

# **A CAMPUS WIDE SET UP OF QUESTION MARK PERCEPTION (V2.5) AT THE KATHOLIEKE UNIVERSITEIT LEUVEN (BELGIUM) – FACING A LARGE SCALE IMPLEMENTATION**

Dirk Cosemans, Leen Van Rentergem,  
An Verburgh, Arnoud Wils



# A Campus Wide Setup of Question Mark Perception (V2.5) at the Katholieke Universiteit Leuven (Belgium) – Facing a Large Scale Implementation

Dirk Cosemans  
Leen Van Rentergem  
An Verburgh  
Arnoud Wils  
(Toledo Team)  
Katholieke Universiteit Leuven  
B-3000 Leuven  
Belgium

leen.vanrentergem@cc.kuleuven.ac.be

## Abstract

The first part of this paper outlines the drawbacks of a large scale implementation of Question Mark Perception's assessment software (QMP). The default publishing procedures offered by QMP, i.e. ODBC or disk sharing, do not meet the needs of global Internet accessibility and security. Academic staff members had to upload their session files by completing a web form; publishing requests were handled manually by members of the Computing Center's staff.

As on the server side all question and session records were stored in one single database, and graphics and multimedia files reside in one directory on the server, a cumbersome system of naming conventions was necessary to prevent files and database records from being overwritten.

While creating questions with QMP's authoring application – Question Manager – authors wanting to refer to graphics or multimedia files had to insert in a non-intuitive way the pathname of the graphics directory on the server.

Moreover QMP's server software never commits a delete transaction in the question database. This caused major problems for authors reloading assessments to the central database after having deleted one or more questions.

To cope with these problems the Computing Centre of Leuven University has developed an upload application for use by the academic staff members. This application, which is described in detail in the second part of this paper, meets the constraints of a campus wide setup of QMP's assessment software.

## CAA at Leuven University

The setup of a computer assisted assessment system at Leuven University is in line with the University's pedagogical benchmark of 'guided self study'. In addition from this academic year onwards the evaluation system moved from a year based towards a semester based system with students passing their final examinations at the end of each semester. This raised the need for a formative assessment system enabling the students to evaluate themselves on a permanent basis keeping track of the offered learning content.

For that reason each first year course should provide at least one formative assessment, offering not only questions relative to the learning content but also appropriate feedback. An assessment platform was considered to be valuable to support this new exam system, mainly because it offers the possibility to provide individual feedback to large groups of students. The increased staff workload hardly allows for a large scale individual feedback in a paper-and-pencil situation.

At Leuven University QMP's assessment platform is closely interconnected with Blackboard, the overall learning software platform. Both the e-learning and CAA platforms were set up and are managed by the 'Toledo' team. 'Toledo' is the acronym for 'TOetsen en LEeren DOeltreffend ondersteunen' ('supporting assessments and learning in an effective way').

The campus wide and centrally managed assessment environment at Leuven University is on line accessible for both students and the academic staff. At this moment 241 assessments (5300 questions) relating to about 45 of the approximately 600 courses have been published. It is very likely that in the near future the number of assessments will increase.

## Constraints of a Large Scale Implementation of Question Mark Perception Assessment Software

### Architecture of Question Mark Perception Assessment Software

QMP version 2.5 comes with a server application and an authoring tool. The server software allows the students to take assessments through a web interface. On the server side, content relating to questions and assessments as well as the students' answers are held in a database; the multimedia material used in the questions is stored in a single directory. QMP's reporting tool allows academic staff members to view assessment results in a web interface.

The Perception authoring tool is a windows based application which runs on the author's PC. He can use the tool to prepare questions and assessments in a user friendly desktop environment. The authoring tool comprises two applications, the *question manager* enabling authors to design questions, classify them by topic, and store them in a question database residing on his own workstation, and the *session manager* allowing the assembly of assessments from the questions residing in the local question database.

To enable academic staff members to preview their assessments in 'real life' – i.e. as they will be presented to the students, with intended order and presentation of questions, and proper display of graphics – at Leuven University QMP's server software runs on two servers. On the *preview server* assessments are stored for previewing, checking, fine tuning and reloading purposes. Finally assessments are stored on the *production server* where they are available for the students. (see Appendix, Diagram 1. Question Mark Perception Server Setup at K.U.Leuven)

## The Constraints

As experiences at Loughborough University (UK) have made clear (Danson, 2001) a large scale implementation of Question Mark Perception software has its drawbacks.

### Publishing route

An assessment has to be published on a server enabling authors to preview the presentation of the assessment in a web browser and to check if questions are presented appropriately.

In order to publish to the server, QMP offers two work flows.

The first option is to enable academic staff members to save content relating to questions and sessions directly in the central question and session database on the server side. As a consequence assessment authors need direct write access to the server disk via a mapped network drive. It is clear that this publishing flow causes major security problems and in a large scale implementation possibly allows for database damages.

Moreover in QMP's server architecture multimedia material is not held in the central database but is stored in a single directory on the server. In order to allow authors to upload multimedia and graphics files, on the server side a sharing of Perception's multimedia directory has to be defined. As this causes major problems of files being overwritten by others with the same name this option is not satisfactory.

In the second publishing setup mode authors publish assessments via an ODBC link. Without taking into account the complexity of using and setting up ODBC, let alone the security problems of an ODBC Oracle link, this publishing route is neither a solution that is compatible with a campus wide implementation of QMP. There is no need to argue that an ODBC link offers any solution for the upload of multimedia and graphics files to QMP's multimedia directory on the server.

To cope with these problems, in Leuven the following workaround has been defined. In order to preview their assessments, authors had to complete a web form indicating not only the names of the local session and question database files, but the multimedia files which are referred to in the assessment as well. On submitting the form, the files were sent via an ftp connection to a holding area on the preview server. A member of the Toledo

team, on receiving a file transfer notification, opened the assessment databases on his own workstation with QMP's client software (Assessment Manager) and manually performed an upload transaction. Multimedia and graphics files were copied manually to the appropriate directory on the Perception server. Several times a day this kind of manual intervention was needed.

Authors could then preview their assessments on line, modify and republish them by filling in the web form as stated above until the assessment was displayed as intended.

(see Appendix, Diagram 2. Publishing route - Question Mark Perception)

At that moment authors sent a final publication request to a Toledo team member, who manually uploaded the assessment to the production server where it was available for students.

This procedure not only is expensive with regard to staffing issues but also causes preview delays for assessment authors. After sending a publication request authors had to wait until a Toledo team member would have published their assessments to the server.

### Naming Conventions

QMP's database design does not allow for the multiple entry of session names, topic names and subtopic names. Moreover all graphics and multimedia files are stored in one directory on the server. In order not to lose overview and to avoid files and database records being overwritten, a cumbersome system of naming conventions was necessary.

Academic staff members were asked to prefix session names, topic and subtopic names with their university intranet userID and course code. As all multimedia files which are referred to in assessments are stored in a single server directory, they too had to be prefixed in the same way to avoid them being overwritten.

These naming conventions created a supplementary threshold for new QMP users.

### Referring to Graphics and Multimedia Files

While creating questions with Perception's authoring application – Question Manager – authors wanting to refer to graphics or multimedia files had in a non-intuitive way to insert the pathname of the server's graphics directory where multimedia files would be stored once the assessment would be available for students. As a consequence when trying out the assessment locally, graphics and multimedia files were not shown appropriately as their paths pointed to a server location.

And the reverse is even worse, when an author in an intuitive way pointed to graphics files by entering in Question Manager the local pathname (e.g. 'c:\perception\graphics\') he might be surprised that after publishing, the graphics were not displayed. In that case a lot of time consuming correction had to be done by the Toledo team members to get things right.

## Republishing Issues

In a testing phase, teachers often republish their questionnaires. Existing question and session entries were overwritten during the republishing process, but no questions were deleted. As a consequence an author who had reworked a session by suppressing some questions saw those questions reappear in his reworked session. In this case Toledo staff members had to intervene manually to delete unwanted questions in the assembled question database on the server, which contains thousands of questions and hundreds of topics. This intervention was also a time consuming and risky transaction.

## Secure Access to Assessment Reports

At K.U. Leuven didactical teams are involved in on-line assessments. Not only the teachers are concerned but also monitors – assisting students in a more individual and personalised way – and assistants who are in charge of practical sessions and exercises. To give adequate feedback to the students they all need a secure, course specific access to QMP's reporting tool which presents the session results.

As information about relationships between didactical team members and courses is lacking in the K.U. Leuven administrative databases, for each course a unique user ID and password has to be created in QMP's security database. This secure access information has to be passed to all didactical team members, enabling them to log in and view the assessment reports containing results from individual students and assessment statistics relating to the courses they are responsible for.

On uploading an assessment to the server session database, a Toledo team member had to verify in the security database if an account for the course to which the assessment related already existed. If not he had to create a new course account using the web based Security Manager application. This operation was again manual work to be performed for every course for which assessments were published.

## Perception Upload Application

To cope with these problems the Toledo Team has developed a special tool for use by the academic staff members, i.e. the 'Perception Upload Application'. This application attributes unique names to sessions, questions, topics, graphics and multimedia files, stores question and session entries in the Oracle database on the server, changes the local pathnames of graphics and multimedia files to the server pathname, creates a user account in QMP's security database, and returns a url pointing to the assessment ready for paste into Blackboard's learning environment, along with a user ID and password to access QMP's reports on the sessions which have been published.

In line with the well known client server two tier model, the upload application consists of a client running on the user's local workstation and an application on the server side.

## Upload Client

The Perception Upload Client (PUC) offers the user an on screen form (see Appendix, Figure 1. Upload Client) asking him to specify:

- the names of the question and session databases to be uploaded;
- his/her K.U. Leuven intranet user ID;
- the course code to which the assessment applies.

On submitting the form, the Upload Client creates a package file, an archive which not only contains the question and session data but multimedia and graphics files which are referred to in the assessment as well.

How does the client software proceed ?

1. PUC copies the session and the question database to its temp directory, which is emptied just before copying starts. All following operations are performed on the database copies, preventing the original files from functioning improperly on the user's workstation;
2. The client software delves into the databases and does some renaming: session names, topic and subtopic names are prefixed according to the naming conventions we described earlier;
3. Next a smart procedure is launched to ensure the proper display of the graphics and multimedia files in the on line assessments. In this respect the upload client software scans the 'QML' encoding of each question.

When saving a question to Perception's question database, all necessary question attributes (question type, question wording, possible choices, scores, feedback) are encoded in a specific xml format suited to describe questions. This format has been developed by Question Mark as an open standard to provide greater growth opportunities for everybody working with test and assessment software ([http://www.questionmark.com/perception/help/v3/xml/qml\\_index.html](http://www.questionmark.com/perception/help/v3/xml/qml_index.html)). As Perception's server software reads the question database and interprets the information in order to display the questions in a web browser, processing is actually done on the QML text.



Scanning the questions' QML encoding, the upload client looks for references to graphics and multimedia files. These references can be retrieved easily because they are enclosed between fixed QML (e.g. `<CONTENT TYPE=' images/'>figure1.gif</CONTENT>`) or HTML tags (e.g. `<IMG SRC=' c:\myassessments\mygraphics\figure1.gif' >`) as QMP allows authors to introduce HTML encoding while designing questions. Pointers to external files (e.g. external images, very big multimedia files that are better served elsewhere) are skipped. If the client encounters references to local (i.e. residing on the user's workstation) multimedia and graphics files, the following operations are performed:

- a. the client software fetches the files, copies them into the upload archive, and prefixes them according to the naming conventions;
  - b. in the questions' QML encoding the local pathnames of the graphics and multimedia files are changed to the server paths pointing to the directory in which the files will be stored once the assessment will be available on the server. No need anymore for assessment authors to refer to graphics or multimedia files by pointing to the server's graphics directory. A pointer to their local graphics directory is fine and has the advantage that graphics will be displayed properly when authors preview questions during design on their local workstation.
4. After opening an ftp connection to the server, the package file is sent to the server, where it is being interpreted by the upload server application.

## Upload Server

The upload server application unzips the archive file and checks if the assessment exists already in the session database. If so, all references to the questions are deleted. This delete operation makes sure that questions which are withdrawn in a reworked session which is uploaded a second time will never reappear in the on line assessment.

The application continues by inserting question and session records to the databases on the server. Graphics and multimedia files are copied to the appropriate server directory.

The next step, yet to be implemented, is to verify and adjust security settings in Perception's security database to make sure that academic staff members can access the result reports for the assessments relating to the courses they are in charge of. Operations to be performed are:

- creation of a group in the security database; at Leuven University for each course for which an assessment has been published, a group is created;
- creation of a course specific user account with 'read only' access to results reports relating to assessments of the course group; to ensure secure access a password needs to be generated, encrypted and stored in the security database; to encrypt passwords before saving them in the database Question Mark announces on their web site an

encrypt.dll  
(<http://www.qmark.com/perception/help/v2/kbase/prog016.html>).  
Unfortunately, up to now we have yet to receive an answer from Question Mark to our query about obtaining conditions. For that reason we have yet to implement the security settings step in the upload server application.

After successfully finishing the processing, the upload application passes an on screen message to the academic staff member who sent the publication request displaying a clickable url pointing to the web page on which he can preview his assessment on-line. Users receive this information also via e-mail. Staff members are free to modify their sessions and questions with QMP's authoring software, and re-upload their assessments several times.  
(see Appendix, Diagram 3. Publishing route to preview server – Upload Application)

When authors are satisfied with the preview version of their assessment, they send a final publication request using the upload client application. This request is handled in much the same way as stated above, except that the system administrator receives an upload request notification, and explicitly has to grant upload permission to the upload application. This step is built in for security reasons permitting the administrator to control the publishing flow, to intervene if necessary, and eventually to decide to withdraw upload requests. It is clear that after the final publication request all transactions are performed on the production server (see Appendix, Diagram 4. Publishing route to production server – Upload Application)

### Technical Specifications of the Perception Upload Application

The upload client and upload server applications are written in Delphi6 programming language (<http://www.borland.com/delphi/>).  
Indy v9.03B is used to define all network related connections (ftp, tcp, etc.) (<http://www.nevrona.com/Indy/>).  
The databases (MS Access 97 on Preview Server, Oracle 8i on Production Server) are accessed via the ADODB (Active Data Objects DataBase) protocol. It is a database wrapper library, and is useful to ensure portability. It provides a common API to communicate with any supported database.

### References

Danson, M., Dawson, B. and Baseley, T. (2001) *Large Scale Implementation of Question Mark Perception (V2.5). Experiences at Loughborough University* in Danson, M. and Eabry, C. (eds.) Fifth International CAA Conference. Proceedings. Loughborough University.

Appendix

Diagram 1. Question Mark Perception Server Setup at K.U.Leuven

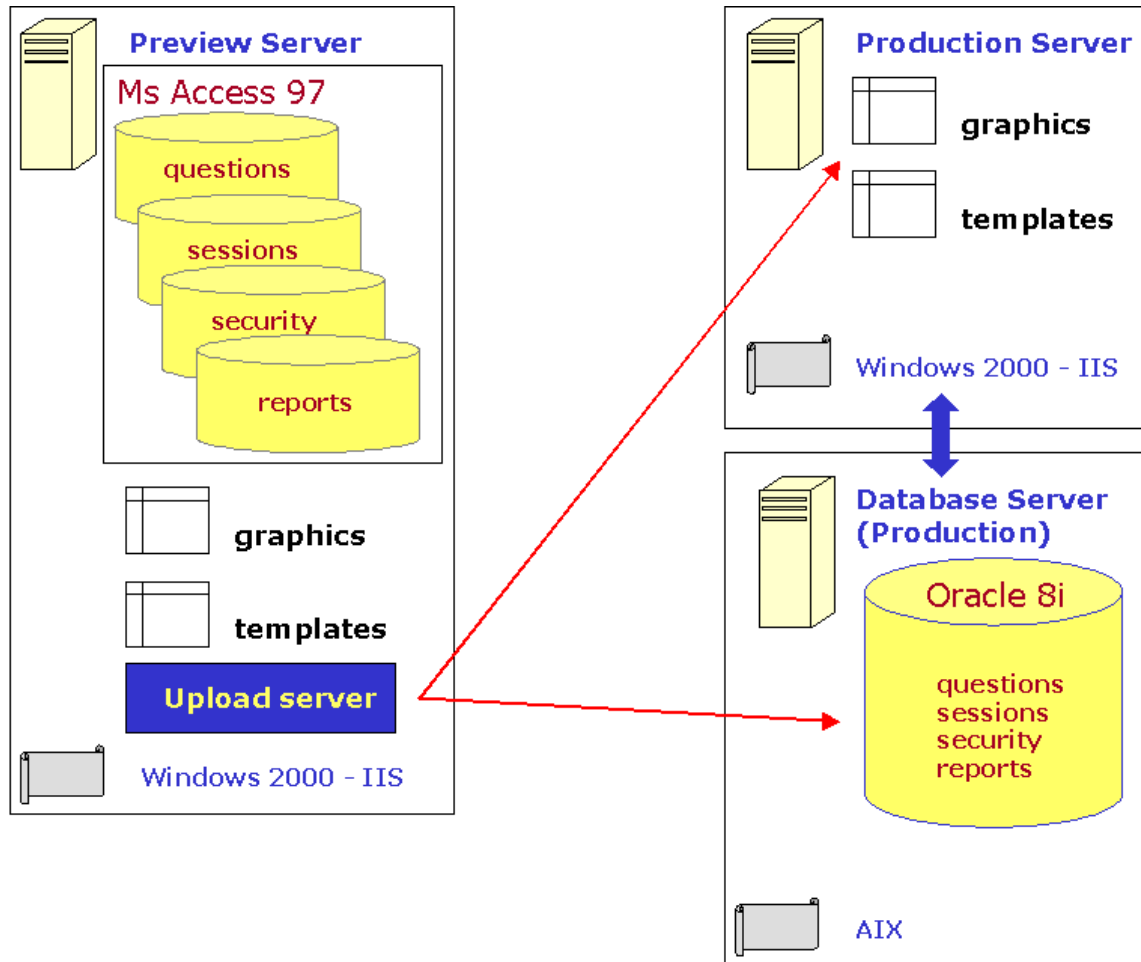


Diagram 2. Publishing route - Question Mark Perception

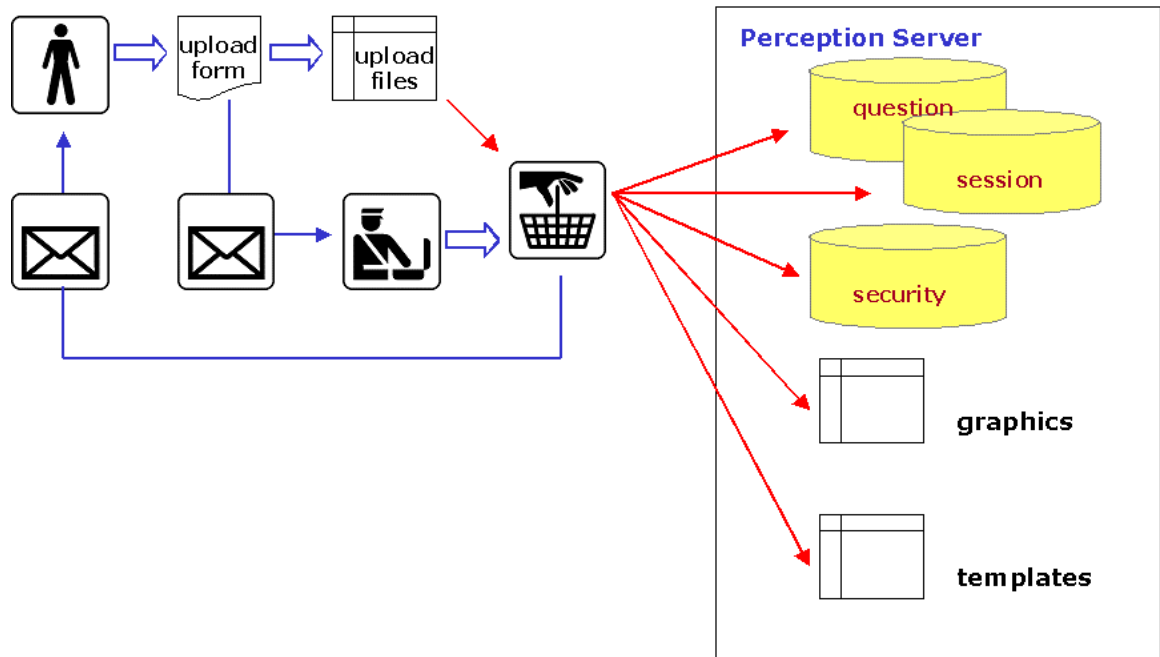


Figure 1. Upload Client

The screenshot shows the 'Perception Upload Client' application window. The title bar includes the application name and standard window controls. The menu bar contains 'File', 'Options', 'Help', 'Info', and 'Debug'. The main interface is divided into two sections: 'Send to test server' and 'Publish'. The 'Send to test server' section contains three sub-sections: 'Select databases' with fields for 'Question database (.question file)' and 'Session database (.session file)', each with a 'Select' button; 'Teacher (Intranet UserID)' with a text input field; and 'Assessment information' with fields for 'Assessment name:' and 'Course number:'. The 'Publish' section on the right contains fields for 'Sender (Intranet UserID):' (with 'uid2' entered), 'Password:', 'E-mail:' (with 'youremail@dep.kuleuven.ac.' entered), and a 'Publish' button. At the bottom right, there is a logo for 'TOLEDO KU LEUVEN'.

Diagram 3. Publishing route to preview server – Upload Application

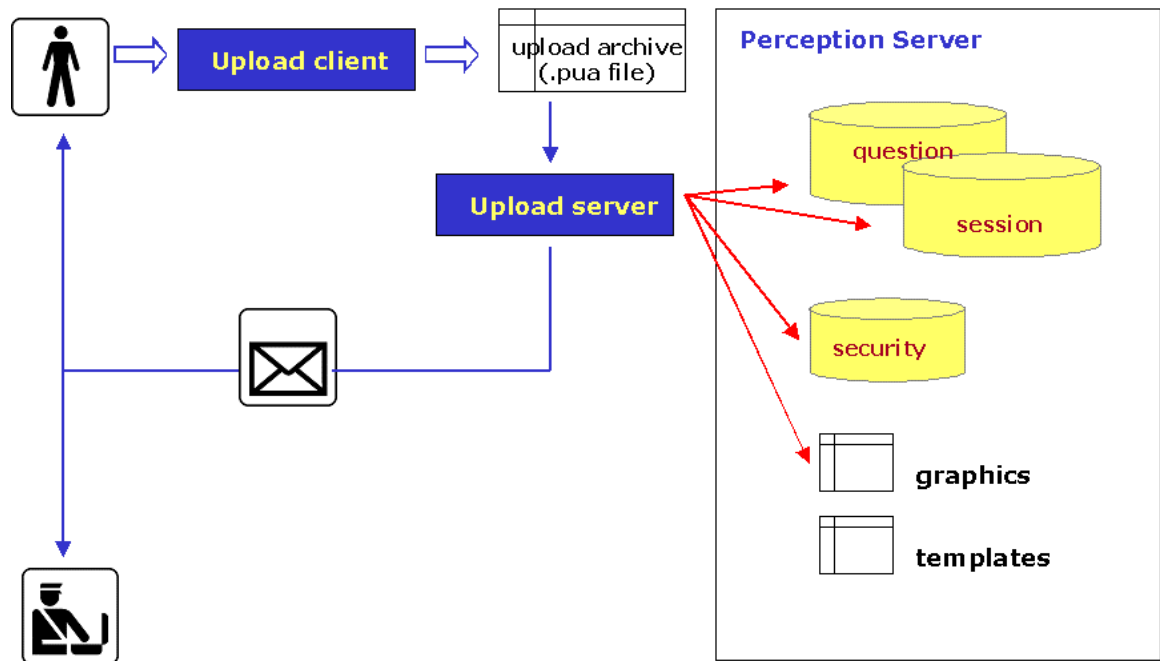


Diagram 4. Publishing route to production server – Upload Application

