



CTC(T&IT), CRPF



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July- 2021



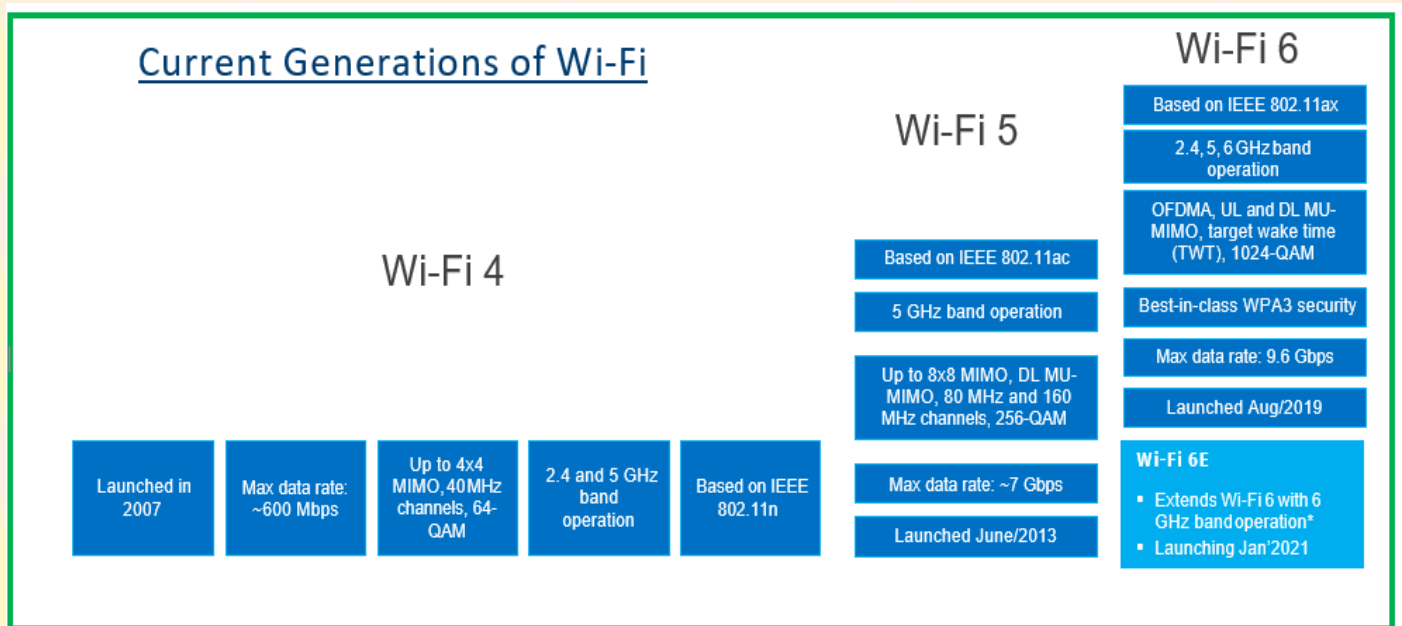
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Editor & Publisher

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Next generation Wi-Fi 7



Wi-Fi 6/6E: A Giant Leap Forward

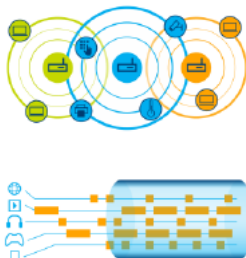
4X GREATER SCALABILITY

OFDMA enables managed, reliable, efficient connectivity across more devices. This means plenty of headroom for future growth or fewer APs required to support existing devices.



REDUCED INTERFERENCE

OBSS enhancements help routers and devices identify local traffic and tune out noise from other networks.



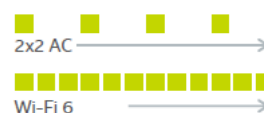
IMPROVED SECURITY

Wi-Fi 6 uses new WPA3 security features, enabling next-generation authentication and best-in-class encryption.



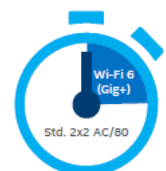
3X FASTER PERFORMANCE

1024 QAM and support for optional 160 MHz channels enable clients and routers to deliver best-in-class Gigabit speeds for the office or home.



RESPONSIVE! LOWER LATENCY

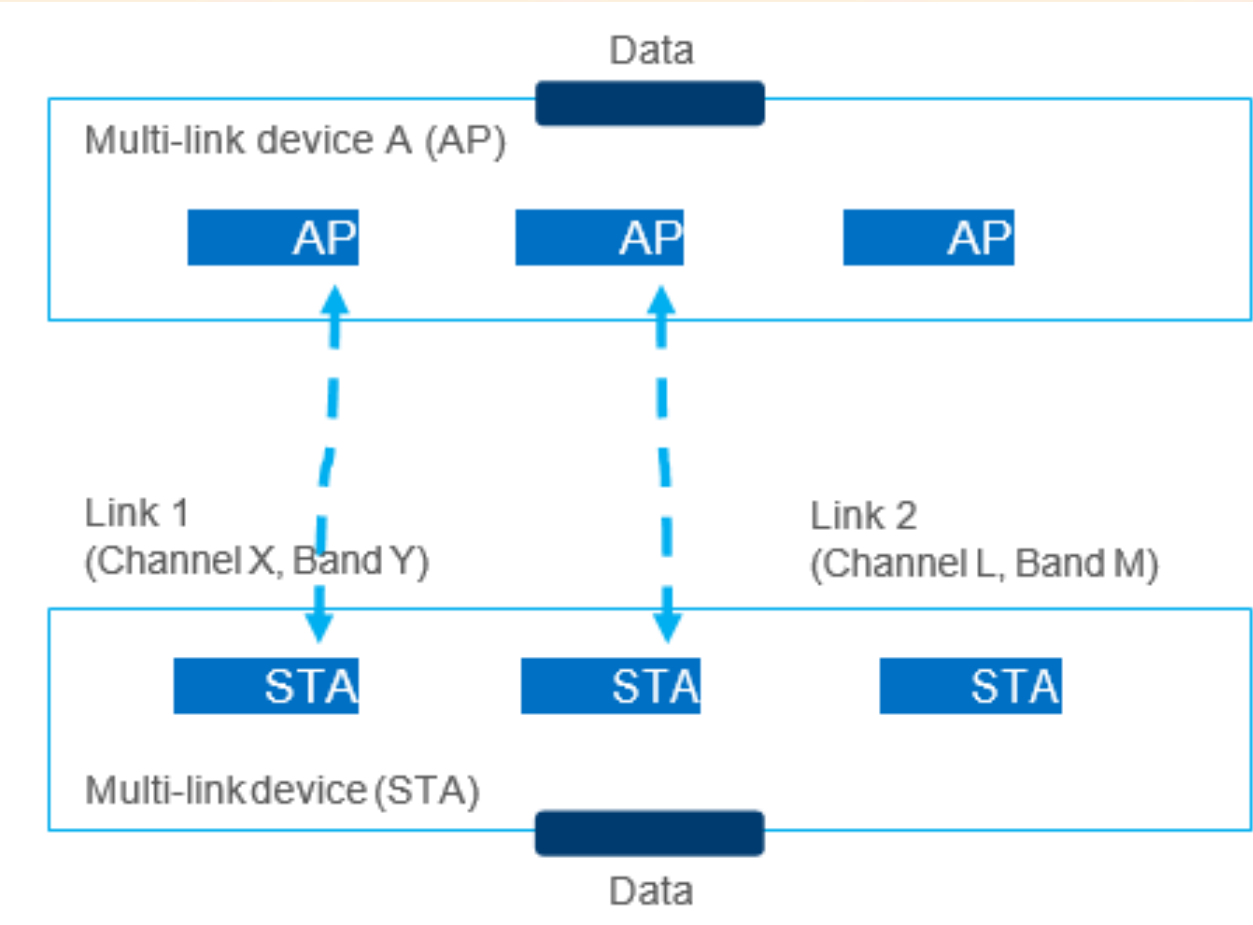
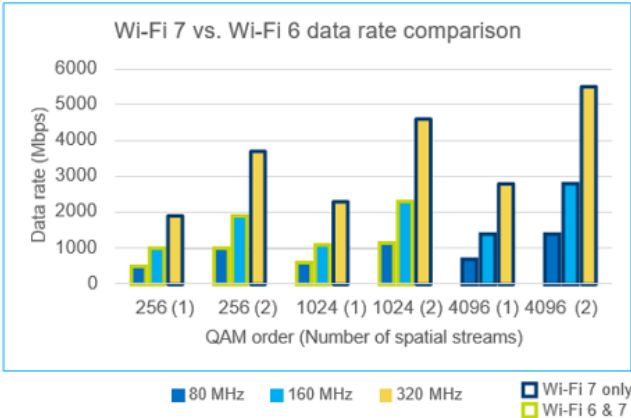
Wi-Fi 6 helps slash lag times to give you the edge you need to win with OFDMA data management and OBSS interference avoidance features.



Increasingly stringent usage (e.g., industrial IoT, AR/VR, robotics, cloud gaming) requirements demand continued evolution

Enhancements: Data Rate

Parameter	Wi-Fi 6	Wi-Fi 7
Max channel bandwidth	160 MHz	320 MHz (3 channels in 6 GHz)
Highest modulation order	1024-QAM	4096-QAM
Max number of spatial streams	8	16
Max data rate*	~9.6 Gbps	~46.1 Gbps



Multi-link Operation(MLO)

MLO enables link aggregation at the MAC layer

- A link is mapped to a channel and band

MLO brings benefits in multiple dimensions:

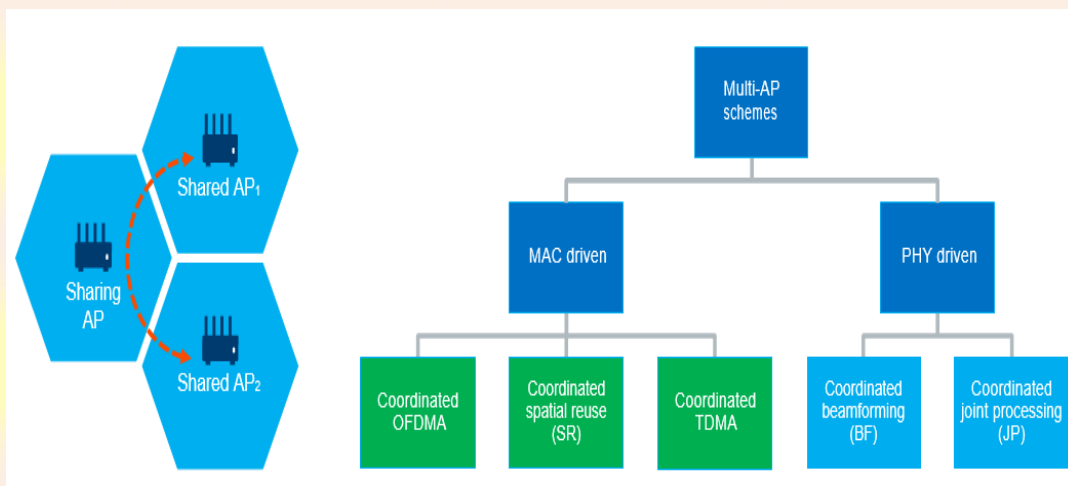
- Additive throughput for data flows split over links
 - For two links (e.g., 5GHz and 6GHz), max aggregate data rate could reach 7.2x compared to Wi-Fi 6
- Lower latency due to access to multiple links in parallel
- High reliability by packets duplication over multiple links
- Assign data flows to specific links based on app needs

MLO provides higher throughput, lower latency and/or higher reliability, which are useful to a number of applications from VR/AR to industrial IoT

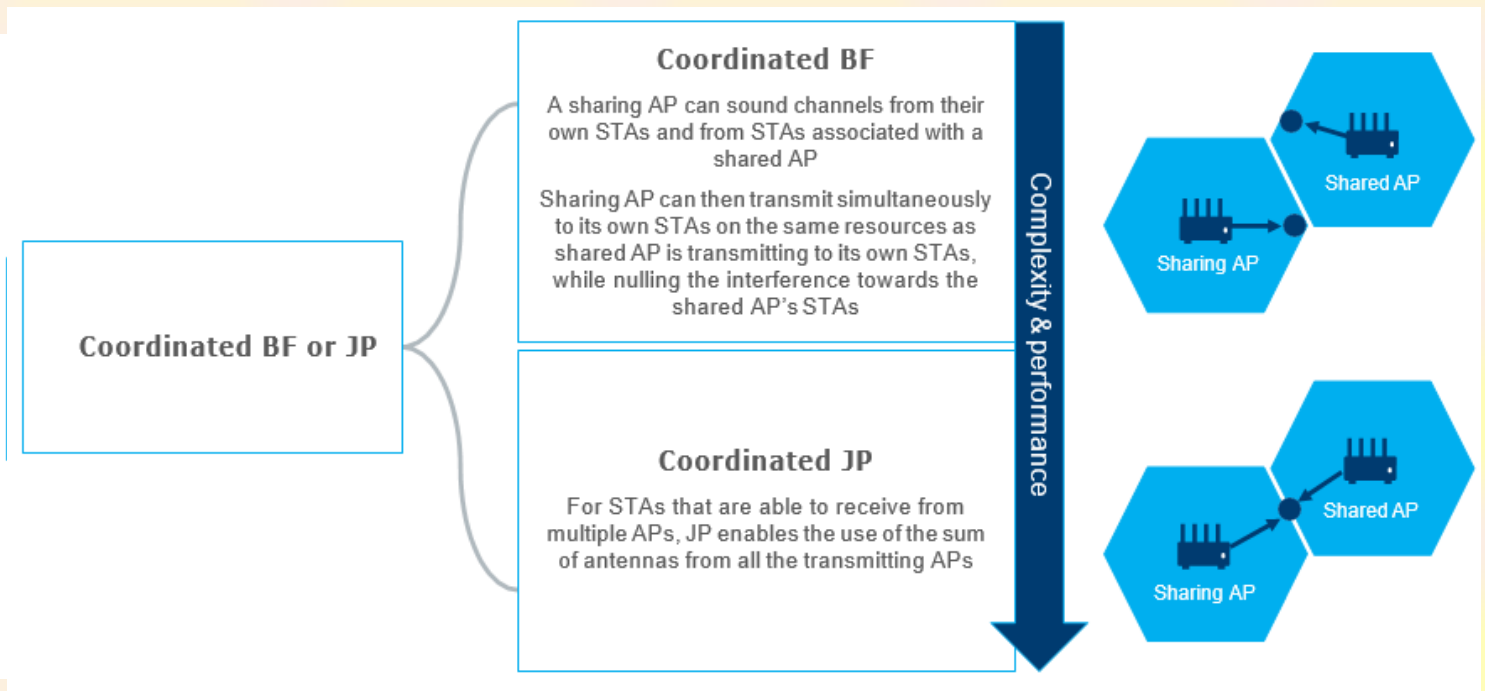
Multi-AP Features

Multi-AP refers to a collection of features that rely on direct AP coordination to achieve desired network performance goals

Different flavors of multi-AP solutions are being considered



Multi-AP Features: MAC Driven:-



Multi-AP Features: PHY Driven

- **Wi-Fi 6 can achieve single-digit millisecond** latency, but the worst- case latency can be high in congested environments
- With the introduction of features like multi-link operation, multi-AP and 320 MHz channels in Wi-Fi 7, latency will be reduced even further
- However, to provide deterministic low latency required by some usages (e.g., industrial



New Wi-Fi 7 innovations
320 MHz channels, multi-link operation, 4K-QAM, multi-AP, deterministic low latency

Wi-Fi 7 will build on Wi-Fi 6/6E

- **Need to open the entire 1200 MHz of the 6 GHz band for unlicensed use**
- Optimal use of the 6 GHz band, even lower latency, even higher throughput, even higher reliability, even more secure

Wi-Fi will become even better

- Video streaming, video/voice conferencing, wireless gaming, real-time collaboration, cloud/edge compute, industrial IoT, immersive AR/VR, interactive telemedicine, etc.
- Open Roaming and Wi-Fi sensing

The future is bright for Wi-Fi!

IoT, AR/VR), new schemes need to be defined

source :- Wi-Fi 7 and Beyond – Intel <https://www.intel.com> › public › documents

AN INTRODUCTION OF THE VIDEO WALL



INTRODUCTION

- ❖ A video wall is a collection of screens that are combined/tiled together to create one large display.
- ❖ video wall controlled by a controller that takes different input and processes them onto the wall so that the wall acts as a single screen.
- ❖ A management software is needed to control the controller. Polly wall, Wall control 10 and front face are the example of controller software.
- ❖ software provide the role of video wall controller, enabling users to change the content, adjust the content layout, and update content schedules.
- ❖ Because of their size and clarity, video walls have a best factor that makes them very effective for marketing messages and branding.
- ❖ They can be used in variety of places at this time like stadium, public places, shopping complex, Malls, control room of various institution etc.

Basic Components of a Video Wall

There are three basic component of a video wall:-

1.Video Wall Display

- Video wall displays are usually made from a tiled arrangement of monitors, panels or projection screens.
- Tiling multiple displays together can create an extremely large display surface.
- Video walls come in a large range of display technologies including LCD, LED, Rear projection cubes, blended projection and more.
- Each display type offers unique advantages in terms of resolution, brightness, reliability, cost and other factors.
- Depending on the display type video walls can be built in flat, curved or even three-dimensional shapes.

2.Wall Processor(controller)

- The video wall processor or controller connects the sources to the displays.
- It control what content is shown on the displays, when and where it appears, and how it looks.
- The processor captures content from all desired sources – like video cameras, PC and cable boxes etc.

3.Controller Software

- Video wall software provides an interface for controlling displays, processor and source content.
- It provides a “dashboard” of the system, including a real-time view of the displays and a list of your available content sources.

Types of video wall:-

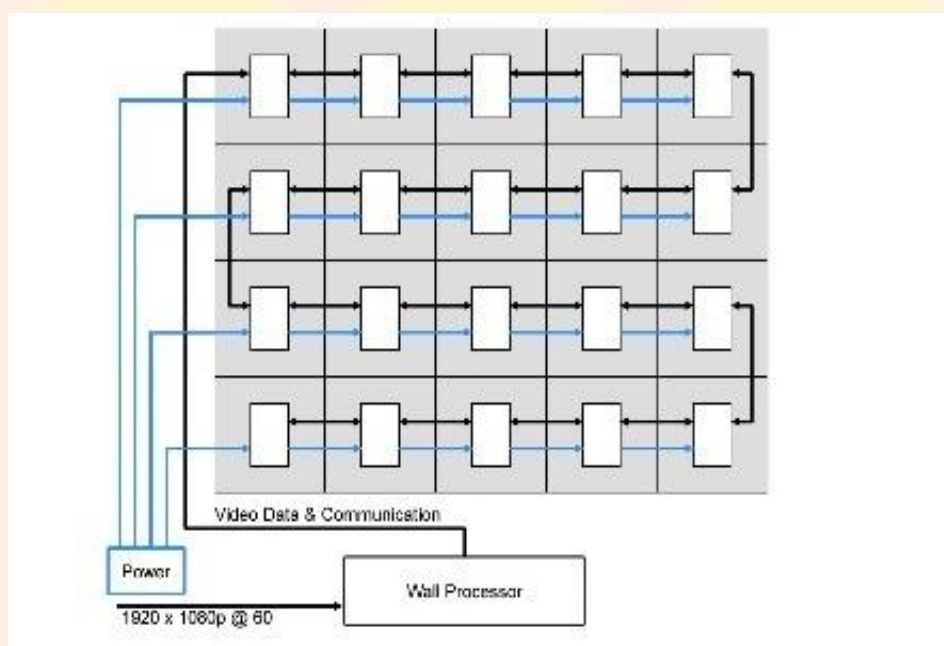
These types of video walls available, namely:-

- ❖ Panel based video walls
- ❖ Direct view LED Video wall
- ❖ Cube based video walls
- ❖ Blended Projection Video wall

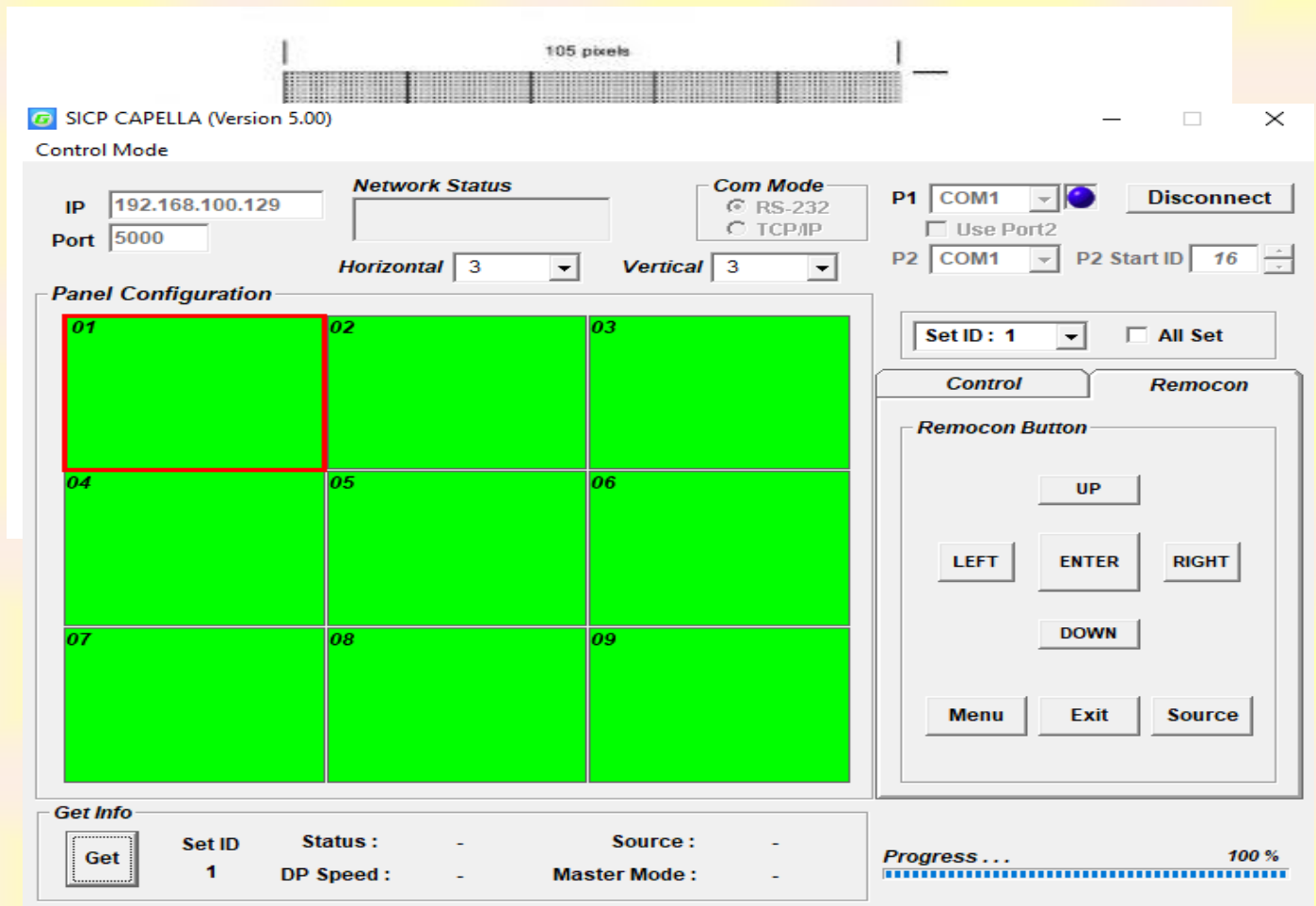
Panel based video walls:-

- ❖ They provide flat screen panels with slightly thinner boundaries (known as bezels) than TVs.
- ❖ All panels connected to each other and shows an image or video as a single screen.
- ❖ These screen controlled by a controller which manage the screen image .
- ❖ Panel based video walls are very cost effective .
- ❖ Samsung, LG and Panasonic are the leaders in providing panel based video walls.

Video wall block configuration:



FRONT VIEW OF THE PANEL BASED VIDEO WALL:-



CONTROLLER SOFTWARE:-

Direct view LED Video wall:-



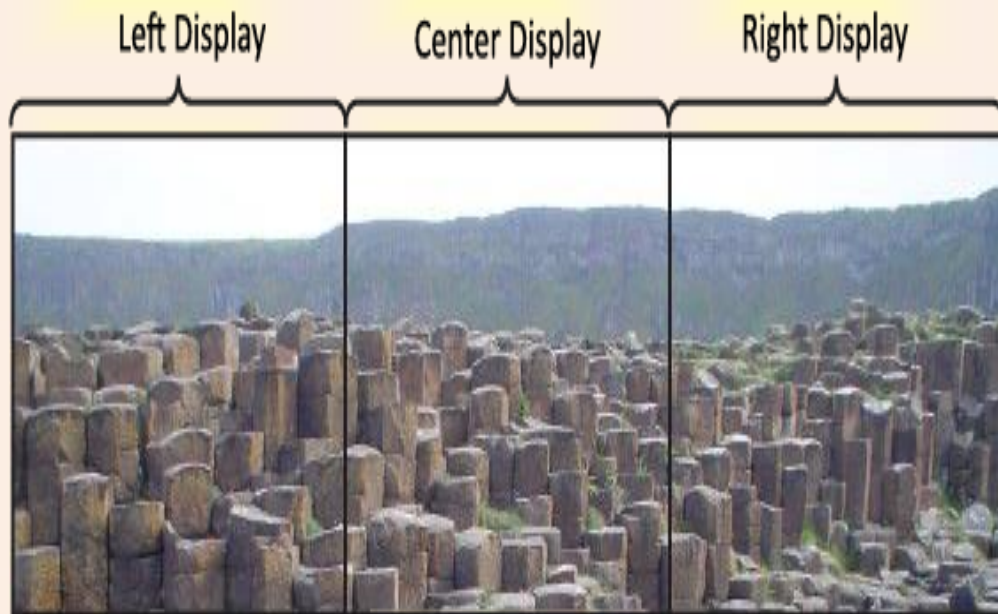
- ❖ An LED display consists of hundreds of tiny LEDs mounted directly on a flat panel.
- ❖ Each LED is essentially a miniature light bulb that emits colored light when a particular voltage is applied to it.
- ❖ Clusters of red, green, and blue LEDs are grouped to create the full-color pixels needed to produce an image.
- ❖ The size of the LEDs and the distance between them (known as "pixel pitch") determines the resolution of the display.
- ❖ Displays with very small LEDs and a fine pixel pitch will produce higher resolutions.

Cube based video walls:-



- ❖ Such video walls have a small projector mounted behind a display panel.
- ❖ The projector and panel are integrated together to give excellent output quality.
- ❖ Using the rear projection can increase the area of projection.
- ❖ The output is 100% seamless because of a technology called edge blending and geometric correction.
- ❖ Cubes are available in a wide range of sizes and aspect ratios, so they offer a great deal of design flexibility.

BLENDED PROJECTION VIDEO WALL:-



- ❖ This systems combine the output of multiple projectors to produce an single image .
- ❖ It display high-resolution images on a completely seamless surface of virtually any size and shape.
- ❖ It produce images on curved, angular or even spherical surfaces.
- ❖ A blended projection system can produce an extremely large display surface that appears with very bright and sharp.

Pros:-

- ❖ Provide high resolutions .
- ❖ Display text, images and video in sharp/fine quality .
- ❖ Very resilient to environmental stressors like vibration, humidity and UV light.
- ❖ Low maintenance requirements, low power consumption and long life spans.
- ❖ No seams on the wall using LED/projection based Video wall.
- ❖ High brightness, flexibility in design & curved screens possibility.

cons:-

- ❖ When LCDs are tiled together to create a video wall, bezels (or seams) are visible between the individual panels.
- ❖ where a static image is displayed for an extremely long time, LCDs may experience image retention.
- ❖ Installation of panels is very complex and not easy to move.
- ❖ Proper maintenance and technical assistance required.

The video wall enable working with a large screen



FIBER OPTICS SIGNAL AMPLIFICATION TECHNOLOGY

(ERBIUM DOPPED FIBER AMPLIFICATION)

- To Transmit a signals over long distances ($>100\text{km}$), to compensate attenuation losses.
- Initially this was accomplished with an optoelectronic module consisting of optical RX, regenerator, equalizer, & an optical TX to send the data.
- Although functional this arrangement is limited by optical to electrical & electrical to optical conversions.

INTRODUCTION:-

An optical amplifier is a device which amplifies the optical signal directly without ever changing it to electricity The light itself is amplified.

Reasons to use the optical amplifiers:

Reliability, Flexibility, Wavelength Division Multiplexing (WDM) and Low Cost

Most optical amplifiers use stimulated emission An optical amplifier is basically a laser without feedback, Optical gain is realized when the amplifier is pumped optically (or electrically) to achieve population inversion and Gain depends on wavelength, internal light intensity and amplifier medium

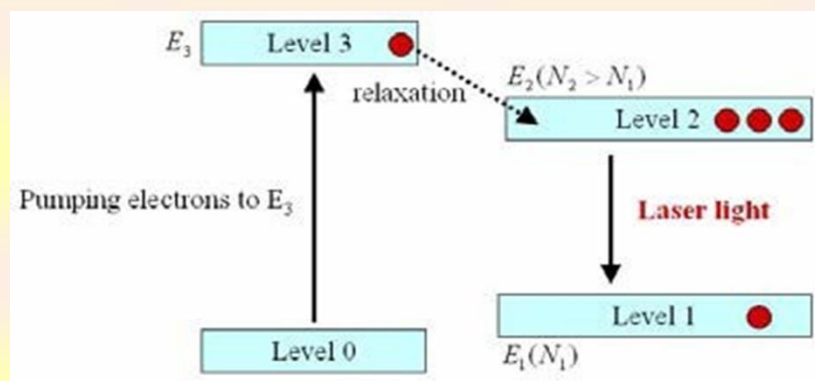
Three types:

semiconductor optical amplifiers,

Raman Amplifiers

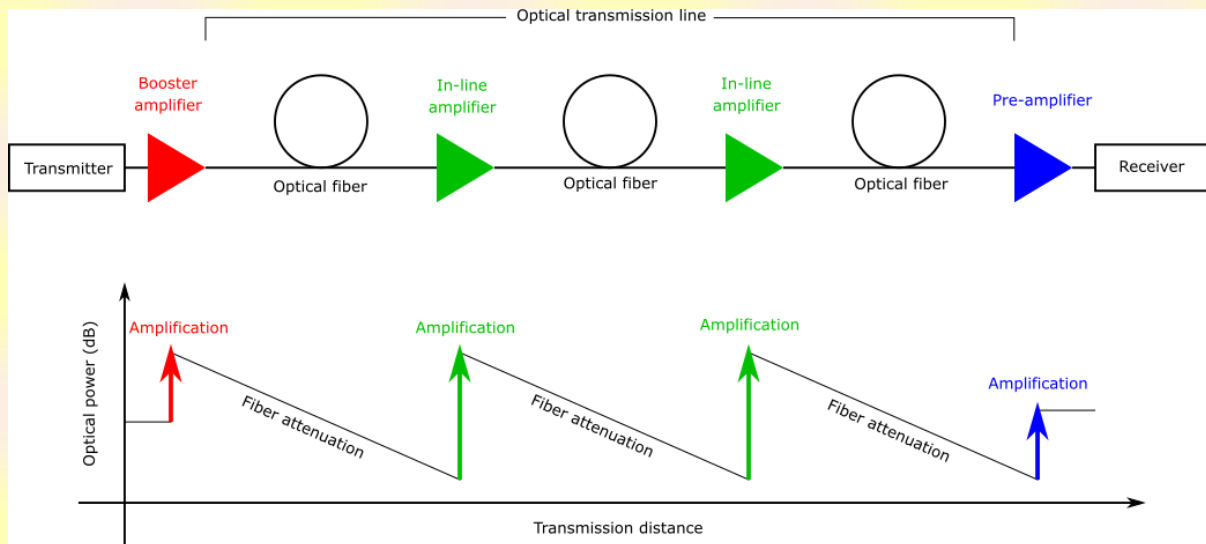
Erbium doped fiber amplifiers

Erbium doped fiber amplifiers:-



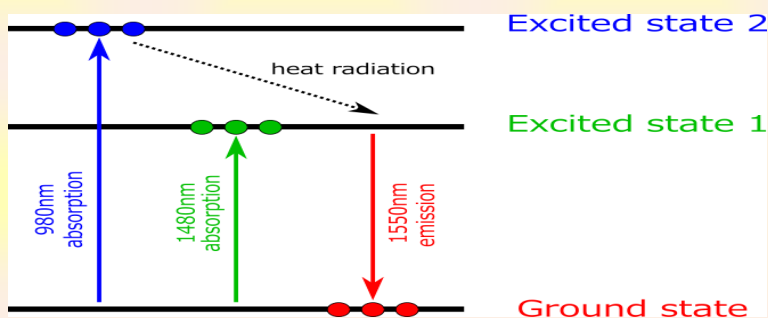
Erbium-Doped Fiber Amplifier (EDFA) is an optical amplifier used in the C-band and L-band, where loss of telecom optical fibers becomes lowest in the entire optical telecommunication wavelength bands. EDFA is now most commonly used to compensate the loss of an optical fiber in long-distance optical communication and EDFA can amplify multiple optical signals simultaneously, and thus can be easily combined with WDM technology.

The booster amplifier is placed just after the transmitter to increase the optical power launched to the transmission line. The inline amplifiers are placed in the transmission line, compensating the attenuation induced by the optical fiber. The pre-amplifier is placed just before the receiver, such that sufficient optical power is launched to the receiver. A typical distance between each of the EDFAs is several tens of kilometers.



Before the invention of EDFA, a long optical fiber transmission line required a complicated optical-to-electrical (O-E) and E-O converter for signal regeneration. The use of EDFA has eliminated the need for such O-E and E-O conversion, significantly simplifying the system. This is especially of use in a submarine optical transmission, where more than a hundred EDFA repeaters may be needed to construct one link.

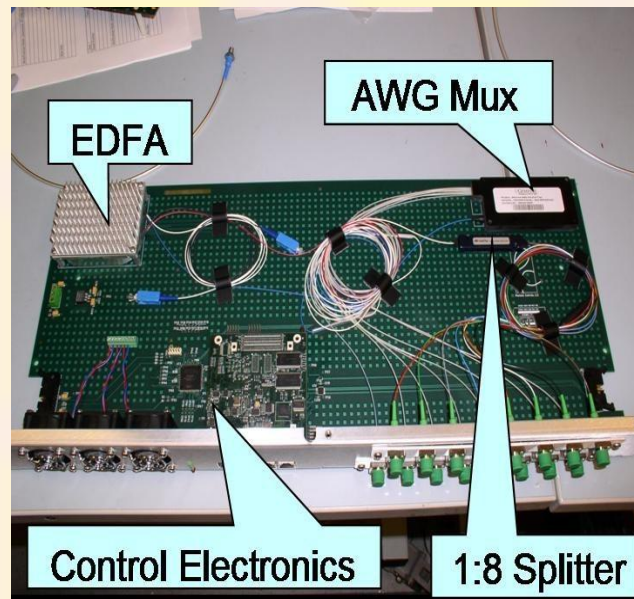
WORKING PRINCIPLE:-



When an EDFA is pumped at 1480 nm, Er ion doped in the fiber absorbs the pump light and is excited to an excited state (Excited state 1). When sufficient pump power is launched to the fiber and population inversion is created between the ground state and Excited state 1, amplification by **stimulated emission** takes place at around 1550 nm. When an EDFA is pumped at 980 nm, Er ion absorbs the pump light and is excited to another excited state (Excited state 2). The lifetime of the Excited state 2 is relatively short, and as a result, the Er ion is immediately relaxed to the Excited state 1 by radiating heat (i.e. no photon emission). This relaxation process creates a **population inversion** between the ground level and Excited state 1, and amplification takes place at around 1550 nm.

The possible pump wavelengths are 980 & 1480 nm. In normal operation, a pump laser emitting 980-nm photons is used to excite ions from the ground state to the pump level, as shown by transition process. These excited ions decay (relax) quickly (in about 1 μ s) from the pump band to the metastable band, shown as transition process 2. During this decay, the excess energy is released as phonons or, equivalently, mechanical vibrations in the fiber. Within the metastable band, the electrons of the excited ions tend to populate the lower end of the band. Hence, they are characterized by a very long fluorescence time of about 10 ms. Another possible pump wavelength is 1480 nm. The energy of these pump photons is very similar to the signal-photon energy, but slightly higher. The absorption of a 1480-nm pump photon excites an electron from the ground state directly to the lightly populated top of the metastable level, as indicated by transition process 3. These

electrons then tend to move down to the more populated lower end of the metastable level (transition 4). Some of the ions sitting at the metastable level can decay back to the ground state in the absence of an externally stimulating photon flux, as shown by transition process 5. This decay phenomenon is known as spontaneous emission and adds to the amplifier noise. Two more types of transitions occur when a flux of signal photons that have energies corresponding to the band gap energy between the ground state and the metastable level passes through the device. First, a small portion of the external photons will be absorbed by ions in the ground state, which raises these ions to the metastable level, as shown by transition process 6. Second, in the stimulated emission process (transition Process 7) a signal photon triggers an excited ion to drop to the ground state, thereby emitting new photon of the same energy, wavevector and polarization as the incoming signal photon



CONCLUSION

- Optical amplifiers perform a critical function in modern optical networks, enabling the transmission of many
- terabits of data over long distances of up to thousands of kilometers.

5 Pen PC Technology

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- Working Principle
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- Why it works with windows only?
- Connectivity 802.11B/G and Blue tooth
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- Demerits
- Applications
- Conclusion
- References

Abstract:

When writing a quick note, pen and paper are still the most natural to use. The 5 pen pc technology with digital pen and paper makes it possible to get a digital copy of handwritten information, and have it sent to digital devices via Bluetooth.

P-ISM (‘Pen-style Personal Networking Gadget Package’), which is nothing but the new discovery which is under developing stage by NEC Corporation. It is simply a new invention in computer and it is associated with communication field. Surely this will have a great impact on the computer field. In this device you will find Bluetooth as the main interconnecting device between different peripherals.

P-ISM is a gadget package including five functions: a pen-style cellular phone with a handwriting data input function, virtual keyboard, a very small projector, camera scanner, and personal ID key with cashless pass function. P-ISMs are connected with one another through short-range wireless technology. The whole set is also connected to the Internet through the cellular phone function. This personal gadget in a minimalist pen style enables the ultimate ubiquitous computing.

Introduction:

Computer affects our life in a much bigger way than most of us might have thought. It has become a compulsory requirement in most professions to be able to use computer software. Modern computers which are based on integrated circuits are small enough to fit into mobile devices but imagine having a computer that will fit into a pen.

Imagine a world where everybody can use modern IT without being an expert. Imagine using only pen and paper to send e-mails and SMS. Pen-style Personal Networking Gadget are computers in the shape of different pens each having a function of its own and when

combined together give us the usage of a full-blown computer. It is a computer broken apart into pieces, each the size of a pen. The screen and keyboard are projected onto surfaces.

The P-ISM (Pen-style Personal Networking Gadget Package) is only a prototype under developing stage by NEC Corporation. In 2003, Geneva held the ITU telecom World exhibition which exhibited a conceptual \$30,000 prototype of a P-ISM designed by the Tokyo-based NEC Corporation.

Working Principle

- A computer that utilizes an electronic pen (called a *stylus*) rather than a keyboard for input. Pen computers generally require special operating systems that support handwriting recognition so that users can write on the screen or on a tablet instead of typing on a keyboard.
- Most pen computers are hand-held devices, which are too small for a full-size keyboard.

How does it work?

The P-ISM (Pen-style Personal Networking Gadget Package) consists of a package of 5 pens that all have unique functions, combining together to create virtual computing experience by producing both monitor and keyboard on any flat surfaces from where you can carry out functions that you would normally do on your desktop computer. P-ISM's are connected with one another via a short-range (Bluetooth) wireless technology. The whole set is connected to the Internet through the cellular phone function.

The five components of P-ISM:

1. CPU pen
2. Communication pen
3. Virtual keyboard
4. LED projector
5. Digital camera

How does each component work?

1. CPU pen:

The functionality of CPU is done by one of the pens. It is also called computing engine.

2. Communication pen:

P-ISMs are connected with one another through short-range wireless technology. The whole set is also connected to the Internet through the cellular phone function. They are connected through Tri-wireless modes (Bluetooth, 802.11B/G, and Cellular) which are made small and kept in a small pen like device.

3. Virtual keyboard:

The virtual keyboard works on any flat surface which uses a camera to track the finger movements. On this specific keyboard, this is done by a 3D IR sensor technology with laser technology to get a full size keyboard. You can also change the language input and the layout of the keyboard. This is more efficient than normal keyboards because you don't have to buy a new keyboard for every language. They are also easy to maintain as they are prone to damage by spills, drops and other malfunctions.

4. LED projector:

The role of the monitor is taken by the LED projector. LED projectors use LCD technologies for image creation with a difference as they use an array of Light Emitting Diodes as the light source, negating the need for lamp replacement. Also it would not need as much energy to used and with a longer lifetime. The size of the screen is approximately 1024 × 768 px which is a size of an A4 paper.

5. Digital camera:

We had digital camera in the shape of pen .It is useful in video recording, videoconferencing; simply it is called as web cam. It is also connected with other devices through Bluetooth. The major advantage it is small which is easily portable. It is a 360- Degree Visual Communication Device. We have seen video phones hundreds of times in movies. Conventional visual communications at a distance have been limited due to the display devices and terminals. This terminal enables showing of the surrounding atmosphere and group-to-group communication with a round display and a central super-wide-angle camera.

Battery of P-ISM gadget:

The most important part in the portable type of computer is its battery. Usually batteries must be small in size and work for longer time. It comes with a battery life of 6+. For normal use it can be used for 2 weeks.

Bluetooth connectivity:

Bluetooth is widely used because we can able to transfer data or make connections without wires. This is very effective because we can able to connect whenever we need without having wires. They are used at the frequency band of 2.4 GHz ISM the

most efficient and comprehensive solution for the most serious problems can be accomplished by silicon vendors. They can implement information exchange capabilities within the designs of the Bluetooth.

Existing usage of this technology:

Even though clients cannot yet purchase "pen" computers like the P-ISM, all of the parts of this computer already exist. For example the virtual projected keyboard is already available from various companies including Lumio and Virtual Device.

How it takes input

It has two methods for input

1. With the virtual keyboard.
2. With digital camera.

Why it works with windows only?

- It consists of dual core processor embedded in it and that is why it works only with WINDOWS operation system.

Applications

Many researches has been made but there is no clear result so far.

Only One that uses it is E-fingerprinting the gadget will be more secure, which allows only owner to activate the Pc. So even if we loose it, no one else cal access the gadget.

Advantages of P-ISM:

1.What makes the P-ISM different from all of the existing parts is that it's shape like pens. Pens are very common objects that we carry around on everyday basis; by carrying just four pens you can create a PC. So, its portable and can be carried easily.

2.As the pen is less visible and it's easier to take it out with you, the size and weight will be a lot less and it can potentially cost less as it will use less material.

3.Using this technology we can carry out functions that we usually carry out on a desktop computer easily and quickly .So, ubiquitous computing can be done.

4.P-ISM adopts Bluetooth technology for data transfer which is a wireless technology.

Disadvantages of P-ISM:

1. The P-ISM is made from 5 loose pens which will move around with any change in the movement of surface area. In a train journey there is a lot of movement which will shake the pens around and shake the projection of the keyboard and screen. So, this can't be as stable and efficient as a laptop.

2. Also these pens are very small and fragile so they can be damaged easily while handling them or carrying them around. One pen itself costs quite a lot so you cannot risk damaging or losing them.

3. As the pens are small you could lose them easily which would cost you

a lot. 4. Also

4. Key board concept is not new.

The advantages outweigh the disadvantages as 5-Pen PC technology is very unique and there would be a great demand in the market for the product like this.

CONCLUSION:

The communication devices are becoming smaller and compact. This is only an example for the start of this new technology. We can expect more such developments in future.

Technical Terms

Ambient Temperature: The average or mean temperature of the surrounding air which comes in contact with the equipment and instruments under test.

Calibration: The process of adjusting an instrument or compiling a deviation chart so that its reading can be correlated to the actual value being measured.

Span: The difference between the upper and lower limits of a range expressed in the same units as the range.

Spectrum: The resolving of overall vibration into amplitude components as a function of frequency.

Thermowell: A closed-end tube designed to protect temperature sensors from harsh environments, high pressure, and flows. They can be installed into a system by pipe thread or welded flange and are usually made of corrosion-resistant metal or ceramic material, depending upon the application.

Zero Voltage Switching: The making or breaking of circuit timed such that the transition occurs when the voltage wave form crosses zero voltage; typically, only found in solid state switching devices.

Auto-Zero: An automatic internal correction for offsets and/or drift at zero voltage input.

Deviation: The difference between the value of the controlled variable and the value at which it is being controlled.

Drift: A change of a reading or a set point value over long periods due to several factors including change in ambient temperature, time, and line voltage.

FAQ

1. Who is the head of the new forum on Artificial Intelligence set up by the Confederation of Indian Industry (CII)?

[A] Sandip Patel

[B] Cyrus Mistry

[C] Rekha Menon

[D] Ramkumar Ramamoorthy

2. Which social media giant launched a new tool 'Business Suite' to help small businesses?

[A] Twitter

[B] Facebook

[C] TikTok

[D] We Chat

3. The custom-made aircraft "Air India One" is manufactured by which company?

[A] DRDO

[B] Boeing

[C] Air Bus

[D] Dornier

4. Which Technology major has partnered with IIIT Hyderabad, Public Health Foundation of India and the Telangana government, for an AI Research Centre?

[A] Google

[B] Amazon

[C] Intel

[D] Facebook

5. Which company has been awarded the contract by NASA for deploying 4G network on Moon?

[A] Airtel

[B] Nokia

[C] Intel

[D] Vodafone

6. Which technology major has announced to launch a virtual private networks (VPN) service for consumers?

- [A] Microsoft
- [B] Google
- [C] Apple
- [D] Amazon

7. Which Indian telecom company has rolled out world's first satellite-based narrowband-IoT network?

- [A] Jio Networks
- [B] BSNL
- [C] Airtel
- [D] Vi

8. The researchers of Durham University have developed a supercomputer simulation to explain the formation of which space body?

- [A] Moon
- [B] Mars
- [C] Sun
- [D] Earth

9. Which social media giant has delayed the implementation of a new privacy policy by 3 months?

- [A] Telegram
- [B] WhatsApp
- [C] Instagram
- [D] Twitter

10. Which tech major has announced the proprietary technology of charging multiple electronic devices in wireless mode?

- [A] Samsung
- [B] Nokia
- [C] Xiaomi
- [D] Sony

Acknowledgement

We are highly thankful for reading out this compilation and hope it will be useful for you in our day to day professional and personal life. We would like to hear your interest areas, suggestions from you to make this newsletter more informative and interesting. Your views will definitely help us to create this newsletter as an effective medium to reach you with latest development in the fields of communication and technology.



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Answers to the Quiz

1	2	3	4	5	6	7	8	9	10
A	B	B	C	B	B	B	A	B	C