Authentication. Fun Times for All

A tour of Linux examples with a focus on practical implementations from real life usage.

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Mar 2012

"Beware the Authentication, my son! The jaws that bite, the claws that catch!"
Jabberwocky, Lewis Carroll (and Faye Gibbins)

Authentication

- TLS setups and CA certs.
- RADIUS using EAP-TLS
- Kerberos
- Using SVN with TLS and krb5
- SASL and LDAP
- PostgreSQL: GSSAPI and TLS auth
- Cosign auth

Openssl generation of self signed certificates

```
[ root_ca_distinguished_name ]
commonName              = Morpheux.org CA
stateOrProvinceName     = Lothian
countryName             = UK
emailAddress            = wibble@morpheux.org
organizationName        = Root CA

[ root_ca_extensions ]
basicConstraints        = CA:true
extendedKeyUsage        = clientAuth
nsCertType              = client, email, objsign
```

Openssl generation of self signed certificates

```
cd /etc/pki/tls
echo '01' > serial
touch index.txt

env OPENSSL_CONF=`pwd`/openssl.conf
openssl req -x509 -newkey rsa:2048 -out
cacert.pem -outform PEM -days $(( 10 * 365 ))
```

Making an request file

```
cat > /tmp/somefile <<EOF
[req]
default_bits            = 2048
default_md              = sha1
prompt                  = no
distinguished_name = morpheux_certs

[ morpheux_certs ]
commonName              = mrsmiggins.morpheux.org
stateOrProvinceName     = Scotland
localityName            = Edinburgh
countryName             = GB
emailAddress            = root@morpheux.org
organizationName        = Morpheux.org
organizationalUnitName = Morpheux
EOF

env OPENSSL_CONF=/tmp/somefile openssl req -newkey rsa:2048 -nodes
-keyout mrsmiggins.key -keyform PEM -out mrsmiggins.req
```

Signing the request

Contents of xpextensions:

[xpclient_ext]
extendedKeyUsage = 1.3.6.1.5.5.7.3.2,serverAuth,clientAuth

[xpserver_ext]
extendedKeyUsage = 1.3.6.1.5.5.7.3.1,serverAuth,clientAuth

env OPENSSL_CONF=`pwd`/openssl.conf openssl ca -in mrsmiggins.req -out mrsmiggins.crt -extensions xpserver_ext -extfile ./xpextensions -policy policy_anything

openssl pkcs12 – export -in mrsmiggins.crt -inkey mrsmiggins.key -out mrsmiggins.p12 -clcerts

Now we can use radius for wireless auth.

eap.conf

```
eap {
        default_eap_type = tls
        timer_expire     = 60
        ignore_unknown_eap_types = no
        cisco_accounting_username_bug = no
        tls {
            private_key_file = ${raddbdir}/certs/jim.morpheux.org.key
            certificate_file = ${raddbdir}/certs/jim.morpheux.org.crt
            CA_file = ${raddbdir}/certs/cacert.pem
        }
}
```

Radius **client.conf**

```
client bounce {
        ipaddr     = bounce.morpheux.org
        secret          = xxxx
        require_message_authenticator = no
}
```

Radius client

3Com Wireless 8760 Dual Radio 11a/b/g PoE Access Point
Bounce

RADIUS Authentication

Primary RADIUS Authentication Server

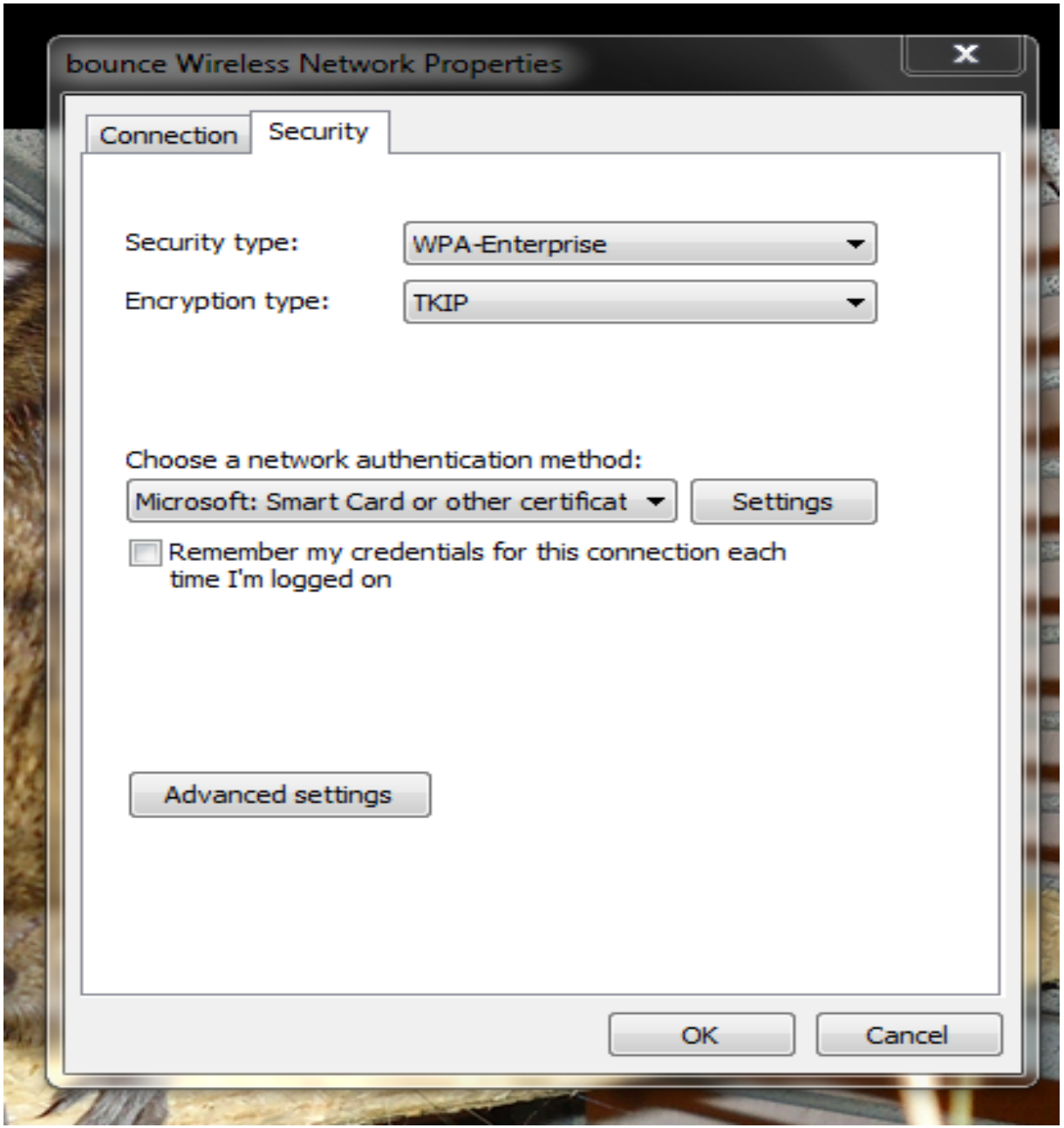
IP Address	192.168.254.17
Port	1812
Key	●●●●●
Timeout (seconds)	5
Retransmit attempts	3

Wireless client: Linux; wpa_supplicant.conf

```
ctrl_interface=/var/run/wpa_supplicant
ctrl_interface_group=wheel

network={
        ssid="bounce"
        key_mgmt=WPA-EAP
        proto=WPA
        auth_alg=OPEN
        pairwise=TKIP
        group=TKIP
        eap=TLS
        ca_cert="/etc/pki/tls/cacert.pem"
        client_cert="/etc/pki/tls/bob.morpheux.org.crt"
        private_key="/etc/pki/tls/bob.morpheux.org.key"
        private_key_passwd=""
        identity="wibble@morpheux.org"
        password=""
}
```

Wireless client: Win7



Adding Krb5 into the mix; /etc/krb5.conf

```
[logging]
 default = FILE:/var/log/krb5libs.log
 kdc = FILE:/var/log/krb5kdc.log
 admin_server = FILE:/var/log/kadmind.log

[libdefaults]
 default_realm = MORPHEUX.ORG
 dns_lookup_realm = false
 dns_lookup_kdc = false
 ticket_lifetime = 24h
 renew_lifetime = 7d
 forwardable = yes

[realms]
 MORPHEUX.ORG = {
  kdc = krb.morpheux.org
  admin_server = krb.morpheux.org
 }

[domain_realm]
 morpheux.org = MORPHEUX.ORG
 .morpheux.org = MORPHEUX.ORG
```

Krb5 server

- Lots of setup instructions on web
- Never forget the master password
- Have a dedicated system
- Plus a back up system
- Keep safe. Very, very safe.

Providing SSH via krb5 #1

```
setsebool -P authlogin_nsswitch_use_ldap=1  allow_ypbind=1

# TLS removed for clarity
authconfig --enableldap  --disableldapauth --enablekrb5
--krb5kdc=krb.morpheux.org --krb5adminserver=krb.morpheux.org
--krb5realm=MORPHEUX.ORG --enablesssd --enablesssdauth
--ldapserver=ldap.morpheux.org --ldapbasedn=dc=morpheux,dc=org
--disablesysnetauth --update

# fix getent passwd.
sed -i -e '/default]/s/$/\nenumerate = True/' /etc/sssd/sssd.conf

# F16 has bug: https://bugzilla.redhat.com/show_bug.cgi?id=751450
sed -i -e '/initgroups/s/^/#/' /etc/nsswitch.conf
```

Providing SSH via krb5 #2

```
[root@vish ~]# klist -k /etc/krb5.keytab
Keytab name: WRFILE:/etc/krb5.keytab
KVNO Principal
---- --------------------------------------------------------------------------
   4 host/vish.morpheux.org@MORPHEUX.ORG
   4 host/vish.morpheux.org@MORPHEUX.ORG
   4 ssh/vish.morpheux.org@MORPHEUX.ORG
   4 ssh/vish.morpheux.org@MORPHEUX.ORG

# In sshd.config on vish:
GSSAPIAuthentication yes
GSSAPICleanupCredentials yes

[faye@pip ~]$ kinit
Password for faye@MORPHEUX.ORG:
[faye@pip ~]$ ssh vish -v
....
debug1: Next authentication method: gssapi-with-mic
debug1: Authentication succeeded (gssapi-with-mic).
```

SVN over HTTPS

- Provides large scale deployment of subversion
- Auditable
- Power of apache
- mod_ssl gives **TLS**
- mod_auth_krb5 gives **Krb5**

Svn krb5 creds

Use FQHN not Virtual Host name

1.addprinc -randkey HTTP/jim.morpheux.org
2.ktadd -k /tmp/svn.keytab \
HTTP/jim.morpheux.org

Transfer keytab to web server and then:

1) chcon system_u:object_r:krb5_keytab_t:s0 \
/etc/krb5_svn.keytab
2) chmod 600 /etc/krb5_svn.keytab
3) chown apache:apache /etc/krb5_svn.keytab

svn config for httpd

```
LoadModule dav_svn_module     modules/mod_dav_svn.so
LoadModule authz_svn_module   modules/mod_authz_svn.so
LoadModule auth_kerb_module modules/mod_auth_kerb.so

<VirtualHost 192.168.254.17:443>

ServerAdmin null@example.org
DocumentRoot /home/svn
ServerName svn.morpheux.org
ServerAlias svn
ErrorLog /home/svn/logs/error.svn.org.log
CustomLog /home/svn/logs/avn.org.log combined
LogLevel warn
```

Svn config for httpd prt2

```
SSLEngine on
SSLCertificateFile /etc/pki/tls/svn.morpheux.org.crt
SSLCertificateKeyFile /etc/pki/tls/svn.morpheux.org.key
SSLCACertificateFile /etc/pki/tls/cacert.pem

<Location /svn>
        ....
        DAV svn
        SVNParentPath /home/svn
        Require valid-user
        AuthType Kerberos
        AuthName "krb5 access only to morpheux.org SVN repo"
        AuthzSVNAccessFile /home/svn/.access
</Location>
```

Svn config for httpd prt3

```
    KrbMethodNegotiate On
    KrbMethodK5Passwd Off
    KrbAuthRealms MORPHEUX.ORG
    KrbServiceName HTTP/jim.morpheux.org@MORPHEUX.ORG
    Krb5KeyTab /etc/krb5_svn.keytab

</VirtualHost>
```

Svn authorization file and CA CERT settings

AuthzSVNAccessFile

[faye:/]
faye@MORPHEUX.ORG = rw

/etc/subversion/servers

[global]
ssl-authority-files = <path to CA cert #1>;<path to CA cert #2>;.....

NO SPACES ANYWHERE IN LIST

SASL

- The SASL mechanism registry is maintained by IANA.
- The registry is currently available at http://www.iana.org/assignments/sasl-mechanisms
- Well documented: http://cyrusimap.web.cmu.edu/docs/cyrus-sasl/2.1.23/sysadmin.php
- Used a lot, e.g. Sendmail, imap and LDAP
- EXTERNAL (user, group and TLS)
- GSSAPI (aka Kerberos)

SASL and LDAP

- EXTERNAL/LDAPI used for local access by users and programs.
- EXTERNAL/TLS used for syncrepl and automatic access by programs with TLS keys protected by file permissions. LDAP loves TLS, both based upon X.500.
- GSSAPI used for user interactions with the LDAP

SASL and LDAP

- Inital LDAP installs have this access control setting:

olcAccess: {0}to * by dn.base="gidNumber=0+uidNumber=0, cn=peercred, cn=external,cn=auth" manage by * none

- LDAPI uses unix sockets which reports uid and gid numbers to LDAP:

ldapsearch -b 'cn=config' -Y EXTERNAL -H ldapi://%2Fvar%2Frun%2Fldapi

TLS Settings on LDAP Master

```
ldapmodify  -Y EXTERNAL -H ldapi:/// <<EOF
dn: cn=config
changetype: modify
replace: olcTLSCACertificateFile
olcTLSCACertificateFile: /etc/pki/tls/cacert.pem
-
replace: olcTLSCertificateFile
olcTLSCertificateFile: /etc/pki/tls/vish.morpheux.org.crt
-
replace: olcTLSCertificateKeyFile
olcTLSCertificateKeyFile: /etc/pki/tls/vish.morpheux.org.key
-
replace: olcTLSVerifyClient
olcTLSVerifyClient: try
EOF
```

Edit /etc/sysconfig/ldap to turn on **SLAPD_LDAPS**
Restart ldap: systemctl restart slapd.service
Confirm port: netstat -tpl | grep ldaps

A user's ~/.ldaprc

TLS_CERT /etc/pki/tls/vish.morpheux.org.crt
TLS_KEY /etc/pki/tls/vish.morpheux.org.key
TLS_REQCERT demand

Testing EXTERNAL/TLS on Master

Access Rule is:
olcAccess: {0}to * by
dn.base="gidNumber=0+uidNumber=0,cn=peercred,cn=external,cn=auth"
manage by * none

Going to test SASL setup:
ldapsearch -x -H ldaps://vish.morpheux.org -LLL -s "base" -b ""
supportedSASLMechanisms
...
supportedSASLMechanisms: EXTERNAL.

Find out who I am:
ldapwhoami -H ldaps://vish.morpheux.org
SASL username:
email=root@morpheux.org,cn=vish.morpheux.org,ou=Morpheux,o=Morpheux.org,l=Edinburgh,st=Scotland,c=GB

Get thrown out by the access rules:
ldapsearch -Y EXTERNAL -H ldaps://vish.morpheux.org -b 'cn=config'

SHOULD RETURN NO RESULTS

Testing EXTERNAL/TLS on Master

Tell the access rules to let me in:

```
ldapmodify  -Y EXTERNAL -H ldapi:/// <<EOF
dn: olcDatabase={0}config,cn=config
changetype: modify
replace: olcAccess
olcAccess: {0}to * by
dn.base="gidNumber=0+uidNumber=0,cn=peercred,cn=external,cn=auth"
manage  by
dn.base="email=root@morpheux.org,cn=vish.morpheux.org,ou=Morpheux,o=M
orpheux.org,l=Edinburgh,st=Scotland,c=GB" read by * none
EOF
```

See if I can search the LDAP again:

```
ldapsearch -Y EXTERNAL -H ldaps://vish.morpheux.org -b 'cn=config'
```

SHOULD WORK, LOTS OF RESULTS

TLS SETUP WORKS, put old access rule back

TLS Settings on LDAP Slave

In **/var/lib/ldap/.ldaprc**

TLS_CERT /etc/openldap/don.morpheux.org.crt
TLS_KEY /etc/openldap/don.morpheux.org.key
TLS_CACERT /etc/pki/tls/cacert.pem
TLS_REQCERT demand
SASL_MECH external
SASL_AUTHCID
email=root@morpheux.org,cn=don.morpheux.org,
ou=Morpheux,o=Morpheux.org,l=Edinburgh,st=Sc
otland,c=gb

Testing Slave Setup

- Same routine as on master but using different certs.
- LDAP user often has “nologin shell” so use “su - ldap -s /bin/bash” when testing
- Search base is for your main tree not “cn=config”, so its access rules **DO NOT APPLY** to “cn=config”'s database but to e.g. “dc=morpheux,dc=org”
- **NO NEED FOR ANONYMOUS ACCESS ON LDAP MASTER, EVER!**

Auth Model for Simple LDAP Setup

- Single Tree
- Few LDAP admins, say around a dozen max
- GSSAPI in one REALM or REALMS that maintain 1-1 user relationships.
- Use auth descriptions directly in access rules.
- olcAccess: {0}to dn.children="dc=morpheux,dc=org" by dn="uid=faye,cn=gssapi,cn=auth" manage by dn="uid=jane,cn=gssapi,cn=auth" manage by dn="uid=sue,cn=gssapi,cn=auth" ..... by * none
- Applies **KISS** and **POLA** principles
- Still use EXTERNAL/TLS for replicas.
- Using GSSAPI requires more infrastructure.
- **Don't use open access rules on LDAP master as a short cut for LDAP master SASL syncrepl access rules (even if using GSSAPI)**.

Auth Model for Complex LDAP

- Multiple trees
- Multiple REALMS, with no 1-1 user relationships
- Many groups of managers.
- Still use EXTERNAL/TLS for replication authorization etc
- Use LDAP's auth regex mapping and groups of names.

http://www.openldap.org/doc/admin24/sasl.html#Mapping%20Authentication%20Identities

Testing LDAP and SASL/GSSAPI on Master

Access Rule is: olcAccess: {0}to * by dn.base="gidNumber=0+uidNumber=0,cn=peercred,cn=external,cn=auth" manage by * none

addprinc -randkey ldap/vish.morpheux.org
ktadd -k **/tmp/ldap.keytab** ldap/vish.morpheux.org
scp root@krb:/tmp/ldap.keytab /etc/openldap/ldap.keytab
chown root:ldap /etc/openldap/ldap.keytab
chmod 0640 /etc/openldap/ldap.keytab

Add **KRB5_KTNAME=/etc/openldap/ldap.keytab** to /etc/sysconfig/ldap
systemctl restart slapd.service

ldapwhoami -H ldaps://vish.morpheux.org -Y GSSAPI
SASL username: faye@MORPHEUX.ORG
dn:uid=faye,cn=gssapi,cn=auth

ldapmodify -Y EXTERNAL -H ldapi:/// <<EOF
dn: olcDatabase={0}config,cn=config
changetype: modify
replace: olcAccess
olcAccess: {0}to * by dn.base="gidNumber=0+uidNumber=0,cn=peercred,cn=external,cn=auth"
manage by dn.base="uid=faye,cn=gssapi,cn=auth" read by * none
EOF

IMHO USE FOR MANAGMENT NOT SYNCREPL

LDAP MASTER and REALMS

```
[faye@pip]$ ldapwhoami -Y GSSAPI -H ldaps://vish.morpheux.org
...
SASL username: faye@MORPHEUX.ORG
...
dn:uid=faye,cn=gssapi,cn=auth

[root@vish]# ldapmodify  -Y EXTERNAL -H ldapi:/// <<EOF
dn: cn=config
changetype: modify
replace: olcSaslRealm
olcSaslRealm: MORPHEUX.ORG
EOF

[faye@pip]$ ldapwhoami -Y GSSAPI -H ldaps://vish.morpheux.org
SASL username: faye@MORPHEUX.ORG
dn:uid=faye,cn=morpheux.org,cn=gssapi,cn=auth
```

ONCE SET DOESN'T SEEM TO GO AWAY DYNAMICALLY UNTIL RESTART

LDAP SyncRepl with SASL/GSSAPI

```
ldapadd -Y EXTERNAL -H ldapi:/// <<EOF
dn: olcDatabase={3}hdb,cn=config
changetype: modify
replace: olcRootDN
olcRootDN:
gidNumber=0+uidNumber=0,cn=peercred,cn=external,cn=auth
EOF

ldapadd -Y EXTERNAL -H ldapi:/// -f listing.ldif

ldapsearch -Y GSSAPI -H ldaps://vish.morpheux.org -b
'dc=morpheux,dc=org' SHOULD PRODUCE LOTS OF RESULTS
```

LDAP SyncRepl with SASL/GSSAPI

```
ldapadd -Y EXTERNAL -H ldapi:/// <<EOF
dn: olcOverlay=syncprov,olcDatabase={3}hdb,cn=config
changetype: add
objectClass: olcOverlayConfig
objectClass: olcSyncProvConfig
olcOverlay: syncprov
olcSpNoPresent: TRUE
EOF

ldapmodify -Y EXTERNAL -H ldapi:/// <<EOF
dn: olcDatabase={3}hdb,cn=config
add: olcDbIndex
olcDbIndex: entryCSN,entryUUID eq
EOF

ldapsearch -Y GSSAPI -H ldaps://vish.morpheux.org -b 'dc=morpheux,dc=org' entryCSN
-s base -LLL
...
entryCSN: 20120215130527.019618Z#000000#000#000000
```

LDAP SyncRepl with SASL/GSSAPI

olcDatabase={3}hdb,cn=config on master is in 'read by all' state by default.

Need to add access rules:

```
ldapmodify  -Y EXTERNAL -H ldapi:/// <<EOF
dn: olcDatabase={3}hdb,cn=config
changetype: modify
replace: olcAccess
olcAccess: {0}to *  by
dn.base="gidNumber=0+uidNumber=0,cn=peercred,cn=external,cn=auth"
manage by
dn.base="uid=spongebob/pip.morpheux.org,cn=gssapi,cn=auth" read  by *
none
EOF
```

LDAP Slave Config SASL/GSSAPI

On krb5 server:

kadmin.local: addprinc -randkey ldap/pip.morpheux.org
kadmin.local: addprinc -randkey spongebob/pip.morpheux.org
kadmin.local: ktadd -k /tmp/ldap_pip.keytab ldap/pip.morpheux.org spongebob/pip.morpheux.org

During SLAPD slave startup:

export KRB5_KTNAME=/etc/openldap/ldap_pip.keytab
runuser -l ldap -s /bin/bash -c "kinit -l 1d -k -t
    /etc/openldap/ldap_pip.keytab
    spongebob/pip.morpheux.org@MORPHEUX.ORG"

Test auth before configuring SyncRepl on slave

su - ldap -s /bin/bash
-bash-4.0$ ldapwhoami -Y GSSAPI -U
        spongebob/pip.morpheux.org@MORPHEUX.ORG -H
        ldap://vish.morpheux.org
...
dn:uid=spongebob/pip.morpheux.org,cn=gssapi,cn=auth

LDAP Slave Config SASL/GSSAPI

```
ldapmodify -Y EXTERNAL -H ldapi:/// <<EOF
dn: olcDatabase={3}hdb,cn=config
changetype: modify
replace: olcSyncrepl
olcSyncrepl: rid=100 provider=ldaps://vish.morpheux.org
type=refreshAndPersist retry="60 10 300 +"
searchbase=dc=morpheux,dc=org bindmethod=sasl
saslmech=GSSAPI authcid=spongbob@MORPHEUX.ORG
interval=00:00:00:30 realm=MORPHEUX.ORG
EOF
```

TLS SETTINGS REMOVED FOR CLARITY

Final Thoughts on SASL/GSSAPI in LDAP

- Setting up SASL/GSSAPI on slave's syncrepl pointless if master's database readable by everyone.
- Slave must be restarted in time to collect new Krb5 ticket.
- Having 'read all' on master no substitute for correct access rules. Prone to failure upon glitches, brittle as slave does GSSAPI and tickets times out. Will look like it works until catastrophe.
- If also using TLS to protect connection why not use SASL/EXTERNAL in those cases.

Postgresql and SSL/TLS

- All the Action takes place in PG's “data” dir.
- SSL cert in <data dir>/server.crt
- SSL key in <data dir>/server.key
- If CACERT present PG demands client validation.
- Owned by “postgres:postgres” and chmod 0400

PostgreSQL and GSSAPI

- Useful for ad-hoc, day to day access.
- krb5 access deprecated in more recent versions of postgresql in favour of GSSAPI, but similar setup
- recommend using with SSL.
- usual principle of “postgres/<FQHN>”

Postgresql and GSSAPI, Server Config

systemctl enable postgresql.service
su to postgres and: initdb -D /var/lib/pgsql/data/
systemctl start postgresql.service

listen_addresses = '*'
ssl = on
ssl_ciphers = 'ALL:!ADH:!LOW:!EXP:!MD5:@STRENGTH'
krb_server_keyfile = '/var/lib/pgsql/data/pg.keytab'
krb_srvname = 'postgres'
krb_caseins_users = off

Postgresql and GSSAPI, Keytab Install

addprinc -randkey postgres/vish.morpheux.org

ktadd -k /tmp/pg.keytab
postgres/vish.morpheux.org

scp root@krb:/tmp/pg.keytab
/var/lib/pgsql/data/pg.keytab

chown root:postgres /var/lib/pgsql/data/pg.keytab
chmod 0640 /var/lib/pgsql/data/pg.keytab

Postgresql and GSSAPI, Using the Auth in pg_hda.conf

START WITH ONLY THIS (or stricter):

local postgres all trust

LOCK DOWN THE POSTGRES BOX

psql -h /tmp/ -U postgres template1 **SHOULD WORK**

CREATE DATABASE testgssapi;
CREATE ROLE faye LOGIN;

kinit faye
psql -U faye -h vish.morpheux,org testgssapi **WILL FAIL**

ADD THIS TO pg_hda.conf:

hostssl testgssapi faye samenet gss

Additional options include_realm, map, krb_realm

psql -U faye -h vish.morpheux.org testgssapi **WILL WORK**

PostgreSQL and TLS Auth

- Use for program access, e.g. CGI/web
- Doesn't time out as fast as GSSAPI, years rather than hours
- Client **MUST** provide a valid certificate.
- Only works on TLS connections.
- The cn (Common Name) attribute of the certificate will be compared to the requested database user name, and if they match the login will be allowed. User name mapping can be used to allow cn to be different from the database user name.[from pg docs]. Mapping is optional

Cosign: Easy krb5 for web pages

In httpd.conf add:

```
LoadModule cosign_module     modules/mod_cosign.so
CosignValidReference    ^https?:\/\/abacus-twiki\.geos\.ed\.ac\.uk(:\d+)?(\/.*)?
CosignValidationErrorRedirect   https://www.ease.ed.ac.uk/validation_error.html
CosignHostname          www.ease.ed.ac.uk
CosignRedirect          https://www.ease.ed.ac.uk/cosign.cgi
CosignPostErrorRedirect https://www.ease.ed.ac.uk/post_error.html
CosignService           xxxxxxxxxxxxxxxxxxxx
CosignCrypto        /etc/pki/tls/private/cosign_abacus-twiki.geos.ed.ac.uk.key
/etc/pki/tls/certs/cosign_abacus-twiki.geos.ed.ac.uk.crt /etc/pki/tls/certs
CosignHttpOnly          Off
CosignCheckIP           never
CosignFilterDB          /var/cosign/filter
CosignFilterHashLength   1
```

Web site protected by TLS using mod_ssl

Authentication

- TLS setups and CA certs.
- RADIUS using EAP-TLS
- Kerberos
- Using SVN with TLS and krb5
- SASL and LDAP
- PostgreSQL: GSSAPI and TLS auth
- Cosign auth

Thanks to:

- Linux Journal for openssl XP extensions for EAP-TLS.
- Matthew Richardson for help with SVN.
- Ed Uni Unix Team for Cosign assistance.
- Ed Uni Inf. System Admin's for LDAP syncrepl GSSAPI examples and work-a-rounds.
- Authors of Sys Admin Books around the world.

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QUESTIONS?