JARINGAN KOMPUTER
PHYSICAL LAYER

STT TERPADU NURUL FIKRI

TEKNIK INFORMATIKA & SISTEM INFORMASI

2018

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NURUL FIKRI

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Ke-14	Review

FUNGSI MANUSIA SEBAGAI KHOLIFAH

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2. Al Baqarah

Penciptaan manusia dan penguasaannya di bumi

وَإِذْ قَالَ رَبُّكَ لِلْمَلَٰٓئِكَةِ إِنِّى جَاعِلٌ فِى ٱلْأَرْضِ خَلِيفَةً ۖ
قَالُوٓا۟ أَتَجْعَلُ فِيهَا مَن يُفْسِدُ فِيهَا وَيَسْفِكُ ٱلدِّمَآءَ وَنَحْنُ نُسَبِّحُ
بِحَمْدِكَ وَنُقَدِّسُ لَكَ ۖ قَالَ إِنِّىٓ أَعْلَمُ مَا لَا تَعْلَمُونَ ﴿٣٠﴾

30. Ingatlah ketika Tuhanmu berfirman kepada para Malaikat: "Sesungguhnya Aku hendak menjadikan seorang khalifah di muka bumi." Mereka berkata: "Mengapa Engkau hendak menjadikan (khalifah) di bumi itu orang yang akan membuat kerusakan padanya dan menumpahkan darah, padahal kami senantiasa bertasbih dengan memuji Engkau dan mensucikan Engkau?" Tuhan berfirman: "Sesungguhnya Aku mengetahui apa yang tidak kamu ketahui."

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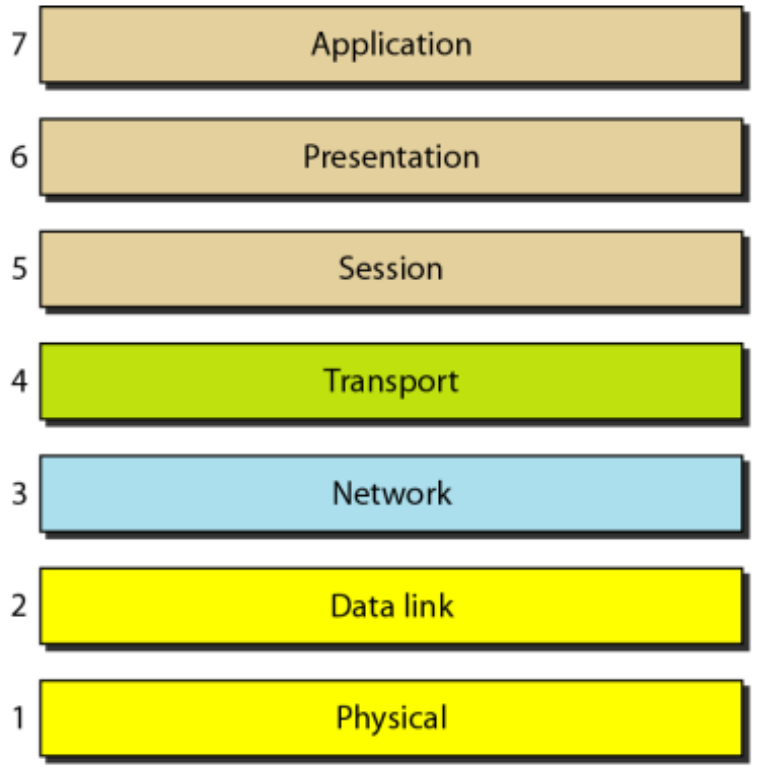
STANDAR PROTOKOL KOMUNIKASI

- Model Referensi OSI International Standard Organization (ISO) pada tahun 1984 mempublikasikan model OSI (Open Systems Interconnection) sebagai model refrerensi untuk mendisain protokol komunikasi.
- Model OSI membagi protokol komunikasi menjadi 7 lapis/layer yang masingmasing memiliki fungsi terhadap proses komunikasi.



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FUNGSI MASING-MASING LAYER

Layer	Fungsi
Application	Menghubungkan aplikasi yang membutuhkan pengiriman data dengan sumber daya jaringan
Presentation	Menerjemahkan, mengurus enkripsi dan kompresi data
Session	Membuat, mengelola, dan menutup sesi
Transport	Menjamin proses pengiriman yang dapat diandalkan
Network	Menyampaikan paket-paket dari sumber ke tujuan
Datalink	Mengelompokkan bit dalam frame untuk proses pengiriman dari hop/node ke hop/node
Physical	Mengirim bit melalui media

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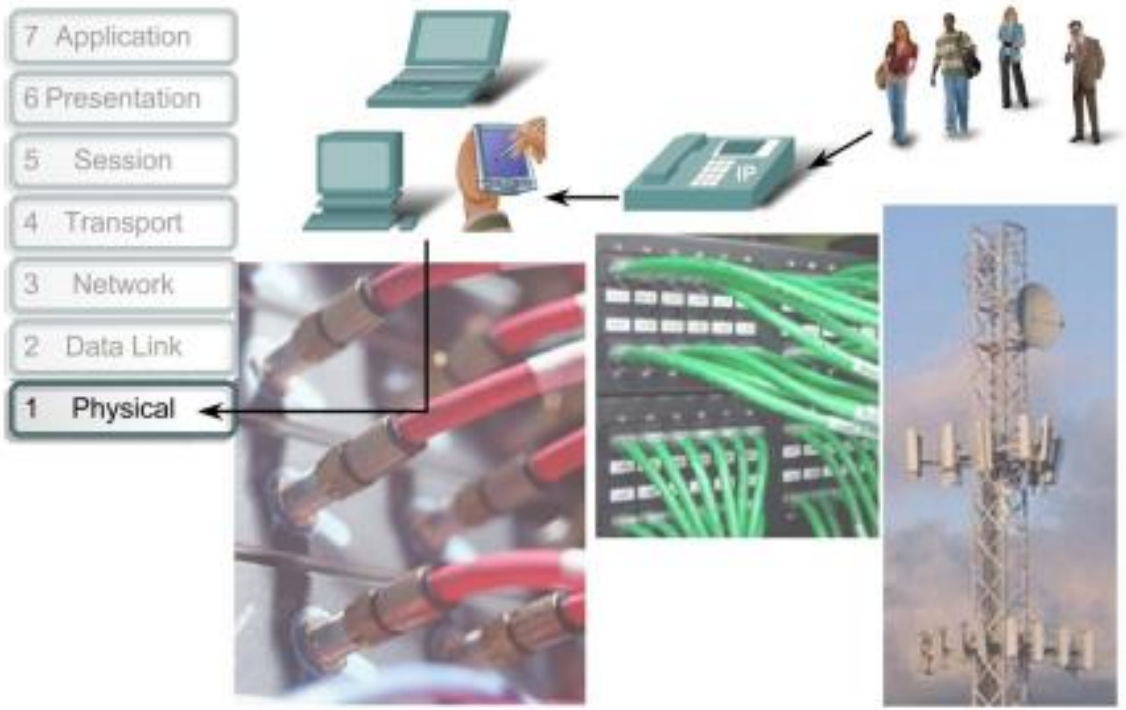
TUGAS PHYSICAL LAYER

- Mengirimkan bit-bit dalam suatu pola sinyal di media (elektrik, optik, atau wireless) yang merepresentasikan bit-bit di setiap frame data yang dibentuk oleh layer di atasnya



The Physical layer interconnects our data networks.

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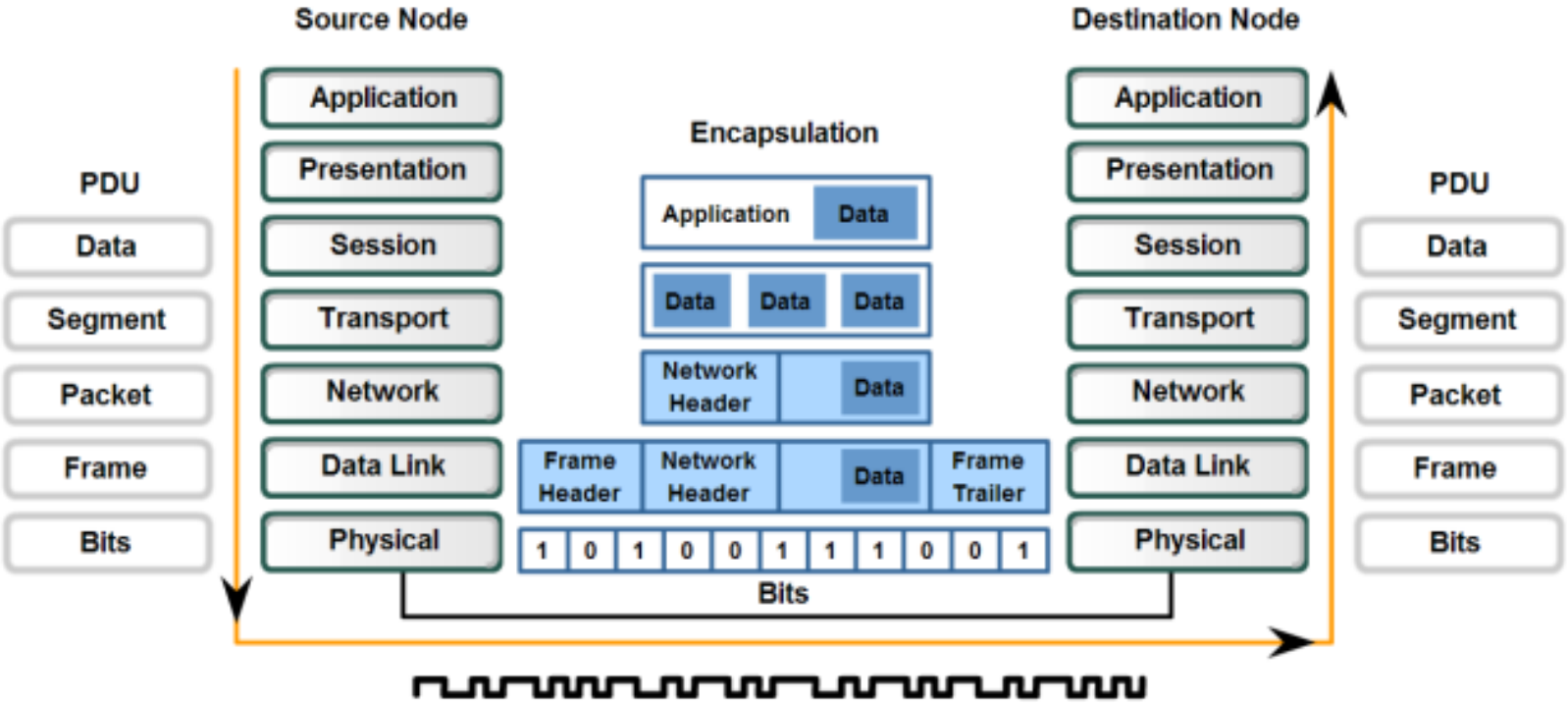
CARA KERJA PHYSICAL LAYER

- Frame data diambil dari Data link layer dan dikonversikan ke bit-bit dan lalu ke dalam bentuk sinyal yang diperlukan dalam media fisik yang digunakan



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STANDAR PHYSICAL LAYER

- Menentukan spesifikasi kabel dan aspek-aspek fisik dari komunikasi jaringan.
  Terdapat 4 area standarisasi di physical layer
  1. Terkait sifat fisik dan elektrikal dari media
  2. Terkait mechanical dari connectors (pinout, bahan, ukuran)
  3. Terkait bentuk representasi bit oleh sinyal
  4. Terkait definisi sinyal untuk informasi kontrol pengiriman di media

- Semua perangkat jaringan seperti NIC, interface, kabel konektor, dsb harus diproduksi mengikuti spesifikasi yang ada di standar ini.

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STANDAR PHYSICAL LAYER

Standard organization	Networking Standards
ISO	• ISO 8877: Officially adopted the RJ connectors (e.g., RJ-11, RJ-45) • ISO 11801: Network cabling standard similar to EIA/TIA 568.
EIA/TIA	• TIA-568-C: Telecommunications cabling standards, used by nearly all voice, video and data networks. • TIA-569-B: Commercial Building Standards for Telecommunications Pathways and Spaces • TIA-598-C: Fiber optic color coding • TIA-942: Telecommunications Infrastructure Standard for Data Centers
ANSI	• 568-C: RJ-45 pinouts. Co-developed with EIA/TIA
ITU-T	• G.992: ADSL
IEEE	• 802.3: Ethernet • 802.11: Wireless LAN (WLAN) & Mesh (Wi-Fi certification) • 802.15: Bluetooth

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PRINSIP DASAR DARI PHYSICAL LAYER

Media	Physical Components	Frame Encoding Technique	Signalling Method
Copper cable	• UTP • Coaxial • Connectors • NICs • Ports • Interfaces	• Manchester Encoding • Non-Return to Zero (NRZ) techniques • 4B/5B codes are used with Multi-Level Transition Level 3 (MLT-3) signaling • 8B/10B • PAM5	• Changes in the electromagnetic field • Intensity of the electromagnetic field • Phase of the electromagnetic wave
Fiber Optic cable	• Single-mode Fiber • Multimode Fiber • Connectors • NICs • Interfaces • Lasers and LEDs • Photoreceptors	• Pulses of light • Wavelength multiplexing using different colors	• A pulse equals 1. • No pulse is 0.
Wireless media	• Access Points • NICs • Radio • Antennae	• DSSS (direct-sequence spread-spectrum) • OFDM (orthogonal frequency division multiplexing)	• Radio waves

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PRINSIP DASAR DARI LAYER 1

BANDWIDTH

Unit of Bandwidth	Abbreviation	Equivalence
Bits per second	bps	1 bps = fundamental unit of bandwidth
Kilobits per second	kbps	1 kbps = 1,000 bps = 10^3 bps
Megabits per second	Mbps	1 Mbps = 1,000,000 bps = 10^6 bps
Gigabits per second	Gbps	1 Gbps = 1,000,000,000 bps = 10^9 bps
Terabits per second	Tbps	1 Tbps = 1,000,000,000,000 bps = 10^12 bps

COPPER CABLING

MEDIA COPPER

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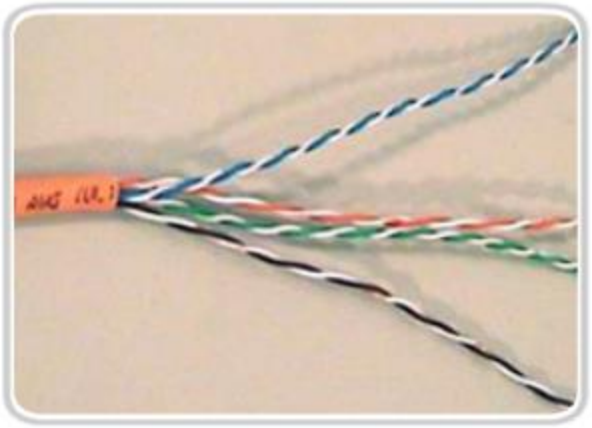
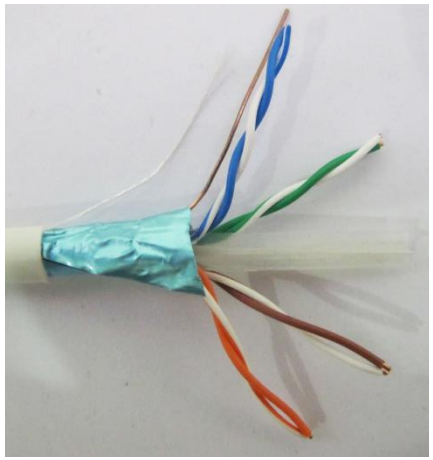
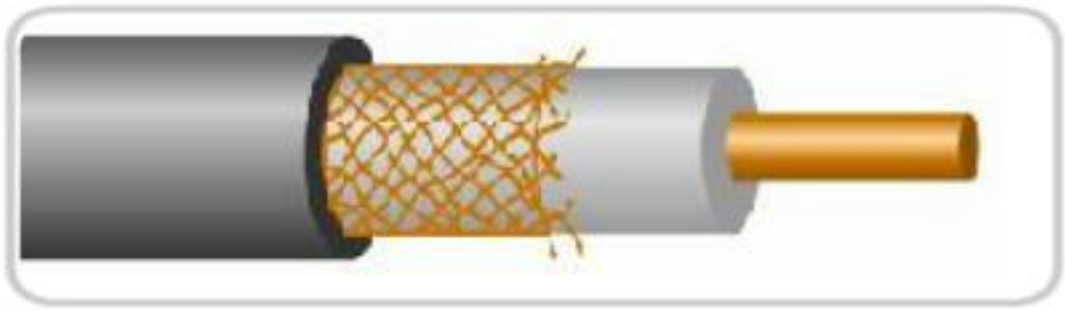


Unshielded Twisted Pair (UTP) cable



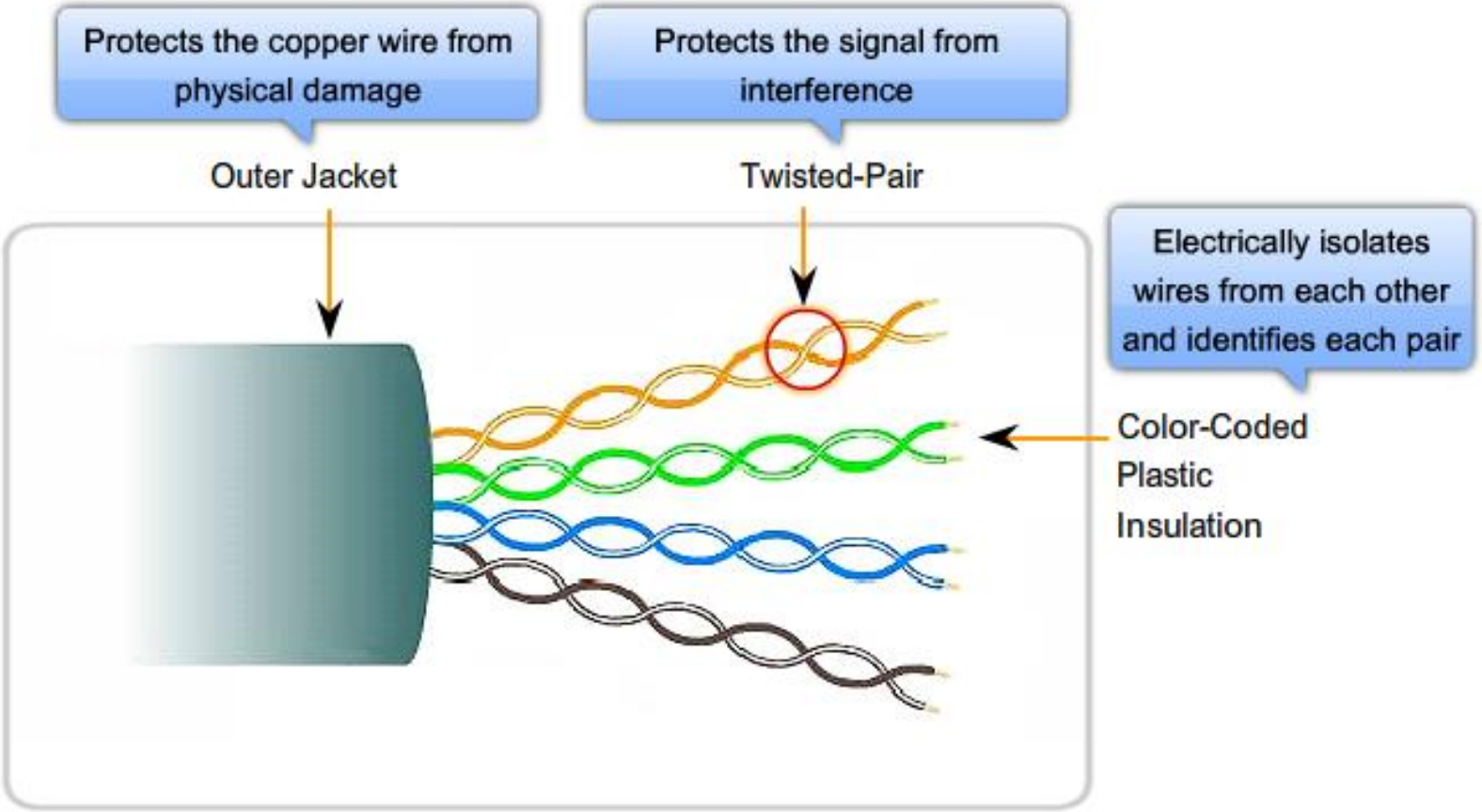
Shielded Twisted Pair (STP) cable



Coaxial cable

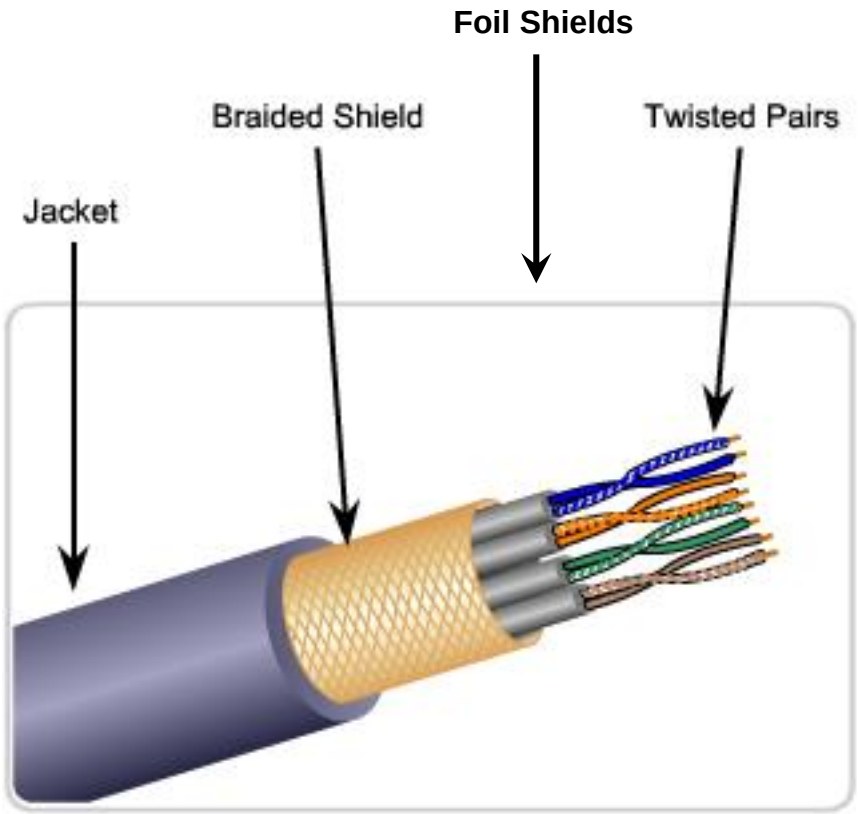
COPPER CABLING

KABEL UNSHIELDED TWISTED-PAIR (UTP)



KABEL SHIELDED TWISTED-PAIR (STP)

Braided or Foil Shield



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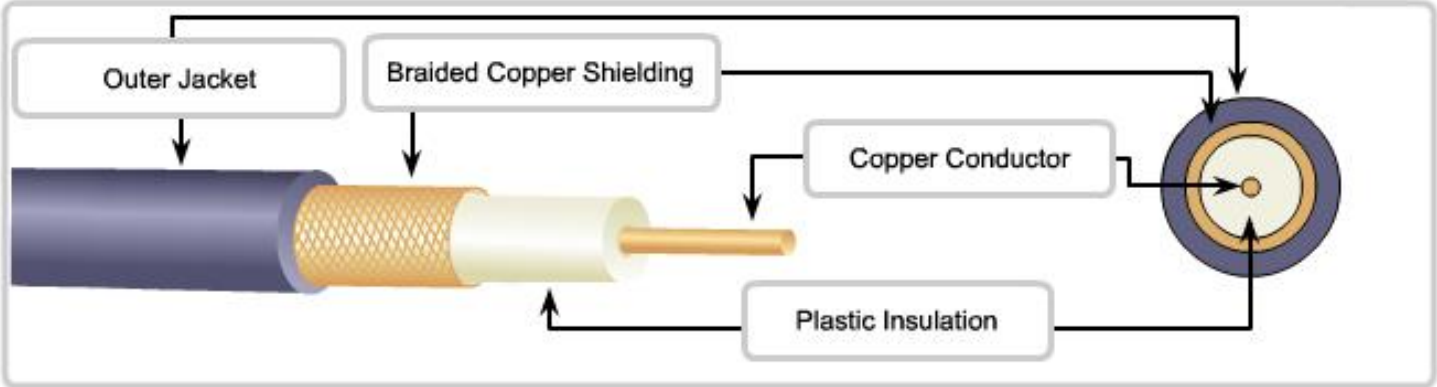
COPPER CABLING

KABEL COAXIAL



KEAMANAN COOPER

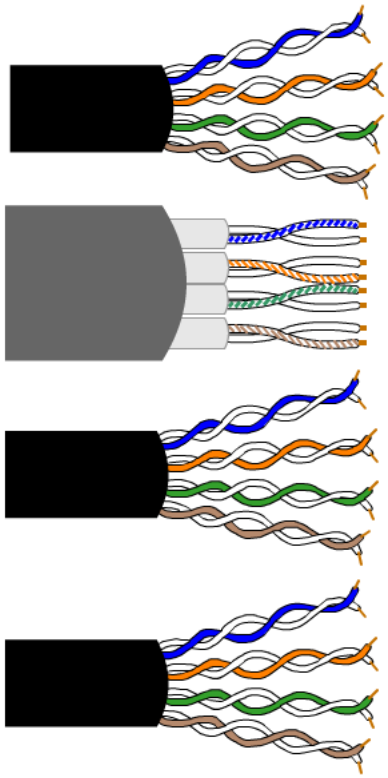
The separation of data and electrical power cabling must comply with safety codes.

Cables must be connected correctly.

Installations must be inspected for damage.

Equipment must be grounded correctly.

UTP CABLING STANDARDS



Category 3 Cable (UTP)

Category 7 Cable (ScTP)

Category 6 Cable (UTP)

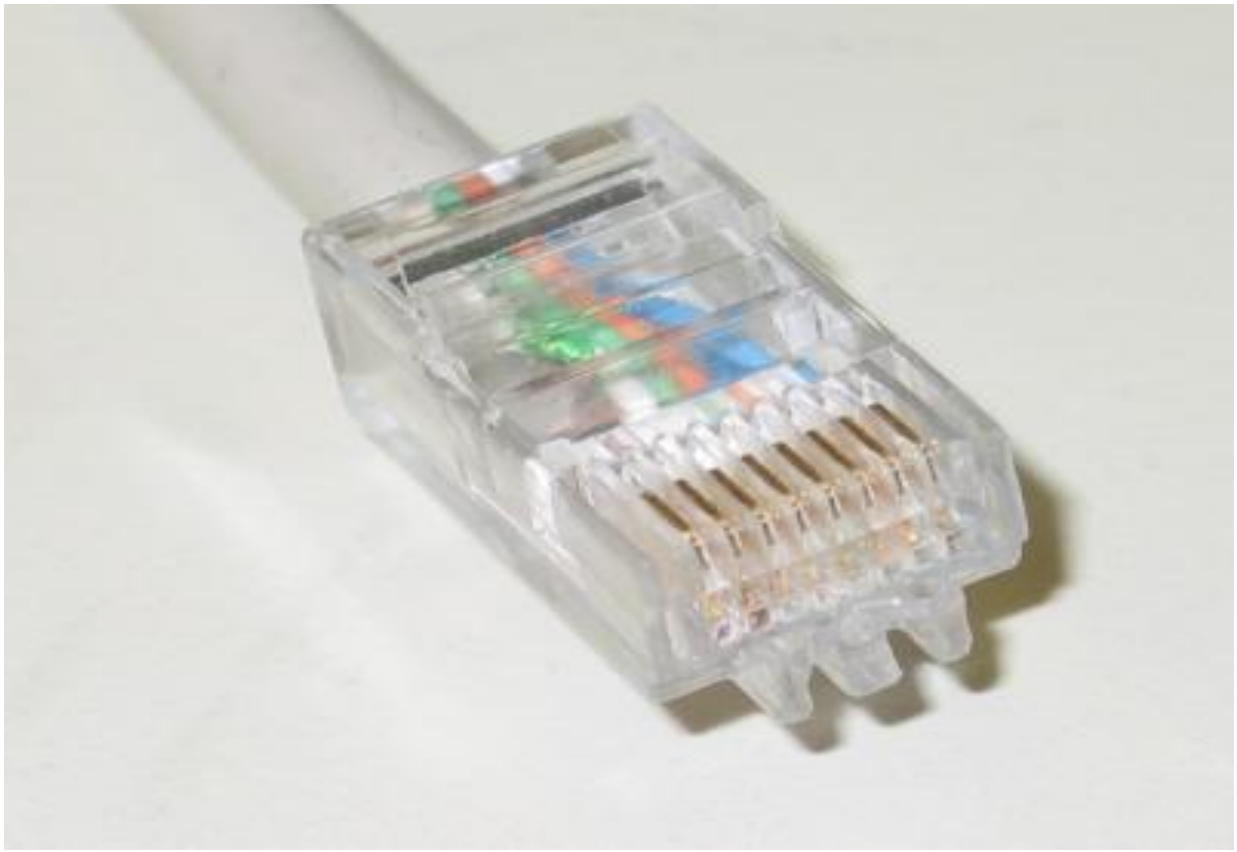
Category 5 and 5e Cable (UTP)

Category 5 and 5e Cable (UTP)

- Used for Data transmission
- Cat 5 supports 100 Mbps and can support 1000 Mbps but it is not recommended
- Cat 5e supports 1000 Mbps

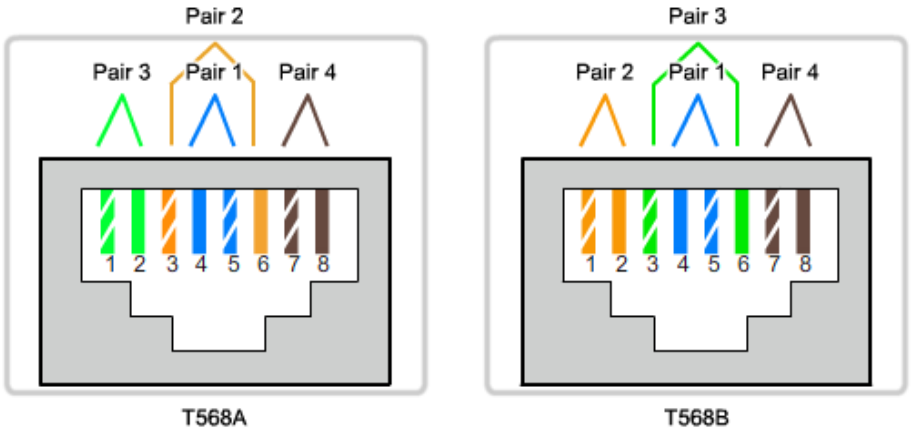
UTP CABLING

KONEKTOR UTP



JENIS-JENIS KABEL UTP

Cable Type	Standard	Application
Ethernet Straight-through	Both ends T568A or both ends T568B	Connecting a network host to a network device such as a switch or hub.
Ethernet Crossover	One end T568A, other end T568B	Connecting two network hosts. Connecting two network intermediary devices (switch to switch, or router to router).
Rollover	Cisco proprietary	Connect a workstation serial port to a router console port, using an adapter.



UTP CABLING

PENGUJIAN KABEL UTP

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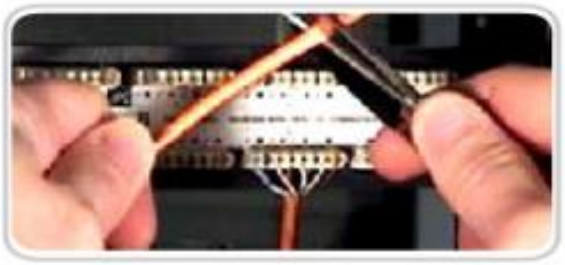
PERALATAN KABEL TEMBAGA

Copper Media Connectors

110 punch block



RJ45 UTP Plugs

RJ45 UTP Socket

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PERALATAN KABEL FIBER OPTIK

Fiber Media Connectors

ST Connector

Straight Tip (ST) connector is widely used with multimode fiber

SC Connector

Subscriber Connector (SC) is widely used with single-mode fiber

Single-Mode (LC)

Single-Mode Lucent Connector (LC)

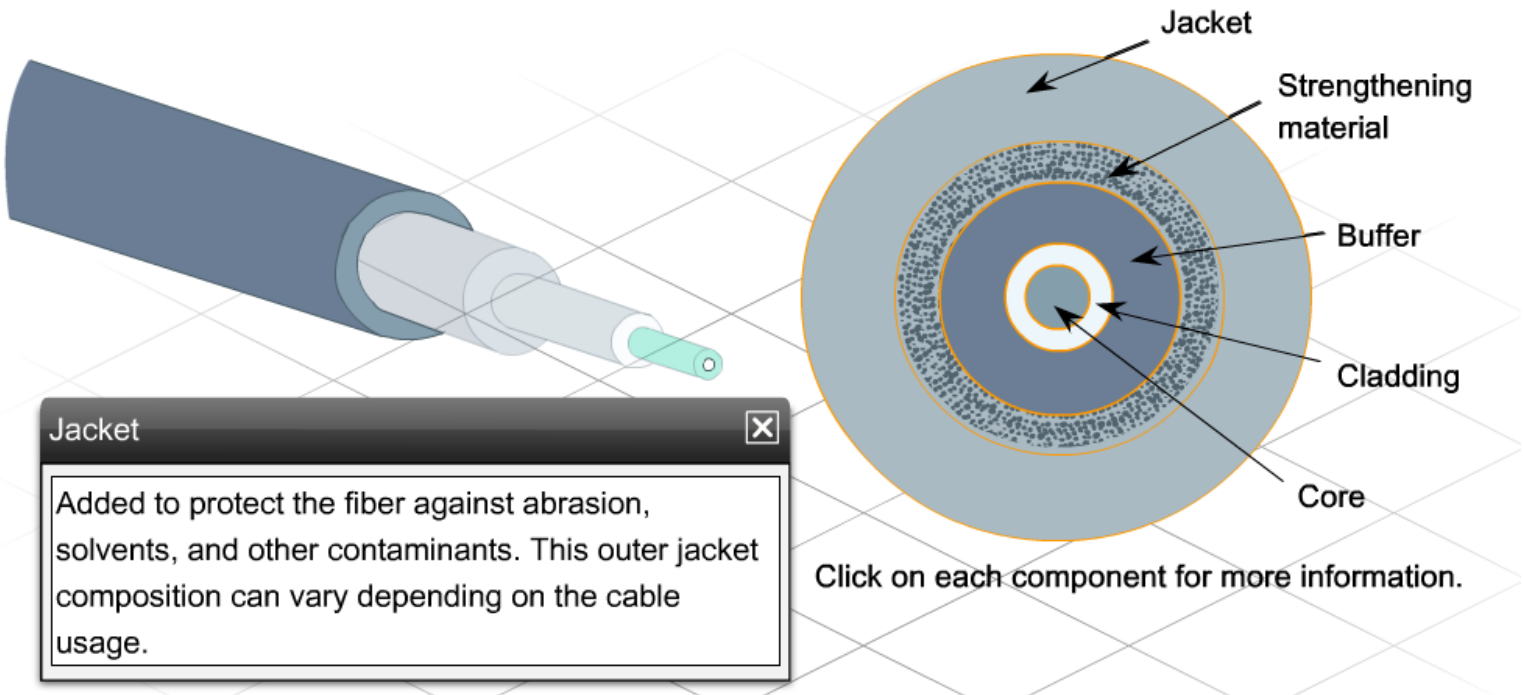
Multimode (LC)

Multimode LC Connector

Duplex Multimode (LC)

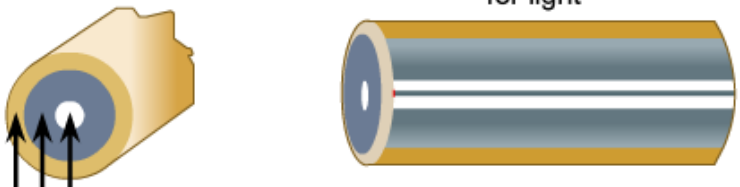
Duplex Multimode LC Connector

FIBER MEDIA CABLE DESIGN



Single Mode

Produces single straight path for light



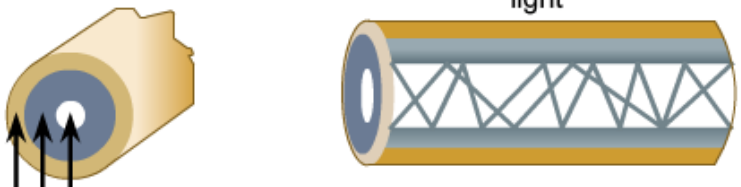
Glass Core=9 microns

Glass Cladding 125 microns diameter

Polymeric coating

Multimode

Allows multiple paths for light



Glass Core=50/62.5 microns

Glass Cladding 125 microns diameter

Coating

- Small Core
- Less Dispersion
- Suited for long distance applications
- Uses lasers as the light source
- Commonly used with campus backbones for distances of several thousand meters

- Larger core than single mode cable
- Allows greater dispersion and therefore, loss of signal
- Suited for long distance applications, but shorter than single mode
- Uses LEDs as the light source
- Commonly used with LANs or distances of a couple hundred meters within a campus network

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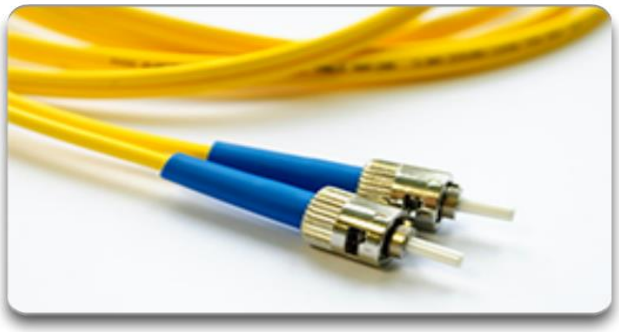
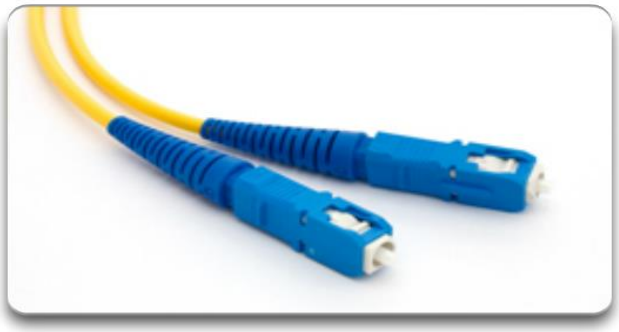
FIBER OPTIC CABLING

KONEKTOR FIBER

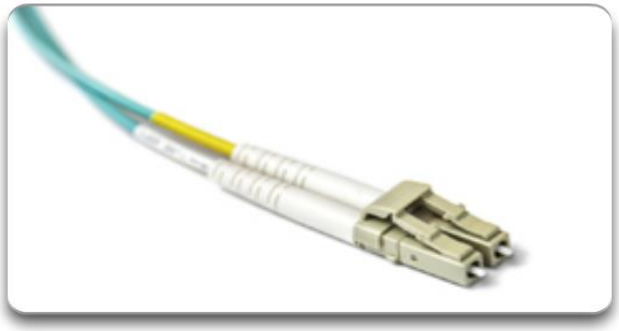


ST Connectors



SC Connectors

LC Connector



Duplex Multimode LC Connectors

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FIBER OPTIC CABLING

PENGUJIAN KABEL FIBER

Optical Time Domain Reflectometer (OTDR)

FIBER VS COPPER

Implementation issues	Copper media	Fibre-optic
Bandwidth supported	10 Mbps – 10 Gbps	10 Mbps – 100 Gbps
Distance	Relatively short (1 – 100 meters)	Relatively High (1 – 100,000 meters)
Immunity to EMI and RFI	Low	High (Completely immune)
Immunity to electrical hazards	Low	High (Completely immune)
Media and connector costs	Lowest	Highest
Installation skills required	Lowest	Highest
Safety precautions	Lowest	Highest

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PERALATAN WIRELESS

WLAN Access Points and Adapters

Wireless Access Point

Wireless Adapters

JENIS-JENIS MEDIA WIRELESS

	• IEEE 802.11 standards
	• Commonly referred to as Wi-Fi.
	• Uses CSMA/CA
	• Variations include:
	  • 802.11a: 54 Mbps, 5 GHz
	  • 802.11b: 11 Mbps, 2.4 GHz
	  • 802.11g: 54 Mbps, 2.4 GHz
	  • 802.11n: 600 Mbps, 2.4 and 5 GHz
	  • 802.11ac: 1 Gbps, 5 GHz
	  • 802.11ad: 7 Gbps, 2.4 GHz, 5 GHz, and 60 GHz

	• IEEE 802.15 standard • Supports speeds up to 3 Mbps • Provides device pairing over distances from 1 to 100 meters.
	• IEEE 802.16 standard • Provides speeds up to 1 Gbps • Uses a point-to-multipoint topology to provide wireless broadband access.

802.11 STANDAR WI-FI

Standard	Maximum Speed	Frequency	Backwards compatible
802.11a	54 Mbps	5 GHz	No
802.11b	11 Mbps	2.4 GHz	No
802.11g	54 Mbps	2.4 GHz	802.11b
802.11n	600 Mbps	2.4 GHz or 5 GHz	802.11b/g
802.11ac	1.3 Gbps (1300 Mbps)	2.4 GHz and 5.5 GHz	802.11b/g/n
802.11ad	7 Gbps (7000 Mbps)	2.4 GHz, 5 GHz and 60 GHz	802.11b/g/n/ac