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Hvordan gjennomføre digital eksamen i den videregående skole med fri programvare?

Wolfgang Leister

Truls Fretland

NUUG møte – 10. November 2009

Oslo / Stavanger

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How to Perform ICT-based Exams in Compulsory Schools

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DIGEKS project

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- DIGEKS – Digital / ICT-based exam (2008)
- In cooperation with Møre og Romsdal county
- Supported by FAD (Norwegian Ministry of Government Administration and Reform)
  - Free and open source software (FOSS)
- Tests at several schools – spring 2009
  - Tests with up to 150 PCs
- «Commercialisation» process ongoing

Exams

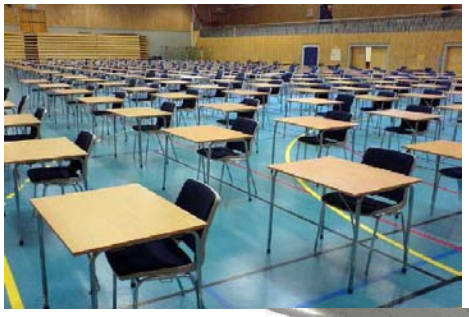


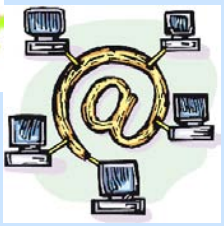
Foto: Silje Fuglerud

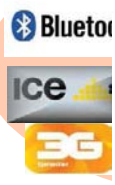
ICT-based Exams

Candidate answers questions in writing in controlled environment using ICT-tools

- Different tools
  - Web-based (browser),
  - text-editor,
  - Specific applications
- Use of aids in exams
  - (Own) files
  - Resources on server
  - Internet
  - Applications, e.g., dictionaries, spell checker
- Interaction with infrastructure
  - Deliver responses
  - Access questions
  - LMS (access, logging, etc.)

candidates PC class room infrastructure & LMS (school, county, Directorate of education and training)





Digital Exam – Requirement

- Must work ! Robustness !
- As little administration as needed
- User-friendly
  - Do not disturb candidates by system properties
- Secure
- As little education/training for all involved
- Must work with LMS and infrastructure
- Must work on candidate's PCs

What can candidates use?

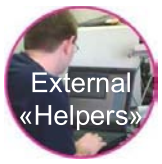
- Network
  - Wired network
  - Wireless network

- Intranet / Internet
- File areas on
  - Own PC
  - Server
  - USB-units, CDROM, ...

- Programs and applications
  - Browser, text-applications, applications for subjects

What should candidates NOT use?

- Unwanted files / file areas / applications / services
  - On own PC
  - Intranet (of school)
  - Internet
  - «External Helpers»
- Other networks
  - Bluetooth, WLAN, ...
  - 3G (GPRS, UMTS, ...), ICE
  - Via USB, PCMCIA, mobile phone, ...



Solutions ... (1)

- PC washing
  - Check PC before exam
  - Put irregular files/tools in quarantine
  - Disadvantages:
    - Change system (temporarily) !
    - Jurisdiction problematic in case of damages!
    - Privacy issues!
    - High technical competency required!
    - Often update of routines (development ...)
    - Labour-intensive !
  - Advantages:
    - Original operating system is used

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Solutions ... (2)

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- Surveillance
  - Install surveillance and logging infrastructure
  - Disadvantages:
    - Costly infrastructure
    - Trained personnel
    - Misjudgements possible
    - Privacy issues
    - Not all communication can be logged
    - Possibly installation of clients on PCs
  - Advantages:
    - Original operating system is used

Solutions ... (3)

- Thin-client
  - Operating system / runtime-system from server
  - Requires infrastructure!
- Network boot
  - System files / applications from server
  - Requires some infrastructure!
- Application Streaming
  - Operating system and applications are streamed on demand.
  - Immature technology – requires infrastructure!
- Kiosk-systems
  - Application covers entire screen. Access only to exam system.

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- Live Distro
  - Start of exam system – without installation – from external medium (e.g., USB)

What is Used in the Norwegian Counties to Limit Cheating?

- Monitoring
  - Network
  - Laptop
    - Modify
    - Replace
- Restricting
  - Network
  - Laptop
    - Modify
    - Replace

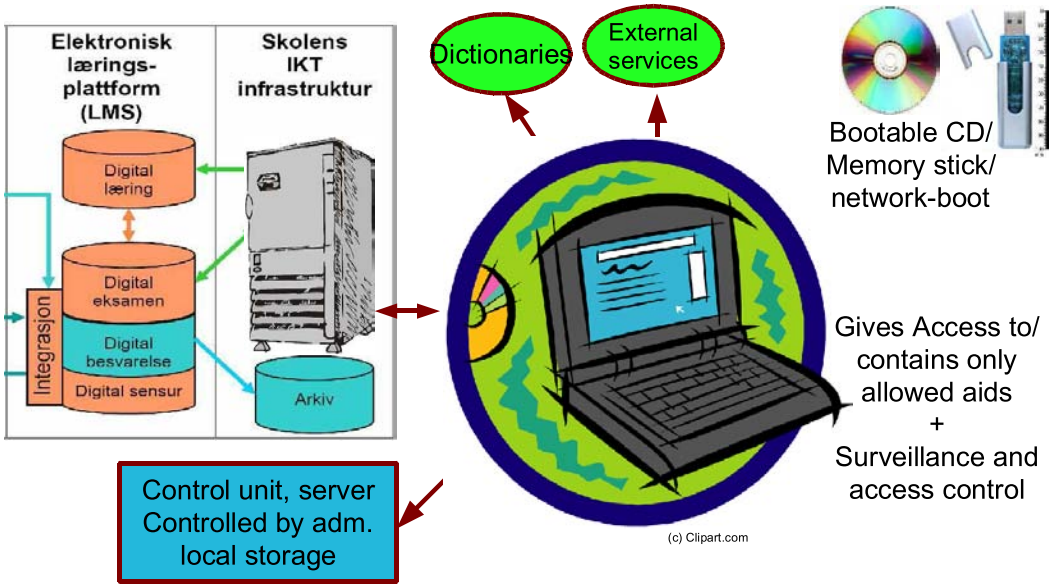
	School network	*Modify laptop*	*Replace on laptop*
Monitor	1	1	0
Restrict	14	5	1

Modify – Monitor – Restrict network - Replace

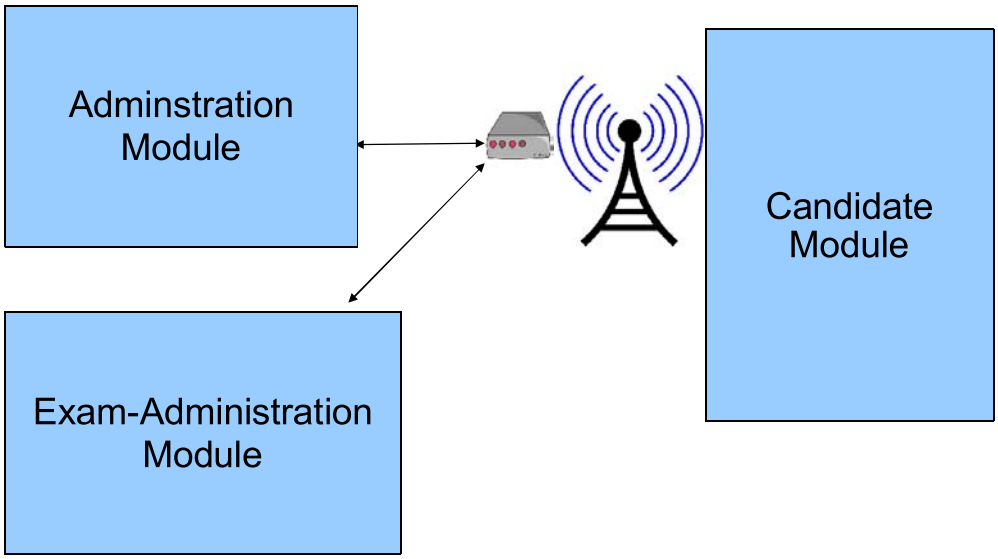
Properties of solutions

	Requirement / Solution	*(i) modify*	*(ii) monitor*	*(iii) restrict netw*	*(iv) replace*
(a)	Familiar working environment	Yes	Yes	Yes	Possibly
(b)	Deliver electronically	Yes	Yes	Yes	Yes
(c)	Perform exam	Yes	Yes	Yes	Yes
(d)	Prohibit communication	Partly	no	Partly	Yes
(e)	access to allowed aids	Yes	Yes	Yes	Possibly
(f)	restrict forbidden applications	Yes	no	No	Yes
(g)	surveillance system	Partly	Yes	Partly	Minimal
(h)	simple setup	No	Yes	Yes	Yes
	same application as in daily work	Yes	Yes	Yes	Possibly
	Detect digital cheating	No	Yes	No	Yes
	Restrict digital cheating	Yes	no	Partly	Yes
	Can utilise user-owned laptop	Not always	Possibly	Yes	Yes

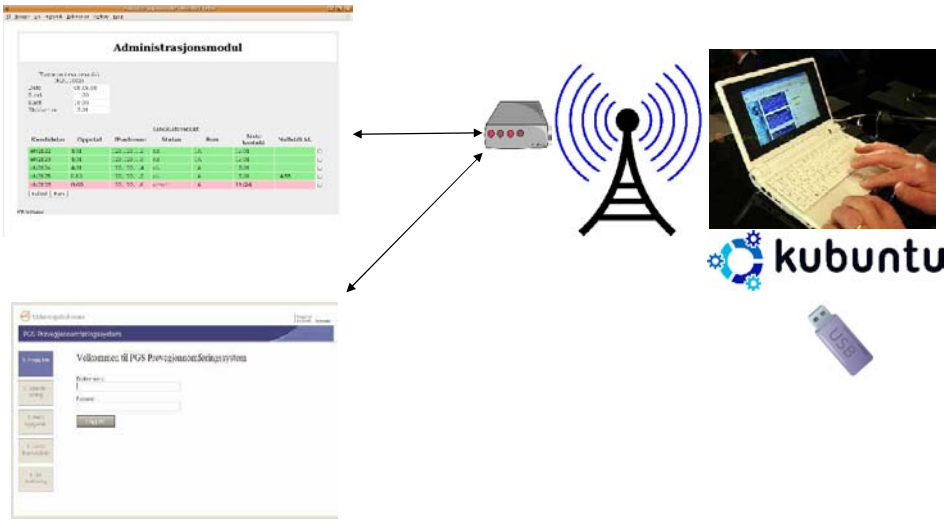
DIGEKS – Infrastructure



DIGEKS – Infrastructure



DIGEKS – Infrastructure



Candidate Module – liveusb

kubuntu

OpenOffice.org

- Startup from memory stick
- FOSS (Kubuntu, openoffice)
- No installation required
- PC stays unchanged after exam
- Automatic detection of hardware
  - support for graphics, sound, SCSI, USB, etc.
- Configurable: applications, operating system, ...

Administrasjonsmodul - Mozilla Firefox

Fil Rediger Vis Historikk Bokmerker Verktøy Hjelp

Administrasjonsmodul

Eksamen i matematikk (MAT1003)

Dato	08.09.08
Start	11:30
Slutt	16:00
Klokken er	15:01

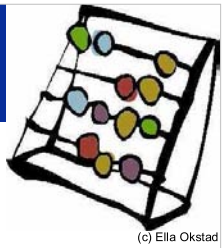
Kandidatoversikt

Kandidatnr	Oppetid	IP-adresse	Status	Rom	Siste kontakt	Nullstilt kl.	
elv2122	4:01	123.123.1.2	ok	1A	15:01		☐
elv2123	4:01	123.123.1.3	ok	1A	15:01		☐
elv2124	4:01	123.123.1.4	ok	1A	15:01		☐
elv2125	0:10	123.123.1.5	ok	1A	15:01	14:55	☐
elv2126	0:05	123.123.1.6	error	1A	11:24		☐

Nullstill Fjern

NR-testskole

Economical musings



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- No extra licensing costs
- FOSS
  - Maintenance and further development locally possible
  - «Production» of exam memory sticks
- Existing hardware can be used
  - Candidates' PCs
    - Who owns the PC?
  - Infrastructure
- Memory stick < 10 € per unit.

Advantages and Challenges

Advantages

- Locks out unwanted communication
- No «PC-washing»
- Easy to adminstrate
- No extra licensing costs for exams
- No extra infrastructure
- Candidates' PCs are unchanged after exam

Challenges

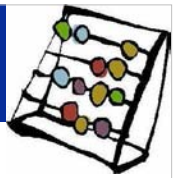
- Hardware support
- Not all applications are supported
- Organisation and maintenance of FOSS
- Universal design issues

Concerns by School Authorities

- Not used to FOSS – expect finished product
- Not familiar with work environments like KDE, gnome, etc.
  - Not familiar with possibility to adjust
  - Office applications

- Problem awareness:
  - «We do not want to monitor candidates»
  - Close the eyes – do not inspect or quarantine content
  - Leave it to local schools how to organise exams
- Fine-grain surveillance can be problematic!

Some Experiences



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Used peer production (FOSS) model after first prototype was developed.

- Tasks by peers: Add driver support, printing, missing software, provide error messages, testing, etc.
- Peers were not selected centrally, but volunteered
- Politicans express support to FOSS, but administrations are not prepared to meet FOSS
- FOSS can work on municipal / county level
- Willingness of authorities to buy from nearly-monopolist instead of FOSS processes.

Microsoft Windows and DIGEKS?

- Technically possible
- Code is not open
  - need expertise to configure OS ...
- License issues
  - Previously: extra license for exams
  - Now: VM-type license
- Suitability for prototyping ...
- Contributions from community ???

The Road Ahead ...

- Extend to more schools
- Maintenance through local enterprises
- Extend to other OS'es
- Extend functionality

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- Extend to more applications
  - (Wine, alternate appl)
- Universal design
  - Make suited for more target groups
- Increase security
- Adapt to requirements
  - Disk access ...
- New Ubuntu versions

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Thank you !

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Questions ?