Security, Authentication and Authorisation

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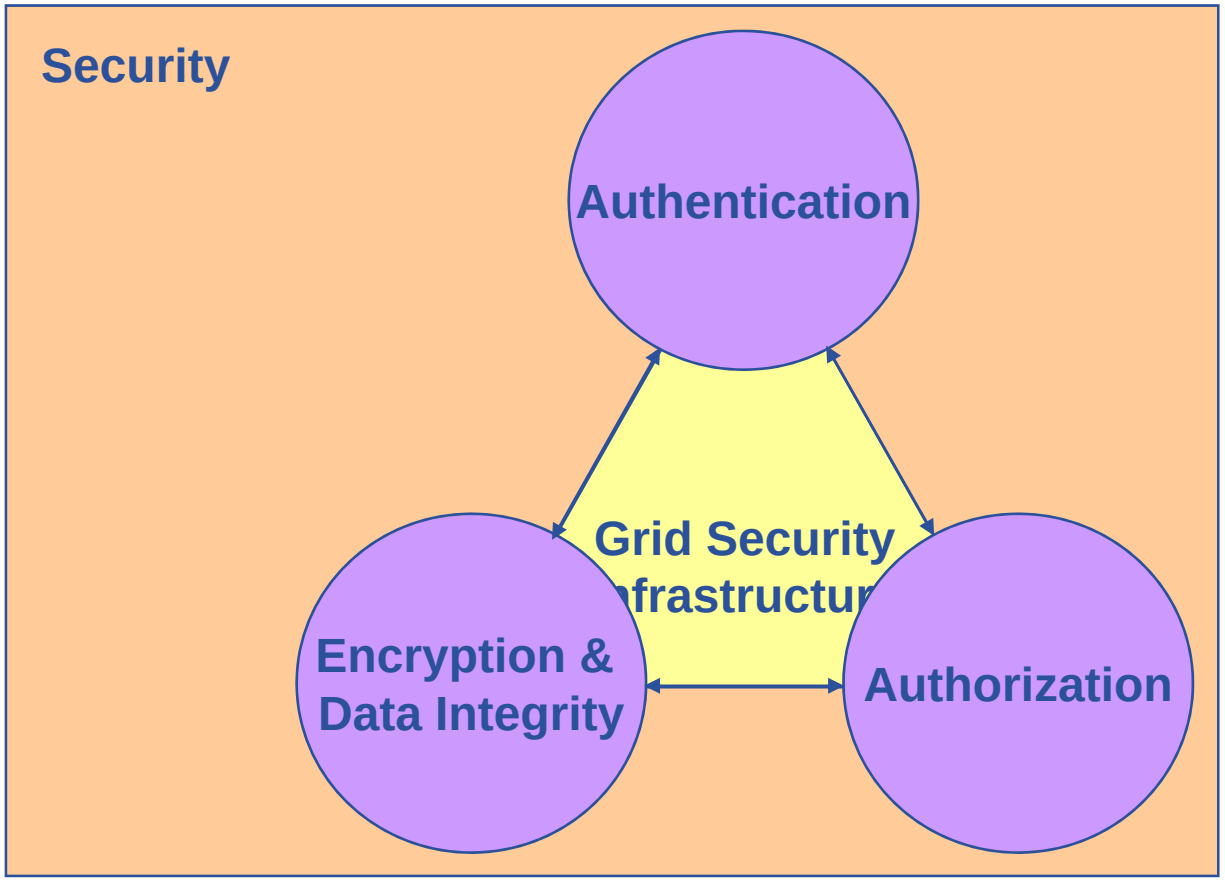
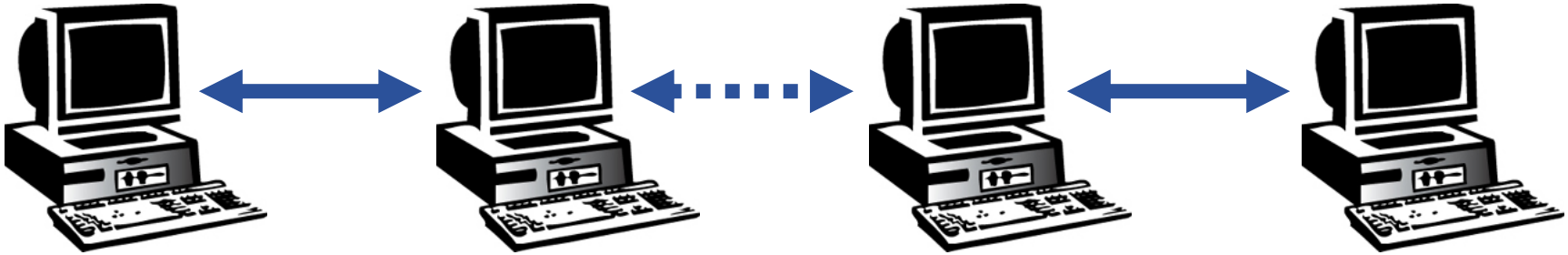
Minor changes and adaptation for Bulgarian users by Stanislav Spasov - spasov@acad.bg

Security Overview



The Problems - 1



User **Resource**

- **How does a user securely access the Resource without having an account with username and password on the machines in between or even on the Resource?**

- **How does the Resource know who a user is?**
- **How are rights controlled?**

Authentication: how is identity of user/site communicated?

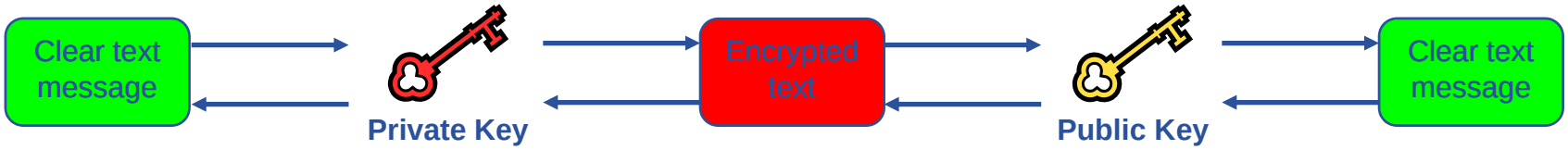
Authorisation: what can a user do?

The Problems -2: reducing vulnerability

- **Launch attacks to other sites**
  - Large distributed farms of machines, perfect for launching a Distributed Denial of Service attack.
- **Illegal or inappropriate data distribution and access sensitive information**
  - Massive distributed storage capacity ideal for example, for swapping movies.
  - Growing number of users have data that must be private – biomedical imaging for example
- **Damage caused by viruses, worms etc.**
  - Highly connected infrastructure means worms could spread faster than on the internet in general.

Basis of security & authentication

- **Asymmetric encryption…**

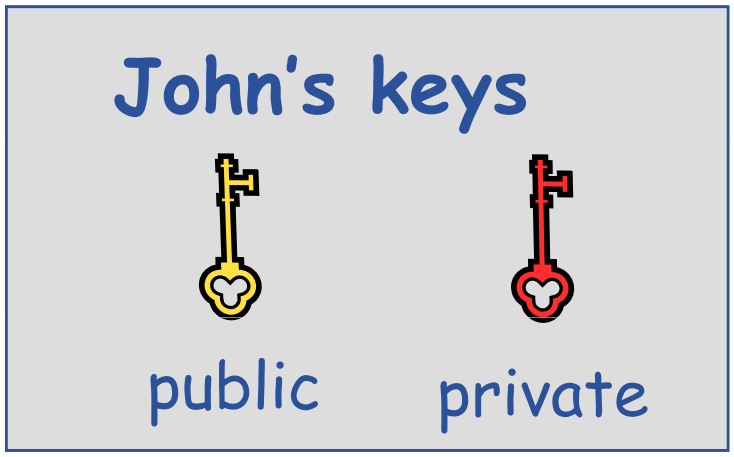


- **…. and Digital signatures …**
  - A hash derived from the message and encrypted with the signer's private key
  - Signature is checked by decrypting with the signer's public key

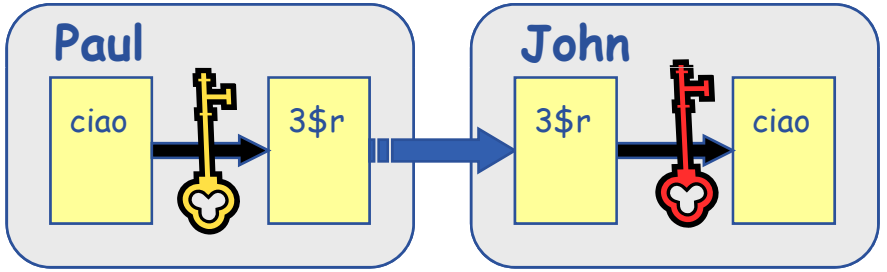
- **Are used to build trust**
  - That a user / site is who they say they are
  - And can be trusted to act in accord with agreed policies

Public Key Algorithms

- **Every user has two keys: one *private* and one *public*:**
  - it is *impossible* to derive the private key from the public one;
  - a message encrypted by one key can be decrypted **only** by the other one.

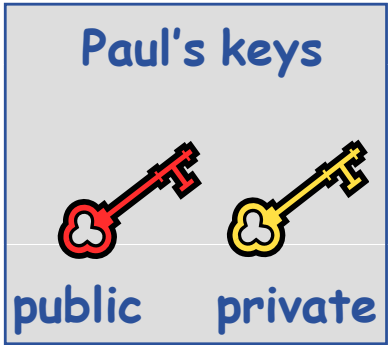


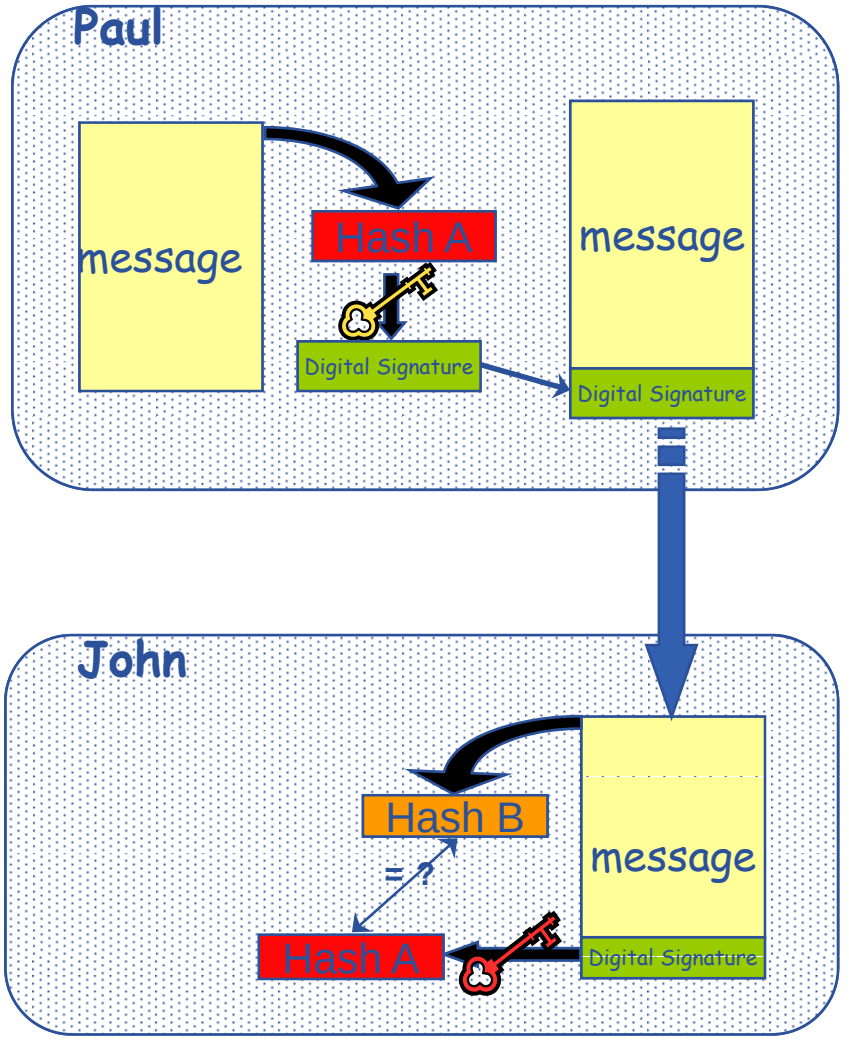
- **Concept - simplified version:**
  - Public keys are exchanged
  - The sender encrypts using receiver's public key
  - The reciever decrypts using their private key;



Digital Signature

- Paul **calculates the *hash* of the message**
- Paul **encrypts the hash using his *private* key: the encrypted hash is the *digital signature*.**
- Paul **sends the signed message to** John.
- John **calculates the hash of the message**
- **Decrypts signature, to get A, using Paul's *public* key.**
- **If hashes equal:**
  1. message wasn't modified;
  2. hash A is from Paul's private key





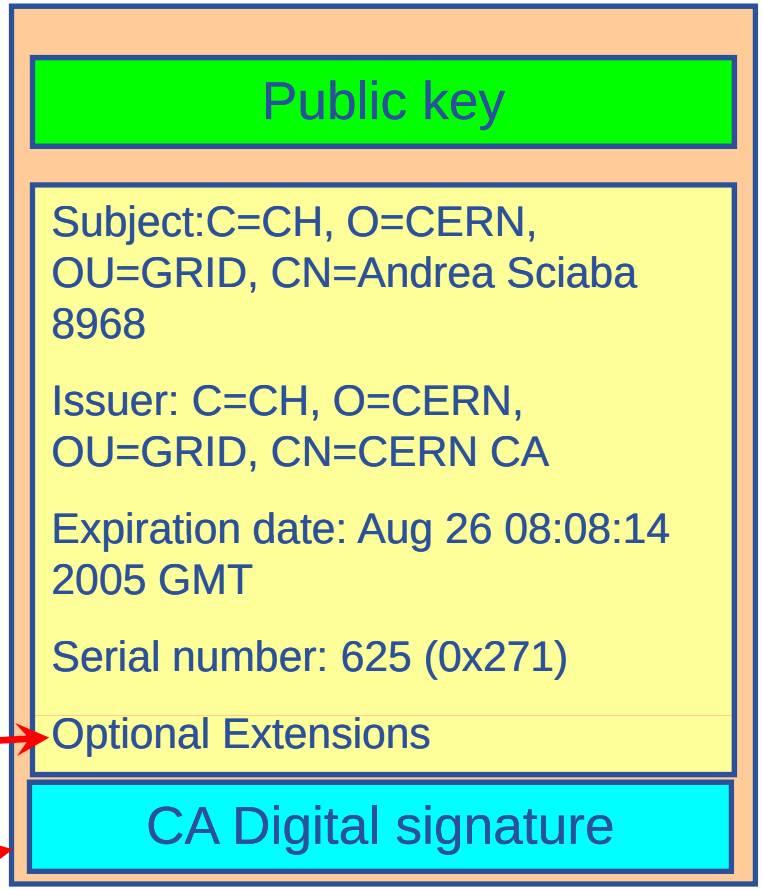
Digital Certificates

- **How can John be sure that Paul's public key is really Paul's public key and not someone else's?**
  - A *third party* signs a certificate that binds the public key and Paul's identity.
  - Both John and Paul trust this third party

The "trusted third party" is called a *Certification Authority* (CA).

X.509 Certificates

- **An X.509 Certificate contains:**
  - owner's public key;
  - identity of the owner;
  - info on the CA;
  - time of validity;
  - Serial number;
  - Optional extensions
  - digital signature of the CA

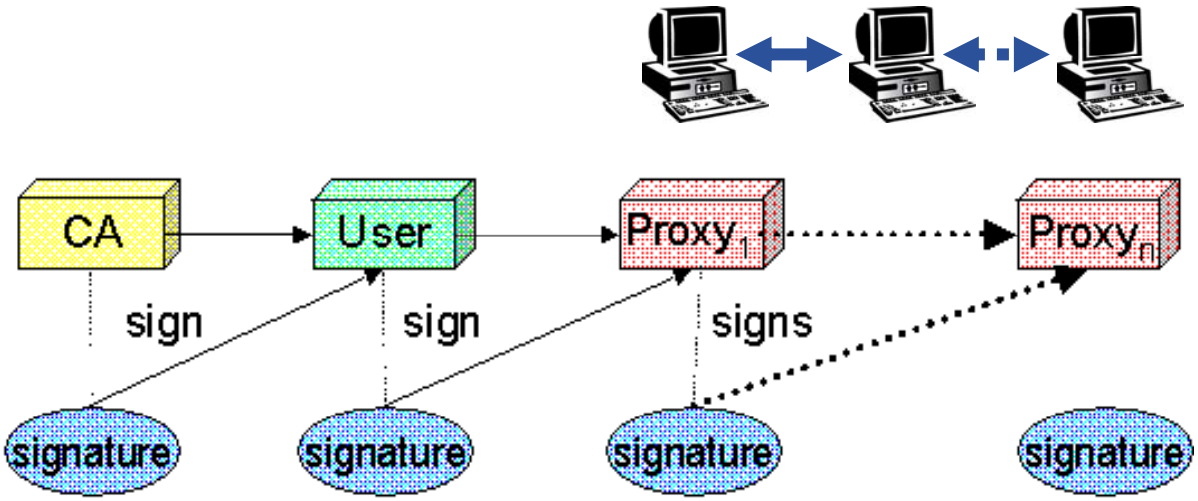


Certification Authorities

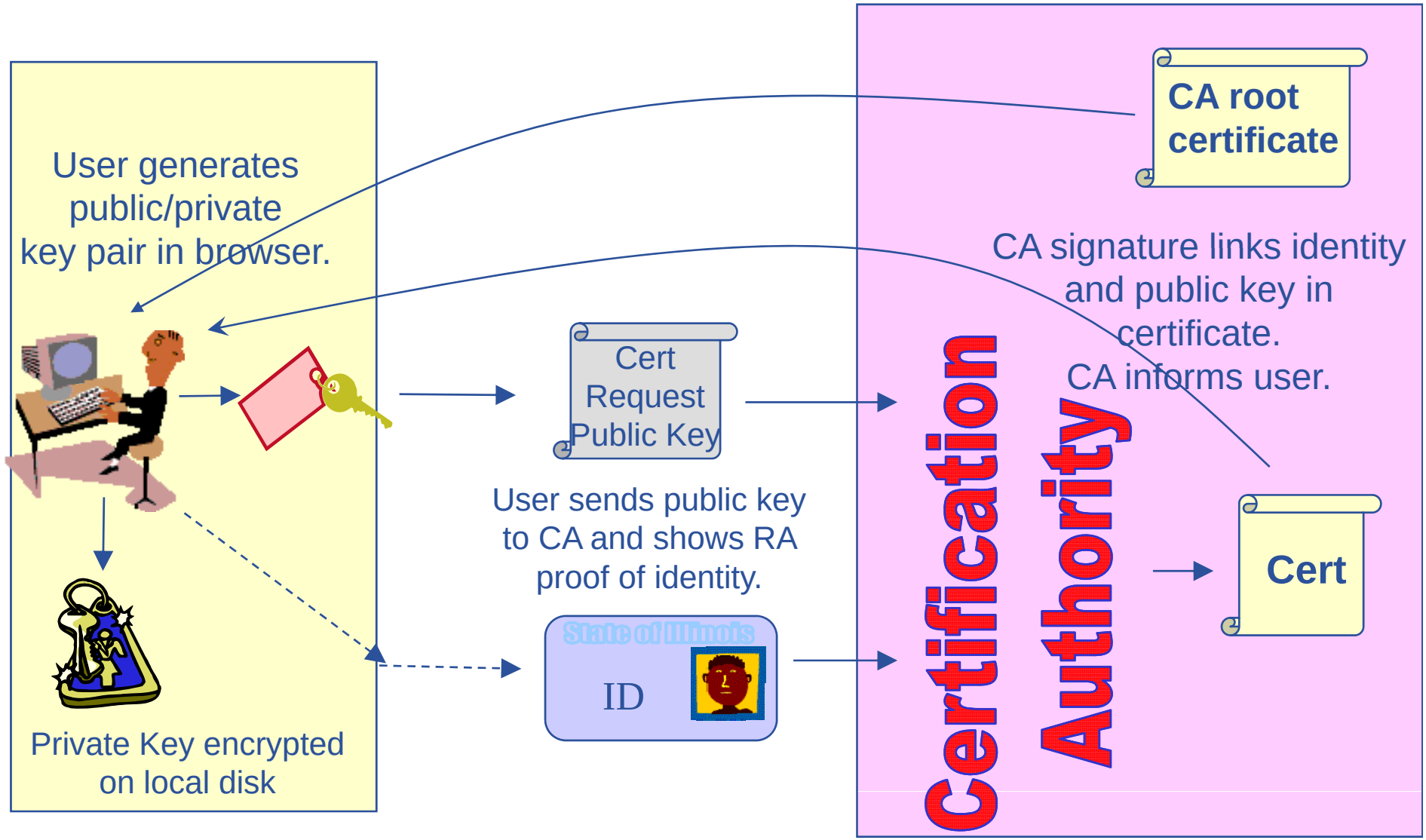
- **User's identity has to be certified by one of the national *Certification Authorities* (CAs)**
- **Resources are also certified by CAs**
- **CAs are mutually recognized http://www.gridpma.org/, http://www.eugridpma.org/,**
- **CAs each establish a number of people "registration authorities" RAs**

Grid Security Infrastructure - proxies

- **To support delegation: A delegates to B the right to act on behalf of A**
- **proxy certificates *extend X.509 certificates***
  - Short-lived certificates signed by the user's certificate or a proxy
  - Reduces security risk, enables delegation



Certificate Request



User Responsibilities

- **Keep your private key secure – *on USB drive only***
- **Do not loan your certificate to anyone.**
- **Report to your local/regional contact if your certificate has been compromised.**
- **Do not launch a delegation service for longer than your current task needs.**

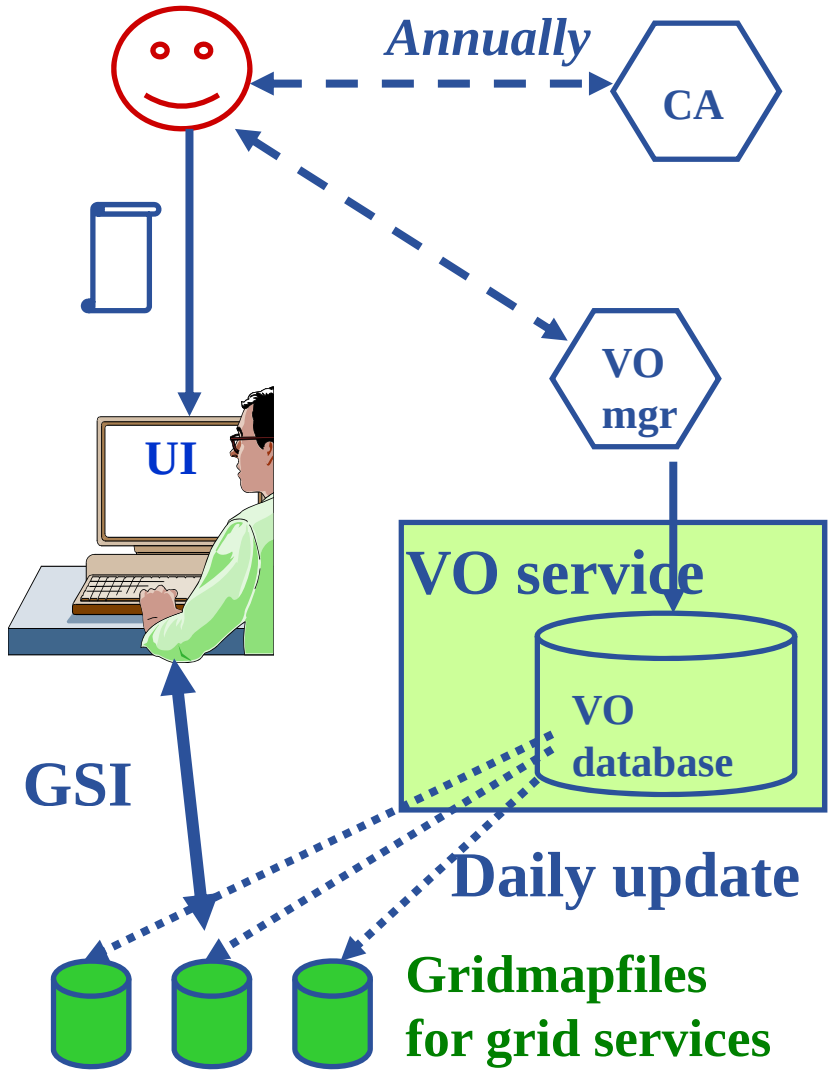
If your certificate or delegated service is used by someone other than you, it cannot be proven that it was not you.

AA Summary

- **Authentication**
  - User obtains certificate from Certificate Authority
  - Connects to UI by ssh
    UI is the user's interface to Grid
  - Uploads certificate to UI
  - Single logon – to UI - create proxy
  - then **Grid Security Infrastructure uses proxies**

- **Authorisation**
  - User joins Virtual Organisation
  - VO negotiates access to Grid nodes and resources
  - Authorisation tested by resource:

Gridmapfile (or similar) maps user to local account



Links for Further Information

The definitive sources:

http://www.egee.nesc.ac.uk/

http://glite.web.cern.ch/

http://glite.web.cern.ch/glite/documentation/default.asp

Read The … Fine Manual:

https://edms.cern.ch/file/722398//gLite-3-UserGuide.html

https://edms.cern.ch/file/722398//gLite-3-UserGuide.pdf

But also:

http://wiki.egee-see.org/

http://www.grid.bas.bg/

http://ca.acad.bg