Integrated Approach to User Account Management

Kesselman, Glenn and Smith, William

Lockheed Martin Mission Services
Quest Software Public Sector

October 17, 2007
Agenda

- Background
- Analysis of Options
- Requirements
- Considered Architectures
- Architecture Evaluation
- Architecture Conclusions
- Benefits
- Then What?
- Proof-of-Concept (POC)
- POC Conclusions
  - Implementation Strategy
  - Results to Date
  - Conclusion
Background

- Multiple Operating Systems
- Systems configurations which will remain unchanged until the Orbiter retirement
- Users with the same or different user accounts in different domains
- Migration from Network Information System (NIS) style domains to the Active Directory (AD) styled domains
- How to deal with groups privileges
  - Using a Lockheed Martin provided tool known as ‘become’
  - Using organizational units and personalities
  - How to roll out
    » Roll out with new equipment
    » Phase in on existing equipment
    » Dealing with unchanged equipment
Analysis of Options

• Was it feasible to provide one user ID management system?
  - Yes, but…

• What options were considered?
  - Reviewed Light Weight Directory Access Protocol (LDAP) vendor offerings and white papers
  - Reviewed LDAP newsgroups and blogs
  - Identified 5 candidate architectures
  - Industry current “best practices” said 2 architectures are consistent with industry approaches
  - Leverage our agreements with our vendors
    » Questions were posted to Microsoft, Red Hat, Sun, and Quest with respect to LDAP
Security Requirements

• **User Passwords:**
  - shall be protected / secured when sent over a network
  - shall be protected / secured as stored on the LDAP server
  - shall be defined by the user (within guidelines and constraints)
  - shall have a minimum and a maximum age
  - shall be checked against a password history record to prevent password reuse
  - shall generate warnings when the password nears expiration
  - shall be checked for triviality and ensure minimum standards (defined) are met (minimum number of characters, types, etc.)

• **Accounts** shall be locked out with warning messages upon successive login failures.

• **Other System Entry Applications** (FTP, Telnet, rsh) will continue to use the existing applications password policies. A follow-on study should be conducted to mitigate application password policy risk acceptance
What Were the Considered Architectures?

- Parallel Authentication Servers
  - Both MS Windows and UNIX/Linux
- Common Authentication Server
  - Supports both MS Windows and UNIX/Linux from a common ‘platform’
Parallel Authentication Servers

• **Architecture A ▪ Separate Management**
  - UNIX/Linux clients authenticate with a UNIX/Linux LDAP server
  - Windows clients authenticate with a Windows 2003 server
  - Use the same user ID and password on the Windows and UNIX/Linux systems

• **Architecture B ▪ Synchronized**
  - Same as Separate Management, but the LDAP database on the Windows and UNIX/Linux servers are synchronized by external tools and processes
Common Authentication Server

- **Architecture C** • Windows AD server
  - Serves both UNIX/Linux and Windows clients

- **Architecture D** • UNIX/Linux LDAP server
  - Serves both UNIX/Linux and Windows clients

- **Architecture E** • Vintela + Windows AD server
  - Serves both UNIX/Linux and Windows clients
  - Vintela option facilitates Kerberized authentication, simpler management, and strict password policy adherence
Parallel Architecture A

PAM = Pluggable Authentication Module
DUA = Directory User Agent

MS Windows Client

Userid /domain/
password
LSASS
MS Active Directory
MS Kerberos V5
RFC 1510
LDAP

MS Windows Client

Userid /password
Login
LSASS
LSASS = Local Security Authority Sub-System

MS Windows Server 2003

UNIX/Linux Client

Login
PAM
DUA
LDAP

UNIX/Linux

User DB
LDAP
daemon
Dir Svcs

A

PAM  =  Pluggable Authentication Module
DUA  =  Directory User Agent
Common Architecture C

Windows LDAP Deployment Architecture

MS Windows Client

- Userid / domain / password
- Login
- LSASS

MS Windows Server 2003

- Userid / domain / password
- LDAP
- MS Kerberos V5
- MS Active Directory
- User DB
- RFC 1510

UNIX/Linux Client

- Userid / password
- Login
- PAM
- DUA

MS Windows Based Authentication

Microsoft Windows copyrighted
Common Architecture D
Linux LDAP Deployment Architecture

MS Windows Client

Login | LSASS

MS Windows Client

Login | PAM | DUA

UNIX/Linux Client

UNIX/Linux LDAP Server

PADL/Samba/WinBind

MIT Athena Kerberos V5

LDAP daemon

Dir Svcs

User DB

Userid / domain/password

Microsoft Windows copyrighted

Userid / password

RFC 1510 (Kerberos V5)

UNIX/Linux Based Authentication
Common Architecture E
Windows LDAP Deployment Architecture

MS Windows Client

UNIX/Linux Client

Login  PAM  Vintela Agent

MS Windows Client

Login  LSASS

E

RFC 1510

MS Windows Server 2003

Vintela

MS Kerberos V5

MS Active Directory

User DB

Userid /domain/password

Userid /password

MS Windows Based Authentication
Candidate Architecture Evaluation Factors

- Highly Available
- Swingable (Ops to Test & back)
- Scalable
- Secure channel to protect authentication
- Supports customized login application
- Cross security level information exchange
- Password History & Aging
- Userid/Password database is secure
- User impacts
- GUI

- Legacy (non-compliant) Systems Support
- Product Support
- Custom Pluggable Authentication Module (PAM) development framework
- Administration tools are adequate
- Customizable
- System administration impacts
- Administration automation
- Interoperable
- Commercial-Off-The-Shelf COTS, COTS, COTS
# Candidate Architecture Scorecard

<table>
<thead>
<tr>
<th>Scorecard</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highly available</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swingable</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>m</td>
</tr>
<tr>
<td>Scalable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secure Channel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>POS login support</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cross Sec Level Info Exchange</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>m</td>
</tr>
<tr>
<td>Password History &amp; Aging</td>
<td></td>
<td></td>
<td></td>
<td>m</td>
<td></td>
</tr>
<tr>
<td>Userid/Password DB is secure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>User impact</td>
<td>m</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACA interface</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Legacy systems support</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>m</td>
</tr>
<tr>
<td>Product Support</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>m</td>
</tr>
<tr>
<td>Custom PAM framework</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>m</td>
</tr>
<tr>
<td>Adequate Tools</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>m</td>
</tr>
<tr>
<td>Customizable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sysadmin impacts</td>
<td>m</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Automated admin</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interoperable</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Estimated Engineering Effort</td>
<td></td>
<td></td>
<td></td>
<td>m</td>
<td>m</td>
</tr>
</tbody>
</table>

- **No Major Issues**
- **Issues With Mitigation**
- **Issues Have No Mitigation**
Architecture Conclusions

- Using a single userid/password can be accomplished for a single domain user (i.e. OPS only or Development only)
- LDAP implementation is feasible with at least 2 defined domains (Operations & Development/Verification)
- The existing NASA Mission Control Center Systems (MCCS) and subsystems will be supported as part of a planned equipment replacement / upgrade, remain ‘as-is’ until an equipment replacement occurs, or be migrated as part of an approved change direction
- Some existing subsystems can be supported with an upgrade
- The recommended architectures will meet the user password management requirements
- The candidate architecture D is not feasible and will not be pursued because the Linux LDAP server with samba and winbind cannot provide all the necessary services required by Windows
Benefits

• Users have 1 User Identity (ID) and fewer passwords for ALL of the MCCS and subsystems
• Password policy will be uniform and consistent across systems and subsystems
• Password change interval will be uniform based upon a NASA Johnson Space Center approved policy
• This is / was NOT Single Sign On (SSO)
  - Requesting access to another system or subsystem WILL require the user to provide their User ID and password
  - The candidate LDAP architectures do not preclude moving to SSO in the future
POC Scope

• Then What? DO Proof-Of-Concept (POC)
  - Validate security requirements
    → password syntax, management, expiration, history, etc.
  - Explore mixed architecture to ensure that a consolidated single product type LDAP server implementation is viable, or prove that the parallel candidate architecture deployment is required.
  - Install client and server systems, using existing resources to evaluate the possible architectures and products.
POC Scope

• Then What?
  - Facilitate identifying products for the common approach.
  - Identifying a common PAM configuration to support / authenticate MCCS systems.
  - Determine if a common schema will support all intended targets.
  - Verify that emulated environment swings are supported.
  - Identify administration tools to support LDAP environment.
  - Report results of POC actions.
POC Conclusions

Architecture “B” – Parallel LDAP Servers (A & B collapsed)
» Uses Red Hat Directory Services (RDS) for Linux, Solaris and AIX logon clients.
» RDS interfaces with AD keep the userid/password database in synchronization over a secure link.

Architecture “E” – Shared LDAP Server (C a variant of E, D infeasible)
» Linux/Unix Clients use the Vintela add-on package to authenticate using Active Directory.
» No synchronization is required – common Windows LDAP server provides one userid/password database.
POC Conclusions

With Architecture “B”, we found RDS + AD, w/sync:
» Did not support the custom operations satisfactorily;
» Password strength lies in the individual client PAM’s and can vary based on host type;
» Installation of the client PAM was not straightforward, but rather error prone;
» Some of the user logon messages are missing or very brief in duration.

With Architecture “E”, we found Vintela + AD:
» Was simple to install using Red Hat style RPM’s;
» Provides the messages needed during login processing;
» Password policy was uniformly implemented by the Windows AD server;
» Performed well during custom operations.
» Most COTS oriented solution
POC Conclusions

• **Bottom Line:**

• **Implement Architecture E**
POC Conclusions

• **Implementation strategy**
  - Infrastructure is installed first, then subsystems are brought in according to outside schedule factors

- **Common Userid Phase I: Development Systems and Subsystems**
  » Install new AD cluster and migrate Windows 2000/XP clients first
  » Verify custom login on Linux workstations
  » Migrate Linux/Unix clients next
  » Support LDAP testing with early adopters

- **Common Userid Phase II: Operations Systems and Subsystems**
  » Repeat installation pattern from the Development Systems domain
  » Support LDAP authentication in equipment replacement devices (Linux workstations and servers)
  » Implement Windows devices (current and new)
  » Implement on Unix clients and servers
Results to date

• All of the Development Domain’s workstations and servers are converted to using the LDAP services based upon the Vintela agents
  - Caveat:
    » Some of the systems in the Development and Operations domain do not support PAM and therefore are still managed separately.
    » Root is managed locally (at the workstation or server).

• Some of the Operations Domain’s workstations and servers are converted to using the LDAP services
  - Caveat:
    » Some of the systems in the Operations domain do not support PAM and therefore are still managed separately
    » Root is managed locally (at the workstation or server)
    » Roll-out to the Operations Domain systems and subsystems are being achieved incrementally with equipment replacements or retrofits
Conclusion

• The implementation proceeds well with little problems.

• Quest has been instrumental in the successful implementation and problem resolution.
  - Problems were resolved at site in some instances with fixes being made in hours or days during the initial testing and roll out to the Development Domain.

• For those systems that are being converted from a NIS based service to a PAM based service, develop a password testing system that user’s can ‘try-it’ before the ‘use-it’.

• Educate the user about this service and why it is important.
Conclusion

- Rolling out a ‘one-size-fits-all’ solution will be difficult, because the size will change
  - For example: If implementation of LDAP services with application authentication is required, then try that first before having the users change to the system.
  - Test the systems with many ‘high-fidelity’ users as possible
    » If you have ‘vocal’ users, get them to be some of those testers and hopefully advocates.

- We did not advertise this as a ‘single sign-on’ solution

- We did not advertise this as a panacea, just a step forward
Active Directory simplifies the situation for Windows systems,

but for non-Windows systems, directories and authentication must all be managed separately

- Multiple directories
- Multiple identities
  - Multiple logins
  - Not secure

Legacy systems
Third-party Directories
Other application
ID Stores
Vintela integrates disparate Unix/Linux/Java identities into one secure Active Directory environment.
### Abstract

IT environments consist of both Windows and other platforms. Providing user account management for this model has become increasingly difficult. If Microsoft’s Active Directory could be enhanced to extend a Windows identity for authentication services for Unix, Linux, Java and Macintosh systems, then an integrated approach to user account management could be realized.