PUCC Printing Protocol

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Peer-to-Peer Universal Computing Consortium (PUCC)

Intellectual Property Notice

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1. Introduction

At present, various digital devices are connected using various communication protocols such as the Internet, mobile network and so on. In the field of the personal area network and home network, various technologies such as ECHONET, DLNA (UPnP) have been developed and are being utilized. They are very effective for specific problem areas and are being considered to be adopted as standards. However, each technology raises several problems for the user, for example, vendor specific and no interoperability.

Given this background, we expect that with the widespread use of mobile phones, digital cameras, printers and digital TVs, technologies that enable these devices to connect to global networks, to be seamlessly utilized from various locations, are strongly desired. The goals of PUCC are just such enabling technologies. To bring about a breakthrough, PUCC aims to research and develop a computing environment that provides interoperability for various networks and advanced services using peer-to-peer communication technology without user-troubling procedures.

This PUCC Printing Architecture and Protocol Specification provide a system architecture and protocol stack structure for peer-to-peer printing applications over a heterogeneous network consisting of the various networks mentioned above.

2. Terminology

2.1. Definition

[Node] A node is an entity that can communicate with other nodes. “Node” is a synonym for “Peer” in this spec. Each node is uniquely identified by a unique node id.

[Node ID] Node ID is a unique identifier for a node that distinguishes it from all other nodes on the network. For example, the Node ID is defined as FQDN (Fully Qualified Domain Name) or UUID (Universal Unique Identifier).

[Community] A community is a set of nodes that have a common set of interests or that obey a common set of policies. Each community is uniquely identified by a unique Community ID. Nodes belong to the same community can communicate one another.

[Community ID] Community ID is a unique identifier for a community that distinguishes it from all other communities. For example, the community id is defined as URN with specific namespace.

[Multicast Group] A multicast group is a collection of nodes under a defined multicast Group.

[Multicast Group ID] Multicast group ID is a unique identifier for a multicast group that distinguishes it from all other node groups on the network. For example, the Node Group ID is defined as URN with specific namespace.

[Message] The basic unit of peer to peer communication; consists of an XML-structured sequence of octets and transmitted via a connection.

[Message ID] Message ID is a unique identifier for a message that distinguishes it from all other messages. For example, the message ID can be defined as, node provided sequence number + current time + node ID

[Application Protocol ID] Application Protocol ID is a unique identifier for a protocol that distinguishes it from all other application protocols. For example, XML namespace can be used to distinguish the application protocols.

[Communication Mode] It indicates the message exchange method. Proactive Mode and Reactive Mode are defined.

[Communication Type] It indicates the method of message sending. Unicast, Multicast, and Broadcast are defined.

2.2. Abbreviations

PUCC	Peer-to-Peer Universal Computing Consortium
HTTP	Hypertext Transfer Protocol
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
IP	Internet Protocol
XML	eXtensible Markup Language

P2P	Peer-to-Peer
MIME	Multipurpose Internet Mail Extensions
URL	Unique Resource Locator
URN	Uniform Resource Names
iAppli	i-mode Java Application

3. Reference

[PUCC] "Peer-to-Peer Universal Computing Consortium",

URL: http://www.pucc.jp/

[XML] "Extensible Markup Language (XML) 1.0 (Second Edition) ", W3C Recommendation 6 October 2000, T. Bray et al. URL: http://www.w3.org/TR/2000/REC-xml-20001006

[HTTP] "Hypertext Transfer Protocol -- HTTP/1.1", RFC2616, R. Fielding et al., June 1999. URL:http://www.ietf.org/rfc/rfc2616.txt

[TCP] "Transmission Control Protocol", RFC793, J. Postel. September1981.

URL: http://www.ietf.org/rfc/rfc793.txt

[UDP] "User Datagram Protocol", RFC768, J. Postel. August 28 1980.

URL: http://www.ietf.org/rfc/rfc768.txt

[IP] "Internet Protocol", RFC791, J. Postel. September 1981.

URL: http://www.ietf.org/rfc/rfc791.txt

[URI] "Universal Resource Identifier"

URL: http://www.w3.org/Addressing/

[UPnP] "Universal Plug and Play PrintEnhanced:1 Service Template Version 1.01", UPnP Forum, October 28, 2006.

URL: http://www.upnp.org/standardizeddcps/documents/Service_PrintEnhanced_v1_20061028.pdf

[Bluetooth] "Bluetooth Basic Printing Profile", Bluetooth SIG, April 27, 2006.

URL:

http://www.bluetooth.com/NR/rdonlyres/A73B2675-418C-4434-8B37-A3AD60035299/2940/BPP_SPEC_V12r00.pdf

[IrDA] "IrDA Data Specifications", Infrared Data Association.

URL: http://irda.org/index.cfm

[OBEX] "OBEX(Object Exchange) Protocol", Infrared Data Association.

URL: http://irda.org/index.cfm

[Media Standardized Name] "Standard for Media Standardized Names", IEEE-ISTO Printer Working Group, February 26, 2002.

URL: ftp://ftp.pwg.org/pub/pwg/candidates/cs-pwgmsn10-20020226-5101.1.pdf

[IPP] ”Internet Printing Protocol”, IEEE-ISTO Printer Working Group.

URL: http://www.pwg.org/ipp/index.html

[PDF] ”Portable Document Format”, Adobe.

URL: http://www.adobe.com/jp/products/acrobat/adobepdf.html

[JPEG] ”Joint Photographic Experts Group”, ISO/IEC 10918-1:1994 | ITU-T Recommendation T.81.

[SVG] ”Scalable Vector Graphics (SVG) 1.1 Specification”, W3C Recommendation, January 14, 2003.

URL: http://www.w3.org/TR/SVG11/

[SGML] ”Standard Generalized Markup Language”, ISO 8879:1986.

[XHTML] ”XHTML1.0 The Extensible HyperText Markup Language (Second Edition)”, W3C Recommendation, January 26, 2000. Revised August 1, 2002.

URL: http://www.w3.org/TR/xhtml1/

[XHTML-Print] ”XHTML-Print”, W3C, September 20, 2006.

URL: http://www.w3.org/TR/xhtml-print/

[vCard] ”vCard version 2.1 Specification”, Internet Mail Consortium, September 18, 1996.

URL: http://www.imc.org/pdi/pdiproddev.html

[vCalendar] ”vCalendar V1.0 Specification”, Internet Mail Consortium, September 18, 1996.

URL: http://www.imc.org/pdi/pdiproddev.html

[iCalendar] ”Internet Calendaring and Scheduling Core Object Specification”, RFC2445, November 1998.

URL: http://www.ietf.org/rfc/rfc2445.txt

4. Goals and Requirements

4.1. Goals

The goals of this document are:

- To define a printing application protocol over the PUCC Core Protocol.
- To leverage existing standards where possible, especially existing and evolving Internet standards.

4.2. Requirements

4.2.1. Various content types

We require the printing various kinds of content from a cell phone. Cell phones have many kinds of content. Cell phones treat not only JPEG and PDF contents but also SVG content. We require the printing of these contents.

4.2.2. Various network interfaces

Recent cell phones use various network interfaces. For example, cell network (3G), Wi-Fi, USB, IrDA, Bluetooth are being used. Each network interface usually has its own printing protocol. For example, IPP, UPnP, BPP are major printing protocols. PUCC Printing Protocol is to support various network interfaces.

4.2.3. Lightweight protocol

Since wireless networks have unique characteristics such as latency, low bandwidth, and expensive data packets, traffic on wireless networks should be minimized. Calculations run on the cell phone should be minimized because it has scant resources

4.2.4. Content location

There are two printing models: direct printing and reference printing. Direct printing means the printer gets the content from the cell phone. Reference printing means the content comes from a content provider on the Internet. PUCC Printing Protocol should support both printing models.

4.2.5. Application extensibility

PUCC Printing Protocol should support not only printers but also displays/TVs as output devices.

4.2.6. Security

To support a broad range of printing applications, the right to print needs to be considered which requires some form of security. Security for PUCC applications based on PUCC platform is considered in PUCC security specification.

5. Printing Model

5.1. Device Model

A general architecture of the PUCC printing device model is shown in Figure 1. The cell phone and the printer host the PUCC protocols. The cell phone is connected to the printer through a 3G network, IrDA, Wi-Fi, Bluetooth, or USB and controls the printer via the PUCC protocols.

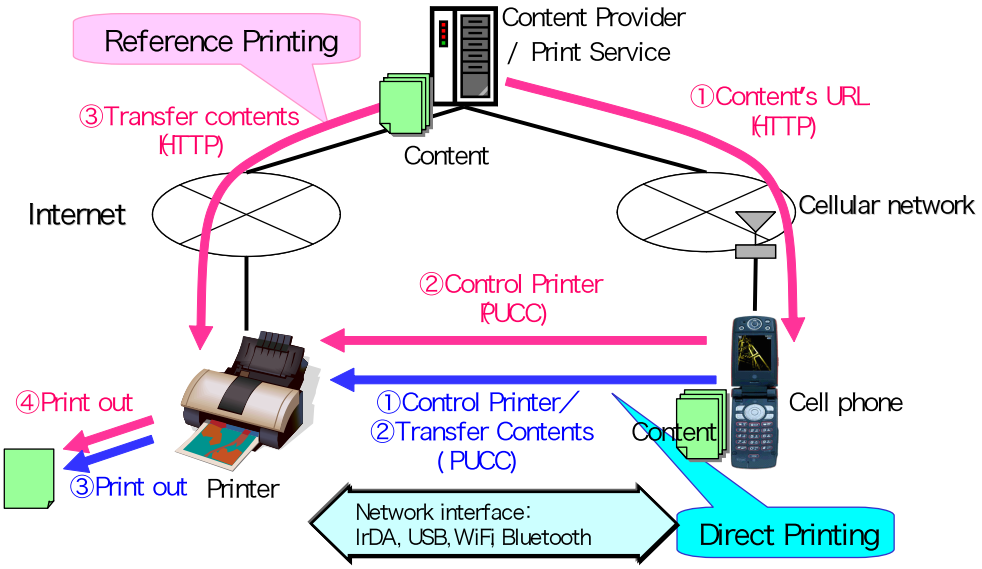

Figure 1 PUCC printing system architecture

5.2. Direct Printing

Direct Printing means the printer gets the content from the cell phone. (1) The cell phone directly controls the printer and sends the content's URI to the printer via various networks (not only local area networks but also wide area networks). The URI specifies the location of the directory holding the content in the cell phone. (2) The printer retrieves the content from the cell phone via the URI.

5.3. Reference Printing

Reference printing means the printer gets the content from the content provider's server on the Internet. (1) Since the cell phone sends the content's URI to the printer, the cell phone is assumed to already have the content's URI. (2) The cell phone controls the printer and sends the content's URI. (3) The printer resolves the URI and accesses the content to be printed.

6. Printing Protocol

6.1. Protocol Overview

This specification defines a PUCC protocol for printing. The PUCC Basic Communication Protocol and the PUCC Control Message Protocol are called the PUCC System Protocol Set; it provides basic functions for peer-to-peer communication. The PUCC Printing Protocol is called the application protocol and is specified in this document.

OBEX is a session layer protocol over IrDA, Bluetooth, or USB. OBEX is also used for direct content transfer. HTTP is used for both direct and reference content transfer.

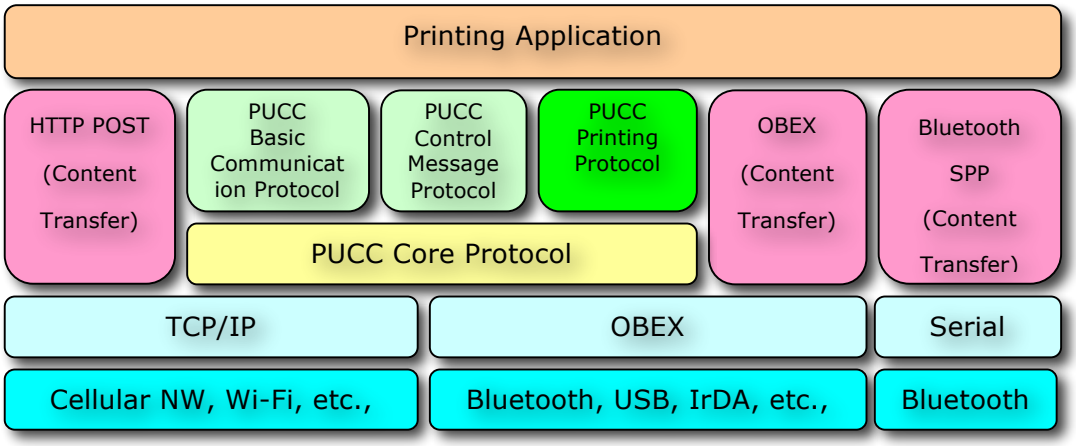

Figure 2 PUCC printing protocol stack

6.2. PUCC Core Protocol

This protocol provides the common peer-to-peer transport functions needed to establish or process a peer-to-peer connection between two nodes on a peer-to-peer network. The functions provided by this protocol include designating communication modes, providing communication types and source information, designating information, tracing route information, and so on. For details, please see the PUCC Basic Protocol Specification.

The following is an example of fields (Parameters) defined in the Core Protocol.

Table 1: Fields of PUCC Core Protocol

Element name	Element Value	Attribute name (if present)	Attribute Value	Occurrence	Status	description
Core	Following XML fragment	-	-	1	Required	
		xmlns	URI	1	Required	
ComType	"Unicast","Multicast","Broadcast"	-	-	1	Required	
MsgID	Message ID (String)	-	-	1	Required	
ReplyID	Message ID (String)	-	-	1	MsgType dependent	
MsgType	"Request","Response","Advertise"	-	-	1	Required	

CommunityID	Community ID (String)	-	-	1	Optional	
Source	Node ID (String)	-	-	1	Required	
Destination	Route,Target element	-	-	1	ComType dependent	
Route	Route,Target element	-	-	Multiple	Optional	
		Node	Node ID(String)	1	Required	
Target	Node ID, Multicast GroupID (String)	-	-	Multiple	Required	
TraceRoute	Route element	-	-	1	Optional	
Route	Route element	-	-	1	Optional	
		Node	Node ID(String)	1	Required	
HopCount	Integer (String)	-	-	1	ComType dependent	
GatewayAction	“Hook”,”Hop”	-	-	1	Optional	
SessionID	Session ID(String)	-	-	1	Optional	
MsgBody	XML document	-	-	1	Required	
		protocol	URI	1	Required	

6.3. PUCC Basic Communication Protocol

The PUCC Basic Communication Protocol is defined to realize the establishment and release of a PUCC connection and/or PUCC session. Additionally, this protocol has the function of exchanging resource information of a node such as the name of its adjacent nodes and PUCC applications running on the node. For details, please see the PUCC Basic Protocol Specification. The Hello method, the Bye method and the Resource Information exchange method are defined in the PUCC Basic Communication Protocol.

6.4. PUCC Control Message Protocol

The PUCC Control Message Protocol is defined to notify a message forwarding error, keep alive of PUCC connection or session and diagnose a condition of a node and first PUCC node discovery. For details, please see the PUCC Basic Protocol specification.

6.5. Printing Protocol

The PUCC Printing protocol consists of the following 4 methods.

Table 2: Fields of PUCC Printing Methods

No.	Method	Summary
1	PrintCapability	This method is used by the cell phone to obtain the printer’s capability.

2	Print	This method is used by the cell phone to assign a job to the printer
3	PrintStatus	This method is used to advertise information of the job to the cell phone that has assigned the job.
4	PrintResult	This method is used to advertise the result of the job to the cell phone that has assigned the job.

6.5.1. PrintCapability Method

6.5.1.1. PrintCapability message

Table 3: Field of PrintCapability message

Element name	Element Value	Attribute name (if present)	Attribute Value	Occurrence	Status	description
PrintCapability	-	-	-	1	Required	
		xmlns	URI	1	Required	

The PrintCapability message is mapped as per following table.

Table 4: Mapping of PrintCapability message to Core Protocol

Element name	Element Value	Attribute name (if present)	Attribute Value	Occurrence	Status	description
Core	Following XML fragment	-	-	1	Required	
		xmlns	URI	1	Required	
ComType	"Unicast"	-	-	1	Required	
MsgID	Message ID (String)	-	-	1	Required	
ReplyID	Message ID (String)	-	-	1	Unused	
MsgType	"Request"	-	-	1	Required	
CommunityID	Community ID (String)	-	-	1	Optional	
Source	Node ID (String)	-	-	1	Required	
Destination	Route,Target element	-	-	1	Required	
Route	Route,Target element	-	-	Multiple	Optional	
		Node	Node ID(String)	1	Required	
Target	Node ID(String)	-	-	Multiple	Required	
TraceRoute	Route element	-	-	1	Optional	
Route	Route element	-	-	1	Optional	
		Node	Node ID(String)	1	Required	
HopCount	Integer (String)	-	-	1	Unused	

GatewayAction	"Hook","Hop"	-	-	1	Unused	
SessionID	Session ID	-	-	1	Optional	
MsgBody	XML fragment	-	-	1	Required	
		protocol	URI	1	Required	

A) PrintCapability element

The PrintCapability element is used by the cell phone to request details of a printer's capabilities.

The following is a sample PrintCapability message.

```
<Core xmlns=" Namespace of PUCC Core Protocol" >
  <ComType>Unicast</ComType>
  <MsgID>12345.2006-04-20T16:15:32Z@968742ab-f9abb-4305-9900-f98e56f12352</MsgID>
  <MsgType>Request</MsgType>
  <Source>968742ab-f9bb-4305-9900-f98e56f12352</Source>
  <Destination>
    <Target>874542ab-a5c6-4305-8745-f98e56f12547</Target>
  </Destination>
  <MsgBody protocol=" Namespace of PUCC Printing Protocol" >
    <PrintCapability xmlns=" Namespace of PUCC Printing Protocol" />
  </MsgBody>
</Core>
```

Figure 3 Sample of PrintCapability message

6.5.1.2. PrintCapabilityResponse message

Table 5: Field of PrintCapability Response message

Element name	Element Value	Attribute name (if present)	Attribute Value	Occurrence	Status	description
PrintCapabilityResponse	XML fragment	-	-	1	Required	
		xmlns	URI	1	Required	
SupportedPrintAttribute	XML flagment	-	-	1	Required	
Copies	PositiveInteger	-	-	1	Optional	
SupportedSides	Sides element	-	-	1	Optional	
Sides	String	-	-	Multiple	Required	
SupportedNumberUp	NumberUp element	-	-	1	Optional	
NumberUp	PositiveInteger	-	-	Multiple	Required	
SupportedOrientation	Orientation element	-	-	1	Optional	
Orientation	String	-	-	Multiple	Required	
SupportedMediaSize	MediaSize element	-	-	1	Optional	

MediaSize	String	-	-	Multiple	Required	
		fullBleed Supported	String	1	Required	
		margins	String	1	Required	
SupportedMediaType	MediaType element	-	-	1	Optional	
MediaType	String	-	-	Multiple	Required	
SupportedPrintQuality	PrintQuality element	-	-	1	Optional	
PrintQuality	String	-	-	Multiple	Required	
SupportedContentTypes	ContentType element	-	-	1	Optional	
ContentType	String			Multiple	Required	
SizeAdjustmentSupported	String	-	-	1	Optional	
AmaountOfInk	Ink element	-	-	1	Optional	
Ink	String	-	-	Multiple	Required	
		color	String	1	Required	
PaperTrays	PaperTray element	-	-	1	Optional	
Tray	String ("loaded", "empty", "removed")	-	-	Multiple	Optional	
		size	String	1	Required	

The PrintCapabilityResponse message is mapped as per following table.

Table 6: Mapping of PrintCapability Response message to Core Protocol

Element name	Element Value	Attribute name (if present)	Attribute Value	Occurrence	Status	description
Core	Following XML fragment	-	-	1	Required	
		xmlns	URI	1	Required	
ComType	"Unicast"	-	-	1	Required	
MsgID	Message ID (String)	-	-	1	Required	
ReplyID	Message ID (String)	-	-	1	Required	
MsgType	"Response"	-	-	1	Required	
CommunityID	Community ID (String)	-	-	1	Optional	
Source	Node ID (String)	-	-	1	Required	
Destination	Route,Target element	-	-	1	Required	
Route	Route,Target element	-	-	Multiple	Optional	
		Node	Node ID(String)	1	Required	
Target	Node ID(String)	-	-	Multiple	Required	

TraceRoute	Route element	-	-	1	Optional	
Route	Route element	-	-	1	Optional	
		Node	Node ID(String)	1	Required	
HopCount	Integer (String)	-	-	1	Unused	
GatewayAction	“Hook”,”Hop”	-	-	1	Unused	
SessionID	Session ID	-	-	1	Optional	
MsgBody	XML document	-	-	1	Required	
		protocol	URI	1	Required	

A) PrintCapabilityResponse element

The PrintCapabilityResponse element designates a response to the PrintCapability. If the cell phone requests the printer’s capability, using PrintCapability, the printer shall respond with all attributes that it supports. PrintCapabilityResponse may contain the SupportedPrintAttribute element.

B) SupportedPrintAttribute element

The SupportedPrintAttribute element designates the printer attributes the printer supports. The SupportedPrinterAttribute element may contain the following elements.

C) Copies element

The Copies element is used to describe largest value of the copies parameter the printer supports.

D) SupportedSides element

The SupportedSides element is used to describe the values of the Sides parameter the printer supports. This element has three values; one-side, two-side-long-edge and two-side-short-edge.

E) SupportedNumberUp element

The SupportedNumberUp element is used to describe the value of the NumberUp parameter the printer supports. Example values; 1:One-page per side, 2:Two pages per side and 4:Four pages per side.

F) SupportedOrientation element

The SupportedOrientation element is used to describe the values of the Orientation parameter the printer supports. This element has four values; portrait, landscape, reverse-portrait, reverse-landscape.

G) SupportedMediaSize element

The SupportedMediaSize element is used to describe all values of the MediaSize parameter the printer supports. Available values are those of the print stock currently available to the printer. Refer to the Media Standardized Names standard. Example values; iso_a4_210x297mm, iso_a3_297x420mm.

The fullBleedSupported attribute of a MediaSize parameter is used to indicate whether a printer supports full-bleed printing or not. The value “true” means that a printer supports full-bleed printing. The value “false” means that a printer does not support full-bleed printing.

A margin attribute of the MediaSize parameter is used to set margin values of the paper, when a paper is printed. The format of values of a margin attribute is “top,right,bottom,left”.

H) SupportedMediaType element

The SupportedMediaType element is used to describe the type of paper the Printer supports. Available values are those of the print stock currently available to the printer. Refer to Media Standardized Names standard. This element has three values; stationery, envelope, photographic.

I) SupportedPrintQuality element

The SupportedPrintQuality element is used to describe the values of the PrintQuality parameter the printer supports. This element has three values; draft, normal and high.

J) SupportedContentTypes element

The SupportedContentTypes element is used to describe MIME types that a printer supports. The ContentType element is used to describe each MIME type that a printer supports.

K) SizeAdjustmentSupported element

The SizeAdjustmentSupported element is used to indicate whether a printer supports the size adjustment function, which corresponds with the size of a paper to be printed. The value “true” means that a printer supports the size adjustment function. The value “false” means that a printer does not support the size adjustment function.

L) AmountOfInk element

The AmountOfInke element is used to indicate the remaining amount of ink of a printer. The Ink element is used to describe the remaining amount of ink for each color type of a printer.

M) Ink element

The Ink element is used to describe the remaining amount of ink for each color type of a printer. The remaining amount of ink is represented by integer value (i.e. 0-100) of percent. The color attribute of the link element is used to describe color type. Color type is represented by three-byte hexadecimal number used in HTML 4.01 and CSS Level 2. The bytes represent the red, green and blue components of color. One byte represents a number in the range 00 to ff in hexadecimal notation.

N) PaperTrays element

The PaperTrays element is used to indicate trays of a printer. The Tray element is used to indicate each tray of a printer.

O) Tray element

The Tray element is used to show the status of each tray of a printer. The value “loaded” means that papers are set in the tray of a printer. The value “empty” means that papers are not set in the tray of a printer. The value “removed” means that the tray is removed from a printer.

The size attribute of the Tray element is used to indicate the size of papers set in the tray. The value

"Unspecified" is used when the size of papers set in the tray is unknown.

The following is a sample of the PrintCapabilityResponse message.

```
<Core xmlns=" Namespace of PUCC Core Protocol" >
  <ComType>Unicast</ComType>
  <MsgID>12345.2006-04-20T16:15:32Z@968742ab-f9abb-4305-9900-f98e56f12352</MsgID>
  <ReplyID>12345.2006-04-20T16:15:32Z@874542ab-a5c6-4305-8745-f98e56f12547</ReplyID>
  <MsgType>Response</MsgType>
  <Source>968742ab-f9bb-4305-9900-f98e56f12352</Source>
  <Destination>
    <Target>874542ab-a5c6-4305-8745-f98e56f12547</Target>
  </Destination>
  <MsgBody protocol=" Namespace of PUCC Printing Protocol" >
    <PrintCapabilityResponse xmlns=" Namespace of PUCC Printing Protocol" >
     <SupportedPrintAttribute>
       <Copies>99</Copies>
       <SupportedSides>
         <Sides>One-sided</Sides>
         <Sides>Two-sided-long-edge</Sides>
         <Sides>Two-sided-short-edge</Sides>
       </SupportedSides>
       <SupportedNumberUp>
         <NumberUp>1</NumberUp>
         <NumberUp>2</NumberUp>
         <NumberUp>4</NumberUp>
       </SupportedNumberUp>
       <SupportedOrientation>
         <Orientation>portrait</Orientation>
         <Orientation>landscape</Orientation>
         <Orientation>reverse-portrait</Orientation>
       </SupportedOrientation>
       <SupportedMediaSize>
         <MediaSize fullBleedSupported="true" margins="0,0,0,0">iso_a4_210x297mm</MediaSize>
         <MediaSize fullBleedSupported="false" margins="10,15,10,15">iso_a3_297x420mm</MediaSize>
       </SupportedMediaSize>
       <SupportedMediaType>
         <MediaType>photographic</MediaType>
         <MediaType>stationery</MediaType>
         <MediaType>cardstock</MediaType>
       </SupportedMediaType>
       <SupportedPrintQuality>
         <PrintQuality>draft</PrintQuality>
         <PrintQuality>normal</PrintQuality>
         <PrintQuality>high</PrintQuality>
       </SupportedPrintQuality>
       <SupportedContentType>
         <ContentType>application/pdf</ContentType >
         <ContentType >image/jpeg</ContentType >
         <ContentType >image/bmp</ContentType >
       </SupportedPrintQuality>
       <SizeAdjustmentSupported>true</SizeAdjustmentSupported>
       <AmountOfInk>
         <Ink color="#ff0000">100</Ink>
         <Ink color="#00ff00">100</Ink>
         <Ink color="#0000ff">100</Ink>
```

```
        </AmountOfInk>
        <PaperTrays>
          <Tray size="iso_a3_297x420mm">empty</Tray>
          <Tray size="iso_a4_210x297mm">loaded</Tray>
        </PaperTrays>
      </SupportedPrintAttribute>
    </PrintCapabilityResponse>
  </MsgBody>
</Core>
```

Figure 4 Sample of PrintCapabilityRresponse message

6.5.2. PrintMethod

6.5.2.1. Print message

Table 7: Field of Print message

Element name	Element Value	Attribute name (if present)	Attribute Value	Occurrence	Status	description
Print	XML fragment	-	-	1	Required	
		xmlns	URI	1	Required	
ContentID	URI	-	-	1	Required	
ContentType	MIME type (String)	-	-	1	Required	
Copies	PositiveInteger	-	-	1	Required	
Sides	String	-	-	1	Required	
NumberUp	PositiveInteger	-	-	1	Required	
Orientation	String	-	-	1	Required	
MediaSize	String	-	-	1	Required	
MediaType	String	-	-	1	Required	
PrintQuality	String	-	-	1	Required	
PrintSize	String	-	-	1	Optional	
Margins	String	-	-	1	Optional	

The Print message is mapped as per following table.

Table 8: Mapping of Print message to Core Protocol

Element name	Element Value	Attribute name (if present)	Attribute Value	Occurrence	Status	description
Core	Following XML fragment	-	-	1	Required	
		xmlns	URI	1	Required	
ComType	"Unicast"	-	-	1	Required	
MsgID	Message ID (String)	-	-	1	Required	

ReplyID		Message ID (String)	-	-	1	Unused	
MsgType		"Request"	-	-	1	Required	
CommunityID		Community ID (String)	-	-	1	Optional	
Source		Node ID (String)	-	-	1	Required	
Destination		Route,Target element	-	-	1	Required	
	Route	Route,Target element	-	-	Multiple	Optional	
			Node	Node ID	1	Required	
	Target	Node ID(String)	-	-	Multiple	Required	
TraceRoute		Route element	-	-	1	Optional	
	Route	Route element	-	-	1	Optional	
			Node	Node ID	1	Required	
HopCount		Integer (String)	-	-	1	Unused	
GatewayAction		"Hook","Hop"	-	-	1	Unused	
SessionID		Session ID (String)	-	-	1	Optional	
MsgBody		XML document	-	-	1	Required	
			protocol	URI	1	Required	

A) Print element

The Print element is used to submit a job to the Printer. The following 10 elements are defined as fields (parameters) of the Print message.

B) ContentID element

The ContentID element is used to describe the location of content. The printer may either process the reference locally or access a network/Internet-based content. When direct printing, this element may be empty. When reference printing, this element designates the URL for the network/Internet-based content.

C) ContentType element

The ContentType element is used to identify the document format. It specifies the document format of the job as a MIME Media type. Example values are text/plain, image/jpeg, application/vnd.pwg-xhtml-print+xml, image/svg+xml. This document doesn't limit allowed ContentType entries since PUCC Printing Protocol is intended to print various content types.

D) Copies element

The Copies element is used to describe the value of the Copies parameter requested by the cell phone. The cell phone should get the number supported by the printer via PrintCapability method.

E) Sides element

The Sides element is used to describe the values of the Sides parameter requested by the cell phone. The cell phone should get this information, what the Printer supports, via PrintCapability method.

F) NumberUp element

The NumberUp element is used to describe the values of the NumberUp parameter requested by the cell phone. The cell phone should get the number supported by the Printer via PrintCapability method.

G) Orientation element

The Orientation element is used to describe the values of the Orientation parameter requested by the cell phone. The Cell phone should get this information, what the Printer supports, via PrintCapability method.

H) MediaSize element

The MediaSize element is used to describe the values of the MediaSize parameter requested by the cell phone. The cell phone should get this information, what the Printer supports, via PrintCapability method.

I) MediaType element

The MediaType element is used to describe the values of the MediaType parameter requested by the cell phone. The cell phone should get this information, what the Printer supports, via PrintCapability method.

J) PrintQuality element

The PrintQuality element is used to describe the values of the PrintQuality parameter requested by the cell phone. The cell phone should get this information, what the Printer supports, via PrintCapability method.

K) PrintSize element

The PrintSize element is used to describe the size of content to be printed. The value “no_adjustment” means that the print size is not adjusted. The value “1_page_adjustment” means that the print size is adjusted to one page. The value “800x600” means that the print size is adjusted to the specified value (e.g. 800x600).

L) Margins element

The Margins element is used to describe the margins value of a paper, when content is printed. The margins value is represented by “top,right,bottom,left”. When this element is omitted, the default margins value of a paper is applied.

The following is a sample Print message.

```
<Core xmlns=” Namespace of PUCC Core Protocol” >
  <ComType>Unicast</ComType>
  <MsgID>12345.2006-04-20T16:15:32Z@968742ab-f9abb-4305-9900-f98e56f12352</MsgID>
  <MsgType>Response</MsgType>
  <Source>968742ab-f9bb-4305-9900-f98e56f12352</Source>
  <Destination>
    <Target>874542ab-a5c6-4305-8745-f98e56f12547</Target>
  </Destination>
  <MsgBody protocol=” Namespace of PUCC Printing Protocol” >
    <Print xmlns=” Namespace of PUCC Printing Protocol” >
     <ContentID>ContentURL</ContentID>
     <ContentType>application/pdf</ContentType>
```

```
      <Copies>5</Copies>
      <Sides>One-sided</Sides>
      <NumberUp>1</NumberUp>
      <Orientation>portrait</Orientation>
      <MediaSize>iso_a4_210X297mm</MediaSize>
      <MediaType>photographic</MediaType>
      <PrintQuality>high</PrintQuality>
      <PrintSize>no_adjustment</PrintSize>
      <Margins>0,0,0,0</Margins>
    </Print>
  </MsgBody>
</Core>
```

Figure 5 Sample of Print message

6.5.2.2. PrintResponse message

Table 9: Field of PrintResponse message

Element name	Element Value	Attribute name (if present)	Attribute Value	Occurrence	Status	description
PrintResponse	XML fragment	-	-	1	Required	
		xmlns	URI	1	Required	
JobID	Job ID. 1～2^{31}-1. (unsignedInt)	-	-	1	Required	
OperationStatus	Status Code (String)	-	-	1	Required	

The PrintResponse message is mapped as per following table.

Table 10: Mapping of PrintResponse message to Core Protocol

Element name	Element Value	Attribute name (if present)	Attribute Value	Occurrence	Status	description
Core	Following XML fragment	-	-	1	Required	
		xmlns	URI	1	Required	
ComType	“Unicast”	-	-	1	Required	
MsgID	Message ID (String)	-	-	1	Required	
ReplyID	Message ID (String)	-	-	1	Required	
MsgType	“Response”	-	-	1	Required	
CommunityID	Community ID (String)	-	-	1	Optional	
Source	Node ID (String)	-	-	1	Required	
Destination	Route,Target element	-	-	1	Required	
Route	Route,Target element	-	-	Multiple	Optional	
		Node	Node ID (String)	1	Required	
Target	Node ID(String)	-	-	Multiple	Required	

TraceRoute	Route element	-	-	1	Optional	
Route	Route element	-	-	1	Optional	
		Node	Node ID (String)	1	Required	
HopCount	Integer (String)	-	-	1	Unused	
GatewayAction	“Hook”,”Hop”	-	-	1	Unused	
SessionID	Session ID (String)	-	-	1	Optional	
MsgBody	XML document	-	-	1	Required	
		protocol	URI	1	Required	

A) PrintResponse element

The PrintResponse element designates a response to Print. Upon receiving Print from the cell phone, the printer responds with the PrintResponse element that indicates whether the printer can print the job or not. This element shall contain the following elements.

B) JobID element

The JobID element, a unique ID value in the range from 1 to 2^{31}-1 generated by the printer, is used to identify this order; 0 and negative values are invalid values. The printer should not re-use values recently assigned, since the cell phone may confuse it with an older job.

C) OperationStatus element

The OperationStatus element describes the status, success or failure, of Print operation. If the Print message contains an invalid value, the printer must reject the request and return the appropriate status code. The status codes are mapped to their meanings in the table section in Section 10.

The following is a sample of PrintResponse message.

```
<Core xmlns=" Namespace of PUCC Core Protocol" >
  <ComType>Unicast</ComType>
  <MsgID>12345.2006-04-20T16:15:32Z@968742ab-f9abb-4305-9900-f98e56f12352</MsgID>
  <ReplyID>12345.2006-04-20T16:15:32Z@874542ab-a5c6-4305-8745-f98e56f12547</ReplyID>
  <MsgType>Response</MsgType>
  <Source>968742ab-f9bb-4305-9900-f98e56f12352</Source>
  <Destination>
    <Target>874542ab-a5c6-4305-8745-f98e56f12547</Target>
  </Destination>
  <MsgBody protocol=" Namespace of PUCC Printing Protocol" >
    <PrintResponse xmlns=" Namespace of PUCC Printing Protocol" >
     <JobID>178059</JobID>
     <OperationStatus>0x0000</OperationStatus>
    </PrintResponse>
  </MsgBody>
</Core>
```

Figure 6 Sample of PrintResponse message

6.5.3. Content Transfer Protocol

The Content Transfer Protocol falls into 2 categories. One is for direct printing, and the other is for reference printing.

A) Content Transfer Protocol for direct printing

The Content Transfer Protocol for direct printing is the protocol to transfer the content from the Cell phone to the Printer. The HTTP protocol (POST method) , the OBEX protocol and the Bluetooth(Serial Port Profile) Protocol shall be supported for this specification, Transport binding of the content transfer protocol over the HTTP protocol, and the OBEX protocol and the Bluetooth(Serial Port Profile) Protocol is specified in Section 7.

B) Content Transfer Protocol for reference printing

The Content Transfer Protocol for reference printing is the protocol to transfer the content from the content server to the Printer. PUCC Printing Protocol Specification supports the Printer which uses a reference to retrieve the content that to be printed. The reference is sent as part of the Print message. The Printer processes this reference and returns a response to the Cell phone. The Printer may either process this reference locally or access a network / Internet-based print service to process the request.

The reference accessed on the network according to the protocol scheme is specified in the Print message. The HTTP protocol (POST method) shall be supported for this specification. Transport binding of the content transfer protocol over the HTTP protocol is shown in Section 7.

When the printer accesses the content server on the Internet to retrieve the content, the printer must leave the server log data. The log shall include NodeID, JobID and ContentID.

6.5.4. PrintStatus Method

Table 11: Field of PrintStatus message

Element name	Element Value	Attribute name (if present)	Attribute Value	Occurrence	Status	description
PrintStatus	XML fragment	-	-	1	Required	
		xmlns	URI	1	Required	
RequestedCopies	positiveInteger	-	-	1	Required	
ComletedCopies	positiveInteger	-	-	1	Required	
JobID	Job ID. 1～2^{31}-1. (unsignedInt)	-	-	1	Required	
OperationStatus	Status Code (String)	-	-	1	Optional	

The PrintStatus message is mapped as per following table.

Table 12: Mapping of PrintStatus message to Core Protocol

Element name	Element Value	Attribute	Attribute Value	Occurren	Status	description

		name (if present)		ce		
Core	Following XML fragment	-	-	1	Required	
		xmlns	URI	1	Required	
ComType	"Unicast"	-	-	1	Required	
MsgID	Message ID (String)	-	-	1	Required	
ReplyID	Message ID (String)	-	-	1	Unused	
MsgType	"Advertise"	-	-	1	Required	
CommunityID	Community ID (String)	-	-	1	Optional	
Source	Node ID (String)	-	-	1	Required	
Destination	Route,Target element	-	-	1	Required	
Route	Route,Target element	-	-	Multiple	Optional	
		Node	Node ID(String)	1	Required	
Target	Node ID(String)	-	-	Multiple	Required	
TraceRoute	Route element	-	-	1	Unused	
Route	Route element	-	-	1	Optional	
		Node	Node ID(String)	1	Required	
HopCount	Integer (String)	-	-	1	Unused	
GatewayAction	"Hook","Hop"	-	-	1	Unused	
SessionID	Session ID (String)	-	-	1	Optional	
MsgBody	XML document	-	-	1	Required	
		protocol	URI	1	Required	

A) PrintStatus element

The printer notifies the cell phone of information about a unique job by using the PrintStatus method. PrintStatus consists of the following elements.

B) RequestedCopies element

The RequestedCopies element describes the total number of Copies requested by the cell phone.

C) CompletedCopies element

The CompletedCopies element describes the number of Copies that the Printer has physically completed printing.

D) JobID element

The JobID element is used to identify the job as indicated by the printer.

E) OperationStatus element

The OperationStatus element describes the status, success or failure of the printing operation. If printing has

been successfully completed, the printer returns the status code indicating success. If printing has encountered some failure, the printer returns the status code about error. Status codes are mapped to their meanings in the table section in Section 10.

```
<Core xmlns=" Namespace of PUCC Core Protocol" >
  <ComType>Unicast</ComType>
  <MsgID>12345.2006-04-20T16:15:32Z@968742ab-f9abb-4305-9900-f98e56f12352</MsgID>
  <MsgType> Advertise</MsgType>
  <Source>968742ab-f9bb-4305-9900-f98e56f12352</Source>
  <Destination>
    <Target>874542ab-a5c6-4305-8745-f98e56f12547</Target>
  </Destination>
  <MsgBody protocol=" Namespace of PUCC Printing Protocol" >
    <PrintStatus xmlns=" Namespace of PUCC Printing Protocol" >
     <RequestedCopies>10</RequestedCopies>
     <CompletedCopies>5</CmpletedCopies>
     <JobID>178059</JobID>
     <OperationStatus>0x0000</OperationStatus>
    </PrintStatus>
  </MsgBody>
</Core>
```

Figure 7 Sample of PrintStatus message

6.5.5. PrintResult Method

6.5.5.1. PrintResult message

Table 13: Field of PrintResult message

Element name	Element Value	Attribute name (if present)	Attribute Value	Occurrence	Status	description
PrintResult	XML fragment	-	-	1	Required	
		xmlns	URI	1	Required	
JobID	Job ID. 1～2^{31}-1. (unsignedInt)	-	-	1	Required	
OperationStatus	Status Code (String)	-	-	1	Required	

The PrintResult message is mapped as per following table.

Table 14: Mapping of PrintResult message to Core Protocol

Element name	Element Value	Attribute name (if present)	Attribute Value	Occurrence	Status	description
Core	Following XML fragment	-	-	1	Required	
		xmlns	URI	1	Required	
ComType	"Unicast"	-	-	1	Required	
MsgID	Message ID (String)	-	-	1	Required	

ReplyID		Message ID (String)	-	-	1	Unused	
MsgType		"Request"	-	-	1	Required	
CommunityID		Community ID (String)	-	-	1	Optional	
Source		Node ID (String)	-	-	1	Required	
Destination		Route,Target element	-	-	1	Required	
	Route	Route,Target element	-	-	Multiple	Optional	
			Node	Node ID(String)	1	Required	
	Target	Node ID(String)	-	-	Multiple	Required	
TraceRoute		Route element	-	-	1	Optional	
	Route	Route element	-	-	1	Optional	
			Node	Node ID(String)	1	Required	
HopCount		Integer (String)	-	-	1	Unused	
GatewayAction		"Hook","Hop"	-	-	1	Unused	
SessionID		Session ID (String)	-	-	1	Optional	
MsgBody		XML document	-	-	1	Required	
			protocol	URI	1	Required	

A) PrintResult element

When the job has been completed or aborted for some reason or reasons, the printer sends a PrintResult message to the cell phone. This method is optional. PrintResult consists of the following elements.

B) JobID element

The JobID element is used to identify the job requested.

C) OperationStatus element

The OperationStatus element describes the status, success or failure of the job. If the printer has completed the job, the printer returns the status code indicating success. If the job has aborted, the printer returns the status code indicating error. Status codes are mapped to their meanings in the table section in Section 10.

```
<Core xmlns=" Namespace of PUCC Core Protocol" >
  <ComType>Unicast</ComType>
  <MsgID>12345.2006-04-20T16:15:32Z@968742ab-f9abb-4305-9900-f98e56f12352</MsgID>
  <MsgType>Request</MsgType>
  <Source>968742ab-f9bb-4305-9900-f98e56f12352</Source>
  <Destination>
    <Target>874542ab-a5c6-4305-8745-f98e56f12547</Target>
  </Destination>
  <MsgBody protocol=" Namespace of PUCC Printing Protocol" >
    <PrintResult xmlns=" Namespace of PUCC Printing Protocol" >
     <JobID>178059</JobID>
     <OperationStatus>0x0000</OperationStatus>
    </PrintResult>
```

```
  </MsgBody>
</Core>
```

Figure 8 Sample of PrintResult message

6.5.5.2. PrintResultResponse message

Table 15: Field of PrintResultResponse message

Element name	Element Value	Attribute name (if present)	Attribute Value	Occurrence	Status	description
PrintResultResponse	XML fragment	-	-	1	Required	
		xmlns	URI	1	Required	
JobID	Job ID. 1～2^{31}-1. (unsignedInt)	-	-	1	Required	

The PrintResultResponse message is mapped as per following table.

Table 16: Mapping of PrintResultResponse message to Core Protocol

Element name	Element Value	Attribute name (if present)	Attribute Value	Occurrence	Status	description
Core	Following XML fragment	-	-	1	Required	
		xmlns	URI	1	Required	
ComType	"Unicast"	-	-	1	Required	
MsgID	Message ID (String)	-	-	1	Required	
ReplyID	Message ID (String)	-	-	1	Required	
MsgType	"Response"	-	-	1	Required	
CommunityID	Community ID (String)	-	-	1	Optional	
Source	Node ID (String)	-	-	1	Required	
Destination	Route,Target element	-	-	1	Required	
Route	Route,Target element	-	-	Multiple	Optional	
		Node	Node ID (String)	1	Required	
Target	Node ID(String)	-	-	Multiple	Required	
TraceRoute	Route element	-	-	1	Optional	
Route	Route element	-	-	1	Optional	
		Node	Node ID (String)	1	Required	
HopCount	Integer (String)	-	-	1	Unused	
GatewayAction	"Hook","Hop"	-	-	1	Unused	
SessionID	Session ID (String)	-	-	1	Optional	

	MsgBody	XML document	-	-	1	Required	
			protocol	URI	1	Required	

A) PrintResultResponse element

PrintResultResponse element designates a response to PrintResult. Upon receiving PrintResult from the printer, the cell phone responds with PrintResultResponse element that indicates whether the cell phone can finish the print job or not. This method is optional. PrintResultResponse consists of the following elements.

B) JobID element

The JobID element, a unique ID value in the range from 1 to 2^{31}-1 generated by the printer, is used to identify this order; 0 and negative values are invalid values. The printer should not re-use values recently assigned, since the cell phone may confuse it with an older job.

The following is a sample of the PrintResultResponse message.

```
<Core xmlns=" Namespace of PUCC Core Protocol" >
  <ComType>Unicast</ComType>
  <MsgID>12345.2006-04-20T16:15:32Z@968742ab-f9abb-4305-9900-f98e56f12352</MsgID>
  <ReplyID>12345.2006-04-20T16:15:32Z@874542ab-a5c6-4305-8745-f98e56f12547</ReplyID>
  <MsgType>Response</MsgType>
  <Source>968742ab-f9bb-4305-9900-f98e56f12352</Source>
  <Destination>
    <Target>874542ab-a5c6-4305-8745-f98e56f12547</Target>
  </Destination>
  <MsgBody protocol=" Namespace of PUCC Printing Protocol" >
    <PrintResultResponse xmlns=" Namespace of PUCC Printing Protocol" >
     <JobID>178059</JobID>
    </PrintResultResponse>
  </MsgBody>
</Core>
```

Figure 9 Sample of PrintResultResponse message

6.6. Protocol Sequence

6.6.1. Direct Printing

A protocol sequence of Direct Printing is described as follows. In this sequence, the printer allows repeat only by the number of copies.

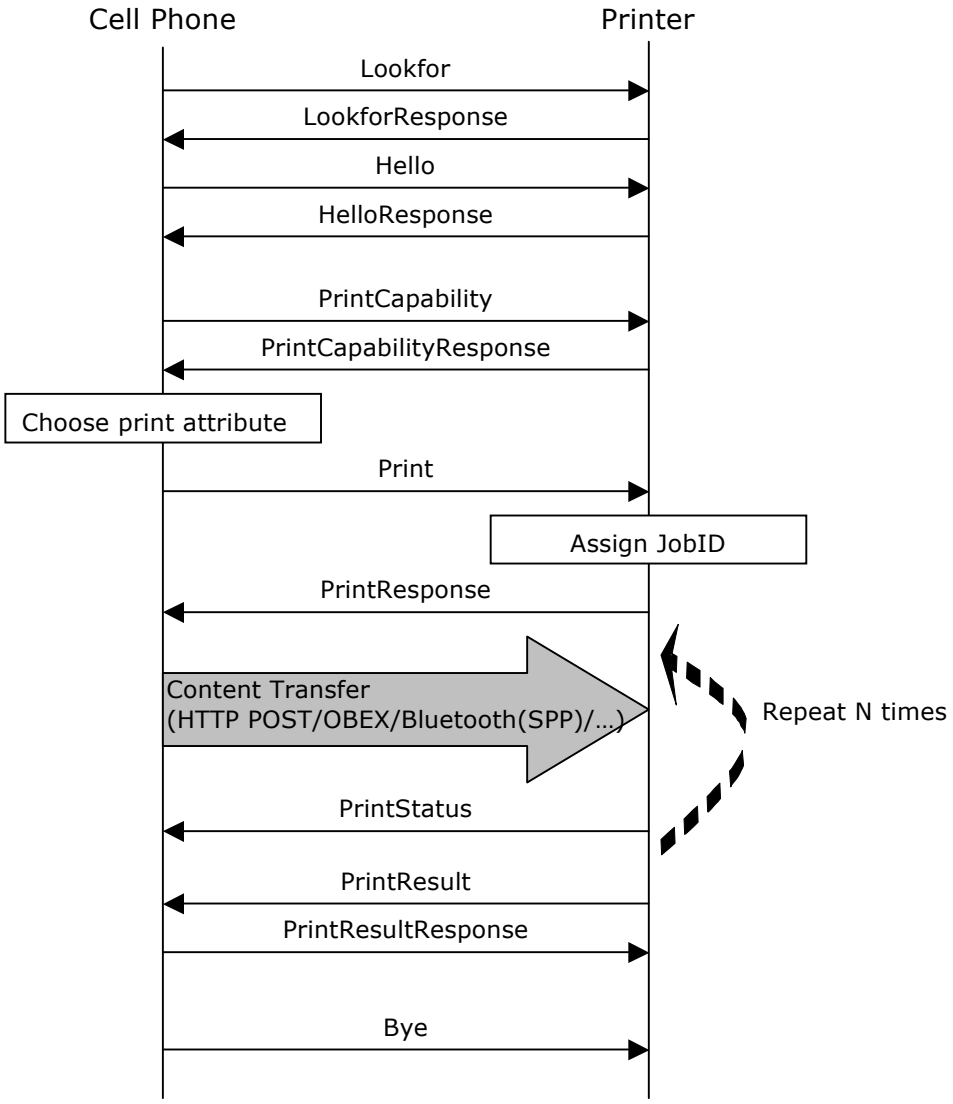

Figure 10 Sequence of Direct Printing model

6.6.2. Reference Printing

A protocol sequence of Reference Printing is described as follows.

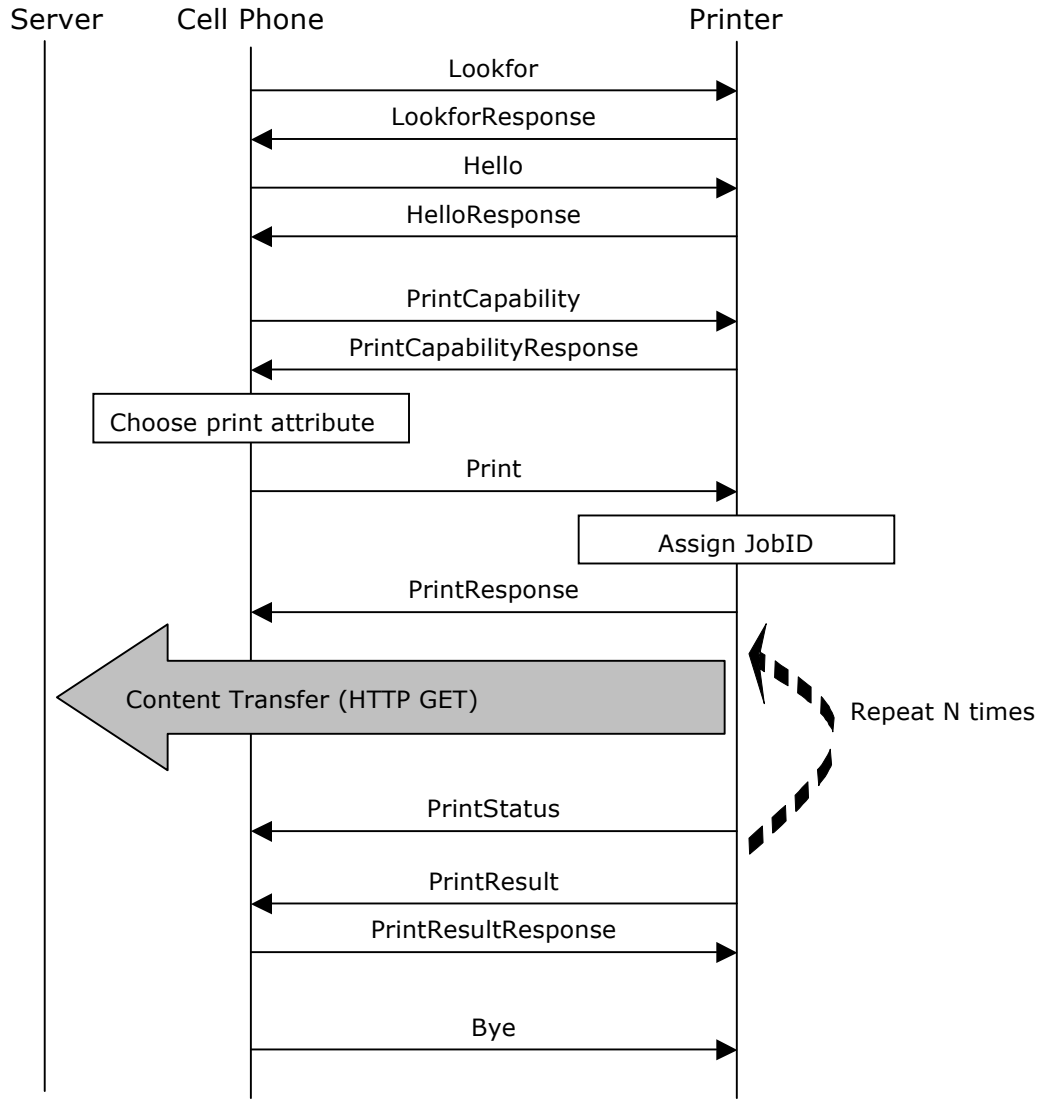

Figure 11 Sequence of Reference Printing model

7. Transport Protocol bindings

7.1. OBEX Transport

A) Frame

This section describes the transport binding of the PUCC Protocols over OBEX. Please refer details of PUCC message specification to chapter of OBEX Transport of PUCC Basic Protocol Specification.

Content transfer protocol messages are encapsulated by the following frame when the Content Transfer Protocol is used over OBEX. The encapsulation format of the Content Transfer Protocol is informative.

Table17: The format of the frame for binding of Content Transfer Protocols over OBEX

	Description	Status
Header	There are 2 kinds of header. A) Frame of normail message **CFRM<SP>Connectiontype<SP>FrameNo(- SeqNo/WholePacketCounts) <SP>Size<SP>DestNodeID<SP>SrcNodeID (<SP>CommunityID) <CR><LF>** B) Frame in response to a frame error **FRMERR<CR><LF>**	Required
	Connectiontype The Connectiontype parameter is used to designate a connection type. **0: keep-alive** (Transport connection not disconnected after this frame. When content transfer protocols are over OBEX, this value must be set.) **1: single** (Disconnect transport connection after this frame.)	Required
	FrameNo The FrameNo parameter is sequential number used to distinguish frames. This parameter is set at the default value at 0 and final value is 2147483647. If a message is divided, "-SeqNo/WholePacketCounts" is given to the end of FrameNo. The frame is specified by changing only the part of "- SeqNo/WholePacketCounts". The position of a frame is specified by "-SeqNo/WholePacketCounts".	Required
	Size The Size parameter is used to designate size of payload (without header and trailer) by the octet number.	Required
	DestNodeID The DestNodeID parameter is used to designate destination node ID. If destination node ID is not fixed, "*" is specified.	Required
	SrcNodeID The SrcNodeID parameter is used to designate source node ID.	Required
	CommunityID The CommunityID parameter is used to distinguish which community the message belongs to.	Optional
Payload	A) Frame of normal message **(MIME entity header) <CR><LF> [Content]** The MIME entity header is optional. The Payload has one Content. B) Frame to response to a frame error **[Header of CFRM]** The Payload has one header of CFRM which is regarded as error.	Required
Trailer	**FRMEND<CR><LF>**	Required

Figure 12The following shows a sample CFRM frame.

```
CFRM 0 0-1/3 702 965841a8-aa56-8746-b456c458450 113541a8-bb56-8746-b456c457581 urn:pucc:community:X

// content
```

```
FRMEND
```

Figure 12 A sample of CFRM frame

7.2. TCP Transport

Please refer details of PUCC message specification to chapter of OBEX Transport of PUCC Basic Protocol Specification. Direct printing use a HTTP POST method, Reference printing use a HTTP GET.

7.3. Blueooth (Serial Port Profile)Transport

This section describes the transport binding of the PUCC Protocols over Bluetooth(SPP). Please refer details of PUCC message specification to chapter of OBEX Transport of PUCC Basic Protocol Specification.

Content transfer protocol messages are encapsulated by the following frame when the Content Transfer Protocol is used over Bluetooth(SPP). The encapsulation format of the Content Transfer Protocol is informative.

Table18: The format of the frame for binding of Content Transfer Protocols over Bluetooth(SPP)

	Description	Status
Header	There are 2 kinds of header. C) Frame of normail message **CFRM<SP>Connectiontype<SP>FrameNo(- SeqNo/WholePacketCounts) <SP>Size<SP>DestNodeID<SP>SrcNodeID (<SP>CommunityID) <CR><LF>** D) Frame in response to a frame error **FRMERR<CR><LF>**	Required
	Connectiontype The Connectiontype parameter is used to designate a connection type. **0: keep-alive** (Transport connection not disconnected after this frame. When content transfer protocols are over OBEX, this value must be set.) **1: single** (Disconnect transport connection after this frame.)	Required
	FrameNo The FrameNo parameter is sequential number used to distinguish frames. This parameter is set at the default value at 0 and final value is 2147483647. If a message is divided, "-SeqNo/WholePacketCounts" is given to the end of FrameNo. The frame is specified by changing only the part of "- SeqNo/WholePacketCounts". The position of a frame is specified by "-SeqNo/WholePacketCounts".	Required
	Size The Size parameter is used to designate size of payload (without header and trailer) by the octet number.	Required
	DestNodeID The DestNodeID parameter is used to designate destination node ID. If destination node ID is not fixed, "*" is specified.	Required
	SrcNodeID The SrcNodeID parameter is used to designate source node ID.	Required
	CommunityID The CommunityID parameter is used to distinguish which community the message belongs to.	Optional
Payload	C) Frame of normal message **(MIME entity header) <CR><LF> [Content]** The MIME entity header is optional. The Payload has one Content.	Required

	D) Frame to response to a frame error **[Header of CFRM]** The Payload has one header of CFRM which is regarded as error.	
Trailer	**FRMEND<CR><LF>**	Required

Figure 13 The following shows a sample CFRM frame.

```
CFRM 0 0-1/3 702 965841a8-aa56-8746-b456c458450 113541a8-bb56-8746-b456c457581 urn:pucc:community:X

// content
FRMEND
```

Figure 13 A sample of CFRM frame

8. Content Types

8.1. PDF

Portable Document Format (PDF) is a proprietary file format developed by Adobe Systems for representing two dimensional documents in a device independent and resolution independent format. Each PDF file encapsulates a complete description of a 2D document (and, with the advent of Acrobat 3D, embedded 3D documents) that includes the text, fonts, images, and 2D vector graphics that compose the document.

Importantly, PDF files don't encode information that is specific to the application software, hardware, or operating system used to create or view the document. This feature ensures that a valid PDF will render exactly the same regardless of its origin or destination. PDF is also an open standard in the sense that anyone may create applications that read and write PDF files without having to pay royalties to Adobe Systems.

8.2. JPEG

JPEG (pronounced jay-peg) is a commonly used standard method of lossy compression for photographic images. The file format which employs this compression is commonly also called JPEG; the most common file extensions for this format are .jpeg, .jfif, .jpg, .JPG, or .JPE although .jpg is the most common on all platforms.

The MIME media type for JPEG is image/jpeg (defined in RFC 1341).

The name JPEG stands for Joint Photographic Experts Group, the name of the joint ISO/CCITT committee which created the standard.

8.3. SVG

Scalable Vector Graphics (SVG) is an XML markup language for describing two-dimensional vector graphics, both static and animated (either declarative or scripted). It is an open standard created by the World Wide Web Consortium, which is also responsible for standards like HTML and XHTML.

8.4. XHTML

The Extensible HyperText Markup Language, or XHTML, is a markup language that has the same expressive possibilities as HTML, but a stricter syntax. Whereas HTML is an application of SGML, a very flexible markup language, XHTML is an application of XML, a more restrictive subset of SGML. Because they need to be well-formed (syntactically correct), XHTML documents allow for automated processing to be performed using a standard XML library — unlike HTML, which requires a relatively complex, lenient, and generally custom parser (though an SGML parser library could possibly be used). XHTML can be thought of as the intersection of HTML and XML in many respects, since it is a reformulation of HTML in XML. XHTML 1.0 became a World Wide Web Consortium (W3C) Recommendation on January 26, 2000.

8.5. vCard, vCalendar

vCard is a file format standard for personal data interchange, specifically electronic business cards. vCards are often attached to e-mail messages, but can be exchanged in other ways, such as on the World Wide Web. They can contain

name and address information, phone numbers, URLs, logos, photographs, and even audio clips.

Version 2.1 of the vCard standard is widely supported by e-mail clients. Version 3.0 of the vCard format is an IETF standards-track proposal contained in RFCs 2425 and 2426. The commonly-used filename extension for vCards is .vcf.

vCalendar is an older standard exchange format for calendar data promulgated by the Internet Mail Consortium (IMC). iCalendar is a newer standard (RFC 2445) for calendar data, heavily based on vCalendar.

9. Security Consideration

Most content has copyright, so we must consider security for content protection. For example, we are considering security approaches for printing from a mobile. Some existing cellular phones have a Felica tag, which suggest the possibility of using the tag's ID for authentication between the cellular phone and the printer.

10. Operation Status Codes

The following table maps operation status codes to their meanings. At minimum, the cell phone and the printer shall be able to respond with these three operation status codes.

Table 13 Operation status codes

Code Value (hex)	Code Meaning
0x0000	successful-ok
0x0400	Client-error
0x0500	Server-error

Appendix A. Version History

Document number	Date	Note
PUCC Printing Protocol	30 Sep, 2007	Version 1.0
PUCC Printing Protocol	31 Mar, 2009	Version 2.0
PUCC Printing Protocol	22 Mar, 2012	Version 3.0

Appendix B: Namespace Definitions

Namespaces are defined with URI.

http://www.pucc.jp/2012/03/printing

xmlns attribute of MsgBody element uses it in PUCC Printing Protocol.