CoreKube: An Efficient, Autoscaling and Resilient Mobile Core System

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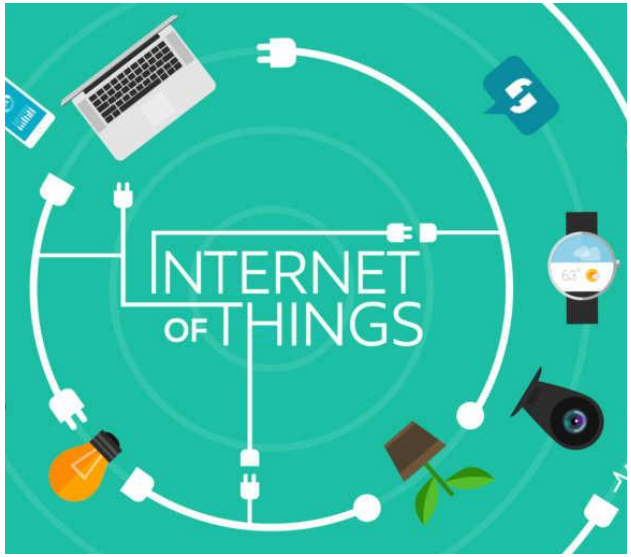
The University of Edinburgh

Motivation: Mobile Core Network Control Plane



Goal: Dynamically scale the core according to demand

How does a device (UE) attach to a mobile network?

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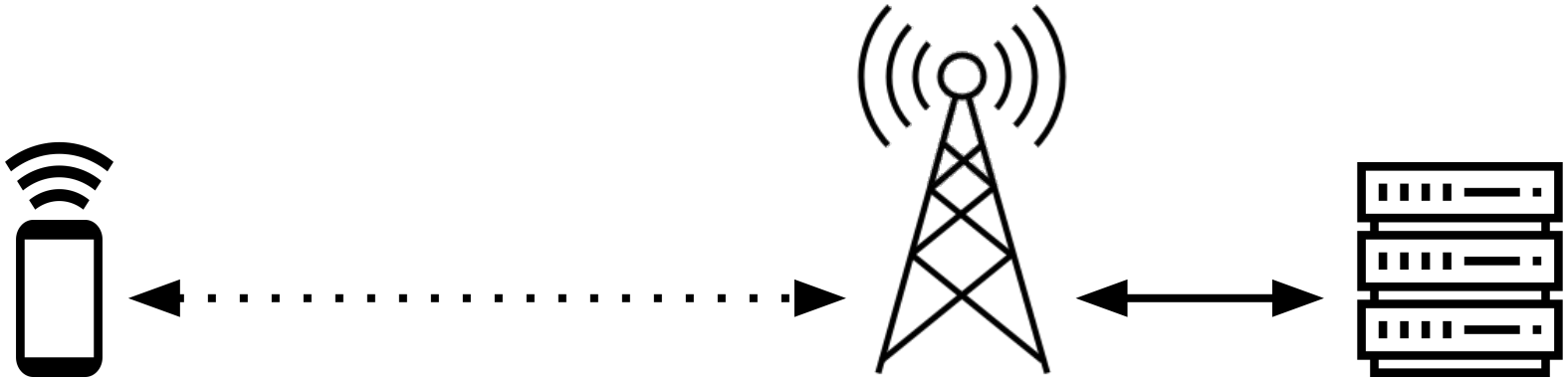
detach from

handover on

Not a straightforward send/receive



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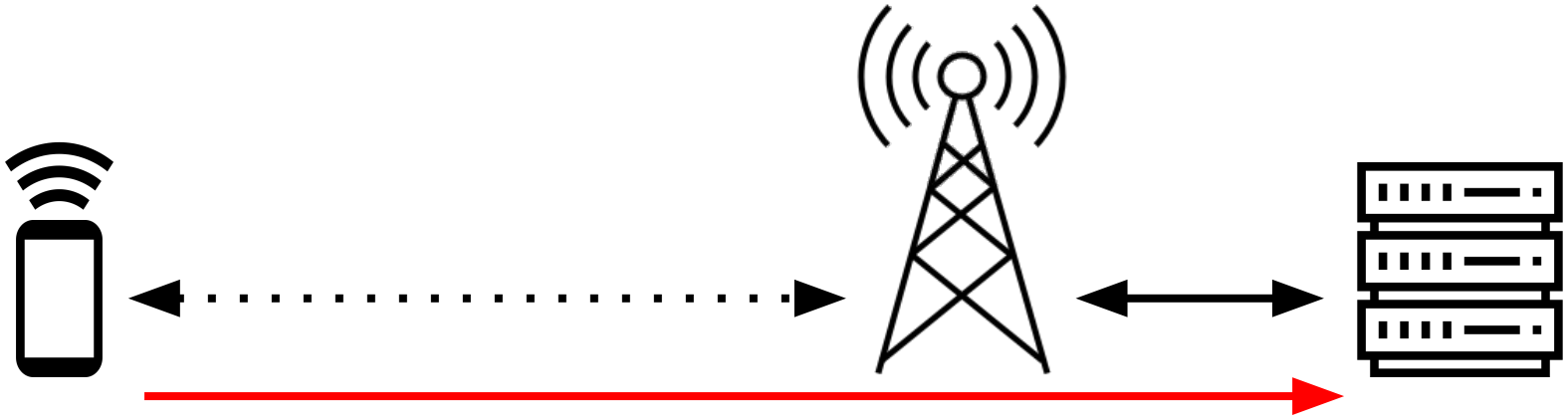

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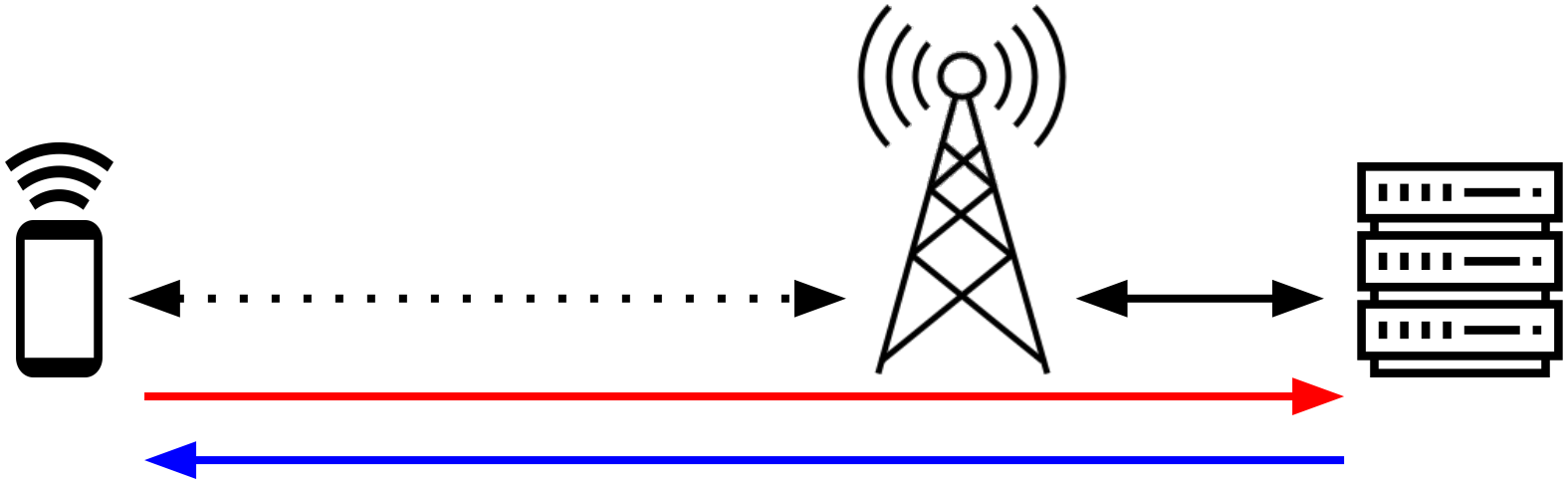
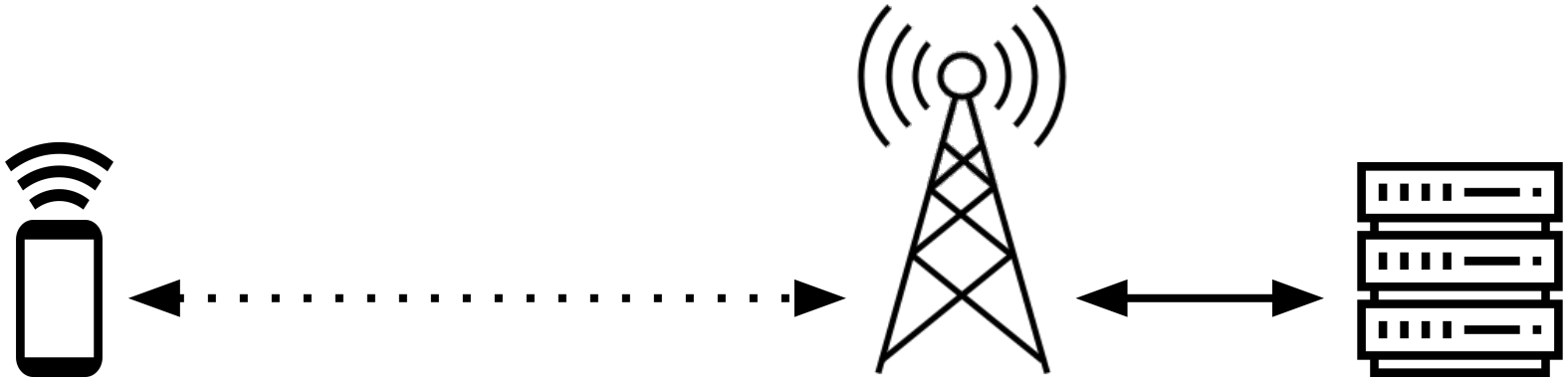


“Attach Procedure” contains multiple messages



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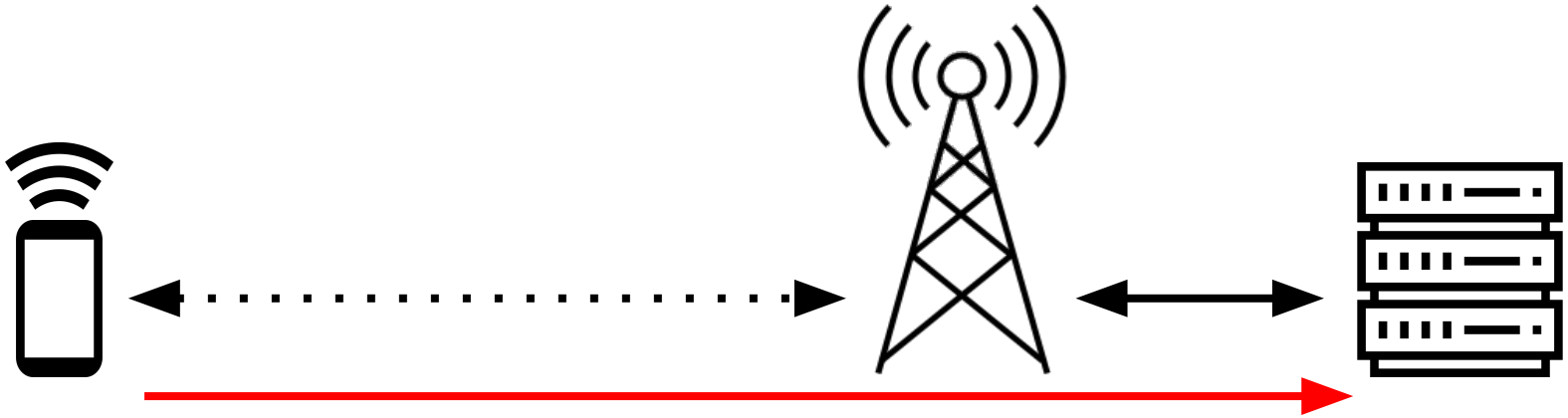

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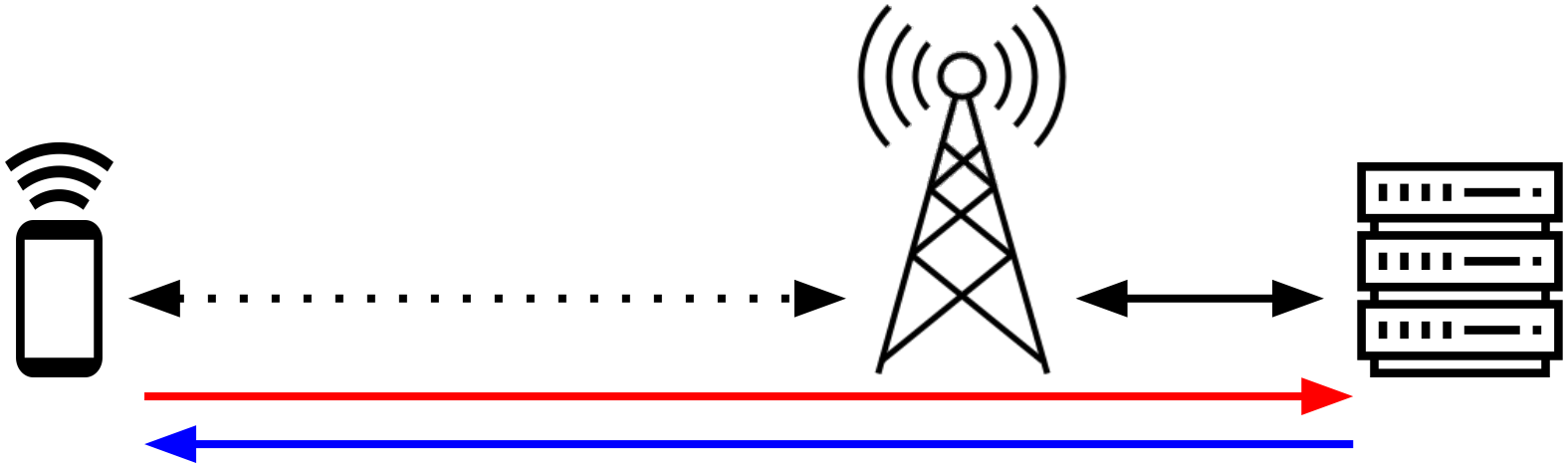

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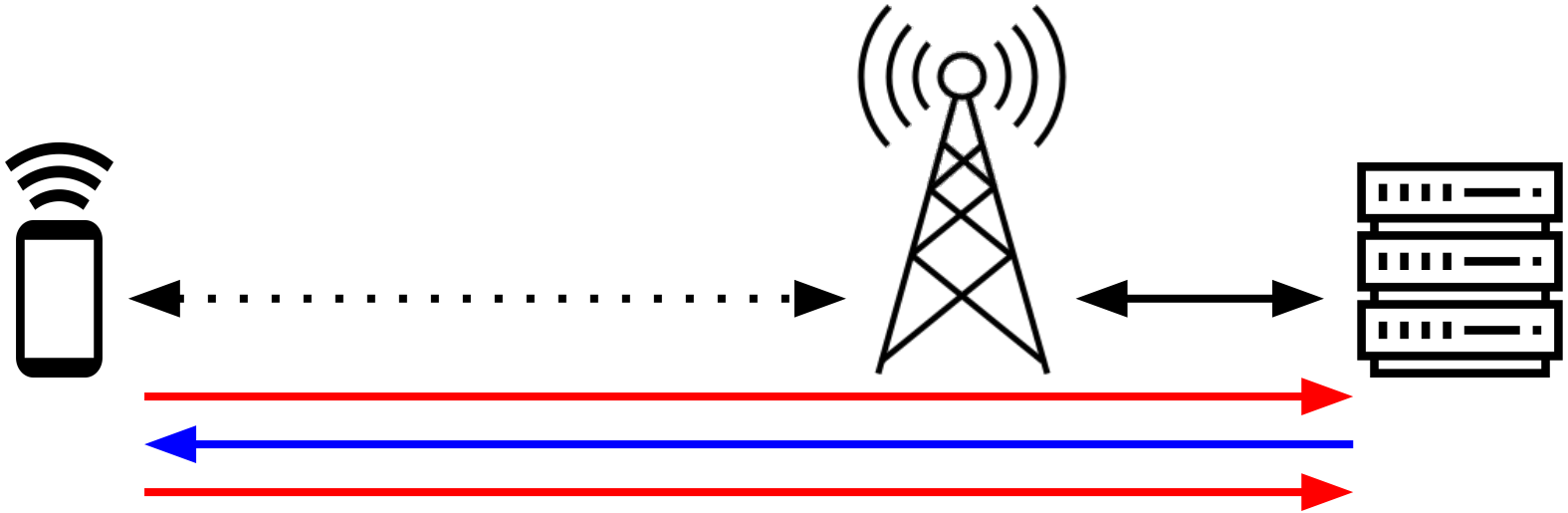

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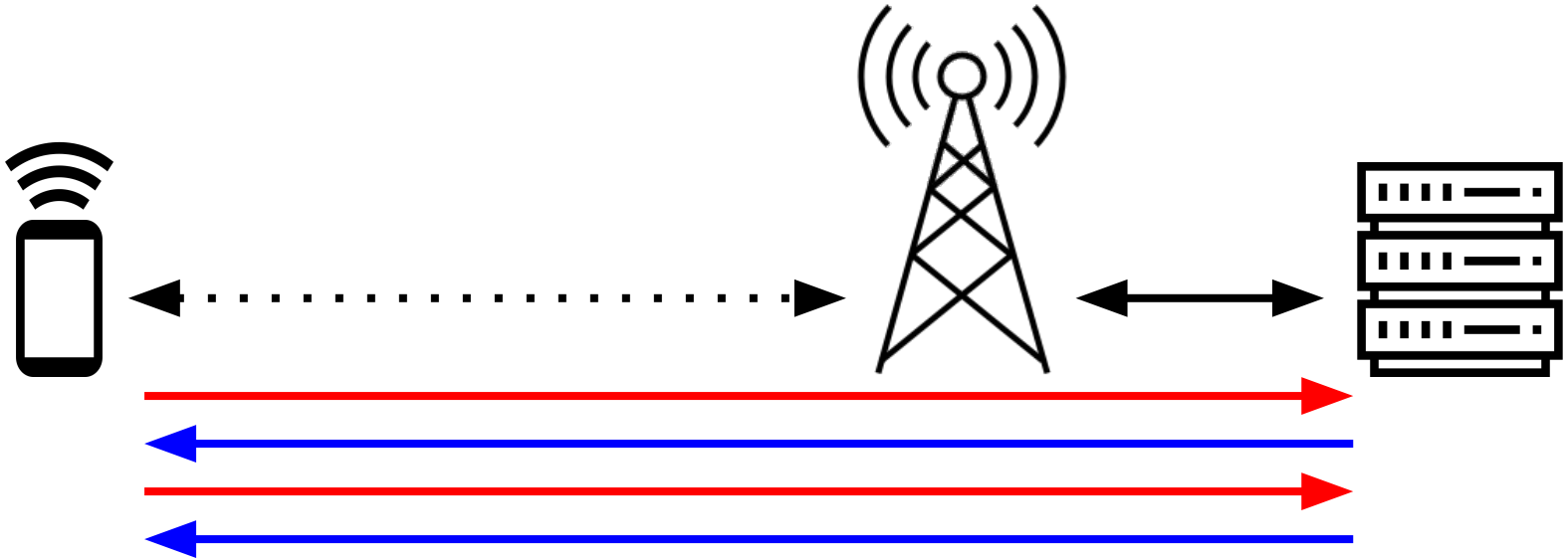

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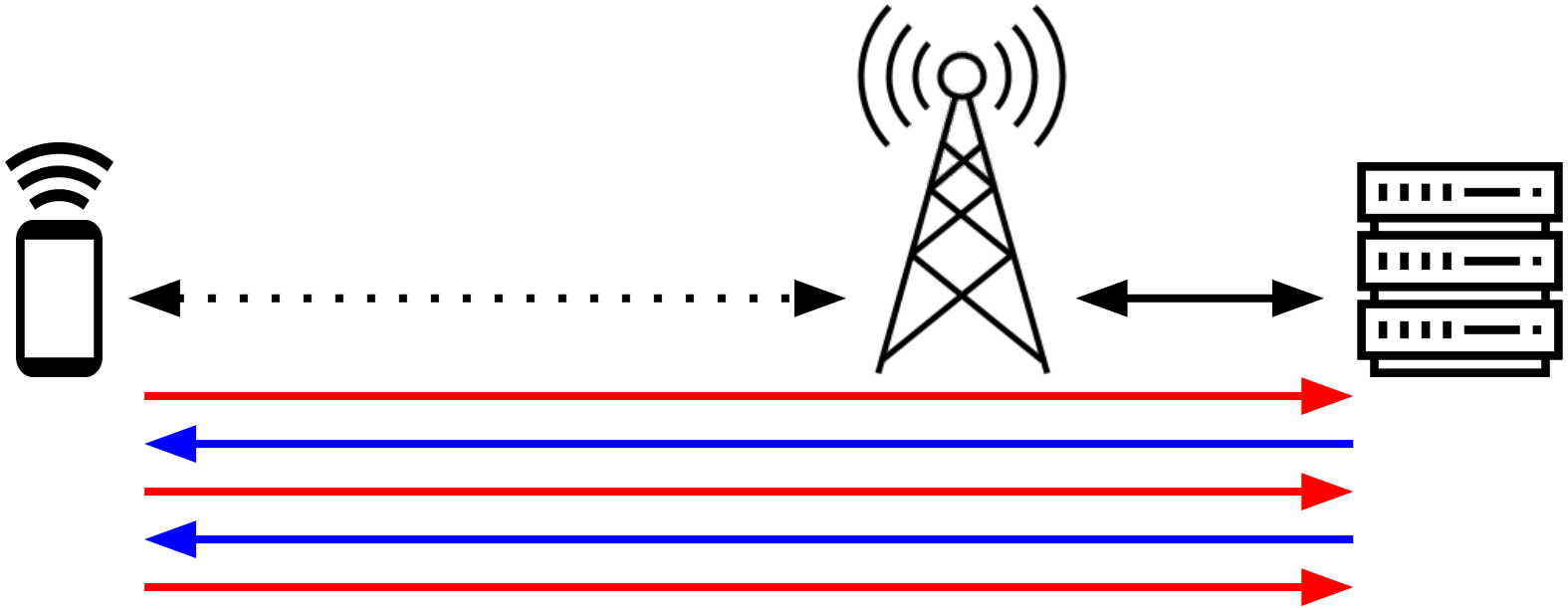

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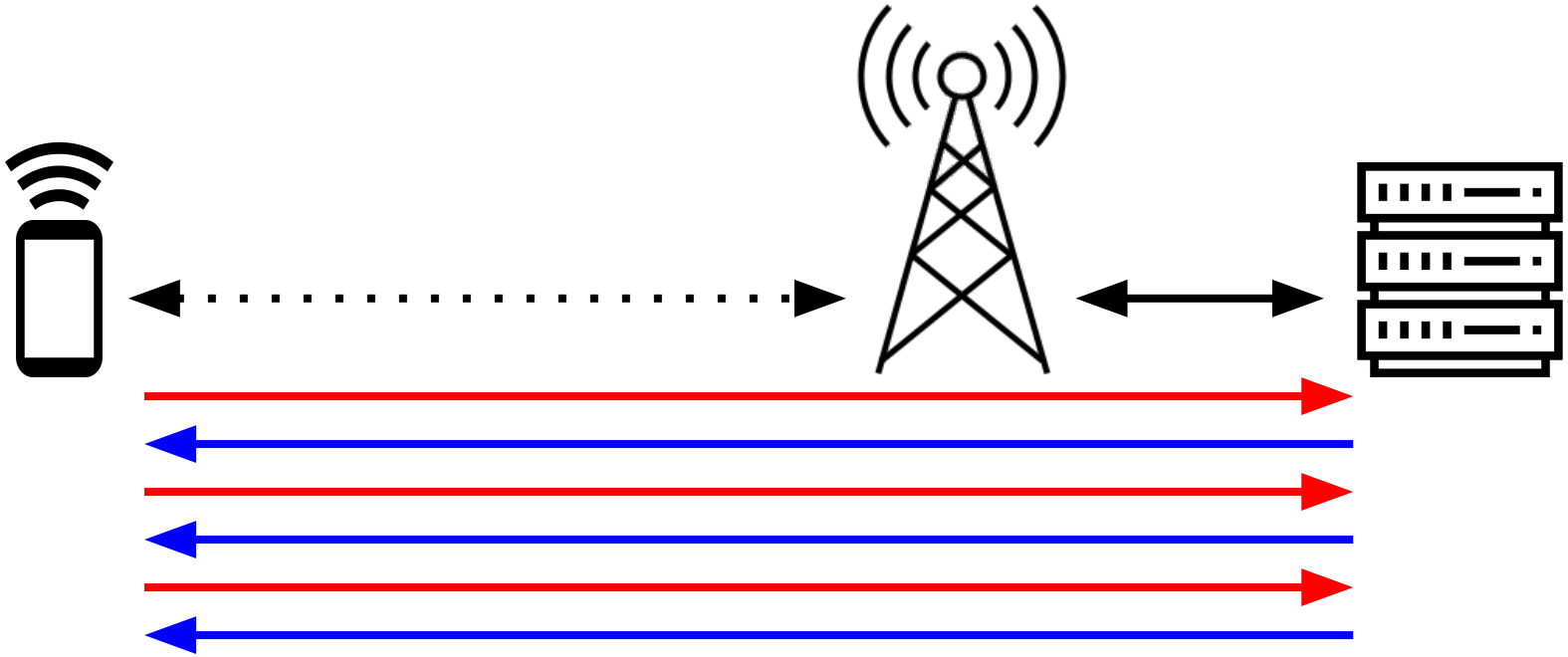
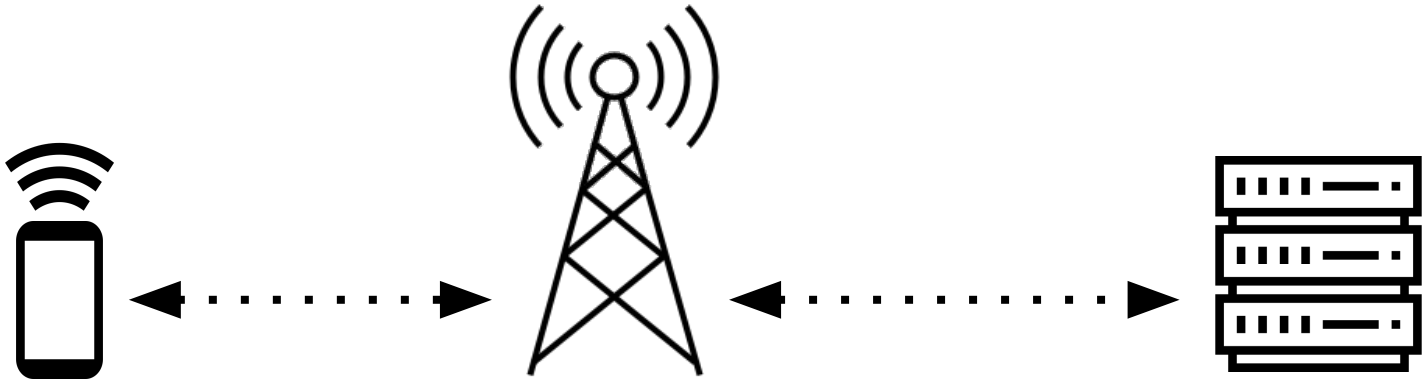


Challenges to Dynamically Scaling the Core

Challenge 1: Coupling between RAN and core



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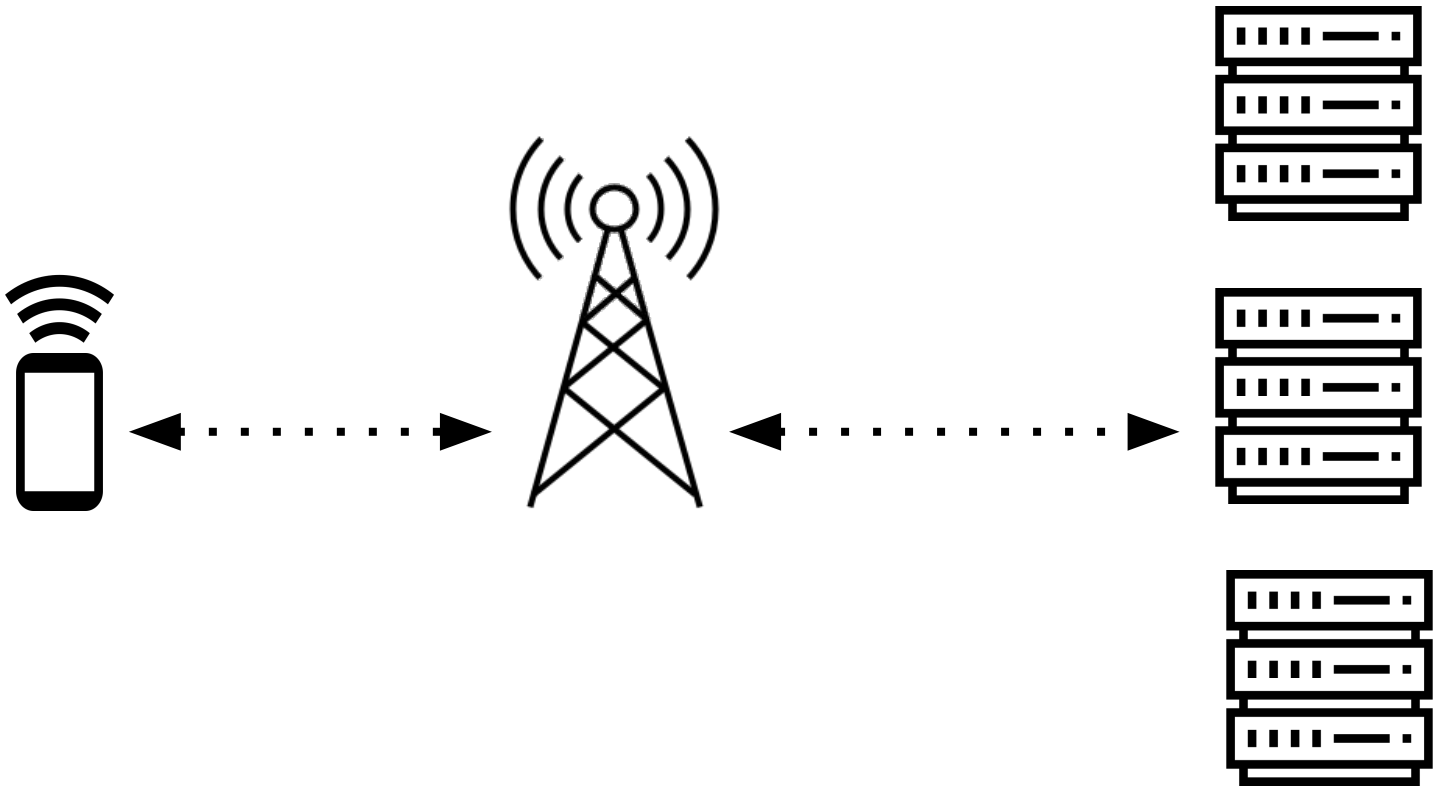

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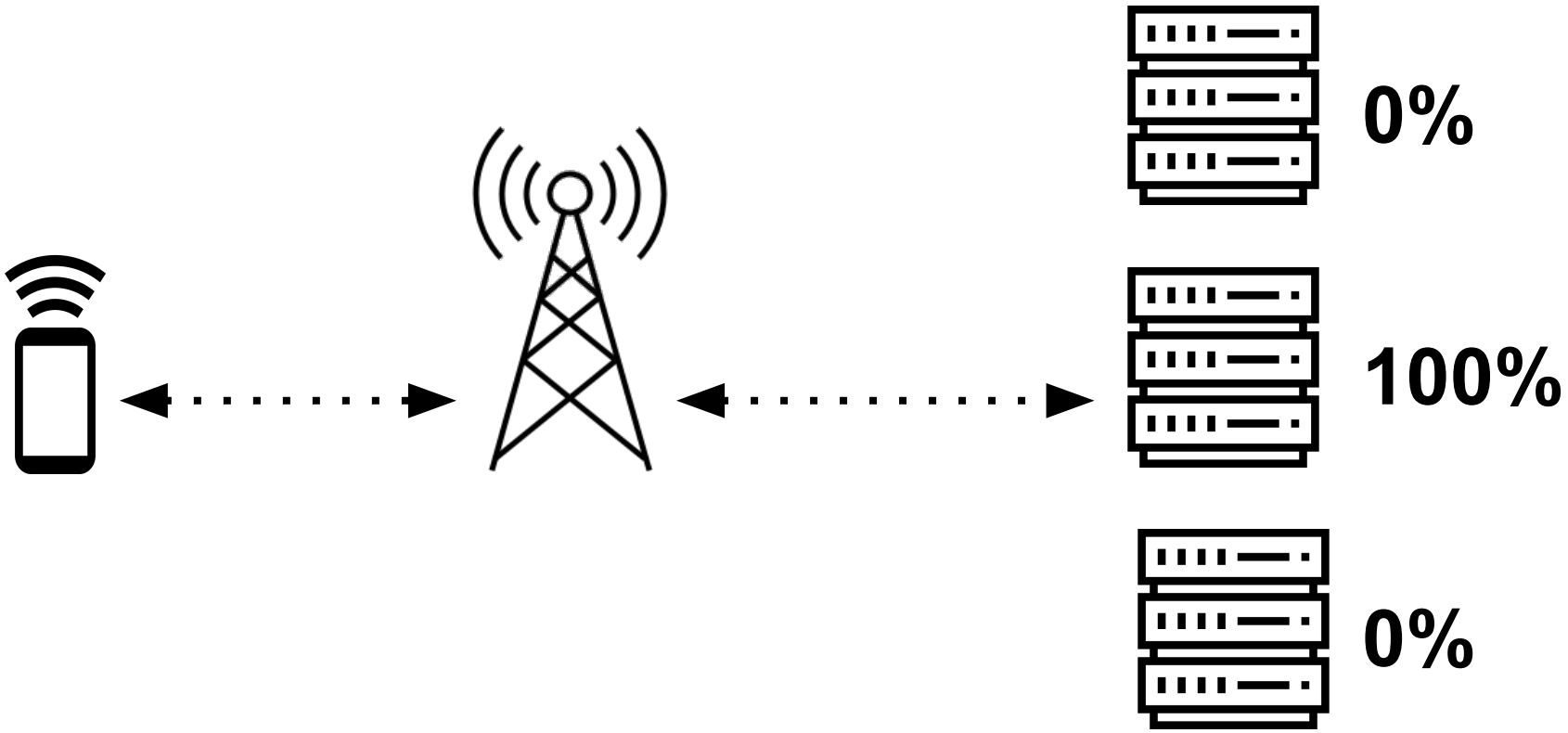
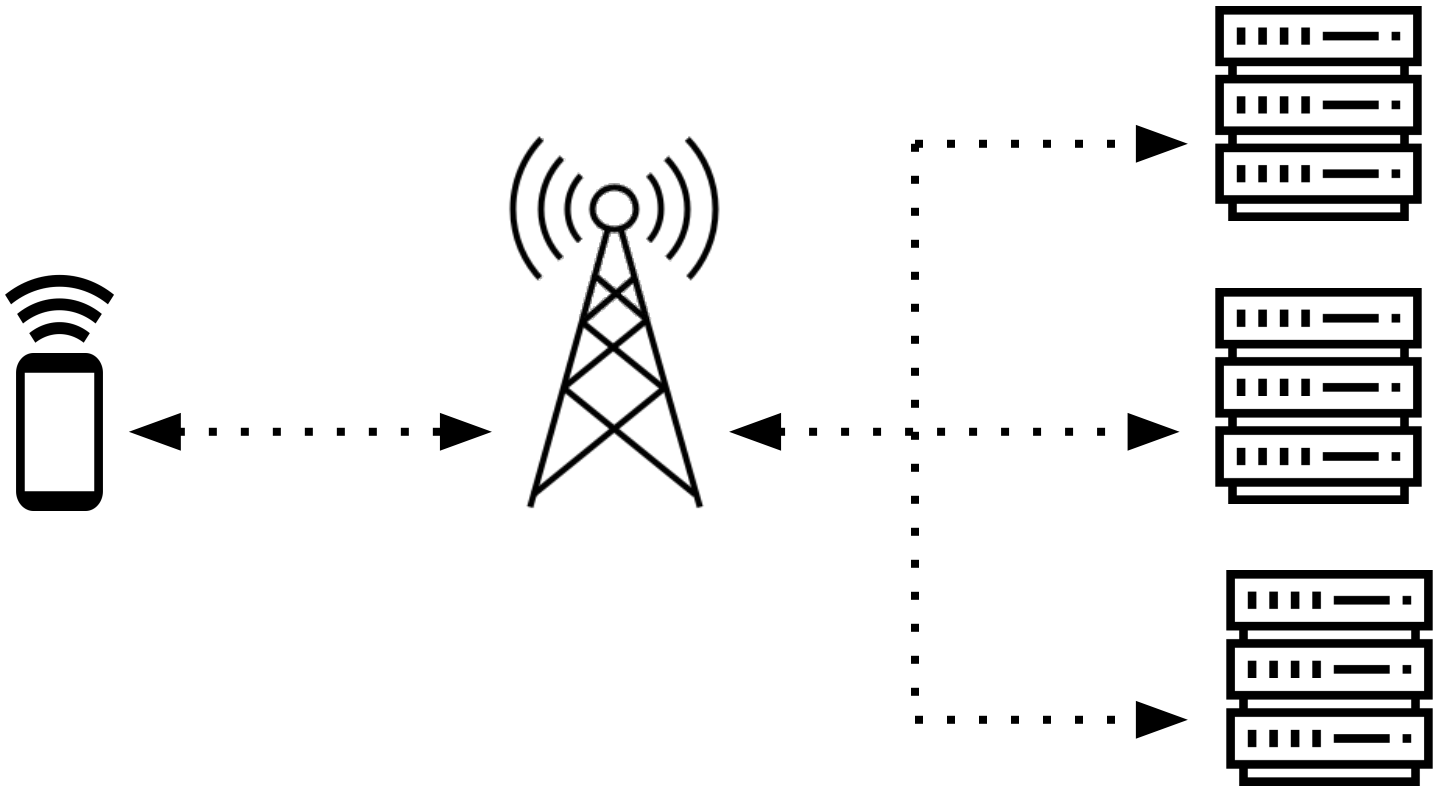


Challenge 2: Entanglement between processing and state



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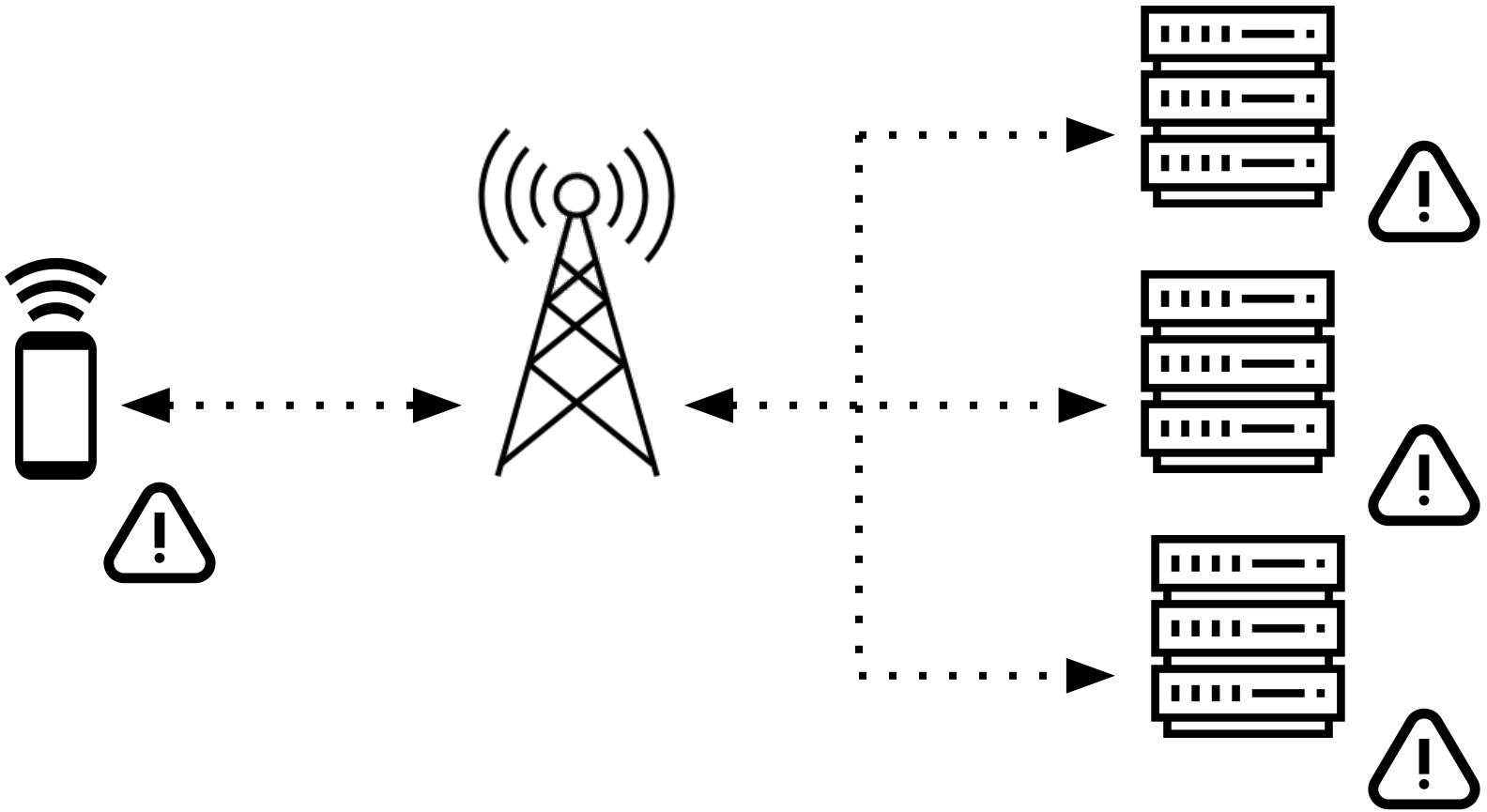
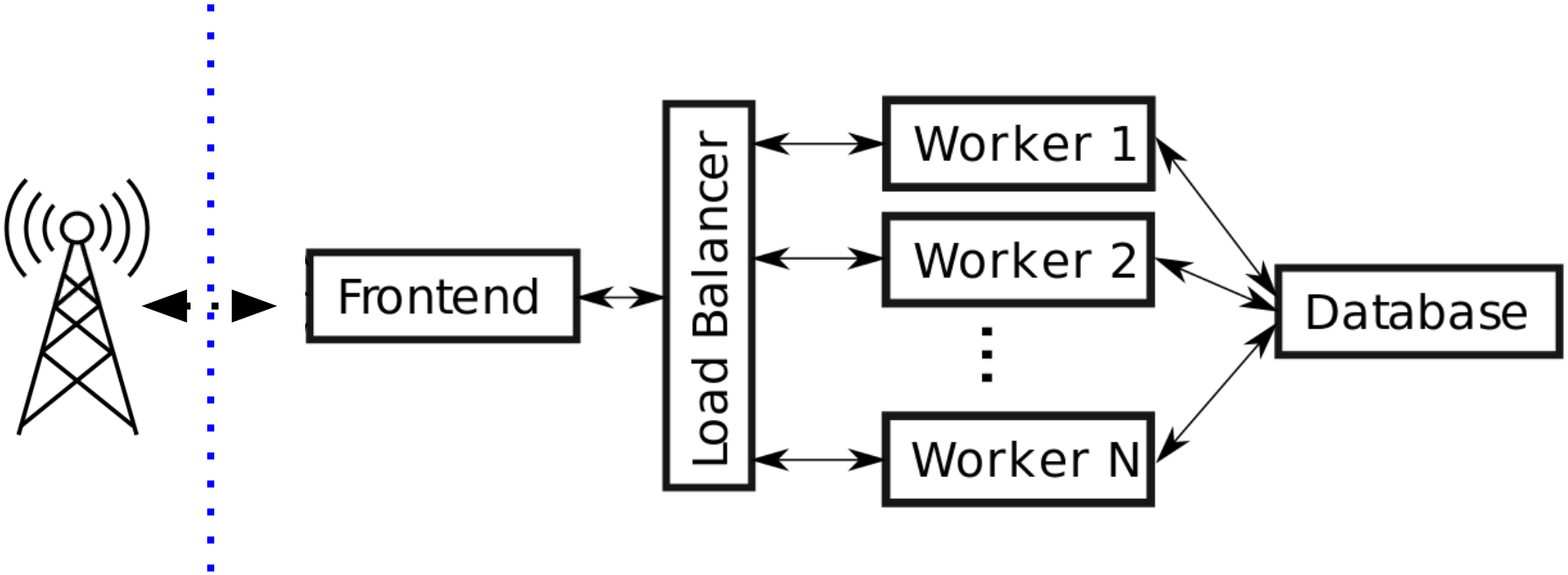


Our Design… CoreKube!



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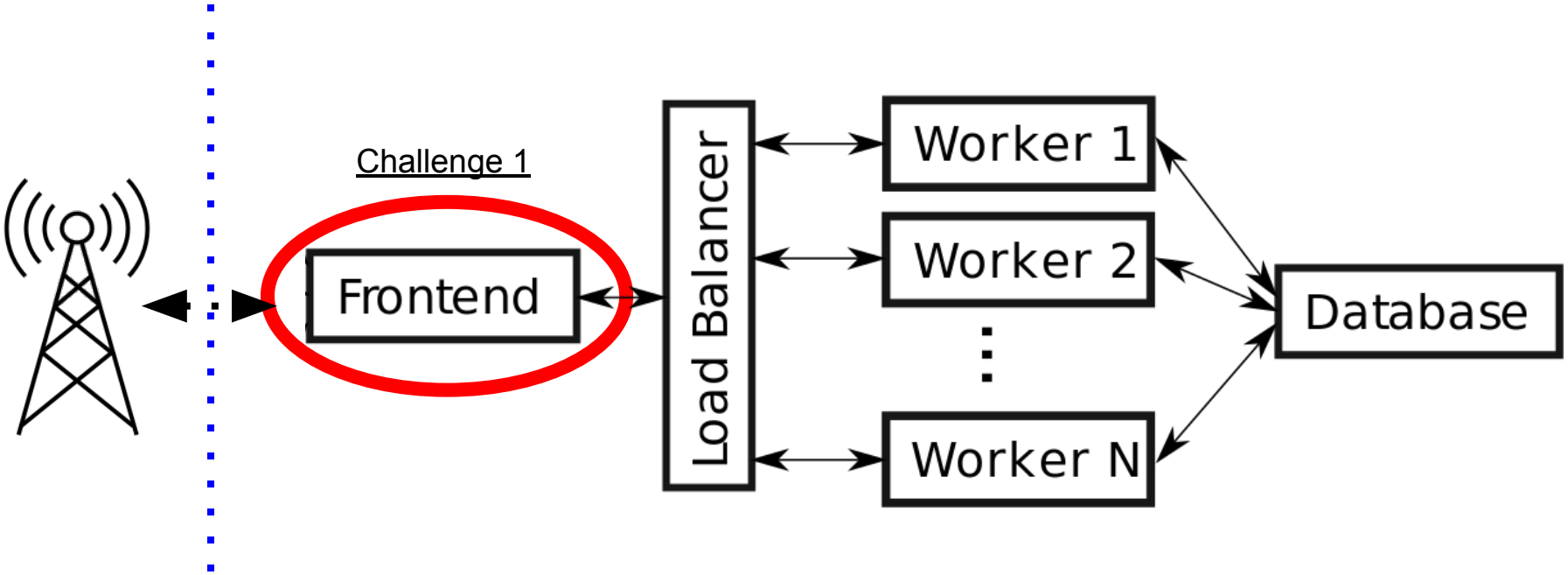

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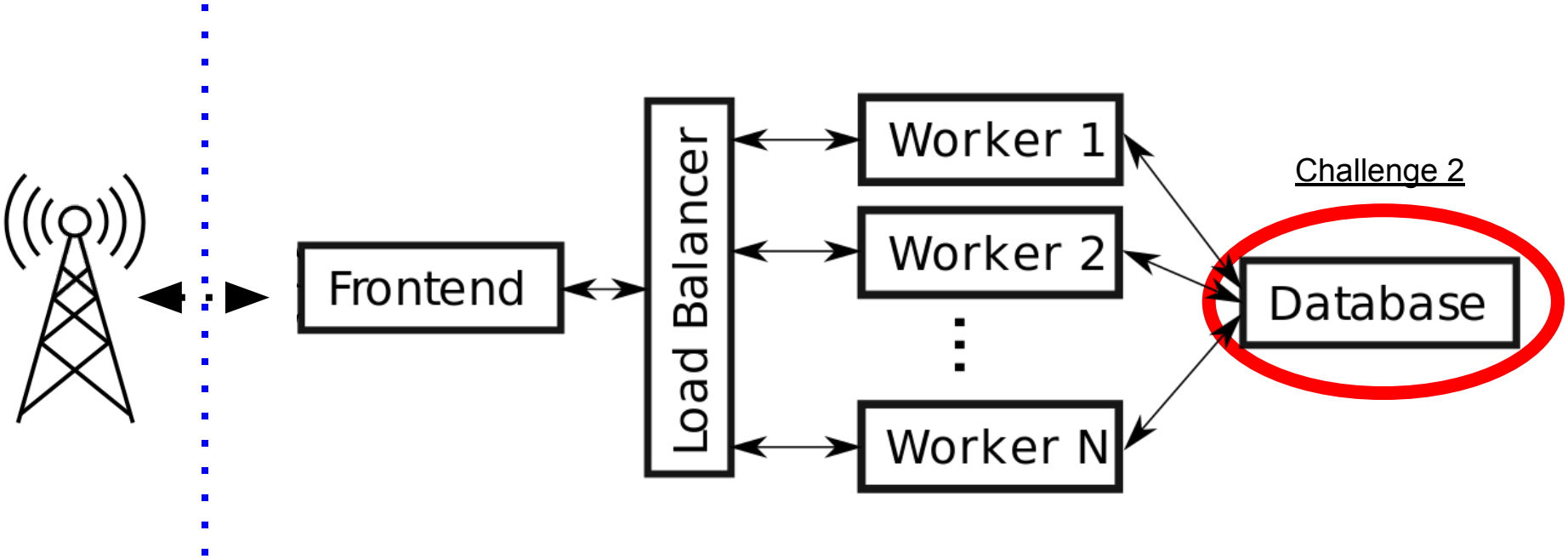
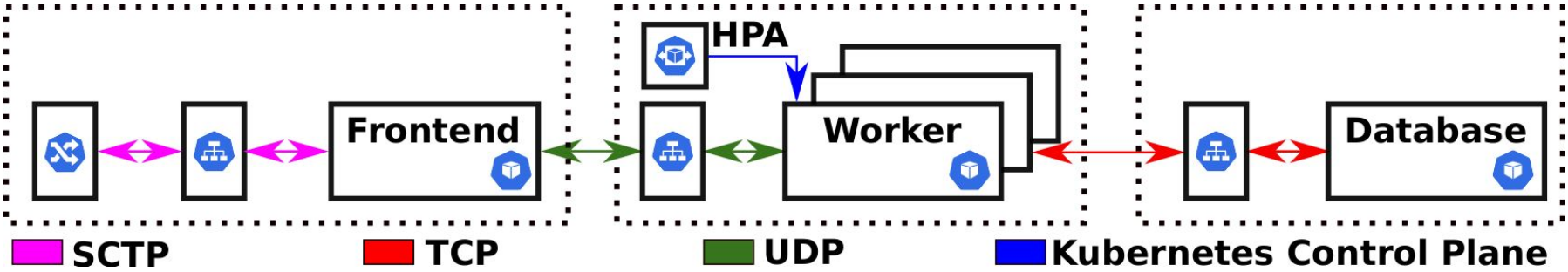
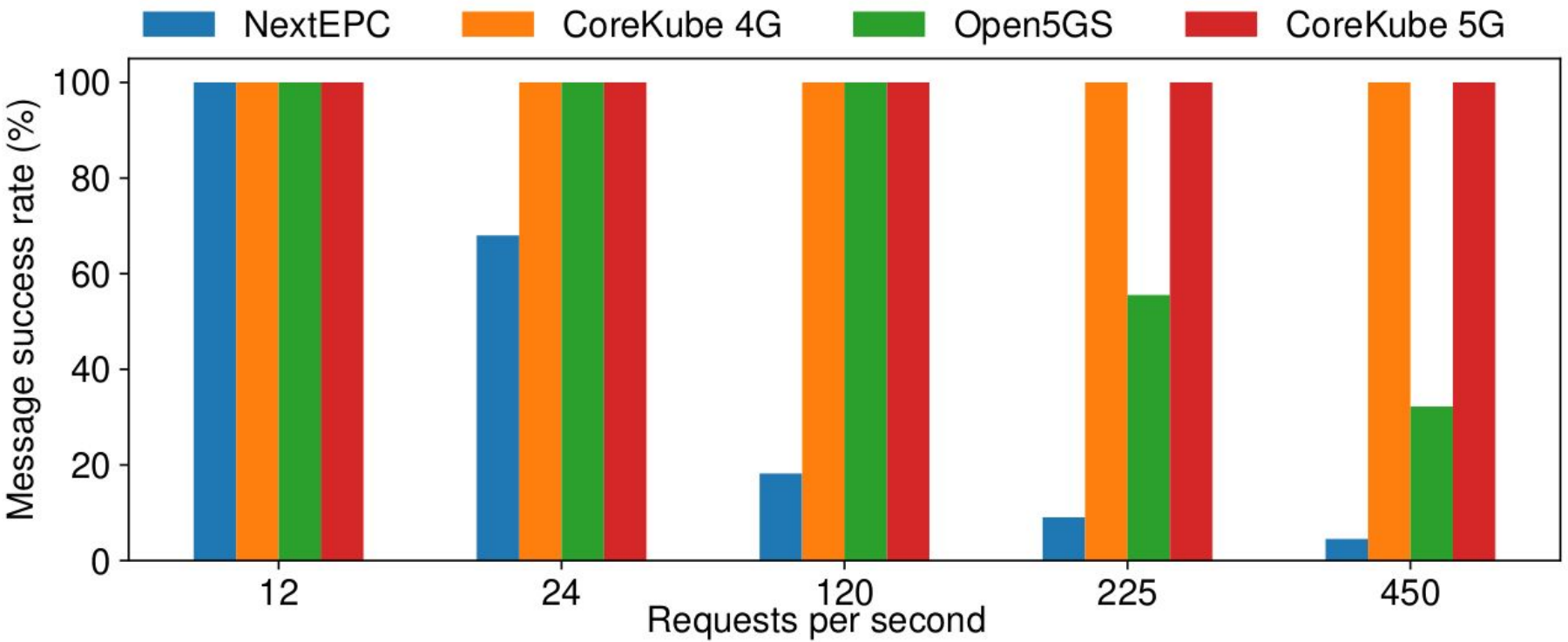


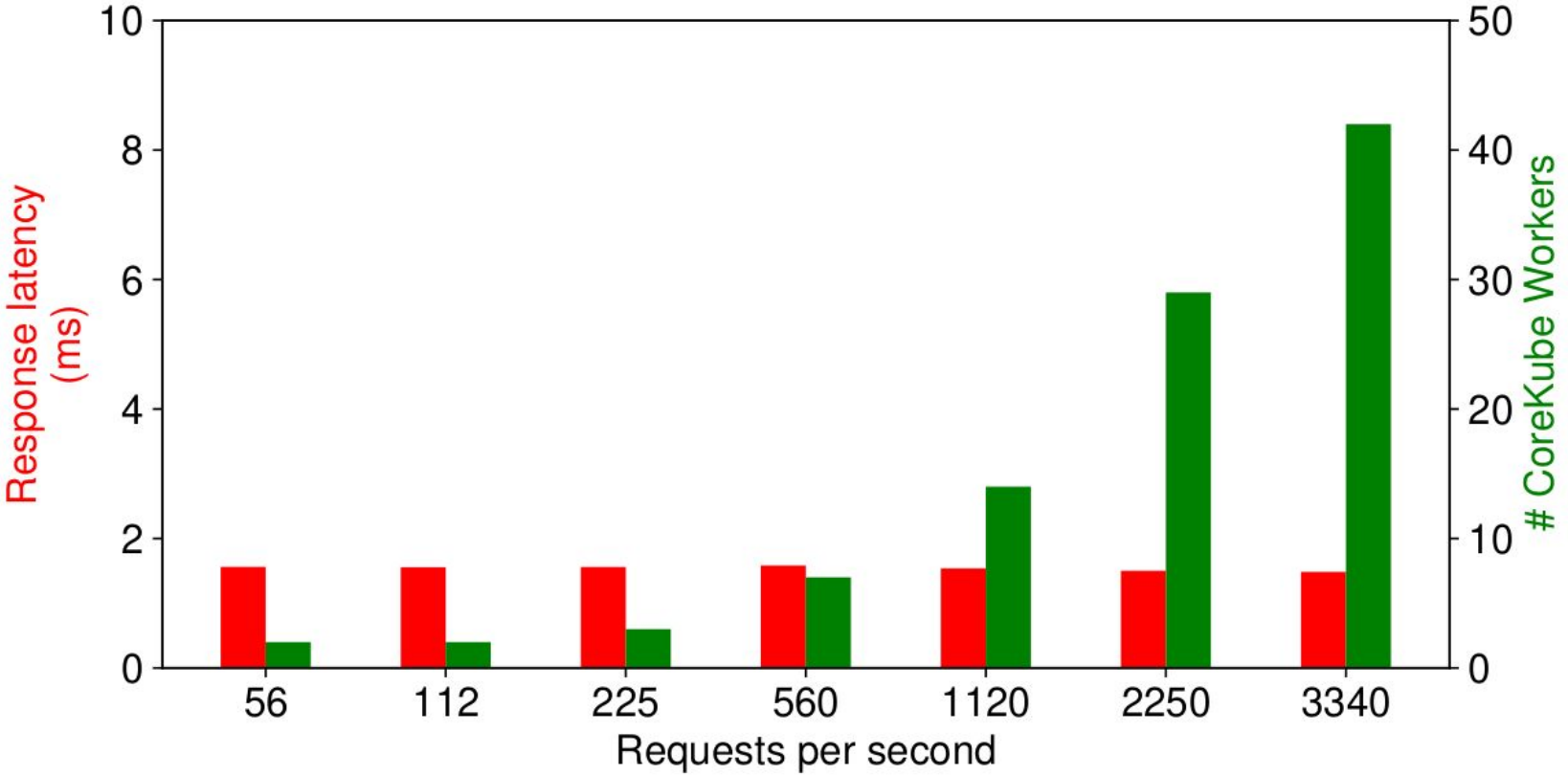
CoreKube over Kubernetes



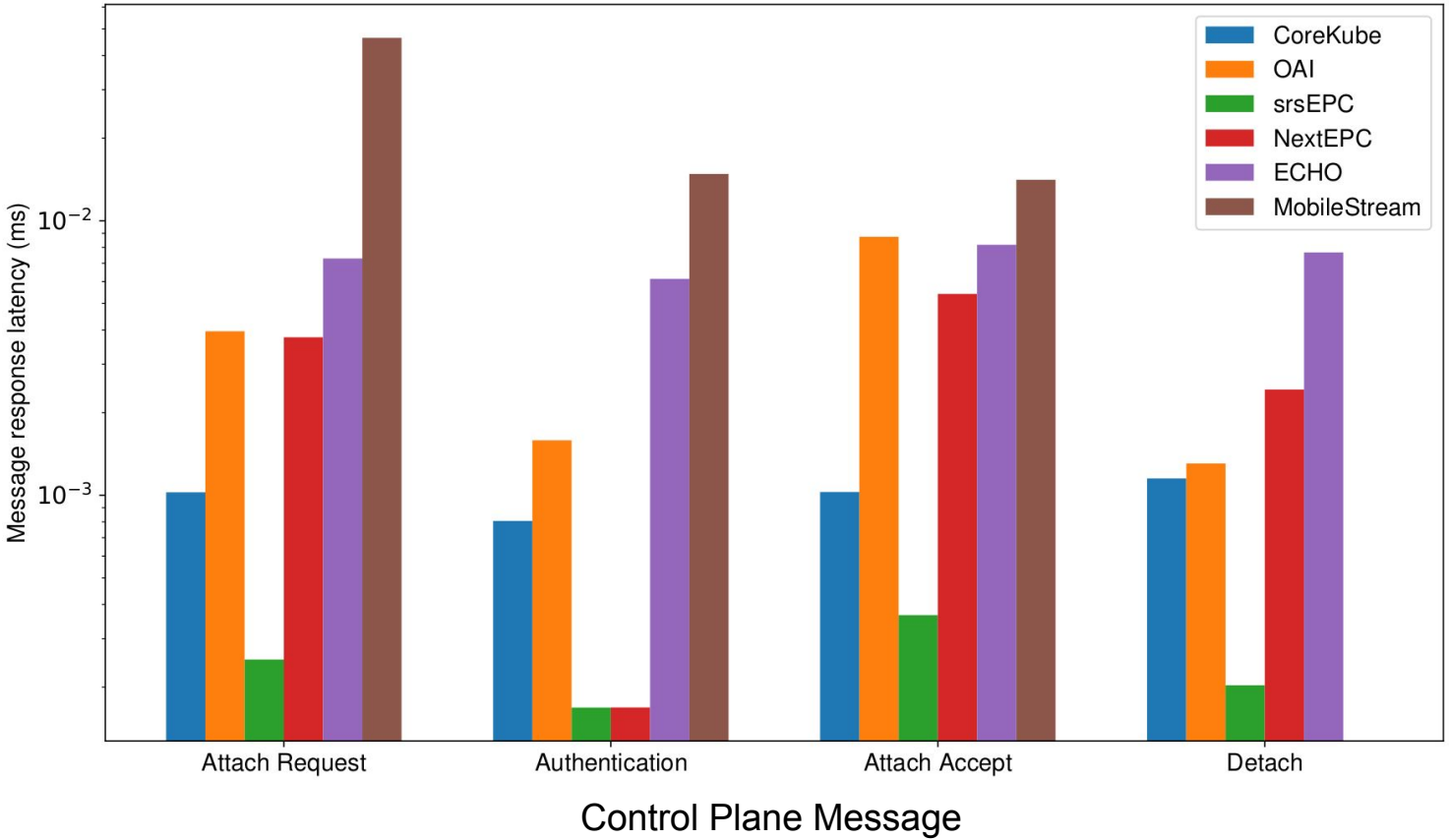
Evaluation: Scalability



Evaluation: Resource Efficiency



Evaluation: Performance



Conclusions

- Motivated the need for an dynamically scalable core
- RAN-Core coupling and state entanglement are two key challenges
- Proposed CoreKube
- CoreKube is able to scale whilst being performant and resource efficient

Future Work

- Evaluation on managed Kubernetes offerings (GKE Autopilot, etc.)
- Placement of components
- Scalable data plane (performance, distribution)

Questions?

Further details available in our Mobicom 2023 paper:

"***CoreKube: An Efficient, Autoscaling and Resilient Mobile Core System***"

(available upon request)

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