InfoCloud

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Introduction

InfoCloud is a platform that targets informatics teachers and students who want to perform in this domain, assuring an attractive interface, easy to use and with multiple features. By using this platform, organizing informatics contests becomes much easier, thanks to our assessment tool, which allows uploading tests and assessing sources from students, as well as generating a leaderboard after finishing a contest.

Using the platform

When the user enters the website for the first time, he will see a page that resembles the following image:
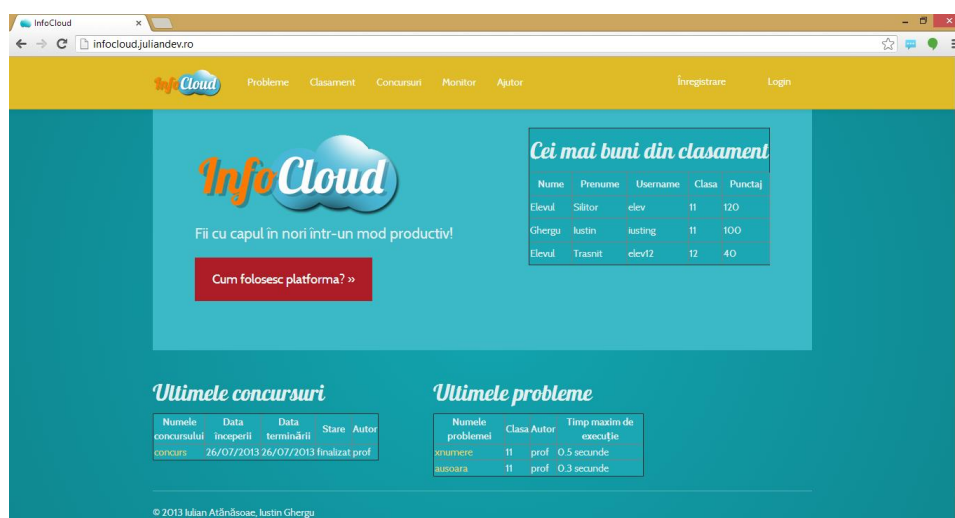

As a guest, a user can view the content (problems, contests and the leaderboard) and he can create student accounts. With the approval of the administrator, teacher accounts can be created as well.

Teachers have the ability to add/edit/delete problems and contests, as well as administering tests for each problem.
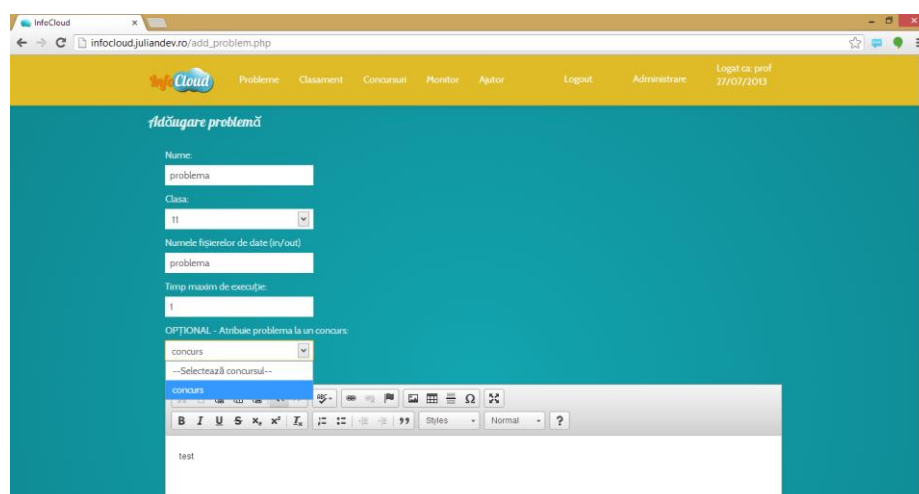
Problems can be added as part of a contest, and in this case the points obtained by the students will be added to the leaderboard of that contest. If the problem is not added as part of a contest, the points will be added to the general leaderboard.

After adding a problem, the teacher must upload tests for the assessment tool using the embedded FTP client, as seen below:
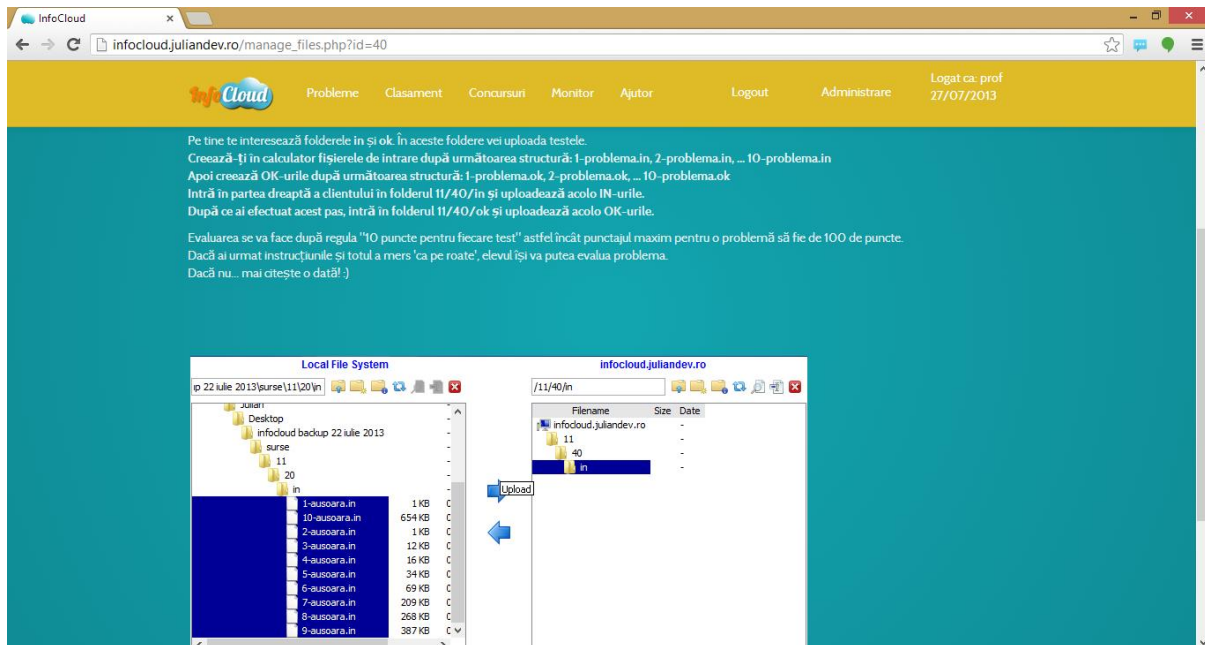
If the upload is done correctly, students will be able to upload solutions to that particular problem. They will upload their own .CPP files, and the virtual machines that host the platform will handle the compilation and execution of the sources. If the output files from the student's solution match the .OK files, the student gets 10 points for that particular test. If the output is not correct, or if the time limit for the execution is exceeded, the student doesn't get any points.
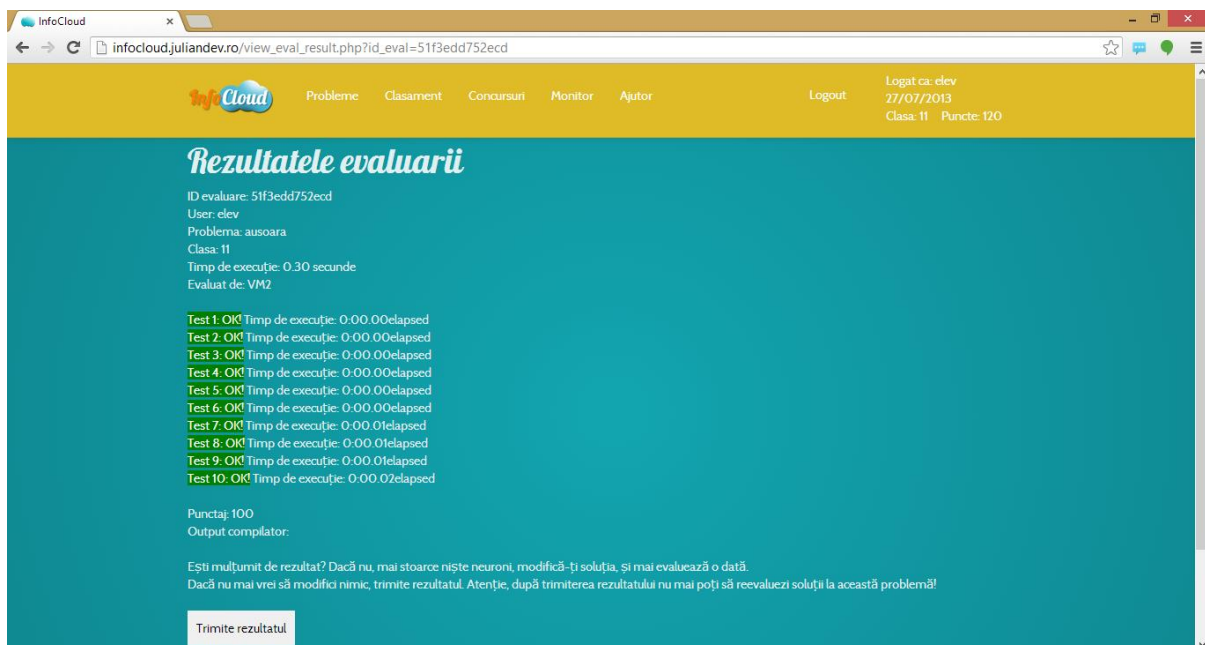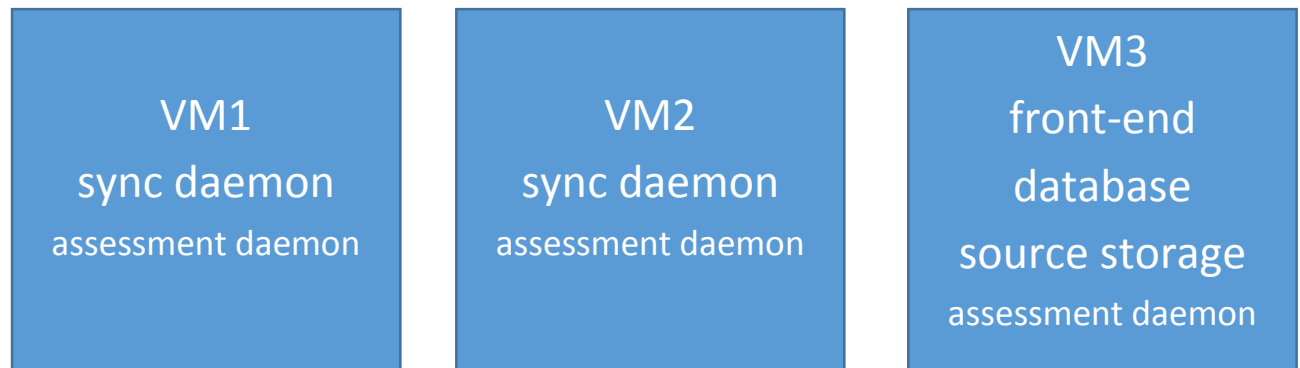
What's different about our platform as opposed to others of this type on the market?

It's SCALABLE.

What does this mean?

Turn one more page to find out.

We mentioned that InfoCloud is scalable. It was written to run in Windows Azure, Microsoft's cloud computing service, and the assessments are made on a number of 3 virtual machines (but there can be many more, if the administrator of the platform affords it). This is how the VM schema looks like:

VM1 sync daemon assessment daemon	VM2 sync daemon assessment daemon	VM3 front-end database source storage assessment daemon

VM3 stores the website itself, the database and the sources, whereas VM2 and VM1 only do assessments. By using a „sync daemon" (a background synchronization task), VM1 and VM2 download the .in and .ok files from VM3 once every 10 seconds. Also, when the student uploads a .CPP file, that daemon is manually run again to download the .CPP file on the VM which started the assessment task.

In Windows Azure we have created a queue which stores the assessments that are waiting to be processed. Each VM has an „assessment daemon" which checks once every 10 seconds if there are new assessments in the queue and it starts to process it. If one of the machines is busy and there are still sources waiting in the queue, the other two VMs will take them.

Monitor de evaluare

Coadă evaluare

ID evaluare	User	Clasa	Problema	Concurs	Timp de execuție	Status
51f3edd752ecd	elev	11	ausoara		0.3 secunde	pending

Coadă evaluare

ID evaluare	User	Clasa	Problema	Concurs	Timp de execuție	Status
51f3edd752ecd	elev	11	ausoara		0.3 secunde	în evaluare pe VM2

Evaluări terminate

ID evaluare	User	Clasa	Problema	Concurs	Timp de execuție	Evaluat de	Punctaj	
51f3edd752ecd	elev	11	ausoara		0.30 secunde	VM2	100	Vizualizare

This is how InfoCloud assesses sources. But there's one more problem: most of the time, the platform doesn't have a high load, therefore it doesn't make sense to keep 3 VMs running all the time, because we waste a lot of compute hours and we have to pay for them. For this reason, InfoCloud uses the Autoscaling feature in Windows Azure, which allows us to turn on additional VMs only when we need them. When the platform doesn't have a high load, we keep only one VM alive; when the number of sources in the queue increases, we fire up one more. When the number of sources in the queue decreases, we turn off VMs, therefore saving costs.

infocloudvm

| AUTOSCALE | OFF | CPU | QUEUE |

| INSTANCE RANGE EXTRA SMALL (SHARED CORE, 768 MB MEMORY) | 1 | | 3 | instance(s) |

| ACCOUNT OR NAMESPACE | portalvhdsqkw3lkzvfk |

| QUEUE NAME | evalqueue |

| TARGET PER MACHINE | 3 |

| SCALE UP BY | 1 instances at a time |
| SCALE UP WAIT TIME | 5 minutes after last scale action |

| SCALE DOWN BY | 1 instances at a time |
| SCALE DOWN WAIT TIME | 5 minutes after last scale action |

Autoscaling rules

RUNNING Not all role instances are ready.
3 Instances: 1 Starting, 2 Running

RUNNING Not all role instances are ready.
3 Instances: 2 Stopped (Deallocated), 1 Running

NAME	STATUS
infocloudvm	Starting
infocloudvm2	Running
infocloudvm3	Running

NAME	STATUS	ROLE
infocloudvm	Stopped (Deallocated)	infocloudvm
infocloudvm2	Stopped (Deallocated)	infocloudvm2
infocloudvm3	Running	infocloudvm3

Turning on a VM in case of high load   *The cloud service in normal running conditions*

In conclusion…

Our platform deserves to be used thanks to the ease of usability and to the features it offers. The capability of assessing sources on multiple VMs, as well as autoscaling for saving costs make our platform unique. We hope that in the future InfoCloud will become a tool frequently used by informatics teachers and by the students that are passionate about this domain.

Keep your head in the cloud in a productive way.