A REVIEW PAPER ON OSI MODEL – A SEVEN LAYERED ARCHITECTURE OF OSI MODEL

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Abstract: **The open system interconnection model, better known as the OSI model, is a network map that was originally developed as a universal standard for creating networks. But instead of serving as a model with agreed-upon protocols that would be used worldwide, the OSI model has become a teaching tool that shows how different tasks within a network should be handled in order to promote error-free data transmission. 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 OSI Developed by representatives of major computer and telecommunication companies beginning in 1983, OSI was originally intended to be a detailed specification of actual interfaces. Instead, the committee decided to establish a common reference model for which others could then develop detailed interfaces, which in turn could become standard. OSI was officially adopted as an international standard by the International Organization of Standards (ISO).**

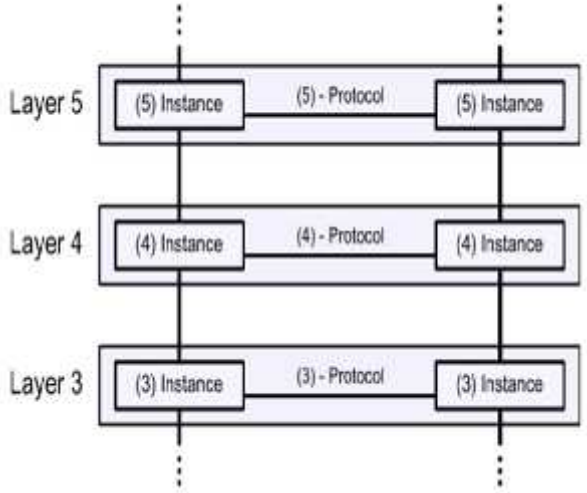
Index Terms:

OSI model, Network troubles, Troubleshooting, Troubles model, ISO, Protocol.

1. INTRODUCTION

The open system interconnection model, better known as the OSI model [l], is a network map that was originally developed as a universal standard for creating networks. But instead of serving as a model with agreed-upon protocols that would be used worldwide, the OSI model has become a teaching tool that shows how different tasks within a network should be handled in order to promote error-free data transmission. The Open Systems Interconnection model (OSI Model) is a conceptual model that characterizes and standardizes the internal functions of a communication system by partitioning it into abstraction layers. The model is a product of the Open Systems Interconnection project at the International Organization for Standardization (ISO), maintained by the identification ISO/IEC 7498-1.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 groups 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. Two instances at one layer

are connected by a horizontal connection on that layer.



Communication in the OSI-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.Thus, to correct the chaos of multiple protocols, computer vendors developed communication standards, both official and de facto. One 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.As a networking professional, there are two good reasons you must have a solid understanding of the OSI model.

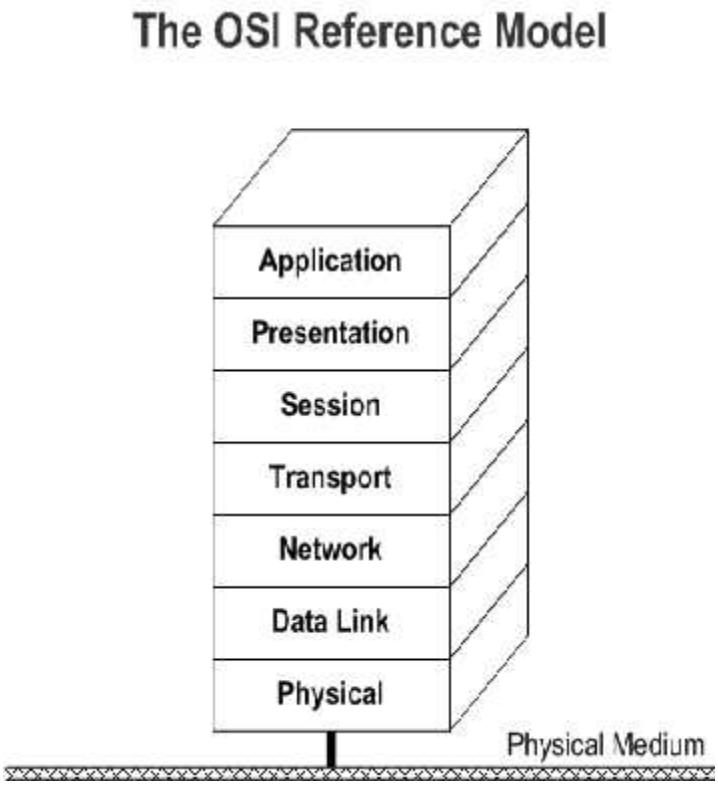


Figure 1. OSI model

The seven layers of the OSI model are -

* Physical
* DataLink
* Network
* Transport
* Session
* Presentation
* Application

1. Physical Layer

The Physical layer is the actual cable, fibers, cards, switches, and other mechanical and electrical equipment that make up a network. This is the layer that transforms digital data into signals that can be sent down a wire to transmit data. These signals are often electrical but, as in the case of fiber optics, they can also be non-electrical signals such as optics or any other type of pulse that can be digitally encoded. From a networking perspective, the purpose of the physical layer is to provide the architecture for data to be sent

and received. The physical layer is probably the easiest layer to troubleshoot but the most difficult to repair or construct, as this involves getting the hardware infrastructure hooked up and plugged in.

2. Data Link Layer

The Data link layer is where information is converted into coherent "packets" and frames that are passed to higher layers. Essentially, the data link layer unpacks raw data coming in from the physical layer and translates information from the upper layers into raw data to be sent over the physical layer. The data link layer is also responsible for catching and compensating fo ranyerrors that occur in the physical layer.

3. Network Layer

The network layer is where the destination for incoming and outgoing data is set. If the data link layer is the highway for cars to drive on, the network layer is the GPS system telling drivers how to get there. Addressing is added to the data by tacking on information around the data packet in the form of an address header. This layer is also responsible for determining the quickest route to the destination and the handling of any problems with packet switching or network congestion. This is the layer where routers work to ensure that data is properly re-addressed before passing it on to the next leg of the packet's journey.

4. Transport Layer

The transport layer is responsible for streaming data across the network. At this level, the data is not thought of in terms of individual packets but more in terms of a conversation. To accomplish this, protocols – which are defined as "rules of communication - are used. The protocols watch the complete transmission of many packets - checking the conversation for errors, acknowledging successful transmissions and requesting retransmission if errors are detected. The network layer and the transport layer work together like a postal system. The network layer addresses the data, much like a person addresses an envelope. Then, the transport layer acts as the sender's local postal branch, sorting and grouping all similarly addressed data into larger shipments bound for other local branches, where they will then be delivered.

5. Session Layer

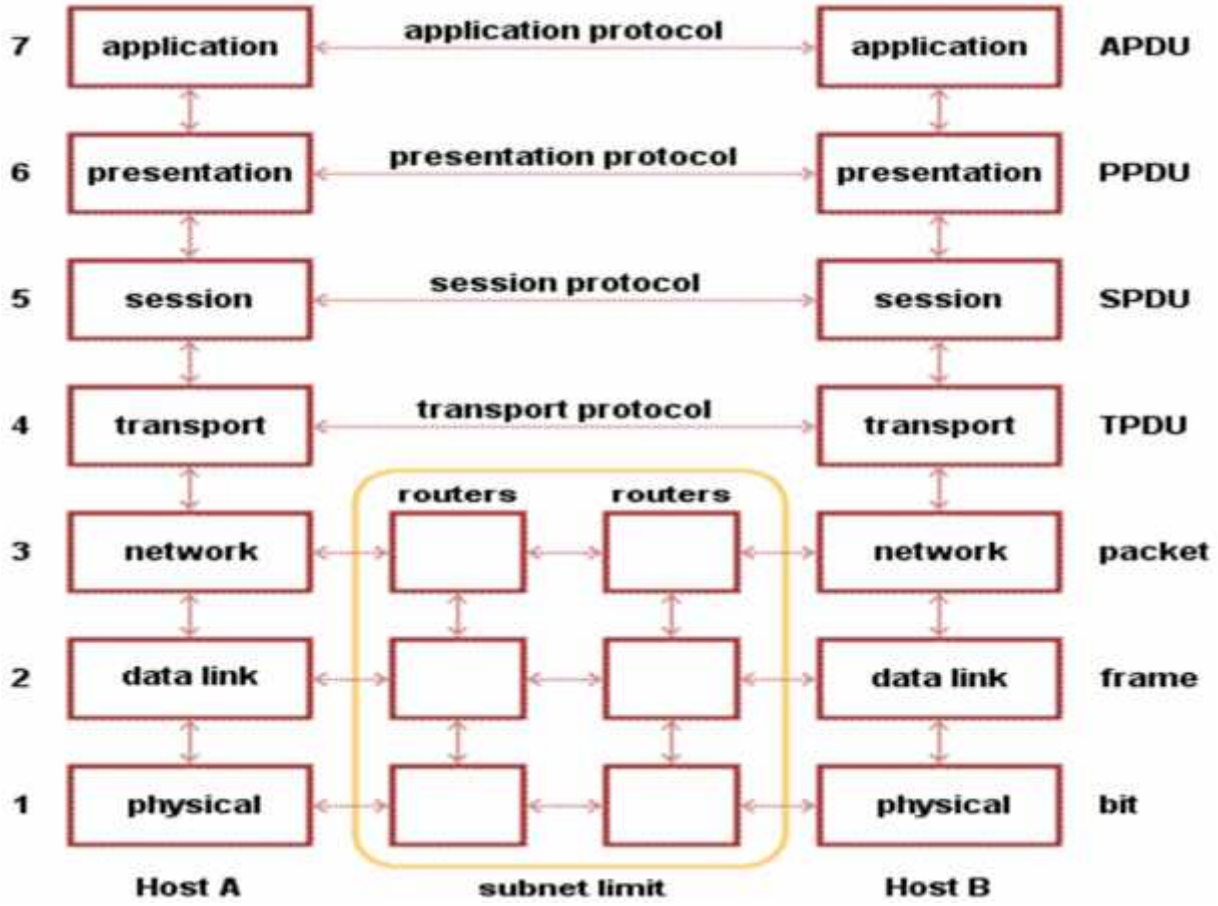
The session layer r is where connections are made, maintained and ended. This usually refers to application requests for data over the network. Whereas the transport layer handles the actual flow of data, the session layer acts as an announcer, making sure that the programs and applications requesting and sending data know their requests are being filled. In technical terms, the session layer synchronizes data transmission.

6. Presentation Layer

The presentation layer is where received data is converted into a format that the application it is destined for can understand. The work done at this layer is best understood as a translation job. For example, data is often encrypted at the presentation layer before being passed to the other layers for sending. When data is received, it will be decrypted and passed on to the application it is intended for in the format that is expected.

7. Application Layer

The application layer coordinates network access for the software running on a particular computer or device. The protocols at the application layer handle the requests that different software applications are making to the network. If a Web browser wants to download an image, an email client wants to check the server and a file-sharing program wants to upload a movie, the protocols in the application layer will organize and execute these requests.



2. PROPOSED NETWORK TROUBLES IDENTIFICATION

MODELS

2.1. Trouble Classification on Application Layer

As it is known, AL is a layer which includes all network software but it is irrelevant to hardware.

Here, it is possible to divide software into two categories: i) **Off-line software** (word processor, spreadsheet and etc.), ii) **On-line software** (TFP, FTP, http, DNS and etc.). In this case, troubles on AL are divided into two: **"Off-line Troubles"** and **"On-line Troubles"**. In network administration, off-line troubles are problems inside the host, and on-line troubles are software problems which affect sharing between computers.

2.2. Trouble Classification on Presentation Layer

In network settings, there might be share troubles caused by file format. Basically, network data has three formats: text, audio, video–graphic. In this respect, problems might be categorized as:

"Text Troubles", **"Audio Troubles"** and **"Video-Graphic Troubles"**. Therefore, text troubles are format malfunctions of text only files in Word, Excel and etc. Similarly, audio troubles are possible problems in formats such as "wav" and "avi". Video-graphic troubles refer to malfunctioning file formats such as "mpeg", "jpeg", "tiff" and "bmp". Briefly, troubles on PRL are divided into three categories.

2.3. Trouble Classification on Session Layer

SL, which functions to start communication between two computers [8] and end communication when data share is over, sometimes serves for right communication when there is multiconnection. Troubles in peer-to-peer model with two computers only are grouped under one category and troubles in multi-connection are grouped under another . In this way, troubles on SL are divided into two: These are

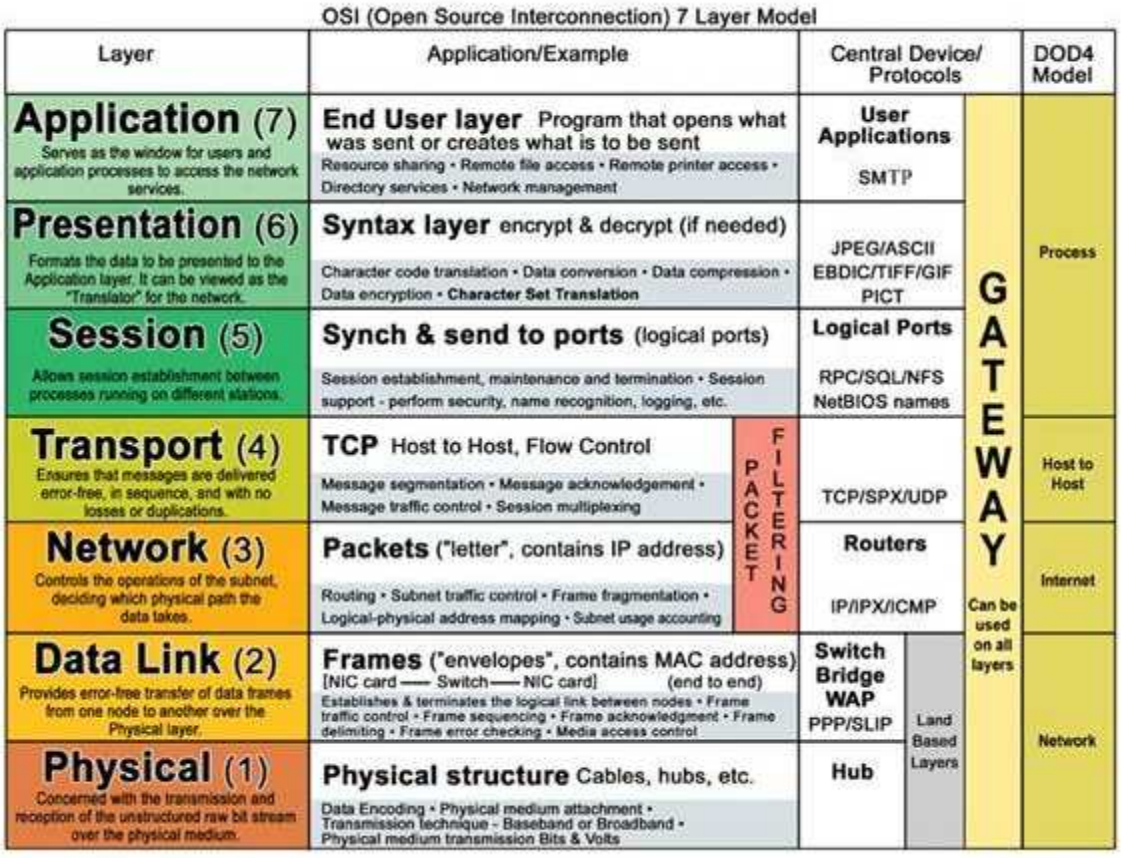
"Peer-to-Peer Troubles" and **"Multi-Connection Troubles**".

2.4. Trouble Classification on Transport Layer

On TL, where data to be transferred is first divided, the number of moves needed for segment transfer to the next terminal. This could be performed as one-way synchronous, two-way synchronous or three-way synchronous. Dividing is possible with UDP (User-Datagram Protocol) or TCP (Transmission Control Protocol). UDP is unreliable but fast, whereas TCP is reliable but slow. In this context, troubles on TL could be divided into two: "UDP Based Troubles" and "TCP Based Troubles". Also, there might be troubles when buffers occupy segment transfer settings. When this case is considered, network troubles on TL are divided into three categories: **"UDP Based Troubles", "TCP Based Troubles"** and **"Buffer Troubles"**. In this way, troubles on this layer are identified at a micro level for network administration and troubleshooting is faster.

2.5. Trouble Classification on Network Layer

It is the most active layer in Network and is known as a setting where telecommunication services and router devices are active. IP, IPX/SPX, known as routed protocol, is covered on Network Layer. Furthermore, RIP (Routing Information Protocol), IGRP (Interior Gateway Routing Protocol), EIGRP (Enhanced Interior Gateway Routing Protocol), OSPF (Open Shortest Path First), AGP (Autonomous Gateway Protocol) and BGP (Border Gateway Protocol), known as routing protocol, are identified on Network Layer



PRINCIPLES OF ISO FOR THE SEVEN LAYERS OF THE OSI ARCHITECTURE

ISO determined a number of principles to be considered for defining the specific set of layers in the OSI architecture, and applied those principles to come up with the seven layers of the OSI Architecture. Principles to be considered are as follows-

(i.) Do not create so many layers to make difficult the system engineering task describing and integrating these layers.

(ii.) Create a boundary at a point where the services description can be small and the number of interactions across the boundary is minimized.

(iii.) Create separate layers to handle functions which are manifestly different in the process performed or the technology involved.

(iv.) Collect similar functions into the same layer.

(v.) Select boundaries at a point which past experience has demonstrated to be successful.

(vi.) Create a layer of easily localized functions so that the layer could be totally redesigned and its protocols changed in a major way to take advantages of new advances in architectural, hardware, or software technology without changing the services and interfaces with the adjacent layers.

(vii.) Create a boundary where it may be useful at some point in time to have the corresponding interface standardized

(viii.) Create a layer when there is a need for a different level of abstraction in the handling of data, e.g., morphology, syntax, semantics

(ix.) Enable changes of functions or protocols within a layer without affecting the other layers.

(x.) Create for each layer interfaces with its upper and lower layer only. **(xi.)** Create further subgrouping and organization of functions to form sublayers within a layer in cases where distinct communication services need it.

CONCLUSION

The development of OSI Standards is a very big challenge, the result of which will impact all future computer communication developments. If standards come too late or are inadequate, interconnection of heterogeneous systems will not be possible or will be very costly. The work collectively achieved so far by SC16 members is very promising, and additional efforts should be expended to capitalize on these initial results and come up rapidly with the most urgently needed set of standards which will support initial usage of OSI (mainly terminals accessing services and file transfers In this way, network troubleshooting could be identified faster. In thetraditional approach, network troubles are expressed by names of layers. However, as it was shown in this research, troubles might vary on each layer. Therefore, troubleshooting will be faster. Such a standardization approach was OSI based and the proposed model

was structured in this way. The model is thought to contribute to make network troubleshooting faster and easier.

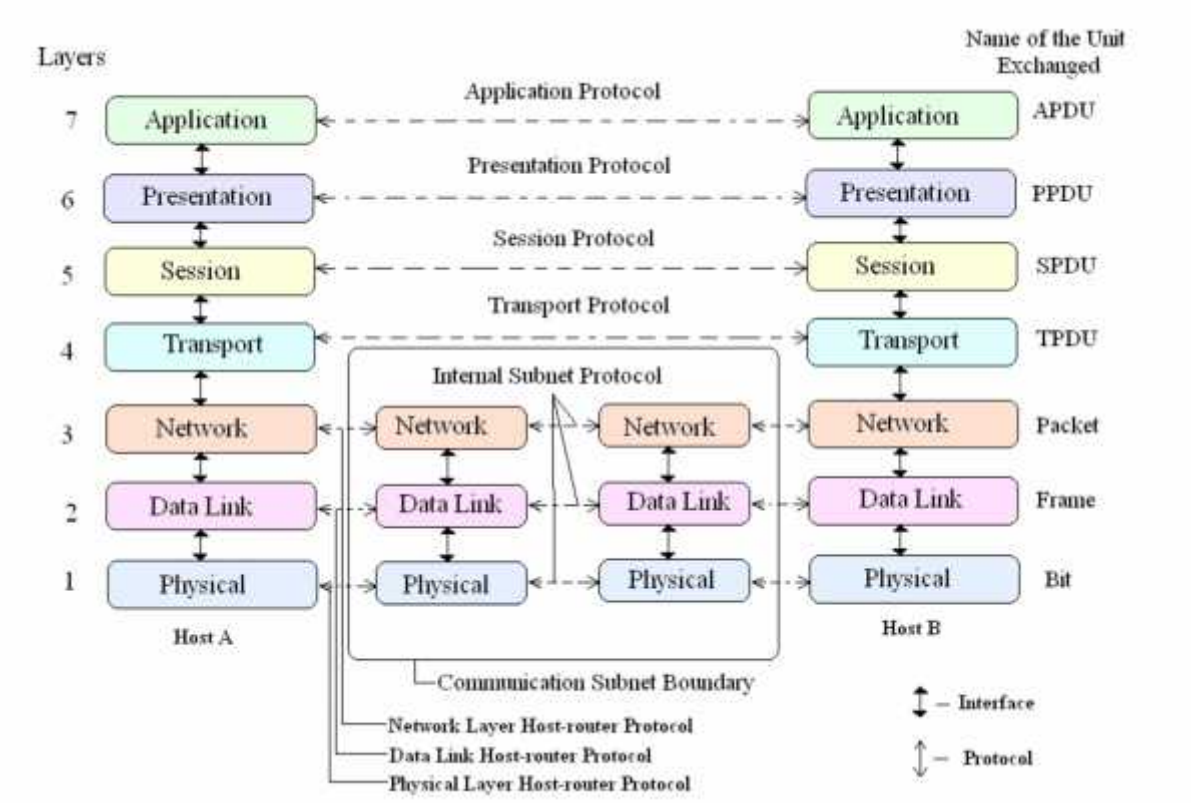


FIG -illustrates OSI Reference Model - A Seven Layered OSI Architecture

REFERENCES

[1] Stewart, K., Adams, A. and Reid, A. (2008). *Designing and Supporting Computer Networks,*

CCNA Discovery Learning Guide, Cisco Press, USA.

[2] Diane, T. (1999). *Designing Cisco Networks,* Cisco Press, USA.

[3] Rudenko, I. (2000). *Cisco Routers*, Coriolis Press, USA.

[4] Giles, R. (1999). *All-in-one CCIE Study Guide*, McGraw Hill Press, USA.

[5] Odom, S., Hammond, D. (2000). *Switching*, Coriolis, USA.

[6] Larson, R.E, Low, C. S. and Rodriguez, P. (2000). Routing, Coriolis Press, USA.

[7] Amato, V. (1999). *Cisco Networking Academy Program: Engineer Journal and Workbook Volume II*, Cisco Press, USA.Mason,

[8] Mizanian, K, Vasef, M. and Analoui, M. (2010) "Bandwidth modeling and estimation in peer to

peer networks", *International Journal of Computer Networks & Communications (IJCNC),* Vol. 2,

No. 3, pp 65-83.

[9] Yuste, A.J., Trivino, A., Trujillo, F.D., Casilari, E. And Estrella, A.D. (2009) "Optimized gateway

discovery in hybrid manets", *International Journal of Computer Networks & Communications*

(IJCNC), Vol. 1, No. 3, pp 78-91.

[10] J.Day, Zimmermann H, "The OSI reference model" published in IEEE vol.71,issue 12, pages:1334- 1340,1983.

[11.] H. Zimmermann "High level protocols standardization: Technical and political issues", *Proc. ICCC*, pp.373 -376, Aug.1976. [4.] ISO/TC97/SC16, *" Provisional model of open systems architecture"*, DOC.N34, Mar. 1978.