

# Semantic-aware LLM-Application Scheduling

Otto Whitee3

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Hard to productionize

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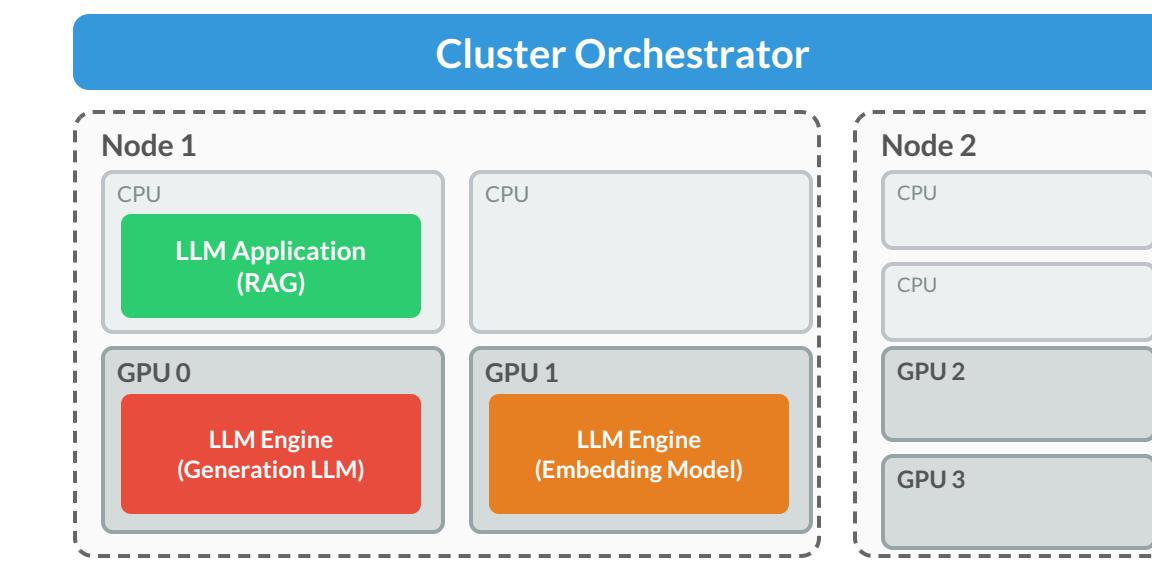
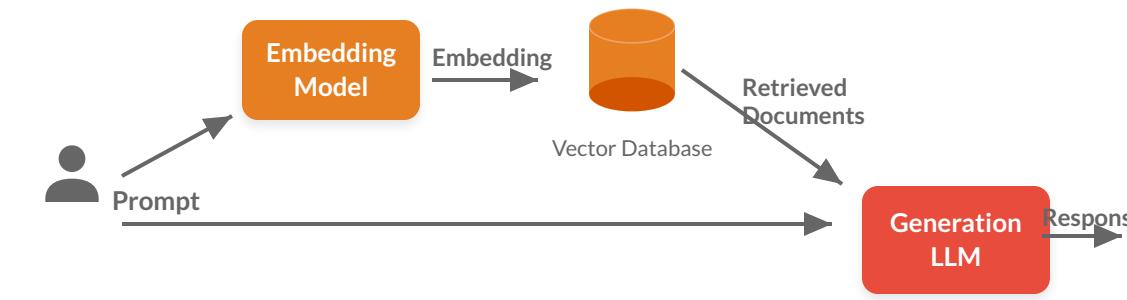
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Infeasible for companies at smaller scale to achieve efficient deployments applications. They need automated solutions.

# LLMs → LLM Applications

- LLM Invocations -> Graphs
- Can't optimise for end-to-end performance
- Lack of Critical Path Awareness
- Unfairness



# Related Work

System	Level	Multi-Engine	Application-Aware	Scheduling Granularity /Co-location

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KServe	Orchestration	✓	✗	✗

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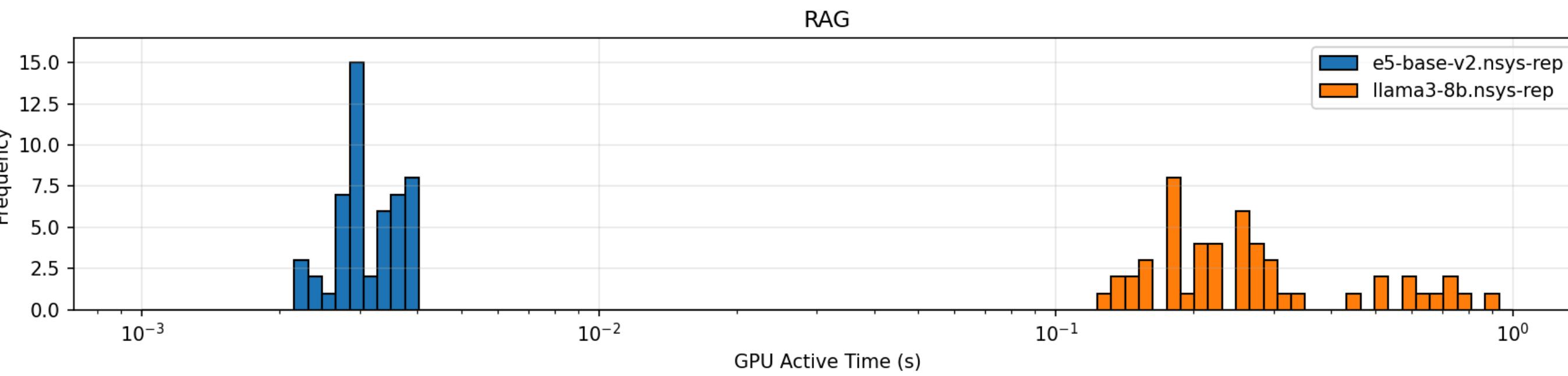
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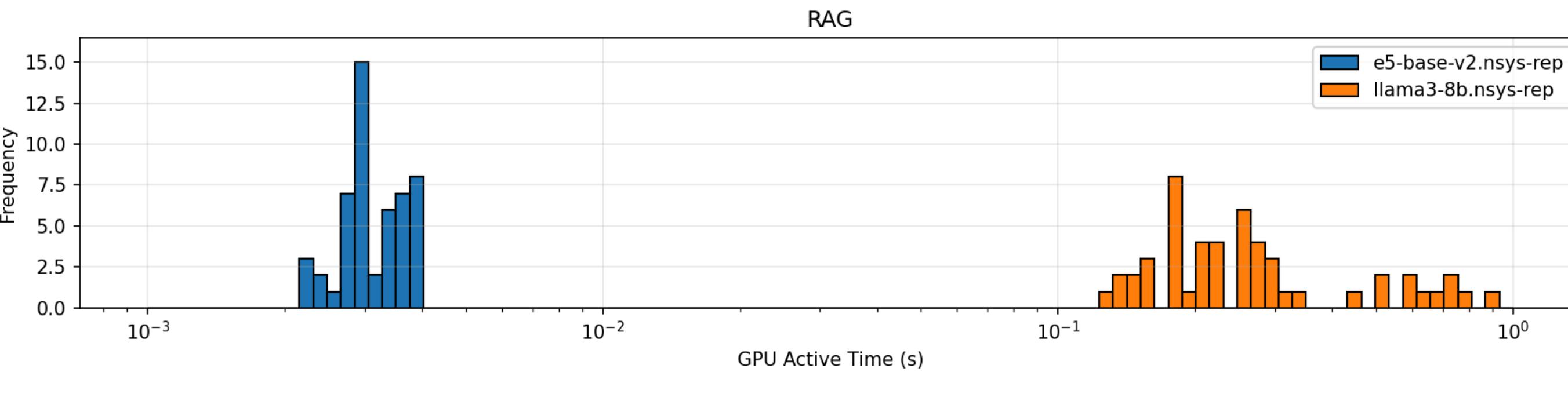
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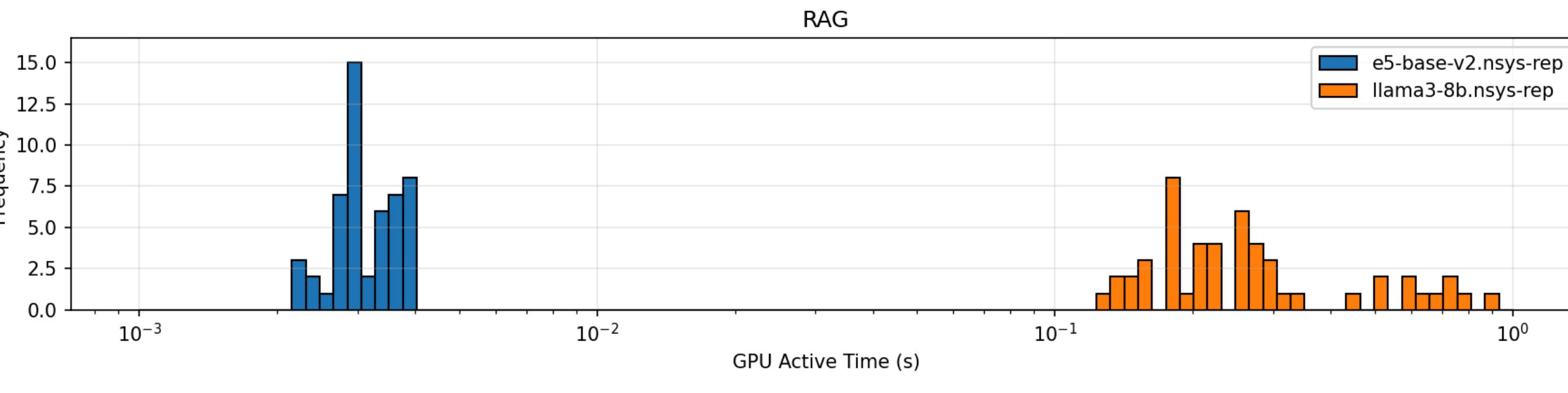
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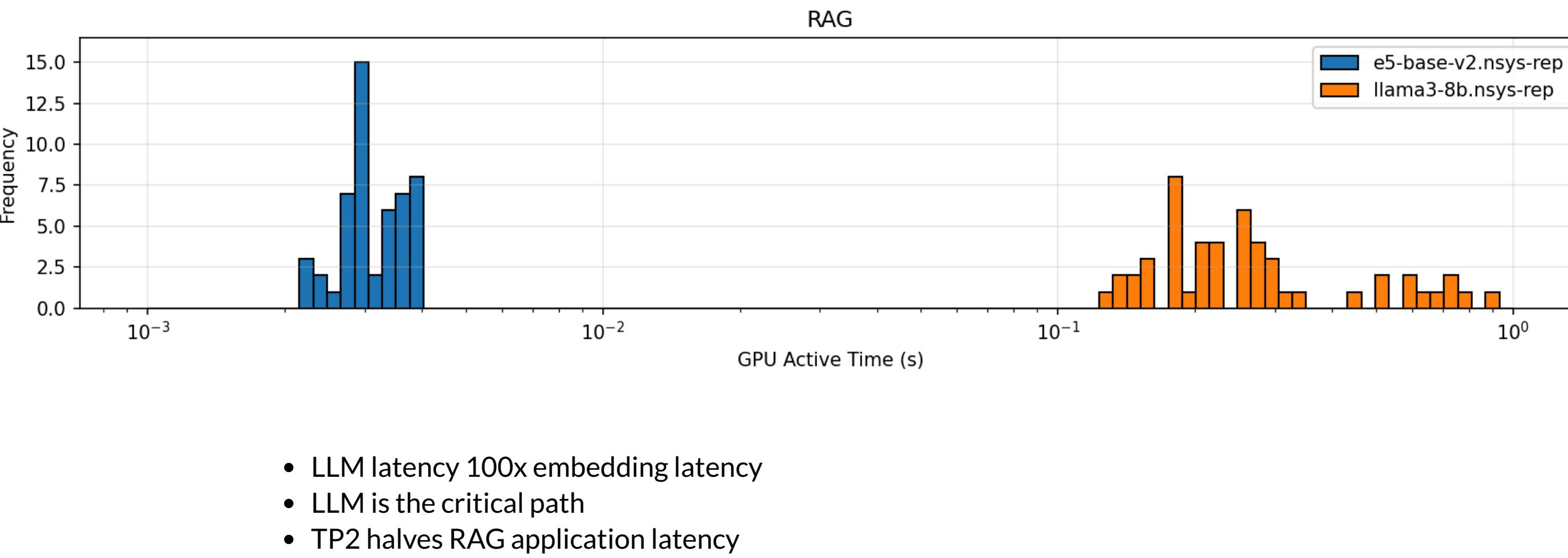
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- LLM is the critical path

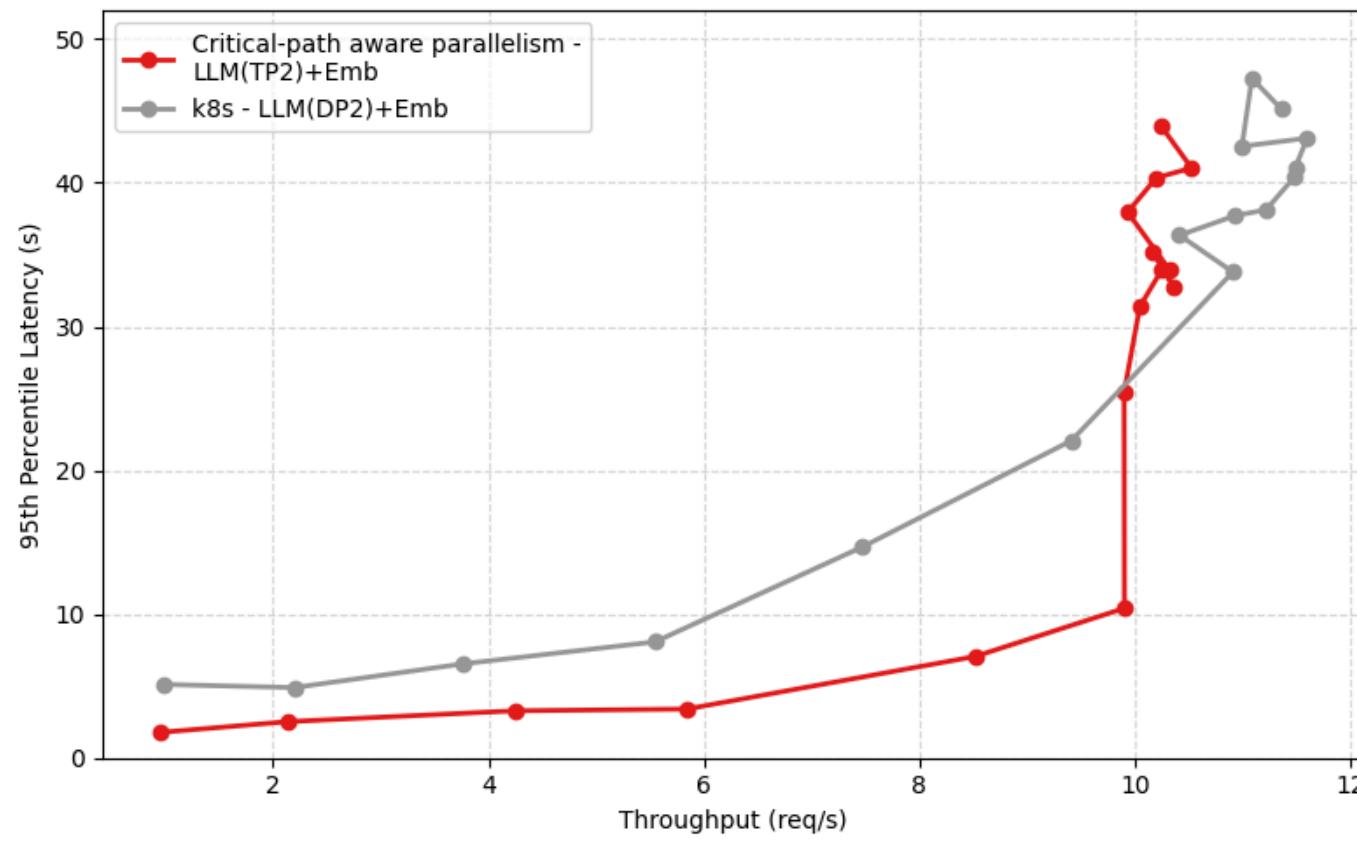
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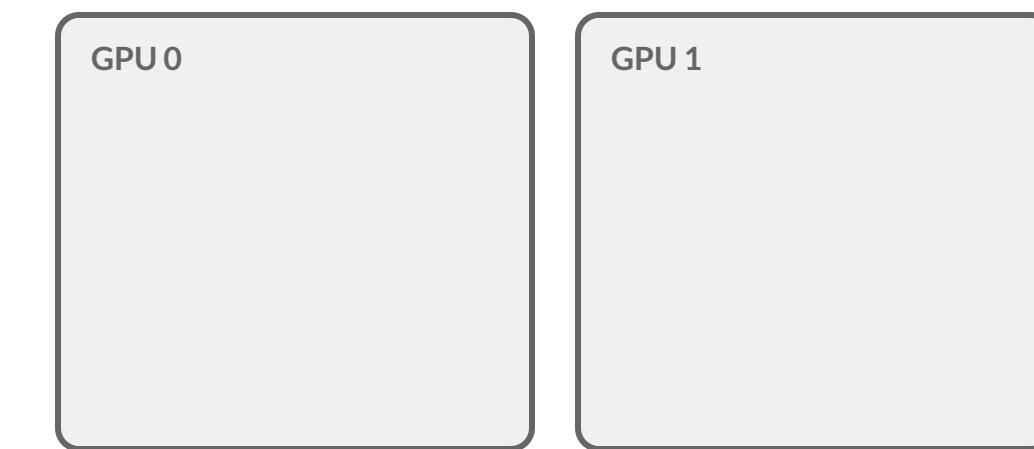


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- **2.4x improvement in latency**
- Minor degradation in throughput

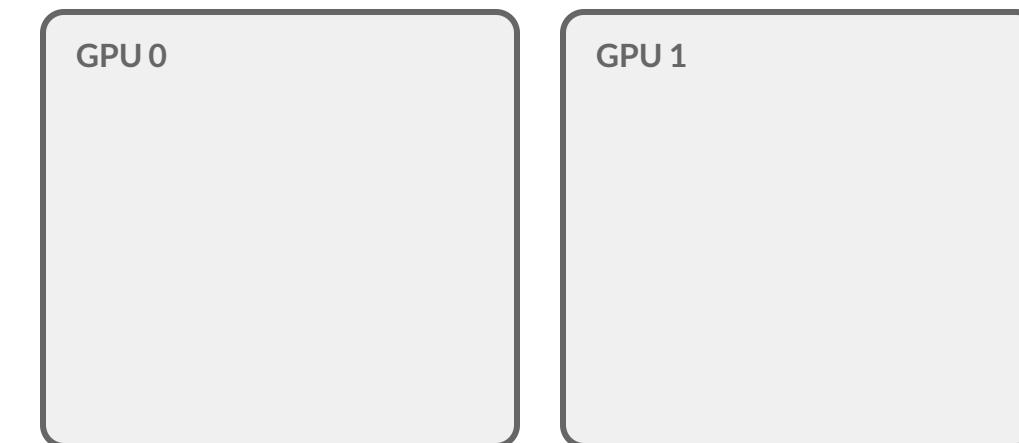


# Critical-path Aware Co-location



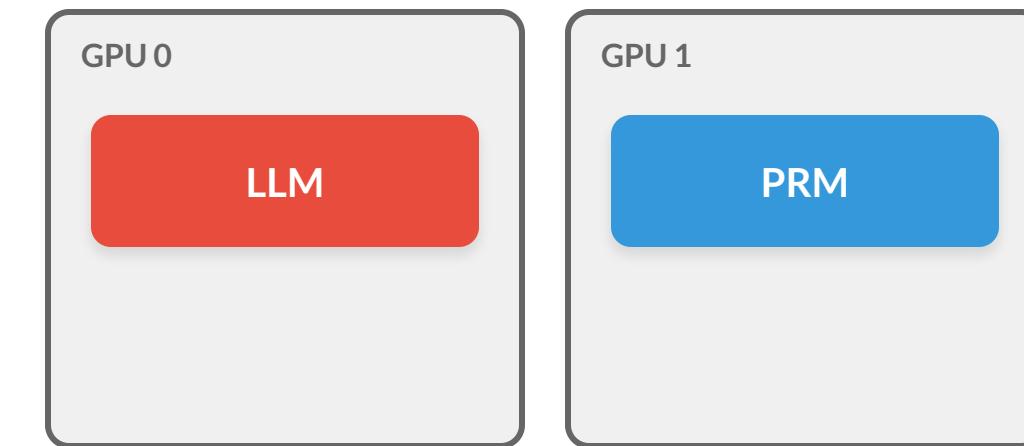
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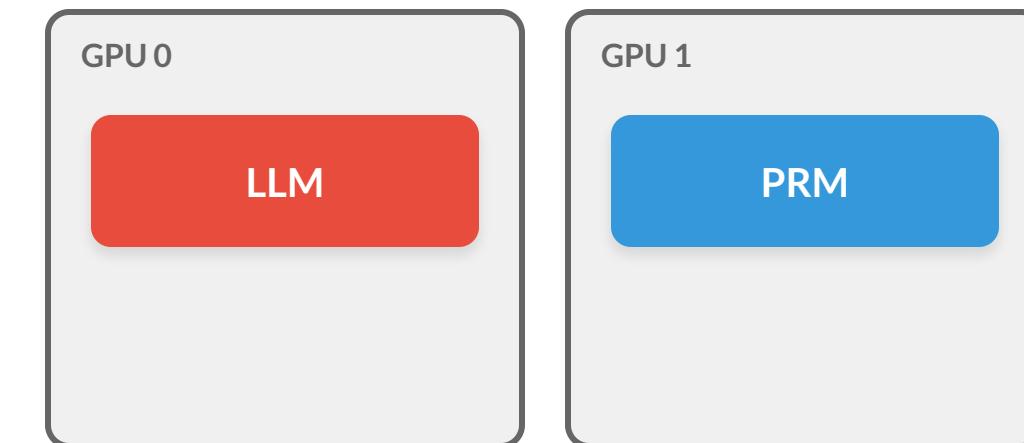
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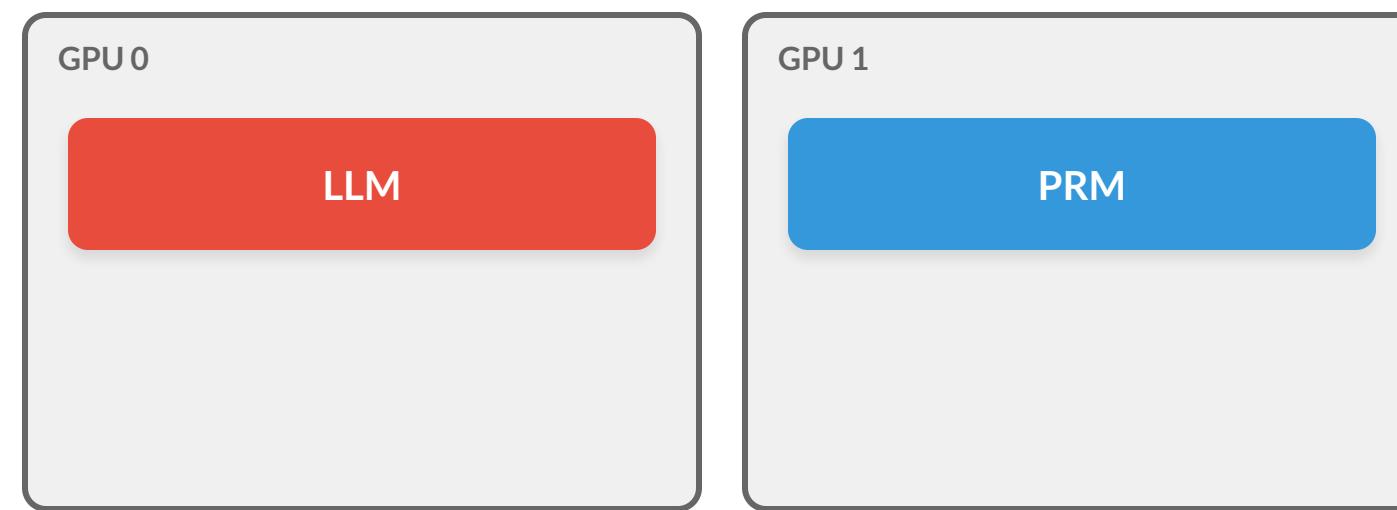


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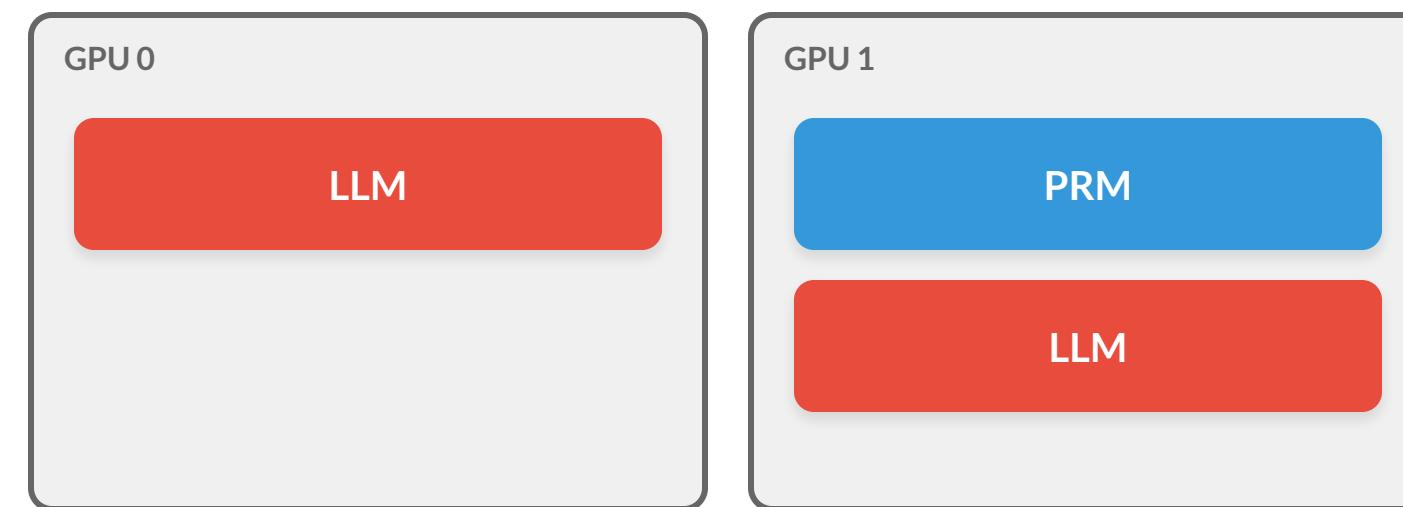
- How should we deploy this application?
- Severe underutilization



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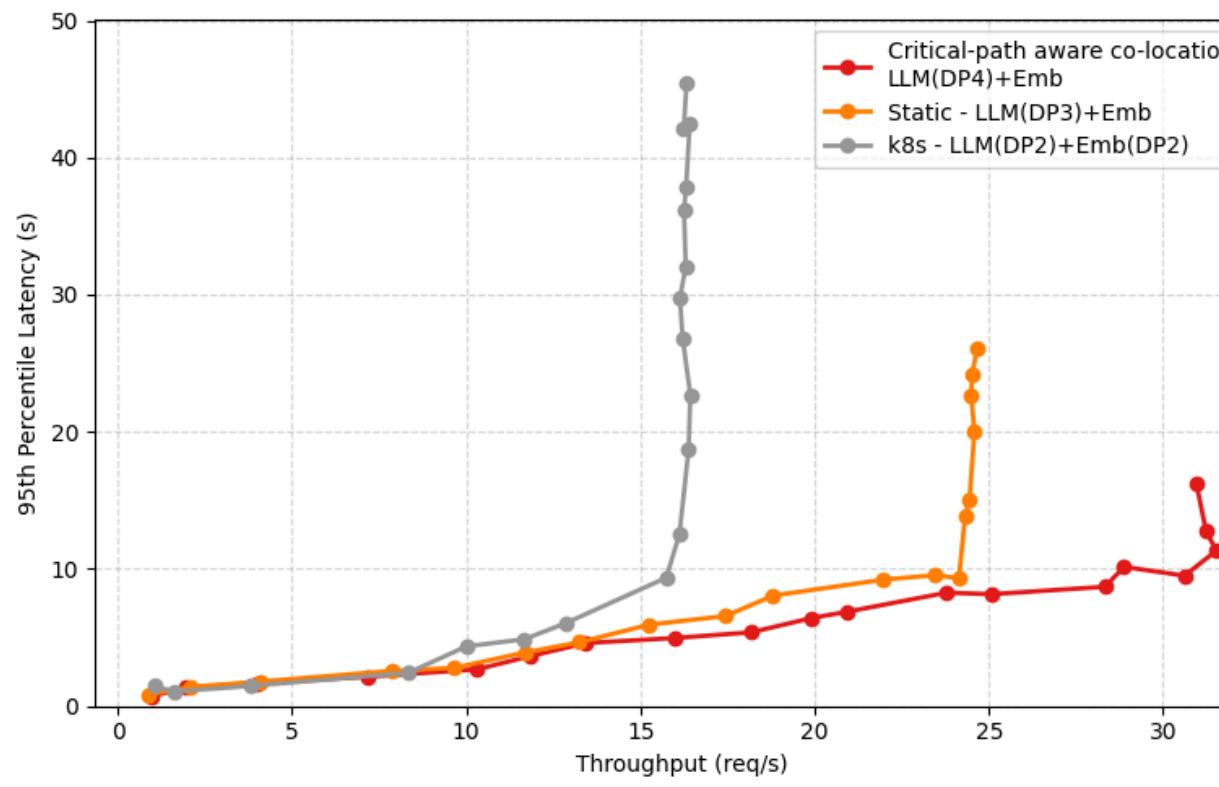


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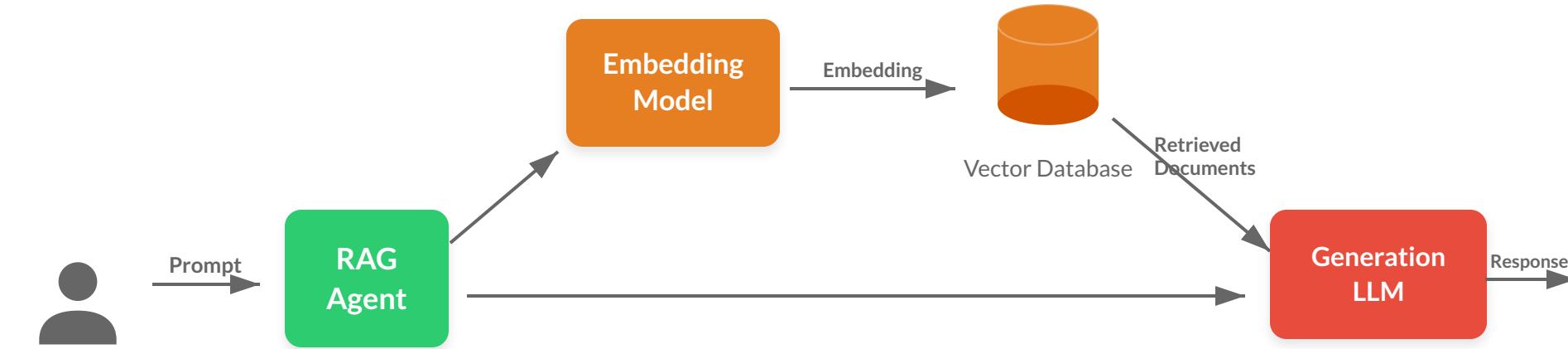


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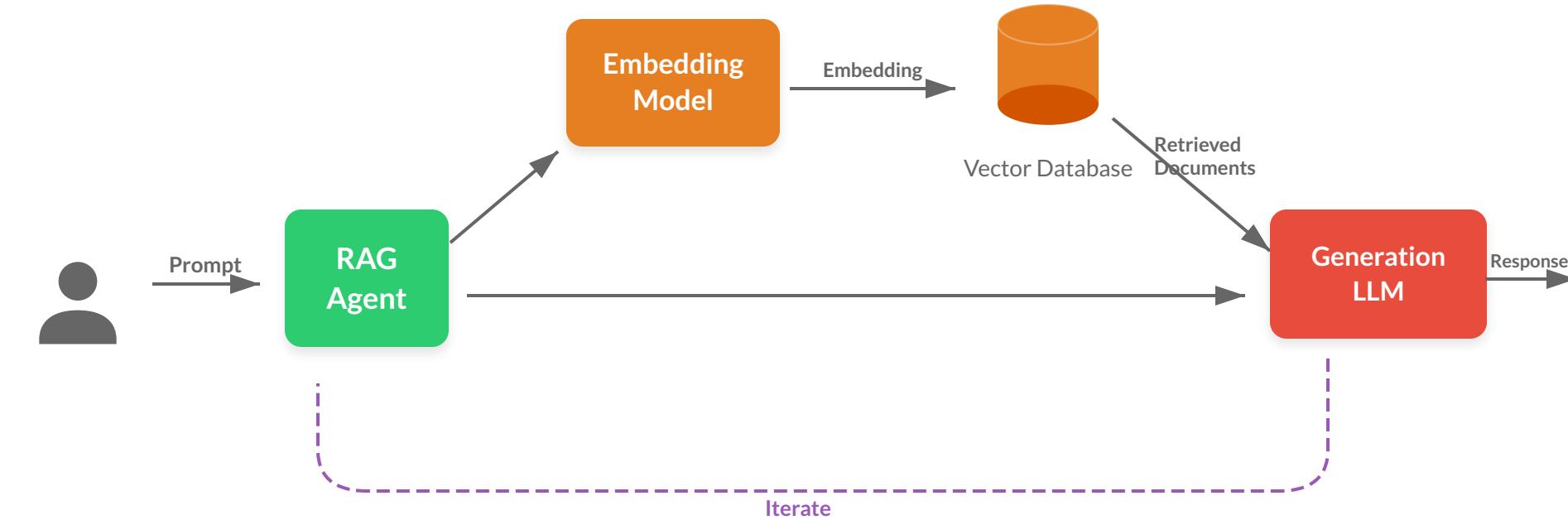
- 2x throughput over K8S
- 50% over best manual K8S config
- K8S: data parallelism only



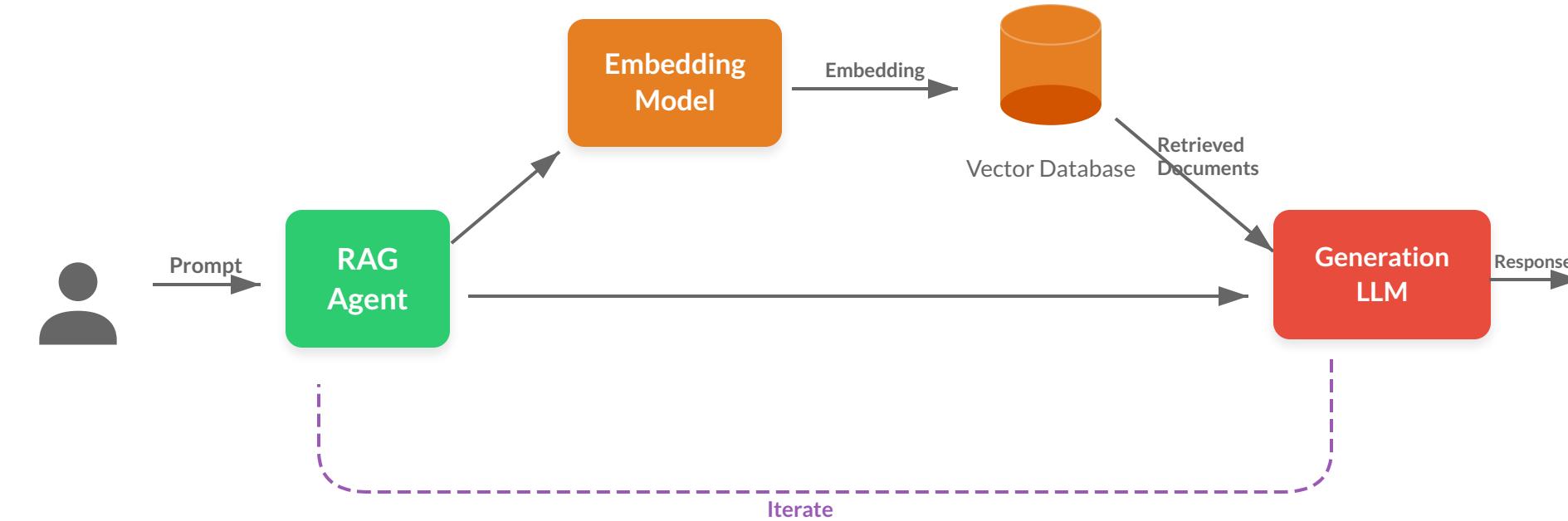
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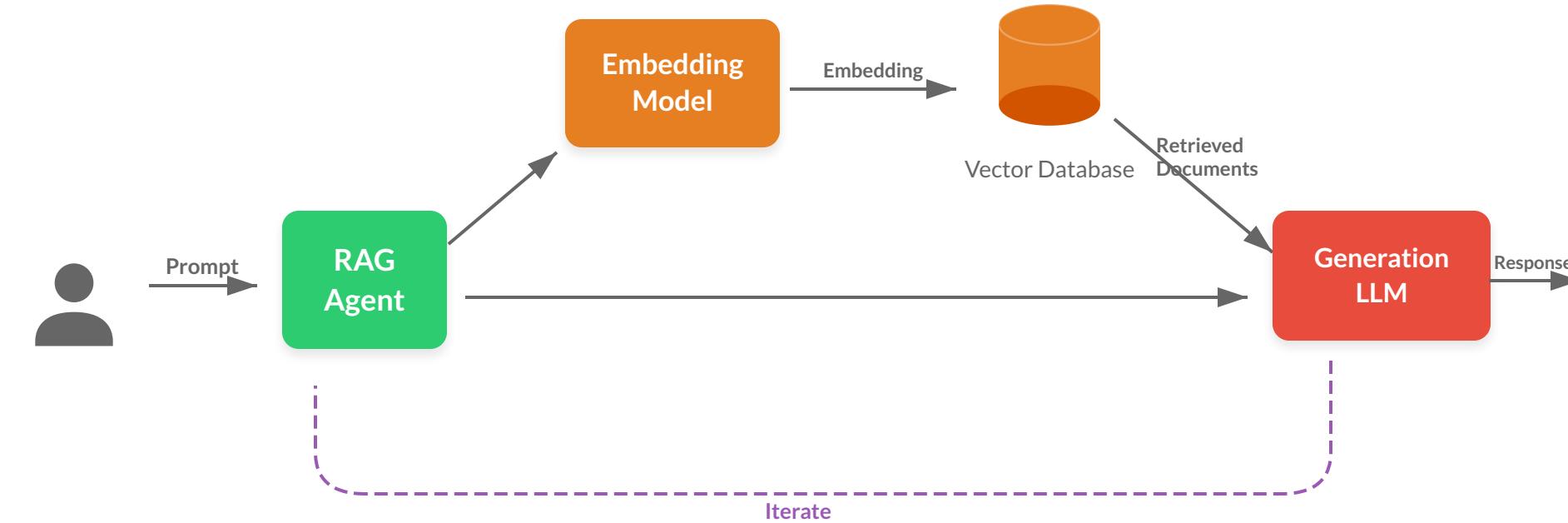


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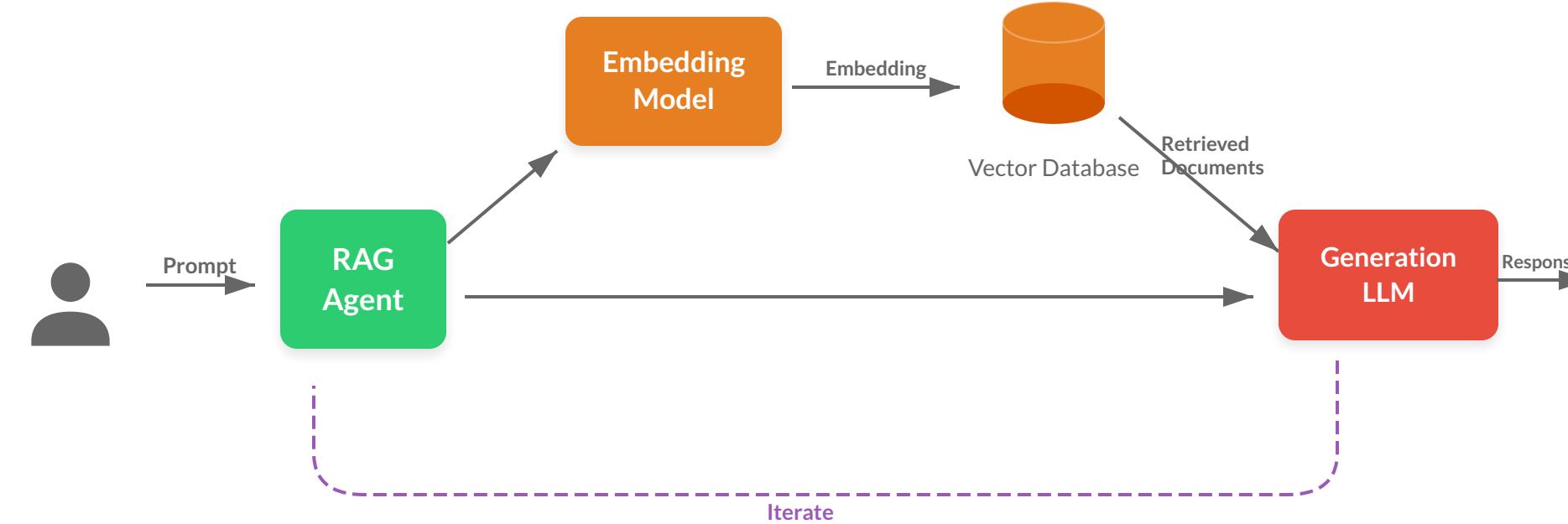
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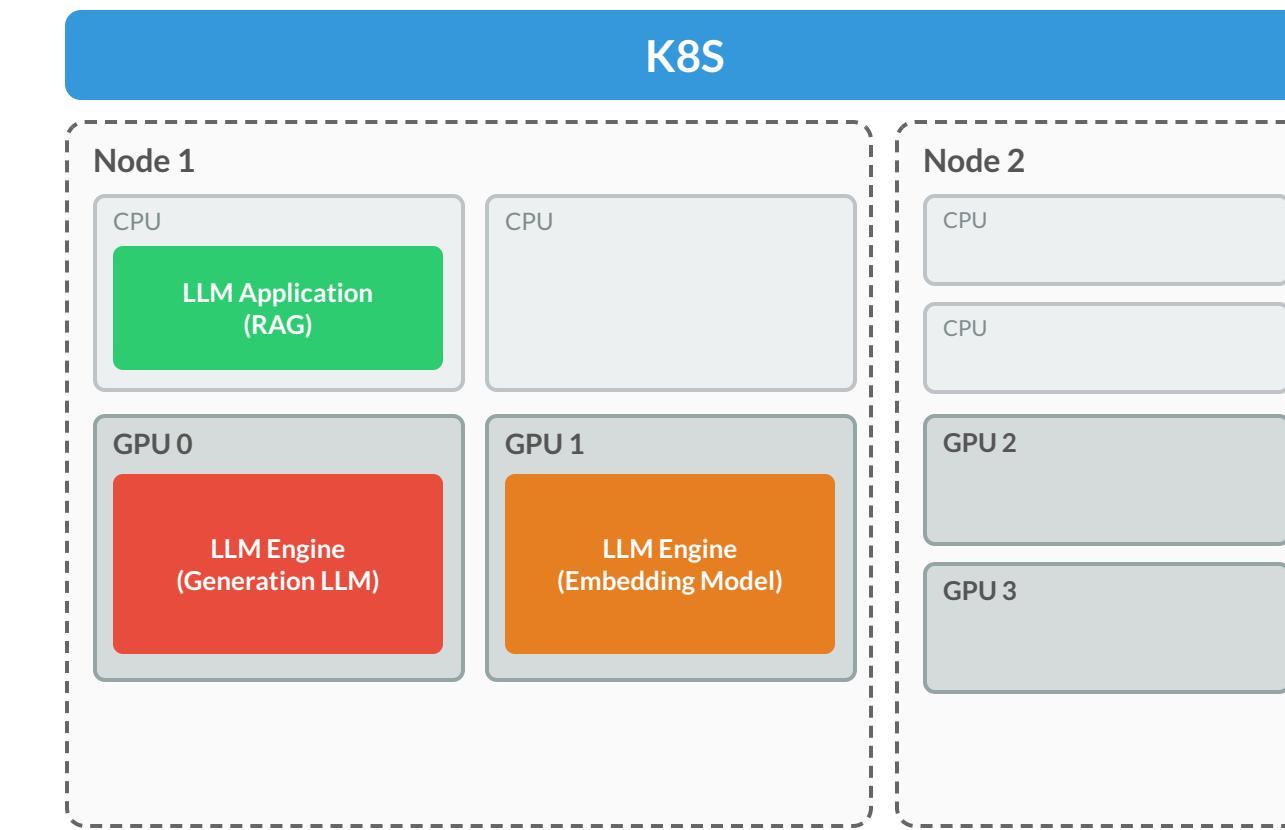
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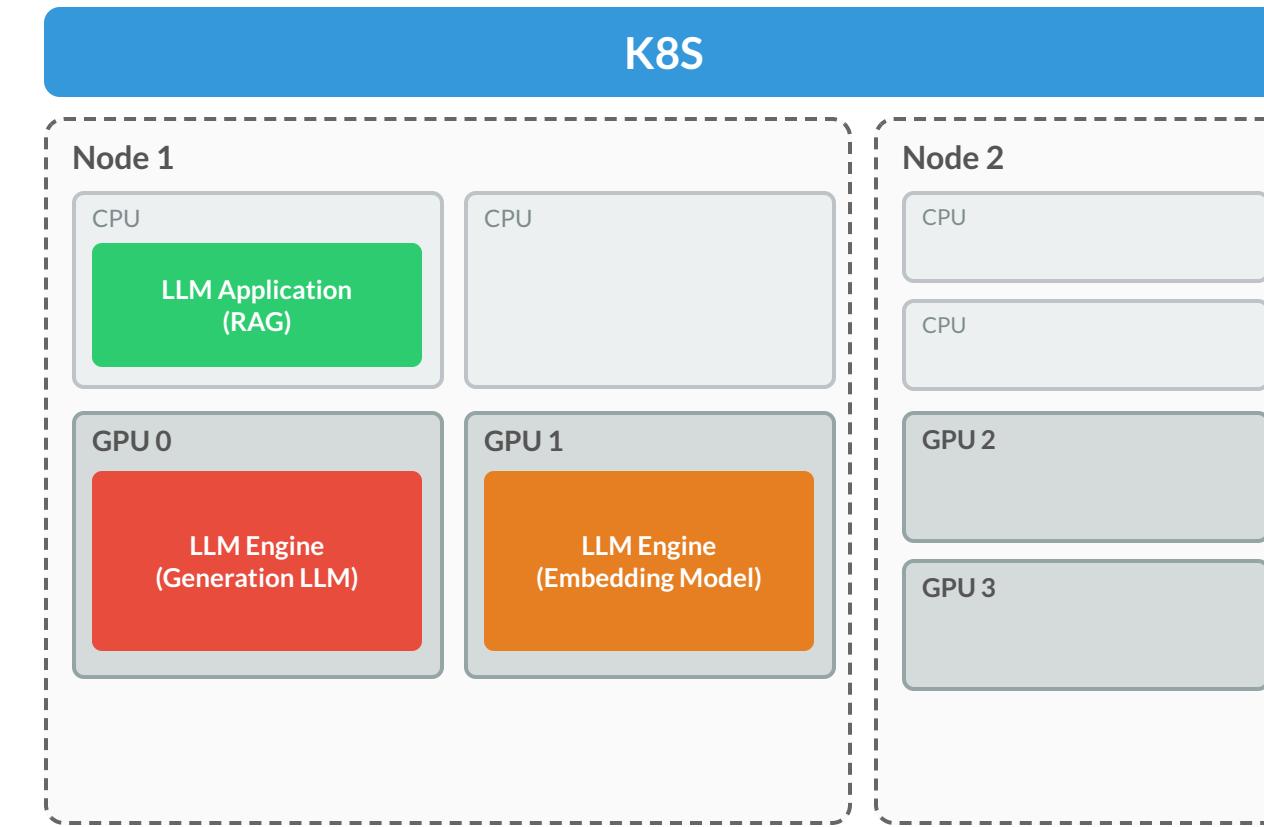
- Common pattern in agentic applications
- Some requests far more expensive than others
- HoL blocking for the many cheaper requests that iterate fewer times

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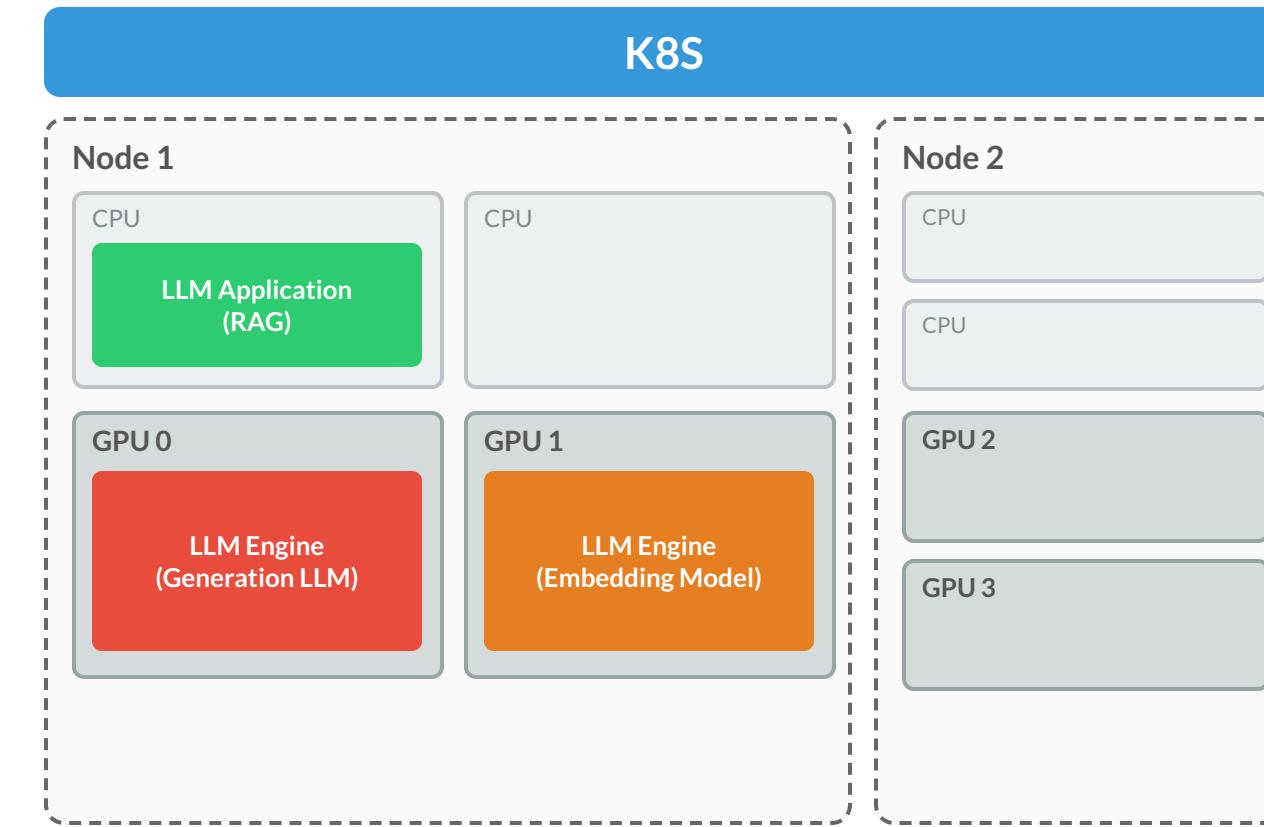
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- Can also have HoL blocking between workflows

