GINESYS 11

SOFTWARE SYSTEM DOCUMENTATION 2.0

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Overview

Hybrid Application Architecture

GINESYS started off with an Oracle based desktop application suite designed for retail businesses. The primary application suite used for this purpose was Oracle Developer 2000. However, over a period of time as technologies changed, newer technology platforms were adopted and newer functionalities started getting delivered with newer technology platforms. Due to the vastness of the software functionality, the migration takes time and in the year 2016, GINESYS has taken an aggressive strategy to complete the entire migration process to the latest web technology platform.

Till the entire conversion is completed, GINESYS remains a hybrid application comprising of multiple technologies, carefully synchronised to work seamlessly without any friction within them.

This document tries to cover the entire GINESYS software landscape with a cross-section of different architectural views. At the beginning, an overview of the various infrastructural layers is given. Then it moves on to detailing the most complex deployment, i.e. the HO infrastructure. Then it describes the Windows Services which deliver some of the most critical functionalities and automation within the software scope. Lastly it describes the GINESYS POS Architecture and the various services associated with it.

We hope that this document will help you see the GINESYS ERP system in a better light and understand the different parts of the system to plan your infrastructure ahead of time with security and performance concerns properly addressed.

Happy reading!!

Infrastructural View
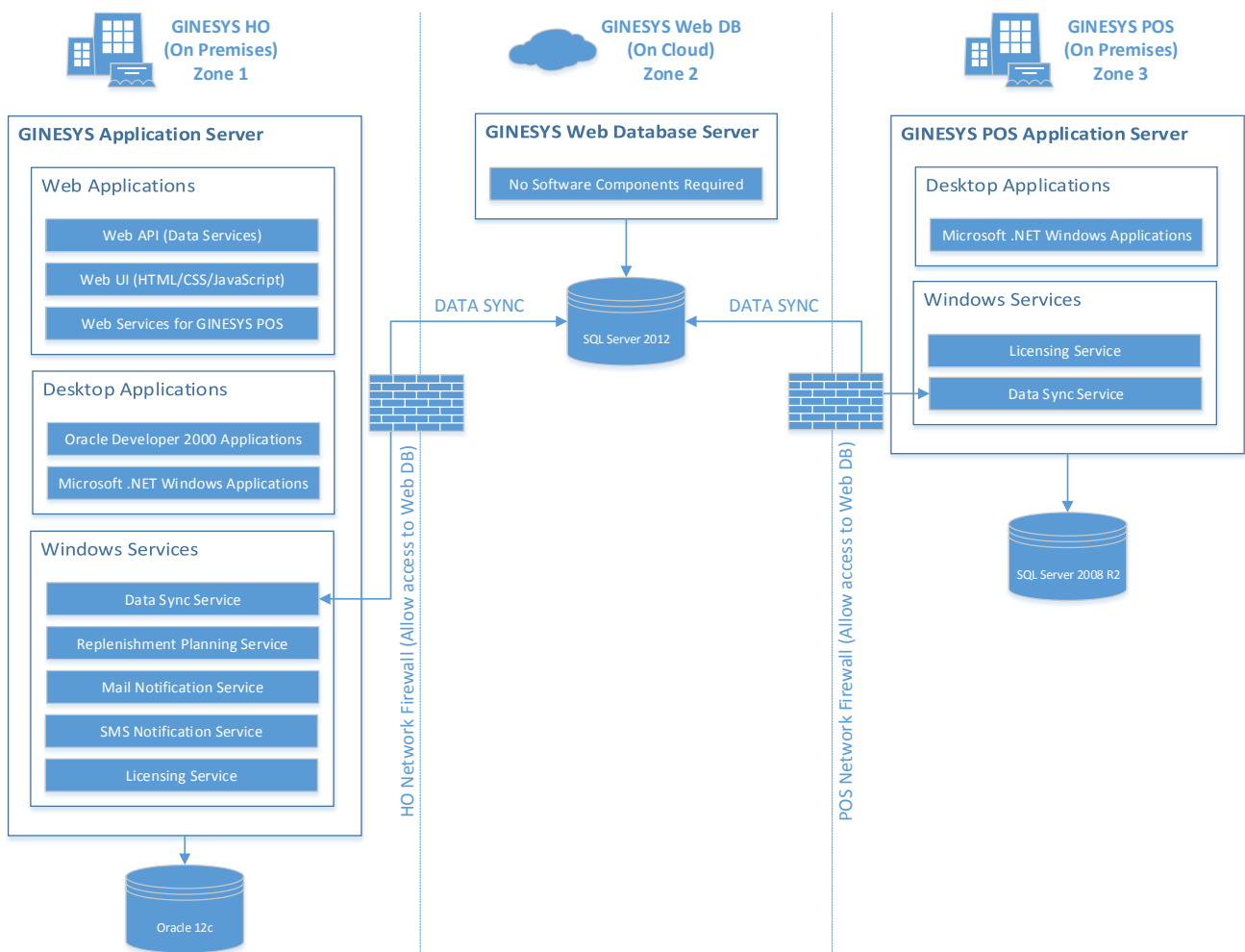
Figure 1

As is eminent from Figure 1, GINESYS system is primarily split into 3 infrastructure zones, namely the Head Office, the Web Database and the GINESYS POS. Each of the zones is described below.

Zone 1: GINESYS HO

The HO infrastructure is the most complex and difficult to understand as most of the hybrid application components are deployed at this infrastructure only. The Head Office infrastructure controls and manages the entire retail chain operations. It is immensely important to plan and optimize this infrastructure as this will play a pivotal role in smooth operations of GINESYS system.

There are three categories of applications deployed at the HO infrastructure, i.e. Desktop Applications, Web Applications and Windows Services. Together they serve the entire functionality of GINESYS.

Desktop Applications

Desktop applications at HO comprises applications built on two technology platforms, Oracle Developer 2000 and Microsoft .NET.

<u>Oracle Desktop Applications</u>

Oracle desktop applications are the ones that GINESYS began with and this platform still delivers a substantial part of the entire functionality. The primary technology used in this platform is Oracle Developer 2000 running Forms 6.0 and Reports 6.0. The different components of the Oracle Desktop Applications are described later in this document.

<u>Microsoft .NET Desktop Applications</u>

Microsoft .NET suite of applications mostly comprises of tools, server utilities and delivers little business functionality but plays a very important role in managing the GINESYS application server and its interactions with other infrastructures like the Web Database and the POS Stores.

Web Applications

This application suite is the future of GINESYS and aggressive strategy has been adopted for migration of the entire software functionality to this platform. The GINESYS web application suite engages the latest web technology available to deliver best in class software performance, usability and aesthetics.

GINESYS has refrained from using traditional web application architecture and has adopted the Single Page Application (SPA) architecture, looking into the future. Once the migration is completed, GINESYS will be one of the world's first Retail ERP system completely delivered on Single Page Application architecture.

Given below is an image showing a comparison between traditional and modern SPA based web applications. GINESYS is being built fully on SPA techniques. A component wise breakup of the Web Application stack is given later in this document.
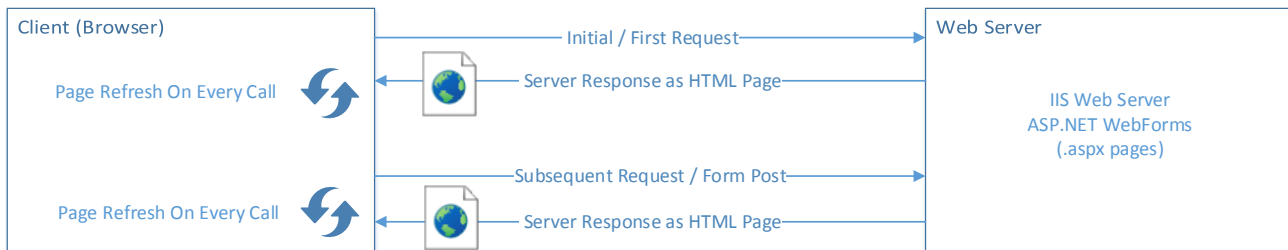
Traditional web application engaging into HTML form based submit and response on every call
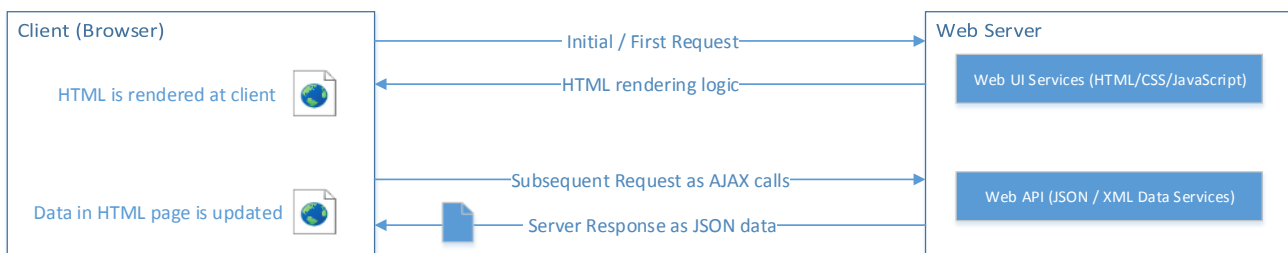
Modern Web Application where HTML rendering logic is obtained only on first call to page and every subsequent call is a Web API call where small foot print JSON structure data is exchanged

Figure 2

Windows Services

Windows services allow running of software operations in an automated and unattended way. GINESYS delivers substantial functionality of the overall system as Windows Services. One of the core functionality which allows offline syncing of data with the POS stores is the data sync services which is built as a windows service. As on today, GINESYS engages five windows services as part of the HO infrastructure. The service layer being immensely important is described below separately with a blow up diagram of their own.

Zone 2: Web Database (Web DB)

The web database is a transient repository of data that is flowing between the Store and Head Office. A transient data store allows offline syncing of data and doesn't need both peers exchanging data to be online at the same point of time. For example, when the HO is sending data to POS stores, it is not mandatory for the POS store to be online at that same point. The sent data from HO will remain in the web database. The POS store can go online anytime later and download the data sent to it. Similarly, data sent from the store is also lodged temporarily in this database and once HO goes online, it successfully fetches and processes the sent data by the store.

Please note that no software component is necessary in this infrastructure zone as on today. However, the image still shows a web database server instead of pure cloud based web database provisioning (e.g. Azure DB) to enable future provisioning of web based software in this zone.

IMPORTANT: It is strongly discouraged to have your Web Database on premise. The access to the web database is very frequent, especially if number of POS stores is high, which might cause an internet traffic choke at HO. Also for 24x7 availability and several other security and management measures it is always recommended to have the web database on cloud only.

Zone 3: POS Store

This infrastructure zone is the one which is most crucial to business revenue generation. Similar to Zone 1, Microsoft .NET Desktop Applications and Windows Services are used to deliver functionalities in this zone. However, no Oracle desktop applications are used in this zone. This zone also will be explained in detail later in this document.

Data Sync – Glue between zones

Data sync demands a special mention while explaining the infrastructure zones, as it is the glue between zones. Data sync is a complex routine which allows HO (Zone 1) and POS (Zone 3) to interact among them by using Web DB (Zone 2) as the transient data store. It is secure, stable and is the backbone of the geographically distributed system.

Retail operations in India still faces the challenges of continuous online connectivity and thus a successful software for India would have to address the issue of internet outages or slow internet and design the system accordingly where it is not required to have both ends of the data transmission to be online at the same point of time. Data sync successfully handles this scenario and stores and pushes transmitted data reliably to the other end of the system.

GINESYS HO Infrastructure Detail View

GINESYS Workstation Components

Oracle Developer 2000 Apps Components

Oracle Developer 2000 Runtime (Forms 6.0, Reports 6.0)	Oracle Discoverer 2000 Runtime (End User Layer v 5.1)

.NET Windows Application Components

Compiled Application Binaries

Microsoft .NET Framework 4.5.2	SAP Crystal Reports 13.0.x

Oracle Data Access Components (ODAC) 64 bit/32 bit

GINESYS Workstation 2

GINESYS Workstation 3

GBPS LAN Cables

GBPS LAN Cables

Database Server

Oracle 12c

GBPS Switch

GINESYS Application Server Components

Roles performed by server

Appl. Server   Web Server   File Server

Oracle Developer 2000 Apps Components

Compiled Application Binaries

Oracle Developer 2000 Runtime (Forms 6.0, Reports 6.0)	Oracle Discoverer 2000 Runtime (End User Layer v 5.1)

.NET Windows / Web Application Components

Compiled Application Binaries

Microsoft .NET Framework 4.5.2

SAP Crystal Reports 13.0.x

Oracle Data Access Components (ODAC) 64 bit	* Oracle Data Access Components (ODAC) 32 bit
SQL Server 2012 Native Client	SQL Server 2012 Command Line Utility (SQLCMD)
SQL Server 2012 CLR Types	SQL Server 2012 SMO

IIS 8.0 with ASP.NET 4.5, HTTP Activation

Visual Basic 6.0 Runtime

Microsoft Data Access Components (MDAC 2.8)	MS Rich TextBox Control 6.0, Tabbed Dialog Control 6.0

GBPS LAN Cables

GBPS LAN Cables

HO Network Firewall
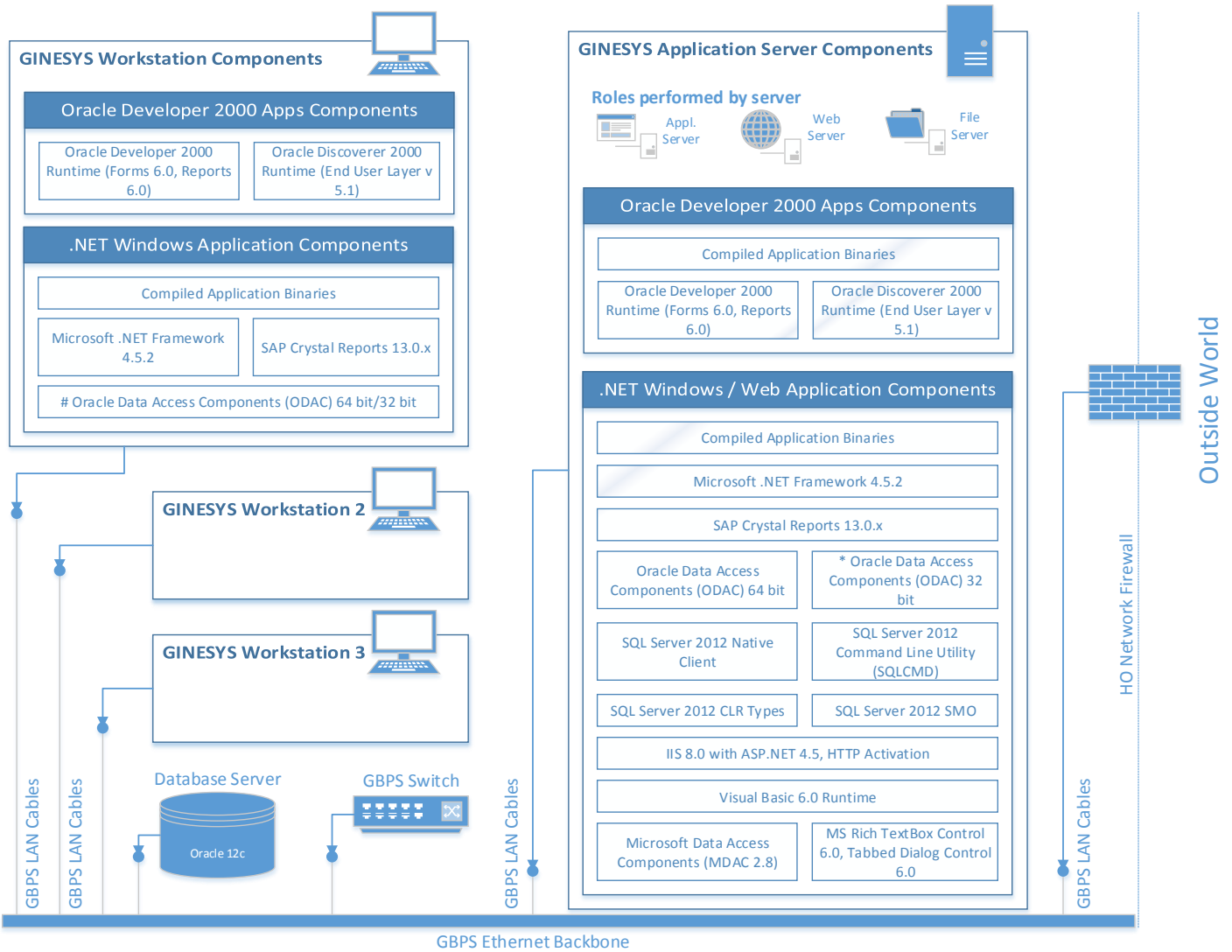
Outside World

GBPS Ethernet Backbone

Figure 3

GINESYS HO infrastructure deployment is complex and requires careful planning for a successful implementation. The picture above will give a fair idea of what components are involved in the infrastructure and how are they interconnected. However, more concepts, ideas and suggestions are outlined below which will help you in planning your GINESYS deployment in a better way.

Database Server

GINESYS uses Oracle 12c as its primary database for local storage. Oracle database will be supported for at least 3 years from the day of sale agreement. Even if GINESYS starts supporting other databases after your sales is closed, your license investments in Oracle database remains secure for at least three years. GINESYS may stop issuing and supporting any particular database for any new sale whenever it deems fit.

Deployment of Database Server

The database server can be deployed in the same machine with the application server or in a separate machine based on security and manageability concerns.

In case the Application Server is made available over public IP for direct access from GINESYS POS stores for using Item Services (web services), it is recommended to deploy the database server on a separate box for increased security and better threat management.

GINESYS Application Server

GINESYS Application Server is a server that engages in three roles as Application Server, Web Server and File Server.

As an Application Server, it serves the web application based modules from this server as the web application binaries are deployed in this box only. As a Web Server it hosts IIS 8.0 or above to serve the single page web application. As a File Server it hosts and shares the application binaries for Oracle Desktop Applications and Microsoft .NET Desktop Applications for keeping the application binaries in a single location. This helps in managing updates to the application binaries easily.

Deployment of Application Server

The Application Server can be deployed locally (on premises) or in private cloud. In case it is deployed on cloud then appropriate CAL (Client Access License) has to be purchased for proper access of the Application Server over RDP protocols from client. In case you are planning to deploy this server on cloud, double check the cloud service provider's competence, credibility, performance and available security measures. In case the application server is deployed on cloud, the Database Server also has to be deployed on cloud.

GINESYS Workstation

GINESYS Workstation is the machine where most user operations are taking place. It mostly houses the runtimes for Oracle Desktop Applications and some supporting runtimes for .NET Desktop Applications. The workstations access the application binaries from the File Share available on the Application Server.

Network

For optimum performance it is recommended to have a proper network in place. GINESYS recommends a Gigabit networking to be done in an End-To-End scenario, i.e. the Server Ethernet Port should support Gigabit, the LAN cables must be CAT6 or higher and the Network Switch also must support Gigabit networking. GINESYS strongly discourages using network hub instead of a switch as performance is substantially degraded in that case.

The Application Server, Database Server should be put on wired LAN compulsorily. Some workstations may remain on wireless LAN but performance issues may be observed in those cases.

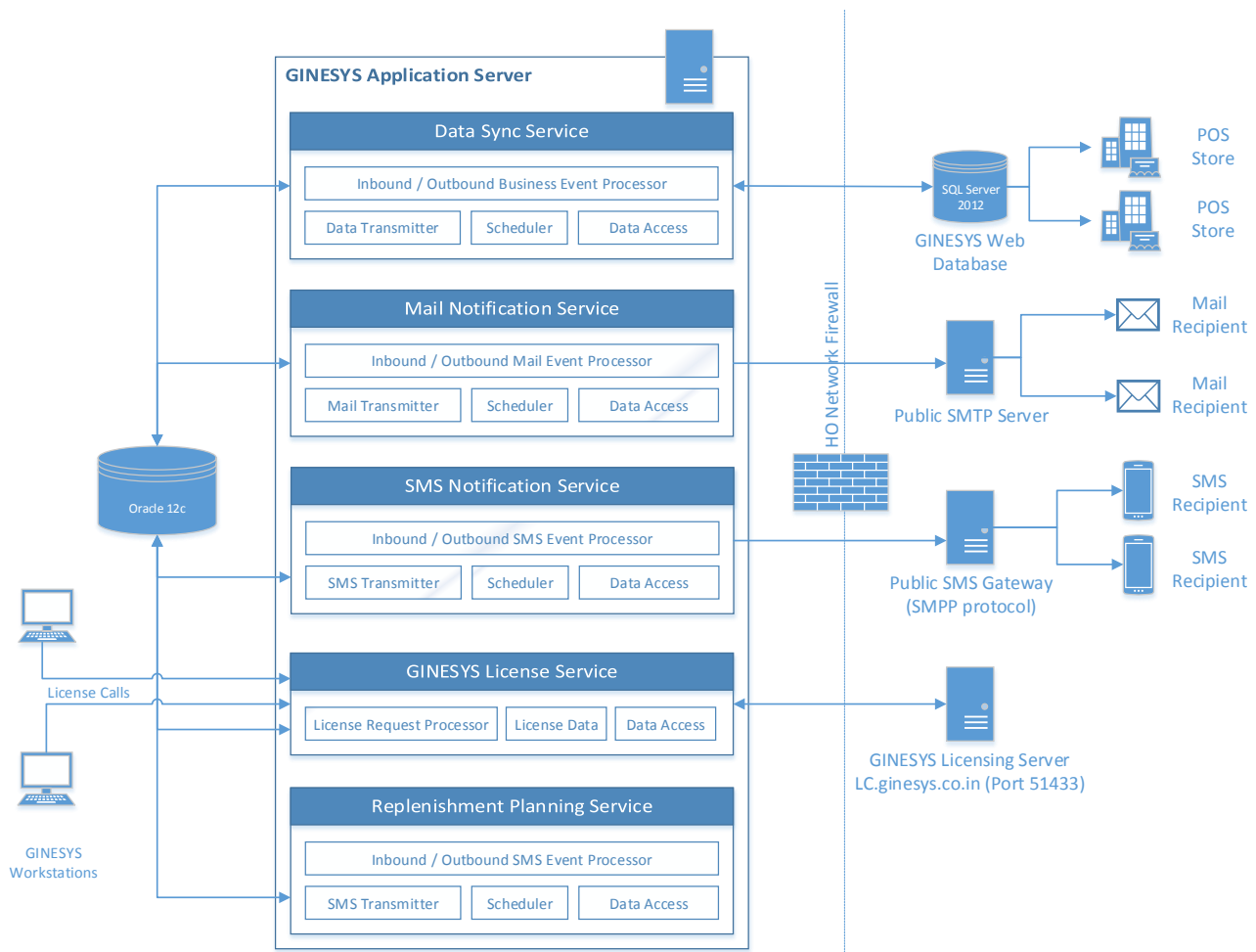# GINESYS Windows Services Detail View

Figure 4

The five windows services together deliver significant business functionality and desired automation in GINESYS. Some services work with on premises components solely and some services need to connect to external systems for completing their functionality. Each service is explained below to understand and plan their required network access grants.

Data Sync Service

Data Sync Service is responsible for offline syncing of data between the HO and POS stores. For outbound business event from HO to POS it connects to the local database for scanning new business events, gathers business data against those events and sends them to the web database. For inbound business data from POS, it handles the business event and stores the data in the local database.

Data Sync Service runs on a schedule and can be configured as low as 15 minutes. **Any lower value will put unnecessary load on your web database server and internet traffic without yielding substantial business value**.

NETWORK Access: Grant access to Web Database in Firewall.

Mail Notification Service

Mail notification service is responsible for scanning mail events occurring in the database. Once events are gathered, email is composed based on settings (TO/CC/BCC/SUBJECT/BODY) provided by the Administrator and sent out to a public (or private) SMTP based mail server

NETWORK Access: Grant access to public SMTP server (typically port 25) in Firewall.

SMS Notification Service

SMS notification service is responsible for scanning SMS events occurring in the database. Once events are gathered, SMS is composed based on settings provided by the Administrator and sent out to a public (or private) SMTP based mail server.

NETWORK Access: Grant access to public SMS Gateway server on SMPP protocol (custom port provided by vendor) in Firewall.

GINESYS Licensing Service

This is the most crucial service of all in the sense that it handles the licensing calls from workstations. If for some reason this service is stopped, GINESYS software will cease to run. The License Manager desktop application utility connects to the GINESYS licensing server for obtaining the required license for GINESYS and once the license is installed, this service stands guard against any intentional or unintentional violation of purchased licenses. This service need to occasionally communicate with the GINESYS licensing server and thus must be provided access to the GINESYS licensing server.

NETWORK Access: Grant access to GINESYS licensing server (port 51433).

Replenishment Planning Service

Replenishment plans are essential to keep your stores well and intelligently stocked and avoid empty shelves during rush sales. This service is responsible for running the replenishment plans automatically on a schedule and make that happen. This service does not need to connect to any external servers and works entirely on local data.

GINESYS POS Infrastructure Detail View

GINESYS POS runs on Microsoft .NET Desktop Applications and Windows Services (built with .NET only). In addition to that Crystal Reports runtime and a few third party components are supplied as part of the installation. The following picture will help you understand the POS infrastructure in detail.
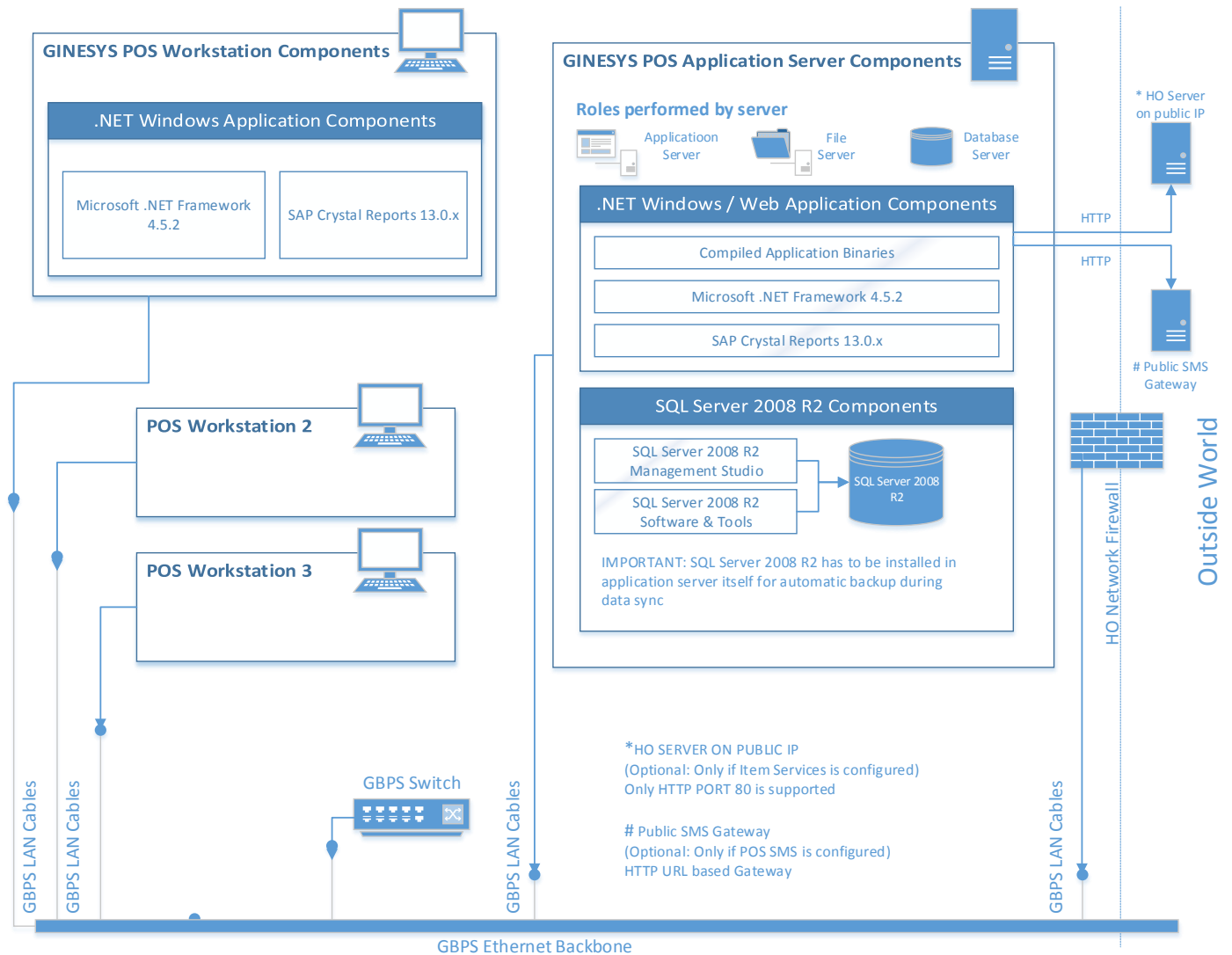

Figure 5

POS Database Server

GINESYS POS Application uses two tier Client-Server architecture with SQL Server 2008 R2 as the data store. The default database that is supplied as part of the installation is SQL Server 2008 R2 Express Edition. However, depending on your store's transaction volumes you may have to select "Standard" or even higher editions. Please check the system requirements document for detail on the same.

Deployment of POS Database Server

The database server must be deployed in the same physical machine with the application server to ensure automatic backup during data sync. SQL Server 2008 R2 Management Studio must also be installed in the same server.

GINESYS POS Application Server

GINESYS POS Application Server is a server that engages in three roles as Application Server, Database Server and File Server.

As an Application Server, it serves the entire GINESYS POS application comprising .NET Desktop Applications and Windows Services, deployed in this box.

As a File Server it hosts and shares the application binaries for Microsoft .NET Desktop Applications for keeping the application binaries in a single location. This helps in managing updates to the application binaries easily via POS AutoUpdate.

As a Database Server, it contains the SQL Server 2008 R2 database server installed in the same physical machine.

Deployment of POS Application Server

The POS Application Server must be deployed locally (on premises) only; it cannot be deployed on the cloud.

GINESYS POS Workstation

GINESYS POS Workstation is the machine where most of the user operations occur. The workstations access the GINESYS POS application binaries from a shared folder on the Application Server (Network Share). However, the binaries are loaded and run from the local workstation machine (client) only. So configurations of the workstations do play an important role in terms of performance, especially memory and processor intensive operations like Analytic Reports.

.NET Framework 4.5.2, SAP Crystal Reports 13.0.x runtimes are required to be installed on the workstations, which are installed via the GINESYS POS Installer.

Network

As in the case of GINESYS HO, for optimum performance it is recommended to have a proper network in place. GINESYS recommends a Gigabit networking to be done in an End-To-End scenario, i.e. the Server Ethernet Port should support Gigabit, the LAN cables must be CAT6 or higher and the Network Switch also must support Gigabit networking. GINESYS strongly discourages using network hub instead of a switch as performance is substantially degraded in that case.

The Server and workstations SHOULD NOT remain on wireless LAN in POS for performance reasons. However, you may choose to put some workstations (e.g. laptops) on wireless provided they have a light workload.

IMPORTANT: Analytic Reports may perform adversely when run from wireless networks.
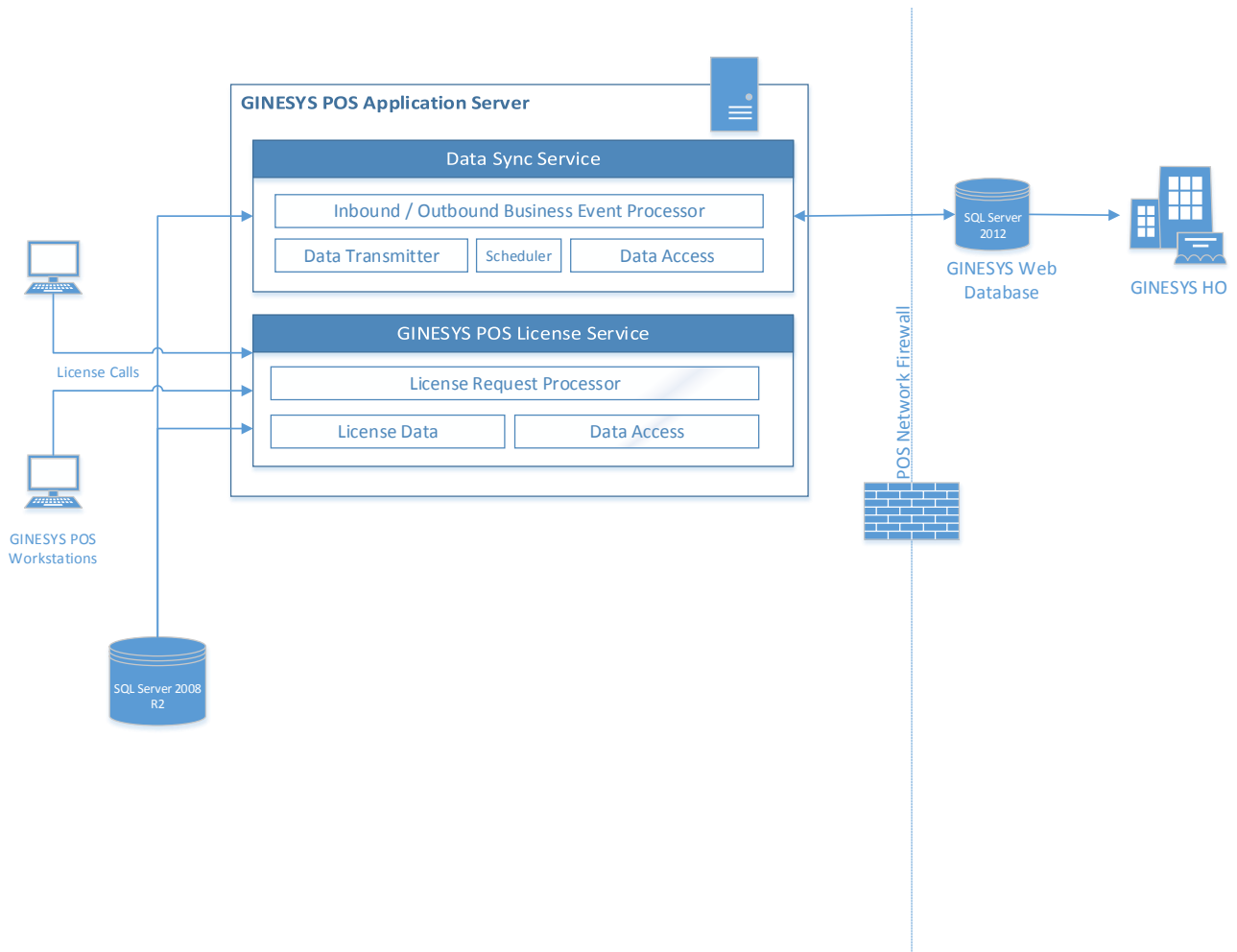
GINESYS POS Windows Services Detail View

Figure 6

The two windows services unitedly provide important business utility and much needed automation in GINESYS. Some services work with on premises components solely and some services need to connect to external systems for completing their functionality. Each service is explained below to understand and plan their required network access grants.

Data Sync Service

As specified before, Data Sync Services are responsible for offline syncing of data between the HO and POS stores. For outbound business event from POS to HO, it connects to the local database for scanning new business events, gathers business data against those events and sends them to the web database. For inbound business data from HO, it handles the business event and stores the data in the local database.

Data Sync Service runs on a schedule and can be configured to an interval as low as 15 minutes. **Any lower value will put unnecessary load on your web database server and internet traffic without yielding substantial business value**.

NETWORK Access: Grant access to Web Database in your Firewall.

Effect of Data Sync Service on POS Data Backup

As explained before, the data sync interval can theoretically, be lowered to less than 15 minutes but your web database will suffer from needless overload without reasonable business value yield. However, if your infrastructure permits, you may lower the data sync interval value. You might need to run your SQL Server database on high performance servers and your database might need to be upgraded to standard edition to lower the interval of data sync interval beyond 15 minutes. Without adequate server hardware support, you may face record locking issues if you put your data sync frequency below 15 minutes.

Every time a POS Data Sync is done, a differential data backup occurs in POS. This differential backup combined with the last full backup, keeps your data backup in sync with the store data as available in HO. However, it must be understood that there will still be a chance of data loss for a very small duration of time. With a 15 minute data sync interval, the maximum duration of data loss will be 15 minutes, i.e. you will always have a backup that has occurred 15 minutes back and most importantly, a backup that is in sync with the store data present in HO.

It must also be understood that other than the Full Backup + Differential Backup combination taken by the software, no other backup will be suitable for restoration as the restored data will always be out of sync with the store data at HO. Any data at store that is out of sync with the same store data at HO, is unusable at POS Store.

So it is always recommended to safe keep the Full Backup (taken manually) + Differential Backup (taken automatically by data sync) so that you can restore a data that is in sync with the HO. Please use a secondary backup device like a secondary Hard Disk for storing a copy of the data backup, in case the primary Hard Disk crashes beyond recovery.

GINESYS POS Licensing Service

GINESYS POS Licensing Service handles the licensing calls from workstations. If for some reason this service is stopped, GINESYS software will cease to run. The Licensing Service handles the license request calls from the POS workstations. The POS Licensing Service then checks in the database and allows the licensed users to access the software. However unlike the GINESYS HO Licensing Service, this POS Service does not need to communicate with the GINESYS licensing server and thus need not be provided access to the GINESYS licensing server.