Developing and Learning with Distributed Internet-based Performance Support Environment for Individualized Learning – DIPSEIL

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Abstract:

This demonstration presents DIPSEIL Environment – its methodology, functionality, workflow model and its interface in an example. We start with the description of developed Learning Objects for Internet-based Performance Support Systems with Educational Elements – IPSS_EE_LOs. Then we present how IPSS_EE_LOs can be created and used in DIPSEIL for the development of "Telecommunication Systems" course.

1 Learning Objects for Internet-based Performance Support Systems with Educational Elements – IPSS_EE_LOs

Internet-based Performance Support System with Educational Elements - IPSS_EE, as a typical performance support system, is an integrated electronic environment, which is available via Internet and is structured to provide individualized online access to the full range of information, guidance, advice, data, images, tools and software to permit the user to perform a task with a minimum of support and intervention by others.

IPSS_EE differs from common IPSS in two characteristics:
- IPSS_EE Tasks for performance aim preliminary speified learning outcomes;
- they differ in target groups - the IPSS learners (IPSS are training systems oriented to professionals) already know something about how the field works and how some of the tools might be used.

In the "traditional" educational systems usually the expository deductive instructional strategy is used: content presentation, examples, sometimes exercises and, rarely task for performance. In these systems the conception of Learning Objects (LO)* is common traditional – LO model "presentation, practice, feedback" is a tool in helping deliver information to students. That is, the learning object presents the information, provides the student with an infinite amount of

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* One of the most popular **definitions of Learning Object** is outlined by Dr. David Wiley, "any entity, digital or non-digital, which can be used, re-used or referenced during technology supported learning are learning objects." (LTSC of IMS: Wiley, Connecting LO's p4)

practice (exercises), and provides a test that allows the computer to provide feedback. Learning objects built on this information delivery model failed to provide solutions for IPSS_EE environment:

- students learn small amounts of discrete information at one time and slowly build a network of these information chunks. For instance, the Task teaches a single process or idea. Once that content is mastered, the student moves on to the next process or idea. Each task (object) is discrete and separate from the next. In the end, however, the student ties these discrete pieces together in order to understand larger ideas;
- IPSS_EE is a performance-based action learning environment. This environment involves the use and application of skills for finding solutions, making decisions, and thinking effectively, i.e. problem-solving skills;
- IPSS_EE environment calls for students to develop skills rather than build content bases - students have critical thinking and problem solving skills, communication skills, and know how to be a professional in their field rather than simply know about the field itself. In this light, IPSS_EE is an inquiry-based, *constructivist learning environment*. IPSS_EE lets students construct understandings of the field through doing and in this process they learn content knowledge in the service of accomplishing their task;
- IPSS_EE consists learning experiences and resources. It is learner-centered and open learning environment (OLE) - complex problems link concepts and content to real situations, where the “need to know” is naturally generated.

IPSS_EE Learning Objects fits Wiley’s definition, “any digital resource that can be reused to support learning”. IPSS_EE_LOs are certainly designed to support learning. More specifically, they support learning in an perfrormance-centered environment by providing necessary materials in an easy-to-access format. IPSS_EE_LOs are reusable. Most immediately, they will be reused project after project for the duration of each MBA cohort. Designers use subsets of the objects in other IPSS_EE, the students use the learning object library to create own courses. IPSS_EE_LOs are digital. In fact, because of the distributed nature of the program and our desire for easy maintenance, our learning objects are exclusively Web-based.

1.1 IPSS_EE_LOs elements

IPSS_EE_LO provides a combination of the following capabilities: reference information about a task or closely related set of tasks; task-specific training; expert advice about a task; automated tools for task performance.
Reference information describes the task that the user has to perform. This reference information supports the user by making immediately available information, which (s)he previously had to memorize or look for in a book or a manual. The reference section allows the user to learn more deeply about a given task and is always available for her/him to read and *provides the theory behind the task it supports*.
Task-specific training reduces preliminary training by helping the user to learn while performing the task. This type of *training is learner-centred* because the learner asks for help when he needs it to perform a task, and the help gives him the specific information that (s)he requests.
Educational performance support systems contain specific advice on performing tasks and it is its greatest advantage. The advice is usually provided by an *expert system*.
Automated tools for task performance are most helpful when a supported task involves the use of *specific software*.
The self-test provides an opportunity for the students to measure their own understanding of the content of the learning object. The students may revisit the test/reflective activity as many

times as they want. The test doesn't involve any interaction with the facilitators. The tests use computer-scored multiple choice items.

1.2 IPSS_EE_LOs characteristics

IPSS_EE_LOs have specific characteristics:

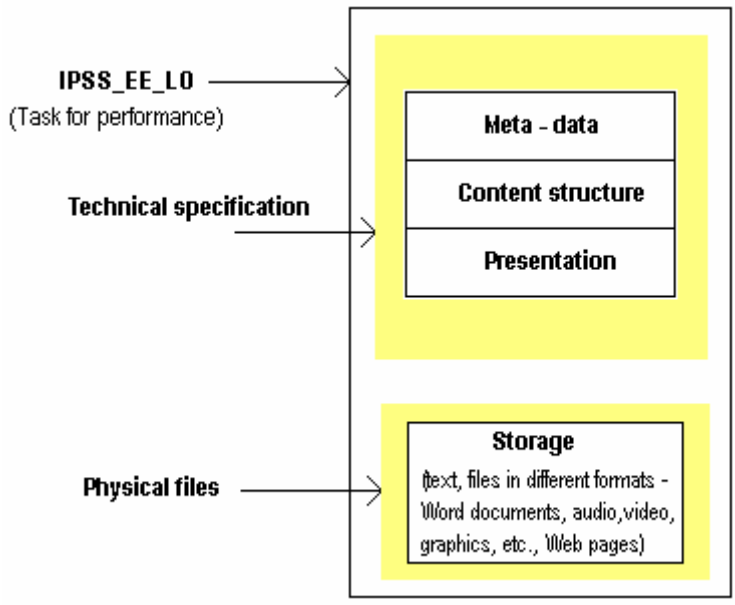
- The Web-based IPSS_EE_LOs library is provided to the students' to support their work – performaning the tasks, that remain at the center of all learning. This library focuses on the foundational information and directs students to seek out and use other Internet-based resources for the more dynamic information. IPSS_EE_LOs could be used on an as-needed basis, although the students come to rely on the learning objects library as a primary source of information;
- Each of IPSS_EE_LOs is the sum of a number of smaller pieces. IPSS_EE_LO includes task-specific training, reference materials, instructions how to perform, expert advices and a self-test, each of these elements may include text, video, audio, graphics etc. There are no purposely accessible smaller components, although we acknowledge that students might use the "Save as…" option to save these smaller pieces, and the objects are not generated by dynamically combining a number of smaller elements based on metadata tags. This is quite different from the view of objects as being able to be instantly generated from small components. The IPSS_EE approach is to address the issues of reusability and repurposability by thinking of the learning objects in our specific context and as elements of a performance support system. We recognize that we are limiting the reusability of the primary building blocks of the learning objects by linking them so tightly to each other. However, we are providing more integrated information within each object, allowing students to have enough tools to perform the task without going to the additional sources;
- Another specific characteristics of IPSS_EE_LO is its ultimate purpose. According to the IPSS_EE Design Model we transform learning objectives to tasks for performance which master the domain. Our goal and design approach is to create a set of LOs that will represent a domain knowledge. These objects will not replace the learning context; rather they will be a supporting it;
- IPSS_EE_LOs exist within IPSS_EE database. We use PHP script to dynamically generate the visible objects from the data in the database. We store the information in a presentation-independent form in the database and use template to generate the presentation form – IPSS_EE Student Area. By using this approach, we create a template for easy upgrading and maintenance of the objects as well as providing a means for controlling how students enter each object – IPSS_EE Editor. Further, by using IPSS_EE Editor, it is easy to modify portions of the objects as necessary without the need to edit multiple HTML pages;
- According to Wiley (2000) IPSS_EE_LO is a "combined-open" learning object. There is a number of discrete items pulled together into a web page. However, functionally it is more like a "combined-closed" object because each learning object is presented to the user as a single unit. The student has no ability to access individual pieces of the larger object. Each of the objects is comprised of pieces its author has chosen to put together. IPSS_EE_LOs are not dynamically generated from the metadata tags as some learning objects are. The self-tests are specific to the object as a whole and help the learner consider her/his own understanding of the concept covered by the object. While we are limiting reusability, because the objects are more detailed than a collection of video, graphics, text, for example, we developed the objects to contain more contextual information to help users. Each of the pieces are accessible from anywhere within an object.

1.3 In/between navigation

In IPSS_EE_LOs we have a within-object navigation. The student may use point-and-click steering to move from one section of the object to the next. We have not a search engine to go directly to a particular part of the object. The screen that presents object's elements is the same for each of the objects, and we have LOs "tree" to the risk of students becoming lost in the learning objects library. While we recognize that some people might see this structure as limiting the learning object potential by not allowing pieces to be interchangeable, we see this structure as being superior in helping students work with considerable information by always having a beginning for the objects and always having the same basic pieces within the objects. IPSS_E_LOs are packaged into certain groups – IPSS_EE, and this packaging comes from the theachers. IPSS_EE is a group of related in specific knowledge context LOs. Within the package students have a possibility to move between the related objects, or use them in the given sequent.
In fact, IPSS_EE_OLs could be packed by the students in IPSS_EE, based on their evolving needs and understandings, and in this the objects serve the scaffolding functions they are intended to serve.
In IPSS_EE, the students have full access to the complete library of objects. But they are packed in modules and IPSS_EEs. The students have different levels of skill in both navigating the Internet and in their content knowledge. This means that we need to offer a variety of options, such as going to the specific IPSS_EE and use LOs insight in the given sequent, or moving between them, or select LOs from the tree and create own IPSS_EE, so that we can support both users that have some experience and need specific LOs, or students that are novice in their learning. This is a quite specific characteristic of IPSS_EE_LOs navigation.

1.4 IPSS_EE_LO Model

IPSS_EE_LO Model specifies content structure, meta-data, storage and presentation of IPSS_EE_LO.



Meta-data are used to describe IPSS_EE_LO. They give the basic information for the learning objects and additional elements like learning object indexing. Metadata helps the system to archive and locate valuable learning data and to select useful knowledge packages for the learners, based on the meta description. Elements of IPSS_EE_LO Model meta-data with examples:

Element title	Example
Topic	Task title (aims_work_name)
Description	Task description, file with task description
Identifier	Task identifier (aims_work_id)
Source	Which Module, which IPSS_EE (modul_id, system_id)
Creator	Who creates the IPSS_EE that contents the task
Resources	Task content (modul_work, modul_work_file, modul_description, modul_file, books, hyperlink, instruction_text, instruction_file, softuer_text, softuer_file, softuer_name, softuer_exe)
Test	Task element (test_id, aims_work_id, name_query, text_query, file_query, answer1, answer2, answer3, answer, answer_points)
References	Task element (inf_resurs_id)
Example	Task element (example_id, aims_work_id, example_file)
Solutions	Task performance (trainee_id, aims_work_id, trainee_name, solution_text, solution_file, a_date)
Problems	Expert advices (problem_id, modul_id, problem_number, problem_text, symptoms, solutions)

Content structure answers to the performance support systems requirements – the content is structured to provide individualized online access to the full range of information, guidance, advice, data, images, tools and software to permit the user to perform a task with a minimum of support and intervention by others. IPSS_EE_LO consists:

- reference information about a task or closely related set of tasks;
- task-specific training;
- expert advice about a task;
- instructions how to perform the task
- instructions how to use the software.

Reference information describes the task that the user has to perform. This reference information supports the user by making immediately available information, which (s)he previously had to memorize or look for in a book or a manual. The reference section allows the user to learn more deeply about a given task and is always available for her/him to read and *provides the theory behind the task it supports*.
Task-specific training reduces preliminary training by helping the user to learn while performing the task. This type of *training is learner-centred* because the learner asks for help when he needs it to perform a task, and the help gives him the specific information that (s)he requests.
IPSS_EE_LO contains specific advice on performing tasks. The advice is usually provided by an *expert system*. Instructions how to perform and how to use the software are automated tools for task performance – they are most helpful when a supported task involves the use of *specific software*.

IPSS_EE_LO presentation allows the learner to perform the task using the text fields, executive files, simulation activities etc. Links provide access to all IPSS_EE_LO elements, defined in the content structure, that help the learner to perform the task – task-specific

training, instructions, reference information, software for task performance and expert advices for problems and trouble shootings. Each of these parts is presented in a new window, opened on a working environment. The rationale behind this is:

- to allow learners to access the elements of IPSS_EE_LO quickly;
- learners generally see themselves as on a work place;
- the learner doesn't loose the assumption that the main goal is to perform the task and the links are used to increase the quality of this performance.

2 Working in DIPSEIL

DIPSEIL, as a typical performance support system, is an integrated electronic environment, which is available via Internet and is structured to provide individualized online access to the full range of information, guidance, advice, data, images, tools and software to permit the user to perform a task with a minimum of support and intervention by others.

DIPSEIL Tasks for performance aim preliminary specified learning outcomes

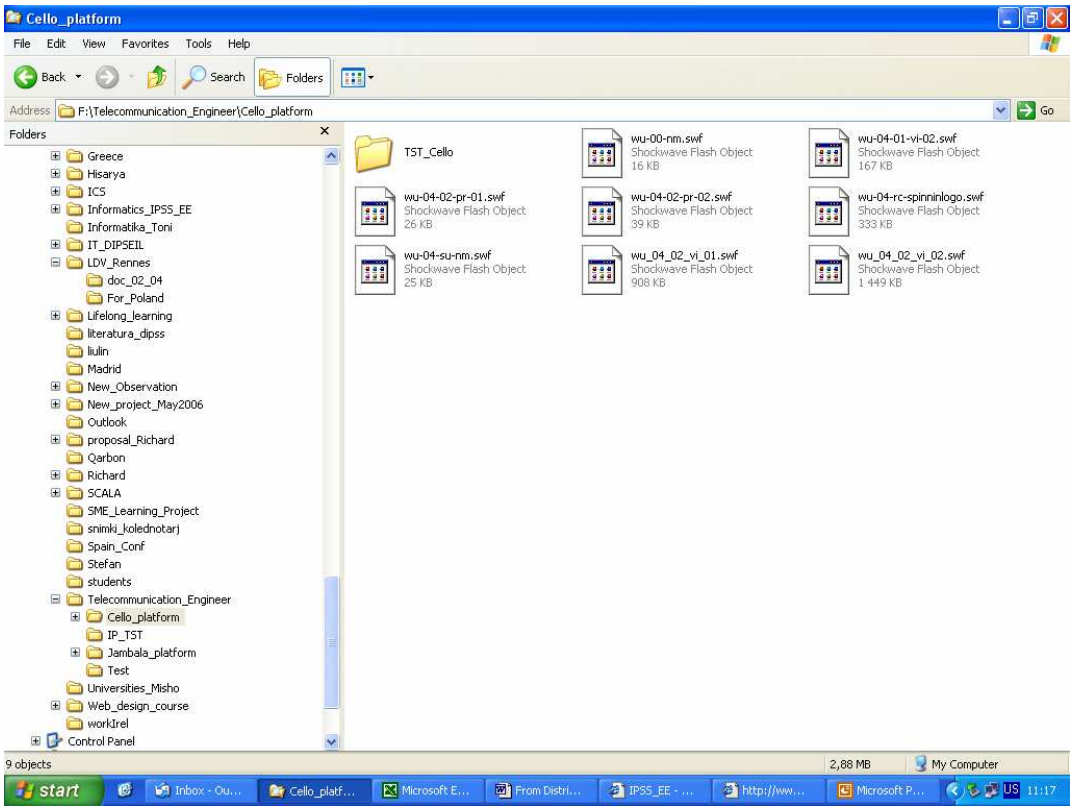
For each task we have:

- reference information about a task or closely related set of tasks;
- task-specific training;
- expert advice about a task;
- instructions how to perform the task
- instructions how to use the software

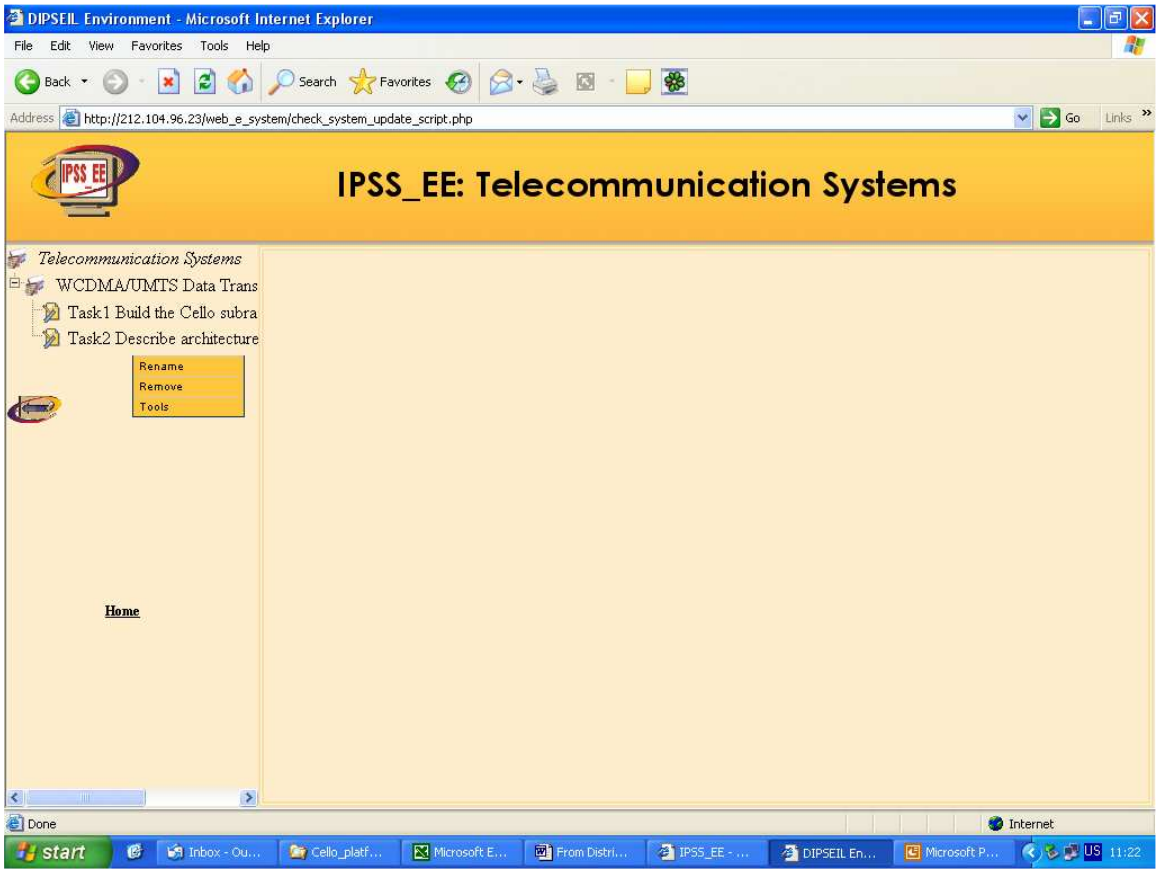
Development process in an example:

Course "Telecommunication Systems"
Module "WCDMA/UMTS Data Transmission Platforms"
Objective of the module: "This section covers the main functionality and architecture of the Cello and the Jambala platform. These platforms are the new transport and execution platforms, developed to meet the demands of 3G networks. They support multimedia services in WCDMA systems. They are cost-effective, flexible, scalable, modular, and user-friendly. After successfully completing the Module you will be able to: Outline the main functionality and architecture of the two platforms."
Two tasks for performance:
Task1 Build the Cello subrack
Task2 Describe architecture and functionality of Jambala

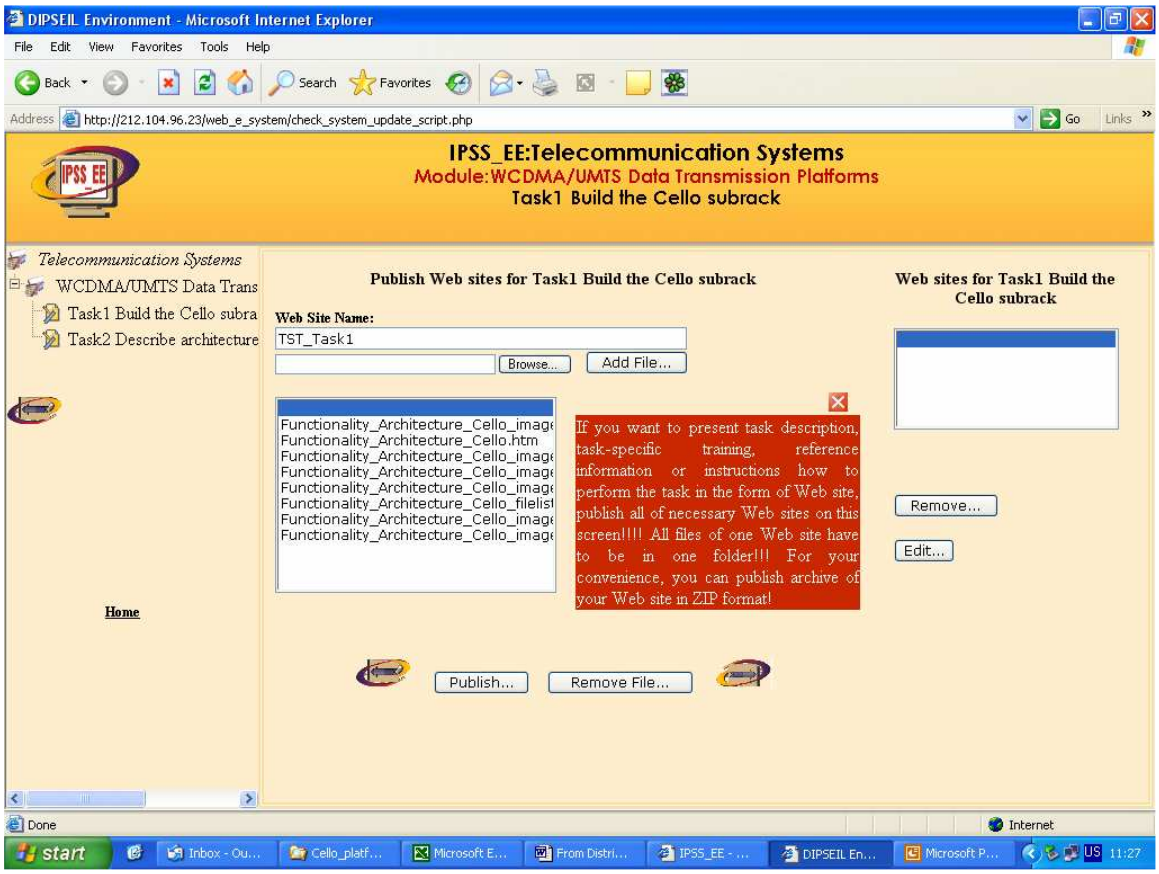
Task1 Build the Cello subrack
Task Description: Put the correct components to the Cello subrack. Identify the management interfaces in Cello.



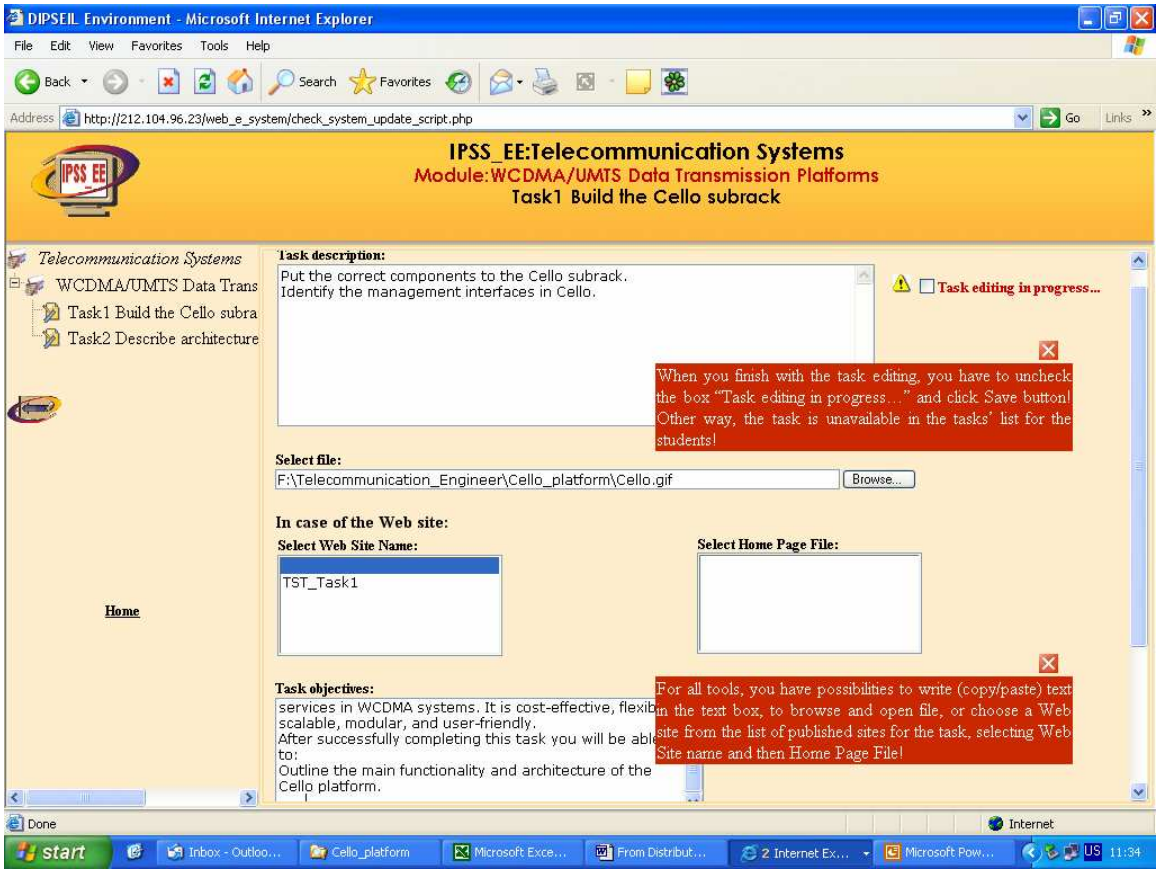
For each of the tools we prepare materials in electronic format (any file format)



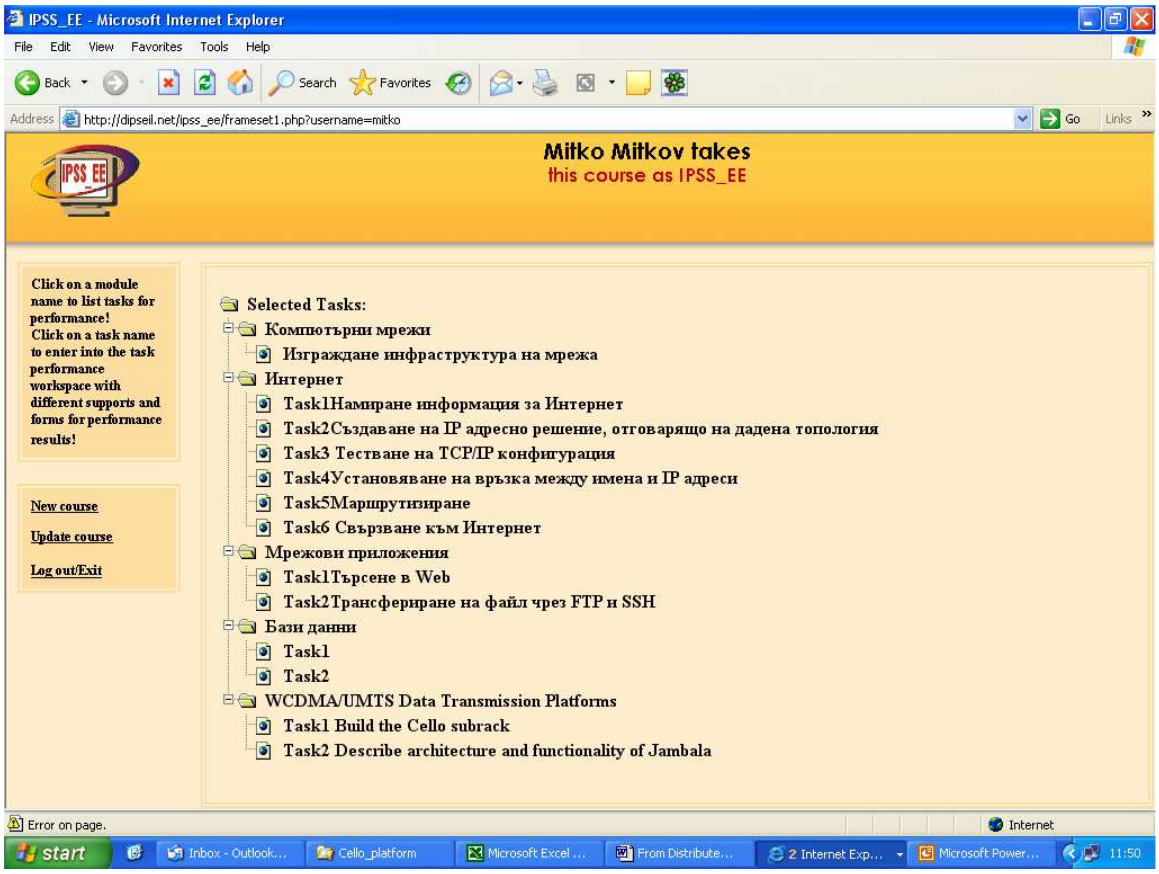
Log in to Editor part of DIPSEIL, select the Server, write the parameters of the course and go to the tree-structure development.



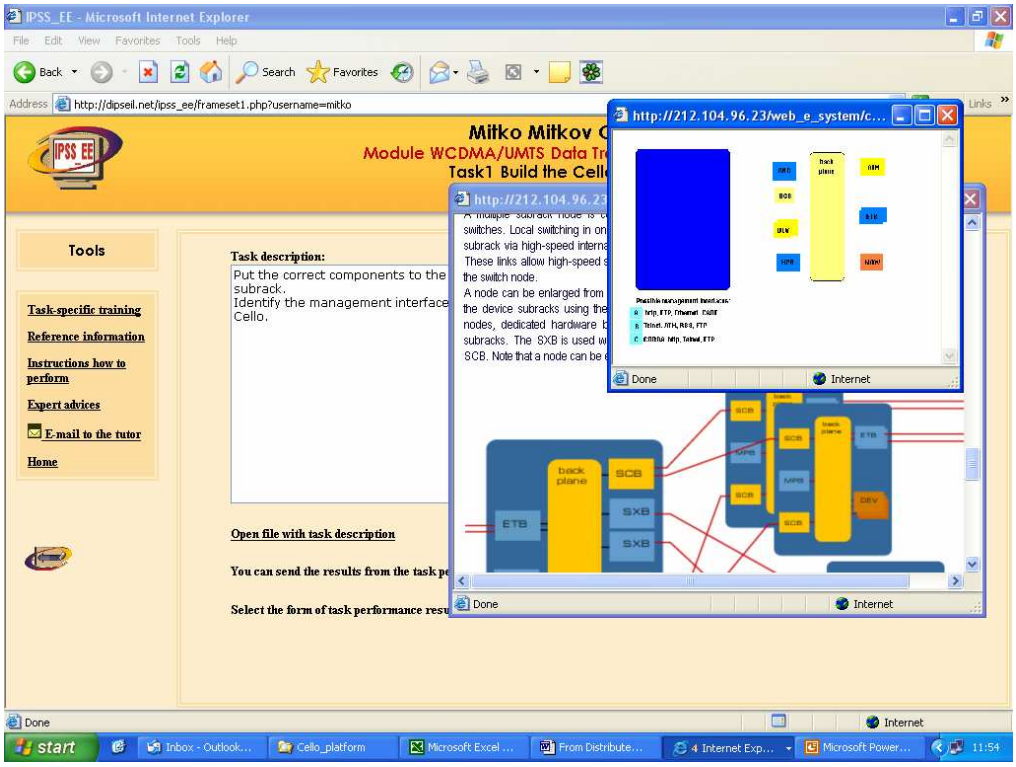
Publish necessary Web pages for Task1 (browse files, add and then publish).



For each of the tools type, copy/paste, browse, or select Web page



Learner logs in to Student Area of DIPSEIL (registers first). Look at the course-data-base (on all servers in Europe), selects according to their preferences and builds his/her own course from the available modules



Learner goes to the working space to perform a task

DIPSEIL learning process organization:

- Learner sends the task performance to the server data-base (account for each of the learners; we collect learners portfolios)
- Learners have deadline for each task performance
- They receive feedback for each of submitted task and credits (forum is the place for points, remarks, discussions)
- They have some limitations and rules
- At the end they receive credits for the whole course
- The learning process is Internet-based with option to learn in DIPSEIL Lab, or completely from distance

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