Open Science Grid

Security in OSG

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Logistical reminder

It is OK to ask questions

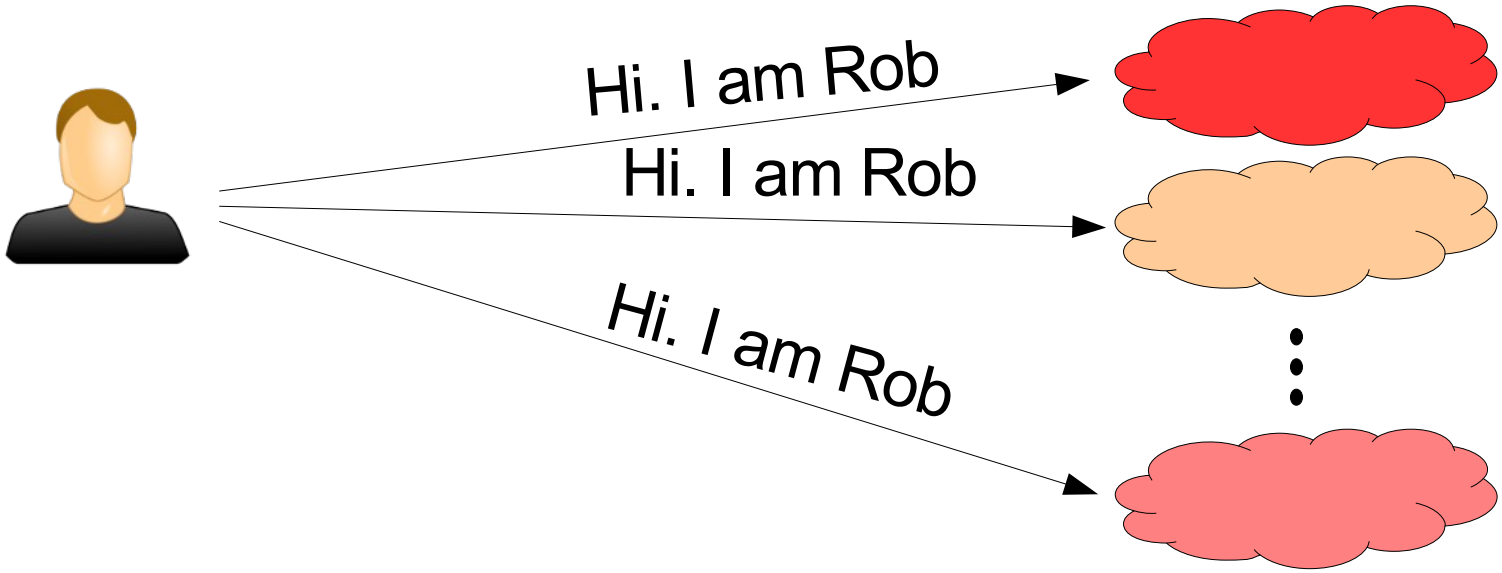
- During the lecture
- During the demos
- During the exercises
- During the breaks

If I don't know the answer,
I will find someone who likely does

Reminder – Single sign-on

The user should use the same mechanism to submit jobs to any site

And there are 100s of them in OSG

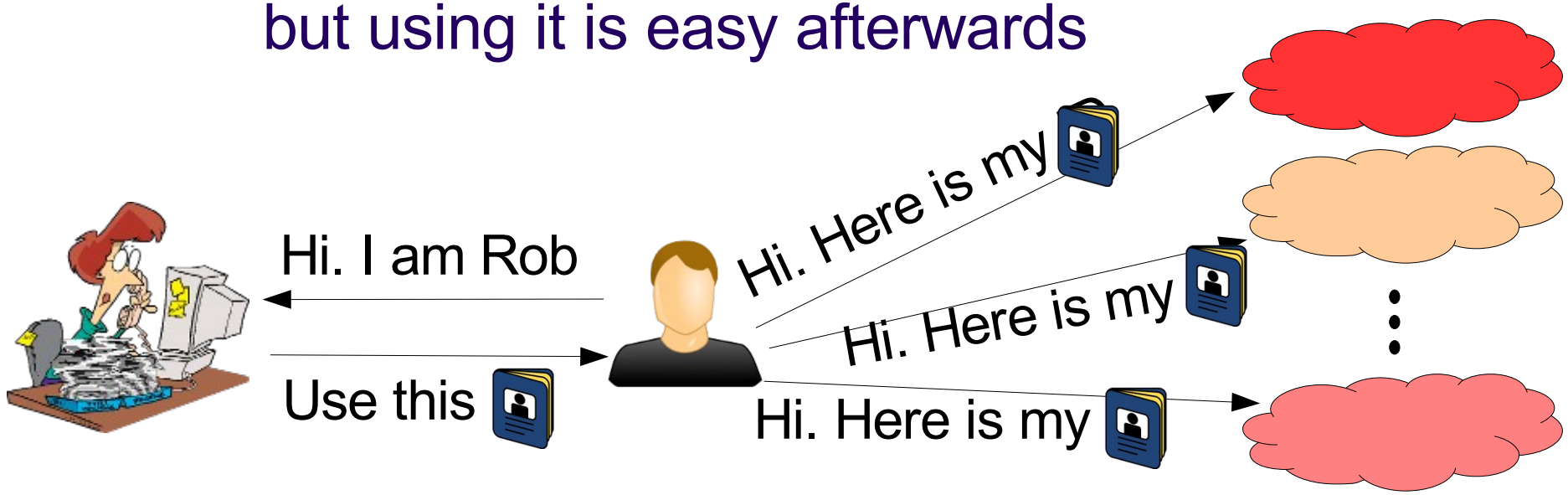


Passwords a non-starter

- We all know username/password is the preferred authentication mechanism
  - Almost everybody use it!
- But not a good solution for distributed systems
  - Uses a **shared secret** between **the user and the service provider**
  - And secrets stay secret only if few entities know it
    - **Sharing passwords between sites a bad idea!**

Adding an intermediary

- A better approach is to introduce a highly trusted intermediary
- Have been used in real life for ages
  - e.g. States as issuers of IDs/Passports
  - Getting the ID can be a lengthy process, but using it is easy afterwards



Adding an intermediary

A better approach is to introduce a highly trusted intermediary

Have been us[illegible] ges

e.g. State[illegible]

Getting[illegible]

but[illegible]

Chain of trust.

You are trusted because the site trusts the issuer, and the issuer trusted you.

Hi. I am [illegible]

Use this

Hi. Here is my

Technical implementations

- Many technical solutions
  - x.509 PKI
  - Kerberos
  - OpenID
  - many more...
- All based on the same basic principle
  - Each has strengths and weaknesses
  - OSG standardized on x.509

Will not argue if it is the best one.

x.509 PKI

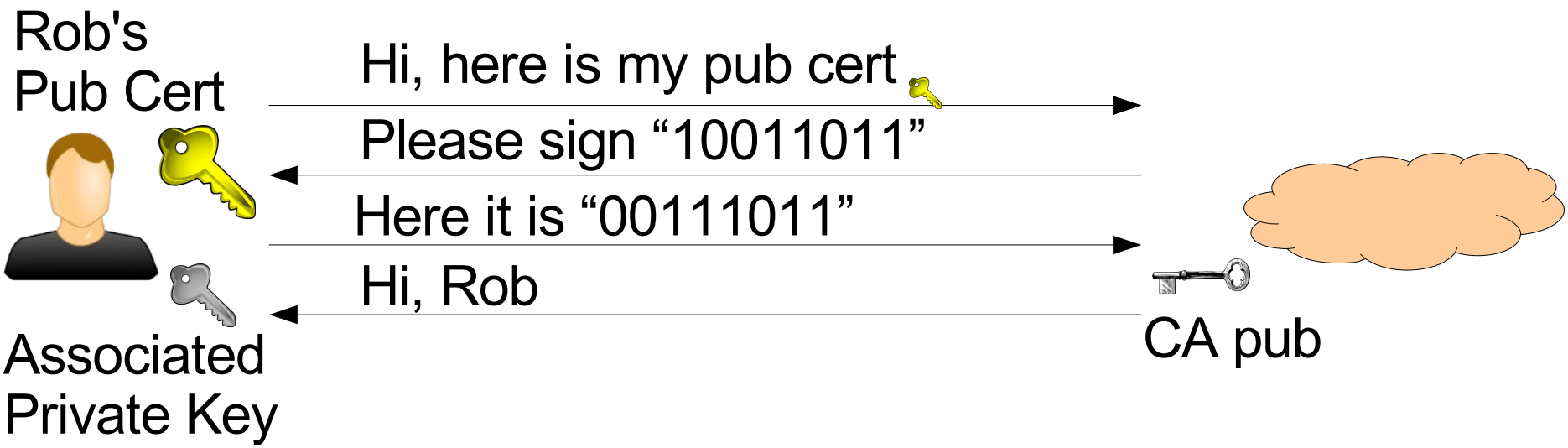
- Based on public key cryptography
  - A user has a (private,public) key pair
    - One signs, the other verifies
- The highly trusted entity is called a **Certification Authority** (CA)
  - The user is given a **certificate**
  - Cert. has user name in it
  - Cert. also contains the (priv,pub) key pair
  - Cert. has a limited lifetime
  - Cert. is signed by the CA private key

You should have one by now.

x.509 authentication

Sites have CA public key pre-installed

User authenticates by signing a site provided string and providing the public part of the cert



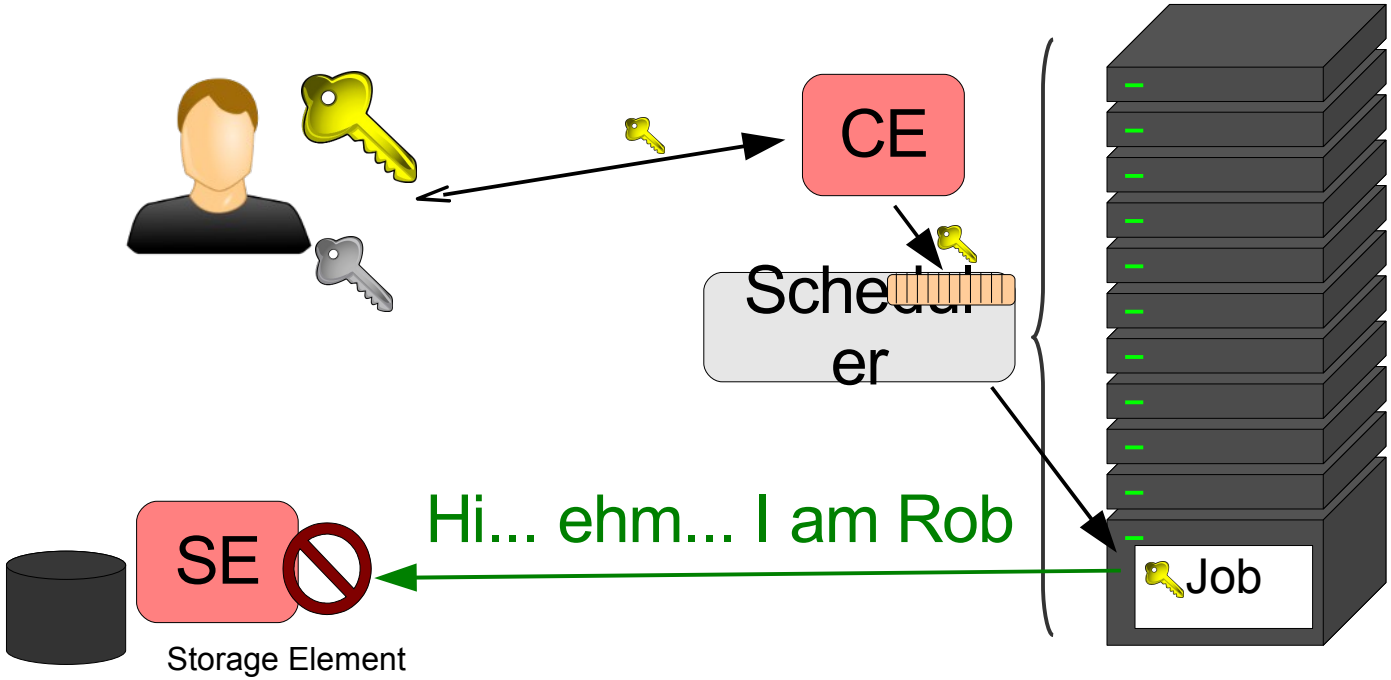
Mutual authentication

- The OSG clients also require servers to authenticate
  - Same principle as before
  - The site's server owns a x.509 certificate
  - User client must have the CA pre-installed
- So we have mutual authentication

Impersonation

Sometimes your jobs need to impersonate you

For example to access remote data



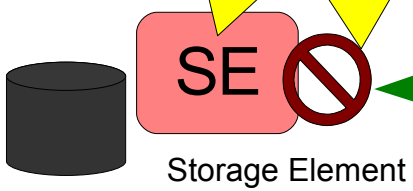
Impersonation

Sometimes your jobs need to impersonate you

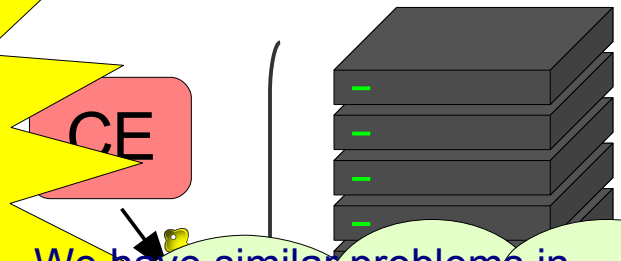
- Fo[illegible] access remote data

Obviously will not work.

The job does not have your private key.



Hi... e[illegible]



We have similar problems in real life, too

e.g. attorney representing you in court

Nobody will buy it that he is you, yet he can speak on your behalf

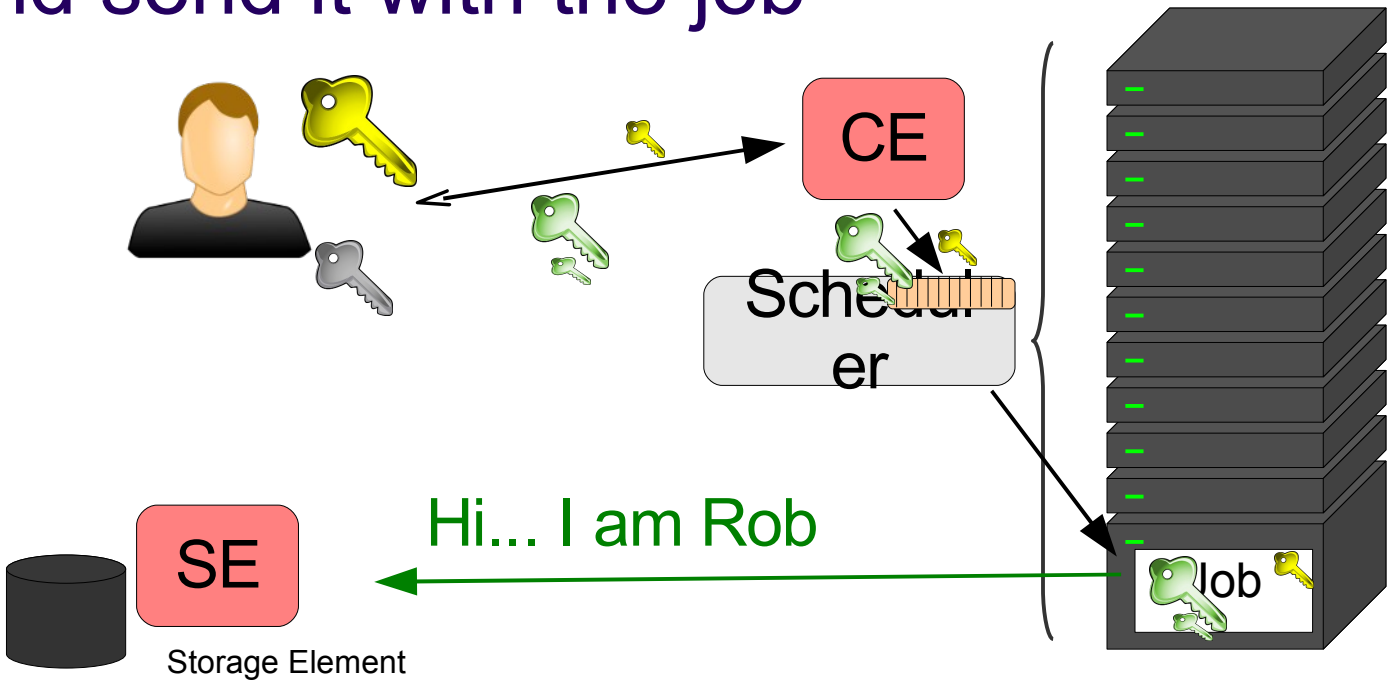
Proxy delegation

The **job is** indeed **not you**

Create a proxy certificate for the job

- Add another level of trust delegation

And send it with the job



Proxy delegation

The **job is** indeed **not you**

Create a proxy certificate for the job

Add another delegation

And send

YES!

You are sending the **proxy's private key** to the WN.

Risk mitigation

- Proxy delegation is risky
  - Your proxy could be stolen
- In OSG, we mitigate by limiting lifetime
  - At most few hours recommended
  - After the proxy expires, the proxy is useless
- Can be annoying
  - Must keep renewing, if long running job!

But we don't have anything better.

Risk mitigation

Proxy delegation is risky

- You … stolen
- If … iting lifetime
- … nded
- Ca … roxy is useless
- Mu … t long running job!

If using glideinWMS, Condor will automatically create a short lived proxy and keep re-delegating it.

But we do … anything

Completely transparent to you.

x.509 in Overlay systems

x.509 is typically used in Overlay systems as well

For glideinWMS,
all communication between processes is mutually authenticated using x.509 (proxy) certificates

Authentication vs. Authorization

Just because you can authenticate yourself, it does not mean you are authorized, too

- e.g. your passport tells who you are, but does not allow you to drive a car

x.509 PKI only covers **authentication**

- Tells the site who you are

Need a different mechanism for authorization

Per-user authorization not an option

The naive approach is using a list

- Since we do not want let just anyone in!

However, the problem is scale

- OSG has ~10,000 users!
- Sites do not want to decide on a user-by-user basis!

Server authorization is easy.

Just require host name in the certificate name; CA will enforce this.

The client decides which host to talk to.

Adding roles

- Sites want to operate on higher level concepts
  - Some kind of attribute
- Like in real life
  - Think about passport vs driver's license
  - Both tell a cop who you are
    (and to 1st approx. are issued by the same entity)
  - But the driver's license tells him
    you are allowed to use a car, too
    - "Class:C"

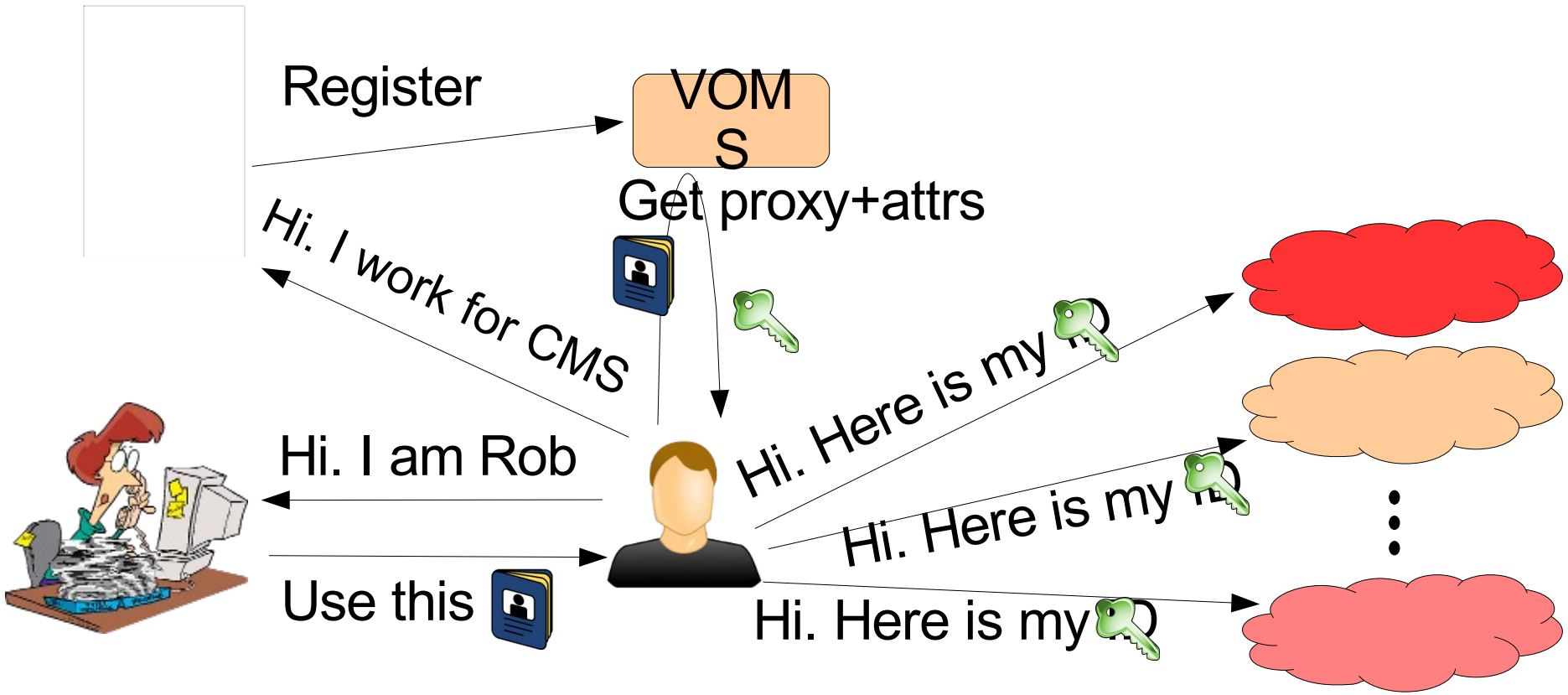
Need for an attribute authority

- Users can have many roles
  - But don't want to have multiple certs
  - e.g. I may be running HEP jobs or School jobs
- So the attributes cannot come from the CA
  - And you would not just trust the user
- In OSG, we use VOMS
  - Virtual Organization Management System
  - OSG expects well organized VOs (e.g. CMS)

VO and VOMS

VO decides who is worthy of an attribute

Site decides based on that attribute



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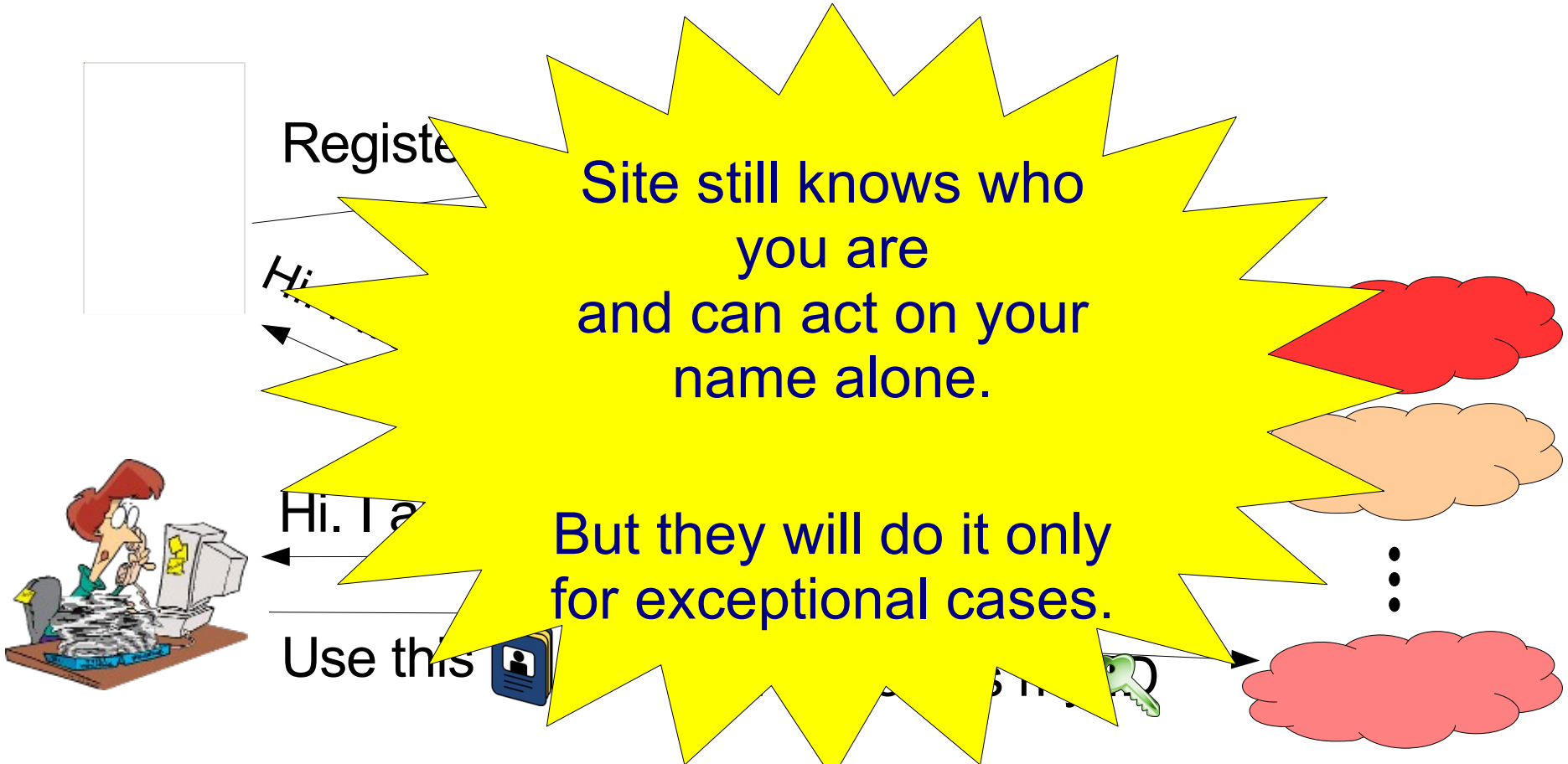

More security considerations

- There is much more than authentication and authorization to security
  - But we don't have the time to cover everything
- Just briefly
  - Sharing of resources
  - Privacy
  - Acceptable conduct

Sharing of resources

- Modern CPUs are many-core, so
  - Very likely your job will be sharing the node with other jobs
- Sites will map your Grid name into UID
  - Hopefully unique... be sure to ask
- Standard *NIX protections
  - Act accordingly
  - e.g. no file should be world writable

Privacy

- By default, no privacy in OSG
  - Assume all your files are publicly readable
  - Apart from your proxy
- If you need privacy, you will have to take explicit measures
  - Both during network transfers, and
  - For files on disk
- x.509 can be used for encryption
  - But remember, proxy has new keys

Acceptable conduct

- Each OSG user is bound by its AUP (Acceptable User Policy)
  - And sites are allowed to have additional rules in place
- In a nutshell
  - Use only for the declared science purpose
  - Do not overload the system
  - Do not attempt to circumvent security

Else,
you will be
banned!

Questions?

Questions? Comments?

Feel free to ask me questions later:

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