OpenLDAP Replication Workshop

Nov 4, 2019

LDAPCon, Sofia

Objective

This tutorial takes the attendee through the process of setting up a multi-tier OpenLDAP replication network. The use case covers installation and configuration of a multi-master cluster and selectively replicating entries based on filters. The documentation provides the instructions for installing onto Centos 7 virtual machines including sample configurations and test cases used to verify completion.

Introductions

- Maryanne Normann
  - mnormann@symas.com
- Shawn McKinney
  - smckinney@symas.com

Agenda

1. Sample LDAP Use Cases
2. Sample System Requirements
3. Sample System Architecture
4. Description of Test Configuration
5. Break 1
6. Student Environment Preparation
7. Install/Test Masters
8. Break 2
9. Install/Test Replicas
10. Wrap-up

Lightweight Directory Access Protocol

From Wikipedia, the free encyclopedia

The **Lightweight Directory Access Protocol** (**LDAP**; /ˈɛldæp/) is an open, vendor-neutral, industry standard application protocol for accessing and maintaining distributed directory information services over an Internet Protocol (IP) network.[1] Directory services play an important role in developing intranet and Internet applications by allowing the sharing of information about users, systems, networks, services, and applications throughout the network.[2] As examples, directory services may provide any organized set of records, often with a hierarchical structure, such as a corporate email directory. Similarly, a 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.

RFC2307bis

Network Working Group L. Howard
Internet-Draft PADL Software
Obsoletes: 2307 (if approved) H. Chu, Ed.
Intended status: Informational Symas Corp.

An Approach for Using LDAP as a Network Information Service
draft-howard-rfc2307bis-02.txt

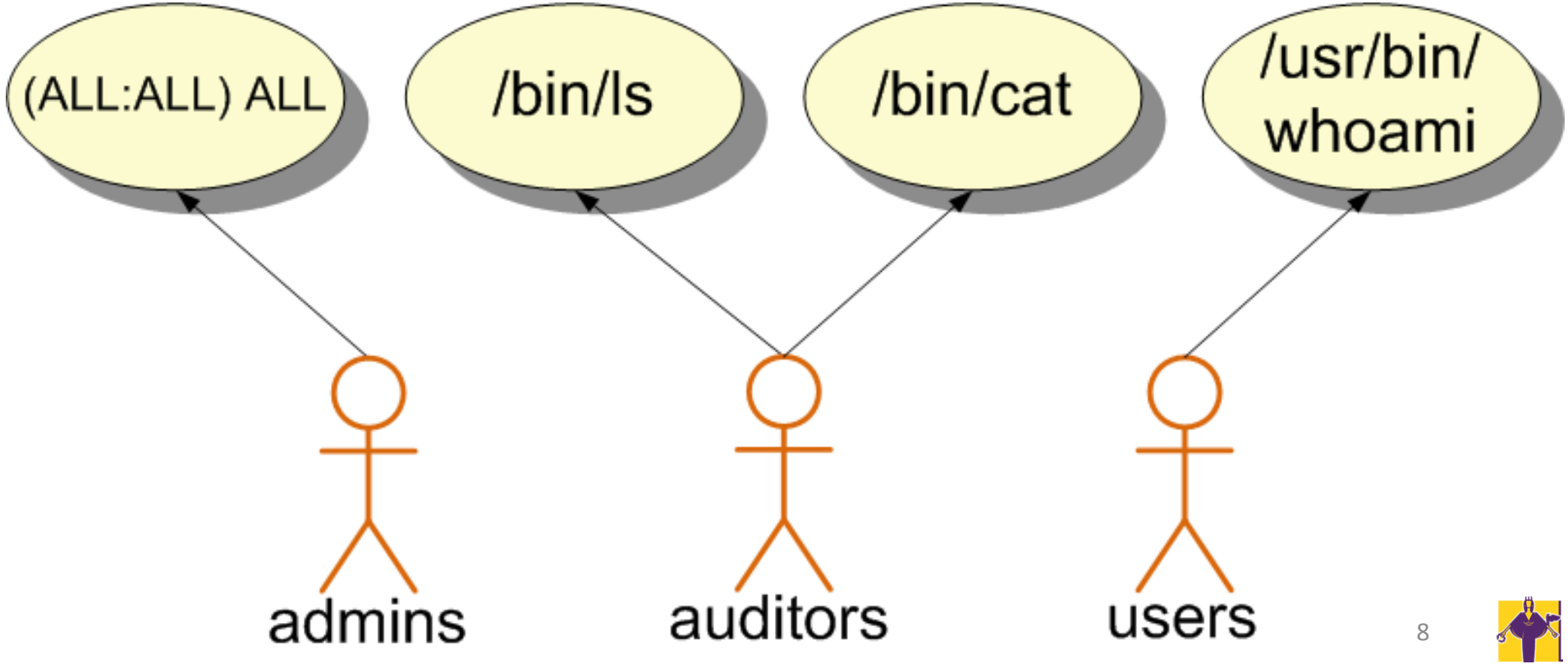
This document describes a mechanism for mapping entities related to TCP/IP and the UNIX system [UNIX] into [X.500] entries so that they may be resolved with the Lightweight Directory Access Protocol [RFC4511]. A set of attribute types and object classes are proposed, along with specific guidelines for interpreting them. The intention is to assist the deployment of LDAP as an organizational nameservice. No proposed solutions are intended as standards for the Internet. Rather, it is hoped that a general consensus will emerge as to the appropriate solution to such problems, leading eventually to the adoption of standards. The proposed mechanism has already been implemented with some success.

Use RFC2307bis LDAP Schema

```
( 1.3.6.1.1.1.2.0 NAME 'posixAccount' SUP top AUXILIARY
    DESC 'Abstraction of an account with POSIX attributes'
    MUST ( cn $ uid $ uidNumber $ gidNumber $ homeDirectory )
    MAY ( authPassword $ userPassword $ loginShell $ gecos $
          description ) )
```

```
( 1.3.6.1.1.1.2.2 NAME 'posixGroup' SUP top AUXILIARY
    DESC 'Abstraction of a group of accounts'
    MUST gidNumber
    MAY ( authPassword $ userPassword $ memberUid $
          description ) )
```


sudo


(ALL:ALL) ALL
/bin/ls
/bin/cat
/usr/bin/
whoami
admins
auditors
users

sudo LDAP Schema

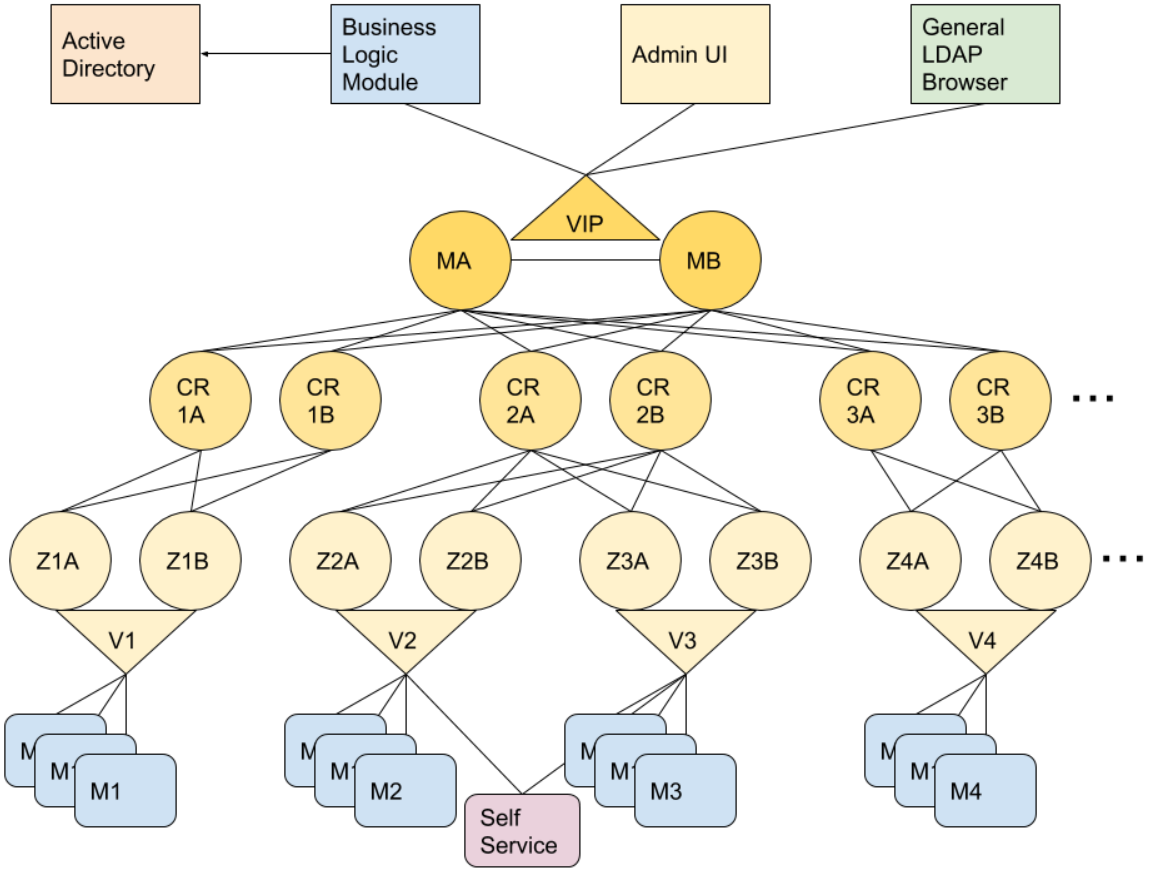
```
objectclass ( 1.3.6.1.4.1.15953.9.2.1
    NAME 'sudoRole' SUP top STRUCTURAL
    DESC 'Sudoer Entries'
    MUST ( cn )
    MAY ( sudoUser $ sudoHost $ sudoCommand
  $ sudoRunAs $ sudoRunAsUser
  $ sudoRunAsGroup $ sudoOption
  $ sudoNotBefore $ sudoNotAfter
  $ sudoOrder $ description )
)
```


User to Role to Machine

<---- Zone 1-----> <------Zone 2 -----> <---- Zone 3 ---->

User-Role-Machine	m1001	m1002	m1003	m2010	m2020	m2030	m3100	m3200	m3300
Huey	Admin	Admin	Admin						
Dewey				Auditor	Auditor	Auditor			
Louie							User	User	User

Target Architecture

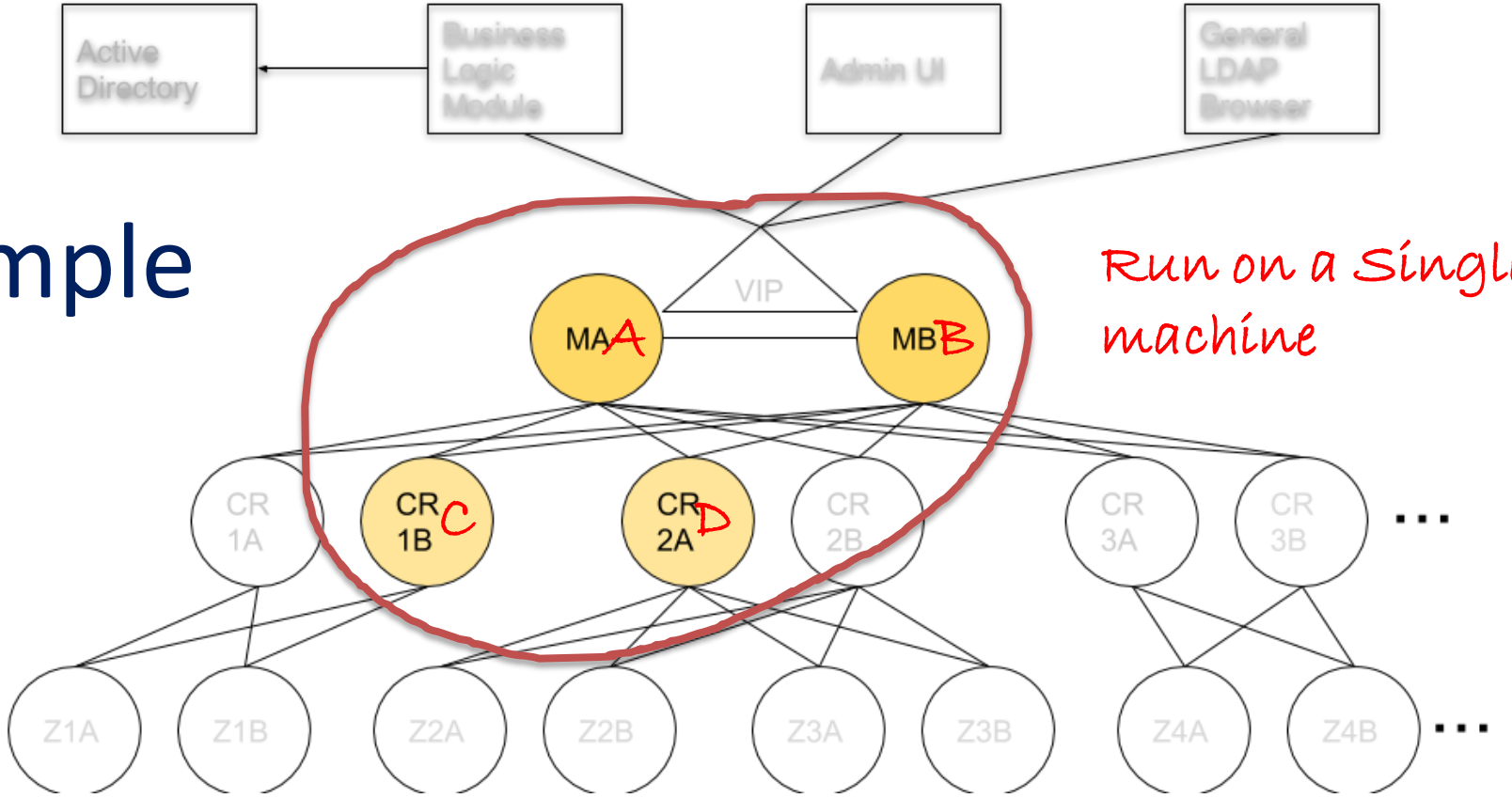


Business Logic Module

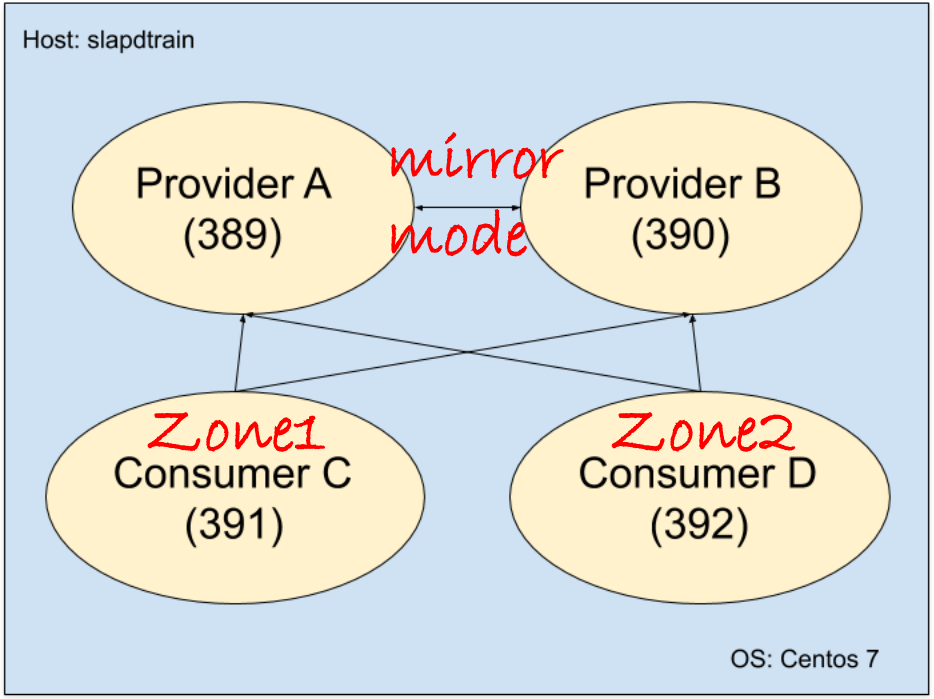
- Lightweight IdM
- Single purpose mapping from *any* data stream to LDAPv3
- Data mappings
- Simplified customizations, like userid mappings, emails, etc.

symas

Sample


Active Directory
Business Logic Module
Admin UI
General LDAP Browser
VIP
MA
A
MB
B
Run on a Single machine
CR 1A
CR 1B
C
CR 2A
D
CR 2B
CR 3A
CR 3B
Z1A
Z1B
Z2A
Z2B
Z3A
Z3B
Z4A
Z4B

Sample Architecture



Details about the sample

- Two masters, MirrorMode, Delta Synchrepl
- Two read-only replicas, Delta Synchrepl with masters, selectively replicate based on filter.
- Access log and Synchprov overlays on master
- All running on a single machine.

Mirror Mode

MirrorMode can be termed as Active-Active Hot-Standby, therefore an external server or device is needed to manage which provider is currently active.

Sample Configuration

- Four instances of slapd running on a single machine.
- Usage of slapd.conf
  - slapd-a.conf (master)
  - slapd-b.conf (master)
  - slapd-c.conf (replica)
  - slapd.d.conf (replica)

Master Config

- slapd-a.conf
- slapd-b.conf

Security Options

```
# File  contains CA certificates.
TLSCACertificateFile "/etc/openldap/certs/ca-cert.pem"

# TLSCertificateFile <filename>
# File contains the slapd server  certificate.
TLSCertificateFile "/etc/openldap/certs/server-cert.pem"

# TLSCertificateKeyFile <filename>
# File contains the slapd server private key.
#  Private key is not be protected with a password.
TLSCertificateKeyFile "/etc/openldap/certs/server-key.pem"
```

More Security Options

```
TLSCipherSuite HIGH:-SSLv3
TLSVerifyClient  try

# Only accept TLS 1.2
TLSProtocolMin 3.3

# Only accept TLS connections
#security tls=128
```


Master Identity Mapping

```
# Id mapping:
authz-regexp
   "email=student@ldap.org,cn=([^,]
   *),ou=Training,o=Symas,l=Sofia,s
   t=Sofia City,c=BG"
   "cn=replicator,ou=admin,dc=examp
   le,dc=com"
```

Master Modules

```
modulepath      "/usr/lib64/openldap"
moduleload      accesslog.la
moduleload      back_mdb.la
moduleload      back_monitor.la
moduleload      pw-sha2
moduleload      refint
moduleload      sssvlv
moduleload      syncprov.la
moduleload      ppolicy.la
```


Master Overlays

```
# ENABLE MIRROR MODE
mirrormode      TRUE

#-----------------------------------------
# OVERLAY [SYNCPROV]
#-----------------------------------------
overlay                 syncprov
syncprov-checkpoint 100 10
syncprov-sessionlog 10000
syncprov-reloadhint TRUE

#-----------------------------------------
# OVERLAY [ACCESSLOG]
#-----------------------------------------
overlay      accesslog
logdb        cn=accesslog
logops       writes
logsuccess   TRUE
logpurge 24:00 01+00:00
```


More Overlays

```
#-------------------------------
# OVERLAY [REFINT]
#-------------------------------
overlay refint
refint_attributes member owner

#-------------------------------------
# SSSVLV overlay
#-------------------------------------
overlay sssvlv

#-------------------------------------
# ppolicy overlay
#-------------------------------------
overlay ppolicy
ppolicy_hash_cleartext
```


Main DB

```
###########
# Main Database
# (lmdb-backed)
###########
database    mdb
suffix      "dc=example,dc=com"
rootdn      "cn=Manager,dc=example,dc=com"

# Cleartext passwords, especially for the
   rootdn, should be avoided. See
   slappasswd(8) and slapd.conf(5) for details
   describing encrypted passwords.
rootpw        secret
directory    "/var/lib/ldap/sample-a"
```


Accesslog DB

```
########################
# Accesslog database
########################

database        mdb
directory       /var/lib/ldap/accesslog-a
maxsize         5120000
suffix          "cn=accesslog"
rootdn          "cn=accesslog"
index           default eq
index
   objectClass,entryCSN,entryUUID,reqEnd,reqRe
   sult,reqStart
```


Replica Config

- slapd-c.conf
- slapd-d.conf

Security Options

```
# File  contains CA certificates.
TLSCACertificateFile "/etc/openldap/certs/ca-cert.pem"

# TLSCertificateFile <filename>
# File contains the slapd server  certificate.
TLSCertificateFile "/etc/openldap/certs/server-cert.pem"

# TLSCertificateKeyFile <filename>
# File contains the slapd server private key.
#  Private key is not be protected with a password.
TLSCertificateKeyFile "/etc/openldap/certs/server-key.pem"
```

More Security Options

```
TLSCipherSuite HIGH:-SSLv3
TLSVerifyClient  try

# Only accept TLS 1.2
TLSProtocolMin 3.3

# Only accept TLS connections
#security tls=128
```


Replica Modules

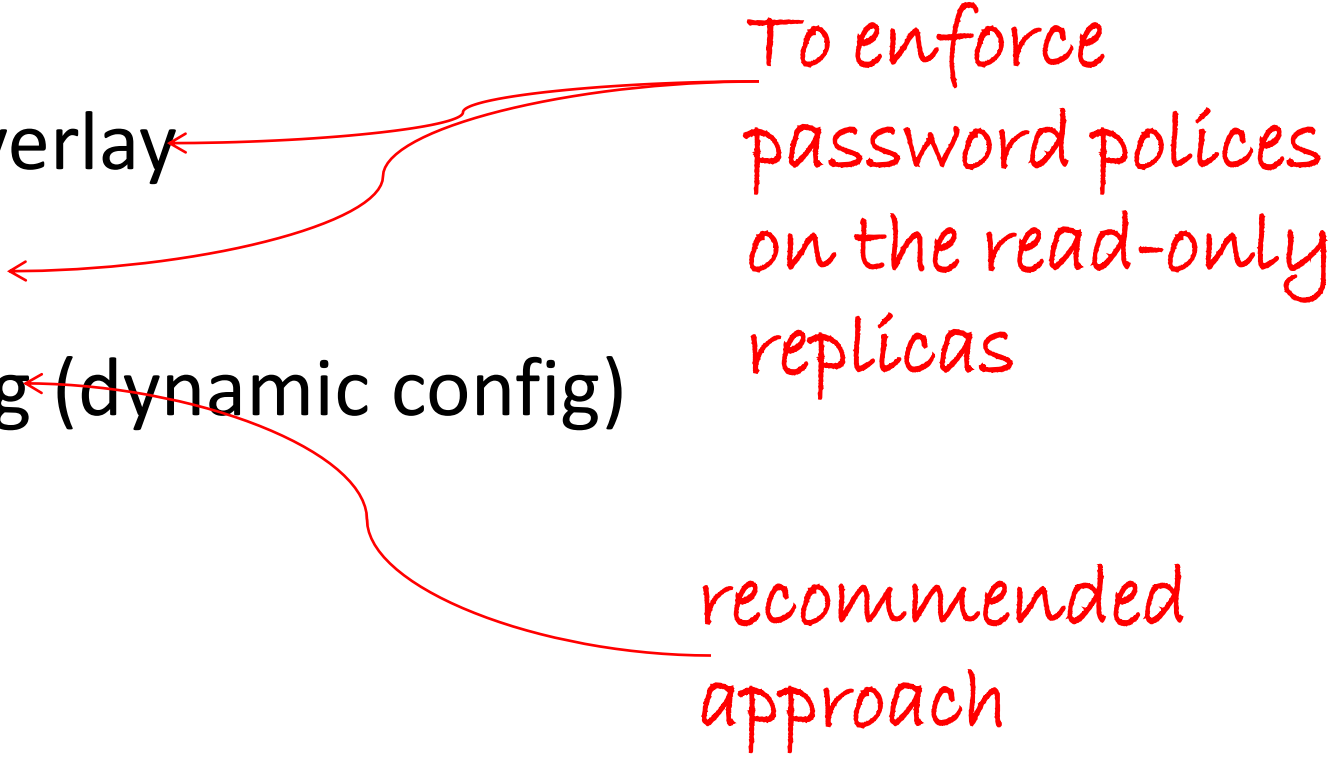
```
modulepath
   "/usr/lib64/openldap"
moduleload      back_mdb.la
moduleload      back_monitor.la
moduleload      pw-sha2
moduleload      ppolicy.la
```

Replication

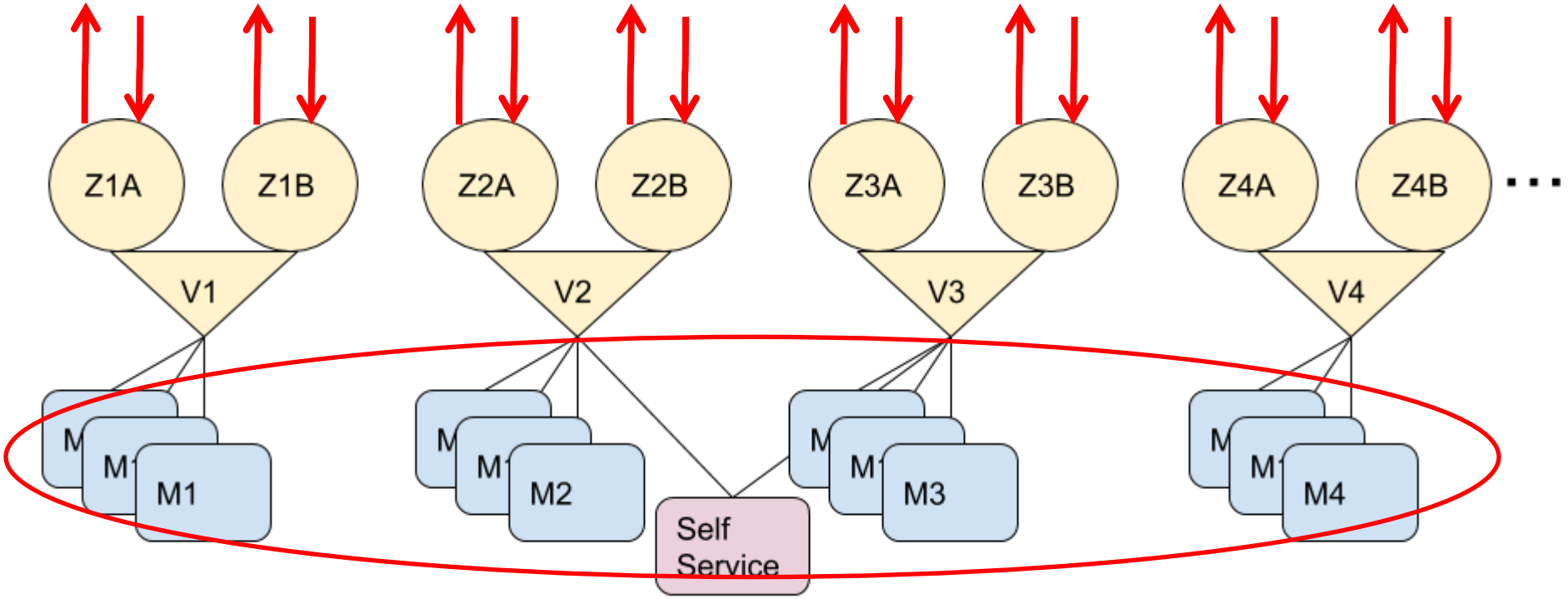
```
syncrepl
        rid=21
        provider=ldap://slapdtrain:389
        bindmethod=sasl
        saslmech=external
        starttls=yes
        tls_cacert=/etc/openldap/certs/ca-cert.pem
        tls_cert=/etc/openldap/certs/server-cert.pem
        tls_key=/etc/openldap/certs/server-key.pem
        tls_reqcert=demand
        type=refreshAndPersist
        searchbase="dc=example,dc=com"
        filter="(|(sampleZone=Z1)(!(objectClass=samplePerson)))"
        scope=sub
        schemachecking=on
        retry="60 5 300 +"
        network-timeout=30
        keepalive=180:30:60
        sizeLimit=unlimited
        timelimit=unlimited
```


What's missing from this example?

- Chain Overlay
- Referrals
- cn=config (dynamic config)



Password Policy Replication



More on Password Policies

- Password events occurring in the read-only replicas are referred upwards via referrals.
- Chaining Overlay handles the referrals on behalf of the client.
- Updates referred to the masters are then replicated back downward.

Testing

Zone Testing

User	Zone 1	Zone 2
Huey	True	True
Louie	False	True
Dewey	True	False

Group Testing

User	sampleUsers *	sampleAdmins	sampleAuditors
Huey	True	True	False
Louie	True	False	True
Dewey	True	False	False

* default posixGroup

Sudo Role Testing

Groups	sudoUser	sudoAdmin	sudoAuditor
sampleAdmins	False	True	False
sampleAuditors	False	False	True
sampleUsers	True	False	False

Huey	Zone 1	Zone 2
Admin	True	True
Auditor	False	False
User	True	True

Louie	Zone 1	Zone 2
Admin	False	False
Auditor	False	True
User	False	True

Dewey	Zone 1	Zone 2
Admin	False	False
Auditor	False	False
User	True	False

Contact Info

Web: http://symas.com

Email: mnormann@symas.com

Email: smckinney@symas.com