

4G



5G



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1G

- ⦿ Refers to first generation of wireless telephone technology.
- ⦿ It's speed was up to 2.4 kbps
- ⦿ It allows voice call in one country.
- ⦿ It uses analog signal.
- ⦿ AMPS was first launched in USA in 1 G mobile systems.
- ⦿ Uses FDMA multiplexing.
- ⦿ Voice itself during a call is only modulated to higher frequency (appx. 150 MHz)



2G

- Refers to 2nd generation mobile technology
- It is based on GSM
- It was launched in Finland in the year 1991.
- It uses digital signals
- It's data speed up to 64 kbps
- It enables services like text messages, MMS.
- Unable to handle complex data like video.



2.5 G

- Technology between 2G and 3G.
- Sometimes described as 2G cellular (Technology combined with GPRS).
- It's data speed is up to 64-144 kbps.
- Uses both CDMA and TDMA multiplexing.



3G

- Refer to 3rd generation mobile technology introduced in year of 2000
- Data transmission speed – 144 kbps to 2Mbps.
- Typically called Smart Phones and features increases its bandwidth and data transfer rates.
- Enable to handle complex data like videos easily.
- Providing faster communication.
- Uses only CDMA multiplexing.

Welcome to the world of
3G communication.

Step into the next generation of
mobile communication.

!dea

- The use of 3G technology is also able to transmit packet switch data efficiently at better and increased bandwidth.
- 3G is also known as IMT-2000.
- Fast Communication, Internet, Mobile T.V, Video Conferencing, Video Calls, Multimedia Messaging Service (MMS), 3D gaming, Multi-Gaming, etc. are also available with 3G phones.

Why 3G faster than 2G

- ⦿ Because it uses more bandwidth
- ⦿ Data Rate=
spectral efficiency(bps/Hz) X available bandwidth(Hz)

GSM is 200Khz.

WCDMA is 5MHz.

CDMA2000 is 1.25MHz.

Disadvantages of 3G

- ⦿ Expensive fees for 3G license services.
- ⦿ It was challenge to build the infrastructure for 3G.
- ⦿ High bandwidth requirement.
- ⦿ Expensive 3G phones.
- ⦿ Large cell phones.



4G

- ⦿ High speed data access.
- ⦿ High quality streaming video.
- ⦿ Capable of providing data speed up to 100 Mbps.
- ⦿ “MAGIC” word used to describe 4G:

Mobile Multimedia

Anytime Anywhere

Global Mobility Support

Integrated Wireless Solution

Customized Personal Services.



- It offers both cellular and broadband multimedia services everywhere.
- It uses packet switching for voice and video calls instead of circuit switching.
- Two 4G candidate systems that have been commercially deployed are WiMAX standard and the first-release Long Term Evolution (LTE) standard.

Technologies used in 4G

- ◎ Smart Antennas For (MIMO).
- ◎ IPv6
- ◎ OFDM
- ◎ Software Defined Radio System(SDR)

Smart Antenna

- ⦿ Faster bit rate
- ⦿ Space division multiplexing (SDMA)
- ⦿ Very high security
- ⦿ Reduction of errors due to multi path fading
- ⦿ Less power used for transmission
- ⦿ Resolve problem of diminishing spectrum availability.

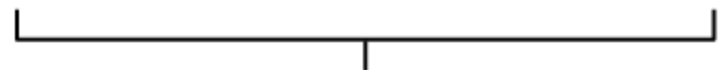
- ⦿ A smart antenna is an array of elements connected to a digital signal processor.
- ⦿ Each antenna element "sees" each propagation path differently, enabling the collection of elements to distinguish individual paths to within a certain resolution.
- ⦿ SDMA scheme enables multiple users within the same radio cell to be accommodated on the same frequency or time slot.

IPv6

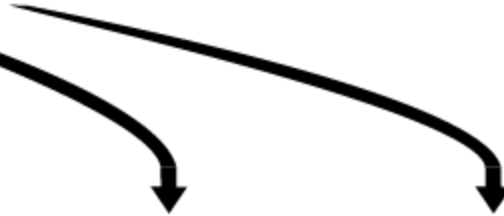
An IPv6 address

(in hexadecimal)

2001 :0DB8 :AC10 :FE01 :0000 :0000 :0000 :0000



2001 :0DB8 :AC10 :FE01 :: Zeroes can be omitted



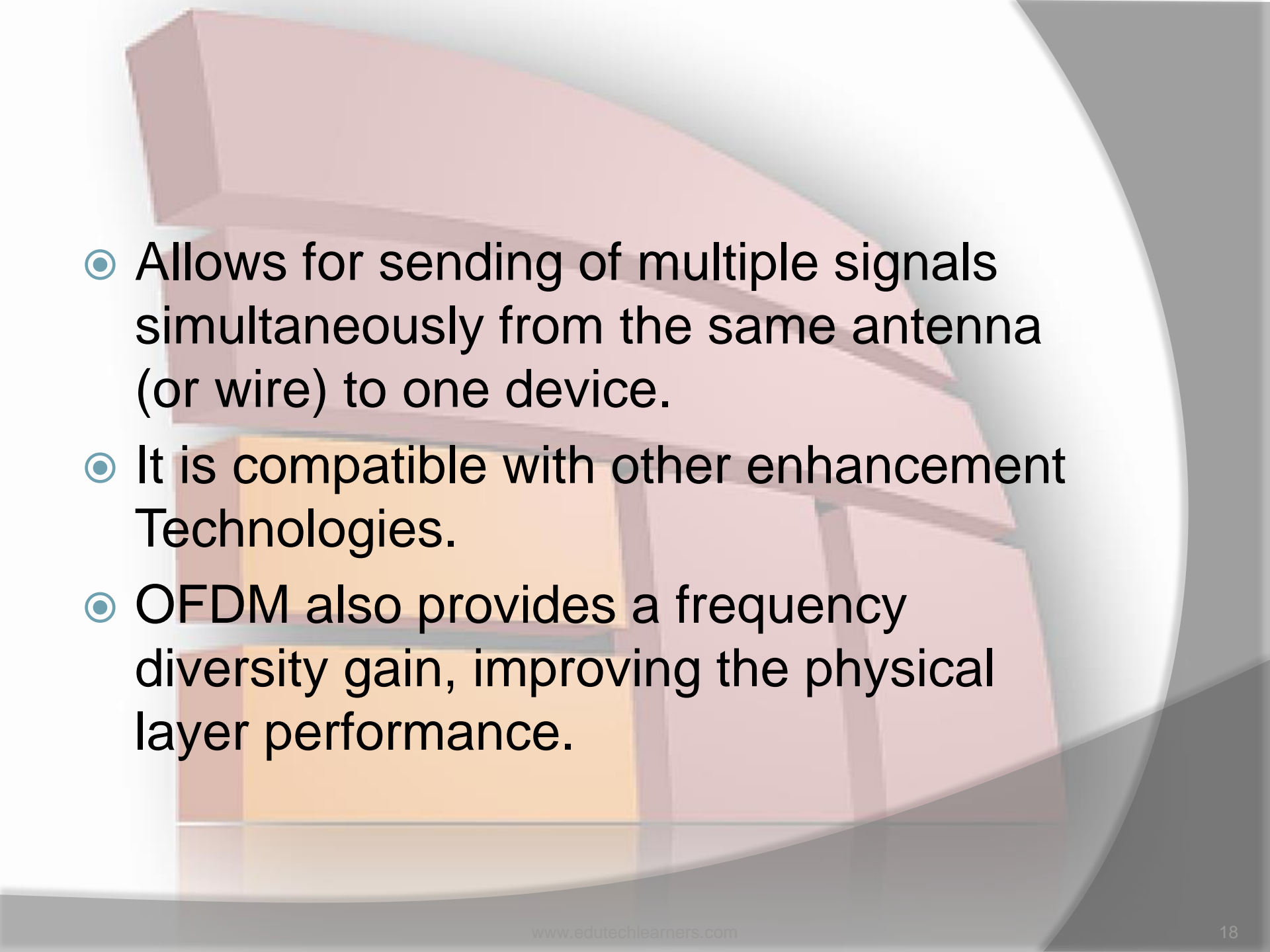
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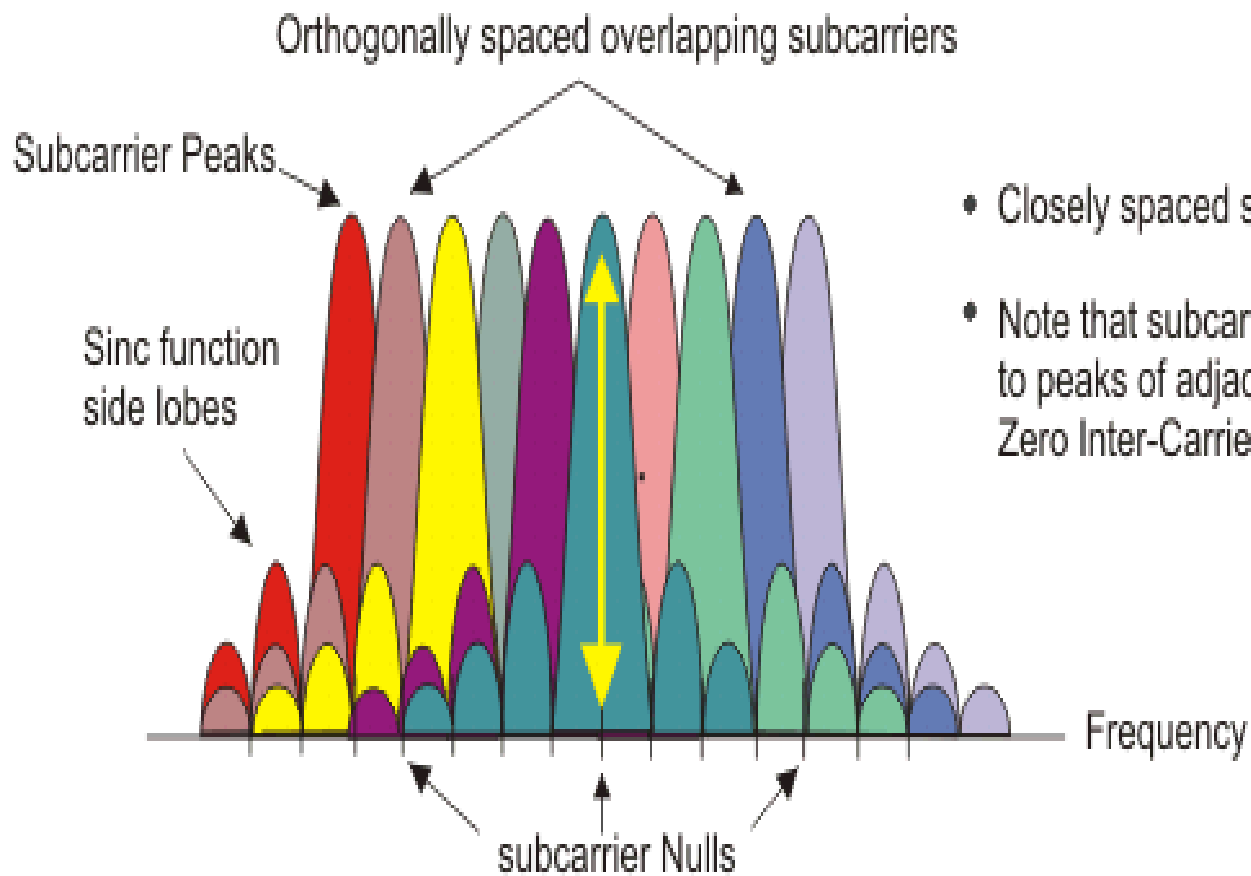
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- It enables a number of application with better multicast, security, and route optimization capabilities.
- IPv6 support is essential in order to support a large number of wireless-enabled services.
- By increasing the number of IP address ,IPv6 removes the need of Network Address Translation(NAT).

OFDM

- ⦿ Orthogonal frequency-division multiplexing (OFDM) is a method of encoding digital data on multiple carrier frequencies
- ⦿ Allows for transfer of more data than other forms of multiplexing (time, frequency, code, etc.)
- ⦿ Simplifies the design of transmitter and receiver.
- ⦿ Allows for use of almost the entire frequency band.
- ⦿ Currently used in WiMax (802.16)
- ⦿ The frequencies are spaced so that the signal do not interfere with each other(no cross talk).

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- Allows for sending of multiple signals simultaneously from the same antenna (or wire) to one device.
 - It is compatible with other enhancement Technologies.
 - OFDM also provides a frequency diversity gain, improving the physical layer performance.



- Closely spaced subcarriers overlap
- Note that subcarrier nulls correspond to peaks of adjacent subcarriers for Zero Inter-Carrier-Interference.

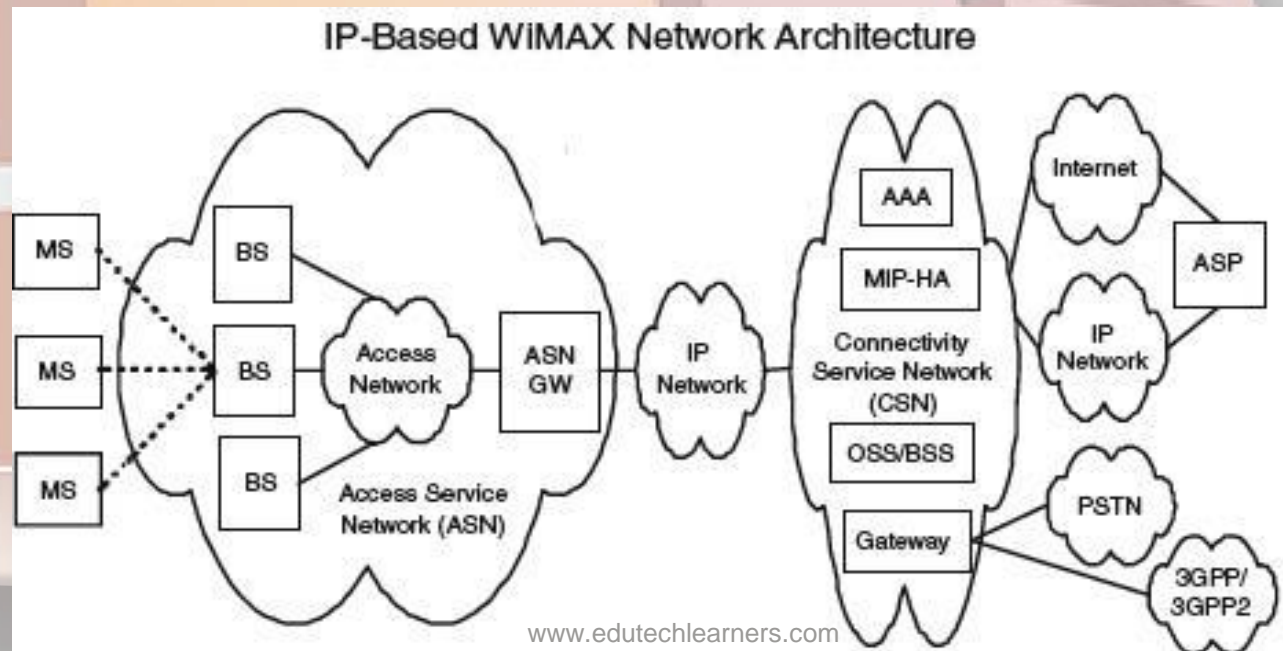
OFDM Signal Frequency Spectra

Software-Defined Radio(SDR)

- It is one of the form of open wireless Architecture.
- Software-defined radio (SDR) is a radio communication system where components that have been typically implemented in hardware (e.g. mixers, filters, etc.) are instead implemented by means of software on a personal computer or embedded system.
- Since 4G is a collection of wireless standards , the final form of a 4G device will constitute various standards which can be efficiently realized by SDR Technology.

WiMaX

- The overall network may be logically divided into three parts:
- 1. Mobile Stations (MS) used by the end user to access the network.
- 2. The access service network (ASN), which comprises one or more base stations and one or more ASN gateways that form the radio access network at the edge.
- 3. Connectivity service network (CSN), which provides IP connectivity and all the IP core network functions

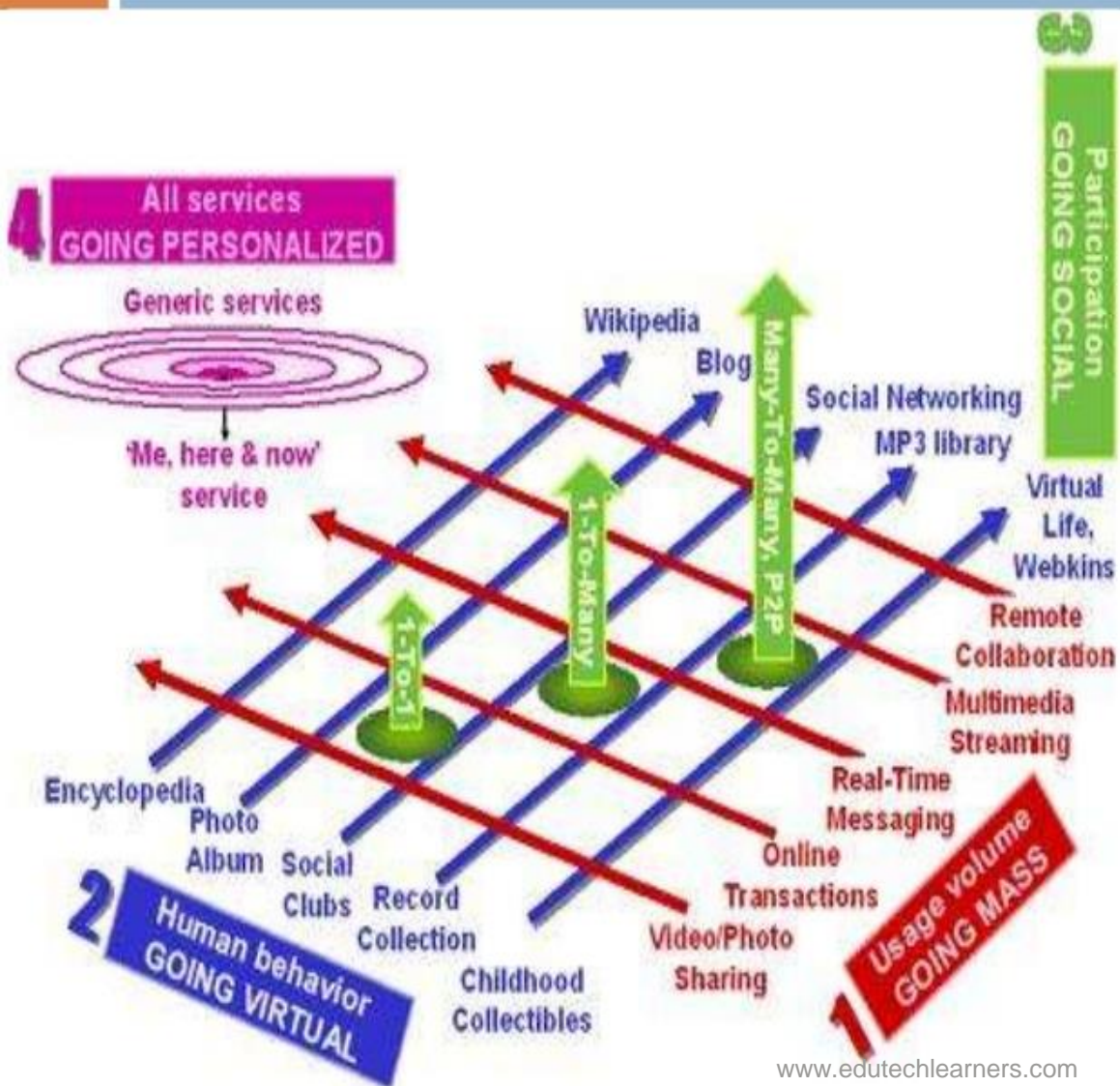




LTE

- ⦿ LTE also has IP based architecture .
- ⦿ It is quite different from WiMAX in security mechanism.
- ⦿ The LTE specification provides downlink peak rates of 300 Mbit/s, uplink peak rates of 75 Mbit/s and QoS provisions permitting a transfer latency of less than 5 ms in the radio access network.
- ⦿ LTE supports scalable carrier bandwidths, from 1.4 MHz to 20 MHz and supports both frequency division duplexing (FDD) and time-division duplexing (TDD).

Broad trends - enabled by 4G networks



Growing mass: 4G will allow the mass-market take-up of such activities as video sharing, multimedia exchanges, and real-time and remote collaboration with very high quality of experience (QOE).

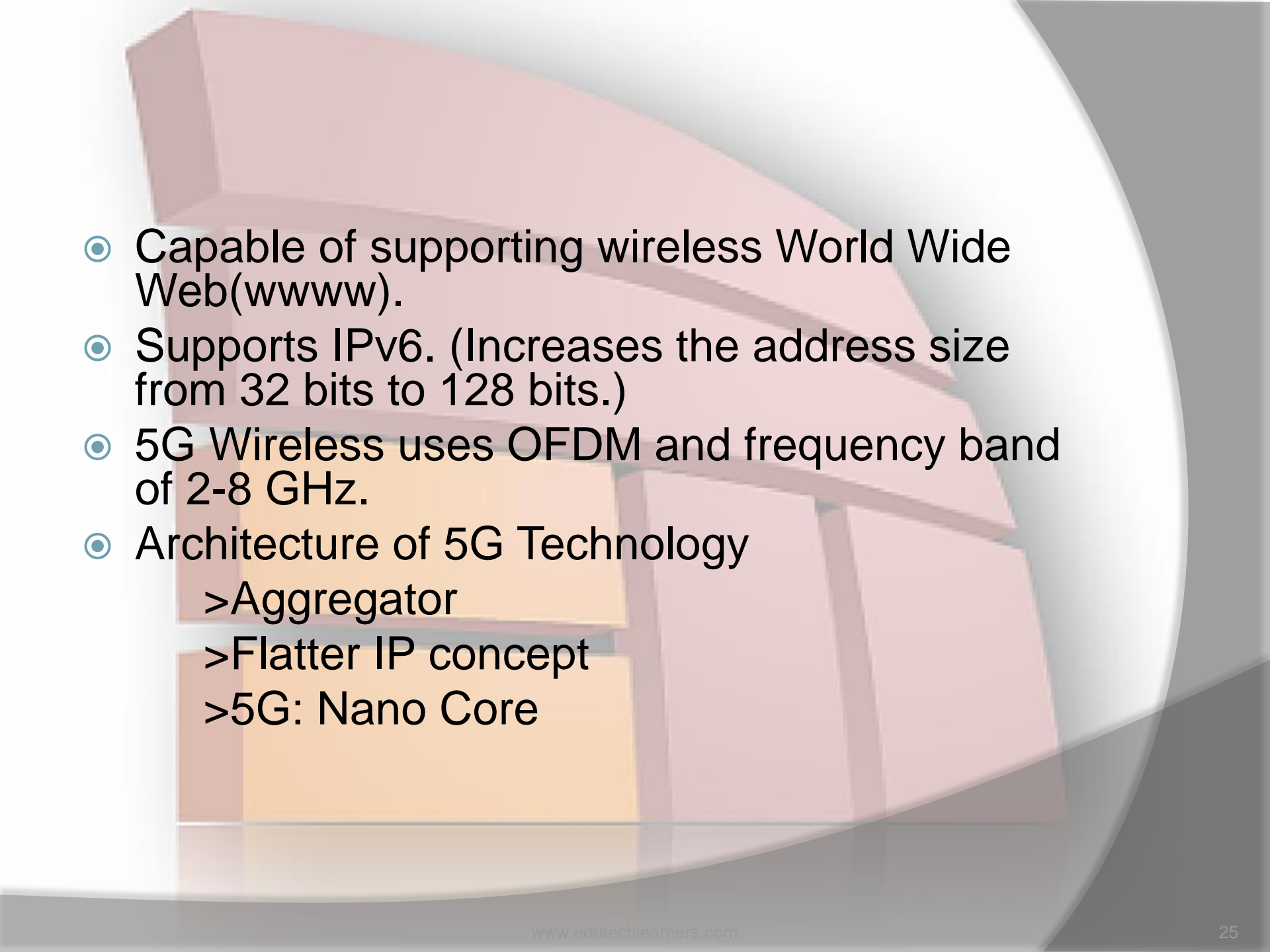
Going virtual: Change in human behavior. today, many are using networked alternatives and extensions, such as Wikipedia and Flickr -like sites

Going social: Social networks have grown very rapidly on the basis of wire line networks growth, and also introduce an element of going from one-to-one communications to one-to-many and many-to-many.

Going personal: Making services more personalized. 4G mobile network, tied to the applications that can be deployed through the combination of high speeds and low latencies to provide very personalized experiences

5G

- ◎ 5th generation wireless technology.
- ◎ High connectivity
- ◎ More clarity in audio and video services.
- ◎ Ubiquitous computing: user can simultaneously be connected to several wireless access technologies.
- ◎ 5G technology is providing large broadcasting of data in Gigabit which supporting almost 65,000 connections.

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- ⦿ Capable of supporting wireless World Wide Web(www).
 - ⦿ Supports IPv6. (Increases the address size from 32 bits to 128 bits.)
 - ⦿ 5G Wireless uses OFDM and frequency band of 2-8 GHz.
 - ⦿ Architecture of 5G Technology
 - >Aggregator
 - >Flatter IP concept
 - >5G: Nano Core

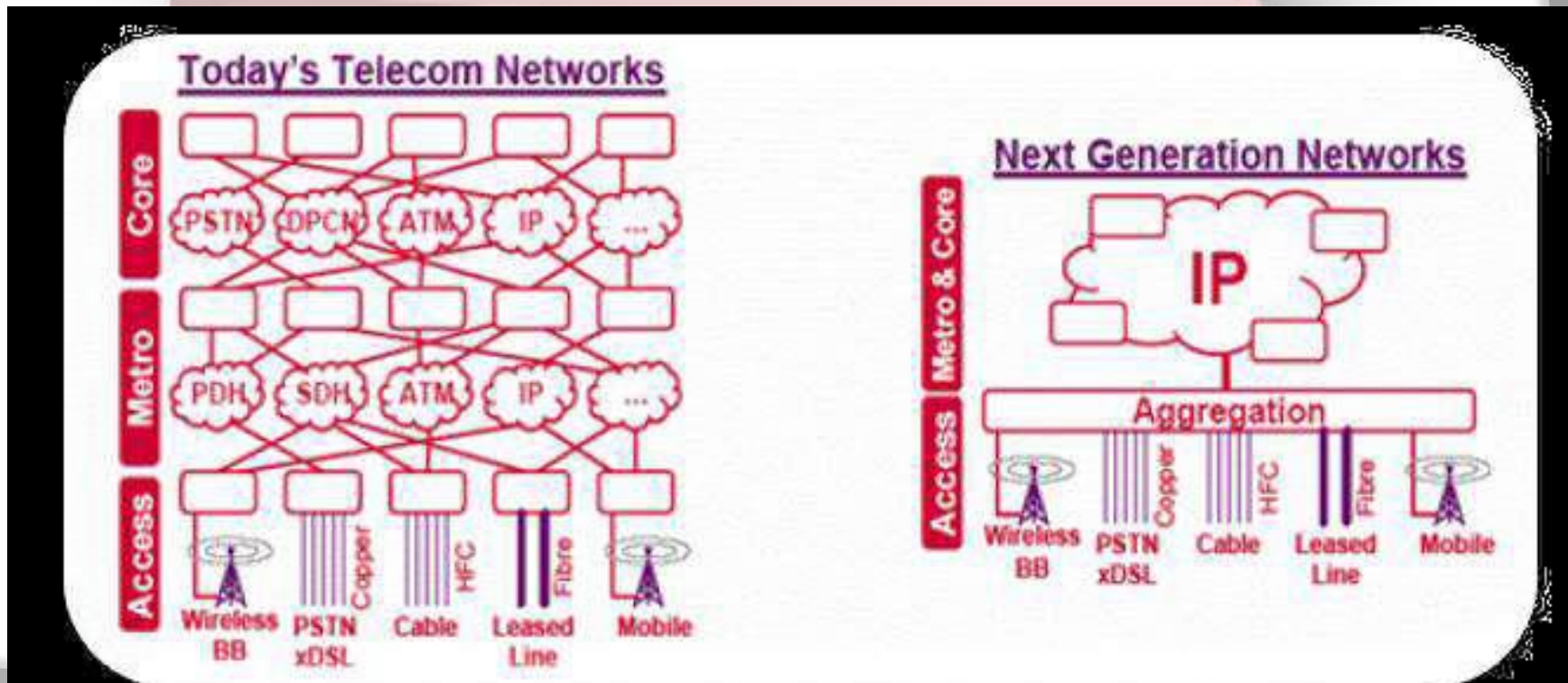
- ① 5G Network uses Flat IP Concept to make it easier for different RAN to Single Nanocore
- ① Flat IP Network is the key concept to make 5G acceptable for all kind of technologies
- ① Flat IP Architecture provides a way to identify devices using symbolic names Unlike the hierarchical architecture such as that used in normal IP addresses

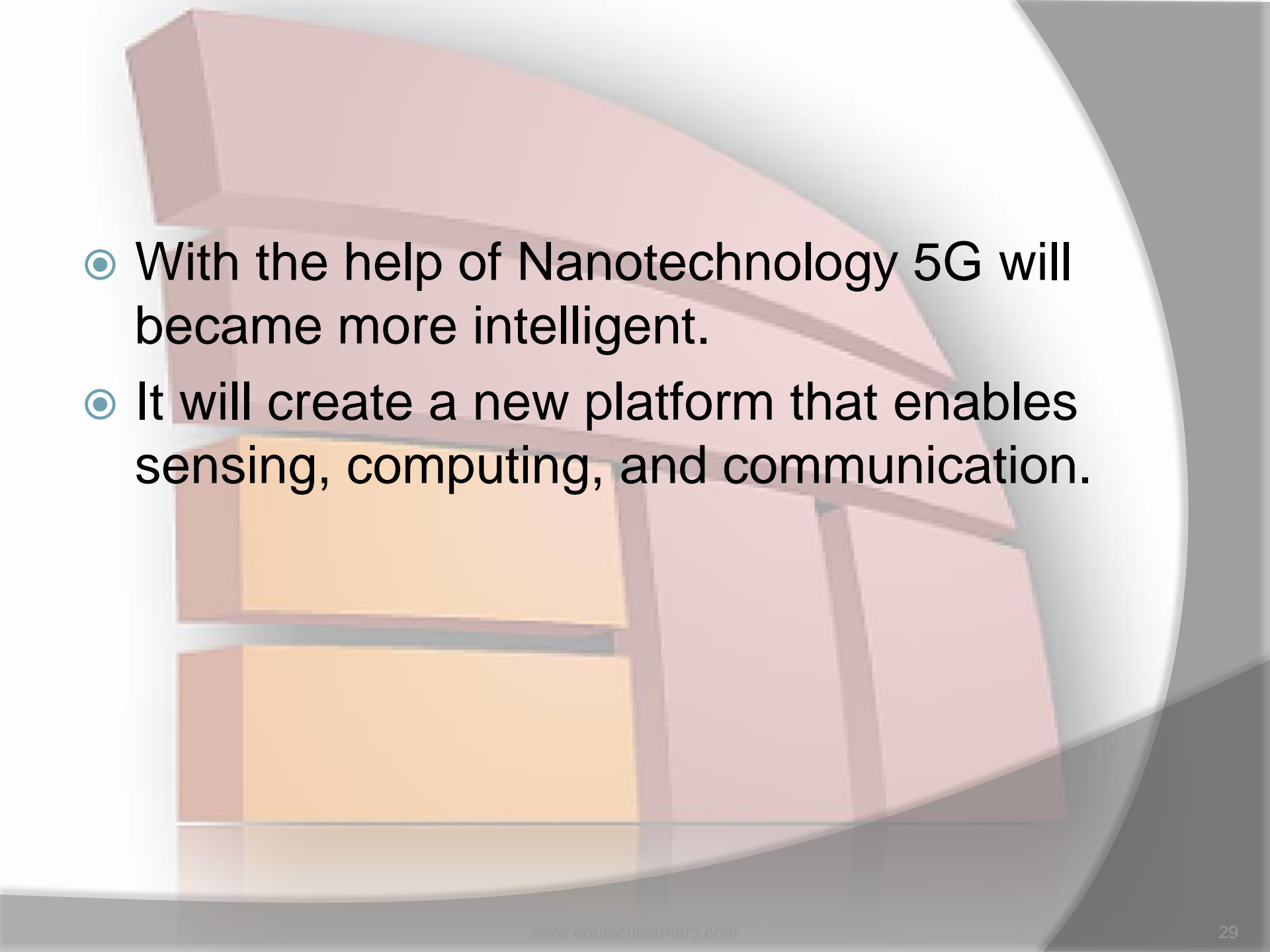
Flat IP Architecture

- ① Reduce the number of Network elements in the data path to lower operation cost and capital expenditure.
- ① Minimize the system latency and enable applications with a tolerance for delay.
- ① Create a platform that will enable mobile broadband operators to be competitive.

5G Aggregator

- Existing telecom networks traffic is aggregated at aggregation point (BSC/RNC) and then routed to gateways.



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- ① With the help of Nanotechnology 5G will become more intelligent.
 - ① It will create a new platform that enables sensing, computing, and communication.

Applications

- ⦿ Our mobile can share the work load.
- ⦿ If you can able to sense Tsunami/earthquake before it occurs.
- ⦿ Mobile phone get cleaned by its own.
- ⦿ You can able to fold your mobile as per your desire.
- ⦿ Able identify your stolen mobile with nanoseconds
- ⦿ Mobile can able to suggest you possible medicine as per your healthiness.
- ⦿ 5G would introduce Artificial Intelligence to
- ⦿ mobile telecommunication.



Thanks