

L09 Configuration as a User Interface

Markus Raab

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Three-way merge

- 1 Three-way merge
- 2 Error Messages
- 3 System Administrator Research
- 4 Meeting
 - Recapitulation
 - Assignments
 - Preview

Learning Outcomes

Students will be able to

- recall a method of avoiding errors.
- apply some principles of good error messages.
- remind some basics of system administrator research.

Synchronization

Problem: transient and persistent configuration settings might be out-of-sync [7]

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Requirement

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Solutions:

- Often write out configuration settings.

Semantic Three-way merge

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- the origin of the configuration settings
- the type of settings

For example, when upgrading slapd:

- System administrator changed the file (Ours).
- Package maintainer changed the file (Theirs).

Conflicts Example

Ours:

```
1 slapd/threads/listener=4
2
3 slapd/threads/enable= \
4     yes # must be enabled for listener
5
```

Theirs:

```
1 slapd/threads/enable = on
2 slapd/threads/listener = 8
```

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Origin:

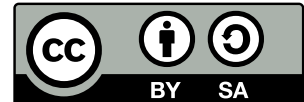
```
1 slapd/threads/listener=8
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Error Messages

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Motivation (Recapitulation)

Error messages are extremely important as they are the main communication channel to system administrators.

```
1 [a]
2   check/type := long
3 [b]
4   check/type := long
5 [c]
6   check/range := 0-10
7   assign/math := ../a+../b
```

Task

Where should the error message point to if we change b to 10 (a is unchanged 1)?

Considerations (Recapitulation)

Task

What needs to be considered when designing error messages?

- Generic vs. specific plugins
- Precisely locate the cause (and do not report aftereffects)
- Give context
- Personification [8]

Further Considerations

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¹terms from classification, it is the numerical counterpart of soundness and completeness

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- colors might help [11]

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Error Messages for Misconfiguration [12]

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Implication

Missing error message means the configuration specification is not complete.

Context for error messages

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- repeat relevant parts of values and the specification
- show mountpoint (to make relative keys unique)
- show file name and line number
- for reporting bugs: show source code lines

Precise Location (Recapitulation)

```
1 a=5    ; unmodified
2 b=10   ; modification bit in metadata
3        ; is only set here
4 c=15   ; unmodified by user but changed
5        ; later by assign/math
```

Example Error Messages (Recapitulation)

Sorry, I was unable to change the configuration settings!

Description: I tried to set a value outside the range!

Reason: I tried to modify b to be 10 but this caused c to
be outside of the allowed range (0-10).

Module: range

At: sourcefile.c:1234

Mountpoint: /test

Configfile: /etc/testfile.conf

Example Error Messages (Improvement)

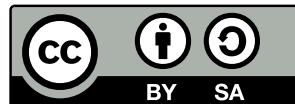
Sorry, module range issued error C03100:
I tried to modify b to be 10 but this caused c to
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User View

Who is the user of CM?

- End Users?

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- End Users?
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- System Administrators (admins)?

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- The workshop was already dropped in the next year.
- The tenor is that “tools ... are not well aligned” [6].
- Research mainly looks at pre-CM. Manual administration is still standard (Source: e.g., Luke Kanies).

CM research

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the only user of each tool in the room at the time was its author [5]
- it is easy to invent CM tools (and configuration file formats)
- it is difficult to make it useful beyond your own goals

Tasks

What do system administrators do?

- keep our infrastructure running

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- coordinate
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- troubleshoot
- \Rightarrow the unsung heroes!

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7 people, 1 command-line [3]

- system administrator misunderstood problem (had a wrong assumption)
- 7 people sought attention and trust, competing to tell the admin what to do
- due to wrong assumption the admin communicated to everyone, people could not help
- there were several instances in which the admin ignored or misinterpreted evidence of the real problem
- eventually someone else solved the problem: admin confused “from”/“to” port in the settings and firewall blocked requests

other cases [3]

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other cases [3]

- lost semicolon: execution of script failed due to missing semicolon, then they tried to delete a non-existent table.
- crontab: onltape/ofltape confused because of discussion about offline backup (although an online backup should be performed).
- crit sit: many system administrators competed against each other trying to write a simple script. The crit sit continued for two weeks.

Haber and Bailey [6]

Later Haber and Bailey [6] repeated an ethnographic field study. The stories are similar to Barrett et al. [3]. Their study was also conducted in the same company. They created personas:

- database administrator
- web administrator
- security administrator

Database Administrator [6]

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- typical errors: stopping wrong database process

Web Administrator [6]

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- moving from test to production done by hand

Security Administrator [6]

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- ad-hoc scripts

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- 90 % is spent with communicating with other admins
- only 6 % is gathering information and running commands
- quality control: monitoring found that non-functional service was down two days

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- configuration and log files are scattered, poorly organized and often used inconsistent terminology

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(not idempotent)

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- provide means of comparing configuration settings
- provide consistent profiles of information
- both transient and persistent settings should be visible
- when errors occur: always display which changes have been made (modern approach is idempotence)

Apply to CM

What can we learn from manual system administration?

+ intensive review process catches errors

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Idea

Replicate parts that work well, automate error-prone parts.

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- Augeas/XML: match a key with XPath and replace it
- Elektra: set the value of a key

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- collaboration
- **management (including knowledge)**

Conclusion

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- Configuration specifications are helpful in different ways.
- Do not design around tools but design tools around you.

L09 Configuration as a User Interface

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Meeting

- 1 Three-way merge
- 2 Error Messages
- 3 System Administrator Research
- 4 **Meeting**
 - Recapitulation
 - Assignments
 - Preview

Conflicts Example

How can you avoid errors when merging these configuration settings?

Ours:

```
1 slapd/threads/listener=4
2
3 slapd/threads/enable= \
4     yes # must be enabled for listener
5
```

Theirs:

```
1 slapd/threads/enable = on
2 slapd/threads/listener = 8
```

Origin:

```
1 slapd/threads/listener=8
2 slapd/threads/enable = true
```


Context for error messages

Error messages should contain:

Context for error messages

Error messages should contain:

- pin-point key (which also pin-points to the specification)
- repeat relevant parts of values and the specification
- show mountpoint (to make relative keys unique)
- show file name and line number
- for reporting bugs: show source code lines

Task

Break.

Tasks

What do system administrators do?

Tasks

What do system administrators do?

- keep our infrastructure running
- coordinate
- do backups
- manage hardware
- do inventory
- install applications
- manage security
- configure applications
- troubleshoot
- \implies the unsung heroes!

Task

Tell a story about system administrators.

Apply to CM

What can we learn from manual system administration?

Apply to CM

What can we learn from manual system administration?

- + intensive review process catches errors
- collaboration ineffective
- context/situational awareness is essential
- + precise editing of configuration files works well
- + self-written tools are very efficient

Idea

Replicate parts that work well, automate error-prone parts.

Learning Outcomes

Students will be able to

- recall a method of avoiding errors.
- apply some principles of good error messages.
- remind some basics of system administrator research.

Task

Break.

P2 Finish

- Any questions?

Finalize PRs:

- Rebase PRs.
- Make CI happy.

Implication

You must be positive on every part (project, presentation) to be positive in the overall lecture!

Outlook

Office hour today 16:00.

How “everything” in CM connects in L10:

- documentation
- introspection
- (code) generation
- context awareness

Best topics at last.

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