



Cloud Computing and its Impacts on Communications

Lawrence Vanston, Ph.D.
President,
Technology Futures, Inc.

lvanston@tfi.com

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13740 Research Blvd., Bldg. C-1 • Austin, Texas 78750
(512) 258-8898 • www.tfi.com

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Drivers for Cloud Computing

- Higher utility of servers
- Redundancy
- Reliability
- Scalability
- Outsourced IT
- Less applications and data needs to be stored locally
- More focus on Core Competencies
- Instant background updates
- More centralized control
- Viability of thin clients and dumb terminals

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Constraints on Cloud Computing

- Bandwidth bottlenecks in the network
- Security, privacy and intellectual property concerns
- Reliability
- Accountability when things go wrong
- Latency
- Somewhat more limited customization
- Resistance from IT staffs

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Balance of Drivers and Constraints

- Balance favors drivers, with bandwidth bottlenecks being the biggest constraint
- This constraint will likely be overcome for wireline, at least in dense areas
- It will remain an issue for wireless

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End-to-End Transfer Time for Hard Drive Contents

Hard Drive Contents (Terabytes)	1					Current Maximum: 2-4 TB	
Gigabytes	1,000					Improvement Rate:	
Megabytes	1,000,000					~25% per year	
Megabits	8,000,000					Maximum in 2016: ~4-8TB	
Disk-to-Buffer Data Transfer Rate (Megabits/sec)	1000	Mb/s				1030 typical in 2011	
						Improvement Rate:	
						~10% per year	
						~1600 typical in 2016	
			End-to-End Transfer Time				
End-to-End Data Rate	Mb/s	Seconds	Minutes	Hours	Days		
1 Gigabit/sec	1000	8,000	133	2	0		
100 Megabits/sec	100	80,000	1,333	22	1		
10 Megabits/sec	10	800,000	13,333	222	9		
1 Megabit/sec	1	8,000,000	133,333	2,222	93		
100 Kilobits/sec	0.1	80,000,000	1,333,333	22,222	926		

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Impacts on Communications

- 100 Mb/s and 1 Gb/s are reasonable requirements if Cloud Computing is to be fully realized
- Upstream capacity will be a big issue
- Requirements will flow through to LD network
- Cloud computing and bandwidth will continue to be a tradeoff for wireless

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