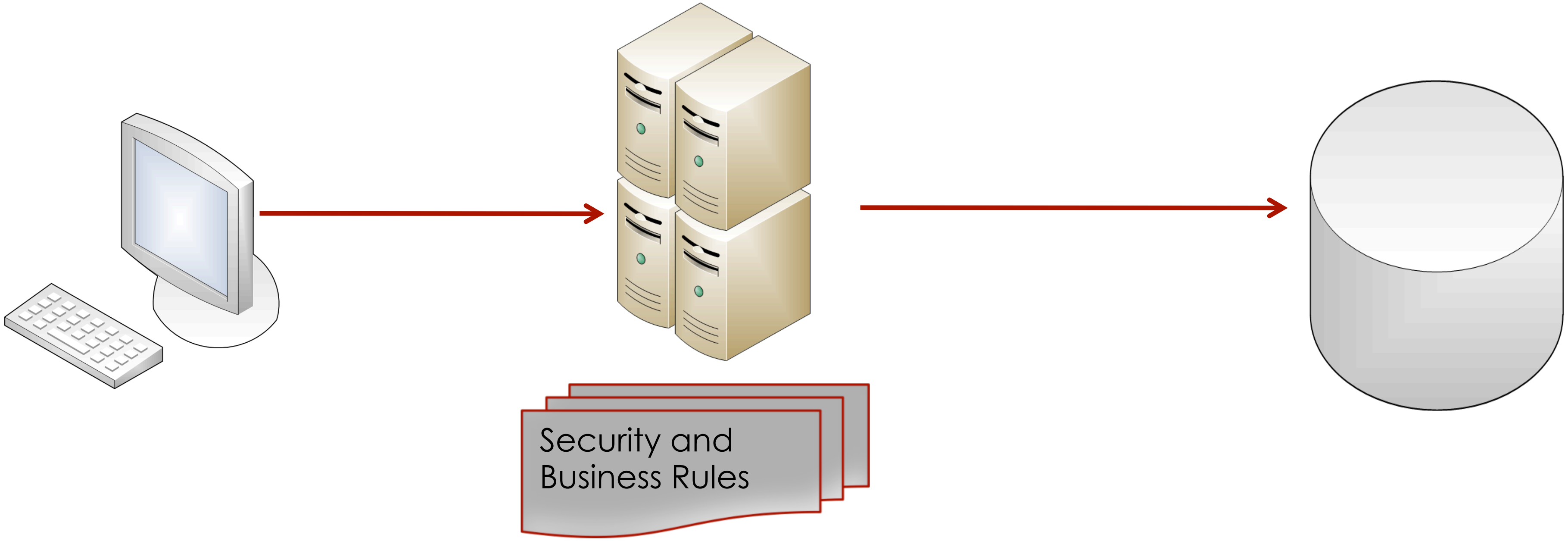
Live-Hacking von Oracle-Datenbanken

Agenda

- Introduction
- Typical Database Attackers
- Exploits
- Countermeasure

Databases in the real world

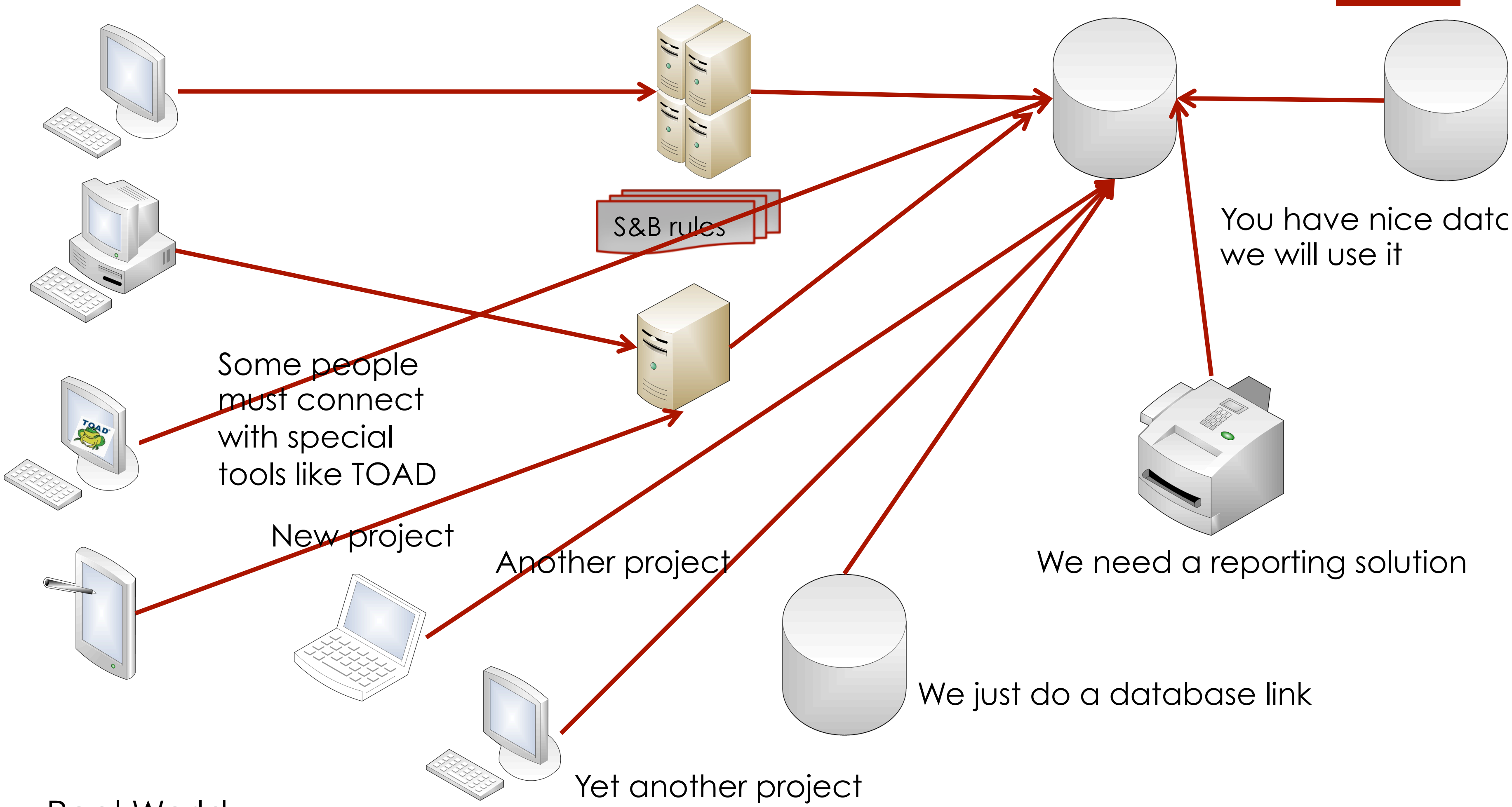
The ivory tower architecture



Simple architecture

- Clients accessing a database via application server
- No direct access to the database
- Security and business rules are enforced in the application server
- Password change on database and application server

The ivory tower solution in the real world



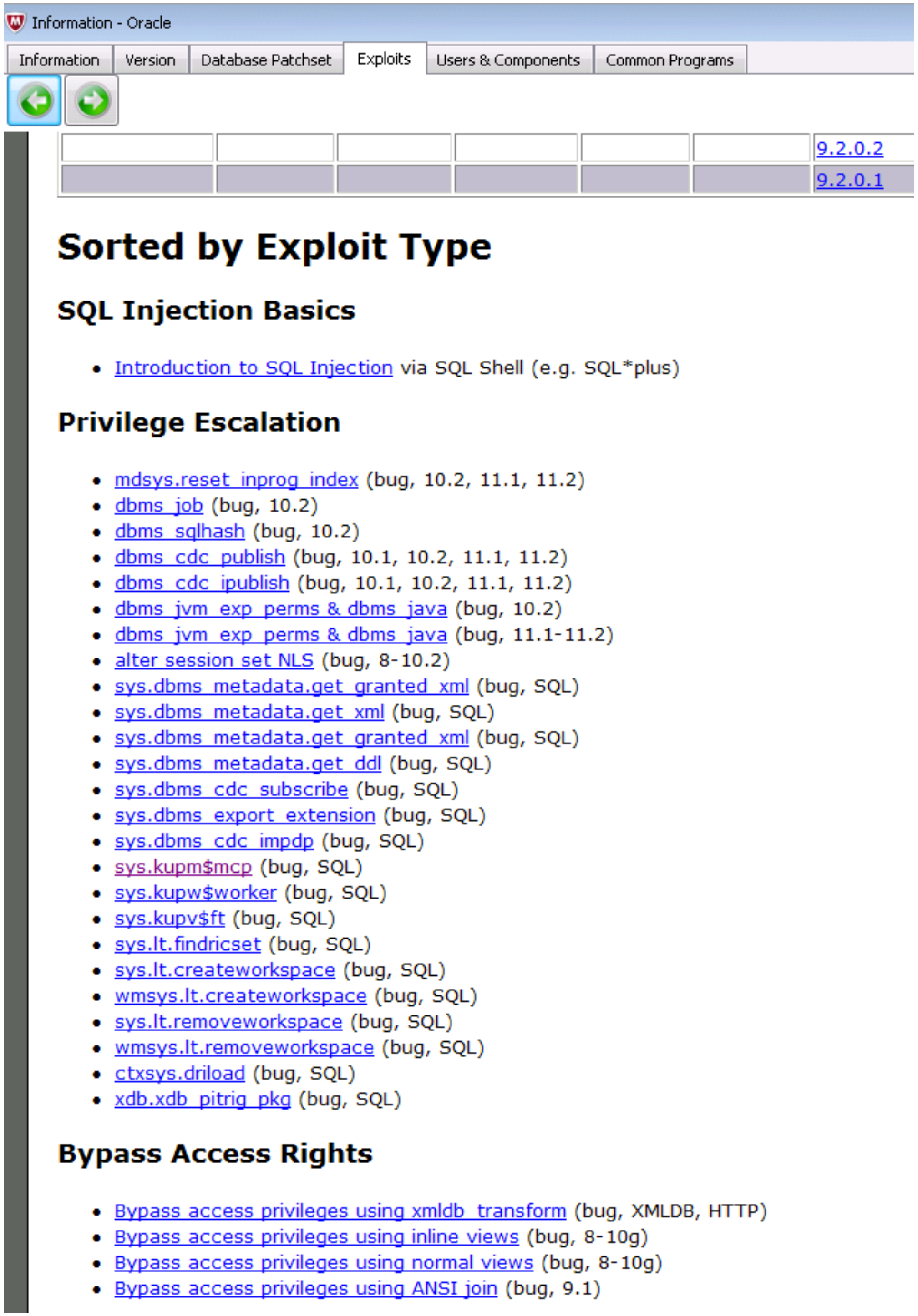
Real World

- Complex architecture
- All types of clients are accessing the database
- Security and business rules only enforced in the first application server
- Passwords are stored in many places. Normally not documented

How difficult is it to hack an Oracle database?

It depends...

- Easy:
  - Old or unpatched versions
  - Database not hardened (weak passwords, unsecure code, ...)
  - Many exploits
- Difficult:
  - Latest, fully patched version
  - Hardened database
  - Database Activity Monitoring running
  - Custom exploit needed



						9.2.0.2
						9.2.0.1

Sorted by Exploit Type

SQL Injection Basics

- Introduction to SQL Injection via SQL Shell (e.g. SQL*plus)

Privilege Escalation

- mdsys.reset_inprog_index (bug, 10.2, 11.1, 11.2)
- dbms_job (bug, 10.2)
- dbms_sqlhash (bug, 10.2)
- dbms_cdc_publish (bug, 10.1, 10.2, 11.1, 11.2)
- dbms_cdc_ipublish (bug, 10.1, 10.2, 11.1, 11.2)
- dbms_jvm_exp_perms & dbms_java (bug, 10.2)
- dbms_jvm_exp_perms & dbms_java (bug, 11.1-11.2)
- alter session set NLS (bug, 8-10.2)
- sys.dbms_metadata.get_granted_xml (bug, SQL)
- sys.dbms_metadata.get_xml (bug, SQL)
- sys.dbms_metadata.get_granted_xml (bug, SQL)
- sys.dbms_metadata.get_ddl (bug, SQL)
- sys.dbms_cdc_subscribe (bug, SQL)
- sys.dbms_export_extension (bug, SQL)
- sys.dbms_cdc_impdp (bug, SQL)
- sys.kupm$mcp (bug, SQL)
- sys.kupw$worker (bug, SQL)
- sys.kupv$ft (bug, SQL)
- sys.lt.findricset (bug, SQL)
- sys.lt.createworkspace (bug, SQL)
- wmsys.lt.createworkspace (bug, SQL)
- sys.lt.removeworkspace (bug, SQL)
- wmsys.lt.removeworkspace (bug, SQL)
- ctxsys.driload (bug, SQL)
- xdb.xdb_pitrig_pkg (bug, SQL)

Bypass Access Rights

- Bypass access privileges using xmldb_transform (bug, XMLDB, HTTP)
- Bypass access privileges using inline views (bug, 8-10g)
- Bypass access privileges using normal views (bug, 8-10g)
- Bypass access privileges using ANSI join (bug, 9.1)

Who attacks a database?

Classifcation of Attackers

- Curious DBA or Employee
- Criminal employee
- Leaving employee
- External hacker
- Intelligence agency / Organized crime

Curious DBA or Employee

- **Type:** Curious DBA or employee
- **Scenario:** Interested in private/ sensitive information.
- **Samples:**
  - Looking up for salary of colleagues, private numbers, emails, account status of politician,…
  - Supporting private investigators (PI)
- **Known incidents:** Miles & More (Employee was looking up politicians)
- **Identification:** Mostly select statements, Few/No traces without audit, Difficult to spot

Curious DBA or Employee

Example:

- Search data of colleagues

  SQL> select * from hr.emp
  where salary > 10000;

Example:

- Search data of celebrities

  SQL> select * from customers
  where lastname='Cruiser'
  and prename = 'Tom';

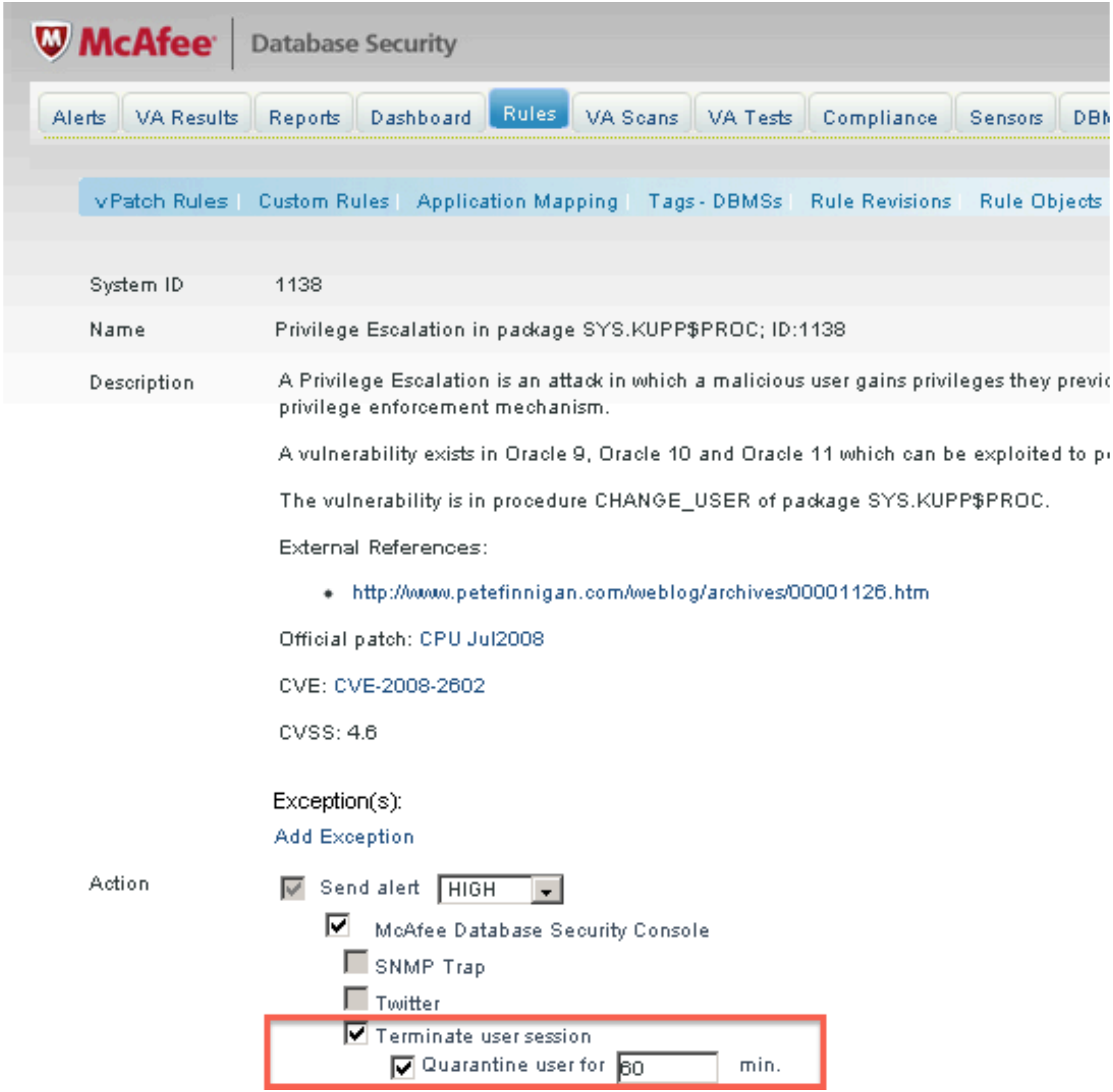
  Tom Cruiser, 27.12.1963,
  Account 123,123.00

Curious DBA or Employee

Example: (Demo)

- Change identity (all versions of Oracle)

```
SQL> exec kupp$proc.change_user(‘HR’);
```



System ID 1138

Name Privilege Escalation in package SYS.KUPP$PROC; ID:1138

Description A Privilege Escalation is an attack in which a malicious user gains privileges they previ privilege enforcement mechanism.

A vulnerability exists in Oracle 9, Oracle 10 and Oracle 11 which can be exploited to p

The vulnerability is in procedure CHANGE_USER of package SYS.KUPP$PROC.

External References:

- http://www.petefinnigan.com/weblog/archives/00001126.htm

Official patch: CPU Jul2008

CVE: CVE-2008-2602

CVSS: 4.6

Exception(s):

Add Exception

Action

☑ Send alert HIGH

☑ McAfee Database Security Console

□ SNMP Trap

□ Twitter

☑ Terminate user session

☑ Quarantine user for 60 min.

Countermeasure

- Use McAfee Database Activity Monitoring to audit sensitive data
- Use and audit fake data (honey table) to catch curious people

Criminal Employee

- **Type:** Criminal employee
- **Scenario:** Interested to earn money, damage the company, blackmail, ….
- **Samples:**
  - Getting insider information (stocks, merger&acquisition)
  - Get company secrets (formulas, algorithm, source code, …)
  - Blackmailing companies (with customer data, e.g. black money)
  - Reset bills of friends and families
- **Known incidents:** LGT Bank Liechtenstein, Coca Cola recipe, …
- **Identification:** Attackers invest time/ resources to hide, modifying data (invoice), Longer period affected

Example

- Reset bill of friends aka “Friends & Family”

  ```
  SQL> update billing set amount=34 where userid=47111;
  ```

  ➔ Monitor direct updates without using the application

- Change Health Insurance account number and bypass SAP completely

```
SQL> update sapr3.tsd1k
set blzzs='50550020' , KNRZS = '35921'
where KUSCH=17;
```

  ➔ Monitor the integrity of sensitive data

Example 3

It is normally easy to follow financial transactions. That's a challenge in (perfect) computer crimes. The following approach steals money without leaving financial traces. The attacker is not stealing money, instead of he is deleting his debts.

- Apply for credit for a house (e.g. 350,000 EUR)
- Get the money from the bank and buy the house
- Pay the rates for the credit for a few months.
- Set the credit to zero.

Countermeasure

Example:

- Use McAfee Database Activity Monitoring to audit/monitor sensitive data
- Use McAfee Security Scanner for Databases to search sensitive data (Data Discovery)

Leaving Employees

- **Type:** Leaving employees
- **Scenario:** Get as much data/ information for the new job as possible. Most common attack
- **Samples:**
  - Export the production database
  - Get customer reports, pricelists, …
- **Identification:** Longer timeframe (1-3 month before they left the company), no/little experience in removing traces

Leaving Employees

Example

- Extract sensitive data (e.g. using Excel, normal reports…)

  ```
  select * from customers
  ```

- Export entire Database (especially developers)

  ```
  exp.exe userid=grips/grips@grips full=y
  ```

Countermeasure

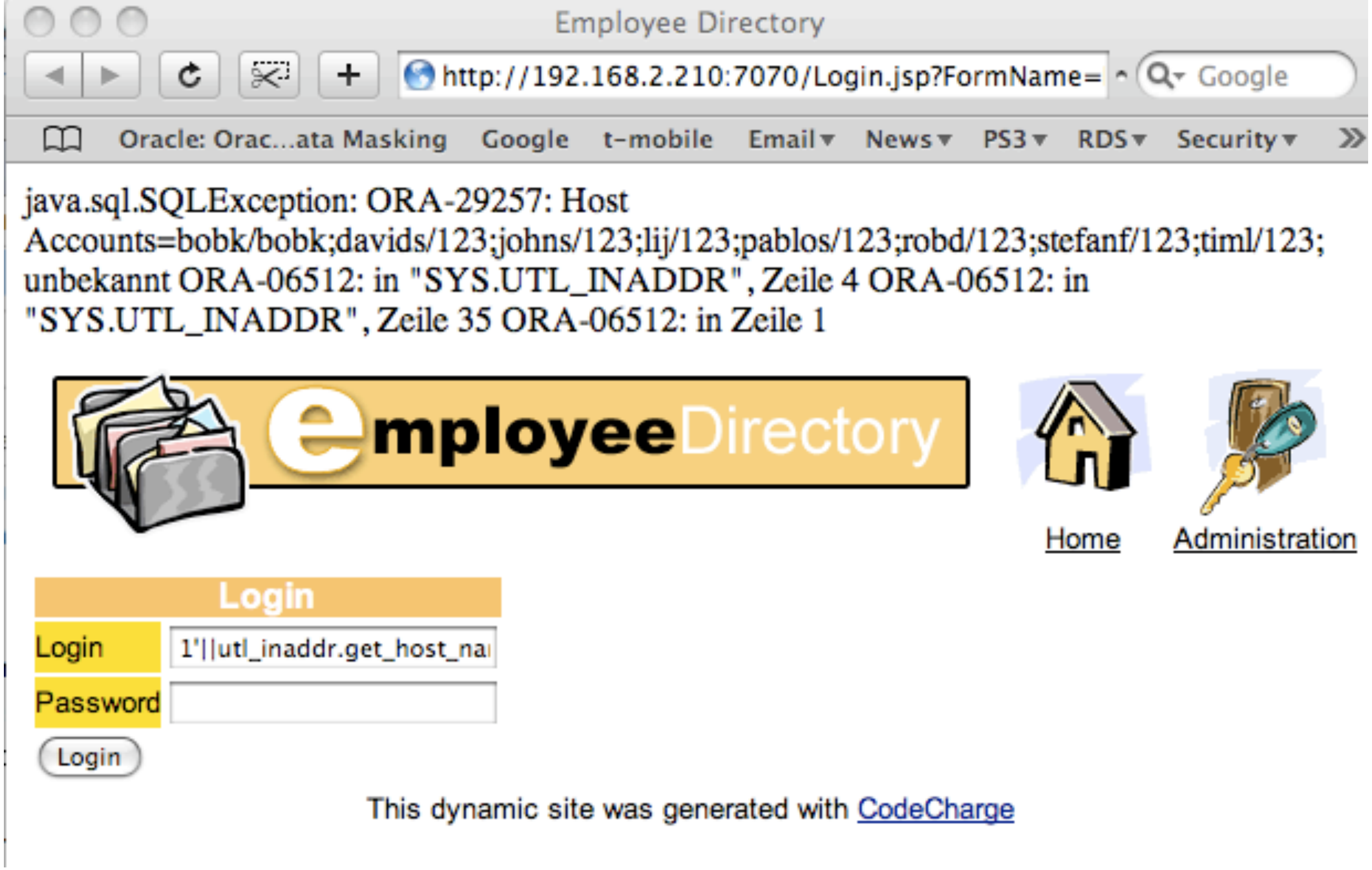
Example:

- Use McAfee Database Activity Monitoring to audit sensitive data or export utilities

External Hacker

- **Type:** External Hacker
- **Scenario:** Steal interesting stuff.
- **Samples:**
  - Steal data for a competitor
  - Steal credit card information
  - Steal Source Code
  - Break in just for fun
- **Known Incidents:**
  - TJX, Cardsystems, Cisco Sourcecode, …
  - **Identification:** Many traces on the way into the system, attackers often lazy

Example – SQL Injection



Employee Directory
http://192.168.2.210:7070/Login.jsp?FormName=
Google
Oracle: Orac...ata Masking
Google
t-mobile
Email
News
PS3
RDS
Security

java.sql.SQLException: ORA-29257: Host Accounts=bobk/bobk;davids/123;johns/123;lij/123;pablos/123;robd/123;stefanf/123;timl/123; unbekannt ORA-06512: in "SYS.UTL_INADDR", Zeile 4 ORA-06512: in "SYS.UTL_INADDR", Zeile 35 ORA-06512: in Zeile 1

Login	
Login	1'||utl_inaddr.get_host_na
Password	

This dynamic site was generated with CodeCharge

Countermeasure

Example

- Use McAfee Database Activity Monitoring to audit sensitive data and typical views/tables used in an attack (e.g. DBA_TAB_COLUMNS)

Intelligence Agency / Organized Crime

- **Type:** Intelligence Agency / Organized Crime
- **Scenario:** Get valuable information (military, economic) to protect the country
- **Samples:**
  - Steal military data
  - Intercept proposals, financial data, …
- **Known Incidents:**
  - Lopez/Volkswagen (CIA), ICE (France), Whitehouse/ Bundestag/… (China)
- **Known Suspects:**
  - China, France, Israel, Russia, US

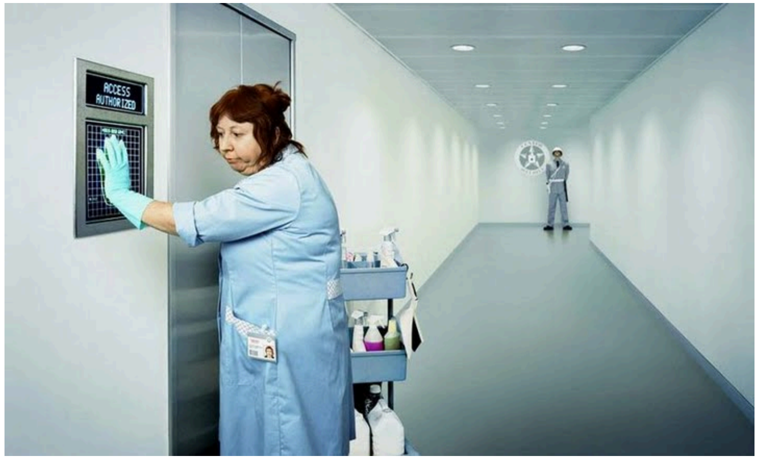
Intelligence Agency / Organized Crime

Examples

- Buy customer list with black money (Germany vs. Liechtenstein/Switzerland)
- Stuxxnet

More information & demos at the McAfee booth…

Thank you



- Contact:

Red-Database-Security GmbH

Bliesstr. 16

D-.66538 Neunkirchen

Germany