



# Active Optical Cables—Markets and Opportunities, 2018 - 2027

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## Active Optical Cables— Markets and Opportunities, 2018-2027

### Report Description

CIR has been publishing a report on the latest opportunities in the Active Optical Cabling (AOC) space for almost a decade. In our 2018 AOC report CIR projects the future of the AOC market, focusing on how AOCs are adapting to current technical and market trends. The report is particularly concerned with how AOCs and embedded optics will coexist and how AOCs will fit in with current data center trends; both the huge data centers that the cloud service providers are building and the smaller enterprise data centers that are resulting from the rise of the cloud itself. We also take a look at how AOCs can increasingly be messaged as part of power consumption strategy for data centers, replacing the old story of AOCs replacing bulky copper IB cables.

In this year's AOC report CIR is putting more emphasis on how the supply chain structure for AOCs varies around the world and who the leading players are for each region is. This includes special consideration of the market environment in China and a discussion of how Chinese firms are making their presence felt in international markets. As with our previous reports on AOCs, this report also includes analyses of how AOCs are being adapted to the latest MSAs, especially those at 100 Gbps and 400 Gbps, and whether AOCs will ever emerge as a consumer electronics item—a long promised development.

This report provides an insider perspective on what's next in the AOC business. It is strongly focused on business strategy and examines all the important marketing issues faced by the AOC market. The report also profiles all the leading suppliers of AOCs including established players, emergent Chinese vendors and the latest innovators, along with quantitative market shares of the AOC market leaders. Finally, the report includes ten-year volume and value forecasts, broken out by data rate, MSA, networking standards, fiber type and length of cable.

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## Chapter One: Introduction

### 1.1 Background to this Report

CIR has been publishing a report on the latest opportunities in the Active Optical Cabling (AOC) space for a decade. As with our previous reports, our 2018 AOC report focuses on how AOCs are adapting to current technical and market trends. In this report, we focus on three major trends that we believe will shape the opportunities for AOCs going forward.

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These trends are (1) the growing role of clouds in data communications of all kinds with the consequent growth of hyperscale data centers, (2) small moves towards 400 Gbps deployment, but perhaps not in the way that people might have expected a few years ago and (3) the growing importance of Chinese suppliers outside of the commodity area of AOCs. There is also some reason to revisit the consumer AOC market, where there is still very little to see in terms of commercial development. In Exhibit 1-1 we set out the pros and cons of the latest developments

Exhibit 1-1: Data Trends – Impact on the AOC Market		
	Drivers for AOC Markets	Factors Retarding AOC Markets
Growing adoption of the cloud computing model	AOCs are well accepted into the cloud data center. Likely to be a vibrant market for 25 Gbps and 100 Gbps AOCs	Corporate data centers may be smaller than they would have been without clouds, so more need for commodity 10 Gbps AOCs
Shift towards 400 Gbps	Need for a new breed of QSFP-DD AOCs. The suppliers moving in this direction currently seem to be Chinese	Shift to 400 Gbps is happening slowly and no one knows what the future of AOCs will be in a future in which embedded optics becomes important
Chinese suppliers become more important	Chinese suppliers are becoming more competitive in world AOC markets and may be a source of innovation	More competition means lower prices. Chinese component suppliers are becoming dominant in large domestic data center market
Video AOCs show no signs of taking off	Suppliers will have to refocus, possibly with messaging that is more videophile-focused	Until a year or so ago, there was great hope for “consumer AOCs” brought on by upgrading of Thunderbolt and HDMI interfaces, but the opportunity now looks much smaller

Source: CIR

#### 1.1.1 Data Centers Infrastructure Changes

One of these important trends is the re-shaping of the data center business as the world shifts to cloud infrastructures and raises the question of how AOCs will fit into “cloudworld.” CIR thinks that AOCs are doing surprisingly well in the hyperscale data

centers and (less surprisingly) in the smaller enterprise data centers that are resulting from the rise of the cloud itself.

In the past, we were concerned that very large data centers would go for field termination/structured cabling rather than AOCs, but this doesn't seem to be happening to anywhere near the degree we feared. Microsoft's data centers have actually turned out to be something of a showcase for AOCs. Meanwhile, with enterprise data centers being smaller than they might otherwise have been, one of the curiosities of the trend towards clouds is that it may keep the 10 Gbps AOC around for a while longer.

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AOCs by definition are always threatening to become a commodity product, but we anticipate that at the higher end of the market, AOC makers will still be able to compete on technical characteristics (power consumption, especially) for the indefinite future. And, of course, AOC makers will be able to continue to generate revenues by adopting the latest and greatest MSAs. AOC makers must also deal with the reality that demand for 40G AOCs and 10G AOCs will begin to phase out to be replaced by 25G/100G linkages. In other words, the future for high-volume AOC sales will be in 25G AOCs from servers to switches and 100G between machines and storage boxes.

In the light of increased competition from Chinese suppliers, we expect to see branding and messaging take a growing role in the marketing of AOCs. One trend that we expect to see more of is AOCs being pitched towards specific market segments—data centers, enterprise networks, medical, military, telecom, etc.

### **1.1.2 400 Gbps, AOCs, Embedded Optics**

Another factor implementing the future of AOCs is 400 Gbps deployment, which generally speaking, is occurring slower than its advocates once thought it might. Possibly for this reason, the 400 Gbps AOC prototypes that were appearing a few years ago seem to have disappeared rather than turned into commercial products.

On a more positive note there are murmurings about AOCs for OSFP and QSFP-DD MSAs. InnoLight already has a 400 Gbps AOC in its catalog and several other Chinese suppliers have 200 Gbps AOC products. Meanwhile, how will the AOC concept fit in with a world that will probably turn to embedded optics at 400 Gbps and above? One possibility is that AOCs will simply be gradually marginalized and commoditized, much as (say) the humble RJ45 has experienced. But there is at least the possibility that somehow the AOC will transform into a follow-on product that will retain the off-the-shelf, ready-to-roll aspect of the AOC, while being more in tune with the spirit of embedded optics.

### **1.1.3 China, Costs and Manufacturing**

The whole AOC business is shifting to China. Five years ago, the largest data centers would never have bought Chinese AOCs fearing that they would be low quality. There are data center managers who worry about such things and are very rigid about specs



when it comes to components such as AOCs. However, we expect that the differences between U.S. and Chinese firms are eroding when it comes to quality.

The best Chinese firms such as GigaLight or 10Gtek are now almost as “respectable” as, say, Finisar. In any case, most “American” AOCs these days are actually made in low labor cost Asian countries—not just China, but Malaysia and Thailand, too, although such products are managed to American standards. One reason for thinking that Chinese AOC firms will continue to grow is that they now have a large and expanding domestic data center market that they can sell to and where they are treated preferentially. However, the exact impact of this trend on quality is not clear. Meanwhile, the fact that Chinese companies say that they can manufacture 200 Gbps and 400 Gbps AOCs must speak to quality to some degree.

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Even if the penetration of the huge data center market by Chinese AOC firms occurs at a slower rate than we expect, we anticipate that Chinese AOC firms will find fewer obstacles to success in the data centers of South American, the Middle East and other Asian nations. Our sense of the market is that European data centers may be more friendly to Chinese AOCs than are their North American equivalents.

#### 1.1.4 Consumer AOCs in Doubt

We remain bullish on AOCs in general (although moderately concerned about what happens to them in a futuristic post-400 Gbps world). However, we are now quite skeptical about consumer AOCs and AOCs for digital signage. We note that despite the fact that very high data rate versions of Thunderbolt and HDMI are now available, optical implementations of them never seem to take off in large volumes.

For consumer products it seems that a relatively small proportion of prospective users feel a need to boost video quality with optical extension and are content with video that is good enough. This might suggest that consumer AOCs have an available market that consists largely of videophiles and that, in the future, this is where the messaging for consumer AOCs should be directed. Meanwhile, while digital signage is definitely buying into AOCs right now, CIR has seen very little effort by AOC makers to sell to that sector and thinks that most of the digital signage demand for AOCs comes through third parties—digital signage firms or value-added resellers.

If this part of part of the AOC market ever does take off, it seems that the Chinese firms may be well set up technically to provide products to it with either MMF or POF offerings. Perhaps, however, if this scenario pans out, it may be the Chinese display firms that will be selling the AOCs at retail, since they already understand what it takes to succeed in this area. They would then source the actual AOCs from local Chinese AOC makers.

#### 1.2 Objective and Scope of Report

As always, the main objective of this year’s CIR AOC report is to quantify the market for AOCs. In this 2018 edition we are focusing on the market trends that we summarize in

the section above. But we are also putting more emphasis this year on how the supply chain structure for AOCs varies around the world and who are the leading players for each region. This includes special consideration of the market environment in China and a discussion of how Chinese firms are making their presence felt in international markets. As with our previous reports on AOCs, this report also includes analyses of how AOCs are being adapted to the latest MSAs, especially those at 100 Gbps and 400 Gbps, and whether AOCs will ever emerge as a consumer electronics item—a long promised development.

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### **1.3 Methodology of this Report**

The methodology used to compile this report is similar to that used in other reports published by CIR. The analysis presented here is based in part on interviews with key players in this space ranging from key suppliers to users of AOCs in the U.S. and throughout the world. These interviews were carried out by telephone and also at major optical networking events in 2017, including OFC and ECOC.

CIR has also collected and analyzed data from third-party sources including (1) corporate websites, financials and presentations, as well as (2) reputable trade and technical publications, including papers delivered at conferences.

#### **1.3.1 Forecasting Methodology**

Over the decade that CIR has been covering the AOC market we have developed a sophisticated forecasting model for AOCs and has been able to test our estimates against the views of AOC industry insiders. This model and our accumulated understanding is the basis of the forecasts in this report.

Our forecasting methodology is based on estimating the size and growth of the underlying addressable markets for AOCs and then adopting plausible penetration rates for each segment of the AOC markets as well as estimate of acceptable price points for each sector:

- The size of the addressable market is determined based on extrapolations and triangulations from publicly available data.
- Our penetration numbers are based on CIR's long experience of market adoption patterns in the data communications business.

- Pricing is based on list pricing for AOCs, which is widely available from almost all the major vendors. However, we have assumed that the actual prices are at somewhat of a discount from list prices.

Using this data, we construct a model that serves as the basis for both our projections and our overall analysis of the AOC market. For each of the AOC applications forecast we breakout the market by the following features and functions of the AOCs:

- Type of transceiver/MSA
- Cable length
- Fiber type
- Electrical connectors supported
- Data rates supported
- End-user application
- Country of use

#### 1.4 Plan of Report

This report consists of three chapters, an Executive Summary and an Appendix. The Executive Summary is intended to bring together the strategic conclusions from the report. Chapter Two is intended to provide an assessment of the current level of AOC technology and the evolution of AOC products. Chapter Three analyzes the leading suppliers of AOCs worldwide and some of the minor ones.

The Appendix contains our detailed ten-year forecasts for the AOC business with break outs by all the major MSAs, connector types, data rates, fiber types, etc.