Deploying Web-to-Host Enablement Technologies
Design and Implementation Considerations
Session 705
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
What Drives Web Integration?

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

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
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

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
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

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
Technology Evolution

In the Beginning
There Was SNA...

- 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
SNA Gateway

- AppleTalk
- IPX
- TCP/IP

3270 Migration to the Web

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

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

80% of Business Data Resides on Mainframes
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

Level 1
TN3270 Clients
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

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
**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

**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
Cisco TN3270E Server Overview

Removes Costly TN3270 Session Processing Cycles from the Mainframe

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
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
Advantages of Using the Web

- Web browsers are readily available
- Web browsers are platform-independent
- Browser interface well understood by the masses

3270-to-HTML Conversion

- Browser-based access to SNA
  - Minimum 3-tier solution
  - Uses TN3270 protocol
  - Casual access
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

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)
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

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
Two- and Three-Tier Solutions

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
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

WebClient and WebConnect Comparison

<table>
<thead>
<tr>
<th>WebClient</th>
<th>WebConnect</th>
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<tbody>
<tr>
<td>Two-Tier Thin Client</td>
<td>Three-Tier Thin Client</td>
</tr>
<tr>
<td>Installed on Hard Drive</td>
<td>Temporarily Loaded in Cache</td>
</tr>
<tr>
<td>Web Server Needed Only for Initial Download</td>
<td>Web Server Needed for Every Session</td>
</tr>
<tr>
<td>NO &gt; 3287 Print, IND$FILE, NLS, Rejuvenation, Encryption</td>
<td>Has &gt; 3287 Print, IND$FILE, NLS, Rejuvenation, Encryption</td>
</tr>
<tr>
<td>Both Have Green-on-Black Support, Color and Keyboard Mapping, Screen Print, Cut-and-Paste</td>
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I See Two Clients… One Fat and the Other Thin… Go with the Thin
Level 3

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

Many-to-One Screen Replacement

Many-to-One Screen Replacement
Level 4

Direct Access

Backend APIs

- Native
- DB/2
- LU 6.2
- TCP sockets
- CICS transaction server
- CTRC
CTRC for IBM Host Access

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

CTRC at the Workstation

DB/2 and CICS

Requests Data Using ODBC
Creates SQL/DRDA Message
Builds the TCP/IP Packet

Requests Data Using CICS Universal Client
Creates ISC Message
Builds the TCP/IP Packet
Cisco Transaction Connection Protocol Flow

- TCP/IP (DRDA) Message
- SNA (DRDA) Message
- TCP/IP (DRDA) Reply
- SNA (DRDA) Reply

AIX Gateways

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

EBCDIC to ASCII Conversion on Host

Large Memory Requirement

Application

CAE Client

Proprietary Data Stream

DRDA

DB2 Connect Gateway

Single SQL Statement Per Frame

Windows, UNIX, or OS/2 Gateway Changes

Proprietary Data Stream to DRDA

DB2 Connect Gateway

DRDA
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
Design Points

- Two tier versus three-tier
- Server platform user limitations
- Security methods for Internet versus intranet connections
- Firewall placement and use

Security Concerns

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

- Client access
- Admin access
- TN3270 access

Public Key Infrastructure

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

Case Studies

Case 1: Before

- 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
Case 1: Solution

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

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
Case 2: Solution

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

Case 3: Before

- Expensive
- Slow
- Project at risk
Case 3: Solution

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

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
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

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
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**
  - Distributed Director, LocalDirector

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**
  - Distributed Director, LocalDirector
Please Complete Your Evaluation Form

Session 705

Empowering the Internet Generation℠