Lightweight Directory Access Protocol

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IAM Workshop

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Overview

- Introduction to LDAP
- LDAP Protocol overview
- Directory structure
- Operations
  - Add
  - Bind
  - Delete
  - Search and compare
  - Modify
- Schema

Lightweight Directory Access Protocol

- Introduction
  - Open, vendor-neutral, industry standard application protocol for accessing and maintaining distributed directory information services over an Internet Protocol (IP) network
  - directory services may provide any organized set of records, often with a hierarchical structure
    - *eg. telephone directory is a list of subscribers with an address and a phone number*
  - LDAP is specified in a series of Internet Engineering Task Force (IETF) Standard Track publications called Request for Comments (RFCs), using the description language ASN.1. The latest specification is Version 3, published as RFC 4511.
  - A common use of LDAP is to provide a central place to store usernames and passwords.
  - allows many different applications and services to connect to the LDAP server to validate users.
  - platform-independent protocol

Lightweight Directory Access Protocol

- Protocol Overview
  - Directory System Agent (DSA)
    - A client starts an LDAP session by connecting to an LDAP server
    - by default on TCP and UDP port 389
    - The client then sends an operation request to the server, and the server sends responses in return
      - StartTLS — use the LDAPv3 Transport Layer Security (TLS) extension for a secure connection
      - Bind — authenticate and specify LDAP protocol version
      - Search — search for and/or retrieve directory entries
      - Compare — test if a named entry contains a given attribute value
      - Add a new entry
      - Delete an entry
      - Modify an entry
      - Modify Distinguished Name (DN) — move or rename an entry
      - Abandon — abort a previous request
      - Extended Operation — generic operation used to define other operations
      - Unbind — close the connection (not the inverse of Bind)

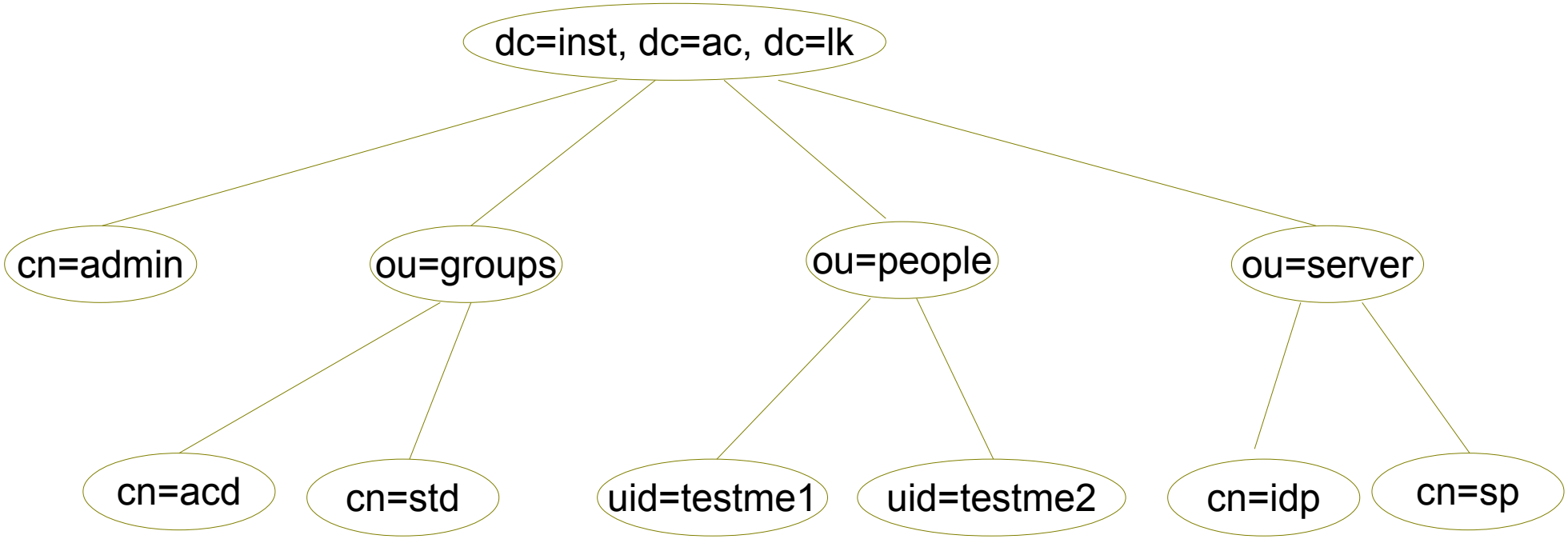
Lightweight Directory Access Protocol

- Directory Structure
  - usually structured hierarchically as a tree of nodes
  - the LDAP directory tree is sometimes referred to as the Directory Information Tree, or DIT
  - Each node represents a record, or “entry” in the LDAP database

  - The Distinguished Name (DN)
    - An LDAP entry consists of numerous attribute-value pairs
    - uniquely identified by what is known as a “distinguished name” (DN)
      - eg.

        dn: mail=joe@novell.com, dc=novell, dc=com
        objectclass: inetOrgPerson
        cn: Joe
        sn: Somebody
        mail: joe@novell.com
        telephoneNumber: 1 234 567 8912

LDAP DIT


dc=inst, dc=ac, dc=lk
cn=admin
ou=groups
ou=people
ou=server
cn=acd
cn=std
uid=testme1
uid=testme2
cn=idp
cn=sp

Open LDAP

- What is Open LDAP
  - free, open source implementation of the Lightweight Directory Access Protocol (LDAP)
  - BSD-style license called the OpenLDAP Public License
  - developed by the OpenLDAP Project
  - OpenLDAP has three main components
    - slapd – stand-alone LDAP daemon and associated modules and tools
    - libraries implementing the LDAP protocol and Basic Encoding Rules (BER)
    - client software: ldapsearch, ldapadd, ldapdelete, and others

Open LDAP

- Open LDAP using OLC (cn=config)
  - On-Line configuration for previous slapd.conf
  - Dynamic configuration of static configuration in slapd.conf where slapd restart needed
  - Configuration may be perform run time using a DIT cn=config
  - Zero down time configuration
  - Stored in /etc/ldap/slapd.d directory
  - Introduce in version 2.3

LDAP Schema

- Schema
  - A set of rules that define what can be stored as entries in an LDAP directory
  - Each LDAP directory has a default schema
  - The elements of a schema
    - Attributes, syntaxes, object classes

- Attributes
  - defines a piece of information that directory entries contain
    - For example, some common attributes for entries related to people are cn (common name), telephoneNumber, and userPassword.
- Syntaxes
  - defines the data format in which an attribute value is stored.
    - Directory String, Integer, and JPEG are examples of standard LDAP syntaxes.

LDAP Schema

- Object Classes
  - defines a set of attributes for a type of directory entry
  - two or more object classes in an object class hierarchy define the attributes for a type of entry
  - An object class inherits attributes from all parent object classes in the hierarchy and then adds attributes of its own
    - for example:

      Object class 1: adds attribute A

      Object class 2: inherits attribute A and adds attributes B, C, and D

      Object class 3: inherits attributes A, B, C, and D, and adds attributes E and F

  - There are three types of object classes: abstract, structural, and auxiliary

LDAP Schema Example

. . .

objectclass (2.5.6.6 NAME 'person' DESC 'RFC2256: a person' SUP top STRUCTURAL

MUST (sn $ cn)

MAY (userPassword $ telephoneNumber $ seeAlso $ description))

attributetype (2.5.4.4 NAME ('sn' 'surname')

DESC 'RFC2256: last (family) name(s) for which the entity is known by' SUP name)

attributetype (2.5.4.4 NAME ('cn' 'commonName')

DESC 'RFC4519: common name(s) for which the entity is known by' SUP name)

. . .