

# Hyperscale and Cloud Growth: Conquering the Challenges of Building Connected Infrastructure

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Smarter, faster, efficient, and scalable.

These are the touchstones of Swick Designs, Steve Cheng's fast-growing network infrastructure design and engineering firm. Steve has spent more than 20 years successfully architecting, building, and operating the world's most advanced connected network infrastructures for companies like Microsoft, Facebook, and Google. Known by insiders as one of the industry's leading experts, Steve has helped shape and define best-in-class connectivity and infrastructure design principles, cabling and component specification standards, and installation and operations best practices.

# Presentation Overview

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1. Mass Growth Of The Connector
2. Current State Of The Connector
3. Challenges Of The Connector
4. The Connector As The Solution

## Section 1

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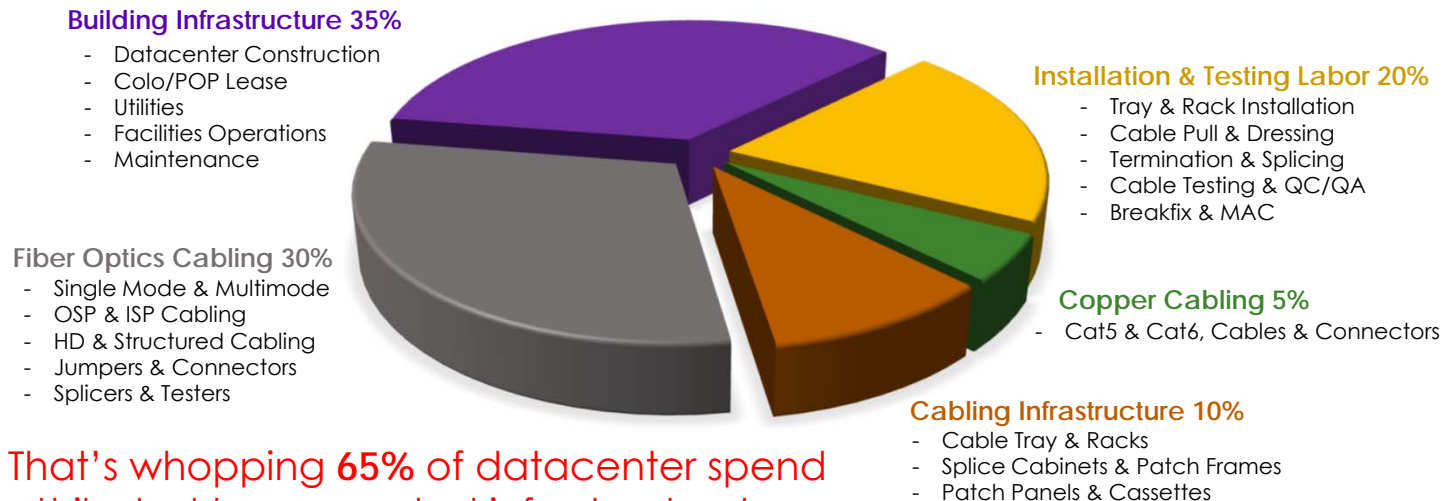
# Mass Growth Of The Connector

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## ▪ The Infrastructure Spend

We begin by taking a quick look at the market holistically and where the costs lie in regard to connected infrastructure. Here is a graph showing the typical datacenter network infrastructure spend, for two of the largest cloud and hyperscale companies, broken into specific component groups:

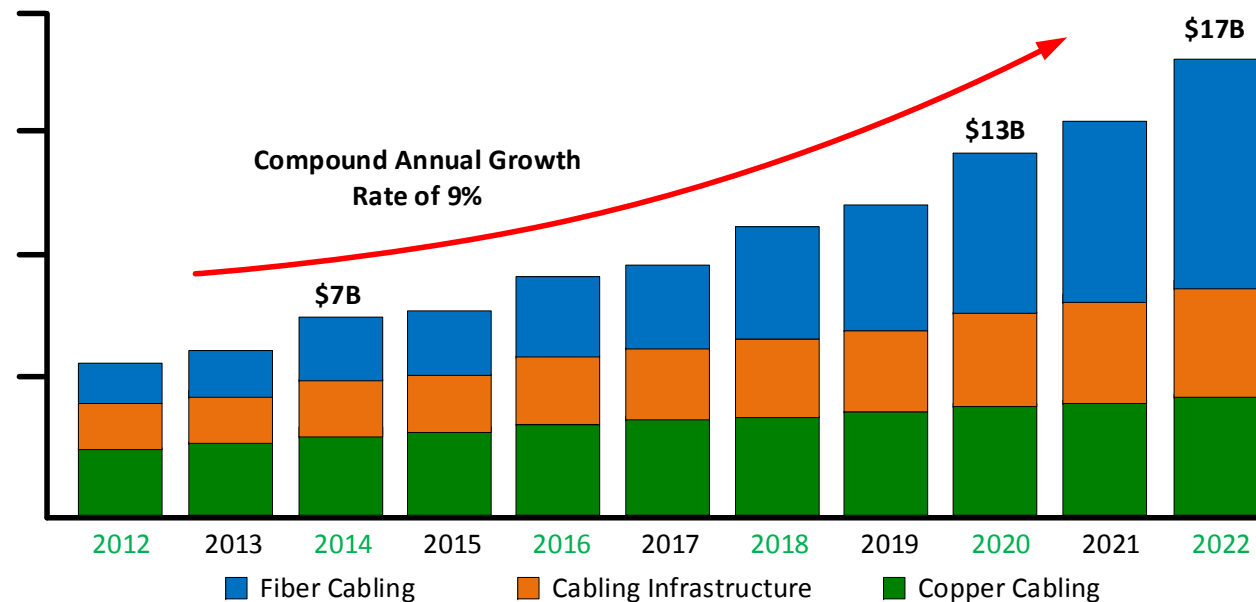
### Datacenter Infrastructure Spend



# Mass Growth Of The Connector

## ▪ The Current Market Forecast

The global structured cabling market was valued at US\$7.72 billion in 2014 and is expected to reach up to \$13.13 Billion by 2020. That's a **growth rate of 9.0%** between 2015 and 2020, equating to **\$17+ billion by 2022**.

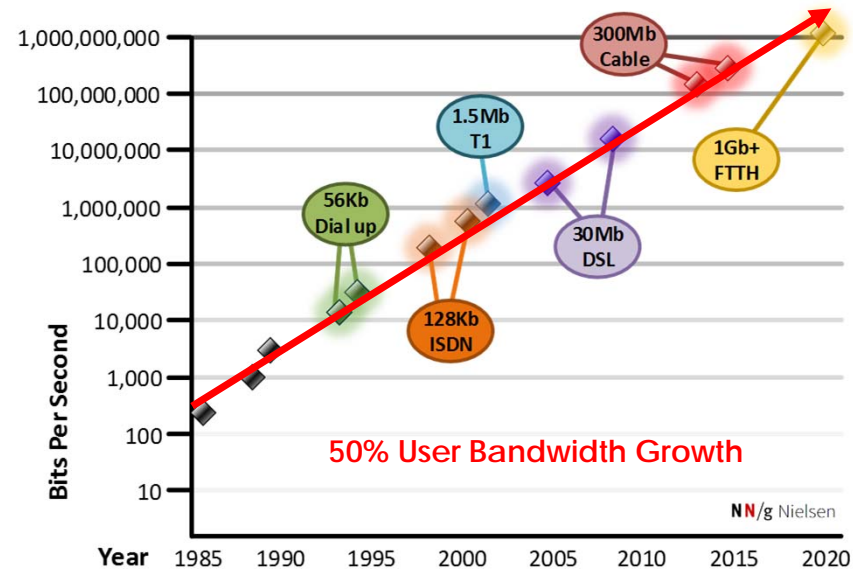


\*Notice a trend of fiber optics cabling extending growth while copper flattens.

# Mass Growth Of The Connector

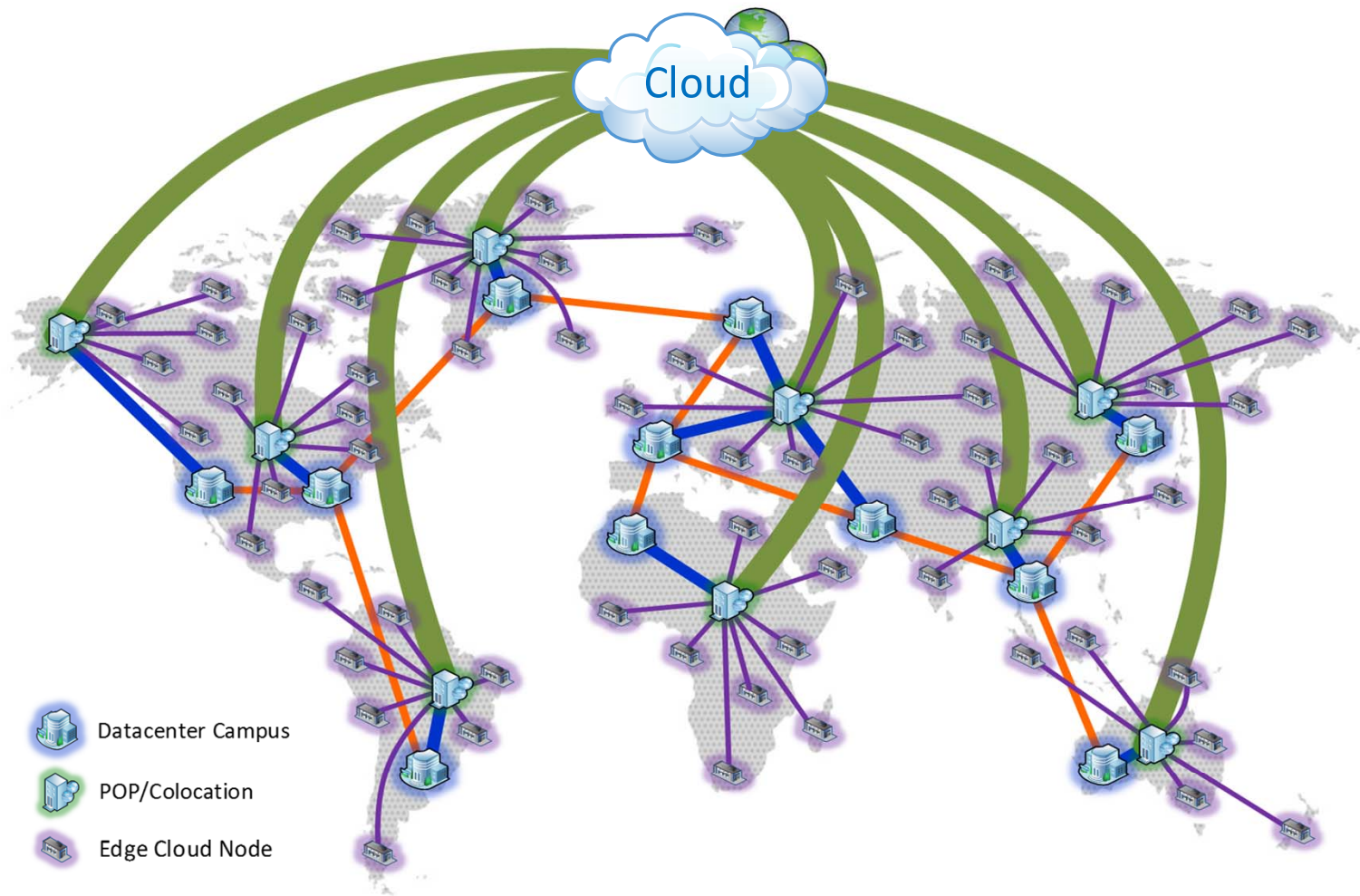
- **A Growth in Bandwidth**




Nielsen's Law of Internet Bandwidth growth states a consistent annualized rate of 50% user bandwidth requirement year over year. This chart shows the empirical data that fits the Nielsen exponential growth curve, along with some of the user technology used at the time to support this bandwidth.



- **HyperScale and Cloud**

Network architecture topologies in support of hyperscale and cloud have evolved the central campus structure to now more distributed nodes, which require remote facilities deployed at the edge to support low latency content distribution and transactions. This equates to exponentially more connected devices, cabling & infrastructure and physical interconnects.



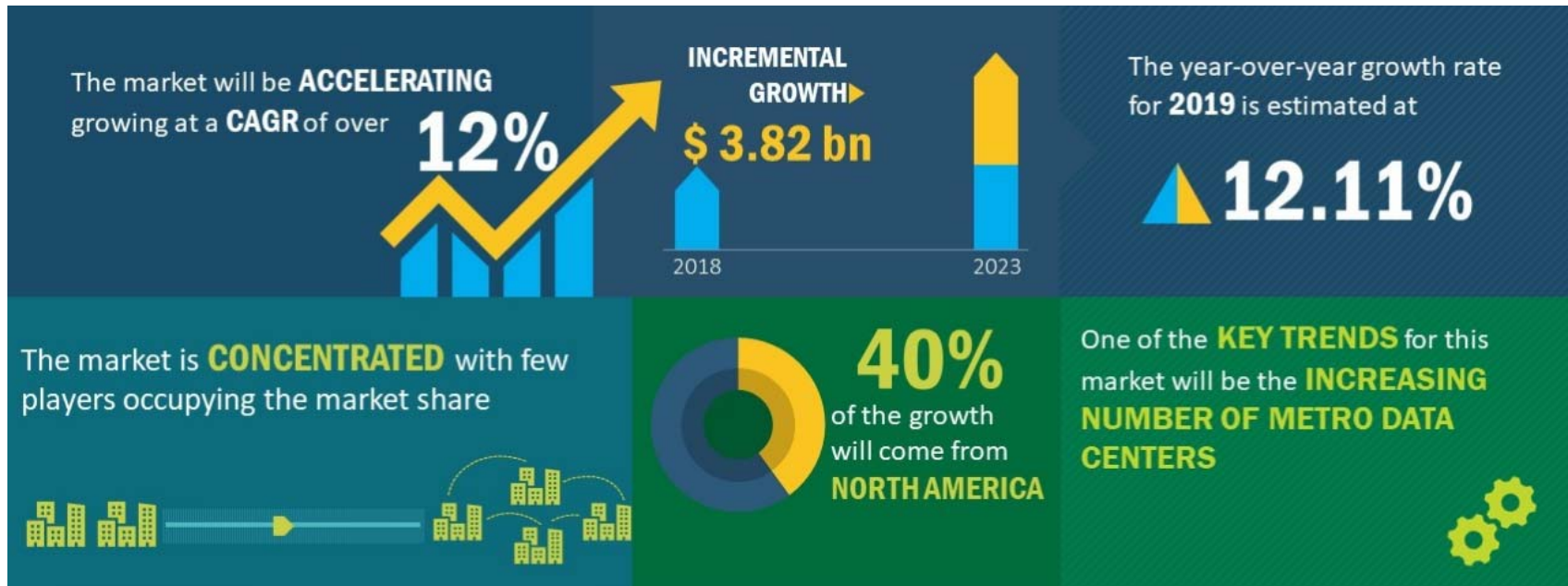
-  Datacenter Campus
-  POP/Colocation
-  Edge Cloud Node



# Mass Growth Of The Connector

- **A Mass Growth in Interconnects**

In terms of connector growth, a recent report published by Technavio (below) reveals global datacenter connector **CAGR of more than 12%** during the periods of 2019-2023.



## Section 2

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# Current State Of The Connector

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## ▪ The Fiber Connector

As the market trend shows fiber cabling leading the way in support of the extraordinary growth of cabling infrastructure, let us take a brief visit to the current fiber connectors in use today, their history, their capabilities and their pros versus cons.

**The ST & FC Connectors:** "Straight Tip/Ferrule Connectors," 1 strand of fiber.  
Brought to market: **1980**.

**Pros:** Small form factor, flexible mating, high performance

**Cons:** Low strand capacity, polarity/key alignment, screw-in connection, fiber type specific



**The SC Connector:** "Subscriber Connector," 1 strand of fiber, developed by NTT.  
Brought to market: **1984**.

**Pros:** Duplex capable, fiber type agnostic, push-in connection

**Cons:** Low strand capacity, polarity/key alignment, delicate connection



**The LC Connector:** The "Lucent Connector," 2 strands of fiber, developed by ATT & Lucent.  
Brought to market: **1986**.

**Pros:** Small form factor, duplex capable, fiber type agnostic, push-in connection

**Cons:** Low strand capacity, polarity/key alignment, delicate connection



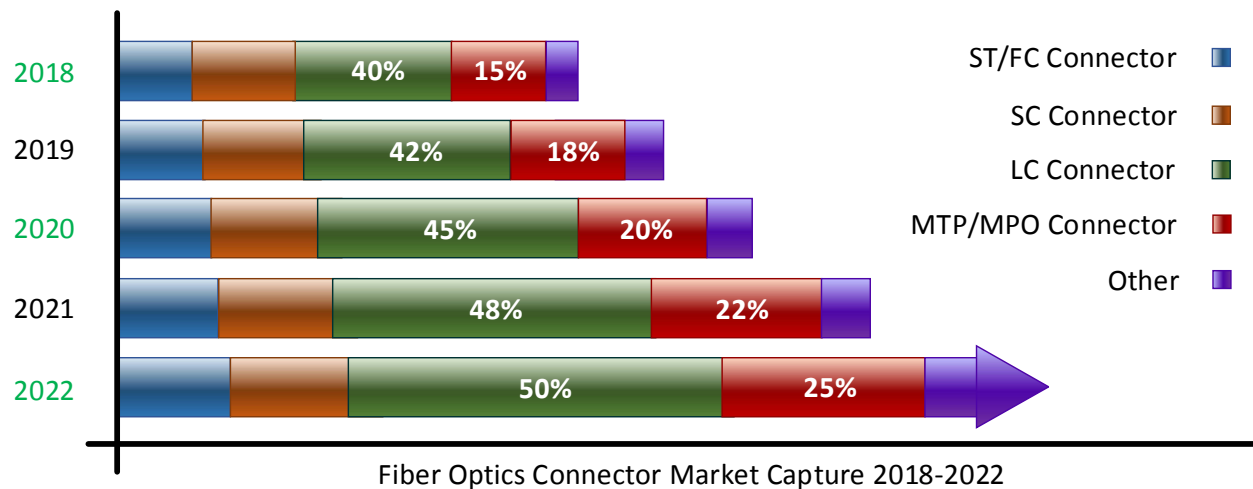
**The MPO or MTP Connector:** "Multi Fiber Push-on Connector," 4-24 strands of fiber, developed by Corning & US Conec.  
Brought to market: **1992**.

**Pros:** High capacity, fiber type agnostic, small form factor, push-in connection

**Cons:** Polarity/key alignment, too many variations, genderized male/female



# Current State Of The Connector



- **Connector Market Capture**

A quick snapshot of the fiber connector market and install base over the next 5 years. As you can see, LC and MTP/MPO connectors are the solutions in majority that will be utilized to support the extraordinary hyperscale and cloud connectivity growth. Remarkably though, these connector technologies were **developed over 30 years ago!**

## Section 3

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# Challenges Of The Connector

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## ▪ The Challenges with Connectivity

These are some of the main challenges that we confront using today's fiber connector technology to support our extraordinary connectivity demands.

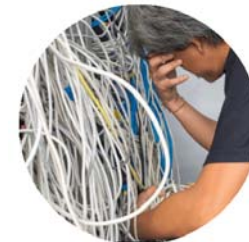
- **High Capacity and Density** – With the limited strand capacity that is offered by connector solutions today, our IT space environments are becoming overwhelmed in the support of the mass amount of cabling infrastructure being deployed.
- **Performance and Quality** – Bandwidth requirements are growing exponentially each year and require the highest quality cabling media/materials, impeccable installation practices and the ideal environment in order to achieve their performance specifications.
- **Labor Costs** – 20% and more of datacenter infrastructure spend is attributed to labor costs, including cabling installation, testing and operational support. This is breaching budgets which ends up limiting service growth, product revenues and quality of service.



# Challenges Of The Connector

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- **Time to Market** – The expediency in which connected infrastructure must be deployed and turned over to production is critical in meeting online service demands. In most cases we have failed in achieving deadlines, or have achieved deadlines, but at extraordinary costs.
- **Flexibility, Scalability and Compatibility** – With all the different technologies evolving and trying to take form, this has made our infrastructures disaggregated, incompatible and unusable from one iteration to the next.
- **Operability and Management** – Even the most advanced tech companies cannot comprehend their own cabling infrastructures. Support and manageability of all these fiber interconnects has come to a point where it is easier to discard it than fix it.



## Section 4

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# The Connector As The Solution



# The Connector As The Solution

## ▪ The Connectors Of Today

Manufacturers are rising to the occasion with new connector technologies that are specifically designed to support high-density, low-loss connectivity, ease of installation, faster deployment, lower TCO and greater flexibility for growth and scale. Let's take a look at these latest connector technologies and determine how to best choose them to support your connectivity and infrastructure growth needs.

### ➤ LC Connector Advancements:

- ✓ Quick Polarity Switch & On-Fly Flips
- ✓ Easy Reach & Push/Pull Tab Connect
- ✓ Mini/UniBoot for Increased Flexibility
- ✓ Shutter Adapters for Dust Protection



### ➤ MTP/MPO Connector Advancements:

- ✓ Increased Capacity & Strands Counts (24+)
- ✓ Higher Performance/Low dB Loss
- ✓ Quick Polarity Flips & Field Gender Changes
- ✓ Shutter Adapters for Dust Protection



# The Connector As The Solution

- **New CS and SN/MDC Connectors** – *A more compact, miniature version of the LC duplex connector*
  - ✓ 40% Size Reduction Over Traditional LC
  - ✓ Grouped for Easy QFSP (4 x Duplex)
  - ✓ Easy Reach & Pull/Pull Tab Connect
- **New Expanded Beam/FlexAir/MXC Connectors**
  - ✓ Dust Insensitive Connector
  - ✓ High Capacity Strand Count (48+)
  - ✓ Gender Agnostic (Some Versions)
- **New SWK Connector** – *This revolutionary new connector incorporates all previous innovations while also improving on them; all-in-one simple solution*
  - ✓ Extreme Capacity, Strand Counts of 192f+
  - ✓ Small Form Factor, High Density
  - ✓ Highest Performance/Lowest dB Loss
  - ✓ Quick Polarity Flips & Gender Changes
  - ✓ Self Cleaning, Eliminates Dust & Debris
  - ✓ Grouped for QFSP and More
  - ✓ Easy Reach & Push/Twist Connect



# The Connector As The Solution

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- **The Key Factors**

Below is a simple method that includes key deciding factors to help in best determining your cabling infrastructure and connector type requirements.

- **CASPER's Rules Of Determining Your Connectivity Requirements**

- **C**osts – Your overall budget vs. costs per infrastructure port.\*

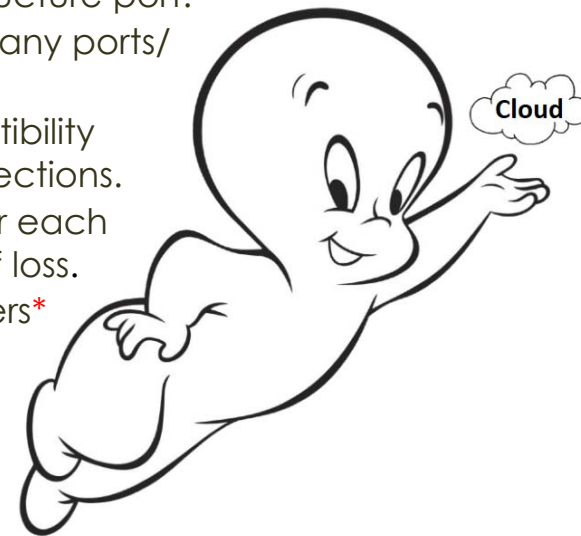
- **cA**pancy – Your designated IT space vs. how many ports/strands that can fit into your environment.

- **S**calability/**F**lexibility – Transceiver type, compatibility with existing infrastructure and your growth projections.

- **P**erformance – Your bandwidth requirements for each connection; 10/100g/400g, duplex, QFSP, ins/ref loss.

- **E**nvironment/**O**perability – Installation parameters\* and support capabilities while in production; high touch, low touch or unmanned.

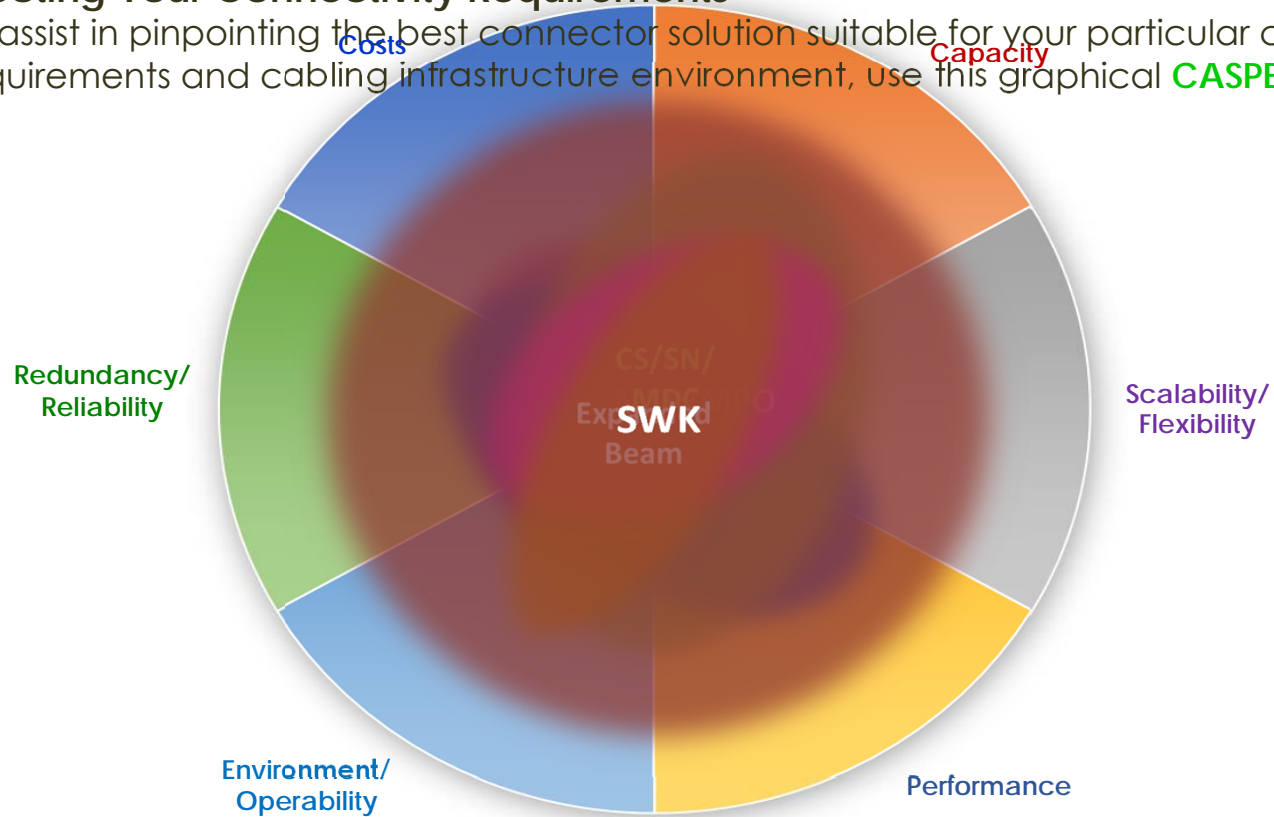
- **R**edundancy/**R**eliability – Your connections' availability and redundancy requirements vs. separation/diversity of each port and/or cable.



# The Connector As The Solution

- **Selecting Your Connectivity Requirements**

To assist in pinpointing the best connector solution suitable for your particular connectivity requirements and cabling infrastructure environment, use this graphical **CASPER Index Wheel**.



# In Summary

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- **A Mass Growth Of Connectivity**

Due to hyperscale and cloud's extraordinary demands, with a projected cabling infrastructure market growth of 9%, annualized bandwidth growth rate of 50% and CAGR of 12% for connector growth.

- **The Challenges With Today's Connectors**

As fiber optics connectivity has become the leading media platform, today's fiber connector technology has brought about major challenges.

- **The Connector Revolution**

Utilizing connector technology **developed over 30 years ago** to support today's hyperscale & cloud growth, the connected components industry is long overdue for a refresh and revitalization.

- **New Connector Technology**

Manufacturers are rising to the occasion to help address the challenges with new connector technologies that are specifically designed to support high-density, low-loss connectivity, ease of installation, faster deployment, lower TCO and greater flexibility for growth and scale.

- **The CASPER Rules & Index**

Using this simple methodology can help you in determining which connector technology solution will work best for your connectivity and cabling infrastructure requirements along with bringing efficiency, capacity, flexibility and longevity.

# Questions? Call or stop by booth 1124

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