

Mobile and Cloud Printing for Android-based Device

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Information technology (IT) environment is currently upon a big transition period. In 2015, tablets are expected to surpass the shipments of PCs and laptops combined. Shipments of mobile devices including smartphones are already substantially higher than PCs. In addition, cloud services using cloud computing are rapidly gaining popularity. With this mobile progress and spread of cloud services in the IT environment, output methods of printed matter have also diversified. As a result, printers/MFPs are demanded "anywhere, anytime, anyone, simple" printing that does not restrict the type of device, output destination or time of usage. Printing technologies and services that utilize these diverse mobile environment and cloud services are referred to as "mobile/cloud printing".

This article presents OKI's efforts in the field of mobile/cloud printing and printing solutions for Android^{*1)} devices.

Overview of Mobile/Cloud Printing

As devices that utilize printing turns mobile, printer and MFP functions are becoming increasingly complex. Implementing these complex functions into printing equipment leads to higher equipment cost. Therefore, OKI provides part of those functions in conjunction with functions in its cloud environment EXaaS^{*2)} to lighten the weight of the MFP and promotes the transition from equipment ownership to utilization service. **Figure 1** shows OKI's idea of mobile/cloud printing.

Printer LCM (Life Cycle Management), a remote print monitoring service, works in conjunction with EXaaS. This service is already being provided at the time of this writing.

OKI's mobile/cloud printing complies with de facto standards to maximize added value and developed products conform to the needs of the time. Current efforts for the MFP include implementation of components to connect with various mobile devices/cloud environments and development of applications to enable printing from mobile devices.

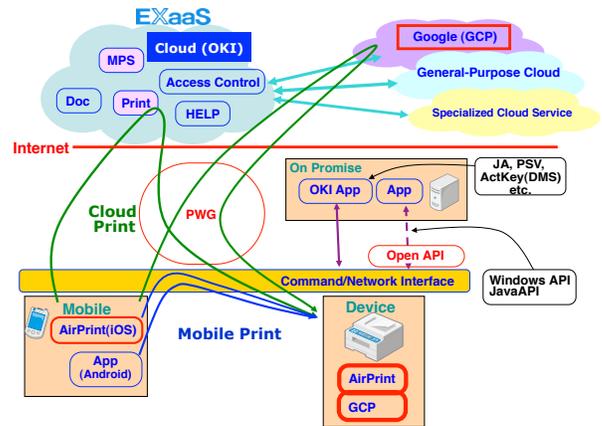


Figure 1. Mobile/Cloud Configuration Diagram

Apple's^{*3)} iOS and Google's^{*1)} Android OS's account for more than 90% of the mobile device (smartphones, tablets) market (Data from April ~ June, 2013).^{2), 3)} To enable direct printing from mobile devices, OKI currently complies with Apple's AirPrint^{*3)} specification for iOS and provides a printing app that operates on Android devices. As for Windows^{*4)} RT, standard drivers come preinstalled in the OS allowing the devices to print to any printer including OKI printers/MFPs.

For printing from cloud services, OKI supports Google's cloud printing specification, which is what users demand most.

Table 1 shows the firmware and software trends for mobile and cloud environments.

Table 1. Mobile and Cloud Printing Technologies

	Mobile Printing	Cloud Printing
Firmware	AirPrint (iOS)	Google Cloud Print
Software	OKI Mobile App (Android)	----

As a member of PWG (Printer Working Group), OKI is actively standardizing the printing and scanning technologies incorporated into printers/MFPs. Through

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*3) Apple, iPhone, iPad and AirPrint are registered trademarks of Apple inc. in the United States and other countries.

*4) Windows is a registered trademark of Microsoft Corporation in the United States and other countries.

this activity, OKI is developing the latest specifications for providing mobile/cloud printing.

Key Technologies of Mobile/Cloud Printing

Technical components necessary for connecting to the mobile/cloud printing environment are described below.

(1) Wireless Technology

One of the key components of mobile/cloud printing is wireless technology. Wireless LAN specifications are standardized in the 802.11 working group of the IEEE802 Committee (Institute of Electrical and Electronics Engineers 802 Projects). As shown in **Table 2**, specification depends on the secondary modulation scheme and frequency band and speeds for each differ.

Table 2. Wireless Specifications

Specification	Secondary Modulation Scheme	Frequency Band	Nominal Speed
IEEE 802.11a	OFDM	5.15 ~ 5.35GHz 5.47 ~ 5.725GHz	54Mbps
IEEE 802.11b	DSSS CCK	2.4 ~ 2.5GHz	11Mbps 22Mbps
IEEE 802.11g	OFDM	2.4 ~ 2.5GHz	54Mbps
IEEE 802.11n	OFDM	2.4 ~ 2.5GHz 5.15 ~ 5.35GHz 5.47 ~ 5.725GHz	65 ~ 600Mbps

OKI's wireless enabled printers/MFPs currently support IEEE 802.11b/g/n. Support for IEEE802.11a is in progress.

To further increase wireless speeds, IEEE802 Committee is working on the IEEE 802.11ac specification (approval planned for December 2013). With this specification, high-speed data communication of 290Mbps~6.9Gbps will be possible using the 5GHz frequency band. OKI is preparing to implement this newest specification in its product after the ratification.

In order to use a wireless device in a wireless LAN environment, the device must connect with a wireless LAN access point. Connection with an access point requires a SSID (Service Set Identifier), which is an ID used to distinguish wireless access points. As the number of wireless devices increases, deployed access points also increase. This in turn increases the number of characters in the SSID. To eliminate the inconvenience of manually entering the long SSID character string into a device, OKI developed a function (Auto Discovery) that automatically displays SSIDs located near the device as shown in **Figure 2**.

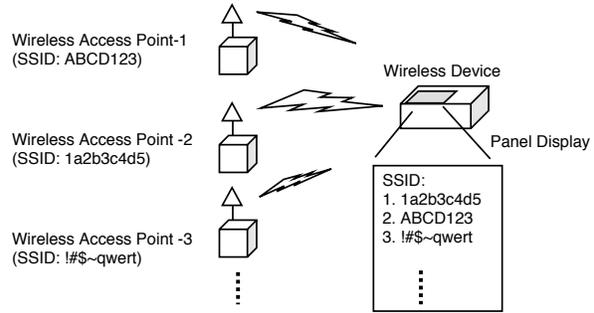


Figure 2. Function to Automatically Display Located SSIDs (Auto Discovery)

There is also a feature called WPS (Wi-Fi Protected Setup) that eases the task of setting up a wireless LAN environment. WPS-enabled device supports either the push button configuration, PIN (Personal Identification Number) entry or both. In push button configuration, wireless LAN devices begin exchanging information with each other when WPS buttons are pushed. Then they automatically set up a connection using optimal setup values. In the PIN entry method, after PIN is entered into a wireless device, information is exchanged with the wireless device that matches the PIN. Then connection is set up between the devices automatically using optimal connection values.

WPS, implemented in OKI's printers/MFPs, was defined by the Wi-Fi^(*) Alliance (Wireless Fidelity Alliance), an industry organization that creates connectivity-testing methods and performs authentication to promote wireless LAN devices.

(2) IPP Technology

IPP (Internet Printing Protocol) is a network protocol for printing over the Internet. It is standardized in RFC2565~2569, 2910~2911 by the IETF (Internet Engineering Task Force), an organization that establishes technical standards for the Internet. One feature of the IPP is the ability to exchange various information and commands between devices using HTTP (Hyper Text Transfer Protocol), similar to Web browsers. Utilizing this feature, the following functions become possible without the need for printer/MFP-specific tools or drivers.

- Print out data in mobile device from printer/MFP.
- Print out data in cloud from printer/MFP.
- Send fax from MFP using mobile device.
- Scan documents on MFP using mobile device.

Functions using IPP like those described above can also be performed from PCs and mobile devices via USB (Universal Serial Bus) instead of through the network.

^(*) Wi-Fi is a registered trademark of the Wi-Fi Alliance. All other product names and company names are in general trade names, registered trademarks or trademarks of their respective owners.

Printing Solutions for Android Devices

A printing app was developed for Android devices to enable printing from OKI printers/MFPs. The Android printing app is described below.

(1) Basic Functions

Top portion of the app screen (**Photo 1**) shows the choice of functions that include “WEB Page”, “Photo Gallery”, “File Explorer”, “Camera” and “Choose a Printer”.

“WEB Page” will start up the WEB browser, and contents of the displayed website can be printed. “Photo Gallery” will enable printing of image files stored in the device.

“File Explorer” will display a list of files in a folder from which a file can be selected for printing.

With the “Camera” option, photos can be taken and printed. The taken photos can be viewed before they are printed using the preview screen (**Photo 2**). Preview screen also allows size, orientation and print positions to be adjusted, and printer setup such as paper size, duplex printing, number of copies and color/B&W selection is possible.



Photo 1. Printing App Screen

(2) Print Management

A feature unique to OKI is software called PrintJobAccount, which has been available since the past for managing print jobs on OKI printers/MFPs. The software is used to keep a record of print jobs and place restrictions on print jobs such as limiting the number of prints and prohibiting color printing. OKI's printing app is compatible with this software. Therefore, it is possible to track and limit print jobs from smartphones and tablets as well. Use of smartphones and tablets in businesses is expected grow, which will likely increase the need for record keeping and restriction of print jobs from these devices.

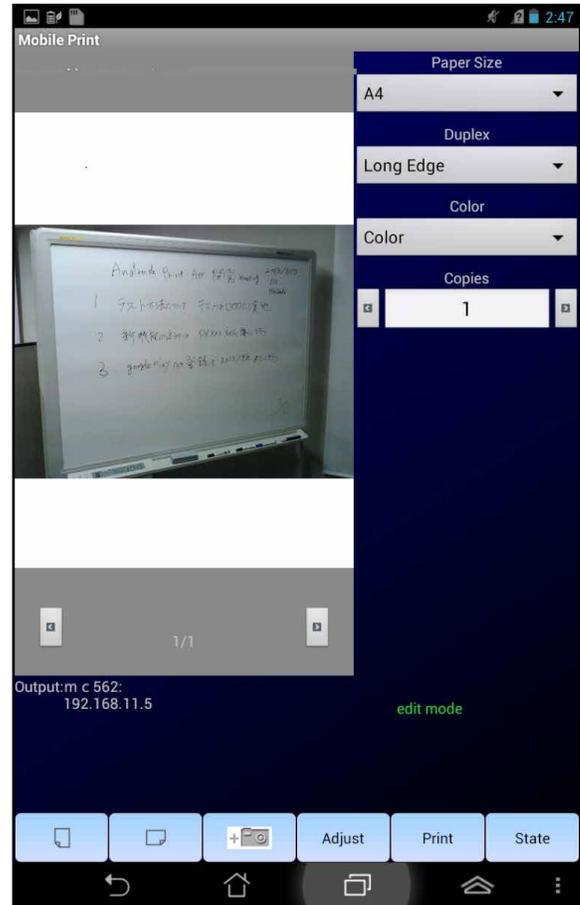


Photo 2. Preview Screen

(3) Communications Technology

OKI's print app uses IPP (HTTP) or RAW (Port9100) for communications between device and printer.

Summary

With the advancements in cloud, wireless and mobile technologies, arrival of various new services is anticipated. OKI's printers will respond appropriately to these new services and environment. Future developments will ensure products match user requirements. Mobile devices including smartphones and tablets are also likely to continue growing in popularity. For this reason, OKI is planning enhancements to the printing app, which will address user needs. Additional plans include enhancing the mobile app's interaction with the cloud, enabling scanning from MFPs and adding functions for services that bring additional value to the MFPs. ◆◆

■ References

- 1) IDC - Press Release 28 May 2013 (IDC Forecasts Worldwide Tablet Shipments to Surpass Portable PC Shipments in 2013, Total PC Shipments in 2015)
- 2) IDC - Press Release 07 Aug 2013 (Apple Cedes Market Share in Smartphone Operating System Market as Android Surges and Windows Phone Gains, According to IDC)
- 3) IDC - Press Release 05 Aug 2013 (Tablet Shipments Slow in the Second Quarter As Vendors Look To Capitalize on a Strong Second Half of 2013, According to IDC)
- 4) Yasuhiro Mitsui et al, "EXaaS SmartWorkspace™", OKI Technical Review (Japanese ver.), November 2012/Issue 220 Vol. 79 No. 2

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TIP **[Glossary]**

PWG (Printer Working Group)

One of the standardization Committee of IEEE that works on standards related to printers/MFPs for printer and OS vendors.

LCM (Life Cycle Management)

Entire management of printer/MFP life cycle from installation to disposal.

iOS

OS utilized in Apple's iPhones and iPads.

Android

OS developed by Google for use primarily in mobile devices such as smartphones and tablets.

Windows RT

ARM version of Windows developed based on Windows 8 for exclusive use in tablet-type devices.

Port9100

RAW data printing using TCP/IP port number 9100.

PrintJobAccount

OKI's server software that runs on Windows and records/monitors print jobs.