IT in Education Technological Series:

Preparing Specifications for Enhancing Wi-Fi Infrastructure in Schools

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Prepared on 13 January 2016

Course Outline – Session 1

No	Nature	Content	Duration
1	Overview	Different scheme for eLearning in Schools	15 min.
2	Overview	Preparation of Building up Wi-Fi Infrastructure	20 min.
3	Introduction	Document reference provided by EDB for Wi-Fi 900	10 min.
4	Introduction	Wi-Fi.HK Service	5 min.
5	Workshop	Preparing Wi-Fi subscription tender according to the document reference as provided by EDB for Wi-Fi 900 – Standard provision	45 min.
6		Break	15 min.
7	Workshop	preparing Wi-Fi subscription tender according to the document reference as provided by EDB for Wi-Fi 900 – Add-on provision	45 min.
8	Case Study	School of Wi-Fi 100 or Wi-Fi 900	15 min.
9	Introduction	Assignment, Q&A & Conclusion (10 min)	10 min.

Course Outline – Session 2

No	Nature	Content	Duration
1	Workshop	Practical workshop for drafting Wi-Fi subscription tender • Assignment review • Site visit • School reference • Selection criteria worksheet (Schools practices and Government practices for reference)	15 min.
2	Overview	Introducing User Acceptance Test	20 min.
3	Sharing	Sharing by Visiting School	60 min.
4		Break	15 min.
5	Site Visit	• from Internet Connection to AP • from Tablet to Projection • how eLearning happened in school (how to handle School Tablets)	60 min.
6	Introduction	Q&A & Conclusion and Course Evaluation	10 min.

1. Practical workshop for drafting Wi-Fi subscription tender

- Assignment review
- Site visit
- School reference
- Selection criteria worksheet (Schools practices and Government practices for reference)

2. Introducing User Acceptance Test

Sample System Test (By EDB)

Sample System Test

Disclaimer: Please note that this is a sample system test designed for a variety of testing situations. Please adopt according to the specification in quotation document.

School Name: _____

Date of System Test: _____

Test Case – Wi-Fi System – Test 1

- Wi-Fi Controller and APs Check

Test 1- Wi-Fi Controller and APs Check

	Procedures	Expected Result	Pass / Fail
1.1	Access to WiFi Controller IP Access With Account Name & Password Backup Configuration.	IP is accessible. Pass the Authentication Location:_____	

Test Case – Wi-Fi System – Test 2

- Controller Power On Self-Test

Test 2 - Controller Power On Self-Test

	Procedures	Expected Result	Pass / Fail
2.1	Turn on the controller and determine whether its Power LED indicator lights	The Power LED indicator lights up in green.	
2.2	After the controller boots up (it takes about several minutes), connect a computer to the management interface of the controller-used LAN cable, and access to the web management interface.	The computer is able to access the Web Management Interface.	

Test Case – Wi-Fi System – Test 3

- Inventory Check

Test 3 - Inventory Check

	Procedures	Expected Result	Pass / Fail
3.1	Conduct an inventory check of the proposed equipment (if required).	All proposed items are installed.	
3.2	Navigate to Monitoring AP(s).	All the connected AP(s) should be shown in the Monitoring Page.	

Test Case – Wi-Fi System – Test 4

- Access Point Association Check

(B) Access Point Association Check

Test 4 - Association Test 1

	Procedures	Expected Result	Pass / Fail
4.1	Associate the Client Device to the SSID and enter the passphrase.	Client Device is connected to the designated SSID.	
4.2	Check the IP information.	The IP address, Subnet Mask, Gateway, DNS should be the same as designed.	
4.3	Ping to Gateway.	Successful ping to the gateway.	
4.4	Open the web browser and browse to www.google.com.	The Google Webpage should be shown in the web browser.	

Test Case – Wi-Fi System – Test 5

Test 5 - Association Test for Wi-Fi.HK (if implemented)

	Procedures	Expected Result	Pass / Fail
5.1	Associate the Client Device to the SSID **Wi-Fi.HK** in designated area.	Client Device is connected to the designated SSID.	
5.2	Check the IP information.	The IP address, Subnet Mask, Gateway, DNS should be the same as designed.	
5.3	Ping to Gateway.	Successful ping to the gateway.	
5.4	Open the web browser and browse to www.google.com.	A different landing page without login will be displayed. Hotline service and contact email will be shown on webpage for public enquiry and technical support. After accepting the disclaimer, the Google Webpage should be shown in the web browser.	
5.5	Access to the School's internal service	School's internal service should not be directly accessible through Wi-Fi.HK, unless access is allowed through the Internet	
5.6	The session should be automatically logged out	The current session will be time-out after 30 minutes	

Test Case – Wi-Fi System – Test 6

- Roaming Test

Test 6 - Roaming Test

	Procedures	Expected Result	Pass / Fail
6.1	Ping to Gateway continually.	Successful ping to the gateway.	
6.2	Move to another AP coverage area.	During the movement, there may be a short period of timeout, but after moving to another AP coverage area, the Client Device is connected automatically.	

Test Case – Wi-Fi System – Test 7

- Controller Redundancy Test

(C) WiFi Controller Redundancy Test (for configuration with dual WiFi Controllers)

Test 7 - Controller Redundancy Test

	Procedures	Expected Result	Pass / Fail
7.1	Login to the Wireless Controller 1 Web-UI, and verify the redundancy status.	The Controller 1 should be running as active while the Controller 2 should be running as standby.	
7.2	Associate the client to the SSID, and do the ping to the gateway.	Ping to the gateway with positive result.	
7.3	Disconnect the Ethernet cable that connected between Controller 1 and Core Switch.	Ping to Controller 1 should be fail. Wireless devices may have a few timeout but it should resume within 10s.	
7.4	Reconnect the Ethernet cable that connected between Controller 1 and Core Switch.	The Controller 1 should act as standby after join back.	

Test Case – Wi-Fi System – Test 8

- Physical Installation Check for Switches and Firewall

Test 8 - Physical Installation Check for Switches and firewall

	Procedures	Expected Result	Pass / Fail
8.1	Check whether the equipment is installed at proper locations according to the customer requirements.	The equipment must be installed at proper locations according to the customer requirements.	

Test Case – Wi-Fi System – Test 9

- Equipment Power On Self-Test Switches and Firewall

Test 9 - Equipment Power On Self-Test Switches and firewall

	Procedures	Expected Result	Pass / Fail
9.1	Turn on the equipment and determine whether its Power LED indicator lights up (both).	The Power LED indicator must light up (both).	
9.2	After boot up, login to the equipment CLI via console port (both).	Successful login to the CLI via console port (both).	

Test Case – Wi-Fi System – Test 10

- Ping Connectivity Test for Switches and Firewall

Test 10 - Ping Connectivity Test for Switches and firewall

	Procedures	Expected Result	Pass / Fail
10.1	From the equipment CLI, ping to the test mobile computing device (e.g. WiFi notebook).	Successful ping to the test mobile computing device.	
10.2	Access to Firewall IP.	The IP should respond to the PING action.	
10.3	DHCP Server Enabled with useable IP addresses.	IP address is assigned to mobile computing device.	
10.4	Access Firewall With Account Name & Password.	Pass the Authentication.	
10.5	Backup Firewall Configuration.	Location:_____	
10.6	Backup Switches Configuration.	Location:_____	

Test Case – Wi-Fi System – Test 11

- Admin Management (Telnet Access) on Both Switches & Firewall

Test 11 - Admin Management (Telnet Access) (Switches and firewall)

	Procedures	Expected Result	Pass / Fail
11.1	From the notebook initialize the telnet session to the IP address of the	Username and password required for the equipment access.	
11.2	Enter the username and password.	Successful login of the equipment via telnet.	

Test Case – Wi-Fi System – Test 12

(E) Test different mobile computing devices with different Operating Systems

Test 12 – WiFi Client Functionalities Test

	Procedures	Expected Result	Pass / Fail
12.1	WiFi Clients Connections Test/Web Browsing Test- Windows 8 Client	No error should be shown with connection and Web Browsing Target: Successful connect in 30 seconds with WPA2 Encryption	
12.2	WiFi Clients Connections Test/Web Browsing Test- Windows 7 Client	No error should be shown with connection and Web Browsing Target: Successful connect in 30 seconds with WPA2 Encryption	
12.3	WiFi Clients Connections Test/Web Browsing Test- Different versions of Android Clients	No error should be shown with connection and Web Browsing Target: Successful connect in 30 seconds with WPA2 Encryption	
12.4	WiFi Clients Connections Test/Web Browsing Test- Different versions of iOS Clients	No error should be shown with connection and Web Browsing Target: Successful connect in 30 seconds with WPA2 Encryption	

Test Case – Wi-Fi System – Test 12

12.6	AP Auto On/Off Schedule and termination of idle sessions and control of the duration features shall be test.	The on and off schedule can be set and functioning accordingly. ide sessions will be Killed when over 15 mins Terminal any session via the System Console.	
12.7	Authentication with HKEdCity account or user designated authentication mechanism.	No error should be shown and pass the Authentication.	
12.8	Content Filter Enabled.	Filtered content/URL cannot be showed.	
12.9	HTTP Redirect The landing page shall only be prompted once for the same session of the user so that user will not have to go through the landing page when a new browser session is initiated from the same WiFi client device	Default: Redirect to school website as landing page. The landing page will not prompt for a new browser session is initiated from the same WiFi client device will not show up again.	
12.10	Establish connection with 802.11a client.	No error should be shown and connection should be established.	
12.11	Connect with 802.11b client.	No error should be shown and connection should be established.	

Test Case – Wi-Fi System – Test 12

12.12	Connect with 802.11g client.	No error should be shown and connection should be established.	
12.13	Connect with 802.11n client 2.4Ghz.	No error should be shown and connection should be established.	
12.14	Connect with 802.11n client 5Ghz.	No error should be shown and connection should be established.	
12.15	Connect with 802.11ac client 5Ghz.	No error should be shown and connection should be established.	
12.16	Speed Test (5Ghz) (target: total 50Mbps with 802.11n or 802.11ac) clients) Tools: OFCA (with broadband)	Each Upload Speed: ____Mbps Each Download Speed: ____Mbps No. of Clients:_____ Total Connection Speed: ___Mbps	
12.17	Speed Test (2.4Ghz) (target: total 50Mbps with 802.11n or 802.11ac) clients) Tools: OFCA (with broadband)	Each Upload Speed: ____Mbps Each Download Speed: ____Mbps No. of Clients:_____ Total Connection Speed: ___Mbps	

Test Case – Wi-Fi System – Test 13

- WiFi Security Test

Test 13 - WiFi Security Test			
13.1	Use device hardware unique ID (ie. MAC address) to register onto AP WiFi controller before letting them to make connection.	Registered device can successfully connected or else stop it from connecting.	
13.2	Hide SSID away from wireless detection. Preset it onto devices so that they are allowed to make a connection.	SSID will not be detected thru auto or manually except those have already preset in the devices.	
13.3	Ensure all WiFi equipment is supported IPV6 addressing method.	Confirm that all WiFi related equipment is supported IPV6.	
13.4	Disable any unsecured FTP service from all WiFi related equipment.	FTP should be disabled in all WiFi related equipment.	

Test Case – Wi-Fi System – Test 14

- Wi-Fi AP Signal Strength Test

Test 14 - WiFi AP Signal Strength Test			
	Procedures	**Expected Result**	**Pass / Fail**
AP1	Signal Strength (Location 1) Target: -68 dBm or better	[ ] Pass [ ] Not Pass	
	Signal Strength (Location 2) Target: -68 dBm or better	[ ] Pass [ ] Not Pass	
	DL/UL Test Tools: OFCA (with broadband)	DL/UL _____Mbps (expected 1Mbps total 40) connections	
	Ping Test Note: ping to hkix.net Target: average latency <40ms Packet loss <4% Package Sent: 100 or above	Packet Sent:____ Average Latency: ____ Packet Loss: ____ [ ] Pass [ ] Not Pass	

Test Case – Wi-Fi System – Test 14

- Wi-Fi AP Signal Strength Test

AP__	Signal Strength (Location 1) Target: -68 dBm or better	[ ] Pass [ ] Not Pass	
	Signal Strength (Location 2) Target: -68 dBm or better	[ ] Pass [ ] Not Pass	
	DL/UL Test Tools: OFCA (with broadband)	DL/UL_____Mbps (expected 1Mbps total 40) connections	
	Ping Test Note: ping to hkix.net Target: average latency <40ms Packet loss <4% Package Sent: 100 or above	Packet Sent:_____ Average Latency: _____ Packet Loss: _____ [ ] Pass [ ] Not Pass	

Test Case – Wi-Fi System – Test 15

- DHCP Server Test

(F) DHCP Server Test

Test 15 - DHCP SERVER

	Procedures	Expected Result	Pass / Fail
15.1	The DHCP server shall support at least 30 queries/sec.	30 Clients smoothly logon to the WiFi System.	

Test Case – Wi-Fi System – Test 16

- Broadband Throughput Test

(G) Broadband Throughput Test

Test 16 - Broadband Throughput

	Procedures	Expected Result	Pass / Fail
16.1	The bandwidth of the broadband link is provided in the proposal.	The bandwidth is greater than 80% of the subscribed bandwidth.	

Resources Introduction and Sharing of Post-Installation

4. WiFi900_SampleSystemTest 20150526

Draft

Sample System Test

Disclaimer: Please note that this is a sample system test designed for a variety of testing situations. Please adopt according to the specification in quotation document.

School Name: _____

Date of System Test: _____

Test Case – WiFi System

(A) Physical WiFi Controller and AP Installation Check on Premise

Test 1 - WiFi Controller and APs Check

5. WiFi900_SampleUAT20150526
(Session 1 PowerPoint)

Draft

User Acceptance Test for WiFi 900 (An example)

This User Acceptance Test (UAT) is suggested to be conducted by service provider to prove that the service expected by school could be delivered through the new WiFi infrastructure. The following test should be conducted according to the maximum no. of connections in classrooms.

Test 1: Connectivity Test Aim of this test: To ensure the ability of the connectivity, coverage and speed of the WiFi infrastructure.				
Test scenario	Expected result	Pass / Fail	Comments	Test execution date
1.1 Internet Connection	All 40 mobile devices can browse websites at the same time while all devices are connecting with the WiFi infrastructure.			
1.2 Speed Test	All 40 mobile devices can obtain the desired speed measured by the broadband performance testing Apps provided by OFCA			

Consideration of System Test & User Acceptance Test

- System testing is a testing conducted on a complete, integrated system to evaluate the system's compliance with its specified requirements.
- System testing is performed on the entire system in the context of a Functional Requirement Specification(s) (FRS) and/or a System Requirement Specification (SRS). System tests not only apply for the design, but also the behavior and even the believed expectations of the customer / client.
- Vendor-led

Consideration of System Test & User Acceptance Test

- User acceptance testing (UAT) consists of a process of verifying that a solution works for the user. It ensures that the solution will work for the user
- The UAT acts as a final verification of the required functionality, emulating real-world usage conditions on behalf of the paying client (the School). If the system works as required and without issues during normal use, one can reasonably extrapolate the same level of stability in production.
- School-based

General / Good Practices of UAT

- Identify common use of apps / platform that will use WiFi
  - Nearpad, Schoology, Moodle, YouTube
  - eClass, eSchoolpad, Office 365, Google Classroom
  - Etc…
- Simulate a testing environment
  - One Classroom, classrooms in the same floor, open areas, school hall
  - When / how / where / who / what for the UAT
  - Staff meeting?
- Estimate expected outcome / test results

- Tool: Testing tool from HKEdCity (TBC)
- Follow up if results are unsatisfactory (WiFi / apps setting, etc)

1. WiFi900_ServiceRequestForm_ v3_20151231 (Session 1 PowerPoint)

WiFi 900 Technical Advisory Service

Request Form

To: Technical Advisory Team, IT in Education Section, EDB
Tel: 3698 4148 / 3698 3566
Fax: 2382 4403
Email: ite@edb.gov.hk
Date: <date>

Our school would like to request for the technical advisory service. Details are as follows. We understand that our request will be served on first-come-first-served basis.

Schedule of Wi-Fi 900-ii
(Session 1 PowerPoint)

項目	Wi-Fi 900	備註
學校簡介會	2015年12月中	12月16日 及 18日
學校檢視學校發展計劃及電子學習推行情況	2016年1月	學校領導專業發展課程 1月19日(中學) 1月27日(小學及特殊學校)
制訂用戶要求方案及用戶要求	1至3月	檢視清單 研討會及工作坊
學校準備報價文件	4至5月 (可盡早進行)	檢視清單、用戶要求範本及技術顧問服務
邀請報價及審閱程序	5至6月 (可盡早進行)	技術顧問服務 技術顧問診症室 (逢星期三下午)
批出合約	5至6月 (可盡早進行)	
工程	6至8月 (可盡早進行)	制訂系統測試及用戶測試
匯報進度	8-10月	

3. Sharing by Visiting School

Q & A

Thanks for your kind attention