CompSci 401: Cloud Computing

Handling Complexity in Cloud-Native Applications

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Sources of complexity in cloud systems

- Large number of technologies and tools
  - Many frameworks
  - Libraries
  - Third-party services
- Multiple layers of virtualization
- Dynamicity
  - Autoscaling
  - Continuous delivery

Intrinsic complexity of distributed systems

- Parallel algorithms and distributed systems are intrinsically complex
- Replicated data must be kept consistent
- Many possible interactions between systems
  - Combinations grow exponentially
- Delays may impact system behavior in unpredictable ways
  - Generally hard or impossible to reproduce consistently and troubleshoot
- Potential for deadlocks
  - Circular dependencies that block services

How can we build a trustworthy system?

- Building prototypes
  - Get insight into possible architectures
  - Test integrations with libraries and frameworks
- Analytical models
  - Theoretical formulations to help reason about a system and its properties
- Extensive, automated testing
- Continuous integration
- Continuous delivery