Open Science Grid

Introduction to the Grid and the glideinWMS architecture

Tuesday morning, 11:15am

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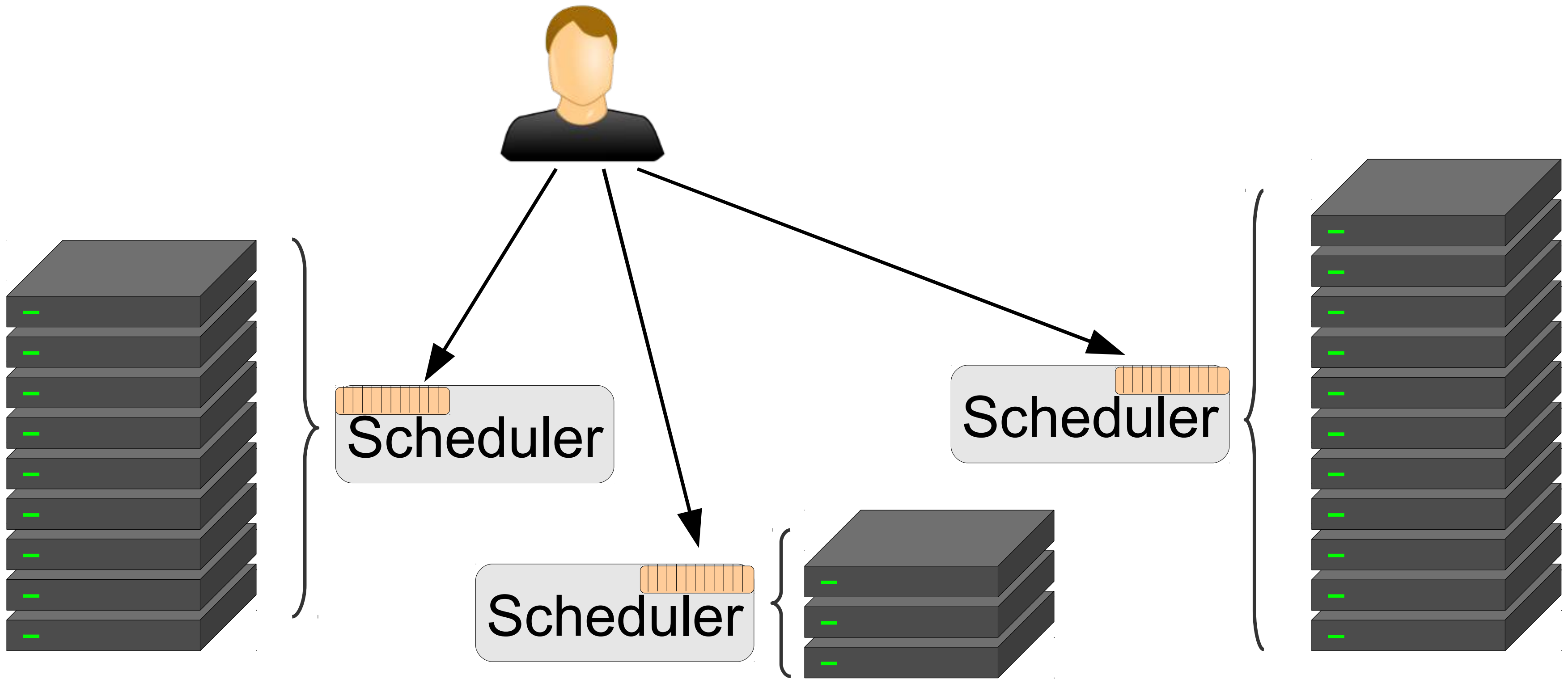
Open Science Grid

Logistical reminder

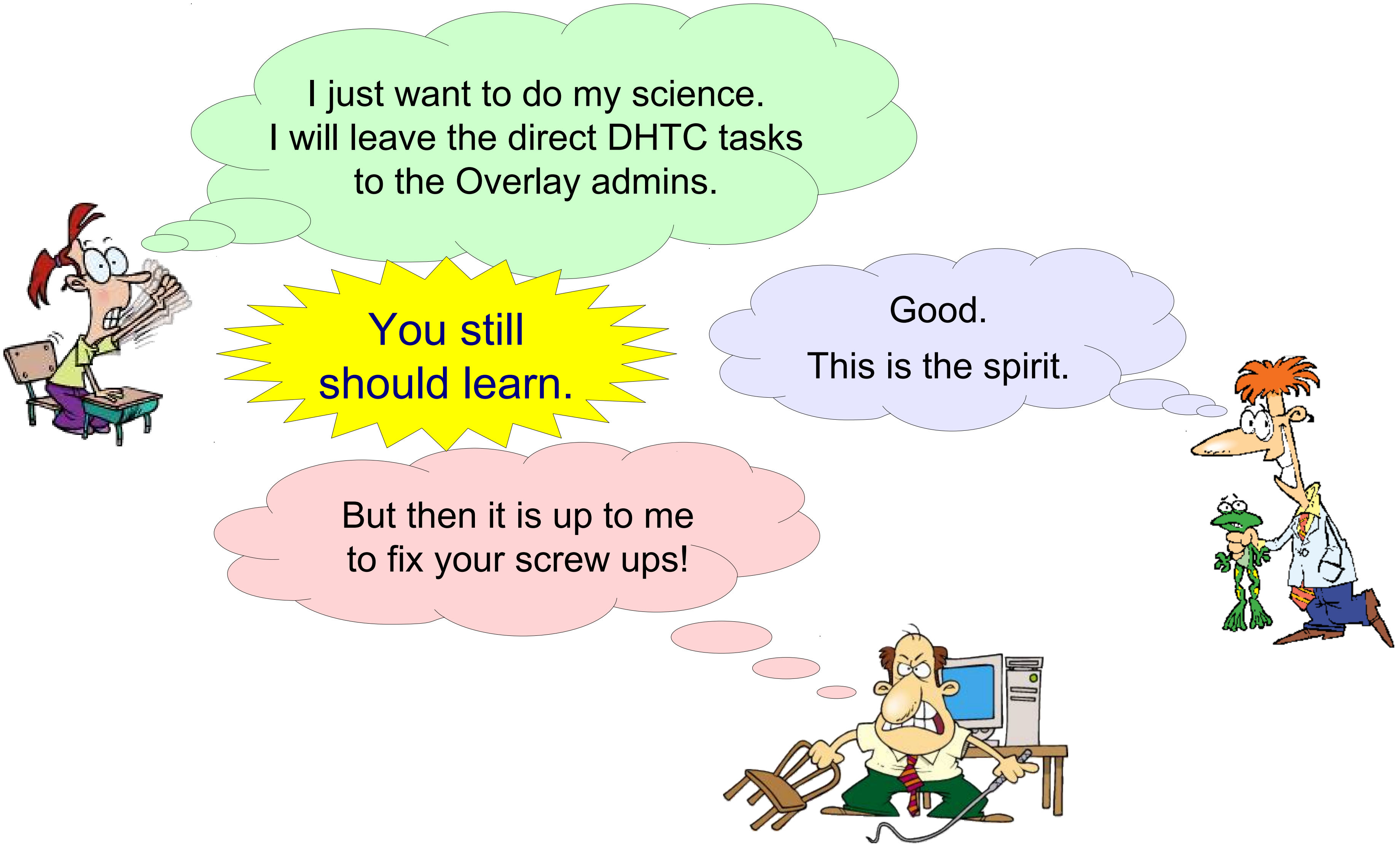
- It is OK to ask questions
  - During the lecture
  - During the demos
  - During the exercises
  - During the breaks
- If I don't know the answer,
  I will find someone who likely does

Reminder - DHTC

- DHTC is about computing on **more than one** HTC system



This lecture goes into details of DHTC



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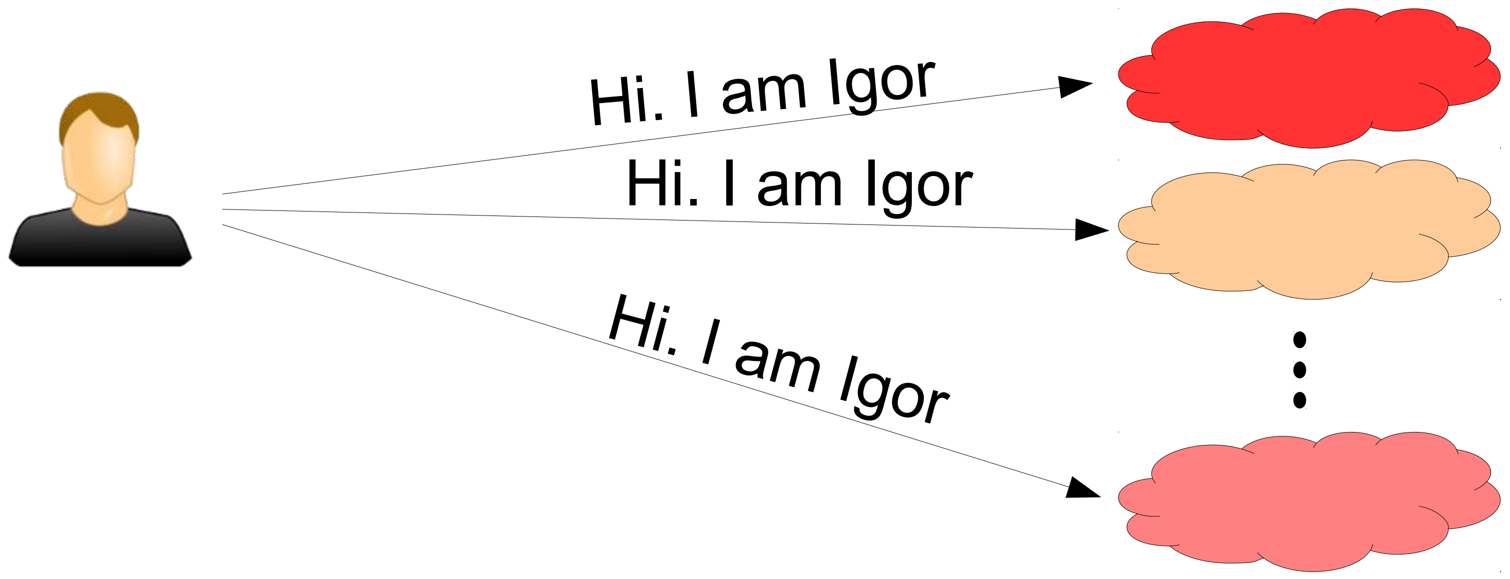
The Grid

- One instance of DHTC
- The idea behind the Grid is to provide a single interface to any HTC system
  - No matter where it is located
  - No matter who operates it
  - No matter what technology it uses
- Based on two principles
  - Single sign-on
  - An abstraction layer for job submission

Single sign-on

- The idea is simple
  - The user should use the same mechanism to submit jobs to any site
    (and there can be 100s of them!)



OSG uses Certificates

- Think of it as a passport
  - It is issued once to you
  - You present it for inspection when doing immigration
  - The immigration officer uses the information in the passport to let you in
- In OSG it is essentially a file

More details in the afternoon

OSG uses Certificates

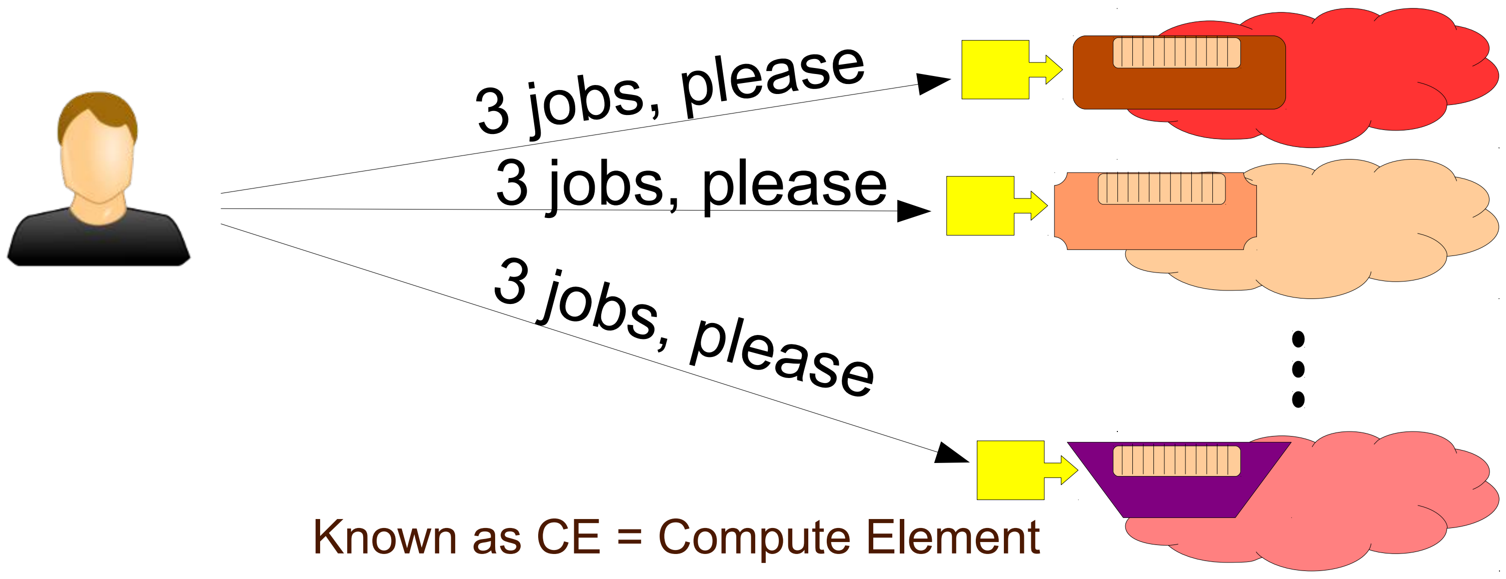
- Think of it as a passport
  - It is iss
  - Yo
- In O

Make sure you get one today!
You will need it for the storage exercises tomorrow.
(We have no Grid exercises)

More details in the afternoon

Abstraction layer for submission

- Again, you want the same mechanism to submit jobs to any site
- We put an abstraction layer between the user and the site-specific technology



Known as CE = Compute Element

Theory and practice

- In practice, no single abstraction layer
  - Several products: GRAM, CREAM, ARC
- Although OSG mostly uses GRAM
  - But even this is under discussion

Theory and practice

- In practice, no single abstraction layer
  - Several produ s: G AM CR AM, ARC
- Althou AM
  - B

Need a flexible submission tool

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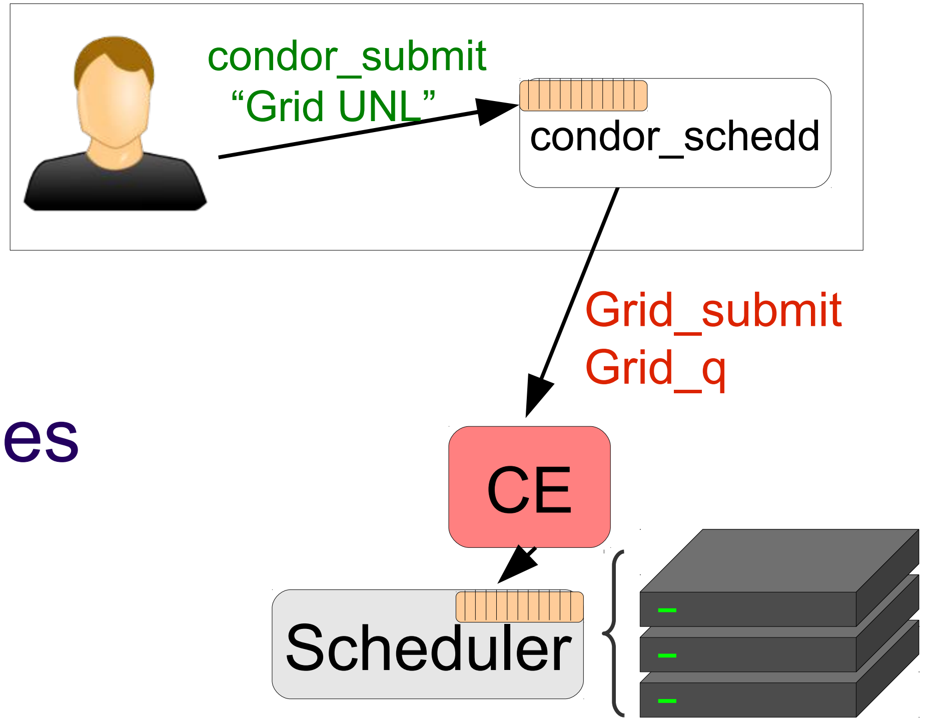
Enter Condor-G

- Condor happens to be the best, most flexible submit tool
  - Indeed, the recommended tool in OSG
- Condor-G is just a name for the components handling “Grid universe” jobs
  - You would still be using condor_submit and condor_q

Condor-G details

- Condor-G doesn't manage remote resources
  - It just forwards and monitors jobs sent to remote HTC systems
  - No condor_status
- No matchmaking
  - User explicitly specifies API and site to use



CE as a black box

- Practically all CE implementations provide only minimal functionality
  - Job submission
  - Basic job monitoring
  - Job removal

Side effect of abstraction

- If anything goes wrong,
  very hard to discover the core reason
  - Not always, but way too often
  - Requires contact with the remote admins

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CE as a black box

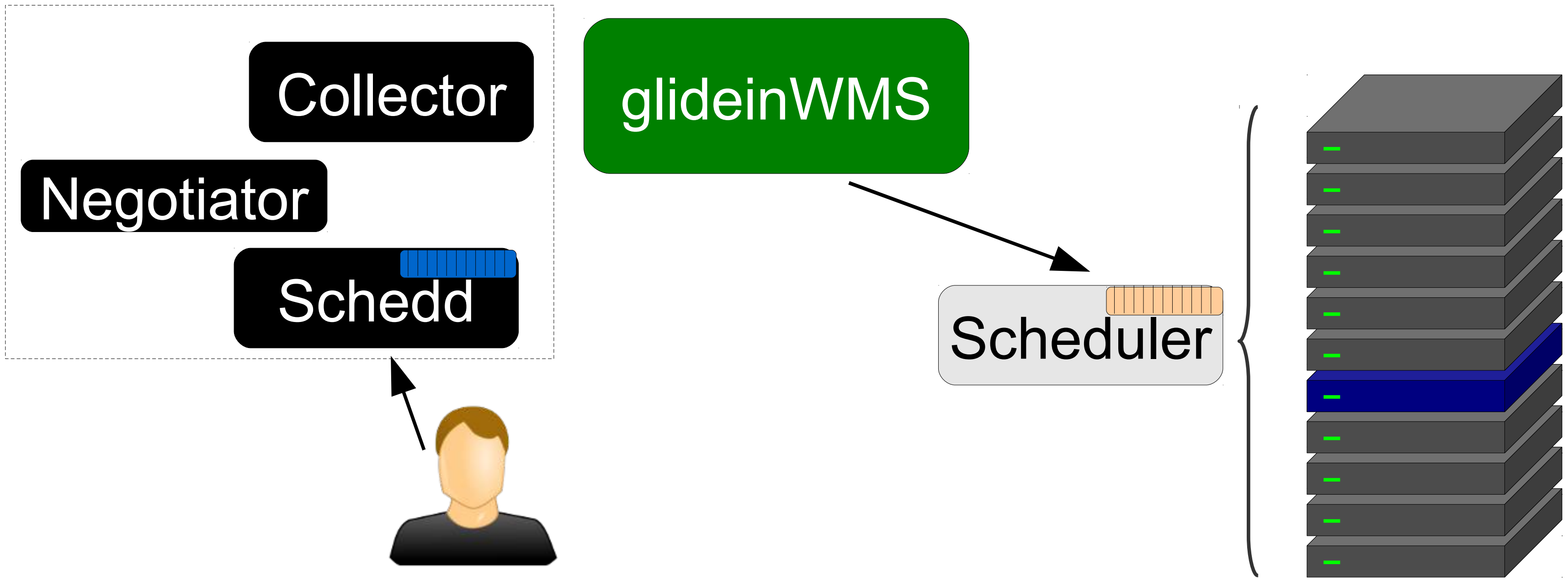
- Practically all CE implementations provide ... ity
  - Jo ... of
- If ...
  very ... on
  - Not always, ... too o... en
  - Requires contact with the remote admins

Avoid direct use of the Grid,
if you can.
Find someone else who
does it for you.

Questions so far?

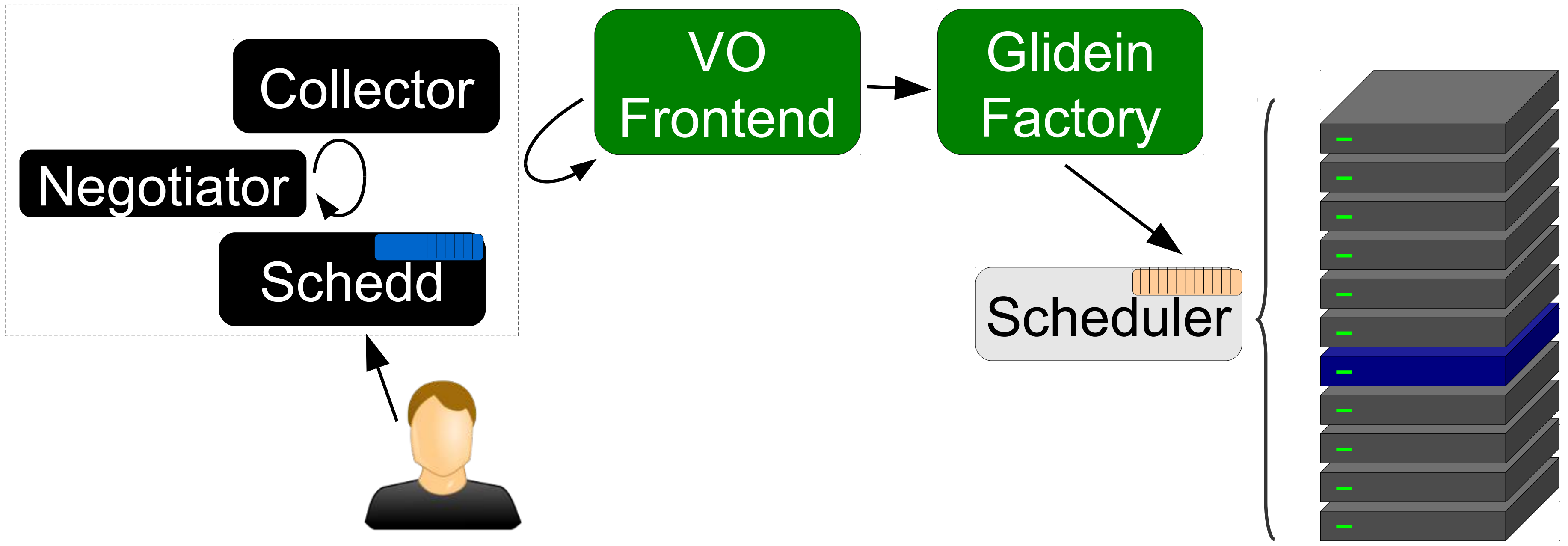
Reminder - glideinWMS

- A Condor based overlay system
  - i.e. looks like a regular Condor system to the users
  - Adds a resource provisioning service
    (i.e. the lease manager)



The inner structure

- The glideinWMS is really composed of two components
  - A VO Frontend – The matchmaker
  - A Glidein Factory – The pilot submitter

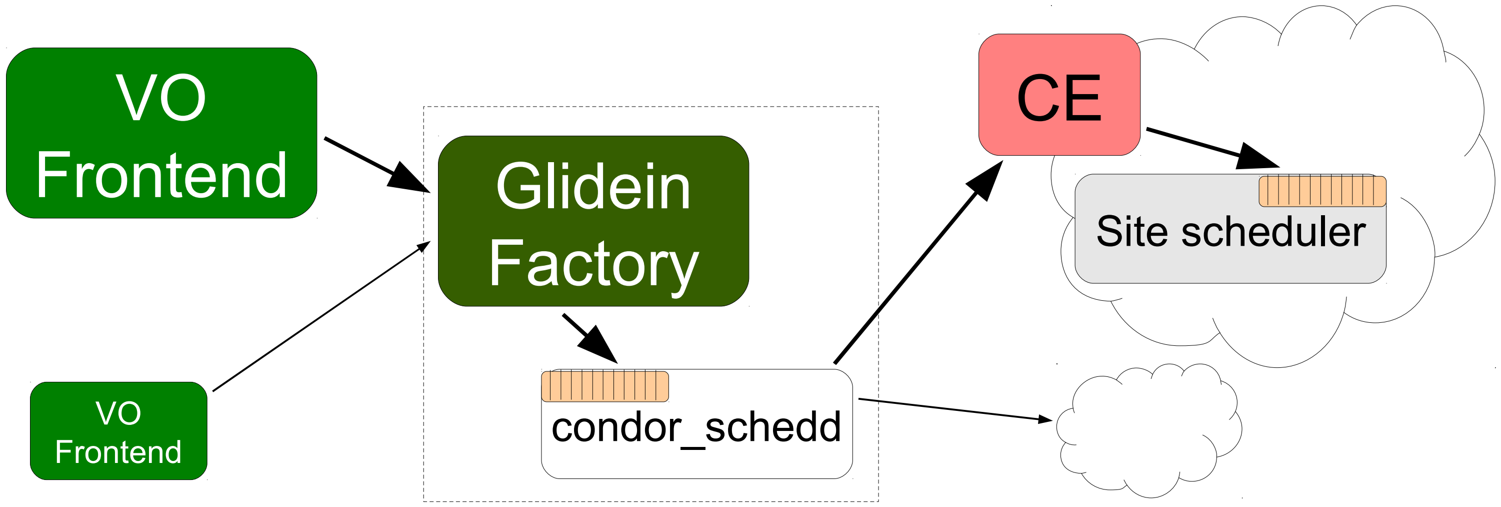


The Glidein Factory

- The Glidein Factory is the interface to the Grid
  - Essentially, an additional abstraction layer
- Meant to be operated by an expert team on behalf of many user communities
  - Think of it as a service, not as a piece of SW
- The factory operators will deal with Grid details
  - Including debugging misbehaving glideins

Glidein Factory internals

- Essentially a slave to VO Frontends
  - Will submit on their behalf
  - Using their certificate
  - Main role is monitoring and debugging
- Uses Condor-G under the hood

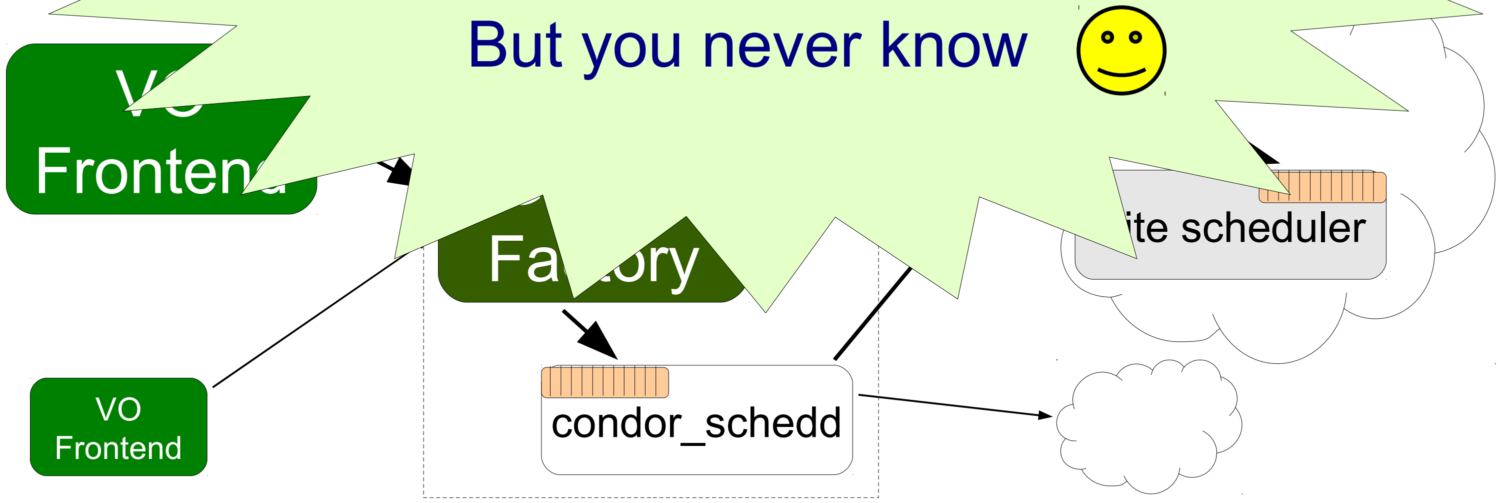


Glidein Factory internals

- Essentially a slave to VO Frontends
  - Will subm it or ei eh
  - Using
  - M ng
- Us

I don't expect you will ever need to operate a Glidein Factory.

But you never know



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VO Frontend

- The “brain” of a glideinWMS system
  - Decides when and where to send glideins
  - Will talk to one or more gfactories
- Each user community needs one
  - i.e each VO == Virtual Organization
  - Alongside the Condor daemons
- Not much Grid knowledge needed here
  - Apart from when things go really wrong!

VO Frontend Matchmaking

Can we skip over this?

I just want [illegible]

Maybe you can get away without.

But you are a likely candidate.

But [illegible]st yo[illegible] have to graduate!
And operating a VO Frontend will be your service work.

VO Frontend Matchmaking

- The VO Frontend config defines the matchmaking policy
  - For both levels of matchmaking
- Unfortunately, the two levels expressed in two different languages
  - Python expression – Frontend logic
  - ClassAd expression – Startd requirements

Example config

```
<match
   match_expr='glidein["attrs"]["GLIDEIN_Site"] in job["DESIRED_Sites"].split(",")'
   start_expr='stringListMember(GLIDEIN_Site,DESIRED_Sites,",")' />
```

Monitoring and debugging

- The system mostly run itself
  - But sometimes things do go wrong
- Two major sources of monitoring
  - Condor itself (condor_q, condor_status)
  - The VO Frontend Web page and logs
- Similar for debugging

More details in the demo.

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Questions?

- Questions? Comments?
  - Feel free to ask me questions later:

    Igor Sfiligoi <isfiligoi@ucsd.edu>
- Upcoming sessions
  - Now – 12:00pm
    - Demo
  - 12:00pm – 1:30pm
    - Lunch + Tour
  - 1:30pm –
    - Next lecture - How to get the needed computing

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