

Content Delivery Networks

Definition

An end-to-end content delivery system leveraging services in the IP core network and content aware layer 4 - 7 capabilities to optimize end user access to content.

CDN-Overview WWW.CISCO.COM 2

Content Delivery Networks

- Cisco is the first and only vendor to deliver a complete system for Content Delivery Networks
- Enables Service Providers to build additional value into their networks and to deploy highly profitable content delivery services

CDN-Overview

WWW.CISCO.COM

3

New IP Appliances and Web Access Devices



Kerbango Radio



WebTV



Whirlpool SmartFridge



TiVo



Sony PlayStation 2

CDN-Overview

WWW.CISCO.COM

4

Emerging Content Services

Business to Consumer Services

- Static Image acceleration (this is the state of CDN's today)
- Large Scale On-Demand and Live Streaming Media Delivery and Hosting
- Content Rating and Filtering
- Distributed Dynamic Content
- Personalization (e.g. Ad Insertion)

Business to Business Services

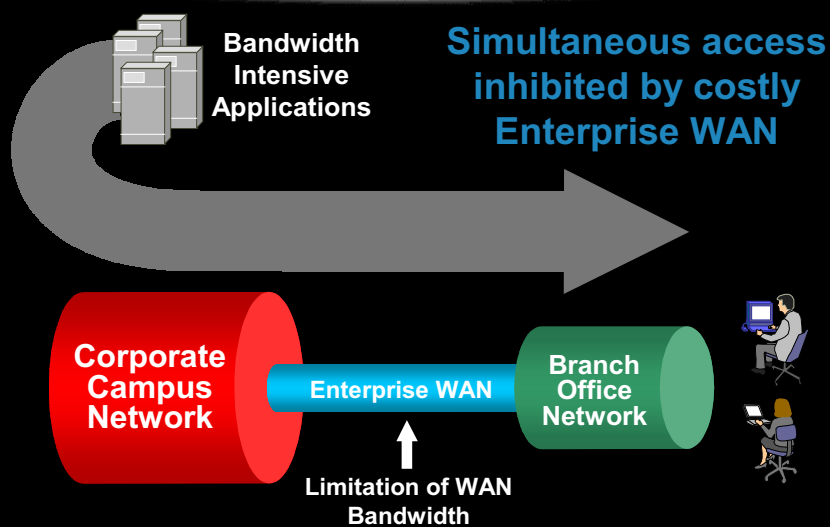
- Distributed Web Hosting, Applications Hosting, and E-Commerce
- Virtual Private Content Delivery Nets (VPCDN's)
- Intranet/Extranet Streaming Media Delivery
- Streaming Media Delivery and Hosting
- Enterprise Controlled Content Access and Delivery

CDN-Overview

WWW.CISCO.COM

5

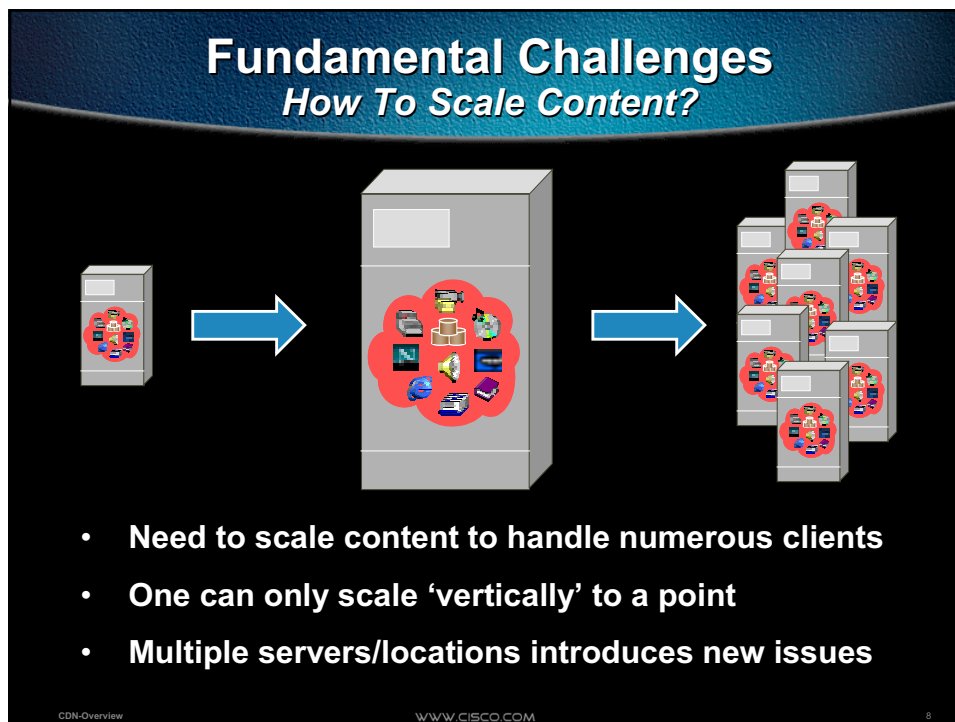
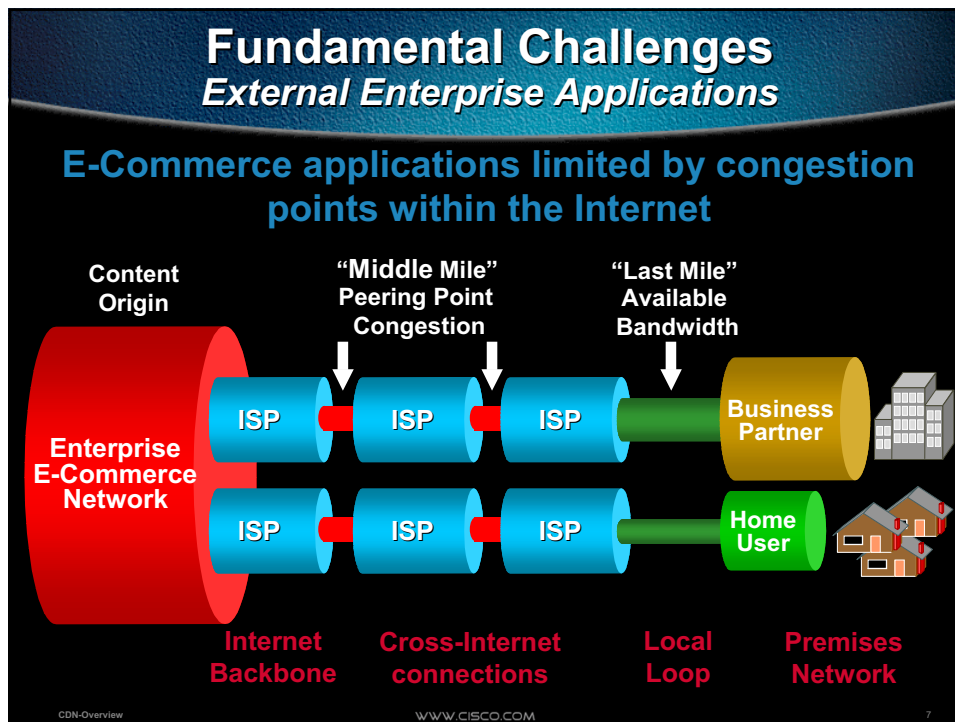
Fundamental Challenges *Internal Enterprise Applications*



CDN-Overview

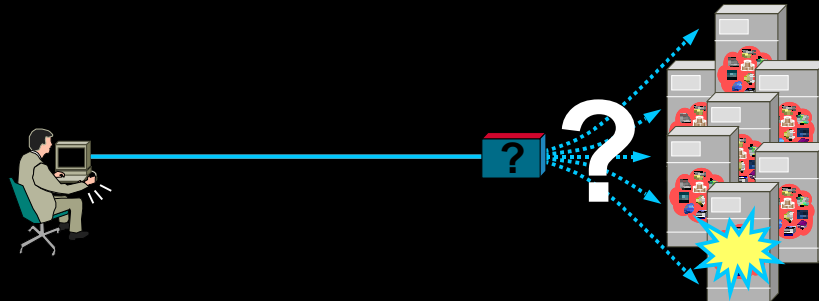
WWW.CISCO.COM

6



Fundamental Challenges

How to Maintain Content Availability?



- Need to synchronize content amongst servers/sites
- Need to avoid faulty servers/sites
- Faulty servers/sites includes invalid/dated content

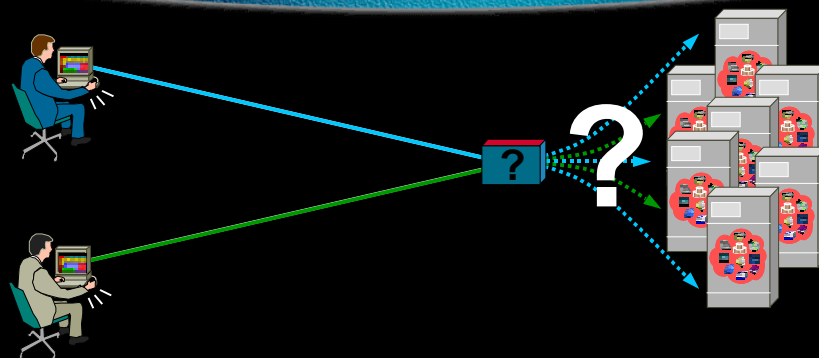
CDN-Overview

WWW.CISCO.COM

9

Fundamental Challenges

How To Load-Share Content?



- Need to handle requests fairly amongst servers/sites
- Need to easily add servers/sites to content service
- Need to adjust connections based on server/site load

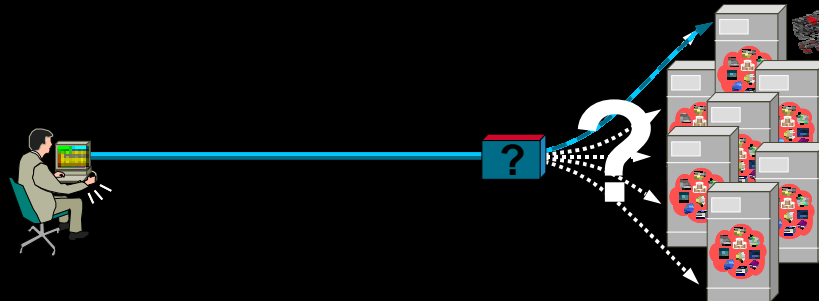
CDN-Overview

WWW.CISCO.COM

10

Fundamental Challenges

How to Maintain Persistence?



- Need to handle applications which use 'state'
- Need to learn client ID to satisfy state requirement
- Need to maintain state for period of time - variable

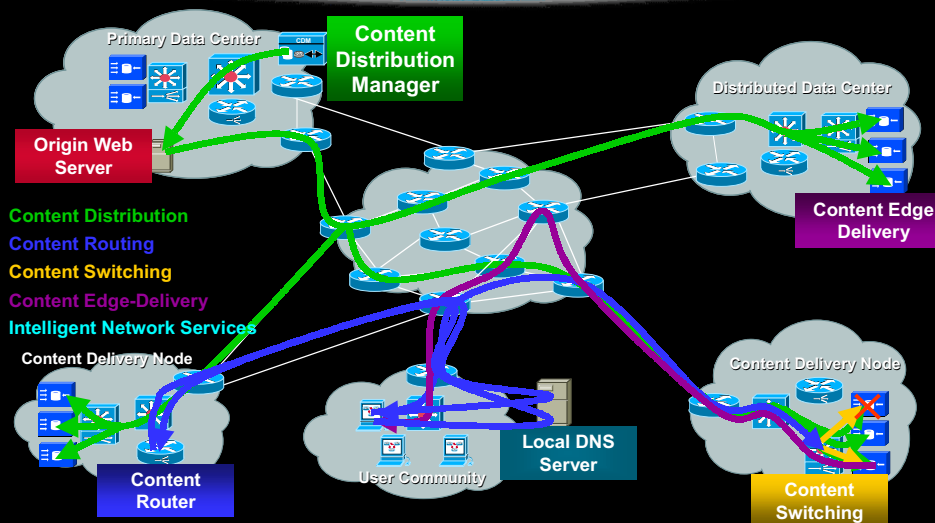
CDN-Overview

WWW.CISCO.COM

11

Content Delivery Networks

Direction Overview



CDN-Overview

WWW.CISCO.COM

12

Content Routing

CAPP Based Content Routers

- **Web-NS 4.0 Tiered Proximity Algorithm**
 - Content Routing based on Proximity
 - Best Site and Best Server Selection Coupled
 - Hierarchical architecture—multiple tiers
 - NS records support for hierarchical routing
- **CAPP Content and Application Peering Protocol**
 - Open, secure, TCP-based protocol
 - Updates state information among distributed Web sites
 - State information Exchanges contain:
 - Site Availability and Load
 - Content Server Availability and Load
 - Availability of Content (URL)
 - Network proximity data
- **Selection of best Site and Content Server for every user request**
 - Based on CAPP information



CDN-Overview

WWW.CISCO.COM

13

CDN Components

Content Switching

Content Switching

Best Server or Content Engine Selection
Intelligently load balances traffic across servers or Content Engines
Gracefully removes 'problem' servers from the rotation
Automatically inserts "well-behaved" server to the rotation
Selection is based on:

- Server Availability
- Server Load
- Server Response Time
- Content Availability
- L3/L4 information (IP address, TCP port, ...)
- L5-L7 content (URL, Cookie, ...)

(Note that HTTP is an L5 protocol/application, NOT L7)

CDN-Overview

WWW.CISCO.COM

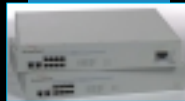
14

Content Switching (L4-L5) Web-NS 4.0

CSS 11800



CSS 11050



CSS 11150



- Extensive L4-L5 load balancing Mechanisms
- Flash Crowd Insurance
- Firewall Load Balancing
- Dynamic Cache Bypass
- Integrated (DoS/ACL) Security
- Sophisticated Content Verification
- Hardware Assisted SLB
- Client/Server NAT
- SLB Algorithm
 - Round Robin (W)
 - Least Connections (W)
- Port Bound Servers
- Client Assigned
- Session Persistence Support: Source IP, Cookie Insert, Cookie Passive, SSL Sticky
- HTTP Redirection
- Maximum Connections
- Slow Start
- SynGuard
- HTTP Probes for Server Failure Detection & Restore
- Dynamic Feedback Protocol
- Delayed Removal TCP Context
- Redundancy (Stateless)

CDN-Overview

WWW.CISCO.COM

15

CDN Components *Content Edge Delivery*

Content Edge Delivery

Provide content serving transparently to the user

Content Edge-delivery Redundancy & Scalability

Content Serving through:

Transparent caching

Reverse-proxy caching

Streaming Media Service

Content Serving of:

Static files

Real G2

MPEG 1 & 2 support

Quicktime

CDN-Overview

WWW.CISCO.COM

16

Content Edge-Delivery

Content Engine 7320:

- Service Provider and Large Enterprise Deployment
- **Caches Enabled** Content
- Populated via Pull or Push
- Serves Requested Content
- Empire management agent
- **OC-3 throughput**
- **Up to 216 GB storage**



CE 7320



CE 507 / 560 / 590

Content Engine 500 Series:

- Enterprise Deployment
- Transparent caching and content delivery software modules
- Static files, Real G2, MPEG 1 and 2 support
- Concord management agent
- **DS-3 throughput (Cisco Storage Array is required)**
- Industry-leading density (Performance / RU)
- 1 RU, Two 10BaseT/100BaseTX ports, AC/DC power
- 36 GB internal storage: (2) 18 GB SCSI drives
- Expandable up to 144GB with Cisco Storage Array

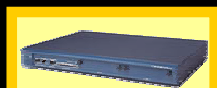
CDN-Overview

WWW.CISCO.COM

17

Content Edge-Delivery

CEs	CE 507/AV	CE 560	CE 590	CE 7320
Features				
Throughput *storage array required	T1/E1	20 Mbps*	45 Mbps*	155 Mbps*
Storage	18-36/18	36-144	36-252	180-396
RU	1	1-4	1-4	4-7
Where is goes				
Service Providers			✓	✓
Enterprise			✓	
Regional Sites		✓		
Small Brach Sites	✓			
Price		\$ 15,000	\$ 30,000	\$ 90,000
Storage Arrays	Storage Array 6	Storage Array 12		
Capacity (3RU)	108	216		
Discs (18 Gbytes)	6	12		
Price	\$13,000	\$21,500		



CE 507 / 560 / 590



CE 7320

CDN-Overview

WWW.CISCO.COM

18

CDN Components

Content Networking Services

Intelligent Networking Services

Intelligent network services in the IP infrastructure

Required to build reliable, scalable CDNs



- Security

Stateful Inspection Firewalls
IOS Firewall Feature set
ACLs, Extended ACLs and Wire-Speed RACLs & VACLs
Intrusion Detection

- QoS & VPNs

QoS policing, QoS marking, ToS, DSCP, 802.1p

- Multicast

- L2/L3 Features

STP Enhancements: UplinkFast, BackboneFast, PortFast, BPDU Guard
Private VLANs,
Fast Convergent IGP and Reliable Proven code: IOS

CDN-Overview

WWW.CISCO.COM

19

Content Delivery Networks

Only Cisco Delivers the Complete System

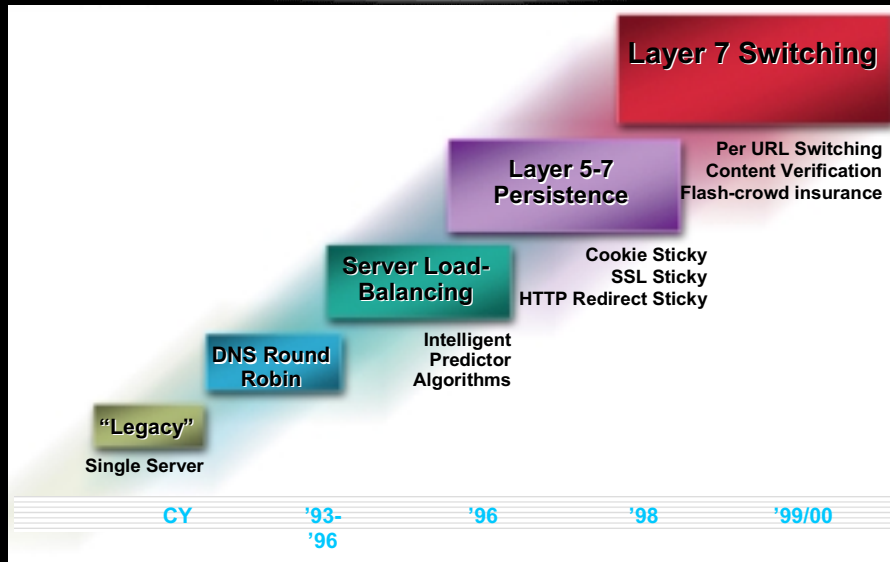
	Content Distribution & Management	Content Routing	Content Switching	Content Edge Delivery	Intelligent Network Services
Cisco	Yes	Yes	Yes	Yes	Yes
Key Features / Benefits	Global / centralized provisioning Real time monitoring Ensuring fresh content Self organizing distribution network	Scalability Routing to best most proximate content Adaptive routing around failures / congestion	Flash crowd protection Optimal handling for non-cacheable content (e-commerce, etc) E-commerce transaction assurance Core distribution capabilities	High-performance content delivery for POPs Integrated caching for transparent insertion into the network Full scalable range product range with common architecture	Leverage existing network infrastructure QoS Security Multicast VPNs
Products (FCS Oct'00)	CONTENT DISTRIBUTION MANAGERS • CDM 4670 • CDM 4650 • CDM 4630	CONTENT ROUTERS • CR 4450 • CR 4400 • WebNS 4.1 • Distributed Director	CONTENT SWITCHES • CSS 11000 • LocalDirector • Catalyst 4840G • Catalyst 6500	CONTENT ENGINES • CE 7320 • CE 507/560/590	NETWORK SERVICES • Cisco IOS

CDN-Overview

WWW.CISCO.COM

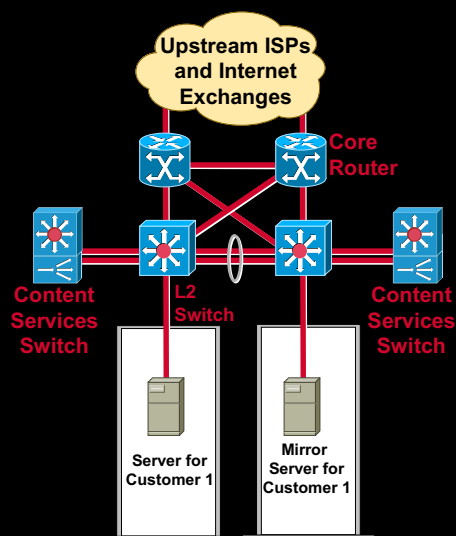
20

Content Switching Evolution



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 content:
 - URL
 - Language type
 - Browser type
 - Host Tag
 - Cookie
 - Session ID

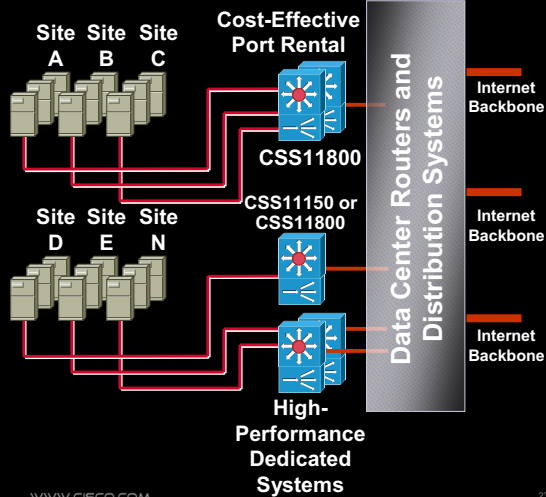


Server Load Balancing Example



NaviSite Advanced Load Balancing Services

- Custom load balancing enhances site performance
- Advanced failover technology
- 3 options: (shared or dedicated)
 - Standard
 - Commerce
 - Distributed



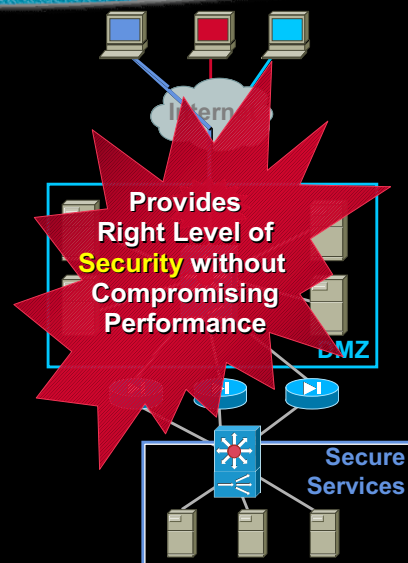
CDN-Overview

WWW.CISCO.COM

23

Site & System 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



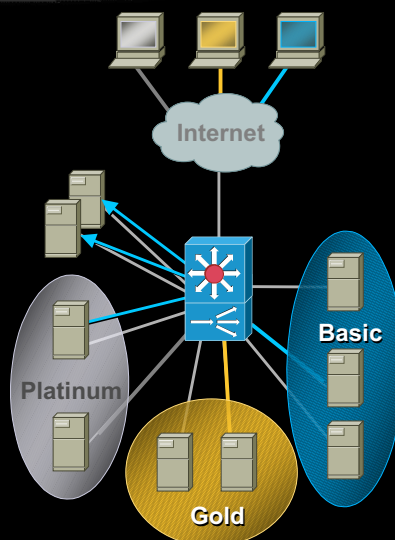
CDN-Overview

WWW.CISCO.COM

24

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
- **Full URL switching** allows content rules to be applied to important content



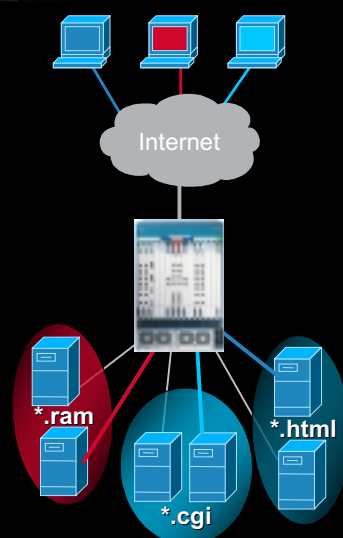
CDN-Overview

WWW.CISCO.COM

25

Application Optimization

- Customers can use optimum server platform for each application
 - Static HTML, Dynamic Pages, Images, Streams
- Speeds time to market and improves site performance
- Selects Best server for requested content
 - Builds normalized load factor for every server
 - Sends requests to fastest server for requested content
 - Maintains Appropriate Persistence
 - Re-maps Connections

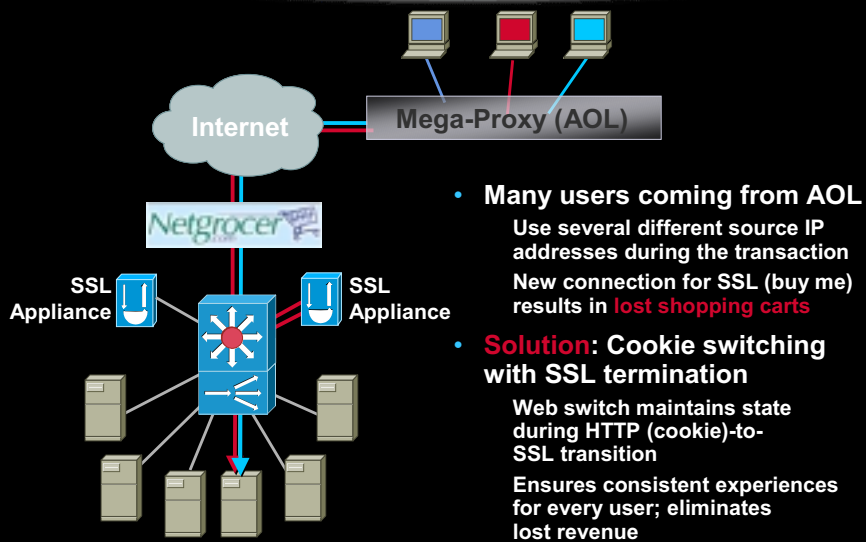


CDN-Overview

WWW.CISCO.COM

26

E-Transaction Assurance



CDN-Overview

WWW.CISCO.COM

27

The Solution

Cisco SSL Optimization Solution

Cisco 11000 series Content Services Switch



Cisco 11000 series Secure Content Accelerator



AVAILABLE TODAY, Cisco SSL Optimization Solution consists of two integrated pieces to form a complete solution

CDN-Overview

WWW.CISCO.COM

28

Cisco CSS 11000 Series Switch



Layer 5-7 Content-Aware Switch

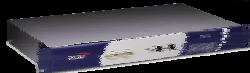
- **Performs wire-speed intelligent traffic management for attached devices on pre-defined policies for:**
URL, HTTP header, host tags, browser language, device type, geographical location, and content types - static/dynamic/streaming/encrypted
- **Identifies authenticated (HTTP) and secure (HTTP-S) content requests**
Load balances multiple SonicWALL SSL-Rack devices to maximize performance for SSL termination

CDN-Overview

WWW.CISCO.COM

29

CSS 11000 series Secure Content Accelerator



SSL Termination Appliance

- **Performs all SSL protocol processing, including SSL handshake and decryption/encryption**
Allows back-end Web servers to handle content-specific tasks at peak performance level
- **Handles all certificate information and key negotiation during SSL session**
- **Custom-engineered for CSS 11000 switch**
- **1U rack-mountable, redundant 10/100 ports**

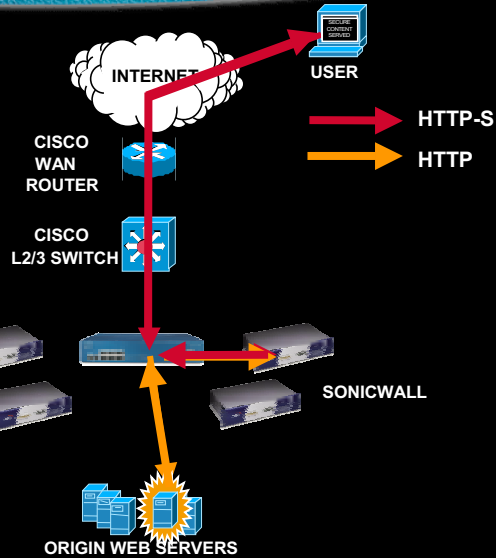
CDN-Overview

WWW.CISCO.COM

30

How the Solution Works

- CSS 11000 switch directs incoming HTTP-S (encrypted Port 443) requests to the SonicWALL SSL-Rack for decryption.
- Once decrypted (HTTP Port 81), CSS 11000 switch has clear-text visibility into request
- CSS 11000 switch applies intelligent load-balancing to pick most appropriate Web server to fulfill request
- Request is sent back to SSL-Rack, encrypted, and sent back to user



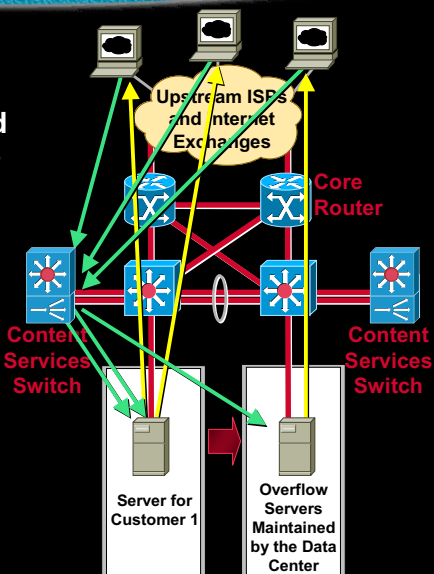
CDN-Overview

WWW.CISCO.COM

31

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



CDN-Overview

WWW.CISCO.COM

32

