LTB 2021

Load Testing & Benchmarking

Enabling Containerized, Parametric and Distributed Database Deployment and Benchmarking as a Service

George Kousiouris, Harokopio University of Athens

gkousiou@hua.gr

Dimosthenis Kyriazis, University of Piraeus

dimos@unipi.gr

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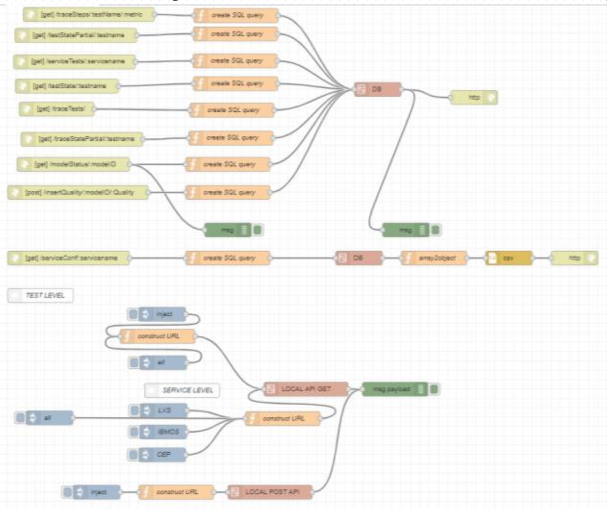
Flexibench Background

- Stress testing as a service framework
- Creation of dynamic, containerized clusters on demand
  - Based on orchestration of a back-end orchestration platform (Docker Swarm)
- Various modes of operation
  - Sequential, parallel, trace-driven experiments
- Based on adapters
  - for baseline load injectors (Jmeter), platforms, sync logic
- Based on Node-RED
  - Node.js driven event-driven app framework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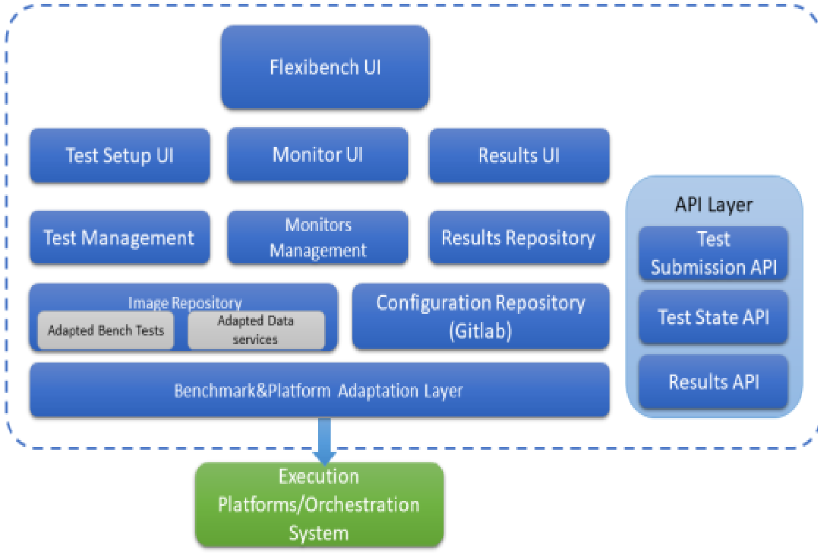
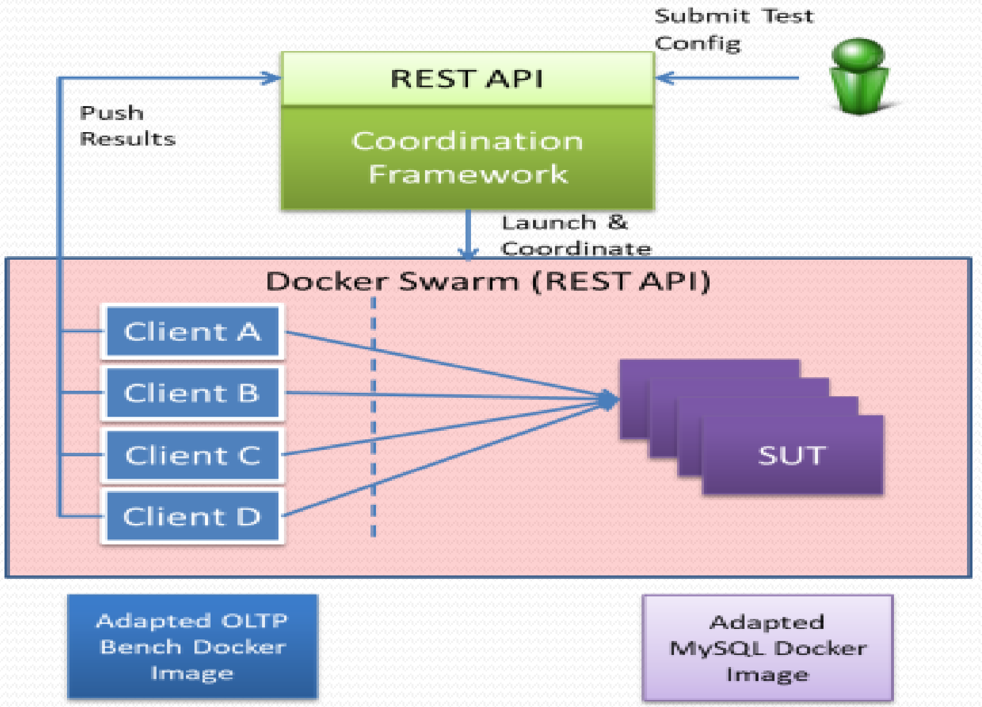
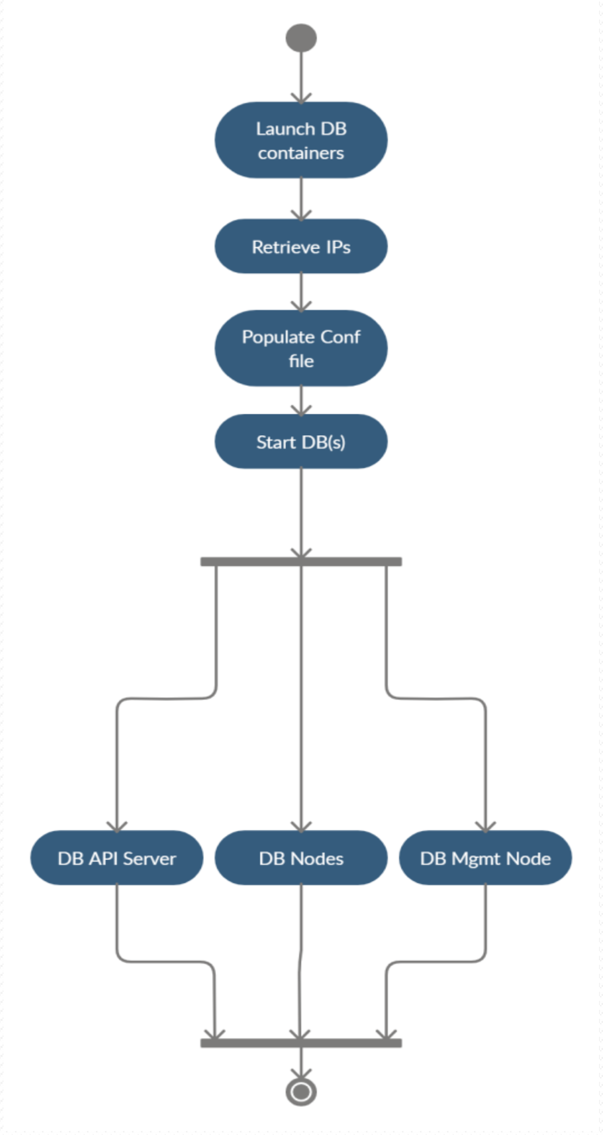


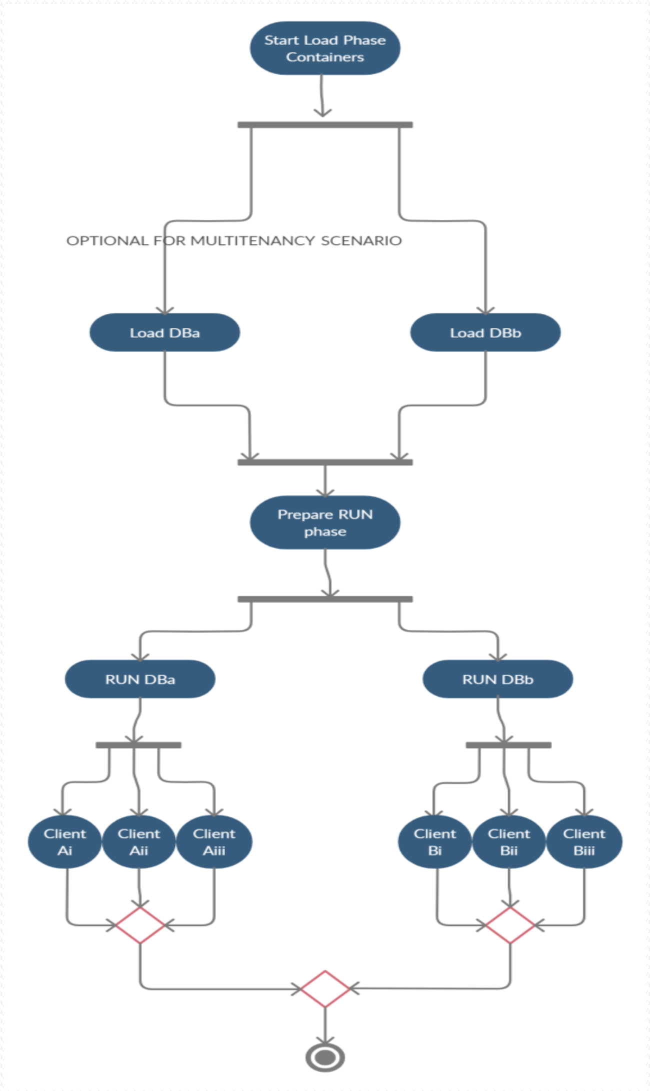
Flexibench DBaaS Tests

- Goal: Performance test configurations of a selected DB instance
  - Launching dynamically parameterized DB instances (MySQL) and then coordinates distributed load injection with OLTPBench/YCSB
  - Can include one instance
    - in parameter sweep kind of testing
    - Detect the effect of various setup parameters (#datanodes, request rate, type of workload etc.) in performance
  - Can include more than one instances
    - For DBaaS co-allocation performance interference investigation



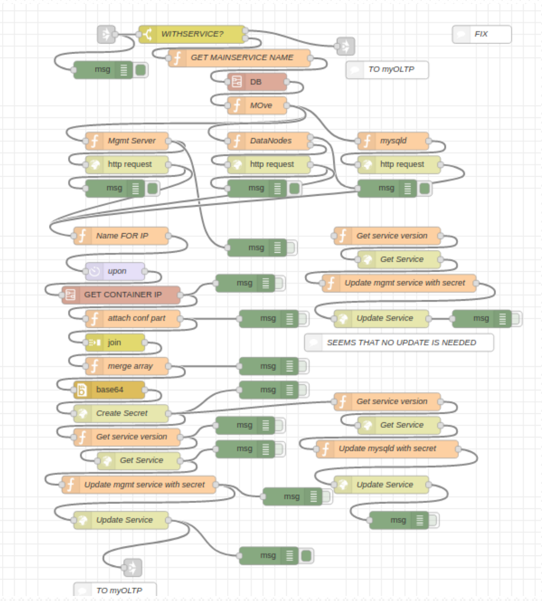
Synchronization needs

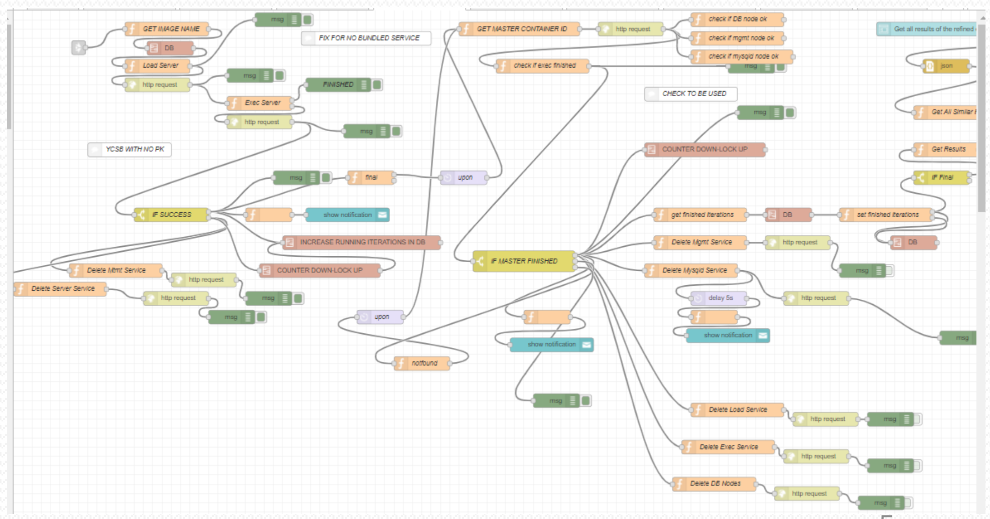




Issues to consider and adapter logic

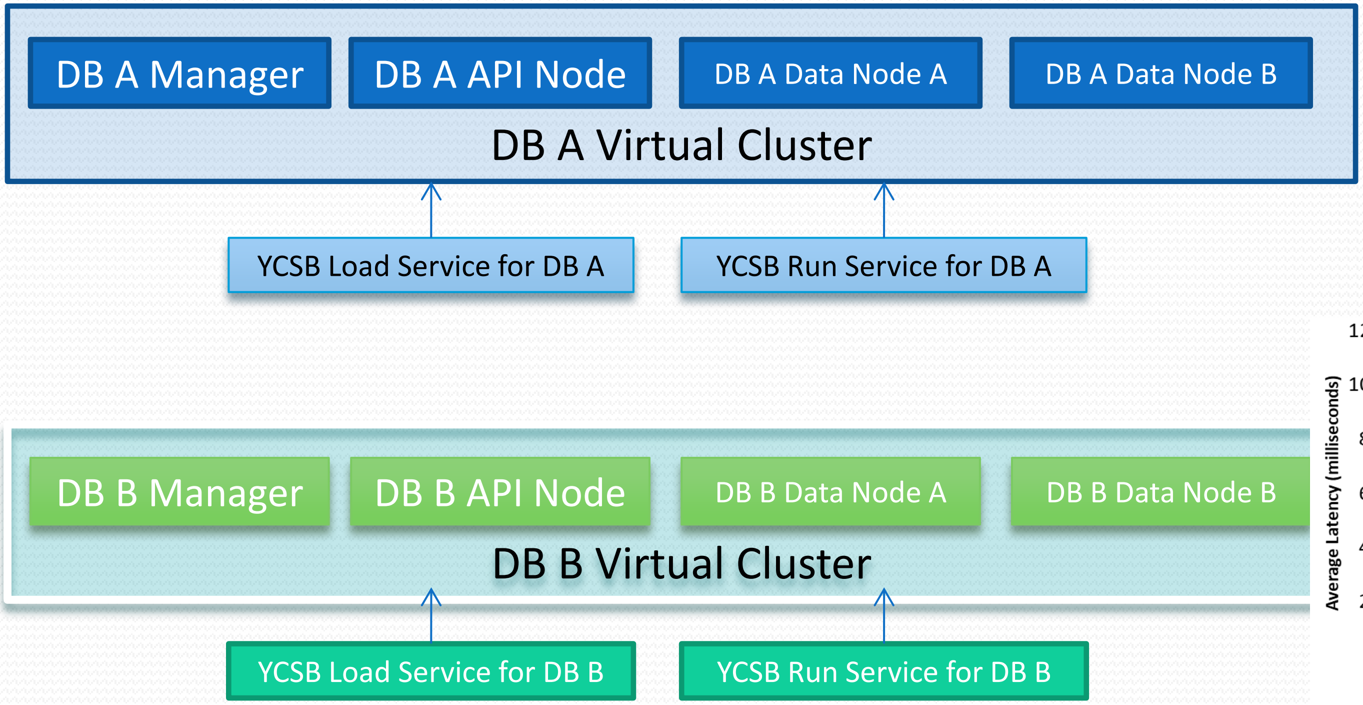
- Change of baseline docker images (MySQL, OLTPBench) to be dynamically configurable and logic to implement experiment synchronization and lifecycle management
    - How information and sync is passed across 4 layers (REST API, server logic, Container configuration and DB scripting)
- YCSB does not have distributed mode
    - Needs to be orchestrated
    - Other bugs: primary key generation conflicts, need to be disabled
- Volumes used for sync files creation not sharable between nodes
    - NFS based mount points
- Trade-off in DB creation for each experiment
- Extensions to other databases need the implementation of the according adapter
    - But adapter logic usually overlaps a lot (exploit existing adapters for reusability)

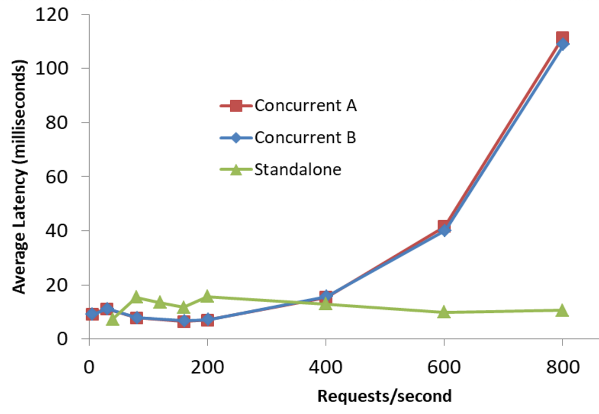




Co-allocation Scenario for performance degradation

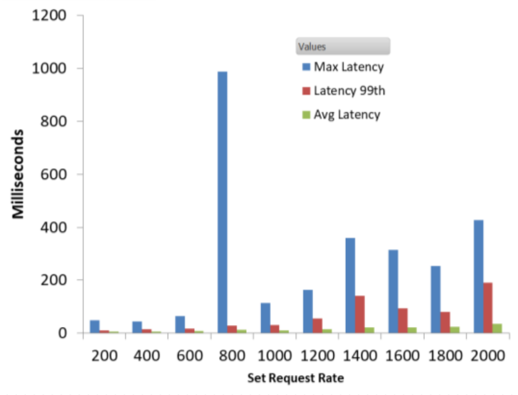
- Two parallel parametric instances of a DB with the databases on the same node
- Suitable for DBaaS co-allocation limits



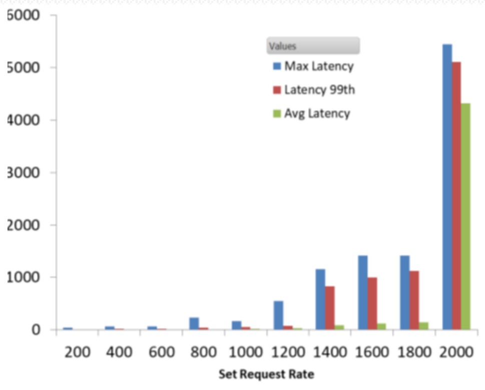


Example Results Analysis

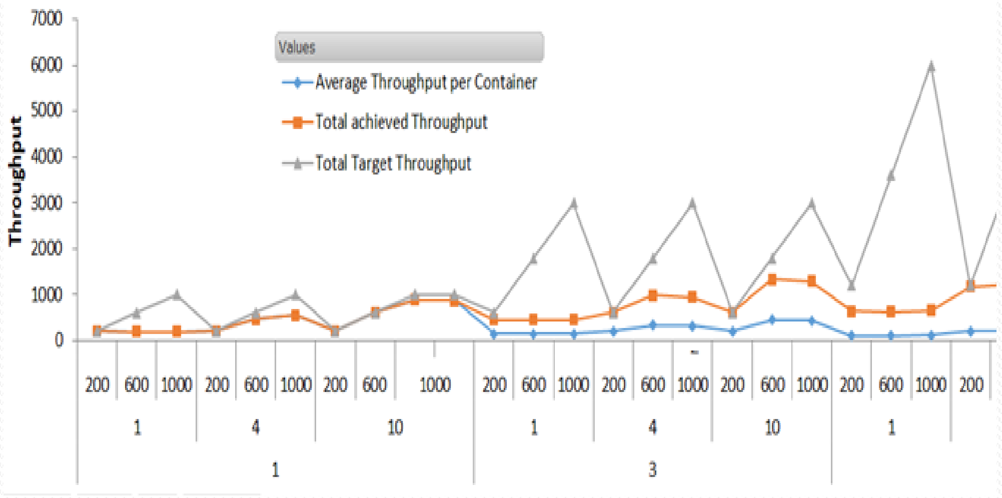
- Investigation of parameters effect on results
  - E.g. #data nodes and request rate in response times
- Investigation of client side bottlenecks
- Results are only indicative and runs were performed for functional testing
  - No optimization was applied on the DB setup, data nodes collocated on the same node



4 datanodes



8 datanodes



Conclusions

- Easy set up and deployment of DB characteristics
  - E.g. size, number of nodes, type of data
- Automated, API based test submission and monitoring
- Ability to include further automation in experiment creation through REST API functionality
- Easier gathering of datasets for further analysis
  - E.g. performance model creation of the SUT
    - Latency=f(#datanodes, param2, param3, request rate)

Future Work

- Improve configuration aspects and packaging of the tool

- Model creation for DB performance

- Extension of Flexibench to FaaS environments

Tool details

- Source code and docs:
  - http://bigdatastack-tasks.ds.unipi.gr/gkousiou/adw
- Docker images
  - https://hub.docker.com/u/gkousiou
- Demo Videos
  - https://www.youtube.com/playlist?list=PLs0yDOuwD6jPdht8A_V9sTO5Et15Z-OOF

Thank you!
Questions?