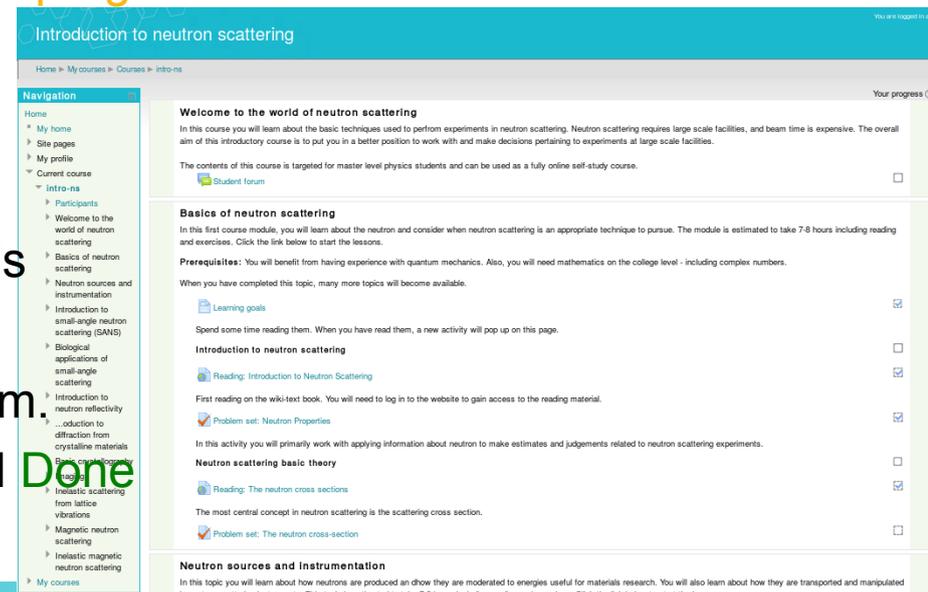


Task 3.1: e-learning platform – Virtual Neutrons for Teaching

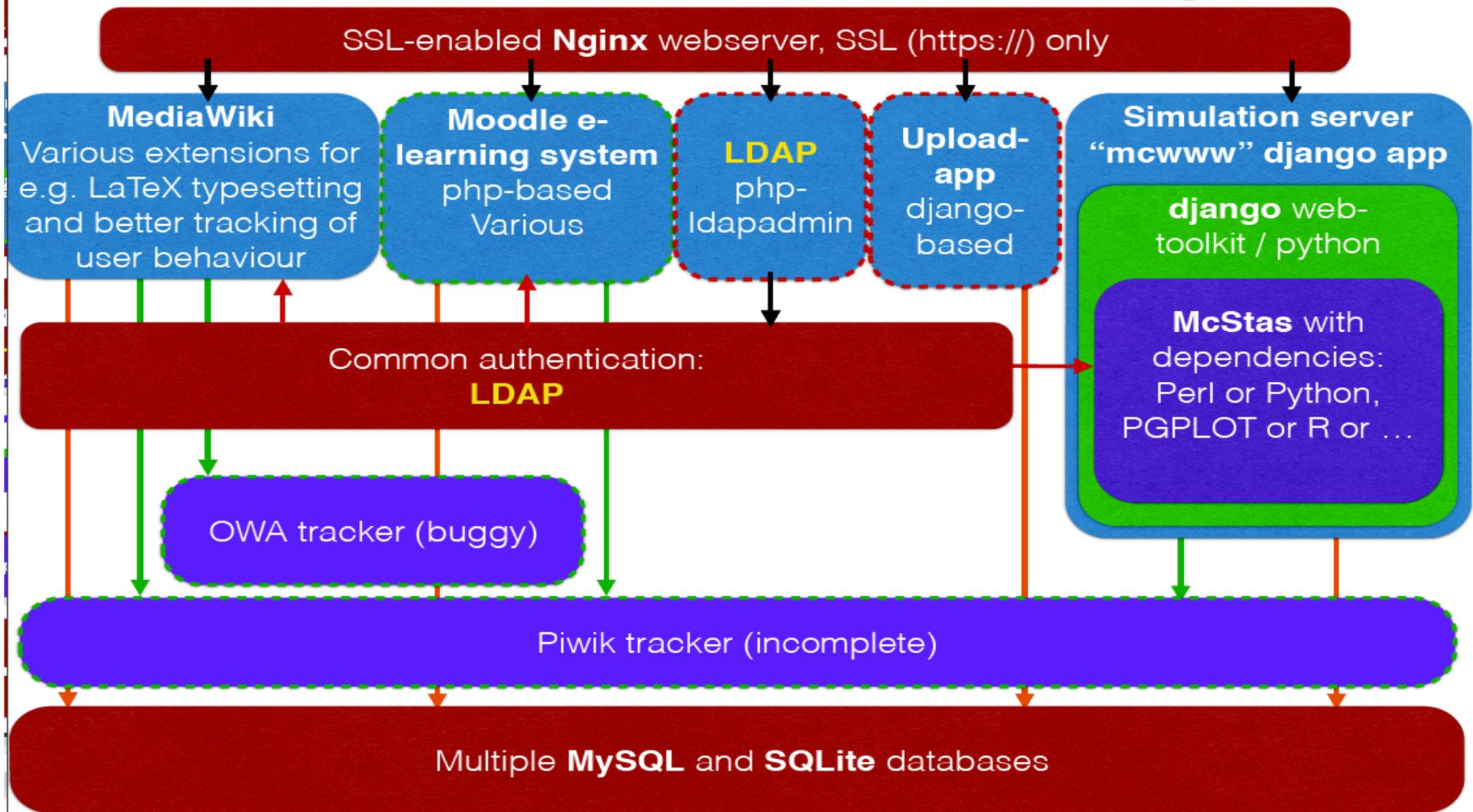
- All software in **VNT is open source**
- We chose the course organisation to be based on **Moodle** LMS software **Done!**
 - Quiz module for student activities is quite extensive and feedback/multiple tries possible – good for learning (vs assessment) activities.
 - Several roles with different permissions are possible (student, teacher, administrator)
- Reading material in WIKI format, based on **MediaWiki** software. **Done!**
- Virtual Experiment Simulation interface, based on **McStas** software. **Done (still optimising)**
- Development of **LDAP based user authentication** for students to use all software parts (Moodle, MediaWIKI, McStas) by a single sign-on. **In progress.**
- Entrace webpage for VNT. **Pending.**

VNT Test and development

- Tracking of student usage by webpage analysis tools (Piwik and OWA) **Done!**
 - For didactical research and optimisation of platform.
- Implementation in blended learning setting at UCPH **Done**
 - For testing and optimisation of learning material.

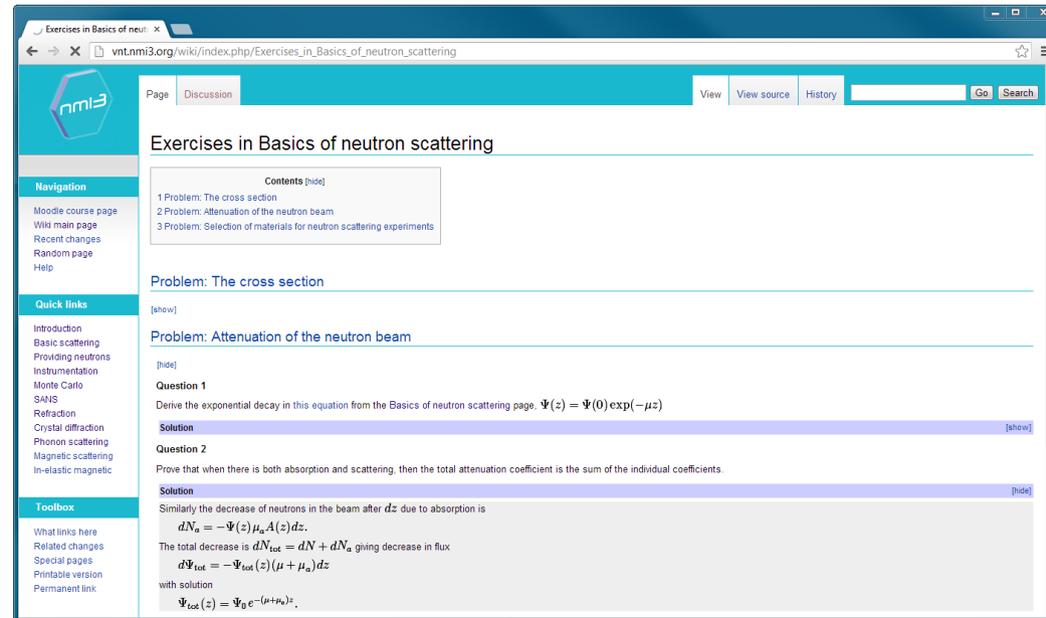


Overview of used technology



Task 3.2: Dedicated lecture material

- Introductory course for neutron scattering (4 weeks full-time study)
- Scope of course has been focused to target master level physics students
 - 10 topics
 - **Learning material:**
 - WIKI book. **Done**
 - Video lectures. **In progress**
 - Pencasts and screencasts **In progress**
 - Library (collection of external resources, material from schools etc). **Pending**
 - **Student activities:**
 - WIKI exercises (with student activated hints/solution but no student input) **(Mostly) Done**
 - Moodle learning quizzes (feedback and multiple tries) **Several done. Some In progress**
 - McStas simulation quizzes (based on online virtual experiments) **Several done. Some In progress.**
- Production of interactive material for an online introductory neutron scattering course has been slower than expected due to staff long-term illness but we are catching up.



Exercises in Basics of neutron scattering

Contents [hide]

- 1 Problem: The cross section
- 2 Problem: Attenuation of the neuron beam
- 3 Problem: Selection of materials for neutron scattering experiments

Problem: The cross section [show]

Problem: Attenuation of the neuron beam

[hide]

Question 1

Derive the exponential decay in this equation from the Basics of neutron scattering page. $\Psi(z) = \Psi(0) \exp(-\mu z)$

Solution [show]

Question 2

Prove that when there is both absorption and scattering, then the total attenuation coefficient is the sum of the individual coefficients.

Solution [hide]

Similarly the decrease of neutrons in the beam after dz due to absorption is

$$dN_a = -\Psi(z) \mu_a A(z) dz.$$

The total decrease is $dN_{tot} = dN + dN_a$ giving decrease in flux

$$d\Psi_{tot} = -\Psi_{tot}(z) (\mu + \mu_a) dz$$

with solution

$$\Psi_{tot}(z) = \Psi_0 e^{-(\mu + \mu_a)z}.$$

Task 3.3 Learning experimental neutron scattering on virtual instruments

- Generic virtual instruments representing major neutron techniques
- Web interface allows student online simulation of virtual experiments
- Dedicated exercises based on investigation of tailored virtual experiments :

- Small Angle Neutron Scattering: **Done**
- Powder Diffraction: **Done**
- Imaging: **Done**
- Reflectometry: **In Progress**
- Inelastic Neutron Scattering: **Pending**



Question 1
Tries remaining: 4
Marked out of 1.00

Run the simulation with default parameters or another set of parameters that you like, except you should always set dlayer=0. You should get a web-page with images that look like the first row of images below. By pressing L, you can get different images. We want you to find out what the different images on the web page represent. We encourage you to play around and click on the page (not the image below).

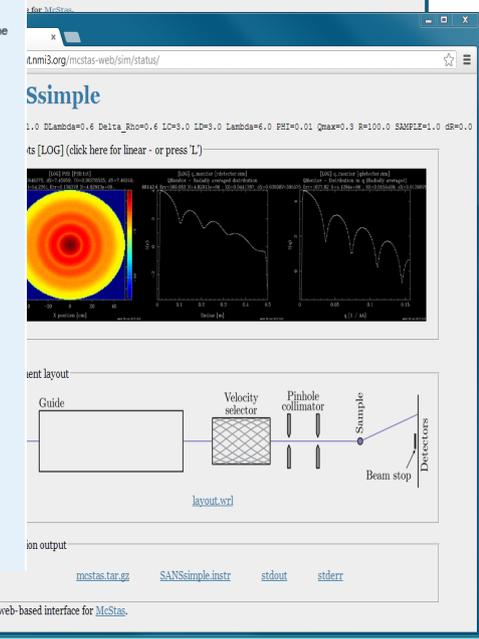
Below the following image, you will find text codes that you can drag onto an area on the image. Each code corresponds to a description of the area on the image:

POI: A plot of the image at the detector
 LPOI: A log-plot of the image at the detector
 RSI: A graph of the intensity measured at the detector in real space.
 LRSI: A log scale graph of the intensity measured at the detector in real space.
 ISI: A graph of the intensity measured at the detector in reciprocal space.
 LISI: A log scale graph of the intensity measured at the detector in reciprocal space.

When you are ready, drag and drop the text boxes to the appropriate places on the image.

POI LPOI RSI LRSI ISI LISI

Check



e-learning						
D3.1	Specifications about technical functionalities needed for e-learning platform	3	UCPH	3	15	Y
D3.2	Advancement report on functionalities development	3	UCPH	12	41	Y
D3.3	Provision of e-learning neutron scattering platform	3	UCPH	48		
D3.4	Content analysis of neutron course	3	UCPH	12	12	Y
D3.5	Didactical course material	3	UCPH	48		
D3.6	Lecture material to support the neutron courses	3	ILL (UCPH)	48		
D3.7	Definition of instruments to be simulated	3	UCPH	12	12	Y
D3.8	Virtual neutron scattering instruments, report on the setup and documentation	3	UCPH	48		

Delivered since last GA

D 3.2: Advancement report on functionalities development in the e-learning software (23 p)

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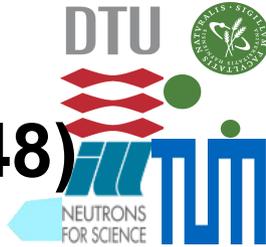
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- Report explains install, configuration and use of various software in VNT
- Necessary to establish a local server in Copenhagen area for efficient development and testing of various versions of software and software interoperability

No further delays of deliverables



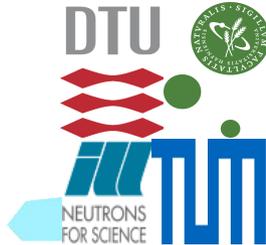
WP3 (e-learning): Due Deliverables (all M48)



- **D3.3 Provision of e-learning neutron scattering platform :**
 - Test platform containing necessary learning software has been established. **Done**
 - Running server needs configuration according to test server development **In progress**
 - A common LDAP-based authentication mechanism for all parts of portal has been developed **done** .
Single sign-on for users **pending**.
- **D3.5 Didactical course material:**
 - An introductory neutron scattering course with been outlined with 10 topics. **Done**
 - In collaboration with experts in both NS and didactics we have developed material for active learning in each topic (e.g. reading material in WIKI format, quizzes, online simulation exercises). **Done**
 - Each topic takes 8-24h for a master student in physics to complete. 7/10 topics **done**. Rest **In progress**
- **D3.6 Lecture material:**
 - Lecture material WIKIbook format. **Done**
 - Video/screen/pencasts **In progress**
 - Library of external teaching/learning resources and material from schools. The hierarchical structure of the Library is a challenge and functionality under development. **Pending**
- **D3.8 Virtual neutron scattering instruments,**
 - 3 virtual experiment exercises **Done**
 - Report on setup and documentation **In progress**



WP3 (e-learning): Impact and value



- An interactive e-learning platform for neutron scattering, free to use for anyone who registers. **Will have the impact of attracting new and/or potential users.**
- Didactical course material provides a full introduction course available online as self-study to students worldwide who are not able to attend face-to-face courses on neutron scattering. **Will have the impact of attracting new users.**
- Many exercises and quizzes which can be freely used stand-alone or as part of face-to-face courses. **Will be of value for teachers of neutron scattering.**
- Teachers and schools can make their own online courses utilising the interactive software tools of the platform to make e.g. simulation exercises and quizzes.
Will be of value for existing schools which may attract remote students, have more participants without increasing limited seats for hands-on and be further exposed.

UCPH:

- Linda Udby (project leader)
- Pia Jensen (WIKI content manager)
- Jesper Bruun, Julie Hougaard (Didactics research)
- Kim Lefmann (main WIKI contributions),
- Ursula Bengård Hansen (french-english tech translation)
- Lise Arleth, Kell Mortensen, Jacob Kirkensgaard, Martin Cramer Pedersen, Maria Thomsen (quiz+WIKI contributions)



DTU:

- Peter Willendrup (VNT platform development)
- Jacob Gaarde
- Mark Lewis (webinterface + plugin programming)
- Bente Lebech (WIKI + quiz contribution)



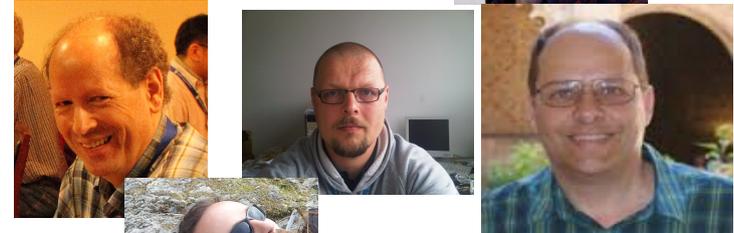
ILL:

- Helmut Schober (ILL coord+ WIKI contribution),
- Andrew Wildes (WIKI contribution),
- Alain Filhol (HTML5 illustrations consultancy)



FRM2/TUM:

- Jurgen Neuhaus (TUM coord)
- Peter Link (Library)
- Jörg Pulz (server maintenance)



ESS:

- Markus Strobl (quiz+WIKI contributions)



Thank you!