Transparency for Control Plane Software

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Friday 13th October, 2017

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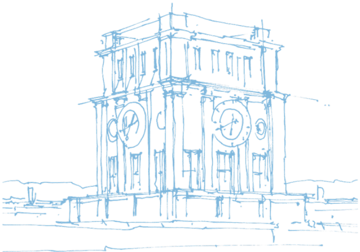


Outline

Motivation

Motivation

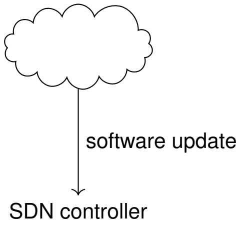
Goal

Make sure that we install same controller software as everybody else

- analysis carries over
- no targeted backdoors

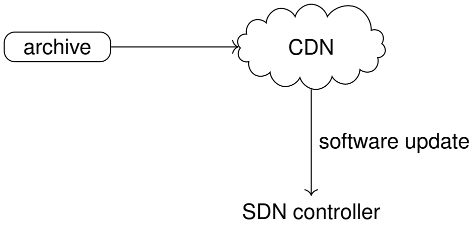
Motivation

Software distribution process



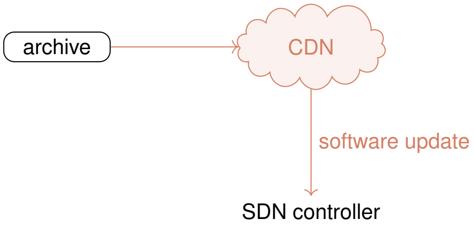
Motivation

Software distribution process



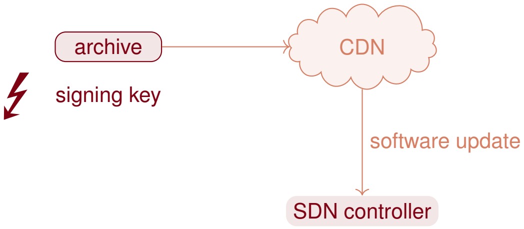
Motivation

Software distribution process



Motivation

Software distribution process



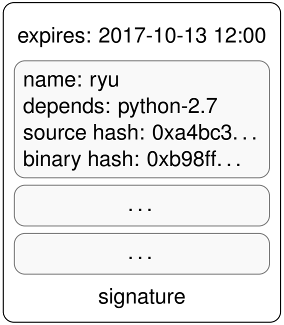
□ untrusted

■ trusted

Motivation

Securing multi-file software projects [1, 3]

release file:

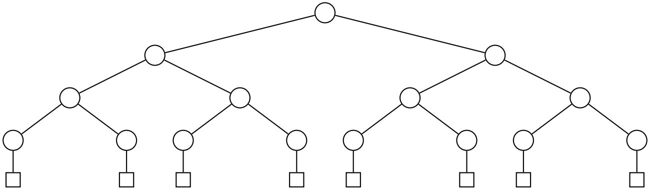


$\Rightarrow$ secure release file

Design

Design

Hash tree over a list of items: Merkle tree



- tree root authenticates leaves

Design

Merkle tree-based transparency logs [2]

Log server operates Merkle tree:

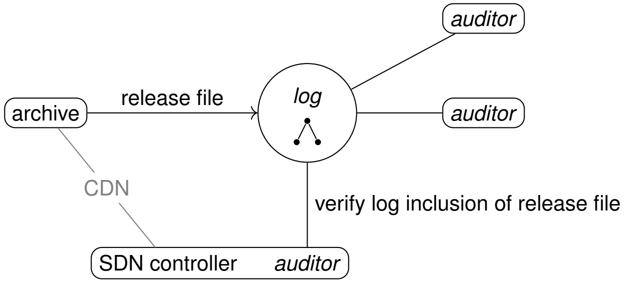
- hash tree over list of *release files*

Log can efficiently and cryptographically prove:

- inclusion of a given element in the list
- append-only operation of the list

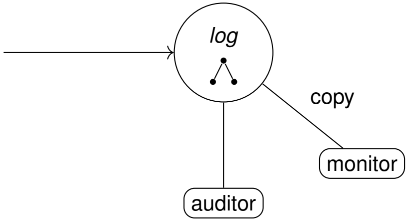
Design

Verifying log operations



Design

Verifying log operations



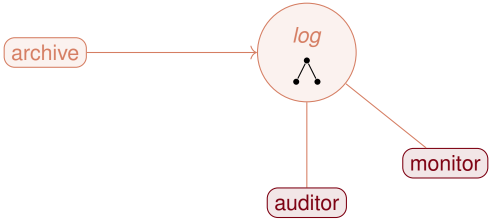
auditor and monitor verify the correct operation of the log

- inclusion of elements
- append-only

Discussion

Discussion

Properties



log: untrusted, but kept trustworthy through verification by auditor and monitor
monitor: inspects elements

Discussion

Extending this idea

When source code is logged, monitors can:

- verify uploader signature on source code
- verify relationship between binary and source code
- detect targeted backdoors

Implementation for APT/Debian

1. prototype
2. deployment can start locally with slightly adjusted architecture

Bibliography

[1] J. Cappos, J. Samuel, S. Baker, and J. H. Hartman.
A Look in the Mirror: Attacks on Package Managers.
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[2] M. Chase and S. Meiklejohn.
Transparency Overlays and Applications.
In *Proceedings of the 2016 ACM SIGSAC Conference on Computer and Communications Security*, CCS '16, pages 168–179. ACM.

[3] J. Samuel, N. Mathewson, J. Cappos, and R. Dingledine.
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In *Proceedings of the 17th ACM Conference on Computer and Communications Security*, CCS '10, pages 61–72. ACM.