THIN CLIENT USAGE IN LONG-TERM ARCHIVATION ENVIRONMENT

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Introduction

Long-term archive (‚LTA') service has been based upon existence server and a client, where client side has been solved by thick client installation. So far, thick client is represented by application interface, which is directly communicating with LTA. In fact, it is using LTA Protocol (‚LTAP') to receive, generate, and transmit eXtensible Markup Language (‚XML') commands over the network. Even though thick client solution is stable, robust, and precisely coded, LTAP XML processing could be also performed by web server engine. This type of solution would enable users to use thin clients on their sides. Both solutions have their advantages and disadvantages which will be compared later on. Nevertheless this article will focus mainly on thin client, as a new approach to the LTA communication within LTAP.

1. Strong and Weak Sides of Thin Client Solution in LTA Environment

Both thin and thick clients derive benefits from universality of XML format. At the beginning it is necessary to compare its advantages and disadvantages (see Tab. 1). However it is still difficult to find clear winner between these two ways of communication. A spread among users depends on local conditions, but from very beginning it is clear that the implementation of the thin client will be much easier.

Before we perform implementation it is necessary for us to know following:

- Computers' hardware configurations, operating systems.
- Network configuration and organization scheme (departments etc.).
- Classification of users who have access to LTA services.
- Supposed type of data intended to store to the LTA.

2. LTA Thin Client Working Background in Greater Detail

Underlying idea of thin client functionality within LTA system is quite simple. LTA user using previously defined type of thin client (web browser in this case) will connect to the LTA. In detail, LTA user using appropriate thin client will connect to the secured web site running on web server with Hypertext Preprocessor (‚PHP') engine. After successful authentication process, certain LTA user will gain access to LTA services according to the rules set for the user group he belongs to (see Fig. 1).

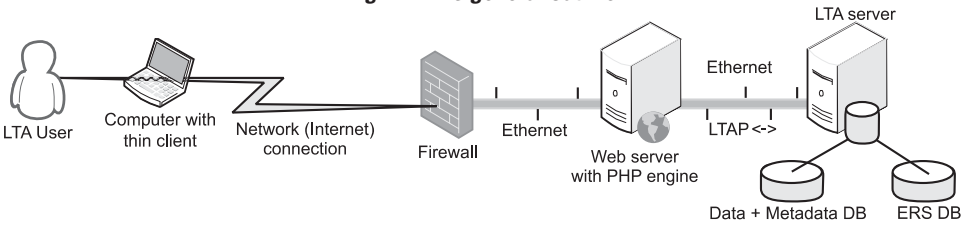
In general, web server is just handling LTAP XML commands for the user, the same thing thick

Tab. 1: Advantages and disadvantages of the thin client in LTA environment

Advantages	Disadvantages
Operating system independent	Need of web server mediator with PHP engine for processing
Most of the processing is done on server side	Possible slight functional differences among different web browsers
Lower hardware requirements	Possible longer request/response processing time
No need for additional supportive software	
More secure than a thick client – user is not communicating directly with LTA server	

Source: author

Fig. 1: LTA's general outline



Source: author

client does. However, relations and communication within LTA is much more complex.

Once LTA user connects from the outside and begins authentication process by entering login information, web server starts to generate LTAP XML tags according to the specification, Appendix D of [2] to verify user on LTA server. LTA server accepts (rejects) and processes these XML request tags and responses with appropriate XML tags back to the web server. Response tags are accepted and processed by a web server. According to the response user is authenticated or rejected by a web server. Analogically all user activities made on the web servers' PHP interface generate proper LTAP XML tags, which are immediately send to the LTA server.

There is an exception to the rule. When LTA user wants to archive or export certain electronic document, network connection between web and LTA servers is not just sending and receiving XML tags according to the user activity. In the archivation case, document (or raw data) is stored on the web server first, and then finally transmitted to the LTA server. Appropriate hash check sum is generated and then compared to the one provided by user. If those two do not match, document is rejected by LTA (i.e. file is different than the one provided by user, in other words document is corrupted and authenticity cannot be proven later on). In the export case web server just performs mediation (translation) function between LTA and thin client.

2.1 LTA as a Functional System

This part will primarily focus on the communication behind firewall. If we would accept LTA as one and the only piece of the system behind firewall, we would probably be interested in knowing which types of users would have access to this system. They can be divided into three main groups, coming from the traditional archival organizational system.

Three basic user groups constitute fundamental user base with appropriate access permissions (see Tab. 2). The user base can be extended hand in hand with set of custom permissions, and depends on local requirements and conditions.

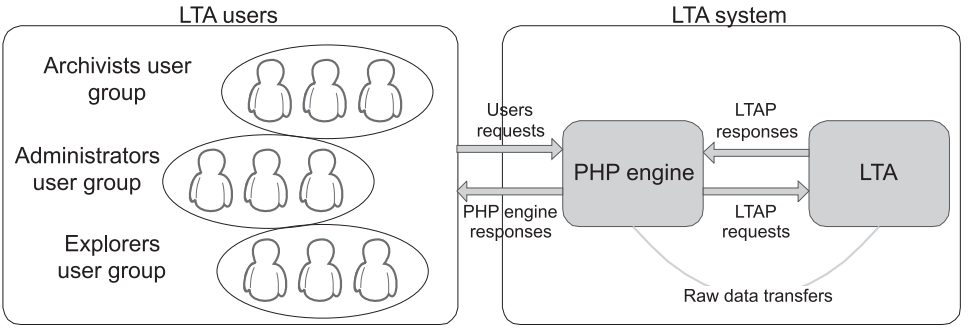
It is necessary to present system scheme (see Fig. 2) in order to demonstrate how interactions between LTA system and LTA user base work.

Tab. 2: User groups overview

Traditional archival function	Role of the person in an archive	Permissions (roles) in LTA
Archive Administrator	Has complete archive management and responsibility	Complete control
Archivist	Adds new titles and exemplars into archive, takes care of exemplars and titles under explicit section	Adds new electronic documents, control over documents archived by the same user group
Explorer	Has complete archive access, but just for exploring already archived titles and exemplars	Read-only access user

Source: author

Fig. 2: User groups and their interactions with LTA system



Source: author

Since exact number of users (service load factors) is unknown, LTA systems cannot be setup to handle explicit load. We can predict the real situation based upon results of several experiments with the web server load endurance. Moreover, general formula for the LTA system load can be defined.

$$\frac{\sum_{1}^{n} U_i * L_u}{hsn_{LTA} * cq_{web}} \leq 1 \qquad (1)$$

where: $1 \leq i \leq 3$ and $n \in Z$

U_i ..... user of i-group

L_u ..... load generated by certain user

LTA system { hsn_{LTA} ... hardware, software, network configuration of LTA; cq_{web} .... PHP source code quality

When load generated by users is not higher than LTA it is expected to work out, reliability of LTA would be lower. The closer result of the formula gets to 1, the less services provided by LTA can get accessible. Ideally LTA system load shouldn't exceed 80 %.

Indeed security aspects of the thin client solution in the LTA cannot be forgotten. Therefore communication between thin client and web server is accomplished over secured HTTP, where all data information going through the network are encrypted. LTA system itself is protected by firewall which filters out all unwanted network traffic.

3. Web Interface Layout Overview

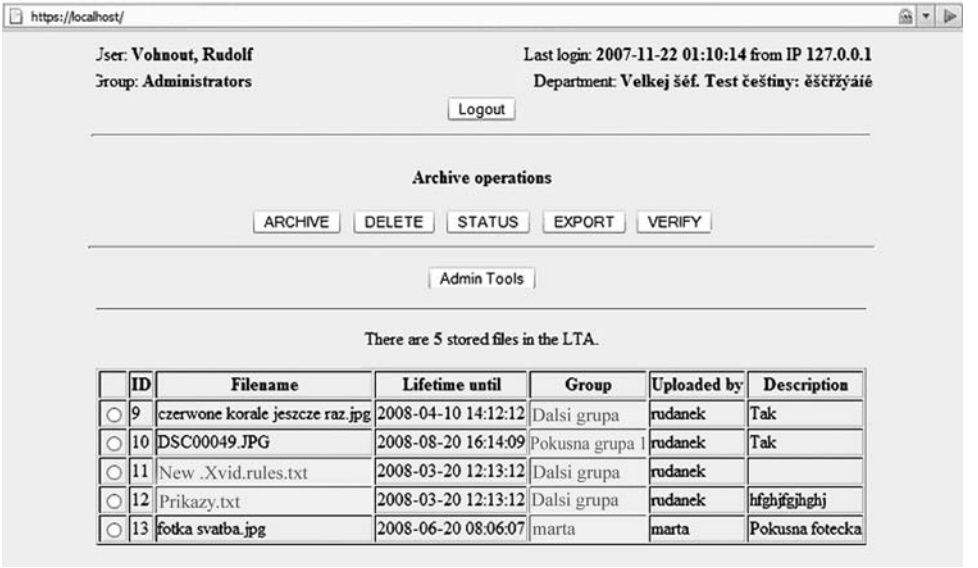
Purpose of the web interface was from the very beginning to provide comfortable layout for the LTA user (see Fig. 3). It was intended to be an alternative solution to existing thick client with wider area of implementation.

Appropriate rights according to the user group policy will be set up once a client is successfully logged in to the LTA. This means that there will be a specific restriction for normal users with an exception for LTA administrators (according to the Tab. 2). Whole functionally corresponds to [2] with few exceptions. First major exception consists of a possibility of direct lifetime extension for certain already archived electronic document. However this option has to be allowed globally by LTA administrator. The second exception is an implementation of linkage hashes [3] to prove sequence of how documents were stored into the LTA.

User metadata can be stored into the LTA in three possible ways (according to [2]). Option „from file" allows user to store metadata along with the document's raw data as XML file. At first, this file is checked for validity and then XML tags carrying certain information stored into database. If some of the required fields are missing archive process is rejected. If optional fields are missing web interface returns warnings to the user, but the storage process can continue.

If export is requested for certain archived electronic document, user can retrieve generated XML file with all related metadata besides the raw document. This XML file structure corresponds to the one that is anticipated for import. Besides these features web interface can also show status information about the document. This covers status of electronic signature and time stamp plus file integrity check. Regarding

Fig. 3: LTA web interface main screen



Source: author

deleting achieved documents from LTA, it should be mentioned, that document is not going to be physically removed, LTA just stops maintaining status of this document.

Conclusion

Regarding to this article, a thin client solution for the LTA could represent very sufficient alternative to an existing thick client. Its wider usage is just a matter of time and a decision on implementation of these two solutions depends on local conditions in certain environment. One of the options is to use thin and thick clients simultaneously. In this case thin solution can be used as alternative (backup) to the thick client. As a creator of this solution along with Security Technology Competence Centre („SETCCE") cooperation and according my experience, I hope there will not be too many obstructions with implementation in future.

References:

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ABSTRACT

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This paper focuses on a new approach to the solution of users' communication problem with the long-term archive services. In the business, government, or any other environment could be real situations, when usage of the original thick client cannot be applied because of its special requirements. On one hand thick client ensures highest possible error free assignment, and on the other hand thin client usage can be a solution in special cases. Its goal from the very begging wasn't to replace thick client, but just supplement it in the environments where thick client cannot be used while still makes its main functionalities accessible. Typically in the huge organizations with non-unified company IT policy thin client could be contribution. However usage of thin client has its limitations which will be expressed within the article.

Emphasis will be placed on main differences between two previously mentioned solutions in different environments as well as their mutual comparison. Moreover, big difference between thick and thin can be found in the way how and which data are transmitted between server and client along with security admissions which will be revealed likewise. Then functional principles of this brand new solution will be revealed along with roles of users, their permissions, and division into groups, plus their influence on system part. Security related things will be briefly mentioned too along with some drawbacks of the proposed solution. At the end self web interface layout of the long-term archive service server mediator will be explained and briefly described.

Key Words: *LTA, XML, LTAP, PHP, system, thin client, electronic document*

JEL Classification: *L84, L86, M15*