Oracle 12c
Unified Auditing

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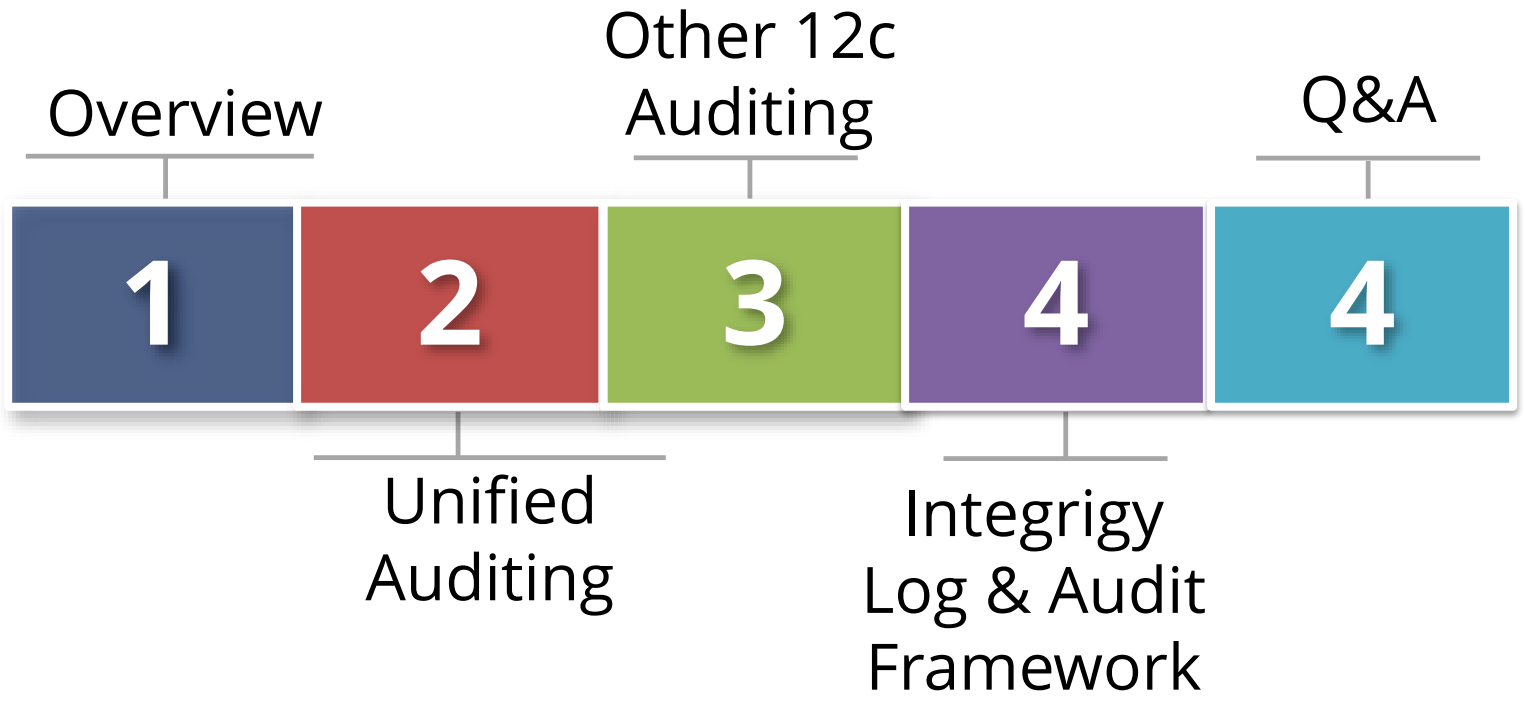
Agenda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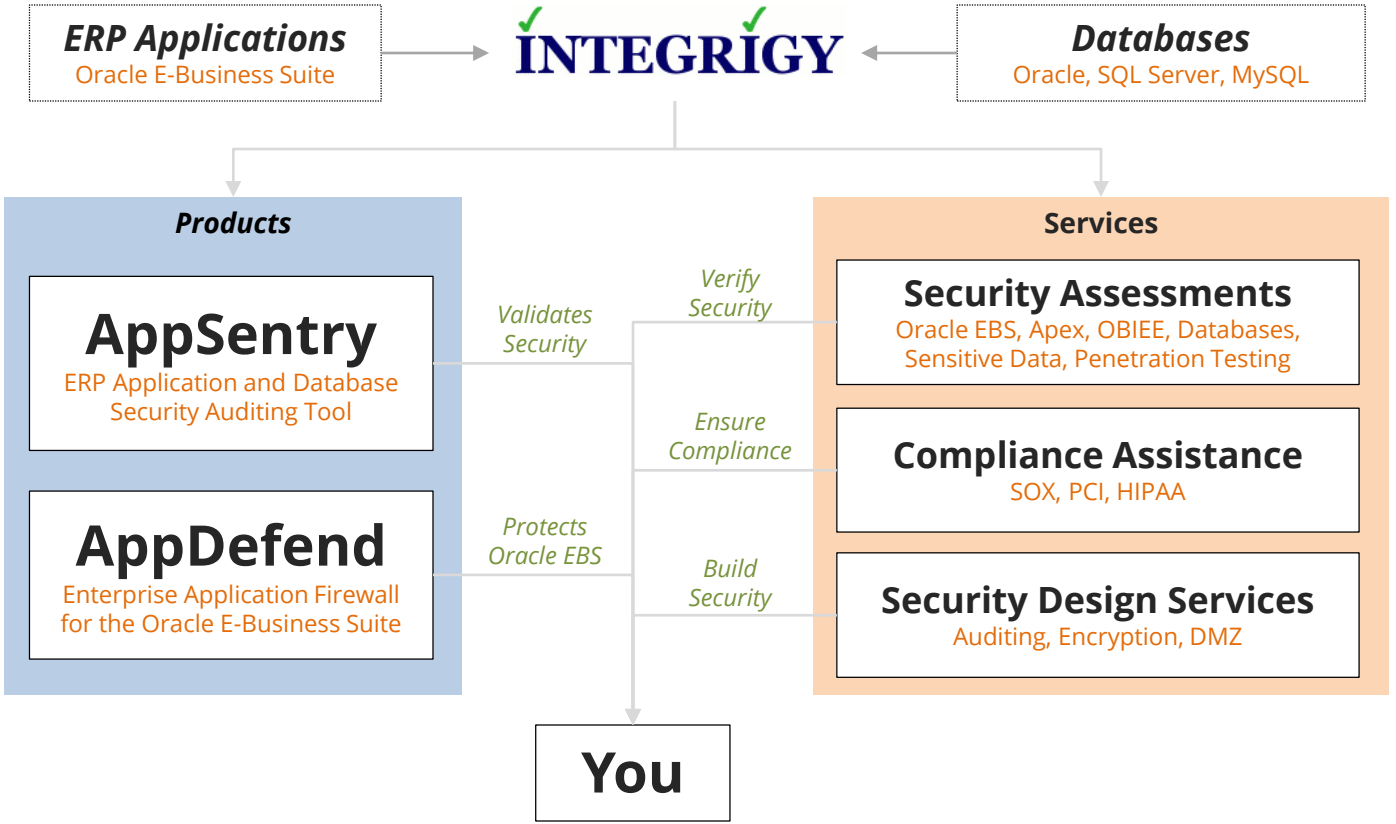
Integrigy Log & Audit Framework

About Integrigy



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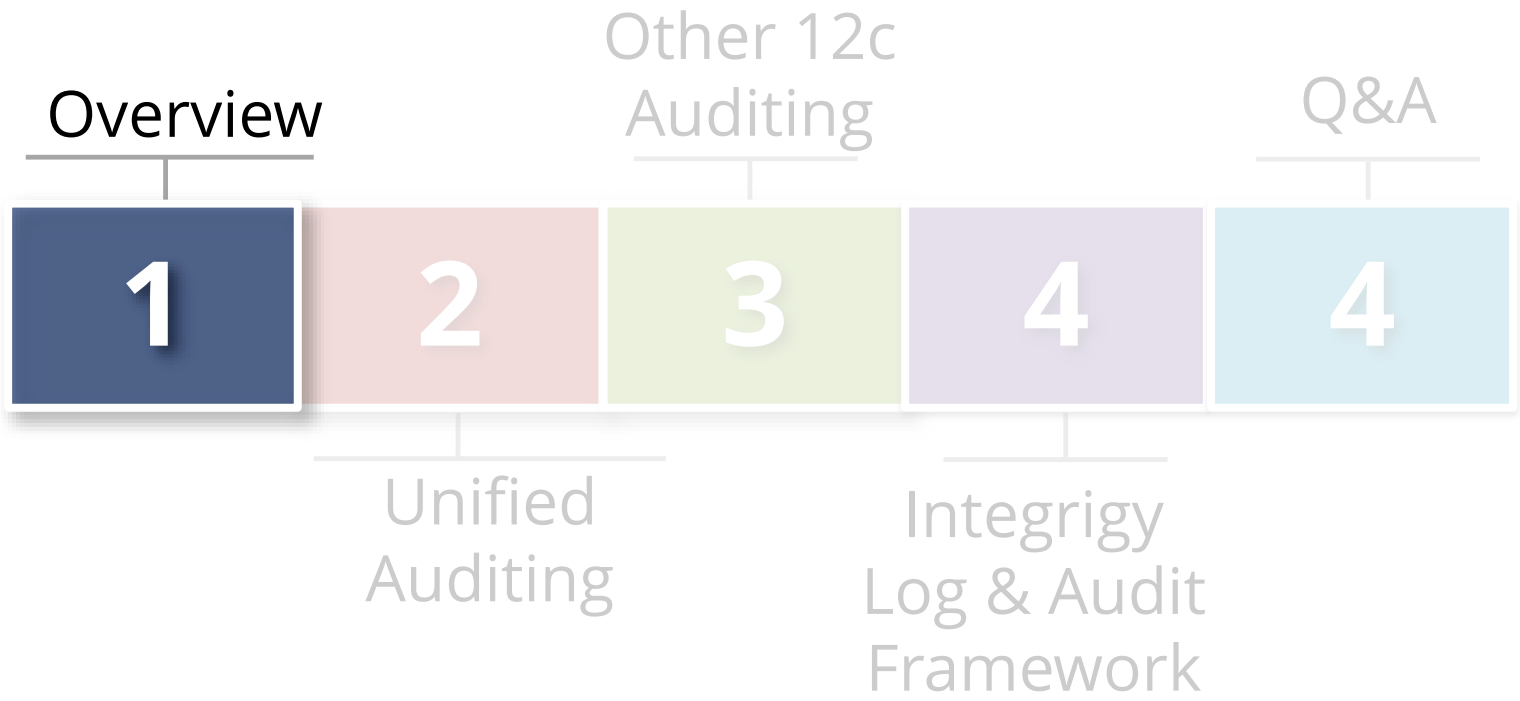
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Oracle Database Security

- **Incremental improvements in Oracle 12c**
  - Unified Auditing
  - Mandatory Auditing
  - Real Application Security
  - Data Redaction
  - Multitenant (pluggable databases)

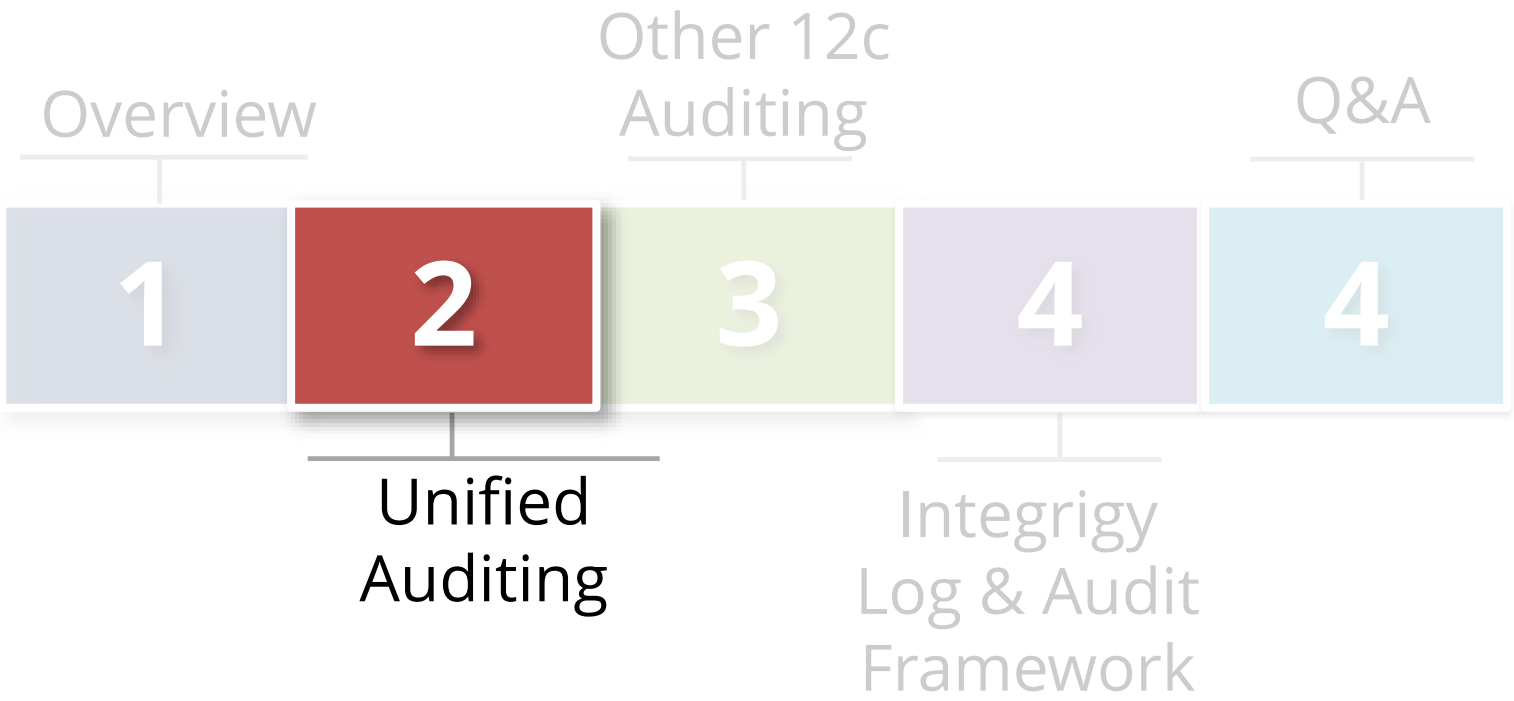
Today's Objectives for Unified Auditing

- **Everything has changed**
  - Pure mode
- **Nothing has changed**
  - Mixed mode
- **Initial survey to make decisions**
  - Impact to logging, auditing and monitoring

Auditing and Logging

- **Log so can audit, monitor, and alert**
  - Related but separate disciplines
- **Requirements are difficult**
  - Technical, Compliance, Audit, and Security
- **The Oracle database offers rich log and audit functionality**
  - **Most organizations do not fully take advantage**
  - **Oracle 12c can change this**

Agenda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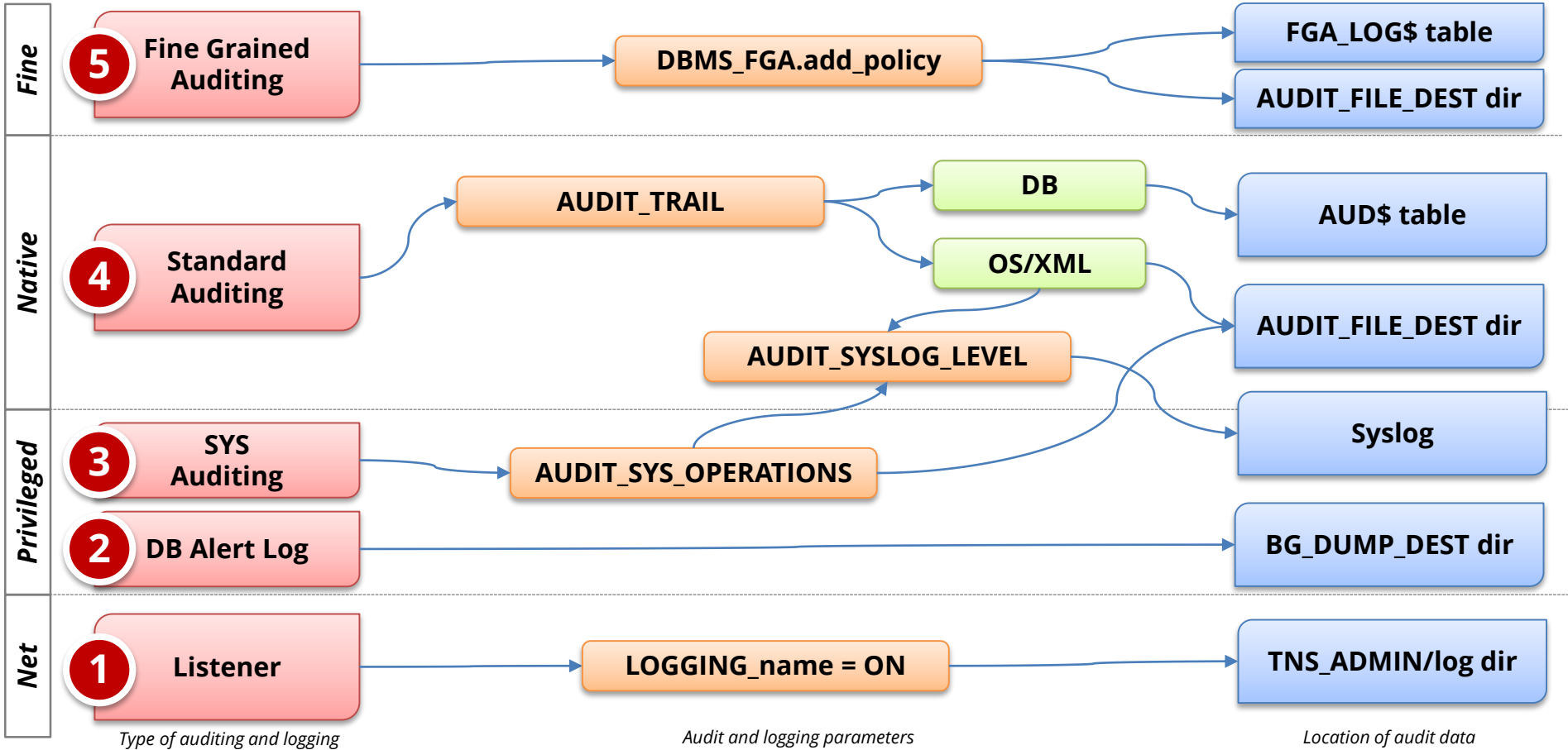
Pre-Oracle 12c Database Auditing



Unified Auditing Has Two Modes

- **Pure**
  - Only 12c Unified Audit functionality available
- **Mixed (Default)**
  - Has both traditional and Unified Auditing
  - Provided as introduction and transition

Mixed Mode

- **All traditional audit features and functionality work same as before**
  - Default Oracle 12c

- **Unified Audit Trail populated in parallel to traditional auditing**
  - Because default policy ORA_SECURECONFIG
  - Purge or disable ORA_SECURECONFIG Doc ID 1624051.1

SYS.UNIFIED_AUDIT_TRAIL IS A VIEW

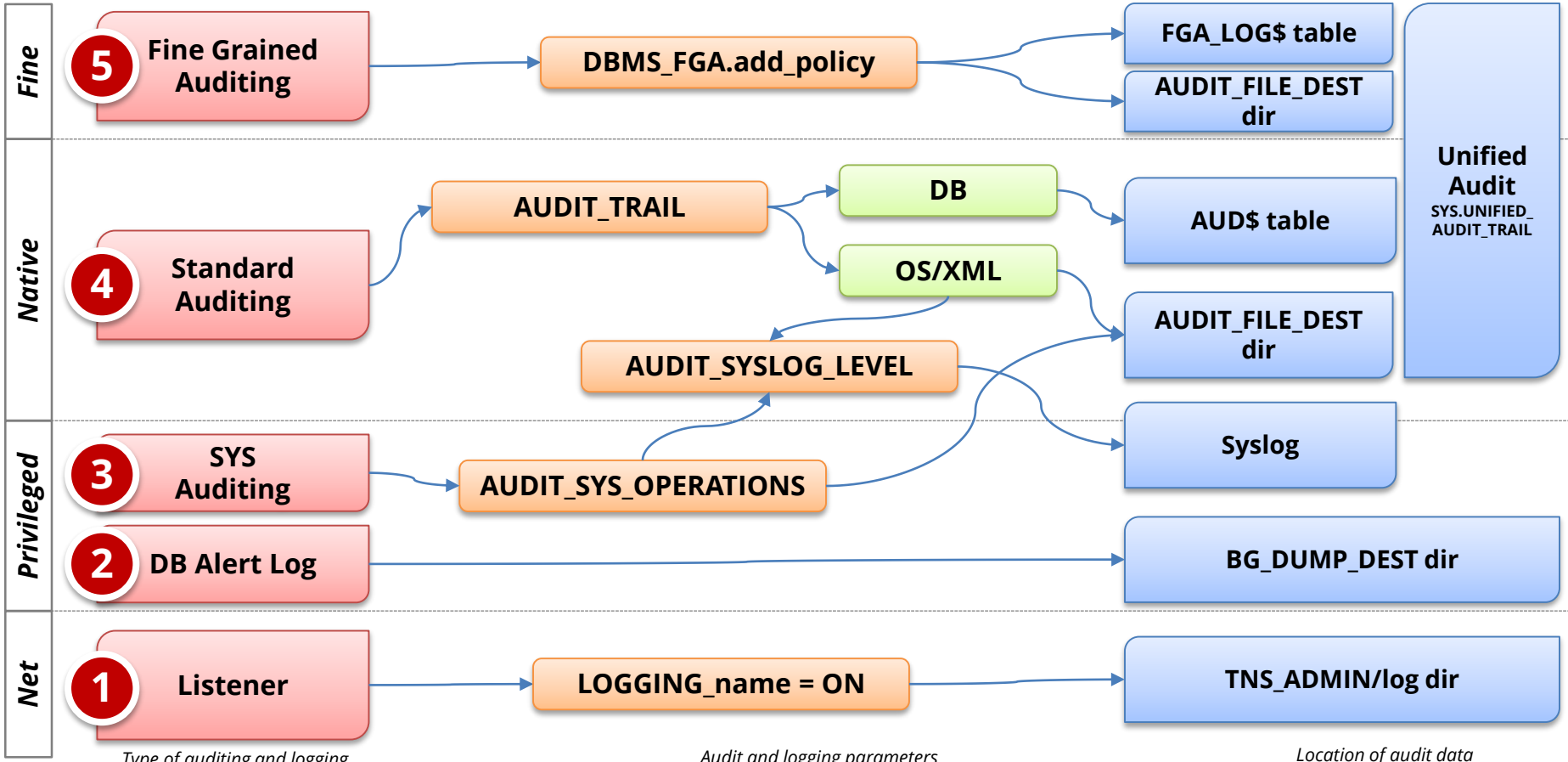
Column Description*	Number of Columns
Standard auditing including SYS audit records	44
Real Application Security (RAS) and RAS auditing	17
Oracle Label Security	14
Oracle Data Pump	2
Fine grained audit (FGA)	1
Data Vault (DV)	10
Oracle RMAN	5
SQL*Loader Direct Load	1
Total	94

*Key column is AUDIT_TYPE

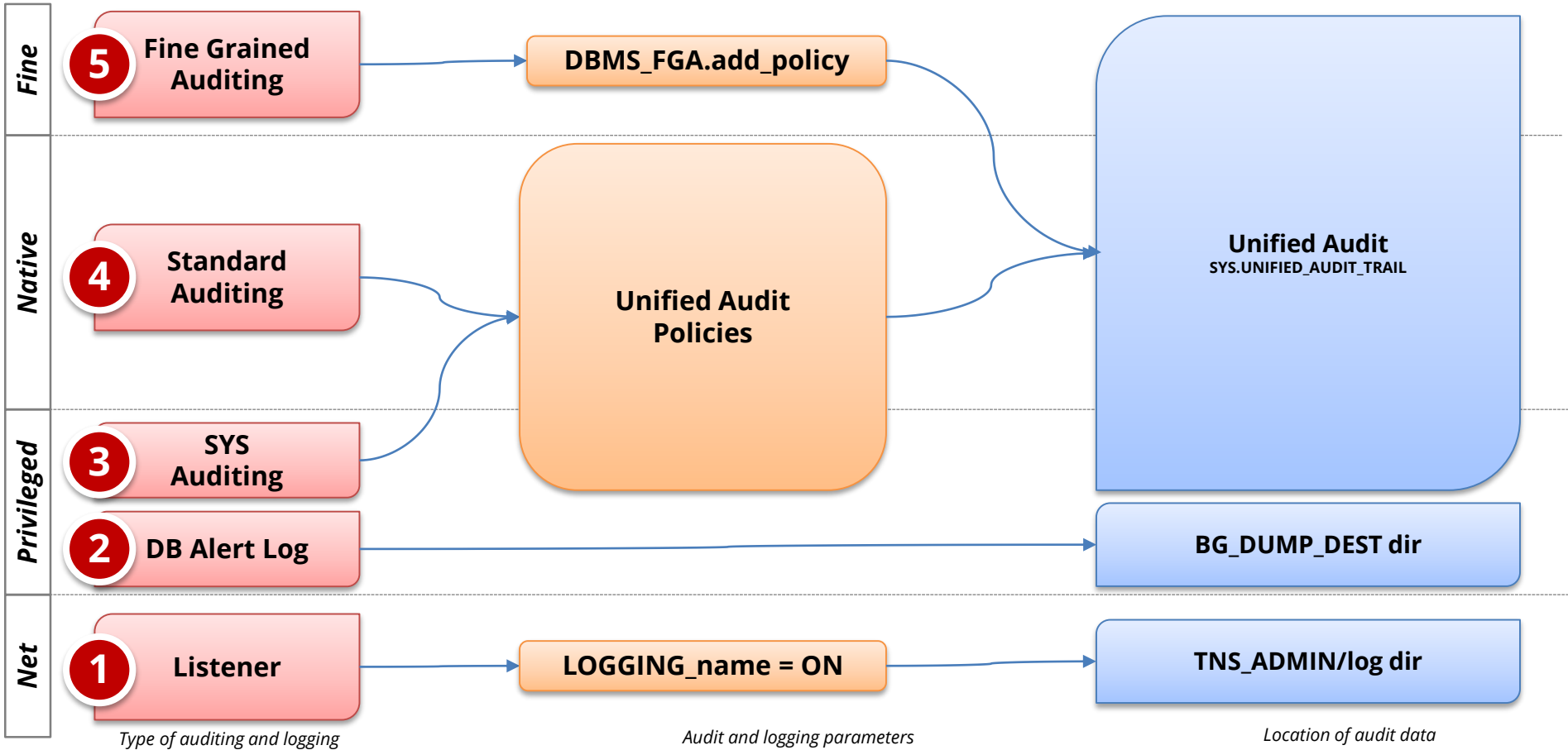
Pure Mode

- **Not default, but is the future**
  - Re-link kernel to use
- **Traditional sources no longer populated**
- **Has new parameters and syntax**
  - Old init.ora parameters ignored
- **Uses OracleSecure files**
  - No syslog
- **Can revert back to Mixed Mode**

Oracle 12c Database Auditing - Mixed



Oracle 12c Database Auditing - Pure



Mixed vs. Pure Mode Audit Configurations

System Parameters	Mixed Mode	Pure Mode
AUDIT_TRAIL	Same as 11g	Not used
AUDIT_FILE_DEST	Same as 11g	Not used
AUDIT_SYS_OPERATIONS	Same as 11g	Not used
AUDIT_SYSLOG_LEVEL	Same as 11g	Not used
UNIFIED_AUDIT_SGA_QUEUE_SIZE	Same as 11g	Used

New Policy Based Audit Syntax

- **Use create/alter audit policy statement***

```
CREATE AUDIT POLICY policy_name
   { {privilege_audit_clause [action_audit_clause ]
[role_audit_clause ]}
       | { action_audit_clause  [role_audit_clause ] }
       | { role_audit_clause }
    }
   [WHEN audit_condition EVALUATE PER
{STATEMENT|SESSION|INSTANCE}]
   [CONTAINER = {CURRENT | ALL}];
```

*DBMS_FGA used to configure fine-grained column and event handlers

Unified Audit Example

```
CREATE AUDIT POLICY logon_pol
ACTIONS LOGON
WHEN 'INSTR(UPPER(SYS_CONTEXT(''USERENV'',
      ''CLIENT_PROGRAM_NAME'')), ''SQLPLUS'') > 0`
AND  'SYS_CONTEXT (''USERENV'', ''HOST'')
     NOT IN (''`prod_db_rac1'',''`prod_db_rac2'')'

EVALUATE PER SESSION;

AUDIT POLICY logon_pol BY APPS;
```

Unified Audit Policies Installed by Default

Policy Name	Default Enabled	Description
ORA_SECURECONFIG	Yes	Secure configuration audit. Same as default 11g auditing.
ORA_RAS_POLICY_MGMT	No	Oracle Real Application Security admin actions for RAS users, roles, and policies
ORA_RAS_SESSION_MGMT	No	Run-time RAS session and namespace actions
ORA_ACCOUNT_MGMT	No	Commonly used user account and privilege settings for create user, role and privilege grants
ORA_DATABASE_PARAMETER	No	Audits commonly used Oracle Database parameter settings

Unified Auditing Separation of Duties

- **Two new roles with Oracle 12c**
  - **AUDIT_ADMIN** – define and maintain audit policies
  - **AUDIT_VIEWER** – view and analyze audit data

New Schema for Unified Audit Data

- **AUDSYS** – New schema used solely for storage Unified Audit trail data in SYSAUX
  - Pure Mode uses Oracle SecureFiles

- **AUD$** and **FGA_LOG$** system tables and objects remain in the SYS schema

Improved Performance

- **Auditing now implemented in SGA**
  - Negligible overhead

- **Two queuing modes**
  - **Immediate-write**: immediately written
  - **Queued-Write** (default): periodically dequeued

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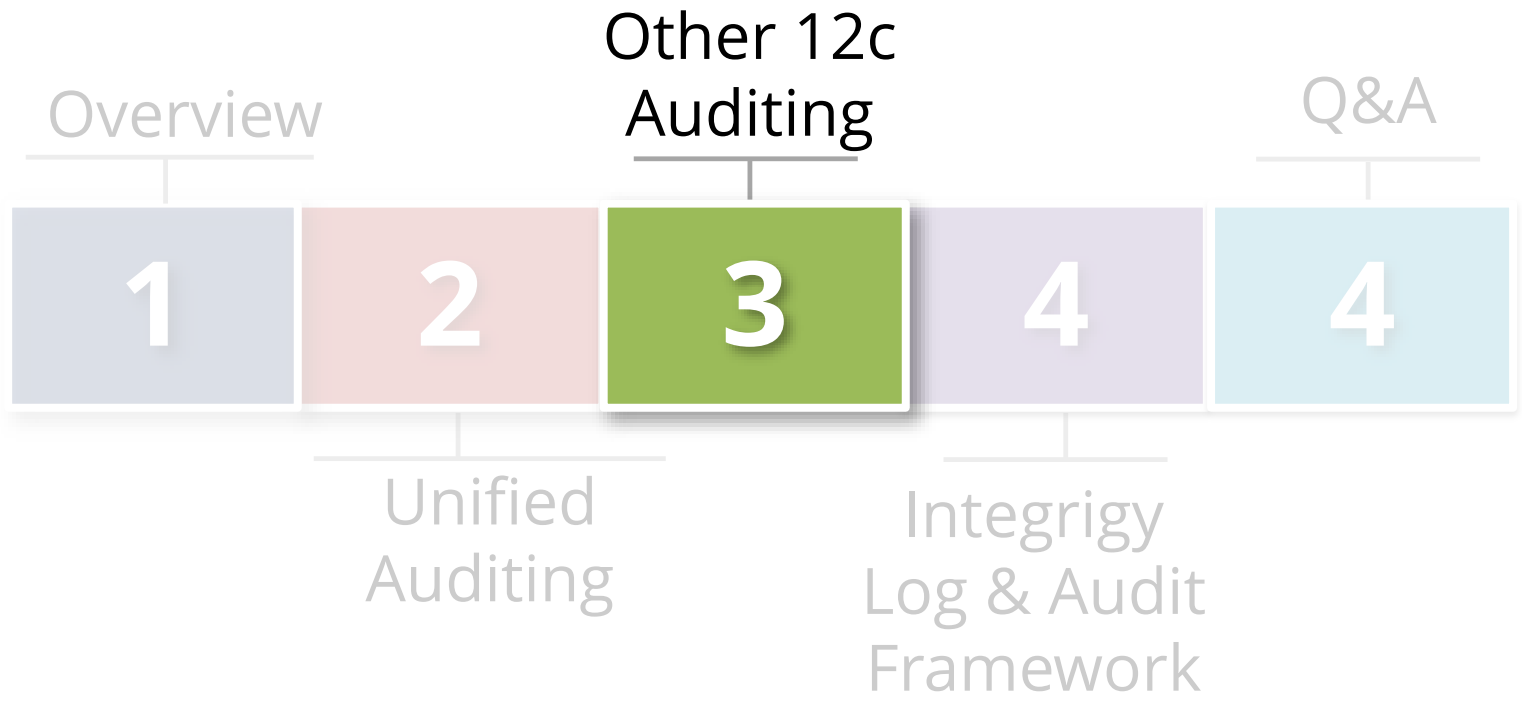
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Pluggable Databases and Common Audit

- **Oracle 12c Multitenant option (Pluggable databases)**
  - Separate license NOT enabled by default
- **For Oracle 12c pluggable databases audit policies can be:**
  - **Common –** Available to all pluggable databases (PDB)s. Enable common audit policies only for common users for common objects.
  - **Local -** These policies apply only to a single pluggable database. By default, audit policies are local to the current PDB.

Oracle 12c Mandatory Auditing

- **New Oracle 12c always-on-auditing for SYSDBA**
  - SYS, SYSDBA, SYSOPER, SYSASM, SYSBACKUP, SYSDG, SYSKM

- **Mandatory Auditing Events (SYS.UNIFIED_AUDIT_TRIAL)**
  - CREATE AUDIT POLICY
  - ALTER AUDIT POLICY
  - DROP AUDIT POLICY
  - AUDIT
  - NOAUDIT
  - Database Vault configurations
  - DBMS_FGA PL/SQL package
  - DBMS_AUDIT_MGMT PL/SQL package
  - ALTER TABLE attempts on the AUDSYS audit trail

Real Application Security

- **New with Oracle 12c**
  - Next generation VPD
- **Define users separately from DBA_USERS**
  - DBA_XS_USERS
  - Can directly connect to the database
- **Log RAS users using Unified Audit Trail**
  - XS$NULL vs. xs_user_name
- **RAS role and event auditing is separate**

Oracle Client Identifier

Application	Example of how used
E-Business Suite	As of Release 12, the Oracle E-Business Suite automatically sets and updates CLIENT_IDENTIFIER to the FND_USER.USERNAME of the user logged on. Prior to Release 12, follow Support Note How to add DBMS_SESSION.SET_IDENTIFIER(FND_GLOBAL.USER_NAME) to FND_GLOBAL.APPS_INITIALIZE procedure (Doc ID 1130254.1)
PeopleSoft	Starting with PeopleTools 8.50, the PSOPRID is now additionally set in the Oracle database CLIENT_IDENTIFIER attribute.
SAP	With SAP version 7.10 above, the SAP user name is stored in the CLIENT_IDENTIFIER.
Oracle Business Intelligence Enterprise Edition(OBIEE)	When querying an Oracle database using OBIEE the connection pool username is passed to the database. To also pass the middle-tier username, set the user identifier on the session. Edit the RPD connection pool settings and create a new connection script to run at connect time. Add the following line to the connect script: CALL DBMS_SESSION.SET_IDENTIFIER('VALUEOF(NQ_SESSION.USER)')

Unified Audit Examples of Client_Identifier

```
CREATE AUDIT POLICY sales_clerk_mm_pol
ACTIONS DELETE ON OE.ORDERS
WHEN 'SYS_CONTEXT(''USERENV'', ''CLIENT_IDENTIFIER'')
      = ''`mmiller'''
EVALUATE PER STATEMENT;

AUDIT POLICY sales_clerk_mm_pol by APPS;
```

11g Auditing Features to Note

- **Alert log access in a view**
  - SYS.X$DBGALERTEXT

- **V$DIAG_ALERT_EXT view shows both the Alert and Listener Logs:**
  - For alert log use: Where trim(COMPONENT_ID)='rdbms';
  - For listener log use: WHERE trim(COMPONENT_ID)='tnslsnr';

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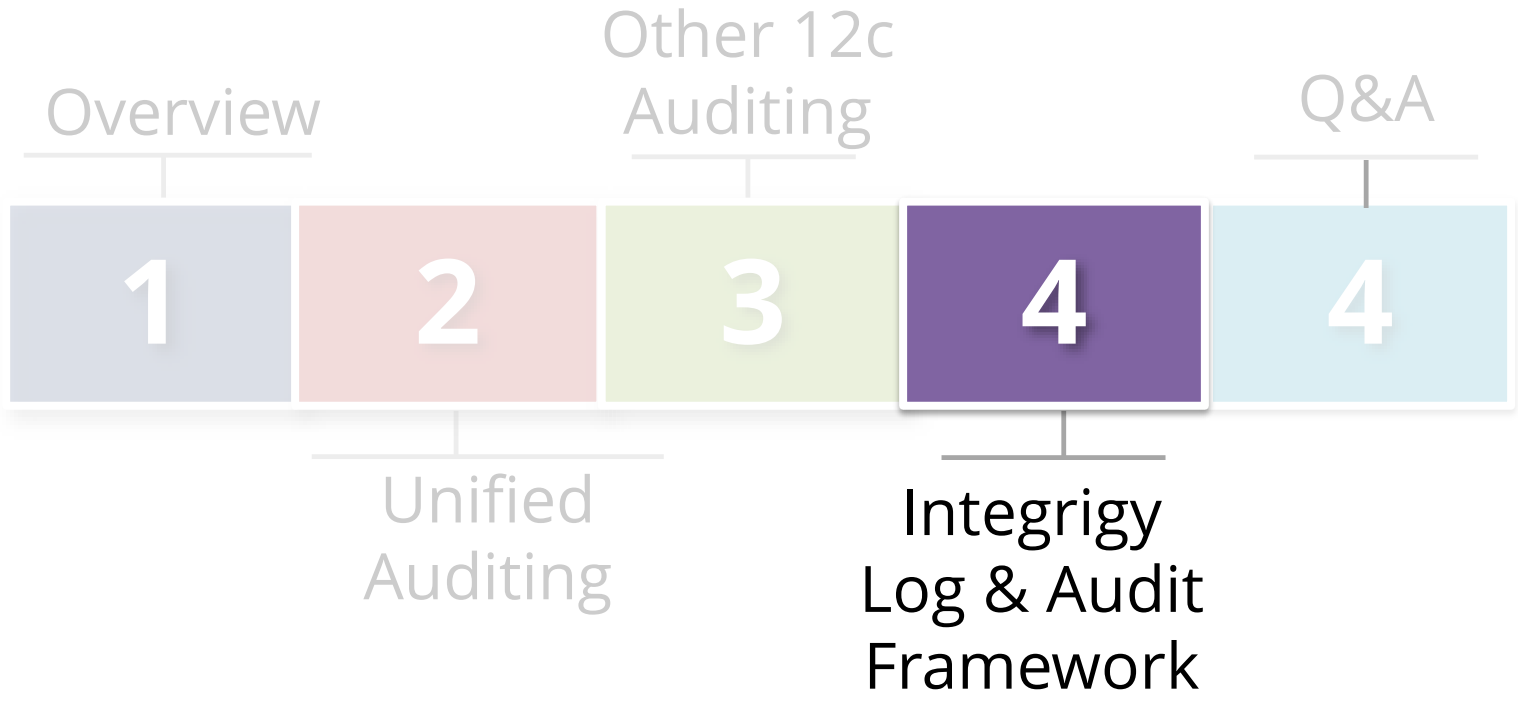
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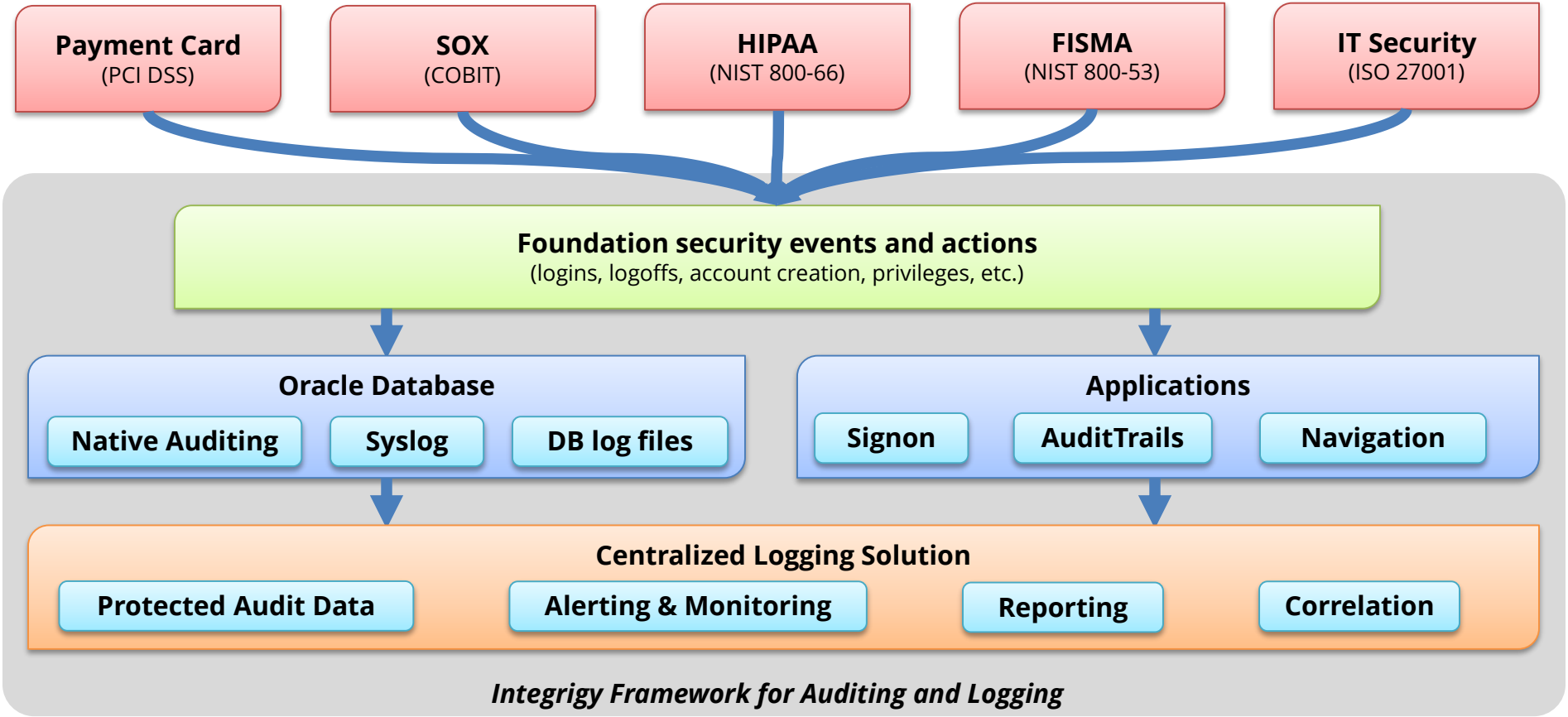
Integrigy Framework for Auditing and Logging



Integrigy Framework for Auditing and Logging

Foundation Security Events and Actions

The foundation of the framework is a set of key security events and actions derived from and mapped to compliance and security requirements that are critical for all organizations.

E1 - **Login**	*E8* - **Modify role**
E2 - **Logoff**	*E9* - **Grant/revoke user privileges**
E3 - **Unsuccessful login**	*E10* - **Grant/revoke role privileges**
E4 - **Modify auth mechanisms**	*E11* - **Privileged commands**
E5 - **Create user account**	*E12* - **Modify audit and logging**
E6 - **Modify user account**	*E13* - **Create, Modify or Delete object**
E7 - **Create role**	*E14* - **Modify configuration settings**

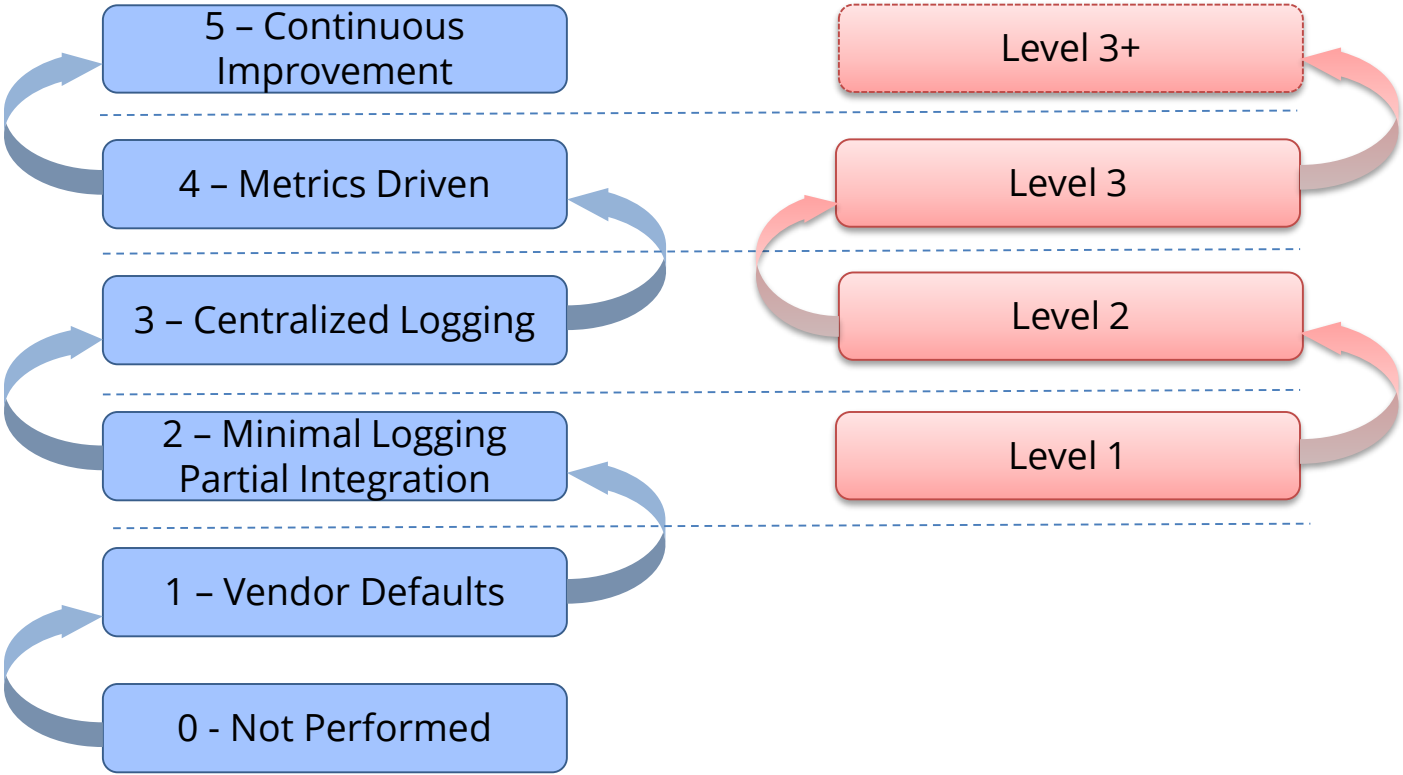
Foundation Security Events Mapping

Security Events and Actions	PCI DSS 10.2	SOX (COBIT)	HIPAA (NIST 800-66)	IT Security (ISO 27001)	FISMA (NIST 800-53)
E1 - Login	10.2.5	A12.3	164.312(c)(2)	A 10.10.1	AU-2
E2 - Logoff	10.2.5	DS5.5	164.312(c)(2)	A 10.10.1	AU-2
E3 - Unsuccessful login	10.2.4	DS5.5	164.312(c)(2)	A 10.10.1 A.11.5.1	AC-7
E4 - Modify authentication mechanisms	10.2.5	DS5.5	164.312(c)(2)	A 10.10.1	AU-2
E5 – Create user account	10.2.5	DS5.5	164.312(c)(2)	A 10.10.1	AU-2
E6 - Modify user account	10.2.5	DS5.5	164.312(c)(2)	A 10.10.1	AU-2
E7 - Create role	10.2.5	DS5.5	164.312(c)(2)	A 10.10.1	AU-2
E8 - Modify role	10.2.5	DS5.5	164.312(c)(2)	A 10.10.1	AU-2
E9 - Grant/revoke user privileges	10.2.5	DS5.5	164.312(c)(2)	A 10.10.1	AU-2
E10 - Grant/revoke role privileges	10.2.5	DS5.5	164.312(c)(2)	A 10.10.1	AU-2
E11 - Privileged commands	10.2.2	DS5.5	164.312(c)(2)	A 10.10.1	AU-2
E12 - Modify audit and logging	10.2.6	DS5.5	164.312(c)(2)	A 10.10.1	AU-2 AU-9
E13 - Objects Create/Modify/Delete	10.2.7	DS5.5	164.312(c)(2)	A 10.10.1	AU-2 AU-14
E14 - Modify configuration settings	10.2.2	DS5.5	164.312(c)(2)	A 10.10.1	AU-2

Integrigy Framework Maturity Model

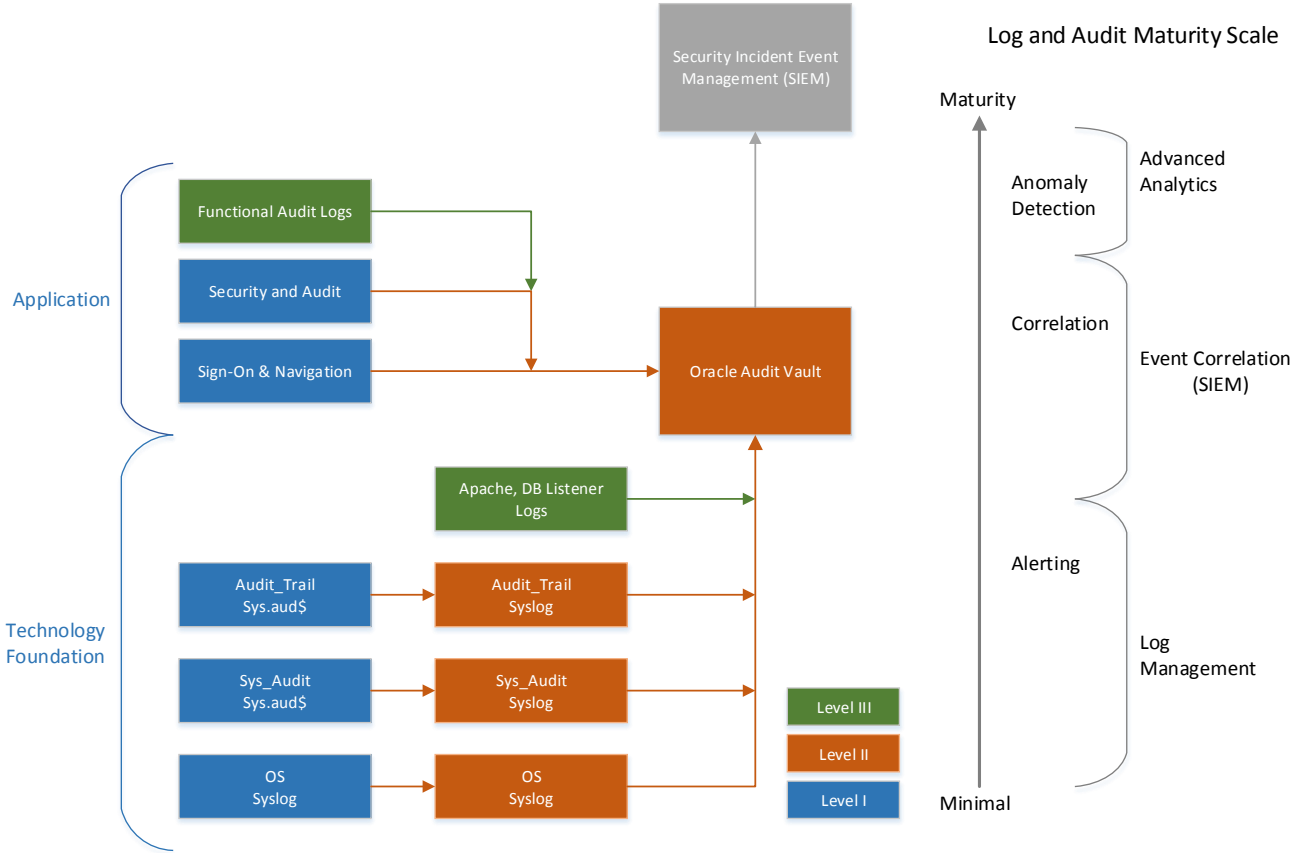
Level 1	Enable **baseline auditing and logging** for application/database and implement security monitoring and auditing alerts
Level 2	Send audit and log data to a **centralized logging** solution outside the Oracle Database and Application(s)
Level 3	Extend logging to include **functional logging** and more complex alerting and monitoring

Logging Maturity Model



Common Maturity Model (CMM) ***Integrigy Framework***

Integrigy Framework for Auditing and Logging



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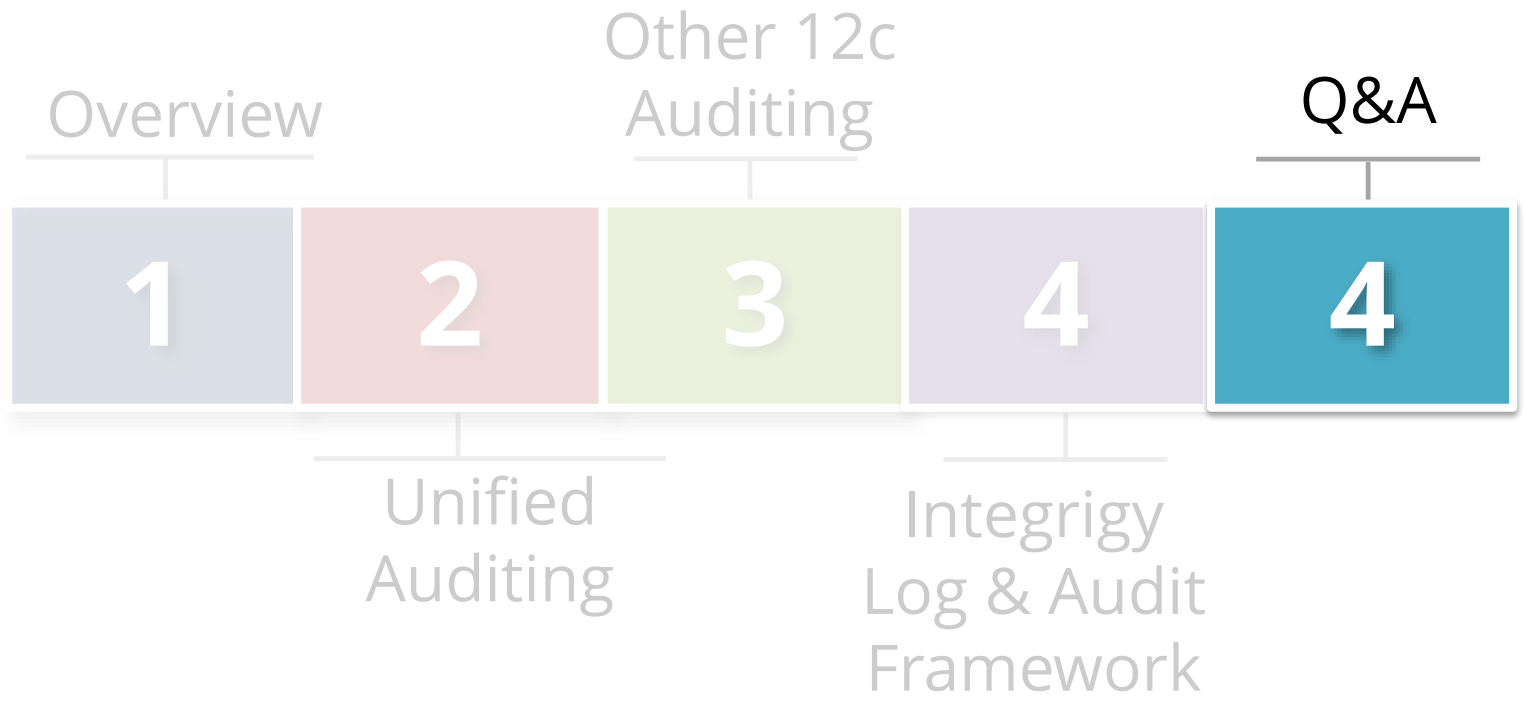
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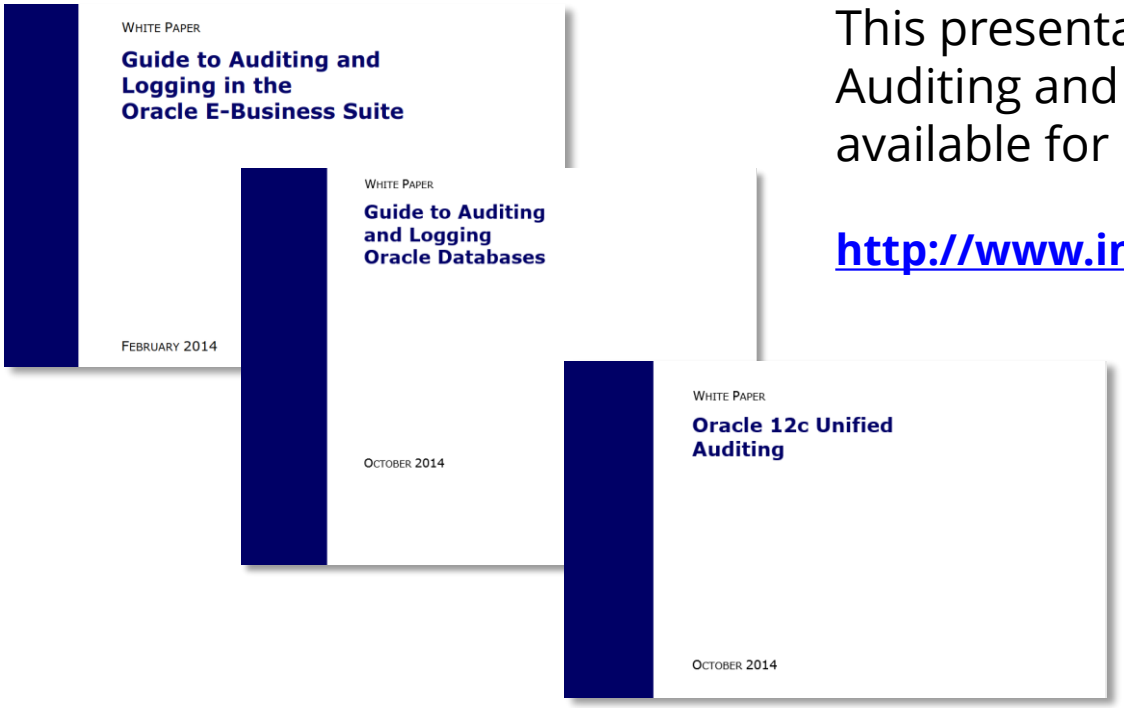

This presentation is based on our Auditing and Logging whitepapers available for download at –

http://www.integrigy.com/security-resources

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