WHITE PAPER

# Implementing Wireless Infrastructure for Common Core Testing in Schools

XIRRUS®
High Performance Wireless Networks

# Implementing Wireless Infrastructure for Common Core Testing in Schools

## Introduction

Until recently, every state had its own set of academic standards, contributing to a disparity in the way students learn from state to state and in national testing expectations. In 2010, states began to adopt the Common Core State Standards (CCSS), a set of rigorous, common standards for K-12 education that provide clarity and consistency around student learning expectations across the country. IT infrastructure within the schools have a significant impact on how these Common Core standards are taught and how the assessments are conducted.

Today, students are beginning to benefit from CCSS, and soon they will be tested on its effectiveness with the much anticipated rollout of CCSS-aligned online assessments. While Common Core education and testing is proudly ushering in a new era of digital curriculum and assessment, it's also creating new challenges for technologists and other personnel responsible for implementation.

Every facet of 21st century common core education, whether it's inquiry-based learning or adaptive instruction and assessment, is tightly integrated with technology. IT organizations are under tremendous pressure to roll out infrastructure in preparation for the fast approaching CCSS field testing slated during Spring of 2014 and the full administration of online assessments during 2014-15 academic year.

This white paper aims to alleviate IT implementation-related concerns and answer mission-critical questions including how and when to meet these new mandates effectively.

> "Nearly 78% of schools nationwide have yet to complete plans to support Common Core assessments for the next academic year."

## Common Core State Standards and Assessments

### What Is CCSS and CCSS-Aligned Online Assessments?

CCSS is a U.S. education initiative that details what K-12 students should know at the end of each grade with an end goal of successfully preparing students for college and careers at the end of high school. With the belief that all students deserve to be prepared to compete with their peers, domestically and globally, administrators, educators, parents and politicians came together to create the Common Core State Standards.

In September 2010, Smarter Balanced Assessment Consortium (SBAC) and the Partnership for Assessment of Readiness for College and Careers (PARCC) were selected to collaborate with multiple organizations and develop a fair and reliable system of next-generation assessments aligned to CCSS for English language arts/literacy and mathematics.

Ultimately, these CCSS online assessment systems will include multiple measures of student performance. These assessments range far beyond the usual multiple-choice and short-answer questions. Instead, students will have to apply their knowledge to real-world situations through performance events and work in interdisciplinary situations. These assessments make use of computer adaptive technology (CAT), which is considered to be a more precise and efficient testing method over Fixed-form testing.

At the core, technology integration will be one of the most critical components to program success.

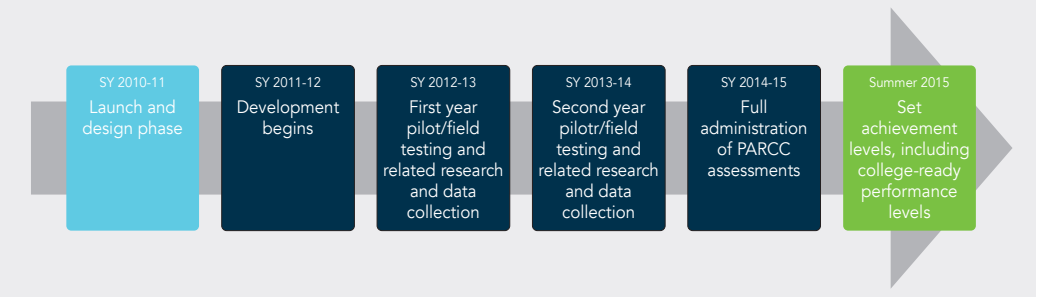
### When Will These New Mandates Be Implemented?

Since spring of 2013, states within each consortium have been piloting the program. However, nearly 78% of schools nationwide have yet to complete plans to support Common Core assessments for the next academic year, let alone the technological implementation of it.[1]

SBAC assessments will be ready for rollout by 2014, while PARCC assessments are slated for the 2014-15 school year. To meet these deadlines, IT personnel are under tremendous pressure.

1 www.educationsuperhighway.org

PARCC's Implementation Timeline




# Implementation Challenges Facing Schools

While CCSS assessments aim to improve student readiness for college and careers, all stakeholders can agree that program implementation promises to deliver challenges for everyone.

## Student and Staffing Adjustments

- **Principals** will need to effectively delegate operations in addition to managing personnel and providing instructional leadership. Likely, IT will be tasked to provide this support, particularly the decision recommendations for infrastructure, software and/or hardware needed to meet the new mandates.
- **Teachers** may have to alter their instructional approach altogether and become reliant on technology and digital media to transition to Common Core standards. For IT, this poses significant challenges since, respectively, only 14% of teachers use digital curricula and 19% use subject-specific content tools weekly.
- **Students** tend to perform better on Common Core Standards assessments when in a familiar classroom setting rather than a sequestered lab. IT will feel pressure in knowing their influence on infrastructure, design and solution choices may impact student performance outcomes.

## Funding Issues

The Common Core mandate requires significant investment. Administrators are seeking funding from many sources. Schools will fund these efforts through local bonds, state allocated Common Core funds, Federal Communications Commission's (FCC) E-Rate and E-Rate 2.0, and ConnectEd, a President Obama initiative aimed to modernize school connectivity and Congress approved categorical grants.

# Network Challenges Facing IT

## Bandwidth Needs

In a 2010 FCC survey of E-Rate connected schools, nearly 80% of respondents reported they had inadequate bandwidth to meet their educational needs.[2] The shift to online assessments will require IT to plan for an increase in access technology where students can benefit from personalized, adaptive instruction and teachers can leverage diagnostic assessments data.

## PARCC Minimum Bandwidth Requirements

PARCC has published minimum bandwidth requirements for its digital curriculum, instruction and assessment based on a recommendation by the State Education Technology Directors Association.

| MINIMUM CONNECTION SPEED (External Connection to the Internet) | | |
|---|---|---|
| Simultaneous Test-Takers/Devices | With Caching (5Kbps/student) | Without Caching (50Kbps/student) |
| 15 students | 75Kbps | 750Kbps |
| 20 students | 100Kbps | 1,000Kbps (1Mbps) |
| 30 students | 150Kbps | 1,500Kbps (1.5Mbps) |
| 60 students | 300Kbps | 3,000Kbps (3Mbps) |
| 90 students | 450Kbps | 4,500Kbps (4.5Mbps) |

## SBAC Bandwidth Requirements

SBAC has issued its minimum bandwidth recommendation at 10–20Kbps of available Internet bandwidth for simultaneous per student testing. This should not be considered a minimum specification to support instruction, which may require additional bandwdith.

2 www.educationsuperhighway.org

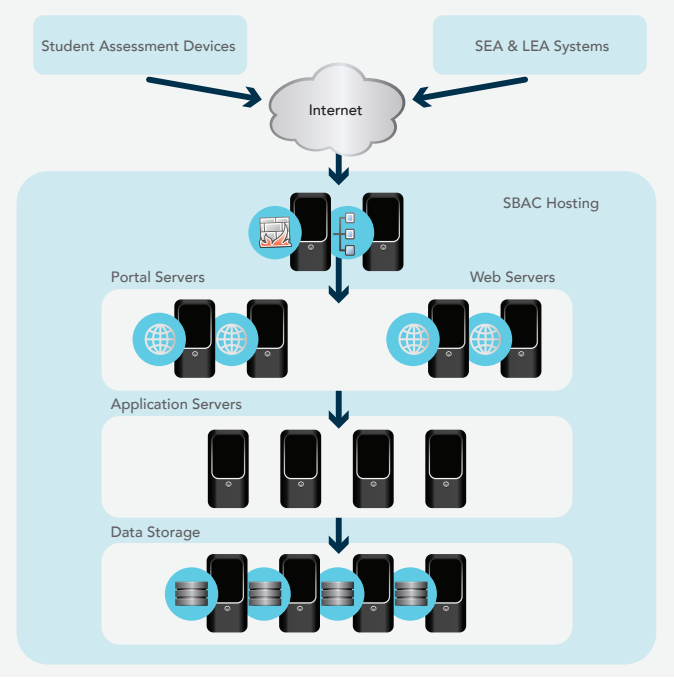
### Classroom Infrastructure Needs

Today, classrooms have one or two computers for teacher's use that are typically connected to a wired network. Wireless networks are deployed on an extremely limited basis and designed for coverage, not executing Common Core testing. These deployed wireless networks predominantly support 2.4GHz band, which has only three non-overlapping radio frequency (RF) channels. This is not ideal for a higher density testing infrastructure, such as a Common Core assessment, where 32 to 40 students test simultaneously.

### School LAN Requirements

Common Core testing is delivered from regional hosting data centers. Delivering an optimal testing environment requires analysis of the entire data path from the computer labs/ classrooms to the regionally hosted locations. Schools should evaluate and address any bottlenecks in their wired local area networks (LANs). The majority of campus backbone and classroom connectivity was implemented many years ago based on Fast Ethernet, technology which may now impede the deployment of CCSS testing and teaching. Schools should consider upgrading their core network to Gigabit Ethernet especially in the wake of new wireless standards that are capable of supporting Gigabit connectivity in the classroom.

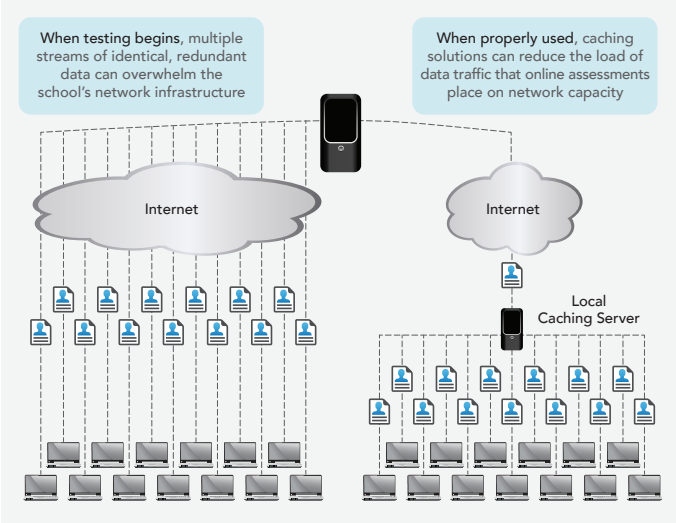
## Architecture and Testing Challenges




Logical Hosting Environment

### Adaptive Versus Fixed-Form Assessments

Common Core-aligned online assessments are either entirely or part adaptive in nature, creating challenges for IT when designing a caching system and the bandwidth needed to support this testing method. Adaptive assessment systems include an intelligence that enables the software to dynamically adapt the test questions' difficulty level specific to the student's knowledge or ability. With Fixed-form assessments (FFA), caching is simple, as all students in a given grade level take the same test including the same test items.




## Infrastructure Options for CCSS Assessments

Presently, schools are pursing many different options for school-testing infrastructure. Here are some considerations around the top five options.

### The Wired Lab

This is a static testing configuration. Computers are hard wired to a switch in a permanent lab or data closet setting and Internet connected via the school's or district's data center through a LAN. On the upside, this option enables schools to immediately address testing needs and requires only a few labs to cover all students within the testing window. On the downside, it is not portable and more costly due to added cabling and switch infrastructure. It also wastes investment when labs aren't in use and restricts schools from using Bring Your Own Device (BYOD), 1:1 learning or in-class teaching.

### The Wireless Lab

Here, laptops are connected to the LAN through a wireless access point in any designated room. On the plus side, schools can meet testing requirements in an easily contained environment and eliminate added costs for cables and switches. Conversely, the unfamiliar dedicated lab setting may adversely impact students' testing performance. Also, schools can't use their investment to enable BYOD, 1:1 learning or in-class teaching.

### Computers on Wheels (COWs)

These self-charging cabinets contain laptops and tablets that are wheeled into the classroom and distributed as needed and returned to the cart when not in use. Access points installed within the cart or APs permanently installed in the classroom provide wireless connectivity. COWs are a popular option. Students and teachers benefit from limited disruption in a familiar in-classroom test setting while, IT benefits from simple set up and teardown. It's critical to design the wireless network to support the number of simultaneous devices being used.

### The 1:1 setup

In this setup, each student is provided a laptop or tablet for in-classroom testing that is wirelessly connected via classroom-installed access points. Younger grade students must leave the device in school. Higher grade students, with parental approval, may take the device home, but may potentially compromise security and test performance due to their ability to download applications onto the machine. Therefore, IT must ensure Mobile Device Management solutions are installed on test devices to ensure compliance and security.

### Bring Your Own Device (BYOD)

Here, students are approved to use their own personal laptops or tablets for testing that are compliant to PARCC and SBAC classroom specifications. Schools are required to provide comparable devices and keyboards as needed to students who don't have their own. This option reduces the school's financial burden. As in the 1:1 setup, IT must ensure all devices are compliant by installing a Mobile Device Management solution. These devices also connect to the network through a classroom installed access point.

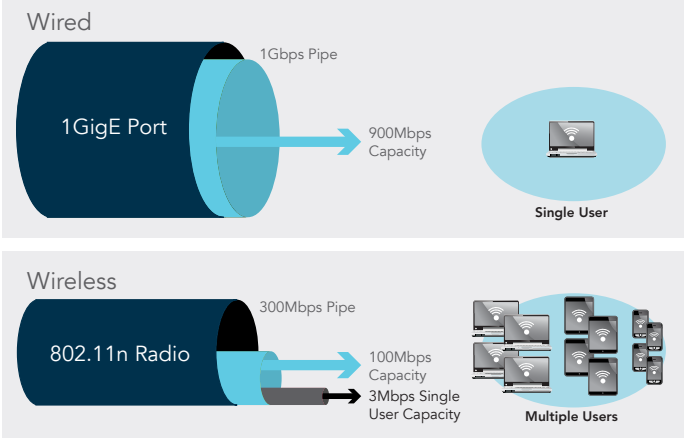
# Wireless Infrastructure Design Considerations

### Application Performance Assurance

Whether it's providing a secure browser for multiple choice questions or video/audio applications for adaptive tests, schools must assure that applications will optimally perform during Common Core assessments. During the testing period, schools must control internet traffic and application accessibility at the edge of the network where students connect, rather than simply blocking traffic at the internet gateway.

### Density – Devices Per Radio

Wi-Fi is a shared medium. With the Wi-Fi protocol overhead, bandwidth is lessoned by approximately 30-40% of the available maximum. The more devices associated with an access point or a radio, the less bandwidth available to each student. Therefore, schools must determine how many students are expected to connect per radio; this will determine how many radios are needed to support testing. This becomes a critical design criterion if schools are planning to deploy 1:1 or BYOD initiatives.




### Peak-Versus-Average Bandwidth Utilization

In planning for network capacity, schools need to account for end-to-end peak bandwidth needs, including the access layer where students connect to the network and during testing when various applications such as multi-media are used and warrant peak load design. With adaptive testing, this requirement is less stringent as students tests vary based on their responses.

### Changing Device Landscape

Not all laptop/tablet devices and vendors are created equal and over time the device landscape will be mixed. In the testing environment, schools must account for a minimum specification that includes Wi-Fi access, including 2.4GHz and 5GHz bands and consider how varying operating systems, drivers and chipsets will behave differently.

### Future-proofing for New WLAN Standards

In Q1 2014, the Institute of Electrical and Electronics Engineers (IEEE) will ratify 802.11ac, the new 5GHz band only wireless standard. The current standard operates on 2.4GHz and 5GHz. New products based on the new standard will be released in multiple waves, with the first wave supporting up to three times the speed of the 802.11n standard currently in the market. IT managers should invest for the future with tablets and laptops that are capable of supporting 5GHz and avoid purchasing devices that support only 2.4GHz, a legacy technology.

### Distributed Versus Centralized Architecture

Distributed and centralized controller-based are the two main wireless architectures. With distributed, intelligence on where to send the traffic lies within the wireless access points. By adding an access point, you can provide more processing power. Distributed architecture is optimal because you can simplify managing multiple access points with an on premise or cloud based management platform without a centralized controller.

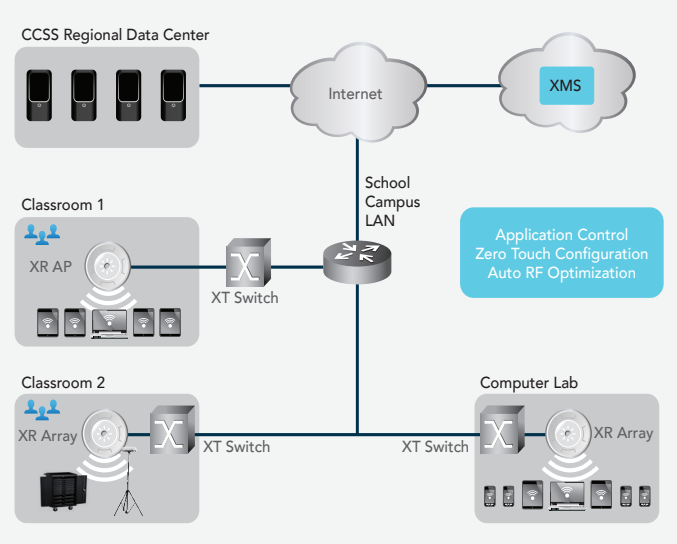
With centralized architecture, intelligence resides in the controller and traffic is routed to the destination through it, creating latency on the network and impacting performance. This is particularly undesirable during a timed test of Common Core assessment. The centralized controller becomes a single point of failure. Adding redundant controllers simply creates more cost and complexity.

### Unnecessary Chatter and Beacons

Schools considering 1:1 deployments or allowing BYOD access should plan for a large density of users, making it extremely critical to optimize the radio frequency (RF) spectrum. Schools should consider features to reduce unwanted station-to-station communications, ARP requests, multicasts and broadcasts. In shared mediums like wireless, unnecessary traffic will consume bandwidth needed for Common Core testing. Consider enabling features that suppress unnecessary beacons and chatter to clean up the RF spectrum.

# Xirrus Solutions for Common Core Testing and Mobile Device Connectivity

Xirrus provides low-cost, high performance wireless solutions for Common Core testing and mobile device connectivity. Its breadth of highly scalable platforms meets low-to high-density connectivity requirements for schools with 2-16 radios in a single platform. This option provides significant savings by limiting added equipment needs such as cables and switch ports in the data closet by over 75%. Xirrus solutions are also future-proofed with software and hardware upgradability and 802.11ac compatibility.




### Xirrus Solution Components

- **Access Points** – Low-cost, dual-fixed radio access points with software programmable radios provide Application Control and support for 802.11ac on both radios concurrently.
- **Arrays** – These multi radio modular platforms are designed for higher density deployments like 1:1, with software and hardware upgradability and ensure Application Control and support.
- **Xirrus Management System (XMS)** – This simple, browser-based management platform deploys on premise or in the cloud offering in-depth visibility into the school testing infrastructure.
- **Rapid Deployment Kit (RDK)** – This is a self-contained kit to temporarily deploy a Wi-Fi network in any location. It includes tripods for use with COWs for classroom-to-classroom mobility.

### Xirrus Solution Benefits

- **Assured Performance** – Xirrus wireless solutions include Application Control for predictable performance even when the network is congested. With a distributed architecture and an integrated controller, Xirrus solutions deliver high performance connectivity for testing in the classroom. The solutions include Air Cleaner and self-healing technologies to deliver a highly available and optimized wireless network.
- **Lower Cost** – Xirrus delivers low total cost of ownership with fewer cables and devices to manage and fewer switch ports needed to deploy wireless networks. Xirrus further reduces the cost of deploying wireless networks with its special educational pricing. Innovations like software programmable radios allow school IT organizations to migrate from a 2.4GHz to 5GHz band with a click of a button and without infrastructure replacement.
- **Scalable** – Xirrus platforms support 2-16 radios in a single device, enabling schools to deploy a highly scalable solution for Common Core testing and right size their network. Depending on client density, schools can choose from a 2, 4, 8 or 16 radio platform to support their access requirements.
- **Upgradable** – Xirrus platforms are built for the future and support the new 802.11ac standard. They're designed for software and hardware upgradability, reducing technology migration costs and IT burden. Xirrus Arrays' modular radio design enable IT organizations to easily update legacy technology without replacing the entire platform, further creating significant cost saving for schools.
- **Easy-to-Use** – Xirrus solutions are easy to manage with an XMS, on premise or cloud based management platform. Features like auto cells, auto channel, band steering and ACExpress™ automatically sense the RF environment and device capabilities, and optimize the network for the best performance without burdening the IT staff.
- **Simple to deploy** – Integrated with zero touch deployment functionality, Xirrus solutions download network profile and configuration without IT involvement. Schools can deploy Xirrus solutions with plug and play simplicity to meet the rigorous timeline of a CCSS roll out. RDKs assist schools to deploy temporary wireless networks and can be easily moved from classroom to classroom along with COWs.

## Conclusion: How Can Xirrus Help You Transition to the New Mandate

Clearly, transitioning your school and/or district to the technical and operational requirements of a CCSS online assessment is not simple. The effort level depends on your school/district size, current infrastructure, financial support and more. Invariably, it takes a team of internal and external resources specializing in different aspects of the effort to accomplish a CCSS assessment readiness transition.

With Xirrus at your side, you have trusted advisors and expertise to guide you along the way and solutions that can minimize stakeholder disruption and maximize success. Moreover, we hope this white paper has shed valuable insight on your next steps toward execution. For more information, visit us at www.xirrus.com/common-core.

## About Xirrus, Inc.

Xirrus is the leading provider of high-performance wireless networks. Xirrus' Array-based solutions perform under the most demanding circumstances with wired-like reliability and superior security. The Xirrus wireless solutions provide a vital strategic business and IT infrastructure advantage to the education, healthcare, government and enterprise industries that depend on wireless to operate business-critical applications. Headquartered in Thousand Oaks, CA, Xirrus is a privately held company that designs and manufactures its products and solutions in the USA. For more information please visit: **www.xirrus.com** and follow us on Twitter: **@Xirrus**.

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