WEEK 2 ASSIGNMENT

Large-Scale Data Storage Systems – DATA-5400 | Spring 2020

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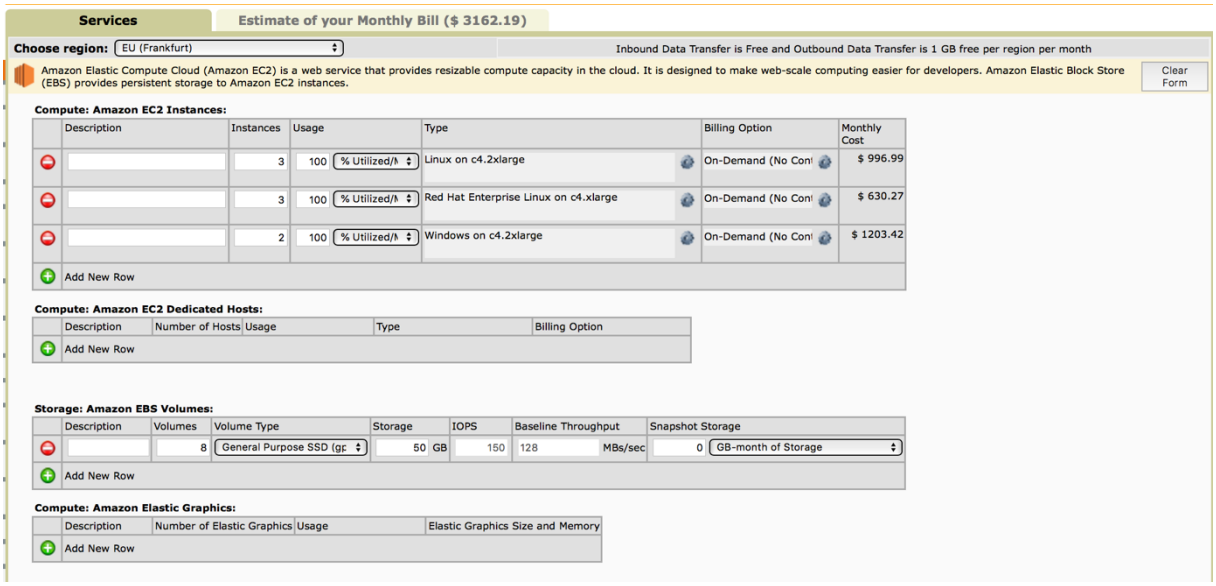
Estimating the costs necessary for establishing cloud architecture in advance is a necessity for every business. All major cloud service providers have online calculators which allow for calculation of monthly costs for services and products. In this assignment, I am using the AWS (https://calculator.s3.amazonaws.com/index.html) and Microsoft Azure (https://azure.microsoft.com/en-us/pricing/calculator/) calculators in order to compare the costs for an architecture containing eight virtual machines (VM), six Linux based, and two Windows based with 50 GB storage each

1. Estimating cloud service costs using the AWS calculator

Amazon Elastic Compute Cloud (Amazon EC2) provides resizable compute activity in the cloud. Estimating prices is done using the what they call “simple monthly calculator”.

I specified 3 Linux VMs with 8 CPUs and 3 Red Hat Enterprise Linux VMs with 4 CPUs. The 2 instances of Windows use 8 CPUs. For each of the eight VMs, I allocated 50 GB storage. The region I selected was EU (Frankfurt) as this is closest to my home (Austria). Calculating the cost for this package yields a monthly bill of 3162.19$.



When taking a more detailed look at the bill, one can see that the majority of costs with approx. 2878.28$ accounts solely for the computing. The cost for the volumes is with 47.60$ negligible. Further 287.48$ are assigned for AWS support services. There is also a discount of 3.57$, which seems hilarious.

Amazon EC2 Service (EU (Frankfurt))			$ 2878.28
Compute:	$ 2830.68		
EBS Volumes:	$ 47.60		
EBS IOPS:	$ 0.00		
AWS Support (Business)			$ 287.48
Support for all AWS services:	$ 287.48		
Free Tier Discount:		$	-3.57
Total Monthly Payment:		$	3162.19

Impact of region on cost

Changing the region to US East (N. Virginia) yields a reduction in costs. Both, the VMs and the storage are cheaper leading to a saving of 274.05$ by just moving the VMs to the US.

Amazon EC2 Service (US East (N. Virginia))			$ 2604.23
Compute:	$ 2564.23		
EBS Volumes:	$ 40.00		
EBS IOPS:	$ 0.00		

Changing the region to Asia Pacific (Sydney) increases the costs for the same services and with 3202.23$ per month this is even more expensive than the Europe region.

Amazon EC2 Service (Asia Pacific (Sydney))			$ 3202.23
Compute:	$ 3154.23		
EBS Volumes:	$ 48.00		
EBS IOPS:	$ 0.00		

To conclude the impact of the region on the bill I can say that there are differences between regions that impact pricing. Although, I haven´t tested all regions, but from the three tested regions, the Asia Pacific (Sydney) region was the most expensive and the US East region (N. Virginia) the cheapest option for the same package. It definitely pays off to compare cost based on different regions. Initially, I chose the region Europe (Frankfurt) based on proximity to my place here in Austria. This might seem a plausible decision but one that has an impact on cost. Generally, an AWS region is defined as a geographic area where AWS has data centers. It seems that N. Virginia is typically the cheapest region and Sao Paulo the most expensive one. However, not all services might be available in all regions [1].

Impact of payment and billing options

Changing the payment and billing options provides a further possibility to reduce costs. When choosing the option “1 Yr No Upfront Reserved”, for the Frankfurt region set up, the costs drop to 2212.05$ for computing and storage costs leading to a saving of 666.23$ for the compute. 1 Yr No Upfront Reserved gives you an hourly computing cost of 0.315$ without upfront pricing. Further billing options can further decrease the hourly computing price but have more constrains like a 3-year contract and partial upfront payments.

Compute: Amazon EC2 Instances:

	Description	Instances	Usage	Type	Billing Option	Monthly Cost
		3	100 % Utilized/M	Linux on c4.2xlarge	1 Yr No Upfront Reser	$ 689.85
		3	100 % Utilized/M	Red Hat Enterprise Linux on c4.xlarge	1 Yr No Upfront Reser	$ 477.42
		2	100 % Utilized/M	Windows on c4.2xlarge	1 Yr No Upfront Reser	$ 997.18
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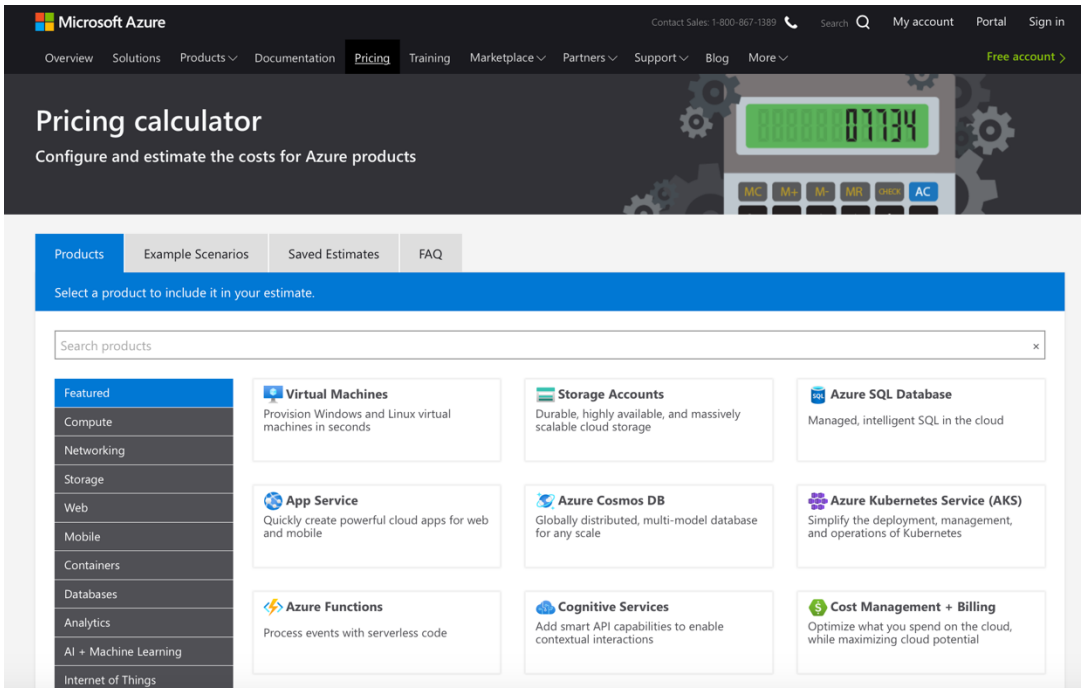
Compute: Amazon EC2 Dedicated Hosts:

Amazon EC2 Service (EU (Frankfurt))			$ 2212.05
Compute:	$	2164.45	
EBS Volumes:	$	47.60	
EBS IOPS:	$	0.00	
Reserved Instances (one-time fee):	$	0.00	

2. Estimating cloud service costs using the Azure Calculator

The pricing calculator to configure and estimate the costs for Azure products can be found on the following website: https://azure.microsoft.com/en-us/pricing/calculator/ . Upon selection of the Virtual Machines tab, one can enter the specifications for a new VM in a separate window below.



Selecting Germany Central as region and specifying six General purpose Dv3 VMs with varying number of CPUs for Linux and two VMs for Windows yielded an estimated monthly cost of 8086,64$. According to Microsoft Azure the Dv3 family is the latest generation for general purpose VMs powered by Intel® Xeon® processors and appropriate for a variety of workloads.

The paying option was pay as you go and the number of hours specified for VMs in use was 730 hours. For the instances selected, there was no other payment option available.

Microsoft Azure Estimate				
Your Estimate				
Service type	Custom name	Region	Description	Estimated Cost
Virtual Machines		Germany Central	3 DS13 v2 (8 vCPU(s), 56 GB RAM) x 730 Hours; Linux – Red Hat Enterprise Linux; Pay as you go; 3 managed OS disks – S4, 100 transaction units	$2.236,97
Virtual Machines		Germany Central	2 DS13-4 v2 (4 vCPU(s), 56 GB RAM) x 730 Hours; Windows – SQL Server; Pay as you go; 2 managed OS disks – S4, 100 transaction units	$3.897,41
Virtual Machines		Germany Central	3 DS13-4 v2 (4 vCPU(s), 56 GB RAM) x 730 Hours; Linux – CentOS; Pay as you go; 3 managed OS disks – S4, 100 transaction units	$1.952,27
Support			Support	$0,00
			Licensing Program	Microsoft Online Services Agreement
			Monthly Total	$8.086,64
			Annual Total	$97.039,72
Disclaimer				
All prices shown are in US Dollar ($). This is a summary estimate, not a quote. For up to date pricing information please visit https://azure.microsoft.com/pricing/calculator/				
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Also, in this calculation the region matters. I tried different regions and found the East US2 region to be among the cheapest whereas European regions like Switzerland, France and the UK are much more expensive.

Microsoft Azure Estimate

Your Estimate

Service type	Custom name	Region	Description	Estimated Cost
Virtual Machines		East US 2	3 DS13 v2 (8 vCPU(s), 56 GB RAM) x 730 Hours; Linux – Red Hat Enterprise Linux; Pay as you go; 3 managed OS disks – S4, 100 transaction units	$1.598,98
Virtual Machines		East US 2	2 DS13-4 v2 (4 vCPU(s), 56 GB RAM) x 730 Hours; Windows – SQL Server; Pay as you go; 2 managed OS disks – S4, 100 transaction units	$3.612,24
Virtual Machines		East US 2	3 DS13-4 v2 (4 vCPU(s), 56 GB RAM) x 730 Hours; Linux – CentOS; Pay as you go; 3 managed OS disks – S4, 100 transaction units	$1.314,28
Support			**Support**	$0,00
			Licensing Program	**Microsoft Online Services Agreement**
			Monthly Total	$6.525,50
			Annual Total	$78.305,98
Disclaimer				
All prices shown are in US Dollar ($). This is a summary estimate, not a quote. For up to date pricing information please visit https://azure.microsoft.com/pricing/calculator/				
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Now, that I have selected the US East 2 region, other payment options become available. I chose a 3-year payment plan for all instances and the costs dropped down to 4659,09$ per month.

Microsoft Azure Estimate

Your Estimate

Service type	Custom name	Region	Description	Estimated Cost
Virtual Machines		East US 2	3 DS13 v2 (8 vCPU(s), 56 GB RAM); Linux – Red Hat Enterprise Linux; 3 year reserved; 3 managed OS disks – S4, 100 transaction units	$902,36
Virtual Machines		East US 2	2 DS13-4 v2 (4 vCPU(s), 56 GB RAM); Windows – SQL Server; 3 year reserved; 2 managed OS disks – S4, 100 transaction units	$3.139,07
Virtual Machines		East US 2	3 DS13-4 v2 (4 vCPU(s), 56 GB RAM); Linux – CentOS; 3 year reserved; 3 managed OS disks – S4, 100 transaction units	$617,66
Support			**Support**	$0,00
			Licensing Program	**Microsoft Online Services Agreement**
			Monthly Total	$4.659,09
			Annual Total	$55.909,11
Disclaimer				
All prices shown are in US Dollar ($). This is a summary estimate, not a quote. For up to date pricing information please visit https://azure.microsoft.com/pricing/calculator/				
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Comparing the two calculators, I found that the Microsoft Azure calculator is more intuitive to operate in selecting different options and researching the underlying architecture. The information on the calculator is easy to access and provided in a transparent form.
Another benefit of the Microsoft Azure calculator is that you can make changes to different fields and see the impact on the price in real time. With the AWS calculator you had to reset the form and start again from entering the numbers and specifications. Also, you can export the costs from Azure calculator in an excel format which is great for continue exploring the numbers and incorporating the data into your business model.
Comparing the costs for similar services, the AWS platform seems to provide the cheaper option.

References

[1] https://www.concurrencylabs.com/blog/choose-your-aws-region-wisely/