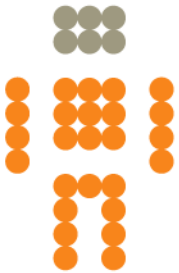
Processes

```
bundle agent myprocesses {
processes:
 "nginx"
  match_range => irange("1","20");
  restart_class => "restart_nginx";
commands:
 restart_nginx::
  "/etc/init.d/nginx start";
}
```



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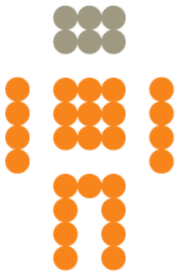

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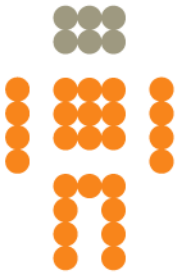
Distributed
Configuration
Management

Processes

```
bundle agent myprocesses {
processes:
 "nginx"
  match_range => irange("1","inf");
  restart_class => "restart_nginx";
commands:
 restart_nginx::
  "/etc/init.d/nginx start";
}
```



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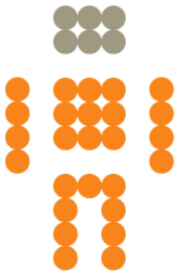

```
def myprocesses() {
 nginx_cnt = count_proc("nginx")
 if nginx_cnt == 0 {
  promises.add(
   command(
     "/etc/init.d/nginx start"))
 } elif nginx_cnt > 20  {
    Promises.add(kill("nginx",
                      nginx_cnt – 20))
 }
}
myprocesses()
run_all_relevant_promises()
```

CFEngine

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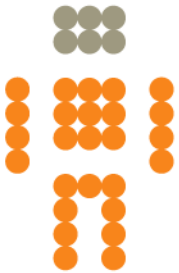
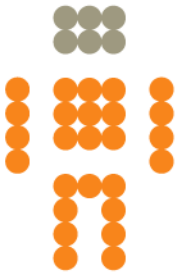
```
def myprocesses() {
 promises.add(
  processes("nginx",
   λ count: if count == 0 {
    define_context("restart_nginx")})
 promises.add(
  commands(
   "/etc/init.d/nginx start",
  activate_if = λ:
   "restart_nginx" in global_contexts))
}
myprocesses()
run_all_relevant_promises()
```



«Ensure that amount of specified processes is kept in specified range, killing extra processes and communicating the need to restart if necessary»



CFEngine

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Convergence

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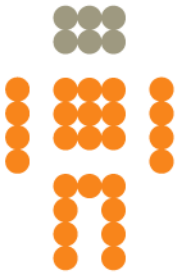

CFEngine

Distributed
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Embracing errors

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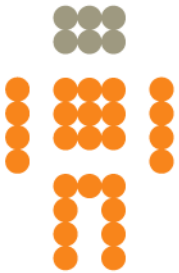

Autonomy

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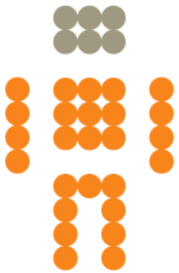

CFEngine

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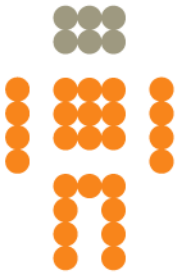
Packages

```
bundle agent mypackages {
packages:
 "libapache2-mod-wsgi"
  package_method => apt,
  package_policy => "addupdate",
  package_version => "3.3-4",
  package_select => ">=";
}
```



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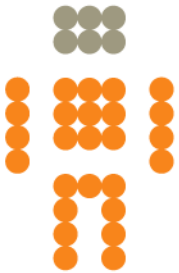

CFEngine

Distributed
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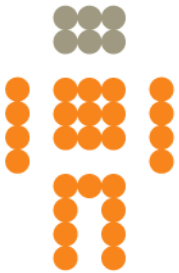
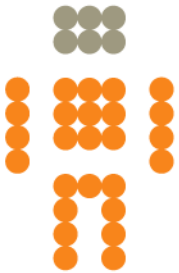
Packages (translated)

(Implementation is too large to fit in the ~~margin~~slide)



«Ensure that specified package is installed or not installed according to the constraints specified. Do this by instructing local package manager to add, upgrade or remove package»



Convergent

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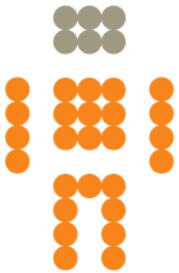

Embracing errors

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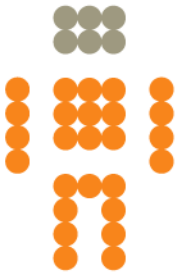

Autonomous

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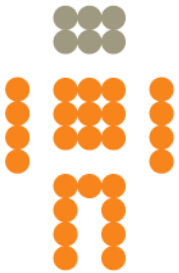

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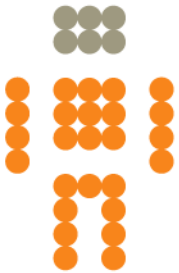
Variables

```
bundle agent myvars {
 vars:
   "a" string =>
          "My $(string)";
}
```



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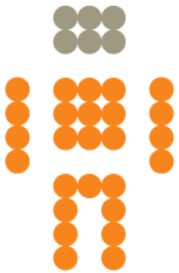
«Maintain in-agent binding of left-side name to the value of right-side expression»



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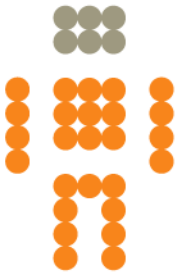
Convergent, autonomous

«Maintain in-agent binding of left-side name to the value of right-side expression»



CFEngine

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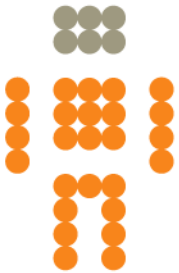
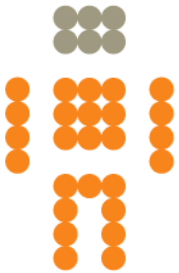
Embracing errors

```
bundle agent myvars {
vars:
 "myvar" string => execresult(
    "/usr/bin/testparm
     /etc/smb/smb.conf",
    "noshell");
}
```

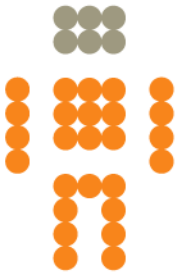


Summary

- CFEngine building blocks are promises
  - Higher-level
  - Convergent
  - Error-embracing
  - Autonomous
  - Not the things from conventional languages



Questions?



DSL vs. eDSL

- Pro eDSL:
  - Familiar host language
- Contra eDSL:
  - Radically different building blocks
  - Different control structure and evaluation

→ DSL