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# Review on Architecture of Computer Networks

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***Abstract---*** *The Open Systems Interconnection model (OSI model) is a product of International Organization for Standardization. A OSI reference model is a conceptual blueprint of how communication should take place. It is a way of sub-dividing a communications system into smaller parts called layers. A layer is a collection of conceptually similar functions that provide services to the layer above it and receives services from the layer below it. When a communication system is designed in this manner, it is known as layered architecture. It's a set of guidelines that application developers used to create and implement application that run on a network. It also provides a framework for creating and implementing networking standards, devices, and internetworking schemes. This paper explains the OSI Reference Model, which comprises of seven different layers. Each layer is having its own responsibilities.*

***Keywords---*** *OSI Model, Seven Layers, Services, Functionality, Protocols.*

## I. INTRODUCTION

The concept of a seven-layer model was provided by the work of Charles Bachman, Honeywell Information Services. Various aspects of OSI design evolved from experiences with the ARPANET, the fledgling Internet, NPLNET, EIN, CYCLADES network and the work in IFIP WG6.1. The new design was documented in ISO 7498 and its various addenda. In this model, a networking system was divided into layers. Within each layer, one or more entities implement its functionality. Each entity interacted directly only with the layer immediately beneath it, and provided facilities for use by the layer above it.

The application, presentation, and session layers comprise the upper layers of the OSI Model. Software in these layers performs application specific functions like data formatting, encryption, and connection management. The transport, network, data link, and physical layers comprise the lower layers, which provide more primitive network specific functions like routing, addressing, and flow controls.

Protocols enabled an entity in one host to interact with a corresponding entity at the same layer in another host. Service definitions abstractly described the functionality provided to an (N)-layer by an (N-1) layer, where N was one of the seven layers of protocols operating in the local host. In 1983 the work of the two organizations was combined, and a single document describing the reference model for Open Systems Interconnection was produced. The term "open systems" refers to the fact that the specifications are publicly available to everyone. The purpose of the OSI model was to assist vendors and communications software developers to produce interoperable network systems. [1]

The OSI model is based on a widely accepted structuring technique called layering. According to this approach, the communications functions are partitioned into a vertical set of layers. Each layer performs a related set of functions, utilizing and enriching the services provided by the immediately lower layer. The layering approach was developed to address the following goals:

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- Provide a logical decomposition of a complex communications network into smaller, more understandable and manageable parts.
- Provide standard interfaces between network functions and modules.
- Provide a standard language for describing network functions, to be used by network designers, managers, vendors, and users.

An important task in the development of the OSI model was to group similar functions into layers, while keeping each layer small enough to be manageable, and at the same time, keeping the number of layers small, since a large number of layers would increase the processing overhead. The principles used in defining the OSI layers are summarized in following list (Stallings, 1987):

1. The number of layers should not be so many as to make the task of describing and integrating the layers more difficult than necessary.
2. Layer boundaries should be created at points where the description of services is small and the number of interactions between boundaries is minimized.
3. Separate layers should be created in cases where manifestly different functions are performed or different technologies are involved.
4. Similar functions should be collected into the same layer.
5. A layer should be created where functions are easily localized. This enables the redesign of the layer to take advantage of new technologies.
6. A layer should be created where there is a need for a different level of abstraction in the handling of data.
7. Changes of functions or protocols of a layer should be made without affecting other layers.
8. For each layer, boundaries with its upper and lower layers only are created.

The application of the above principles resulted in the seven-layer OSI reference model, which we describe next.

## II. How The Message Is Transferred From One System To Another System

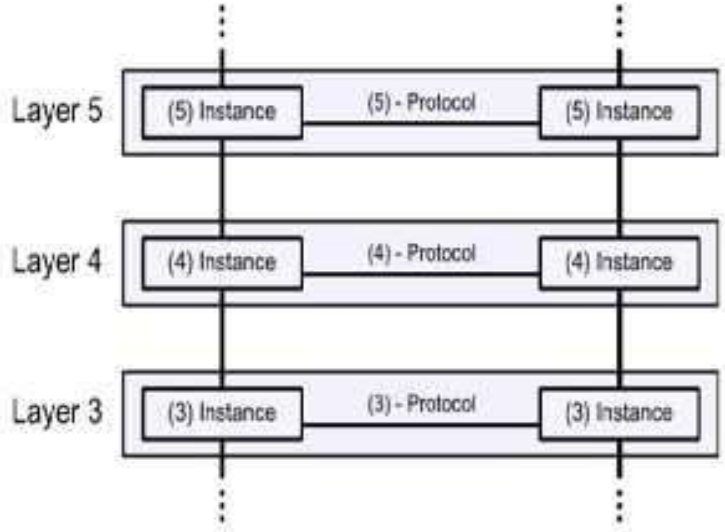


Fig. 1: Protocol Model

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An open system is a set of protocols that allow any two different systems to communicate regardless of their underlying structure. The purpose of OSI model is to show how to facilitate communication between different systems without requiring changes to the logic of the underlying hardware and software.

The OSI model isn't a protocol; it is a model for understanding and designing a network architecture that is flexible, robust and Interoperable. The model group's communication functions into seven logical layers.

A layer serves the layer above it and is served by the layer below it. For example, a layer that provides error-free communications across a network provides the path needed by applications above it, while it calls the next lower layer to send and receive packets that make up the contents of that path. [2]

## III. ARCHITECTURAL MODEL

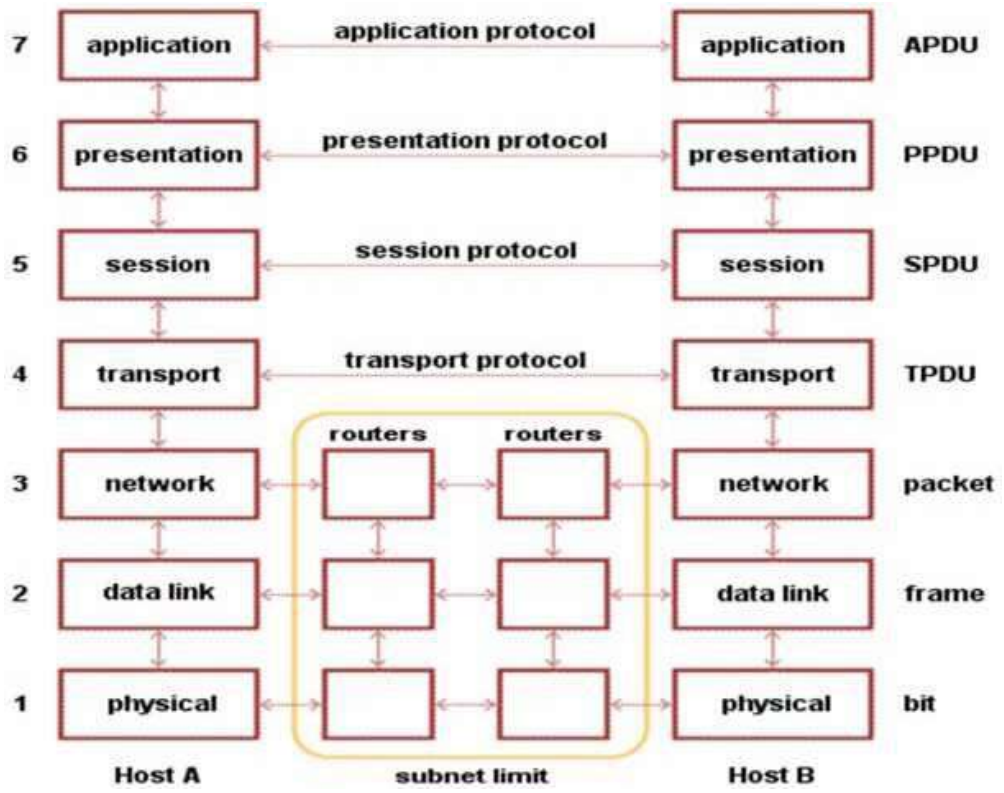


Fig. 2: Hierarchical 7 Layer Model

These jobs are split into seven layers, each of which depends on the function's "handed-off" from other layers. As a result, the OSI model also provides a guide for troubleshooting network problems by tracking them down to a specific layer. Here we'll take a look at the layers of the OSI model and what functions they perform within a network. The first networking protocols were developed by computer manufacturers. Each manufacturer developed its own protocols for its own platforms. Some manufacturers even had multiple protocols, because protocols were developed independently for different computer platforms. IBM, for example, had more than a dozen protocols back in the 1960s.However, as you have learned; computers and programs must use a common protocol to communicate. If many different protocols for data Communication exist, it is difficult to link computers into common networks.

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Thus, to correct the chaos of multiple protocols, computer vendors developed communication standards, both official and of the most important of these is the OSI model. The OSI model is not a protocol, but a reference model, or an abstract structure that describes the functions and interactions of various data communication protocols. It provides a conceptual structure that helps us discuss and compare network functions, just as other classification systems help biologists or chemists talk about their fields.

***Application Layer (AL)***

AL provides an interface between computer application and network. AL is the layer where network software (spreadsheet, word processor, FTP, TFTP, DNS, http and etc.) is generally defined.

***Presentation Layer (PRL)***

This layer attempts to identify the type of data to be transferred to network settings. On this layer, whether the package to be transferred is a text, picture, video or sound file is identified. PRL regulates the nature and type of data to be transferred, so data format is defined.

***Session Layer (SL)***

In SL, two computer applications are connected, used and ended. When a computer is in communication with more than one computer, SL provides communication with the right computer. In this process, data to be transferred to SL is separated by different sessions.

***Transport Layer (TL)***

TL divides data from top layers into pieces in the size of a network package. TCP, UDP protocols start on this layer. The protocols carry out tasks like error control.TL serves as a means of top layer transfer and also increases quality of network service (QoS –Quality of Service). As it is known, data on this layer is divided into pieces called segments and gradually transferred to the lower layer. TL provides end-to-end data transfer. Error control is done and due data transfer is checked.

***Network Layer (NL)***

NL is one of the most active layers in the OSI model. This is the layer where telecommunication services are active and router activities are defined. On this layer, data in segments are divided into packages and gradually transferred to the lower layer. In NL, the most economical data transfer between two stations is controlled. Owing to this layer, data is directed through routers .Messages are addressed at network phase and also reasonable addresses are changed into physical addresses. At this phase, procedures such as network traffic and directions are completed. IP protocol starts on this layer.[3]

## IV. BENEFITS OF OSI

"By separating the network communications into logical smaller pieces, the OSI model simplifies how network protocols are designed. The OSI model was designed to ensure different types of equipment (such as network adapters, hubs, and routers) would all be compatible even if built by different manufacturers."[4][6]

The OSI model has many benefits which include:

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a) Compatibility: The OSI model can fit to any compatible software/hardware from different users in other parts of the world. As software/hardware differs among various users so OSI is a model that is compatible to all.

b) Easy Troubleshooting: Since each layer in an OSI is independent of each other so it makes it easier to detect and solve all errors prevailing in it.

c) Easy Understanding Nature: OSI model is very interactive and even guides us to know what a model is, how it operates, and common methodologies, how new technologies are developed in existing networks. Security: OSI model have functionality for

Encryption and Decryption which has a major Add multiple network models: The OSI model is designed in such a way that user can further extend

## V. CONCLUSIONS

Not every network uses all of the model's layers. ISO's intent in creating the OSI model wasn't to describe every network but to give protocol designers a map to follow to aid in design. This model is useful for conceptualizing network components to demonstrate how they fit together to help the computers within the network communicate.[5]

The OSI reference model was formulated as a template for the structure of communications systems. It was not intended that there should be standard protocols associated with each layer. Instead, a number of different protocols have been

Instead, a number of different protocols have been developed each offering a different functionality. There are three major international organizations developing standards and protocols for communications including:

- International Standards Organization (ISO)
- American Institute of Electrical Engineers (IEEE) – produces standards for use by computer manufacturers
- International Telecommunications Union – Telecommunications Sector (ITU-T) – produces standards for connecting different types of national and international public networks

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