Attempting to define my PhD project

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Outline

- Work Justification
- Problem Identification
- Objectives
- Possible Contributions
- Supporting Methodology
- Ongoing study
- Related Works
- Planned Schedule
- References

Why cloud computing?

70%

of organizations have at least **one application in the cloud**

16%

have plans to do so **within 12 months**

14%

have plans to do so **within 1 to 3 years**

Fonte: IDG 2016

Why cloud computing?

28%

total IT budget allocated to cloud computing **within next 12 months**

45% SaaS

30% IaaS

19% PaaS

Fonte: IDG 2016

Why cloud computing?

42%

drives investments on cloud to **lower cost of ownership**

35%

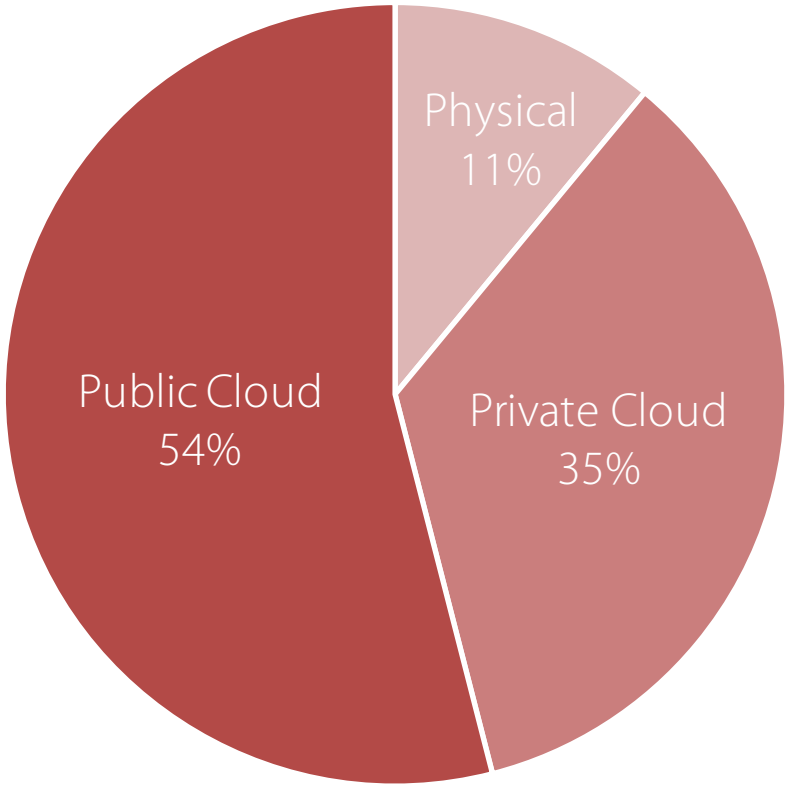
invest in cloud to **replace on-premise legacy technology**

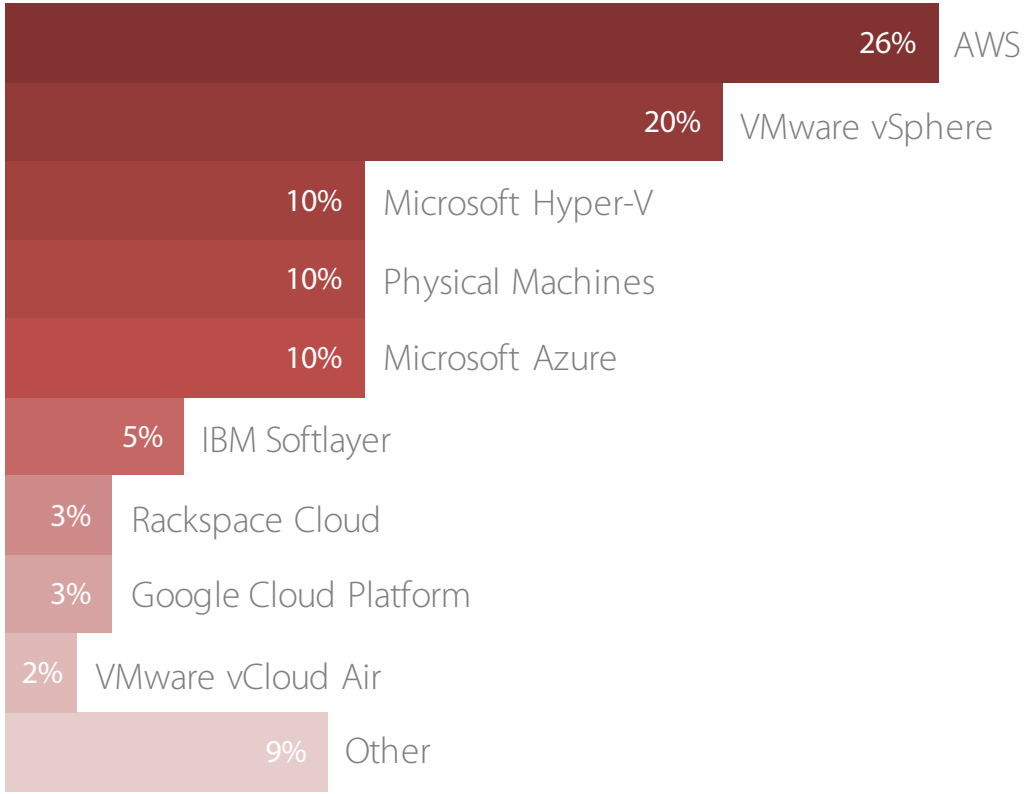
33%

invest in cloud to **enabling business continuity**

Fonte: IDG 2016

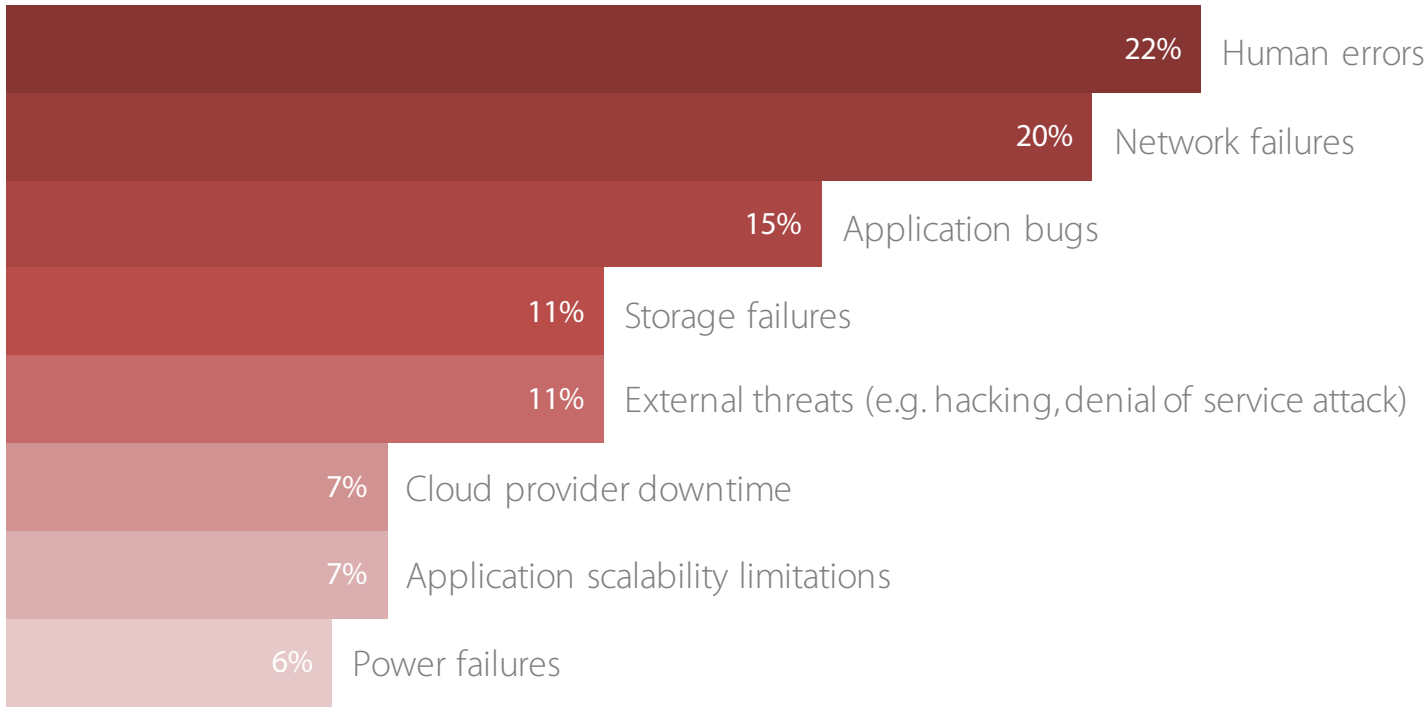
Problem Identification (Disaster Recovery target infrastructure)





Fonte: CloudEndure 2016

Problem Identification (Primary risks to system availability)



Fonte: CloudEndure 2016

Problem Identification

- Business Continuity Strategy
  - Disaster preparedness plan
  - Disaster recovery
  - Fault tolerance
  - Financial impact of service downtime for providers and consumers company
  - Best scenario for a cloud computing provider infrastructure to minimize these risks

Problem Identification

- Let's try to contribute by

Using the hierarchical model approach for modeling business continuity strategies in cloud computing environment

General Objectives (provisional)

The main objective is to propose methods for support business continuity strategy in cloud computing systems

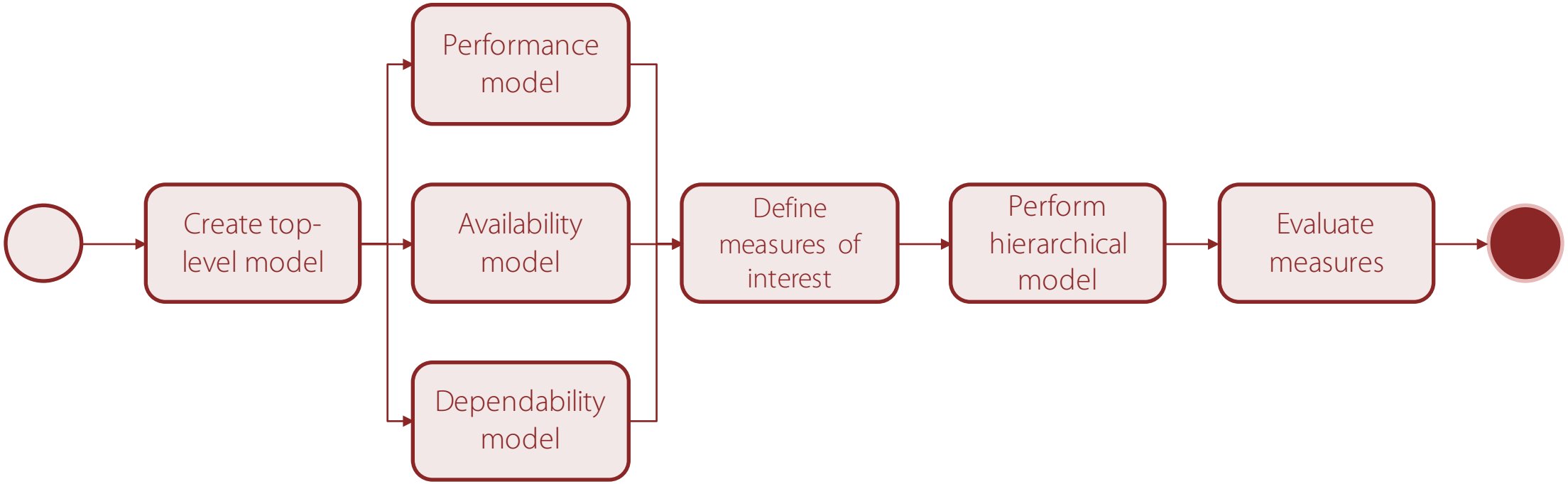
Specifics

1. Explore the live migration of VMs between clusters
2. Data recovery techniques in case of unexpected situation
3. Build availability, dependability and performance models for the problem
4. Develop hierarchical models, define metrics and evaluate measures
5. Suggest improvements to existing cloud computing architectures

Possible Contributions

- Provide models for availability, dependability and performance evaluation
- Scenarios that can help cloud providers
- A supporting methodology that describes the activities required in order to support companies to provide or improve their services

Supporting Methodology



Experimentation

- Analytics modeling
  - RBD
  - SPN
  - Markov Chains
- Measurement
  - Obtain more accurate results
  - Models validation

Ongoing study

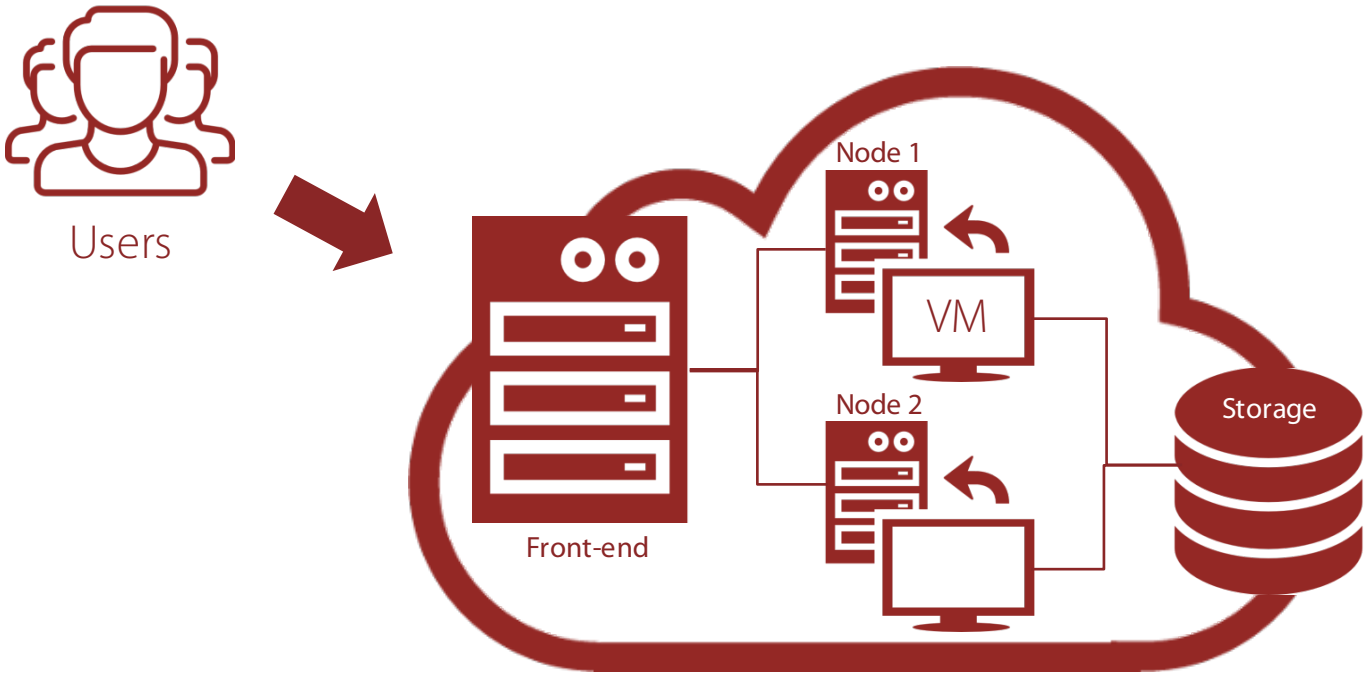
The main challenges to be investigated will be the copy/move VMs dynamically (live migration) and data recovery in case of disaster

#	VM types	Switches	Image format	Volume attached	Time Average (sec)
Scenario 1	m1.tiny	Megabit	qcow2	No	11.5455
Scenario 2	m1.small	Megabit	qcow2	No	15.8384
Scenario 3	m1.medium	Megabit	qcow2	No	21.2745
Scenario 4	m1.tiny	Megabit	qcow2	Yes	18.4343
Scenario 5	m1.small	Megabit	qcow2	Yes	22.8687
Scenario 6	m1.medium	Megabit	qcow2	Yes	28.4898

#	VM types	Switches	Image format	Volume attached	Time Average (sec)
Scenario 7	m1.tiny	Megabit	raw	No	11.4848
Scenario 8	m1.small	Megabit	raw	No	15.8182
Scenario 9	m1.medium	Megabit	raw	No	21.5636
Scenario 10	m1.tiny	Megabit	raw	Yes	18.7879
Scenario 11	m1.small	Megabit	raw	Yes	23.6701
Scenario 12	m1.medium	Megabit	raw	Yes	28.6739

Ongoing study

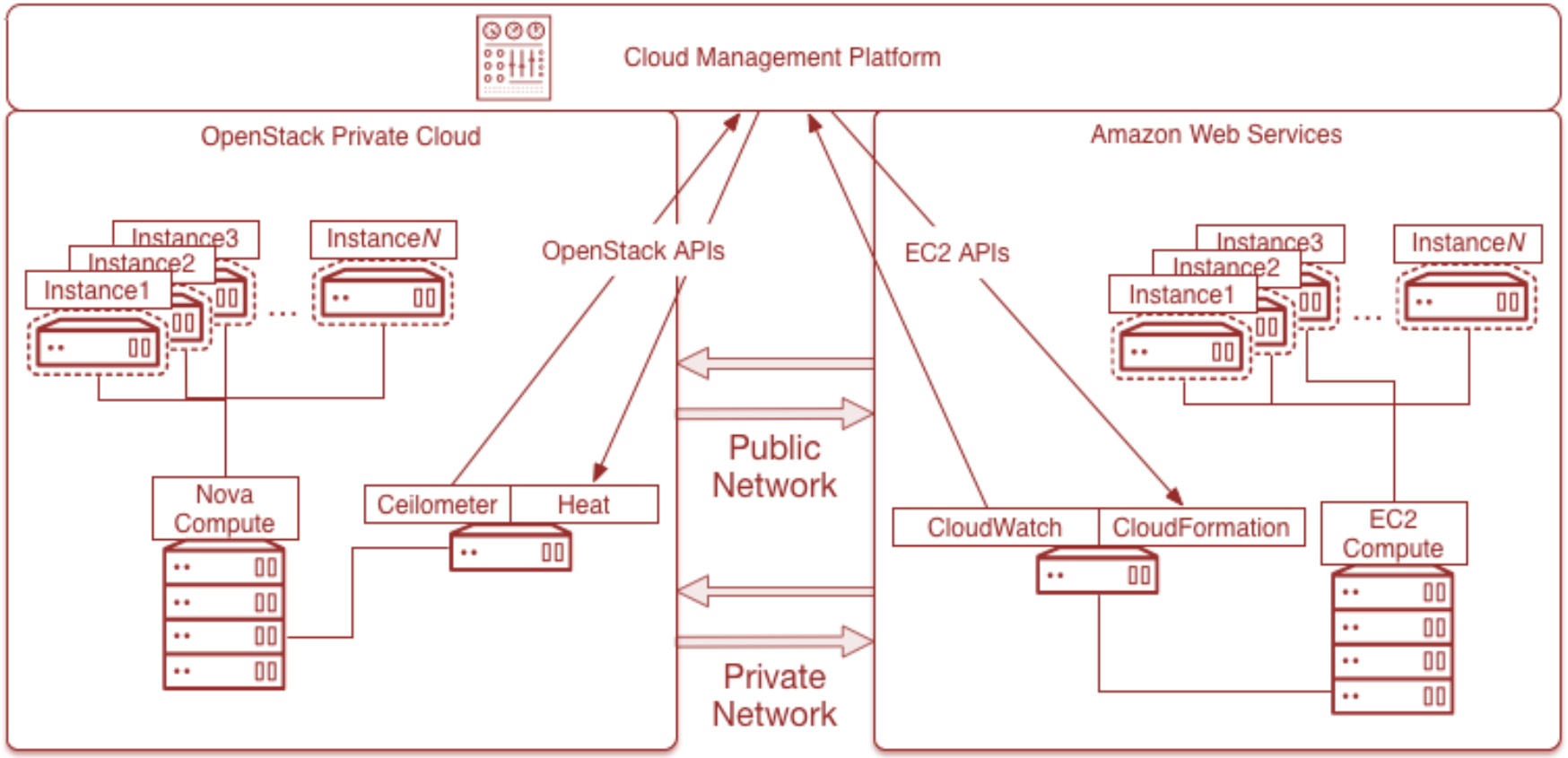
Architecture in the laboratory



- Collecting data from live migration
  - openstack: **pre-migration**;
  - openstack and hypervisor: **reservation**;
  - hypervisor: **iterative pre-copy, stop and copy, commitment**
- To analyse the availability impact on system

Ongoing study

Hybrid architecture



- Evaluate the availability of the system considering:
  - backup
  - machine migration
  - data recovery

Related Works

	Analytical and Simulation Models	Availability Evaluation	Performance Evaluation	Dependability Evaluation	Optimization
Yu Gu et al., 2014	Yes	No	No	No	Yes
Alhazmi et al., 2013	No	No	No	No	Yes
Javaraiah, 2011	Yes	No	No	No	No
Suguna et al., 2015	Yes	No	No	Yes	Yes
Wood et al, 2010	Yes	No	No	No	No
This Ph.D. project	Yes	Yes	Yes	Yes	Yes

Planned Schedule

	Oct/16	Nov/16	Dec/16	Jan/16	Feb/16	Mar/16
State of art	X	X	X			
Background				X	X	X
Related works					X	X
Case studies					X	X

References

- Herzog, U. (2001). Formal methods for performance evaluation. In Lectures on Formal Methods and Performance Analysis
- Maciel, P. R., Trivedi, K. S., Matias, R., & Kim, D. S. (2011). Dependability modeling. Performance and Dependability in Service Computing: Concepts, Techniques and Research Directions, 1, 53-97.
- Avizienis, A., Laprie, J. C., & Randell, B. (2001). Fundamental concepts of dependability. Newcastle upon Tyne, UK: University of Newcastle upon Tyne, Computing Science.
- Cassandras, C. G. (1993). Discrete event systems: modeling and performance analysis. CRC.
- Jiang, J., Sekar, V., & Zhang, H. (2012, December). Improving fairness, efficiency, and stability in http-based adaptive video streaming with festive. In Proceedings of the 8th international conference on Emerging networking experiments and technologies (pp. 97-108). ACM.

Thank you

Workshop MoDCS Nov'16