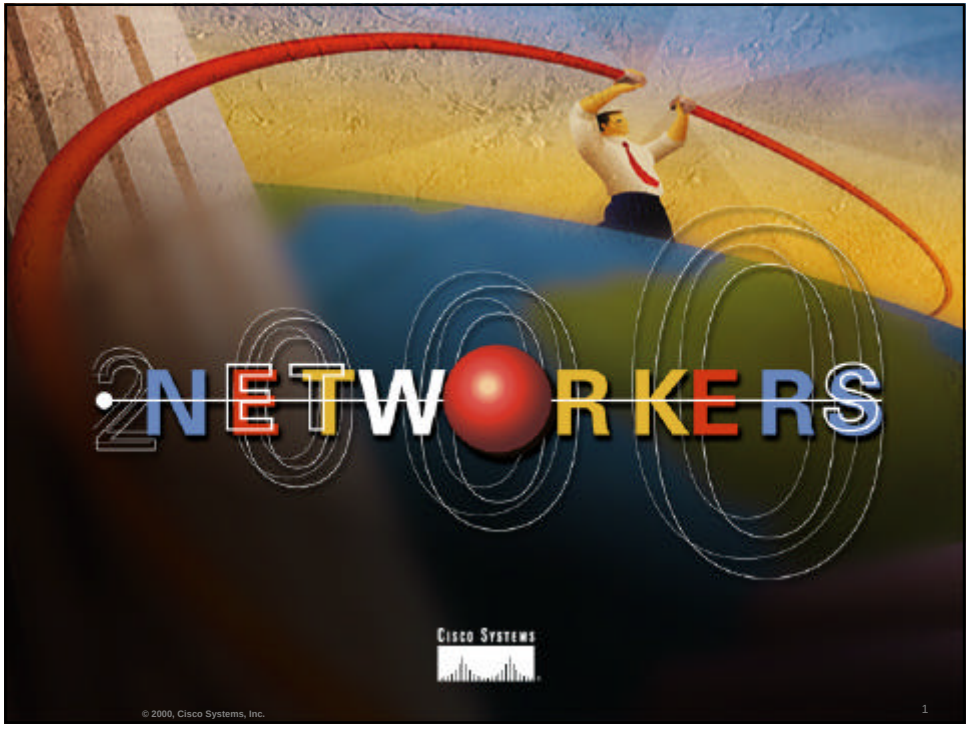
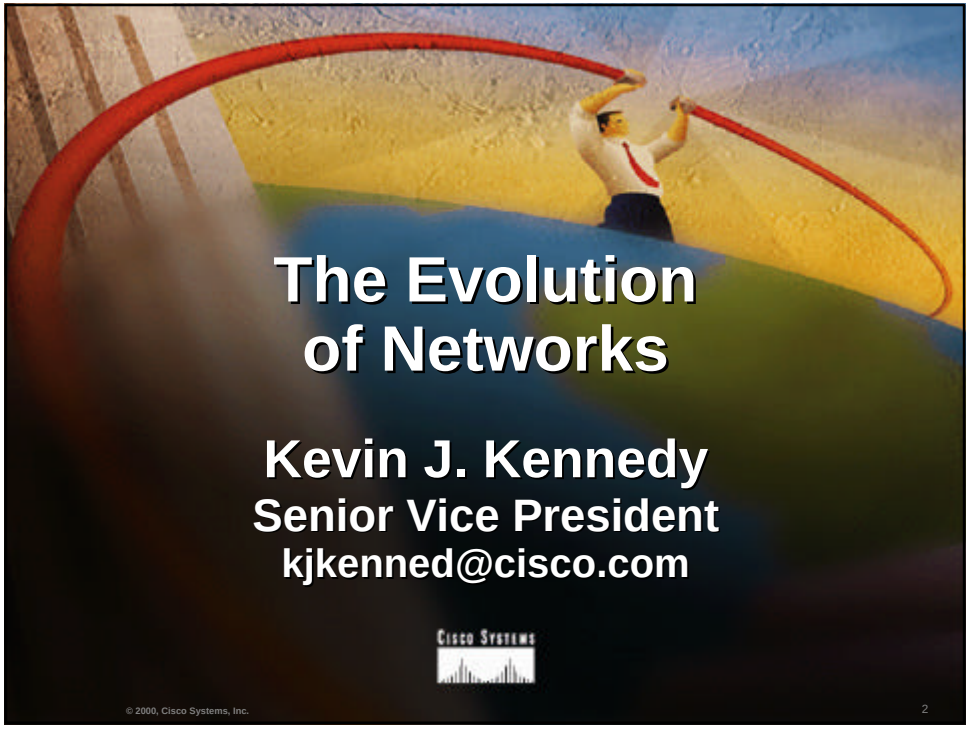




Agenda

Disruptive Technology:
Who Survives?

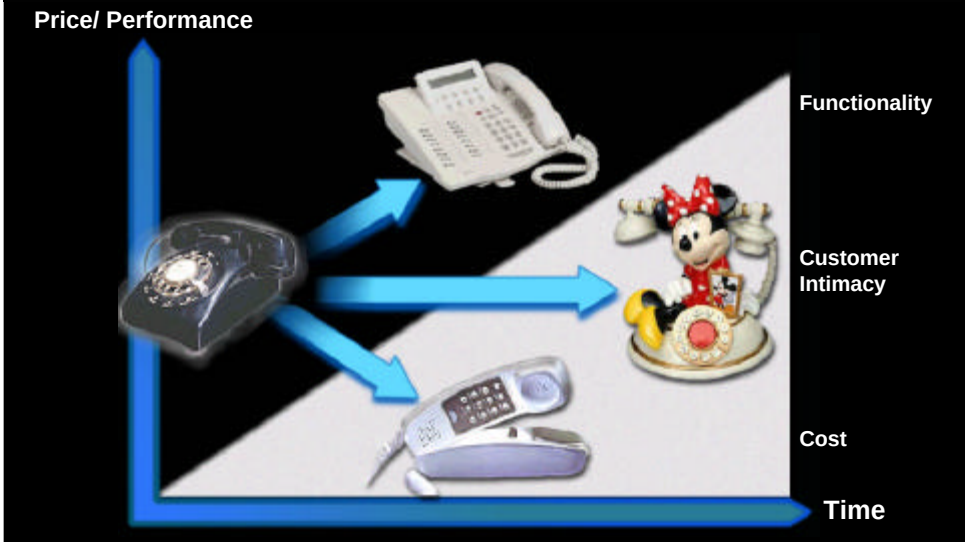
Network Evolution

The Choices for Innovators

Technology Trends Creating Disruption

- Cheap Bandwidth
- Network Intelligence
- Outsourced Enterprise IT
- Mobility

Introduction to Telephone



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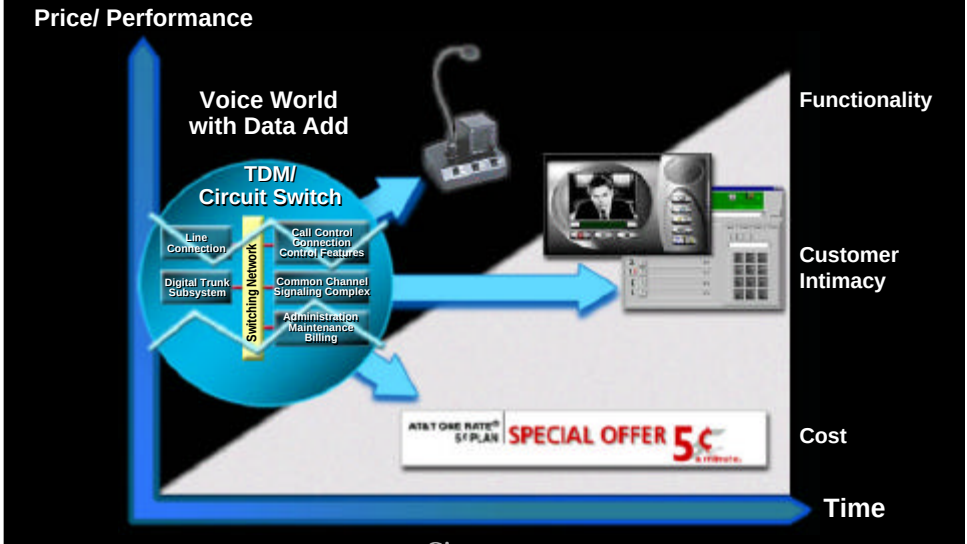
Network Evolution



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Physics of Disruption

- Market size increases
- Market segments are created
- Winners of the past are not winners of the future
- Values of the past are not indicative of values of the future

Evolutionary View of IP Telephony

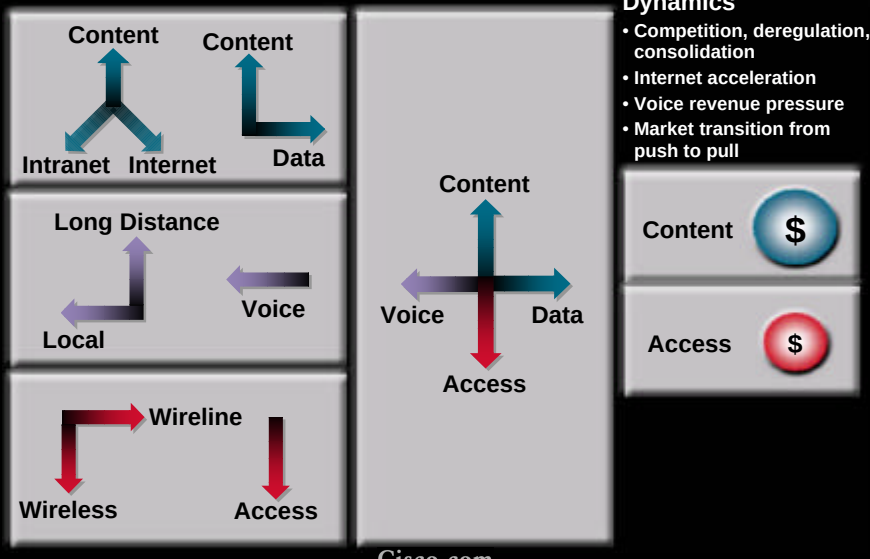
	<1998	1998-1999	1999-2001	2000-2002
Segments	Hobbyist	Early Adopters Surgical Applications	Early Majority; Internet Applications	All SPs Ubiquitous Communications, 3G Wireless
Applications	PC-PC PC to Phone	International Arbitrage Toll Bypass	Multicast Internet Augmentation Local Access	LD Services Local Access Service Innovative Services Unified Communications
Technology	PC Based, PC S/W Analog Cards Proprietary Protocols	PC Based Embedded Systems	Embedded Systems GWs Call Agent Servers	Embedded Systems Gateways Call Agent Servers Appl/Feature Servers
PSTN Signaling	Analog	Analog T1/E1 CAS/ PRI	Analog T1/E1 CAS/ PRI SS7	Analog T1/E1 CAS/PRI SS7
IP Signaling Models	Proprietary	H.323	H.323, MGCP	H.323, MGCP, SIP

Real Customers, Real Solutions

	ITSP/ISP	Cable	CLEC	GIXC	IXC	ILEC/PTT	Wireless
SOLUTIONS	Wholesale Long Distance Click-to-Dial Internet Call Waiting	Residential Voice	Internet Offload Managed Voice/Data Services—Integrated Access	Managed Voice/Data Services—Integrated Access	Managed Voice/Data Services—Integrated Access Click-to-Dial Virtual Call Center	Internet Call Waiting Managed Voice/Data Services—Integrated Access	Packet Transit
STATUS	Maturing (SS7) Moving Up Value Chain	Initial Deployments with Residential Focus	Initial Deployments with Enterprise Focus	Initial Deployments with Enterprise Focus	Early Field Trials	Early Field Trials	Inserting with Infrastructure

The Service Provider 'Q' Factor

Predictable Consolidation



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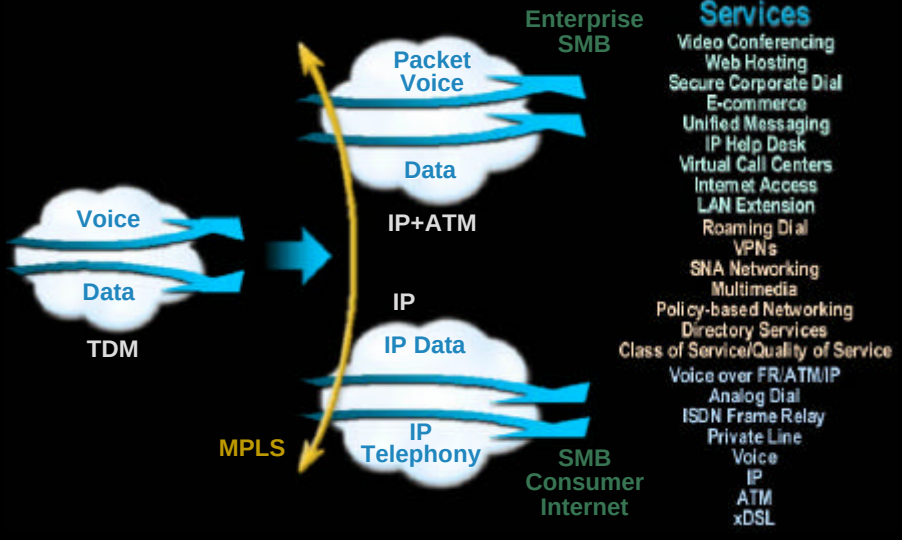
Network Evolution to IP Services



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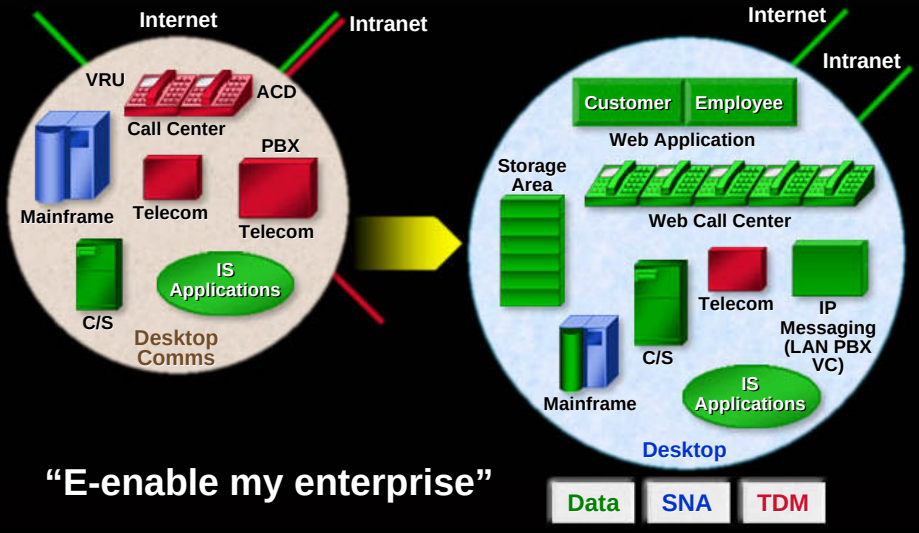
Enterprise Evolution



"E-enable my enterprise"

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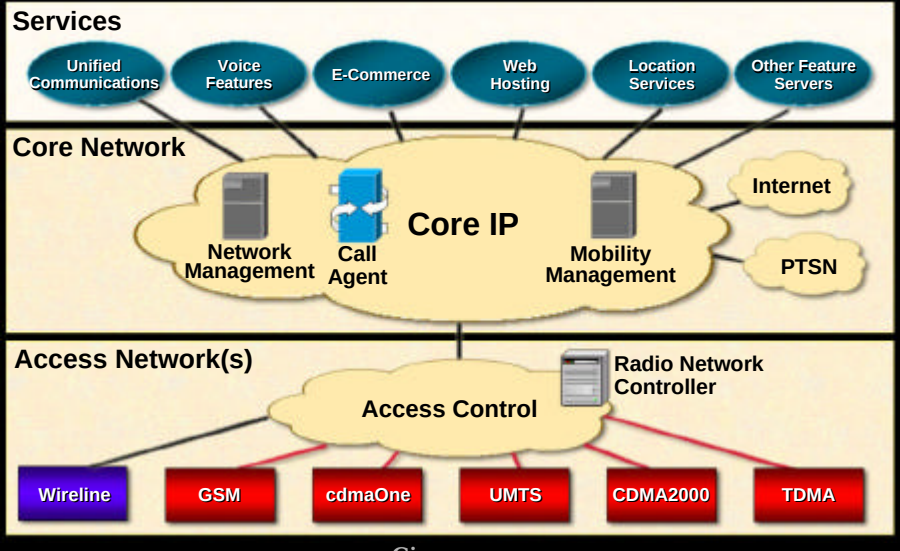
Mobile: Common IP Architecture



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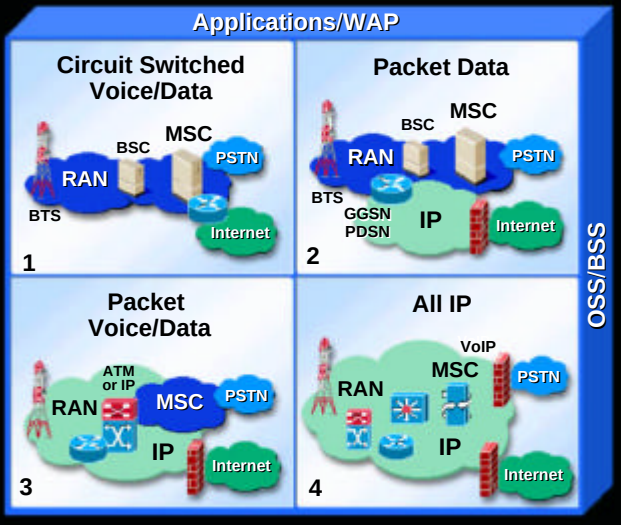
Mobile Wireless Strategy

- Open IP architecture
- Consistent wireless/ wireline Internet services
- Accelerate IP adoption
- Develop horizontal industry structure
- Partner based go-to-market



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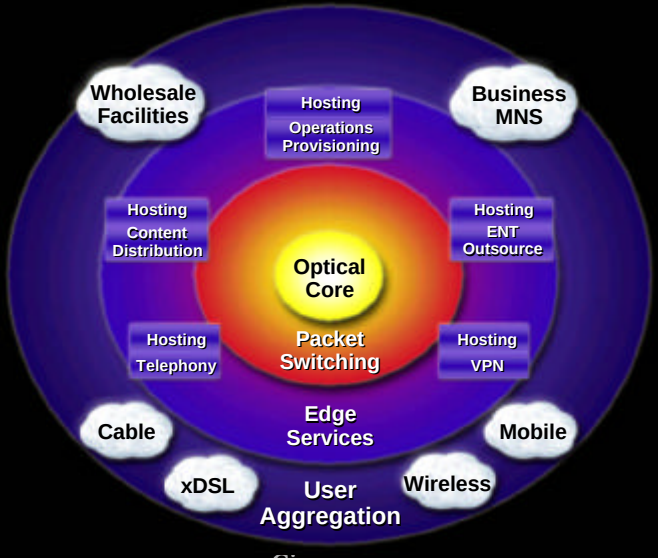
Network Architecture Evolution



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Elements of Network Disruption

DS0 Tyranny

Single Service Ubiquity

Network-Defined Subscriber/Application

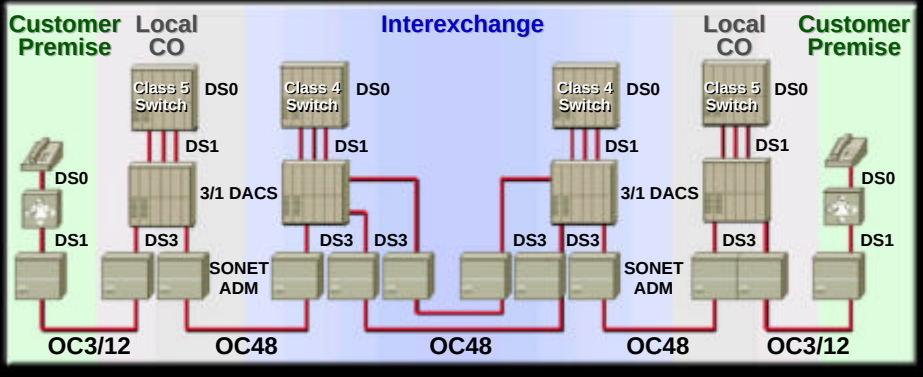
Planned Bandwidth Allocation

Static Service Delivery

Vertical Industry

$ Software Application

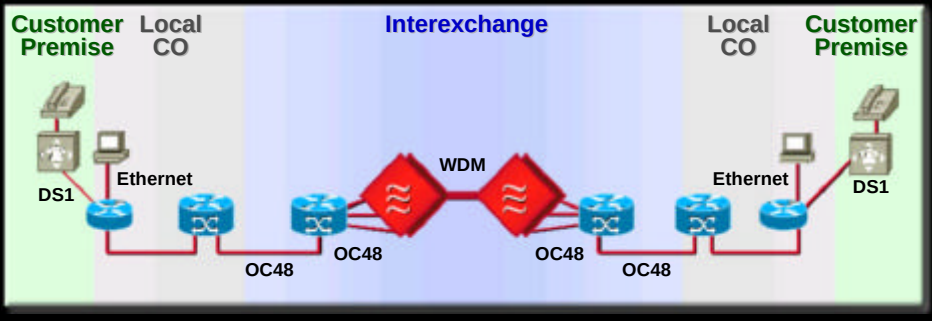
The Tyranny of the DS0



Rigid structure yields high cost per bit

Lower-margin services disfavor new investment

IP Service Internetworking



Optimized infrastructure for data services

Statistical muxing over largest available pipe

"Flattened" network gives a cost reduction

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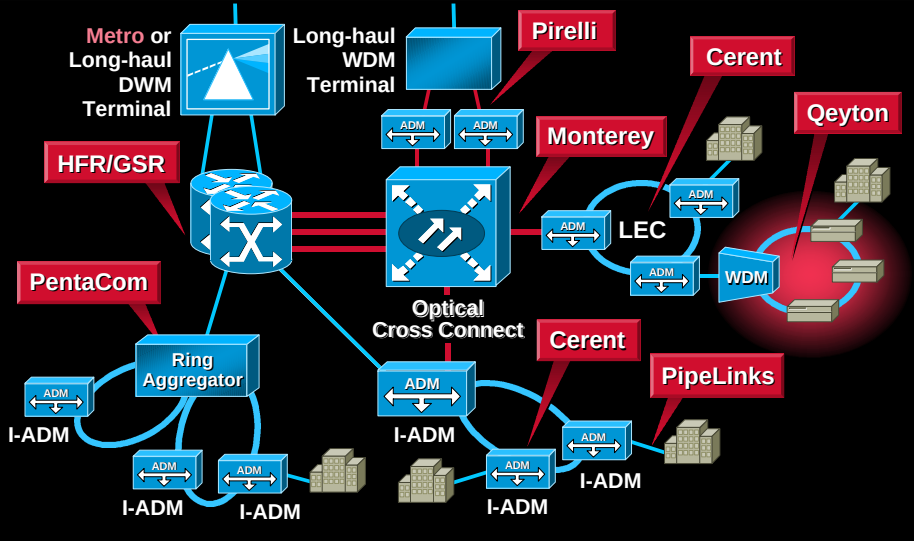
Dynamic Bandwidth Allocation



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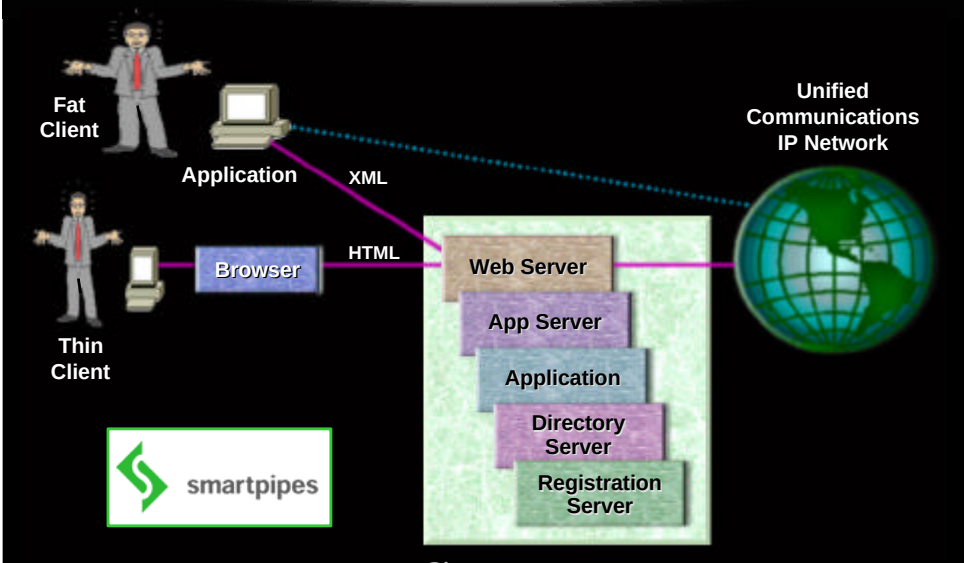
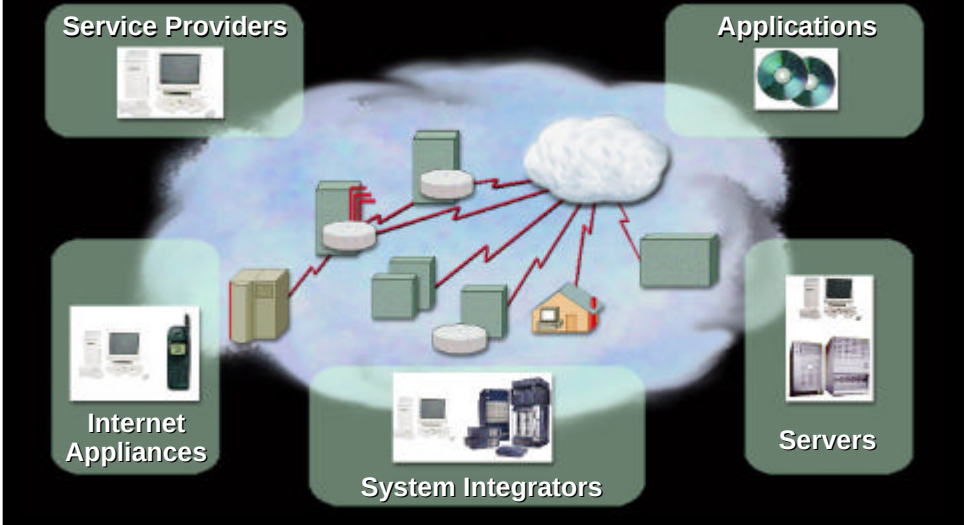
Internet Server



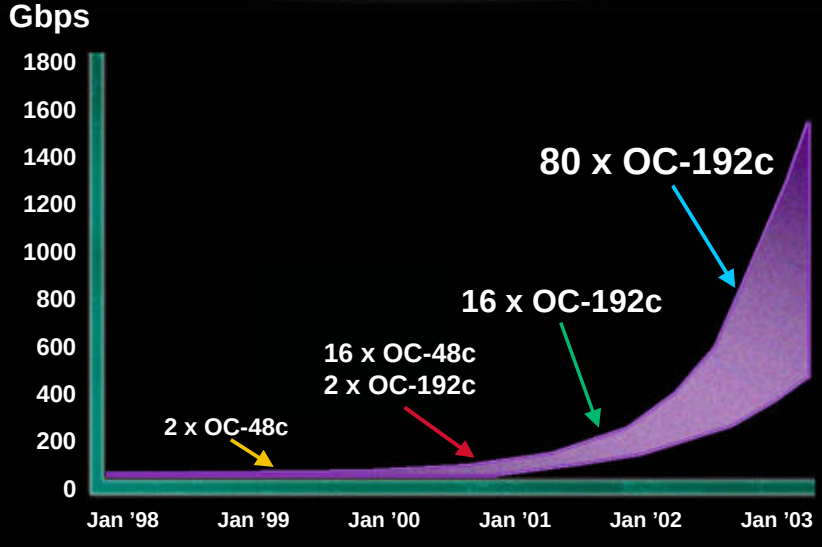
The Open Communications Community



Considerations for Winners

- Scale
- Network Intelligence
- High Availability
- Dollars for Data

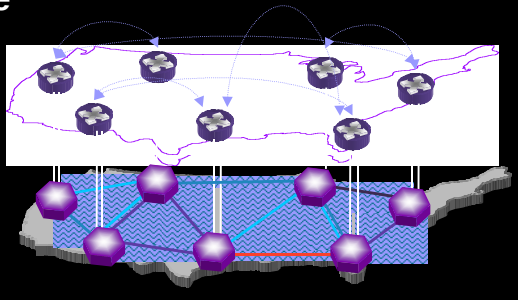
Scaling the IP Core
Traffic Loads on Inter-city Trunks



Intelligent Bandwidth Management in the Optical Core

- Create intelligent optical core with Wavelength Granularity and Layer 3 Intelligence
- Rapidly provision, restore end-end paths
- Scale up rapidly, efficiently delivering bandwidth anywhere, anytime

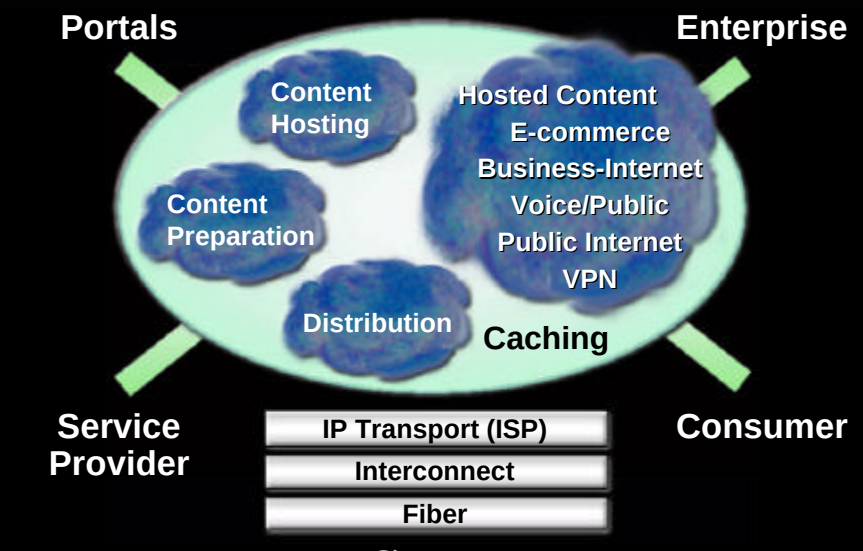
Optical Core with Wavelength Routers



Network Intelligence

- Content Networking
- Open Packet Telephony
- Universal Communications

Content Hosting



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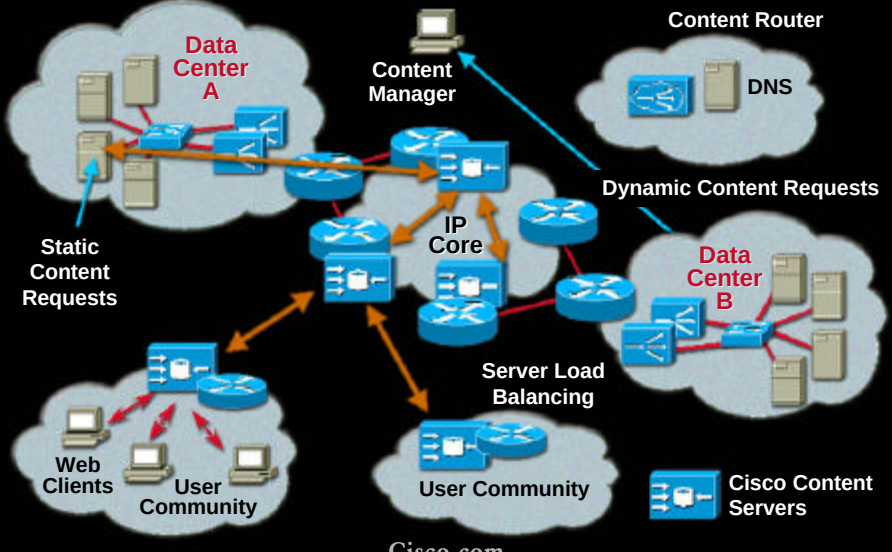
Content Distribution/ Routing



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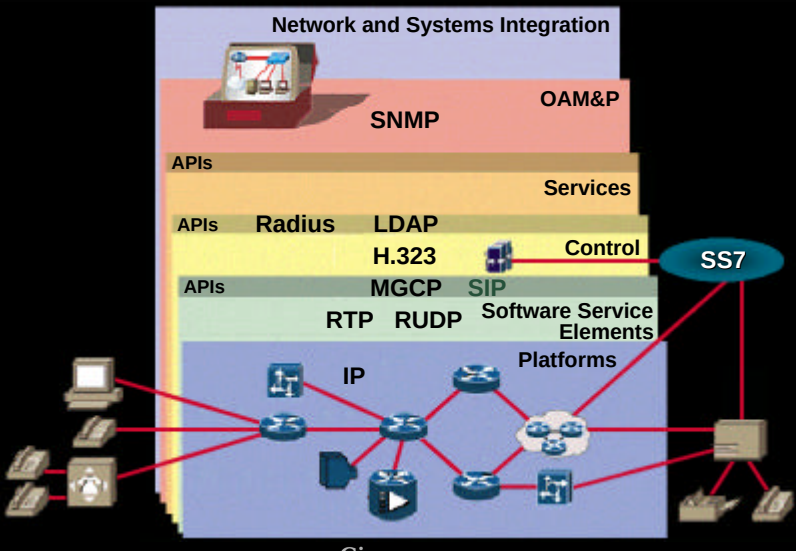
Open Telephony Architecture



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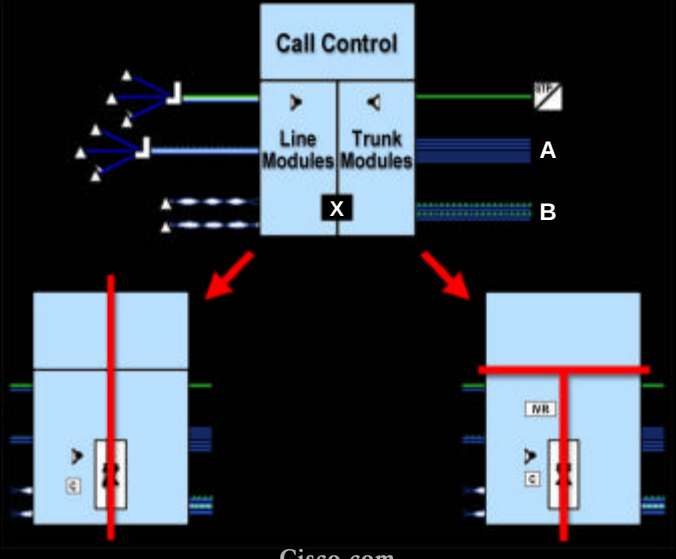
Multiple Control Models



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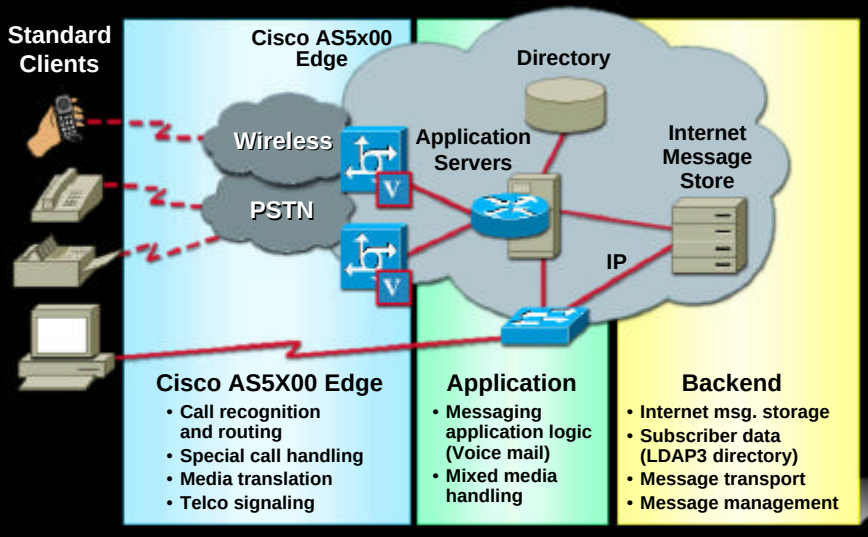
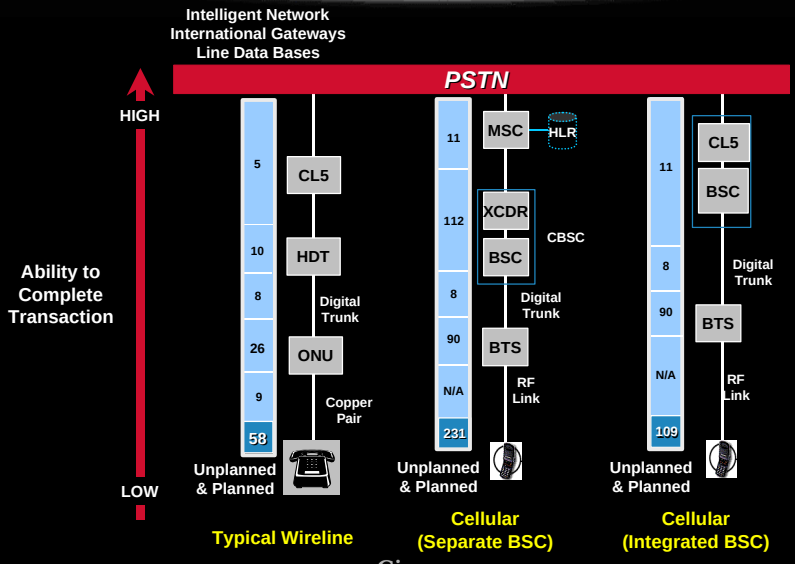
Unified Communications Network Components



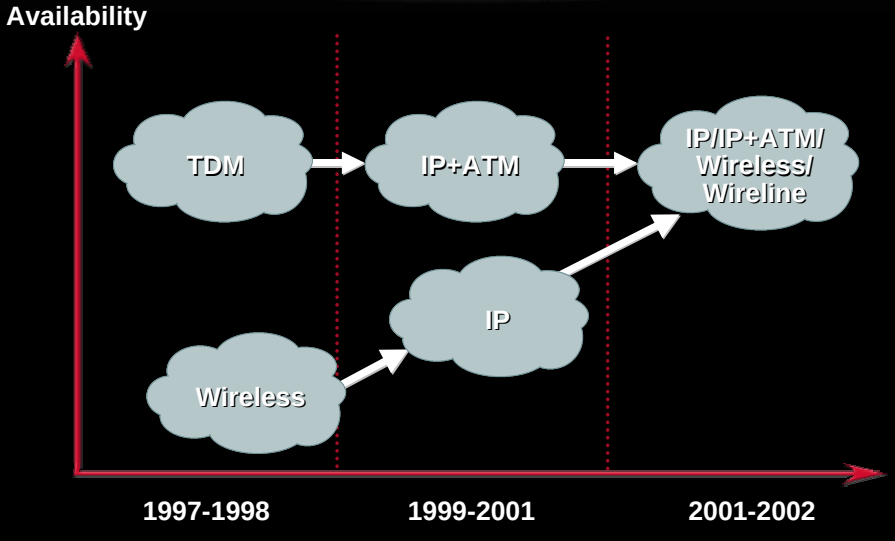
High Availability

Company	Real Cost of Business Downtime
eBay	6/12/99 outage: 22 hours 26% stock price decline
E*TRADE	2/3/99–3/3/99: 4 outages at least 5 hours 22% stock price hit on 2/5/99
AOL.COM	8/6/96 outage: 24 hours Announced $80M in new infrastructure
Charles Schwab	2/24/99–4/21/99: 4 outages at least 4 hours Announced $70M in new infrastructure

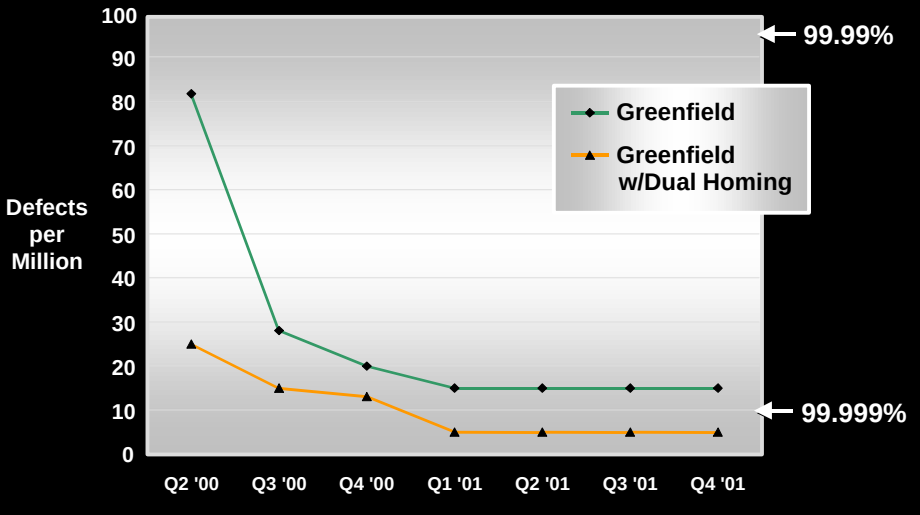
Availability



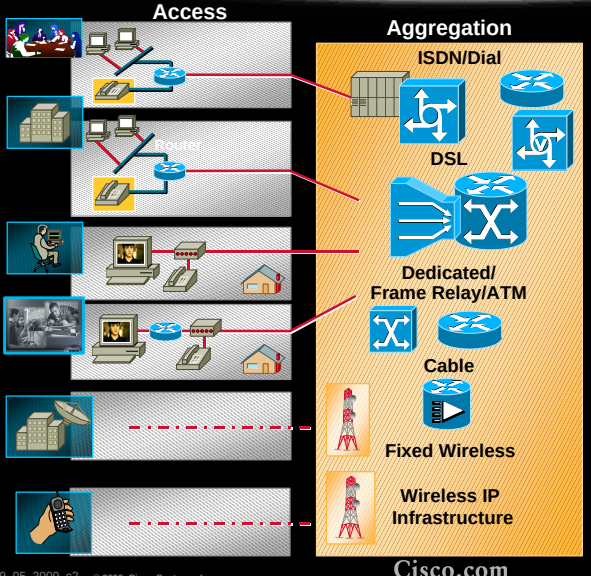
Network Architecture Evolution



Network Availability Trending



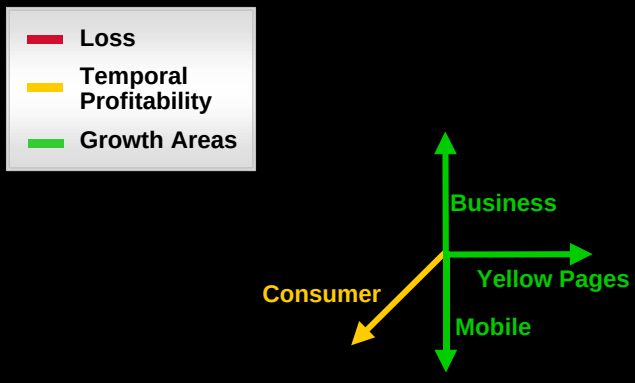
Broadband for Dollars



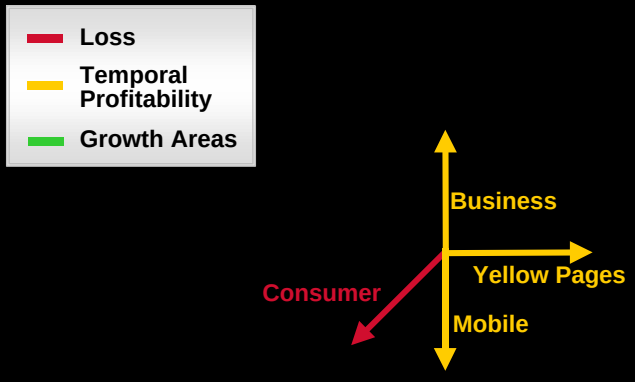
VoD	$10
Travel Service	$10
Gaming	$10
Corporate Access	$25
Internet Access	$25
Second Line Voice	$10
Premium	$10
Basic	$20

Cable IP Infrastructure

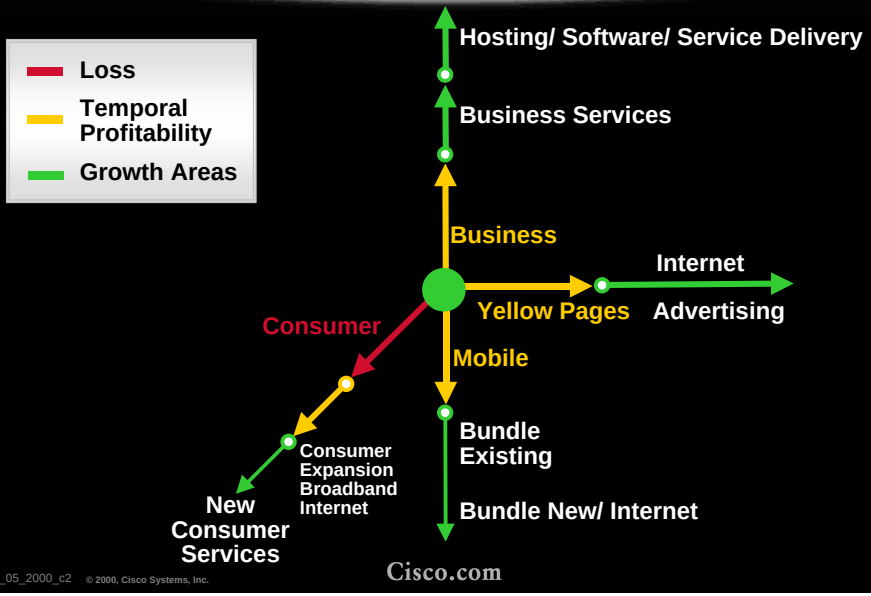
Opportunity: Stage 1



Opportunity: Stage 2



Opportunity: Stage 3



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Upcoming Inflection Points

ITEM	STATUS			
	Radar	Start	Inflection	Main Stream
Incumbent provider OSS dilemma	■	□	□	□
VoIP/Local exchange telephony competition	■	□	□	□
Ecosystem engagement	■	□	□	□
Broadband scale/ volume	■	□	□	□
CLEC/ISP next wave	■	□	□	□
Mobile/ Wireless architecture advance	■	□	□	□
Public carrier portfolio mix	■	□	□	□
Optical infrastructure retooling	■	□	□	□
Content hosting/ delivery	■	□	□	□

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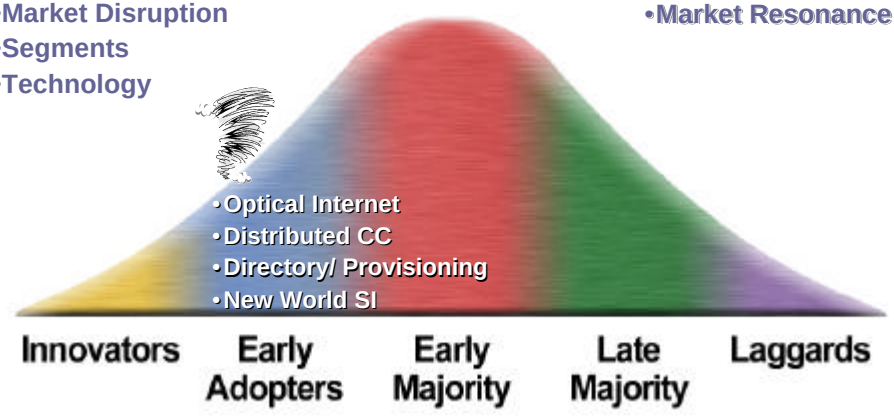
Summary

- Market Disruption
- Segments
- Technology

- Market Resonance



Function → | Reliability/ Scale → | Price/Fulfillment →

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