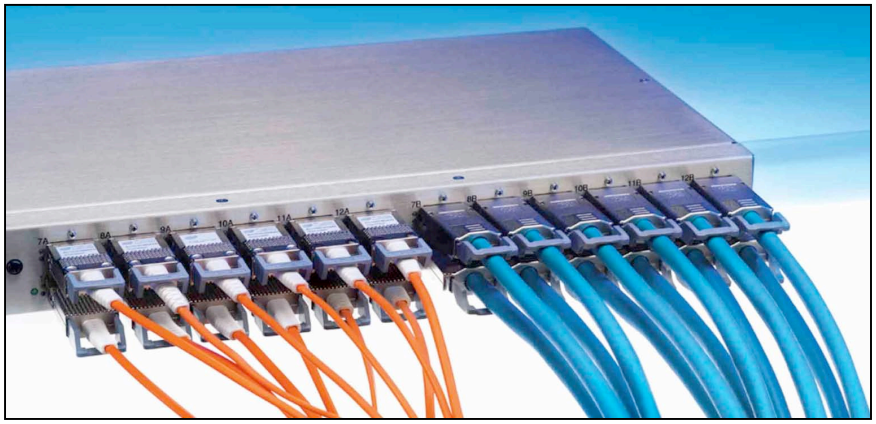
FIBERFEST SYMPOSIUM: New Opportunities in Fiber Optics



Opportunities for Fiber Optics Less Than 100 Meters

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Outline

- **Opportunities for Fiber Optics to Replace Copper**
- **New Opportunities for Fiber Optics**
  - Obama Stimulus Package
  - Active Optical Cables

Why is This the Time for Fiber Optics to Replace Copper?

- Trend to higher speed data communications 10G-100G
- Need to reduce cable size and weight
  (data centers and supercomputers)
- Lower costs (through Higher Volumes)
- Lower power consumption
- EMI resistance
- Reduce Ground Loops

Specific Applications and Trends

- Automotive applications
  - Lower weight
  - EMI (MOST)
- Supercomputers and data centers
  - Lower weight, size, and power consumption
- Aircraft
  - Weight
  - EMI
  - Future growth and change potential

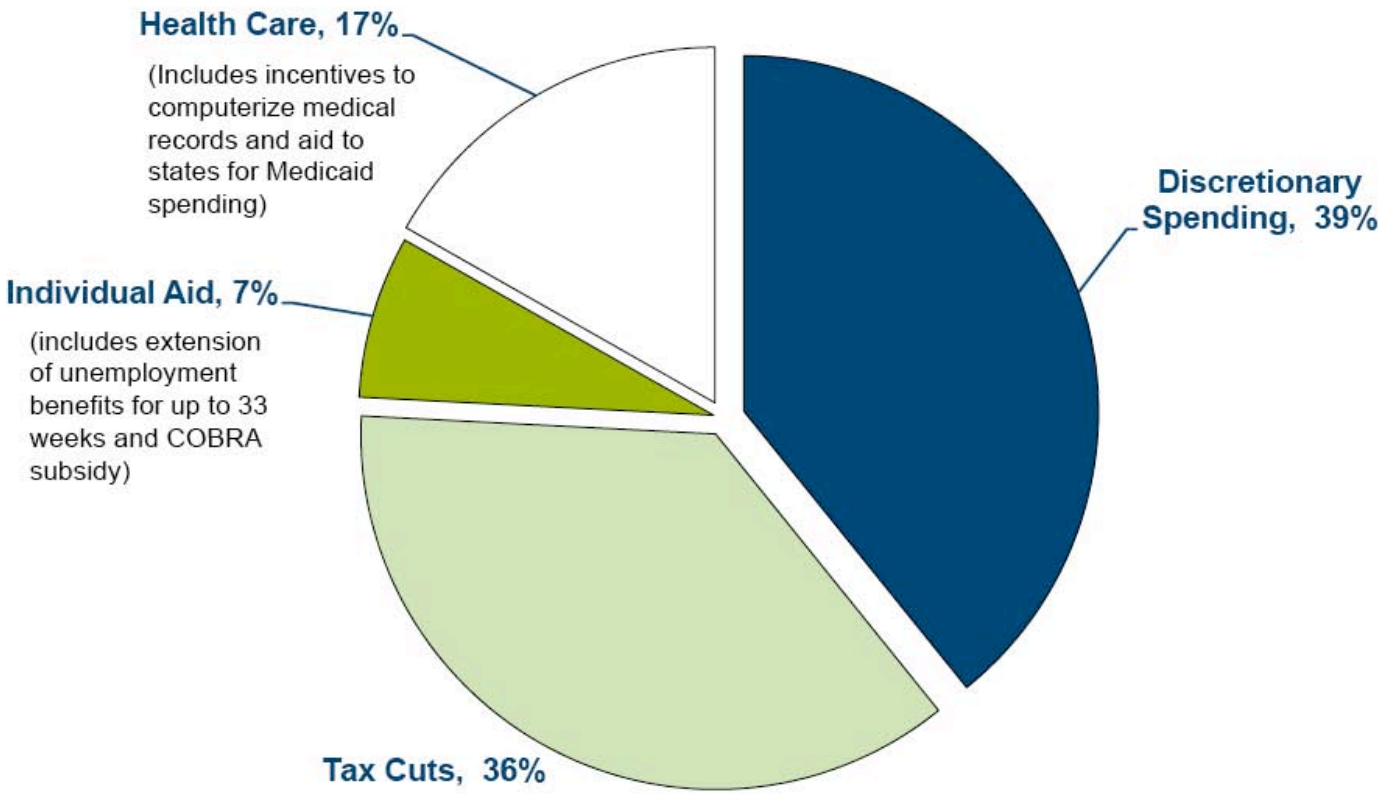
Top 40 Potential Applications

- Active Optical Cables (AOC)
- Audio/Visual
- Auto Aftermarket, Other Transportation Applications
- COTS and Environmental Hardening
- Data Centers
- Digital Signage
- DisplayPort
- Ethernet SAN
- Fibre Channel
- Flex Circuits/Flat Cables
- Gambling Casinos
- Gaming
- Green Energy Technology
- HDMI and DVI
- HyperTransport
- IEEE 1394 FireWire
- Industrial Ethernet
- InfiniBand
- IPTV and Home Networking
- Machine Vision
- Media Converters, Transceivers & Connectionless Links
- Medical Applications
- Military and commercial aircraft
- Mobile Handset Devices
- POF Sensors
- RF over POF and Femtocells and Picocells
- SATA
- SCSI, SAS, and iSCSI
- Ships and Boat Manufacturing
- Smart Fabrics and Textiles
- Storage Area Networks
- Supercomputers (HPCs)
- Surveillance
- Universal Serial Bus (USB)

Source:
Top 40 Actual & Potential
Plastic Optical Fiber Markets for 2008
IGI Consulting, Inc. , 2008

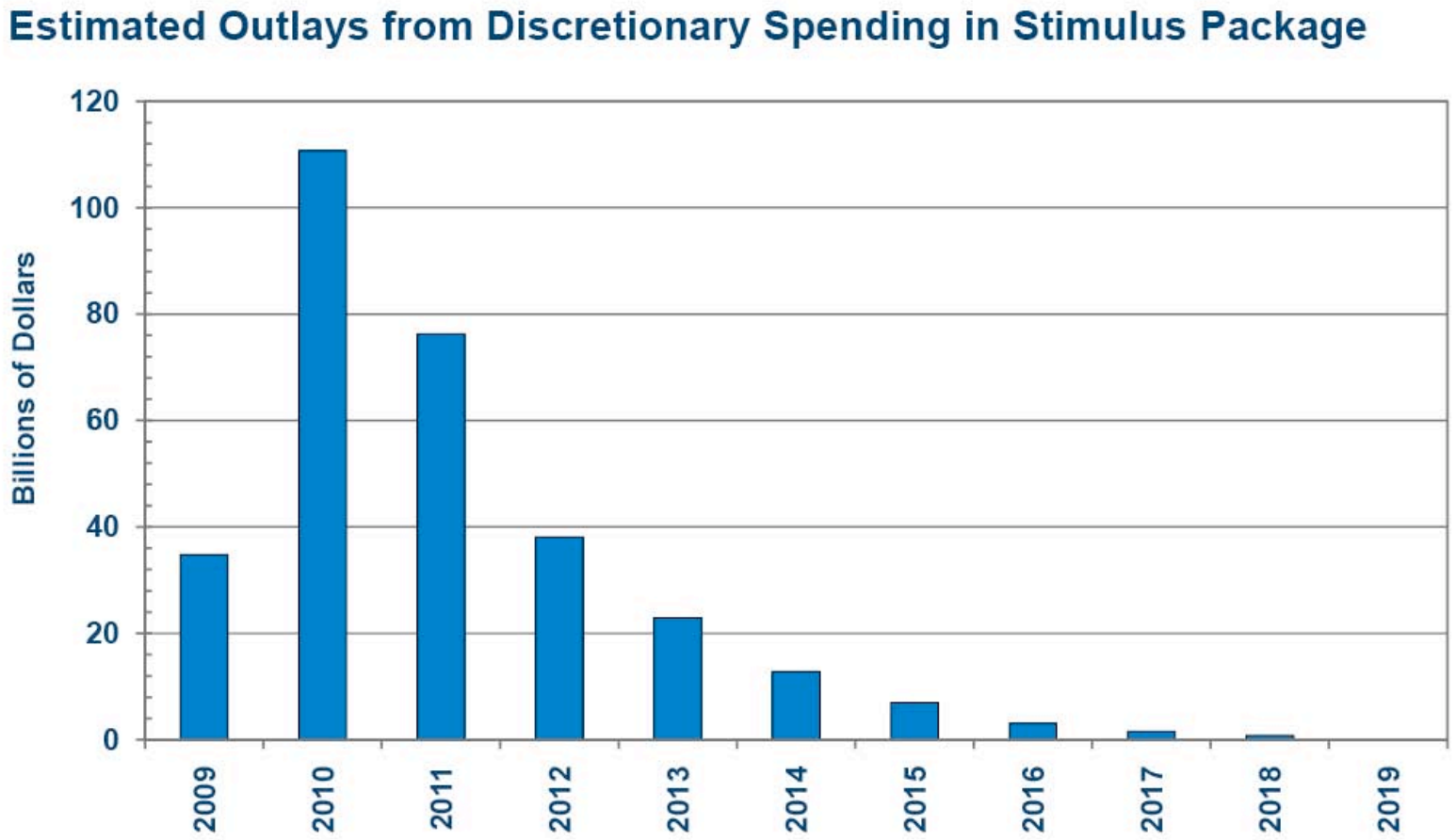
Opportunities in the Obama Stimulus Package

$787 Billion Stimulus Package by Major Category



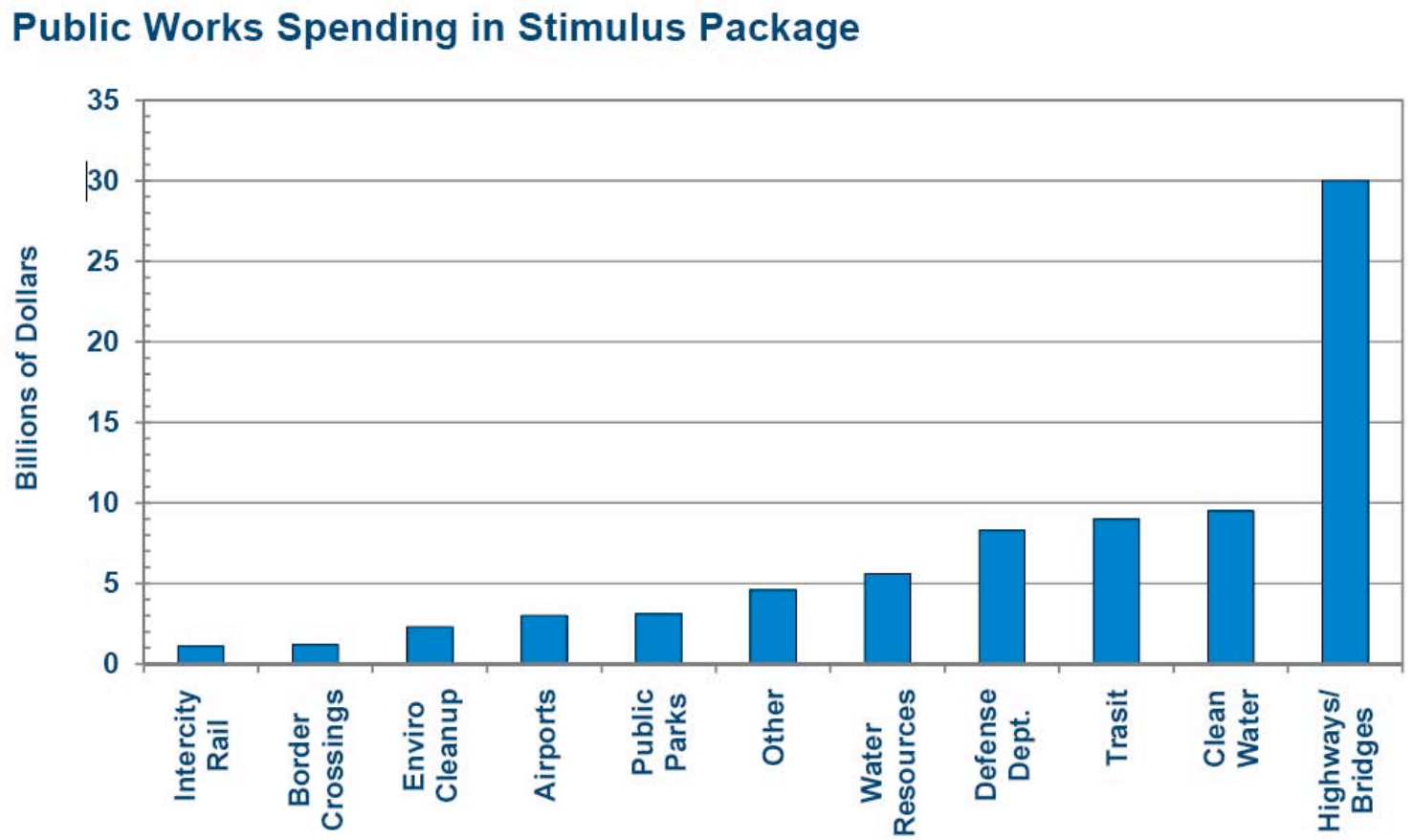
Sources: MAPI Economic Update - 2009 CIP Networks Conference;
Joint Committee on Taxation, House Committee on Rules, Congressional Budget Office

Over Half the Spending Occurs After FY 2010



Sources: MAPI Economic Update - 2009 CIP Networks Conference; Congressional Budget Office

Infrastructure Spending Could Have Positive Impact for Long-Term Private Investment



Sources: MAPI Economic Update - 2009 CIP Networks Conference; House Appropriations Commitee

Major Investment Areas of the Stimulus Bill

- Broadband
- Smart Grid
- Health and IT
- Education
- Science and Technology
- Infrastructure and Transportation
- Green Energy

The Multiplier Effect of Obama Stimulus Package (Some examples and Estimates)

	Obama Stimulus Plan ($Billion)	Total * ($Billion)
Broadband	$7.2	$100
Transportation and Highways	$30	$300
Smart Grid	$4.5	$200
High Speed Transport	$8.0	$200
Healthcare and IT	$17	$680
Education	$20	$200
Energy (Renewable)	$36	$500
Total	$122.7	$2,180

* Total is the estimated amount of investment to implement a nationwide system, coverage of the whole population, etc.

Telecommunications in Different Sectors (Some examples)

Broadband
- Fiber Optics (FTTP + FTTN)
- Wireless
- Home Wiring
- Network Access
- Powerline
- IPTV
- Applications (Health, Energy, Education, etc.
- Wireless

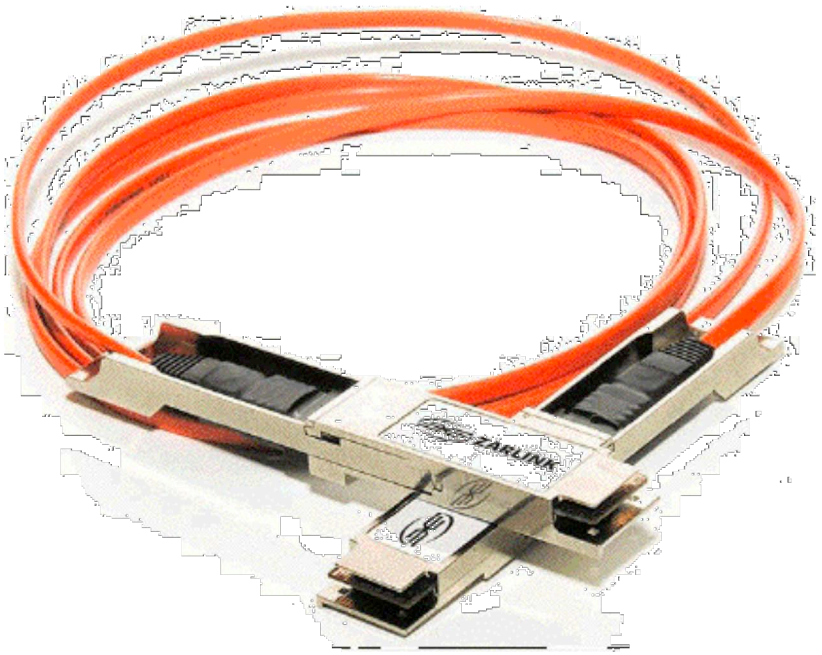
Smart Grids
- Networks (Local, Regional, Wide Area)
- OPGW
- Sensors & Monitoring Devices
- Smart Meters
- Data Collection Systems
- Control Centers
- Automation Systems
- Wireless

Transportation
- Intelligent Highway Systems
- Fiber Optic Backbone Networks
- Wireless (Terrestrial & Satellite)
- Sensor Networks (Bridges & Roads)
- Surveillance
- Digital Signage
- Traffic Light Control
- Vehicle Communications
- RFID (EZ-Pass & Advanced Systems)

Health and IT
- EHR (Electronic Health Records)
- Patient Monitoring
- Medical Sensors (Photonics)
- Wireless
- RFID (Asset Management)
- Billing, Campus and Wire area Networks
- Telemedicine
- Patient Monitoring (Hospital and Home)
- LANs
- Storage Area Networks
- Digital Signage
- Data Centers
- Facility Wiring

Education
- Tele-education
- Wire Area Networks (Building, Campus)
- Broadband Access (Fixed & Wireless)
- LANs
- Surveillance
- Tele-training
- Building Wiring
- Digital Signage
- Wireless
- Broadband Access

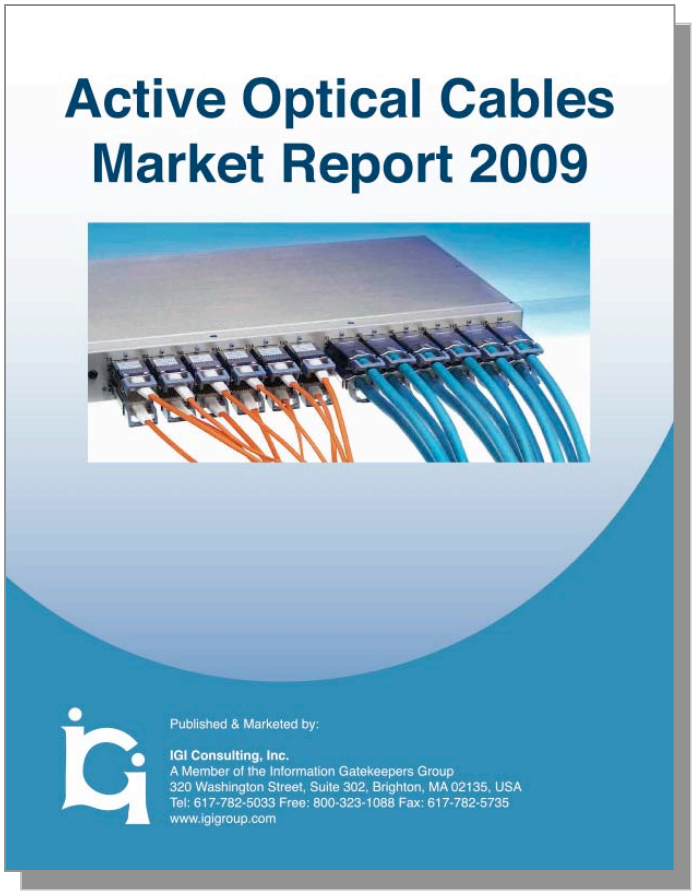
Market Opportunities for Active Optical Cables



Contents

- Definition of AOC
- Benefits of AOC
- Market drivers
- Markets
- Market size and trends
- Speed Trends
- Summary

Active Optical Cables Market Report 2009



Active Optical Cables Market Report 2009

This material is taken from a market study on Active Optical Cables from IGI Consulting completed in January.

Report is 172 pages long, contains 166 figures,120 tables and is available for viewing at booth 2134.

The report may be ordered directly at:

http://igigroup.com/st/pages/aoc.html

Definition

Active Optical Cable (AOC)

A term used to describe a cable that mates with standard electrical interfaces. It uses electrical-to-optical conversion on the cable ends to improve speed and distance performance of the cable without sacrificing compatibility with standard electrical interfaces.

Benefits of AOC

- Longer reach
- Higher bandwidth
- Independent of transceiver type
- Lower interconnection costs
- EMI Immunity
- Smaller size compared to copper cables
- Lower weight compared to copper cables

Market Drivers

- Small size
  - prevent blocking of air flow for HPCs
- Light weight
- Greater reach
- Higher bandwidth

Markets

- Mainframes/Supercomputers (HPC)
- Personal Computers (Desktop & Notebook)
- High definition Television (HDMI)
- Consumer electronics

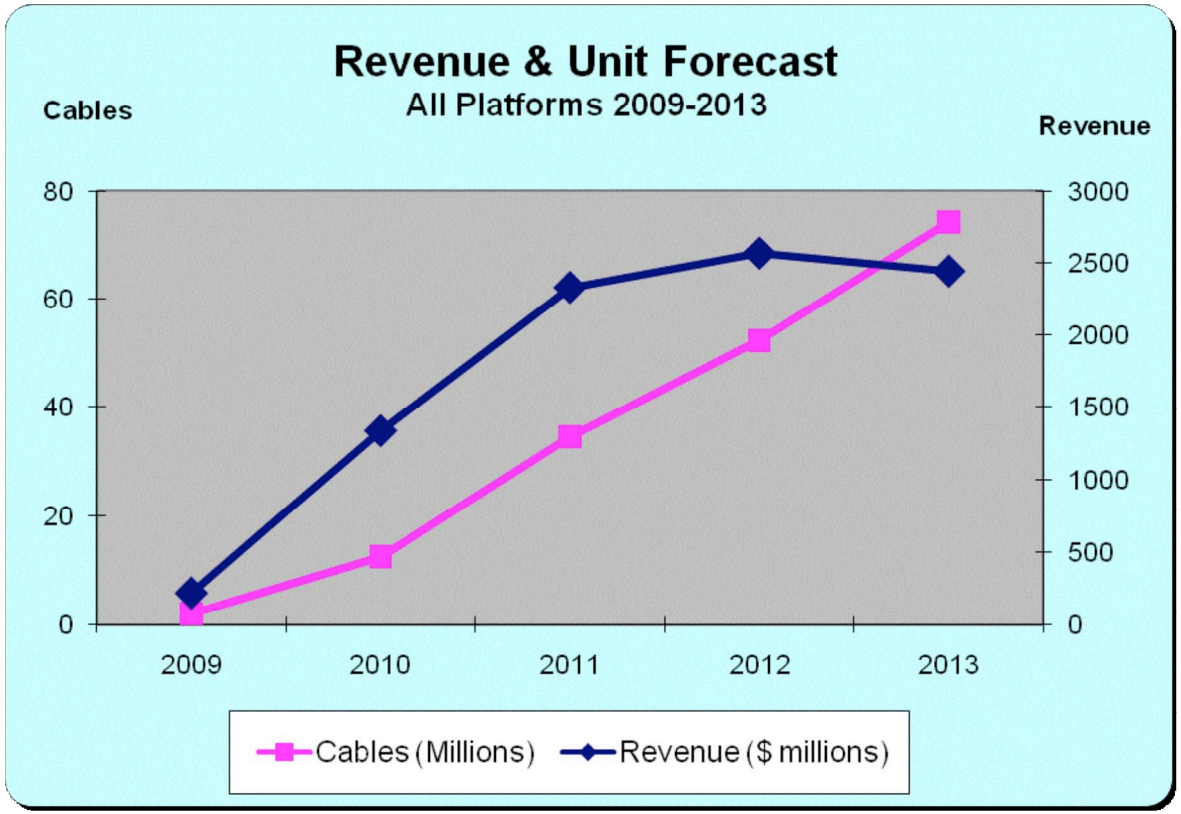
AOC Protocols

- Infiniband
- USB
- HDMI
- DisplayPort

Market Size and Trends

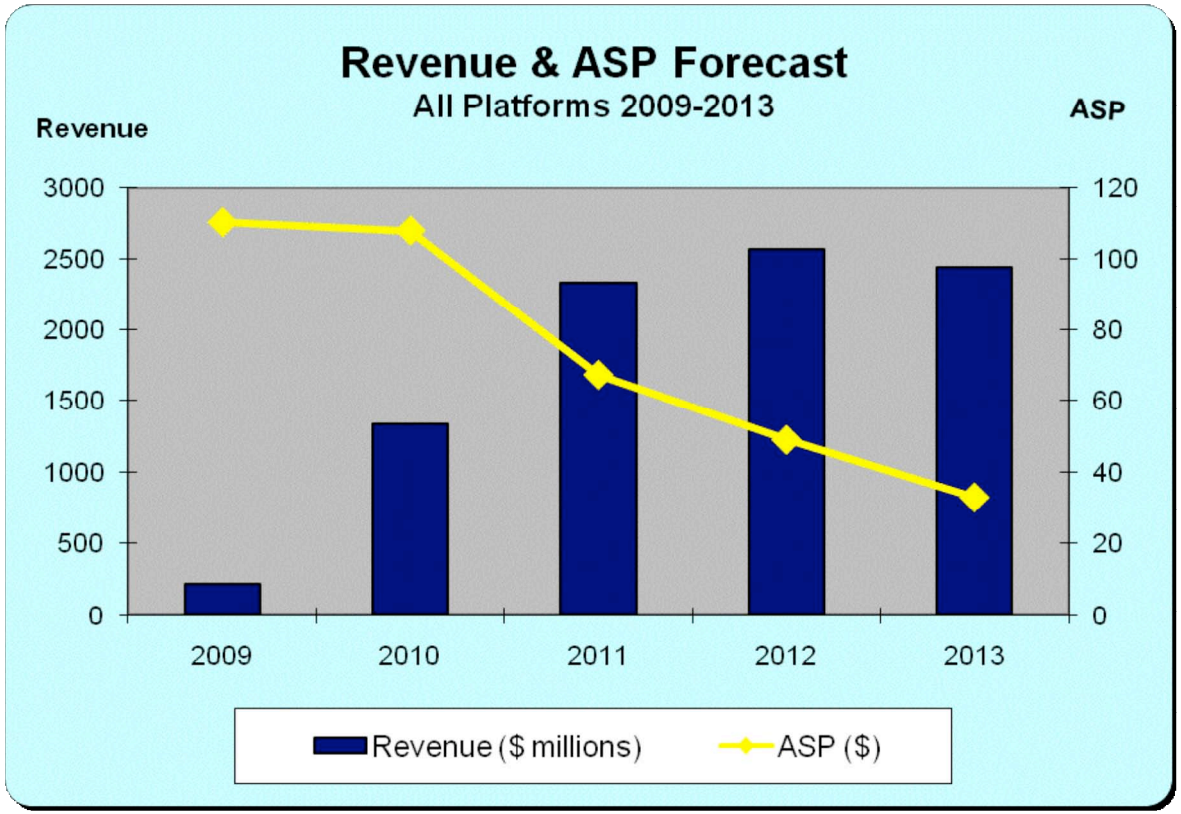
- The AOC Market is estimated to be $221 million in 2009 growing to over $2.4 billion in 2013
- The average selling price in 2009 is $100.00 per AOC decreasing to $33.00 in 2013
- Two million units are forecasted to be shipped in 2009, rising to 74 million in 2013
- The total optical fiber length is 47 million meters in 2009 to nearly 1.1 billion in 2013
- VCSEL shipments across all speed range from 7.9 million in 2009 to over 200 million by 2013.

Revenue & Unit Forecast (2009-2013 All Platforms)



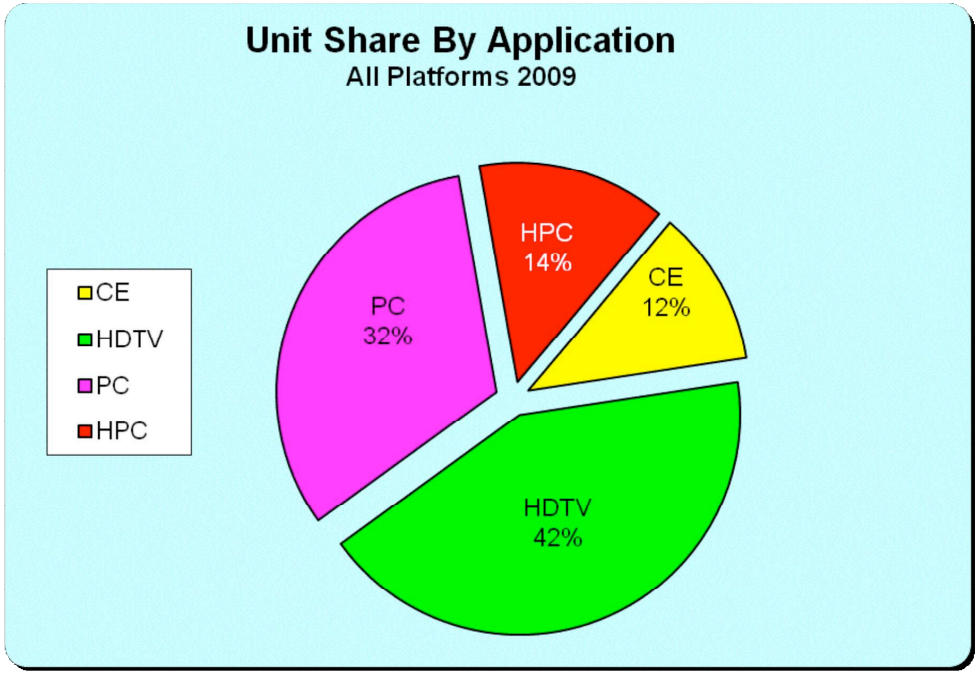
Source: Solutions By Design (c) 2009

Revenue & ASP Forecast (2009-2013 All Platforms)



Source: Solutions By Design (c) 2009

Unit Share by Application (2009 All Platforms)

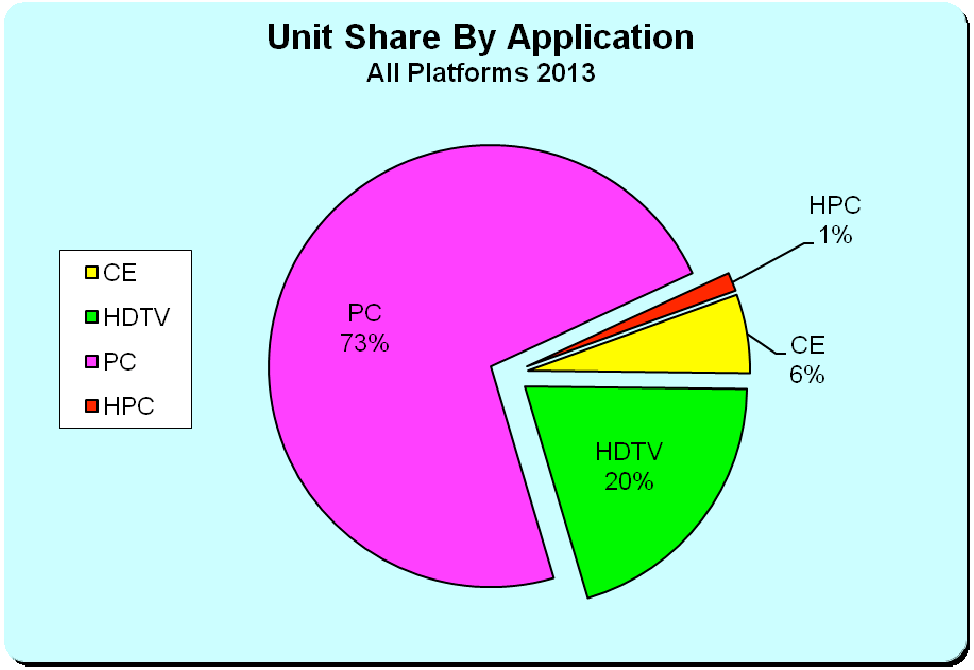


Source: Solutions By Design (c) 2009

Table Error! No text of specified style in document.**-1: AOC 2009 Trends: Unit Share by Application (2009 All Platforms)**

	CE	HDTV	PC	HPC	Grand Total
Cables (Millions)	0.23	0.85	0.65	0.28	2.00
Share	11%	42%	32%	14%	100%

Unit Share by Application (2009 All Platforms)



Source: Solutions By Design (c) 2009

Table Error! No text of specified style in document.**-1: Unit Share by Application (2013 All Platforms)**

	CE	HDTV	PC	HPC	Grand Total
Cables (Millions)	4.2	15.0	53.8	1.0	74.1
Share	6%	20%	73%	1%	100%

Speed Trends

- In 2009, 10 Gbps AOC will dominate with 70% market share
- By 2013, 20 Gbps AOC will dominate with a 75% market share
- Bulk of the AOC business is centered on the 10-20Gbps
- For 40 Gbps and above, AOC usage is expected to dominate copper cable share

Cable Suppliers by Protocol

Cable Type	Optical OEM Suppliers
InfiniBand	EMCORE (formerly Intel ICC), Luxtera, Reflex, Zarlink
USB	Numerous
HDMI	Opticis, OwlLink, Hoya-xPonent
DisplayPort	Luxtera

Component Suppliers

Core Component	OEM Suppliers
VCSELs & PIN Diodes	Analog Devices, Avago, EMCORE, Finisar, Fuji-Xerox, JDS Uniphase, Zarlink
Optical Cable	Corning, HanWei, Hitachi Cable, Mitsubishi, others
Connectors	FoxConn, Japan Aerospace Electronics (JAE), Molex, Tyco
Cabling	

Summary

- AOC is one of the most rapidly growing optical fiber markets
  – first shipments in 2007
- High Performance computers are the main driver
- Now market is moving towards HDMI and consumer electronics
- More companies expected to enter the market
- AOC represents a "Killer APP" for fiber optics