A2 NETWORKS · A2.3

Data transmissions

How data moves across a network: **IP addressing**, the **media** it travels through, **packet switching**, and static vs dynamic **routing**.

01 IP addressing

IPv4	32-bit, dotted decimal (192.168.0.1).
IPv6	128-bit, hexadecimal, colon-separated.
Public	Globally unique, internet-routable.
Private	LAN only (192.168.x.x); NAT to public.
Static	Fixed, manual (servers).
Dynamic	DHCP-assigned, can change.

02 Transmission media

Fibre	Light in glass; fast, long, immune to interference.
Twisted pair	Copper pairs; cheap LAN cabling (UTP/STP).
Coaxial	Shielded copper core; cable broadband.
Wireless	Radio waves; mobile, but least secure.

03 Packet switching

01
Segmentation

Data is split into numbered packets, each wrapped with a header (encapsulation): source IP, dest IP, sequence number.

02
Routing

Routers forward each packet by the best path, so packets can take different routes and arrive out of order.

03
Reassembly

Headers are stripped (de-encapsulation) and sequence numbers put the packets back in order.

04 Routing

Static

Routes set manually and fixed. Simple and predictable, but does not adapt if a link fails.

Dynamic

Routers update routing tables automatically to find the best path. Resilient and scalable, but complex.

05 Key terms

Packet	Header + payload.
Header	Source IP, dest IP, sequence number.
Payload	A chunk of the actual data.
Encapsulation	Adding the header before sending.
NAT	Many private addresses to one public.
DHCP	Hands out dynamic IP addresses.

06 Know the difference

IPv4 vs IPv6	32-bit dotted decimal (~4.3 billion) versus 128-bit hexadecimal (~340 undecillion).	ADDRESSING
Public vs private	Internet-routable and globally unique versus LAN-only; NAT bridges the two.	SCOPE
Static vs dynamic IP	Fixed and manually set versus assigned automatically by DHCP and able to change.	ASSIGNMENT
Packet vs circuit	Independent packets on any route versus one dedicated path reserved for the whole transmission.	SWITCHING

FINAL PASS BEFORE THE EXAM

Rapid exam tips

Eight things that lose marks in Paper 1 if you slip on them. Skim before you walk in.

01

IPv4 is 32-bit; **IPv6** is 128-bit. Don't swap the bit sizes.

02

Private IPs (192.168.x.x) are **not** internet-routable; **NAT** bridges to public.

03

Static/dynamic **IP** is not the same as static/dynamic **routing**. Two different uses.

04

In packet switching, packets can take **different routes** and arrive out of order.

05

A packet's **header** holds source IP, dest IP, and sequence number; the **payload** is the data.

06

Fibre is fast and immune to interference; **wireless** is the least secure medium.

07

Static routing is manual and fixed; **dynamic routing** adapts via routing tables.

08

Packet switching is not **circuit switching**: no single path is reserved end to end.