International Journal of Science and Engineering Applications
Volume 7–Issue 05, 68-70, 2018, ISSN:-2319–7560

A Proposed Study with the "DARPA Model" Network Issue Classifier

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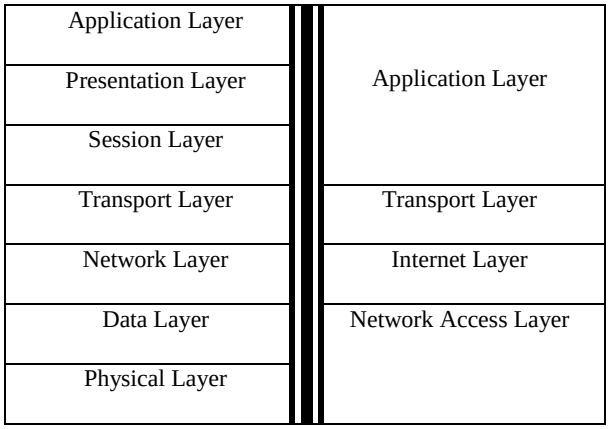
Abstract: DARPA model named after the U.S. government agency "Defense Advanced Research Projects Agency" that initially developed TCP/IP. Moreover, network issues are expressed by taking the DARPA 4 Layer model into account. Possible issues on such layer of these four categorized as efficacious network administration so they standardized in a way that would be more eligible. Network issue shooting policy developed by considering the mentioned earlier model.

Keywords: DARPA model, Network issues

1. INTRODUCTION

TCP/IP protocols compressed from 7 to 4 layers calling it "*DARPA model"*, named after the American government agency that initially dealt with the so called TCP/IP [1]. The layers of DARPA model are: Application, Transport, Internet, and Network Interface. Each layer in the DARPA model compared to single or several layers of the old layers in Open Systems Interconnection (OSI) model [2, 3, and 4].



7 - Layer OSI Model *4 - Layer DARPA Model*

I. Application Layer

The *Application layer* provides the access ability to such services of other layers and characterizes the protocols that applications use to exchange data. Widely application used in application layer such as (Telnet, SMTP, spreadsheet, word processor, FTP, TFTP, DNS, http and etc.) it consists the old three layers in the *OSI Model* (Application, Presentation & Session).

II. Transport Layer

The *Transport layer* (also known as the Host-to-Host Transport layer) responsible for providing the Application layer with session and datagram communication services, two core protocols of the Transport layer are TCP and UDP.

III. Internet Layer

Responsible for addressing, packaging, and routing functions. The core protocols of the Internet layer are IP, ARP, ICMP, and IGMP.

IV. Network Access Layer

Responsible for placing TCP/IP packets on the network medium and receiving TCP/IP packets off the network medium. TCP/IP was designed to be independent of the network access method [5], frame format, and medium. In this way, TCP/IP can be used to connect differing network types. These include LAN technologies such as Ethernet and Token Ring and WAN technologies [6, 7].

2. PROPOSED NETWORK TROUBLE IDENTIFIER MODELS

I. Issue Classification on Application Layer

As it is known, Application layer is a layer which includes all network software but it is irrelevant to hardware. Here, it is possible to split or divide them to two categories: ***i)*** **Off-line software** (word-processor, spread-sheet and etc.), ***ii)*** **On-line software** (TFP, FTP, http, DNS and etc.). In this case, issues on Application layer are divided into two: **"Off-line Issues"** and **"On-line Issues"**. In network administration, off-line issues are problems inside the host, and on-line issues are software which affects sharing between computers. As for presentation there will be issues such as Text, audio, video–graphic. Such Problems might be categorized as: **"Text Issues"**, **"Audio Issues"** and **"Video-Graphic Issues"**. Therefore, text issues such format malfunctions of text only files in MS (Word, Excel and etc.) Problems in peer-to-peer model with two PCs just are assembled under one category and problems in connection-multi are grouped under another.

In this way, problems of session are split down into pair: These are **"Peer-to-Peer Issues"** and **"Multi-Connection Issues**" [8].

II. Issue Classification on Transport Layer

The *Transport layer* (Known as the Host-to-Host) is in charge of giving the Application layer session and datagram communication services. The Transport layer core protocols is *Transmission Control Protocol* (**TCP**) and the *User Datagram Protocol* (**UDP**). Network Problems are divided into tri-categories: **"UDP Based Issues", "TCP Based Issues"** and **"Buffer Issues"**. In this way, troubles on this layer are at a micro level for network administration identification and troubleshooting become faster.

A) **TCP:** Gives a balanced, connection-oriented, dependable communications service. TCP is in charge for establishment of a TCP connection, the sequencing and acknowledgment of packets sent, and the recuperation of packets lost amid transmission.
B) **UDP:** Gives a balanced or one-to-many, connectionless, inconsistent communications service. UDP is utilized when the amount of data to be small when transferred (for example data that would fit into a solitary packet), when the overhead of setting up a TCP connection isn't wanted or when the applications or upper layer protocols give dependable conveyance.

3. ISSUE CLASSIFICATION ON INTERNET LAYER

The *Internet layer* is addressing, packaging, and routing functions which the internet layer responsible for. The core protocols of the Internet layer are **IP, ARP, ICMP, and IGMP**.

- **The *Internet Protocol* (IP)** is a routable protocol in charge of IP addressing, packet routing, and packet fragmenting and reassembly.
- **The *Address Resolution Protocol* (ARP)** Is in charge of Internet layer address's resolution to the Network Interface layer address such as a hardware address.
- **The *Internet Control Message Protocol* (ICMP)** Is in charge for giving symptomatic functions and errors reports due to the delivery failure of IP packets.
- **The *Internet Group Management Protocol* (IGMP)** is responsible for the management of IP multicast groups. In internet layer issues are classified as: "**Hardware Issues"** for standard router hardware problems, **"Echo Message Issues** may categorized as Non-reach problems like echo messages such as ping to the next terminal and tracerout. Problems caused by telecommunication systems in general might be categorized as "**Telecommunication Issues"**. Problems on internet layer caused by wrong structuring of routed protocols are standardized as "**Routed Configuration Issues"** problems on internet layer in network administration cannot be handled under one category and the fact that problem on one layer may vary should be taken into account. Thus, standardization the problem by categorization is predestined [9].

4. PROBLEM CLASSIFICATION ON NETWORK ACCESS LAYER

There are active devices such as switch and bridge used in LAN administration, and protocols such as PPP (Point-to-Point Protocol), HDLC (High Data Link Control), and Frame Relay which are Wide Area Network's protocols. As a result, Problems on this layer might belong to both LAN and WAN. There is NIC (Network Interface Card), an indispensable part for LAN for communication. As it is easy to recall, there are two sub-layers on MAC (Media Access Control) and LLC (Logic Link Control). MAC totally refers to framing on LAN based on NIC. Standardization or so to be called classifying of Problems *network access layer* will be realized according to the above mentioned information. Problems on WAN might be Classified as **"WANs Protocols Issues"**. Problems on NIC, an determined part for communication in LAN administration, are called **"NIC Issues"** and problems in MAC address, which has virtually been changed recently, are called **"MAC Issues"**. Therefore, Classification is ensured. Problems on LLC, which provides transfer from Data Link Layer to Network Layer within the Network Access Layer, might be standardized as **"LLC Issues"**. In this sense, it is possible for a network administrator to identify Problems on Network Access Layer immediately. This layer in charge of setting TCP/IP packets on the medium of the network and receiving TCP/IP packets off that medium. TCP/IP was intended to the network access method and being independent, frame format, and medium. Along these lines, TCP/IP can be what we can call "interface utilization" by connecting different network types. These comprise LAN technologies for example like Ethernet, Token Ring and WAN technologies such as X.25 and Frame Relay [10]. Unrestrained from any specific network technology TCP/IP the ability to be adapted to new technologies such as Asynchronous Transfer Mode (ATM). Network Access layer encompasses the Data Link and Physical layers of the OSI model. Note that the Internet layer does not take advantage of sequencing and acknowledgment services that might be present in the Data-Link layer. An untrusted Network Interface layer is assumed, and trusted communications through session establishment and the sequencing and acknowledgment of packets is the obligation of the Transport layer. It is known that all data on communication networks are changed into electrical signals (0-1). Data to be transferred in network settings are varies to be into electrical signals on physical layer and this layer is the last phase where data splits. In this unique circumstance, on physical layer, there are active-passive components such as electrical signals, cables, modems and hubs. Troubles on this layer are generally electrical problems. Troubles on cables such as UPT, STP, Coaxial and RS-232, V.35, especially used in LAN and WAN, are handled on Physical Layer. Cable based troubles on mentioned layer above might be categorized as **"Cables Troubles"** and excessive voltage loadings might be called **"Overload Voltage Troubles"**. In addition, troubles in hub devices used on LAN might be standardized as **"Hub Troubles"** and troubles in modems used on WAN might be

standardized as **"Modem Troubles".** Moreover, broadcast troubles in wireless settings should be handled on PL. **"Wireless Wave Signal Troubles"** standard may be eligible for such troubles. In this way, possible troubles on Physical Layer are standardized and troubleshooting in network administration could be faster [11].

Layers	Troubles
Application Layer	Off-line Troubles, On-line Troubles, Text Troubles, Audio Troubles, Video-Graphic Troubles, Peer-to-Peer Troubles, Multi-connection Troubles
Transport Layer	UDP Based Troubles, TCP Based Troubles, Buffer Troubles
Internet Layer	Hardware Troubles ,Echo Message Troubles ,Telecommunication Troubles, Routed Configuration Troubles, Routing Configuration Troubles
Network Access Layer	WANs Protocols Problems on, Network Access Layer , NIC **Issues** ,MAC **Issues**, LLC **Issues** ,Cables **Issues**, Overload Voltage Troubles, Hub Troubles, Modem Troubles, Wireless Signal Wave Troubles

5. CONCLUSION:

In this research, network troubles were identified and standardized for network administration. In this way, network troubleshooting could be identified faster. In the traditional 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.

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