



Cloud-TM Overview & Collaboration Opportunities

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At a glance



Partners:



INESC ID (PT)



Algorithmica (IT)



C.I.N.I. (IT)



Red Hat (IE)

Project coordinator:

Paolo Romano, INESC ID (PT)

Duration:

From June 2010 to May 2013

Programme:

FP7-ICT-2009-5 – Objective 1.2

Further information:

<http://www.cloudtm.eu>

Cloud computing: the vision

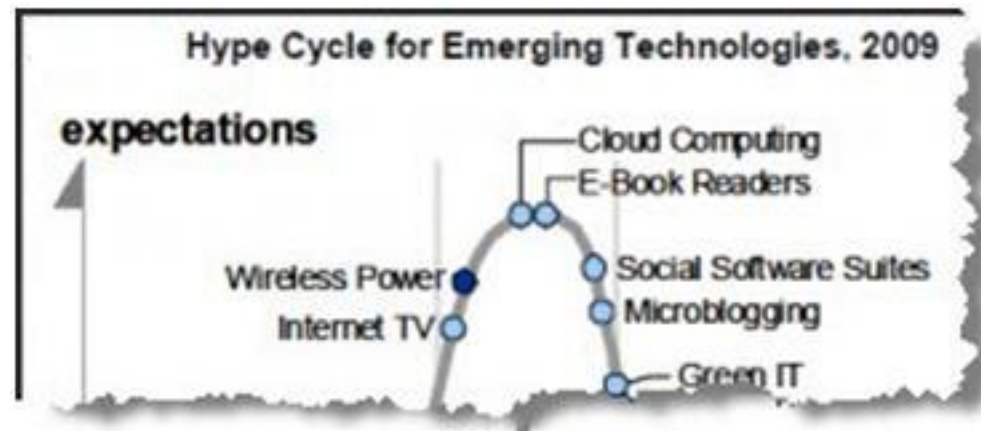


- lower barriers to entry and capital costs via usage-based pricing schemes
- minimize operating costs & carbon footprint via elastic resource provisioning
- achieve unprecedented scalability levels

Project Motivations



- Cloud computing is at the peak of its hype...



- How to materialize the vision and maximize actual productivity?

**SIMPLIFYING THE DEVELOPMENT AND
ADMINISTRATION OF CLOUD APPLICATIONS**

Key Goals



Develop an open-source middleware platform for the Cloud:

1. Providing a simple and intuitive programming model:

- hide complexity of distribution, persistence, fault-tolerance
- let programmers focus on differentiating business value

2. Minimizing administration and monitoring costs:

- automate elastic resource provisioning based on applications QoS requirements

3. Minimize operational costs via self-tuning

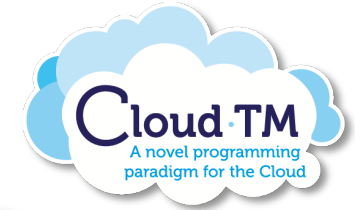
- maximizing efficiency adapting consistency mechanisms upon changes of workload and allocated resources

The Cloud-TM Programming Paradigm: Background



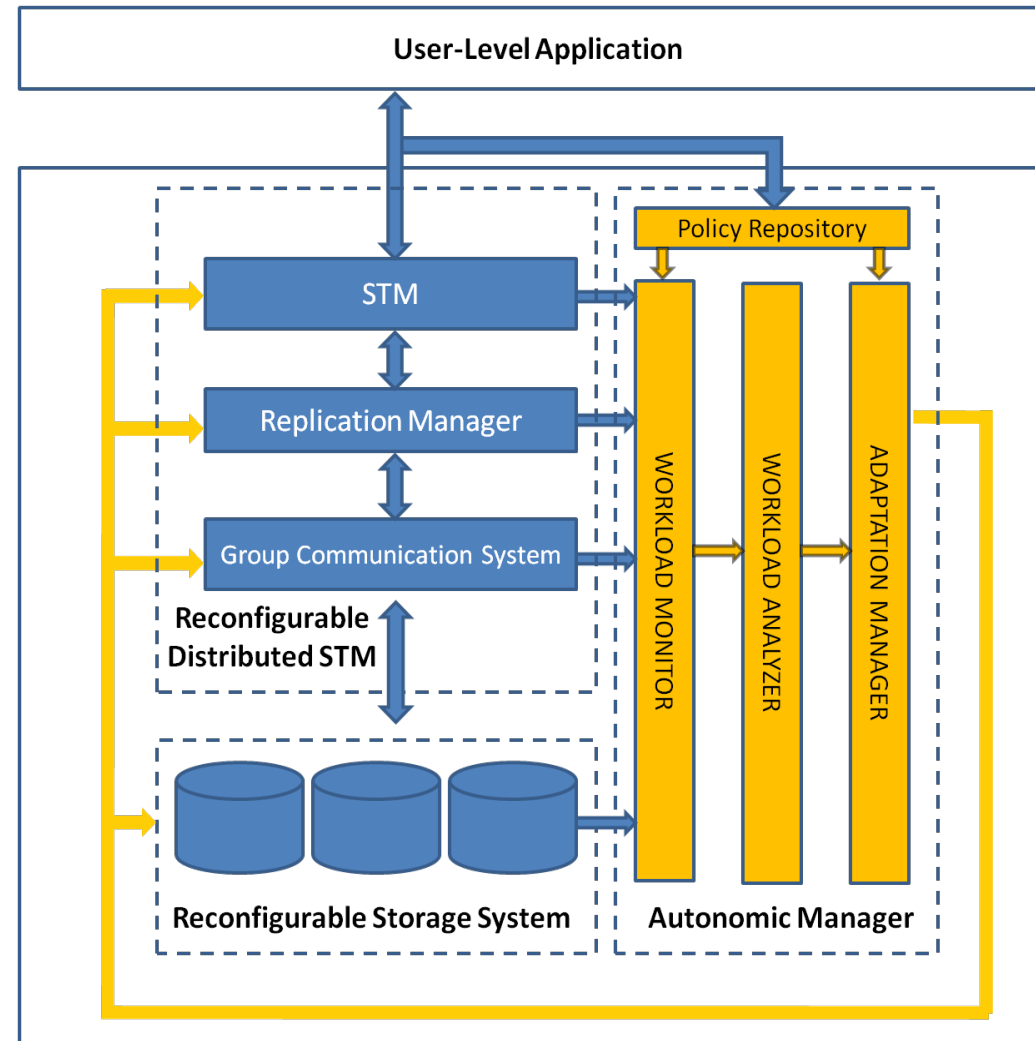
- Transactional Memories (TM):
 - replace locks with atomic transactions in the programming language
 - hide away synchronization issues from the programmer
 - avoid deadlocks, priority inversions, convoying
 - way simpler to reason about, verify, compose
 - deliver performance of hand-crafted locking via speculation
 - **drastically simplify development of parallel applications**
- Distributed Transactional Memories (DTM):
 - extends the TM abstraction over the boundaries of a single machine
 - avoid performance pitfalls of Distributed Shared Memory by batching consistency actions at commit time

The Cloud-TM Programming Paradigm: Elastic Distributed Transactional Memory

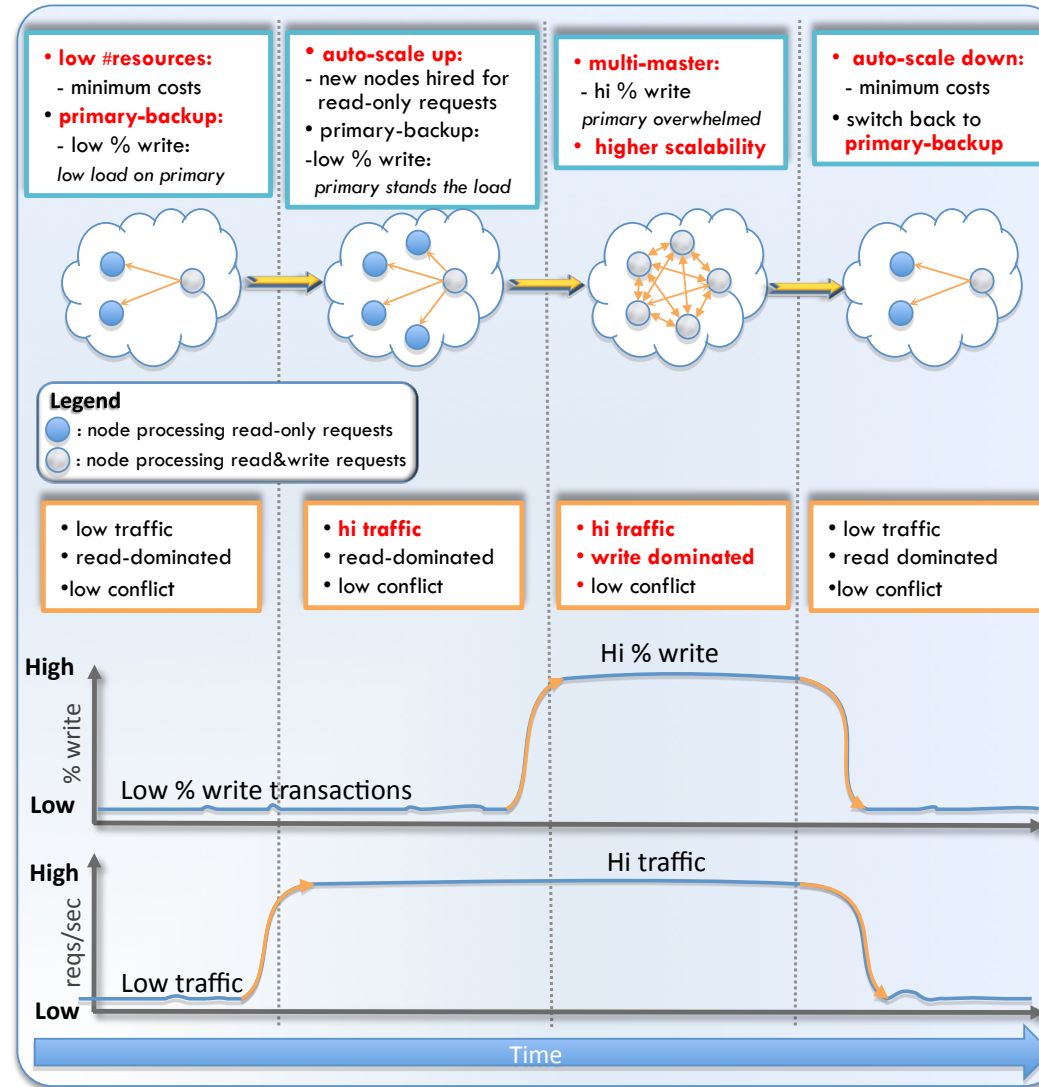


- Elastic scale-up and scale-down of the DTM platform:
 - data distribution policies minimizing reconfiguration overhead
 - auto-scaling based on user defined QoS & cost constraints
- Transparent support for fault-tolerance via data replication:
 - self-tuning of consistency protocols driven by workload changes
- Language level support for:
 - persistence (ACI vs ACID transactions)
 - parallel transaction nesting

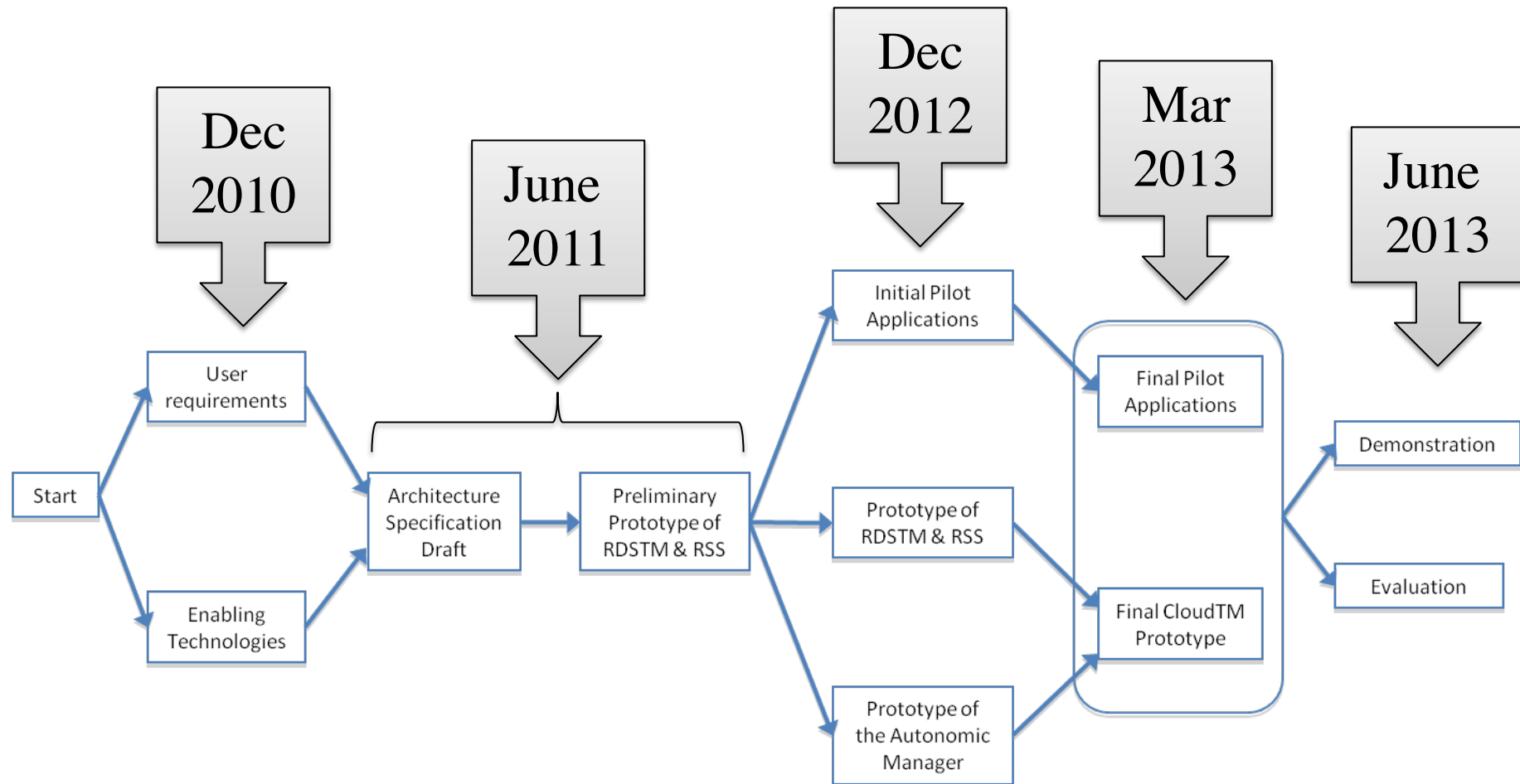
Architectural Overview



Autonomic adaptation at play



Project's timeline



Opportunities for collaboration



- Standards/tools to specify and negotiate SLAs
 - focus in Cloud-TM is on performance, reliability and cost
- Standards/tools to allocate resources from the Cloud
- Tools for monitoring provided QoS
- Auto-scaling/proactive reconfiguration:
 - challenging goal common to very projects
 - in Cloud-TM we will target data intensive applications
- Achieve interoperability with storage solutions for the cloud developed by other projects

Conclusions





THANKS FOR THE ATTENTION

Q&A

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