Programming Model Support for Dependable, Elastic Cloud Applications

Wei-Chiu Chuang, Bo Sang, Charles Killian, Milind Kulkarni

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Motivation

Elasticity

Dependability

Implementation

Conclusion

Motivation – Cloud in Reality





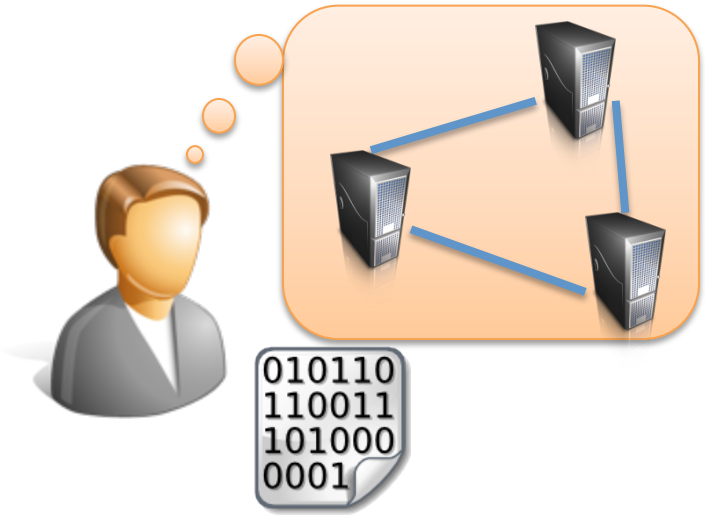
Chuang, Sang, Killian and Kulkarni, "**Programming Model Support for Dependable, Elastic Cloud Applications**" HotDep '12

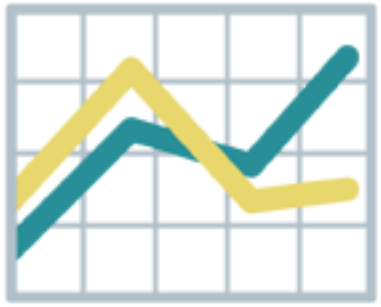
Motivation

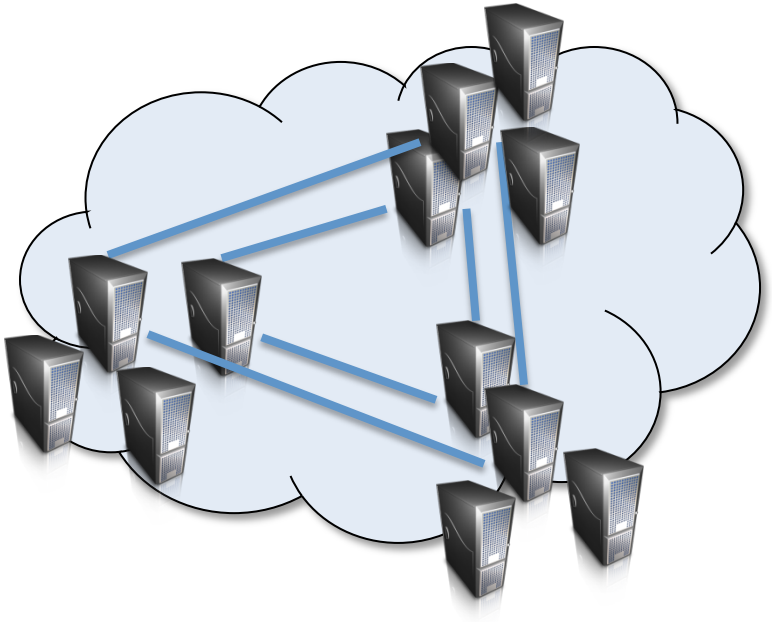
- Imagine an ideal world…



Motivation -"Ideal" Cloud

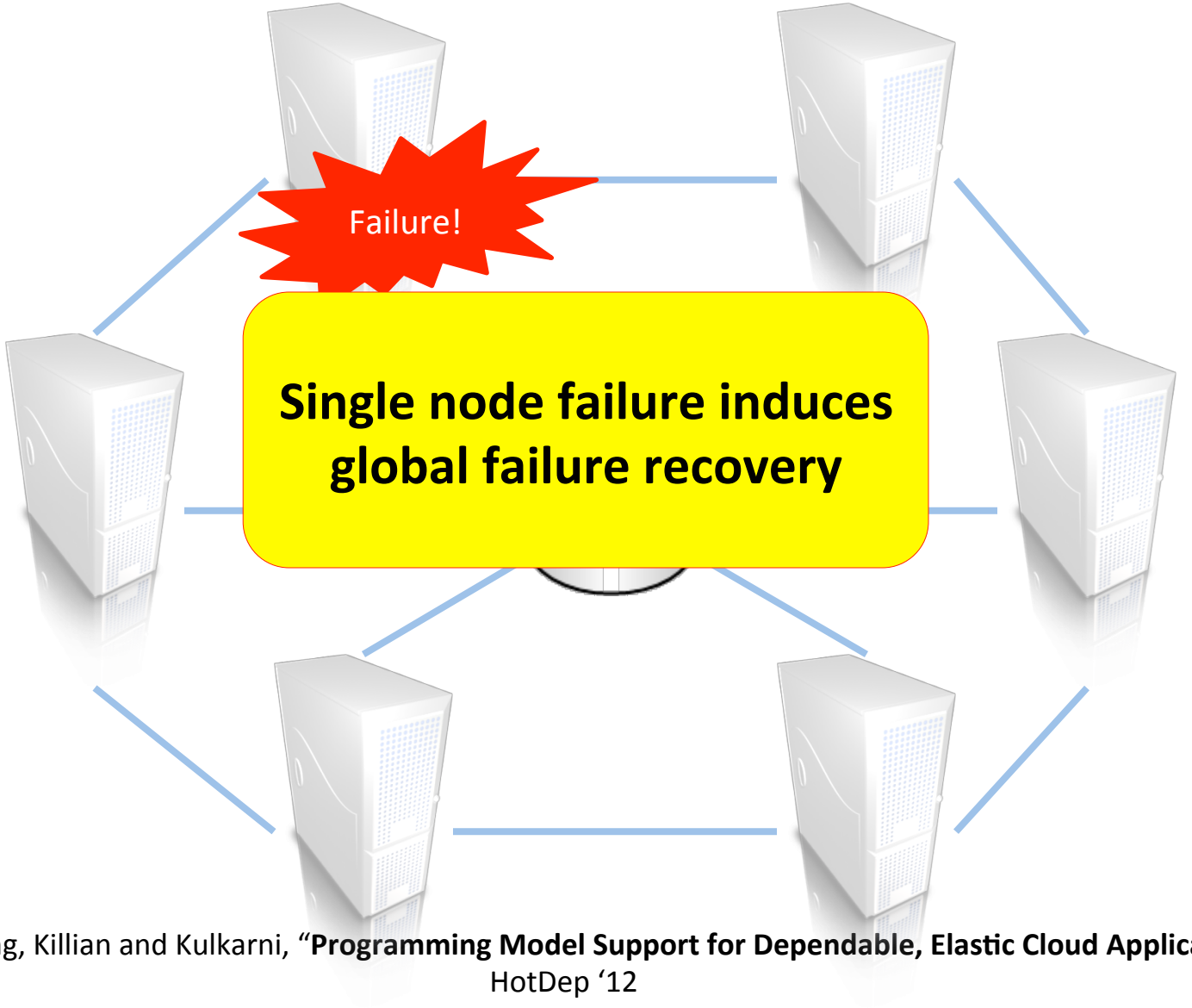






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Motivation - Failures



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Motivation – Failure in Large Systems



Naïve elasticity makes system more likely to fail

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Motivation - Too Big To Fail



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Motivation

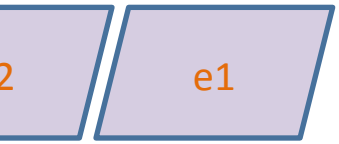
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Elasticity – Context



Node state

X = 5

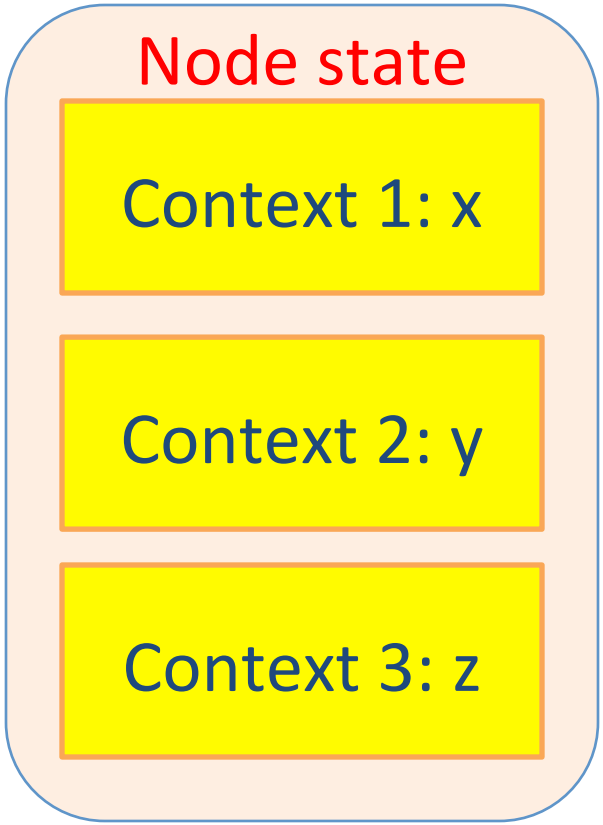
Y = 2

Z = 4

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Elasticity – Independent Contexts

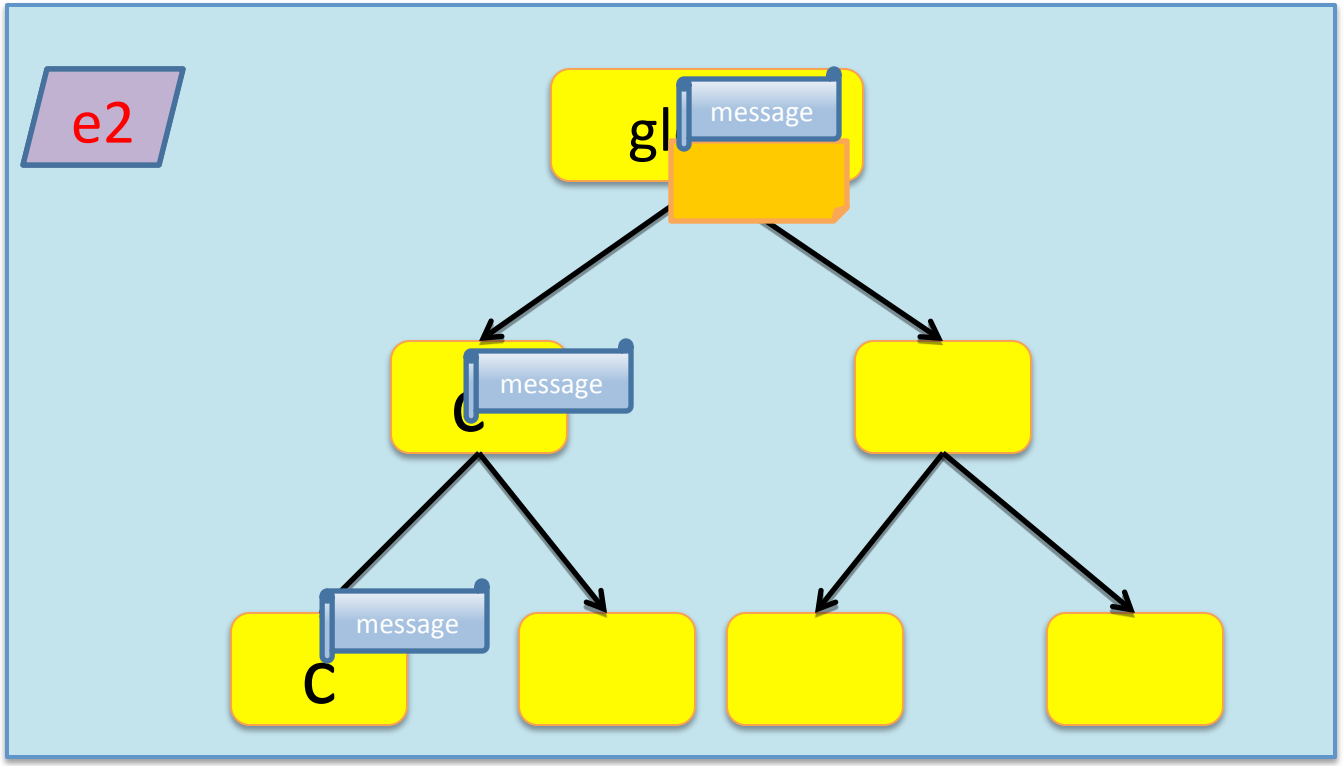
Commit in sequential order



2 e1

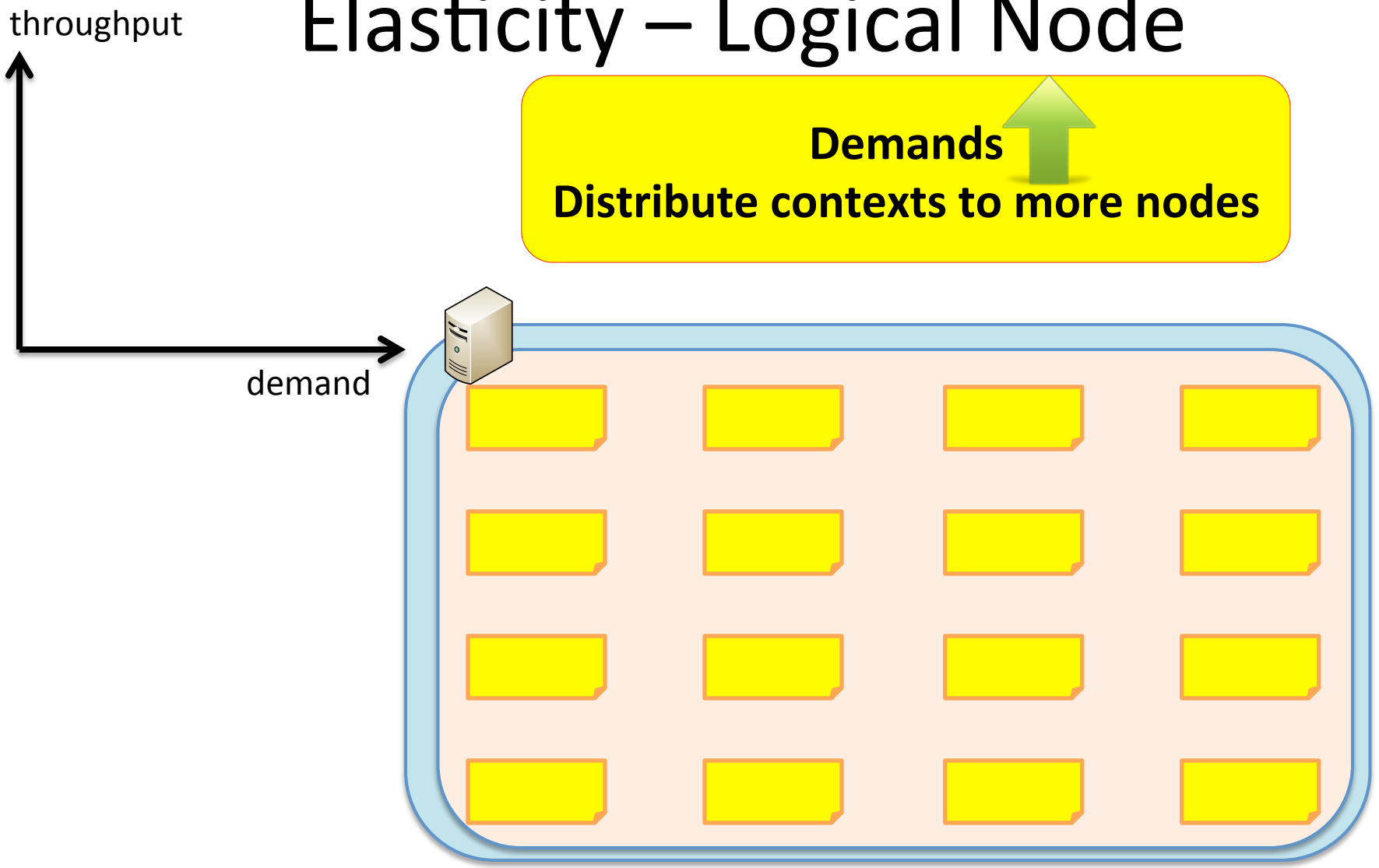
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Elasticity - Hierarchical Contexts



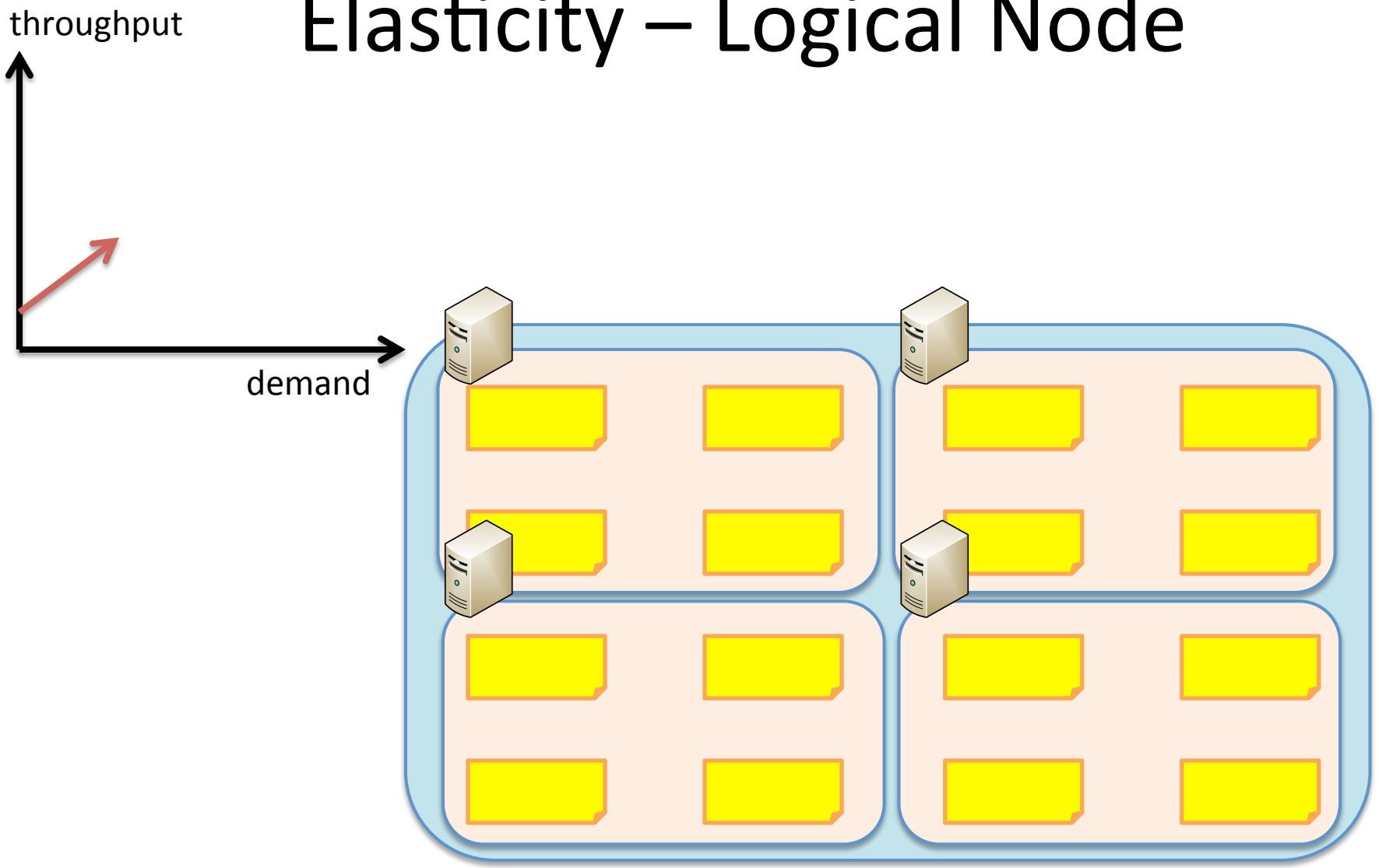
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Elasticity – Logical Node



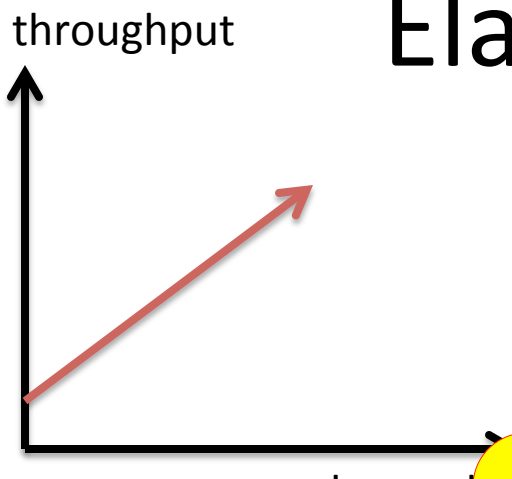
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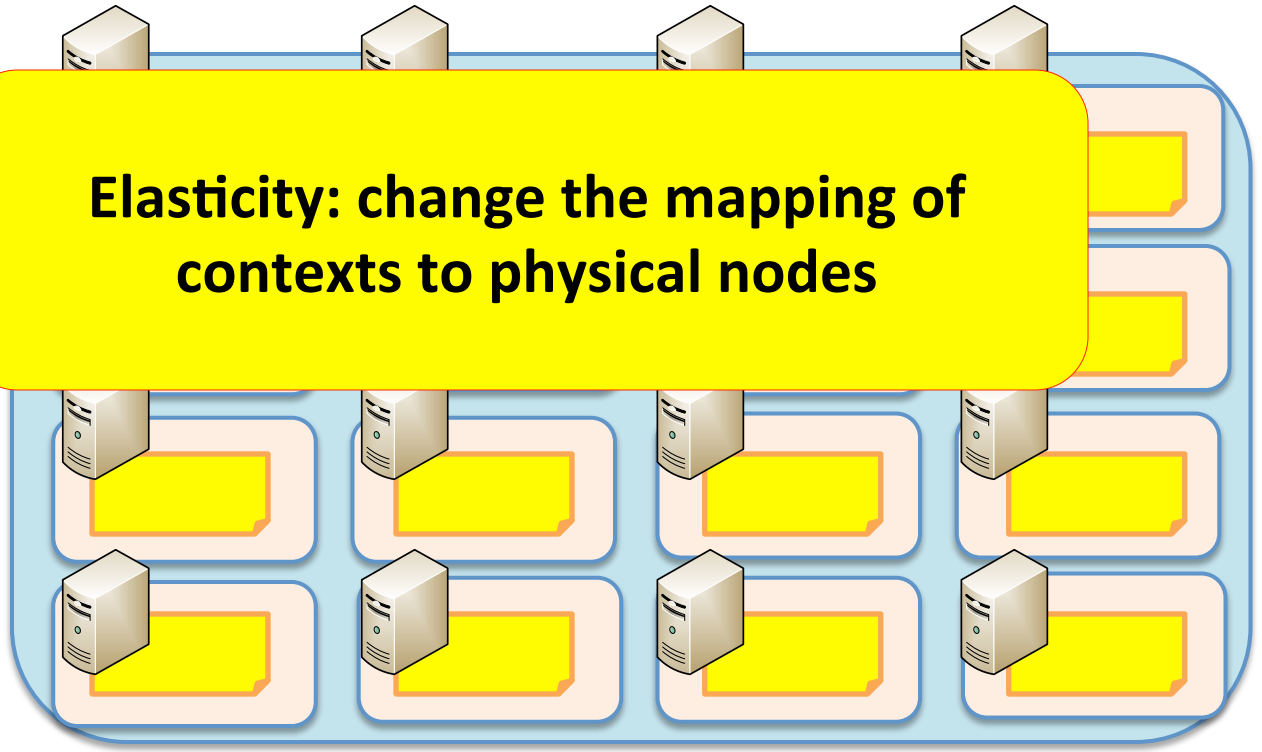
Elasticity – Logical Node



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Elasticity – Logical Node





Elasticity: change the mapping of contexts to physical nodes

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Motivation

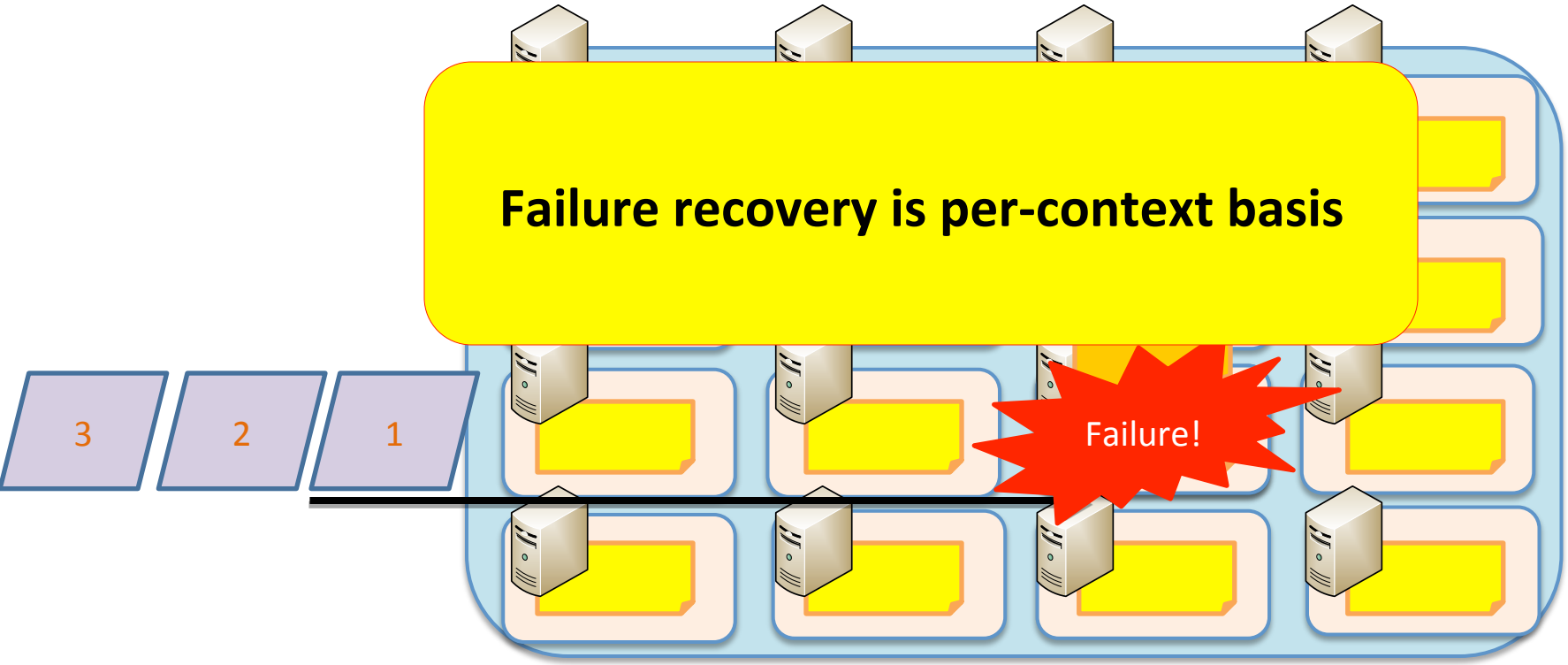
Elasticity

Dependability

Implementation

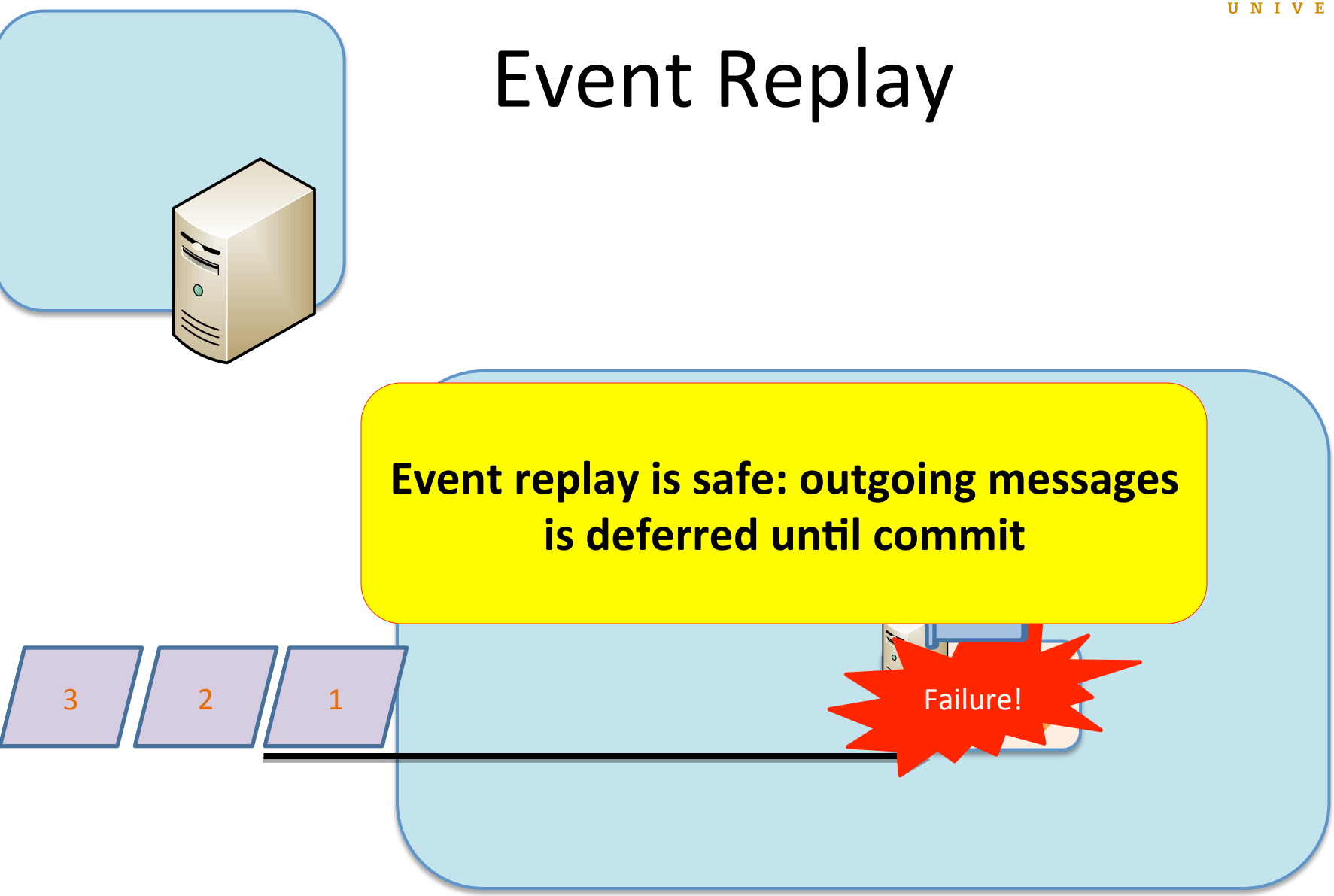
Conclusion

Partial Recovery



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Event Replay



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Motivation

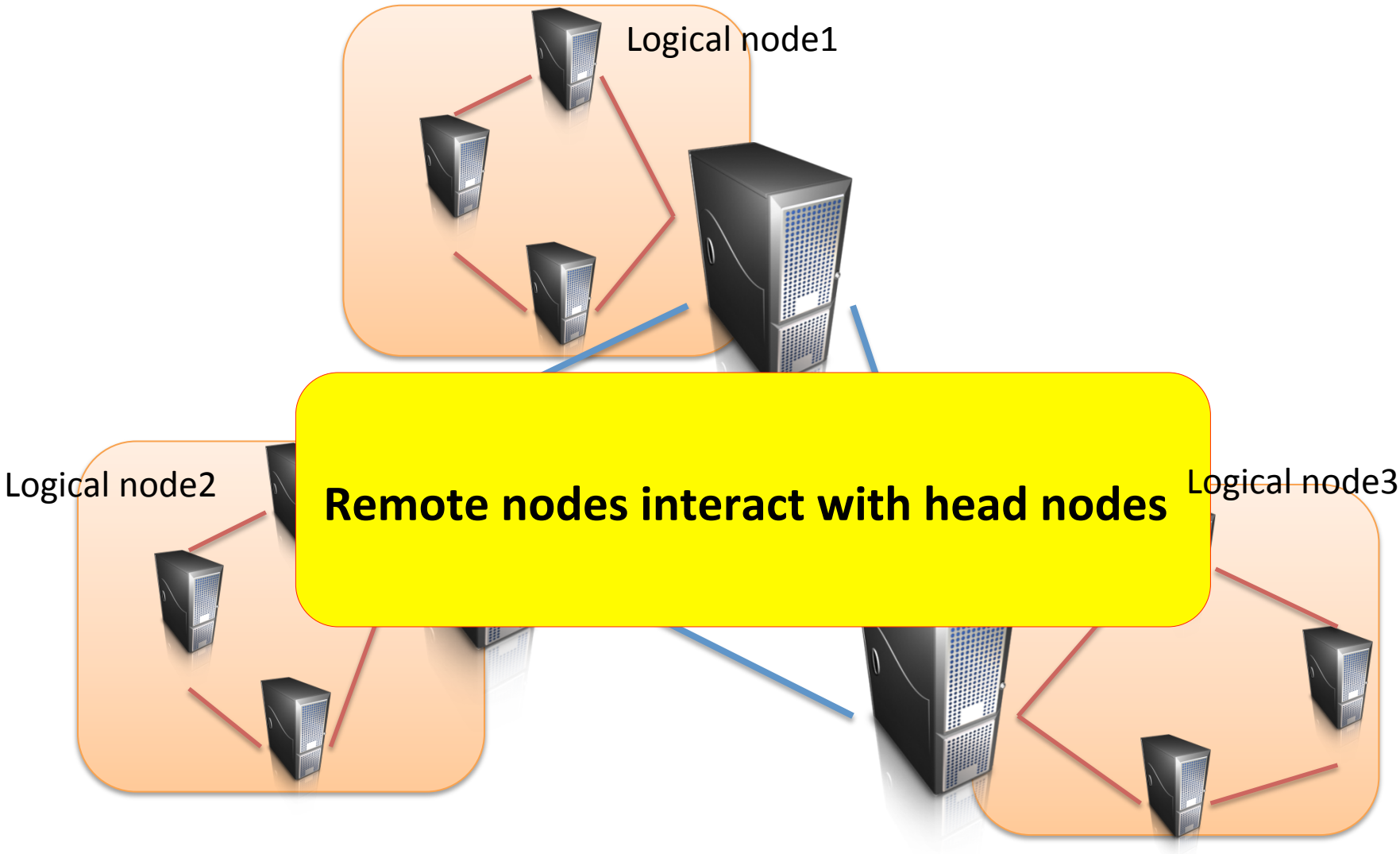
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Head Node



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Conclusion

- Elasticity is crucial for cloud applications.
- Our programming model enables elastic execution.
- The elastic mechanism also helps fault tolerance.

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Questions?



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Programming Model

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