OpenVMS Security

Presented by

Wayne Sauer

PARSEC Group

999 18th Street, Suite 1725
Denver, CO 80202

www.parsec.com

888-4-PARSEC

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Outline

- OpenVMS Security Design
- Physical Security
- Object Security
- UIC/ACL Security
- User Access
- Break-in Detection
- Network and Internet Considerations
- Encrypted Network Communication
- Kerberos
- Secure Socket Layer (SSL)

Goals

- Discuss the important points and consideration of OpenVMS Security
- Concentrate on the mechanics and mechanisms of OpenVMS features.
- Show how OpenVMS is one of the most secure operating systems on the market.

OpenVMS Security Design

- Security was designed into OpenVMS since V1.0
- Many different levels of security in OpenVMS
    - ➢Physical Security
    - ➢Object Security
    - ➢User Management
    - ➢Network Security
- Has never had a virus

Physical Security

- System
- System Console
- Storage devices and media
    - ➢System Disk
    - ➢Data and Database Volumes
    - ➢Backups
- Network devices and media

Physical Security: System

- Increase system reliability through restricted access
  - Prevent intentional tampering and outage
  - Prevent outage due to accidents
- Prevent Front Panel Access
  - Halts
  - Reset/initializations
  - Power switch/source
  - Power on action settings (VAX) switch

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Physical Security: Console

- Can be a big security hole for OpenVMS
  - Anyone with physical access to the console can break into OpenVMS buy getting into the SYSBOOT utility.
  - Then OpenVMS can be broken into:
    - Buy redirecting startup
    - Buy changing SYSBOOT parameters

Physical Security: Getting to SYSBOOT on the Integrity Console Example

- On the Integrity shutdown to the EFI Boot Manager and select the EFI Shell and create a alias.

```
Please select a boot option

OpenVMS V8.2
Conversational Boot
DVD
OpenVMS Production
EFI Shell [Built-in]
Boot Option Maintenance Menu
System Configuration Menu

Use ^ and v to change option(s). Use Enter to select an option
Loading.: EFI Shell [Built-in]
EFI Shell version 1.10 [14.61]
Device mapping table
...
Shell> alias b “fs1:\efi\vms\vms_loader.efi”
Shell> b -fl 0,1

SYSBOOT>
```

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Physical Security: Getting to SYSBOOT on the Integrity Console Example

- From the SRM prompt on the Alpha

```
>>> boot –flags 0,1 [device]
     (boot dkb300.3.0.13.0 -flags 0,1)
  block 0 of dkb300.3.0.13.0 is a valid boot block
  reading 1143 blocks from dkb300.3.0.13.0
  bootstrap code read in
  base = 1cc000, image_start = 0, image_bytes = 8ee00
  initializing HWRPB at 2000
  initializing page table at 3ffd0000
  initializing machine state
  setting affinity to the primary CPU
  jumping to bootstrap code

SYSBOOT>
```

Physical Security: Console Example

```
SYSBOOT> show /startup
Startup command file = SYS$SYSTEM:STARTUP.COM
SYSBOOT> set/startup opa0:
SYSBOOT> continue
...
$ set noon
$ spawn
spawn
  %DCL-S-SPAWNED, process SYSTEM_132 spawned
  %DCL-S-ATTACHED, terminal now attached to process SYSTEM_132
$ set noon
$ @sys$system:startup
...
$ mcr authorize
UAF> modify account_name /password…
```

Physical Security:
Console Example (Part 2)

```
SYSBOOT> show maxsysgroup
Parameter Name            Current    Default      Min.       Max.   Unit  Dynamic
--------------            -------    -------   -------    -------   ----  -------
MAXSYSGROUP                     8          8         1      32768 UIC Group  D
SYSBOOT> SET . %O200
SYSBOOT> SHOW .
Parameter Name            Current    Default      Min.       Max.   Unit  Dynamic
--------------            -------    -------   -------    -------   ----  -------
MAXSYSGROUP                   128          8         1      32768 UIC Group  D
SYSBOOT> EXIT
...
$ a=128
$ show sym a
  A = 128   Hex = 00000080  Octal = 00000000200
$ mcr authorize show sauer

Username: SAUER                            Owner:  Sauer, Wayne
Account:  STAFF                            UIC:    [200,2] ([STAFF,SAUER])
CLI:      DCL                              Tables: DCLTABLES
Default:  STAFF:[SAUER]
...
```

Physical Security: Satellite Console

- Preventing Conversational Booting on a Satellite
  - ➢Prevent system modifications during boot
  - ➢Should be disabled for unsecured workstations
  - ➢Is not a dynamic parameter

➢The following example shows how to prevent conversational boot on which the node these commands are issued (this parameter value should also be set in MODPARAMS.DAT):

```
$ mcr sysgen
SYSGEN> use current
SYSGEN> set niscs_conv_boot 0
SYSGEN> write current
```

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Physical Security: Storage Devices and Media

- System Disk
  - ➢ Normally co-located in the system
  - ➢ Sensitive security files normally located here
  - ➢ Secure all backups of the system disk
  - ➢ Ensure proper UIC/ACL security on system files
- Non-System data
  - ➢ Ensure all other database volumes are backed up on a regular basis.
  - ➢ All backup media should be kept secure

OpenVMS Object Security

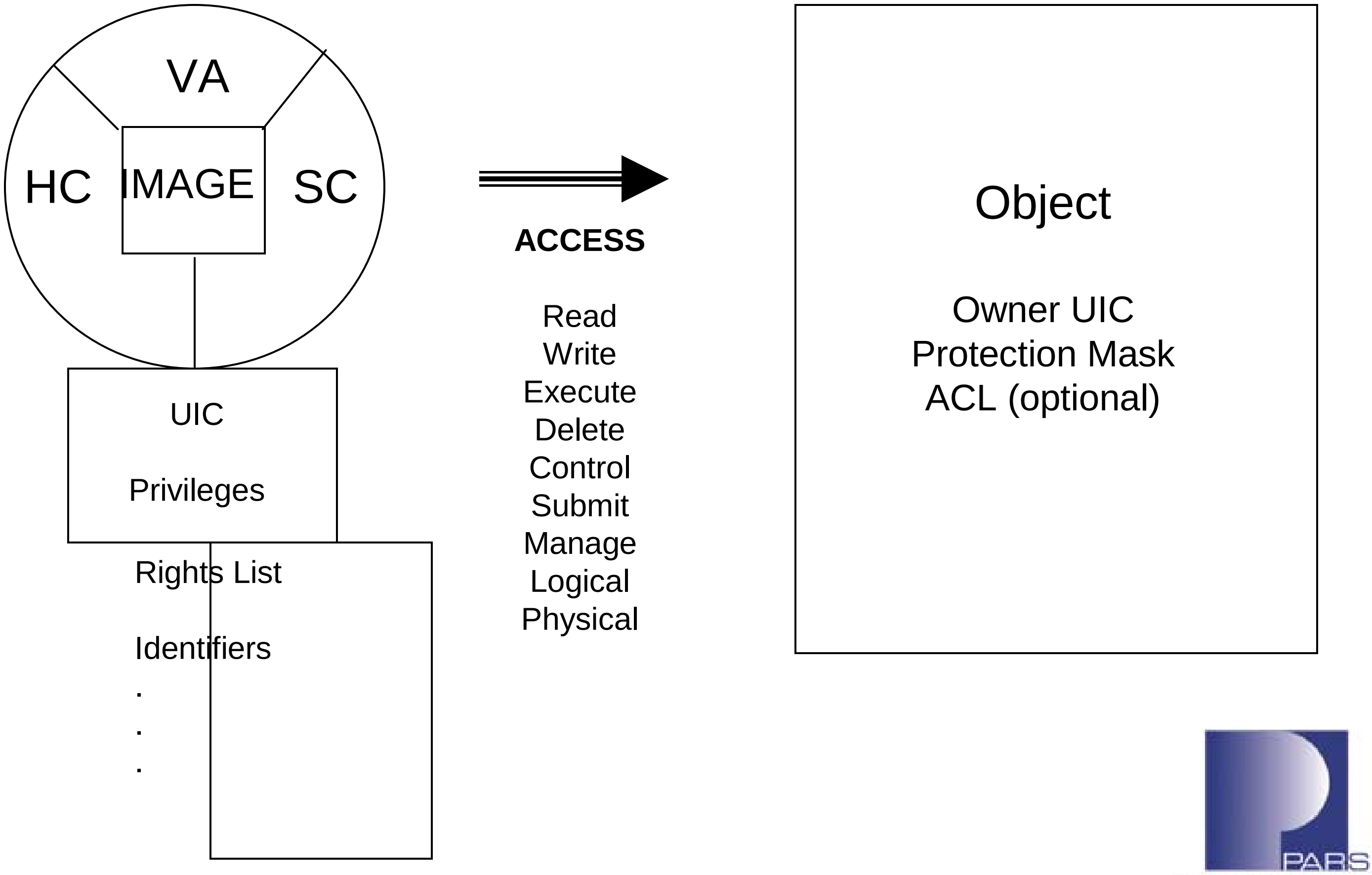
- An Object is a component (hardware or software) of the system to which we apply permissions
- Several different types of objects in OpenVMS
- Objects have multiple levels of protection
  - ➢UIC (User Identification Code)
  - ➢ACL (Access Control Lists)
  - ➢Privileges

Types of OpenVMS Objects

- Capability (VAX Only)
- Common Event Flag Cluster
- Devices
- Files (including Directories)
- Global Sections
- ICC Associations
- Logical Name Tables
- Queues
- Resource Domains
- Security Class
- Volumes

OpenVMS Object Security Model

Rights to an Object



VA

HC IMAGE SC

UIC

Privileges

Rights List

Identifiers

.
.
.

ACCESS

Read
Write
Execute
Delete
Control
Submit
Manage
Logical
Physical

Object

Owner UIC
Protection Mask
ACL (optional)

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OpenVMS UIC Security

- UIC assigned to process when it is created
  - [group, member] is an octal number
  - Group numbers are any octal number between 1 and 37777
  - Member numbers are any octal number between 1 and 177777
  - Both group and member number 0 is reserved

OpenVMS UIC Security

- UIC assigned to an object to reflect the objects owner
  - ➢ Creator becomes the owner (unless the owner has a system UIC or SYSPRV, in which case the owner will be the owner of the directory)
  - ➢ Owner can change permission and ownership
- Any account that has a UIC group number equal to or less than the SYSGEN parameter MAXSYSGROUP automatically belongs to the system group
  - ➢ The System account UIC is [1,4]

OpenVMS UIC Security – Categories

System - determines access for any system UICs or a process with SYSPRV

Owner - determines the access for processes that have the same UIC as the object

Group - determines the access for processes that have the same group number as the object

World - determines access for all processes

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OpenVMS UIC Security

Types of access

Read allows a process to read the object, obtain information

Write allows the process to modify or change the object

Execute allows the execution of the object, a command procedure or image

Delete allows the process to remove the object

Control allows the process to change the security of the object and is implied with ownership (ACL only)

Example syntax is (S:RWED, O:RWED, G:RE W)

OpenVMS UIC Security

Types of access (Continued)

Create In the case of volumes, allows the process to create files.

Manage In the case of queues, allows the process to control characteristics

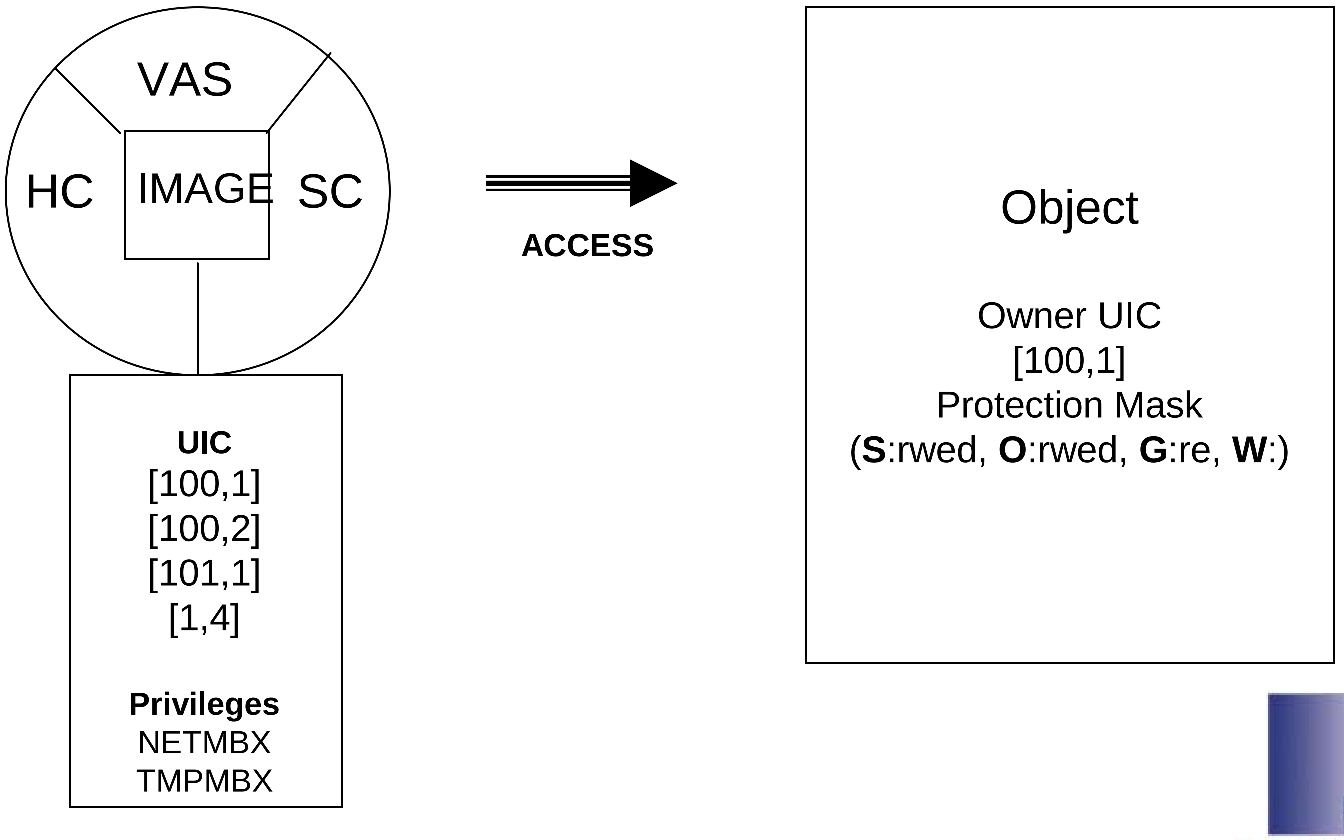
Submit In the case of queues, allows the process to submit/print to the queue

Logical Allows logical I/O to devices

Physical Allows physical I/O

OpenVMS UIC Security

Rights to an Object



VAS

HC

IMAGE

SC

ACCESS

UIC
[100,1]
[100,2]
[101,1]
[1,4]

Privileges
NETMBX
TMPMBX

Object

Owner UIC
[100,1]
Protection Mask
(**S**:rwed, **O**:rwed, **G**:re, **W**:)

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OpenVMS UIC Security

Summary of commands

```
$ SET FILE /PROTECTION=(mask) /OWNER=[uic] file-spec
$ SET FILE/OWNER_UIC=(uic)
$ SET DIRECTORY/OWNER_UIC=(uic)
$ SET PROTECTION=(mask) file-spec
$ SET SECURITY /PROTECTION=(mask) /OWNER=[uic] file-spec
$ SET PROTECTION/DEFAULT
$ SET QUEUE/PROTECTION=(mask)
$ SET QUEUE/OWNER_UIC=(uic)
```

OpenVMS ACL Security

- Base all security on UIC and use ACL as the exception
- Uses Right Lists Identifiers
- Identifiers are added to the RIGHTSLIST.DAT file by the System Administrator
- Identifiers are then granted to users typically via the AUTHORIZE Utility
- An ACE (Access Control Entry) within the ACL contains Identifiers and the access allowed them

OpenVMS ACL Security

- When the user logs on, the identifier is included in the process rights list
- Process rights list may be modified on the fly if it is added to the RIGHTSLIST.DAT with a dynamic attribute Or process has CMKRNL privilege

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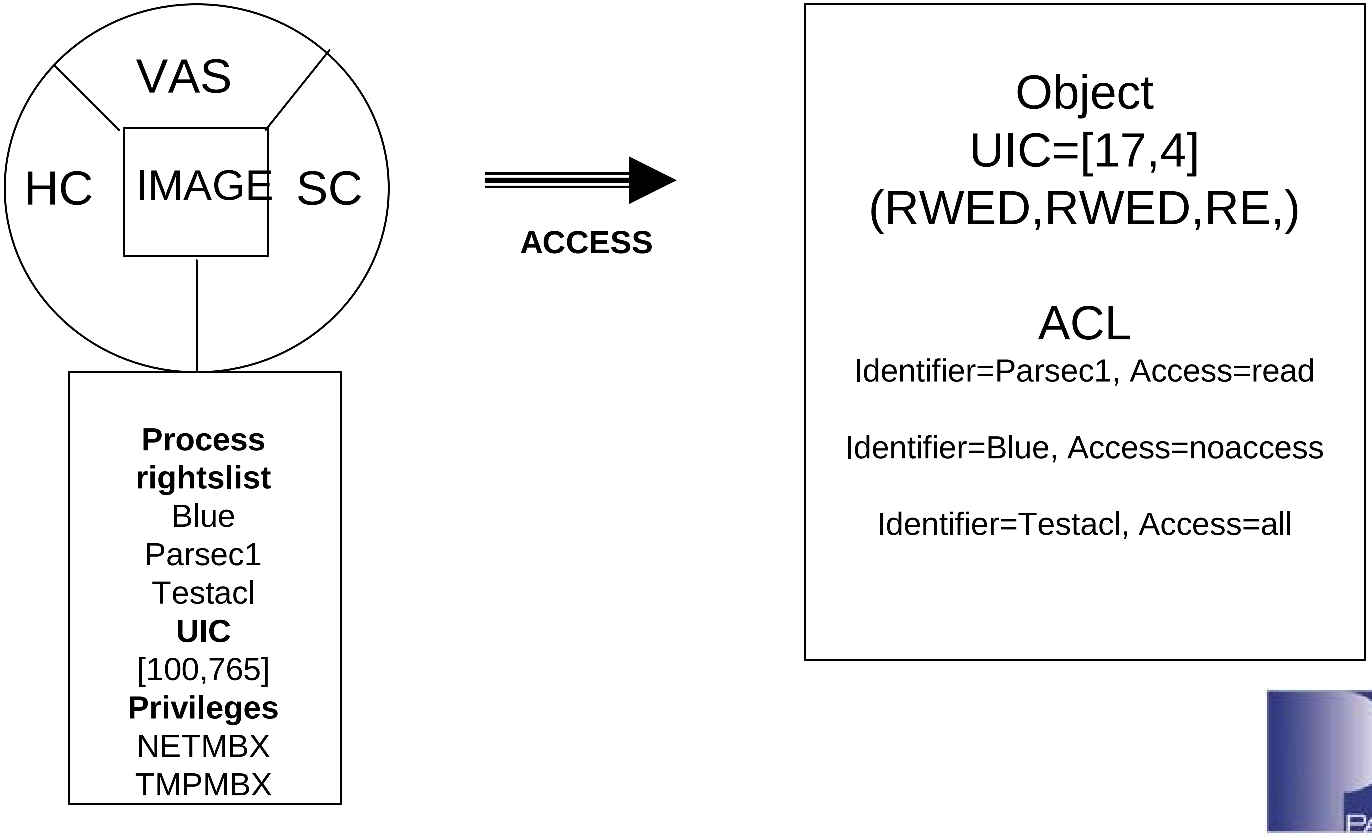
OpenVMS UIC Security

Rights to an Object



Process rightslist
Blue
Parsec1
Testacl
UIC
[100,765]
Privileges
NETMBX
TMPMBX

Object
UIC=[17,4]
(RWED,RWED,RE,)

ACL
Identifier=Parsec1, Access=read

Identifier=Blue, Access=noaccess

Identifier=Testacl, Access=all

OpenVMS ACL Security

Example, adding and granting an identifier:

```
UAF> add/id testacl
%UAF-I-RDBADDMSG, identifier TESTACL value %X80010261 added to rights database
UAF> grant/id testacl parsec1
%UAF-I-GRANTMSG, identifier TESTACL granted to PARSEC1
UAF> show/id testacl
  Name                             Value           Attributes
  TESTACL                          %X80010261
UAF>
UAF> show/id testacl/full
  Name                             Value           Attributes
  TESTACL                          %X80010261
    Holder                           Attributes
    PARSEC1
UAF> show/rights parsec1
Identifier                         Value           Attributes
  TESTACL                          %X80010261
UAF> exit
```

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OpenVMS ACL Security

Example, Using a UIC Identifier:

```
Username: parsec1
Password:
   Welcome to OpenVMS (TM) Alpha Operating System, Version V8.3 on node CLASS3
    Last interactive login on Friday, 14-MAR-2008 15:00:17.58
$ show proc/priv
17-MAR-2008 17:25:22.32   User: PARSEC1          Process ID:   2BC07976
                          Node: CLASS3           Process name: "PARSEC1"
Authorized privileges:
 NETMBX       TMPMBX

Process privileges:
 NETMBX                  may create network device
 TMPMBX                  may create temporary mailbox

Process rights:
 PARSEC1                                  resource
 INTERACTIVE
 REMOTE
 TESTACL
...
$
```

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OpenVMS ACL Security

Example, Using a UIC Identifier:

```
$ type [mehlhop.webinar]a.a
%TYPE-W-OPENIN, error opening $22$DKA300:[MEHLHOP.WEBINAR]A.A;1 as input
-RMS-E-PRV, insufficient privilege or file protection violation
$ lo
     From a privileged account or an account that has write access to the file

CLASS3$ set security/acl=(id=parsec1,access=read) a.a
CLASS3$ dir/security a.a

Directory $22$DKA300:[MEHLHOP.WEBINAR]

A.A;1                [STAFF,MEHLHOP]                  (RWED,RWED,RE,)
          (IDENTIFIER=[PARSEC1],ACCESS=READ)

Total of 1 file.
CLASS3$
```

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OpenVMS ACL Security

Example: Using a UIC Identifier

```
CLASS3$ set host 0


 Welcome to OpenVMS (TM) Alpha Operating System, Version V8.3


Username: parsec1
Password:
   Welcome to OpenVMS (TM) Alpha Operating System, Version V8.3 on
  node CLASS3
    Last interactive login on Monday, 17-MAR-2008 17:25:16.01
$ type [mehlhop.webinar]a.a
This is a test file
$
```

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OpenVMS ACL Security

Example: Using a **General** Identifier

```
$ type [mehlhop.webinar]b.b
%TYPE-W-OPENIN, error opening $22$DKA300:[MEHLHOP.WEBINAR]B.B;1 as
  input
-RMS-E-PRV, insufficient privilege or file protection violation
$ lo
```

From a privileged account or an account that has write access to the file

```
CLASS3$ set security/acl=(id=testacl,access=read) b.b
CLASS3$ set security/acl=(id=testacl,access=read) b.b
CLASS3$ dir/sec b.b

Directory $22$DKA300:[MEHLHOP.WEBINAR]

B.B;1                [STAFF,MEHLHOP]                      (RWED,RWED,RE,)
          (IDENTIFIER=TESTACL,ACCESS=READ)

Total of 1 file.
CLASS3$
```

OpenVMS ACL Security

Example: Using a General Identifier

```
CLASS3$ set host 0


 Welcome to OpenVMS (TM) Alpha Operating System, Version V8.3


Username: parsec1
Password:
 Welcome to OpenVMS (TM) Alpha Operating System, Version V8.3 on node
  CLASS3
    Last interactive login on Monday, 17-MAR-2008 17:35:14.15
$ type [MEHLHOP.WEBINAR]b.b
Test file to be examined by using a general identifier
$
$
```

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OpenVMS Security: Privileges

- BYPASS - Bypass all protections
- READALL - Bypass protections for read access only
- SYSPRV - Access an object using the SYSTEM category protection mask
- GRPPRV - Access an object using the SYSTEM category protection mask if the user has the same group number as the object
- VOLPRO - Overrides volume protection
- IMPERSONATE - Allows a process to create or assume a persona

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OpenVMS User Access to the System

- All user account information for the system or cluster is in the User Authorization File (SYSUAF.DAT).
- The SYSUAF.DAT file is not an ASCII file and can be modified by using the AUTHORIZE utility
- Profile in the SYSUAF.DAT file is identified by the USERNAME and contains:
  - Identification information
  - Quota and limit settings
  - Privileges
  - Encrypted password

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OpenVMS User Access to the System

- A Username and Password must be entered (minimum 1 maximum 2 passwords/username and possibly one system password)
- Username identifies the record in the SYSUAF.DAT file
- The entire password is verified by OpenVMS by encrypting the password that was entered and comparing it with the encrypted password field in the SYSUAF.DAT record
- You can set a password minimum length and lifetime with the commands in the AUTHORIZE utility:

```
    UAF> MOD username/PWDMINIMUM=
    UAF> MOD username/PWDLIFETIME=
```

OpenVMS User Logon

- All password are pre-expired by default when reset or the account is created by the system manager
- The following UAF FLAGS affect the security of the Username and Password
  - DISFORCE_PWD_CHANGE
  - DISPWDDIC
  - DISPWDHIS
  - DISUSER
  - GENPWD
  - LOCKPWD
  - PWD_EXPIRED
  - PWD2_EXPIRED
  - PWDMIX

Additional UAF Flag Keywords

- Additional UAF flag keywords that affect security:

AUDIT

AUTOLOGIN

CAPTIVE

DEFCLI

DISCTLY

DISIMAGE

RESTRICTED

OpenVMS Break-in Detection

- OpenVMS employs automatic break-in detection and evasion
- Once a login failure occurs, the user becomes a suspect and is monitored by the system
- Suspects become intruders by exceeding their allowed login failures during the monitoring period

OpenVMS Break-in Detection

- Login failures are logged into the intrusion database, and is maintained by the Security Server process
- You can display content of the database by issuing the DCL command $ SHOW INTRUSION
- You can delete content of the database by issuing the DCL command $ DELETE/ INTRUSION

OpenVMS Break-in Detection

- Login behavior is controlled through the following set of dynamic SYSGEN parameters

```
$ mcr sysgen
SYSGEN> show /lgi
Parameters in use: Active
Parameter Name           Current    Default     Min.      Max.     Unit  Dynamic
--------------           -------    -------    -------   -------   ----  -------
LGI_CALLOUTS                    0          0         0        255 Count      D
LGI_BRK_TERM                    1          1         0          1 Boolean    D
LGI_BRK_DISUSER                 0          0         0          1 Boolean    D
LGI_PWD_TMO                    30         30         0        255 Seconds    D
LGI_RETRY_LIM                   3          3         0        255 Tries      D
LGI_RETRY_TMO                  20         20         2        255 Seconds    D
LGI_BRK_LIM                     5          5         1        255 Failures   D
LGI_BRK_TMO                   300        300         0    5184000 Seconds    D
LGI_HID_TIM                   300        300         0 1261440000 Seconds    D
```

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OpenVMS Break-in Detection Example

```
CLASS3$ SET HOST 0

 Welcome to OpenVMS (TM) Alpha Operating System, Version V8.3

Username: PARSEC1
Password:
User authorization failure
Username: PARSEC1
Password:
User authorization failure
Username: PARSEC1
Password:
User authorization failure
%REM-S-END, control returned to node CLASS3::
```

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OpenVMS Break-in Detection Example

```
CLASS3$ SHOW INTRUSION
Intrusion       Type       Count        Expiration         Source
---------       ----       -----        ----------         ------
   NETWORK      SUSPECT       3   18-MAR-2008 18:11:51.17  CLASS3::MEHLHOP
CLASS3$ SET HOST 0

 Welcome to OpenVMS (TM) Alpha Operating System, Version V8.3

Username: PARSEC1
Password:
User authorization failure
Username: PARSEC1
Password:
User authorization failure
Username: PARSEC1
Password:
User authorization failure
%REM-S-END, control returned to node CLASS3::
```

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OpenVMS Break-in Detection Example

```
CLASS3$ SHOW INTRUSION
Intrusion       Type       Count        Expiration         Source
---------       ----       -----        ----------         ------
   NETWORK      INTRUDER      6   18-MAR-2008 18:02:54.57  CLASS3::MEHLHOP
CLASS3$ SET HOST 0

Welcome to OpenVMS (TM) Alpha Operating System, Version V8.3

Username: PARSEC1
Password:
User authorization failure
Username: PARSEC1
Password:
User authorization failure
Username: PARSEC1
Password:
User authorization failure
%REM-S-END, control returned to node CLASS3::
```

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OpenVMS Break-in Detection Example

```
CLASS3$ SHOW INTRUSION
Intrusion        Type        Count          Expiration           Source
---------        ----        -----          ----------           ------
   NETWORK       INTRUDER       9    18-MAR-2008 18:02:54.57
  CLASS3::MEHLHOP
CLASS3$ DEL/INTRUSION CLASS3::MEHLHOP
CLASS3$ SHOW INTRUSION
%SHOW-F-NOINTRUDERS, no intrusion records match specification
CLASS3$
```

OpenVMS Break-in Detection Example

```
CLASS3$ SET HOST 0


 Welcome to OpenVMS (TM) Alpha Operating System, Version V8.3


Username: PARSEC1
Password:
   Welcome to OpenVMS (TM) Alpha Operating System, Version V8.3 on
  node CLASS3
    Last interactive login on Tuesday, 18-MAR-2008 17:37:08.78
        13 failures since last successful login
$
```

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Security Auditing

- OpenVMS has the ability to audit nearly everything that happens on the system.
- The following are items that you can audit:

ACL	Mount	INSTALL	Authorization
Time	SYSGEN	Identifier	Connection
NCP	Audit	Persona	Process
Breakin	Login	Logfailure	Logout
Privilege Use		FILE access	All

- There are two types of auditing
  - ➢Alarms – go to any terminal that has been enabled as the operator terminal; by default the console terminal
  - ➢Audits – go to the audit server log file

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Security Auditing

- To view security auditing:

```
$ show audit
```

- To enable security auditing:

```
$ set audit/audit/enable=item
```

- To enable security alarms:

```
$ set audit/alarm/enable=item
```

- To disable security auditing:

```
$ set audit/audit/disable=item
```

- To disable security alarms:

```
$ set audit/alarm/disable=item
```

Security Auditing

```
$ show audit
System security alarms currently enabled for:
  ACL
  Authorization
  Audit:          illformed
  Breakin:        dialup,local,remote,network,detached
  Logfailure:     batch,dialup,local,remote,network,subprocess,detached

System security audits currently enabled for:
  ACL
  Authorization
  Audit:          illformed
  Breakin:        dialup,local,remote,network,detached
  Login:
  batch,dialup,local,remote,network,subprocess,detached,server
  Logfailure:
  batch,dialup,local,remote,network,subprocess,detached,server
  Logout:
  batch,dialup,local,remote,network,subprocess,detached,server
```

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Security Auditing

```
$ set audit/audit/enable=sysgen
$ set audit/alarm/enable=time
$ show audit
System security alarms currently enabled for:
  ACL
  Authorization
  Time
  Audit:           illformed
  Breakin:         dialup,local,remote,network,detached
  Logfailure:      batch,dialup,local,remote,network,subprocess,detached
System security audits currently enabled for:
  ACL
  Authorization
  SYSGEN
  Audit:           illformed
  Breakin:         dialup,local,remote,network,detached
  Login:           batch,dialup,local,remote,network,subprocess,detached,server
  Logfailure:      batch,dialup,local,remote,network,subprocess,detached,server
  Logout:          batch,dialup,local,remote,network,subprocess,detached,server
$
```

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Security Auditing

- To generate Audit reports, issue:

```
$ analyze/audit/qualifiers [file-spec]
```

- The default file-spec is the audit server log file SYS$MANAGER:SECURITY.AUDIT$JOURNAL
- The following are the qualifiers that can be specified:

```
/BEFORE     /BINARY/BRIEF      /EVENT_TYPE
/FULL       /IGNORE/OUTPUT     /INTERACTIVE
/PAUSE      /SELECT/SINCE      /SUMMARY
```

Security Auditing - Example

```
$ ana/audit/since=1-jan-2008/summary sys$manager:security.audit$journal

Total records read:     2152248          Records selected:         52823
Record buffer size:         512
Successful logins:         3113          Object creates:             549
Successful logouts:        4975          Object accesses:          25152
Login failures:             102          Object deaccesses:        14209
Breakin attempts:            26          Object deletes:             659
System UAF changes:          12          Volume (dis)mounts:           1
Rights db changes:            2          System time changes:          9
Netproxy changes:             0          Server messages:              0
Audit changes:               47          Connections:                  9
Installed db changes:         3          Process control audits:     787
Sysgen changes:               0          Privilege audits:          3113
NCP command lines:           30          Persona audits:              25
$
```

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Security Auditing - Example

```
$ ana/audit/since=1-mar-2008/event=authorization sys$manager:security.audit$journal
 Date / Time            Type       Subtype          Node   Username     ID       Term
______________________________________________________________________________________


 2-MAR-2008 13:31:48.12 SYSUAF     SYSUAF_MODIFY    CLASS8 SYSTEM       24800427
 2-MAR-2008 13:36:42.04 SYSUAF     SYSUAF_MODIFY    CLASS8 <login>      24800428 _TNA3:
 2-MAR-2008 13:37:12.19 SYSUAF     SYSUAF_MODIFY    CLASS8 SYSTEM       24800428 TNA3:
 2-MAR-2008 16:09:44.33 SYSUAF     SYSUAF_ADD       CLASS8 SYSTEM       25000446 TNA4:
 2-MAR-2008 16:09:44.37 RIGHTSDB   RDB_ADD_ID       CLASS8 SYSTEM       25000446 TNA4:
 2-MAR-2008 16:10:08.05 SYSUAF     SYSUAF_MODIFY    CLASS8 SYSTEM       25000446 TNA4:
 2-MAR-2008 16:46:55.99 SYSUAF     SYSUAF_ADD       CLASS8 SYSTEM       2500044C TNA10:
 2-MAR-2008 16:46:56.01 RIGHTSDB   RDB_ADD_ID       CLASS8 SYSTEM       2500044C TNA10:
 2-MAR-2008 16:46:56.34 SYSUAF     SYSUAF_MODIFY    CLASS8 SYSTEM       2500044C TNA10:
 2-MAR-2008 16:46:56.38 SYSUAF     SYSUAF_MODIFY    CLASS8 SYSTEM       2500044C TNA10:
 2-MAR-2008 16:51:50.98 SYSUAF     SYSUAF_MODIFY    CLASS8 TCPIP$SSH    2500049B
 8-MAR-2008 14:33:04.81 SYSUAF     SYSUAF_MODIFY    CLASS8 SAUER        25E0046C RTA1:
11-MAR-2008 08:58:33.21 SYSUAF     SYSUAF_MODIFY    CLASS8 STUDENT207   25E004F8 RTA2:
21-MAR-2008 11:54:55.81 SYSUAF     SYSUAF_MODIFY    CLASS8 <login>      298006AF _TNA5:

Command >

End Of File for input reached.
```

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Network and Internet consideration

- Minimize the use of username and passwords over network

For example, consider the access control string below:

```
$ copy/log xyz.dat alpha2"spencer foobar"::dka200:[foobar]
```

- In the above example the username and password would be sent in a packet over the network in plain text
- Someone looking over the shoulder of someone else typing from the command line can see the username, password and nodename

DECNET Proxy Example

```
CLASS2> mc authorize
UAF> add/proxy class8::sauer sauer/default
%UAF-I-NAFADDMSG, proxy from CLASS8::SAUER to SAUER added
UAF> show/proxy class8::sauer

 Default proxies are flagged with (D)

CLASS8::SAUER
    SAUER (D)
UAF> remove/proxy class8::sauer
%UAF-I-NAFREMMSG, proxy from CLASS8::SAUER to * removed
UAF>
```

TCP/IP Proxy Example

```
$ set process/privilege=(sysprv,syslck)
$ tcpip
TCPIP> add proxy williams/remote_user=williams
/host=yahoo.parsec.com
TCPIP> show proxy williams

VMS User_name     Type      User_ID    Group_ID   Host_name

williams           CD      WILLIAMS                YAHOO.PARSEC.COM
TCPIP>  Exit
$
$ tcpip
TCPIP> remove proxy williams

VMS User_name     Type      User_ID    Group_ID   Host_name

williams           CD      WILLIAMS                YAHOO.PARSEC.COM
Remove? [N]:y
TCPIP>  Exit
```

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Network and Internet Consideration
Hubs vs. Switches

- A hub essentially connects all the wires together
- Switches and routers are store and forward boxes
- Throw in network monitoring analyzers and
  - When connected to hub all data is viewable
  - When connected to a switch only the data on that system can be monitored

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Encrypted Network Communication

- Secure Shell (SSH)
  - ➢ Protects the user’s data on network by encrypting it
  - ➢ Supported authentications include password, public key and host based
    - OpenVMS implementation of SSH server does not use the secondary password for user accounts
    - Keys are normally generated when SSH is initially configured
    - Enabled via an option in TCPIP$CONFIG.COM

Encrypted Network Communication

```
$ ssh system@class3.parsec.com     !use system as a username not the current one
Host key not found from database.

Key fingerprint:

xizif-vobyc-sucep-myvac-kyhil-devas-kyzev-cumus-hysec-lyhen-fexyx

You can get a public key's fingerprint by running

$ ssh_keygen "-F" publickey.pub

on the keyfile.

Host key saved to ssh2/hostkeys/key_22_class3_parsec_com.pub

host key for class3.parsec.com, accepted by williams Fri May 16 2008 19:33:55

system's password:
Authentication successful.

 Welcome to OpenVMS (TM) Alpha Operating System, Version V8.3
    Last interactive login on Thursday, 10-APR-2008 15:07:34.16
    Last non-interactive login on Friday, 16-MAY-2008 11:52:22.56
$
```

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Encrypted Network Communication

- Secure Shell (SSH)
  - ➢ Supports stunneling or secure tunnel
    - Provides encrypted communication for applications not designed for it
    - Tunnel set up when SSH connection is set up
    - Application communications to remote host through tunnel
    - Support included for passive mode FTP and X11 tunneling

Encrypted Network Communication

```
CLASS1> ssh system@class3.parsec.com -"R" ftp/2001:localhost:21
system's password:
Authentication successful.
 Welcome to OpenVMS (TM) Alpha Operating System, Version V8.3
    Last interactive login on Friday, 16-MAY-2008 13:39:31.12
    Last non-interactive login on Friday, 16-MAY-2008 11:52:22.56
CLASS3> ftp localhost 2001
220 paul.parsec.com FTP Server (Version 5.7) Ready.
Connected to LOCALHOST.
Name (LOCALHOST:system): williams
331 Username williams requires a Password
Password:
230 User logged in.
FTP> passive on
Passive is ON.
FTP> ls x.*
227 Entering Passive Mode (127,0,0,1,192,26)
150 Opening data connection for x.* (127.0.0.1,49179)
x.bck;2
x.x;32
226 NLST Directory transfer complete
17 bytes received in 00:00:00.00 seconds (162.12 Mbytes/s)
FTP> quit
221 Goodbye.
CLASS3>
```

Encrypted Network Communication

- Secure File Transfer (SFTP)
  - Same communications protocol as SSH
  - Is not as advanced as OpenVMS FTP
  - Uses the same public and private keys used by SSH providing host authentications
  - Enabled via the same option as SSH in TCPIP$CONFIG.COM

Kerberos

- Three headed dog that guarded the gate to Hades
- Created by MIT to provide strong authentication for client/server applications
- Configuration not covered in this session
- Overview of the three parts of Kerberos

Kerberos

- Kerberos Support
  - Kerberos Version 2.1 is based on MIT Kerberos V5
  - Release 1.2.6, with CERT patches through 1.2.8
- Operating System Support
  - OpenVMS Industry Standard 64 V 8.2 or higher
  - OpenVMS Alpha V 7.2-2 or higher
  - OpenVMS VAX V 7.3

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Kerberos

- TCP/IP Transport
  - hp TCP/IP Services for OpenVMS V 5.5 or higher (for Kerberos on I64 and Alpha V 8.2)
  - hp TCP/IP Services for OpenVMS V 5.4 or higher (for Kerberos on Alpha V 7.3-2)
  - hp TCP/IP Services for OpenVMS V 5.3 or higher (for Kerberos on VAX)
  - If using third-party TCP/IP product such as Multinet or TCPware from Process Software Corporation, please contact them for support versions

Kerberos

- First head of three headed dog represents the Kerberos server
  - Key Distribution Center (KDC)
  - Authentication Service (AS)
  - Ticket Granting Service (TGS)
  - The server contains all passwords associated with each principal and should be highly secured

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Kerberos

- Second head of three headed dog represents the client

  - Any entity that gets a service ticket for a Kerberos service

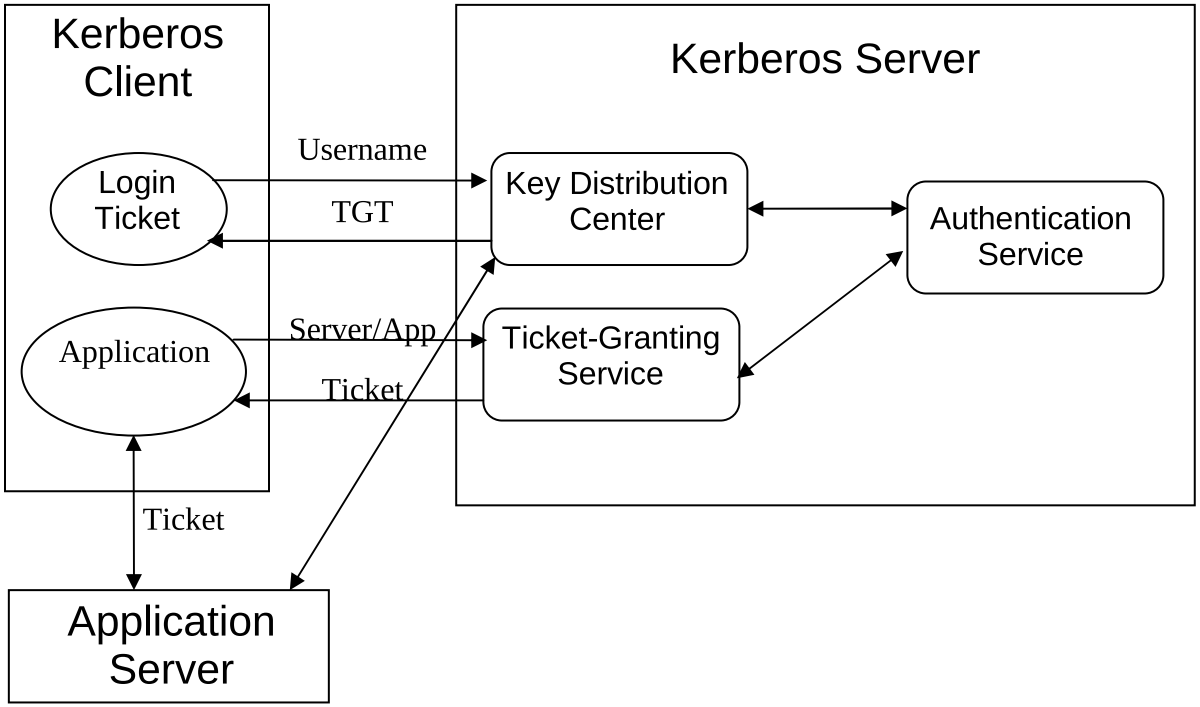
  - Server must be configured as a client

    - Allows client utilities to be used to manage the server

Kerberos

- Third head of three headed dog represents the application server
  - Also known as Kerberized programs that clients communicate with using Kerberos tickets
  - OpenVMS currently provides a Kerberized version of Telnet
    - Once authentication has completed, all other communication is normal for the application
  - Tickets are time stamped to limit reuse
    - Because of the time limited value of the tickets, time must be synchronized on all systems involved

Kerberos



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Secure Socket Layer

- Secure web browser (https://) uses SSL
- Based on OpenSSL 0.9.7d and includes latest security updates from OpenSSL.org
- Easily integrated into any application that wants secure implementation (at the programming level)
- Operating System
  - ➢OpenVMS Industry Standard 64 V 8.2 or higher
  - ➢OpenVMS Alpha V 7.3-2 or higher
  - ➢OpenVMS VAX V 7.3

Question & Answer

Presented by

Wayne Sauer

www.parsec.com

888-4-PARSEC
sauer@parsec.com

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