Programming Model Support for Dependable, Elastic Cloud Applications

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

Elasticity

Dependability

Implementation

Conclusion
Motivation – Cloud in Reality

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Motivation

• Imagine an ideal world...
Motivation -“Ideal” Cloud

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Motivation - Failures

Single node failure induces global failure recovery

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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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Elasticity – Context

Node state

\[
X = 5 \\
Y = 2 \\
Z = 4
\]

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Elasticity – Independent Contexts

Node state

Context 1: x
Context 2: y
Context 3: z

Commit in sequential order

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Elasticity - Hierarchical Contexts

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Elasticity – Logical Node

Demands
Distribute contexts to more nodes

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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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Partial Recovery

Failure recovery is per-context basis

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Event Replay

Event replay is safe: outgoing messages is deferred until commit

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Conclusion

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

MaceSystems
http://www.macesystems.org

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Questions?
Motivation
Elasticity
Dependability
Programming Model
Conclusion
Backup Slides

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