Clients for Digital Assessment

Best Practice Document

Produced by the UNINETT-led working sub-group on digital assessment

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September 2015

Document No:
Version / date: V1.1, 15 July 2015
Original language : Norwegian
Original title: UFS 146 klienter for digital eksamen
Original version / date: V1.0, 30 April 2015
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UNINETT bears responsibility for the content of this document. The work has been carried out by the digital assessment sub-group.

The research leading to these results has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 691567 (GN4-1).

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Part 1: INTRODUCTION

1 Introduction

Under the auspices of the eCampus program, UNINETT has set up a program on digital assessment. The project consists of several working groups and a steering group. The working group on clients produced this document.

Best practice documents (BPDs) have been developed to describe recommended solutions for digital assessment in universities and colleges. The agreed-upon solutions are based on the experience of working group members.

The documents are intended as working tools for the planning and implementation of digital assessment.

The primary target group is the technical staff and advisors responsible for planning and carrying out digital assessment.

The present document does not take a position on all the existing software solutions for digital assessment. It will focus on what is required of clients and the operation of client solutions for digital assessment. Requirements concerning software, servers, virtualisation solutions, firewalls and surveillance systems follow from the chosen software solution for holding digital assessment.

This is the first version of this BPD.

1.1 Digital Assessment Documentation

UFS 146 (CBP-44): Clients for Digital Assessment

- Recommendations on clients for use in digital assessment (this document)

There are other best practice documents in this series on digital assessment:

UFS 145 (CBP-42): Physical Infrastructure for Digital Assessment

- Recommendations on the physical infrastructure in permanent and temporary halls used for holding digital assessment.

In addition, two further documents will be available:

UFS 147: Integrating Solutions for Digital Assessment

- Recommendations on datasets and formats for data exchange between solutions for digital assessment.

UFS 148: Workflow for Digital Assessment

- Recommendations on workflow changes in the transition from paper-based assessment to digital ones.

2 Recommended Process

Preparation work for holding a digital assessment should start well before the assessment. The following process is recommended for hardware quality assurance and for installing the required software.

1. Get an overview from the student administration/assessment office about the planned use of the digital assessment in the coming assessment period.
2. Get an overview of the demands that the planned assessment and chosen assessment solutions will make on clients and on the network and power infrastructure.
   a. - Will Bring Your Own Device (BYOD) apply?
   b. - Will Bring Your Own Application (BYOA) apply?
3. Draw up a schedule and plan the time until the completion of the entire digital assessment in the assessment period concerned.
4. Plan the training of examinees, proctors and support resources.
5. Document the setting up of clients and the implementation solution.
   a. Software requirements.
   b. Requirements of BYOD units.
6. If BYOD applies, plan and set up a “malware and virus cleaner”.
7. Hold the assessment.
8. Collect logs and incident reports.
9. Delete the installed software (and contents) from the devices, free up the licences.

Also see the checklist in UFS 145, **Physical Infrastructure for Digital Assessment**

Note that these Best Practice Documents do not deal with questions concerning the procurement process itself, such as administrative and contractual provisions, the contracting process, tender evaluation, or operating and service agreements.

Part II: FUNDAMENTALS

3 Delimiting the Topic

The focus of this BPD is on digital assessments that replace traditional paper-based, written in-class assessment. It covers assessment with and without aids.

This BPD will focus on what is required of clients for digital assessment. Digital assessment workflows and infrastructure requirements are dealt with in separate BPDs.

The document aims to support several different digital-assessment solutions, and hence does not discuss details of software, servers, virtualisation solutions, firewalls and surveillance solutions.

A report on "Digital assessment and exams"[1] (hereafter: "Legal Report"), elaborated by the Expert Group on Digital Assessment, discusses the issues concerning the students' use of their own equipment for digital assessment. We refer the reader to this report for information on the rules concerning BYOD (Legal Report chap. 2, 4, 6.3 and 6.6).

Digital-assessment client solutions to support oral assessment or take-home assessment with digital tools are not dealt with in this BPD. However, parts of the specifications and tools may also be used in connection with examination forms other than written, digital in-class assessment, with proctors present in the examination hall.

4 Universal Design (Adaptive Solutions)

Solutions for digital assessment are to be universally designed. In addition, the current assessment regulations allow students to apply for adapted assessment based on medical statements or disabilities. Students without disabilities may apply for a computer-free assessment on the grounds of a lack of knowledge or skills in the use of computers (Legal Report chap. 3.3).

4.1 Universal Design Requirements

In Norway, ICT solutions should be universally designed: usable by everyone to the greatest possible extent, regardless of the user's age or ability. In connection with digital assessment, this implies that all *web-based solutions* are to be universally designed according to the applicable standards and that clients using these web-based solutions are to accommodate assistive technologies for specific groups with disabilities, when necessary.

The choice and design of clients must therefore take into account users with special equipment. This applies to physical equipment with a bearing on the client, such as refreshable braille displays and eye control, as well as software-based aids with implications for the choice of client. Examples include:

- Screen readers/magnifiers

[1] "Digital vurdering og eksamen, en juridisk vurdering" (Digital assessment and exams, a legal assessment). A cooperative project carried out on behalf of the Expert Group on Digital Assessment and Examination, spring 2014, by representatives of the UiO, UiB, UiA, HiO, UiT, UiN, NTNU and HiST.

- Voice commands
- Support for reading and writing (including speech synthesis).

The client must be designed to enable use of this equipment. Also required is an audio-out option (e.g. with headphones) and an option for voice control of the software and basic functionality.

Particular awareness should also be placed on the challenges posed by the use of “thin clients” (a terminal without a hard drive). Aids for those with visual impairments, among others, do not work well with thin clients, and this area is poorly documented. The greater share of special software must be installed locally.

The choice of operating system and browser also has implications for the use of assistive technologies, especially screen readers and magnifying programs. Internet Explorer (Microsoft Edge) and Mozilla Firefox have been tested and work well with most of the software-based aids.

Where students with severe visual impairments or blindness are concerned, training in the use of special software may be required locally. In this case, BYOD is recommended as a solution.

4.2 Language Support

Language support is composed of language support in the client, in the assessment solution, in the assessment questions and the assessment paper. This is a complex situation, and there may be yet more dependencies when taking into account all the surrounding systems with which the assessment solution is to integrate. One can only recommend that the implementation solution should at least support the languages in official use in each country, as well as English. However, assessments for language courses may require additional language support.

As an example, for Norway the following languages should be supported:

- Norwegian Bokmål
- Norwegian Nynorsk
- Sami languages (note: remember keyboard support for all the necessary characters, even with a lockdown browser)
- English

5 Anonymisation and the Removal of User Information

In higher education, assessments are to be anonymously graded. However, it is necessary to identify the examinee and the examinee must also be authenticated in the network, client, and implementation solution. In addition, many tools store user information and client information in documents and other materials produced in connection with assessment.

One must specifically explore the possibility of anonymisation and the removal of user and client information in the implementation/supply solution. There are also advantages to using anonymous grading numbers.

6 Testing Environment, Malware Cleaner

Regardless of the choice of client solution, it is important to set up a test environment where students and staff can test the chosen solution for digital assessment.

If one opts for letting students use BYOD for the assessment, one must also produce a “mock assessment” that students can use to test that the chosen assessment solution is compatible with their hardware.

Experience suggests that many student PCs are infected with viruses and other malware. It is recommended that they be offered help with cleaning and updating their own PCs before they are used for assessment, often called a “malware and virus cleaner”. Such a solution cannot cover all operating system and software options, but a solution that covers the most-used versions of MS Windows and Mac OS will contribute significantly to reducing the need for spare equipment.

7 Clients

The costs of having rooms permanently set up, and hence capital tied up, must be weighed against the costs of holding assessment with the students’ own equipment (BYOD).

The various solutions for digital assessment may pose demands on the hardware and operating systems. This must be clarified in the planning phase and communicated to the students and to the facilitators of digital assessment as early as possible.

In order to make the most efficient use of the halls, the holding of digital assessment should require as little change as possible to client configurations between assessments. This means that assessment requiring the distribution of various applications, special web access, and so on, should be dealt with as a special matter and not altered if not needed.

7.1 Thick Clients (Desktop and Laptop PCs)

Thick clients refer to desktop or laptop devices used as client devices for digital assessment with specific software installed for holding digital assessment. The devices may be owned by the institution or by the students (BYOD).

Licence solutions for special software are often designed to preclude installing the software on the students’ own equipment (BYOD). For assessment of courses that require special software, the use of the institutions’ own devices as thick clients is a solution that respects the provisions of the software licence.

Desktop computers:

- Large screen, usually between 20” and 27” in size.
- Ergonomically-correct, full-size keyboard.
- Ergonomic mouse.

- Updated software.
- Cheaper equipment compared to laptop computers; may have longer lifespan.
- Quality-controlled by the institution.
- Uses a wired network, making it easier to control access to external information sources (such as the Internet).
- Takes Health and Safety (HSE) into account, with a large screen and a good keyboard.
- Moving large numbers of desktop computers around is resource-intensive.
- Can be expensive if one has to purchase a great deal of dedicated assessment equipment, which ties up capital, and cannot realistically be scaled up to cover the need for computers for digital assessment.

Institutionally owned laptop computers:

- Typical screen size is 15" to 17".
- Ergonomic keyboard, but reduced in size (92% or 88%).
- Trackpad; varying size and functionality may be a problem.
- There are solutions for image-based deployment.
- Laptop devices of adequate quality will be more expensive than the corresponding desktop devices.
- Quality-controlled by the institution.
- Uses a wireless network. It is possible to standardise the devices' wireless network cards with regard to quality and functionality. It is harder to control network capacity and access to external information sources (Internet).
- Takes HSE into account, with an ergonomically OK (screen and keyboard.)
- There are good solutions for moving and securing large numbers of laptop devices.

BYOD laptops

Students' own laptop devices may be used as thick clients. If the student's own laptop (BYOD) is to be used as a "thick client", solutions must be set up for hardware quality assurance and the necessary software installation. See Section 8.3, requirements for BYOD units.

7.2 Thin Clients (Terminals, RDP, VDI)

"Thin clients" refers to solutions using "dumb" terminals (screens, keyboards and mice) with all the software running on a central setup (server cluster), whether locally on-campus or on a shared national resource.

Students' own PCs or Macs (BYOD) may be used in a VDI solution. A VDI solution requires the installation of a small client on the student's device. Installation and testing of the client must be completed before the day of the assessment and the use of the students' own devices in a VDI solution will make greater demands on the competence of proctors and assessment support staff.

The use of thin clients requires a "server cluster" running both the operating system and the actual implementation software. A "server cluster" is resource-intensive, both in procurement and operation. For VDI to be a real alternative to thick clients, such a "server cluster" must be procured and operated

for the shared use of the HE sector. In periods when the “server cluster” is not needed for assessment, it might for example form part of a national “cloud utility”.

Licence solutions for special software are often designed to preclude the installation of the software on the students’ own equipment (BYOD). The use of students’ own equipment (BYOD) in a VDI solution is a possible solution for the problem of licences that preclude installing special software on the students’ devices (BYOD).

”Dumb” terminals.

- Usual screen size is between 18” and 24”.
- Ergonomically correct full-size keyboard.
- Ergonomic mouse.
- Little or no own software; uses updated software on a central resource.
- Cheap equipment compared to laptop computers.
- Operating the clients is simple, no need for large software-update effort.
- Uses a wired network and central computing resources, making it very easy to control access to external information sources (Internet).
- Takes HSE into account, with a large screen and a good keyboard.
- Can be moved, but depends on wired infrastructure.
- Expensive if one has to purchase a great deal of dedicated assessment equipment, which ties up capital, but solutions with “dumb” terminals can also be used by students during the semester outside assessment periods.

7.3 BYOD (laptop PC/tablet)

The institution is responsible for holding the assessment in the form chosen by the institution; in connection with digital assessment, the use of BYOD is a money-saving solution and does not shift the responsibility for holding assessment away from the institution (Legal Report chap. 4).

For planned assessment done using BYOD, the institution needs to have a certain amount of spare equipment, both for examinees who do not have at their disposal a unit of their own with the required capacity/specifications, and to be able to replace units that fail during the assessment.

Where BYOD assessment solutions are desired, it is important that the assessment takes a form requiring no more than a minimum of installed software; ideally, just a wireless network (cf. UFS 112) and a working browser. It is preferable for the assessment to be limited to the use of a “lock-down browser” or to solutions employing VDI, which only require a simple client to be installed.

7.3.1 Laptop PC/MAC

Laptops for BYOD may be either Windows or Mac devices. The distribution of PCs vs. Macs used by students for BYOD will vary between institutions and studies. Currently, the distribution is fairly even, so neither can be excluded as a BYOD client for digital assessment.

Examinees showing up for examinations with laptop PCs (BYOD clients) borrowed from e.g. employers or parents may generate some additional challenges. Devices borrowed from employers may be "locked down" to the extent that the required software cannot be installed or that they cannot be authenticated on the wireless network.

The pilot studies noted examinees who "went blank" and were unable to remember the local username or password for the device. There is probably no simple solution for this problem, except the use of spare equipment. One solution may be to recommend that the candidates keep a written note of this information and bring it along to the assessment in case they suffer a mental block.

Laptop PC and tablet network cards differ widely in quality and functioning, and misconfigured clients may "kill" the capacity of the wireless network. To safeguard against this, requirements should be posed as to the functionality and configuration of the wireless network cards in laptop PCs and tablets.

Both device types are well suited as thin clients for digital assessment. A mix of PCs and Macs as thick clients for the same assessment may pose some problems concerning software versions and differing functionalities.

7.3.2 Tablets

It is uncertain whether today's tablets are suitable clients for holding digital assessment.

Considering the various tablets in existence today, they may be divided into three "families" based on operating systems: **Apple iOS (iPad)**, **Windows 8 Tablet** and **Android**.

Even with the use of external keyboards, we do not think today's tablets are suitable for use in an all-day written assessment.

For short assessment employing alternative examination forms such as "multiple choice", tablets are possible BYOD clients.

External keyboards for tablets are often Bluetooth-based. There is considerable uncertainty about scaling up the use of tablets with external keyboards in the same examination hall and the number of available channels in the various keyboards' Bluetooth implementations. More testing is needed in this area.

Apple iOS (iPad) is the family where the least variation may be expected, as this is the most "locked-down" of the three operating systems. This is also the tablet family with the least hardware differences between the different units. This makes it a possible candidate for a digital-assessment client.

Windows 8 Tablet is a family offering a tablet user interface that closely resembles that found on PCs with Windows 8. The availability of applications is still more limited on Windows 8 Tablets than on the two other tablet families.

Android is a large tablet family, with many different adaptations and changes between the different vendors' versions of the operating system. eduroam authentication is more difficult with tablets from the Android family; work on this problem is ongoing and an Android/eduroam solution is expected by the end of 2015.

The use of tablets from the Android family in an assessment context will also make more demands on the design of the wireless network in the examination hall. Some Android units are simply troublesome in connection with wireless networks.

7.3.3 BYOD Requirements

- Initially limit BYOD to Macintosh or Windows laptops.
- Have an adequate service and support apparatus standing by so students can get help if their equipment fails to work.
- In the beginning, one has to expect a considerable need for borrowing equipment. It is recommended that at least a 10% reserve of spare equipment should be purchased.
- Require proven compatibility with the eduroam wireless network (cf. UFS 127). Equipment that keeps starting and stopping the network interface to save power, or similar, should not be used.
- Require updated drivers on the computer.
- Require BYOD equipment to have the appropriate keyboard or language, e.g. Norwegian or English. Otherwise, borrowed (spare) equipment must be used.
- Require the computer to have an appropriate version of the operating system.
- Require the computer to have an appropriate version and type of browser, compatible with the software used for holding assessment.
- Draw up a proposal for recommended equipment.
- Get a signed statement from the student that his or her own equipment has been verified, that eduroam works and that a test assessment has been done without problems.

7.4 BYOA (Bring Your Own Application)

Bring Your Own Application is an issue in the borderland between the client solution and the implementation solution for digital assessment. The main aim of an assessment is to test the abilities of the student in a given subject, not the student's skills, with a given piece of software (word processor or similar). For the student to complete the assessment as well as possible, it is preferable to let the student use the tools the student masters the best.

This challenge also applies to the sciences (mathematics, physics, chemistry, statistics) and some technical subjects where special tools are used in teaching, and where the student is required to be able to use the same tools in a digital assessment.

At present, there is varying support for BYOA in the various implementation solutions. These subject-specific tools will not be supplied as an integrated part of the solution, but will need to be installed on the client. This raises some new "problems", such as licensing, and whether the licence allows the tools to be installed on the students' own devices (BYOD).

8 Cheating

There are various forms of cheating:[2]

1. The use of *aids* against the rules
2. *Communication* with others against the rules
3. *Authentication*, where persons other than the student have shaped the contents of the paper or have acted in the student's stead
4. *Plagiarism*, where contents of the text have been copied from other sources without following the relevant rules

Digital assessment opens up new possibilities for all of these points (for instance, copying from Wikipedia on another person's advice infringes all four of them). It also opens up possibilities for the more detailed surveillance of each individual student, and for checking the paper for plagiarism afterwards. The great majority of cases of cheating on assessment involves plagiarism, which may be due to the fact that plagiarism is easy to detect in a digital context.

Measures against cheating:

- Clear regulations and good information.
- Training the proctors, e.g., to move to the back of the examination hall so they can see the screens.
- Reducing physical peeking by other examinees.
- Activities on the device/account must be logged and must be available for checking afterwards.
- A lock-down browser for control with the device.
- An option to check for plagiarism after the paper is handed in.
- Shutting off the network if no aids are permitted.

9 Need for Spare Equipment

There will be a need for spare equipment during assessment, but the extent of the need is unknown and there is little experience from the pilot exams. The pilots were run on good quality, institution-owned equipment, with very low incidence of equipment failure.

- For desktop computers owned by the institution, the spare-equipment factor should be 5%.
- For laptop PCs owned by the institution, the spare-equipment factor should be 5%.
- For BYOD equipment for students, the spare-equipment factor should be 10%.

In addition to the need for spare computers, there will be a need for backup solutions for uploading and handing in the papers produced by the examinees, such as:

- Memory sticks for the local storage of papers.
- Camera/scanner for the digitalisation of drawings and hand-written materials (and in case of emergency, for taking screenshots).

[2] The overview of forms of cheating is taken from work done at Hedmark University College.

9.1 Training Needs

- Hold workshops in advance of assessment.
- Students' IT skills vary widely; perform an assessment of the student group in question when planning what training to offer for the assessment solution.
- For BYOD-based assessment, a solution could be set up for testing whether a students' equipment qualifies.
- If the student does not possess a suitable computer and has to borrow one, consider placing all the students borrowing computers in a separate room. Distributing borrowed devices in examination halls is work-intensive.
- There will also be a need for training of proctors and for briefly going over the assessment with the proctors before the assessment begins.

9.2 Competence in Using the Solution

- Make an open, mock assessment permanently available in the assessment system so students can learn to use the assessment system, and test their BYOD in a setting as similar to the real assessment as possible.
- Completing a mock assessment could be made a required part of a course every semester.
- Procedures should be in place for allotting extra time in the case of technical problems.
- Procedures for completing the assessment on paper in accordance with ordinary procedures on the same day, possibly with extra time.

9.3 Support

- A back up computer must be available/set up for use by the student if his/her equipment fails to work.
- Competent IT support staff should be available before and during the assessment. A support helpline can be used an alternative point of help if dedicated personnel cannot be available in every exam room.
- Spare equipment should be available in case BYOD equipment fails to work.
- Consider having an alternative wireless network available in addition to eduroam. This network should have simpler authentication, e.g. WPA2/PSK.
- Be aware that access to online help in the operating system may provide access to the Internet.

10 Security

Security in connection with digital assessment is a very important issue and an integral part of the complete digital exam solution. Security concerns all aspects of the assessment solution, not just the client solution dealt with in this BPD.

Each institution should carefully document the assessment infrastructure, client and the configuration of the assessment-solution It is also important for and this documentation to be kept up to date as changes are made. A simple event log from each completed assessment would be a very useful tool for uncovering weaknesses in the chosen solutions for infrastructure and assessment clients.

10.1 Wireless Network Security

Wireless network security is described in UFS 112 (Recommended Security System for Wireless Networks)and wireless networks used for digital assessment should comply with the security recommendations for the internal zone in UFS 122 (Recommended ICT Security Architecture in the HE Sector).

10.2 Risk and Vulnerability Assessment

It is necessary to carry out a Risk and Vulnerability Assessment of the chosen assessment solution, the client solution and the infrastructure for digital assessment. This must be done by each institution, both before the solution is used and after major upgrades and changes to the assessment solution.

10.3 Visual Privacy

The requirement for visual-privacy measures will increase with digital assessment; while paper lies flat on the table, screens stand upright, and some students may need enlarged text, which makes it very easy to see from the neighbouring table.

Students with visual impairment may be placed at the back of the hall so that others cannot peek at their screens, which often features large text.

The problem is most acute for assessment held on desktop computers, which often have large screens, (from 19 to 24 inches). Here, one might consider installing a 3M privacy filter, but this option is expensive, (the cost of this screen attachment can run up to NOK3,000 (EUR350) per screen).

The simplest approach is to reduce the capacity of the hall, or to mix examinees from several assessments in the same hall so that examinees sitting next to each other are not taking the same test. It is also possible to seat the examinees further apart than one usually does in paper-based exams.

10.4 Wireless Keyboards/Mice

Wireless keyboards and mice pose an administration problem, as well as some security problems that cannot be easily controlled. It is recommended to establish a policy that students wishing to use wireless keyboards and mice have to apply for it, and that they be placed in separate areas/halls where the proctors have been trained to spot the associated problems with these wireless devices.

Wired keyboards and mice do not pose a similar problem and may be permitted for use in the examination hall.

10.5 Documentation and Implementation Log for Each Assessment

The infrastructure, client and implementation solution set-up for each assessment should be documented together with logs from the implementation and incidents that might have occurred during the assessment.

In some institutions, a year may pass between an assessment and the final grading. During this span of time, one must assume that the client set-up and implementation solution have been updated and improved, and it will be important to collect this documentation in case a complaint is brought over how the assessment was held. Logs have limited archival value after the assessment becomes final, and those parts of the logs that do not have archival value should be deleted when the assessment is finalised.

The solutions for digital assessment have varying degrees of built-in solutions for surveillance of the assessment. How the surveillance is carried out and what is being monitored/logged must be documented and communicated to the examinees.

For security and quality reasons, it is recommended to establish procedures for the implementation and incident logs from each completed assessment. These logs will be useful for uncovering weaknesses and security problems with the chosen infrastructure, client and implementation solution for digital assessment.

The Legal Report lists the following items for an incident log:

- What happened?
- Where did it happen?
- When did it happen?
- Who is involved?
- Who has been alerted?
- Possible reasons?

10.6 Surveillance and Logging During Assessment

To ensure quality in the holding of digital assessment, the solutions have varying tools for surveillance and logging during the assessment. According to the Legal Report, there is a distinction between what is logged, why it is logged, and the uses of logging.

If the implementation solution is procured from an external service provider, it must be clarified what surveillance and logging is carried out by the service provider. How these logs are to be used, and

possibly stored, must be specified in the data processor agreement drawn up between the institution and the service provider.

Operative logging

An institution is always allowed to log activities on the institution's own IT resources based on purely technical considerations, and as far as these logs are used to uncover technical errors and deficiencies in the solution. This also means that logging is permitted in order to be able to investigate and document what happened if a paper "disappears" in the system, or if a candidate wasn't or isn't able to hand in a paper (Legal Report chap. 6.3.1).

Note! Logs gathered for operative purposes cannot be used to uncover issues such as cheating, because catching cheats is not the purpose of the surveillance and the resulting logs (Legal Report chap. 6.3.1).

Logging in order to uncover cheating

Within digital assessment, "cheating" is defined as ***the examinee has access to illegal aids during the assessment, or otherwise acts contrary to the assessment regulations or the rules for quoting sources.***

Keeping logs on the examinee's PC during a digital assessment in order to uncover cheating will store the student's username and activities inside the assessment application during the assessment. What is stored by the system will vary between systems, but in any case, this is processing of the examinees' personal information. Today, there is no direct authority in Norwegian law covering the surveillance of activities on the examinee's PC and the consent of the examinee is not sufficient (Legal Report chap 6.3.2).

11 Students' Own equipment (BYOD): Example requirements

11.1 University of Agder (UiA)

The following list is taken from the UiA's pages on written-in-class assessment (20 April 2015).

> *You should bring your own laptop computer (PC or Mac) on the day of the assessment. Tablets or hybrid PCs are not permitted. If you don't have a device of your own that you can use, you need to apply to borrow a PC from the UiA within a specified deadline (see separate section below).*
>
> *It is important that you have updates installed on your PC or Mac. Also check that your equipment works with the UiA's wireless network eduroam.*
>
> *Your device must meet the following requirements as a minimum:*

Assessment via Inspera
***PC**: Windows 7 or newer, Google Chrome/Mozilla Firefox/Internet Explorer 10 or newer*
***Mac**: Mac OS/X 10.7 or newer, Safari 6 or newer.*
Assessment via Fronter

***PC**: Windows 7 or 8, Google Chrome / Mozilla Firefox / Internet Explorer 9 or 10*
***Mac**: OS X 10.7, 10.8 or 10.9, Google Chrome / Mozilla Firefox / Safari (for Mac OS X)*

11.2 University of Tromsø (UiT)

The following list is taken from the UiT's pages on written-in-class assessment (updated 23 March 2015).

Will your PC work for digital assessment? Below, you will find what we require of your PC/Mac in order for it to work for a digital assessment.

If you don't have your own device that you can use, you need to apply to borrow a PC from UiT (see separate section). Using a tablet or hybrid PC is not an option. It is important that you have installed all updates on your PC/Mac and have run a virus check. Also check that your device works on the UiT's wireless network, eduroam.

Your device must meet the following requirements as a minimum:

***PC:** Operating system: Windows 7 or newer*

One of the following browsers:
- *Google Chrome*
- *Mozilla Firefox 3 or newer*
- *Internet Explorer 9 or newer, and Adobe Flash 10 or newer*

Mac: Operating system: Mac OS/X 10.8 (Mountain Lion) or newer
Browser: Safari 6 or newer installed, Adobe: Adobe Flash 10 or newer installed

IMPORTANT!
- *You cannot take the assessment with a tablet or hybrid PC.*
- *You cannot use a wireless mouse or keyboard.*
- *You have to bring your own charger cable for your PC/Mac.*

11.3 University of Bergen (UiB)

The following list is taken from the UiB's pages on written in-class assessment, updated 19 March 2015.

You will bring a laptop computer (PC or Mac) on the day of the assessment. Tablets or hybrid PCs will not work for an in-class assessment.

In-class assessment are held using a secure browser and you are responsible for downloading and installing this browser, BEFORE the day of the assessment, on the device you bring with you for the assessment.

In order to use a secure browser, your device has to meet the following requirements:

Operating system	***From version***
OSX (Mac)	*10.9*
Windows	*7*

Information on browser support for the use of Inspera may be found here.

If you are not able to bring a laptop computer to the assessment, you need to apply within the specified deadline to borrow a computer from the University of Bergen during the assessment (see separate tab).

References

References to relevant regulations and guides freely available for download:

- UFS 102: Requirements for Generic Cabling Systems
  https://www.terena.org/activities/campus-bp/pdf/gn3-na3-t4-ufs102.pdf
- UFS 112: Recommended Security System for Wireless Networks
  https://www.terena.org/activities/campus-bp/pdf/gn3-na3-t4-ufs112.pdf
- UFS 122: Recommended ICT Security Architecture in the HE Sector
  https://www.terena.org/activities/campus-bp/pdf/gn3-na3-t4-ufs122.pdf
- UFS 127: Guide to Configuring eduroam Using a Cisco Wireless Controller

https://www.uninett.no/webfm_send/667

- UFS 145: Infrastructure for Digital Assessment

https://agora.uninett.no/documents/867091/968042/Physical+Infrastructure+for+Digital+Assessments.docx/e6adebb1-74b6-47c6-9274-35d98c866094

Requirements for students' devices in digital assessment at the University of Agder:
http://www.uia.no/student/eksamen/skriftlig-skoleeksamen

Requirements for students' devices in digital assessment at the University of Tromsø:
http://uit.no/prosjekter/prosjektsub?p_document_id=388448&sub_id=393673

Requirements for students' devices in digital assessment at the University of Bergen:
http://www.uib.no/utdanning/86719/digital-eksamen#krav-til-utstyr

(In Norwegian) "Digital vurdering og eksamen, en juridisk vurdering" (Digital assessment and exams, a legal assessment). A cooperative project carried out on behalf of the Expert Group on Digital Assessment and Examination, Spring 2014
https://norgesuniversitetet.no/files/attachment/2830/digital-vurdering-eksamen-juridisk-versjon1.pdf

Glossary

BPD	Best Practice Documentation
BYOA	Bring Your Own Application
BYOD	Bring Your Own Device
CBP	Campus Best Practice
HSE	Health and Safety
PSK	Pre-shared Key
UiA	University of Agder
UiB	University of Bergen
UiT	University of Tromsø
VDI	Virtual Desktop Infrastructure
WPA2	WiFi Protected Access 2