Security of Programmable Network Infrastructures

Jonathan M. Smith
University of Pennsylvania

OPENSIG, 10/97

Security is not Cryptography!

- Is your message "secure" if it doesn't get there? (e.g., denial of service)
- Security is adherence to a security policy
- Unfortunately, in many systems policy is informal, defined in *ad hoc* manner, and focused only on *selected* attacks
- NB: Attacker may not agree on selection

Network Infrastructures

- Shared, so virtualization matters
- Need timing, privacy and authentication
- Focus must be on protection of the network elements (what will be programmed), in spite of improved flexibility
- Node security, then network security

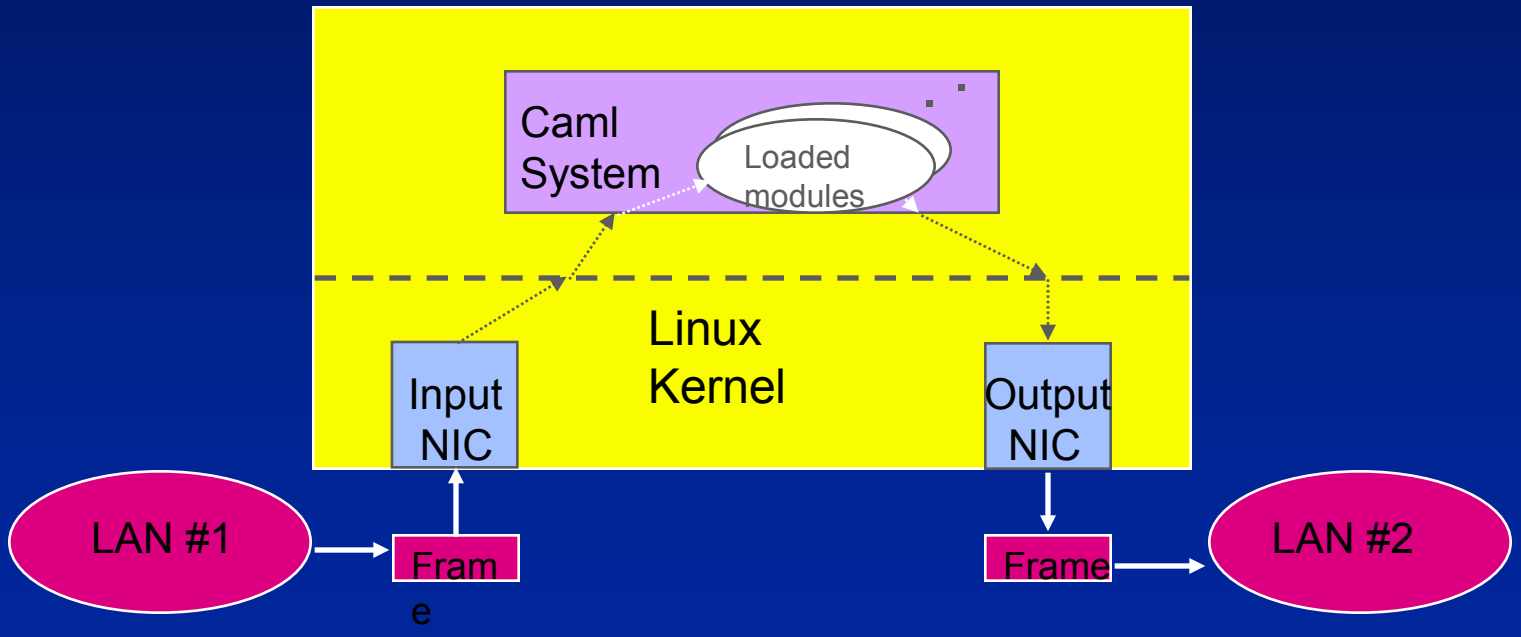
Penn/Bellcore SwitchWare Project: A Language-Oriented Model

- Switchlet Language for users (SL)
  - » formal semantics restrict programs
  - » e.g., Prog. Language for Active Nets (PLAN)
- Wire Language for communicating (WL)
  - » formal semantics across boundaries
  - » Java or Caml bytecodes
- Infrastructure Language for Virtual Machine (IL)
  - » formal semantics supported on metal: run-time

See http://www.cis.upenn.edu/~switchware

Current Software

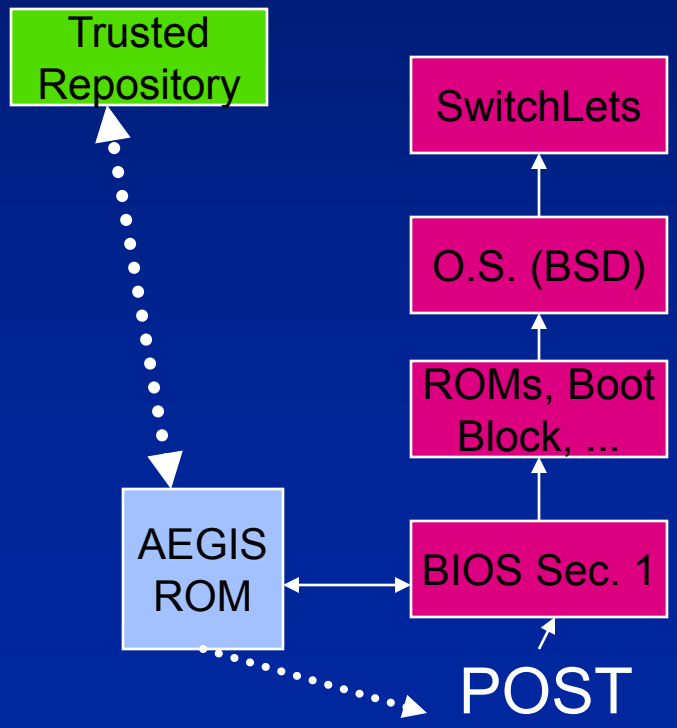
- Active Bridging



See http://oilhead.cis.upenn.edu/~salex

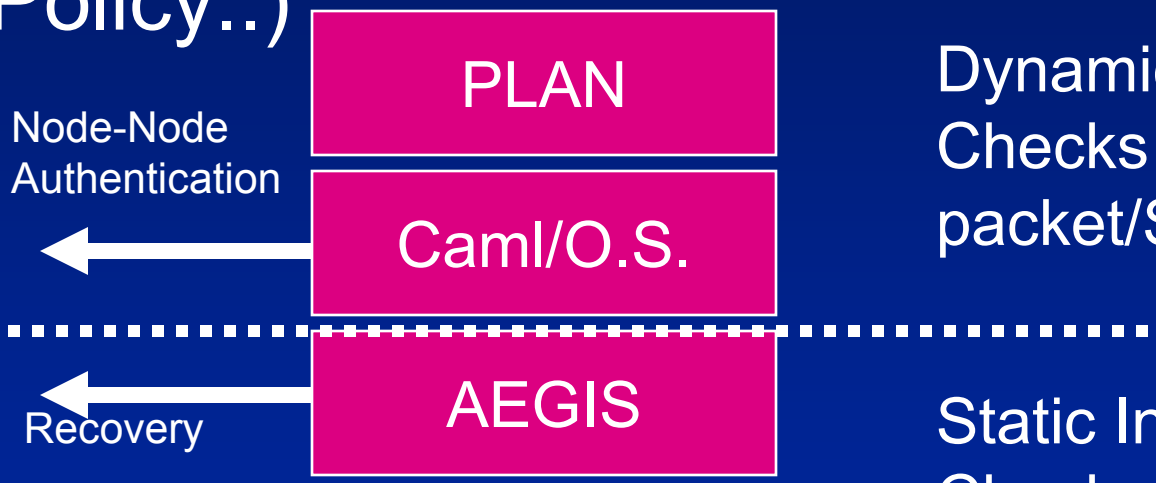
AEGIS Secure Bootstrap

- Integrity Guarantees for Dynamic Integrity Checking (http://www.cis.upenn.edu/~waa)



Secure Active Network Element (SANE)

- "Trust, but Verify" (U.S. Nuclear Policy..)



http://www.cis.upenn.edu/~waa
http://www.cis.upenn.edu/~angelos

Restricting Programs

- Node safe versus network safe