



Chameleon

A self-adaptive multi-cloud testbed

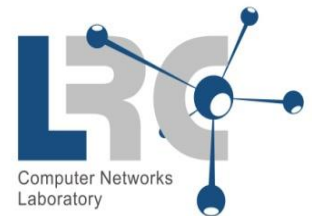
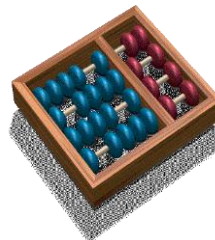


Edmundo Madeira

IC - Institute of Computing
UNICAMP - University of Campinas

<http://www.ic.unicamp.br/~edmundo>

São Paulo, Brazil, October 15th, 2015



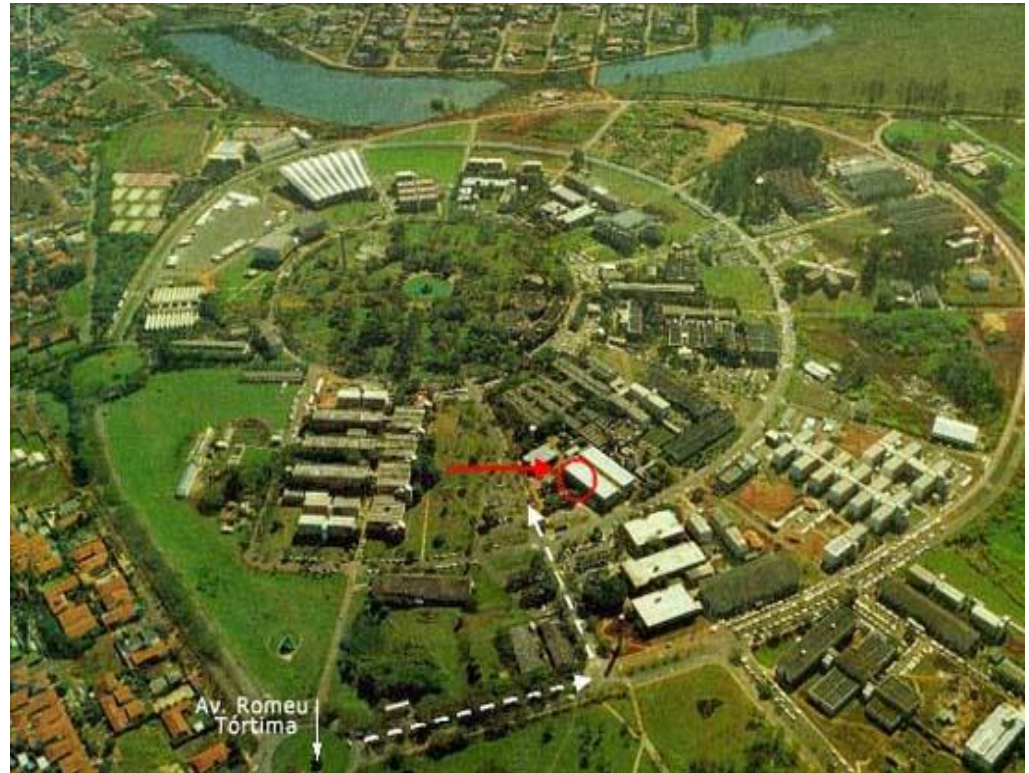
Agenda

- University of Campinas
 - General and Academic Information
 - Institute of Computing
 - Computer Networks Laboratory

- Research Projects - Focus on Cloud Computing
 - Chameleon Testbed
 - Orchestration of Hadoop Apps in Hybrid Clouds
 - Service Workflow Monitoring
 - Multi-cloud Orquestration Management

University of Campinas - UNICAMP

<http://www.unicamp.br>
City of Campinas, State of São Paulo, Brazil



UNICAMP

University of Campinas - UNICAMP

- UNICAMP was officially founded on October 5th, 1966, as a public university in the State of São Paulo.
- Even within Brazilian context, in which the oldest university is about 75 years old, UNICAMP can be considered a young institution one that has already conquered a strong tradition in education, in research and services to society.

University of Campinas - UNICAMP

- Strong relationship between teaching and research
- 15% of all PhD theses of Brazil
- 12% of all papers published internationally by Brazil
- First university in Brazil to create an innovation agency
- University with the highest number of patent deposits
- Enabled ~140 high tech spinoff companies



- Annual Budget: > U\$ 1B
- 40K+ students in total
- ~50% are graduate students
- 2K faculty members
- 98% are PhDs

Institute of Computing - IC

- Two undergrad courses: CS & CE
- Two graduate programs: Msc & PhD
- Two extension courses:
 - Computer Networks
 - Software Engineering



- First CS program of Brazil:1969
- Consistently ranked among the 3 top CS/CE programs
- 48 faculty members (~50% are CNPq Researchers)
- Extensive collaboration with the industry
 - Microsoft, Intel, IBM, Petrobras, Google, Samsung, Motorola, etc.

IC - Alumni

- Bachelor alumni
~2100 Computer Scientists
~1300 Computer Engineers
- Graduate alumni
~700 Masters
~140 PhDs



IC – International Collaborations

Research Areas

- Software Engineering
- Database and data-mining
- Image processing
- Computer Graphics
- Algorithms and Graph Theory
- Combinatorics and Optimization
- Hardware-software codesign
- Computer Architecture
- VLSI Design
- Compilers
- Artificial Intelligence
- Human-computer Interface
- Distributed Systems
- Computer Networks
- Natural Language Processing
- Bioinformatics
- Cryptography



Computer Networks Laboratory



Research Areas

- Optical networks
- Wireless networks
- Internet of Things and Data
- Grid and Cloud Computing
- Transport Protocols
- Middleware
- Network Management
- Traffic Modeling and Control
- Future Internet, Virtualization

Current Sponsored Research Projects

- INCT Fotonicom (FAPESP)
- Scheduling Methods and Algorithms for cloud computing (CNPq)
- FUTEBOL: Federated Union of Telecommunications Research Facilities for an EU-Brazil Open Laboratory (CTIC/RNP) - 2016
- SORTS: Support for Orchestration of Reliable and Secure Services in the Fog (CAPES) - Portugal
- Resource allocation and placement in Computing Clouds (CNPq)
- Time-Dependent and Energy-Aware Design in Multilayer Networks and Data Center Networks (CNPq) – USA
- The Sustainable Internet (CNPq) - Italy

Coordinators



Prof. Edmundo Roberto Mauro Madeira, PhD

Prof. Nelson Luis Saldanha da Fonseca, PhD



Research Projects in Cloud Computing

- Scheduling in Hybrid Clouds
- Scheduling multiple workflows
- Scheduling and Big Data
- Big Data Experience: a framework for management strategy evaluation
- An Architecture for Orchestrating Hadoop Applications in Hybrid Cloud
- Virtual Data Center Networks Mapping as a Service Through Software Defined Networks
- Fog Computing and Internet of Things

Our testbed?

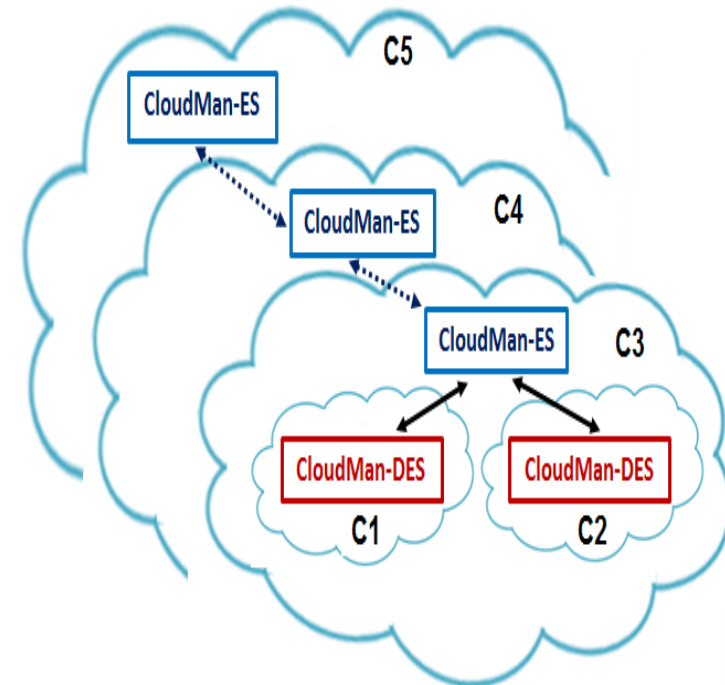
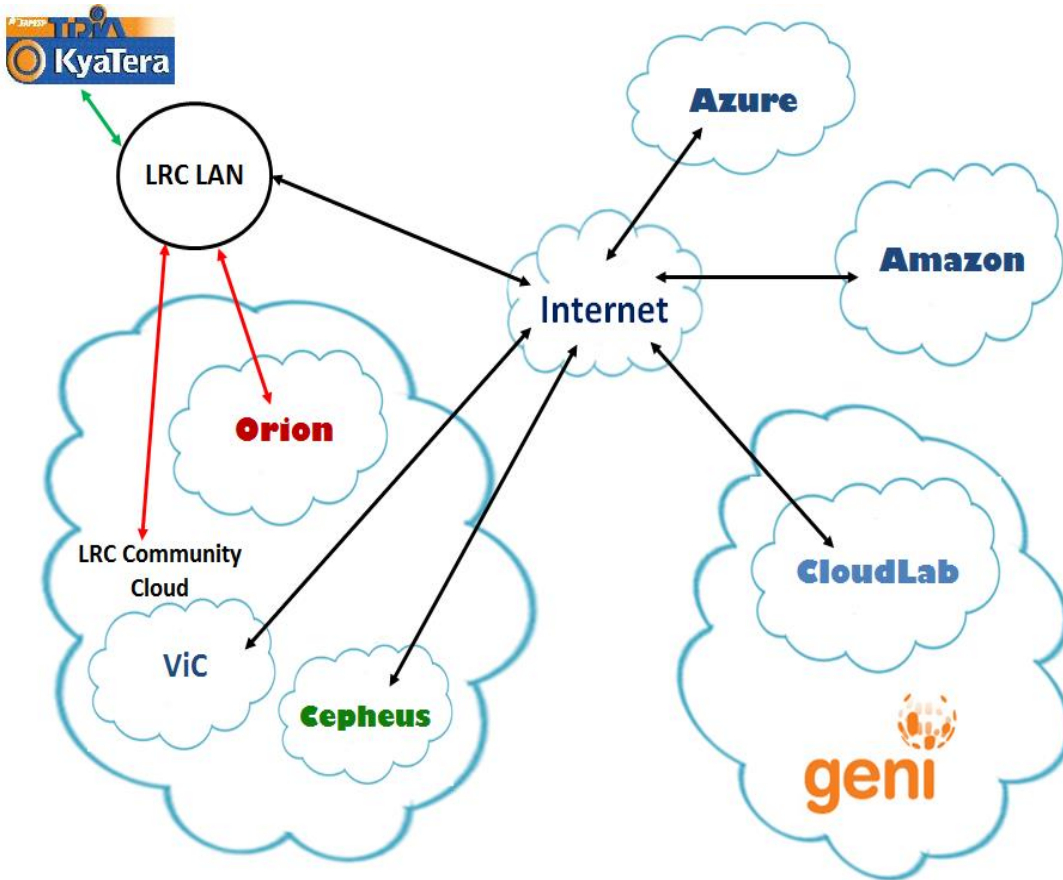


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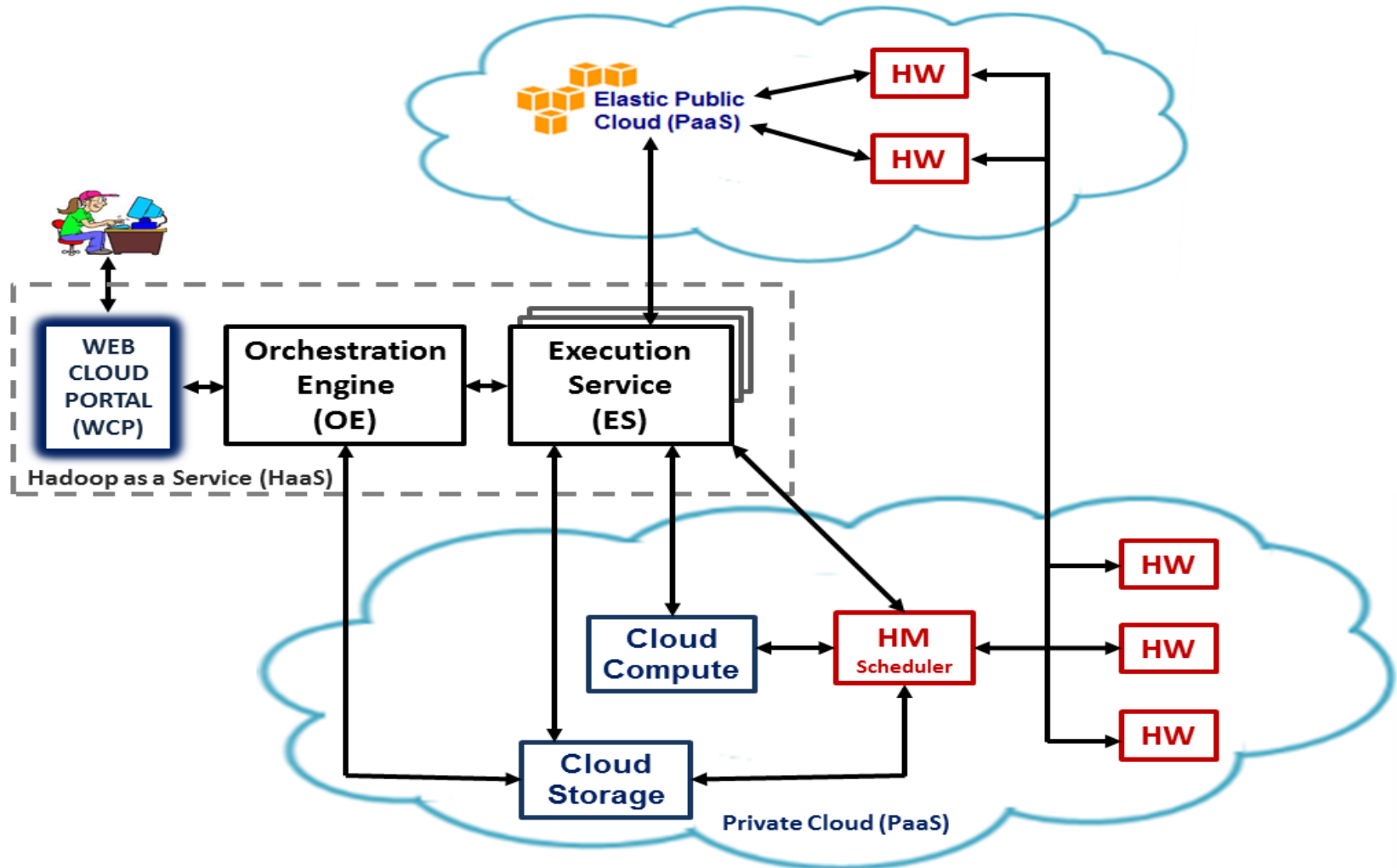
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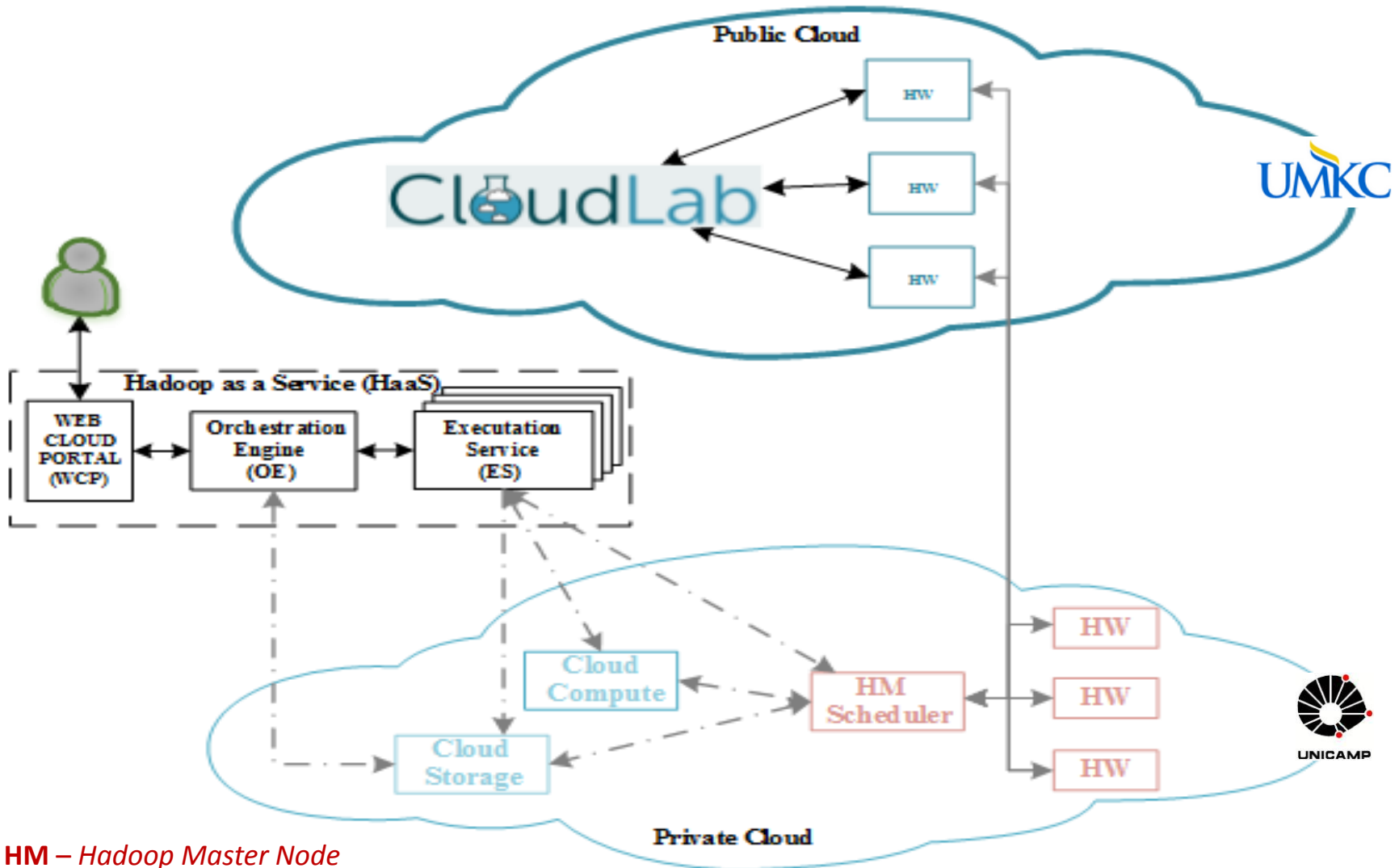
An Architecture for Orchestrating Hadoop Applications in Hybrid Cloud



HM – Hadoop Master Node
HW – Hadoop Worker Nodes



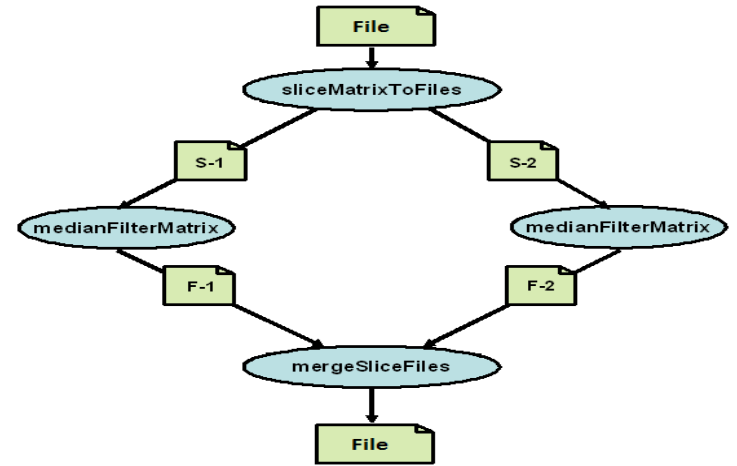
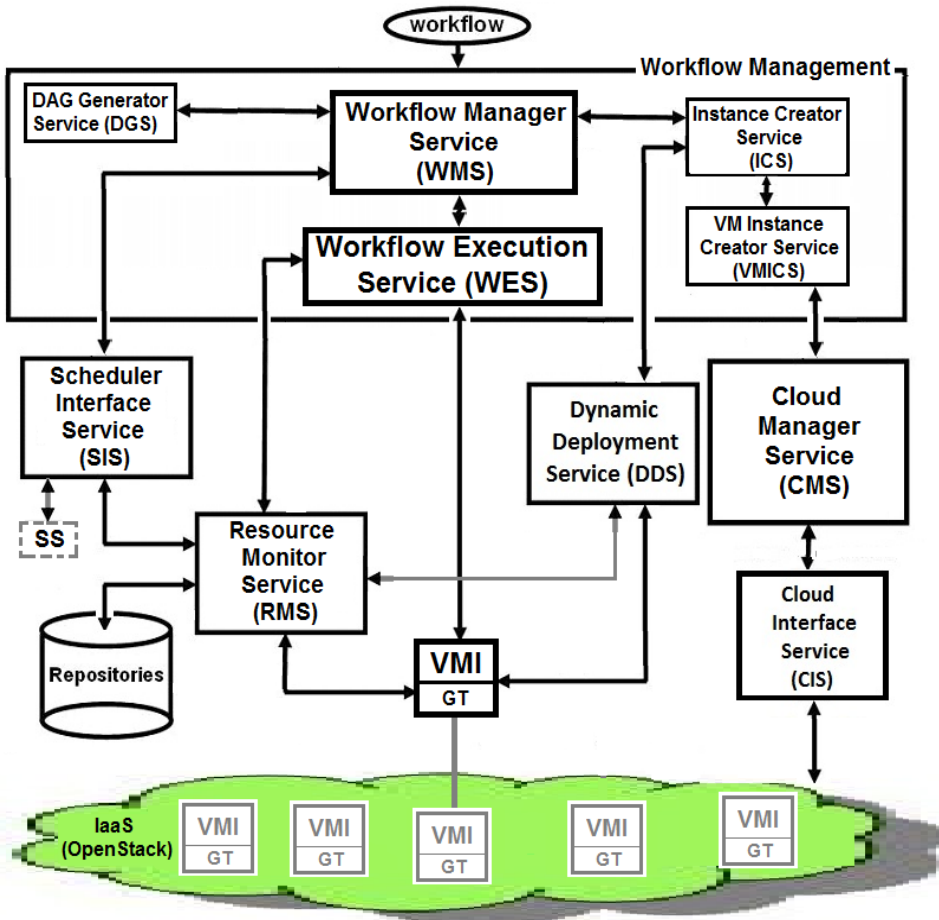
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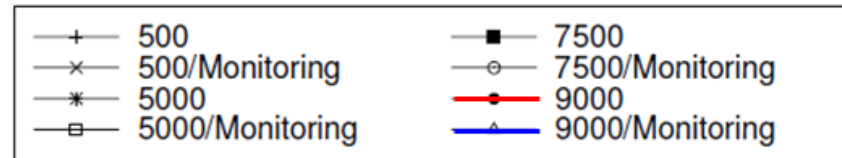
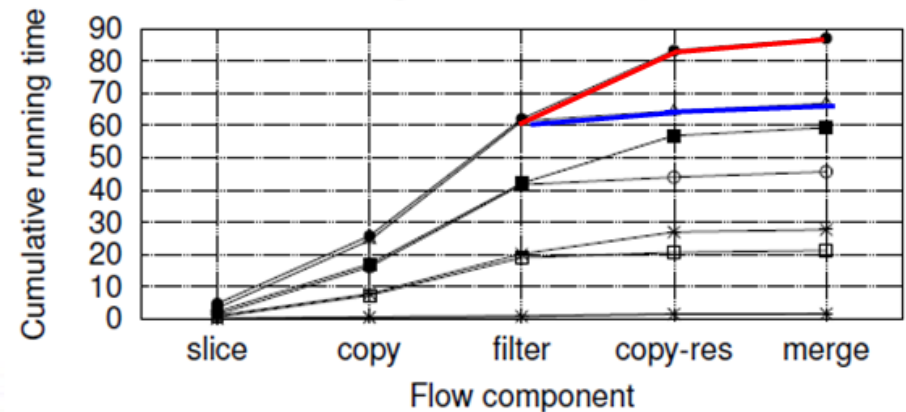
HM – Hadoop Master Node
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Service Workflow Monitoring

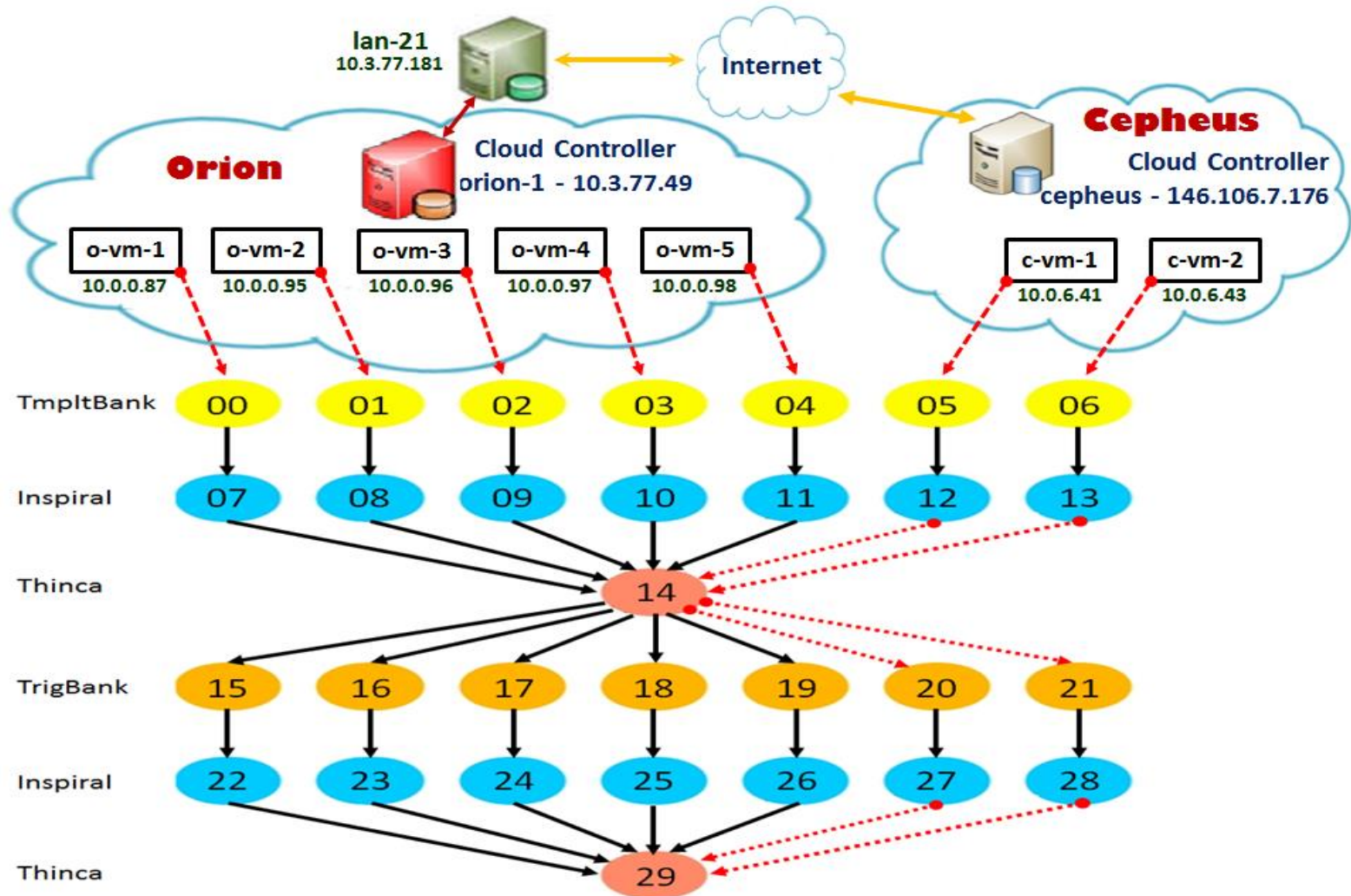


Running time of flow components



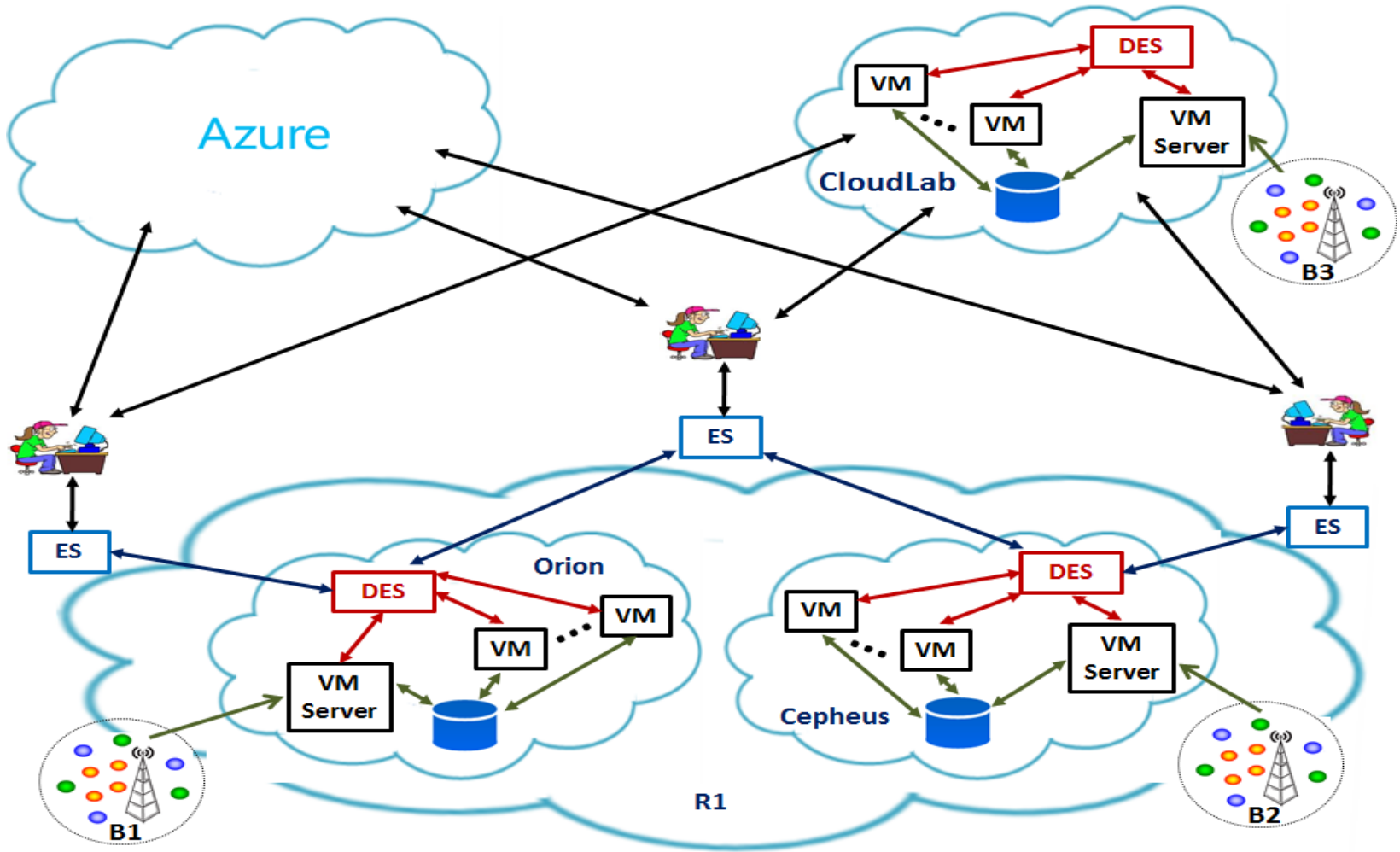


Interconnected Cloud Orchestration Management - ICOM



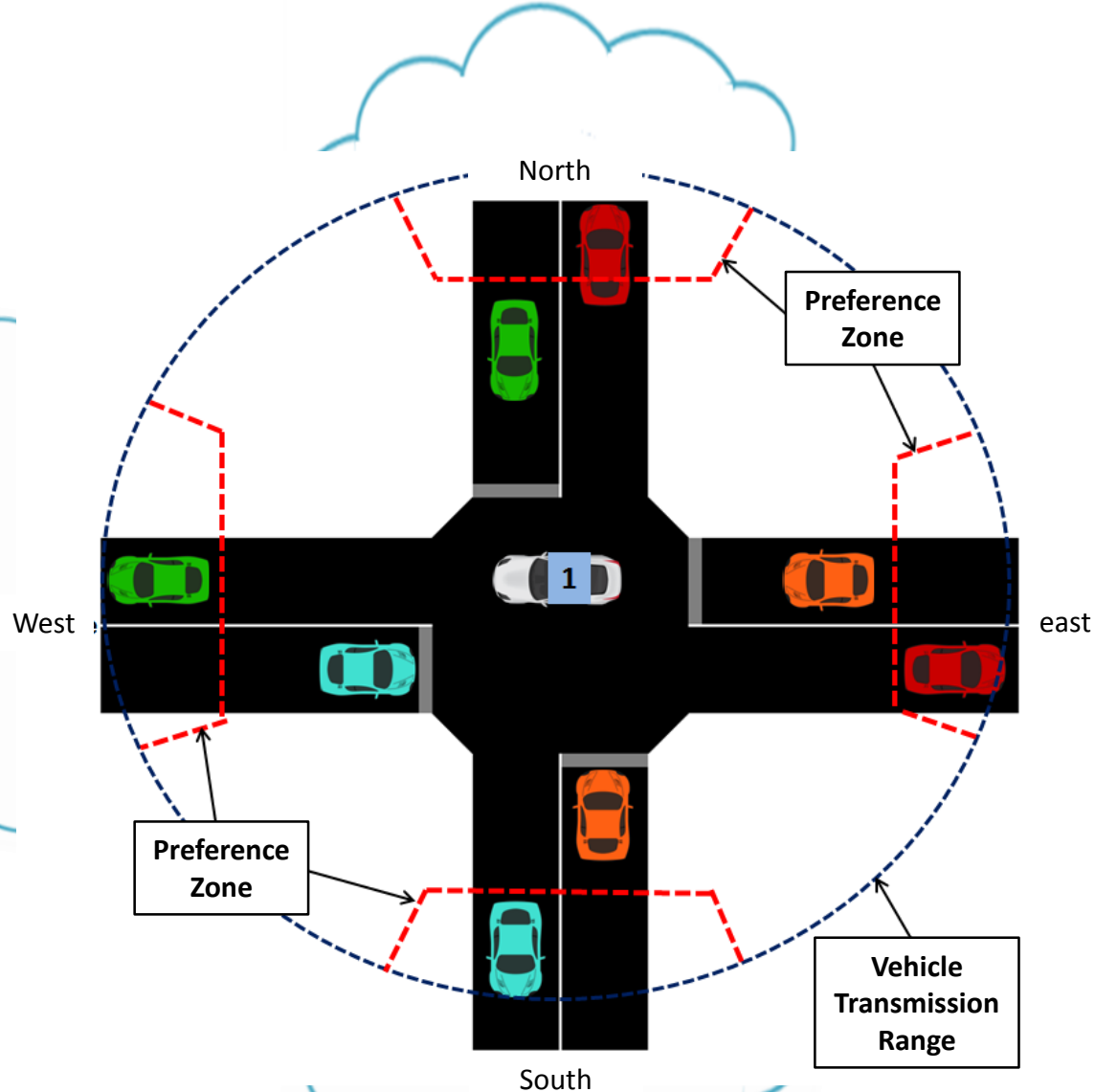


Interconnected Cloud Orchestration Management - ICOM





VANET & ICOM





Chameleon



Thank you!

Edmundo Madeira

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<http://lrc.ic.unicamp.br>

São Paulo, Brazil, October 15th, 2015

