

1.0 INTRODUCTION

1.1 Purpose

The purpose of this document is to provide a detailed design for the Government Electronic Directory in support of the vision for an electronic Government.

1.2 Background

In a memorandum dated July 22, 1993, the Honorable Sally Katzen, Administrator, Office of Information and Regulatory Affairs, Office of Management and Budget, chartered the Electronic Mail Task Force (EMTF) to examine electronic messaging among Federal Agencies. Dr. Neil J. Stillman, Deputy Assistant Secretary for Information Resource Management, Department of Health and Human Services, and the "E-mail Champion" for the National Performance Review (NPR) initiative IT08, was named chairman of the Task Force.

The EMTF Report provided several recommendations, including the formation of a Government E-mail Program Management Office (E-mail PMO) and a corresponding oversight committee. The EMTF used as its foundation, the following vision:

A service that appears to the user to be a single, unified electronic postal system that offers robust and trustworthy capabilities with legally-sufficient controls for moving all forms of electronic information among employees at all levels of government, and with the public we serve; and, like the Nation's telephone network is affordable, ubiquitous, efficient, accessible, easy-to-use, reliable, cost-effective, and supported by an effective directory service.

The E-mail PMO charter, which formally established the program office, as part of the Office of Current and Emerging Technology, was signed on August 19, 1994 by Mr. Joe M. Thompson, Information Technology Services Commissioner, General Services Administration. Dr. Stillman was named to chair the Government Information Technology Services (GITS) Working Group E-mail Steering Committee (GEMSS).

With assistance from GEMSS, the E-mail PMO is developing a comprehensive approach to direct the development and expand the use of "Business Quality Messaging" within the Government. The E-mail PMO is using the EMTF Report as its cornerstone. With the confirmation from GEMSS, the E-mail PMO is establishing overall strategies for Government electronic messaging and directory services. The E-mail PMO is aggressively capitalizing on volunteer efforts, agency and NPR pilots, and industry associations to build Federal messaging capabilities. The E-mail PMO provides the overall direction for Government Electronic Messaging.

The E-mail PMO will provide support to agencies developing initial electronic messaging capabilities. In addition, the E-mail PMO will identify coordinated requirements for all levels of government and include them in all the long range plans. Simultaneously, the E-mail PMO will work with vendors, developers, and service providers to enhance the availability of products that support the full range of Government messaging requirements. The E-mail PMO will ensure the synchronized implementation of the Government's electronic messaging capabilities by working in close coordination with the Chairpersons of the Electronic Commerce Acquisition Program Management Office (ECA-PMO), the Records Management PMO, and the Security Infrastructure Program Management Office (SI-PMO).

Success will be demonstrated by the improved connectivity of agency E-mail with external systems and by a marked increase in inter-agency E-mail traffic. Current objectives include 75 percent connectivity by the end of the FY95 and 100 percent connectivity by the end of FY96.

Realizing that the Government does not have a comprehensive electronic messaging infrastructure suitable for meeting these objectives, the E-mail PMO has initially identified major subject priorities that are critical to the development of an overall program.

One of the major subject priorities is Directory Services Support, which includes Registration Services, Government Directory Schema Publication and Management, and Security Certificate Publication Service. The focus of this document is on developing a detailed design for this major subject priority.

1.3 Scope

This document provides a detailed design for a fully functional, visionary electronic directory that is based upon the implementation of International Telecommunications Union (ITU-T) 1993 X.500 Series of Recommendations. The detailed design supports the requirements associated with the Federal, State, Commonwealth, Local and Tribal governments of the United States.

1.4 Organization of this Document

Section 1 sets forward the purpose of the detailed design document, provides background on events that fostered the Government Electronic Directory Initiative, lays out the scope of the Detailed Design Document, and specifies definitions of the services that will be available to the user community served by the Government Electronic Directory.

Section 2 defines the Directory Service Architecture and includes topologies for the Directory System Agents and Directory User Agents that will be used in the Government Electronic Directory.

Section 3 describes the infrastructure and conventions for supporting the naming and registration of entities within the Government Electronic Directory.

Section 4 defines the Security Architecture associated with the Government Electronic Directory. This section contains security policies, procedures, and guidelines, as well as, security infrastructure component design, and services for supporting security requirements necessitated by the Government Electronic Directory.

Section 5 defines the Government Electronic Directory Schema and its component object classes, structure rules, content rules, name forms, and attributes. This section identifies the minimum set of object classes required to ensure interoperability and compatibility of X.500 directories within the Government Electronic Directory.

1.5 Government Electronic Directory Services Overview

Electronic directories are a fundamental component of distributed network environments. Containing network configuration information that allows resource names to be mapped to network addresses, directories have traditionally been a transparent component of network architectures. They have typically been integrated as part of electronic mail applications or operating systems. However, because directories offer wide-ranging capabilities as an independent network application, their utility can be expanded to meet the real life needs of a networked user community. The Government Electronic Directory will not only support the messaging requirements of government entities (as depicted in Exhibit 1-1), it will also provide value-added services, such as on-line lookup services, application support, and security.

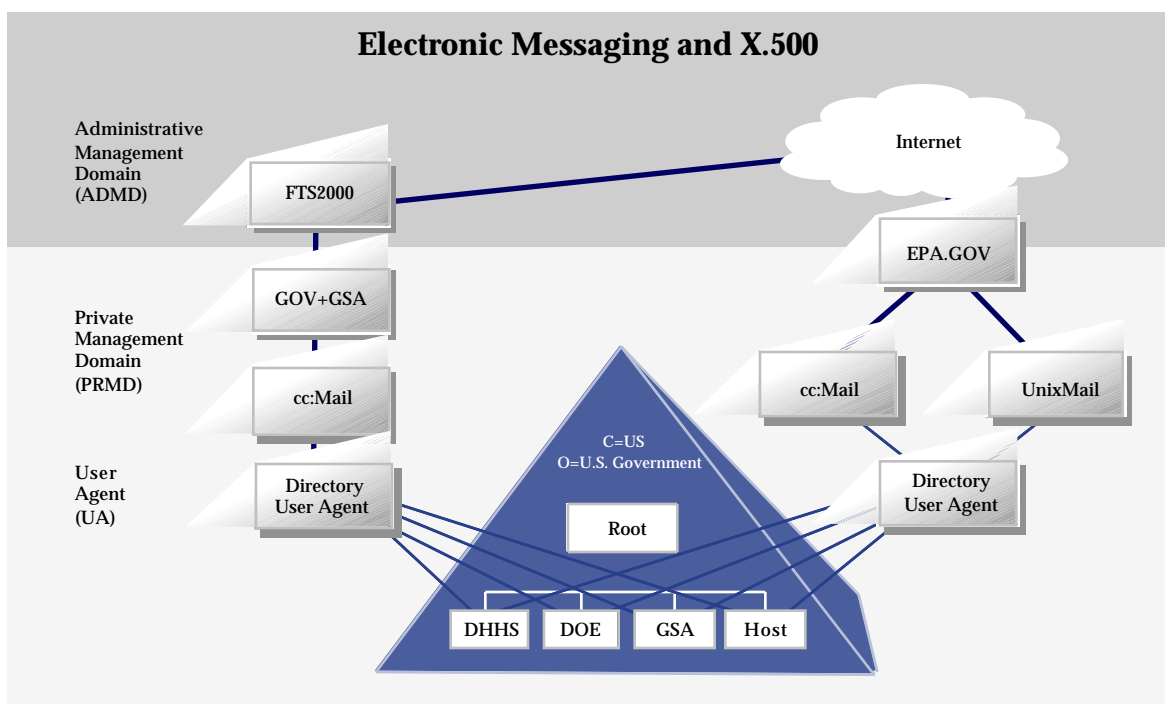


Exhibit 1-1
Government Electronic Directory

Organizations are now making use of directories to store information specific to their organization. The hierarchical architecture and unique naming constructs employed by directories enables organizations to uniquely and unambiguously identify entities and/or objects belonging to the organization (e.g., organizational units,

individuals, computers, application systems, documents) and store them as entries in the directory. Furthermore, information elements (attributes) associated with each entry in the directory can be used to store data relative to the entry. This data, coupled with rapid search and retrieval capabilities provided through emerging application technology, enables directory users to access this information in a reliable and timely fashion.

Directory users include both people and electronic applications, as shown in Exhibit 1-2. A Directory User Agent (DUA) is an electronic application, or interface, that enables communications between the directory user and the directory. DUAs can take on any form of interface and can be tailored to the needs of the directory user. The DUA hides the details of the directory from the user and additionally provides a standard interface to the directory.

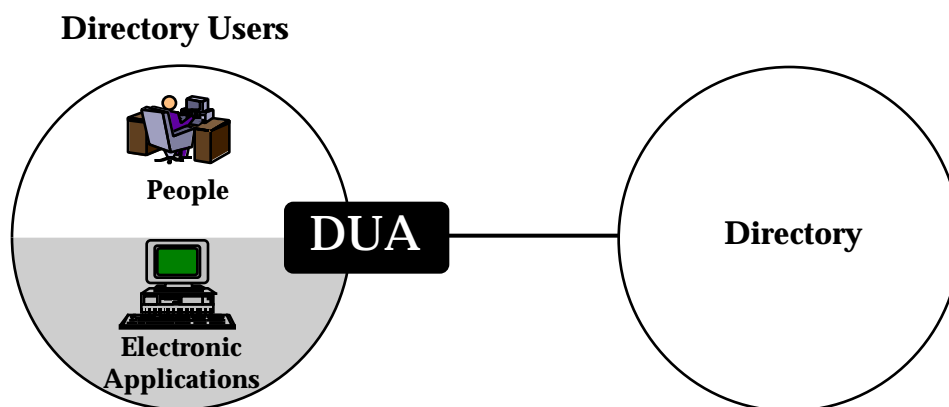


Exhibit 1-2

Directory Users and the Directory

The directory is a storage facility for information on objects (directory entries) of interest to a community of users (directory users). This object information is stored in a Directory Information Base (DIB). As depicted in Exhibit 1-3, the DIB provides an interface between directory users and system providers. Directory users have the ability to publish and/or retrieve directory entries stored within the DIB.

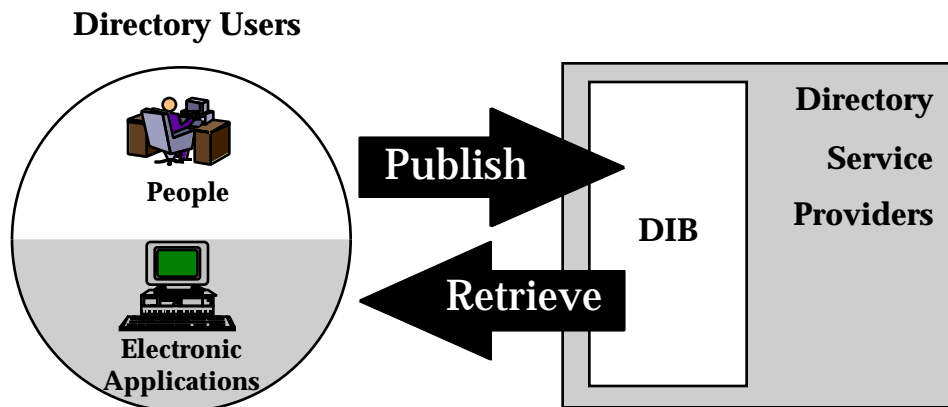


Exhibit 1-3

Directory Users and the Directory Information Base

The Government Electronic Directory will provide a myriad of services as depicted in Exhibit 1-4. The extensibility of the Government Electronic Directory makes it possible for additional services to be dynamically constructed, integrated, and deployed without impacting on-going directory operations.

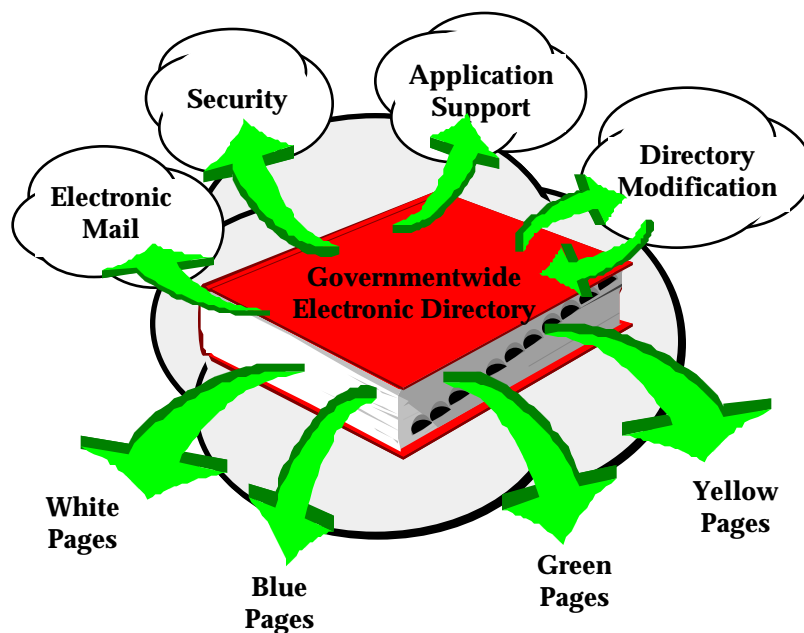


Exhibit 1-4

Government Electronic Directory Services

1.5.1 Application Support

Directories provide a crucial support element for networked applications and services. Electronic directories can be used for storing and collecting information via Application Programming Interface (API) protocols. Organizations can develop unique applications to meet their specific needs and tailor directories by adding elements and entries unique to their environment. DUAs can be integrated into an application suite to request and/or store information in a directory in a fully automated fashion transparent to the directory user. Example applications include Inventory, Personnel, Payroll, and Time and Attendance systems. In addition, other application-oriented services, such as Gopher, Wide Area Information Services (WAIS), and World Wide Web can be supported.

1.5.2 Electronic Messaging

Electronic Messaging applications can use directories to store and gather addressing information such as Internet Request For Comments (RFC) 822 Addresses for Simple Mail Transport Protocol-based (SMTP) electronic mail systems and Message Handling System (MHS) Organization/Recipient (O/R) Addresses for X.400-based electronic mail systems. Electronic mail distribution lists and their membership can be stored and maintained in the directory, as well as preference information, unique to a recipient, such as the maximum acceptable length of a message, preferred methods of delivering a message, reporting requirements for message non-delivery, and the types of messages and their originators that are allowable.

1.5.3 Security

Security of the DSA is handled through Access Control Information (ACI) that determines authentication techniques required for accessing directory entries. The ACI determines the types of entries and specific entry information that may be viewed, added, updated, and deleted based on the users access credentials. Additionally, security support for external applications is available through the use of X.509 Certificates. Applications employing strong authentication techniques can retrieve the X.509 certificate stored in a directory entry. The X.509 certificate contains public keys

and related information that enable applications to verify the integrity of a digitally signed electronic document and authenticate the identity of the signer.

1.5.4 Directory Management

Directory Management is handled through an Administrative Directory User Agent (ADUA). The ADUA enables users with directory manager privileges to add, update, and delete information relevant to the structure and content of the directory.

1.5.5 White Pages

The White Pages directory service is a “basic” lookup facility modeled after the well known and familiar white pages listings found in telephone books. The purpose of the White Pages directory service is to provide information specific to individuals. Information associated with an individual and published in the White Pages directory service may include an individual’s full name, parent organization information, organizational role information, telephone numbers (voice mail, fax, pager, and mobile numbers), physical mailing address information, office location, electronic mail addresses (RFC 822 and X.400), WWW home page location, and X.509 Public Key Certificates.

Organizations can publish as much information as they feel necessary to support the White Pages directory service based on the needs of the specific user community. The amount of information disseminated through a White Pages lookup can be limited via access control mechanisms. For example, an organization may limit access to an individual’s office telephone number to only those individuals belonging to the same organization. Therefore, anyone outside the organization would not be able to retrieve the office telephone number. In this case, access control procedures would be implemented to determine if a directory user has the appropriate privileges enabling the user to retrieve the phone number.

Detailed Design

The following example demonstrates how a directory user might enter information at a workstation-based DUA to retrieve an SMTP electronic mail address for an individual the user wishes to communicate with. Assume that a directory user has previously attended a Federal Government-sponsored event in which a Mr. William Shakespeare of the General Services Administration spoke on the merits of digital signature technology and the electronic Government. Our directory user wishes to communicate with Mr. Shakespeare via electronic mail to pose questions regarding the technology. Knowing only Mr. Shakespeare's full name and parent organization, our directory user accesses a publicly available DUA with connectivity to the Government Electronic Directory from the user's personal workstation. Our directory user initiates a search request by entering Mr. Shakespeare's name and parent organization as depicted in Exhibit 1-5.

Topic:	<input type="text" value="William Shakespeare"/>	Person
	<input type="text" value="GSA"/>	Agency Enter text or F1 for Help
	<input type="text"/>	Document
	<input type="text"/>	Form
	<input type="text"/>	Project
	<input type="text"/>	Map
	<input type="text"/>	Keyword(s) Enter text or F1 for Help

Exhibit 1-5
White Pages DUA Search Request Example

Organizational Person = William Shakespeare(RDN), Bill Shakespeare
 Organizational Unit Name = General Services Administration
 Title = Program Manager
 Locality Name = Washington, D.C.
 Street Address = 7th and D Streets. SW
 State = D.C.
 Postal Address = 7th and D Streets, SW, Washington, DC
 Postal Code = 20001
 Post Office Box =
 Telephone Number = 202-456-0000
 FAX Number = 202-456-0001
 X.400 Address = C=US, ADMD="" "PRMD=GSA,
 S=Shakespeare,G=William
 RFC 822 Address = william.shakespeare@fed.gov
 Business Category = digital signature, electronic commerce
 Keyword = digital signature, electronic commerce,
 program manager

Exhibit 1-6
White Pages Search Results

Exhibit 1-6 provides an example of the type of information that might be returned regarding an individual. Those elements not accessible as a result of access control restrictions will not be returned to the requesting user. Hence, the results fields will either remain blank or will not be shown. Our directory user may now contact

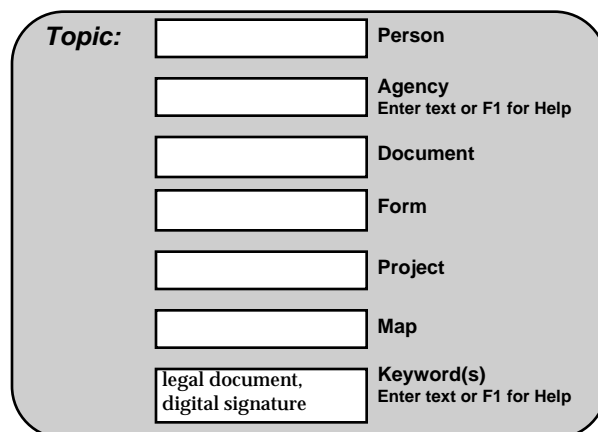
Mr. Shakespeare of the General Services Administration by telephone, via the postal service, or more importantly by electronic mail using the SMTP-compatible RFC 822 Internet address published in the directory.

1.5.6 Blue Pages

The Blue Pages directory service capability is also a basic lookup service. The purpose of the Blue Pages directory service is to make available information specific to a government organization. Blue pages information is available through the use of subject matter listings related to the government organization, its programs, and its activities. These subject matter listings are accessible through keyword search functions; for instance entering a search for "Medical Service Providers" should identify the organization(s) that support this service category. A browse function might also be initiated that enables the user to specify a starting point and filter through layers of information to achieve a finer granularity.

The information published in the Blue Pages directory service may include Government Departments' name, location, address, hours of operation, primary telephone and facsimile numbers and central electronic post office mailbox. In addition, it may contain pointers to directory entries for primary and secondary points of contact. Value-added Blue Pages information can be used to identify the organizational structure, list of programs, and keywords describing the organizations subject matter categorizations.

The following example demonstrates how a directory user might use a DUA to retrieve blue pages information. Let us revisit our previous directory user who is now interested in identifying government organizations that may be responsible for resolving legal issues surrounding the use of electronic documents and digital signatures. Our directory user initiates a search



Topic:	<input type="text"/>	Person
	<input type="text"/>	Agency Enter text or F1 for Help
	<input type="text"/>	Document
	<input type="text"/>	Form
	<input type="text"/>	Project
	<input type="text"/>	Map
	<input type="text" value="legal document, digital signature"/>	Keyword(s) Enter text or F1 for Help

Exhibit 1-7

Blue Pages DUA Search Request Example

request by entering subject matter keywords “legal document” and “digital signature”, as shown in Exhibit 1-7. These keywords might be a part of a universal, standardized thesaurus that is accessible by the DUA and updated on a regular basis. It is important to note that the organizations populating the directory will be identifying the subject matter keywords that reflect their specific business functions.

Exhibit 1-8 provides an example of information that might be returned in the event that multiple organizations meet the criteria entered. In this case, our directory user highlights and selects the “Department of Justice”.

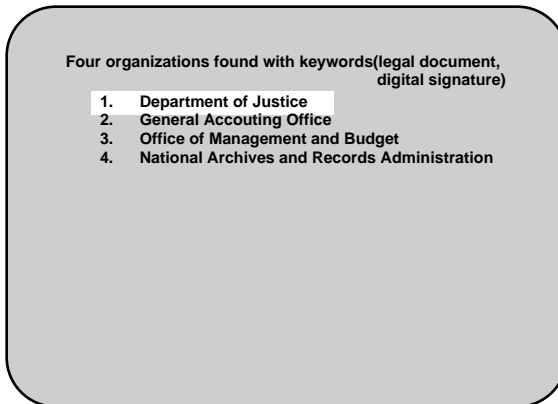


Exhibit 1-8

Blue Pages Search Results

Exhibit 1-9 provides an example of the Blue Pages screen containing the requested organization information. The information provided in this case identifies points of contact and their respective phone numbers, mailing address, and it provides sites that support the file transfer protocol (ftp) for accessing information specific to the organization.

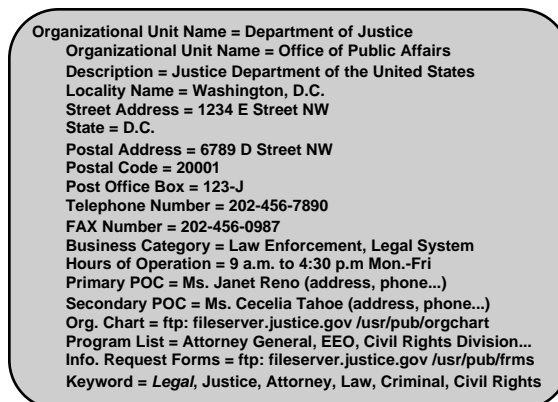


Exhibit 1-9

Blue Pages Search Results

1.5.7 Green Pages

The Green Pages directory service provides a lookup facility for accessing bibliographic retrieval information. The purpose of the Green Pages directory service is to provide directory users with retrieval information sufficient to enable them to identify an electronic document, determine the retrieval requirements, and retrieve it through an automated tool. Electronic documents will not be stored in the directory, just the bibliographic retrieval information. The Government Electronic Directory will support the Z39.50 to

X.500 Gateway protocol and the Government Information Locator Service (GILS) for integrated access to on-line Government document repositories. Document information published in the Green Pages will include document series information specifying general topic areas for indexing related documents. Document specific information will include:

- Document title
- Unique identifier assigned to a specific document
- Description of the document and its contents
- Version information
- Author's Name
- Publishing organization information
- Retrieval location of the electronic document, e.g., ftp site, World Wide Web page
- Related links information, e.g., cited references, the authors distinguished name, related document series, and related documents.

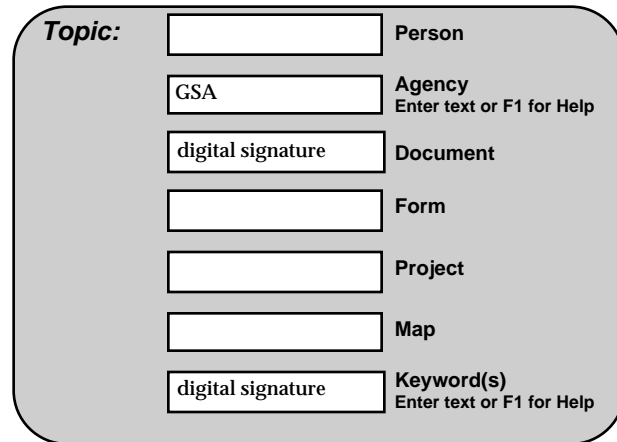
Government electronic documents are defined as electronically recorded voice, data or imagery material that may include:

- Forms, e.g., Tax, Immigration, Licenses, and Social Security Forms
- Documents of record, e.g., patents, copyrighted documents
- Publications, e.g., Department of Defense Regulations, Standards, Circulars and Newspapers
- Images, e.g., photographs and drawings

- Voice messages, e.g., electronic voice recordings
- Data, e.g., statistical data, computer code, and census data
- Multimedia records containing integrated voice, data, and imagery files.

The following example demonstrates how a directory user might use a DUA to retrieve Green Pages information. Let us suppose that our directory user has successfully corresponded with Mr. Shakespeare of the General Services Administration via electronic mail. He has learned that Mr. Shakespeare recently co-authored a Requirements Document containing functional requirements to enable the integration of digital signature technology into an application. Our directory user wishing to acquire a copy of this document initiates a search request by entering "GSA" in the agency field, "digital signature" as a document name, and just for good measure enters "digital signature" in the keyword field of the DUA entry screen, as presented in Exhibit 1-10.

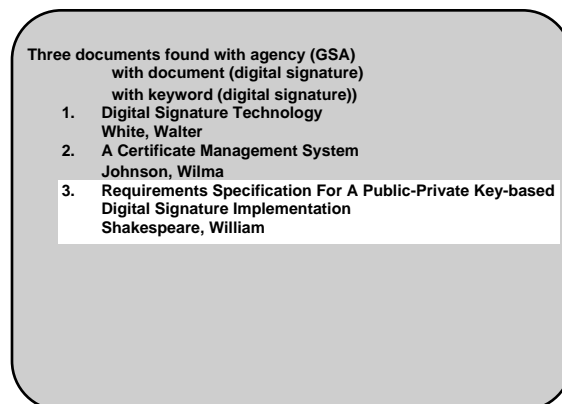
Exhibit 1-11 contains an example of the information that might be returned in the event of multiple documents having met the specified criteria. Our directory user highlights and selects the "Requirements" document authored by Mr. Shakespeare.



Topic:	<input type="text"/>	Person
	<input type="text" value="GSA"/>	Agency Enter text or F1 for Help
	<input type="text" value="digital signature"/>	Document
	<input type="text"/>	Form
	<input type="text"/>	Project
	<input type="text"/>	Map
	<input type="text" value="digital signature"/>	Keyword(s) Enter text or F1 for Help

Exhibit 1-10

Green Pages DUA Search Request Example



Three documents found with agency (GSA)
with document (digital signature)
with keyword (digital signature)

1. Digital Signature Technology
White, Walter
2. A Certificate Management System
Johnson, Wilma
3. Requirements Specification For A Public-Private Key-based
Digital Signature Implementation
Shakespeare, William

Exhibit 1-11

Green Pages Search Results

Exhibit 1-12 provides an example of document information specific to the selected “Requirements” document. The document title attribute is underscored to indicate that it is retrievable through a hypertext link via a World Wide Web interface. The document location attribute specifies a ftp site from which the document can be retrieved in electronic form.

Document Series= Digital Signature
Document Identifier = GSA-95-112323
Document Name = Digital Signature RequirementsSpecification
Organizational Unit Name = General Services Administration
Description = Requirements specification for implementing a
Public-Private Key Based Digital Signatures within the Fund
Control Module using the Digital Signature Algorithm and
Fortezza Crypto-devices.
Locality Name = Washington, D.C.
Document Title = Requirements Specification For A
Public-Private Key-based Digital Signature Implementation
Document Version = Microsoft Word 5.1
Document Author = William Shakespeare
Document Location = ftp://ftpserver@fed.gov
Document Publisher = SI-PMO
Keyword = Electronic Commerce, *Digital Signature*, X.500,
operational concept

Exhibit 1-12

Green Pages Search Results

1.5.8 Affinity Group Support

The Government Electronic Directory will support the management of groups of individuals, referenced as affinity groups. Affinity groups are further defined in Section 5.4. In order to understand the notion of an “affinity group” we should begin with the following definitions for “affinity” and “group” as provided by The New Merriam-Webster Dictionary © 1989.

af•fin•i•ty - 1: kinship, relationship; 2: attractive force

group - a number of individuals related by a common factor

Using the above definitions as a frame of reference we can further define an “affinity group” as follows:

An affinity group consists of a number of individuals that are related (kinship/relationship) through a common interest (attractive force).

Considering the many interests shared by individuals and organizations we can identify, at least, four categories of affinity groups:

- Professional Organizations
- Government Sponsored Organizations

- Occupational Roles
- Special Interest Groups.

1.5.8.1 Professional Organizations

International/national organizations that represent a community of interest. These organizations are typically chartered and register their membership through association fees. These organizations forward their goals and support their community of interest through a series of membership meetings and production of documents of interest to their membership. Representative organizations include: Association for Computing Machinery (ACM), Institute for Electrical and Electronics Engineers (IEEE), American Association of Retired Persons (AARP), and the Electronic Mail Association (EMA).

1.5.8.2 Government Sponsored Organizations

Government organizations that are chartered and sponsored by a Government entity. These organizations support the special interests of the sponsoring organization. Example organizations include:

- National Performance Review (NPR) sponsored by the Office of the President and specifically tasked with reducing waste in the Federal Government
- Directory Registration Working Group (DRWG) is sponsored by the Integrated Services Panel (ISP). The ISP is a subgroup of the Federal Information Resources Policy Council (FIRMPoC). The DRWG is tasked with developing policies and guidelines for implementing directory services within the Federal Government.
- Fairfax City Chamber of Commerce sponsored by Fairfax City Government and local business organizations to maintain the quality and standards of businesses within the community.

1.5.8.3 Occupational Roles

Consists of a specific role within an organization that is performed by an individual. These roles may be replicated within an organization and may be common across various organizations. These might include such roles as: Security Officer, Procurement Officer, Chef, Information Resources Manager, and Chief Counsel.

1.5.8.4 Special Interest Groups

Consists of individuals that have identified specific topics of interest. Individuals may belong to many special interest groups. These interests might include: childcare, accounting, medical services, computers, and auditing.

1.5.8.5 Document Distribution

The Green Pages will support a mechanism for locating documents in the Government Information Locator System (GILS) for affinity groups with an interest in the subject matter of the specified document. Documents that are available are categorized as belonging to a specific subject matter area, e.g., Rulings. Documents are also defined as being of a specific document type, e.g., Microsoft Word, WordPerfect.

When a document is generated it is categorized as belonging to a specific subject matter area and passed to the document management system for distribution. The system broadcasts the document to all users that have specified, in their profile, the subject matter associated with document. In addition, the system passes the document in the appropriate format requested by the user.

1.5.8.6 Affinity Group Requirements

Maintaining affinity groups within an X.500 Directory will require strict administrative controls and access control techniques. To generate an affinity group within an organization the requesting organization will be required to register the name of the affinity group. Once the affinity group's name is registered, the owning organization or individual may enter the affinity group information.

Affinity groups should:

- Be formally defined
- Enable sponsoring organizations to dynamically maintain the member list
- Prevent unauthorized persons from modifying the member list
- Enable directory users to browse affinity groups and identify their membership.

1.5.9 Yellow Pages

The Yellow Pages directory service provides a specialized lookup that supports information services related to commerce involving Governmental organizations and the general public. Bibliographic information for procurement actions such as Contracts, Request For Proposals, Invitations For Bid, and Requests For Information can be stored on-line, as well as information for retrieving the specific documents. Government organizations can disseminate product and service requirements in a manner similar to the Commerce Business Daily, as well as listing products and services that they provide. The GSA Schedule can be located, enabling federal buyers to identify source and pricing information for products they wish to acquire. Information can be stored in the directory to enable Electronic Commerce/Electronic Data Interchange (EC/EDI) support. Vendors can be registered within the Government Electronic Directory by a sponsoring government organization with whom they are doing business. Thus enabling private organizations to make available descriptive information regarding their products and services. These products and services can be listed by the Standard Industrial Classification (SIC) Codes.

The following example demonstrates how a directory user might use a DUA to retrieve Yellow Pages information. In our final example, let us assume our directory user wishes to collect information about the contractor organization currently supporting the General Service Administration's implementation of digital signature technology. Our directory user initiates a search request by entering "GSA" in the agency field, "contractor" and "digital signature" in the keyword field, as depicted in Exhibit 1-13.

Exhibit 1-14 presents the organization specific information associated with the contractor, including points of contact and their respective phone numbers, and mailing address. It also identifies related information sources, i.e., the functional requirements document prepared by the contractor, the contract on which the contractor currently provides services, and two related digital signature documents.

Topic:	<input type="text"/>	Person
	GSA	Agency
	<input type="text"/>	Document
	<input type="text"/>	Form
	<input type="text"/>	Project
	<input type="text"/>	Map
	contractor, digital signature	Keyword(s) Enter text or F1 for Help

Exhibit 1-13

Yellow Pages DUA Search Results Example

Organizational Unit Name = Signature Development Company
 Description = GSA Contractor
 Locality Name = Washington, D.C.
 Street Address = 7th and D Streets. SW
 State = D.C.
 Postal Address = 1000 Leesburg Pike, Vienna, Virginia
 Postal Code = 22180
 Post Office Box =
 Telephone Number = 703-813-1000
 FAX Number = 703-813-1111
 Business Category = Software Development, Digital Signatures
 Keyword = Computers, Software Development,
 Digital Signatures
 Primary POC = Ms. Mary Rome (address, phone...)
 Secondary POC = Mr. Roger Milan (address, phone...)
 See Also = Digital Signature Requirements Specification
Funds Control Module Contract GS-95-0001
Digital Signature Technology Document
A Certificate Management System Document

Exhibit 1-14

Yellow Pages Search Results