EDGELESS

Cognitive edge-cloud with serverless computing

Benchmarking an EDGELESS Cluster for Serverless Edge Computing Applications

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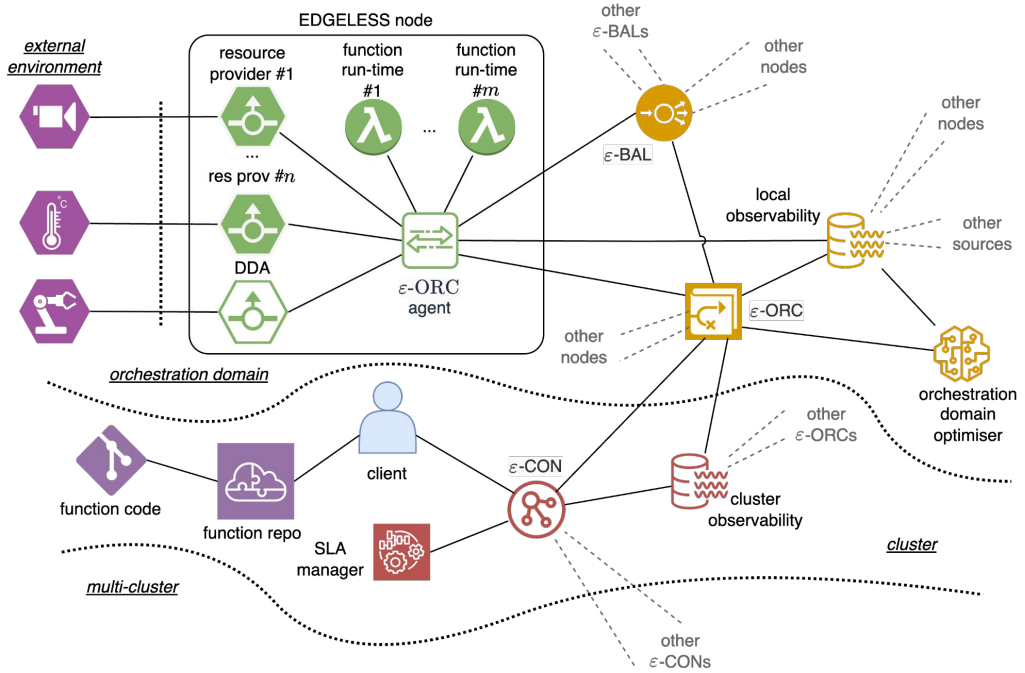
EDGELESS as a complex system

- a lot of workflows, running in
- multiple domains, each hosting
- many nodes, each running
- several function/resource instances



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Problem

- How to evaluate the performance of an EDGELESS system in **controlled** and **repeatable** conditions?

Why?

Examples:

- Study the impact of a new algorithm (e.g., orchestration function)
- Provision the system
- Assess what-if scenarios

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Solution

`edgeless_benchmark`

- Shipped with core EDGELESS software
- Interacts as a client with the real system
  - Benchmark flows can be mixed with real flows
- Creates workflows in a repeatable manner

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Workload: arrival models

Arrival model	Description
poisson	Inter-arrival between consecutive workflows and lifetimes are exponentially distributed.
incremental	One new workflow arrive every new inter-arrival time, with constant lifetime.
incr-and-keep	Add workflows, with constant lifetimes, incrementally until the warm up period finishes, then keep until the end of the experiment.
single	Add a single workflow that lasts for the entire experiment.
trace	Read the arrival and end times of workflows from a file specified with `--workload-trace`, one workflow per line in the format `arrival,end_time`

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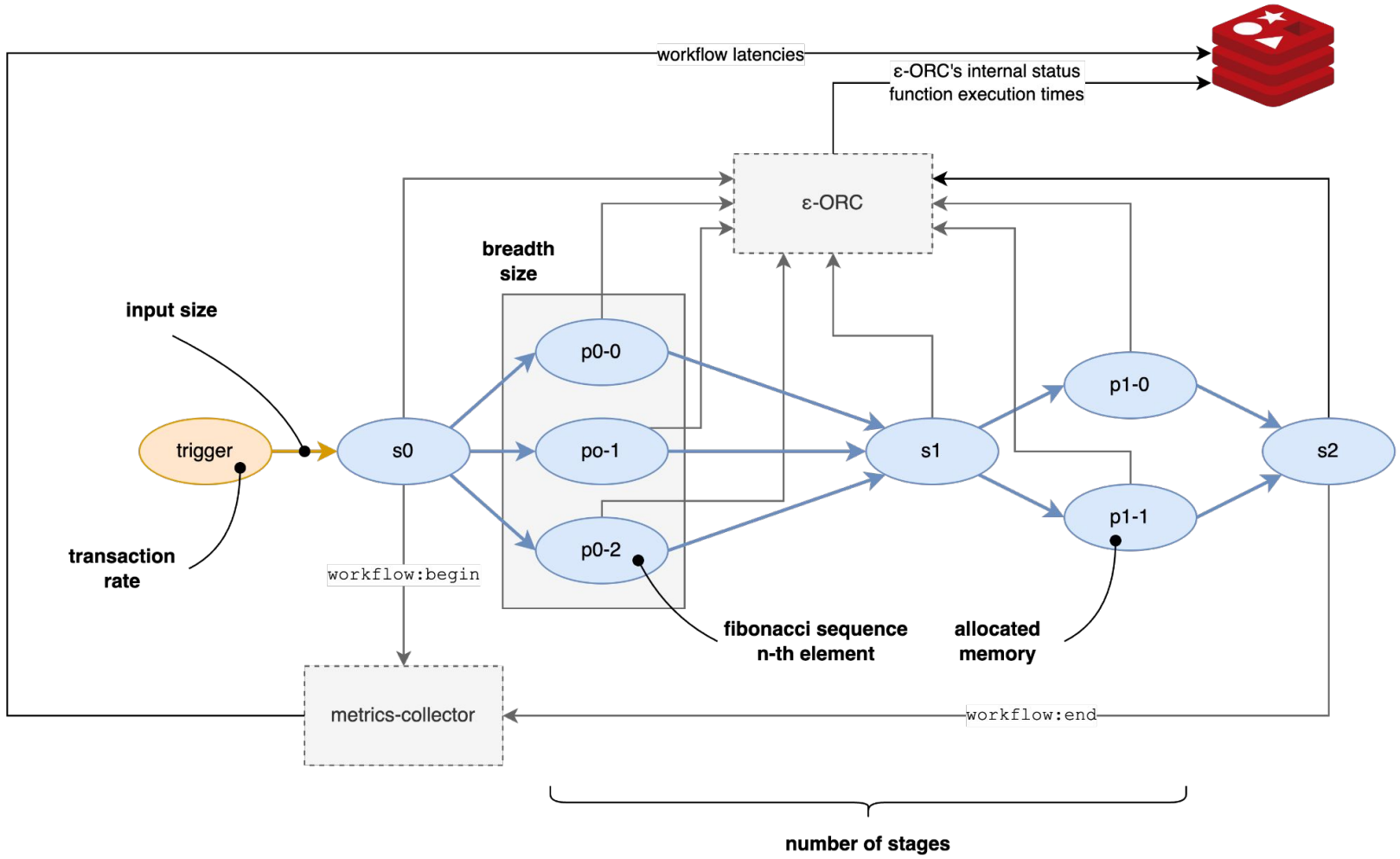
Workload: workflow types

Workflow type	Description	Application metrics	Template
none	No workflow is created. This option is meant only for testing/troubleshooting.	None	N
single	A single function.	--	N
matrix-mul-chain	A chain of functions, each performing the multiplication of two matrices of 32-bit floating point random numbers at each invocation.	workflow,function	Y
vector-mul-chain	A chain of functions, each performing the multiplication of an internal random matrix of 32-bit floating point numbers by the input vector received from the caller.	workflow,function	Y
map-reduce	A workflow consisting of a random number of stages, where each stage is composed of a random number of processing blocks. Before going to the next stage, the output from all the processing blocks in the stage before must be received.	workflow	Y
json-spec	The workflow specified in the given JSON file. The string `@WF_ID` in the file is substituted with a sequential identifier of the workflow.	--	N

Workflow example: map-reduce



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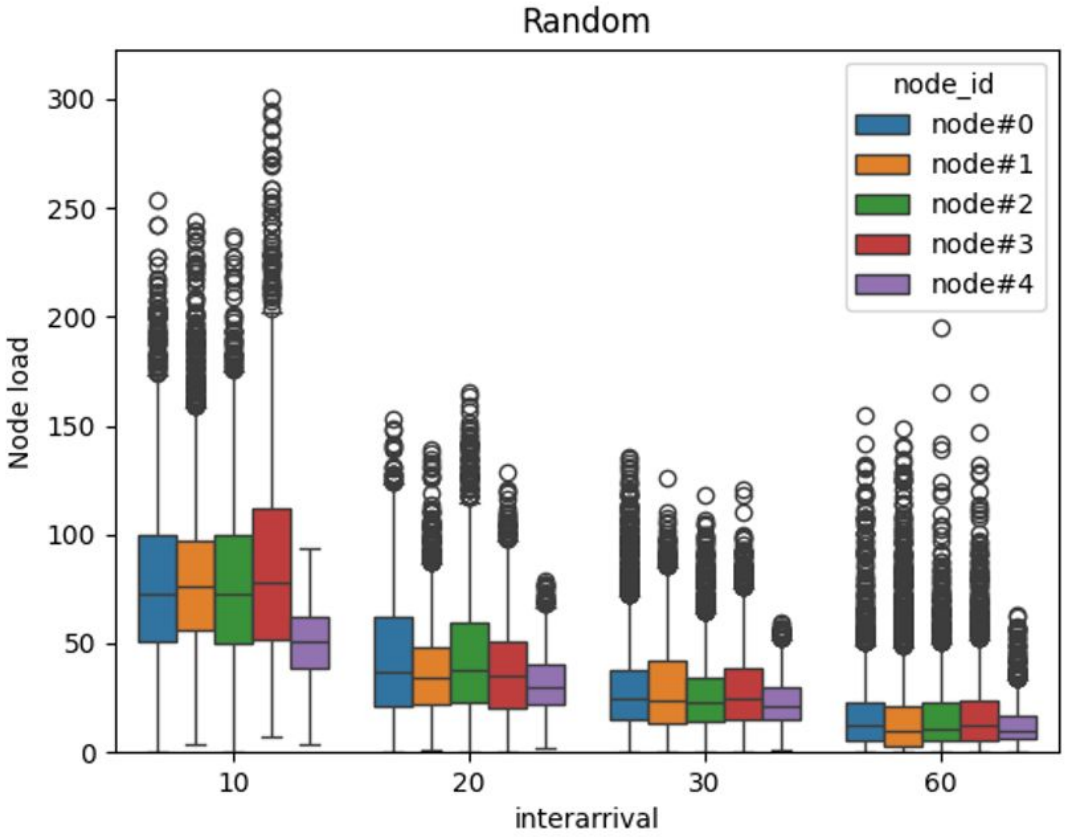
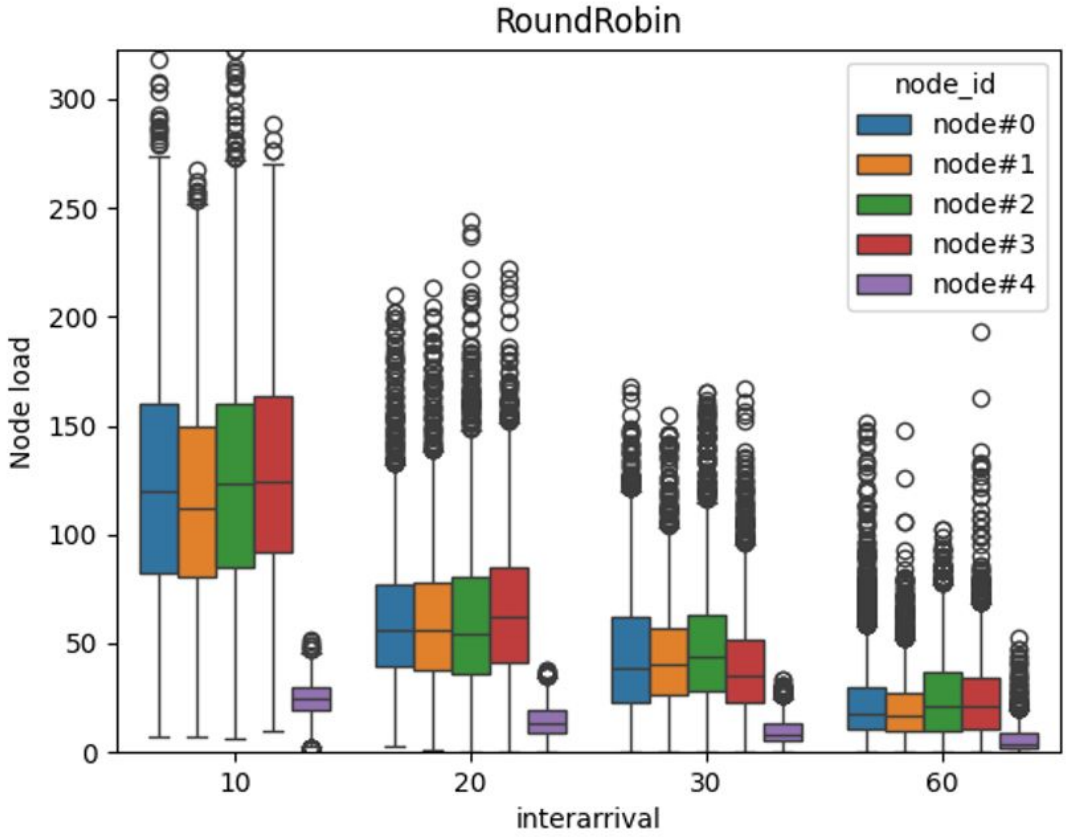
Example of results (20 experiments, 1 hour each)





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Thank you for your attention

Talk is cheap, here's the code:

`https://github.com/edgeless-project/edgeless`

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