L05 Configuration Management

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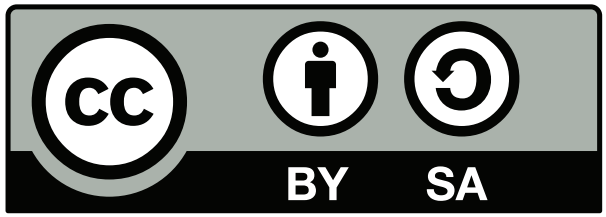
21.04.2021



History of CM

Learning Outcomes

Students will be able to

- remember differences between CM languages and historical approaches.
- write simple configuration management scripts.

Definition

Configuration Management:

- is a discipline in which configuration (in the broader sense) is administered.
- makes sure computers are assembled from desired parts and the correct applications are installed.
- ensures that the execution environment of installed applications is as required.

Definition

Configuration Management Tools:

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Configuration Management Tools:

- help people involved in configuration management.
- have means to describe the desired configuration of the whole managed system.
- try to converge the actual configuration to the desired one [4].

Challenging tasks in configuration management:

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- inventory list
- installing packages
- monitoring
- add/replace machines
- maintaining files/databases
- ***configuration file manipulation***

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- clone all files with dd, rdist, rsync or unison ("golden image")
- then do necessary modifications with scripts or profiles
  - \+ works good for many identical stateless machines
  - – fails if differences between machines are too big

Scripts

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Possible benefits:

- Documentation

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- Documentation
- Customization (using configuration settings)
- **Reproducability**: Reproduce creation using different operating system versions

Profiles

Profiles are groups of configuration settings between which the user can easily switch.

- by hostname, information EEPROM, manual selection, ...
- can be activated via the `profile` plugin:

```
1 [application/profile]
2   type:=string
3   opt:=p
4   opt/long:=profile
5   default:=current
```

with a config like:

```
1 application/current/key = "current"
2 application/myprofile/key = "myprofile"
3 application/%/key = "default"
```

First four configuration management tools

Cloning, and then NIS/NFS, was state of the art for a long time, until in 1994 when *"the community nearly exploded with four new configuration systems"* [6]:

lcfg from Anderson [2]. The development of lcfg started first in 1991 [1, 2]. Nevertheless, its development still continues [3, 9].

GeNUAdmin from Harlander [7].

omniconf from Hideyo [8].

config from Rouillard and Martin [12].

Possible Benefits

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- Pull/Push
- Reusability
- (Resource) Abstractions

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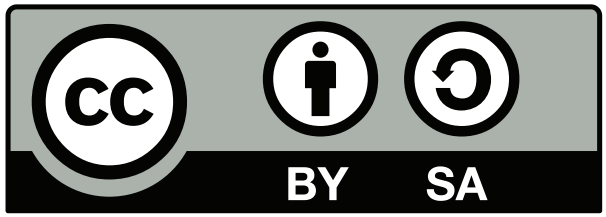

CM Languages

See Reading Text

See accompanied reading text for this section.

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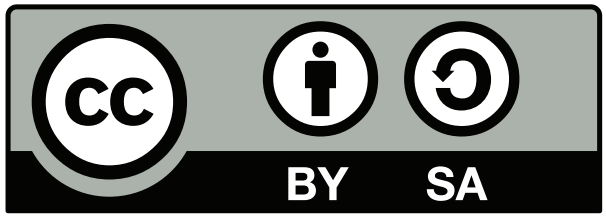

CM Tools

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- Itamae (2014)
- Puppet
- OpsMops (2019)

Key/value access in puppet-libelektra [11]:

```
1 kdbkey {'/slapd/threads/listener':
2       ensure => 'present',
3       value => '4'
4       check => {
5           'type' => 'short',
6           'range' => '1,2,4,8,16',
7           'default' => '1'
8       }
9 }
```

Key/value access in puppet-libelektra:

```
1 kdbmount {'system:/sw/samba':
2     ensure => 'present',
3     file => '/etc/samba/smb.conf',
4     plugins => 'ini'
5 }
6 kdbkey {'system:/sw/samba/global/workgroup':
7     ensure => 'present',
8     value => 'MY_WORKGROUP'
9 }
10 kdbkey {'system:/sw/samba/global/log level':
11     ensure => 'absent'
12 }
```

Uniqueness of keys is essential. Ideally, applications already mount their configuration at installation.

Key/value specifications in puppet-libelektra:

```
kdbkey {'system:/sw/samba/global/log level':
    ensure => 'present',
    value => 'MY_WORKGROUP',
    check => {
        'type' => 'short',
        'range' => '0-10',
        'default' => '1',
        'description' => 'Sets the amount of log/
            debug messages that are sent to the
            log file. 0 is none, 3 is consider-
            able.'
}
```

Key/value specifications in puppet-libelektra:

```
kdbkey {'spec:/xfce/pointers/Mouse/RightHanded':
    ensure => 'present',
    check => {
        'namespaces/#0' => 'user',
        'namespaces/#1' => 'system',
        'visibility' => 'important',
        'default' => 'false',
        'check/type' => 'boolean'
}
```

Ideally, applications already specify their settings.

Key/value access in Chef:

```
1 kdbset 'system:/sw/samba/global/workgroup' do
2     value 'MY_WORKGROUP'
3     action :create
4 end
```

Key/value access in Chef:

```
1 kdbset '/slapd/threads/listener' do
2     value '4'
3     action :create
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Finding

We have CM code representing the settings.

Key/value access in Ansible:

```
1 - name: setup LDAP
2   connection: local
3   hosts: localhost
4   tasks:
5   - name: set listening threads
6     elektra:
7       key: '/slapd/threads/listener'
8       value: '4'
```

Key/value access in Ansible:

```
1  - name: setup samba
2    connection: local
3    hosts: localhost
4    tasks:
5    - name: set workgroup
6      elektra:
7        mountpoint: system:/sw/samba
8        file: /etc/samba/smb.conf
9        plugins: ini
10     elektra:
11       key: 'system:/sw/samba/global/workgroup'
12       value: 'MY_WORKGROUP'
```

Key/Values Revisited

Decide about **changeability** per key:

- Who is responsible (end user, packages, admin manual or CM).

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- Which configuration values are allowed (validation).

Changeability

Ownership of every key must be very clear and documented.

Layers of Abstractions

Recursively define useful abstractions (meta-levels):

- Bits in (configuration) files and memory

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- Global optimization: allocation of nodes and decision regarding topology in the whole network
- Global goals/specifications of the whole network

Design Rules [5]

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Design Rules [5]

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- Maintain clear separation of ownership (for every key).
- Specify replicated settings in a single source (use links and derivations).
- Document all remaining overlaps (in the specification).
- The manageability of settings is reduced by the number of possible configuration values.

Open Topics

- global optimizations/self-healing

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- centralized vs. distributed

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- use all help you can get: e.g. build tools, preseeding, installer automation, virtualization, package managers, distributions
- complexity in CM vs. complexity in applications' specification

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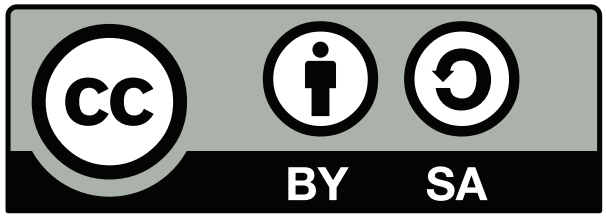

Meeting

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