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Oracle Security MasterClass

By

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# Introduction – About Me

- PeteFinnigan.com Limited
- Founded February 2003
- CEO Pete Finnigan
- Clients UK, States, Europe
- Specialists in researching and securing Oracle databases
- [http://www.petefinnigan.com](http://www.petefinnigan.com)
- Consultancy and training available
- Author of Oracle security step-by-step
- Published many papers, regular speaker (UK, USA, Slovenia, Norway, Iceland, more)
- Member of the Oak Table
Agenda

- Introduction
- Demonstration of how to hack Oracle
- Summary of the issues found during the demo
- Why a database must be secured
- Basic Oracle security tenets
- Conclusions
Demonstration

• Hacking an Oracle database to “steal”
The Issues

- Access is available to the database
- Credentials are guessable
- Default accounts have access to critical data
- Critical data is easy to find
- Poor, weak encryption and protection used
- This is reality, this is what Oracle database security REALLY looks like!!
What Is Oracle Security?

• Performing a security audit of an Oracle database?
• Securely configuring an Oracle database?
• Designing a secure Oracle system before implementation?
• Using some of the key security features
  – Audit, encryption, RBAC, FGA, VPD…
• Oracle security is about all of these
  – It is about creating a secure database
  – Storing critical / valuable data securely
The Basic Tenets Of Oracle Security

- Reduce the version / installed product to that necessary
- Reduce the users / schemas
- Reduce and design privileges to least privilege principal
- Lock down direct access
- Lock down basic configurations
- Audit
- Clean up
Why Do Hackers Steal Data?

- Data is often the target now, not system access; this can be for:
- Identity theft to clone identities
- Theft of data to access money / banks
- [http://www.petefinnigan.com/weblog/archives/00001129.htm](http://www.petefinnigan.com/weblog/archives/00001129.htm) - 25 million child benefit identities lost on two discs (not stolen but lost)
- Insider threat is now greater than external threats
Internal Or External Attacks

- Internal attacks are shown to exceed external attacks in many recent surveys.
- The reality is likely to be worse as surveys do not capture all details or all companies.
- With Oracle databases external attacks are harder and are likely to involve:
  - Application injection or
  - Buffer Overflow or
  - Protocol attacks
- Internal attacks could use any method for exploitation. The issues are why:
  - True hackers gain access logically or physically
  - Power users have too many privileges
  - Development staff
  - DBA’s
How Easy Is It To Attack?

- Many and varied – the world is your lobster
- Passwords are the simplest – find, guess, crack
- Bugs that can be exploited
- SQL injection
- Denial of Service
- Exploit poor configuration – access OS files, services
- Network protocol attacks
- Buffer overflows, SQL buffer overflows
- Cursor injection
- ?
Stay Ahead Of The Hackers

• When deciding what to security audit and how to security audit a database you must know what to look for:
  – Existing configuration issues and vulnerabilities are a target
  – Remember hackers don’t follow rules
  – Combination attacks (multi-stage / blended) are common

• The solution: Try and think like a hacker – be suspicious
General Oracle Security Info

- Vulnerabilities and exploits:
  - SecurityFocus – [www.securityfocus.com](http://www.securityfocus.com)
  - Milw0rm – [www.milw0rm.com](http://www.milw0rm.com)
  - PacketStorm – [www.packetstorm.org](http://www.packetstorm.org)
  - FrSirt – [www.frsirt.com](http://www.frsirt.com)
  - CERT – [www.kb.cert.org/vulns](http://www.kb.cert.org/vulns)

  - Who_has scripts, CIS benchmark, Scuba, rorascanner, Metacortex, cqure, many more

- Papers, blogs, forums, books
- Checklists
  - CIS Benchmark - [http://www.cisecurity.org/bench_oracle.html](http://www.cisecurity.org/bench_oracle.html)

- Websites – petefinnigan.com, cqure, RDS, Argeniss, databasesecurity.com
A Poll

• Please join in and answer the Poll question
The Access Issue

• A database can only be accessed if you have three pieces of information
  – The IP Address or hostname
  – The Service name / SID of the database
  – A valid username / password

• Lots of sites I see:
  – Deploy tnsnames to all servers and desktops
  – Allow access to servers (no IP blocking)
  – Create guessable SID/Service name
  – Don’t change default passwords or set weak ones
What to Look For (First?)

- Perform a password audit – use a tool such as worauthbf – http://www.soonerorlater.hu/index.khtml?article_id=513
- Reduce network access and leakage
- Review the listener
- File system
  - look for passwords
  - permissions
- Audit basic configuration
  - Parameters
  - User accounts that exist
  - Privileges on objects
  - Privileges assigned to users
- Tools: Use one of the free tools – CIS, OScanner, rorascanner
- Or one of my scripts, who_can_access.sql, find_all_privs.sql, who_has_role.sql, who_has_priv.sql – see http://www.petefinnigan.com/tools.htm
Access To Key Data (DBA_USERS)

Object type is -> VIEW (TAB)
Privilege -> SELECT (ADM = NO) which is granted to ->
  Role -> APP_ROLE (ADM = NO) which is granted to ->
    User -> SCOTT (ADM = NO)
    User -> SYSTEM (ADM = YES)
User -> CTLSYS (ADM = NO)
Role -> SELECT_DATABASE_ROLE (ADM = NO) which is granted to ->
  Role -> ODLAP_USER (ADM = NO) which is granted to ->
    User -> SYS (ADM = YES)
Role -> DBA (ADM = YES) which is granted to ->
  User -> SYS (ADM = YES)
User -> SYSHAH (ADM = NO)
User -> SYSTEM (ADM = YES)
User -> TESTUSER (ADM = NO)
Role -> IMP_FULLDATABASE (ADM = NO) which is granted to ->
  User -> SYS (ADM = YES)
Role -> DBA (ADM = NO) which is granted to ->
  User -> SYS (ADM = YES)
User -> SYSHAH (ADM = NO)
User -> SYSTEM (ADM = YES)
User -> TESTUSER (ADM = NO)
Role -> ODLAP_DBA (ADM = NO) which is granted to ->
  Role -> DBA (ADM = NO) which is granted to ->
    User -> SYS (ADM = YES)
User -> SYSHAH (ADM = NO)
User -> SYSTEM (ADM = YES)
User -> TESTUSER (ADM = NO)
User -> ODLAPSYS (ADM = NO)
User -> SYS (ADM = YES)
User -> SM (ADM = NO)
Role -> EXP_FULLDATABASE (ADM = NO) which is granted to ->
  Role -> DBA (ADM = NO) which is granted to ->
    User -> SYS (ADM = YES)
User -> SYSHAH (ADM = NO)
User -> SYSTEM (ADM = YES)
User -> TESTUSER (ADM = NO)
User -> SYS (ADM = YES)
User -> IX (ADM = NO)
Run in SQL*Plus

```sql
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:9B5981663723A979:71C46D7FD2A8A607A93489E899C08FFDA75B147030761978E640EF57C35:ORA11G:vostok:
```

Then run the cracker

Password Cracker (1)

http://soonerorlater.hu/download/woraauthbf_src_0.2.zip

http://soonerorlater.hu/download/woraauthbf_0.2.zip
Password Cracker (2)

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

Worauthbf can also be used to crack from authentication sessions

Worauthbf can be used in dictionary or brute force mode

Use it to check user=pwd and defaults
Role Based Access (RBAC)

- Review the complete RBAC model
- Understand default schemas installed and why
- Understand the application schemas
  - Privileges, objects, resources
- Understand which accounts are Admin / user / Application Admin etc
  - Consider privileges, objects, resources
- Lock accounts if possible
  - Reduce attack surface
Secure Listener by Default?

STATUS of the LISTENER
------------------------
Alias LISTENER
Version TNSLSNR for Linux: Version 11.1.0.6.0 - Production
Start Date 31-OCT-2007 09:06:14
Uptime 0 days 4 hr. 56 min. 27 sec
Trace Level off
Security ON: Local OS Authentication
SNMP OFF
Listener Parameter File /oracle/11g/network/admin/listener.ora
Listener Log File /oracle/diag/tnslsnr/vostok/listener/alert/log.xml
Listening Endpoints Summary...
  (DESCRIPTION=(ADDRESS=(PROTOCOL=ipc)(KEY=EXTPROC1521)))
  (DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=vostok)(PORT=1521)))
Services Summary...
Service "ORA11G" has 1 instance(s).
  Instance "ORA11G", status READY, has 1 handler(s) for this service...
Service "ORA11GXDB" has 1 instance(s).
  Instance "ORA11G", status READY, has 1 handler(s) for this service...
Service "ORA11G_XPT" has 1 instance(s).
  Instance "ORA11G", status READY, has 1 handler(s) for this service...
Clean Up

• This is the security killer in most systems I see
• Often file systems include
  – Scripts with passwords
  – Use tools such as
    • Oracle Password Repository
    • DBMS_JOBS, DBMS_SCHEDULER
    • OS authenticated users under certain circumstances
• Clean up all of the
  – ad-hoc scripts
  – Maintenance evidence
  – Trace files
  – Data files, exports..
  – Audit logs..
Defaults

• Defaults are one of the biggest issues in Oracle
• Most default accounts in any software
• Tens of thousands of public privileges granted
• Many default roles and privileges
  – Many application developers use default Roles unfortunately
• Reduce the Public privileges as much as possible
• Do not use default accounts
• Do not use default roles including DBA
• Do not use default passwords
The Public Issue

• Just some examples not everything!
• Public gets bigger – (figures can vary based on install)
  – 9iR2 – 12,132
  – 10gR2 – 21,530 – 77.4% more than 9iR2
  – 11gR1 – 27,461 – 27.5% more than 10gR2
• Apex is installed by default in 11g
  – Good example of attack surface increase – BAD!
  – Unless you are writing an Apex application you don’t need it
  – There are other examples as well
• More default users with each version!
Database Configuration

• Default database installations cause some weak configurations

• Review all
  – configuration parameters
  – File permissions

• Some examples
  – No audit configuration by default (fixed in 10gR2 for new installs)
  – No password management (fixed in 10gR2 new installs)
Get The Basics Right

- OK, we have covered a lot of information
- Concentrate on
  - Checking users passwords
  - Removing default schemas and software not needed
  - Reduce leakage of critical data (passwords and more) from the database and filesystems
<table>
<thead>
<tr>
<th>Get The Basics Right (2)</th>
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<tbody>
<tr>
<td>• Don’t leak network data to allow connection attempts</td>
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<tr>
<td>• Use firewalls or valid node checking to protect the database</td>
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<tr>
<td>• Review privileges and access to key data</td>
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<td>• Confirm key configuration is set correctly</td>
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Conclusions

• We didn’t mention CPU’s – Apply them – they are only part of the process
• Think like a hacker
• Get the basics right first – stop connections to the database or cracking
• Sort out the RBAC, configuration, installed software and privileges
• Use audit / IDS / IPS solutions
Any Questions?
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