Global Solutions Wholesale

GEAR ID 102621

Architectural Design Document

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| ***Current Version:*** | 10.0 |
| Approved By: | **APEX Process Owner** |
| Approval Date: | **5th February 2015** |

Document Instructions:

Replace <text within brackets> and any instructions [usually in blue] with project specific information. Some of the topics may not apply to all projects. In the topics where a response is optional, a choice [“N/A for this report”] is included in the instructions.

Please retain hidden (blue) text to assistance to future authors who may be required to revise the document.

Any fill-in text in black should remain unchanged.

Project Revision History

*To be updated by Author*

|  |  |  |  |
| --- | --- | --- | --- |
| **Version Number** | **Date Updated** | **Revision Author** | **Brief Description of Changes** |
| 1.0 | 13 May 2011 | Tony Edmonds | Creation from merging appropriate sections of the Tech Refresh project ADD and the Itanium Migration project ADD. Document incomplete and not ready for review. |
| 1.1 | 25 May 2011 | Tony Edmonds | Revision updates following review by GMAC. |
| 1.2 | 3 Aug 2011 | Tony Edmonds | Completed missing sections as per GMAC diagram standards. |
| 1.3 | 26 Aug 2011 | Tony Edmonds | Revision updates following review by GMAC. |
| 1.4 | 15 Sep 2011 | Tony Edmonds | Further updates following review by GMAC and HP. |
| 1.5 | 22 Sep 2011 | Steven Goldingay | Approval from BU Architect and Technical lead embedded. |
| 1.6 | 22 Sep 2011 | Tony Edmonds | Document updated to reflect changes for the GSW China Relocation project. |
| 1.7 | 23 Sep 2011 | Tony Edmonds | Revision updates following review by HP. |
| 1.8 | 05 Dec 2011 | Tony Edmonds | Updated following GMAC review comments – received 8 Oct 2011. |
| 1.9 | 19 Jan 2012 | Tony Edmonds | Approval from BU Architect and Technical lead embedded. |
| 1.10 | 20 Apr 2012 | Tony Edmonds | Updated for GSW release CL53 to include AspectJ library.  Added missing interface to LAO Retail. |
| 1.11 | 26 Apr 2012 | Tony Edmonds | Approval from BU Architect and Technical lead embedded. |
| 1.12 | 21 May 2012 | Paul Randall | Updates after GMAC review. |
| 1.13 | 29 May 2012 | Paul Randall | Updates after GMAC review, included section on housekeeping. |
| 1.14 | 6 July 2012 | Paul Randall | Updates after GMAC review, include diagram for China + expand on encryption used in certificates. |
| 2.0 | 9th Jul 2012 | Debbie Downer | Baselined & approvals embedded. |
| 3.0 | 16th Aug 2012 | Debbie Downer | Baselined for CL54 & approval embedded. |
| 3.1 | 14th Nov 2012 | Tony Edmonds | Updated to reflect the changes in release CL55. (See section 4.2.) |
| 3.2 | 20th Nov 2012 | Tony Edmonds | Updates following Ally review. |
| 4.0 | 23rd Nov 2012 | Debbie Downer | Baselined for CL55 & approval embedded. |
| 4.1 | 4th Mar 2013 | Tony Edmonds | Updated to reflect the changes in release CL56. See Logical Component View (Fig.2) |
| 5.0 | 8th Mar 2013 | Debbie Downer | Baselined for CL56 and approval embedded. |
| 5.1 | 23rd May 2013 | Tony Edmonds | Rebranding from Ally to GM Financial.  Updated to include changes for CL57. |
| 5.2 | 28th May 2013 | Tony Edmonds | Added Java Certification Level. |
| 6.0 | 6th Jun 2013 | Debbie Downer | Baselined for CL57 and approval embedded. |
| 6.1 | 27th August 2013 | Tony Edmonds | Updated for CL58:  - Java Certification Level updated  - “GMAC” to “GMF” corrections |
| 7.0 | 3 Sep 13 | Debbie Downer | Baselined for CL58 & approval embedded. |
| 7.1 | 7th Jan 2014 | Dan Howell | Updated for Evergreen project |
| 7.2 | 20th Jan 2014 | Dan Howell | Updated following GMF review for Evergreen |
| 7.3 | 23rd Jan 2014 | Dan Howell | Minor changes following further internal review |
| 7.4 | 29th Jan 2014 | Dan Howell | Minor changes following further GMF review |
| 8.0 | 31st Jan 2014 | Debbie Downer | Baselined for CL59 & approvals embedded |
| 8.1 | 22nd April 2014 | Tony Edmonds | Updated for CL60 changes:  - Revised Java ‘certified’ version |
| 9.0 | 9th May 2014 | Debbie Downer | Baselined for CL60 & approvals embedded |
| 9.1 | 3rd July 2014 | Dan Howell | Updates related to HP ExStream migration |
| 9.2 | 24th July 2014 | Dan Howell | Updated following GMF architect feedback |
| 9.3 | 20th August 2014 | Edgardo Acosta | Updated for CL61.  All CSRs have been reviewed and there are no changes required. |
| 9.4 | 11th Dec 2014 | Edgardo Acosta | Updated for CL62.  The document has been reviewed and there are no changes required. |
| 10 | 5th February 2015 | Neil Wallwork | Baselined for CL62 & approvals embedded |

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| --- | --- | --- | --- |
| **Version Number Approved** | **Approver Role** | **Approver Name** | **Embedded Approval and Date** |
| 1.4 | Business Unit Architect & Technical Lead | Jaime Gonzalez | Sept 21, 2011 |
| 1.8 | Business Unit Architect & Technical Lead | Jaime Gonzalez | Jan 17, 2012 |
| 1.10 | Business Unit Architect & Technical Lead | Mabu Shaik | Apr 25, 2012 |
| 1.14 | Business Unit Architect & Technical Lead | Mark Robinson | 9 Jul 2012 |
| 1.14 | Solutions Architect | Alan Liu | 9 Jul 2012 |
| 2.0 | Technical Lead | Mabu Shaik | 15th Aug 2012 |
| 3.2 | Technical Lead | Mabu Shaik | 22nd Nov 2012 |
| 4.1 | Technical Lead | Mabu Shaik | 8th Mar 2013 |
| 5.2 | Technical Lead | Mabu Shaik | 6th Jun 2013 |
| 6.1 | Technical Lead | Jaime Gonzalez & Steven Goldingay | 3rd Sep 2013 |
| 7.4 | Technical Lead  IT Application Owner  Security Architect | Salman Riaz  Andy Goymer  Gilda Kavousian | 31 Jan 2014 |
| 8.1 | Technical Lead  IT Application Owner | Salman Riaz  Andy Goymer  Gilda Kavousian | 9 May 2014 |
| 9.3 | Technical Lead  IT Application Owner  Security Architect | Chris Payne  Andy Goymer  Gilda Kavousian | 5 Jan 2014 |
| 10 | Technical Lead  IT Application Owner  Security Architect | Chris Payne  Andy Goymer  Gilda Kavousian | 5 Jan 2014 |

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# Introduction

[The following template is provided for use with APEX for all system development. The primary focus of this document is to provide a consistent format to record the system architecture of any project. This template encourages the perspective of component-based application architectures and diagrams. Component-based application architectures may be created using any combination of smaller grained components (e.g., object-oriented development) and/or large grained components (usually purchased COTS components such as applications or frameworks).

Text enclosed in square brackets and displayed in blue is included to provide guidance to the author. It does not appear on printed versions of the document. Leave it present within the document for future guidance – do not delete it.

The introduction of the Architectural Design provides an overview of the entire architectural design. It includes the purpose, scope, definitions, acronyms, abbreviations, references and overview of the architectural design.]

## Purpose

[This section defines the role or purpose of the Architectural Design in the overall project documentation, and briefly describes the structure of the document. The specific audiences for the document are identified, with an indication of how they are expected to use the document.]

This document provides a comprehensive architectural overview of the Global Solutions Wholesale system (GSW), using a number of different architectural views to depict aspects of the system. It is intended to capture and convey the significant architectural decisions that have been made.

This GSW Architecture Design Document (ADD) is part of the system documentation rather than forming part of a project’s document set. It can be referenced throughout the development lifecycle of enhancements to identify the impact of proposed changes and by the Sustain Team in supporting issues with the production environment. Both teams will keep the document up to date as changes are introduced and approved.

The GM Financial business operations and IT departments will use the document to help analyse potential change requests.

## Scope

[A brief description of what the Architectural Design applies to; what is affected or influenced by this document. Refer to the Project Charter and System Requirements Specification for the overall Project Scope.]

This ADD applies to all system components comprising GS Wholesale. Significant architectural elements are documented such that the impact of change to them or their related components can be identified easily as the system evolves.

### Included Topics

[A brief description of topics to be included in this document and what is affected or influenced by these topics.]

The latest changes to this document were made to include changes arising from the GMF Evergreen project, which migrates GSW to new hardware and software using a virtualised platform.

### Excluded Topics

[A list of topics excluded from this document, if any, with reasoning as to why they are excluded. Provide references to any topics addressed in other documents.]

There are no significant components currently excluded from this document.

## Definitions, Acronyms and Abbreviations

[Provide definitions of all terms, acronyms and abbreviations required to interpret the Architectural Design. This information may be provided as a reference to the project’s glossary.]

| **Term** | **Definition** |
| --- | --- |
| ADD | Architectural Design Document |
| API | Application Programming Interface |
| COTS | Custom Off-The-Shelf |
| DBMS | Database Management System |
| DR | Disaster Recovery. An environment state which may be employed should a failure within the application environment (such as hardware failure) be sufficiently critical that the backup environment needs to be employed to continue delivering the service levels required. |
| DSA | Data Sharing Agreement |
| Exstream | HP Exstream is a document generation & distribution software product. GSW leverages this for some of its document generation. |
| FAD | Fusion Adapter Designer - historically the component used to write the GSW real-time interfaces. The name is linked to the Forte product used to originally write it; although this is no longer technically relevant the name has stayed. |
| GMF | GM Financial |
| GSS | Global Solutions SmartLink – a web-based dealer portal |
| GSW | Global Solutions Wholesale system |
| HTTP | Hypertext Transfer Protocol  A method used to transfer or convey information on the World Wide Web. HTTP is a request/response protocol between clients and servers. |
| HTTPS | A URI scheme used to indicate a secure HTTP connection. It is syntactically identical to the http:// scheme with an additional encryption/authentication layer. |
| IRD | Infrastructure Requirements Document |
| J2EE | Java 2 Platform, Enterprise Edition  J2EE is a programming platform — part of the Java Platform — for developing and running distributed multi-tier architecture Java applications, based largely on modular software components running on an application server. |
| Java EE | Java Platform, Enterprise Edition. See J2EE.  J2EE was renamed “Java EE” by Sun in version 1.5. |
| JDBC | Java Database Connectivity A Java API that defines how a client may access a database. It provides methods for querying and updating data and is oriented towards relational databases. |
| LDAP | Lightweight Directory Access Protocol An application protocol for querying and modifying directory services running over TCP/IP. |
| NSAPI | Netscape Server Application Programming Interface Extends the web server software functionality through ‘plug-ins’. |
| PDA | Personal Digital Assistant |
| PoC | Proof of Concept |
| POJO | Plain Old Java Object |
| RDBMS | Relational DataBase Management System |
| RMI | Remote Method Invocation A Java API for performing the object equivalent of remote procedure calls. |
| RSH | Rüsselsheim Server Hosting team |
| SDD | System Design Document |
| SFTP | Secure FTP. A secure version of the File Transfer Protocol that encrypts transferred data. |
| SOAP | Simple Object Access Protocol A protocol for exchanging XML-based messages over networks, normally using HTTP. |
| SPOF | Single Point of Failure |
| SRS | System Requirements Specification |
| SSO | Single Sign On A specialised form of authentication that enables a user to authenticate once and gain access to the resources of multiple systems. |
| TNG | Scheduling application used by the production sustain teams to invoke and monitor jobs across the GMF applications |
| UNRAE | Unione Nazionale Rappresentanti Autoveicoli Esteri (National Union of Automotive Foreign Representatives) Italian organisation within the car industry representing foreign producers. |
| WAN | Wide Area Network |
| WAS | Wholesale Audit System application |
| WOL | Wholesale Online – the web-enabled functionality available within GSW |
| WSDL | Web Service Definition Language An XML-based language for describing Web Services. Using a WSDL, a client can locate a web service and invoke any of its publicly available functions. |

## References

[Provide a complete list of all documents referenced elsewhere in the Architectural Design. Identify each document by title, report number (if applicable), date and publishing organization. Specify the sources from which the references may be obtained.]

| **Item** | **Title** | **Author** | **Location** |
| --- | --- | --- | --- |
| Ally Data Modeling Standards | Ally Data Model Development Guide v1 (pdf) | Architecture  Delivery | <https://teamroom.exchange.gmacfs.com/Infrastructure/ArchDelivery/DG/default.aspx> |
| Context Diagram | GSW Context Diagram | Doug Page | StarTeam project: GD000010-GS Wholesale  View: production\_support\_and\_enhancements\_wbk  Folder: \Production\_Support\_and\_Enhancements\07\_Production\_Support\_Handbook\Context\  File: GSW\_Context\_diag.vsd |
| Core J2EE Patterns | Core J2EE Patterns | Sun Microsystems | http://java.sun.com/blueprints/corej2eepatterns/Patterns/index.html |
| EDS HS GMAC Itanium Design | GMAC Itanium Refresh Project v2.0 (Dec 08) | John Clark | Acquire through GSC36A |
| Eurotax Valuation Interface | EurotaxGlass's Web Services - Valuation | eurotaxGLASS’S Automotive Business Intelligence | \\StarTeam\_Repositories\GM\GD000010-GS Wholesale\04\_System\GS Wholesale\System\_Doco\System\_Documentation\Wholesale\Eurotax\WS\_Valuation\_interface\_v0.5.pdf |
| Gang of Four patterns | “Design Patterns: Elements of Reusable Object-Oriented Software” | Erich Gamma  Richard Helm  Ralph Johnson  John Vlissides | ISBN 0-201-63361-2 |
| GSS Interfaces | SCR1026 - GSS Interfaces modifications for UK & introduction for Australia | Peter Brown | \\StarTeam\_Repositories\GM\GD000010-GS Wholesale\04\_System\GS Wholesale\Appl\_SW-Data\WhsOther\SmartMarket\23112\_SCR1026\_04\_CSR\_\_Design.doc |
| GSW Runbook | GS Wholesale Production Support Run Book | HP Support Team | \\StarTeam\_Repositories\GM\GD000010-GS Wholesale\Production\_Support\_and\_Enhancements\07\_Production\_Support\_Handbook\Runbook\GSW\_TR\_Runbook.doc |
| Tech Refresh Impact Analysis | Project 284614 - GSW Technical Refresh Impact Analysis Document | Daniel Howell | \\StarTeam\_Repositories\GM\GD000010-GS Wholesale\Technical Refresh\04\_Sys\Busn\_and\_Tech\_Asmnt\284614\_Impact\_Analysis\_TechnicalRefresh.doc |
| Itanium Migration Impact Analysis | GSW Itanium Migration – Application Impact Assessment | Daniel Howell | GSW Project Workbook (StarTeam) |
| Implementation Plans | Implementation Plans | Stephane Trouche | \\StarTeam\_Repositories\GM\GD000010-GS Wholesale\Technical Refresh\04\_Sys\Impl\_Plans\GSW\_Technical\_Refresh\_Implementation\_Plans.doc |
| Oracle Workshop document | Move to Oracle Database 11g – The Whole Story | Mike Dietrich | Oracle-sourced document via email  Available via Metalink |
| Tech Refresh System Design Document | System Design Document | Daniel Howell | \\StarTeam\_Repositories\GM\GD000010-GS Wholesale\Technical Refresh\04\_Sys\Tech\_Arch\_Specs\GSW Technical Refresh System Design Document.doc |
| UML 2.X Specification - Unified Modeling Language: Superstructure | UML 2.X Specification | Object Management Group | <http://www.uml.org/> |
| WAS Specification | Web Service Specification for Mobile Financial Audit Assessor GMF | David Wheaton, Solution Architect, Hewlett-Packard Australia Pty. Ltd | \\StarTeam\_Repositories\GM\GD000010-GS Wholesale\04\_System\GS Wholesale\System\_Doco\System\_Documentation\Wholesale\WAS\_Audits\HP iPAQ GMAC Web Service Specification v4 1 CR002 Pt 1 and 2.doc |

## Notation

[Describe the diagrammatic notation used in this document to represent the architectural views. Use of the Unified Modeling Language (UML2.X) is required, except for the following circumstances:

1. If the standard architectural diagrams for a COTS product are not available in UML2.X, then use the Supplier’s standard diagrams for the COTS portion of the project.
2. This project enhances an existing application that has been previously deployed and was not documented using UML. Diagrams for the existing application do not need to be converted to UML. However, new functions are to be documented using UML2.X.
3. If this project reuses existing reusable assets that were not documented using UML, then use the documentation bundled with the asset for that portion of the project.

If UML2.X is not used then please provide a detailed legend in this section for all symbols and semantics.]

Diagrams in this document use the Unified Modelling Language (UML) v2 notation.

# Architectural Representation

[Describe an overview of the software architecture for the system, and outline what diagrams are included in its representation. For the typical 4+1 views (Use-Case, Logical, Process, Deployment, and Implementation Views), enumerate the views that are necessary, and for each view, explain the types of model elements it contains.]

The system is based around an Enterprise Java (J2EE) middle tier running the primary online application functions. End users access the application functionality via either of two methods. The first utilises a Java Swing thick-client deployed to local GM Financial branch workstations via Java Web Start and communicating to the middle tier over the GMF WAN. The second method uses a web-based application accessible via a suitable web browser and the Intranet or Internet.

Back-end business functions are provided by a COBOL server which handles both real-time and overnight batch processing. Enterprise Java communicates with COBOL through a web service exposed by the Microfocus SOA COBOL server.

Interfaces into the application are provided via XML over HTTP or HTTPS. These currently serve the Wholesale Audit System (WAS) service for PDA devices, an interface for Global Solutions SmartLink (GSS) and the Latin American Organisation Retail system (LAO Retail).

File-based interfaces used by the batch cycle only are supported by SFTP and Tumbleweed.

The output interfaces comprise: an SMTP connection to the email system to send reports to the users on request; a vehicle valuation request service to Eurotax; and a vehicle registration advice notification to UNRAE for Italian registrations.

Data persistence is provided by an Oracle 11gR2 DBMS.

Business reporting for applicable geographic regions is provided by Oracle Reports. Document generation is provided by HP Exstream.

## Logical Application Architecture Drawing

**2.1.1 Context View**

[Insert here the Logical Application Architecture Drawing - Context View, per the instructions in the [Architecture Drawing Standards](https://teamroom.exchange.gmacfs.com/Infrastructure/ArchDelivery/ArchGov/Architecture%20PSP/Ally%20Arch%20Drawing%20Standards.doc), available on the [Architecture Governance TeamRoom](https://teamroom.exchange.gmacfs.com/Infrastructure/ArchDelivery/ArchGov/default.aspx)]

\*EurotaxGlass  
Vehicle Valuations

Goldrush

GSW Logical Application Architecture Diagram

End User Desktop/Laptop



Java Client App

[101834, 101824, 101735, 101833]

Security

[100608]

GSW

[100608]

GS Wholesale (ATS#?)

X64 • RHEL • WebLogic AS

[101066, 101834, 101824, 101735]

Metrics

[100608]

FAD Interface (ATS#?)

X64 • RHEL • WebLogic App Server

[101066, 101824, 101823, 101735]

GS Metrics (ATS#?)

X64 • RHEL • WebLogic AS

[101066, 101735]

GS Cobol (ATS#?)

GEAR ID 100514

X64 • RHEL • WebLogic AS

[101824, 101066, 101834, 101824, 101823, 101735]

GS Security (ATS#?)

X64 • RHEL • WebLogic AS

[101066, 101834, 101824, 101735]

GS Wholesale Online (ATS#?)

X64 • RHEL • WebLogic AS

[101066, 101834, 101735]

GS Parameters (ATS#?)

X64 • RHEL • WebLogic AS

[101066, 101834, 101824, 101823, 101735, 101835, 101671]

End User Desktop/Laptop



Web Browser

COBOL

X64 • RHEL • Microfocus  
[100514]

\*GS Smartlink (GSS)

\*Wholesale Audit System (WAS)

3 HTTPS

1 HTTP

6 XML/HTTP

7 XML/HTTP

8 XML/HTTPS

5 WS/HTTP

2 HTTPS

Email System

9 SMTP

1 HTTPS

10 SFTP

GSW BATCH (ATS#?)

X64 • RHEL • Shell Scripts

[7917, 101830]

Local file store

HP ExStream

[101828]

TUMBLEWEED

\*UNRAE

Vehicle Registration

12 WS/HTTPS

13 Oracle

SCHLEP Monitoring

X64 • RHEL • Java

\* Not all countries

\*Latin American Retail System

14 XML/HTTP

Figure 1

**2.1.2 Interface Descriptions**

[Describe here each of the interfaces listed in the Logical Application Architecture Drawing, using the interface numbers from the drawing. For each interface with a data file or database, list the following information:]

[For each API (interface between two programs), list the following information:]

2. API Spec

Description:

API #1:

(I) Input received from Ext

(O) Output sent to Ext

API #2:

. . .

**Data Spec**

**Description: Security**

Provides user role permissions for GS Wholesale, Wholesale Online and GS Parameters applications, via the GS Security module.

**Reads:** GS Security

**Writes:** GS Security

**Data Sharing Agreement:**

**Data Spec**

**Description: Metrics**

Records performance metrics for specific operations within the GS Wholesale application, via the GS Metrics module.

**Reads:** None from application.

**Writes:** GS Metrics

**Data Sharing Agreement:**

**Data Spec**

**Description: GSW**

The primary data store for GS Wholesale business data and parameters.

**Reads:** GS Wholesale, GS Wholesale Online, GS Parameters

**Writes:** GS Wholesale, GS Wholesale Online, GS Parameters

**Data Sharing Agreement:**

**1. API Spec**

**Description: Thick-client Java Swing application**

**API #1:**

Both input and output are represented as serialized Java objects between the thick client and J2EE application server. Basic transport uses HTTPS over TCP/IP. Clients connect via a web tier and appropriate inner and outer firewalls. The web tier then proxies the call using the NSAPI proxy plug-in for Weblogic from Oracle.

**2. API Spec**

**Description: Parameters – Web application**

**API #2:**

Standard HTTPS request/response traffic via TCP/IP. Clients connect via a web tier and appropriate inner and outer firewalls. The web tier then proxies the call using the NSAPI proxy plug-in for Weblogic from Oracle.

**3. API Spec**

**Description: Wholesale Online – Web application**

**API #3:**

Standard HTTPS request/response traffic via TCP/IP. Clients connect via a web tier and appropriate inner and outer firewalls. The web tier then proxies the call using the NSAPI proxy plug-in for Weblogic from Oracle.

**5. API Spec**

**Description: COBOL – Web Service over HTTP**

**API #5:**

SOAP request made from Wholesale application to retrieve information from COBOL business logic systems. Since this does not pass outside of the EA compartment (it is traffic wholly within the localhost) there is no need to encrypt the traffic. This also helps keep transactional performance as high as possible.

**6. API Spec**

**Description: Eurotax – XML over HTTPS**

**API #6:**

A web service call to the Eurotax system to provide a vehicle valuation. This is used only in Germany and Austria. Standard SOAP-wrapped XML web service provided by Eurotax using HTTP(S) encrypted communication.

**7. API Spec**

**Description: WAS Audit – XML over HTTP**

**API #7:**

Interface for GSW to receive incoming XML requests from the Wholesale Audit System PDAs (redirected by the web server). The connection is encrypted between the client and the web tier (HTTPS) but the backend connection into GSW is unencrypted HTTP.

**8. API Spec**

**Description: GSS – XML over HTTPS**

**API #8:**

Interface for the Global Solutions SmartLink application. Data is passed in the form of XML over TCP/IP, with an outer SOAP wrapper. It is similar to a Web Service although is not fully W3C compliant but a proprietary communication specific to GSW. Data is encrypted between endpoints via standard SSL encryption.

**9. API Spec**

**Description: Mail – SMTP**

**API #9:**

The JavaMail API for sending messages over the email system to the user. The batch cycle also makes calls to the Unix *sendmail* utility to achieve the same goal.

**10. API Spec**

**Description: Batch – SFTP**

**API #10:**

There are numerous inbound and outbound file-based interfaces initiated by the batch cycle. These use the SFTP (Secure FTP) protocol to transfer files to/from the Tumbleweed service, which itself co-ordinates the transfer of files with the external systems. Some interfaces retain the use of the Reflections file transfer product, which itself provides a similar means of secure file transfer between GSW and external systems. These systems are a mix of internal GM Financial systems and external 3rd parties such as banks, GM Financial branches, external 3rd party suppliers and factories.

Document generation is handled by Unix batch scripts, which interact with HP Exstream via Tumbleweed SFTP. The scripts are initiated by TNG during the batch cycle, and formulate the necessary information to send to Exstream in order for it to generate the relevant PDF documents. The data is transferred to Exstream via SFTP (the generated documents are also returned via this method).

Note that HP Exstream is, at present, used to document generation only. No use is made of email delivery capabilities or direct printing, or real-time document generation.

**12. API Spec**

**Description: UNRAE – Web Service over HTTPS**

**API #12:**

Automatic vehicle registration over a secure web service connection for Italian dealers. Users enter a PIN to the WOL application and a vehicle registration request is queued for transmission to UNRAE every 10 minutes from GSW.

**13. API Spec**

**Description: Goldrush – Oracle ‘Materialized Views’**

**API #13:**

A cut-down version of GS Wholesale data for the UK is sent to external Goldrush databases using Oracle materialized views on a regular basis.

**14. API Spec**

**Description: Latin American Retail System – XML over HTTP**

**API #14:**

GSW receives requests for data from the external LAO Retail system. The standard SOAP-wrapped XML requests are received on a dedicated listening port on the application server. There is no requirement to encrypt this interface since it passes entirely within the GMF WAN (and contains no personal information).

## Architectural Goals and Constraints

[Describe the software requirements and objectives that have significant impact on the architecture; for example, safety, security, privacy, use of a COTS product, portability, distribution, performance, scalability or reuse. This section should also capture special constraints that may apply: design and implementation strategy, development tools, team structure, schedule, legacy code, etc.]

This is an important section describing why the system was created as it is.

### Architectural Requirements and Vision

[Depict the vision on choosing a particular architecture and how completely the software requirements are met by the proposed architecture. The vision should address how the project’s architecture satisfies current tactical requirements while accommodating strategic/corporate goals. The vision should explain how the project’s architecture enables future application integration within the process area/region. The vision should explain how the project’s architecture allows for future technology change.]

GSW retains its current architectural requirements that resulted from the migration to Itanium and then to the current Intel x64 hardware. The application is served from a J2EE/JavaEE-based application tier, via a web tier and suitably-configured firewalls, to a mix of thin-client (web browser) and thick-client (Java application) end user applications. The data tier is served by Oracle DBMS and there is a mix of real-time and batch COBOL processing supported by Microfocus Server for SOA, which includes Web Service calls to invoke real-time programs during the online day. A web tier based upon Oracle iPlanet Web Server sits between the application server and the end user for security purposes. There is no significant content hosted upon the web tier; it exists purely to proxy requests across to the application tier.

The GSW architecture has grown over many years, including updates as part of the Technical Refresh project (2008), which migrated it from an ageing unsupported Sun One UDS application tier to Java. As such, the requirements and vision may seem at odds with modern direction but the reader should understand that many of the aspects of the solution were set in place long before such direction became standardized by GMF.

### Compliance with GM Financial’s Standard Architectures

[List any standard GM Financial Architecture Patterns being used by this project. See GEAR (Global Enterprise Architecture Repository) for standard architectures, best practices, and lessons learned, accessed from Ally Pulse.

No proprietary / third party ‘standards’ are introduced to the landscape.

| **Architecture Pattern Name** | **Architecture Pattern Version** | **Repository Location** |
| --- | --- | --- |
|  |  |  |

### Open Standards Conformance

[List all the open standards and the version numbers to which this architecture conforms.]

The following Open Standards are followed:

* HTTP 1.1 / HTTPS
* XML 1.1
* SOAP 1.2
* WSDL 1.1

### Vendor Specific Solutions

[List any vendor specific and/or proprietary protocols and APIs used in this architecture.]

None.

## Potential Reusability

[If component or service-oriented development is included then give a brief overview on how incorporating Reusable Assets (components, frameworks, web services and design patterns) are expected to benefit the project. Identify the functional areas or business components for which Reusable Assets may be developed or purchased.

If COTS extensions are included, then give a brief overview on how incorporating existing Reusable Assets (COTS templates, data modules) and/or reusable COTS modules could benefit the project.]

### Components and Frameworks Reused by Project

[List any commercial Reusable Assets (components or frameworks) that are reused by the project, including the supplier name and reusable asset name. List any GM Financial custom Reusable Assets (components or frameworks) to be reused by the project including the repository source. Itemize any related tangible and intangible benefits to the project as a consequence of using these reusable components and frameworks. IT Standards are found in GEAR (accessed from Ally Pulse).

Please refer to the deviation requests that were filed as part of the Tech refresh project for the reasons why the following software is required.

|  |  |  |  |
| --- | --- | --- | --- |
| **Reused Component or Framework** | **Supplier** | **Benefits List** | **Repository Source** |
| Apache Axis  (for web services call to COBOL) | Open Source | Apache Axis is an open source, XML based Web service framework. It consists of a Java and a C++ implementation of the SOAP server, and various utilities and APIs for generating and deploying Web service applications. Using Apache Axis, developers can create interoperable, distributed computing applications. Axis is developed under the auspices of the Apache Software Foundation. | <http://ws.apache.org/axis/> |
| Apache FOP | Open Source | Formatting Objects Processor. A Java print formatter driven by XSL formatting objects (XSL-FO) and an output independent formatter. Used to create the basic pay slip form boxes and layout. | http://xmlgraphics.apache.org/fop/ |
| Apache Jakarta Commons:  Bean utils  CLI  Codec  Collections  DBCP  Discovery  File Upload  HTTP Client  Logging  Pool  Validator | Open Source | The Jakarta Commons is a subproject of the Jakarta Project under the umbrella of the Apache Software Foundation. The purpose of the Commons is to provide reusable, open source Java software.  The libraries are used extensively throughout GS Wholesale to:  provide easy-to-use wrappers around complex Java capabilities, like introspection and reflection;  parse command line arguments;  convert to/from base 64 for secure encryption;  handle object collections;  pool database connections in development mode;  locate web resources;  upload files;  accessing resources by HTTP protocol;  provide basic logging;  pool generic objects;  validate XML files. | http://jakarta.apache.org/commons/ |
| Apache PDFBox | Open Source | Generation of PDF documents from Java | http://pdfbox.apache.org/ |
| Apache POI | Open Source | Apache POI is the Java API for Microsoft documents. It maintains APIs for the manipulation of various file formats based upon the Office Open XML standards and Microsoft’s OLE 2 Compound Document format. GSW uses only the Java Excel solution from POI. | http://poi.apache.org |
| AspectJ | Open Source  (Eclipse Foundation) | A Java library implementing Aspect Oriented Programming (AOP) to allow simple implementation of cross-cutting concerns to the existing codebase. Initially used for custom session management on the thick clients. | http://www.eclipse.org/aspectj/ |
| Barcode4J | Open Source | A flexible Java barcode generator. | http://barcode4j.sourceforge.net/ |
| ICEfaces | Open Source  (ICEsoft Technologies Inc.) | A J2EE AJAX framework used with JavaServer Faces to provide rich user interface functionality in the browser. | http://www.icefaces.org |
| log4j  (for logging) | Open Source | log4j is a Java-based logging utility. | <http://logging.apache.org/log4j/docs/index.html> |
| Spring Framework | Open Source (Interface21) | Spring is an integral part of the ITerative Consulting conversion solution. Spring remoting has the same semantics as Forté and is required to convert Forté Service Objects that cross the process boundary to Java. The solution also uses JDBC templates and standard bean utilities from the Spring framework. | http://www.springframework.org/ |
| WSDL4J  (for web services call to COBOL) | Open Source | The Web Services Description Language for Java Toolkit (WSDL4J) allows the creation, representation, and manipulation of WSDL documents. It is the reference implementation of the JSR-110 specification and is an open source project originated on the IBM developerWorks site. | <http://sourceforge.net/projects/wsdl4j/> |

*NB: The use of Open Source software within the solution has required HP to accept the maintenance and support of such software, and indemnify GM Financial against any liability concerning its use.*

### Web Services Reused by Project

[List any Web Service Reusable Assets that are to be reused by the project. List any GM Financial custom or commercial web services to be reused by the project, including the repository containing the implementation and UDDI reference. Itemize any related tangible and intangible benefits to the project as a consequence of using these web services. IT Standards are found in GEAR (accessed from Ally Pulse).

None

| **Reused  Web Service** | **Supplier** | **Benefits List** | **UDDI Reference** | **Repository Source** |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |

### COTS Templates Reused by Project

[List any templates for standardized configuration of a COTS product that is reused by the project. Indicate the source of the standardized template and derived benefits. IT Standards are found in GEAR (accessed from Ally Pulse).

None

| **COTS module or application** | **Reused COTS Template** | **Supplier** | **Benefits List** | **Archive or Location** |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |

### Reusable Components and Frameworks Created by Project

[Identify functional services and business components in the project that are candidates for generalization in the form of reusable components or frameworks. Indicate the reason for creating a new component/framework and the archive containing the new assets. Notify the repository Registrar of the intent to create these Reusable Assets during Plan Phase. When delivered to the Registrar, provide details (e.g., Java Doc, UML model, usage guidelines, etc) about these components or frameworks. IT Standards are found in GEAR (accessed from Ally Pulse).

None.

| **Candidate Component or Framework** | **Business Function or Service** | **Notification Date** | **Delivery Date** | **Archive or Location** |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |

### Reusable Web Services created by Project

[Identify functional business services in the project that are candidates for generalization as reusable Web Services. Indicate the reason for creating a new web service and the archive containing the web service. Notify the repository Registrar of the intent to create these Reusable Assets during Plan Phase. When delivered to the Registrar; provide details (e.g., UDDI reference, UML model, usage guidelines, etc) about these Web Services. IT Standards are found in GEAR (accessed from Ally Pulse).

None.

| **Candidate Web Service** | **Business Service** | **Notification Date** | **Delivery Date** | **UDDI Location** |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |

### Reusable COTS Templates Created by Project

[Identify COTS applications or modules for which new standardized COTS Templates are being created. Indicate the reason for creating a new template and the archive containing the template. Notify the repository Registrar of the intent to create these Reusable Assets during Plan Phase. When delivered to the Registrar, provide details (e.g., version compatibility, usage guidelines, etc) about the COTS Templates. IT Standards are found in GEAR (accessed from Ally Pulse).

None.

| **COTS module or application** | **Candidate COTS Template** | **Justification** | **Notification Date** | **Delivery Date** | **Archive or Location** |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |

### Design Patterns Reused or Created

[Identify project components or packages where existing industry standard design patterns may be applied and indicate the source of the pattern (e.g., GoF, Sun’s J2EE, etc.). If new design patterns are developed, then name them, indicate the archive containing the pattern and provide a brief description. A logical view of each new design pattern should be provided in the Logical View section.]

The following standards and well-established patterns are used within the Enterprise Java application.

“Gang of Four” Patterns:

* Proxy
* Façade
* Factory Method
* Singleton

Core J2EE Patterns

* Front Controller
* Service Locator
* Data Access Object
* Transfer Object
* Business Delegate

# Use-Case View

[List those use cases or scenarios from the use-case model (created as part of the System Requirements Specification) that represent some significant, central functionality of the final system, or if they have a large architectural coverage. Include use cases that exercise many architectural elements or if they stress or illustrate a specific, delicate point of the architecture. This list of use cases should be considered as the use cases for an executable architecture (architectural prototype), if one is to be used on this project. References should be provided for the project’s use case model. The required notation for the Use-Case View is UML2.X]

## Use-Case Realizations

[Show how the software actually works by giving a few selected use-case (or scenario) realizations. Explain how the configuration for the architecture enables the use cases to be achieved.]

Three core areas of functionality represent a good cross-section of the use case types in the system.



GMF GSW User

Thick Client

SmartIcon



GM Dealer WOL User

HTML Client

GS

\_

SmartIcon

Wholesale Online

GS

\_

Parameters

GS

\_

Wholesale

GSW DB

(

7

Instances

)

Metrics DB



RSH Webserver

Thick Client

Thick Client

Internet

DWASO

GS

\_

Security

Security DB

(Doxford,  
Shanghai)

GS

\_

Metrics

Thick Client

GS

\_

Interface

GS

\_

Cobol

GSS

Eurotax Vehicle

Valuations

WAS Audits PDA

System

XML via GM

Proxy server

XML

XML

Monitor

Manages Forte Apps

Oracle Reports

Adobe Central

Pro

UNIX JOBS

Scheduled in TNG

Batch Cobol

COBOL Library

Microfocus

SMTP

Emailing

Start and stop

messages

WebLogic Application Server (7 instances)

Oracle Databases

GSW Technical Architecture

EDS SMTP

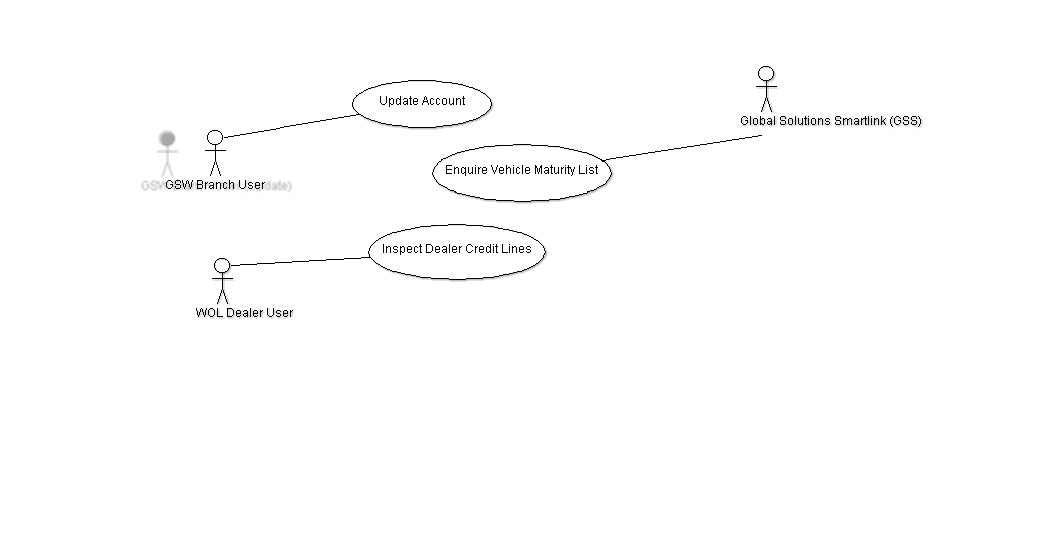
Mail Gateway

Scenario 1

Scenario 2

Scenario 3

(Doxford,  
Shanghai)

*  
Use Case Diagram showing the three scenarios*

Scenario 1 (green) covers the Account Maintenance function as provided by the GS Wholesale, thick client application. The scenario involved selecting an account, selecting a dealer and changing the name. It impacts on the GS\_Wholesale module and the main GSW database, GS\_Cobol and the COBOL Library from Microfocus, as well as the GS\_Security module and its database.

Scenario 2 (orange) covers the display of the credit lines page in the Wholesale Online web-based, thin client application. The scenario involved selecting data from the Oracle database and displaying UTF8 Chinese characters. It impacts on the Wholesale Online module and the main GSW database, as well as the GS\_Security module and its database.

Scenario 3 (blue) covers the interface to GS Wholesale from the GSS external system via an XML call. The scenario involved making sure an XML call from a tester application could be received. It impacts the external GSS system as well as the GS\_Interface module and the main GSW database.

# Logical View

[Describe the functional decomposition of the entire application based on a logical ordering of the application’s requirements. The aspects of the application with similar functionality should be aggregated into a subsystem and then subsystems organized to depict the dependencies between subsystems.

If component or Service-Oriented development is included then describe the architecturally significant parts of the design model, such as its decomposition into subsystems and packages. For each significant package, show its decomposition into the key classes and interfaces. Introduce architecturally significant classes and describe their responsibilities, as well as architecturally important relationships, operations and attributes. The required notation for the Logical View is UML2.X.

GSW follows the general principles of a client/server architecture, although there are numerous additional logical components that sit on the periphery of the architecture serving additional business functions.

**Logical Application Architecture Drawing – Component View**

[Insert here the Logical Application Architecture Drawing - Component View, per the instructions in the [Architecture Drawing Standards](https://teamroom.exchange.gmacfs.com/Infrastructure/ArchDelivery/ArchGov/Architecture%20PSP/Ally%20Arch%20Drawing%20Standards.doc), available on the [Architecture Governance TeamRoom](https://teamroom.exchange.gmacfs.com/Infrastructure/ArchDelivery/ArchGov/default.aspx):]Follow the drawing standards for UML

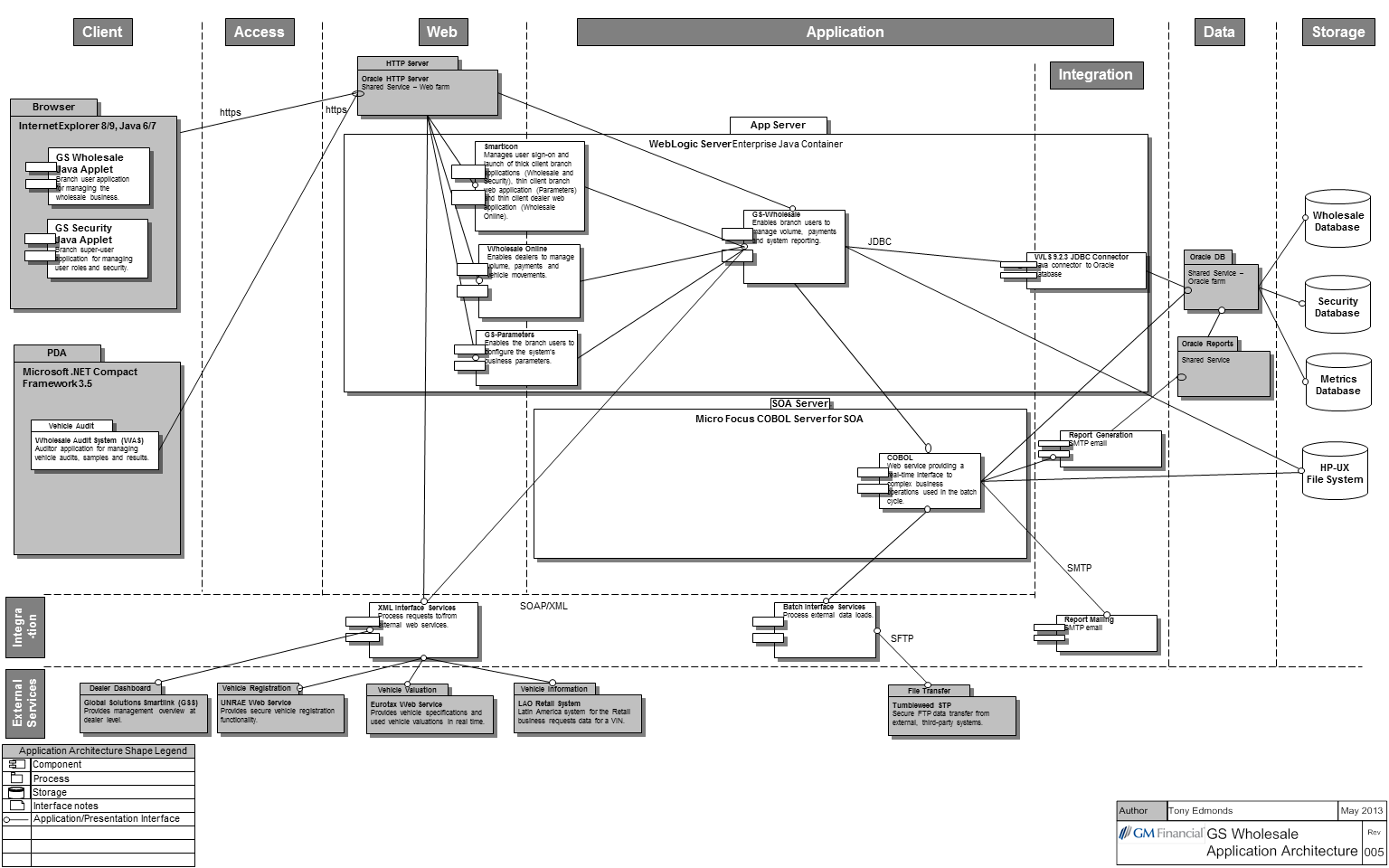


Figure 2 – Logical Component View

## Layered Overview

[If component or service-oriented development is included then describe the overall decomposition of the design model in terms of its package hierarchy and layers. Indicate within what layer a package resides. Layered architecture proposed by the Architecture Leadership team should be used as the basis for discussion in this section. See the References section of this document for more information on the layered architecture document.

If COTS products or extensions are included then describe the vendor’s overall product design model in terms of its key components or modules. Indicate what high level architectural approach the vendor is using (layered architecture, pipes and filters, etc.). Provide a reference to the vendor’s architectural overview documentation.]

For the main part, GSW employs a Java thick client GUI from which users access the application functionality. This uses serialized objects and ‘Spring Remoting’ to invoke business functions upon the application server. The application server in turn integrates to various backend data tiers, most notable a persistence layer based on Oracle RDBMS and a transactional processing layer running upon Microfocus COBOL Server for SOA. There is also a thick-client security administration application for configuration GSW security aspects, such as user and group permissions.

Wholesale Online and Parameters are two different applications that utilise a web-based front-end and so are accessed by users via a conventional web browser (typically Microsoft Internet Explorer). They are predominantly dynamic web applications, with minimal static content.

GSW is only available to users within the GMF WAN, with the exception of Wholesale Online which is made available over the public internet to authorised dealers only.

The bulk of real-time interfaces are performed via HTTP(S) between the client user and the application tier (via the web tier). However there are a small number of interfaces supported directly into the application server tier itself. This real-time interface service, internally referred to as the FAD server, offers both secure and non-secure protocols and implements a proprietary SOAP-wrapped XML over TCP/IP interface through which external systems can access GSW services directly. It is used by WAS, LAO Retail and GSS only. However, the WAS application connects via the web server, at which point the request is routed to the interface.

In addition to the above services which support real-time operations, there are some batch operations that are performed at scheduled times via TNG. These include report and document generation and the import and export of transactional data files between other external systems. The batch layer of GSW consists of Unix shell scripts, the execution of which is controlled and monitored by the TNG system. There are a limited number of ad-hoc batch jobs that can be initiated during the working day but scripts are predominantly end-of-day or end-of-month.

Generation of electronic documents (such as PDF reports) are handed over to a leveraged instance of HP Exstream (which provides the standard GMF solution for document generation to multiple applications, not just GSW). The documents are generated and returned to GSW via Tumbleweed SFTP. GSW then distributes them accordingly, via email or further SFTP transfers to branch servers.

Following the creation of these reports, documents and transaction files, the Tumbleweed file transfer service is employed to co-ordinate the transfer of the files to the relevant destination systems. In the case of inbound files to GSW, Tumbleweed is also employed. File transfer is based around the SFTP protocol. This replaces previous uses of 3rd party products such as XCOM and Connect Direct, although Reflections remains in place. File transfer is again controlled and monitored via shell scripts and TNG.

Databases are defined as data sources and managed in the deployment descriptors of the Java application and within the configuration of the WebLogic Managed Server configuration also.

On the server side, Service Classes are implemented using Spring framework objects and Singleton classes, where appropriate. Spring Remoting is used for service objects that cross the process boundary (e.g. when distributed events are propagated between event managers).

Spring Remoting simplifies the creation of RMI-based services. Any POJO service object can be exposed using Spring's ‘service exporter’. In Java, the distributed service objects (especially the distributed events) are propagated between the event managers this way.

## Subsystem Overview

[If component or service-oriented development is included then describe how all packages and services provided by this project map into the overall enterprise application architecture. Indicate what major aspect of the enterprise application architecture a package or service fulfills. Enterprise Application Architecture proposed by the Architecture Leadership team should be used as the basis for discussion in this section. See the References section of this document for more information on the Enterprise Application Architecture diagrams.

If COTS products or extensions are included then describe the how all modules used by this project map into the overall enterprise application architecture. Indicate what major aspect of the enterprise application architecture a module fulfills. Enterprise Application Architecture proposed by the Architecture Leadership team should be used as the basis for discussion in this section. See the References section of this document for more information on the Enterprise Application Architecture diagrams.]

The following diagram shows the functional sub-systems of the GS Wholesale online systems and where they communicate with each other.

The modules are logical business components of GSW and are split by responsibility between Security, Metrics, Wholesale and Wholesale Online.



## Architecturally Significant Design Packages or COTS Modules

[If component or service-oriented development is included then for each architecturally significant component package or service (not less than 20% of the project functionality), include a subsection with its name, a brief description, the interface definition, dependencies and a diagram with all significant classes and packages contained within it (required notation is UML2.X). For each significant class in the component package/service, include its name and a brief description.

If COTS extensions are included then for each architecturally significant module in the COTS application that has been impacted by the extension, include a subsection with its name, a brief description, a summary of APIs, and a high-level design diagram. Existing vendor design diagrams maybe referenced.]

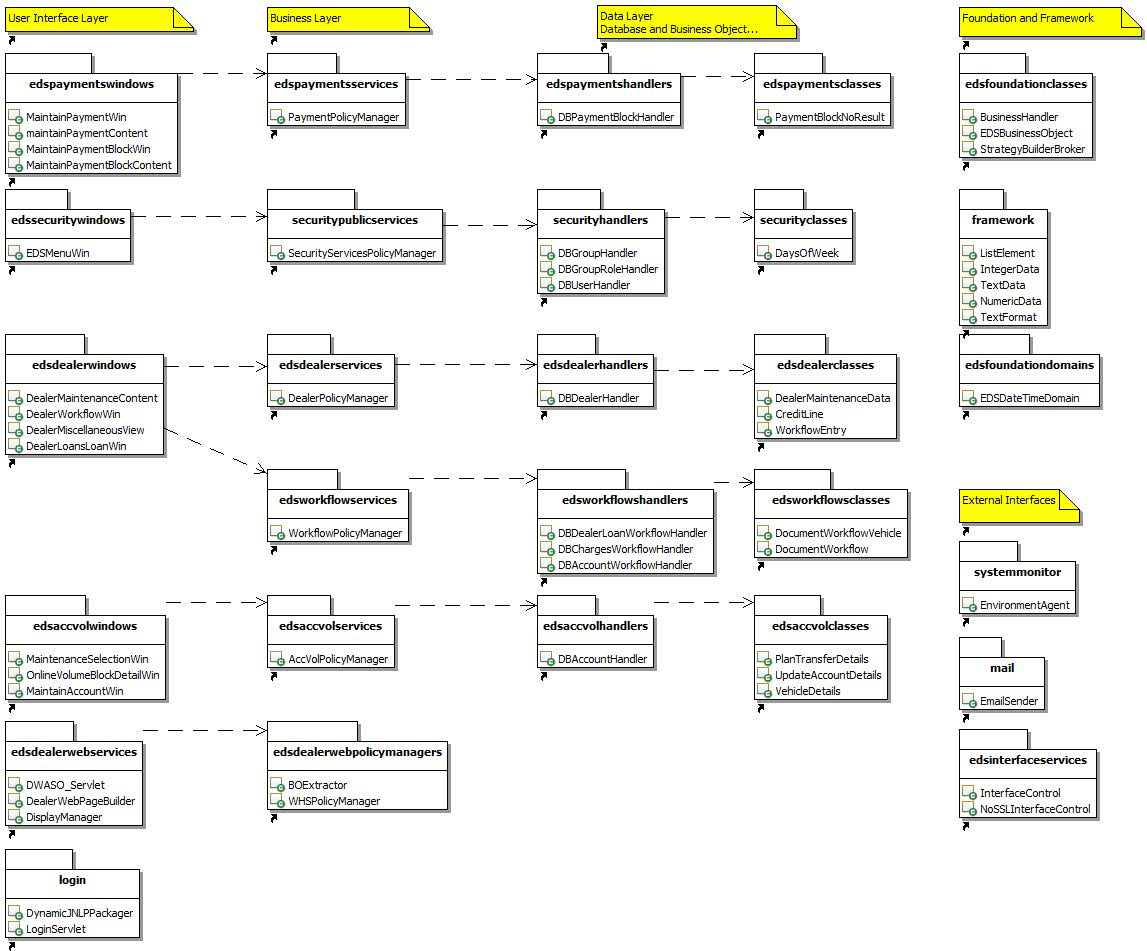
None.

## Package Hierarchy

[If component or service-oriented development is included, then show the project’s components/services package hierarchy. Relationships and containment between packages should be shown in UML2.X notations, preferably using GM Financial’s standard modeling tool. The naming convention for packages should be described.

We don’t need to show ALL Java packages here, but just pick the key ones. Pick the architecturally-relevant ones. This is a one-pager.]

The following diagram shows the significant packages within the application code. Each package gives a representative sample of the classes held within.



## Logical View of the Created Design Patterns or COTS Templates

[If component or service-oriented development is included then provide the logical view of any custom design patterns that have architectural significance for this project. The list of custom design patterns shown in Section 2.2.7 should be documented in this section.

If COTS extensions are included then for each custom COTS template created provide a logical view indicating the architectural significance of the template.]

None

# Process View

[Describe the system's decomposition into lightweight processes (single threads of control) and heavyweight processes (groupings of lightweight processes). Organize the section by significant groups of processes that communicate or interact to complete a significant feature such as a Use Case or technical requirement. Describe the main modes of communication between processes. Indicate how durability and integrity are managed. Indicate how performance is being optimized (e.g., what tuning parameters may be modified to impact process/thread response time, scalability, throughput and latency).

If component or service-oriented development is included then depict the information requested using project specific sequence diagrams (object Interaction diagrams), using UML2.X notation. Where possible, diagrams should explain process interaction required for key use cases as listed in Use Case View Section.

If COTS extensions are included then use existing vendor diagrams supplemented as necessary by project specific sequence diagrams and text discussion.

Each architectural diagram should be accompanied with a description. Refer to Appendix A.

This should be the execution view on the system. Show the “system in motion” e.g. a scheduled task triggers the execution of a batch job. Show in UML. Sequence diagram to be used.]

The process details for GSW are now included as part of the System Design Document (SDD), since the level of detail they provide is considered significantly deeper than is desired for an architectural overview, and only served to duplicate the information in two places.

Please consult the SDD for more detail. All the UML sequence diagrams are present for the identified scenarios in GSW.

# Deployment View

[Describe the physical platform configurations (processor/storage/COTS) for the system.

If the system is to be deployed at multiple sites, provide a deployment view for each different site.

At a minimum for each configuration it should indicate the physical nodes (e.g., computers, CPUs, memory) and their interconnections (e.g., bus, LAN topology, point-to-point, WAN topology). Include a mapping of the processes of the Process View onto the physical nodes. Also state the location of deployment (within GM Financial or outside). The required notation is UML2.X.

Instead of a UML deployment view, projects may optionally substitute the Logical Infrastructure Drawing from the System Design Document template. This Logical Infrastructure Drawing does not need to have all of its details completed - the finalized Logical Infrastructure Drawing is not due until the Construct Phase.

In the table shown below please list all intended deployment sites that use the system being architected. Create a separate Deployment View for each deployment site that requires significantly different platform environment, scalability, availability or performance characteristics.

Each architectural diagram should be accompanied with a description. Refer to Appendix A ]

The development environment consists of several virtual machines hosted by the HP ES-LABS facility. The environment is entirely within the HP private network, although there is the possibility of exposing the application out via the public internet if need be. The physical hosting is of no relevance to the application team and the ES-LABS service handles all of the physical hosting and maintenance as part of their service offering. Development and system test run their own individual VMs for J2EE, COBOL and database partitions. This allows the two logical environments to be upgraded at different timeframes to different versions of software without impacting one another. They can also be scaled independently over time, as needed. Separate HP ExStream virtual machines for each provide document generation facilities.

System Integration Test environments are hosted within the GMF EA hosting compartment within Wynyard. They are a mix of virtual server instances running on VMware and physical servers – the application instance runs on a virtual server whereas the database instance runs on a physical server. Each server provides an effective hardware specification of 1 CPU core and 8GB of memory.

UK Pre-production is located in the Wynyard data centre and provides 14 servers – 6 virtual application servers, 2 physical database servers (1 primary; 1 local failover) and 1 common server for Microfocus COBOL.

UK Production is located in the Doxford data centre and also provides 14 servers identical to pre-production; 6 application servers, 2 database servers (1 primary; 1 local failover) and 1 COBOL server.

***Client Java Runtime Environment (JRE)***

The thick client applications of GSW (namely: Wholesale and Security) are deployed to and executed on branch users’ PCs. These GSW components are ‘certified’ for execution on the following client JREs:

Java 6 Update 45

Java 7 Update 40

*Java 8 is not yet certified*

The certification for these versions of Java is given on the understanding that a full regression test of all thick client functionality has NOT been carried out against the given Java versions, but that all System Testing for the release has been performed by testers with one of these versions installed and additional System Test cases have been written and executed to cover JRE changes considered relevant to GSW reported in the Oracle Release Notes.

## China Deployment View

China has been separated from the APO region in Doxford and moved to its own environment running off virtual machines in Shanghai. Pre-production consists of 1 virtual server (application) and 1 physical (database) located in the China Telecom secondary data centre. China Production consists of the same (1 virtual application, 1 physical database) located in the Shanghai Data Solutions data centre. In China, the Security and Metrics database instances are located on the same server as the Wholesale China database. China does not have its own development or SIT environments. Web servers are virtualised within a separate Blade enclosure using two or more Blade servers (necessary for redundancy).

Each environment below includes a separate diagram showing the deployment used for China.

**Package IP addresses and Host Names**

For the UK environments, IP addresses are assigned to the virtual machines. All servers are given host names and DNS maps these to the IP addresses.

***Development / System Test***

|  |  |  |  |
| --- | --- | --- | --- |
| **Server** | **Phy/Vir?** | **Purpose** | **Contents** |
| Tbc | Virtual | Dev – app server | Weblogic Application Server 11gR2  Oracle Forms & Reports 11gR2 |
| tbc | Virtual | Dev – db server | Oracle RDBMS 11gR2 |
| tbc | Virtual | Dev – COBOL server | Microfocus COBOL Server for SOA 5.1WP8 |
| tbc | Virtual | Dev – HP ExStream server | HP ExStream 8.6 |
| tbc | Virtual | Sys – app server | WebLogic Application Server 11gR2  Microfocus COBOL Server for SOA 5.1WP8  Oracle Forms & Reports 11gR2 |
| tbc | Virtual | Sys – db server | Oracle RDBMS 11gR2 |
| tbc | Virtual | Sys – COBOL server | Microfocus COBOL Server for SOA 5.1WP8 |
| tbc | Virtual | Sys – HP ExStream server | HP ExStream 8.6 |
| tbc | Virtual | Source Code repository | Subversion |

All development and system test environments are hosted within the HP Wavendon site using the HP ES-LABS service.

|  |
| --- |
| **Licensing** |
| Oracle RDBMS 11gR2 |
| Oracle Forms & Reports Standalone 11gR2 |
| Microfocus COBOL Server for SOA 5.1 |
| WebLogic Application Server 11gR2 (as part of Fusion Middleware) |
| HP ExStream 8.6 |

**Software / Virtual Hardware**



***System Integration Test***

|  |  |  |  |
| --- | --- | --- | --- |
| **Physical Server** | **VM Name** | **Description** | **Contents** |
| tbc | tbc | SIT application server | Weblogic Application Server 11gR2  Microfocus COBOL Server for SOA 5.1 |
| tbc | n/a - physical | SIT database server | Oracle RDBMS 11gR2 |

**Software**



|  |
| --- |
| **Licensing** |
| Oracle Database 11gR2 Enterprise Edition Release – covered by GMF/Oracle global license |
| WebLogic Application Server 11gR2 – covered by GMF/Oracle global license agreement as part of Fusion Middleware |
| Microfocus COBOL Server for SOA 5.1 |

**Hardware**

The application server instance is homed within a virtual machine upon HP Blade servers running VMware ESX/vSphere. The virtual machine is allocated 1 virtual CPU and 8GB of memory. The virtual machine could run on any physical Blade server within the VMware farm, therefore any reflection of underlying hardware is irrelevant to the application.

The database server is a physical server, not virtualized. The actual hardware is at this point flexible but should provide a minimum of 1 physical CPU core and 8GB of memory.

Note there is no Exstream instance allocated to the SIT environment.

***Pre-Production***

|  |  |  |  |
| --- | --- | --- | --- |
| **Physical Server** | **VM Name** | **Description** | **Contents** |
| tbc | tbc | AP app | Weblogic Application Server 11gR2  Oracle Forms & Reports 11gR2` |
| tbc | tbc | EE app | Weblogic Application Server 11gR2  Oracle Forms & Reports 11gR2` |
| tbc | tbc | EU app | Weblogic Application Server 11gR2  Oracle Forms & Reports 11gR2` |
| tbc | tbc | GR app | Weblogic Application Server 11gR2  Oracle Forms & Reports 11gR2` |
| tbc | tbc | GY app | Weblogic Application Server 11gR2  Oracle Forms & Reports 11gR2` |
| tbc | tbc | LA app | Weblogic Application Server 11gR2  Oracle Forms & Reports 11gR2` |
| tbc | n/a - physical | All regions DB (inc sec/met) | Oracle Database 11gR2 Enterprise Edition Release |
| tbc | tbc | AP/EE/EU/GR/GY/LA COBOL | Microfocus COBOL Server for SOA 5.1 |
| tbc | tbc | CN app | Weblogic Application Server 11gR2  Oracle Forms & Reports 11gR2` |
| tbc | n/a - physical | CN DB (inc sec/met) | Oracle Database 11gR2 Enterprise Edition Release |
| tbc | tbc | CN COBOL | Microfocus COBOL Server for SOA 5.1 |
| tbc | n/a | Leveraged HP ExStream server | HP ExStream 8.6 |

**Software**

 *Located in the UK*

 *Located in China*

|  |
| --- |
| **Licensing** |
| Oracle Forms & Reports Standalone 11gR2 |
| Oracle Database 11gR2 Enterprise Edition Release |
| MFCOBOL Server for SOA 5.1 |
| Weblogic Application Server 11gR2 (Oracle Fusion Middleware) |
| HP ExStream 8.6 (leveraged instance; also used by SRS application) |

**Hardware**

Please note that pre-production hardware is leveraged by production also – it is used to support production in a DR scenario. It is also shared with the SRS application. Due to the nature of virtualization it is not possible to directly tie all of the GSW virtual machines to one physical piece of hardware.

The hardware mentioned below can be considered “double-counted” between pre-prod and production DR.

 *Located in UK*

 *Located in China*

***Production***

|  |  |  |  |
| --- | --- | --- | --- |
| **Physical Server** | **VM name** | **Description** | **Contents** |
| tbc | tbc | AP app | Weblogic Application Server 11gR2  Oracle Forms & Reports 11gR2` |
| tbc | tbc | EE app | Weblogic Application Server 11gR2  Oracle Forms & Reports 11gR2` |
| tbc | tbc | EU app | Weblogic Application Server 11gR2  Oracle Forms & Reports 11gR2` |
| tbc | tbc | GR app | Weblogic Application Server 11gR2  Oracle Forms & Reports 11gR2` |
| tbc | tbc | GY app | Weblogic Application Server 11gR2  Oracle Forms & Reports 11gR2` |
| tbc | tbc | LA app | Weblogic Application Server 11gR2  Oracle Forms & Reports 11gR2` |
| tbc | n/a - physical | All regions DB (inc sec/met) | Oracle Database 11gR2 Enterprise Edition Release |
| tbc | tbc | AP/EE/EU/GR/GY/LA COBOL | Microfocus COBOL Server for SOA 5.1 |
| tbc | tbc | CN app | Weblogic Application Server 11gR2  Oracle Forms & Reports 11gR2` |
| tbc | tbc | CN DB (inc sec/met) | Oracle Database 11gR2 Enterprise Edition Release |
| tbc | tbc | CN COBOL | Microfocus COBOL Server for SOA 5.1 |
| tbc | n/a | Leveraged HP ExStream server | HP ExStream 8.6 |

**Software (x86\_64 architecture)**

 *Located in the UK*

 *Located in China*

|  |
| --- |
| **Licensing** |
| Oracle Forms & Reports 11gR2 |
| Oracle Database 11gR2 Enterprise Edition Release |
| MFCOBOL Server for SOA 5.1 – 8 prod cores, 8 DR cores (over-capacity but retains previous arrangement; allows for growth. Little to be gained by dropping to 4+4) |
| Weblogic Application Server 11gR2 (part of Fusion Middleware) |
| HP ExStream 8.6 (leveraged instance; also used by SRS application) |

**Hardware**

 *Located in the UK*

 *Located in China*

***Local Failover***

In the event of localised failure, VMware VMotion will automatically migrate any affected virtual machines onto alternative Blade servers within the cluster.



The hardware upon which the VMotion cluster is running is a simple pool of physical resources, and the GSW application has no knowledge of which physical server it is running on at any given point in time (nor does it care).

The production c7000 Blade chassis in the UK (Doxford) contains 7 physical Blade servers of identical specification; 5 are considered for normal production utilisation and 2 are available as hot spares in the event of local hardware failure or maintenance. The pre-production/DR c7000 chassis in Wynyard contains 6 physical Blade servers of identical specification. 4 are used for normal pre-production utilisation, 1 is available as a hot spare in the event of local hardware failure or maintenance and a further 1 blade is reserved as a physical host for Oracle regression testing.

Physically-hosted database servers will rely on HP ServiceGuard packages to handle local failover over two dedicated Blade servers. The production database node resides on a primary HP Blade server running 7 ServiceGuard packages (one for each of the 6 regional databases, plus a 7th instance for security and metrics databases). During local failover, HP ServiceGuard will fail these database packages over to the alternative (secondary) Blade server in the same chassis.

The virtual and physical failover solutions are entirely separate. VMware does not need to be involved in any database package failovers and, likewise, should the virtual machines fail over within the VMware cluster, the database packages do not need to be cognisant of the fact.



The production c7000 Blade chassis in the China (SDS) contains 2 physical Blade servers of identical specification; 1 is for normal production utilisation and the other is available as hot spare in the event of local hardware failure or maintenance. An identical configuration is held at the secondary data centre (China Telecom) for the purposes of hosting pre-production and DR environments.

As with the UK environment, physically-hosted database servers will rely on HP ServiceGuard packages to handle local failover over two dedicated Blade servers. The production database node resides on a primary HP Blade server running 1 HP ServiceGuard package containing all the China GSW databases. During local failover, HP ServiceGuard will fail these database packages over to the alternative (secondary) Blade server in the same chassis.

 *Located in China*

***Disaster Recovery***

In the event of remote failover (a full DR scenario), virtual machines within Wynyard would be started up to take over the production system. The pre-production environment running at Wynyard is first shut down to relinquish capacity upon the hardware. The underlying application SAN storage is mirrored to the DR site constantly, so the DR VMs are started up with the same underlying application and database SAN storage. DNS entries for the application entry points (the web tier) will need to be re-configured manually, since Wynyard and Doxford do not share identical IP address ranges. The DR servers then resume application processing for the production environment. HP ServiceGuard continental cluster technology will fail over the GSW database packages to the remote site.

For a remote failover in China, a similar process is performed albeit on a smaller scale. The pre-production virtual machines are shutdown, DR VMs are started and the production SAN mirrors are used to run production functionality out of the DR data centre. HP ServiceGuard packages are failed over to the remote site. Pre-production will be shut down to relinquish machine resources.

Degraded performance while running in DR mode would be expected, although VMware administrator can allocate additional resources across the cluster if necessary. It is considered unlikely that there will be any capacity issues on the DR hardware (particularly considering that pre-production will be shut down).

***Web Tier***

For reference the web tier architecture is shown below.

The web tier hardware is physically separate to the application and database servers. This is mandated by GMF security requirements and avoids any misconfiguration of the web servers or supporting network infrastructure resulting in a breach of security. Please note this includes separation at a physical enclosure level (ie. The web tier must NOT share a Blade enclosure with the application tier).

Each environment runs within its own web server domain. The use of separate virtual servers for each environment was considered excessive given the minimal task of the web tier (SIT is used minimally; the DR environment will not be used during any normal operational day, so the additional load upon pre-prod is minimal).

 *Located in the UK*

 *Located in China*

No web tier is provided for development environments.

**SIT/Pre-Prod**

SIT utilizes a single web instance to support Wholesale Online testing only. This is provided by the pre-production environment as no dedicated SIT web tier exists, or is warranted, for GSW.

Pre-production (UK) utilizes 6 instances for each regional instance, plus a separate instance for the top-level landing page. Pre-production (China) utilizes 1 instance for the regional instance, plus a separate instance for the top-level landing page. There is also a “daily checks” instance that remains for support staff use only. All instances are mirrored across two physical servers in an active-active configuration (a load balancer fronts the requests).

Pre-production resides within the Doxford and Shanghai data centres.

**Production/DR**

Production (UK) utilizes 7 instances - 6 regional servers plus a single top-level landing page server. Production (China) utilizes 2 instances - 1 regional server plus a single top-level landing page server. All production instances are mirrored across two physical servers in an active-active configuration (a load balancer fronts the requests).

DR requirements for Europe are supported by a single physical server in Wynyard UK and China) that runs all the failover instances. DR requirements for China are supported by separate web server instances that run on the two mirrored pre-production servers.

The production servers reside within the Doxford and Shanghai Zhangjiang data centres. The DR servers are hosted from the Wynyard Park and China Telecom data centres.

**Deployment Map**

| **Deployment Site (location)** | **CIO Region** | **Corresponding Deployment View** |
| --- | --- | --- |
|  |  |  |
|  |  |  |

## Supporting Services

[Provide dedicated deployment view(s) indicating the interconnection of the new application with GM Financial common supporting services.]

### Naming/Directory

[Indicate the architectural configuration for the naming/directory service (LDAP, JNDI, etc.) and how it inter-operates with GM Financial’s overall infrastructure.]

The GSW URLs require a Domain Name Server to resolve the names.

GSW makes no use of directory services.

### Security

[Indicate the architectural configuration for the security service and how it inter-operates with GM Financial’s overall infrastructure.]

GSW uses an internal security sub-system embedded with the application.

A single security database serves all application instances in each deployed physical location (one for UK and one for China). The database is co-located with the Wholesale and Metrics databases for each physical location.

The relocation of the Greece, Germany and Latin America instances to the Doxford data centre removed the SPOF on the WAN connection between the sites that existed previously (and had been known to impact production access during network failure).

Where it is required, a 2048 bit encryption is utilised.

**Certificate details**

|  |  |  |  |
| --- | --- | --- | --- |
| **Type** | **Name** | **Encryption / Hash Algorithms** | **Strength** |
| LoadBalancer | \*.int.gmacfs.com | Sha1RSA / Sha1 | 1024 |
| Weblogic servers | tbc | Sha1RSA / Sha1 | 2048 |
| Application, internal cert for signing jars | gswapp.jks | MD5/Sha1 | 1024 |
| Unix Servers – sftp on RHEL |  | aes / ssh-rsa | 2048 |

Several certificates are 1024 bits, these will be upgraded to 2048 when they expire.

#### Citrix remote access

The security standards for Oracle databases require encrypted access from the client to the server. The suggestion for this is to install the Oracle ASO product. This has not been adopted for GSW. Connections to the Oracle listener from outside the data centres will not be allowed. HP support staff needing to access the database will first need to connect to Citrix servers in China and run the connections from there. This will satisfy the security standard.

### External Channels

[Indicate the architectural configuration for the external presentation channels (telephony, wireless, portal, etc.) service and how it inter-operates with GM Financial’s overall infrastructure.]

None.

### System Monitoring

[Indicate the approach taken to provide infrastructure and application monitoring services (events, alerts, filtering, etc.) during integrated testing and production.]

There is automatic monitoring in place to report file systems exceeding limits, application & database processes ceasing. HP Operations staff escalate any of these alerts to the support teams but in addition the support teams are alerted automatically by email. HP Operations are also alerted to batch failures. If the batch failures occur during the business day operations raise a case with the European GMF helpdesk for onward routing to the support team. If out of hours HP Operations escalate direct to the support teams.

HP middleware team (who provide web hosting for the GS Wholesale sub-system Wholesale Online) also provide automatic monitoring of the WO websites.

GSW Sustain supplement the above monitoring with an automated monitoring tool, the Scheduled Live Environment Poller (SCHLEP), which regularly monitors all aspects of the GSW system (Wholesale Online, GSS and WAS interfaces, COBOL and Java Application server) and reports warnings directly to GSW Sustain when necessary.

In further addition to the above, the level 2 support teams carry out early morning, afternoon and evening checks to ensure the application is working correctly and that all the required batch jobs are either complete or ready to run.

HP Operations escalate either to the help desk (in business hours) or directly to level 2 support if out of hours. Level 2 support will escalate to level 3 support if they cannot resolve the problem. If the problem is a severity 1, 2 or 3 incident it is also escalated to the application delivery manager and production environment manager. For severity 1 or 2 incidents the problem will be escalated to GMF IS&S. For severity 1 incidents the RTOP/Playbook process will be followed (ref. GSW Runbook).

Log files are not monitored automatically.

### System Logging

[Indicate the approach taken to provide infrastructure and application logging services (logging alerts, etc.) during integrated testing and production.]

GSW implements a file-based approach using the open source Java logging API, *log4j*. Log files are available to support staff for the purposes of investigation into production issues. Logging detail levels on the application server can be changed “in-flight” using the application support console, JConsole, if necessary.

Offline batch jobs also maintain log file of their activity, and report success/return codes to TNG. TNG monitors running jobs and quickly raises automated alerts should job return codes indicate failure. The GSW Runbook identifies the location of application log files for the batch processes. (See References)

# Implementation View

[Describe the overall structure of the implementation model, and decomposition of the system into layers and subsystems as viewed from a software development perspective. Indicate how subsystems are assembled and augmented as the project implementation progresses. This section also provides a package/component view that guides software development and assembly of the system in accordance with the system’s Project Plan.

If COTS extensions are included, then show how the constituent COTS components are phased-in and interconnected during the assembly process.

Each architectural diagram should be accompanied with a description. Refer to Appendix A ]

Production implementations are generally carried out on all regional packages on the same date, organising each region’s deployment to take place during the usual overnight batch cycle downtime so that no online users are affected. Sometimes for point releases, if only one region is affected by a change then just that one will have the new deployment of the application installed.

## Packages/Components

[If component or service-oriented development is included then for each implementation package/component, include a subsection with its name, description and a diagram.

If COTS extensions are included, then show how the custom code extensions are packaged and maintained within the native COTS development environment to ensure integration with the appropriate COTS modules/versions.]

The solution is divided into the following packaged components, these being areas of the application that are delivered and deployed in separate components or modules of work. Each component can be deployed ahead of, or behind, another as befits the application release schedule.

Some components may require no deployment for a given release (for example, a defect fix may deliver only an updated GSW & WOL application deployment and require no changes to the database or Parameters).

Likewise, a release may introduce dependencies between two or more components that must be delivered into an environment at the same time (for example, a COBOL change may be linked with some database SQL updates which need to applied into an environment together).

| **Item** | **Description** | **Required for phase(s)** |
| --- | --- | --- |
| GSW & WOL | The main GS Wholesale application, including Wholesale Online. This is a Java EAR deployment to WebLogic Application Server. | All |
| Parameters | The Parameters application is separated in build and deployment from the main GSW app, and can be deployed separately. This is a Java EAR deployment to the WebLogic Application Server. | All |
| DB SQL | Updates to the database structure itself are deployed via SQL script updates, administered by a DBA. | All |
| Batch Scripts | Unix shell scripts used to initiate report generation, document generation via ACP and/or transfer files into or out of the application. | Implemented to varying degrees in each environment. Not used within SIT. |
| Oracle Reports | Primarily delivered as .RDF files into the Oracle software installation (document templates). | Not used within SIT; available in all others |
| COBOL | Delivered as compiled COBOL programs (binaries) into the Microfocus COBOL Server for SOA application server | All |
| HP ExStream | Leveraged service across several systems (GSW and SRS) for document generation, Converts unformatted data to formatted reports, typically in PDF format. | All but SIT |
| Web Config | Oracle HTTP Server configuration files and some static content (although this rarely changes) deployed by Middleware team to web servers | Only available from SIT through to PROD |
| Firewall & Infrastructure Config | Firewall rules, load balancer and certificate configuration communicated to HP GOC/AT&T and deployed by their engineers. | Only available from SIT through to PROD |

### GS Wholesale / Wholesale Online Component

The core deliverable component of GS Wholesale is the Java (J2EE) application itself, a single Enterprise Archive (EAR) file deployed into a WebLogic application server instance.

### Parameters Component

The GS-Parameters application is deployed separately from the GSW and Wholesale Online applications. Typically it does not change from release to release and is very stable.

### Database/SQL Component

The Oracle databases are managed by the DBA group. Changes to the structure of tables are requested in advance by the GSW Development team and implemented by the DBA team. Data changes are written as SQL scripts by the GSW team, reviewed and executed as part of the release deployment.

### Batch Scripts Component

The various batch scripts used by the back end of GSW are typically initiated by scheduled TNG jobs and perform various tasks, such as end-of-day or end-of-month processing, document generation and distribution, and bulk file uploads in to (and out of) GSW to external parties.

There are around 1681 batch scripts that serve all the various GSW regions.

### Oracle Reports Component

Various Oracle Report templates exist as part of GSW, and feed into numerous batch scripts.

Oracle Reports 11gR2 is available as part of the following Oracle software products :-

* Oracle Application Server 11gR2 (11.1.2) Forms and Reports Services
* Oracle Fusion Middleware 11gR2

The development tools to create and edit the reports are available via the following products :-

* Oracle Developer Suite 11gR2 (11.1.2)
* Oracle Business Intelligence Tools 11gR2 (11.1.2)

There are 131 Oracle report templates (.rdf files).

### COBOL Component

The COBOL programs are compiled and deployed to the relevant Microfocus application server for the given region.

### HP Exstream Document Generation Component

All documents previously generated with Adobe Central Pro and pcl2pdf now utilise HP Exstream for their production.

Batch scripts (initiated and monitored by the batch scheduler) initiate the copy of the raw data files to the HP Exstream server via Tumbleweed SFTP. Once there, HP Command Centre will invoke the necessary local scripts on the Exstream server to generate the documents (typically PDF files). Once generated, the files are transferred back to the GSW server (again, via Tumbleweed) where they are distributed according to application needs. Exstream does not handle any document delivery. In the future, Exstream could be utilised to handle different delivery options for the documents (email, FAX, printing, SMS, etc)

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### Web Configuration Component

The web tier configuration files are maintained and implemented by the GSC36A middleware team. The configuration scripts that control how the web tier redirects to the WebLogic application servers are configured in relation to IP addresses, particularly with regards to failover scenarios.

### Firewall & Infrastructure Configuration Component

As part of the UK re-architecture of GSW into the Doxford data centre (with Wynyard Park serving only pre-production and disaster recovery environments), the various firewall rules in place with AOPS and AT&T were revised to take into account the different IP addresses and locations of the various traffic sources and destinations used within GSW. Equivalent firewall rules for the China deployment are being established.

|  |  |  |  |
| --- | --- | --- | --- |
| **Port(s)** | **Usage** | **Traffic Type** | **Affected infrastructure** |
| 443 | Between GMF client PCs and web tier. Primary application traffic. | HTTPS | EA firewalls (internal and external facing) |
| 15011, 15012  15021, 15022  15031, 15032  15041, 15042  15051, 15052  15061, 15062  15071, 15072 | Backend communication between web tier and application tier. | HTTPS | EA & AT&T firewalls |

# Data View

[Provide description of the persistent data storage perspective of the system. This section may be considered not applicable if there is little or no persistent data or the translation between the Logical Model and the Data Model is trivial.

Note: It may not be necessary to fill out both Sections 8.1 and 8.2 below. In most cases a project may only address data centric operation or behavior centric operation. ]

Historically, data models of the entire GSW application are not available or are significantly out of date. As such, no effort was spent during the recent projects to retrospectively document the application. There is no perceived value in conducting the lengthy process of documenting the application data model. Therefore this section provides a high-level summary for any applicable areas.

All databases, servers and the underlying storage are subject to Disaster Recovery procedures.

The data model for GS Wholesale follows a data-centric approach to its structure, rather than a behaviour-centric one.

Detailed physical data models are maintained using the ERwin Data Modeler tool from CA. Each formal release reviews and updates these models to keep them current. There are three models in total: one each for Wholesale (GS\_WHOLESALE.ER1), Security (GS\_SECURITY.ER1) and Metrics (GS\_METRICS.ER1).

## Behaviour Centric Projects

### Persistence Mechanism (Data Access)

[Explain the persistence mechanism used and describe any persistence patterns used to address any complex persistence issues (e.g., delegation of attribute refresh to data objects from business components, disk stripping to improve COTS access time). Discuss the interfaces and APIs that are used to access key data stores.]

Data is persisted in GSW primarily in an Oracle database. Data access is achieved from the Java application using the JDBC API from Java EE.

Various generated documents (reports, letters, end of month summaries, etc.) are persisted locally to disk on the application server. These are kept for a pre-determined time and then deleted from the archives to manage disk utilization. These reports typically take the form of text files, Excel spreadsheets or Adobe PDF documents.

### Encapsulation

[Show how the project maintains encapsulation of data (the owning application is responsible for data integrity and data access). Provide an explanation if more than one application is given privilege to access the same data simultaneously.

If COTS extensions are included, then show how encapsulation at the business services level is maintained. If component or service-oriented development is included then show how encapsulation is maintained at the component level. Also show how the potential for cyclic redundancy has been minimized via interfaces and packaging.]

N/A for this report

### Connectors and Enterprise Application Integration Adapters

[Detail any use of EAI Adapters or Connectors to connect to data store systems.]

There is a bi-directional SOAP-wrapped XML over IP interface into GSW. It is used by the Latin America Organisation (LAO) Retail, GSS and WAS applications.

## Data Centric Projects

[Review Data Subject Area Definitions, Core Data Entity, and Metadata Repository Users Guide Documents, to reuse pertinent existing core data entities.]

N/A for this report

[Describe where and how enterprise adapters are being used in the systems to share data using common methods. Also describe how use of enterprise adaptors affects the over all system from a data management perspective.]

# Size and Performance

[Provide description of the major dimensioning characteristics of the software that impact the architecture, as well as the target performance constraints.

We have an existing system. Describe the existing scenarios. E.g. If a new country release then add a section on performance testing being required. Otherwise, just list appropriate metrics to show that the architecture is appropriate for the required performance.]

With each release of the application, performance is required to be no worse than previously. The use of HP Performance Center 9.52 to run performance load and endurance testing is utilised on releases where a large number of changes or significant new functionality is being implemented. The decision to employ this approach on a release (or not) is taken in consultation between the GMF Project Manager and the HP Project Team.

|  |  |  |
| --- | --- | --- |
|  | **IA64 (Outgoing)** | **Virtual (New)** |
| **Doxford App** | 4 cores dedicated to GSW | 14 virtual CPUs across 6 virtual servers |
| **Wynyard Park App** | 4 cores dedicated to GSW | 14 virtual CPUs across 6 virtual servers |
| **Doxford DB** | 4 cores dedicated to GSW | 8+ cores dedicated to GSW |
| **Wynyard Park DB** | 4 cores dedicated to GSW | 8+ cores dedicated to GSW |

The sizing of the virtual CPU allocation is based upon expected environment utilisation. Dormant regions with no on-line processing (e.g. AP, EE) are allocated a single virtual CPU and minimal memory to enable GSW to run for audit purposes. Regions with active countries are allocated further virtual cores in line with the size of the active region (where size is gauged by number of active users, quantity of accounts and other relevant metrics). Current allocation for production has been specified as follows (pre-production is identical) :-

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Region** | **Server** | **Status** | **vCPU allocation** | **RAM allocation (GB)** |
| AP | Application | Dormant | 1 | 4 |
| EE | Application | Dormant | 1 | 4 |
| EU | Application | Active | 4 | 4 |
| GR | Application | Active | 2 | 4 |
| GY | Application | Active | 2 | 4 |
| LA | Application | Active | 4 | 4 |
| CN | Application | Active | 4 | 4 |
| AP/EE/EU/GR/GY/LA | Web 1 | Active | 4 | 8 |
| AP/EE/EU/GR/GY/LA | Web 2 | Active | 4 | 8 |
| CN | Web 1 | Active | 1 | 4 |
| CN | Web 2 | Active | 1 | 4 |

These allocations may be revised over time once the environment has been established and some utilisation metrics captured. The CPU allocation in particular may be over-specified and some regions may not require as many virtual cores as has been allocated.

If dormant regions are re-activated then vCPU allocation to those instances may need increasing. This is a simple matter of VMware reconfiguration and restarting of the virtual machines in question. It will not be possible to alter the database machine sizing so easily, since the database servers are physical and not virtual, so some spare capacity should be provided for in the physical server allocation.

**Storage Sizing**

A detailed review of application storage was conducted and appropriate storage requested and allocated for the Itanium environment.

Current production utilization shows the following capacities for the various underlying file systems. The following assumes a virtual solution. DR storage will be identical to production.

|  |  |  |  |
| --- | --- | --- | --- |
| **Site** | **Env** | **Storage use** | **Storage Requirement** |
| Doxford | SIT | Weblogic install | 30GB |
|  |  | Microfocus install | 5GB |
|  |  | Oracle client install | 12GB |
|  |  | Oracle DB Enterprise install | 35GB |
|  |  | GSW SIT database storage | 300GB |
|  |  | Oracle export area | 20GB |
|  |  | GSW application install | 30GB |
| Wynyard | PP | Weblogic install | 6x30GB |
|  |  | Microfocus install | 5GB |
|  |  | Oracle client install | 6x30GB |
|  |  | Oracle DB Enterprise install | 7x35GB |
|  |  | Oracle HTTP Server install | 2x1.5GB |
|  |  | Web Server data files | 2x1GB |
|  |  | GSW AP database storage | 220GB |
|  |  | GSW EE database storage | 30GB |
|  |  | GSW EU database storage | 600GB |
|  |  | GSW GR database storage | 80GB |
|  |  | GSW GY database storage | 227GB |
|  |  | GSW LA database storage | 220GB |
|  |  | GSW Security/Metrics database storage | 32GB |
|  |  | GSW export area | 256GB |
|  |  | GSW application install | 6x5GB |
|  |  | Weblogic install | 30GB |
|  |  | Oracle client install | 30GB |
|  |  | Oracle HTTP Server install | 1.5GB |
|  |  | Web Server data files | 1GB |
|  |  | GSW database storage | 600GB |
|  |  | GSW export area | 256GB |
| Shanghai | PP | Weblogic install | 30GB |
|  |  | Microfocus install | 5GB |
|  |  | Oracle client install | 30GB |
|  |  | Oracle DB Enterprise install | 35GB |
|  |  | Oracle HTTP Server install | 2x1.5GB |
|  |  | Web Server data files | 2x1GB |
|  |  | GSW CN database storage | 200GB |
|  |  | GSW application install | 5GB |
| Doxford | Prod | Weblogic install | 6x30GB |
|  |  | Microfocus install | 5GB |
|  |  | Oracle client install | 6x30GB |
|  |  | Oracle DB Enterprise install | 7x35GB |
|  |  | Oracle HTTP Server install | 2x1.5GB |
|  |  | Web Server data files | 2x1GB |
|  |  | GSW AP database storage | 220GB |
|  |  | GSW EE database storage | 74GB |
|  |  | GSW EU database storage | 521GB |
|  |  | GSW GR database storage | 145GB |
|  |  | GSW GY database storage | 300GB |
|  |  | GSW LA database storage | 287GB |
|  |  | GSW Security/Metrics database storage | 60GB |
|  |  | GSW AP application storage | 16GB |
|  |  | GSW EE application storage | 40GB |
|  |  | GSW EU application storage | 80GB |
|  |  | GSW GR application storage | 30GB |
|  |  | GSW GY application storage | 30GB |
|  |  | GSW LA application storage | 20GB |
|  |  | ExStream storage | 100GB |
| Shanghai | Prod | Weblogic install | 30GB |
|  |  | Microfocus install | 5GB |
|  |  | Oracle client install | 30GB |
|  |  | Oracle DB Enterprise install | 35GB |
|  |  | Oracle HTTP Server install | 2x1.5GB |
|  |  | Web Server data files | 2x1GB |
|  |  | GSW CN database storage | 223GB |
|  |  | GSW application install | 16GB |

These sizes may be revisited during the detailed design phase.

## High Availability and Scalability

[Explain the clustering, fault-tolerant and redundancy mechanisms used to achieve the availability and scalability needs of the system. Include, for example, how operating system clustering, J2EE Application Server clustering, CORBA clustering, and/or RDBMS parallelism is being leveraged. Discuss the strategy for redundant infrastructure services (e.g., Naming Server, Security Server, etc.)

List any state-full sessions (e.g., session beans) and discuss the need for their state-fullness. Include trade offs with performance and scalability.]

**Virtual**

High availability is provided by the inherent architecture of the VMware hosting cluster spread across the HP Blade servers. VMware vMotion handles the automatic localised failover of virtual machines within a cluster, should a physical Blade server fail in any way. The production hosting utilises 5 active Blade servers in the UK with 2 standby Blade servers to cover for maintenance or failure. Even at 5 active Blades the solution is architected at 80% utilisation with some allowance for growth. The above servers host VMs for both GSW and SRS.

For China, a similar architecture is used but on a smaller scale. Only 2 physical Blade servers are required to support production; 1 active and 1 local failover. These two Blade servers run only GSW virtual servers.

The nature of the HP Blade system and the use of VMware provides for a highly flexible, scalable solution. Individual virtual machines that may require additional compute resources (vCPUs, memory) can simply have their allocation increased within the VMware hypervisor. If the underlying physical environment starts to reach its resource limits, then additional Blade servers can be inserted into the c7000 enclosures and added into the VMware cluster – the virtual machines running within that cluster can then leverage the additional resources. Using this approach, the environment is fully scalable for the foreseeable future.

**Physical (Database)**

The physical database servers consist of a pair of HP Blade servers within a c7000 enclosure, but these Blades are not included within the VMware cluster – they each host a single physical operating system within which Oracle runs within an HP ServiceGuard cluster. In order to provide resilient, two HP Blade server cards are to be installed in the enclosure, the second providing a local failover destination for the database packages should the primary server card fail.

No virtual scaling will be achievable with this physical hosting, short of replacing the Blade cards with higher specification modules with additional CPU and memory as needed.

**Disaster Recover / ADRP**

During a DR scenario, the production data centres are unavailable and the application fails over to a secondary DR site. For the UK, DR is provided by the Wynyard data centre. For China, a second data centre within Shanghai provides DR capability (China Telecom).

During normal operations, all SAN storage used by the application is mirrored between the production and DR sites. Should the primary site fail, the secondary site can take over production operations at reduced capacity. Since the physical DR servers are also used as the pre-production environment, any pre-production virtual servers upon them are shut down in order to relinquish resources. Unlike a local failover, the initiation of this remote failover process is manual. Full details of the DR process are covered within the ADRP document (Active Disaster Recovery Plan).

**China DR**

The China environment disaster recovery process is similar to that adopted for the other regions. Production database packages and application VMs are failed over from the Shanghai site to the China telecom site and brought up on the machines that usually run pre-production. Lastly an alternative DR web tier is started on the webservers usually used for pre-production.

## Caching, Pooling and Replication

[Identify caching opportunities across the application architecture (e.g., web caching, persistence tool data access optimization, database caching, distributed caching in the cluster, etc.). In addition, identify and define pooling opportunities in this system (e.g., network connection pooling, database connection pooling, component pooling). Discuss how these mechanisms impact the systems response time and throughput.]

Thick-client Java application libraries are cached locally at the client workstation level by Java Web Start. The download of the application, and subsequent patches/releases, are handled automatically by Java Web Start technologies.

The Wholesale Online web application is presented to end users via a standard web browser which may employ caching techniques to store content locally and reduce bandwidth consumption. However, since 99% of content is dynamic, caching opportunities are in this sense limited to content such as icons and images.

The JDBC connectivity between the application and database tiers employs standard JDBC connection pooling in order to make efficient use of connections to the database. This pooling is provided by the application server.

## Transaction Types and Their Management

[Discuss transactional scope for selected resource managers (local vs. distributed), transaction demarcation (container, bean or client managed), isolation levels and drivers/adapters, and their impact on overall performance of the system.]

Transaction management is coded within the application and also managed at the JDBC level. The migration does not change or impact the way transactional management is employed and is therefore considered outside of the scope of this design.

## Response Time

[Discuss the strategy to meet technical requirements for end-to-end application response time.]

For major releases, application response times will be baselined prior to the implementation, and then compared as part of performance and load testing to ensure that performance remains as-is (or improves) in a like-for-like configuration (UAT/Pre-Production).

The document generation and file transfer processes are not considered suitably ‘real-time’ to warrant concern over response times.

For end users their experienced response times will be largely dependent upon their physical location and connectivity to the relevant regional web server.

For China users, they access GSW via a local web tier located within the primary SDS data centre in Shanghai, with no need to traverse the VPN40 WAN. As such, their user experience should be very good.

For the rest of the world, the web servers are located within the UK Doxford data centre and may have a significant traversal of the VPN40 WAN in order to reach them. User experiences may vary depending upon location and quality of their network connection.

## Bandwidth Consumption

[Discuss the strategy to measure and meet technical requirements for operation in WAN/LAN environments with limited network capacity.]

The application does not often change significantly enough to warrant any concern over increased bandwidth consumption.

## Housekeeping

Housekeeping is covered by the various teams responsible for the output e.g.

* Logs and files produced out of the GSW batch are automatically cleaned up by the batch cycle as per application rules e.g. generally 40 days are kept online except for documents that are made available for download in the archive folders.
* Weblogic log files are managed by middleware team. They are compressed each day and kept in a separate archive directory.
* Oracle archive logs are managed by SDBA team. Scripts run that backup logs to TSM prior to removing.
* Webserver logs are managed by webhosting team. An automatic process runs to make logs available on Tumbleweed for the application team prior to removing from the webservers.

# Quality

[Describe how the system architecture contributes to all capabilities (other than functionality) of the system: extensibility, reliability, portability, etc. If these characteristics have special significance, such as safety, security or privacy implications, they must be clearly delineated.]

The quality aspects that were introduced as part of the Java conversion are all retained. This includes the use of popular and established technologies such as Java, Oracle, WebLogic Server and Microfocus COBOL server.

The use of virtualised infrastructure provides a greater degree of flexibility to change for the application as a whole. Regions can now be re-sized according to operational need.

The use of the HP ExStream leveraged document generation service consolidates document generation to a single channel, reducing the reliance on older hardware and software technologies.

# Architectural Prototype

[Indicate if an architectural prototype (executable architecture) has been created for this project per the use cases identified in Section3.0. If an architectural prototype was created indicate the scope of architectural elements included, quality of implementation, testing plan and results of executing the architecture.

Only if applicable to the CSRs.]

None

# Conclusion

[Describe conclusion drawn from the architecture, assessments, as well as past and current open issues. The section should attempt to assess the architecture against its requirements.

The section should:

* Document the rationale for key (i.e., significant effect on cost, schedule, or technical performance) decisions made or defined. If multiple architectures solutions were considered, which is necessary for projects using newer technologies or for complex projects, document the alternate architectures or solutions considered and the selection criteria. If required, refer to the Decision Analysis and Resolution Document used to identify the architecture/design.
* Highlight the advantages and known limitations of the chosen solution,
* Describe how well non-functional requirements are met,
* List any known inconsistencies within the architecture document (terminology, deviations from the requirements stated in System Requirements Specifications Document),
* Optionally discuss possible directions for the evolution of the architecture,
* Optionally document any consistency analysis done across the architectural views presented in sections 4 to 8.

Don’t worry too much about this section.]

Not applicable for on-going system documentation.

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APEX Revision History

*To be updated by GPMO*

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| --- | --- | --- | --- |
| **Version Number** | **Date Updated** | **Revision Author** | **Brief Description of Changes** |
| 1.0 | December 17, 2010 | Ally Process Team | Initial Creation for APEX. |
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