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# Complexity-Less Optical Multi-Plug Hardware Architecture For Enhancing The Optical Networks.

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**Abstract**: Optical Multi-plug is a several ports hardware architecture that is able to establish point-to-point and multipoint optical networks to enhance transmission capabilities which have possible by combining the operation of components are the “Opto-mechanical arrangement”, "color glass filter" and "single color sensor" each of all work in conjunction with each other. Wherein they worked in such a manner that when the incoming ray of light had fallen in "Opto-mechanical arrangement" at that time "Opto-mechanical arrangement" sequentially transmit that to each of the output ports where that communicated with the "color glass filter" for mixing (filtration) and after filtering that ray moved toward the "single color sensor" and that sensor had detected different "color of light" in different intervals of time sequentially and let pass through the channel, and at during operation both "Opto-mechanical arrangement" and "single color sensor" worked in the synchronization as in time divisional manner due to which transmission of signals occurred sequentially. thus, the architecture had capable to provide sequential transmission of signals and signals were able to utilize the complete channel in particular intervals therefore interference and distortion not occurred additionally architecture is less complex as compared to previous devices. finally, the optical multi-plug establishes the interference-less, distortion-less, fast-transmission, larger channel capacity, and less complicated system.

**Index Terms**: Opto-mechanical arrangement, color sensor, color glass filter, Hardware architecture

## I. Introduction:

The present field of technology belongs to optical communication where communication occurs optically and can say that in the form of light between the transmitter and the receiver unit as a point-to-point communication or multipoint point communication, wherein for long-distance communication the signal has required the channel that channel is called the optical channel by which the signal is transmitted from the transmitter to the receiver end at the speed of light [1]. The optical channel performs the main role in optical communication because it carries, the signal from one end to another end, and this channel is made of the optical fiber so this channel is called optical fiber channel which is available as a single-mode optical fiber and multimode optical fiber, and both types of optical fiber are used for data transmission for different applications as per different requirements, further, both types of fibers have some limitations for long-distance transmission in the form of bandwidth, interference, less transmission, aliasing, dispersion, as well as it also face difficulty for extending the connection, hence to resolve these issues it has required to incorporate new technology, especially like optical multi-plug which include an optical and mechanical component such as reflector, color sensor, "color glass filter" and the commutator part which all works in respect of time. The optical multi-plug performs the operation in a way that the multiple input and multiple output ports work as transmitting and receiving points, and inside multi-plug housing includes a reflector, color glass filter, and color sensor which are used to guide the light so when the particular wavelength of light communicate to the channel after multi-plug housing it transmits homogeneously toward the receiver end hence optical multi-plug housing include "color glass filter", color sensor, an optical and mechanical arrangement which are described below.

Light guide: The light guide is mainly can be represented as a channel by which light can pass it is also possible to say that when the source provides the light at the input port of the light guide where the light guide is made of transparent material, therefore, it is able to transmit a particular ray of light equally along the core due to which the light is propagated in a particular direction from the transmitter end to the receiver end and it is able to cover a longer distance and area [2] [3].

Single Channel /single Mode fiber: In the present case single mode fiber is used as a single channel and according to the structure of the single mode fiber which includes the core which is very narrow in diameter in comparison to the multimode fiber due to which the single color of light and also can say that single wavelength of the light can propagate through the core to the longer distance [4], where the multimode core has more diameter than single mode fiber so multimode fiber allow to pass a number of different wavelengths that is the reason that losses occur in form of interference and dispersion, therefore, multi-mode fiber is not able to carry light longer distance where the single mode fiber using single wavelength and carry the data longer distance hence single mode fiber is having larger data carrying capacity than the multi-mode fiber [4] [5].

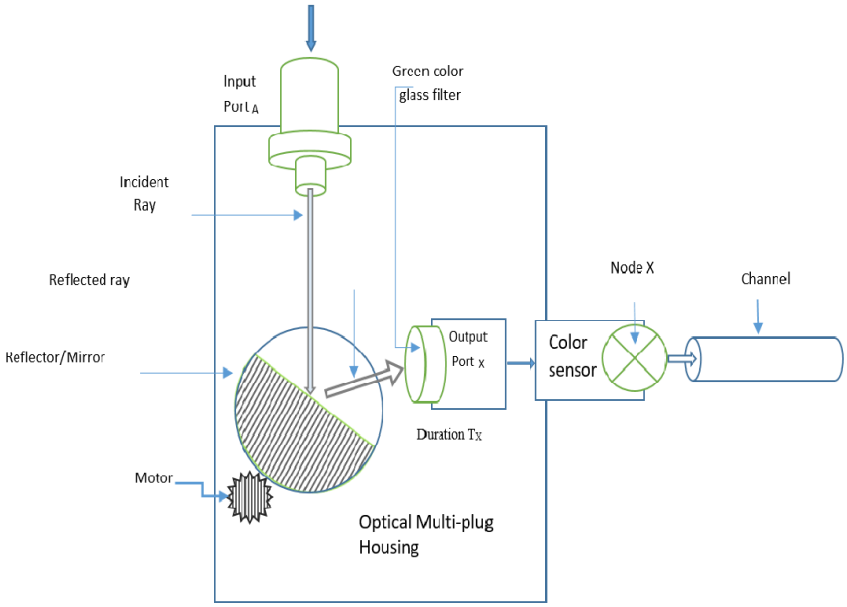
Color glass filter: The optical color glass filter mainly use to filter and then transmit the different colors of light, and each of the colors is having different wavelength so it is able to pass a particular wavelength of light which is similar to the "color glass filter" and hence it gets the same output wavelength, the basic principle of operation of the color glass filter is that when the particular ray of light is fall on the color glass filter and if the color ray of light is same as color glass filter so it provides same color light at the output, but if the color of light is different than comparison to the color glass filter so output color of the light would not same and also can say that the different color of light will obtain, hence this is found that color glass filter is a transparent film which is allowed to pass light of different wavelength [6] [7].

Color sensor: The color sensor is usually used to sense the color of the light of the different wavelengths according the color sensor is a type of photoelectric sensor that emits light to the object and then color detection perform by detecting the reflected light from the object and in the present condition has using that type of color sensor which is capable to sense more than two or three light in the particular duration of the time such as red, green and blue in given different slot of the time. where in the present case color sensor is used in the device's optical Multi-plug which is associated with more than one input and output port and also connected with a single output channel at where the color ray of light propagates from the source to the destination, and color sensor perform the color matching with the color glass filter and provide the pass-fail output [8].

Opto-Mechanical Arrangement: The optical-mechanical arrangement is the type of arrangement that develops by the combination of the optical and mechanical components in this device, in the optical multi-plug basically includes multiple input and multiple output port arrangements, and in this particular arrangement also consists of the reflector, commutator/rotator, color glass filter, and color sensor in the optical multi-plug housing, wherein all the components in the device are arranged in a manner that the optical multi-plug device is able to perform the operation in which input incoming light of any color in the input port would be capable to communicate to the output port directly and pass through the single channel in the time division manner.

## II. Hardware architecture

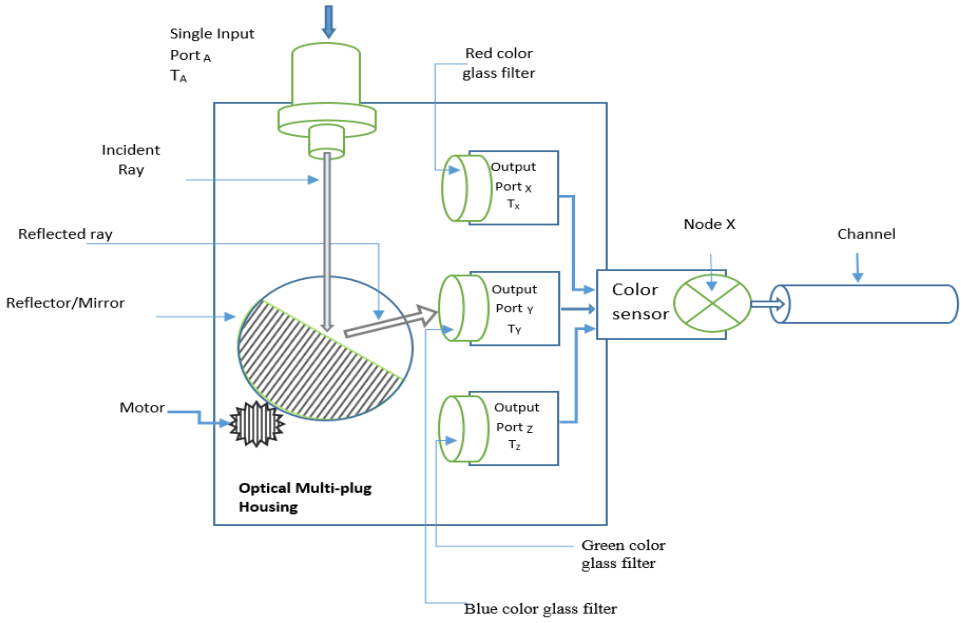
First stage Single Input Single Output Architecture:




1:Single Input and Single Output

In the given First stage Single input single output architecture for optical multi-plug is include a single input port which is used to provide for give entrance a single ray of light in the multi-plug housing further the input color of the light has reflected by using an "Opto-mechanical arrangement", and that arrangement directs the light to move toward the color glass filter arrange near the output port in the particular interval of time In duration TX , wherein the input color of the light is similar as reflected color of light and that reflected ray of the light color is same as the color glass filter so, the color sensor which is arranged in Node X is able to sense similar color light after passes the color glass filter in prescribed duration of the time and that time is same for input incident light to output reflected light to the output channel so it is possible to establish the connection between transmitter and receiver using Optical Multi-plug [6] [8].

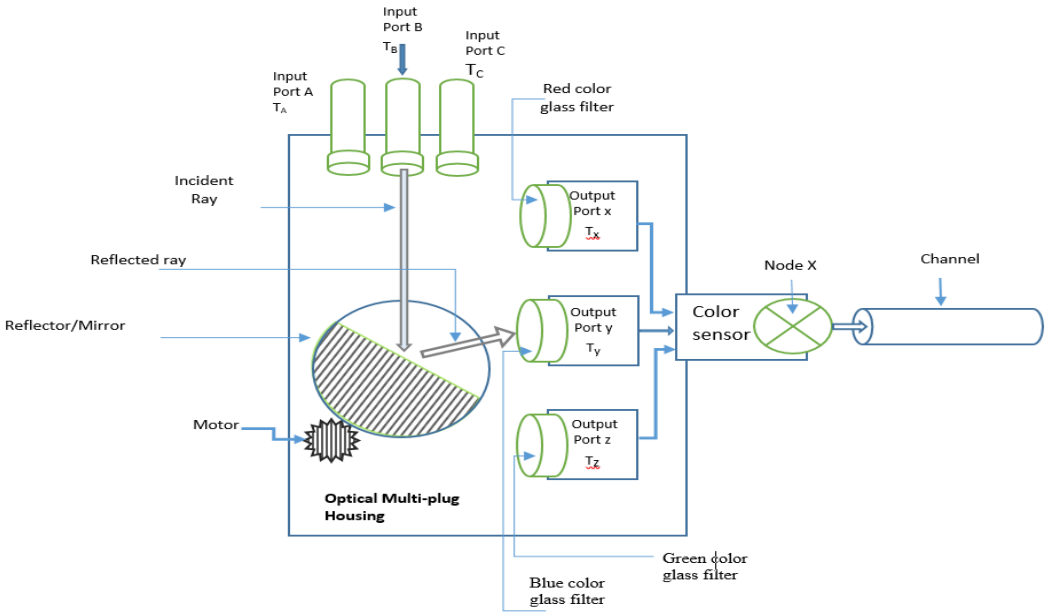
Second stage Single Input Multiple Output Architecture:




2:Single Input and Multiple Output

The component of the second Stage architecture is similar to the First stage architecture such as the color glass filter and the color sensor but differences in the number of components and the arrangement of the component, where consequently in the first stage single input and single output include one color sensor and one color glass filter, but now in the second stage consist single input and multiple outputs are present more number of component compared to the first stage which is used in order to perform the operation and avoid the losses during transmission. due to which output results get changed and obtain lossless transmission. And in the second stage architecture color coding is provided in the form of a color glass filter and the color sensor where the sensor sense color in particular intervals [9]. so any color of incoming light communicates with the all-color glass filter at output ports but recognize by only a single output port which includes a similar color glass filter as the same color light, thus by using second-stage architecture the complexity of the connection between ports removed and able to get lossless transmission [3] [6] [7].

Third stage Multiple Input Multiple Output Architecture:




3:Multiple Input and Multiple Output

The Third stage architecture is similar to the first stage and the second stage but this provides the advancement in the multiple port operation, wherein the till second stage used the single input port only but now the third stage uses more than one input due to which number of ports increases in the input side and when the number of ports increases so the number of transmission operations also increases according to which if input ports more than one, therefore, number of different color wavelength can pass through a number of different input ports and then each output port and another way to say that each input color light can communicate to

each output port, where the light passes at input port at particular interval is equal to that light has passed through each output port which is divided equally in time division manner .

According to the above figure in the third stage operation, the number of input ports is three, and at each input port passing a different wavelength of the light and where in the optical multi-plug housing placed the reflector and that reflector is rotated continuously due to which reflector reflect input incoming ray of light to each output port in a particular interval of time one after other, and also can say as per experiment perform that if the light color1 fall in reflector through the $port_A$ so that reflector reflect that incoming light to each "output port" one after another at each output $port_X$, $port_Y$ and $port_Z$. in a given interval of time and when the light is matched with same color glass filter and sense by the color sensor at node x so the color sensor passes the light of equal interval to the channel [3] [4] [6]. And again the same operation performs if the incoming light comes through the second input port which is light2 so light 2 is reflected by the reflector to each output port one by one at equal time slot and the second light communicate with all ports but light passes only by that particular port which is having the same color glass filter. And all operation performs in the same manner for each incoming light.

According to all the above-given architectures 1st,2nd, and 3rd all given structures are nearly the same but the operation performed by each of these is different and that gives different results in the different stages.in the first stage, it is observed that by using the "optical multi-plug" It is possible to establish the connection between the transmitter unit and the receiver unit, similarly in the second stage architecture number of output ports increases due to which a single input port can communicate with different output ports so the losses of data reduce during transmission, because of the multiple output ports are used to send the data. The optical multi-plug system is also capable to self-recognizing the port connection by implementing the color glass filter. Further, in the third stage introduce multiple input ports as well as multiple output port wherein each input port are able to communicate to each output port in the time interval because of increasing the number of transmission points and receiver points so that larger data can pass through the ports in lesser time.

The present hardware architecture of the device is similar to the previous related technology “Optical Multi-Plug Based Hardware Architecture For Long Distance Optical Network" [10], Wherein it includes both the color glass filter and color sensor but that technology has some limitations such as a more number of the requirement of the different color sensor where each of the color sensors has to perform the single operation for each wavelength so the complexity of the device is high as well as the previous device has only able to pass single wavelength only as per hardware arrangement hence to avoid this limitation in the given new technology, further, introduce the single color sensor which is able to sense one or more than one color in given interval so that requirement of the color sensor is one due to which complexity has reduce ,and device include opto-mechanical arrangement where data has transfer in a particular interval of time so all wavelength of light can pass during the particular interval of time thus all type of wavelength can pass through single channel [3] [4] [8].

The optical multi-plug is basically a connecting device that is specially used to provide the connection between the transmitter unit and receiver unit, and it can be used to extend the connection of the network by applying the multiple input and output ports arrangement [10] [11] [12]. The optical multi-plug provides a number of advantages such as higher speed and the least requirement of the bandwidth which is possible by implementing the optical multi-plug hardware architecture wherein the optical multi-plug device has include an opto-mechanical arrangement in which data is transferred based on a time divisional manner one after another through the single channel so by which it is possible to utilize the complete bandwidth in the particular interval of time therefore possible to achieve higher data transfer rate [4].

**However there are some issues arises like:**

1. How to connection establish using the optical multi-plug hardware architecture?
2. What are the significance of using color sensor?
3. How the Optical multi-plug arrangement is better than conventional devices?

To resolve these issues the multi-plug hardware architecture has been proposed.

## III. Methodology:

According to given both arrangements single-input and single-output as well as multiple-input multiple-output, the main purpose of the operation was to establish the connection between the input and the output ports by used in an optical multi-plug arrangement [10], due to which data could be transferred in the time divisional manner means was each input port was connected with each output port for the particular interval because of “Opto-mechanical arrangement” where the duration of communication between each port was equal and operation was performed according to the time divisional manner in a one after another, where the mode of connection was the contactless and basically in the form of light because of this data can transmitted through a single channel in the desired manner [3] [4].

**Single Input Single Output:**

The basic concept of the single input and single output operation had to establish the connection between the transmitter and receiver end or establish the extended connection and utilize the complete channel for the single connection, and proposed method of established the connection was perform in a manner that the input green color light had passed through the input $port_A$ and then fall on “opto-mechanical arrangement” such as reflector part which had work in conjunction with the motor and suppose that the motor was in stationary condition, so the green light was reflected by the reflector at the same time because reflector was in stationary position at duration $T_A$ and that reflected light had passed through the color glass filter which was arrange near the output port and that particular "color glass filter" was also in green color so the output color of green light not changed after passed through the green color glass filter, further that green light had communicated with the color sensor at node X where the color sensor was pre-

instructed to detect the green light and let passed the green color light. thus, the light passed through the channel and the connection had established [3] [4] [6] [8].

Input section Include: Green color light , $Port_X$ and Duration $T_A$
Output Section:
$Port_X$ × Node X Duration $T_X$
$Port_X$ Include: Green color glass filter, and color sensor arrange at node X where color sensor able to sense green color in duration $T_X$.
Architecture: green color glass filter in series with color sensor.
Output reflected light green.

**Input $Port_A$ and Output $Port_X$**
Incident light at Input $Port_A$ ≡ Reflected light at Port $_X$
Operation perform at Input $Port_A$= Input incident green light passed through Input $Port_A$ in duration $T_A$
Expression= Incident green color light× $Port_A$× Duration $T_A$
Operation perform at output section which was series operation= Reflected Green light × $port_X$ × Node x ×duration $T_X$
Operation perform at output $port_X$:
STEP 1: Reflected Green color light had passed through the Green color glass filter therefore output light after the green color glass filter was still green.
.Reflected Green color light× green color glass filter = output green color light
Operation Perform At Node X and duration $T_X$.

Step2:
Output light had after passed through the green color glass filter was also green and that green color light had communicated with the color sensor at node X as per series operation where the color sensor was pre-instructed to sense green color light in duration $T_X$ therefore, the sensor had sensed the green light and let passed through the channel.

Output green color light × color sensor × Duration $T_X$= Output
Thus color sensor let pass the light through the channel.

**Multiple Input Multiple Output:**
The method and operation in Multiple Input and Multiple Output were slightly different from Single Input and Single Output architecture in that the results of the performed operations were divided into two main categories such as Condition 1 and Condition 2, where in Condition 1 the methods of connection establishment and operation were included and further condition 2, where the connection was not established and both of these are described below:

**Condition 1:**
Condition1 had pertained to the connection establishment conducted between the multiple input ports and the multiple output ports used in the optical multi-plug arrangement [10]. wherein an input incoming ray of a particular wavelength or color of light was passed through the particular input port and then that color of light fell on the "Opto-mechanical arrangement" mainly on the reflector part, certainly that reflector part" was reflected the light at each output port in time divisional manner one after another, therefore that reflected light was passed through each color glass at each output port where the process of the color mixing occurred, and it was observed that the incoming color of light at the input port and the "color of light" after passed through the "color glass filter" was same because of "color glass filter" was also the same color. therefore, output light was not converted to another color and further moved toward the "single color sensor" where that color sensor was pre-instructed to detect the light in a similar color as the "color glass filter" in the proposed interval of time thus color sensor had detected the same color light and permitted to pass through the channel [3] [4] [7] [8].

**Condition 2:**
The process of operation performed in condition 2 had similar to condition 1 but the components were different such as the "color glass filter" wherein when the particular color or wavelength of light was passed through the input port and then came into the "Opto-mechanical arrangement" mainly at the reflective part, therefore that reflective part had reflected the light equally to each output port in a time division manner one by one, therefore connection time between inputs and output ports were equals and then that particular wavelength of light or color of light passed through the color glass filter where the concept of color mixing was performed between the "color glass filter" and "color ray of light" due to which resultant light was converted to another color and that converted light is further moved toward color sensor at NodeX where the color sensor was pre-instructed to sense the color of light which was same as color glass filter but because of color mixing output light got converted this was the reason behind the color sensor was not able detect the color light and due to which color sensor had did not permitted to pass the color light through the channel [3] [6] [8].

**Case1**
Input section Include: Red color light , $Port_A$ and Duration $T_A$
Output Section:
$Port_X$× Duration $T_X$ ×Node X
$Port_X$ Include: Red color glass filter, and color sensor arrange at node X where color sensor able to sense Red color in duration $T_X$
Architecture: Red color glass filter in series with color sensor.
Output reflected light Red.

**Input $Port_A$ and Output $Port_X$.**
Incident light at Input $Port_A \equiv$ Reflected light at $Port_X$
Operation perform at Input $Port_A$= Input incident Red light passed through Input $Port_A$ in duration $T_A$
Expression= Incident Red color light× $Port_A$× Duration $T_A$
Operation perform at output section which is series operation= Reflected Red light × $Port_X$ × Node x ×Duration $T_X$
Operation perform at output $Port_X$:
STEP 1: Reflected Red color light was passed through the Red color glass filter therefore output light after the Red color glass filter was also Red.
Reflected Red color light× Red color glass filter = output Red color light
Operation Perform At Node X and at duration $T_X$.
Step2:
The output light passed through the Red color glass filter was also red and that red color light was input to the color sensor at node X as per series operation where the color sensor was pre-instructed to sense the red color light at the duration $T_X$. therefore the color sensor sensed the red light and let passed to the channel.

Output Red color light × color sensor × Duration $T_X$= Output
Thus color sensor let pass the light through the channel.

**Case 2**
Input section Include: Red color light , $Port_A$ and Duration $T_A$
Output section
$Port_Y$× Duration $T_Y$ ×Node X
$Port_Y$ Include: blue color glass filter, and color sensor arrange at node X where color sensor able to sense blue color in duration $T_Y$.
Architecture: blue color glass filter in series with color sensor.
Output reflected light Red

**Input $Port_A$ and Output $Port_Y$**
Incident light at Input $Port_A \equiv$ Reflected light at $Port_Y$
Operation perform at Input $Port_A$= Input incident Red light passes through Input $Port_A$ in duration $T_A$
Expression= Incident Red color light× $Port_A$× Duration $T_A$ .
Operation perform at output section which was series operation= Reflected Red light × $Port_Y$ × Node x ×duration $T_Y$
Operation perform at output $port_Y$:
STEP 1: Reflected Red color light had passed through the blue color glass filter therefore output light after the Blue color glass filter was purple.
Reflected Red color light× Blue color glass filter = output purple color light

Operation Perform At Node X and at duration $T_Y$.

Step2: Output light after passing through the blue color glass filter had changed to purple and that purple color light had communicated with the color sensor at the node X according to the series operation where the color sensor was Pre-instructed to sense blue color light in duration $T_Y$ but output light was purple therefore color sensor was not able to sense purple light and not let pass the light through the channel.

Purple light × (color sensor) × Duration $T_Y$= No Output

**Case 3**
Output Section:
$Port_X$× Duration $T_X$ ×Node X
Port1 Include: Red color glass filter, and color sensor arrange at node X where color sensor able to sense Red color in duration $T_X$.
Architecture: Red color glass filter in series with color sensor.
Output reflected light Red.

**Input $Port_B$ and Output $Port_X$**
Input section Include: Blue color light , $Port_B$ and Duration $T_B$
Expression: blue color light ×$Port_B$× Duration $T_B$
Output Section Include :$Port_X$, NodeX, and Duration $T_X$
Expression: $Port_X$ × Node X × Duration $T_X$
Duration $T_B \equiv$ Duration $T_X$ (Condition for light transmitted through the channel)
Incident light at Input $Port_B \equiv$ Reflected light at $port_X$
Operation perform at Input $Port_B$ =Blue color light × Duration $T_B$
(As per above operation incident blue color light passes through Input $Port_B$ in Duration $T_B$)
Total Operation perform at output section: Reflected blue light × $Port_X$ × duration $T_X$× Node x
Operation perform at output port 1:
STEP 1: Reflected Blue color light had passed through the red color glass filter therefore the output light after the red color glass filter was purple.
Reflected blue light× Red color glass filter = Purple light.

Operation Perform At Node X and duration $T_X$.
Step 2: output purple color light had communicated with the color sensor at node x where the color sensor was pre-instructed to sense red light at $T_X$ duration. Thus color sensor was not able to sense the output purple light in duration $T_X$ and had not let pass the purple light through the channel.
.
Purple light × (color sensor) × Duration $T_{X=}$ No Output

**Case 4**
Output section
$Port_Y$× Duration $T_Y$ ×Node X
$Port_Y$ Include: Blue color glass filter, and color sensor arrange at Node X where color sensor able to sense blue color in duration $T_Y$.
Architecture: Blue color glass filter in series with color sensor.
Output reflected light blue
.
**Input $Port_B$ and Output $Port_Y$**
Input section Include: Blue color light , $Port_B$ and Duration $T_B$
Expression: Blue color light ×$Port_B$ × Duration $T_B$
Output Section Include: $Port_Y$,NodeX,and Duration $T_Y$
Expression: $Port_Y$ × Node X × Duration $T_Y$
Duration $T_B \equiv$ Duration $T_Y$ (Condition for light transmitted through the channel)
Incident light at Input $Port_B \equiv$ Reflected light at $Port_Y$
Operation perform at Input $Port_B$ =Blue color light × Duration $T_B$
(As per above operation incident blue color light passed through Input $Port_B$ in Duration $T_B$)
Total Operation perform at output section: Reflected blue color light × $Port_Y$ × duration $T_Y$× Node x
Operation perform at output $Port_Y$:

STEP 1: Reflected Blue color light had passed through the blue color glass filter therefore output light after the blue color glass filter was still blue.

Reflected blue light× blue color glass filter = blue color light .

Step 2: Output blue color light was incoming at the color sensor and the color sensor was arranged in a series with the color glass filter where the color sensor was able to sense output blue color light in $T_Y$ Duration that was pre-instructed to sense and after sensing the blue color light the color sensor had let pass the blue color light through the single channel.

Output blue color light × color sensor × Duration $T_Y$= Output
Thus color sensor let pass the light through the channel.

According to the above-performed operations, it is observed that case 1,and case 4 has empirically satisfied condition 1 where the connection has established and data pass through the channel there is also the observation that case 2 and case 3 satisfied Condition 2 where the connection has not established and transmission not occurring.

## IV. Results:

The optical multi-plug hardware architecture established a connection between the multiple inputs and output ports and, was also able to extend the connections between transmitter and receiver ends which increased the communication network and area of the communication, and, optical multi-plug had included the "color glass filter" due to which device was able to self-recognize ports combination and connection [7] [9], next, after the establishment of connection the optical multi-plug architecture enhanced the transmission ability where the optical multi-plug hardware architecture was associated with the "single core optical fiber" which worked as a single channel so signal propagated in the speed of light, thus transmission speed and channel capacity had increased [4].

In addition, the optical multi-plug hardware architecture included "opto-mechanical" arrangement and color sensor both components worked in conjunction with each other due to which optical multi-plug hardware architecture had established connection between multiple inputs and outputs ports in the time divisional manner sequentially one after another, so, the interference between the signals had not occurred during transmission, and also transmission occurred in the time divisional manner due to this reason the requirement of bandwidth reduced and in other words to say that a signal of the particular wavelength had transmitted through the single channel and signal had utilize complete channel for a particular interval of time so signal reach to destination without interference and loss [3] [4].

Moreover, the requirement of repeaters and amplifiers had an essential part of any communication system such as the optical communication where the amplifier amplified the strength, this was the reason that it also amplified the unrequired signal and noise to avoid this noise the repeaters were introduced but for the repeater, it needed to convert the signal from optically-to-electronically and again electronically-to-optically, in order to reconstruct the signal due to which complexity and cost increased, therefore, optical multi-plug arrangement provided the solution wherein it had transmitted the "particular wavelength" ("color of light") within a particular interval of time sequentially so interference between two different signals not occurred and the signal had transmitted

without attenuated/distorted, therefore, in the optical multi-plug arrangement had not required to re-constructed the signal as like the repeater, due to this reason, the cost and complexity of the system had reduced.

As a result, the optical multi-plug hardware architecture had able to provide a "long-distance optical network" more particularly for the "local area network" as well as for the "metropolitans area network" [13], with numerous different advantages such as high-speed, high bandwidth, higher channel capacity, low in cost, and long-distance communication with less complexity.

## V. Discussion

The Present technology is able to solve the network complexity using optical multi-plug hardware architecture where the optical multi-plug establishes the connection between input and output ends, and the optical multi-plug is also able to self-recognize the combination of the ports using the color coding where color markings provide in the form color glass filter, further, the procedure of establishing the connection is similar to the previous study of optical multi-plug but in present architecture additionally include the "Opto-mechanical arrangement" which work in a time division manner hence each input port connects to output port sequentially which means that complexity of the system reduces because of each port is having a channel for a particular duration as result establishing the connection as well as extending the connection is simple.

Also, according to the present observation, it is finding the complexity in the present hardware architecture is very less in comparison to the previous hardware architecture due to by including only one single color sensor that detects the color of light in a time divisional manner [8] whereas, the previous hardware architecture has provides a various number of the color sensor for each wavelength (color of light) so the number component is more, due to this reason, complexity in previous hardware architecture is also more, which is reduced in the present hardware architecture by using only single color sensor which detect light in time divisional manner [8] [10].

Moreover, The optical multi-plug hardware architecture provides the solution for obtaining good transmission between transmitter and receiver by include a color sensor which is work in conjunction with "opto-mechanical" arrangement and color glass filter, where the color sensor is a special type of sensor that senses the color in a time divisional manner, resultantly the transmission of signal occurs one after another through the single channel (single core optical fiber) using specific hardware architecture which is not performed in previously, therefor by using the both "optical multi-plug hardware architecture" and "single-core fiber channel" the communication occurs fastest in a manner and the signals transmit one after another this provides an advantage in term of bandwidth, speed, and data transmission rate and also avoid interference, losses and require less channel capacity which means due to utilizing the complete channel for particular data in a particular interval of time so larger data can transmit one by one this achieve high data rate at higher speed [4] [6] [8].

Additionally, the optical multi-plug architecture provides advantages in terms of bandwidth, speed, and high transmission rate but it also has some limitations such as in the present hardware architecture it is not possible to use white light as a source, and also, white light cannot pass through the channel, because of the device include components like color glass filter and color sensor and both work with respect to color that means when the white light passes through the color glass filter it converts as the same color as color glass filter and that converted color of light communicate with a color sensor which is pre-instructed to sense the color which is as similar to color glass filter, therefore, color sensor let pass all the color of light as a result interference, distortion and losses occur [3] [4] [7] [8]. in addition, the optical multi-plug architecture includes opto-mechanical arrangement which performs mechanical operation so the frequency of establishment of the connection between ports is limited.

Further, it is suggest that to include the additional white light source at the optical multi-plug housing which can perform ON/OFF operation in a timely manner according to the connection establishment between the ports, where due to using the white light source in an optical multi-plug housing it is possible to white light perform the mixing with the other incoming colored ray of light therefore luminous of light increases which means the strength of light increases and there is no effect on the colored ray of light because that colored light passes through the color glass filter, thus, it is possible to increase the strength of light and light able to cover more distance without repeater or amplifier.

## VI. Conclusion

The present multiple input and multiple output port hardware architecture use to perform transmission between the transmitter and receiver end where it is found that transmission occurs by establishing the connection between the multiple ports in the form of different "colors of light" by using the hardware architecture, that includes combination components such as "color glass filter" and "colors sensor" [7] [8]. But, in previously for the transmission of each various different wavelength (color of light) has needed the larger number of "color sensors" for "sensing and passing" the different "color of light" [10] due to which complexity was higher where in order to overcome the problem in the present paper has include an architecture that presents novelty approach in which the system include only one special type of single color sensor which has able to detect different "color of light" in different intervals of time sequentially, therefore complexity in architecture reduce and further the system also includes "Opto-mechanical arrangement" which has establish the connection between ports sequentially in the synchronization manner with the single color sensor, therefore, the transmission of the data has occurred through the "optical multi-plug" to the channel also sequentially thus signal utilize the complete channel for particular interval due to which interference and attenuation of signal has not occur and signal able to travel longer distance due to which it has possible to more expansion of communication networks such as LAN and MAN [13], as well as, single-channel capacity and bandwidth are higher thus larger groups can use the single channel.

However, the architecture has limitations, such as it is not possible to use the white light as input and output signal for the signal transmission because the components such as the "color glass filter" and "color sensor" allow the passing of the white light through the channel due to which distortion occurs. despite that, it is suggested that the white light source can include in the optical multi-plug hardware architecture housing because of the given system arrangement that it is possible to achieve the amplification of the signal by color mixing and filtering with the white light through the hardware architecture, due to which signal can travel more distance this avoid the much requirement of amplifiers and repeaters in the communication system.

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