Will Clouds Reign?  
A Stormy Future for Pure-play Communications

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Agenda

- Infrastructure is for applications
- Clouds: Distributed *Computing*, 30 years late (Liquidity)
- Mobility and Clouds
- People and Clouds
- Business and Clouds
Infrastructure is for *applications*

- What applications are best served by network businesses and business models?
  - Conversations
  - Broadcasts
  - Remote Access to distant resources
- What are the emerging applications?
  - Locating relevant information
  - Augmenting the users' environment
Tradition: connectivity platform

- Tele- is the problem to solve
- Resources are fixed – servers, people, content
- Transporting bits faster, farther, cheaper
Hypermediated applications

- Web 2.0
  - Mashups, YouTube
- Social networking
  - Facebook
- MMORPG
  - Blizzard Games
- Online Collaboration and Simulation
  - Second Life, Croquet
- Augmented reality
  - Mscapes, Smart cars
Distributed computing, Thirty years late

- Location
- Identity/Relation
- Privacy/safety
- Resiliency
- Sensing/capture
- Interaction/expression
- Computing
- Glue (comms)
Architecture for hypermediated apps: composable functions

- Local computing and interaction (cellphones, laptops, other)
- Wireless glue, positioning, sensing
- Databases, filters, searching, recording
- Social glue and tracking
- Resilient resources configured on demand
- Authentication, security
- Economic elements (billing, payments)
3 Distinct “Clouds” of resources

- Peer-to-peer cloud (edge)
  - Skype and Croquet
  - End users, personal computing
- Service-on-demand cloud (center)
  - Web 2.0, Second Life and Worlds of Warcraft
  - Amazon, HP, IBM, ... - “Cloud computing”
- Pervasive-context cloud (neighborhood, social context)
  - Social networking, augmented reality, nav systems
  - Google (search, OpenSocial, Android), Facebook
Amazon Web Services

• Key idea: dynamically scalable resources
• EC2 – servers configured on demand for pennies
• S3 – reliable storage on demand
• SimpleDB – databases on demand
• FPS – payments on demand
Resources can be cheap and incremental

Simple Storage Services: $0.15/GB-Month
Electric Computing Cloud: $0.10/VM-hour
Flexible Payments Service: 2.9%+$0.30/payment

Small costs easily bundled into value-added product or advertising-supported services.
Google

- Geospatial resources (maps, streets, ...)
- OpenSocial – a platform framework for maintaining human-human relationships and identity
- Android – a personal platform that incorporates contextual framework
PlanetLab prototype

• Slices and slice management exemplify planet-scale coordination function
• “Contribute to participate” business model
  – P2P for suppliers
  – Internet suggests peering might work here
• Avoids pricing by arbitrary cost accounting
Mobility and Clouds

- A supercomputer in your hand
- A data warehouse on your belt
- Exchanging 1 Terabyte in business cards
People and Clouds

- “Your life bits” are stored throughout the cloud
- Your social relationships are mediated through the cloud
Business and Clouds

- Enterprise provides additional context in each cloud
  - Roles/relationships
  - Data stores
  - Payment systems

- Inter-enterprise clouds instantiate resources and value
Communications value chain redefined by hypermediation

- Communications platforms provide context
- Transactions, Awareness, Search, Persistence, Resilience become essential platform elements
- Value chain embodied in the cloud via mediated business arrangements
- Resources become liquid
Action items?

- Computing Distribution Network in mobile space up for grabs... (Akamai for mobile)
- Interoperability for mediated services across providers - path to growth? W3C or Internet project?
- Peering requires economic exchange framework