AOC vs DAC

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In our article on AOC vs DAC, our Product Manager for Data Centre Vibin Varghese has compiled a comparison of the two data centre products, including: Power Consumption, Data Transmission Distance, Cost, Anti-electromagnetic Interface and Flexibility.

Keywords:

Power Consumption | Data Transmission Distance | Cost | Anti-electromagnetic Interface | Flexibility

For more information on DACs or AOCs view our range of extensive articles.

DAC: In data centres, high speed direct attach cable (DAC) assemblies or twinax cable assemblies are employed. It offers a lower-cost, higher-density alternative cabling option for high-speed 10G-400G interconnection to fibre optic transceivers.

A direct attach cable (DAC cable) is a type of factory terminated twinax cable that connects directly into transceivers. These cables are comprised of permanent lengths of shielded copper coaxial with pluggable transceivers on either end or are available in a range of lengths for short distances of up to 15 metres.

There are two common DAC cable Types:

- Passive DAC Cables
- Active DAC Cables

The passive DAC cable has no electrical components and so has a low power consumption of 0.15w, however the connection distance is restricted to 7m. While active DAC cables include electrical components in the connections that can improve signal levels, they can reach higher lengths (5m or more) via copper media and provide superior transmission quality. As a result, active copper cables are somewhat more costly and use more power than direct connect passive copper cables.

AOC is a multimode fibre optic cable with SFP/QSFP form factor connectives on both ends that requires an external source of power to complete the process of conversion of electric and optical signals, from electric signals to optical signals, and then back to electric signals. AOC cables are mostly employed to connect switches, servers, and storage between numerous racks inside data centres.

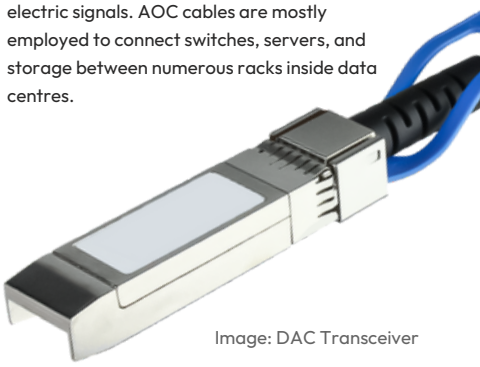

Image: DAC Transceiver

Power Consumption

Active Optical cables use more power than Direct Attach Copper cables. The direct attached copper cable takes less than 1W of power, whereas the AOCs requires 1-2W of power since it powers the electronic components inside the transceiver that perform signal conversion. Despite the absence of any electrical components inside the transceiver, passive DACs consume relatively little power (less than 0.15W) due to their thermal design. Using the DAC options will result in lower operational costs for power consumption.

Data Transmission Distance

Due to the restricted capabilities of copper transmission, direct connected copper cable can only transmit up to 15 metres, making it the ideal cost-effective solution for short-distance data transmission applications, whereas AOC cable can send over longer distances by utilising optical fibre technology.
The maximum distance a signal may be sent over a DAC connection varies with data rate. As the data rate increases, the link length decreases; for example, 100G DAC cables can only transmit up to 5 metres.

Cost

Copper cables are much cheaper than fibre cables and the DAC has a relatively simple internal structure with fewer components which makes AOC a bit expensive than DAC. Thus makes the DAC as a cost-effective solution over AOCs for short range applications whereas for large clusters, the link distance and the actual layout of the cluster plays crucial role to decide which one is cost-effective.

Anti-electromagnetic Interface

Electromagnetic interference (EMI) refers to disruptions caused by external sources that impact electrical circuits. As previously stated, active optical cables comprise optical fibres, which are dielectrics that do not conduct electrical current. Because AOC fibre optic cable is not susceptible to electromagnetic interference, it may be utilised in the majority of applications. Direct-attach copper cables, on the other hand, are prone to electromagnetic interference due to copper's ability to transmit electrical impulses. As a result, the usage environment is critical to minimise undesirable responses, performance deterioration, or system failure.

Flexibility

DACs are constructed of thick copper wires that get thicker as the bandwidth rises. 100G DACs have a greater thickness than 10G DACs. The thickness of the AOC optical cable, on the other hand, is set and has nothing to do with bandwidth. AOC fibre optic cables are generally half the thickness of standard copper wire. AOCs are easier to install in confined places than DACs.

Conclusion

Based on the comparison aforementioned, I believe the distinction between DAC cables and AOC cables is more comprehensible. The high-performance networking of DACs and AOCs may benefit typical data centres. Understanding the distinction between the two is essential for choosing the most appropriate cable and saving money. If the transmission distance is less than 5 metres, DAC cables are the most cost-effective; if the distance is beyond 5 metres, AOC cables are the preferable option, which are superior in terms of performance and price.