

Automata and Formal Languages (10)

Email: christian.urban at kcl.ac.uk

Office: SI.27 (1st floor Strand Building)

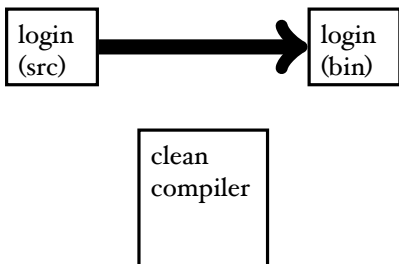
Slides: KEATS (also home work is there)

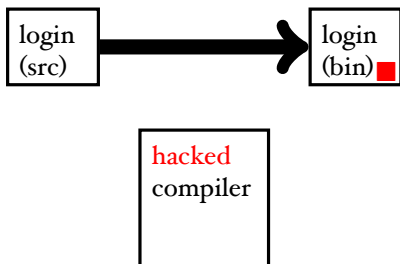
**Using a compiler,
how can you mount the
perfect attack against a system?**

What is a **perfect** attack?

- 1 you can potentially completely take over a target system
- 2 your attack is (nearly) undetectable
- 3 the victim has (almost) no chance to recover

clean
compiler





my compiler (src)



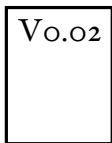
Scala

host language

my compiler (src)

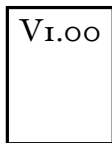


Scala



Scala

...



Scala

host language

my compiler (src)

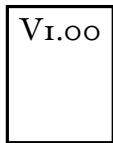


Scala

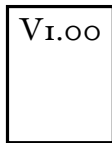


Scala

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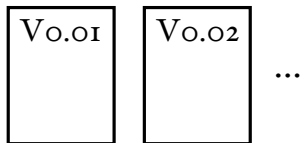


Scala



host language

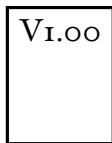
my compiler (src)



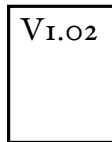
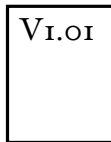
Scala

Scala

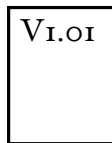
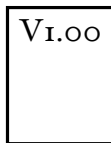
host language



Scala



...



...

no host language
needed

Hacking Compilers



Ken Thompson
Turing Award, 1983

Ken Thompson showed how to hide a Trojan Horse in a compiler **without** leaving any traces in the source code.

No amount of source level verification will protect you from such Thompson-hacks.

Therefore in safety-critical systems it is important to rely on only a very small TCB.

Hacking Compilers



Ken Thompson
Turing Award, 1983



- 1) *Assume you ship the compiler as binary and also with sources.*
- 2) *Make the compiler aware when it compiles itself.*
- 3) *Add the Trojan horse.*
- 4) *Compile.*
- 5) *Delete Trojan horse from the sources of the compiler.*
- 6) *Go on holiday for the rest of your life. ;o)*

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