

All Things SQL

In the Microsoft Cloud

David Klee



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About David Klee





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Specialties / Focus Areas / Passions:

- Virtualization & Cloud
- Performance Tuning
- Business Continuity
- Infrastructure Architecture
- Health & Efficiency
- Capacity Management



Founder & Technical Exorcist



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Major Cloud Players



*(My personal pick because they
... uhh... own the code.)*



Google Cloud Platform



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SQL Server

- Traditionally boxed product
- DMBS platform – and more
 - Relational database engine
 - Integration services
 - Reporting services
 - Analysis services
- Relational database launched on MS Azure in 2010



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Cloud Database Choices

laaS?



AaaS?

DBaaS?

QaaS?

PaaS?

ZaaS?



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DBaaS – Azure SQL Database

▪ Just a database...

▪ Fully compatible SQL Server 2019

▪ Use cases

- Ease of use
- Quick development
- Smaller databases
- POCs / Pilots
- DevOps
- Many single-tenant DBs



Application

SQL Server DB

SQL Server Instance

Operating System



Virtualization

Physical Server

Storage

Interconnects

Networking



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DBaaS – Azure SQL Database

■ Pros

■ No instance to manage

■ No OS to manage

■ Straightforward HA + DR options

■ Cons

■ Single database


■ No cross-database calls

■ No SQL Agent

- Use Azure Runbooks (PowerShell)

■ Code adjustments?

■ Migration strategy



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Azure SQL Database

■ “Serverless” option

■ New!

■ Charged for storage but not compute during ‘auto-pause’

■ Max 16 vCores

■ Max 1.5TB DB

Compute tier

Provisioned

Serverless

Compute Hardware


Hardware Configuration

Max vCores

Min vCores

Auto-pause delay


Data max size




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SQL Database Migrations

- Cannot backup DB and restore into
- Recreate schema / SSIS
- BACPAC import / export
 - DACPAC = schema for upgrades
 - BACPAC = schema and data for import / export
- Azure Database Migration Service
 - <https://azure.microsoft.com/en-us/services/database-migration/>

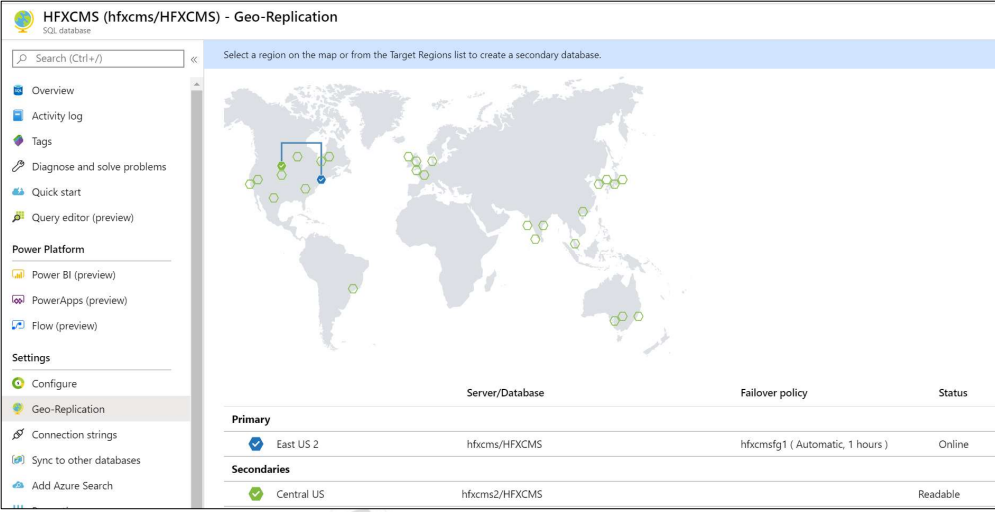





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SQL Database Disaster Recovery

- Trivial!



	Server/Database	Fallover policy	Status
Primary			
<input checked="" type="checkbox"/> East US 2	hfxcms/HFXCMS	hfxcmsfg1 (Automatic, 1 hours)	Online
Secondaries			
<input checked="" type="checkbox"/> Central US	hfxcms2/HFXCMS		Readable



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Instance-aaS – SQL Managed Instance

- SQL Server instance without operating system
- Almost a full SQL Server
- Multiple databases
- Features not available in SQL DB
 - XEvents
 - Service Broker
 - CDC
 - Transactional Replication
 - SQL Agent
 - DB Mail
 - Query Store
 - Cross-DB Queries
 - Linked Servers
 - CLR Assemblies

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SQL Managed Instance



- Pros
 - (Almost) full SQL Server instance
 - Full DB restore from Azure Blob
 - SQL Agent
 - HA + DR options?
 - Faster possible migration time
- Cons
 - Less flexibility
 - External dependencies won't work
 - HA + DR options? Backups?

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SQL Managed Instance Migrations



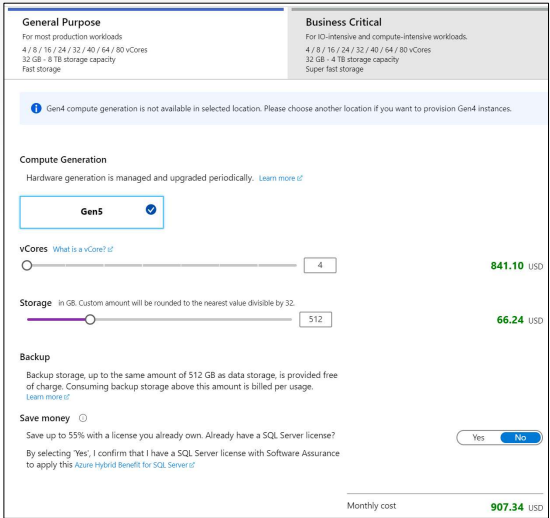
- Can backup DB and restore into via Azure Blob
- Recreate schema / SSIS
- BACPAC import / export
 - DACPAC = schema for upgrades
 - BACPAC = schema and data for import / export
- Azure Database Migration Service
 - <https://azure.microsoft.com/en-us/services/database-migration/>



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SQL Managed Instance Limitations



- DB engine + Agent only
 - No SSRS, SSAS
 - SSIS possible, but needs ADF
- Agent limitations
 - Not all job types exist
- Manual backups are COPY_ONLY
- 4 vCore minimum, 80 vCore max
- Storage
 - Up to 8TB ‘fast’ storage for GP
 - Up to 4TB for ‘super fast’ storage in BC



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SQL Managed Instance Limitations


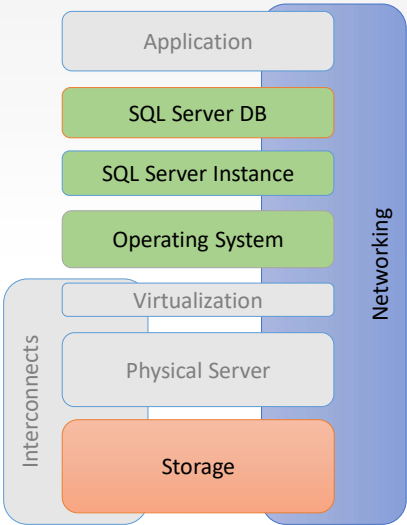

- 100 DBs max
- No PolyBase
- No access to server level functionality
 - *Is this really a bad thing?*
- App vendor support?
- Can backup INTO but not RESTORE FROM
 - SQL version always higher than boxed



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VM + SQL Server (IaaS)

- Pros
 - Full flexibility
 - Maximum customization
 - Fastest possible migration time
- Cons
 - You patch Windows
 - You patch SQL Server
 - You manage HA
 - You manage DR
 - You manage backups



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Choices

- What platform works best for you?
 - DBaaS
 - Instance-aaS
 - VMaaS
 - On-prem?
- DBAs work with Infra Admins
- Selection of platform depends on DB requirements
- Once you pick the platform...
- *Then you pick the SCALE*



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Scale



(img src: <https://auto.ndtv.com/lamborghini-cars/aventador-s>)



(img src: <https://www.toyota.com/sienna>)



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“Right-Sizing”

- Cloud claims: “pay for what you use”
- Not true** for most cloud services
- Reality: “pay by allocation”
- Allocate what you need

Virtual Machines

REGION:
West US

OPERATING SYSTEM:
Windows

TYPE:
SQL Server

TIER:
Standard

LICENSE:
SQL Enterprise

INSTANCE:
D13 v2: 8 Cores(s), 56 GB RAM, 400 GB Temporary storage, \$4.134/hour

Pay as you go option

Pay as you go

1 year reserved (~7% savings)

3 year reserved (~11% savings)

Save up to 40% with Windows Server Licenses you already own. [Learn more about Azure Hybrid Benefit to save compute costs.](#)

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×

730

Hours

\$3,017.82

Per month

You pay whether you use it or not...

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Resource Allocation

- What do you need?
 - CPU
 - RAM
 - Storage space
 - Storage SPEED
- More flexibility as approach VM
- YOU** have to define this, not a sysadmin
- Do you have a resource consumption baseline?
- Low-granularity averages ARE NOT ACCURATE

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CPU Performance

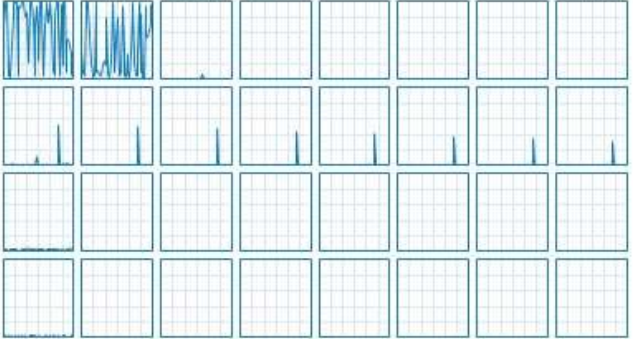
- “I have 32 CPUs!”
- “It’s still slow!”
- 6% CPU consumption average?


CPU


Intel(R) Xeon(R) CPU E7- 4870 @2.40GHz

% Utilization over 60 seconds

100%







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Windows Perfmon

- Collect raw data first
- Perfmon how-to guide
 - Download at hfxte.ch/perfmon
- 30-second interval
- Export to CSV (relog)
- Review trends
- Or use other third-party tools


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Perfmon Collection Setup - Windows Server 2008+

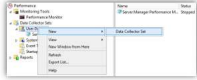
Perfmon Collection Setup Instructions for Windows Server 2008+

Performance statistics are critically vital for the long-term health and capacity management of an enterprise environment. Unless a third-party performance statistics collection utility, such as Microsoft System Center, is already in place in an environment, Perfmon on each Windows Server can be configured to constantly record performance statistics for future use.


Open Windows Perfmon and expand the Data Collector Sets, User Defined tree item.




Right-click on User Defined, select New, and select Data Collector Set.



Name the Data Collector Set appropriately, and select Create manually (Advanced).







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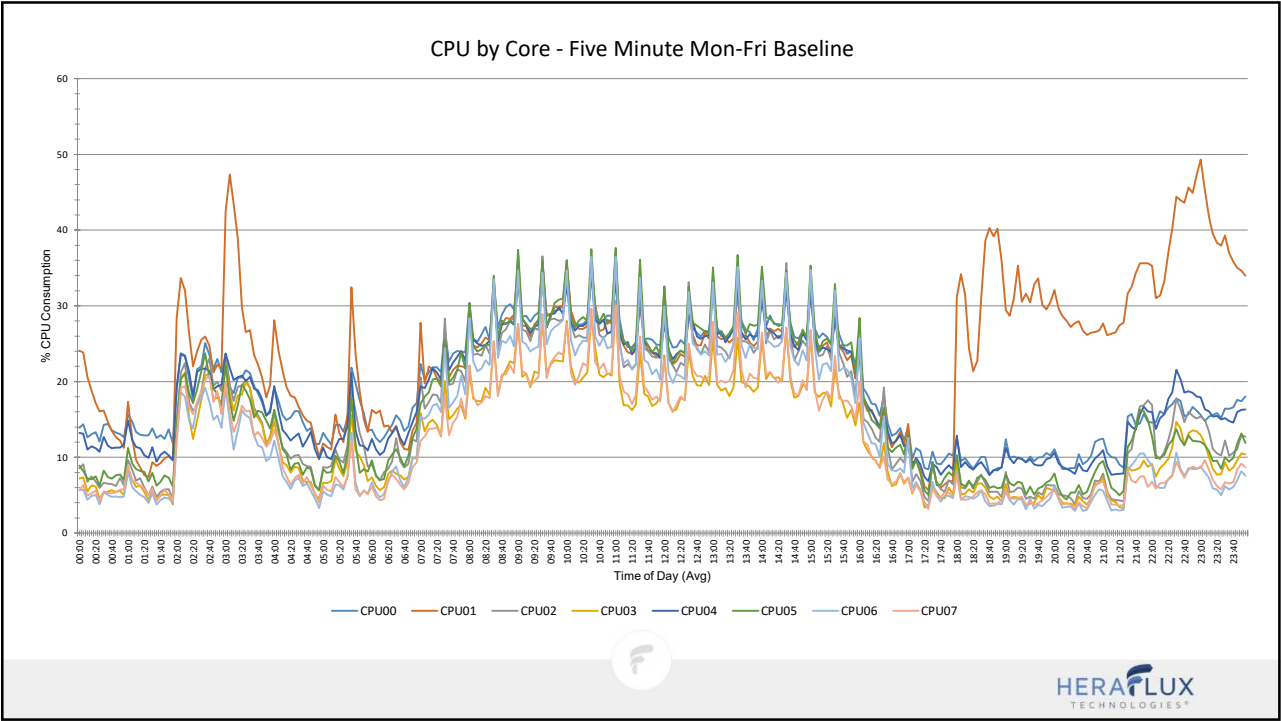
Perfmon to SQL

PowerShell Loader for Perfmon Files into SQL Server

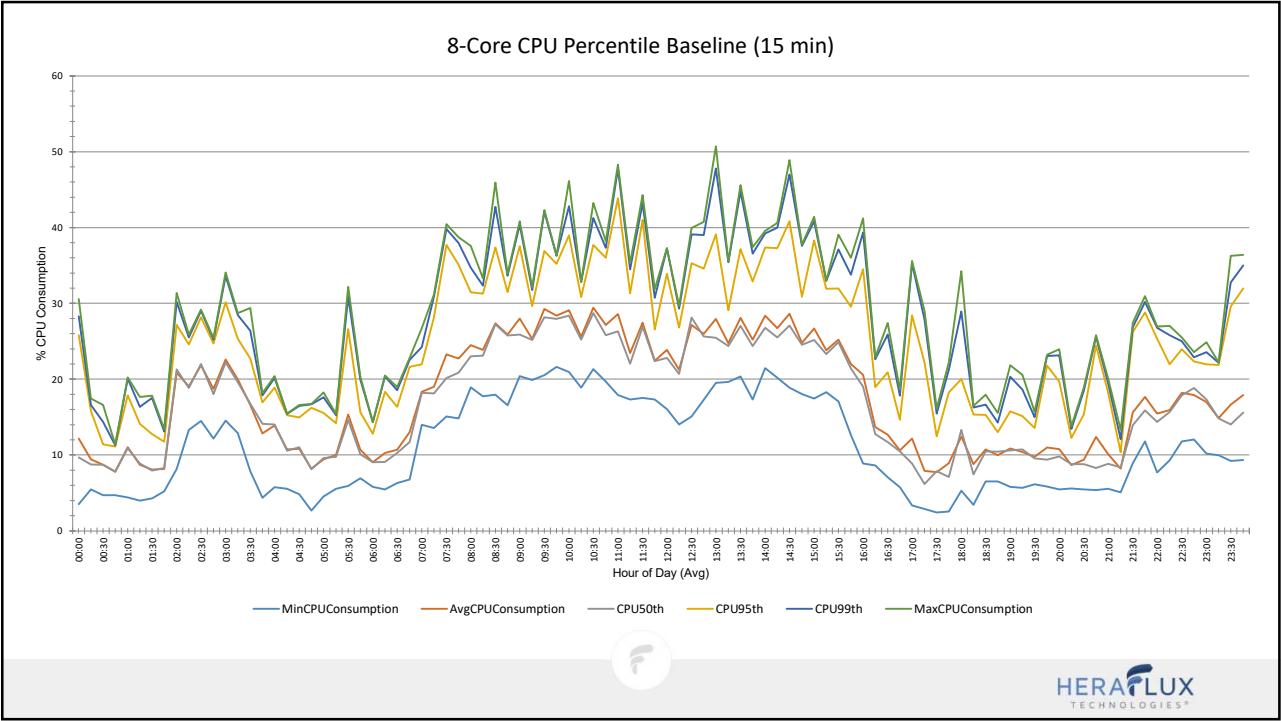
<https://github.com/heraflux/BLGtoSQL>



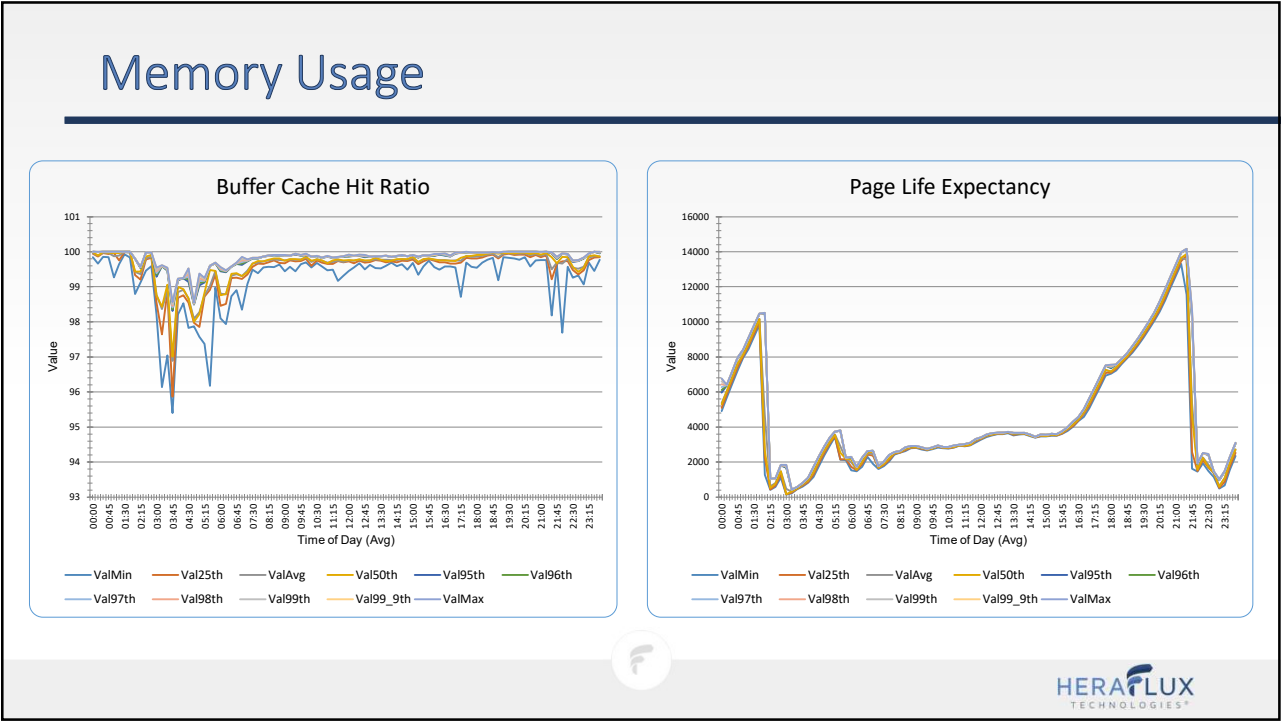
23



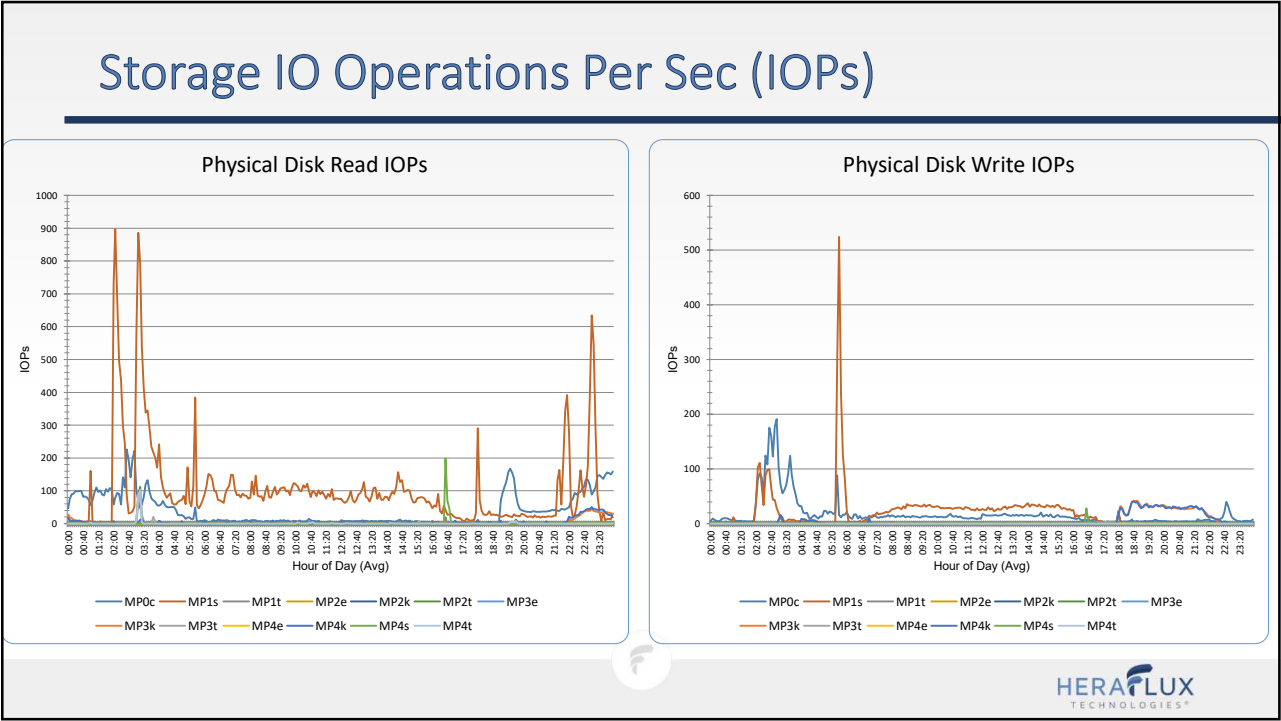
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Limits

- Single drives have IOPs / throughput limits
- Scaling up speed is costly if you don't need the *space*
- DBaaS / Instance-aaS
 - Less choice
- VMs
 - Windows Storage Spaces
 - Bundle multiple smaller disks together for faster performance and lower costs

DISK SIZE:

P4: 32 GiB, 120 IOPS, 25 MB/sec, \$5.280/month
P6: 64 GiB, 240 IOPS, 50 MB/sec, \$10.207/month
P10: 128 GiB, 500 IOPS, 100 MB/sec, \$19.710/month
P15: 256 GiB, 1100 IOPS, 125 MB/sec, \$38.012/month
P20: 512 GiB, 2300 IOPS, 150 MB/sec, \$73.220/month
P30: 1024 GiB, 5000 IOPS, 200 MB/sec, \$135.170/month
P40: 2048 GiB, 7500 IOPS, 250 MB/sec, \$259.046/month
P50: 4096 GiB, 7500 IOPS, 250 MB/sec, \$495.566/month

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Not Just SQL Server

- Azure Database for:
 - PostgreSQL
 - MySQL / MariaDB
- Cosmos DB
- Data Lake
- Data Factories



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Recap


- You must determine resource allocations
- Saving your company \$\$ makes you a hero
- Many platform choices
 - DBaaS / Instance-aaS / VMaaS
- With SQL Server - pay by allocation, not consumption
- So allocate just what you need!
- Leave just enough headroom
- Scale as needed




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Questions at 12:30p Q&A Session





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Thanks for attending!



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