



ILP PROGRAM - ORACLE APPLICATIONS

Tata Consultancy Services

Technical Architecture Study Guide

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Contents

Table of Contents

Document Control.....	2
How to use this manual	6
R11/R12 Architectural Difference:.....	7
Components of R12 Application	8
Forms Services:	9
Concurrent Processing Services:	10
Concurrent Processing Architecture	11
Concurrent Processing Operations	12
Web Services:.....	12
HTML – Based Applications and Oracle Application Framework:.....	13
Single vs Multi-Tier Architecture.....	15
Single Tier	15
Multi-Tier	15
Application File System Structure:	17
APPL_TOP Concept.....	17
Instance Home (INST_TOP)	18
APPS_ST:.....	19
TECH_ST:	19
The COMMON_TOP Concept	20
Difference between 11i and R12 File System Architecture	20
11i File System Architecture:	21
R12 File System Architecture:	21
DB Tier File System Structure:.....	23
APPS_ST.....	23

TECH_ST	23
Data Files:	23
Control Files:	24
Security.....	25
Authentication:	25
Authorization:	26
Audit Trail:	26
Network Security:.....	26
Oracle User Management:	26
Security Strategies:	27
Load Balancing	28
Load Balancing Definitions:	28
Categories of Load Balancer.....	28
Load Balancing Options.....	29
High Availability.....	30
Shared APPL_TOP.....	30
Distributed AD (Active Directory)	30
NoLogging Operations.....	31
Disaster Recovery.....	31
Authentication and Integration	32
Oracle Application Server 10g Optional Components:	32
Oracle Portal:	32
Oracle Discoverer:.....	32
Enterprise – Wide Single Sign – On	33
Application Server Integration Options	33
Basic Single Sign – On Deployment Scenario	33
Advanced Single Sign – On Deployment Scenarios.....	35
Advanced Single Sign – On Options	37

Application Database Organization.....	38
Hands – On Exercises	41

How to use this manual



Video1: Script: Vid1-Introduction to the chapter and its content – Face recording.

This video will introduce the material covered in this pdf, the goals,

1. How this document is organized
 2. What is the purpose of this document
 3. What will you achieve after going through the document and related videos
 4. How to read this document
 5. How does it relate to the work you will be doing on real project
 6. Reference to other reading materials for further references
-

This manual has been organized as a step by step guide to teach how to create reports using Oracle Developer Suite 10G. The target audience is new comes to Oracle Developer suite. It assumes that the reader has basic knowledge of Oracle concepts and PL/SQL. After completing this course, you will be able to create variety of reports using Oracle Developer Suite 10G.

This manual is organized to be read in a serial fashion and follow the instructions given in the document as it is. Practical examples are given in each section to guide you through every step. The tables referred here are common (shared) tables used by different batches, so care should be taken not to delete or update the rows which does not belong to you, this may create problem for the other batches. At the end of the course, you should delete the data you have created.

There are several symbols used to designate particular sections, which are described below:



- Describes the purpose of the section.



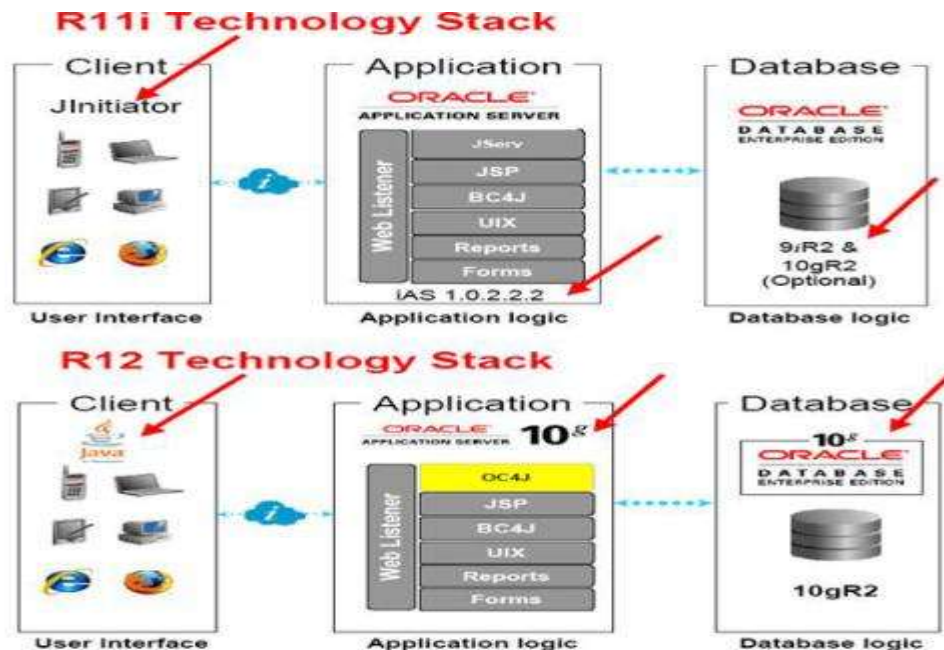
- Notes relevant to the section above



- This denotes the task to be completed by the audience on his own PC. The layout of the output has to be followed as it is. For any confusion, the faculty should be contacted.

R11/R12 Architectural Difference:

The Oracle e-Business Suite R12 Architecture is a framework for multi - tiered, distributed computing that supports Oracle Application products.



In Oracle e-Business Suite R12 various services/servers are distributed among the following three levels or tiers:

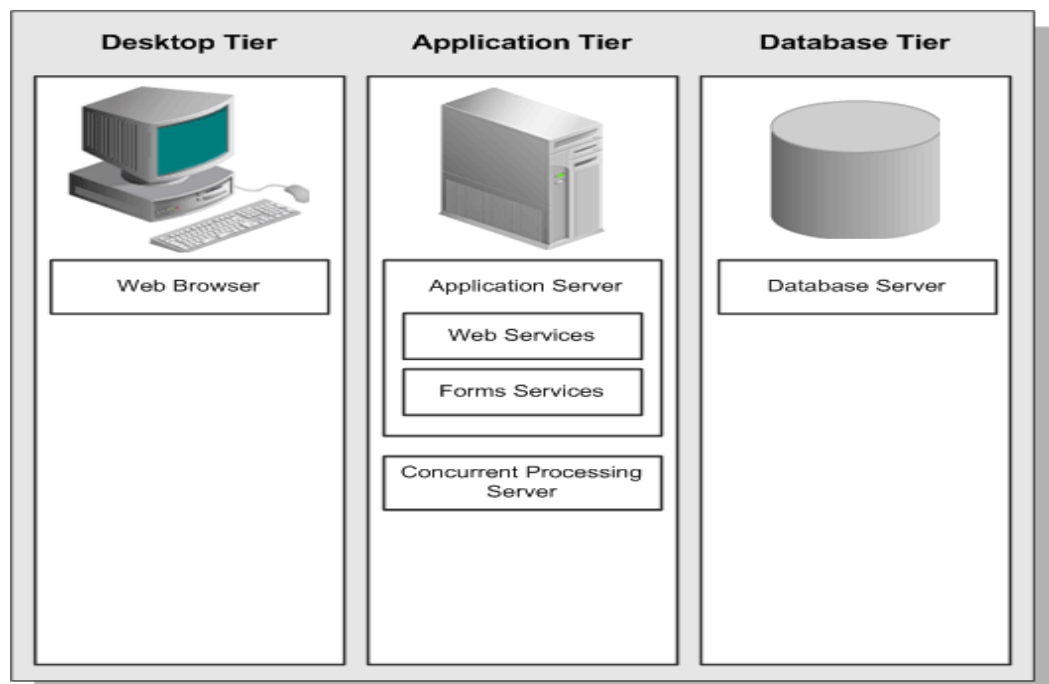
1. The Desktop Tier
 2. The Application Tier
 3. The Database Tier
1. The Desktop Tier – The Desktop Tier is a Client Interface which is provided through HTML for HTML – based applications and via a Java Applet in a web browser. In Oracle e-Business Suite each user logs into Oracle Applications through the e-Business Suite Homepage on a desktop client browser.
 2. The Application Tier – The Application Tier does the hosting of various servers and services that process the business logic and manages the communication between Desktop Tier and Database Tier. This tier is sometimes called as Middle Tier.
 3. The Database Tier – The Database Tier contains the Oracle Database Server which stores all the data maintained by Oracle Applications.
The Database Tier contains the Oracle Data Server Files and Oracle Application Database executables which store Tables and other database objects. This tier does not directly communicate with the desktop clients.



Components of R12 Application

A Server (or services) is a process or group of processes that runs on a single machine and provides a particular functionality. For ex. Web Services process HTTP requests from clients, Forms Services process requests for activities related to Oracle Forms (One of the Components of Oracle Developer Suite).

The Concurrent Processing Server/Services supports data intensive programs that run in the background. A Tier is a logical grouping of services spread across more than one physical machine. The Three Tier Architecture that comprises an Oracle e-Business Suite installation is made of the Database Tier which supports and manages Oracle Database, the Application Tier which supports and manages various Oracle e-Business Suite components also called as Middle Tier and the Desktop Tier which provides user interface to a standard web browser.



A Machine may be referred to as a Node in the group of computers that work closely in a Cluster. Each Tier may consist of one or more nodes and each node can accommodate more than one tier. Centralizing the Oracle e-Business Suite software on the Application Tier eliminates the need to install and maintain application software on each desktop client PC. On the Database Tier the feature of multiple nodes support a single database instance to give greater availability and scalability.

Forms Services:

Forms Services in Oracle e-Business Suite R12 are provided by the Forms Listener Servlet which facilitates the use of firewalls, load balancing, proxies and other networking options.

Benefits of using Forms Listener Servlet:

1. Ability to re – establish dropped network connections
2. Fewer Machines and ports need to be exposed at the firewall
3. Easier Firewall/proxy server configuration
4. More robust and secure deployment over the Internet.

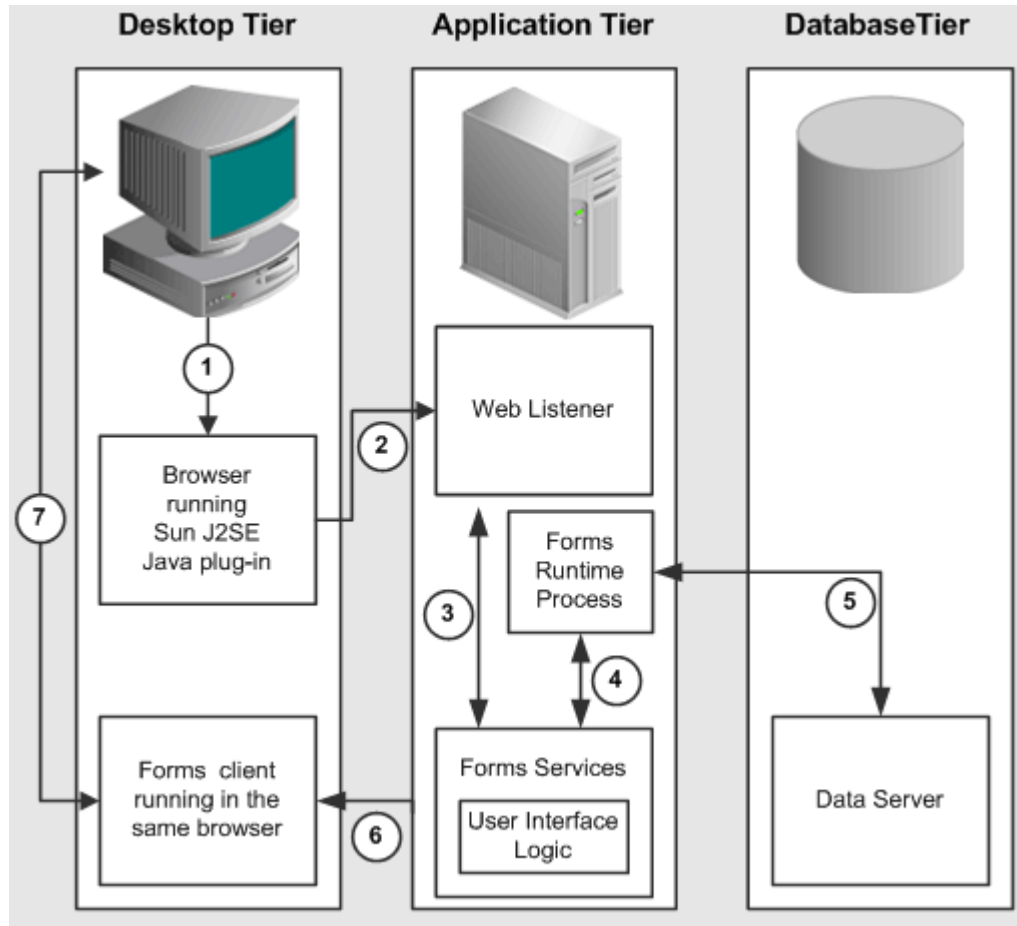
Architecture of Forms Listener Servlet

The Forms Listener Servlet is a Java Servlet that delivers the ability to run Oracle Form Applications over HTTP or HTTPS connections. It hosts Oracle e-Business Suite forms and associated runtime engine, making the communication easier between desktop clients and Oracle Database Server, displaying client screens and initiating changes in the database according to user's actions. The Forms Listener Servlet caches data and provides it to the client. For example when scrolling through multiple Sales Order Lines that exceed the limitations of a single screen. The Forms Listener Servlet communicates with the Oracle Database Server using Oracle Net networking infrastructure.

The client sends HTTP requests and receives HTTP responses from Web Services which in turn acts as a network endpoint for the client.

When a User initiates an action in the Forms Client Applet (such as entering data into a field or clicking a button), data is passed to the Forms Server on the Application Tier. The User Interface logic runs in the Forms Server and determines the appropriate user interface effect based on the user's action.

For example, a window may open, or another field value may be populated. If necessary the Database Tier is contacted for any data not already cached on the application tier or for data – intensive processing.



Once a connection is established many operations can be performed with little or no further interaction with Forms Server. For example when a few field values change in response to a User Action there is no need to update the entire screen, only the changed fields are updated with new values.

Concurrent Processing Services:

User's interactions with Oracle e-Business Suite data can be conducted via HTML – based applications or the more traditional Forms Based Applications.

In addition to these there are also reporting programs and data updating programs that need to run either periodically or on ad hoc basis. These programs which normally run in the background while users continue to work on others tasks may require a large number of data – intensive computations and these set of activities are run by a concept named Concurrent Processing Architecture.

Concurrent Processing is an Oracle e-Business Suite feature that allows these non – interactive and long – running functions to be executed efficiently. It uses operating system facilities to enable background scheduling of data via a set of programs and forms. To ensure Concurrent Processing operations do not interfere with interactive operations they are run on a specialized server which is otherwise called as Concurrent Processing Server.

Processes that run on the Concurrent Processing Server are called Concurrent Requests. When a user submits a request either through a HTML based or Forms based application a row is inserted into a database table. A Concurrent Manager reads the requests from the table and appropriately starts the concurrent request.

To better understand the concept of Concurrent Processing we need to have knowledge on the characteristics that a Concurrent Manager can offer.

Following are the characteristics of a Concurrent Manager:

1. A Concurrent Manager is an executable that is registered as a program library within Oracle e-Business Suite and runs its own operating system process.
2. A Concurrent Manager can even run an immediate request.
3. A Concurrent Manager can be allowed to run any concurrent request or we can define certain specialization rules which allow only few concurrent requests to process.
4. A Concurrent Manager operates during the day and times specified in a Work Shift.

The **Internal Concurrent Manager (ICM)** controls all other concurrent managers. It administers the startup and shutdown of managers as defined by their work shifts, monitors for process failures and cleans up if a failure occurs.

The Internal Concurrent Manager does not process concurrent requests itself.

The **Conflict Resolution Manager (CRM)** enforces rules to ensure that incompatible concurrent requests do not run in the same conflict domain.

The **Standard Manager** will accept and run any concurrent requests as it has no specialization rules that would restrict its activities.

The **Transaction Manager** supports synchronous request processing. It will not read the request from the table to process the request; instead it waits to be signaled by the client. For example An Approval of a Sales Order wherein the execution of this approval process should happen immediately.

Concurrent Processing Architecture

In Concurrent Processing, requests are run as operating system background processes. These requests may be written using a variety of Oracle Tools.

A Concurrent Request has a lifecycle which consists of three or four phases:

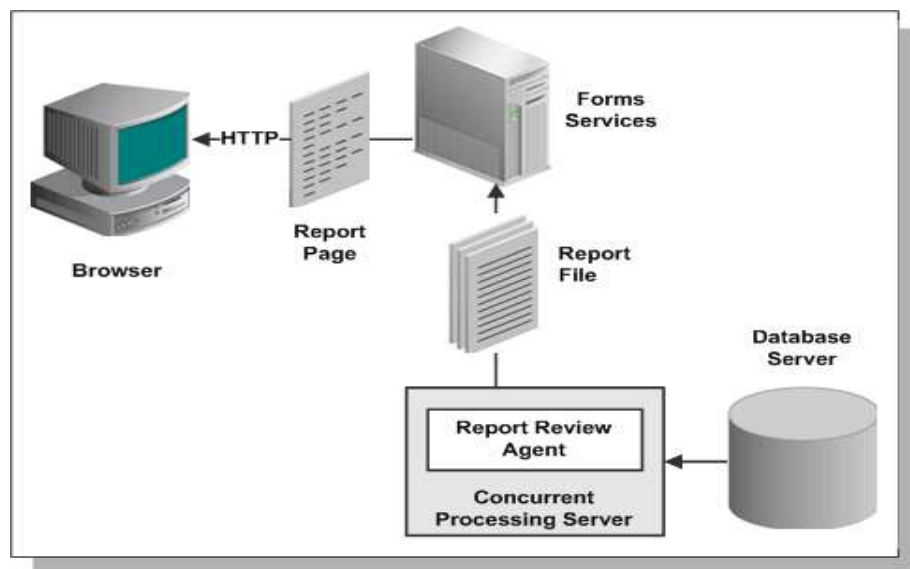
Phase	Activity
Pending	The request is waiting to be run
Running	The request is running
Completed	The request has finished

Inactive	The request cannot be run
----------	---------------------------

Concurrent Processing Operations

As discussed earlier the Internal Concurrent Manager controls all the other managers it must always be running and active before any other manager can be activated.

Once the ICM is activated it starts a Service Manager on each machine which is enabled for concurrent processing. This service manager which acts as an agent of the ICM starts the concurrent manager on its node excluding any managers that are in inactive state or that have no current work shifts.



Parallel Concurrent Processing (PCP) allows concurrent processing activities to be distributed across multiple nodes in an Oracle Real Application Clusters (Oracle RAC). By doing so hardware resources can be fully utilized. Parallel Concurrent Processing allows the running of concurrent processes on the remaining nodes when one or more nodes fail.

In environments where one or more concurrent processing nodes exist the Parallel Concurrent Processing is always available.

Web Services:

The Web Services Component of Oracle Application Server processes requests received over the network from the desktop clients and includes the following components:

- Web Listener

- Java Servlet Engine
- Oracle Process Manager

The Web Listener component accepts incoming HTTP requests from client browsers and routes the requests to the appropriate OC4J container. Depending on type of request the Web Server services the request itself by returning the HTML to construct a simple web page.

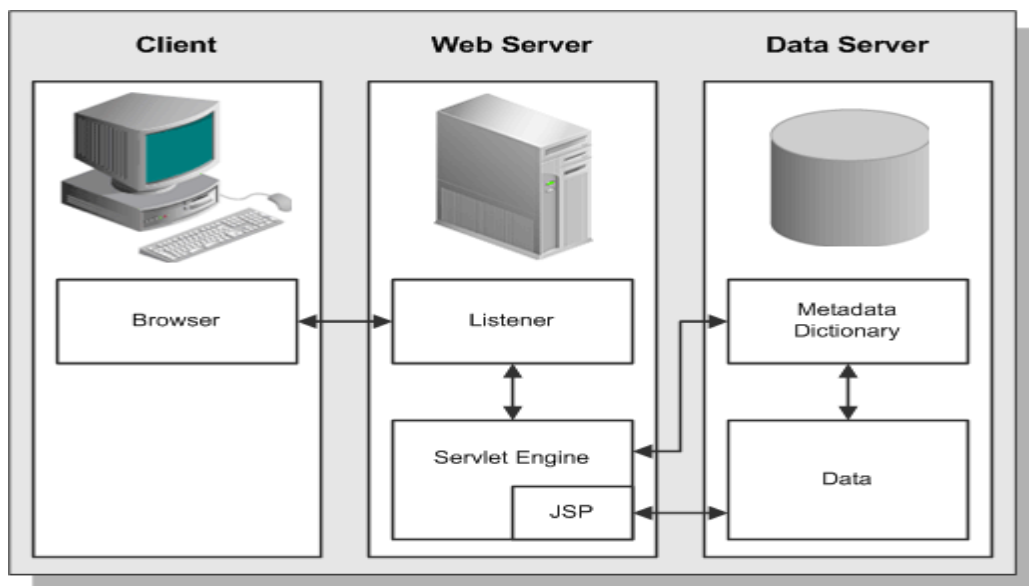
HTML – Based Applications and Oracle Application Framework:

The Oracle HTML – based applications (also known as Self – Service Applications) have the following characteristics:

1. These applications do not use Oracle Forms for interfacing between client and server.
2. These applications are designed in pure HTML and JavaScript
3. Generation of HTML pages happens dynamically by executing the Java Code.
4. Operates by direct connection to the Web Server.

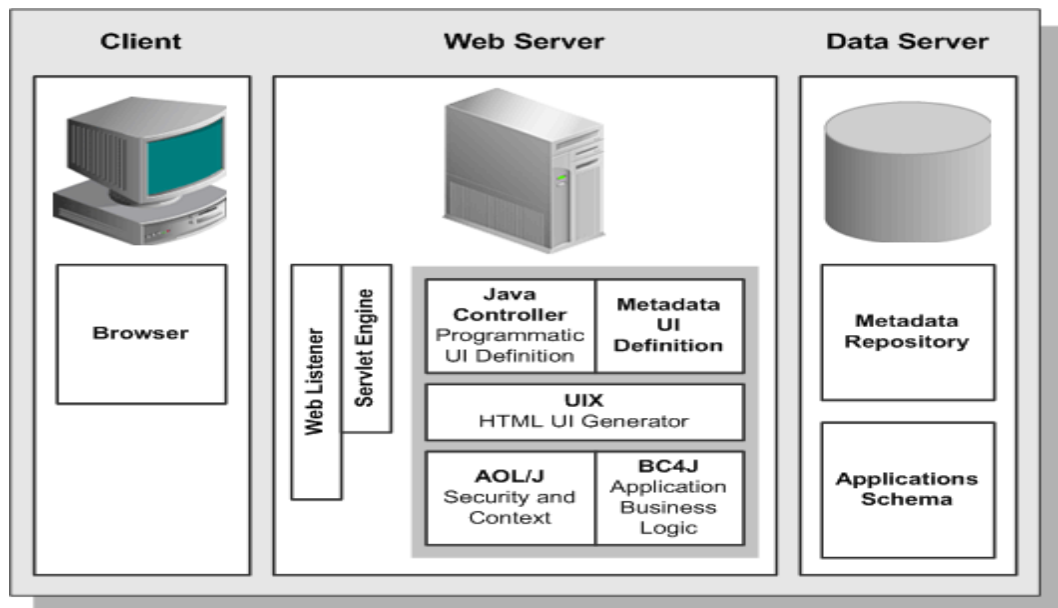
An HTML – based Application Module uses the following access path:

1. The User clicks the hyperlink of a function from a browser.
2. The Browser makes a URL request to the Web Listener.
3. The Web Listener contacts the Servlet engine (OC4j) where it runs the .jsp file.
4. The .jsp file obtains the content from Oracle e-Business Suite tables and uses information from the metadata dictionary to construct the HTML page.
5. The resulting HTML page is passed back to the browser via the Web Server.



The Oracle Application Framework is the development platform for HTML based applications. It consists of a Java – Based application tier framework and associated services designed to facilitate the rapid deployment of HTML – based applications.

The Framework – based application logic is controlled by procedures that execute through Java Servlet Engine. This Servlet engine uses the metadata dictionary in constructing Framework user interface.



The following is a more detailed explanation of how the JSP obtains content from Oracle e-Business Suite Tables and uses information from metadata dictionary to construct the HTML page:

- The **Security & Context** (AOL/j) process validates user access to the page.
- The **Page Definition (Metadata UI Definition)** is loaded from the metadata repository on the database tier into the application tier.
- The **Application Business Logic** (BC4J) objects that contain the application logic and access the database are initiated.
- The **Programmatic UI Definition** (Java Controller) manipulates the page definition based on dynamic user interface rules.
- **HTML User Interface** (UIX) interprets the page definition and creates the corresponding HTML in accordance with User Interface standards and finally sends the page to the browser.

Video 2 – Components of R12

Face recording + block diagram + screen capture

This section needs lots of explanation, so explain each section in detail. Use screen captures wherever applicable. Open Oracle Apps, and show them which part is serviced by which component.

Single vs Multi-Tier Architecture

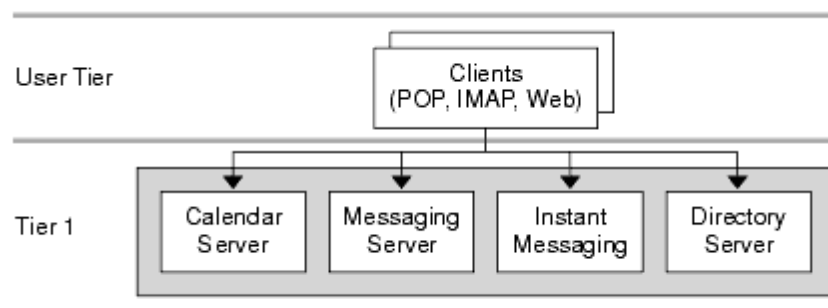
Single Tier

A Single Tier Architecture is one where all the services are located on a single host with sufficient memory and CPU's or deployed on multiple servers with each server hosting all components' product services.

As its name implies the Single Tier locates all services onto a single machine.

Such architecture is best suited for enterprises that are:

- Composed of 500 users or less
- Not geographically distributed
- Served by few administrators



End – User client programs such as Web Browsers (Internet Explorer, Mozilla) form the User Tier. Tier 1 is a single machine running all services.

The Single Tier, one host architecture requires a machine that provides sufficient CPU, memory and storage.

Multi-Tier

Multi-Tier Architecture also called as 'Three Tier Architecture' is used when any software application tries to connect to a database server.

There are three major tiers to any software:

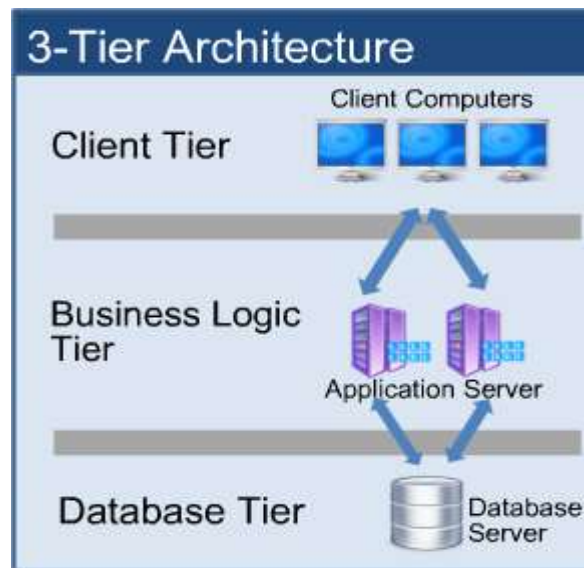
1. User Interface – This is what we see when we work with the software. We normally interact with User Interface. There might be buttons, icons, text boxes, and radio buttons. The User Interface passes on clicks and typed information to the Business Logic Tier.
2. Business Logic - The Business Logic is the code that is executed to accomplish something. When a user clicks a button it will trigger the Business Logic to run some code. The Business Logic in turn will send back the information to the User Interface so that the user can see the result of clicking a button or typing something in a field.

For example when we enter some value in a cell in Microsoft Excel Sheet the Business Logic will recalculate other cells once you hit Enter Key and the User Interface will present the new information to the user. The Business Logic also needs to be able to store and retrieve data that is handled in the Database Tier.

3. Database – The Database is where the data is stored and where the Business Logic can retrieve it whenever required.

In a Multi-Tier Architecture all the three tiers mentioned above are separated into different computers or nodes. The User Interface runs on the client. The Business Logic is runs on a separate server called Business Logic Tier otherwise called as a middle tier or service tier. Finally the Database is runs on its own database server.

In the Client Server the client handles the User Interface and Business Logic which makes the client thick and in turn it requires heavy traffic with the server making it difficult to use over slower network connections like Internet. By introducing the middle tier the client now the complete responsibility of handling the presentation logic alone which reduces the communication needed between the client and the middle tier making the client thin. As more users access the system a three tier solution is more scalable because we can add as many middle tiers (running on each own server) as needed to ensure good performance.

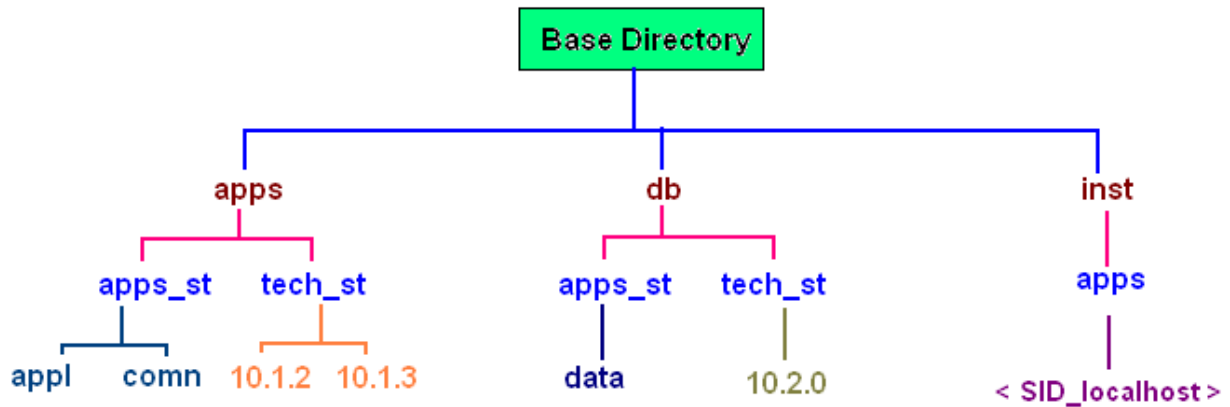


	<u>Single Tier</u>	<u>Multi – Tier</u>
Benefits	Very Simple and no need a Server	Fastest Execution and very scalable
Issues	Poor Security and Multi – User issues	Very Costly and Very Complex
Users	Usually 1 (or a few)	Users ranging from 50 to 2000 plus.

Application File System Structure:

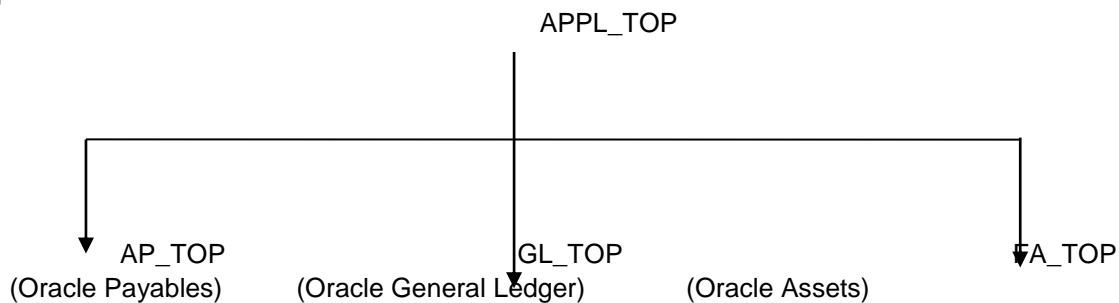
An Oracle e-Business Suite R12 system uses components from many Oracle products. The product files are stored in several top – level directories.

Depending on how we chose to install Oracle e-Business Suite these product directories may be located on a single machine or on multiple machines.



APPL_TOP Concept

APPL_TOP directory also known as Application Top Directory contains files pertaining to each Module/Application. Example:



The APPL_TOP directory contains:

1. Core directories and technology files
2. The Product Files and Directories for all products
3. The main Oracle e-Business environment file called **<CONTEXT_NAME>.env** on Unix platform and **<CONTEXT_NAME>.cmd** on Windows platform
4. The consolidated environment file called **APPS<CONTEXT_NAME>.env** on UNIX and **APPS<CONTEXT_NAME>.cmd** on Windows platform.

During Oracle Application Installation which is handled by Rapid Install it creates a directory tree for every Oracle e-Business Suite product in the APPL_TOP directory. Each APPL_TOP directory is associated with a single Oracle e-Business Suite database.

Instance Home (INST_TOP)

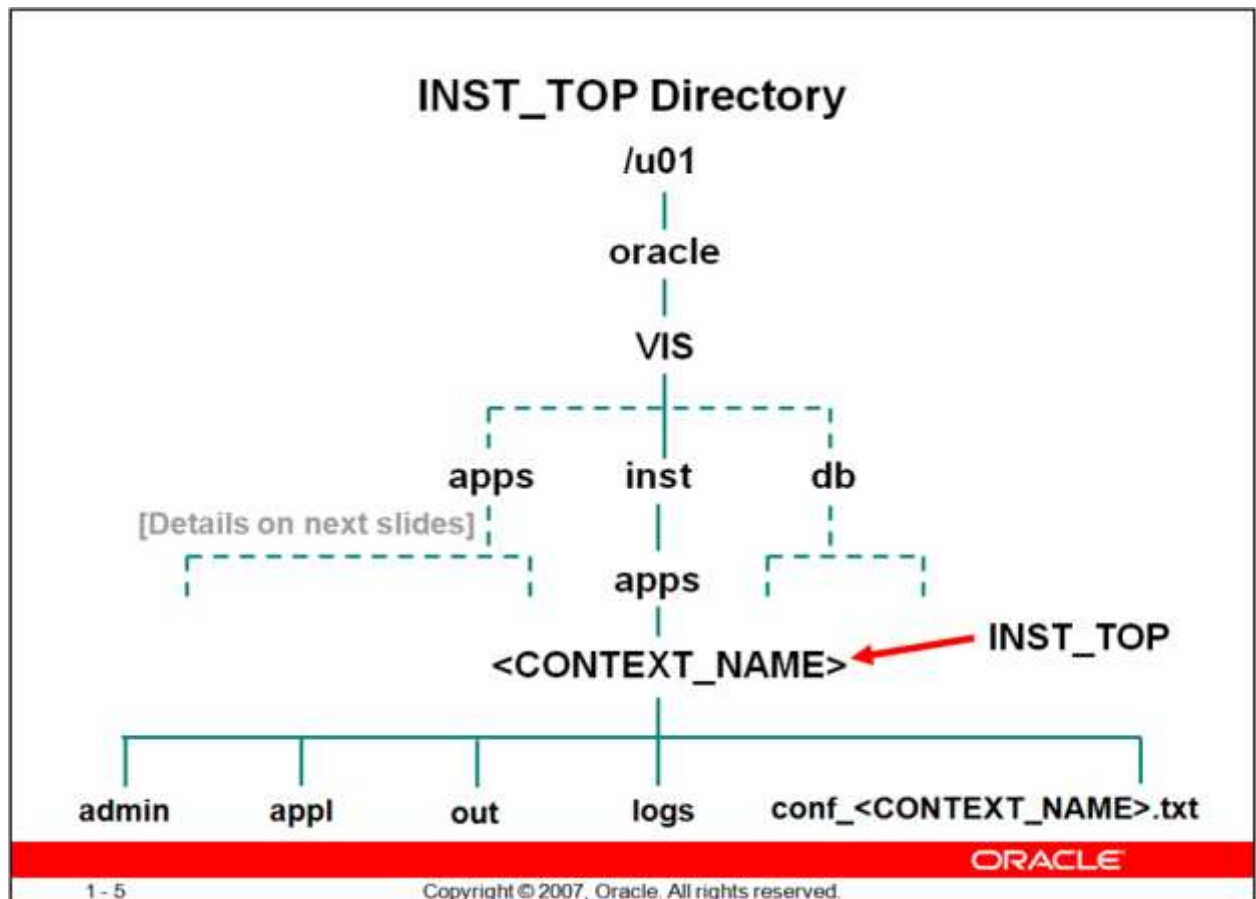
Oracle e-Business Suite R12 introduces the concept of a top – level directory referred to as Instance Home and denoted by the environment variable as \$INST_TOP.

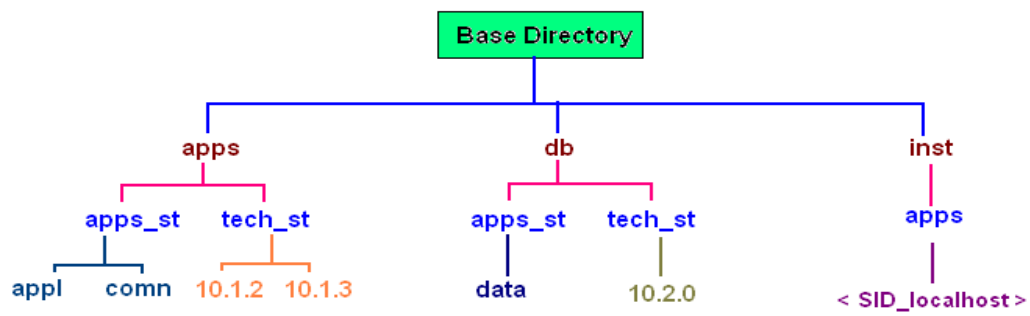
This provides the ability to share application and technology layers among multiple instances.
The basic structure of the Instance Home is :

<APPS_BASE>/inst/apps/<context_name> where APPS_BASE is the top level of Oracle e-Business Suite and <context_name> is the highest level at which the application context exists.

All configuration files created by a utility AutoConfig are stored under the Instance Home.

All the Oracle Application specific configurations or changes made at the server level for those log files are written in INST_TOP directories.





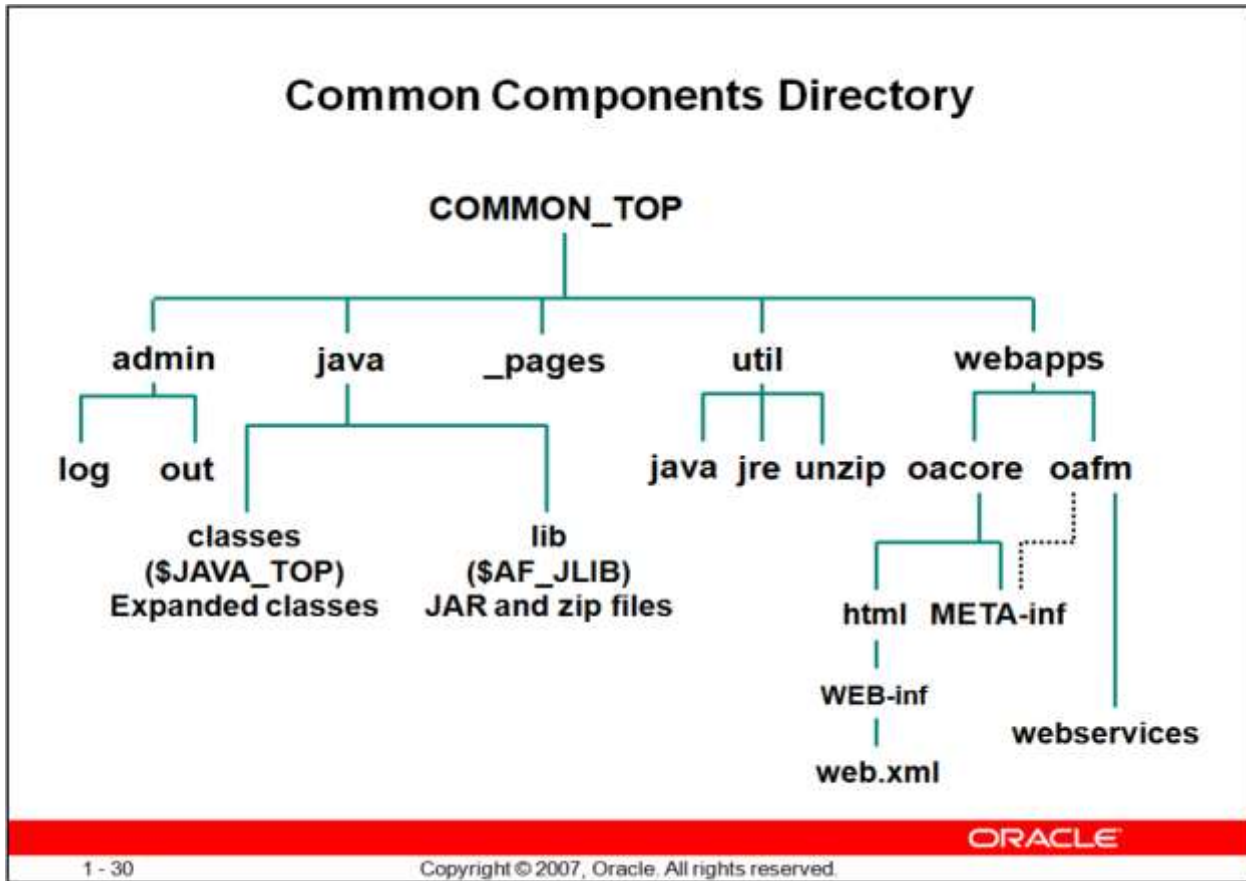
APPS_ST:

APPS_ST directory resides under the APPS directory which in-turn resides under the HOME directory. The APPS_ST contains the APPL_TOP and COMMON_TOP. This directory holds information relevant to Oracle Applications.

TECH_ST:

The version for Oracle Forms used in Oracle Applications is 10g and version for Oracle Application Server is also 10g. The directory 10.1.2 belongs to ORACLE_HOME for Oracle Forms and the directory 10.1.3 belongs to ORACLE_HOME for Oracle Application Server. Since these are the underlying technology they are grouped under TECH_ST.

The COMMON_TOP Concept



The admin directory under the COMMON_TOP directory is the default location for Concurrent Manager Log and Output File directories. When the concurrent managers run Oracle e-Business Suite Concurrent Requests they write the log files and to the log subdirectory of the admin directory and output files to the out subdirectory of admin directory.

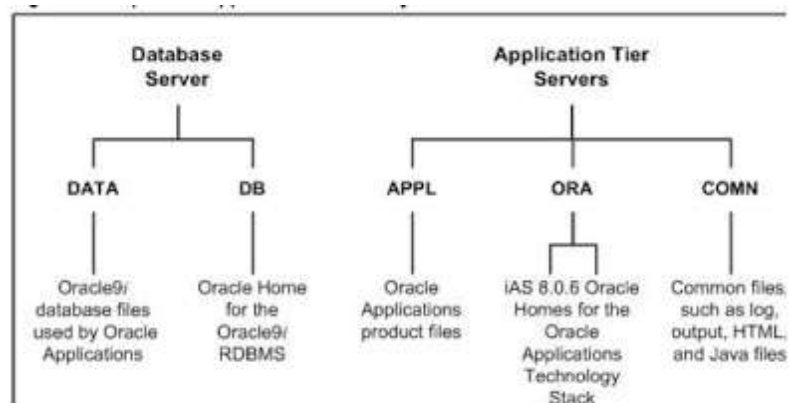
The install directory under the COMMON_TOP directory contains script and log files used by Rapid Install. The scripts subdirectory of admin directory is used to start and stop services such as concurrent managers.

Difference between 11i and R12 File System Architecture

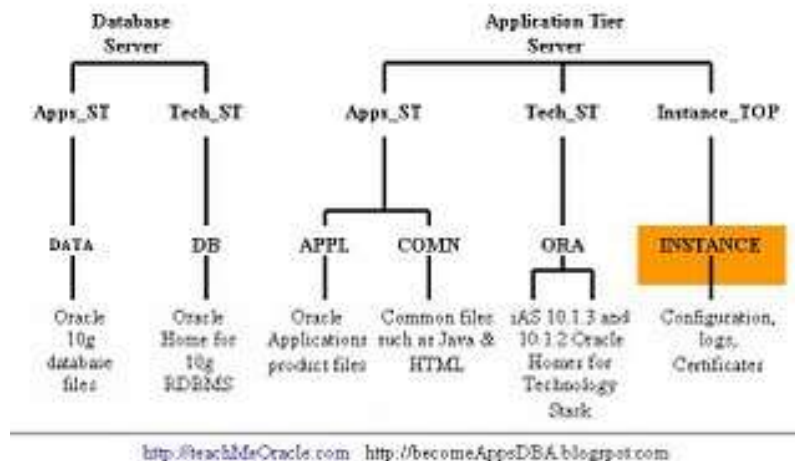
The below table explains the difference between 11i and R12 File System Architecture:

<u>Component</u>	<u>Release 11i</u>	<u>Release 12</u>
Database	9.2	10.2
Developer	6i	10i
Application Server	1.0	10.1
Client Plug – In	JInitiator	SUN JRE
Java Containers	JServ	OC4j
INST_TOP	N/A	\$HOME/inst/apps/<context_name>

11i File System Architecture:



R12 File System Architecture:



<http://teachMeOracle.com> <http://becomeAppsDBA.blogspot.com>

CUSTOM_TOP Structure

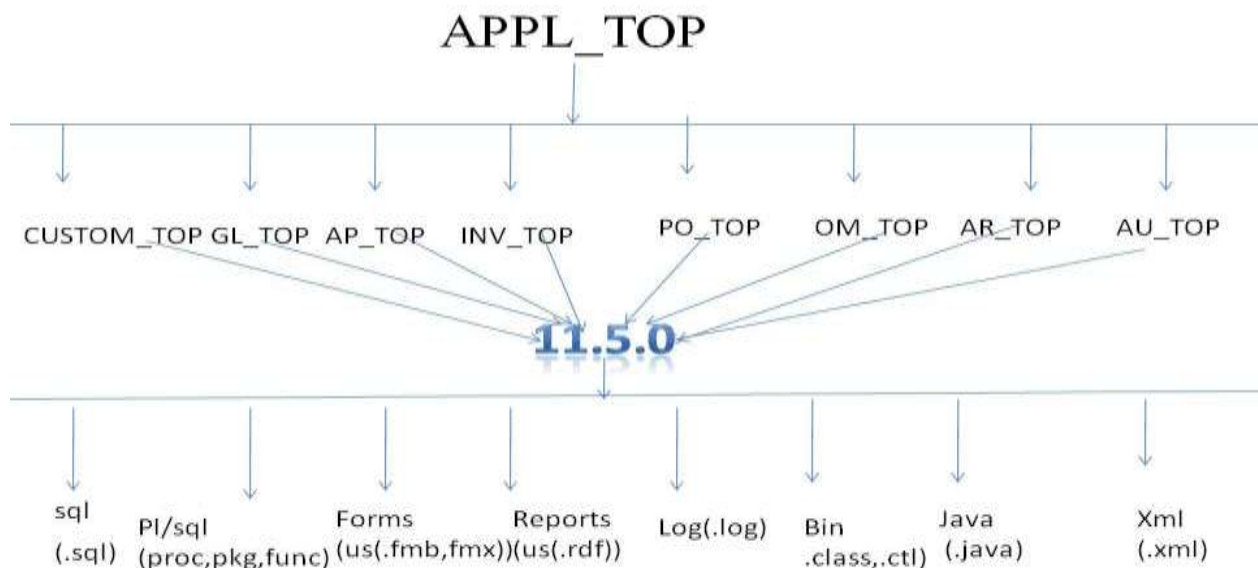
Oracle e-Business Suite is shipped with pre – seeded products/modules and applications which is tailored to meet the requirements of any industry.

As the business expands with the growth happening in the organization, products and applications pre – installed in Oracle e-Business Suite might not be able to address the changes happening in the business. In order to address the business changes Oracle e-Business Suite allows us to extend the Application according to the business need.

With respect to the File System Architecture in Oracle e-Business Suite each product has its own pre – defined sub products.

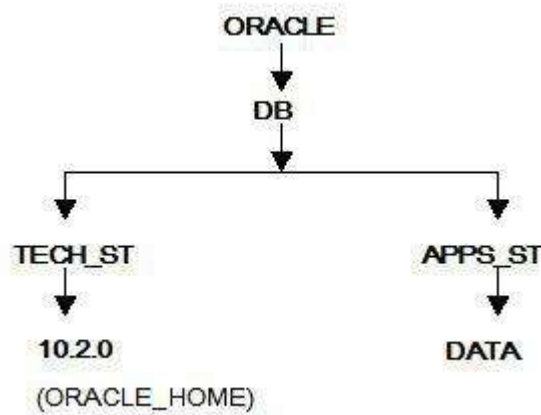
Oracle e-Business Suite normally goes for an update version or an upgrade from lower version to higher version. Due to this Oracle would also change the product wise files and would not support customization to the pre – existing product files. So to address these issues and concerns Oracle e-Business Suite allows us to create a new product (CUSTOM_TOP) i.e. Custom Application.

The directory structure of a CUSTOM_TOP should be similar to each product directory structure and should reside under the APPL_TOP.



Mostly screen captures, go to the server and show different file systems, APPL_TOP, COMMON_TOP and what they contain. Login to apps and pick up a form, now show them how to find the form on a server, same for a report. Go to INST_TOP and show the DBA scripts.

DB Tier File System Structure:



APPS_ST

APPS_ST directory resides under the Base Directory (Top Level Directory).
APPS_ST directory is common for both APPS related script files and database related script files.
In regards to Oracle Database APPS_ST contains data files for the database.

TECH_ST

TECH_ST directory resides under the Base Directory (Top Level Directory).
TECH_ST directory is common for both APPS related script files and database related script files.
In regards to Oracle Database TECH_ST is the ORACLE_HOME for Oracle Database 10g. All the database related files like SQL*Plus for executing SQL queries are located in TECH_ST directory.

Data Files:

Before we start explaining the concept of a Data File we need to understand what a Tablespace is.
An Oracle Database is comprised of one or more logical storage units called Tablespaces. The Database's Data is collectively stored in the database's Tablespace.

Each Tablespace in an Oracle Database is consists of one or more operating system files called Data Files. A Tablespace's Data Files physically store the associated database data.

A Database's data is collectively stored in the data file that constitutes each Tablespace of the database.

For Example -

The simplest Oracle Database would have one Tablespace and one Data File.

A complicated database might have three tablespaces each comprising of two data files.

Control Files:

Control File is a small binary file that records the physical structure of the database. The Control File contains:

- The Database Name
- Name and Locations of associated data files and redo log files.
- The timestamp of the database creation
- The current log sequence number

The Control File must be available for writing by the Oracle Database server whenever the database is open. Without the Control File the database cannot be recovered in case of data loss issues.

The Control File of an Oracle Database is created at the same time when the database is created.

Security

The foundation of Security is Access Control. This means how the system is being accessed and by whom. User Security consists of three principal components:

1. Authentication – Validates User's Identity
2. Authorization – Controls User's Access based on Roles & Responsibilities
3. Audit Trail – Keeps track of User's transactions to ensure that the user's privileges are not being misused.

Authentication:

Identifying and verifying who is allowed to access the system is the first line of defense. The most common approach is password – based authentication.

If the legitimate user is the only one who knows the password then whoever just entered the correct password is very likely to be the person authorized to use the account.



There are quite a few practical problems which can arise with passwords. These include:

1. Passwords that are allowed to be too short, and thus vulnerable to being observed on entry
2. Passwords that are forced to be too long and which user might decide to write down.
3. Easy – to – guess passwords chosen as being easy to remember
4. Rarely changed passwords
5. Passwords that are used for multiple accounts.

An attacker will generally focus on identifying the password of a powerful user such as System Administrator. Such users are generally more aware of security risks and can be persuaded to take more care in their choice of password and to change it regularly.

Authorization:

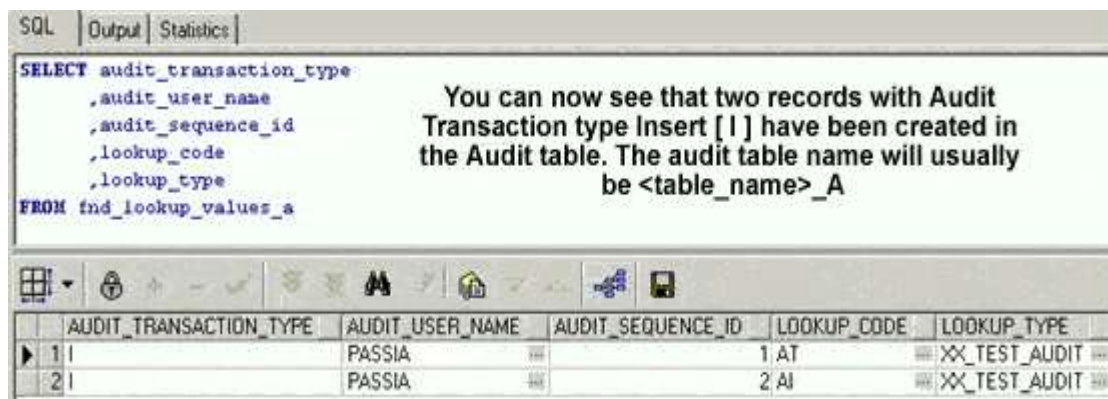
On entering the system the application user should be granted access to the specific data according to his roles and responsibilities. For Example: A Clerk is authorized to enter only Invoices whereas the Manager of the Department is authorized to approve invoices on a day to day basis.

Audit Trail:

An Audit Trail can be used to keep track of a User's transaction to verify that the user is not misusing his access privileges. Information about the identity of the user is also attached to all the transactions. This feature helps the organization to detect the person responsible for any transaction or to determine which users viewed confidential information in a given time period.

The below example will make us clear on the impact of Audit Trail done on a Table.

User 'PASSIA' has added two new values to a particular category type 'TEST_AUDIT'.



The screenshot shows an Oracle SQL Developer window with the 'SQL' tab selected. The query window contains the following SQL statement:

```
SELECT audit_transaction_type
, audit_user_name
, audit_sequence_id
, lookup_code
, lookup_type
FROM fnd_lookup_values_a
```

Below the query window, a message box states: "You can now see that two records with Audit Transaction type Insert [I] have been created in the Audit table. The audit table name will usually be <table_name>_A".

At the bottom, the 'Output' tab displays the results of the query in a table format:

	AUDIT_TRANSACTION_TYPE	AUDIT_USER_NAME	AUDIT_SEQUENCE_ID	LOOKUP_CODE	LOOKUP_TYPE
1	I	PASSIA	1	AT	XX_TEST_AUDIT
2	I	PASSIA	2	AI	XX_TEST_AUDIT

Network Security:

An enterprise may or may not have any physical control over its network infrastructure currently in use. The Internet is the best example for this. It would not have any control and the organization would want to take steps to ensure that security is not compromised. In order to consider these security risks HTTPS (Secure HTTP) connection to Oracle e-Business is highly recommended.

All browser – based password login screens send the password as a parameter in the HTTP form submission. This information is encrypted using an HTTPS connection. So the best practice is to use HTTPS for all web – based access.

Oracle User Management:

Oracle User Management (OUM) is a secure and scalable system which enables organizations to define administrative functions and management of Users based on their Job Roles and Responsibilities.

With Oracle User Management instead of always relying on an Administrator to manage all its users an organization can create a Functional Administrator and grant them sufficient privileges to manage a specific set of users.

A new introduced feature in R12 allows a user for Login Assistance if needed instead of always relying on Administrator. This works through the 'Login Assistance' link located just below the Login and Cancel buttons and then can go to Forgot Password/Username.

Another feature introduced in R12 will allow users having privileges to enable other users to act on their behalf as delegates without having to share their login credentials. For example Managers may need to grant subordinates limited authority to act on their behalf while they are out of office.

Security Strategies:

A large, worldwide organization will benefit immensely with the usage of a 'Hub and Spoke' network topology with high – capacity links to regional hubs and medium – capacity connections from regional hubs to local offices. The location of these hubs should be based on organizational need, carrier availability, pricing and network latency. The routers should be short and efficient. Latency (Time taken for a packet to travel from its source to its destination and which is a key determinant of network efficiency)

Load Balancing

Oracle e-Business Suite provides various options for building an installation to meet the specific business requirements. This includes the capability to utilize varying number of machines to distribute the technology layers with accordance with expenditure without compromising on performance.

Load Balancing concentrates on how to make decisions needed to balance the load on various components which serves for two important reasons:

- Load Balancing involves the entire infrastructure of Oracle e-Business Suite installation with a change in one area having significant effects elsewhere
- Making decisions on Load Balancing can enable higher level of performance to be obtained without expenditure on additional hardware.

Load Balancing Definitions:

Load Balancing is the means by which network traffic directed to a Web Site is divided between one or more machines in a group of servers. These set of servers will be running the same application and with the use of Load Balancing it would like a Single Server rather than a group of servers.

The hardware device referred to as the Server Load Balance receives the relevant network traffic for the site, distributes it to various servers based on the Load Balancing Methodology. By doing so system performance is increased and application availability is enhanced.

Load Balancing includes Monitoring Server Availability and Context – Based Load Distribution

Monitoring Server Availability maintains a watch on the server pool by checking that all the machines are responding to network traffic and if not route the same to the server which is available.

Context – Based Load Distribution is required for applications for Oracle e-Business Suite that need to maintain session persistent – connections wherein cookies are created when each session is established.

To support this requirement Load Balancer reads and updates the network packet header information sent with each request made by the client and routes the request to the node in the group of servers with which the corresponding session was initially established and maintained.

Categories of Load Balancer

The main categories of Load Balancer are:

1. Session Persistent Load Balancers - After a client's HTTP connection is established with a particular server, subsequent HTTP requests from that client are directed to the same server for the duration of the session. This persistency is also known as stickiness.
2. Non – Session Persistent Load Balancers – These Load Balancers do not maintain session persistent client connections. After a client's HTTP connection is directed to a given server subsequent HTTP requests from that client will not be necessarily be directed to the same server.
3. Secure Sockets Layer (SSL) Accelerators – These are used to reduce the SSL traffic and workload of the Web Servers.

Load Balancing Options

Different types of Load Balancing can be employed with Oracle e-Business Suite.

- Domain Name Server (DNS) Round Robin Load Balancing :

This distributes the end – user requests across multiple server nodes, based on IP address assignments to a given hostname and its associated domain name.

Using DNS Round Robin Load Balancing allows the association of more than one IP address with a given hostname which facilitates distribution of network traffic.

- HTTP Layer Hardware Load balancing:

This can be used if we have a hardware load balancer which accepts HTTP communication and forwards it to a group of server nodes which is sometimes referred to as a 'farm'. This distributes the load across the farm consisting of two Web Server nodes.

High Availability

The content of High Availability covers a range of features that can help to minimize planned and unplanned downtime or facilitate recovery after a period of downtime.

This will help us in getting a high – level guide to the key features that can help make an Oracle e-Business Suite highly available with the emphasis on guidelines for making the correct decisions when planning a new installation or upgrade.

Shared APPL_TOP

A traditional multi – node installation of Oracle Applications requires each application tier node to maintain its own file system. Due to this each application tier would not have a facility to share its files among the group.

From R12 version onwards installation and migration options were introduced to enable a single APPL_TOP to be shared between all the application tier nodes of a multi – node system. This was referred to as a Shared APPL_TOP file system abbreviated as Shared APPL_TOP.

Further to this R12 introduced the option to merge APPL_TOP's of multiple nodes each having its own set of application tier services and finally to give a single APPL_TOP that could be then shared between them.

Benefits of Shared APPL_TOP:

1. Disk space requirements are reduced as there is only a single copy of Oracle e-Business Suite code.
2. Since there is only one physical application tier file system administrative tasks need to be carried on any node and rest of the nodes gets the same result.

Distributed AD (Active Directory)

Normally a deployment process uses large database servers and multiple small application tier systems. Due to the increase in deployment of low cost Linux – Based systems this type of process is quite common.

(Active Directory) AD has utilized a job system where multiple workers are assigned jobs. Information pertaining to each job is stored in the database and workers receive their day to day assignments based on contents of the database tables.

The Distributed AD feature offers improved scalability, performance and resource utilization by allowing workers of the same AD session to be started on multiple application tier nodes thus using the resources to complete their jobs more efficiently.

There are certain requirements for a distributed AD. Since the AD workers create and update file system objects as well as database objects, a shared application tier file system must be employed to ensure the files are created in a single centralized location.

NoLogging Operations

One of the very important features in Oracle Database is NoLogging which is used to enhance performance in Oracle e-Business Suite. This feature is frequently used during Patch Installation.

At certain times Oracle e-Business Suite uses the database nologging feature to perform resource – intensive work more efficiently. NoLogging Operations are also useful during the Instance Recovery and Database Recovery.

NoLogging is used in the following situations in Oracle e-Business Suite:

1. Building new objects or components during patch/update application this NoLogging makes initial build faster and downtime for patch work shorter.
2. While Partitioning a Database Table this NoLogging reduces the time needed for the partitioning activity and consequently the overall downtime.

Disaster Recovery

During Oracle e-Business installation there would be quite a few common problems which could put the organization at risk:

1. An external disaster such as a fire at a company's data center resulting in a loss of service which would hamper the business of the organization
2. An internal disaster such as a serious error by a privileged user resulting in major loss or corruption of data.
3. A hardware or system failure or malfunction that could corrupt the actual data in the database.

Disaster Recovery involves taking steps to protect the database and its environment to ensure that the application users can still operate in the face of major problems.

Oracle provides features such as Oracle Data Guard and Oracle Flashback Database.

Oracle Data Guard is used to set up and maintain a secondary copy of a database sometimes referred to as a standby database. This standby database is brought into use after a failover.

Oracle Flashback Database is used to rewind a database to a prior point in time making it possible to recover from major corruptions of a database without requiring a complete restore.

Oracle Flashback Database creates database restore points to which we can flash back in case an upgrade or major application change encounters a serious problem.

Authentication and Integration

Authentication of Oracle e-Business Suite users can be configured using FND_USER (Base Table in Oracle Applications which consists of User Details) mechanism.

The System Administrator chooses the optimal solution for an installation taking into factors such as simplicity of setup and maintenance the possible need for a single point of access to enterprise – wide applications and ability to integrate with third – party user directories as well as overall security requirements of an organization.

After a User has been authenticated by the system as a valid user, Oracle e-Business Suite retrieves the authorization information associated with the application account the user is logged into. Authorization information for application accounts is managed through application responsibilities.

Oracle Application Server 10g Optional Components:

There are a few benefits of utilizing Oracle Application Server 10g with Oracle e-Business Suite R12:

1. Performance, Scalability & high availability via distributed architectures.
2. The ability to connect a single Enterprise Portal to web providers running on multiple R12 instances.
3. Uniformity in Single Sign – On support for all Oracle e-Business products.
4. Easier synchronization between Oracle Internet Directory – to – FND_USER which is bidirectional.
5. Link – on – the – fly support for environments where a Single Sign – on user id may be associated with one or more R12 user ids.
6. Bookmark able URL's where Applications Navigator Portlet will produce links that authenticate users and create Oracle e-Business Suite sessions as and when needed.

Oracle Portal:

Oracle Portal is a complete, browser based environment for the development, deployment, administration and configuration of enterprise class portals. Oracle Portal incorporates a complete portal building framework with self-service publishing features to facilitate creation and management of information accessed within any organization's portal.

Oracle Discoverer:

Application Users and Business Level Users at all the levels of an organization can use the Oracle Discoverer 10.1.2 to have access to information from large data sources e.g. Data Warehousing and Online Transaction

Processing (OLTP) systems. The current version of Oracle Discoverer enables business analysts to create, modify and execute ad hoc queries (on demand management reports).

Business Users can also utilize Oracle Discoverer for viewing predefined reports and graphs. Oracle e-Business Suite application users can use Oracle Discoverer to analyze data from selected business areas in Oracle Financials, Oracle Purchasing/Procurement and others.

Enterprise – Wide Single Sign – On

The Single Sign – One feature in Oracle e-Business Suite allows users to access Oracle e-Business Suite and other related applications through a single user ID.

Without this feature otherwise the user would have to log into each application separately to access information pertaining to that application. This feature is handled via Oracle Single Sign – On , Oracle Internet Directory and Oracle Portal.

The Enterprise – Wide Single Sign – On has brought out drastic changes to Oracle e-Business Suite on authentication of application users. Instead of going through the normal process via the FND_USER table the functionality is delegated to Oracle Single Sign – On which performs the following set of activities:

- Perform User – Validation against the information stored in Oracle Internet Directory
- Delegate validation to third – party single sign – on server.

Application Server Integration Options

Oracle Application Server 10g acts as a integration hub that enables Oracle e-Business Suite to work relatively with other software including software from third – party vendors also.

By default R12 continues to use the local e-Business Suite user directory FND_USER for user authentication. If required we can even delegate this authentication activity to Single Sign – On 10g and Oracle Internet Directory.

There is also a feasibility to integrate R12 with a Third – Party LDAP such as Microsoft Active Directory or a third – party single sign – on solution such as Microsoft Windows Kerberos. This in turn requires integration of third – party solutions via an external Oracle Application Server 10g instance.

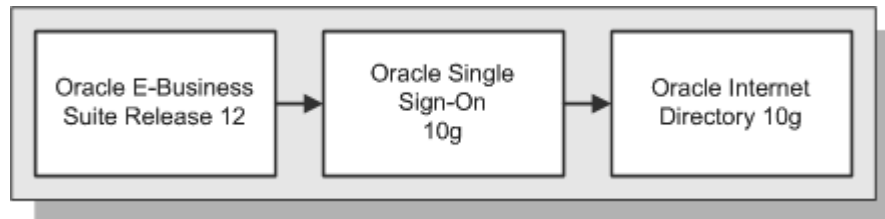
Note: R12 delegates User Authentication to Oracle Single Sign – On and this Oracle Sign – On delegates authentication activity to a third – party single sign – on solution.

Basic Single Sign – On Deployment Scenario

This section explains the step by step procedure to follow in deploying the basic single sign – on in Oracle e-Business Suite.

- An existing Oracle e-Business Suite instance is integrated with a new Oracle Single Sign – On and Oracle Internet Directory infrastructure.

- Installation of an existing Oracle e-Business Suite R12 plus a new Oracle Application Server 10g installation (which includes Oracle Single Sign – on and Oracle Internet Directory) on a different machine.
- Oracle e-Business Suite will delegate user Sign – On and authentication to Oracle Single Sign – On
- Oracle Single Sign – On will authenticate user credentials against user entries stored in Oracle Internet Directory.
- Oracle Internet Directory will store every user's Single Sign – On Account ID and Password.



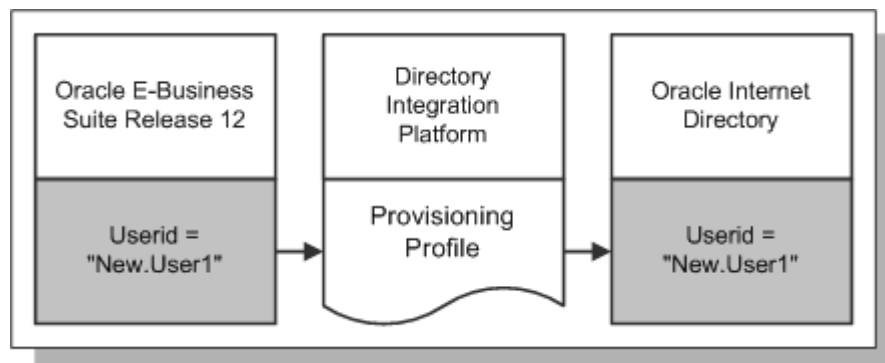
Using the Bulk Migration Tool facility the existing Oracle e-Business Suite R12 application accounts are migrated to single sign – on accounts which reside in Oracle Internet Directory.

After the migration the System Administrator would have a set of options like the location where user information is created and where it is sent to.

Option 1:

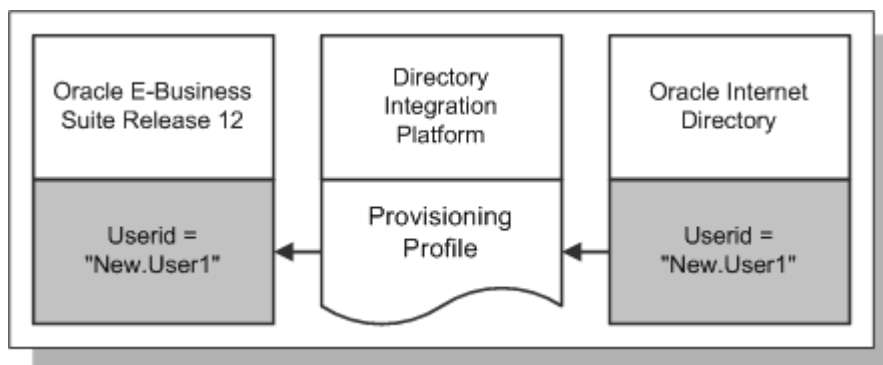
User Information is created in Oracle e-Business Suite and moved into Oracle Internet Directory.

System Administrators configure the provisioning integration via provisioning profiles.



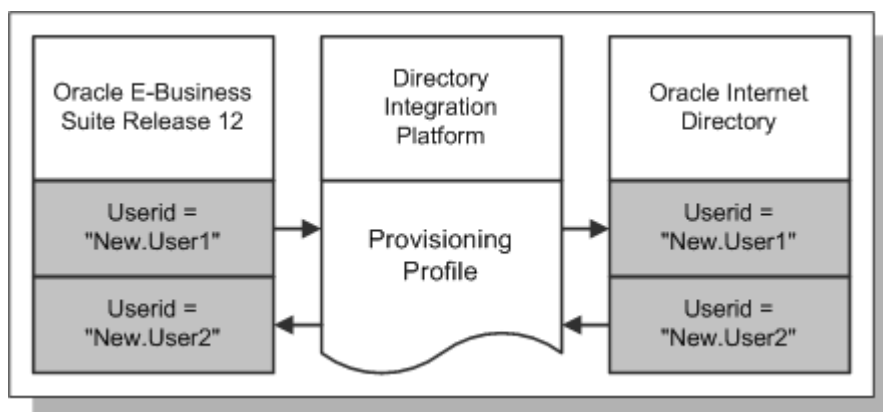
Option 2:

User information is created in Oracle Internet Directory and moved into Oracle e-Business Suite R12.



Option 3:

User information is created either in Oracle Internet Directory or Oracle e-Business Suite and moved into other systems.



Advanced Single Sign – On Deployment Scenarios

Scenario 1

Requirement – Enable Oracle Single Sign – On with Oracle e-Business Suite R12

Starting Environment

- Multiple new Oracle e-Business Suite R12 environments have been installed.
- No user accounts have been defined.
- Oracle Portal is not implemented
- No Single Sign – On infrastructure done.

Solution

- Oracle Application Server 10g with Oracle Single Sign – On and Oracle Internet Directory are needed to fulfill the requirement.
- Oracle e-Business Suite R12 will delegate User Sign – On and Authentication to Oracle Single Sign – On
- Oracle Single Sign – On authenticates User credentials against user entries in Oracle Internet Directory
- Oracle Internet Directory contains every user's Single Sign – On Account ID and Password

Scenario 2

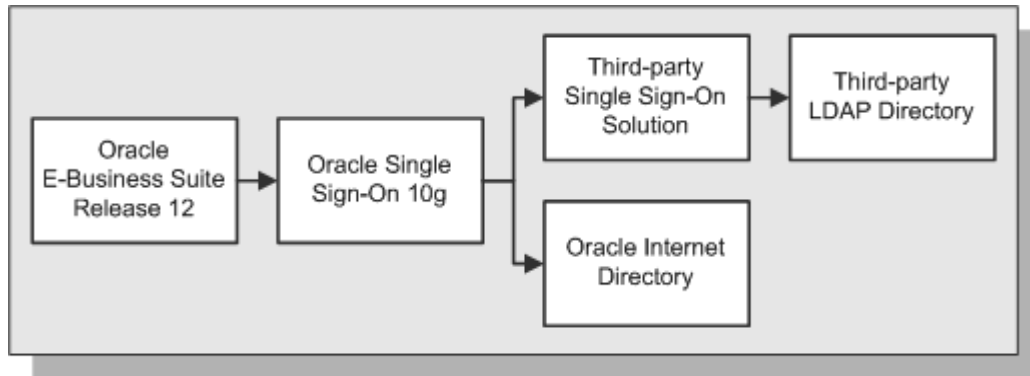
Requirement – Integrate new installation of Oracle e-Business Suite R12 with existing third – party Single Sign – On and User Directory infrastructure

Starting Environment

- Oracle e-Business Suite R12 has been installed.
- No user accounts have been defined.
- Oracle Portal is not implemented
- A Third – Party Single Sign – On solution such as Netegrity SiteMinder.
- A Third – Party LDAP directory such as SunONE/iPlanet for user directory.

Solution

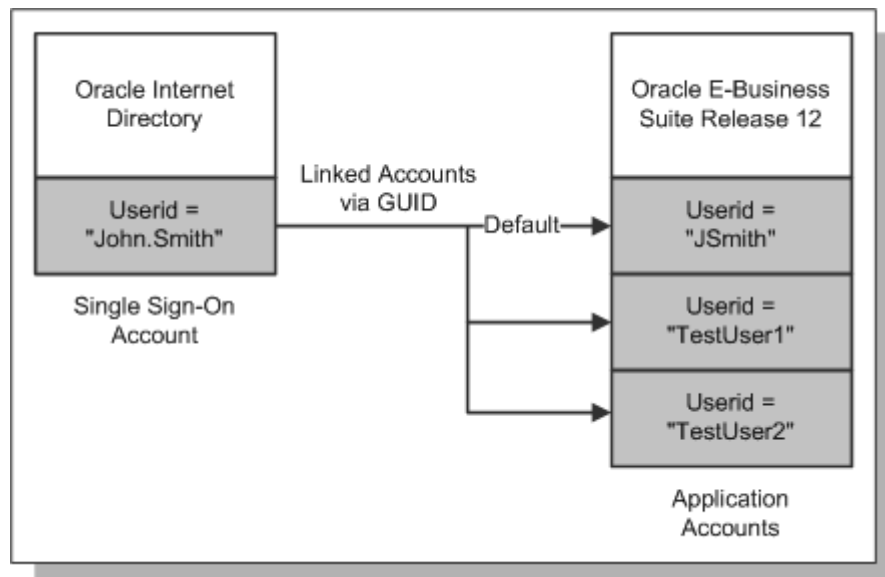
- Oracle Application Server 10g (including Oracle Single Sign – On and Oracle Internet Directory) is needed for integration
- Oracle e-Business Suite and Oracle Single Sign – On must be setup so that Oracle e-Business Suite delegates authentication to Oracle Single Sign – On which in turn delegates this to any Third Party Single Sign – On server.
- Oracle Internet Directory needs to be setup to synchronize a set of information from Third Party LDAP directory for all users who will access to Oracle e-Business Suite via Single Sign – On
- Oracle Internet Directory needs to be setup to provision users in Oracle Internet Directory to Oracle e-Business Suite.



Advanced Single Sign – On Options

Linking Multiple Application Accounts to a Single Oracle Sign – On Account:

Normally a Single Sign – On Account in Oracle Internet Directory will correspond to a Single Application Account in Oracle e-Business Suite R12. But in some cases a User may need to have a Single Sign – On Account in Oracle Internet Directory and multiple application accounts in Oracle e-Business Suite R12.



This feature is enabled by a System Administrator via a Profile Option 'Application SSO Allow Multiple Accounts'

Application Database Organization

An Oracle e-Business Suite Database Organization consists of the following components:

Schemas:

An Oracle Database has the capacity to store objects associated with a single installation of Oracle e-Business Suite.

The Product Code objects are stored in the APPS schema whereas Product Data objects are stored in the relevant Base Product Schemas.

The APPS Schema:

The APPS Schema has access to the complete Oracle e-Business Suite data model. This Schema is otherwise known as the Central Repository Schema (similar to Oracle General Ledger otherwise known as Central Repository Module).

This APPS Schema is similar to the Oracle Database SYSTEM schema which has access to the Oracle Database. The APPS schema owns all the code objects for Oracle e-Business Suite and has access to all the data objects.

The following code objects are installed in the APPS schema:

- Packages
- Procedures
- Functions
- Triggers
- Views
- Materialized Views
- Java Classes

Base Product Schemas:

A Base Product Schema is a Schema wherein all data objects pertaining to each module/application/product are owned. Example:

Oracle Payables owned by AP Schema
Oracle Receivables owned by AR Schema
Oracle General Ledger owned by GL Schema

The following objects are installed in each base product schemas:

- Tables
- Sequences
- Indexes
- Constraints

Relationship between APPS Schema and Base Product Schemas:

Each Base Product Schemas contains grants from various tables and sequences to the APPS Schema as well as Synonym from the APPS Schema to same objects.

Example:

FND_USERS (Base Table containing all the Application User Details) which originally resides in FND Schema will have the grants to APPS Schema and the APPS Schema will have a synonym in the name of FND_USERS.

Custom Schema Access

In certain circumstances or situations the organization may wish to create a schema which would have limited access or a read – only access to Oracle e-Business data. Since the APPS schema has all the privileges to all Oracle e-Business Suite objects we should never give users direct access to this schema unless and until required.

Schemas and Data Access

Some views residing in APPS schema will access packages or functions where the value returned by the package or function may depend on the environment setup options. This environment initialization happen automatically when accessing Oracle e-Business Suite through Sign – On Screen or when using concurrent processing with Oracle Reports or SQL Scripts.

If we directly connect to a schema the rows returned by the view may be different from those returned when we access it in Oracle e-Business Suite.

For example: A View may reference a Profile Option when accessed from SQL * Plus, the default value will be used rather than the setting done for a particular user.

Oracle User IDs

Every individual Oracle e-Business Suite product (e.g. Oracle General Ledger, Oracle Payables) has a default Oracle User ID having the product abbreviation as schema name & password.

Example Oracle User ID/Password combination for the product

Oracle General Ledger is GL/GL (Schema Name/Password)

Space Management

Oracle Database has the capacity to meet the space management needs of Oracle e-Business suite efficiently. This section talks about Tablespaces and describing about the traditional tablespace structure used to support Oracle e-Business Suite products.

An Oracle Database requires the following tablespaces:

- System Tablespace: This tablespace holds data dictionary tables owned by SYS user.
- Undo Tablespace: This tablespace holds rollback information that is used to track database changes until they are either committed or rolled back.
- Temporary Tablespace.

Oracle e-Business Suite R12 uses as standard a modern infrastructure for tablespace management the Oracle Applications Tablespace Model (OATM).

The difference between Oracle Database Tablespace and Oracle e-Business Suite Tablespace is that in OATM there is a smaller number of Tablespaces.

The schema objects are allocated to the shared tablespace based on two factors:

1. The type of data they contain
2. The Input/output characteristics such as size, life span, access methods.

Oracle Seeded Tables will have a different tablespace and Transactional Tables will have a different tablespace.

Hands – On Exercises

Exercise 1: Access to APPS Schema

This will be provided to you in a separate file, please check with your faculty

Exercise 2: Access to File System in Linux Environment

This will be provided to you in a separate file, please check with your faculty

Exercise 3: Comparison between Oracle Database & Oracle e-Business Suite Database Structure

This will be provided to you in a separate file, please check with your faculty

Exercise 4: SQL Script to retrieve the object details for each set of objects which resides in APPS Schema

Exercise Task:

Run the SQL Script in SQL*Plus to retrieve the object details for any set of objects which resides in APPS Schema.

Solution:

Execution Flow Path:

Step 1: Connect to APPS Schema through SQL *Plus client software.

Step 2: Run the below mentioned SQL commands as given.

```
SET LINES 200
SET PAGESIZE 200
SELECT object_name, object_type FROM all_objects
WHERE object_name IN ('FND_USER','PO_VENDORS','AP_INVOICES_PKG')
```