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Palette

Pedagogically sustained Adaptive LEarning Through the exploitation of Tacit and Explicit knowledge

Instrument: Integrated Project

Thematic Priority: Technology-enhanced learning

D.MED.10 – Third operational version of CoPe_it!

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Deliverable manager

- Nikos Karacapilidis, CTI

List of Contributors

- Nikos Karacapilidis, CTI
- Manolis Tzagarakis, CTI
- Dora Nousia, CTI
- Vassilis Kallistros, CTI
- Spyros Christodoulou, CTI
- Nikos Karousos, CTI
- George Gkotsis, CTI
- Christos Mettouris, CTI

List of Evaluators

- Amaury Daele, UNIFR
- Stéphane Sire, EPFL

Executive Summary

This document reports on the third operational version of CoPe_it! (v.3.0, release: July 29, 2008). It should be read as a continuation of the deliverables D.MED.02 (“First operational version of the web-based tool supporting argumentative collaboration towards learning”), and D.MED.06 (“Second operational version of CoPe_it!”), which have described in detail the functionality of the first and second operational versions of the tool, respectively. More specifically, this document focuses on the new functionality added in the tool’s third operational version, while it also indicates amendments done towards improving the functionality of its earlier two operational versions.

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1 Overview

CoPe_it! (http://copeit.cti.gr) is a web-based tool supporting argumentative collaboration towards learning, which is being developed in the context of the Palette project. The tool implements a series of functional specifications of argumentative collaboration services, which have been described in detail in D.MED.05 ("Functional Specifications of Argumentative Collaboration Services"). It addresses the related CoPs' needs, as these have been identified and continuously elaborated through the work performed in the context of WP1 and WP5. Moreover, the tool is being developed in line with the Web services approach followed throughout the project; the technical specifications of its Web services have been presented in D.MED.09 ("Technical specifications of collaboration support tools as Web services").

To give a brief overview of its development history, we mention that the first operational version of CoPe_it! (v2.03, release: June 21, 2007) was developed from scratch. In a later version (v2.1, release: October 19, 2007), we expanded the functionality offered and made progress on the tool's performance and user interface. In the second operational version (v2.2, release: February 28, 2008), the tool's functionality, usability and performance were further improved, by elaborating issues related to the user and role management, awareness and communication, collaboration workspaces and objects, exploitation of legacy resources, interoperability with other tools, and the tool's resource repository.

This document should be read as a continuation of the deliverables D.MED.02 ("First operational version of the web-based tool supporting argumentative collaboration towards learning") and D.MED.06 ("Second operational version of CoPe_it!"). It reports on the new functionality added in the tool's second operational version, while it also indicates amendments done towards improving the functionality of its earlier releases. Following the participatory design methodology adopted in Palette, such amendments took into account the usability analysis described in D.PAR.04[*] ("User-centered description of PALETTE tools and services, and first analysis of usability"), D.PAR.07[†] ("Second Analysis of Usability"), as well as comments and suggestions

[*] It is noted that this usability analysis concerned version 2.03.
[†] It is noted that this usability analysis concerned version 2.2.

resulted out of the tool's evaluation by a series of users and communities during the duration of the project.

People involved in the development of CoPe_it! are: Manolis Tzagarakis, Nikos Karousos, Spyros Christodoulou, George Gkotsis, Vassilis Kallistros, Christos Mettouris and Panayiotis Kyriakou.

2 Additions and improvements

CoPe_it! supports, among others, diverse formalization and visualization features, argumentation mechanisms, management of diverse collaboration objects (stored in the tool's content repository), decision making, exploitation of legacy resources, interoperability with other tools (developed in or out of the context of the Palette project), and a sophisticated management of users, Communities of Practice (CoPs), as well as their roles and privileges.

This section reports on additions to and improvements of the tool's second operational version (v2.03), which now appear in the recently released third operational version (v3.0). Referring to the contents of this section, the following table summarizes the features/functionalities that have been either added or improved.

FEATURE/FUNCTIONALITY	ADDED	IMPROVED
2.1 Synchronous Collaboration	√	
2.2 Replay	√	
2.3 Filtering/transformation to formal		√
2.4 Rating of items	√	
2.5 Synchronized projections	√	
2.6 User interface improvements		
2.6.1 Open Space		√
2.6.2 Left Bar		√
2.6.3 Selecting and dragging multiple objects	√	
2.7 RSS Fields Support	√	
2.8 Web Services	√	
2.9 Native import/export	√	

Table 1: Features / functionalities added or improved

2.1 Synchronous Collaboration

2.1.1 Synchronous collaboration model

Computer-Supported Cooperative Work (CSCW) has introduced various technologies, since early nineties, which were meant to support people in their need to communicate and exchange information. Systems have been especially designed to enable distributed synchronous interaction with the point of interest in a cooperative session [1].

To facilitate the process of collaboration and coordination between CoP members working on the same workspace, CoPe_it! provides the ability of *semi-synchronous collaboration*. By the term semi-synchronous collaboration, we denote a collaboration that may proceed in asynchronous as well as synchronous ways, depending on the availability of collaborators (if there is only one user present in a workspace, he is working asynchronously; if there are more than one, the mode is synchronous). By asynchronous, in turn, we define a collaboration where different actions may be performed on the same workspace at a different time, while by synchronous, we mean the case when different actions are carried out and observed at the same time as they happen [2]. Synchronous collaboration in CoPe_it! is possible via two means: the workspace, where every workspace operation such as moving, adding new item, relating two items, deleting/updating etc. are immediately visible to all users connected to the workspace where the change took place, and the Chat facility, where users connected to the same workspace can exchange text messages.

The asynchronous work mode adopted by CoPe_it! is activated whenever a user is the sole person accessing a particular workspace. In case a second user accesses the same workspace, the collaboration over the workspace is automatically switched into the synchronous mode. During CoPe_it!'s synchronous mode, every change occurring in a workspace is immediately rendered visible to all users that are currently connected to that particular workspace.

The synchronous collaboration model adopted by CoPe_it! follows the turn-taking approach[‡] [3,4] as far as collaboration in the workspace is concerned, and the full synchronous model for the Chat facility. According to the turn-taking approach (which is the most appropriate one for our objectives, since it fully aligns with the CoPs requirements), although many users may be connected to a workspace and can notice simultaneously modifications of the space as they happen, only one user at a time is allowed to make modifications on the workspace. A specific protocol determines which user the control of a workspace is given to. On the other hand, the user of Chat is not constrained; this means that all users of a workspace may exchange messages via chatting at any point in time during their collaboration.

A workspace's synchronous model is based on the idea of a token that determines the user that has currently control over a workspace. Other users, wishing to make changes on the same workspace, must request the token from the current holder. When more than one users request the token, their requests are queued according to the token request time, in a first come first served mode. Whenever a user, holding currently the token, finishes his changes on the workspace, he releases the token which is then given to the user who first requested it. The model also introduces a particular role with extended rights over the token distribution, called the "moderator" of a workspace. A moderator is able -at any point during the collaboration- to revoke the token from a user that currently possesses it and give it to any other workspace participant.

2.1.2 Avoiding race conditions

The synchronous collaboration model of CoPe_it! tries to avoid situations that may lead to problems with respect to token allocation. In this section, we briefly mention such situations and present the way the model addresses them.

Uninhabited workspaces/bootstraping. In workspaces where no user is currently connected (i.e. has not been opened by any user of CoPe_it!), the token is possessed by no one. This means that new users, opening the workspace are not able

[‡] Alternative approaches to the synchronous collaboration issue, and especially to the floor control problem, can be found in [5]. The adopted approach will be validated by the CoPe_it! users towards its appropriateness.

to request the token, as this is not possessed by any user. In such situations, the model automatically gives the token to the first user entering (or opening) the workspace, who is thus able to make modifications on the workspace. This approach is, in particular, important as it permits the asynchronous use of the workspace.

User disconnect. When a user, currently holding the token, performs an ordered disconnect from the entire application, the token becomes orphaned. In such situations, the system automatically gives the token to the next user who requests it. In case no user has issued a request for the token, the token is not allocated. There is, however, one exception to this rule: if exactly two users are connected to a workspace, and the user holding the token quits (either the workspace or the application) the token is given to the last remaining user, independently of whether he requested it or not. Such behavior has been chosen in order to enable for the last remaining user a transparent flow of control.

User timeout. The user timeout scenario is similar to the user disconnect situation described above. It differs in that, in the event signaling, a disconnect from the workspace (or the application) is not initiated explicitly by the user but happens due to uncontrolled circumstances in the users' environment. These situations can occur when a user holding the token experiences problems with his network connection causing delays and lags, or when his application is abruptly terminated (as it is the case in a crash), or even when a user closes the browser window without disconnecting. In these situations, the remaining users, waiting for their turn to make changes to the workspace, may be subjected to token starvation: although users can request the token, the system is not able to give it to them. To address such situations, the model introduces a time-out period that determines whether a token should be revoked from a holding user, giving it to the next one. In particular, if the period a user has not interacted with a workspace exceeds a "time-out" value, the token is automatically revoked and given to the next user waiting for the token.

User verbosity. A particular difficult situation occurs when a user currently holding the token, does not want to give the token away, although others are waiting to receive it. In such situations, the requesting users may be again subjected to token starvation. The approach the model takes to address this situation is process oriented: first, it introduces the notion of the "moderator" that has special privileges over the token distribution. Hence, when encountering such situation, the moderator can simply revoke the token from the holding user and give it to the next user waiting. In cases where no moderator is present during a collaborative session, the waiting users may use the Chat facility, whose use and operation is not controlled by the token, in order to communicate with the current token holder to release the token.

2.1.3 Summary of the protocol

In the following, we summarize the sequence of events that happen when a user requests the token in order to make changes to a workspace.

1. Upon entering a space, if the user is the sole user of the workspace he receives the token and may proceed to make changes to the workspace. Without the token, the user is unable to make any change to the workspace.
2. If other users are currently connected to the workspace, the user requests the token. If he is the only user requesting the token, he receives it. If requests from other users are pending, the request is added to the request queue. The user receives a numbered “ticket” designating his current position in the queue.
3. If the user, holding currently the token, signals the termination of his changes or quits the workspace (or logs out), the token is given automatically to the next user waiting.
4. If no user is waiting for the token, the token is not given away.
5. If a user waiting for the token and having a specific queue position quits the workspace of the application, the position of the any subsequent request is modified accordingly.
6. Moderators of a workspace may grant/revoke the token to/from any participant.

2.1.4 Design and implementation of synchronous collaboration in CoPe_it!

In this section, we briefly describe the design and implementation of the modules that facilitate synchronous collaboration within workspaces. The design and implementation of synchronous collaboration support in CoPe_it! is based on a server "pull" architecture, whereby clients (i.e. web browsers) periodically query the server for new events. A "pull" architecture approach has been chosen over a server "push" architecture [6] or a COMET model [7], due to its ability to support the turn-taking model described previously with reasonable implementation efforts. In particular, in the turn-taking model, since changes to the workspaces occur in a controlled fashion (only the user possessing the token), new events are generated at a stable rate and there is a low risk of loosing events, the necessary conditions are present to allow a successful deployment of a "pull" architecture [6].

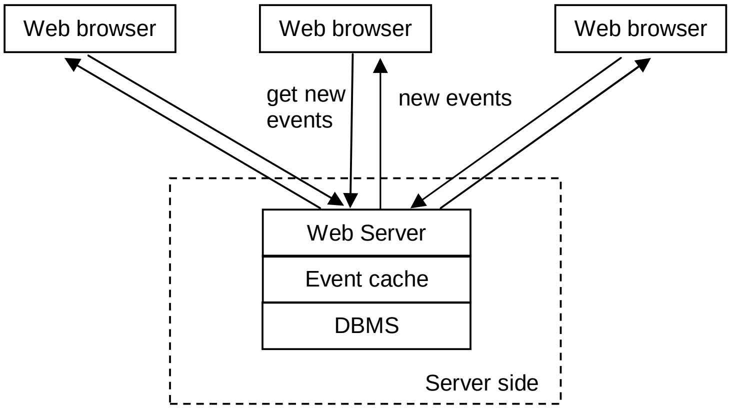


Figure 1: The conceptual architecture of CoPe_it! to support synchronous collaboration.

Figure 1 depicts the conceptual architecture of CoPe_it! enabling the provision of synchronous services. In the following, we describe each architectural component and outline briefly its behavior. Whenever a user opens a workspace, a periodic activity for the opened workspace is initiated on the client side (i.e. web browser), querying the server for new events that are related to the newly opened workspace. There exists one such periodic activity for each opened workspace. One such periodic activity is initiated for each open workspace and is responsible for getting the new events that happened on the associated workspace. On the web browser's side, this periodic activity has been implemented using asynchronous AJAX technology. The query interval is configurable and has been currently set to 3 seconds. This value has been determined after carrying out a number of tests with various numbers of users.

The "Event Cache" is the place that maintains all recent operations carried out by any user.

Each workspace has its own Event Cache and every time an operation is carried out on a workspace, after the event successful execution, an event record is added into the respective Event Cache. The Event Cache of a workspace maintains information about the following events:

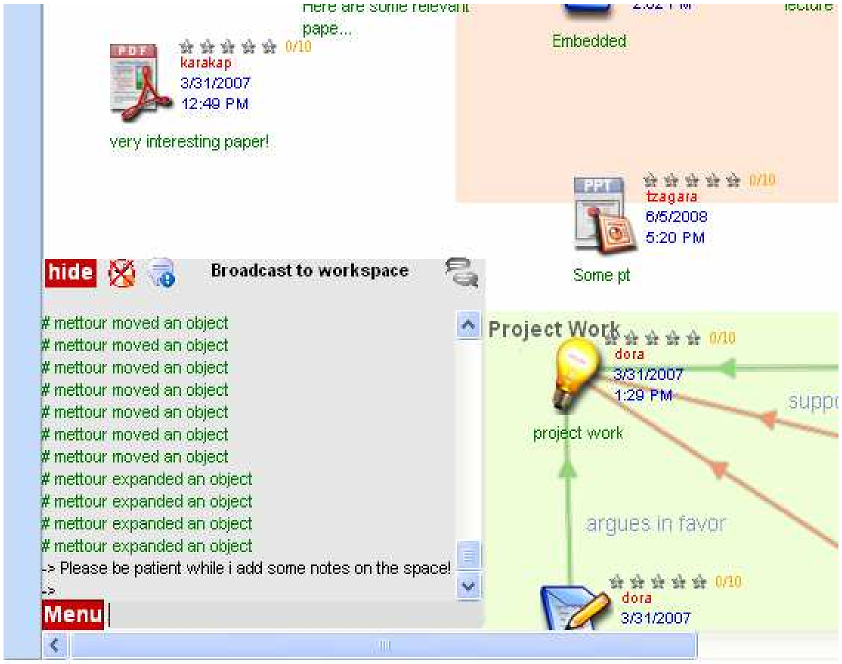
1. Users that either open or close the workspace. These events will be used to update the list of connected users that appears in the head-up display.
2. All events that are related to changes of a workspace, such as moving an item, relating two items, deleting and updating an item.
3. The chat messages exchanged between the users of a workspace.
4. The status of each client with respect to what it has already received. In particular, the Event Cache maintains, for each connected user, the time of the latest event that the client has received. This determines which events have to be sent back to clients when subsequent event requests occur.

Each workspace's Event Cache maintains along the event information (who carried out the operation, which object has been affected), the timestamp of the event which is used to order the events when these are send back to the client. The event's timestamp is used also to determine which events are sent back to clients as only new events, i.e. events which have occurred since the last client query request. All data relevant to the Event Cache are stored in special data structures maintained in main memory, in order to ensure minimum overhead when retrieving the newest events. However, all events are stored in the database as well, as these are vital for functionalities other than the synchronous collaboration, such as the replay functionality.

2.1.5 Synchronous collaboration features

Chat

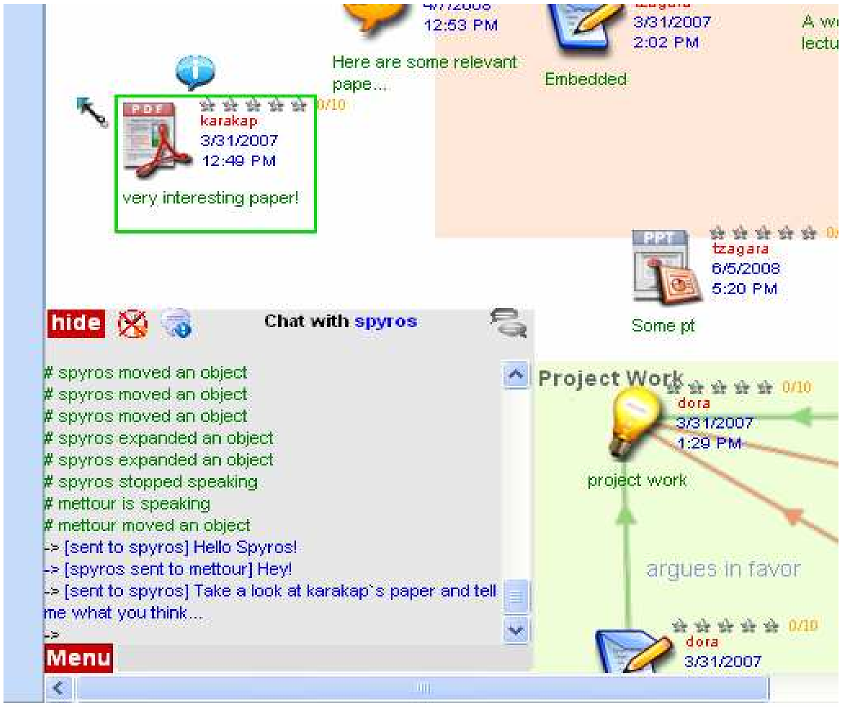
Chat enables users to exchange messages at any time during their collaboration in a workspace. A user has the option to broadcast a message to a workspace, or send a private message to another user. In the case of a user broadcasting a message, every other user in that workspace will receive that message. Broadcasted messages appear in black color. In Figure 2, the user broadcasts a message to notify all other users about the changes he is going to make on the current workspace.



```
# mettour moved an object
# mettour moved an object
# mettour moved an object
# mettour moved an object
# mettour moved an object
# mettour moved an object
# mettour moved an object
# mettour expanded an object
# mettour expanded an object
# mettour expanded an object
# mettour expanded an object
-> Please be patient while i add some notes on the space!
->
```

Figure 2: User broadcasting a message

Private messages, on the other hand, are received by only one user and are displayed in blue color. That user (receiver) is specified by clicking on his image, in order to chat with him. Other users apart from the receiver are not notified of private messages. In Figure 3, users *mettour* and *spyros* are chatting.



spyros moved an object
spyros moved an object
spyros moved an object
spyros expanded an object
spyros expanded an object
spyros stopped speaking
mettour is speaking
mettour moved an object
-> [sent to spyros] Hello Spyros!
-> [spyros sent to mettour] Hey!
-> [sent to spyros] Take a look at karakap`s paper and tell me what you think...
->

Figure 3: User *mettour* chatting with user *spyros*

Workspace Head Up Display (WHUD)

The light grey area in which the chatting messages are displayed is called Workspace Head Up Display (WHUD). Besides chatting, the WHUD is used to display system messages as well. System messages appear in green color and inform the user about other users' actions, for example when a user moves an object or when he enters or leaves the workspace. Upon a user's entry on a workspace, the WHUD initially displays the 10 most recent system/chat messages (this number is configurable).The WHUD provides users with a number of options. Figure 4 shows the buttons used to enable or disable certain actions.

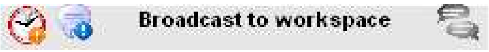
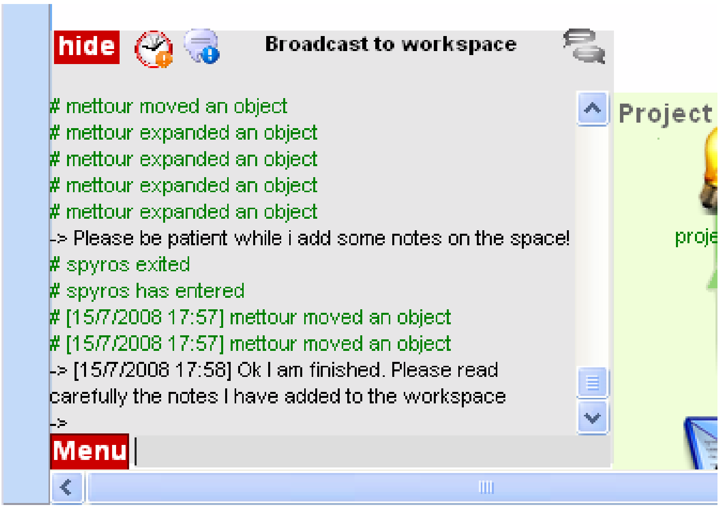


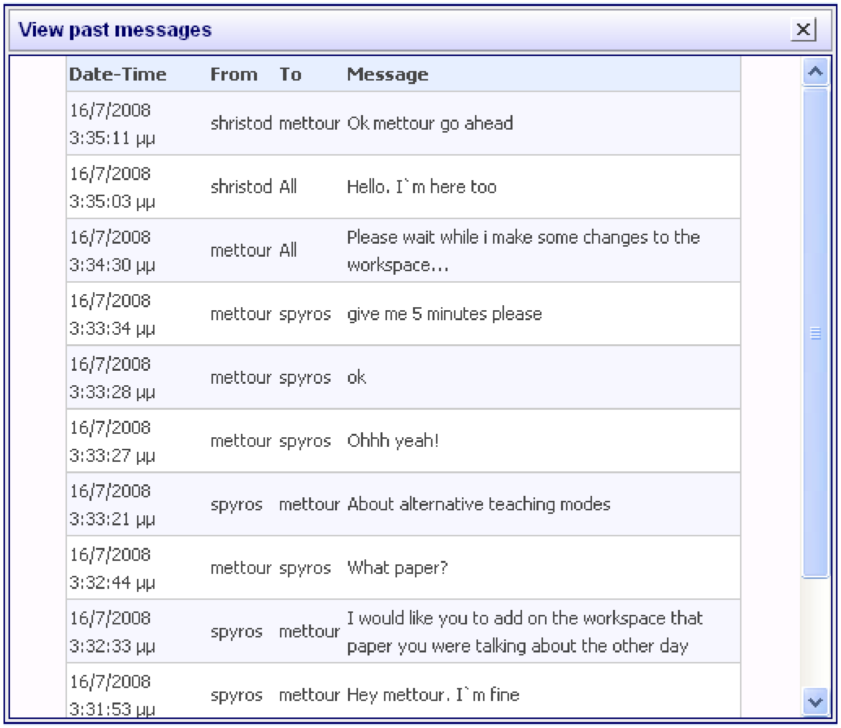
Figure 4: Available options on the WHUD

The clock icon (first icon) provides the option of showing (or hiding) the date and time within all messages displayed by the WHUD. In Figure 5, the user enabled this option, before the last three messages appear. The second icon provides the option of displaying or not the system messages. If a user disables this option, only chat messages will be displayed. The third icon is used to display past messages. Past messages are displayed in a separate form (Figure 6) and not in the WHUD. The messages displayed consist of only past chat messages. By clicking on the top-right icon of WHUD (Figure 5), the user is informed about all past messages broadcasted to the workspace, as well as past private messages that he sent to other users or were sent to him by other users (by clicking on this icon, a window such as the one shown in Figure 6 pops up).



mettour moved an object
mettour expanded an object
mettour expanded an object
mettour expanded an object
mettour expanded an object
-> Please be patient while i add some notes on the space!
spyros exited
spyros has entered
[15/7/2008 17:57] mettour moved an object
[15/7/2008 17:57] mettour moved an object
-> [15/7/2008 17:58] Ok I am finished. Please read carefully the notes I have added to the workspace
->

Figure 5: The last three messages appear with the date option enabled



Date-Time	From	To	Message
16/7/2008 3:35:11 μμ	shristod	mettour	Ok mettour go ahead
16/7/2008 3:35:03 μμ	shristod	All	Hello. I`m here too
16/7/2008 3:34:30 μμ	mettour	All	Please wait while i make some changes to the workspace...
16/7/2008 3:33:34 μμ	mettour	spyros	give me 5 minutes please
16/7/2008 3:33:28 μμ	mettour	spyros	ok
16/7/2008 3:33:27 μμ	mettour	spyros	Ohhh yeah!
16/7/2008 3:33:21 μμ	spyros	mettour	About alternative teaching modes
16/7/2008 3:32:44 μμ	mettour	spyros	What paper?
16/7/2008 3:32:33 μμ	spyros	mettour	I would like you to add on the workspace that paper you were talking about the other day
16/7/2008 3:31:53 μμ	spyros	mettour	Hey mettour. I`m fine

Figure 6: Viewing past messages

Signaling

Signaling is the procedure of highlighting a particular point on the workspace. The user must click on the hand icon surrounded by a circle on the Workspace Menu (Figure 7) and then click on the point he wants to signal to other users. When this happens, the certain point on the workspace is highlighted to all users, as well as the corresponding point on the Mini Map with an "X" mark. Figure 7 depicts this effect. If the Mini Map is closed, it opens automatically so that the user gets the signal, even if the signaling point is out of the screen boundaries.

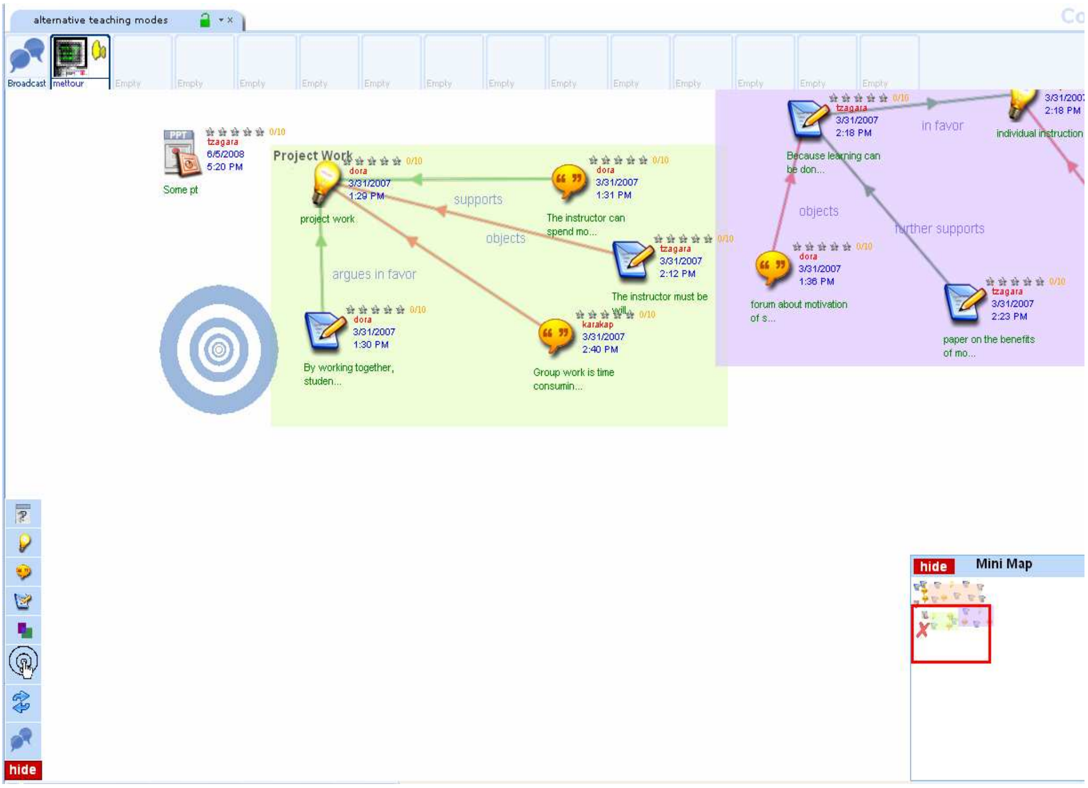
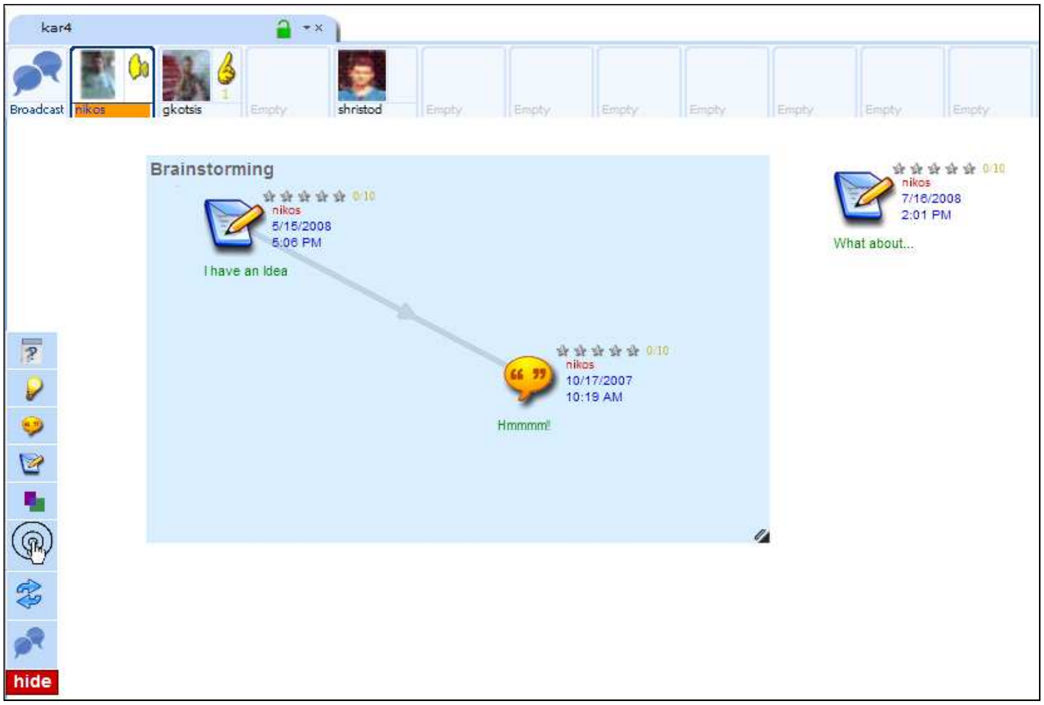


Figure 7: The certain point on the workspace is highlighted to all users, as well as the corresponding point on the Mini Map (X mark)

Visualizing the online participation in a workspace

The online (synchronous) participation in a workspace is now depicted on the top of the workspace. Each participant may see all the other online members of the workspace and communicate with them by sending personal or broadcasted messages. The top bar of the workspace gives the possibility to send messages or participate to the ongoing discussion by:

1. requesting (or canceling the request) to take turn (in order to be able to perform changes within the workspace);
2. stopping the turn (after a user has been granted turn and performed all necessary changes on the workspace).



nikos
5/15/2008
5:06 PM
I have an Idea

nikos
10/17/2007
10:19 AM
Hmmmmm!

nikos
7/16/2008
2:01 PM
What about...

Figure 8: Displaying on-line participants on the top of workspace

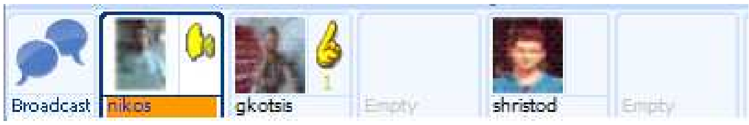


Figure 9: The top bar of a workspace

As depicted in Figure 8, a participant may be informed about the other online participants as well as about who has the turn and who else is requesting to take turn. If more than one request exists, the priority is depicted through an appropriate number for every request.

Each participant's image has a black colored border while the moderator is indicated with an orange background color under his name (Figure 9). When someone has the turn, his image's background color becomes white, while an appropriate icon is depicted right to his/her photo.

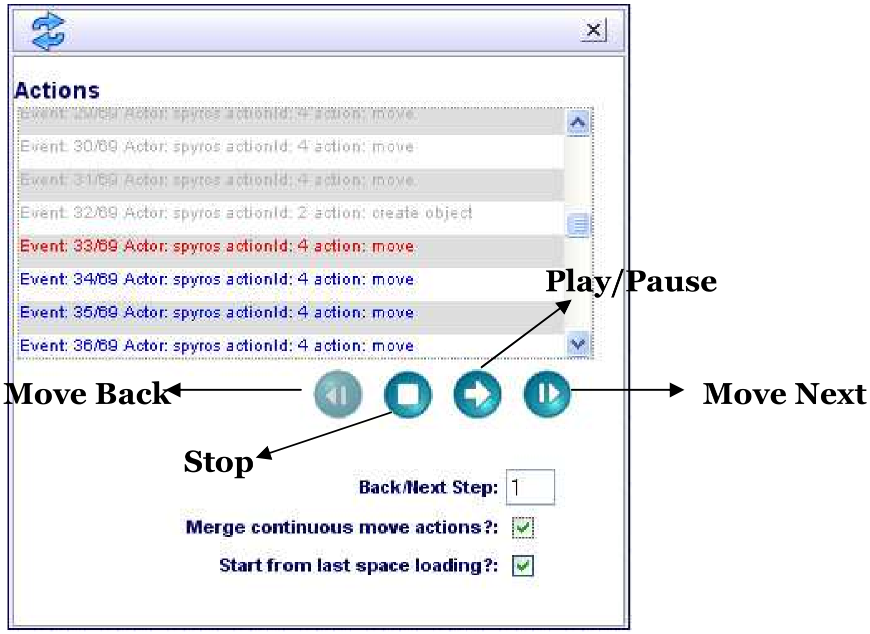
The area corresponding to each user on the top bar is clickable and provides the following behavior:

- Each participant can click on other participants' photos and names in order to send a direct message. He can also click to the broadcast icon (on the left of the bar) to send a message to all.

- By clicking on the icon area (at the right of the photo), a participant can request (or cancel the request) to take the turn and stop the turn in case he already has it.
- The moderator apart from his icon area can also click on the icon area of other participants in order to direct give or stop the turn.

2.2 Replay

In order to better help a CoPe_it! user realize the changes performed on a workspace by all workspace users, especially since the user's last login, a replay mechanism has been developed. This mechanism is also very useful for users who want to comprehend/view the evolution of a collaboration (cases where one joined a collaboration long after its initiation, one has missed some parts of it, etc.). The replay mechanism is accessible through the main menu. Pressing the Replay button on the menu results in a blank workspace canvas, representing the workspace immediately after the workspace creation. The Replay mechanism window pops up on the right hand corner (Figure 10).



Actions

Event: 29/69 Actor: spyros actionId: 4 action: move
Event: 30/69 Actor: spyros actionId: 4 action: move
Event: 31/69 Actor: spyros actionId: 4 action: move
Event: 32/69 Actor: spyros actionId: 2 action: create object
Event: 33/69 Actor: spyros actionId: 4 action: move
Event: 34/69 Actor: spyros actionId: 4 action: move
Event: 35/69 Actor: spyros actionId: 4 action: move
Event: 36/69 Actor: spyros actionId: 4 action: move

Back/Next Step: 1
Merge continuous move actions?: ☑
Start from last space loading?: ☑

Figure 10: Replay mechanism window

First of all, an action on a workspace may be anything that a user can do with the workspace and its objects/relations. Examples of such actions would be the creation of an object/relation, an object's movement, changing color of a relation/adornment, adding tags to an object or even rating of an object. All actions performed on a workspace are logged in order to be used as input for the Replay mechanism[§]. The idea of this logging is to enable user "execute", step by step, each action performed on the workspace starting from the creation of the workspace.

The "Actions" area includes all the actions performed by all users, starting from the time point the workspace was created and finishing at the time point the Replay mechanism was run. An action in grey font color means that the action has been already executed/depicted on the replay canvas (i.e. if the action refers to the creation of an object, the object has been already created on the Replay workspace). The action in red font color is the last action that has been be executed/depicted on the canvas.

Through the Replay window, a CoPe_it! user is able to:

- **Move Back**: moving back results in undoing the action in red font color on the actions list, i.e. if the action in red font color corresponds to an object added on the workspace, undoing this action would result in deleting the object from the workspace. The default "**Back/Next Step**" is 1. Setting it to a greater value would result in undoing a number of actions equal to this value with each click on the "Back" button. Undoing all actions results in a null workspace, as it was when created.
- **Stop**: Pressing "Stop" will stop the Replay procedure performed so far and clear all the objects on the canvas, if the "**Start from last space loading**" option is not checked. If the "Start from last space loading" option is checked, pressing "Stop" would result in a Replay workspace as it was when this user loaded this space for last time.
- **Move Next**: Similar to Move Back. Executes one action (or a number of actions if "Back/Next Step">1). Executing all actions on the "Actions" area would make the Replay Workspace identical to the original Workspace (as it was when the replay mechanism was run).

[§] provided that the workspace has been created after 30/7/2008 (no replay mechanism available for workspaces created before 30/7/2008)

- **Play (Pause):** Play button is pressed to start executing actions successively, one at a time, until the Pause (Play button turns into Pause) button is pressed or all actions have been executed.

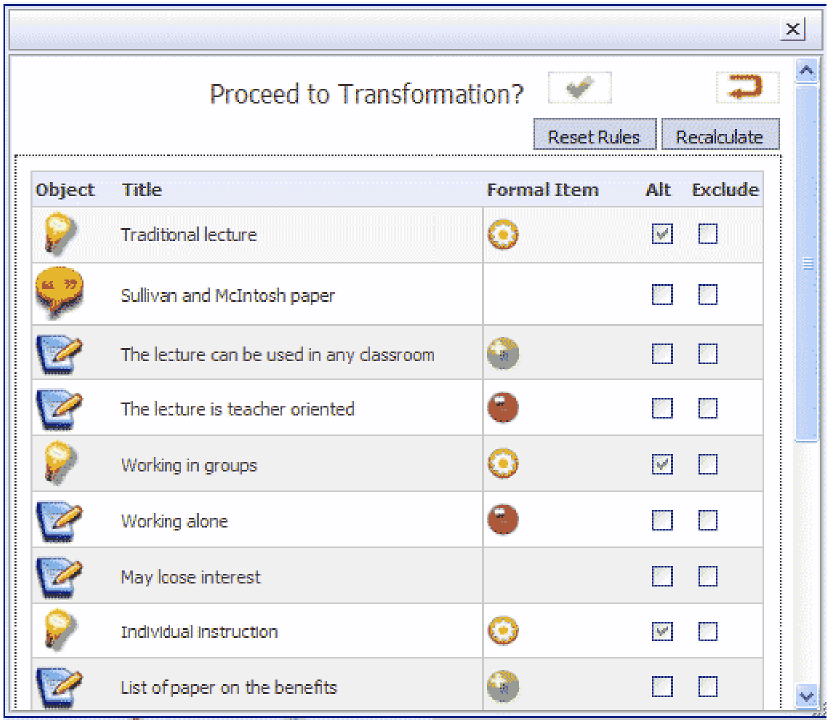
A CoPe_it! user has also the option to consolidate successive move actions on the same object in one action. Suppose that an object of a workspace has been successively (i.e. no other actions have been performed meanwhile on the other workspace objects) moved from point P_1 to P_2, ..., to P_N. Checking the **"Move Continuous Actions"** checkbox and pressing **"Move Next"** or **"Play"** when the object is at point P_1, would result to moving the object at P_N at once (omitting all the intermediate object moves). The opposite stands for the **"Move Back"** case.

Closing the Replay form results in removing the Replay canvas (and all "Replay" objects that have been created as a result of the execution of events in the Replay mode) and brings back the real workspace canvas as it was before the Replay function was used.

2.3 Filtering/Transformation to formal

2.3.1 Transform to Formal Projection

The previous version of CoPe_it! was based on a predefined set of rules when transforming the workspace from the informal to the formal projection. These rules were fixed and they were depicted in an appropriate picture when the particular action was selected. In this version, CoPe_it! supports the customization of the "formal to informal" object mapping in order to give the members the ability to exclude some objects from the transformation or change the transformation rules for one or more particular objects.



Object	Title	Formal Item	Alt	Exclude
💡	Traditional lecture	●	☑	□
💬	Sullivan and McIntosh paper		□	□
📝	The lecture can be used in any classroom	●	□	□
📝	The lecture is teacher oriented	●	□	□
💡	Working in groups	●	☑	□
📝	Working alone	●	□	□
📝	May loose interest		□	□
💡	Individual instruction	●	☑	□
📝	List of paper on the benefits	●	□	□

Figure 11: Customization of the transformation rules is now supported.

As depicted in the Figure 11, one can choose the items to be excluded from the transformation. Furthermore, it is possible to declare one or more items to be transformed to alternative solutions in the formal projection. In this way, the formal projection will be calculated based on the mapping that has been set by the user. Whenever the above table is altered, the user is able to preview all the requested transformations by pressing the "recalculate" button. Finally, it is possible to reset the changes to the initial (default) status by pressing the "reset" button.

Although customization of the transformation rules is a very powerful and useful option, CoPe_it! members have the ability to proceed to the formal projection using the existing (default) transformation rules. However, regardless of the selected way of transformation, CoPe_it! stores internally the "informal to formal" object mappings and reuses them each time a member wants to move from informal to formal projection without altering the map table.

2.4 Rating of items

The rating procedure enables users to evaluate a certain object. The rating of an object is done by assigning a score to it. More specifically, the score is defined by assigning a number of stars to an object. One star denotes poor rating while five stars denote top rating (in terms of importance/significance).

Before an object is rated, five gray stars appear next to its icon. Its initial score is assumed to be 0 (Figure 12a). After the users rate the object, the average score (out of the scores given by all users) is shown as a fraction and the corresponding amount of stars becomes gold (Figure 12b). A user may rate an object many times, but only his latest rating score will count for the average rating of the object.

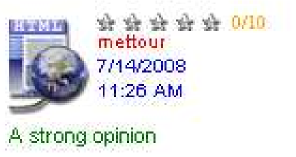


Figure 12(a): Before the object is rated – the overall score is 0

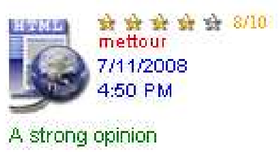


Figure 12(b): After the object is rated – the overall score is 8/10

The rating of objects allows one to easily distinguish which objects on the workspace are important and which are not.

2.5 Synchronized projections

CoPe_it! now supports a run-time synchronization of its informal and formal projections, thus keeping projections consistent (with respect to the collaboration items that appear on a workspace). Furthermore, members can now use the formal projection without loosing their work each time they leave the system. Thus, it is possible for a user to start a collaborative activity using the formal projection and then move back to the informal one and vice versa.

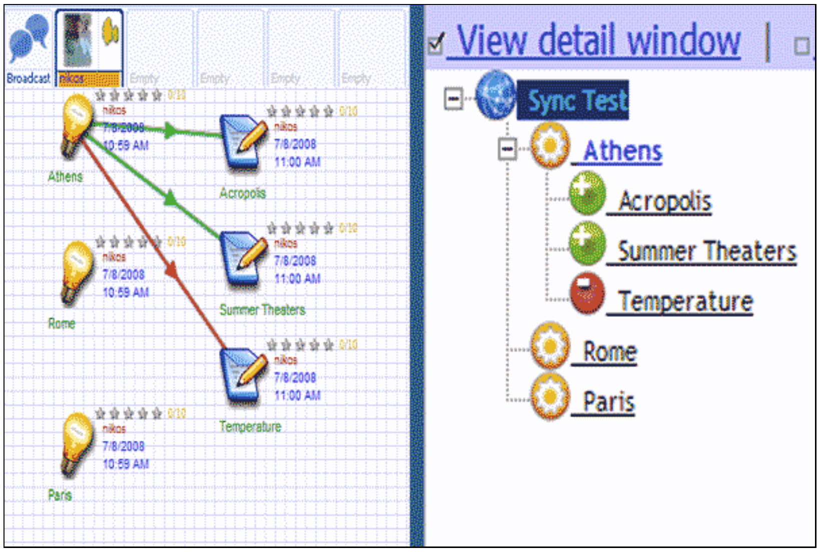


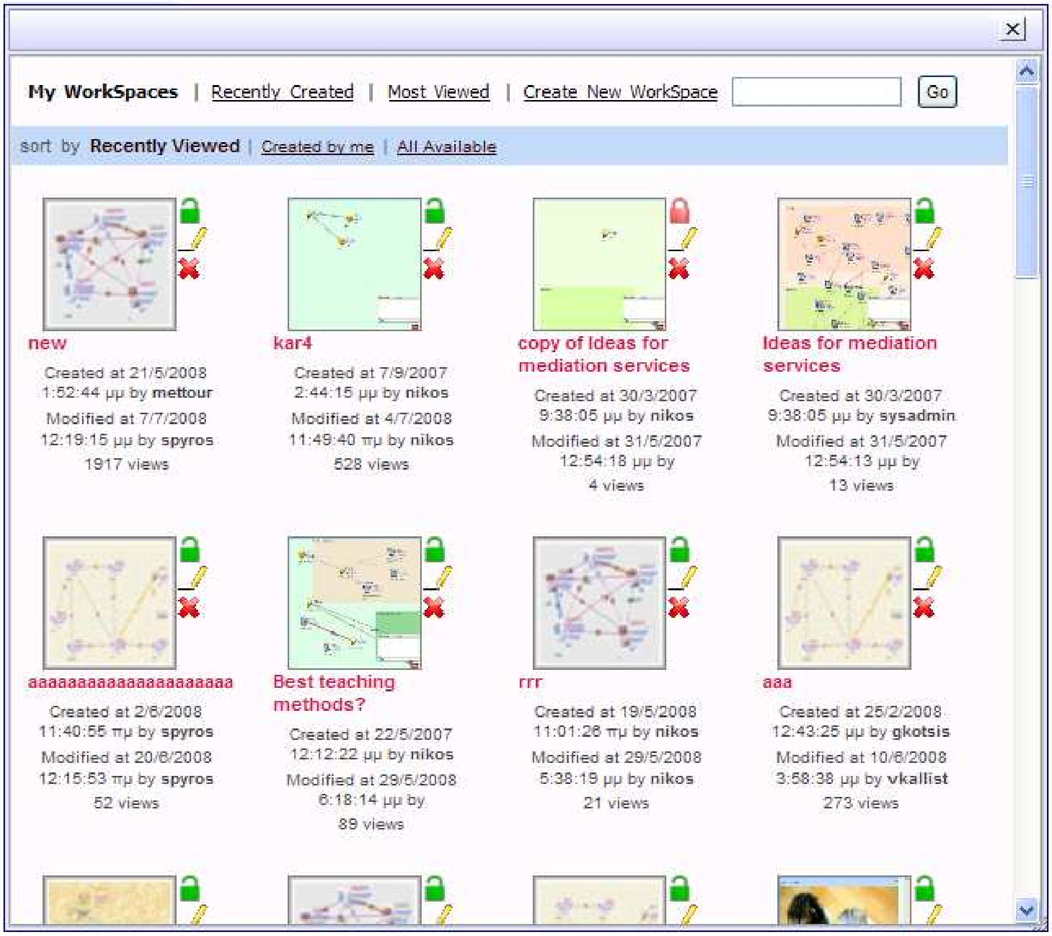
Figure 13: Formal and informal projections of the same workspace. This paradigm has been started from the formal projection.

As depicted in Figure 13, when starting from the formal projection, the synchronization procedure arranges the items in the informal projection in such a way that users will have similar views on both projections. While working in a workspace, whenever a new item is inserted in one projection, it is automatically inserted in the other projection as well.

2.6 User Interface improvements

2.6.1 Open Space

The simple scrollable list with all the available workspaces used in previous CoPe_it! versions has now changed to a new tabular view of workspace lists (Figure 14). This view allows members to have a very easy and fast way to access the workspaces and provides search capabilities as well. Furthermore, workspaces details have been enriched with information concerning the creation and modification date, the creator, the modifier and the number of total views.



My WorkSpaces | Recently Created | Most Viewed | Create New WorkSpace
Go
sort by Recently Viewed | Created by me | All Available

new
Created at 21/5/2008 1:52:44 μμ by mettour
Modified at 7/7/2008 12:19:15 μμ by spyros
1917 views

kar4
Created at 7/9/2007 2:44:15 μμ by nikos
Modified at 4/7/2008 11:49:40 πμ by nikos
528 views

copy of Ideas for mediation services
Created at 30/3/2007 9:38:05 μμ by nikos
Modified at 31/5/2007 12:54:18 μμ by
4 views

Ideas for mediation services
Created at 30/3/2007 9:38:05 μμ by sysadmin
Modified at 31/5/2007 12:54:13 μμ by
13 views

aaaaaaaaaaaaaaaaaaaaa
Created at 2/6/2008 11:40:55 πμ by spyros
Modified at 20/6/2008 12:15:53 πμ by spyros
52 views

Best teaching methods?
Created at 22/5/2007 12:12:22 μμ by nikos
Modified at 29/5/2008 6:18:14 μμ by
89 views

rrr
Created at 19/5/2008 11:01:26 πμ by nikos
Modified at 29/5/2008 5:38:19 μμ by nikos
21 views

aaa
Created at 25/2/2008 12:43:25 μμ by gkotsis
Modified at 10/6/2008 3:58:38 μμ by vkallist
273 views

Figure 14: The updated form to open a workspace under the "My Workspaces" option in the main menu.

Workspaces are now listed based on the following classification:

1. My Workspaces. Contains all the workspaces that have been accessed or created by the particular requestor. This list can be further filtered by presenting the **recently viewed** workspaces (default choice), the workspaces that have been **created by the requestor** or finally, by presenting **all the available** workspaces.
2. Recently Created Workspaces. This option, allows members to have direct access to the recently created workspaces within a Community. The displayed list can be ordered by the number of **views**, **the creation date**, **the modification date** and **the title**.
3. Most Viewed Workspaces. With this option, one can be informed about the most popular or active workspaces. This criterion can be applied in several periods of time: **this week**, **this month**, **this year** and **ever.**

Finally, the new form provides the user with the option to create a new workspace.

2.6.2 Left Bar

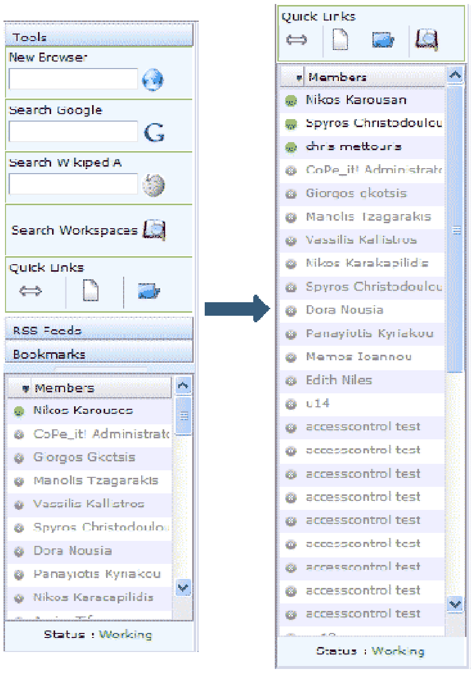


Figure 15: The old and new left bar of CoPe_it!.

The evaluation of CoPe_it! usage, along with the feedback from CoPe_it! communities, showed that the tools appeared on the left side of the main system's interface were not actually used. In order to make the environment more user friendly, the aforementioned options were removed and the left bar became simpler with only four shortcuts in the beginning (Figure 15). Moreover, the list of contacts is now filling the rest of the surface.

The available quick links in the left bar are:

1. Switch Community
2. Create new Workspace
3. Open a Workspace
4. Search for items in CoPe_it!

Furthermore, new options have been added such as that a user is able to view the past messages he/she has exchanged with a selected user from the contact list.

2.6.3 Selecting and dragging multiple objects

Due to the large amount of objects added on some workspaces, a need for an easy way to rearrange objects' positions on the workspace seemed to be urgent. Apart from dragging one object on the workspace, the CoPe_it! user is now able to drag multiple objects on the workspace canvas. Objects may be selected by using either of the two methods described below:

1. The user can hold down the CTRL key and click on an object. A green rectangle will appear around the object stating that the object is selected. Multiple objects may be selected by clicking on objects that are not already selected,

always holding down the CTRL key. Clicking on an already selected object causes the de-selection of the object. In order to drag all the selected objects, the user has to drag just one of the selected objects. During dragging, a copy of all selected objects is dragged (ghost objects), letting the original objects and relations still (reducing the effort needed by the browser to perform all the necessary object and relation repainting). When dragging ends, the original objects are moved to the appropriate positions, all the adjacent relations are redrawn and the ghost objects disappear.

2. By pressing down the left mouse button and drawing a rectangle, the user may select all the objects included in the rectangle (Figure 16). Objects dragging is performed as described in the method above.

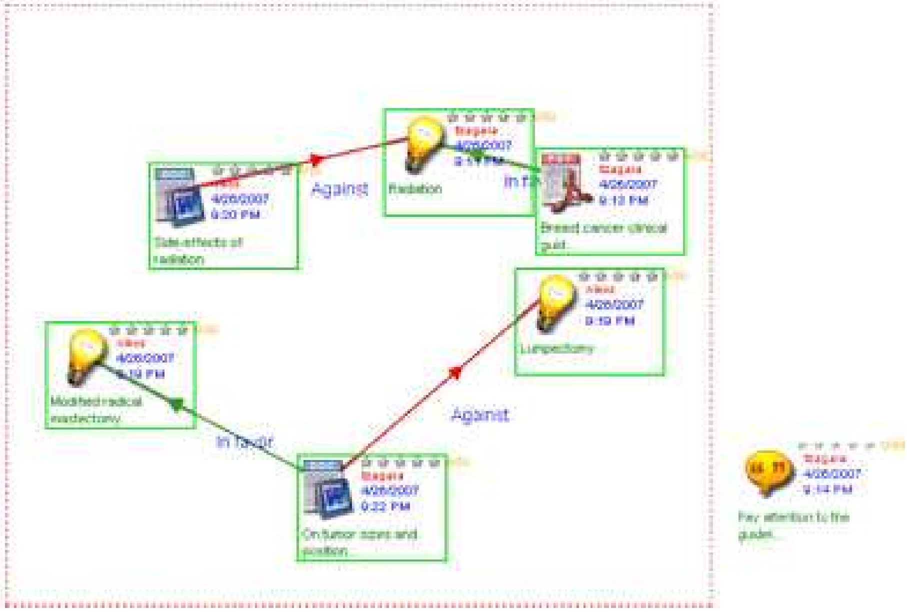


Figure 16: Selecting multiple objects by forming a rectangle on workspace.

Dragging an adornment is a special case of dragging an object. Adornments are used to group objects (objects and relations located on them), so dragging an adornment results in dragging everything placed within the adornment boundaries (Figure 17). Ghost objects are created (as described above) and disappear after dragging ends.

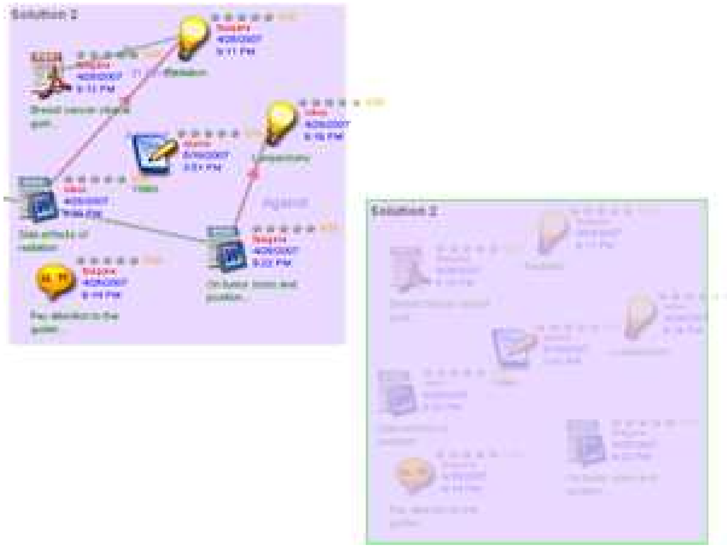


Figure 17: Adornment (and object/relation dragging)

2.7 RSS feeds support

The new release of CoPe_it! includes RSS (Really Simple Syndication) feed support. The link to the feed is found on every web page while browsing on the web site through the common feed indicator provided by most common browsers. The url for this feed is http://copeit.cti.gr/rest/rss/ and contains information concerning the most recent events that took place in CoPe_it!. This includes information like the users recently registered or public workspaces been last created. RSS feed conforms to common version 2.0 released under Creative Commons License[**].

2.8 Web services

In the current version, CoPe_it! has released a set of web services. These services are aiming at facilitating developers to make use of CoPe_it! functionality. The web services provided concern: searching, repository access, import/export and user management. Each web service is implemented with respect to web standards and is accessed through SOAP messages. It is worth noting that in addition to SOAP messages, a search RSS feed is available as well at web page: http://ws.copeit.cti.gr/searchRSS.aspx. Every web service provides several web methods which allow developers to perform actions on CoPe_it! without manually

[**] http://cyber.law.harvard.edu/rss/rss.html

accessing the CTI hosted web site. A thorough presentation and analysis of the above web services is provided at http://ws.copeit.cti.gr/, where documentation, technical information (like WSDL, DTD definitions etc) and examples of use are provided. The reader is encouraged to consult the aforementioned web page for further exploitation of those web services.

2.9 Native import/export

CoPe_it! allows users to export and import workspaces. Exporting is available for every workspace where users have “view” privileges. The export procedure includes downloading a zip file. This file contains an XML and several files corresponding to the content of collaboration items. More specifically, a Document Type Definition (DTD) has been designed to describe a collaboration space. Any application that complies with the above definition is able to create workspaces outside the CoPe_it! web site and import them. More information about the DTD definition and naming conventions for files is provided at http://ws.copeit.cti.gr/.

In the context of this work, and as a first application of the tool's generic Import/Export Service, we have already implemented the importing and exporting of workspaces created in a very popular application, namely Compendium (CoPe_it! workspaces are interpreted as 'maps' in Compendium). The above functionality is provided as a web service as well. For a detailed study, see http://compendium.open.ac.uk/developers/os_documentation.php.

3 Performance issues

The implementation of CoPe_it! relies heavily on the use of novel technologies that have been recently introduced in Web development. In particular, to achieve the level of interactivity and responsiveness required, CoPe_it! moves responsibilities that traditionally reside at the server to the client side. The tool achieves this by using asynchronous javascript and XML, an approach termed AJAX. In addition, CoPe_it! and in particular the informal projection, moves away from the concept of the 'page' that prevails in traditional web development, by introducing the "workspace" as the stage where presentation and interaction events occur.

Although the implementation approach that took place by CoPe_it! is characteristic of almost all Web 2.0 applications, it nevertheless introduces a model that differs from the model Web browsers were initially designed and implemented with. Web browsers assume page-based navigation and form-based interaction. The issue with this discrepancy is that it may introduce performance problems that affect the application's interactivity and ultimately harm users' tasks. Therefore, in the context of the development of CoPe_it! efforts concentrated on evaluating the performance of the tool in order to identify relevant issues, as well as to assess the limits of its consistent and smooth operation. The evaluation process attempted also to identify the relevant issues and limits taking into consideration the browsers of different vendors.

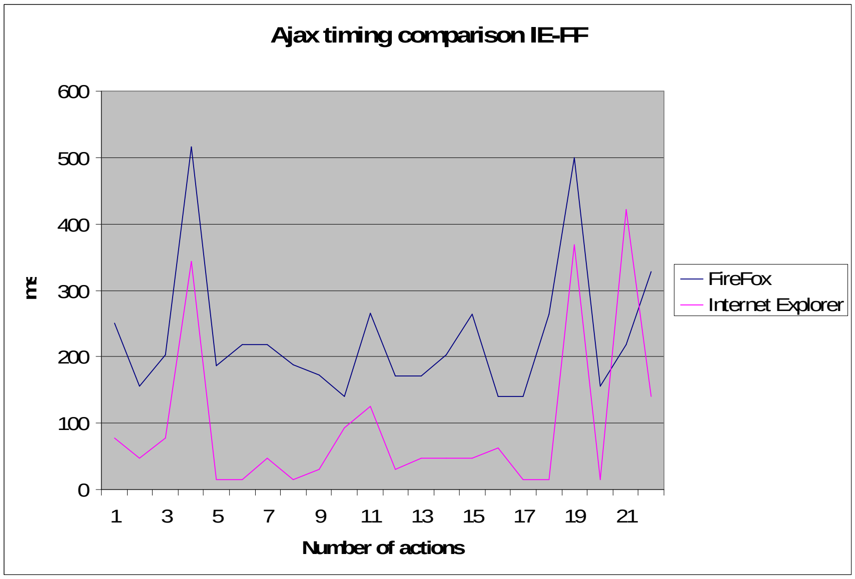


Figure 148: Time needed to execute various AJAX operation in a workspace.

Figure 18 illustrates the execution times of various operations that were conducted on a workspace. The figure illustrates the time for two browsers, namely FireFox v2 and Internet Explorer 7 (IE). The operations measured were random operations (that span the entire repertoire from moving an item, relating it, renaming it or adding a new one) that were carried out within a single workspace during the course of a session.

The analysis showed that almost all operations have the same completion time on the same browser, with IE having higher execution times: while the average execution time on FireFox is about 100ms, the same set of operations has an average of 200ms on IE. A notable difference is the 'move' operation, which exhibits high execution times. In Figure 18, the spikes represent the execution time of the 'move' operation that completes in about 300ms and 500ms on FireFox and IE respectively. The reason for this huge difference between the move and the other operations is due to the different type of AJAX requests deployed: while the AJAX request for the move operation is executed asynchronously, the AJAX requests for all other operation (rename, relate etc) are executed synchronously (this supports the claim that current Web browsers do not support asynchronous operations adequately well).

4 Future Development Plans

Future development plans cover a series of issues that fall into two categories: (i) issues related to bugs, known limitations of the current release and usability improvements, and (ii) issues related to the integration of new functionality. With respect to the latter, the table below summarizes the features/functionalities that we plan to add or improve. These features/functionalities are then elaborated in more detail.

FEATURES/FUNCTIONALITY	ADD	IMPROVE
Search related		
• extend the set of types supported		√
• take into consideration the semantic dimension of all CoPe_it! objects	√	
Workspace related		
• additional Views and Projections	√	
• exploit ranking of items	√	
• extend the supported abstraction mechanisms		√
• capturing instances of workspaces	√	
Personalization related		
• extend personalization services focusing on awareness and notification issues		√
Social space related		
• provide functionalities to allow a better coordination and monitoring of a CoP's actions	√	
Interoperability related		

• adapt internal aspects of CoPe_it! to facilitate interoperability efforts		√

Table 2: Features / functionalities to be added or improved.

Search related

- Currently, CoPe_it! permits simple keyword search that is restricted to the collaboration object type (only workspace items) and takes into consideration only one of their properties (their title). Future search functionality will extend the set of types supported, including workspaces and users. Moreover, formulating queries with multiple criteria taking into consideration more object properties (such as last access time or creator) will be possible.
- Future versions of the search functionality will take into consideration the semantic dimension of all CoPe_it! objects by exploiting the assigned tags that relate to ontologies, as well as the work being performed in WP5 with respect to "global search" scenario.

Workspace related

- Additional Views and Projections which will elaborate various visualization issues are foreseen. For instance, we foresee the implementation of a filtered view of workspaces aiding the appropriate "cleaning" of data intensive workspaces (other mechanisms will be also elaborated).
- Exploiting ranking of items as an alternative reasoning mechanism in the formal projection is also planned.
- Work towards further extending the supported abstraction mechanisms (e.g. aggregating and collapsing a cluster of items).
- Work towards capturing instances of workspaces.

Personalization related

- Although the current release provides a number of personalization services, future development steps aim at extending this set of services focusing on awareness and notification issues.

Social space related

- Work towards providing functionalities that allow a better coordination and monitoring of a CoP's actions (e.g. allowing a CoP coordinator to schedule specific activities, allowing a CoP member to view summaries of activities).

Interoperability related

- In order to seemingly interoperate with other tools in the Palette project, internal aspects of CoPe_it! need to be adapted to facilitate interoperability efforts.

Finally, we plan to work towards the development of the tool's set-up module (setting up CoPe_it! to a particular CoP setting; this involves selection and customization of various visualization, reasoning and user management issues).

The abovementioned development plans are the outcome of an ongoing brainstorming process within the CoPe_it! development team, which takes into account the Palette project's participatory design approach and exploits all the related testing of the tool. The priorities regarding their implementation are defined and revised through this very process.

5 References

[1] Ellis, C.A., S.J. Gibbs and G.L. Rein. January 1992. "Groupware : Some Issues and Experiences," Communications of the ACM, 34(1):39-58

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[4] Bruce Phillips: Should we take turns?: a test of CMC turn-taking formats, CHI '00 Extended Abstracts on Human Factors in Computing Systems, April 01-06, 2000, The Hague, The Netherlands.

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[6] Engin Bozdag, Ali Mesbah, Arie van Deursen: A Comparison of Push and Pull Techniques for Ajax, Technical Report, TU Delft, The Netherlands, 2007 (available from: http://swerl.tudelft.nl/twiki/pub/Main/TechnicalReports/TUD-SERG-2007-016.pdf).

[7] Egloff, Andreas. "Ajax Push (a.k.a. Comet) with Java Business Integration (JBI)" JavaOne 2007, San Francisco, California (2007-05-05). Retrieved on 2008-06-10

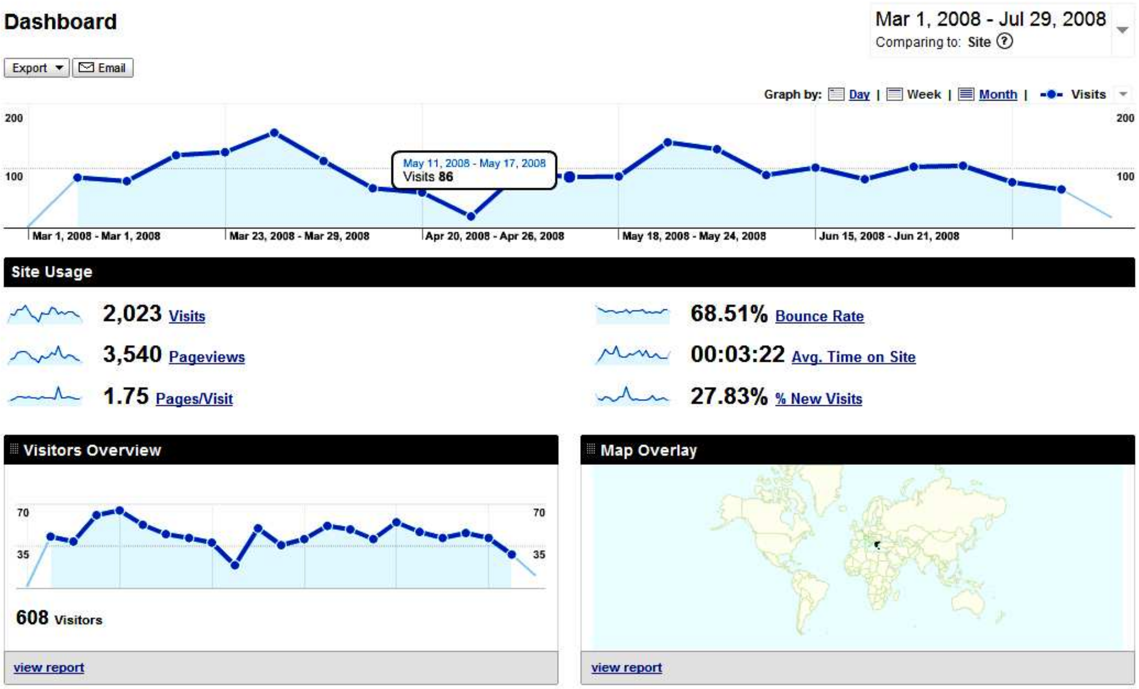
Appendix A: Some figures about the tool's active use

For the period **01/03/2008 - 29/07/2008:**

- 115 different users from 240 different IPs have participated in CoPe_it!.
- Total actions (create, open, move, update, link, or delete a collaboration object) performed in the Desktop View Collaboration Workspaces are 20,816.
- 55 Collaboration Workspaces have been created (some of them have been deleted), while 1,527 items have been uploaded on these spaces.
- Total active Collaboration Workspaces are 561, out of which 411 are private and 150 are public.
- 38 communities have been created, namely: "Test Community" (20 members), "Earth" (353 members), "learn-nett" (13 members), "TeL" (9 members), "Teachers in the four cardinal points" (15 members), "Real-E-Learning" (2 members), "Curriculum M&T" (6 members), "Greenhouses" (9 members), "Malengrez's Familiy" (1 member), "Community Deborah" (2 members), "teimess" (27 members), "sxolia" (1 member), "testing cop-it!" (4 members), "LucoSpace" (2 members), "Mike com" (1 member), "My team" (4 members), "CopeitCom" (1 member), "ELO COM" (1 member), "acompagnement" (1 member), "Team Lyon" (1 member), "Soleil Vert" (9 members), "Scenarisation Did@cTIC" (4 members), "SecurityCouncil" (59 members), "Cope-learning" (2 members), "CoPeL" (4 members), "my new community" (2 members), "Renewable Energy" (15 members), "Sandbox" (1 member), "ADIRA" (1 member), "Ajax" (1 member), "Skuska" (3 members), "CoP2" (8 members), "MZ" (2 members), "Medical Association" (8 members), "Cope_it! Learning" (2 members), "copeit evaluation" (3 members), "Testers of Pathways" (9 members), "EUROAVIA" (12 members).

Appendix B: Google Analytics

CoPe_it! has been registered with "Google Analytics" (http://www.google.com/analytics), a free web site statistic tool that provides useful information about how many people visited a site, how they found it, how they explored it, etc. On July 29th, 2008, a number of 2023 visits and 3540 page views have been recorded since March 1st [††](Figure 19).



Dashboard

Mar 1, 2008 - Jul 29, 2008
Comparing to: Site

Site Usage

2,023 Visits
3,540 Pageviews
1.75 Pages/Visit
68.51% Bounce Rate
00:03:22 Avg. Time on Site
27.83% % New Visits

Visitors Overview

608 Visitors

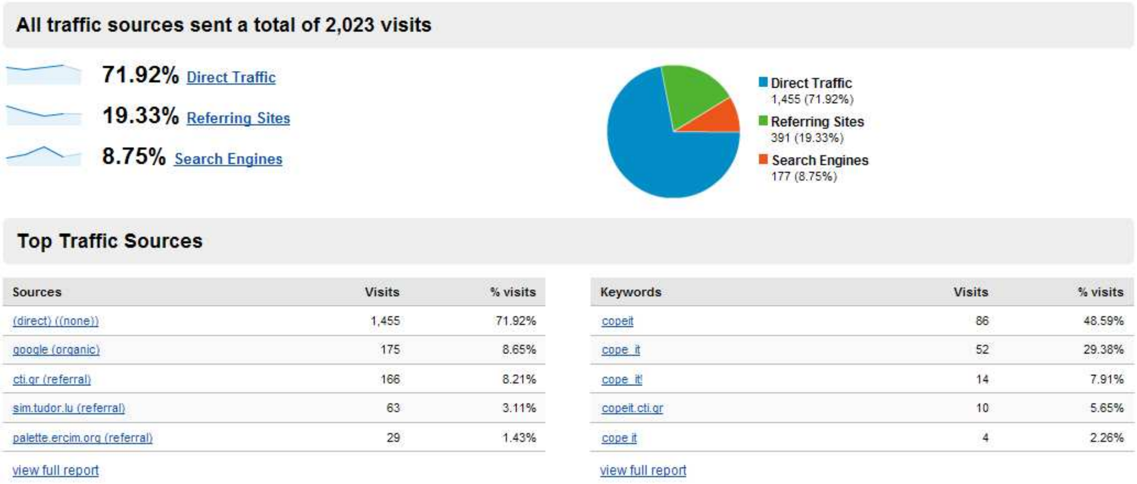
Map Overlay

Export
Email
Graph by: Day | Week | Month | Visits
200
100
200
100
May 11, 2008 - May 17, 2008
Visits 86
Mar 1, 2008 - Mar 1, 2008
Mar 23, 2008 - Mar 29, 2008
Apr 20, 2008 - Apr 26, 2008
May 18, 2008 - May 24, 2008
Jun 15, 2008 - Jun 21, 2008
70
35
70
35
view report
view report

Figure 19: Number of daily visits in CoPe_it!

Moreover, as shown in Figure 20, a percentage of 71.92% of the whole traffic of the site comes directly, while a portion of 19.33% stems from referring sites.

[††] when CoPe_it! second operational version was released.



All traffic sources sent a total of 2,023 visits

71.92% Direct Traffic

19.33% Referring Sites

8.75% Search Engines

Top Traffic Sources

Sources	Visits	% visits
(direct) ((none))	1,455	71.92%
google (organic)	175	8.65%
cti.gr (referral)	166	8.21%
sim.tudor.lu (referral)	63	3.11%
palette.ercim.org (referral)	29	1.43%

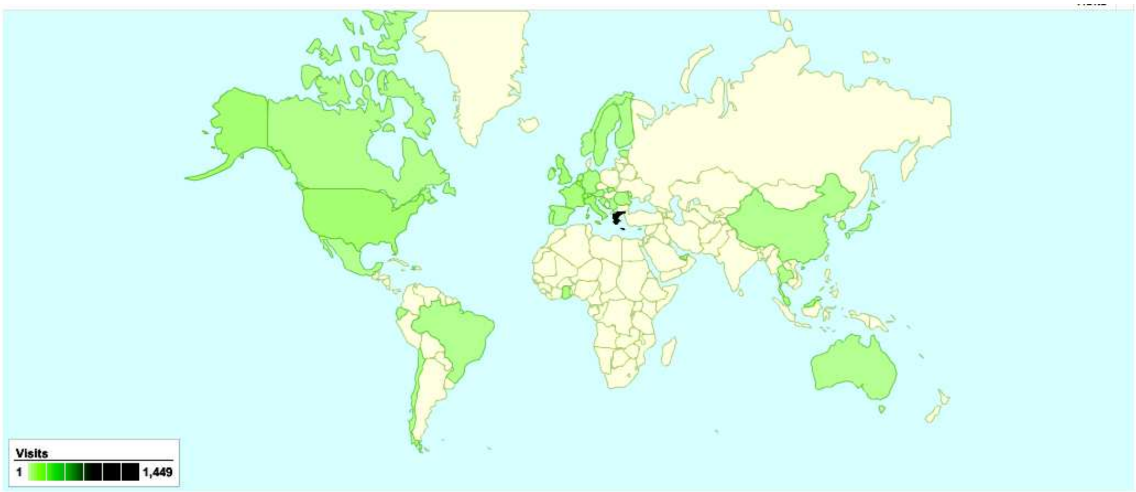
view full report

Keywords	Visits	% visits
copeit	86	48.59%
cope_it	52	29.38%
cope_it!	14	7.91%
copeit.cti.gr	10	5.65%
cope it	4	2.26%

view full report

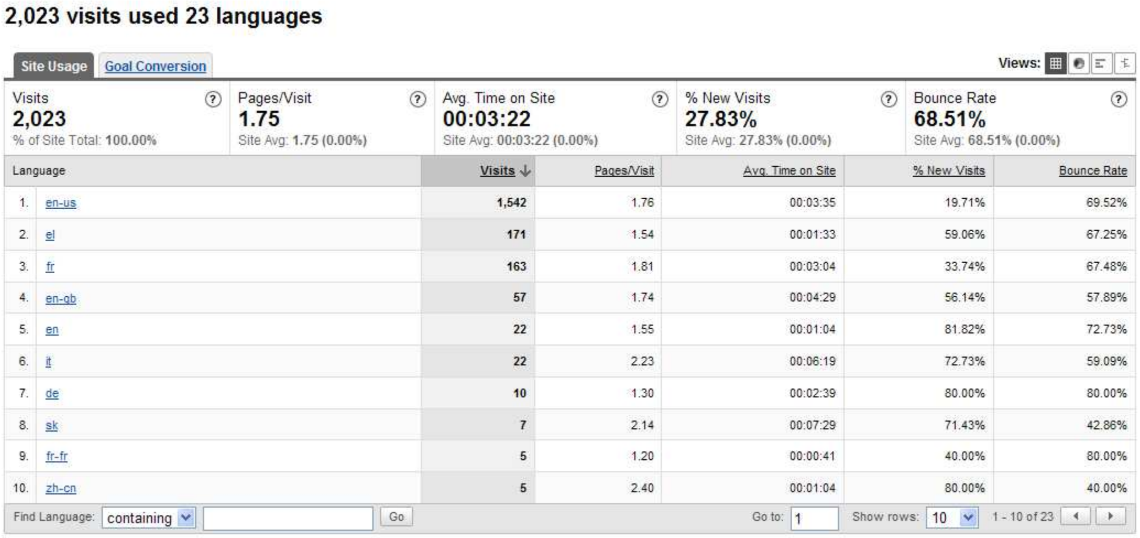
Figure 20: CoPe_it! traffic sources

Worth mentioning is the fact that CoPe_it! users come from a number of 40 countries/territories all over the world (Figure 21). Finally, CoPe_it! users have used browsers in 10 different languages (Figure 22).



2,023 visits came from 40 countries/territories

Figure 21: CoPe_it! visits from different countries



2,023 visits used 23 languages

Visits	Pages/Visit	Avg. Time on Site	% New Visits	Bounce Rate
2,023	1.75	00:03:22	27.83%	68.51%
% of Site Total: 100.00%	Site Avg: 1.75 (0.00%)	Site Avg: 00:03:22 (0.00%)	Site Avg: 27.83% (0.00%)	Site Avg: 68.51% (0.00%)

	Language	Visits ↓	Pages/Visit	Avg. Time on Site	% New Visits	Bounce Rate
1.	en-us	1,542	1.76	00:03:35	19.71%	69.52%
2.	el	171	1.54	00:01:33	59.06%	67.25%
3.	fr	163	1.81	00:03:04	33.74%	67.48%
4.	en-gb	57	1.74	00:04:29	56.14%	57.89%
5.	en	22	1.55	00:01:04	81.82%	72.73%
6.	it	22	2.23	00:06:19	72.73%	59.09%
7.	de	10	1.30	00:02:39	80.00%	80.00%
8.	sk	7	2.14	00:07:29	71.43%	42.86%
9.	fr-fr	5	1.20	00:00:41	40.00%	80.00%
10.	zh-cn	5	2.40	00:01:04	80.00%	40.00%

Figure 22: CoPe_it! visits from browsers in different languages