Trusted End Host Monitors for Securing Cloud Datacenters

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Cloud workload is dynamic and hostile

Traditional datacenters

Infrastructure supports small # of internal clients

- Software and topology change **slowly**
- Can exploit natural network chokepoints
- Feasible to audit app code

Cloud datacenters

Infrastructure is shared among many untrusted tenants

- **Rapidly** changing config
- Chokepoints torque network topology
- Too many apps to audit!

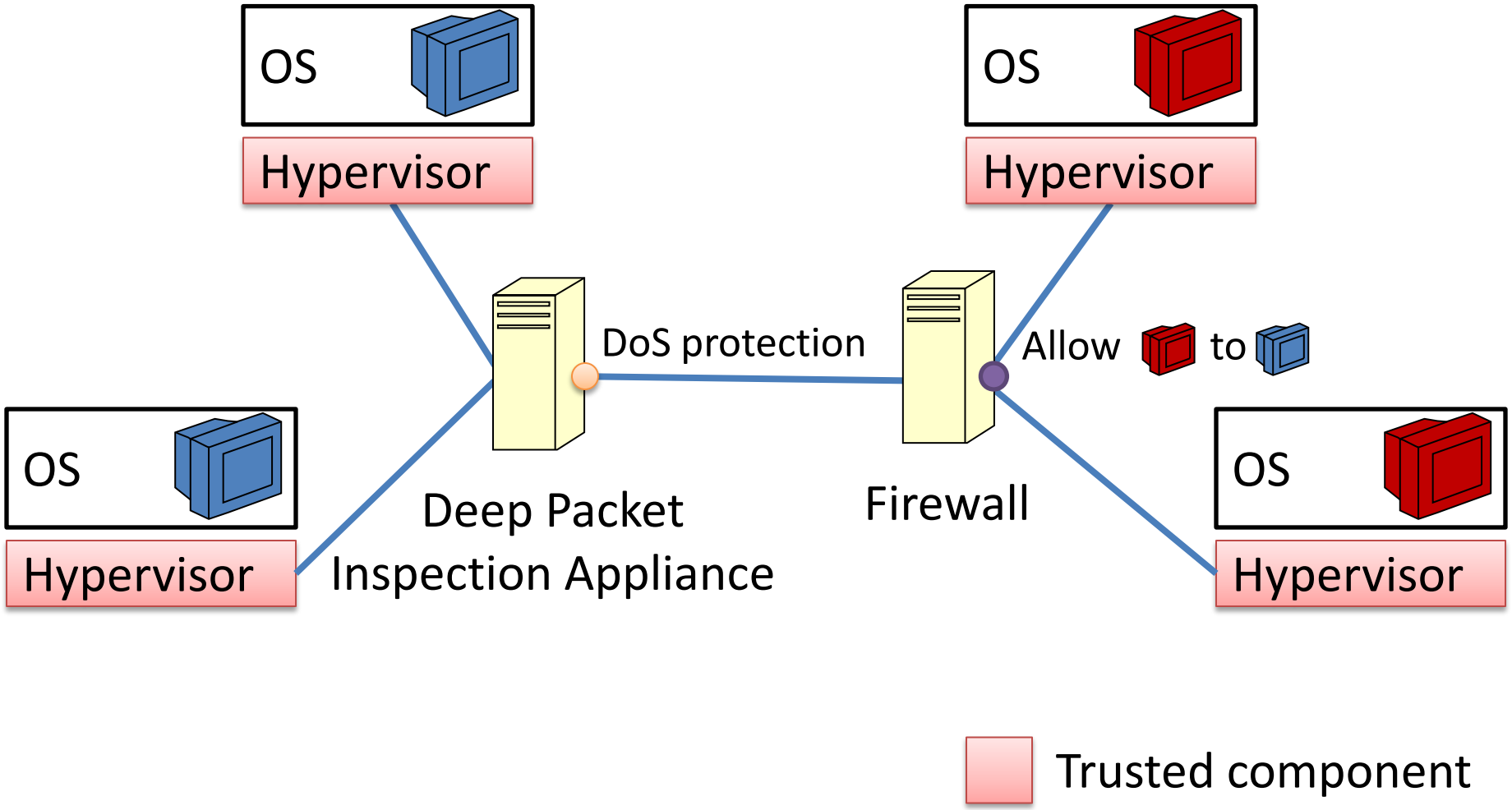
- Scaling requires more agility & flexibility
- Exploits more likely
- Exploits can use cloud resources to do more damage
  - Attack other tenants
  - External/internal DoS

Need new approach

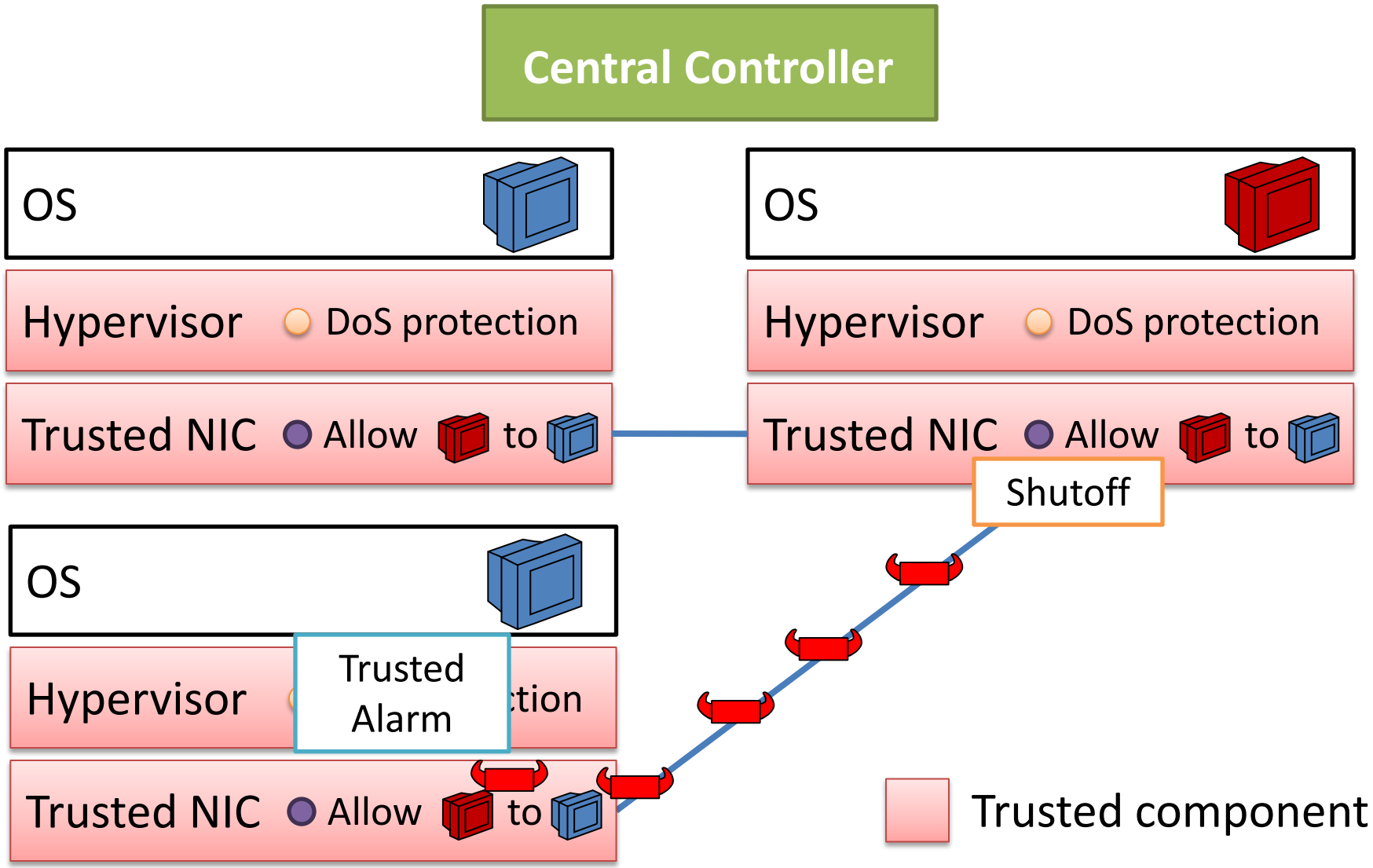
Insight: Cloud datacenters can help!

- Cloud data centers tend to be:
  - Centrally controlled
  - Homogeneous hardware & software
    - Clean slate feasible
  - Have strongly isolated, trusted functionality
    - VMs, TPMs, management coprocessors
- Our approach: **Trust end host monitors**
  Push enforcement from network to end hosts
  - Distributed across many hosts
  - Runs in trusted layers

In-network enforcement



Trusted end host monitors



Summary

- Cloud DCs have unique challenges & opportunities
  - Address, exploit these with **trusted end host monitors**
- Runs on commodity network & end host hardware
  - Simplifies controller design
  - Improves scalability
  - Reduces cost
- Status: Built prototype from VMs, trusted NIC (Intel AMT)