The Testing of the Web Services Accessibility of CENIA Company

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Abstract. There exists many ways how to realize the shared data access. In Geoinformatics sciences it can be e. g. access to map sources and to information about particular geo-objects. For these purposes there can be used map servers, which generally share geographic information e. g. like raster or vector maps. The communication between clients and map server can be proceeding by the help of proprietary interface or by the standard interface. In case of map servers the standard is so-called WMS service, which is developed and further expanded by Open Geospatial Consortium. The next solution is offered by ESRI Company in form of IMS technology. For utilization of these services it is possible to use quite a number of clients. By one of the map service providers is the Czech Environmental Information Agency. This one offers the access to map services through the Portal of the Public Administration. The article describes the testing of accessibility of these map services provided through the medium of WMS and IMS services and inform about the results of this tests.

Keywords: CENIA, IMS, WMS, web, internet, map, services, testing.

1 Introduction

The article deals with description of tools, process and results of the testing of IMS and WMS CENIA services availability. The target of the tests was to find out the reliability of selected services, their accessibility and to document performance of these services.
At work in clients acceding to IMS and WMS services it is able to happen, that the user is waiting for a long time for server response, that will display needed data, or data could not be downloaded from the server at all. At such system behavior arises the question, if it acts about problem on the client side, or on the server side providing the services. The imposition of tests was to verify, whether these problems can be incurred from server side. It deals about tests just intent on identification on long time server responses problem and on inquest states, when service isn't accessible at all. The aim of tests wasn't to carry out mutual comparison of IMS and WMS services and their qualities.

2 The IMS and WMS CENIA services

CENIA (Czech Environmental Information Agency) arose Czech ecological constitution transformation, the contributory organization of Ministry of Environment. Her imposition is administration sectional information not only from environment. Data here pooled be instrumental towards support achievement public funds repair, as well be right usable for education in schools of all steps.

Through Portal of the Public Administration is offered service Internet Maps Service (IMS), whose founder is Ministry of Internal Affairs Czech republic and is run just by CENIA agency. Map server is independent part of Portal of the Public Administration. The technical fulfillment of map services of Portal of the Public Administration is based on unix surgical systems and ESRI technology – the ArcIMS map server and ArcSDE spatial database. The map server web interface forms application develop by MGEData – Mapmaker company, susceptible interactive work with map. Web service is accessible on the web address: http://geoportal.cenia.cz/ [1].

Access to map services is except usage of web portal interface enabled as well directly form IMS and WMS services, which allows their usage not only by professionals working with all sorts of GIS software, but also next map servers that may individual map services pick and depict in conjunction with personal, locally saved data. As well the map services of Portal of the Public Administration they may pick external map services from distant servers.

IMS service (ArcIMS) is product of ESRI company. This is the solution for delivering dynamic maps and GIS data and services via the Web. IMS support a wide variety of client platforms by using communication standards such as HTML and XML to deliver spatial data and they are easy to integrate with spatial databases [2] [3].

The CENIA agency offers access to spatial data as well through WMS services. This service is offered through WMS connector for ArcIMS. To WMS CENIA service it is impossible come up over web interface so, how that be in at IMS CENIA. Basic address pattern for questioning WMS CENIA be as follows:
http://geoportal.cenia.cz/wmsconnector/com.esri.wms.Esrimap/<service_name>
Illustrate inquiry be but bare frame, behind which is necessary add next characteristics. Map services of Portal of the Public Administration support all function defined in WMS standard version 1.1.1.

Access to WMS services was tested through ArcExplorer web pages:
http://www.geographynetwork.com/arcexplorer/arcexplorer.html
The application ArcExplorer WEB Services Edition here posture so - called middleware and makes it possible to obtain URL with concrete map cut. Realization of such map output is then buckthorn over tools of ArcExplorer native pages.

2.1 IMS and WMS CENIA layers

The both of the services offer the same layers to be used. In the table 1 there is a list of layers and it's description used in tests. The list of all layers and their description which are offered through IMS and WMS service is available at web address: http://geoportal.cenia.cz/cenia_docs/help/sluzby.html

Tab 1. List of selected layers and their description.

URL title of layer	Description of layer
cenia_sprava_csu	Border of territorial units
cenia_arccr_admin	Municipality and communication
cenia_b_auto_sde	Road map of CR 1:100 000
cenia_b_ortorgb1m_sde	Color orthophotograph map
cenia_arccr_pod	Topohraphic basis – surface
cenia_arccr_nad	Foundation topohraphic layer - seat, road, railway, waters
cenia_uses	Territorial system ecological steadiness (life set out, protection life set out)
cenia_prparky	Natural parks

Remark:
- *URL title of layer – title of layer used in the URL chains*
- *description of layer – word description of layer*

3 WAPT

For the test there was used Web Applications Testing 3.0 (WAPT) testing software. WAPT makes it possible to interactively define pages scenarios by the help of on - line compile - time action in inbuilt browser that can capture individual user operations above pages. Compared to upgrade 5.0 version makes it possible to this version prove scenarios access to web application in a way that generate record test for individual pages apart. Version 5.0 primary doesn't prove strictly after pages ballast in a way, anyhow version 3.0 of even software. Nevertheless version 3.0 isn't able catching some way user actions connected especially with map operations (e.g . reloaded of the map, zoom in the map, cut,

map shift or hide some layer) and here prohibitive to create scenario according to single user activity. In consequence hereof poverty it was necessary individual pages, then exactly map cuts, scales and used layers, to define for testing application by hand. In terms of using of web client for access to IMS offered on CENIA web pages, it is possible for individual map opinions to generate URL that in parameters outgoing through GET method specifies layers, scale and cut. It is possible to map these URL's into the testing software WAPT, so that WAPT then goes through exactly specified pages. This application was used because we were familiar with it's abilities, that perfectly matched our requirements.

4 Testing

The target of testing was divided on 2 parts – testing IMS CENIA service reliability and testing WMS CENIA service reliability.

To needs testing software WAPT were to be created scenarios access to IMS and WMS services. In terms of scenarios were to be defined pages with map cuts, scales and depicted layers. Pages scenarios were to be defined for access on individual layers and on some of their mutual combinations. In terms of scenarios accesses to service to be quite defined 19 pages. The pages were defined by usage of Portal of the Public Administration by the selection of layers and areas. After definition of individual pages the user can obtain the URL of each one. The example of such one is: http://geoportal.cenia.cz/mapsphere/Map.aspx?WIDTH=560&BBOX=-575613:-1204198:-560797:-1193615&M_Servers=geoportal.cenia.cz|geoportal.cenia.cz&M_Site=cenia&HEIGHT=400&M_Services=cenia_arccr_nad|cenia_arccr_pod

In terms of testing were to be compile - time blocks access on services in step each 60 minutes. Blocks contained stress test with increasing of the number of repetition accesses on individual pages scenarios. In every block was provided repeated access on defined pages (layers and combination of layers). Tests were to be realized on office PC that matches today's standard. Joining the net internal medicine was line LAN 10MB. Testing proceeded two months, 9/2008 – 10/2008. The individual access blocks to both services didn't proceed parallel at exactly the same times.

Characteristics of tests were to be adjusted subsequently:

- Batch iterations run.
- Number of users: concurrently ran tests with avenues of approach 1, 3, 5 and 10 users.
- Number of iterations: max. 48 (in every iteration raise up number of repeated accesses)
- Step between iterations: 1
- Delays between iterations: 60 minutes
- Delays between users: 10 ms
- Web transaction (including images)

5 Results of stress tests

Average access time on individual pages is by an overwhelming majority under limits 2 seconds that it is possible perceive like satisfactory. Maximum access times to single pages however embody considerable excess. Response time greater than 10 seconds isn't exemption, but also occur pages with response time round 50 seconds. Among pages, near which repeats maximum response time greater than 10 seconds lines mostly those, which access next layers:

- cenia_b_ortorgb1m_sde
- cenia_b_auto_sde

Overall performance of tested application it is possible evaluate like stable. Near most tests at increasing of the number of iteration was the system response constant, usually occurs at intervals 20 – 40 pages per second. From hereof it is possible judge on slack solved cache on the provider side, when at repeated access on the same pages would put wait growth of the total application achievement.

The WAPT application distinguishes 3 mode of failures:

- Net error (or Socket error)
- HTTP error
- Timeout error

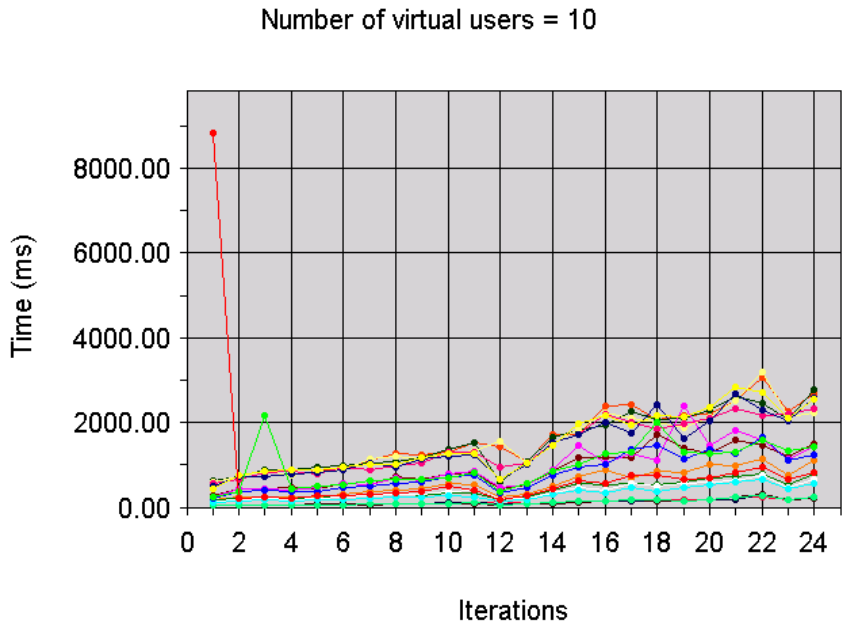
From graphic outputs it is impossible distinguish among those by three mode of failures. However it is possible sight them in output reports of .xls file format. Most often incident error is NETERROR. This error occur in tests every day, sometimes repeatedly. Application isn't built like TNA (transient network analyzer), it is impossible then find out, whereat network element occurred error. Rarely was registered error HTTPERROR.

There were created next results of stress tests:

- Average access times to single pages
- Maximum access times to single pages
- Minimum access times to single pages
- Overall performance
- Error accesses rate
- Average bandwidth at access
- Average, maximum and minimum times access for individual pages

During the testing period there was run several batch iterations run for testing both, the IMS and WMS service. In next there are depicted some choice graphic output results of IMS service testing:

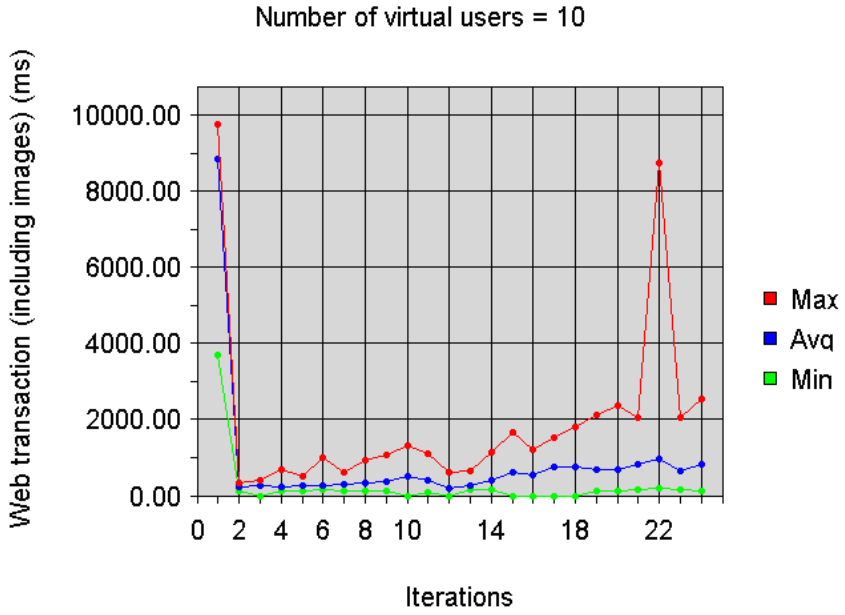
Average web transaction:



Pic. 1: Average times of web transactions of all scenario pages in 24 block accesses.

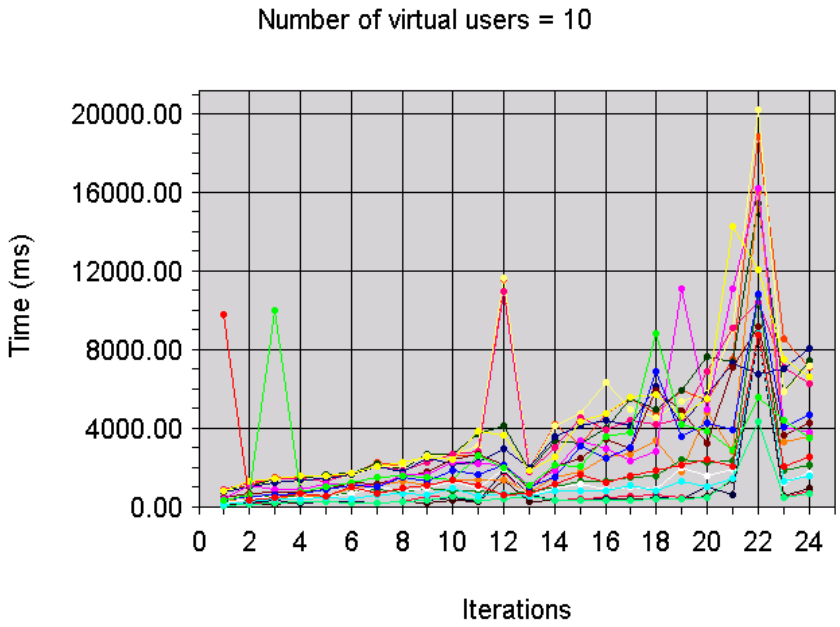
Graph on picture 1 provides survey about responses single pages (colored waveform). Page No.1 had in first iteration average response time more than 8 seconds. Average responses of all others pages are yet to the 3 seconds.

Results for individual page nr. 1, average, maximum and minimum times of web transactions:



Pic. 2: Detailed graph of system responses on page issue 1.

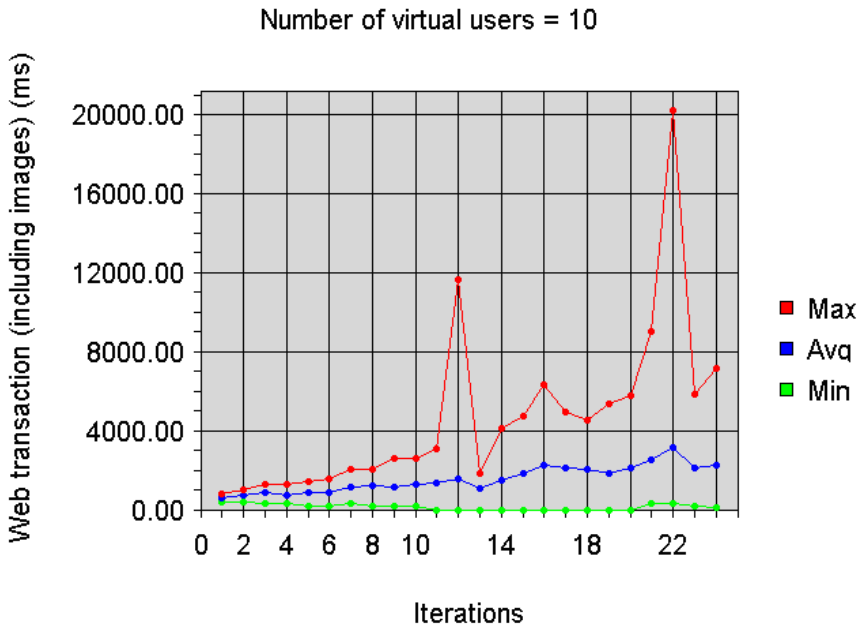
Maximum web transactions of single pages:



Pic. 3: Maximum access times to single pages.

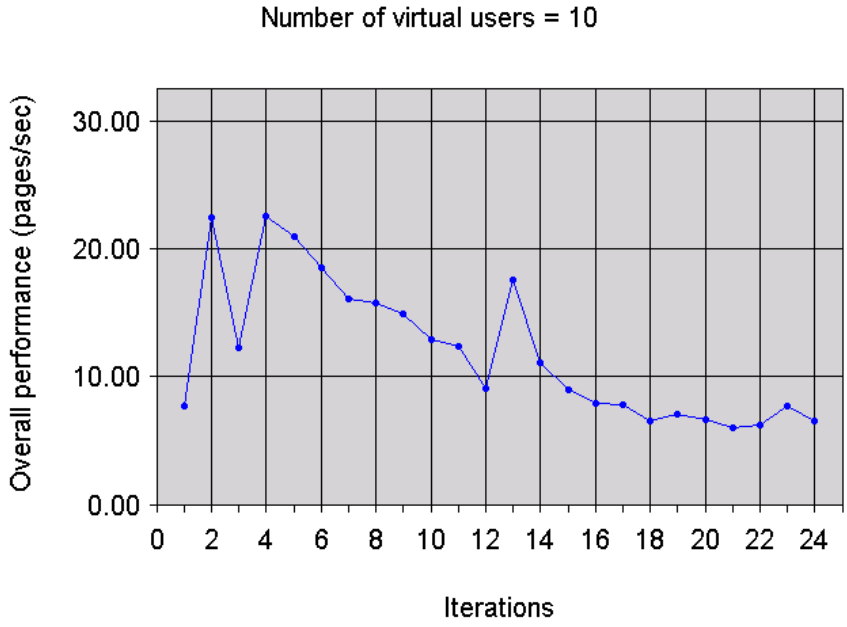
Apparently, maximum access times excepting reserve holds below limits 8 seconds. Of all iteration yaws globally anomalous iteration No.22. As well it is possible watch slowly growing maximum access times with increase number of iteration.

Results for individual page nr. 14, average, maximum and minimum times of web transactions:



Pic. 4: Detailed graph of system responses on page issue 14.

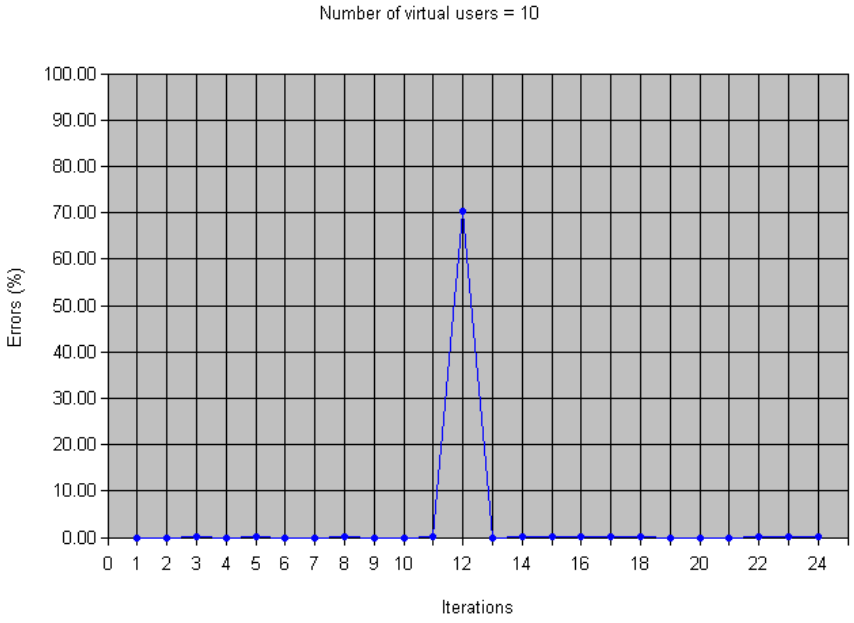
Overall performance:



Pic. 5: Gross effect at of the number of 10 virtual users along 24 iteration (number of pages/second).

From graph on picture 5 it is possible to watch decreasing achievement application at repeated access on pages.

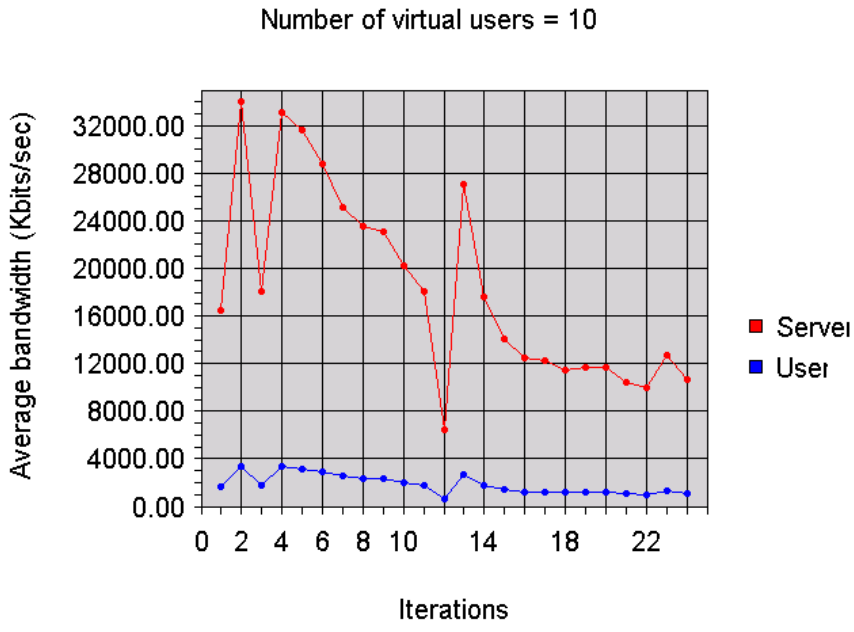
Erros:



Pic. 6: Errors proportion at single iterations.

Service access embodies little error condition, but the number should be zero (warrant by the country), especially near so small number of virtual users (low stress). At 12. iteration occurred mistakes. From generated reports in .xls file format it is possible to sight, that the it discusses NETERROR, error in net.
From the others access error diagrams it is perceptible, that the error condition happens repeatedly, sporadically and rather cumulative. In all recorded bug cases dealt at the most about 70% error rate in terms of iteration and nearly always discuss error in net – NETERROR.

Average bandwidth in access:



Pic. 7: Average bandwidth at single iterations (Kbit/with).

Bandwidth considerably oscillates, by the increase of the number of iteration slowly decreases.

6 Conclusion

The objective of tests was to identify, whether problems with prolonged data visualization on clients side can be incurred by the server. The tests were focused on service failures and long time responses. From realized stress tests it is perceptible, that the commonly happens to outages or disproportionate long responses in using IMS services. There wasn't ascertained any dependence among access time to services and outages or delays in system. It is possible state, that the layer cenia_b_ortorgb1m_sde repeatedly embodies high time demands to display. IMS service is able to from time to time do inner refresh services, thereby fall for some moments is able to be given to service inaccessible.
Tests found out repeated outages in connectivity as well as on WMS services. At increased burden on service slightly increases server achievement. Access on pages and their time responses is possible at average evaluate like good, nevertheless there has been a lot of local extremes in time heftiness, namely above all near pages using cenia_sprava_csu and cenia_arccr_admin layers.

References

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