Azure Backup Cost Calculation

Azure General Parameters

Parameter	Unit	Default	Description
R_{azure}	%	100%	Azure Backup Data Reduction (volume size after reduction in percent of original volume)
ψ_{stacc}	MB/s	3,200 MB/s	Maximum throughput of a single Azure blob storage account (25 or 60 Gb/s $\implies$ 3200 or 7680 MB/s)

Veeam Infrastructure Parameters

Parameter	Unit	Default	Description
R_{veeam}	%	50%	Veeam Data Reduction (volume size after reduction in percent of original volume)
β_{veeam}	kB	1024 kB	Veeam blocksize (read at source)
ψ_{worker}	MB/s	125 MB/s	Maximum throughput of a single Veeam worker (depends on worker VM size: 70 - 140 MB/s)
$N_{veeam}^{max(\text{VBR})}$		10,000	Maximum number of protected VMs per Veeam Backup & Replication server
$N_{veeam}^{max(\text{appl})}$		3,000	Maximum number of protected VMs per Veeam Backup for Azure appliance
$N_{veeam}^{max(\text{policy})}$		75	Maximum number of protected VMs per Veeam Backup for Azure policy
$J_{veeam}^{max(\text{appl})}$		300	Maximum number of policies per Veeam Backup for Azure appliance
M_{veeam}^{appl}	GB	32	Provisioned RAM per Veeam Backup for Azure appliance VM

Azure Cost Parameters

These depend on chosen region, VM size, storage tier, reserved vs. pay-as-you-go, etc., and should be selectable from Azure cost tables. The given defaults are just examples from *WestEurope* region.

Parameter	Unit	Default	Description
R_{azure}	%	100%	Azure Backup Data Reduction (volume size after reduction in percent of original volume)
$C_{azure}^{storage}$	$ per GB per month	*(hot RA-GRS payg)* 0.04900 $	Azure blob storage (used as Veeam backup target) cost per GB per month
C_{azure}^{vault}	$ per GB per month	*(RA-GRS)* 0.05696 $	Azure backup vault (used as Azure backup target) cost per GB per month
C_{azure}^{vm}	$ per hour	*(Std_F4s_v2 payg)* 0.22700 $	Azure VM cost per hour
C_{azure}^{snap}	$ per GB per month	0.13020 $	Azure **VM snapshot** cost per GB per month
$C_{azure}^{backupsnap}$	$ per GB per month	0.14500 $	Azure **backup snapshot** cost per GB per month
C_{azure}^{put}	$ per 10,000	*(hot tier)* 0.10800 $	Cost of 10,000 Azure storage account API *put* calls
$C_{azure}^{backup(\text{small})}$	$ per VM	5 $	Monthly cost of Azure backup service per VM of provisioned size < 50 GB

Parameter	Unit	Default	Description
$C_{azure}^{backup(\text{medium})}$	\$ per VM	10 \$	Monthly cost of Azure backup service per VM of provisioned size $\geq$ 50 GB and $<$ 500 GB
$C_{azure}^{backup(\text{addon})}$	\$ per VM per 500 GB	10 \$	Monthly add-on cost in steps of 500 GB for Azure backup service per VM of provisioned size $\geq$ 500 GB

Note: All Azure cost parameters need to be multiplied by R_{azure} to get the discounted value, **also for Azure services used by the Veeam infrastructure**, given that the provided discount applies to all Azure services!

Veeam Cost Parameters

Parameter	Unit	Default	Description
D_{veeam}	%	30%	Veeam discount percentage
C_{veeam}^{list}	\$ per VM per month	10.85 \$	VUL list price (= 1.302, 00 \$ per 10 VMs per year)
$C_{veeam}^{real} = C_{veeam}^{list} \cdot (1 - D_{veeam})$	\$ per VM per month	7.60 \$	Real (i.e. discounted) VUL cost per VM per month

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Main Input variables

Variable	Unit	Description	Constraints
Δ_{daily}	%	Daily change rate (average for all workloads)	
N_{vm}^{small}		Number of small VMs $<$ 50 GB	
N_{vm}^{medium}		Number of medium VMs $\geq$ 50 GB and $<$ 500 GB	
N_{vm}^{large}		Number of large VMs $\geq$ 500 GB	
N_{vm}		Total number of VMs to be protected	$= N_{vm}^{small} + N_{vm}^{medium} + N_{vm}^{large}$
V_{vm}	GB	Average provisoned size of protected VMs	
U_{vm}	%	Average disk utilization of protected VMs	
T_{incr}	hours	Time window for incremental backups	
R_{days}	days	Retention	
N_{snaps}		Number of daily snapshots to be kept	must be ≥ 2
δ_{isfull}		Does first Azure native snapshot require full (used) size ?	1 = yes | 0 = no

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Calculation Formulas

General

Value			Formula
Total provisioned source volume of workloads in TB (all VMs)	V_{prov}	$=$	$(N_{vm} \cdot V_{vm}) \div 1024$
Total used source volume (average) of workloads in TB (all VMs)	V_{used}	$=$	$V_{prov} \cdot U_{vm}$
Total snapshot volume in TB (if $\delta_{isfull} = 0$)	V_{snaps}	$=$	$V_{used} \cdot \Delta_{daily} \cdot N_{snaps}$
Total snapshot volume in TB (if $\delta_{isfull} = 1$)	V_{snaps}	$=$	$V_{used} + (V_{used} \cdot \Delta_{daily} \cdot (N_{snaps} - 1))$
$\implies$ Total snapshot volume in TB as function of δ_{isfull}	$V_{snaps}(\delta_{isfull})$	$=$	$\Big((V_{used} \cdot \Delta_{daily} \cdot N_{snaps}) \cdot (1 - \delta_{isfull})\Big) + \Big(\Big(V_{used} + (V_{used} \cdot \Delta_{daily} \cdot (N_{snaps} - 1))\Big) \cdot \delta_{isfull}\Big)$

Azure Backup

Value			Formula
Volume of full backups in TB (all VMs)	V_{azure}^{full}	$=$	$R_{azure} \cdot V_{used}$
Volume of incremental backups in TB (all VMs)	V_{azure}^{incr}	$=$	$V_{azure}^{full} \cdot \Delta_{daily}$
Total backup volume in TB for retention of r days (no GFS, all VMs)	$V_{azure}^{total}(r)$	$=$	$V_{azure}^{full} + (V_{azure}^{incr} \cdot (r - 1))$
Monthly cost of Azure Backup service for all small VMs < 50 GB	C_{azure}^{small}	$=$	$N_{vm}^{small} \cdot C_{azure}^{backup(small)}$
Monthly cost of Azure Backup service for all medium VMs ≥ 50 GB and < 500 GB	C_{azure}^{medium}	$=$	$N_{vm}^{medium} \cdot C_{azure}^{backup(medium)}$
Monthly cost of Azure Backup service for a single large VM ≥ 500 GB	$C_{azure}^{backup(large)}$	$=$	$C_{azure}^{backup(\text{addon})} \cdot \text{roundup}\Big(V_{vm}^{large} \div 500\text{GB}\Big)$
Monthly cost of Azure Backup service for all large VMs ≥ 500 GB	C_{azure}^{large}	$=$	$N_{vm}^{large} \cdot C_{azure}^{backup(large)}$
Total monthly cost of Azure Backup service for all VMs	$C_{azure}^{service}$	$=$	$C_{azure}^{small} + C_{azure}^{medium} + C_{azure}^{large}$
Monthly total cost of Azure Backup vault storage for all VMs with retention of r days	$C_{azurevault}^{total}(r)$	$=$	$V_{azure}^{total}(r) \cdot C_{azure}^{vault} \cdot 1024$
Monthly total cost of Azure Backup snapshots for all VMs	$C_{azure}^{snaptotal}(\delta_{isfull})$	$=$	$V_{snaps}(\delta_{isfull}) \cdot C_{azure}^{backupsnap} \cdot 1024$
$\implies$ Total monthly Azure Backup cost	$C_{azure}^{total}(r, \delta_{isfull})$	$=$	$C_{azure}^{service} + C_{azurevault}^{total}(r) + C_{azure}^{snaptotal}(\delta_{isfull})$

Veeam Backup

Value			Formula
Volume of full backups in TB (all VMs)	V_{veeam}^{full}	=	$R_{veeam} \cdot V_{used}$
Volume of incremental backups in TB (all VMs)	V_{veeam}^{incr}	=	$V_{veeam}^{full} \cdot \Delta_{daily}$
Total backup volume in TB for retention of r days (no GFS, all VMs)	$V_{veeam}^{total}(r)$	=	$V_{veeam}^{full} + (V_{veeam}^{incr} \cdot (r-1))$
Throughput required for incremental backup in MB/s	Φ_{incr}	=	$(V_{veeam}^{incr} \cdot 1024^2) \div (T_{incr} \cdot 3600)$
Veeam workers required for incremental backup rounded up to full integer	$N_{workers}$	=	$\Phi_{incr} \div \psi_{worker}$
Estimated number of API *put* calls within given r days incrementals only	$A_{put}(r)$	=	$(r \cdot V_{veeam}^{incr} \cdot 1024^3) \div \beta_{veeam}$
Maximum number of Veeam workers per storage account rounded up to full integer, based on storage account limit given as ψ_{stacc}	$N_{maxworkers}(\psi_{stacc})$	=	$\psi_{stacc} \div \psi_{worker}$
Number of storage accounts required rounded up to full integer, based on storage account limit given as ψ_{stacc}	$N_{stacc}(\psi_{stacc})$	=	$\max\Big((\Phi_{incr} \div \psi_{stacc})\ ,\ (N_{workers} \div N_{maxworkers})\Big)$
Appliance RAM available for policies in GB (e.g. 28.9 GB for an appliance VM with 32 GB)	M_{veeam}^{pol}	=	$M_{veeam}^{appl} - (M_{veeam}^{appl} \cdot 0.05) - 1.5\text{GB}$
Max number of VBAzure policies per appliance (based on RAM only)	$J_{veeam}^{appl(\text{RAM})}$	=	$1024 \cdot M_{veeam}^{pol} \div (10 + N_{veeam}^{max(\text{policy})})$
Resulting max number of VBAzure policies per appliance	J_{veeam}^{appl}	=	$\min\Big(J_{veeam}^{max(\text{appl})}\ ,\ J_{veeam}^{appl(\text{RAM})}\Big)$