Capgemini

SAP BASIS Introductory Training Program

Day 1 : Agenda

- SAP Architecture Overview
- Break
- SAP Architecture Overview
- Lunch Break
- SAP Architecture Fundamentals
- Break
- SAP Application Server Processed -- AS ABAP
- Break
- Exercise & Break Out Session

Overview of SAP Products & Components

SAP AG – An Overview

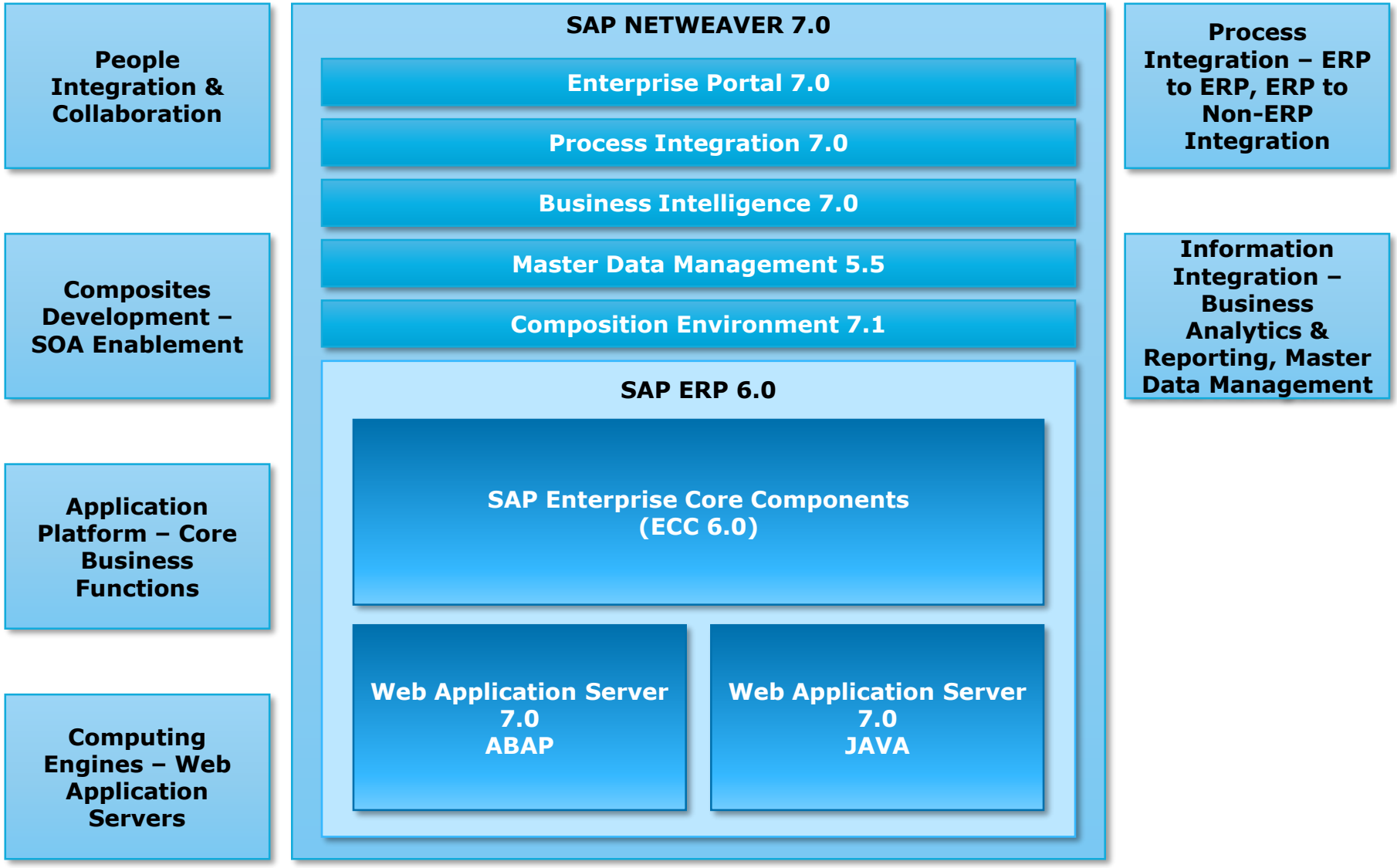
- World's Leading Provider of Business Management Software
- Established in 1972. Headquarters in Walldorf, Germany
- 82,000 Customers run SAP in 120 countries
- Addressing business needs of organizations ranging from Fortune 500 Global Organizations to Small & Medium businesses
- Solution offerings for more than 25 diverse industries

Media Courtesy: SAP-TV AG

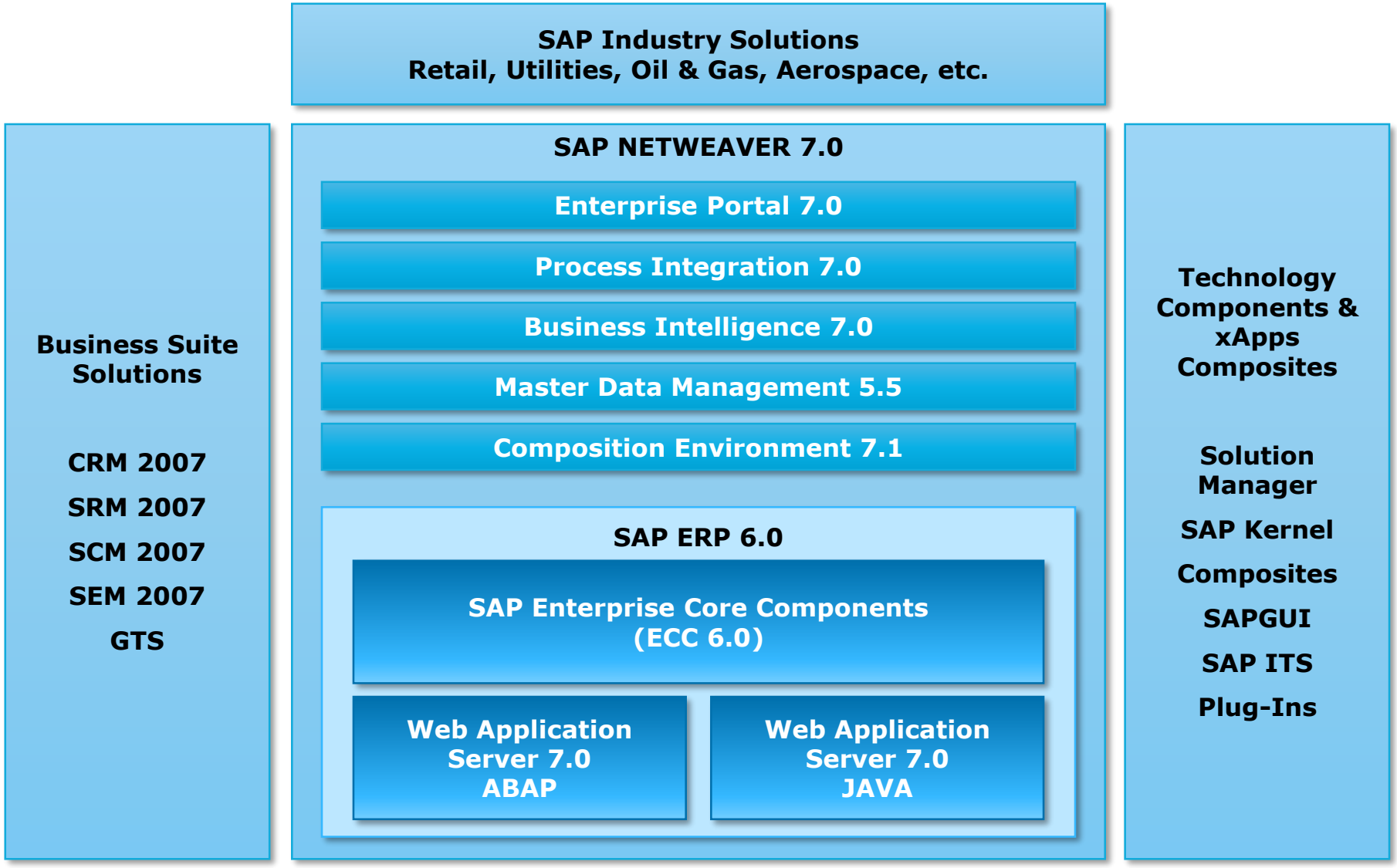
SAP Components and Solutions – Overview

- SAP is an acronym for Systems, Applications and Products for Data Processing
- SAP's ECC 6.0 (Enterprise Core Components) provide the core solutions for running enterprise business processes in Financials, Logistics and Human Resources
- SAP's Netweaver 7.0 Platform provide the computing environment for managing the core ECC applications using the Web Application Server 7.0 (WAS 7.0). The server can power business application programming in ABAP as well in JAVA
- SAP's Netweaver 7.0 Platforms power Business Analytics and Reporting (BI 7.0), Process Integration with other enterprise components (PI 7.0), Data Management (MDM 5.5) and People Integration and Collaboration (EP 7.0)
- SAP Cross-Application Business suite components, such as CRM, SRM, SCM are built on the core business functions provided in ECC 6.0
- SAP provides a wide ranging set of solutions for specific Industries, such as Utilities, Retail, Oil & Gas, Aerospace, Mining etc, known as SAP Industry Solutions.

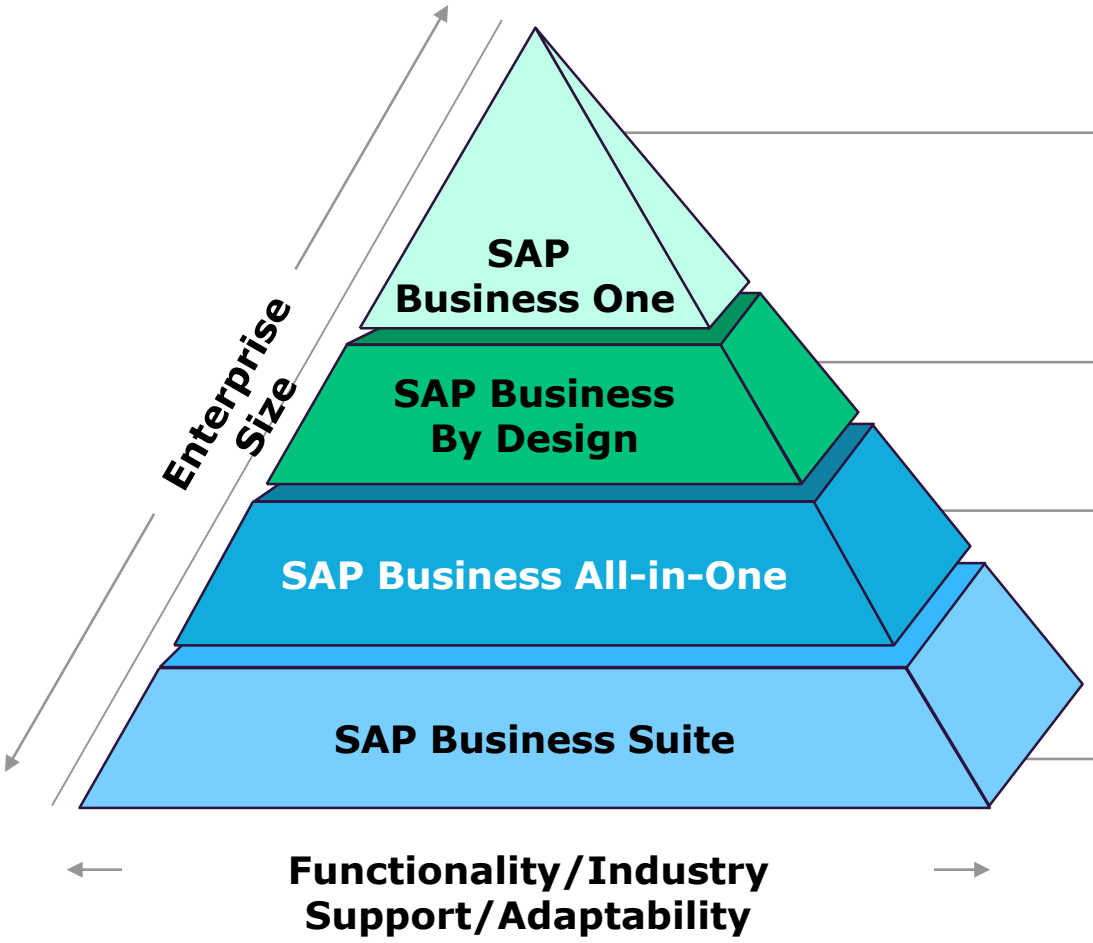
SAP Components & Solutions: Positioning



SAP Components – One View



SAP Offerings based on Company Size



Solution for Small Businesses
- Less than 100 Employees
- Less than 30 Users
- Basic functions pre-configured

Solution for Medium Businesses
- Between 100 and 500 Employees
- On demand solution catering to niche process areas

Solution for Medium Businesses
- Strong Industry-specific focus
- Stable core business processes
- Preconfigured solutions

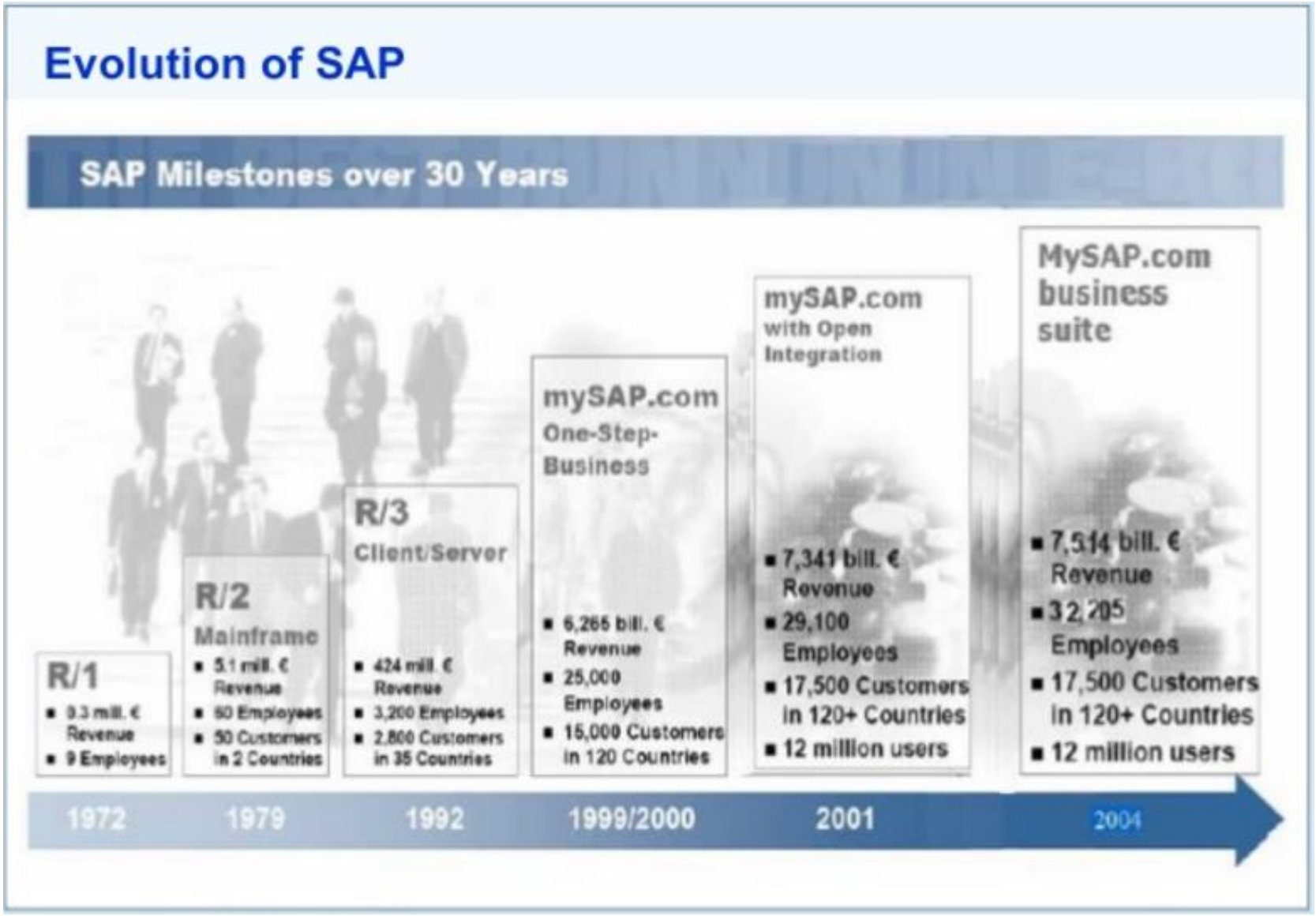
Large & Very Large Enterprises
- Complete spectrum of business solutions
- Adaptable components to address business process complexities
- For over 500 employees

Evolution of SAP Releases

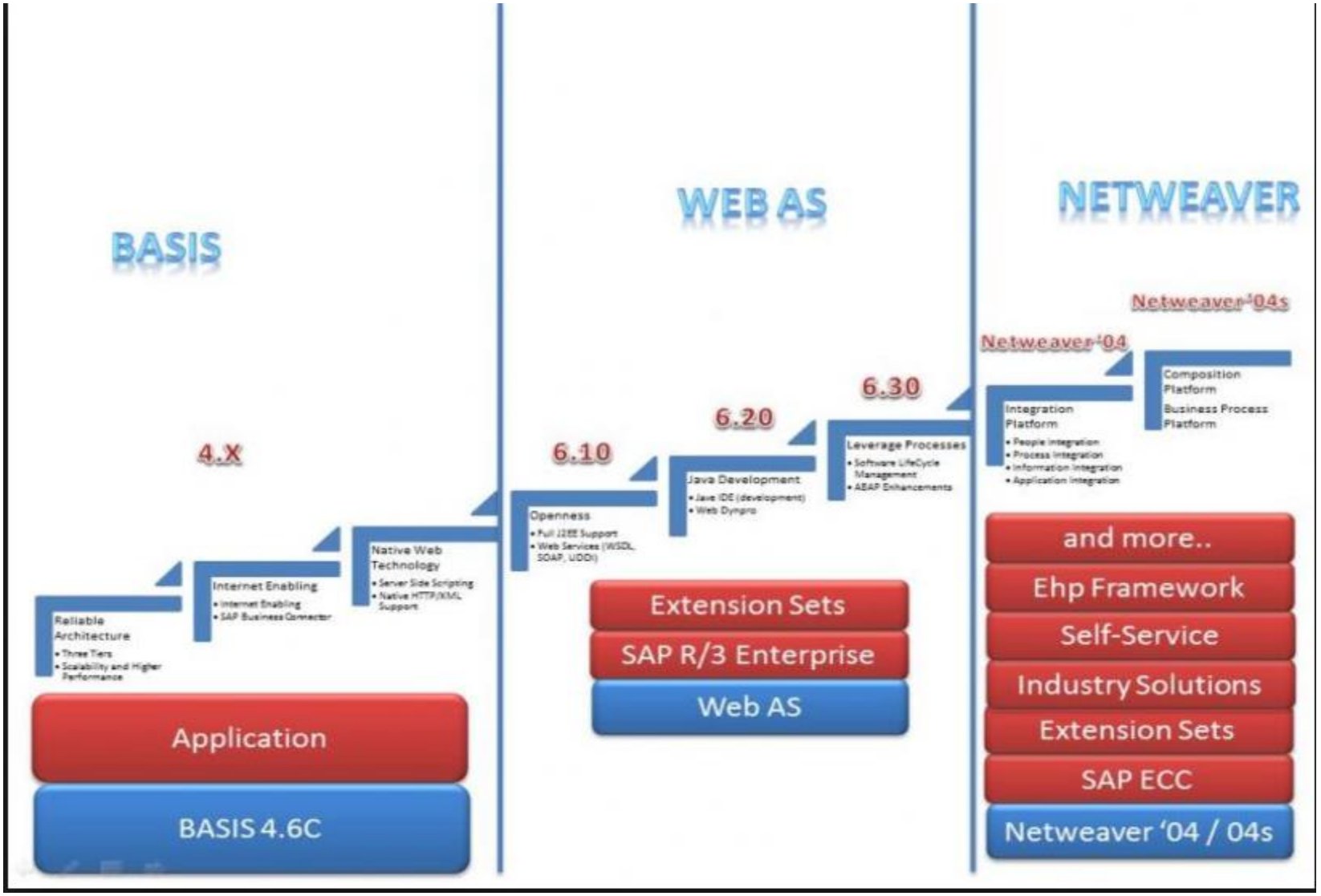
Part of SAP NetWeaver	Basis Functionality (SAP Basis/SAP Web AS/ SAP NetWeaver AS)	Business Functionality (-/Core)	Business Extension Set	Part of SAP ERP
7.1	7.10	-	-	-
7.0 (2004s)	7.00	6.0	6.00	6.0 (2005)
2004 ('04)	6.40	5.0	5.00	2004
(2003)	6.30	4.7	2.00	(2003)
	6.20	4.7	1.10	(2003)
	6.10	-		
	4.6D	-		
	4.6C	4.6C		
	4.6B	4.6B		
	4.5B	4.5B		
	4.0B	4.0B		
	3.1I	3.1I		

- SAP releases come in two flavors – An application flavor and basis(was) flavor.
- The SAP Application, otherwise called ECC 6.0 was earlier called mySAP ERP 2005, and this is based on WAS 7.0
- The older release, ECC 5.0 was called mySAP ERP 2004 and was based on WAS 6.40
- The predecessor to ECC 5.0, was called SAP Enterprise 4.7, based on WAS 6.20 and 6.30. This was the first time SAP BASIS kernel came to be referred to as WAS. The JAVA Engine made its first appearance in this release.
- Earlier SAP releases were called R/3. This is starting from R/3 3.1i to 4.6c. The underlying BASIS kernel was versioned from 3.1i to 4.6D.All such releases were based purely on ABAP engines

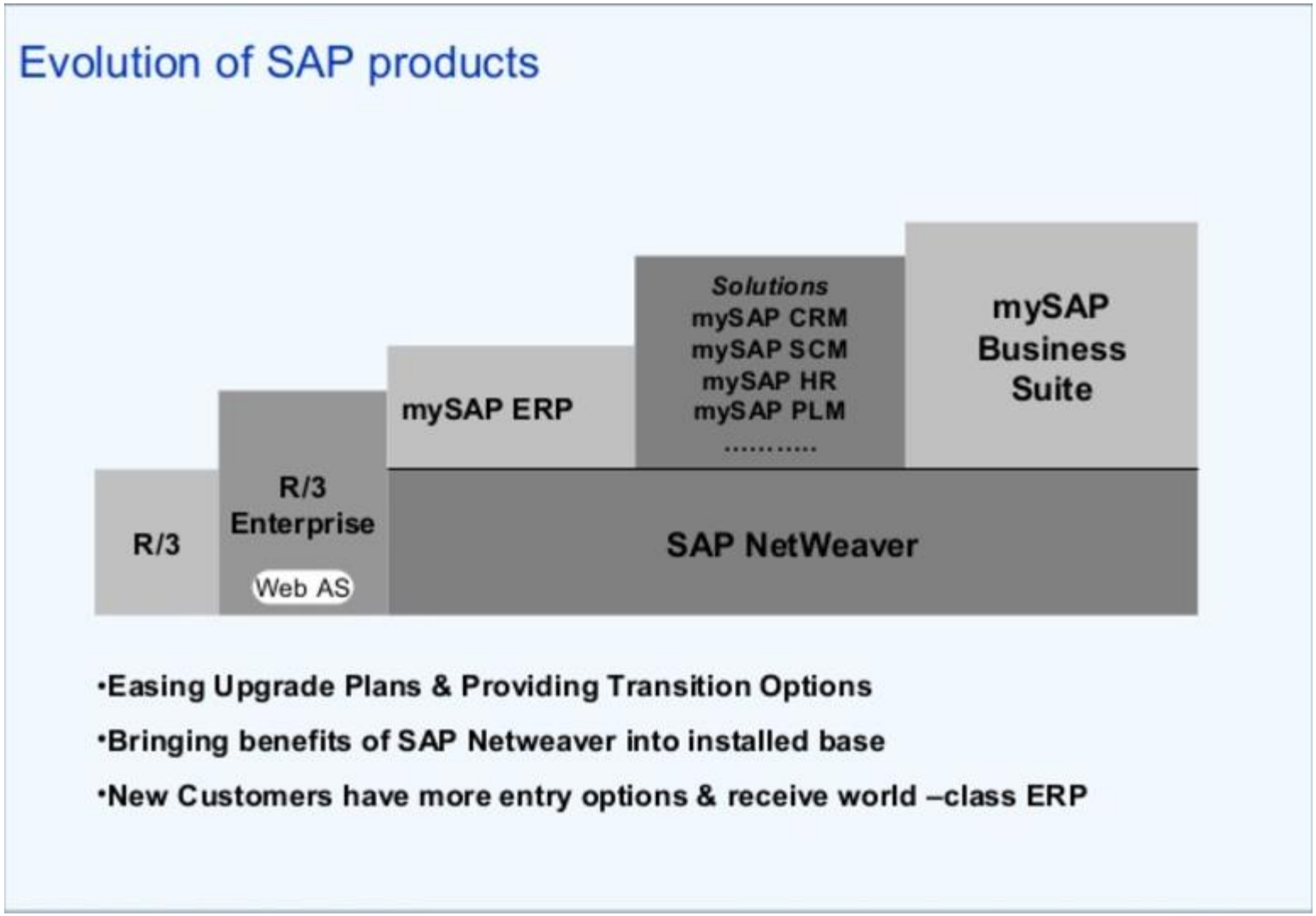
Evolution of SAP Releases



Evolution of SAP Releases



Evolution of SAP Releases



Breakout Session

SAP BASIS Overview

What is SAP BASIS ?

- The term “BASIS” is a reference to the underlying technical architecture of an SAP application. The term encompasses the server infrastructure, software and the server processes that run the SAP application.

Who are BASIS consultants ?

- SAP consultants who design, build and manage the SAP environment are termed as BASIS consultants. They are the SAP Technical architects in the IT organization.

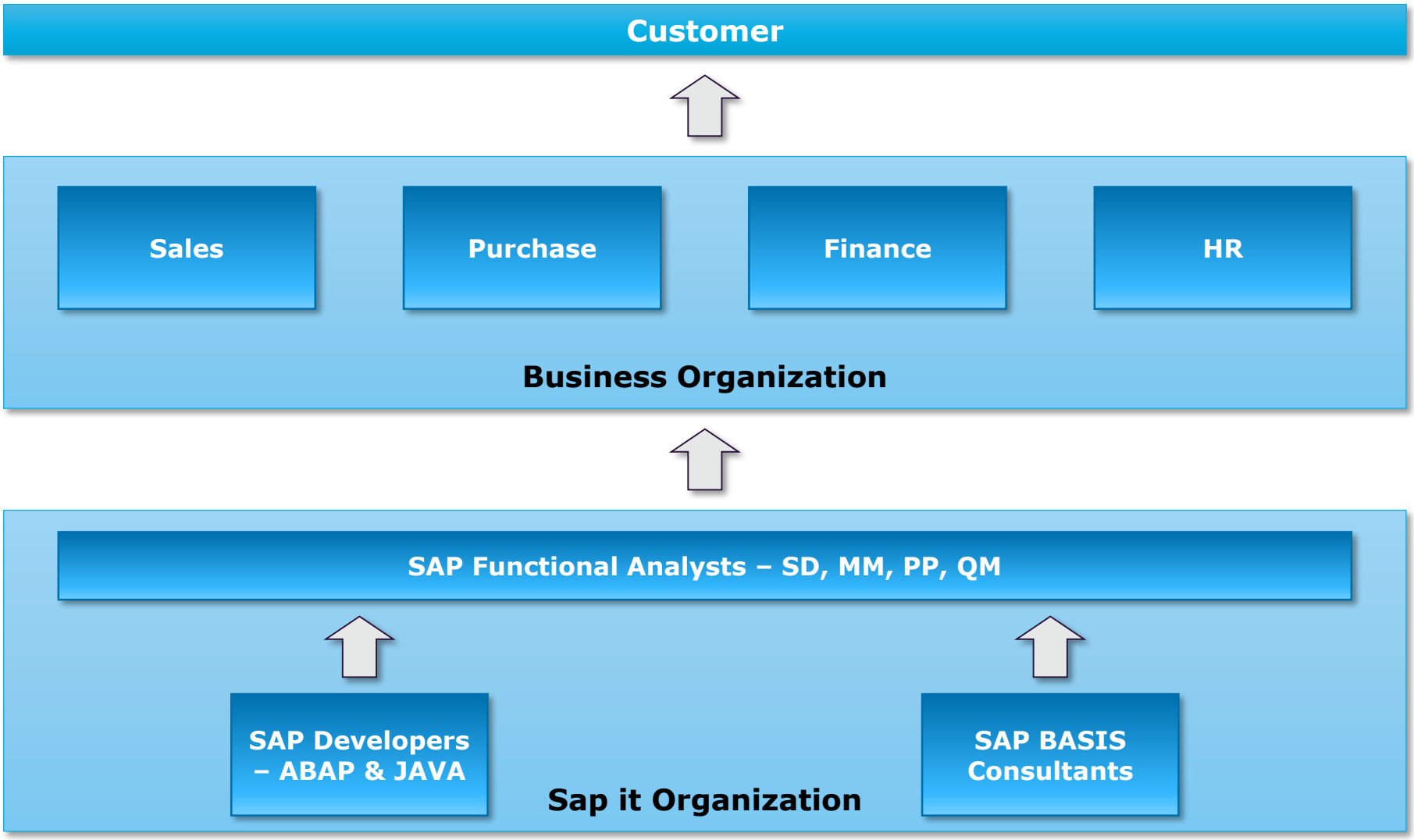
What is the scope of BASIS consultants in an IT organization ?

- SAP consultants possess the skills required to administer and configure SAP specific settings in an IT landscape. They are part of a larger organization which may run a landscape consisting of several SAP and Non-SAP applications.

What are the pre-requisites for starting a career in SAP BASIS ?

- Basic knowledge of operating system administration, network management and database administration.

SAP BASIS Services in an Organization



Introduction to Netweaver

Introduction to SAP Netweaver

- Basic Concept of SAP Netweaver
- SAP Netweaver Application Server

Basic Concepts

- SAP Netweaver provides the platform for deploying IT processes that support enterprise business functions. Such IT processes when grouped together form “IT Practices”
- Each IT practice requires an integration of various IT scenarios as shown below

IT Practices	IT Scenarios			
User Productivity Enablement	Running an Enterprise Portal	User Collaboration - Discussion	Enterprise Knowledge Management	Enterprise Search Functions
Data Unification	Master Data Management		Enterprise Data Warehousing	
Business Information Management	Enterprise Reporting and Queries		Business Analytics	
End-To-End Process Integration	Application-to-Application process	Business-To-Business Process enablement	Business Process Management	
Development	Developing custom ABAP and Java Objects		Building application using pre-configured content	
Lifecycle Management	Software Lifecycle Management - Release and Version Patching , Upgrades		SAP Netweaver Day-to-Day Operations	
Security Management	User Authentication	Single Sign On	Segregation of Duties	Compliance Measures
SOA Enablement	Anytime-Anywhere Service Consumption	Achieving true platform interoperability	Flexibility in adapting business to rapidly changing economic scenarios	

Basic Concepts

- Each IT scenario requires an integration between various components of the SAP Netweaver stack
- The SAP Netweaver stack consists of 4 broad layers
  - People Integration
  - Process Integration
  - Data Integration
  - Application Platform

People Integration	Process Integration	Data Integration	Application Platform
▪ Achieved by using SAP Enterprise Portal ▪ SAP EP provides tools for developing applications for the presentation layer ▪ Knowledge Management and Collaboration functions are in-built	▪ Achieved by using SAP Process Integration ▪ PI provides the tools and functions for SAP to SAP and Non-SAP communications ▪ Provides means for performing Business Performance monitoring	▪ Achieved by using SAP Business Intelligence and SAP MDM ▪ A dual stack solution that provides powerful tools for data extraction, reporting, analytics and providing real-time view of business performance	▪ Platform is based on SAP Web Application Server for ABAP and for JAVA ▪ Platform that provides numerous tools for administration, monitoring and integration

SAP Netweaver Application Server

Architecture View of SAP Netweaver Application Server

SAP Netweaver Application Server Features

- Multi Level Architecture
- Runtime environment for both ABAP and JAVA Programs
- High Scalability

External Systems (SAP, Non-SAP)

- Built on a wide range of Operating systems and Database Platforms
- Choice of Presentation layer tools – SAPGUI, WEBGUI
- Development IDES for Java and ABAP
- Standard protocols supported Ex: HTTP, RFC
- Security functions follow industry standards

Presentation Layer

Application Layer

JAVA ABAP

Database Layer

Lunch Break

SAP Architecture Fundamentals

SAP Architecture Fundamentals

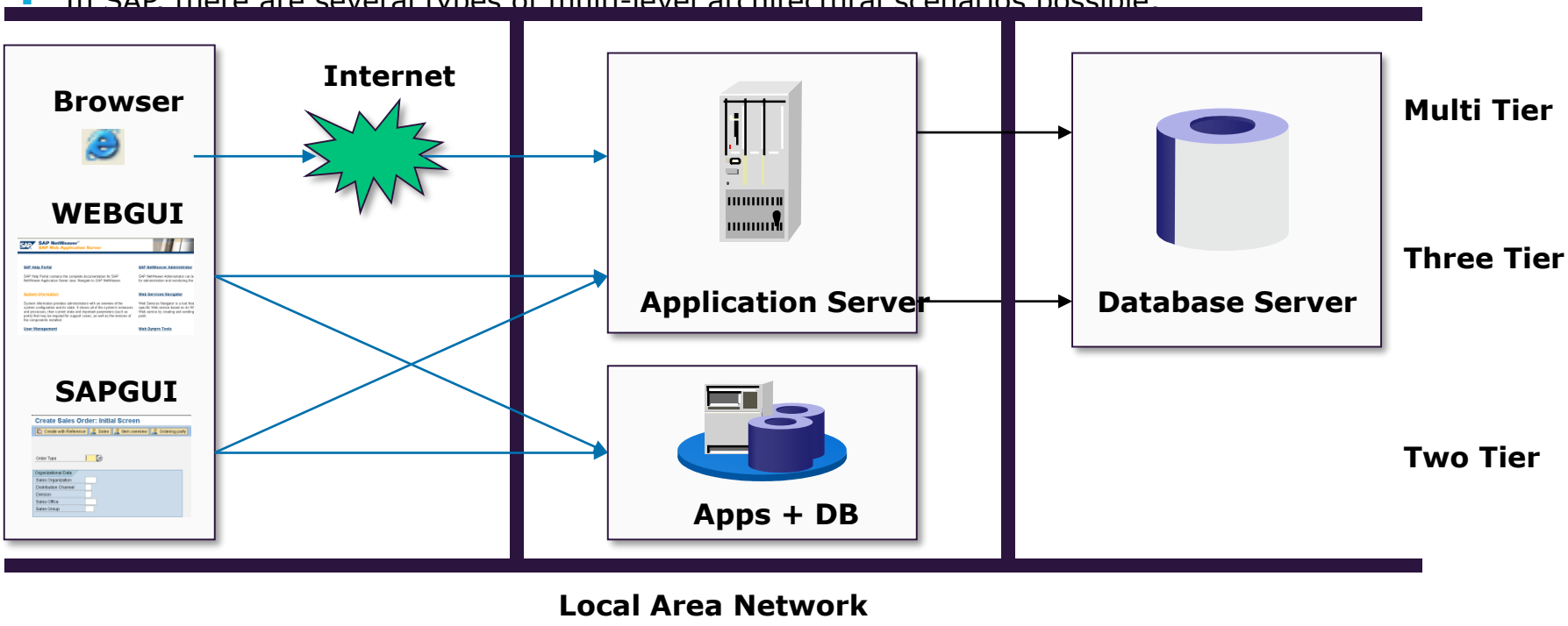
- ABAP & JAVA Runtimes
- Client Server Architecture
- Concept of SAP Instances
- AS ABAP Processes & Architecture
- Request Processing in AS ABAP

ABAP & Java Runtimes

- SAP systems provide the basis for building applications that implement business processes
- The SAP applications are not dependent on the type of Operating systems and Databases to a great extent
- Applications can be built in either ABAP or JAVA languages
- ABAP stands for “Advanced Business Application Programming”. Most applications in SAP are written in ABAP
- To run ABAP programs, the Netweaver application server provides a ABAP Runtime environment
- To extend SAP applications so that they become highly interoperable with external and internet web-based applications, the JAVA runtime was introduced in the SAP Netweaver environment. The JAVA runtime is based on J2EE standards
- IMPORTANT NOTE: The ABAP and JAVA runtimes are also called as ABAP and JAVA engines

Client Server Architecture

- The client is a device on a network, which transmits requests for data processing. The client in the SAP architecture can be either the SAPGUI running on Windows, SAPGUI for JAVA for other OS' or WEBGUI which can be invoked from any common browser
- The server is the Netweaver application server which processes client requests in the ABAP or JAVA engine
- Communication happens over a dedicated network infrastructure (LAN) or through Wireless LAN (WLAN)
- In SAP, there are several types of multi-level architectural scenarios possible:



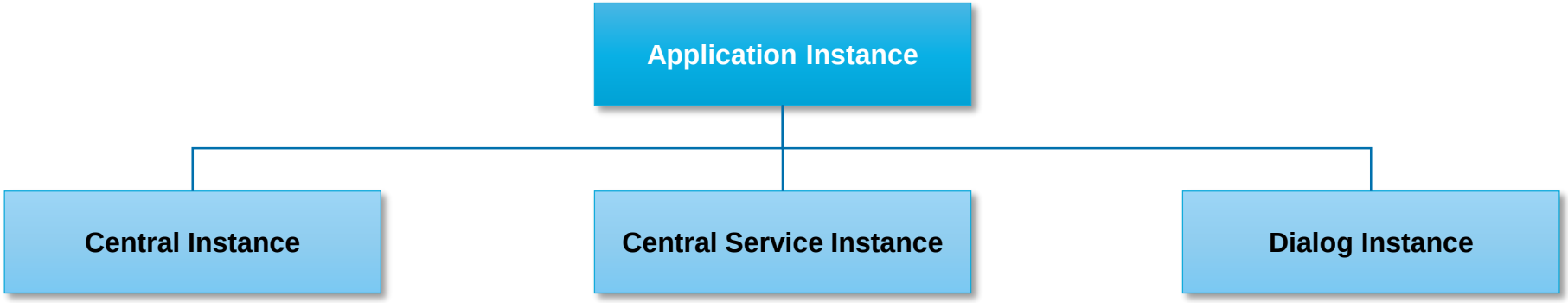
Concept of SAP Instance

- An SAP Instance is the basic building block of an SAP system
- An SAP system can comprise of one or more SAP instances
- It is an administrative unit that combines multiple components to provide one or more services
- An SAP system comprises of two parts: Application Instance and Database Instance
- When the application instance and database instance reside on the same hardware, it is then known as a "**Single Instance**"
- When the application instance and database instance do not share the same hardware resources, then the instance is known as a "**Distributed Instance**"
- An SAP Instance is uniquely identified with a system ID, known as SID and an instance number
- Each SAP instance can be distributed over multiple hardware units. These units can be separate physical machines, logical/physical partitions within the same machine

The Database Instance ID, also called DBSID is normally the same as the SAP instance ID, or SID. The SID is always 3 characters long and can contain alphanumerals, but it must start with an alphabet. The Instance Number is always a 2 digit number, and can be any combination of digits between 0 and 9.

Concept of SAP Instance

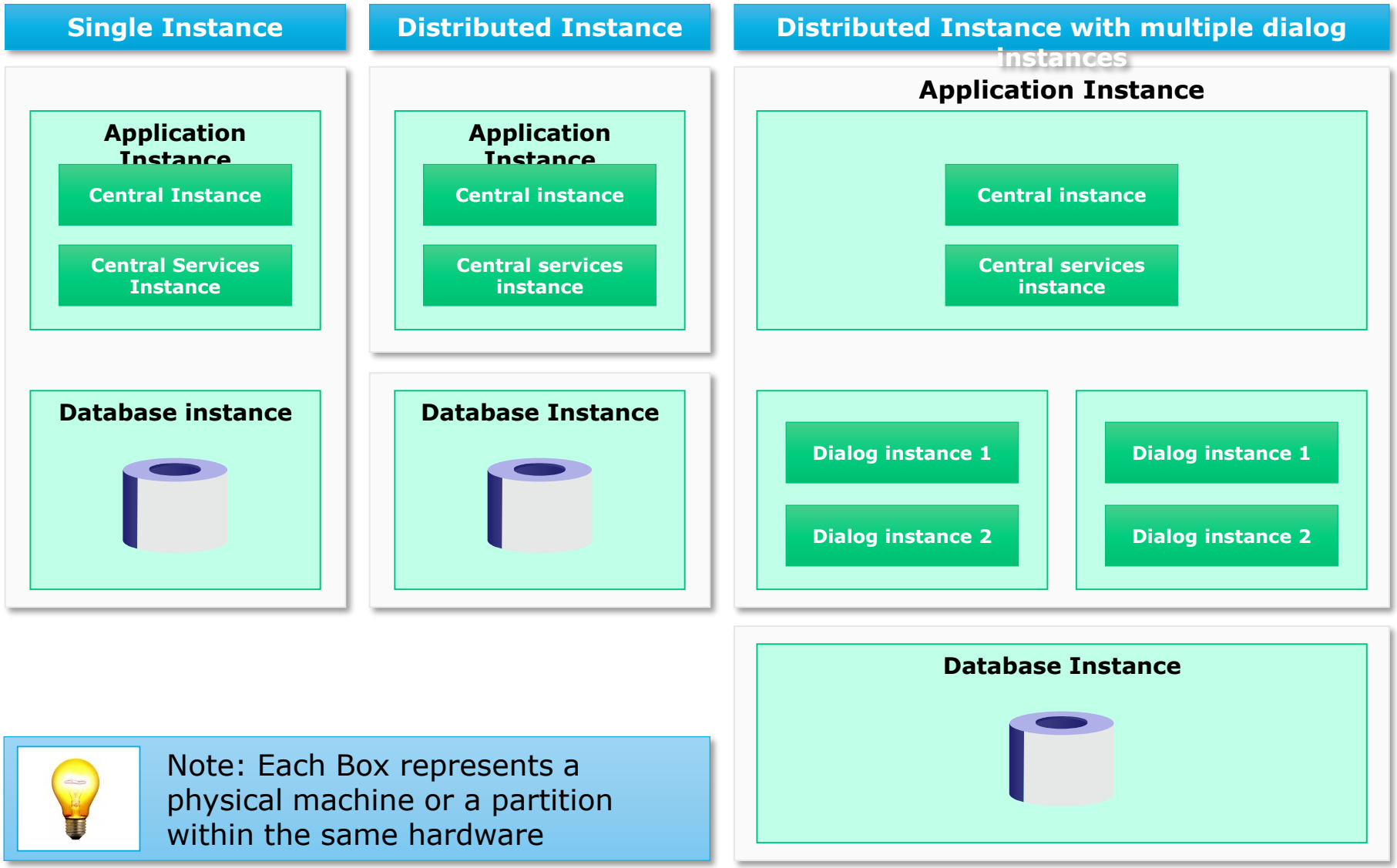
An SAP Application Instance can be broken down to the following types:



Type of Application Server	Instance Name	Name of Processes
ABAP Application Server	Central Instance	Enqueue Server, Gateway Process
	Central Services Instance	Message Server
	Dialog Instance	ABAP Work Processes
JAVA Application Server	Central Instance	Software Deployment Manager (SDM), Dispatcher
	Central Services Instance	Message Server
	Dialog Instance	JAVA Server Processes

Each SAP system can have only 1 Central Instance, 1 Central Services Instance and only 1 Database instance. It can have any number of additional dialog instances

Distribution of SAP Instances in a SAP system



Break

Application Server – ABAP Processes

AS ABAP Processes

The table shows the different types of Processes in AS ABAP Environment

Process Name	Description
Dispatcher Work Process	▪ There is 1 dispatcher work process per Application Instance and per each Dialog Instance. If there is 1 Central Instance and 2 Dialog instances in an SAP system, there will be 3 dispatchers. The role of the dispatcher is to distribute incoming requests to the ABAP worker threads.
Dialog Work Process (D)	▪ There are a minimum of 2 Dialog work processes required per dispatcher that need to be configured per instance. This work process executes the transactions as required and communicates with the database instance processes
Background Work Process (B)	▪ Background work processes execute programs that run without interacting with the user. At least two background work processes for each SAP system are required. More than one background work process for each dispatcher can be configured.
Enqueue Work Process (E)	▪ Only 1 enqueue process exists in each SAP system. This process ensures that updates are serialized with the help of a lock table.
Update Work Process (V)	▪ Minimum 1 Update process is required, and more than 1 process per dispatcher is allowed. This process takes care of processing update requests.
Spool Work Process (S)	▪ Minimum 1 spool process is required and more than 1 process per dispatcher is allowed. This process passes sequential data to output devices such as printers.

AS ABAP Processes

The table shows the different types of Processes in AS ABAP Environment (Contd.)

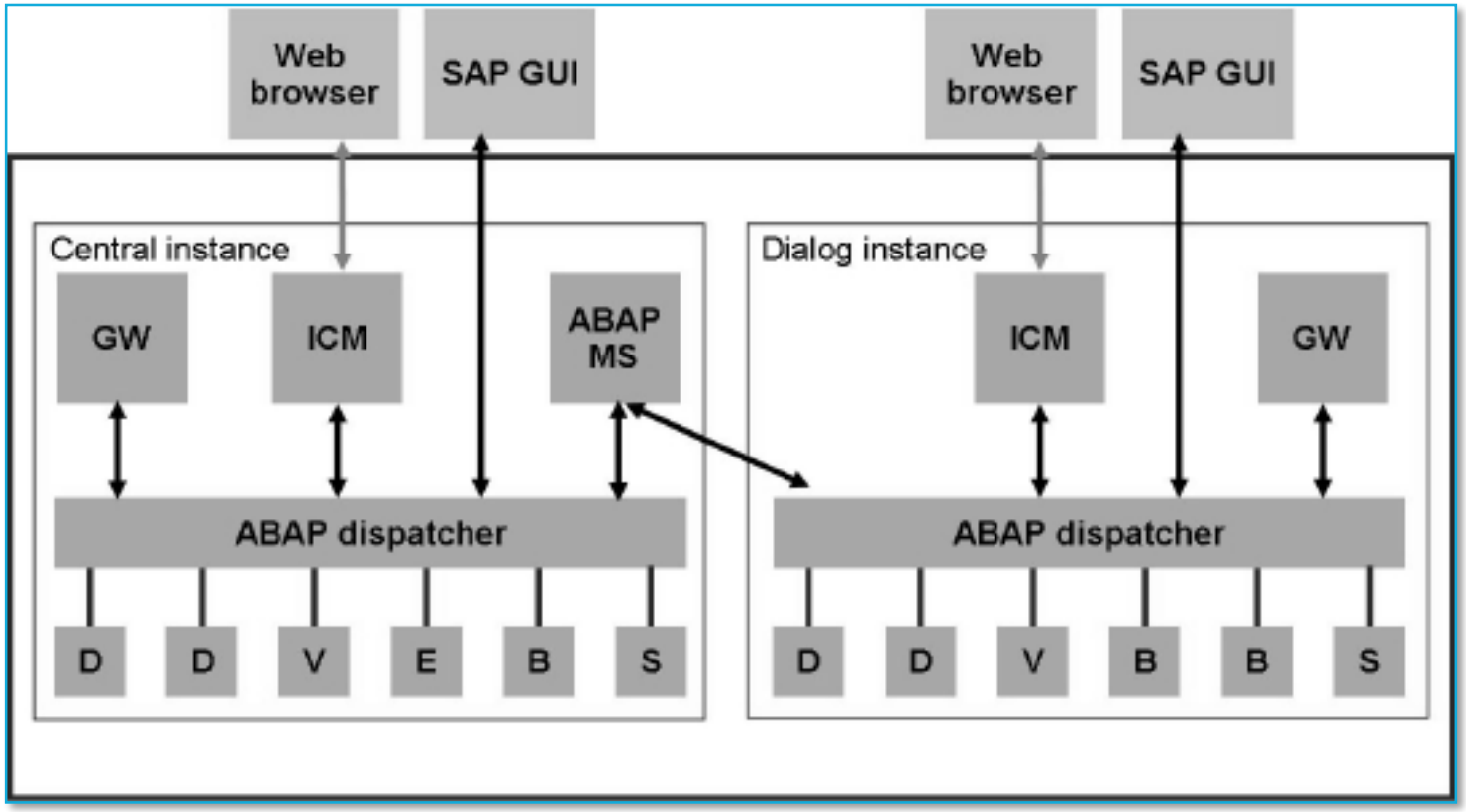
Process Name	Description
Message Server (M)	▪ Only 1 Message server exists in the SAP system and is installed on the Central Services Instance. It is responsible for communication between the different dispatchers of each SAP instance within the same SAP system.
Gateway (G)	▪ There is exactly 1 Gateway Per Dispatcher in a SAP system. The gateway is meant to allow communication between different SAP systems
Internet Communication Manager	▪ There is only 1 ICM per SAP system. The ICM receives requests for HTTP protocol and forwards it to the ABAP dispatches for further processing

SAP uses the acronym DVEBMGSxx, where xx is the instance number to denote an SAP instance within the SAP system.

Example: If an SAP system comprises of 1 Central instance with number 01, and 2 Dialog Instances, with number 02 and 03, then the SAP system is said to be comprised of DVEBMGS01, DVEBMGS02 and DVEBMGS03 instances

AS ABAP Architecture

- Architecture showing the interaction between ABAP processes in a SAP system with a Central Instance and 1 Dialog Instance



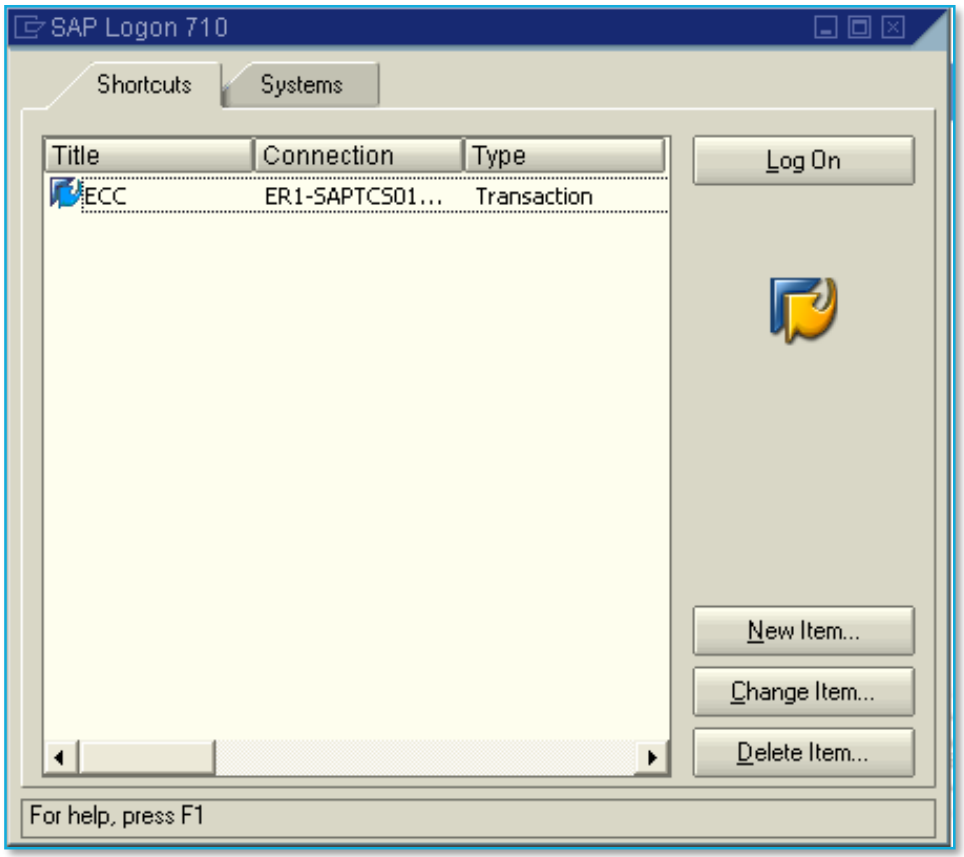
Note that there is no enqueue process within the dialog instance.

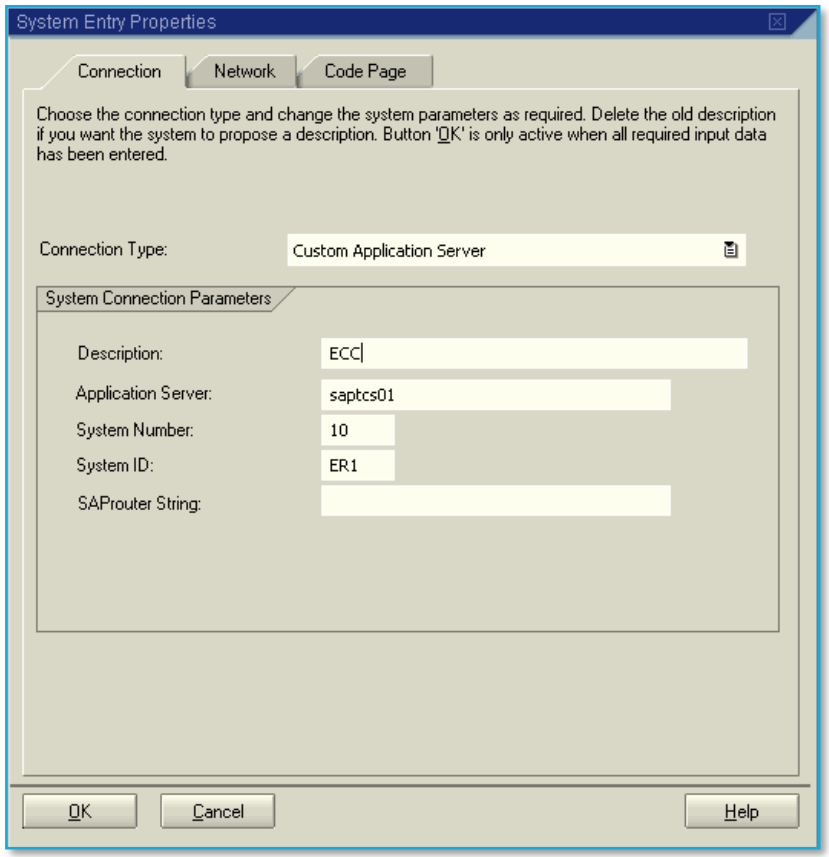
AS ABAP Processes

- The AS ABAP Message Server process is for internal communication. For example initiating updates, requesting and removing locks, triggering background requests, etc.
- It also keeps track of which instance is available by periodically pinging each instance
- There is 1 dispatcher per instance. In a system with multiple instances, the dispatchers communicate with each other through the message server
- All requests received through HTTP are handled by the ICM. Each ICM then forwards the request to the dispatcher within its own instance
- The gateway process accepts requests that follow the RFC protocol. Typically such requests are sent from either other SAP systems or from applications running outside the SAP system

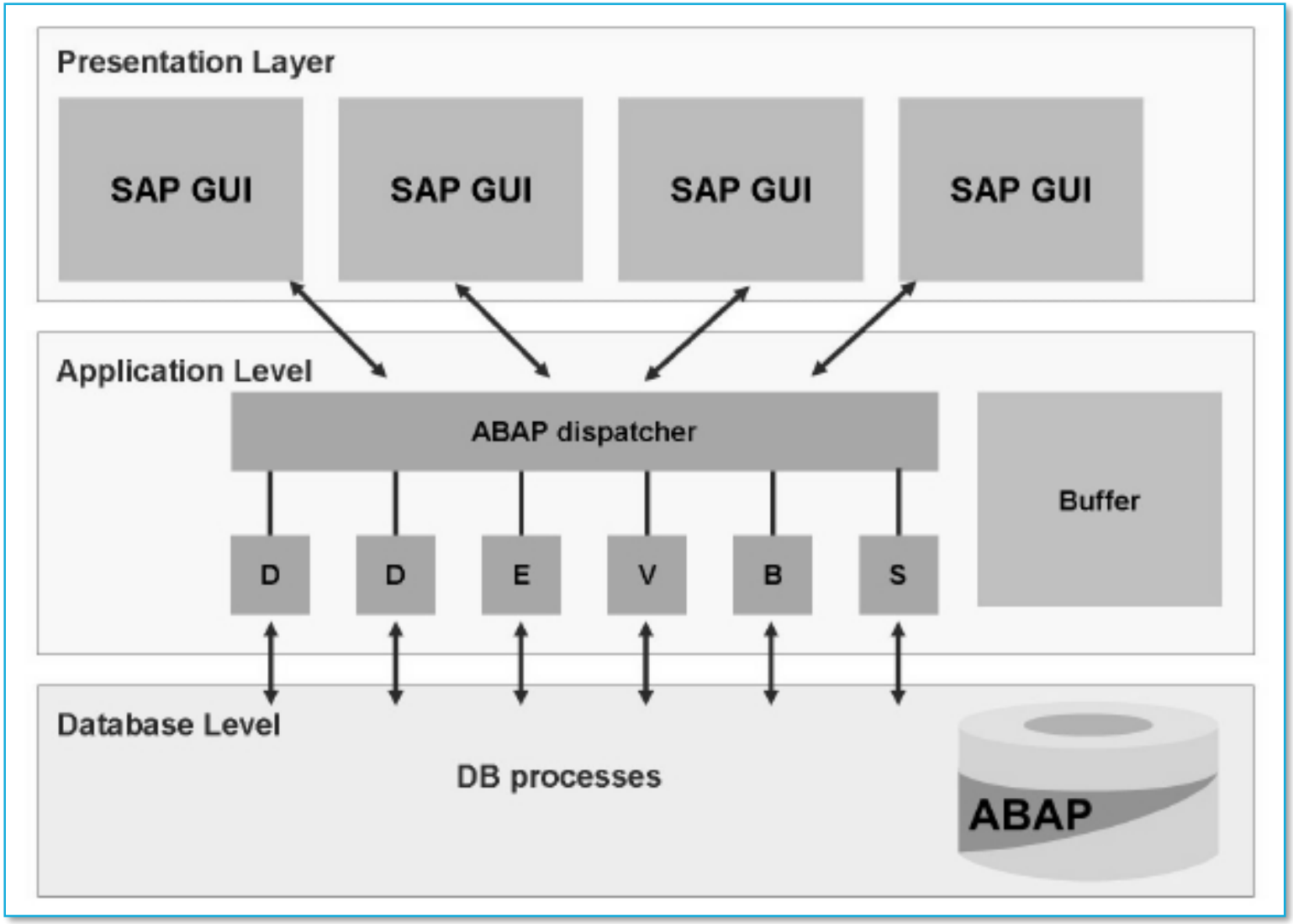
Request Processing in AS ABAP

- Users in SAP use the SAP Frontend, called SAPGUI as shown below. The details of the system to login into has to be specified in the SAP Logon Pad

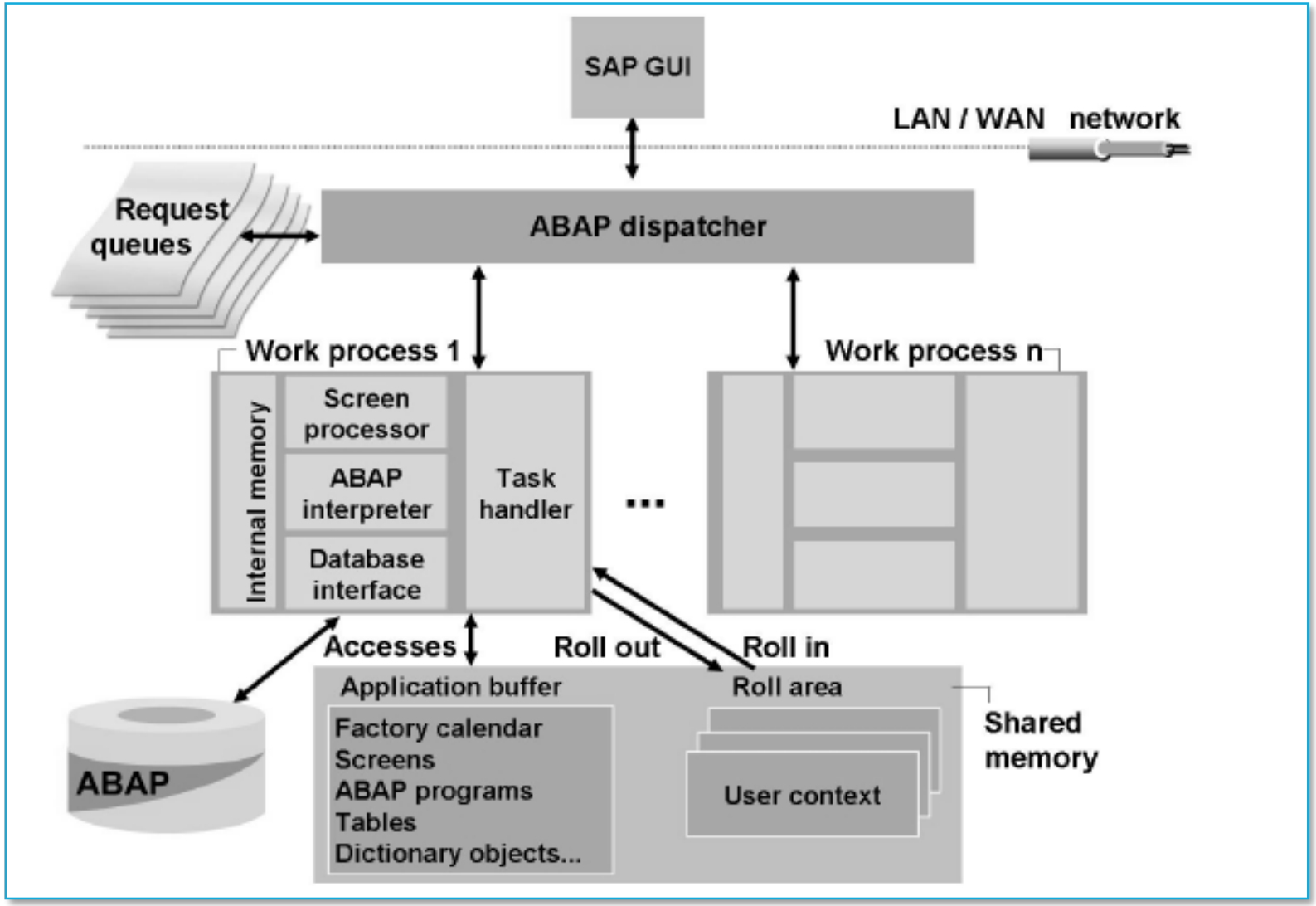




Processing a user request

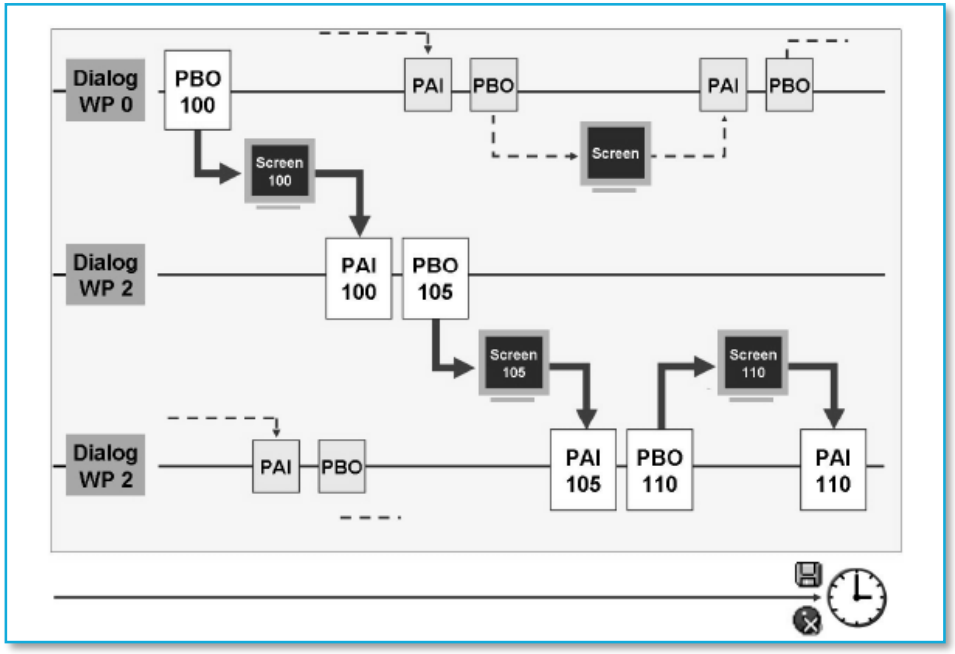


Processing a user request



Processing a Dialog Request

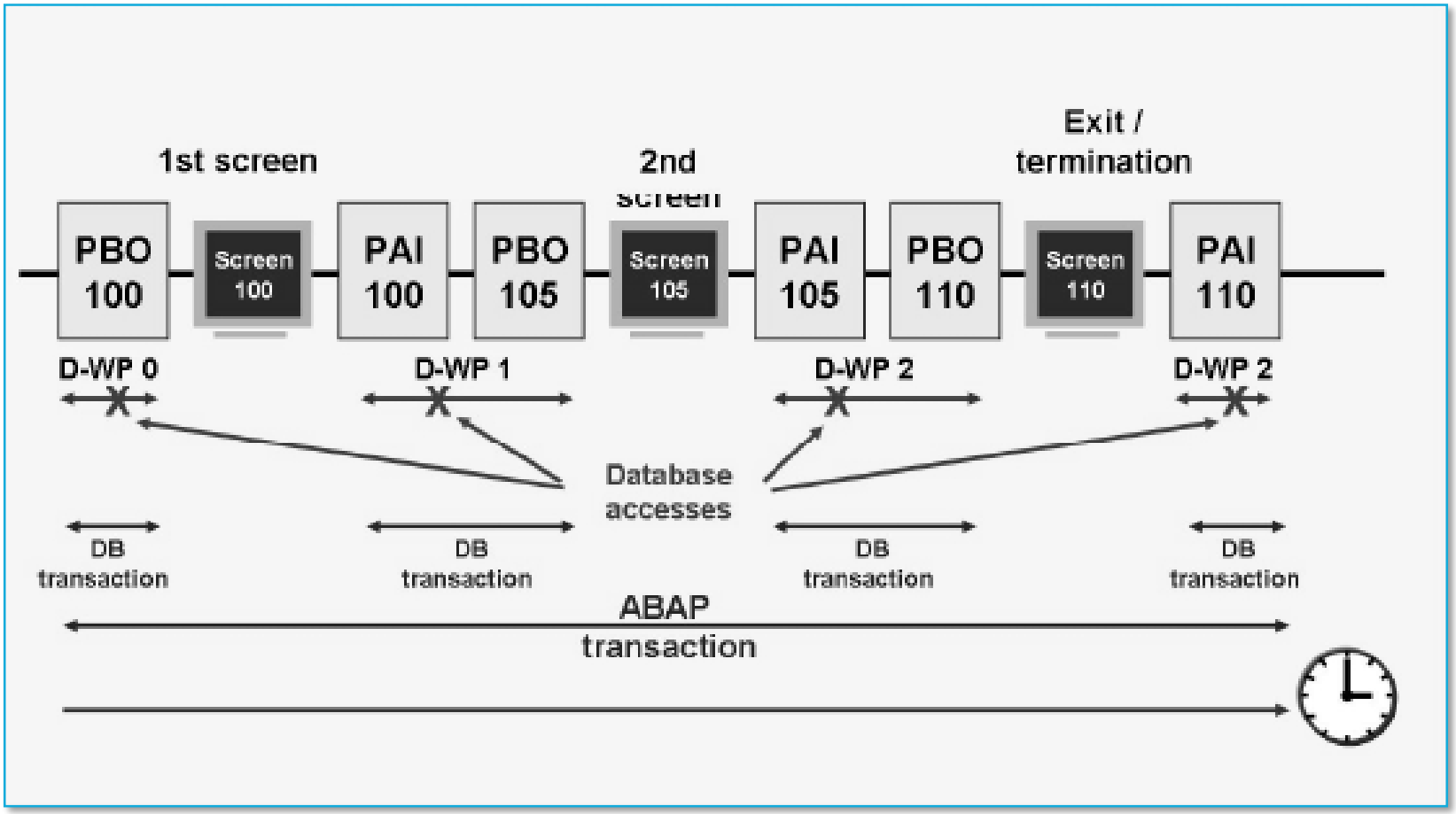
- Each SAP program has a number of dialog steps, which are steps that have input parameters, processing functions and output parameters. Each step is manifested in the form of screen changes from a user's point of view.
- Each dialog step can have multiple screens to process. Each step may be executed by any of the available dialog work processes. This is known as Work Process Multiplexing.
- A single dialog process therefore may sequentially process dialog steps for any user and any program during its activity cycle.



Transaction Processing in AS ABAP

- Transactions are processing units, that functionally belong together. They have four principal characteristics. The initial letters of these characteristics together form the acronym ACID
  - Atomic
  - Consistent
  - Isolated
  - Durable
- Atomic means that a transaction is either fully successful or does not have any effects at all. If a transaction-oriented system goes down, you need to ensure that inconsistent, partial results are not stored
- Consistent means that the system status changes from one that is accurate and consistent in business terms to another that is also accurate and consistent in business terms
- Isolated means that the changes made within a transaction can only be seen by other transactions, even those that run simultaneously, after the final confirmation (Commit)
- The results of a transaction are durable because after the final confirmation they are stored permanently in the database

Database Transactions & ABAP Transactions



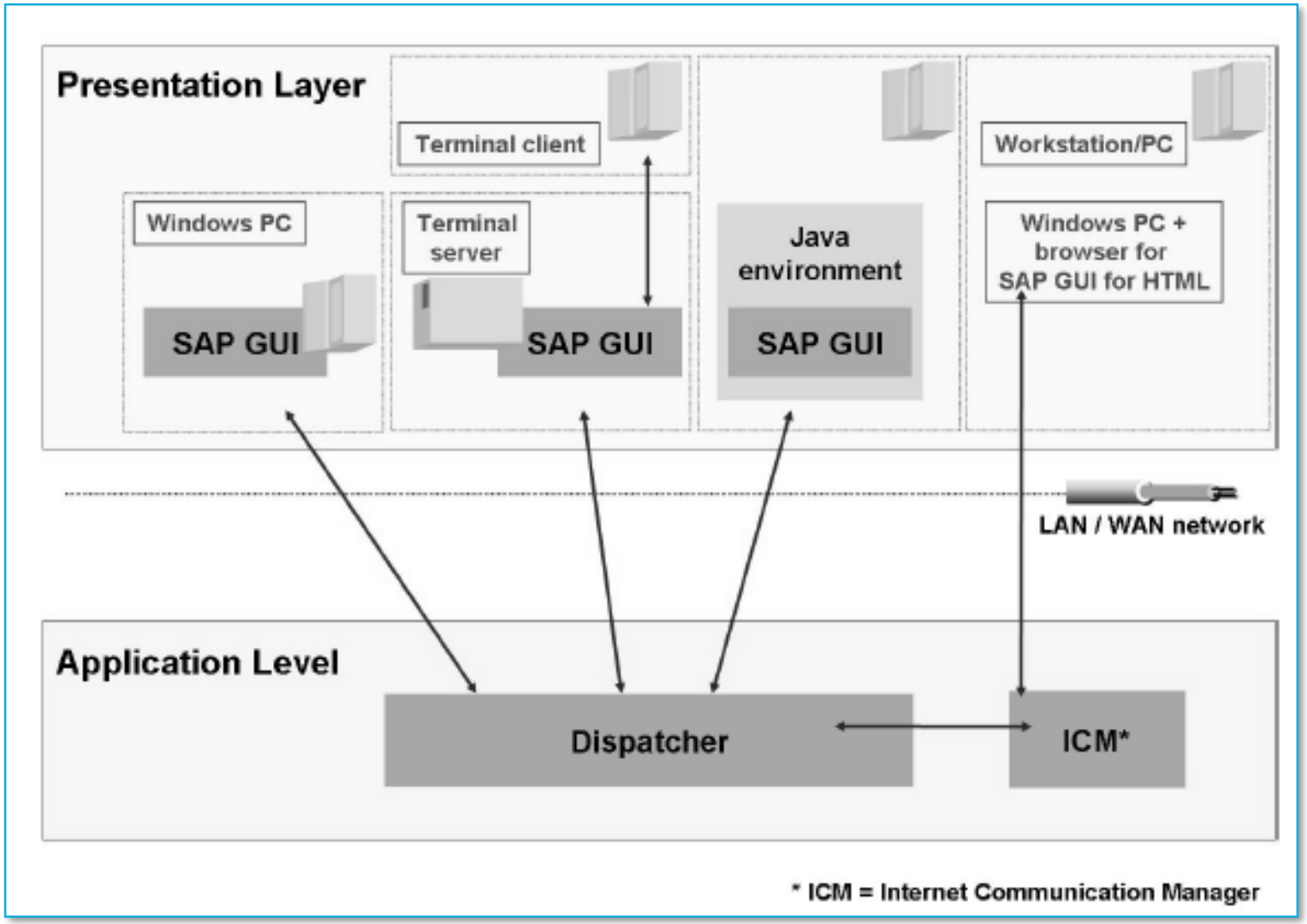
Graphical Illustration of an Asychronous Update

Breakout Session

Notes on SAPGUI

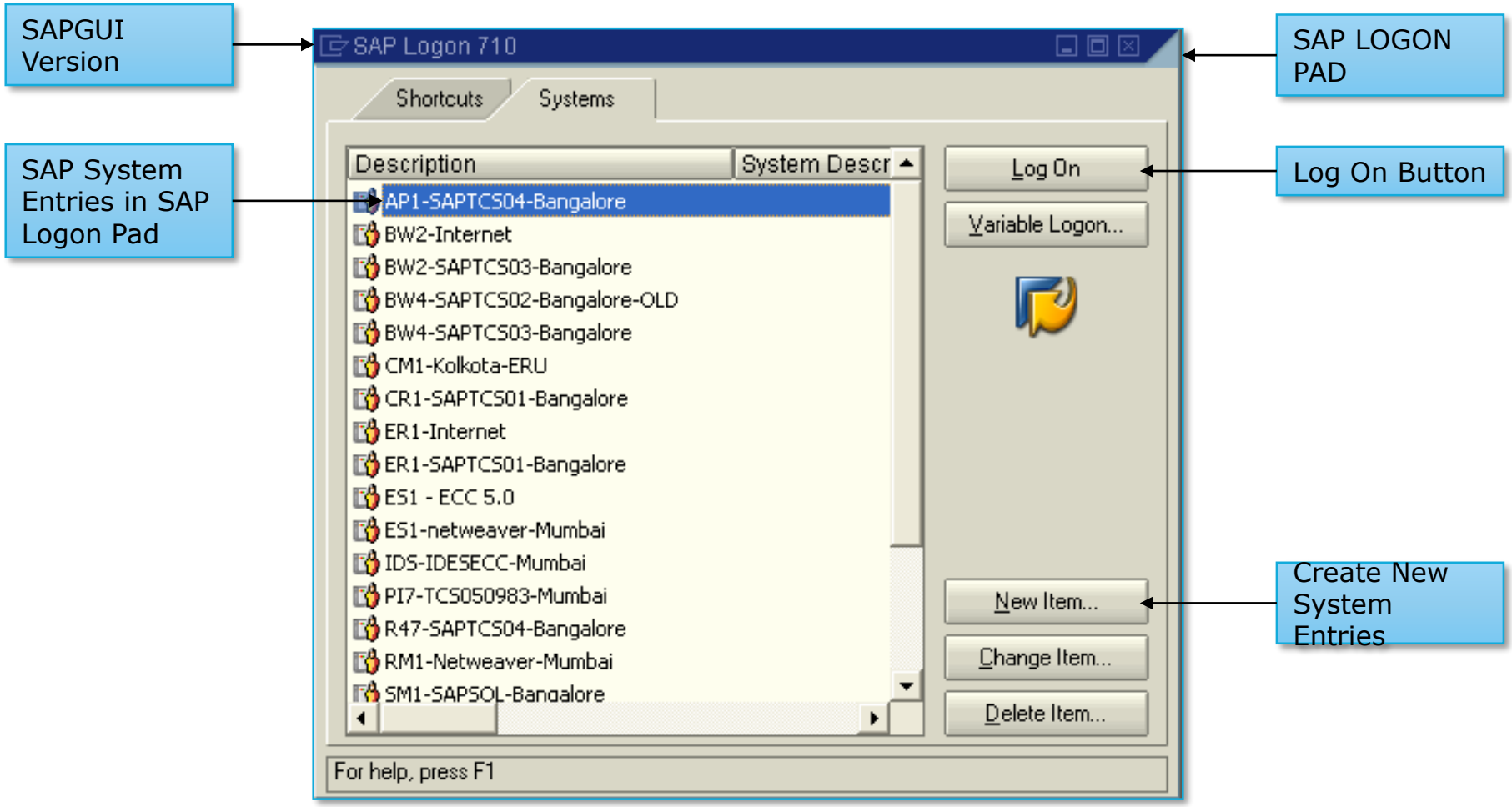
- There are various ways to access an SAP System. The most commonly used are SAPGUI for Windows, SAPGUI for JAVA and WEBGUI for browsers
- SAPGUI is a client utility that has to be installed on a user's machine
- SAPGUI is available for installation on Windows and on Non-Windows platforms as well
- A JAVA based SAPGUI is required for OS such as Linux or any other Unix flavor
- SAPGUI is available as SAPGUI for HTML, popularly called WEBGUI, that is supported on most common browsers such as IE 6, Firefox 3
- For Windows desktops, the entries in the SAPGUI logon pad are stored in a file called saplogon.ini file, which is located in the path C:\Windows

Alternative types of SAPGUI



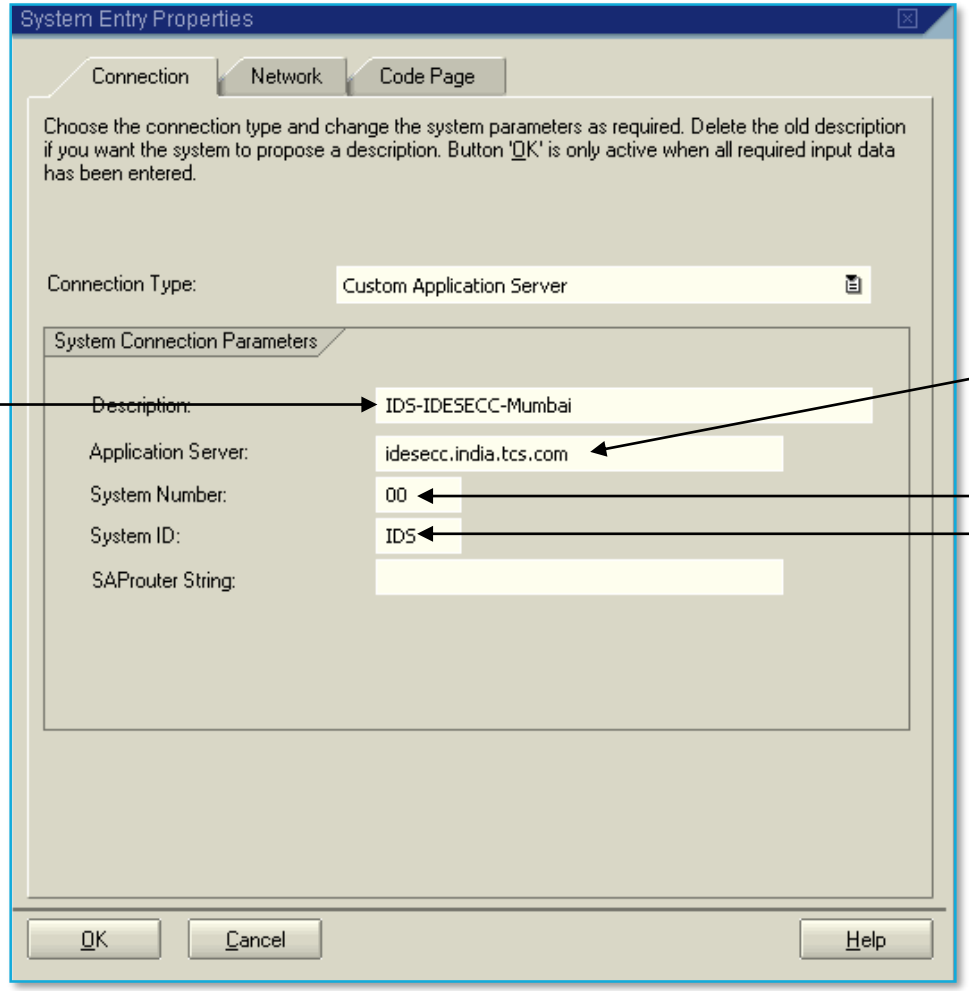
Navigation using SAPGUI

Elements of SAPGUI



System Entry in SAPGUI

Elements of SAPGUI



Description of the SAP System. This can have any convenient name as per the users choice

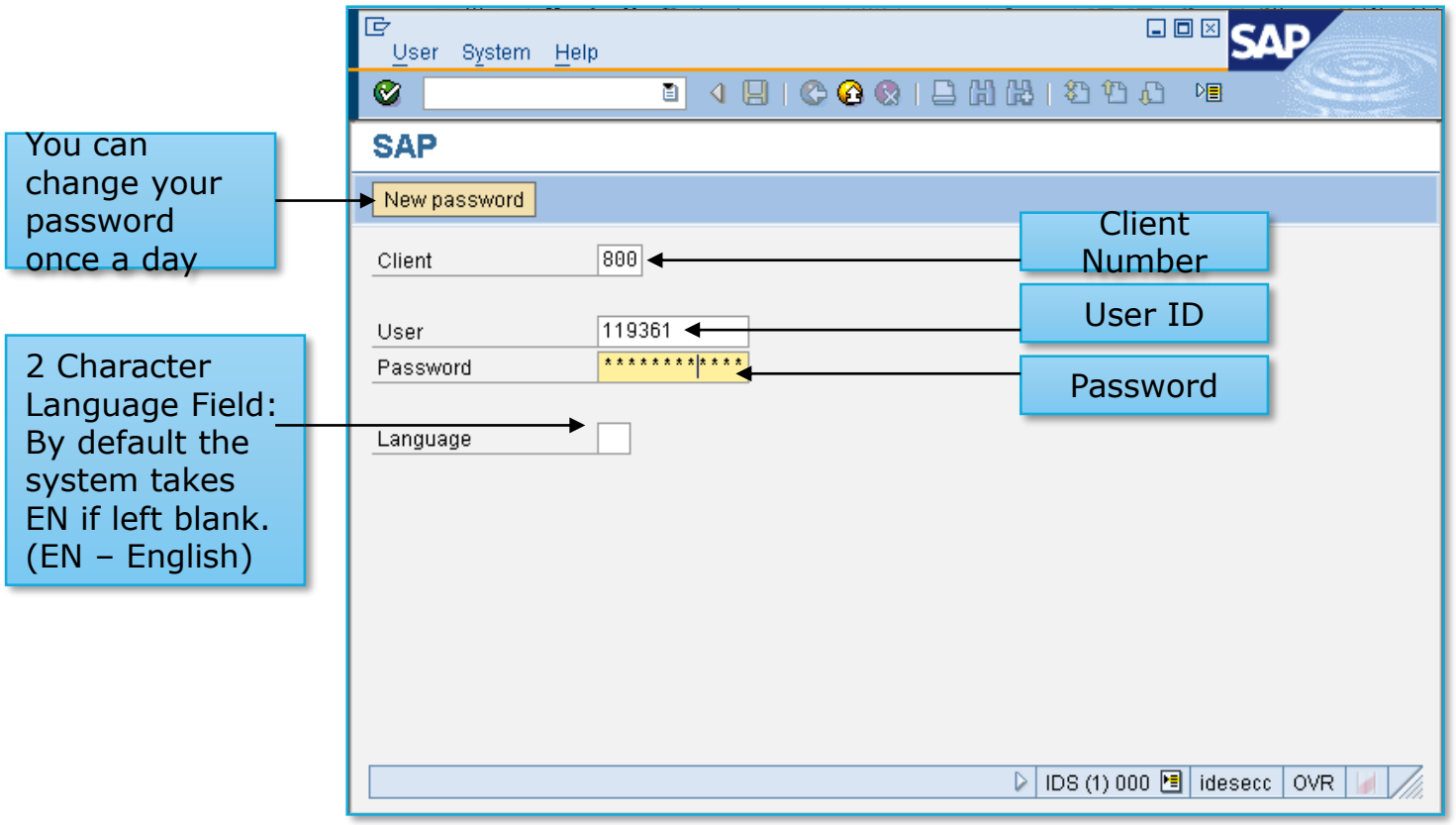
SAP Application Server Host Name or IP address

SAP System Number

System ID

SAP Logon Screen

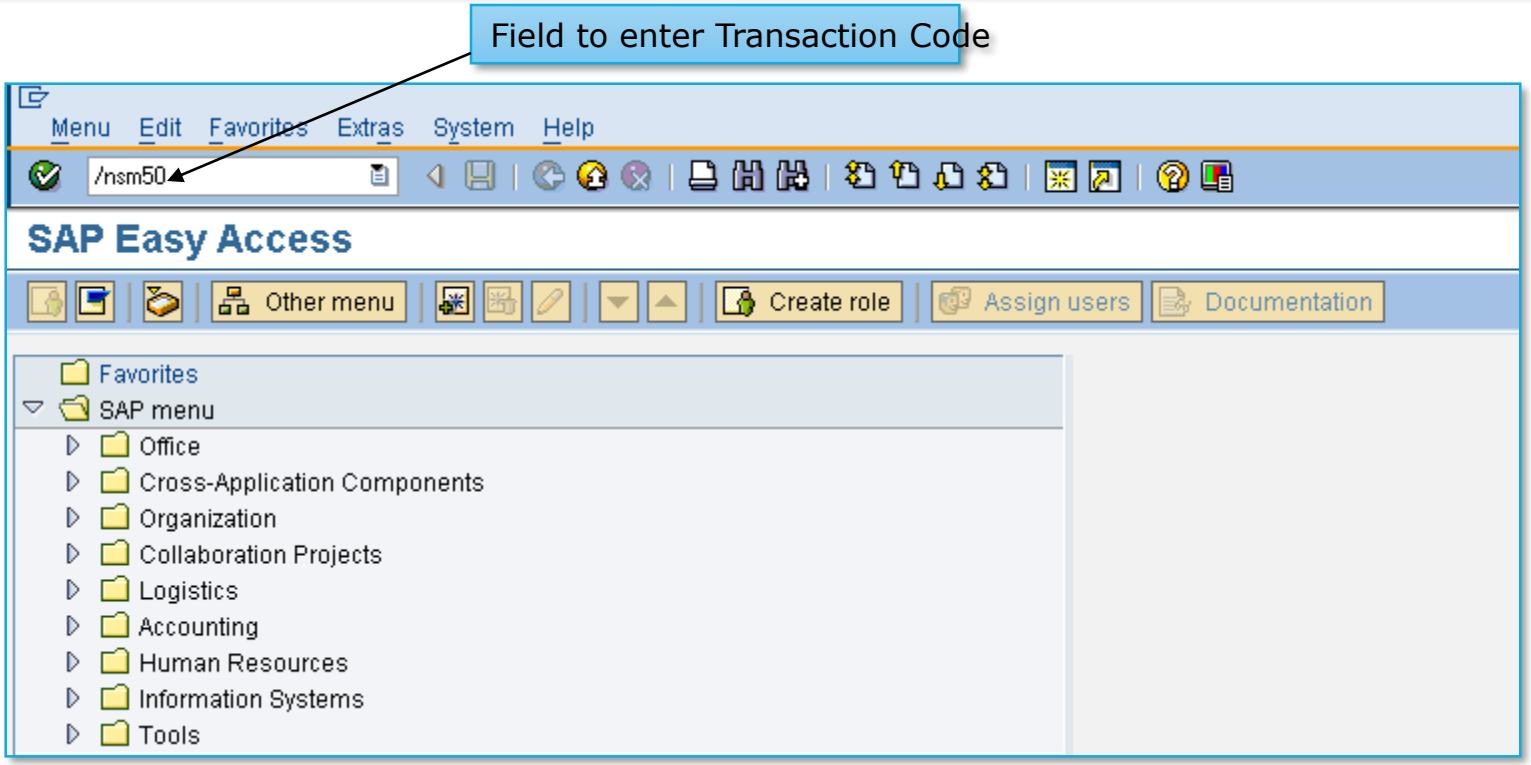
Elements of SAPGUI



Note: Client Number is a logical unit of an SAP system. Password field is case-sensitive

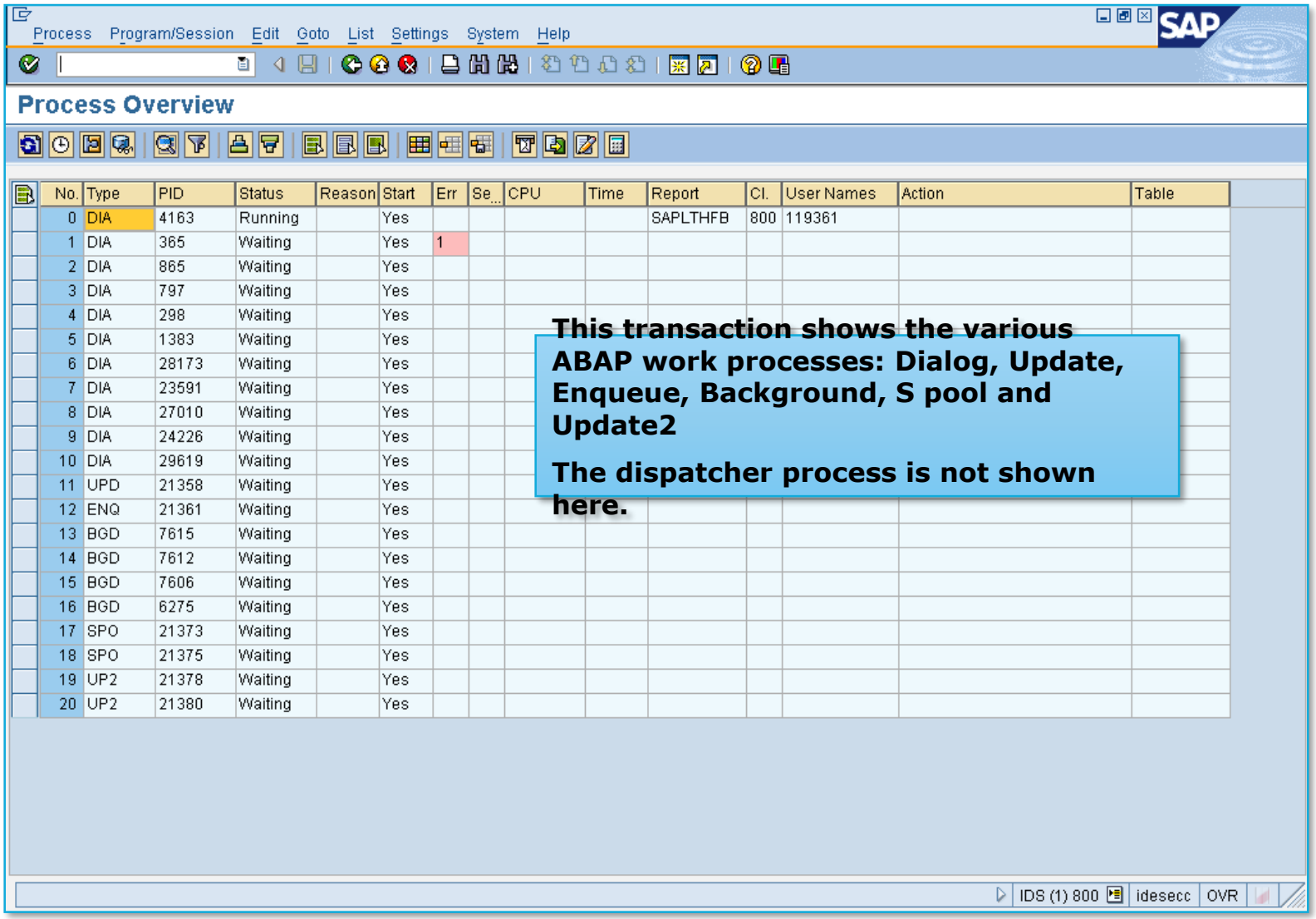
SAP Logon Screen

Elements of SAPGUI



- In SAP, all operations are carried out using Transaction Codes. These are codes that can call reports, programs from the users screen.
- /n denotes a new session. A user can open up to maximum of 6 sessions where he/she can parallely work
- /o followed by a transaction code causes the transaction to open in a new session.
- Each new session means a new window opened on your computer

ABAP Work Processes – SM50

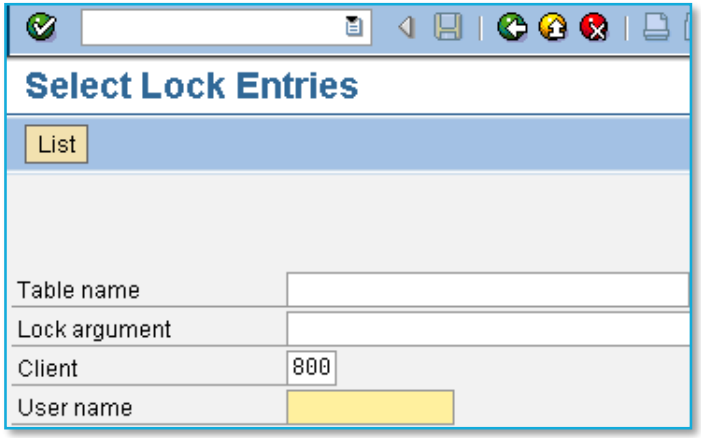


ABAP Work Processes as Unix Processes

```
idesecc:idsadm 3% ps -ef | grep dw
  idsadm  7612 21320   0 16:37:07 ?           0:01 dw.sapIDS_DVEBMGS00 pf=/usr/sap/IDS/SYS/profile/IDS_DVEBMGS00_idesecc
  idsadm 21375 21320   0   Feb 09 ?           0:07 dw.sapIDS_DVEBMGS00 pf=/usr/sap/IDS/SYS/profile/IDS_DVEBMGS00_idesecc
  idsadm 21378 21320   0   Feb 09 ?           0:41 dw.sapIDS_DVEBMGS00 pf=/usr/sap/IDS/SYS/profile/IDS_DVEBMGS00_idesecc
  idsadm  7615 21320   0 16:38:07 ?           0:04 dw.sapIDS_DVEBMGS00 pf=/usr/sap/IDS/SYS/profile/IDS_DVEBMGS00_idesecc
  idsadm 27010 21320   0   Feb 18 ?           1:59 dw.sapIDS_DVEBMGS00 pf=/usr/sap/IDS/SYS/profile/IDS_DVEBMGS00_idesecc
  idsadm 23591 21320   0   Feb 12 ?           6:39 dw.sapIDS_DVEBMGS00 pf=/usr/sap/IDS/SYS/profile/IDS_DVEBMGS00_idesecc
  idsadm 21358 21320   0   Feb 09 ?          10:26 dw.sapIDS_DVEBMGS00 pf=/usr/sap/IDS/SYS/profile/IDS_DVEBMGS00_idesecc
  idsadm 21320 21286   0   Feb 09 ?           8:09 dw.sapIDS_DVEBMGS00 pf=/usr/sap/IDS/SYS/profile/IDS_DVEBMGS00_idesecc
  idsadm  7767  7625   0 16:52:17 pts/2       0:00 grep dw
  idsadm 21361 21320   0   Feb 09 ?           0:06 dw.sapIDS_DVEBMGS00 pf=/usr/sap/IDS/SYS/profile/IDS_DVEBMGS00_idesecc
  idsadm 21373 21320   0   Feb 09 ?           4:21 dw.sapIDS_DVEBMGS00 pf=/usr/sap/IDS/SYS/profile/IDS_DVEBMGS00_idesecc
  idsadm  1383 21320   0   Feb 26 ?           0:23 dw.sapIDS_DVEBMGS00 pf=/usr/sap/IDS/SYS/profile/IDS_DVEBMGS00_idesecc
  idsadm 24226 21320   0   Feb 13 ?           3:19 dw.sapIDS_DVEBMGS00 pf=/usr/sap/IDS/SYS/profile/IDS_DVEBMGS00_idesecc
  idsadm  6275 21320   0   Mar 07 ?           0:15 dw.sapIDS_DVEBMGS00 pf=/usr/sap/IDS/SYS/profile/IDS_DVEBMGS00_idesecc
  idsadm  7606 21320   0 16:16:40 ?           0:01 dw.sapIDS_DVEBMGS00 pf=/usr/sap/IDS/SYS/profile/IDS_DVEBMGS00_idesecc
  idsadm  4163 21320   0   Mar 03 ?          89:55 dw.sapIDS_DVEBMGS00 pf=/usr/sap/IDS/SYS/profile/IDS_DVEBMGS00_idesecc
  idsadm   298 21320   0   Feb 24 ?           4:52 dw.sapIDS_DVEBMGS00 pf=/usr/sap/IDS/SYS/profile/IDS_DVEBMGS00_idesecc
  idsadm   365 21320   0   Feb 24 ?          67:53 dw.sapIDS_DVEBMGS00 pf=/usr/sap/IDS/SYS/profile/IDS_DVEBMGS00_idesecc
  idsadm 28173 21320   0   Feb 20 ?           2:13 dw.sapIDS_DVEBMGS00 pf=/usr/sap/IDS/SYS/profile/IDS_DVEBMGS00_idesecc
  idsadm   865 21320   0   Feb 25 ?          31:56 dw.sapIDS_DVEBMGS00 pf=/usr/sap/IDS/SYS/profile/IDS_DVEBMGS00_idesecc
  idsadm   797 21320   0   Feb 25 ?          12:34 dw.sapIDS_DVEBMGS00 pf=/usr/sap/IDS/SYS/profile/IDS_DVEBMGS00_idesecc
  idsadm 29619 21320   0   Feb 23 ?           1:53 dw.sapIDS_DVEBMGS00 pf=/usr/sap/IDS/SYS/profile/IDS_DVEBMGS00_idesecc
  idsadm 21380 21320   0   Feb 09 ?           0:07 dw.sapIDS_DVEBMGS00 pf=/usr/sap/IDS/SYS/profile/IDS_DVEBMGS00_idesecc
idesecc:idsadm 4%
```

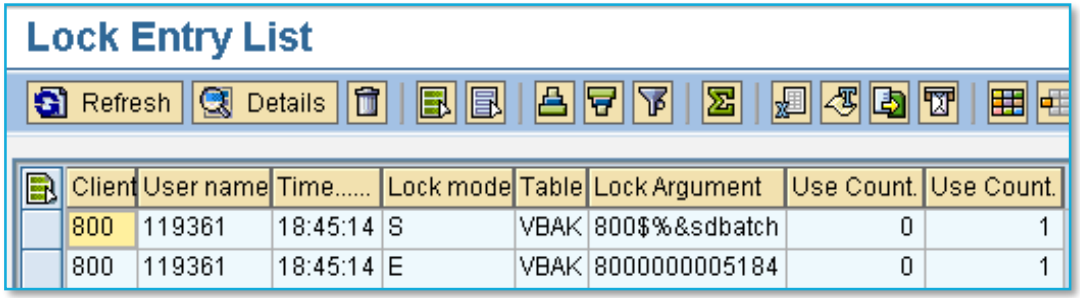
- In the previous screen, there were a total of 21 ABAP processes indicated
- On an UNIX OS Level, these processes are realized as individual unix processes denoted by “dw”
- The above screen shows 22 dw processes. This is because there is the additional “Dispatcher” process
- The ICM process is a process that starts with the name “icman”
- The Gateway process is a process that starts with the name “gwrd”
- The Message server is a process that starts with the name “ms”

Checking for Locks – SM12



- You can check for lock entries in a system using SM12 transaction

- The above screen shows locks on table VBAK (Sales Order Table)
- The lock will remain on the table until the user either saves the sales order data or exits the transaction without saving



Client	User name	Time.....	Lock mode	Table	Lock Argument	Use Count.	Use Count.
800	119361	18:45:14	S	VBAK	800$%&sdbatch	0	1
800	119361	18:45:14	E	VBAK	8000000005184	0	1