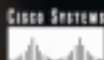# Deploying Web-to-Host Enablement Technologies

Design and Implementation Considerations

Session 705

Agenda

- Industry Drivers and Trends

- Four Levels of Web-Enablement

- Benefits and Characteristics of Each Level

- Design Considerations

- Case Studies

www.cisco.com

What Is Web-Enablement?

- **Web-enablement extends access to traditional 3270 data center applications and information via web browsers**

- **Web-enablement assumptions**

  No change to host applications or databases

  No change to communications environment

  Focus is on data center—3270 applications

  Web server used to support/distribute the applet application

www.cisco.com

What Drives Web Integration?

- Reduce/eliminate emulator costs
- Simplify software distribution
- Provide universal access to data center applications and data
- Improve usability

?

www.cisco.com

Reduce Costs

"
…Web-to-host terminal emulators will lower the TCO of terminal emulation by 25% compared to traditional terminal emulation for basic "green screen" functionality
"

Gartner Group
March 1998

www.cisco.com

Costs

- **Terminal emulators are "expensive"**
  - **Licensed on a per machine/seat basis**
  - **Repeated upgrades/support**
- **Web solutions lower total cost of ownership**
  - **Purchase**
  - **Administration and software distribution**
  - **Operations and support**

www.cisco.com

Universal Access

- **Extend application access to:**
  - **New internal users**
  - **Business partners, clients, suppliers**
- **Maintain/automate security**
  - **Userid/PW**
  - **Firewalls**
  - **Access lists/encryption**
- **Simplify interface—GUI**

www.cisco.com

Improving Usability

- **Motivation for improving usability of data center access:**

  Diversity: Support for multiple languages

  Enabling technologies: Visually impaired

  New workforce: Tailored to user skills

  Protect information: Mask "need to know" information

www.cisco.com

Solutions

- **Retail and business**
  - www.amazon.com
  - www.fedex.com
- **Financial**
  - www.etrade.com
  - www.yourbank.com

- **Government**
  - Library of Congress
  - IRS forms
- **Education**
  - Registration (UNC)
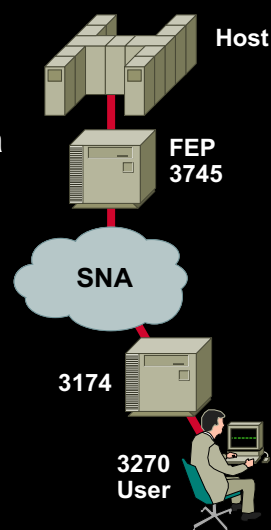 - Libraries

www.cisco.com

Technology Evolution

In the Beginning
There Was SNA…

Host

- **Transport of 3270 data**

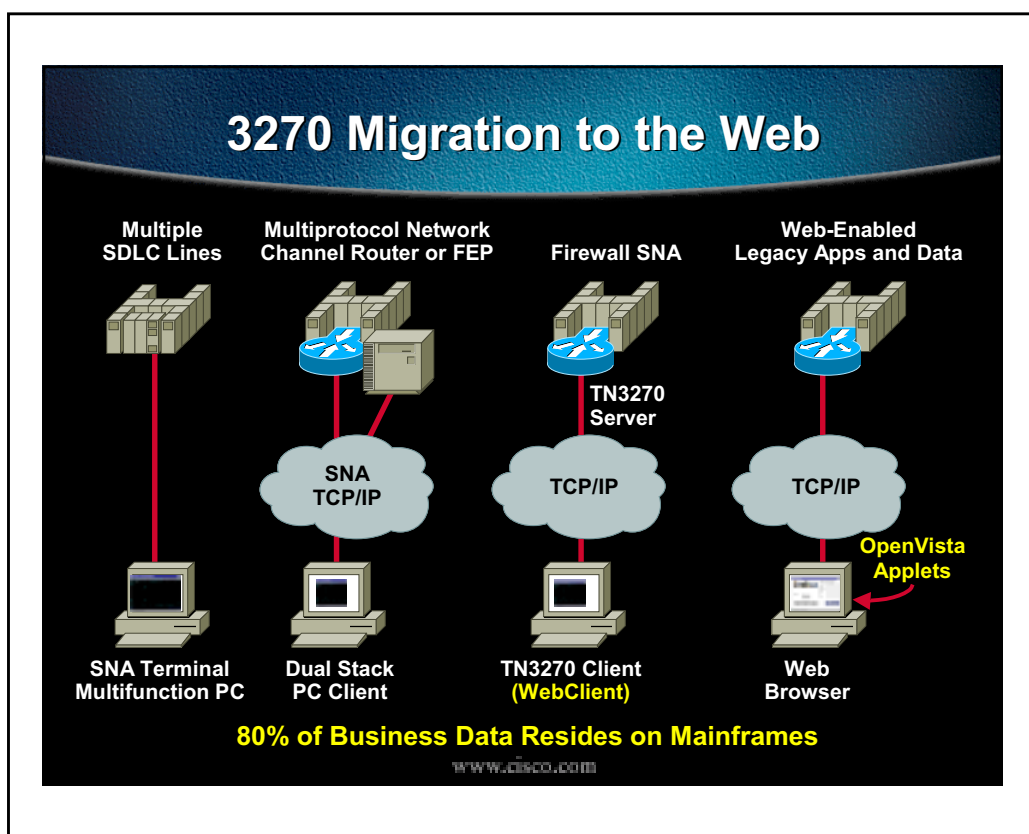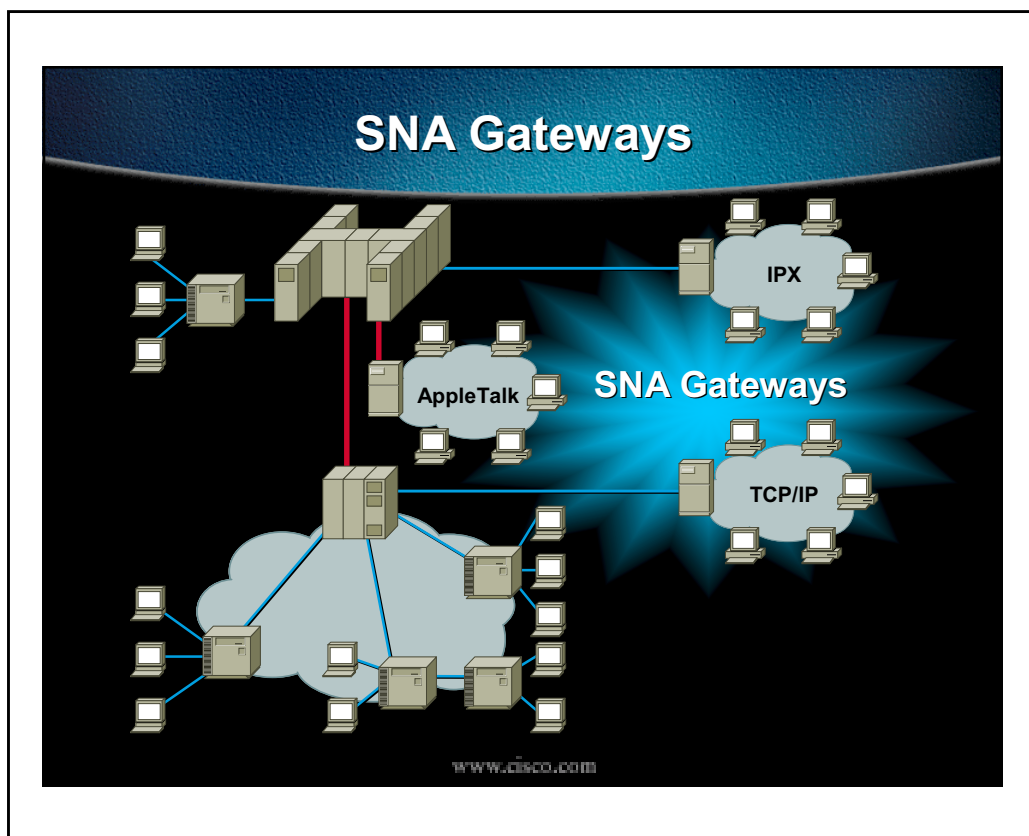 **Controllers transport 3270 data streams between mainframe and 3270 devices**

  User screen sends updated fields, mainframe returns refreshed screen

  Control characters in data stream instruct 3270 how to display information

FEP 3745

SNA

3174

3270 User

SNA Gateways

IPX

AppleTalk   SNA Gateways

TCP/IP

www.cisco.com

3270 Migration to the Web

Multiple SDLC Lines	Multiprotocol Network Channel Router or FEP	Firewall SNA	Web-Enabled Legacy Apps and Data

TN3270 Server

SNA TCP/IP   TCP/IP   TCP/IP

OpenVista Applets

| SNA Terminal Multifunction PC	Dual Stack PC Client	TN3270 Client (WebClient)	Web Browser

80% of Business Data Resides on Mainframes

www.cisco.com

Four Levels of Web-to-Host Migration

- TN3270 clients

- Web access via HTML conversion or Java applets

- Screen rejuvenation providing a GUI front end

- Direct host data access via mainframe API

Direct Access

Screen Rejuvenation

Web Access

TN3270 Clients

Complexity
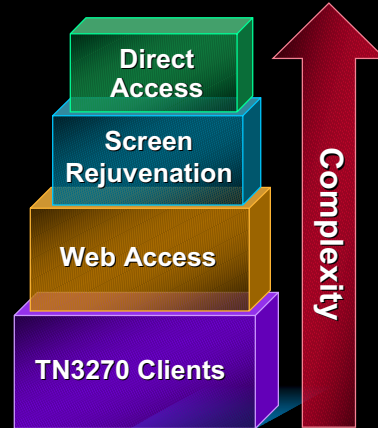
www.cisco.com

Level 1

TN3270 Clients

www.cisco.com

Level 1: TN3270 Clients

- **Key characteristics:**

  3270 data stream is transported inside IP packet

  TN3270 emulation software eliminates the need for additional SNA stack at client PC

  www.cisco.com

What Is TN3270?

- **Defines how to transport Cisco 3270 data streams over a TCP/IP network**

  Originally RFC 1576

- **TN3270 does the following:**

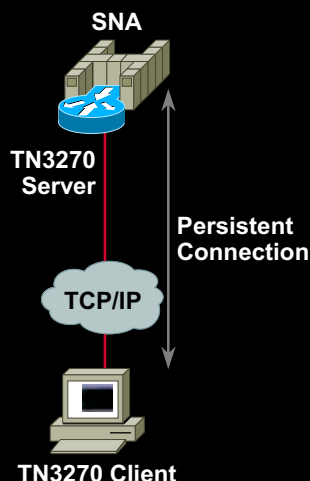 **Telnet protocol sends one Cisco 3270 screen refresh at a time**

  Emulates LU type 2 devices

  www.cisco.com

TN3270 Communication

- **TN3270 client**

  Emulates a 3270 terminal

  Uses Telnet to send TN3270 data to a TN3270 server

- **TN3270 server:**

  Assigns an LU/PU to the TN3270 client

  Converts TN3270 data to an SNA 3270 data stream

SNA

TN3270 Server

Persistent Connection

TCP/IP

TN3270 Client
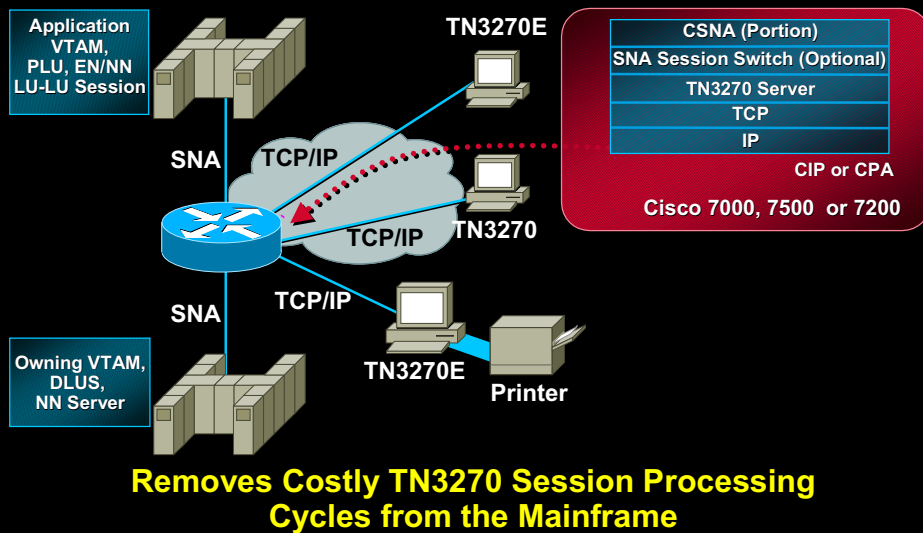
www.cisco.com

TN3270E…New and Improved

- **TN3270E, in RFC 2355 (1647), addressed several shortcomings of TN3270:**

  Emulation of 328x printers (LU 1 + 3)

  Client request of a specific LU name

  Support for 3270 ATTN key

  SNA positive/negative responses

  Client access to bind information

www.cisco.com

Cisco TN3270E Server Overview

Application VTAM, PLU, EN/NN LU-LU Session	**TN3270E**

CSNA (Portion)
SNA Session Switch (Optional)
TN3270 Server
TCP
IP
CIP or CPA

Cisco 7000, 7500 or 7200

SNA   TCP/IP

TCP/IP   TN3270

SNA   TCP/IP

Owning VTAM, DLUS, NN Server

TN3270E   Printer

**Removes Costly TN3270 Session Processing
Cycles from the Mainframe**
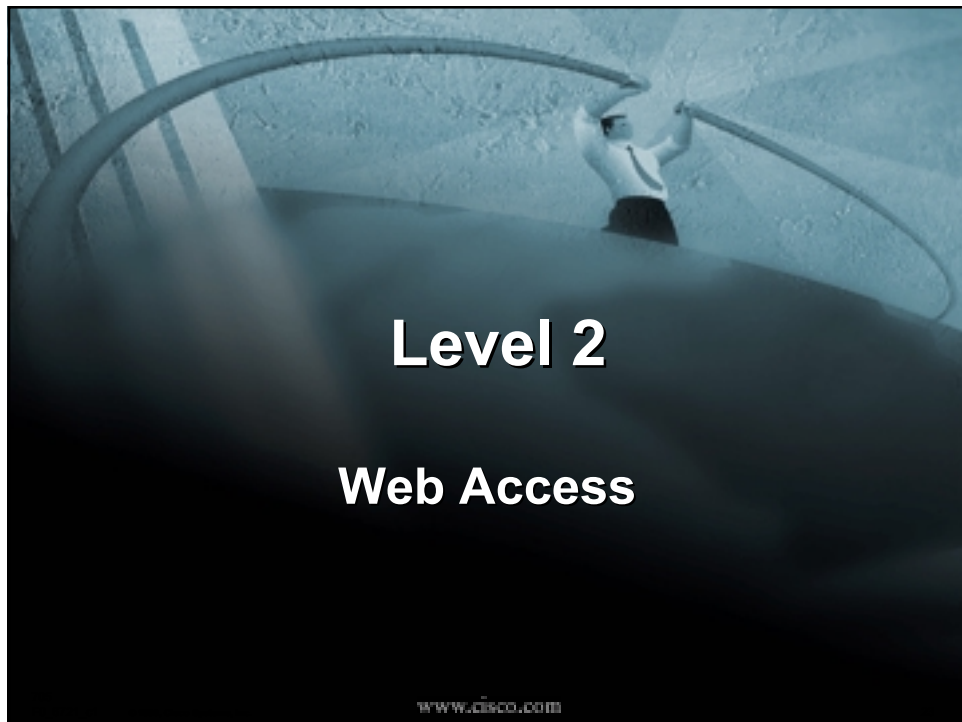
www.cisco.com

Why TN3270?

- **Proliferation of IP networks**

  **Cost-effective to manage a
  single protocol, IP**

- **Reduced desktop complexity and cost**

  TCP/IP stack comes standard with PCs

- **Shortage of SNA skills, abundance
  in IP skills**

- **Opportunity to leverage mainframe for
  new services and products**

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Level 2

Web Access
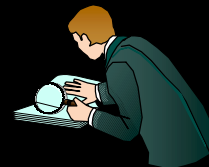
www.cisco.com

Fat and Thin Clients

- **FAT clients**

    Platform-based (hardware, CPU, or operating system-dependent)

    Desktop installation (large footprint)

    High cost of ownership

- **Thin clients**

    Requires only a browser at the desktop

    Web server download (small footprint)

    Low cost of ownership

Fat Clients…Hmmmph! Here's Another Fine Mess You've Gotten Us Into!

www.cisco.com

Advantages of Using the Web

- **Web browsers are readily available**

- **Web browsers are platform-independent**

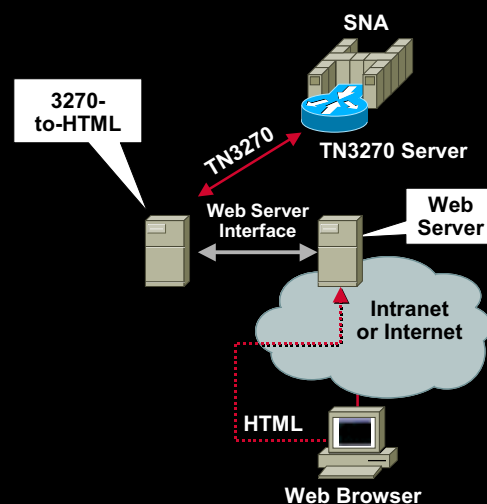- **Browser interface well understood by the masses**

www.cisco.com

3270-to-HTML Conversion

- **Browser-based access to SNA**

  Minimum 3-tier solution

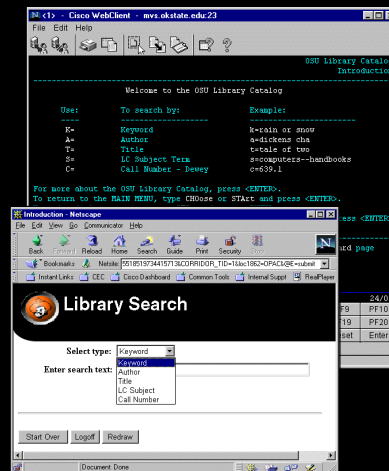 **Uses TN3270 protocol**

  Casual access

SNA

3270-to-HTML

TN3270

TN3270 Server

Web Server Interface

Web Server

Intranet or Internet

HTML

Web Browser

www.cisco.com

3270-to-HTML Example

- **Before and after**

  - **Oklahoma State University (PETE)**

  - **Esker's corridor product**

  - **TN3270 server at: mvs.okstate.edu**

  - **Web access at: http://corridor.esker.com/ corridor/corrcgi.cgi**

3270-to-HTML Browser-Based Access

- **Advantages**

  - **Requires only a browser at the client**

  - **Delivers basic interface rejuvenation**

  - **No client download or software to maintain**

- **Disadvantages**

  - **Early implementations—poor session integrity**

  - **No end-to-end persistence (solved by HTTP 1.1)**

  - **No file transfer, function key, or light pen support**

  - **Not for power users**

  - **Bandwidth intensive**

TN3270 Java Applets

- **Key characteristics:**

  Java applet obtains a persistent connection to the host

  Java code eliminates need for TN3270 "Fat" client software

  Java is platform independent

  Java applet code makes web page content dynamic

  www.cisco.com

TN3270 Java Applet Capabilities

- **Some or all logic for communication within the "client"**

- **2 and 3 tier solutions available**

- **Product capabilities vary**

  User features (copy/paste, colors, keyboard remapping)

  SNA features (IND$FILE, session limitations, models supported)

  www.cisco.com

How Java Works

- **Java is a high-level programming language**

- **Compiled programs inside an HTML document invoke the Java virtual machine (JVM)**

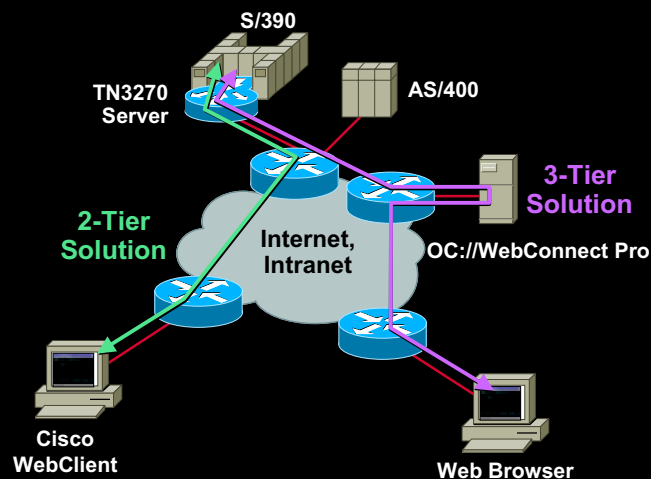- **JVM issues commands to the desktop operating system and hardware**

Browser Application

Java Code

Java Virtual Machine

Operating System

Hardware Platform
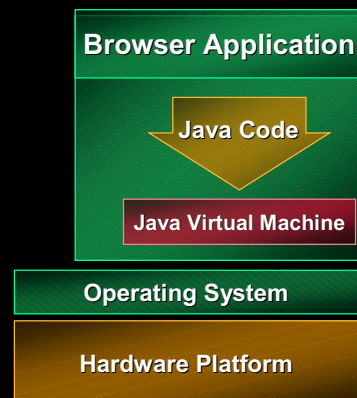
WWW.CISCO.COM

What Is WebClient?

- **Cisco standalone TN3270/TN3270E client**

- **Entry-level Web-to-host access**

  "Web-enables the CIP"

- **Simple installation**

  Netscape's Smart Update/ IE Active Setup

- **Two-tier solution**

  No server software administration

  After initial download, client is run from users desktop

Web-Enabled Mainframe Access

CISCO WEBCLIENT

WWW.CISCO.COM

Two- and Three-Tier Solutions

S/390

TN3270
Server

AS/400

3-Tier
Solution

2-Tier
Solution

Internet,
Intranet

OC://WebConnect Pro

Cisco
WebClient

Web Browser

www.cisco.com

Two-Tier Solution: WebClient

- **First-time access**
    1. **User accesses web server URL**
    2. **Downloads the Java applet using Smart Update or Active Setup, which installs applet on workstation**
    3. **Accesses mainframe application via the corporate intranet using WebClient**
- **Subsequent access**
    1. **User can check URL for newer version of applet and download it OR**
    2. **Just start up WebClient, which is now resident on desktop**
   3. **Access mainframe application across corporate intranet via WebClient**

TN3270 Server
on CIP/CPA

Corporate
Web Server

IP

1

2

3

TN3270
WebClient
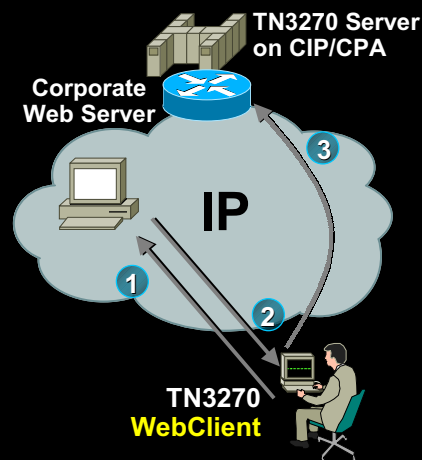
www.cisco.com

Three-Tier Solution: WebConnect

- **First and remaining accesses:**

  1. **User accesses web server URL**

  2. **Java applet saved to workstation "cache"**

  3. **Java applet opens an SSL connection with WebConnect server**

  4. **WebConnect server establishes a connection to TN3270 server**

  5. **TN3270 server establishes a "persistent connection" to the mainframe**

  6. **If connection is lost, the process is repeated**

TN3270 Server on CIP/CPA

TN3270 via Web Browser
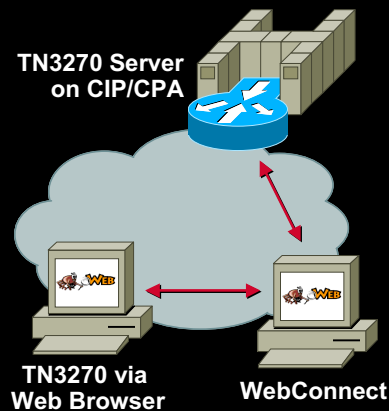
WebConnect

www.cisco.com

WebClient and WebConnect Comparison

WebClient	WebConnect
Two-Tier Thin Client	Three-Tier Thin Client
Installed on Hard Drive	Temporarily Loaded in Cache
Web Server Needed Only for Initial Download	Web Server Needed for Every Session
NO > 3287 Print, IND$FILE, NLS, Rejuvenation, Encryption	Has > 3287 Print, IND$FILE, NLS, Rejuvenation, Encryption
Both Have Green-on-Black Support, Color and Keyboard Mapping, Screen Print, Cut-and-Paste	

I See Two Clients… One Fat and the Other Thin… Go with the Thin

www.cisco.com

Presentation_ID.scr

Level 3

Screen Rejuvenation

Screen Rejuvenation

- **Simplifies access to mainframe applications**

- **Replaces green on black screen with familiar browser GUI**

- **Can consolidate multiple green screens into one Java web GUI screen**

- **Masks where data really resides**

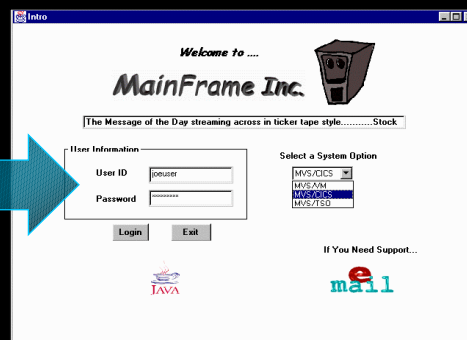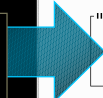- **Simplified interface can be used to streamline processes, offer new services**

Screen Rejuvenation Example

- **OpenVista component of OC://WebConnect Pro**

- **Integrated development environment**

  Look-and-feel of VisualBasic

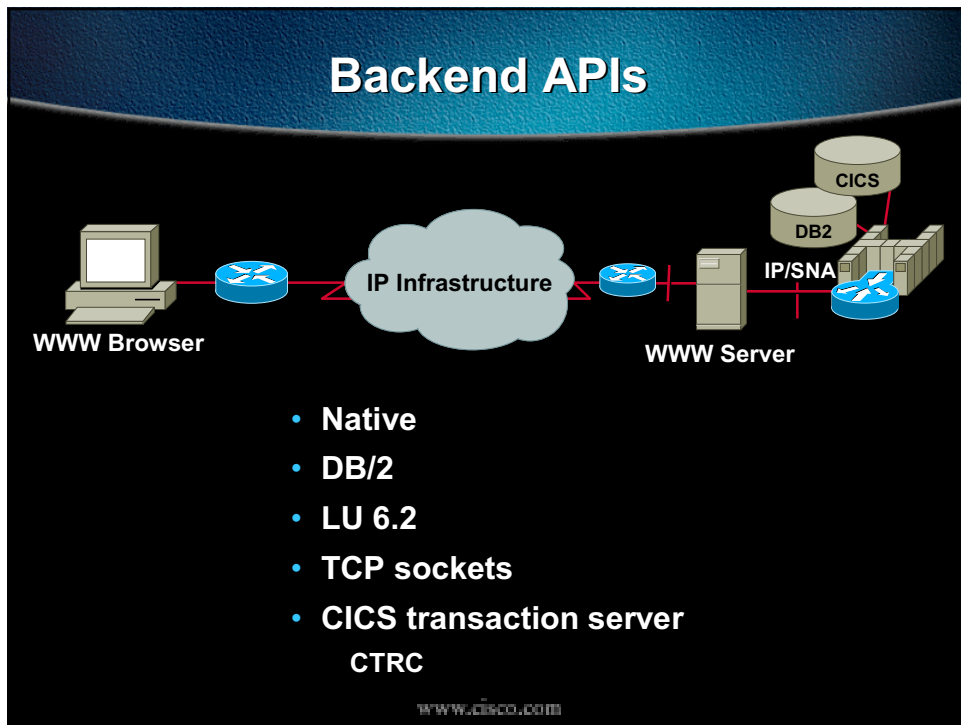- **Easy rejuvenation of green-on-black interface**
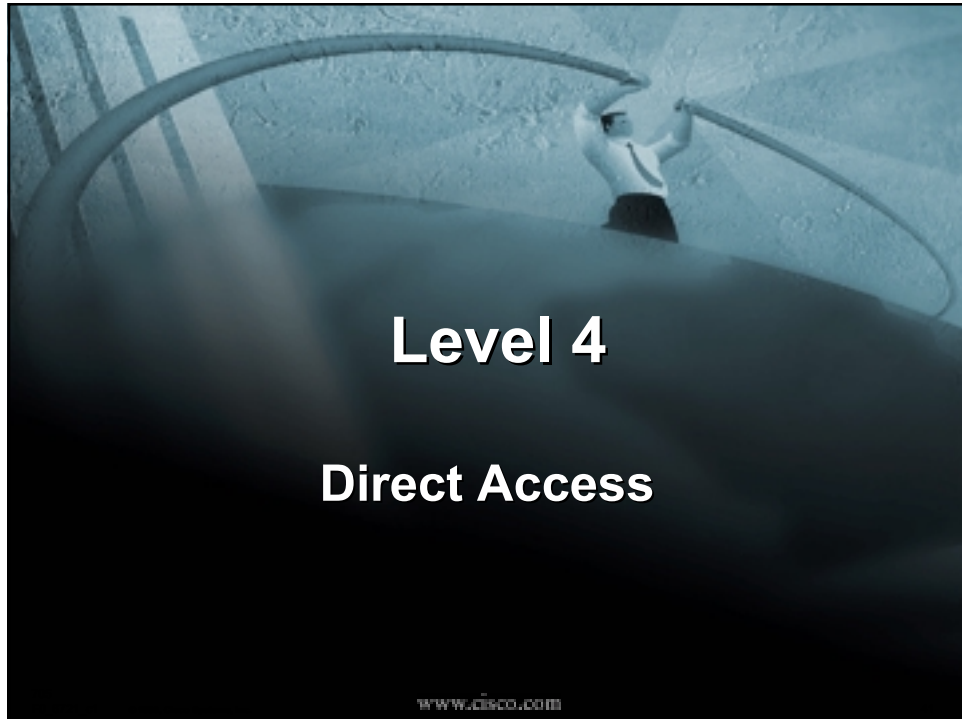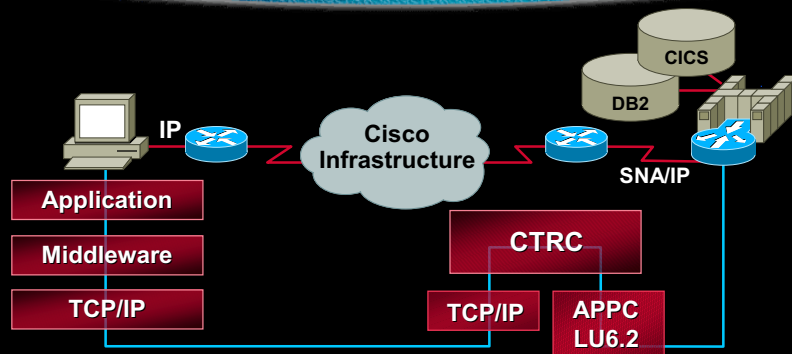
- **NT or UNIX platforms**

WWW.cisco.com

Many-to-One Screen Replacement

WWW.cisco.com

Level 4

Direct Access

Backend APIs

CICS

DB2

IP/SNA

WWW Browser — IP Infrastructure — **WWW Server**

- **Native**
- **DB/2**
- **LU 6.2**
- **TCP sockets**
- **CICS transaction server**
  - **CTRC**

CTRC for IBM Host Access

CICS

DB2

IP

Cisco Infrastructure

SNA/IP

| Application |
| Middleware |
| TCP/IP |

| CTRC |
| TCP/IP | APPC LU6.2 |

- **Cisco IOS® software**
  - Real-time router-like performance
  - Host offload
  - IP or SNA mainframe connectivity
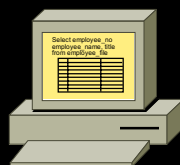 - Interoperates with other Cisco products (LD, DD…)

www.cisco.com

CTRC at the Workstation DB/2 and CICS

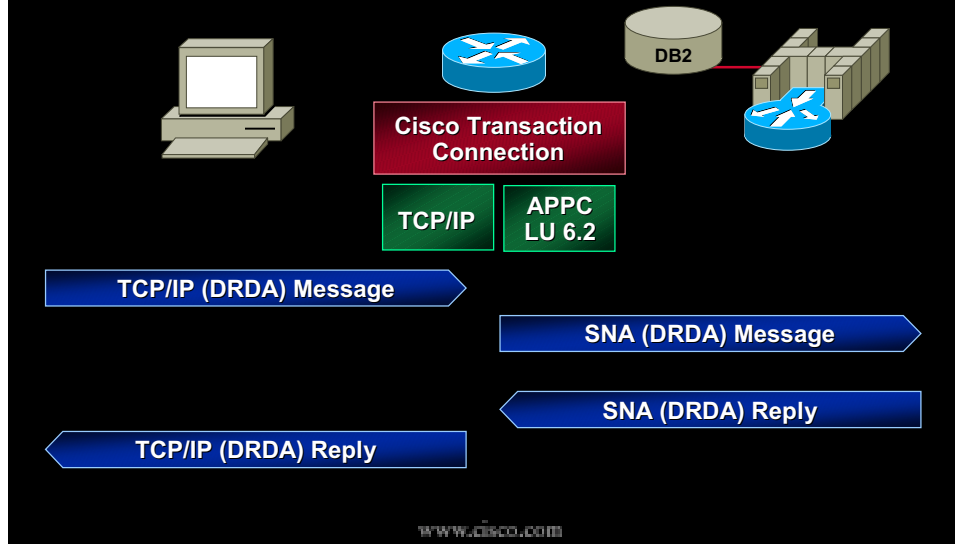| Application | Requests Data Using **ODBC** |
| Middleware | Creates **SQL/DRDA** Message |
| TCP/IP | Builds the **TCP/IP** Packet |

Select employee_no
employee_name, title
from employee_file
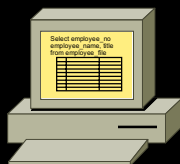
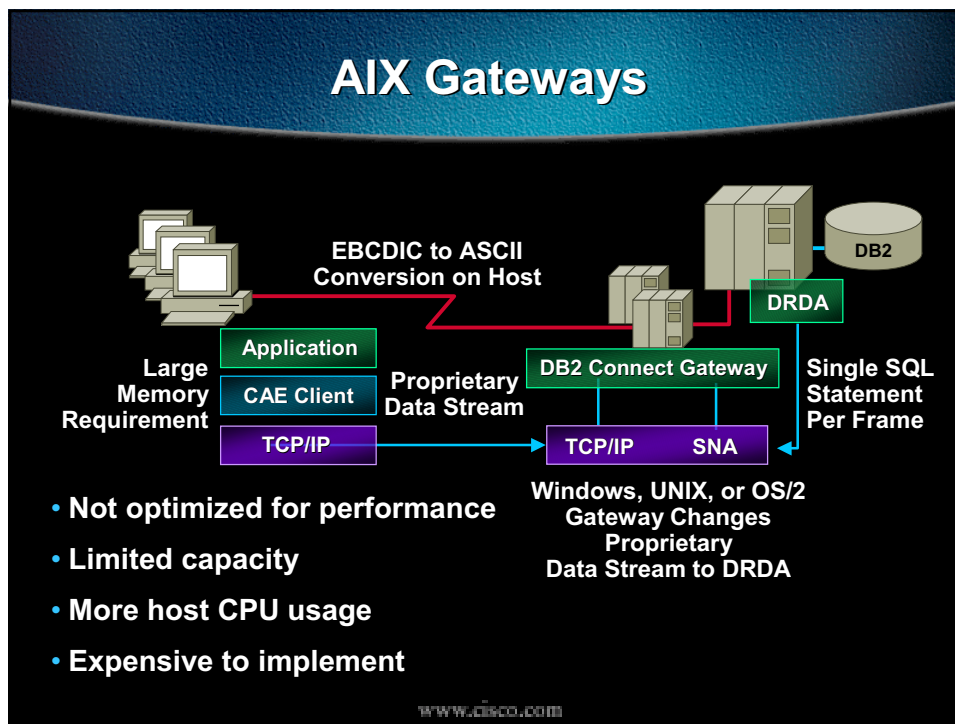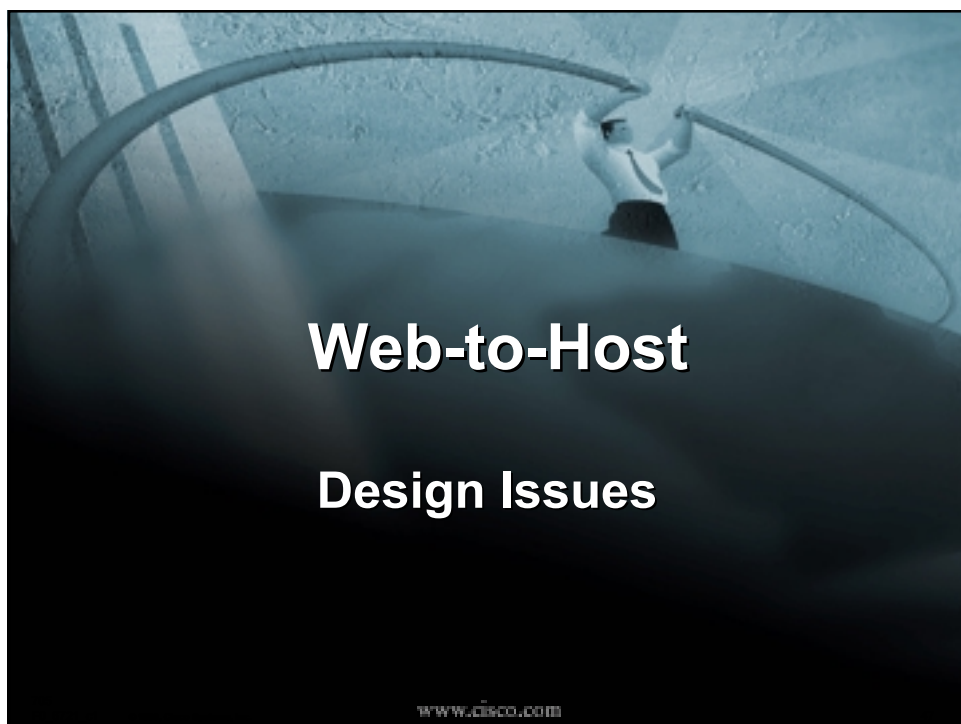| Application | Requests Data Using **CICS Universal Client** |
| Middleware | Creates **ISC** Message |
| TCP/IP | Builds the **TCP/IP** Packet |

Select employee_no
employee_name, title
from employee_file

www.cisco.com

Cisco Transaction Connection Protocol Flow

Cisco Transaction Connection

TCP/IP

APPC LU 6.2

DB2

TCP/IP (DRDA) Message

SNA (DRDA) Message

SNA (DRDA) Reply

TCP/IP (DRDA) Reply

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AIX Gateways

EBCDIC to ASCII Conversion on Host

DB2

DRDA

Application

CAE Client

TCP/IP

Large Memory Requirement

Proprietary Data Stream

DB2 Connect Gateway

TCP/IP   SNA

Single SQL Statement Per Frame

Windows, UNIX, or OS/2 Gateway Changes Proprietary Data Stream to DRDA

- Not optimized for performance
- Limited capacity
- More host CPU usage
- Expensive to implement

www.cisco.com

Web-to-Host

Design Issues

Design Drivers

- **Software distribution: total cost of ownership**

- **Intranet access to 3270 applications**

- **Customer/supplier access to 3270 applications**

- **3270 webification/rejuvenation**

- **Current infrastructure limitations**

Presentation_ID.scr
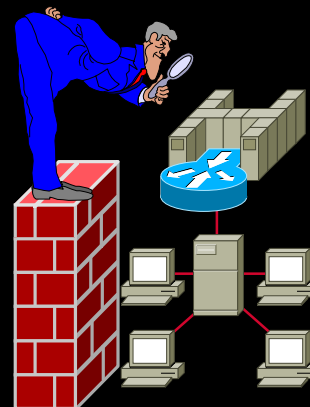
Design Points

- **Two tier versus three-tier**
- **Server platform user limitations**
- **Security methods for Internet versus intranet connections**
- **Firewall placement and use**
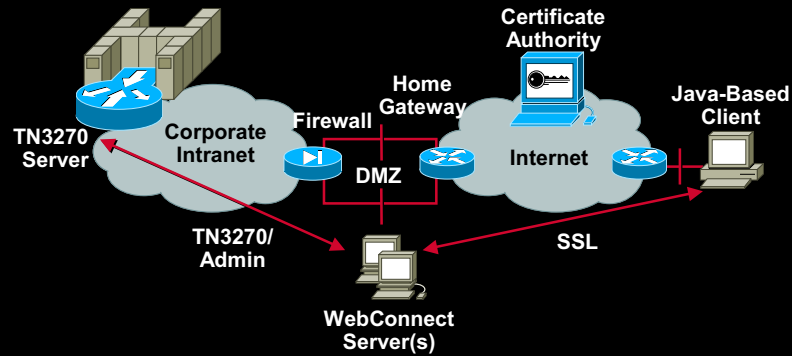
www.cisco.com

Security Concerns

- **Data privacy (encryption)**
- **Data integrity (message authentication)**
- **Authentication of server to client**
- **Authentication of client to server**
- **Firewalls and network topology**

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Firewalls and Network Topology

Certificate Authority

Home Gateway

Java-Based Client

TN3270 Server

Corporate Intranet

Firewall

DMZ

Internet

TN3270/ Admin
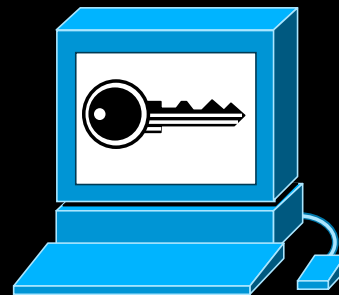
SSL

WebConnect Server(s)

- Client access
- Admin access
- TN3270 access

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Public Key Infrastructure

- SSL
- X.509 certificates
- Certificate authority
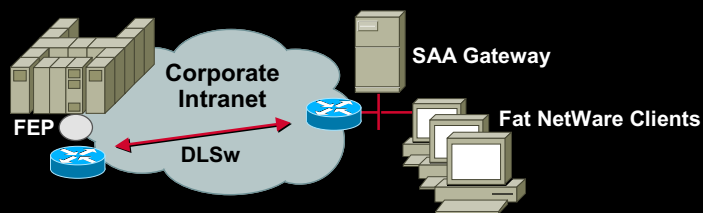- WebConnect, internal, or 3rd party

www.cisco.com

Web-to-Host

Case Studies

Case 1: Before

FEP

Corporate Intranet

DLSw

SAA Gateway

Fat NetWare Clients
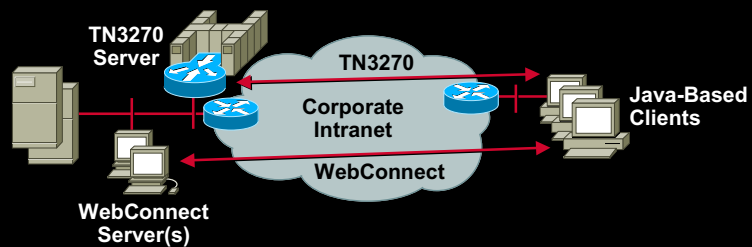
- 15,000 desktops across 20 sites
- Mainframe complex at a central site
- Novell file and print services with Novell SAA gateways at the remote sites
- Moving to centralized support model with NT
- Recent desktop refresh brought them to Windows 95

Presentation_ID.scr

Case 1: Solution

TN3270 Server

TN3270

Corporate Intranet

WebConnect
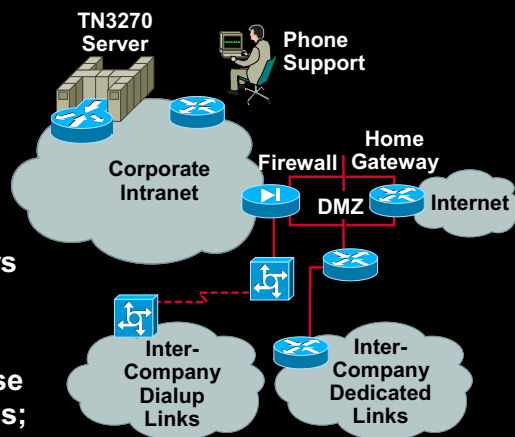
Java-Based Clients

WebConnect Server(s)

- **Expand intranet**
- **Open to new users**
- **Reduce costs (admin, software)**
- **Use both WebClient and WebConnect for different user requirements**
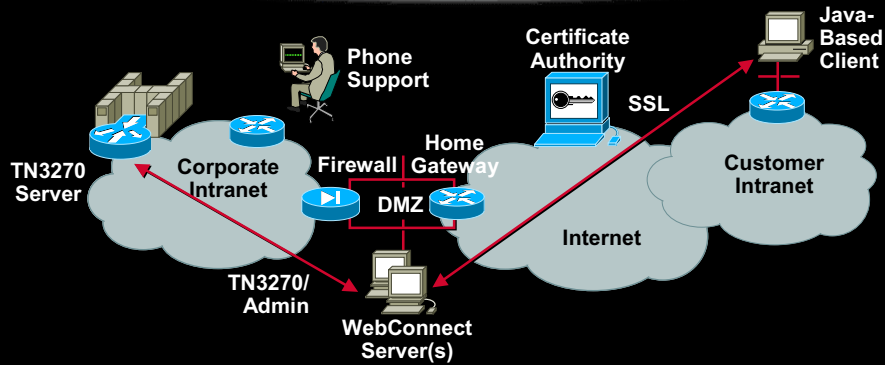
www.cisco.com

Case 2: Before

- **Fragmented customer order feedback system**
- **High profile customers have dedicated SNA connections to application**
- **Medium profile customers have dial-in access to application**
- **Low profile customers use the phone for order status; phone personnel use same SNA application**

TN3270 Server
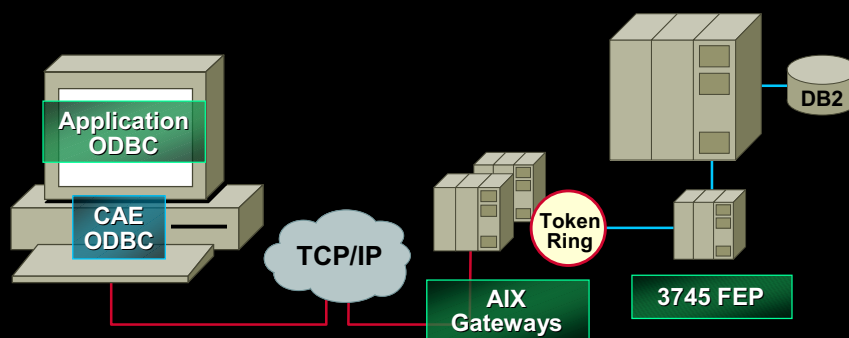
Phone Support

Corporate Intranet

Firewall

Home Gateway

DMZ

Internet

Inter-Company Dialup Links

Inter-Company Dedicated Links

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Case 2: Solution

Phone Support

Certificate Authority

Java-Based Client

TN3270 Server

Corporate Intranet

Firewall

Home Gateway

SSL

DMZ

Internet

Customer Intranet

TN3270/ Admin

WebConnect Server(s)

- **Access simplified**
- **One protocol to manage**
- **Open up access to customers, suppliers over the Web**

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Case 3: Before

Application ODBC

CAE ODBC

TCP/IP

AIX Gateways

Token Ring

3745 FEP

DB2

- **Expensive**
- **Slow**
- **Project at risk**

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Case 3: Solution

Application
ODBC

CAE
ODBC

TCP/IP

DRDA-over-TCP/IP

Cisco Transaction
Connection

TCP/IP   SNA

DRDA

DB2

SNA
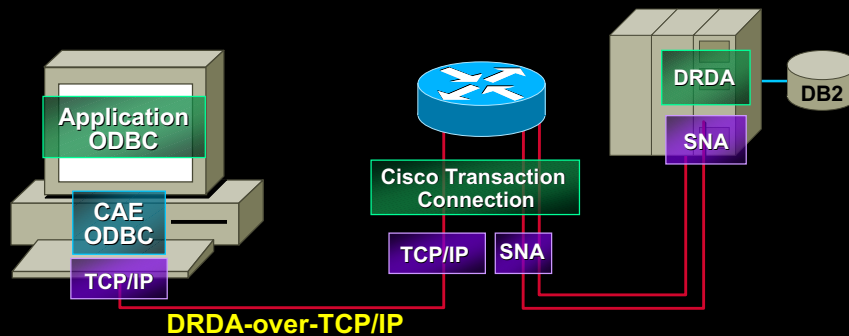
- **Eliminated UNIX gateways (saved $1M)**
- **Eliminated IBM FEP (saved > 100K)**
- **Increased performance (400%)**
- **Reduced cost of maintenance**

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Enable Your Applications

- **Familiarize current/future infrastructure yourself with the Web-to-Host enabling technologies and their capabilities**

- **Know your design drivers**

- **Create your design points based on your drivers and your capabilities and resources**

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Web-to-Host Rules of Thumb

- **Compare TN3270 client requirements**

  Centralized control and admin

  Features/functions

  - **Printing/user features/file transfer**

  Browser support (platform independence)

  Internet/intranet

  - **Security**

  - **Deployment of client software**

  - **Download times for client**

  www.cisco.com

Web-to-Host Rules of Thumb

- **Rejuvenation**

  Application re-engineering AKA rejuvenation

  Look for product with integrated development environment (IDE) tool to create Web data objects

  Screen-scraping (playback)

  WebConnect Pro and others

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Sizing TN3270 Server

- **Transaction rate and sessions**

  CIP—16,000 concurrent transactions

  CPA—5,000 concurrent transactions
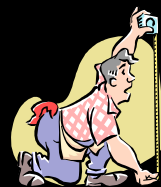 *Tests at 100 bytes in/1400 out, 850TPS*
  # of concurrent transactions increase with lower TPS

  Can have multiple CIPs or CPAs per channel attached router for redundancy

- **Load balancing solutions provide increased scalability/availability**

  DistributedDirector, LocalDirector

  www.cisco.com

Sizing the WebConnect Server

- **UNIX-based—4000 sessions**

- **NT-based—1000 sessions**

  These are rules of thumb will vary depending upon transaction rate and use of session encryption

- **Load balancing solutions provide increased scalability/availability to the WebConnect solution**

  DistributedDirector, LocalDirector

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Please Complete Your Evaluation Form

Session 705

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