

SESSION 1

Tujuan: Mengetahui Dasar dan Pengertian umum Komunikasi Data

Pokok bahasan: Dasar-dasar Komunikasi Data

Reference:

- Book 5 (Bab 2), Buku 6 (Bab 1)
- IBM Glossary of Computing Terms, <http://www.networking.ibm.com/nsg/nsgmain.htm>
- Alentis Trade Journal, What is an ASP? <http://www.alentis.com/aspinfo.asp?aspinfoID=874&streamID=11>

Additional Reference:

- GSM World, <http://www.gsmworld.com>
- GSM World Glossary, http://www.gsmworld.com/using/glossary_using.html
- Yahoo! Broadcast, <http://www.broadcast.com/>
- International Telecommunications Union (ITU), <http://www.itu.int/>
- European Telecommunications Standards Institute (ETSI), <http://www.etsi.org/>
- Telecommunications Industry Association (TIA), <http://www.tiaonline.org/>
- The T1 Committee, <http://www.t1.org/>

Tugas:

- Form 10 groups and try finding the definition and providing description of **Data Communication System Parameter**. (Rudy's Class)

BASIC DATA COMMUNICATION CONCEPT

Transmitter & receiver devices, transmission medium and data package (the thing we want to transmit)

TRANSMITTER

Transmitter is the device capable to initiate connection and send data to the transmission medium

RECEIVER

Receiver is the device capable to receive data sent by the receiver through the transmission medium.

TRANSCEIVER

A **transceiver** is a combination of transmitter and receiver in a single package. The term applies to wireless communications devices such as cellular telephone and cordless telephone sets, handheld two-way radios, and mobile two-way radios.

In a radio transceiver, the receiver is silenced while transmitting. An electronic switch allows the transmitter and receiver to be connected to the same antenna, and prevents the transmitter output from damaging the receiver. With a transceiver of this kind, it is impossible to receive signals while transmitting. This transmission mode is called **half duplex**. Transmission and reception often, but not always, are done on the same frequency.



Some transceivers are designed to allow reception of signals during transmission periods. This mode is known as **full duplex**, and requires that the transmitter and receiver operate on substantially different frequencies so the transmitted signal does not interfere with reception. Cellular and cordless telephone sets use this mode. Satellite communications networks often employ full-duplex transceivers at the surface-based subscriber points. The transmitted signal (transceiver-to-satellite) is called the uplink, and the received signal (satellite-to-transceiver) is called the downlink.



Another mode of communication is called **simplex**, which a device can only act as a transmitter or receiver, but not both. Thus the direction of communication is constantly one way.

Thus **communication modes** are: (see explanation above)

- Simplex
- Half-Duplex
- Full-Duplex

TRANSMISSION MEDIA

Transmission media is classified into two groups: Guided and unguided.

- **Guided media.** The waves are guided along a physical path, e.g.: twisted pair, coaxial cable and optical fiber.
 - **Two-wire open line.** Two-wire open line is the simplest transmission medium, which supports up to 50m transmissions with 19.2kbps. This type of medium must be protected from cross coupling (cross talk) of electrical signals, it is also susceptible to noise signals and electromagnetic radiation.
 - **Twisted-pair line.** Twisted pair is the ordinary copper wire that connects home and many business computers to the Telephone Company. To reduce cross talk or electromagnetic induction between pairs of wires, two insulated copper wires are twisted around each other. Each connection on twisted pair requires both wires. This type of media can support up to 1Mbps over short distance (100m).
 - For some business locations, twisted pair is enclosed in a shield that functions as a ground. This is known as shielded twisted pair (**shielded twisted pair** or **STP**), which has protective screen to reduce signal interference effect.
 - Ordinary wire to the home is unshielded twisted pair (**Unshielded Twisted Pair** or **UTP**), which is used in telephone and networks (data communication) communication.
 - **Coaxial Cable.** To overcome the skin effect, Coaxial cable use protective layers to shield the center conductor from external interference from the outer conductor and electromagnetic radiation. It can be used with various signal types and can reach several hundred meters in 10Mbps.
 - **Optical Fiber.** FO carries the transmission in the form of light beam in a glass fiber. A light wave has much wider bandwidth than electrical signal in a wire. It also immune from electromagnetic interference and cross talk, thus it can be used for high-speed transmission or low speed transmission in a noisy environment. FO can reach hundreds of Mbps
- **Unguided media.** Provides means for transmitting electromagnetic waves but not guide them, e.g. propagation through air, vacuum and seawater.
 - **Satellite.** A microwave beam is transmitted to the satellite on board circuit (transponder), which then relayed to a pre-defined destination. Communication using satellite usually requires 2 channels, one for up-link and the other for downlink connection both will use extremely high frequency band. E.g. of the communication application using this type of medium is ATM machine with its VSAT (Very Small Aperture Terminal) and mobile cell phone.
 - **Terrestrial Microwave.** Terrestrial microwave links is widely used to provide communication links when it is too expensive to establish physical transmission medium. Terrestrial microwave link requires the existence of unobstructed line

of sight and it can be used reliably over 50Km distance. E.g. of the application using this type of media would be the PSTN/Cell-phone provider transmission between ground stations in different provinces.

- **Radio link.** Radio wave is almost similar with terrestrial microwave, but it over much shorter area coverage and usually used in distributed computer networks where it would be much too expensive to establish extensive wired connection. E.g. of the application using this type of media would be Bina Nusantara's BiNus Access connections.

WHY DATA COMMUNICATION?

TIME SHARING

- Network connection to the Internet, which is shared among several personnel of the company.

DATA SHARING

- File sharing between staff in a network or over the Internet e.g using Novell Netware.

PROGRAM SHARING

- Windows Terminal Server to give multi-user access to a single application, we can install once and use it in distributed environment across the network by several people.
- ASP (Application Service Provider) is the delivery of application functionality and associated services across a network to multiple customers using a pay-as-you-go payment model. The core proposition behind an ASP is the delivery of pre-configured template software from a remote location over an IP network on a subscription-based outsourcing contract.
 - True ASP solutions do not include and are not synonymous with one-to-one relationships, post-implementation contracts only, application management, outsourcing, Web hosting, application hosting, co-location or payment for perpetual licenses.
 - An ASP solution always includes services around a pre-configured solution implemented offsite vs. simply taking an application that has already been implemented onsite and moving it offsite, as in a one-to-one customized outsourcing deal. Over time, some enterprises may choose to use ASP solutions for rapid deployment, and later migrate their solution to a more customized, one-to-one model, if needed

EQUIPMENT SHARING

- Network printer shared among several people in the network.
- Network scanner as means to share resources to achieve higher efficiency in resource utilization.

DATA COMMUNICATION TOPOLOGY

BROADCAST (POINT TO MULTIPOINT)

In general, to **broadcast** (verb) is to cast or throw forth something in all directions at the same time. Example is a radio or television broadcast, which transmit programs over airwaves for public reception by anyone with a receiver.

The term is sometimes used in e-mail or other message distribution for a message sent to all members, rather than specific members, of a group such as a department or enterprise.

On the Internet, certain Web site deliver original or redistributed broadcasts from existing radio and television stations, using streaming sound or streaming video techniques, to Web users who visit the Web site or "tune it in" using a special program such as RealPlayer. Like publicly available radio and television broadcasts, Web broadcasts are available to anyone. The Web now offers live as well as prepackaged broadcasts and also plays back audio and videotapes. Some programming is scheduled and other prepackaged programs can be delivered on demand. Many Web users listen to music from a particular broadcasting site as they browse other sites on the Web.

POINT TO POINT

Point to point provide single link between two nodes, it is the most common method of connectivity and widely used in WAN (Wide Area Network) and MAN (Metropolitan Area Network). Examples of the application of point-to-point are Private line, circuit switched and packet switched services. Analogues example of the Point-To-Point is when you send an e-mail to a single person, only that targeted destination will receive the data package and no one else.

PARAMETER IN DATA COMMUNICATION SYSTEM

TRIB (TRANSFER RATE OF INFORMATION BITS)

TRIB is the amount of bit received at the receiver divided by the total transmission time. It is used to measure the amount of information received at the destination.

BER (BIT ERROR RATE)

In telecommunication transmission, the **bit error rate** (BER) is the percentage of bits that have errors relative to the total number of bits received in a transmission, usually expressed as ten to a negative power. For example, a transmission might have a BER of 10 to the minus 6, meaning that, out of 1,000,000 bits transmitted, one bit was in error. The BER is an indication of how often a packet or other data unit has to be retransmitted because of an error. Too high a BER may indicate that a slower data rate would actually improve overall transmission time for a given amount of

transmitted data since the BER might be reduced, lowering the number of packets that had to be resent.

A BERT (bit error rate test or tester) is a procedure or device that measures the BER for a given transmission.

A **packet** is the unit of data that is routed between an origin and a destination on the Internet or any other network

CHANNEL THROUGHPUT

- In computer terminology, throughput is the amount of work that a computer can do in a given time period. Historically, throughput has been a measure of the comparative effectiveness of large commercial computers that run many programs concurrently. Recent measures assume a more complicated mixture of work or focus on some particular aspect of computer operation. While "cost per million instructions per second (millions of instructions per second)" provides a basis for comparing the cost of raw computing over time or by manufacturer, throughput theoretically tells you how much useful work the MIPS are producing.
- In data transmission, throughput is the amount of data moved successfully from one place to another in a given time period through a single communication channel.

RELIABILITY

Reliability is the measure of which to judge whether a device (Transmitter, receiver or the transmission channel) is able to operate properly at a given period of time for a certain level of usage. For example: A cell phone using pre-paid card Pro-XL is said to be reliable when is used inside Jakarta, not inside certain buildings and not during peak hour; or a modem connection to the university is said to be reliable if you are connecting from a any phone number with the same prefix, between 9:00PM through 6:00AM and as long as the total concurrent user to the network is below 100 caller.

AVAILABILITY

Availability is the measure of which to judge whether a device is available or ready to be serves when needed. It is calculated as the ratio between MTBF (Mean Time Between Failure) and the sum of MTBF and MTTR (Mean Time To Repair).

$$Availability = \frac{MTBF}{MTBF + MTTR}$$

- **MTBF** is the device's predicted lifetime by the manufacturer starting from the first time the device stars its operational service until it is no longer able to do so without experiencing any device or hardware failure.
- **MTTR** is the predicted time required to repair or do maintenance on the device when it does experiencing device failure.

Other form of availability measurement is by measuring the “downtime” of a system or device during its service in the company. The downtime is the time where the system is not available to give any service, which it should provide.

CHANNEL TRANSFER DELAY (PROPAGATION DELAY)

Channel transfer delay or propagation delay is the amount of time required by a signal (either it is in the form electronic current in a wire, light in fiber optic medium or electromagnetic wave) to propagate (move) from the transmitter’s transmission point to the receiver’s receiving point.

TURNAROUND TIME

Response time

According to the IBM Dictionary of Computing (which cites International Organization for Standardization Information Technology Vocabulary as the source), response time is:

The elapsed time between the end of an inquiry or demand on a computer system and the beginning of a response; for example, the length of the time between an indication of the end of an inquiry and the display of the first character of the response at a user terminal.

CHANNEL ESTABLISHMENT TIME

Channel establishment time is the total time required by the transmission medium (PT Telkom’s PSTN switches in public telephone network, or between your personal modem and the ISP’s modem pool in dial up network) to form a live link between the transmitter and the receiver (for Simplex) or between 2 transceivers (Half duplex & Full duplex).