

**Project:** Boosting the telecommunications engineer profile to meet modern society and industry needs [BENEFIT]

**Project ID:** 585716-EPP-1-2017-1-AT-EPPKA2-CBHE-JP

**Work Package 3:** Modernization of teaching methodologies and infrastructures

**Title:** D3.4 Web repository for class and lab sessions material, recorded remote classes, and network of audio libraries

**Lead Organization:** FERIT

**Participating Organizations:** UNI-KLU, UL, UBL, UNSA, UNTZ, UB, UNI, UNS, ENT, BICOM, BIT, CISCO, NiCAT, RT-RK

**Editors:** A. Tonello, M. Zajc, S. Rimac-Drlje, N. Suljanović, V. Delić

**Contributors:** V. Delić, Z. Krpić, D. Došen, A. Mujčić, N. Jakovljević, D. Mišković

**Disclaimer:**

"The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein."

Deliverable data	Work Package and Outcome ref.nr	WP3 D3.4
	Title	Web repository for class and lab sessions material, recorded remote classes, and network of audio libraries
	Type	<input checked="" type="checkbox"/> Teaching material <input type="checkbox"/> Event <input checked="" type="checkbox"/> Learning material <input type="checkbox"/> Report <input checked="" type="checkbox"/> Training material <input checked="" type="checkbox"/> Service / Product
	Description	A web repository has been made available on the web portal (from D2.3) and become filled with class and lab sessions material, recorded remote classes and audio-libraries developed during the course of the project. AlfaNum has provided high quality Text-to-Speech synthesizer that is necessary for audio-library implementation as an innovative education resource (Task T3.5). The same material is available in all the WB partner countries' languages to promote integration.
	Date	14.04.2020
	Language	English and Bosnian/Croatian/Serbian
Target groups	<input checked="" type="checkbox"/> Teaching staff <input checked="" type="checkbox"/> Students <input checked="" type="checkbox"/> Trainees <input type="checkbox"/> Administrative staff <input checked="" type="checkbox"/> Technical staff <input checked="" type="checkbox"/> Librarians <input checked="" type="checkbox"/> Industry partners, WB Higher education authorities	
Dissemination level	<input type="checkbox"/> Department / Faculty <input type="checkbox"/> Local <input type="checkbox"/> National <input type="checkbox"/> Institution <input type="checkbox"/> Regional <input checked="" type="checkbox"/> International	
Lead Organization	FERIT	
Participating Organizations	UNI-KLU, UL, UBL, UNSA, UNTZ, UB, UNI, UNS, ENT, BICOM, BIT, CISCO, NiCAT, RT-RK	

Revision History				
Version	Date	Author(s)	Organization(s)	Brief description of change
01	03.04.2020	V. Delić, S. Rimac-Drlje	UNS, FERIT	Sections 1 and 2
02	07.04.2020	Z. Krpić, D. Došen, A. Mujčić, N. Jakovljević, D. Mišković	FERIT, FERIT, UNTZ, UNS, AlfaNum	Contributions to Section 3
03	14.04.2020	A. Tonello, M. Zajc, S. Rimac-Drlje, N. Suljanović, V. Delić	UNI-KLU, UL, FERIT, UNTZ, UNS	External review revisions
release 1	01.09.2020			

**Table of Contents**

1. Introduction.....	5
2. Objectives of the Deliverable .....	5
3. A Brief Description of Web Repository as a Web Service .....	5
3.1. Web Repository.....	6
3.2. Link to CABUNS.....	7
4. Conclusions.....	9
5. References.....	10

## 1. Introduction

The deliverable D3.4 “Web repository for class and lab sessions material, recorded remote classes, and network of audio libraries” is a service (not a report). Nevertheless, a short report is given here.

The relationships of D3.4 with other deliverables and WPs, particularly the WP3 tasks, are shown in Fig. 1, with the final goal to contribute to the project goal:

**G3:** Increase the attractiveness of ICT studies through the development of joint e-platform.

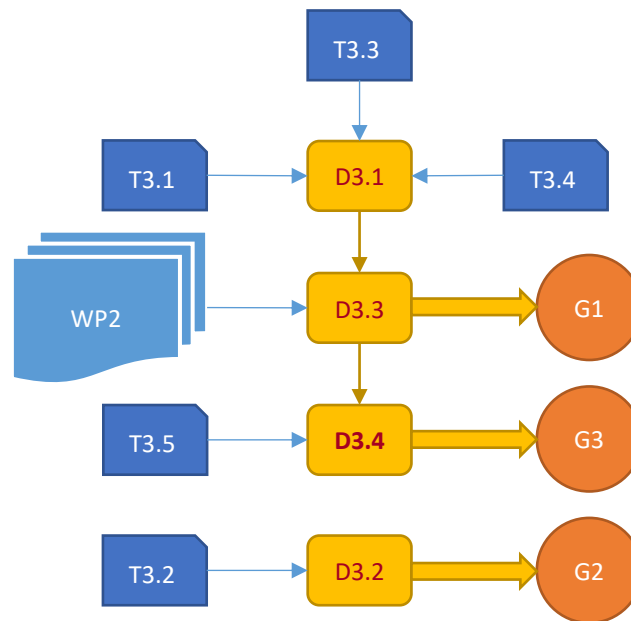


Figure 1. *D3.4 among other WP3 deliverables and their contributions to the project goals*

The web repository is one of e-platforms integrated in the central project web platform. It is based on the collection of teaching material for new and modernized courses (D3.3) as well as the Central Audio Library of the University of Novi Sad (CABUNS), which is developed in collaboration with AlfaNum as industrial partner at the project BENEFIT.

## 2. Objectives of the Deliverable

The main objective of the D3.4 deliverable is to provide teaching/learning materials of novel and modernized courses, class and lab sessions material, recorded remote classes, and network of audio libraries – altogether as a web service.

## 3. A Brief Description of Web Repository as a Web Service

Web repository and E-platform have been delivered and used. Each PowerPoint presentation can be accompanied with link to its audio edition made by CABUNS using TTS (text-to-speech technology).

### 3.1. Web Repository

Web Repository is available as an integral part of the Web Platform. It enables the upload of the teaching materials in text, audio or video formats in numerous file types. The Web Repository itself is a single point of storage for all the teaching materials from all the studies and all the courses. It utilizes protection from the potential data loss by backup mechanisms, it is easily searchable and readily available. As shown on Fig. 2., browsing of the Web Repository is available by several categories: study programme (1) or other training materials (2), knowledge area (3) and course (4).

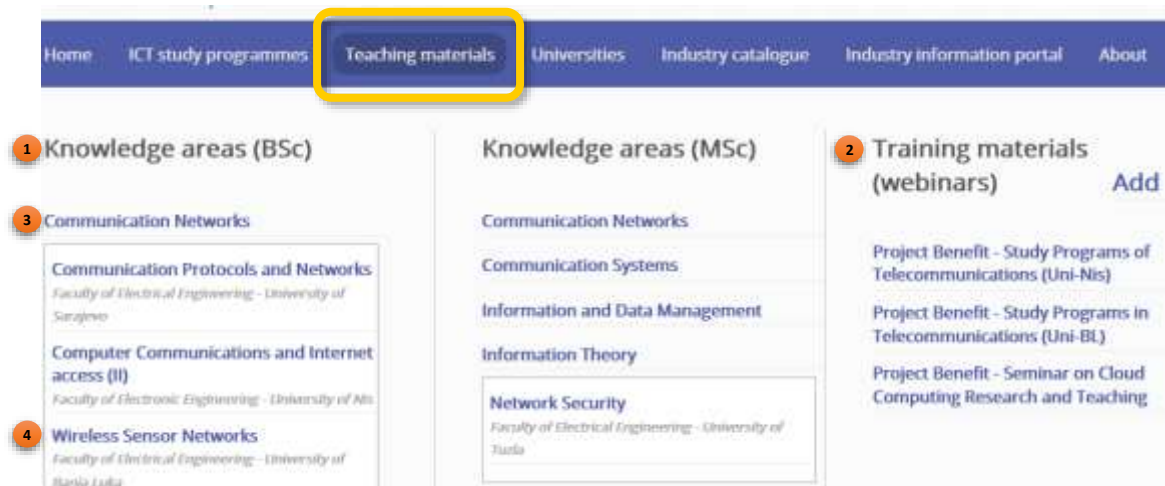


Figure 2. Teaching materials Web Repository browsing categories

Web Repository itself is a collection of course repositories. A course can have multiple repositories, thus enabling an easy organization of the course materials according to the arbitrary criteria. Course repositories are maintained within each course, which can be seen on Fig. 3. There, the repositories can be created, edited and deleted. The list of uploaded files for a single course per repository is visible when a user clicks on a course. Basic information for each file is displayed when browsing a course repository, such as a filename and size of the file. Also, the authorised persons can delete each file from a course repository or a complete repository can be removed.



Figure 3. Handling course repositories within the Course administration panel

For each course repository a desired storage size can be defined, thus making an efficient use of the storage space of the Web Repository. This way the teachers can estimate how much storage they need, avoiding the need for reserving unnecessary storage space. When creating a course repository teachers can specify the title (1) and description (2) of the repository, shown of Fig. 4. Additionally, a

course repository can be password protected so teachers can restrict the access to the teaching materials (3).

Figure 4. *Creating a course repository*

The files can be uploaded to the course repository by a simple drag and drop action, or by manually selecting the file(s) to upload, Fig. 5.

Figure 5. *Editing a course repository*

### 3.2. Link to CABUNS

Central Audio Library of the University of Novi Sad (CABUNS) is a web-portal that provides textbooks, presentations and other teaching material augmented by accompanying audio contents generated automatically from the written text. The main architectural aspects are presented in Fig. 6. The core of the system is ASP.NET framework as the latest generation of Active Server Pages (ASP) technology. This layer is responsible for processing requests accepted by Internet Information Services (IIS) server and work distribution according to the request type

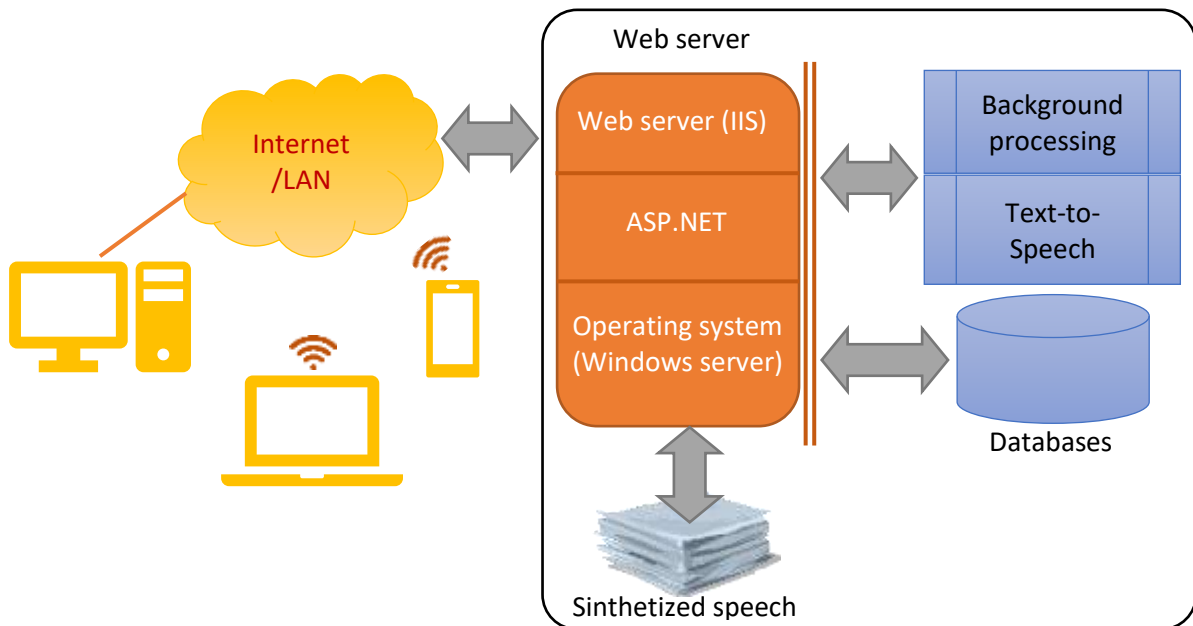


Figure 6. CABUNS architecture and data flow diagram

Only academic teaching stuff that is registered to CABUNS can upload teaching material in the form of Word documents and PowerPoint presentations. Processing of the word document include following phases:

- parsing a document to extract pages and text;
- generating a pdf file to provide visual access on various devices (personal computers, tablets, smartphones);
- synthesizing speech from the extracted text;
- verification of the crated material by owner of the original documents.

Processing of PowerPoint presentations is very similar to previous one, but with two important distinctions:

- text is extracted from the slide notes;
- for each slide, output HTML combines visual presentation (in the form of the picture) and corresponding synthesized speech.

Quality of synthesized speech is high and it is obtained by AlfaNum synthesizer based on principles of parametric speech synthesis using neural networks. The synthesis is limited to Serbian, Croatian, Bosnian and English. It support changing speaking style and speaker voice. More details about CABUNS and TTS system reader are given in the references.

In the near future, CABUNS will be available to the all participants at BENEFIT project in the Western Balkan countries. From technical point of view, it is ready at this moment, but some administrative issues should be solved. Appropriate teaching material could be uploaded on CABUNS web-portal, and only the link on it could be posted on BENEFIT e-platform. From the user perspective there would not cause any significant changes. The proposed concep is proofed by prof. Aljo Mujčić.



## 4. Conclusions

Although the deliverable D3.4 “Web repository for class and lab sessions material, recorded remote classes, and network of audio libraries” is not a report, but it is actually a service, a short report is given here. The connections of D3.4 with other deliverables and WPs are shown, including the relationship to WP3 tasks. After a brief description of objectives, a few more details are given about the Web Repository; it is described as a Web Service. Finally, it is explained how Central Audio Library of the University of Novi Sad become available to BENEFIT partners.

## 5. References

- Vlado Delić, Dejan Vukobratović, Milan Sečujski, Milan Narandžić, Živko Bojović, Tatjana Lončar-Turukalo, Dragana Bajović, Nikša Jakovljević, Vojin Šenk (2019) „Unapređenje profila inženjera telekomunikacija u skladu s potrebama savremenog društva i industrije“, XXV skup trendovi razvoja “Kvalitet visokog obrazovanja” - TREND 2019, Kopaonik, Srbija, 11-14.02.2019., ISBN: 978-86-6022-157-7, pp. 147-150
- Vlado Delić, Dragiša Mišković, Siniša Suzić, Tijana Delić, Branislav Popović, Nikša Jakovljević, Milan Sečujski (2019) „Centralna audio-biblioteka Univerziteta u Novom Sadu“, XXV skup trendovi razvoja “Kvalitet visokog obrazovanja” - TREND 2019, Kopaonik, Srbija, 11-14.02.2019., ISBN: 978-86-6022-157-7, pp. 36-39
- Vlado Delić, Dragiša Mišković, Branislav Popović, Milan Sečujski, Siniša Suzić, Tijana Delić, Nikša Jakovljević (2019) “Central Audio-Library of the University of Novi Sad”, Intelligent Human-Machine Interfaces, 13th International Symposium on Intelligent Distributed Computing, 7-9.10.2019, Saint-Petersburg, Russia, I. Kotenko et al. (Eds.): IDC 2019, SCI 868, Springer, pp. 467-476, DOI: 10.1007/978-3-030-32258-8\_55
- Tijana Delić, Siniša Suzić, Milan Sečujski, Darko Pekar (2018) "Rapid development of new TTS voices by neural network adaptation." In: 17th Int. Symposium INFOTEH-JAHORINA, 1–6. Jahorina, Bosnia and Herzegovina
- Tijana Delić, Milan Sečujski, Siniša Suzić (2017) "A review of Serbian parametric speech synthesis based on deep neural networks." Telfor Journal, 9(1), 32–37, DOI: 10.5937/telfor1701032