Future Directions of Directory White Pages Services

Networkshop 27

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DANTE

- **D**elivery of **A**dvanced **N**etwork **T**echnology to **E**urope
- Non-profit organisation
- NRNs are shareholders and customers
- Participant in EC co-funded projects
- Current Network: (ATM, IP, managed bandwidth)
  - TEN 155: Pan European highspeed network for European Academic and research networks
  - DANTE-US connectivity for TEN-155 participants
- Delivery of the NameFLOW Directory services

1.) Introduction to Directory

- Why Directories
- Basics of X.500
- Basics of LDAP

Why do we need the Directory?

- White Pages information for communication
- Email integration
- Publication of public key certificates
  - Authentication
  - Encryption
  - E-commerce
- User administration (OS integration, NIS)
- Calendaring and scheduling
- Policy publication
- Directory Enabled Networking (DEN)

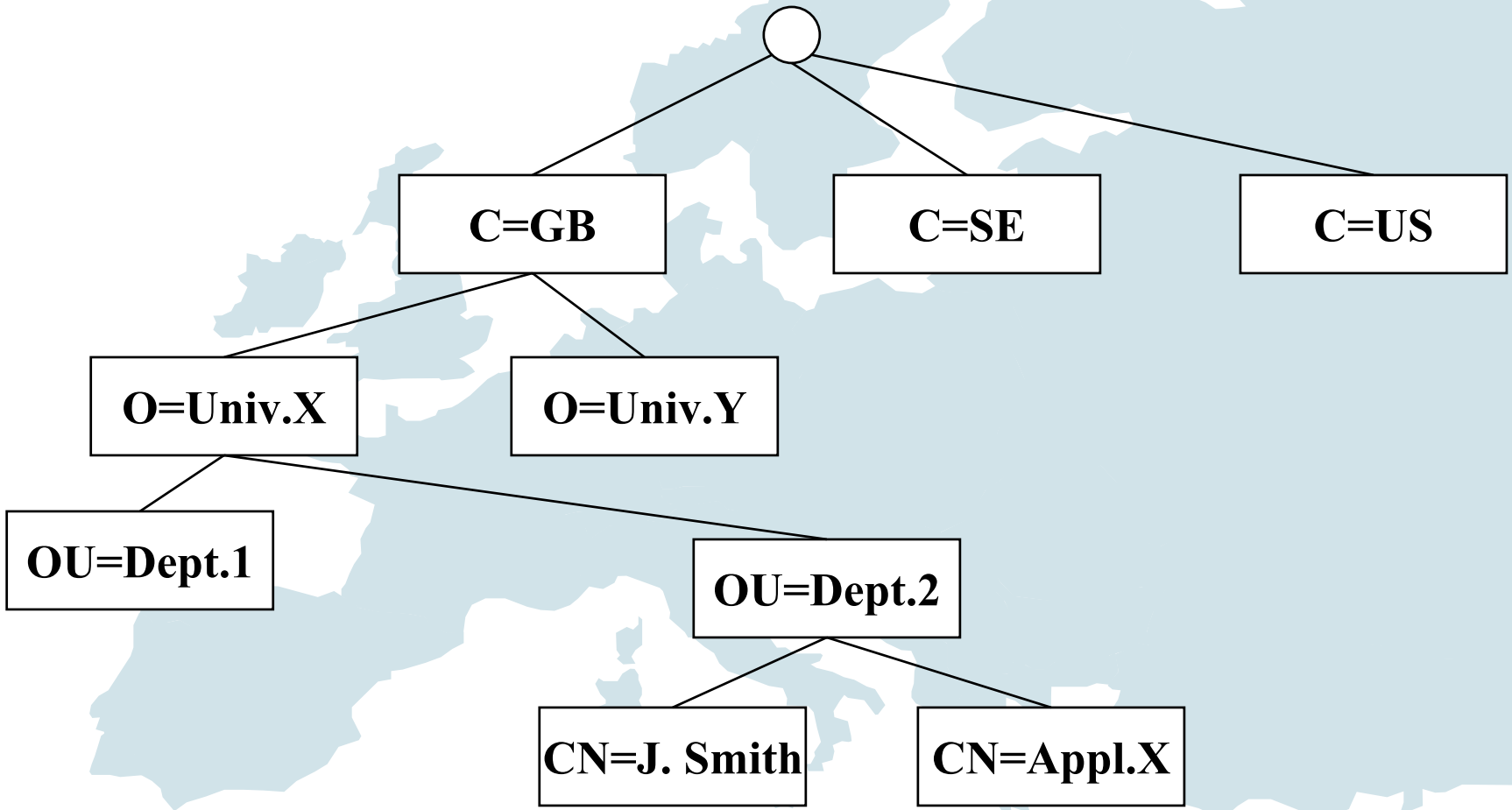
The X.500 Standard

- OSI (Open Systems Interconnection) standard
- Defined by:
  - ISO (International Standards Organisation)
  - ITU (International Telecommunications Union)
- Evolving
  - X.500(88), X.500(93), X.500(97), X.500(2000)
- Deployed
  - NameFLOW service by DANTE
  - based on X.500(88) Quipu flavor (public domain software)

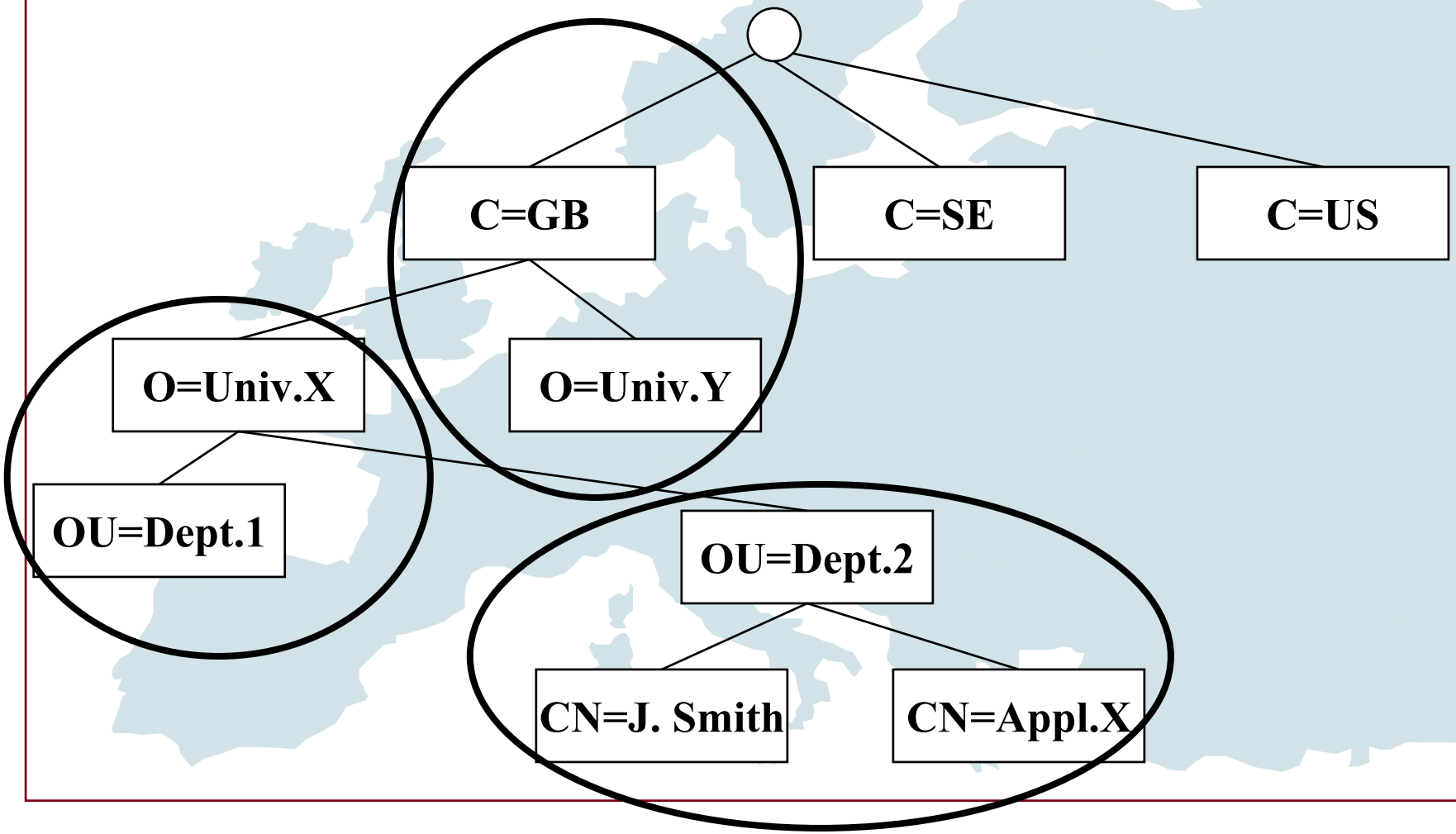
Basic Features of X.500

- General purpose
  - Any kind of data can be stored
- Object oriented
  - Object classes define which kind of data can be stored
  - Inheritance of Object classes
- Hierarchical data structure
  - Directory Information Tree (DIT)
- Distributed
  - Data are stored and managed in local Directory System Agents (DSA)
  - DSAs are interconnected

Directory Information Tree (DIT)



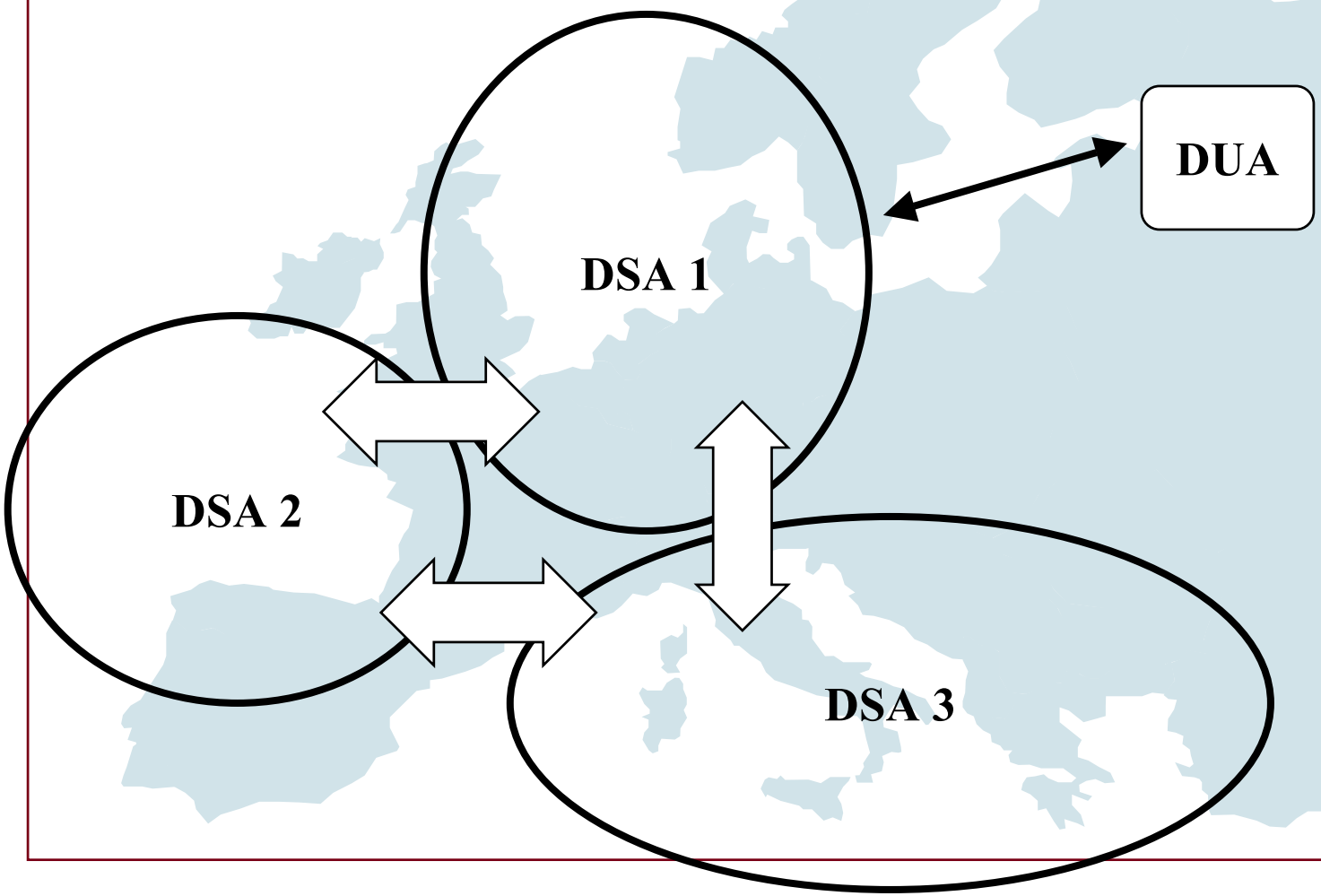
Distribution of the DIT into DSAs



X.500 Protocols

- DSP (Directory System Protocol)
  - DSA-DSA protocol for information management
- DISP (Directory Information Shadowing Protocol)
  - DSA-DSA protocol for replication
- DAP (Directory Access Protocol)
  - Directory User Agent (DUA) - DSA protocol for information retrieval

Client: Directory User Agent (DUA)



LDAP v2

- LDAP: Lightweight Directory Access Protocol
- Lightweight DUA-X.500 DSA protocol
- No OSI stack
- Internet protocol (RFC 1777-1779)
- Public domain software
  - University of Michigan
  - OpenLDAP

LDAP v3

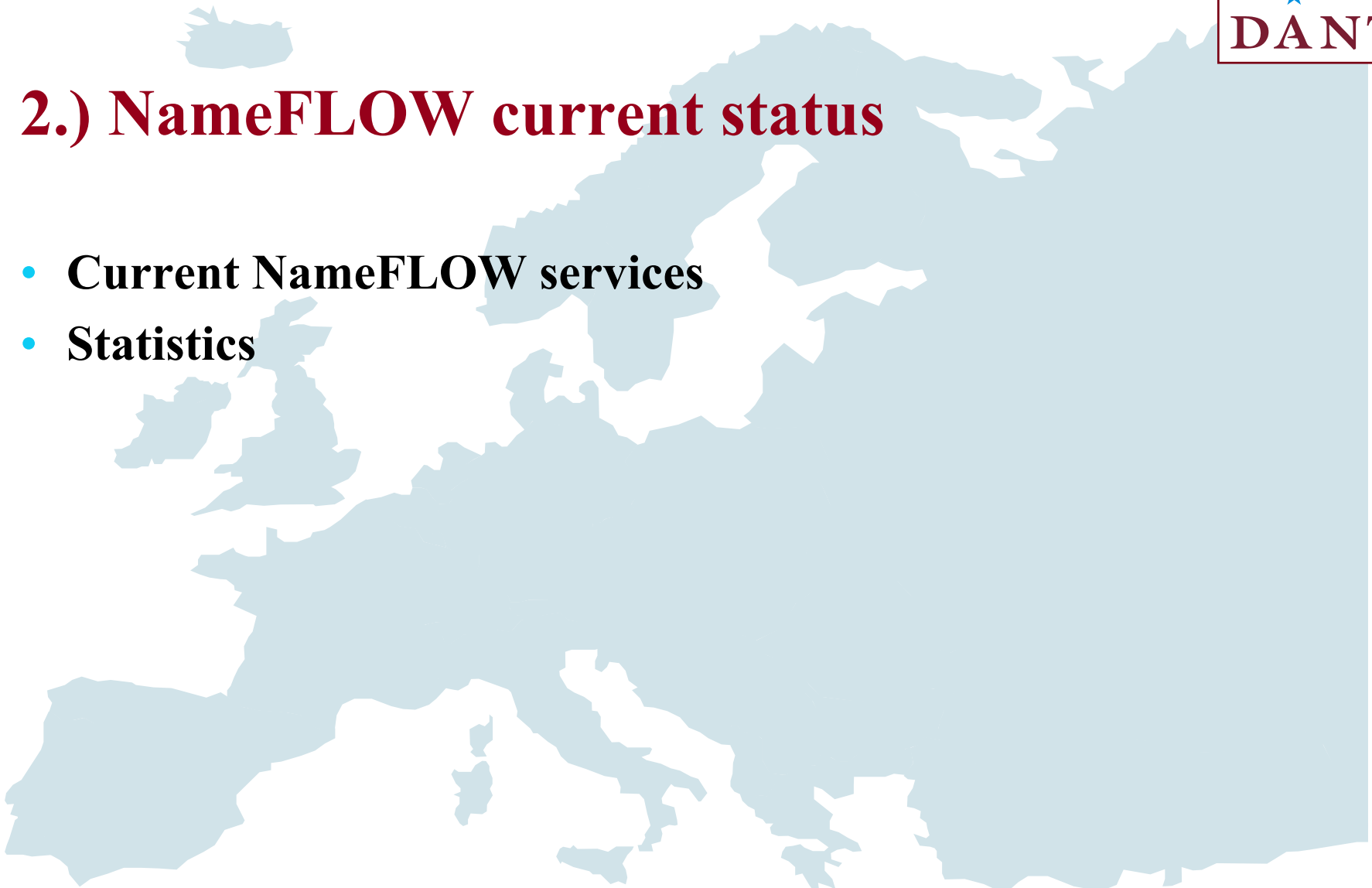
- Stand-alone client server architecture
- Referral technology
- IETF defined (RFC 2251-2255)
- Extensions (IETF ldapext WG)
- Authentication and access control (IETF ldapext WG)
- Replication (IETF ldup WG)
- LDIF (LDAP Data Interchange Format)

Problems of LDAP

- Important features (access control, replication, etc.) not yet defined
- LDAP servers are difficult to interconnect
- No international service deployed yet
- Referral technology not yet completely interoperable

2.) NameFLOW current status

- **Current NameFLOW services**
- **Statistics**



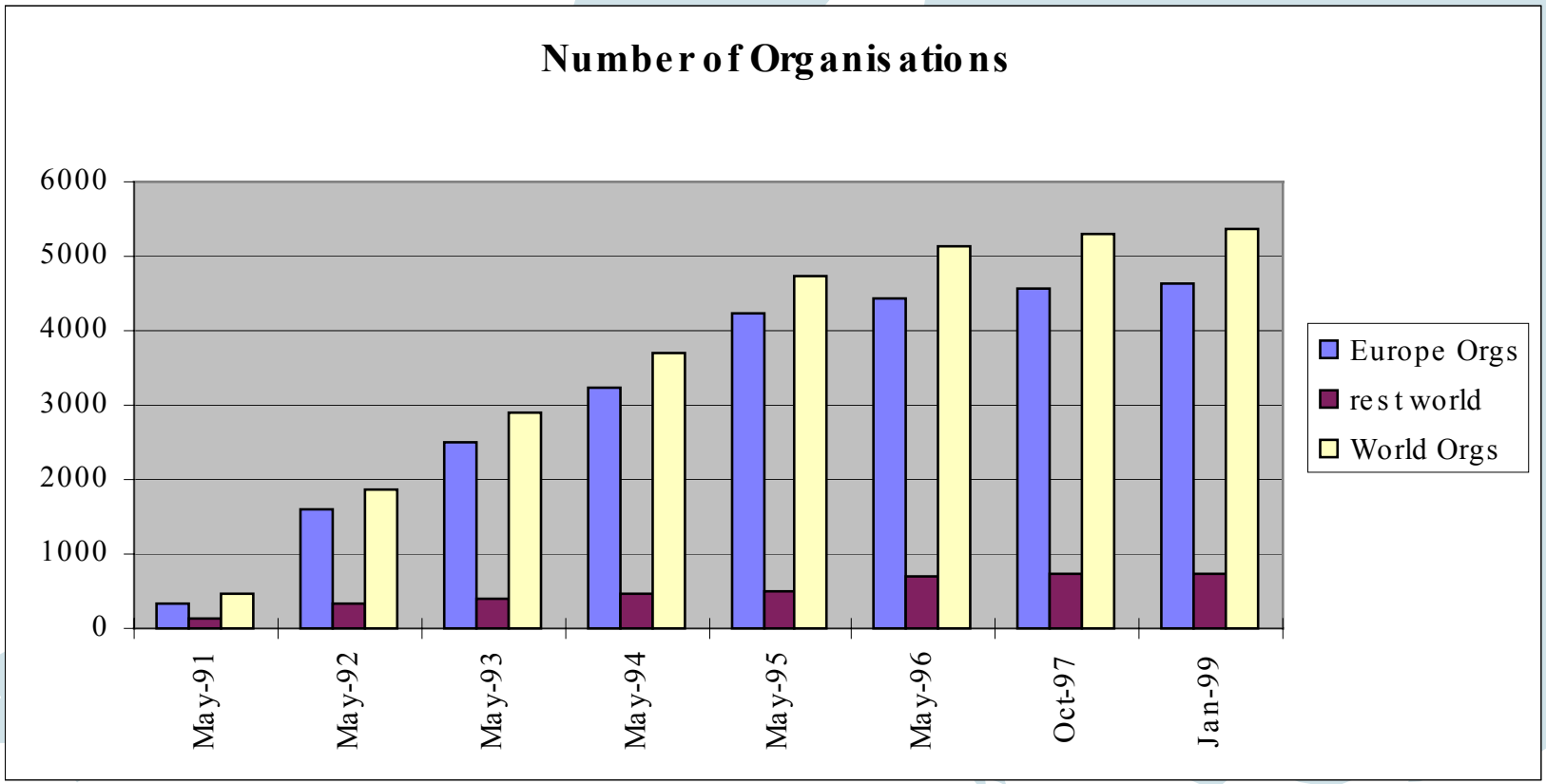
Current NameFLOW services 1

- **Root DSA**
  - **Using X.500 (88) Quipu (*not Y2K compliant* !)**
  - **Replication of FLDSA knowledge information (RFC 1276)**
  - **Reachable via Internet (RFC 1006 over TCP/IP)**
  - **Available 7 by 24**
  - **Supported and covered during normal working hours**
- **Statistics**
- **LDAP daemon**
- **Webgateway**

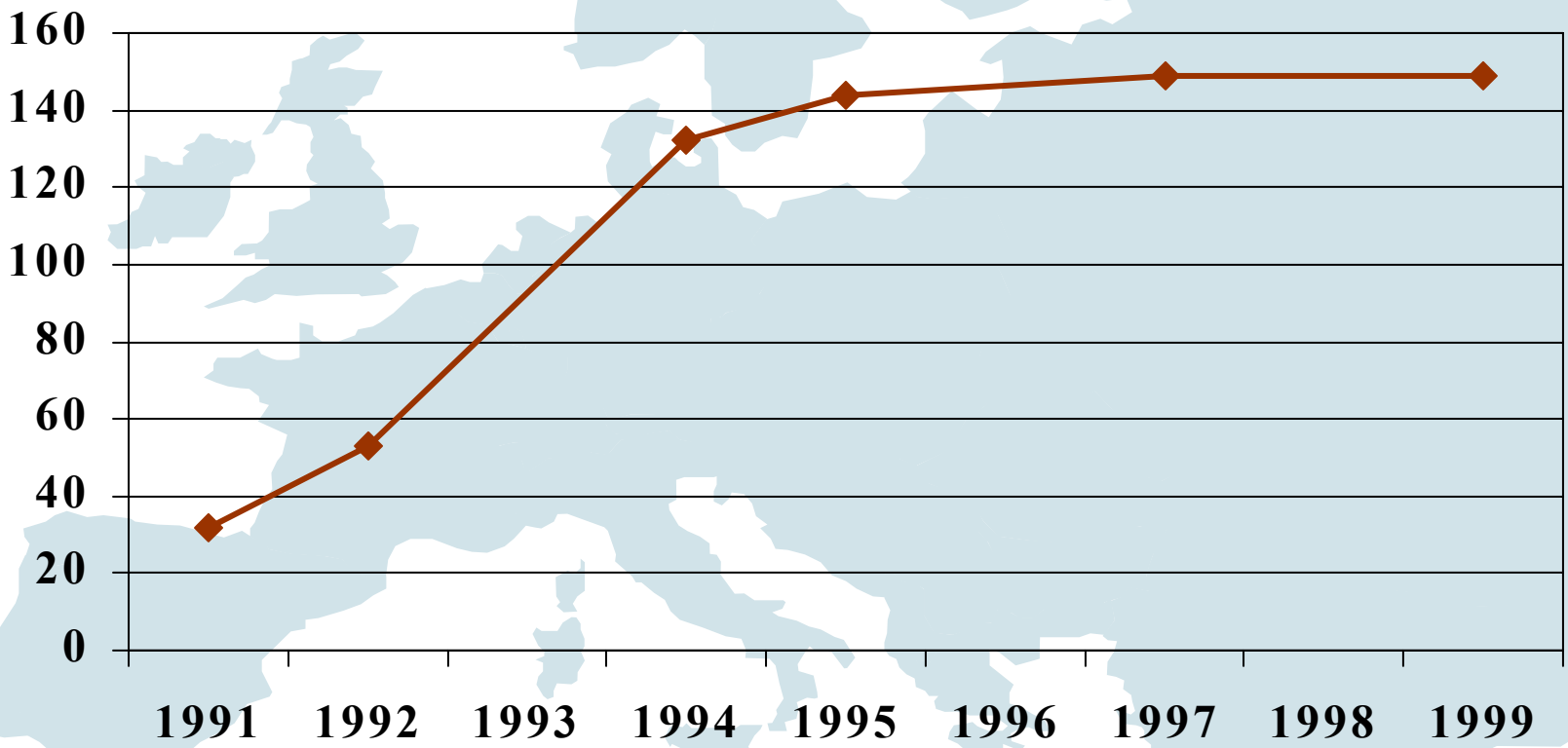
Current NameFLOW services 2

- NameFLOW mailing lists:
  - NameFLOW-Forum@Dante.org.uk
  - NameFLOW-Managers@Dante.org.uk
- FTP Information Server
  - Documents, minutes, reports, replication files, LDAP software, X.500 software, mirrors of relevant FTP sites
- Web Site
  - Documents, announcements, national contact persons, registration authorities, RFC store, etc.
- NameFLOW helpdesk

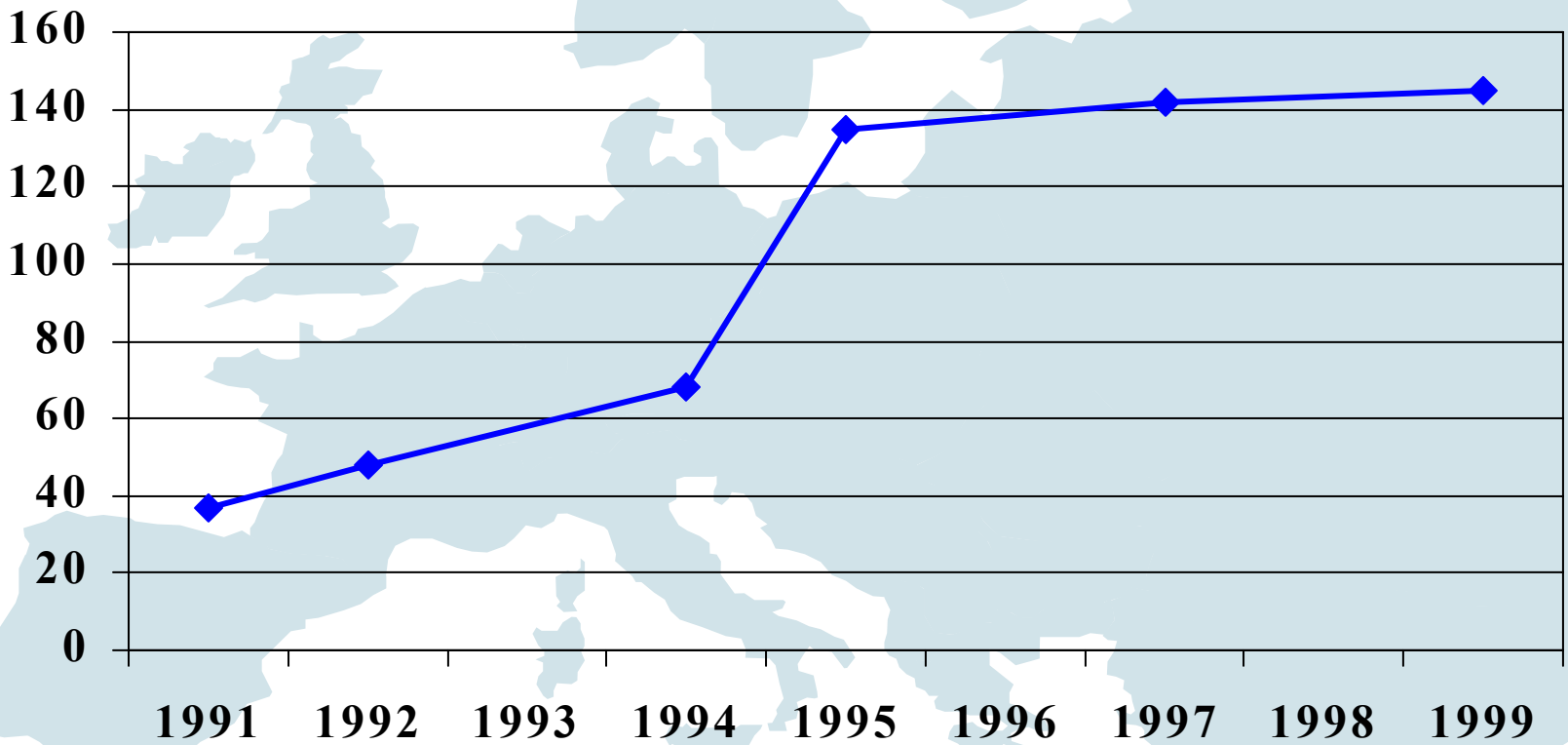
NameFLOW statistics 1



Number of Organisations in the UK



Number of DSAs in the UK



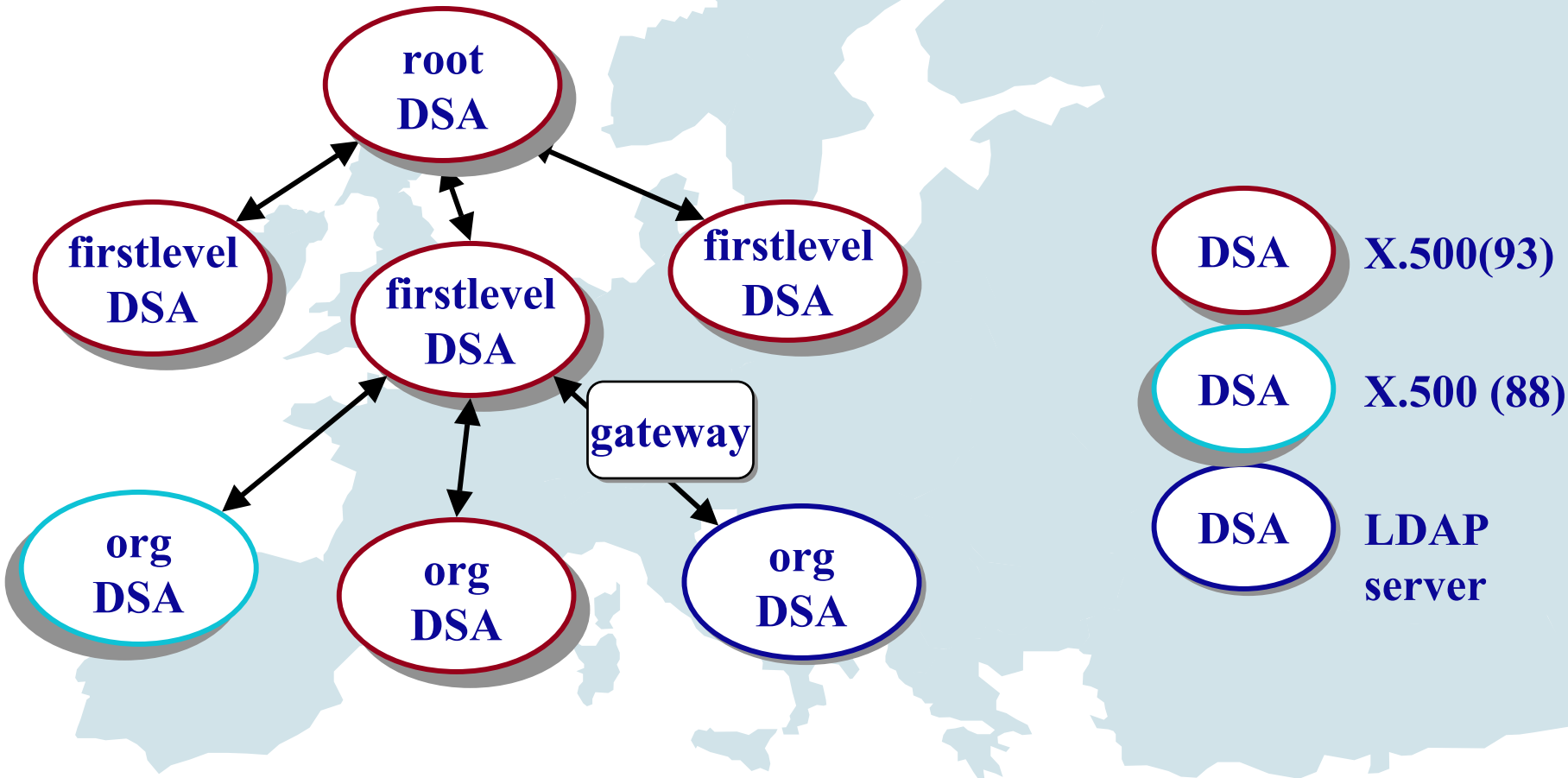
3.) Future NameFLOW Service 1: Hybrid X.500(93)-LDAP Solution

- Architecture
- Replication models
- LDAP DIT

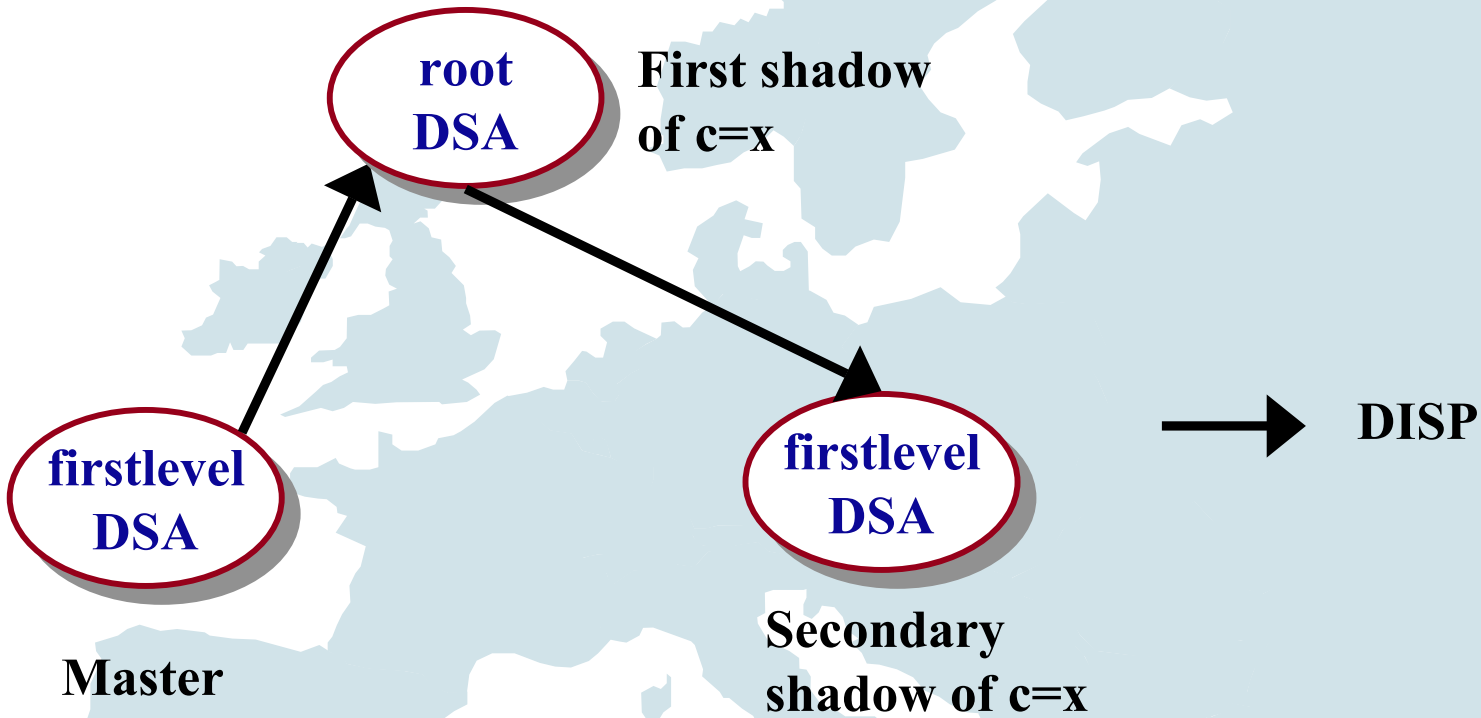
Hybrid solution architecture

- Root DSA and first level DSAs single vendor X.500(93)
- Knowledge information includes LDAP servers
- LDAP servers connected via X.500-LDAP gateway
- Future: Integration of an indexing system

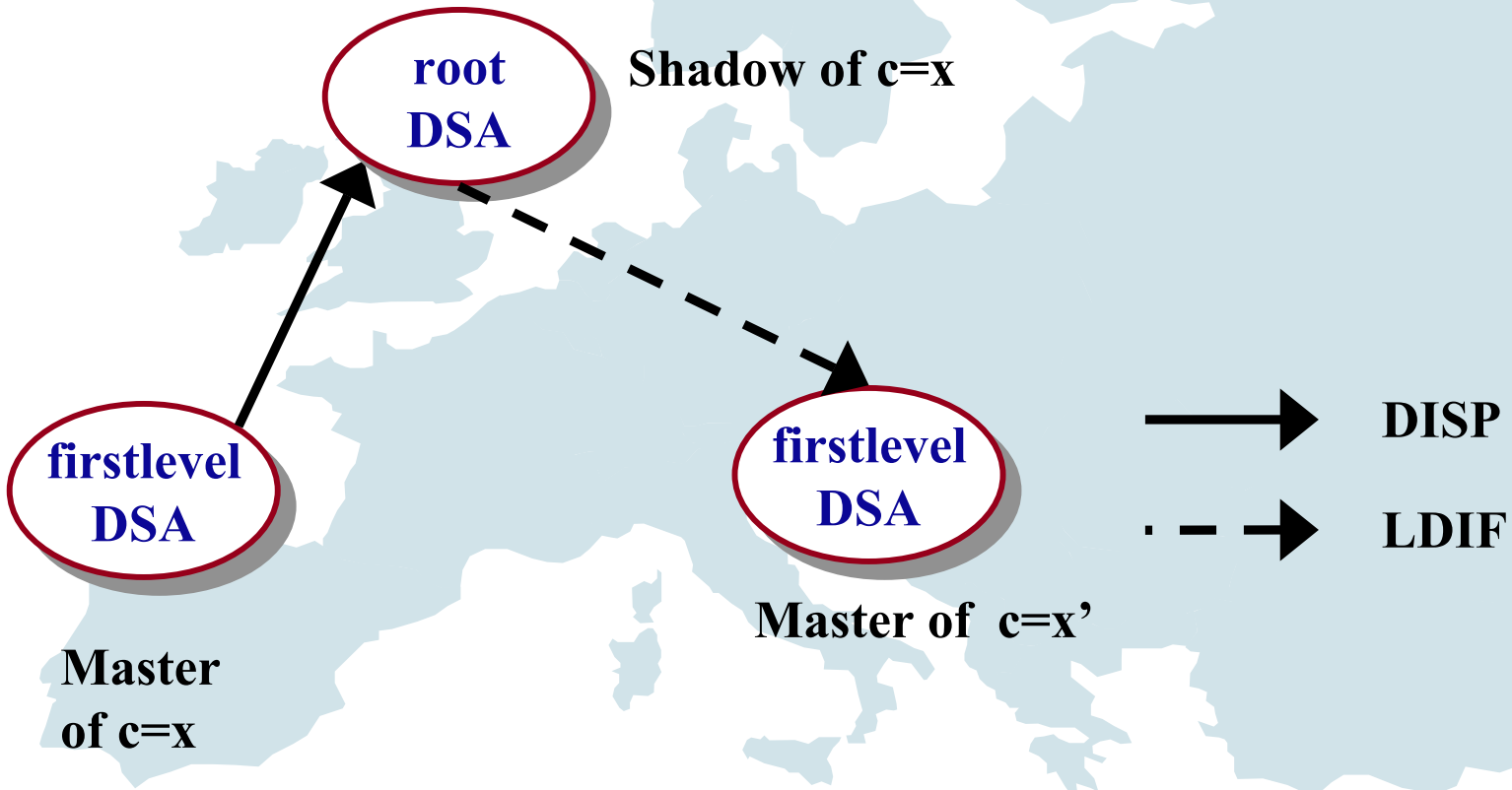
Hybrid solution architecture



Hybrid solution: replication model 1



Hybrid solution: replication model 2



LDAP DIT

- Setting up a LDAP DIT via v3 referrals
- Draft-ietf-ldapext-referral-00.txt:
  - Superior reference
  - Unnamed reference (≈ nonspecific subordinate reference)
- Netscape Directory Server
  - “Smart Referrals”

4.) Future NameFLOW Service 2: LDAP Indexing System

- **DESIRE II**
- **Architecture**
- **Index object distribution**
- **Query routing**

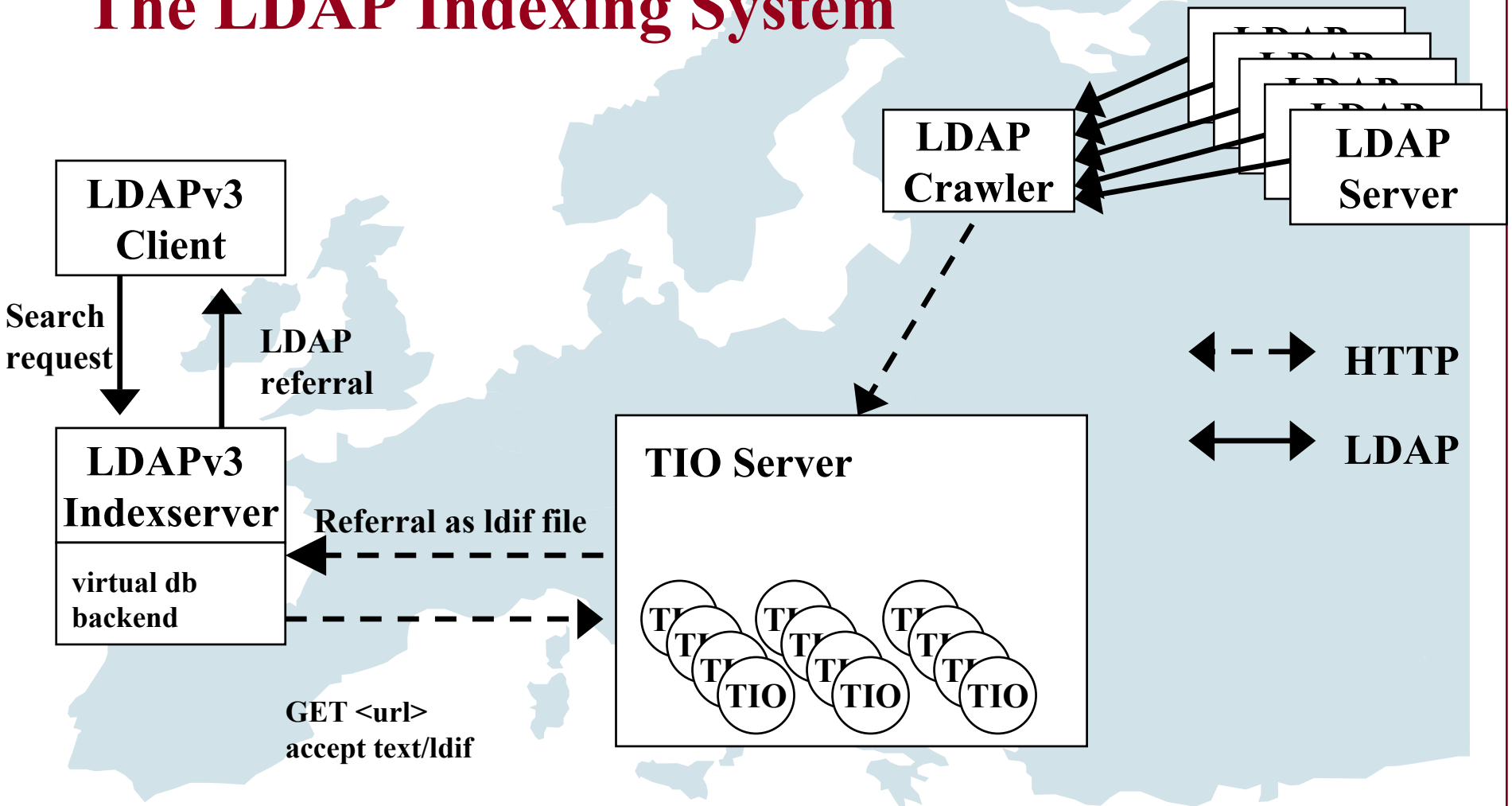
DESIRE II

- **D**evelopment of a **E**uropean **S**ervice for **I**nformation on **R**esearch and **E**ducation
- European Union's Telematics Applications Programme
- 10 European Partners
- Information discovery, integrated in a Web-centered model
- Integration of other distributed information services
- Metadata management
- Distributed Index system for Directory and Web data

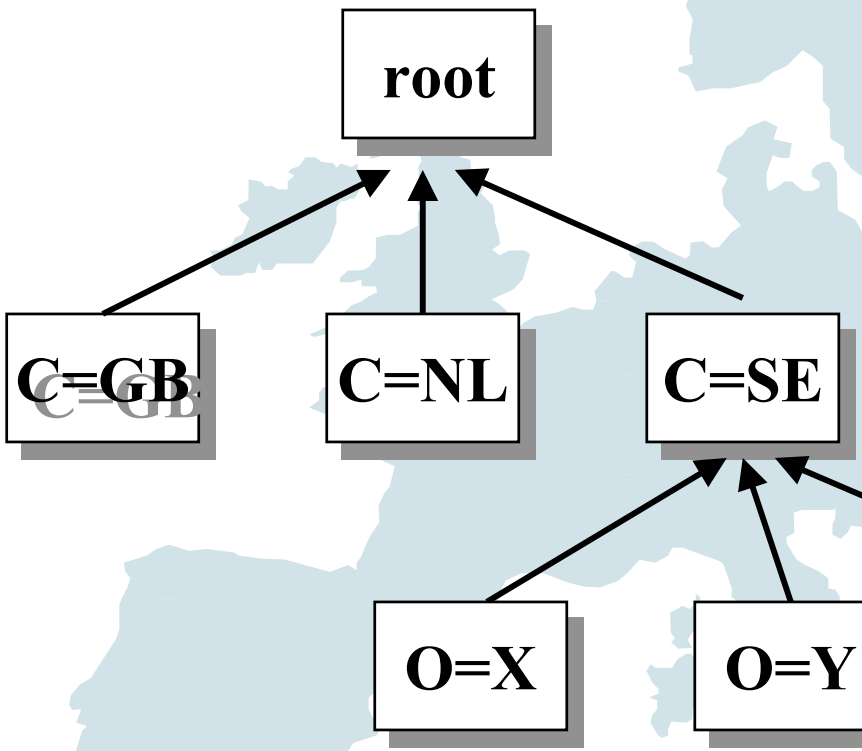
Distributed Index system

- Index system to interconnect LDAP servers
- Hierarchical topology
- LDAP v3 referral technology
- Managed by the server side
- Index server registration
- Subset of Common Indexing Protocol (CIP)
- Usage of the Tagged Index Object (TIO)

The LDAP Indexing System

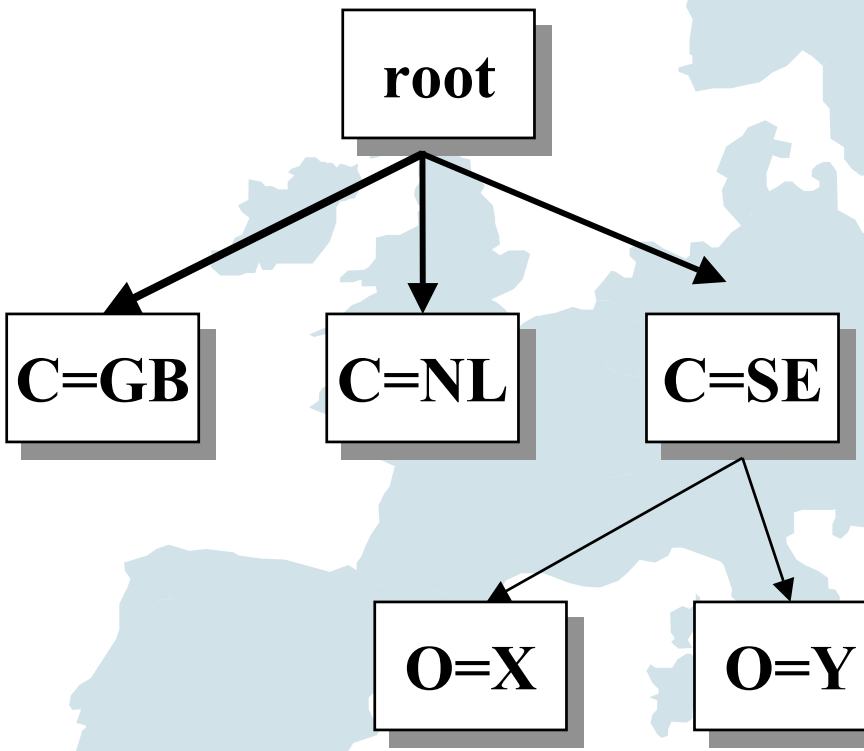


Index Object Gathering



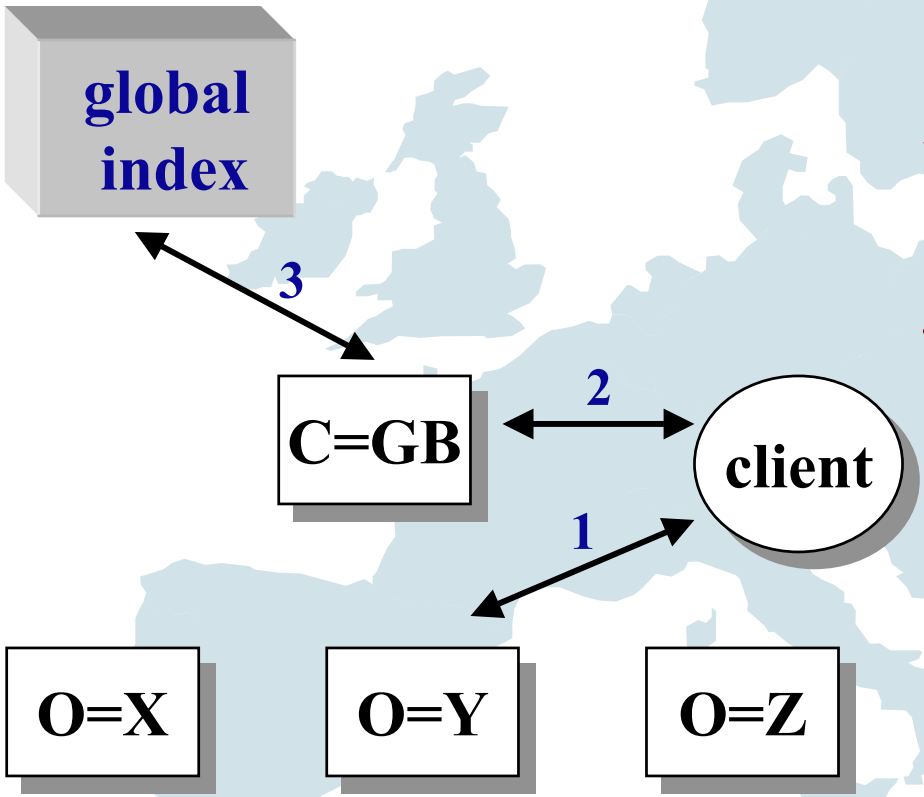
- Organisational index objects generated by crawlers
- Transport via FTP, email, or CIP but always encrypted
- Server gather index objects

Index distribution



- Global index to country level
- Country index can be distributed downwards
- Transport via email, FTP, or CIP but always encrypted

Index query routing



1. Client searches local server
2. Client searches country level server (CLS)
3. CLS looks up the referral index

Contact and additional information

- **Email: nameflow@dante.org.uk**
- **Web: http://www.dante.net/nameflow.html**
- **ftp://ftp.dante.net/pub/flowservices/NameFLOW**

- **Peter Gietz, "Requirements for the future NameFLOW Directory Service", DIP 35, http://www.dante.net/pubs/dip/35/35.html**

- **DESIRE Webpage: http://www.desire.org**