



Traditional Rationale behind IPv6

- IP Next Generation Requirements described in RFC 1752
- Address depletion concerns
 - Circa 1994 - routing table increases, IP address availability
 - CIDR/Supernetting deployed, currently around 66,000 routes carried on the Internet backbone
 - Latest IETF estimates - sufficient addresses until beyond 2010
- Opportunity to optimize on many years of deployment experience
- Integrate autoconfiguration, security, real-time flow support,...
- Protocol remains the same in principal

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New Rationale behind IPv6

- IP Everywhere for Data, Voice, Audio, Video integration
 - ~300 millions Mobile Phone Users in 1998, 1 billion in 2005
 - New GSM standard (UMTS) will support IP
 - 1 billion Cars in 2010 with GPS & Yellow Page services
 - PDA's, Toaster's,...
- Emerging Internet Countries
 - China, India, Russia, ...
 - Internet in every school,...
- New Technologies/Applications for Home users
 - Cable, xDSL, Wireless,...

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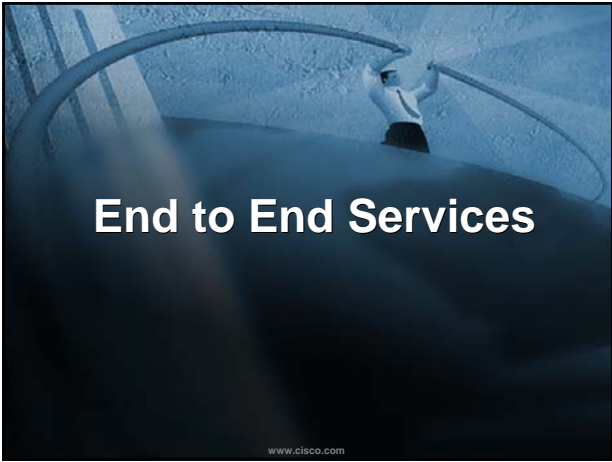
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Continued Massive Growth of IP Traffic *and* Services



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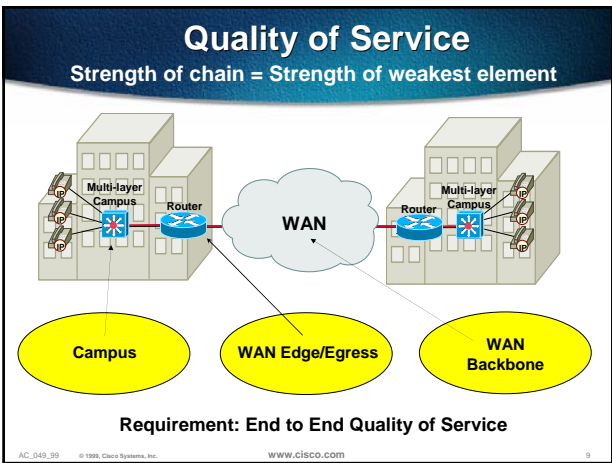
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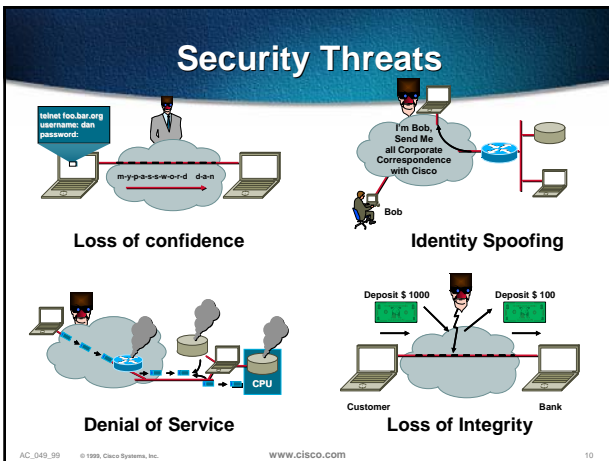


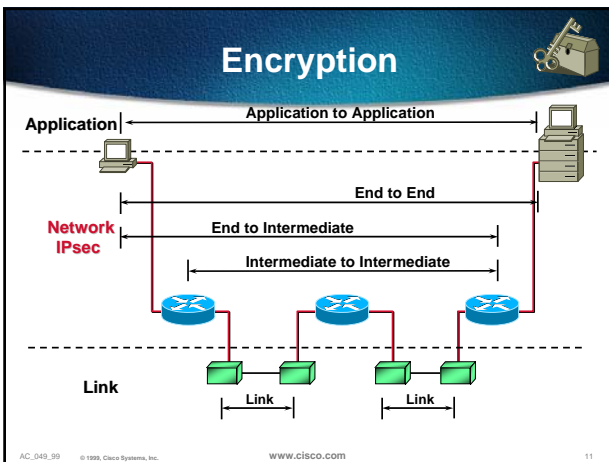
End to End Services

- QoS
- Security
 - Encryption
 - Data Integrity

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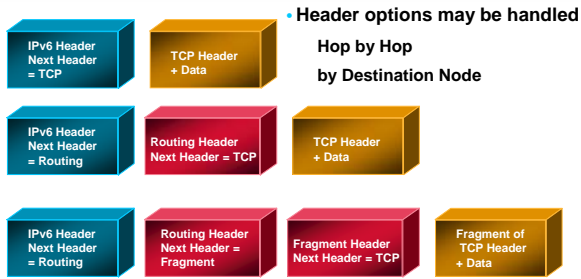






- ## IPsec
- IETF Standard Track for IPv4 and IPv6
 - Network Layer Encryption
 - IPv4 add-on
 - Mandatory for IPv6
 - IPv6 header concept simplifies implementation and operation
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IPv6 Header Options (RFC 2460)



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IP QoS

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QoS - Different Views...

“
**Quality of Service -
the elusive
elephant**”

Paul Ferguson & Geoff Huston: Quality of Service,
John Wiley & Sons, 1998, ISBN: 0471243582

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QoS - Definition

“
Capability of the network to offer better or special service to some applications
 ”

Data / Video / Video

Consistent and predictable performance:
 {Bandwidth/Delay/Jitter/Packet loss}

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Why QoS ?

- **Protect business critical applications**
 Transactions, Databases, ...
- **Prioritize Group of Users**
 Administration, Medicine, ...
- **Multimedia-Applications**
 Voice, Distance Learning, Conferences

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IP QoS Standards for IPv4 and IPv6

- **Integrated Services (Int-Serv)**
 RFC 1633, (RSVP, RFC 2205)
 Guaranteed and predictable service for **single connections**
 State
- **Differentiated Services (Diff-Serv)**
 RFC 2475
 Resource Reservation for **traffic classes**
 Stateless

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Int-Serv and RSVP

- **Integrated Services (Int-Serv):**
End to End QoS Services
 - controlled load
 - guaranteed services (Bandwidth, Delay)
- **RSVP (RFC 2205):**
Generic IP signalling protocol

Int-Serv can use RSVP or other protocols,
RSVP can be used for Int-Serv or other protocols

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RSVP Protocol



- **PATH : Sender -> Receiver**
Sender traffic parameters
Collect Info about network capability
Detect current route
- **RESV: Sender <- Receiver**
Int-Services accepted by receiver
Receiver determined traffic parameters
Follows route determined by PATH
Reserves resources

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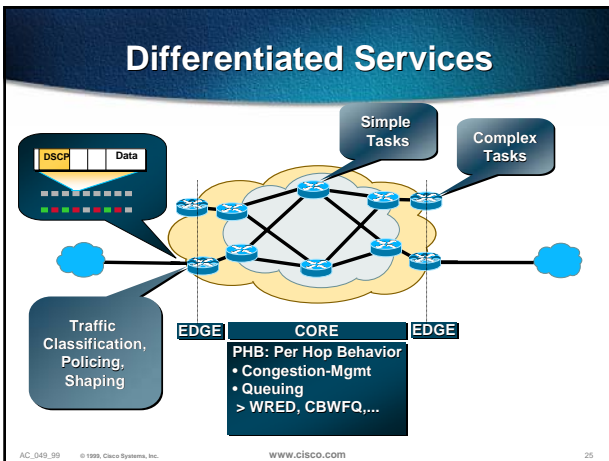
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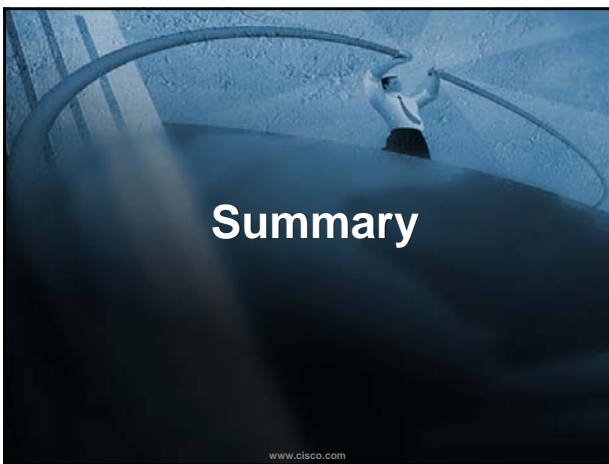
Why IPv6 ?

- **IPv4 Routers use Source IPv4 address/destination IPv4 address/IP protocol/Layer 4 port information to identify reserved flow**
Need to look at L4 header
Modern routers are able to do this in HW
- **IPv6 uses unique 20 bit flow label to identify reserved flow**

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IPv4 - IPv6 Functionality Comparison

IP Service	IPv4 Solution	IPv6 Solution
Quality-of-Service	IP Precedence driven, DiffServ - DS Byte	Per Flow/Class DiffServ - DS Byte
Security	IPSec	IPSec
Autoconfiguration	DHCP	Serverless/DHCP/ Site Renumbering
Mobility	Mobile IP	Mobile IP
IP Multicast	PIM/Multicast BGP	PIM/Multicast BGP/ Scope Identifier
Addressing Range	NAT/32-bit	128-bit addressing

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IPv4 vs. IPv6

- End to End Services have been defined for v4 and v6
- IPv4 add-on vs. integral part of IPv6
- IPv6 implementations are badly needed for the success of IPv6 !

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