Active-Standby for High-Availability in FaaS

Presented at: Sixth International Workshop on Serverless Computing (WoSC6) 2020

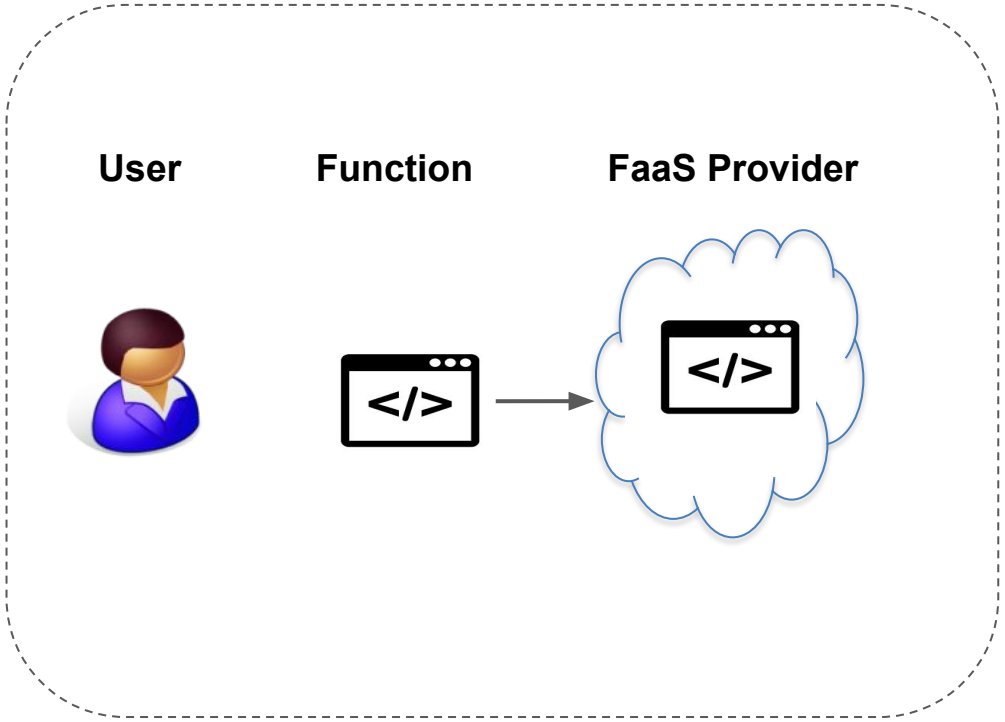
Yasmina BOUIZEM
Inria, University of Rennes, France
LRIT, University of Tlemcen, Algeria

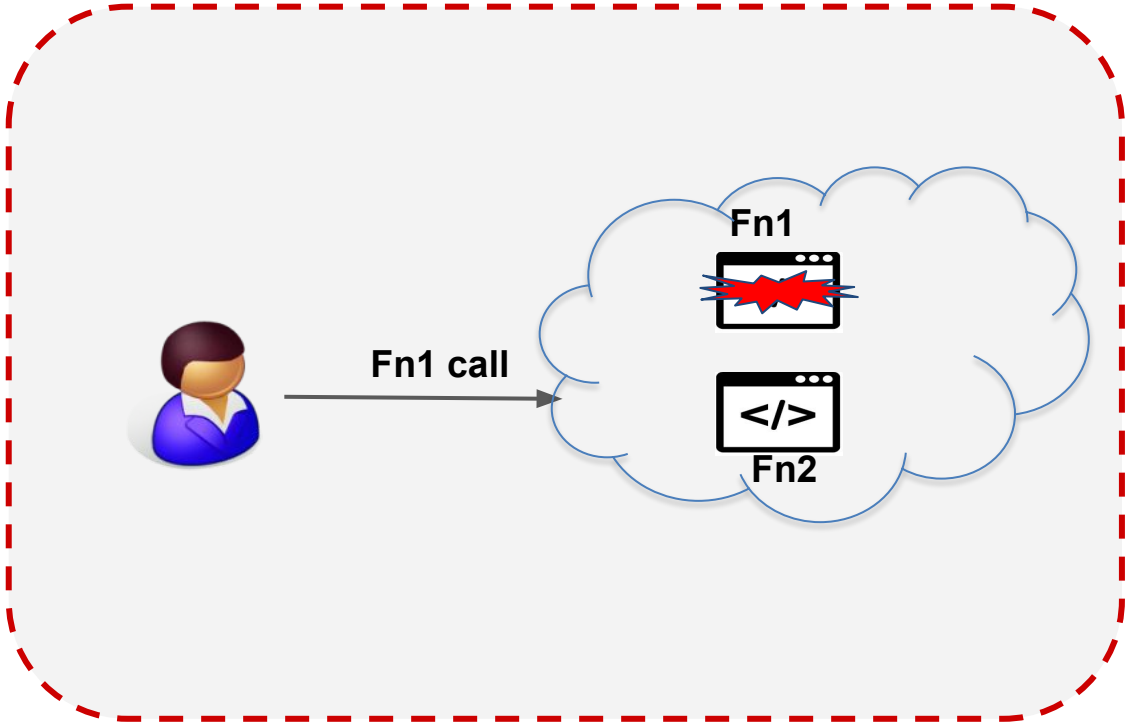
Christine MORIN, Inria, France
Djawida DIB, University of Tlemcen, Algeria
Nikos PARLAVANTZAS, IRISA, INSA Rennes, France

Laboratoire de Recherche Informatique Tlemcen

https://www.serverlesscomputing.org/wosc6/#p6

Function-as-a-Service (FaaS)



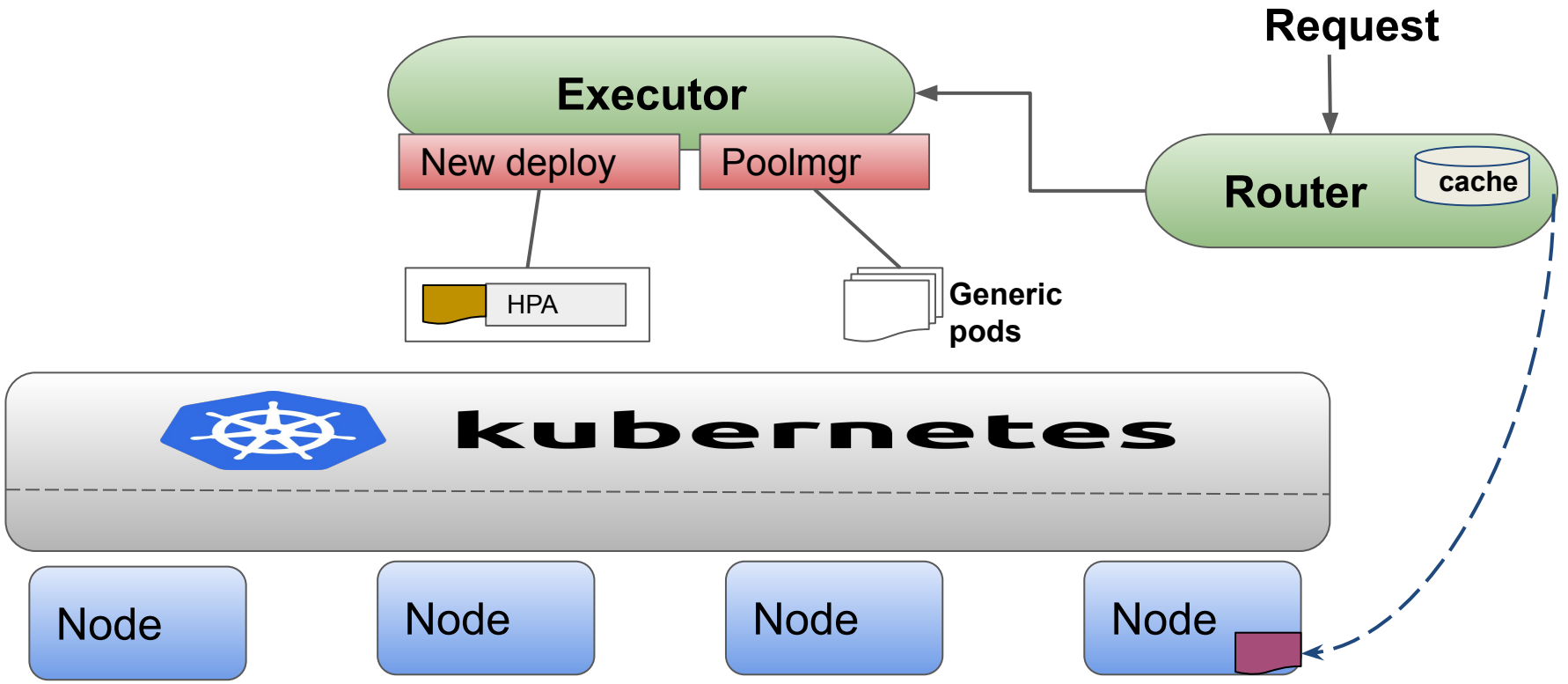


Objective

❖ Develop a solution to achieve High-Availability (HA) in FaaS

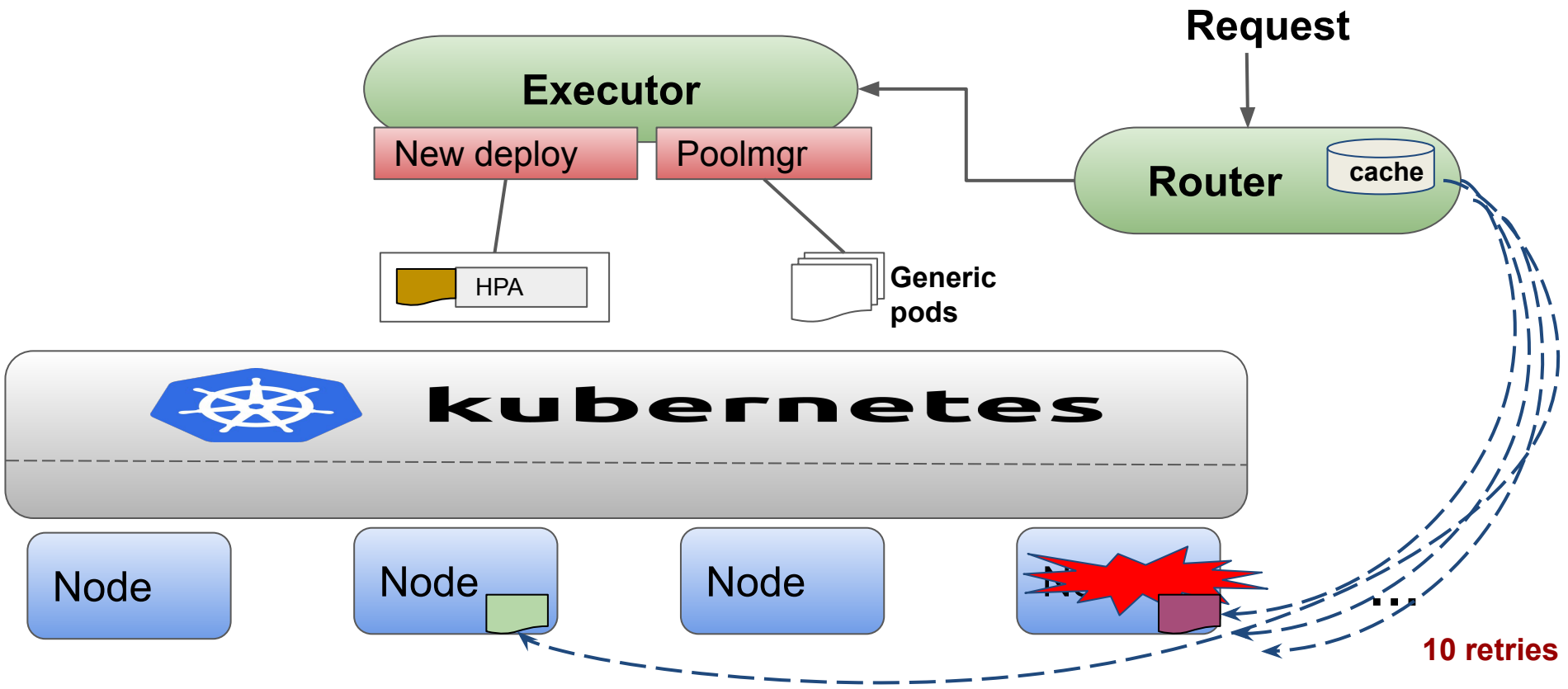
- Proposed a HA approach for FaaS based on active standby
- Implemented approach in an open-source FaaS platform, namely Fission
- Compared with the retry-based approach

Fission Architecture

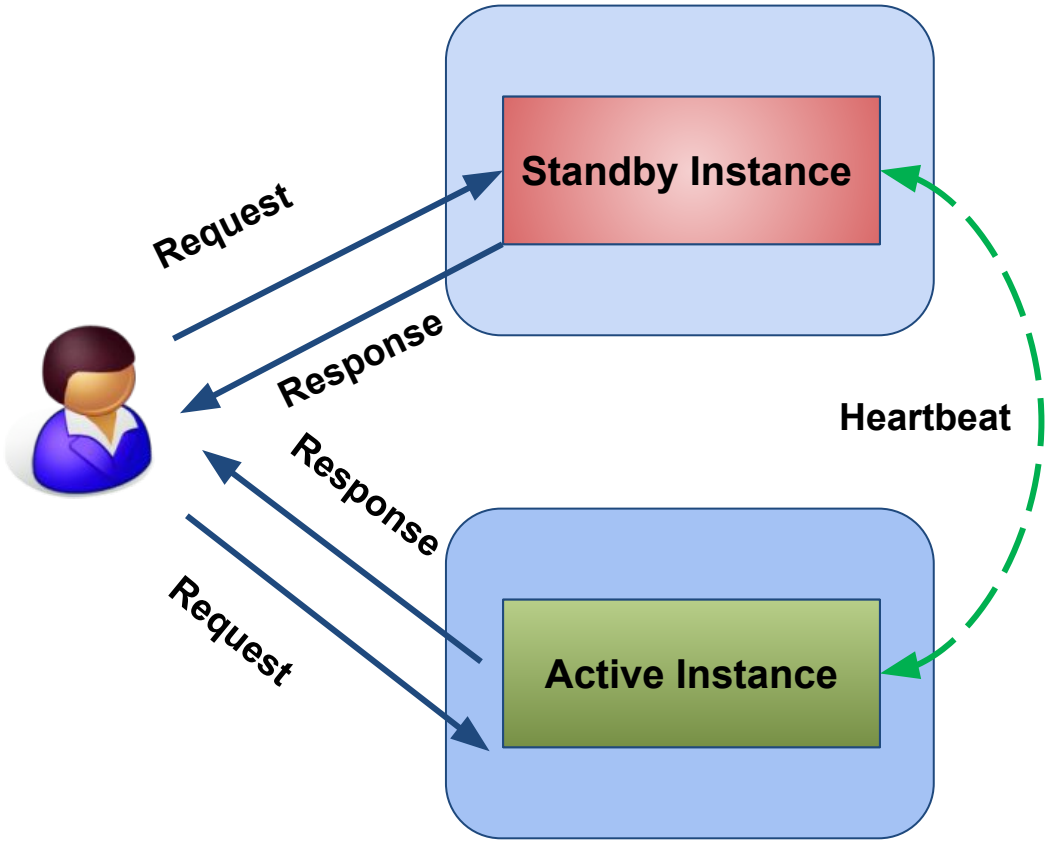


Retry Mechanism in Fission

Fission Vanilla

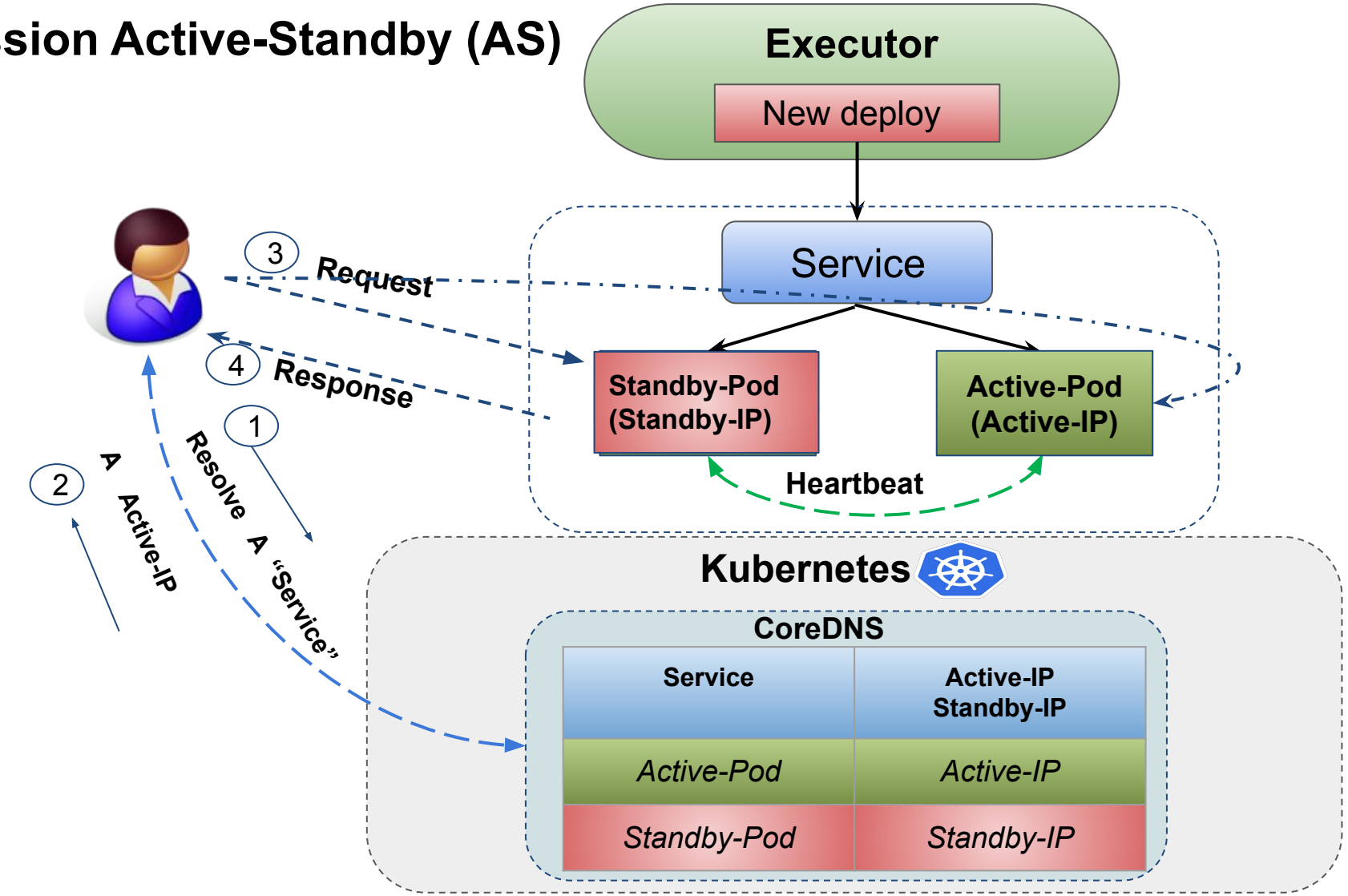


Active-Standby Approach



Implementation in Fission

Fission Active-Standby (AS)



Experimental Setup

❑ FaaS Frameworks

- Fission vanilla
- Fission AS

❑ Workload

- 3000 requests during 5 minutes

❑ Fault Injection

- Function pod failure at a random time between 30 s and 60 s
- Node crash 30 s after the beginning of the workload execution

❑ Environment Setup

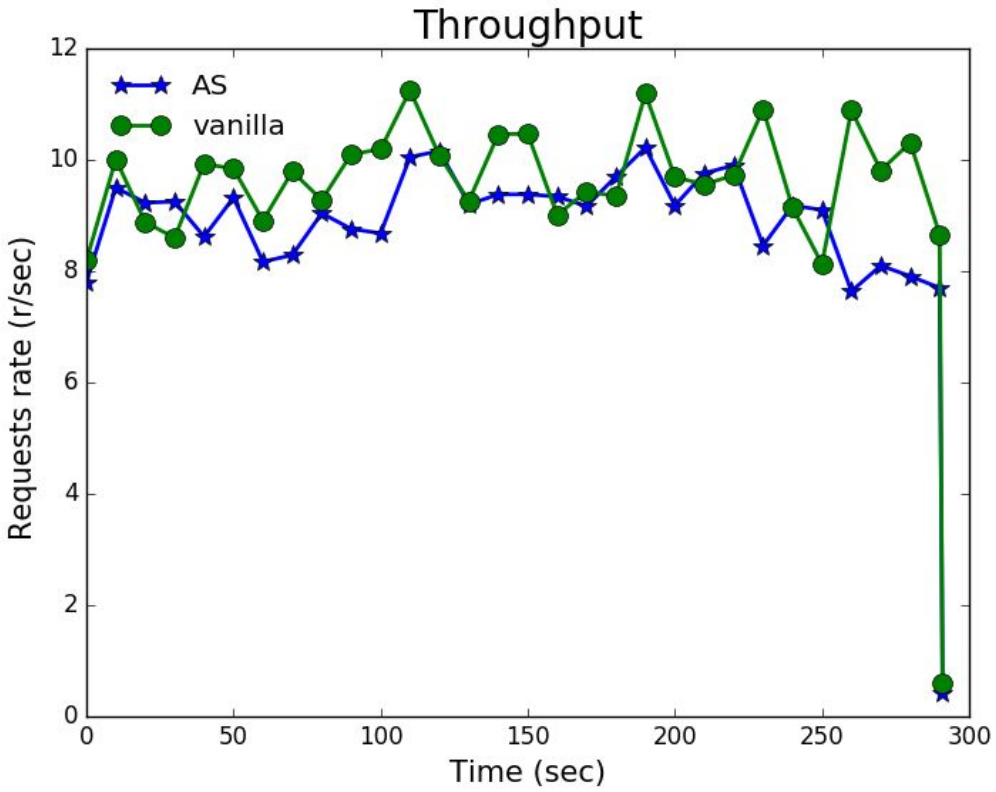
- Functions : Fibonacci.py, Guestbook.py
- 7 nodes (5 for the cluster, 1 to invoke functions and another to inject faults)
- Scenarios:
  - Pod failure
  - Node failure

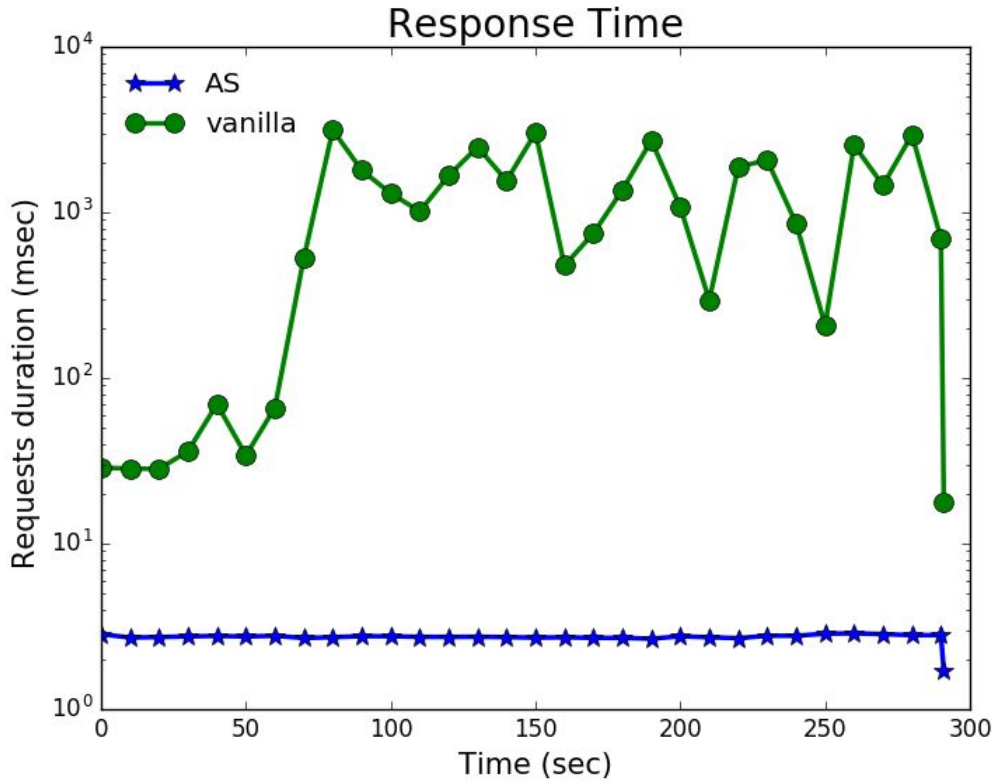
❑ Metrics

- Throughput
- Response Time
- Recovery Time

Performance Results: (1) Pod Failure

Guestbook Application

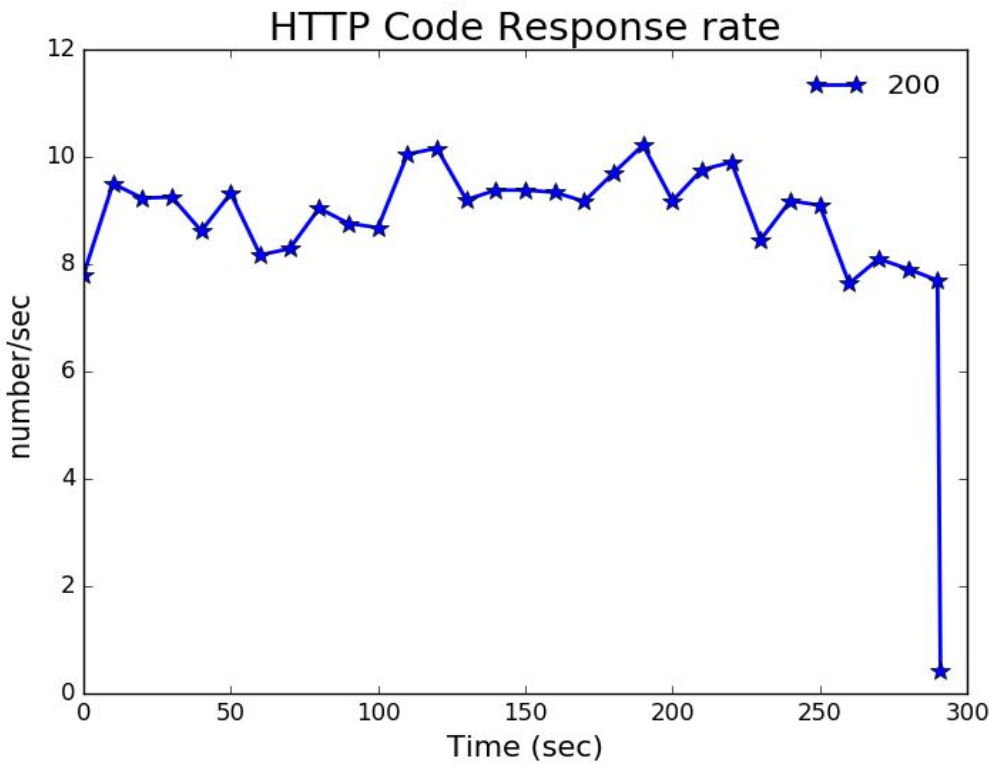




User Perception : (1) Pod Failure

Fission Vanilla

Fission AS



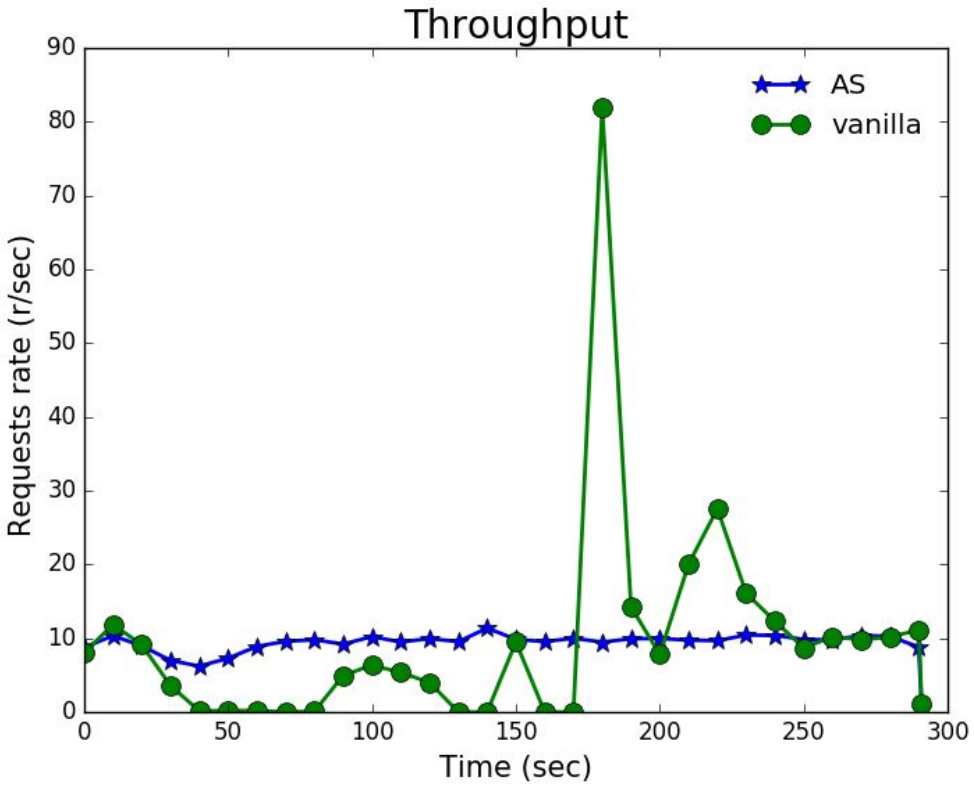
Availability Results: (1) Pod Failure

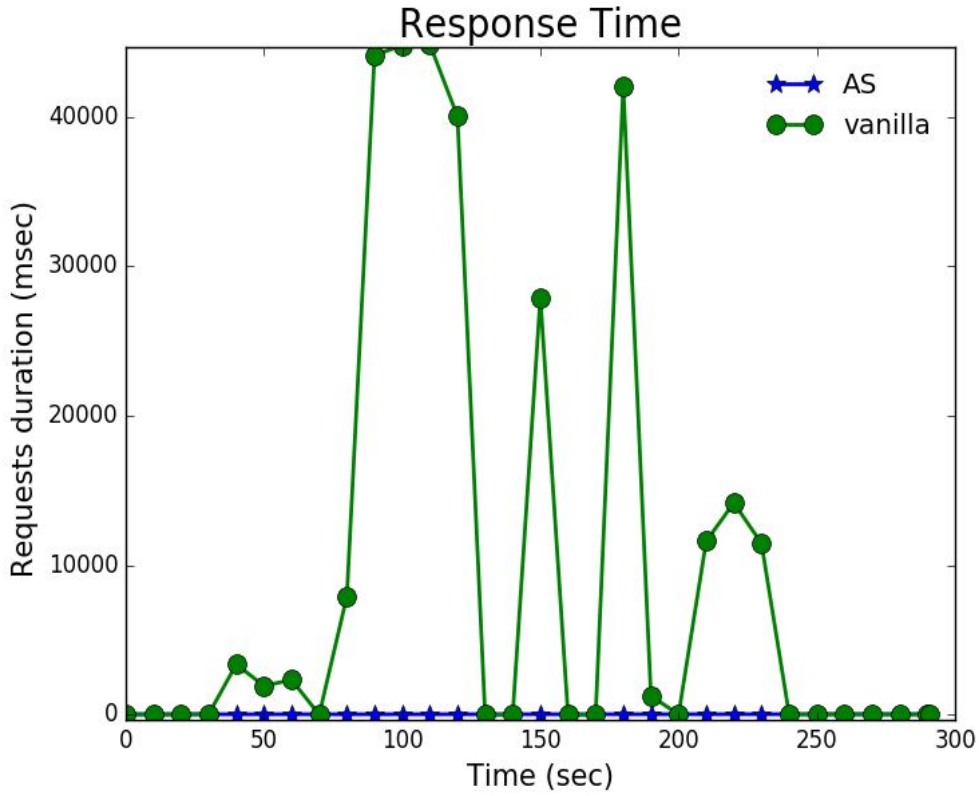
Recovery Time

	Fission Vanilla	Fission AS
Guestbook Application	3.614s	1.528s

Performance Results: (2) Node Failure

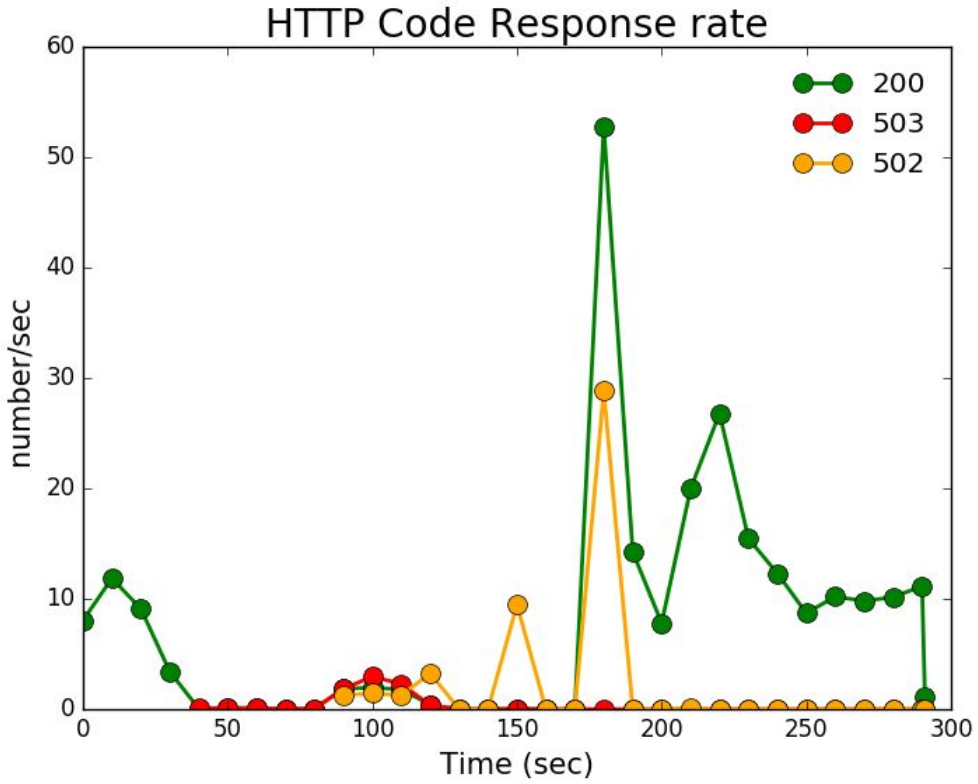
Guestbook Application



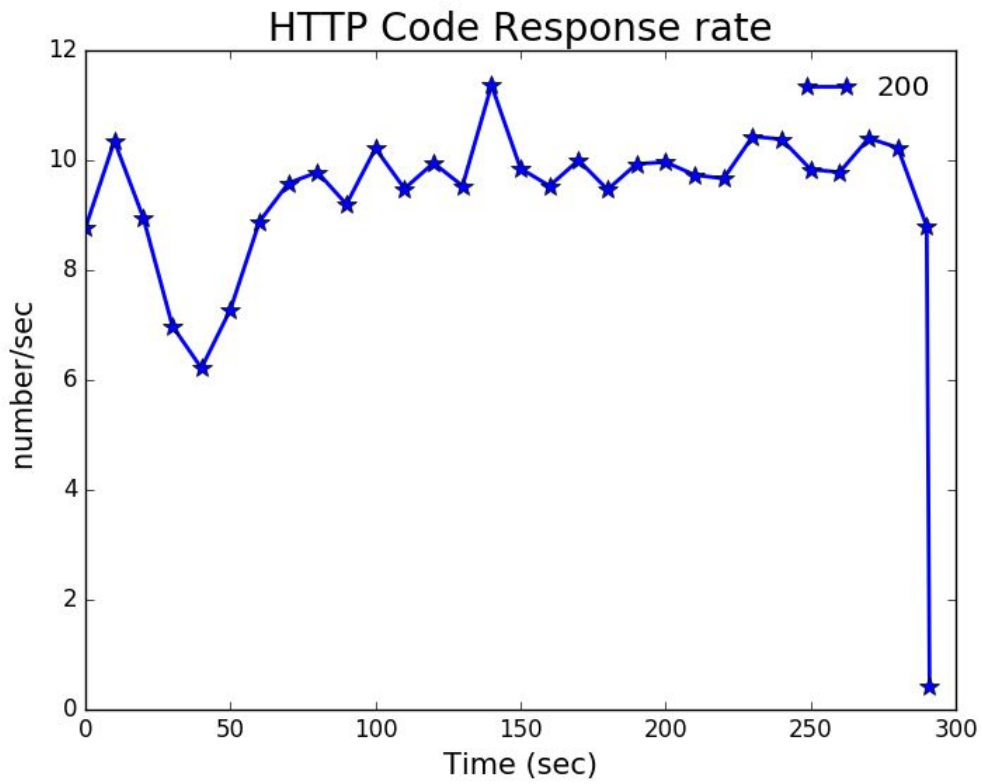


User Perception : (2) Node Failure

Fission Vanilla



Fission AS



Availability Results: (2) Node Failure

Recovery Time

	Fission Vanilla	Fission AS
Guestbook Application	2min39s	6.194s

Conclusion & Future Work

- Experiments showed that the Active-Standby approach outperforms the one based on the Retry mechanism in terms of response time and availability
- Future work directions
  - Investigate additional fault-tolerance techniques applicable in the FaaS context, such as check-point/restart, logging
  - Design a smart, fault-tolerant system for FaaS