AXIS COMMUNICATIONS

WHITE PAPER

NETWORK PRINT SERVERS **AXIS 5800 MOBILE**

Mobile Printing
- Today and in the Future

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1 Mobile Printing – The Vision

This document describes innovations, technology and concepts related to the launch of the AXIS 5800 Mobile Network Print Server, the first print server that supports wireless printing. Scenarios that lie further ahead in the future are also discussed.

Two new major printing concepts will be introduced and explained:
- Wireless Printing
- Mobile Printing Solutions

The Mobile Printing vision from Axis involves wireless printing from mobile devices such as mobile/cellular phones, laptops, PDA's and digital cameras but also traditional PCs.

Mobile Printing uses radio communication to transport the print data. This means that no cables, additional connectors, or other complicated networking hardware is needed. While radio communication is used, the printer can even be located in another room from where the printed document is sent, i.e. Mobile Printing combines data connectivity and mobility.

2 Radio Technologies, Differences

Axis foresees the Mobile Printing vision to utilize multiple radio technologies depending on the genetics of mobile devices and the application/scenario that is at hand. In the foreseeable future, data communications technologies such as *Bluetooth*™ and IEEE 802.11b are at hand.

Both *Bluetooth* and 802.11b are radio based data communications standards that operate in the free ISM band at 2.4GHz.

2.1 Bluetooth

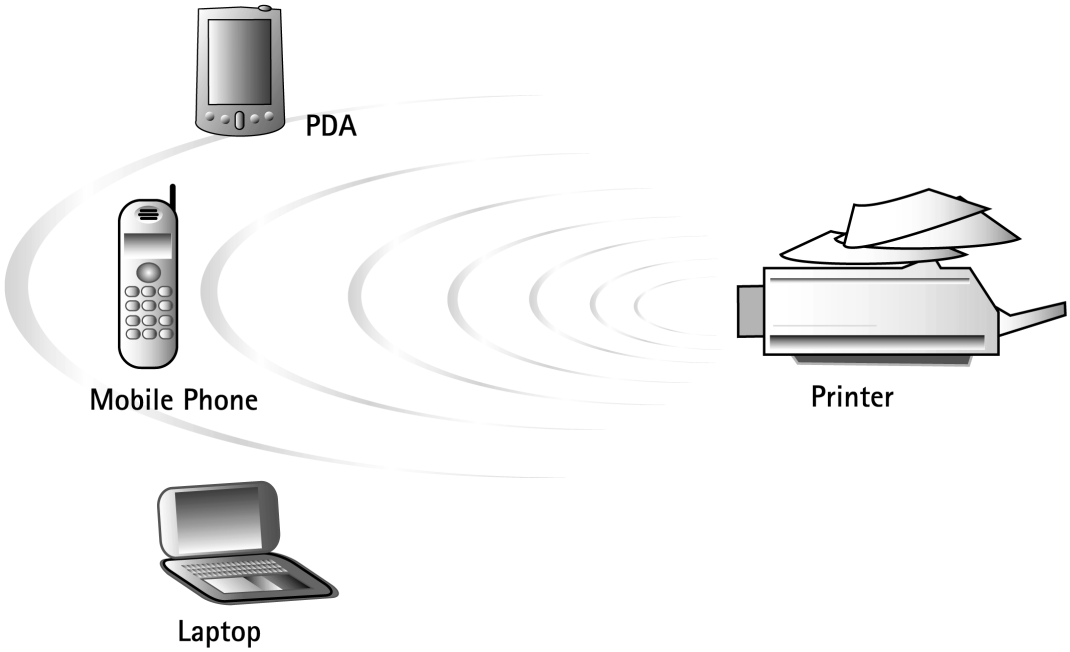
Bluetooth is a low-cost, low power-consumption standard and allows computerized devices to communicate wirelessly over distances of up to 10 meters with a data throughput of up to 720kbps. *Bluetooth* is also aimed at being very power efficient and cheap so that it can be built in to almost all mobile devices powered by batteries.

2.2 802.11b

802.11b, or Wireless Ethernet as it is also called, has a data throughput of up to 11Mbps and radio coverage of up to 150 meters. 802.11b is mainly aimed for wireless networking applications and is considerably more expensive and power consuming than *Bluetooth*.
The first Mobile Printing product from Axis, AXIS 5800 Mobile uses *Bluetooth*. Therefore this has been used in all the scenarios and examples in this document.

3 Wireless Printing - Local Information

In the Wireless Printing scenarios, the information to be printed resides within the memory, hard disk or other container of the mobile device. *Local* refers to the physical location of the print content, i.e. calendars and e-mails found locally in your mobile phone/PDA or a document residing in your laptop.



Wireless Printing from Axis includes three basic steps:

1. The user selects the item he/she wants to print from the mobile device by choosing “Print”.
2. The mobile device will automatically scan the immediate surroundings for *Bluetooth* printers. Capabilities of the discovered printers will be investigated and a list will be created with best-fit *Bluetooth* printers. The user only needs to select one printer in the presented list.
3. The hardcopy is now in the printer to be shared, distributed and used!

3.1 Visions of what Wireless Printing can be used for

Rather than having a fixed work area and desk space, office workers nowadays tend to find temporary desks when they need. With Mobile Printing technology, office professionals are free to print wherever they are in the office, whenever they want.

The mobile professional can print e-mails, contracts etc. in airport lounges as well as in hotel receptions without the hassle of wires and network configuration.

Home users may want to print pictures directly from their digital cameras at the local photo shop, or print messages from mobile phones at home. Getting rid of cables is especially attractive in the home environment.

3.2 Printing from a mobile phone

In the near future, printing from a mobile phone would enable you to print e-mails, calendar items, WAP content, phone book and in the future also multimedia content such as images.

Typically mobile phones do not include a lot of memory and computing capabilities. This makes them unsuitable for normal print driver handling. Instead mobile phones can utilize so called vObject formats, encoded in XML-like syntax, to output information. Specifically vCard (electronic business card), vCalendar and vMessage formats can be used to output phone book, calendar items as well as e-mails. The transformation to a printer-specific page description language is performed in the *Bluetooth* print server connected to the printer.

Another advantage of the vObject format is that it is used today to transfer electronic business cards between mobile phones that support IrDA (Infrared Transmission). This means that it is easy to add the same functionality over *Bluetooth* as well as to support the newer vObject formats such as vCalendar and vMessage.

The recently launched AXIS 5800 Mobile print server supports printing from e.g. Ericsson R520 Mobile Phone using vObjects.

3.3 Printing from a laptop

Printing from a laptop would enable users to print anything stored on the laptop's hard disk such as MS Word documents, MS PowerPoint slides, MS Excel sheets, e-mails and attachments etc.

Amongst mobile devices in general, the laptop is the most powerful. It has the ability to use the dedicated printer driver regardless of the printer model connected to the *Bluetooth* print server. This guarantees the normal high quality output expected from the printer type, just as if it had been connected directly to the laptop via a parallel cable.

Moving forward, the challenge will be how to handle automatic discovery of printer type as well as how to automate the process of printer driver handling to spare the user from the real world printer driver hassle.

3.4 Printing from other devices

The device types mentioned above are only examples on how the new Mobile Printing technology could be used and the list can of course go on and on.

For instance, digital cameras are another interesting group of devices that could benefit a great deal from Mobile Printing, as this would enable printing directly from the camera to the printer.

Furthermore, printing from a PDA (Personal Digital Assistant) would allow users to output anything stored within the PDA such as e-mails, e-books, documents, calendar items etc.

The PDA is in an intermediate position when it comes to computing performance and memory capabilities. Some PDA's supports real print drivers, but the printer manufacturers only provide printer drivers to PDA's for a very small subset of all printers available on the market. Thus it is recommended for PDA's to use the same print method as the less capable mobile phones.

4 Mobile Printing Solutions - Remote Information

Building on the Wireless Printing approach, Axis' vision for further Mobile Printing Solutions is printing documents that are accessible over the Internet without first having to download them to the mobile device.

Normally a mobile phone or a PDA would not have the capabilities of storing and displaying a large document, which makes it even more appealing to print the documents using the mobile device as a remote control.

Remote Printing includes the same basic functionality as Local Printing, i.e. discovery and printer capability inquiry.

4.1 What can Mobile Printing Solutions be used for?

Imagine working in a large office:

You are carrying your PDA or mobile phone equipped with Bluetooth wireless technology. On your way to the sales meeting, you remember that the report you prepared a week ago might be useful. You simply use your PDA or phone to locate the file on the network and print the report on the laser printer that is normally used by the sales department.

Note that the document never will be stored locally in the PDA, which makes it different from Local Printing.

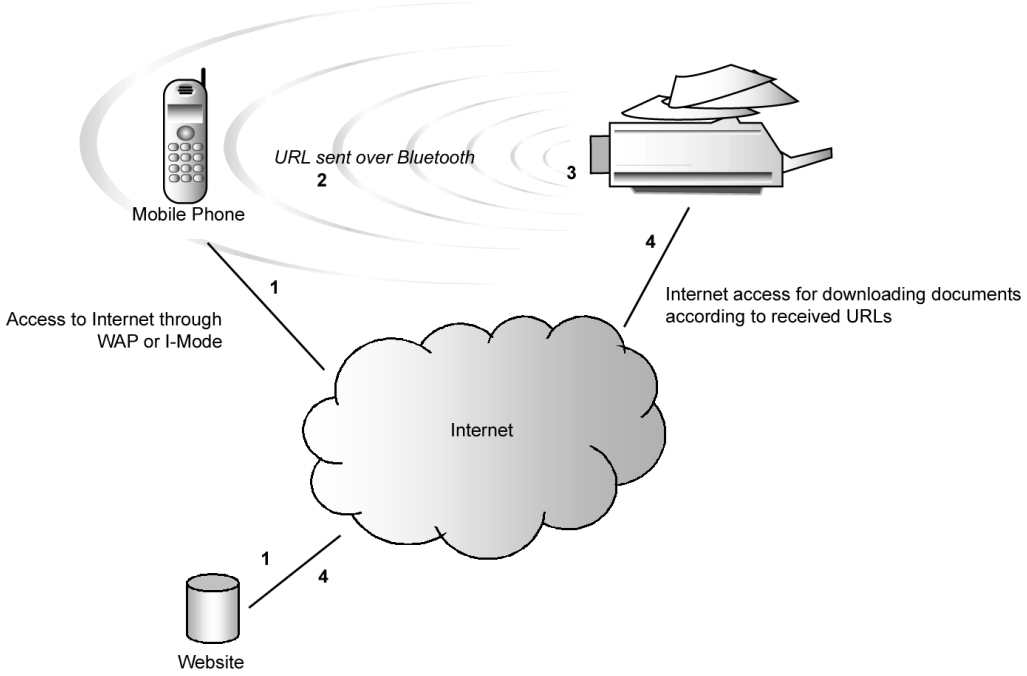
Another typical scenario:

After a particularly successful meeting at a hotel, a salesman wants to take his client for lunch. Not knowing the area, he simply looks at the Internet using his mobile phone to find a list of restaurants. He picks one and prints out directions at the courtesy printer in the hotel's reception area, directly from his mobile phone. He also prints a menu that they look at in the taxi on the way to the restaurant.

It is exceedingly difficult to view complex images like maps or read a set of directions on a mobile phone or PDA because of the size of the screen. So the obvious answer is to print them. With Mobile Printing, you can - anywhere. Note that the map will never be downloaded into the mobile device. The printing of the map will be initiated by a reference only, i.e. the URL.

4.2 Simple Usage Model

In the simplest scenario, only a URL needs to be transferred over *Bluetooth* to the print server from the mobile device. After receiving the URL, the print server decides whether the printer can handle the document format pointing to by the URL directly or if the format needs to be processed in any way. If the printer supports the document format directly, the print server only fetches the document using HTTP or FTP and passes it on to the printer.

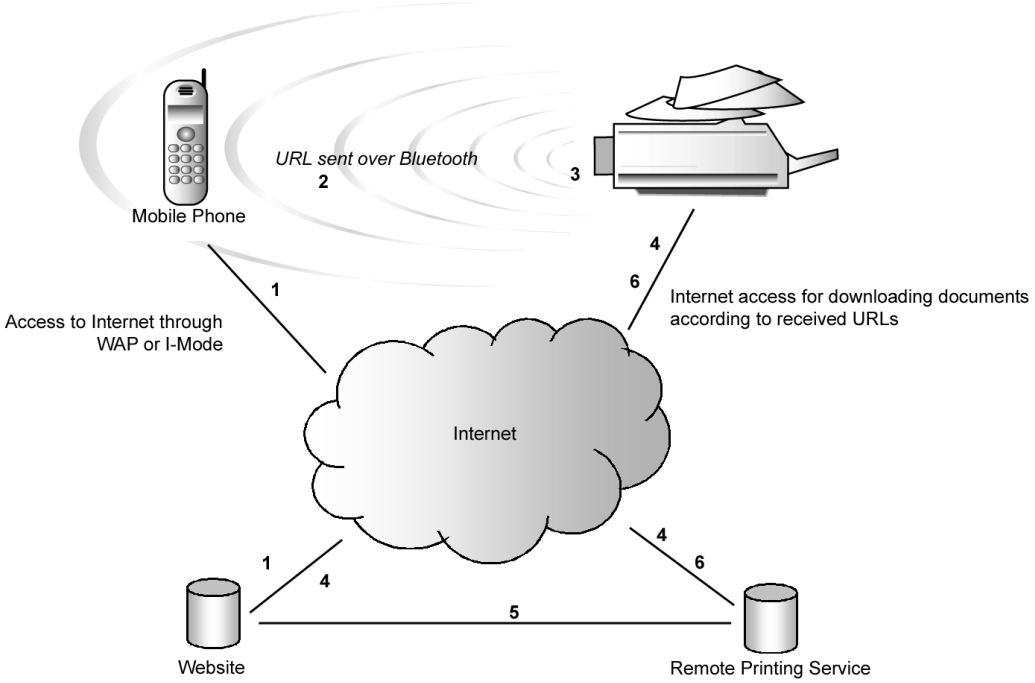


The steps involved are:

1. The user browses the Internet in order to locate the document to be printed using a mobile device.
2. The mobile device sends the URL to the *Bluetooth* print server.
3. The print server decides that the printer knows how to handle the document format.
4. The print server accesses the Internet to download the document for printing.
5. The hardcopy is now in the printer to be shared, distributed and used!

4.3 Remote Printing Service Model

In the real world, the most common case will likely be that the printer *does not* support the document format pointed out by the URL. Consider that documents found on the Internet can be anything from HTML, PDF to Microsoft Office document types. In this scenario, a Remote Printing Service is needed in order to obtain a successful output on the printer.

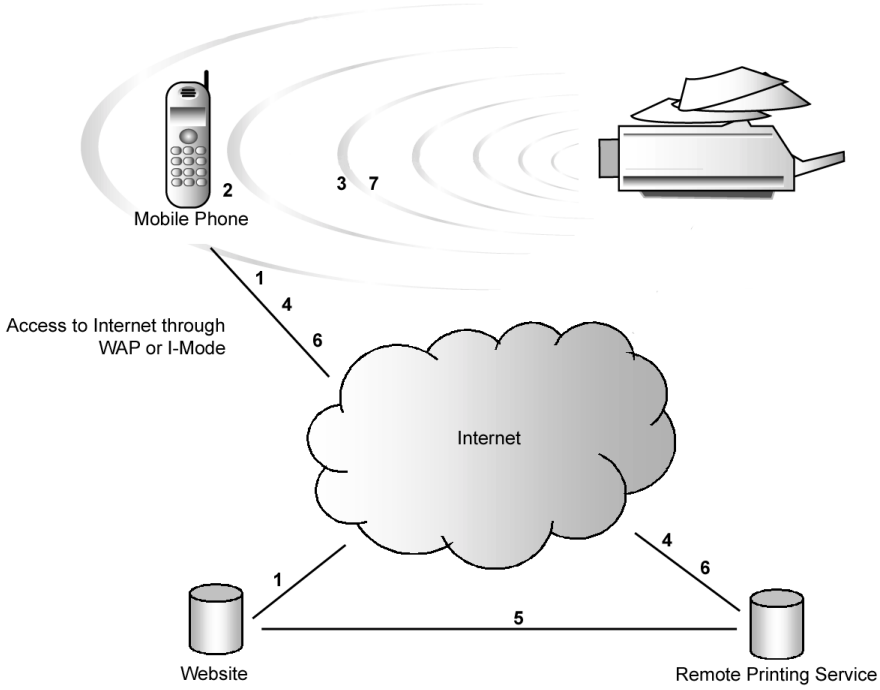


The steps involved are:

1. The user browses the Internet in order to locate the document to be printed, using a mobile device.
2. The mobile device sends the URL to the *Bluetooth* print server.
3. The print server decides that the printer does not know how to handle the document format.
4. The print server accesses a Remote Printing Service that can process the document.
5. The Remote Printing Service fetches the document pointed to be the URL.
6. The Remote Printing Service replies to the print server with the processed document.
7. The hardcopy is now in the printer to be shared, distributed and used!

4.4 Remote Printing Service with Print Data over Cellular Network

In some cases, the *Bluetooth* print server does not have an Internet connection, which would normally prohibit the use of Remote Printing. However, there is a way to solve this problem by having the mobile device manage and route the print data over the cellular network and on to the print server using *Bluetooth*.



The steps involved are:

1. The user browses the Internet in order to locate the document to be printed, using a mobile device.
2. The user selects the URL and activates the print option.
3. The mobile device connects to the *Bluetooth* print server in order to find out the printer capabilities.
4. If the printer cannot handle the document format pointed to by the URL directly, the mobile device connects to the Remote Printing Service and delivers the URL. (However, if the printer supports the document format pointed to by the URL, the mobile device downloads the document directly and forwards it over *Bluetooth* to the print server, which prints the document.)
5. The Remote Printing Service fetches and processes the document pointed to by the URL.
6. The Remote Printing Service replies to the mobile device with the processed document.
7. The mobile device forwards the print data to the print server using *Bluetooth*. The document is printed.

4.4.1 Conditions

There is a notable difference in this usage model compared to the other Remote Printing models. In this model, the mobile device has a more active role and in some cases it must also know how to communicate with a Remote Printing Service. However, this model allows the print server to be *Bluetooth* only i.e. no connection to a LAN or the Internet is needed. All data is sent over the cellular network.

5 Axis Communications and Mobile Printing

Mobile Printing is a completely new concept, led by Axis, the world's pioneering mobile print developer. Axis' cutting-edge wireless technology, combined with strong focus on usability and simplicity, creates Mobile Printing solutions that are easy to install and manage, and remarkably easy for people to use.

Mobile Printing is based on the continuous development and increased capacity of wireless devices such as mobile phones, laptops and PDA's equipped with *Bluetooth* or IEEE 802.11 wireless technology.

Axis is actively participating in developing these technologies and is working with other world-class organizations to ensure that standards are formed and adhered to. Axis' worldwide sales and distribution network, strong OEM partnerships and 15 years of experience in printer connectivity, provides an excellent ground for Mobile Printing solutions - for today and tomorrow.

6 About Axis Communications

The Axis Communications Group, with the parent company Axis AB, is a leader in network connectivity and emerging wireless Internet based services. The company is at the forefront of developing network appliance solutions that enable people and organizations to get easy and immediate access to devices and services. Axis is one of the global leaders in several key thin server and network device markets, such as printer, storage and video connectivity, and is doing pioneering work in the rapidly expanding markets of wireless and mobile communications.

Founded in 1984, Axis employs more than 500 people worldwide, including the 50 percent owned subsidiary, Netch Technologies. The group had a turnover of approximately 695 MSEK in the financial year 1999/2000. Axis is headquartered in Lund, Sweden and has a total of 28 offices throughout North America, Asia and Europe. Axis is a publicly traded company on the OM Stockholm Exchange's O-list. Information about Axis can be found at http://www.axis.com/