A Secure Access Control Architecture for Multi-Tenancy Cloud Environments

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Outline

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- CONTEXT AND BACKGROUND
- EXISTING METHODS AND MODELS
- THE PROPOSED ARCHITECTURE
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INTRODUCTION

Multi-tenancy

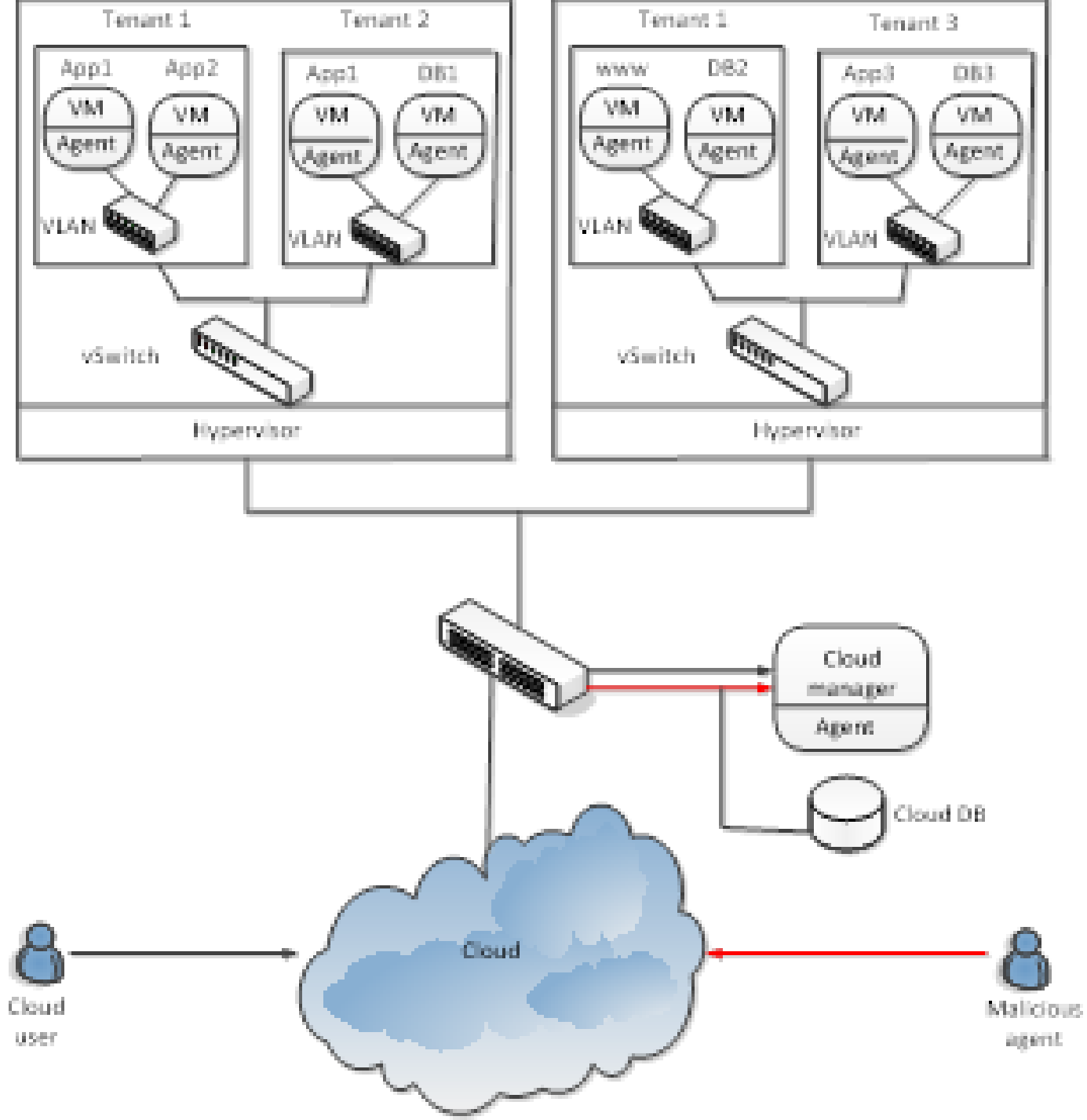
- Customers share computing resources, including CPU time, network bandwidth, data storage space, with other users.

Access control

- Security feature that controls how users and systems communicate and interact with other systems and resources.
- 3 types : physical access control, technical access control and administrative access control.

CONTEXT AND BACKGROUND

- Model for a multi-tenant cloud service provider
- 3 main components
  - Cloud manager
  - Hypervisor or Virtual Machine Manager
  - Virtual Machines
- Types of possible attacks
  - Virtual Machine (VM) Hopping
  - Denial of Service (DoS)



EXISTING METHODS AND MODELS

- Distributed Access Control (DAC)
  - 3 main components: Cloud Service Provider (CSP), Cloud Service Consumer (CSC) and Identity Provider (IdP)
- Adaptive access algorithm
  - Combination of trust management and Role-Based Access Control (RBAC)
  - Based on loyalty
- Multi-Tenancy Access Control Model (MTACM)
  - Based on limiting the management privilege of Cloud Service Provider and letting the customers manage the security of their own business.

EXISTING METHODS AND MODELS (cont’d)

- Role-Based Multi-Tenancy Access Control (RB-MTAC)
  - Combination of identity management and role-based access control.

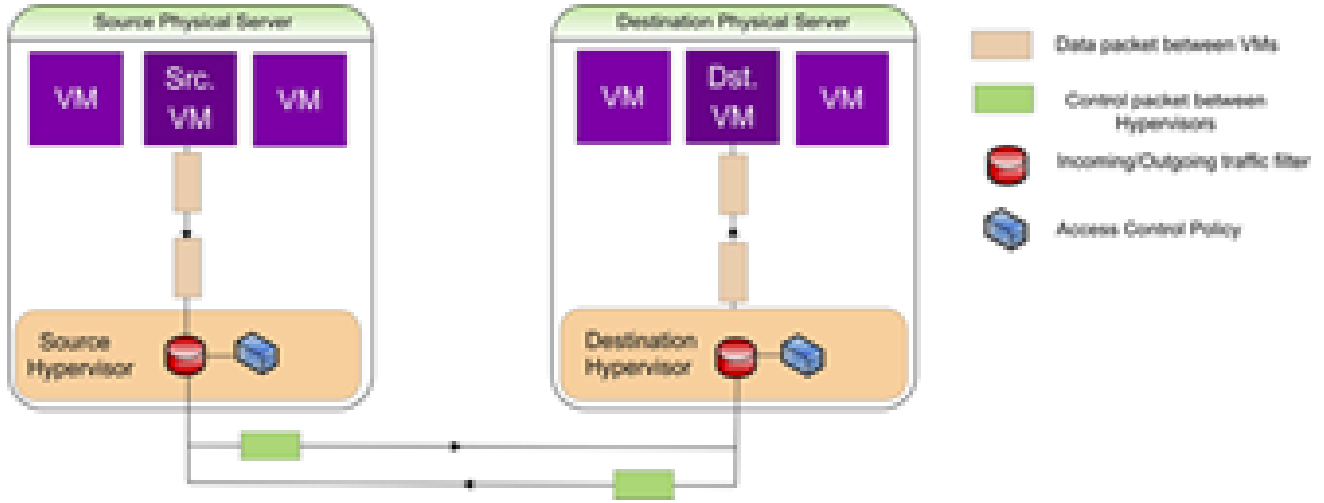
- CloudPolice
  - Hypervisor-based access control mechanism
  - Effective to prevent denial of service (DoS) attacks

THE PROPOSED ARCHITECTURE

- Main assumptions
  - The virtual machines and physical servers are co-located at the same cloud provider.
  - Each physical server has only one hypervisor.
  - Each physical server is hosting at least one tenant, and each tenant has at least one virtual machine.
  - All access control lists are defined and stored in the hypervisor
  - In its startup process, a hypervisor sends an update message to the other hypervisors that are located at the same Cloud

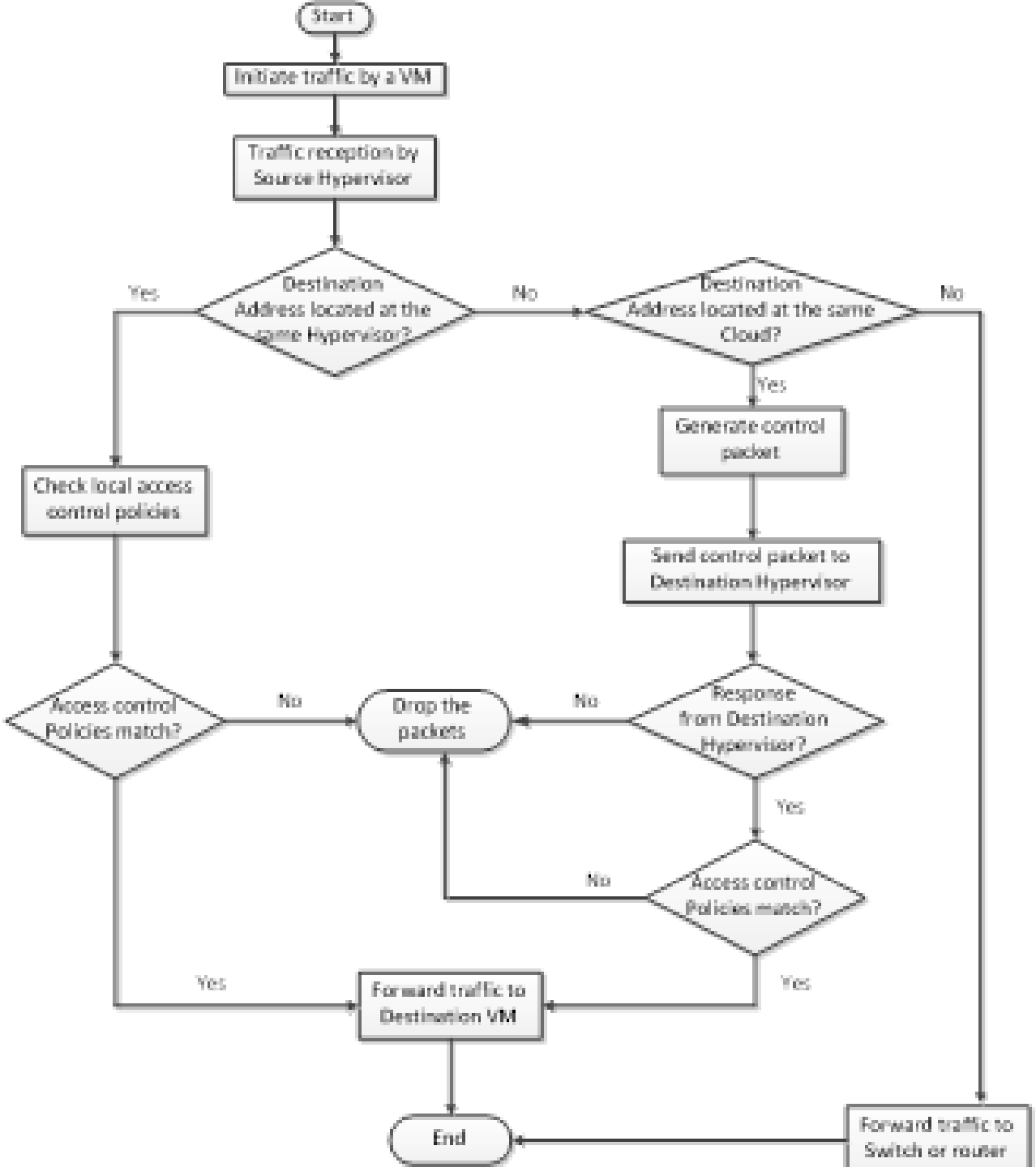
THE PROPOSED ARCHITECTURE (cont'd)

- Principles
  - Source VM
  - Destination VM
  - Control packet
  - Incoming/outgoing traffic filter
  - Access control list



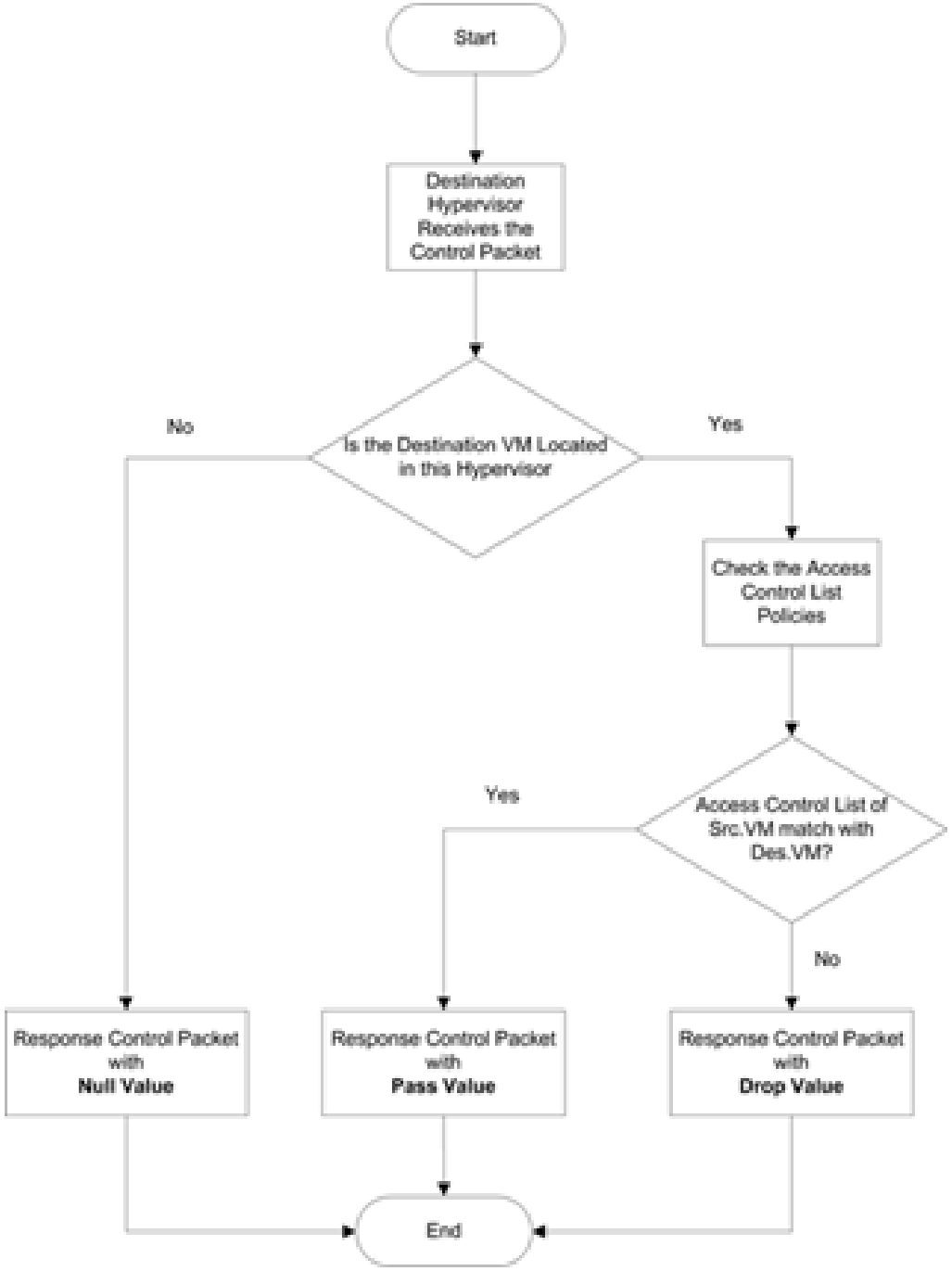
THE PROPOSED ARCHITECTURE (cont'd)

Flowchart



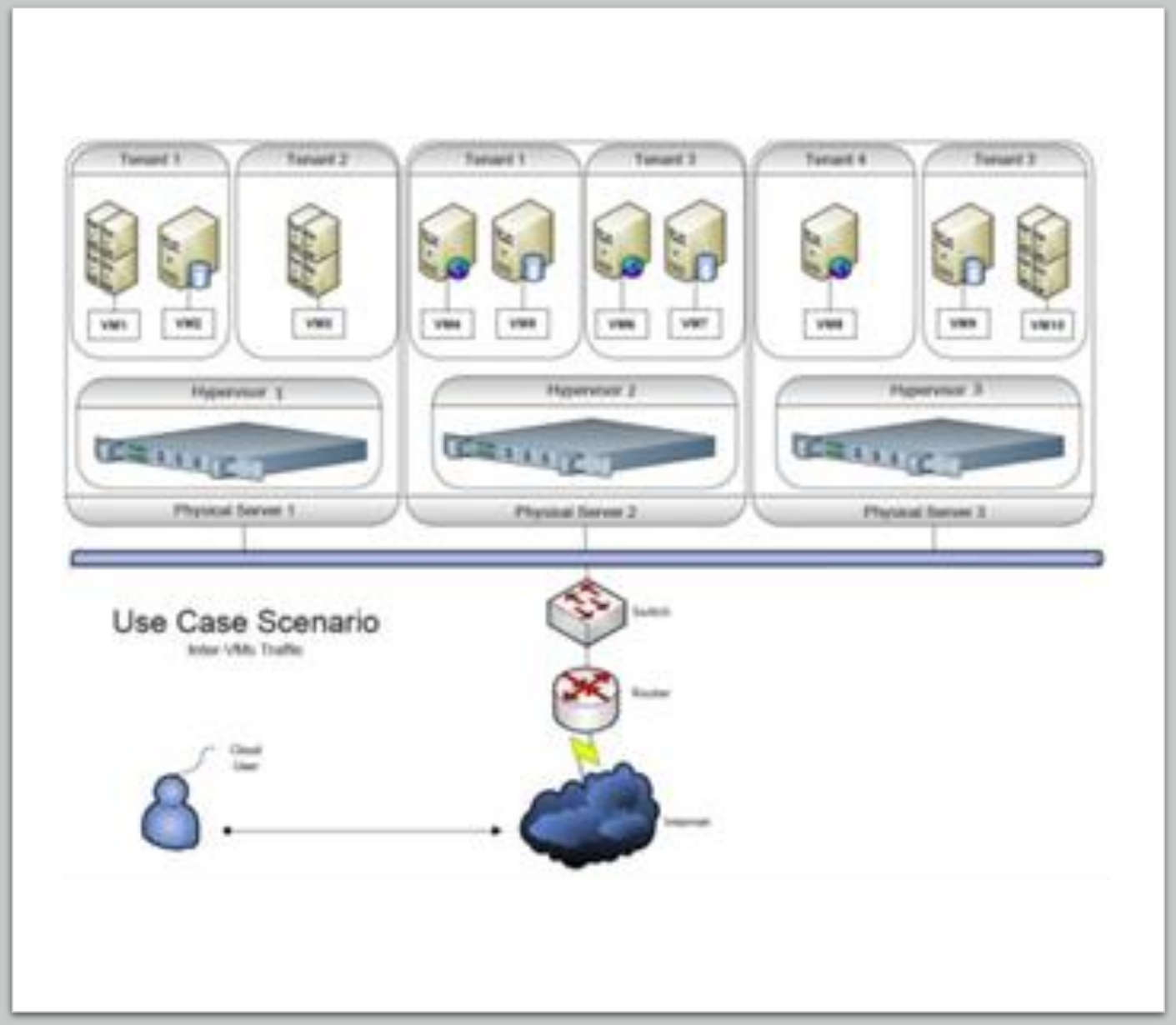
THE PROPOSED ARCHITECTURE (cont'd)

Destination hypervisor's tasks upon control packet reception



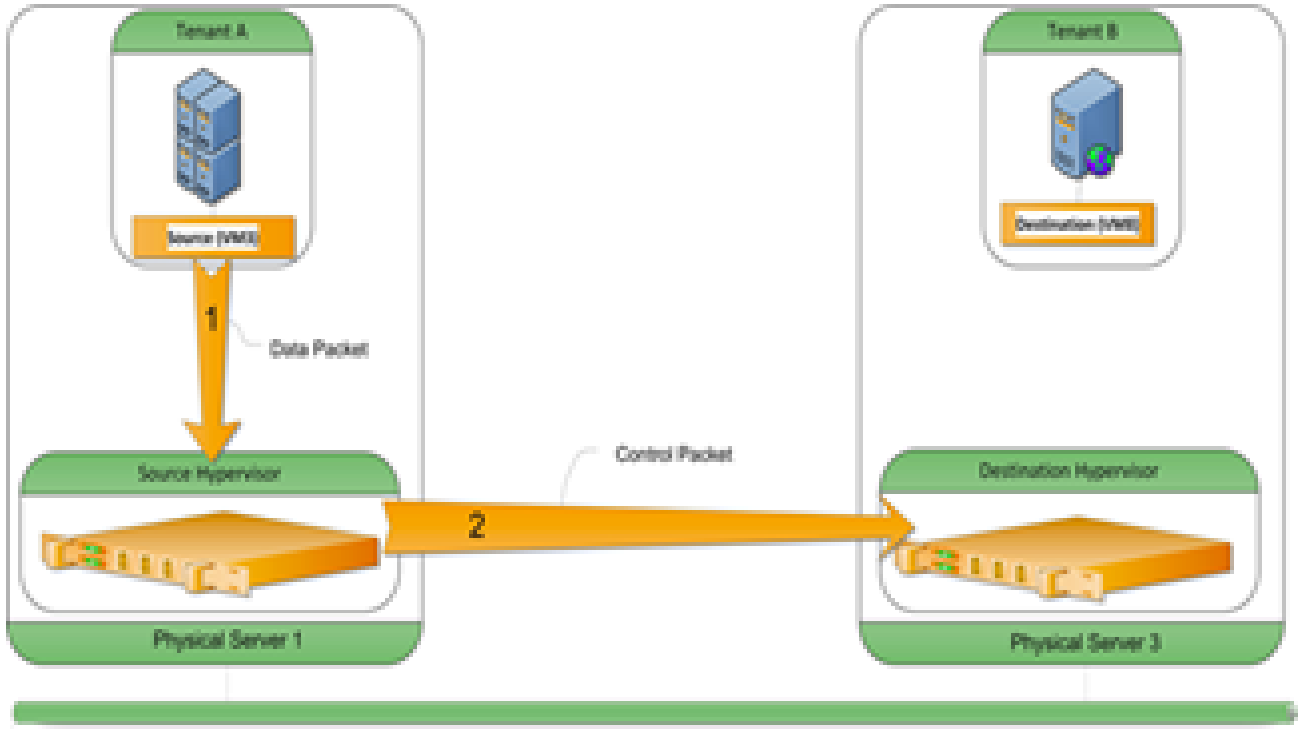
A USE CASE SCENARIO

- 3 physical servers
  - Server 1: Tenant 1 (VM1, VM2) and Tenant 2 (VM3)
  - Server 2: Tenant 1 (VM4, VM5) and Tenant 3 (VM6, VM7)
  - Server 3: Tenant 4 (VM8) and Tenant 3 (VM9, VM10)



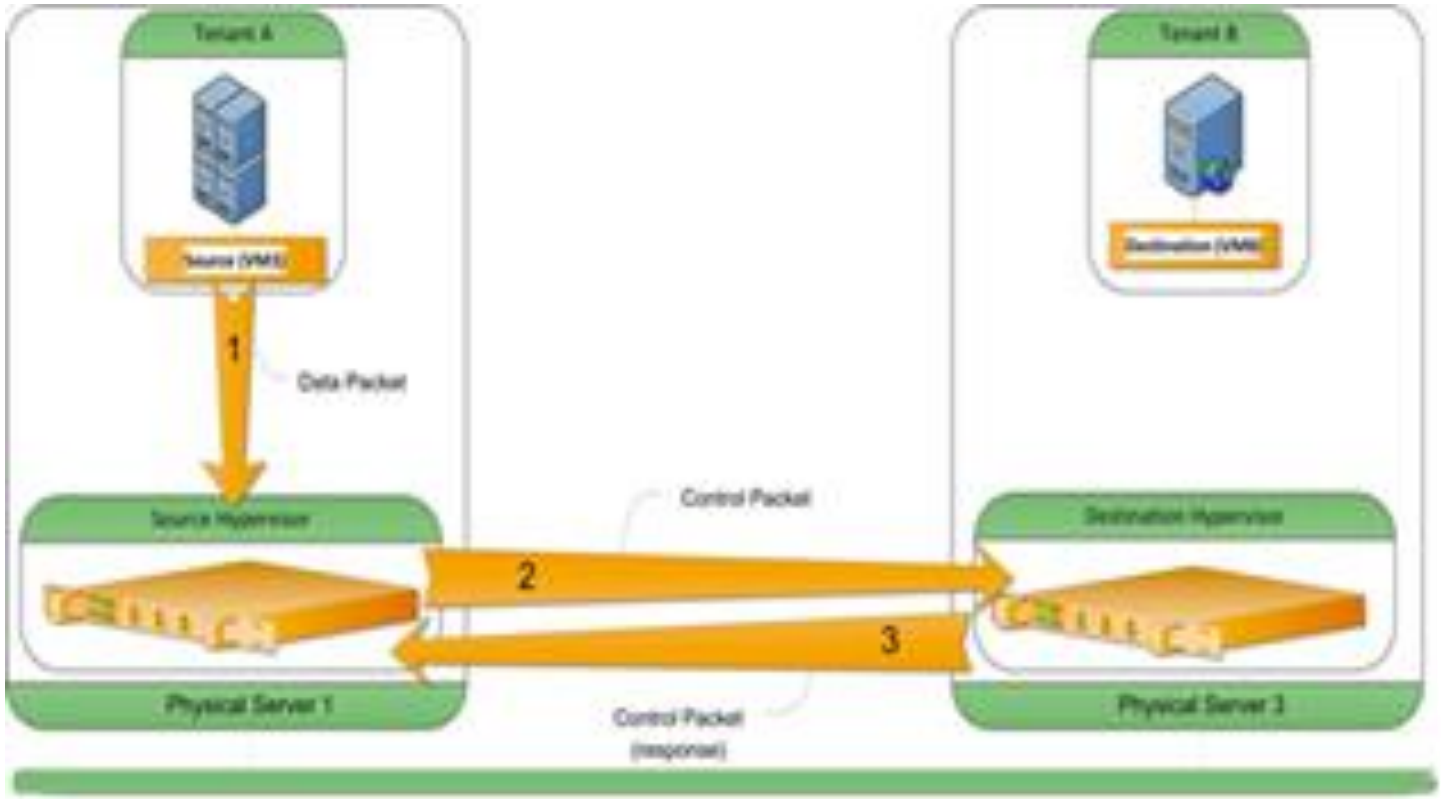
A USE CASE SCENARIO (cont'd)

Illustration of phase one



A USE CASE SCENARIO (cont'd)

Illustration of phase 2



CONCLUSION

- Advantages of the proposed architecture
  - Scalability
  - Security

- Future works
  - Implementing a prototype of the proposed architecture

Questions?