

## Solution of Exercise Sheet 5

### Exercise 1 (Different Cloud Services)

1. Google Cloud Print implements...  
☐ IaaS      ☐ PaaS      ☒ SaaS
2. Amazon S3 implements...  
☒ IaaS      ☐ PaaS      ☐ SaaS
3. Google App Engine implements...  
☐ IaaS      ☒ PaaS      ☐ SaaS
4. Amazon EC2 implements...  
☒ IaaS      ☐ PaaS      ☐ SaaS
5. AppScale implements...  
☐ IaaS      ☒ PaaS      ☐ SaaS
6. Google Cloud Storage implements...  
☒ IaaS      ☐ PaaS      ☐ SaaS
7. Google Compute Engine implements...  
☒ IaaS      ☐ PaaS      ☐ SaaS
8. Microsoft Windows Azure implements...  
☒ IaaS      ☒ PaaS      ☐ SaaS

## Exercise 2 (Functioning of some Cloud Services)

Statement	true	false
Google Cloud Storage implements the API of Amazon EBS.		X
EBS volumes can be attached to multiple instances at the same time.		X
EBS volumes can be attached at any time only to a single instance.	X	
EBS volumes must contain the ext3 file system.		X
EBS volumes can contain any file system.	X	
Data can be copied to/from EBS volumes without attaching the volume to an EC2 instance first.		X
Before data can be copied to/from an EBS volume, it must be attached to an EC2 instance first.	X	
The Google Compute Engine implements the API of Amazon EC2.		X
The Google Compute Engine implements a proprietary API.	X	
Firewall settings of EC2 instances can be specified by using security groups.	X	
The customers of S3 can decide for each object, whether it should be assigned to a bucket or not.		X
Objects in S3 can be assigned to multiple buckets.		X
Each object in S3 is assigned to a single bucket.	X	
The number of objects, each S3 customer can store, is limited.		X
Each S3 customer can store an unlimited number of objects.	X	
All objects, which are stored inside S3, have the same size.		X
Google Cloud Storage implements the API of Amazon S3.	X	
Objects inside S3 are online accessible per default.	X	
S3 implements a hierarchic name space.		X
S3 implements a flat name space.	X	
The name of an object in S3 is called <i>key</i> .	X	
In S3, the file extension of uploaded files is essential for the way, the storage service treats the file.		X
Interaction with the S3 service is only possible via the official tools, provided by Amazon.		X
Buckets in S3 have unique names.	X	
When a customer uses a Cloud Printing service, the print jobs are printed out by the provider and sent to the customer via airmail.		X
When a customer uses a Cloud Printing service, the print jobs are prepared by the service for the customers local printer and forwarded to the local printer which prints them out.	X	
When a customer uses a Cloud Gaming service, the video games are executed at the servers of the service provider and the customers' devices are only used to display the compressed video stream.	X	

## Exercise 3 (Sudoku in the Google App Engine)

Develop a web application for the Google App Engine, which allows its users to play Sudoku. The application can be implemented in any programming language, the App Engine supports. The application should meet the following requirements:

- A Sudoku with 9x9 fields and some given numbers is presented in the browser. Every time, the web application is queried, it generates (calculates) a new, solvable Sudoku. If this is too difficult for you to implement, for the sake of simplicity, you can just implement (*hard-code*) 5 Sudoku fields and every time, the web application is queried (reloaded), one of the 5 already available Sudokus is randomly chosen.
- Users can insert numbers into empty fields.
- Users can erase numbers, which have been inserted prior by themselves.
- Every time, a number is inserted into an empty field, the web application checks, whether the field is still in consistent state.
- Every time, a number is erased, the web application checks, whether the field is still in consistent state.
- If the Sudoku is solved correctly, the web application recognizes this and reacts to this situation in an appropriate way.

A helpful collection of the mathematical fundamentals of Sudoku is [1].

[1] [http://en.wikipedia.org/wiki/Mathematics\\_of\\_Sudoku](http://en.wikipedia.org/wiki/Mathematics_of_Sudoku)

Your tasks:

1. Implement the Sudoku web application for the Google App Engine.
2. Upload the web application into the App Engine.
3. Present your implemented application live during the exercise session.