ProFaaStinate: Delaying Serverless Function Calls to Optimize Platform Performance

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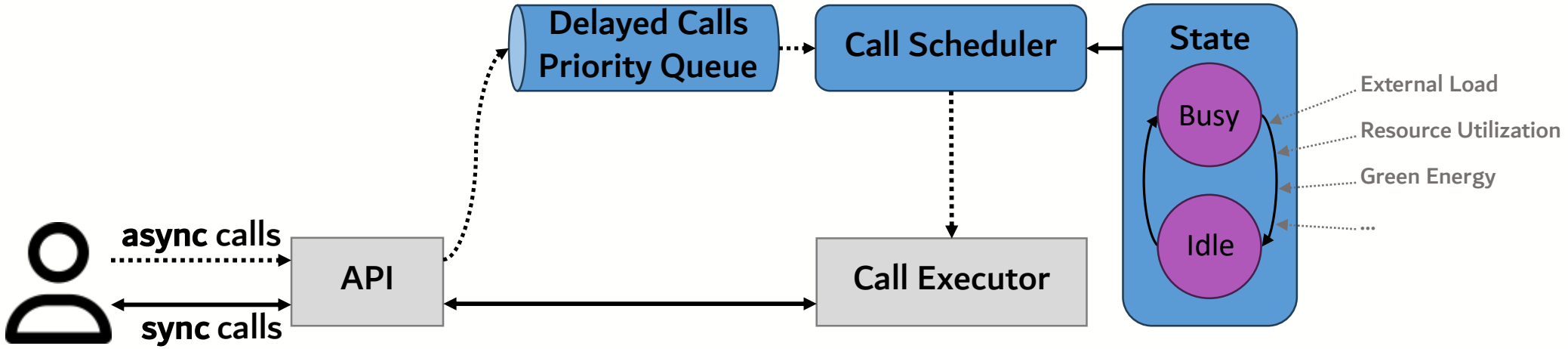
Serverless

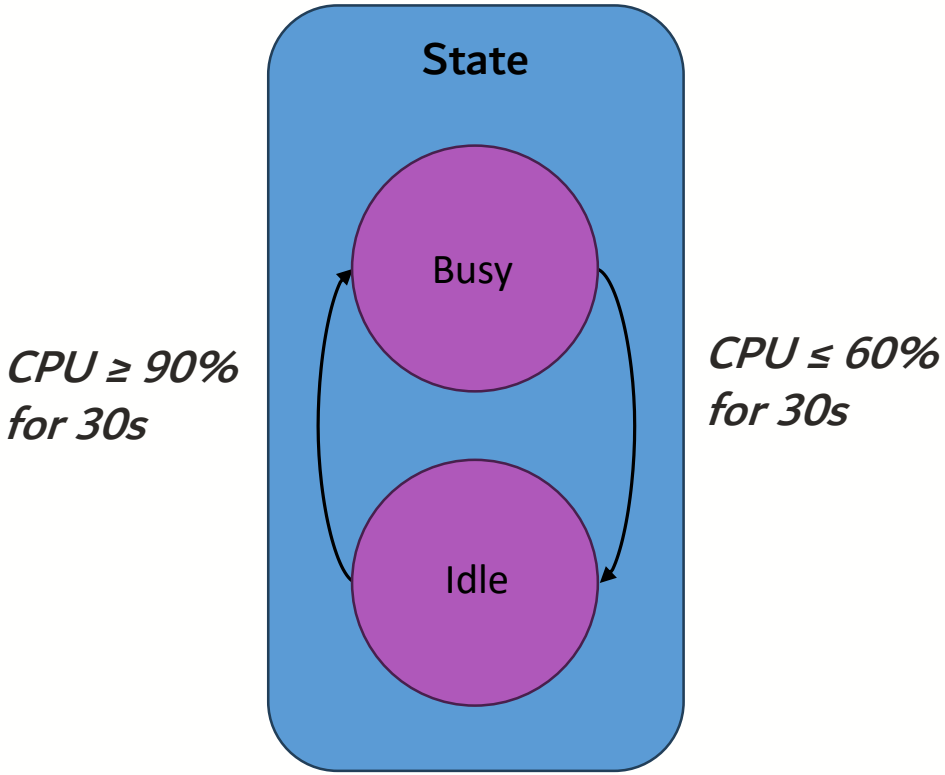
Just the Code + Serverless Platform =

- (Infinite) Scalability + Elasticity
- Hidden Abstractions
- Unreliable Performance
- Expensive?

ProFaaStinate



Scheduler

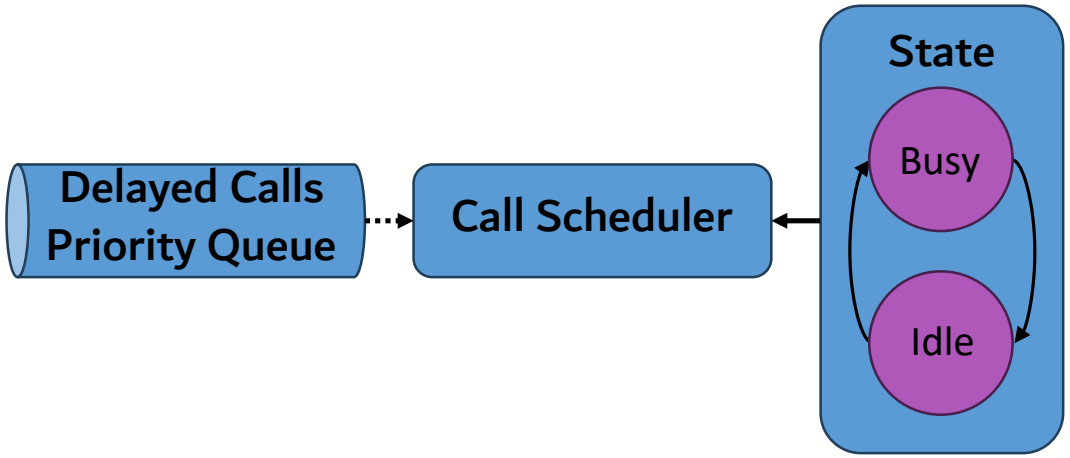


Feedback Control System

Plattform-specific Resource Bottlenecks

Watch out for *hunting oscillation*!

Queue



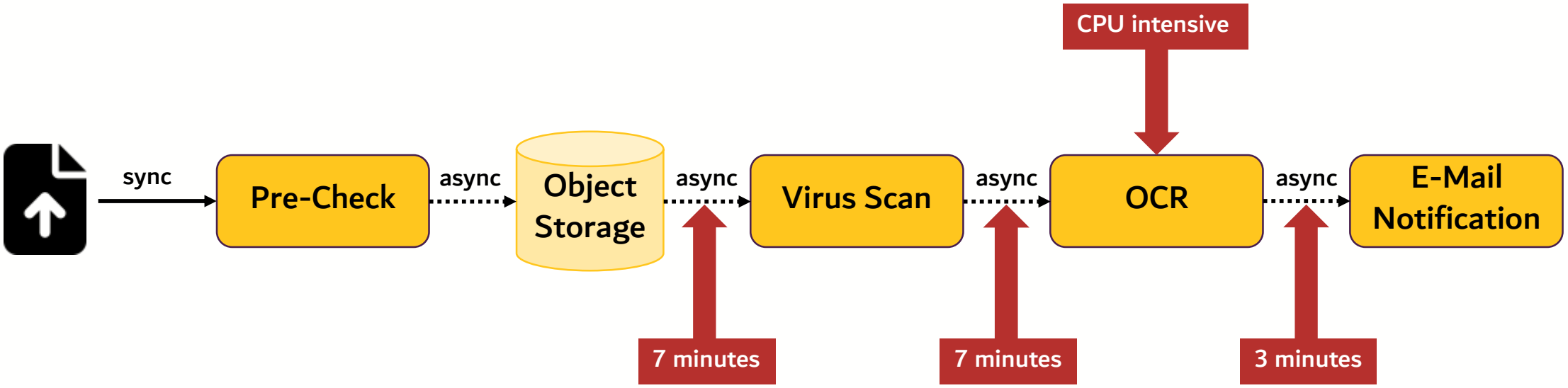
Scheduler takes calls from Queue.

Busy State: Only calls that expire soon

Idle State: Calls that expire soon, but always at least N

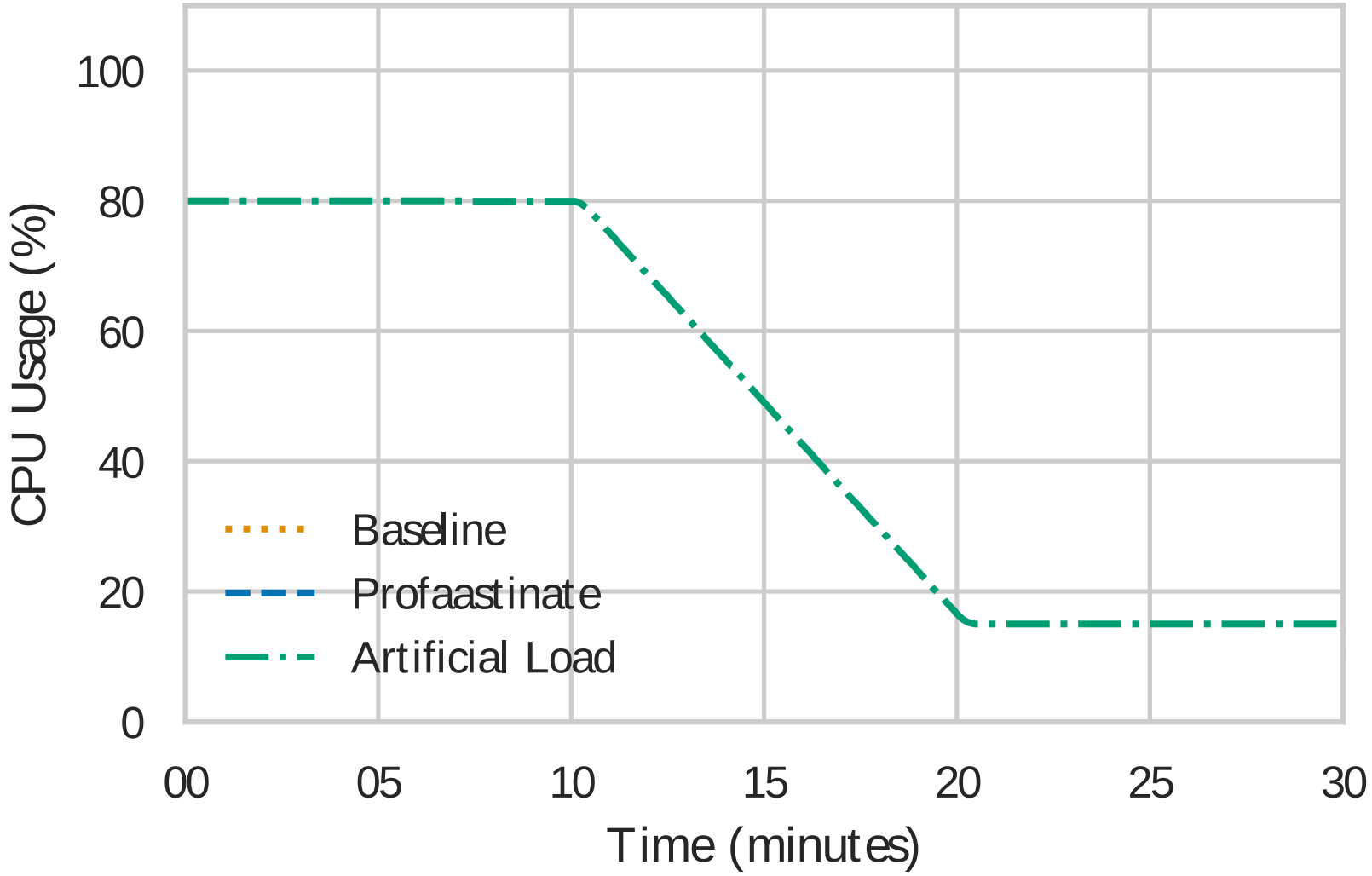
→ Tune based on normal load on platform

Evaluation: Use Case

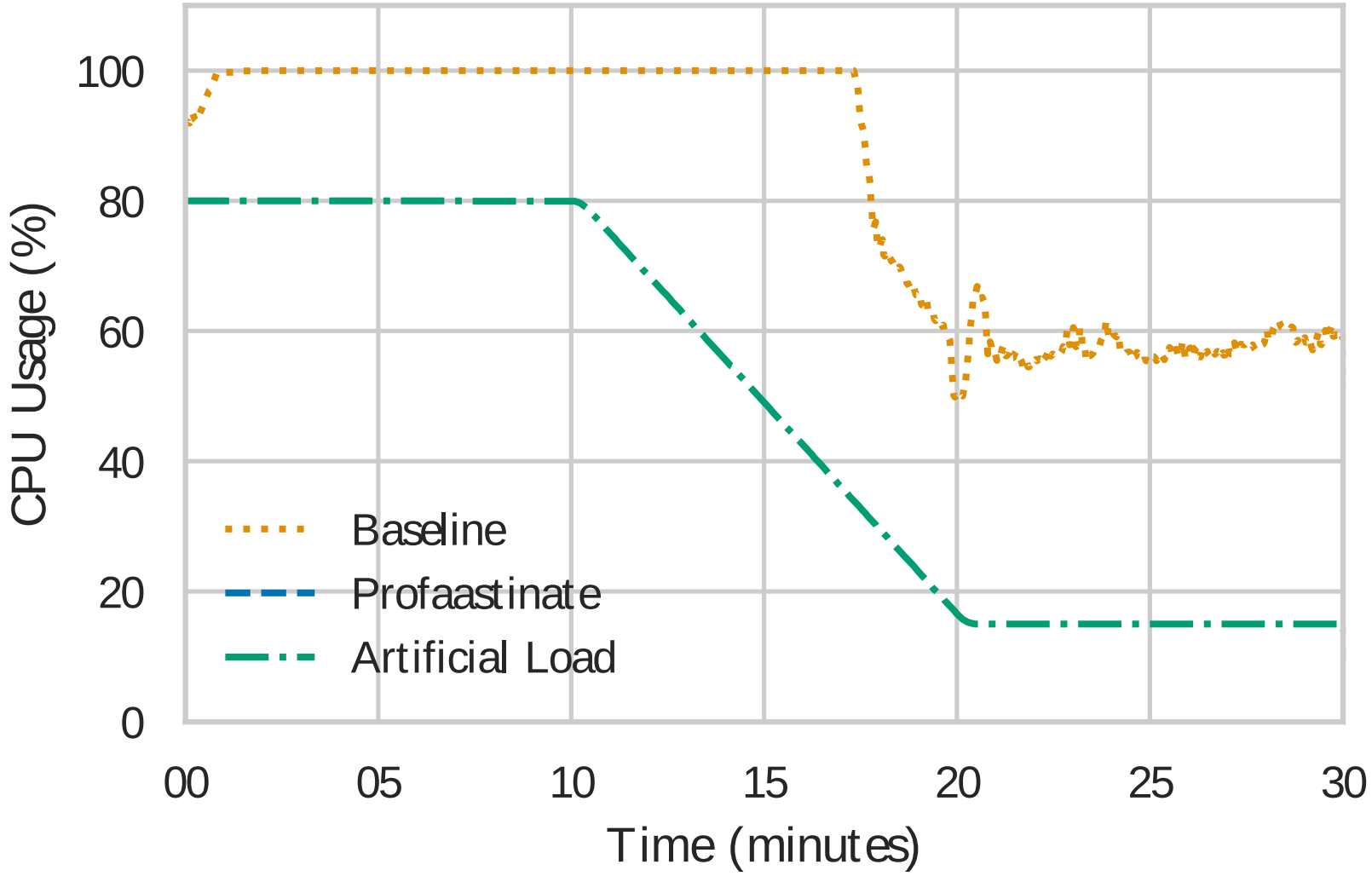


=> 1 req/s for 30m

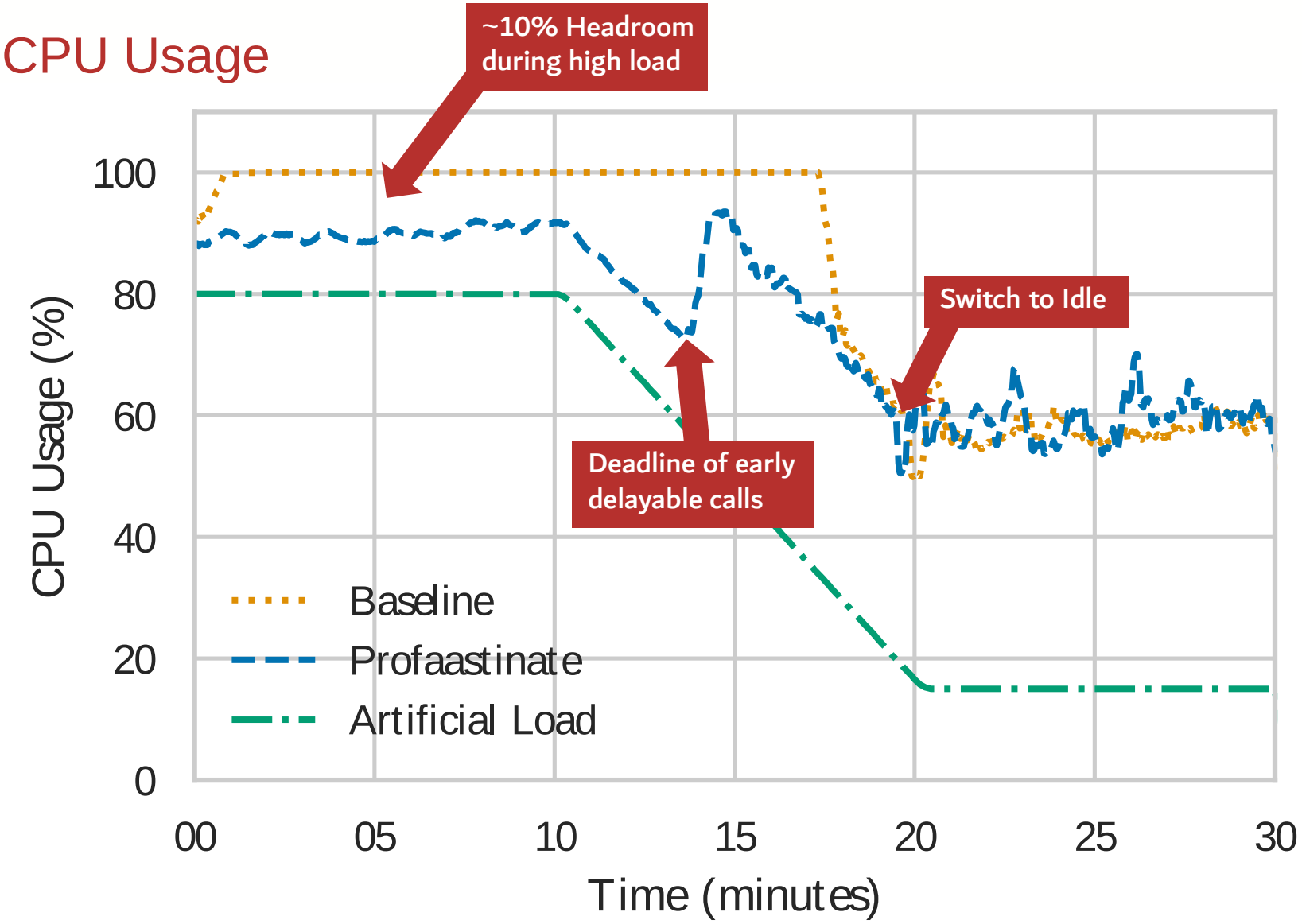
Evaluation: CPU Usage



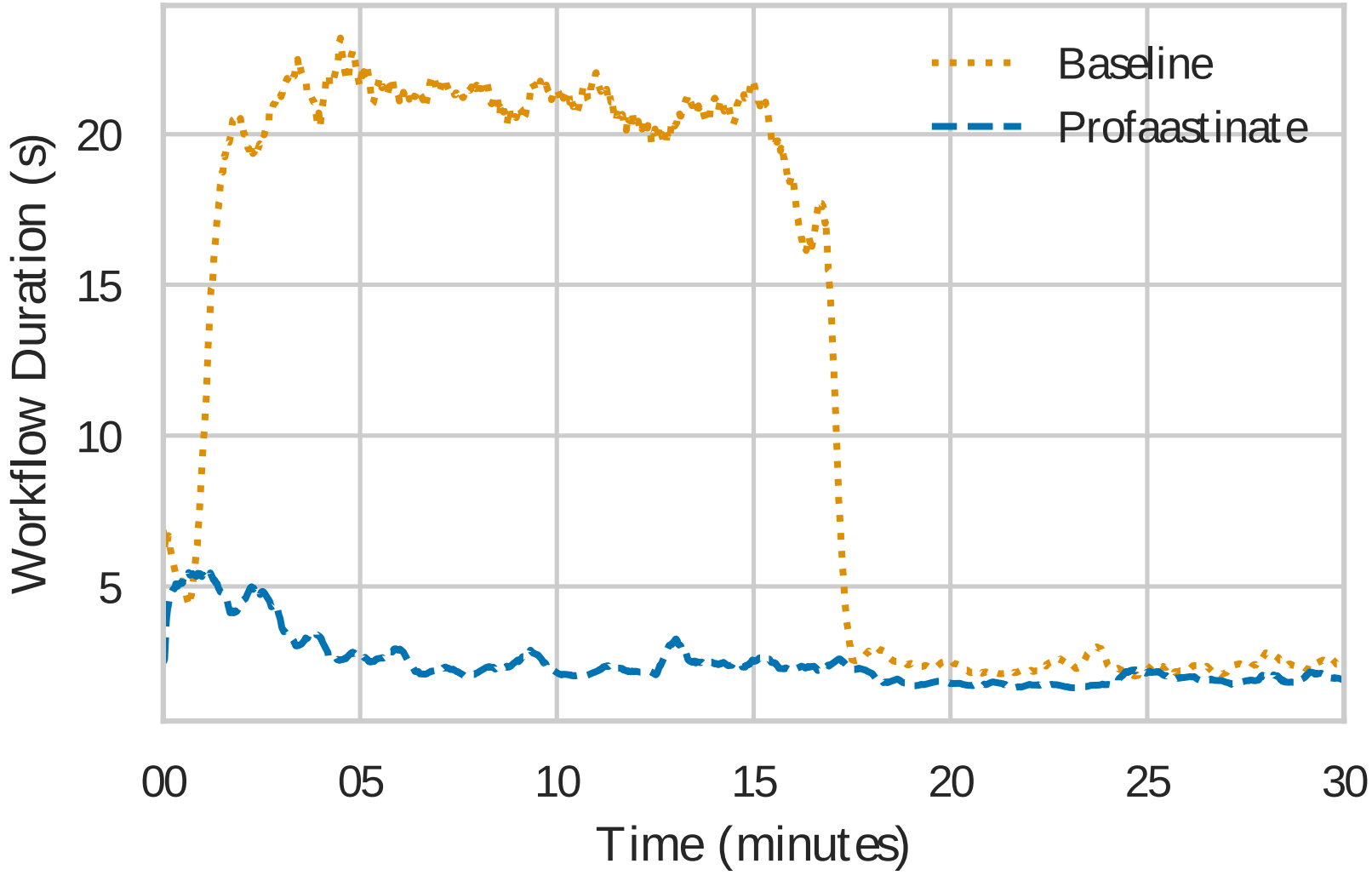
Evaluation: CPU Usage

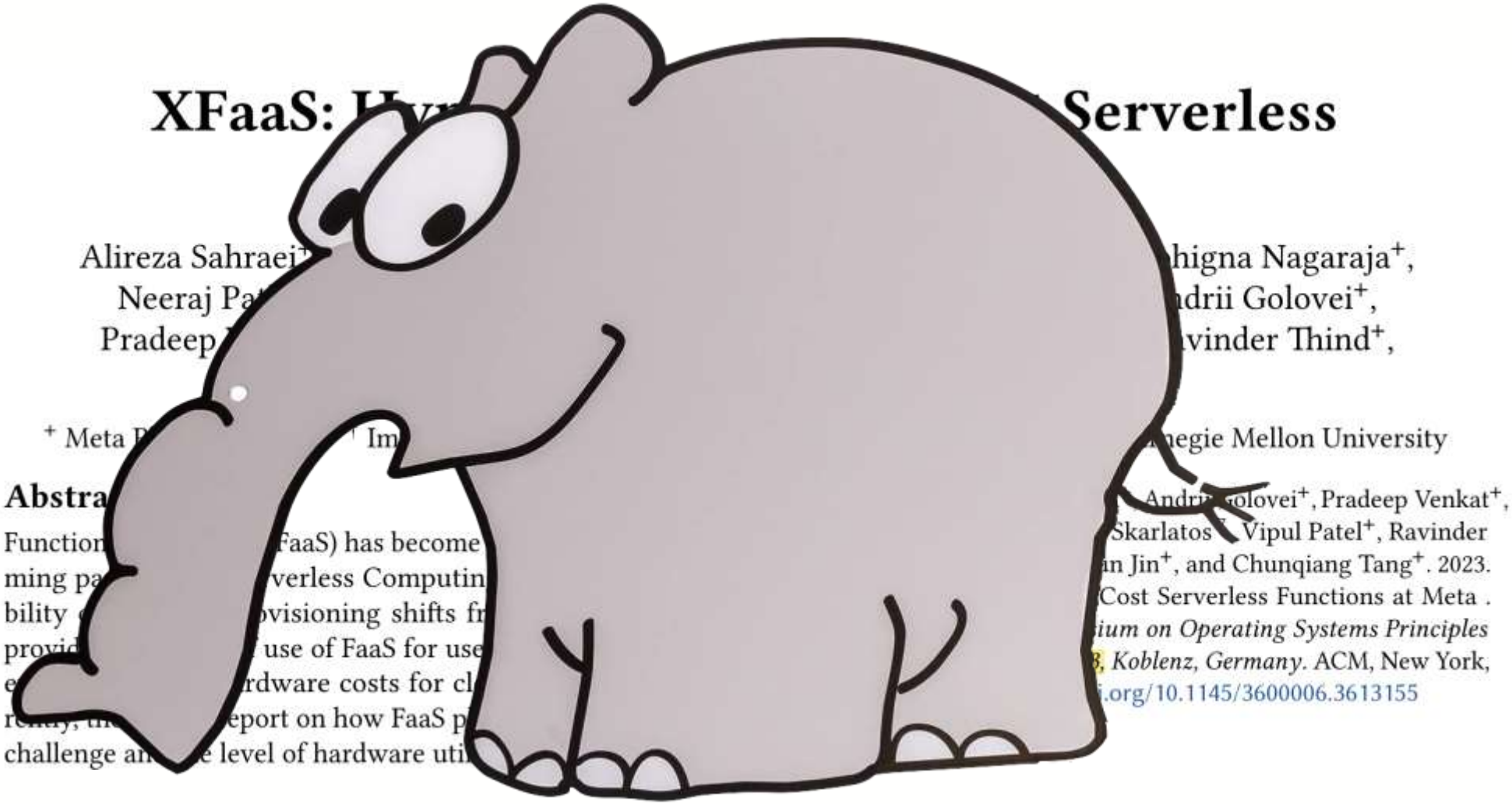


Evaluation: CPU Usage



Evaluation: Workflow Duration





XFaaS: Time-Shift

Solution for high variance of load. To reduce hardware costs, we intentionally provision XFaaS with hardware that is insufficient for its peak demand and then leverage several techniques to manage overload situations. First, it employs time-shift computing to postpone the execution of certain functions. Each function has a criticality and a deadline, with the deadline ranging from seconds to 24 hours. When XFaaS reaches its capacity limit, delay-tolerant functions are deferred to off-peak hours for execution. If the capacity is still

XFaaS: Evaluation

At Meta, we operate a hyperscale private cloud that includes a FaaS platform called *XFaaS*. XFaaS processes trillions of function calls per day on more than 100,000 servers spread across tens of datacenter regions. Due to the hyperscale of

XFaaS: Spiky Functions

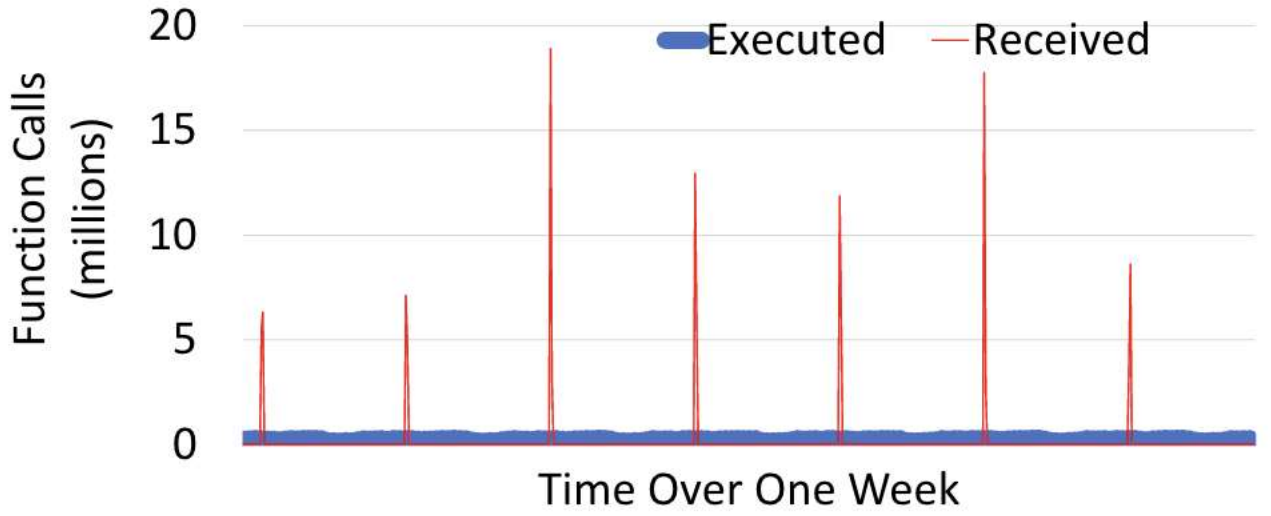


Figure 4. The load of a spiky function. This function allows its function calls to be executed with a 24-hour SLO. XFaaS leverages this property to spread out its function execution.

Conclusion

ProFaaStinate

Some serverless function calls can be delayed.

This can be used to “shave-off” load peaks.

Our scheduler uses two states: Idle and Busy.

Future Work: Scheduling Complexity (≃ Queue Complexity)

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Sources

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