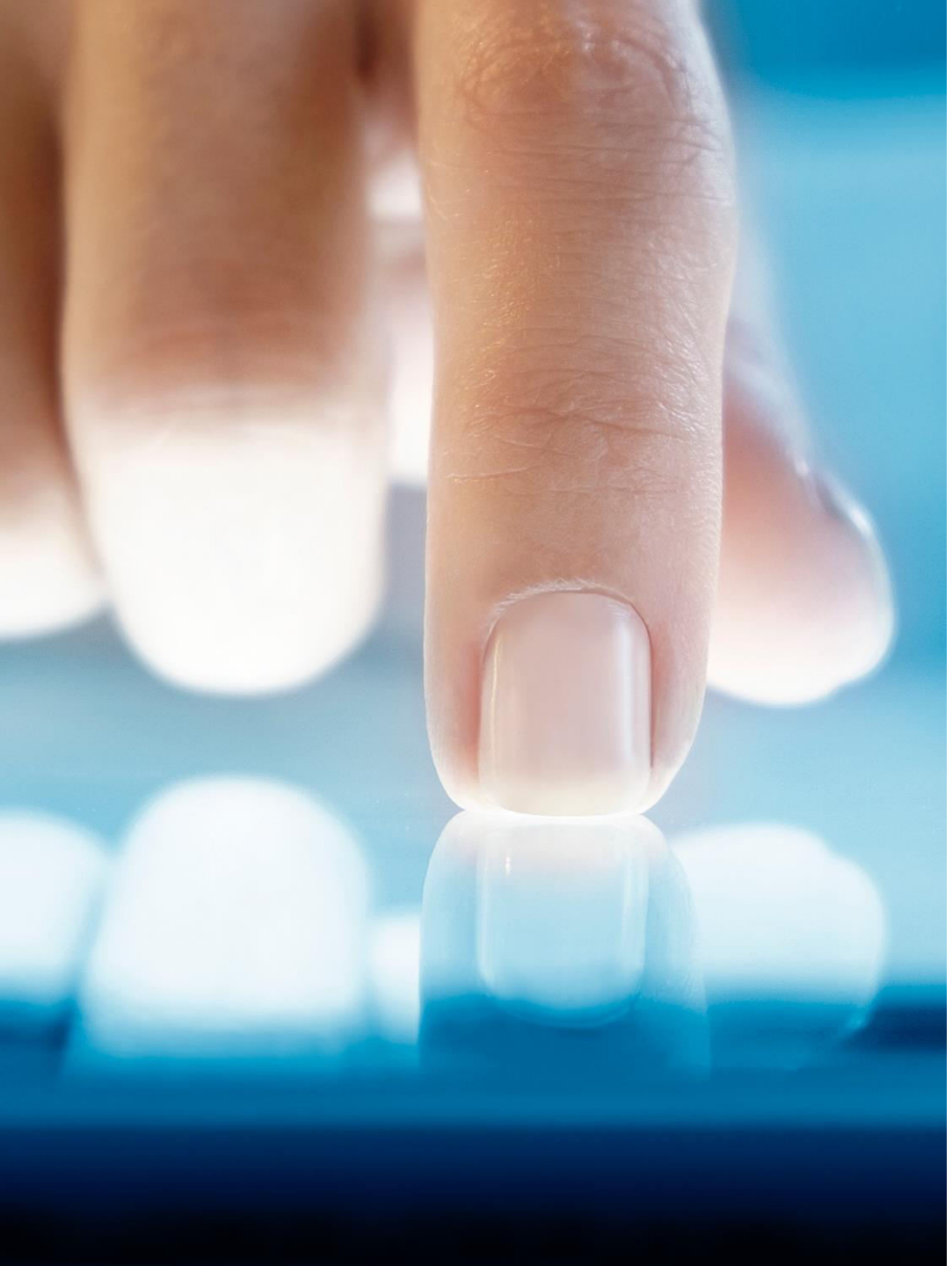

ARGO TECHNOLOGIE SA

Simple, Scalable, Flexible
Storage Building Blocks

Introduction

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So is a salesman really qualified to talk about storage ?

- 28 Years in the IT Industry
- Held many positions Technical Architect through to Operations Manager
  - Virgin Atlantic/ Prudential/ O2/ Ericsson/ TotalFinaELF/ Celera Genomics/ One2One/ Global Asset Managers/ Sainsburys/ Deutsche Bank/ London Clearing House/ BBC
- Held both End user & Hardware/ Software Vendors positions
- When I started in IT, everything was proprietary !
  - Phoenix/ IBM 3090/ HP3000
- I also had hair !!

Storage Vendors

- Veritas (Acquired by Symantec)
- EqualLogic (acquired by Dell)
- Copan Systems (acquired by SGI)
- Rackable Systems (who acquired SGI)
- Pillar Data Systems (acquired by Oracle)
- Coraid (Closed their doors, VC victim…)
- Solidfire (acquired by NetApp)
- Argo Technologie SA (Current)

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How has the CPU market changed in 28 years ?

- When Moore's Law did apply, the now say it doesn't.
  - "the number of transistors per square inch on integrated circuits had doubled every year since their invention"
- Do you remember the CPU race between IBM Power/ SUN UltraSparc/ HP PA-RISC and later HP/ Intel with their Itanium models ?
- Intel CPU's were only supposed to be used in desktops..
- Very few people predicted x86 winning the CPU race, made into a commodity product by the size of the market and fueled by the virtualization market

What's happened to tape ?

Introduced in 1964, 9 Track Tape stored data in 8-bit characters. Stopped production in 2002
You didn't have to go to the gym back in those days

Super DLT4 Capacity 800/1600GB

- LTO joint project by HP, IBM and Seagate
- Released in 2000 with a capacity of 100Gb, version 6 released in 2012 can hold 2.5Tb
- LTO won this race, price, speed, density !

Released by Sony in 1987, 120minutes tape being 60m in length. Tapes longer than 60m had problems due to thinner media

Has storage changed that much ?

HP7933

HP7933H Model Disk Drive providing 1.2GB capacity.
Directly connected using HP-IB/ Average Seek Time of 24ms/ Data transfer rate of 1MB/s / Rotation 2694RPM
Purchase price $ 63, 560.00 or $52,966.00 per GB !
When introduced back in 1982 (before mobile phones), the first HP7933 had a whopping 404MB.

HGST 10Tb NL-SAS Helium Drive
Connected via a SAN/ Average Seek Time 8.5ms/
Data Transfer Rate 157MB/s / Rotation 7200rpm
Purchase price $787.00 or $13.00 per GB

A short history of HDD's…

- 1983 - The first 3.5" drive appeared from IBM, massive 10MB
- 2002 – 137Gb drive appeared (before 300MB), space barrier broken
- 2003 – ATA appeared, standardized 3Gbit by 2005
- 2005 – SAS is born..
- 2006 – The first 2.5" 200Gb HDD from Toshiba
- 2007 – 1Tb from Hitachi
- 2008 – 1.5Tb Seagate
- 2009 – 2Tb Western Digital
- 2010 – 3Tb Western Digital/ Seagate, with this came the 4K block size
- 2011 – 4Tb Seagate
- 2014 – 6Tb & 8Tb drives from Seagate
- 2015 – 10Tb from HGST

The introduction of Flash…

28 Years ago, flash meant something different !

- Lots of storage vendors now pushing their flash platforms on the market.
- Flash comes with lots of benefits, reduced footprint, low power consumption, low heat, no moving parts
- SSD drive prices are coming down, but to compete with spinning drives you still need to leverage compression, de-duplication and thin provisioning
- Samsung did hold the title fot the largest SSD drive, it was a 2.5” 15Tb flash drive, but Seagate has now announced a 3.5” 60Tb !
- Definitely the way the market is moving, SSD’s are killing the 15k rpm drives

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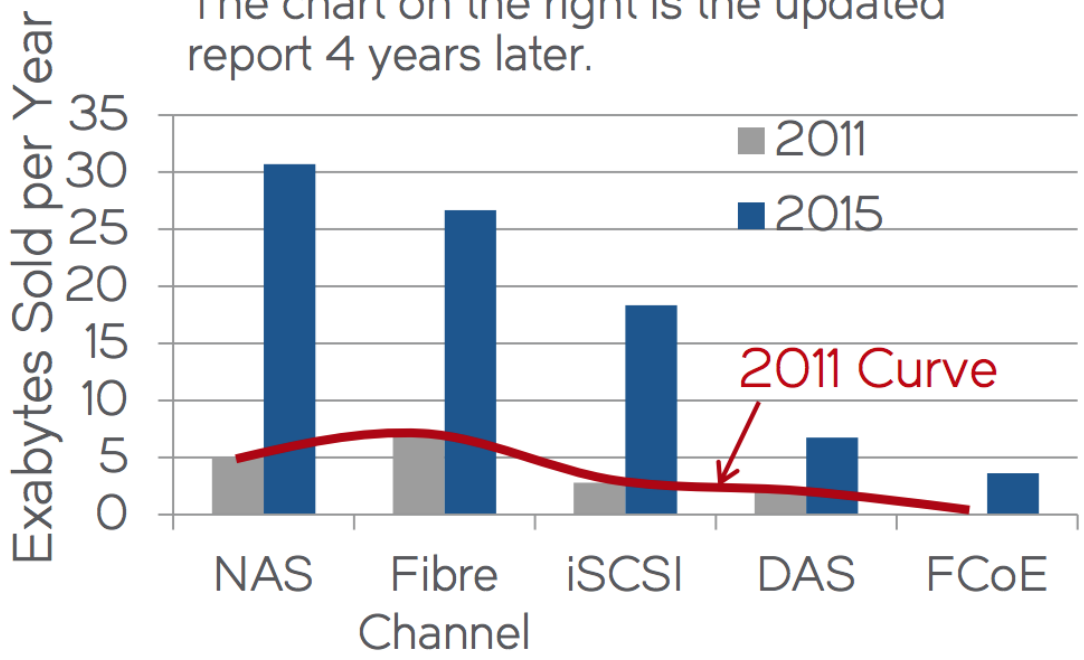
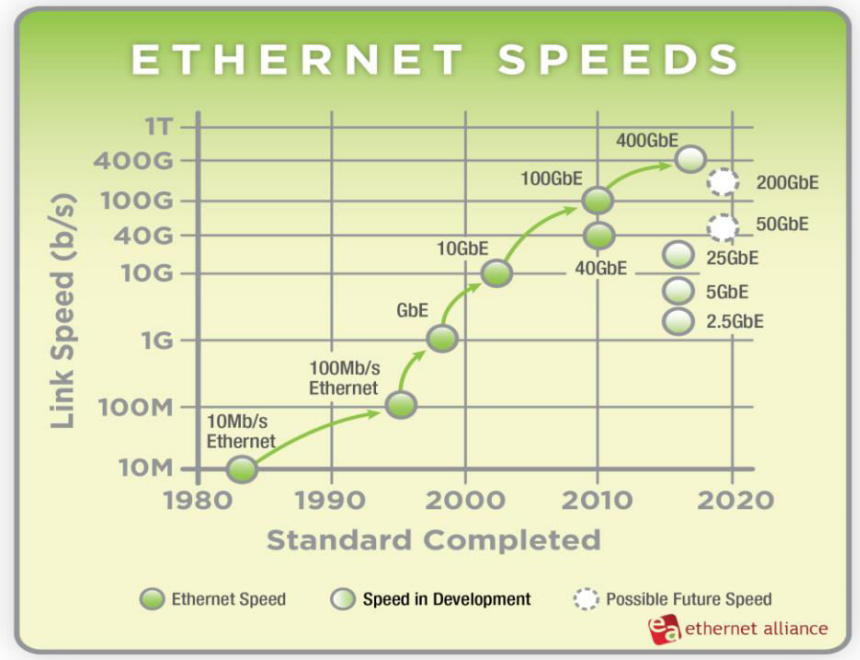
What has happened with storage networking ?

- We have moved on from the days Token Ring/ FICON ESCON.

The chart below was presented in kipp_01_0911 and based on a 2011 report. The chart on the right is the updated report 4 years later.



- The battle is now between FC vs iSCSI, so who is winning that race ?



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Trends in the market.

- All IT used to be in house, it was the only option ! There was no internet 28 years ago, no Google, Larry Page and Sergey Brin were still at school.
- When 56k modems started to being used as door stops and WANS's became more affordable, it created a market for Managed Service Providers.
  - Challenge with MSP's, poorly negotiated contracts resulting in higher costs than in-house solutions
  - As competition increased, MSP margins diluted, so low quality people employed resulting low quality of service
- Again, driven by the advances in networking, as WAN networks speeds increased, the next generation of MSP's, the ISP's started driving the transition to the Cloud market that we see today.
  - Storage costs are low, just don't try and access your data, it's gets expensive !
  - Large ISP's are an obvious choice for hackers, Google, Yahoo, Apple all compromised.
  - All experiencing DDOS attacks

My one observation.

- Nothing has really changed, it always has been and will always be about doing more with less, without compromising reliability, performance or availability to save money !
- That’s right, it’s all about money.

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My final prediction.

- Lots of transition over the next 12-24 months.
  - As the market drives down prices, the large vendors are struggling to survive their overheads do not reflect the old margin profile !
    - Cloud Companies/ ISP's do not purchase from big vendors, they are also competition
    - Fewer HDD's being sold/ less CPU's/ Ethernet being leveraged/ Larger tapes solutions
    - Do you remember paying for each feature you needed ?
    - Storage solutions that were software limited ? You needed to purchase license key to release additional performance.
    - HP Splitting the company/ Dell acquiring EMC for $67b/ IBM selling x86 business to Lenovo
    - Look at the level of restructuring ***"getting rid of people"*** going on with the large vendors
    - When will Cisco buy a storage company ?
  - Venture Capital companies in the USA pulling out of the tech start-up market.
    - The pre-IPO technical startup companies that are VC funded are in for a tough time

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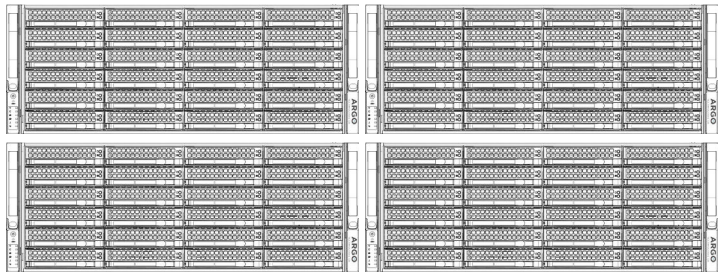
Spectrum of Storage Solutions

Open ⟷ Closed

White-Box Open Storage
PhD "Build It"

- Commodity economics
- Requires expertise to assemble, upgrade & Maintain
- No enterprise-class support



ArgoTech Scale-Out
Ethernet Storage Fabric

- Commodity x86 economics
- Rapid refreshes tracking hardware trends
- Appliance simplicity
- Product roadmap
- Enterprise-class support

Big-Iron, Closed Storage
Legacy Storage "Buy It"

- Proprietary expensive hardware
- Long hardware refresh cycles
- Enterprise-class support

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Argo Technologie SA

European HQ

HQ, Sales, Marketing, and Support :

- Founded 2015
- HQ & Support Lausanne, Switzerland
- Sales Office: Lausanne, London, Moscow
- Privately held and profitable
- 40Pb currently under management

- Route to market is a 100% Channel

Simple, Scalable, Flexible

Highly scalable Unified Storage Platform

- Scale-out Open Storage Architecture
- Open x86 technology
- Designed for Petascale
- Based on the Zettabyte Filesystem
- Complete Enterprise feature set
- High Speed - Layer 2 Ethernet interconnect

Established

Enabling Big Data Projects

- Over 40Pb currently under management
- 1-2Pb pre-configured “plug & play” pod design available

- Argo Storage Fabric Architecture GA since Sept 2015

- Support & Upgrade options for existing Coraid install base

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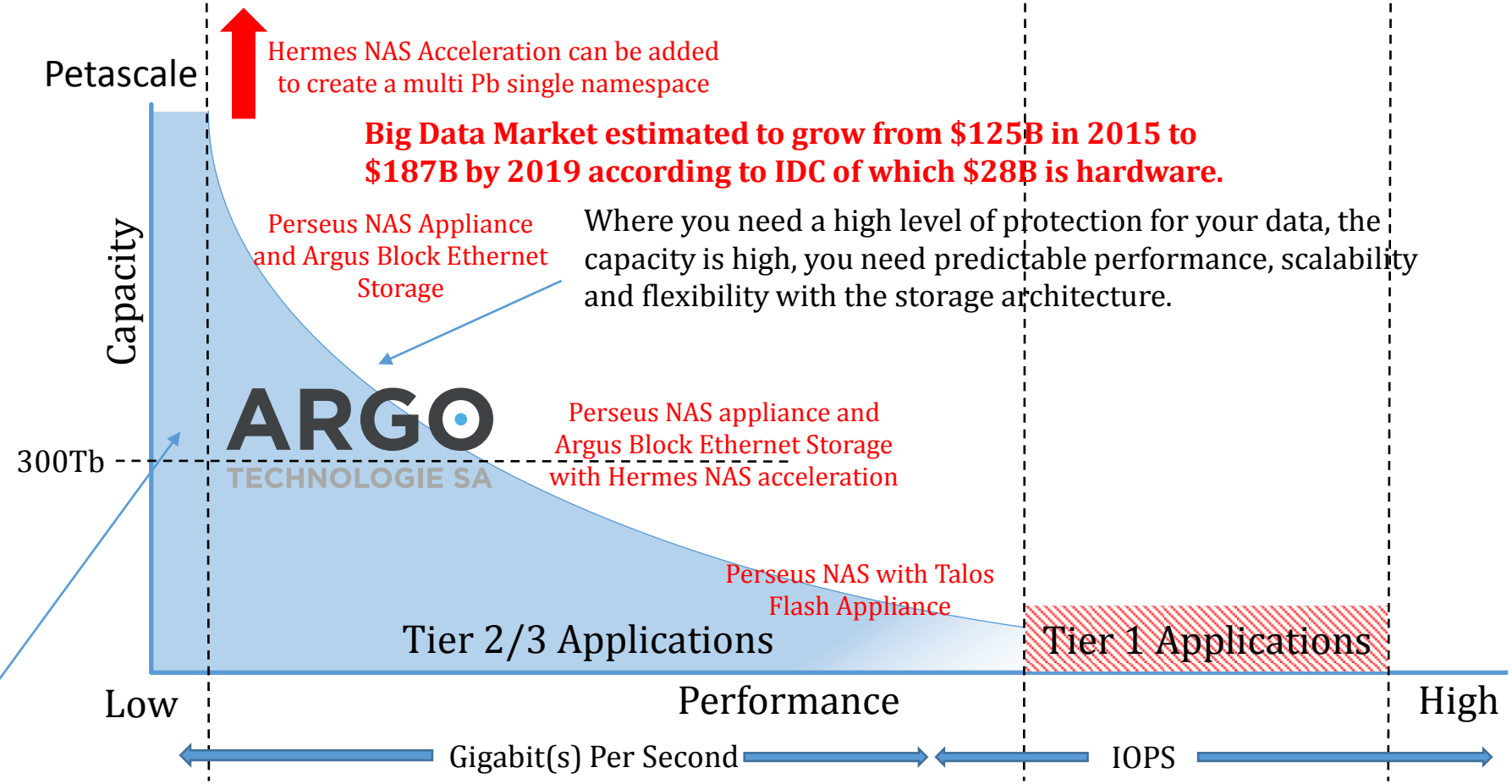
Market Focus



If there are no measurable performance or access time requirements, if the capacity is high, the best solution is tape technology or Cloud solutions like Amazon S3

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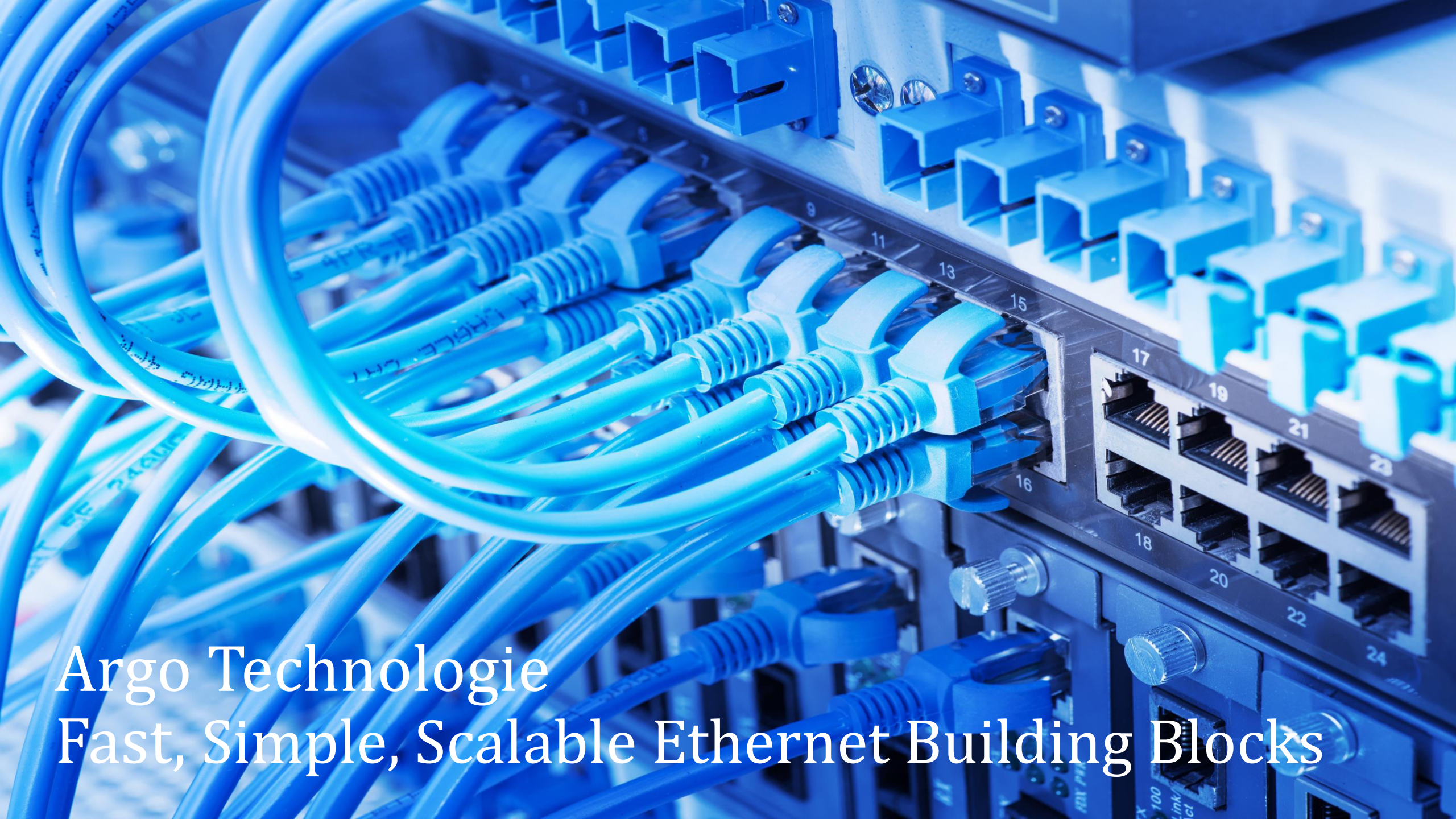
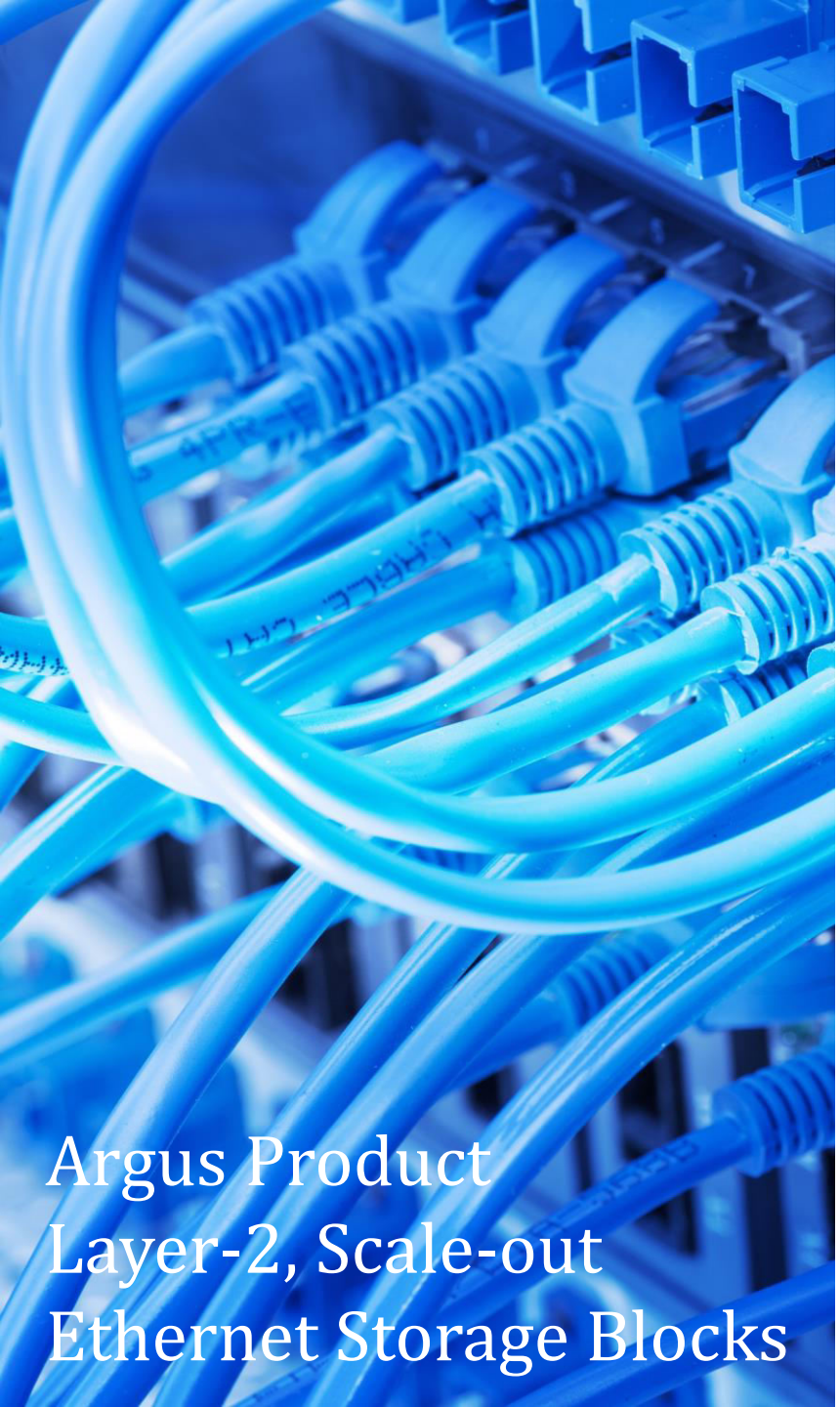


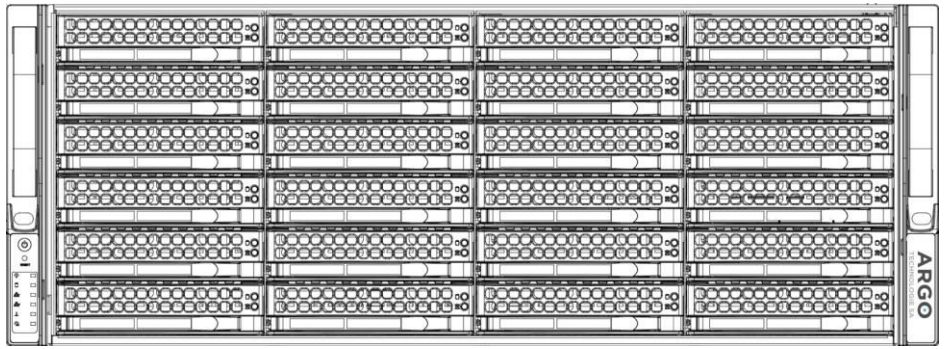
Argo Technologie
Fast, Simple, Scalable Ethernet Building Blocks



Argus Product Layer-2, Scale-out Ethernet Storage Blocks

Fast, Simple, Scalable, Flexible Block Ethernet Storage

- Commodity x86 architecture
- Argus Ethernet disk shelves 36, 72 or 90 drive slot options
- Hot swappable drive slots
- Minimum Dual 10GigE or 40GigE Ethernet RJ45 or SFP+ connections
- Layer2 ATA over Ethernet (AoE) communication with the NAS appliance
- Scale Compute and Connectivity with capacity for predictable performance
- Simple CLI for administration and automation



Argus disk shelves are designed to be used with the Perseus NAS appliance in a (RAIN) redundant array of independent node architecture.

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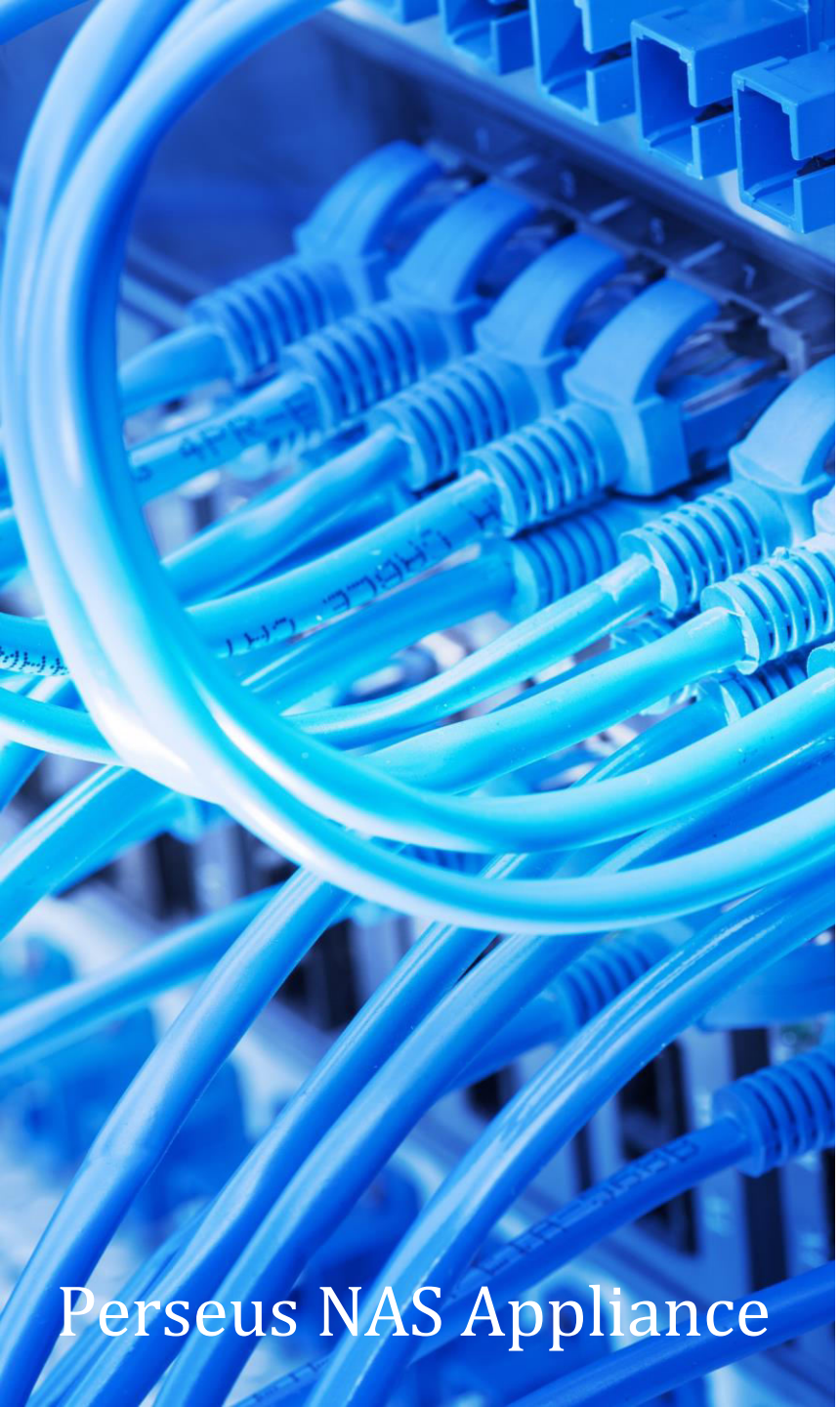
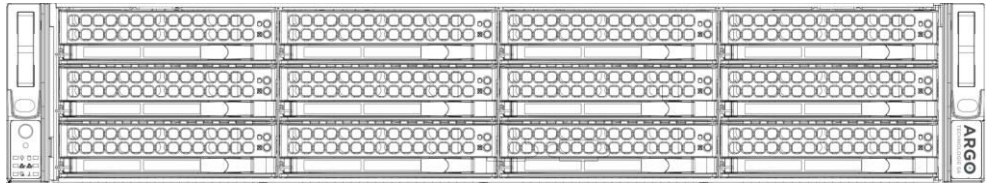


Perseus NAS Appliance

Fast, Simple, Scalable, Flexible NAS Appliance

- Argo Ethernet Storage Fabric scales to multiple Petabytes using Perseus NAS appliances and Argus Ethernet block storage units
- Available as standalone appliances or as a fully preconfigured storage pod with top of rack switches
- Predictive and independent scaling of both performance and capacity
- Fast, scale-out layer 2 Argo Ethernet Storage Fabric leveraging the ATA over Ethernet protocol (AoE) as the high speed interconnection between the storage shelves and the NAS appliances
- ZFS checksum error correction to address silent data corruption and transmission errors
- All our products are developed on proven x86 architectures allows us to be more agile in bringing new products to market
- In-house software development reducing lead times to respond to our customers' needs more efficiently while ensuring we remain competitive in the market while avoiding vendor lock-in
- All features included, no hidden costs



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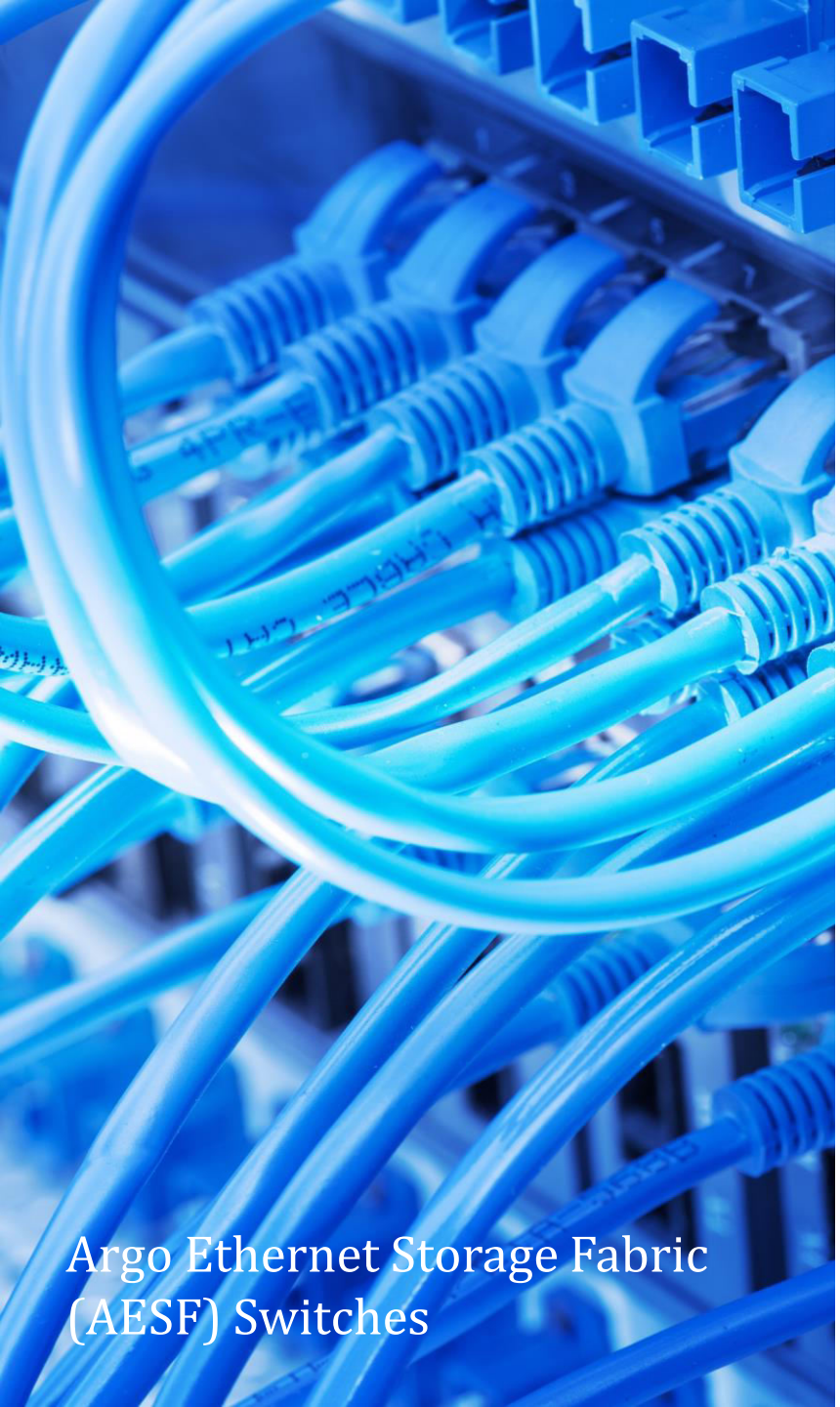

Argo Ethernet Storage Fabric (AESF) Switches

- High performance Ethernet switches designed to for Next Generation Metro, Data Center and Enterprise networks
- Supports L2/L3/Data Center/Metro features
- Complete system software with comprehensive protocols and applications to facilitate rapid deployment and management
- Supports the fans with speed control as well as power consumption adjustment which is based on the flow status of the ports

- Argo do not mandate that you purchase our switches, if you wish to use your own you the switches they will need to support flow control, jumbo frames and not have shallow buffers !

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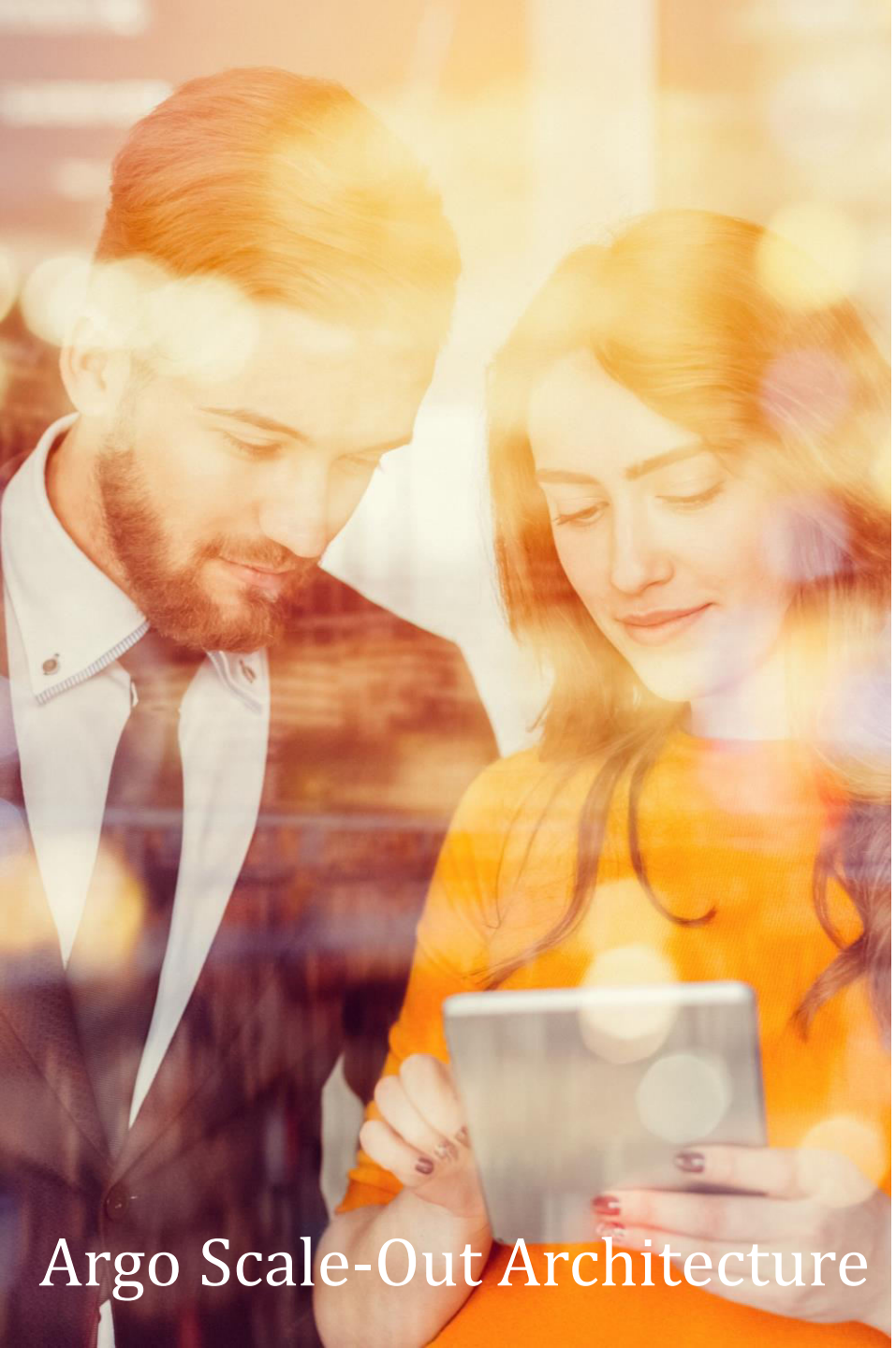
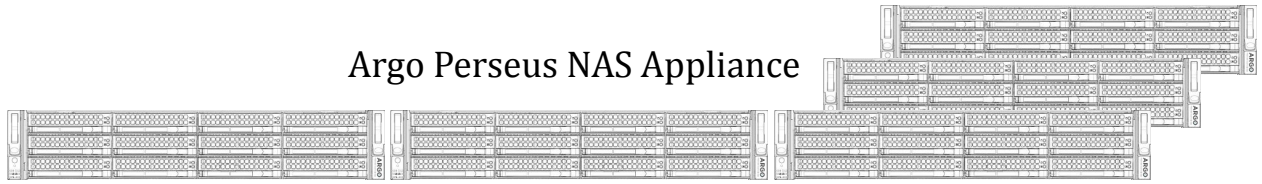
Advantages of a RAIN Architecture



Argo Scale-Out Architecture

iSCSI/ CIFS & NFS Shares

Argo Perseus NAS Appliance



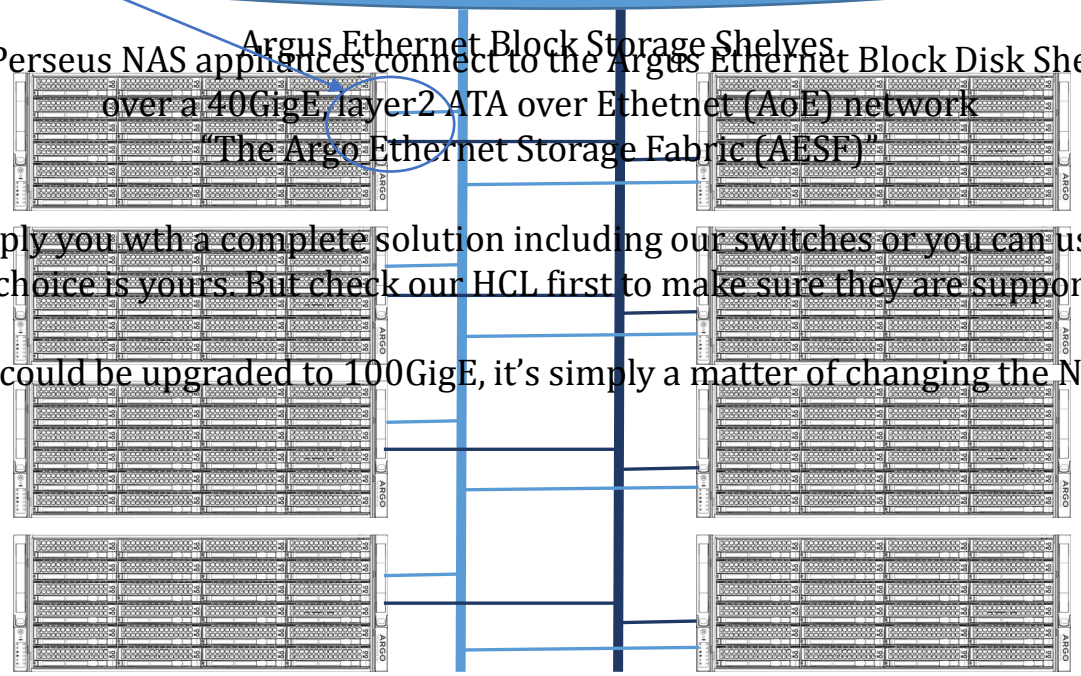
Each time you scale out the capacity you add the compute and network to drive the capacity for predictable performance

or simply add NAS nodes to raise performance, independently of the capacity

Argo Layer2 Ethernet Storage Fabric

Argus Ethernet Block Storage Shelves

The Perseus NAS appliances connect to the Argus Ethernet Block Disk Shelves over a 40GigE layer2 ATA over Ethetnet (AoE) network "The Argo Ethernet Storage Fabric (AESF)"



Argo can supply you wth a complete solution including our switches or you can use your own, the choice is yours. But check our HCL first to make sure they are supported.

This could be upgraded to 100GigE, it's simply a matter of changing the NIC's

Add more Argus Ethernet Block Disk Shelves to scale capacity independently of NAS performance

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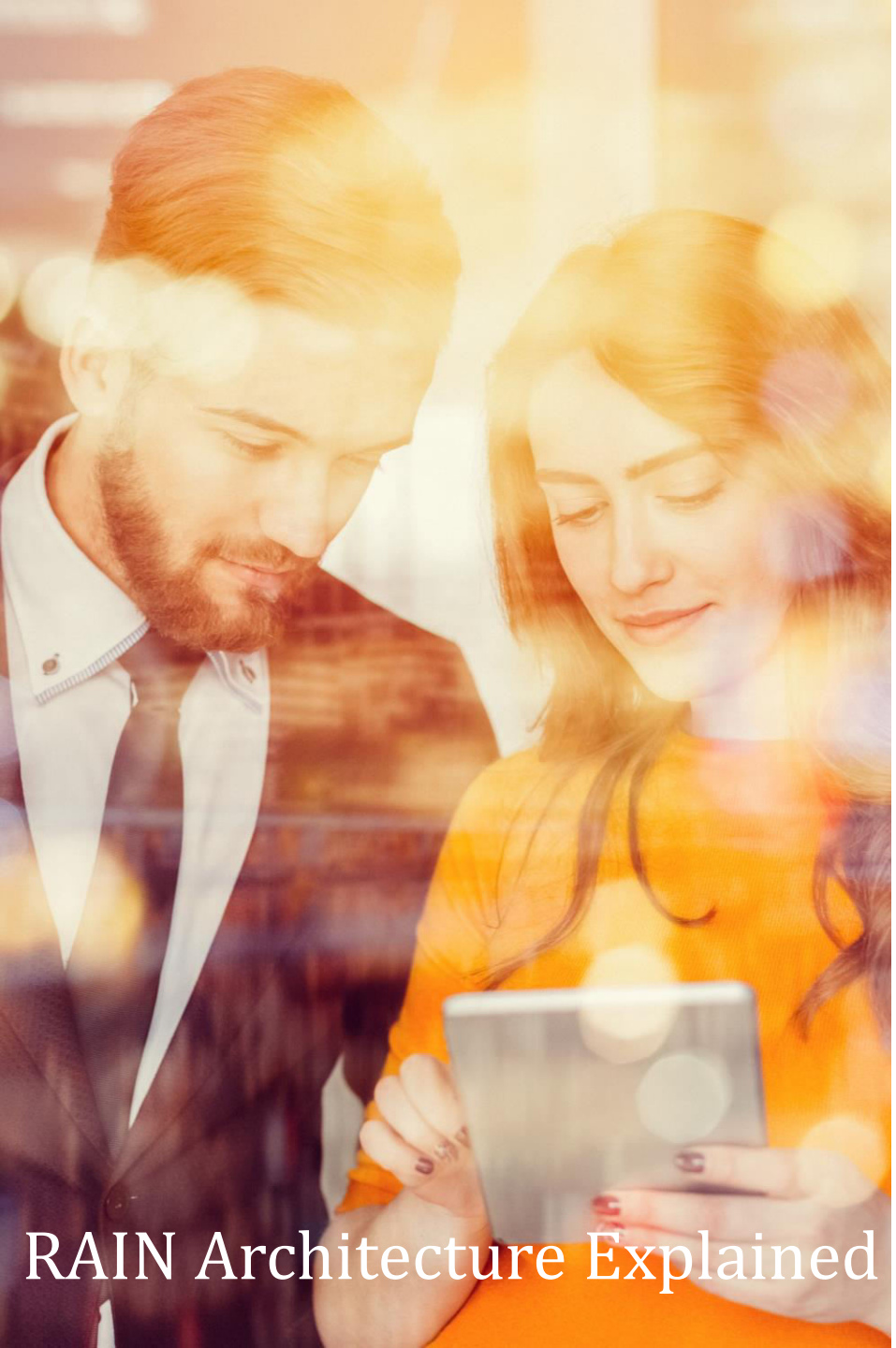
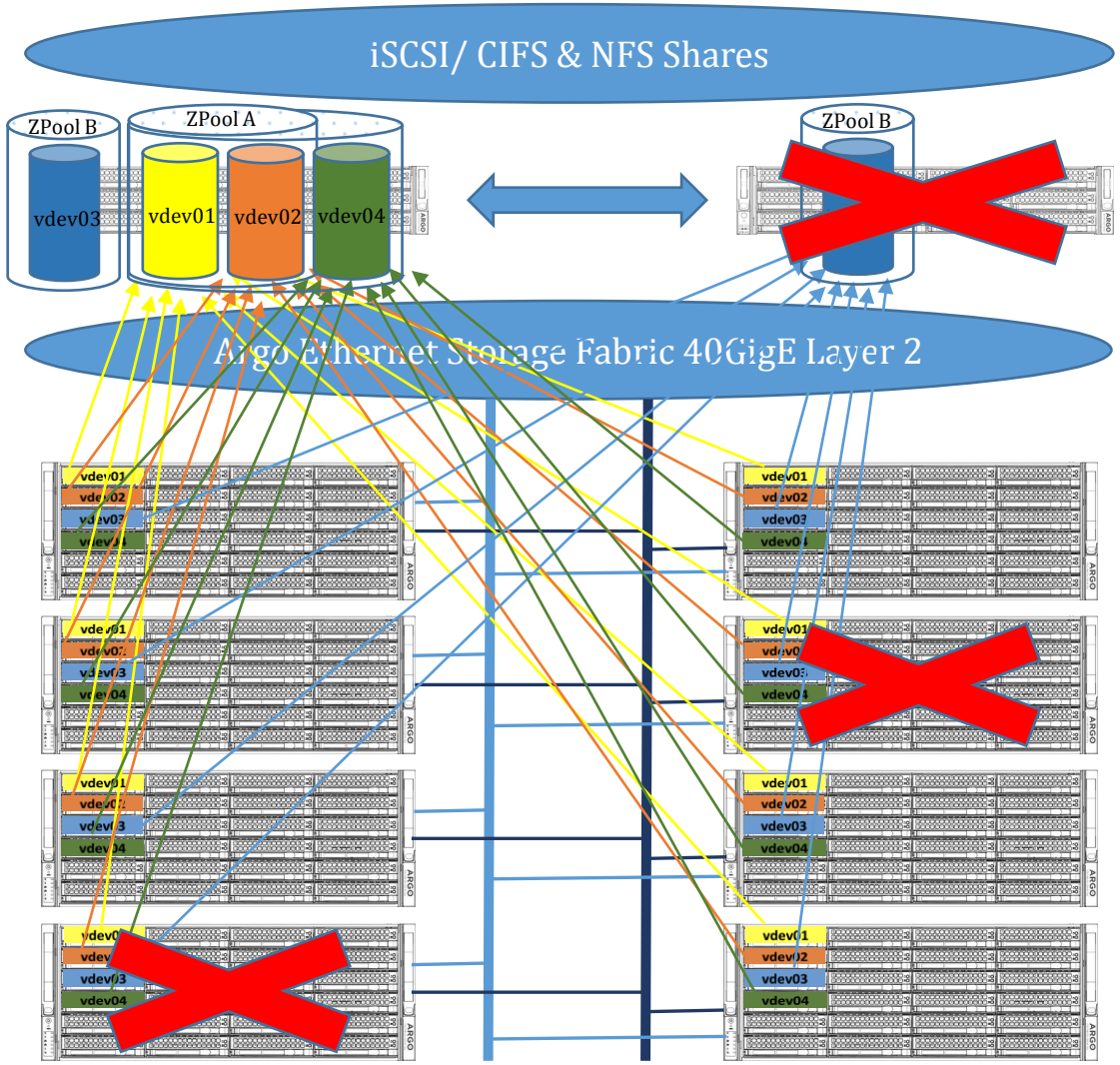


RAIN Architecture Explained



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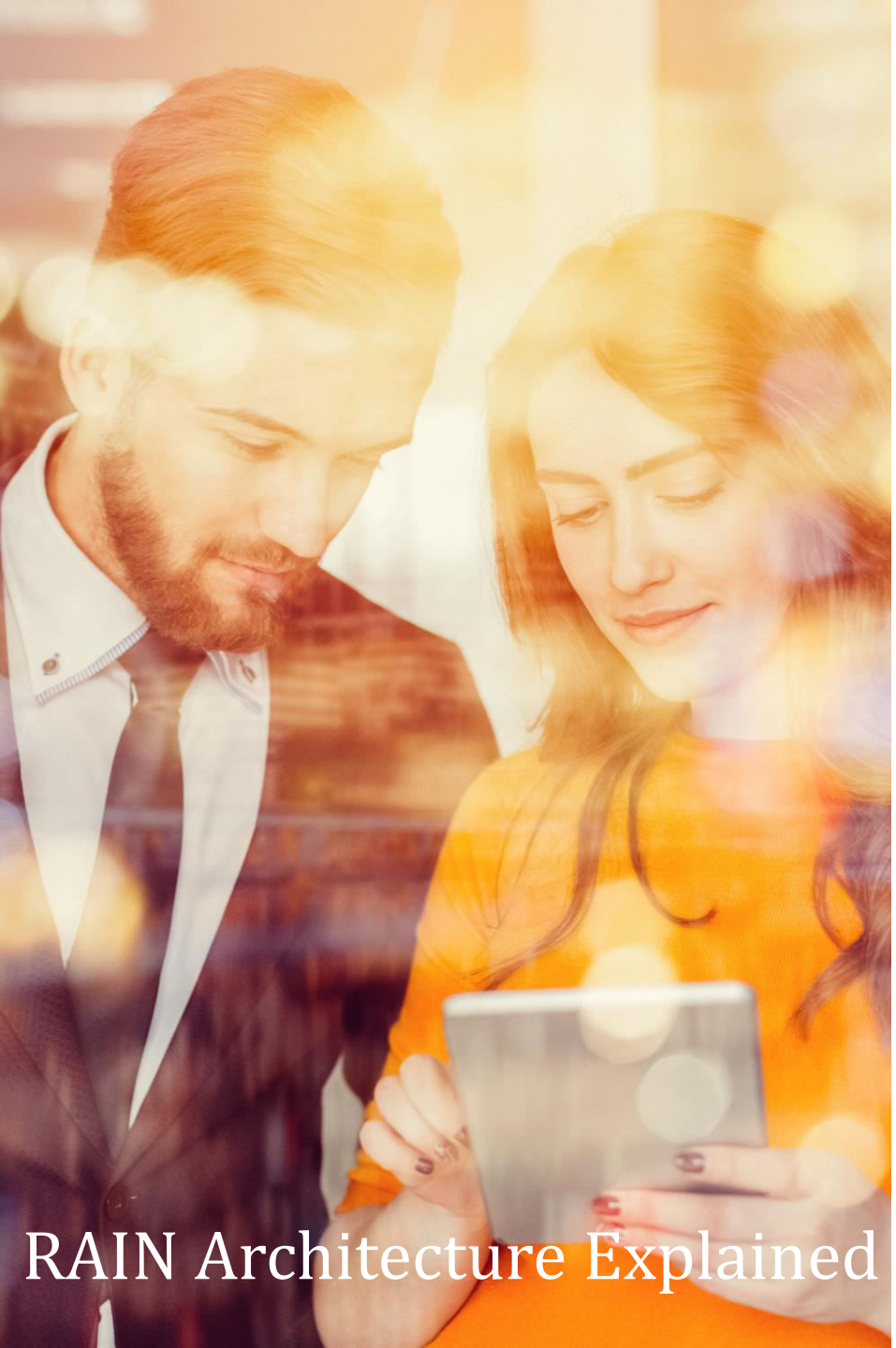

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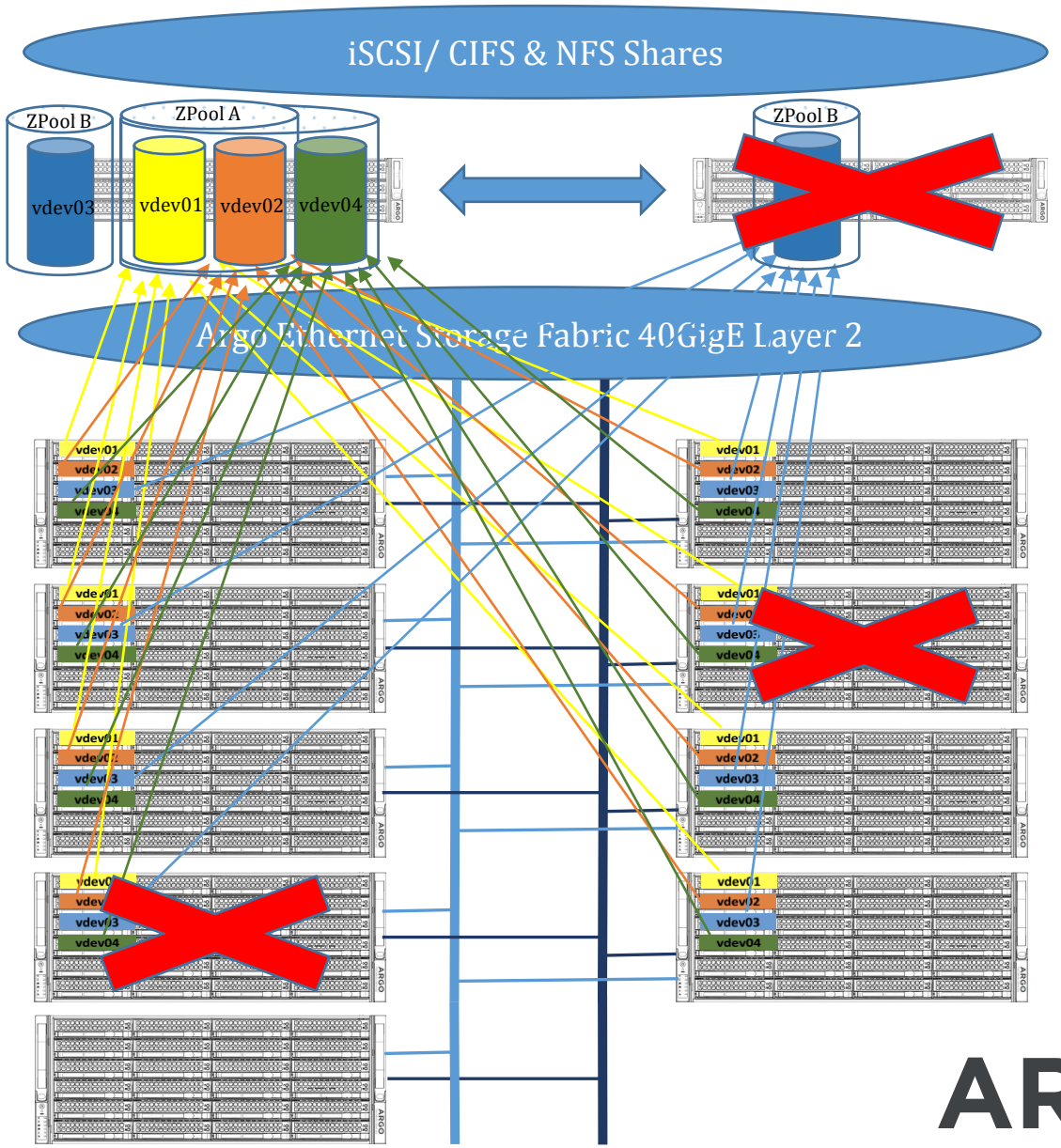

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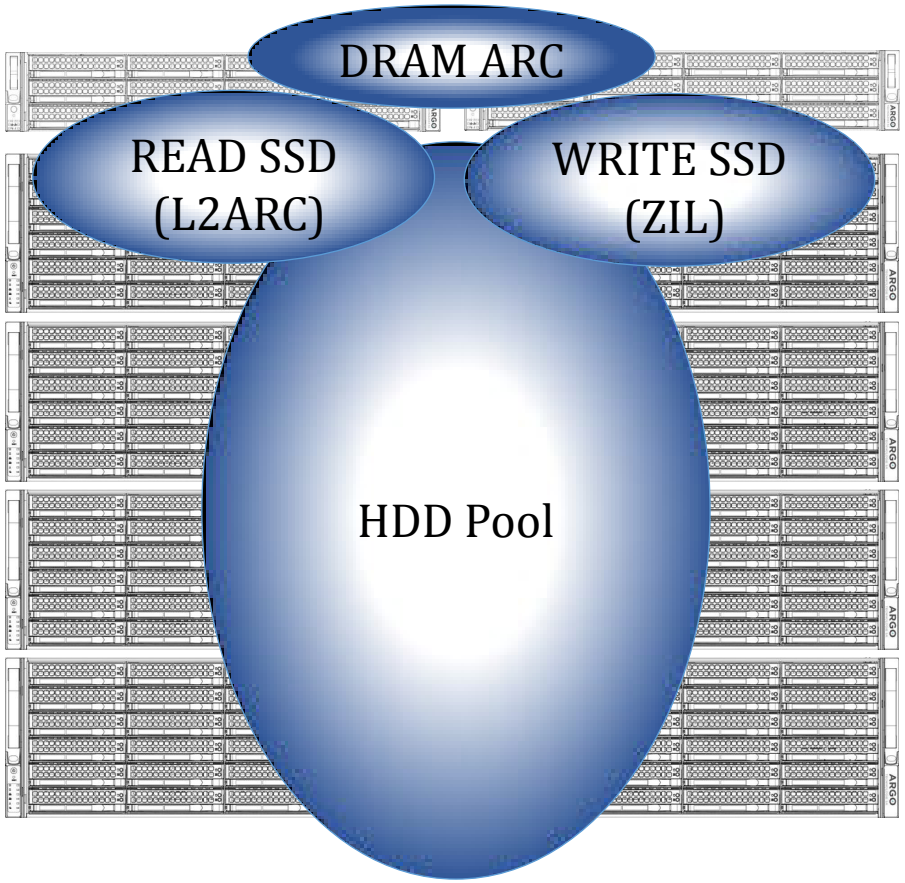
Hybrid Storage Pools



Benefits of Hybrid Storage Pools

- ARC – DRAM Read Cache
- L2ARC – Read Optimised SSD Cache
- ZIL – Write Optimised SSD Cache
  - ZIL drives are mirrored pairs
- HDD: 4Tb NL-SAS capacity drives
- Caching is enabled at the Zpool layer.
- Separate disparate workloads using Zpools, stops noisy neighbour scenarios.
- Build in a high level of resilience into the RAIN architecture

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Argo Ethernet Storage Fabric (AESF)

ArgoTech Storage Protocol
Serial vs Parallel Transfer

iSCSI and FC

- Like a single lane carriageway
- Easily congested
- One lane(bandwidth) = less traffic (throughput)
- MPIO difficult to add additional individual roads

AESP

- Like a Motorway
- More difficult to congest
- More Lanes(bandwidth) = More Traffic(throughput)
- Parallelism = Lower Latency = Higher Throughput
- MPIO can easily add multiple lanes

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ArgoTech Storage Protocol Summary

	iSCSI/ FC/ FCoE	AESP
Topology	Connection	Connectionless
Transport	IO Session/Serial delivery IO TCP scatter/gather	Not required Disk IO, Ethernet Frames
Multi-Path	Multipath Driver Manual Setup	Not required Automatic
Dropped Data Recovery	iSCSI: TCP with Retransmit FC: Link Flow Control, SCSI timeout	AESP Correlation Timeout AESP Retransmit
Out of Order Data	iSCSI: TCP scatter/gather FC: Prevented via Link Level Flow Control	In order arrival not mandated
Overhead	Fibre Channel provides 2-3x higher performance than iSCSI **AESP is the most direct and fastest SAN protocol**	

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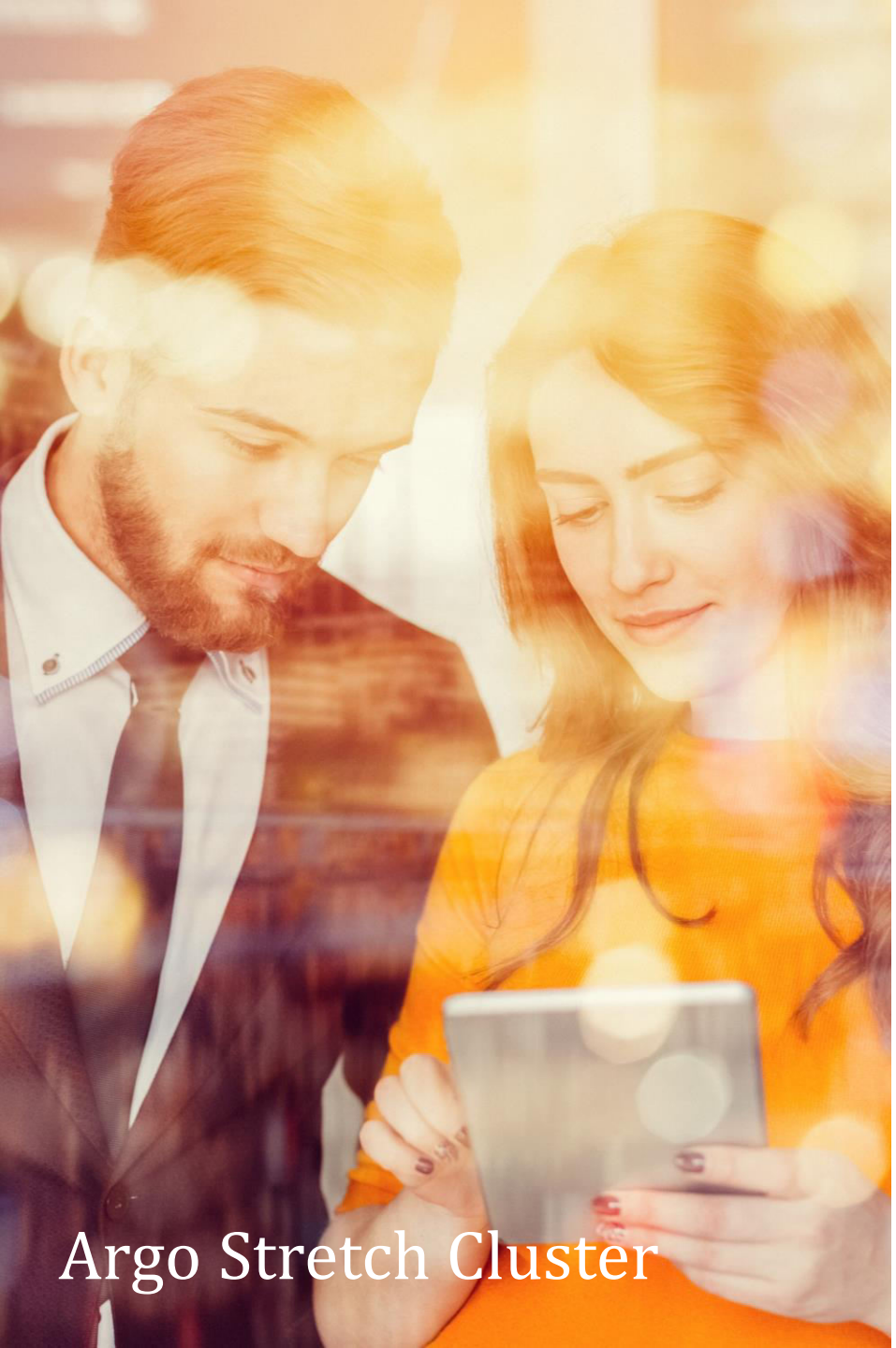
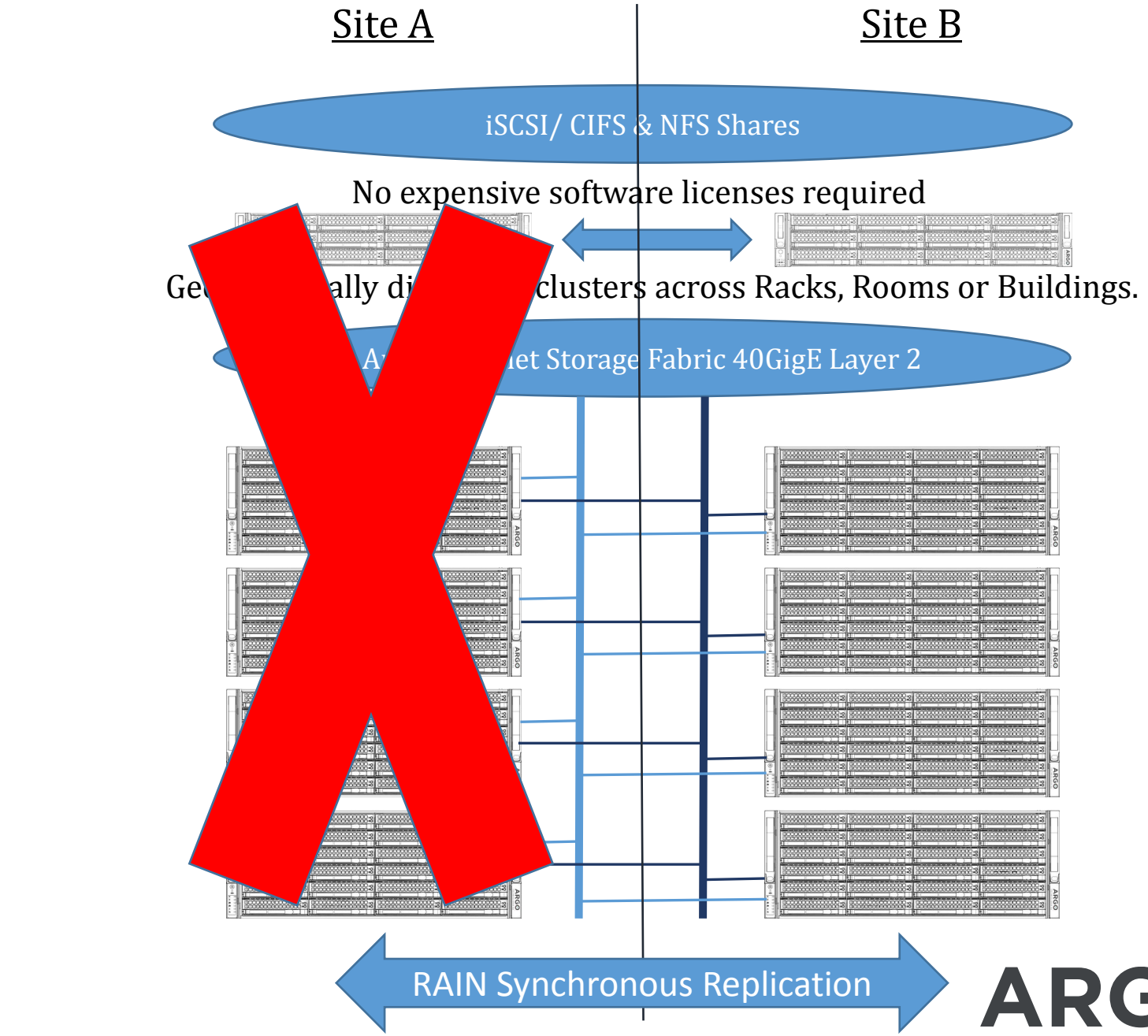


Argo Stretch Cluster



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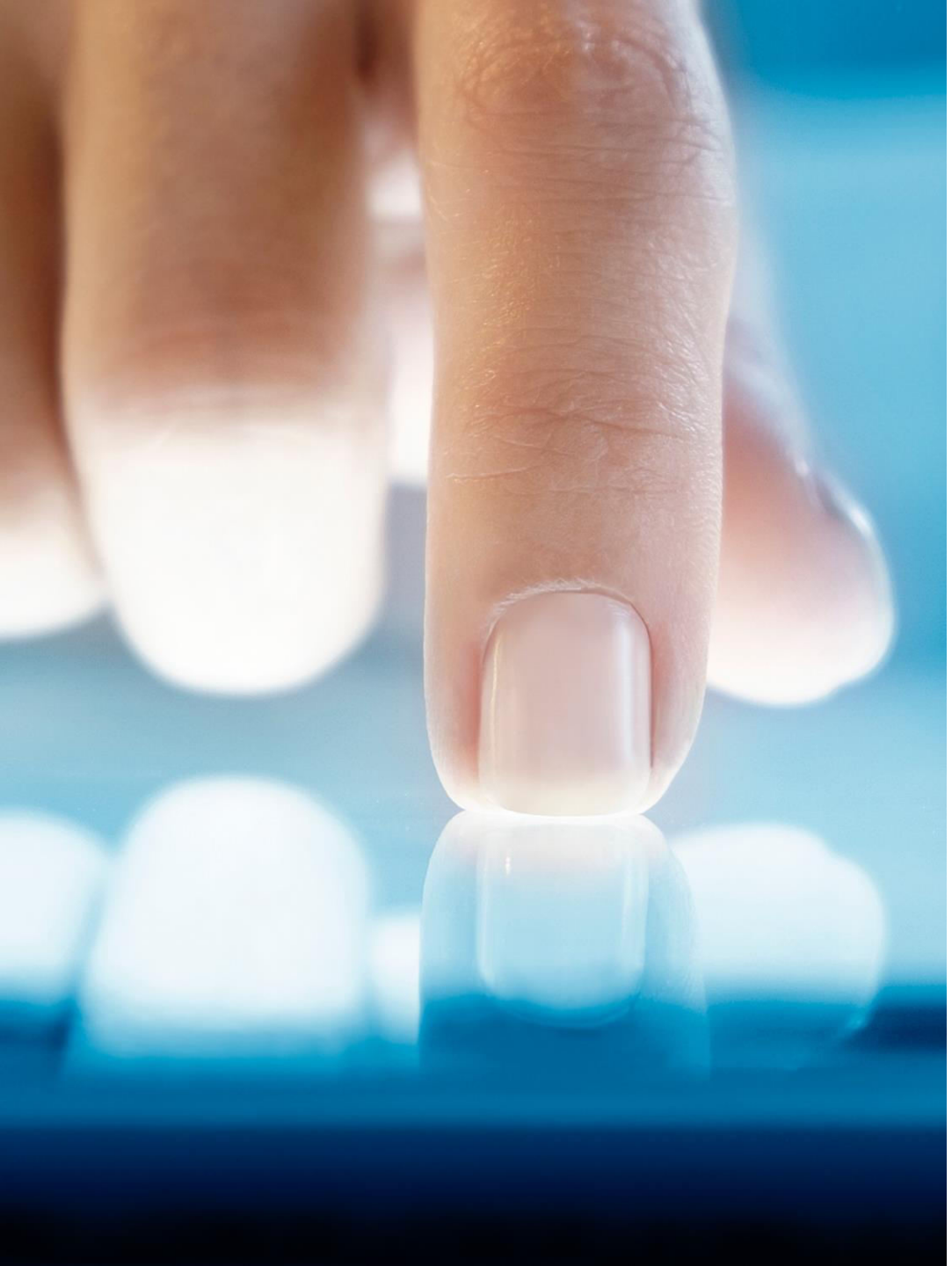

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Thank you.