"If you are programming for the cloud, you are not programming for the cloud."

--Cameron Purdy
Internet as a Platform

- Falling cost of storage and computing power
- Ubiquitous broadband connectivity
- Democratized tools of production
Yesterday’s Software Environment

• Collaborating services instead of monolithic applications
• The cloud as middleware platform
• Services are all about interaction
• Connected, but loosely coupled

Google.stanford.edu (Circa 1997)
Current Design

• Fault tolerant distributed disk storage: *Google File System*
• Distributed shared memory: *Bigtable*
• Parallel programming abstraction: *MapReduce*
• Domain Specific Languages: *Sawzall*

Programming the Cloud

• Uncertainty
• Asynchrony
• Interaction
• Back to Basics
• Empower the Run-time
• New Programming Models
Uncertainty

- Waiting for results is not a smart use of a 3 GHz processor
- Therefore, continue processing and handle results as they become available
- Becomes event-driven
- Out-of-sequence, time-outs, conversation state
- No read consistency
Interaction

• Not free
• Conversations to overcome uncertainty
• Conversation State

Back to Basics

• Even simple things become complicated in a distributed environment
• Bigtable, not Bigdatabase
• A well understood failure scenario better than an incomprehensible and unproven “failsafe” system
Empower the Run-time

- Traditional programming often overprescribes
- Relax rules to enable parallel execution
- More difficult to understand and debug

New Programming Models

**Before**
- Object-Oriented
- Rich Domain Models
- Method Calls
- Prescriptive
- Single threaded
- Easy to debug

**After**
- Process Modeling
- Event-based
- Channel-based
- Descriptive
- Parallelizable
- Difficult to debug
Learn from the Real World

- Start making coffee before customer pays
- Reduces latency
- What happens if...

Customer rejects drink ➔ Remake drink
   Retry

Coffee maker breaks ➔ Refund money
   Compensation

Customer cannot pay ➔ Discard beverage
   Write-off

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Thank You!

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