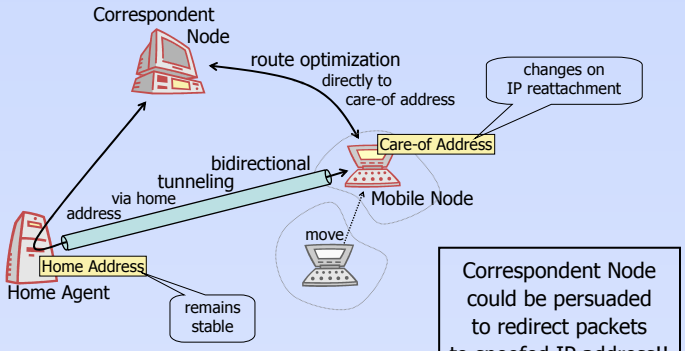
Credit-Based Authorization for Concurrent IP-Address Tests

① Mobile IPv6 Architecture

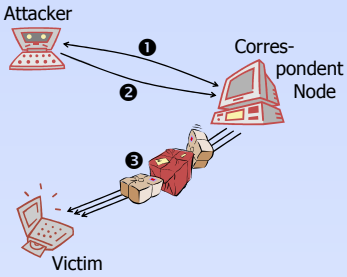


Correspondent Node could be persuaded to redirect packets to spoofed IP address!!

② Redirection and Flooding

Vulnerability
- Home Agent can control Mobile Node, but Correspondent Node can not

Attack Procedure
- Mobile Node requests download from Correspondent Node ❶
- Mobile Node registers a victim's IP address as "its" care-of address ❷



Amplification!!
- Correspondent Node causes flood ❸ (without being aware)
- Attacker may send bogus ACKs

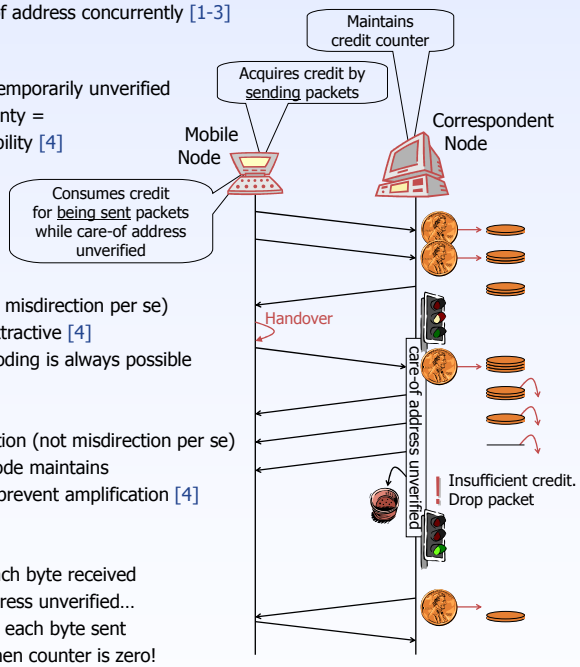
③ Usual Solution and Its Drawback

- Correspondent Node verifies Mobile Node's presence at new care-of address
- End-to-end token exchange = IP-address test; **delays applications by 1 RTT**

④ Concurrent IP-Address Test and Credit-Based Authorization

Idea
- Resume communications ASAP
- Test care-of address concurrently [1-3]

Challenge
- Care-of address temporarily unverified
- Period of uncertainty = period of vulnerability [4]

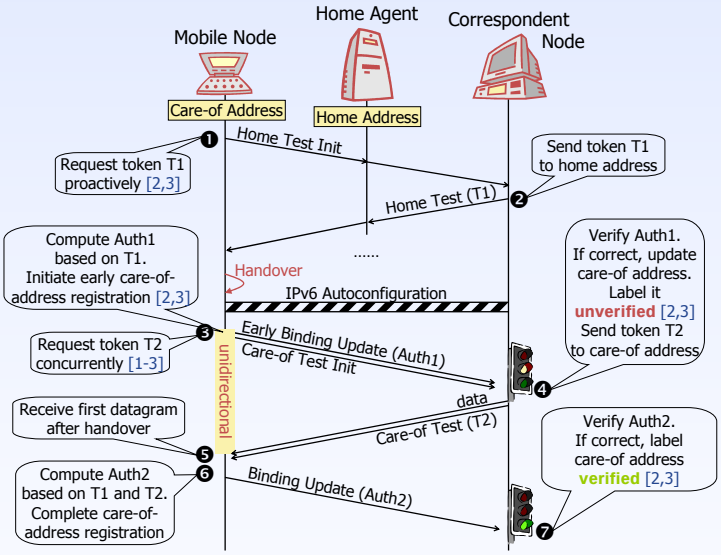


Observation
- Amplification (not misdirection per se) makes flooding attractive [4]
- Non-amplified flooding is always possible

Approach
- Prevent amplification (not misdirection per se)
- Correspondent Node maintains credit counter to prevent amplification [4]

Credit counter
- Increments for each byte received
- While care-of address unverified…
  - Decrements for each byte sent
  - Do not send when counter is zero!

⑤ Mobile IPv6 with Credit-Based Authorization



⑥ Discussion

Integrability
- Credit-Based Authorization optimizes **any mobility protocol** with IP-address tests
- Examples are Mobile IPv6 [1-3], Host Identity Protocol (HIP) [1], Optimized Mobile IPv6 (OMIPv6)…

Applicability
- Mobile Node gets credit for **sending** packets, needs credit for **receiving** packets
- Asymmetric traffic ⇒ credit may be insufficient

Advanced Mode
- Mobile Node gets credit for **receiving** packets [4]
- **IP-Address Spot Checks** approximate reception rate

References

[1] Christian Vogt: Credit-Based Authorization for Concurrent IP-Address Tests. TeleMatics Technical Report TM-2005-3, ISSN 1613-849X, June 2005.
[2] C. Vogt, R. Bless, M. Doll, T. Kühner: Early Binding Updates for Mobile IPv6. Proceedings of the IEEE Wireless Communications and Networking Conference, March 2005.
[3] Christian Vogt: Early Binding Updates for Mobile IPv6. IETF Internet Draft, February 2005.
[4] Christian Vogt, Jari Arkko: Credit-Based Authorization for Mobile IPv6 Early Binding Updates. IETF Internet Draft, February 2005.