DATACOM CAPABILITY INSIGHTS

AVNET SILICA

AVNET 100 YEARS

Industrial

Security

Data Centres and Cloud

Ethernet is everywhere

With the spread of Ethernet through many systems and applications, Datacom is found in a huge number of applications and products. Here are just a few.

Military

Communication / LTE

Internet Of Things

Transport

Smart Grid

/ DATACOM

INTRODUCTION

It is no surprise that many companies believe data to be their most valuable asset – and that they invest so much in systems to process, transmit and store it. From businesses to governments to public authorities to consumers and beyond, data permeates every aspect of our lives.

This is why data communication systems – or datacom for short – are vital to the fabric of our society. It is also the reason for Avnet Silica placing such importance on it.

We work with a wide range of leading suppliers who deliver cutting-edge technologies across a broad spectrum of datacom products. But that's not all. At Avnet Silica, we also provide an array of value-added services of our own, which are described further on in this brochure.

When we talk about datacom, in today's world we mean Ethernet. Let's look at some of the ways Ethernet has become central to our civilisation – a little like the blood vessels in the human body.

The dominance of Ethernet

Ethernet underpins metropolitan networks that include residential, commercial, infrastructure, fixed line and mobile communications.

Historically, most of the telecommunications network was based on SONET or SDH. Ethernet has grown rapidly since the late 1980s, helping to reduce costs and commoditise the network. This growth has helped accelerate the ubiquity of data communications today.

Ethernet itself is non-deterministic in nature, so features like OAM, 1588 and SyncE were added to improve the networks' quality and performance. These additions have helped Ethernet spread to nearly every market and product type. The list is almost endless: industrial, military, medical, security, the internet of things, telecommunications, transport, broadcasting, entertainment, energy, data centres, video communications and many more. Some of the newer growth markets are shown opposite.

SOLUTION EXAMPLES

Defence

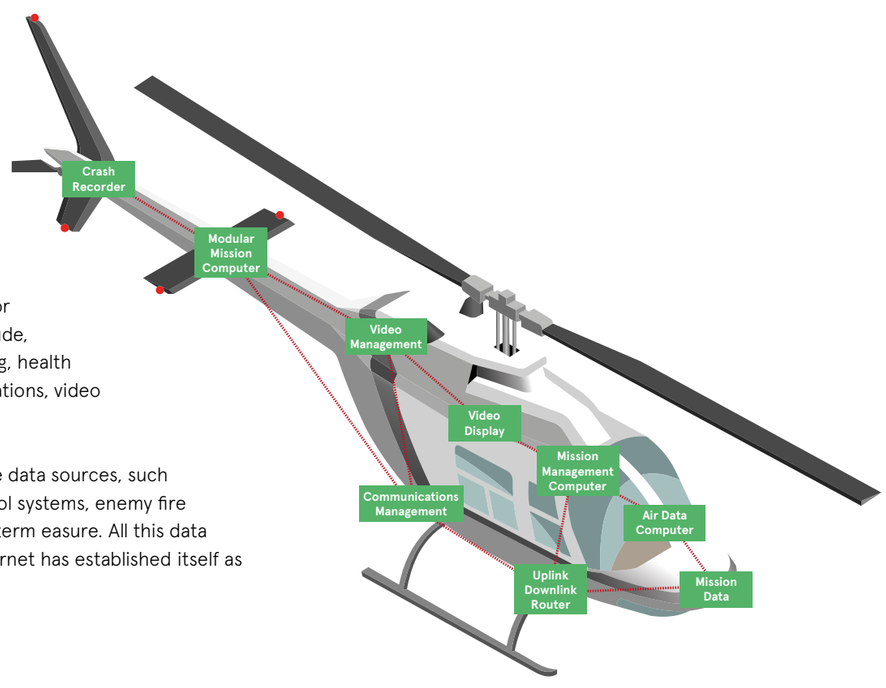
Military vehicles like tanks usually have multiple crew members, each with their own job, tasks and specific information requirements. This data is collected and processed by the various sensors in and on the vehicle, then shared with other on-board equipment as well as remote control and command centres.

Data volumes on the battlefield are increasing exponentially with the use of drones, autonomous vehicles and soldiers equipped with sensors, displays and augmented reality. Many governments are working on systems that increasingly rely on the accurate transmission of larger and larger amounts of data.

Helicopters

Commercial helicopters generate data from many sources and the image below shows some of the paths this information can take. Helicopter systems include navigation and flight computers for monitoring speed, direction, altitude, yaw and pitch, black box recording, health of aircraft monitoring, communications, video and audio to name but a few.

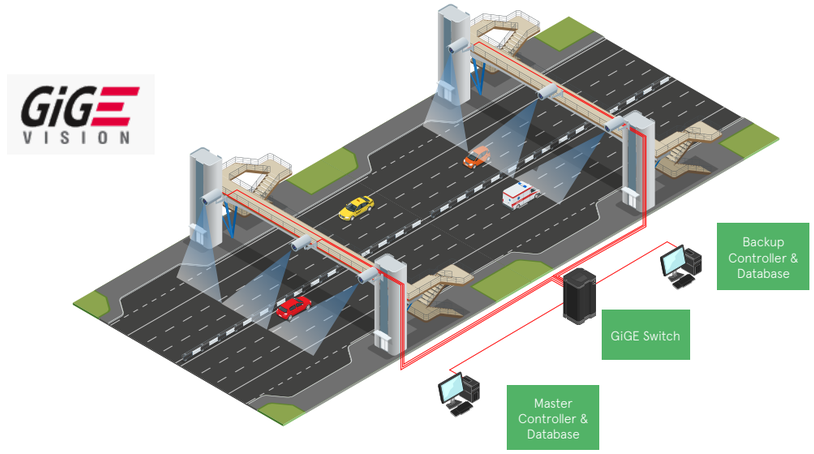
Military aircraft include even more data sources, such as head-up displays, missile control systems, enemy fire suppression, avoidance and counterm easure. All this data needs to be transmitted and Ethernet has established itself as the main way of doing this.



GigE Vision Systems

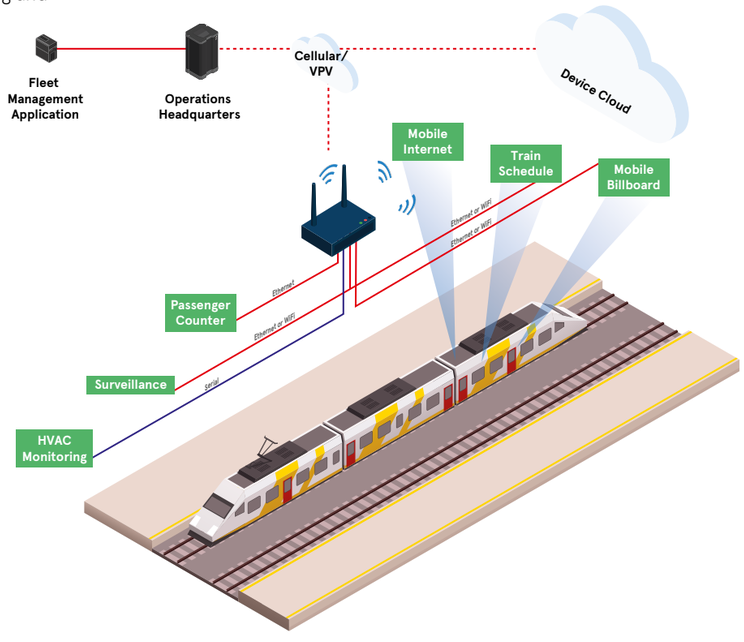
The GigE Vision standard, introduced in 2006, defines the interfaces used in advanced industrial cameras. Visualisation is used in many applications, including industrial, infrastructure and military. GigE allows both video and control data to be transmitted at high speed over an Ethernet network.

In this diagram, the GigE Vision cameras monitor traffic flow, congestion and speeding on a motorway. The data is carried on an Ethernet cable to a local control centre or transmitted over a secure network to a remote centre for monitoring and data collection. Authorities can then change road sign instructions and warnings based on the information received by the camera operators.



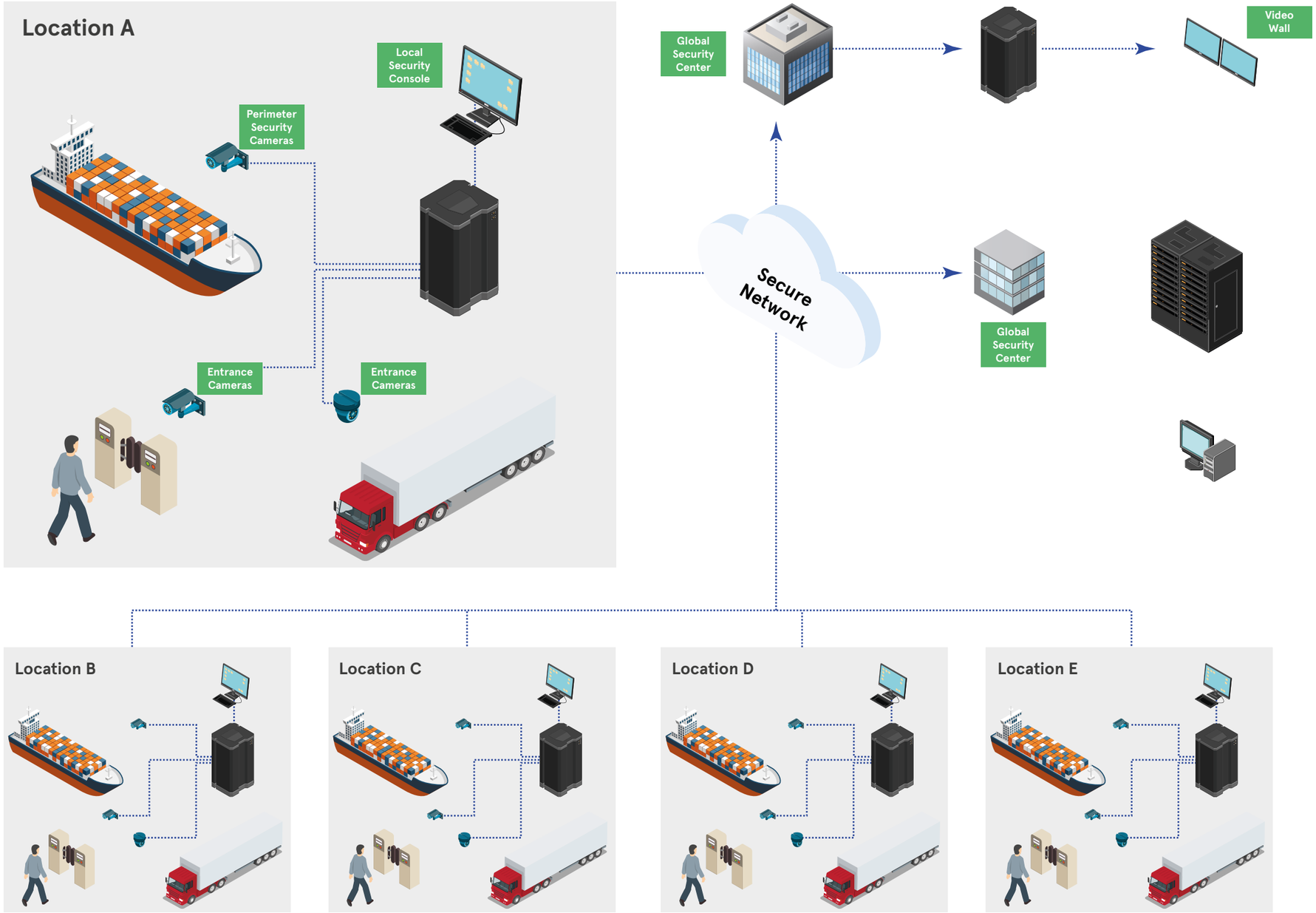
Train Information System

Today's trains are highly networked, with screens showing journey information and adverts as well as TV displays delivering news and entertainment. Drivers benefit from information systems delivering data on train speed, congestion, routing and hazard information, passenger counters, video surveillance and fault information. Some trains provide Wi-Fi for passengers to use on their devices. In most cases, all this information is transmitted and received via Ethernet.



Security Systems

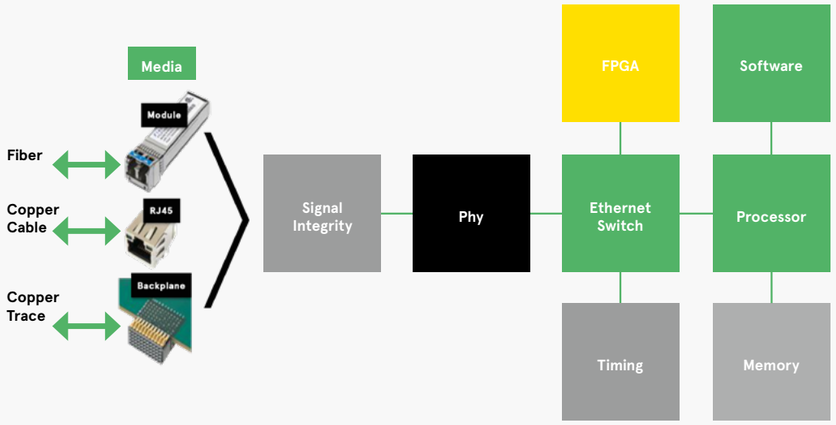
Security is a major industry in its own right – and it relies on Ethernet data communications. Data like video, tagging, location of cargo, police communications etc. is collected from multiple sites. It is then converted into Ethernet and sent over a secure network to a control centre. Data can also be stored on servers for evidence retrieval or analysis purposes.



HOW DOES IT WORK?

Design 1: Datacom Signal Path

Design 1 shows a typical signal path in a datacom design. The majority of designs will be some variation of this. For example, the processor and PHYs could be embedded in the switch. The Ethernet switch may be inside an SOC or the FPGA may be replaced by an ASIC. But in general, the data path will be very similar, if not identical.

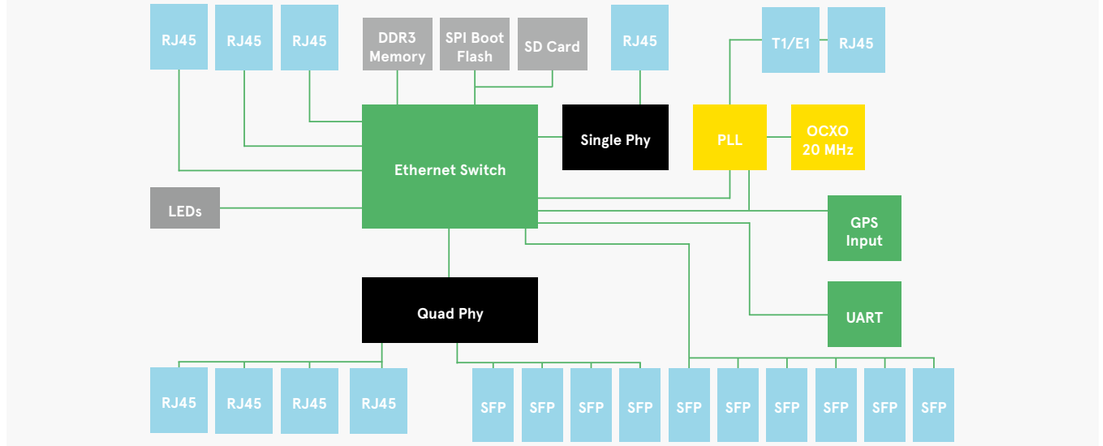


A Typical Datacom Signal Path

Ethernet Switch	Ethernet PHY	FPGA	CPU	Memory	Optics	Wi-Fi	Timing	Signal Integrity	SAS/ SATA
Intel	Intel	Xilinx	AMD	Alliance Memory	Finisar	Laird Technologies	Microchip	Marvell	N/A
Marvell	Marvell		Infineon	ISSI	Intel	Marvell	NXP	Maxim Integrated	
Microchip	Microchip		Intel	Microchip		Microchip	onsemi	Microchip	
	STMicroelectronics		Marvell	Micron		Nordic Semiconductor	Diodes	onsemi	
			Maxim Integrated	onsemi		Quectel			
			Nordic Semiconductor	ROHM Semiconductor		STMicroelectronics			
			NXP	STMicroelectronics					
			Renesas Electronics						
			Teledyne e2v						

Design 2: Basic Ethernet switch design

In this design, the Ethernet switch could be managed or unmanaged, depending on whether it includes a processor. In addition, the type and size of the switch will affect the mix and number of fibre and copper ports. But the design will usually have a very similar structure to this.

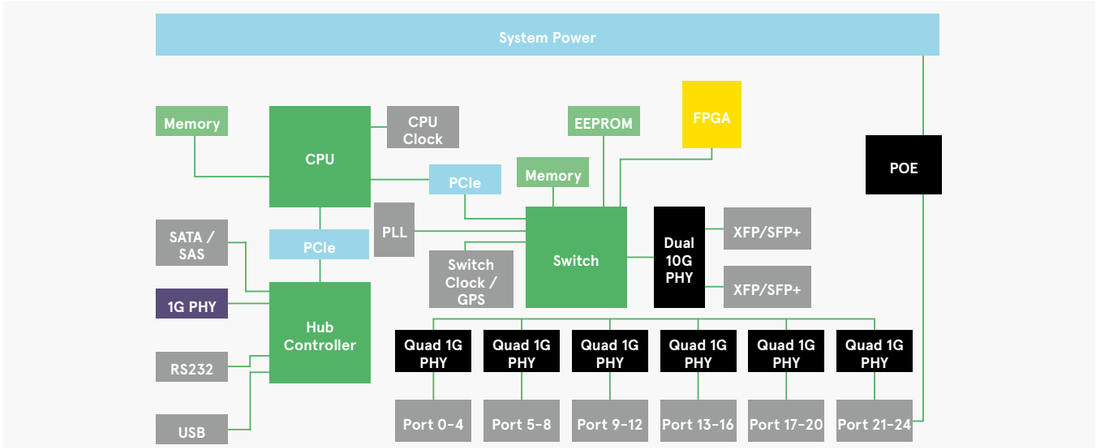


Ethernet Switch Block Diagram (Example 1)

Ethernet Switch	Ethernet PHY	FPGA	CPU	Memory	Optics	Wi-Fi	Timing	Signal Integrity	SAS/ SATA
Intel	Intel	Xilinx	AMD	Alliance Memory	Finisar	Laird Technologies	Microchip	Marvell	N/A
Marvell	Marvell		Infineon	ISSI	Intel	Marvell	NXP	Maxim Integrated	
Microchip	Microchip		Intel	Microchip		Microchip	onsemi	Microchip	
	STMicroelectronics		Marvell	Micron		Nordic Semiconductor	Diodes	onsemi	
			Maxim Integrated	onsemi		Quectel			
			Nordic Semiconductor	ROHM Semiconductor		STMicroelectronics			
			NXP	STMicroelectronics					
			Renesas Electronics						
			Teledyne e2v						

Design 3: Ethernet Switch variant

In the design below, the Ethernet switch is controlled by an external processor, which the application would need if the processor inside the switch had insufficient processing power for the workload. In some cases, the customer decides that they want to use the switch but do not want to rewrite software, which is currently in an external processor. Many new switches contain the PHYs, enabling engineers to attach the XFP /SFP+, 1G copper and fibre ports directly to the switch.

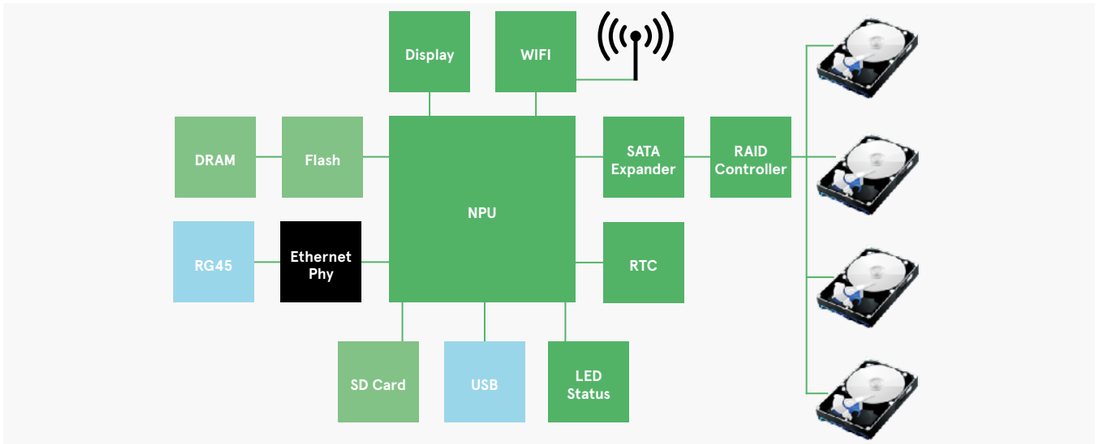


Ethernet Switch Block Diagram (Example 2)

Ethernet Switch	Ethernet PHY	FPGA	CPU	Memory	Optics	Wi-Fi	Timing	Signal Integrity	SAS/ SATA
Intel	Intel	Xilinx	AMD	Alliance Memory	Finisar	Laird Technologies	Microchip	Marvell	Marvell
Marvell	Marvell		Infineon	ISSI	Intel	Marvell	NXP	Maxim Integrated	
Microchip	Microchip		Intel	Microchip		Microchip	onsemi	Microchip	
	STMicroelectronics		Marvell	Micron		Nordic Semiconductor	Diodes	Onsemi	
			Maxim Integrated	onsemi		Quectel			
			Nordic Semiconductor	ROHM Semiconductor		STMicroelectronics			
			NXP	STMicroelectronics					
			Renesas Electronics						
			Teledyne e2v						

Design 4: Network Attached Storage Design

In this design, the NPU – which could also be an Ethernet switch/processor combination, an ASIC or SOC designed by the customer – controls the data communication between the hard drive array and the outside world. Data can typically be transmitted and received via Ethernet or Wi-Fi.

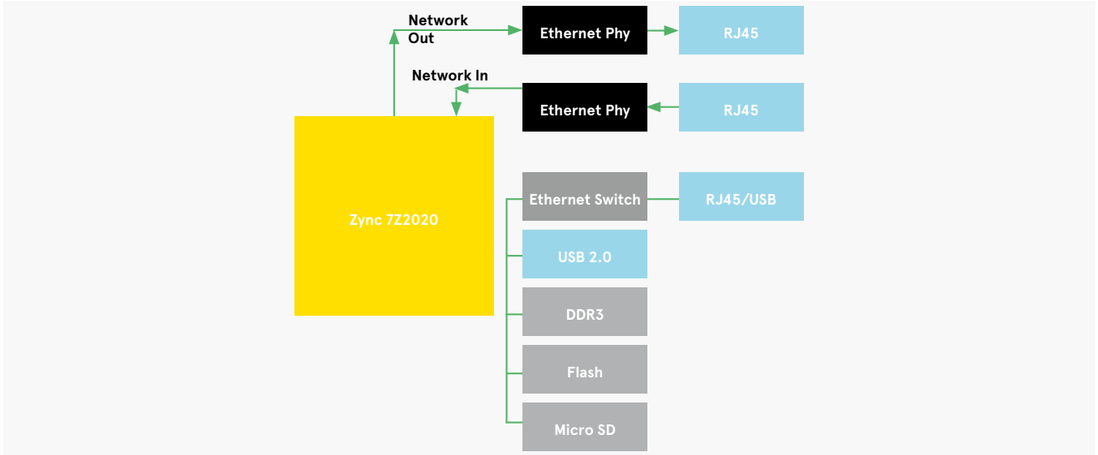


NAS Storage Design

Ethernet Switch	Ethernet PHY	FPGA	CPU	Memory	Optics	Wi-Fi	Timing	Signal Integrity	SAS/ SATA
N/A	Intel	Xilinx	AMD	Alliance Memory	Finisar	Laird Technologies	Microchip	Marvell	Marvell
	Marvell		Infineon	ISSI	Intel	Marvell	NXP	Maxim Integrated	
	Microchip		Intel	Microchip		Microchip	onsemi	Microchip	
	STMicroelectronics		Marvell	Micron Technology		Nordic Semiconductor	Diodes	onsemi	
			Maxim Integrated	onsemi		Quectel			
			Nordic Semiconductor	ROHM Semiconductor		STMicroelectronics			
			NXP	STMicroelectronics					
			Renesas Electronics						
			Teledyne e2v						

Design 5: Avnet MicroZed Ethernet 4.0 Design

The design below uses a Xilinx Zynq 7000 to implement an Ethernet 4.0 switch. The Ethernet switch, PHY and USB functionality can be embedded in the SOC by using readily available modules. Alternatively, designers can use off-the-shelf components such as Ethernet switches, PHYs and USB controllers to achieve the same results.

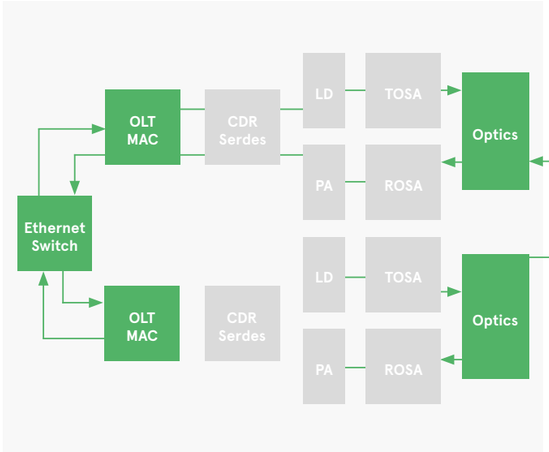


Avnet 4.0 Ethernet Kit

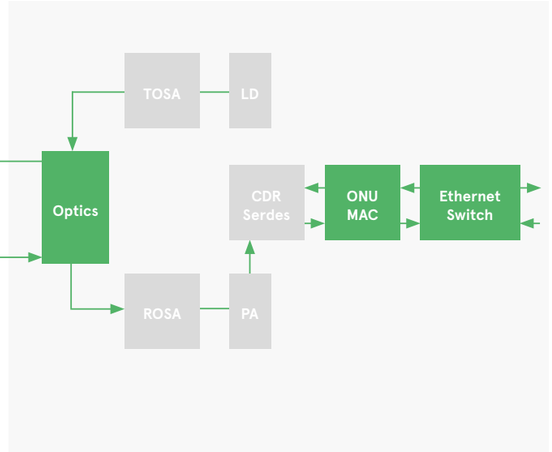
Ethernet Switch	Ethernet PHY	FPGA	CPU	Memory	Optics	Wi-Fi	Timing	Signal Integrity	SAS/ SATA
Intel	Intel	Xilinx	N/A	Alliance Memory	Finisar	N/A	N/A	Marvell	N/A
Marvell	Marvell			ISSI	Intel			Maxim Integrated	
Microchip	Microchip			Microchip				Microchip	
	STMicroelectronics			Micron Technology				onsemi	
				onsemi					
				ROHM Semiconductor					
				STMicroelectronics					

Design 6: Typical Passive Optical Network (PON) OLT and ONU

Both the ONU and OLU have similar components, the block diagram below shows standard components such as Ethernet switches, MACs, Laser drivers and power amplifiers. However many of the associated functions can now be purchased as a module such as the Finisar EPON SFP ONU Stick.



OLT System Block



ONU System Block

VALUE ADDED SERVICES

Here is an overview of the principal services Avnet Silica offers to help you get your products to market faster.

Custom Packaging Solutions
Avnet can help extend the life of a component once the original package and/or product grade is no longer available by developing an IC using commercially available die placed in custom packages.

Enterprise Custom Packaging
Avnet can customise packaging for large enterprise products like racks and provide custom labelling and branding - learn about all the options available.

Tape & Reel
Avnet Reel provides a customised quantity on a continuous tape, cut from the manufacturer's reel with attached 15-inch leader and trailer, enabling easy setup of automated board assembly.

Device Programming and Modifications
As the leading global programmer of electronic devices, Avnet programs an average of 300 million devices per year and can scale on demand to meet your evolving needs. Our state-of-the-art Global Programming Centres provide the most advanced programming and related services to support your current and future business.

Display Solutions
Avnet offers a complete portfolio of display, peripheral and support accessories from world-class manufacturers and combines them with state of the art integration services.

Power Supply
Whether a design requires an off the-shelf or a custom solution, Avnet has the inventory, technical expertise and value-add services to meet any design requirement.

Thermal Management
Avnet is one of the world's largest producers of thermal management products, shipping millions of cooling fans, blowers and heat sinks each year through the Avnet Logistics Solution Centre (LSC).

Interconnect Assembly Services
When you purchase your products from Avnet, you can turn to us for custom interconnect specifications, IC programming, device modifications and testing. In addition, you benefit from reliably quick turnaround times and access to our very broad inventory.

Commercial Interconnect Assembly
Avnet has invested in robotic automation for part identification, adhesive application, contact insertion and insulator insertion, which is deployed to minimise human error, increase productivity and maintain cost efficiencies.

Mil-Aero Interconnect Assembly
The proven track record of Avnet's value-add service has been built over 50 years, starting with commercial and military connector assembly and testing. The Avnet LSC is one of the industry's largest producers of high-reliability and military-aerospace interconnect products.

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July 1st, 2021