Conceptual design of the ICT solution for BAEKTEL OER framework

DEV 3.1

BAEKTEL

Blending academic and entrepreneurial knowledge in technology enhanced learning

Blending Academic and Entrepreneurial Knowledge in Technology enhanced learning – BAEKTEL

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Contents

1 Introduction

This document describes the BAEKTEL network and resource topology and the accompanying platforms, which resulted from procedures and guidelines for creating OER content developed within Dev 2.1 and the conceptual design of the ICT solution developed within Dev 2.3.

Within the BAEKTEL network all WB partner institution involved in producing OER content are expected to implement the procedures and guidelines by creating a network node, where the necessary hardware and software equipment to support the acquiring, assembling and publishing of OER content will be installed.

U ovom dokumentu opisani su topologija BAEKTEL mreže i resursa, kao i prateće platforme, koji su rezultat procedura i smernica za kreiranje OER sadržaja razvijenih u okviru Dev 2.1 kao i konceptualnog dizajna IKT rešenja razvijenog u okviru Dev 2.3.

U okviru BAEKTEL projekta očekuje se da sve partnerske institucije sa Zapadnog Balkana koje su uključene u stvaranje otvorenih obrazovnih resursa kreiraju mrežne čvorove na kojima će biti instaliran neophodan softver i hardverska oprema za podršku prikupljanju, postavljanju i publikovanju otvorenih obrazovnih resursa.

2 Procedures and guidelines in practice

WB network nodes should support the main objective of the project, that is, the creation of educational content in different subject areas from both academia and enterprises. It is expected that the OER materials will be created and published in various forms. The form will depend on the OER creator's decision which material to choose, how to use it and in case it pertains to a course, how to adapt it to the context of the course, and integrate it into learning activities [1].

The software and hardware within BAEKTEL nodes should thus support different forms of educational content, combining textual and multimedia materials, such as textbooks, reading materials, presentations, videos, audio recordings, animation and photography. As one of the aims is to make the users active stakeholders in the learning process, special attention has to be given to providing interactivity of OER materials.

An important place in the guidelines for creating open educational content is given to educational video content due to its high

Svaki mrežni čvor treba da podrži glavni cilj projekta koji podrazumeva kreiranje obrazovnog sadržaja iz različitih predmetnih oblasti od strane akademskih ustanova i privrede. Očekivano je da nastavni materijali budu kreirani i publikovani u različitoj formi. Forma obrazovnog materijala zavisiće od odluke kreatora otvorenog obrazovnog resursa koji će materijal odabrati, načina njegovog korišćenja, i u slučaju da se radi o kursu, prilagođavanja ciljevima kontekstu kursa i integraciji u nastavne aktivnosti. [1]

Softver i hardver u okviru BAEKTEL mrežnih čvorova treba da omoguće kreiranje i publikovanje različitih formi obrazovnih sadržaja koje će kombinovati tekstualne i multimedijalne sadržaje, poput udžbenika, skripti, video snimaka, audio zapisa, animacija i fotografija. Kako je jedan od ciljeva da korisnici postanu aktivni subjekti u procesu učenja posebna pažnja posvećena je obezbeđivanju interaktivnosti otvorenih obrazovnih resursa.

Značajno mesto u smernicama za kreiranje obrazovnih sadržaja zauzima obrazovni video kako zbog velike stope usvajanja

transfer rate and data retention rate. Hence the node hardware and software should support all forms of videos.

gradiva tako i zbog velike stope zadržavanja naučenog. Dakle u tom cilju svaki mrežni čvor treba da sadrži odgovarajući softver i hardver koji će omogućiti kreiranje različitih formi videa.

The key disadvantage of video content that needs to be tackled is the general inability to search its content, which is especially important when the user wants to find an answer to a specific question. The software and hardware within BAEKTEL nodes should thus offer functionalities that lessen these disadvantages to some extent. A good example is offered by YouTube, where by simply keeping the mouse at a certain point on the time axis a minimized, frozen view of the video content at a certain point in time is displayed. Another useful feature is the possibility of placing text links to specific points on the video timeline, thus enabling some form of search. Finally, it should also be possible to set markers with textual description to the video timeline, so that users can easily find the part of the video that they are interested in, which is of particular importance when it comes to long videos.

There are also other specific types of content that might be of interest, such as interactive learning programs, virtual labs, simulators and the like, and their support by the BAEKTEL nodes should be considered.

Veliki nedostatak video sadržaja kojim se treba pozabaviti je generalna nemogućnost pretraživanja samog sadržaja videa, što je posebno bitno kada korisnik želi da pronađe odgovor na specifično pitanje. Softver i hardver u okviru BAEKTEL čvorova treba da ponude funkcionalnosti koje će u izvesnoj meri smanjiti navedeni nedostatak. Dobar primer je YouTube kanal, gde se jednostavnim zadržavanjem miša u određenoj tački na vremenskoj osi prikazuje umanjen, zaleđeni prikaz video sadržaja u tom trenutku. Druga korisna opcija je mogućnost postavljanja tekstualnih linkova na određenu tačku na vremenskoj osi videa, čime se omogućava i njegovo mašinsko pretraživanje. Dobra praksa je postaviti markere sa tekstualnim opisom na vremenskoj osi videa, koji omogućavaju korisniku da lako nađe deo videa koji ga zanima, što je od posebnog značaja kada je u pitanju duži video zapis.
Postoje naravno i druge vrste sadržaja koje mogu biti od značaja, poput interaktivnih programa za učenje, virtualnih laboratorija, simulatora i sl., što svakako mora biti uzeto u obzir prilikom pružanja funkcionalnosti na BAEKTEL čvorovima.

2.1 Implications of basic didactical criteria

One of the basic didactic criteria in creating educational materials is adjusting the content to the target group. Due to the specific nature of BAEKTEL, concerned with open education resources relating both to higher educational institutions and partners from the industry, the needs of the end users are hard to define. Since neither the level of education of the end users, nor their age or their motivation for using these means of education is easily predicable, it is important to enable the creation of courses in a way that would allow the users to inform themselves in advance on the aim, knowledge and skills that can be obtained by a given course. To that end, it is necessary to provide a description of the course and of the necessary prerequisites and competences which the user must possess in order to follow the content of the course, which is the main aim of the metadata platform.

The software and hardware within BAEKTEL nodes should provide for combining different forms of teaching content, such as plain and dynamic text, power point presentations, video clips and animations, etc., in order to adjust the educational content to various needs and learning styles of the end users. Integrating various audio-visual components is especially important as it should help users increase the quality of learning outcomes and better understand the content presented.

Another didactic principle pertains to systematization and gradualism in the teaching process. This principle can be partly accomplished by structuring and organizing courses [2]. BAEKTEL nodes should thus provide for creating modular courses through which the user can gradually advance until the end of the course. It is necessary to provide that all segments which form the structure of the course can be combined into a coherent whole.

A further important didactic principle is connecting the theory and the practice, which

Jedan od osnovnih didaktičkih kriterijuma prilikom kreiranja obrazovnih materijala je prilagođenost sadržaja ciljnoj grupi. S obzirom da se u projektu BAEKTEL radi o otvorenim obrazovnim sadržajima koji će imati određenu vezu sa institucijama visokog obrazovanja kao i sa partnerima iz privrede, teško je definisati potrebe krajnjih korisnika. Kako nije lako unapred predvideti nivo obrazovanja krajnjih korisnika, starosno doba, kao i motivaciju za korišćenje ovog vida obrazovanja, potrebno je kurseve kreirati na takav način da korisnicima mogu unapred da se informišu o cilju kursa kao i skup znanja i kompetencija koje je moguće steći na datom kursu. U tom cilju, neophodno je dati opis kursa kao i opis neophodnih predznanja i kompetencija koje korisnik mora posedovati kako bi mogao da prati sadržaj kursa, što je glavni cilj platforme metapodataka.

Softver i hardver u okviru BAEKTEL čvorova treba da mogući kombinovanje različitih vidova nastavnog sadržaja poput klasičnog i dinamičkog teksta, ppt prezentacija, video snimaka i animacija, itd., kako bi se obrazovni sadržaj prilagodio raznolikim potrebama i stilovima učenja krajnjih korisnika. Kombinovanje različitih audio-vizuelnih komponenti je od posebnog značaja, pošto treba da utiče na podizanje kvaliteta ishoda učenja i dublje razumevanje prezentovanih sadržaja.

Drugi važan didaktički princip je princip sistematičnosti i postupnosti u nastavi. Ovaj princip se jednim delom može ostvariti kroz struktuiranje i organizaciju kursa.[2] BAEKTEL čvorovi treba da omoguće kreiranje modularnih kurseva kroz koje će korisnik postepeno napredovati do samog kraja kursa. Neophodno je omogućiti kombinovanje svih delova kursa tako da oni čine jednu koherentnu celinu.

Još jedan od važnih didaktičkih principa je povezivanje teorije i prakse što je jedan od

is the main aim of BAEKTEL. Hence its nodes should enable both the presentation of theoretical knowledge by higher education institutions, followed by illustrations of practical applications, and best practice examples by partner companies. The university node software and hardware should be designed in such a manner that companies can also publish their OER content within these nodes.

Finally, the OER published within the BAEKTEL network should adhere to the didactic principle of awareness within the teaching process. This principle implies an active role of participants in the learning process, who should be able to adjust the learning process to their own needs. Thus the node software and hardware should allow interaction between users and course creators, as well as between users and the learning platform itself.

glavnih ciljeva projekta BAEKTEL. Dakle potrebno je da čvorovi omoguće kako prezentovanje teorijskih znanja od strane akademskih institucija praćenih ilustracijama i praktičnim primenama, tako i prezentovanje primera dobre prakse od strane partnerskih kompanija. Softver i hardver na univerzitetskim čvorovima treba da bude takav da omogući objavljivanje otvorenih obrazovnih sadržaja i kompanijama u okviru ovih čvorova.

Konačno, otvorene obrazovne resurse kreirane u okviru BAEKTEL mreže potrebno je uskladiti i sa didaktičkim principom svesne aktivnosti učenika u nastavi. Sam princip podrazumeva ulogu korisnika u procesu učenja kao aktivnog subjekta, sposobnog da prilagodi proces učenja svojim potrebama. Stoga hardver i softver svakog čvora treba da omogući interakciju između korisnika i kreatora kursa kao i između korisnika i same platforme.

2.2 Recommendations for MOOC creation

Given that MOOCs are expected to present a large part of OER content within the BAEKTEL network, special attention is given to securing all prerequisites needed for quality MOOC creation.

To that end it is necessary to support different MOOC content types: electronic books, animation, interactive applets, audio-visual content, tests, quizzes and the like. It is also essential to provide for communication between teachers and users, as well as user forums and discussion groups, enable easy navigation and movement through MOOC, and keep courses fresh and constantly improved.

Imajući u vidu da se očekuje da će MOOC-ovi predstavljati najveći deo otvorenih obrazovnih sadržaja u okviru BAEKTEL projekta, posebna pažnja posvećena je obezbeđivanju preduslova koji će omogućiti kreiranje kvalitetnih MOOC sadržaja.

U tom cilju neophodno je omogućiti kreiranje različitih tipova MOOC sadržaja: elektronske knjige, animacije, apleti, audio-vizuelni sadržaji, testovi, kvizovi i dr. Takođe je bitno omogućiti komunikaciju između predavača i korisnika, kao i korisničke forume i diskusione grupe, zatim jednostavnu navigaciju i kretanje kroz MOOC kao i mogućnost adaptiranja kurseva i kontinuiranog unapređivanja.

As the modular approach to MOOC development is adopted, akin to that of the Khan Academy, it is important to support combining of individual tutorials in complete lessons, lessons into sections, sections into chapters. The combination of more chapters

Kako je prihvaćen modularan pristup MOOC-ovima, po uzoru na Kan Akademiju, važno je da se omogući kombinovanje individualnih tutorijala u lekcije, lekcija u odeljke, a odeljaka u poglavlja. Kombinovanje više poglavlja tada može da

can then provide the material for one comprehensive MOOC.

obezbedi materijal za jedan sveobuhvatni MOOC.

At the same time, access to individual content within MOOCs should be enabled in such a way that users with prior knowledge can find specific fragment of the content without necessarily registering for the MOOC and reviewing all of its materials.

Istovremeno, treba obezbediti pristup pojedinačnim sadržajima MOOC-a tako da korisnici sa određenim predznanjem imaju mogućnost da pronađu specifične delove sadržaja, a da ne moraju da se registruju za *online* kurs i pregledaju njegove kompletne materijale.

2.3 Guidelines for production of video tutorials

Bearing in mind the advantages and possibilities of video material and its positive impact on the users, special attention is given to guidelines for creating videos.

Imajući u vidu prednosti i mogućnosti video materijala kao i njihov pozitivan uticaj na korisnike, posebna pažnja posvećena je smernicama za kreiranje videa.

It is advisable to take advantage of audio-visual potential of videos that can be used to properly present a specific topic. Since video is a specific form of presenting educational content, it is recommended to keep focus on one topic rather than covering several topics by one video. [3]

Poželjno je iskoristiti prednosti audio-vizuelnih mogućnosti videa koji se mogu koristiti za što adekvatnije predstavljanje određene teme. Kako video predstavlja specifičnu formu prezentovanja obrazovnih sadržaja preporuka je da se prilikom predstavljanja nekog sadržaja fokus zadrži samo na jednoj temi umesto obuhvatanja više tema kroz jedan video.[3]

In addition to voice-over and texts, which represent the most common content of educational videos, the hardware and software of BAEKTEL nodes should also offer comprehensive and ample support to the use images, tables and graphs. Video presentation should be followed with key words (sentences) put up on a visual display to allow users to follow the content easily. For a video to be coherent, it is necessary for audio and video content to be aligned. Finally, attention must be paid that all the materials used are properly licensed.

Poželjno je da osim glasa i teksta, koji su najčešći sadržaj obrazovnih videa, hardver i softver BAEKTEL čvorova pruži široku i sveobuhvatnu podršku korišćenju slika, tabela i grafikona. Predlaže se da video prezentacija bude praćena ključnim rečima (rečenicama) na vizuelnom displeju kako bi korisnik lakše pratio sadržaj. Kako bi sam video bio koherentan neophodno je da audio i video sadržaj budu usklađeni. Konačno, mora se obratiti pažnja da svi materijali koji se upotrebljavaju budu adekvatno licencirani.

2.4 Technical characteristics of the videos

When it comes to educational videos intended for adults, the recommended duration of a single video is between 12 and 15 minutes. However, one should not strictly adhere to the recommended time; exceptions

Kada je reč o obrazovnom videu namenjenom za odrasle, preporučuje se trajanje videa od 12-15 min. Svakako, ne treba se striktno držati preporučenog vremena, mogući su izuzeci zavisno od

are possible depending on the topics presented. If the topic requires a long video, it is desirable to support the division of its content into smaller segments.
A difference between educational videos and other educational materials is audio track. It is not desirable that the voice sounds too formal, or sterile like the voice on GPS devices. It is desirable that the video resembles a conversation. Another effective approach is the presentation of content through conversation between two lecturers. During the presentation lecturers should speak at the pace that is comfortable for them, and the users should be able to speed up or slow down the video. Audio software should support the above mentioned functionalities

It is very important that the audio track is clear, so it is not recommended to use integrated microphones or computer cameras. External variants of these devices are preferred. The video should be recorded in HD (min. 1280x720px, 1920x1280px recommended). If this is not possible for technical reasons, then it should at least be in the 16: 9 format.
When it comes to recording more stakeholders, it is desirable to use two or more cameras so that they can be combined to display a wider and large frame.[4]
Video is a suitable presentation mode since individual segments can be easily deleted or changed at a later stage. The node hardware and software should provide for editing of videos after recording. There is a wide range of programs that enable video editing [5]. During video editing, it is desirable to delete all the background noise or any sayings lecturers.

prezentovane teme. Ukoliko je tema šira i zahteva prikaz videa čije je trajanje duže, poželjno je sadržaj podeliti u više manjih segmenata.
Jedna od razlika koja izdvaja obrazovni video od drugih obrazovnih sadržaja je audio zapis. Nije poželjno da glas zvuči previše formalno, ili sterilno poput glasa na različitim GPS uređajima. Video treba da bude nalik razgovoru. Još jedan od efikasnih pristupa je prezentovanje sadržaja kroz razgovor dva predavača.
Tokom prezentacije predavači treba da govore tempom koji njima odgovara, a korisnicima treba da bude omogućeno da sami ubrzavaju ili usporavaju video. Audio softver treba da omogući gore navedene funkcionalnosti.

Vrlo je važno da audio zapis bude jasan, pa se ne preporučuje upotreba integrisanih mikrofona i kamera na računarima. Poželjno je koristiti eksterne varijante ovih uređaja. Predlog je da se video snima u HD rezoluciji (min. 1280x720px, preporučeno 1920x1280px). Ukoliko to iz tehničkih razloga nije moguće, onda bar treba težiti da dimenzije videa budu u odnosu 16:9.
Kada je reč o snimku više aktera, poželjno je koristiti dve ili više kamera kako bi se mogli kombinovati i prikazati širi i krupniji kadar.[4]
Video je pogodan jer se pojedini segmenti u kasnijoj fazi mogu jednostavno brisati ili menjati. Potrebno je da svaki od čvorova sadrži odgovarajući hardver i softver koji će omogućiti dodatno uređivanje videa nakon snimanja. Postoji širok spektar različitih programa koji omogućavaju uređivanje videa. [5] Tokom uređivanja videa, poželjno je izbrisati sve pozadinske šumove ili eventualne uzrečice predavača.

3 BAEKTEL topology

3.1 Network topology

The BAKTEL network topology, that is, the conceptual map that covers the graphical representation and informational model of all the entities required to build BAEKTEL OER software solution is depicted in Figure 1.
University of Belgrade (UB) hosts a central repository, which should include:

- BAEKTEL Metadata Portal (BMP) with metadata for all published OER within BAEKTEL network.
- Terminological web application for management, browse and search of terminological resources.
- Web services for linguistic support (query expansion, information retrieval, OER indexing, etc)
- Annotation of selected resources (not all)
- OER repository on local edX platform.

Topologija BAEKTEL mreže, odnosno konceptualna mapa koja obuhvata grafički prikaz i informatički model svih segmenata potrebnih za izgradnju BAEKTEL OER softverskog rešenja prikazana je na Slici 1.
Univerzitet u Beogradu hostuje centralni repozitorijum koji čine:

- BAEKTEL portal sa meta podacima o OER sadržajima publikovanim u okviru projekta.
- Terminološka veb aplikacija za rukovanje, prelistavanje i pretragu terminoloških resursa
- Veb servisi za lingvističku podršku (proširenje upita, pretragu informacija, indeksiranje OER, itd.).
- Anotacija izabranih resursa (ne svih)
- OER repozitorijum na lokalnoj edX platformi.

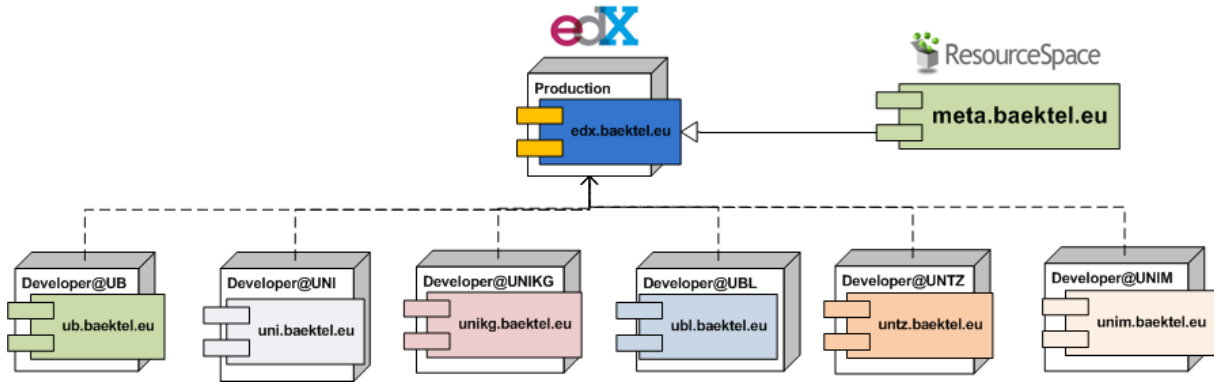

Figure 1 Conceptual map of BAEKTEL network **Slika 1 Konceptualna mapa BAEKTEL mreže**

3.2 Resource topology

Production EDX portal is currently on the virtual server and uses the resources of the University of Belgrade. Resources assigned to the virtual server are:

- Intel Xeon E5-2630v2

Produkcioni edX portal trenutno se nalazi na virtuelnom serveru i koristi resurse Univerziteta u Beogradu. Resursi koji su dodeljeni virtuelnom serveru su:

- Procesor Intel Xeon E5-2630v2

- 16GB of RAM at a frequency of 1866MHz
- 127GB of physical storage space

The number of users, as well as courses on production edX is on the rise, so the use of server resources increases. Current resources can meet the needs of the platform. After completion of the tender procurement of equipment conducted by UB, the platform will be migrated to the new equipment. The equipment installed at UB will be able to handle a large number of users, and server capacity will increase, which will allow room for new courses. The resources that will be available upon completion of the tender are:

- 2 Intel Xeon processors E5-2630v2
- 64GB of RAM at a frequency of 1866MHz
- 4TB of physical storage space

edX platform is installed on the Linux operating system Ubuntu 14.04 LTS. The n umber of courses on the platform is eight of which UB has created five, and AMP, UBL and UNIKG one each. The number of users is increasing daily.

- 16GB RAM memorije na frekvenciji 1866MHz
- 127GB fizičkog prostora za skladištenje podataka

Broj korisnika, kao i kurseva na produkcionom edX je u porastu, tako da se korišćenje resursa servera povećava. Trenutni resursi mogu da zadovolje potrebe platforme. Nakon završetka tendera javne nabavke opreme koji sprovodi UB, platforma će biti migrirana na novu opremu. Oprema koja će biti instalirana na UB biće u mogućnosti da opsluži veliki broj korisnika, a kapacitet servera će se povećati što će omogućiti prostor za nove kurseve. Resursi koji će biti dostupni nakon sprovedenog tendera su:

- 2 Procesora Intel Xeon E5-2630v2
- 64GB RAM memorije na frekvenciji 1866MHz
- 4TB fizičkog prostora za skladištenje podataka

edX platforma je instalirana na operativnom sistemu Linux Ubuntu 14.04 LTS. Broj kurseva na platformi je 8 od kojih je UB kreirao pet, AMP, UBL i UNIKG po jedan. Broj korisnika se svakodnevno povećava.

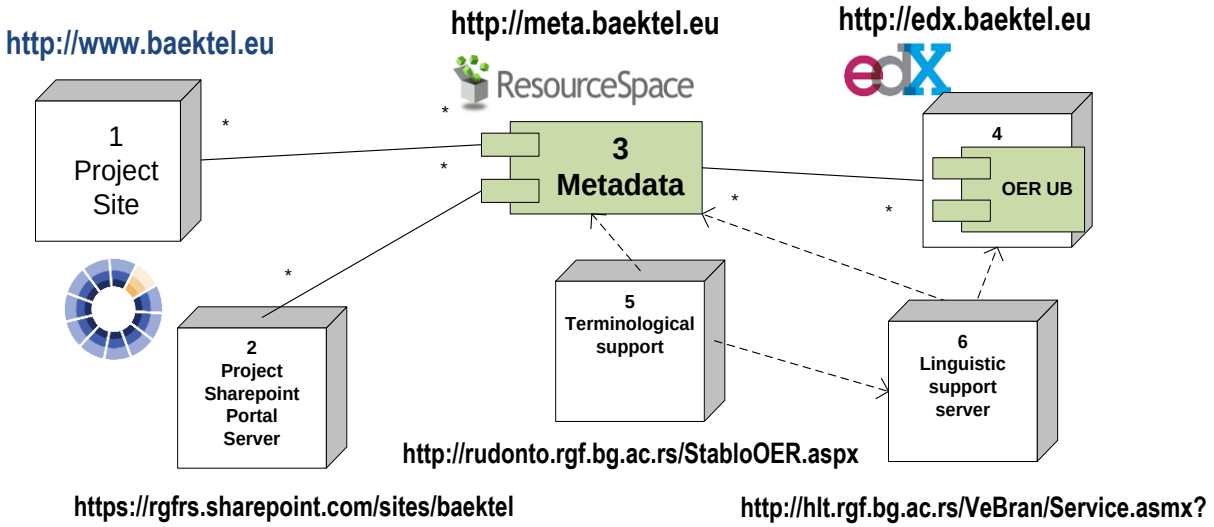

Figure 2 Slika 2 Logička topologija BAEKTEL resursa

Google analytics tools will be used to monitor activity in courses, as well as insight into the use of individual network nodes and particular web tools. It will also be analyzed how users reached one of the nodes and how to provide the return to a previously visited location.

Alati Google analitike će se koristiti za praćenje aktivnosti na kursevima, kao i za uvid u način korišćenja čvorova mreže i pojedinih veb alata. Takođe će se analizirati kako su korisnici došli do nekog od čvorova i kako se može obezbediti ponovno vraćanje na prethodno posećenu lokaciju.

4 BAEKTEL platforms

4.1 LMS platform

The selected platform for OER is edX. Each institution has an installed edX, which is hosted locally and used to develop courses [6]. Development edX platforms are visible to institutions that will develop courses and are located at:

- UB – ub.baektel.eu (147.91.183.10)
- UNI – uni.baektel.eu (160.99.1.203)
- UNIKG – unikg.baektel.eu (91.187.132.34)
- UNIM – unim.baektel.eu (195.66.171.38)
- UNTZ – untz.baektel.eu (80.65.66.239)

Production edX is physically located in UB and all the institutions will move courses that are ready to the production platform, which is located at edx.baektel.eu.

Odabrana platforma za OER je edX. Svaka od institucija ima instaliran jedan edX, koji hostuju lokalno i služi za razvijanje kurseva [6]. Razvojne edX platforme su vidljive smo institucijama koje razvijaju kurseve i nalaze se na adresama:

- UB – ub.baektel.eu (147.91.183.10)
- UNI – uni.baektel.eu (160.99.1.203)
- UNIKG – unikg.baektel.eu (91.187.132.34)
- UNIM – unim.baektel.eu (195.66.171.38)
- UNTZ – untz.baektel.eu (80.65.66.239)

Produkcioni edX je fizički smešten na UB i sve institucije će kurseve koji su spremni za produkciju prebacivati na platformu koja se nalazi na adresi edx.baektel.eu.

4.2 Metadata platform

http://meta.baektel.eu/

BAEKTEL metadata portal is a Web application for managing, browsing and searching metadata, but also uses web services for terminology and linguistic support. Bearing in mind that OER content in the network can be published in various languages, web applications and related web services support multilingualism in BAEKTEL network. It provides a structured approach to information about open educational resources. Portal is the central repository with meta data for all published OER within BAEKTEL network. To creators

BAEKTEL metadata portal je veb aplikacija za rukovanje, prelistavanje i pretragu meta podataka, ali koristi i veb servise za terminološku i lingvističku podršku. Imajući u vidu da OER sadržaji u mreži mogu biti publikovani na različitim jezicima, veb aplikacija i prateći veb servisi podržavaju višejezičnost u BAEKTEL mreži. Obezbeđuje struktuirani pristup informacijama o otvorenim obrazovnim resursima. Portal predstavlja centralni repozitorijum sa meta podacima za sve publikovane OER u okviru BAEKTEL mreže. Kreatorima OER-a portal obezbeđuje

of OER the portal provides input of metadata, and to students effective searching of metadata and direct access to educational resources, such as courses, training materials, guidelines, case studies, examples of good practice, etc. The portal is designed using an Open Source solution - ResourceSpace.
The meta portal is installed on Windows Server 2012 R2. In addition to ResourceSpace the following services are installed:

- Php 5.2.0
- MySql database
- phpMyAdmin 4.0.10
- Web server Microsoft –IIS/8.5
- exiftool 9.6
- ImageMagick 6.8.9

Currently at the portal there are 35 user accounts and 8 described educational resources.
The structure of the metadata is described in Dev 2.3 [7]

unos meta podataka, a učenicima efikasnu pretragu meta podataka i direktan pristup obrazovnim resursima, kao što su kursevi, materijali za obuku, uputstva, studije slučaja, primeri dobre prakse, itd. Portal je projektovan pomoću OpenSource rešenja – ResourceSpace.
Meta portal je instaliran na operativnom sistemu Windows Server 2012 R2. Pored ResourceSpace-a su instalirani sledeći servisi:

- Php 5.2.0
- MySql baza podataka
- phpMyAdmin 4.0.10
- Web server Microsoft –IIS/8.5
- exiftool 9.6
- ImageMagick 6.8.9

Trenutno na portalu postoji 35 korisničkih naloga i 8 opisanih obrazovnih resursa.
Struktura meta podataka je opisana u Dev 2.3 [7]

4.3 Language support platform

Lexical resources in the form of terminological dictionaries, wordnet, electronic dictionaries will be used for different purposes: from controlling the entry and classification of metadata on educational resources to tagging of the resources [8]. Lexical resources will also be the basis for advanced indexing of courses and other open educational content for better search results.
Monolingual and multilingual resources will be used. Multilingual resources will be in the form of parallel aligned texts where appropriate sentence or paragraphs in two languages are paired. [9]
Monolingual resources will be used for terminology extraction, definitions and analysis of texts on e-learning and open resources.
Support to the use of lexical and linguistic resources will be provided by web services

Leksički resursi u vidu terminoloških rečnika, wordneta, elektronskih rečnika će se koristiti za različite namene: od kontrolisanja unosa i klasifikacije metapodataka o obrazovnim resursima do tagiranja resursa [8]. Na leksičkim resursima će se takođe bazirati i napredno indeksiranje kurseva i drugih otvorenih obrazovnih sadržaja radi bolje pretrage.
Koristiće se jednojezični i višejezični resursi. Višejezični resursi će biti u obliku paralelizovanih poravnatih tekstova gde su odgovarajuće rečenice ili pasusi u dva jezika upareni. [9]
Jednojezični resursi će se koristiti za izdvajanje terminologije, definicija i analizu tekstova o e-obrazovanju i otvorenim resursima.
Podršku korišćenju leksičkih i jezičkih resursa će pružati veb servisi koje je Društvo

developed by the Society (Group) for language technologies, which are available at: http://hlt.rgf.bg.ac.rs/VeBran/Service.asmx?

To named entity recognition, annotation and statistical analysis of occurrence of named entities a web application may be used available at http://hlt.rgf.bg.ac.rs/VeBranka/NERanka.aspx, and a web service is available for B2B communication.
For the presentation of the document by the so-called bag of words for the purposes of text classification and information retrieval the software available at: http://hlt.rgf.bg.ac.rs/VeBranka/BagOfWords.aspx can be used. With the app a web service is also available for the B2B scenario.
A detailed description of the lexical and linguistic resources and tools will be outlined within Dev 3.3.

(Grupa) za jezičke tehnologije razvila, a koji su dostupni na: http://hlt.rgf.bg.ac.rs/VeBran/Service.asmx?
Za prepoznavanje imenovanih entiteta, anotaciju i statističku analizu pojavljivanja imenovanih entiteta se može koristiti veb aplikacija dostupna na http://hlt.rgf.bg.ac.rs/VeBranka/NERanka.aspx, a za B2B komunikaciju je na raspolaganju veb servis.
Za predstavljanje dokumenta takozvanom vrećom reči za potrebe klasifikacije tekstova i pronalaženja informacija se koristi softver dostupan na adresi: http://hlt.rgf.bg.ac.rs/VeBranka/BagOfWords.aspx. Uz aplikaciju je dostupan i veb servis za B2B scenario.
Detaljan opis leksičkih i jezičkih resursa i alata će biti izložen u Dev 3.3.

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