                  A Survey of Advanced Usages of X.500

Status of this Memo

   This memo provides information for the Internet community. It does
   not specify an Internet standard. Distribution of this memo is
   unlimited.

Abstract

   This document is the result of a survey asking people to detail their
   advanced usages of X.500. It is intended to show how various
   organizations are using X.500 in ways which extend the view of X.500
   as a "White Pages" service. This RFC is a product of the Integrated
   Directory Services Working Group of the Application and User Services
   Areas of the IETF.

1. Introduction

   As the use of X.500 spreads in the Internet, organizations are
   finding uses for it which go beyond the "white pages" paradigm which
   has been used to introduce it to new users. Consequently, to document
   those new uses and to encourage the wider use of X.500, we sent out a
   survey to obtain "advanced usages" of X.500.

1.1 The survey

   The survey we sent out is included here for two purposes:

   1) completeness, and
   2) we'd like to encourage anyone who retrieves this document to send
      us their advanced usage for inclusion in the next revision.

   If you wish to fill this out, please send it to the working group
   list: IDS@merit.edu.

_____

Application Name:

Author(s):

Company or Institution:

e-mail address for more information:

If this is a product for public distribution, please give us the
   Type: FREE, COMMERCIAL PRODUCT, or PROTOTYPE/RESEARCH
   FREE   - Anyone may obtain this product at zero cost.
   COMMERCIAL PRODUCT - One may purchase this product.
   PROTOTYPE/RESEARCH - This product is not yet available, only a
                        prototype.

If FREE, please give us:
   * FTP and/or FTAM address (if available via FTP and/or FTAM):

If COMMERCIAL, please give us:
   * Directions to obtain product:

Availability: (When will product be available?)

List of platforms product runs on:
[The platform list can be general - e.g. UNIX]

Short Description (< 100 words):

Full Description (< 1 page):

                  Fig. 1: Advanced Usages Survey Template

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   This survey went out to the following mailing lists: osi-
   ds@cs.ucl.ac.uk, disi@merit.edu (now ids@merit.edu), and
   dssig@ics.uci.edu.

1.2 Disclaimer

   Descriptions of the advanced usages were written by the implementors,
   and not by the members of IDS. Although IDS has worked with the
   description authors to ensure readability, no guarantees can be made
   regarding the validity of descriptions. Caveat emptor.

2. The Survey Responses

2.1 Index to Responses

   Application   Page

2.2 Survey Responses

2.2.1 Global Time-table Information Service

   Application Name: Global Time-table Information Service based on X.500

   Date Received: 7/1/1992

   Date Last Validated: 7/1/1992

   Author(s):
     Jens Hofmann
     Cuno Lanz

   Company or Institution:
     Laboratory of Computer Engineering and Networks,
     Swiss Federal Institute of Technology (ETH Zurich)
     Switzerland

   e-mail address for more information:
     c=CH; a=ARCOM; p=SWITCH; o=ETHZ; ou=TIK; s=Lanz (lanz@tik.ethz.ch)

   Type:
     experimental prototype; not public

   FTP address: <none>

   Short Description:
     This application aims at integrating the time-table information
     services offered by public transport providers of different scope
     (local, regional, national or international) into a homogeneous and
     unified user interface. X.500 is used to store the information in
     an autonomous and extensible way.

   Full Description:
     Most of the public tranport providers offer some kind of time-table
     information service like printed directory, help-desk, telephone
     support or PC software. Unfortunately these services have some of
     the following drawbacks:

          - no automatic update of data (information accuracy)
          - no global availability (place independency)
          - no permanent availability (time independency)
          - no inter-provider service (service integration).

     X.500 may serve as a vehicle to overcome these drawbacks as
     follows: The public transport providers store the time-table
     information in a standardized format on locally managed DSAs. There
     is some kind of special purpose DUA which (1) queries the user for
     the input parameters (date, time, source and destination station)
     then (2) searches for the relevant paths by querying the involved
     DSAs and (3) displays the resulting time-table to the user.

     In a diploma thesis a student is developing a new data model which
     supports easy selection of source and destination station as well
     as fast exploring of the time-table information. He is implementing
     a prototype application onto an existing DUA interface (based on
     HyperCard and running on Apple Macintosh) which is connected to the
     world-wide X.500 pilot service over DIXIE protocol. In order to
     test the prototype application the time-table information of the
     Swiss national public transport company and of most of the regional
     providers around the city of Zurich is included under the branch:
     c=CH;o=ETH Zurich.

2.2.2 Pre-Message Security Protocol

   Application Name:
     Defense Message System Directory

   Date Recieved: 7/1/1992

   Date Last Validated: 7/1/1992

   Author:
     Bob Cooney

   Company or Institution:
     The Naval Computer and Telecommunications Station, Washington
     and
     The Defense Information System Agency

   E-mail address for more information:
     cooney@wnyose.nctsw.navy.mil

   Type:
     experimental prototype, not public

   FTP address: <none>

   Short Description:
     The U.S. Navy will build a directory based on X.500 to support the
     distribution of Pre-Message Security Protocol security keys.

   Long Description:
     The U.S. Navy has been asked to build a directory service to support
     the distribution of Pre-Message Security Protocol security keys.
     The Pre-Message Security Protocol will provide SMTP/X.400 security
     services for unclassified but sensitive mail on the Defense Data
     Network.

     The directory will be based on QUIPU. Proof of concept is expected
     by October 1992, with initial operational capacity by October 1993.

2.2.3 Electronic Data Interchange

   Application Name: An X.500 User Agent for Electronic Data Interchange

   Date Received: 7/10/1992

   Date Last Validated: 7/10/1992

   Author:
     Neil Weldon

   Company or Institution:
     Networks Group,
     Computer Science Dept.,
     Trinity College Dublin,
     Ireland

     e-mail address for more information:
       omahony@cs.tcd.ie
       nmweldon@vax1.tcd.ie

   Type:
     Research product and not for public distribution

   FTP address: <none>

   Short Description:
     The Directory is used to assist in solving the 'first order'
     problem associated with Electronic Data Interchange (EDI). EDI is
     the transfer of trade documents between application processes in a
     processable form. The 'first order' problem describes the
     agreements that two organizations must come to regarding
     capabilities and preferences, before using EDI.

     To solve this problem we defined object types to allow the storage
     of product catalogues within the Directory, as well as information
     about the EDI readiness of trading partners: addresses, preferences
     and EDI capabilities.

   Full Description:
     Electronic Data Interchange (EDI) is the means by which
     organizations exchange trade related documents between application
     processes in an format which may be processed electronically.

     Before using EDI an organization must establish a series of goals
     and objectives, to establish what type of documents they wish to be
     able to transmit (invoices, purchase orders etc.) and what their
     communication requirements are. Each of these time consuming and
     tedious steps is usually done in conjunction with trading partners
     where these agreements regarding EDI capabilities and preferences
     must be made.

     To solve this 'first order' problem (the need to come to agreements
     with other organizations before trading using EDI takes place) we
     defined object types to allow the storage of product catalogues
     within the Directory. The Directory may also convey information
     regarding the EDI readiness of trading partners: addresses,
     preferences and EDI capabilities.

     Using an experimental User Agent based on Pod which was developed
     at Brunel in the UK, trade documents may be built up by selecting
     products from the stored catalogues. These documents are then
     encoded as an EDI Interchange after the Directory has been queried
     about addresses, etc.

The current object types are very basic and may only convey the
minimal amount of information necessary. We are now in the process
of extending this further to a full product class hierarchy which
is being based on information that may be sent within an EDI trade
document using the EDI standard document syntax EDIFACT.

By using the Directory as a repository for product information to
aid in EDI the catalogues become available worldwide. They may be
replicated at various nodes, and the updating and propagation of
changes to slave copies becomes trivial.

2.2.4 Network Topology Information

There are two projects in this area; Merit Network's Shared Whois
Information Project, and EARN's Network Directory.

2.2.4.1 Shared Whois Information Project

Application Name: Shared Whois Project

Date Received: 6/1/1993

Date Last Validated: 6/1/1993

Author(s): Sheri Repucci

Company or Institution: Merit Network, Inc.

e-mail address for more information: swip@merit.edu

Availability: June 1993

Type:
  experimental prototype, not public

List of platforms product runs on: UNIX

Short Description:
  The Shared Whois Project merges network data held by various
  organizations. The principal purpose of merging this data is to
  find and resolve conflicting network information between the
  databases. The longterm goal of this project is to move away from
  the current model of storing similar and/or duplicate network
  information in multiple databases and to move to a X.500
  distributed database model. To this end, we are working on loading
  the NSFNET network information into X.500 in anticipation of
  participating in a distributed database trial.

   Full Description:
     The Shared Whois Project is a collection of programs and shell
     scripts which collectively merges the network data held by each of
     the participating organizations. Currently this includes Merit,
     the RIPE-NCC and the InterNIC. The principal purpose of merging
     this vast quantity of data is to find and resolve conflicting
     network information between the various databases. It is our
     intent to merge this data bi-weekly and thus rapidly reach, and
     thereafter maintain, a stable set of commonly held network
     information.

     While there is a common set of information all three of the
     participants hold in their various databases, additional
     information unique to the function of each organization is also
     held. Furthermore, the resulting set of data created by the merger
     holds only one entry per network without attempting to combine the
     variations. Thus, each entry includes a listing of all databases
     found to contain information for that network as well as all
     databases found to be in conflict with the entry held in the
     resultant set.

     The longterm goal of this project is to move away from the current
     model of storing similar and/or duplicate network information in
     multiple databases and to move to a X.500 distributed database
     model. To this end, Merit is working to load the NSFNET network
     information into X.500 in anticipation of participating in a trial
     with the InterNIC and others on the road to a globally distributed
     database model.

2.2.4.2 EARN's Network Directory

   Application Name: Ditnet/EARN Network Directory

   Date Received: 7/7/1992

   Date Last Verified: 7/7/1992

   Author(s):
     Peter Sylvester

   Company or Institution:
     Inria Rocquencourt - France

   e-mail address for more information:
     peter.sylvester@inria.fr

   Type: FREE (data owned by EARN/Bitnet)

   Short Description:
      The EARN/Bitnet Network database consists of descriptions of all
      participating members, network nodes, adminstrators, and topology
      information. This database commonly known as BITEARN NODES is being
      made available through x.500.

   Full Description:
      A full description of the contents of the EARN/Bitnet database
      can be found in some EARN internal document which is available
      as a file BITEARN NODES from any NETSERV in EARN/Bitnet. The
      contents of this file is mapped into an X.500 subtree containing
      descriptions of network nodes, adminstrational personnel, and
      topology information.

      The first version of the directory subtree will be created using a
      simple textual mapping to a flat directory tree using private
      attributes.

2.2.5 Soft Pages

   Application Name: Soft Pages

   Date Received: 9/25/1992

   Date Last Validated: 9/25/1992

   Author(s):
      Thomas Johannsen
      Glenn Mansfield

   Company or Institution:
      AIC Systems Laboratory,
      Tohoku University Sendai

   e-mail address for more information:
      spp-support@aic.co.jp

   Type:
      Intended for public distribution, not yet public

   FTP address: <none>

   Short Description:
      A file name look-up services for anonymous FTP servers, provides ls
      -lR information and FTP server address. Additionally, the nearest
      FTP site (from user's site) which holds the requested file is
      chosen.

   Full Description:
     With the growing of number and size of electronic archives for
     documents, programs and the like, the problem of finding and
     retrieving a specific file becomes more and more complex.
     Furthermore, bandwidth in the Internet is still limited. Users
     should be encouraged and supported to do local FTP sessions as often
     as possible instead of getting everything from the other end of the
     world (i.e., the net).

     The Soft Pages Project combines an Archie-like file look-up service
     with network configuration knowledge. A dedicated User Agent gives
     a suggestion how to retrieve a document in a network traffic
     optimized manner.

     Basically, Directory information introduced by Soft Pages falls
     into two parts: A file information part and a network configuration
     part.

     The file information part describes objects and attributes for file
     servers and their contents. For each file server, names and
     attributes of its files are stored and updated periodically. This
     provides global access to Archie-like information for all
     registered file servers and, furthermore, opens the way to store
     document description together with the file name. Thus, document
     search is not restricted to file name matches but might be run for
     keywords as well.

     The network configuration part provides information on networks
     (subnetworks), nodes and lines in the Internet. Furthermore, IP
     numbers can be mapped to network and node objects. In order to
     evaluate file server sites, Internet (site to site) connections are
     given a cost index and then alternatives are compared by their cost
     index. Cost index is a calculated parameter representing properties
     of a connection like speed, average traffic, charges etc. where
     values for the latter are hold as attributes to line objects.

     If a document is stored at two or more sites, the site with the
     lowest cost index (which naturally will be the "nearest" in network
     terms) will be chosen for retrieval. A Soft Pages User Agent
     basically interacts with the Directory for finding a pointer to the
     "best" copy of a file wanted by a user.

2.2.6 X-Tel

   Application Name: X-Tel's advanced applications

   Date received: 7/1/1992

Date last verified: 7/1/1992

Author(s):
  Colin Robbins
  Julian Onions
  Graeme Lunt

Company or Institution: X-Tel Services Ltd.

e-mail address for more information:
  x500@xtel.co.uk

Type:
  Commercial Products / Ideas

Short Description:
  1) Product Information. Products that have DUA facilites built in
  have a "latest info" button or other request method. When
  "pressed" a well known node below the X-Tel part of the tree is
  read. The attributes contain descriptions of the latest version of
  the software, new features etc. If you decide you would like the
  new version, a second read obtains the information required for a
  template order form.

  2) BUG Status. As above, but obtains details of known bugs in the
  version of software you are running. (If only we could find a way
  of putting fixes in, and automatically updating the software
  itself!)

  3) X-Terms. We have a conferencing product, allowing X users to
  "talk" and share windows. The problem is identifying which X
  Terminal device a particular user is currently on. One solution we
  are using is modify a users directory entry during login to say
  which X display they have logged into. The conference can the
  query the directory, and open windows on the appropriate device.
  The directory is also used to store details of current conferences,
  so new delegates can join the conference easily.

  4) Organisation browsing. There are a rich set of attributes about
  people and their roles stored in the directory. We have a special
  purpose DUA that exploits this information, and presents
  information on who manages who, who is secretary for who etc. This
  is very useful when combined with the search ACL mechanism defined
  in OSI-DS 21 as different views can be given to different
  catergories of users.

  5) MHS use of directory. The directory is use to store MHS routing
  information (as per the MHS DS working group documents)

6) Mail Lists. Details of mailing lists are stored in the
directory. With careful use of access control, users can be given
access so that they can subscribe and unsubscribe themselves
to/from a list.

7) Details of restuarants in the Nottingham area are stored in the
directory!

8) We plan to use the directory as a rendevuz for a multi-user
adventure game. Each "room" will be a different entry, and modify
operations will be used to pick up and put down objects!

The next two are "advanced" features of our DUA, they may not be
considered relevant to this document!

9) Templates. The directory is used to store template entries.
Our DUA then uses this template when adding new users. Very
useful, as a number of default attributes can be set.

10) Editors. Special purpose editors for a number of complex
attribute syntaxes are built in to our DUAs. This includes QUIPU
ACLs, and X.400 OR Addresses.

2.2.7 Xerox Clearinghouse

Application Name: Clearinghouse Interface

Date Received: 7/1/1992

Date Last Validated: 7/1/1992

Author(s):
  Margaret Avino

Company or Institution:
  Xerox Corporation

e-mail address for more information
  mavin.cin_ops@xerox.com

Type:
  Early Design/Implementation stages

Short Description:
  X.500 DSA interface to XNS (Xerox Network Services) Clearinghouse
  directory to provide access to Xerox Corporation's Clearinghouse via
  X.500 DUAs.

Full Description:
   Xerox uses the XNS network protocol suite to provide Mail, Filing,
   Directory, Authentication, etc. network services for the installed
   based of 45,000+ Xerox workstations. The Directory is based on the
   XNS Clearinghouse protocol which is similar to X.500 in that it
   contains objects which have properties (attributes) and is a fully
   distributed, replicatable directory. The searching capabilities of
   the Clearinghouse protocol are not as robust as the X.500 search
   operation and the physical structure of the original database is
   not amenable to complex searches as it could be if it were stored
   in a relational database.

   The first piece of this project is to transfer the data into an
   Oracle relational database and create a new Clearinghouse server
   which accesses the oracle database and is a full fledged member of
   the Clearinghouse, sending and receiving updates to other servers
   using the XNS Clearinghouse protocol. This will allow powerful SQL
   queries to be performed on the data which will provide some very
   desired functionality such as: list all of the Distribution Lists
   of which this name is a member.

   To build on the new database, we are probing the implementation of
   an X.500 DSA interface to the Oracle Clearinghouse Directory. This
   would allow X.500 DUAs to access the data and utilize the powerful
   search operations. It will require the definition of one or more
   new object classes and several new attributes and some thought
   about the appropriate schema.

2.2.8 X.500 Sendmail

   Application Name: X.500 Sendmail

   Date Received: 9/25/1992

   Date Last Verified: 9/25/1992

   Author(s):
     Tim Howes

   Company or Institution:
     University of Michigan

   e-mail address for more information:
     x500@umich.edu

   Type:
     FREE

FTP address: terminator.cc.umich.edu

Directions to obtain product:
  get x500/sendmail-5.65.x500.tar.Z

Short Description:
  Modifications to sendmail-5.65 to do X.500 lookups.

Full Description:
  We have modified sendmail-5.65 so that it does X.500 lookups,
  returning the value of a user's rfc822Mailbox attribute. It
  handles multiple matches by sending a message containing the
  choices back to the sender. If the user has no email address in
  X.500, the sender is sent a message containing postal and phone
  information on the user. Both exact and approximate matching is
  supported.

2.2.9 Transparent ODA Conversion

  Application Name: Transparent ODA Conversion

  Date Received: 7/16/1992

  Date Last Verified: 7/16/1992

  Author(s):
    MacFarland Hale (MITRE Open Systems Group)

  Company or Institution:
    The MITRE Corporation

  e-mail address for more information:
    machale@mitre.org

  Type:
    Not Yet Available

  Short Description:
    Plan to use X.500 in conjunction with X.400 and Open Document
    Architecture (ODA) to provide transparent translation of compound
    documents between a sender and one or more recipients.

  Full Description:
    In the future, MITRE would like to combine X.500, X.400 and Open
    Document Architecture (ODA) to automate the conversion of compound
    documents in such a way that the users need not know about ODA or
    even that the conversion is taking place. This will require new
    and/or updated X.400 products.

A preferred compound document format (e.g., Microsoft Word,
FrameMaker, etc.) for each user is stored in the X.500 directory.
Each X.400 Message Transfer Agent (MTA) host also houses converters
between each such format and the Open Document Interchange Format
(ODIF).

A user (sender) creates a document with his or her preferred
compound document editor. Ideally, the editor software will have a
link (e.g., button or pull-down menu) to the X.400 User Agent (UA).
The user invokes the X.400 UA (either using this link, or outside
of the editor software) to send the document as an X.400 message to
one or more recipients. Next, the document may need to be
converted to ODIF, and this may be done in one of two ways.

Preferably, the X.400 MTA will be responsible for the ODIF
conversion. The UA must somehow be told what format the original
document is in. This may be done via the UA invocation from inside
the editor, via a UA configuration file, by examining the filename
extension, etc. It then tags the document to indicate the
document's original format using one of the body parts:
"Bilaterally Defined" (body part 14), "Nationally Defined" (body
part 7) or "Externally Defined" (body part 15). The UA then sends
the message, and the MTA interprets the tag to determine the
document's format.

For messages internal to MITRE, the MTA will look up the
recipient's preferred document format. If it is different than the
sender's format, the MTA calls the appropriate ODIF converter and
sends the message. If the recipient's preferred format is the same
as that of the document being sent, then no conversion is
performed. For messages going outside MITRE, the document is
always converted to ODIF. The user may prevent this by specifying
that the enclosed document is not to be converted, in which case
the UA simply sends the document in binary form with no special
tag.

Alternatively, the UA may do the conversion. As above, the UA must
be told the document's original format. The UA may then call the
appropriate local ODIF converter, and then send the message. There
are some disadvantages to this approach:

  1) ODIF converters must be purchased for and maintained on many
     more hosts;

  2) the document is always converted to ODIF (unless the UA
     accesses the directory, but...);

  3) conversion overhead could be traumatic on a small PC.

At each recipient host, the X.400 MTA catches the incoming message,
recognizing the contents as ODIF. It then looks up the recipients'
preferred compound document formats, calls the appropriate
converters to translate the contents, and then delivers the
messages to the recipients. If the incoming message contains one
of the format tags described above, then no conversion is performed
(since the document is not in ODIF).

Please note that MITRE is a not-for-profit organization. We will
not produce commercial products to support this scenario, but we
are anxious to encourage and work with companies interested in
doing so.

2.2.10 X.500 and the WHOIS protocol

Application Name: Phone Book

Date Received: 7/15/1992

Date Last Verified: 7/15/1992

Author(s):
  Steven Schoch

Company or Institution:
  NASA Ames Research Center

e-mail address for more information:
  schoch@sheba.arc.nasa.gov

Type:
  FREE, see Steve

Short Description:
  On-line edition of our phone book, using X.500 for storage and
  retrieval.

Full Description:
  Phone Book is a user application which communicates using the
  Internet WHOIS protocol. It is listed in the Internet Resources
  Guide as such. The latest incarnation, however, does not make use
  of a flat file -- it gets information from a DUA that performs
  conversions between information received via DAP and the format that
  users expect to get back from our Phone Book queries. The change to
  X.500 has allowed us to supply additional data such as E-mail
  address which do not normally appear in the phone book. The fields
  supplied in response to a query include:

            Name
            Telephone Number
            Mail Stop
            Office Number
            Organizational Affiliation (either a NASA organization code
                    or a contractor name)
            E-mail address

   Queries may be made on any of the fields specified, with the office
   being divided into building and room components. A sample lookup
   might be:

   trident:297-->phbook yee
   Name   Phone   M/S   Office   Organization
   ---------------------------- -------- ------- --------- ------------
   Arnold M. Yee   4-4315 258-6   N258/134 COMPSCICOR
   Cindy Yee   226-3   N226/105 CALSPAN
                                  cyee@ames.arc.nasa.gov
   David H. Yee   4-4106 213-8   N213/256 EEF
                                  david_yee@qmgate.arc.nasa.gov
   Dr. Helen M C. Yee   4-4769 202A-1 N202A/216 RF
   Harry Yee   4-6557 213-2   N213/101F EES
   Peter Edmond Yee   4-3812 233-18 N233/240 EDC
                                  yee@atlas.arc.nasa.gov
   Robert Yee   4-4122 T041-3 TA20/155 SFA
                                  robert_yee@qmgate.arc.nasa.gov

2.2.11 X.400 table handling

   Application Name: X.400 table handling

   Date Received: 7/15/1992

   Date Last Verified: 7/15/1992

   Author(s):
     Julian Onions
     Colin Robbins

   Company or Institution:
     X-Tel Service Limited,
     Nottingham, England

   e-mail address for more information:
     jpo@xtel.co.uk

   Type:
     FREE, not yet available to the general public

   Short Description:
     Implementation of the work of the IETF MHS-DS group. The goal is to
     put X.400 tables into X.500 in order to facilitate gateway and
     routing functions.

   Full Description:
     See the Internet drafts for MHS-DS. NASA Ames Research Center is
     participating in the testing and development of the next release of
     the PP message handling software. The latest update (alpha test)
     contains usage of X.500 by X.400 for RFC 822<->X.400 gatewaying, as
     well as hooks for X.400 intelligent routing. Use of X.500 to
     eliminate static tables will greatly improve the ability to
     maintain the information necessary for mail gatewaying and routing,
     while making it easier to keep this data current and well
     distributed.

3. Security Considerations

   Security issues are not discussed in this memo.

4.   Authors' Addresses

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   Berkeley, CA 94720

   Phone: (415) 486-6965
   EMail: wright@lbl.gov