ALPHA

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Adaptive and Lightweight Protocol
for Hop-By-Hop Authentication

Summary

What we did since last meeting

- Finished implementing hash chain framework
- Exchange of hash chain anchors via initial handshake
- Intermediate storage model (good balance between storage and computation)
- „evil `ipqueue` filter“

Problems

- When to think of a packet as „OK“ (i.e. when to decrement the counter)
- Alpha screws up when using our „evil `ipqueue` filter“
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Alpha-packets - recap

What different Alpha packets are there?

S1 new hash anchor $h_i^{S_s}$ and an HMAC of the packet to follow $M(h_{i-1}^{S_s}, m)$

A1 new hash anchor $h_i^{V_a}$ and returns received anchor $h_i^{S_s}$

S2 new hash anchor $h_{i-1}^{S_s}$ and message m

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Hash chains - Problems recap

Problem / design decision I

Q Store everything or compute everything?

A Store only every kth element. Compute everything in between as needed

Problem / design decision II

Q Different environments: Storage constraints vs. computing constraints

A Number of elements to be stored can be set during build-time

A Small hash chains can be compensated for with frequent anchor redistribution

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Our hash chain data structure

0	1	2	3	4	5	6	7	8	9
$h^0(x)$	$h^{10}(x)$	$h^{20}(x)$	$h^{30}(x)$	$h^{40}(x)$	$h^{50}(x)$	$h^{60}(x)$	$h^{70}(x)$	$h^{80}(x)$	$h^{90}(x)$

- hash chain length 100, but only 10 elements in memory
- worst-case computation rounds: 10

Example: We want $h^{42}(x)$

The way it was until now:

- Compute 42 iterations of h on seed x
- Next round, we will need $h^{41}(x)$
- Compute 41 iterations again, even though we just did that before

With our new storage scheme:

- We have $h^{40}(x)$ in memory
- Compute $h^2(h^{40}(x))$, which are only two iterations

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vm2: Handshake

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Initiating handshake with vm2, sending SYN.
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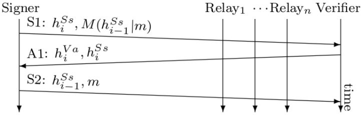

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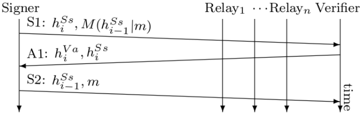

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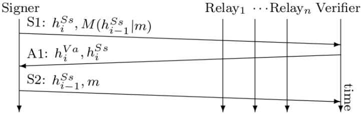

Signer
Relay_1 $\cdots$ Relay_n
Verifier
S1: $h_i^{Ss}, M(h_{i-1}^{Ss}|m)$
A1: h_i^{Va}, h_i^{Ss}
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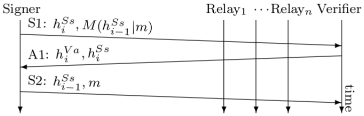
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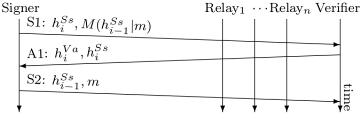
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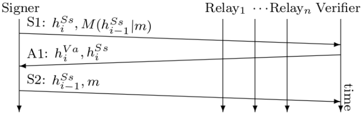
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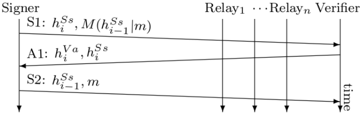
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64 bytes from vm2 (192.168.10.61): icmp_seq=1 ttl=64 time=2.48 ms
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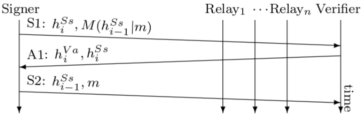
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Goals

What we want to do next

- Figure out what to do when forged packets are detected (and implement the solution)
- Problem: high latency, figure out a way to reduce this
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- Figure out a routing solution for Mac OS X
- Make alpha work on the nokia
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