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Flexible Infrastructure Management for Smart Cities

Research Interests

Cloud (elasticity)
SDN (reconfiguration)
NFV (creation/adaption)
IoT (sensors/connectivity)
OSN (crowdsensing/sourcing)
Context-Awareness (trigger)
Big Data (analytics)

Resources



Federal University of ABC
UFABC
Interdisciplinarity

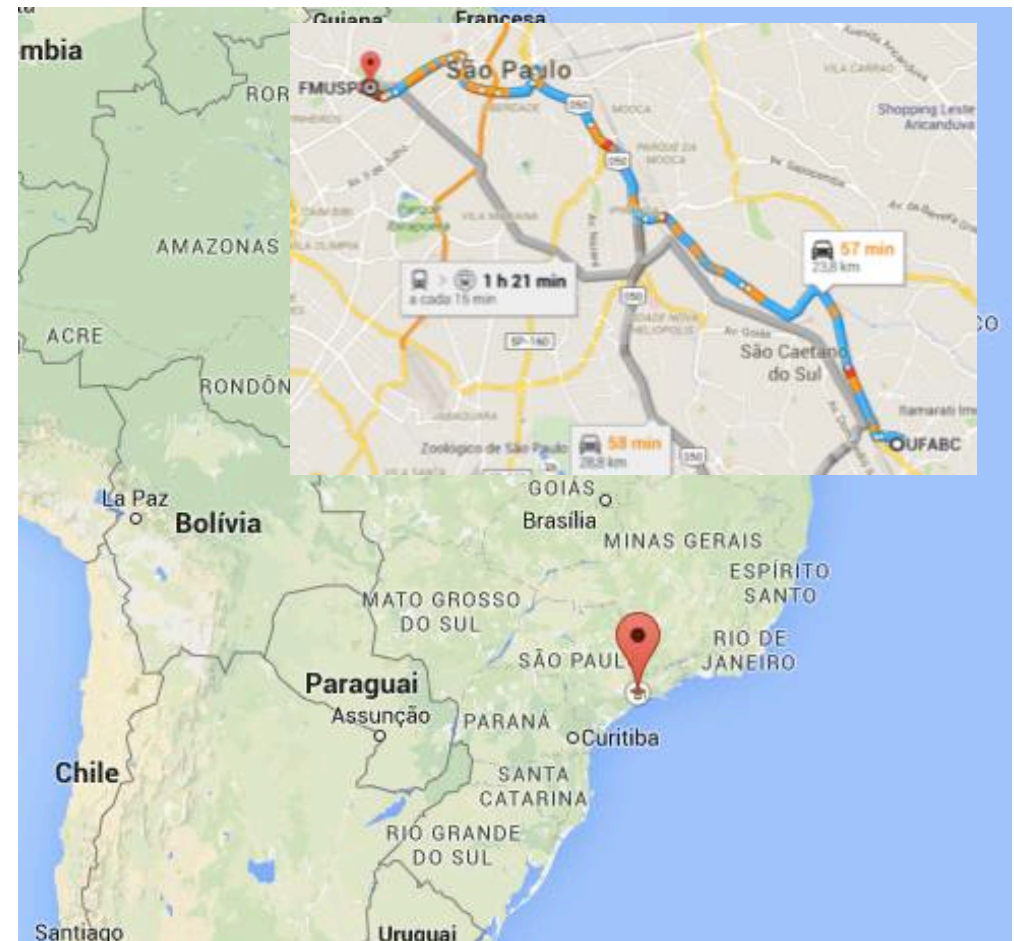


NUVEM
Research Strategic Unit
nuvem.ufabc.edu.br

Federal University of ABC (UFABC)

Located in the **ABC** area, an industrial belt
in the southeast of São Paulo

Santo **A**ndré
São **B**ernardo do Campo
São **C**aetano do Sul
Started in **2006**



**Brazilian
RUF Ranking**



Internationalization

UFABC

#1 (2015, 2014, 2013)

NUVEM UFABC

Research Strategic Unit



- NUVEM is an acronym = CLOUD
 - Núcleo Estratégico de Universos Virtuais, Entretenimento e Mobilidade
 - Virtual Universes, Entertainment and Mobility Strategic Unit
- Selected in an internal call for Strategic Units
- 18 professors
- 5 Broad Research Areas

NUVEM – Research Areas

Smart Societies

Virtual Sensations

Connected Mobility

Extreme Computing

Integrated Universes

Smart Cities vs. Urban Computing

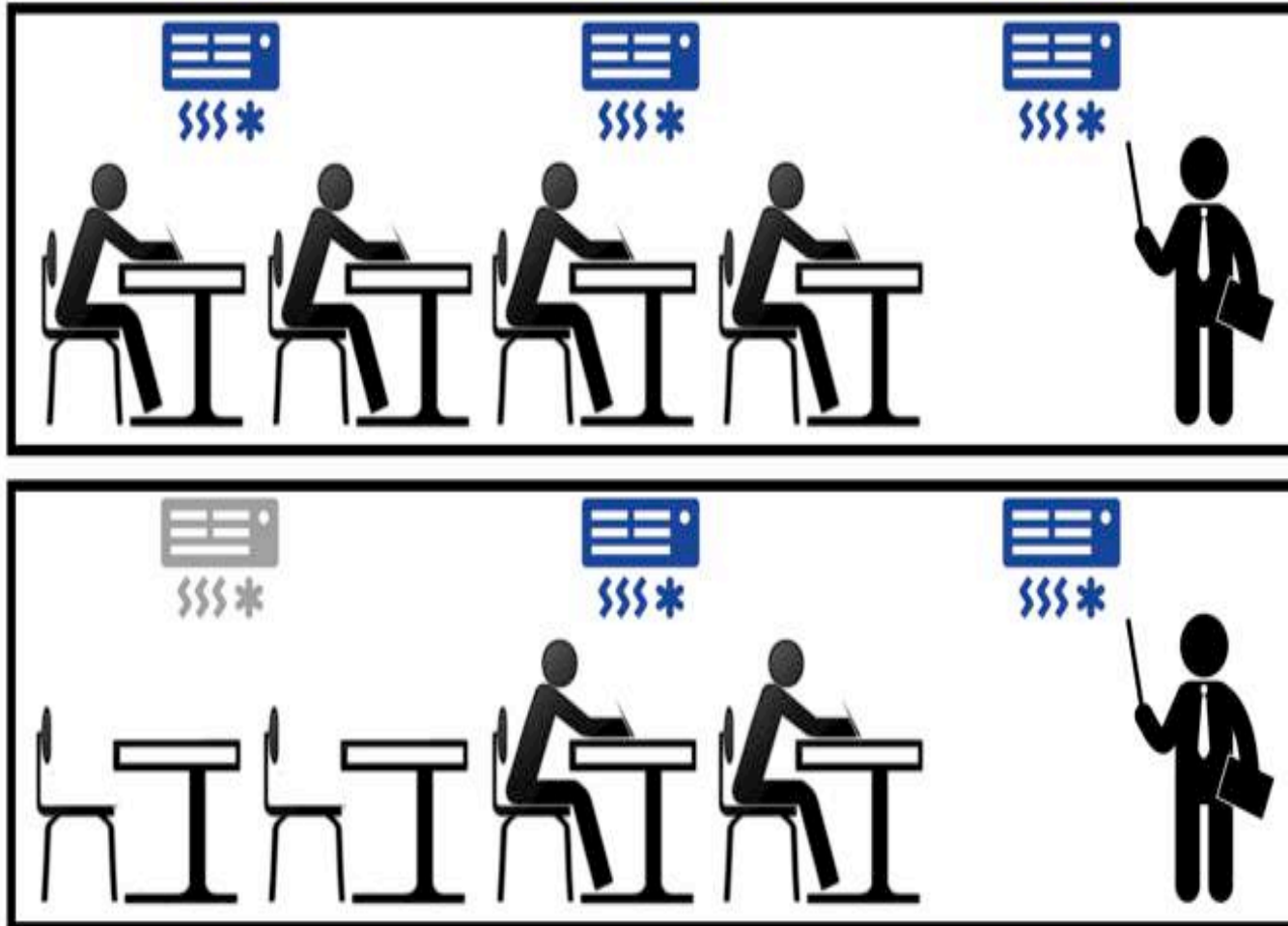
- “Urban computing is a process of acquisition, integration, and analysis of big and heterogeneous data generated by a diversity of sources in urban spaces, such as sensors, devices, vehicles, buildings, and human, to tackle the major issues that cities face, e.g., air pollution, increased energy consumption and traffic congestion.”
 - Zheng, Y. et. al, "Urban Computing: Concepts, Methodologies, and Applications", ACM Transactions on Intelligent Systems and Technology, 6(2), July 2014.

Flexible Infrastructure Management for Smart Cities

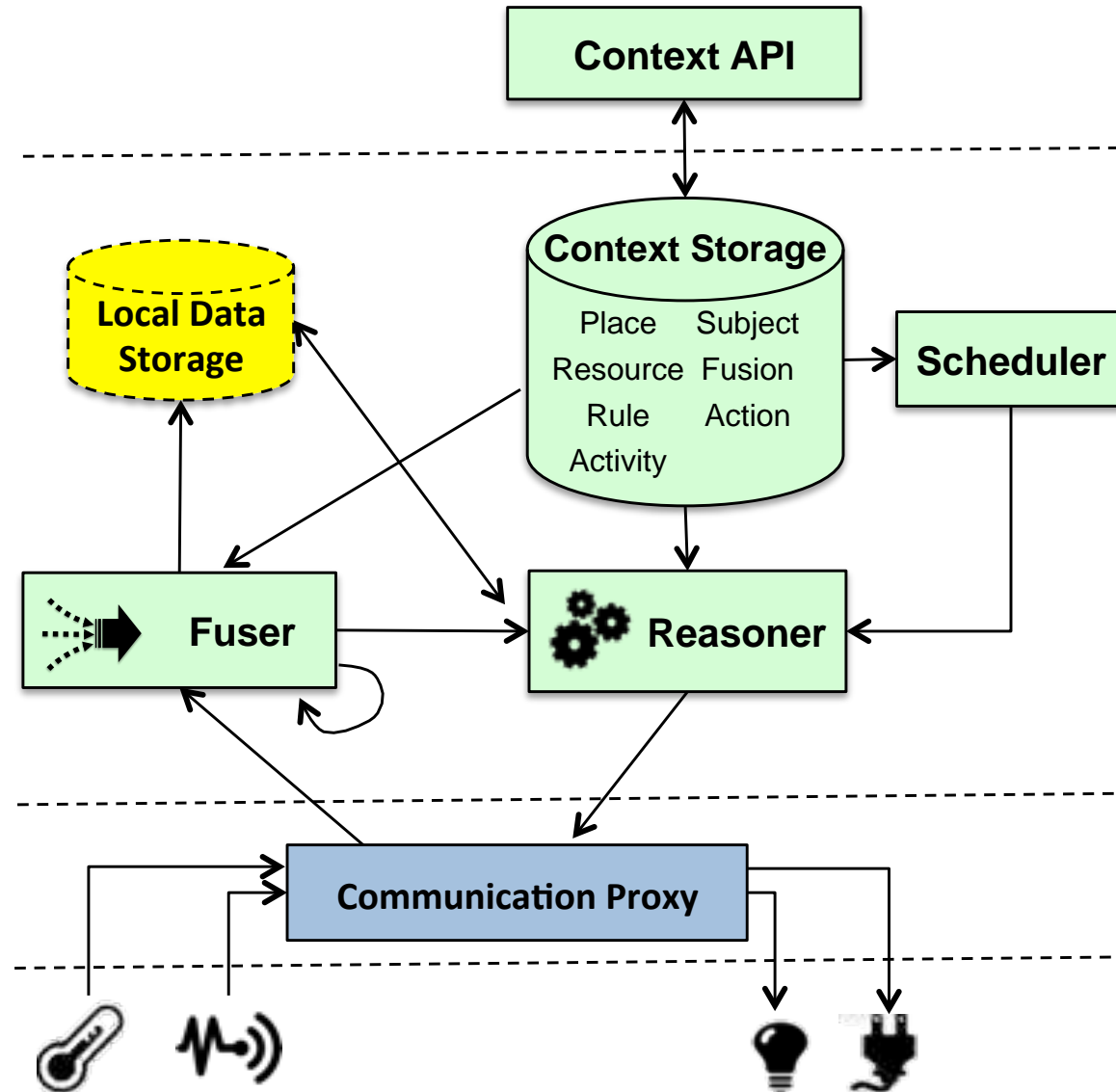
- Idea: On demand service creation/management
- Focus: Urban Spaces: Smart Cities
- Technology: Cloud, SDN/NFV, Big Data
- Trigger: Context-Awareness
 - to detect the need of action
- Support:
 - IoT: sensors, actuators, connectivity
 - Online Social Networks
 - Crowdsourcing/crowdsensing

IMPreSS Project

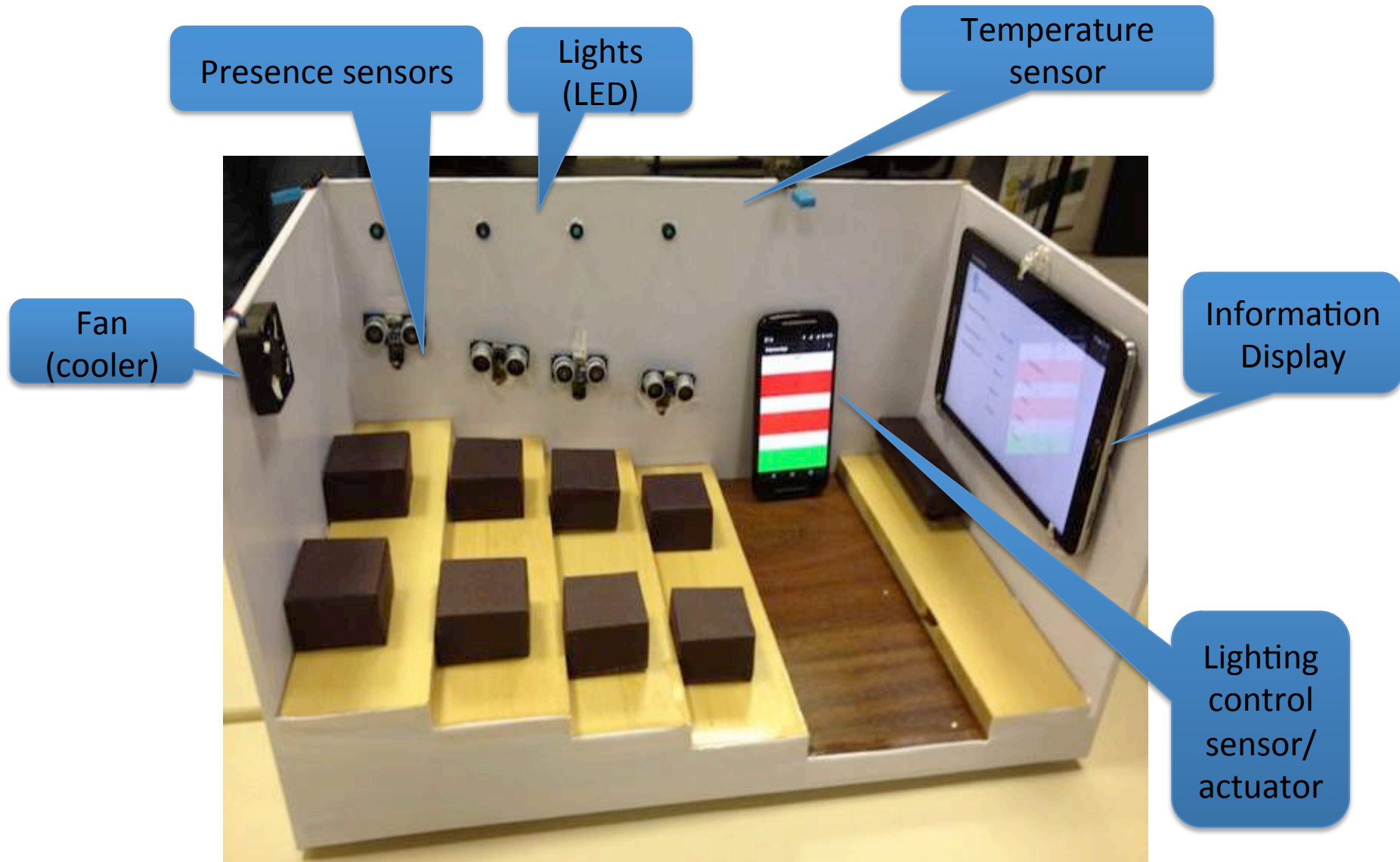
Context-Aware Energy Efficiency Management for Smart Buildings



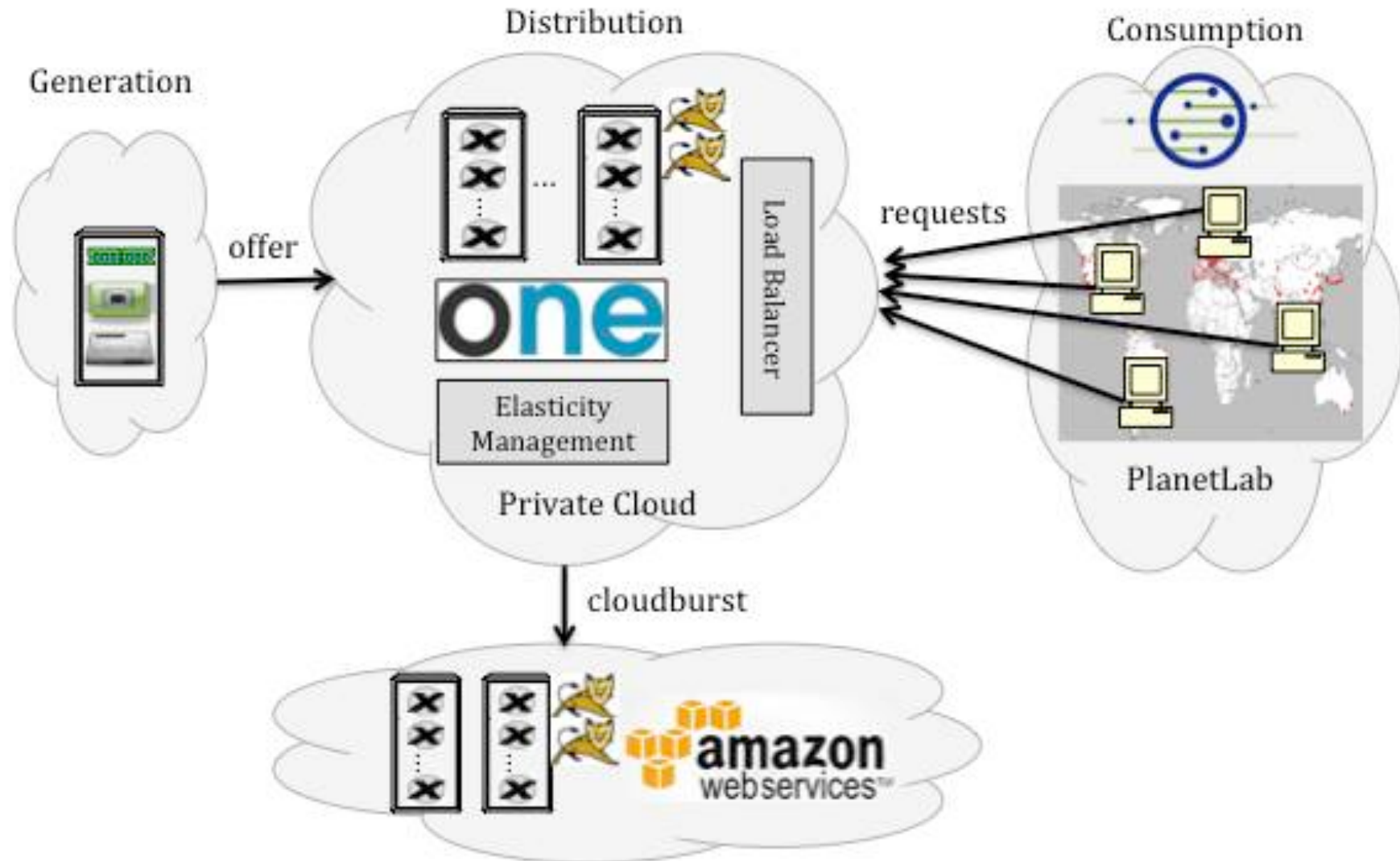
IMPreSS Project: Context Manager



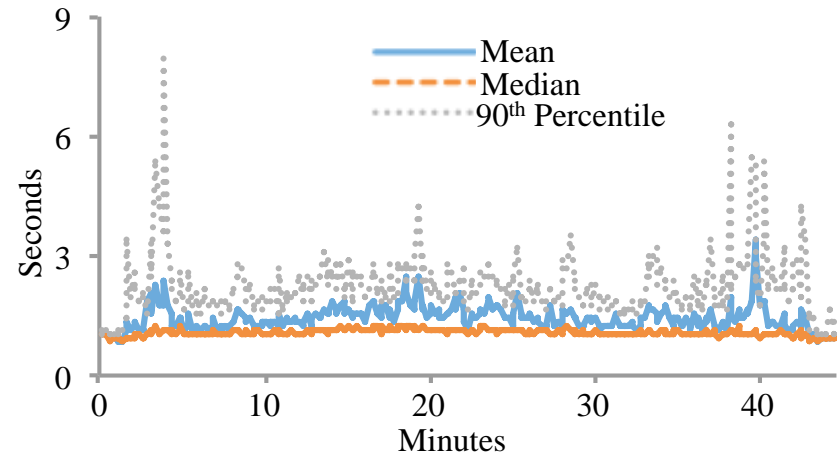
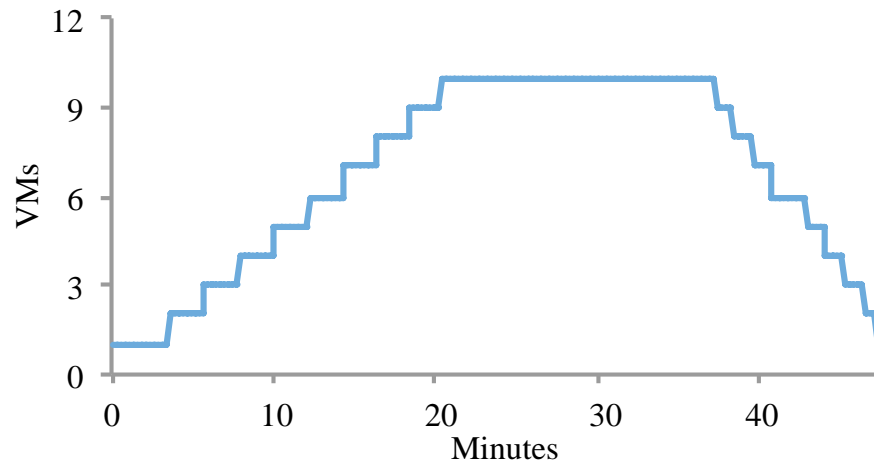
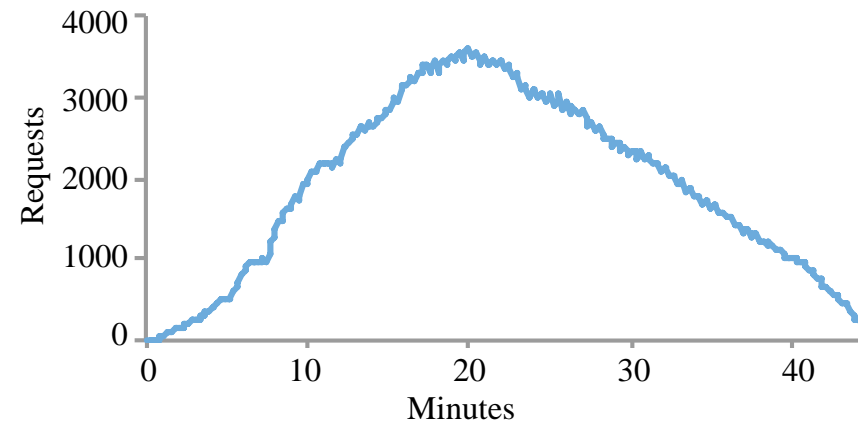
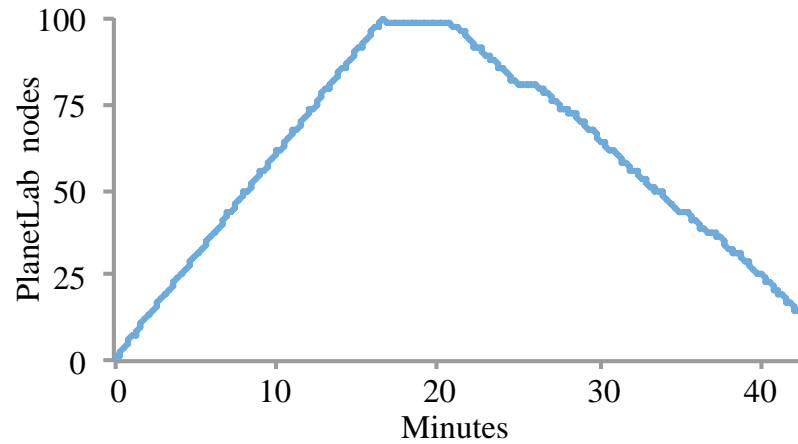
IMPreSS: University Classroom



Elasticity Management in Private and Hybrid Clouds (Smart Grid)

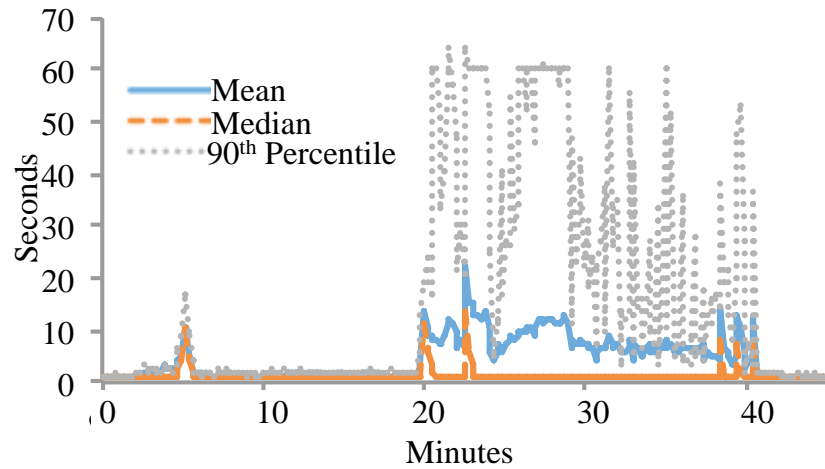


Elasticity: Private Cloud

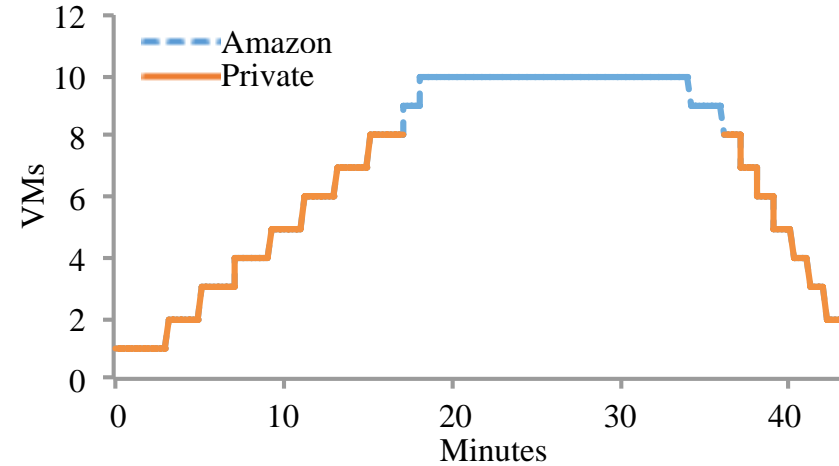
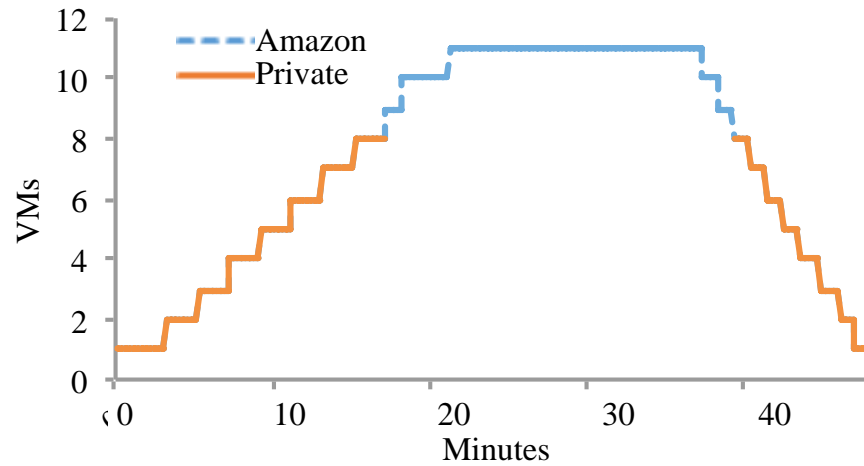
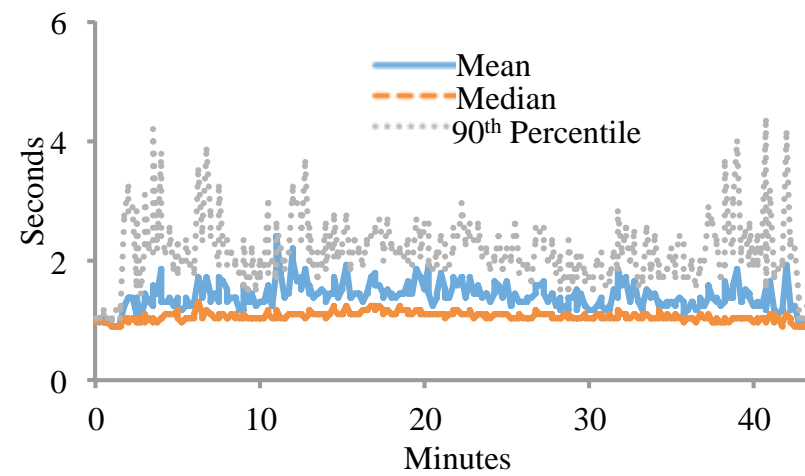


Elasticity: Hybrid Cloud

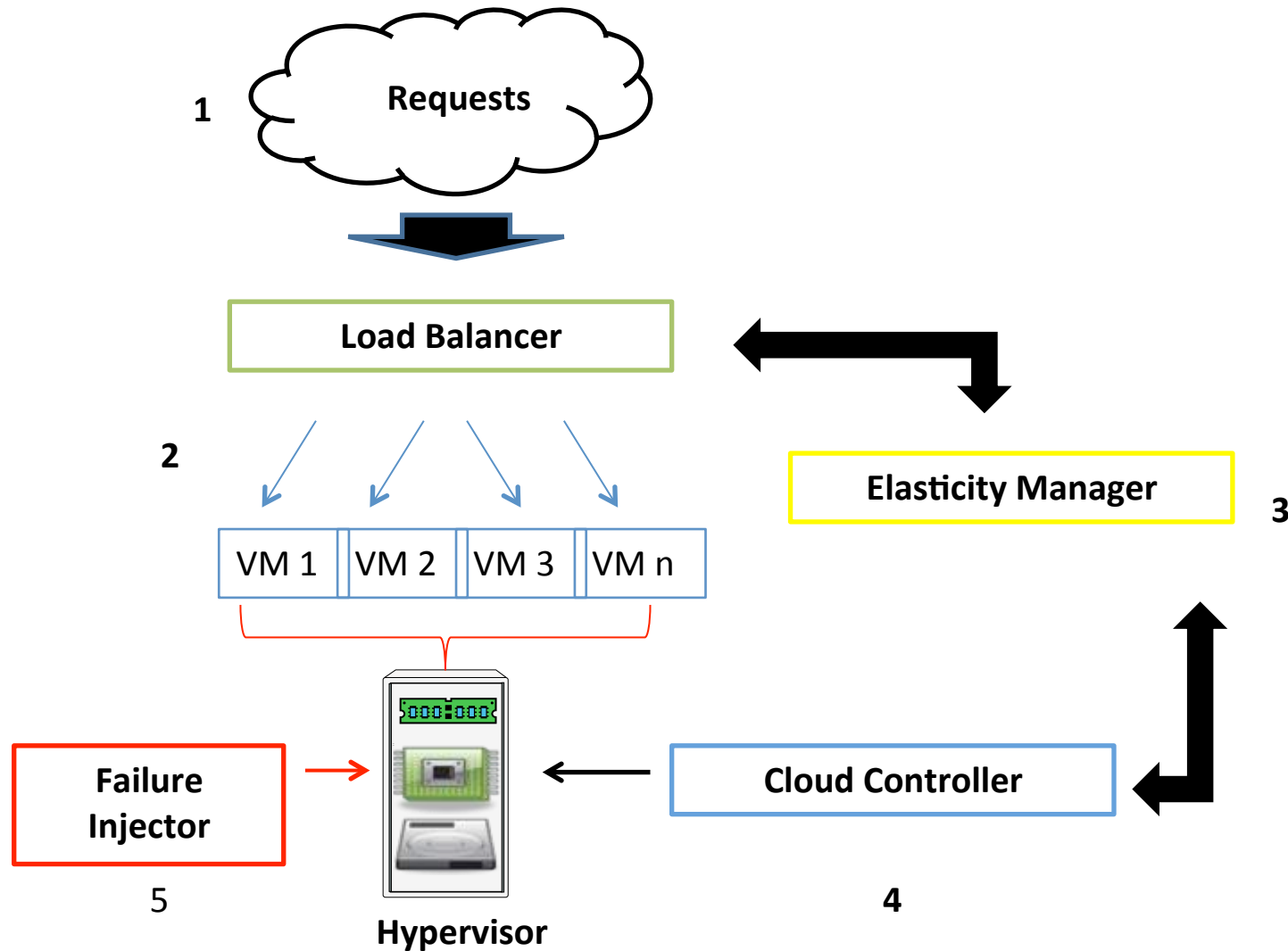
Instance: small



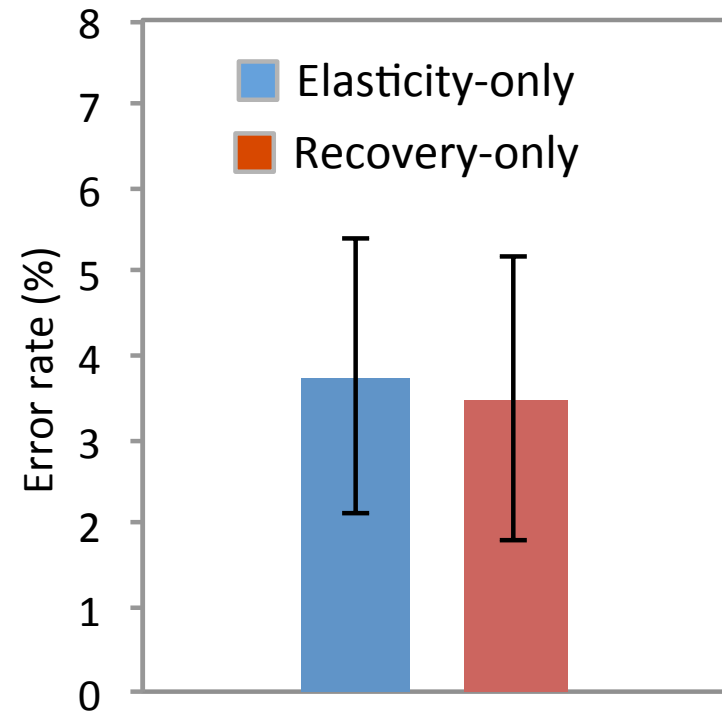
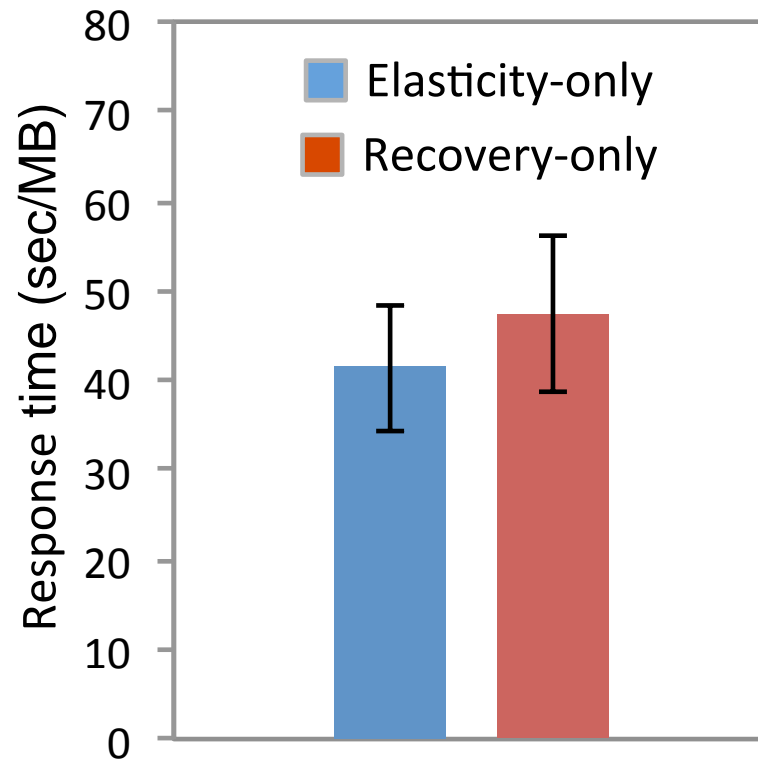
Instance: medium



Elasticity Mechanisms for Failure Recovery in the Cloud

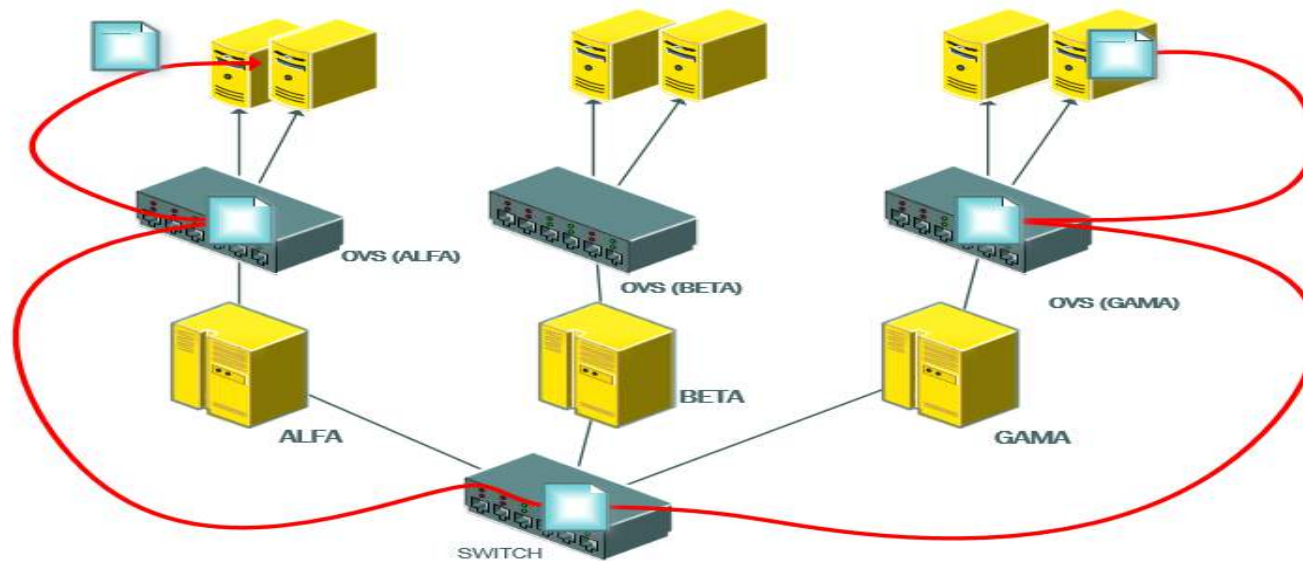


Elasticity Mechanisms for Failure Recovery in the Cloud

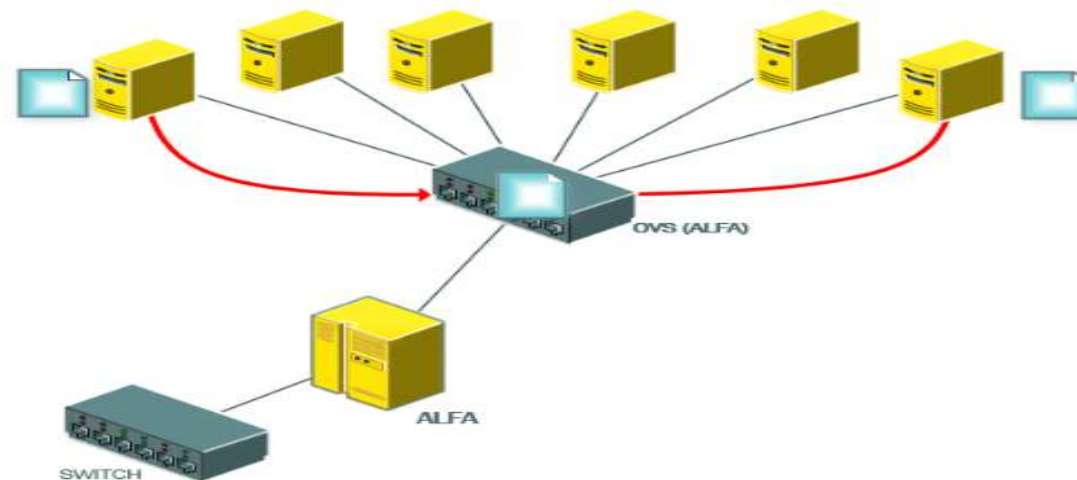


Network Defragmentation in Datacenters using SDN

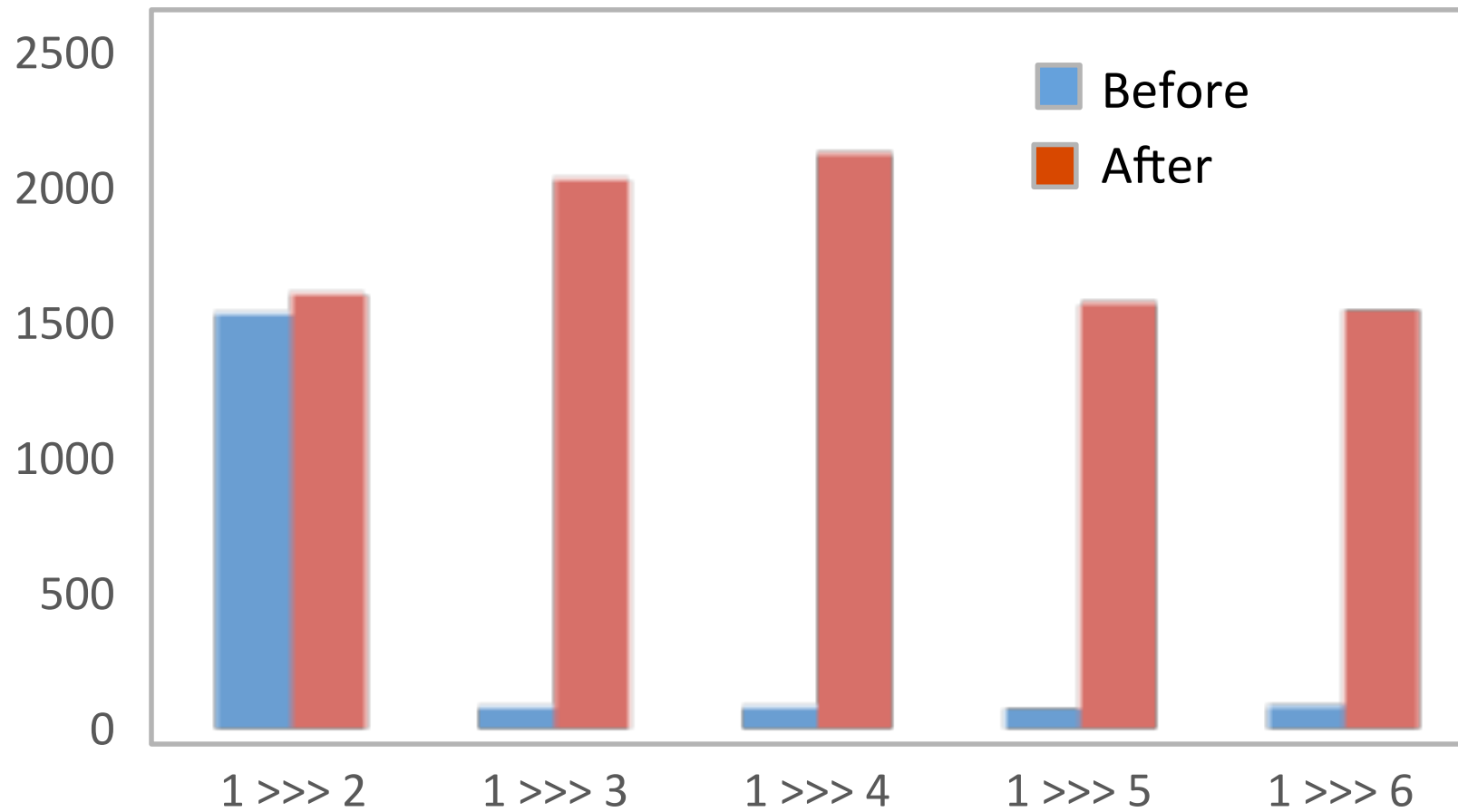
Before



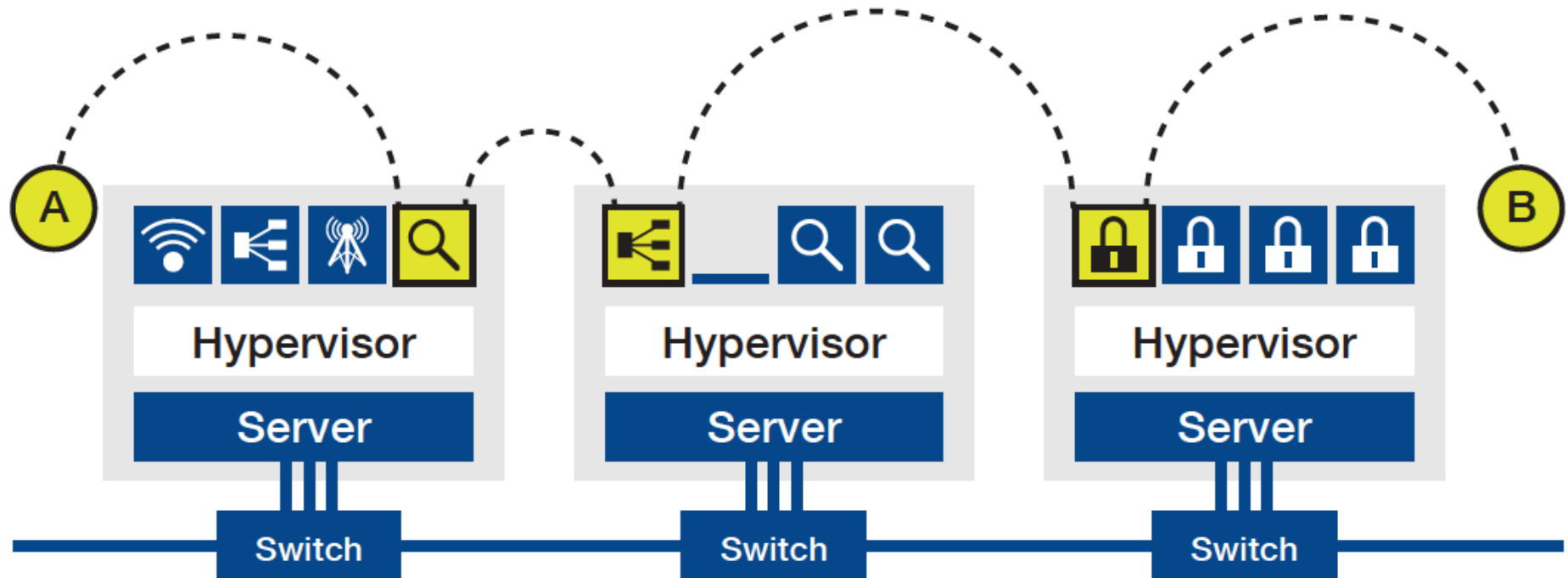
After



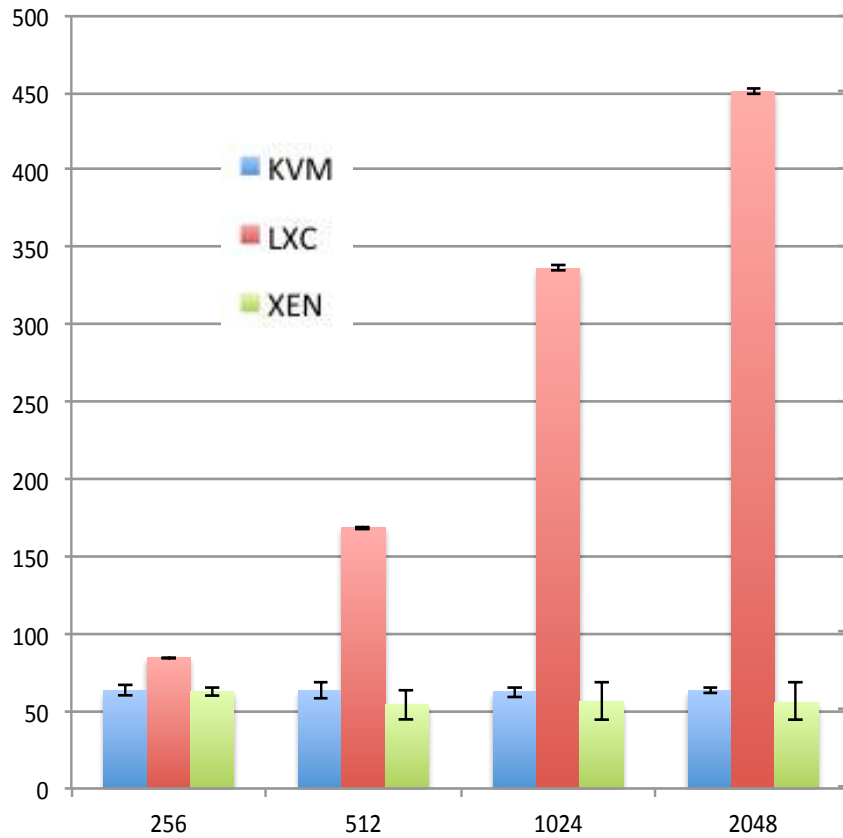
Network Defragmentation in Datacenters using SDN



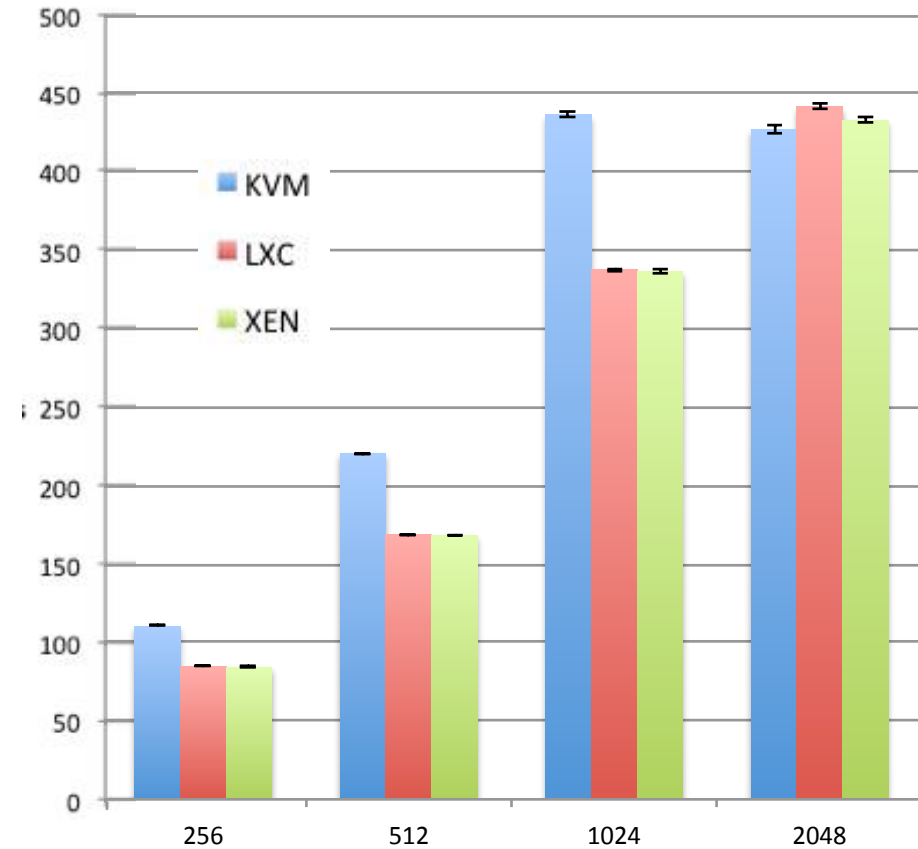
NVF: Elastic VNF Management (dealing with flash crowds in Smart Cities)



NVF: Elastic Service Chaining DNS + NAT



1 SC



16 SC

WiFi Livre SP

Performance Analysis

WiFi LIVRE SP

PREFEITURA DE SÃO PAULO SERVIÇOS

CONECTANDO SÃO PAULO

ACESSO LIVRE E GRATUITO À INTERNET EM 120 PRAÇAS E LOCAIS PÚBLICOS DA CIDADE.

120
Praças em operação

Conheça nosso App Wifi Livre
Disponível em Android Play Store

- O Projeto
- Características
- Regiões atendidas
 - Centro
 - Zona Norte
 - Zona Leste
 - Zona Sul
 - Zona Oeste
- Notícias
- Perguntas Frequentes
- Contatos

Zona Norte

Centro

Zona Oeste

Zona Leste

Zona Sul

Destaques

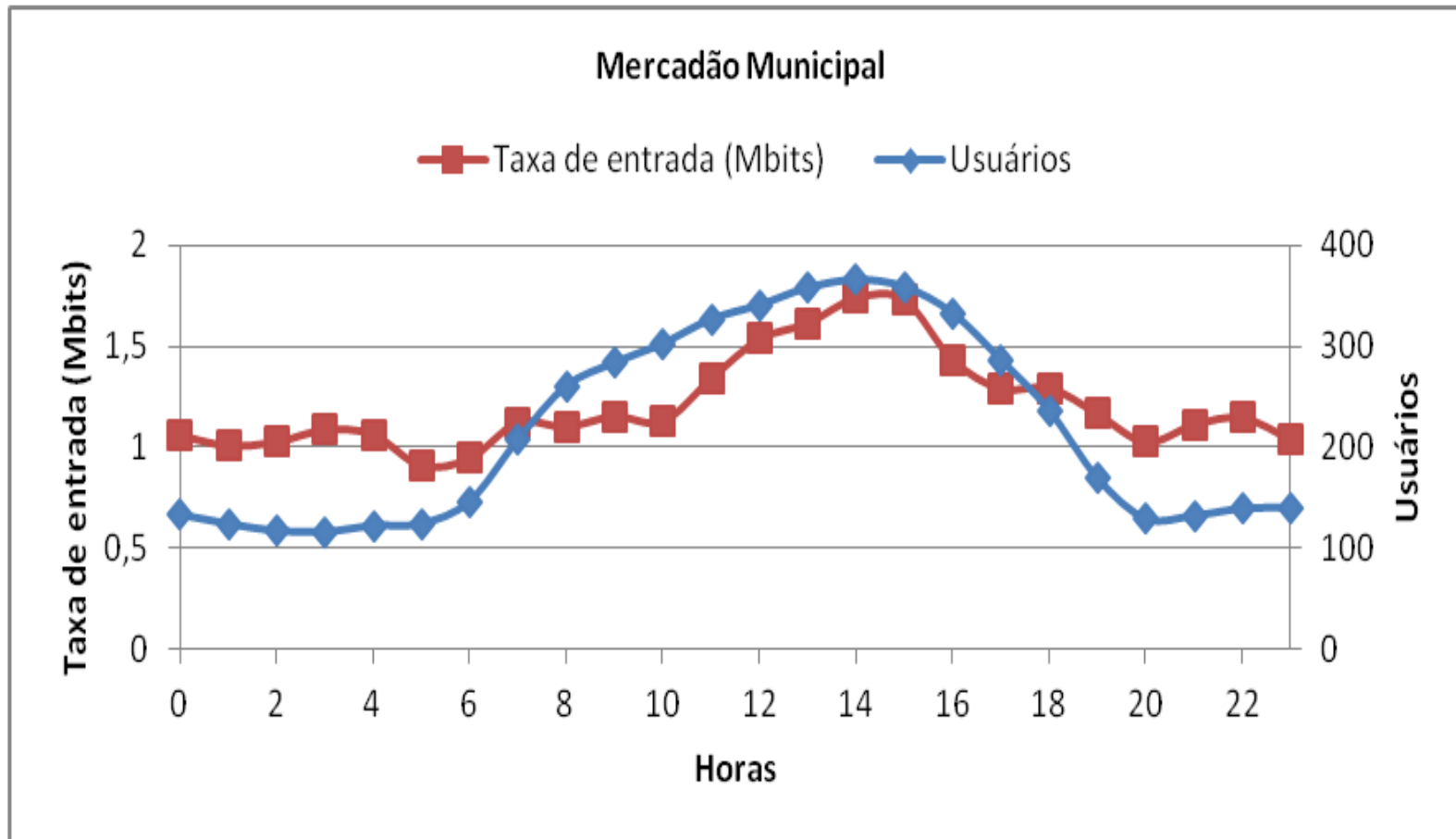
Notícias | Clique na chamada para ler

- Prefeitura supera meta e entrega à cidade 120ª praça com WiFi Livre
- UFABC apresenta primeira pesquisa sobre usos e empregos da internet
- Wi-fi livre já está em mais de 70 locais públicos da cidade
- WiFi Livre SP: 40 praças e parques oferecem internet gratuita para a população

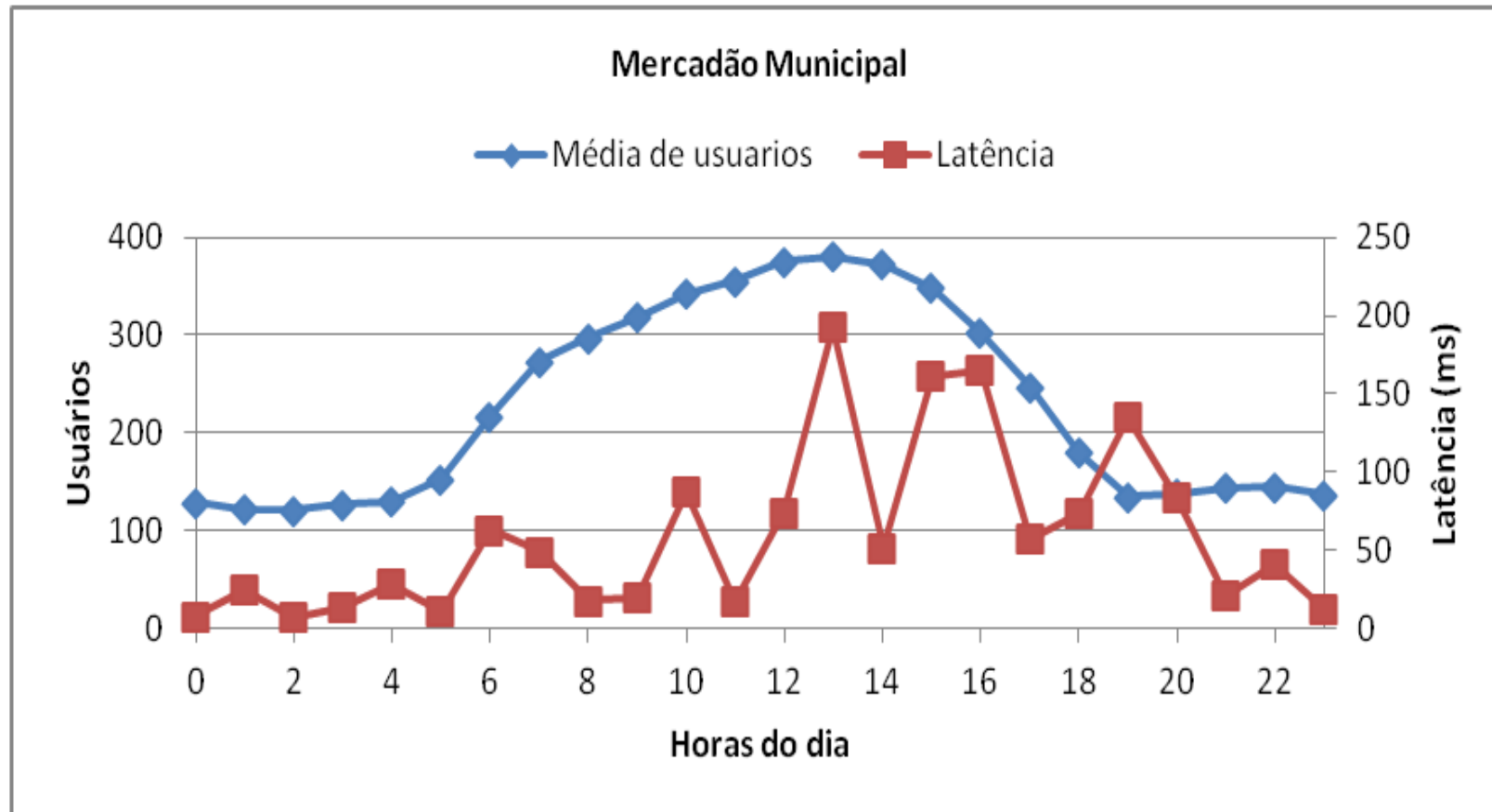
Mercado Municipal (Public Market)



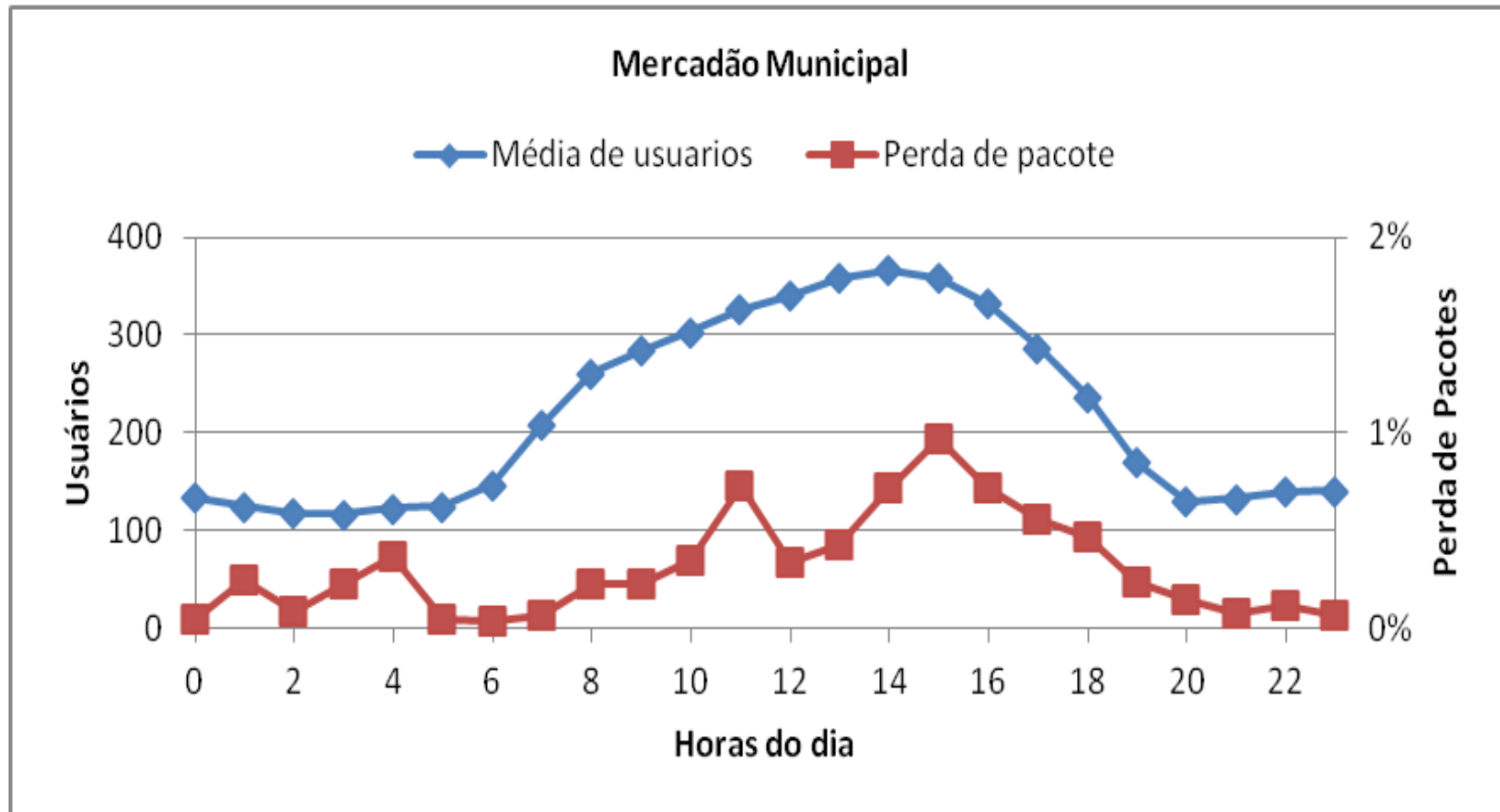
Mercado Municipal



Mercado Municipal



Mercado Municipal



Next Steps

- Data modelling for Smart Cities
 - Big Data Integration
- Crowdsensing/Crowdsourcing for Smart Cities
- Distributed Cloud for Smart Cities
 - Cloud, Fog, ..., workload offloading
 - SDN/NFV-enabled
- Infrastructure Management for Flash Crowds
- Secure Financial Transactions

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