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create or replace function log_start[fv_path
return utl_file.file_type is
lv_fptr utl_file.file_type:=null;
lv_module varchar2[100]:='log_start';
begin
dbms_output.disable;

Oracle Security Expertise

Oracle User Group Norway, April 22nd 2008

Oracle Security Tools

By

Pete Finnigan

Written Friday, 19th October 2007

Introduction - Commercial Slide.☹

- PeteFinnigan.com Limited
- Founded February 2003
- CEO Pete Finnigan
- Clients UK, States, Europe
- Specialists in researching and securing Oracle databases
- http://www.petefinnigan.com
- Consultancy and training available
- Author of Oracle security step-by-step
- Published many papers, regular speaker (UK, USA)
- Member of the OAK table network

Agenda

- Where to find Oracle security tools
- Look at the types of tools (categorize)
- Consider free and commercial tools
- Protecting against Oracle Security tools
- A quick look at what Oracle provides
- Demo and summarise some of the key tools that can be used

Where To Find Oracle Security Tools

http://www.petefinnigan.com/tools.htm

Oracle Security Tool Categories

- Discovery tools
  - User enumeration – OAK toolkit
  - Sid guessing – RDS, Cqure, THC
  - Connect brute force – bfora.pl
  - SYSDBA brute force – Paul Wright
  - Listener enumerators – nmap, metacortex, tnsprobe, WinSID
- Testing tools
  - Password crackers – orabf, woraauthbf, checkpwd
  - Listener enumeration – integrigy, DokFleed, tnscmd
  - Default passwords – PeteFinnigan.com
  - Inguma – Joxean Koret
  - Backtrack CD

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Oracle Security Tool Categories (2)

- Scanners
  - Listener scanners – Integrigy, DokFleed
  - CIS Benchmark – old but the best free scanner
  - Scuba - Imperva
  - RoraScanner – Rory McCune
  - Audit scripts (who_has_priv) – Pete Finnigan
  - Commercial – AppDetective, Squirrel, AuditPro
- Fuzzers – Joxean Koret script + inguma
- Hardening scripts (similar to SQLsecurity.com for SQL Server) – none that I know of

Oracle Security Tool Categories (3)

- Audit Trail software
  - many e.g. SQL Guard from Guardium
  - No free solutions in same space
  - Many built in solutions
- Database IDS / IPS
  - Many e.g Hedgehog from Sentrigo
  - No other free solutions in same space
- In-line Patching – BlueLane patchpoint and virtualshield
- Encryption
  - small number of players including Application Security Inc
  - Some free software but no GUI solutions

Free And Commercial

Area	Free	Commercial
Discovery	X	X
Testing	X	X
Scanner	X	X
Fuzzing	X	
Hardening		
Audit Trail		X
IDS / IPS / Patching		X
Encryption		X

This is not scientific but a simple look at the spread of tools between commercial and free - a trend is visible

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Does Oracle Provide Anything?

- None of the tools listed above are supplied by Oracle as complete tools BUT
  - Oracle supplies a default password tool
  - 11gR1 has a default password check built in
  - There are no Oracle scanners (at least not public)
  - Oracle does provide various audit scripts (quite old) on Metalink
  - Oracle includes many built in audit solutions and audit vault
  - Oracle also provides many encryption solutions

Support And Maintenance

- All Commercial products can include – support and upgrade
- Free tools – depends on developers and
  - Is this an issue?
  - We have source code in lots of cases
  - A lot of tools can be extended
  - A problem of research?
  - A problem of wasted (duplicate) efforts
  - Commercial / free requires careful considerations

Supporting Role Tools

- Whilst we are talking about Oracle security tools we should not ignore the platform and network

  – This should include database discovery using network security tools such as nmap, amap, nessus

  – This should also include platform checks. The CIS benchmark tools are very good as a start in this area

Security Issues With Tools

- Protect against tools run on your own databases
- Just as you can use for audit / testing etc these tools can also be used against you
- Beware some *rare* tools have virus code included to allow the author to take over your machine
- One legitimate tool is recognised as a virus / worm
- Choose extendable tools with source, then from trusted sources.
- Protection methods? – many and varied

Some Demonstrations

- Sidguess – Patrik Karlsson
- User Enumeration – OAK – David Litchfield
- Default passwords – 11g plus Pete Finnigan list
- Password cracker – woraauthbf
- SYSDBA brute force – Paul Wright
- Listener checks - Integrigy
- Scanners
  - Scuba - imperva
  - CIS benchmark
  - OScanner
- Privilege checks – PeteFinnigan.com scripts

SIDGuesser

```
C:\WINDOWS\system32\cmd.exe                                      _ □ X

C:\pete_finnigan_com_ltd\presentations\tools>sidguesser -i 127.0.0.1 -p 1521 -d
sidlist.txt

SIDGuesser v1.0.5 by patrik@cqure.net
----------------------------------------

Starting Dictionary Attack (<space> for stats, Q for quit) ...


C:\pete_finnigan_com_ltd\presentations\tools>sidguesser -i 127.0.0.1 -p 1522 -d
sidlist.txt

SIDGuesser v1.0.5 by patrik@cqure.net
----------------------------------------

Starting Dictionary Attack (<space> for stats, Q for quit) ...

FOUND SID: ORA10GR2

C:\
```
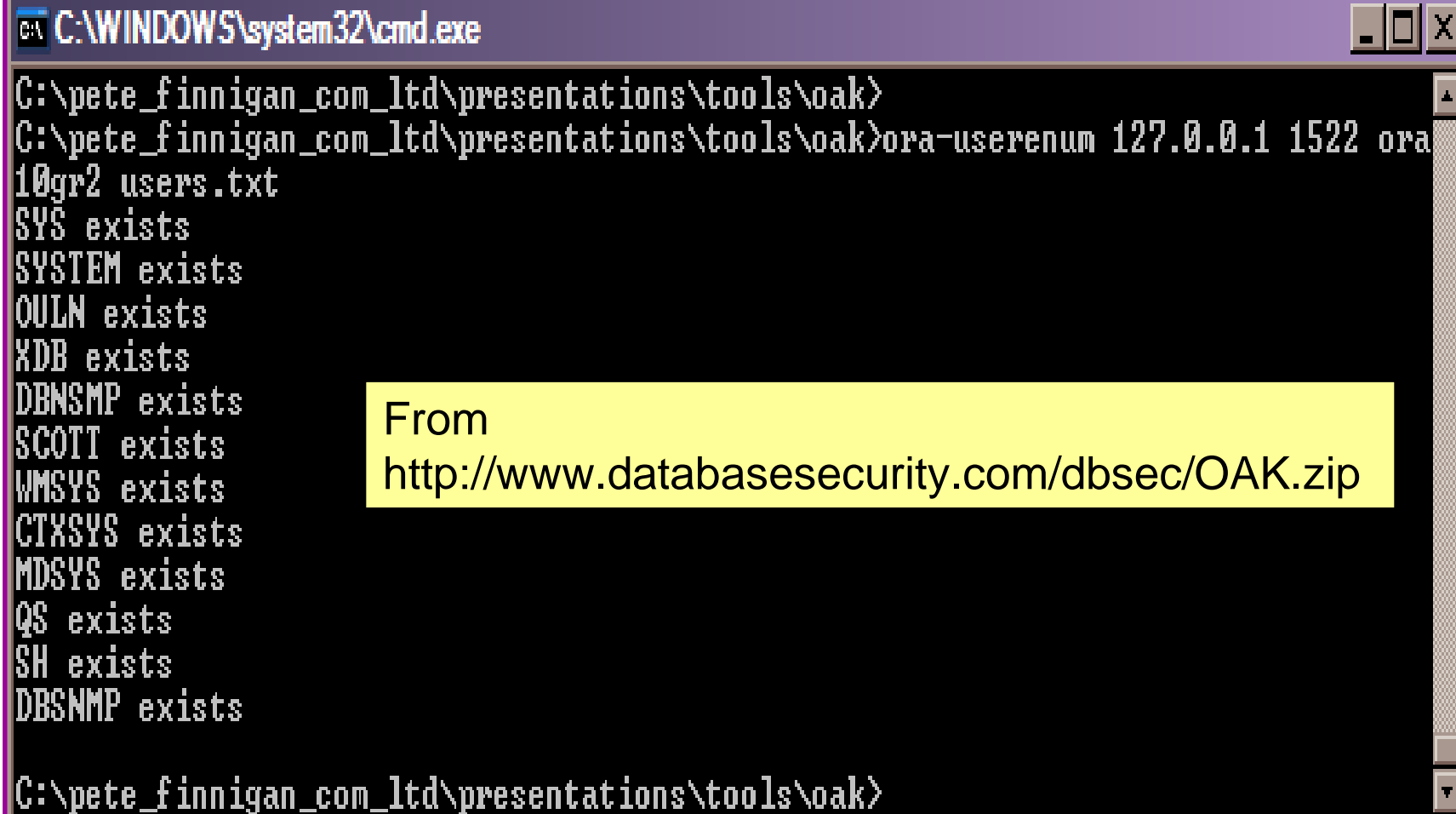
From http://www.cqure.net/tools/SIDGuesser_win32_1_0_5.zip

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User Enumeration

```
C:\WINDOWS\system32\cmd.exe                          _ □ X

C:\pete_finnigan_com_ltd\presentations\tools\oak>
C:\pete_finnigan_com_ltd\presentations\tools\oak>ora-userenum 127.0.0.1 1522 ora
10gr2 users.txt
SYS exists
SYSTEM exists
OULN exists
XDB exists
DBNSMP exists
SCOTT exists
WMSYS exists
CTXSYS exists
MDSYS exists
QS exists
SH exists
DBSNMP exists

C:\pete_finnigan_com_ltd\presentations\tools\oak>
```

From
http://www.databasesecurity.com/dbsec/OAK.zip

Default Password Check

```
SQL> select * from dba_users_with_defpwd;

USERNAME
------------------------------
DIP
MDSYS
WK_TEST
CTXSYS
OUTLN
EXFSYS
MDDATA
ORDPLUGINS
ORDSYS
XDB
SI_INFORMTN_SCHEMA
WMSYS

12 rows selected.
```

Alternative is to use woraauthbf with a default file

See
http://www.petefinnigan.com/default/default_password_list.htm

11g Uses the old 10gR2 hash

No passwords available

690 records in the table

Remember if found you would still need to resolve the case sensitive password in 11g if its not all one case

Can implement your own version of the same

Password Cracker (1)

Run in SQL*Plus

```
Select u.name||':'||u.password
    ||':'||substr(u.spare4,3,63)
    ||':'||d.name||':`
    ||sys_context('USERENV','SERVER_HOST')||':'
from sys.user$ u, sys.V_$DATABASE d where u.type#=1;
```

Create a text file with the results – mine is called 11g_test.txt

```
SCOTT:9B5981663723A979:71C46D7FD2AB8A607A93489E899C0
    8FFDA75B147030761978E640EF57C35:ORA11G:vostok:
```

Then run the cracker

Password Cracker (2)

```
C:\WINDOWS\system32\cmd.exe                                              _ □ ×

C:\laszlo\release_code_cracker\woraauthbf_0.2>woraauthbf -p 11g_test2.txt -t 11g
10g -m 5 -c alphanum
The number of processors: 2
Number of pwds to check: 60466176
Number of pwds to check by thread: 30233088
Password file: 11g_test2.txt, charset: alphanum, maximum length: 5, type: 11g10g

Start: 0 End: 30233088
Start: 30233088 End: 60466176
Password found: SCOTT:Cra3k:ORA11G:vostok
Elpased time: 11s
Checked passwords: 11070392
Password / Second: 1000200

C:\laszlo\release_code_cracker\woraauthbf_0.2>_
```

As you can see the password is found – running at over 1million hashes per second

Woraauthbf can also be used to crack from authentication sessions

Woraauthbf can be used in dictionary or brute force mode

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SYSDBA Brute Force

```
C:\tools\brute_wright>orabrute 127.0.0.1 152
2 ora10gr2 100
Orabrute v 1.2 by Paul M. Wright and David J. Morgan:
orabrute <hostip> <port> <sid> <millitimewait>sqlplus.exe -S -L
    "SYS/AASH@127.0.0.1:1522/ora10gr2" as sysdba @selectpassword.sql


NAME                               PASSWORD
------------------------------     -------------------------------
SYS                                B024681DBF11A33E
PUBLIC
CONNECT
RESOURCE
DBA
SYSTEM                             D4DF7931AB130E37
SELECT_CATALOG_ROLE
EXECUTE_CATALOG_ROLE
DELETE_CATALOG_ROLE
EXP_FULL_DATABASE
IMP_FULL_DATABASE
```

http://www.ngssoftware.com/research/papers/
oraclepasswords.zip

Listener Check

Works with 10gR2

Can enumerate SIDS using TNS commands

From: http://www.integrigy.com/downloads/lsnrcheck.exe

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Sample Audit Checks Using SCUBA

http://www.imperva.com/application_defense_center/scuba/

Sample Audit Checks Using SCUBA

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Sample Audit Checks Using SCUBA

Copyright (c) 2007
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CIS Benchmark

The Center for Internet Security – Scoring Tool

File   Scoring   Reporting   Benchmarks   Help

Score

Scoring

SID: ora92

Oracle User: SYSTEM

Password: *****

Owner Username: Administrator

DBA Group: ORA_DBA

Options

☐ OAS SSL

☐ OAS Native Security

Level 1

Host Files	3.97
Database Access	4.91
Policy and Procedure	0.81
Total	3.20

Level 2

Host Files	2.14
Database Access	1.00
Policy and Procedure	2.56
Total	1.91

Appendix A

Additional Settings	0.00

100% complete (269/269)

CIS Benchmark

Scoring Results

File

Action:
os_authent_prefix="" (A null string)

Comments:
Setting this ensures that the only way an account can be used externally is by specifying IDENTIFIED EXTERNALLY when creating a user.

Failed Results:
os_authent_prefix is not a null string ("") in init.ora.

Item #: 1.22   **Status:** passed
Configuration Item:
init.ora
Action:
os_roles=FALSE
Comments:
O/S roles are subject to control outside the database. This separates the duties and responsibilities of DBAs and system administrators.
Item #: 1.23   **Status:** passed
Configuration Item:
init.ora

http://www.cisecurity.org/bench_oracle.html

Action:
Settings for utl_file_dir parameter should avoid certain directories (see comments)
Comments:
Do not use the following settings: - "*" - Allows access to any fileAny trace file directories - Critical information could be read - "." - Allows access to the current directory - Location of the core dump trace files - Critical information could be read

OScanner

```
C:\WINDOWS\system32\cmd.exe                                          _ □ ×

C:\pete_finnigan_com_ltd\presentations\tools\cqure\oscanner_bin>oscanner -s 127.
0.0.1 -P 1521
Oracle Scanner 1.0.6 by patrik@cqure.net
--------------------------------------------------------------------------------
[-] Checking host 127.0.0.1
[-] Checking sid (ora92) for common passwords
[-] Account CTXSYS/CTXSYS is locked
[-] Account DBSNMP/DBSNMP found
[-] Enumerating system accounts for SID (ora92)
[-] Succesfully enumerated 30 accounts
[-] Account HR/HR is locked
[-] Account MDSYS/MDSYS is locked
[-] Account OE/OE is locked
[-] Account OLAPSYS/MANAGER is locked
[-] Account ORDPLUGINS/ORDPLUGINS is locked
[-] Account ORDSYS/ORDSYS is locked
[-] Account OUTLN/OUTLN is locked                  http://www.cqure.net/wp/?page
[-] Account PM/PM is locked                        _id=3
[-] Account QS/QS is locked
[-] Account QS_ADM/QS_ADM is locked
[-] Account QS_CB/QS_CB is locked
[-] Account QS_CBADM/QS_CBADM is locked
[-] Account QS_CS/QS_CS is locked
[-] Account QS_ES/QS_ES is locked
[-] Account QS_OS/QS_OS is locked
[-] Account QS_WS/QS_WS is locked
[-] Account RMAN/RMAN is locked
[-] Account SH/SH is locked
[-] Account WKSYS/WKSYS is locked
[-] Checking user supplied passwords against sid (ora92)
[-] Checking user supplied dictionary
[-] Account WMSYS/WMSYS is locked
[-] Account XDB/XDB is locked
[-] Account WKPROXY/WKPROXY is locked
[-] Account ODM/ODM is locked
[-] Account ODM_MTR/ODM_MTR is locked
[-] Querying database for version information

C:\pete_finnigan_com_ltd\presentations\tools\cqure\oscanner_bin>dir /p
```

PL/SQL Scripts

```
Oracle SQL*Plus                                                    _|□|×|
File  Edit  Search  Options  Help

find_all_privs: Release 1.0.7.0.0 - Production on Sat Nov 10 10:37:41 2007
Copyright (c) 2004 PeteFinnigan.com Limited. All rights reserved.


NAME OF USER TO CHECK                   [ORCL]: SCOTT
OUTPUT METHOD Screen/File                [S]: S
FILE NAME FOR OUTPUT              [priv.lst]:
OUTPUT DIRECTORY [DIRECTORY  or file (/tmp)]:

User => SCOTT has been granted the following privileges
======================================================================
        ROLE => APP_ROLE which contains =>
                ROLE => MAN_ROLE which contains =>
                        SYS PRIV => EXECUTE ANY PROCEDURE grantable => NO
                SYS PRIV => ALTER USER grantable => NO
                SYS PRIV => SELECT ANY TABLE grantable => NO
                TABLE PRIV => SELECT object => SYS.DBA_USERS grantable => NO
        ROLE => CONNECT which contains =>
                SYS PRIV => CREATE SESSION grantable => NO
        ROLE => RESOURCE which contains =>
                SYS PRIV => CREATE CLUSTER grantable => NO
                SYS PRIV => CREATE INDEXTYPE grantable => NO
                SYS PRIV => CREATE OPERATOR grantable => NO
                SYS PRIV => CREATE PROCEDURE grantable => NO
                SYS PRIV => CREATE SEQUENCE grantable => NO
                SYS PRIV => CREATE TABLE grantable => NO
                SYS PRIV => CREATE TRIGGER grantable => NO
                SYS PRIV => CREATE TYPE grantable => NO
        SYS PRIV => UNLIMITED TABLESPACE grantable => NO

PL/SQL procedure successfully completed.

For updates please visit http://www.petefinnigan.com/tools.htm

SQL>
```

PL/SQL Scripts (2)

```
Oracle SQL*Plus
File  Edit  Search  Options  Help

FILE NAME FOR OUTPUT                    [priv.lst]:
OUTPUT DIRECTORY [DIRECTORY  or file (/tmp)]:
EXCLUDE CERTAIN USERS                   [N]:
USER TO SKIP                           [TEST%]:

Checking object => SYS.DBA_USERS
==================================================================


Object type is => VIEW (TAB)
        Privilege => SELECT is granted to =>
        Role => APP_ROLE (ADM = NO) which is granted to =>
                User => SCOTT (ADM = NO)
                User => SYSTEM (ADM = YES)
        User => CTXSYS (ADM = NO)
        Role => SELECT_CATALOG_ROLE (ADM = NO) which is granted to =>
                Role => OLAP_USER (ADM = NO) which is granted to =>
                        User => SYS (ADM = YES)
                Role => DBA (ADM = YES) which is granted to =>
                        User => SYS (ADM = YES)
                        User => SYSMAN (ADM = NO)
                        User => SYSTEM (ADM = YES)
                        User => TESTUSER (ADM = NO)
                Role => IMP_FULL_DATABASE (ADM = NO) which is granted to =>
                        User => SYS (ADM = YES)
                        Role => DBA (ADM = NO) which is granted to =>
                                User => SYS (ADM = YES)
                                User => SYSMAN (ADM = NO)
                                User => SYSTEM (ADM = YES)
                                User => TESTUSER (ADM = NO)
                Role => OLAP_DBA (ADM = NO) which is granted to =>
                        Role => DBA (ADM = NO) which is granted to =>
                                User => SYS (ADM = YES)
                                User => SYSMAN (ADM = NO)
                                User => SYSTEM (ADM = YES)
                                User => TESTUSER (ADM = NO)
                        User => OLAPSYS (ADM = NO)
                        User => SYS (ADM = YES)
                User => SH (ADM = NO)
                Role => EXP_FULL_DATABASE (ADM = NO) which is granted to =>
                        Role => DBA (ADM = NO) which is granted to =>
                                User => SYS (ADM = YES)
                                User => SYSMAN (ADM = NO)
                                User => SYSTEM (ADM = YES)
                                User => TESTUSER (ADM = NO)
                        User => SYS (ADM = YES)
        User => SYS (ADM = YES)
        User => IX (ADM = NO)
```

Conclusions

- Looked at where to find Oracle security tools
- Look at the types of tools and categorized them
- Considered free and commercial tools
- Looked at protecting against Oracle Security tools
- A quick look at what Oracle provides
- Demonstrated some of the key tools that can be used
- The free tools tend to occupy the enumerate, test and scan areas

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Any Questions?

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```
create or replace function log_start(fv_path
return utl_file.file_type is
 lv_fptr utl_file.file_type:=null;
 lv_module varchar2(100):='log_start';
begin
 dbms_output.disable;
```

Oracle Security Expertise

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