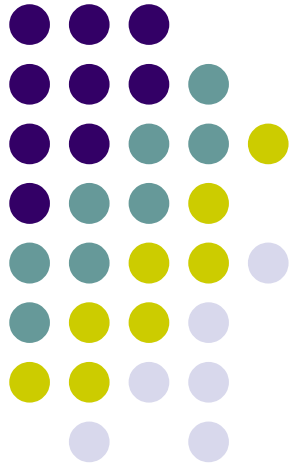
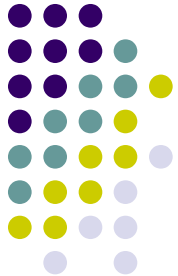
Crypto libraries
OpenSSL II (cont.)

Milan Brož
xbroz@fi.muni.cz

PV181, FI MUNI, Brno



Today’s exercise



- Continue with OpenSSL on Linux
- Work with certificates
- More complex example
- Trivial TLS client with https cert. validation

Example 6: Signing and certificates

PKCS12

- `PKCS12_verify_mac, PKCS12_parse`

PKCS7

- `PKCS7_sign, PKCS7_verify`

X509

- `X509_STORE_add_lookup`

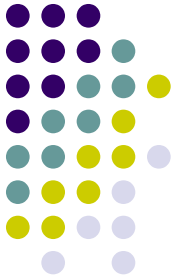
BIO

- `BIO_new, BIO_new_mem_buf, BIO_new_file`
- `BIO_push, BIO_f_cipher, BIO_set_cipher`
- `BIO_flush, BIO_free_all`
- `d2i_PKCS12_bio, d2i_PKCS7_bio`

*See **6_cert_sign_openssl** directory.*

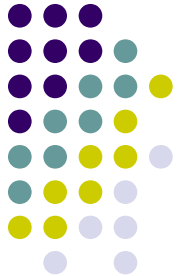
Ex6: prepare CA signed cert.

script: 6_cert_sign_openssl/create_CA



```
#!/bin/bash

CA=ca
CA_SUBJ='/C=CZ/ST=Utopia/L=Brno/O=Test s.r.o./OU=Test CA'
SIGN=sub-ca
SIGN_SUBJ='/C=CZ/ST=Utopia/L=Brno/O=Test s.r.o./OU=Test sign'

PASSWORD="mypassword"

# Generate RSA key for root CA
openssl genrsa -out $CA.key 4096
# self-sign CA
openssl req -new -x509 -days 365 -key $CA.key -out $CA.crt -subj "$CA_SUBJ"

# Generate sub-ordinate CA signed by CA
openssl genrsa -out $SIGN.key 4096
openssl req -new -key $SIGN.key -out $SIGN.csr -subj "$SIGN_SUBJ"
# sign by root CA
openssl x509 -req -days 365 -in $SIGN.csr -CA $CA.crt -CAkey $CA.key -set_serial 01 -out $SIGN.crt

# Package it as PKCS12 file
openssl pkcs12 -export -out $SIGN.p12 -inkey $SIGN.key -in $SIGN.crt -chain -CAfile $CA.crt -password "pass:$PASSWORD"

for i in $(ls *.crt)
do
        h=$(openssl x509 -hash -noout -in $i)
        echo "$i => $h.o"
        ln -s $i $h.0
done
```

Example 7:
TLS connection & certificates



BIO TLS connection

- `SSL_CTX_set_verify, SSL_get_peer_certificate, SSL_get_verify_result`
- `BIO_new_ssl_connect, BIO_get_ssl, BIO_do_connect, BIO_do_handshake`

X509

- `X509_STORE_CTX_get_current_cert, X509_print_ex_fp, X509_NAME_get_entry, …`

Connect to https://www.google.com.

Read and validate certificates.

Sent HTTP GET and receive /robots.txt through a secured connection.

*See **7_tls_client_openssl** directory.*