Multi-Layer Threat Analysis of the Cloud

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Cloud's Benefits

- Access to geo-distributed resources.
- Flexible on-demand binding of resources to services.

Cloud's Security Concerns

- Multi-layer, multi-technology attack surfaces.
- Complex and dynamic threat propagation pathways.

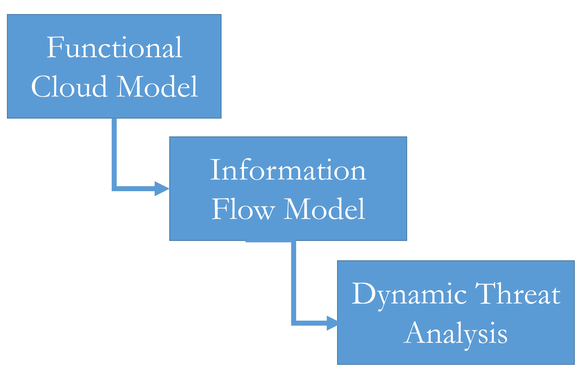
State of the Art

Threat Analysis (TA) as a process of ascertaining a system's exposure to threats focuses on analysing threats to targeted assets and considers static interconnections amongst the assets.

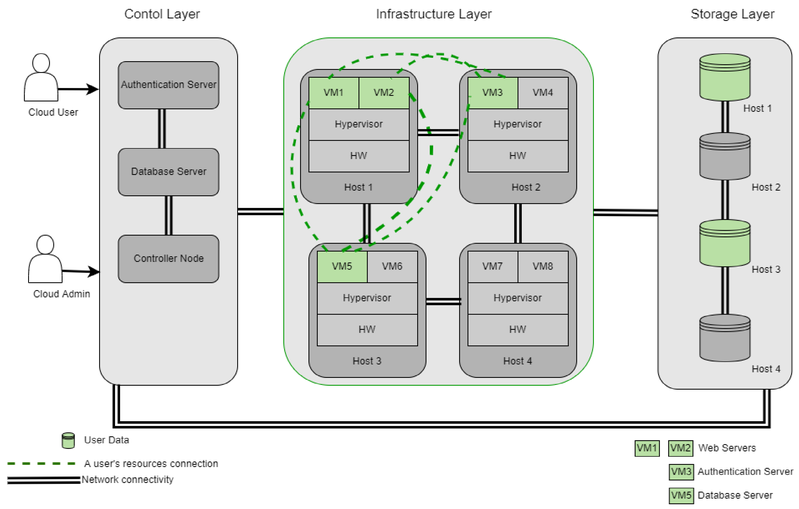
Our Contributions

- Development of a Functional Cloud Model.
- Development of a technology-agnostic Information Flow Model.
- Development of a Dynamic Threat Analysis approach for the Cloud.

Methodology: The Building Blocks

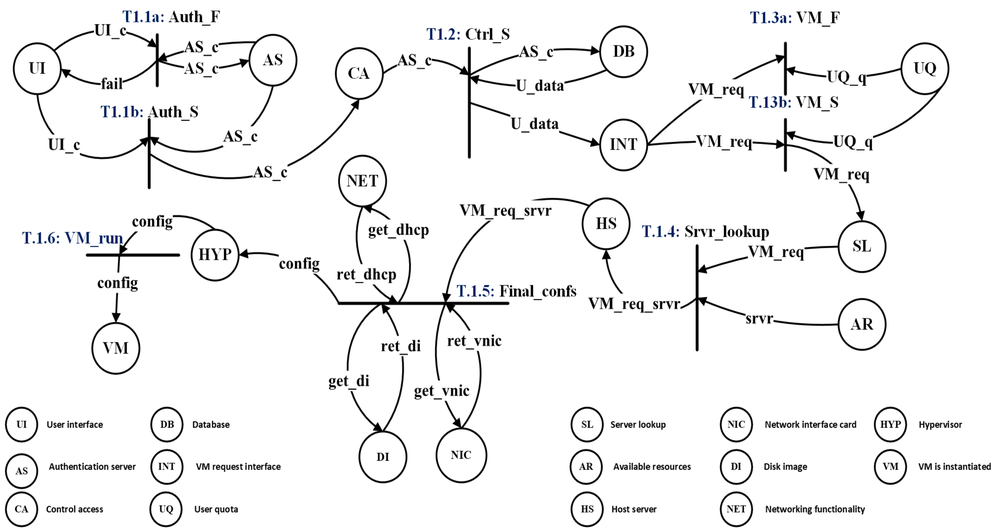


Functional Cloud Model



Control Layer: Authenticates users, manages and schedules resources.
Infrastructure Layer: Binds VMs to physical hosts.
Storage Layer: Provides consistent data to users.

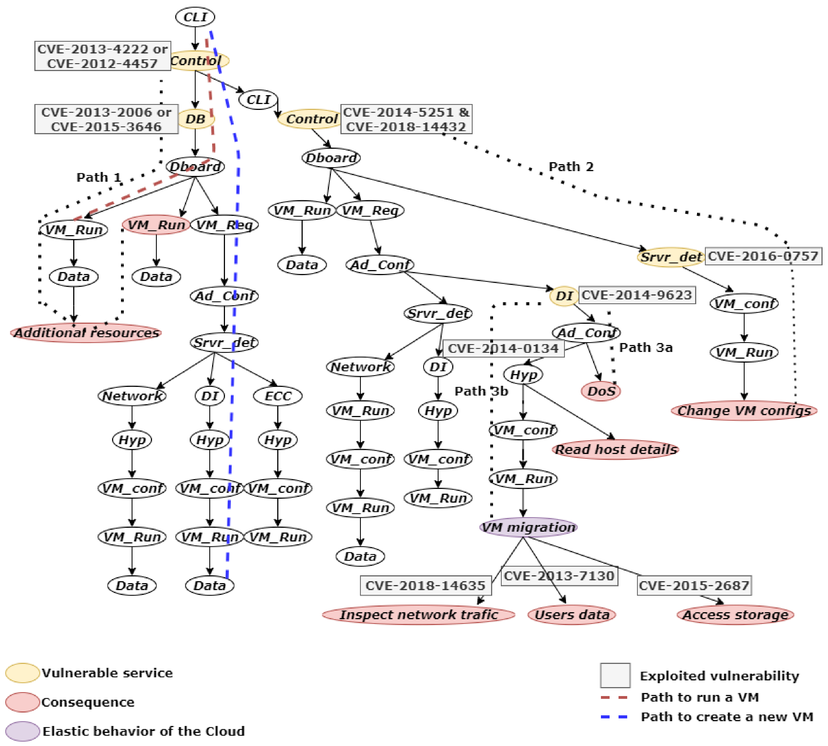
Information Flow Model



- Technology-agnostic information flow model using Petri nets.
- Ability to capture dynamic interconnections over the VM migration.
- Scalable to additional constraints, e.g., addition of new threats.

Threat Analysis

- Create a baseline of the Cloud's functional behaviour.
- Ability to explore propagation of threats in considering new interactions created at run-time.



- Capability to trace specific threats in a technology-agnostic manner (Path 1).
- Capability to analyse the impact of threats on services belonging to different layers in the Cloud (Path 2).
- Capability to explore the potential of threats to propagate across the Cloud considering the elasticity of the Cloud (Path 3(b)).

Acknowledgments

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