

Configuration Revolution

Why it needed 13 years and how it will be done

FOSDEM 2018

Main Track



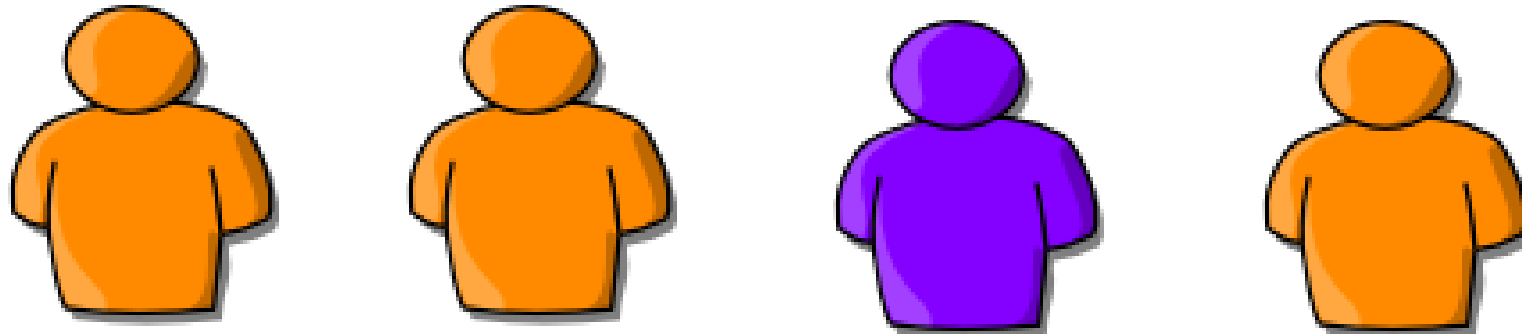
Markus Raab <markus@libelektra.org>

<https://www.libelektra.org>

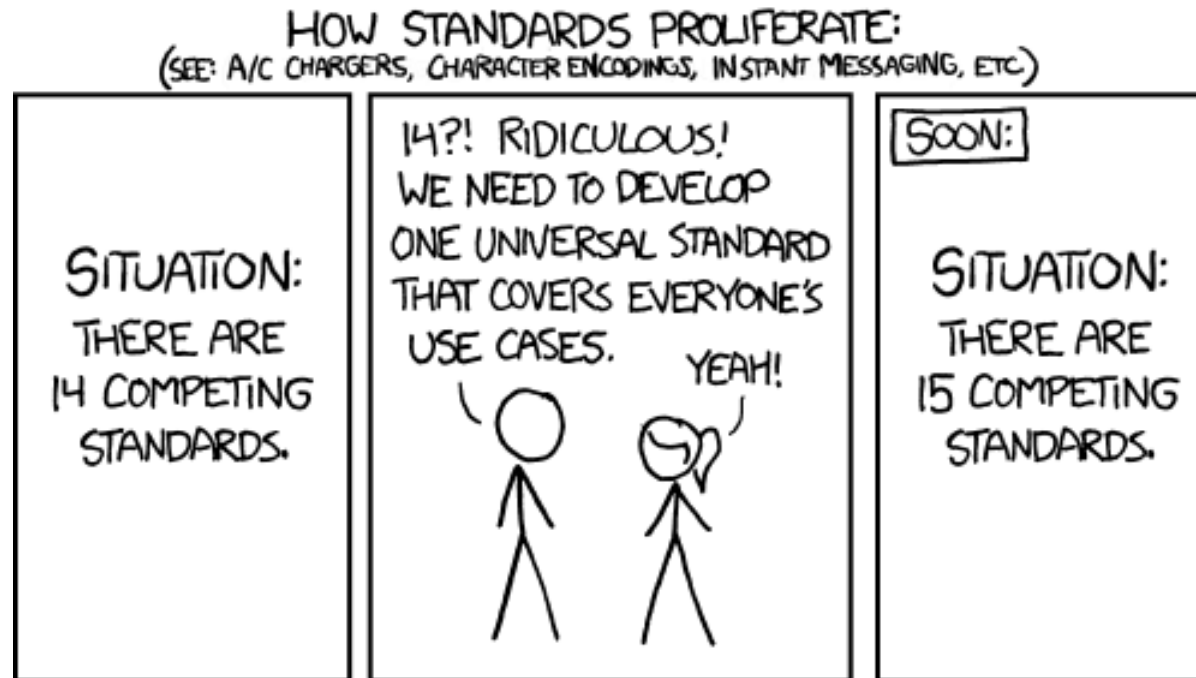


Time is valuable

- *25% reinvented the same wheel (me included)*



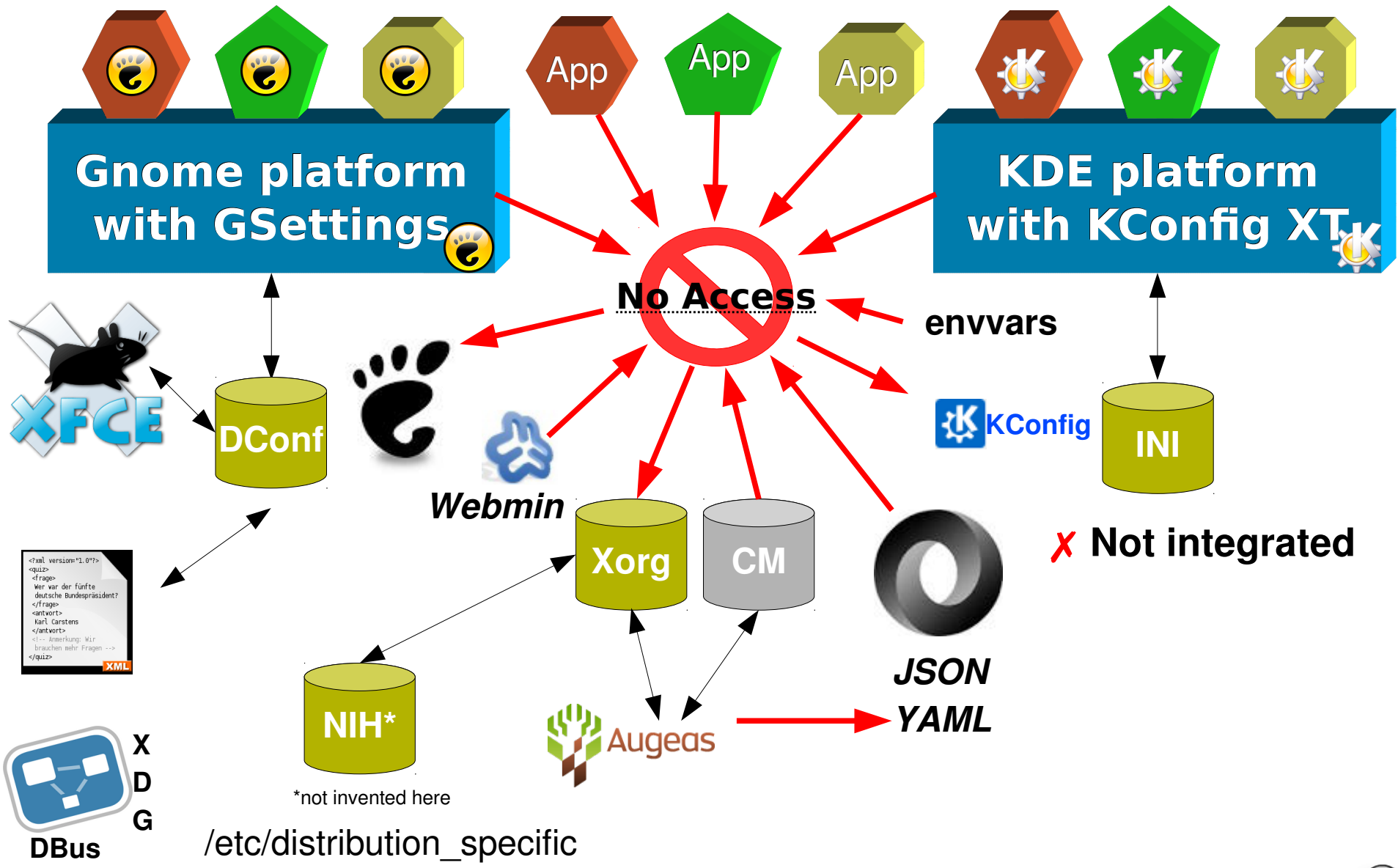
How to (not) change the situation?



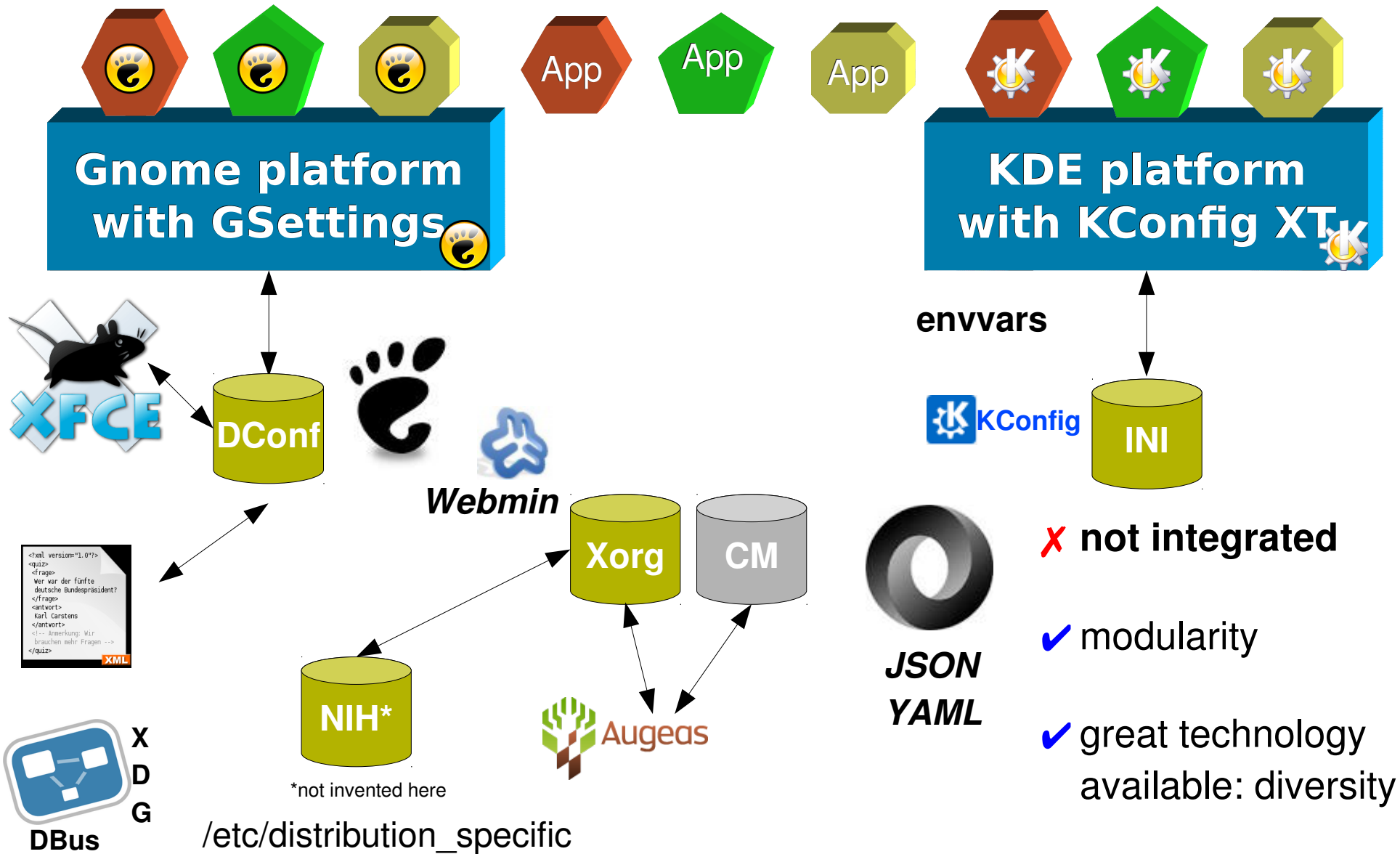
(thanks to xkcd.com)



What is **wrong** with Configuration?



What is right with Configuration?



Misconfiguration

configuration is a user interface

*not only for **developers** but also:*

- for **end users** and
- for **system administrators**

*misconfiguration often lead to **system failures***

Ladder of Abstraction



➤ *Abstract Nonsense*

➤ ...

➤ *Config Management*

➤ ***Key/Value Specification***

➤ *Key/Value Registry*

➤ *File System*

➤ *Block Devices*

➤ *Bits on Harddisc*



Content for Today

- I. Introduction
- II. Popular Ways for Configuration
- III. Trend in Number of Configuration Options
- IV. Configuration Specification (Demo)
- V. Elektra

II. Popular Ways for Configuration

Questions? <https://issues.libelektra.org/1808>

Markus Raab <markus@libelektra.org>

<https://www.libelektra.org>



What we did

➤ *Online Questionnaire*

➤ from 672 persons 286 gave answers, 162 completed

➤ *Source Code Analysis*

➤ 50 million LOC

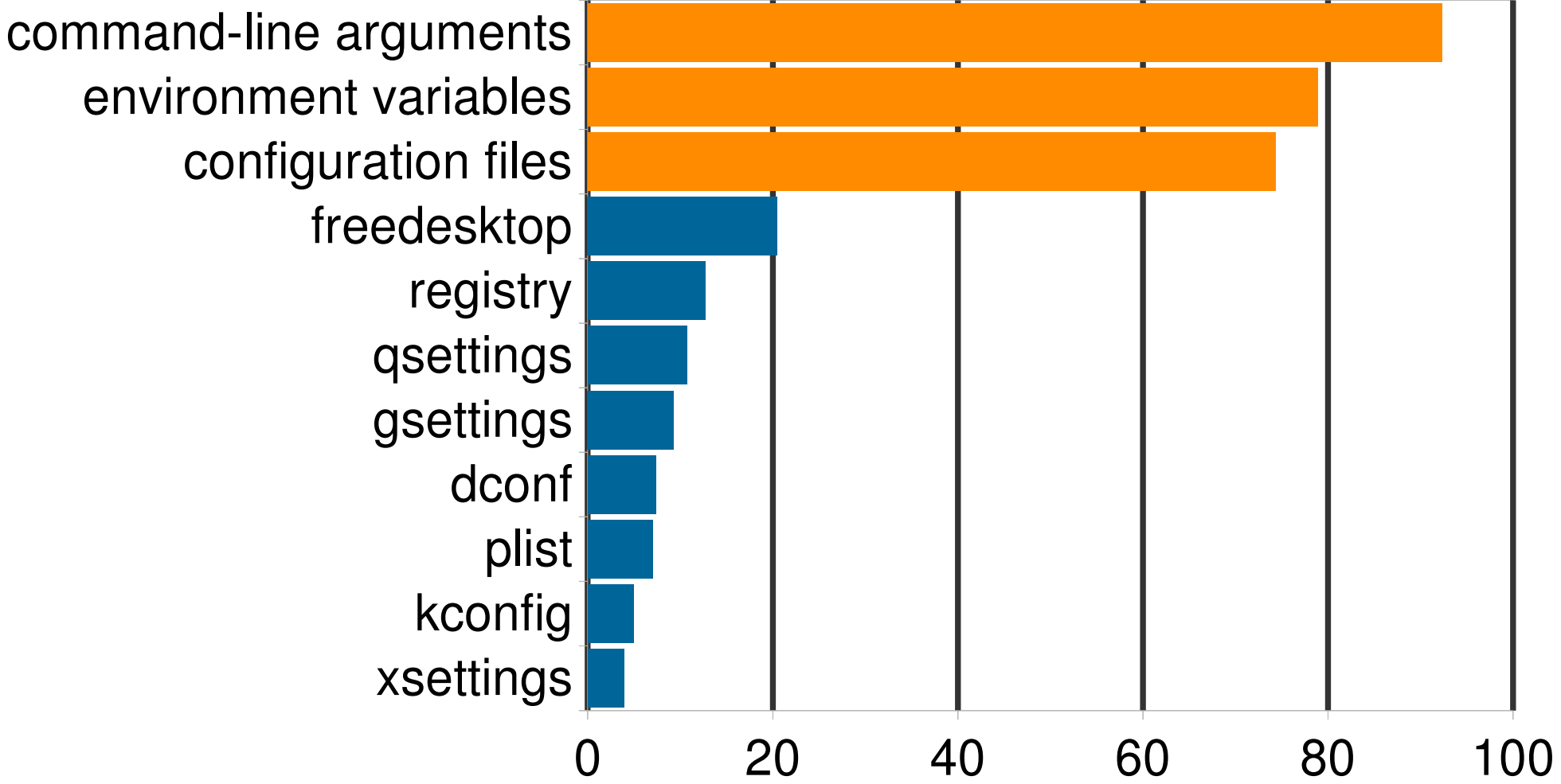
Application	Domain	Application	Domain
0ad	Game, Network	Gimp	Desktop
Akonadi	Server, Network	Inkscape	Desktop
Chromium	Browser, Mobile	Ipe	Desktop
Curl	Command-line, Network	LibreOffice	Desktop
Eclipse	Development	Lynx	Browser
Evolution	Development	Man	Command-line
Firefox	Browser, Mobile	Smplayer	Desktop
GCC	Development	Wget	Command-line, Network

➤ *Case Study+User Study (presented tomorrow 12:30)*

<https://www.libelektra.org>



And the Winners are...



Abstraction: Cascading Namespaces

[/sw/org/myapp/#0/current](#) uses all of below (cascading):

- ◆ [proc](#) namespace is for the current process (**cmdline+env**)
- ◆ [dir](#) namespace is stored in cwd like .git or .htaccess
- ◆ [user](#) namespace is stored below [~/.config/](#)
- ◆ [system](#) namespace is stored below [/etc/config/](#)



Abstraction: Key/Value



➤ *INI*



➤ *XMLTool*

```
[env]
ls = ls -FH
vnc = vncserver
```

```
<?xml version="1.0"
encoding="UTF-8"?>
<keyset xmlns=""
xsi:schemaLocation=""
parent="user/env/alias">
<key basename="ls"
type="string"
value="ls -Fh"
<comment></comment>
</key>
<key basename="vnc"
type="string">
<value>vncserver
</value>
<comment></comment>
</key>
</keyset>
```

- *Augeas:*
 - Hosts
 - Fstab
- *XML*
- *JSON*
- *YAML*
- *Line*
- *CSV*
- *Hosts*
- ...



key/value abstraction
is not enough



III. Trend in Number of Configuration Options

Questions? <https://issues.libelektra.org/1808>

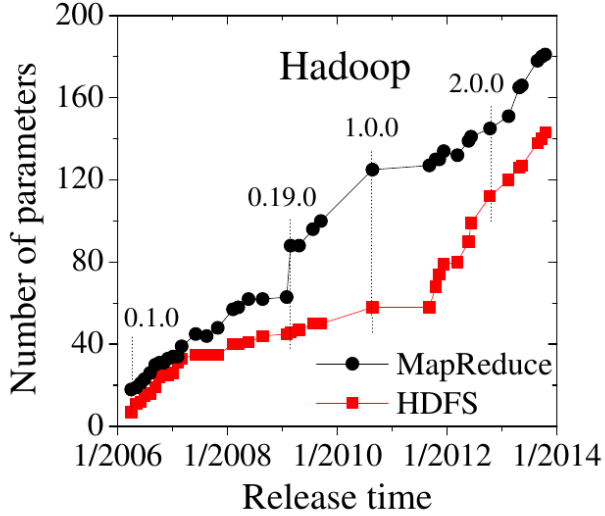
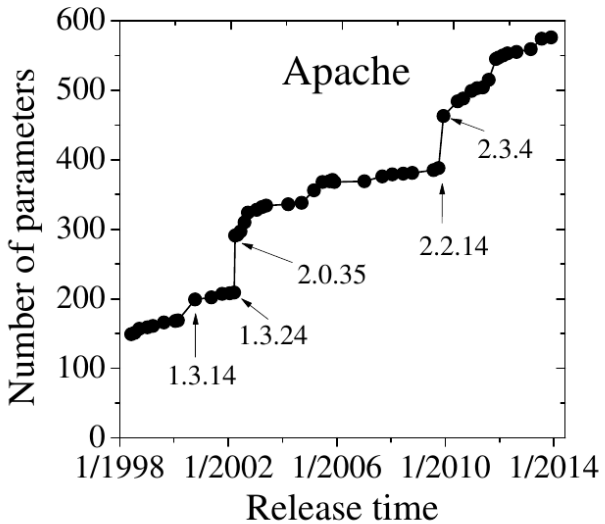
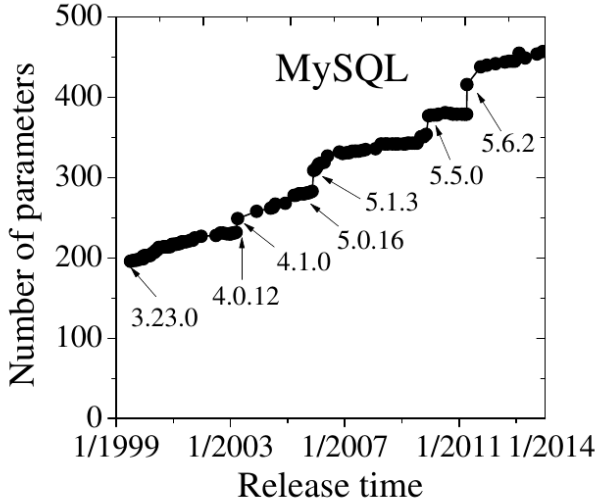
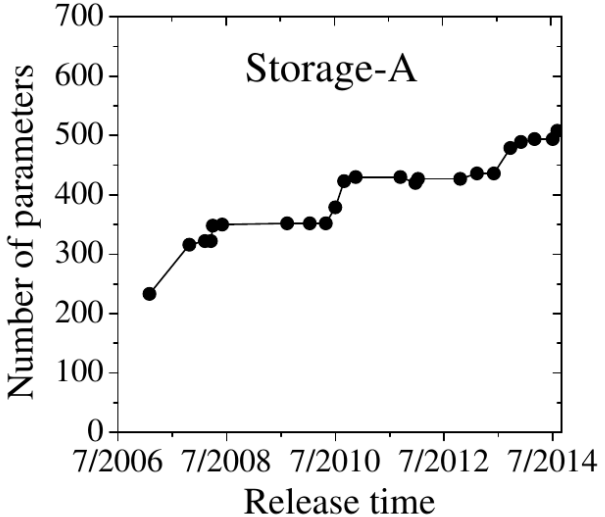
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Trend (1)

(thanks to Tianyin Xu)



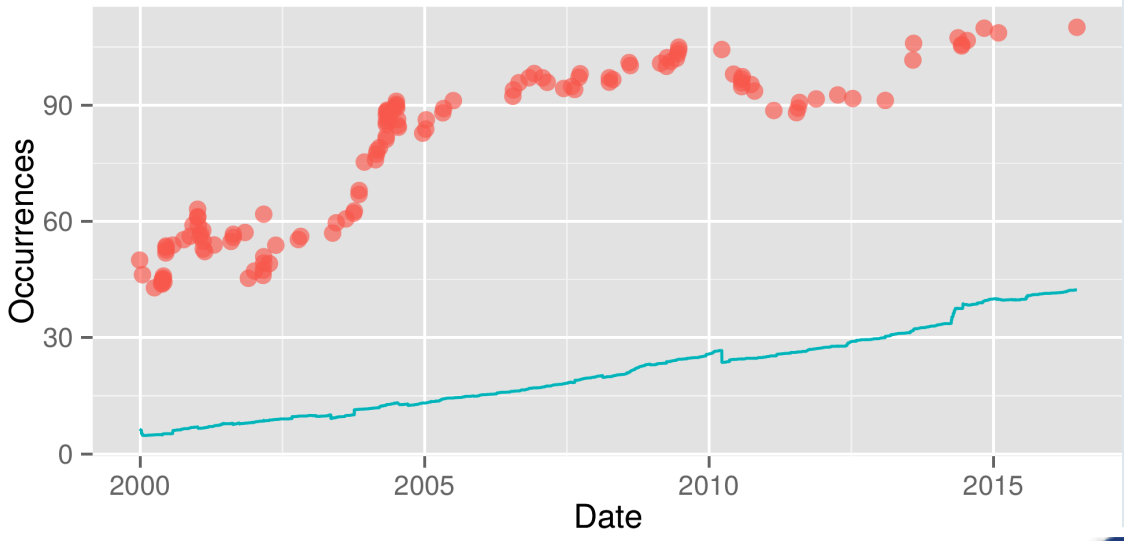
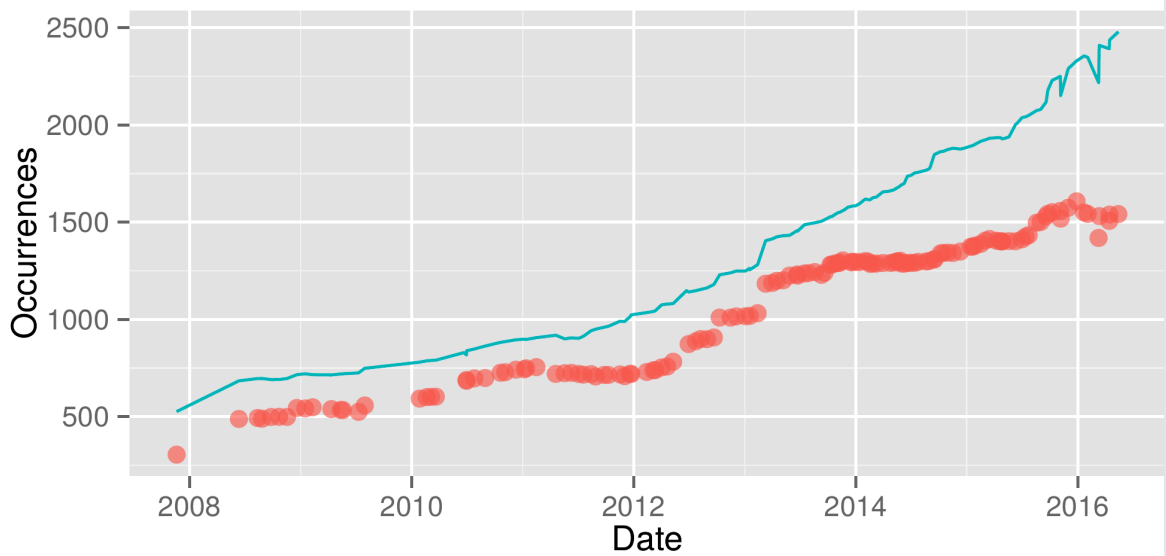
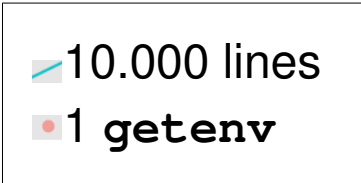
➤ 52% of configuration options are rarely used

<https://www.libelektra.org>



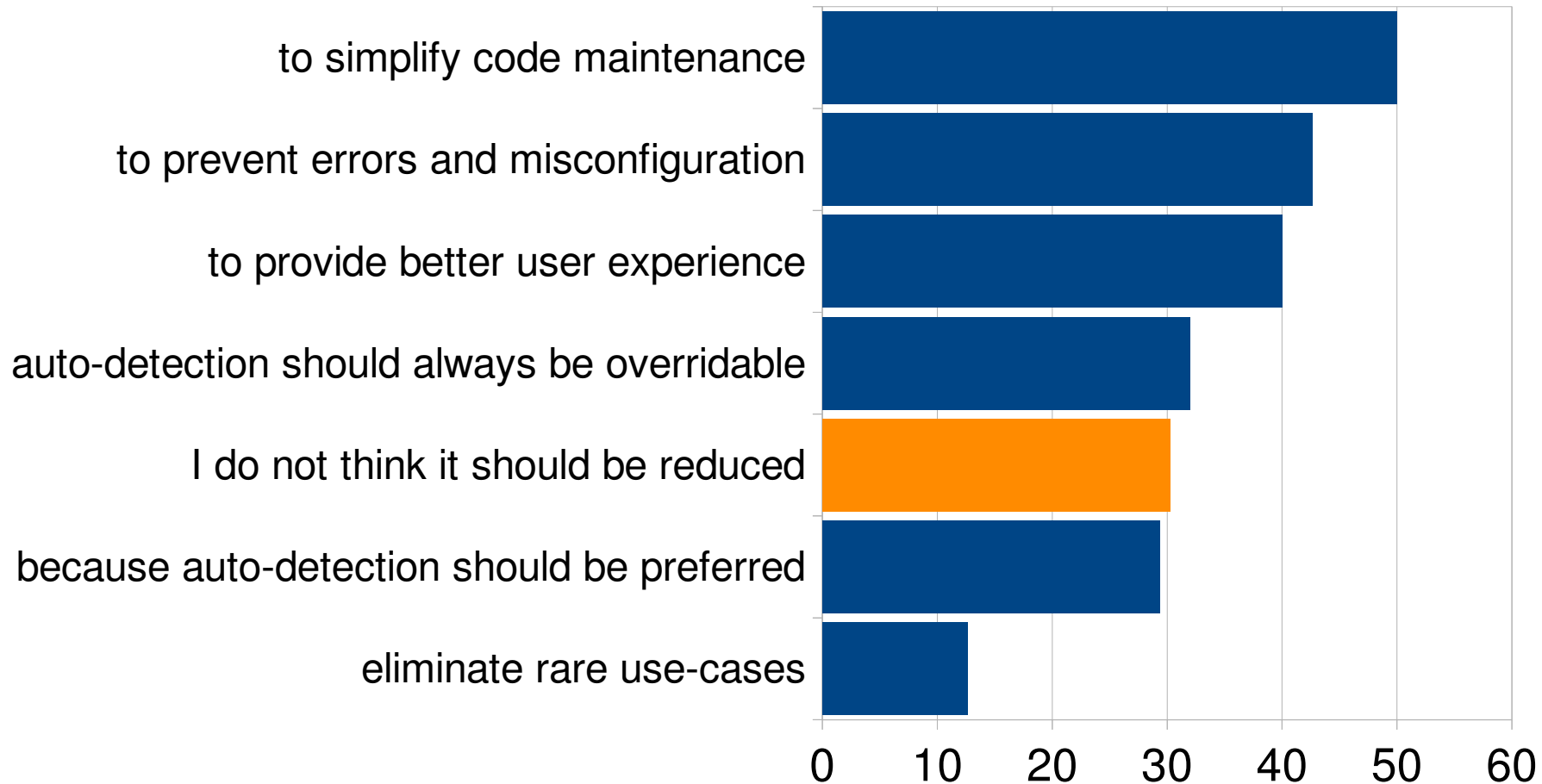
Trend (2)

➤ For environment vars/*getenv* we have a similar trend



Then let us reduce

Why do you think configuration should be reduced?



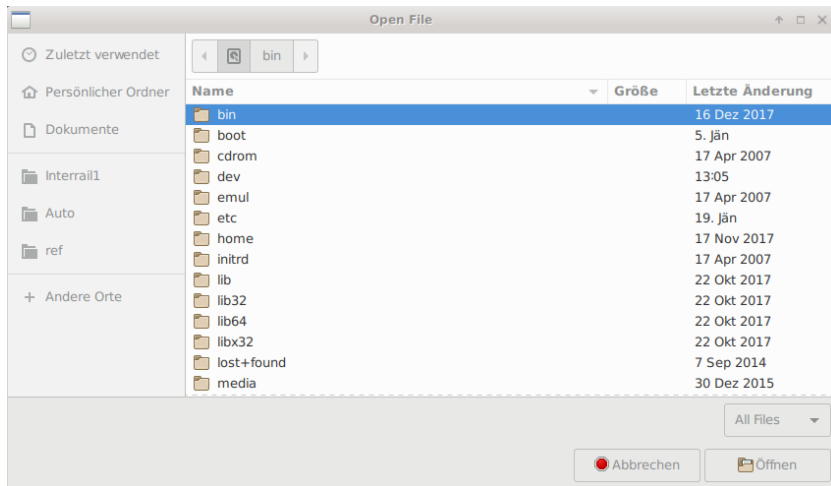
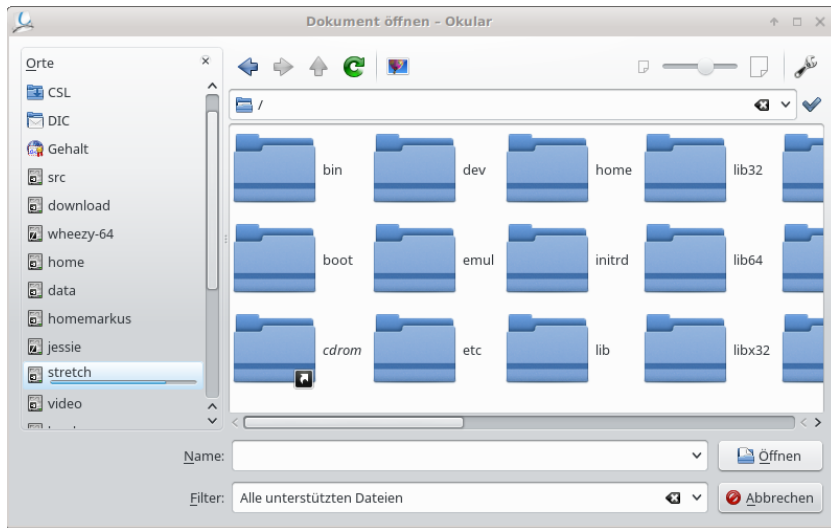
Current Situation





XServer GPSd

Customization is needed everywhere

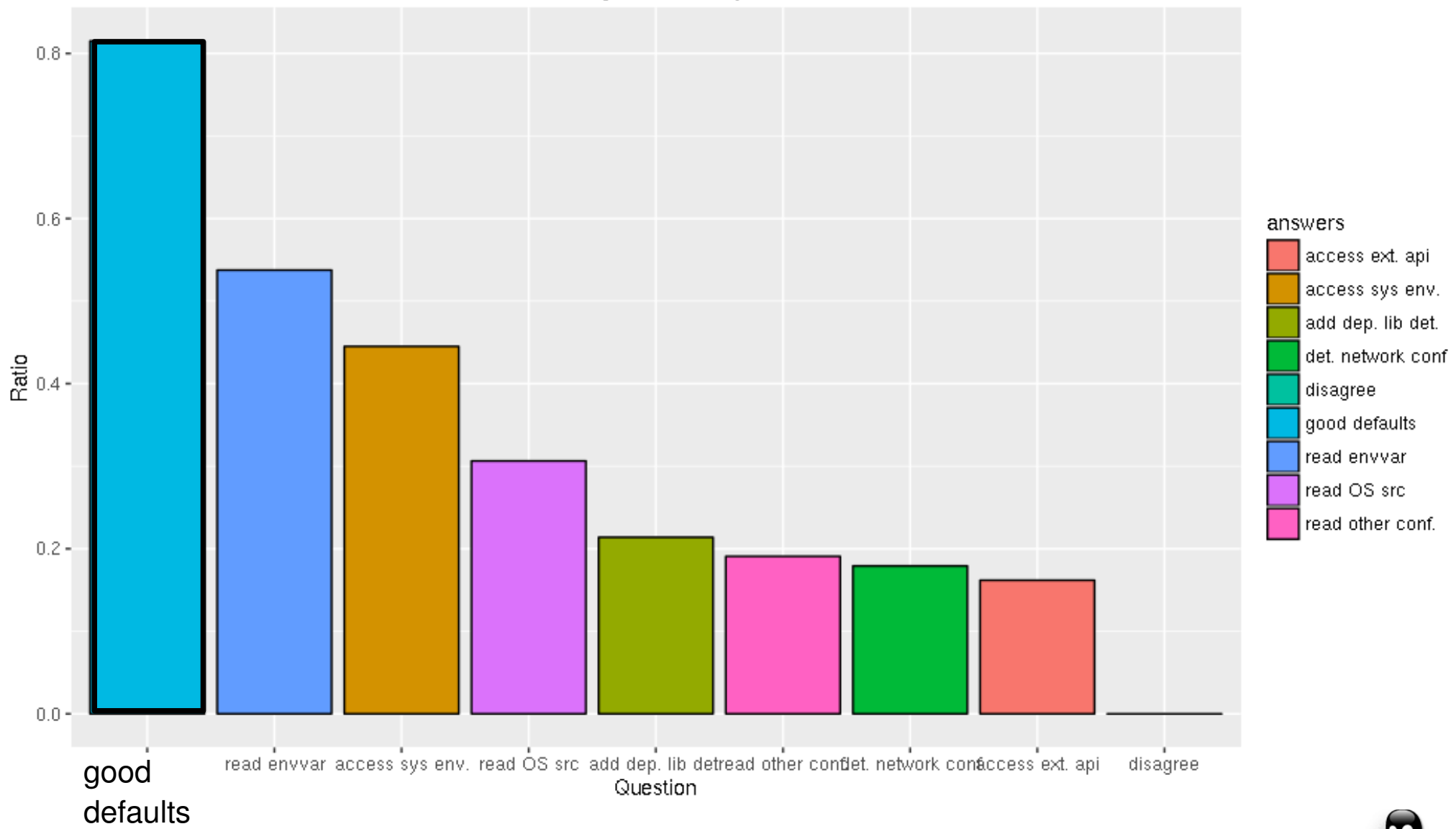


- *Shortcuts*
- *EditorConfig*
- *Favourite Places*
- *Language*
- *Power Management*
- *Sorting Criteria*
- *Size of Icons*
- *Proxy Settings*
- ...



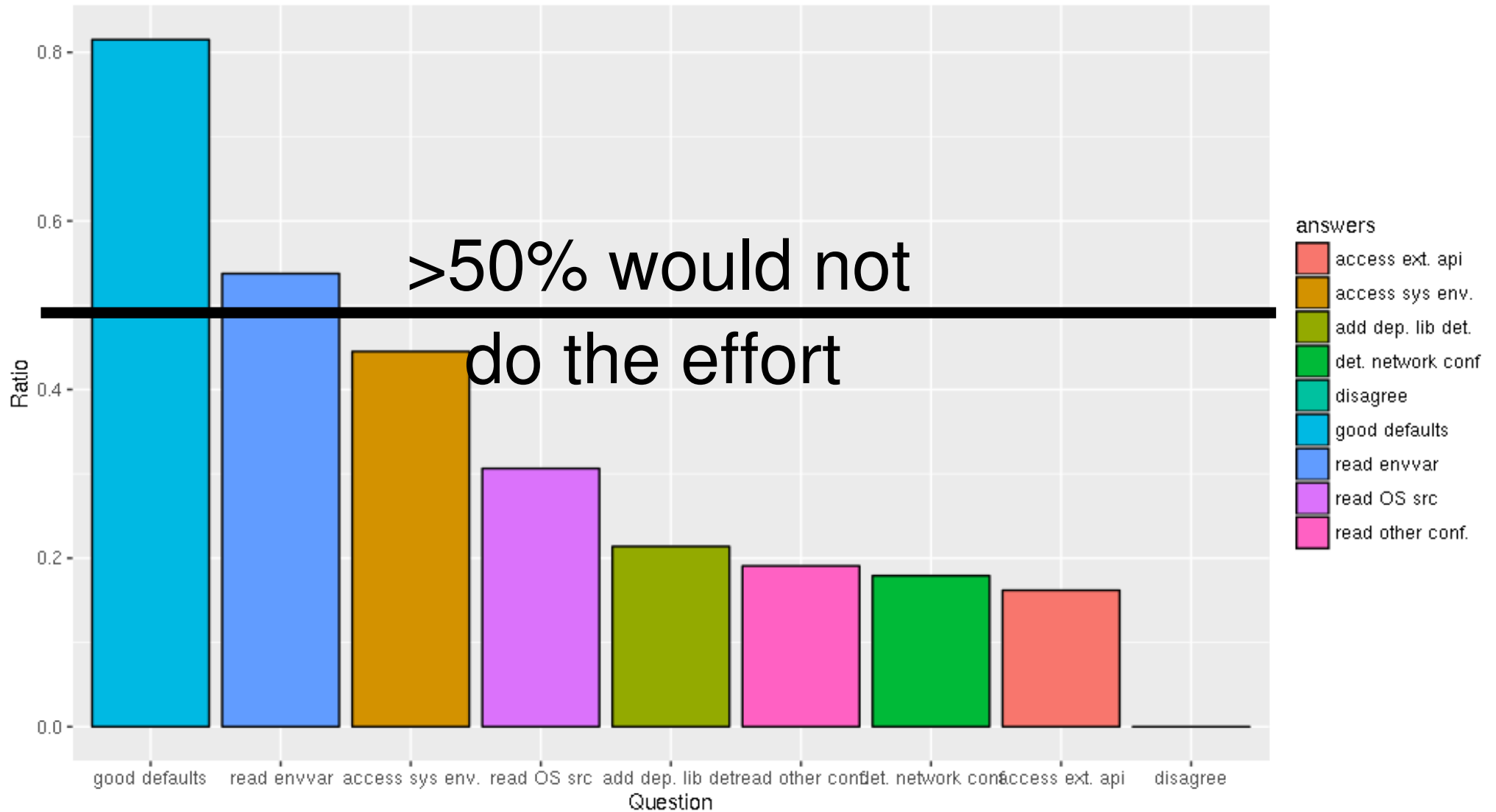
Good Defaults

Which effort do you think is worthwhile for providing better configuration experience?



Detection of other sources

Which effort do you think is worthwhile for providing better configuration experience?



Cascading Namespaces (again)

/sw/org/myapp/#0/current uses all of below (cascading):

- ◆ ***spec*** namespace allows you to specify default values, validations, overrides, visibility, etc. (via metadata)
- ◆ ***proc*** namespace is for the current process (**cmdline+env**)
- ◆ ***dir*** like *.git* or *.htaccess*
- ◆ ***user*** namespace is stored below *~/.config/*
- ◆ ***system*** namespace is stored below */etc/config/*

IV Configuration Specification

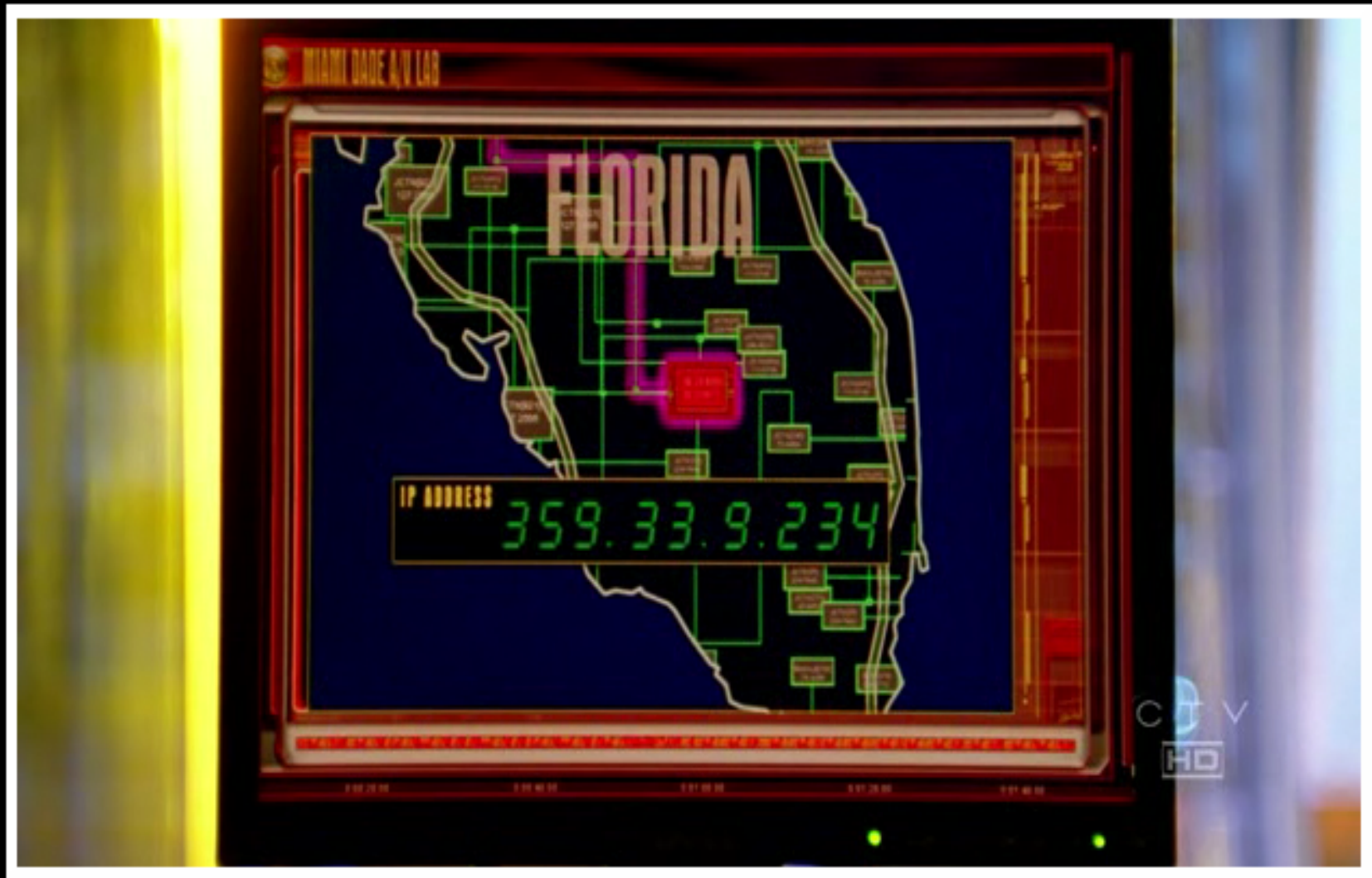
Questions? <https://issues.libelektra.org/1808>

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Back to Misconfiguration



IPv4, 5
CSI has it

State of the Art



User sw77 [CC BY-SA 2.0] via flicker

Use the source

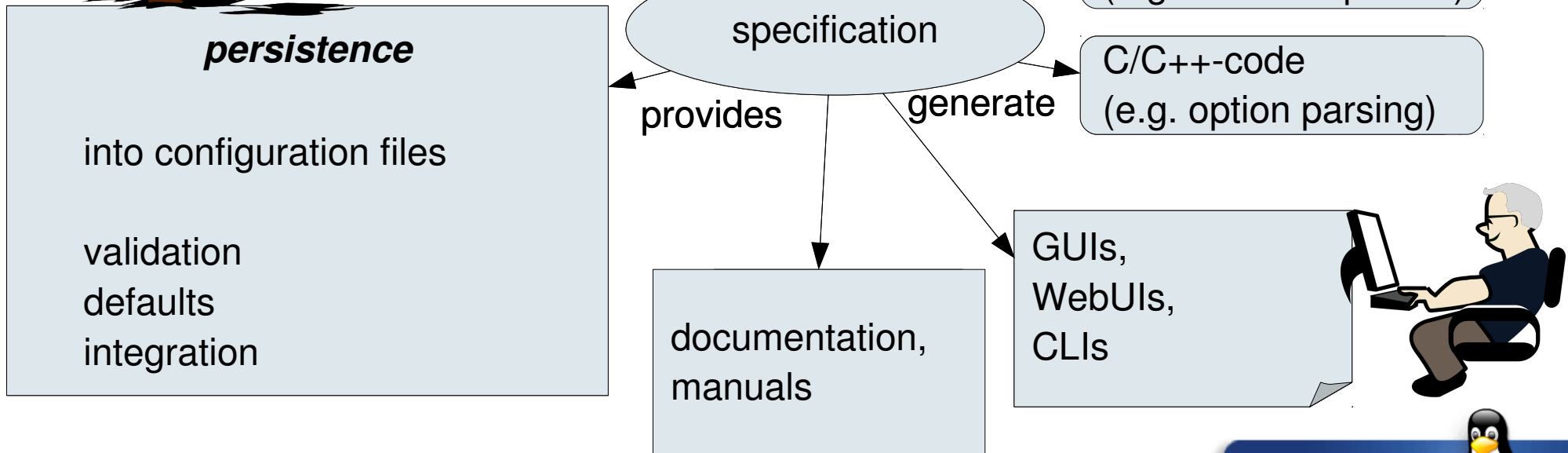
```
1563 case CFG_LTHREADS:
1564 >-----{ int mask = 0;
1565 >-----/* use a power of two */
1566 >-----while (c->value_uint > 1) {
1567 >----->-----c->value_uint >>= 1;
1568 >----->-----mask <<= 1;
1569 >----->-----mask |= 1;
1570 >-----}
```

<https://www.libelektra.org>



Specification

```
[  
  mountpoint = /etc/hosts  
  infos/plugins = hosts  
[ipv4/localhost]  
  type = ipv4  
  default = 127.0.0.1  
  check/ipaddr = ipv4  
  check/validation = ^127\..*  
  check/validation/message = "localhost ip must  
    be within 127.0.0.0/8"
```





DEMO

Markus Raab <markus@libelektra.org>

Thomas Waser <thomas.waser@tuwien.ac.at>

<https://www.libelektra.org>



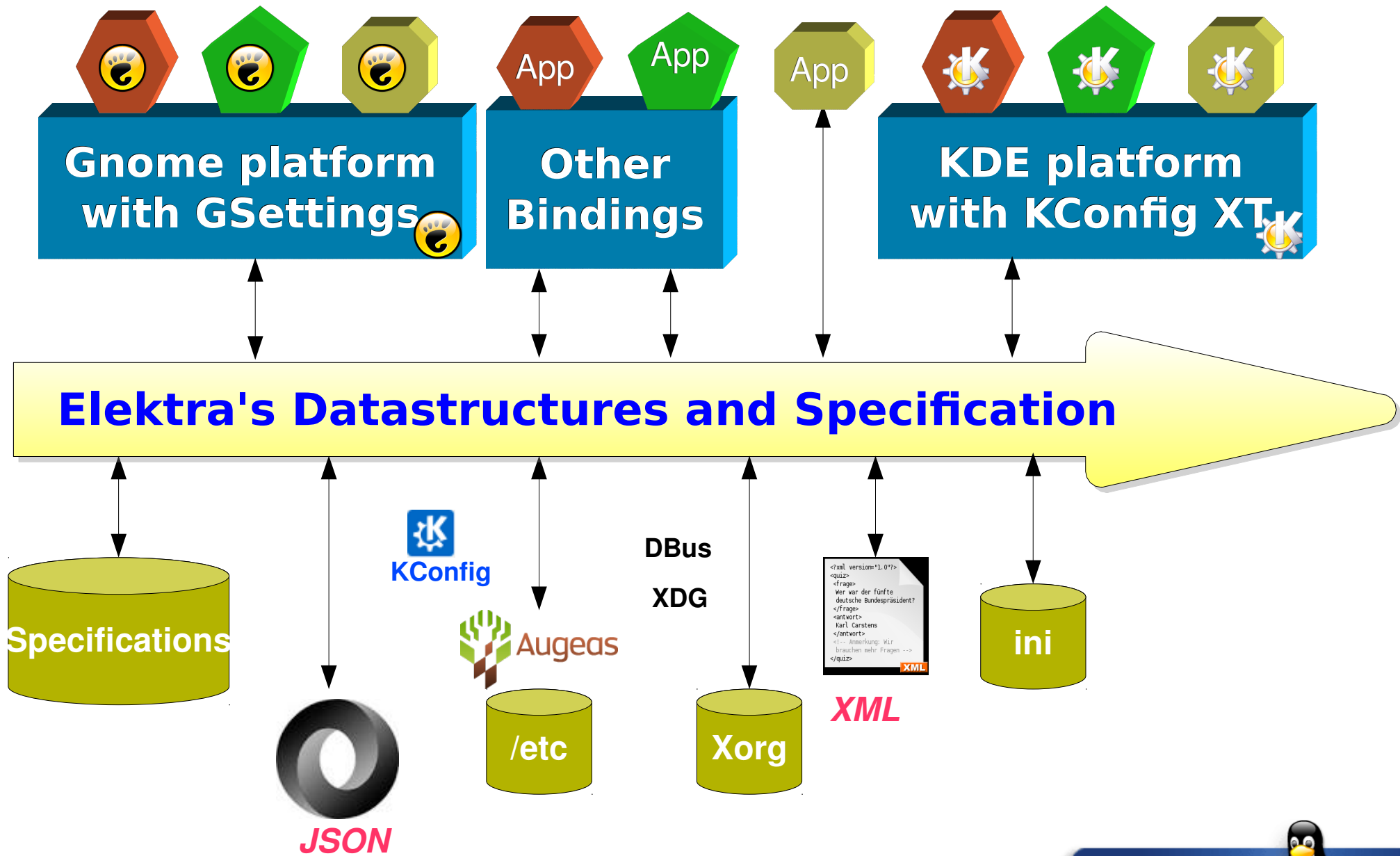
introspection

reusable

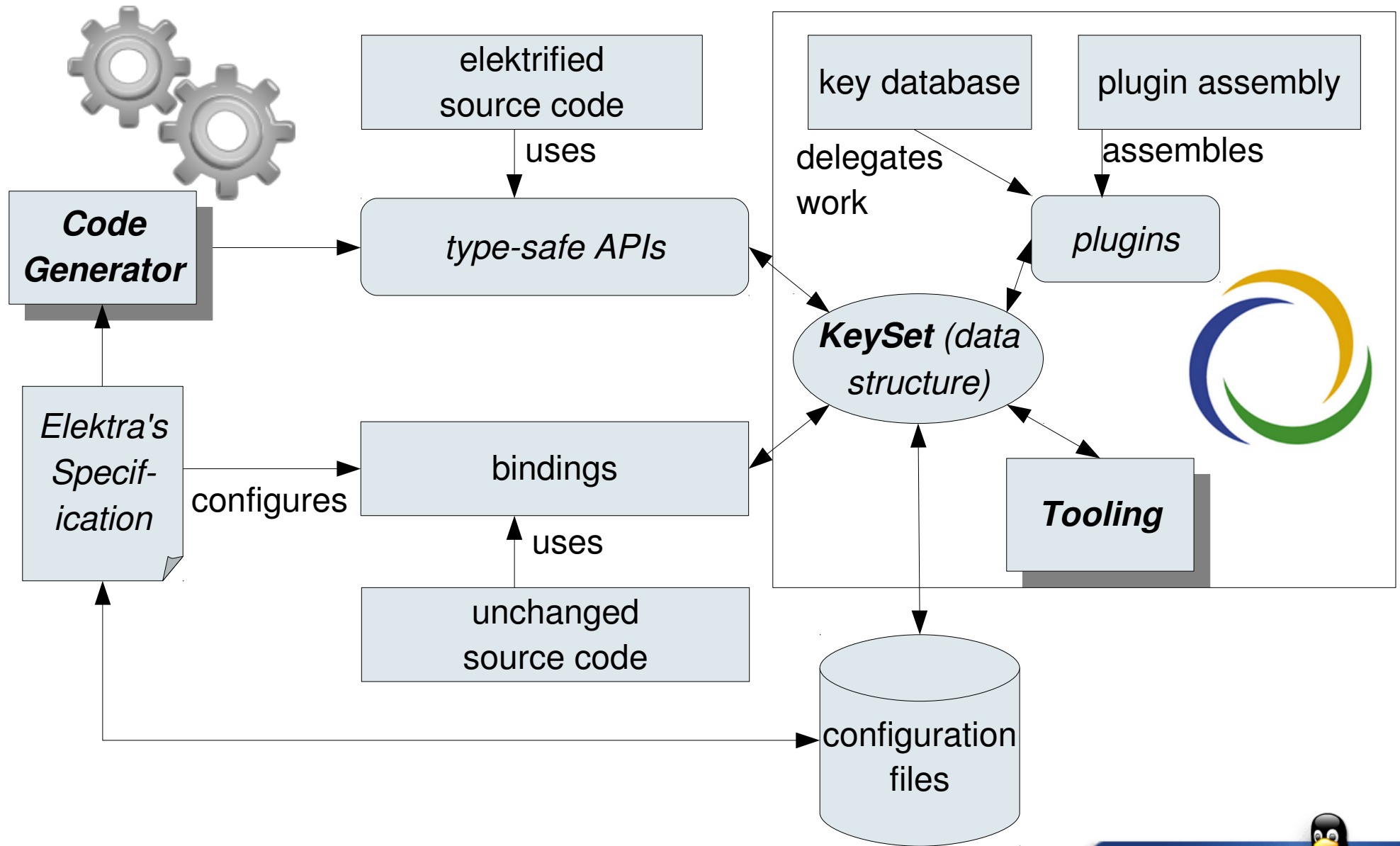
safe



Technology Integration



Ways to use Elektra (“Elektrify”)





V. Elektra

Questions? <https://issues.libelektra.org/1808>

Markus Raab <markus@libelektra.org>

<https://www.libelektra.org>



What is libelektra?



```
sh$ ldd /lib/libelektra.so
libc.so.6 => /lib/tls/libc.so.6
/lib/ld-linux.so.2 => /lib/ld-linux.so.2
```

- ✓ *small, fast library*
- ✓ *access to global configuration*
- ✓ *portable, no deps required (ANSI C)*
- ✓ *no daemon: security by OS*

<https://www.libelektra.org>



Available Bindings

➤ Language

- ✓ C/C++
- ✓ Shell
- ✓ Lua
- ✓ Python
- ✓ Java
- ✓ Ruby
- ✓ Haskell



➤ Interception

- ✓ Getenv
- ✓ GSettings
- ✓ Filesystem

The *kdb* Command

```
$ kdb get /filesystems/boot/mpoint  
  
# kdb set /sw/xorg/Screen/Display/Modes 1280x1024  
  
$ kdb editor system/sw/xorg/
```

- Perfect for scripts: administrative work+package install
- **Easy** to write tools like this
- Also for **specifications!** It has **tab completion!**



Web UI and GUIs

← elektra-web > instance #878

configuring instance "Studenten"
http://localhost:33333

- hello/
- pk/
- student/
 - age/: 21
 - gender/: male female
 - name/: Daniel
 - registered/:

Create new key: value

DONE

Elektra Qt Editor (Edit Mode)

Database Edit Settings Help

Find Key ...

- spec
- dir
- user
- system
 - elektra
 - modules
 - mountpoints
 - version
 - constants
 - infos
 - env
 - fstab
 - hosts
 - ipv4
 - ipv6
 - info
 - constants
 - cmake
 - compiler

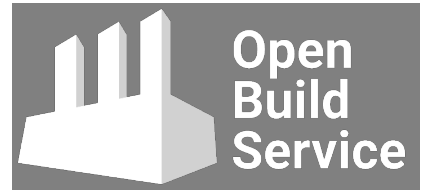
Key Name	Key Value
ip6-allhosts	ff02::3
ip6-allnodes	ff02::1
ip6-allrouters	ff02::2
ip6-mcastprefix	ff00::0
localhost	::1

Metakey Name	Metakey Value
comment/#0	comment
comment/#1	
comment/#2	the more comments the better
order	3

system/hosts/ipv6/ip6-mcastprefix



Available Packages



➤ Thanks to the maintainers!

<https://www.libelektra.org>



Users and Targets

✓ *Embedded Systems*



cameras



universities

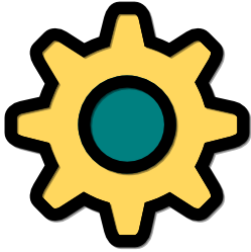


weighting scales

✓ *shared configuration in FLOSS (Desktop)*



(in progress)



➤ Your project?

✓ *Administrators (Servers)*

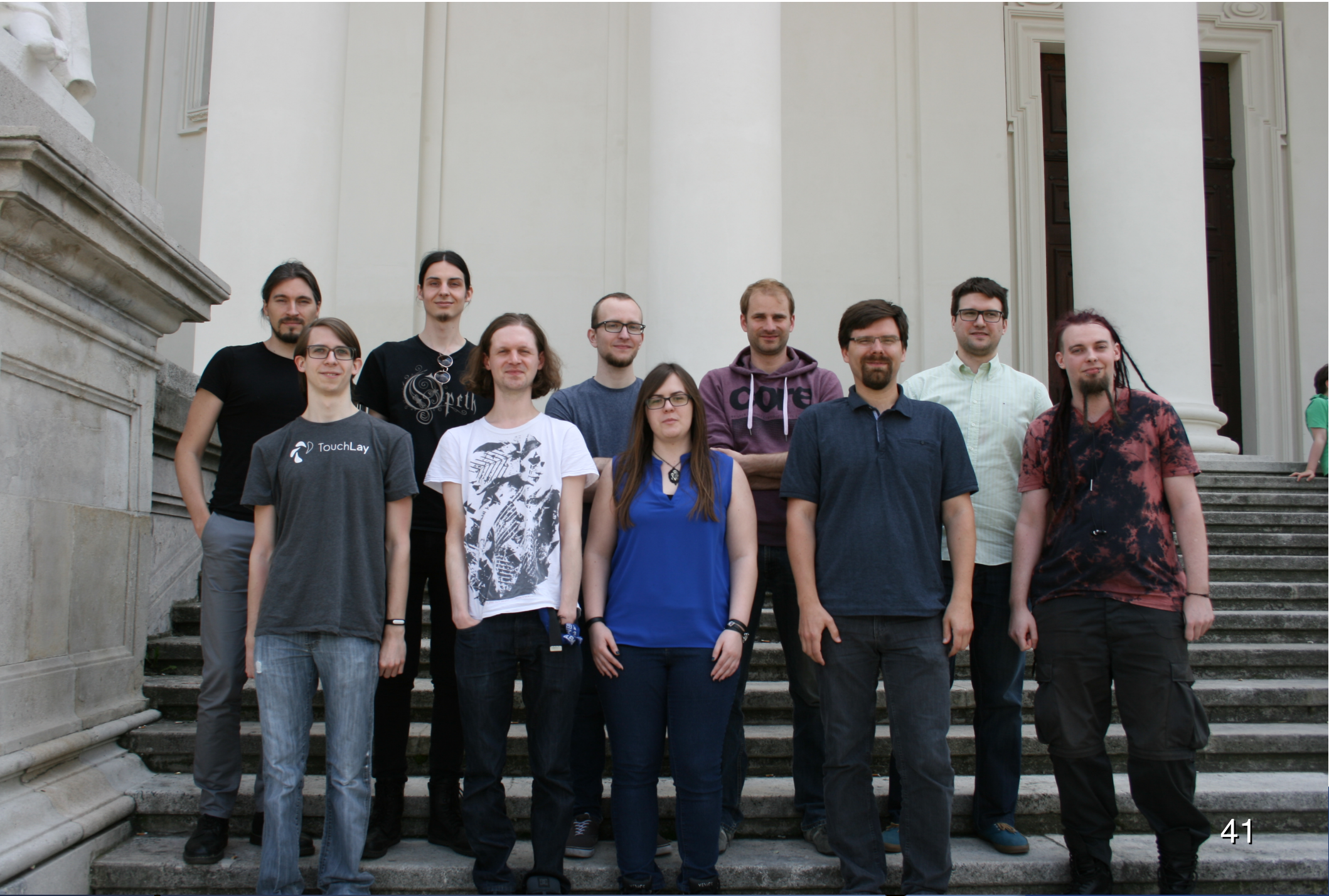


libelektra.org, universities, insurances, ...

<https://www.libelektra.org>



Who is working on Elektra?



Who is working on Elektra?

- *Armin Wurzinger: type system*
- *Bernhard Denner: Puppet*
- *Daniel Bugl: WebUI*
- *Dominik Hofer: high-level API*
- *Kurt Micheli: order preserving minimal perfect hash map*
- *Marvin Mall: website*
- *Mihael Pranjić: mmap plugin*
- *Peter Nirschl: fcrypt+crypto plugin*
- *Raffael Pancheri: Qt GUI*
- *René Schwaiger: parsing techniques*
- *Thomas Wahringer: notification*
- *Thomas Waser: validation and transformations of configuration*
- *Ulrike Schaefer: shell completion*
- *Vanessa Kos: misconfiguration bug database*



active community



➤ You: Fun Parts?



<https://www.libelektra.org>



Future Work

misconfiguration database

fail-safe user interface

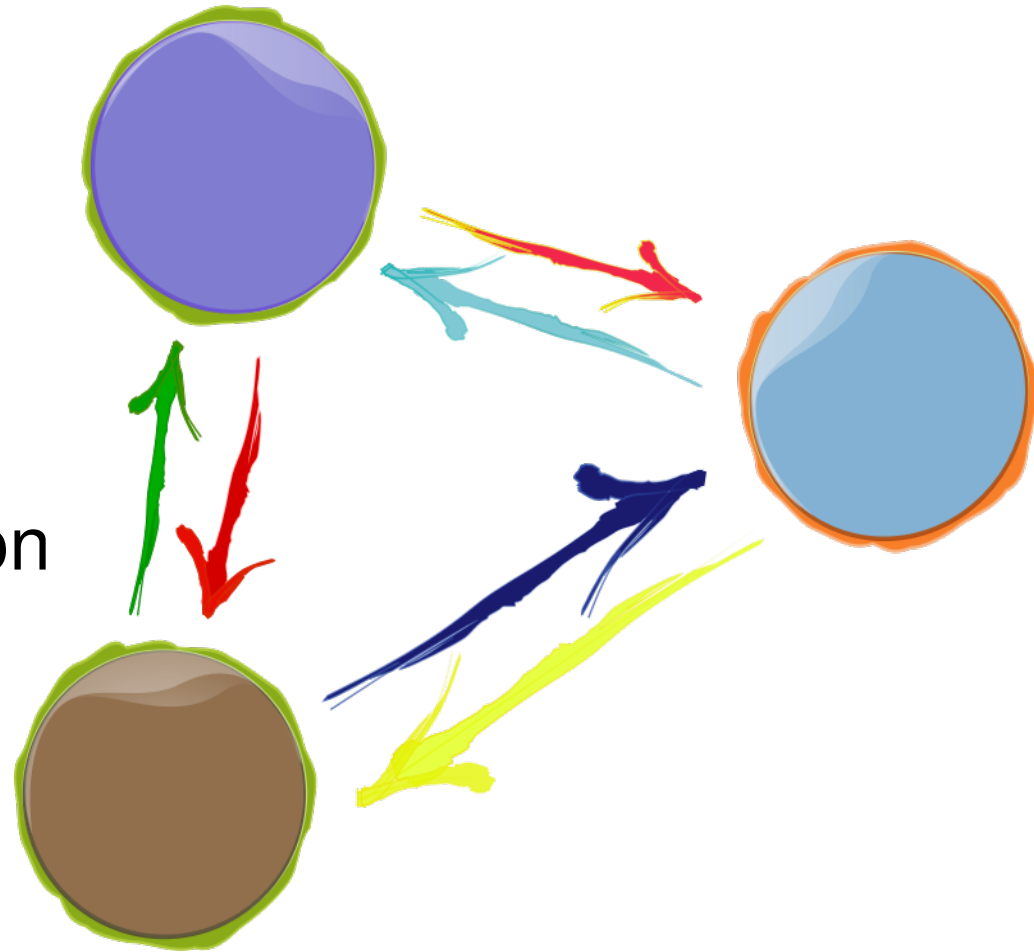
extend type system

optimizations

elektrify

Conclusion

- **out-of-the-box experience**
 - better defaults
 - dependences in plugins
- **share configuration**
 - using other's configuration
 - across applications
- **support tooling**
 - introspection
 - make system administration sane



Resources

Thank you for your attention!

Drop us an email or open a issue!

Questions?

- *Homepage: <https://www.libelektra.org/>*
- *Open Data: <https://rawdata.libelektra.org/>*
- *Build Server: <https://build.libelektra.org/>*
- *Book: <https://book.libelektra.org/>*

see you tomorrow 12:30

Config Management DevRoom

UA2.114 (Baudoux)



Markus Raab <elektra@markus-raab.org>

<https://www.libelektra.org>

