Azure Backup Cost Calculation

General Parameters

Parameter	Unit	Default	Description
P_{veeam}	%	50%	Veeam Data Reduction (in percent subtracted from original volume)
P_{azure}	%	0%	Azure Data Reduction (in percent subtracted from original volume)
Δ_{daily}	%	3.0%	Daily change rate (average for all workloads)
β_{veeam}	kB	1024 kB	Veeam blocksize (read at source)
ψ_{worker}	MB/s	90 MB/s	Maximum throughput of a single Veeam worker (depends on worker VM size: 90, 180 or 270 MB/s)
ψ_{stacc}	MB/s	3200 MB/s	Maximum throughput of a single Azure blob storage account (25 or 60 Gb/s $\Longrightarrow$ 3200 or 7680 MB/s)

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
D_{azure}	%	0%	Azure discount percentage
$C_{azure}^{storage}$	$ 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 API *put* calls

Parameter	Unit	Default	Description
$C_{azure}^{backup(small)}$	$ per VM	5 $	Monthly cost of Azure backup service per VM of provisioned size < 50 GB
$C_{azure}^{backup(medium)}$	$ per VM	10 $	Monthly cost of Azure backup service per VM of provisioned size ≥ 50 GB and < 500 GB
$C_{azure}^{backup(addon)}$	$ per VM per 500 GB	10 $	Monthly add-on cost in steps of 500 GB for Azure backup service per VM of provisioned size ≥ 500 GB

> All cost parameters need to be multiplied by $\left(1 - D_{azure}\right)$ to get the discounted value, given that the provided discount applies to all Azure services.

Veeam Cost Parameters

Constant	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

Main Input variables

Variable	Unit	Description	Constraints
N_{vm}^{small}		Number of small VMs < 50 GB	
N_{vm}^{medium}		Number of medium VMs ≥ 50 GB and < 500 GB	
N_{vm}^{large}		Number of large VMs ≥ 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	

Variable	Unit	Description	Constraints
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

Calculation Formulas

General

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

Azure Backup

Value			Formula
Volume of full backups in TB (all VMs)	V_{azure}^{full}	$=$	$(1 - P_{azure}) \cdot V_{used}$
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)	$V_{azure}^{total}(r)$	$=$	$V_{azure}^{full} + \left(V_{azure}^{incr} \cdot (r - 1)\right)$
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 all large VMs ≥ 500 GB	C_{azure}^{large}	$=$	$N_{vm}^{large} \cdot C_{azure}^{backup(large)}$

Value			Formula
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	$C_{azurevault}^{ttotal}(r)$	$=$	$V_{azure}^{total}(r) \cdot C_{azure}^{vault} \cdot 1024$
Monthly total cost of Azure Backup snapshots for all VMs	$C_{azure}^{snaptotal}(\delta_{isfull})$	$=$	$V_{snaps}(\delta_{isfull}) \cdot C_{azure}^{backupsnap} \cdot 1024$
$\Longrightarrow$ Total monthly Azure Backup cost	$C_{azure}^{ttotal}(r, \delta_{isfull})$	$=$	$C_{azure}^{service} + C_{azurevault}^{ttotal}(r) + C_{azure}^{snaptotal}(\delta_{isfull})$

Veeam Backup

Value			Formula
Volume of full backups in TB (all VMs)	V_{veeam}^{full}	$=$	$(1 - P_{veeam}) \cdot V_{used}$
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)	$V_{veeam}^{total}(r)$	$=$	$V_{veeam}^{full} + \left(V_{veeam}^{incr} \cdot (r-1)\right)$
Throughput required for incremental backup in MB/s	Φ_{incr}	$=$	$\left(V_{veeam}^{incr} \cdot 1024^2\right) \div \left(T_{incr} \cdot 3600\right)$
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	$A_{put}(r)$	$=$	$\left(r \cdot V_{veeam}^{incr} \cdot 1024^3\right) \div \beta_{veeam}$
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}	$N_{stacc}(\psi_{stacc})$	$=$	$\max\Big((\Phi_{incr} \div \psi_{stacc}), (N_{workers} \div N_{maxworkers})\Big)$