

Science and Technology

Topics

- 5G
- Super Computing, Cloud Computing and Edge Computing
- Quantum Technologies
- Blockchain Technology and Cryptocurrencies
- Internet – ICANN, Net neutrality, Dark Net, Space Based Internet
- Deep Learning, Machine Learning, AI
- Data Localization and Data Protection Regime
- Robotics

Transverse Wave



isvr

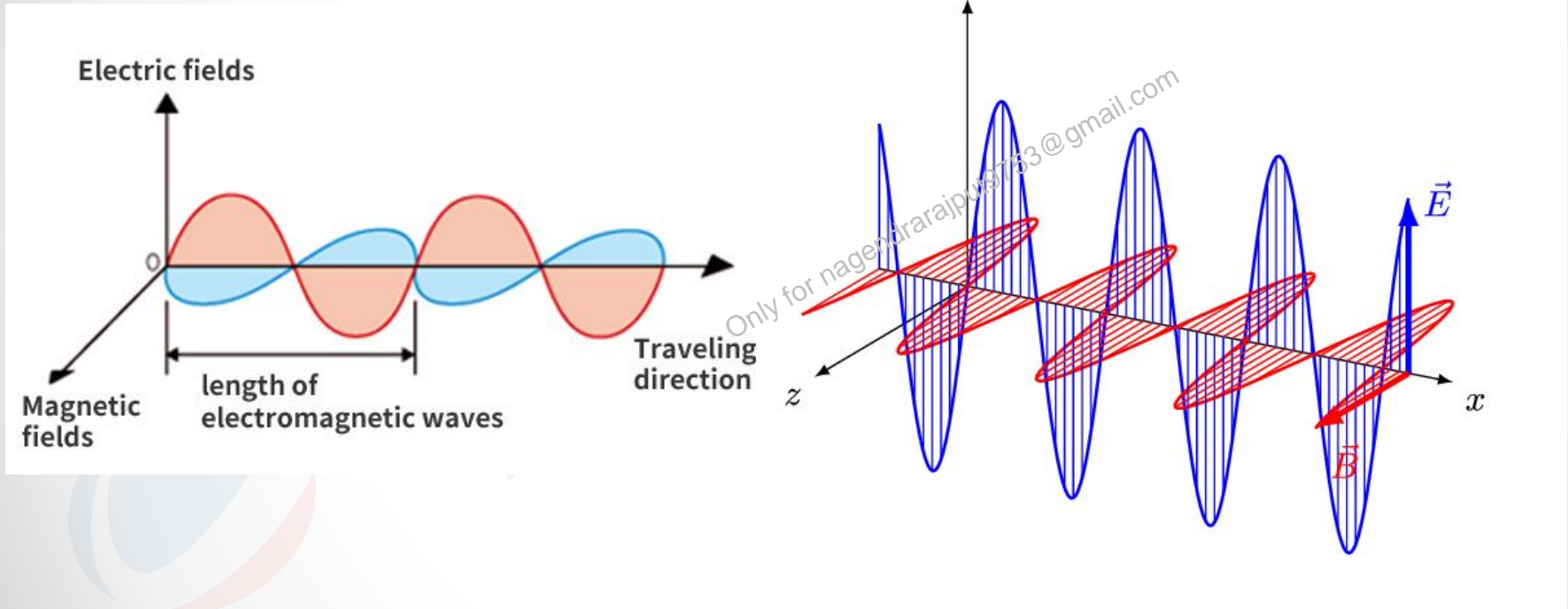
Longitudinal Wave



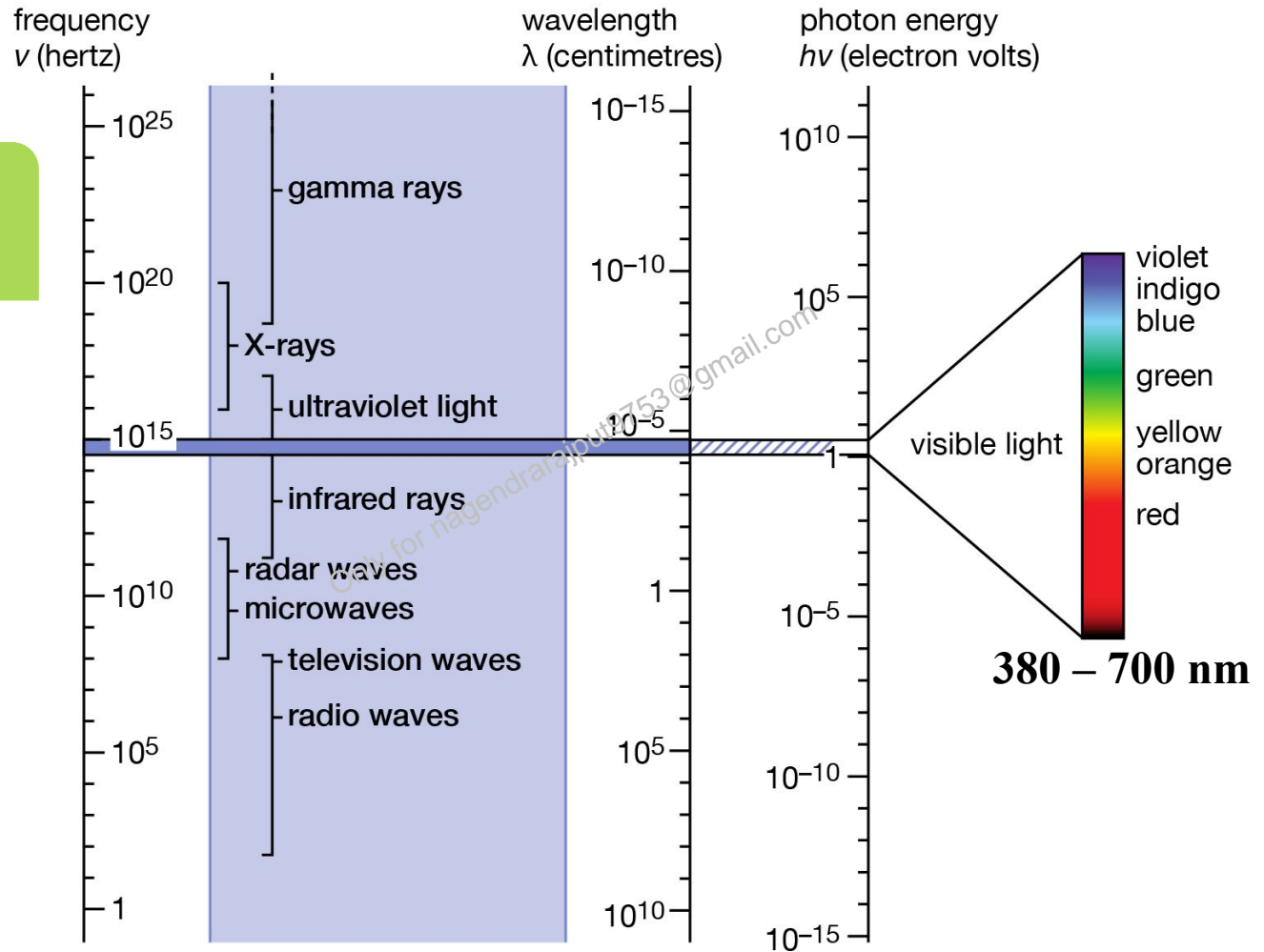
Transverse Wave



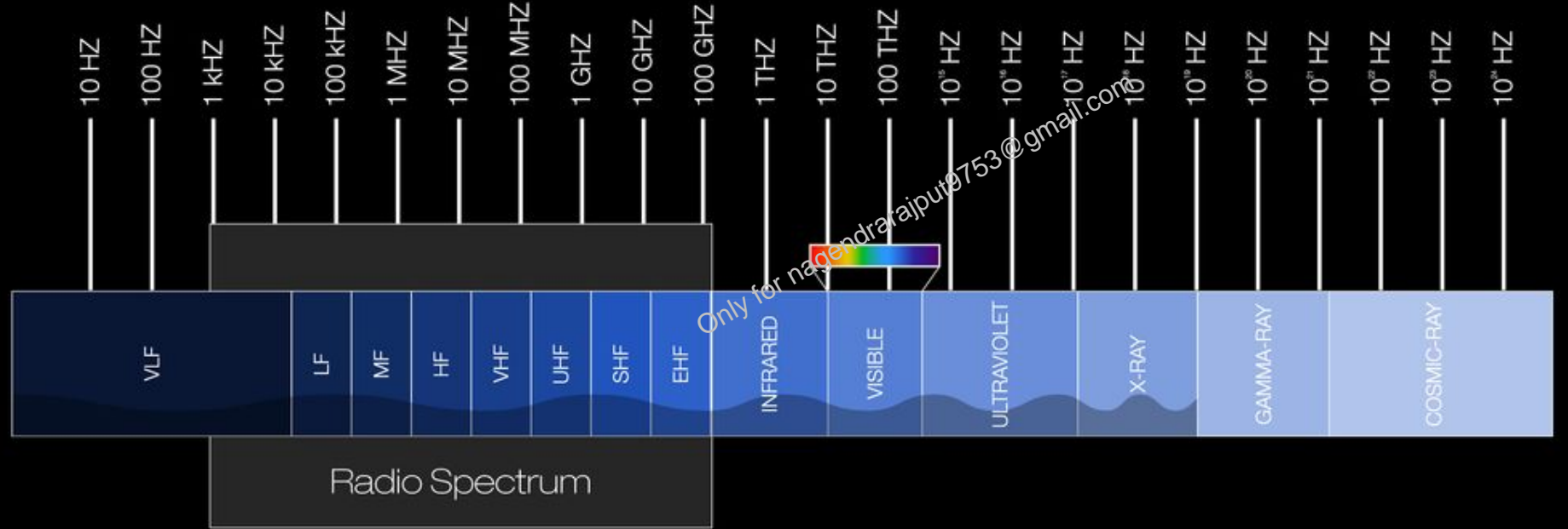
Electromagnetic Waves



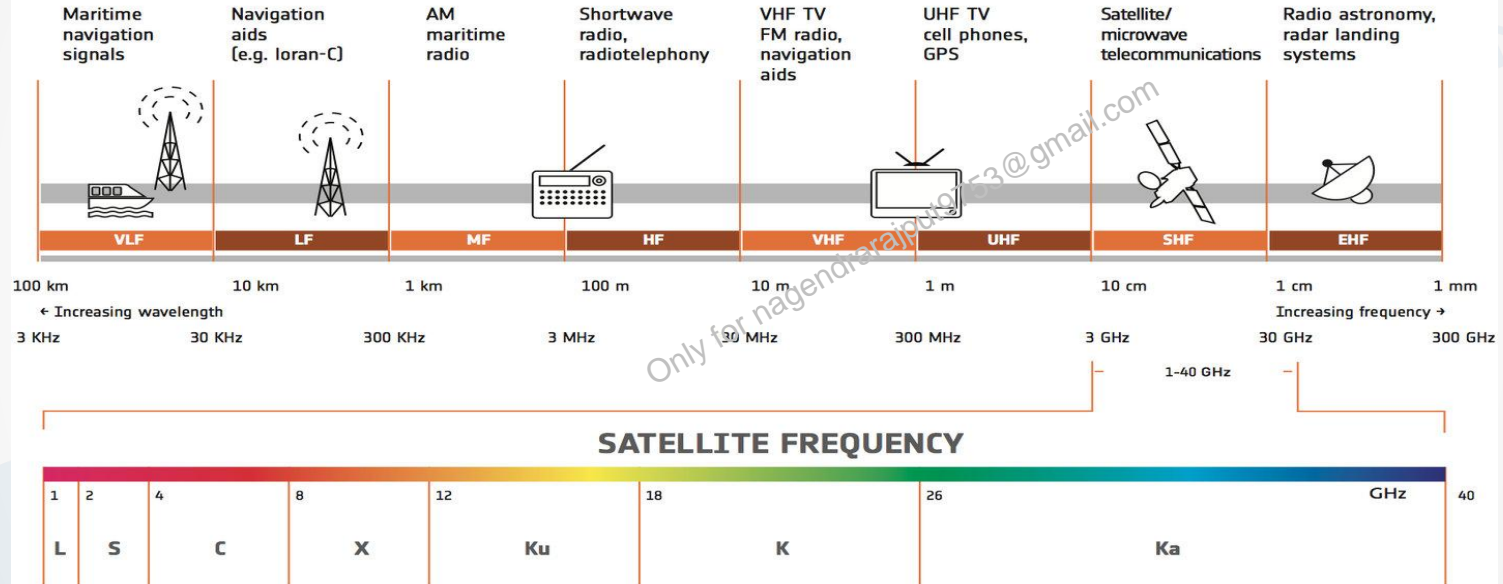
Electromagnetic Spectrum



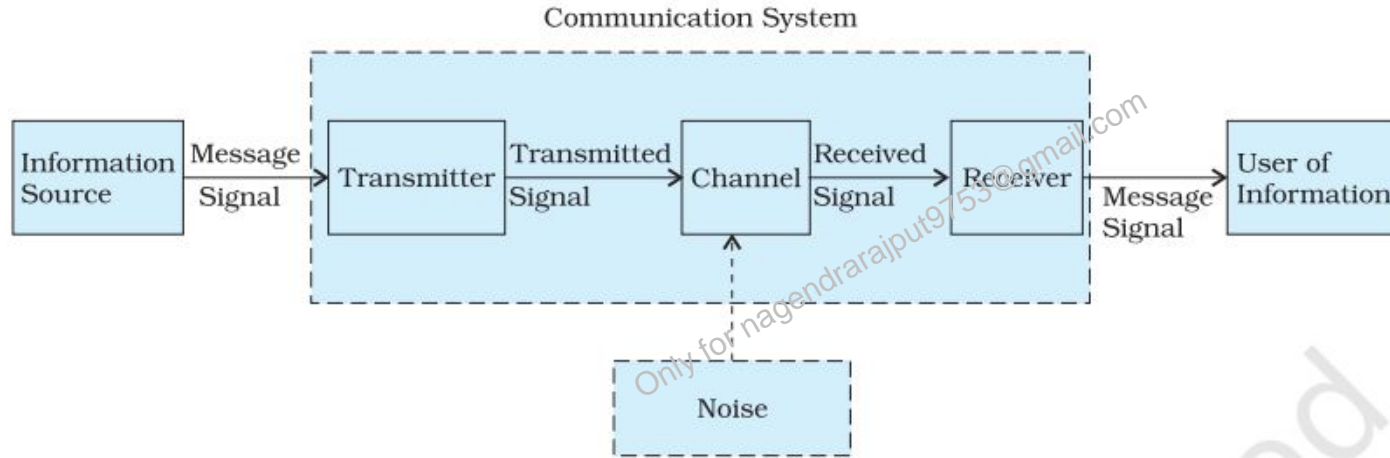
Electromagnetic Spectrum



Satellite Frequency



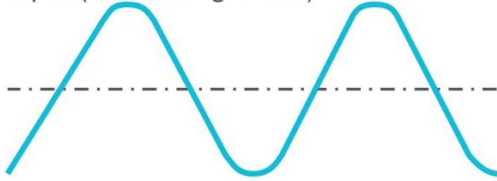
Generalized Communication System



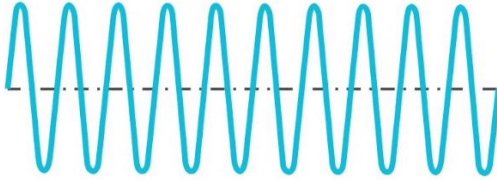
Modulation

Amplitude Modulation (AM)

Input (Modulating Wave)



Carrier

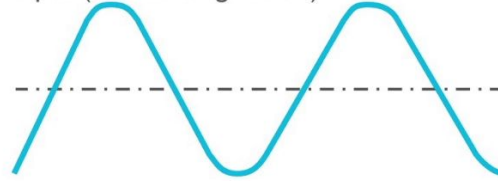


Modulated Result

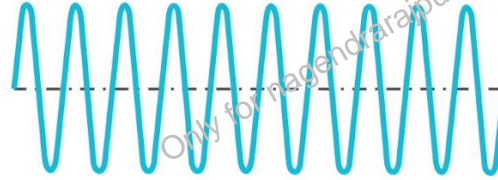


Frequency Modulation (FM)

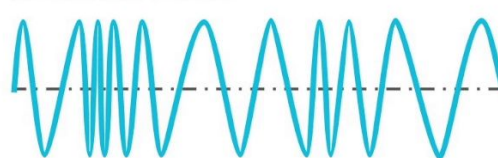
Input (Modulating Wave)



Carrier

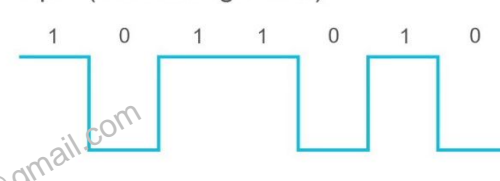


Modulated Result

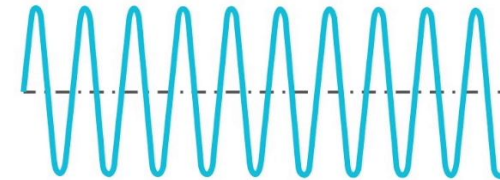


Digital Modulation

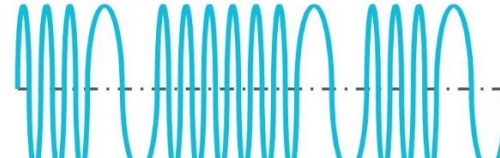
Input (Modulating Wave)



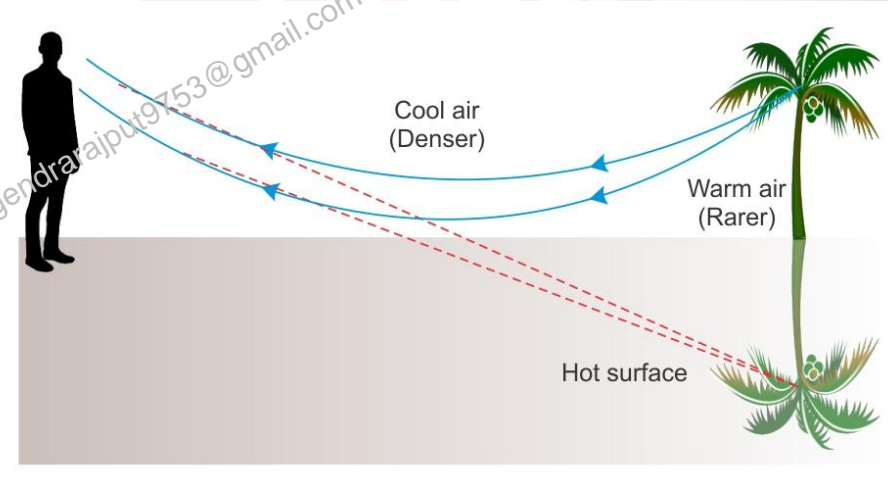
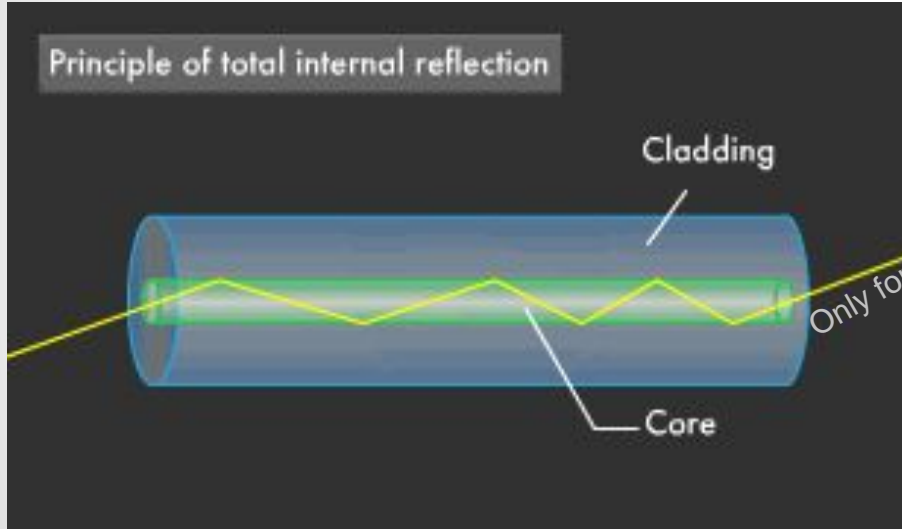
Carrier



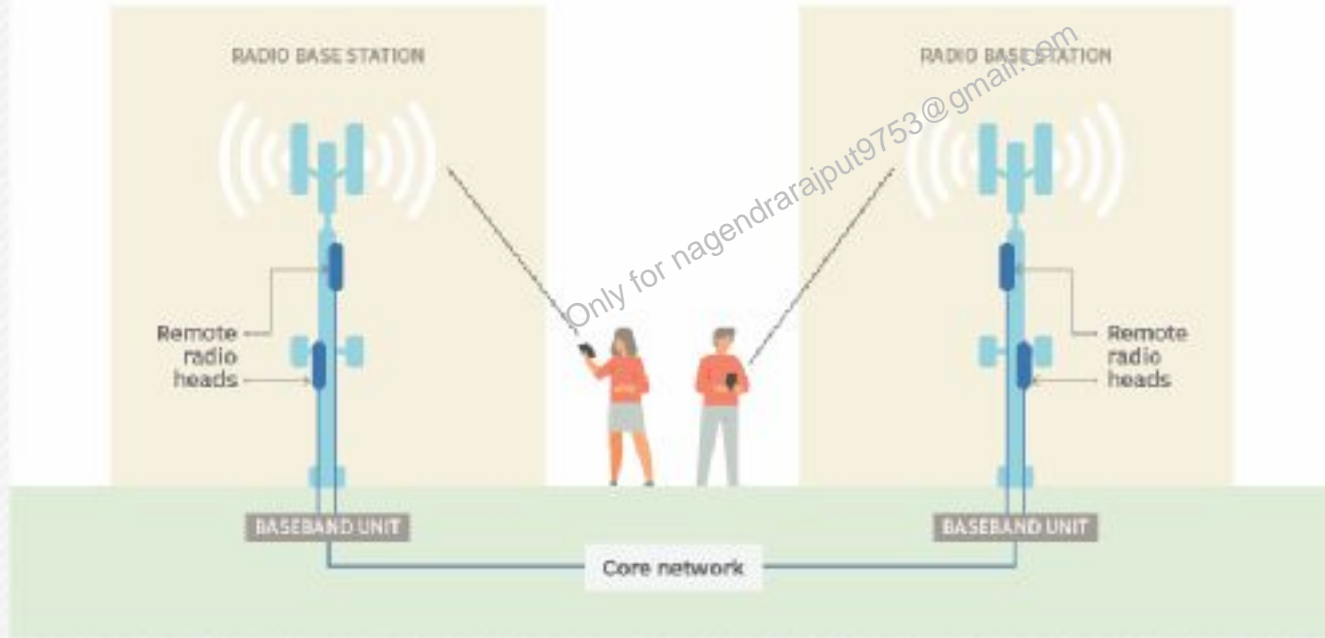
Modulated Result



Optical Fibre Cables



Basic RAN architecture



History of Mobile Technology

SYNOPSIS[®]

1G



Analog
Technology



2G



Digital
Technology



3G



Wireless
Capability



4G



Phones Became
Computers



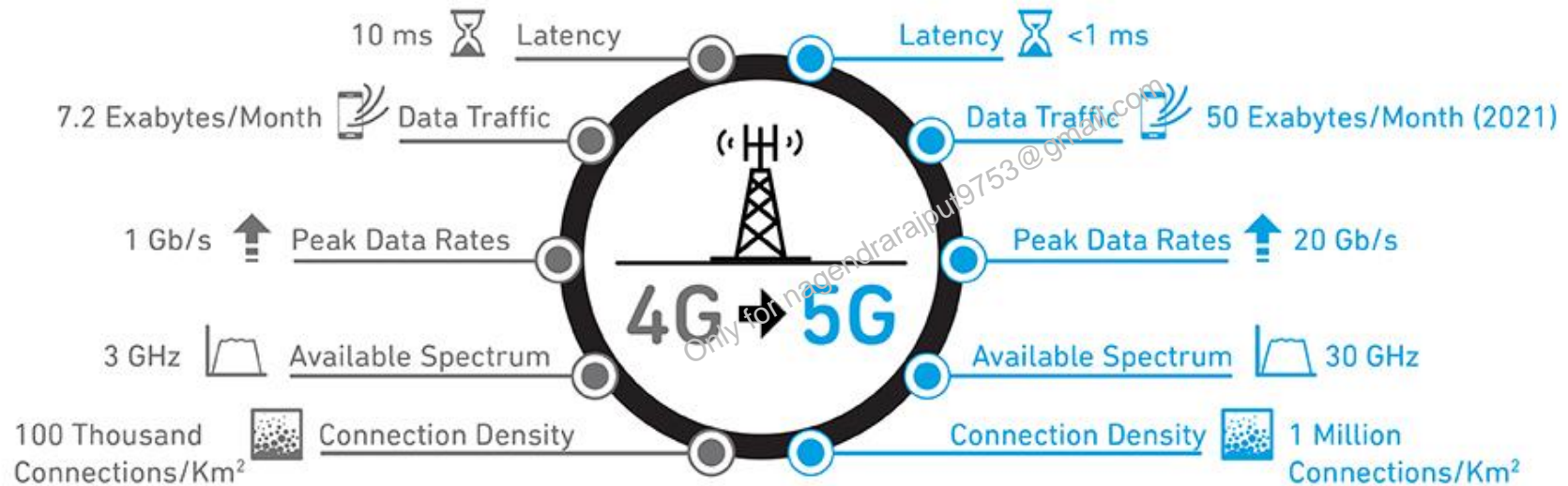
5G



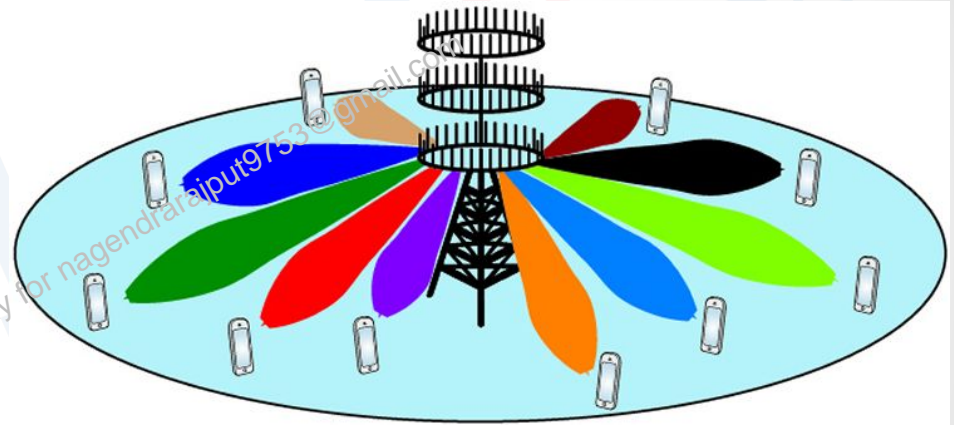
Unparalleled
Latency

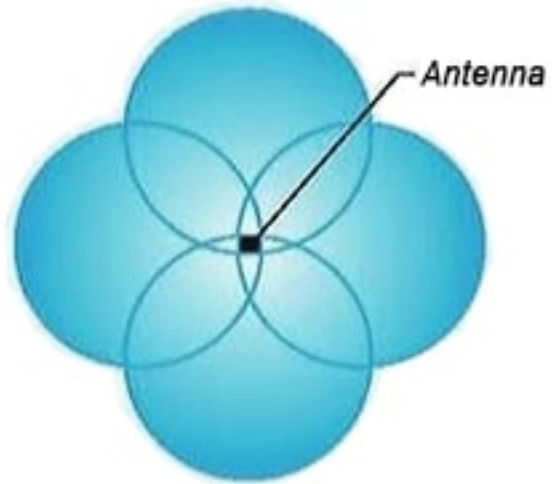


Comparing 4G and 5G

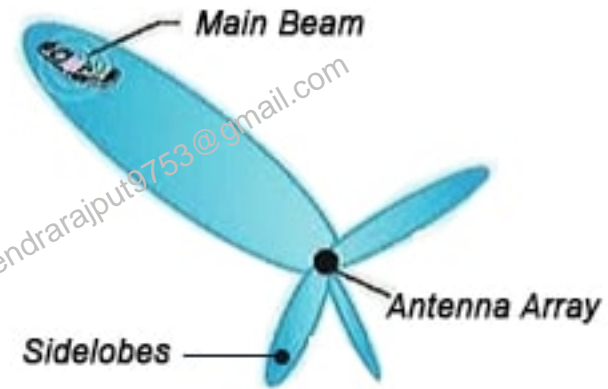


5G Technologies



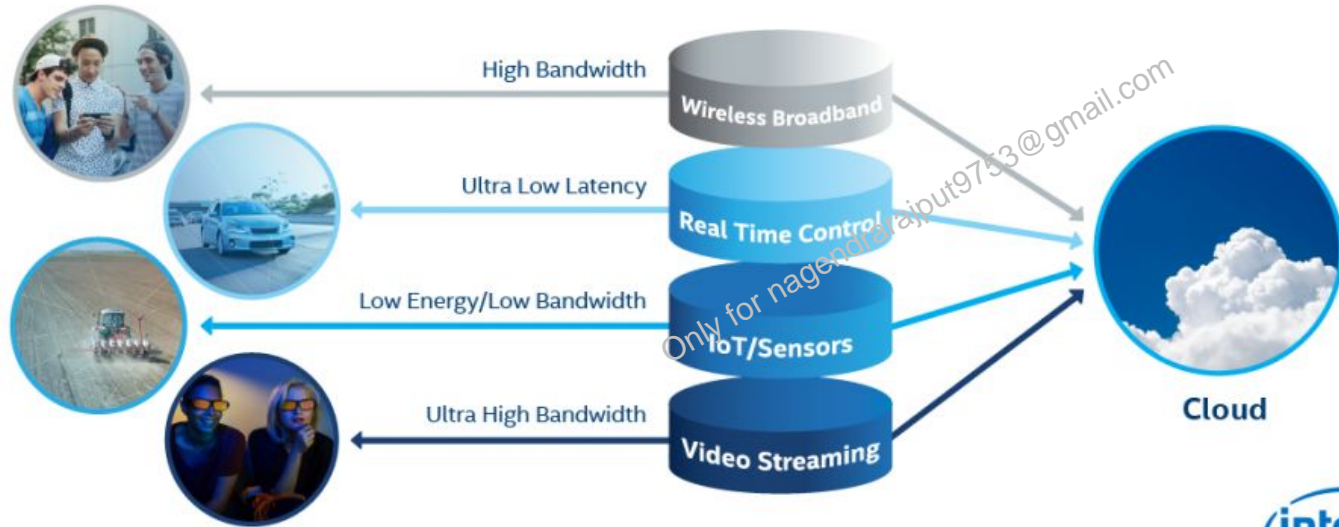


Conventional Array

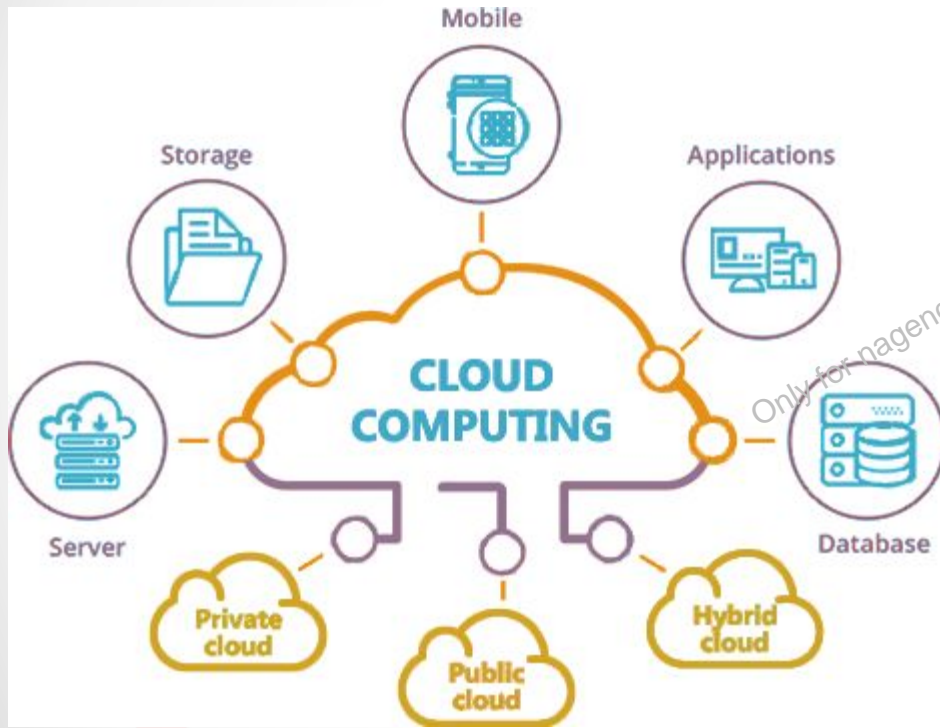


Beamforming Array

5G Network Slices

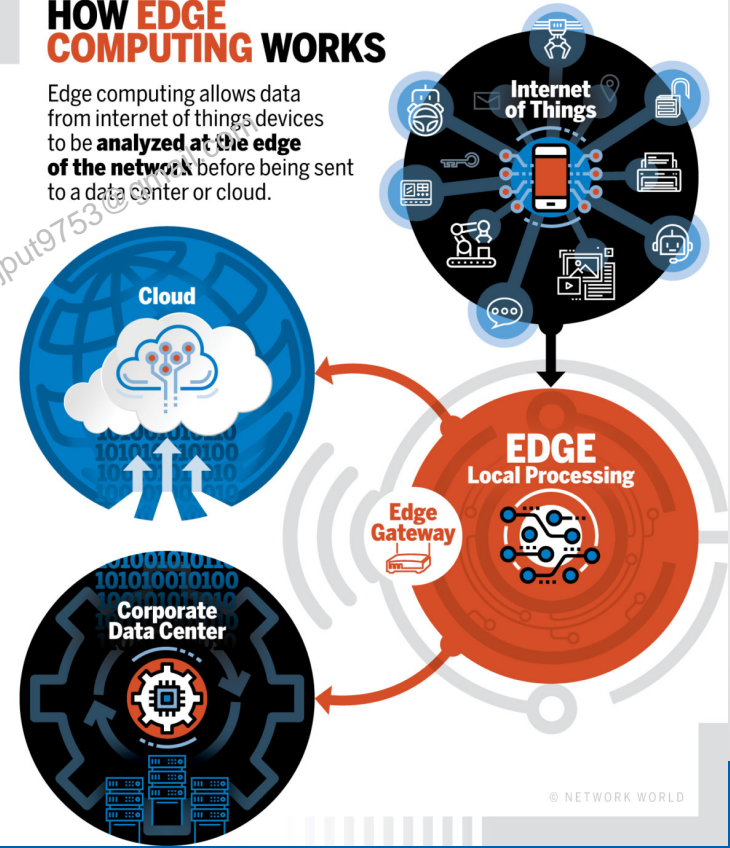


Cloud and Edge Computing

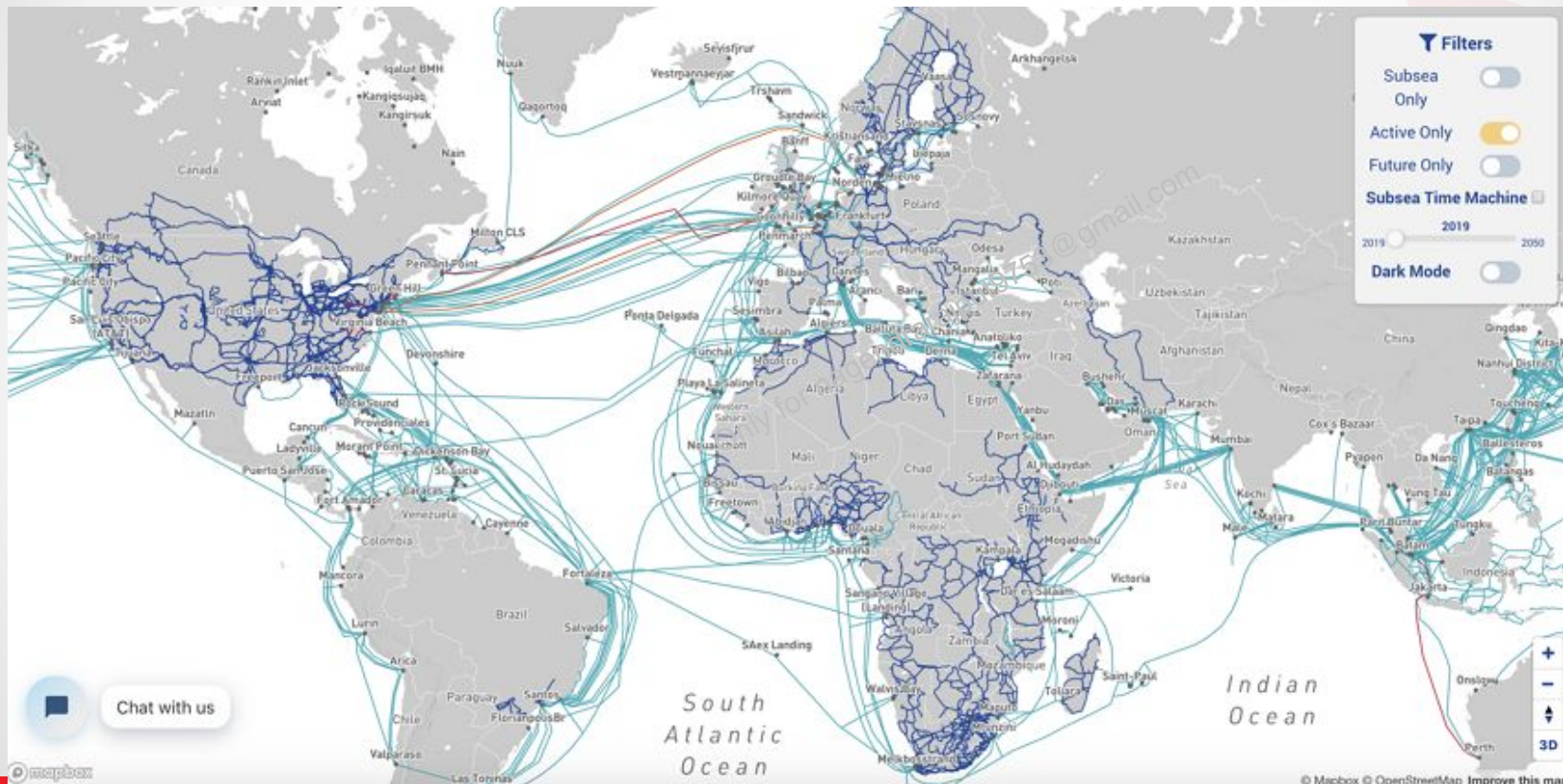


HOW EDGE COMPUTING WORKS

Edge computing allows data from internet of things devices to be **analyzed at the edge of the network** before being sent to a data center or cloud.



Subsea Network

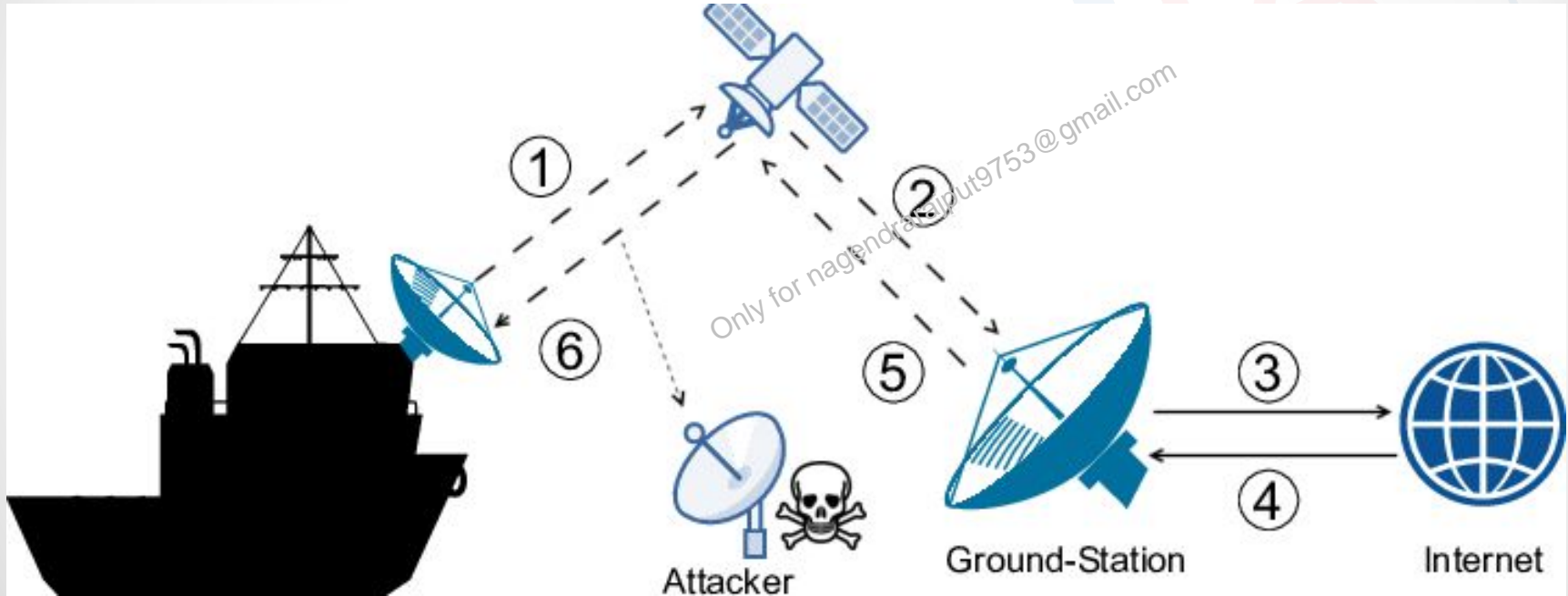




Internet of Things



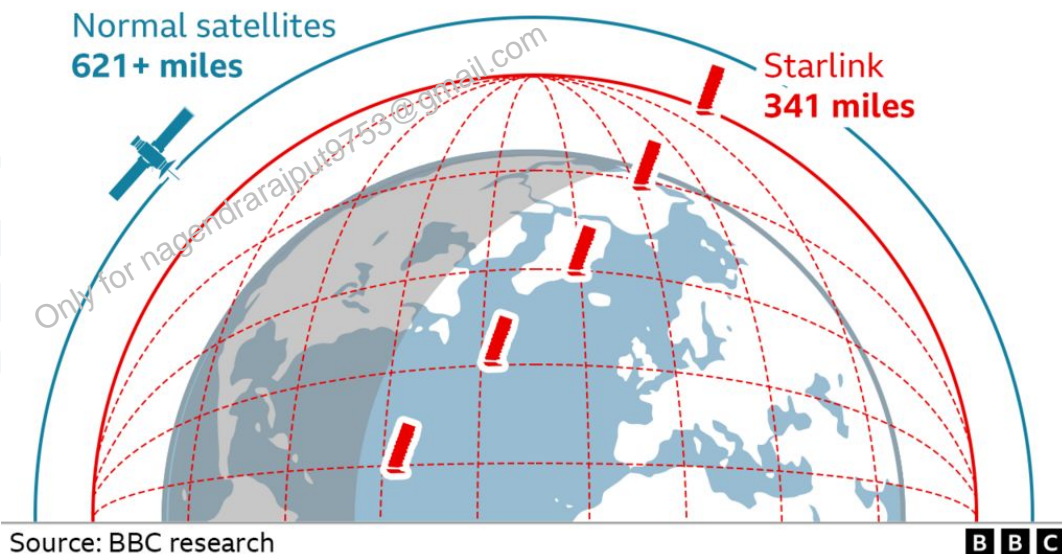
Maritime VSAT Network





Starlink operates in low orbit

Low-Earth orbit satellites can link to Earth faster, but more are needed to provide coverage



Q4. With reference to Visible Light Communication (VLC) technology, which of the following statements are correct?

1. VLC uses electromagnetic spectrum wavelengths 375 to 780 nm
2. VLC is known as long range optical wireless communication.
3. VLC can transmit large amounts of data faster than Bluetooth
4. VLC has no electromagnetic interference.

Select the correct answer using the code given below:

- (a) 1, 2 and 3 only
- (b) 1, 2 and 4 only
- (c) 1, 3 and 4 only
- (d) 2, 3 and 4 only

Q5. With reference to communications technologies, what is/are the difference/differences between LTE (Long-Term Evolution) and VoLTE (Voice over Long-Term Evolution)?

1. LTE is commonly marketed as 3G and VoLTE is commonly marketed as advanced 3G.
2. LTE is data-only technology and VoLTE is voice-only technology.

Select the correct answer using the code given below.

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

Q5. With reference to 'LiFi', recently in the news, which of the following statements is/are correct?

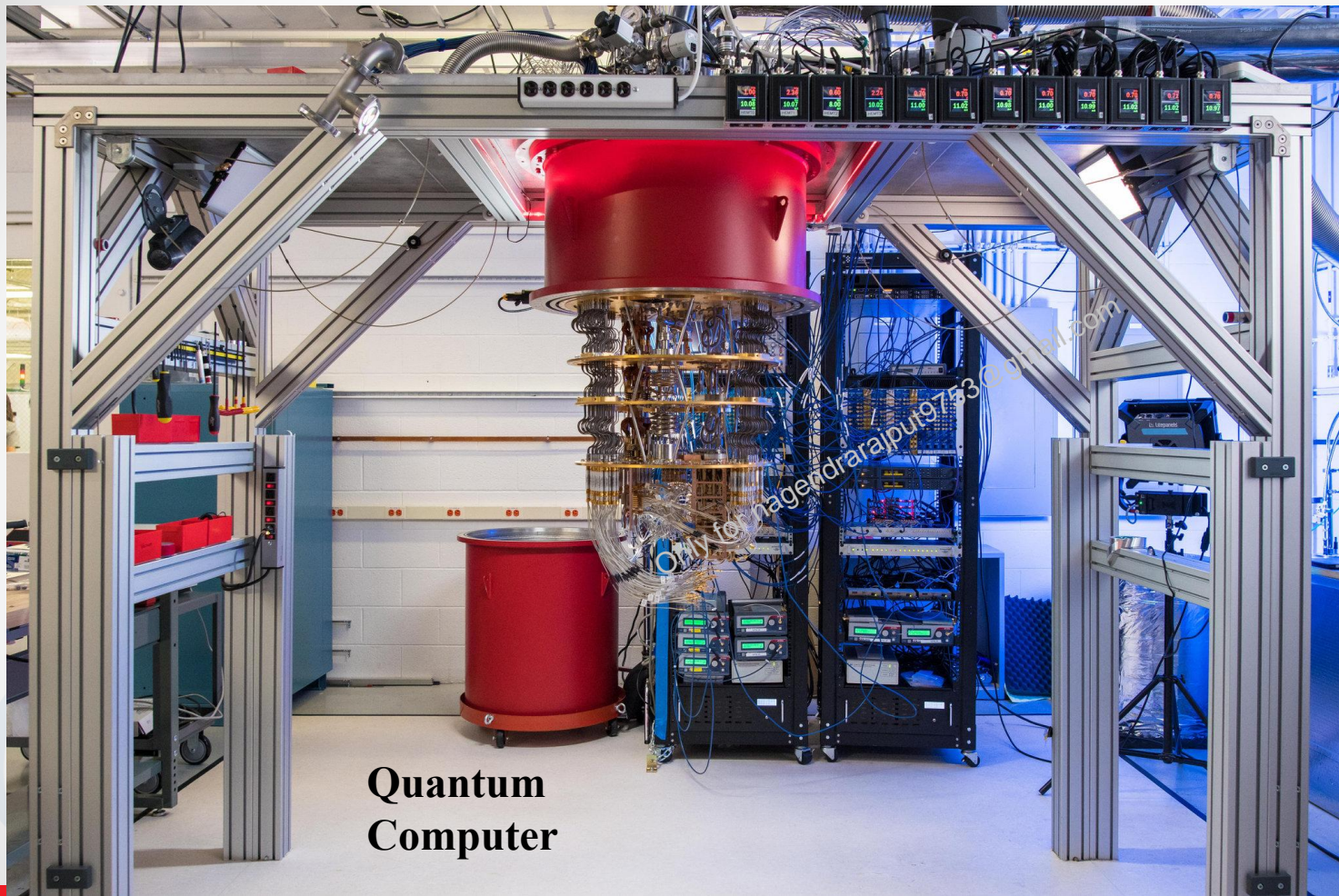
1. It uses light as the medium for high-speed data transmission.
2. It is a wireless technology and is several times faster than 'WiFi'.

Select the correct answer using the code given below.

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

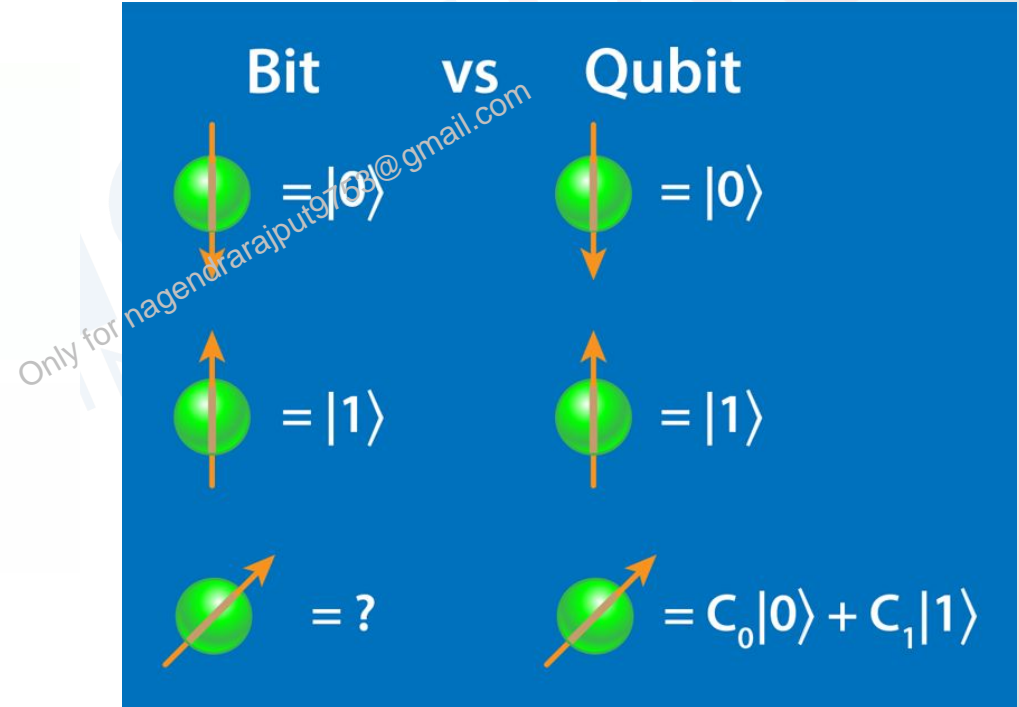
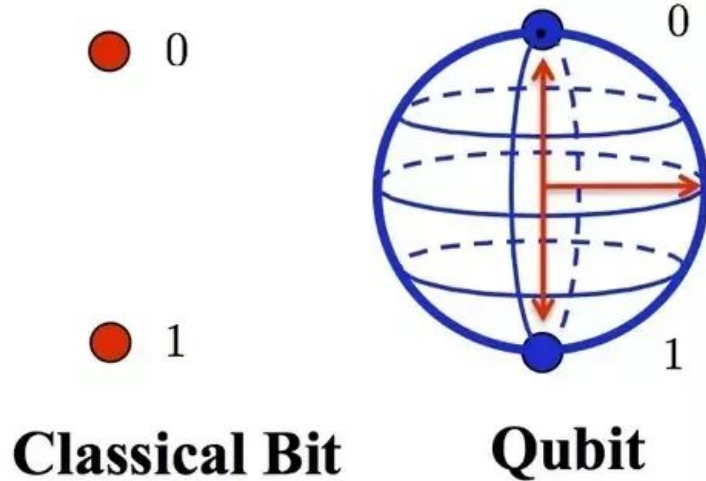
Param Siddhi Supercomputer



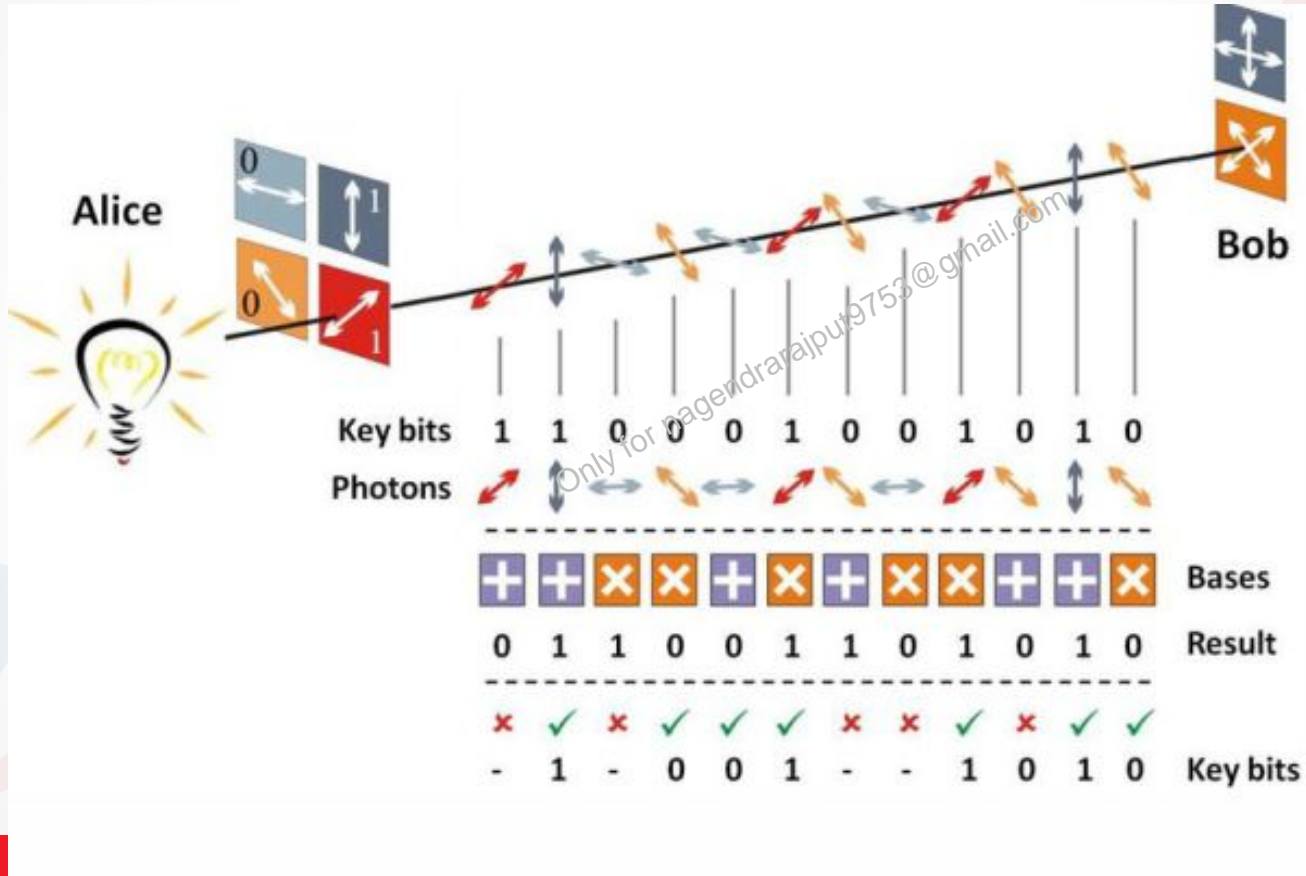


**Quantum
Computer**

Bit vs Qubit



Quantum Key Distribution



3 PARTS OF THE WEB

SURFACE WEB



Only represents about 5% of total internet content

Sites that can be indexed and accessed from search engines

Visible to average users without using The Onion Router (Tor) or any special software

Made up of popular .com, .net, and .org sites

DEEP WEB



Represents about 90% of total internet content

Sites that can't be accessed from search engines

Examples: email inboxes, banking information, credit card accounts

These sites are protected by authentication forms, passwords, and security firewalls

DARK WEB



5% of total internet content

Sites that exist within the deep web

Can only be accessed with a Tor browser

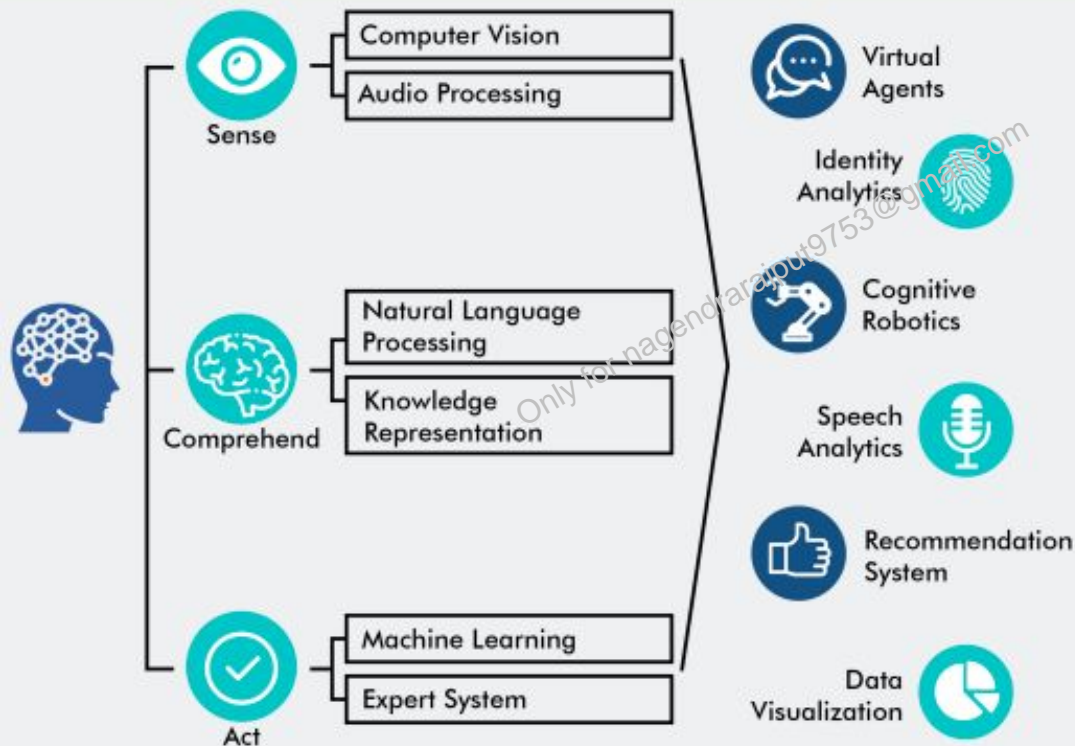
Used for both legal and illegal purposes



Artificial Intelligence

AI TECHNOLOGOES

ILLUSTRATIVE SOLUTIONS



The Properties of Distributed Ledger Technology (DLT)

Programmable

A blockchain is programmable (i.e. Smart Contracts)

Secure

All records are individually encrypted

Anonymous

The identity of participants is either anonymous or pseudonymous

Unanimous

All network participants agree to the validity of each of the records

Distributed

All network participants have a copy of the ledger for complete transparency

Immutable

Any validated records are irreversible and cannot be changed

Time-stamped

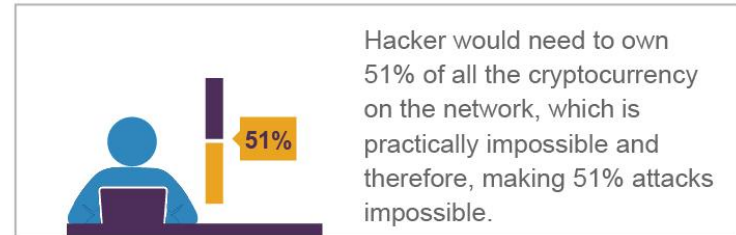
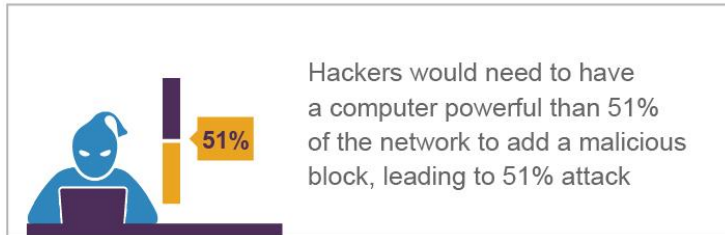
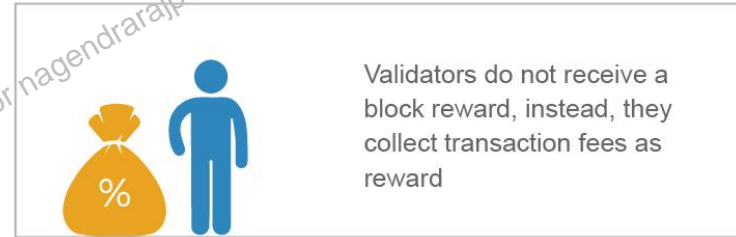
A transaction timestamp is recorded on a block

https://www.youtube.com/watch?v=_160oMzbIY8

Proof of Work

VS

Proof of Stake





GDPR PRINCIPLES

Q. In the context of digital technologies for entertainment, consider the following statements:

1. In Augmented Reality (AR), a simulated environment is created and the physical world is completely shut out.
2. In Virtual Reality (VR), mages generated from a computer are projected onto real-life objects or surroundings.
3. AR allows individuals to be present in the world and improves the experience using the camera of smartphones or PC.
4. VR closes the world, and transposes an individual, providing complete immersion experience.

Which of the statements given above is/are correct?

- (a) 1 and 2 only
- (b) 3 and 4
- (c) 1, 2 and 3
- (d) 4 only

Q: With reference to Web 3.0, consider the following statements:

1. Web 3.0 technology enables people to control their own data.
2. In Web 3.0 world, there can be blockchain based social networks.
3. Web 3.0 is operated by users collectively rather than a corporation.

Which of the statements given above are correct ?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Q. Which one of the following-is the context in which the term "qubit" is mentioned ?

- (a) Cloud Services
- (b) Quantum Computing
- (c) Visible Light Communication Technologies
- (d) Wireless Communication Technologies

Q. With reference to "Blockchain Technology" consider the following statements:

1. It is a public ledger that everyone we inspect, but which no single user controls
2. The structure and design of blockchain is such that all the data in it are about crypto currency only.
3. Applications that depend on basic features of blockchain can be developed without anybody's permission.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 1 and 2 only
- (c) 2 only
- (d) 1 and 3 only

Q. With reference to Non- Fungible Tokens (NFTs), consider the following statements:

1. They enable the digital representation of physical assets.
2. They are unique cryptographic tokens that exist on a blockchain.
3. They can be traded or exchanged at equivalency and therefore can be used as a medium of commercial transactions.

Which of the statements given above are correct?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3