

Guide

The essential transceiver selection guide

How to choose the right optics for scalability and cost efficiency

Don't miss out on the best transceiver for your network

Whether you're a communication service provider, enterprise or internet exchange, choosing the wrong optics can lead to bottlenecks, unnecessary costs and missed opportunities to optimize fiber utilization. Beyond the transceiver itself, factors like reach, fiber efficiency and interoperability are key to whether your network can scale seamlessly without costly infrastructure overhauls.

At Smartoptics, we offer a wide range of industry-leading transceivers and have unmatched expertise in optical networking solutions. In this guide, we want to share our expertise with you in easily digestible technical and operational considerations to help you make cost-effective, future-proof choices and get the most out of your optics. By using illustrative scenarios for backbone networks, enterprise DCI and peering networks, we will showcase how different transceivers solve specific network challenges.



Speed and distance considerations for selecting the right transceiver

Ethernet and Fibre Channel (FC) are the dominant protocols in modern networks. Regional, metro and peering networks mainly use Ethernet. Enterprises rely on both protocols for data center interconnects (DCI), using FC for mission-critical SANs. To choose the right transceiver, you need to consider different bit rates and priorities for each protocol.

Ethernet and FC synergy: Did you know you can run both over the same line system for increased simplicity and cost efficiency?

Go for scalable high-speed Ethernet

Ethernet speeds currently range from 1G to 10G, 40G, 100G, 400G and 800G. To optimize your Ethernet traffic, look for higher-speed transceivers that are scalable and support the latest standards like 400ZR and 800ZR.

Use approved FC optics for mission-critical SANs

FC progresses from 1G to 8G, 16G, 32G and then 64G. To avoid compatibility issues, ensure FC transceivers are vendor-approved (e.g., Brocade, Cisco). For example, Brocade Gen 7 blocks unapproved optics entirely.

Distances: When to choose multimode, single-mode and DWDM

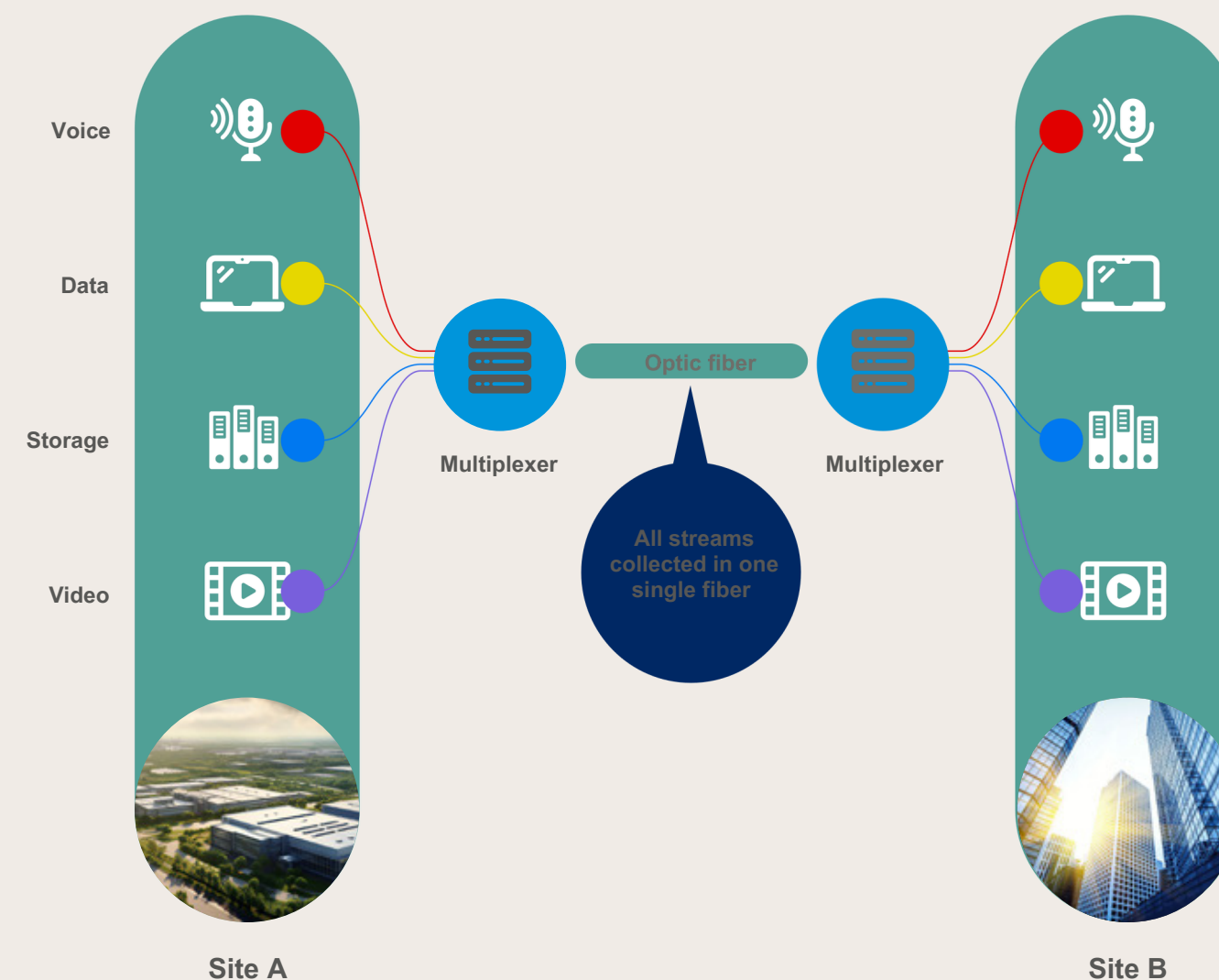
For short intra-datacenter links, choose multimode transceivers to maximize cost efficiency. For point-to-point links up to 80 km, you can reach far enough with single-mode optics. If you need to reach further, DWDM optics are the best option, supporting 100s of km with superior amplification and dispersion

compensation. In the next section, you'll learn how DWDM can also help you maximize fiber utilization, which is another reason to choose it regardless of reach needs.

Three tips to optimize your optics strategy

Optimizing your optics strategy means maximizing fiber utilization, minimizing complexity and ensuring long-term scalability. The following three strategies will help you get the most value out of your optics.

Dense Wavelength Division Multiplexing (DWDM)



1

Expand fiber capacity with DWDM multiplexing

Dense Wavelength Division Multiplexing (DWDM) is the industry standard for maximizing fiber capacity, supporting several wavelengths over a single fiber pair by multiplexing different channels. Use DWDM optics when it's more cost-effective to extend fiber capacity over existing links than to pay for additional fiber. For maximum flexibility and scalability, try using DWDM transceivers with an open line system to expand capacity efficiently.

[Learn more about DWDM](#)

2 Simplify your network architecture with pluggable, compact solutions

Pluggable transceivers can be plugged directly into routers and switches. This eliminates the need for transponders when they don't add value. (Keep in mind that transponders are useful for use cases such as demarcation, aggregation and encryption). You can also benefit from choosing compact transceiver form factors along with compact DWDM multiplexers and open line systems to minimise your network footprint. [Read more about pluggable solutions.](#)

3 Future-proof your optics with scalable deployment

Selecting multi-rate transceivers gives you long-term flexibility. For instance, some QSFP-DD optics support 100G today and can later be reconfigured for higher bit rates such as 400G. Transponder-based aggregation bypasses switch or router limitations, allowing higher-speed optics to be deployed now and reused as infrastructure upgrades. With 800G-ready open line systems, ROADMs and transponders, you can scale seamlessly – simply swap transceivers instead of overhauling your transport network.



Maximize fiber utilization with aggregation and breakouts

Breakout allows a high-speed transceiver to breakout into multiple lower-speed connections, such as one 400G QSFP-DD linking to four 100G QSFP28 ports. Aggregation is the same concept only the reverse of breakout, combining multiple lower-speed connections into a higher-speed link. The following scenarios will show you how breakout and aggregation help you use the right transceivers to overcome switch or router infrastructure limitations.

Breakout scenario: Maximizing 400G switch capacity with 100G breakout

A global enterprise is rolling out new data center switches with only 400G ports, but many internal systems and external connections still run at 100G. Rather than restricting scalability or overhauling equipment, they can break out 400G ports with QSFP-DD optics to multiple 100G QSFP28 transceiver connections for seamless integration with existing 100G systems.

Aggregation scenario: Extending lifespan of 100G routers

A service provider is expanding its metro network but still relies on existing routers with only 100G ports. Upgrading all infrastructure to 400G or 800G would be costly, yet demand is increasing. Instead, they can aggregate multiple 100G QSFP28 transceiver links into a single QSFP-DD 400G or 800G transport link, allowing them to scale efficiently without having to replace their 100G routers.

Why to select backwards compatible transceivers with transponders

Breakout cables expand aggregation and breakout options but skipping them by choosing backwards-compatible transceivers simplifies deployment. Most SFP/QSFP generations of optics are backwards compatible with the previous generation. This means that selecting transceivers from two compatible generations is an effective way to streamline your breakout and aggregation applications.

While some routers and switches support aggregation, you can reach further and enhance multi-vendor interoperability by pairing your transceivers with transponders or muxponders for aggregation. Read more about how to deploy and benefit from aggregation and breakout.

Cost-efficient 400G and 800G breakout: Did you know that Smartoptics is an innovator in 400G and 800G muxponders supporting cost-efficient breakout? [Learn more about our transponders and muxponders.](#)



Transceiver form factor selection table

Use the table to select the right form factor for your required protocol, bit rate, aggregation scenario and use case while ensuring compatibility with your existing or planned network infrastructure.

Form factor	Bit rates/protocols	Popular breakout/aggregation	Backward compatibility	Key differentiator
SFP	100 Mbps – 1G Ethernet, 1G–2G FC, SDH/SONET	10× 1G ← 1× 10G SFP+	N/A	Widely supported for legacy networks
SFP+	10G Ethernet, 4G–16G FC	4× 10G ← 1× 40G QSFP+*	SFP	Cost-effective for SANs and standard for mobile backhaul/fronthaul
XFP	10G Ethernet, 10G FC, SONET/SDH OC-192, OTN OTU-2	4× 10G ← 1× 40G QSFP+*	N/A	Telecom-optimized with independent clocking
SFP28	25G Ethernet, 32G FC	4× 25G ← 1× 100G QSFP28	SFP+	Standard for modern FC SAN with Brocade/Cisco and more
QSFP+	40G Ethernet	1× 40G → 4× 10G SFP+*	N/A	Cost-efficient 10G scaling with breakout
QSFP28	100G Ethernet	1× 100G → 4× 25G SFP28	QSFP+	Standard for 100G with long-reach coherent and cost-effective PAM4
QSFP-DD	400G/800G Ethernet	1× 400G/800G → 4/8× 100G QSFP28	QSFP28	Compact and backwards compatible for 400ZR/800ZR
OSFP	400G/800G Ethernet	1× 400G/800 → 4/8× 100G QSFP28*	N/A	Superior thermal management for 400ZR/800ZR

* Requires breakout cables

Three key vendor selection criteria

Beyond technical compatibility, selecting the right transceivers also requires evaluating key vendor factors such as product quality, supply reliability and expert support. These considerations ensure long-term performance, minimize downtime and streamline network operations.

1 Quality assurance

Reliability starts with rigorous testing. Ensure your vendor performs comprehensive thermal, electrical, and optical testing to minimize the risk of performance issues. Without proper quality control, transceivers may fail prematurely or cause network disruptions, leading to costly troubleshooting and downtime.

2 Delivery and availability

Fast and predictable deliveries are essential for keeping networks running smoothly. Look for a vendor with well-stocked, efficiently managed inventories that can adapt to your needs, including reprogrammable transceivers for flexible deployment. A streamlined logistics process helps ensure you get the right optics, right when you need them.

3 Technical expertise and support

A vendor should be more than just a reseller. Deeper knowledge of the big picture comes from those who design and develop complete optical networking systems, not only optics. Look for fast, direct access to specialists – not just a maze of generic support agents who pass you around or read from a script. When every minute counts, you need real expertise, not a lesson in rebooting.



Illustrative scenarios to help select the right transceiver

The right transceiver depends on your network’s specific needs. In certain use cases, special considerations make it important to get just the right transceiver to fill a gap or open up a smoother path to scalability. Get inspired by some illustrative scenarios and success stories that draw on our experience at Smartoptics to show when some of our transceivers provide unique advantages.



AES-256
Layer 1
encryption

Scenario: A smarter way to provide secure 400G Ethernet

As security concerns grow, regional data center operators and internet exchanges are looking for a simple way to offer encrypted 400G Ethernet services. Many enterprise customers don’t require complex Layer 2 encryption but still seek cost-efficient protection for high-speed data transfers. However, deploying traditional encryption often means adding dedicated appliances, increasing costs and complexity.

Smartoptics coherent QSFP-DD transceivers provide AES-256 Layer 1 encryption at the optical layer, a rare feature that eliminates the need for separate encryption appliances. This approach ensures minimal latency, easy integration and a seamless upgrade path while giving enterprise clients an optional security layer for their high-speed traffic.

Scenario: Seamless DCI upgrade to go along with Brocade Gen 7

When a financial institution or other organization with mission-critical SANs upgrades to Brocade Gen 7, it may face compatibility challenges with existing infrastructure. 32G is the standard for Gen 7, and non-approved optics won't function due to Brocade's secure optics framework. Upgrading to 32G FC optics also poses multiplexing challenges as passive systems do not provide the amplification and dispersion compensation required for 32G DCI.

Deploying Smartoptics SFP28 32G FC transceivers – the only approved and pluggable optics for Brocade Gen 7 – allows direct switch integration, reducing both network footprint and latency. A compact transponder can also be easily added if needed. Replacing a passive setup with a Smartoptics active open line system ensures optimal signal performance with a simple 1-1 migration of services.

[Learn more about our Brocade-approved solutions](#)



the only approved
and pluggable optics
for Brocade Gen 7



Long-range
transceivers fills
reach gap perfectly



Success story: Filling reach gap in regional network

West River Telecommunications (WRT), a regional network provider in North and South Dakota, upgraded its backbone network to 100G with an intelligent access and aggregation platform to meet demand for increased capacity. However, typical transceivers would not reach past 80 km with WRT's infrastructure, while some towns to be connected in the rural operating area were as far as 120 km apart.

Long-range QSFP28 100G transceivers from Smartoptics filled this reach gap perfectly.

Smartoptics

also collaborated in testing these optics for interoperability with WRT's access and aggregation platform, ensuring smooth deployment. This solution exemplifies how Smartoptics transceivers can

address unique challenges in regional networks, offering tailored solutions that bridge critical gaps.

[Learn more about the WRT success story.](#)

Checklist for selecting the right transceiver

Choosing the right transceiver starts with understanding your network needs today and how you plan to scale in the future. Use this checklist to ensure the best fit for your infrastructure.



Network compatibility & capacity

- ☐ What transceiver form factors do my switches or routers support?
- ☐ What distances do my links need to cover? (500m, 80 km, 100s of km)
- ☐ How much capacity do I need today, and how much will I need in 3–5 years?

Fiber utilization & scalability

- ☐ How much traffic do I need to carry per fiber?
- ☐ Is additional fiber or DWDM more cost-effective for my network long-term?
- ☐ Do the transceivers support your preferred aggregation/breakout applications?

Protocol-specific interoperability

- ☐ FC: Are the transceivers tested and approved for my switches (e.g. Brocade, Cisco)?
- ☐ Ethernet: Are the optics compliant with the MSA, 400ZR/800ZR or other standards?

Vendor reliability

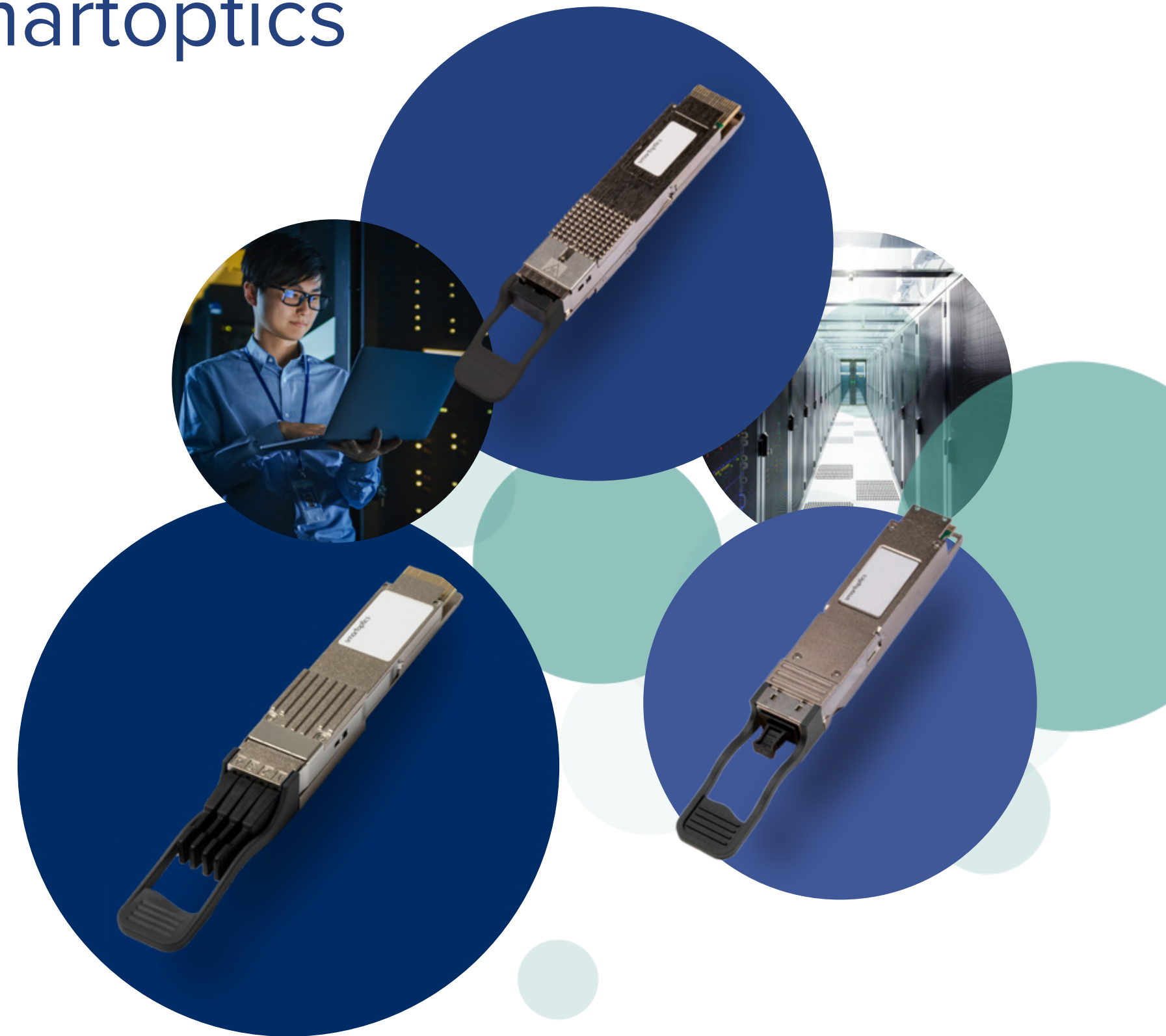
- ☐ Do the transceivers meet my network’s reliability and performance needs?
- ☐ How has the vendor tested the transceivers?
- ☐ How critical is fast delivery?
- ☐ Can I count on fast, expert technical support when I need it?

Why buy transceivers from Smartoptics

At Smartoptics, we provide a complete range of Ethernet and Fibre Channel transceivers from 1G to 800G, ensuring interoperability and compliance with the latest industry standards. Beyond optics, our open line systems, ROADMs and transponders/muxponders provide a cost-effective way to maximize fiber utilization with DWDM.

Our transceivers undergo rigorous optical, electrical and thermal testing to ensure flawless performance. With fast, reliable delivery from well-stocked inventories and direct access to expert technical support, you can count on Smartoptics for both mission-critical SANs and high-speed optical transport. Find the right transceivers for your network today.

[Explore our full transceiver portfolio.](#)





Frame Communications is an authorised reseller of Smartoptics in the UK and Ireland.

Frame Communications is a distinguished supplier of Network Test, Performance & Security Solutions. Thriving to make the best solutions available to all our customers across the UK & Ireland.

Smartoptics provides innovative optical networking solutions and devices for the new era of open networking. Our customer base includes thousands of enterprises, governments, cloud providers, Internet exchanges, as well as cable and telecom operators. We have an open networking approach in everything we do, which allows our customers to break unwanted vendor lock-in, remain flexible and minimise costs. Our solutions are used in metro and regional network applications that increasingly rely on data center services and specifications. Smartoptics is a Scandinavian company founded in 2006. We partner with leading technology and network solution providers such as Brocade, Cisco and Dell EMC and have a global reach through more than 100 business partners.

For additional information about Smartoptics, please visit

smartoptics.com.

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