

Mat-2.4177
Seminar on case studies in operations research

Simulating Insurance Portfolios using Cloud Computing

Midterm Report
March 28, 2011

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Current status

All in all, our project has progressed mainly according to original plans. The literature review has been conducted. Technical configurations have been started and some simple applications run to get acquainted with the Azure environment. The configuration phase is now running at full speed and the next step will be introduced in the Deployment process chapter.

There was one risk we did not account for in the project plan, and that was license issues. In our technical testing we are using three instances – MATLAB, msII and Microsoft Azure – which all require proper licenses. Since msII needs the physical address of the computer in order to work, we could not use our school's computers to operate MATLAB. Luckily, one of our team members had a spare laptop we could use for the project. It had not been used for a few years, so a couple of days were spent just downloading and installing updates.

At first, we obtained only a 15-day trial license for MATLAB from our client. That expired before we were able to get a permanent license, but now we have MATLAB up and running. We are still waiting for the final required license, Microsoft Azure. The license will be either donated by Microsoft or we will have to acquire a 'normal' license of which bills are sent to our client. At the moment, we are using a free trial license for the configuration phase. That allows us to use only Azure's Extra Small and Small computing instances (see Table 1).

For the testing phase of the project we need Extra Large instances because of the heavy simulations. In addition, having a larger allocation of the shared resource will result in more consistent performance, considering for example bandwidth and I/O performance. That will make the tests more comparable, although there still remain internal factors of the cloud infrastructure which we cannot exactly account for.

Table 1. Windows Azure Compute Instance specifications and pricing. Source:
<http://www.microsoft.com/windowsazure/compute/default.aspx>

Compute instance size	CPU	Memory	Instance Storage	I/O Performance	Cost per hour
Extra Small	1.0 GHz	768 MB	20 GB	Low	\$0.05
Small	1.6 GHz	1.75 GB	225 GB	Moderate	\$0.12
Medium	2 * 1.6 GHz	3.5 GB	490 GB	High	\$0.24
Large	4 * 1.6 GHz	7 GB	1 000 GB	High	\$0.48
Extra Large	8 * 1.6 GHz	14 GB	2 040 GB	High	\$0.96

Results and findings

The literature review has been conducted as planned. The scarcity of available information was expected, but the material we have found has given us a good starting point and will provide a good introduction for the final report. In the beginning of the project we made ourselves familiar with Amazon's EC2 product since there was a lot of useful information about it, for example a thorough manual on how to use MATLAB with EC2.¹ After the decision to use primarily Microsoft Azure was made, we reserved time to allow all team members to get acquainted with it, at least the basics.

Deployment process

Figure 1 depicts the deployment process of a MATLAB script / application to Microsoft Azure platform. First, the MATLAB script needs to be compiled into a .NET library file (.dll) using MATLAB's deployment toolkit. The script could also be converted into a Windows executable (.exe) or a C++ -code file. However a .NET library suits our needs well, because Visual Studio is highly compatible with Azure and has an automatic packaging feature.

Once the .dll-file has been compiled, a new .NET cloud project will be created and the .dll-file will be copied and added to the project. The user interfaces and input/output features will be programmed and configured using C# and Visual Studio. The project can also be tested and debugged using Visual Studio. When the project is finished and runs as planned, an Azure application package is assembled and finally uploaded and run in the cloud (Microsoft Azure Platform).

The process contains three major challenges: (i) compiling .m-files with msII into a .dll form, (ii) running MATLAB runtime library in Azure and (iii) debugging the application in production environment. We have not yet examined compiling .m-files with msII, but we expect to encounter some difficulties.

The problem with running MATLAB Runtime Library in Azure is that it is not readily installed and needs to be included within the application package every time it is uploaded. Once uploaded, it needs to be installed and controlling the installation process is relatively difficult. The MATLAB Runtime Library is also often many times the size of the functional part of the package.

¹ The Mathworks. *Parallel Computing with MATLAB on Amazon Elastic Compute Cloud*. Retrieved 2011, from http://www.mathworks.com/programs/techkits/ec2_paper.html

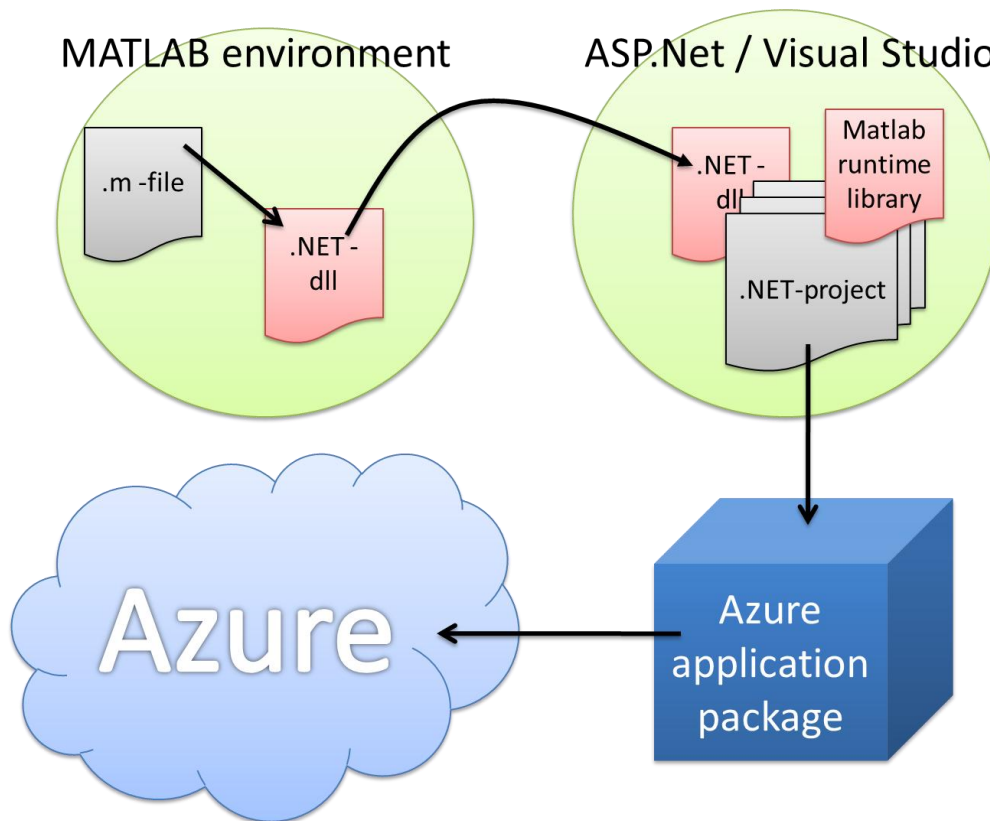


Figure 1. Deployment process.

Changes

The original project plan was never meant to be an exact guideline on the different aspects and phases of the project. Writing it helped our team to understand the project as a whole and to identify the vital steps for a successful execution. Now it serves as an excellent base whenever modifications are necessary.

Schedule

The original project plan did not account for the examination week during which little was done for the project because of exams and trips abroad. That was not a big problem since that week was reserved mainly for literature review (tasks 1 and 2 in Table 2). We would not have been able to conduct the configurations anyway because of the license issues mentioned before. After getting to understand the deployment process, we have noticed that configuring (task 3) requires more time.

Scope

The scope of the project has remained mostly the same. So far we have not faced insurmountable problems that would prevent from achieving the original goal. Also, it is still too early to tell, whether there is enough time to do things which would be interesting, but not vital for the project.

Table 2. The original and revised task schedules. The highlighted rows mark the changes to the project plan schedule.

Task	Weeks (plan)	Weeks (revised)
1. Literature review, simulation (Monte Carlo)	7-10	7-9
2. Literature review, High performance computing	7-10	7-9
3. Configuring the technological environment for testing	9-10	9, 11-13
4. Determining test portfolios	11-13	13-14
5. Running test portfolios, gathering results and the preliminary analysis of the results.	13-14	14-15
6. Comparison of the results with the literature and conclusions	15	16
7. Cost analysis of the pricing options based on the results	16	12 (estimate) 16 (actual)
8. Reporting findings and results. Communication with the client	All the time	As before
9. Conducting a final report	15-18	15-18

Risks

Licenses

As mentioned in the first chapter, we did not take into consideration the different licenses required when estimating the risks in the project plan. That has caused some delay in the project, but will not result in major setback. Two of the licenses are already obtained, and the last one is just a matter of who will provide it to us

Update on risks mentioned in the project plan

We recognized technical difficulties as the biggest risks of the project, and we still believe that is the case. So far we have some promising results that the technical implementation will not run into too big obstacles. The second risk was about problems finding information because of the young nature of the field.

These two risks are tightly connected, because in the case of technical problems the lack of information available could cause a major delay in the project. Luckily, we are not the first ones trying to run MATLAB with Azure so we will have some peer support on the Internet for any minor practical malfunctions.

The risk concerning time problems has been managed by working on the project continuously. A week's delay caused by the examination week altered the schedule a bit, but not significantly.