Ref. Ares(2025)9317782 - 30/10/2025

Aurora IT Handbook

Deliverable 6.1

Date 31/10/2025

AURORA

Co-funded by the European Union

UNIVERSITY OF ICELAND
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Deliverable Number	6.1		
Deliverable Name	Aurora IT Handbook	Lead Beneficiary	UDE
Type	R-Document, report		
Due Date (month)	24	Dissemination level	PU - Public
Contributors (selects relevant partners and associate partners)	6	Work Package No	WP6
	UICE, UIBK, UDE, URV, UNINA, UP, VUA, CBS, UPEC, CIMEA		

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1. Executive Summary

The Aurora IT Handbook outlines the strategic and technical foundation for developing the Aurora Virtual Campus (AVC) – a key component of the Aurora 2030 project under Work Package 6 Green and Digital Campus. The Aurora Virtual Campus aims to create an interoperable, learner-centered digital environment connecting the nine Aurora partner universities, enabling students and staff to seamlessly access, register for, and participate in courses and other offerings across institutions.

The handbook translates the high-level objectives of the Aurora 2030 Grant Agreement into an actionable framework composed of four core modules:

- **Joint Centralised Course Catalogue:**
  Establishes a unified, automatically updated platform displaying Aurora-wide learning opportunities using the eduXchange system (developed by SURF). Each university connects its course catalogue via standardised interfaces based on the OOAPI standard, ensuring real-time synchronisation and data accuracy.
- **(Semi)Automated Enrolment and Course Registration:**
  Builds on the Joint Centralised Course Catalogue to enable streamlined student enrolment across institutions through eduGAIN (for authentication) and EMREX, as well as direct national SDG connections (for data exchange). A Data Exchange Agreement between Aurora universities will define the legal and technical parameters for secure, GDPR-compliant student data transfer.
- **Issuance, Storage, and Exchange of Digital Credentials:**
  Utilise EU-recognised systems – European Digital Credentials for Learning (EDCL) and the Europass Digital Credentials Infrastructure (EDCI) – to issue tamper-proof, portable academic records. Partner universities will integrate their student and examination systems with the EDCI APIs and implement e-seals for credential authenticity. The framework also supports micro-credentials aligned with Aurora's educational guidelines.
- **(Semi)Automated Access to Learning Environments and Infrastructure:**
  Ensures that students from one Aurora university can access another's learning management and digital systems seamlessly using federated identity mechanisms. This module pioneers integration between Student Information Systems and Learning Management Systems across the alliance, leveraging Single Sign-On and open standards.

Across all modules, the handbook emphasises two guiding principles: decentralisation (each university retains autonomy over implementation while adhering to shared standards) and the once-only principle (minimising redundant data entry and system duplication).

Implementation timelines extend from Winter Semester 2025/26 to Summer Semester 2028, with phased rollouts for each module. The first operational milestone is the piloting of the Joint Centralised Course Catalogue.

Key challenges include heterogeneous IT infrastructures, legal variations, data protection compliance, and limited (personnel) resources. The handbook proposes mitigation through phased implementation, shared technical standards, capacity building, and continuous political and institutional alignment within the Alliance to provide the needed resources – the later serving as the most important issue to assure a successful implementation of the Aurora Virtual Campus.

Ultimately, the Aurora IT Handbook provides a pragmatic, modular roadmap toward an interoperable and sustainable digital ecosystem for higher education collaboration in Europe which all Aurora Partners will work towards. It sets the groundwork for the Aurora Virtual Campus as a federated, student-centered model that enhances mobility, strengthens institutional autonomy, and advances European interoperability in higher education.

2. Introduction

Mobility is an essential aspect of European higher education policy. It enables students, lecturers and researchers to work, learn and conduct research at different higher education institutions across Europe. Through mobility, students (and staff) can acquire new skills and knowledge, gain international experience and develop a global perspective. For higher education institutions, mobility fosters (inter)national cooperation, collaboration and partnerships. It also contributes to the development of a more mobile and flexible workforce in Europe. Mobility can be broadly categorised into long-term mobility (semester or year-long exchanges such as Erasmus, double degree programmes), short-term mobility (short programmes such as summer schools and seminars), blended mobility (e.g., Blended Intensive Programmes) and virtual exchanges (online courses or programmes, e.g., COIL).

Student mobility is driving the need for interoperability, as students and institutions need the ability to share data and processes across higher education institutions to facilitate mobility. Interoperability refers to the "ability of organisations to interact towards mutually beneficial goals, involving the sharing of information and knowledge between these organisations, through the business processes they support, by means of the exchange of data between their ICT systems (European Commission 2017, p. 5)". More specifically, interoperability in higher education requires the ability of different systems to exchange data and information in a standardised format; to use standard protocols and interfaces to communicate with each other; to interact with each other to provide a consistent, coherent, and as seamless as possible experience for students, lecturers, and administrators; and to support the sharing of resources such as courses, programmes, and services between institutions.

The Aurora Network of research-intensive universities was established in 2016 to strengthen international collaboration, from which the Erasmus+-funded Aurora European University Alliance emerged in 2020. As part of the Erasmus+-funded project, a strong focus was placed on mobility and teaching development, with the Horizon 2020-funded project "Aurora Research and Innovation for Societal Impact" 2021 being acquired for the research agendas. The Erasmus+ project was extended in 2023 with the "Aurora 2030" project. The Aurora Alliance offers all the mobility options mentioned above, so that many students travel between the different campuses each semester. Hence, creating interoperability between the various universities and developing an appropriate virtual campus is important to the Alliance, which aims to provide a seamless university experience for students, researchers and staff from the nine Aurora universities.

The development of a virtual campus requires a long-term process and involves certain risks and obstacles, such as ensuring interoperability between diverse systems, safeguarding data security, and supporting users in developing the necessary digital

skills. The Aurora Virtual Campus is based on the vision of an inter-operable and learner-centered European education system, where students, lecturers and staff can work seamlessly across institutions of all partner universities, sharing data and processes from enrolment to the awarding of diplomas and certificates. This is closely linked to the idea of digital sovereignty, by relying on open standards; institutions can control their own data and processes independently of external providers, while complying with European data protection regulations. At the same time, learners retain full ownership and control over their personal data, without being tied to a particular company or propriety software.

In this handbook, we will outline, starting from our current situation, the key aspects described in the grant agreement for the Aurora 2030 project, including the vision and goals for the Aurora Virtual Campus, and provide an envisioned target process for the Aurora Alliance. We are going to describe in detail:

- How we want to implement a joint centralised Aurora course catalogue using eduXchange,
- How we want to achieve (semi)automated enrolment and course registration for students within Aurora,
- How we want to handle the issuance, storage, and exchange of digital credentials and
- How we aim to provide (semi)automated access to local learning management systems for both students and teachers.

We are also going to describe possible risks that might arise during the implementation of these four modules, as well as strategies on how to mitigate them. For each module, we are also going to provide a rudimentary timeline for when the described measures will be implemented. All of this allows us to describe what we want to achieve with the Aurora Virtual Campus, what the limitations of the Aurora Alliance as a consortium are, where each Aurora university needs to fulfill their institutional responsibilities, which overall risks might occur (and how we want to tackle them) as well as how the complete timeline for the implementation of the Aurora Virtual Campus looks like.

What this handbook is not and cannot be is a detailed guide on how to implement each of these modules at each university respectively. A plethora of systems are in use at each university and even if there are some overlaps of commonly used systems, a detailed description of how all of the modules need to be implemented in accordance with all the used systems is neither manageable nor useful. Rather, the common understanding of what should be achieved through which systems, standards, and protocols will be detailed.

2.1. Content Grant Agreement

In the grant agreement for the Aurora 2030 project, the Aurora Virtual Campus is described as follows:

> "The Aurora Virtual Campus is the central database for all shared learning and training opportunities offered to students (and staff) in Aurora Universities. [...] The Virtual Campus is a one-stop-shop of all opportunities that Aurora universities currently offer and will offer to the wider Aurora community. It is a way to pool together offers and showcase externally what we do [...]." (Aurora 2030 Grant Agreement, p. 157)

The activities regarding the Aurora Virtual Campus are part of work package 6 "Green and Digital Campus". The objective of WP6 relating to the Virtual Campus is described as:

> "The overall goal of WP6 Green and Digital Campus is to support the establishment of an Aurora Alliance inter-university campus through advancing our IT and sustainability capacities.
>
> More concretely, this WP will address the following specific objectives:
>
> O6.1 To provide the necessary digital administrative processes and data as well as IT- and business services, to enable the students and university staff to successfully participate in curricular activities spanning all partner universities. This is a continuous effort. It also aims to initiate and foster cooperation with other European University Alliances, to implement and promote shared interoperability standards for European higher education institutions." (Aurora 2030 Grant Agreement, p. 81)

The Task Team 6.1 "Aurora IT Development & Services" details on how the objective should be realised: Existing EU standards for online authentication and authorisation to access digital services should be utilised to increase interoperability between the partners. The Virtual Campus should be redesigned to integrate activities and IT services agreed upon by all Aurora members, "like a joint course catalogue, or enrolment processes", but not exclusively to these. A focus should be on Digital Credentials and how they are created, issued, and managed within the Alliance. (see Aurora 2030 Grant Agreement, p. 81)

Related to the Virtual Campus are three deliverables as well as two milestones:

- D6.1: Aurora IT Handbook by month 24. "Aurora IT Development & Services handbook for Alliance-wide guidance and implementation."
- D6.2: Aurora Virtual Campus by month 48. "Relaunched website with variety of Aurora IT-services implemented."
- D6.4: Draft components for the report on the Virtual Campus by month 22. "Draft components for the report on the website."
- MS17: First Aurora Digital Credential Issued by month 24.
- MS20: Aurora Virtual Campus Relaunch by month 40.

2.2. Vision and Goals

Building on these rather vague statements, we concretised the descriptions of the grant agreement. Overarching, the Aurora Virtual Campus aims to provide students of Aurora universities with seamless access to the learning opportunities and resources of all partner universities. Our aim is to create a learning environment where students can use their existing credentials from their home university to navigate seamlessly through the academic and administrative systems of all Aurora partners – just as if they were on campus. At the same time, the Aurora Virtual Campus should also serve the staff of the Aurora universities to boost their participation in international opportunities, such as BIPs, staff training, calls for conferences, grants, further education formats, and further opportunities – one of the additional agreed upon use cases between all Aurora universities that is not directly mentioned in the grant agreement. Interoperability between the technical systems of the universities should be established to the greatest extent possible. In this context, the harmonisation of local processes is particularly relevant in order to achieve not only technical but also organisational interoperability – here, the results of Work Package 8 "Enabling Mobility and Exchange" and their respective reports must be taken into special consideration.

To achieve our overarching goal, we agreed to define the Aurora Virtual Campus as consisting of four modules with specific requirements per module, which will create the new Aurora Virtual Campus:

- **Joint Centralised Course Catalogue**
  Requirement: To offer a central website/point where "Aurorarised"[1] courses are offered by partner institutions and are displayed and updated in an automated, real-time manner.
- **(Semi)Automated local enrolment & course registration**
  Requirement: To allow well-identified students to enroll as seamless as possible in the institution providing an Aurora course. User accounts and provided student data from the student's home-universities should be used for this purpose.
- **Issuance, exchange, and recognition of digital credentials**
  Requirement: The university providing a course through the Aurora course catalogue will issue, upon successful completion of a course by students, an appropriate digital credential. These digital credentials, which must be well defined and commonly understood within the alliance, shall be issued in a form

[1] **Aurorarised Course**: A course designed or adapted within the Aurora framework, often SDG-aligned and based on co-creation, transdisciplinarity, or innovative teaching methods.
Level 1: Course is linked to a Pilot Domain and at least one SDG.
Level 2: Course is linked to a Pilot Domain, at least one SDG and develops at least one key competence incl. in the Aurora Competence Framework (AFC).
Level 3: Course is linked to a Pilot Domain, at least one SDG, develops at least two key competences incl. in the ACF and uses at least one teaching method described in the Aurora Education Principles.

that enables seamless portability and recognition among Aurora institutions (and beyond).

- **(Semi) Automated access to local learning environment and infrastructure**
  Requirement: To enable authenticated students to access the local learning environment (e.g., learning management systems, virtual classroom tools) for their Aurora courses as seamless as possible. For this purpose, user accounts and, if necessary, student data provided by the student's home universities should be used.

Two baselines of the Aurora Virtual Campus are to implement systems and procedures that are as decentralised as possible and to follow a once-only principle. Adhering to these baselines will allow us to develop effective solutions for our target groups while avoiding the costly and inefficient duplication of data and systems. Building on this, we will treat decentralisation as a strategic asset and a defining strength of Aurora's approach. By embracing our federated structure – where each partner retains autonomy yet works toward clear, shared goals – we can strengthen collaboration across the alliance.

To ensure this vision is realised, we will engage a broad range of stakeholders (see chapter 7), keeping our collective vision strong, aligned, and well-resourced. In particular, political alignment within the alliance, as well as the integration of Aurora's overarching goals into the local objectives of the individual universities, is of crucial importance. Equally essential are other strategic discussions that directly influence the usability and development of the Aurora Virtual Campus – such as defining the alliance's focus in the area of mobility, determining how all Aurora partners can best contribute their respective strengths, and clarifying the values the alliance stands for. These discussions must be initiated from different levels and carried out within the respective Aurora governance bodies, and – as already noted – must also be translated into institutional objectives. In this context, exchange with other European University Alliances via the FOREU4ALL project is highly relevant, especially in those modules and discussions where Aurora is taking a pioneering role like with the module "(Semi) Automated access to local learning environment and infrastructure".

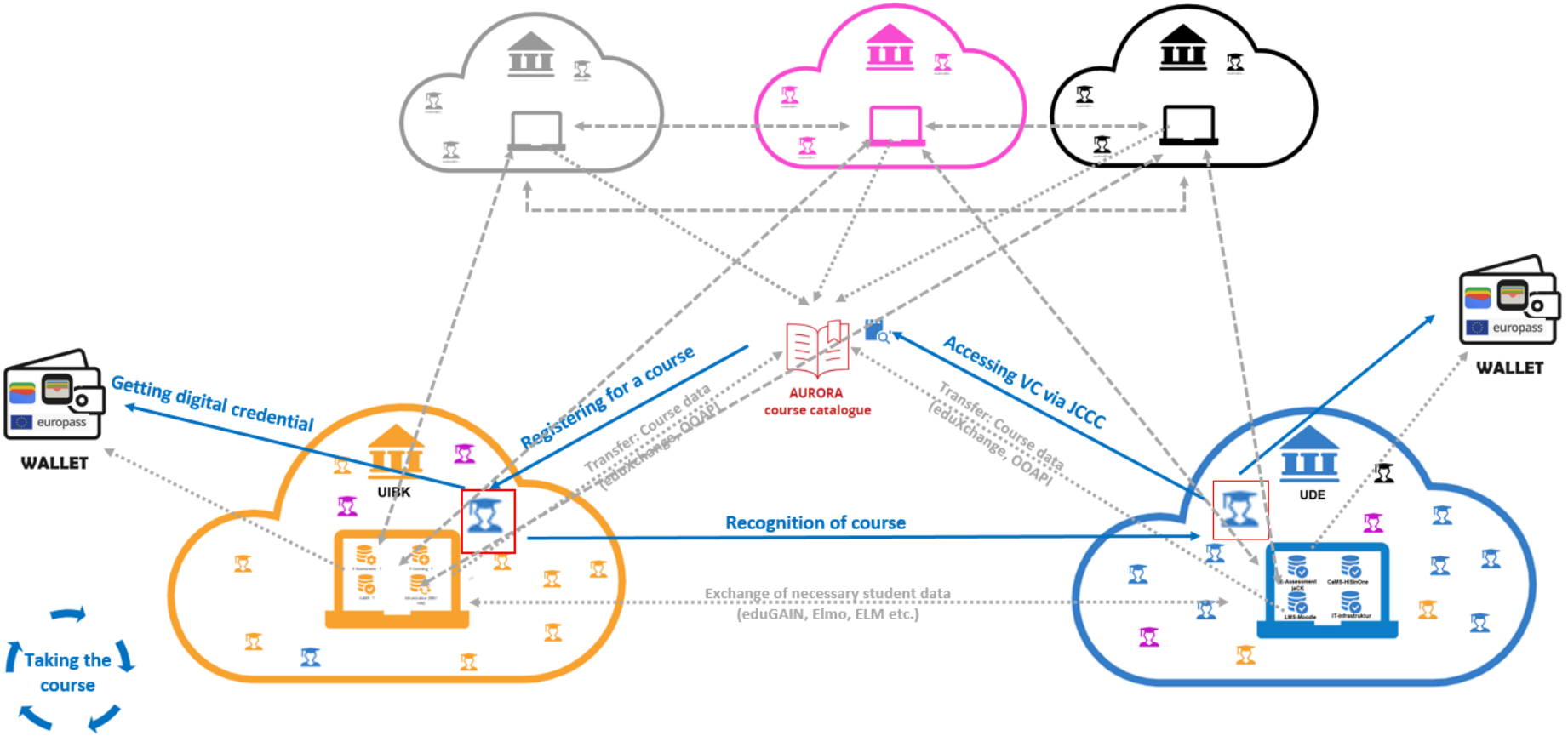
2.3. Envisioned Target Process

With the different modules of the Aurora Virtual Campus implemented, the envisioned target process for students of the Aurora Alliance looks like this:

1. **Population of the Joint Centralised Course Catalogue:**
   Course data on Aurora courses at each partner university is pulled from each respective university system via eduXchange to display it in the Joint Centralised Course Catalogue.
2. **Course selection via the centralised course catalogue:**
   Students browse the Aurora Course Catalogue and select relevant courses.

3. **Initiation of the registration process:**
   Upon clicking the "Register" button on the course detail page, authentication via eduGAIN is triggered.
4. **Data transfer via EMREX or direct national SDG connection:**
   After successful authentication, study-relevant data are transferred from the home university to the host university via an EMREX-compatible interface or direct national SDG connection if the student agrees.
5. **Automated enrolment (if necessary):**
   The host university automatically checks the transmitted data. If all requirements are met, enrolment and course registration occur automatically wherever possible, or manually if necessary.
6. **Feedback to students and collection of further data if needed:**
   Students receive confirmation of successful registration or information on further steps or missing data. The processes to receive further data differ from university to university.
7. **Student takes the course**
   Student enters seamlessly the university's learning management system and may have (un)restricted access to tools used to complete learning activities like digital semester apparatuses / digital course materials provided in the library for teaching purposes, to integrated or non-integrated VC solutions or examination tools. This process step is highly related to the possibility or progress of implementing SSO and the associated specific roles in different systems.
8. **Transfer, recognition and/or lifelong (wallet) storage of academic results**
   a. **Transfer between Aurora Universities initiated by student**
      i. **Inter institutional transfer:** After successful registration and course completion, academic results are automatically transferred to the student management system of the delivering university.
      ii. **Recognition of digital credentials:** Students submit their received digital credential to their home university for academic recognition if they wish to do so.
   b. **Creation, issuing and storage of digital credentials**
      i. **Creation of digital credential:** Based on this data, a digital credential is created using EDCL/EDCI.
      ii. **Signing and sealing digital credential through Europass / EUDI:** The credential is digitally signed as well as sealed (e-seal) and made available to students in the Europass Wallet.
      iii. **Storage and exchange of digital credentials:** Students can store, manage, and share the credential with other institutions, employers, or further education providers as needed.

Figure 1: Schematic visualisation of the Aurora virtual campus



3. Joint Centralised Course Catalogue

As integration and cooperation within the Aurora Alliance continue to deepen, there is a growing need for visibility and accessibility regarding the academic offerings of partner universities. A centralised course catalogue allows students, faculty, and administrative staff to obtain a structured overview of mobility-relevant courses offered by all member institutions. To efficiently and scalably implement this, the eduXchange service, developed by the Dutch IT provider SURF, will serve as the technical foundation.

3.1. Grant Agreement and Goals

The goal is to establish a Joint Centralised Course Catalogue that is automatically populated with relevant course data pulled from the local course catalogues of the Aurora partner universities. This central catalogue will serve as the digital backbone for student-centred mobility offerings within the Alliance.

3.2. Target Process

The Aurora course catalogue will not be maintained manually but synchronised automatically with data from the universities' local course management systems via interfaces. This approach significantly reduces administrative workload while ensuring high data accuracy and quality. This requires that each university adheres to the already agreed-upon criteria for Aurora courses so that they only flag such courses to be pulled from the Joint Centralised Course Catalogue, that are meeting these criteria. This represents a system shift compared to previous processes, where courses were manually entered into the Virtual Campus and thereby also underwent a manual quality control.

1. **Population of the Joint Centralised Course Catalogue:**
   Course data on Aurora courses at each partner university is pulled from each respective university system via eduXchange to display it in the Joint Centralised Course Catalogue
2. **Course selection via the centralised course catalogue:**
   Students browse the Aurora Course Catalogue and select relevant courses.
3. **Initiation of the registration process:**
   Upon clicking the "Register" button on the course detail page, authentication via eduGAIN is triggered.
4. **Data transfer via EMREX or direct national SDG connection:**
   After successful authentication, study-relevant data are transferred from the home university to the host university via an EMREX-compatible interface or direct national SDG connection if the student agrees.
5. **Automated enrolment (if necessary):**
   The host university automatically checks the transmitted data. If all requirements are met, enrolment and course registration occur automatically wherever possible, or manually if necessary. The same applies for access to local learning management systems and learning infrastructure.

6. **Feedback to students and collection of further data if needed:**
   Students receive confirmation of successful registration or information on further steps or missing data. The processes to receive further data differs from university to university.
7. **Student takes the course**
   Student enters seamlessly the university's learning management system and may have (un)restricted access to tools used to complete learning activities like digital semester apparatuses / digital course materials provided in the library for teaching purposes, to integrated or non-integrated VC solutions or examination tools. This process step is highly related to the possibility or progress of implementing SSO and the associated specific roles in different systems.
8. **Transfer, recognition and/or lifelong (wallet) storage of academic results**
   a. **Transfer between Aurora Universities initiated by student**
      i. **Inter institutional transfer:** After successful registration and course completion, academic results are automatically transferred to the student management system of the delivering university.
      ii. **Recognition of digital credentials:** Students submit their received digital credential to their home university for academic recognition if they wish to do so.
   b. **Creation, issuing and storage of digital credentials**
      i. **Creation of digital credential:** Based on this data, a digital credential is created using EDCL/EDCI.
      ii. **Signing and sealing digital credential through Europass / EUDI:** The credential is digitally signed as well as sealed (e-seal) and made available to students in the Europass Wallet.
      iii. **Storage and exchange of digital credentials:** Students can store, manage, and share the credential with other institutions, employers, or further education providers as needed.

3.3. Technical Implementation based on OOAPI-standard via eduXchange

eduXchange is a software solution developed by SURF, designed for aggregating and displaying course information. The platform enables centralised presentation of courses from various universities, pulling data from source systems via defined interfaces. The system is already in use by other European University Alliances, such as the EuroTeQ Alliance.

The implementation of the centralised Aurora Course Catalogue via eduXchange occurs in several steps:

3.3.1. Pilot Agreement with SURF

Each university must sign an individual pilot agreement with SURF, to enable the implementation of eduXchange so that course data can be automatically supplied to the Aurora catalogue. This pilot agreement governs data protection, operational, and technical frameworks, as well as possible costs that will occur after the pilot phase ends

after 2026. Once the Aurora partners checked the agreement with their respective legal departments, these agreements will be signed.

3.3.2. Interface Setup

After the contract is signed, technical interfaces between the university's local course management system and eduXchange must be established. This typically includes:

- Ensuring the possibility of selecting mobility-relevant courses
- Provision of course data in a format readable by eduXchange
- Setup of automated data synchronisation (e.g., via REST APIs, CSV feeds, or XML interfaces)

It should be noted that each university is responsible for connecting its local systems to eduXchange. Due to the wide diversity of course management systems used across the Alliance, no universally applicable setup guide is possible. Therefore, local IT expertise should be engaged and consultations with SURF are strongly recommended (e.g., through joint hackathons).

3.3.3. Local Course Tagging

In order for eduXchange to identify which courses should be included in the centralised Aurora catalogue, a corresponding tag or designation must be implemented at the local system level. This tagging may vary by system (e.g., through a tagging feature, an additional data field, or a specific course category).

3.4. Joint Centralised Course Catalogue Data Model

The underlying data model[2] for course descriptions in the Joint Centralised Course Catalogue is designed to provide students with all necessary information to make informed choices and is separated into obligatory and optional data fields, as described below:

Obligatory	Optional
University	Department
Instructors	Period
Contact	Mode of repetition
Course number	Methods
Title	Literature
Study cycle	Privacy notice
ECTS credits	Remarks
Mode of delivery	SDG
Language of instruction	Aurora Educational Hubs
Requirements	Aurora Competence Framework
Learning Outcome	Location

[2] This data model was developed by task team 6.1, which then was discussed within the so called "Virtual Campus Committee" that consists of participants from all work packages that are somehow connected to the Virtual Campus, namely WP2, WP4, WP6, WP7, WP8, and WP10. (See Annex A and B)

Content	Deep Link to course
Assessment	
Start Date	
End Date	
Application Start	
Application Deadline	

Courses that are flagged locally for inclusion in the Joint Centralised Course Catalogue but lack one of the mandatory data elements will not be displayed on the Virtual Campus. However, if optional information is missing but all mandatory fields are present, the course will still be displayed without the optional information.

Adaptions to the data model might occur during the implementation of eduXchange due to organisational, technical or other unforeseen circumstances, and will be discussed with task team 6.1 and the Virtual Campus Committee.

3.5. NocoDB as an Alternative

For universities that either do not operate an integrated course management system or lack the technical capacity to connect to eduXchange via an interface, a pragmatic solution using NocoDB[3] is offered. NocoDB is an open-source database solution that allows manual management and upload of course data through a spreadsheet-like interface or CSV import.

These data sets are then transferred to the central eduXchange system via a middleware interface, enabling full participation even for universities without automated systems. However, ongoing maintenance of these data sets must be performed manually, as course information is not automatically extracted from local systems.

NocoDB might also be used for providing (obligatory or optional) course information that might not yet be implemented in a local course catalogue. The eduXchange endpoint would need to be pointed to a database with the missing information.

3.6. Excurse on Further Offerings

The integration of courses in a Joint Centralised Course Catalogue is not a one-sided issue. In addition, each university will carry out internal legal and technical checks to determine whether it is possible to reintegrate the courses of the partner universities into its own course catalogue. This would not only make semester planning easier for students, but would also increase the reach and visibility of Aurora courses.

Within the Aurora Alliance, not only are ECTS-bearing courses offered to students who are part of an accredited study program but they are also part of a curriculum. There are also other non-ECTS-bearing courses, opportunities for administrative employees of the

[3] Altgough NocoDB is based in the USA, it is only used to display course information that is already publicly available. It is also possible for universities to self-host NocoDB on their own servers if needed.

universities or further education formats for external persons. All these and other offers that are not ECTS-bearing courses from curricula, which are summarised under “Other Offerings”, can also be displayed in eduXchange. For this purpose, NocoDB is to be used via an endpoint at the Aurora Central Office as middleware by manually entering these Other Offerings there so that the Joint Centralised Course Catalogue can then display them as such in a separate area – similar to what the EuroTeQ Alliance has already implemented with its “For professionals” offerings. A data model for these Other Offerings is currently being developed by members of WP10 Impact and Dissemination, who have the most experience with these offerings as they currently have to upload these to the existing Aurora Course Catalogue.

3.7. Risks and Mitigation

Implementing the Joint Centralised Course Catalogue via eduXchange is technically demanding and may present several challenges. One major risk is the potential lack of commitment from Aurora universities to allocate the necessary human resources for implementation alongside their regular IT operations. Additional challenges may include extended development times due to missing or poorly documented interfaces in local systems, or technological incompatibilities between different campus and course management systems. During the parallel operation phase of the new Joint Centralised Course Catalogue and the existing Virtual Campus, uncertainties regarding data maintenance responsibilities and inconsistencies in displayed courses may also arise. It may also be that local course catalogue systems don’t contain info that the data model deems as obligatory.

These challenges will be addressed by allocating sufficient time for technical implementation. Based on previous experience, implementation of eduXchange at a university is estimated to take approximately three to four months as a side activity for one IT professional. The direct exchange of experience between universities will allow problems to be solved efficiently, leveraging solutions developed by others. Ongoing reporting to institutional coordinators will ensure university commitment, while unforeseen technical difficulties can be mitigated through the extended implementation timeline. Regular meetings of the Virtual Campus Committee will also ensure alignment between the Aurora work packages. The system’s modular design also allows universities to be integrated successively, eliminating the need for full synchronisation of all partners at the same time. The data model will also be further developed and adapted as needed, to be flexible for the needs of the Aurora Alliance. In addition, workarounds may be implemented where needed, also based on NocoDB.

3.8. Timeline

Winter Semester 25/26: Implementation of eduXchange at each partner university; piloting of the Joint Centralised Course Catalogue.

Summer Semester 26: Operation of the Joint Centralised Course Catalogue displaying courses; parallel operation of the old Virtual Campus to ensure a smooth transition, as well as serving as a fallback option.

Winter Semester 26/27: Implementation of (semi-)automated enrolment and course registration processes in the Joint Centralised Course Catalogue; deactivation of the old Virtual Campus.

4. (Semi)Automated Enrolment and Course Registration

Building on the Joint Centralised Course Catalogue, a highly automated registration process will be developed that allows students to register directly via the platform for selected courses at partner universities — including enrolment where necessary.

4.1. Grant Agreement and Goals

One of the key objectives of digital cooperation within the Aurora Alliance is to establish seamless processes for student participation in academic courses across institutional borders.

To achieve this, a technical solution will be implemented based on the internationally recognised frameworks and procedures like eduGAIN, EMREX and direct national SDG connections where possible. These enable secure and standardised exchange of student data between higher education institutions based on authenticated identities. Through interfaces grounded in a common data exchange agreement, the systems of participating partner universities will be interconnected.

4.2. Target Process

1. **Population of the Joint Centralised Course Catalogue:**
   Course data on Aurora courses at each partner university is pulled from each respective university system via eduXchange to display it in the Joint Centralised Course Catalogue
2. **Course selection via the centralised course catalogue:**
   Students browse the Aurora Course Catalogue and select relevant courses.
3. **Initiation of the registration process:**
   Upon clicking the "Register" button on the course detail page, authentication via eduGAIN is triggered.
4. **Data transfer via EMREX or direct national SDG connection:**
   After successful authentication, study-relevant data are transferred from the home university to the host university via an EMREX-compatible interface or direct national SDG connection if the student agrees.
5. **Automated enrolment (if necessary):**
   The host university automatically checks the transmitted data. If all requirements are met, enrolment and course registration occur automatically wherever possible, or manually if necessary. The same applies for access to local learning management systems and learning infrastructure.
6. **Feedback to students and collection of further data if needed:**
   Students receive confirmation of successful registration or information on further steps or missing data. The processes to receive further data differs from university to university.
7. **Student takes the course**
   Student enters seamlessly the university's learning management system and may have (un)restricted access to tools used to complete learning activities like digital

semester apparatuses / digital course materials provided in the library for teaching purposes, to integrated or non-integrated VC solutions or examination tools. This process step is highly related to the possibility or progress of implementing SSO and the associated specific roles in different systems.

8. **Transfer, recognition and/or lifelong (wallet) storage of academic results**
    a. **Transfer between Aurora Universities initiated by student**
        i. **Inter institutional transfer:** After successful registration and course completion, academic results are automatically transferred to the student management system of the delivering university.
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        iii. **Storage and exchange of digital credentials:** Students can store, manage, and share the credential with other institutions, employers, or further education providers as needed.

4.3. Technical Implementation

The use of eduGAIN, EMREX, and direct national SDG connections allows administrative procedures to be streamlined and access to course offerings to be significantly simplified for students.

eduGAIN is an authentication and authorisation infrastructure (AAI) coordinated by GÉANT, based on a federated identity infrastructure. With eduGAIN, students can authenticate themselves with their home university credentials when accessing external services. In the context of the Aurora Alliance, this means that students can log in to courses from the Joint Centralised Course Catalogue or external systems of the host university using their home institution credentials.

EMREX is a European based solution for the electronic exchange of academic records and other student data. It operates through a system of data recipients (EMREX Clients) and data sources (EMREX National Contact Points, NCPs). The EMREX architecture is flexible enough to be used for the transmission of other student-related data, such as course registration or enrolment information. EMREX, through its dedicated OOTS bridge, serves as a highly effective and recommended pathway for universities that do not yet have a direct national SDG connection to achieve this compliance for educational data. For universities already possessing a functional direct connection to their national SDG node, this already existing infrastructure will be used and aligned with Aurora's interoperability needs.

4.3.1. Necessary Data

The foundation for this automated process is a defined set of data elements to be exchanged between the partners as these are needed at the partners to register students into their systems. The following table is based on data provided by Work Package 8 Enabling Mobility and Exchange and does not show every data point that each university asks for, but rather a selection of the most common and important ones – for a complete overview, see Annex C. These data elements form the basis for interface specifications and technical implementation.

In order to minimise manual steps, the aim is to enable as much data exchange as possible via eduGAIN, EMREX, and direct national SDG connections. Ideally, this will eliminate the need for separate study confirmations, as the exchange between university systems itself confirms enrolment at the respective partner institution. Data that cannot be exchanged via eduGAIN, EMREX, and direct national SDG connections will need to be collected through university-specific processes (see also chapter 4.3.3. “Workarounds”).

	UIBK	UICE	VUA	CBS	UDE	UPOL	UNINA	URV	UPEC
Identity									
(Color) Scan of ID with Photo	X	X		X	X		X	X	X
ID/Document Number	X		X				X	X	X
Passport Number						X			
Date of Issuance	X						X		
Place of Issuance	X						X		
Country of Issuance	X						X		
ID-Picture of Student	X								X
Last Name	X	X	X	X	X	X	X	X	X
First Name	X	X	X	X	X	X	X	X	X
Married Name									X
Date of Birth	X	X	X	X	X	X	X	X	X
Place of Birth	X		X		X		X	X	
Place of Birth - City and Country						X			X
Country of Birth			X						
Citizenship/Nationality		X	X	X	X	X	X	X	X
Second Nationality (if applicable)			X	X					X
Gender	X	X		X	X		X		X
Contact Details									
Home / Street Address		X	X	X	X	X			X
City/Town		X		X	X	X			X
Postal Code		X	X	X	X	X			X
State / Province / Region				X		X			
Country		X	X	X	X	X			X
Country Code									X
Additional Address Info					X	X			
Phone Number		X	X	X	X				X

E-Mail Address			X	X	X	X	X		X
Residence Permit (if needed)				X					
Home University Information									
Study Confirmation From Partner		X							
Study Program at Home University						X			X
Name of Home University		X		X		X			X
Faculty/department at Home University		X				X			X
Credits Completed / Years Completed at Home University		X		X		X			X
Level of Study at Home University		X				X			X
Academic Year at Home University				X					X
Period at Home University				X					
Most recent Transcript of Grades				X					
Institutional Mobility Coordinator - Name and Mail						X			

4.3.2. Data Exchange Agreement Between Aurora Partners

To ensure the data exchange is legally compliant, secure, and consistent regardless of the implemented specific technical pathways, a Data Exchange Agreement will be concluded among all Aurora partner universities. This agreement will cover, among other things:

- Legal basis and scope of the data exchange
- Technical and organisational measures for data security
- Responsibilities in case of errors or issues
- Detailed definition of the data to be exchanged (see above)
- Data protection-compliant storage and further processing

The agreement will be based on the work and findings of Work Package 8 and will serve as a legally binding framework to support both technical implementation and operational data exchange. The agreement will be prepared by task team 6.1 in close consultation with legal experts from the Alliance universities.

4.3.3. Workarounds

Since not all universities will be able to fully adopt the described approach (e.g., due to missing interfaces, legal barriers, missing connectivity to commercial systems in use, or technical limitations), university-specific alternative processes will be documented. These processes will build on existing procedures for recognition, registration, or enrolment and may include, for example:

- Upload of additional documents by students
- Manual validation by responsible offices
- Internal forwarding to faculties or student services
- Use of existing email workflows for data transmission

The goal is to ensure a smooth transition from digital systems to existing university procedures even in these cases. These workarounds will be based on the current processes in place and will need to be specified individually per university depending on local technical capabilities.

4.4. Risks and Mitigation

Implementing a fully automated course registration process is a complex endeavour associated with various challenges:

- Missing or incompatible interfaces in local Student Management Systems
- Differences in technical standards and data models currently used at each partner university
- Limited human resources within IT departments
- Country-specific data protection regulations
- Legal hurdles in processing personal data

These risks will be mitigated by the following measures:

- Allowing sufficient development and implementation time (minimum 3–6 months per university)
- Building on existing processes to avoid additional workload
- Step-by-step implementation and pilot runs with selected courses
- Coordination via Aurora central offices to pool expertise
- Legal safeguards provided by the Data Exchange Agreement

4.5. Timeline

Winter Semester 25/26: Review of necessary data and clarification of technical feasibility with eduGAIN, EMREX, and direct national SDG connections. Preparation of the Data Exchange Agreement.

Summer Semester 26: Completion of the Data Exchange Agreement.

Winter Semester 26/27: First interface implementations and definition of alternative processes where automatic data exchange is not possible. Integration of the module into the Joint Centralised Course Catalogue where feasible.

Summer Semester 27: Ongoing roll out of feature.

Beyond the end of the Aurora 2030 programme: If needed, ongoing roll out of feature.

5. Issuance, Storage, and Exchange of Digital Credentials

In the context of increasing digitalisation of educational processes, the electronic issuance, storage, and exchange of academic records – so-called digital credentials – is gaining increasing importance. Within the Aurora Alliance, established European standards and infrastructures are being utilised for this purpose.

5.1. Grant Agreement and Goals

As outlined in the Grant Agreement, two key systems play a central role: European Digital Credentials for Learning (EDCL) and the Europass Digital Credentials Infrastructure (EDCI). These two systems are closely interconnected and provide Aurora partner universities with a robust, EU-wide interoperable foundation for issuing and managing digital credentials.

5.2. Target Process

The process for students within the Aurora Alliance is designed to be as seamless and automated as possible:

1. **Population of the Joint Centralised Course Catalogue:**
   Course data on Aurora courses at each partner university is pulled from each respective university system via eduXchange to display it in the Joint Centralised Course Catalogue
2. **Course selection via the centralised course catalogue:**
   Students browse the Aurora Course Catalogue and select relevant courses.
3. **Initiation of the registration process:**
   Upon clicking the "Register" button on the course detail page, authentication via eduGAIN is triggered.
4. **Data transfer via EMREX or direct national SDG connection:**
   After successful authentication, study-relevant data are transferred from the home university to the host university via an EMREX-compatible interface or direct national SDG connection if the student agrees.
5. **Automated enrolment (if necessary):**
   The host university automatically checks the transmitted data. If all requirements are met, enrolment and course registration occur automatically wherever possible, or manually if necessary. The same applies for access to local learning management systems and learning infrastructure.
6. **Feedback to students and collection of further data if needed:**
   Students receive confirmation of successful registration or information on further steps or missing data. The processes to receive further data differs from university to university.
7. **Student takes the course**
   Student enters seamlessly the university's learning management system and may have (un)restricted access to tools used to complete learning activities like digital semester apparatuses / digital course materials provided in the library for teaching purposes, to integrated or non-integrated VC solutions or examination

tools. This process step is highly related to the possibility or progress of implementing SSO and the associated specific roles in different systems.

8. **Transfer, recognition and/or lifelong (wallet) storage of academic results**
    a. **Transfer between Aurora Universities initiated by student**
        i. **Inter institutional transfer:** After successful registration and course completion, academic results are automatically transferred to the student management system of the delivering university.
        ii. **Recognition of digital credentials:** Students submit their received digital credential to their home university for academic recognition if they wish to do so.
    b. **Creation, issuing and storage of digital credentials**
        i. **Creation of digital credential:** Based on this data, a digital credential is created using EDCL/EDCI.
        ii. **Signing and sealing digital credential through Europass / EUDI:** The credential is digitally signed as well as sealed (e-seal) and made available to students in the Europass Wallet.
        iii. **Storage and exchange of digital credentials:** Students can store, manage, and share the credential with other institutions, employers, or further education providers as needed.

5.3. Technical Implementation

The technical implementation varies depending on which process step is being considered. For instance, transferring academic results requires an interface between the two universities' student management systems. In contrast, the creation, signing and storage of digital credentials involves transferring them from the universities' systems to the shared platforms used by students.

5.3.1. Technical Implementation of data transfer between institutions

Whether or not the ECTS gained in the host institution are transferred to the home institution is at the student's discretion, so this step in the process is usually initiated by the student at their home institution after completion of the course abroad. Technically, however, the process will be no different to enrolment with requirements, since the same data exchange solutions (EMREX) will be used in the opposite direction.

5.3.2. Technical Implementation of data transfer between institutions and students via EDCL and EDCI

The European Digital Credential for Learning (EDCL) is a standardised, EU-recognised format for digitally certifying learning outcomes. It is a machine-readable, secure, and tamper-proof digital document, characterised by the following features:

- **Standardised data model:**
  Structured according to EU norms to ensure interoperability.
- **Digital signature:**
  Ensures authenticity via a qualified electronic seal (e-seal).

- **Machine-readability:**
  Enables automated processing and validation.
- **Long-term availability:**
  Enhanced security through standardised storage.

The EDCL format allows educational institutions to digitally document both full qualifications and individual learning outcomes, certificates, and courses.

The Europass Digital Credentials Infrastructure (EDCI) underpins the creation, issuance, storage, and verification of EDCL documents. Key components include:

- **Credential Issuer:**
  The platform through which institutions issue credentials.
- **Learner Wallet:**
  A digital wallet where students can securely store and manage their credentials.
- **Verification Services:**
  Services that allow third parties to verify the authenticity of credentials.
- **Europass Portal:**
  Integration with the broader Europass ecosystem, which also supports portfolio management, CV generation, and job matching.
- **EUDI**:
  The European Digital Identity (EUDI) is an initiative by the European Union that provides EU citizens with a secure and trusted digital identity for accessing public and private online services across Europe. Using the EUDI Wallet, users can securely store and manage digital credentials such as ID cards, certificates, and other official documents directly on their smartphones. EUDI is built upon the eIDAS regulation, ensuring a unified, interoperable solution for digital authentication and identification within the EU.

Within the Aurora Alliance, partner universities will use the EDCI issuer platform to issue digital credentials to their students after successful course completion.

Implementation of EDCL and EDCI follows a well-documented process provided by Europass. The key technical and organisational steps are as follows:

Requirement	Description
Verified e-Seal	Each university requires a qualified electronic seal (e-seal) issued by an accredited certification body to ensure credential authenticity.
Issuer Registration	Registration of the university as an official credential issuer on the EDCI platform.
Technical Interfaces	Integration of university systems (student management, exam systems, course administration, etc.) with EDCI APIs for automated credential generation and transmission.
Legal Framework	Ensuring GDPR compliance and adherence to national data protection laws.

Human Resources	Technical personnel for setup, customisation, and ongoing maintenance.

Europass provides extensive tutorials, API documentation, and reference implementations to support a smooth onboarding and implementation process.

Suggested Implementation Phases:

1. **Project initiation:**
   Establish internal project teams including IT, exam offices, legal departments, and quality management.
2. **e-Seal acquisition:**
   Apply for and install the qualified e-seal where not yet available.
3. **Issuer registration:**
   Complete registration with the EDCI platform where needed.
4. **System integration:**
   Develop interfaces between institutional systems and the EDCI APIs.
5. **Testing phase:**
   Issue test credentials and validate the entire process.
6. **Training & communication:**
   Inform and train administrative staff and communicate with students.
7. **Production rollout:**
   Roll out the solution for all eligible courses and programs.

Responsibility for the technical implementation, integration, and maintenance lies with each Aurora partner university. This includes:

- Setting up the necessary technical infrastructure (interfaces, e-seal, system adjustments),
- Defining internal processes and ensuring legal compliance,
- Registering as a credential issuer on the EDCI platform,
- Coordinating internal stakeholders (IT, legal, administration, exam offices), and
- Collaborating with colleagues from other Aurora universities where applicable.

Due to the diversity of IT systems used, a centrally dictated implementation is not feasible. Instead, each university must define its own implementation path based on the shared target architecture.

5.4. Micro Credentials as Digital Credentials

A specific application of digital credentials is the issuance of micro-credentials. These are smaller, targeted learning opportunities – often worth a few ECTS credits and comprising one or more courses – that can be earned flexibly and may be jointly offered by multiple universities.

The Aurora Alliance has already defined its own framework for micro-credentials across its joint educational offerings, described in the Aurora Micro-Credentials Guidelines (see

Deliverable 2.4 for the Aurora 2030 programme). Based on these guidelines, Aurora micro-credentials can also be fully issued within the EDCL and EDCI infrastructure, following the same issuance, signature, and storage processes as regular degrees or certificates. It is essential that participating universities adhere to the Aurora Micro-Credentials Guidelines and ensure that digital credentials are correctly described in the EDCI system.

5.5. Risks and Mitigation

Several challenges may arise during implementation:

- **Long implementation timelines:**
  Time needed for interface development and system integration.
- **Missing interfaces:**
  Legacy systems (e.g., exam management) may not yet support EDCL/EDCI integration.
- **Staffing constraints:**
  IT and project personnel must be sufficiently trained and available.
- **e-Seal procurement:**
  Acquiring and managing a qualified e-seal can involve administrative effort and additional license costs.
- **Data protection:**
  Ensuring full compliance with the GDPR throughout all processes.
- **Mismatch with local recognition processes:**
  The usage of EDCL/EDCI may not be usable within current recognition processes at partners.
- **Missing procedure for revocation and suspension of digital credentials:**
  No clear procedure is described on how to revoke or suspend digital credentials.

These challenges can be mitigated through:

- A well-documented, proven infrastructure provided by Europass and already in use across Europe,
- A large support community and responsive help channels,
- Step-by-step tutorials and guides for technical integration,
- Sufficient time allocated by Aurora for implementation, acknowledging that these projects are often carried out alongside day-to-day operations,
- A high level of standardisation, ensuring long-term sustainability of the solution,
- Adapted processes for recognition alongside established ones.
- Outline explicit policies and technical mechanisms for the revocation and suspension of digital credentials.

5.6. Timeline

Summer Semester 26: Prerequisites for EDCL and EDCI operation established: acquire verified e-seal and register the university as a credential issuer on the EDCI platform.

Winter Semester 26/27: Integration of university systems (student management, exam systems, course management, etc.) with the EDCI APIs for automated credential creation and transmission.

Summer Semester 27: Further integration and testing: issue test credentials and validate the entire process.

Beyond the end of the Aurora 2030 programme: Full production rollout of the solution for all eligible courses and programs.

6. (Semi)Automated Access to Learning environment and infrastructure

Providing seamless access to digital learning environments across multiple universities is essential for the successful implementation of the Aurora Virtual Campus (AVC). Due to the diversity of systems and infrastructures used by partner universities, it is crucial to establish clear and standardised mechanisms to facilitate straightforward access for students from different home institutions.

The infrastructure typically required for teaching at a university usually consists of several core systems. While the specific implementations vary, the general functions are broadly similar across universities:

1. **Student Information System (SIS):**
   Management of student records, enrollment status, course registration, and exam results.
2. **Learning Management System (LMS):**
   Provision of course materials, assignments, forums, quizzes, assessments, and communication with lecturers.
3. **Video Conferencing and Collaboration Platforms:**
   Hosting virtual classes, enabling group collaboration, online communication, and interactive learning.
4. **Examination and Assessment Systems:**
   Handling registration for exams, administration of digital examinations, publication of results, and issuing digital certificates.
5. **Library Systems and Educational Resource Platforms:**
   Providing access to literature, databases, and Open Educational Resources (OER).

6.1. Grant Agreement and Goals

This access is one of the additional use cases that has been agreed upon within task team 6.1 as a module for the new Virtual Campus, as described in the Grant Agreement. Through automated access to Learning Management Systems and further learning environment, students are enabled to directly access course materials, communication channels, and virtual learning spaces without manual additional steps. This creates a highly convenient, fully integrated learning process for students, while also relieving teachers of administrative tasks.

We are also fully aware of the fact that this is in a new and innovative technical territory without proper tested solutions by other Alliances to build on. We will thus pioneer this approach and plan to share any insights we make along the implementation with other European University Alliances via the corresponding topical sub-groups of the FOREU4ALL project.

6.2. Target Process

The process for students can be described as follows:

1. **Population of the Joint Centralised Course Catalogue:**
   Course data on Aurora courses at each partner university is pulled from each respective university system via eduXchange to display it in the Joint Centralised Course Catalogue
2. **Course selection via the centralised course catalogue:**
   Students browse the Aurora Course Catalogue and select relevant courses.
3. **Initiation of the registration process:**
   Upon clicking the "Register" button on the course detail page, authentication via eduGAIN is triggered.
4. **Data transfer via EMREX or direct national SDG connection:**
   After successful authentication, study-relevant data are transferred from the home university to the host university via an EMREX-compatible interface or direct national SDG connection if the student agrees.
5. **Automated enrolment (if necessary):**
   The host university automatically checks the transmitted data. If all requirements are met, enrolment and course registration occur automatically wherever possible, or manually if necessary. The same applies for access to local learning management systems and learning infrastructure.
6. **Feedback to students and collection of further data if needed:**
   Students receive confirmation of successful registration or information on further steps or missing data. The processes to receive further data differs from university to university.
7. **Student takes the course**
   Student enters seamlessly the university's learning management system and may have (un)restricted access to tools used to complete learning activities like digital semester apparatuses / digital course materials provided in the library for teaching purposes, to integrated or non-integrated VC solutions or examination tools. This process step is highly related to the possibility or progress of implementing SSO and the associated specific roles in different systems.
8. **Transfer, recognition and/or lifelong (wallet) storage of academic results**
   c. **Transfer between Aurora Universities initiated by student**
      i. **Inter institutional transfer:** After successful registration and course completion, academic results are automatically transferred to the student management system of the delivering university.
      ii. **Recognition of digital credentials:** Students submit their received digital credential to their home university for academic recognition if they wish to do so.
   d. **Creation, issuing and storage of digital credentials**
      i. **Creation of digital credential:** Based on this data, a digital credential is created using EDCL/EDCI.
      ii. **Signing and sealing digital credential through Europass / EUDI:** The credential is digitally signed as well as sealed (e-seal) and made available to students in the Europass Wallet.

iii. **Storage and exchange of digital credentials:** Students can store, manage, and share the credential with other institutions, employers, or further education providers as needed.

6.3. Technical Implementation

To enable students from one university to gain seamless and simple access to the teaching infrastructure of another university within the Virtual Campus, an abstract technological and organisational solution is required, adhering to the following principles:

1. **Unified and Transparent Entry Points (Single Point of Entry):**
   A central course catalogue acts as the entry point. Students select a module or course and are automatically redirected to the relevant environment, simplifying access regardless of the specific systems in use.
2. **Federated Identity and Access Management:**
   Authentication occurs via centralised federation services (e.g., EduGAIN). Students can use their existing credentials from their home university, thus avoiding multiple registrations or separate accounts.
3. **Automated Data Transfer and Integration:**
   Student data (such as name, status, and email) is securely and automatically transferred from the home university's administrative systems. This reduces workload and potential errors during the registration process.
4. **Transparent Course Organisation and Virtual Classrooms:**
   All students enrolled in a particular module or course are automatically grouped into a unified virtual classroom, regardless of their home university. This remains seamless, independent of the specific LMS or collaboration systems involved.
5. **Unified Issuing and Recognition of Credentials:**
   Participation and academic achievements are documented in standardised digital formats (e.g., Europass or similar credentialing standards), enabling smooth integration into the home university's systems.

Ultimately, students attending a particular course, irrespective of their home institution, can easily and reliably gather at one shared virtual location, without manual intermediate steps or complicated access procedures.

This abstract description offers maximum flexibility to accommodate the specific systems and standards at each Aurora partner university, while clearly guiding the implementation of seamless access within the Virtual Campus.

Automated access to learning infrastructure can thus build upon the already established technical infrastructures used for single-sign-on. Moreover, the implementation of integrated systems serves to further streamline and seamless processes:

- **Single-sign-on via eduGAIN:**
  Provision and exchange of student data through federation mechanisms.

- **System integration between Student Management Systems and Learning Management Systems:**
  Transfer of course registrations into the LMS platforms.
- **Integration of different tools into Learning Management Systems:**
  For example VC-access via LMS or redirection to Examination-Tools via LMS.
- **Transparent Course Organisation and Virtual Classrooms:**
  All students enrolled in a particular module or course are automatically grouped into a unified virtual classroom, regardless of their home university. This remains seamless, independent of the specific LMS or collaboration systems involved

The integration may be implemented differently depending on the infrastructure of the target university, for example through direct API integration, a middleware solution, or an LTI-based integration. The chosen approach depends on the technical systems and capabilities of each partner university. The same technical prerequisites apply as for (semi-)automated course registration and enrollment.

The responsibility for technical integration lies, as with course registration, with each partner university. Each university must carry out the following tasks within its own IT system landscape:

- Ensure eduGAIN integration for federated authentication.
- Develop interfaces between the Student Management System and the local LMS if needed.
- Define processes for automated account creation and concept of associated roles & rights.

Due to the heterogeneous system landscapes, no universally valid, detailed central guideline can be applied to all universities. Instead, common standards have been defined that are implemented locally.

6.4. Risks and Mitigation

This step is highly related to the possibility or progress of implementing SSO and the associated specific roles in different systems. The following relevant challenges have been identified:

- **Heterogeneity of IT systems:**
  Different LMS platforms (e.g. Moodle, Canvas, Blackboard) and further tools at partner universities. We can transfer the proof of concepts only to a limited extent.
- **Missing APIs or custom integrations:**
  In some cases, custom development is necessary to integrate the systems.
- **Different account creation processes:**
  Manual approvals or authorisation processes at individual universities.
- **Personnel resources:**

Additional workload for IT departments during development and maintenance of integrations.

- **Data protection and legal requirements:**
  Consideration of national specifics.

The following solutions are planned to address these challenges:

- In the sense of 'minimum viable products' not incorporate all SSO features, but instead rely on back-office workarounds such as manual processes during transition periods.
- Use of existing open-source tools for synchronisation tasks (e.g., OpenLMS-Sync).
- Setup of test environments and pilot projects for phased implementation.
- Sufficient planning time for the realisation of interfaces.

6.5. Timeline

Winter Semester 26/27: Integration of university systems (local Student Management Systems, local Learning Management Systems, etc.) with the intended interfaces to eduGAIN, EMREX, and direct national SDG interfaces.

Summer Semester 27: Continued integration of university systems with the intended interfaces to eduGAIN, EMREX, and direct national SDG interfaces.

Beyond the end of the Aurora 2030 programme: Further integration of university systems with eduGAIN, EMREX, and direct national SDG interfaces. Productive operation where possible.

Ongoing integration and productive operation of university systems with eduGAIN, EMREX, and direct national SDG interfaces where possible.

7. Conclusion

The preceding chapters have provided a comprehensive overview of the technical, organisational, and procedural considerations for the realisation of the Aurora Virtual Campus. In the following, these findings are summarised and consolidated into key conclusions, structured along central aspects that are critical for the implementation of the Virtual Campus.

7.1. Limitation of the Aurora Alliance

The advantage of European University Alliances is that they are provided with financial resources to implement such projects. While this sounds good, these resources are finite and generally insufficient for the entire duration of the project, particularly if sustainable and scalable solutions are prioritised that should also work after the project ended. In this context, short-term solutions in the form of manual operations or partial automation should only be used as interim measures, not as 'the solution'. We in no way want to demonise individual temporary solutions. However, they should be used with the realisation that they are only a stopgap until a sustainable solution is implemented, and the alliance should aim for such solutions.

One of the fundamental limitations of the Aurora Alliance lies in its decentralised structure. There is no central development unit or shared IT organisation that could carry out the implementation work uniformly across all partner universities. Instead, each university operates with its own IT infrastructure, internal processes, and national regulatory frameworks. This leads to a high degree of heterogeneity in technical systems (Student Management Systems, Learning Management Systems, identity management solutions, etc.) as well as legal diversity (e.g., national data protection laws, institutional approval procedures). As a result, no fully standardised, central technical solution can be applied across the entire Alliance. Each university must translate the commonly agreed goals into its own specific technical and organisational environment. This is certainly a big challenge for the implementation of the Aurora Virtual Campus, but will, once successfully done, ensure a sustainable integration of Aurora within the universities. Although the decentralised structure may seem restrictive at first, it actually presents a genuine opportunity within the Alliance to develop and implement sustainable solutions in collaborations beyond the Alliance. As described in chapter 2.2, we position decentralisation as a strategic advantage and a core strength of Aurora's model. By fully embracing our federated structure—where each partner maintains autonomy while pursuing common, clearly defined objectives—we will enhance collaboration and cohesion across the alliance.

Lastly, we clearly state that while technical implementations for the issuance, storage, and exchange of Digital Credentials have been developed in this document and are supported by the Aurora Alliance, there can be no detailed specifications regarding the general process of recognition of students' academic achievements in this document, as this would overstretch the competencies of task team 6.1. To achieve the goal of a seamless experience for students, other work packages within Aurora are addressing the

issue of recognition. In general, in this document reference can only be made to the Lisbon Recognition Convention, which has been ratified by all member states of the Aurora Alliance universities and serves as the foundation for The European Recognition Manual for Higher Education Institutions, which provides further guidance on this topic.

7.2. Responsibilities of Aurora Universities

Across all described work packages and use cases, one central principle consistently emerges: the responsibility for implementing the agreed solutions lies with the individual partner universities themselves. While common standards, interfaces, and target architectures have been jointly defined at the Alliance level, the technical realisation, integration into existing systems, and ongoing operation are local responsibilities. This decentralised implementation model requires a high degree of commitment, readiness to invest resources, and active engagement from each partner university. Without the necessary institutional commitment and the provision of sufficient financial, technical, and human resources, the realisation of the Aurora Virtual Campus is not feasible. The success of the entire project fundamentally depends on the willingness of each partner university to prioritise these tasks within their institutional agendas and to align internal stakeholders (IT, administration, legal departments, academic leadership, etc.). To achieve this commitment, the goals and vision of the Aurora Virtual Campus should not only be realised within the alliance but should also be embedded in each institution's agenda (see below for further details).

7.3. Risks and Mitigation

The implementation of the Virtual Campus faces multiple challenges and risks, which have been addressed in detail in the previous sections. The most relevant risks, along with their corresponding mitigation strategies, can be summarised as follows:

Risk	Mitigation
Heterogeneous IT landscapes: Diverse technical systems (LMS, SMS, identity management) across partner universities	Definition of joint technical standards; local implementation adapted to existing infrastructures; phased rollout; exchange of best practices
Complexity of Diverse Trust Models (federated, centralised, user-centric, administrative)	Develop a unified governance framework for trust that clearly defines policies, security standards, and compliance requirements across all integrated solutions and their interaction points; provide training and awareness for staff on different trust models and secure interaction.
Missing interfaces and need for custom integrations	Use of open-source synchronisation tools (e.g., OpenLMS-Sync); sharing of reference implementations; cooperative development where feasible.

Missing data on courses or student information	Ad hoc solutions for missing course information and provision of missing student data in processes for registration.
Inconsistent data across different repositories	Implementing robust data synchronisation mechanisms to maintain consistency across all data repositories.
Different national legal frameworks and data protection requirements	Close coordination with legal departments at each institution; full compliance with GDPR; use of established secure infrastructures (e.g., eduGAIN, EDCI)
Missing or difficult to implement connectivity to already used commercial student information or learning management systems	Close cooperation with affected universities; provision of workarounds at the early stages of implementation; early planning.
Limited personnel resources and competing priorities at universities	Early planning; establishment of dedicated internal project teams; capacity building through training and knowledge sharing within the Alliance; commitment of university leadership to allocate needed resources.
Complex account management processes (manual approvals, institutional policies)	Development of automated processes where possible; institutional process harmonisation
Lengthy procurement and certification processes (e.g., e-Seal acquisition)	Early initiation of procurement processes; technical support from Europass and national certification bodies
Lack of commitment and political alignment within the Alliance	Continuous political dialogue within Aurora governance bodies; active commitment of university leadership; regular exchange and coordination among technical, administrative, and academic stakeholders
Changing systems, standards, and protocols	Technical flexibility to accommodate evolving national and European regulations; design of technical solution to support adaption to ongoing changes.
Missing accessibility of the Virtual Campus	Adherence to the European Accessibility Act
Missing stakeholder engagement of teachers and students	Designing the Virtual Campus with their needs always in mind; inclusion of these professionals as well as students in the Virtual Campus Committee
Unclear terms and vocabulary may lead to misunderstandings and lost efforts	Developing a common glossary of terms and semantic definitions for key data fields to ensure consistent interpretation across the Alliance.

The challenges in terms of commitment and political alignment within the Alliance pose as two of the most significant ones. Successfully implementing the Aurora Virtual Campus requires not only technical solutions but also continuous political support, transparent communication, and ongoing cooperation across different institutions. To fully realise this ambitious vision of the Aurora Virtual Campus, sustained commitment and close collaboration are essential, especially considering the lack of a central legal entity for the Aurora Alliance. The sustained commitment and close collaboration have to be created through continuous exchange within the different Aurora (decision making) bodies and binding agreements between the partners. These binding agreements also need to be implemented at the local level at each institution and thus, the general decision of agreeing to this ambitious plan, laid out in this IT Handbook, will have to be made by the Aurora General Council and the universities' rectors / presidents with their university in mind. In the best case, the vision for the Aurora Virtual Campus will be integrated into each university's vision and long-term goals, which will result in the allocation of the needed human resources of IT personnel that is both knowledgeable on current systems in use and developments in software solutions for the European Higher Education Area, legal experts for national and international cooperations, support for local administrative and teaching staff as well as funds for needed licenses.

In this context, exchange with other European University Alliances via the FOREU4ALL project will also hugely help us to get needed perspectives on our development as well as providing other Alliances with knowledge so that they do not have to start from scratch if they want to implement similar solutions. Generally speaking, the active participation of Aurora members in relevant European stakeholder groups like European Digital Education Hub or standardisation bodies to anticipate and adapt to the evolution of data models will also allow for a more efficient development.

7.4. Timeline Aurora Virtual Campus

Module	WS25/26	SS26	WS26/27	SS27	WS27/28	SS28
Joint Centralised Course Catalogue						
(Semi)Automated Enrolment and Course Registration						
Issuance, Storage, and Exchange of Digital Credentials						
(Semi)Automated Access to Learning Management Systems						

7.5. Pragmatism as an Asset

In the development of the IT Handbook and the work within Task Team 6.1, it became clear that a pragmatic approach to the Virtual Campus and its implementation is an essential asset.

This was also noted by the external experts who accompanied TT6.1 as part of the Peer-to-Peer Consultation of the Hochschulforum Digitalisierung (a German think & do tank working at the forefront of the digitalisation of higher education, funded by the Federal Ministry of Education and Research (BMBF) of Germany).[4] Secured by the Universität Duisburg-Essen, the P2P consultation accompanied us for one year, and the involved peers formulated their concluding insights as follows:

> "You are working on a complex, high-pressure project across national systems, diverse institutional landscapes, and with tight timelines shaped by European Commission expectations. In that context, the Aurora IT team has achieved a great deal and produced strong foundations for future work. [...] Make sure to keep communicating openly, stay flexible, and move forward step by step. Remember: perfection is not necessary, real progress comes through collaboration and collective commitment. You are well prepared. Take each step with confidence. You'll cross the bridges as you reach them." (PEER-TO-PEER-STRATEGY CONSULTING I 2025 Review of the AURORA IT Handbook, Annex G, p. 9)

[4] For more details see Annex A, D, E, F, G.

8. Annexes

Annex A – Report on the Aurora IT Handbook

Annex B – Merged Fields Aurora Joint Centralised Course Catalogue

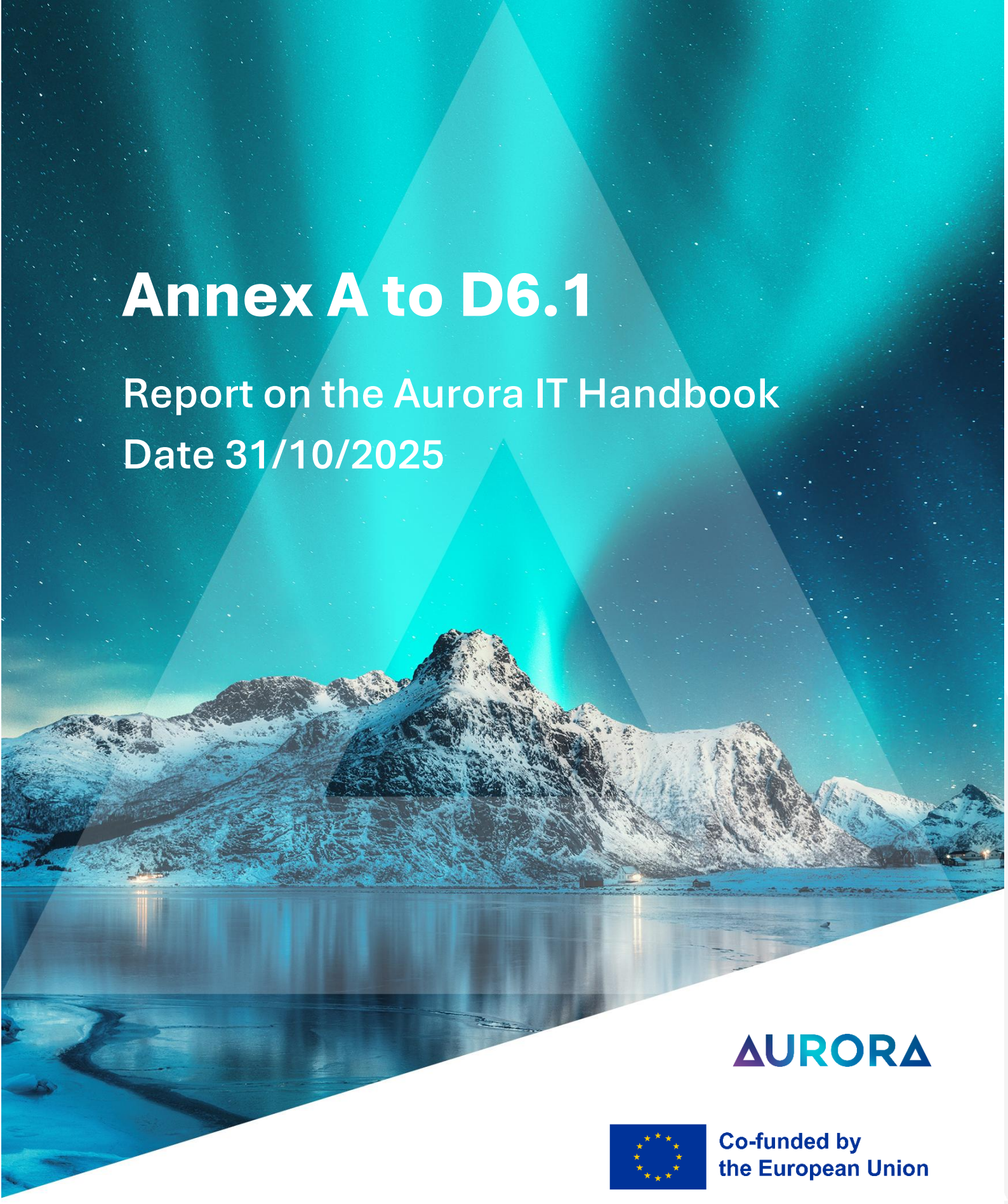
Annex C – Data Student Registration per Partner

Annex D – AURORA Virtual Campus Short Concept for P2P Consultation

Annex E – Evaluation of the AURORA Virtual Campus Short Concept

Annex F – Appendix Evaluation of the AURORA Virtual Campus Short Concept

Annex G – Review of AURORA IT Handbook by P2P Consultation



Annex A to D6.1

Report on the Aurora IT Handbook

Date 31/10/2025

AURORA

Co-funded by the European Union

UNIVERSITY OF ICELAND

VU VRIJE UNIVERSITEIT AMSTERDAM

CBS COPENHAGEN BUSINESS SCHOOL

Palacký University Olomouc

UNIVERSITÄT DUISBURG ESSEN
Offen im Denken

universität innsbruck

UPEC UNIVERSITÉ PARIS-EST CRÉTEIL VAL DE MARNE
Connaissance - Action

UNIVERSITAT ROVIRA i VIRGILI

UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II

Table of Content

1. Introduction

Work Package 6 Green and Digital Campus of the Erasmus+ funded "Aurora 2030" programme aims to further improve sustainability within the Aurora Alliance as well as its partner universities and increase international cooperation through advancement in digitalisation efforts, primarily through the relaunch of the Aurora Virtual Campus. The Grant Agreement states the following objectives related to the Virtual Campus:

> "The overall goal of WP6 Green and Digital Campus is to support the establishment of an Aurora Alliance inter-university campus through advancing our IT and sustainability capacities.
>
> More concretely, this WP will address the following specific objectives:
>
> O6.1 To provide the necessary digital administrative processes and data as well as IT- and business services, to enable the students and university staff to successfully participate in curricular activities spanning all partner universities. This is a continuous effort. It also aims to initiate and foster cooperation with other European University Alliances, to implement and promote shared interoperability standards for European higher education institutions." (Aurora 2030 Grant Agreement, p. 81)

These objectives should be met through the activities of T6.1 "Aurora IT Development & Services", which is described as follows:

> "Through the expansion of EU standards for online authentication and authorization to access digital services - e.g. for registration and access to Learning Management System – this task will deliver on shared interoperability among the partner institutions (organisational, legal, semantic and technical).
>
> This task will apply a particular focus on creating, issuing and managing Digital Credentials for Aurora Alliance educational activities in close coordination with educational experts working on this topic. Therefore, a dedicated committee will be set up with representatives from other relevant task teams within the Aurora Alliance, in

particular from WP2 Transdisciplinary European Research-Driven Educational Hubs and WP8 Enabling Mobility & Exchange.

The task will also work on the further development of the Aurora Virtual Campus, as a "shopping window" for results and activities of the whole of the Alliance. Integration of key Aurora IT services to be agreed upon all Aurora members – like a joint course catalogue, or enrolment processes – are part of this, but not exclusively. These key processes will be built upon shared interoperability standards and agreed use cases, taking into account existing EU references (e.g. European Learning Model), existing building blocks (e.g. European Digital Credentials for Learning, European Blockchain Services Infrastructure, MyAcademicID, European Student ID), EU ongoing initiatives (e.g. Single Digital gateway, eIDAS review), In the choice of technologies, the variables of sustainability and efficiency will also be considered." (Aurora 2030 Grant Agreement, p. 81)

In a nutshell, TT6.1 Aurora IT Development & Services aims to enhance shared interoperability across the Aurora Alliance by expanding EU standards for online authentication and digital credentials. It will coordinate with educational experts and key work packages. Additionally, the TT will further develop the Aurora Virtual Campus and integrate core IT services using sustainable, efficient technologies aligned with EU frameworks.

Closely related to these endeavours are the following deliverables and milestones:

- D6.1: Aurora IT Handbook by month 24. "Aurora IT Development & Services handbook for Alliance-wide guidance and implementation."
- D6.2: Aurora Virtual Campus by month 48. "Relaunched website with variety of Aurora IT-services implemented."
- D6.4: Draft components for the report on the Virtual Campus by month 22. "Draft components for the report on the website."
- MS17: First Aurora Digital Credential Issued by month 24.
- MS20: Aurora Virtual Campus Relaunch by month 40.

In this context, the following report describes how TT6.1 contributed to the creation of the Aurora IT Handbook. We will describe how the task team was formed, what were the main discussion threads throughout the current Aurora 2030 project, how the concept of the Virtual Campus was concretized, and how the "Peer to Peer Consultation" (P2P-Consultation) of the Hochschulforum Digitalisierung (HFD), which UDE was able to get awarded for the Aurora Alliance, in combination with the aspects above led to the creation of the Aurora IT Handbook.

2. Description

Building on the work done in the Aurora Pilot Phase, T6.1 was able to start from an advantageous start point, as mappings of IT systems, necessities, and ideas were already present from the very start of the Aurora 2030 project. In a kick-off workshop at Innsbruck in March 2024, all partners were invited to work collaboratively on the

baselines to define the Aurora Virtual Campus. During this four-day-long workshop essential foundations were laid for the future work on the Virtual Campus, most importantly the modules for the Virtual Campus and their requirements were defined:

- **Joint Centralised Course Catalogue**
  Requirement: To offer a central website/point where "Aurorarised"[1] courses are offered by partner institutions and are displayed and updated in an automated, real-time manner.
- **(Semi)Automated local enrolment & course registration**
  Requirement: To allow well-identified students to enroll as seamless as possible in the institution providing an Aurora course. User accounts and provided student data from the student's home-universities should be used for this purpose.
- **Issuance, exchange and recognition of digital credentials**
  Requirement: The university providing a course through the Aurora course catalogue will issue, upon successful completion of a course by students, an appropriate credential in a digital way. These digital credentials, which have to be well defined and commonly understood within the alliance, shall be issued in a form that enables seamless portability and recognition among Aurora institutions (and beyond).
- **(Semi)Automated access to local learning environment and infrastructure**
  Requirement: To allows well-authenticated students to access as seamless as possible the LMS environment (or other environments) for the Aurora courses they are enrolled in. User accounts and provided student data from the student's home-universities should be used for this purpose.

It was also decided that the timeline for the development of the Virtual Campus will follow the sequence of the modules as display above: At the beginning, the Joint Centralized Course Catalogue will be realized, to allow the implementation of (semi)automated registration and enrolment processes as well as process for an (semi)automated access to learning management system. The work on digital credentials would then be the next step, as the task team was also depending on WP2 for this topic to create the guidelines for Aurora Micro Credentials.

The workflow of the task team was also defined during this workshop: A small core team consisting of UIBK and UICE will meet fortnightly to take care of everyday business. A steering group will meet approximately every six weeks to review the results of the

[1] **Aurorarised Course**: A course designed or adapted within the Aurora framework, often SDG-aligned and based on co-creation, transdisciplinarity, or innovative teaching methods.
Level 1: Course is linked to a Pilot Domain and at least one SDG.
Level 2: Course is linked to a Pilot Domain, at least one SDG and develops at least one key competence incl. in the Aurora Competence Framework (AFC).
Level 3: Course is linked to a Pilot Domain, at least one SDG, develops at least two key competences incl. in the ACF and uses at least one teaching method described in the Aurora Education Principles.

workshops and monitor the progress of working groups on the various Virtual Campus modules. Workshops like the one in Innsbruck will take place two times per year to define the bigger picture of the task as well as to make strategic decisions within the limitations of the task team. Smaller working groups for the modules were also implemented, where proof of concepts and further details will be worked out.

After the Innsbruck workshop, the steering group of the task team met regularly to assess the progress of the different working groups, with a primary focus on the topic of the Joint Centralized Course Catalogue. Different IT solutions were assessed throughout the months, such as BloomHUB[2], the system for the EPICUR Alliance[3], as well as eduXchange[4] of the Dutch service provider SURF, with whom the Aurora Alliance already cooperated during the pilot phase. The steering group agreed that from the closer assessed options, eduXchange served the needs of the Aurora Alliance the best, as it would provide an already tested solution in the use case of European University Alliances, UICE and VUA already had experience working with them. The costs for acquiring as well as implementing the solution were overall the lowest. eduXchange would also allow for a solution via NocoDB[5] for those universities that won't able to implement a new IT system in the foreseeable future. Since this decision was made, the task team went into further discussions with SURF on how to procure the needed licenses per university. Currently, these discussions are still ongoing, as only some universities can procure eduXchange independently. It would only make sense to acquire eduXchange in bulk when all universities are ready to do so, to mitigate the risk that unforeseen circumstances may require us to pivot to another IT solution. Due to changes within SURF and how they want to offer eduXchange as a service, we will be able to implement eduXchange free of charge until the end of 2026. For this, so called "pilot agreements" between each university and SURF as well the Aurora Central Office and SURF will be signed, which regulate the terms of use and which are currently being reviewed at each institution.

During the next workshop in Amsterdam from the 12th to 14th of November, a data model for the course descriptions within the Joint Centralised Course Catalogue was developed, which was also discussed within the so called "Virtual Campus Committee" that consists of participants from all work packages that are somehow connected to the

[2] The BloomHUB was developed througout the Erasmus+ funded "OpenU" project and is described as follows on the projects website: "The digital infrastructure will link local software of universities and be supported by an efficient search engine in order to provide exchange and interconnectivity. HEIs will be encouraged to share resources and best practices, promote their learning offers, co-create and co-deliver innovative pedagogies and learning opportunities, and integrate existing solution for streamlining administrative processes for student and staff mobility. Using a federated approach, BLOOM will make it possible for European University Alliances to be connected through their own middleware enabling them to publish content aimed at EU level platforms." (https://bloomhub.eu/)

[3] A self-developed centralized system to fit the specific needs of the EPICUR alliance.

[4] eduXchange is a central linking point where educational data can be offered from an institution to various data consumers in a uniform and secure manner.

[5] NocoDB allows for creating online databases to which the eduXchange API can be directed and connected to. Through this, courses and other offerings can be manually added to the Joint Centralized Course Catalogue if needed. For more information, see here: https://nocodb.com/

Virtual Campus, namely WP2, WP4, WP6, WP7, WP8, and WP10. The working groups also showed their progress: UDE and URV presented proof of concepts on how to realize a (semi)automated course registration and enrolment via eduGAIN[6] and EMREX[7], while UIBK and UNINA provided an update on the topic of digital credentials, for which European Digital Credentials for Learning (EDCL)[8] and European Digital Credential Infrastructure (EDCI)[9] in combination with Europass seemed like the best fit for the needs of the Aurora Alliance.

During the workshop, UDE also presented the so-called P2P-Consultation that they were able to acquire through the HFD, a German think-&-do-tank working on the forefront of digitalisation of the higher education area. It is funded by the Federal Ministry of Education and Research (BMBF) of Germany. The goal of this consultation was to give feedback on the Aurora IT strategy / handbook as well as helping UDE to assess on how to use the results of T6.1 also for other UDE-specific use cases as well as other consortia they are part of. Through the P2P consultation, we were able to gather essential feedback from experts in the field of digitalisation in higher education, which helped us to redirect our efforts in regards to the Aurora Virtual Campus. In their assessment of a first short concept paper, that included a detailed description of our approach towards the Joint Centralised Course Catalogue but only vague ideas for the other modules, the peers stated that our technical provisions are more than sufficient to achieve our goals – they are even very ambitious, as we don't want to develop a centralised system but rather connect the different Aurora systems in a meaningful manner. Ensuring the political alignment and commitment of the Aurora Alliance as well as its partners to properly implement the vision of the Aurora Virtual Campus is of upmost importance. The aforementioned Virtual Campus Committee is one measure to ensure the alignment between the work packages and the T6.1 leads are constantly bringing the progress on the Aurora Virtual Campus to the attention of the Aurora Institutional Coordinators and other relevant Aurora decisions making bodies where possible. The peers also gave

[6] „The eduGAIN interfederation service connects identity federations around the world, simplifying access to content, services and resources for the global research and education community. eduGAIN comprises over 80 participant federations connecting more than 8,000 Identity and Service Providers." (https://edugain.org/)

[7] „EMREX is an international (European) data protocol that can be implemented with simple means to exchange education data (with focus on educational data from Higher Educational Institutions (HEI)), between two digital systems in a digitally machine-processable and GDPR-compliant way. The benefit of EMREX, with its electronic data exchange solution, is to empower individuals to control their own student data and exchange throughout lifespan, across borders for various purposes in a GDPR-compliant way." (https://emrex.eu/strategy-and-vision/)

[8] „A European Digital Credential for Learning (EDC) is a verifiable, digital version of a credential issued by an organisation to a learner to document their learning. These include diplomas, training certificates, micro-credentials, certificates of participation, and more. They can be issued in all EU and Europass languages and are signed with an electronic seal (a form of digital signature belonging to a trusted institution or organisation)." (https://europass.europa.eu/en/european-digital-credentials-learning)

[9] „The EDC infrastructure allows institutions or organisations to issue digital credentials directly to a learners' wallet, a personal online space for storing credentials, such as the one available in the My Library section of a person's Europass account." (https://europass.europa.eu/en/stakeholders/european-digital-credentials)

feedback on an earlier version of the Aurora IT Handbook (see Annex O), which was implemented in the final version of the deliverable (see D6.1).

For the first half of 2025, TT6.1 decided against hosting another workshop due to reasons of efficiency: The signing of the pilot agreements with SURF is being prepared and was unfortunately delayed due to unforeseen problems with national regulations regarding the procurement and the work on the other modules is advancing as presented. Thus, no workshop was needed. In the steering group meeting on the 3rd of June, the group made the final decision on which technical solutions to include in the Aurora IT Handbook. The handbook was then written by UIBK and UDE as provisioned in the grant agreement.

3. Discussion of the final outcome

The Aurora IT Handbook is a collection of the various considerations and implementation steps on how the Aurora Alliance intends to move towards a new Virtual Campus. The various technical solutions are presented in so far as they and their conditions are described in principle. However, the handbook does not contain detailed instructions on how the systems can be implemented at the respective universities, as the system landscape at the Aurora partner universities is too diverse. Therefore, it is up to each university to implement the systems as listed in the handbook, although implementation instructions are available for the individual modules from the respective providers. The Aurora IT Handbook will establish and align a shared vision of the new Aurora Virtual Campus across all partner universities.

4. Conclusion

With the Aurora IT Handbook now complete, TT6.1 has laid the foundation for launching and expanding the Aurora Virtual Campus. What began as an internal concept for TT6.1 has become an officially endorsed alliance objective, and we will realise it through continued, collaborative effort. As soon as the Aurora IT Handbook has been finalised in this form, the first concrete implementations should also take place, such as the implementation of eduXchange at the locations, work on the joint (semi)automatic registration and inscription processes, or the creation of the conditions for issuing digital credentials using EDCL/EDCI. The TT6.1 Steering Group will continue to work on the content of the handbook and the Virtual Campus Committee should ensure alignment between the work packages. Any planned presentation of the Handbook in the Aurora decision-making bodies will be relevant in order to obtain the political alignment for the relaunch of the Aurora Virtual Campus.

	UIBK	UDE	UPOL	UNINA	URV	UPEC	CBS	UIce	VUA
Must Haves									
University:	X	X	OK	X	X	X	X	X	X
Instructors:	Instructor	Reponsible Insctructur	OK, sometimes multiple	Teacher	Coordinador/a / Professors/es	X	Course coordinator	Supervisior	Teaching Staff / Docent
Contact:	Instructor	Reponsible Insctructur	Contact to guarantor, not lecturers	Teacher	Adreça electrònica	X	Course coordinator (Note: This is not the AURORA coordinator)	Supervisor	Course Coordinator
Course number:	Course number	Number	OK	URL	Codi	Identifiant Apogée ?	Yes (But it is part of the name of the course)	Shortnumber	Course Code
Title:	Title	Yes	OK	Title	Assignatura	Nom de l'ECUE	English Title	Title	Yes
Study cycle:	*Information available*	yes (information comes from structure tree and target group)	One course may be in more than one Study cycle	X	X	Semestre	Level	Level/cycle	Course level Target Audience
ECTS credits:	ECTS credits	Credits (but not filled consequently)	OK	CFU	Crèd	ECTS	Exam ECTS	ECTS credits	Credits
Mode of delivery:	*Information available*	E-Learning		X	Impartició	X	Teaching Methods	Mode of study	Teaching methods are registered both as text in study field and as structured information on 'werkvormen'
Language of instruction:	Language of instruction	Language	OK	X	Impartició	X	Language	Language of instruction	Language of Tuition
Requirements:	Prerequisites	Requirements (Voraussetzungen) - optional field	OK	Required preliminary courses/prerequisites	X	X	Course prerequisites	Entry requirements/Prerequisits	Entry Requirements
Learning Outcome:	Learning Outcome	X (partly under comments)	OK	Expected learning outcomes	Competències / Resultats d'aprenentage	X	Learning objectives	Learning Outcomes	Course Objective
Content:	Contents	Description	OK	Course Content / Syllabus	Continguts	X	Course content, structure and pedagogical approach	Cousre Description	Course Content
Assessment:	Assessment	Assessment (Leistungsnachweis) optional	OK	Examination/Evaluation Criteria	Avaluació	Oral/CC/Examen	Description of the exam procedure	Assessment	Method of Assessment
Start Date:	Date	Duration (Dauer)	see below	X	X	X	X	X	Can be found via period. Exact dates would only be available through our scheduling software.
End Date:	Date	Duration (Dauer)	see below	X	X	X	X	X	Can be found via period. Exact dates would only be available through our scheduling software.
Application Start:	Start of booking period	Application Periods	not in database, common rules for whole school	X	X	X	X	X	X
Application Deadline:	End of booking period	Application Periods	not in database, common rules for whole school	X	X	X	X	X	X
Nice to Haves									
Department:	Department	Organization unit (faculty or Lehreinheit, it depends)	OK	X	Departament	UFR/Champs disciplinaire	Study Board	School / Faculty	Faculty
Period:	Period	Frequency (Rhythmus)	OK - spring/autumn/both	X	X	X	Start time of the course	Teaching Period	Period
Mode of repetition:	Mode of repetition	Term	Just study cycle - number of hours, not repetitions	X	X	X	X	Semester	This is not registered as a separate datafield, but a course can be indicated to occur in multiple periods.
Methods:	Methods	X	OK	Teaching Methods	Metodologies	X	Description of the teaching methods	X	Teaching Methods
Literature:	Literature	Literature	OK	Readings/Bibliography	Fonts d'informació	X	Expected Literature	Books / Other Reading Material	Literature
Privacy notice:	Privacy notice	X	X	X	X	X	X	X	X
Remarks:	Remarks	Remarks	X	X	Descripció general i informació rellevant	X	Further information	X	Additional Information
SDG:	SDG	X	X	X	X	X	X	X	X
Aurora Educational Hubs:	X	X	X	X	X	X	X	X	X
Aurora Competence Framework:	X	X	X	X	X	X	X	X	X
Location									
Deep Link to course									
Course Catalogue	UIBK	UDE	UPOL	?	URV	None	CBS	UIce	VUA
~~**Type/hours:**~~	~~Type/hours~~	~~Hours per week in term (SWS)~~	~~or lectures/seminars/labs. Not how many times a v~~	~~X~~	~~Planificació~~	~~Nb heures TD/TP/CM~~	~~Student workload~~	~~Total number of lectures/classes~~	~~X~~
~~**Max Participants:**~~	~~*Information available*~~	~~Max. participants~~	~~see below~~	~~X~~	~~X~~	~~X~~	~~Max. Participants~~	~~Max participants~~	~~X - There can be enrollment limits in our scheduling software but these are not likely to always be available~~

Annex B

Annex C

	UIBK	UICE	VUA	CBS	UDE	UPOL	UNINA	URV	UPEC
Identity									
(Color) Scan of ID with Photo	X	X		X	X		X	X	X
ID/Document Number	X		X				X	X	X
Passport Number						X			
Date of Issuance	X						X		
Place of Issuance	X						X		
Country of Issuance	X						X		
ID-Picture of Student	X								X
Last Name	X	X	X	X	X	X	X	X	X
First Name	X	X	X	X	X	X	X	X	X
Married Name									X
Date of Birth	X	X	X	X	X	X	X	X	X
Place of Birth	X		X		X		X	X	
Place of Birth - City and Country						X			X
Country of Birth			X						
Citizenship/Nationality		X	X	X	X	X	X	X	X
Second Nationality (if applicable)			X	X					X
Gender	X	X		X	X		X		X
Family Status									X

Contact Details									
Home / Street Address		X	X	X	X	X			X
City/Town		X		X	X	X			X
Postal Code		X	X	X	X	X			X
State / Province / Region				X		X			
Country		X	X	X	X	X			X
Country Code									X
Additional Address Info					X	X			
Phone Number		X	X	X	X				X
E-Mail Address			X	X	X	X	X		X
Additional Address Info				X					

Home University Information									
Study Confirmation from Partner		X							
Study Program at Home University						X			X
Name of Home University		X		X		X			X
Faculty/Department at Home University		X				X			X
Credits Completed / Years Completed at Home University		X		X		X			X

Level of Study at Home University		X				X			X
Academic Year at Home University				X					X
Period at Home University				X					
Most Recent Transcript of Grades				X					
Institutional Mobility Coordinator - Name and Mail						X			
High School Diploma Titel for BA							X		
High School Diploma Date Awarded for BA							X		
High School Diploma Institution for BA							X		
High School Diploma Finale Grade for BA							X		
Previous University Degree Titel for BA							X		
Previous University Degree Date Awarded for BA							X		
Previous University Degree Institution for BA							X		
Previous University Degree Finale Grade for BA							X		
Delcaration of Value or Similar (Foreign Students)							X		

Course Information									
Course Selection Name				X					
Course level				X					X
Fulfiled Prerequisites				X					
Mobility Framework									X
Subject Area									X
Start Semester									X
End Semester									X
Duration in Semester									X
Planned Date of Arrival									X
Planned End Date of Mobility									X

Emergency Contact									
Emergency Contact First Name				X					X
Emergency Contact Last Name				X					X
Emergency Contact Relationship				X					X
Emergency Contact E-Mail Address				X					X
Emergency Contact Phone Number				X					X

Languages									
Native Language		X							
English-Speaking		X							
English-Reading		X							
English-Writing		X							

English-Listening		X							

Miscellaneous									
Danish CPR Number (if applicable)				X					
CBS E-Mail Address (if Current or Former CBS-Student)				X					
Student Category				X					
Ever enroled at host-university?				X					
Fiscal Code							X		
ISEE Certificate (if not imporated from INPS)							X		
French Student Card									
First registration in French HEI?									X
Do you have a French baccalauréat?									X
Baccalauréat equivalent									X
Country of graduation									X
Graduation date									X
Occupational Category									
Do you have a job ?									X
Your occupational category									X
Mother occupational category									X
Father occupational category									X
Financial aid for the year of mobility									X
Do you benefit from a French state financial aid or governmental aid from a foreign country ?									X
Previous year situation									
Where you a student last year ?									X
Name of the last university or school attended									X
Country of the institution									X
Academic year									X
What is your last degree ?									X
Graduation year of the last degree									X
Country of the institution									X
Image right									
Allow UPEC to reproduce my image ?									X
Additional information									

Do you want to participate in the welcoming day ?									X
French course									
Do you want to attend French course ?									X
Student public residence									
Would you like to apply for a room at the student residence CROUS ?									X
Specific needs									
Do you have a disability or specific needs due to your medical condition?									X
Language skills									
Mother tongue									X
FRENCH									X
I am currently studying this language ?									X
Have you taken a language teste?									X
Level									X
ENGLISH									X
I am currently studying this language ?									X
I have sufficient knowledge to follow lectures									X
Level									X
Have you taken a language test ?									X
Test name									X
Score									X
Test date									X
Uploads									
LA or Erasmus mobility Kit									X
Health insurance certificate									X
French language certificate									X
Statement of consent									X

Annex D

The (first) Vision: AURORA Virtual Campus

AURORA-Alliance

Work-in-progress, 02.12.2024

Contents

1. Introduction

Mobility is an essential aspect of European higher education policy. It enables students, lecturers and researchers to work, learn and conduct research at different higher education institutions across Europe. Through mobility, students (and staff) can acquire new skills and knowledge, gain international experience and develop a global perspective. For higher education institutions, mobility fosters (inter)national cooperation, collaboration and partnerships. It also contributes to the development of a more mobile and flexible workforce in Europe. Mobility can be broadly categorized into long-term mobility (semester or year-long exchanges such as Erasmus, double degree programmes), short-term mobility (short programmes such as summer schools and seminars), blended mobility (e.g. Blended Intensiv Programmes) and virtual exchanges (online courses or programmes, e.g. COIL).

Student mobility[1] is driving the need for *interoperability*, as students and institutions need the ability to share data and processes across higher education institutions to facilitate mobility. Interoperability refers to the ability of different systems, applications and data formats to work together seamlessly, allowing data and processes to be exchanged between them. More specifically, interoperability in higher education involves the ability of different systems to exchange data and information in a standardized format; to use common protocols and interfaces to communicate with each other; to interact with each other to provide a consistent and coherent experience for students, lecturers and administrators; and to support the sharing of resources such as courses, programmes and services between institutions.

The Aurora Network of research-intensive universities was established in 2016 to strengthen international collaboration, from which the Erasmus+-funded Aurora European University Alliance emerged in 2020[2]. As part of the Erasmus+-funded project, a strong focus was placed on mobility and teaching development, with the Horizon 2020-funded project "Aurora Research and Innovation for Societal Impact" 2021 being acquired for the research agendas. The Erasmus+ project was extended in 2023. The Aurora Alliance offers all the mobility options mentioned above, so that many students travel between the different campuses each semester, so creating interoperability between the different universities and developing an appropriate virtual campus is important to the Alliance, which aims to provide a seamless university experience for students, researchers and staff from the nine Aurora universities.

The development of a virtual campus requires a long-term process and involves some risks and obstacles depending on the choice of technical approach and the orientation towards

[1] Even if we are talking about international mobility here, the considerations, including benefits and risks, can in principle also be applied to national mobility programmes.

[2] The AURORA partner universities are: Vrije Universiteit Amsterdam (NL), University of Iceland (IS), University of Duisburg-Essen (DE), University Federico II of Naples (IT), Universitat Rovira i Virgili (ES), Universität Innsbruck (AT), Palacký University Olomouc (CZ), Copenhagen Business School (DK), Université Paris-Est Créteil (FR)

objectives or results. Our *AURORA Virtual Campus concept* is based on the vision of an interoperable and learner-centred European education system, where students, lecturers and staff can work seamlessly across institutions using the existing systems of all partner universities, sharing data and processes from enrolment to delivery of diplomas and certificates. This concept is closely linked to the idea of digital sovereignty, which, based on open standards, should enable institutions to control their own data and processes rather than being dependent on external providers. On the other hand, it should allow learners to have full control over their data by not tying it to a particular company or software.

However, it would be too short-sighted to develop a concept only for the exchange programmes of the AURORA Alliance. Our aim is to use the concept to create a solid basis for transferability to other collaboration projects at national and/or international level and to provide at least initial starting points towards the idea of 'one European university' (Jorgensen et al. 2024).

In this short concept, starting from our current situation, we will briefly outline the vision and goals of the AURORA Virtual Campus, its key features and functionalities, and the ongoing and targeted practical implementations. We will also discuss the potential challenges and risks associated with the development and implementation of such a project.

2. AURORA Virtual Campus

2.1. Starting Position

The AURORA course catalogue on the website is currently manually maintained and regularly updated based on feedback from partner universities. Interested students are directed to local landing pages of the partner universities through this catalogue, but digital registration or enrolment for the course is not readily available. The process of registering for a course varies from university to university and in most cases requires direct contact with the lecturer or the International Office/Mobility Coordinator. As a result, students are at best using technical crutches to access the systems of the university offering the course. At worst, they may bypass some or all of the provider's digital systems and have their achievements certified 'manually'. Registration with the own university ID (e.g., via eduGAIN) in the system landscape of the partner university is currently not implemented or not implemented by all partners. Another limitation is that not all student information systems and learning management systems currently support collaboration and exchange processes in a way that allows cooperative students to move within the system without being enrolled as regular students. International (de facto) standards such as Elmo or European Learning Model (ELM) for the exchange of records in the context of mobility have also been implemented by the partners to a limited extent and need to be further developed.

2.2. Vision and Goals

The AURORA Virtual Campus aims to provide students of AURORA universities with seamless access to the learning resources of all partner universities. Our aim is to create a learning environment where students can use their existing credentials from their home university to navigate seamlessly through the academic and administrative systems of all AURORA partners - just as if they were on campus.

Through the AURORA Virtual Campus, all AURORA students will be able to take full advantage of the courses and materials offered by the partner universities, regardless of where they are enrolled. This promotes real exchange between universities and allows students to make the most of local opportunities, build international learning communities and potentially connect with students from other locations outside the AURORA network.

The gateway to the virtual campus is a centrally developed course catalogue that links the learning environments of all participating universities. This increases the visibility and reach of the courses on offer, allowing students from across the network to access a diverse and shared offering. From the central course catalogue, students can log in to the university's own student administration, learning management and teaching infrastructure systems, providing them with a comprehensive and versatile learning experience.

In order to access different courses, student data may be collected as required. This data may be retrieved from the administrative systems of the home institution, where available, or may be requested (e.g. a letter of motivation) during the course registration process. The process of searching for a course, applying for participation, attending the course and transferring the examination results back to the home university system should be carried out without technical hurdles, allowing a seamless transition to an AURORA course and potentially facilitating recognition at the home university at the end. To illustrate this concept, we provide a chart (see below) showing the student's journey through the different systems and landscapes. This provides an overview of how students can navigate smoothly between the systems of the AURORA partner universities.

As far as possible, the project will use the existing infrastructure of the partner universities and existing standards for the exchange of student and performance data. This will increase the sustainability of the solutions developed and ensure that they can be used in other collaborative contexts.

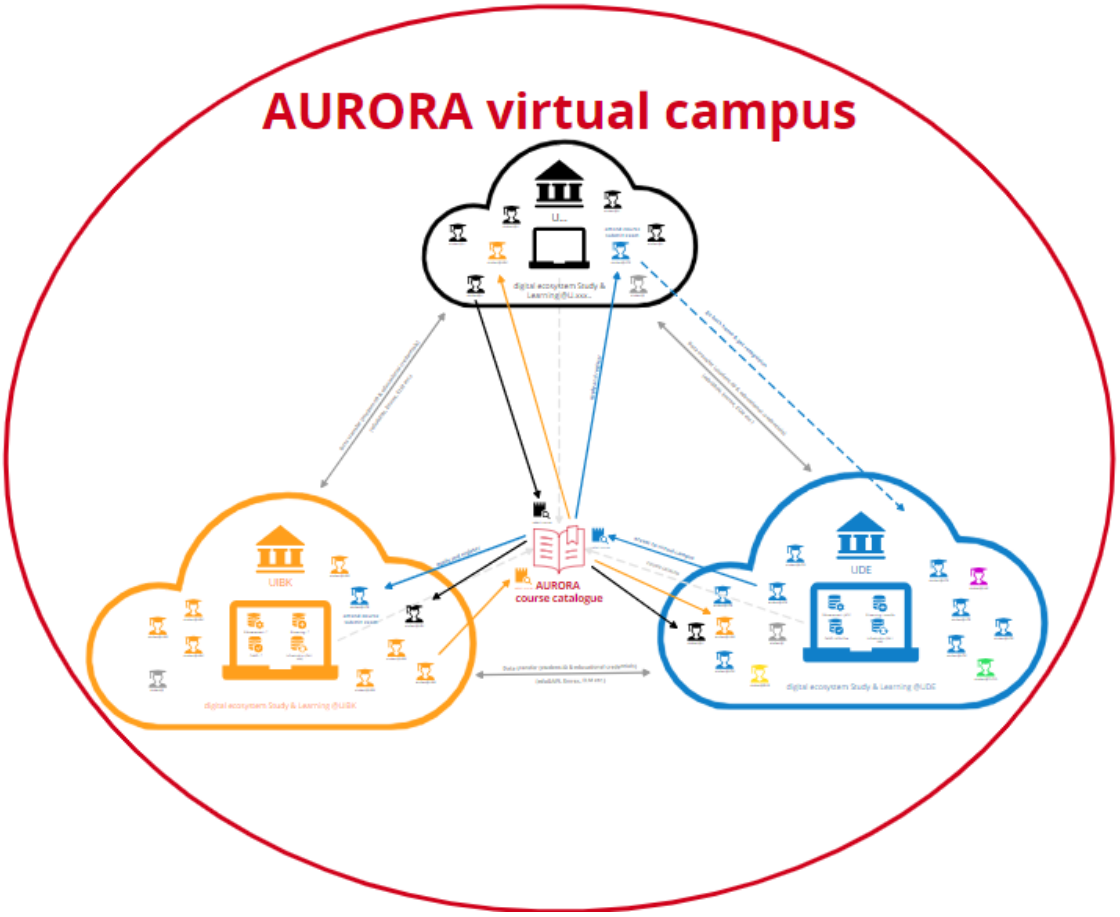


Chart 1: AURORA Virtual Campus, for better resolution and interaction within AURORA and beyond, see: https://app.conceptboard.com/board/cg18-g441-qp6n-7g4z-xdp7 (Login as a Guest is required)

2.3. 'Universal' process steps / use cases

Even if there are different regulations, procedures or technical solutions for the same problem at national and institutional level, it can be assumed that the individual steps taken by a student during the student journey are relatively universal: A student navigating through the process needs to access the virtual campus, apply and register for a course, attend the course and have the ECTS recognised by their home university. If we continue to think in terms of a learner-centered education system, where the learner ultimately has access to his or her educational outcomes, certificates, micro-credentials, etc., then the final step is to export and store this *validated* data from the different higher education institutions and sub-systems in an EU-wide system that can be accessed throughout life.

1. **To access the virtual campus:** The joint centralized course catalogue is the access point to the virtual campus. This use case will not be discussed in detail here, as we have decided to use the centralised eduXchange solution using OOAPI standard described in chapter 2.4. It is also conceivable that the joint course catalogue will eventually be reintegrated into the local course catalogue in order to increase and facilitate visibility and access to Aurora courses for local students. Booking from one system also has the

advantage that these courses can be integrated directly into the timetable of the home system.

2. **To apply and register for a course:** A student from one AURORA university (e.g. UIBK) selects a course offered by another AURORA university (e.g. UDE) in the AURORA joint course catalogue and wants to register for it. By clicking on the 'Register' button, the person is redirected to the local system of the course provider (UDE) with the federated login option via eduGAIN using the credentials of the home university. The system of the course provider recognises the student as a student with a predefined role (e.g. AURORA cooperation student). The minimum required master data (surname, first name, date of birth, email address) will be transferred to the other system during registration. Depending on the course, enrolment may be direct (no eligibility requirements) or via a multi-stage process (due to formal, content-related and/or organisational eligibility requirements) that must be processed centrally and/or decentrally. If the requested information is available in this form in the student information system of the sending university, an automatic mechanism should ideally be implemented, based on existing standards, which allows the student to initiate the transfer of this information from his home system directly to the target system. Existing prototype solutions and standards should be analysed for this purpose, e.g. the SURF solution with edubroker, ELM or Elmo. Additional requirements such as letters of motivation must be uploaded by the students themselves. The student is informed of the result of his/her application via a system message and can track it in the system at any time.
   As part of this use case, we also need to consider the creation of the online learning agreement if we want to transfer the concept to other use cases like Erasmus+.

3. **To attend (and complete) a course**: The student is admitted after registration and, if necessary, after checking the subject-related and organisational criteria of the course. He/she enters the university's LMS and may have (un)restricted access to tools[3] used to complete learning activities like digital semester apparatuses provided in the library for teaching purposes, to integrated or non-integrated VC solutions or examination tools. If a student wants to submit an exam, the registration for exams is the same for all students at a university and does not differ between regular and AURORA students. In which system the digital registration for the exams within the given deadline take place might differ between the universities.[4] Participation in the examination varies according to the type of examination (mandatory attendance, written or oral exam, homework,

[3] For contractual reasons, the libraries' digital resources that go beyond semester course reserves and content uploaded to the LMS are generally only available to regular university students and staff and cannot be extended to the entire alliance without further ado.
[4] It is also conceivable that the enrolment of AURORA collaboration students to a course will always include an automatic registration for the exam in order to save the students a step, as the negative consequences of failing to do so do not apply to cooperation students.

essays, etc.). In the case of a written examination, participation takes place via the local examination tools, access to which is again regulated via the SSO with the credential of the home university. It is up to the lecturer to decide whether the work to be submitted should be uploaded via an LMS such as Moodle/Canvas or made available by email. Oral examinations will follow the same rules as course attendance, i.e. the VC solutions used for teaching will also be used for oral examinations. By default, grades and credit data is recorded in the student information system or examination management system.
To sum up, this step is highly related to the possibility or progress of implementing SSO and the associated specific roles in different systems.

4. **To get the ECTS recognized**: It is at the student's choice whether he or she wishes to have the ECTS recognized and credited by his or her home institution, so this step in the process is usually initiated (or not) by the student himself or herself at his or her home institution after completion of the course. Technically, however, the solution will be no different from that for enrolment with requirements, since the same data exchange solutions will be used, now in the other direction.

5. **To export and store certificates/edu-badges/micro-credential**: As a final step, it would be desirable not only for universities to record ECTS credits and grades digitally, but also for students to be able to take their educational credentials, such as certificates, diplomas, etc., with them in digital and validated form so that they can use them at another point in their educational career or present them as evidence. However, we consider this last step to be desirable, as digital document validations such as the e-seal are not only subject to technical requirements, but also to strict national legislation, which can involve lengthy legislative amendment processes at national and, in federal states such as Germany, state level.

The 'universal' process steps defined here, although different in name, are largely the same as the use cases discussed in the EDEH Interoperability Workgroup (2024), although in our Virtual Campus vision we have initially ignored some of the Workgroup's 'advanced' use cases, e.g. generating data or managing educational resources.

3. Practical implementation

Over the next two years, the AURORA virtual campus project will undergo a thorough academic and technical evaluation. Subsequently, a technical blueprint for the AURORA virtual campus will be developed, which will then be implemented step by step by the individual partner universities. It is important to emphasise that the implementation projects of the individual universities should initially proceed independently of the other projects, so that each partner university can address the requirements step by step according to its own capabilities. A first milestone has already been reached with the use of SURF as a central course catalogue that allows redirection to local systems.

3.1. Developing a joint centralized course catalogue (the SURF solution)

Starting from this basic situation, digital solutions for a joint virtual campus and thus also for a joint course catalog were developed in the first phase of the Erasmus+-funded Aurora project. Possibilities for the technical implementation of a joint course catalog were already being sought at the time, with the Dutch service provider SURF and its *eduXchange* product being used for a pilot, in which the University of Iceland was involved at the time.

As part of the new Erasmus+-funded "Aurora 2030" project, the activities of the old project were built upon. Different technical solutions were examined in the current project: eduXchange from SURF (already in use at EuroTeQ Alliance), the technical solution from the EPICUR Alliance and BLOOMHub from OpenU. It emerged that of the possible solutions, only eduXchange met the requirements and appeared to be realistically feasible in terms of implementation. The EPICUR solution is a monolithic and centralised system that met many requirements, but because of its centralisation, it conflicts with the other virtual campus components that we had agreed upon (such as automated local enrolment and local course registration, access to local LMS) (for further information, see "Aurora T6.1 Workshop 05.-08.03.2024 – Workshop Summary"), and its development would require too many human resources. The BLOOMHub solution suffers from similar problems and was ruled out primarily due to the high level of manpower required.

eduXchange is based on the OOAPI standard and uses it to pull aggregated information about courses from local course catalogs or university databases to the frontend of SURFeduhub/eduXchange. By implementing an OOAPI endpoint at each university, courses from all partner universities can be fed in, whereby local adaptations or workarounds will be necessary to provide all the required information (see descriptions below). The OOAPI standard already specifies certain information fields that can be accessed, but it is possible to implement additional information fields through individual extensions.

A schematic representation of eduXchange can be found below:

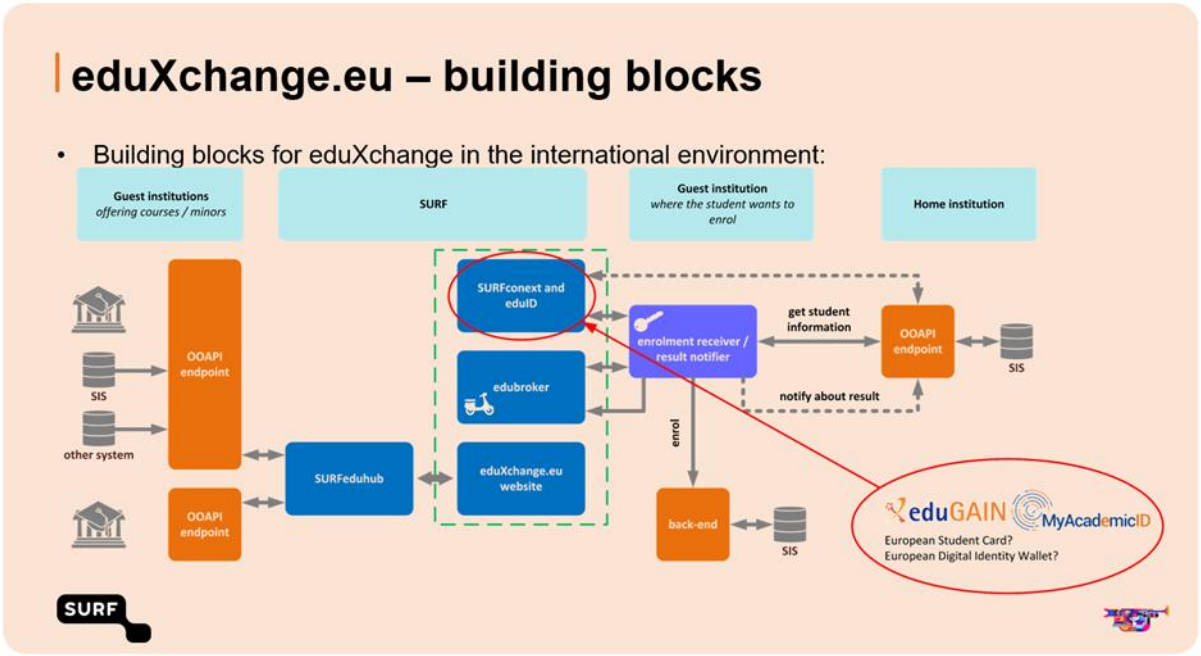


Chart 2: eduXchange.eu – building blocks; provided by SURF

We have agreed which fields should be included in the common course catalogue as mandatory and which as non-mandatory. For pragmatic reasons, we have deliberately decided *not* to declare fields such as the Aurora Competence Framework or the SDGs as mandatory, as very few partner universities are currently in a position to implement them. Once the joint course catalogue is implemented, adaptations to existing models such as ELM including corresponding fields like Competence Framework will follow. There is currently a discussion about how the purchase of eduXchange should be carried out, which raises the question of a public tender. As soon as this question has been clarified, the technical implementation should take place at the partner universities in summer semester 2025 so that a pilot can be launched in the winter semester 25/26, with the course catalog being fully productive in the summer semester 26.

We are convinced that the centralized joint course catalogue will give immediate visibility of the courses offered by the Aurora Alliance, both for students and for the Alliance in general. It will therefore contribute directly to the acceptance by the various stakeholders of the necessary efforts to achieve interoperability in university cooperation and, in this sense, is a gateway to the virtual campus we envision.

3.2. Exemplary Target Processes

Although the universal process steps described in chapter 2.3 are broadly common to all universities, the technical and organisational design of the individual processes varies from university to university and is often framed by different legal conditions.

In the case of the *University of Duisburg-Essen*, the ideal process is that the student from a partner university selects a course at the UDE from joint course catalogue and is redirected directly to the corresponding course in the local UDE course catalogue via the registration link there, in order to register for the course there - just like all other regular students at the UDE. As the UDE course catalogue is part of the student information system (HISinOne), almost all process steps take place in the same system, while Moodle is used for the LMS. The student enters SIS with a pre-defined role using home credentials (eduGAIN), initiates the data exchange based on ELM, Elmo (or something else?) if necessary to apply for admission to the course, is admitted, has access to learning materials via Moodle which is integrated with HISinOne via web services, registers for the exam in HISinOne, takes the exam using the in Moodle-integrated tool Jack, receives a grade in HISinOne, exports a digitally sealed transcript of records/certificate from HISinOne to an EU-wide established platform and if he/she wants, initiates the import of records via an adequate webservice at the home university to the SIS of the home university.

In contrast to UDE, *University of Iceland* (UIce) interposes an Aurora registration portal behind the registration button in the AURORA course catalogue, where the student logs in with eduGain and ESI credentials and UIce receives all basic information about the student via eduGain/ESI and/or agreed web services (Information required: Full name, university email, study programme, study cycle, ECTS and courses completed - i.e. UICE should receive the student's transcript). After registration the student accesses a list of Aurora courses taught at UIce that are open for application. The student clicks on "Apply" to submit an application for the course. Applications for individual courses are reviewed internally and accepted or rejected based on the criteria of the course and/or the limited number of places available. UIce Student Registration registers accepted students and provides them with limited access to internal systems like Canvas and Inspera. All Aurora students receive a Transcript of Records upon completion of a course at UIce, which can be accessed in the SIS.

Neither process has yet given much attention to the nomination process, which is essential for Erasmus+ or Aurora grants. As a result, there are still manual steps to be taken before registration (email exchange between university administrations). The ideal process at *Copenhagen Business School* covers this nomination process to some extent as the incoming AURORA students first gain access to the CBS systems via MoveOn, which automatically redirects them to the CBS student information system. The rest follows the same logic whereas also in Copenhagen students are regularly enrolled.

At the *University of Innsbruck (UIBK)*, it is also necessary that the students are enrolled there and that the UIBK remains the data-holding organisation. In this respect, student data

should be automatically transmitted to the UIBK via the “Register” button of the Aurora course catalog. At best, the data is sufficient to automatically enroll them at the UIBK within the self-developed UIBK campus management system VIS, whereby course registration can only be semi-automatic, as it must always be possible for teachers to reject students. Access to the local LMS OLAT would then follow the UIBK's internal processes, as would the issuing of ECTS credits - although this is also where the discussion about digital and micro credentials would start.

4. Challenges and Risks

There are many risks and challenges in implementing a virtual campus for the alliance. To name just a few:

From a technical perspective, the biggest challenge is agreeing on standards and implementing them consistently. In addition, there are now several standards for the same issue, and none of them has yet been definitively established. For example, the UDE software has implemented Elmo and XHochschule, but it does not yet support ELM. Too many standards in some places not only leads to increased customisation effort, but also potentially carries the risk of a certain reticence (wait and see what happens) and stagnation. In this respect, agreeing on standards is the greater challenge than technical implementation, the latter often threatened by a lack of human and financial resources, particularly in the public sector.

In addition to technical problems, process-related barriers such as incompatible time slots and semester times can make mobility or participation difficult or not possible at all. In this respect, technology can hardly be considered in isolation from the framework conditions, which require close coordination but cannot be changed without changes or flexibilisation in the respective higher education laws. From a national legal perspective, the regulations on enrolment are also critical and influence the processes. While in some EU countries participation in COIL or BIP requires formal enrolment, in others it is sufficient to register for the course, so that the individual steps in the process and the actors involved differ from country to country in terms of implementation. At University of Innsbruck, for example, ECTS points can only be awarded to formally enrolled students and courses need to be part of a quality assured accredited program. In this sense, the legal framework has an impact on the state of development of the software used, so that certain functionalities are not even in demand and therefore not developed, as they only serve the national market.

Another example, where national legal perspectives and regulations influence the process, is the issue of micro-credentials and digital badges. For example, in Germany, there is still no final and clear regulation on whether universities are allowed to issue digital certificates and seal them electronically. It is not forbidden, but it is not explicitly allowed. As a result, many universities are still reluctant to do so, especially as an electronic seal also involves

considerable costs. Until these issues are resolved at national level, the projects cannot be fully implemented. At University of Innsbruck, the course or courses that are part of a micro-credential, if it bears ECTS points, must be part of a quality assured accredited programme. This is different at UNINA, where digital credentials are already awarded via badges. In addition, there are few best practices from other European University Alliances on which the Aurora Alliance could orient itself. To return to the starting point of the argument, this is also due to the fact that there are different international standards (EDCL, Open Badge Standards, etc.) and, at least from the perspective of the Aurora Alliance, there has not yet been a decision on which standard to follow, with EDCL being the most likely to be followed so far.

But perhaps the biggest factor slowing things down is uncertainty about whether this virtual campus venture is a sledgehammer to make life easier for a few exchange students and lecturers, or whether the European education system is really moving towards the idea of 'one European university'.

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6. Annexes

6.1. Expectations from the P2P-Concultancy and Questions to the Peers

We have opted for a decentralised approach because it appears to be more sustainable and flexible than a centralised approach, even if the latter can sometimes be implemented more quickly. In principle, we want to take a critical look at our decision in favour of this approach in order to become aware of the consequences of our actions and to be able to take countermeasures in time, if necessary.

1. What are the advantages and disadvantages of each approach in terms of
    a. efficiency,
    b. speed of implementation,
    c. uniformity,
    d. centralised access & control,
    e. maintenance and development,
    f. flexibility and changeability,
    g. issuance of (distributed) digital certificates, such as micro-credentials
    h. ...

    both for the alliance and for the individual partner universities, as well as for the individual stakeholders (students, lecturers, administration, IT stuff, etc.)?
2. Which use cases are particularly well or poorly supported by which approach, or are there specific challenges that can be better addressed by one approach or the other
3. Off-topic question: What are the legal requirements for collecting and storing student data, particularly with regard to privacy and data security?

6.2. IT-System of the AURORA universities

IT_Systems_AURORA.xlsx

6.3. Current and target processes of the AURORA universities

https://app.conceptboard.com/board/qx3b-ttd6-q959-c45f-oizy (Access as a guest)

Annex E

PEER-TO-PEER-STRATEGY CONSULTING I 2025

Evaluation of the AURORA Virtual Campus Short Concept

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Introduction

The AURORA Alliance has made commendable progress in developing its virtual campus concept. The **short concept for the establishment of a virtual campus** (dated 2 December 2024) effectively describes the different phases of the learner journey, with a particular focus on access and exchange through IT infrastructure. Although not all the partners in the alliance were involved in writing the short concept, it is an excellent analysis of the relevant technological issues that arise in the process of creating a joint course catalogue, and it makes a strong case for mobility as a driver for interoperability, highlighting the complexity of working in different legal and organisational contexts. However, a more comprehensive approach that integrates (IT) governance concepts and stakeholder perspectives with technical considerations is needed to ensure AURORA's long-term success.

The following evaluation provided by Hochschulforum Digitalisierung's peer-to-peer consultation highlights key areas for improvement and additional considerations that may be relevant. It analyses the short concept and provides recommendations to help AURORA refine its strategies and address key challenges related to IT infrastructure for the implementation of its joint virtual campus.

Scope and Limitations

The short concept describes five use cases - elements of the student journey - and focuses primarily on the initial phase of the learner journey, emphasising access to partners' campus management systems to facilitate a variety of mobility formats. This consultation focuses on the strategic and operational aspects of the short concept and one of the key use cases: providing students with access to courses at partner institutions through a course catalogue. While this focus is essential, ***the peers emphasise that it should be broadened to include the governance challenges that affect the Alliance's ability to deliver these elements of its mission***. A comprehensive approach that integrates governance with technical and operational measures will be critical to the continued success of IT-supported mobility in AURORA.

This consultation is not intended to provide legal advice.

The hurdles for technical implementation in all the systems concerned cannot be investigated within the scope of this report.

There are currently still different standards with different focuses and application scenarios. Even the peers are unable to say which standards will ultimately prevail.

Impression

AURORA faces challenges similar to those faced by other university alliances, including the difficulty of aligning processes across institutions and integrating technical solutions for campus management that are prevalent at each member university. However, AURORA is making notable progress, particularly in its conceptual development, as evidenced by the short concept paper. The AURORA team has done a very good job of looking at the choices that other university alliances have made in the same situation and determining their own position against that benchmark. Getting stakeholders on board, determining the necessary measures for each partner institution, investigating which metadata to use: all this takes time. Considering the scope of the envisaged goals, the University of Duisburg-Essen (UDE), as a member of the Alliance, is at a comparable level with other institutions in the implementation of key (IT) measures. AURORA's active participation in exchange forums such as the European Digital Education Hub and the DAAD network for alliances also strengthens its efforts, for example in supporting the collegial exchange of information about good practices.

1. Strategy

1.1 Vision

A shared vision for the virtual campus is essential to align efforts across the Alliance. This vision must be learner-centred and guide the design of systems, processes and interactions to enhance the student and staff experience and therefore address the question: What does a "seamless university experience" mean in practice for AURORA students and staff? ***It is recommended that this vision is articulated clearly and collaboratively, involving student representatives from each university's AURORA Student Council.*** In a way, this is AURORA's answer to the question posed at the end of the concept paper: Are we making life easier for a few mobile students, or are we really working towards the integration of our system? Admittedly, this is a very difficult question to answer at this stage, but ultimately it is essential to work towards an answer - both at the level of the individual AURORA Alliance and at a collective European level.

The aim of creating “a learning environment where students can use their existing credentials from their home university to navigate seamlessly through the academic and administrative systems of all AURORA partners - just as if they were on campus” in connection with the idea of using eduGAIN is welcome.

1.2 Sustainability and scalability

A clear roadmap with defined timelines and milestones is essential to achieve shared goals and scale up efforts. While the concept note proposes a roadmap, how binding is it for all members? Are all members committed to it? And is it possible to revisit decisions if necessary? What has been achieved so far in Work Package 6 in relation to the objectives (such as blockchain mechanisms, etc)? ***The peers recommend clarifying these fundamental issues as well as the timetable for achieving 50% student mobility and explicitly linking the virtual campus to this specific mobility target.***

The concept note mentions the use of existing infrastructure and standards. While this is commendable, it remains unclear how this can be achieved across all partner campuses? ***The peers recommend including a concrete plan to ensure the long-term sustainability of the joint campus (with details on funding, resource allocation, technical maintenance - local and networked IT services - and adaptability).***

1.3 Use Cases

The concept refers to the different stages of the learner journey. It provides a comprehensive overview including access to the VLE, transfer of results and ultimately, access to wallets with credentials. The initial phase of the learning journey is described in most detail. For following phases, a greater emphasis should be placed on the workflows that support mobility, as well as the processes that facilitate platform development and enhance the user experience. These workflows and processes should align with the technical frameworks to cover the entire student learning journey, including formal learning pathways, extracurricular activities and developmental milestones: Will AURORA distinguish between long-term mobility, short-term mobility, blended mobility and virtual exchanges, all of which have (slightly) different requirements? Aligning the offering with the Alliance's objectives could help prioritise specific use cases. These decisions also have implications for the goal and timing of what is to be included in the course catalogue by summer term 2026. ***Trying to support all mobility formats at the same time may be too complex; the intended IT solution may not be able to address all practical constraints for all use cases. Aligning the offer with the objectives of the alliance could help to prioritise specific use cases.***

Beyond that, ***referencing the European Digital Education Hub resources and involving student representatives*** in the definition of use cases can provide valuable insights into the diverse needs of the AURORA student body. EDEH's Higher Education Interoperability Framework consists of three main components available on the Hub:

- Reference Architecture: This provides a technical blueprint for achieving interoperability, detailing shared building blocks, specific architectures for different use cases, and different architectural views for comprehensive understanding.

- Mapping Report: This report provides an inventory of existing standards and solutions used in EU-As to achieve interoperability. It identifies existing tools and services and analyses challenges faced by alliances to facilitate informed decision making.
- Implementation Guidelines: These guidelines bridge the gap between theory and practice, providing practical steps and resources to support the implementation of the Framework concepts in real-world scenarios.

2. Structure

2.1 Decentralised (hybrid) approach

The central question posed to the peers concerns the choice for a decentralised approach for the virtual campus of AURORA. The peers support the argument made in the short concept for a decentralised approach, also based on their experience with similar initiatives. A key argument for a decentralised approach is that it avoids the need to collect and store student data centrally somewhere in the Alliance. Other advantages and disadvantages of this and other approaches (for different stakeholders) are outlined for consideration in the appendix. ***Proceeding with the plan in its current form will give AURORA valuable practical experience and help sharpen the focus on all the issues involved, effectively building for the future, even if there is no absolute certainty*** that the technical path chosen now will eventually prove "the standards" or not. This effort can be seen as a "training area", where practical experience of automated collaborative processes can be gained.

From the peers' point of view, ***the decision of the AURORA network to rely on an established solution for the joint course catalogue and to programme appropriate interfaces is the right one***, as no definitive standards have yet been established across the EU, and the technical solution may have to be migrated to a different standard in a few years' time.

The planned ***automatic integration of the partners' AURORA courses into the UDE's HISinOne system would be very welcome***, if legally permitted, as it would make semester planning much easier, especially for students. A side effect for the AURORA network is that the AURORA courses offered will be more visible.

The Task Team considers presenting a "validated solution" (which is to be specified) to leadership as critical for securing buy-in. Indeed, ***Task Team 6.1 should take the lead in moving the Alliance forward.*** While doing so it should be recognised that changes to organisational processes are often a much bigger hurdle for collaborative projects than technical implementations. Key next steps could therefore include mapping how all IT departments operate across partner universities, presenting the analysis of the short concept to AURORA Alliance leadership and proposing an implementation plan. This plan should outline timelines, financial implications and

the commitment from each institution and stakeholders that would be required to achieve the desired goals. The Annual Meeting could serve as the key forum for decision-making.

2.2 Standardisation and Technical Challenges

Eventually the joint course catalogue with course display is only one element of the process steps required: 1. to access the virtual campus / 2. to apply and register for a course / 3. to attend (and complete) a course / 4. to get ECTS recognised / 5. to export and save certificates/edu-badges/micro-credentials. In the appendix, further aspects that should be taken into account are listed.

Current gaps in standardisation, such as the lack of a single solution for managing transcripts of records, require urgent attention. EMREX could improve the exchange of data between institutions. Although the short concept provides a draft of the general architecture (eduXchange diagram) and an overview of the target process, more technical details of the target system could be useful for further evaluation. ***Throughout the implementation process a feasibility analysis could be helpful to address integration with existing systems and data security and privacy.***

The concept notes the ambition to have a fully productive course catalogue by the summer term of 2026. Whether this can be achieved will depend, among other things, on the procurement process, the availability of programmers, agreement on course metadata, and the progress of all partner universities. Needless to say, only when all partners have completed their endpoints can all the data be incorporated into a fully productive shared course catalogue. If this is not the case, manual corrections will have to be made. The main question remains: Are all courses to be included or only those that are the core of the AURORA collaboration?

3. Culture

3.1 Commitment and Participation

The implementation of a joint course offer is complex and involves many stakeholders. ***The peers recommend that the overall participation in the strategic planning and short concept development be broadened and that any stakeholders (from Task Team 6.1) who might not have been taking part in the process to date, be more actively involved.*** At work package level, there seems to be a lack of coordination and cooperation between WP8 (Mobility) and 6.1. However, as IT is expected to support a number of different mobility use cases with different functional needs, whose requirements are defined by WP8, coordination between the two work packages is crucial. Furthermore, it is important to recognise that IT support is only one element in the success of a joint course. Equally important are the teachers and professors who have to deliver the courses (and the didactic expertise to redesign the courses to make them suitable for

sharing), the students in the Alliance with their needs as users (e.g. for suitable examination formats), and informal stakeholders such as mentors and advisors who need to be aware of the possibilities offered by AURORA so that they can pass them on to students where appropriate. ***It is therefore necessary to develop a comprehensive stakeholder analysis.*** This plan should outline how different stakeholders, including management, student councils, faculty, administrators and IT staff will be involved throughout the project and consider engagement with the different groups (including any possibly resistant or "show-stopping" stakeholders).

A learner-centred approach requires the active involvement of users, including students and teachers. From the governance document it becomes clear that the AURORA Student Council plays a role and ís consistently involved in the project. However, it should be considered that student council members tend to be among the most motivated students and as such may have a bias.

3.2 Leadership and Governance

The prioritisation of technical versus organisational aspects requires careful consideration. The challenges of such initiatives go beyond technical implementation. Effective governance structures and collaboration between partners are critical to success. While technical issues are crucial (and a desired outcome of this consultation process as indicated by the Task Team), interoperability is not solely a technical challenge. It is also an organisational issue that requires dedicated forums and processes to ensure clarity and facilitate decision-making. This requires a level of specificity, such as decision trees to guide stakeholders through key choices and dependencies. ***AURORA needs to recognise and address these organisational challenges to ensure clarity for all stakeholders.*** This includes defining the commitment of all AURORA partners to the course catalogue project: Is there a commitment to provide courses (and how many?) and to market the AURORA offer to their home students? Does this commitment provide enough substance to embark on the significant journey of building an IT-system to support the catalogue?

Beyond that, with regard to the allocation of responsibilities and decision-making structures within the alliance the following aspects should be taken into account: How effective are the established channels, forums or "town halls" for communication and decision-making? The concept does not specify who has the ultimate authority to make decisions about the virtual campus. Is this agreed at the (strategic) leadership level (How are decisions communicated and implemented across the alliance? Are technical specifications communicated clearly and transparently?)? In the interaction between the mobility and IT work packages, what are the arrangements for decision making? In WP6, what is the relationship between the digital campus and the sustainability activities? They seem to be independent, but there are interrelated aspects such as sustainable IT and IT for sustainability.

3.3 Networks & Exchange

The peers recommend leveraging the European Digital Education Hub interoperability framework to address challenges and for resources such as guidelines, stakeholder mapping tools and the HERM Model, as well as the FOREU4ALL initiative and national programmes for alliances.

4. Conclusion

As stated above: proceeding with the plan in its current form will give AURORA valuable practical experience and help sharpen the focus on all the issues involved. The peers offer specific recommendations and ideas based on their expertise such as clarifying the vision, outlining specific governance structures and developing concrete implementation plans involving all stakeholders and addressing their concerns.

However, they also acknowledge that, to make innovation happen, AURORA might only be able to address certain issues or challenges as they arise. This pragmatic approach is beneficial, despite some challenges being fundamental. It may be necessary to adopt a "cross certain bridges when we get there" mentality to make progress.

Overall, the peers recognise the AURORA Virtual Campus' potential to maximise collaboration and learning within the Alliance. By considering the points raised in this evaluation, the short concept can evolve into a comprehensive and actionable roadmap and an important guide for building a learner-centred and sustainable virtual campus that benefits all partners.

PEER-TO-PEER-STRATEGY CONSULTING I 2025

Evaluation of the AURORA Virtual Campus Short Concept

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The Hochschulforum Digitalisierung is a joint initiative of the Stifterverband, the CHE Centre for Higher Education and the German Rectors' Conference (HRK).
It is funded by the Federal Ministry of Education and Research (BMBF).

www.hochschulforumdigitalisierung.de

Annex F

Hochschulforum Digitalisierung

Evaluation of the AURORA Virtual Campus Short Concept

Appendix

Goal and Timing:

The timing is ambitious. Provided that there is a 'go' on contract, finances and commitment (which took me more than 1 year!), you then need to start building OOAPI endpoints at each participating institution. That itself does not take too long, maybe a week of work for a programmer? But finding the programmers first and getting green light to put them on the project and green light from CIOs to 'mess' with the course information system is what takes a long time! Also, the alliance will need to come to an agreement on the precise selection of course metadata that they want to share in their catalogue, and they need to 'find' those data in each of their own systems and make them compatible. For example, if you decide on a list of subject areas, you will need to re-code the locally used descriptions of subject areas towards the AURORA list in a sort of a translation table and build that into the OOAPI end point. Otherwise the data wouldn't display. - Another consideration is the one I raised a little earlier: which use cases exactly do you want to support right away? if only online courses (such as EuroTeQ did), this is much easier compared to if you also want to support physical mobility with Learning Agreements, EWP connection etc.

Good Practices and Semantics: Centralised, Decentralised or Hybrid

From the peers' point of view, the approach chosen by AURORA is not a purely decentralised approach, but a hybrid approach with a focus on interfaces between the existing system landscapes of the partners. Just as the solutions in other European university alliances, which are never purely centralised or purely decentralised. Instead these are usually hybrid in some way, relying on centralised or decentralised systems at different points in the student journey. For the purpose of this evaluation we are referring to “decentralised”

Euroteq

A decentralised approach, like the EuroTeQ alliance took, may take a little longer to implement, because it necessitates adjustments to each individual partner’s IT systems. But it offers greater

flexibility and opportunities for alignment with diverse institutional needs. A central argument for a decentralised approach is that it avoids the necessity to collect and store student data somewhere centrally in the Alliance. Such data collections invariably raise concerns of data handling, security etc, which can be especially problematic as the Alliance lacks a legal entity. A decentralised approach, as described in the short concept, allows the IT systems to 'talk directly to each other' in a background process, after the student has given consent. This is much more in line with the current developments towards data sovereignty for individual learners, in contrast to building a central database that will then act as a data silo.

We do recommend double-checking if the approach such as chosen by EuroTeQ will match all the desired use cases that AURORA intends to support with its virtual campus. EuroTeQ 's decision to exclude face-to-face courses from its course catalogue stems from the consideration that physical mobility, especially long-term mobility, requires different information, different timelines and different connections to related IT-systems (such as mobility support software and EWP). Trying to support all mobility formats at once might present too high complexity; the intended IT solution might not be able to accommodate all practical constraints for all use cases. Aligning offerings with alliance objectives could help to prioritise specific use cases.

Taking AURORA as an example: In its current state of development (if understood correctly), SURF provides the shared course catalogue (or this is being worked towards) as a central component and automatically retrieves the courses from the local systems via interfaces. Application to the courses, course participation and Transcripts of Records are decentralised. In the EPICUR network, the course catalog is currently maintained manually in the central VURS system. For course participation, the decentralised learning management systems (LMS) are linked via a central ECS server (VCLP) and tunnel the participants from the VCLP into the local LMS system of the university offering the course.

The answer to the question "What are the advantages and disadvantages of each approach in terms of efficiency, speed of implementation, uniformity, ..." for the various stakeholder groups depends on numerous factors. Let's look at the topics of efficiency and speed of implementation as an example.

From the point of view of the universities involved, a central solution is very efficient and quick to implement when it comes to a manageable number of courses in the network. The technical system can be set up quickly using project funds without any major dependencies, and the data is maintained manually by the existing project staff. With a massive increase in the number of courses, efficiency quickly plummets, as all data ultimately has to be maintained twice. The maintenance effort is not only incurred when creating the course catalog, but also affects all changes that occur in the course offering, as all changes have to be maintained twice.

In terms of efficiency from the students' perspective, the picture is quite different, even with small course numbers. Modern campus management systems such as the HISinOne system used by UDE offer students numerous convenient functions for semester planning. For example, the

system provides each student with a study planner containing a list of courses from the central course catalog that match the study and examination regulations in which the student is enrolled in the current semester. Courses can be booked or noted directly from the study planner. A timetable shows all course dates that have been booked or noted on a daily basis. If an individual date is canceled, it is marked as a canceled date in the calendar, etc. Courses that are booked outside of the study planner via the course catalog are seamlessly integrated into the calendar. In the module view - if configured accordingly - examination registration is also offered directly in addition to course registration. Alternatively, exam registration takes place automatically with course registration. Courses that have to be booked and managed in a different system therefore mean additional work and loss of convenience for students in any case.

Let's take another look at efficiency from the university's perspective under the aspect of "participation in other alliances/multiple networks". As soon as a course offered by a university is made available in more than one network, e.g. for the UDE in addition to AURORA in the University Alliance Ruhr (UA Ruhr) and a central solution is also used there, continuous manual maintenance must be carried out not only in two, but in three or more places. Conversely, in addition to implementation, the maintenance effort for automatic interfaces should not be underestimated. Campus management systems are developed further or changed, interface definitions change, ... The work is not done with the one-off networking of decentralised systems as part of a project. Continuous investment in maintenance is required. Whether funds are used efficiently here depends heavily on how many courses are integrated or used in joint projects and it depends on how many different standards and technologies are used. As an example: in Dutch higher education, big efforts are being made to use the OOAPI for as many data exchange needs a possible. Not only for course exchange in alliances, but also for governmental registries of educations, for example.. If the number of courses is permanently low, manual maintenance may well be more efficient. The speed and intended scope for scale-up are therefore crucial to map.

Standards

There is a kind of chicken-and-egg problem in the area of standards. As long as the standards are not used, none of them will prevail. The practicability of individual standards or their elements will only become truly resilient when they are used in everyday university life (which is why the alliances have such an important role as innovators! They have the funds and the tasks to get moving with something. Only practical experience will teach us what works and will ultimately lead us to joint standards.). The recommendation to the AURORA network would be to examine which of the systems in use already support which standards (or have them on the roadmap) and then decide pragmatically where further implementations with which standards should be continued alongside eduXchange/eduGAIN.

Here are a few tips for assessing / selecting / using the existing standards:

- The term "standard" is a very broad term and it may not be sufficient to agree on a standard; further agreements must be made. Example ELMO: offers many, many optional

data fields and it should be clarified which are actually required / can be filled in the network when deciding on ELMO. If necessary, with a gradual concept, as the AURORA network has already done when using the eduXchange standard.

- Data protection. The assignment to the peers also formulated “Off-topic question: What are the legal requirements for collecting and storing student data, particularly with regard to privacy and data security.” The peers cannot provide legal advice here. Nevertheless, we would like to use an example here to show that there are ways that seem legally simpler and ways that are probably more difficult to implement legally.
- As an example, we take ELMO as a standard for coding and formatting the data of a Transcript of Records (ToR) and the concepts from Erasmus+ and EMREX as possible transmission paths. EMREX is a transmission path for ELMO. Erasmus+ has not yet defined which standards will be used to transfer ToRs. Let's assume it is ELMO and further assume that the transmission path is the same as Erasmus+ for Inter-institutional Agreements and Learning Agreements.
- With Erasmus+ data is always transferred directly from one higher education institution to another. It is therefore imperative that appropriate data protection agreements are made between the universities. Before these agreements have been made, no ELMO file may be transferred from one university to another. (however there are alliances which have set up a sort of generic Data protection agreement for the alliance as a whole. While that may work legally, it does not always work in practice - because it also needs expertise to enforce it,
- With EMREX, the student himself initiates the transfer of the ELMO file via EMREX from/to his home university from/to another university. For this to work, they need a browser and access to both university systems concerned at the time of transfer. If the use of eduGAIN is implemented in the AURORA network as planned, the question of access has been clarified. The transfer via EMREX is technically carried out by the student from the source university to their browser and from there directly and automatically to the target university. Signature mechanisms ensure that the data actually originates from the source university and has not been altered during transmission. Much simpler than the Erasmus+ mechanisms in terms of data protection law, although the same ELMO standard would be used in the example.
- One of the peers data protection officers answer to this off-topic question: “What are the legal requirements for collecting and storing student data, particularly with regard to privacy and data security” was roughly:
    - include a privacy note in the form through which you collect the data;
    - do NOT use consent as legal basis, but rather "task carried out in the public interest";
    - strictly only collect those data that you absolutely need, no 'nice to haves',
    - store the data in a well-secured environment with good access management;
    - don't link the management to someone's personal account but rather to a functional account;
    - be sure to purge them as soon as they have served their purpose,

- define exactly who can access which data, why and for how long;
- write a privacy scan in which you explain all considerations around the data collection and file this with the institutions' privacy officer (I am ready to share this if anyone is interested)

Students' involvement

In EuroTeQ, we had good experiences with the student council providing input to the course catalogue set-up. But it also had some limitations: for example, the student council had stressed that students want courses that provide credits that are recognised in their own programme. We took a lot of trouble to make that happen for 1 specific programme, and in the end it turned out that we had almost no sign-ups, because the 'average' student didn't turn out to want such courses. They 'only' wanted extra-curricular courses that they could take out of personal interest and weren't offered by their home uni. - I'm trying to say: student council members tend to be among the most motivated students and as such may have a bias.

Joint Course catalogue further considerations

The joint centralised course catalogue with display of courses is only one element of the process steps needed to access the virtual campus / apply and register for a course / attend (and complete) a course / get the ECTS recognised / export and store certificates/edu-badges/micro-credential. In addition, the following notes should be taken into account:

- Under "apply and register for a course" the minimum required master data is listed as: surname, first name, date of birth, email address. We recommend including the European Student ID (ESI) as an additional criterion. In case of doubt, this facilitates problem solving or communication between universities in individual cases.
- For "attend (and complete) a course", "email" is mentioned as a possible transmission channel for works of the students. The peers know from practical experience that this method is chosen in particular if no data protection-compliant solutions are available or if they are too cumbersome or appear too cumbersome for teachers or students. In this respect, yes - it happens in practice - but should only be part of a concept as an encrypted email solution.

Annex G

PEER-TO-PEER-STRATEGY CONSULTING I 2025

Review of the AURORA IT Handbook

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Introduction

The AURORA IT Handbook was submitted to the peers on July 13th by Task Team 6.1 (represented by UDE and UIBK). It outlines the current state of affairs, explains what is defined in the Aurora 2030 project's grant agreement, articulates the vision and goals for the Aurora Virtual Campus, and presents a target process envisioned for the Aurora Alliance.

Alongside the handbook, five guiding questions were submitted. These are intended to explicitly invite the peers of the peer-to-peer strategy consulting to conduct a critical evaluation of the handbook with particular attention to potential obstacles or problem areas.

It is in this context that the review should be understood and read.

Impression

The IT Handbook of Aurora reads like a well-structured and ambitious plan. It lists the necessary steps to work towards a Joint Virtual Campus in the way Aurora is envisioning it. It focuses on the IT-systems that are needed, building on experiences from others and on preliminary research of available solutions and standards. It also points out clearly that in the end, the actual work needs to be performed locally at the different partner institutions.

However, there is a potential risk in leaving important questions about content, policy, and governance to other work packages. The peers would like to stress that while it is understandable that the IT team cannot be responsible for these areas, ensuring strong alignment across them is crucial. When the time comes for institutions to allocate their own financial and human resources to maintain and develop the course catalogue beyond the project's funding, the connection to their local priorities and the vision of the long-term goal behind it must be solid enough to sustain ongoing commitment.

Building bridges between technical planning and broader strategic goals now will help secure long-term success and institutional engagement.

Guiding Questions

1. *When it comes to digitalisation projects, the standard objection is 'It won't work anyway'. Are there any pitfalls in the concept that could trigger this reaction? What countermeasures would the peers recommend to address such objections?*

The peers recognise that concerns about digital transformation projects often come from a feeling of complexity and potential overload. The fact alone that in some cases extensive explanations are needed, may signal to external readers that implementation will be challenging. It is commendable though that the IT workpackage already identifies many of these challenges in the risks and mitigation sections. Addressing these transparently is the first step that positions you for success.

Key challenges which the peers see might trigger resistance include:

- A key risk lies in ensuring sustained commitment from Aurora universities, particularly in allocating the necessary human resources for implementation alongside their day-to-day regular IT operations. For this initiative to succeed, partners will need enough staff who have a deep understanding of both current systems and future processes, as well as the broader IT landscape. Importantly, in addition to IT personnel, administrative and teaching staff will also require dedicated time and support to handle the additional tasks that come with such a major project.
- The absence of a central legal entity (contractor) for the alliance which can create legal and procedural hurdles, particularly when contracting with service providers (e.g., SURF).
- Differences in national regulations and local IT systems, which may mean that some required course or enrollment data simply does not exist everywhere, for instance limiting the effectiveness of interoperability via eduGAIN (this connection won't help, if the data does not exist).
- Partners that rely on national or commercial student information or learning management systems may have less flexibility to adapt, which may slow integration within the desired time frame.
- Opening up the catalogue to staff and lifelong learners is very positive, but it is important to anticipate that different data structures and source systems can make enrollment processes more complex.

- Moving to new systems, such as using ECDL for digital certification (instead of the traditional Transcript of Records), may need local adaptations as it might not match with local recognition processes.
- Mentioning or considering the use of platforms that are not based in Europe might raise questions about data privacy and compliance. E.g. NocoDB seems to be open source and you might consider running a self-hosted NocoDB (it is not clear in the concept who runs NocoDB in AURORA. Every partner who needs it themselves?), but it is based in the US.

To overcome these hurdles the peers suggest to make the most of your modular, flexible approach which allows for adaptations. Clear communication about this approach will reduce resistance and shows that you plan to address local needs as they arise and that you aim to maintain local ownership to ensure everyone feels invested and informed.

Secondly, it will be important to build strong commitment and collaboration across institutions, involving IT teams, legal departments, and academic leadership. This is critical to build shared understanding and agree on joint solutions.

2. *With this expanded concept paper / handbook, are there any recommendations on how to ensure (political) alignment? Do we consider this topic enough in the handbook?*

The Handbook does an excellent job setting out the technical landscape and identifying potential risks. There is an opportunity to further strengthen your work by addressing political alignment and stakeholder management strategically.

The peers suggest first of all to specify concrete mechanisms for stakeholder involvement, with clear roles for leadership at each institution. Naming champions, such as a Chief Integration Officer, can give Aurora's digital initiatives visibility and drive.

Secondly, while the IT strategy is central, anchoring it in a broader alliance vision is vital. You will need to identify: *Which mobility models matter most? How do institutions contribute their unique strengths? What story are we collectively telling?* The IT-systems, though highly important, cannot be considered in isolation from the content-related questions. Without this shared vision that goes beyond IT into collaboration, recognition, teaching, and student engagement it will be very hard to inspire alignment.

Thirdly, consider treating decentralisation as a strategic asset. Rather than seeing the lack of centralisation as a limitation, embrace your federated approach. Major organisations succeed with coordinated, decentralised models and so can Aurora, provided the collaborative vision is strong and enough resources are allocated to make it happen. Think about which steps to take to emphasise the value of Aurora's federated structure where each partner retains autonomy but works toward clear, shared goals. This can for instance be achieved by investing in visioning workshops that actively inform and involve a wide group of stakeholders.

3. *What is your opinion of the proposed schedule in terms of feasibility?*

The proposed timeline is bold and reflects the ambition of the project. With strong engagement, your plan is achievable, but the peers suggest that special attention is needed on staffing and local resource availability. As mentioned, the iterative, modular approach is a major asset here and the peers encourage you to stay flexible, regularly reassess dependencies, and adjust course if needed.

Successful implementation of the proposed schedule depends on whether partner universities have the required IT resources available when key integration phases begin: Are there enough people allowed to work on these phases in an overlapping time frame? Will they be available to build the end points in the period reserved for this work?

The peers urge you to consider the following points:

- Double-check that each partner has sufficient staff available for project phases.
- Plan for running into competing priorities at each institution. You will need to factor in flexibility and allow for local adjustments to meet Aurora milestones.
- When it comes to running parallel catalogue systems (as suggested for SS26), clarify early how students and staff will navigate different platforms. *How can you combine these? Will just one of the two platforms be actually in production mode at any one moment in time? If needed, focus on one system in production at a time to avoid confusion.*
- Recognise that semi-automated enrolment may require extra time due to varying local or national conditions. *Consider adding another six months for this stage if needed*.
- The goal of automating access to VLEs is innovative and forward-looking (it's something for instance EuroteQ has not attempted yet). Celebrate that you are pioneering new,

technically complex, territory here! And allow for surprises and create space for learning and iteration.

4. *Beyond and apart from the use case sequence, where do you see opportunities for quick wins? What criteria could AURORA use to define quick wins?*

Quick wins are notoriously hard to identify in such complex, long-term projects. What seems "quick" often isn't and what could be a "win" may not scale easily. Nevertheless, Aurora has already achieved important early successes:

- The consolidated overview of intended course metadata (page 14) provides a valuable foundation for local implementation efforts. It will help advance the local research which data are available where and how they could be connected to eduXchange.
    - *Note: You will probably discover that you are going to need to build some extra fields into the local course information systems, and/or that you are going to need translation tables to 'aurorafy' data that currently follow a local metadata structure. For example, 'mode of delivery': this will require agreement on which options are possible, and then these options need to be available in exactly the agreed-on format in all the local source systems. This is very unlikely to be the case now and will probably require alignment work.*
    - *Be also aware that additional data fields need processes to fill and handle them. Administration and teaching staff need to be motivated to adapt to changed processes or additional steps.*
- The visualisation of different student data formats (page 19) is already helping to uncover key differences, such as in gender classifications, that might affect future automation processes.
    - *Note: the devil can be in the detail! For example, 'gender' may be a binary choice in some countries, whereas a third or more options may be given in other countries (e.g. the German Hochschulstatistik uses four options for "Geschlecht": 1 - Männlich, 2 - Weiblich, 3 - Divers, 4 - Ohne Angabe - see: https://www.statistik-bw.de/Hochschulstatistik/SP/Schluesselverzeichnis_WS_2023.pdf page 260, which is normally reflected in the student management systems). It's important to align on this to avoid problems in the automation process.*

The following criteria might define quick wins for Aurora:

- Achievable in the short term
- Provide clear value or insights
- Help clarify or resolve future work
- Help build confidence and buy-in with visible progress

Based on these criteria (depending on whether there is a (different) group working on the strategic vision behind the intended course catalogue and on the intention for priorities of content) a quick win might be to host a joint visioning workshop behind the course catalogue with stakeholders across both strategy and technical areas. This will help you all to form a picture of your ideal final product and its strategic value for the alliance.

5. *Are there general recommendations/good practices that the peers can offer to AURORA partners regarding steps they can take to facilitate knowledge-sharing and (political) alignment between AURORA and the other alliances they are involved in?*

Aurora is already collaborating with other alliances (EUAs and others). This is excellent and should continue as each alliance brings in different approaches, creating valuable learning opportunities.

There are many creative and practical formats that can support effective knowledge-sharing and alignment, ranging from communication-focused approaches to structured knowledge management tools to systematically document progress. These options sit on a spectrum between outreach and collaboration, blending elements of marketing and classic knowledge-sharing.

On the marketing and communication-side, shared social media channels such as a joint Instagram account could be a great way to showcase student experiences across the alliance and bring visibility to the work being done. Short, flexible learning formats like webinars, Learning Shots, or web-based training modules can be powerful tools for exchanging knowledge. These formats allow individuals to access relevant insights independently, anytime and anywhere, fostering inclusion and continuous learning.

From a project management and technical perspective, a combination of established collaboration tools and purpose-built systems can further enhance shared understanding. Beyond commonly used platforms like Nextcloud, tools like Jira (ticketing systems) or Confluence (content management systems) can help structure and document decisions, track progress, and support collaborative development of shared knowledge over time.

The peers also highlight the value of a comprehensive Quality Assurance Plan, which many alliances use to track progress, monitor resource use, and identify potential critical paths. These tools are only effective if actively used: they must be lived and embedded in daily practice. Promoting their use and a culture of openness and transparency rather than working in silos goes a long way in strengthening collaboration and alignment across all partners.

Furthermore, the peers recommend to engage in inter-allicance knowledge sharing:

- Host regular small working sessions between technical teams from Aurora and alliances like EuroTeQ or CHARM-EU to share solutions and compare challenges.
- Join forces with alliances while/when engaging with software vendors (like HIS in Germany). By collaborating across alliances, you will increase your influence on standards or features.
- Share your pioneering approaches (e.g., compared with Euroteq in using EMREX, ECDL (instead of ToRs), or NocoDB) with the wider EUA community.
- Think about extensive (even longterm) staff exchanges between the Aurora Partners not only, but especially on the IT-side. This may boost the common understanding of the different partners' needs, processes and systems and may help a lot in design, implementation and test phases.
- Push for transparent dialogue about practical and financial implications like evaluating cost models for services.
    - For example, CHARM-EU has examined the financial case behind implementing eduXchange *for their course catalogue* and found current models potentially unsustainable without broader uptake or reduced fees. Such findings should be shared to drive collective improvements.

Conclusion

You are working on a complex, high-pressure project across national systems, diverse institutional landscapes, and with tight timelines shaped by European Commission expectations. In that context, the Aurora IT team has achieved a great deal and produced strong foundations for future work.

The peers' core recommendations are to further develop the shared, strategic vision and make sure everyone across roles and locations feels part of it. Make sure to keep communicating openly, stay flexible, and move forward step by step. Remember: perfection is not necessary, real progress comes through collaboration and collective commitment. You are well prepared. Take each step with confidence. You'll cross the bridges as you reach them.

Hochschulforum
Digitalisierung

PEER-TO-PEER-STRATEGY CONSULTING I 2025

Review of the AURORA IT Handbook

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The Hochschulforum Digitalisierung is a joint initiative of the Stifterverband, the CHE Centre for Higher Education and the German Rectors' Conference (HRK).
It is funded by the Federal Ministry of Education and Research (BMBF).

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