

Verification of Shell Scripts

Performing File Hierarchy Transformations

Journées PPS

Nicolas Jeannerod

Institut de Recherche en Informatique Fondamentale
Université de Paris

March 23, 2021

Software Installation

Software Installation in Debian GNU/Linux

Debian GNU/Linux



Software Installation in Debian GNU/Linux

Debian GNU/Linux

Linux distribution
~= Operating System



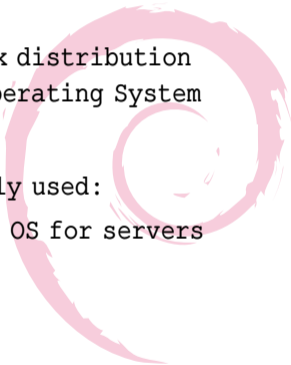
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Widely used:

- > as OS for servers



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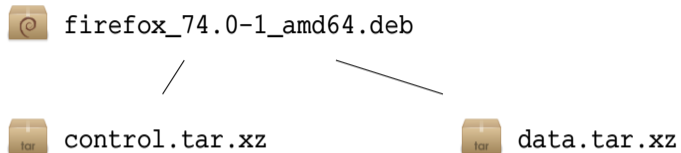
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Software Packages and their Content

 firefox_74.0-1_amd64.deb

Software Packages and their Content



Software Packages and their Content



firefox_74.0-1_amd64.deb




control.tar.xz





data.tar.xz

```
/etc/firefox/firefox.js
/usr/bin/firefox
/usr/lib/firefox/application.ini
/usr/lib/firefox/browser/blocklist.xml
/usr/lib/firefox/browser/chrome
/usr/lib/firefox/browser/crashreporter-override.ini
/usr/lib/firefox/browser/defaults
/usr/lib/firefox/browser/features/doh-rollout@mozilla.org
/usr/lib/firefox/browser/features/formautofill@mozilla.org
/usr/lib/firefox/browser/features/screenshots@mozilla.org
/usr/lib/firefox/browser/features/webcompat@mozilla.org
```


Software Packages and their Content

 firefox_74.0-1_amd64.deb

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control



postinst



prerm

...

```
/etc/firefox/firefox.js
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```

Software Packages and their Content



firefox_74.0-1_a



control.tar.xz



control



postinst



prerm

...

```
Package: firefox
```

```
Version: 74.0-1
```

```
Architecture: amd64
```

```
...
```

```
Depends: libatk1.0-0 (>= 1.12.4), libc6 (>= 2.29), libcairo-gobject2 (1.10.0), libcairo2 (>= 1.10.0), ...
```

```
...
```

```
Description: Mozilla Firefox web browser
```

```
Firefox is a powerful, extensible web browser with support for modern web application technologies.
```

```
/usr/bin/firefox
```

```
/usr/lib/firefox/application.ini
```

```
/usr/lib/firefox/browser/blocklist.xml
```

```
/usr/lib/firefox/browser/chrome
```

```
/usr/lib/firefox/browser/crashreporter-override.ini
```

```
/usr/lib/firefox/browser/defaults
```

```
/usr/lib/firefox/browser/features/doh-rollout@mozilla.org
```

```
/usr/lib/firefox/browser/features/formautofill@mozilla.org
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Software Packages and their Content



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control.tar.xz



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postinst



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```
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Description: Mozilla Firefox web browser
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```
we #!/bin/sh -e
```

```
if [ "$1" = "remove" ] || [ "$1" = "deconfigure" ] ; then  
    update-alternatives --remove x-www-browser /usr/bin/  
    update-alternatives --remove gnome-www-browser /usr/
```

```
fi
```

```
if [ "$1" = "remove" ]; then  
    rm -rf /usr/lib/firefox/updates
```

```
fi
```

```
/usr/lib/firefox/browser/features/webcompat@mozilla.org
```

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User Request

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with full privileges.

```
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┆
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┆
Done
```

What Could Possibly Go Wrong?

From: "Aaron M. Ucko" <ucko@debian.org>
To: Debian Bug Tracking System <submit@bugs.debian.org>
Subject: cmigrep: broken emacsen-install script
Date: Fri, 29 Jun 2007 20:27:06 -0400

Package: cmigrep

Version: 1.3-1

Severity: critical

Justification: breaks unrelated software

cmigrep's emacsen-install script is overzealous; specifically, it inappropriately attempts to compile all .el files in /usr/share/emacs/site-lisp even if they don't work with the current emacs flavor (for instance, remembrance-agent's remem.el vs xemacs) and compounds the problem by removing

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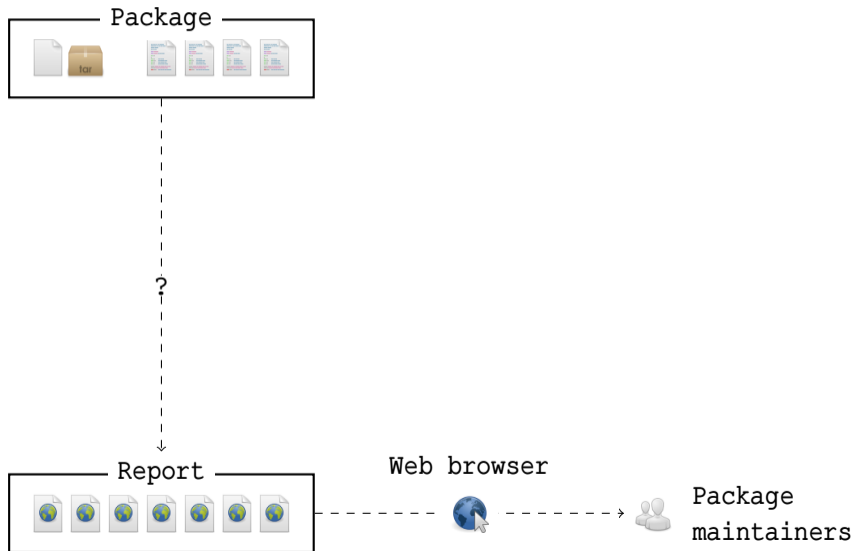
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 - > and Unix utilities: transformations of such filesystems.

Battle Plan

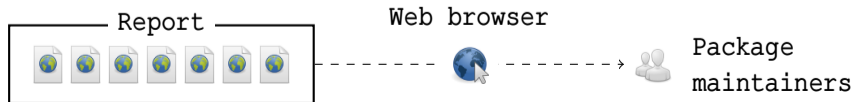
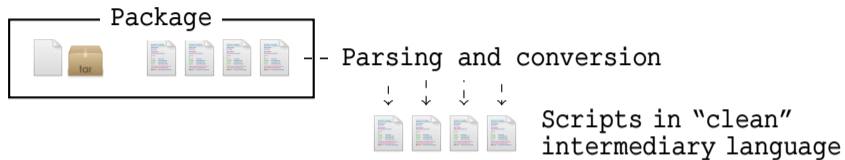
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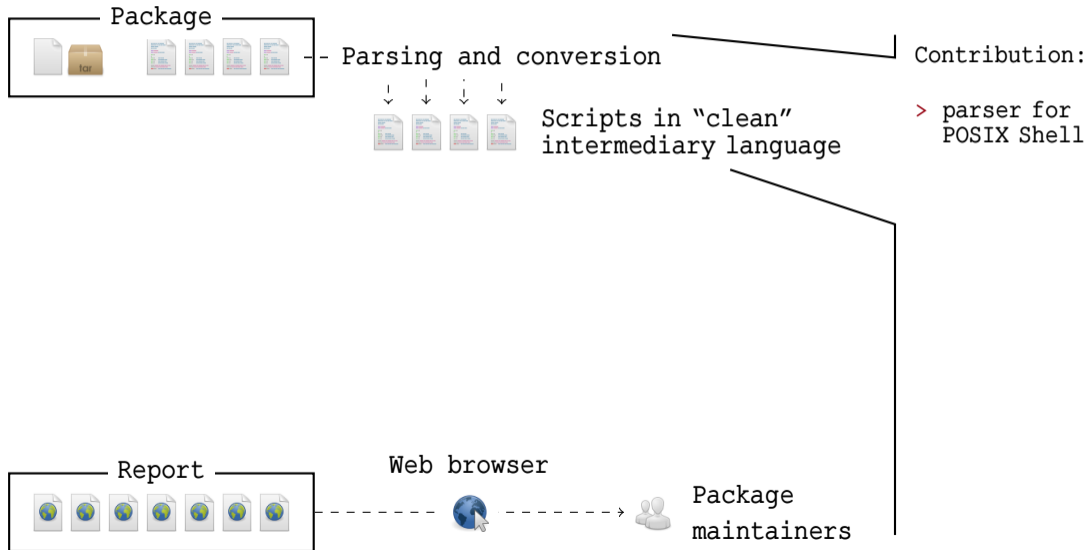
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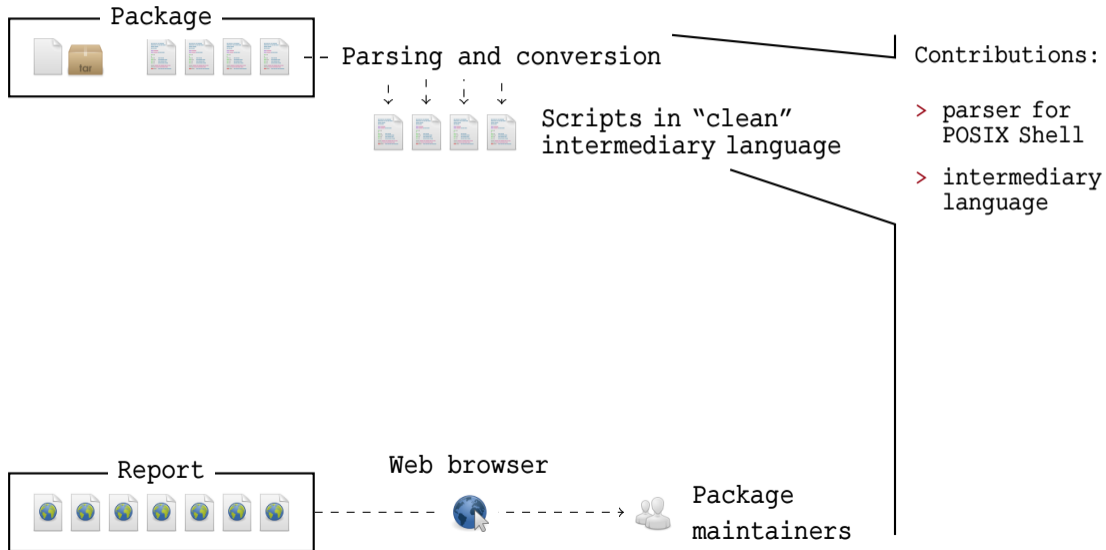
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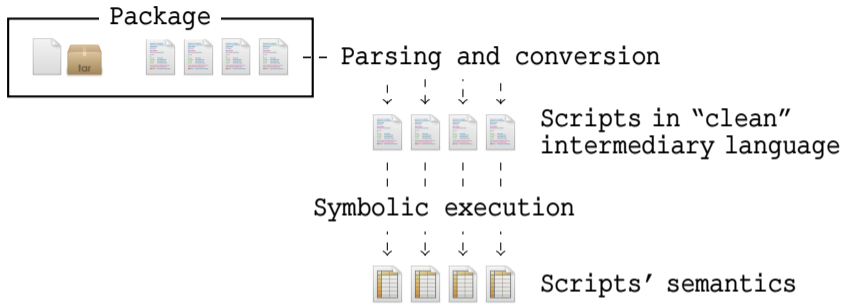
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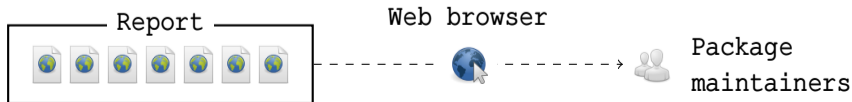


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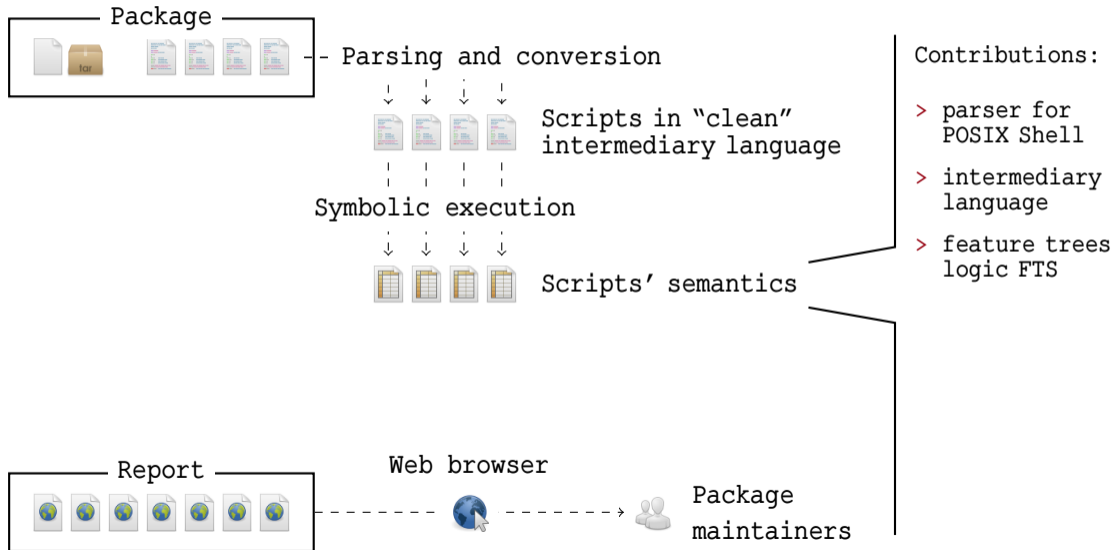


Contributions:

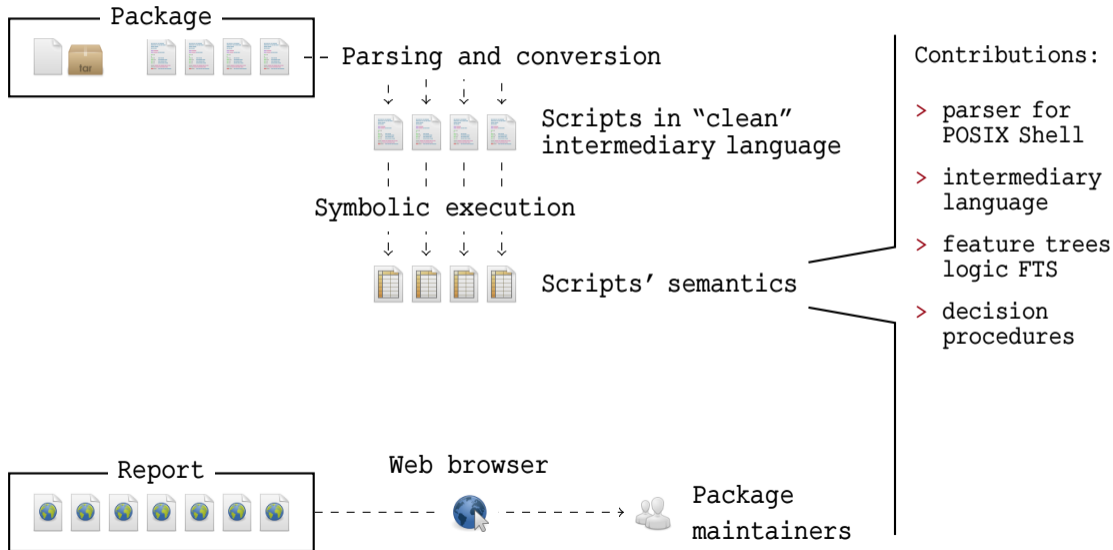
- > parser for POSIX Shell
- > intermediary language



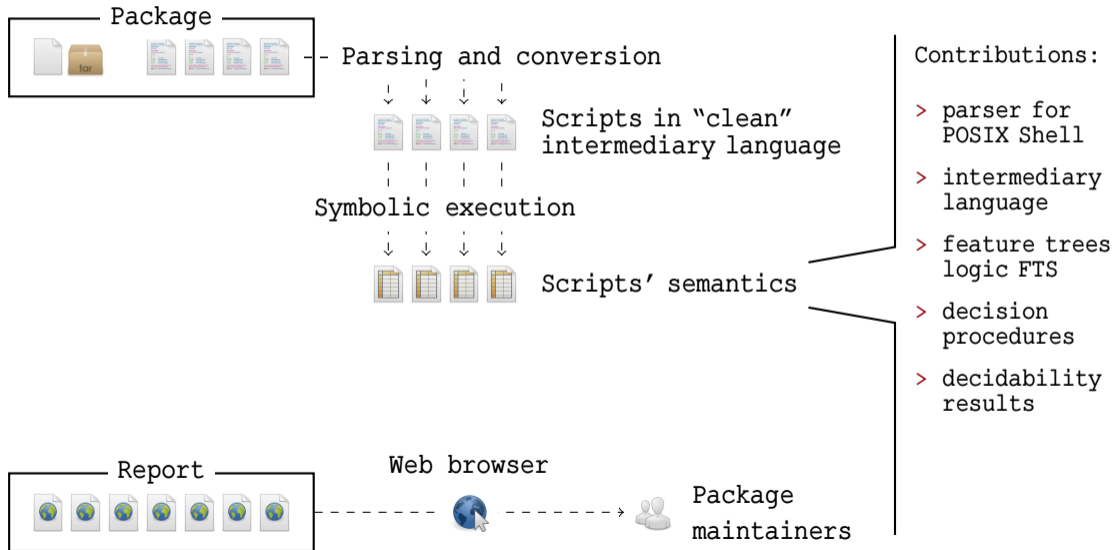
Battle Plan



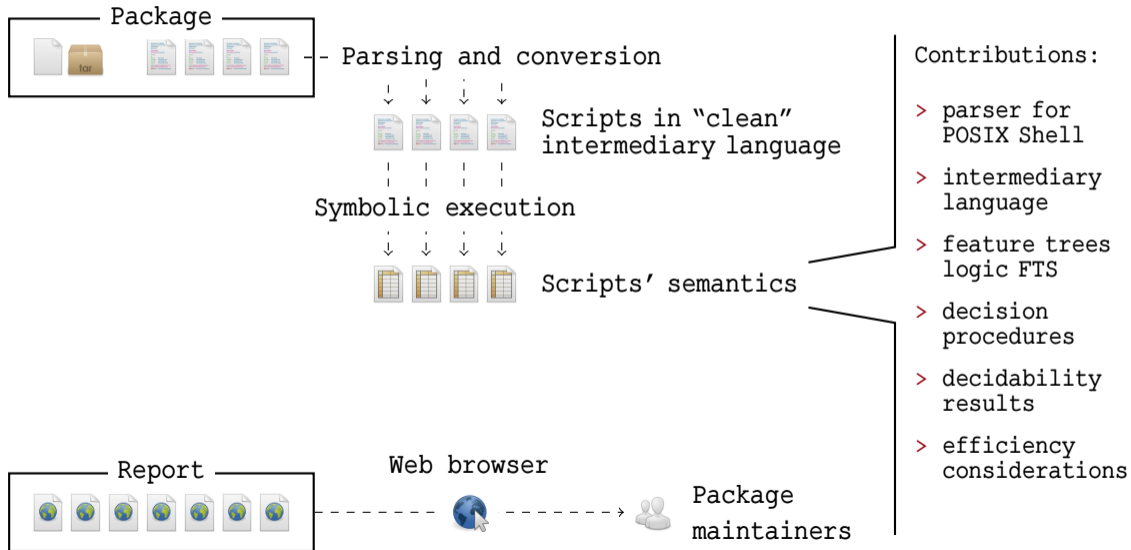
Battle Plan



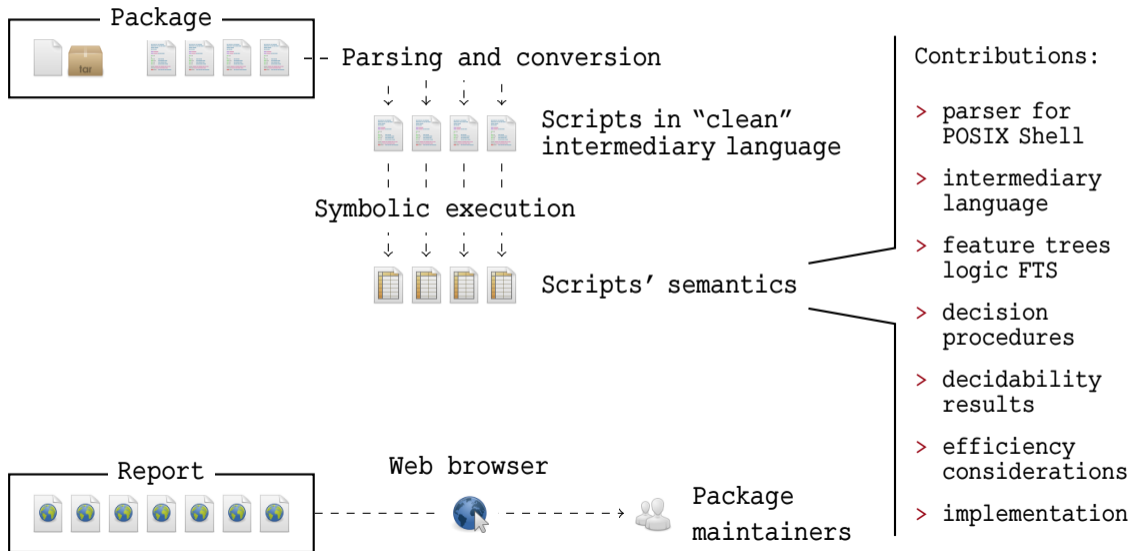
Battle Plan



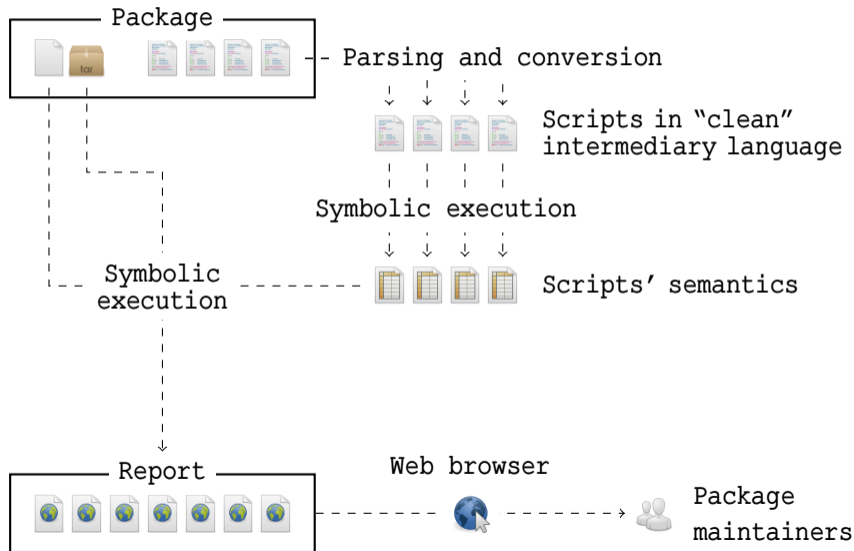
Battle Plan



Battle Plan



Battle Plan



Contributions:

- > parser for POSIX Shell
- > intermediary language
- > feature trees logic FTS
- > decision procedures
- > decidability results
- > efficiency considerations
- > implementation

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- > About this project:

- > TACAS 2020 Paper:

- “Analysing installation scenarios of Debian packages”

- with Benedikt Becker, Claude Marché, Yann Régis-Gianas,
Mihaela Sighireanu and Ralf Treinen