Review Open Call FEC10 experiments AM-NVE (using Grid5000)

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Open Call experiments Review FEC10

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AM-NVE: Exploring the use of Atomic Distributed Shared Memory in 3D Networked Virtual Environments

ON GRID'5000 – A FED4FIRE+ TESTBED

Background

Virtual Network Environments

Resource: Decentraland

Virtual Network Environments

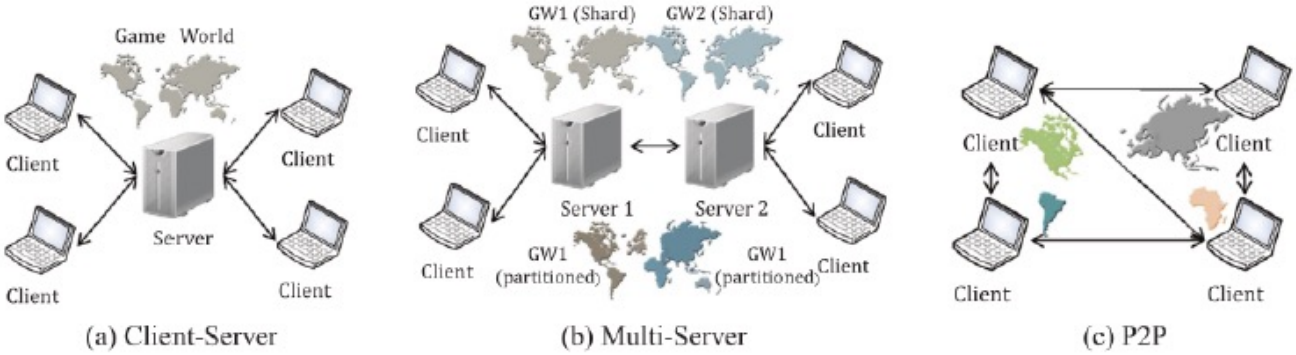
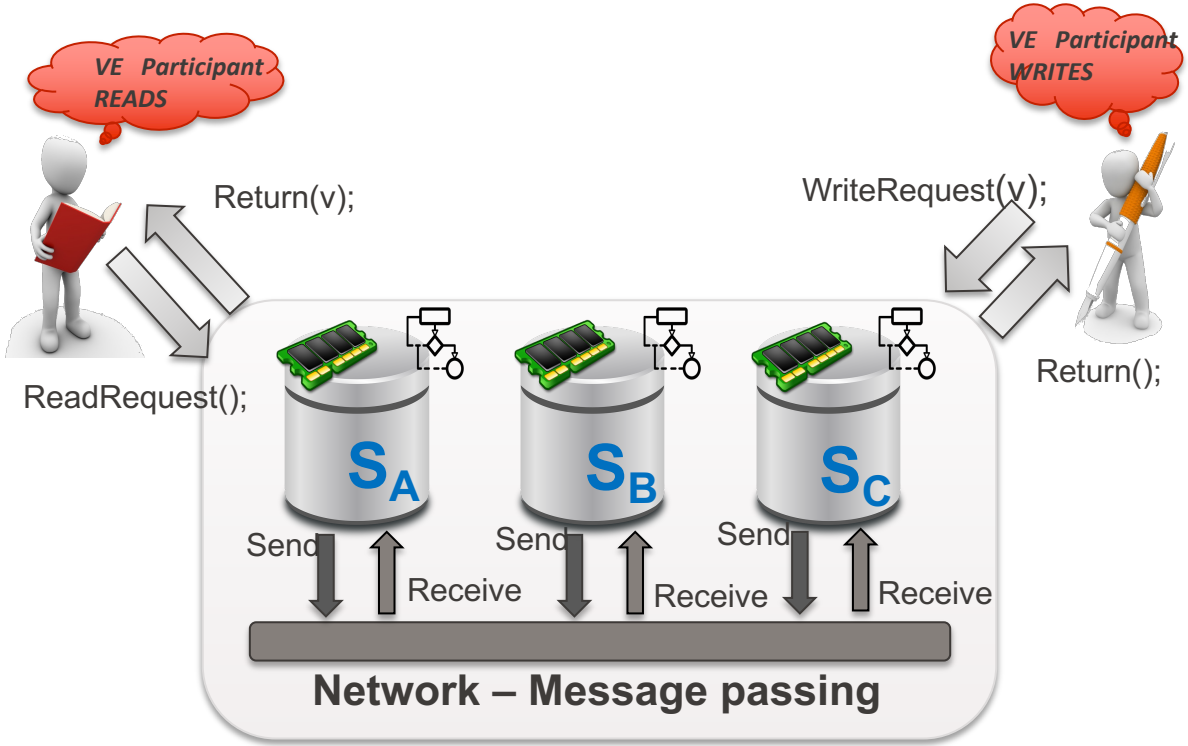


Figure 1 - Different architectures of Virtual Environments (image from Yahyavi and Kemme [21])

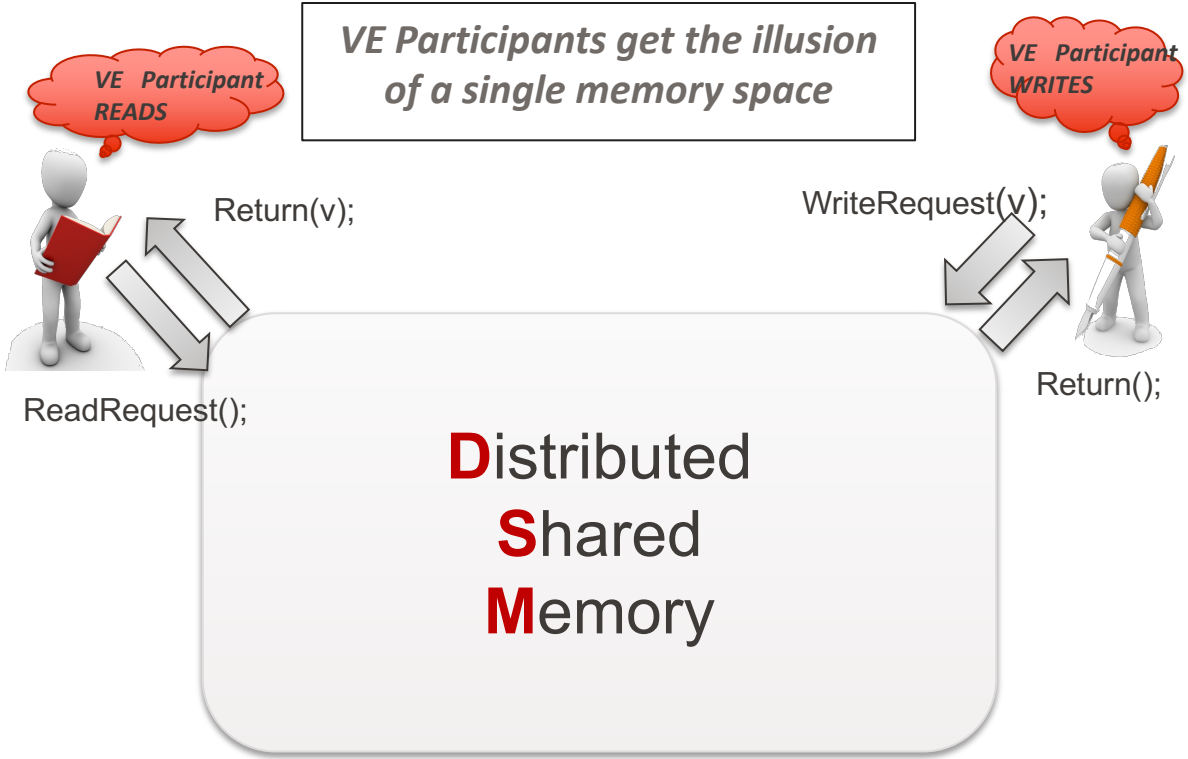
Architecture	Pros	Cons
Client-Server	+ Simplicity + Easy management + Consistency control	−− Scalability −− Fault tolerance −− Cost
Multi-Server	+ Scalability + Fault tolerance	− Isolation of players − Complexity −− Cost
Peer-to-Peer	++ Scalability ++ Cost + Fault tolerance	− Harder to develop − Consistency control − Cheating

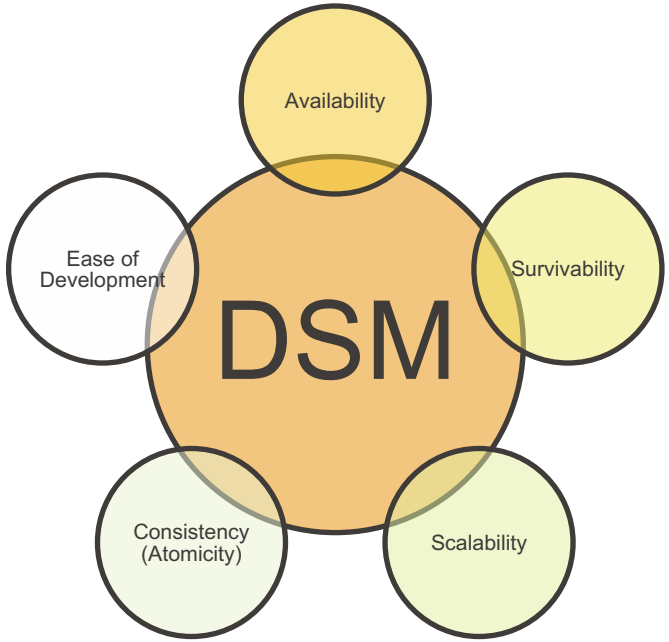
Distributed Shared Memory



Distributed Shared Memory

VE Participants get the illusion of a single memory space





Main Objective

Can we use DSM as a Memory as a Service (MaaS) for Network Virtual Environment Applications?

Background Description

EXECUTION PLAN

Objective 1 - Deployment

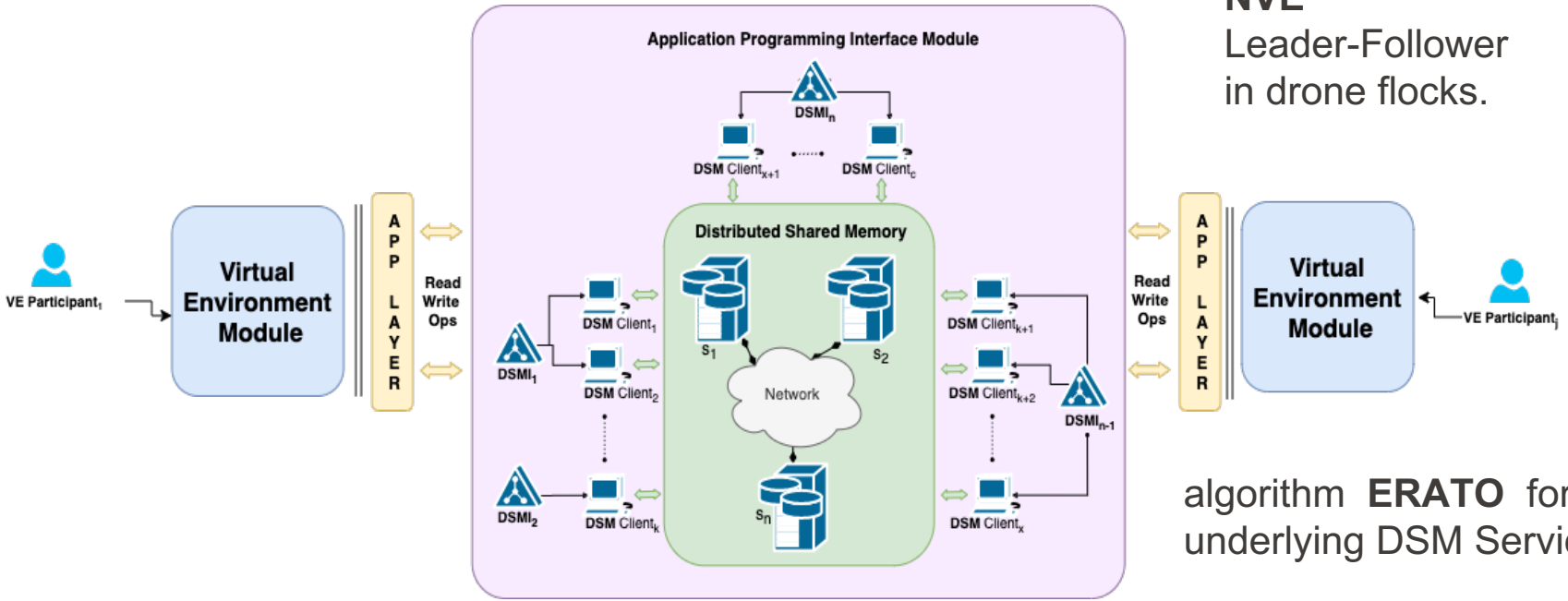
- Deploy our DSM PoC over a set of replica servers on GRID'5000
- Deploy an NVE that will contain at most 500 interacting network objects
- Prepare all the necessary infrastructure and scripts

Objective 2 - Experimental Evaluation

- Scalability Tests
- Concurrency Tests
- Fault-tolerance Tests

Background Description

OUR ARCHITECTURE



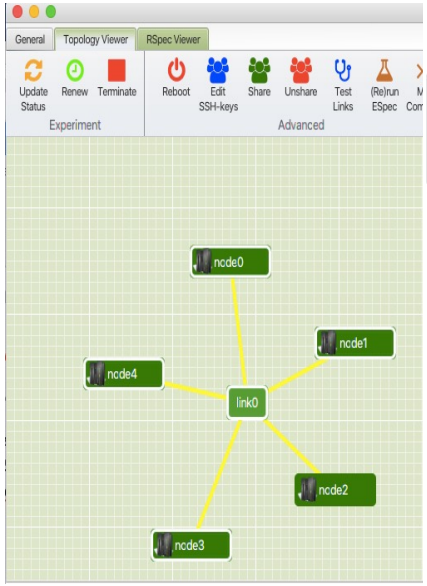
NVE
Leader-Follower
in drone flocks.

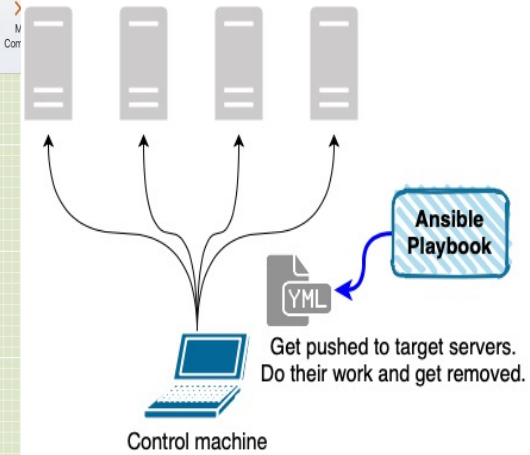
algorithm **ERATO** for the underlying DSM Service

Background Description

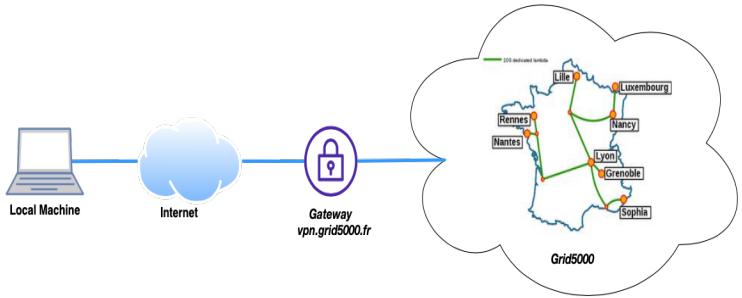
EXPERIMENT SET-UP: GRID5000 SETUP

jFed & Ansible to start the experiment





Tunnelblick for VPN connection

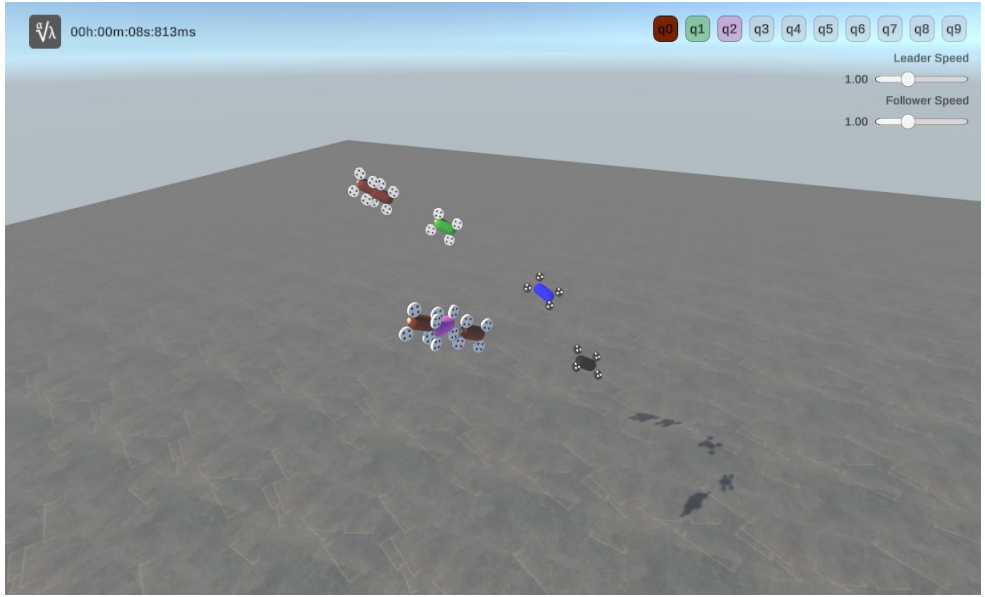


Background Description

SCENARIO

Leader-Follower in drone flocks. A set of drones acting as leaders and each is followed by a set of drones.

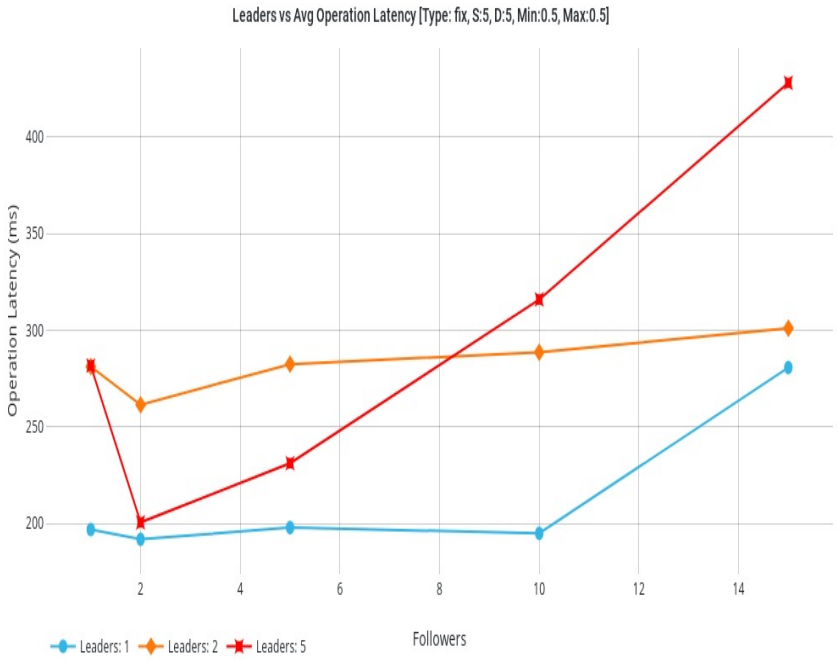
- Leader **write** their position
- Followers **read** their leader's position



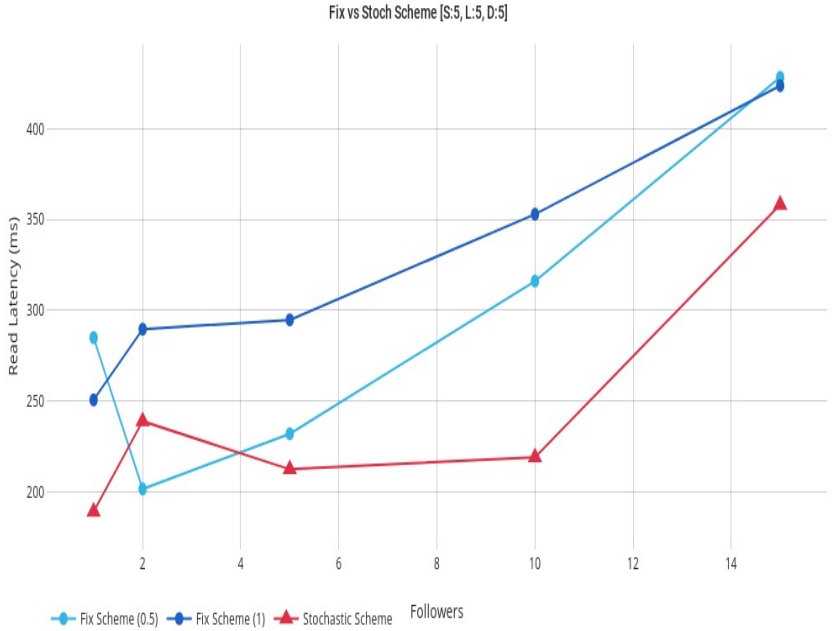
Project Results

EXPERIMENTAL RESULTS

SCALABILITY TEST

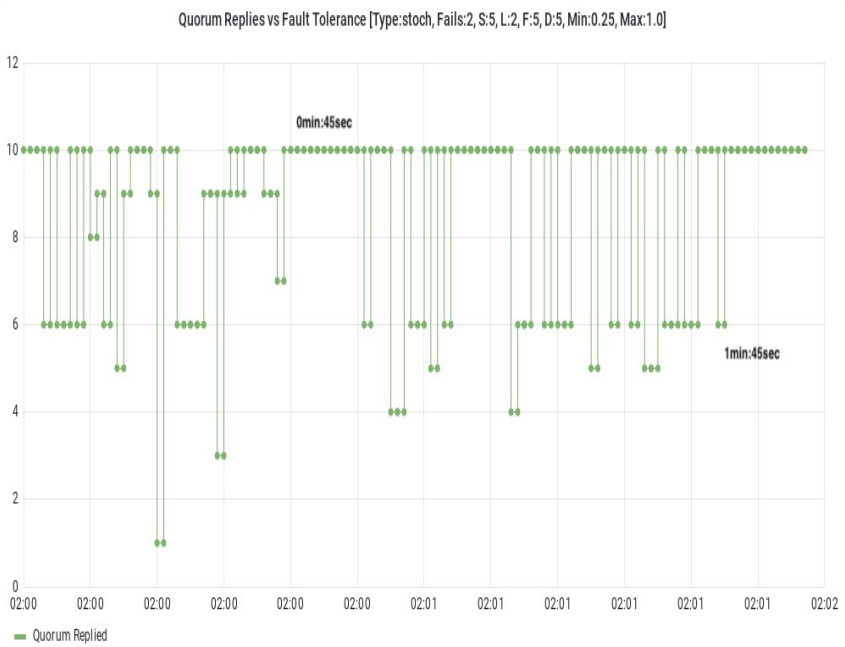


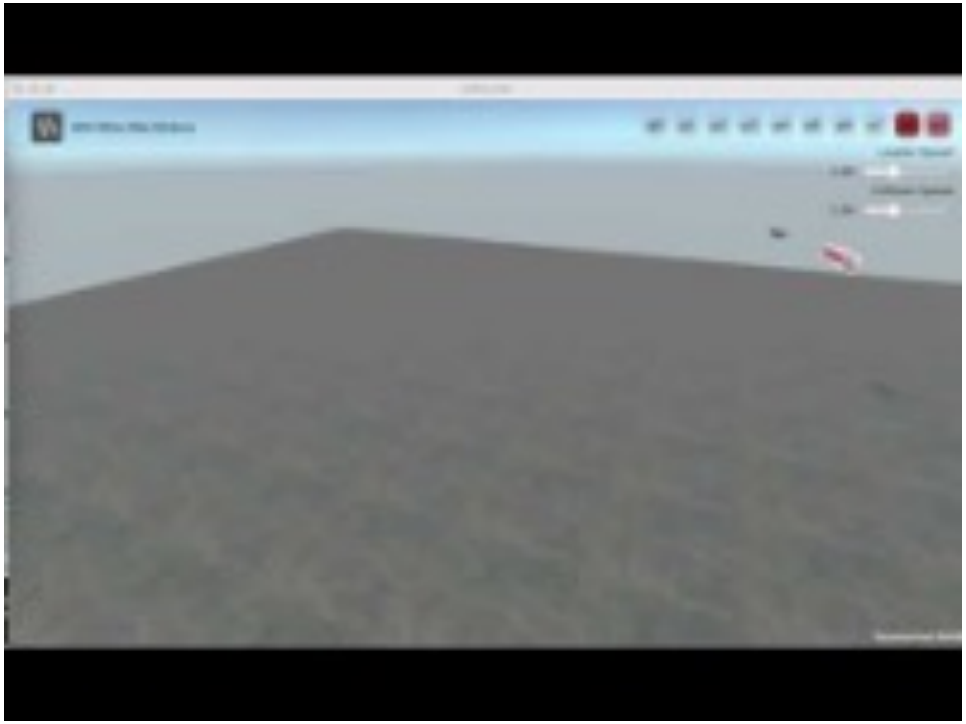
CONCURRENCY TEST



EXPERIMENTAL RESULTS

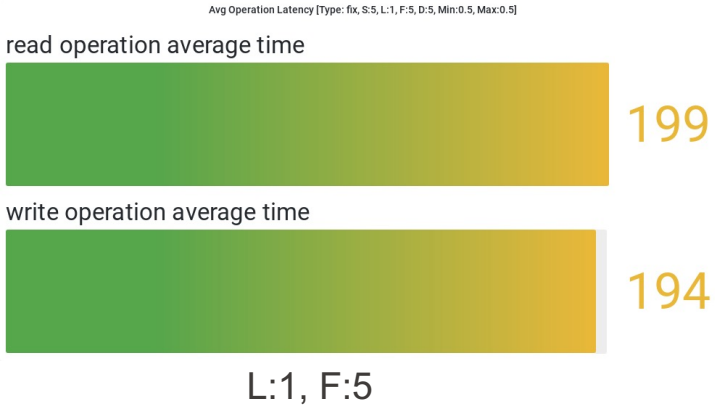
FAULT-TOLERANCE TEST

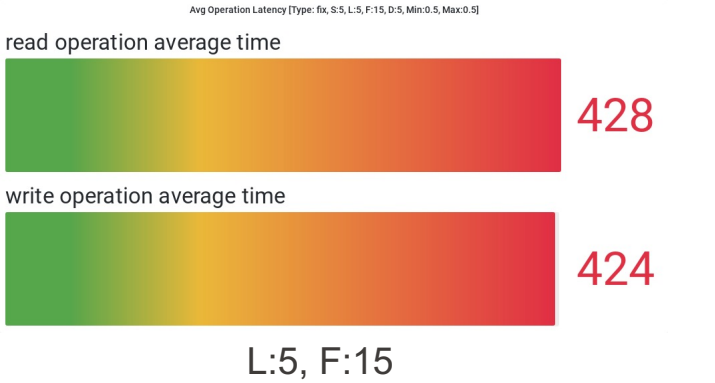




Lessons learned

- Operation latencies >200ms (desired is <150ms)
- Optimizations need to be applied to handle increasing number of clients
- Failures are tolerated efficiently
- DSM is a promising technology





Business Impact

Business Impact

F

Business Operation	Funding for devoting resources
	New intangible asset for securing funding for further R&D
Product Development	Technology Validation
	Initial Stage testing
Planning	Plan further exploitation of the technology
	Estimate further investment
	Examine the need for technology refocus

Business Impact

F

Skill Development	Developing and deploying new technologies
	Generate new scientific and innovation ideas
Track Record	Improved Standing as an R&D Company
	Improved the Company Profile for potential partners
Market Penetration	Increases company standing in an emerging market
	Early adopters and experimenters in VR/AR markets

Business Impact

- Enabled initial testing of the potential of DSM as a MaaS for NVE
- Examine the technology performance under various traffic situations and real-time environments
- Test our distributed algorithm over a real distributed infrastructure without sustaining high costs
- Identify shortcomings and performance bottlenecks

Business Impact

An early-stage validation of the development cycle before full commercialization (i.e., proper testing and experimentation)

Insight of the potential exploitation of the technology in related applications developed in the company (e.g., collaborative DSS for high concurrent access on large data objects)

All-inclusive platform for running any distributed system experiments.

Feedback

Resources Utilised

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- Inria Grid’5000
- Deployed replicas on 5 physical devices
- Used one device as a proxy for external access

U

- Deployment Tool: JFed
- Replica Distribution / Experiment executions: Ansible

Overall Experience

F

- \+ Ideal for running experiments for Distributed Algorithms
  - Various Node Architectures
  - Various Node Locations
- \+ Easy setup and easy deployment of the infrastructure: Jfed Tool
- \+ Single platform to give access to multiple testbeds
- − Not straight forward deployment of the code to the nodes
- − Parametarisation of the experiment execution / experiment repetition

Feedback

Administration	+ Easy setup of the team and connection to the testbets
	+ Great response to any inquiries
	- Spend a significant time to writing the report
Experiment Setup	+ Very useful documentation
	+ Easy node provisioning
	+ Easy access to the nodes
	- Learning curve to learn how to setup and run a first experiment in the platform
	- Use of Ansible for code deployment

Feedback

Experiment Environment (Grid 5000)	+ Nodes in multiple locations in France
	+ Provision of physical nodes
	+ Secure access and deployment
	+ Real World Conditions
	- Time constrains: only short term experiments are possible (<4h)
	- Not possible to renew resources -> setup experiment each time it starts
Experiment Execution	+ Enough time to execute preliminary results
	- Not enough time to fix shortcomings and improve outcomes
	- No routable IPs: use of VPN for external access

Feedback

Added Value

+ The combination of infrastructures
+ The diversity of resources is required for experiments in real-world conditions
+ One-stop platform
+ Easy setup of the experiments (using JFed & Ansible)
+ Extensive documentation
+ Low Cost Experiments (?)

What is Missing

- Experiment parametarisation / Automation of experiment execution
- Unified documentation structure for all the testbeds
- Cross Continent testbed access
- More info of node setup (e.g., physical distance, ping times, performance benchmarks)
- Nodes for intensive graphic applications

Conclusions

- Looking forward to use the federation for further experimentation
- The federation is an esential tool for the development of new technologies in the EU
- Need to maintain a free or low-cost infrastructure to allow SMEs experiment for new products
- Expand beyond EU and recruit testbeds in other continents to allow long distance experiments


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