

Imagination
to
Realization



Banner XtenderSolutions: Architecture and Implementation

*Presented by: Stephen J. Grim, CDIA+
SunGard Higher Education*

Tuesday, April 4, 2006

8:30 – 9:30 am

Evaluation Code 295

Session Rules of Etiquette

- Please turn off your cell phone/pager
- If you must leave the session early, please do so as discreetly as possible
- Please avoid side conversation during the session

Thank you for your cooperation!

Introduction

- Your Speaker: **Stephen J Grim, CDIA+**
 - BXS Development Lead
 - With SunGard Higher Education and predecessors since 1998
 - Associated with Banner XtenderSolutions since inception, 2000.

PRIMARY GOAL: PROVIDE KNOWLEDGE

- Provide the audience members with a broad understanding of:
 - **What** Banner XtenderSolutions is
 - **Where** Banner XtenderSolutions (“BXS”) fits into their technical environment
 - **How** to achieve a successful implementation.

Specific Goals for Today

- Technical Design of BXS
 - Database
 - Authentication
 - Web Tier
- What does it take to get BXS up and running?
 - Planning
 - Resources
 - Processes
- Q&A

Selected Terminology

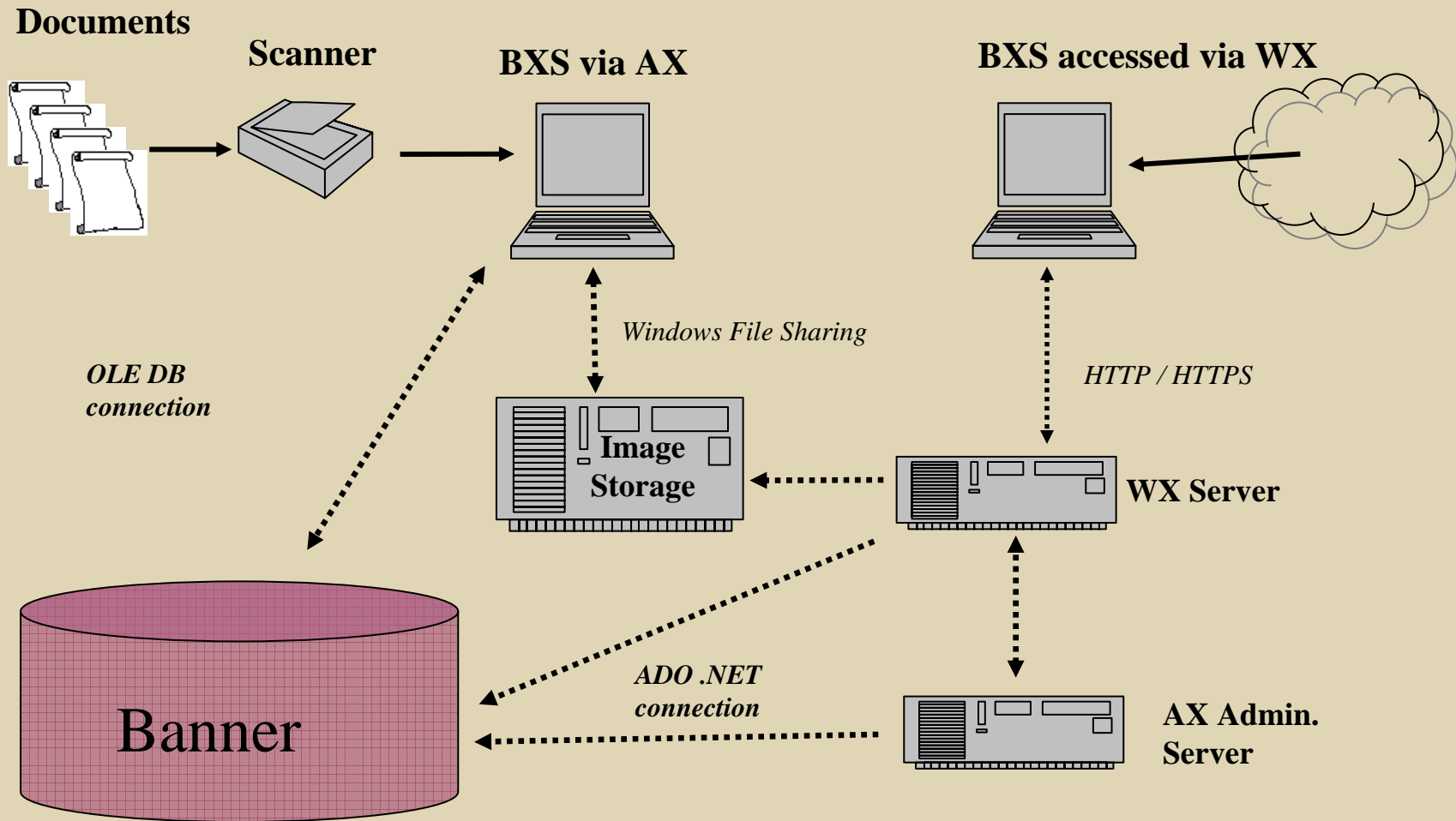
DOCUMENT MANAGEMENT:	The capture, indexing, storage, and retrieval of any kind of electronic file, including images; Access management and change control are a part of any good EDMS.
INDEX:	Data used to identify documents/images; may be created manually or through automated process (a.k.a. 'metadata')
APPLICATION:	In BXS usage, a document collection, characterized by a common index structure and users

What is Banner XtenderSolutions ?

It is an Electronic Document Management System (EDMS) integrated with Banner.

- Integration between EMC Documentum's ApplicationXtender product suite and Banner
- Integration is built into numerous layers of the architecture
- Provides easy access to documents related to Banner data

Systems Overview: Banner XtenderSolutions



ApplicationXtender Components

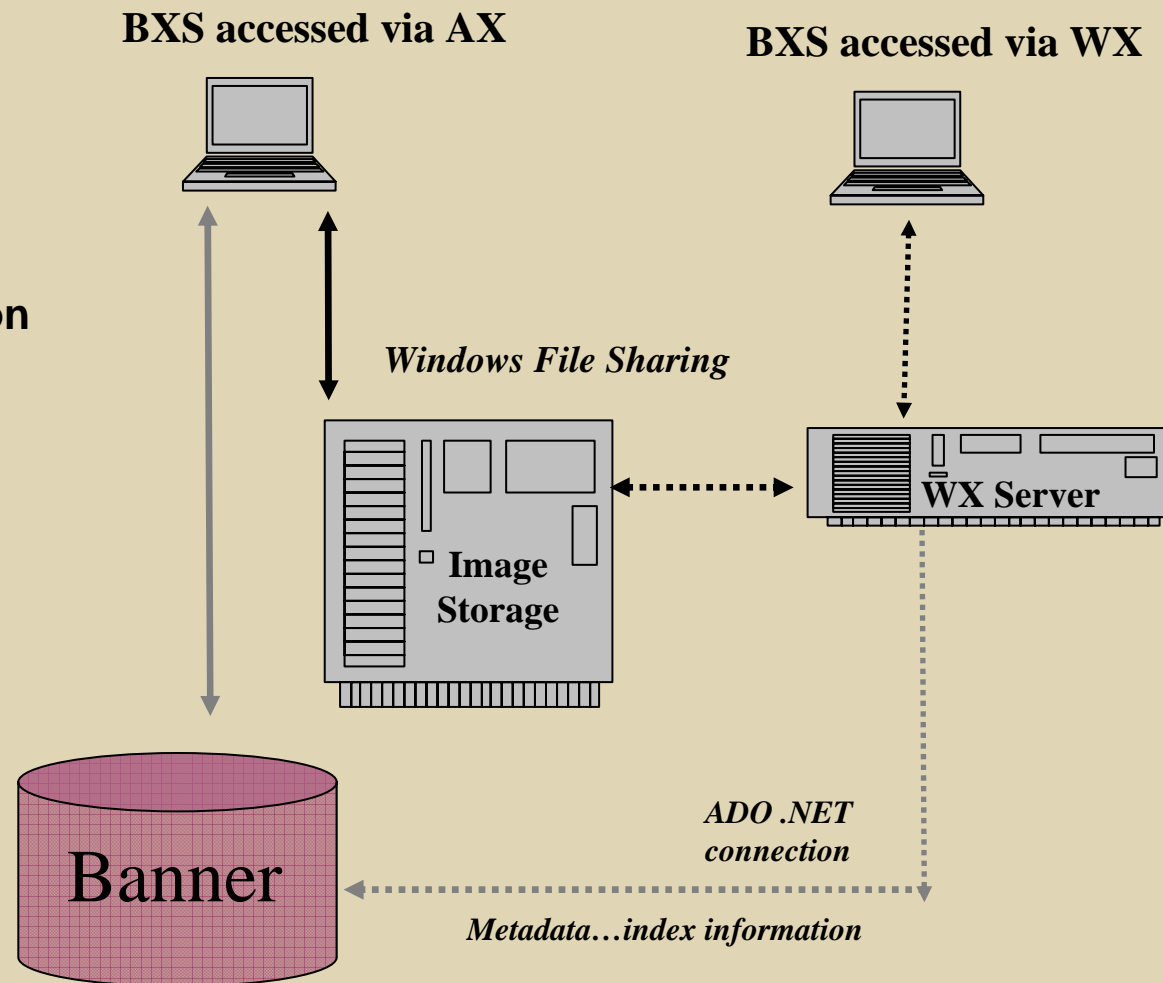
- Document Storage Server
- Database Server
- ApplicationXtender (AX)
- WebXtender (WX)
- Rendering Server
- AX Administrative Components

ApplicationXtender Components

- **Document Storage Server**
- Database Server
- License Server
- ApplicationXtender (AX)
- WebXtender (WX)
- Rendering Server
- AX Administrative Components

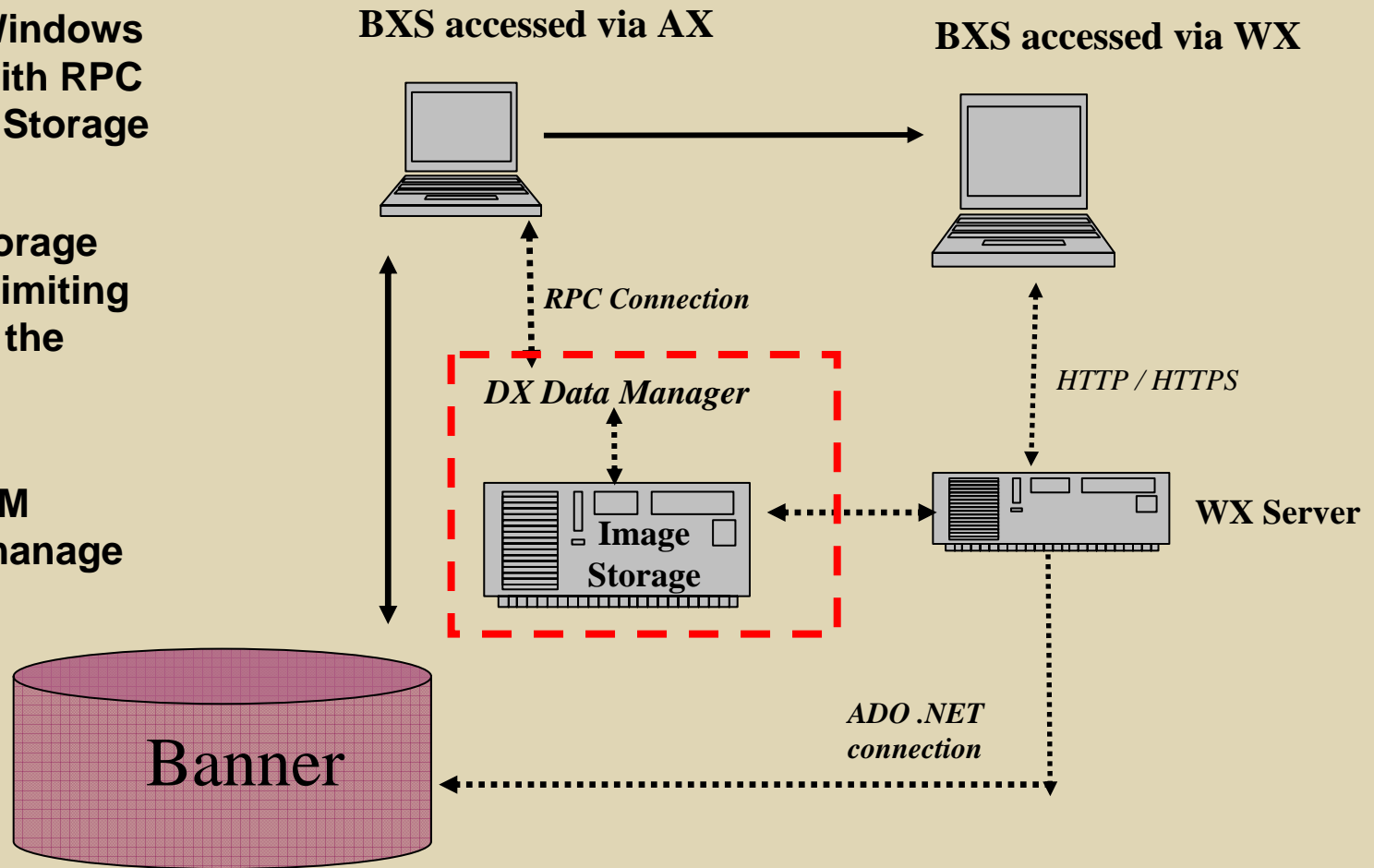
File Storage

- Scanned documents, imported files are stored as file objects on a file system
- Files stored in native format; use .bin extension
- RAID, M/O Disk, SAN, Permanent Media
- Accessed by AX users
- Access by WX impersonation Account



Storage Managed By DiskXtender

- Replaces Windows File Sharing with RPC connection to Storage
- Protects storage resources by limiting availability on the network
- Provide HSM capability to manage disk space



ApplicationXtender Components

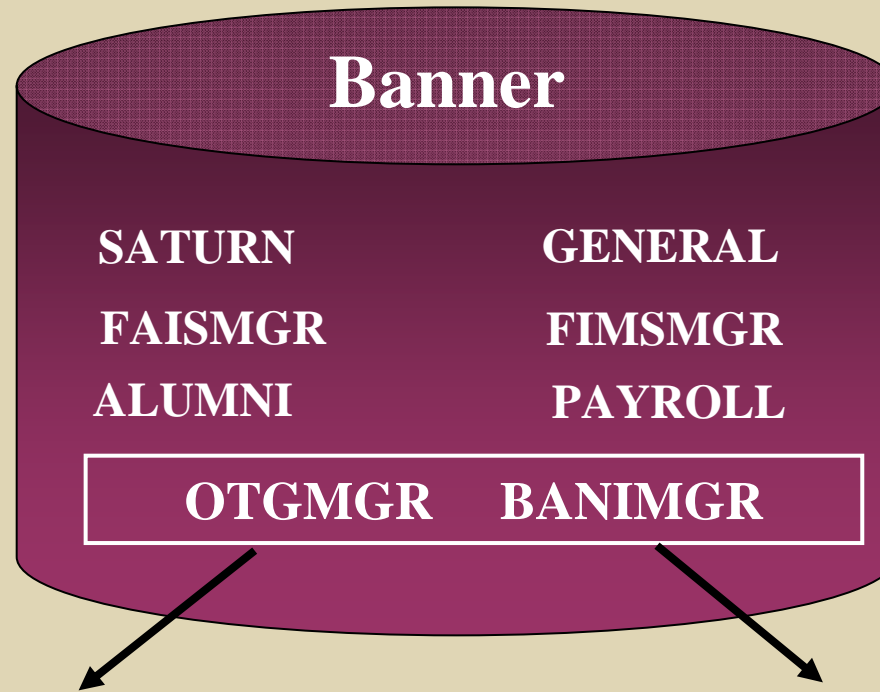
- *Document Storage Server*
- **Database Server**
- ApplicationXtender (AX)
- WebXtender (WX)
- Rendering Server
- AX Administrative Components

Technical Details: DATABASE

- BXS *metadata* is maintained in a series of Oracle* tables
- Tables are created within the Banner instance under two schemas:
 - OTGMGR: Document metadata
 - BANIMGR: Integration tables,

* ApplicationXtender is also supported on MS SQL Server and MySQL

Database Structure



Documentum
tables; Repository
for metadata

Integration Objects;
Communication
with Banner

Core OTGMGR Tables

- **AE_APPS:**
 - Application Definition; each BXS Application is assigned an APPID value, used elsewhere in product architecture
- **AE_CFG:**
 - Contains environment-wide settings for BXS product
- **AE_DT{appid} :**
 - Index information for each document in an application
- **AE_RFSCT:**
 - Shared key-reference data; facilitates faster indexing through lookup system
- **AE_AI{appid}:**
 - “Auto-Index” data for each application; also used to facilitate faster indexing

Core BANIMGR Objects

- **Tables:**

- ERBLINK ESBLINK ESRAUDT ETVAXAP
- ETVDTYP EURVERS EXBINST EXBUFLT
- EXBUPRF EXTRAXPA EXRBCXT EXRPRID
- EXRRSLT

- **Triggers:**

- 99 triggers, on various Banner tables
- Respond to a range of events to provide data updates, maintain synchronization

example: ET_{table_name}_AIR_EXTSOL

- ET_RTVTRST_AUR_EXTSOL RTVTRST
- ET_SARCHKL_AIR_EXTSOL SARCHKL

Core BANIMGR Tables

- ***EXBINST:***
System settings for interaction between Banner and AX
- ***EXRBCXT, EXRAXPA:***
Context Rule and Parameter data
- ***ERBLINK, ESBLINK:***
Event Linking Rule data
- ***ETVAXAP, ETVDTYP :***
Validation tables for applications, and Document types.

ApplicationXtender Components

- *Document Storage Server*
- *Database Server*
- **ApplicationXtender (AX)**
- WebXtender (WX)
- Rendering Server
- AXAdministrative Components

ApplicationXtender

ApplicationXtender Document Manager - [B70(DEMO) - B-H-EMPL - 061120043]

File Edit View Document Page Scan Annotate Utilities Window Help

Records Manager

- B70
 - B-A-ID - BANNER ADVA
 - B-A-IDGP - BANNER AD
 - B-F-DOCS - BANNER FIM
 - B-F-GRNT - BANNER FIM
 - B-F-ID - BANNER FINAN
 - B-F-PROP - BANNER FIM
 - B-G-ID - BANNER COMPY
 - B-H-APPL - BANNER HR
 - B-H-EMPL - BANNER I**
 - New Query [1]
 - B-H-ID - BANNER HR CC
 - B-H-POSN - BANNER HR
 - B-R-ID - BANNER FINAN
 - B-R-ISIR - ISIR APP
 - B-R-TREQ - BANNER FIM
 - B-S-ADMN - BANNER ST
 - B-S-CRSE - BANNER STU
 - B-S-DGRE - BANNER STU
 - B-S-ID - BANNER STUDE
 - B-S-SECT - BANNER CA
 - DRM1 - TEST OF DYNAM
 - _RSTAMP - RUBBER STA

Fields	Values
ID	061120043
PIDM	1667
DOCUMENT TYPE	FMLA
LAST NAME	JONES
FIRST NAME	ALLANA
SSN	061-12-0043
BIRTH DATE	04-May-1966
POSITION	BUDGET OFFICER
POSITION NUMBER	A00106
POSITION SUFFIX	00
HIRE DATE	01-Jun-2004
TERMINATION DATE	
ROUTING STATUS	{Null}
ACTIVITY DATE	2004-11-17 11:23:13

Form W-4 (2002) Page 2

Deductions and Adjustments Worksheet

Note: Use this worksheet only if you plan to itemize deductions, claim certain credits, or claim adjustments to income on your 2002 tax return.

- Enter an estimate of your 2002 itemized deductions. These include qualifying home mortgage interest, charitable contributions, state and local taxes, medical expenses in excess of 7.5% of your income, and miscellaneous deductions. (For 2002, you may have to reduce your itemized deductions if your income is over \$137,300 (\$68,650 if married filing separately). See **Worksheet 3** in Pub. 919 for details.) 1 \$
- Enter:
 - \$7,850 if married filing jointly or qualifying widow(er)
 - \$6,900 if head of household
 - \$4,700 if single
 - \$3,925 if married filing separately
 2 \$
- Subtract line 2 from line 1. If line 2 is greater than line 1, enter "-0-". 3 \$
- Enter an estimate of your 2002 adjustments to income, including alimony, deductible IRA contributions, and student loan interest. 4 \$
- Add lines 3 and 4 and enter the total. Include any amount for credits from **Worksheet 7** in Pub. 919. 5 \$
- Enter an estimate of your 2002 nonwage income (such as dividends or interest). 6 \$
- Subtract line 6 from line 5. Enter the result, but not less than "-0-". 7 \$
- Divide the amount on line 7 by \$3,000 and enter the result here. Drop any fraction. 8
- Enter the number from the **Personal Allowances Worksheet**, line H, page 1. 9
- Add lines 8 and 9 and enter the total here. If you plan to use the **Two-Earner/Two-Job Worksheet**, also enter this total on line 1 below. Otherwise, **stop here** and enter this total on Form W-4, line 5, page 1. 10

Two-Earner/Two-Job Worksheet

Note: Use this worksheet only if the instructions under line H on page 1 direct you here.

- Enter the number from line H, page 1 (or from line 10 above if you used the **Deductions and Adjustments Worksheet**). 1
- Find the number in **Table 1** below that applies to the **lowest** paying job and enter it here. 2
- If line 1 is **more than or equal to** line 2, subtract line 2 from line 1. Enter the result here (if zero, enter "-0-") and on Form W-4, line 5, page 1. **Do not use the rest of this worksheet.** 3
- If line 1 is **less than** line 2, enter "-0-" on Form W-4, line 5, page 1. Complete lines 4-9 below to calculate the additional withholding amount necessary to avoid a year-end tax bill. 4
- Enter the number from line 2 of this worksheet. 5
- Subtract line 5 from line 4. 6
- Find the amount in **Table 2** below that applies to the **highest** paying job and enter it here. 7 \$
- Multiply line 7 by line 6 and enter the result here. This is the additional annual withholding needed. 8 \$
- Divide line 8 by the number of pay periods remaining in 2002. For example, divide by 26 if you are paid every two weeks and you complete this form in December 2001. Enter the result here and on Form W-4, line 6, page 1. This is the additional amount to be withheld from each paycheck. 9 \$

Married Filing Jointly				All Others			
If wages from LOWEST paying job are—	Enter on line 2 above	If wages from LOWEST paying job are—	Enter on line 2 above	If wages from LOWEST paying job are—	Enter on line 2 above	If wages from LOWEST paying job are—	Enter on line 2 above
\$0 - \$4,000	0	44,001 - 50,000	8	\$0 - \$6,000	0	75,001 - 96,000	8
4,001 - 9,000	1	50,001 - 55,000	9	6,001 - 11,000	1	95,001 - 110,000	9
9,001 - 15,000	2	55,001 - 65,000	10	11,001 - 13,000	2	110,001 and over	10
15,001 - 20,000	3	65,001 - 80,000	11	13,001 - 23,000	3		
20,001 - 25,000	4	80,001 - 95,000	12	23,001 - 28,000	4		
25,001 - 32,000	5	95,001 - 110,000	13	28,001 - 38,000	5		
32,001 - 38,000	6	110,001 - 125,000	14	38,001 - 55,000	6		
38,001 - 44,000	7	125,001 and over	15	55,001 - 75,000	7		

Married Filing Jointly		All Others	
If wages from HIGHEST paying job are—	Enter on line 7 above	If wages from HIGHEST paying job are—	Enter on line 7 above
\$0 - \$5,000	1	\$0 - \$5,000	1
5,001 - 10,000	2	5,001 - 10,000	2
10,001 - 15,000	3	10,001 - 15,000	3
15,001 - 20,000	4	15,001 - 20,000	4
20,001 - 25,000	5	20,001 - 25,000	5
25,001 - 30,000	6	25,001 - 30,000	6
30,001 - 35,000	7	30,001 - 35,000	7
35,001 - 40,000	8	35,001 - 40,000	8
40,001 - 45,000	9	40,001 - 45,000	9
45,001 - 50,000	10	45,001 - 50,000	10
50,001 - 55,000	11	50,001 - 55,000	11
55,001 - 60,000	12	55,001 - 60,000	12
60,001 - 65,000	13	60,001 - 65,000	13
65,001 - 70,000	14	65,001 - 70,000	14
70,001 - 75,000	15	70,001 - 75,000	15
75,001 - 80,000	16	75,001 - 80,000	16
80,001 - 85,000	17	80,001 - 85,000	17
85,001 - 90,000	18	85,001 - 90,000	18
90,001 - 95,000	19	90,001 - 95,000	19
95,001 - 100,000	20	95,001 - 100,000	20
100,001 - 105,000	21	100,001 - 105,000	21
105,001 - 110,000	22	105,001 - 110,000	22
110,001 - 115,000	23	110,001 - 115,000	23
115,001 - 120,000	24	115,001 - 120,000	24
120,001 - 125,000	25	120,001 - 125,000	25
125,001 - 130,000	26	125,001 - 130,000	26
130,001 - 135,000	27	130,001 - 135,000	27
135,001 - 140,000	28	135,001 - 140,000	28
140,001 - 145,000	29	140,001 - 145,000	29
145,001 - 150,000	30	145,001 - 150,000	30
150,001 - 155,000	31	150,001 - 155,000	31
155,001 - 160,000	32	155,001 - 160,000	32
160,001 - 165,000	33	160,001 - 165,000	33
165,001 - 170,000	34	165,001 - 170,000	34
170,001 - 175,000	35	170,001 - 175,000	35
175,001 - 180,000	36	175,001 - 180,000	36
180,001 - 185,000	37	180,001 - 185,000	37
185,001 - 190,000	38	185,001 - 190,000	38
190,001 - 195,000	39	190,001 - 195,000	39
195,001 - 200,000	40	195,001 - 200,000	40
200,001 - 205,000	41	200,001 - 205,000	41
205,001 - 210,000	42	205,001 - 210,000	42
210,001 - 215,000	43	210,001 - 215,000	43
215,001 - 220,000	44	215,001 - 220,000	44
220,001 - 225,000	45	220,001 - 225,000	45
225,001 - 230,000	46	225,001 - 230,000	46
230,001 - 235,000	47	230,001 - 235,000	47
235,001 - 240,000	48	235,001 - 240,000	48
240,001 - 245,000	49	240,001 - 245,000	49
245,001 - 250,000	50	245,001 - 250,000	50

App: B-H-EMPL - BANNER HR EMPLOYEE Page 1/1 Ver 1/1

System Requirements - AX

- AX Database Platform
 - Oracle 9i (9.2), 10g (10.2)
 - MS SQL Server 2000 (SP4)
 - Also... MySQL, DB2, Sybase SQL Anywhere
- ApplicationXtender Workstation
 - Windows 98, ME, NT, 2000, XP
 - Minimum 128 MB RAM for Scan stations*, 64MB for retrieval

* Scanning station specs may vary according to Scanner

ApplicationXtender Components

- *Document Storage Server*
- *Database Server*
- *ApplicationXtender (AX)*
- **WebXtender (WX)**
- *Rendering Server*
- *AX Administrative Components*

ApplicationXtender Components

- *Document Storage Server*
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WebXtender

ApplicationXtender Web Access .NET Document - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address: http://maldevm8/AppXtender/DocView.aspx?DataSource=B70&DocRef=%2F%2FB70%2F

Links: Kaleidoscope Home Page Travel Center CNN.com UDC Support Center Extended Search Communities BANNER URLs Google Raindance Seminar Edition

File View Document Page Help

Page 1 Zoom 75% Rotate 0°

Index Name	Field Value
ID	061120043
PIDM	1667
DOCUMENT TYPE	FMLA
LAST NAME	JONES
FIRST NAME	ALLANA
SSN	061-12-0043
BIRTH DATE	04-May-1966
POSITION	BUDGET OFFICER
POSITION NUMBER	A00106
POSITION SUFFIX	00
HIRE DATE	01-Jun-2004
TERMINATION DATE	
ROUTING STATUS	
ACTIVITY DATE	2004-11-17 11:23:13

Modify

Form W-4 (2002) Page 2

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4,001 - 50,000	2	5,001 - 35,000	2

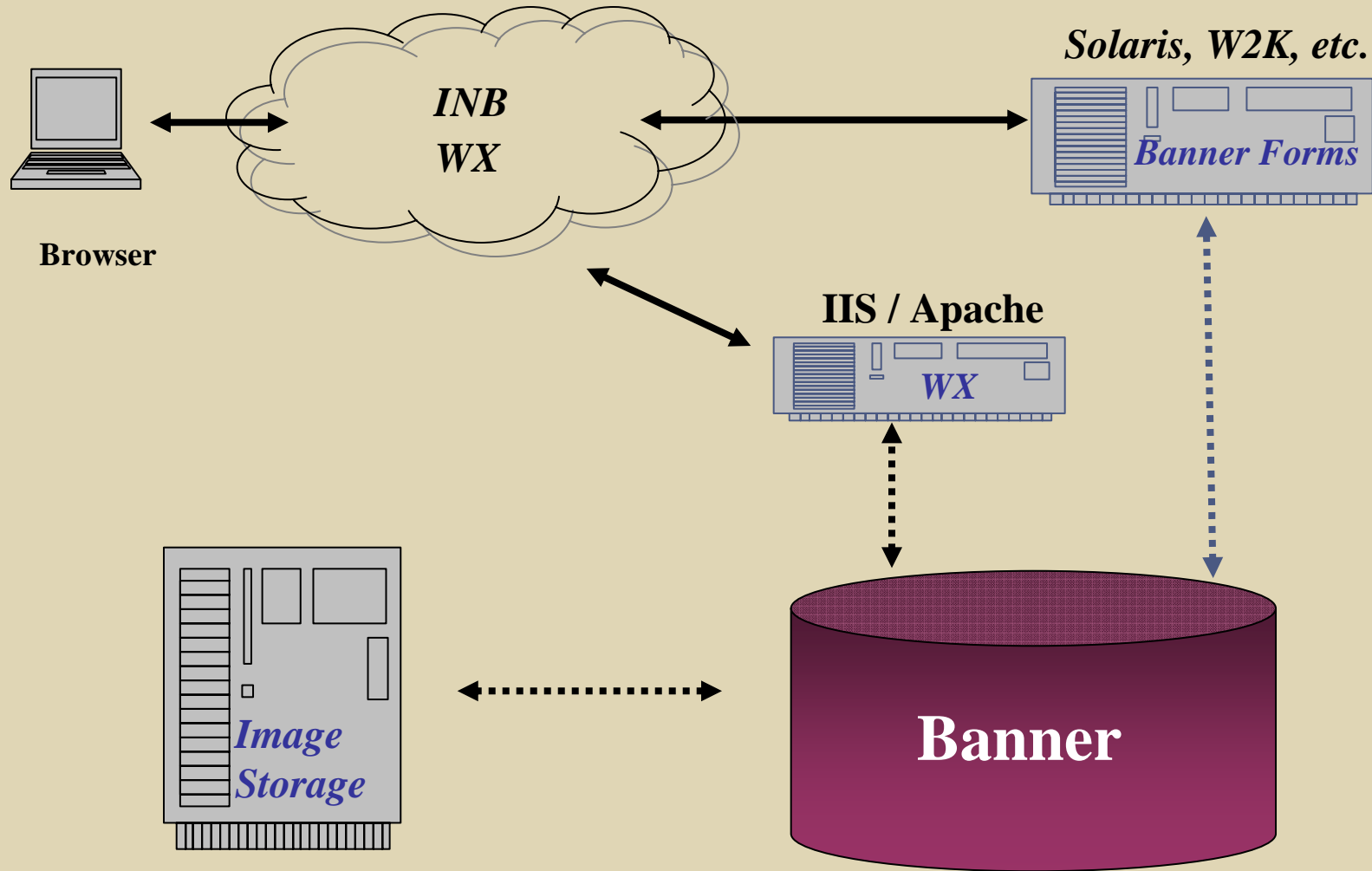
Data Source: B70; Doc Id: 57; Page 1 of 1; Version 1 of 1; Sub Page 1 of 1

Local intranet

Web Access to BXS

- WebXtender (Web Access Module for AX)
- Provides the same capabilities as the client/server application
- Runs on either IIS or Apache
- Interacts with other components in architecture

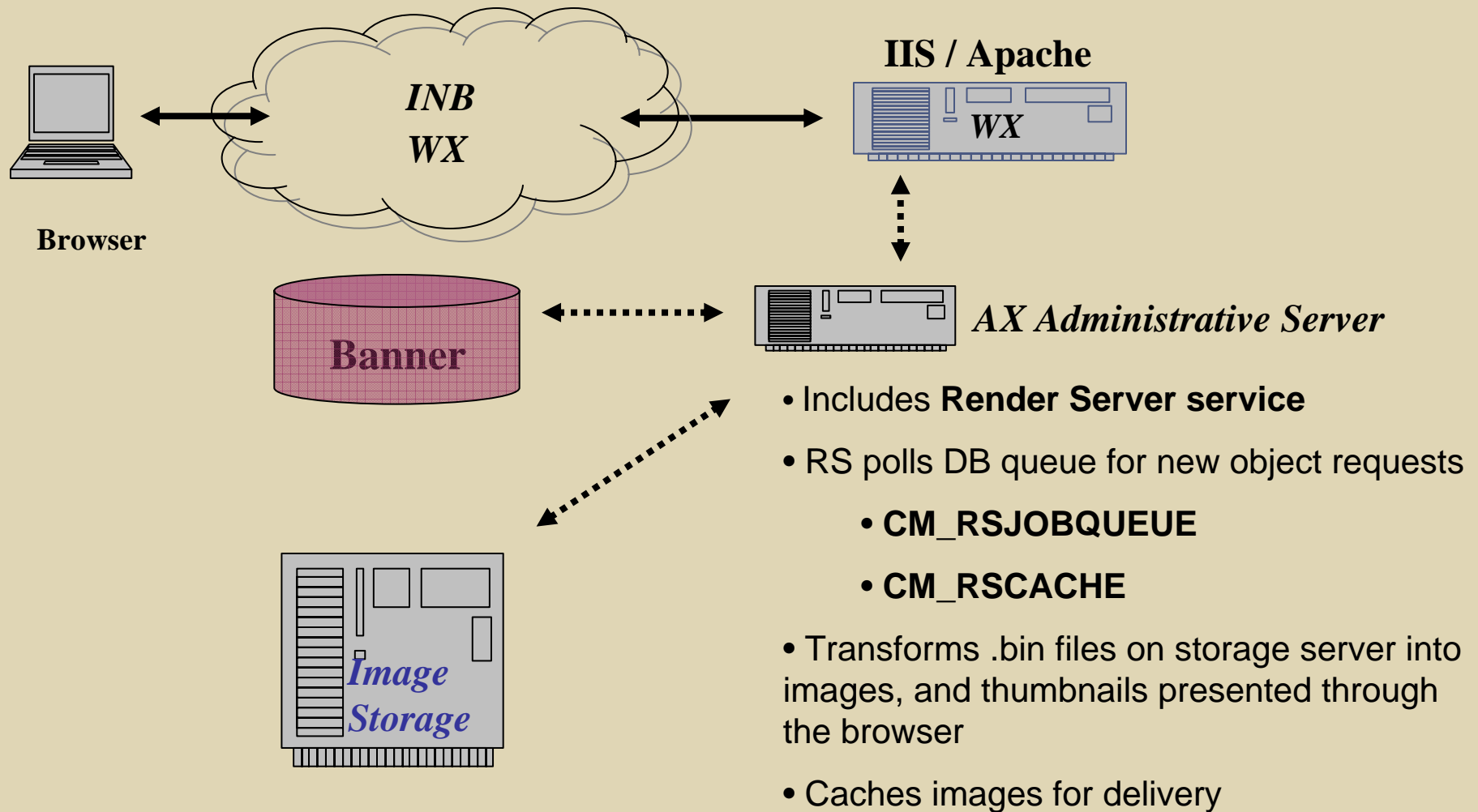
BXS Web Architecture



System Requirements - WebXtender

- WX .NET: Based on ASP.NET technology
 - Windows 2000 / IIS v. 5.0
 - Windows 2003 / IIS v. 6.0
 - .Net framework v. 1.1
- WXJ2 / WebJ2 5.3
 - Based on SUN Java framework
 - Requires J2EE (1.3, 1.4)
 - Tomcat 5
 - Windows 200, 2003, Sun Solaris 10, SuSE Linux 9.2 (Professional edition)
- Both support the following browsers:
 - Microsoft Internet Explorer 6.0 (SP1)
 - Netscape Navigator 7.1

Render Server

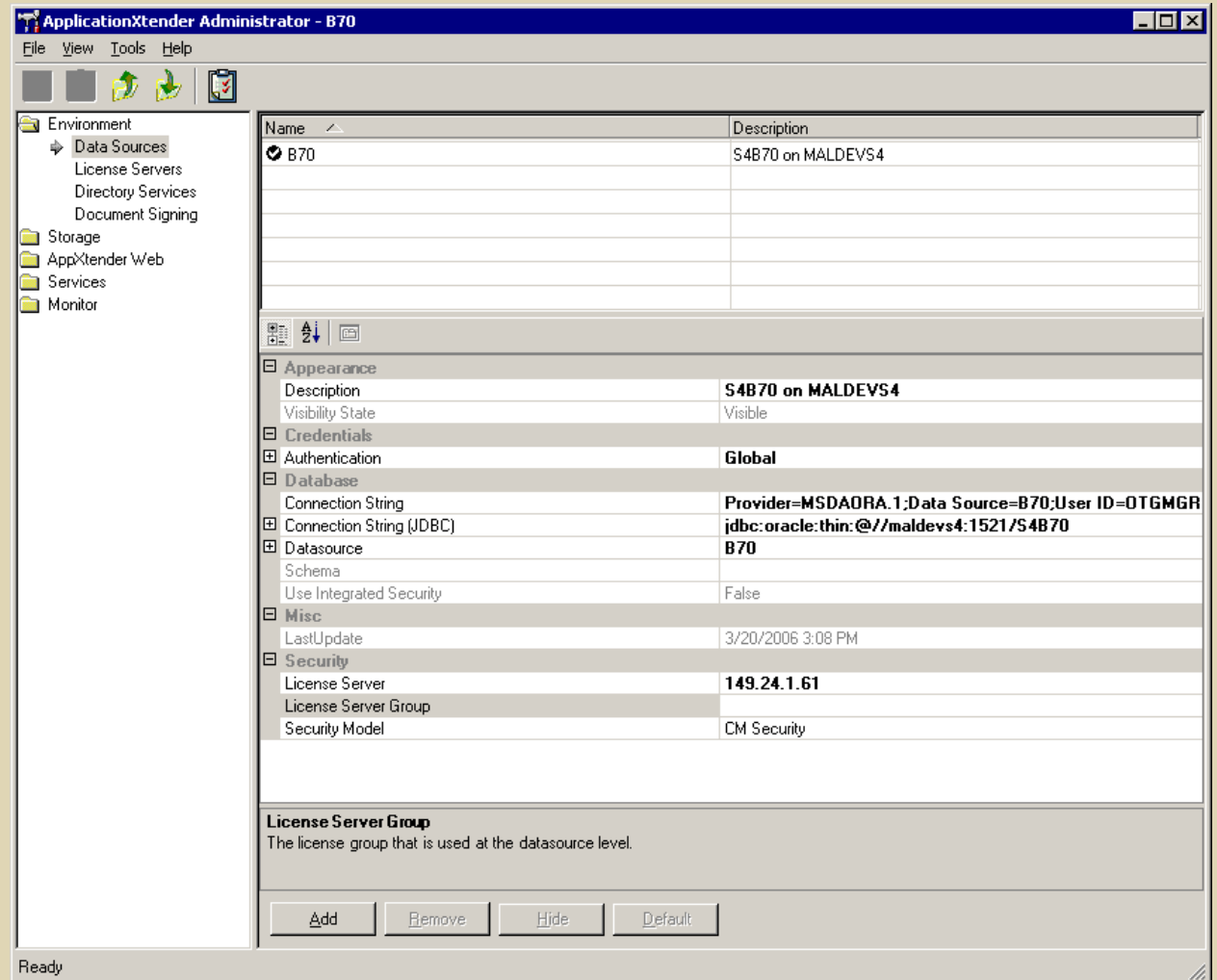


ApplicationXtender Components

- *Document Storage Server*
- *Database Server*
- *ApplicationXtender (AX)*
- *WebXtender (WX)*
- *Rendering Server*
- **AX Administrative Components**

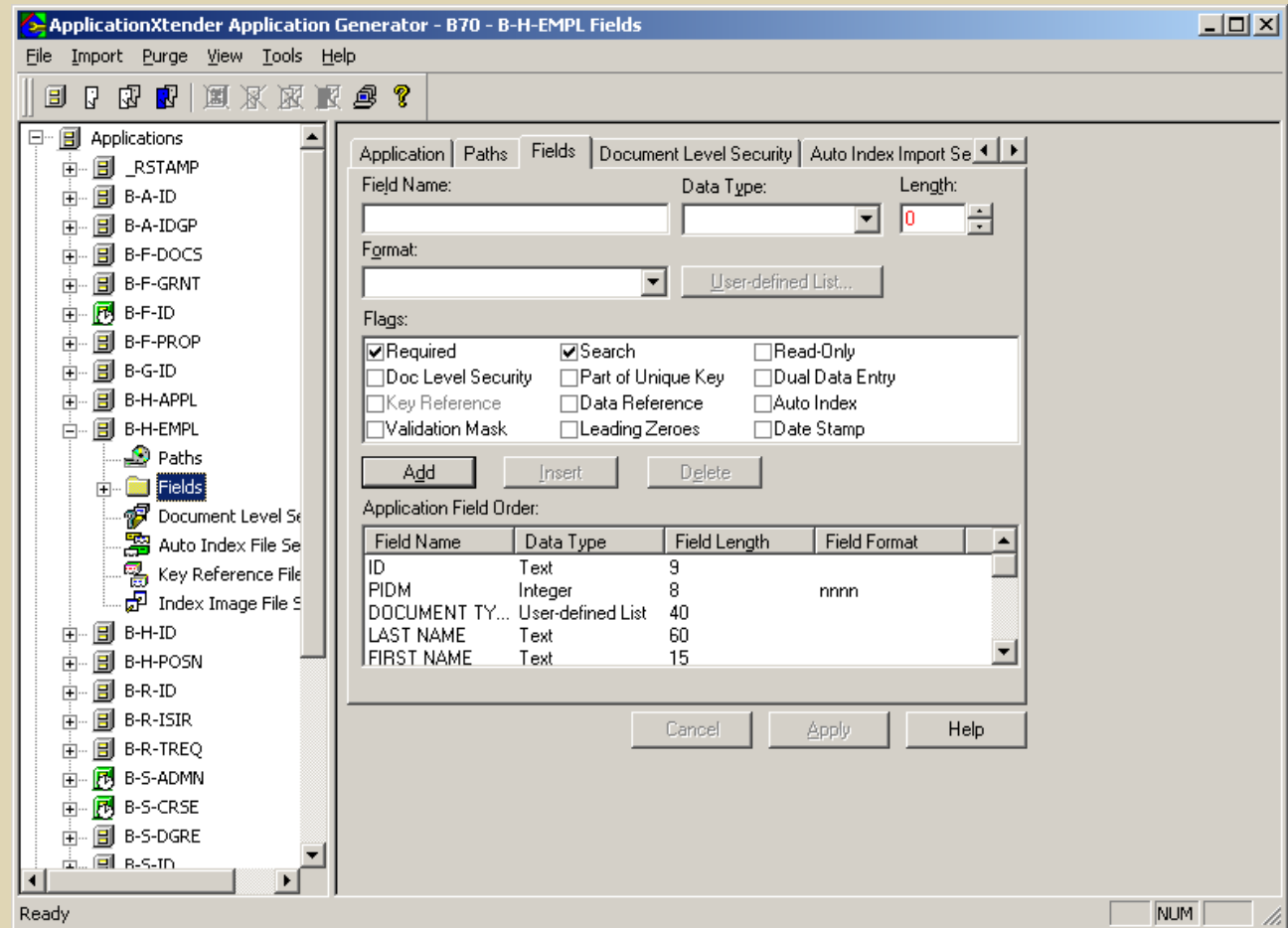
Administration: XSAdmin

- Used to manage the enterprise-wide settings for the AX system
 - Define Data Source configuration, webserver settings, WebService connectivity
- Interacts with database table *CM_CONFIG*
- Settings replicated to *XSCM.Config*
- *Should be installed on central Administrative Server*



Administration: App Gen

- Used to manage the application-specific settings for the AX system
- Define Users, Groups, Document-Level Security and more ...
- should be managed through SYSOP account instead of OTGMGR, as of BXS 6.3 & 7.0.1



License Server

- Windows-based service, tracking concurrent sessions of all AX modules (AX, WX, ERMX, etc.)
- Built –in event monitoring capabilities
- Basic reporting capabilities
- Small footprint on server (~ 10 MB)

License Server

The screenshot shows the License Server Administrator interface. The title bar reads "License Server Administrator". The menu bar includes "Service", "Edit", "View", "Tree", "Tools", and "Help". The "Computer:" dropdown is set to "(Local)". The left pane shows a tree view for "MALDEVMS (Connected)" with a "Licenses" folder expanded, listing various services like "ApplicationXtender", "ApplicationXtender Image Capture", etc. The right pane displays the "ApplicationXtender License:" details in a text area.

ApplicationXtender License:		
AppXtender Server Connections:	25	(0 in use)
OCR Enabled:	Yes	
AppXtender Full-Text Clients:	5	(0 in use)
AppXtender Max Users Read-Only:	50	(0 in use)
Verity K2 for AppXtender:	50	(1 in use)
Demo Expiration:	12/1/2006	
Max Demo Documents:	999999	

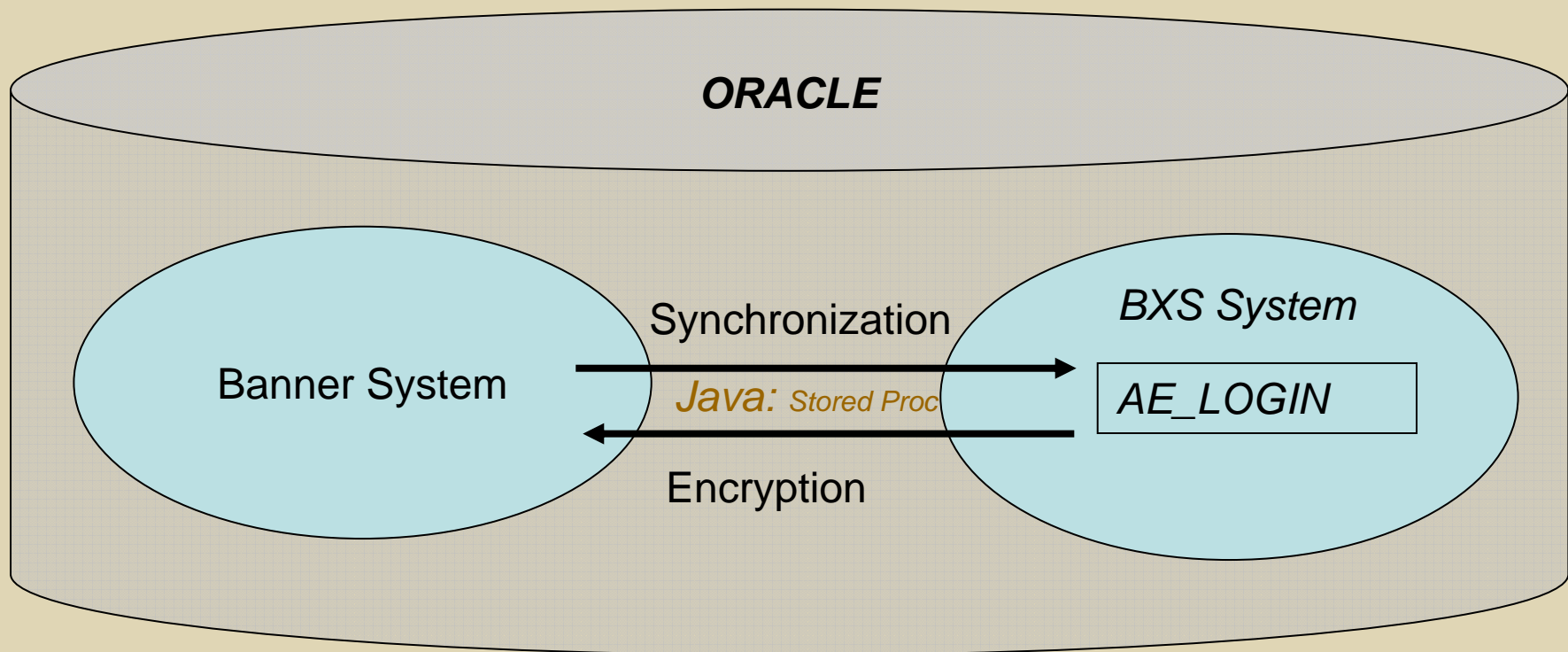
For help, press F1

CONNECTED NUM

BANNER INTEGRATION

User Authentication and SSO

- User Accounts mirror those established in Banner
- Users added to AX via AppGen
- PW synchronization upon Login



CM Security Provider

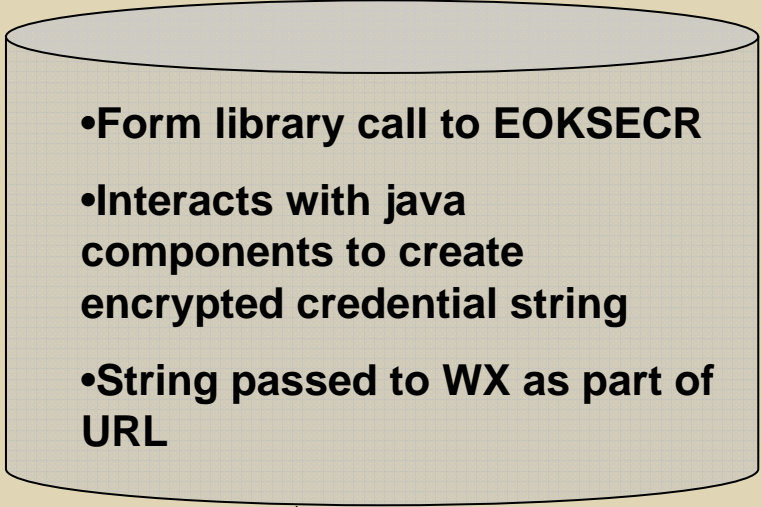
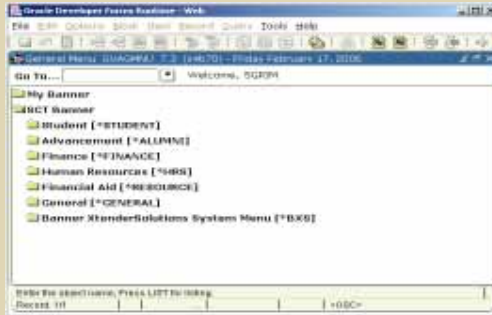
- Beginning from BXS 6.3 and 7.0, BXS started to use CM Security Provider
- AX user information, including username and password, is stored in **AE_LOGIN** table
- An AX user does not need to have an Oracle account

How Does SSO Work?

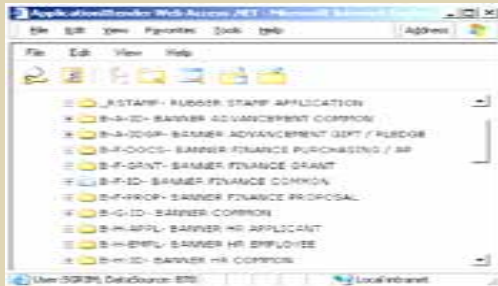
1. User Accounts are imported into AppGen; the “SCT” list presented in AppGen is a list of Oracle users.
2. On first login, user enters BXS via Banner. Passwords are synchronized between Oracle & AE_LOGIN table
3. A credential String is generated by Banner ...
 - a. Encrypted using java component installed on the database (Script : loadbxsjava.sh /.bat)
 - c. Requires Oracle JVM option installed on database
4. The Credential string is decrypted by:
 - a. **WebXtender**
 - b. ***INB-AX Bridge.exe*** if using INB to ApplicationXtender

How Does SSO Work?

Button click on Banner form



User is happy.



Credential string is decrypted on WX Server

About Cryptix JCE

- Cryptix Java Cryptography Extension: Version 1.2 for JDK 1.4, 1.3, 1.2 and 1.1.x
- The Cryptix JCE Provider is a cryptography plug-in for Sun's Java Cryptography Extensions (JCE) framework. provides symmetric and asymmetric encryption and key generation

Credential Generation Models

BXS 7.0

- Depends on the platform of the INB server
 - Windows: Install and register **WxCrypto5.dll** on the INB server
 - Non-windows: Install BXS Encryption Component
- The SSO key is stored in
 - Banner: EOQRPLS.pll
 - AX: *web.config or web.xml*

BXS 6.3 / 7.0.1+

- Installation
 - DB Package EOKSECR
 - Required Cryptix JCE files
- SSO key is stored in
 - Banner : EXBINST
 - AX: *web.config or web.xml*

Common Problems with SSO

- If the Credentials string is missing, it means:
 - WxCrypto5.dll is not installed/registered (BXS 7.0, 6.2)
 - BXS Encryption Component is not running (BXS 7.0, 6.2)
 - Java files are not loaded. Run the troubleshooting script provided on slide 9
- INB->AX: Unable to decrypt the SCT BXS Key
 - It usually is caused by a wrong version of INB-AX Bridge being installed on the AX workstations
- The length of the SSO Key
 - BXS 7.0: 8 to 12 is preferred
 - BXS 6.3 or later: 8 to 12, **required**
- Ensure there is a record in EXBUFLT table like this: **1, BANINST1**

Other Points of Banner Integration

- Data Lookup Systems
 - Key Reference
 - Auto Index
- Event Integration
 - Student Checklist
 - Financial Aid Tracking Requirements
- Banner Security
 - HR
 - Finance

Data Look Up Integration

- **Key Reference**

- ID field in application Structure is defined as Key Reference
- Name, SSN, etc, defined as Data Reference
- SPRIDEN and SPBPERS data is synchronized with table *AE_RFSCCT*
 - *Package: EOKRFSY*

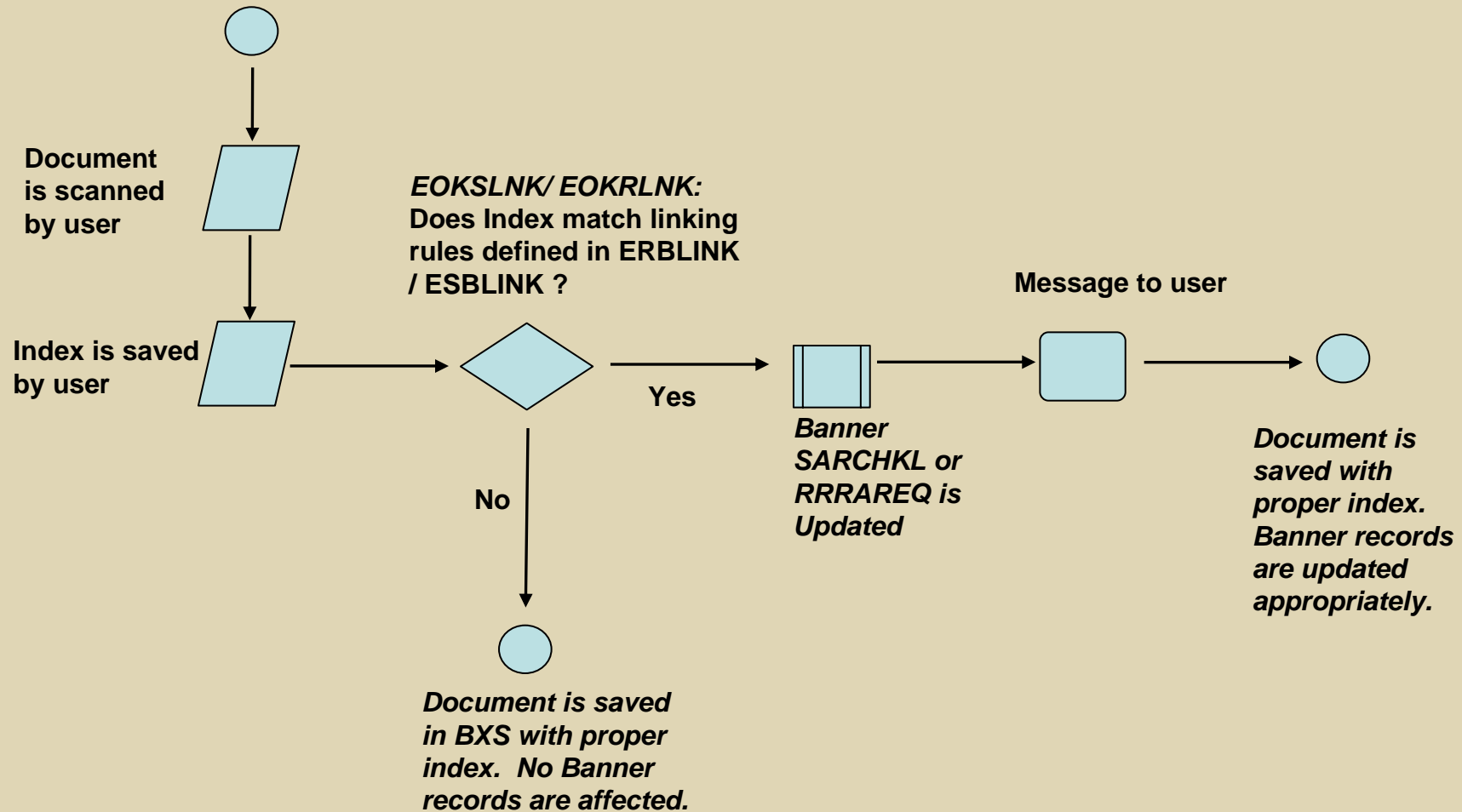
- **Auto Index**

- Allows lookup of repeating data for specific ID (ex: multiple Checklist Requirements for a Student)
- Source of data varies by BXS Application
 - *Packages: EOK%RTS*

Event Integration

- Allows for update of Banner Student Checklist or Financial Aid Tracking Requirement list based on BXS event:
 - Insert, Update, Delete
- Specific Applications: B-S-ADMN , B-R-TREQ
- Rule Based system: ESALINK, ERALINK

Event Integration



Banner Security

- **All setup performed in Banner**
- **Banner Human Resources**
 - 3 Layers of security: Salary, Emp. Class, Employer Code
 - Enforced by EOKPSEC
 - Calls to NOKSECR
 - Active in B-H-ID, B-H-EMPL
- **Banner Finance**
 - Fund /Orgn Security
 - Enforced by EOKIMAG
 - B-F-DOCS

PLANNING

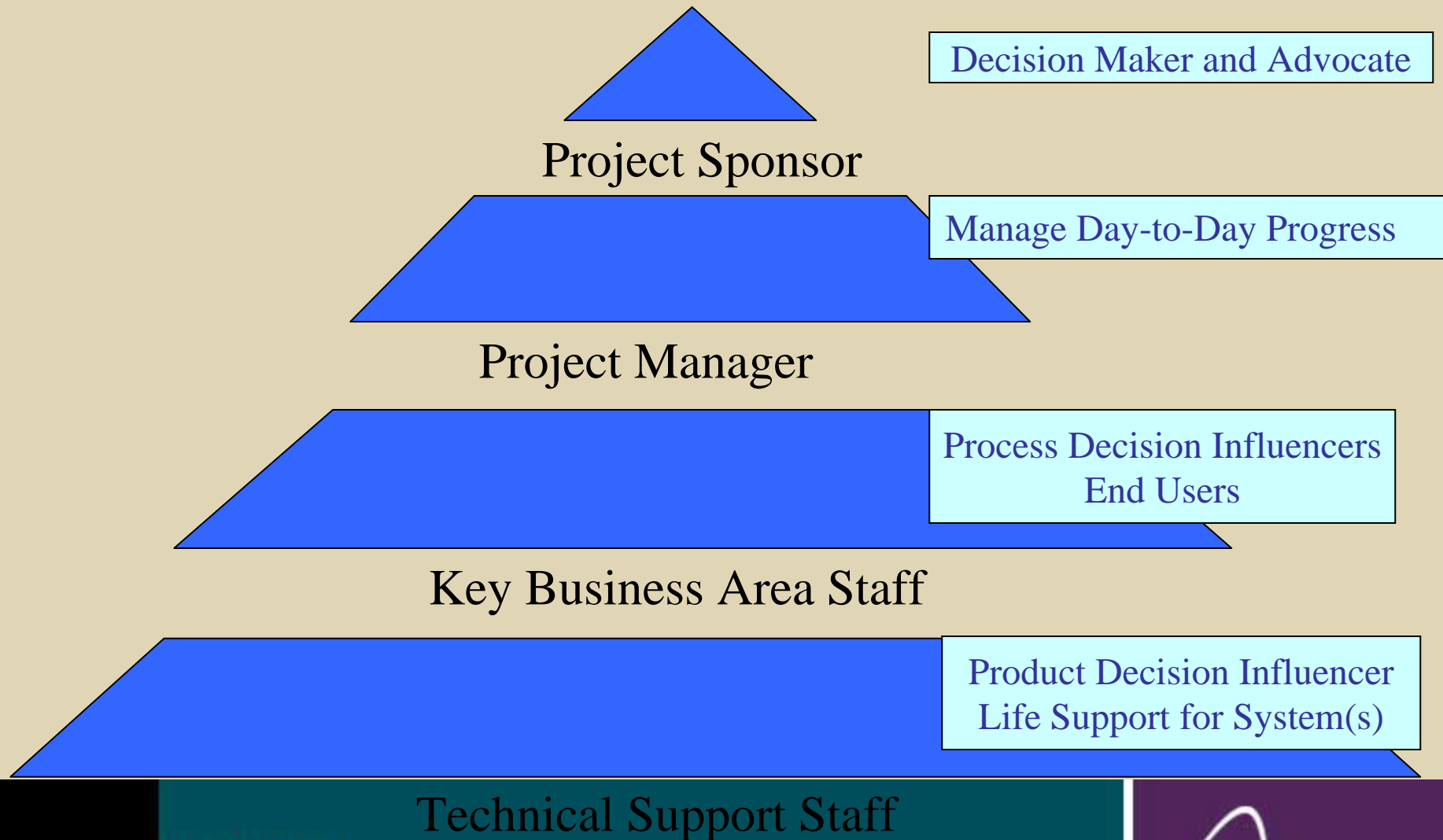
Key Elements of Planning

- Resource Identification
- Process Assessment
- Information Assessment
- Infrastructure Assessment

Proper Resource Involvement

- Project Sponsor
- Project Manager
- Departmental Leads
- Technical Leads
- Users
- Technical Staff

The Model for Success



Technical Resource Involvement

- Database Expertise:
 - Installation
- Banner Support:
 - Oracle Forms
 - Product Knowledge
- Desktop Administration:
 - Interact with Users
- Networking / Storage Administration:
 - Performance
 - Volume

Functional Resource Involvement

- Process Expertise:
 - Banner Skills:
 - What to type, and where to type it.
 - Paper Management:
 - Where does the paperwork currently go?
 - Understanding of Informational Flow:
 - *Who* needs information
 - *What* do they need
 - *When* do they need it?

How Many Servers Do I Need?

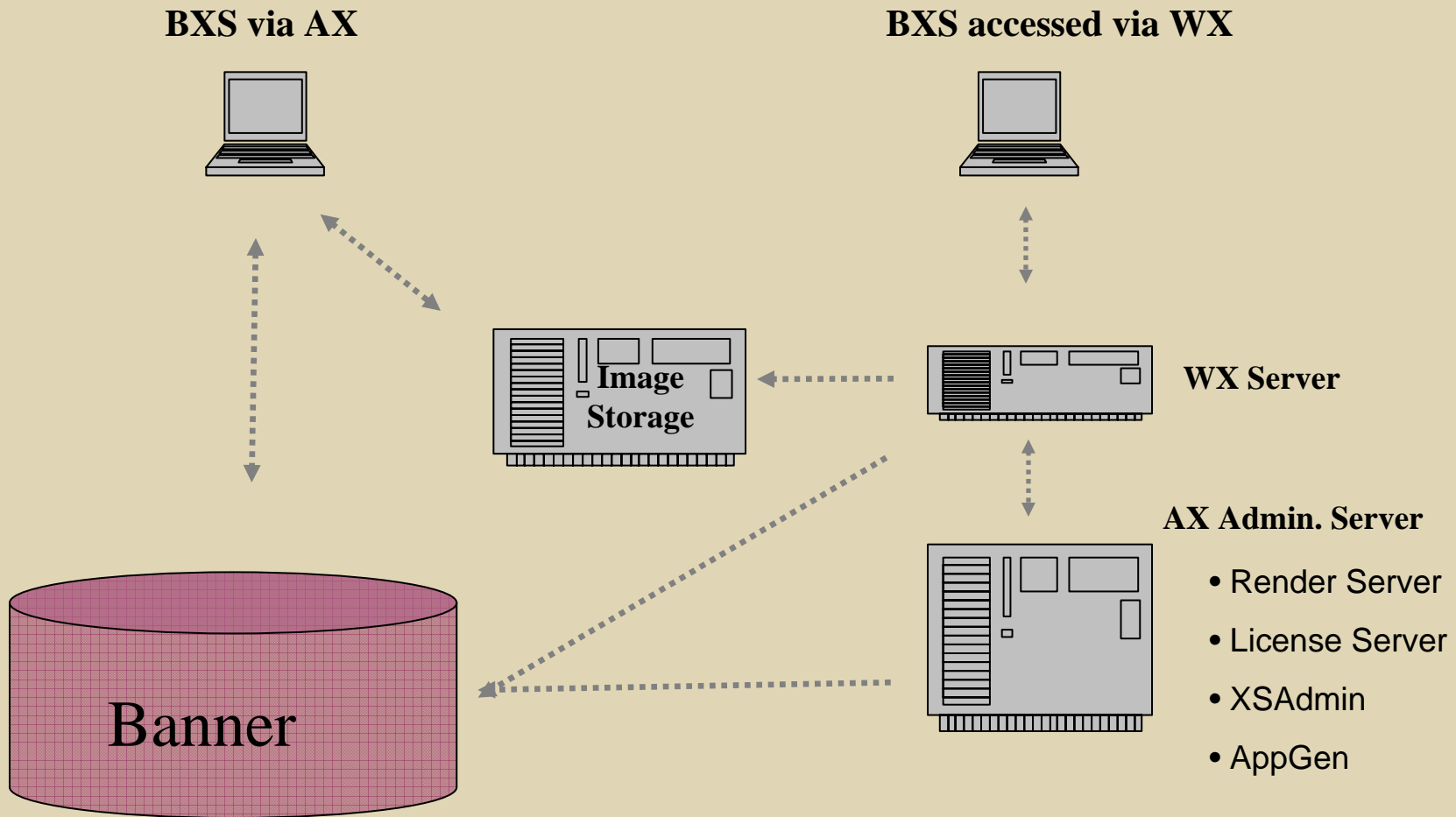
Frequently Asked Question:

“Which components can I combine on one server?”

Answer: ***“It depends.”***

- *Processing power*
- *Anticipated usage*
- *Infrastructure*

How Many Servers Do I Need? (p. 2)



Summary

- SCT Banner XtenderSolutions (BXS) provides secure online access to any kind of electronic image, document, or network file from within or outside of SCT Banner.
- BXS has the only native SCT Banner integration of its kind on the market.

Q & A

Storage?
Database?
Components?
Planning?

Thank You!

Stephen Grim

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Please complete the on-line Evaluation Form
Evaluation Code 295

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Scanner Support

- XtenderSolutions supports the following drivers:
 - TWAIN -- commonly distributed for free
 - ISIS -- faster processing; better acquisition
 - Kofax -- an industry leader; Virtual ReScan (VRS) Technology
 - Contex -- wide format; CAD, reprographics
 - VIDAR -- wide format scanners; medical imaging
 - BUIC -- Checks; MICR encoded document scanning