Lecture 13
November 7, 2001

- Authentication & Identification

SSL and S-HTTP

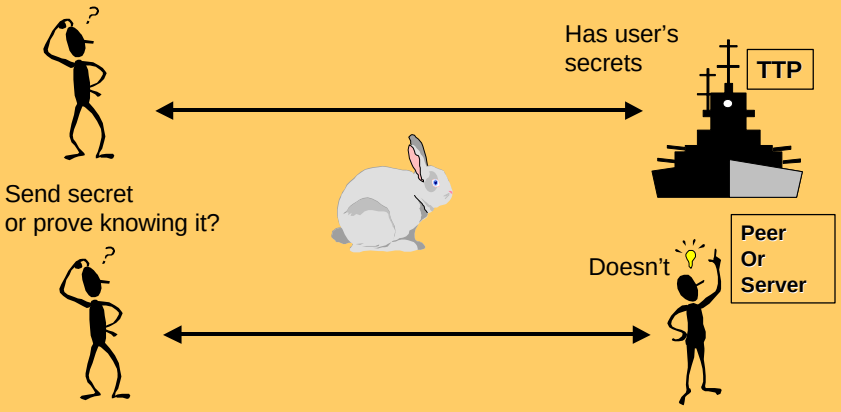
- SSL (Secure Socket Layer), S-HTTP (Secure HTTP)
- Certificate based systems without specific PKI
- CA certificates are embedded in browsers
- You (client) trust them because the browser company (MS, NS, AOL) wants you to!
- The worst security, but the most practical !!!

Authentication and identification

Purpose

Examples:

- Bank transactions, e.g., cash withdrawals
- Remote login
- File access or print

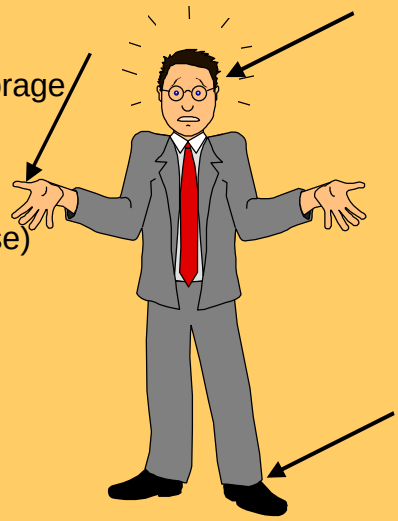


Human Failings

- Humans are notoriously unreliable
- Human memory is very volatile storage

What a human can remember:
- PIN (not more than 6-8 digits)
- Password (a word or a short phrase)
- Single-digit sums? Forget it…

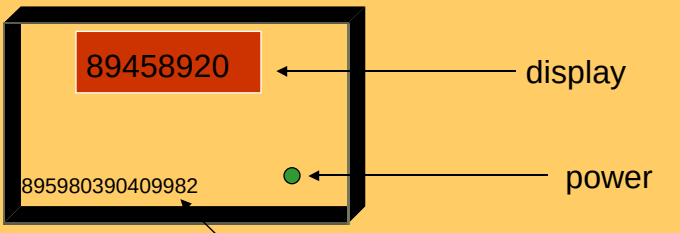
Biometrics:
Eyes, fingers, writing, toes?



Concrete ID Scenarios

- **PIN-, PW-, Biometric-based schemes**
  - **Kerberos (covered later)**
  - **SecureID token**
  - **Iris/retina scanners**
  - **Thumbprint & Handprint**
  - **Handwriting acceleration & pressure**
- **Public Key Identification Schemes:**
  - **Fiat-Shamir, Schnorr, Guillou-Quisqater**

SecureID



TTP knows all secrets!

Id-based key (inside)

Serial #

Fiat-Shamir ID Scheme

$p, q - large\ primes$

$n = pq$

$t - security\ parameter$

$Publics: n, t, ID = x^2 \bmod n$

$Secrets: p, q - global, x - Alice$

$Note: \gcd(x, n) = 1$

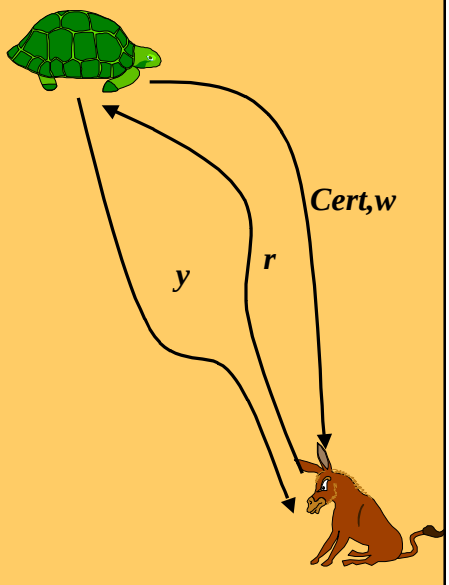
$1. Alice: k \in [1, n[\ ,\ w = k^2 \bmod n$

$2. Bob: r \in [0,1]$

$3. Alice: y = kx^r \bmod n$

$4. Bob: y^2 = ? = wID^r \bmod n$

$Repeat\ \ t\ \ times!$



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Repeat t times!

Suppose t=1
Eve chooses:

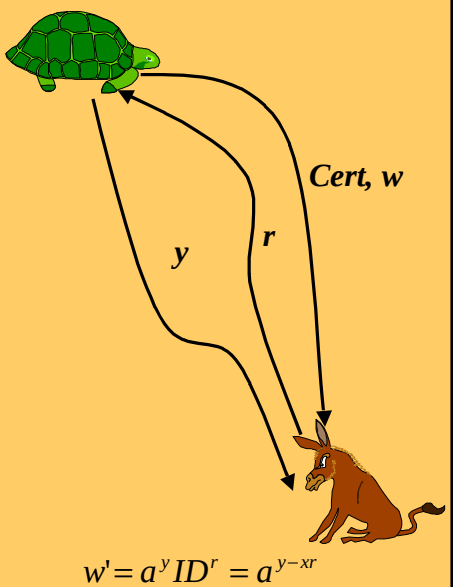
$any\quad k$
$w = k^2 / ID$
$if\ (r = 1)\ y = k$
$Bob: y^2 = k^2 = ? = wID^1 = k^2$
$if\ (r = 0)\ y = \sqrt{w} = k / \sqrt{ID}$

Schnorr ID Scheme (contd)

$p - large\ prime$
$q - large\ (prime)\ divisor\ of\ \ p - 1$
$g - generator$
$a = g^{(p-1)/q} \bmod p$
$t - security\ parameter\ (40?)$

$Publics: p, q, g, a, t, ID = a^{-x} \bmod p$
$Secrets: x\ \ (Alice)$

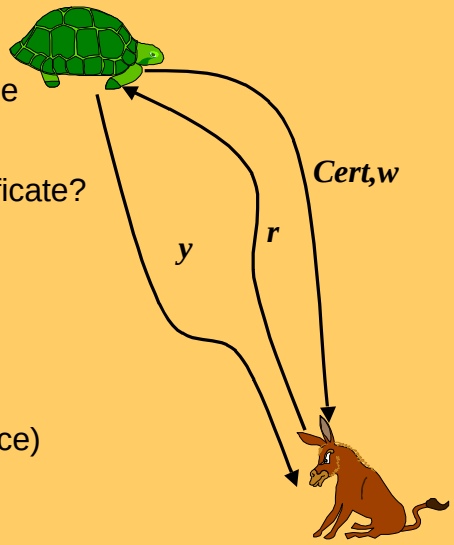
$Alice: k \in [0, q[\ ,\ w = a^k \bmod p$
$Bob: r \in [1, 2^t]$
$Alice: y = k + xr \bmod q$
$Bob: w = ? = a^y ID^r \bmod p$



$w' = a^y ID^r = a^{y - xr}$

Attacks on ID Schemes

- Eve forges Alice's certificate
- Eve guesses Bob's challenge
- Eve computes x from ID
- Eve obtains a copy-cat certificate?



- Efficient for BW, CPU
- Targeted for smartcards (Alice)
- Used commercially
- Not proven secure