

An Overview of Print Number and Use Cases

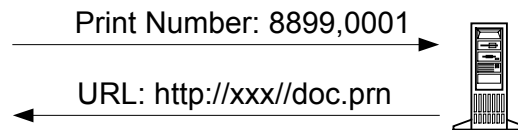
1. Introduction

With introducing Print Number System in the Internet Printing, people can use network printers to print documents on the Internet without the needs of personal computers.

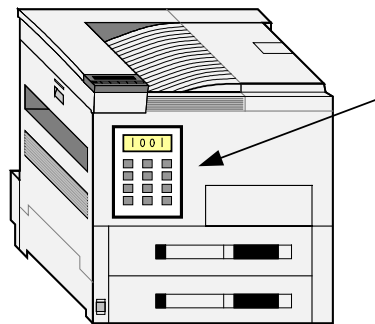
Print Number (PN) – A numeric string (e.g. 8899,0001, like phone number) represents the URL of a document.

Print Number: **8899,0001**

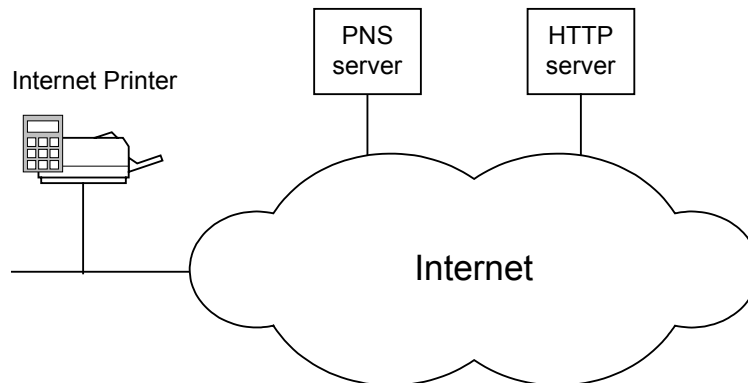
Print Number System (PNS) – A server's service that translates print numbers into URLs for all Internet printers.



Internet Printer – A network printer or MFP with a built-in keypad for the user to enter PN, and enhanced communication capabilities to access PNS and HTTP server.



2. How it Work



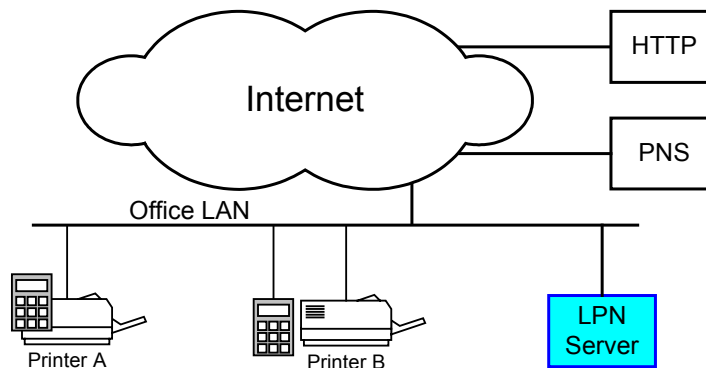
Using URL and Print Number (PN), the method for users to print documents includes:

For information providers: Document→URL→PNS→PN

1. Use URLs to describe how to retrieve documents on the Internet (HTTP server)
2. Store the URLs in Print Number System (PNS server), and represent the URLs as PNs

For users who retrieves Information, at the printer: PN→PNS→URL→Doc→Printer

1. The user enters a PN on the keypad of Internet printer;
2. The printer sends the PN to PNS server over Internet;
3. PNS server translates the PN into a URL, and returns the URL to the printer;
4. According to the URL, the printer retrieves document from HTTP server and prints the document.



Alternatively, for users in the LAN, at the printer A, or the keypad near printer B:

1. The user enters a PN on the keypad of printer A, or the keypad near printer B;
2. The printer/keypad sends the PN to Local PN (LPN) server;
3. The LPN server sends the PN to PNS;
4. PNS server translates the PN into a URL, and returns the URL to LPN server;
5. According to the URL, LPN server retrieves the document from HTTP server
6. LPN server prints the document to printer A or B.

Feature and Benefit

Network printers don't access PNS and HTTP.

But, a local LPN server accesses PNS and HTTP over Internet for all network printers in a LAN.

Flexibility, using existing network printers and local document printing

Formulization

Information Provider: **Doc → URL → PNS → PN**

Information Retriever: **PN → PNS → URL → Doc → Printer**

3. CASE STUDIES

Case Studies

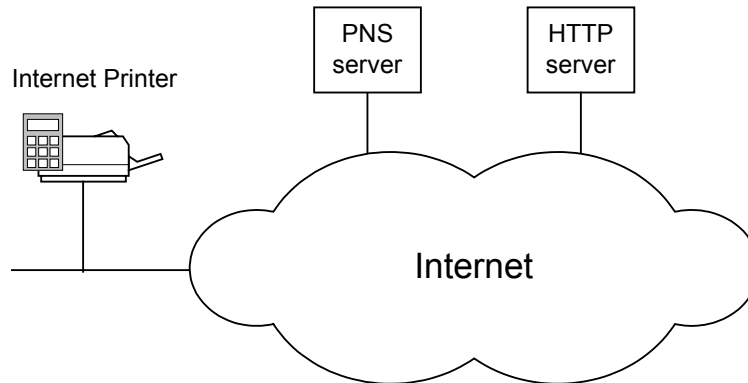
1. Printing of the Advertisement
2. Public Printing for People Who Do Not Have Their Own Printers
3. Printing of Account Statement for the Bank and Corporation
4. Internet Health Information Printing System

Users

- Anyone. Workers, customers, even children, elderly, and people who never use a computer before.
- Age range from 7 to 70 years old.
- Anyone who does not own computers but do have Internet printers at homes

Case Study 1: Printing of the Advertisement and Document

The user (Alice, personnel of a Bank) prepared an advertisement of a credit card to be published in the newspapers, and an application form for the public to apply the card. Due to the cost constraint, the Bank decided not to publish the application form in the newspapers but to let the public print with the *Internet Printer*.



For the Bank (**Application Form → URL → HTTP → PN**)

1. Alice prints the application form into a printable file in her computer, stores the printable file in a web server of the bank, and uses a URL to describe where to get the file from the Internet
2. In PNS server, Alice registers the URL and receives a PN (e.g. 8888-0001) of the URL
3. The advertisement is published in the newspaper with *Application Form PN (8888-0001)*

For the Public at the Printers Worldwide (**PN → URL → HTTP → Form → Printer**)

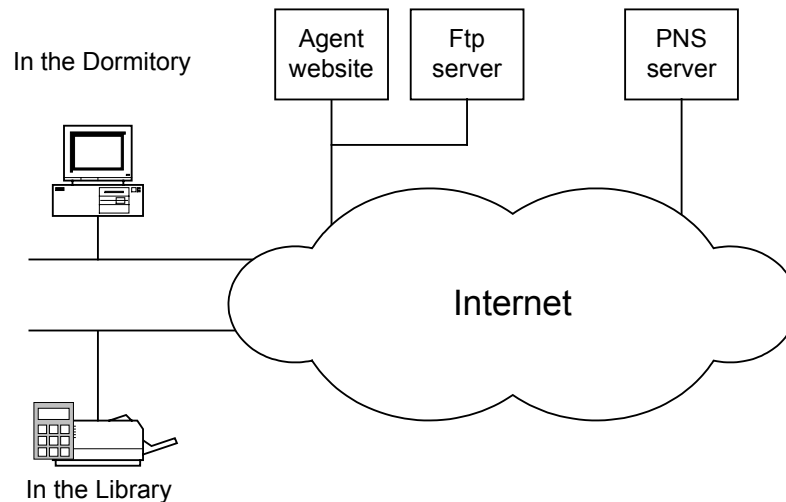
1. In the newspaper, somebody (Bob) read the ad and wanted to apply the card
2. In his office, Bob entered the PN (8888-0001) on the keypad of the printer
3. The printer will send the PN to PNS server, and requests for the URL of the PN
4. PNS maps the PN to the URL of the printable file of application form, and returns the URL to the printer
5. The printer executes the URL, downloads and prints out the application forms

Benefits:

- The users do not need to power-up computers and browse the Internet; anyone can operate in the printer like in the phone set, by just keying in numbers.
- Print documents and forms on demand.

Case Study 2: Public Printing for Students and People Who Do Not Have Their Own Printers

The user (Candy, a university's student) wrote her thesis with her computer, and wanted to print it out with a laser printer, but she has no personal laser printer in her dormitory. However, she knows that the print shop and school library do have public laser printers.



In the Dormitory: **Paper→Printable File→FTP→URL→PNS→PN**

1. Candy prepares her document into a printable file
2. Candy views the web page of an agent website, and uploads the printable file to the website
3. The website assigns a PN e.g. 8888-0002 to Candy
4. The website stores the file in the Ftp server. And in PNS server, the website registers the URL of the file, and PN e.g. 8888-0002 represents the URL

In the School Library: **PN→PNS→URL→FTP→Printable File→Printer**

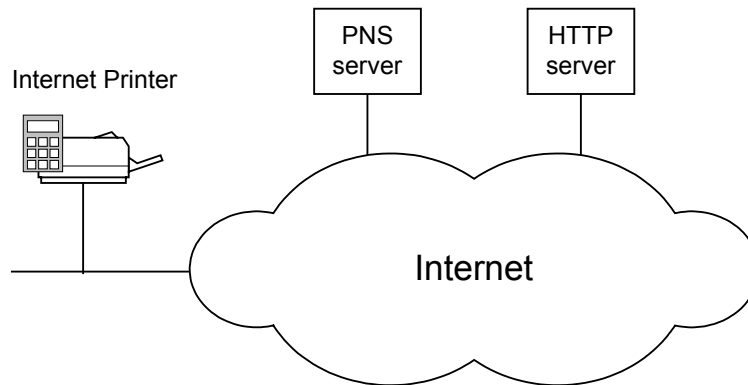
1. Candy keys in PN (8888-0002) on the keypad of a laser printer
2. The printer sends the PN to PNS server
3. PNS server maps the PN to the URL of the printable file of Candy's paper, and sends back the URL to the printer
4. The printer executes the URL, downloads and prints out the Candy's paper

Benefit:

- Students and anyone who do not have printers or prefer to use high-end printers
- Travelers do not need to carry hardcopies of documents, and instead print-on-demand worldwide just with a print number
- Not necessary to have own websites to host documents.

Case Study 3: Account Statement Printing of the Bank and Corporation

The user (Don, a bank account holder) wanted to print his bank statement from his office/home printer.



For the Bank: **A series of Account No. → URL → PNS**

1. In PNS server, the bank registers a series of account number as the PN, and assigns the URL of accessing bank statement to the PN

For the Public: **Account No. → PNS → URL → HTTP → Statement → Printer**

1. Don enters his account number on the keypad of the printer
2. The printer sends the account number to PNS server, and requests for the related URL
3. PNS server sends back the URL of accessing bank statement to the printer
4. The printer prompts Don for his account password, and Don enters on the keypad
5. With the URL and password, the printer sends a http request to bank server
6. Bank server produces the statement, and sends back to the printer
7. Don's statement is printed

Benefit

- Print account statements on demand instantly, in offices, at homes or in service counters self-help

Internet Health Information Printing System

Objective

1. Explore the possibility of using Internet printing technology to assist doctors to provide **printed consultative advices** or health information to patients during consultations.
2. Provide the convenient public access to comprehensive health information, including information of all known diseases, as well as reduce the costs for mass printing, distributing and storing of health education pamphlets and booklets.

Background

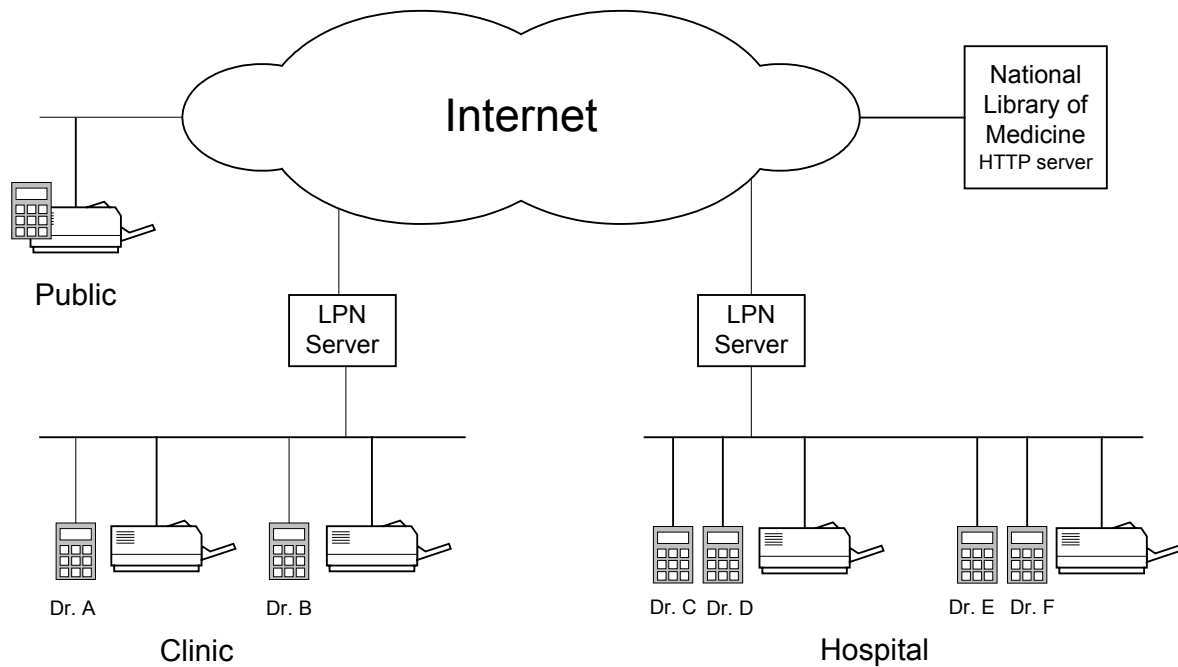
In the medical consultations, patients receive medications and consultative advices. Typically the consultative advices are easy to be forgotten, and soon the patients remember only few fragmentary pieces of the advices. However, for many diseases, the full consultative advices are important for the patients, families and friends to cure and prevent diseases, and to promote health. In the 19th and 20th century, medical science progresses tremendously, but the media and the way to record consultative advices remain stagnant, and patients still rely on their memories to memorize bits and pieces of what the doctors have said during their consultations.

In the primary investigation, it became obvious that patients highly demand consultative advice that are written down or printed in the paper, but at present there are no efficient ways to provide paper consultative advice during regular consultation time in hospitals and clinics. To satisfy patients' demands on the printed consultative advice, we develop the *Internet Health Information Printing System*.

We can expect that in the future medical consultations, patients will receive medications that are produced by pharmaceutical factories, and also will receive printed consultative advices that are prepared by health authorities and institutes.

People also improve their health by reading health articles from health education materials e.g. pamphlets, booklets, newspapers and magazines. However, there are many limitations in using these education materials. (1) The mass printing materials are limited to a few common diseases only, and cannot cover all diseases. (2) At the time want to refer to health materials for a health concern, typically people cannot find them. (3) Costs of mass printing, distributing and storing health education materials. The *Internet Health Information Printing System* also aims to remove these limitations, and to provide the convenient public access to comprehensive health information.

Internet Health Information Printing System



In the National Library of Medicine

1. Consultative advices of different diseases are edited, collected and stored in the HTTP server. Each advice can be identified and HTTP accessed according to a code. For example, the advice *Pre-diabetes* has the code 10032.
2. The booklets that include titles and codes of these advices, such as [*Pre-diabetes* 10032], are distributed to doctors.

Sample Medical Index Booklet For Doctor

Title	Code		
		How to prevent diabetes	10031
...		Pre-diabetes	10032
High Blood Pressure		Impaired Fasting Glucose	10033
What is high blood pressure?	10021	Impaired Glucose Tolerance	10034
Pre-hypertension	10023	Type 1 diabetes	10035
Hypertension Stage 1	10024	Type 2 diabetes	10036
Hypertension Stage 2	10025	Gestational diabetes	10037
...		...	
Diabetes		Liver	10041

Example: MEDLINE/PubMed is the National Library of Medicine's database of references to more than 14 million articles published in 4800 biomedical journals. Please note that most of the articles you will find listed in MEDLINE/PubMed are written for health professionals. Articles are for educational use only and are not intended to replace advice from a health professional.

For the Doctor in the Hospital and Clinic

1. When the doctor thinks that it is useful to provide a printed consultative advice to a patient, he refers to the booklet, on the corresponding classification basing on his medical knowledge, and chooses a advice such as *Pre-diabetes 10032*
2. The doctor keys in the code 10032 on a network keypad
3. The keypad sends the code to LPN server, which downloads the advice *Pre-diabetes* from the HTTP server of National Library of Medicine, and prints it in an appropriate printer

The Future Scenario: Eve visited the doctor. As a busy-working adult, she lacks health awareness. In the consultation, the doctor decided that it is necessary to provide full consultative advice to Eve as she may develop diabetes. However, searching for the required information through Internet or from books cannot be done during the regular consultation. Alternatively, with the assistance of the *Internet Health Information Printing System*, the doctor refers to a medical index booklet, selects and prints instantly a complete consultative advice *Pre-diabetes* for Eve.

For the Public in the Hospital or Library

Sample Medical Index Booklet for the Public

Title	Code	...	
...		<u>Liver</u>	
Understanding Cholesterol	20001	What I need to know about Hepatitis A	10041
What is high blood pressure	20002	What I need to know about Hepatitis B	10042
...		What I need to know about Hepatitis C	10043
<u>Diabetes</u>		Vaccination for Hepatitis A and B	10044
How to prevent diabetes?	20003	...	
Healthy eating, physical activity of the patient	20004		

1. Anyone refers to a public medical index booklet, selects the article such as *How to Prevent Diabetes*, and enters the code on a network keypad.
2. The keypad sends the code to LPN server, which downloads the advice *How to Prevent Diabetes* from the HTTP server of National Library of Medicine, and prints it in the printer

The Future Scenario: After Eve hears that a friend is sick of Hepatitis B, she wants to know how to maintain healthy contact with the friend. She goes to a local public library. Referring to the medical index booklet, she enters codes 10042 and 10044 in the network keypad, and prints the articles *What I Need to Know about Hepatitis B* and *Vaccination for Hepatitis A and B*.

Benefits of Printed Consultative Advice

A. Patient

1. Understand the illness, reduce worry and tension
2. Use the right consultative advice that is chosen by the doctor, and is prepared by health authorities
3. Speed up recovery by detailed advice, such as good exercises and diets.
4. Refer to FAQ and health education to clear doubts and lead a healthy lifestyle
5. Save printed advice for future reference. It is especially useful to senior citizens, children and persons who lack medical knowledge.
6. Prevent the disease in the first place, by receiving continued health education in each consultation

B. Family and friend

1. Understand the disease, reduce worry, tension and discrimination
2. Understand how to assist the patient, and to speed up his recovery
3. Understand how to prevent family members and friends from the disease

C. Doctor

1. Print the consultative advice during consultations
2. Provide more professional service by issuing printed consultative advice
3. Avoid negligence by using the advice from health authorities and institutes
4. Focus on highlighting key items, as well as use the printed advice to provide the full and detailed health information.
5. Reduce consultation time, and attend more patients

D. Hospital and Clinic

1. A higher degree of patient turnover as doctors are able to consult more patients
2. Reduce requirements of consultation in government hospitals/clinics by providing enough health information during consultations to answer patient concerns, to reduce patient inquires, and to increase self-help of minor illness
3. Not require editing, updating and managing consultative advices, as they are prepared by health authorities and institutes

E. The Public, Society and Government

1. People receive better health care service and up-to-date health information
2. Health information and health educations are easily accessible by the public
3. Reduce medical costs for individuals, society and government.
4. Cost-effective in term of reducing mass printing and distributing of health publications
5. Cost-effective as consultative advices developed by health authorities or institutes are used by doctors in hospitals and clinics countrywide.

System Requirement of a Hospital or a Clinic

- One local PN server
- Network Keypads
- Network printers