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Mistral performance in numbers

Will it blend?

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- 07-06-2017

http://tinyurl.com/osmistralbp

Keep it open!
Instant feedback to me!

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Play with us! Keep this page open during The presentation.

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Mistral

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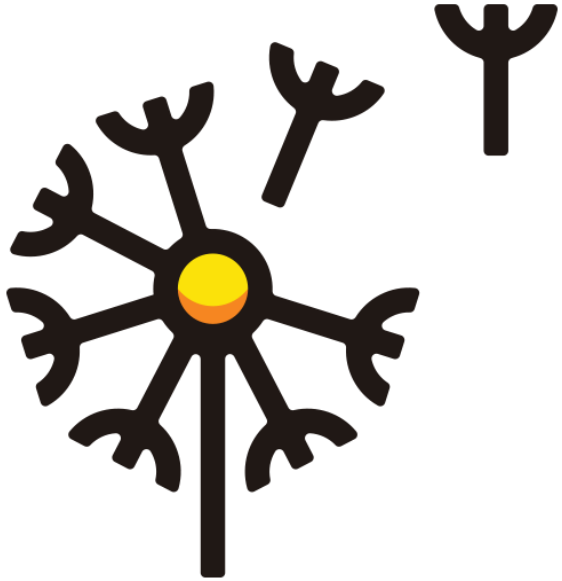
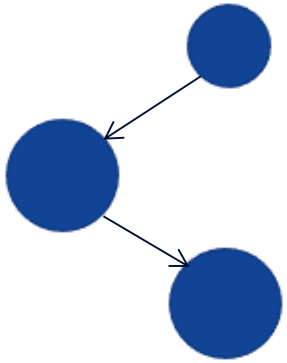


Workflow

- “orchestrated and repeatable pattern of business activity” – Wikipedia



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Main properties of a workflow system

Language to describe workflows

Tasks are **distributed** across enterprise/cloud environment

Support **parallelism** for running tasks

Synchronization of parallel branches

Data flows from one task to another

APIs to **create/update/delete workflows**

APIs and active component to **execute workflows**

APIs to **monitor state** of running workflows and tasks

Persistent state of running workflows and tasks

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Persistent state is a key!

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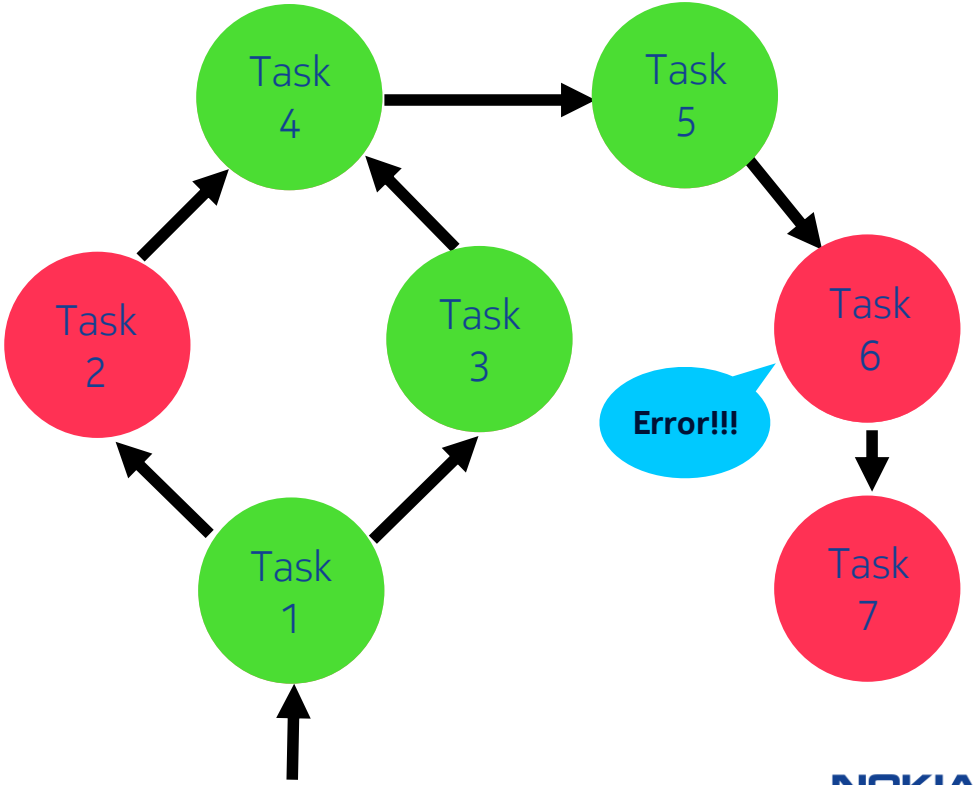
- Progress
- Observability
- Execution history
- Persistent result
- Asynchrony
- Effective error handling
- Recovery



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Right tool for the right task!
Scripts

Error handling is challenging

- All is OK while a script is working
- On an error we're left with a mess

Not scalable

Lack of monitoring

No parallelism & synchronization

Not suitable for large scale orchestration!

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Mistral Workflow language

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YAML-based

Relies on expression languages (YAQL, JINJA)

Main features

- Define workflow tasks
- Conditional task transitions
- Publish persistent variables
- Fork & Join
- Loop (to process data collections)
- Engine commands (fail, succeed, pause, noop)
- Task policies (retry, timeout, wait-before, wait-after, pause-before)
- Nested workflows

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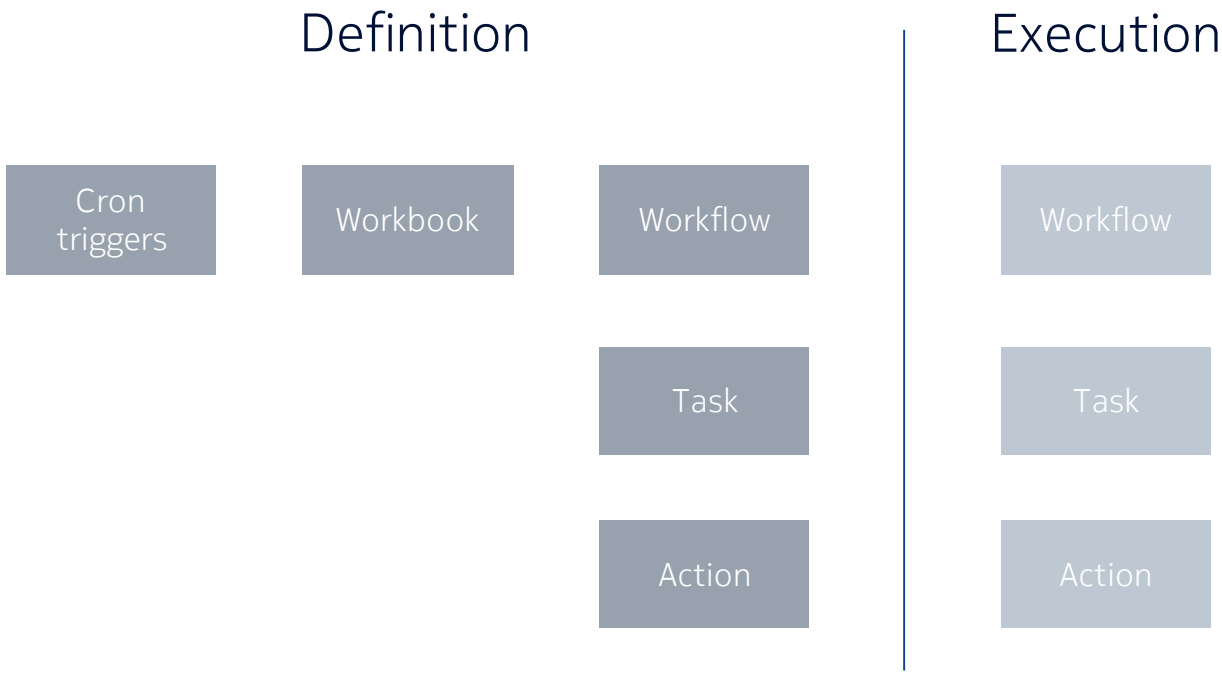
Building blocks



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Example: deleting VMs by criteria

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```
version: '2.0'

tenant_cleanup:
  description: Deletes virtual machines containing "mistral" in their names.

  tasks:
    get_vms:
      action: nova.servers_list
      publish:
        vms: <% $.get_vms['mistral' in $.name]
                        .select(dict(id=>$.id,name= >$.name)) %>
      on-success:
        - delete_vms
      on-error:
        - fail

    delete_vms:
      with-items: vm in <% $.vms %>
      action: nova.servers_delete server=<% $.vm.id %>
```


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Available actions

Common system actions:

- std.echo
- std.email
- std.fail
- std.http
- std.mistral_http
- std.java_script
- std.ssh
- std.ssh_proxied
- std.wait_ssh

OpenStack services actions available for:

- Ceilometer
- Cinder
- Glance
- Heat
- Keystone
- Neutron
- Nova

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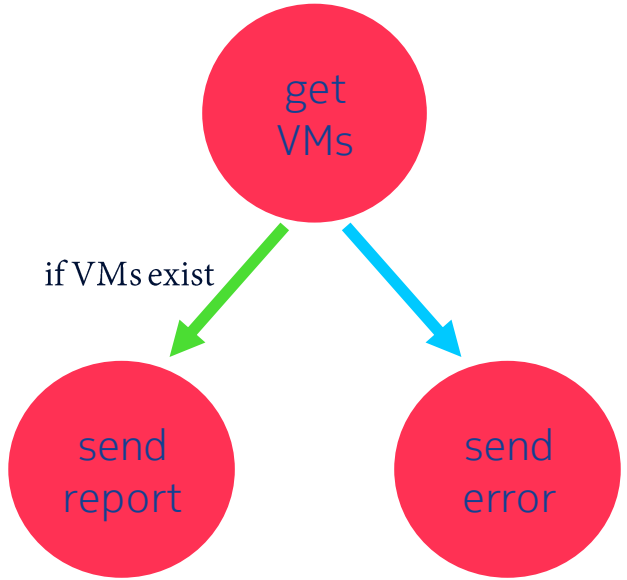
Conditional transitions

```
report_vms:
  input:
    - email_info

  tasks:
    get_vms:
     action: nova.servers_list
     on-success:
        - send_report: <% $.get_vms.len() > 0 %>
     on-error:
        - send_error

    send_report:
     action: std.email
     …

    send_error:
     action: std.email
     …
```



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Publishing persistent variables

```
version: '2.0'

tenant_cleanup:
  tasks:
    get_vms:
      action: nova.servers_list
      publish:
        vms: <% $.get_vms['mistral' in $.name]
                        .select(dict(id=>$.id,name=>$.name)) %>
      on-success:
        - delete_vms

    delete_vms:
      with-items: vm in <% $.vms %>
      action: nova.servers_delete server=<% $.vm.id %>
```


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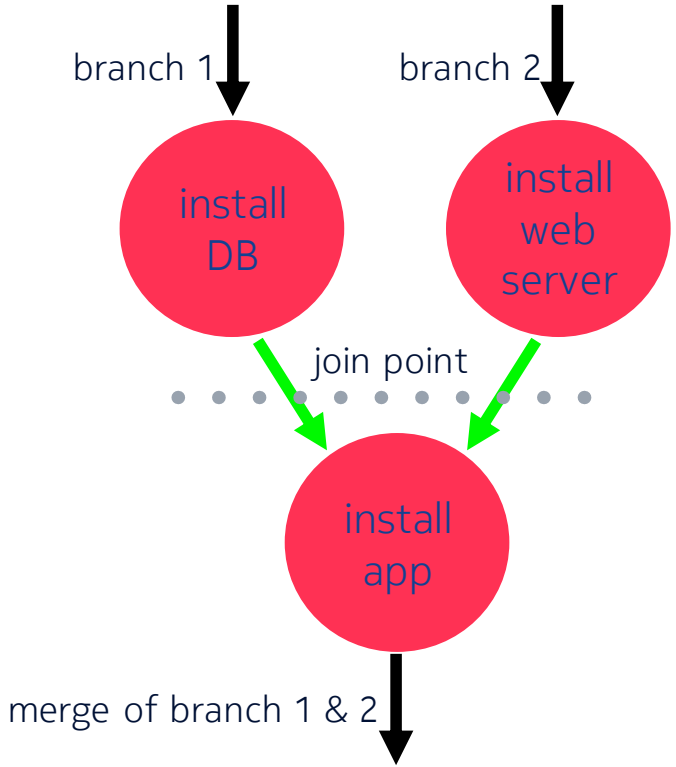
Fork & Join

```
version: '2.0'

deploy_app:
  tasks:
    install_db:
      action: install_mysql
     on-success:
        - install_app

    install_web_server:
      action: install_web_server
     on-success:
        - install_app

    install_app:
      join: all   1, 2, 3…
      action: install_my_app
```



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Loops

```
version: '2.0'

tenant_cleanup:
  description: Deletes virtual machines containing “mistral” in their names.

  tasks:
    get_vms:
      action: nova.servers_list
      publish:
        vms: <% $.get_vms['mistral' in $.name]
                        .select(dict(id=>$.id,name=>$.name)) %>
      on-success:
        - delete_vms
      on-error:
        - fail

    delete_vms:
      with-items: vm in <% $.vms %>
      action: nova.servers_delete server=<% $.vm.id %>
```


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Engine commands

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```
version: '2.0'

deploy_app:
  tasks:
    get_vms:
      action: nova.servers_list
      on-success:
        - fail: <% $.get_vms.len() = 0 %>
        - install_app

    install_app:
    …
```

- **fail** - ends entire workflow with a failure
- **succeed** - ends entire workflow with success
- **pause** - puts entire workflow on hold (can be resumed manually)

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Task policies

```
cinder_backup:
  tasks:
    start_backup:
      action: cinder.backups_create …
      publish:
        backup_id: <% $.start_backup.id %>
      on-success:
        - wait_for_backup

    wait_for_backup:
      action: fail_if_not_ready id=<% $.backup_id %>
      wait-before: 30
      retry: count=3 delay=5
      on-success:
        - report_backup_is_ready

    report_backup_is_ready:
      …
```

- **retry** - repeats a task on failure
- **wait-before** - waits a number of seconds before starting a task
- **wait-after** - waits a number of seconds after task completion
- **pause-before** - puts workflow on hold before running a task
- **timeout** - fails a task is running longer than configured value

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Nested workflows

```
version: '2.0'

deploy_app:
  input:
    - vm_ids

  tasks:
    install_db:
      workflow: install_db vm_id=<% $.vm_ids[0] %>
      on-success:
        - install_app

    install_app:
      with-items: id in <% $.vm_ids %>
      action: std.ssh host=<% $.id %>
      input:
        cmd: 'sudo apt-get install my_app'
```


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Cron trigger

Cloud crontab
HA
Runs workflow by configured cron pattern
Can limit number of executions

Example using CLI:
$ mistral cron-trigger-create trig **tenant_cleanup** --pattern '*/5 * * * *'

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More at

https://docs.openstack.org/developer/mistral/dsl/dsl_v2.html

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Numbers

Measurement and Predictions

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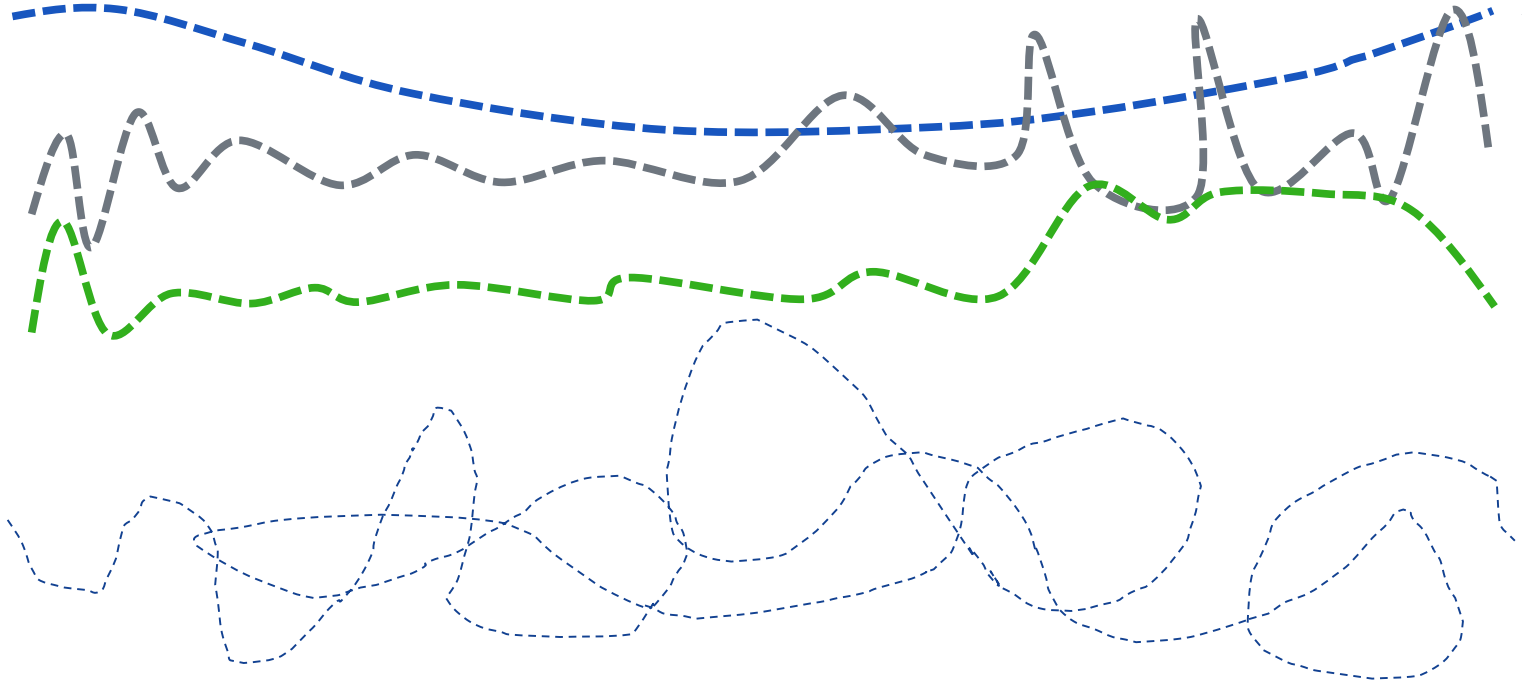
- Memory
- CPU
- IO
- KPIs



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Numbers
Performance, Reliability, Scalability

- Number of tasks
  - Types of tasks
    - Sleep
    - CPU intensive
    - External communication
    - Data processing (filter, collect data from input)
- Data flow between tasks
  - No data
  - Small documents
  - Large documents
  - Increasing size documents
- Task dependencies
  - #of join
  - #of fork
  - Loops
  - Recursion
  - Type
    - spider web (entagled, radial (directed inward, directed outward))
    - Tree
- Sequence length
  - Short sequence
  - Long sequence
- Parallelism
  - Tasks
    - Sequential
    - Parallel
  - Workflows
    - Many at once
    - Few at once
- Workflows
  - Flat
  - Hierarchical
- Trigger types
  - on-demand
  - cron
- Size of database
- #API requests
  - create/delete
  - read

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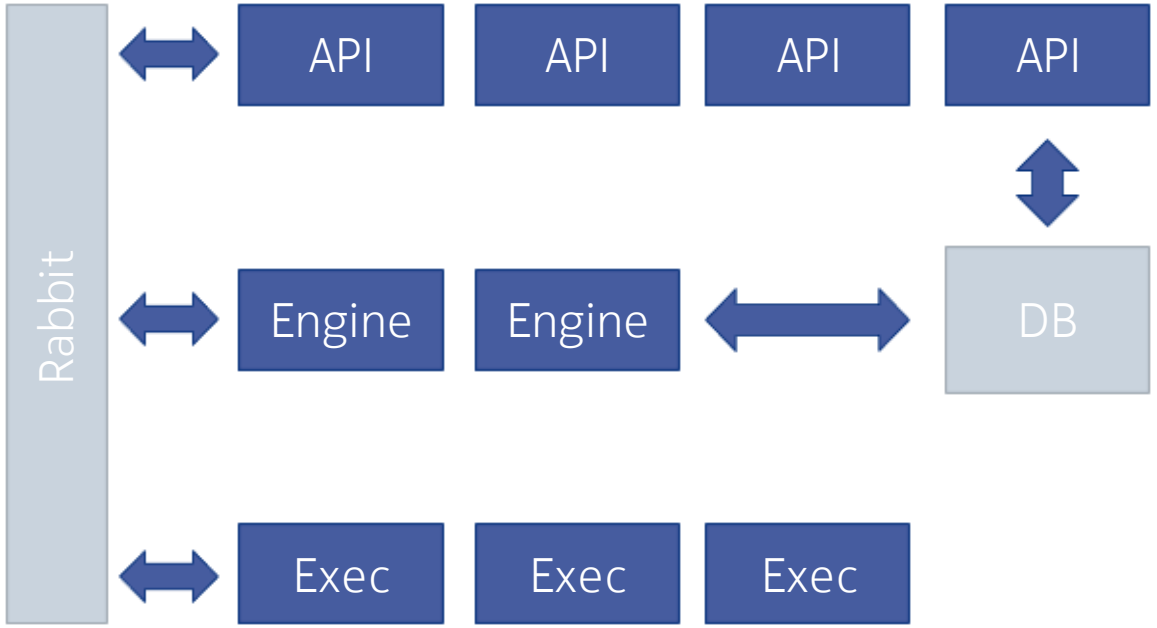
Mistral services
Responsibilities

- API (any number)
- Engine (any number)
- Executors (any number)
- Transport - RabbitMQ
- DB – MySQL, Postgres



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Mistral services - API

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Functions
- REST Model query
- Work initiation

Stats
- Memory per instance (~70MB initial)
- Load distribution (socket accept based)
  1. `fork()`
  2. `accept()`

Jmeter ☺

Tests
- Create executions
- List all
- List limited
- API traversal…

Responsiveness

Load distribution
- Forked API processes

API traversal
- Flat workflow
- Sub-sub-sub

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Responsiveness
Workflow CRUD

#workflows	Create	List	limit=10
100	6.5/sec	30/sec	
1000	7/sec	3/sec	50/sec
7000	7/sec	3/sec 913Kb	34/sec

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Mistral services - Engine

Functions

- Workflow processing
- Data flow management

Input-output calculation

YAQL `<% $.vm_ip %>`

JINJA `{{ _.data }}`

Data size

keep result ?

Redundant engines

- Ongoing stability improvements

Move actions to engine?

```
install_app:
  with-items: id in <% $.vm_ids %>
  action: std.ssh host=<% $.id %>
  input:
    cmd: 'sudo apt-get install my_app'
```


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Mistral services - Executor

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Actions run here

Operation mode

1. RPC request
2. Work
3. Respond

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Long test

1 week

50 cron triggers (Mistral) (H/60 * * * *)

50 runs per minute

3000 runs per hour

72000 per day

~500000 runs total

Max executions policy

- # < 700
- Age < 1 day

Run

- Create/Start dedicated container
- Touch files
- Cleanup files
- Stop container

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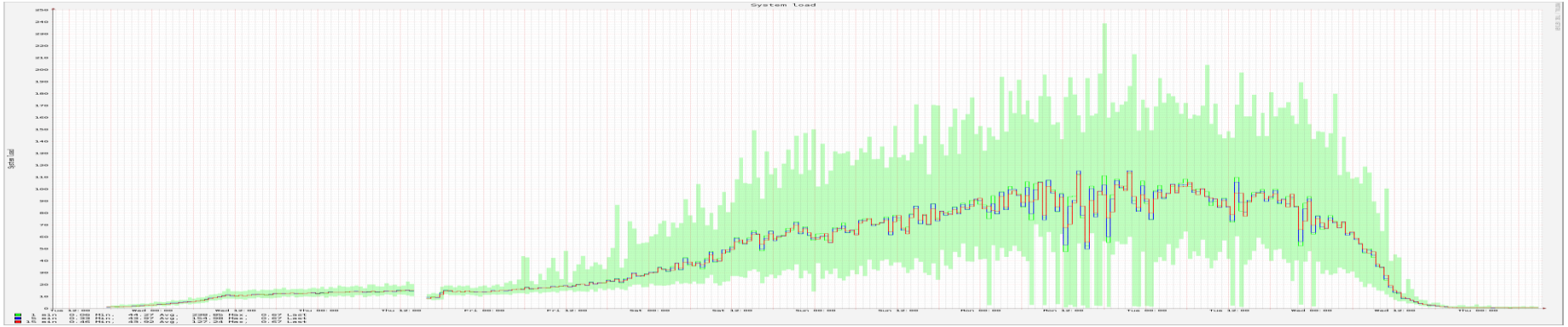
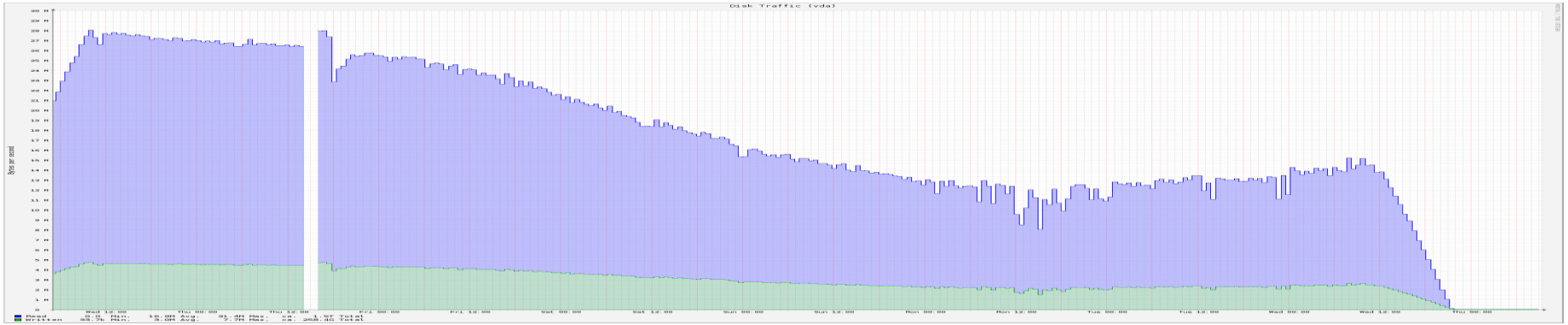
Long test - results





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War stories

Size

- Rally job

Expressions

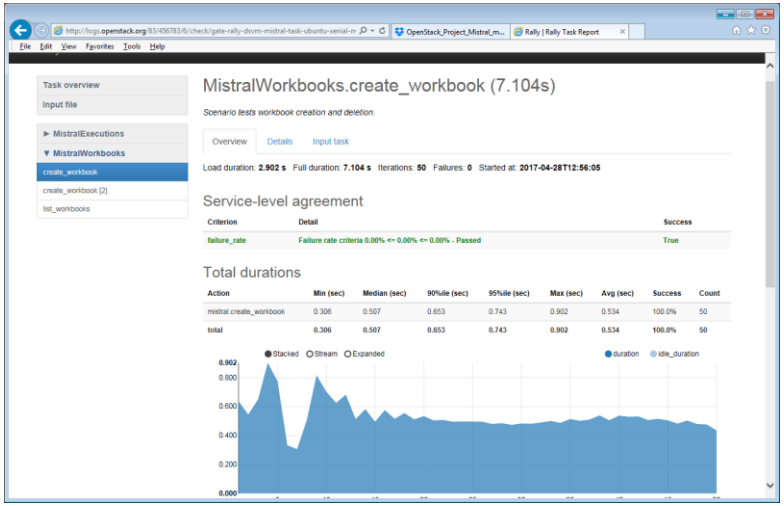
- YAQL -> Jinja

Big data

- execution_field_size_limit_kb
- mysqld -> max_allowed_packet value

Database trashing

- execution_expiration_policy
  - max_executions



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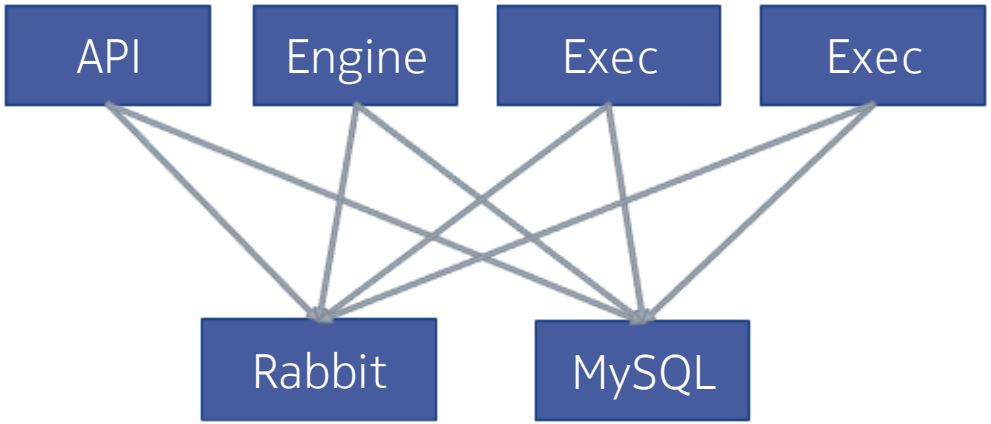
Evaluation setup
Demo time

.../mistral/tools/docker/

build.sh

start_....sh



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Quotes from the (Boston) Summit

„Can I use Mistral to implement a VM expiration policy?”

„Absolutely”

„Cron jobs are one of the killer features we still don’t use in TripleO”

„Go ahead and do so”

„Masakari could call Mistral workflows...” - Openstack HA discussion

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