Technology Guide

Considerations for choosing network speed

Migration paths for 1000BASE-T networks

Today, more than any other time, there are many options for network speed. The choices are vast and can be simple or complex, depending on network requirements.

The process of network upgrades and migration cannot be underestimated—many factors go into the decision. The process usually involves a thorough understanding of current and future business needs, complexity of the upgrade, and available budget.

Often, it is the processor that is top of mind when upgrading the data center, but newly upgraded systems running 1GbE networks can limit both processor and storage potential, so Ethernet speed becomes a key factor. Final decisions also take cost and risk mitigation into consideration.

This guide covers the more common Ethernet network upgrade paths. The examples provided show the benefits and considerations for each speed, including basic system and device requirements, complexity level for each migration path, and sometimes-overlooked costs when migrating to higher network speeds.

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1000BASE-T to 10GBASE-T

The RJ45 connector used for BASE-T networks is probably the best known of all the connections—it has been used to connect Ethernet networks for over 30 years. Similar cabling can be used to connect a variety of speeds from 1000BASE-T to 10GBASE-T. Because of this, it is likely the easiest to deploy and the most budget friendly to implement.

- Leverages same RJ45 connection
- In many cases, reuses existing cabling; additional cabling maybe needed based on speed (2.5/5 or 10GBASE-T)
- Field-terminated cables
- 100-meter reach for nearly all cabling options[1]
- Leverages same switches
- Migration path supports partial system upgrades, as 10GBASE-T equipment also supports 1000BASE-T standards
- Maximum network speed up to 10GbE

As network speeds increase beyond the capabilities of 10GBASE-T, available bandwidth also increases, along with infrastructure requirements and the technical expertise needed to implement new designs.

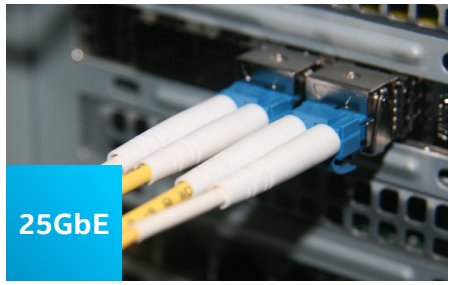
Migrating 1000BASE-T to 10, 25, or 100GbE based on DAC or optical network

Migrating servers from BASE-T to direct attach cables (DAC) or fiber-based infrastructures will require the redesign of the network. By increasing available bandwidth, it's also possible to consolidate adapters and switch ports into more space-effective configurations.

SFP+ and DAC

These options offer the same speed as 10GBASE-T with lower power and lower latency and can coexist with higher network speeds (25GbE). However, there are several trade-offs to consider.

- Requires new cabling/connections
- Requires new switches
- DAC supports cabling distances up to 15 meters, and requires more airflow; DAC can be more difficult to route through the rack
- Potential network adapter and switch port consolidation



SFP28 and DAC

When switches are upgraded to 25GbE, any server still running at 10GbE (SFP+/DAC) will be compatible with the upgraded sections of your network. As network speeds increase, supported cable distances decrease, which can require redesign of cabling deployments to achieve full 25Gbps.

- 2.5x increase in bandwidth with the same port density/connections
- Requires upgrading cables and optics
  - Optics supported: SFP+ for 10GbE and SFP28 for 25GbE
- Maximum cable distances drop:
  - From 300 meters on multimode fibers and 10GbE to 70 meters for 25GbE
  - From 15 meters on active DAC 10GbE to five meters for 25GbE
- Requires a 25GbE switch

QSFP28 and DAC

Migrating networks to 100GbE provides a tremendous increase of available bandwidth and the ability to improve port density through consolidation of adapters and switch ports. Reducing cable congestion and the number of connections improves the use of space and cooling requirements.

- Supports speeds from 1GbE to 100GbE
- Significant reduction in cable congestion for the same bandwidth
- Requires QSFP28 optics and AOC or DAC cables
- Supports cable distances up to:
  - Seven meters on DAC cables
  - 70 meters on multimode fiber
- Breakout cables can be used to split switch ports into multiple 25GbE or 10GbE connections, providing long-term and smooth transitions from portions of the network
- Requires 100GbE switch

The decision to migrate BASE-T networks to 10, 25, or 100GbE merits thoughtful consideration

Business needs and the technical ability required to implement changes should be taken into account, as well as the overall cost of the network design.

Migrating from 1000BASE-T to 10GBASE-T is likely the easiest to deploy—and a solid financial decision, with 10x improvement in overall bandwidth and performance. This budget-friendly option is one of the least-disruptive paths for upgrading; there is no change to the RJ45 connection, and changes in cabling can be relatively minor. The Intel® Ethernet 700 Series offers multiple 10GBASE-T adapters, in both standard PCIe and OCP form factors.

To learn more about how to move data faster with Intel Ethernet products, visit intel.com/ethernet

Migrating from BASE-T to direct attach cabling and optical transceivers enables high-bandwidth network speeds and much more. In addition to network speeds up to 100Gb, new technologies and capabilities available on the Intel Ethernet 700 and 800 Series network adapters give organizations the ability to move data faster by shaping network traffic with innovative and versatile technologies that optimize workload performance.

Moving from 1000BASE-T to higher Ethernet speeds provides more network bandwidth—and more performance—but it's important to understand and consider the additional complexities and costs of moving to higher network speeds.

Intel Ethernet 700 and 800 Series network adapters, available in multiple speeds and form factors, provide customers with many choices for network designs.

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1. 10GBASE-T maximum cable reach for CAT6A is 100 m. Other cabling types support shorter distances (CAT6 55 m, CAT5e 45 m).
Intel® technologies may require enabled hardware, software, or service activation.
No product or component can be absolutely secure.
Your costs and results may vary.
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