CHAPTER 2
THEORITICAL FOUNDATION

1.1. Java

Java is an object-oriented programming language developed by James Gosling and colleagues at Sun Microsystems in the early 1990s [4]. In the Java Programming Language, all of source code is first written in plain text files which the extension with the .java extension. Those source files are then compiled into .class files by the Java compiler (javac). Class file does not contain code that is native to your processor; it instead contains byte codes (a high-level, machine-independent code for a hypothetical machine that is implemented by the Java interpreter and run-time system) which is the machine language of the Java Virtual Machine. The Java launcher tool (java) then runs your application with an instance of the Java Virtual Machine.

![Java Virtual Machine (JVM)](image)

Figure 2.1 Java Virtual Machine (JVM), taken from [5]

A Java Virtual Machine (JVM) is a piece of software that is responsible for running Java programs. A new JVM is started whenever you type in java program name on the command line. It is called a virtual machine since it is software that
emulates a physical computer. Java programs are built to be run on this virtual machine, allowing them to be run on any real machine that has a JVM [5].

Java is a high-level, object-oriented programming language developed by Sun Microsystems. It is similar to C++, but has been simplified to eliminate language features that cause common programming errors. Java is a general purpose programming language with a number of features that make the language well suited for use on the Web. Small Java applications are called Java applets and can be downloaded from a Web server and run on your computer by a Java-compatible Web browser such as Netscape Navigator or Microsoft Internet Explorer [6].

Java has several advantages such as Architectural Neutral (platform independence), object-oriented language, support libraries, Multithreading, Provide Security, and garbage collection.

The solution that the Java System adopts to solve the binary-distribution problem is a “Binary Code Format” that’s independent of hardware architecture, Operating System Interface. The format of this system-independent binary code is architectural neutral. If the Java run-time platform is made available for a given hardware and software environment, an application written in Java can then execute in that environment without the need to perform any special porting work for that application. Java Virtual Machine is available in many different OS such as Windows, Solaris, Linux, so that the .class file also are capable of running on different Operating System. That’s why Java is said by most people have the characteristic of platform independence which means that program written in Java
Language must run similarly on diverse hardware or in short word it is said “write a program once and run it anywhere”.

Object Oriented Programming means to design software so that the various types of data it manipulates are combined together with their relevant operation. Moreover, state (data) and behavior (code) are combined into entities which are called as objects. An object is a self-contained bundle of behavior (code) and state (data). In order to be truly considered “Object Oriented”, a programming language should support at a minimum four characteristic which are Encapsulation, Polymorphism, Inheritance, and Dynamic Binding. Encapsulation implements information hiding and abstraction. Polymorphism means the same message sent to different objects results in behavior that’s dependent on the nature of the object receiving the message. Inheritance defines new classes and behavior based on existing classes to obtain reusable code and code organization. Dynamic Binding means object could come from anywhere, possibly across network.

Java also supports so many libraries that can be used for developers in creating multi-platform application for example the package for input / output which

Figure 2.2 Platform independence in Java
is java.io, the package for AbstractWindowToolkit which is java.awt, etc. those kinds of libraries is known as Java Application Programming Interface (Java-API) which is a large collection of ready-made software components that provide many useful capabilities, such as graphical user interface (GUI) widgets. It is grouped into libraries of related classes and interfaces; these libraries are known as packages. In addition, programmers can be relatively deals with memory when programming in java. The garbage collection system makes the programmer’s job greatly easier, with the weight of memory management taken off the programmer’s responsibility.

![Diagram](https://via.placeholder.com/150)

**Figure 2. 3 How API and Java Virtual Machine Insulate Program from the Hardware**

### 1.2. **Java Database Connectivity (JDBC)**

JDBC is an API which provides universal data access for java programming language. It consist of a number of class and interface which is written using java programming language and provide standard API for help the developers , and also give the possibility for writing database application which use all of Java-API. It is an API for java programming language that defines how a client may access a database such as provides methods for querying and updating data in a database. The JDBC classes are contained in the Java package java.sql
JDBC (Java Database Connectivity) is an application program interface (API) specification for connecting programs written in Java to the data in popular databases. The application program interface lets you encode access request statements in structured query language (SQL) that are then passed to the program that manages the database. It returns the results through a similar interface. JDBC is very similar to the SQL Access Group’s Open Database Connectivity (ODBC) and, with a small "bridge" program; you can use the JDBC interface to access databases through the ODBC interface [7].

The JDBC API is the industry standard for database-independent connectivity between the Java programming language and a wide range of databases. The JDBC API provides a call-level API for SQL-based database access. JDBC technology allows you to use the Java programming language to exploit "Write Once, Run Anywhere" capabilities for applications that require access to enterprise data [8].

The advantages by using JDBC are we can access any data source which can run in multiple platforms which has Java Virtual Machine (JVM). In other words, we don’t need to write code for Sybase database, another code for Oracle database, another code for IBM DB2, etc. we only need to write code once which using JDBC API, and the program can send SQL statement or other statements to particular data sources. It is more likely the principles of “Write Once, run anywhere”. JDBC-API makes it possible to do three things such as establish a connection with a database or access any tabular data source, send SQL statements, and process the results.

In addition, JDBC also can leverage existing enterprise data. It means with JDBC business are not locked in any proprietary architecture, and can continue to use their
installed database and access information easier. It also simplified enterprise
development. It means JDBC hides the complexity of many data access tasks, so that
programmer doesn’t need to know what happened behind the scenes. Moreover, it is
easy to learned, easy to be implemented. JDBC also doesn’t need configuration for
network computer. It means with a driver written in the Java programming language,
all the information needed to make a connection is completely defined by the JDBC
URL or by a Data Source object registered with a Java Naming and Directory
Interface (JNDI) naming service.

Moreover, JDBC provides full access to metadata that enables so that any
application that needs facility and capability from database connection can be well
developed. No installation in JDBC, it is automatically downloaded as part of the
applet that makes the JDBC calls. At last, JDBC technology exploits the advantages
of Internet-standard URLs to identify database connections. The JDBC API includes
an even better way to identify and connect to a data source, using a Data Source
object that makes code even more portable and easier to maintain.

![Connecting to a Data Source](image)

Figure 2.4 Connection to A Data Source
1.3. J2EE (Java 2 Enterprise Edition)

Java classified its technology into 3 different platforms which are Java2StandardEdition (J2SE), Java2MicroEdition (J2ME) and java2EnterpriseEdition (J2EE). J2SE is the platform which contains core of java class and graphical user interface. J2ME is the platform that provide runtime environment for embedded system which is used for consumer product such as pager, hand phone, PDA, mobile technology, etc. J2EE is the platform that contains a package of class and interface which used for develop web-application such as servlet, Java server pages, and enterprise java beans.

Therefore, J2EE is a platform-independent, java-centric environment from Sun for developing, building, and deploying web-based enterprise application. It consists of a set of services, APIs, and protocols that provide the functionality for developed multi tiered, web-based application

Java Platform, Enterprise Edition or Java EE (formerly known as Java 2 Platform, Enterprise Edition or J2EE up to version 1.4), 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. The Java EE platform is defined by a specification [9].

The purpose of having J2EE with the project is the separation of functionality and presentation. Presentation is located by Java Server Pages (JSP) and servlet layer. Business logic or functionality resides in Java Bean or it can reside in EJB Layer. So that the application code and front end are built and maintained in modular fashion, with the programmers not concerned with graphic design, and designers not concerned with algorithms.
In addition, with J2EE Projects there are numerous clients as J2EE application may serve. For example are web-clients, legacy information system all receive the same information provided by business logic directed through a controller server that determine which output format to provide in the presentation layer by using Java Server Pages (JSP), it supports cross-platform portability, availability of open source libraries, a huge server-side deployment base.

Figure 2.5 J2EE Server and Containers, taken from [10]

Figure 2.6 J2EE Server Web Components Communication, adopted from [11]
1.4. Java Server Pages (JSP)

JSP is a web technology based on java programming language which runs in the java platform and part of J2EE technology. JSP is used to handle the presentation layer in the web. Moreover, Java Server Pages (JSP) is a technology that lets you mix regular, static HTML with dynamically-generated HTML or provides easy way to create dynamic web-pages. JSP uses a component-based approach that allows web-developers to easily combine static HTML for look-and-feel with java component for dynamic features. In addition, Many Web pages that are built by CGI (Common Gateway Interface) programs are mostly static, with the dynamic part limited to a few small locations. But most CGI variations, including Servlets, make you generate the entire page via your program, even though most of it is always the same. JSP lets you create the two parts separately. JSP needs JVM and web-container.

Java Server Pages is an extension of the Java Servlet technology. It allows for java code to be embedded in HTML pages. JSP pages use XML tags and scriptlets written in the Java programming language to encapsulate the logic that generates the content for the page. It passes any formatting (HTML or XML) tags directly back to the response page. In this way, JSP pages separate the page logic from its design and display [12].

Java Server Pages (JSP) is a Java technology that allows software developers to dynamically generate HTML, XML or other types of documents in response to a Web client request. The technology allows Java code and certain pre-defined actions to be embedded into static content [13].
JSP has many advantages such as platform independence. It means because JSP use java programming language, so that any application that is written in java programming language can use JSP in different platform. In addition because JSP is part of JEE, so any application can be improved into enterprise application. With Java Server Pages, you don't have to be a hardcore programmer to develop Java-based web applications. There are 2 model of JSP Architecture which is model 1 and model 2. In the model 1 of JSP Architecture which is shown below. Model 1 tells us the JSP page alone is responsible for processing the incoming request and replying back to the client. There is still separation of presentation from content, because all data access is performed using beans. Basically it is suitable for simple project and project that need to be done rapidly. Unsystematic usage of this architecture usually leads to a significant amount of scriptlets or Java code embedded within the JSP page, especially if there is a significant amount of request processing to be performed.

Moreover, the model 2 of JSP Architecture which is shown below is a hybrid approach for serving dynamic content, since it combines the use of both servlets and JSP. It takes advantage of the predominant strengths of both technologies, using JSP to generate the presentation layer and servlets to perform process-intensive tasks. Here, the servlet acts as the controller and is in charge of the request processing and the creation of any beans or objects used by the JSP, as well as deciding, depending on the user's actions, which JSP page to forward the request to. Note particularly that there is no processing logic within the JSP page itself; it is simply responsible for retrieving any objects or beans that may have been previously created by the servlet, and extracting the dynamic content from that servlet for insertion within static templates.
1.5. **DBMS (Database Management System)**

A database management system (DBMS) is a computer program (or more typically, a suite of them) designed to manage a database (a large set of structured data), and run operations on the data requested by numerous clients. It is used for the management of any collection of compatible, and ideally normalized, data. Types of DBMS that is often used are Relational DBMS (RDBMS) and Object-oriented DBMS (OODBMS).
1.6. **RDBMS (Relational Database Management System)**

A relational database management system (RDBMS) is a DBMS that is based on the relational model. It is a type of DBMS in which the database is organized and accessed according to the relationships between data values. This model is based on the principles of relational algebra. Example of RDBMS Systems: Oracle, SQL Server, and MySQL.

1.7. **MySQL**

MySQL is an open source RDBMS that supports multithreading. It uses Structured Query Language (SQL), the most popular language for adding, accessing, and processing data in a database. Its main goals are speed, robustness, and ease of use.

1.8. **Client-Server Architecture**

A basic concept used in computer networking, describe a network architecture which separates client from the server. The easiest example to visualize client-server architecture is the current use of web pages on the internet, wherein servers retrieve information requested by clients, and clients display that information to the user.

The purpose of having Client-Server Architecture is to provide a scalable architecture, where the computer process takes place only on the client or server. Server software generally, but not always, runs on powerful computers dedicated for exclusive use to running the business application. It waits for requests from clients and sends a reply afterwards. Client software on the other hand generally runs on common PCs or workstations. Client sends requests to server and waits until reply arrives. [14]
1.9. **CSS (Cascading Style Sheet)**

A style sheet is a template that controls the formatting of HTML tags on your Web pages. It is first introduced in Microsoft Internet Explorer 3.0 and change the way people build and maintain their Web pages. A style sheets works behind the scenes, therefore it may not obvious to readers of web pages. The use of style sheets are similar to templates, where you only change the appearance of a web page by changing the formatting assigned to your HTML tags. Obviously, the use of style sheets means better control, where change the format of a web page can easily be done without touching any HTML files.

The W3C draft refers to "cascading style sheets" because you can use multiple styles to control the appearance of your page, and the browser follows rules (a "cascading order") to determine precedence and to resolve conflicts.

Style sheets can use in different ways depends on your design needs [15]:

- **By linking** to a style sheet from your HTML file. Changes the appearance of multiple Web pages by alter a single file.

- **By embedding** a style sheet in your HTML file. Change the appearance only a single web page by changing a few lines.

- **By adding inline** styles to your HTML file. This gives you a quick way to change the appearance of a single tag, a group of tags, or a block of information on your page.
1.10. Java Script

JavaScript is a programming language that is mostly used in web pages, usually to add features that make the web page more interactive. When JavaScript is included in an HTML file it relies upon the browser to interpret the JavaScript. JavaScript is combined with Cascading Style Sheets (CSS), and later versions of HTML (4.0 and later) the result is often called DHTML.

Usually JavaScript used for the following kinds of solutions [16]:

1. Getting your Web page to respond or react directly to user interaction with form elements (input fields, text areas, buttons, radio buttons, checkboxes, selection lists)
2. Controlling multiple-frame navigation based on user choices in the HTML document
3. Preprocessing data on the client before submission to a server
4. Changing content and styles in modern browsers dynamically and instantly in response to user interaction.

1.11. HTML (Hyper Text Markup Language)

Hypertext Markup Language (HTML) is a markup language designed for the creation of web pages with hypertext and other information to be displayed in a web browser. HTML is used to structure information — denoting certain text as headings, paragraphs, lists and so on — and can be used to describe, to some degree, the appearance and semantics of a document [17]. The "hyper" in Hypertext comes from the
fact that in HTML you can specify that a block of text, or an image, is linked to another file on the Internet. HTML files are meant to be viewed using a "Web Browser"[18].

1.12. **USDA Standard**

From Wikipedia, definition of USDA is “*The United States Department of Agriculture, also called the Agriculture Department, or USDA, is a United States Federal Executive Department (or Cabinet Department). Its purpose is to develop and execute policy on farming, agriculture, and food.*” [19]

There are three specific USDA standards that applied for the system, United States Standards for Grades of Canned Fruits for Salad, United States Standards for Grades of Canned Pineapple, and United States Standards for Grades of Pineapple Juice. These standards act as a basis for inspection and grading the quality of products. Generally, all those standards define product description, styles, grade measurement for specific products, in this case, pineapple juice, canned pineapple, and canned fruits for salad.

1.13. **Six Sigma**

Six Sigma stands for Six Standard Deviations (Sigma is the Greek letter used to represent standard deviation in statistics) from mean. The target of Six Sigma methodologies is to improve the capability and reduce the defects in any process, virtually defect-free processes and products.

First developed by Motorola, Six Sigma applied in its manufacturing divisions where millions of parts are made using the same process repeatedly. Six Sigma
methodologies improve any existing business process by constantly reviewing and re-tuning the process. It allows for only 3.4 defects per million opportunities for each product or service transaction (99.9997% of all products produced in a process are of acceptable quality) [20]. In this case, it maintains consistent quality of the process output. This leads to defect reduction and improvement in profits, product quality and customer satisfaction.

In Six Sigma, metrics are used as a standard measure to assess your performance in a particular area. Some primary metrics that are used in the project includes DPO and DPMO. These metrics are well known as Six Sigma Defect Metrics, explained as follows:

- Defects per opportunity (DPO) represent total defects divided by total opportunities. DPO is a preliminary calculation to help you calculate DPMO (defects per million opportunities). Multiply DPO by one million to calculate DPMO. Example: If there are 34 defects out of 750 units having 10 opportunities per unit, then DPO=34/750*10=0.045/10=0.0045 [21]

- Defects per million opportunities (DPMO) are a Six Sigma calculation used to indicate the amount of defects in a process per one million opportunities. The formula is to multiply DPO by one million to calculate DPMO [22].

1.14. HACCP

Before we elaborate more about the HACCP (Hazard Analysis and Critical Control Points), we would like to elaborate more about the terms of Critical Control Points (CCP). A critical control point (CCP) is a point, step, or procedure in a food process at which control can be applied and, as a result, a food safety hazard can be
prevented, eliminated, or reduced to an acceptable level. A food safety hazard is any biological, chemical, or physical property that may cause a food to be unsafe for human consumption. [38]

HACCP is a systematic preventative approach to food safety that addresses physical, chemical and biological hazards as a means of prevention rather than finished product inspection. HACCP is used in the food industry to identify potential food safety hazards, so that key actions, known as CCP can be taken to reduce or eliminate the risk of

Figure 2. 9 the HACCP Seven Principles, adopted from [24]
the hazards being realized. The system is used at all stages of food production and preparation processes. [23]

HACCP is based around seven established principles which are represented by Figure 2.8. The flow diagram is a representative of HACCP for the food industry. The first thing we have to do is conducting hazard analysis, including identifying the potential hazards and the preventive measures to control these hazards. Next, we need to identify the CCP throughout the production process of the product. Then we could establish the maximum and minimum value for each CCP as a prevention measure. The forth principle is establishing monitoring of CCP Prevention Measures. The monitoring activities are essential to ensure the process is under control at each CCP. After that, precaution needs to be established, so that when the monitoring indicates that the CCP is not met, there would be actions taken. Corrective actions are intended to ensure that no product injurious to health or otherwise adulterated as a result of the deviation. The HACCP regulation also requires all factories for documenting all the analysis, including the hazard analysis, CCP monitoring, and the corrective actions. The last principle would be establishing procedures for validating and verifying the HACCP system is working as intended. The HACCP plans need to be validated that they would be successful in ensuring the production of safe product. Also, they need to be reviewed whether they are adequate, including microbial testing [38].

1.15. ERD (Entity Relationship Diagram)

ERD is a data model or diagram for high-level descriptions about the relationship (a natural business connection between one or more entities) between one entity which is a class of persons, places, object, events or concepts about which we need to capture and
store data and their relationship with another entity. It is a high level description of conceptual data models.

Entity-relationship diagram (E-R diagram): A detailed, logical, and graphical representation of the entities, associations, and data elements for an organization or business area [25].

The primary purpose of ERD is to represent entity with their relationship with another entity. So that we can know about what type of relationship between entities such as one to many relationships, one to one relationship, many to many relationships, etc. Figure 2.10 in following page shows one example of ERD.

1.16. DFD (Data Flow Diagram)

DFD is a tool of the graphical representation that depicts the flow of data through a system and the work processing performed by that system, and the transform that are applied as data move from input to output. It is a graphical representation of the "flow" of data through an information system.

Data flow diagram (DFD): A graphic that illustrates the movement of data between external entities and the processes and data stores within a system [27].

A data flow diagram can also be used for the visualization of data processing (structured design). It is common practice for a designer to draw a context-level DFD first which shows the interaction between the system and outside entities. This context-level DFD is then "exploded" to show more detail of the system being modeled [28].
Figure 2. 10 Entity Relationship Diagram (ERD), taken from [26]
The purpose of having DFD because we want to know the flow of data whether the input the output of each process and including the data store which is a repository for data. So that by using DFD, it will provides a mechanism for data flow modeling and functional modeling.

Level 0 DFD is a fundamental system model or a context model, represents the entire software element as a single bubble with input and output data indicated by incoming and outgoing arrows [29]

Level 1 DFD might contain five or six bubbles with interconnecting arrows. Each of process represented at level 1 is a sub function of the overall system depicted in the context model [29]

Figure 2.11 shows one example of DFD.
Figure 2. 11 Data Flow Diagram, taken from [30]
1.17. Flow Chart

Flow Chart is a graphic representation of the logic or steps in a program or system. It represents how a program or activity moves through various processes or program routines. It uses symbol-symbol to represent the activities and arrows to represent the direction of activity through the process.

A flowchart (also spelled flow-chart and flow chart) is a schematic representation of a process. They are commonly used in business/economic presentations to help the audience visualize the content better, or to find flaws in the process [31]

Flowchart: A diagram consisting of a set of symbols (such as rectangles or diamonds) and connecting lines that shows step-by-step progression through a procedure, process or system [32]

The purpose of flowchart is to give useful picture that would describe the flow of process (processing steps) so that we can gain better way of communicating the logic of a system to all concerned, the problem can be analyzed in more effective way. Moreover, Flowchart also acts as a guide or blueprint during the systems analysis and program development phase, helps in debugging process, and it really helps programmer to put efforts more efficiently on that part.

- Flowcharts are simple to draw and easy to follow
- If Flowcharts are developed correctly then the result will be a clear and unambiguous description of the process that will help to clarify the understanding of the process structure [33]

Figure 2.12 shows an example of flowchart, which is water rocket launcher flowchart.
Figure 2. 12 Example of Flowchart, taken from [34]
1.18. Web Service

Web service is a software application that conforms to the web service interoperability organization basic profile 1.0 (an organization of web services vendors that are committed to defining a standard for web service interoperability). It is a software system designed to support interoperable machine-to-machine interaction over a network. It has an interface that is described in a machine-processable format such as WSDL (Web Service Description Language). With Web-Service, software component that is described via WSDL is capable of being accessed via standard network protocols such as but not limited to SOAP over HTTP. Web Service technologies are used for Application to Application (A2A) and Business to Business (B2B). A2A refers to disparate application with in a single organization communicating and exchanging data. Meanwhile B2B refers to multiple organizations, typically business partners, exchanging data. A2A is also known as Enterprise Application Integration (EAI), so that Web Services are software programs that use XML to exchange information with other software via common internet protocols such as HTTP as the key communication protocol of the World Wide Web.

A Web service is any piece of software that makes it available over the Internet and uses a standardized XML messaging system. There should be some simple mechanism for interested parties to locate the service and locate its public interface. The most prominent directory of Web services is currently available via UDDI, or Universal Description, Discovery, and Integration [38].

Several advantages by using web-service are:

- It enables components in different language and different platform to communicate each other.
- It promotes a modular approach of programming, so that multiple organizations can communicate with the same web-service.
- It is comparatively easy and inexpensive to implement, because they employ the existing architecture to exchange information so that companies don’t have to adopt entirely new software.
- It reduces the costs of Enterprise Application Integration (EAI) and Business to Business (B2B) communication.
- It can be implemented incrementally, rather than all at once. This lessens the cost of adopting web-services and can reduce organizational disruption resulting from an abrupt switch in technologies.
- It provides interoperability between various software applications running on disparate platforms.
- It allows software and services from different companies and locations to be combined easily to provide an integrated service.
- It allows the reuse of services and components within an infrastructure.
- It are loosely coupled thereby facilitating a distributed approach to application integration.

Figure 2.13 and figure 2.14 below describe the Web service architecture.
Figure 2. 13 Web Service Architecture, taken from [41]
There are 4 key points of web service which are XML (Extensible Markup Language), SOAP (Simple Object Access Protocol), WSDL (Web Services Description Language), and UDDI (Universal Description, Discovery, and Integration). XML (Extensible Markup Language) is a widely accepted standard for describing data and creating markup languages. It is defined by the W3C as an open, standard technology. It is used to organize documents and business data. In addition it can be stored or transmitted between two applications on a network. It is just a plain text documents that contain special tags that level different parts of a document or fields of data.

XML solves a key technology requirement that appears in many places. By offering a standard, flexible and inherently extensible data format, XML significantly reduces the burden of deploying the many technologies needed to ensure the success of Web services [42].

SOAP is one of the most common standard packaging formats for transmitting XML data between applications on the network and is used to deliver web-service. It consists of a set of standardized XML. So, when an application communicates with a web service, SOAP messages are the most common means through which the two systems...
exchange data. A SOAP message sent to a web service invokes a method provided by the service, meaning that the message request that the service execute a particular task. The Service then uses information contained in the SOAP message to perform its function; if necessary, the web service return the results via another SOAP which is SOAP Response.

Simple Object Access Protocol: When using the optional SOAP RPC Representation, a SOAP message represents a method invocation on a remote object, and the serialization of in the argument list of that method that must be moved from the local environment to the remote environment. [43]

WSDL is a standard for describing the structure of XML, data exchange between two system using SOAP. It is an XML-based language through which a web service can convey to other applications the methods that the service provides, and how those methods can be accessed. It lists and defines the service capabilities, states the location in a web, and provides instructions regarding its use, defines the kind of messages provided for the web service to perform its task, provide specific technical information that informs applications about how to connect to and communicate with web-services over HTTP or another communication protocol.

WSDL describes Web services starting with the messages that are exchanged between the requester and provider agents. The messages themselves are described abstractly and then bound to a concrete network protocol and message format. [44]

UDDI defines a standards set of web service operations / methods that are used to store and look up information about the web service application. It defines a standard SOAP-based interface for a web-service registry. We use UDDI to find a particular type of web-service, or to find out about the web service hosted by a specific organization. UDDI registry is often referred to as “Yellow-Pages” for web-service.
1.19. Parallel Conversion

Parallel conversion is a process of converting from one information system to a newer system by using both systems concurrently until the new system is demonstrably stable and reliable. Under this approach, the old and new systems are operated for some time period. This ensures that all major problems in the new system have been solved before the old system is discarded. This strategy minimizes the risk of major flaws in the new system causing irreparable harm to the business.
1.20. System Acceptance Test

System acceptance test is a final system test performed by end-users using real data over an extended time period. It is an extensive test that addresses three levels of acceptance testing: verification testing, validation testing, and audit testing.

- Verification testing runs the system in a simulated environment using simulated data. This simulated test sometimes called alpha testing. The simulated test is primarily looking for errors and omissions regarding end user and design specifications that were specified in the earlier phases but not fulfilled during constructions.

- Validation testing runs the system in a live environment using real data. This is sometimes called beta testing. During this validation, a number of items are tested.
  - *System performance*. To check whether the throughput and response time for processing is adequate to meet a normal processing workload.
  - *Peak workload processing performance*. To ensure that the system can handle workload during peak processing period.
  - *Human engineering test*. Is the system easy to learn?
  - *Methods and procedures test*. During the conversion, the methods and procedures for the new system will be put to their first real test.
- **Backup and recovery testing.** All backup and recovery procedures should be tested. This should include simulating a data loss disaster and testing the time required to recover from that disaster.

- Audit testing certifies that the system is free of errors and is ready to be placed into operation. Not all organizations require an audit. But many firms have an independent audit or quality assurance staff that must certify a system’s acceptability and documentation before that system is placed into final operation. There are independent companies that perform systems and software certification for end-users’ organization.

### 1.21. Integration Testing

Integration testing (sometimes called Integration and testing and abbreviated I&T) is the phase of software testing in which individual software modules are combined and tested as a group. Integration testing takes as its input modules that have been checked out by unit testing, groups them in larger aggregates, applies tests defined in an Integration test plan to those aggregates, and delivers as its output the integrated system ready for system testing. The purpose is to verify functional, performance and reliability requirements placed on major design items. These "design items", i.e. assemblages (or groups of units), are exercised through their interfaces using black box testing, success and error cases being simulated via appropriate parameter and data inputs. Simulated usage of shared data areas and inter-process communication is tested; individual subsystems are exercised through their input interface. All test cases are constructed to test that all components within assemblages interact correctly, for example, across procedure calls or process activations. The overall idea is a "building block" approach, in
which verified assemblages are added to a verified base which is then used to support the integration testing of further assemblages.

### 1.22. Regression Resting

Regression testing is any type of software testing which seeks to uncover regression bugs. Regression bugs occur whenever software functionality that previously worked as desired stops working or no longer works in the same way that was previously planned. Typically regression bugs occur as an unintended consequence of program changes. Common strategies are to run such a system after every successful compile (for small projects), every night, or once a week. Regression testing can be used not only for testing the correctness of a program, but it is also often used to track the quality of its output. For instance in the design of a compiler, regression testing should track the code size, simulation time, and compilation time of the test suite.

### 1.23. Spiral Model

Each phase of spiral model starts with a design goal and ends with the client reviewing the progress. Analysis and engineering efforts are applied at each phase of the project, with an eye toward the end goal of the project.

Usually, development of the system is using this spiral model for several reasons:

- Concentrates on evaluating and reducing risk.
- Get more realistic as work progresses, because important issues are discovered earlier.
- Need a constant review to stay on target.