NBME

National Board of Medical Examiners

NBME Best Practices for

Web-based Testing on Wireless Networks

2017

Overview

The purpose of this document is to provide guidance to medical schools for facilitation of NBME web-based testing (WBT) on wireless networks. The NBME defines WBT as the infrastructure and activities surrounding the delivery of assessment services over the internet or other large-scale wide-area network.

A growing number of medical schools now require students to have wireless-enabled personal laptops for local WBT and other educational purposes. The NBME conducted pilot tests with several medical schools to understand the common challenges schools face when administering web-based exams on their wireless networks. The result is this best practices document that schools may reference when adjusting their wireless networks to accommodate WBT.

Speed and Performance of Exam Delivery over a Wireless Network

Many factors may affect speed and performance, and these factors may differ per school. While the standard NBME WBT testing requirements are applicable to wired as well as wireless exams, the four wireless component recommendations summarized in the table below are based on the performance results of several medical schools that administered web-based exams over their wireless networks, as well as a series of trial web-based exams conducted at the NBME.

NBME Web-Based Testing Wireless Recommendations

Wireless Component	Recommendation
Access Points	Access points used for an exam should be dedicated to examinee laptops during the exam. This will eliminate the possibility of overloading the access points due to "outside" traffic. ***NBME recommends that the ratio of laptops to access points not exceed 25:1.***
Network Bandwidth	NBME recommends that at least 256Kbps or higher be available per laptop.
Test Site Physical Barriers	When choosing a location for the exam, try to utilize a room with few physical barriers between examinee laptops and access points. Walls and columns can have an adverse effect on reception.

Access Point Coverage

There are several variables which should be accounted for when estimating the number of access points needed for a wireless exam. These variables include:

- Number of examinees
- Total coverage area of exam room
- The minimum bandwidth needed for the examinee's laptop (in this case, 256Kbps or higher)
- The brand and quality of the access point

As a rule of thumb, schools can expect good wireless performance for up to 25 student laptops per access point. One access point could handle more than that, especially in a space with no physical barriers and square footage well within the range of the access point. However, in a space where physical barriers are a concern or if the coverage area is beyond the range of an access point, more access points may be needed.

Other Factors to Consider

As a result of wireless testing scenarios conducted at NBME, it was observed that exams with higher numbers of images, as well as above-average image sizes, experienced more screen performance problems than those exams that did not. Performance problems more than tripled when the same test scenarios were conducted with the presence of an external laptop downloading a large file from the internet using the same access point utilized by examinees. While the screen performance problems consisted mostly of slow-loading images (longer than 2 seconds to appear) and hanging screens, examinees in both scenarios were able to finish the exam.

There are potential problems associated with conducting wireless web-based exams using access points which are open to users other than examinees. For example, if a wireless web-based exam utilizes the same access points as the school's common student center, student center users are competing with examinees for access point bandwidth.   This increases the likelihood of problems such as latency and hanging screens during the test administration.

To ensure a good environment for wireless web-based exams, schools should pay particular attention to the location of the testing room and the potential for outside sources competing for exam bandwidth.

Standard NBME Web-Based Testing Requirements

The standard NBME WBT requirements outlined below apply to exams delivered over both wired *and* wireless networks. Examinees may take a web-based exam on either Macs or PCs. Any combination of fixed desktops, institutional laptops, or examinee personal laptops may be used for exam delivery.

Dedicated technical support staff with "Admin" privileges is required prior to and on the test days.	
Hardware	• Windows 7, Windows 8, Windows 10 • Mac OS v10.8, v10.9, v10.10, v10.11, v10.12 • 1 GHz processor or higher • 17" or larger color monitor recommended (Desktops) • 13" or larger color monitor recommended (Laptops) • A minimum screen resolution of 1024 x 768 • 32-bit color setting enabled • Turn off Windows updates or virus scanner updates to avoid interruptions during the exam. • Virtual machines and applications are not allowed. • iPads/tablets are not allowed.
Browser	• Microsoft Internet Explorer 9, 10, 11 • Safari 5.1.9 or higher • Google Chrome 34.0.1847 or higher • Mozilla Firefox 29 or higher
Browser Settings	• JavaScript, CSS, and Cookies all enabled • Disable pop-up blockers • If possible, disable toolbars, pop-up blockers, and Adware/Spyware programs to prevent slowness.
Internet/Network Bandwidth	• Broadband (DSL, Cable or T1) • 256Kbps or higher per workstation
Network Security	Some level of encryption must be in place for wireless networks while the exam is in progress. SSL can be supplemented with another security protocol, such as but not limited to WEP, WPA or WPA2.
Secure Browser	A Secure Browser is required to administer an NBME web-based exam; this application "locks down" the computer and prevents examinees from accessing other software applications during the exam. The Secure Browser will also detect any programs running on the examinee's computer that could compromise exam content. The Secure Browser application does not require configuration or administrator rights to install and is downloaded on test day when the examinee URL is provided by the Chief Proctor.

Workstation Certification for School-owned Workstations*	The NBME provides a utility that checks the computer for WBT compatibility and launches a sample test. This utility must be run on each computer in the testing room prior to test day. Fourteen days prior to the test date, Chief Proctors will receive an email with a URL, a unique ticket number and instructions to run the Workstation Certification utility. Do not forward this email to examinees – it is for institutional use only.
Workstation Certification for Examinee-owned Laptops	Examinees with personal laptops are required to run a separate Workstation Certification check. Prior to test day, forward the URL and Workstation Certification instructions from the 'Prior to Test Day' section of the Chief Proctor's Manual to examinees. Do not send examinees the unique ticket number used for the institutional version of the utility. Examinees with personal laptops should also be advised to arrive early to re-run Workstation Certification to detect any problems with the local firewall.
Additional Workstations	Extra workstations/laptops should be available to replace computers that may malfunction during the test session. These spares should be enabled for wired and wireless LAN use.

* Please review the Chief Proctor's Manual for additional details regarding Workstation Certification.