Directory Services on OS/390 and z/OS (Vanguard Session 61)

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What are we going to talk about?

- Directory Information model
  - Hierarchy of entries
  - Object classes
  - Attributes
- Directory Servers and a Directory Service
- OS/390 LDAP Client/Server Overview
  - Features
  - Differences Between releases
  - Capabilities
  - Usage

What is LDAP?

- LDAP - Lightweight Directory Access Protocol
- de-facto Internet (TCP/IP-based) wire protocol for accessing and updating directory information
- "V2" defined in Internet Drafts
- "V3" defined in IETF RFCs 2251-2256, 2829, 2830
- New RFCs all the time (e.g. RFC 2849 - LDIF format)
- Protocol defines interfaces between a client and a server for requesting and returning information

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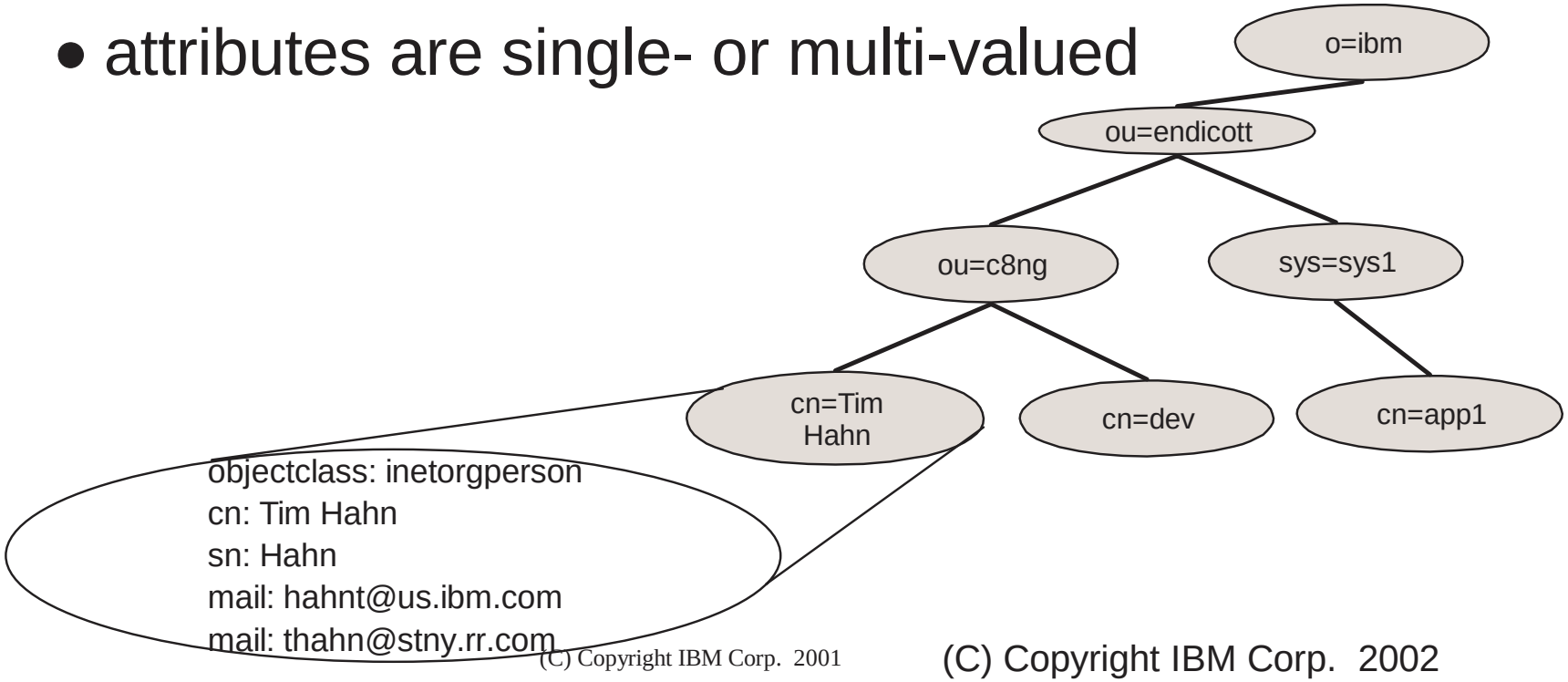
Directory Information Model

- An LDAP Directory is formed by a hierarchy of "entries"
- Each "entry" has:
  - a name (called a distinguished name)
  - a structure (called an "object class")
  - attributes
    - attributes are single- or multi-valued



Directory Information Model

- An Entry's "object class" defines
  - structure of an entry
  - attributes that MUST be present in an entry
  - attributes that MAY be present in an entry
- An individual Entry in the directory can take on the form of multiple object classes
  - The attributes in the entry are the UNION of those defined for individual object classes

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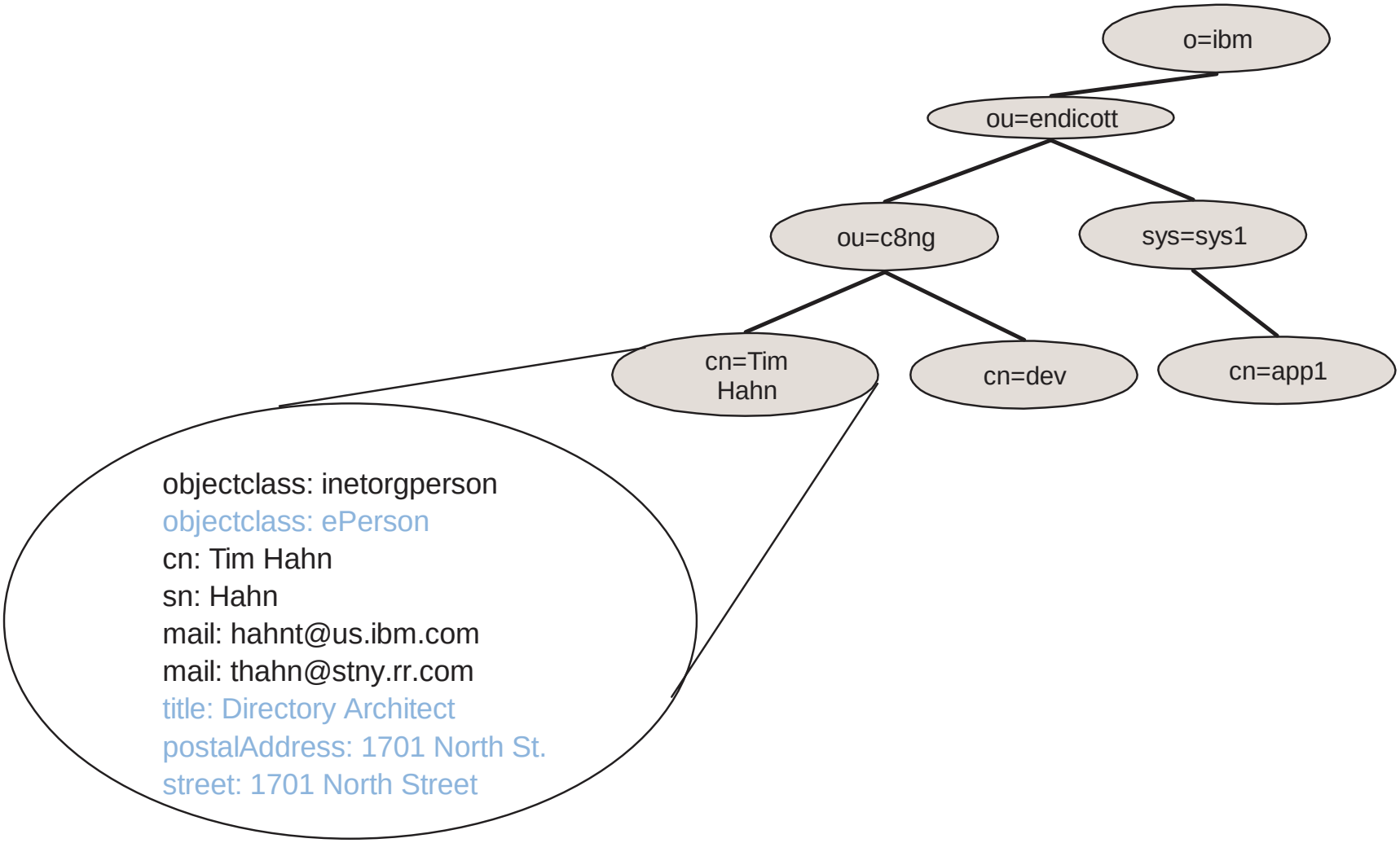
Directory Information Model



Directory Information Model

- Attributes are defined by their name, syntax, and matching rule(s)
  - Syntax refers to the type of data stored in attribute values
    - Examples: directoryString, binary, integer
  - Matching Rules define how equality and ordering comparisons are performed on attribute values
    - Examples: caseIgnoreMatch, caseExactMatch, octetStringMatch
- Different attributes within an entry may be more "sensitive" than others within an entry
  - Example: common name (cn) vs. uid vs. userPassword

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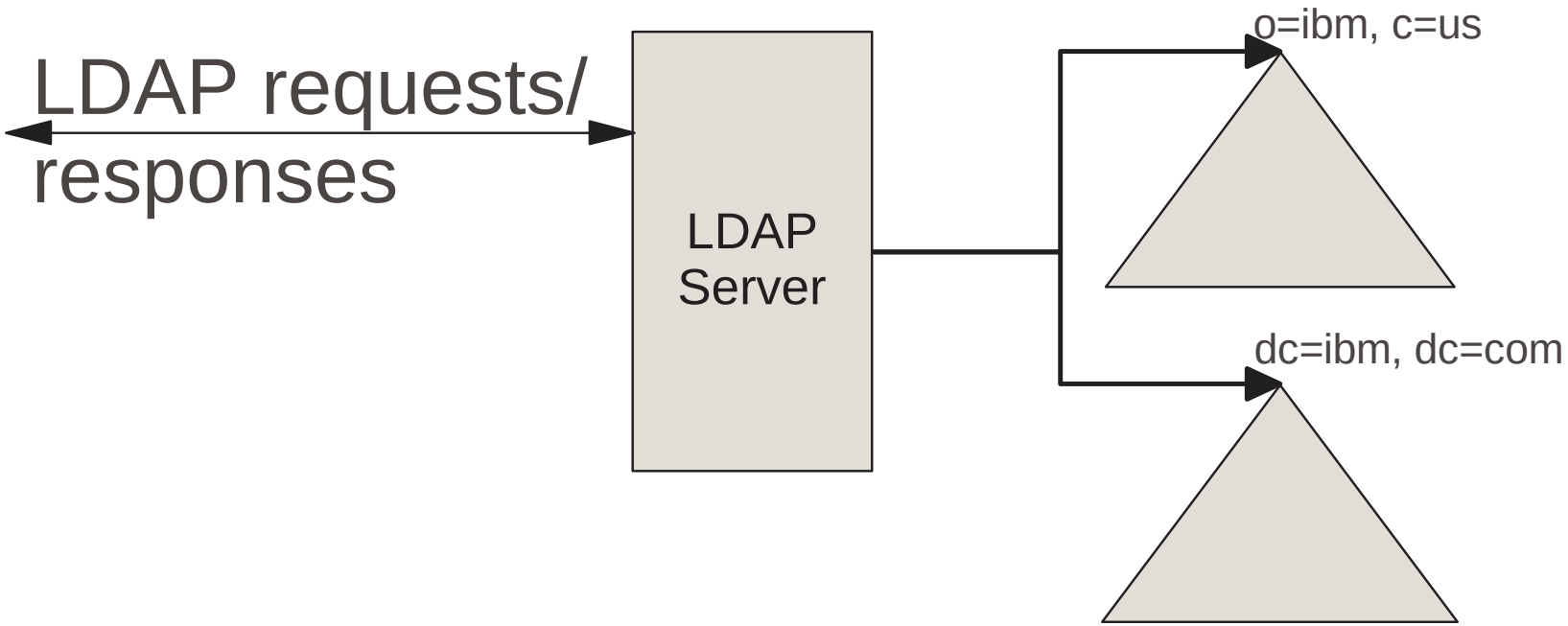
Directory Servers

- A Directory Server
  - accepts and responds to directory requests
  - manages a portion (set of "sub-trees") of a directory "namespace"



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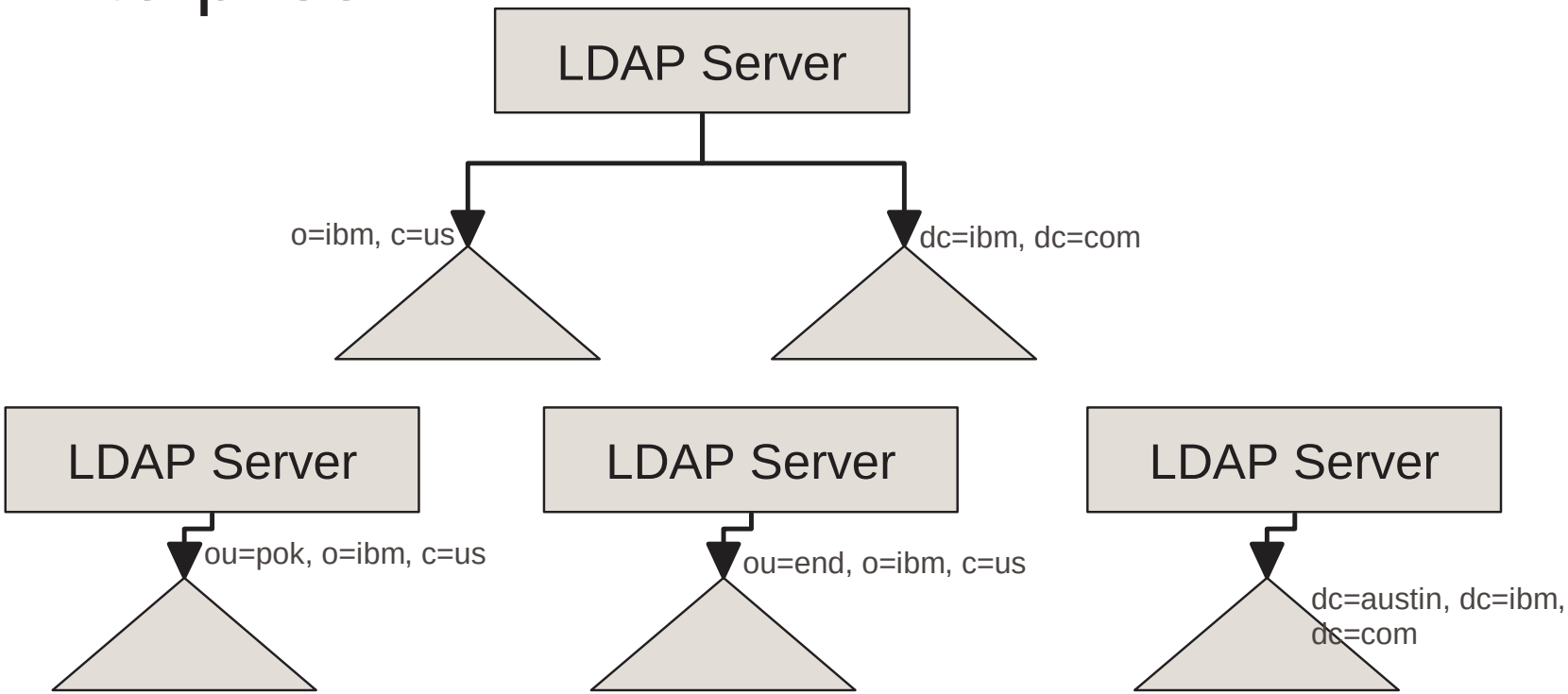
Directory Service

- A Directory Service
  - is a set of servers which, together, serve a directory "namespace"
  - is a value to the Enterprise, across the Enterprise



OS/390 LDAP Components

- LDAP C/C++ APIs (client)
  - As of V2R8 ships in OS/390 Security Server in same FMID as LDAP Server (HRSL180)
  - DLL provides interfaces that can be called from C or C++ programs to contact any server supporting the LDAP protocol
  - APIs are callable from COBOL via C; but not callable from CICS applications
- LDAP Java APIs (client)
  - JNDI interface, available as of V2R7
  - Compatible with AIX JNDI (as of 12/2000)

Features of the OS/390 LDAP Clients

- Secure communications using SSL
- LDAP V3 protocol support
  - Certificate Bind (SASL bind)
  - Controls
  - V3 referrals
  - SOCKS support
- Client ships as ALWAYS ENABLED in OS/390 Security Server

OS/390 LDAP Components

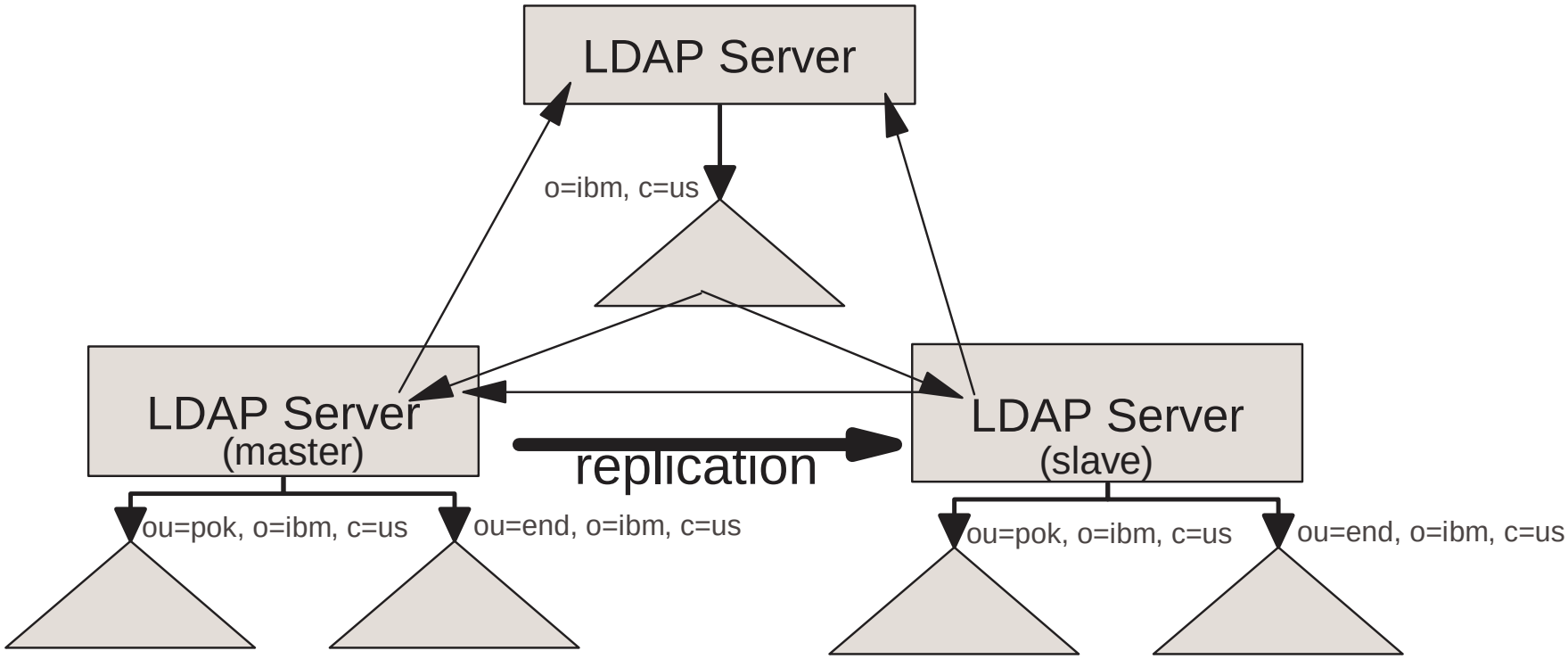
- LDAP Server
  - Accepts and responds to LDAP protocol requests
  - Supports DB2 backing store(s) and access to RACF
  - OS/390 R10 scalability improvements
  - OS/390 R10 "V3" schema support
  - z/OS R1 LDAP configuration utility
  - z/OS R2 Concurrent client scalability
- Server ships as ALWAYS ENABLED in OS/390 Security Server
- For customers to use LDAP clients or server, MUST install OS/390 Security Server

Features of the OS/390 LDAP Server (pre-V2R10)

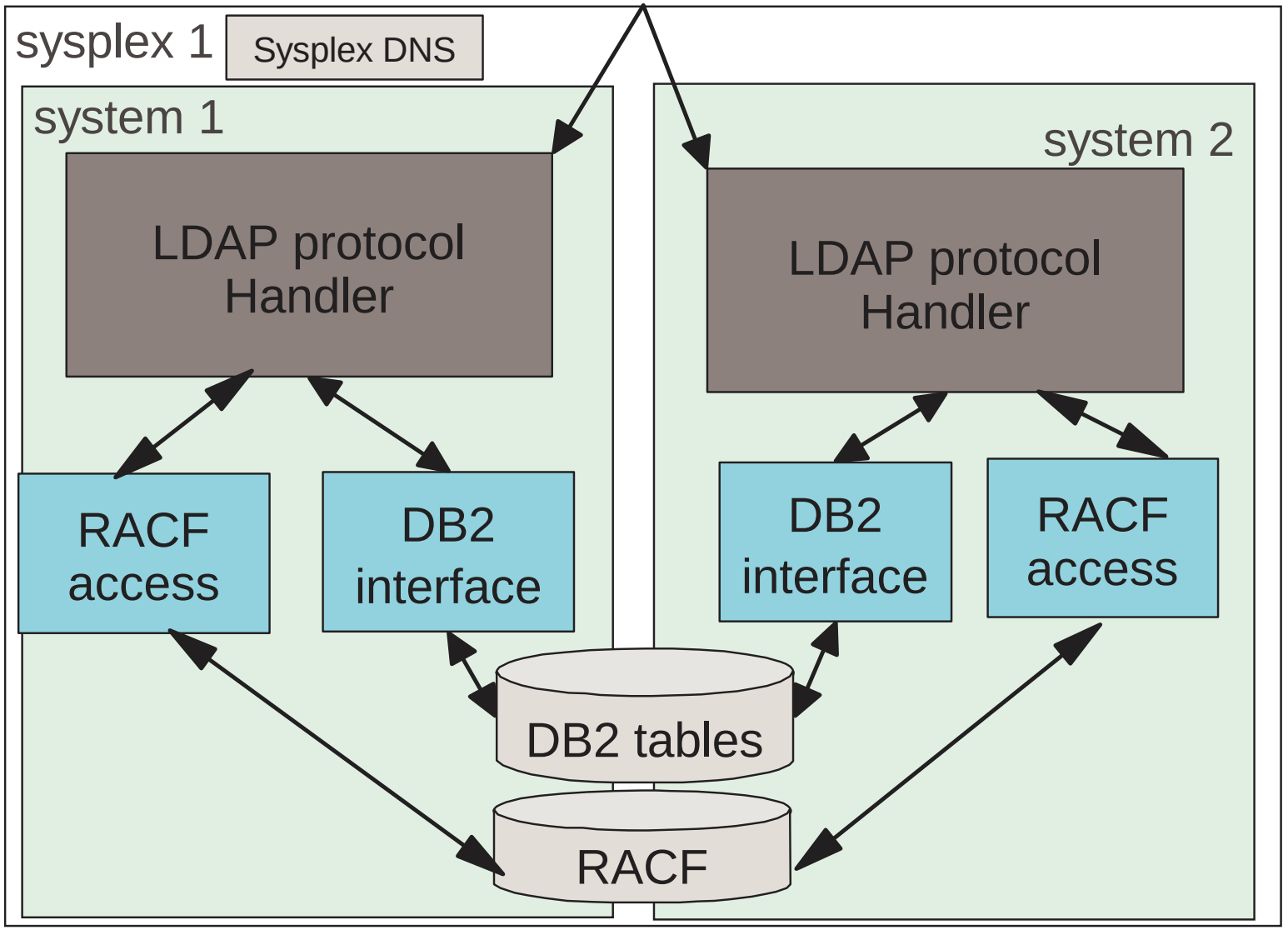
- OS/390 R5
  - Secure communications using SSL
  - Multiple Concurrent Servers
  - Master/Slave replication
- OS/390 R7
  - Sysplex Support
  - DB2 and RACF backing stores
  - Extended group searching for access control checking
- OS/390 R8
  - LDAP V3 protocol support (partial) - rootDSE, certificate bind, V3 referrals, UTF-8

Namespace Example Using Referrals and Replication

Example using referrals and replication



OS/390 LDAP Server Sysplex Support



Features of the OS/390 LDAP Server with V2R10 & z/OS R1

- OS/390 V2R10
  - LDAP V3 protocol support (more complete)
    - Schema publication and update
    - Many more syntaxes and matching rules
    - Case Sensitive attributes in distinguished names
    - limited Modify DN support
  - Scalable backend/TDBM
    - Small/fixed DB2 data model allows for tuning
    - Allows multiple DB instances
    - Access control check performance improvements
    - New bulkload utility for TDBM
- z/OS R1
  - LDAP configuration utility
  - Native Authentication

Schema pub & update

- Schema publication per RFC 2251-2252 - TDBM and SDBM backends
- Schema appears as an entry in the directory
  - Attribute types
  - Object Classes
  - Matching Rules
  - Syntaxes
- Schema update via LDAP protocol (LDAP MODIFY operation) - TDBM only
- Server ships schema definitions for a large number of known schemas (for use with TDBM, SDBM schema is unmodifiable)

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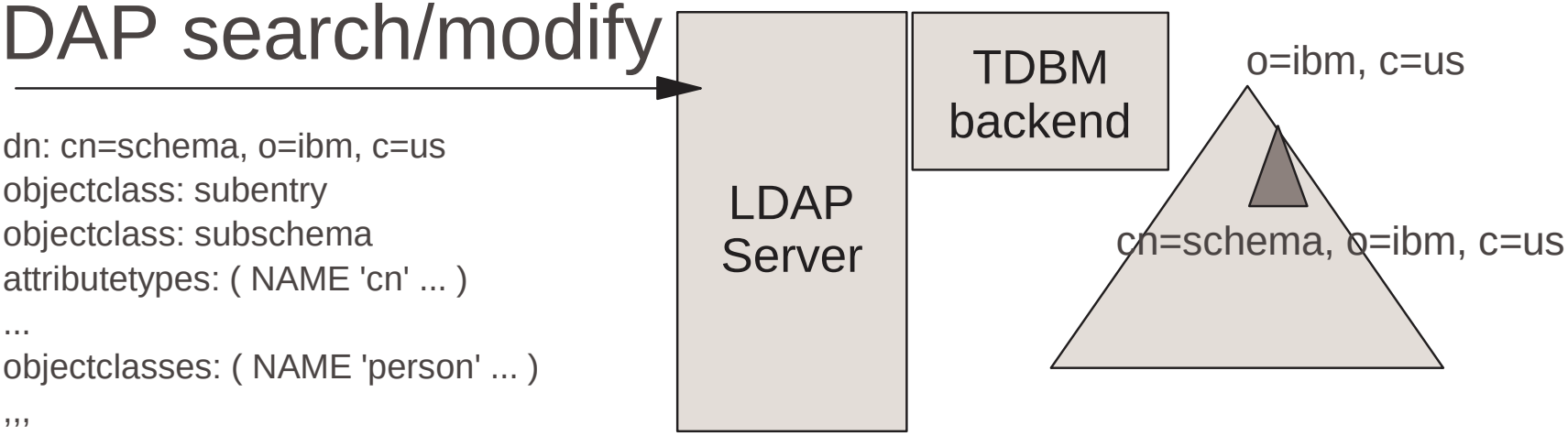
Schema pub & update

LDAP search/modify



Scalable Backend/TDBM

- New database implementation to support higher scalability
  - Uses a small/fixed number of DB2 tables
  - Concurrent search/update
- Allows multiple "instances" of backends to be enabled
  - Use this to "partition" your tree
- Schema is backend "instance" specific
- Minimal configuration options
- All attributes are "indexed"

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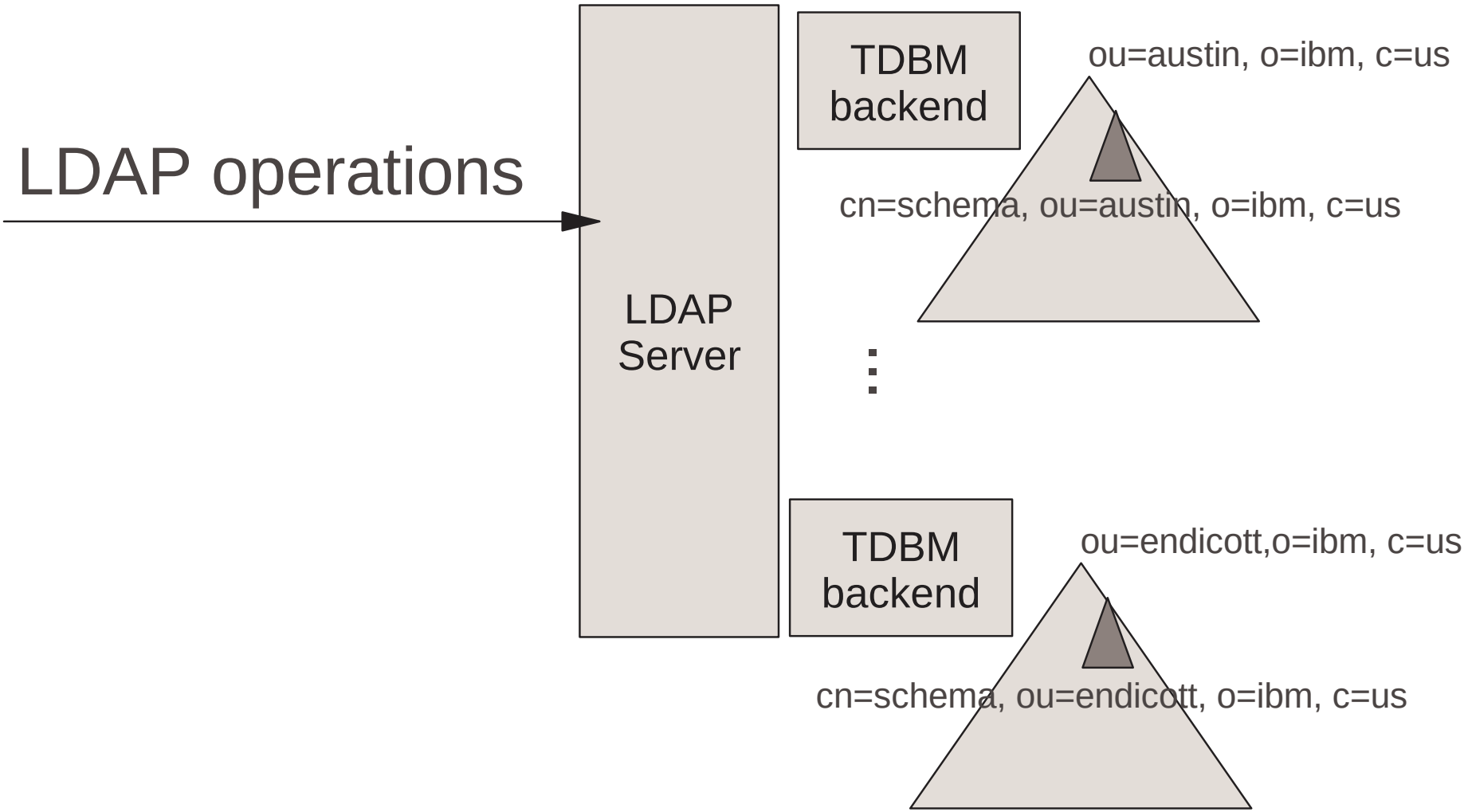
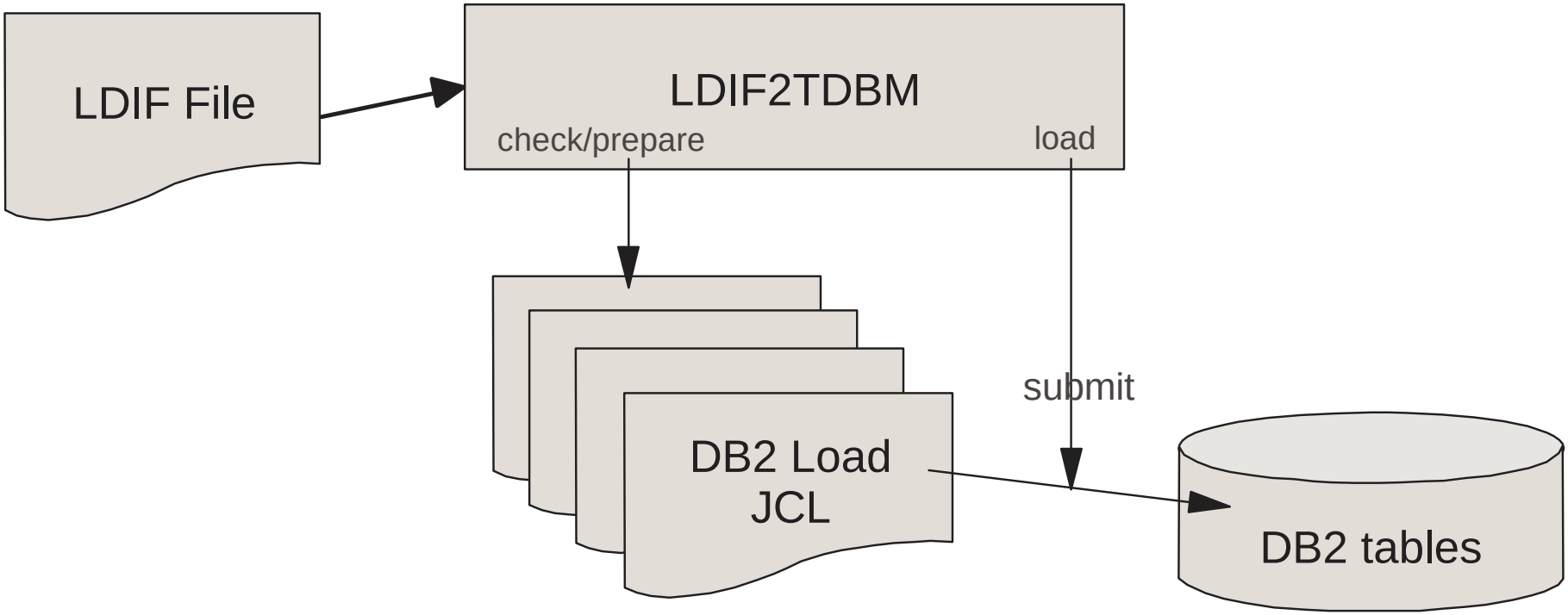
Scalable backend/TDBM



Bulk load utility - ldif2tdbm

- Scalable backend requires new bulk load command ldif2tdbm to replace the ldif2db command.
- ldif2tdbm load uses DB2 LOAD facility to increase bulk load speed
- ldif2tdbm "check" step can be done while LDAP server is running
- ldif2tdbm "prepare" and "load" steps can be done while LDAP server is operating in "read-only" mode
- From TSO, use LDF2TDBM

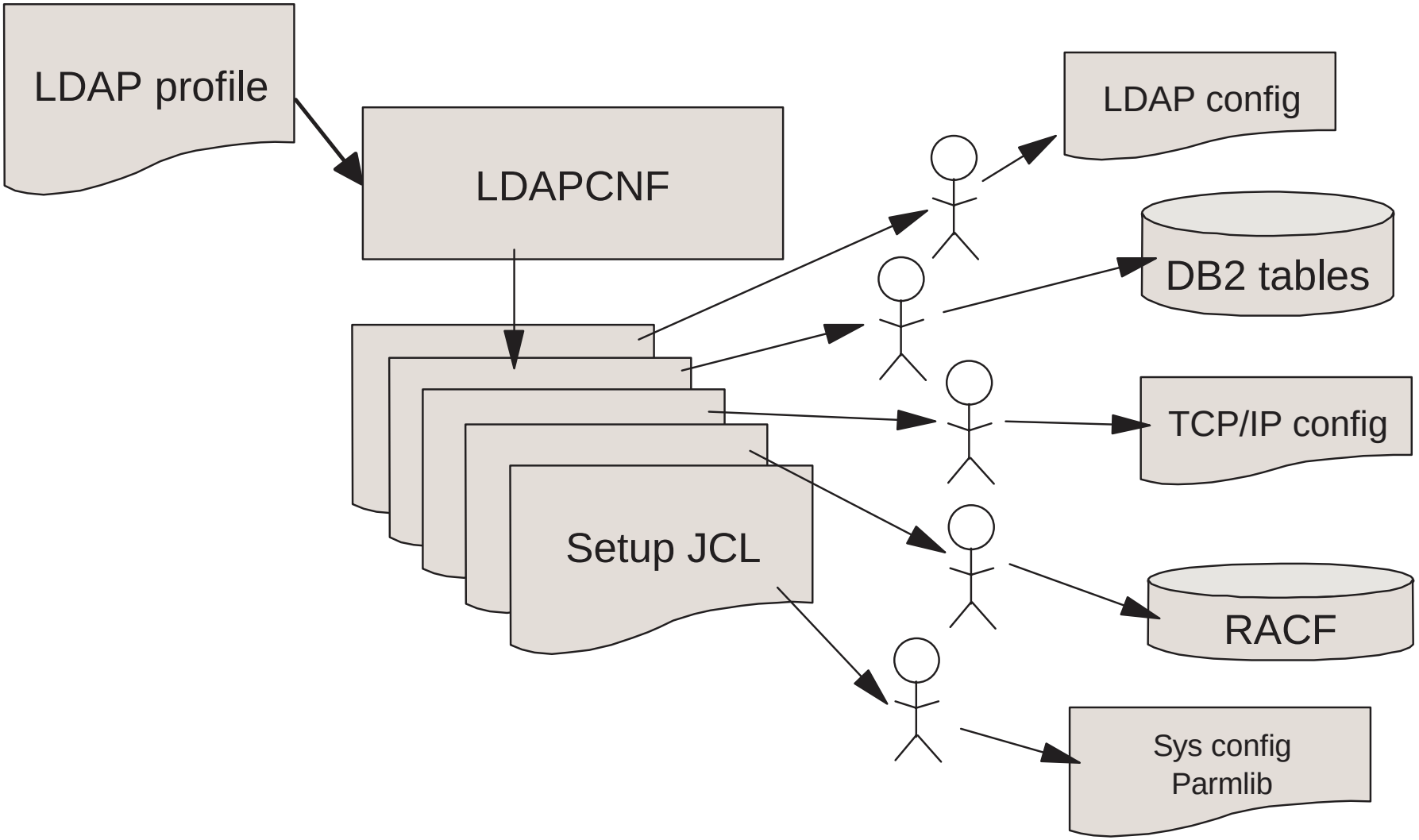
Bulk load utility - block diagram



LDAP Configuration Utility

- Streamlines implementation of LDAP servers on a system
- Input is a set of parameter files
- Output is a set of batch jobs (JCL)
- Batch jobs should be verified by
  - Network Administrators
  - Database Administrators
  - Security Administrators
  - System Programmers
  - LDAP Administrators
- Once acceptable, batch jobs should be submitted which will create the necessary configurations and settings for the server

LDAP Configuration Utility



Native Authentication (OW47596)

- Allows appropriately set up directories to take advantage of SAF-accessed password strength and control
- Allows web-based login using SAF-accessed password and LDAP
- Relies upon proper set up of information in both SAF security server and DB2-based backing store (TDBM)
- How it works:
  - If configured, if `uid` value in TDBM directory entry matches OS/390 userid, then password check is done using `__passwd()` service.

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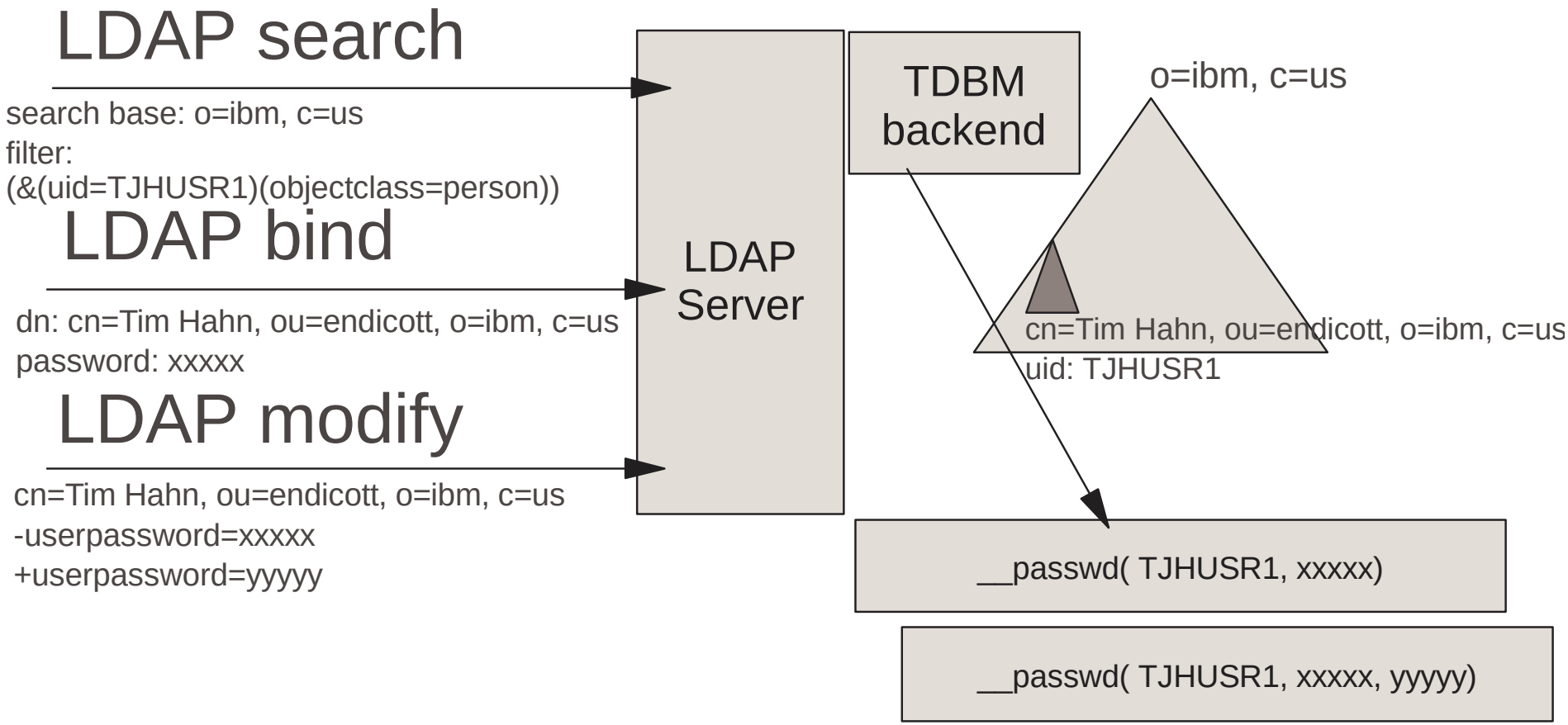
Native Authentication



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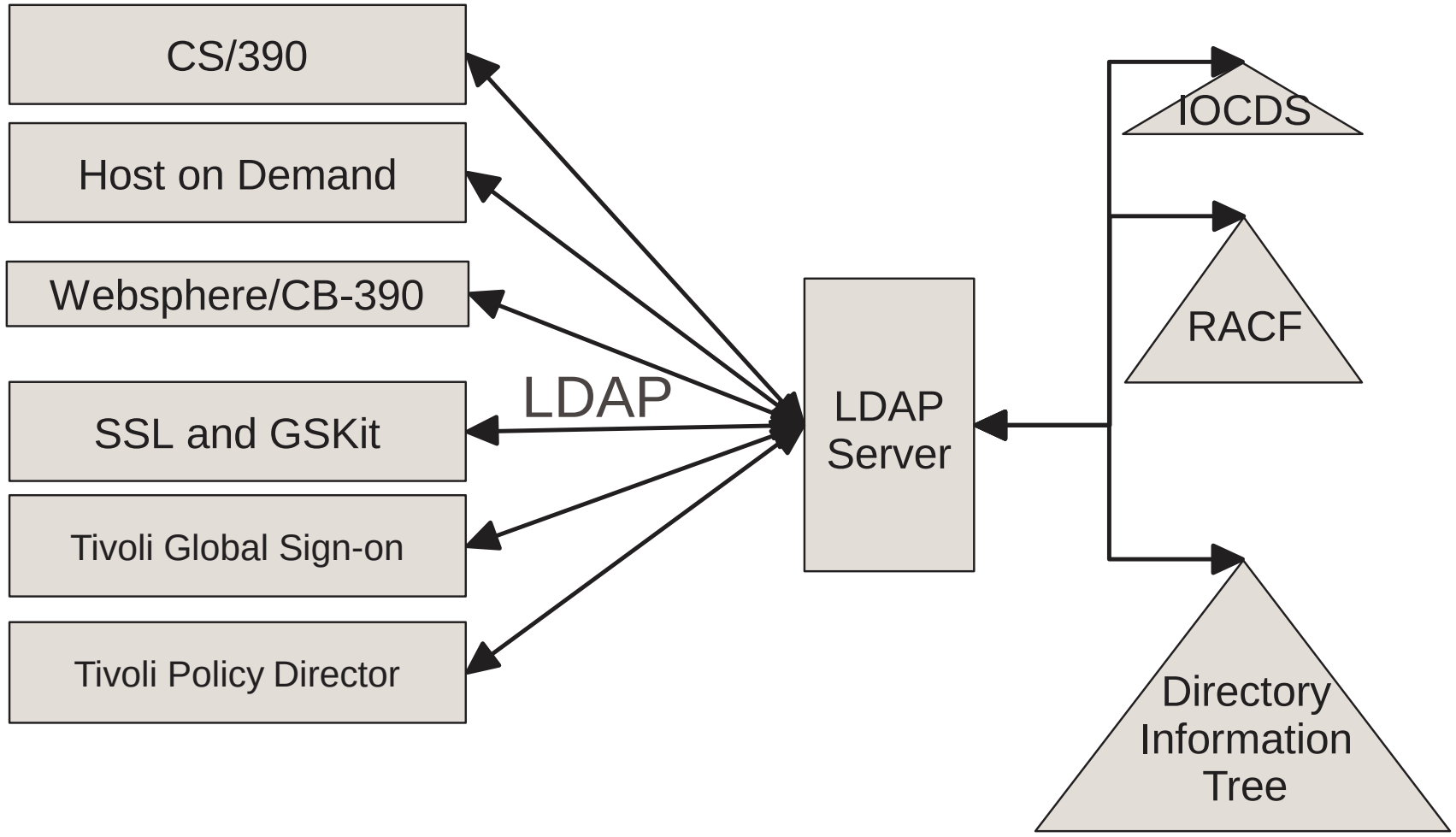
Features added in z/OS V1R2

- Also made available on OS/390 V2R10 and z/OS V1R1 via APAR OW50971
- Server Features
  - CONNECT support - add/remove users from groups using RACF access
  - Allow selected attribute-based searching of RACF user/group information
  - Handle over 50,000 concurrent clients
  - Kerberos-based authentication
- Client Features
  - results caching - reduces network requests for repeated searches
  - DNS SRV records for locating LDAP servers
  - Kerberos-based authentication

Directory Usage by IBM Products



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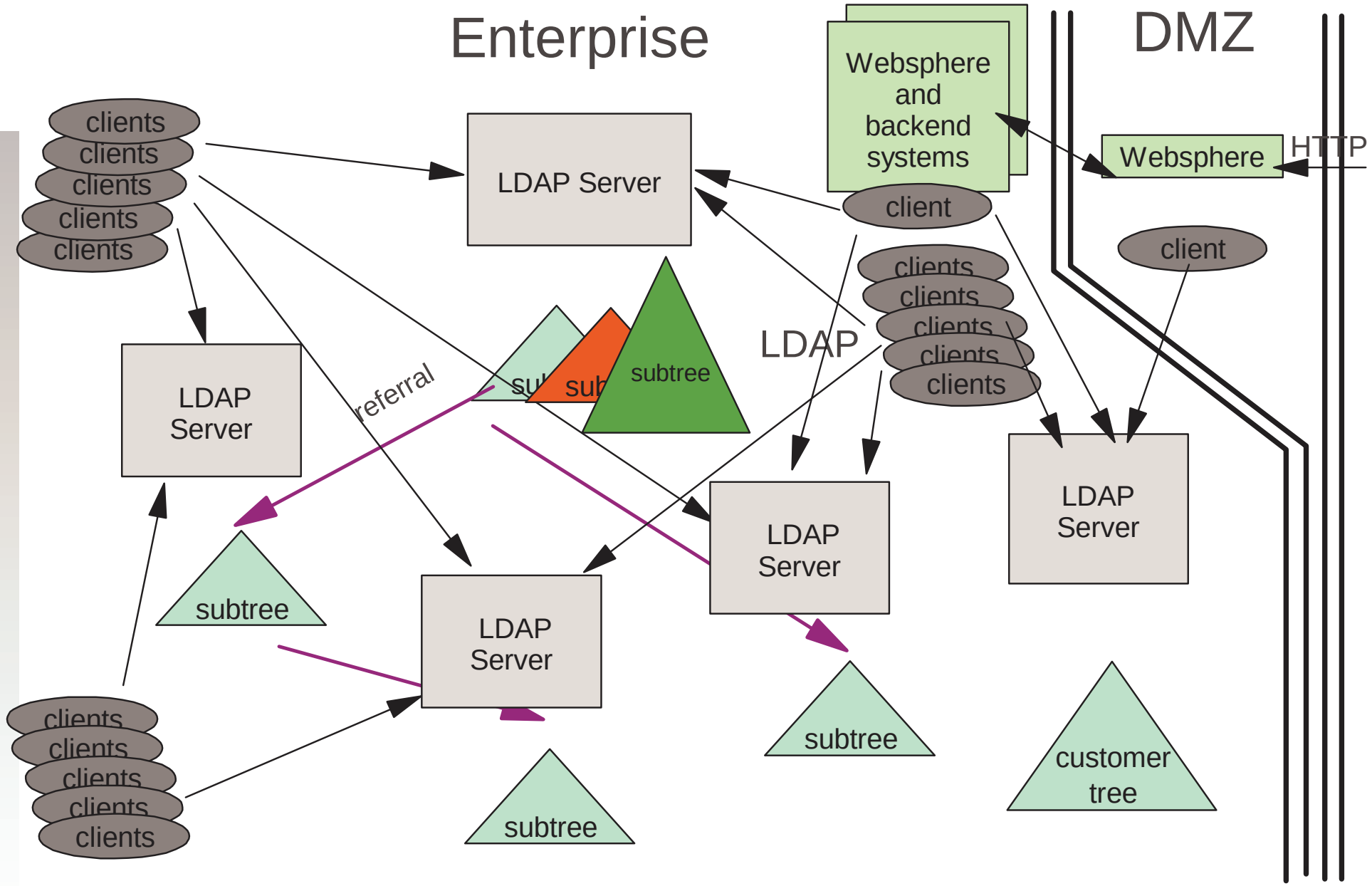
Enterprise Namespace



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For More Information

- LDAP RFCs
  - http://sunsite.auc.dk/RFC/rfc/rfc2251.html- rfc2256.html
- z/OS LDAP Documentation
  - SC24-5923-02 z/OS V1R2.0 Security Server LDAP Server Administration and Use
    - http://publibz.boulder.ibm.com/epubs/pdf/glda2a11.pdf
  - SC24-5924-01 z/OS V1R2.0 SecureWay Security Server LDAP Client Programming
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