

雲馥數位 – EDA on Azure Case Study

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Agenda

- IC設計產業現今狀況與面臨之問題
- EDA在雲端與地端運行的差異
- 用Azure運行EDA的優勢
- 產業案例成效分享

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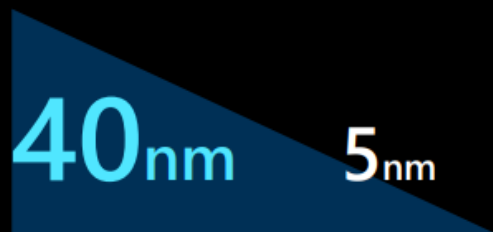
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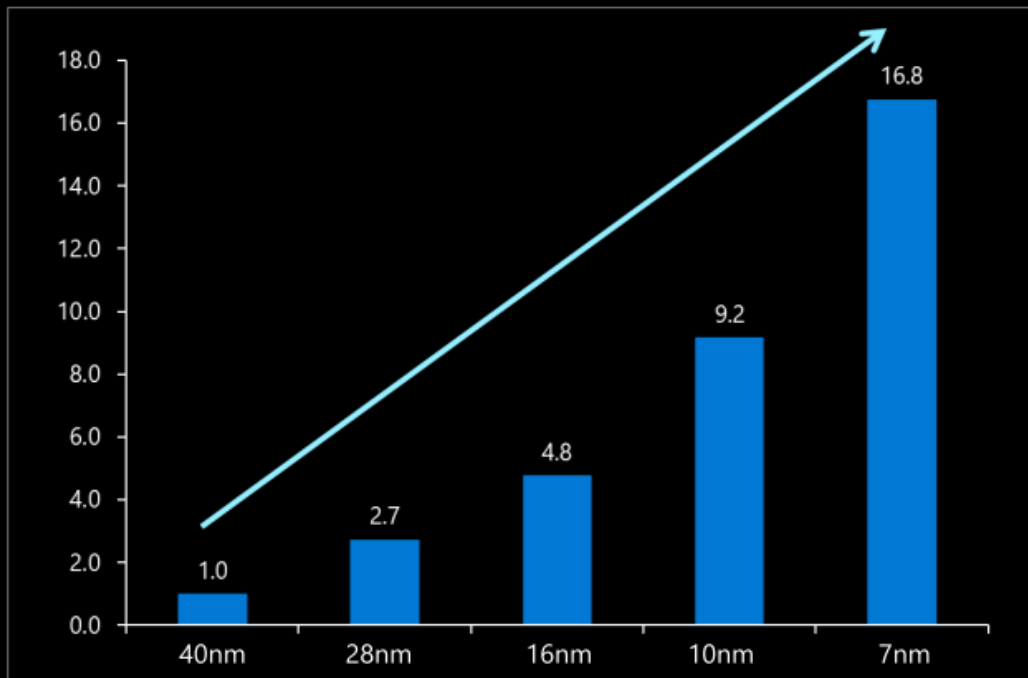

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Increasing Design Complexity and Resource Requirements

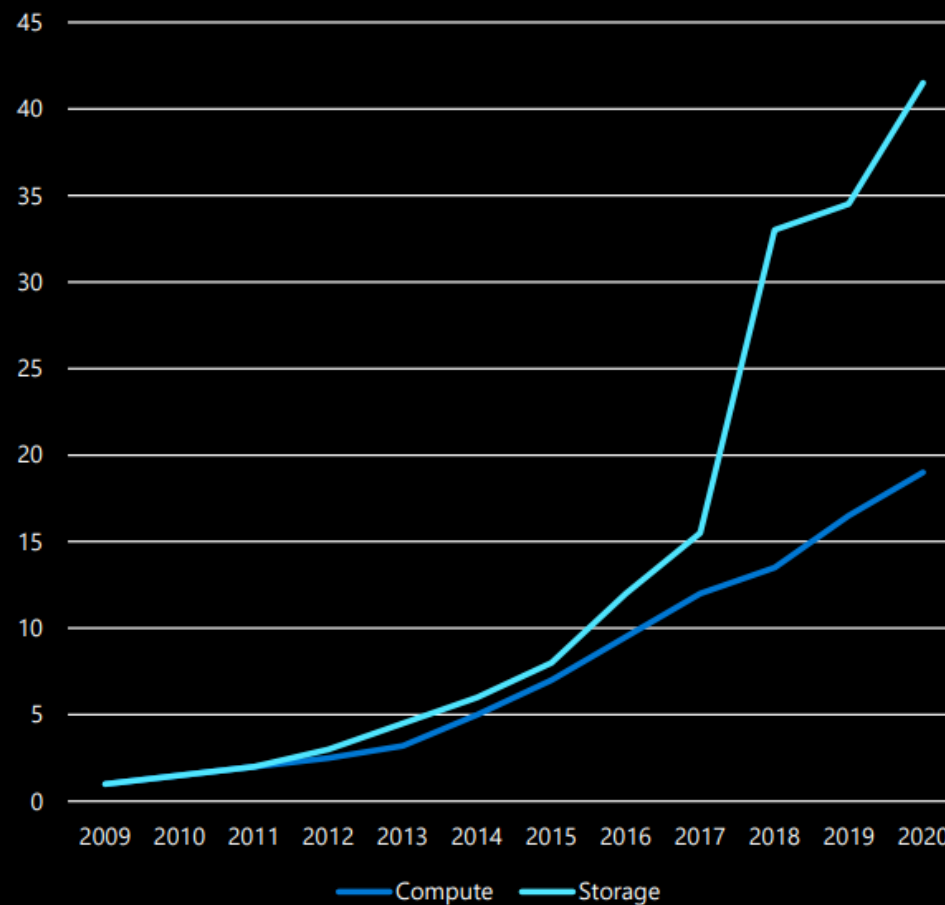
How will the semiconductor industry keep up?



The density factor of modern transistors has increased over 17x over the last decade

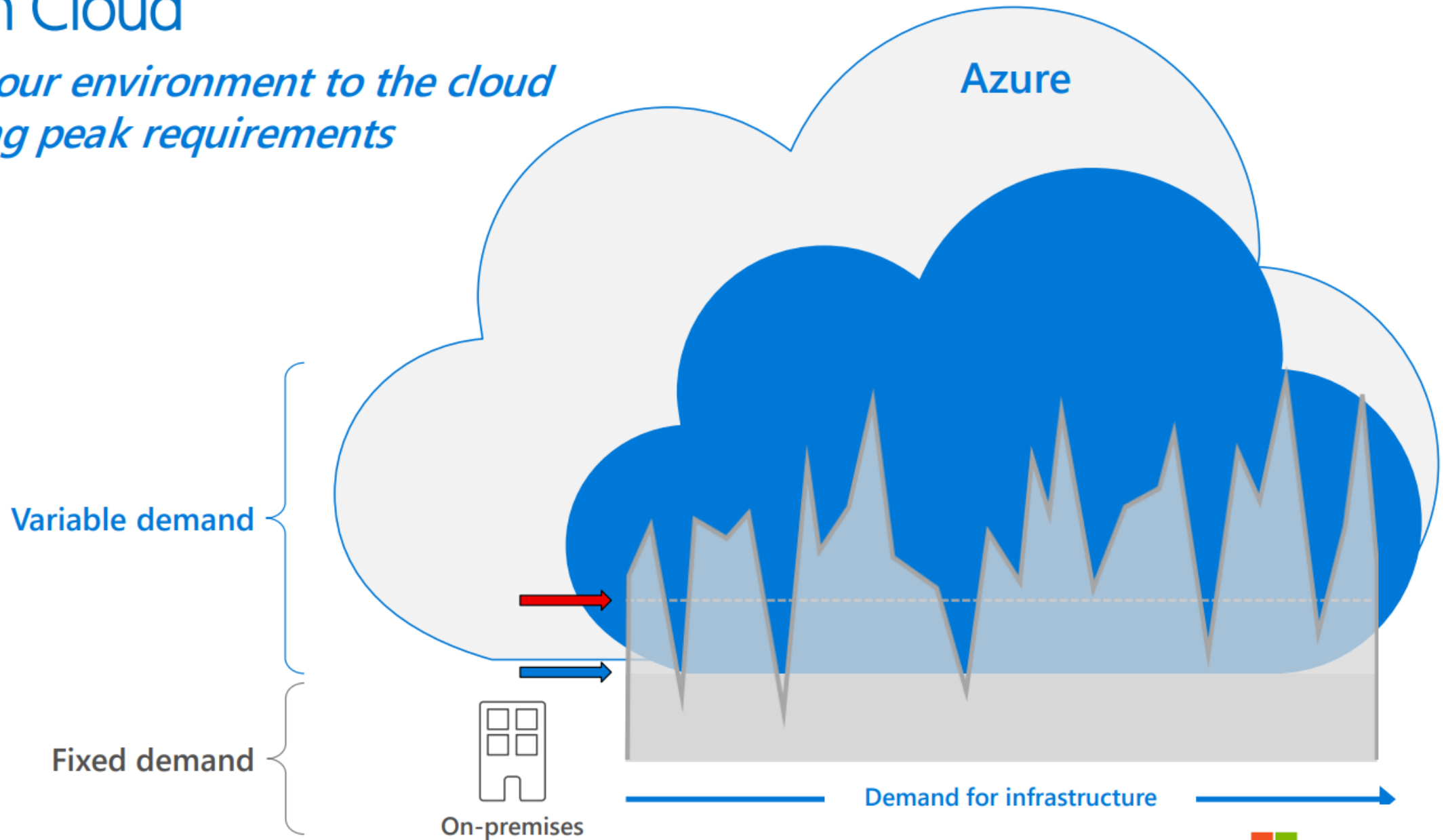


Relative Scale of Compute Infrastructure Increase for EDA



EDA on Cloud

*Expand your environment to the cloud
addressing peak requirements*



EDA在雲端與地端運行的差異

On-Premises EDA

1. High Performance Computing → Optimized Compute
2. High-IOPS & Low-Latency → Best Storage Device
3. Fully Private Environment → Security

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What are the Benefits of Running EDA Tools on Cloud ?

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Cloud-based EDA benefits

• 成本優化考量

- 地端：設備添購時間較長，花費較高，設備故障需較長時間排除問題。
- 雲端：隨用隨附特性，開啟快速，EDA低運算時可以彈性節省成本。

• 訂單時間急迫性

- 地端：面對高性能且有時間壓力的需求訂單，地端硬體效能有限。
- 雲端：在花費相同的費用下，可以1台跑100小時，也可以100台跑1小時。

• 減少硬體設備維護

- 地端：設備存在維護與折舊問題，過了幾年就會有更新的處理器與伺服器出現。
- 雲端：隨時可以使用最新的設備，花費更自由，維護更簡單。

Cloud-based EDA benefits

• EDA 優化機型

- 地端：多種機型採購流程複雜，不同製程階段需不同設備。
- 雲端：提供多樣性機型，快速找到所需並隨選隨用，解決當前困難。

• 高度安全資安環境

- 地端：為維護地端資安環境，廠房需設立層層檢查關卡來保護內部資料。
- 雲端：打造私有雲端環境，透過 VPN & ER 建立延伸內網，採用嚴密身分驗證機制與限制資料流動。

• 完整產線打造

- 地端：以往從收接收需求到交單，為確保資料安全依靠人力到處跑。
- 雲端：雲端環境內，從收單到研發跑運算，甚至最後交單都能在雲上完成。

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為何許多同業首選Azure雲平台？



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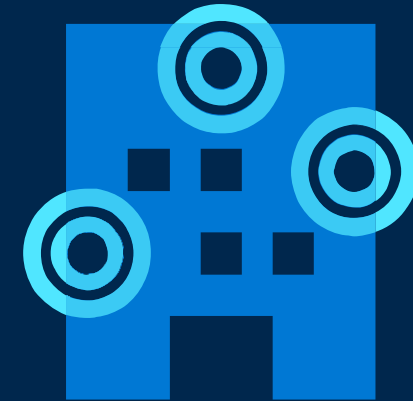
Azure enables these benefits by directly addressing these needs.



Agility / Speed



Scale



Datacenter EOL

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Put the power of Azure to work for you



66+

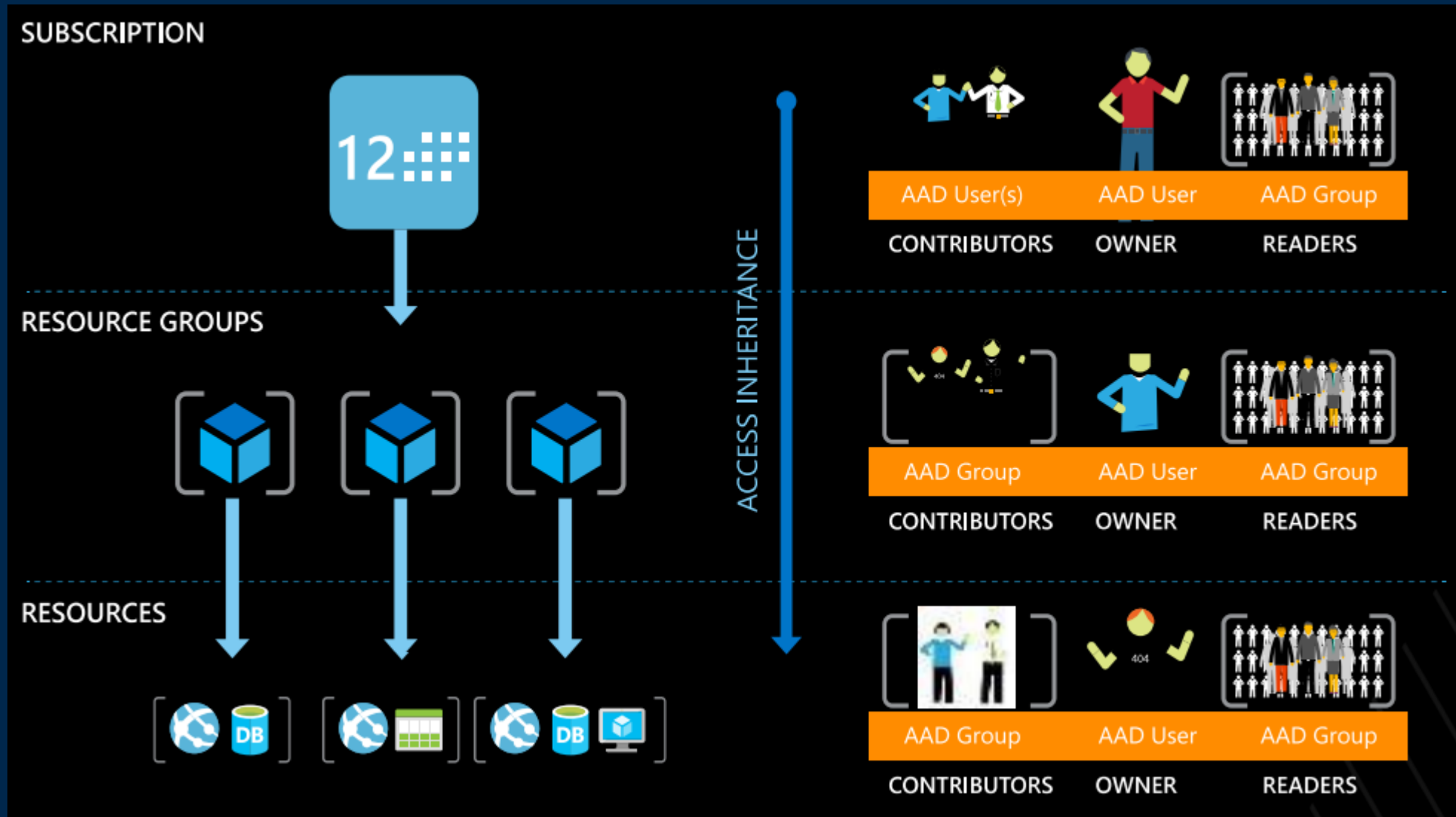
Azure regions

More than AWS & Google combined

165k+ miles of fiber

● Available region ⚙️ Announced region ◆ Availability zones

Azure AD and Role Based Access Control Scopes



EDA Resource Stack on Azure

Remote Control
Access



Azure Virtual Desktop

Workload
Services



License Server



Azure VM Scale Sets



Scheduler Server

Fast, Secure
Network



Network Security Group



VPN



ExpressRoute



Accelerated
Networking

High Performing
Storage



Azure NetApp Files

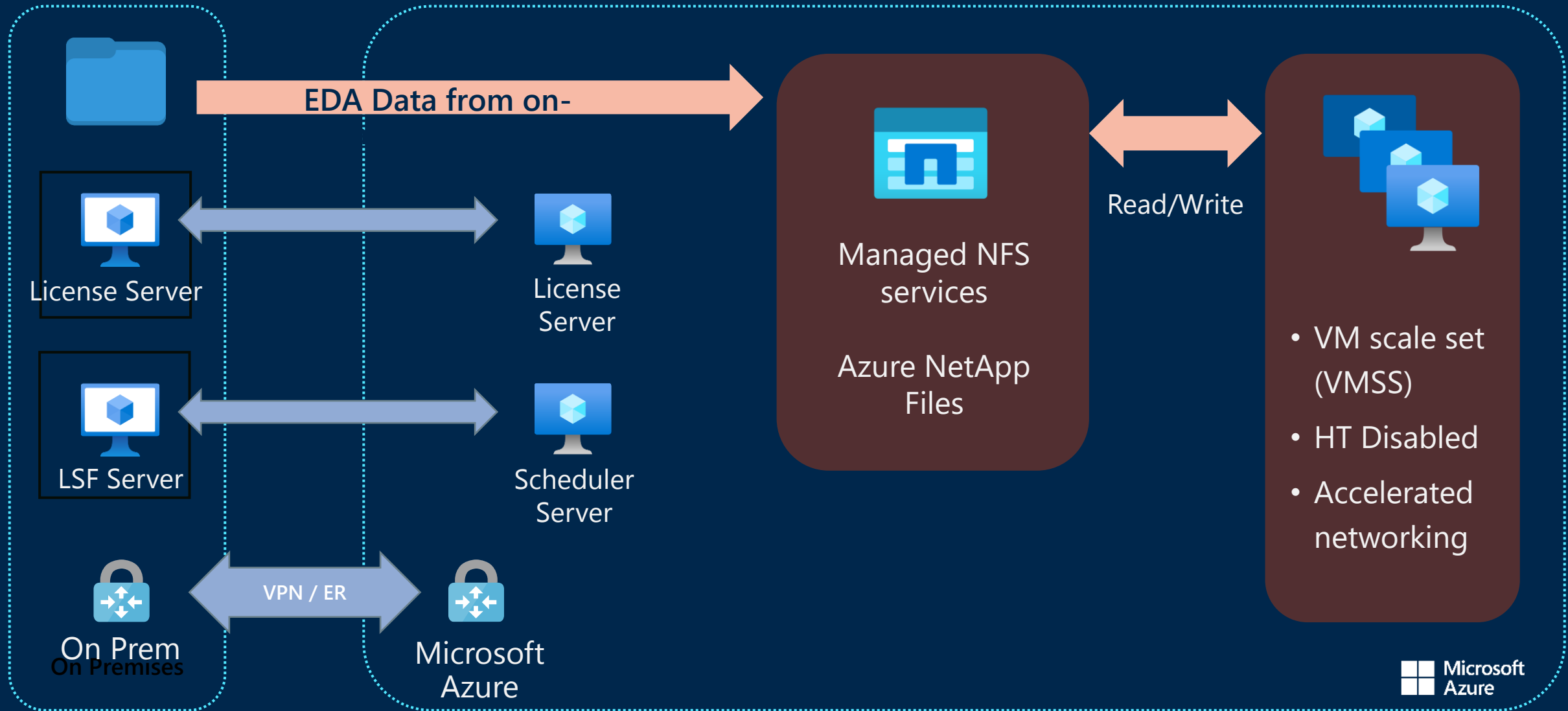


Azure NFS Blob

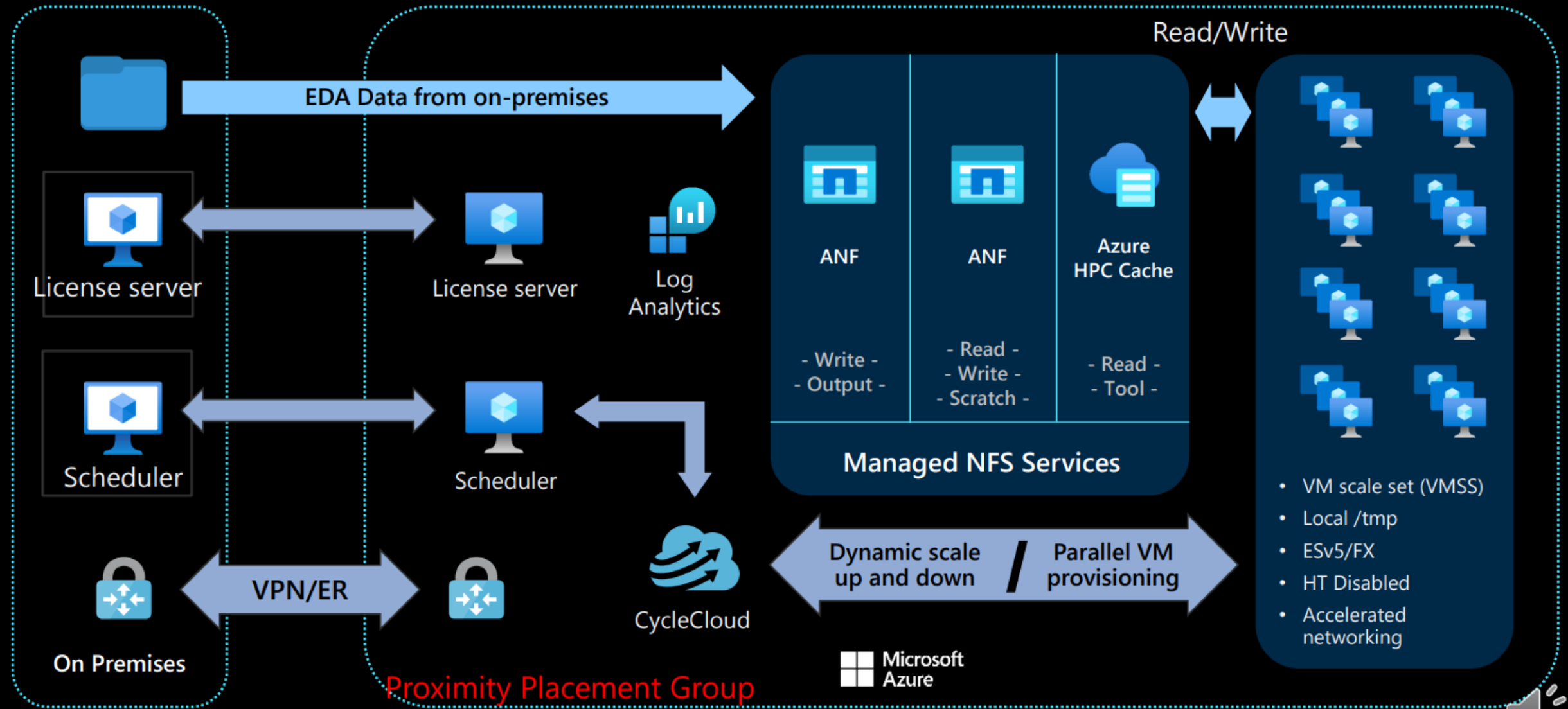
Optimized
Compute




Simple Architecture of EDA on Azure



A full production cluster



Examples of silicon design workloads








		Context	# iterations in full Design Cycle (e.g. 9 mo)	Number of parallel jobs (distributed)	Peak mem across all jobs (GB)	Average mem per jobs (GB)	# cores per job (Multi-threading)	Data I/O per iteration (GB)	Average Runtime per job (Hrs)	Azure Fit
IP Design	Circuit Layout	Full Chip	50	1	10	10	8	10	8	Fs72v2
	Circuit Simulation - Cells	Block	50	1,000	1	0.1	1	100	24	Fs72v2
	Circuit Simulation - MEM/IP	Block	50	100	60	16	1	100	24	Fs72v2
Chip Design (Front End)	High Level Synth (HLS)	Block	10	20	50	50	8	10	12	E64d v5
	Functional Simulation (RTL)	Block	810	1,000	8	4	1	3	0.20	HB120 v3
		Full Chip	270	500	64	16	1	10	0.75	HB120 v3
	Functional Simulation (Gate Level)	Block	20	2	384	128	1	10	12	E64d v5
		FullChip	5	1	1,500	1,500	1	100	72	E64d v5
	RTL Synthesis	Block	90	50	64	32	8	50	8	HB120 v3
		Full Chip	20	4	768	768	16	100	24	E64d v5
	CDC (Clock domain crossing)	Block	10	8	30	30	16	50	4	HB120 v3
	Formal Verification	Block	90	40	50	50	16	50	8	HB120 v3
	DFT (Scan/Bist/ATPG)	Block	30	4	384	384	16	50	4	HB120 v3
RTL Power Analysis	Block	90	4	64	64	16	50	4	E64d v5	
Chip Design (Back End)	APR (P&R)	Block	30	50	384	128	16	200	72	E64d v5
		Full Chip	20	4	768	768	16	500	72	M208s v2
	Signoff Timing	Block	90	250	128	80	16	100	6	FX
		Full Chip	60	50	800	800	16	700	12	FX
	Extraction	Block	90	30	100	50	32	200	6	FX
		Full Chip	30	256	300	300	32	1,000	6	M208s v2
	Signoff DRC/LVS	Block	90	16	384	200	200	200	8	FX
		Full Chip	20	10	2,000	2,000	244	1,000	12	M208s v2
	IR Drop	Full Chip	30	700	128	128	64	200	12	M208s v2
	ECO (e.g.Tweaker)	Full Chip	10	10	500	500	16	200	12	M208s v2

EDA Tools/ISV landscape

EDA	EDA Flow	Synopsys	Mentor	Cadence	Empyrean	Ansys
AMS/IP	Circuit Layout	Custom Compiler	Tanner	Virtuoso	Aether	x
	Circuit Simulation - Cells	Hspice	Eldo/AFS	Spectre	Qualib	x
	Circuit Simulation - MEM/IP	Hspice	Eldo/AFS	Spectre	ALPS	x
Front-End	High Level Synth (HLS)	x	Catapult	Stratus		x
	Functional Simulation (RTL)	VCS	Questa	xCelium / Ncsim		x
	Functional Simulation (Gates)	VCS	Questa	xCelium / Ncsim		x
	RTL Synthesis	Design Compiler	Oasys-RTL	Genus		x
	CDC (Clock Domain Crossing)	Spyglass CDC	Questa CDC	Conformal CDC		x
	Formal Verification	VS Formal / Formality	Formal-Pro	JasperGold / Conformal		x
	DFT (Scan/Bist/ATPG)	DFTMAX/Tetramax	Tessent	Modus		x
TRL Power Analysis	PrimePower	Power-Pro	Joules		PowerArtist	
Back-End	APR (P&R)	ICC-II	Nitro	Innovus	Argus	x
	Signoff Timing	PrimeTime	Optimus	Tempus		x
	Signoff Extraction	Star-RC	Xact-RC	Quantus /QRC	RCExplorer Extraction	x
	Signoff DRC/LVS	ICV	Calibre	Pegasus /Assura	Argus	x
	Signoff EM/IP Drop/Power	PrimePower	BlueWave	Voltus		RedHawk / RedHawk-SC
	Programmable ERC	ICV	Calibre PERC	Pegasus		x
	ECO (Tweaker)	PrimeTime ECO	Optimus	Tempus ECO		x
Post Tapeout	Computational Lithography (OPC, RET)	Proteus	Calibre	x		x



Azure VMs for EDA workloads



					
CPU	Intel Xeon Gold 6246R "Cascade Lake"	AMD EPYC 3rd Gen 7003 "Milan-X"	Intel Xeon Platinum 8168 "Skylake"	Intel Xeon Platinum 8370C "Ice Lake"	Intel Xeon Platinum 8180M "Skylake"
Cores/VM	24	32 – 120	4 – 44	2 – 96	4 – 208
CPU Frequency	3.4 GHz/4.1 GHz	3.675 GHz	3.4 GHz	3.5 GHz	2.5 GHz
Memory	42GB/core, 1008 GB	4 GB/core, 480 GB	8 GB/core, 352 GB	8GB/core, 768 GB	1 – 12 TB
Local Disk	~2 TB NVMe	~2 TB NVMe	700 GB NVMe	2.4 TB SSD	2 TB SATA
InfiniBand	None	200 Gb HDR	100 Gb EDR	None	56 Gb FDR
Network	50 GbE	50 GbE	50 GbE	25 GbE	16 GbE

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客戶案例EDA硬體規格

	 CPU	 CAD
Skus	Esv5	NCasTv3
CPU	Intel Xeon Platinum 8370C "Ice Lake"	AMD EPYC 7V12
Core / Frequency	16 Core / 3.5 GHz	16 Core / 3.3GHz
Memory	128 GB	110 GB
Local Disk	64GB SSD	64 GB
GPU	None	Nvidia Tesla T4 (16 GB)
NIC / Network	12500 Mbps	8000 Mbps

Azure NetApp Files service levels



Service level

Standard

Premium

Ultra

Throupgut

16 MB/s/TB

64 MB/s/TB

128 MB/s/TB

Latency

3-6ms

1-3ms

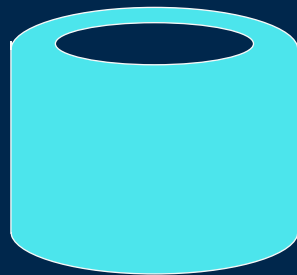
<1ms

Performance

Standard Performance -
1000 IOPS per TB (16k
IO) and 16MB/s/TB

Premium Performance –
4000 IOPS per TB (16k IO)
and 64MB/s/TB

Extreme Performance –
8000 IOPs per TB (16k IO)
and 128MB/s/TB



Volume Quota

=



Performance

VPN Gateway

VPN Gateway Sku	VpnGw1	VpnGw2
Site-to-Site	30	30
Throughput	650 Mbps	1 Gbps

Generation	SKU	Algorithms used	Throughput observed per tunnel	Packets per second per tunnel observed
Generation1	VpnGw1	GCMAES256	650 Mbps	58,000
		AES256 & SHA256	500 Mbps	50,000
		DES3 & SHA256	120 Mbps	50,000
Generation1	VpnGw2	GCMAES256	1 Gbps	90,000
		AES256 & SHA256	500 Mbps	80,000
		DES3 & SHA256	120 Mbps	55,000

<https://docs.microsoft.com/zh-tw/azure/vpn-gateway/vpn-gateway-about-vpngateways>

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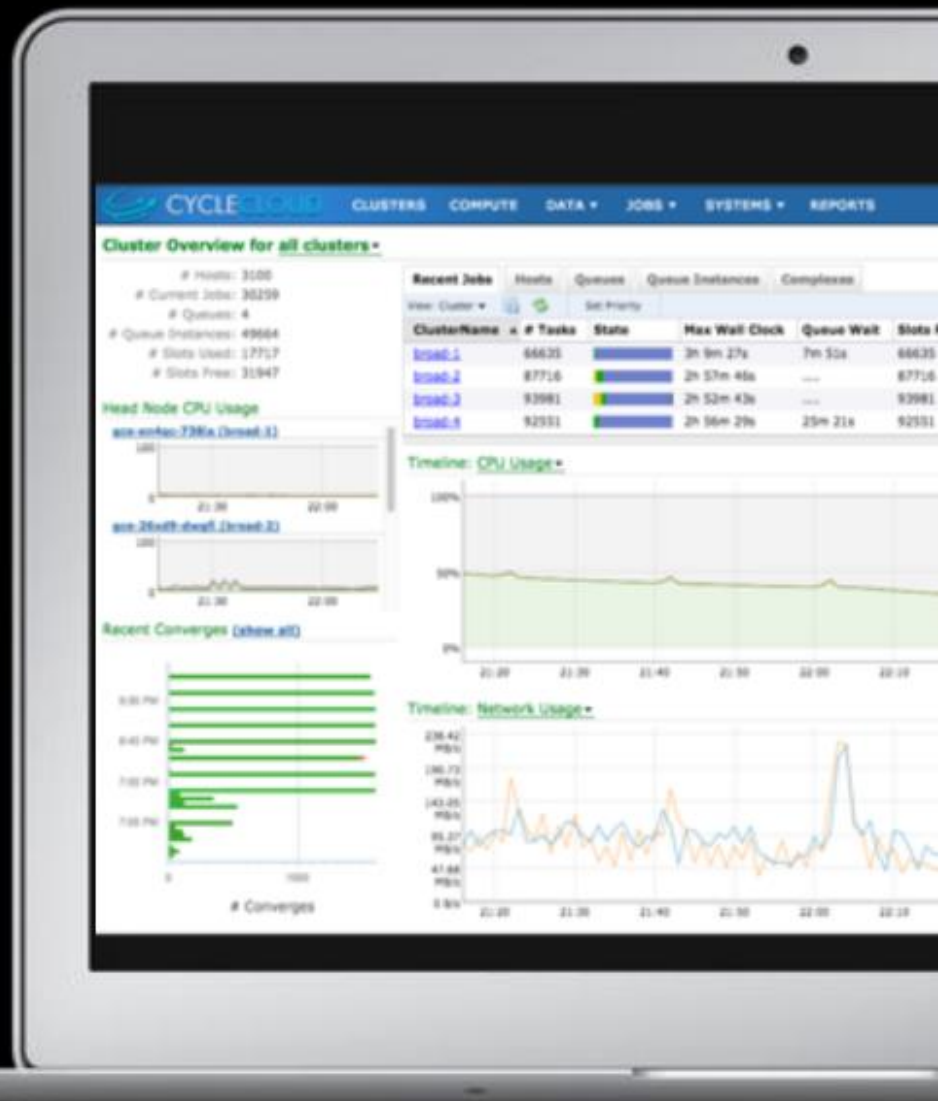
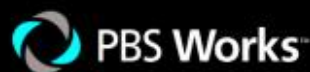
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Azure CycleCloud

- Instant access to resources
 - Deploy a complete HPC cluster in just minutes
 - Azure-enable workflows with no changes
- Support for all Azure IaaS components
- Cluster autoscaling
 - Automatic or manual resource control
- Cost reporting and controls
 - Near real-time cost reporting
 - Link usage to spend
 - Tools to manage and control costs
- Hybrid workflows
 - Link on-premises and cloud clusters
- Authorization and governance:
 - AD and Azure AD integration
 - Audit and event logging
 - RBAC authorization control



IBM Spectrum LSF 10.1.0.9 production-ready with an Azure resource connector built right in!

Azure Virtual Desktop

Customized Features

Security

Audit



磁碟機/儲存體重新導向 ①

- 不要重新導向任何磁碟機
- 重新導向所有磁碟機，包括稍後連線的磁碟機
- 動態磁碟機: 重新導向稍後連線的任何磁碟機
- 手動輸入磁碟機與標籤

剪貼簿重新導向 ①

- 遠端工作階段現在無法使用本機電腦上的剪貼簿
- 遠端工作階段現已可使用本機電腦上的剪貼簿

成功案列

知名積體電路業者

- 案例痛點
 - 疫情之下產生大量遠距辦公需求
- 案例使用環境
 - 多點廠區且跨國
 - 開發人員分散各地，無法進公司上班
 - 地端機器不足且老舊，訂單量增加無法負荷



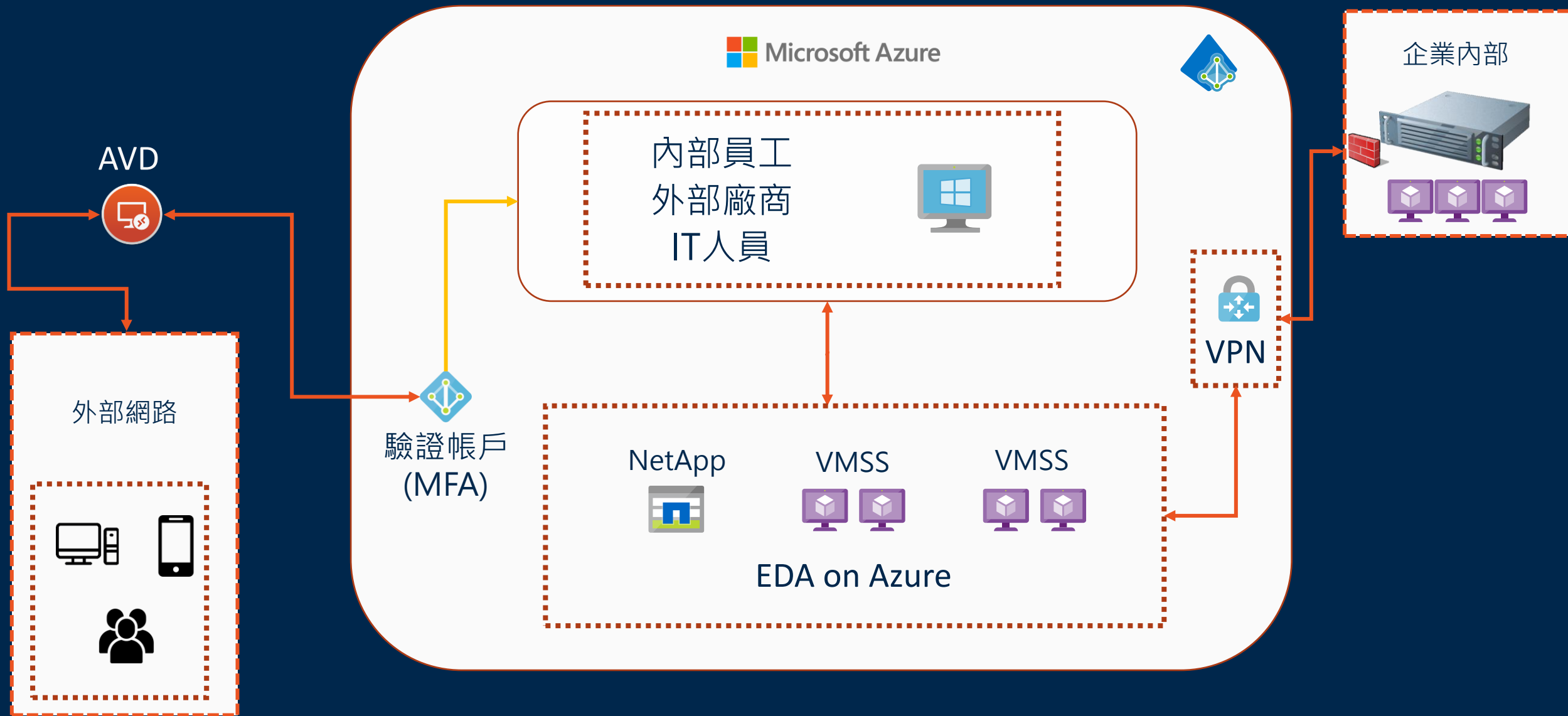
■ 成功案例

知名積體電路業者

- 導入後成效
 - 建立完整開發運算環境
 - 環境封閉且建立完整身分驗證審查機制
 - 外部廠商下單到收單都能透過事前配置雲端儲存體進行操作
 - 運算資源效能龐大，訂單可快速解決



使用端存取EDA服務流程





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Thank You !

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