IEEE COMMUNICATIONS SOCIETY
San Francisco

NETWORK INDUSTRY DYNAMICS

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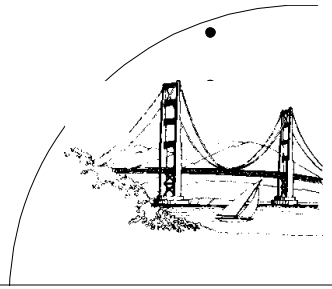
August 14, 2004



"AT&T posts $12.7-billion loss for second quarter" - AP, July 2002

"AT&T posts $1.7 billion loss" - Telephony online, Jan 2001

"$80B loss for WorldCom" - BBC, Mar 2003

"Lucent Posts $8.8 Billion 4Q Loss" - REUTERS, Oct 2001

"Lucent announces $1 billion loss, layoffs" - IDG, Jan 2001

"Nortel forecasts $19.2B net Q2 loss; cuts 10,000 more jobs" - IDG, Jun 2001

"Qwest: net loss of $38.47 billion for 2002" - Denver Post, Feb 2004

"Global Crossing: Quarterly Net loss of $24.88 Billion Isn't a Typo" - Wall Street Journal, Mar 2004

"Ericsson axes 17,000 jobs" - Guardian (UK), Apr 2002

"Alcatel to post another huge loss; cutting 30,000 jobs over 2001 and 2002" - CNN (Europe), Apr 2002

"Marconi losses reach £5.1bn" - BBC, Nov 2001

"Bridging Capability Gaps"SM

Agenda

- The meltdown
- How did this happen?
- Forces operating in the network sector
- Models to understand network industry
- Future outlook

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Industrial Depression in Telecom/network sector

"..full-blown industrial depression, one that has wiped out half a million jobs and $2 trillion in U.S. market value."

- BusinessWeek Oct 2002

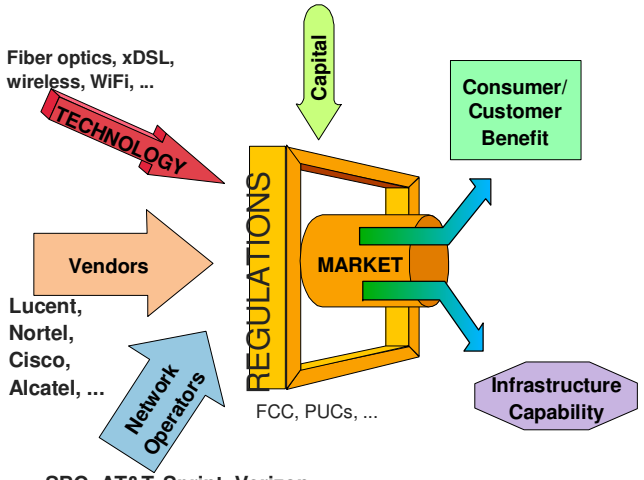
Cause

"Political (business) leaders without technical knowledge were making stupid technical decisions, and engineers did not care about the politics (business). There was (is) a great need for people with knowledge in both areas to help spur the growth of the whole telecommunications industry"

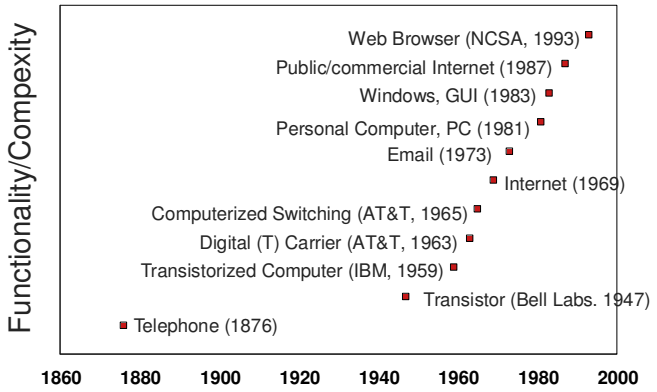
- Frank S. Barnes

2004 Winner, IEEE Gordon Prize

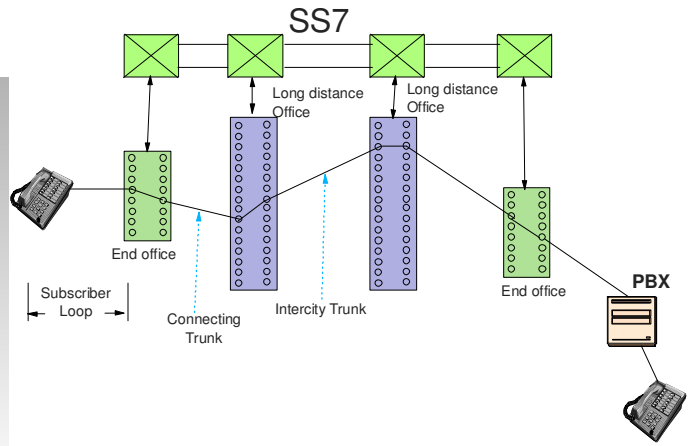
Network Marketplace



Key Developments



Phone (circuit) Network



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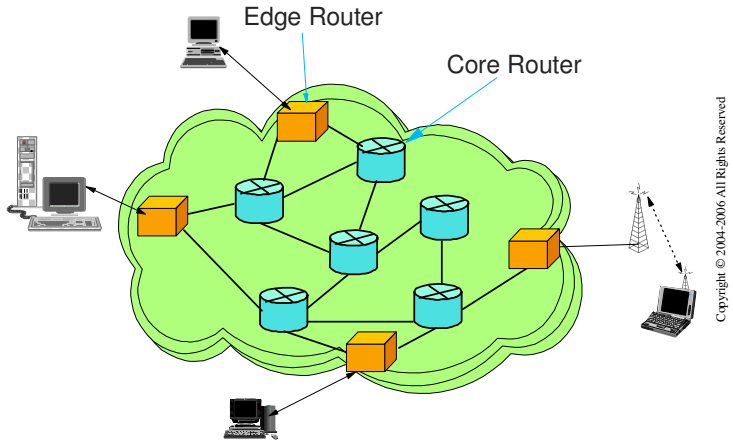
Internet (packet) Network



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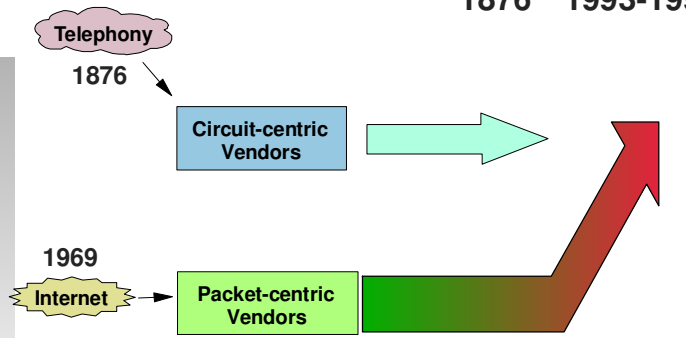
Industry Dynamics

1876 - 1993-1997



Packet systems assimilate circuit systems

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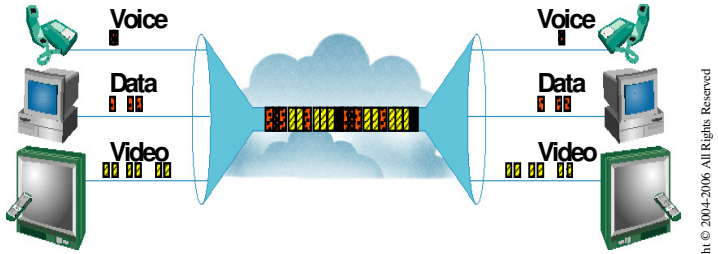
Packet-centric Model



(Homogeneous packet network)

Source: Bellcore

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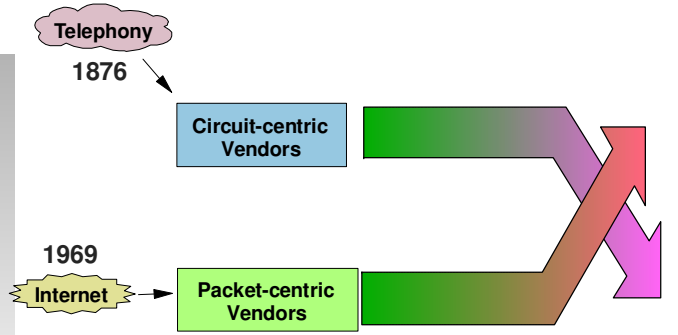
Industry Dynamics

1993-1997-2001



Packet systems assimilate circuit systems

Circuit-vendors counter attack

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Network Design Requirements

REALTIME

- Live signals
- Delay in-tolerant
- Circuit/TDM better

Circuit systems built for voice

NON-REALTIME

- Storable Data
- Delay tolerant
- Packet better

Internet built for computer-based data

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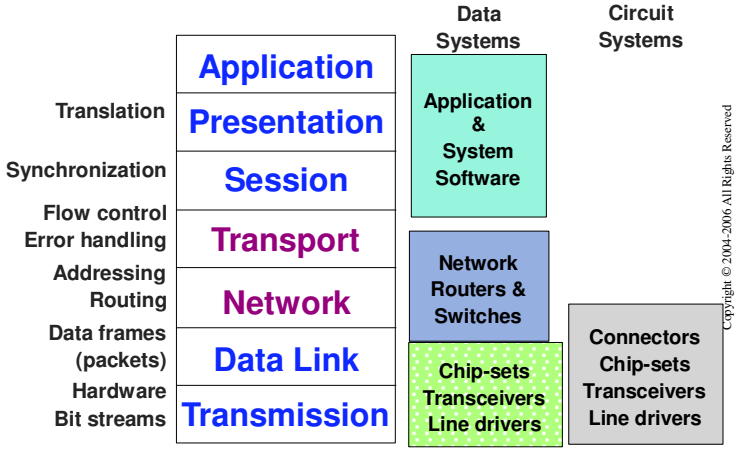
OSI Model (Network Node)



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Two Mindsets

- Internet -- (car rental)
  - "Buffet pricing"
  - Unlimited choices
  - Lack distinctions between customer and Carrier systems
- Telco -- (airline / bus service)
  - "a la carte pricing"
  - Provide "pipes" -- carrier model
  - Limited choices
  - Clear distinctions between customer and Carrier systems

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System Differences

Packet

- "Best effort" system, without guarantees or perfection
- Store and forward
- Requires intermediate store and processing
- "In-band" signaling

Circuit

- 99.999% reliability (< 5 min downtime/year)
- Deterministic
- Need only intermediate signal regeneration
- "Out-of-band" signaling

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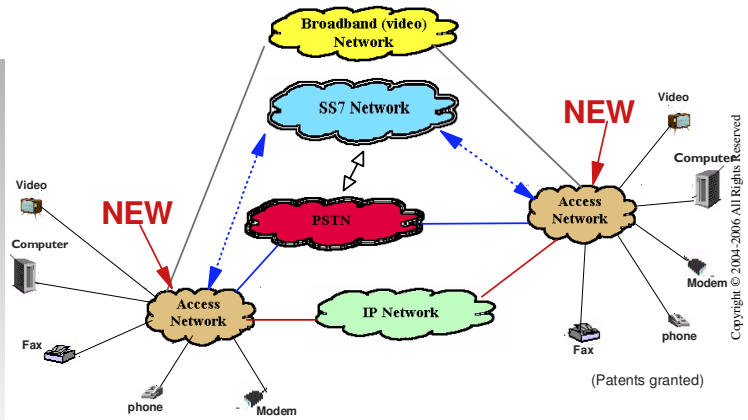
Transfer Network™ Architecture(TNA™)



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Myths & Reality

Myths

- Wireless for Broadband
- Fiber to home is economically viable
- Competition as a universal solution

Reality

- Network is a natural monopoly
- Wireline is necessary for effective Broadband
- High inertia for incumbents to change

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VoIP

- Real issue: Billing
  - Internet - subscription
  - Phone - usage pricing
- VoIP adoption directly result in Telco revenue decline
  - Reduces capital base for infrastructure needs (e.g. 911 services)

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Wireless

- Basic limitation
  - Signal strength declines square of distance
- Same wireless encoding will provide several times bandwidth on a wireline
- Real advantages
  - Ease & lower cost of deployment
  - Eliminate wired connections

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Fiber connections

- Limitation
  - Signal conversion from electronics-optics-electronics
  - High per connection costs
- Real advantage
  - Very high bandwidth for shared facilities

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Cable

- Broadcast network
- Low deployment levels
- Asymmetric bandwidth capacity
- Real advantage
  - Consumer-centric service
- Disadvantage
  - Cannot replace network infrastructure

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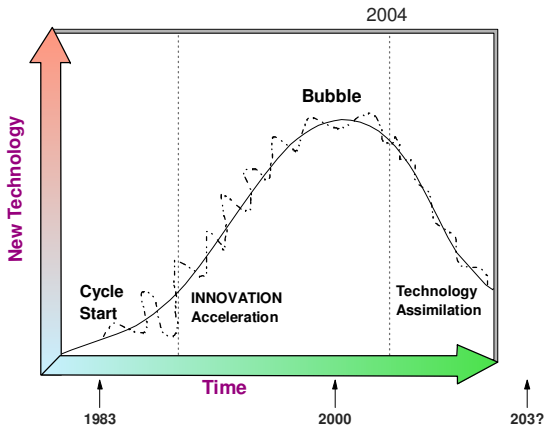
Macro-cycle



Kondratieff Waves: 1800-1843, 1844-1896, 1897-1945, 1946-
Bubbles: 1819, 1875, 1929, 2000

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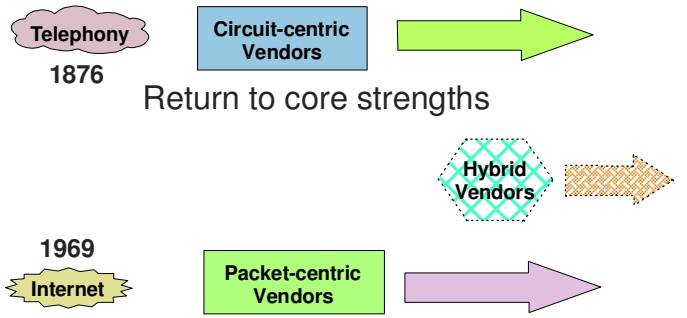
Industry Possibilities

2005-201?



Stop mimicking circuit with packets, and build better packet systems

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