Title: OCS ITAG IT Technology Statement of Direction

Summary: Schools will be adopting innovative education technology over the next 3-5 years. The education technologies include digital curricula, bring your own device (BYOD), 1:1 computer classrooms. This document provides technology statement of direction to schools, so they may plan and incorporate the advanced, high performance IT infrastructure necessary for the emerging digital classroom.

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1.0 Introduction

The Seattle Archdiocese Catholic School Strategic Plan, Strength to Strength, provides guidance for the establishment of an information technology committee. Dr Haggarty, school superintendent, established the Information Technology Advisory Group (ITAG) in December 2015. The OCS ITAG team members consist of school technology leaders with responsibilities IT operations, planning, and strategy.

The OCS Information Technology Advisory Group (ITAG) team is tasked to providing direction and guidance for schools. School preparation for on demand and interactive digital education environment (1:1 student workstations, digital curriculum) requires integrating education and information technology plans and strategies. The following are OCS ITAG IT technology statement of direction (SoD) recommendations to lay the IT infrastructure foundation. The ITAG selected IT infrastructure components that are common and core to all schools to establish statements of direction. The SoD's goal is to provide a brief overview to the technology and provide technology guidance for school technology planners.

Network infrastructure (Internet, wired, and wireless systems) contributes 5-15% to the total IT operational cost but since the network infrastructure provides the digital highway the investment is highly leveraged. These first SoD topics, data transport and network infrastructure, are components that are critical to delivering data to classroom end systems (student computers/workstations). WiFi wireless networks are a technology meeting place for widely diverse end systems with a wide ranging mix of basic and advanced capabilities. Classroom network infrastructure and network end systems is the most critical IT integration point and need to interoperate seamlessly. One of the SoD strategies is to maximize the total cost of ownership via focusing on classroom network infrastructure with advanced capabilities to enable a school to skip a technology refresh cycle.

2.0 Wireless Statement of Direction

Scope: Classroom WiFi network access systems.

2.1 IEEE 802.11n Network Systems

1. Schools should restrict future purchases of IEEE 802.11n wireless network technology and limit purchases to "break/fix" operation responses.

The most common wireless system manufacturers used by the schools provide IEEE 802.11 Wave 2 wireless access points (AP) so technology availability is generally not a concern. Wave 2 access points are fully interoperable with older

network end systems (laptops, notebooks, printers, etc) that have pre-Wave 2 radios. All current Wave 2 systems that are designed by the major wireless system manufacturers are fully interoperable, and function in a mix, of Wave 2 and pre-Wave 2 access points. This will provide an option of per classroom not necessarily full-school, AP migration.

2.2 IEEE 802.11ac Wave 2 Network Systems

2. Schools should adopt IEEE 802.11ac Wave 2 network systems beginning in 2016. The Wave 2 high performance technology offers an opportunity to skip a tech refresh cycle and extend the wireless network system useful life into 2024.

Historically, the planning cycle for adoption of workstations (which includes client mobile devices and tablets) is much shorter than for the supporting network infrastructure. The typical refresh cycle of workstations is 3-5 years; comparatively with network electronics the refresh cycle is 5-6 years. ITAG recommends that classroom wireless network infrastructure be upgraded in advance of the workstations. The release of IEEE 802.11ac Wave WiFi network systems in 2016 provides a unique opportunity for a school to move its classroom technology forward.

IEEE 802.11ac Wave 2 is the highest performance WiFi network technology available and is fully downward compatible with workstations and devices that support legacy WiFi network standards (IEEE 802.11a, b, g, n, ac/Wave1). Adoption of Wave 2 wireless network systems should be a considered a seamless technology transition. The ITAG considered three different network infrastructure refresh strategies during the development of this SoD. The network infrastructure needs to be ready for phased workstation refresh cycles that will require simultaneous support for both basic and advanced capabilities in a classroom. Considering the typical long lead time to architect, design, and install classroom networks. ITAG selected a strategy to immediately adopt Wave 2 enabled classroom networks. Note that IEEE 802.11ac Wave 1 access points may have installed in some locations. Wave 1 technology products were displaced by Wave 2 products in 2016.

2.3 Technology Refresh Plan

3. Schools should build a technology refresh plan to retire IEEE 802.11n wireless network systems by 2020 unless current infrastructure is less than 3 years old and meeting the school's functional and operational requirements.

2016 is the year when there will be a rapid transition of workstations from 802.11n only wireless capabilities to 802.11ac Wave 2 wireless. The Wave 2 performance is at least 2-3 times greater than 802.11n. The ITAG guidance is for all schools to establish technical plan targets to prepare for workstations with advanced wireless capabilities by retiring the current/legacy wireless network. If a schools WiFi network system is less than three years old and meets their functional and operational requirements, schools should consider the following a 5 year refresh cycle during the transition to Wave 2.

3.0 Internet Connection Statement of Direction

3.1 Target Minimum Speed

1. Schools should target for a minimum of 100 Mbps Internet Service by 2020.

Education IT infrastructure guidance to schools is consistently projecting increasing requirements for higher Internet speeds. The Internet connection speed in just one factor to eliminating performance bottlenecks so oftentimes is, but not always, the primary focus to improve performance. Schools need to consider the end-to-end system to optimize IT infrastructure performance. 100 Mbps service has been increasing affordable during the last 2 years and this have been driven by increased competition and lower cost technology availability. When forecasting the Internet speed, consider the number of students and curriculum 3 to 4 years out to minimize operational impacts.

Technical References:

http://fibertoolkit.educationsuperhighway.org/toolkit/k-12-bandwidth-targets

http://www.setda.org/priorities/equity-of-access/the-broadband-imperative/

Digital Classroom

http://www.hopkinsschools.org/servicesdepartments/technology-media/educational-technology-integration/21st-century-digital-classrooms

BYOD

http://usingtechnologybetter.com/byod-what-works/

3.2 Multi-year Contract Considerations

2. Schools should avoid multi-year contracts for service doesn't provide both uplink and downlink service level agreements.

The industry is rapidly adopting cloud based workstations that require Internet access to boot up and provide access to software applications. Intermittent and unreliable Internet access can be very disruptive to workstations. Internet service provider agreements with service level agreements (SLAs) provide contractual performance and availability guarantees. SLAs are key to delivering a robust and reliable Internet service to classrooms. Typically, SLAs are standard with fiber optic based Internet service and less common with coaxial cable based Internet service. Internet providers are phasing in affordable high speed fiber service over the next 3 years, so it is a best practice to position the school to move to fiber service for avoiding long term contracts.

4.0 Internet Protocol Statement of Direction

Internet Protocol Version 4 (IPv4) is the standard protocol deployed at all schools and will remain the standard for many years to come.

4.1 Internet Protocol Version 6 Strategy

1. The OCS ITAG is considering establishing an IPv6 Internet service and school network readiness strategy. ITAG is following trends and seeking school input.

ITAG is planning for the inevitable adoption of IPv6. The IPv4 addresses pool allocation to the North American registrars was exhausted in 2015. In 1996 the replacement for IPv4, IPv6, was adopted. Most student workstations are IPv6 capable. The industry adoption of IPv6 has accelerated dramatically but considerable planning and design work will be required before school adoption. There is a potential for a small scale inter-school technology investigation in 2017. Google reports in March 2016 that 10% of devices used IPv6 to reach the Google search engine. IT (firewalls, routers, switches, WiFi systems) and particularly non-IT infrastructure (bells, intercom, phones, smartboards) can have long life spans than may more efficiently operate on IPv6 networks. Operational efficiencies, minimizing complexity, and extending useful life are challenging to project but worthy of tracking.

Note: IPv4 address examples: 10.0.y.z, 172.16.y.z, 192.168.0.y

Note: IPv6 address example: 2601:600:9200:4113:w:x:y:z

Technical References:

https://www.fcc.gov/consumers/guides/internet-protocol-version-6-ipv6-consumers

http://www.internetsociety.org/

https://www.google.com/intl/en/ipv6/

https://technet.microsoft.com/en-us/network/bb530961.aspx