



The Use of Virtual Slides in the EUROPALS examination

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Introduction

- The EUROPALS Life Long learning programme was started in October 2007..
- EUROPALS test is as far as we know the first test that involves virtual slides that is simultaneously approached by hundreds of candidates over > 20 countries
- The system is entirely web based containing a series of multiple choice questions using a series of virtual slides and standard jpeg images.
- Hosting server: i-Path Diagnostics online platform PathXL
- The aim of this presentation is to outline the advantages and disadvantages of virtual pathology use in a complex test environment

Participants/Results

Participants: >1500 at 4 occasions, trainees and pathologists

Results:

1st test: accessibility problem with 700 simultaneous users

2nd test: 250 users over 2 weeks, no problems

3rd test: varying numbers of simultaneous users (40-110), normal to slow

4th test 350 users over 2 weeks, no problem

Testing System

Serving virtual slides in a test is band width and server intense

- **Hosting server architecture:**
- **Server side requirements**
- **User side requirements**

Testing System

Hosting Server Architecture:

- Multiple load balanced image servers operating in tandem.
- Server capacity should not be filled >75%
- Infrastructure should be able to deal with > than expected numbers of users
- Infrastructure is provided from a centralised hosted service connected to a main internet backbone serving Europe and USA
- The larger the infrastructure the higher the expenses

Testing System

Server side requirements

- PathXL platform supports all major image formats
- PathXL viewer is part of the browser
- PathXL runs through a standard internet port (80), thus not blocked by company firewalls
- File of standard jpeg image varies from kilobytes to few megabytes
- Virtual Slide varies from 100MB to 7GB in size
- Cytology is scanned in depth and are scanned in layers (Z-stack)
- Ideal number and space between layers is 21 and 1,5 microns respectively (7,3 GB)

Testing System

User side requirements

- Virtual slide can be delivered via a bandwidth of 1-2 MB/s
- At bandwidths of > 1 GB panning and zooming is smooth and instantaneous
- 1GB RAM level is recommended, lack of RAM results in “tiled” effect
- Controlled study of the virtual images makes the download process smoother

Advantages

- Participants can access the test at the same time from locations all across Europe
- All participants looking at the same cut of the same slide
- Immediate feedback and answers can be automatically provided at the end of each test
- Scores can be compared automatically against peer groups at the end of each test
- Virtual slides supported from all major scanning manufacturers
- Questions created using standard jpeg images
- Questions created on annotated areas of a virtual slide
- Automatic user registration page

Disadvantages

- Unable to determine if individual users broadband speeds and computer processing power is sufficient to view virtual slides
- Unable to determine if individual users have adequately sized monitors and screen resolution to view the virtual slides
- Image Serving such large files grows more expensive as the number of simultaneous participants increases.
- Users not as familiar navigating a virtual slide and tend to zoom and pan therefore queuing each tile being served by the image server and slowing the speed of delivery.

Conclusion

- Dealing with large numbers of concurrent users across large geographical distances is a major challenge in virtual slide tests
- Server architecture of the host and local bandwidth of the user determine the outcome of the test
- Despite the growing pains virtual slide testing has a place in the future of large scale pathology examinations