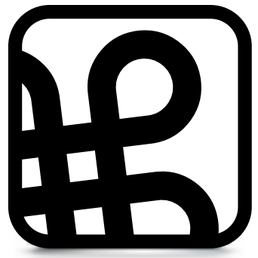


Macoun’11

QEEVEE

Kommunikativer Stabilbaukasten

Pascal Bihler

Ab, Lauf!

- Beziehungen spielen lassen
- Voll Konkret
- Privat werden

Beziehungen spielen lassen

(dt.: die Connections)

Verbindung zur Welt

- Das iPhone hat zwei unabhängige Daten-Kommunikationswege
  - WiFi (WLAN)
  - Mobilfunknetz
    - UMTS
    - EDGE
    - einfaches GPRS

Paketvermittelt
Asynchron
Ohne Garantien

Das Internet Protokoll

- IP-Adresse identifiziert Kommunikationspartner
  - Ändert sich bei Trägerwechsel!
- IP-Datenübertragung unsicher
  - User Datagram Protocol (UDP) gibt dies direkt weiter
  - Transmission Control Pr. (TCP) garantiert Datenübertragung
- Übertragungsabbrüche / -unterbrechungen immer möglich!

Network Link Conditioner

- Simulationstool
  - seit XCode 4/ Lion

`/Developer/Applications/Utilities/Network Link Conditioner`

Wahl der Übertragungstechnik

- Anwendungsfallabhängig:
  - UDP funktioniert auch!
  - Um die Übertragungsgarantien muss man sich bei Bedarf selbst kümmern

```
CFSocketRef newSocket = CFSocketCreate(
                        NULL,
                        PF_INET,
                        SOCK_DGRAM,
                        IPPROTO_UDP,
                        kCFSocketReadCallBack,
                        NetworkSocketCallBack,
                        &context);
…
CFSocketError err = CFSocketConnectToAddress(newSocket, address, 0.1);
```

```
CFSocketError err = CFSocketSendData(self.networkSocket,
                                     NULL, (CFDataRef) data, 0.1);
```

```
ssize_t bytesRead = recv(CFSocketGetNative(self.networkSocket),
                  buffer,
                  sizeof(buffer),
                  MSG_DONTWAIT);
```

```
CFSocketRef newSocket = CFSocketCreate(
                        NULL,
                        PF_INET,
                        SOCK_DGRAM,
                        IPPROTO_UDP,
                        kCFSocketReadCallBack,
                        NetworkSocketCallBack,
                        &context);
…
CFSocketError err = CFSocketConnectToAddress(newSocket, address, 0.1);
```

… weitere 115 Zeilen

UdpObjectiveC.m

```
CFSocketError err = CFSocketSendData(self.networkSocket,
                                     NULL, (CFDataRef) data, 0.1);
```

```
ssize_t bytesRead = recv(CFSocketGetNative(self.networkSocket),
                  buffer,
                  sizeof(buffer),
                  MSG_DONTWAIT);
```

```
final DatagramSocket socket = new DatagramSocket();
InetSocketAddress dest = new InetSocketAddress(…, UDP_LISTENER_PORT);

socket.connect(dest);
```


```
DatagramPacket packet = new DatagramPacket(text.getBytes("UTF-8"),
                                           text.length(), dest);
socket.send(packet);
```

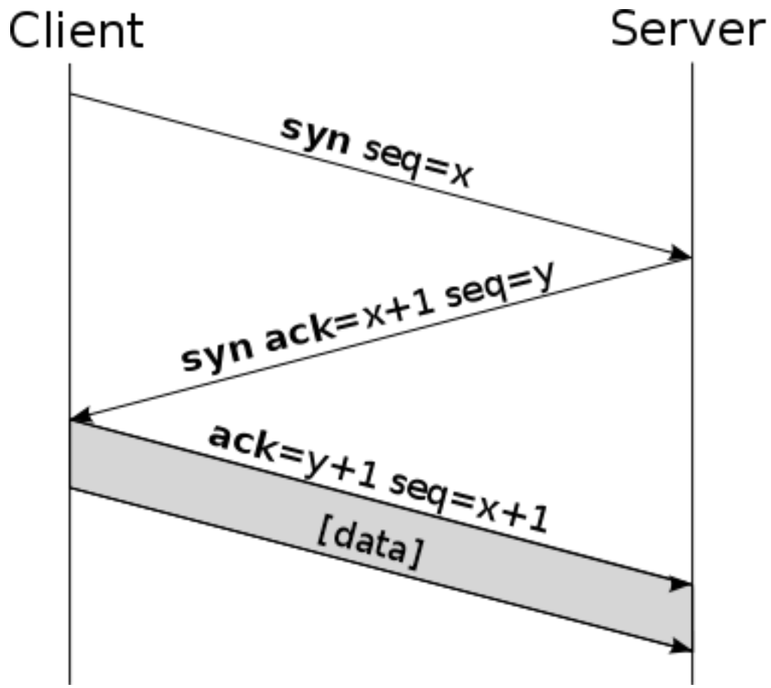
UdpSender.java


```
DatagramPacket inPacket =
             new DatagramPacket(new byte[MAX_UDP_PACKETLENGTH],
                                                MAX_UDP_PACKETLENGTH);
socket.receive(inPacket);
String payload =
             new String(inPacket.getData(), 0, inPacket.getLength());
```

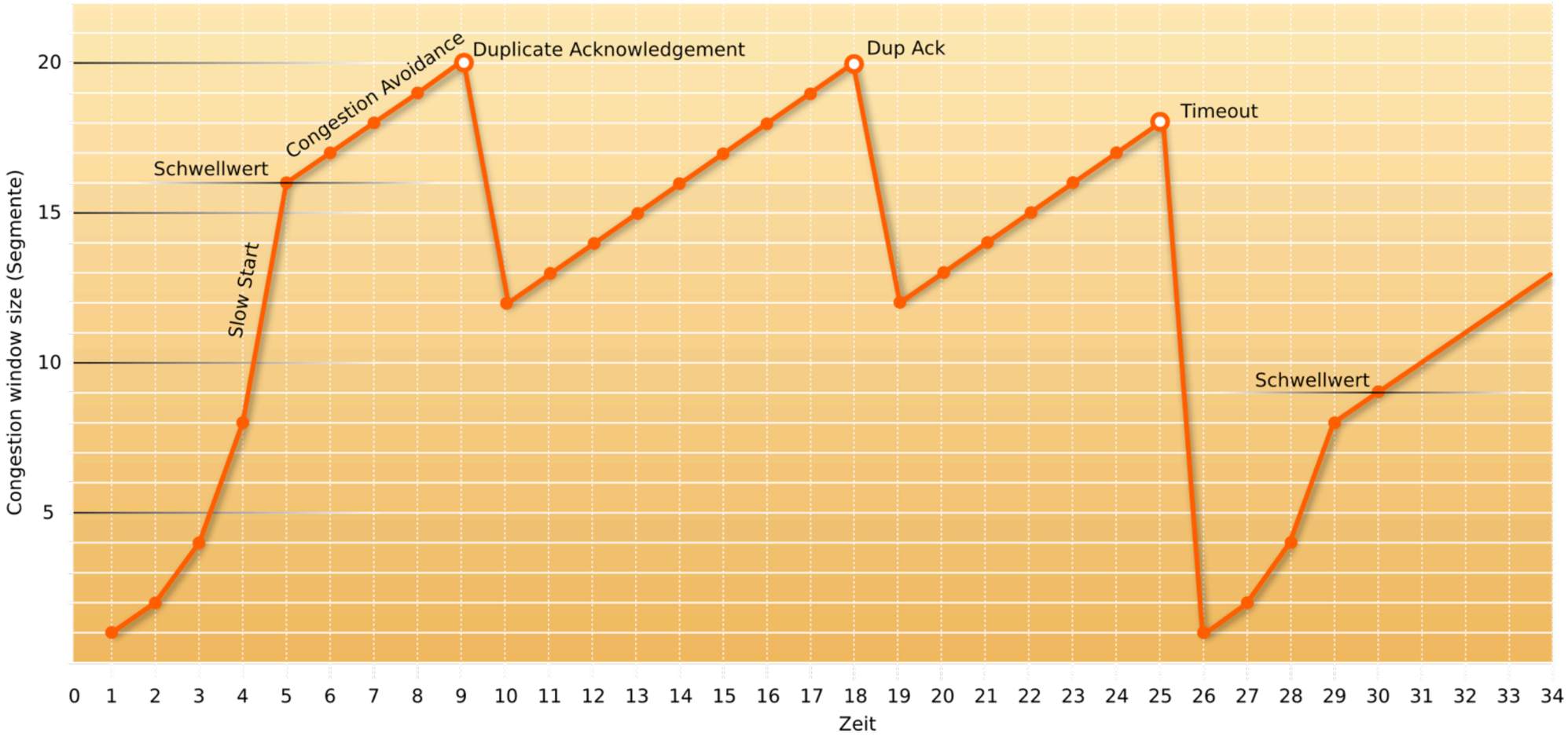
UdpListener.java

Transmission Control Protocol

- TCP verwendet Sequenznummern und Bestätigungen



TCP Slow-Start



Warum trotzdem HTTP?

- Gut gekapselt vom Betriebsystem
- Je nach Implementierung kleiner Overhead
- Meta-Daten-Übertragung spezifiziert
- Transparente Komprimierung möglich
- REST-Kompatibilität
  - Client-Bibliotheken

Resty für Objective-C

```
- (void)fetchSomething
{
  [[LRResty client] get:@"http://www.example.com"
   withBlock:^(LRRestyResponse *r) {
    NSLog(@"That's it! %@", [r asString]);
  }];
}
```

http://projects.lukeredpath.co.uk/resty/

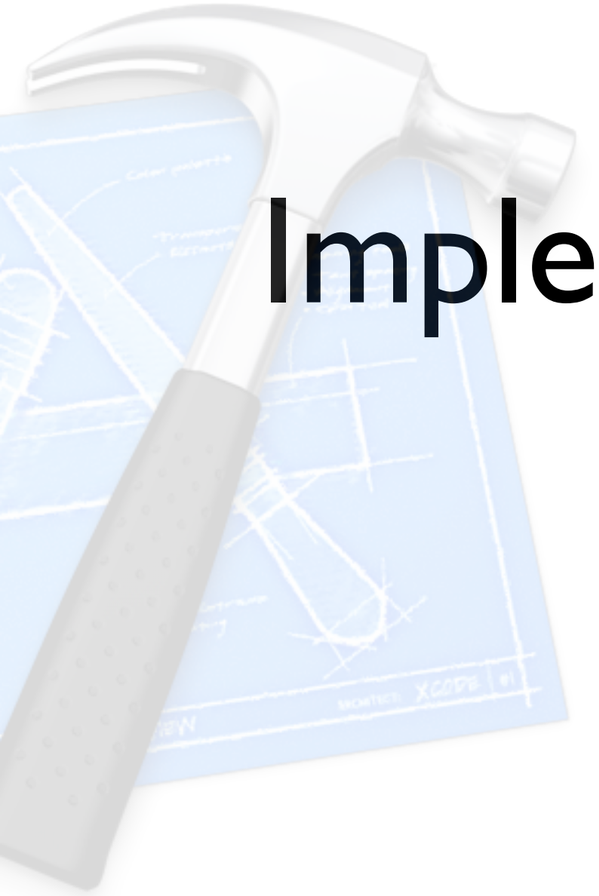
Voll Konkret

(weiter im Beispiel)

Anwendungs-Beispiel

- Beispiel 2009: „MacRunner“

- Erweiterung 2011: Wegpunkte online nachverfolgen können



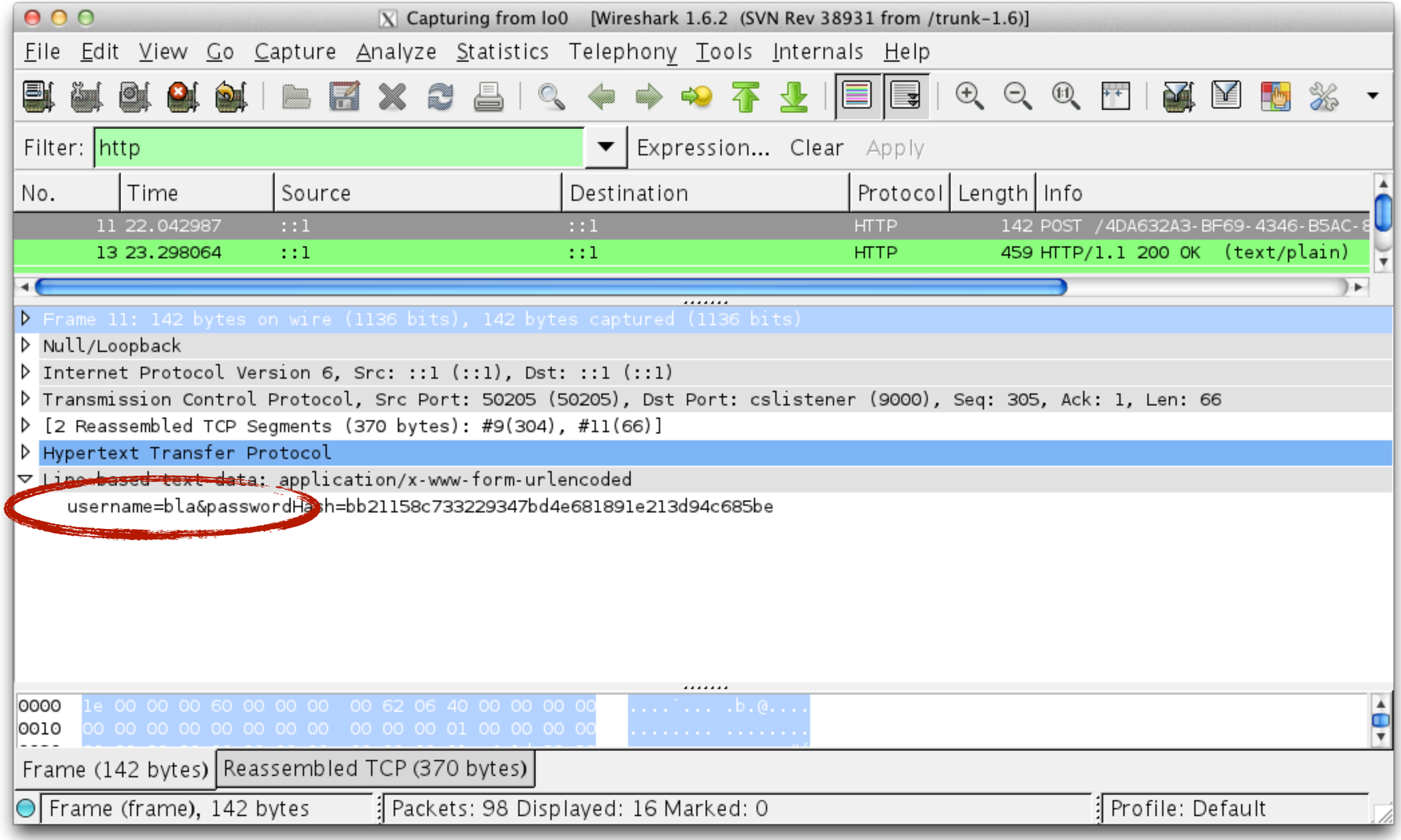
Implementierung…

Mitprogrammieren:

http://pascal-bihler.de/macoun2011.zip

Privat werden

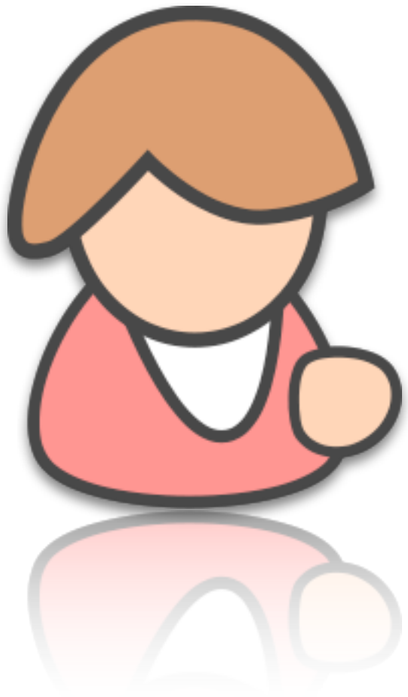
(You are not alone)

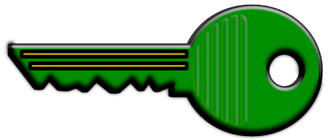

Capturing from lo0 [Wireshark 1.6.2 (SVN Rev 38931 from /trunk-1.6)]
File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help
Filter: http
Expression... Clear Apply
No. Time Source Destination Protocol Length Info
11 22.042987 ::1 ::1 HTTP 142 POST /4DA632A3-BF69-4346-B5AC-8
13 23.298064 ::1 ::1 HTTP 459 HTTP/1.1 200 OK (text/plain)
Frame 11: 142 bytes on wire (1136 bits), 142 bytes captured (1136 bits)
Null/Loopback
Internet Protocol Version 6, Src: ::1 (::1), Dst: ::1 (::1)
Transmission Control Protocol, Src Port: 50205 (50205), Dst Port: cslistener (9000), Seq: 305, Ack: 1, Len: 66
[2 Reassembled TCP Segments (370 bytes): #9(304), #11(66)]
Hypertext Transfer Protocol
Line-based text data: application/x-www-form-urlencoded
username=bla&passwordHash=bb21158c733229347bd4e681891e213d94c685be
0000 1e 00 00 00 60 00 00 00 00 62 06 40 00 00 00 00 ....`.... .b.@....
0010 00 00 00 00 00 00 00 00 00 00 00 01 00 00 00 00 ....
Frame (142 bytes)
Reassembled TCP (370 bytes)
Frame (frame), 142 bytes
Packets: 98 Displayed: 16 Marked: 0
Profile: Default

Verschlüsselung

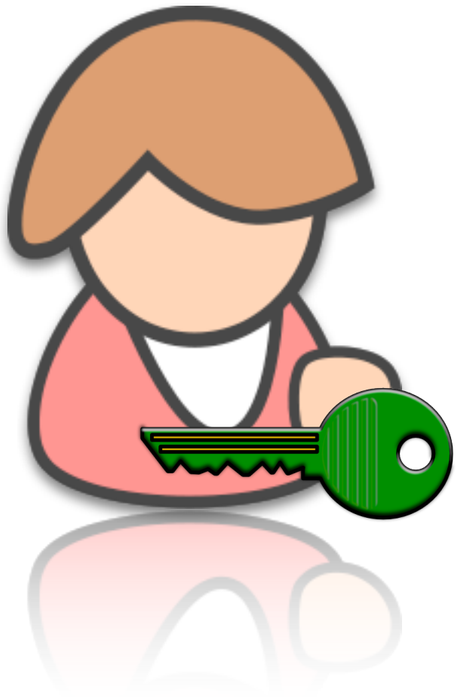
- HTTP ist ein Klartextprotokoll
- Verschlüsselung sensibler Daten notwendig
  - Symmetrische Verschlüsselung
  - Asymmetrische Verschlüsselung

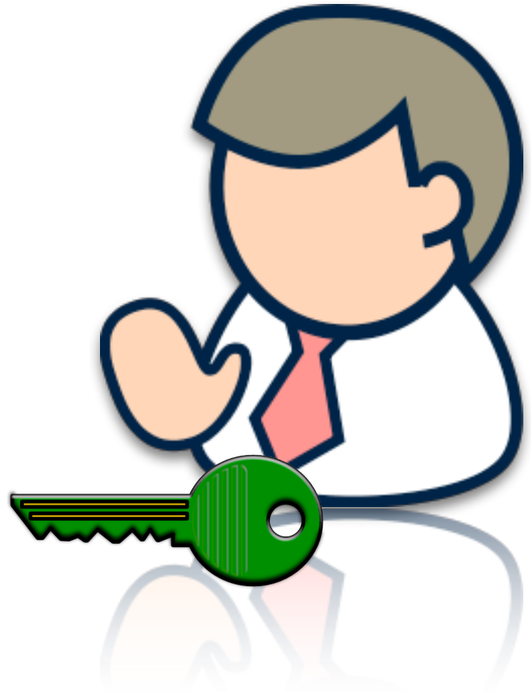
Symmetrische Verschlüsselung



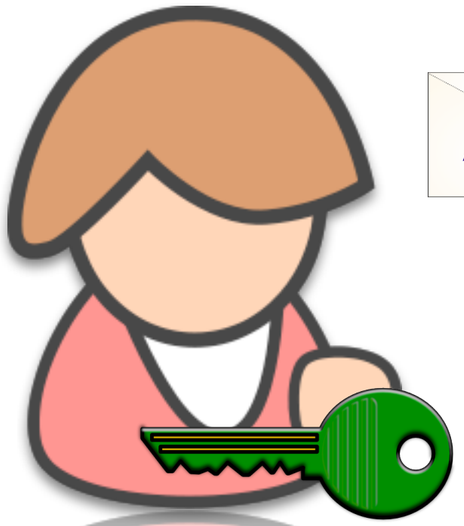


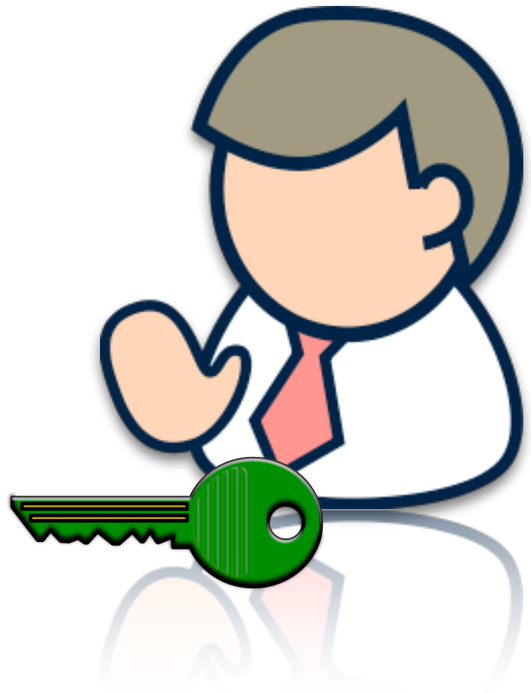
Symmetrische Verschlüsselung





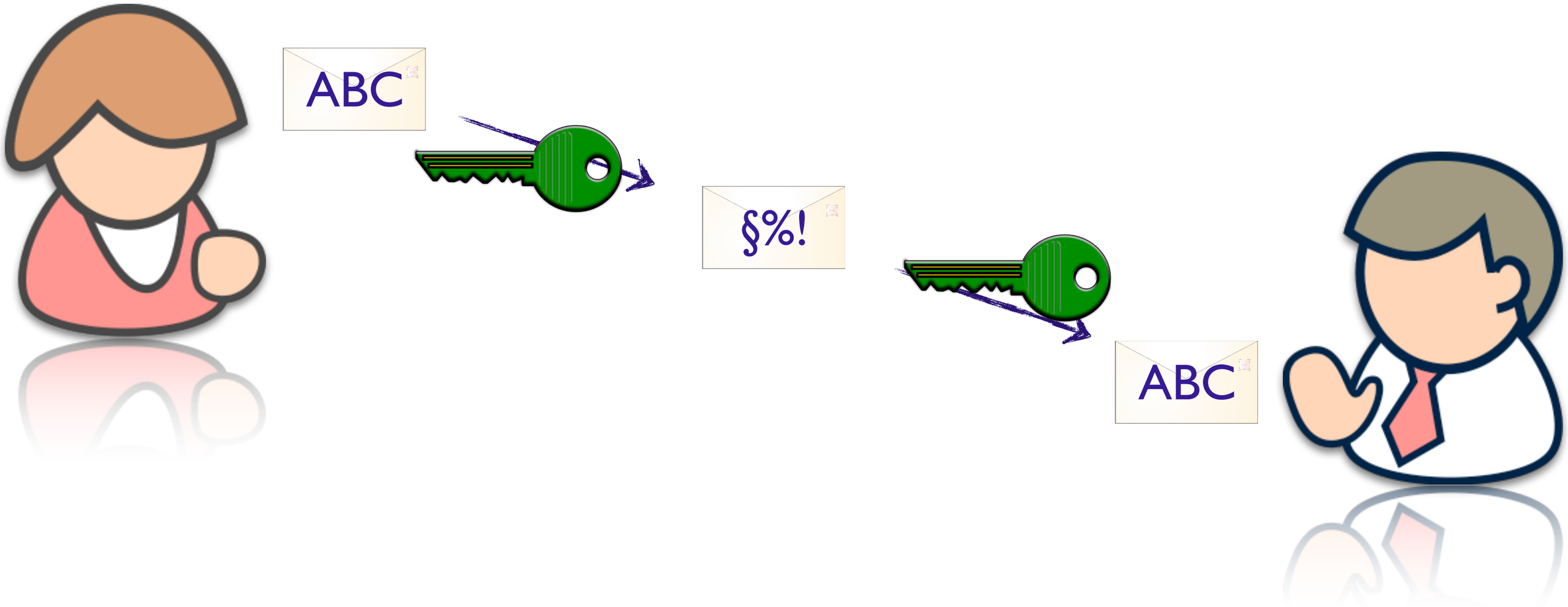
Symmetrische Verschlüsselung



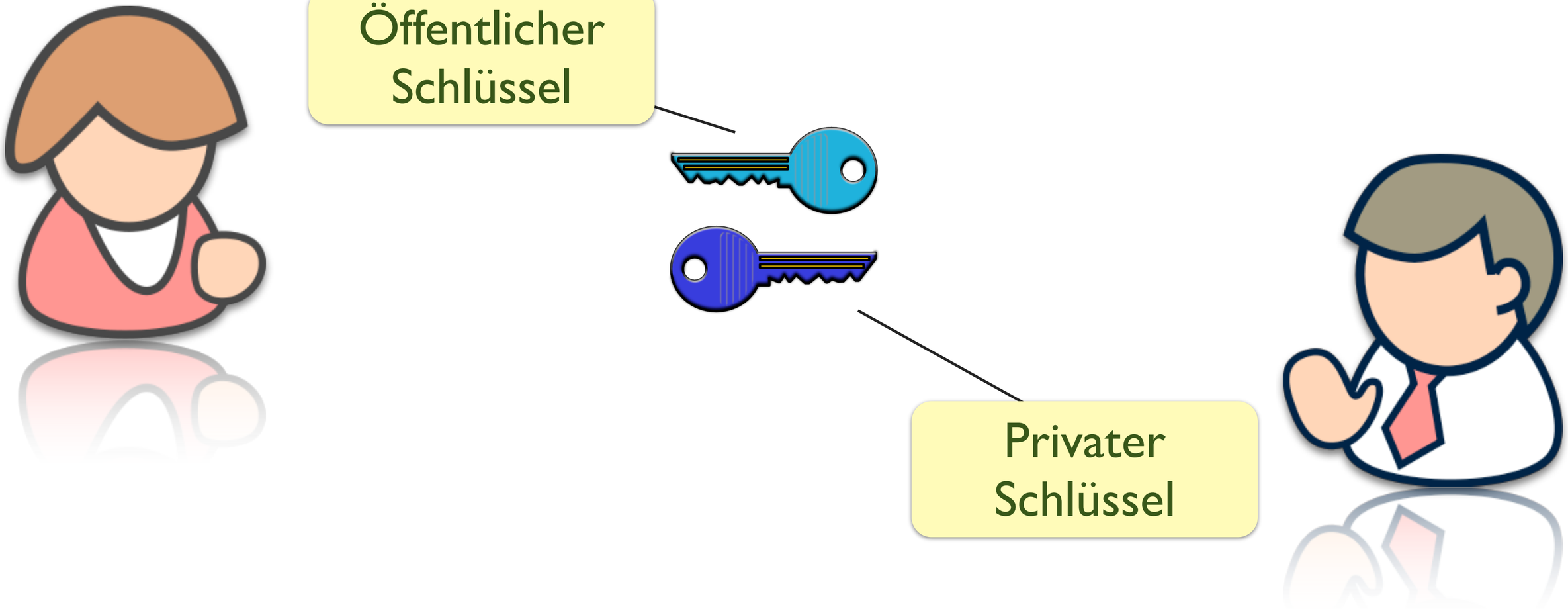


Symmetrische Verschlüsselung

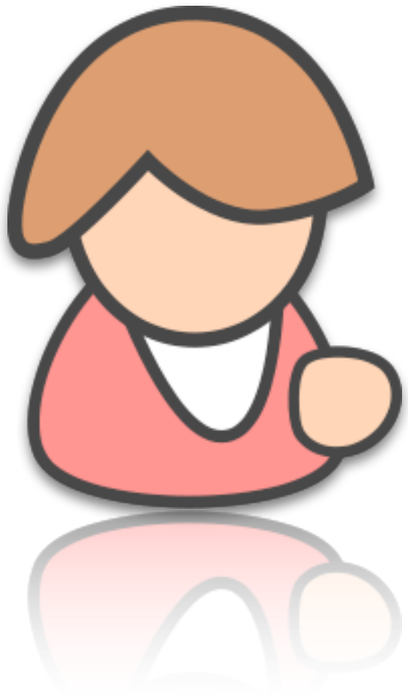
Symmetrische Verschlüsselung

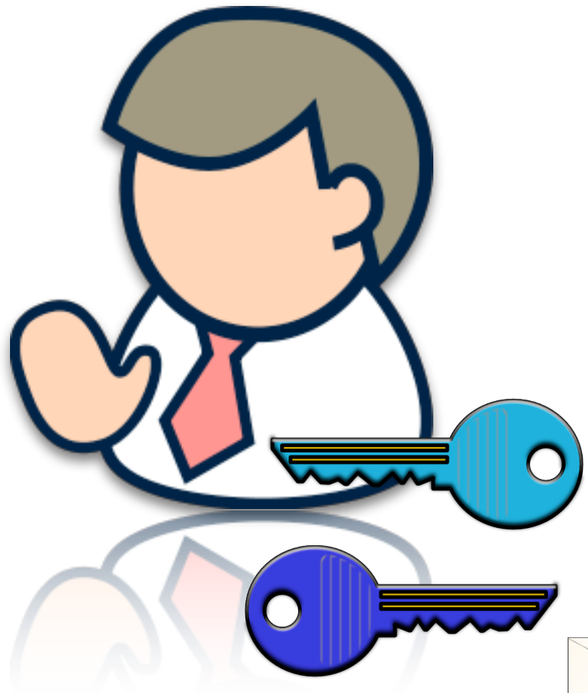


Asymmetrische Verschlüsselung

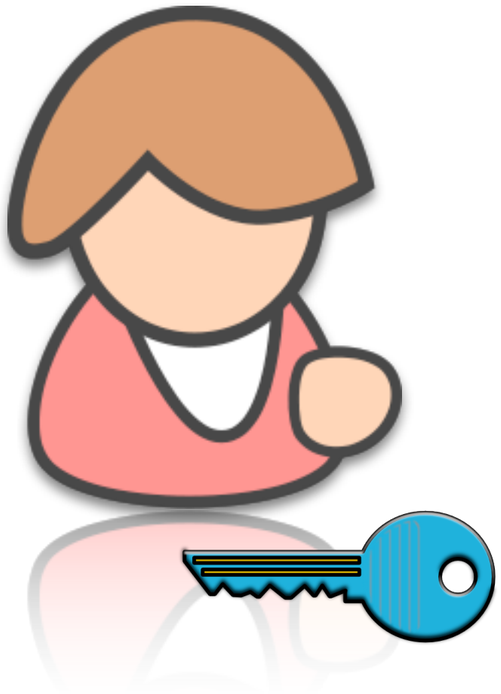


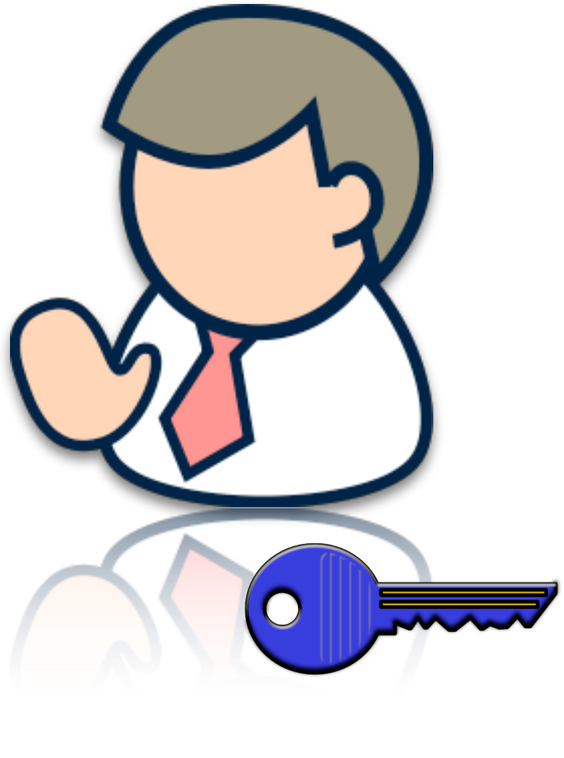
Asymmetrische Verschlüsselung



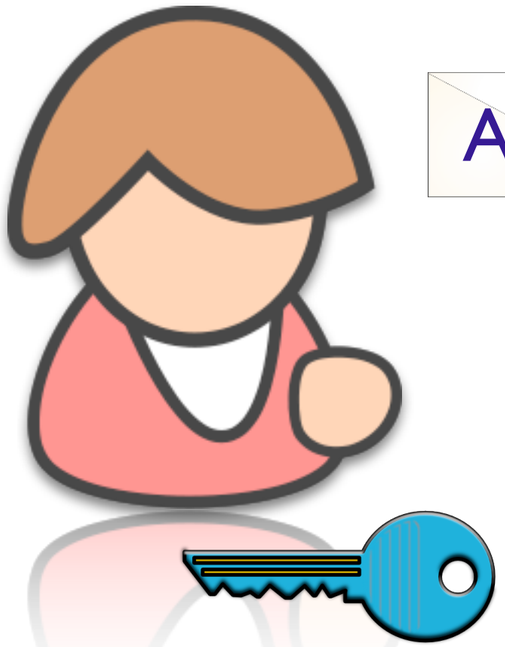


Asymmetrische Verschlüsselung

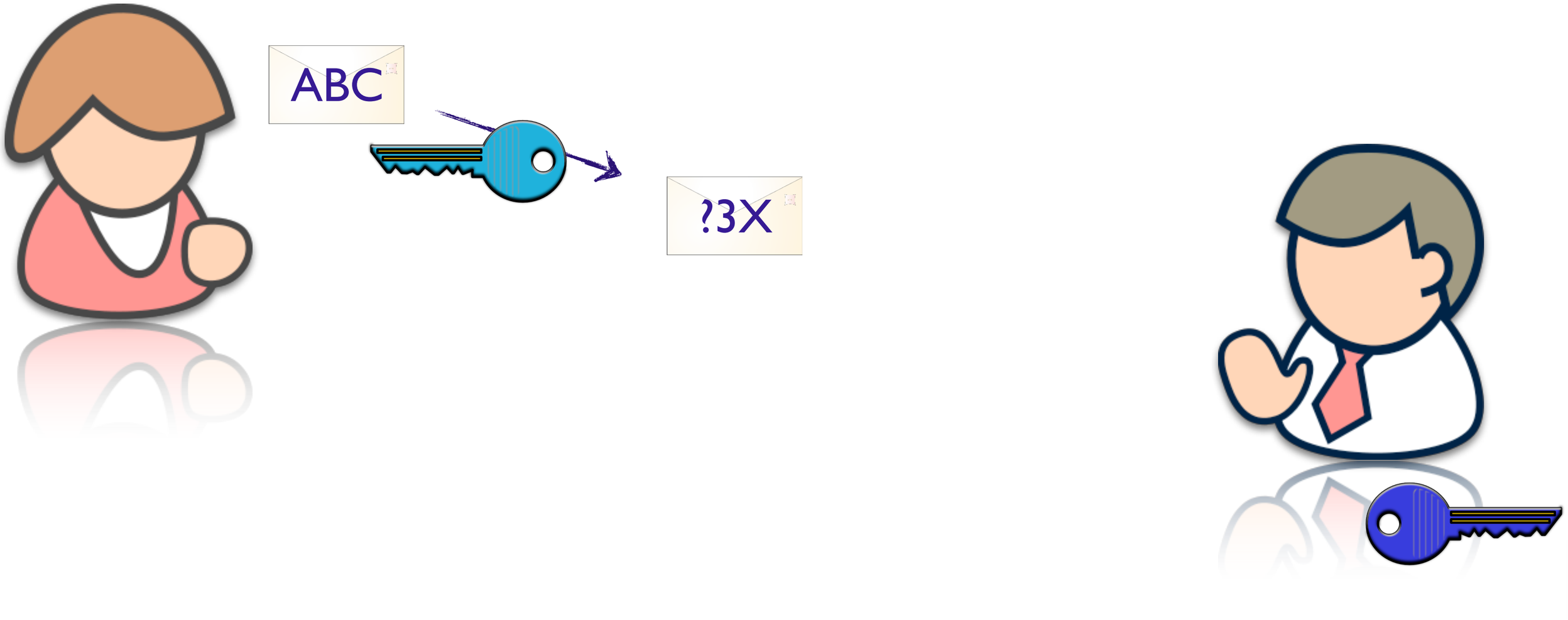




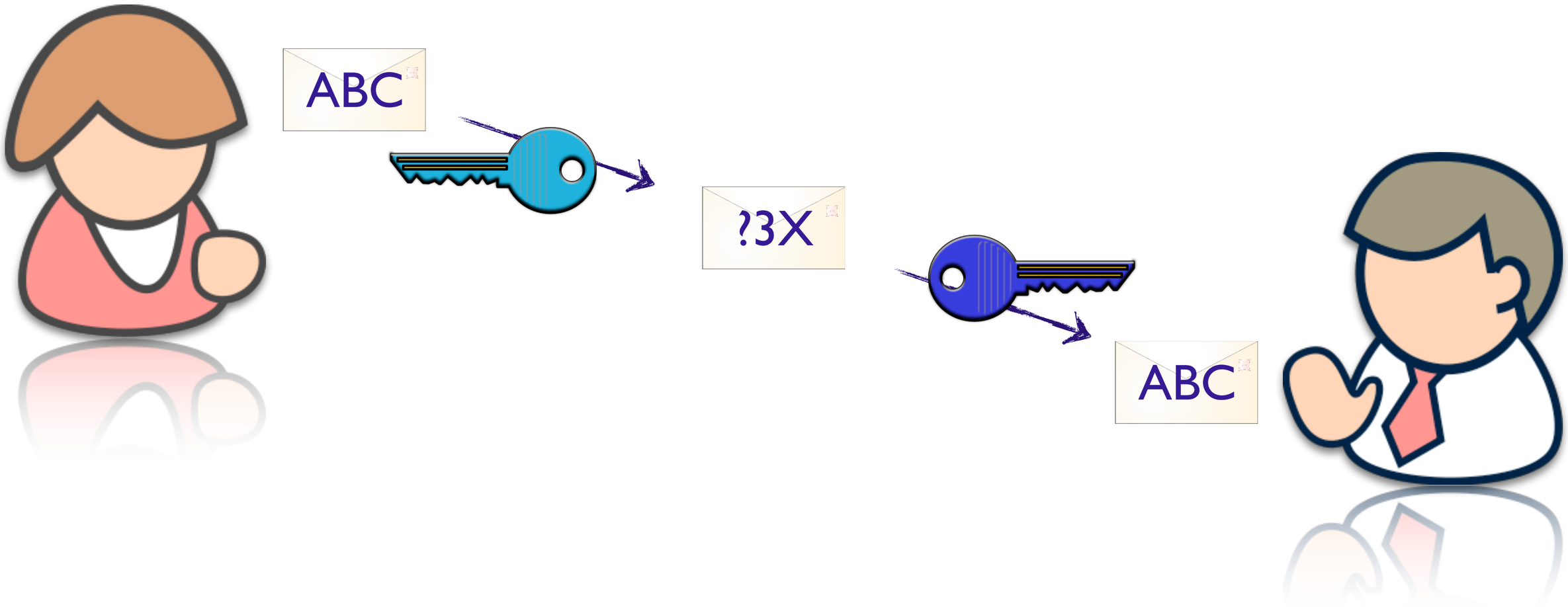
Asymmetrische Verschlüsselung



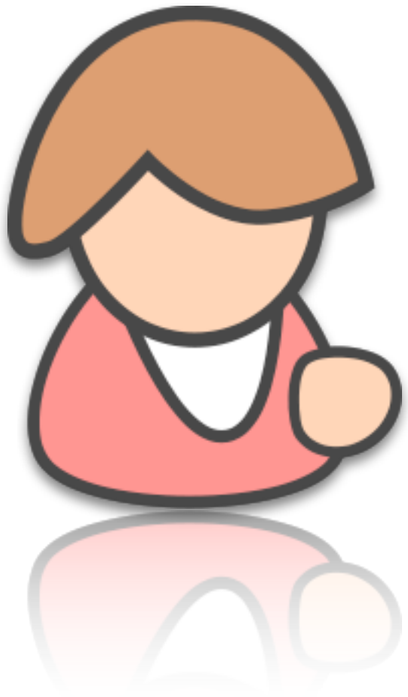
Asymmetrische Verschlüsselung

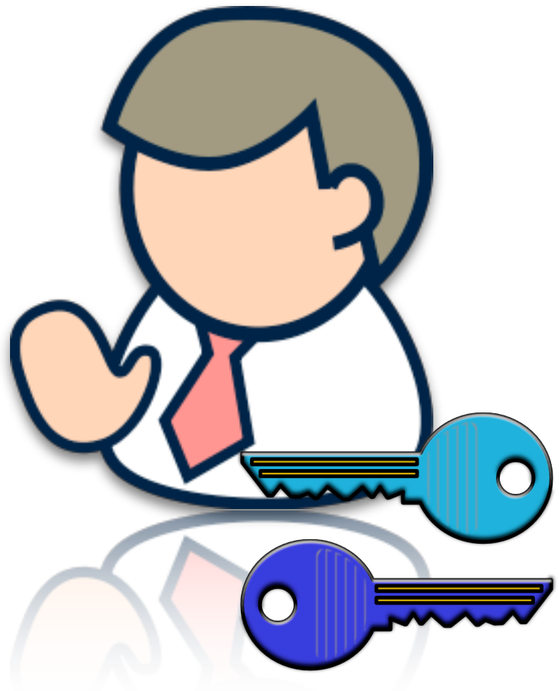


Asymmetrische Verschlüsselung

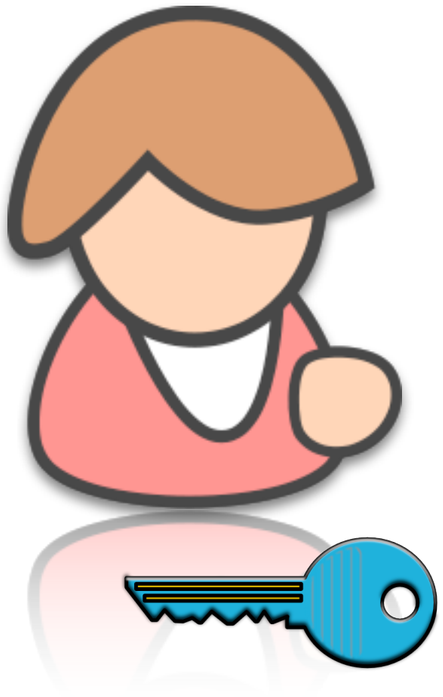


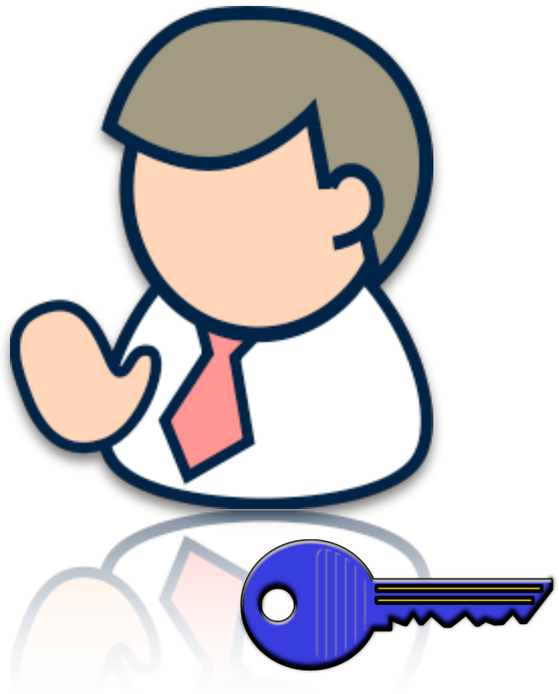
Kombiniertes Verfahren



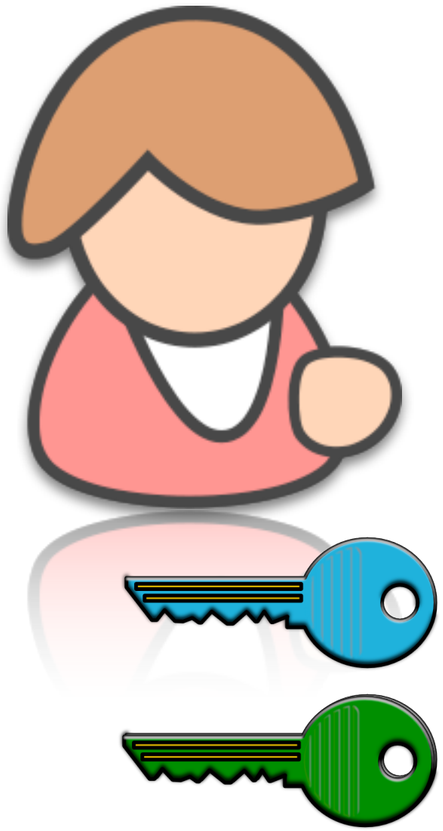


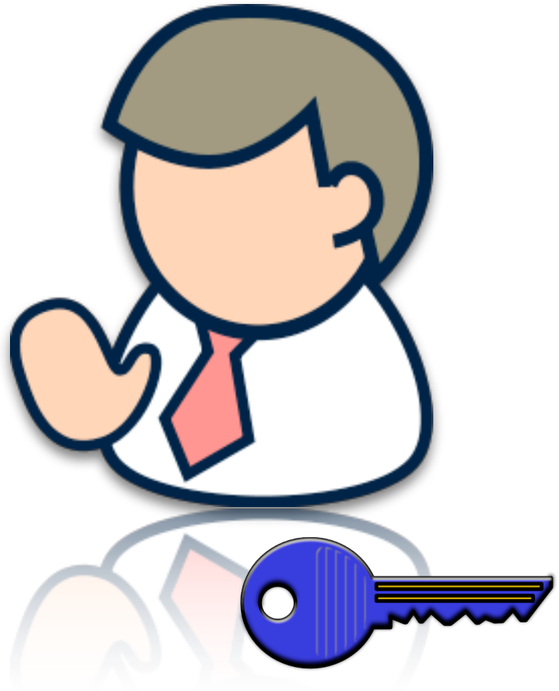
Kombiniertes Verfahren





Kombiniertes Verfahren





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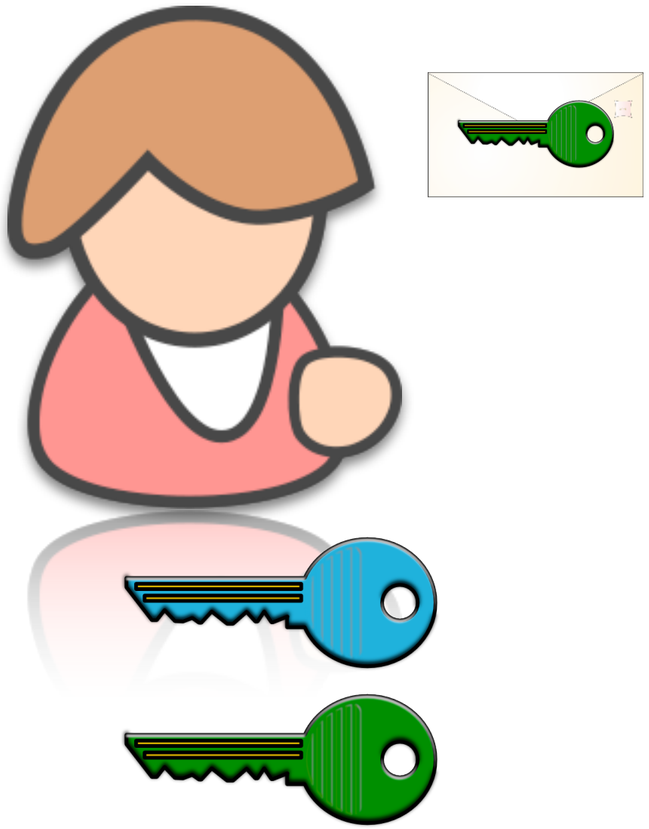

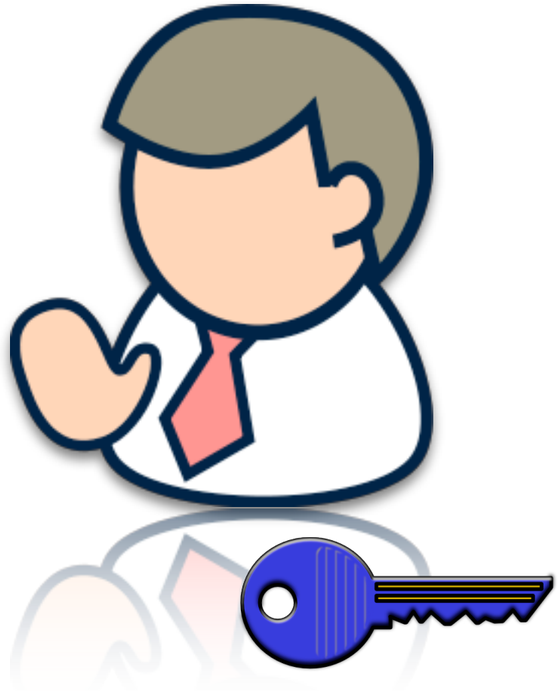

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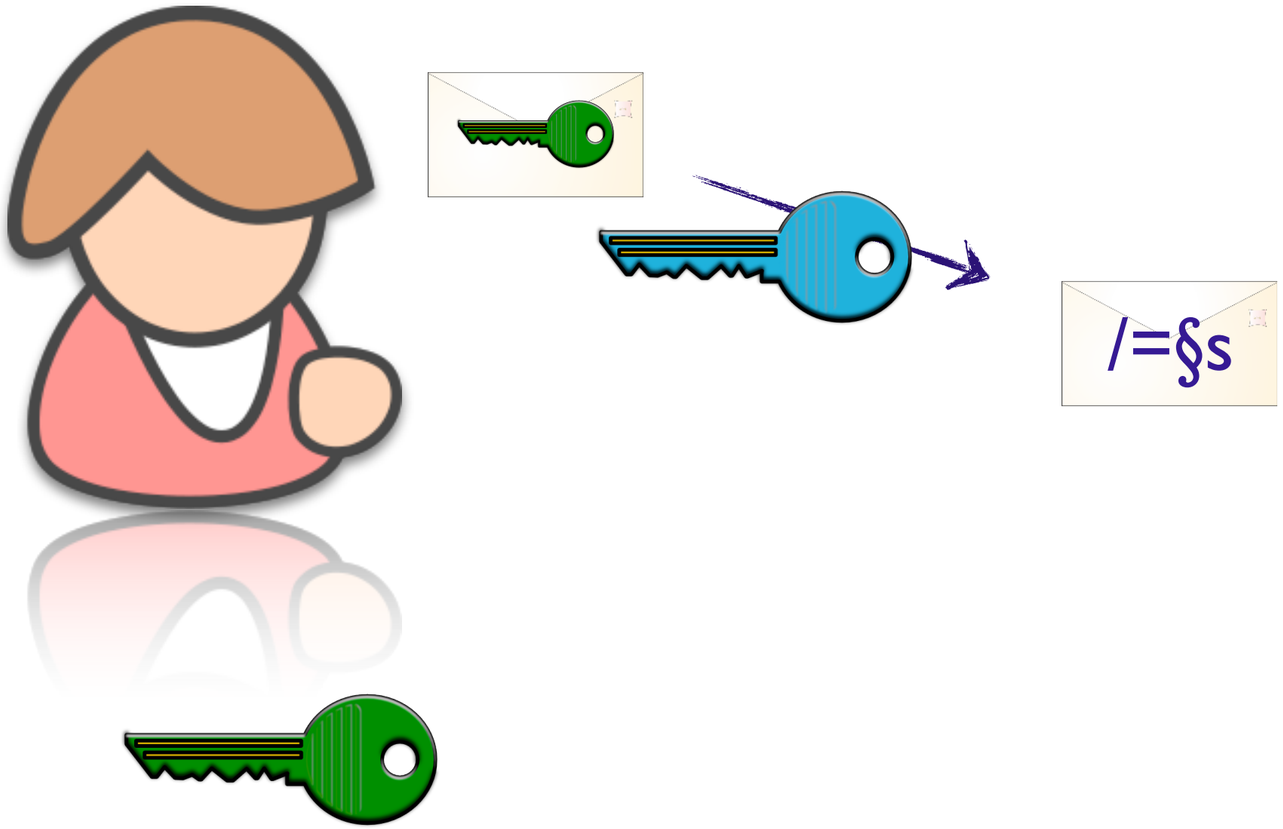

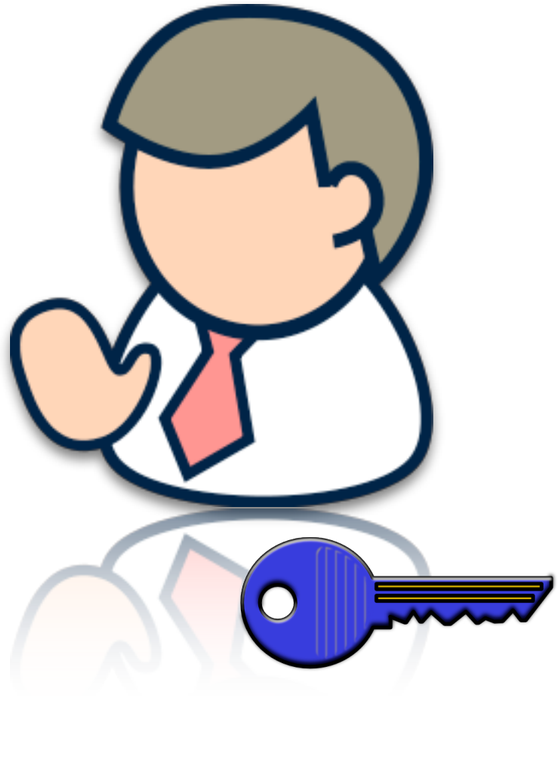

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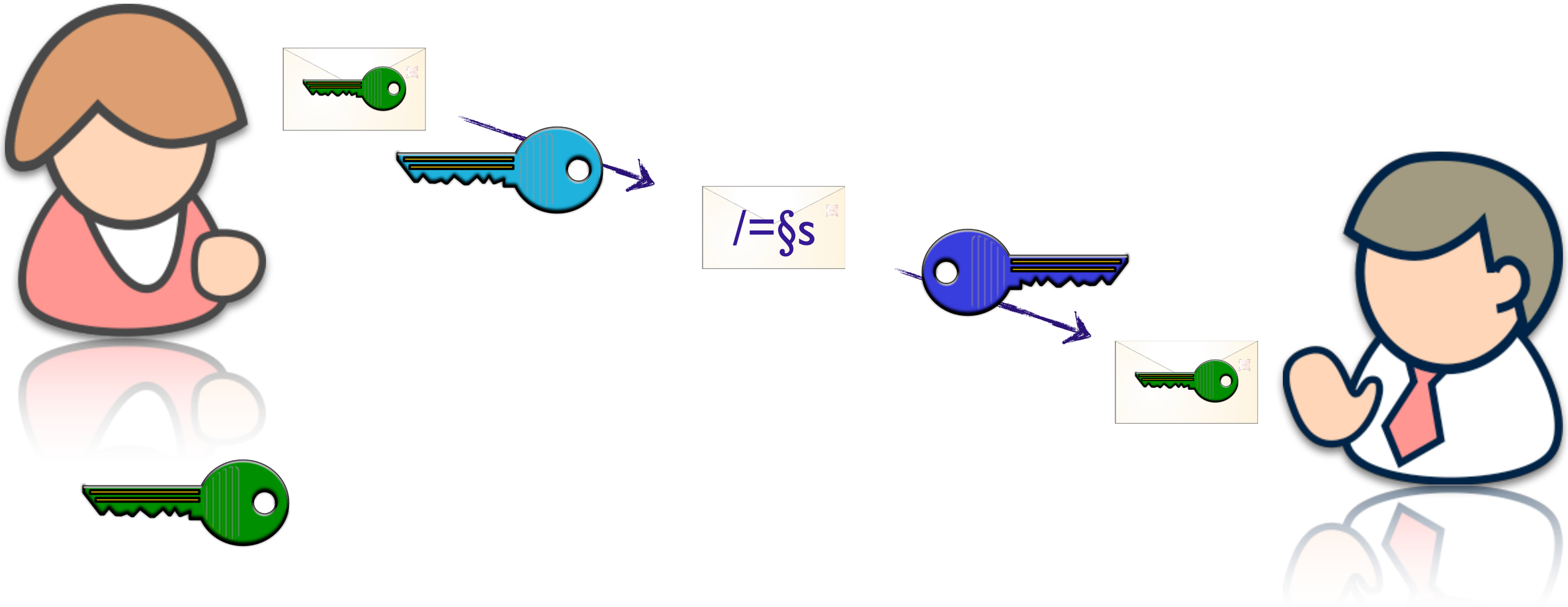

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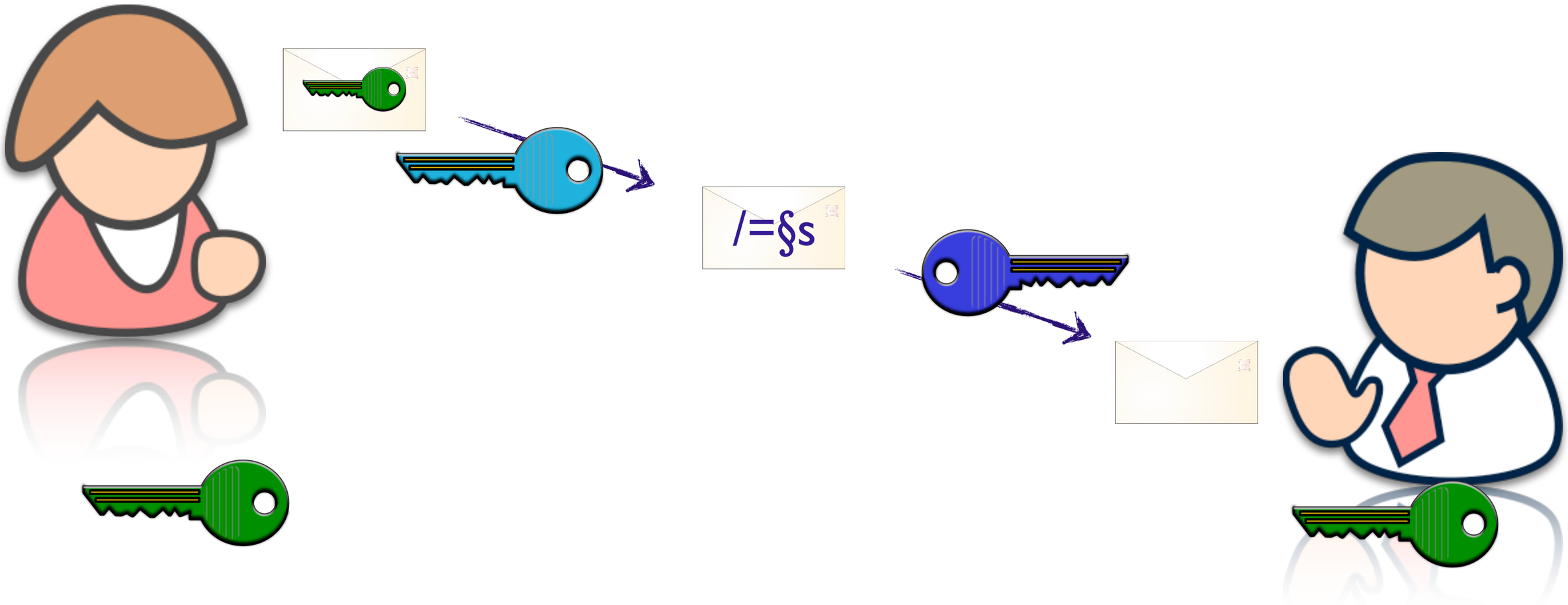

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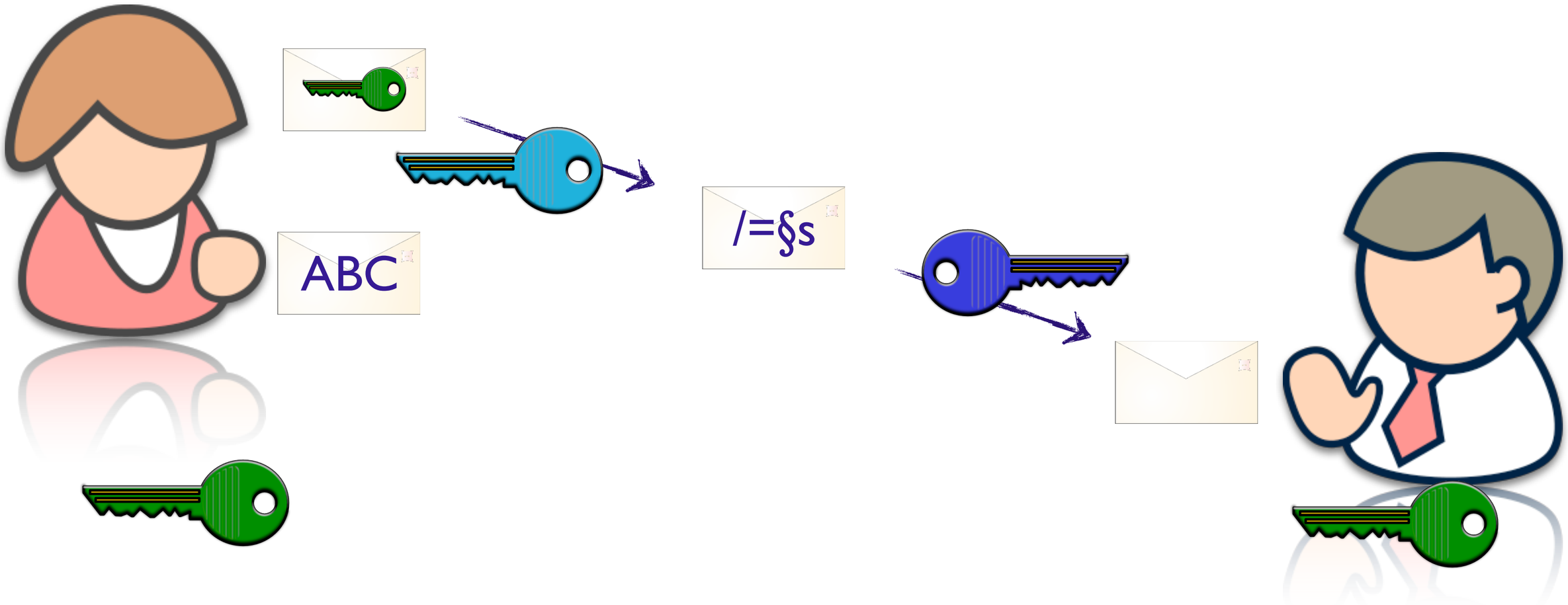

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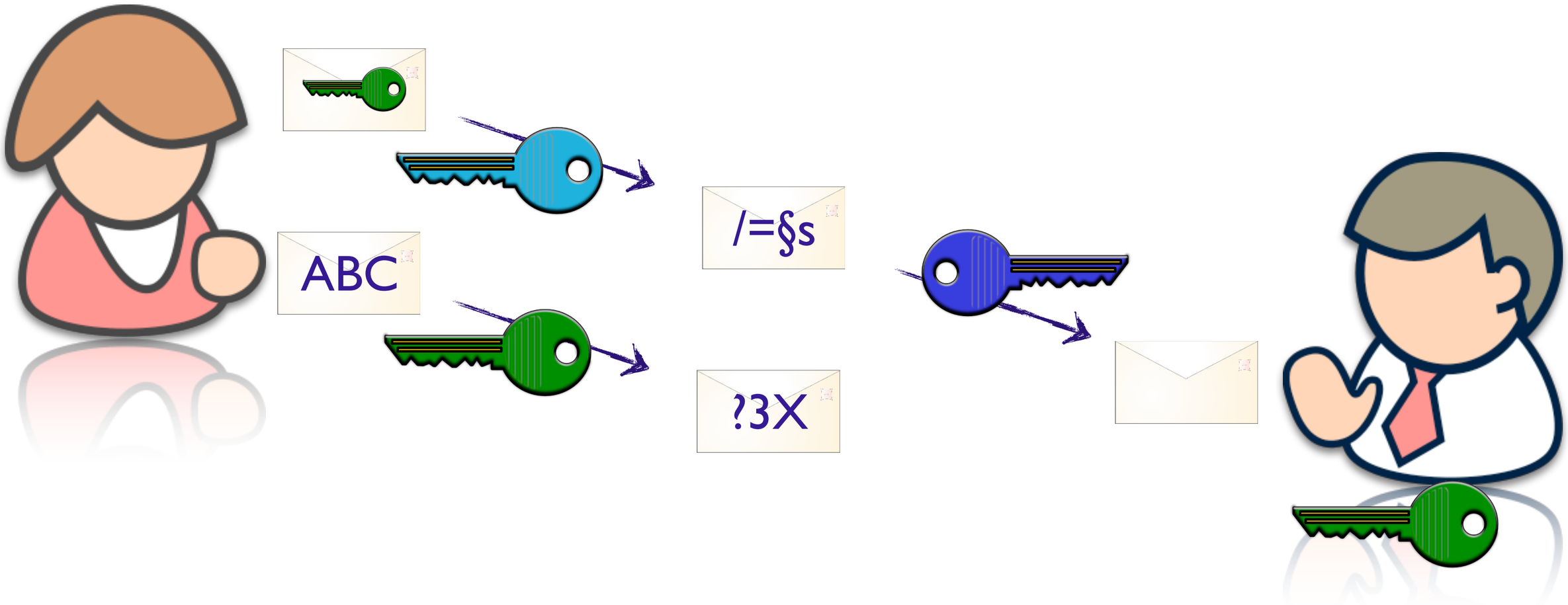

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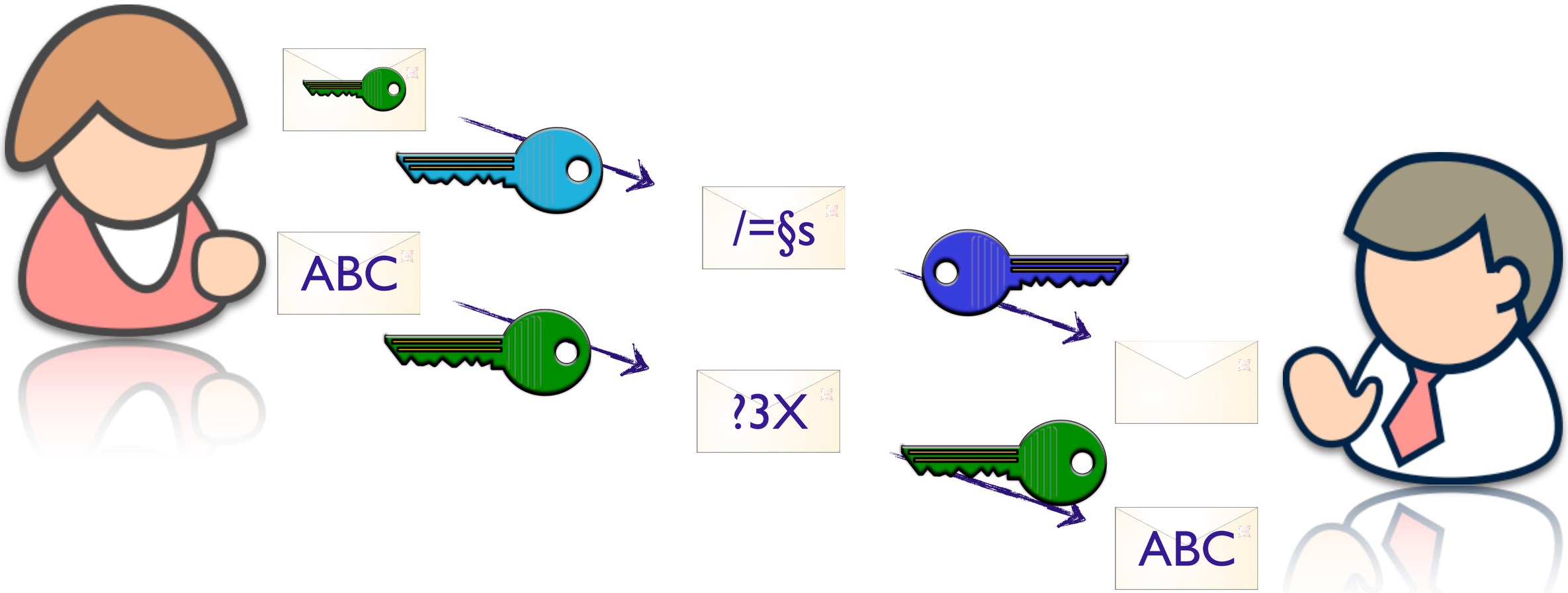


HTTP**S**

- TLS (aka SSL) ermöglicht verschlüsselte Datenübertragung mit Bordmitteln
- Serverzertifikat muss geprüft werden
  - Checksummenvergleich

```
NSURLRequest *theRequest=[NSURLRequest requestWithURL:
                                    [NSURL URLWithString:@"https://…"];

NSURLConnection * theConnection = [[NSURLConnection alloc]
                            initWithRequest:theRequest delegate:self];
…
```

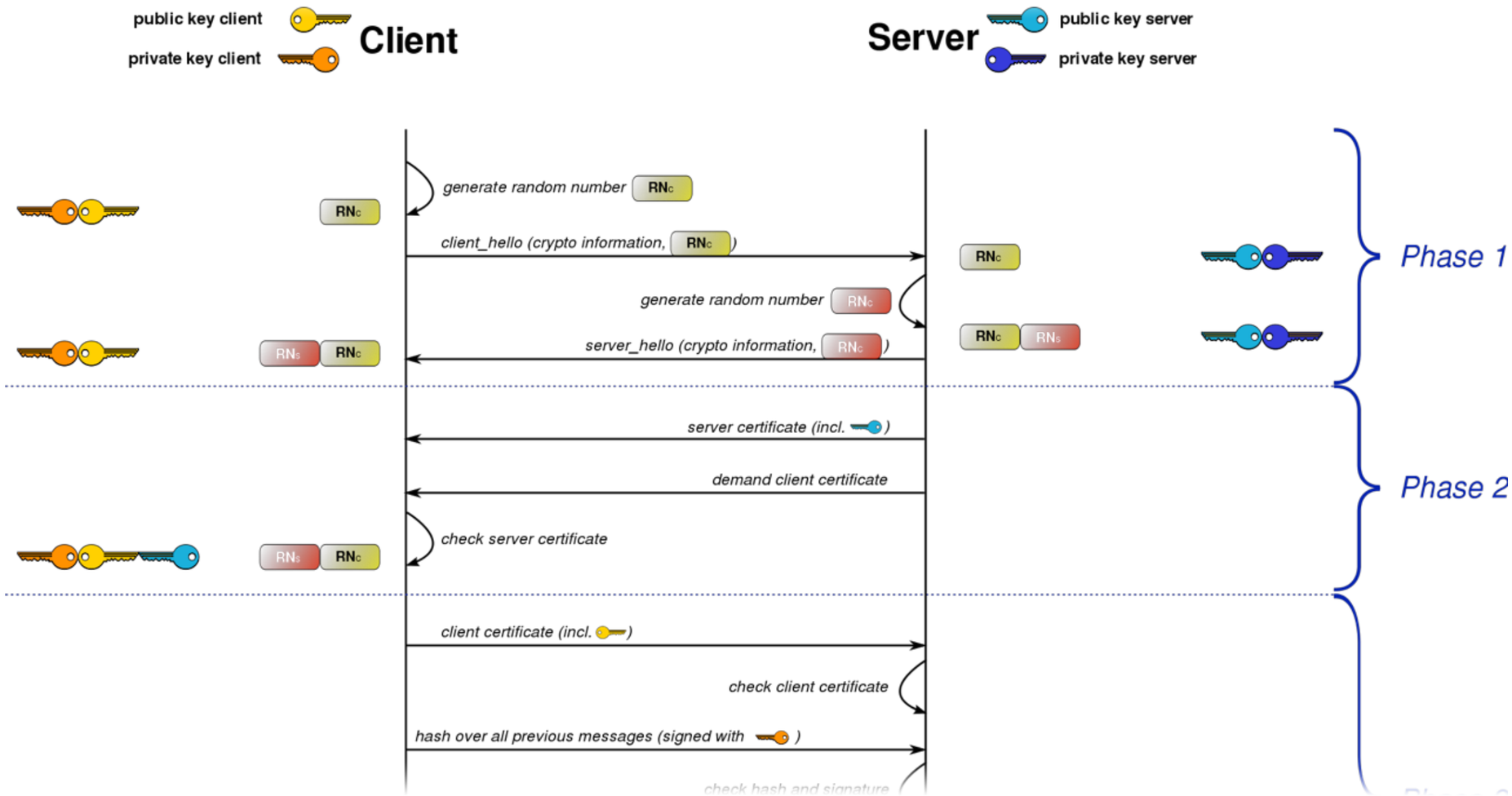
```
#define SERVER_CERT_HASH @"1893bf2d3e527d44f6f1b68632f97e237a48cae8"

- (BOOL)connection:(NSURLConnection *)connection
            canAuthenticateAgainstProtectionSpace:… {
    return ([[protectionSpace authenticationMethod]
         isEqual:NSURLAuthenticationMethodServerTrust]);
}

- (void)connection:(NSURLConnection *)connection
            didReceiveAuthenticationChallenge:… {
             …
  cert = SecTrustGetCertificateAtIndex(trust, certIndex);
  certData = SecCertificateCopyData(cert);
  trusted |= [SERVER_CERT_HASH isEqual:[self sha1HexDigest:(NSData*)
  certData]];
  …
```

```
#define SERVER_CERT_HASH @"1893bf2d3e527d44f6f1b68632f97e237a48cae8"

- (BOOL)connection:(NSURLConnection *)connection
             canAuthenticateAgainstProtectionSpace:… {
    return ([[protectionSpace authenticationMethod]
          isEqual:NSURLAuthenticationMethodServerTrust]);
}

- (void)connection:(NSURLConnection *)connection
             didReceiveAuthenticationChallenge:… {
              …
  cert = SecTrustGetCertificateAtIndex(trust, certIndex);
  certData = SecCertificateCopyData(cert);
  trusted |= [SERVER_CERT_HASH isEqual:[self sha1HexDigest:(NSData*)
  certData]];
  …
```

Insgesamt ca. 60 Zeilen

certcheck.m

HTTPS Handshake



Eigene Verschlüsselung

- Nur zu Beginn der Kommunikation
- Client erstellt zufälligen AES-Schlüssel
- Sendet diesen verschlüsselt mit bekanntem RSA-Public-Key zum Server
- Server dekodiert diesen mittels RSA-Private-Key
- Security.framework

AES (Symmetrisch)

```
#import <CommonCrypto/CommonCryptor.h>

CCCryptorStatus cryptStatus = CCCrypt(kCCDecrypt, kCCAlgorithmAES128,
                                      kCCOptionPKCS7Padding | kCCOptionECBMode,
                                      keyPtr, kCCKeySizeAES128,
                                      NULL,
                                      [self bytes], dataLength, /* input */
                                      buffer, bufferSize, /* output */
                                      &numBytesDecrypted);
```

RSA (Asymmetrisch)

```
#import <CommonCrypto/CommonCryptor.h>


SecKeyRef publicKey = SecTrustCopyPublicKey(trust);

OSStatus  sanityCheck = SecKeyEncrypt(publicKey,
                        kSecPaddingPKCS1,
                        (const uint8_t *)[self bytes],
                        keyBufferSize,
                        cipherBuffer,
                        &cipherBufferSize);
```

```
Cipher c = Cipher.getInstance("AES");
SecretKeySpec k = new SecretKeySpec(key, "AES");

c.init(Cipher.ENCRYPT_MODE, k);
byte[]  encryptedData = c.doFinal(clear.getBytes());

c.init(Cipher.DECRYPT_MODE, k);
byte[]  decryptedData = c.doFinal(encrypted.getBytes());
```


```
KeyStore keyStore = KeyStore.getInstance("PKCS12");
keyStore.load(new FileInputStream(…), password);

Cipher decryptCipher = Cipher.getInstance("RSA");
        decryptCipher.init(Cipher.DECRYPT_MODE,keyStore.getKey
("…",password));
byte[] messageDecrypte = decryptCipher.doFinal(messageCrypte);
```

```
Cipher c = Cipher.getInstance("AES");
SecretKeySpec k = new SecretKeySpec(key, "AES");

c.init(Cipher.ENCRYPT_MODE, k);
byte[]  encryptedData = c.doFinal(clear.getBytes());

c.init(Cipher.DECRYPT_MODE, k);
byte[]  decryptedData = c.doFinal(encrypted.getBytes());
```

```
CertificateFactory cf = CertificateFactory.getInstance("X.509");
trustedCert = (X509Certificate) cf.generateCertificate(Application.
          getInstance().getResources().openRawResource(R.raw.encryption));
encryptCipher = Cipher.getInstance("RSA/ECB/PKCS1Padding");

encryptCipher.init(Cipher.ENCRYPT_MODE,trustedCert.getPublicKey());
byte[] messageEncrypte = encryptCipher.doFinal(key);
```

Fragen?

Der finale Code:

http://pascal-bihler.de/macoun2011-final.zip

Vielen Dank