1.1 New hosting platform architecture

Maintaining the same principles from a service point of view, LG-TMS platform migrated into a fully virtualized solution and running on a state-of-the-art hosting platform providing a long-lasting and highly redundant technology

This chapter will provide an on-premise hosting platform proposal to support all required LG-TMS services:

- Hosting Platform architecture for all TMS Core and additional services
- Hosting Platform architecture for Operators Posts
- High Availability and Business Continuity technical approach
- Scalability properties

1.2 Systems architecture overview

IT hosting platform for both TMS Servers and Operators Posts follows the logical architecture of the picture:

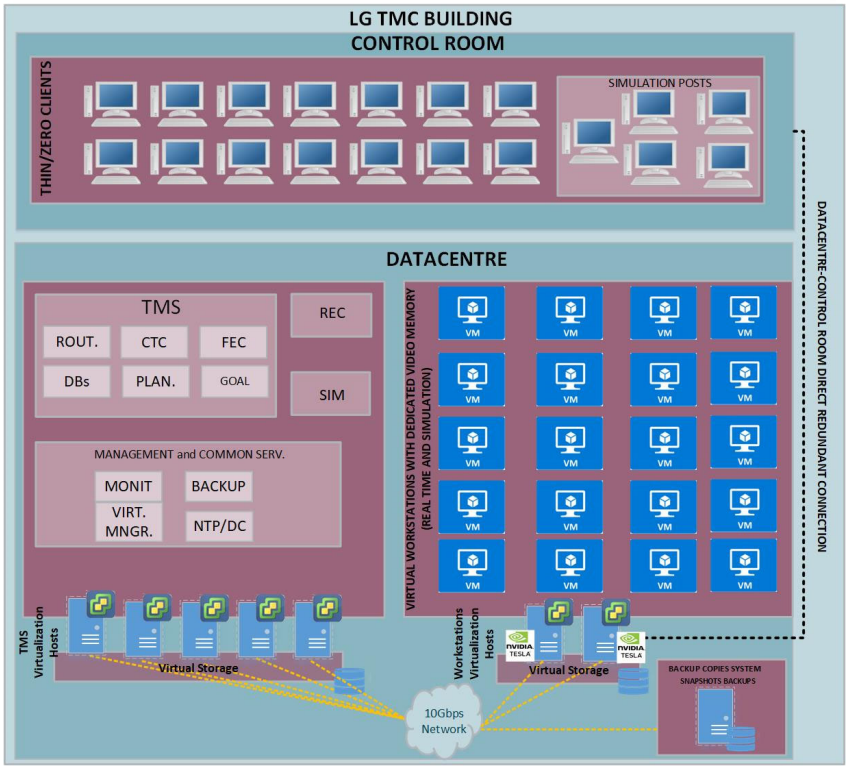

Figure 1: New TMS Hosting Platform Architecture

The platform focus on the key concepts:

- **Hyperconverged Platform (HCI) or similar state-of-the-art virtualization architecture for both TMS Servers and Workstation platforms.** IT platform has to offer a powerful, highly redundant, easy to manage and extremely scalable virtualization architecture.

- **Dedicated video cards to assign video memory for workstations**.

- **Isolation of environments**, to virtualize all different environments without the need of deploying different hosting platforms.

- **Business Continuity Design.** Redundant system that supports the failure of any component. The platform is integrated with a snapshot backup system to provide a quick backup recovery of any workstation or server.

- **Migration to latest version of OS and Databases.** All systems have to be migrated to current OS versions, and database has to be migrated to current database engines. OpenSource software is the preferred option for all software.

2 Database Architecture

2.1 New database architecture

The requirements at the database level are those detailed at this point:

- Operating system: A Linux-based operating system is required.

- Database management system: a database engine based on opensource model is required. For example Postgresql.

- This motor must have at least the following characteristics:

    - Open source object-relational database

    - Fully ACID

    - Multiplatform and Cloud Native

    - Reliability, High Availability and Disaster Recovery

    - Rich ecosystem (backUp, monitoring, application servers, etc.)

    - Development and active maintenance by a distributed community

    - Data Partitioning and Indexes

    - Alternative to Oracle Database

- Oracle Compatibility.

- High Availability: A database system based on robust high availability is required.
- Shared storage is not required for the database engine.
- The database architecture proposal on a virtualized environment will be positively valued.
- Two well differentiated environments are required, one of them will be for Real Time and the other for Simulation (Pre-Production).
- A migration from the current Oracle database to the new chosen database engine (based on opensource technology) is required. This database engine must have compatibility with the Oracle 11 database manager in order to reduce the risk and impact on the systems migration process.
- In relation to the previous point, there is a need to detail and divide the migration process into different correctly identified phases.
- 24x7 database engine business support is required.

The architecture is as follows:

- Production Environment

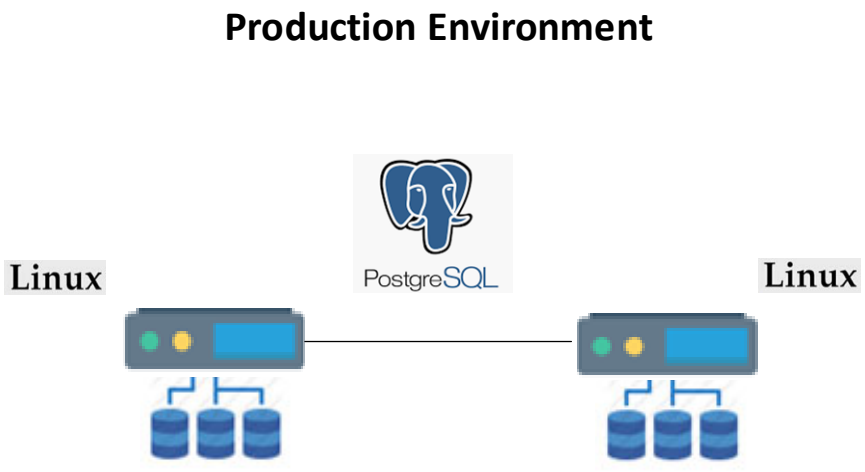

Figure 2: New Production Database

- Simulation environment

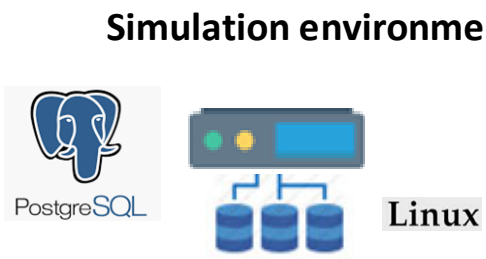

Figure 3: New Simulation Database

Requirements	**Architecture Design & Implementation Choices**
Virtualization layer	• System should run on virtual machines within the HCI infrastructure. • Layer should be able to work with less than 40 Virtual Machines/5 Virtualization hosts (4 + 1 Spare host).
OS Compatibility	• System should support Red Hat Enterprise Linux version 8.0 or above.
Performance and Scalability	• Deployment of the data management and storage services within HCI infrastructure. • Ability for direct low-latency interactions of the applications and tools, no more than 2-5ms maximum Round Trip Time (RTT).
Development and Deployment Flexibility	• Automatic deployment via Ansible tool or other Red Hat compatible automation tool. • Provision of visual tools for development and deployment tasks.
Management and Configuration	• Design and implementation of a management and monitoring module over the virtualization layer, via Zabbix or Zabbix compatible system. • Management and monitoring of data streams, applications and services.
Extensibility and Expandability	• Design WM machine to be able to handle expandability both vertically and horizontally.
Compliance with standards	• SIL-2 (Safety integrity level) certificate.
Back ups	• Ability to back up only the database from specific virtual machine without back up the underlying application and OS. • Ability to back up virtual machine fully.