Config::Model and configuration upgrades during package upgrade

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Debian Perl Group

Feb 2011

Outline

Configuration is often painful!

Boy, so much doc to read

Configuration upgrade is often difficult for a user:

- Surprise question during upgrade
- Edit a text file outside of /home
- Read man pages
- Ensure consistency
- Leave spurious files

Basic configuration may also be difficult...

F+ - Extrêmement inflammable

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Objective 1: Make configuration easier for users

Better user experience:

- Smooth the learning curve
- Handle configuration upgrade smoothly (mostly no interaction)

Provide a graphical interface with:

- Integrated help
- Default values
- Validation of configuration data
- Several levels of skills *(from beginner to master)*
- Search

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Objective 2: Make maintenance easy for developers

Help the developers help the users...

Config tool and upgrader must be easy to maintain:

- Avoid ad-hoc validation code
- Base validation on "meta-data": the *configuration model*
- Generate interfaces from the model
- Model designed to upgrade user configuration
- GUI to create and maintain models

Minimise code required to read or write config:

- Use existing libraries (Config::Ini, Augeas)
- Provide base classes to help configuration reads and writes

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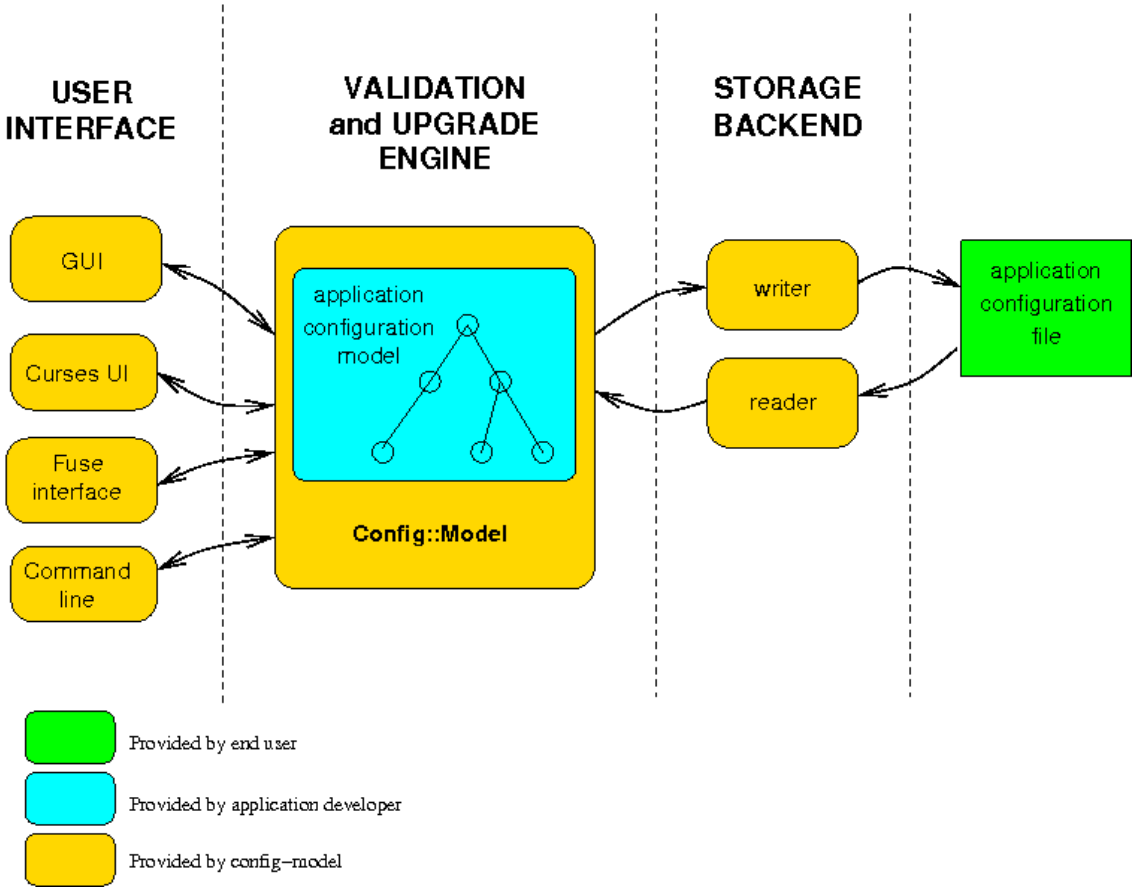
Config::Model design

Very high level...



What is a model?

Kind of a blue print

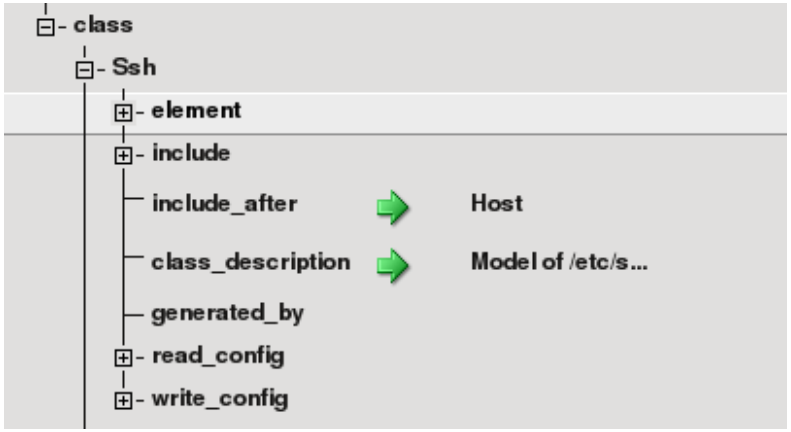
Configuration is represented as a tree.

The model defines its structure:

- A config class is a node
- A config parameter a leaf

Each class contains:

- elements (parameters)
- optional: specs to access config file (backend)
- upgrade instructions



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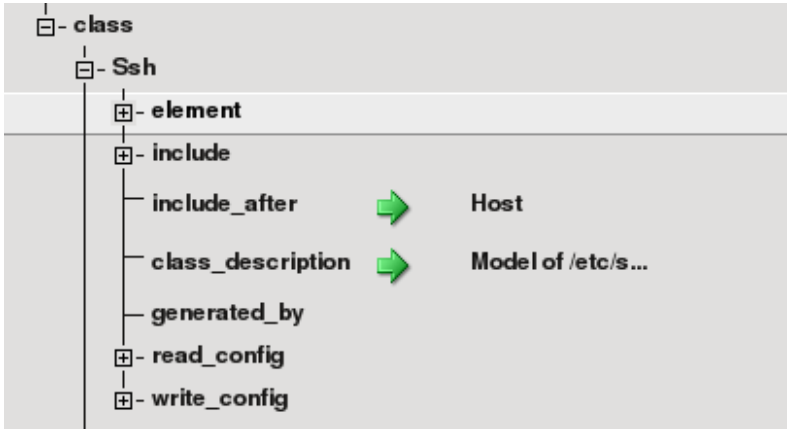

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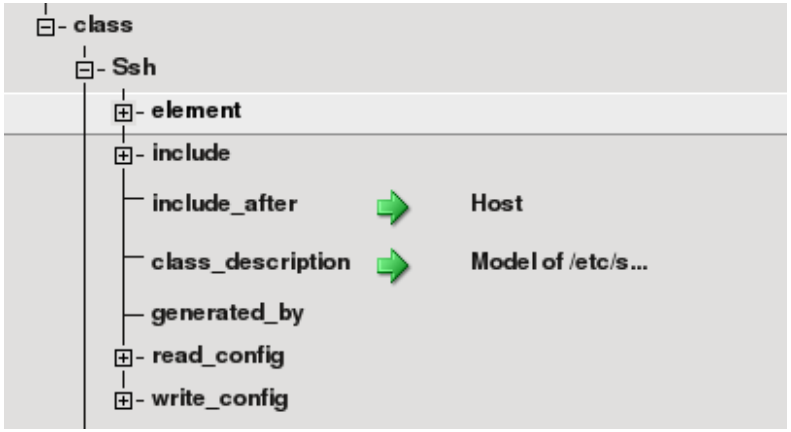


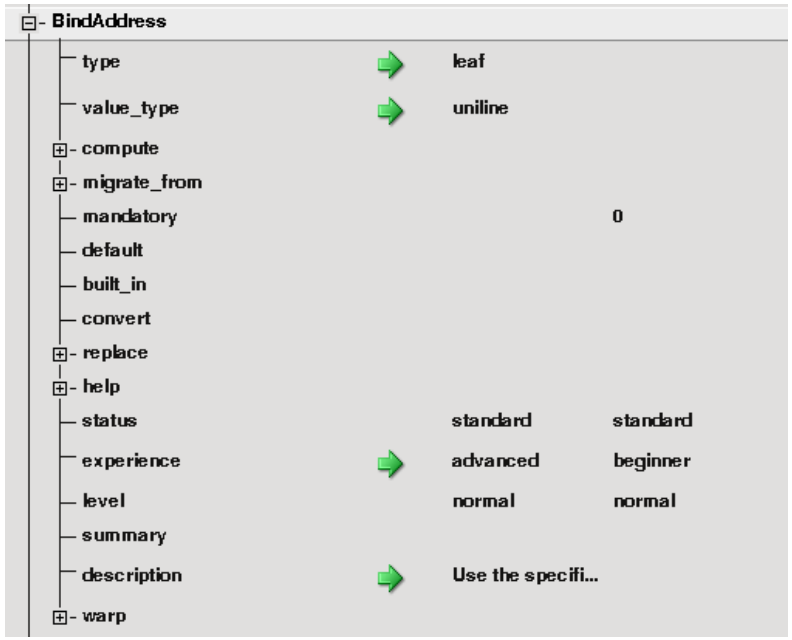
model GUI

Simple elements

For most config parameters

Each element has:

- a type (leaf, hash, list, node)
- constraints (int, max, min...)
- a default value
- a description and a summary (for integrated help)
- an experience level (beginner, advanced, master)
- a status (normal or obsolete)



Model GUI

Unknown elements

S#!t happens

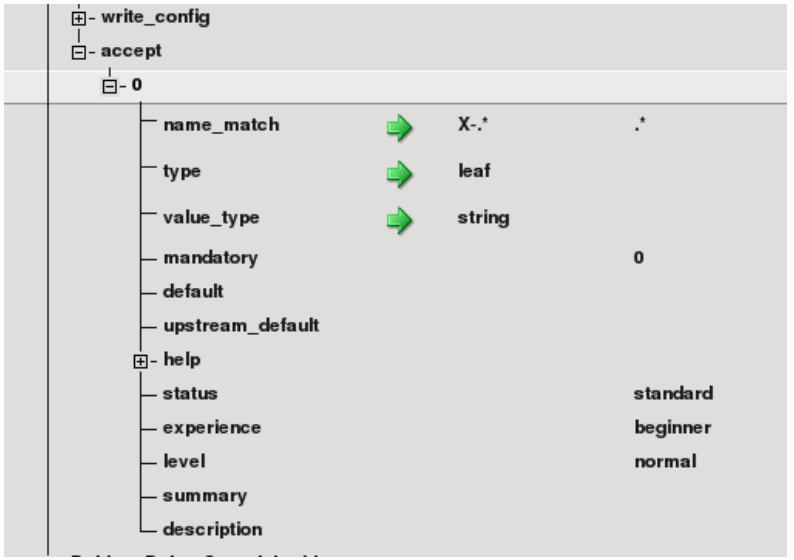
Murphy's law

- Software evolve
- Easy to miss parameters
- X-* parameters

Declare a fallback

Declare condition where an *unknown* element can be *accepted*

accept specification



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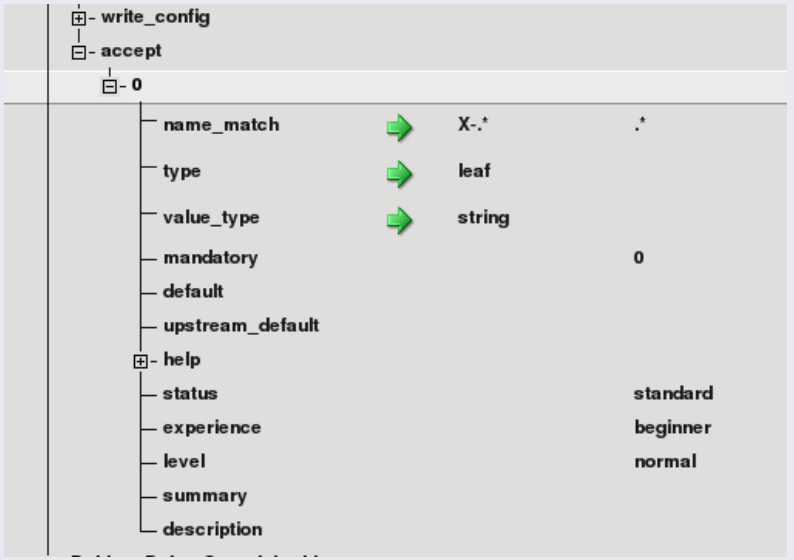


Config warnings and repairs

Between right and wrong

Protect the user

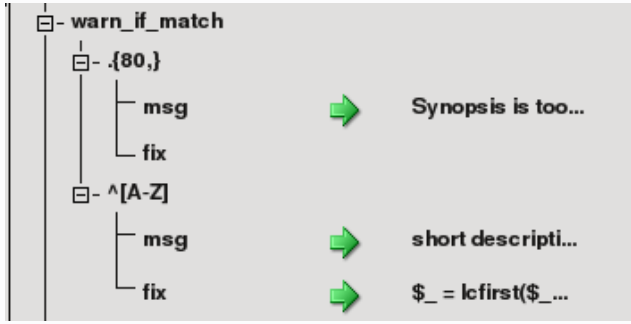
Model can specify:

- warning conditions
- warning message

Help user fix warning

- Declare fix instructions
- Applied by user
- Optional

warning specification



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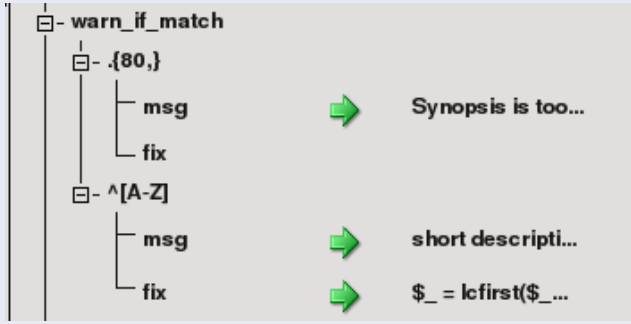

Model analysis
RTFM alert

Read the application man pages

- Find the (hidden) structure of the config tree
- Identify config parameters, their constraints and relations
- Decide: accept or reject unknown parameters?
- Identify potential upgrade issues (deprecated parameters)
- Find upgrade paths

Find several valid examples

- To verify that the documentation was understood
- For the non-regression tests

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Model declaration
The hard way

Config doc is translated into a format usable by Config::Model:

- The structure is translated into configuration classes
- Configuration parameters into elements
- Constraints into element attributes

Ssh element

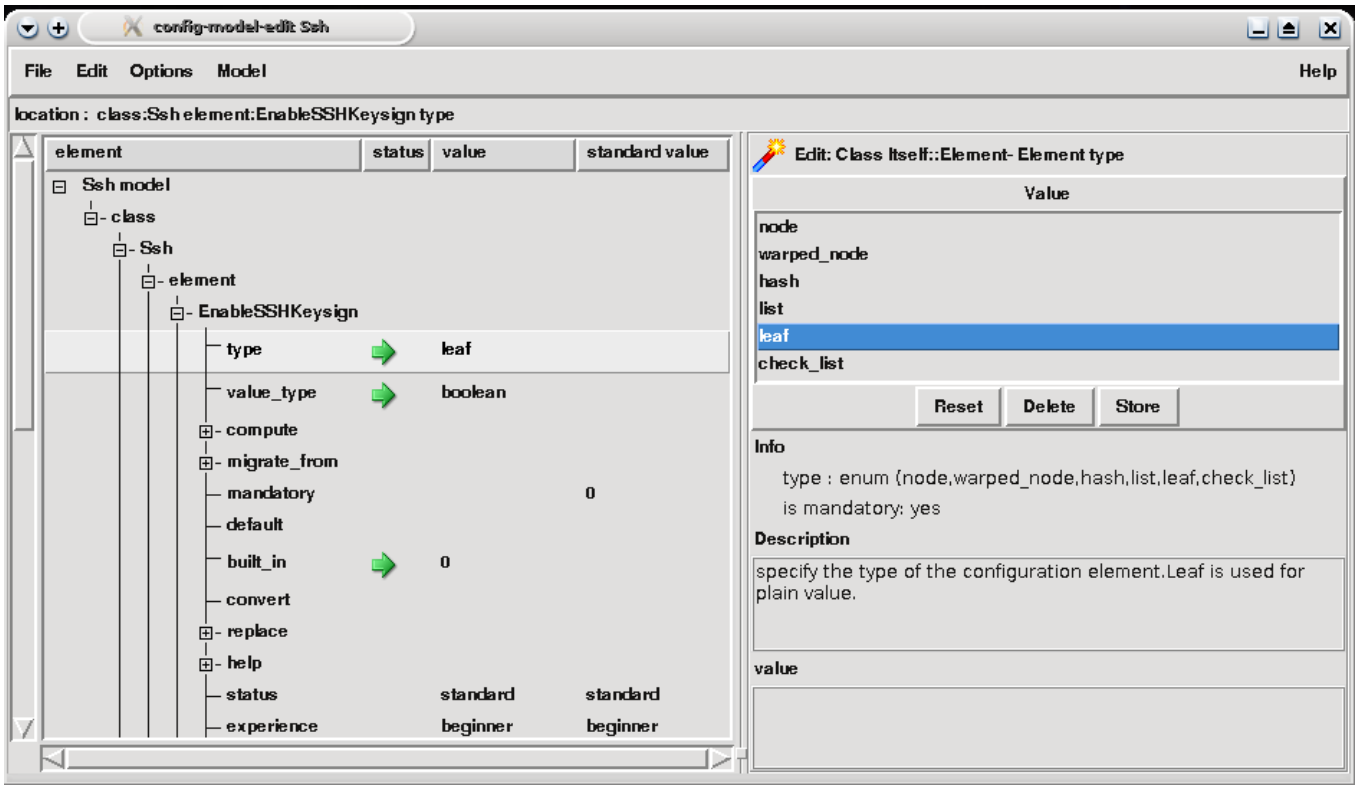
```
name => 'Ssh',                    # config class name
element => [
  EnableSSHKeysign => {           # element name
    type           => 'leaf',
    value_type     => 'boolean', # strong typing
    built_in       => '0',        # default value
    description    => 'Setting ...',
  },
]
```

See `http://search.cpan.org/dist/Config-Model/lib/Config/Model/Manual/ModelCreationIntroduction.pod`

Model declaration

The easier way

Since writing a data structure is not fun (even with Perl), a model can be created with a GUI:



From time to time, do a Menu → Model → test

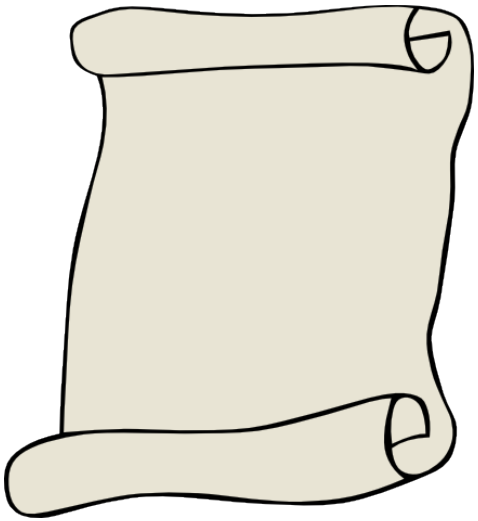
Read/Write backend

No Perl knowledge required...

Declare a backend in the model from this list:

- YAML
- INI files
- Shell vars like (e.g. "FOO=bar")
- Augeas
- Perl data structure

Ask if you need a new backend (mail or bug report)



Designing configuration files
Avoid pitfalls

For application designers

1. No new parameters <-> no new problems
2. Picking parameter name and value : A good name is better than 3 pages of doc
3. Default values : Application can work with an empty config file
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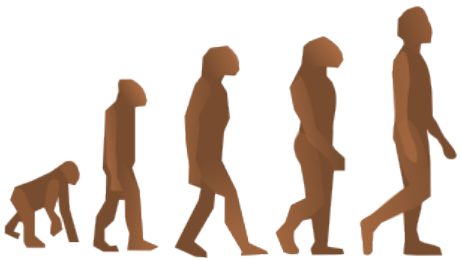
For smooth package updates



Model can specify

- How to replace a value (replace)
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- How to migrate deprecated values (migrate_from + formula)
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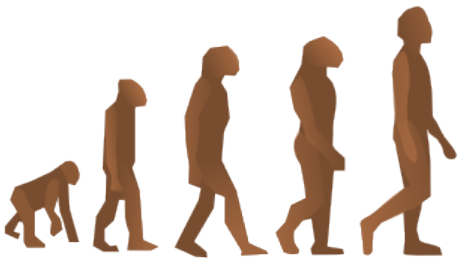

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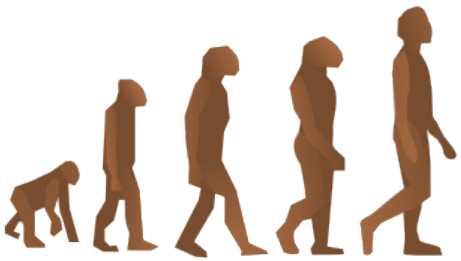

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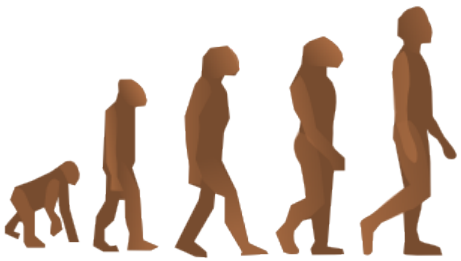

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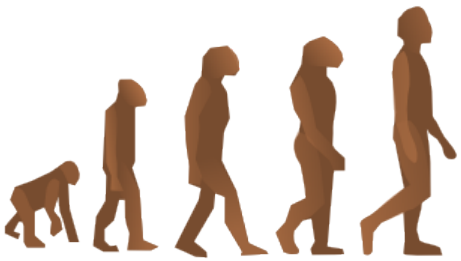

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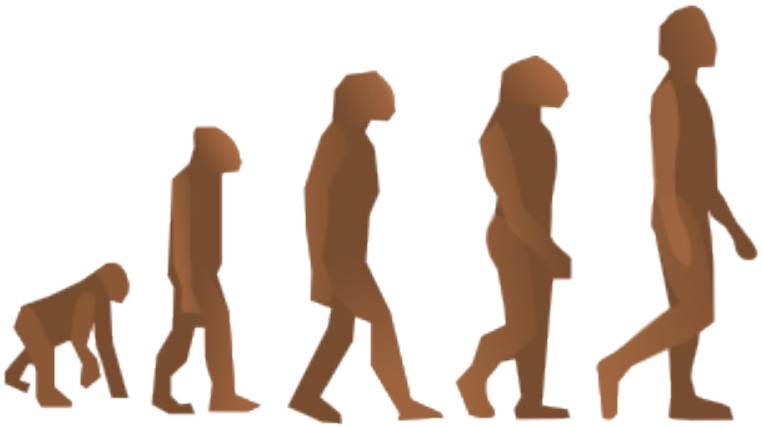
Benefit of smooth configuration upgrades

Enable upstream evolution



Configuration improvement

With smooth upgrades, configuration files can be improved:

- keyword clarification (to reduce doc)
- re-structuration to match user's point of view instead of application design
- Even syntax change

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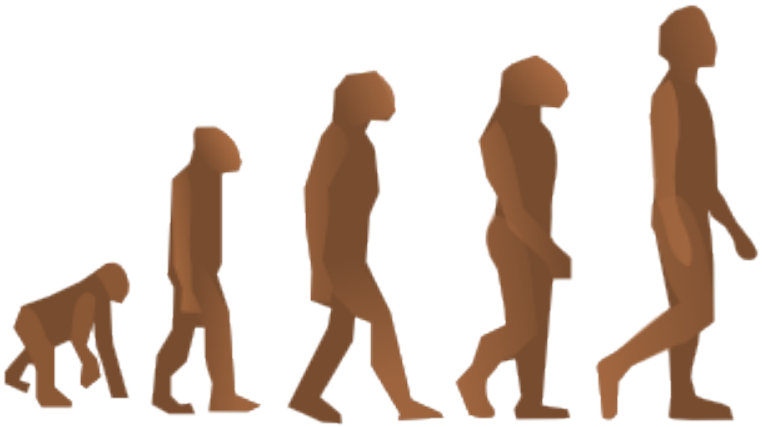

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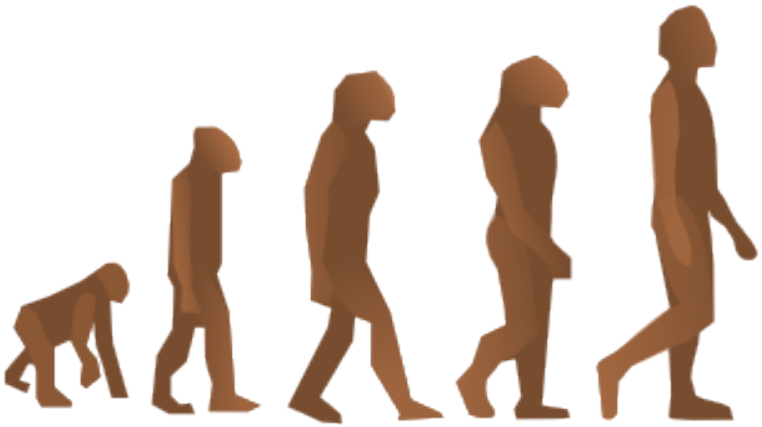

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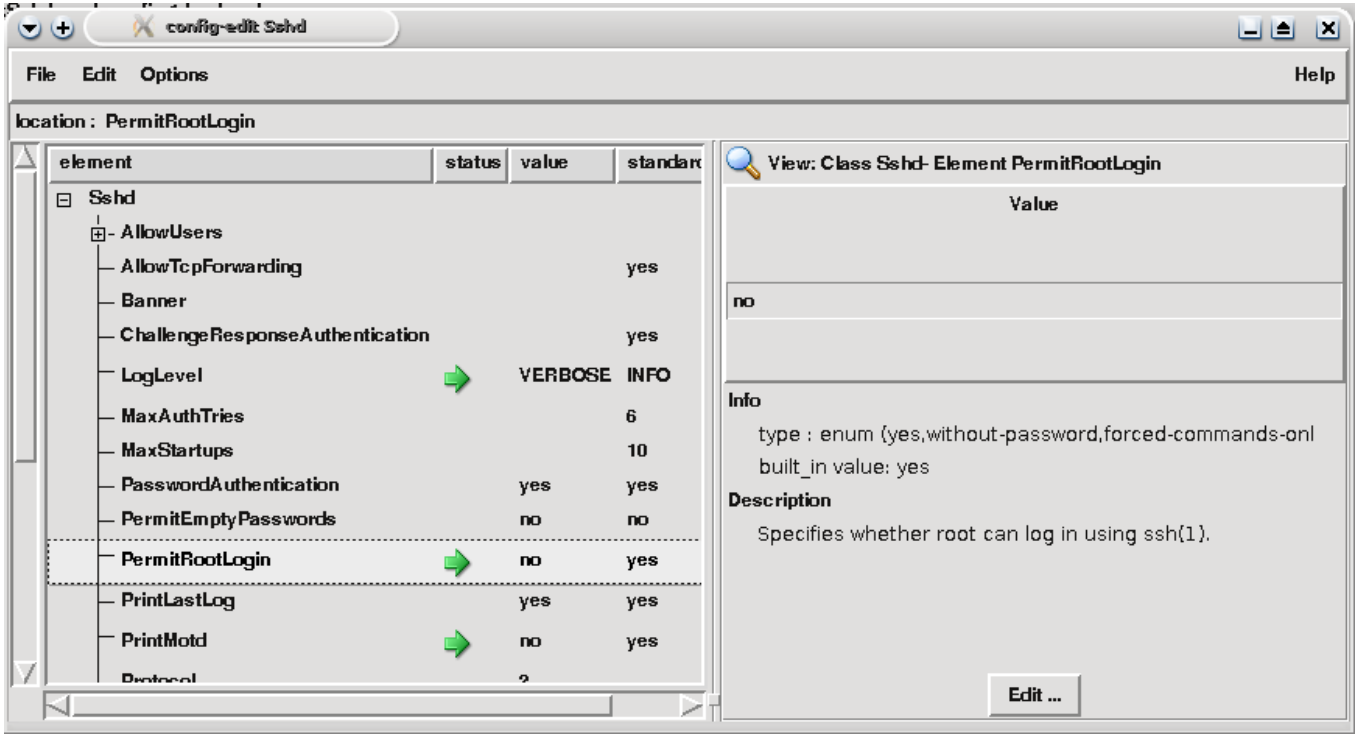
Configuration GUI

Your work may be seen by user

Shown only when user requires it, not during upgrade.



Note: In the menu, change "Option → experience" to show more parameters

Other interfaces

Other ways to see the result of your work

Other interfaces are available:

- Curses
- Shell like (with 'ls' 'cd' commands)
- Telnet like (command and answers)
- Fuse (each parameter is a file)

Config and package upgrades status

Lackluster situation

Package upgrade:

- RedHat: Configuration evolutions leave rpm.new or rpm.save file
- Debian: Configuration evolution either:
  - trigger questions (often cryptic)
  - expose details to user with a diff
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In all cases

Merging configuration requires good knowledge from user.

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Better configuration and package upgrades

Towards a solution?

Proposal

Use Config::Model to merge:

- user data from config file
- package/upstream evolutions from distributed model

Models with merge capability can be implemented by:

- Upstream projects
- Distributions (Debian, RedHat ...)
- Derived distributions (Knoppix, SkoleLinux ...)

Each can improve model coming from upstream

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Example of model with migration

A parameter was renamed by upstream

sshd_config: TCPKeepAlive option was formerly called KeepAlive.

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  value_type => 'enum',
  choice     => [ 'no', 'yes' ]
  status     => 'deprecated',     # KeepAlive is a goner
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TCPKeepAlive => {
  type       => 'leaf',           # same spec as KeepAlive
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    variables => {
      keep_alive => '- KeepAlive' # where is the old param
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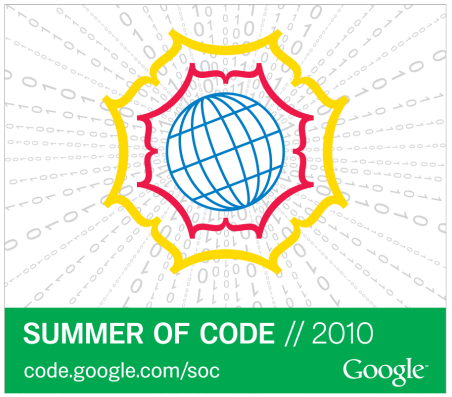
Coping with unknown parameters

Invite user feedback

Accept unknow parameters... with warning




```
{
  name => 'Sshd',
  ...
  accept => [ {
    name_match => '.*',    # match any unknown parameter
    type       => 'leaf',
    value_type => 'uniline',
    summary => 'boilerplate parameter that may hide a typo',
    warn => 'Unknown parameter: please make sure there\'s '
          . 'no typo and log a bug'
   }
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Package upgrade howto

Minimal change in source package

Debian

In package build instructions (*debian/rules* file):

```
dh_config_model_upgrade --model_name Sshd \
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In postinst:

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Project status 1

Functionalities provided by Config::Model

Available Models

- OpenSsh
- Approx
- Dpkg Control Copyright
- Krb5
- Xorg

Backend

- INI syntax
- Perl
- YAML
- Dpkg control
- Augeas

Framework

- Model composition (plugins)

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Project status 2
Community

Community

- Debian packages
- Mageia packages
- Proposal and patches for dh_config (package upgrades)
- Article in GNULinux Mag France
- 2010 GSoC project based on Config::Model

Future projects

Interfaces

- Search parameters, values and help
- Annotations (e.g. comments) on-going
- Web UI? (help needed)

backend

- JSON
- XML
- Need other?

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- Support included config files (à la Apache)
- Configuration aggregation (to reduce redundancies between different configs)
- More doc, examples, blogs, FAQ ...

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Users are waiting for

- No question asked, no slag left after upgrade of their favorite application
- Smooth multi-level configuration (e.g cascaded models for Debian pure-blend project)

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Links

- Config::Model site
  `http://config-model.wiki.sourceforge.net`
- Config::Model on CPAN
  `http://search.cpan.org/dist/Config-Model/`
- Config::Model user mailing list `https://lists.sourceforge.net/lists/listinfo/config-model-users`
- GNU/Linux Mag France n°117 and n°120 "Config::Model - Créer un éditeur graphique de configuration avec Perl" (2 parts)
- Proposal to use Config::Model to upgrade configuration during Debian package upgrade
  `http://wiki.debian.org/PackageConfigUpgrade`
- Augeas project `http://augeas.net`