CloudKon: DTS – Reloaded with efficient Monitoring ,Bundled Response and Dynamic Provisioning with improved concurrency.

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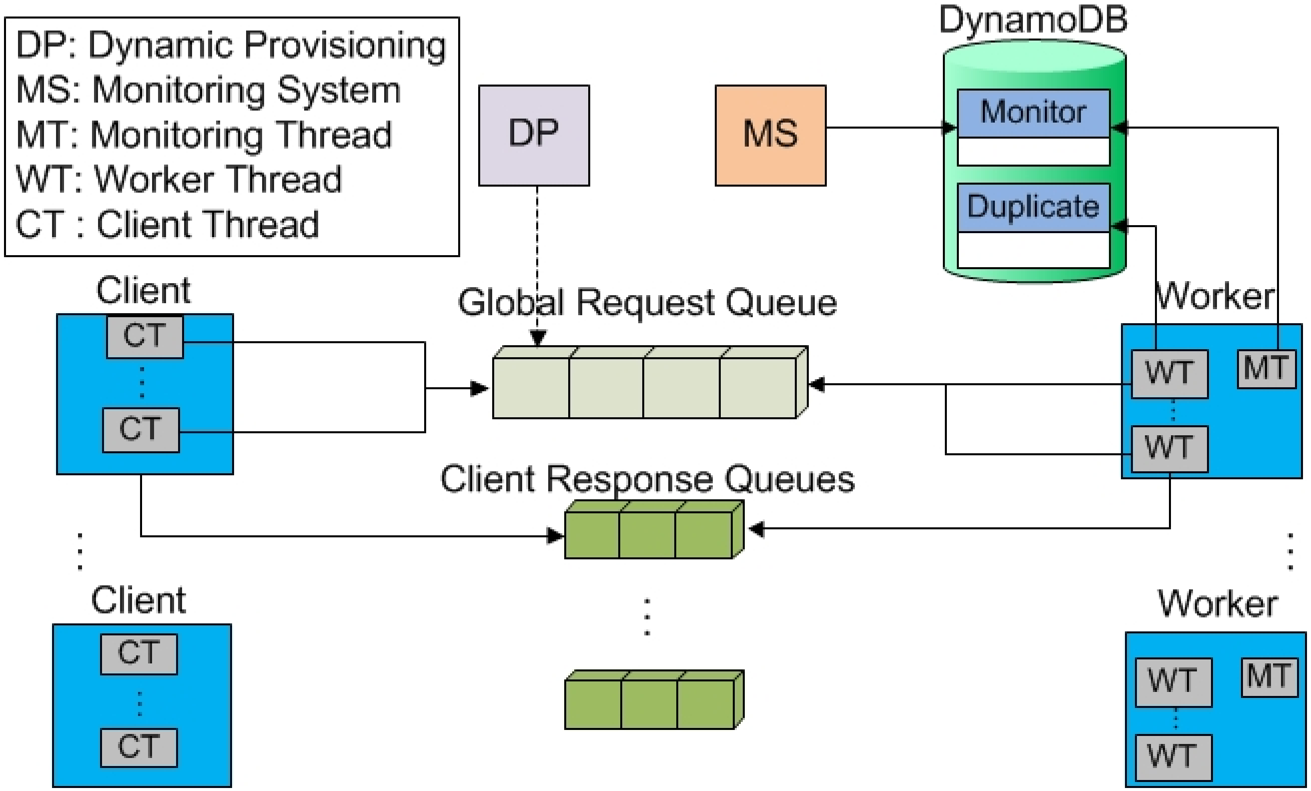
Introduction

- CloudKon is a compact, light-weight, scalable, and distributed task execution framework .

- Built on following Amazon components:
- EC2
- SQS
- DynamoDB

- Major Components in CloudKon:
- Client
- Server
- Global Request Queue (SQS)
- Client Response Queue (SQS)

Cloudkon Architecture

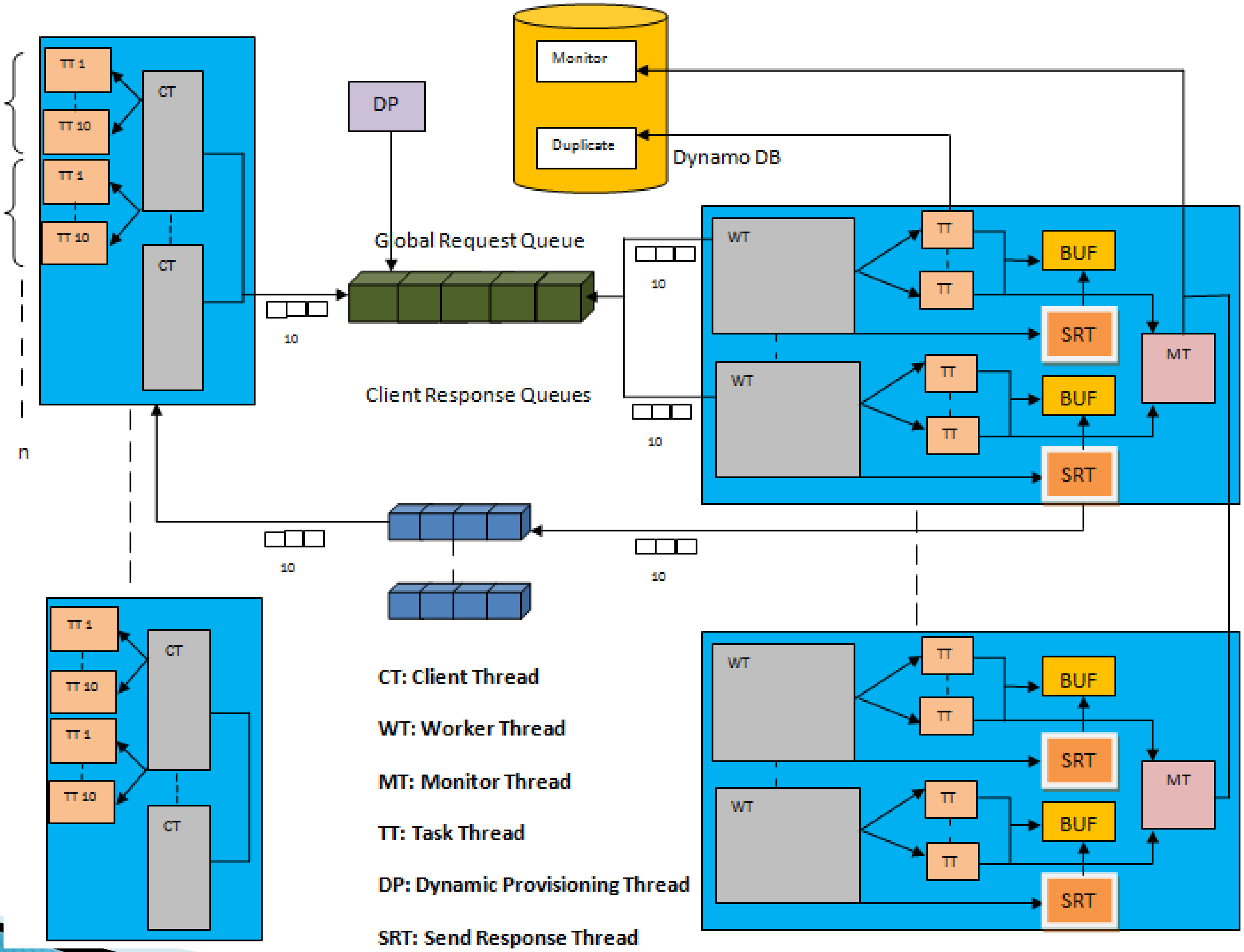


DP: Dynamic Provisioning
MS: Monitoring System
MT: Monitoring Thread
WT: Worker Thread
CT : Client Thread

CloudKon-Reloaded Improvements

- 1. Improved concurrency
- 2. Bundled Response
- 3. Efficient Monitoring

CloudKon-Reloaded Architecture



CT: Client Thread

WT: Worker Thread

MT: Monitor Thread

TT: Task Thread

DP: Dynamic Provisioning Thread

SRT: Send Response Thread

CloudKon-Reloaded Components

- **Server**
- **Worker Thread (WT)**

1. Pulls task bundles from global request queue.
2. Creates task thread in optimal concurrency mode.

- **Task Thread (TT)**

1. Deletes the task from the global request queue.
2. Checks for duplication with DynamoDB.
3. Executes task and puts back response to client specific array in Buffer.

CloudKon-Reloaded Components

- **Buffer (BUF):**

  1. Concurrent hash map
     - Key :Client Response Queue link.
     - Value: ArrayList of task responses.

- **Send Response Thread (SRT):**

  1. Pulls message bundles from buffer.
  2. Sends bundled response to clients.

- **Monitor Thread (MT):**

  1. Attaches object with task thread.
  2. Tracks utilization using object's reference.

CloudKon-Reloaded Components

- **Client**
- **Worker Thread (WT):**

  1. Creates client response queue.
  2. Submits task to global request queue.
  3. Pulls messages from it’s response queue.
  4. Creates task threads using maximum concurrency mode.

- **Task Thread (WT):**

  1. Deletes message from response queue.
  2. Adds message in the concurrent ArrayList.

Improvements

1. Improved concurrency

- All tasks are processed concurrently.
- Reduces Latency.
- Increases throughput.

2. Bundled Response:

- Reduces network overhead.
- Utilizes network bandwidth more effectively i.e. reducing the probablity of network latency.

3. Efficient Monitoring:

- Reduces network overhead .
- Reduces contention by 1/n, where n = no. of workers

Benchmarking

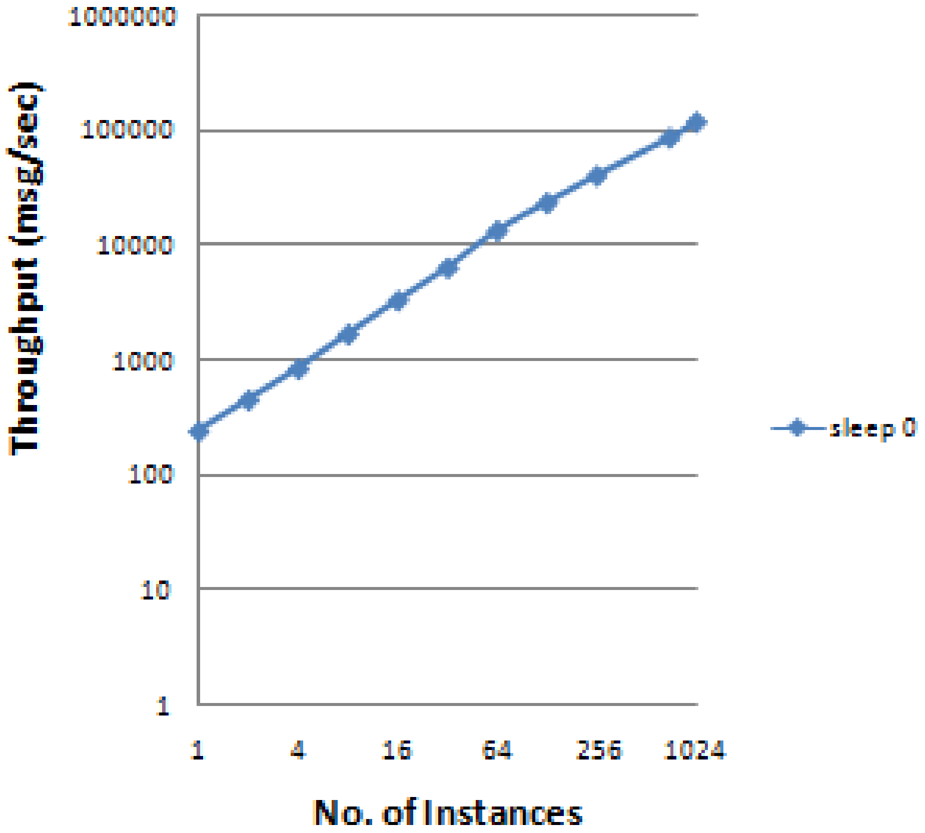
- **Test-bed:**
  - Ran on Amazon EC2 instances experiments on us.east.1 datacenter of Amazon.
  - Instance type - m1.large
  - All instances have Linux OS with JRE 1.7 installed.
  - Each instance runs both client and server.
  - 2 client threads and 4 worker threads run on each instance.
  - Each instance submits 16000 tasks. (8000/thread)
  - Tasks: sleep 0 , 16, 128

Benchmarking

- *Scripts and programs developed specifically for benchmarking:*
- 1. Shell Scripts (Bash): Throughput, Latency, File transfer from EC2 instances.
- 2. Parallel-SSH: For parallel execution on EC2.
- 3. EC2 CLI (Command Line Interface): For instance startup, terminate, Getting IP address, etc.
- 4. AWS CLI (Command Line Interface): Mainly for Dynamic Provisioning for SQS operations and EC2 dynamic instance startup.

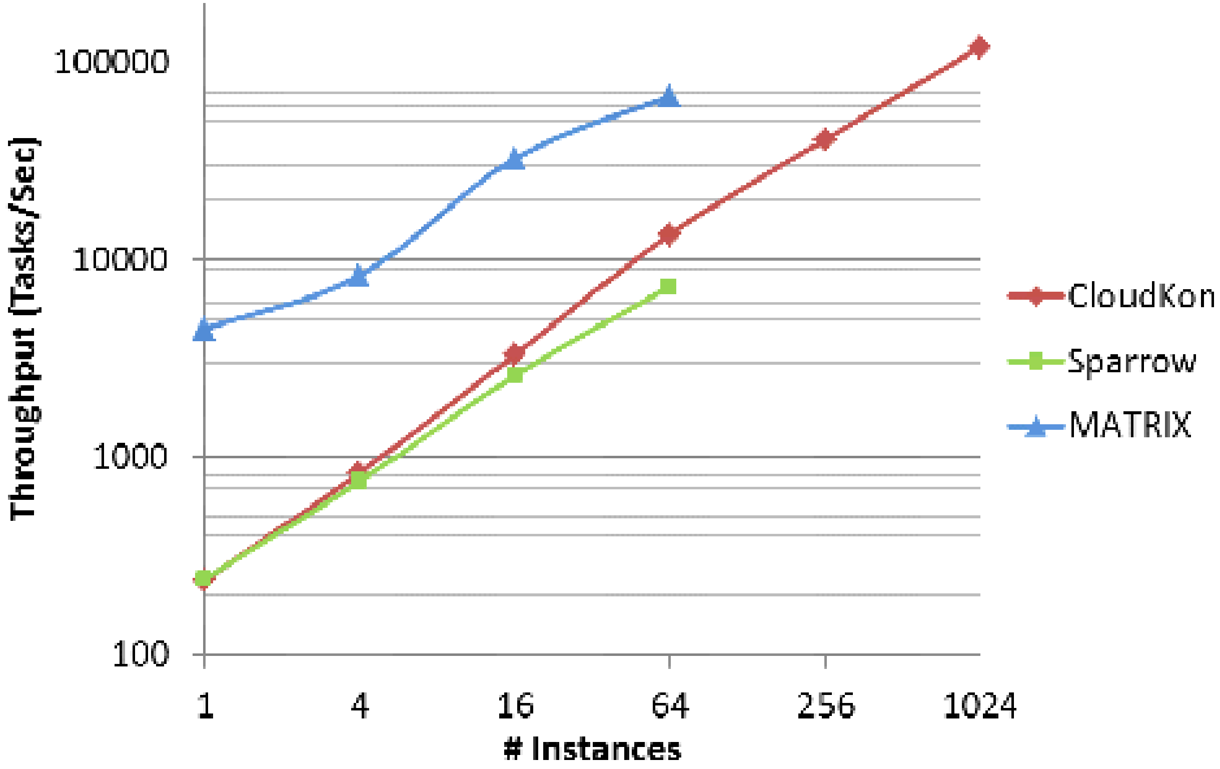
Benchmarking

- Throughput:
  - sleep 0 tasks



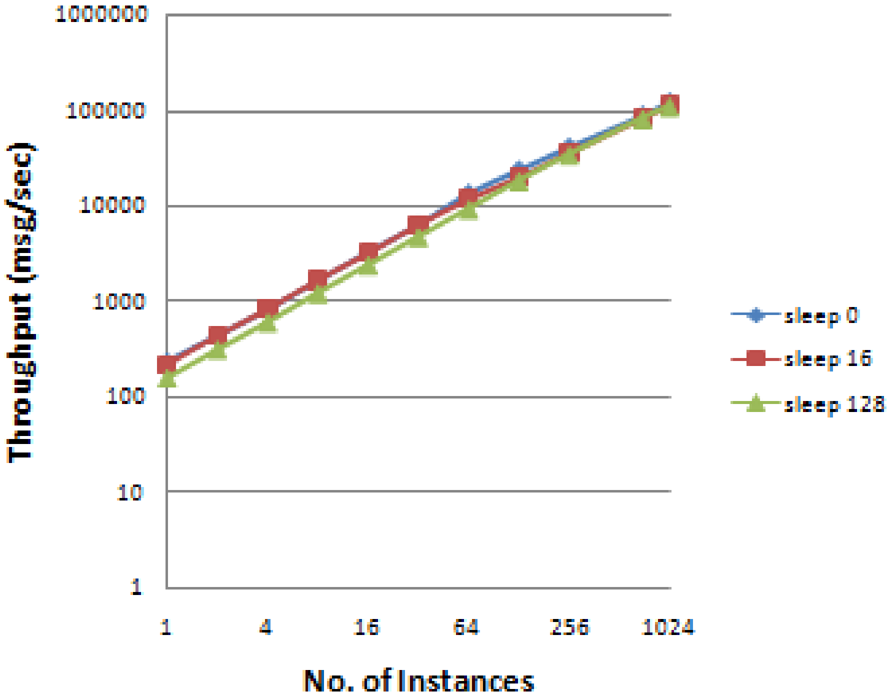
Benchmarking

- Throughput Comparison:



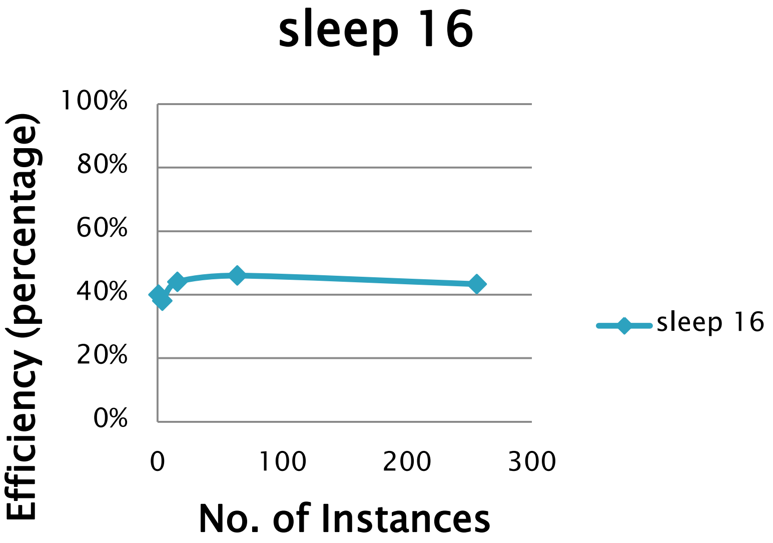
Benchmarking

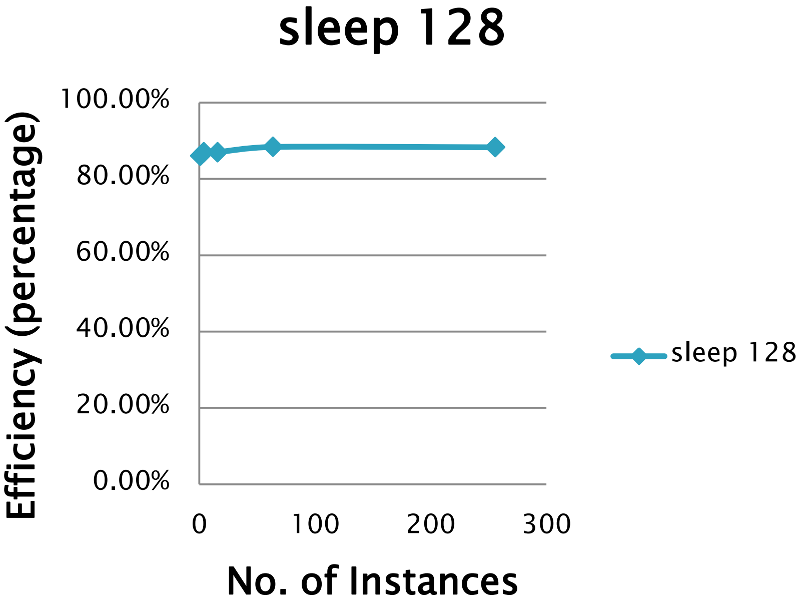
- Comparison of Sleeps for Throughput:
- sleep 0 tasks



Benchmarking

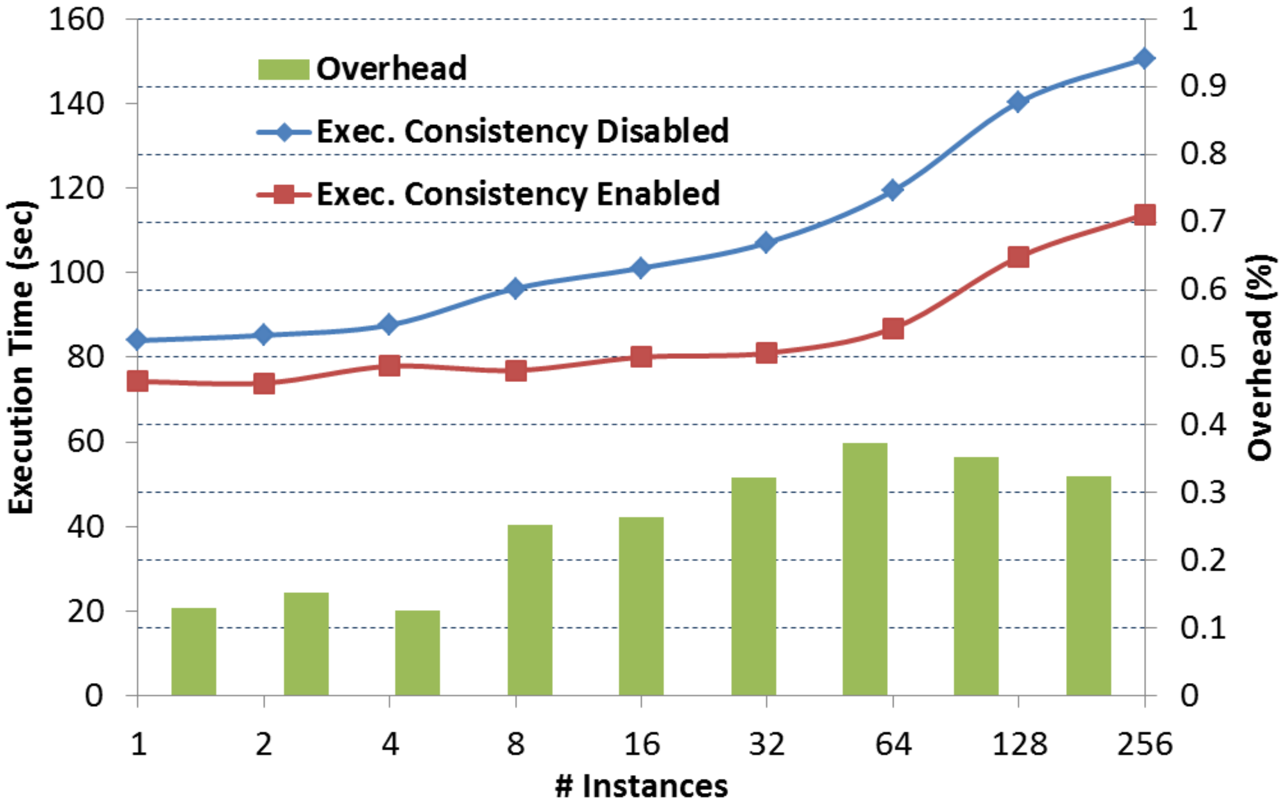
- Efficiency:
  - Homogenous workloads.





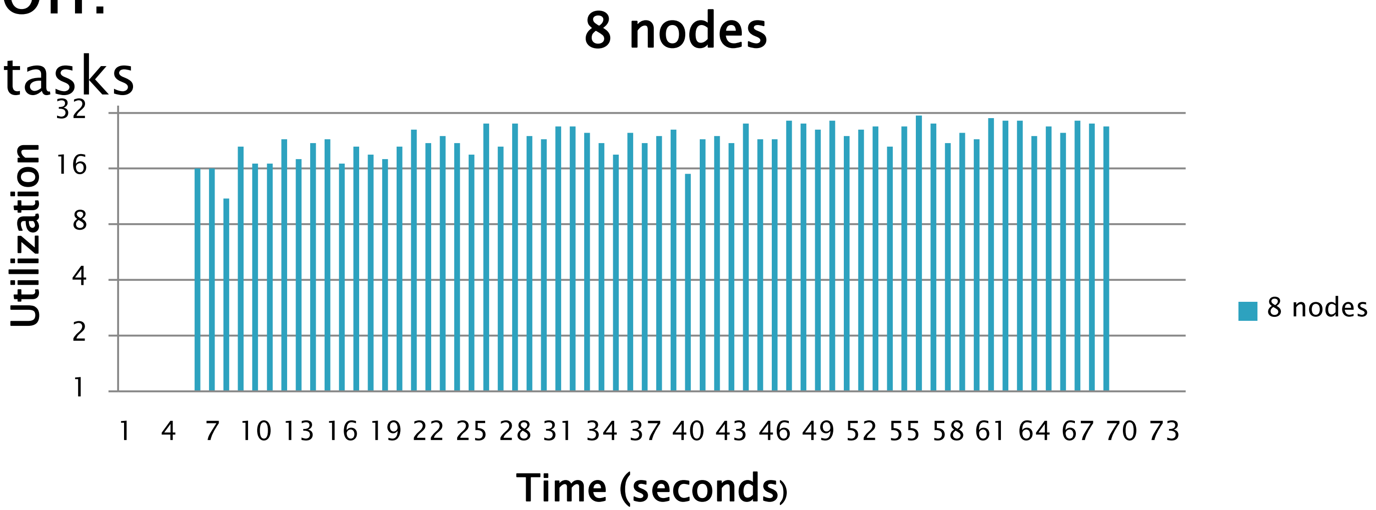
Benchmarking

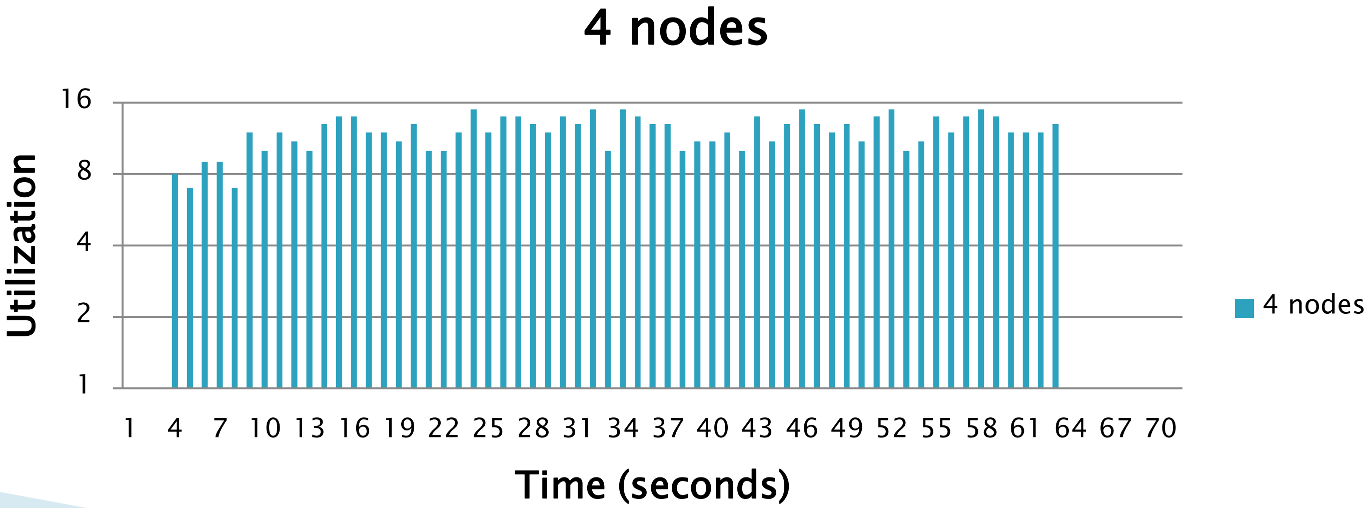
- Consistency:
- sleep 16 tasks



Benchmarking

- Utilization:
  - sleep 100 tasks





Conclusion

- The evaluation of the CloudKon proves that it is highly scalable and achieves a stable performance over different scales.
- CloudKon achieves up to 87% efficiency.
- CloudKon was able to outperform other systems like Sparrow and MATRIX on scales of 128 instances or more in terms of throughput.

Contributions

- Throughput and efficiency experiments for sleep (0,1,16,128) on the following scales (1,2,4,8,16,32,64,128,256,512,1024).

- Our code was used for throughput and efficiency benchmarking experiments in CloudKon paper submitted for CCGRID 2014.

DEMO

THANK YOU

Questions??