Real-Life Database Security Mistakes

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Integrigy Corporation

Session #715

Background

Speaker

Stephen Kost

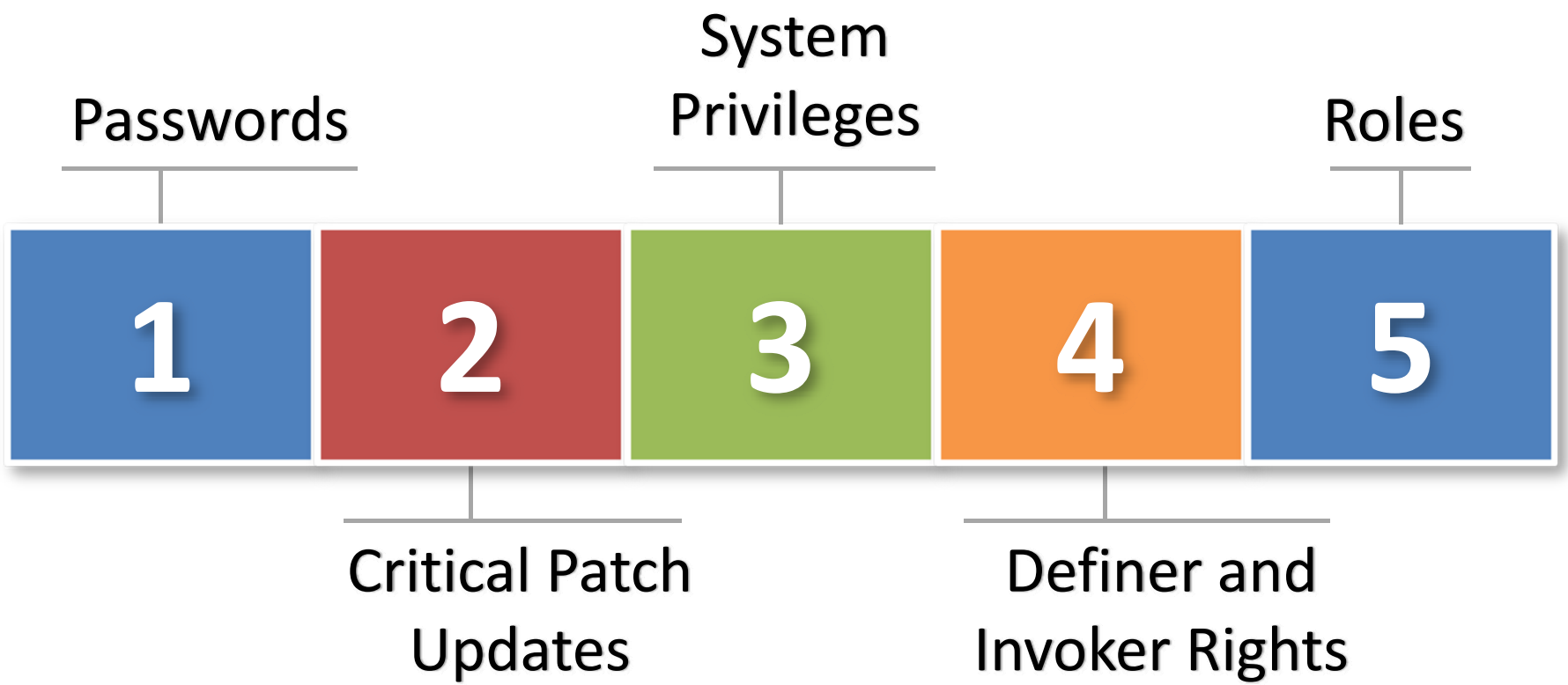
- CTO and Founder
- 16 years working with Oracle
- 12 years focused on Oracle security
- DBA, Apps DBA, technical architect, IT security, …

Company

Integrigy Corporation

- Integrigy bridges the gap between databases and security
- Security Design and Assessment of Oracle Databases
- Security Design and Assessment of the Oracle E-Business suite
- AppSentry – Oracle Database Security Assessment Software Tool

Agenda

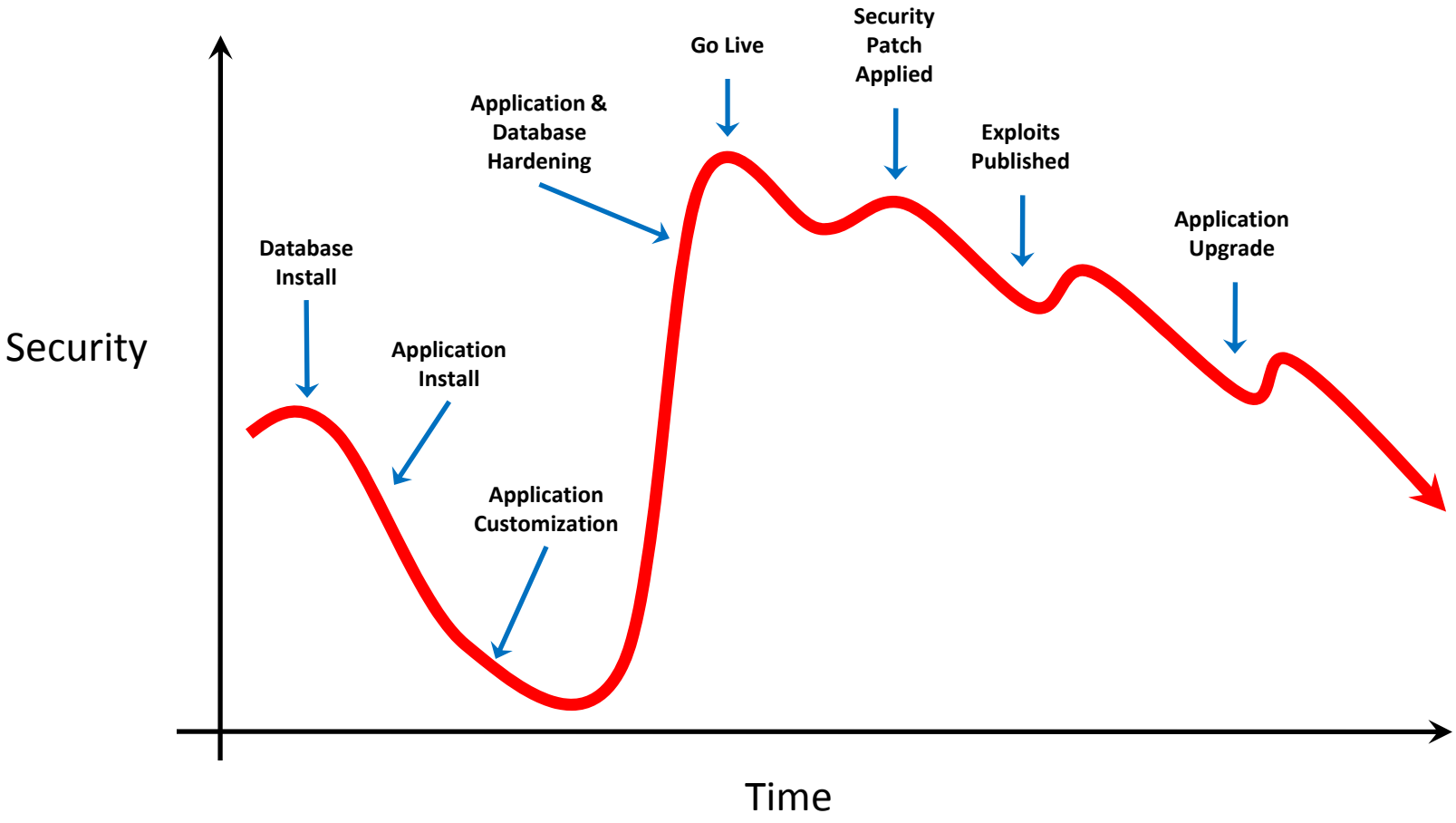

Passwords
System Privileges
Roles
1
2
3
4
5
Critical Patch Updates
Definer and Invoker Rights

Caveats

- The information contained here is generalized across Oracle Database versions platforms and may not be applicable for a specific version or platform
- The scenarios and situations described are from actual customers, although the customers processes and actions may not always be considered best practice

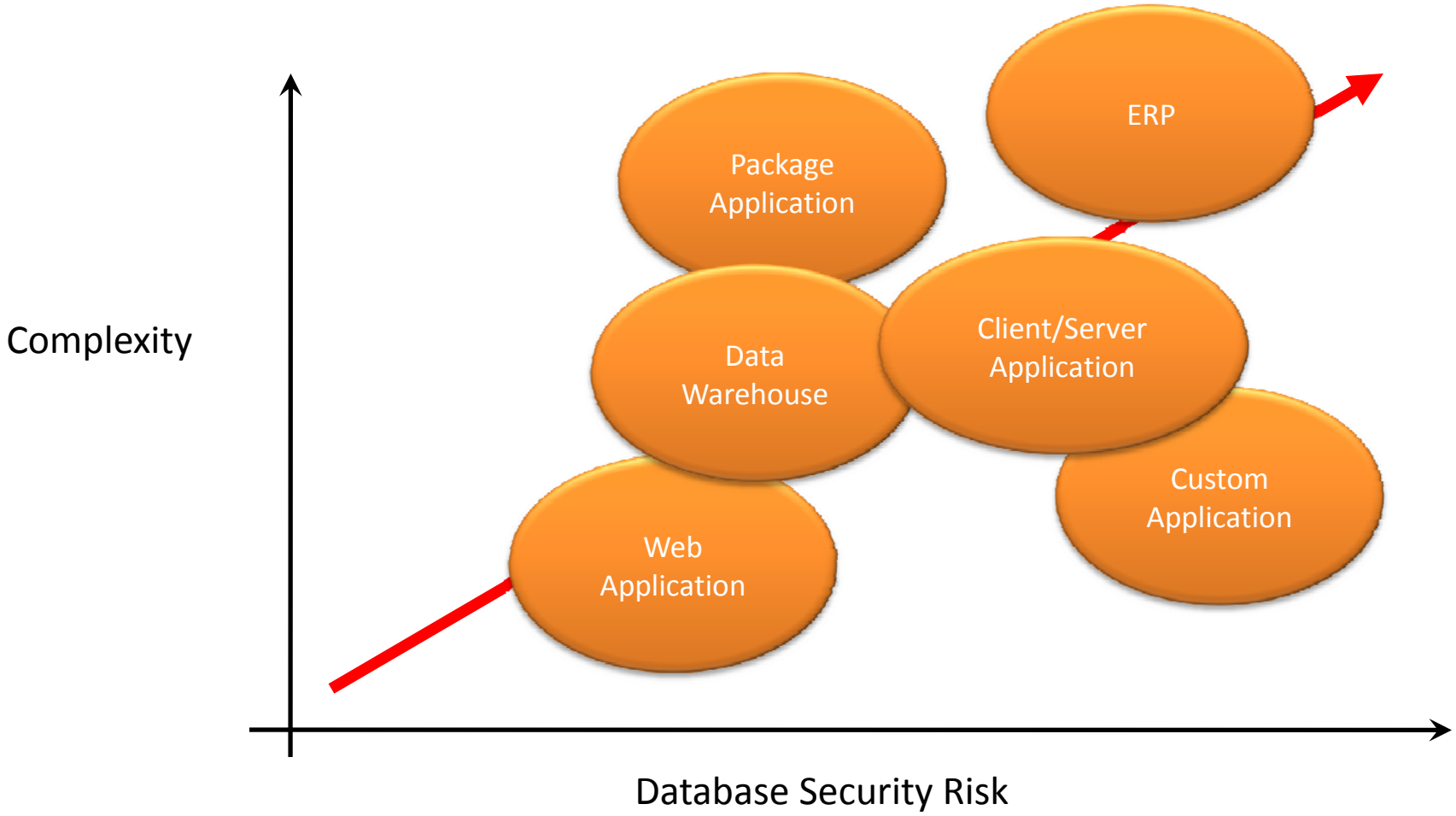
Database Security Decay

Database security decays over time due to complexity, usage, application changes, upgrades, published security exploits, etc.



Complexity and Security are Opposed

The more complex a database and application environment are, the less secure the entire environment will be.



Default Passwords and More Default Passwords

1a

The completely and totally obvious answer –

You never changed the default passwords!

1b – DB Creation DBCA vs. Script

- Using Database Creation Assistant (DBCA), no default passwords are set and/or the accounts are locked/expired
- DBCA can be used to generate a create script in order to recreate the database
  - Depending on version, default passwords may be set
  - Fixed in 11gR1
- Manual database creation using custom scripts may set default database passwords

1c – “How did that get reset!?”

- Default database account passwords like CTXSYS and OUTLN often “magically” get reset to default values
  - As part of application installation or maintenance (i.e., Oracle E-Business Suite)
  - As part of database maintenance (see April 2008 CPU DB13 for DBMS_STATS and OUTLN)

1d – "I checked all the passwords!"

- **Oracle Password Scanner** only checks 683 known accounts for a single password
  - Oracle Metalink Note ID 361482.1
  - Included as part of 11g – dba_users_with_defpwd
  - Oracle's password list has a number of important omissions/errors and does not include many common application accounts
- **Use a tool that checks all password hashes for all accounts against common dictionary words**
  - See http://www.petefinnigan.com/tools.htm for a list of password checking tools
- Use database auditing with "AUDIT USER;" to capture new database accounts and password changes

Default Oracle Password Statistics

Database Account	Default Password	Exists in Database %	Default Password %
SYS	CHANGE_ON_INSTALL	100%	3%
SYSTEM	MANAGER	100%	4%
DBSNMP	**DBSNMP**	**99%**	**52%**
OUTLN	**OUTLN**	**98%**	**43%**
MDSYS	MDSYS	77%	18%
ORDPLUGINS	ORDPLUGINS	77%	16%
ORDSYS	ORDSYS	77%	16%
XDB	CHANGE_ON_INSTALL	75%	15%
DIP	DIP	63%	19%
WMSYS	WMSYS	63%	12%
CTXSYS	**CTXSYS**	**54%**	**32%**

Oracle Database Passwords

- **Standard Oracle passwords are a limited character set**
  - A…Z, 0…9, and _ # $
  - Passwords must start with an alpha character
  - More complex passwords can be set by enclosing the password in double quotes, however, many programs do not support these types of passwords
- **Oracle Password algorithm is published on the Internet**
  - Algorithm uses two cycles of DES encryption with the Username to produce a one-way hash of the password
  - Hash is unique to the username, but common across all versions and platforms of the Oracle database
  - APPS/APPS is always D728438E8A5925E0 in every database

Cracking Database Passwords

- A number of efficient and quick password cracking programs exist for Oracle
  - Speed is around 1 million passwords per second
  - Speed improvements up to 100 times due to technical advances
  - Only the hash and username are required
  - Estimated time to crack a password of x length –

Length	Permutations	Time
1	26 (26)	0 seconds
2	1,040 (26 x 39)	0 seconds
3	40,586 (26 x 39 x 39)	0 seconds
4	1,582,880	1.5 seconds
5	61,732,346	2 minute
6	2,407,561,520	40 minutes
7	93,894,899,306	1 day
8	3,661,901,072,960	42 days
9	142,814,141,845,466	1,600 days
10	5,569,751,531,973,200	64,000 days

Critical Patch Updates

Quiz – Database CPU

ACTION_TIME	ACTION	VERSION	COMMENTS
18-JUN-08 03.13.45.093449 PM	UPGRADE	10.2.0.3.0	Upgraded from 9.2.0.8.0
18-JAN-09 06.51.32.425375 AM	APPLY	10.2.0.4	CPUJan2009
09-APR-09 04.48.14.903718 PM	UPGRADE	10.2.0.4.0	Upgraded from 10.2.0.3.0
18-JUL-09 08.50.30.021401 AM	APPLY	10.2.0.4	CPUJul2009
16-OCT-10 07.18.57.042620 AM	APPLY	10.2.0.4	CPUOct2010
30-OCT-10 06.42.55.108783 AM	UPGRADE	11.1.0.7.0	Upgraded from 10.2.0.4.0

What CPU Level is this database patched to?

A. January 2007

B. January 2009

C. January 2010

D. October 2010

Database Upgrades and CPU Patches

Database Version Upgrade Patch	Latest CPU Patch Included In Upgrade Patch
9.2.0.8	July 2006
10.1.0.5	October 2005
10.2.0.3	October 2006
10.2.0.4	April 2008
10.2.0.5	October 2010
11.1.0.6	October 2007
11.1.0.7	January 2009
11.2.0.1	January 2010
11.2.0.2	January 2011*

2a – CPU Forgotten Steps

- **CPU is two parts –**
  - OPatch to update files in the ORACLE_HOME
  - catcpu.sql to update database objects
- **Some CPUs require additional manual steps –**
  - January 2008 CPU requires all views to be recompiled due view/SQL complier bugs in July 2007 CPU
- **Query SYS.REGISTRY$HISTORY to verify CPU row is present**
  - An indicator CPU patch was successfully applied

2b – CPU Database Upgrades

- **Scenario**
  - Latest CPU patch is applied (July 2010)
  - Upgrade database to new version or patchset (9.2.0.8 to 10.2.0.4 or 10.2.0.3 to 10.2.0.4)
- **Do I have to reapply the latest CPU after the database upgrade?**
  - Yes, you must apply 10.2.0.4 July 2010 patch

2c – CPU Oracle Home vs. DB

- **Scenario**
  - Latest CPU patch is applied (July 2010) to ORACLE_HOME
  - Install a new database from the patched ORACLE_HOME
- **Do I have to run the *catcpu.sql* from the July 2010 CPU?**
  - Yes, a few of the SQL statements in the *catcpu.sql* do not exist as files in the Oracle Home
  - *catcpu.sql* does perform some drops and grants

2d – CPU Oracle Home vs. DBCA

- **Scenario**
  - Latest CPU patch is applied (July 2010) to ORACLE_HOME
  - Install a new database from the patched ORACLE_HOME using **DBCA and a seeded database**
- **Do I have to run the *catcpu.sql* from the July 2010 CPU?**
  - Yes, since the seeded database files are pre-loaded with packages and none of the vulnerable packages would be updated without running *catcpu.sql*

Database Upgrades and CPU Patches

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System Privileges

2a

Create Public Synonym

“Probably not the best, but somewhat innocent, right?”

CREATE object privilege

equals

CREATE AND REPLACE

DBMS_SQL, DBMS_OBFUSCATION_TOOLKIT, DBMS_CRYPTO, …

Other System Privileges

- CREATE ANY <object>
- CREATE PUBLIC DATABASE LINK
- EXECUTE ANY PROCEDURE
- CREATE ANY JOB
- CREATE EXTERNAL JOB

Invoker and Definer Rights

Dear PL/SQL developers,

Definer Rights is Default

By default, stored procedures and SQL methods execute with the privileges of their **owner**, not their current user.

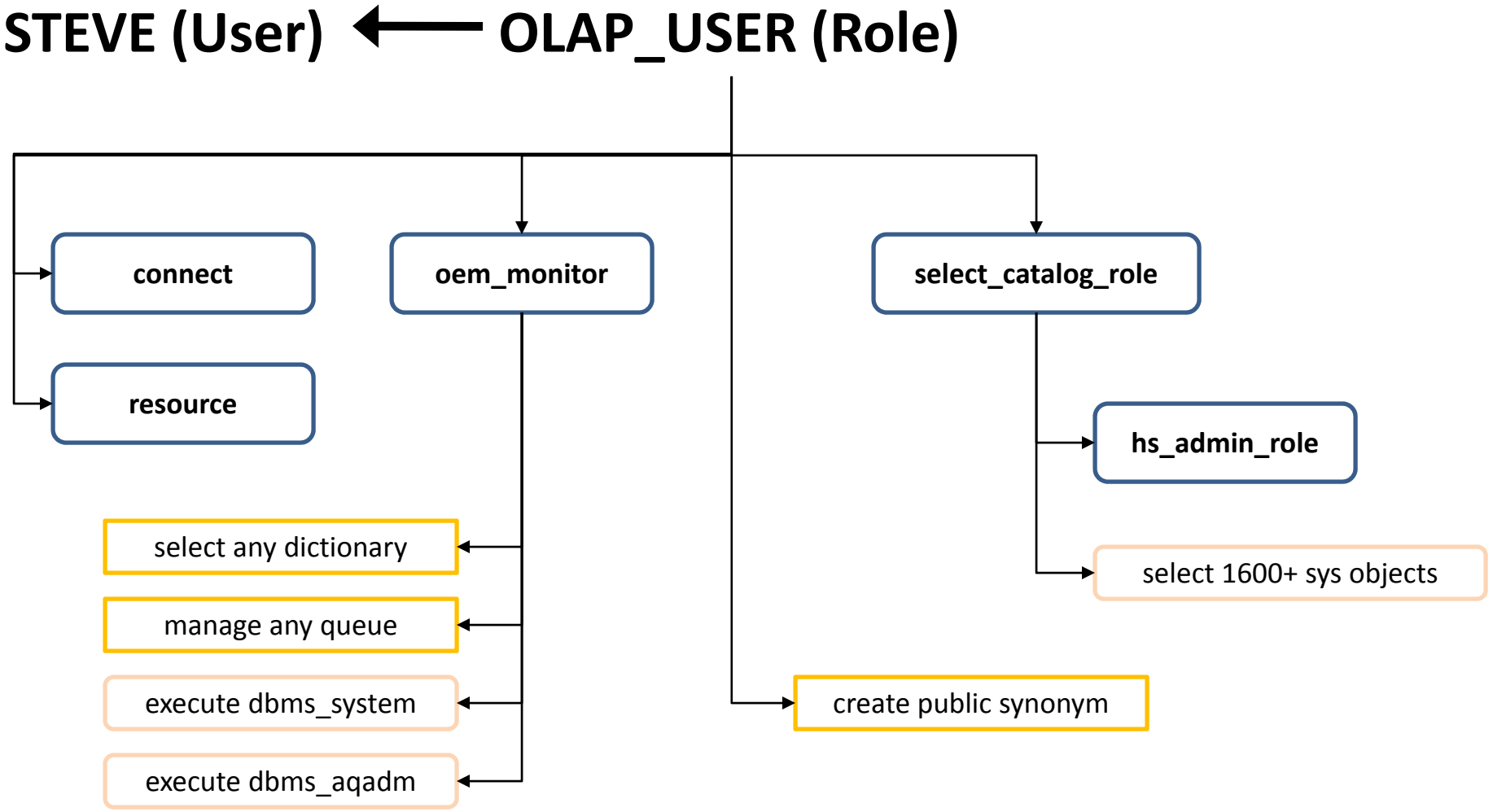
```
CREATE TYPE Num AUTHID CURRENT_USER AS OBJECT (x NUMBER,
   STATIC PROCEDURE new_num (
      n NUMBER, schema_name VARCHAR2, table_name VARCHAR2)
);


CREATE TYPE BODY Num AS
   STATIC PROCEDURE new_num (
      n NUMBER, schema_name VARCHAR2, table_name VARCHAR2) IS
      sql_stmt VARCHAR2(200);
   BEGIN
      sql_stmt := 'INSERT INTO ' || schema_name || '.'
         || table_name || ' VALUES (blake.Num(:1))';
      EXECUTE IMMEDIATE sql_stmt USING n;
   END;
END;

GRANT EXECUTE ON Num TO scott;
```

Definer and Invoker Rights

- **Definer/Invoker rights impact packages, procedures, functions, java, types, views (definer), and triggers (definer)**
- **Must understand access to and execution of packages/procedures/functions**
  - Easier for developers use definer rights since no need for specific grants to objects in the code schema
  - For every code object creation and grants on the object, need to think through the impact
  - Should have a development standard if definer or invoker rights should always be used
  - Impact is mostly for databases where end-users have direct access to code objects through direct SQL*Net connections or ad-hoc query tools

Roles

STEVE (User) ⟵ **OLAP_USER (Role)**


STEVE (User)
OLAP_USER (Role)
connect
resource
oem_monitor
select_catalog_role
hs_admin_role
select any dictionary
manage any queue
execute dbms_system
execute dbms_aqadm
select 1600+ sys objects
create public synonym

Roles

- **Roles can be deceptive especially when dealing with the hierarchical granting of roles**
  - No standard way to determine all the privileges assigned to a specific role through the role hierarchy
  - See www.petefinnigan.com for find_all_privs.sql to see hierarchy of roles and privileges

Q & A

Integrigy Sessions

Credit Cards and Oracle: How to Comply with PCI-DSS

IOUG Session #1718

Tuesday, April 12

11:45am – 12:12pm

Real-life Oracle E-Business Suite Security Mistakes

OAUG Session #8387

Wednesday, April 13

2:15pm – 3:15pm

Real-life Database Security Mistakes Session #715

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For information on -

- Oracle Database Security
- Oracle E-Business Suite Security
- Oracle Critical Patch Updates
- Oracle Security Blog

www.integrigy.com