Towards Real-Time, Spectrally-Efficient, Cognitive Networks

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Advisor: Ashutosh Sabharwal

Thanks to Hunter, Melissa, Patrick, Pedro, Sid, Steger

17 October 2007

Common Complaint

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Claim

- Lots of spectrum available, we just dont use it well
- Its not the spectrum, its spectral efficiency

New Opportunities

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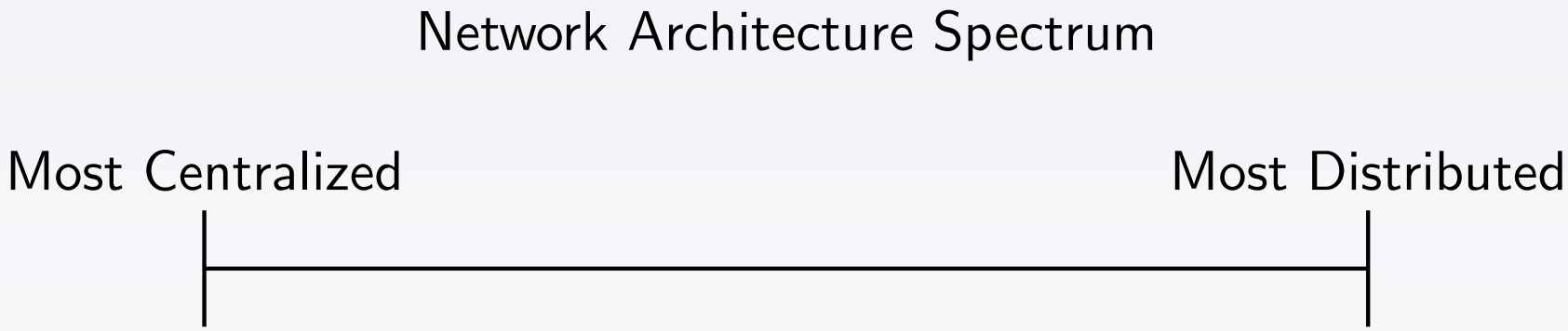
Many potential scenarios!

Outline

Designing Cognitive Networks



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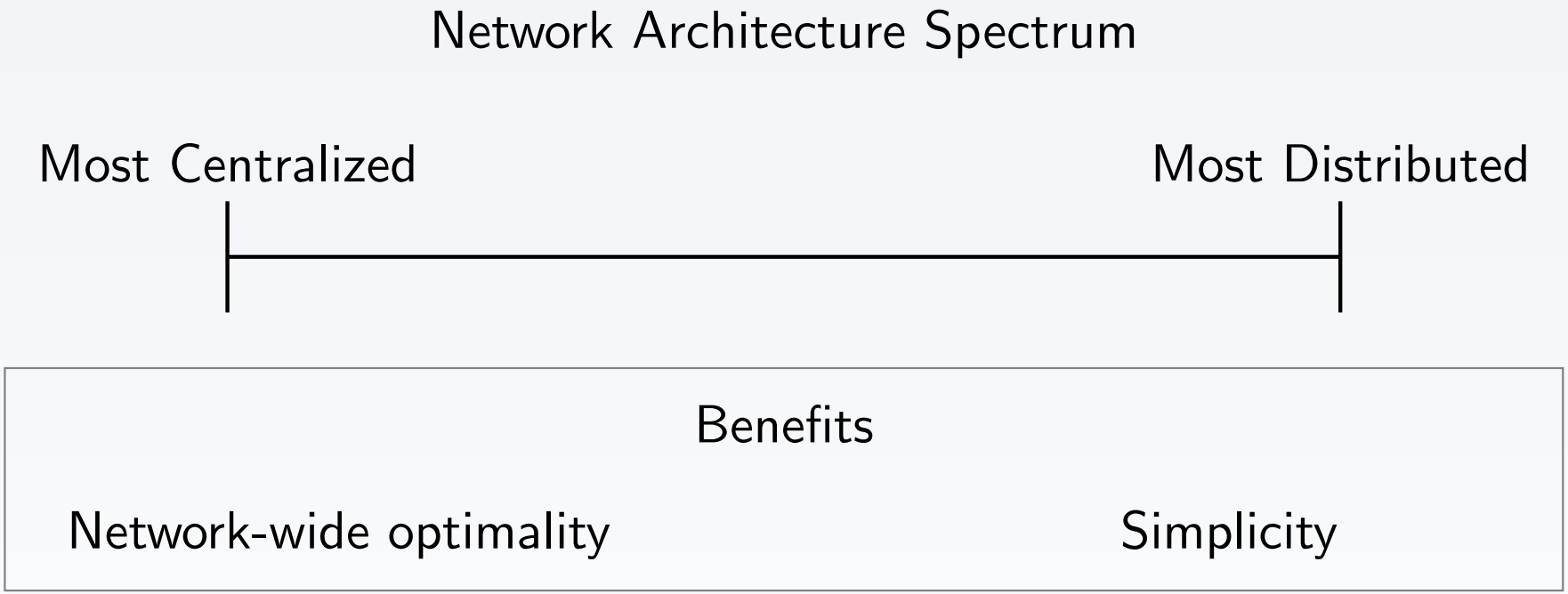

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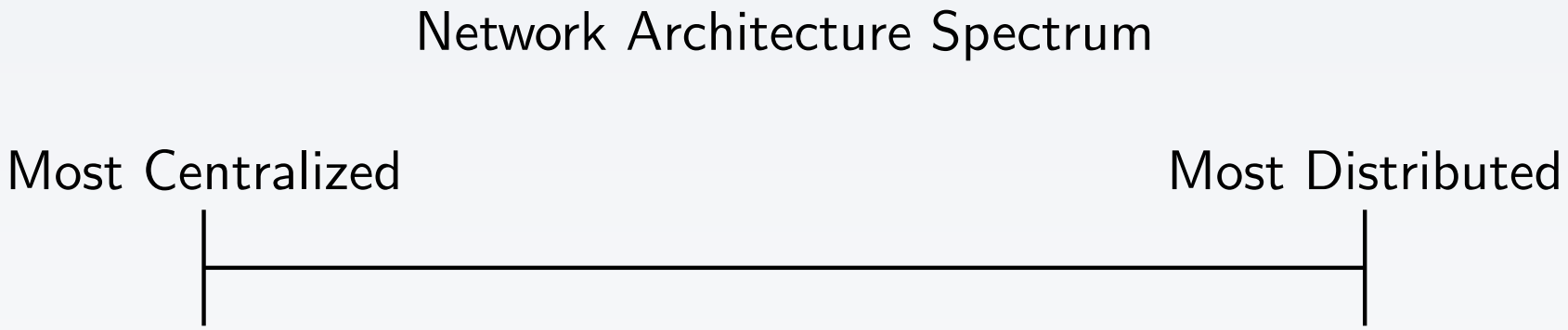


Benefits

Network-wide optimality

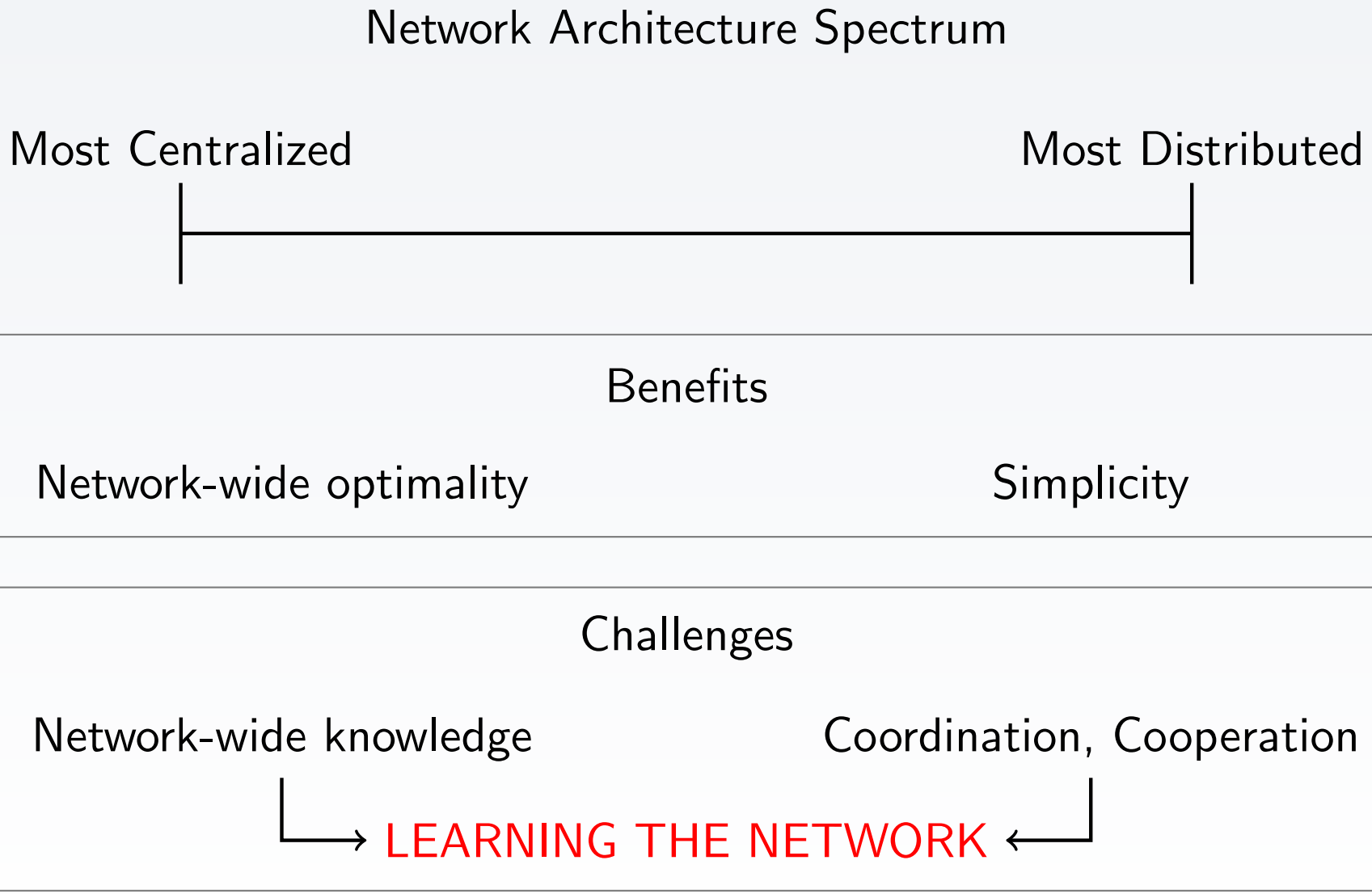
Simplicity

Challenges

Network-wide knowledge

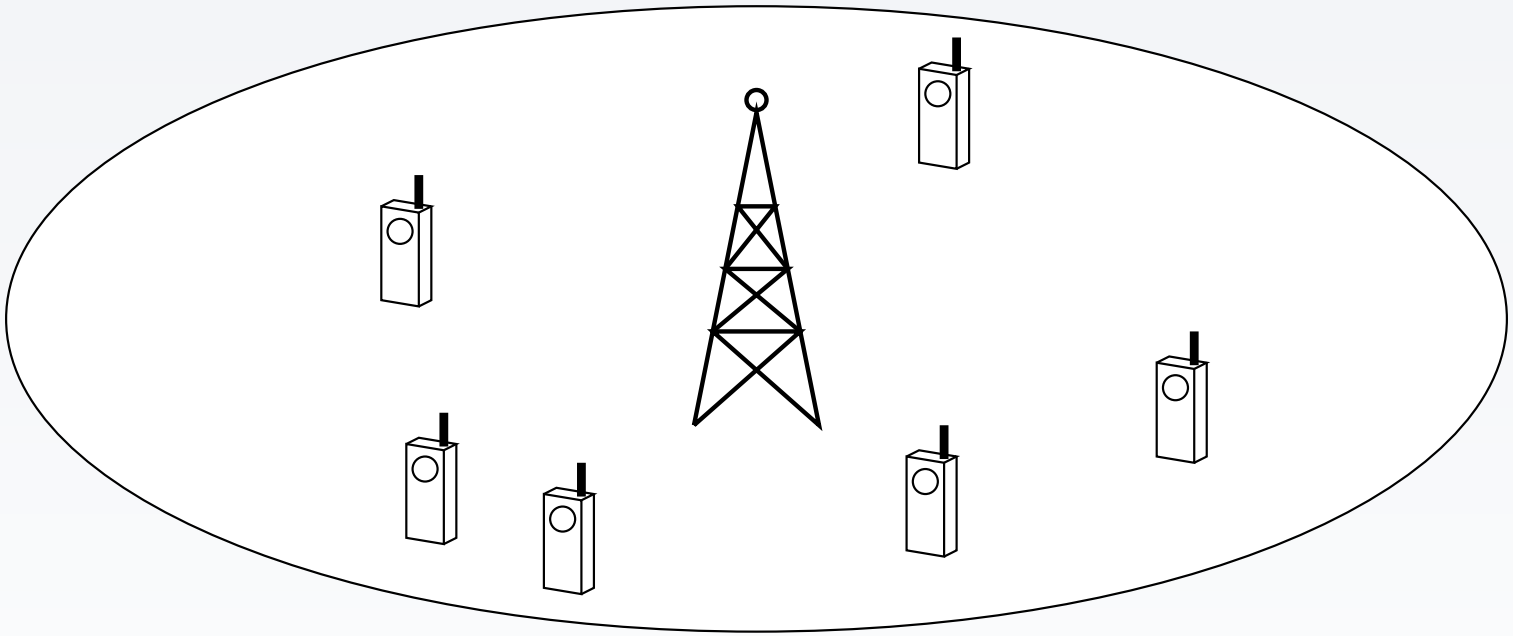
Coordination, Cooperation

Designing Cognitive Networks



Bandwidth Broker: Base Stations to Network Arbiters

(David)



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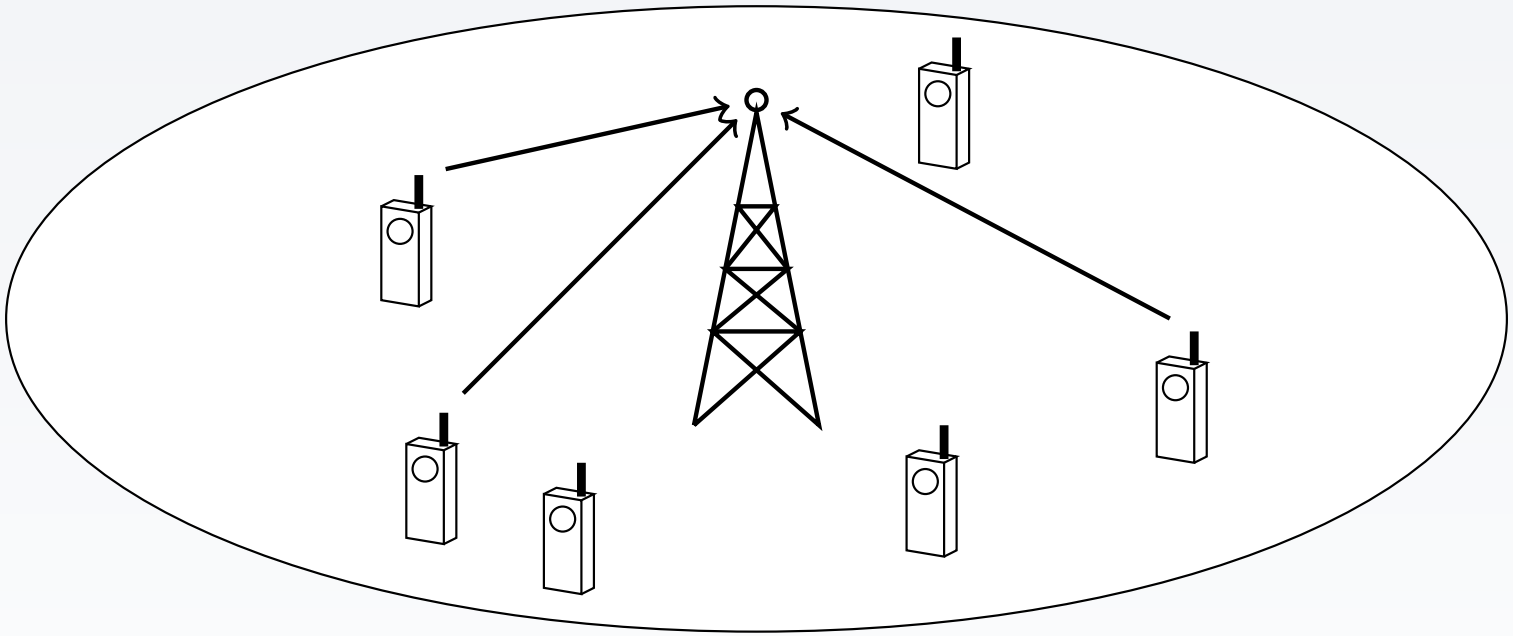

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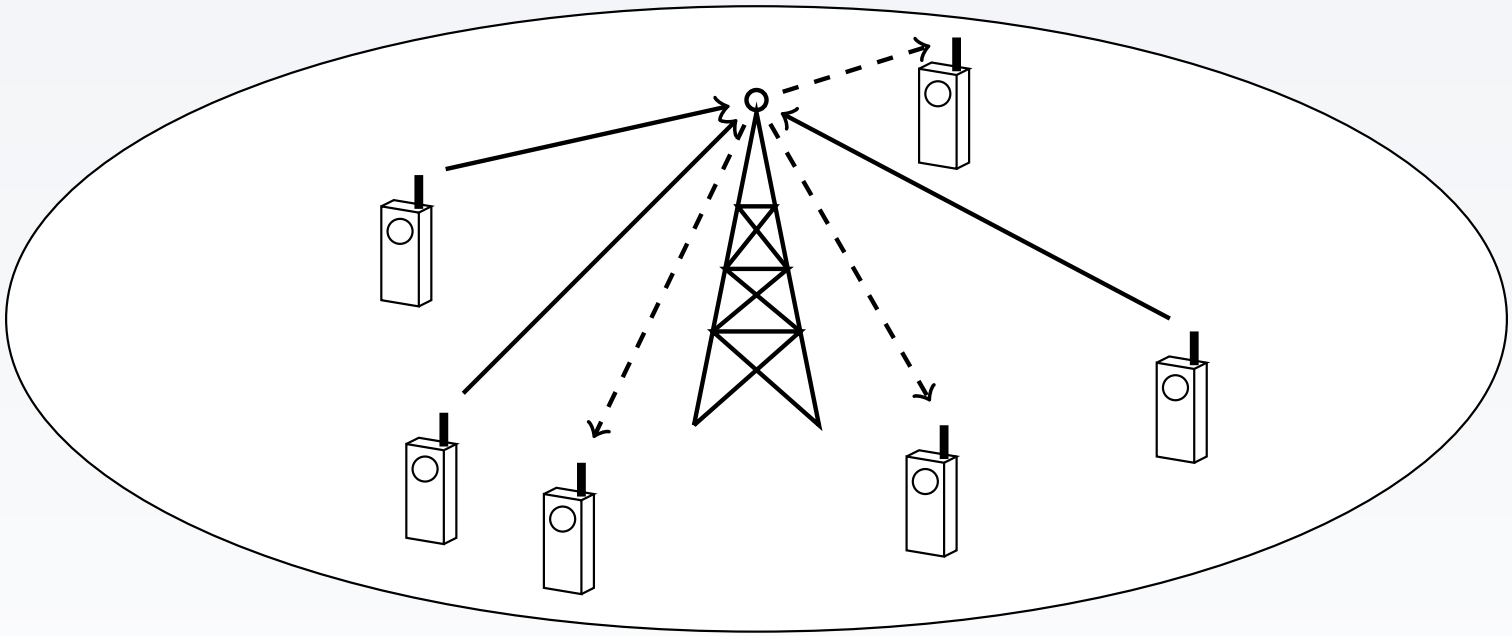

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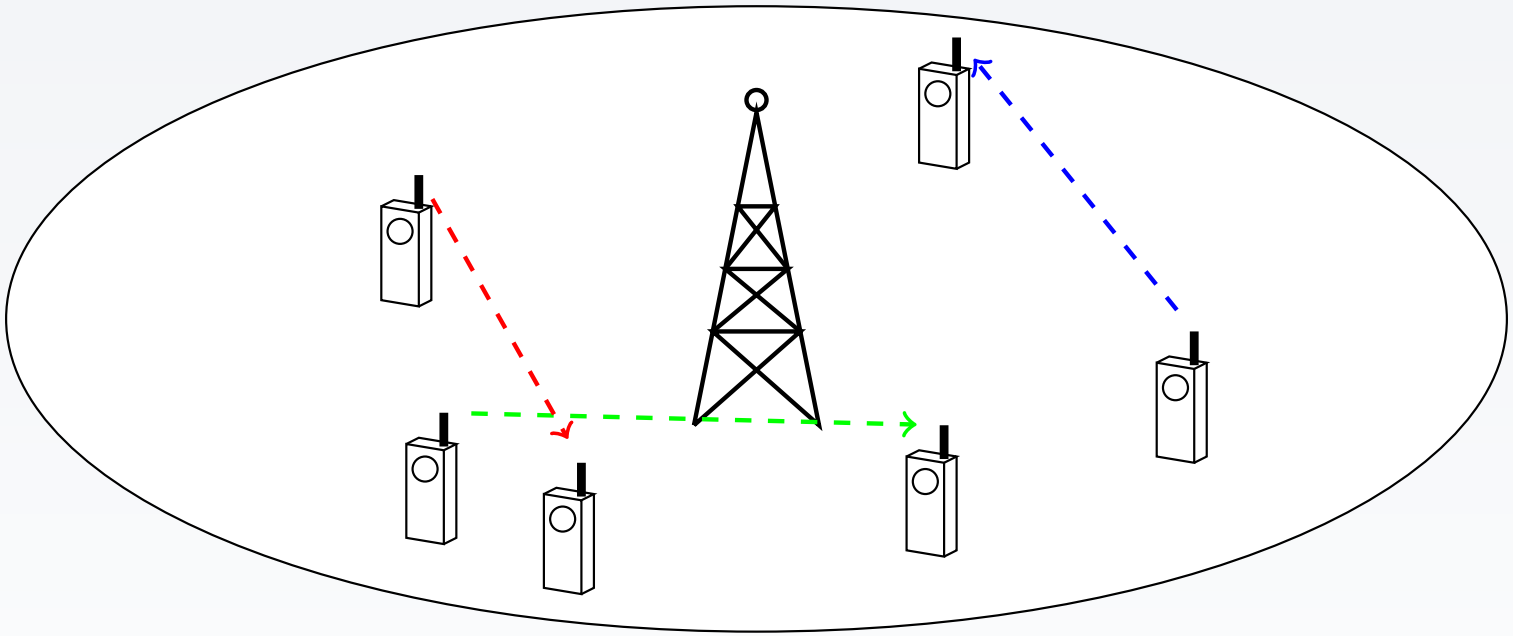

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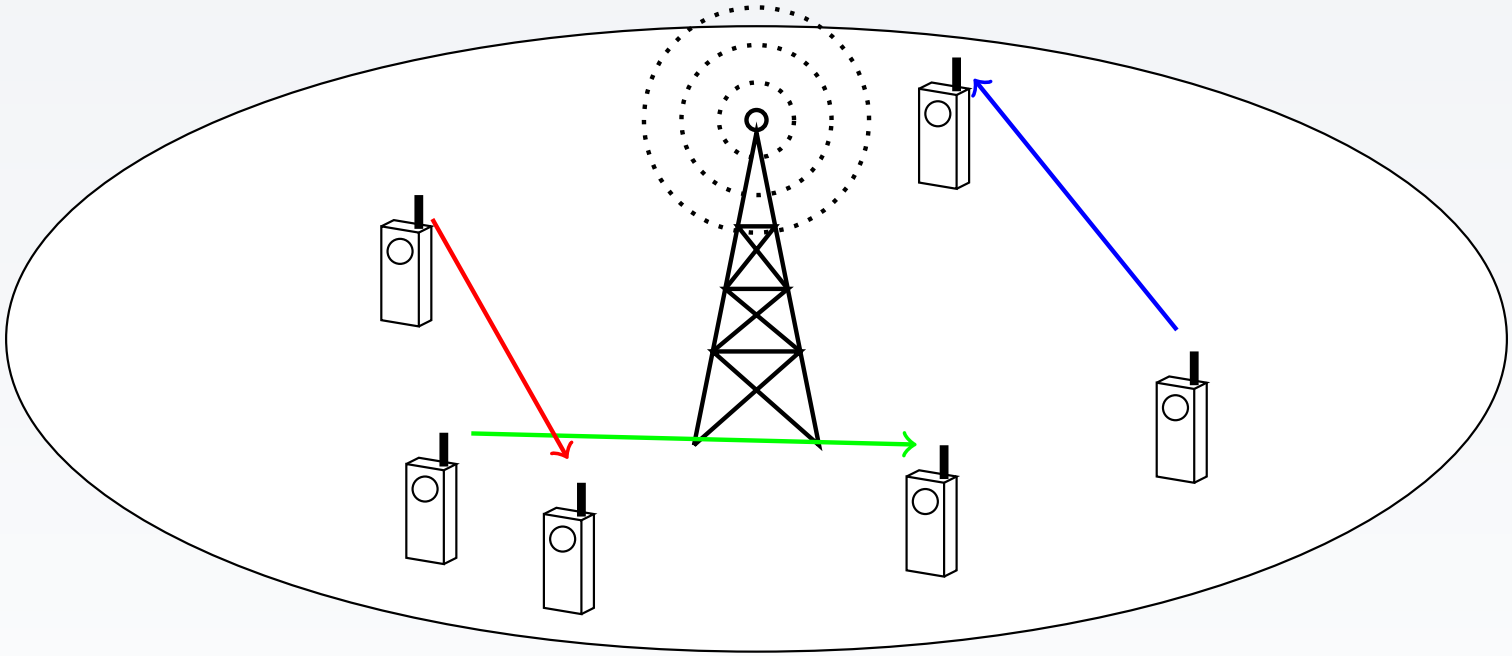

Arbiter allocates resources to maximize performance

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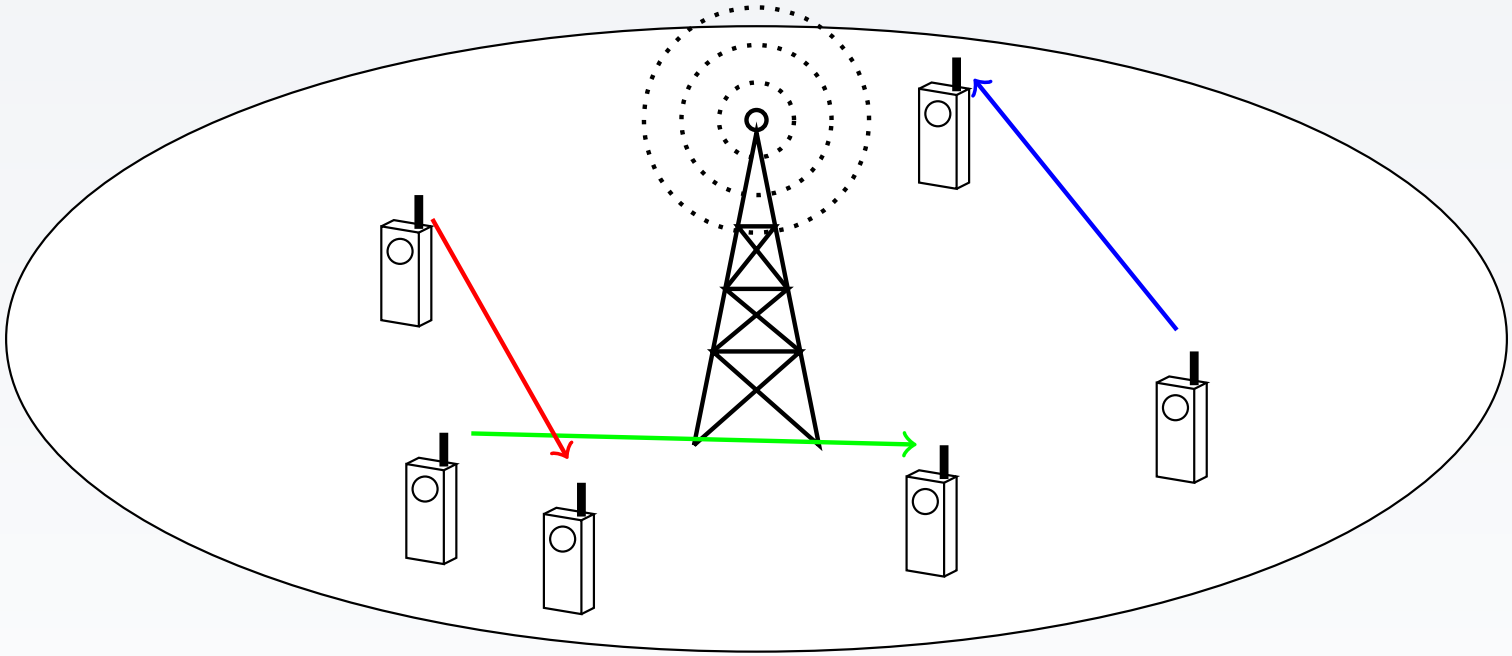

Network optimization requires network state information!

Bandwidth Broker: Scability of Managed Networks

Control Channel

- Management (Allocation)
- Learning (Feedback)

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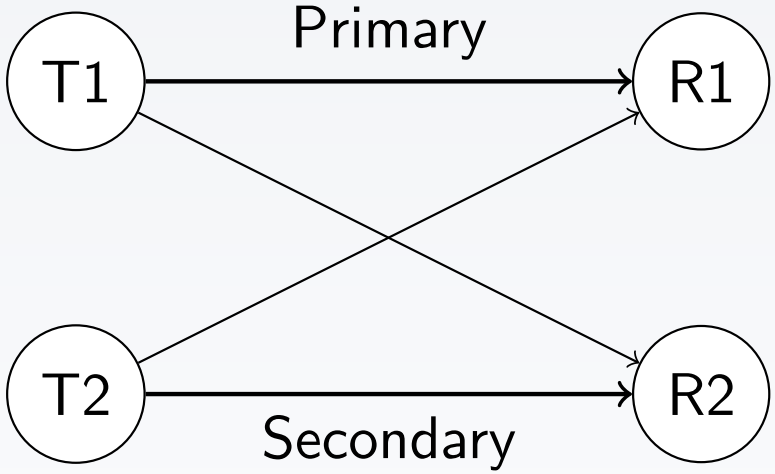

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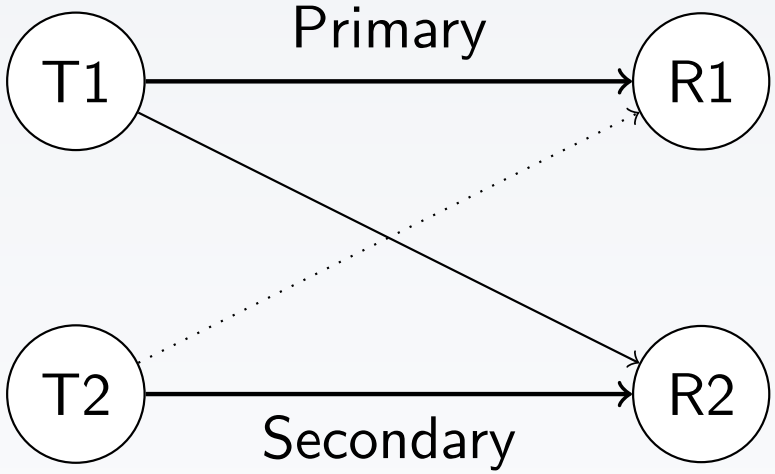

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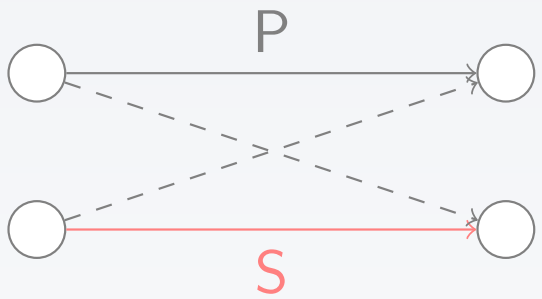

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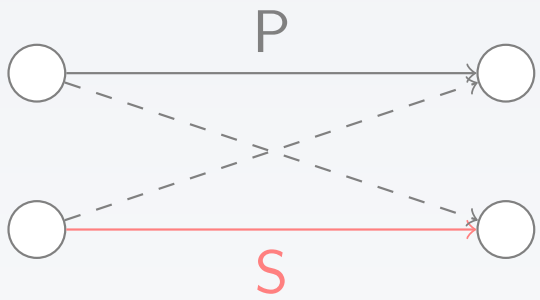

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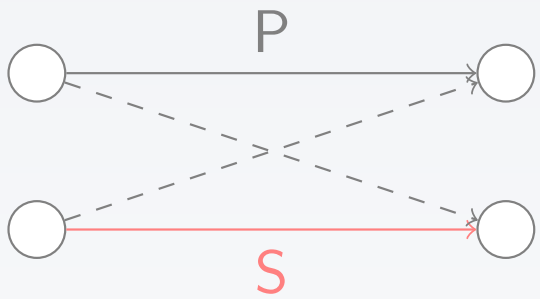

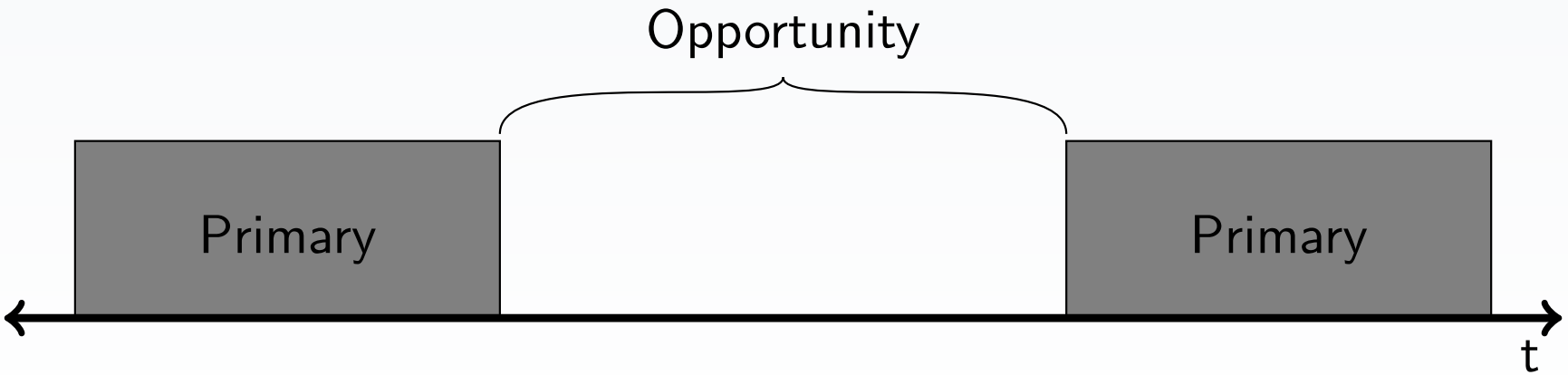

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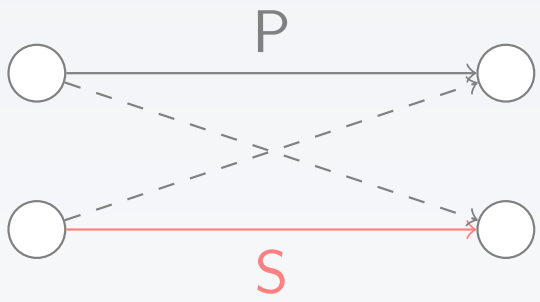

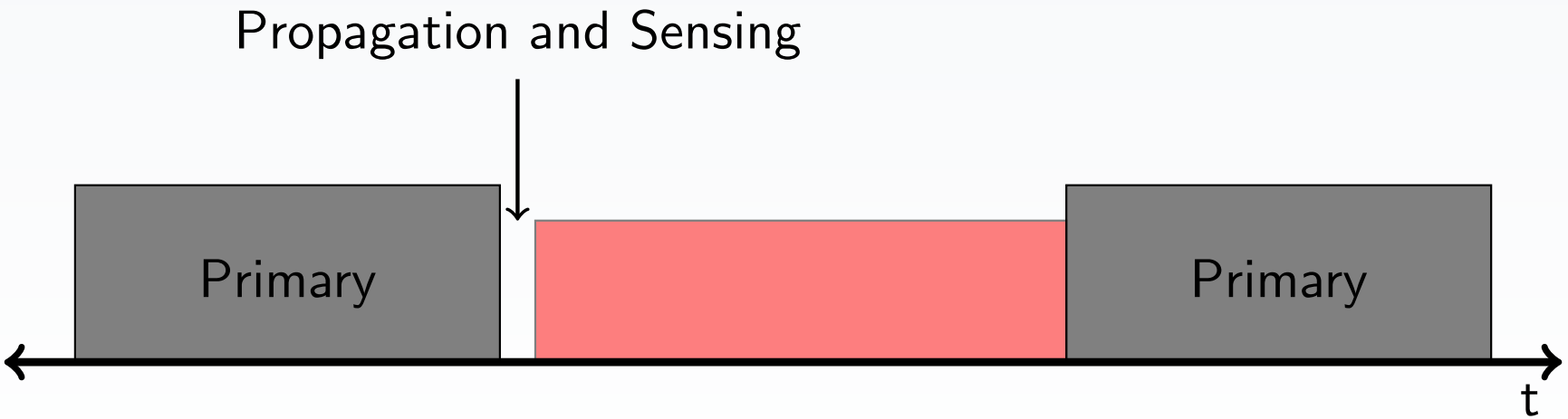

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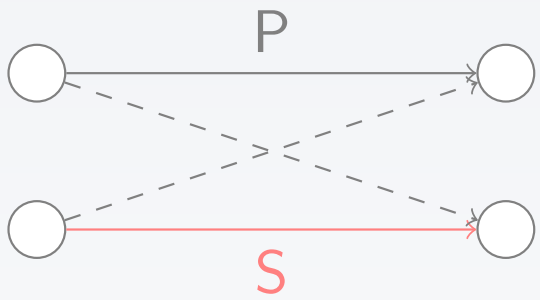

Single-Shot Strategy

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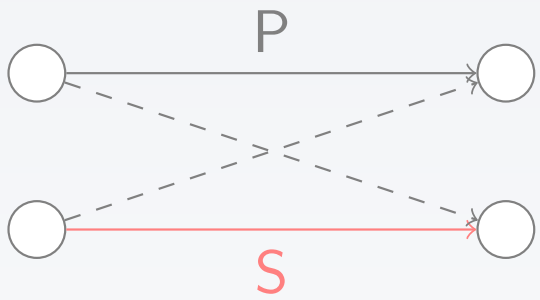

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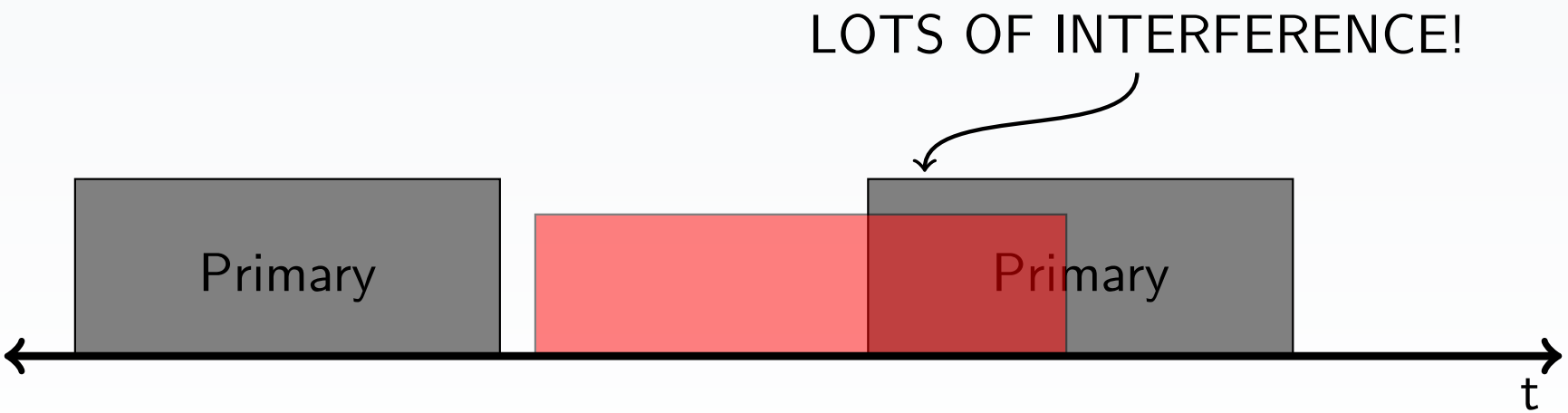

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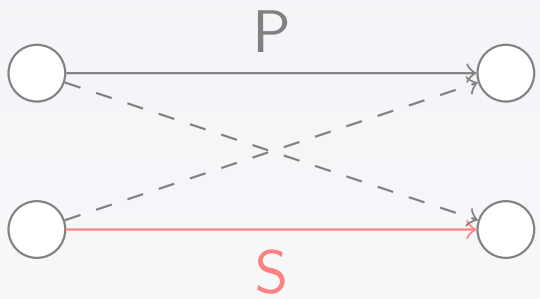

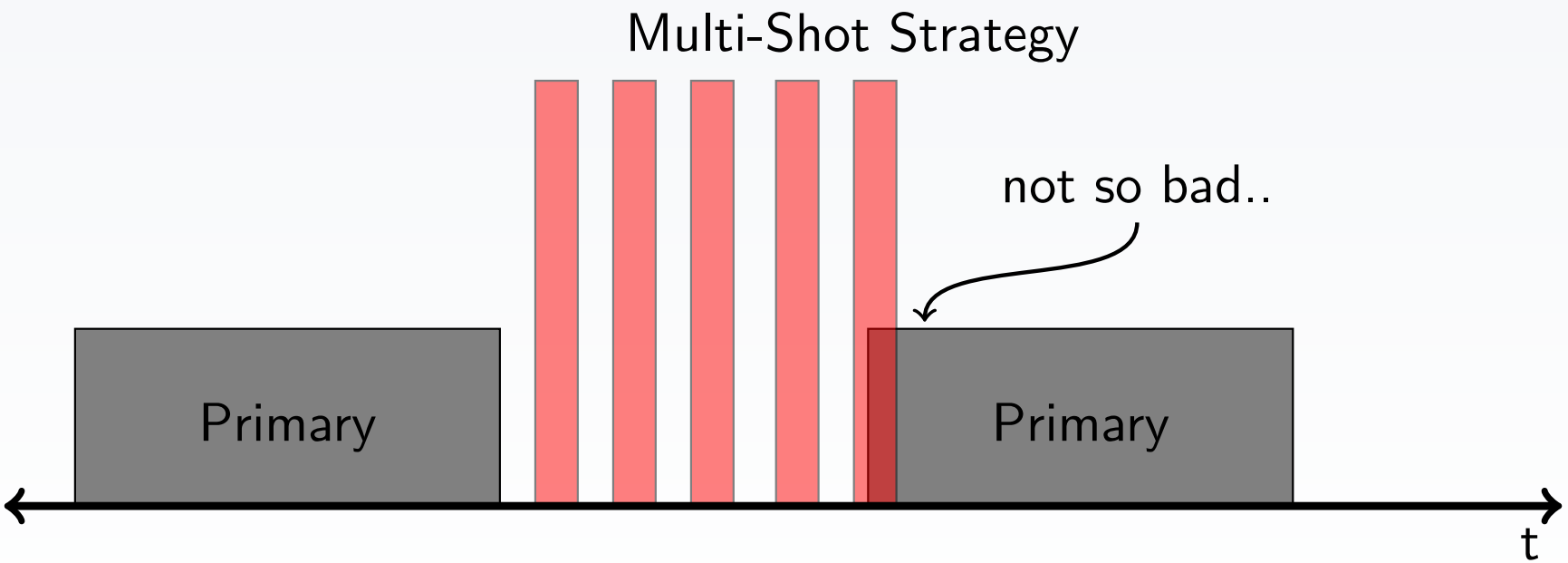

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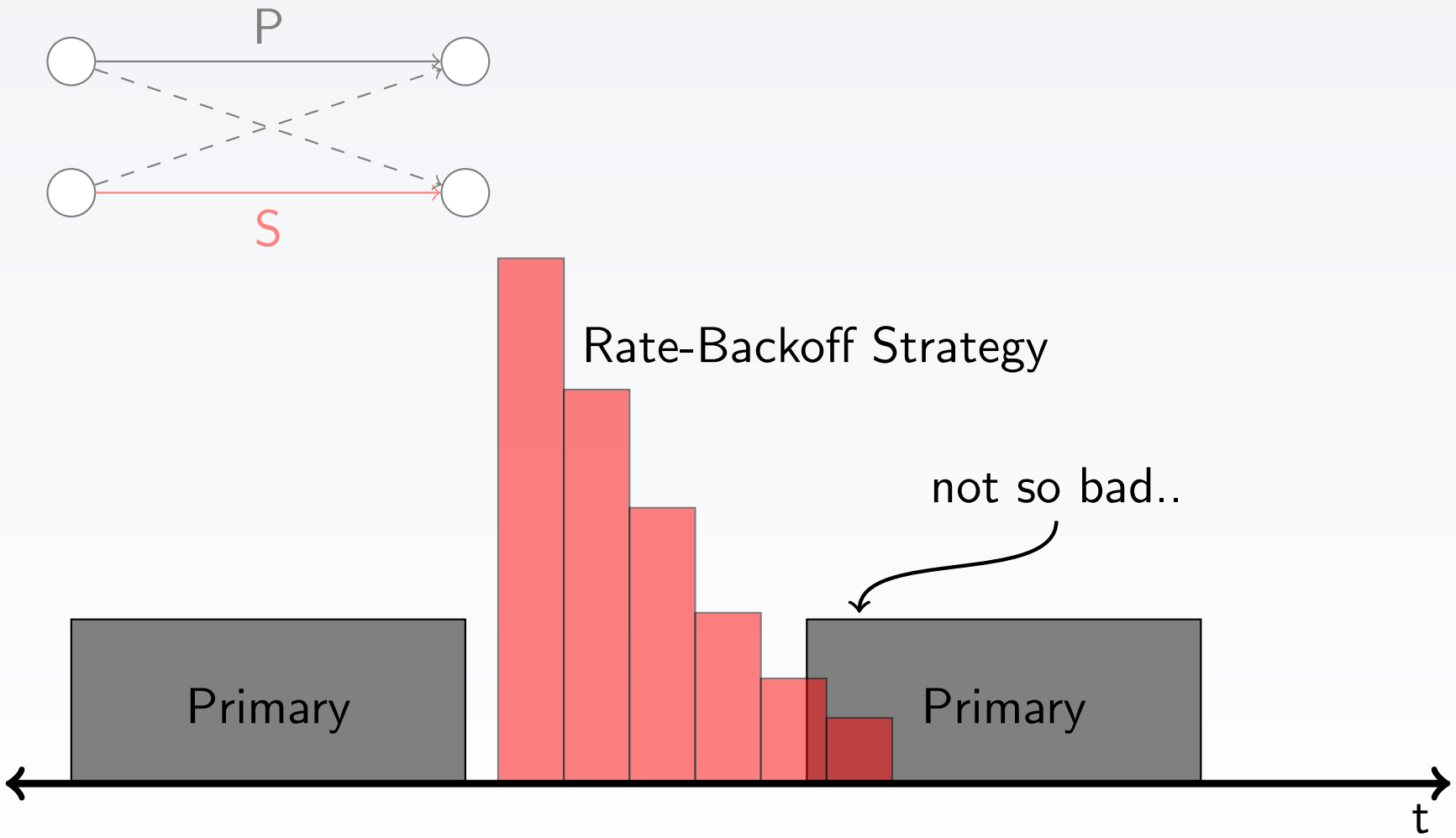

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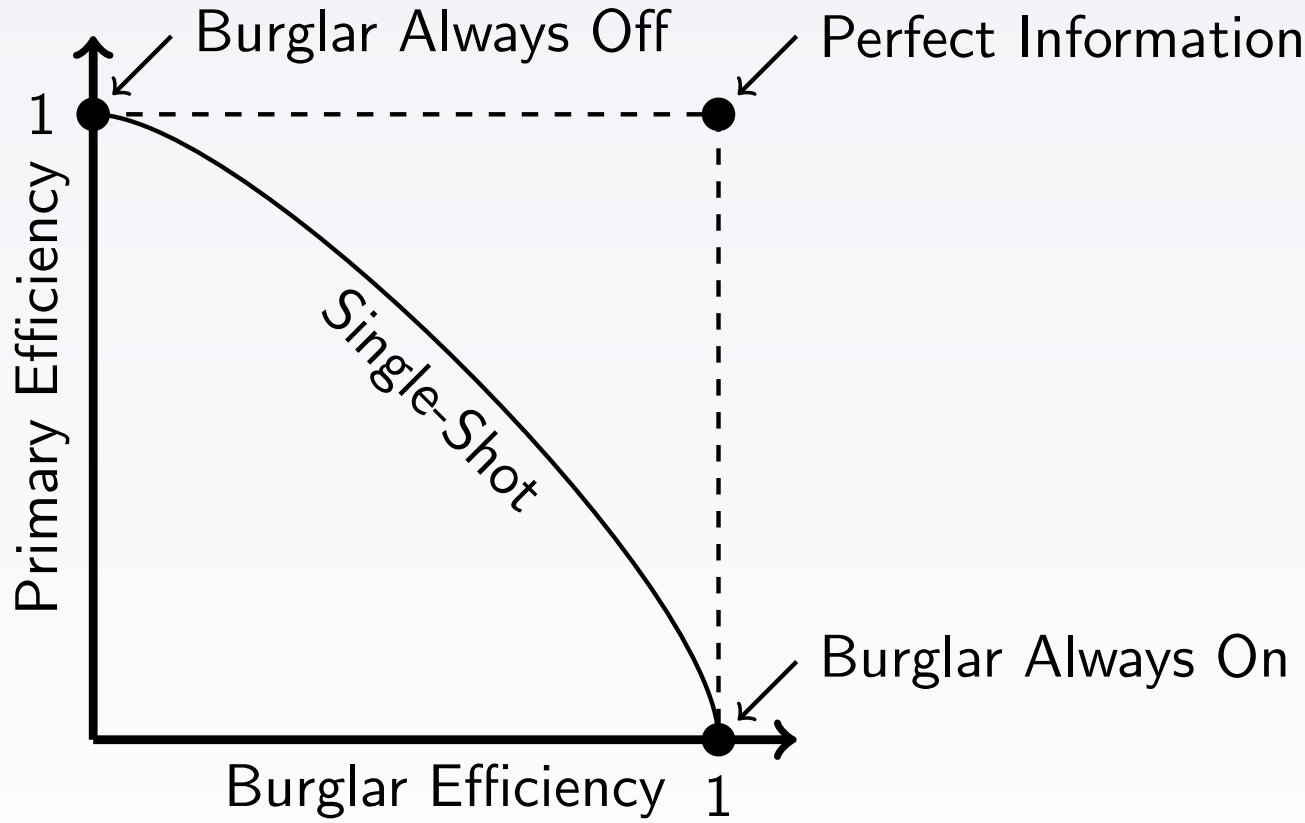

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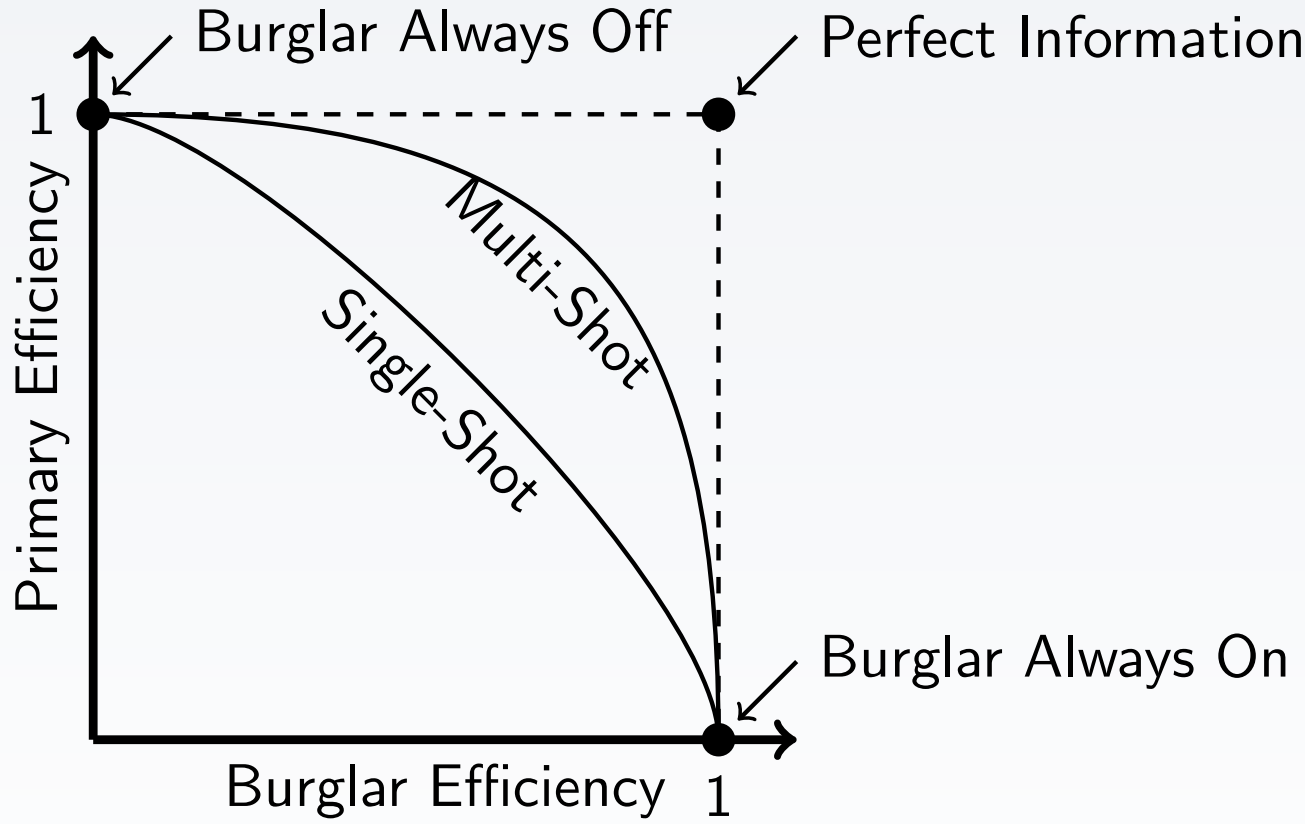

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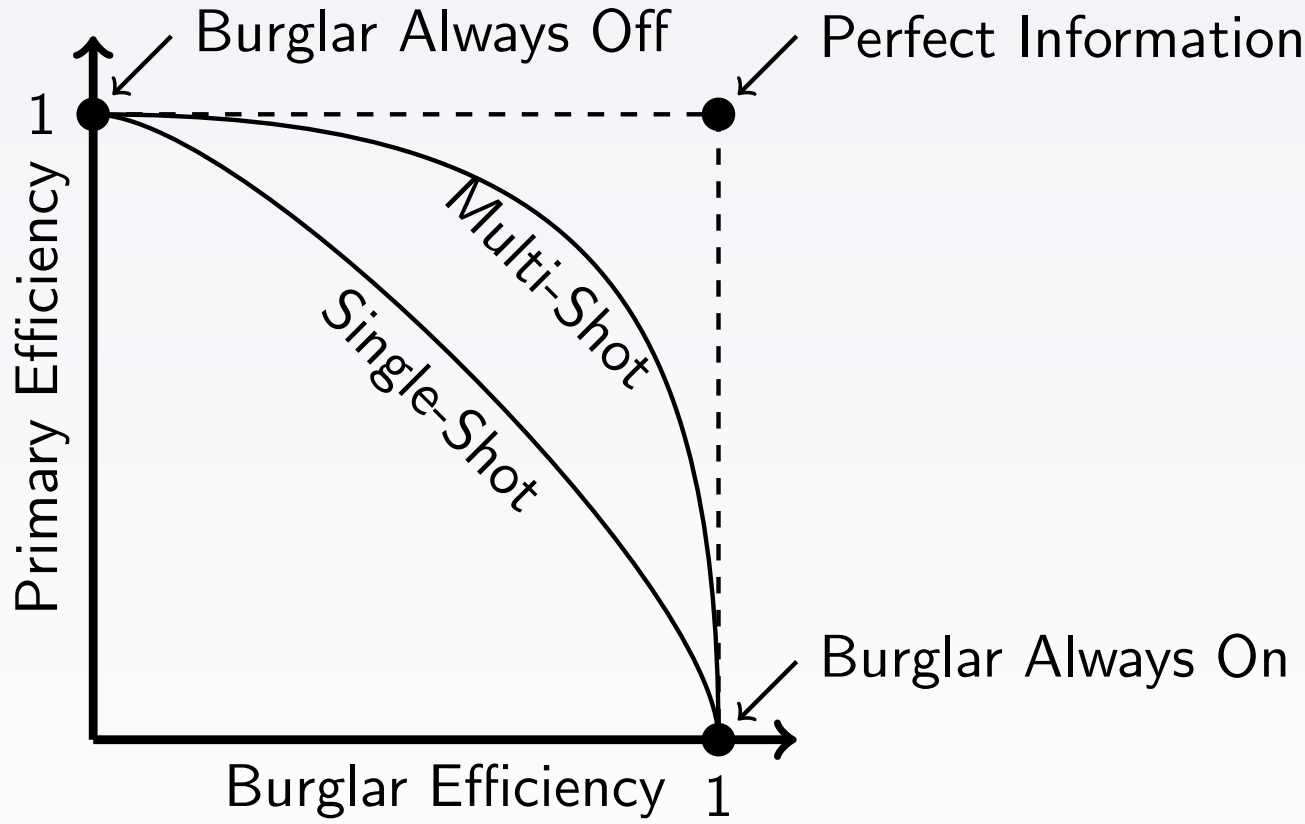

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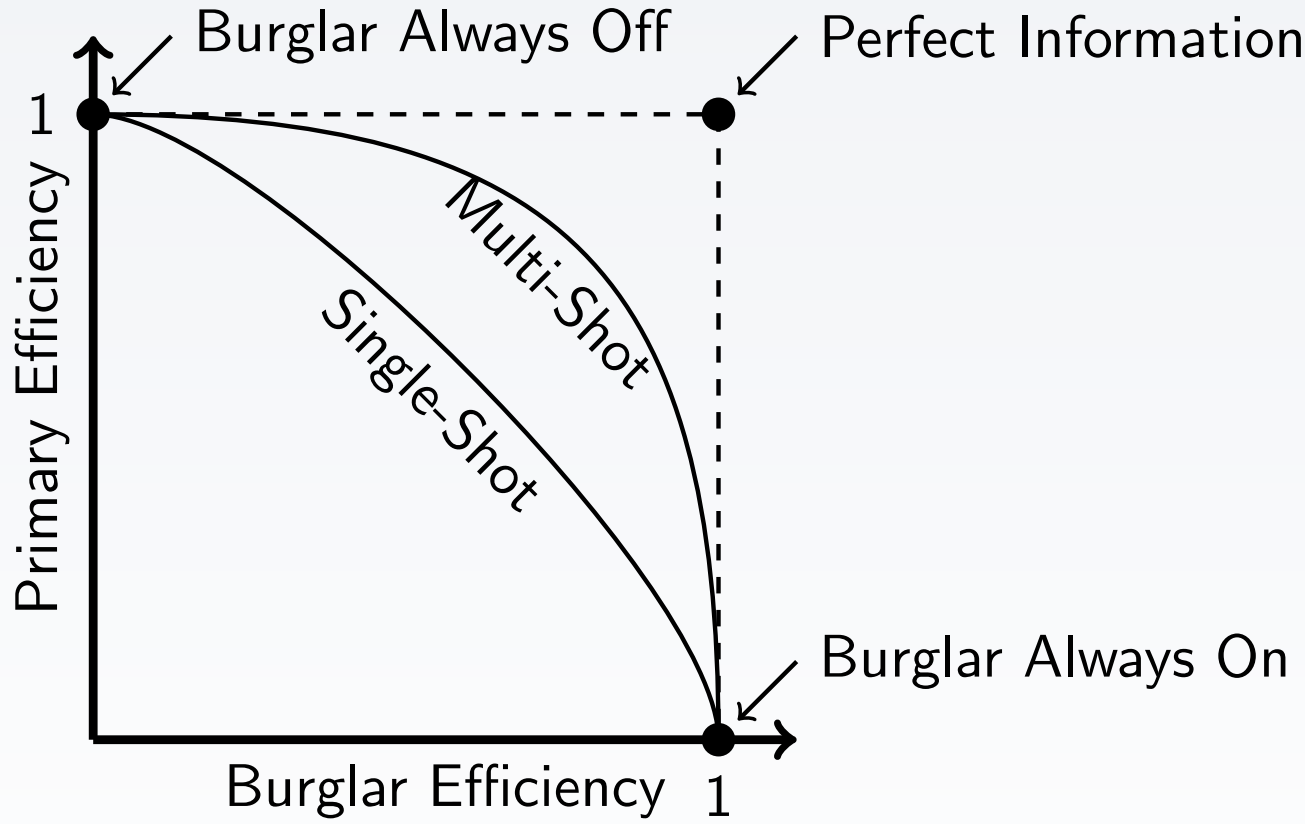

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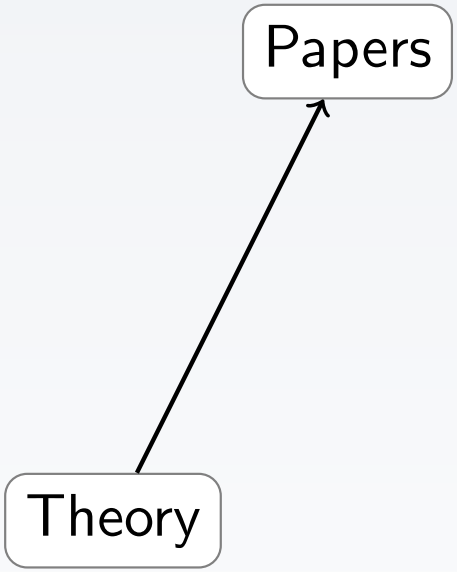

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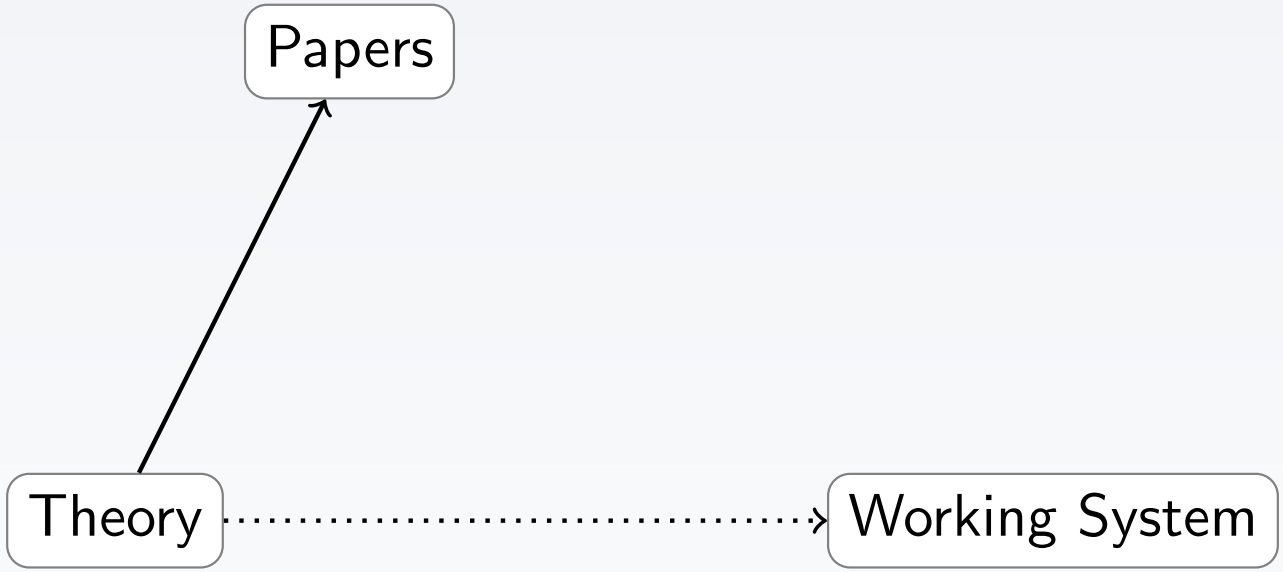

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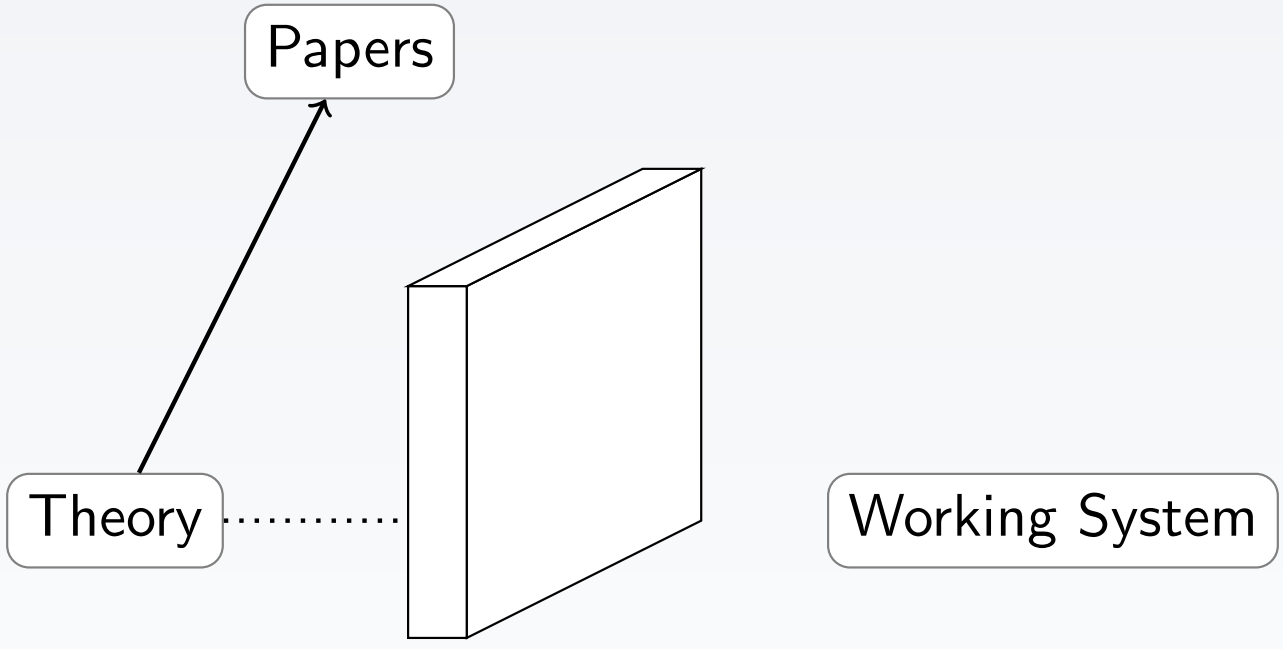

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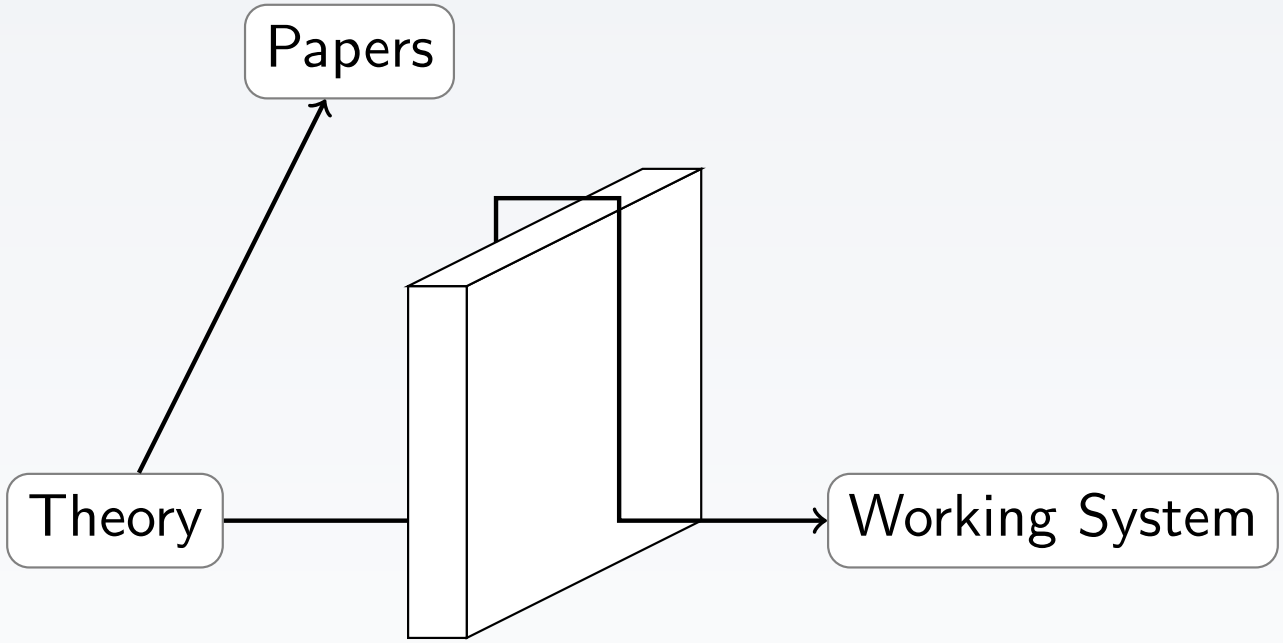

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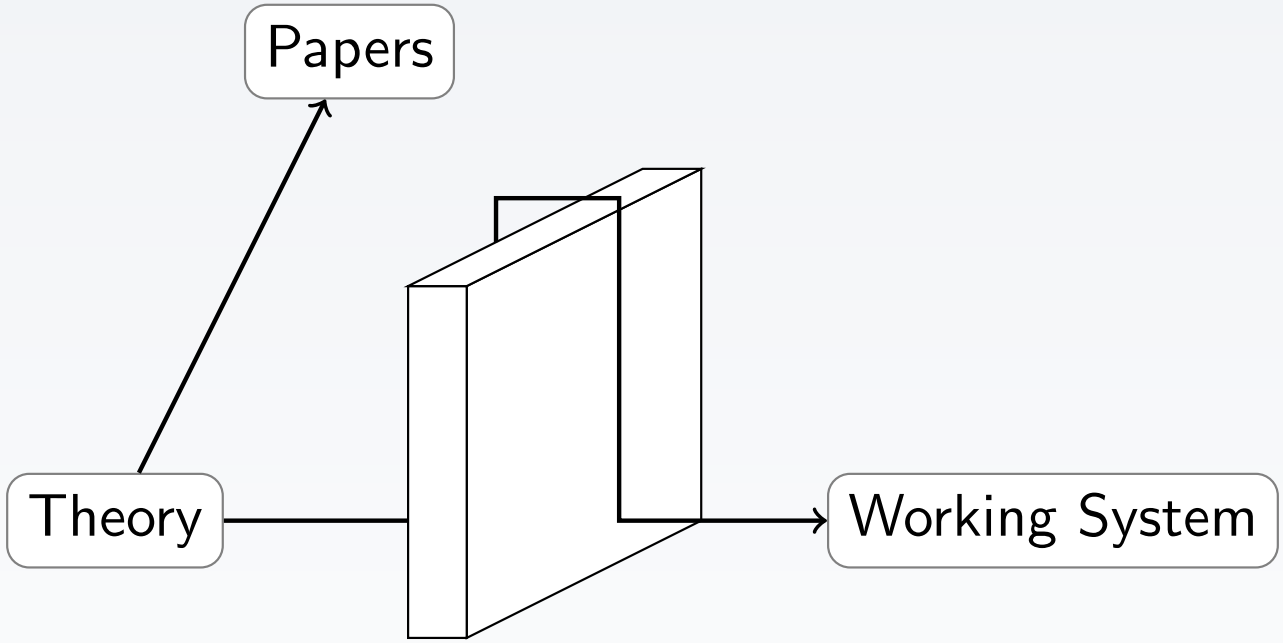

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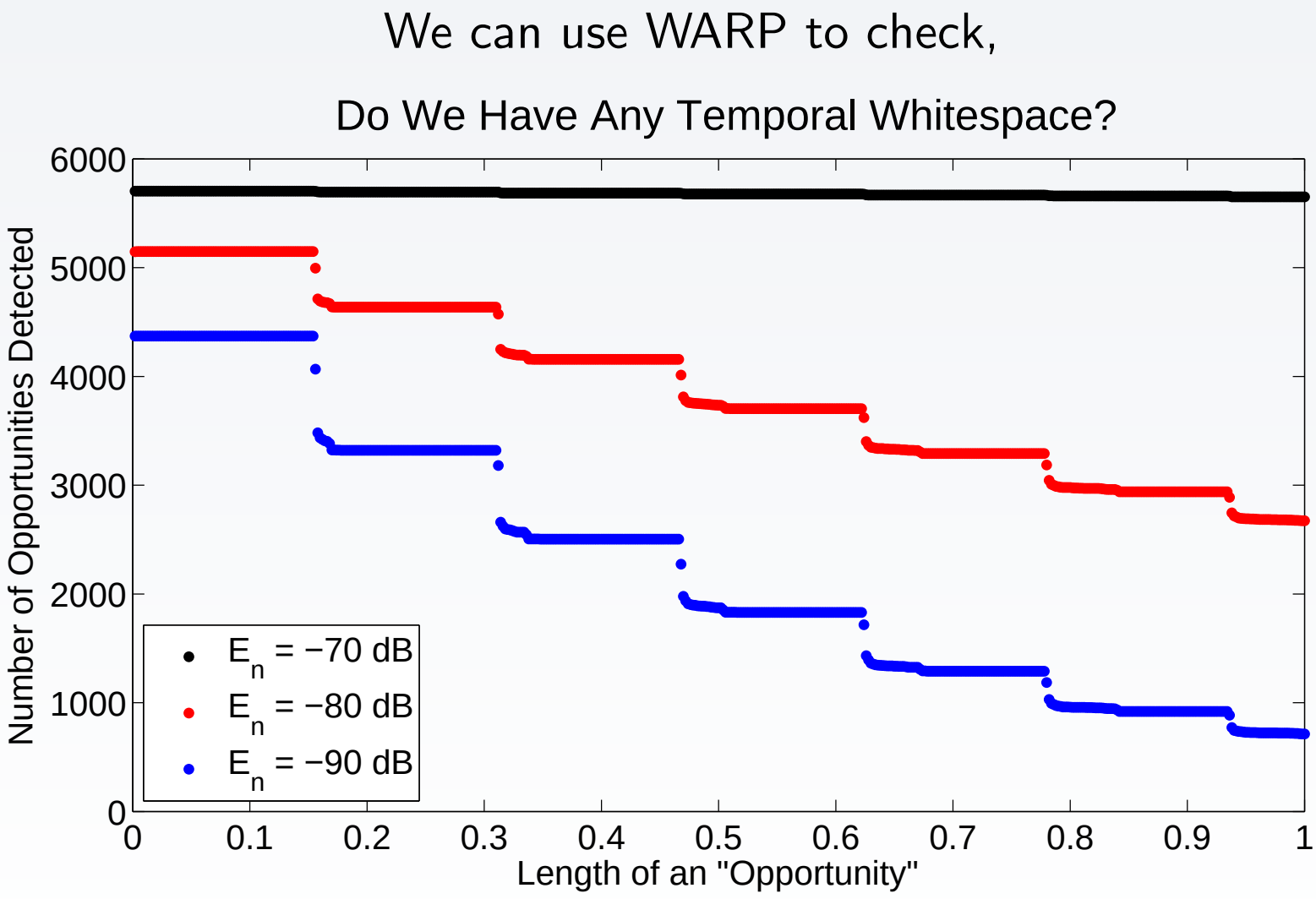

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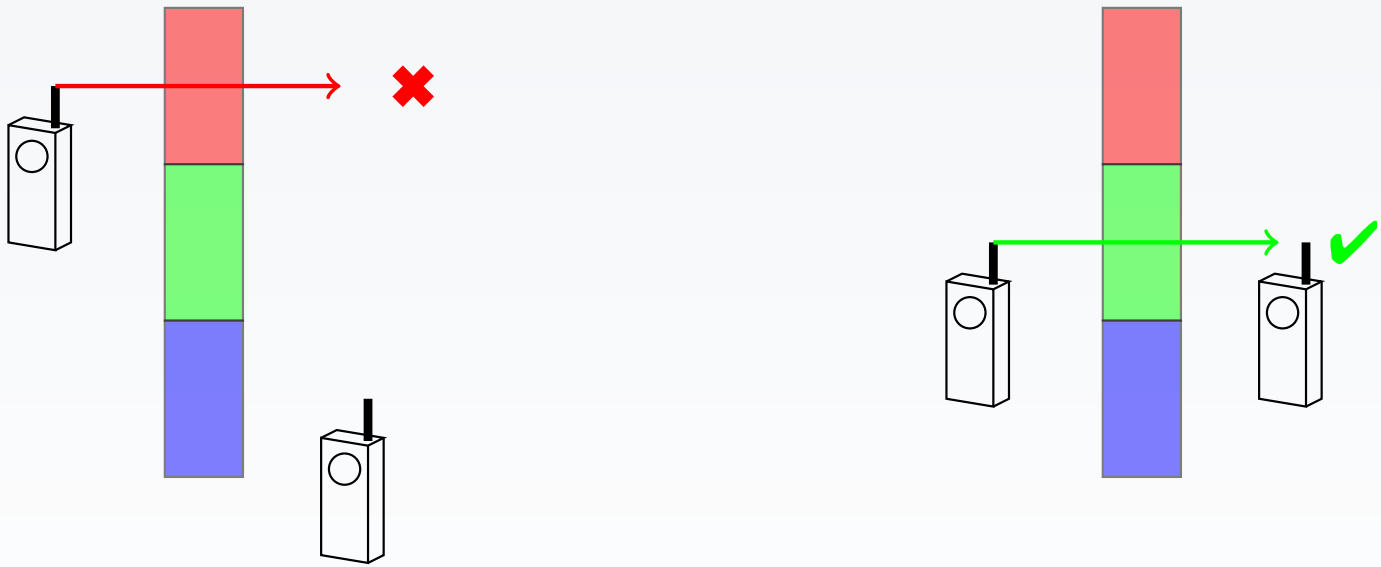
We can use WARP to check,

and may discover new problems to consider.



User Coordination in Multi-Channel Systems (Scott)

Challenge 2: How do we test it?

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- Incentive for development of new components
  - Long range radio for remote control
  - Packet sniffer for network discovery

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- Many opportunities to consider
  - Centralized vs. Ad-hoc
  - Licensed vs. Unlicensed
- Feasibility of Learning

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