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Chapter 1 : LTC 16 Channel Video Multiplexer - Worldeyecam

*A 16 channel medium speed multiplexer [Vincent T Prestianni] on calendrierdelascience.com *FREE* shipping on qualifying offers. This is a reproduction of a book published before*

With the right type of fiber it is possible to have a device that does both simultaneously, and can function as an optical add-drop multiplexer. The concept was first published in , and by WDM systems were being realized in the laboratory. The first WDM systems combined only two signals. A system of channels is also present WDM systems are popular with telecommunications companies because they allow them to expand the capacity of the network without laying more fiber. By using WDM and optical amplifiers , they can accommodate several generations of technology development in their optical infrastructure without having to overhaul the backbone network. Capacity of a given link can be expanded simply by upgrading the multiplexers and demultiplexers at each end. Certain forms of WDM can also be used in multi-mode fiber cables also known as premises cables which have core diameters of 50 or Early WDM systems were expensive and complicated to run. However, recent standardization and better understanding of the dynamics of WDM systems have made WDM less expensive to deploy. Optical receivers, in contrast to laser sources, tend to be wideband devices. Therefore, the demultiplexer must provide the wavelength selectivity of the receiver in the WDM system. Coarse WDM provides up to 16 channels across multiple transmission windows of silica fibers. Some technologies are capable of Coarse wavelength division multiplexing CWDM in contrast to DWDM uses increased channel spacing to allow less sophisticated and thus cheaper transceiver designs. Avoiding this region, the channels 47, 49, 51, 53, 55, 57, 59, 61 remain and these are the most commonly used. With OS2 fibers the water peak problem is overcome, and all possible 18 channels can be used. WDM, DWDM and CWDM are based on the same concept of using multiple wavelengths of light on a single fiber, but differ in the spacing of the wavelengths, number of channels, and the ability to amplify the multiplexed signals in the optical space. EDFA provide an efficient wideband amplification for the C-band , Raman amplification adds a mechanism for amplification in the L-band. For CWDM, wideband optical amplification is not available, limiting the optical spans to several tens of kilometres. In general, these things shared the fact that the choice of channel spacings and frequency stability was such that erbium doped fiber amplifiers EDFAs could not be utilized. Newer fibers which conform to the G. The relaxed optical frequency stabilization requirements allow the associated costs of CWDM to approach those of non-WDM optical components. CWDM is also being used in cable television networks, where different wavelengths are used for the downstream and upstream signals. Thus, a legacy switch system can be easily "converted" to allow wavelength multiplexed transport over a fiber simply by judicious choice of transceiver wavelengths, combined with an inexpensive passive optical multiplexing device. It separates the wavelengths using passive optical components such as bandpass filters and prisms. Many manufacturers are promoting passive CWDM to deploy fiber to the home. EDFAs can amplify any optical signal in their operating range, regardless of the modulated bit rate. In terms of multi-wavelength signals, so long as the EDFA has enough pump energy available to it, it can amplify as many optical signals as can be multiplexed into its amplification band though signal densities are limited by choice of modulation format. EDFAs therefore allow a single-channel optical link to be upgraded in bit rate by replacing only equipment at the ends of the link, while retaining the existing EDFA or series of EDFAs through a long haul route. At this stage, a basic DWDM system contains several main components: The terminal multiplexer contains a wavelength-converting transponder for each data signal, an optical multiplexer and where necessary an optical amplifier EDFA. These data signals are then combined together into a multi-wavelength optical signal using an optical multiplexer, for transmission over a single fiber e. The terminal multiplexer may or may not also include a local transmit EDFA for power amplification of the multi-wavelength optical signal. In the mids DWDM systems contained 4 or 8 wavelength-converting transponders; by or so, commercial systems capable of carrying signals were available. An intermediate optical terminal, or optical add-drop multiplexer. Optical diagnostics and telemetry are often extracted or inserted at such a site, to allow for localization of any fiber breaks or signal impairments. In more sophisticated systems which are no longer point-to-point , several signals out of the multi-wavelength optical signal may be removed and dropped locally. A DWDM terminal demultiplexer. The OSC carries information about the multi-wavelength optical signal as well as remote conditions at the optical terminal or EDFA site. It is also normally used for remote software upgrades and user i. ITU standards suggest that the OSC should utilize an OC-3 signal structure, though some vendors have opted to use megabit Ethernet or another signal format. Precision temperature control of laser transmitter is required in DWDM systems to prevent "drift" off a very narrow frequency window of the order of a few GHz. In addition, since DWDM provides greater maximum capacity it tends to be used at a higher level in the communications hierarchy than CWDM, for example on the Internet backbone and is therefore associated with higher modulation rates, thus creating a smaller market for DWDM devices with very high performance. Recent innovations in DWDM transport systems include pluggable and software-tunable transceiver modules capable of operating on 40 or 80 channels. This dramatically reduces the need for discrete spare pluggable modules, when a handful of pluggable devices can handle the full range of wavelengths. Wavelength-converting transponders[edit] At this stage, some details concerning wavelength-converting transponders should be discussed, as this will clarify the role played by current DWDM technology as an additional optical transport layer. It will also serve to outline the evolution of such systems over the last 10 or so years. In the mids, however, wavelength converting transponders rapidly took on the additional function of signal regeneration. Signal regeneration in transponders quickly evolved through 1R to 2R to 3R and into overhead-monitoring multi-bitrate 3R regenerators. These differences are outlined below: Basically, early transponders were "garbage in garbage out" in that their output was nearly an analogue "copy" of the received optical signal, with little signal cleanup occurring. This limited the reach of early DWDM systems because the signal had to be handed off to a client-layer receiver likely from a different vendor before the signal deteriorated too far. Signal monitoring was basically confined to optical domain parameters such as received power. Transponders of this type were not very common and utilized a quasi-digital Schmitt-triggering method for signal clean-up. Some rudimentary signal-quality monitoring was done by such transmitters that basically looked at analogue parameters. Many systems will offer 2. Many transponders will be able to perform full multi-rate 3R in both directions. Muxponder The muxponder from multiplexed transponder has different names depending on vendor. Reconfigurable optical add-drop multiplexer As mentioned above, intermediate optical amplification sites in DWDM systems may allow for the dropping and adding of certain wavelength channels. In most systems deployed as of August this is done infrequently, because adding or dropping wavelengths requires manually inserting or replacing wavelength-selective cards. This is costly, and in some systems requires that all active traffic be removed from the DWDM system, because inserting or removing the wavelength-specific cards interrupts the multi-wavelength optical signal. The architecture of the ROADM is such that dropping or adding wavelengths does not interrupt the "pass-through" channels. Numerous technological approaches are utilized for various commercial ROADMs, the tradeoff being between cost, optical power, and flexibility. Optical cross connects OXCs [edit].

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Pre-Multiplexer Circuitry (Appendix C Schematics, Sheets) Each pre-multiplexer channel comprises seven flip-flops, "nand" gates for scanning and control, and level convertor cir- cuits for voltage compatahility between the pre-multiplexer and the synchronous serial data channels.

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Chapter 3 : HEFB - channel analog multiplexer/demultiplexer | Nexperia

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Types[edit] Multiple variable bit rate digital bit streams may be transferred efficiently over a single fixed bandwidth channel by means of statistical multiplexing. This is an asynchronous mode time-domain multiplexing which is a form of time-division multiplexing. Digital bit streams can be transferred over an analog channel by means of code-division multiplexing techniques such as frequency-hopping spread spectrum FHSS and direct-sequence spread spectrum DSSS. Space-division multiplexing[edit] In wired communication, space-division multiplexing , also known as Space-division multiple access is the use of separate point-to-point electrical conductors for each transmitted channel. Examples include an analogue stereo audio cable, with one pair of wires for the left channel and another for the right channel, and a multi-pair telephone cable , a switched star network such as a telephone access network, a switched Ethernet network, and a mesh network. In wireless communication, space-division multiplexing is achieved with multiple antenna elements forming a phased array antenna. Different antennas would give different multi-path propagation echo signatures, making it possible for digital signal processing techniques to separate different signals from each other. These techniques may also be utilized for space diversity improved robustness to fading or beamforming improved selectivity rather than multiplexing. Frequency-division multiplexing[edit] Frequency-division multiplexing FDM: The spectrum of each input signal is shifted to a distinct frequency range. Frequency-division multiplexing FDM is inherently an analog technology. FDM achieves the combining of several signals into one medium by sending signals in several distinct frequency ranges over a single medium. In FDM the signals are electrical signals. One of the most common applications for FDM is traditional radio and television broadcasting from terrestrial, mobile or satellite stations, or cable television. Receivers must tune to the appropriate frequency channel to access the desired signal. Time-division multiplexing TDM is a digital or in rare cases, analog technology which uses time, instead of space or frequency, to separate the different data streams. TDM involves sequencing groups of a few bits or bytes from each individual input stream, one after the other, and in such a way that they can be associated with the appropriate receiver. If done sufficiently quickly, the receiving devices will not detect that some of the circuit time was used to serve another logical communication path. Consider an application requiring four terminals at an airport to reach a central computer. Each terminal communicated at baud , so rather than acquire four individual circuits to carry such a low-speed transmission, the airline has installed a pair of multiplexers. A pair of baud modems and one dedicated analog communications circuit from the airport ticket desk back to the airline data center are also installed. Orbital angular momentum multiplexing[edit] Orbital angular momentum multiplexing is a relatively new and experimental technique for multiplexing multiple channels of signals carried using electromagnetic radiation over a single path. As of [update] it is still in its early research phase, with small-scale laboratory demonstrations of bandwidths of up to 2. One form is frequency hopping, another is direct sequence spread spectrum. In the latter case, each channel transmits its bits as a coded channel-specific sequence of pulses called chips. Number of chips per bit, or chips per symbol, is the spreading factor. This coded transmission typically is accomplished by transmitting a unique time-dependent series of short pulses, which are placed within chip times within the larger bit time. All channels, each with a different code, can be transmitted on the same fiber or radio channel or other medium, and asynchronously demultiplexed. Advantages over conventional techniques are that variable bandwidth is possible just as in statistical multiplexing , that the wide bandwidth allows poor signal-to-noise ratio according to Shannon-Hartley theorem , and that multi-path propagation in wireless communication can be combated by rake receivers. Telecommunication multiplexing Multiple access method[edit] A multiplexing technique may be further extended into a multiple access method or channel access method , for example, TDM into time-division multiple access TDMA and statistical multiplexing into carrier-sense multiple access CSMA. A multiple access method makes it possible for several transmitters connected to the same physical medium to share its capacity. Multiplexing is provided by the Physical Layer of the OSI model , while multiple access also involves a media access control protocol, which is part of the Data Link Layer. Code-division multiplexing CDM is a technique in which each channel transmits its bits as a coded channel-specific sequence of pulses. All channels, each with a different code, can be transmitted on the same fiber and asynchronously demultiplexed. Early experiments allowed two separate messages to travel in opposite directions simultaneously, first using an electric battery at both ends, then at only one end. In , the quadruplex telegraph developed by Thomas Edison transmitted two messages in each direction simultaneously, for a total of four messages transiting the same wire at the same time. This is likewise also true for digital subscriber lines DSL. Fiber in the loop FITL is a common method of multiplexing, which uses optical fiber as the backbone. Asynchronous Transfer Mode is often the communications protocol used. IPTV also depends on multiplexing. Demultiplexer media file In video editing and processing systems, multiplexing refers to the process of interleaving audio and video into one coherent data stream. In digital video , such a transport stream is normally a feature of a container format which may include metadata and other information, such as subtitles. The audio and video streams may have variable bit rate. A demuxer is software that extracts or otherwise makes available for separate processing the components of such a stream or container. Digital broadcasting[edit] In digital television systems, several variable bit-rate data streams are multiplexed together to a fixed bitrate transport stream by means of statistical multiplexing. This makes it possible to transfer several video and audio channels simultaneously over the same frequency channel, together with various services. The device that accomplishes this is called a statistical multiplexer. In several of these systems, the multiplexing results in an MPEG transport stream. A multiplex is a stream of digital information that includes audio and other data. Where multiplexing is not practical such as where there are different sources using a single transponder , single channel per carrier mode is used. In fact, the stereo multiplex signal can be generated using time-division multiplexing, by switching between the two left channel and right channel input signals at an ultrasonic rate the subcarrier , and then filtering out the higher harmonics. Multiplexing in this sense is sometimes known as MPX, which in turn is also an old term for stereophonic FM, seen on stereo systems since the s. Other meanings[edit] In spectroscopy the term is used to indicate that the experiment is performed with a mixture of frequencies at once and their respective response unravelled afterwards using the Fourier transform principle. In computer programming , it may refer to using a single in-memory resource such as a file handle to handle multiple external resources such as on-disk files. Multiplexing may refer to the design of a multiplexed display non-multiplexed displays are immune to break up. Multiplexing may refer to the design of a "switch matrix" non-multiplexed buttons are immune to "phantom keys" and also immune to "phantom key blocking". In high-throughput DNA sequencing , the term is used to indicate that some artificial sequences often called barcodes or indexes have been added to link given sequence reads to a given sample, and thus allow for the sequencing of multiple samples in the same reaction.

Chapter 4 : Multiplexing - Wikipedia

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Pre-Multiplexer Circuitry 12 C. Software Specifications 29 B. System Schematics 45 iii 1. The system permits simultaneous communica- tion between the Control Data 66OO computer, at the Courant Insti- tute of Mathematical Sciences, and any 16 sites accessible by tele- phone or private line. The salient features of the system are: The multiplexer channels function with any synchronous data device in a half or full duplex mode. The multiplexer channels handle data rates up to 10k bps. The multiplexer channels are incividually synchronized by the data channel clocks. Eight-bit byte registration for a channel in the input mode is accomplished within the multiplexer. This fea- ture can be bypassed for any channel if complete data transparency is desired. The operating modes of each channel are controlled by the Honeywell computer software. The data passing through the multiplexer, whether trans- mitting or receiving on any channel, is in no way alter- ed. The philosophy of data transparency, a necessity in a research environment, is thus adhered to. The Honeywell computer is interfaced to the CDC The data to and from the serial channels is in the form of bit streams driven by channel clocks. There- fore, the throughput of the multiplexer requires that it contain a memory. Accordingly, the multiplexer utilizes the hardware interrupt fea- ture of the computer. From an overall system point of view, the computer outputs data through the multiplexer to any one of the 16 serial channels. Transmission from computer to multiplexer is in 8-bit bytes. The multiplexer distributes the bytes as specified by the computer. Then the 8-bit bytes are marched out serially onto the appropriate channels. Since the channels are synchronized to channel trans- mission clocks, the computer must maintain an output data rate of one S-blt byte for every 8 counts of the corresponding channel transmission clock. The computer collects data from any one of the l6 serial channels. The bit streams are synchronized to channel derived receive clocks. The multiplexer collects and stores the bits into groups of 8-bit bytes. The computer takes these bytes along with additional information for channel identification. Since the channels are synchronized to channel derived receive clocks, the computer must maintain an input data rate of one 8-blt byte for every 8 counts of the corresponding channel clock. While the bits are collected, the multiplexer hardware establishes the byte synchronization of the received message. The computer software is thus relieved of this task. A hardware switch can bypass this feature for any channel. The multiplexer allows each of the l6 channels to operate independently. Thus, each channel may operate in a receive or transmit mode, at different data rates, in full or half-duplex, and with or without byte synchronization for received messages. The computer Interrupt circuitry controls the byte level communication between the computer and multiplexer. When the computer is Interrupted for input, it collects the 8-bit bytes that the receive channels have ready. When the computer is in- terrupted for output, it outputs the 8-bit bytes that the multi- plexer can accept for the channels in the transmit mode. The multiplexer memory contains 48 bits for each channel: In each case, double level byte buffering is employed. The design allows the computer an 8 bit time interval for servicing the multiplexer for input or output data. A real time hardware clock in the multiplexer paces the computer input and output interrupts. The real time bit require- ments of the l6 serial channels determine the pacing rate. Previous techniques would have required the computer to treat the l6 serial channels with individual 8-bit byte interfaces as separate devices, all with separate interrupts. This creates a software environment with a high interrupt overhead. The multi- plexer has only two interrupts for all of the l6 serial channels: This feature reduces the interrupt software overhead that is required for communication between the l6 serial channels and the computer. Clock, Timing, and Decode Circuitry. Synchronizes each serial data channel to the multiplexer memory. Contains the individual channel mode selection switches. Consists of twelve 1 MHz delay lines for double, level buffering of each of l6 channels. Functions as a communi- cation channel between the delay line memory and the computer. Can buffer an 8-bit byte for computer input and output data. The 2 bit decoder cycles every 4 clock counts; the 4 bit decoder cycles every 64 clock counts. The 4 bit decoder has sixteen 4 j. Each state has four 1. TO, Tl, T2, and T3- Thus in the sequential time allocation of the l6 data set channels, the time slice for each is subdivided into four 1 lasec sub-states: Pre-Multiplexer Circuitry Appendix C Schematics, Sheets Each pre-multiplexer channel comprises seven flip-flops, "nand" gates for scanning and control, and level convertor cir- cuits for voltage compatahility between the pre-multiplexer and the synchronous serial data channels. Two flip-flops are used for channel mode selection, and are separately controlled by the computer software. Two flip-flops are used for receiving serial data from the channel. Three flip- flops are used for transmitting serial data onto the channel. In the "0" state, closes off the logic and disconnects the channel from the remote user. Request to Send Flip-Flop In the "1" state, sets the channel into the transmit mode. In the "0" state, sets the channel into the receive mode. The state of this flip-flop is forced by a hardware switch when the channel is used in a full-duplex mode. The receive clock flip-flop functions as a switch which is set by the channel receive clock. The switch remains set until the delay line memory can accept the bit from the receive data flip-flop. This can occur only during the h [isec time slice as- signed to the channel. Transmit Clock and Two Transmit Data Flip-Flops The transmit clock flip-flop functions as a switch which is set by the channel transmit clock. The switch remains set until the delay line memory can output data to the two transmit data flip-flops. The two flip-flops function as a two bit serial buf- fer which outputs data to the channel at a rate determined by the transmit clock. Delay Line Memory Appendix C Schematics, Sheets This section of the hardware contains the memory required for control and double level buffering of all of the l6 serial data channels. The receive buffers are used with a compare circuit to establish byte synchronization of the receive message. The memory consists of 6k sequential blt words. A new word Is accessed from the sequential memory at a l- j. The total cycling time of the memory is 64 j,seconds. Four of the bit words are used for handling data bits of each serial data channel. Channel bit storage requirements are shown in Tables I and II, p. Delay line memory bit assignments are shown In Fig. The first two words, TO and Tl, are used for channel receive data. Because of the sequential nature of the memory, byte transfers from TO to Tl and T2 to T3 are accomplished by using an 8-blt data delay register 8 flip-flops. According- ly, in the receive mode, the channel data collection buffer TO precedes the byte static buffer Tl; in the transmit mode, the channel data distribution buffer T3 follows the static buffer T2. The combination of serial and parallel 8-blt buffers, for In- put and output, forms the double level buffering mechanism for each channel. The byte static buffers store 8-blt bytes. The serial 14 buffers satisfy the real time requirements of the serial data chan- nels one bit per channel clock interval. The delay line memory consists of the following circuitry plus interconnecting logic and f lip-f lops--see Fig. It is used to transfer byte data from the ser- ial buffer to tlie byte static buffer receive mode , or from the byte static buffer to the serial buffer transmit mode. These transfers take place when the input serial buffer goes full, or when the output serial buffer goes empty. Synch Compare Circuitry Establishes the first bit of a receive message. The circuit compares the contents of the receive serial buffer against a known pattern synch , as the receive bit stream is marching through the receive serial buffer. Add "1" Logic Six bits for each channel are reserved in memory to store two separate 3 bit counts. One set is for the number of receive serial buffer shifts, the other is for the number of transmit serial buf- fer shifts. The add "1" logic updates these counters every time data is shifted. A stored bit can only be read when it is shifted out of the end of the delay line. By feeding the delay line output back into the input logic gates, a bit can either be stored indefinitely or modified as required. An expandable "or" node is provided at the input of each delay line. This allows for the addition of as many control functions as needed. The 12 delay lines operate in parallel; therefore, at any one time, a bit word is read out by looking at the output of each of the delay lines. Because of the output to input feedback, this word can be either stored in- definitely or modified. When clocking these lines at a 1 MHz rate, a new bit word appears at the outputs of the delay lines every one iJ,second. Since these lines are 6k bits long, a particular bit word is accessible every 64 iiseconds. At this point, it can either be modified or reinserted as is into the lines.

Chapter 5 : Wavelength-division multiplexing - Wikipedia

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Chapter 9 : Full text of "A 16 channel medium speed multiplexer"

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