• April 16 Notes

10 . 20 . 30 . 40
255.255 . 0 . 0

Network | Node

8 bits.8 bits.8 bits.8 bits
255 . 255 . 255 . 0

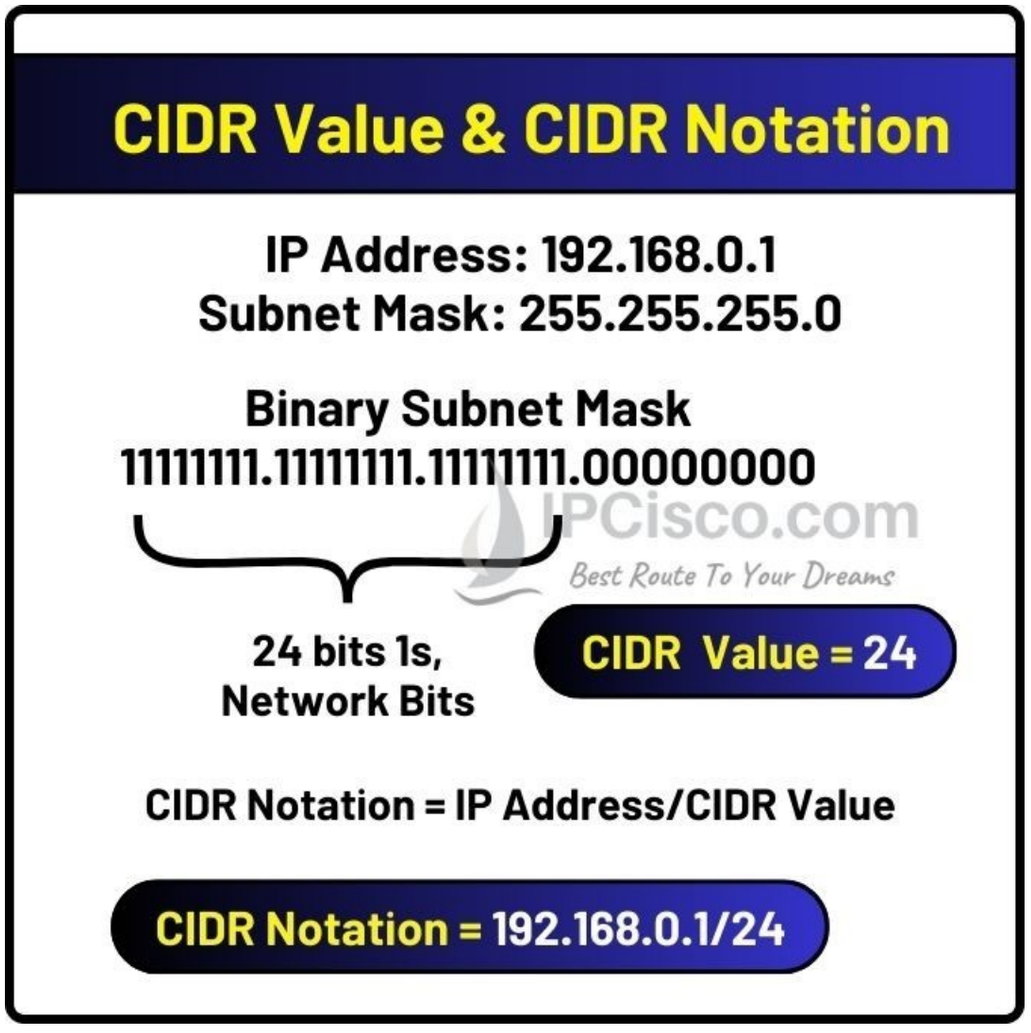
128+64+32+16+8+4+2+1 = 255

CIDR: Classless Interdomain Routing

10.20.30. 40/18 - 8+8+2=18

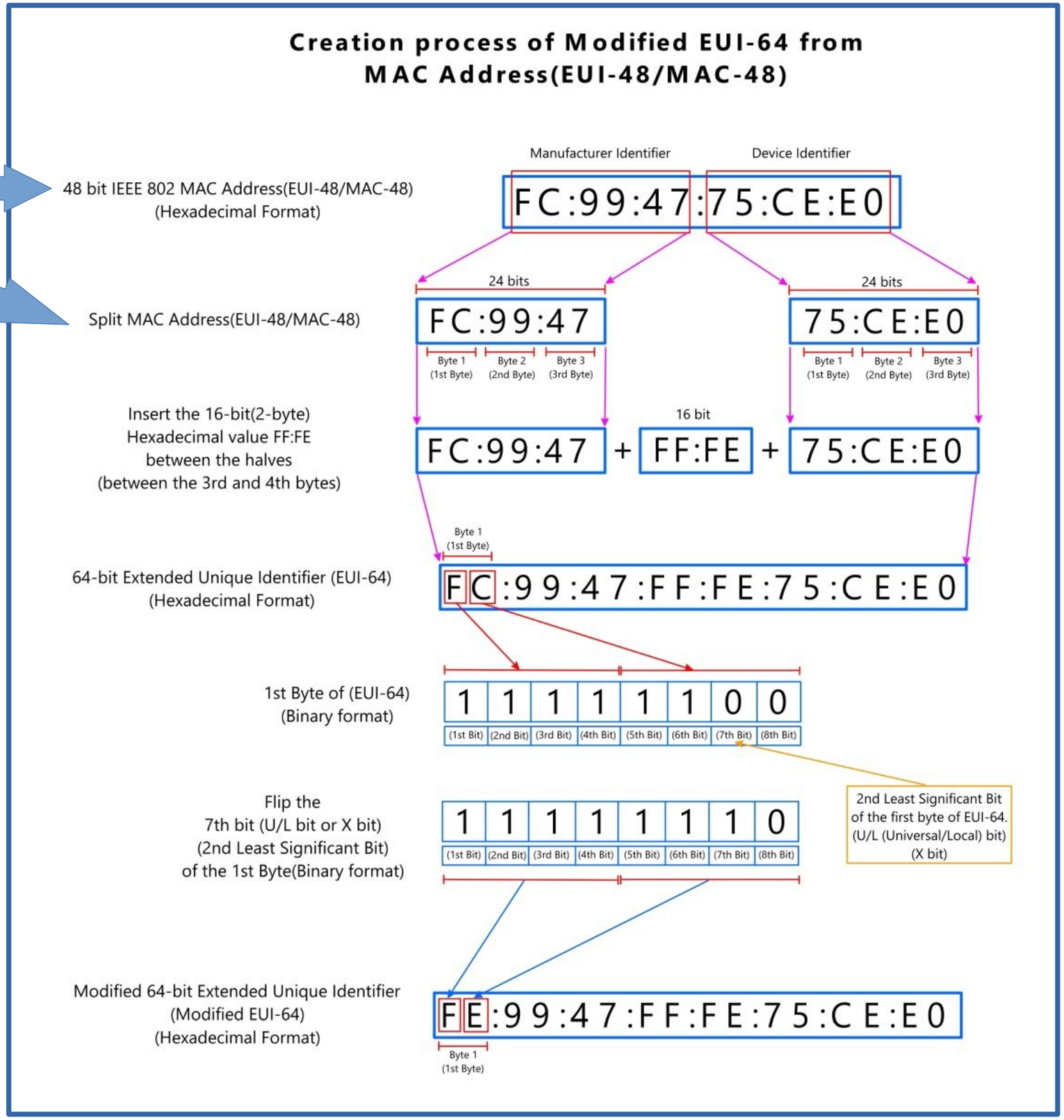
To determine network or node:
- Use subnet mask or CIDR

IPv6: partially based on MAC address



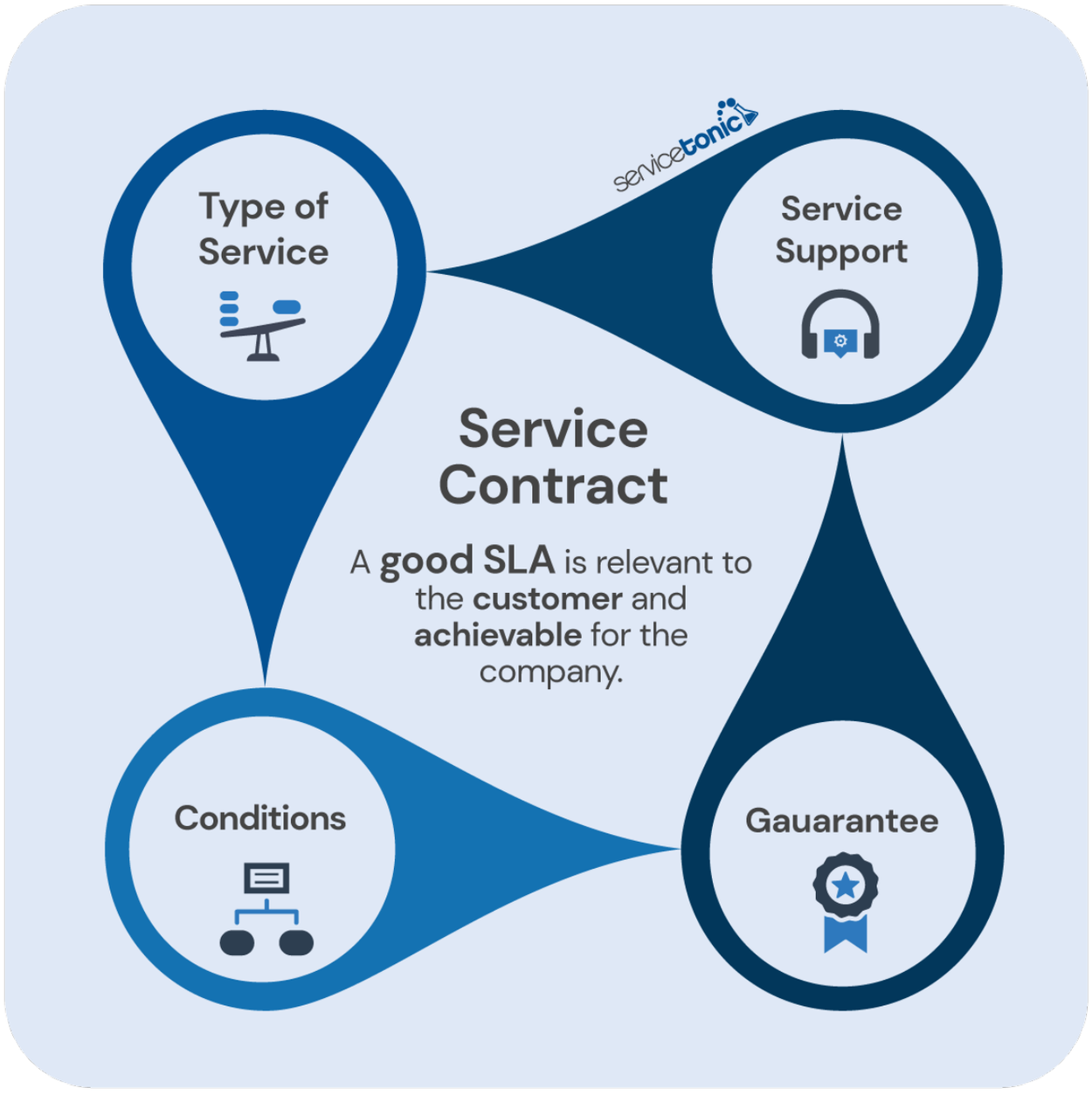
- **April 16 Notes**

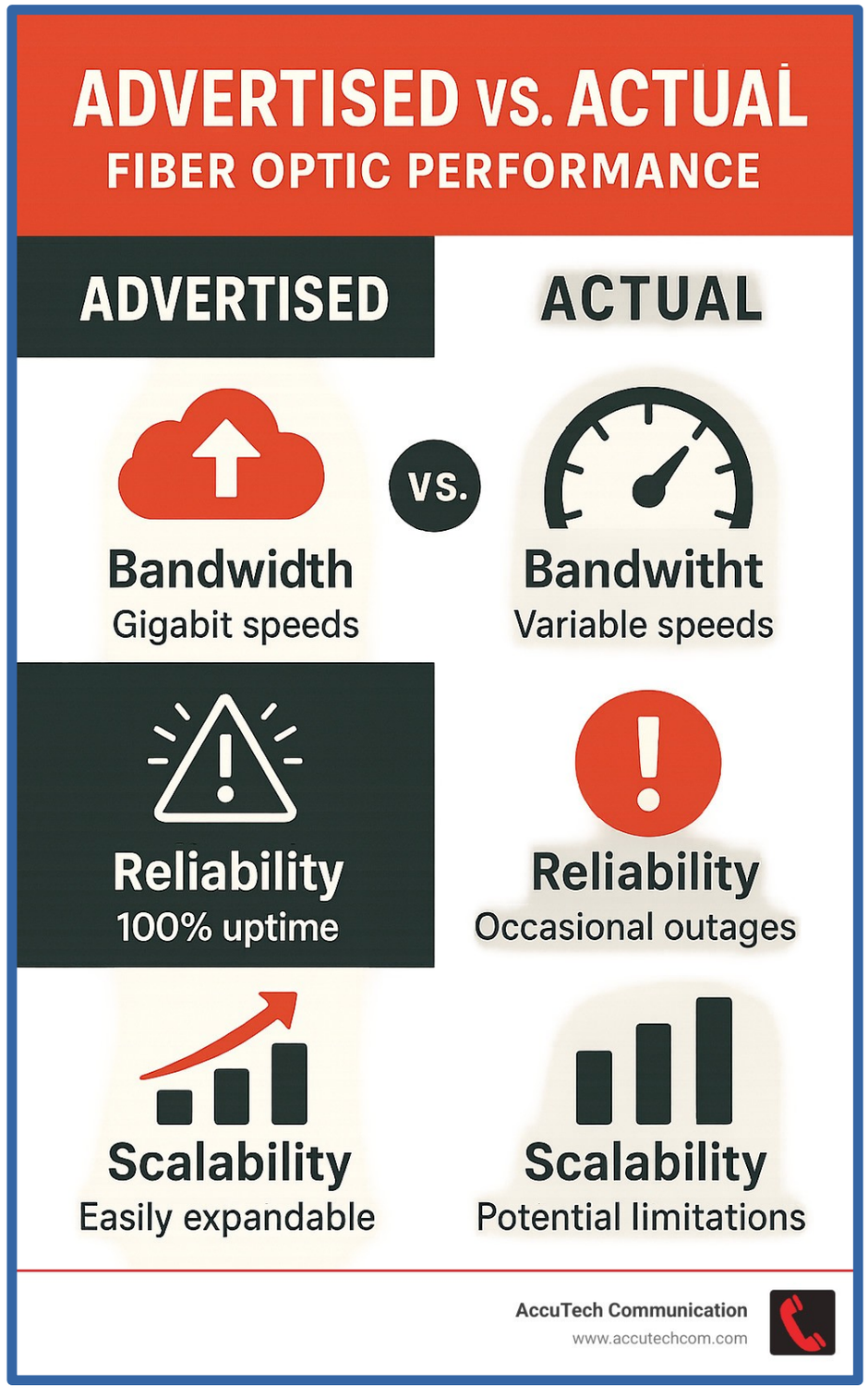
IPv6: partially based on MAC address



Rated speed: advertised what you are going to get
Throughput: what speed you actually get

- No Service Level Agreement [SLA] for residential!
- Business lines get SLA

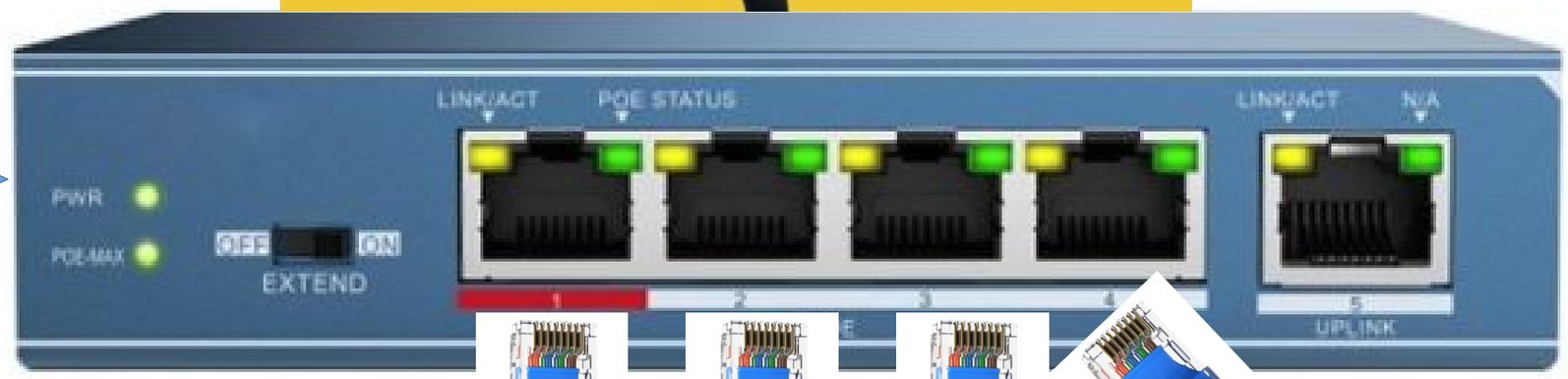




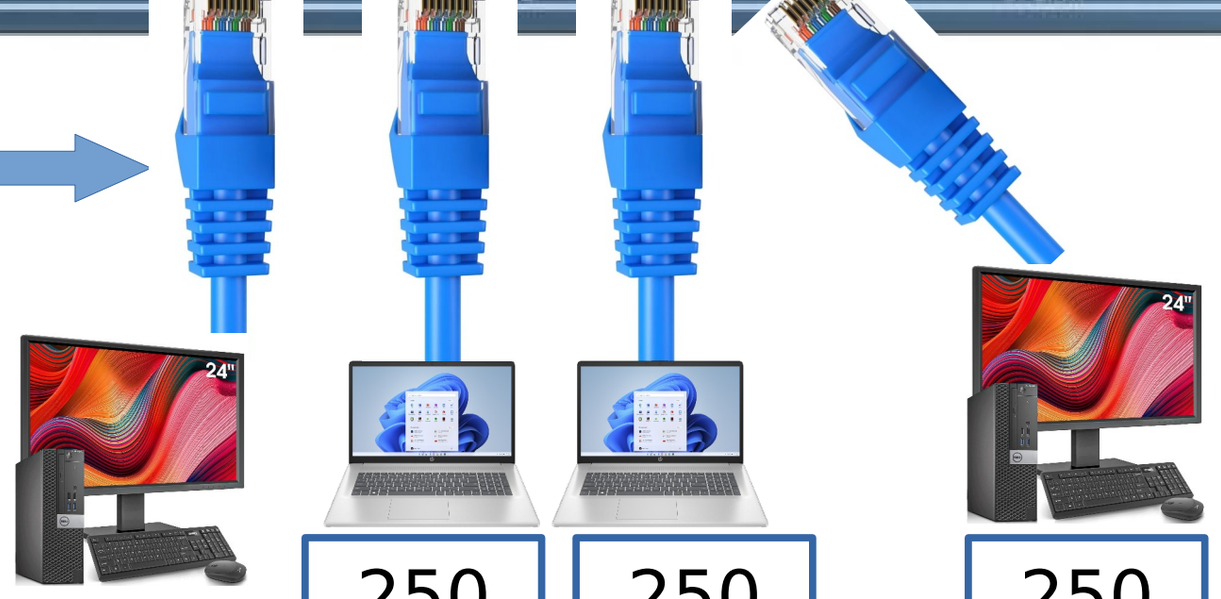
Gigabit Switches: Shared Speed and Throughput

1 GBit FIOS Pipe

Gigabit Switch



Cat 6 cables



Cannot go over 1 Gbit each!

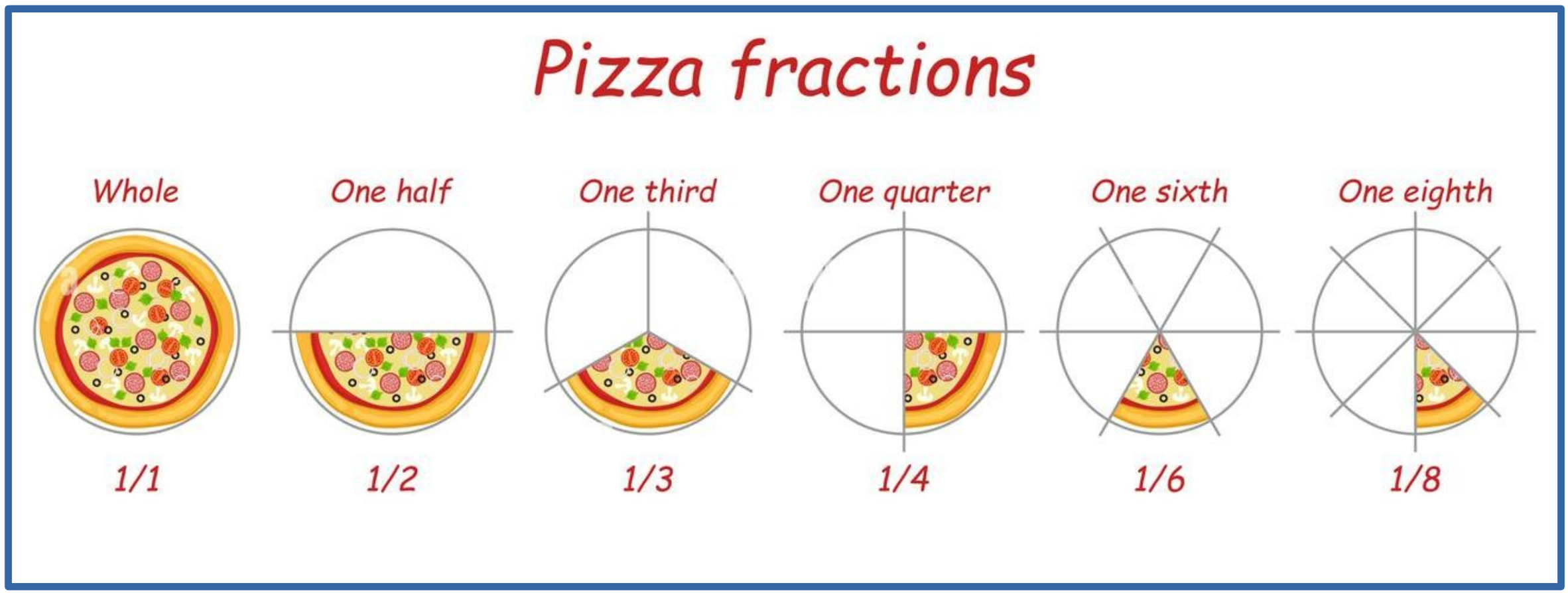
250 Mbit

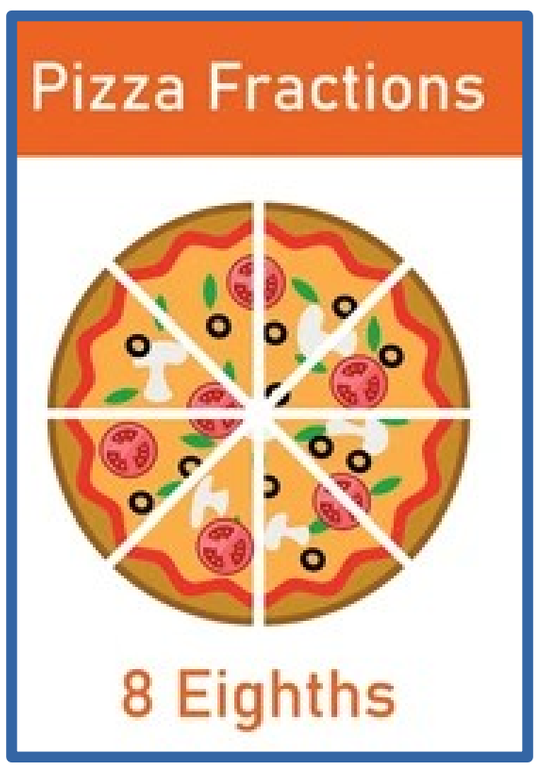
250 Mbit

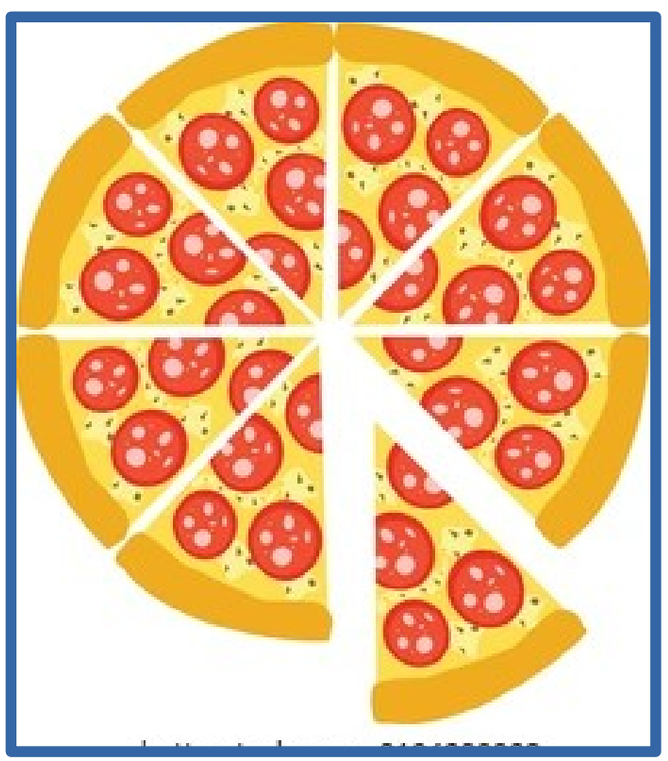
250 Mbit

250 Mbit

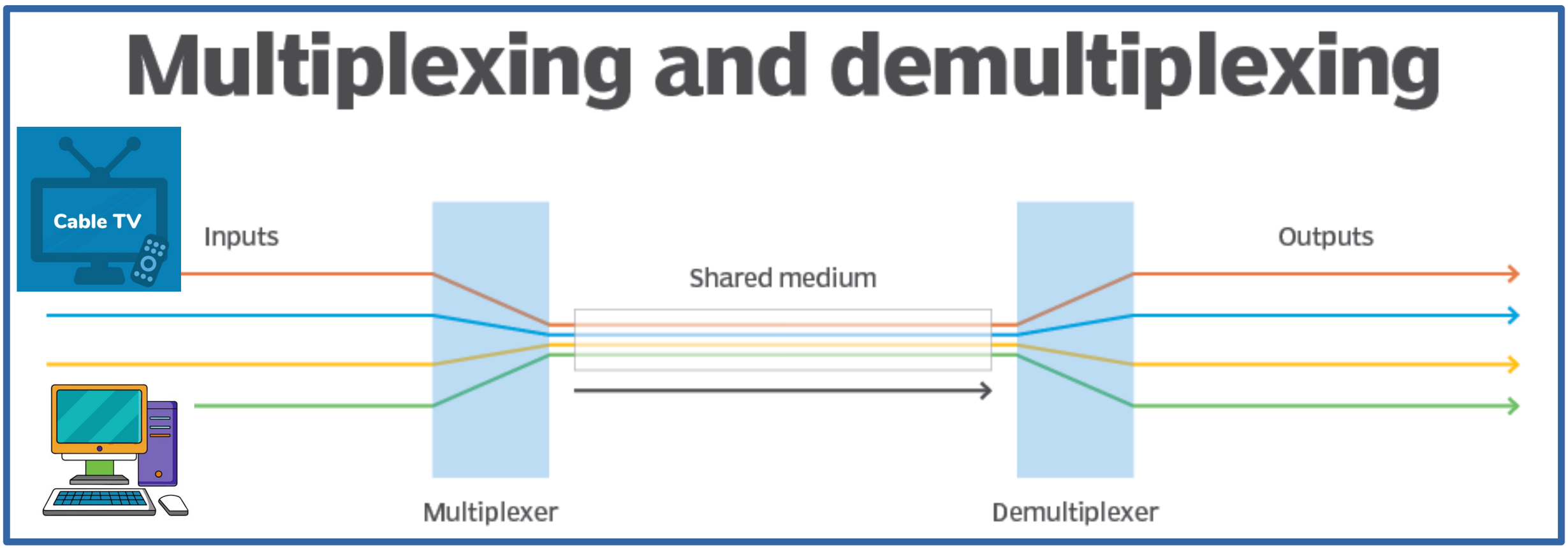
Pizza Pie
Contains 8 slices and cannot eat more



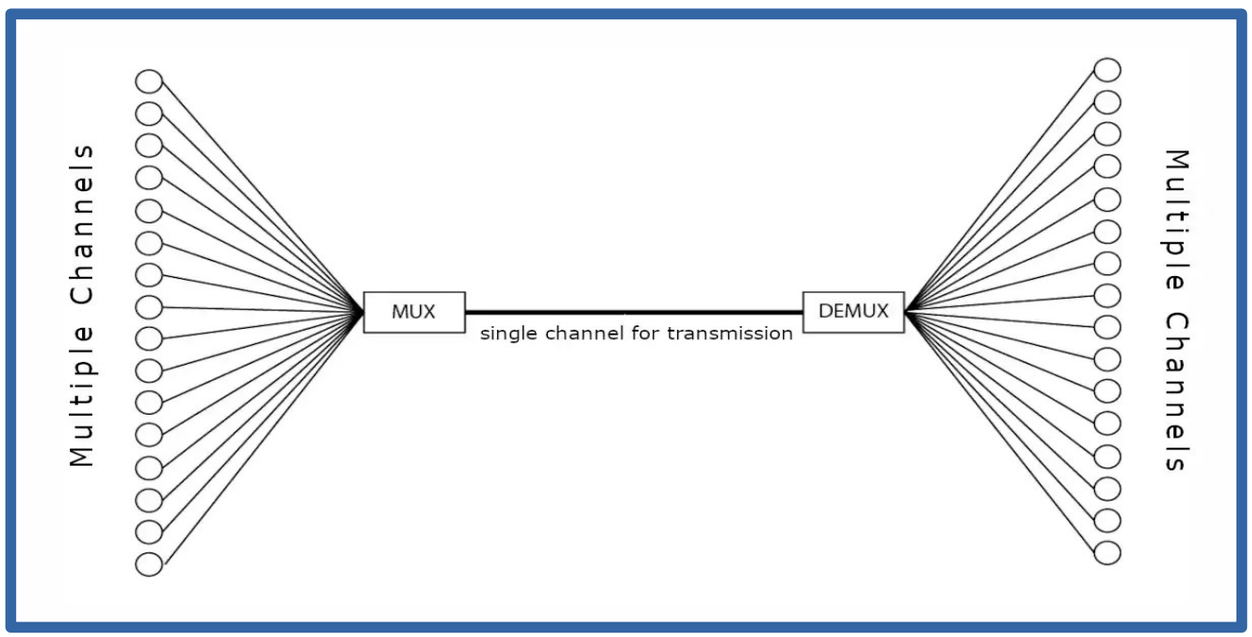




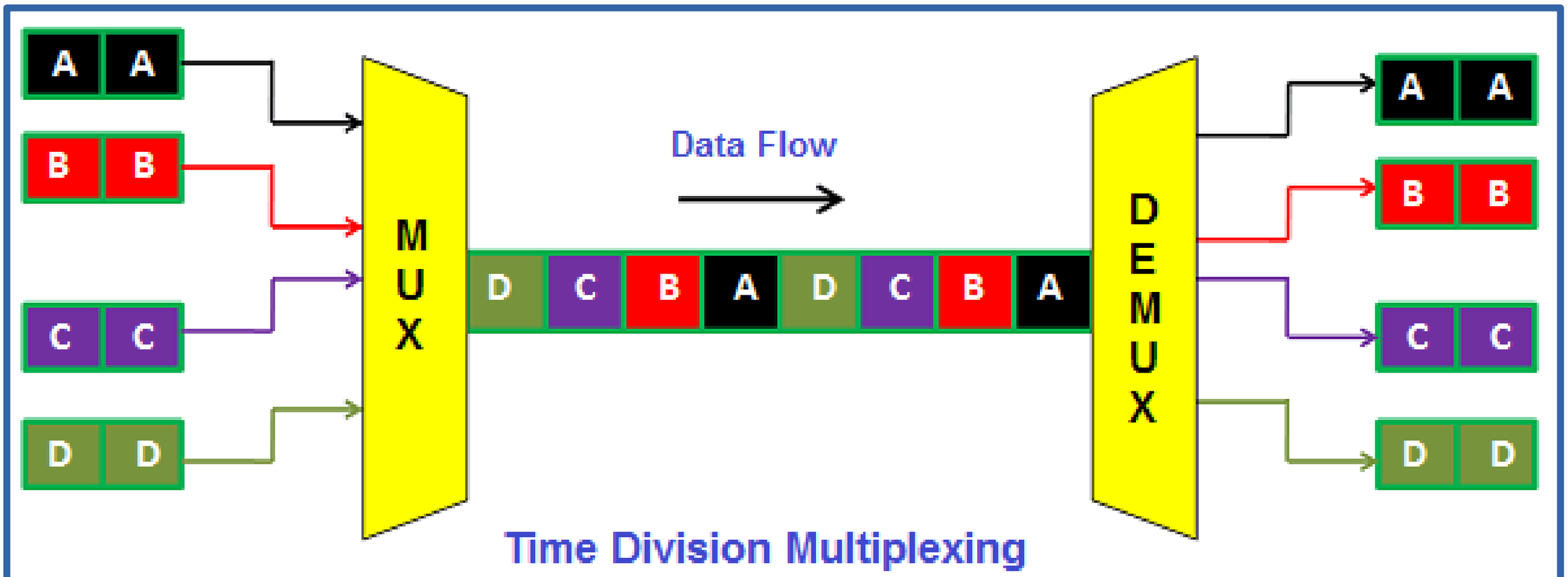
Multiplexing: allow for multiple users
- Shared link
- Send at same time
- Multiple messages at once

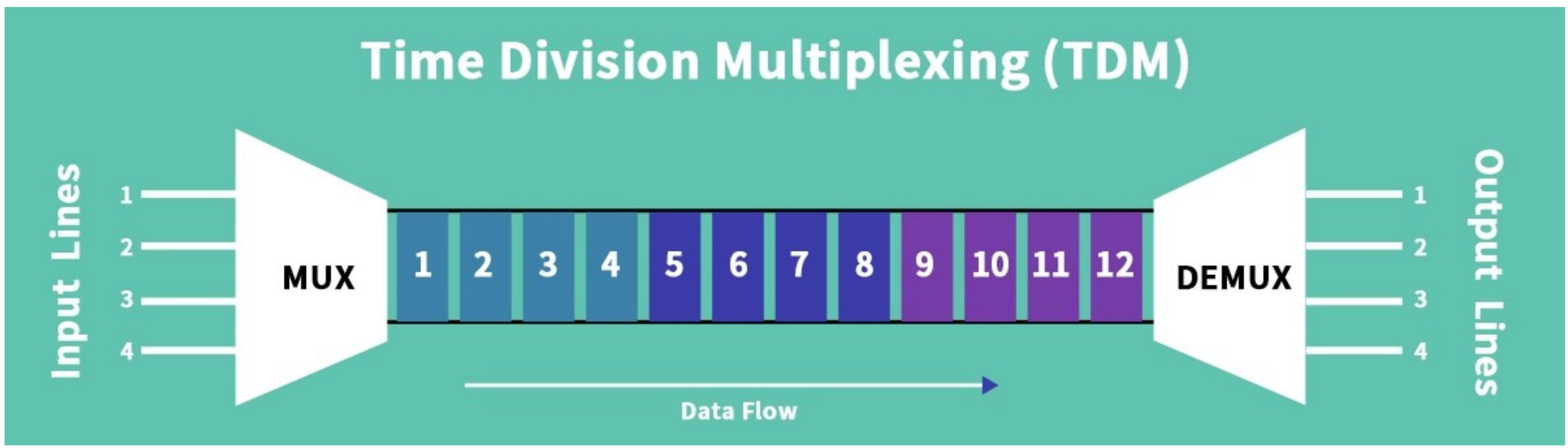


- Multiplexer consolidates signal
- Demultiplexer separates signal
- Signals will not interfere
- Signals can be voice/data



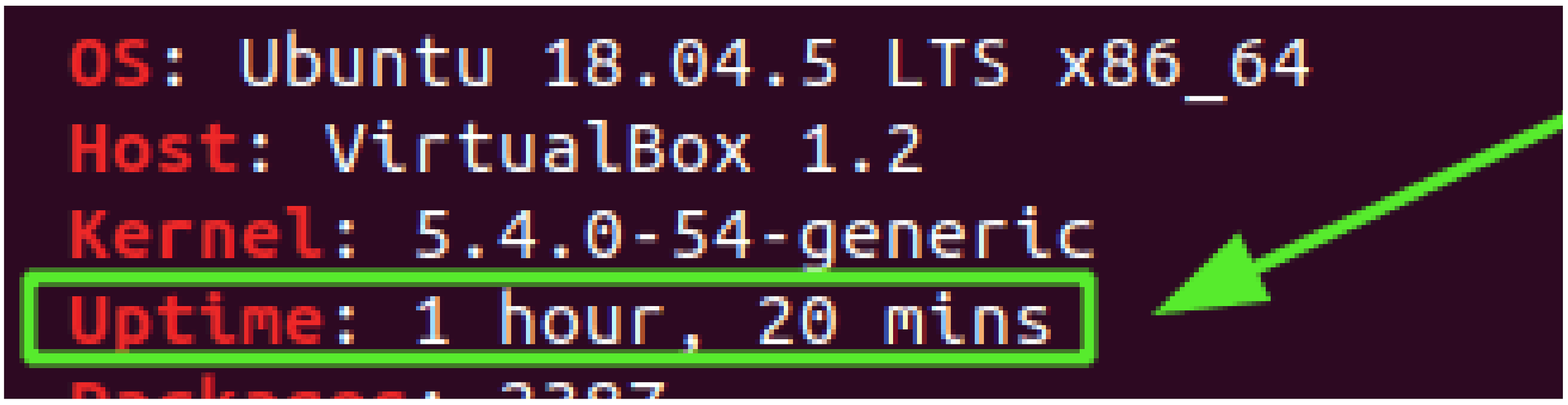
TDMS: Time Division Multiplexing
- Transmits signals by dividing time frame into several slots



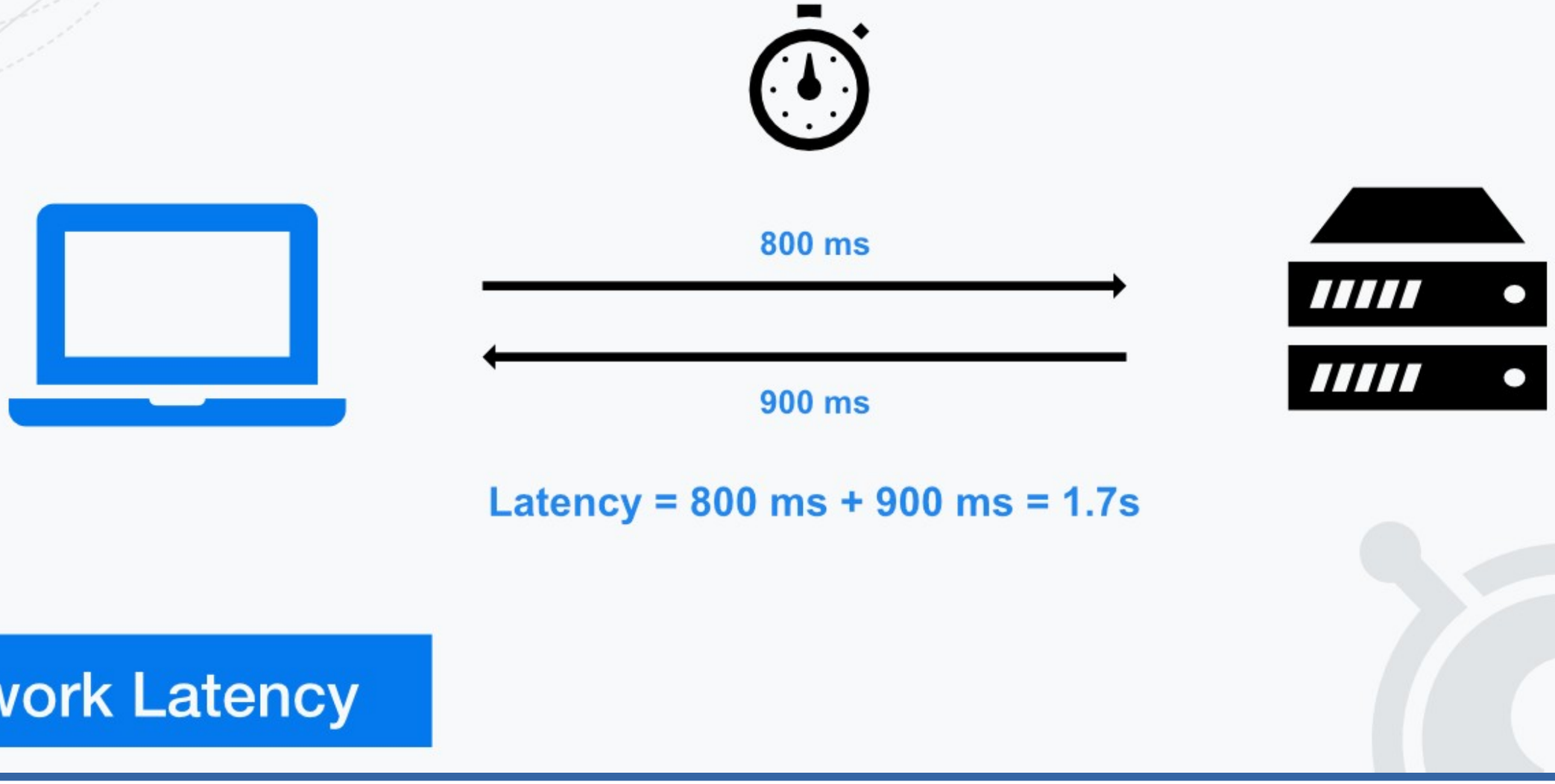


Quality of Service: how much time server is down per year

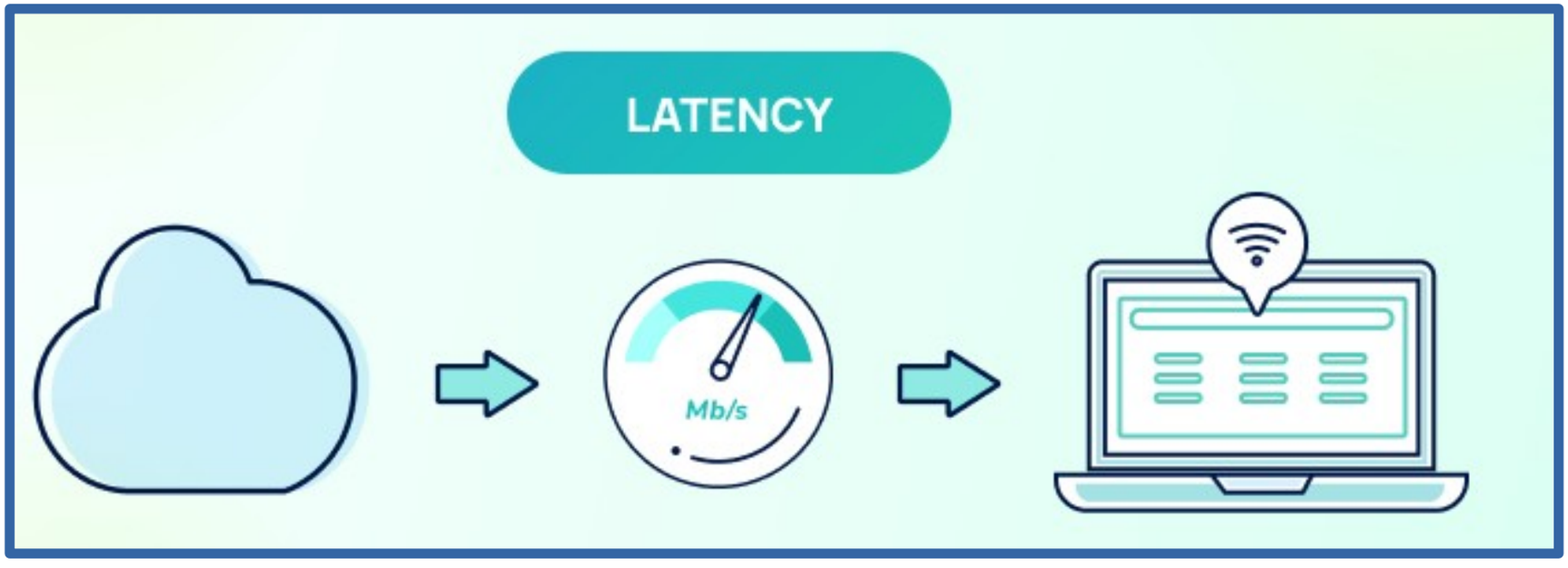
- 99%: 1 hour down per year; bad
- 99.999%: good uptime



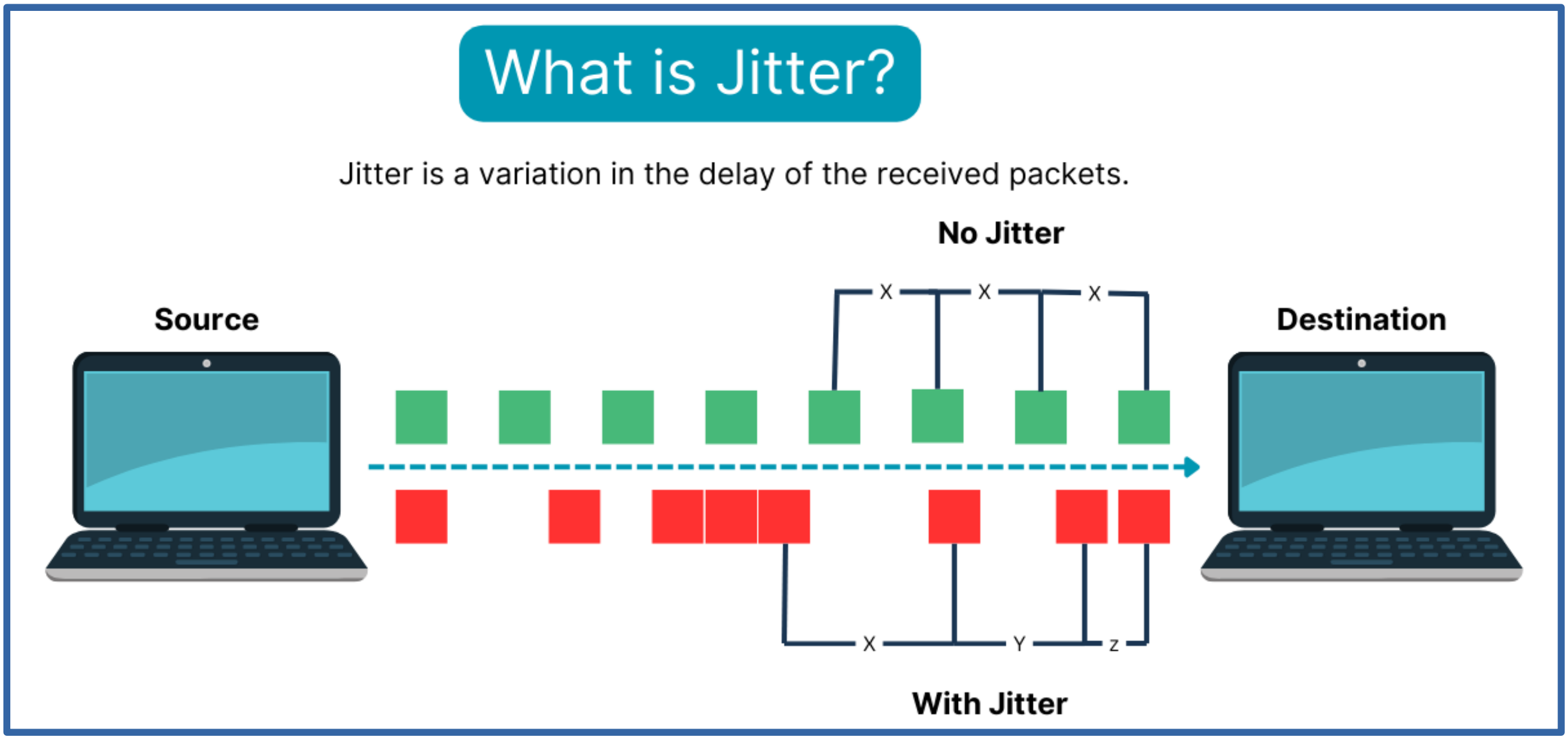
Latency: Time delay in sending information

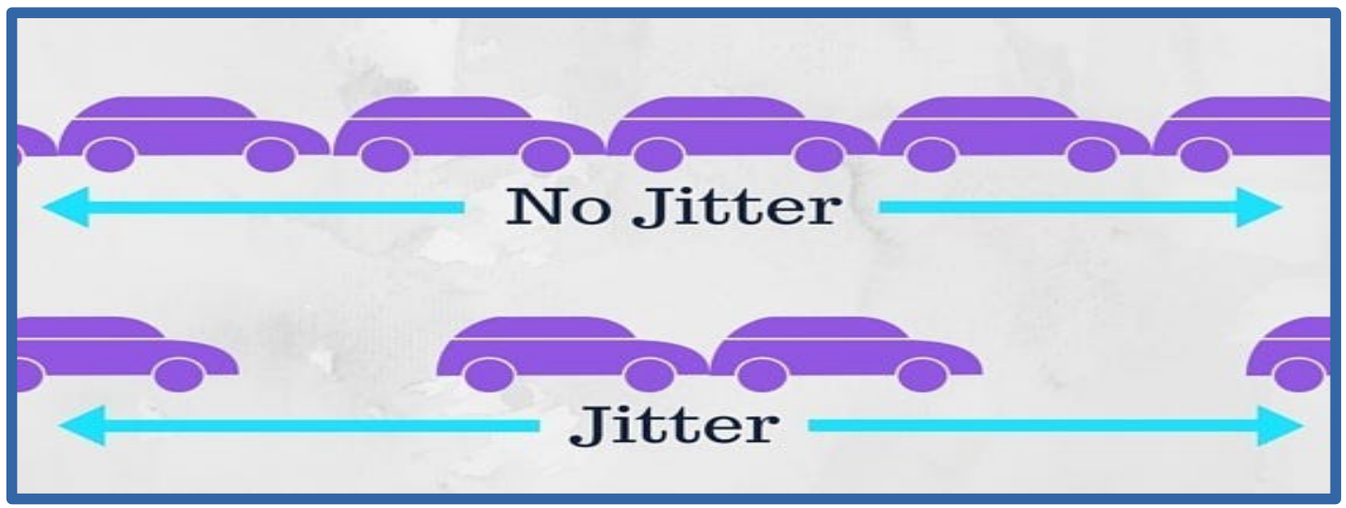


Network Latency



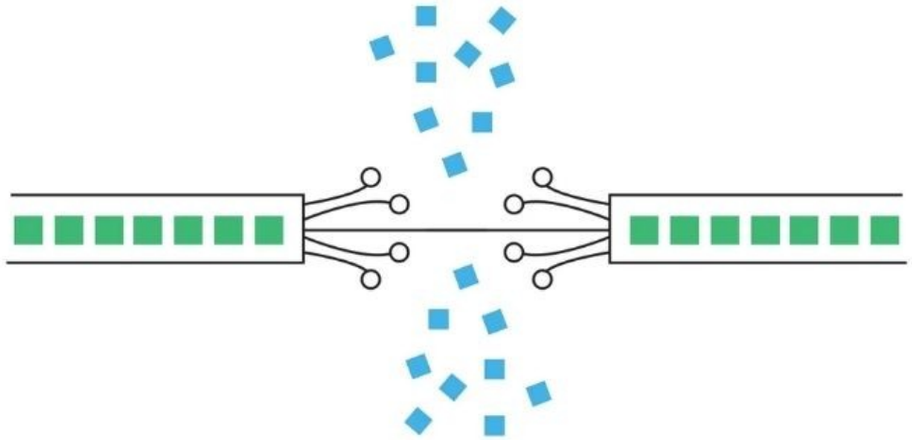
Jitter: random delay of latency
- High variability





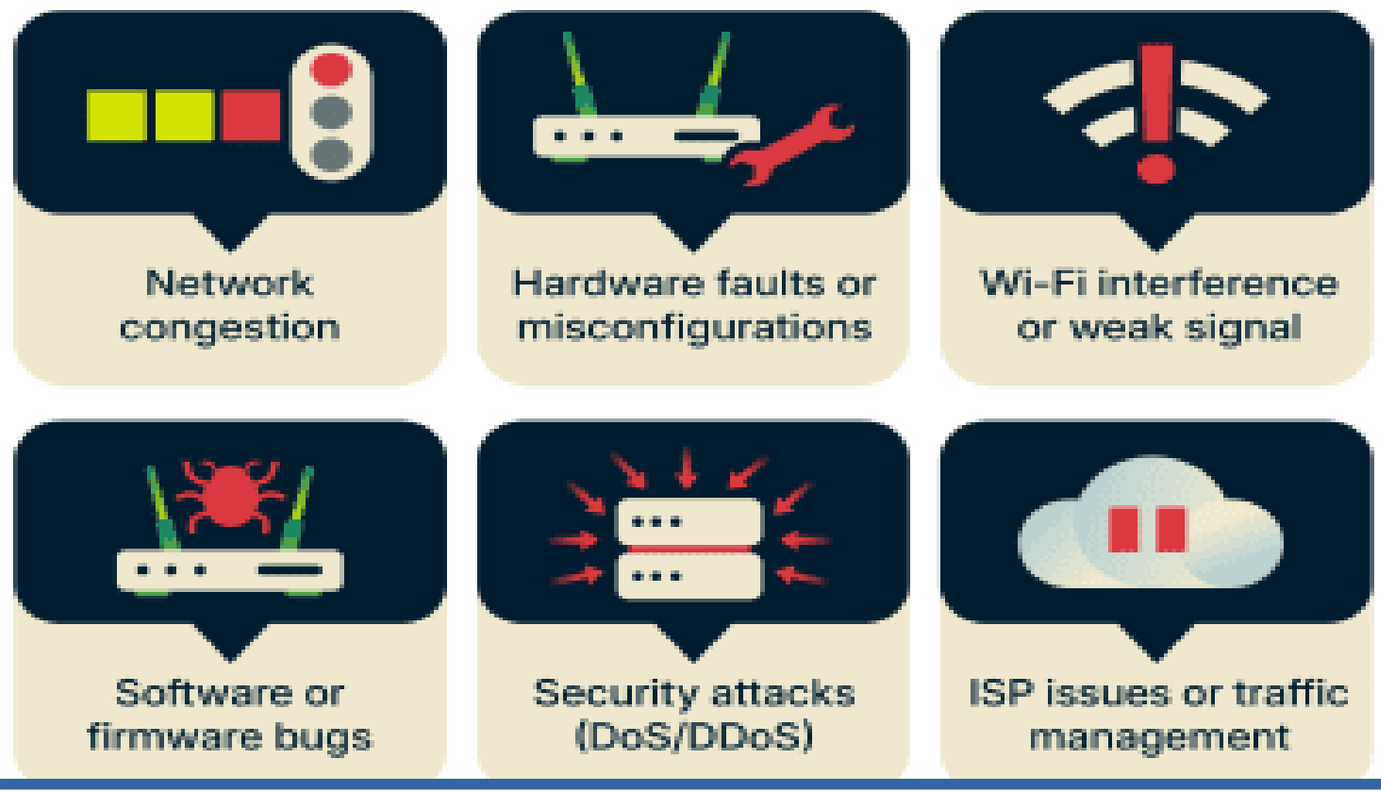
Errors: % of incorrect packets

What is Acceptable vs. High Packet Loss?



Acceptable Packet Loss	Moderate Packet Loss	High Packet Loss
Less than 1% or 0.1%	2% -5%	Above 5%

Common causes of packet loss

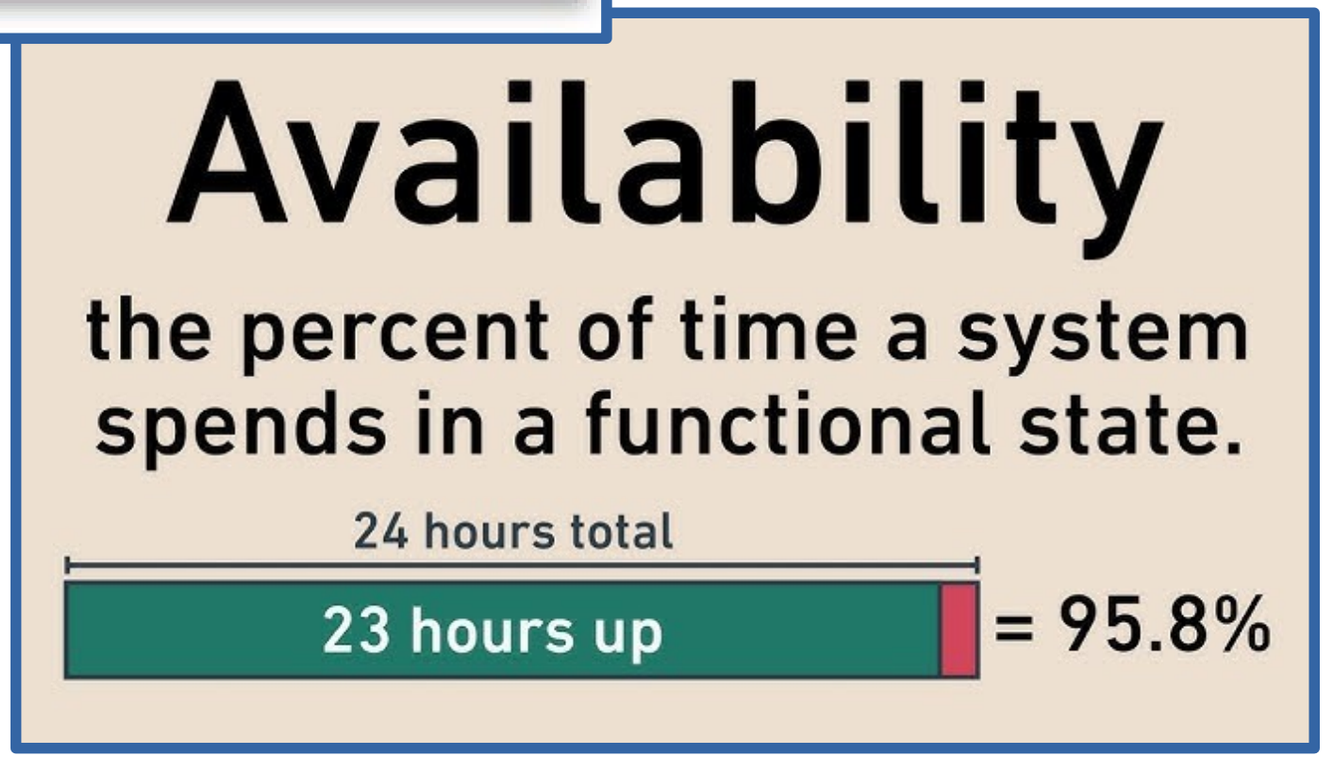


Availability:
- % of time resource is available, ie: server, Internet connection

The Nines of Availability

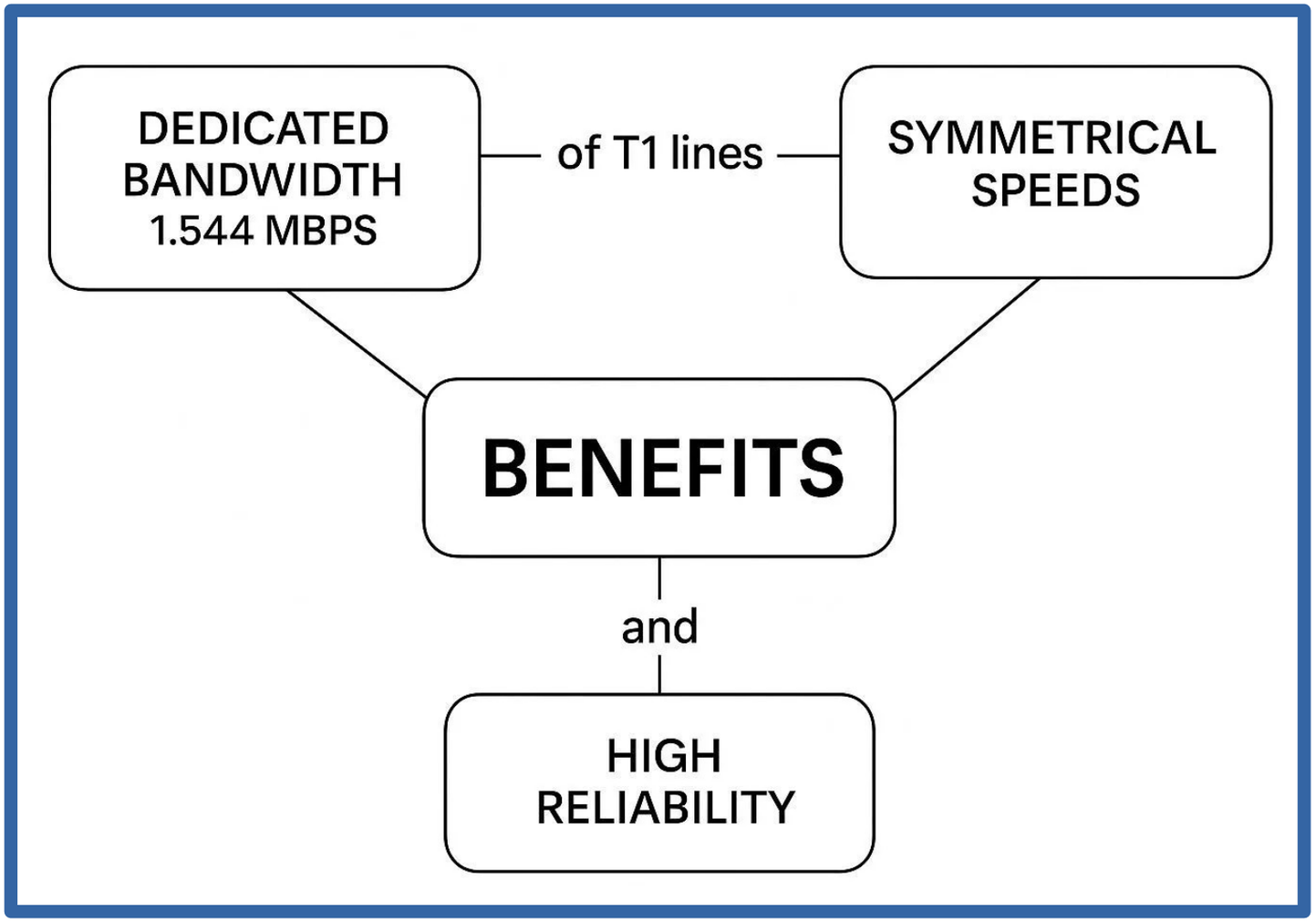
Availability percentages vs service downtime

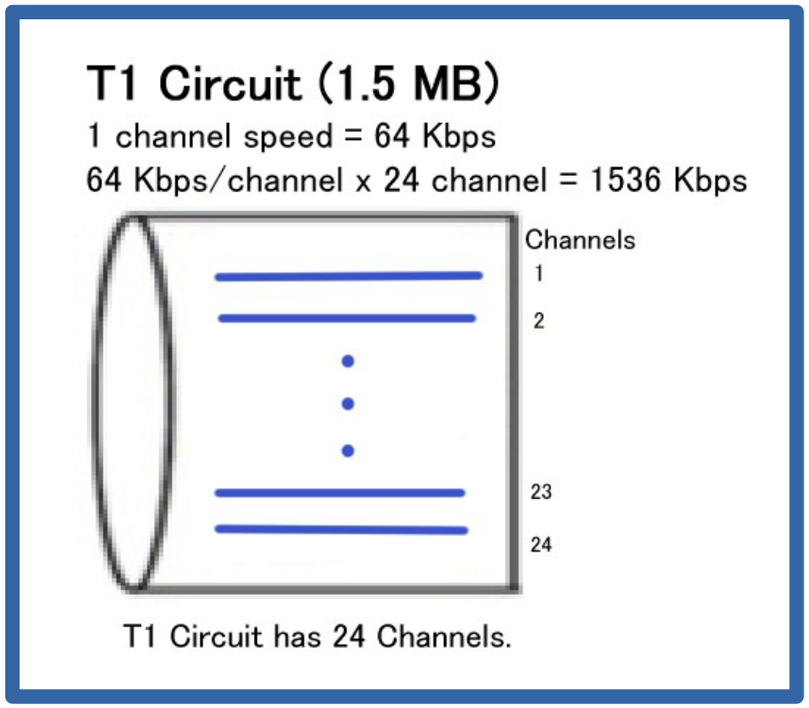
Availability %	Downtime per year	Downtime per month	Downtime per week
90% (one nine)	36.5 days	72 hours	16.8 hours
99% (two nines)	3.65 days	7.20 hours	1.68 hours
99.5%	1.83 days	3.60 hours	50.4 minutes
99.9% (three nines)	8.76 hours	43.8 minutes	10.1 minutes
99.95%	4.38 hours	21.56 minutes	5.04 minutes
99.99% (four nines)	52.56 minutes	4.32 minutes	1.01 minutes
99.999% (five nines)	5.26 minutes	25.9 seconds	6.05 seconds
99.9999% (six nines)	31.5 seconds	2.59 seconds	0.605 seconds
99.99999% (seven nines)	3.15 seconds	0.259 seconds	0.0605 seconds



Dedicated Lines:

- T1: 1.5 Mbps
- Dedicated Link; point to point with SLA
- No one sharing line
- Demarcation

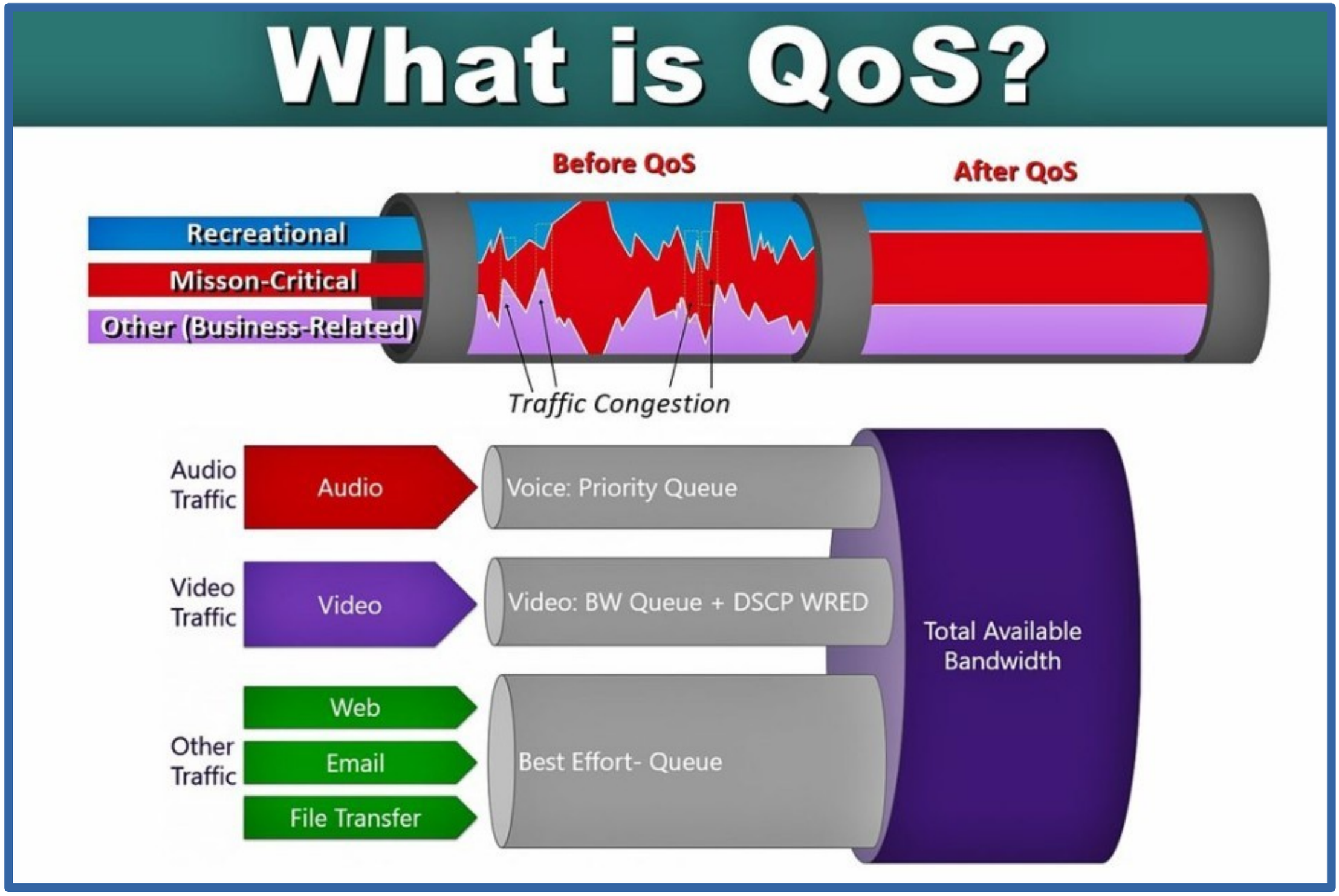




- Leased lines
- Do not go to web
- Can connect to office that routes to web

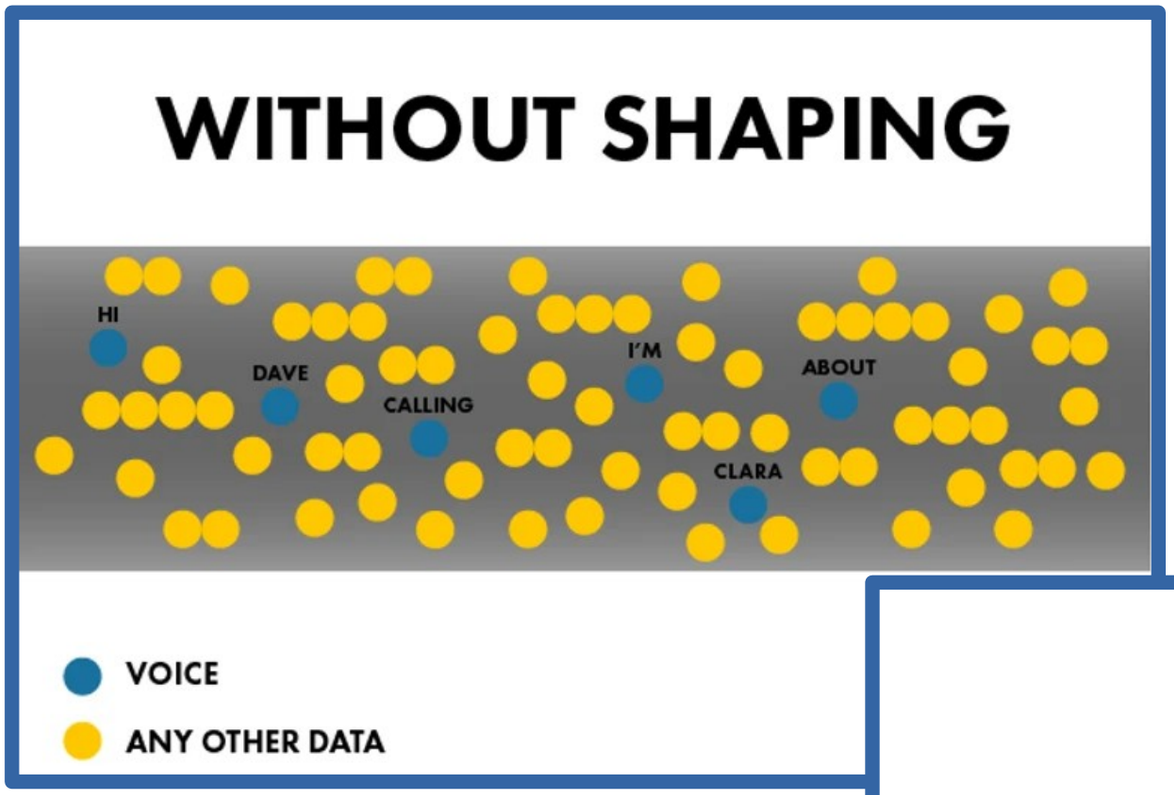
Quality of Service (QoS):

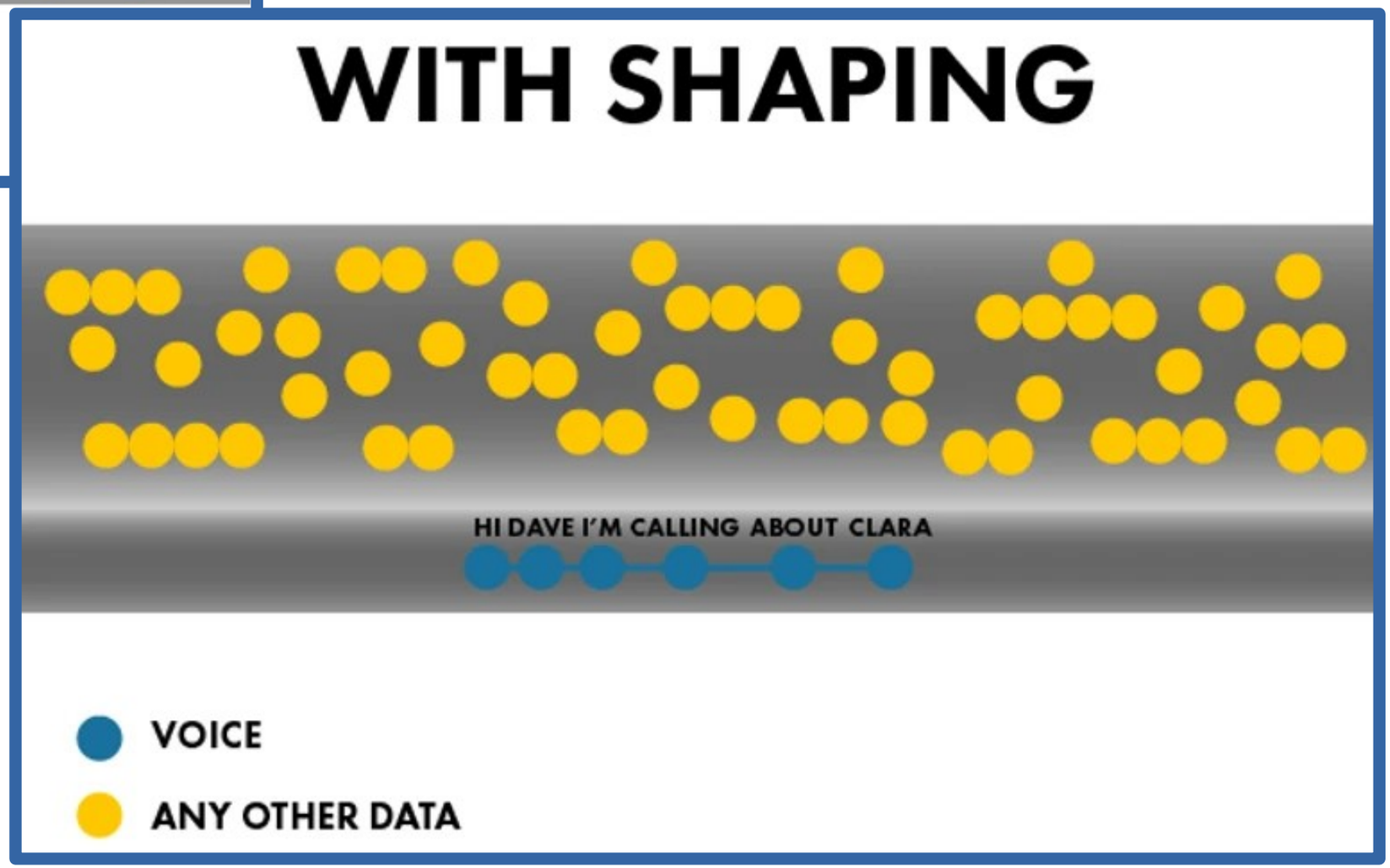
- Prioritize traffic
- Real time traffic (voice) gets priority
- Email is low priority



Traffic Shaping:

- Only approved applications, ie: email
- Not approved: Youtube, Facebook, etc





Network Operations Center [NOC]:

- Runs datacenters
- Help to see problems from a higher level
- Can NYC communicate with other datacenters in USA?
- Global picture
- Monitor servers, websites, databases, routers
- Software helps to monitor system, ie: bad hard drive