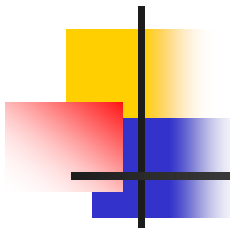


Convergence ?

Keynote Presentation
Interop Japan 2007

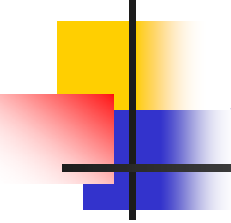
Geoff Huston
Chief Scientist
APNIC





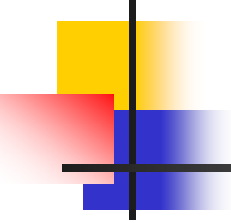
Networking as we knew it...

- Communications networks were traditionally constructed to precisely meet the requirements of the intended service
- For example:
 - The dynamics of the human voice and the telephone network:
 - Voice range covers 300 Hz to 3500 Hz
 - Poor high frequency response reduces intelligibility
 - Dynamic range of 70db
 - Delay within 400 ms
 - Limited Total Harmonic Distortion
 - Digitally, voice can be mapped with 8000 samples per second, with each sample quantized to 256 discrete levels: 8KHz of 8 bit samples
 - The PSTN is a time switched network with a base 125usec clock pulse
 - “Digital Circuits” are derived from these time-switched 64K synchronized bit streams, using multiples of this basic service “atom”
 - Voice networks are highly constrained systems that operate to a Highest Common Factor service model



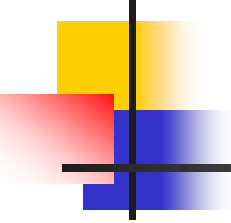
Architecting Networks for Data

- Data networks are different....
 - There is no fixed “speed” unit
 - There is no fixed minimum bit error rate
 - Loss, jitter and latency variance tolerance
 - There is no particular service model:
 - Variable speed, bandwidth, times, reliability,...
- Data networks have variable control models, with a strong pressure to operate a lowest common denominator service model with edge-based control imposition



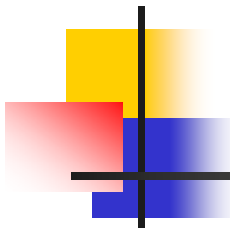
The “Full Service” Communications Enterprise

- Operates a variety of different networks, each attuned to differing service requirements
 - PSTN
 - Video reticulation
 - Data circuit services (DSN, Frame, ATM)
 - Data cloud / VPN services (EtherSwitching)
 - Access networks (DSL, Cable)
 - IP
 - MPLS
 - Lambda services
 - OOB, Command and Control networks



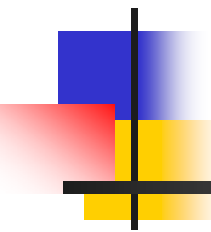
What's wrong with this?

- Proliferation of special purpose networks within each “full” service provider’s infrastructure – high operating costs, low revenue yields
- But all these little networks are just shovelling digital packets around
 - Why does the communications service operator need to construct and operate many distinct networks?
 - If all these ‘networks’ are just moving packets around, why can’t this be achieved within a single packet-switching plane?
 - Higher volume lowers unit cost, doesn’t it?

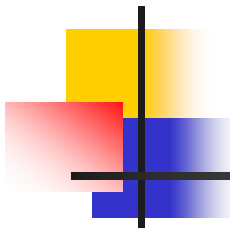


Can we simplify the picture?

- If all these networks are just moving digital packets around then why not build a single digital network and place ALL services onto this common network substrate?

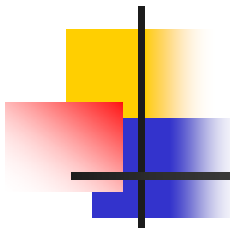


Welcome to “Convergence”!



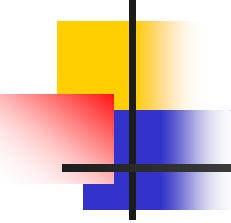
The Converged Utopia

- A small number of vertically integrated “full” service providers leveraging their underlying infrastructure investment into a high yield, high margin service delivery retail system using a single network platform for comprehensive service delivery
- Low cost, high value, strong service control, fantastic margins!



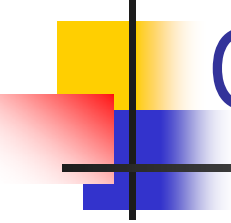
Wouldn't it be good if...

- You could operate all forms of real time and data services within a single network and a single switching plane
- Your carriage plane could be triggered to support graded service responses for each class of service usage
- You could support both high resilience high quality real time and various profiles of data services, and all points in between within a common switched network platform
- You only needed a single protocol, a single carriage architecture and a single OSS (and a single operator!) to drive the entire network operation



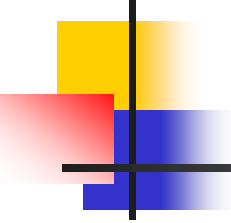
And wouldn't it be even better if...

- You could account for, and tariff, the end user value of delivered services rather than just switched packets
- Customers paid you for value-added service solutions, rather than the marginal cost of packet delivery



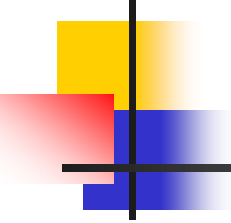
So is IP the Holy Grail of Convergence?

- Does IP offer the industry the reality of “convergence”?
- Can we load up the totality of all kinds of service profiles upon a single IP substrate?
- Can we run all service profiles, all security domains, all network models, upon a single IP switching plane and a single network operational platform from core through to edge?
- Will this offer the service provider enterprise more efficient cost structures with higher revenue leverage?
- Can we really reconstruct massive vertically integrated communications service providers using IP as the convergence lever?



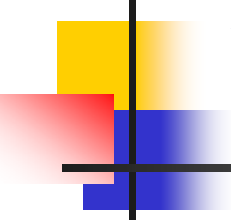
Or is this Hopelessly Unrealistic?

- The drive for convergence of services in a single delivery system is a persistent theme in this industry:
 - Mixing Data and Voice streams with ATM
 - Mixing circuits and packets with MPLS
 - Mixing Video, Voice and Data with Triple Play
- Each new generation of carriage technology is heralded as the harbinger of a wonderful new converged era of communications service provision
- And each time it just doesn't happen that way!



Then and now

- The communications enterprise was a public sector service enterprise
 - Exclusive license for service provision
 - Monopolistic control over prices and services
 - Strong control
- Deregulation should've changed all that
 - Competitive service providers
 - Strong competition in prices and services



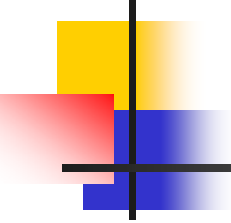
What if...

- “Deregulation” was more than industry lip service to a vague political premise?
- We experience intense competition at every level of the service delivery enterprise?

In other words:

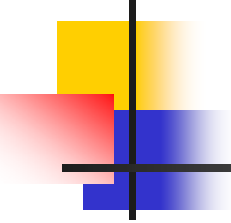
What if we acknowledge today's reality?

Is “convergence” still a valid concept?



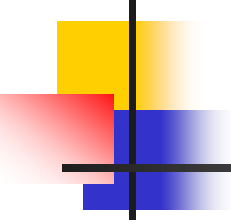
The Unconverged Reality

- Deregulation, intense competition, branching role specialization at every level
- Resulting in
 - many parallel service delivery networks, many network operators,
 - industry-wide duplication of activities,
 - continual exposure to inefficient resource use,
 - exposure of niche markets,
 - limited planning capability,
 - high investment risks,
 - high costs,
 - low operating margins,
 - continual restatement of investor expectations,
 - negative returns on equity investments,
 - continual recycling of management and staff



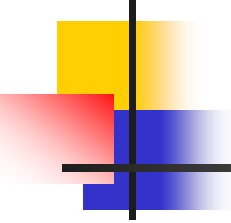
The Unconverged Reality

- Deregulation, intense competition, branching role specialization at every level
- Resulting in
 - competitive discipline placed on service providers
 - market forces match supply to demand
 - pricing based on cost of supply, not value of service
 - service delivery skill specialization
 - service innovation
 - continuous industry response to meet current user needs



“Convergence” vs Reality

- Voice is no longer the emperor of communications – its reign is over
 - Voice is becoming just another UDP application (and a low volume one at that)
 - Voice signalling is just a SIP rendezvous question
 - VOIP + ENUM is inevitable
 - Sooner or later
 - Somehow or other

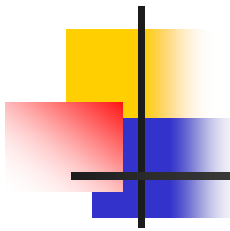


“Convergence” vs Reality

- Triple Play time is over – BitTorrent and P-2-P has already won!
- It's a service network, not a forcing function - support the user to run what ever services they want rather than force feeding the user with a limited set of services that the service provider finds easy to deliver

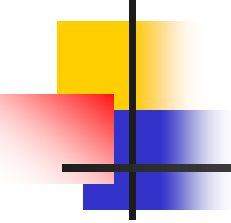
News Clip: October 24

BitTorrent is collaborating with a number of global hardware manufacturers to embed its peer-assisted digital content delivery technology into consumer electronics. ASUS, Planex and QNAP are among the first CE manufacturers to implement the BitTorrent download manager into their digital home devices. Products include wireless routers, media servers and network attached storage (NAS) devices.



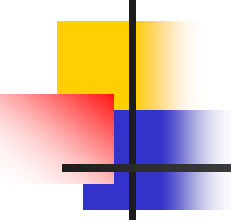
“Convergence” vs Reality

- Value-Added service networks are causing value added service network providers to go value-added negative earnings per share
- Overlay-based services now own the user



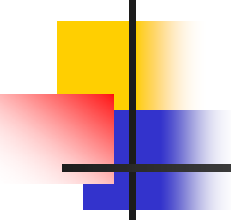
“Convergence” vs Reality

- The Internet’s major leverage was always cheaper price and lowest common denominator service profiles in the network
- Arming networks with complex quality and service manipulation capabilities is a business lose
 - arming networks with adequate bandwidth is a superior strategy – QoS, NGNs and their converged friends have completely lost the plot



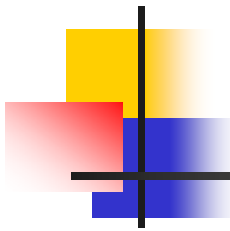
“Convergence” vs Reality

- IP Transit is a volume-based low-value commodity activity
- IP Access is a volume-based low-value commodity activity
- Adding value to packet pushing happens as an end device to end device transaction not a network “value-add”



“Convergence” vs Reality

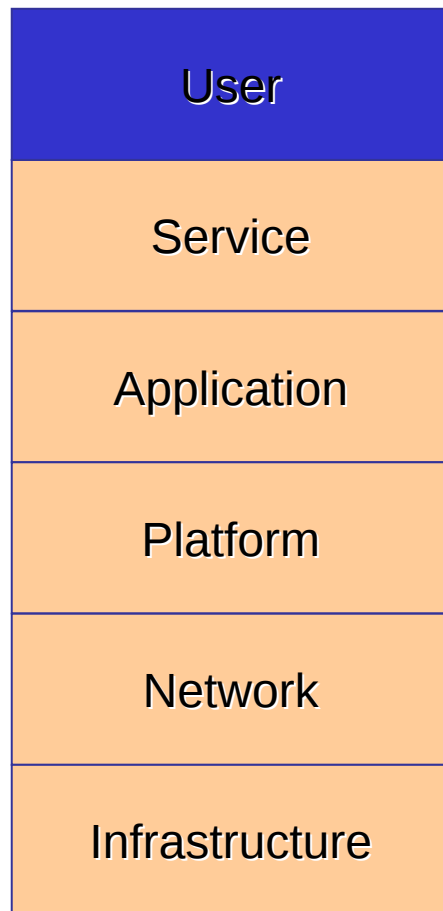
- There is no next vertical “killer app”
- Overlays have already claimed the user!
 - Think XML, Ajax, RSS, Rendezvous, Torrents, Podcasts



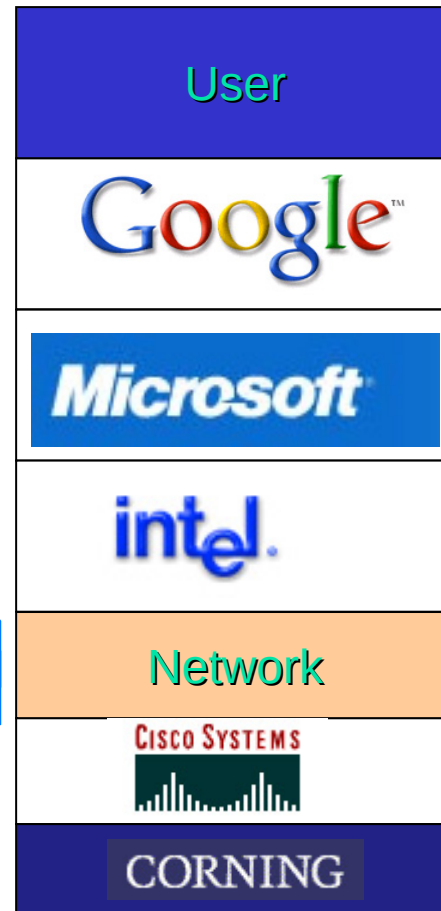
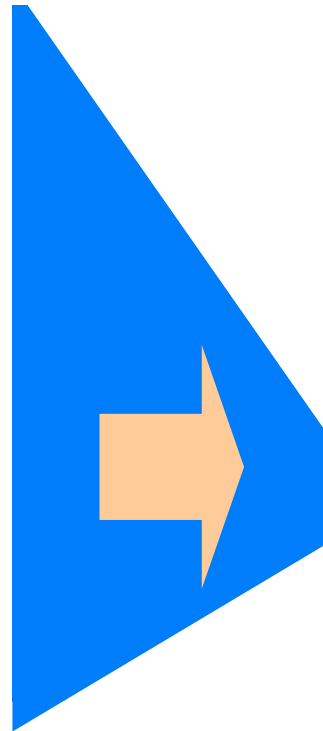
“Convergence” vs Reality

- Circuits are so yesterday!
 - If you wanted to deploy a network for decentralized data and P-2-P services what would be critical in your design?
 - What would be unnecessary and useless?
 - Just what is MPLS all about anyway?

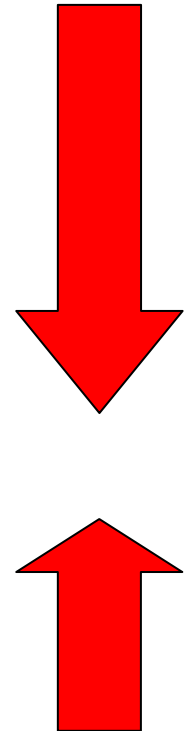
Today's Carrier Squeeze Play

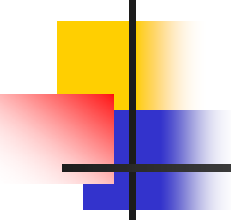


Nostalgia



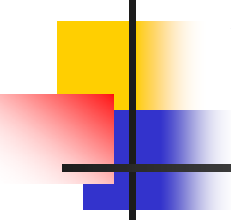
Reality





Today's Operating Principles

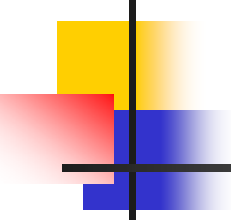
- Stick to the basics - keep the overheads low and keep the network offering simple, stable, fast and cheap
- User value construction is happening over the top of the network through overlay structures
 - Open the network edge up for innovation
 - Stop playing pointless cat and mouse games with selective service interception!
- Really Useful Networking is a lowest common denominator packet carriage utility



What have we learned?

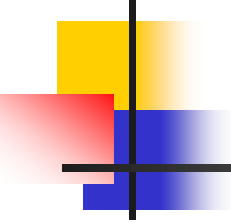
- Vertically integrated service providers are fading away into history - the deregulated competitive service industry continues to specialize rather than generalize at every level

“Convergence” is now obsolete

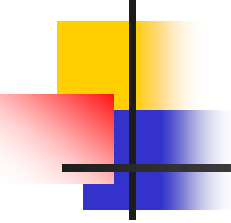


End-to-End really IS important!

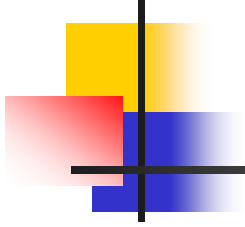
- Valued service delivery is changing – we are now seeing user value based on interactions across overlay systems that treat the network as a simple transmission service
- As it should be!



The Converged Utopia of the old world carrier industry remains only as a piece of dull, unimaginative, nostalgic monopolistic mythology within today's communications industry



The Unconverged Internet world is
diverse, vibrant, innovative, exciting and
very much alive



And maybe that's a
Very Good Thing!