

Agenda

- **Introduction: Why Content PoPs?**
- Content Networking-Market Drivers
- (IDC &) Content Services Opportunities
- Internet Data Center Architecture
- Conclusion

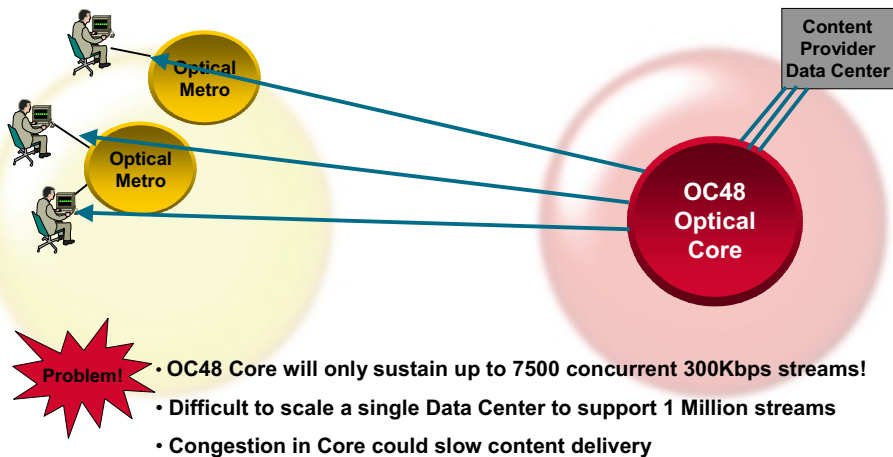
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“IP Unaware” Network Increased Availability

Example: Typical Content Provider wants to provide streaming media (average 300Kbps per stream) for up to 1 Million concurrent users.



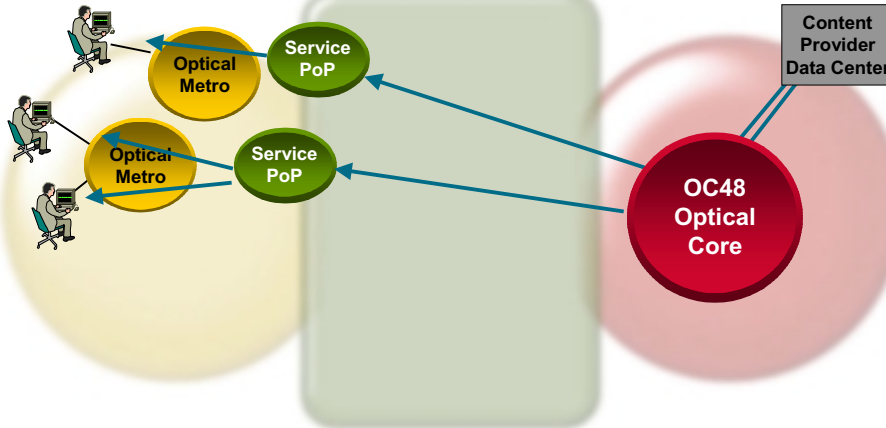
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“IP Aware” Network Increased Availability

Primary Data Center can send a single stream to the Service PoP – which will replicate the stream for multiple end users.



Prepositioned content **reduces latency time** for content delivery

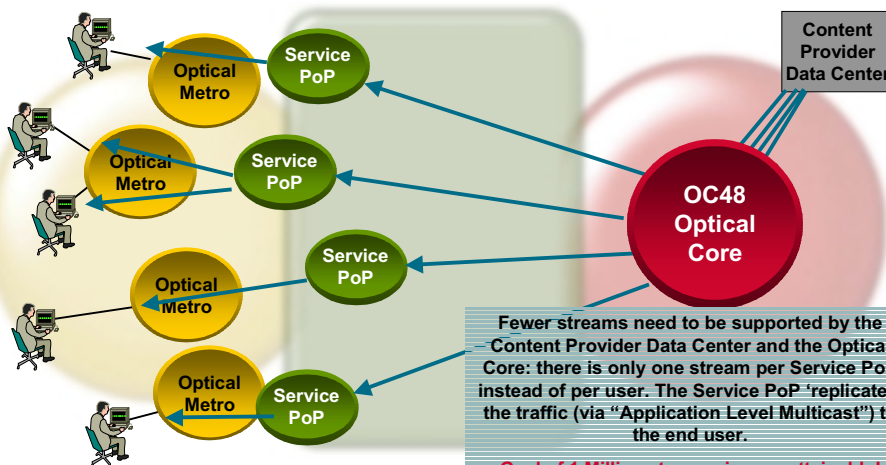
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“IP Aware” Network Increased Availability

Additional Content PoPs can be added as the need grows



Fewer streams need to be supported by the Content Provider Data Center and the Optical Core: there is only one stream per Service PoP instead of per user. The Service PoP ‘replicates’ the traffic (via “Application Level Multicast”) to the end user.

Goal of 1 Million streams is now attainable!

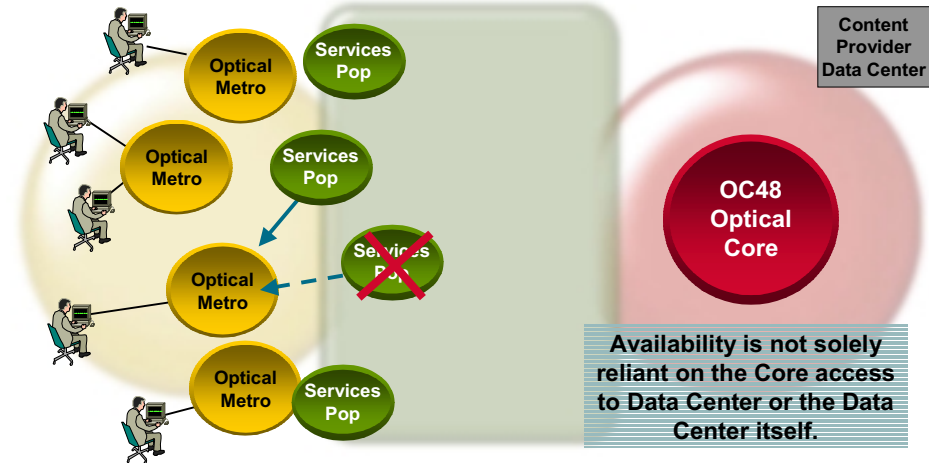
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“IP Aware” Network Increased Availability

If a Content PoP becomes unavailable users will be re-routed to the next ‘best’ PoP.



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Why IP? Because...

With an IP ‘aware’ network, you can distribute Service PoPs throughout the Optical Core & Metro.

Content aware Service PoPs provide for **increased scaling, availability, and performance** of hosted applications.

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Content Networking is the Future



In mid-2001 we expect to see an acceleration of CDN deployments....

By offering CDN services, Web hosters, data center providers, and ISPs can **achieve higher margins and differentiation from competitors**



**Morgan Stanley Dean Witter,
December 2000**

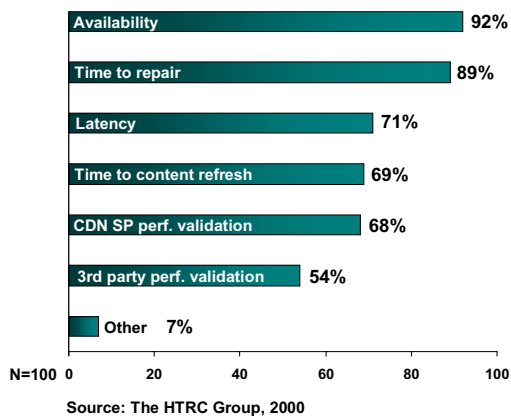
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What do the Web owners want?

Desired Level of Service Agreement by Enterprise Customers



Lost Revenue Per Hour due to System Downtime

- Online Subscription: \$6K
- Products Purchased from the Website: \$377K
- Advertisement Impressions (through banner or placement ads): \$703K

Lost Revenues due to Slow Downloads

Estimated to be \$4 billion
in 1999

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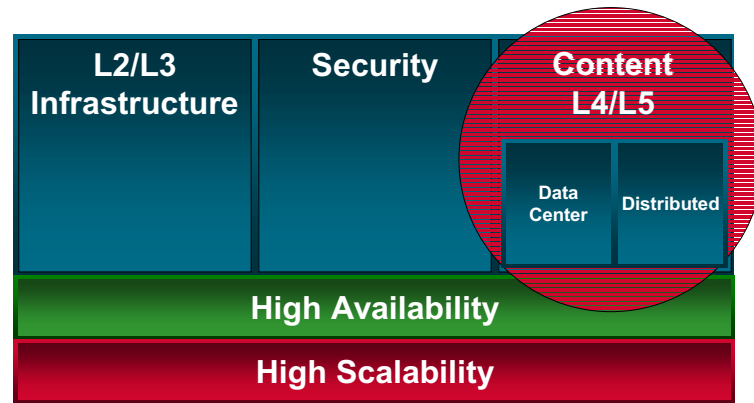
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IDC Components (Services)



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L2/L3 Infrastructure

- Policy Based Routing
- Private VLANs
- QoS
- MPLS VPNs
- ...

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Security

- Highly Secure Firewalls
- Intrusion Detection (IDS)
- IPSec VPN Termination
- ...

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High Availability

SLA will offer competitive differentiation

SLAs Offered by US ASPs Today

SLAs	% of ASPs
Less than 99%	26%
99% Availability	39%
99.9% Availability	24%
99.99 Availability	15%
99.999 Availability	18%
More than 99.999% Availability	13%
Don't know	13%

N = 62

Source: Summit Strategies, 2000

In future, SLA will have to be defined in availability and in response time.

Performance metrics should cover:

- End-to-end network
- Hardware platform
- Applications

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High Scalability

According to Chris Dodds,
— CFO Charles Schwab Inc.

In 1996 we had 3 Web Servers

In 1998 we had 160 Web Servers

In 1999 we had over 800 Web Servers

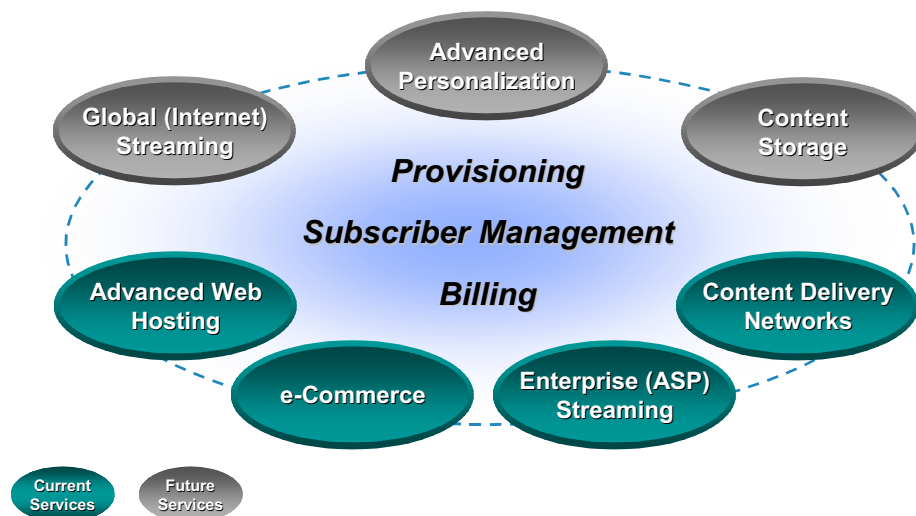
E-CFO Magazine, April 2000

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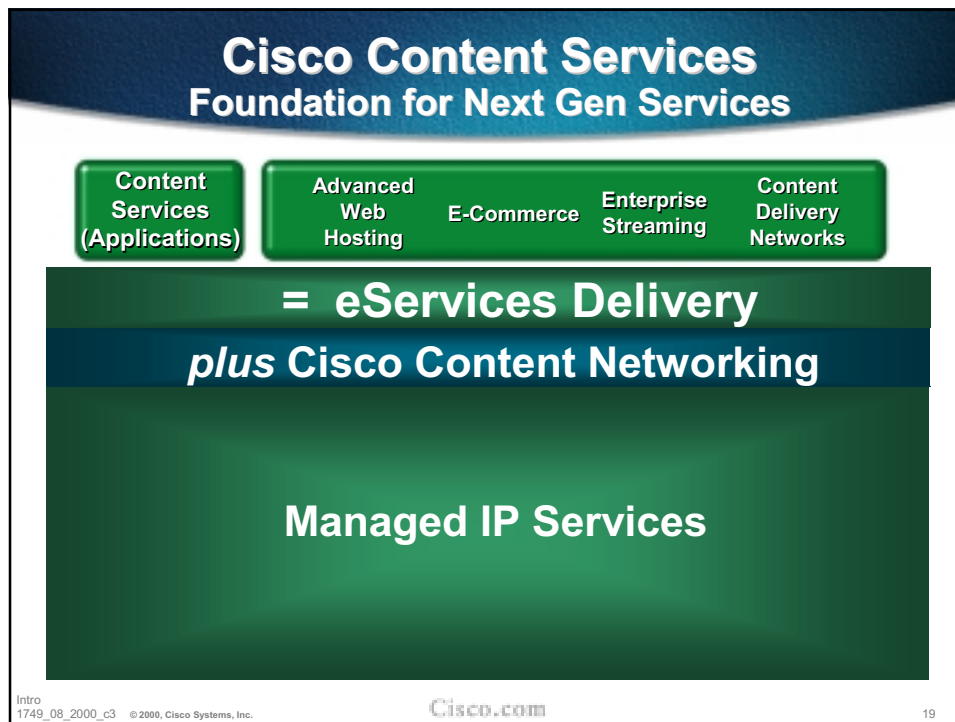
Content Services Applications



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The slide features a dark blue header with the text "Content Applications Advanced Web Hosting". Below the header, a large quote is presented in bold black text: "We believe Web-hosting is the backbone of the Internet economy due to the fact that all businesses seeking to leverage the Internet opportunity require Web-hosting capabilities." The quote is enclosed in large quotation marks. Below the quote, the attribution reads: "Thomas Weisel Partners, LLC, US Investment Banking Firm, March, 2000". At the bottom left, small text reads "Intro 1749_08_2000_c3 © 2000, Cisco Systems, Inc.". The Cisco logo and "Cisco.com" are at the bottom center, and the number "20" is at the bottom right.

Content Applications e-Commerce

e-Commerce Generates 90% of
Hosting Revenues by 2004



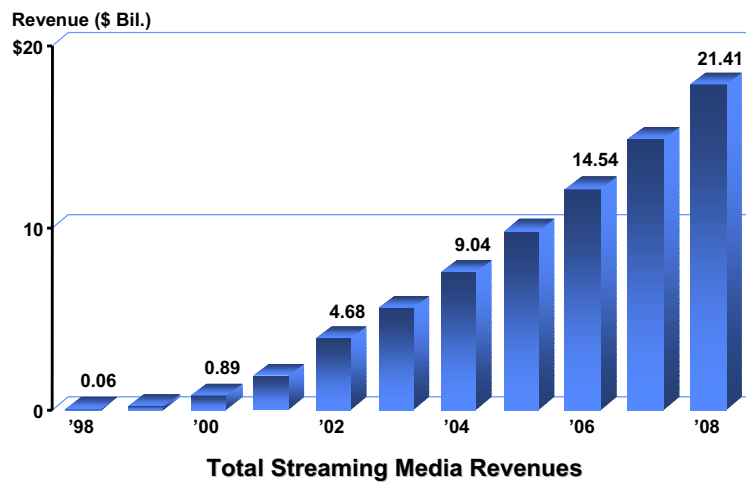
Source: Forrester Research, 2000

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Content Applications Enterprise Streaming



Source: Paul Kagan Associates

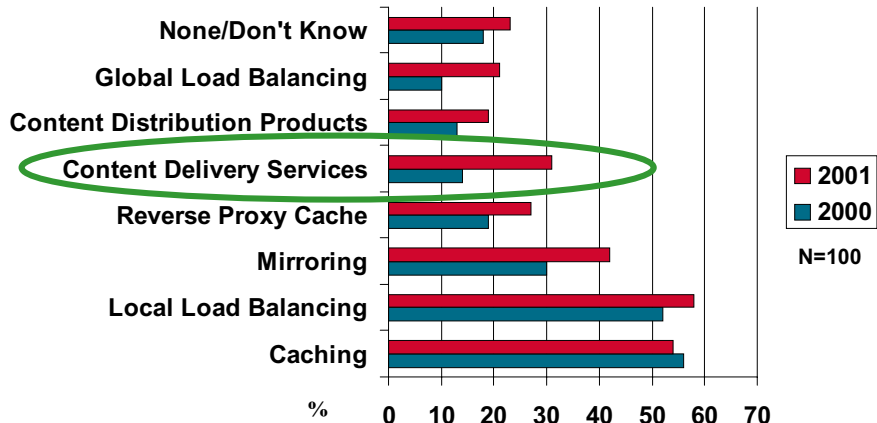
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Content Applications CDNs

Use and Planned Use of CDN Products/Services by Enterprise Customers



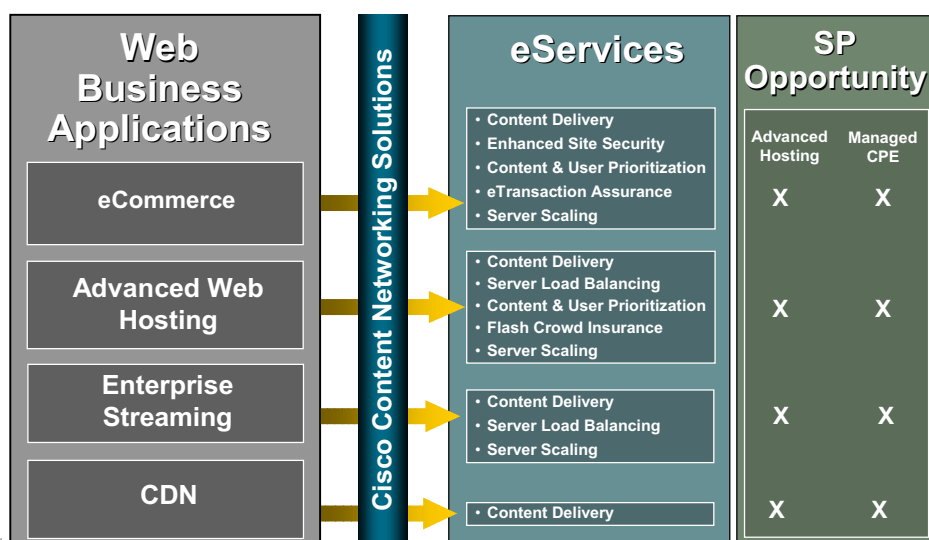
Source: The HTRC Group, 2000

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Business Application & eServices Framework



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Content eServices

- **Enhanced Site Security**

Firewall Load Balancing, and DoS protection provide right level of security without compromising performance. These are “content aware” services over and above traditional security services.

- **Flash Crowd Insurance**

“Hot” Content Replication in real time to dynamically scale the Web site.

- **Content & User Prioritization**

“Content Rules” and cookie switching speed access for important content or premium users.

- **eTransaction Assurance**

“Sticky Connections” prevent dropped shopping carts.

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Content eServices Continued

- **Server Load Balancing**

Intelligent SLB based on content (including URL, language, browser type, ...), allowing content redundancy and scalability.

- **Server Scaling**

Content aware caching offloads static traffic from the server farm.

- **Content Delivery**

Content distribution and routing for enhanced site **performance, availability, and scalability**. User-tailored services (based on geographical location) enable eLearning, ASP/ Intranet, Video on Demand Delivery, Live Event Broadcasting, ...

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eServices Enhanced Site Security

- **Content Aware Security**

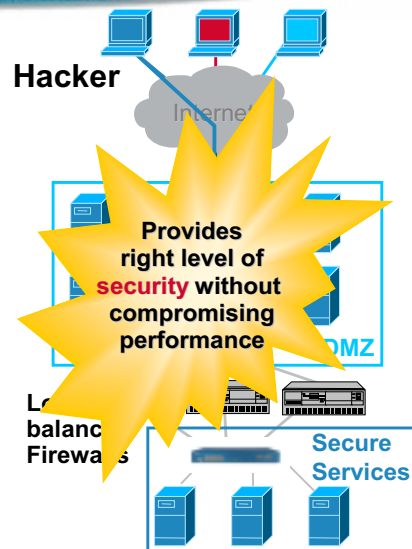
Eliminates DoS attacks for IP, TCP, SSL, and HTTP traffic

Provides high-speed access control

Wire speed NAT protects server IP addresses

- **Content Aware Security Scaling**

Firewall load balancing



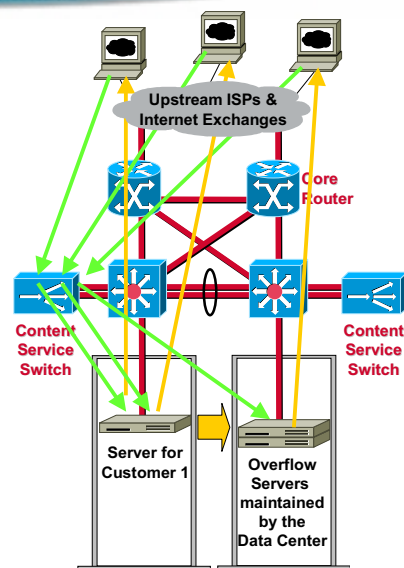
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eServices Flash Crowd Insurance

- **Problem:** Sometimes server(s) may be overflowed by the suddenly 'hot' flows
- **Solution:** The Server Overflow service allows the suddenly 'hot' content to be replicated to a temporary Overflow Servers or Caches to maintain the application response
- **Benefits:** Customer can still maintain its application responses before adding another server



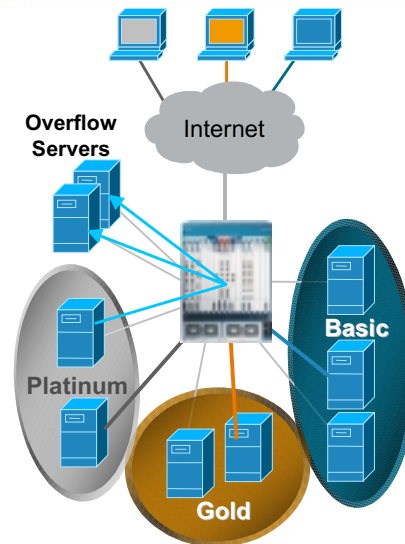
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eServices Content and User Prioritization

- **Cookie Switching** enables premium services for important customers
 - Route users to specific servers based on cookie
 - Restrict max # of transactions on "Platinum" servers to ensure best performance
 - Provide overflow servers for **Gold** and **Platinum** customers or content

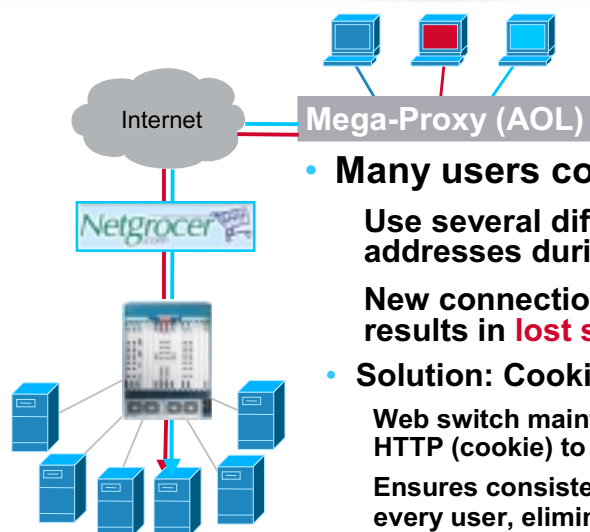


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eServices eTransaction Assurance



- **Many users coming from AOL**
 - Use several different source IP addresses during the transaction
 - New connection for SSL (buy me) results in **lost shopping carts**
- **Solution: Cookie Switching**
 - Web switch maintains state during HTTP (cookie) to SSL transition
 - Ensures consistent experiences for every user, eliminates lost revenue

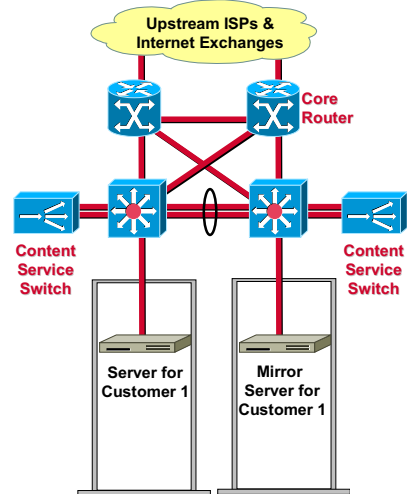
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eServices Server Load Balancing

- Server Load Balancing allows **content redundancy** and **content scalability**
- Charge customers by number of IP addresses used in addition to space and bandwidth
- Server selection based on contents:
 - URL
 - Language type
 - Browser type
 - (Weighted) Round Robin
 - Least Connections
 - Max connections limits

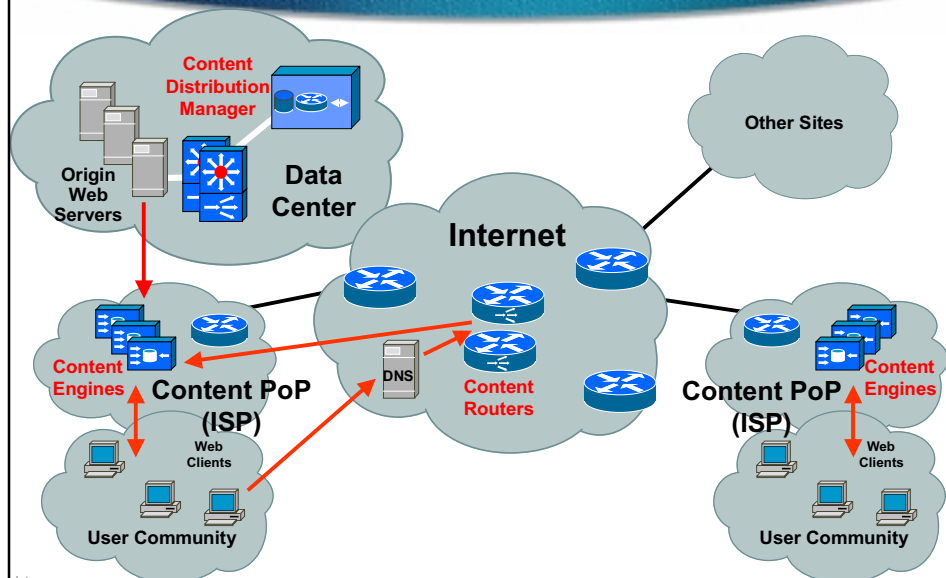


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eServices Content Delivery



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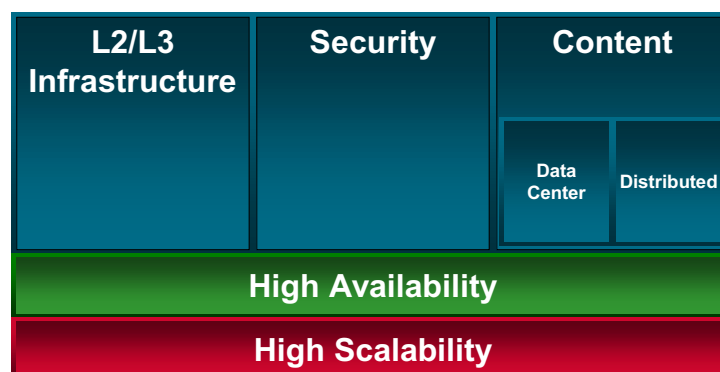
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IDC Architecture Components



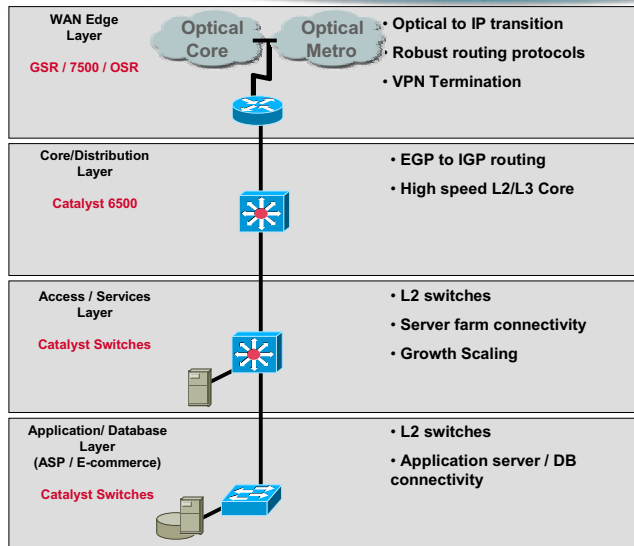
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IDC Architecture

L2/L3 Infrastructure



L2/L3 Infrastructure



Services:

- Policy Based Routing
- Private VLANs
- QoS
- MPLS VPNs

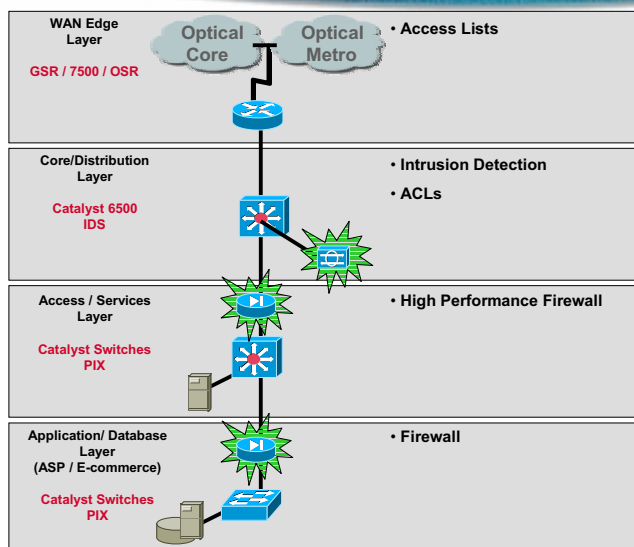
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IDC Architecture

Security



L2/L3 Infrastructure Security



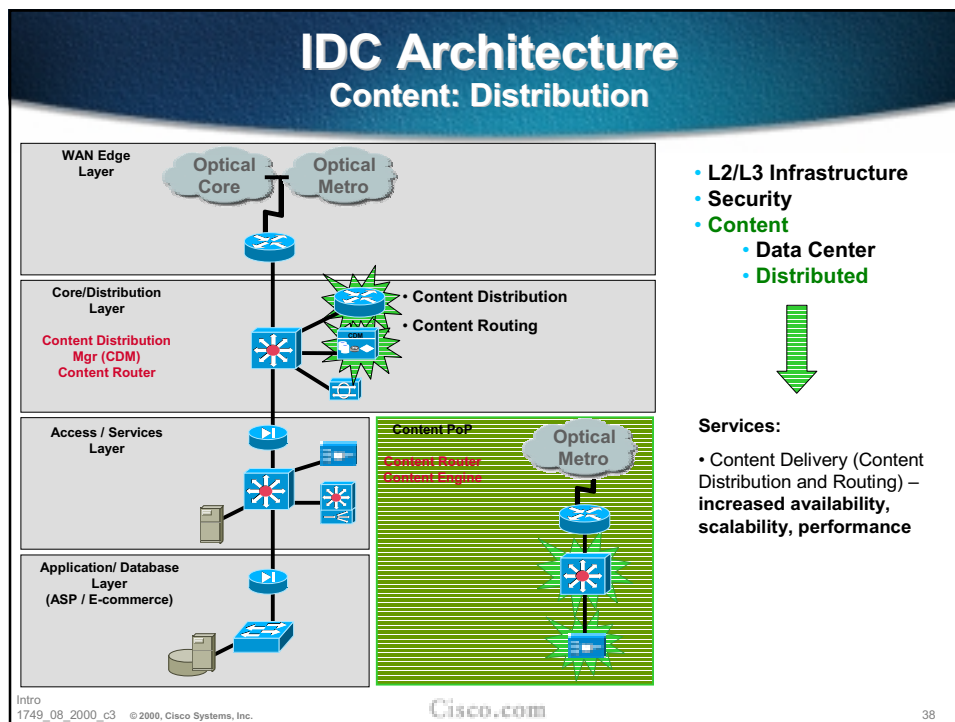
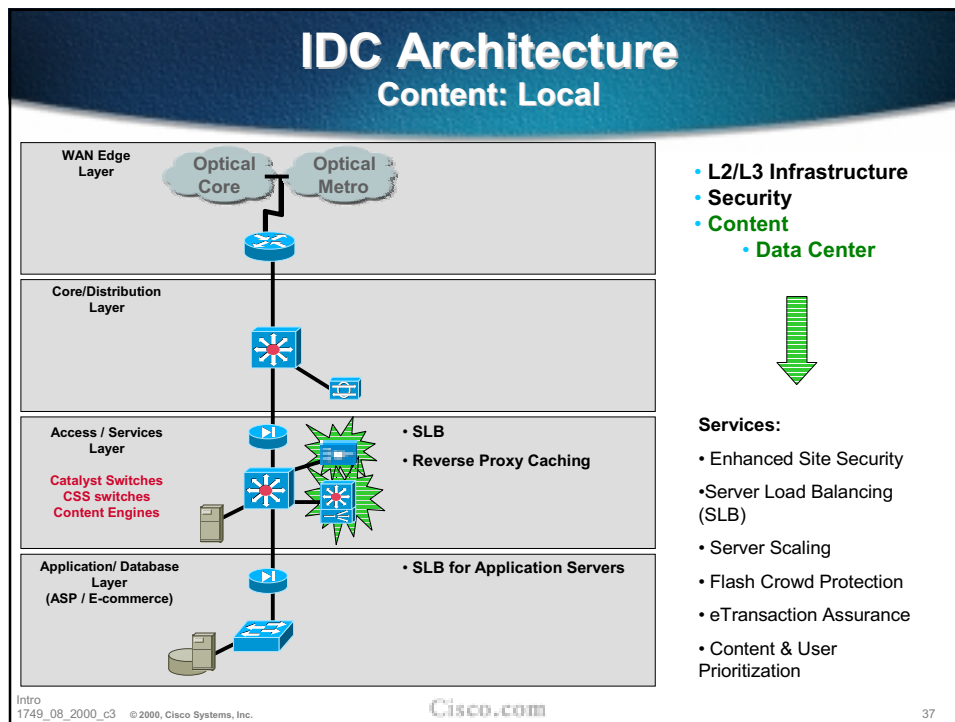
Services:

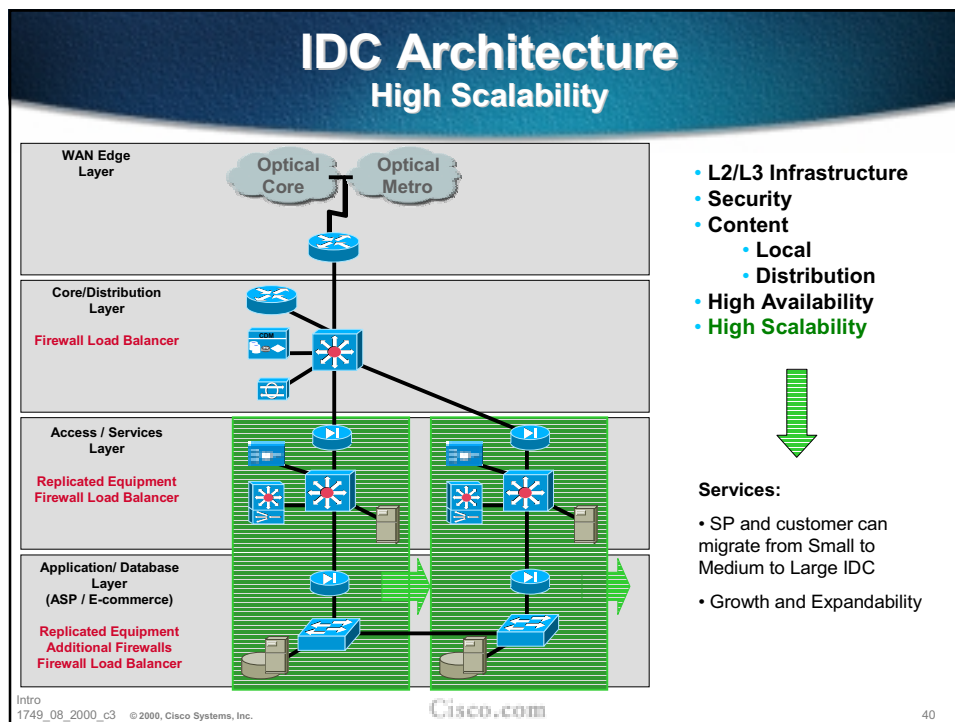
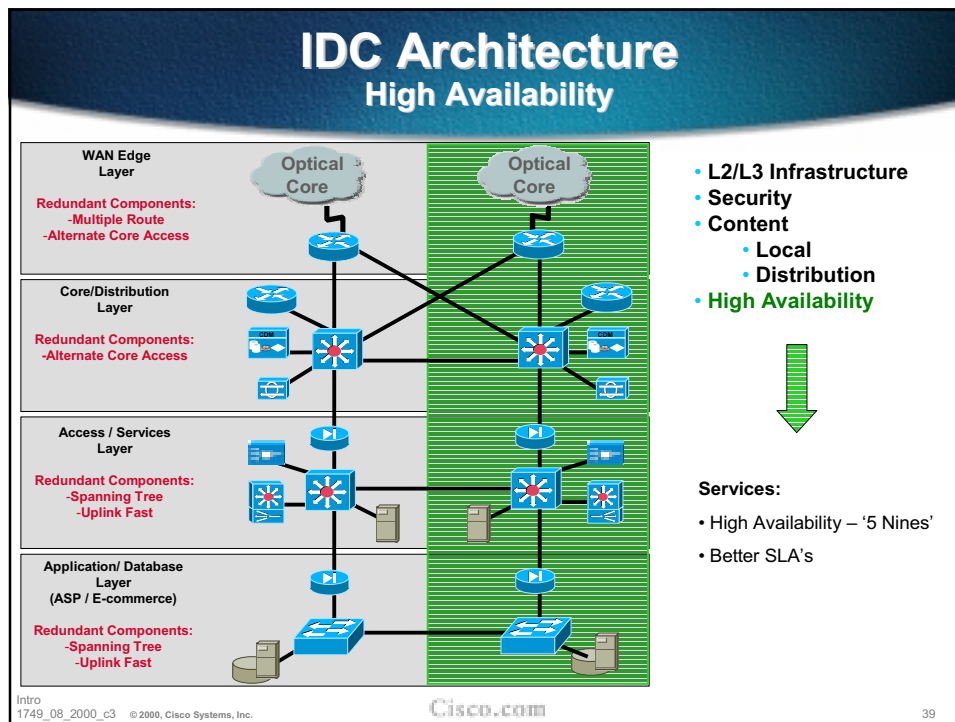
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Conclusion

How do you scale emerging Applications (Advanced Web Hosting, Streaming, ...) on the Internet?

By distributing IP Awareness – to support Content Delivery Services – in the Optical Core & Metro.

**IP + Optical =
Increased Scalability, Availability, and Performance!**