

# Breaking with conventional Configuration File Editing

Puppet with a Key/Value API in a User Study

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*FOSDEM 2018*

*Config Management devroom*

**Bernhard Denner (Author of Study)**

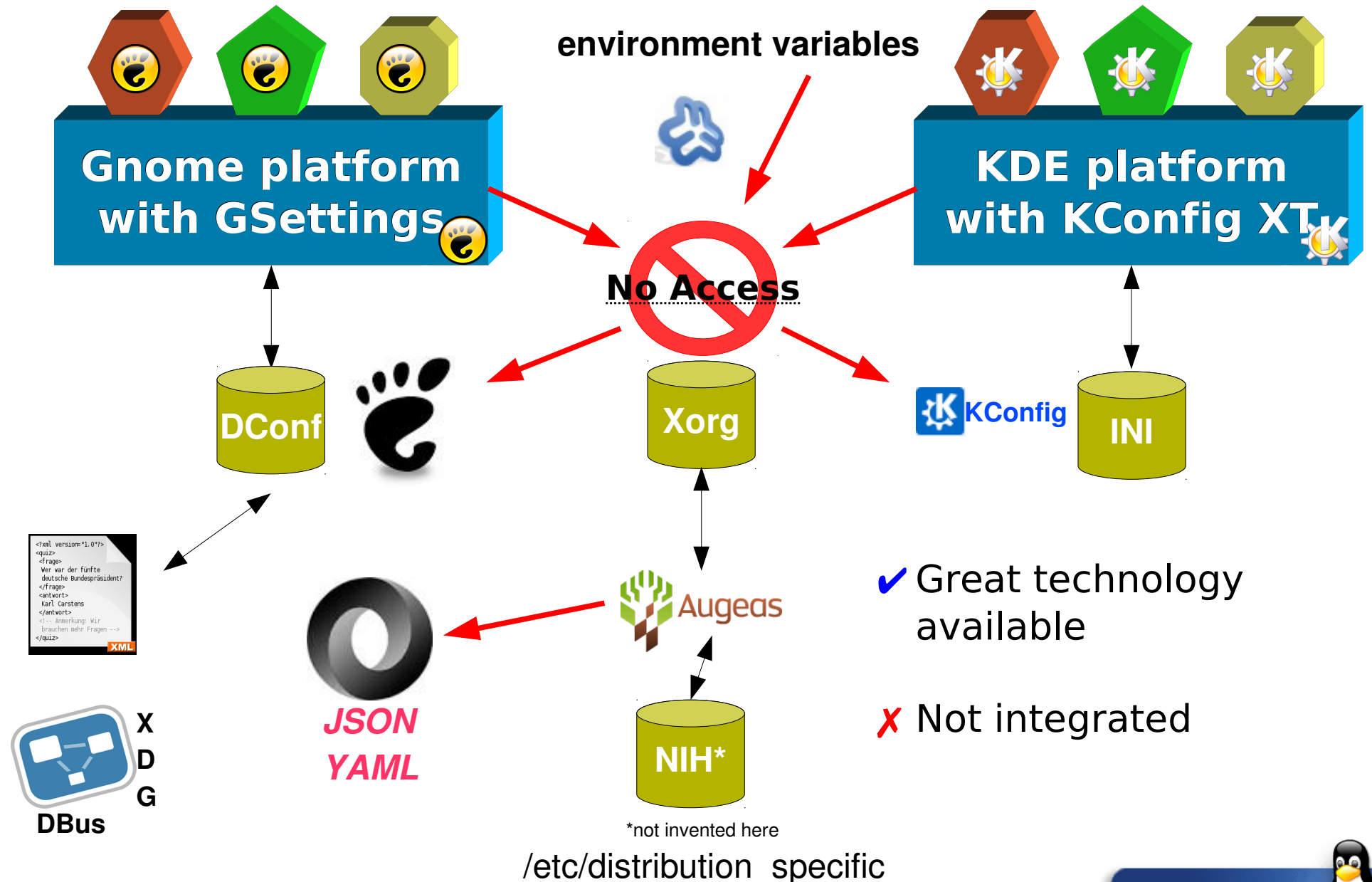
**Markus Raab <[elektra@markus-raab.org](mailto:elektra@markus-raab.org)>**

**xmpp: [jabber@markus-raab.org](xmpp:jabber@markus-raab.org)**

**<http://www.libelektra.org>**



# What is wrong with Configuration?

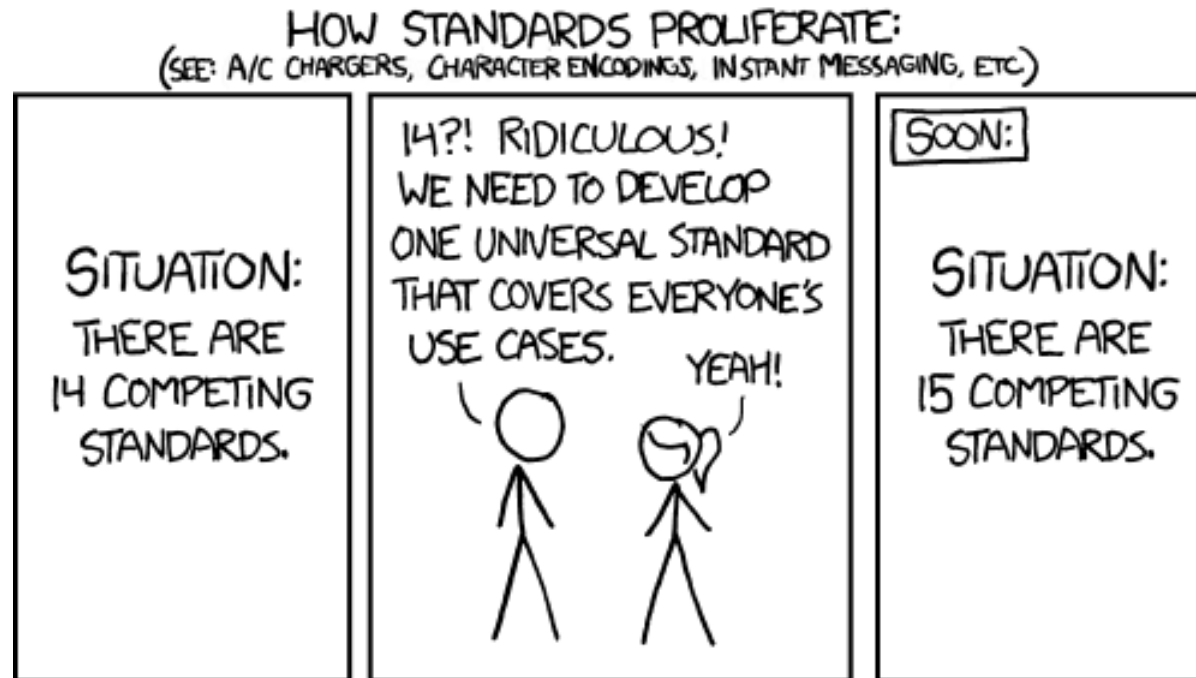


# Where are we heading?

- *Many formats*
- *Weak tooling*
- *Little documentation*
- *No specification*
- *Not declarative*
- *Not transparent*
- *System administrators have no easy life*



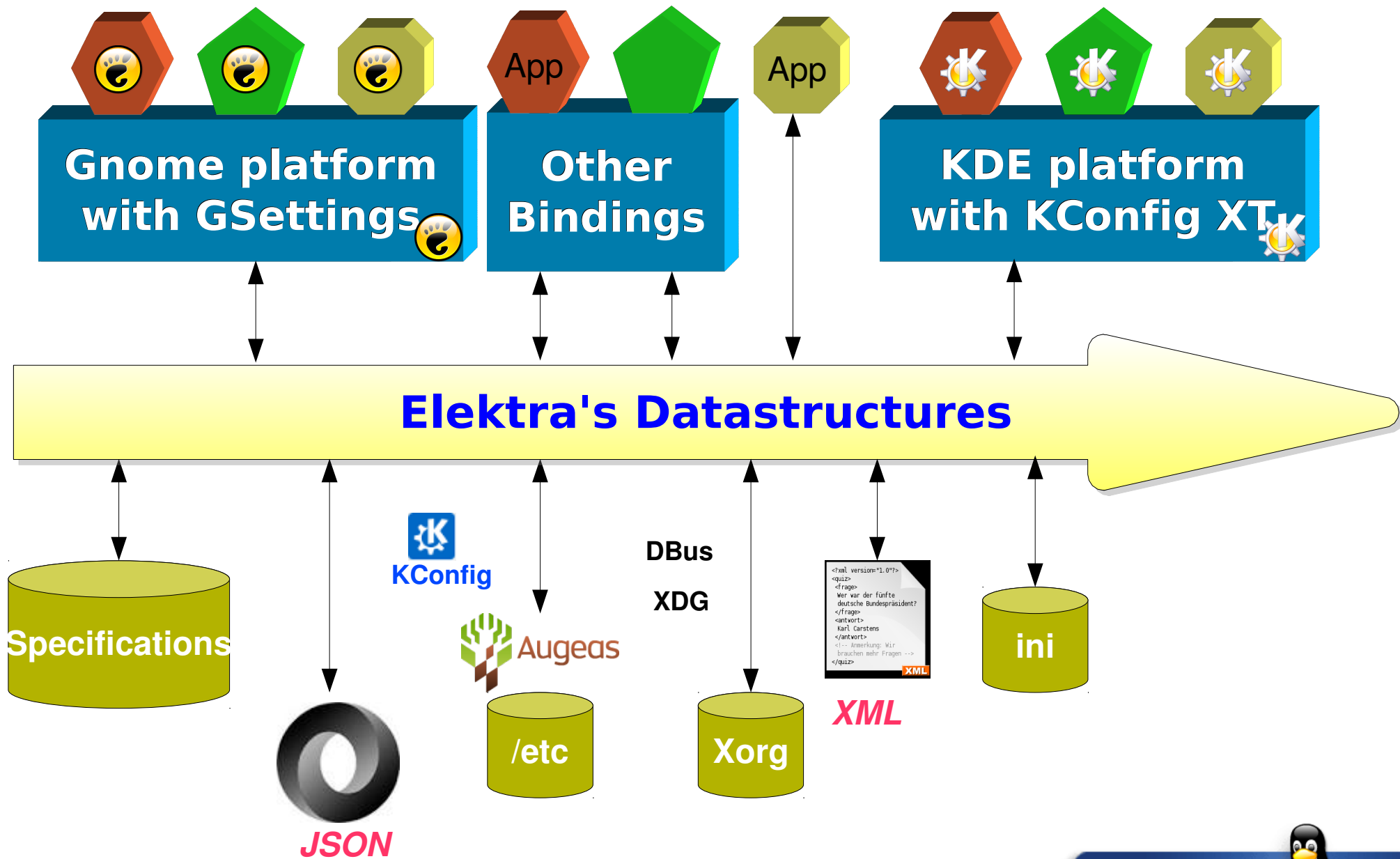
# How to (not) change the situation?



(Thanks to xkcd.com)



# Goal: Technology Integration



<http://www.libelektra.org>

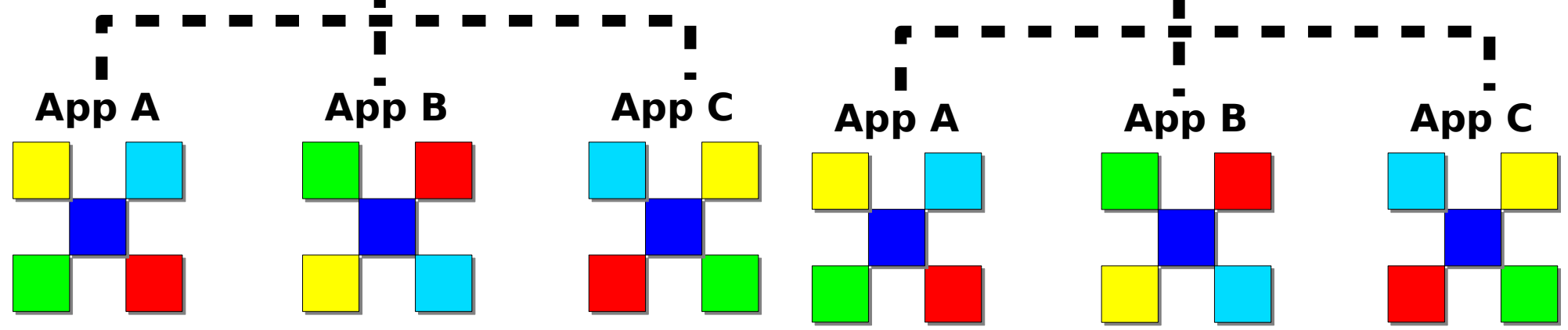


# Usable in Configuration Management



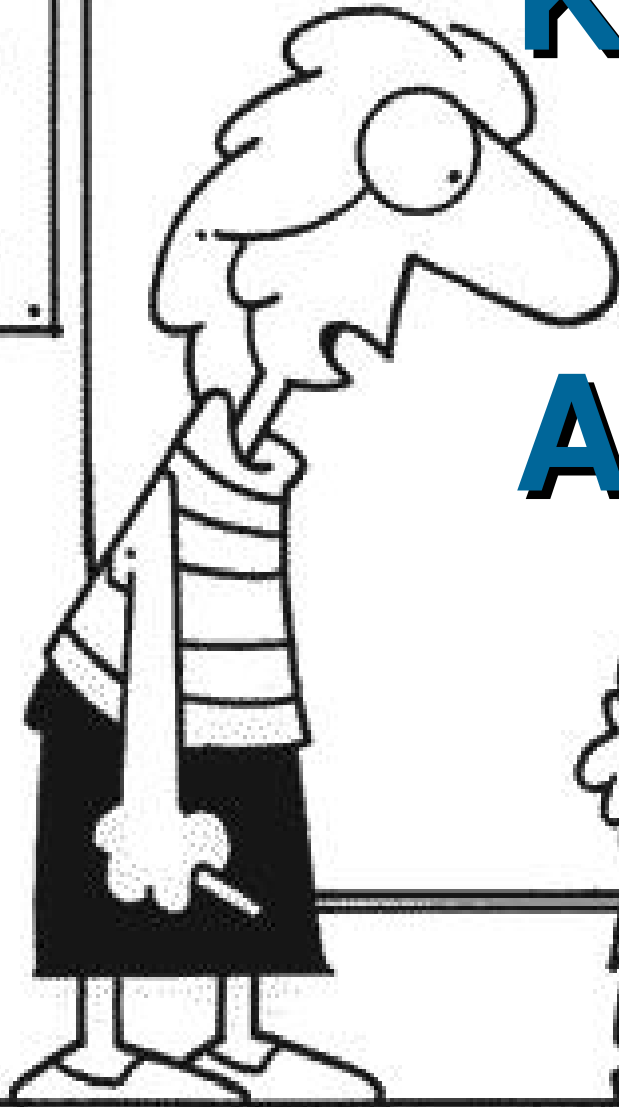
Specified Node Configuration

Specified Node Configuration





# Key Message: Key/Value Abstraction

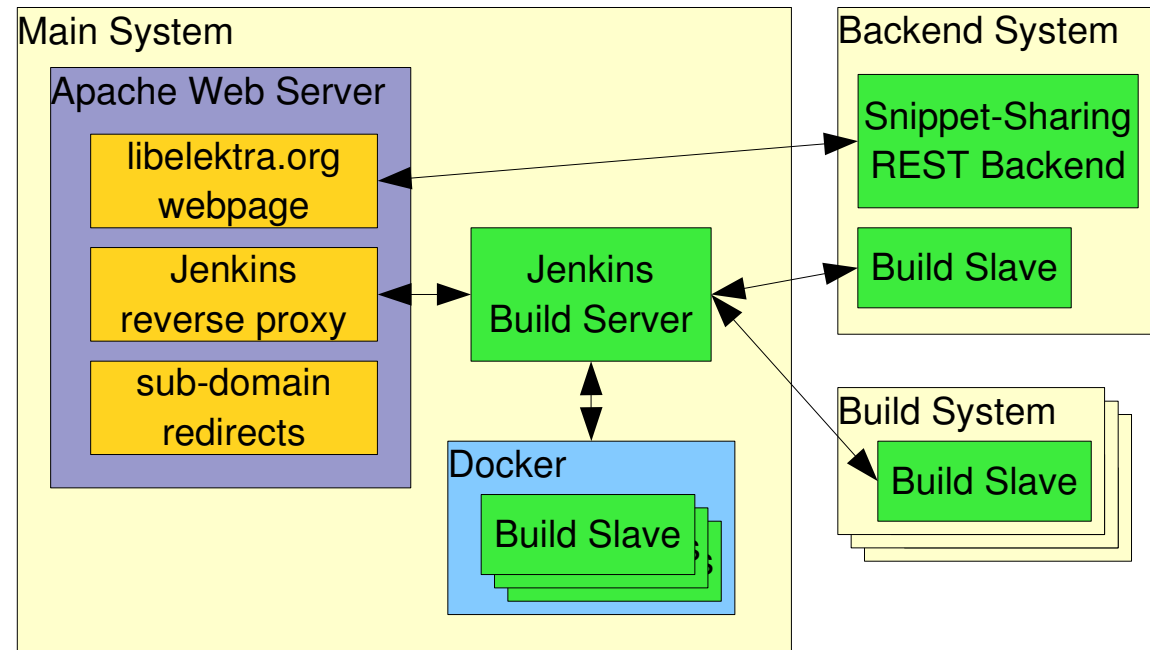
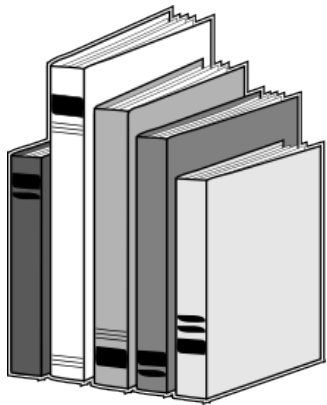


GLASBERGEN

**“There aren’t any icons to click. It’s a chalk board.”**

# What we did

- **User Study**
  - 4 Puppet tasks in up to 3 Variants
  - 14 subjects
- **Case Study**
  - Web+Build Server





# Content for Today

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- I. Elektra*
- II. Puppet-Elektra*
- III. Case Study*
- IV. User Study*





# I. Elektra

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**Bernhard Denner (Author of Study)**  
**Markus Raab <elektra@markus-raab.org>**

***<http://www.libelektra.org>***



# Abstraction: Key/Value



➤ *INI*



➤ *XMLTool*

➤ *INI*

➤ *JSON*

➤ *TCL*

➤ *Line*

➤ *CSV*

➤ *Hosts*

➤ *Fstab*

➤ *Passwd*

➤ ...

```
[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>
```



# Abstraction: Data Structure

```
aviram@sampa:~/src/elektra - Shell - Konsole
Session Edit View Bookmarks Settings Help
$ EDITOR=kate kdb editor system/filesystems xmltool

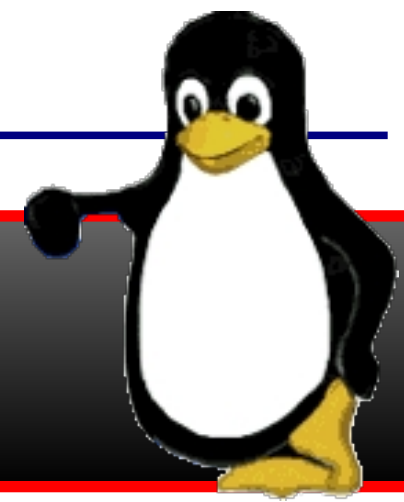
kdbeditNv8vm6 [modified] - Kate
File Edit Document View Bookmarks Tools Sessions Settings Window Help
Documents
Filesystem Browser
<?xml| version="1.0" encoding="UTF-8"?>
<!-- Generated by Elektra API. Total of 66 keys. -->
<keyset xmlns="http://www.libelektra.org"
  parent="system/filesystems">
  <key basename="mediacdrecorder/mpoint"
    type="string" uid="root" gid="root" mode="0644">
    <value>/media/cdrecorder</value>
    <comment>Mount point</comment>
  </key>
  <key basename="mediacdrecorder/options"
    type="string" uid="root" gid="root" mode="0644">
    <value>pamconsole, fscontext=system_u:object_r:removable_t, exec, noauto, me
    <comment>Filesystem specific options. See mount(8)</comment>
  </key>
  <key basename="mediacdrecorder/device"
    type="string" uid="root" gid="root" mode="0644"
    value="/dev/hdc">
    <comment>Device or Label</comment>
  </key>

```

- any syntax mappable to key/value
- any API
- any language
- edit any configuration file format in any editor



# 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
```

- ✓ *Technology-neutral datastructures which allow access to global configuration storage*
- ✓ *Portable (ANSI C)*
- ✓ *For embedded systems (small, can be static)*
- ✓ *No daemon, Security by OS*

<http://www.libelektra.org>



# Bindings

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## ➤ Available

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



## ➤ Interception

- ✓ GSettings
- ✓ Getenv
- ✓ Filesystem



# Who uses Elektra? What are the targets?

## ✓ *Embedded Systems*



cameras

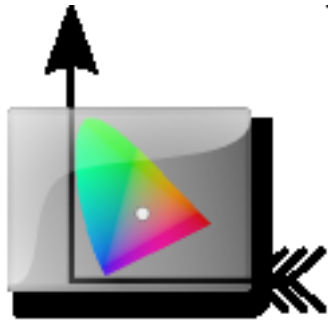


universities



weighing scales

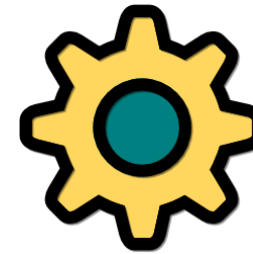
## ✓ *shared configuration in FLOSS (Desktop)*



oupanos



(in progress)



➤ Your project?

## ✓ *Administrators (Servers)*



<http://www.libelektra.org>





# Specification

---

```
1 [/sw/openldap/slapd/#0/current/listener-threads]
2 check/range:=1,2,4,8
3 check/condition:=(../info/threads/available) ? (.) : (!)
4 check/condition/message:=Thread support is not available
5 default:=next-range(/info/system/cpu/number / '16')
6 description:=One thread is adequate for up to 16 CPU cores.
7 type:=long
```

- ***Introspection***
- ***Documented***
- ***Safe (Enforced when settings change)***





## II. Puppet-Elektra

---

**Bernhard Denner (Author of Study)**  
**Markus Raab <elektra@markus-raab.org>**

*<http://www.libelektra.org>*



# Architecture

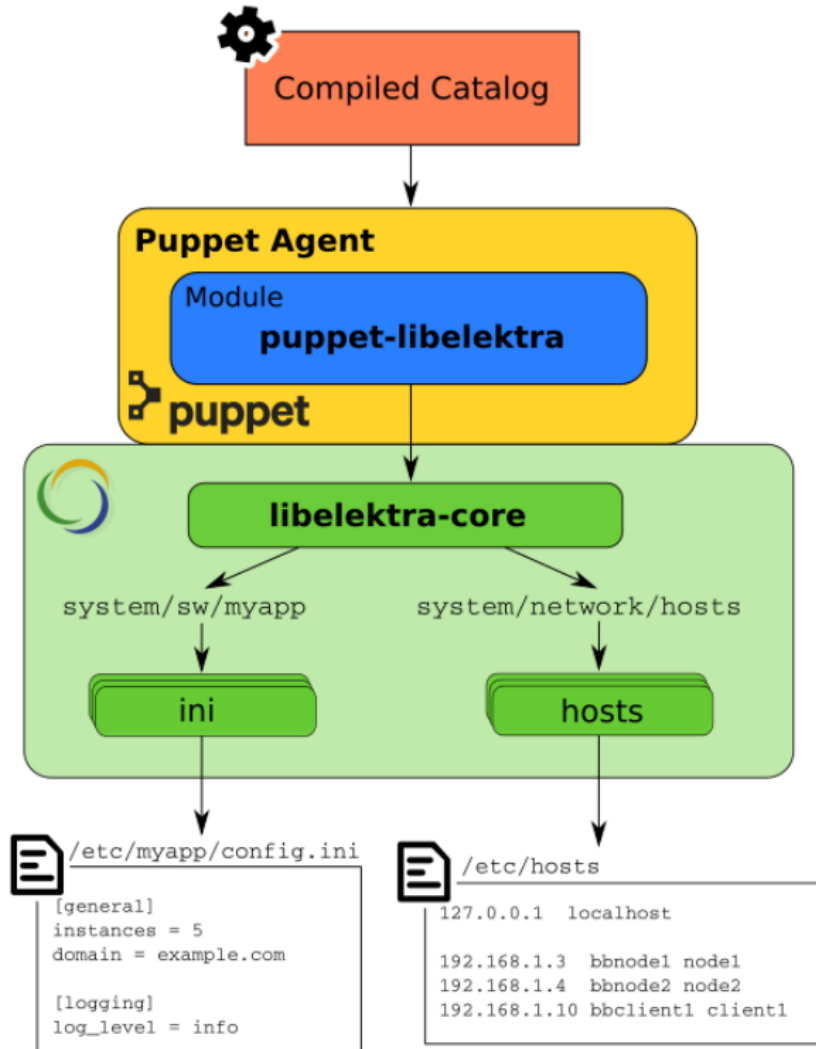


Figure 3.1: puppet-libelektra system overview



# Mounting

---

- ✓ *Mapping between File System and Elektra via mounting*
- ✓ *Ideally applications mount their configuration*
- ✓ *Otherwise, we do it in Puppet:*

```
# mount the file /etc/samba/smb.conf at system/sw/samba
kdbmount { 'system/sw/samba':
  ensure => 'present',
  file    => '/etc/samba/smb.conf',
  plugins => 'ini'
}
```



# Manage Keys

---

✓ *As Puppet users would expect:*

```
kdbkey { 'system/sw/samba/global/workgroup':  
  ensure => 'present',  
  value  => 'MY_WORKGROUP'  
}
```

```
# ensure desired configuration setting is missing  
kdbkey { 'system/sw/samba/global/debug level':  
  ensure => 'absent'  
}
```



# Specifications

---

✓ *Add validation code:*

```
kdbkey { 'system/sw/myapp/priority' :  
  ...  
  check => {  
    'type'   => 'short',  
    'range'  => '0-9'  
  }  
}
```

✓ *Is checked on the target with plugins*

✓ *Can refer to information only available locally*



A close-up photograph of two monkeys, likely macaques, engaged in grooming. The monkey on the left is looking towards the right, while the monkey on the right is being groomed. The background is a blurred natural setting with dirt and some greenery.

Is more comfort possible?

<http://www.libelektra.org>



# Implicit Checks

- ✓ *Some plugins already know the data:*

```
kdbmount {'system/hosts':  
  ensure => 'present',  
  file => '/etc/hosts_bs',  
  plugins => ['hosts', 'glob', 'network']  
}  
  
kdbkey{  
  prefix => 'system/hosts/ipv4'  
}  
  
kdbkey {"$master_hostname":  
  ensure => 'present',  
  value => "$master_ip"  
}
```

- ✓ *Hostnames are checked locally using getaddrinfo*
- ✓ *Applications could (should) deliver the specification*







## III. Case Study

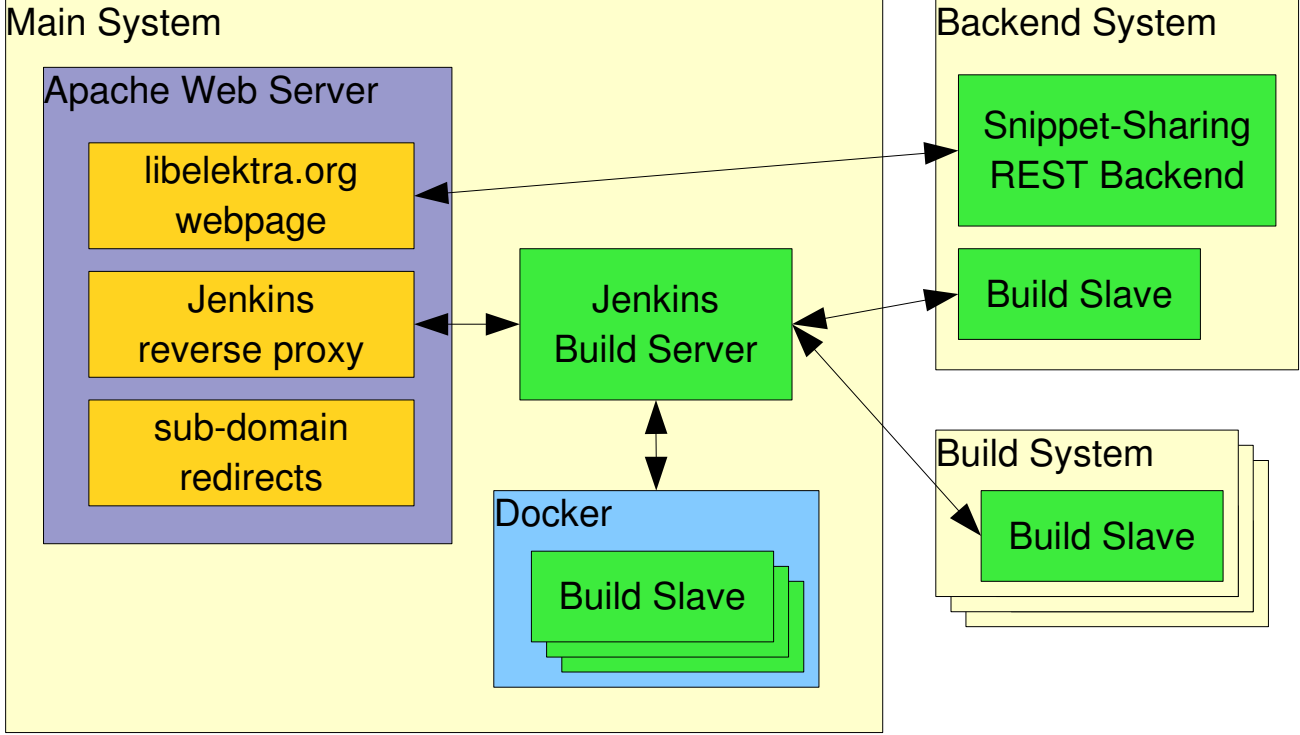
---

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# Case Study



<http://www.libelektra.org>



# Performance

resource type	INI benchmark		JSON benchmark		Hosts benchmark	
	create	update	create	update	create	update
kdbkey ruby provider	46.76	50.28	6.43	3.85	10.92	5.22
kdbkey kdb provider	103.85	168.81	34.92	33.91	39.43	38.19
augeas standard file	393.07	362.02	412.78	369.69	167.73	154.84
augeas custom file	50.20	20.34	67.32	24.63	12.22	3.53
ini_setting	2.91	3.27				
file_line	3.49	2.04			1.23	0.79
host					1.08	0.79
file	0.97	0.95	1.09	1.11	0.47	0.47

file create and update times in seconds





## IV. User Study

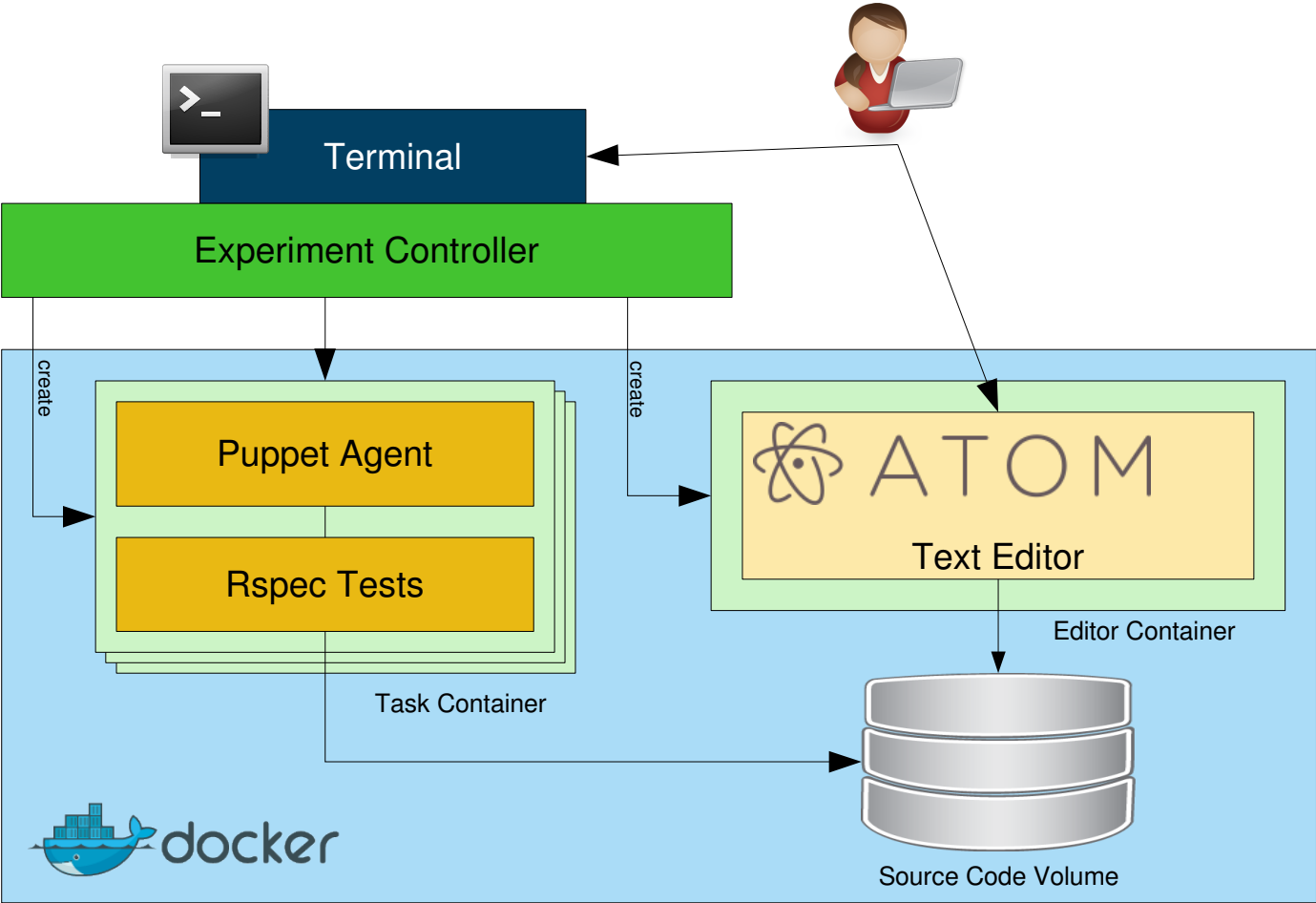
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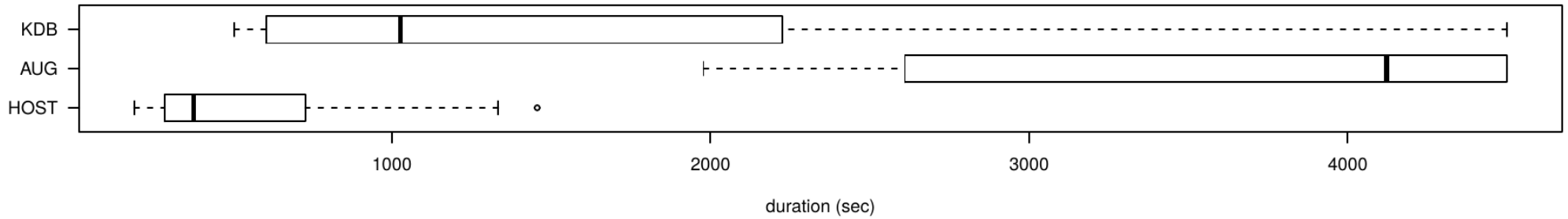


# Setup

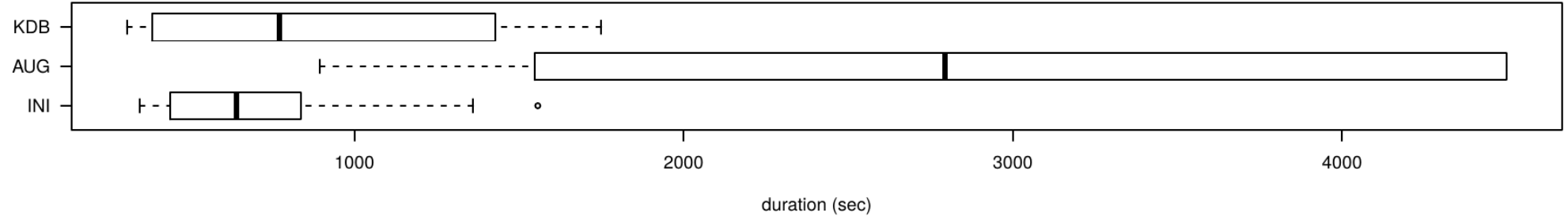


# Working Duration

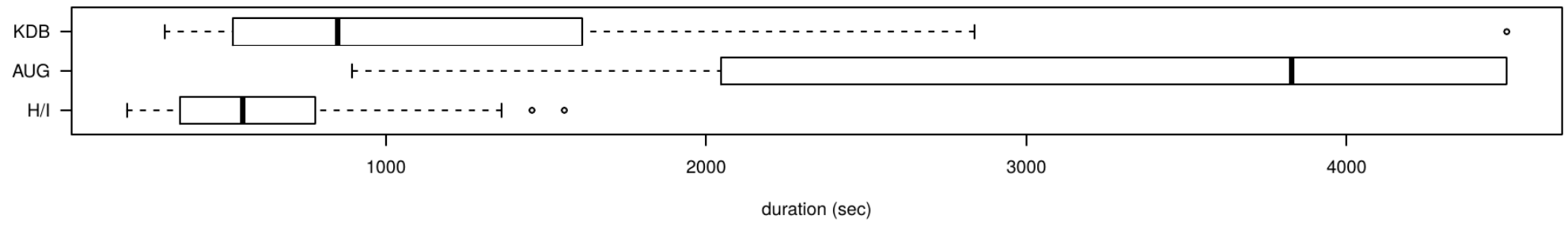
Task 2.1



Task 2.2



Task 2.1 + 2.2



# Significant?

- *Puppet-Elektra significantly faster to use, except:*
  - host is faster (Task 2.1)
  - ini\_setting is on-par but not generic (Task 2.2)
  - unclear for maintenance tasks (Task 3)

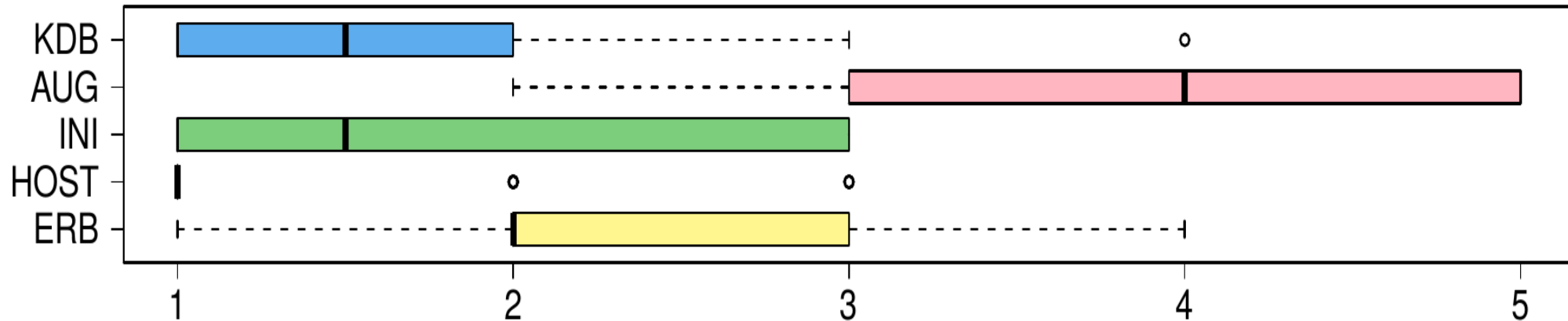
Task	Methods	Shapiro-Wilk	paired T-test	Wilcoxon test	$H_0$ rejected
Task 1	ERB - KDB	0.4	0.06	0.02	yes <sup>†</sup>
Task 2.1	HOST - AUG	0.08	$8 \times 10^{-8}$	$6 \times 10^{-6}$	yes
Task 2.1	HOST - KDB	0.5	0.004	0.005	yes
Task 2.1	AUG - KDB	0.6	$5 \times 10^{-6}$	$4 \times 10^{-4}$	yes
Task 2.2	INI - AUG	0.1	$3 \times 10^{-5}$	$3 \times 10^{-5}$	yes
Task 2.2	INI - KDB	0.4	0.1	0.7	no
Task 2.2	AUG - KDB	0.3	$7 \times 10^{-5}$	$3 \times 10^{-4}$	yes
Task 3	ERB - KDB	1	0.3	0.2	no

<sup>†</sup> result of Wilcoxon test used, since test for normality was rejected. However, the result of the paired T-test is very close to your chosen significance level



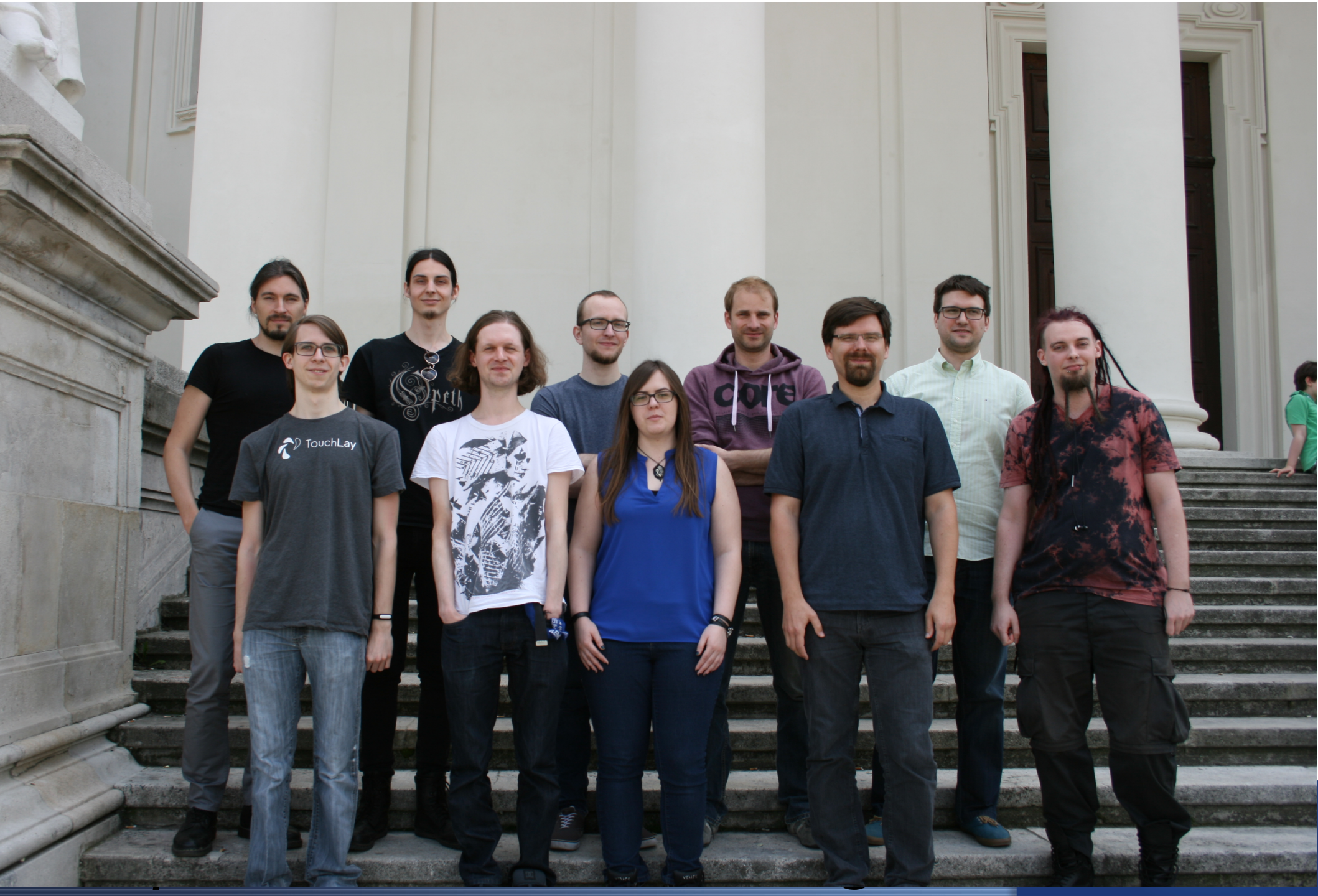
# Usability?

- *People liked host best (specialized)*
- *ini\_settings and Puppet-Elektra are second best*





# Who is working on Elektra?



# Who is working on Elektra?

- Armin Wurzinger: *Type Interference*
- Bernhard Denner: **Puppet Module**
- Daniel Bugl: *WebUI*
- Dominik Hofer: the **high-level API**
- Kurt Micheli: *Order Preserving Minimal Hash Map*
- Ulrike Schaefer: **Code Completion**
- Michael Zehender: *Quality Improvements*
- Mihael Pranjić: *mmap plugin*
- Peter Nirschl: *crypto plugin*
- René Schwaiger: **YAML plugin**
- Sebastian Bachmann: *Shell Completion*
- Thomas Waht: *Notification*
- Thomas Waser: **Validation** and Transformations of Configuration
- Vanessa Kos: *Misconfiguration Bug Database*

  
1.0 this year

  
➤ **You?**

<http://www.libelektra.org>



# Resources

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*Thank you for your attention!*  
*Drop us an email or open a issue!*  
*Questions?*



- *Homepage: <https://www.libelektra.org/>*
- *Data: <http://puppet-userstudy-results.libelektra.org/>*
- *Build Server: <https://build.libelektra.org/>*
- *Puppet-Elektra: <https://puppet.libelektra.org/>*

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