



# University of Copenhagen tests functionality of new exam app

HPE StormRunner Load verifies concurrent use for 6,000 remote students

## Objective

Ensure the operational efficiency of a new digital examination app

## Approach

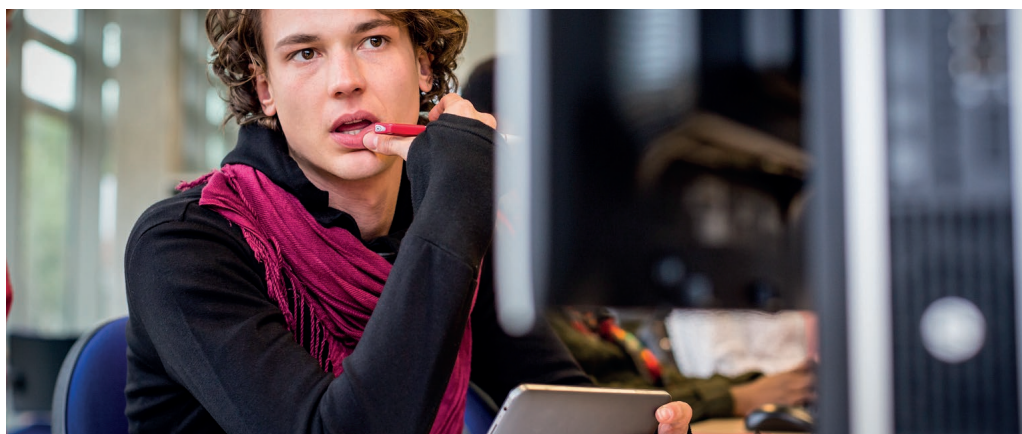
Directly contacted trusted specialist aHOC following positive previous experience

## IT Matters

- Simulated concurrent download and upload by 6,000 virtual users
- Identified problems with certain configurations and database items
- Delivered unlimited scalability through cloud-based SaaS solution

## Business Matters

- Ensured that new exam system operated efficiently from day one
- Verified a system that is now processing 300,000 examinations a year
- Saved 75% of test costs through hourly pay-as-you-go licensing model



The University of Copenhagen and five other Danish universities have combined to implement a web-based application that allows students to download and upload exam papers from any location. It had to work successfully from day one so comprehensive testing was vital. This was achieved with the cloud-based performance and load testing tool, HPE StormRunner Load.

## Challenge

### Need to test new exam process

The candidates file into the hall and sit at rows of desks. At a word from the invigilator, they turn over the papers and start to write their answers. This tightly controlled environment is the classic examination scenario but one that is rapidly becoming a thing of the past.

Computers in the exam room have increasingly replaced pen and paper and now there is a further development necessitated by growth in distance learning and the pure volume of students. The controlled environment of the exam room is being superseded by distance digital exams which candidates can download and complete from any location.

“If we had not run this project in the way we did, a hit and run test like this would have needed 600GB of memory and 60 CPUs. We would have to buy these machines, get them up and running and then decommission them after one week which doesn't make any sense at all. When you need this kind of resource, cloud is the way to go and that is the value of HPE StormRunner Load.”

– Jesper Mortensen, project manager, aHOC

In line with the Danish government's exam digitalisation strategy, six of the country's eight universities have collaborated to develop a coordinated solution. They are Aalborg University, Aarhus University, University of Copenhagen, Copenhagen Business School, Roskilde University and from 2017 Technical University of Denmark.

“This is an important core service so we needed to have an extremely trustworthy application that we knew would not fail in a live situation,” says Jorgen Adrian Groskopf, project consultant at the University of Copenhagen. “If it did not operate efficiently, it would have been a catastrophe for students and would have also attracted very bad publicity for the universities concerned.”

The system had to be rigorously tested to ensure that it could cope with thousands of concurrent users and still operate successfully from day one.

## **Solution**

### **Web-based performance tests**

None of the five universities had the in-house skills to thoroughly test the application. The University of Copenhagen (UCPH) sought help from a company it had worked with in the past – Danish consultancy aHOC which lists testing and quality assurance among its many specialisms.

“The university asked us to conduct performance tests on the part of its website which allows students to download and upload examinations,” explains aHOC project manager Jesper Mortensen. “They created all the test cases and test data and I did the scripting. It works in two ways. The students can be off-site, at home, and download an exam paper or they can also use it for on-site exams. This testing was for UCPH and a community of four other Danish universities who use this website.”

Each of the universities wanted the capability to provide exams for 1,000 students at a time so aHOC had to test for 6,000 concurrent students downloading a paper and uploading the results one hour later. The precise targets were that all candidates must be able to download the examination paper in 10 minutes and upload their completed paper in 15 minutes. The universities provided aHOC with relevant statistics on the size of the examination papers that needed to be uploaded.



“Another thing we wanted to test was that these files could be uploaded without affecting other uploads being run on student systems. To do this we uploaded a 2GB file manually on top of the other two scenarios and the test was a success,” explains Mortensen. “We needed to ensure that the website was able to handle this large file at the same time as going full speed without having to stop doing everything else in order to upload.”

Mortensen specialises in using Hewlett Packard Enterprise (HPE) testing tools and for this project he selected HPE StormRunner Load. A cloud-based performance and load testing tool for web and mobile-based apps, HPE StormRunner is a scalable, agile solution that allows tests to be conducted from anywhere on any device. Load tests can be created by executing open source JMeter scripts in addition to HPE LoadRunner web/http and TruClient, JavaScript-based TruAPI, and HAR file-based scripts.

Scripts can be uploaded and tests run in minutes and can be scaled from 1,000 to 1,000,000 virtual users with the ability to specify geographical locations so real network conditions can be simulated. Intelligent analytics identify bottlenecks and give a holistic view with client, network and server-side breakdown reports so users can conduct a root cause analysis and quickly remediate issues.

## **Benefit**

### **Operational defects remedied**

When aHOC’s HPE StormRunner scripts were applied to the UCPH website it revealed problems, as Groskopf explains: “The downloads and uploads were failing, big time, so we had to make changes to our configurations and part of the database which means that the testing was a great success. Following the changes, the system has now been used by all the universities for six months and has not failed. In this year alone, we anticipate that it will deal with 300,000 examination papers.

“This is good news for our students because when you are taking an examination it’s not acceptable if it takes a long time to download the paper and even worse if, having completed the examination, you can’t upload it again. This system has completely eliminated the need for paper and it has made our workflows much more efficient.”

The pay-as-you-go licensing available with HPE StormRunner made the solution financially attractive for the universities, as Mortensen explains: “Other testing solutions have an upfront cost. You have to buy licences for a certain number of virtual users but with HPE StormRunner, you buy virtual user hours. This was a hit and run test – not one that had to be done every week or month - so buying a tool and paying maintenance didn’t make any sense.”

## Customer at a glance

### Software

- HPE StormRunner Load

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“There is no other way to enable 6,000 students to take an examination at the same time but if we had launched this system without prior testing from HPE StormRunner Load it would have failed.”

– Jorgen Adrian Groskopf, project manager, University of Copenhagen

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Using the old method of charging by virtual user would have been much more expensive. With its HPE StormRunner package, UCPH paid by virtual user hours which reduced the cost by 75%.

“In the end we scripted this using a program that has a very small footprint but we could have chosen one of the new hot HPE LoadRunner protocols which would have a footprint of hundreds of megabytes per user. Executing a test like this would require 600GB of memory and maybe 60 CPUs which would be equivalent to a server farm of 10 machines.

Using HPE StormRunner you don't have to worry about this. You just start your test and HPE StormRunner will allocate the resources from the cloud. If you need 600GB it will do that. With our test, it ended up allocating four machines but if we needed 60, HPE StormRunner would have handled it,” concludes Mortensen.

Learn more at  
[hpe.com/software/stormrunner](http://hpe.com/software/stormrunner)

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