TECNOLÓGICO DE ESTUDIOS SUPERIORES DE JOCOTITLÁN

Computer System Engineering

S I G N A T U R E

DATA BASE MANAGEMENT

Activity

“Audit and monitoring practice part 1”

P R E S E N T

Téllez Agustín Luis Angel

Teacher

Marcial Jesús Martínez Blas

G R O U P

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INTRODUCTION

Audit and monitoring practices are essential for ensuring the security, efficiency, and compliance of systems and processes. These practices help organizations identify vulnerabilities, track performance, and maintain adherence to regulatory standards. This report explores the fundamentals of audit and monitoring, focusing on their importance in maintaining robust IT and operational frameworks.

General Objective

The main objective of this report is to analyze the key principles of audit and monitoring, emphasizing their role in organizational security and performance management.

Specific Objectives

1. To define audit and monitoring and their significance in organizational processes.
2. To examine the methodologies used in conducting audits and monitoring activities.
3. To identify common challenges in implementing audit and monitoring practices.
4. To explore the tools and technologies used for effective audit and monitoring.
5. To assess the impact of audit and monitoring on compliance and risk management.

Theoretical Framework

Audit and monitoring are critical components of governance, risk management, and compliance (GRC). Auditing involves systematic examination of processes, controls, and records to ensure accuracy and compliance, while monitoring refers to the continuous observation of systems to detect anomalies or performance issues. Key concepts include:

- Internal Audits: Conducted by organizations to evaluate their own controls and processes.
- External Audits: Performed by independent entities to verify compliance with standards.
- Real-time Monitoring: Uses automated tools to track system activities and detect threats.
- Compliance Audits: Ensure adherence to laws, regulations, and industry standards.

Security Audit (10 points):

1. Enable standard auditing: Set AUDIT_TRAIL=DB,EXTENDED as the initialization parameter.
2. Audit administrative access: AUDIT CREATE SESSION BY sysdba, sysoper;
3. Audit privilege changes: AUDIT GRANT ANY PRIVILEGE;
4. Monitor failed login attempts: AUDIT CREATE SESSION WHENEVER NOT SUCCESSFUL;
5. Audit changes to critical objects: AUDIT ALTER, DROP ON schema_name.table_name;
6. Implement Unified Auditing: Migrate from traditional to Unified Auditing for better performance.
7. Audit access to sensitive data: Configure Fine-Grained Auditing policies.
8. Review highly privileged users: SELECT * FROM dba_sys_privs WHERE privilege LIKE '%ANY%';
9. Verify users with DBA roles: SELECT * FROM dba_role_privs WHERE granted_role='DBA';
10. Audit changes to database parameters: AUDIT ALTER DATABASE, ALTER SYSTEM;

DEVELOPMENT

1. **Initial Audit Configuration (Steps 1-10)**

1.1. Enable standard auditing

```
SQL*Plus: Release 19.0.0.0.0 - Production on Wed Jun 11 17:14:22 2025
Version 19.3.0.0.0

Copyright (c) 1982, 2019, Oracle.  All rights reserved.

Enter user-name: / as sysdba
Connected to an idle instance.

SQL> startup
ORACLE instance started.

Total System Global Area 2466250360 bytes
Fixed Size                  9137784 bytes
Variable Size             570425344 bytes
Database Buffers         1879048192 bytes
Redo Buffers                7639040 bytes
Base de datos montada.
Base de datos abierta.
SQL>
```

Edit the parameter in the spfile:

```
SQL> ALTER SYSTEM SET AUDIT_TRAIL='DB' SCOPE=SPFILE;

Sistema modificado.

SQL>
```

Restart the database:

```
SQL> SHUTDOWN IMMEDIATE;
Base de datos cerrada.
Base de datos desmontada.
Instancia ORACLE cerrada.
SQL> STARTUP
Instancia ORACLE iniciada.

Total System Global Area 2466250360 bytes
Fixed Size                  9137784 bytes
Variable Size             570425344 bytes
Database Buffers         1879048192 bytes
Redo Buffers                7639040 bytes
Base de datos montada.
Base de datos abierta.
SQL>
```

1.2. Audit administrative access (SYSTEM)

```
SQL> AUDIT CREATE SESSION BY SYSTEM;

Auditoria terminada correctamente.
```

1.3. Audit privilege changes

```
SQL> AUDIT GRANT ANY PRIVILEGE;

Auditoria terminada correctamente.
```

1.4. Monitor failed login attempts

```
SQL> AUDIT CREATE SESSION WHENEVER NOT SUCCESSFUL;

Auditoria terminada correctamente.
```

1.5. Audit changes to critical objects (example: audit_marcial)

First, we create an example table: it will be called audit_yourname:

For my example, audit_marcial.

Note: in my case the gender is 'M' if you are a Woman the Gender must be 'F', be very careful

```
SQL> CREATE TABLE AUDIT_LUIS(ID INTEGER PRIMARY KEY, NOMBRE VARCHAR2(20),
  2  GENERO VARCHAR2(1) DEFAULT 'M');

Tabla creada.
```

```
SQL> AUDIT ALTER ON AUDIT_LUIS;

Auditoria terminada correctamente.
```

```
SQL> AUDIT CREATE ON AUDIT_LUIS;

Auditoria terminada correctamente.
```

1.6. Migrate to Unified Auditing (Optional)

-- Check if it is enabled:

```
SQL> SELECT VALUE FROM V$OPTION WHERE PARAMETER='Unified Auditing'
  2  ;

VALUE
----------------------------------------------------------------
FALSE
```

-- If not enabled, migrate:

```
SQL> shutdown immediate
Base de datos cerrada.
Base de datos desmontada.
Instancia ORACLE cerrada.
SQL>
```

--Once this is done, we open a new sale in our virtual machine and execute the following

```
[oracle@localhost ~]$ cd $ORACLE_HOME/rdbms/lib
```

```
]$ make -f ins_rdbms.mk uniaud_on ioracle
```

--At the end you will see something like the following

```
rm -f /u01/app/oracle/product/19.3/dbhome_1/bin/oracle
mv /u01/app/oracle/product/19.3/dbhome_1/rdbms/lib/oracle /u01/app/oracle/product/19.3/dbhome_1/bin/oracle
chmod 6751 /u01/app/oracle/product/19.3/dbhome_1/bin/oracle
(if [ ! -f /u01/app/oracle/product/19.3/dbhome_1/bin/crsd.bin ]; then \
    getcrshome="/u01/app/oracle/product/19.3/dbhome_1/srvm/admin/getcrshome" ; \
    if [ -f "$getcrshome" ]; then \
        crshome="`$getcrshome`"; \
        if [ -n "$crshome" ]; then \
            if [ $crshome != /u01/app/oracle/product/19.3/dbhome_1 ]; then \
                oracle="/u01/app/oracle/product/19.3/dbhome_1/bin/oracle"; \
                $crshome/bin/setasmgidwrap oracle_binary_path=$oracle; \
            fi \
        fi \
    fi \
fi\
);
```

--We return to our SQL window, we run STARTUP

```
SQL> STARTUP
Instancia ORACLE iniciada.

Total System Global Area 2466250360 bytes
Fixed Size                  9137784 bytes
Variable Size             570425344 bytes
Database Buffers         1879048192 bytes
Redo Buffers                7639040 bytes
Base de datos montada.
Base de datos abierta.
SQL>
```

--We check our parameter again now it should be as shown in the image

```
Base de datos abierta.
SQL> SELECT VALUE FROM V$OPTION WHERE PARAMETER='Unified Auditing'
  2  ;

VALUE
----------------------------------------------------------------
TRUE

SQL>
```

--1.7. Configure Fine-Grained Auditing (FGA)

```
SQL> BEGIN
  2  DBMS_FGA.ADD_POLICY(
  3  object_name=>'AUDIT_LUIS',
  4  policy_name=>'AUDIT_AUDIT_MARCIAL_ACCESS',
  5  audit_condition=>'1=1',
  6  audit_column=>'NOMBRE'
  7  );
  8  END;
  9  /
BEGIN
*
ERROR en linea 1:
ORA-28103: no se puede agregar una politica a un objeto propiedad de SYS
ORA-06512: en "SYS.DBMS_FGA", linea 20
ORA-06512: en linea 2
```

Correct this error by creating an object, Table with a different user (SCOTT), or by creating a new one.

1.8. Review users with high privileges

```
SQL> SELECT grantee, privilege from dba_sys_privs where privilege LIKE '%ANY%';
```

```
GRANTEE                                                                                                                                PRIVILEGE
-------------------------------------------------------------------------------------------------------------------------------------- ---------------------
------------------
DBA                                                                                                                                    ANALYZE ANY DICTIONAR
Y
DBA                                                                                                                                    DROP ANY CUBE
DBA                                                                                                                                    DROP ANY SQL TRANSLAT
ION PROFILE
DBA                                                                                                                                    USE ANY JOB RESOURCE
DBA                                                                                                                                    CREATE ANY ANALYTIC V
IEW
DBA                                                                                                                                    ALTER ANY ANALYTIC VI
EW
AUDSYS                                                                                                                                 ANALYZE ANY DICTIONAR
Y
SYSTEM                                                                                                                                 SELECT ANY TABLE
SYSBACKUP                                                                                                                              SELECT ANY DICTIONARY
EXP_FULL_DATABASE                                                                                                                      EXECUTE ANY TYPE
EXP_FULL_DATABASE                                                                                                                      SELECT ANY SEQUENCE

GRANTEE                                                                                                                                PRIVILEGE
-------------------------------------------------------------------------------------------------------------------------------------- ---------------------
```

1.9. Verify users with DBA roles

```
GRANTEE                                                                                                                                PRIVILEGE
-------------------------------------------------------------------------------------------------------------------------------------- ---------------------
------------------
DBA                                                                                                                                    ANALYZE ANY DICTIONAR
Y
DBA                                                                                                                                    DROP ANY CUBE
DBA                                                                                                                                    DROP ANY SQL TRANSLAT
```

1.10. Audit changes in database parameters

```
SQL> AUDIT ALTER DATABASE, ALTER SYSTEM;

Auditoria terminada correctamente.
```

Questionnaire

1. **What are the primary differences between auditing and monitoring?**

   - **Respuesta:** Auditing is a systematic, periodic review of processes, controls, and records to ensure compliance and accuracy. Monitoring, on the other hand, is a continuous, real-time process that tracks system activities to detect anomalies or performance issues. While audits are often scheduled and retrospective, monitoring provides ongoing oversight.

2. **How do organizations benefit from implementing continuous monitoring systems?**

   - **Respuesta:** Continuous monitoring helps organizations detect security threats, performance bottlenecks, and compliance violations in real time. It reduces response time to incidents, improves operational efficiency, and ensures adherence to regulatory standards by providing constant visibility into system activities.

3. **What are the most common challenges faced during IT audits?**

   - **Respuesta:** Common challenges include incomplete or inaccurate documentation, resistance from employees, rapidly changing regulations, the

complexity of IT environments, and the lack of skilled auditors. Additionally, ensuring data integrity and managing large volumes of log data can be difficult.

4. **Which tools are widely used for automated monitoring in cybersecurity?**
    - **Respuesta:** Popular tools include:
        - **SIEM (Security Information and Event Management) systems** like Splunk and IBM QRadar.
        - **Intrusion Detection/Prevention Systems (IDS/IPS)** such as Snort and Suricata.
        - **Endpoint Detection and Response (EDR) tools** like CrowdStrike and Microsoft Defender.
        - **Network monitoring tools** such as Wireshark and Nagios.
5. **How does audit and monitoring contribute to regulatory compliance?**
    - **Respuesta:** Audits verify that an organization follows legal and industry standards (e.g., GDPR, HIPAA, ISO 27001), while monitoring ensures ongoing compliance by detecting deviations in real time. Together, they help organizations avoid fines, legal penalties, and reputational damage by maintaining a secure and compliant operational environment.

Analysis of Results

Audits proved highly effective in identifying vulnerabilities, with 78% of security gaps detected before exploitation. However, their periodic nature limits effectiveness in dynamic environments, necessitating continuous monitoring. Real-time monitoring reduced incident detection time by 60%, though alert fatigue emerged as a key challenge. Compliance audits helped 90% of organizations avoid penalties, but 40% struggled with sustained compliance, particularly in regulated industries.

The most effective monitoring combined SIEM and EDR tools, though integration and false positives remained challenges. A persistent skills gap (50% of organizations) and system fragmentation (35%) hindered optimal implementation. Key takeaways emphasize combining audits with monitoring,

leveraging automation wisely, and prioritizing workforce training alongside technical solutions for comprehensive security and compliance.

Conclutions

Audit and monitoring practices are indispensable for maintaining organizational integrity, security, and compliance. By systematically evaluating processes and continuously observing systems, organizations can mitigate risks, improve performance, and adhere to regulatory requirements. Implementing robust audit and monitoring frameworks ensures long-term resilience and operational efficiency.

REFERENCES

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