# Internship Report

## A semantic-driven approach to system call filtering

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# Section 1

# Context of project

beginframe

What do Bitcoin transaction scripting, network packet filtering and power management have in common ?

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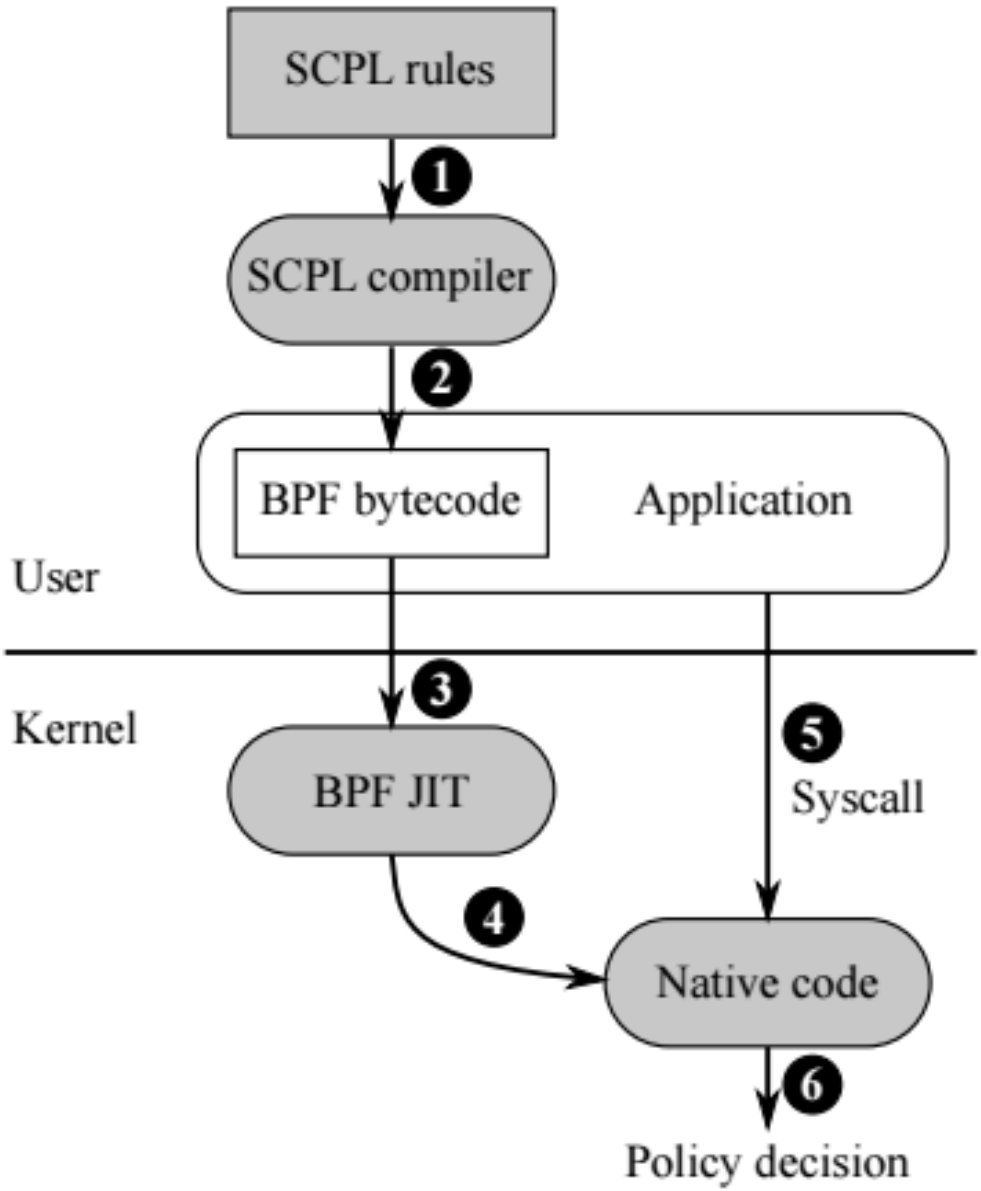
SCPL rules
1
SCPL compiler
2
BPF bytecode
Application
User
Kernel
3
BPF JIT
5
Syscall
4
Native code
6
Policy decision

# Introducing BPF

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# Example of BPF

```
; load syscall number
ld [0]
; deny open() with errno = EACCES
jeq #SYS_open, L1, L2
L1: ret #RET_ERRNO|#EACCES
; allow getpid()
L2: jeq #SYS_getpid, L3, L4
L3: ret #RET_ALLOW
; allow gettimeofday()
L4: jeq #SYS_gettimeofday, L5, L6
L5: ret #RET_ALLOW
L6: ...
; default: kill current process
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As seen above, each system call gets an entry in the list of rules, along with the expected behavior regarding this particular sytem call. A default behavior is also defined, should any system call be absent from the previous list.

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As seen above, SCPL is really close to the natural thought process of defining the rules of sytem call behavior, and this intuitive ease of use guarantees minimal errors within policies definition.

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- Computations: sequences of computational tasks as nested lists

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# Section 2

# Design Choices

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Regarding the SCPL syntax

- DSL made for JITK
- Simple and close to thought process

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Rewriting-based semantic definition

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- A rule with a different system call gets deleted

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Environment-based semantic definition

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# Section 3

# Results and evolutions

# Final features

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- Parsing of user-submitted SCPL or BPF scripts

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# Discussion

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# Section 5

Thank you for your attention ! Any questions ?

# Further Reading I


Xi Wang, David Lazar, Nickolai Zeldovich, Adam Chlipala, Zachary Tatlock
Jitk: A Trustworthy In-Kernel Interpreter Infrastructure.
11th USENIX Symposium on Operating Systems Design and Implementation, 2014.

Grigore Rosu, Traian Florin Serbanuta
An Overview of the K Semantic Framework
J.LAP, 2010.

Steven McCanne and Van Jacobson Lawrence Berkeley Laboratory
The BSD Packet Filter: A New Architecture for User-level Packet Capture
December 19, 1992

# Further Reading II

Mihail Asvoae, Computer Science Department, University "Al I Cuza" Iasi, Romania

K Semantics for Assembly Languages: A Case Study

Electronic Notes in Theoretical Computer Science 304 (2014) 111125