Towards a Security Model to Bridge Internet Desktop Grids and Service Grids

Gabriel Caillat(1) , Oleg Lodygensky(1), Etienne Urbah(1), Gilles Fedak(2) , and Haiwu He(2)

(1)
Laboratoire de l'Accelerateur Lineaire,
Universite Paris Sud, Orsay
{gcaillat, lodygens, urbah}@lal.in2p3.fr

(2)
INRIA Saclay, LRI,
Universite Paris Sud, Orsay
{fedak, haiwu.he}@lri.fr

Europar / SGS 2008

Summary

- Service Grid and Desktop Grid Definitions
- Service Grid and Desktop Grids Security Models
- Bridging SG and DG
  - The SuperWorker approach
  - The Giding-in approach
- Bridging XtremWeb and EGEE
- Conclusion

Service Grids

- EGEE, NorduGrid, National Grid Service...
- Dedicated and known computing ressources.
- High quality of service.
- High security (Authentication, Encryption)

- Difficult to join as ressource and/or user
- Difficult to maintain

Desktop Grids

- BOINC, XtremWeb, Xgrid...
- One of the largest distributed computing system
- Anyone can join at any time
- No special expertise to maintain

- Low Quality of Service
- Low security, anonymous computing ressources / users

Security Model of Service Grids

- Grid Security Infrastructure (EGEE)
- Secured authenticationd and communications
- based on:
  - public key encryption (auth. and com.)
  - X.509 certificates (auth.)
  - SSL (com.)
- Managed by trustable Certicate Authorities and VO Management Services.

Security Model of Desktop Grids

- Boinc is assymetric:
  - Open to the web
  - Many anonymous volunteers must trust a few well known projects. Reverse is not true
  - Enforced by a private/public key to authenticate the project, jobs and results.
- XtremWeb is P2P:
  - Open to the web
  - Any participant can be user and/or volunteer
  - Unix like user rights/access rights and optional sandboxing to protect the platform
  - Enforced by private/public key to authenticate the coordinator
- Xgrid is (too) easy:
  - Optional single password for authentication

Bridging SG's and DG's

- Part of the EDGeS european FP7 infrastructure project
  More information at www.edges-grid.eu

- Two main approches:
  - The Superworker
  - The Gliding-in

Bridging SG's and DG's

- The superworker approach:
  - proposed by the Lattice project and the SZTAKI Desktop Grid
  - is a centralized agent between DG and SG.
  - can be considered as a scheduler by itself

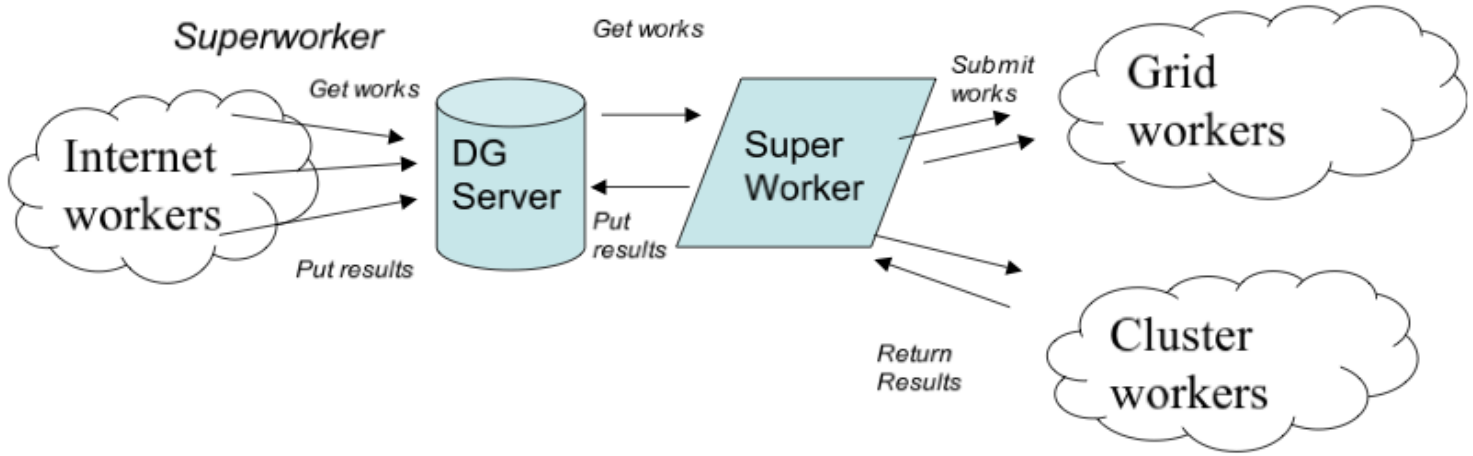
- It does not requires modification of the infrastructures
- Jobs are wrapped and then run on the grid with the good user id
- Since it's centralized, it can be a bottleneck
- Round trip per work unit is increased
- Single and low fault-tolerant point of failure

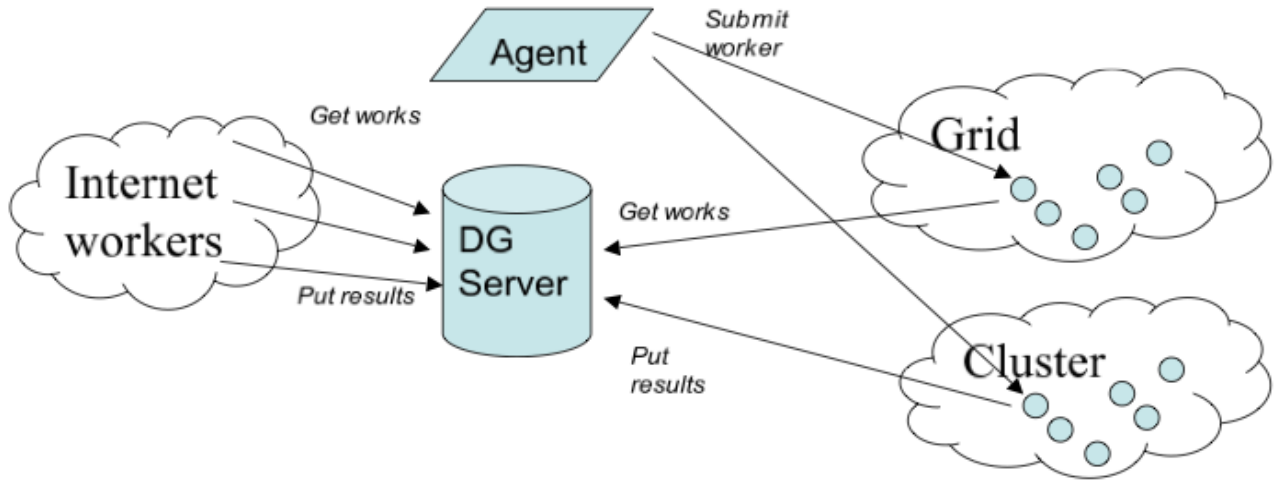
Bridging SG's and DG's

- The Gliding-in approach (aka Pilot Job):
  - Consist in running the DG worker on the SG as a regular task
  - At execution time, worker pulls and execute a job from DG server
  - It then returns the results to the DG server
  - can be considered as a scheduler by itself

- Load is balanced between grids
- Fault tolerant
- Performant due to direct link between DG server and SG computing element
- Pilot job owner may be different from final job owner. It then breaks grids security rules

SuperWorker VS Gliding-in





Bridging XtremWeb and EGEE

- How to aggregate EGEE worker nodes in a XtremWeb platform?
- XtremWeb responsible for user authentication and workers integrity
- XtremWeb responsible for secured communications
- XtremWeb responsible for applications and results integrity
- XtremWeb responsible for logging

Bridging XtremWeb and EGEE

- The Gliding-in technology has been prefered
- XtremWeb server must have a valid certificate
- Authentication ensured by:
  - user registration by XtremWeb coordinator
  - X.509 certification system integrated in XtremWeb
- Only users with a valid certificate may run jobs on EGEE
- XtremWeb worker software is submitted to EGEE using JSDL wrapper, and comes with a proxy of the user's certificate
- EGEE computing nodes integrity is ensured by the XtremWeb sandboxing features

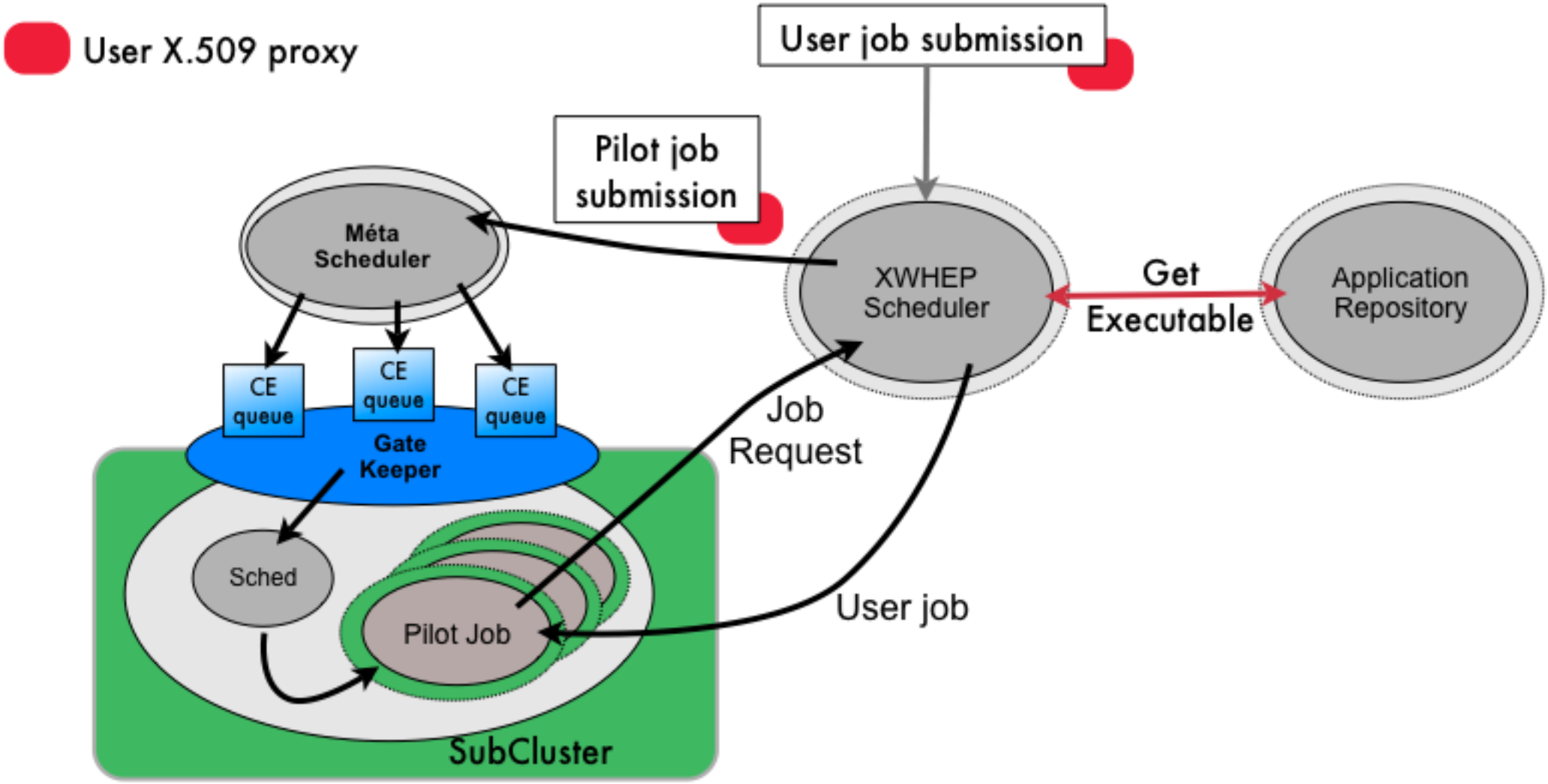
Bridging XtremWeb and EGEE

- Applications, parameters and results are secured:
  - Inside XtremWeb thanks to its user rigths and access rights management system
  - Inside EGEE thanks to the central coordinator
- Outside, while transfer between the domains, security is ensured by:
  - encryption through SSL tunnels
  - workers connect to coordinator for which they have the public key
- This prevents from:
  - malicious persons that try to intercept and read connections
  - malicious persons to connect to coordinator
  - EGEE worker nodes to connect to a wrong coordinator

Bridging XtremWeb and EGEE

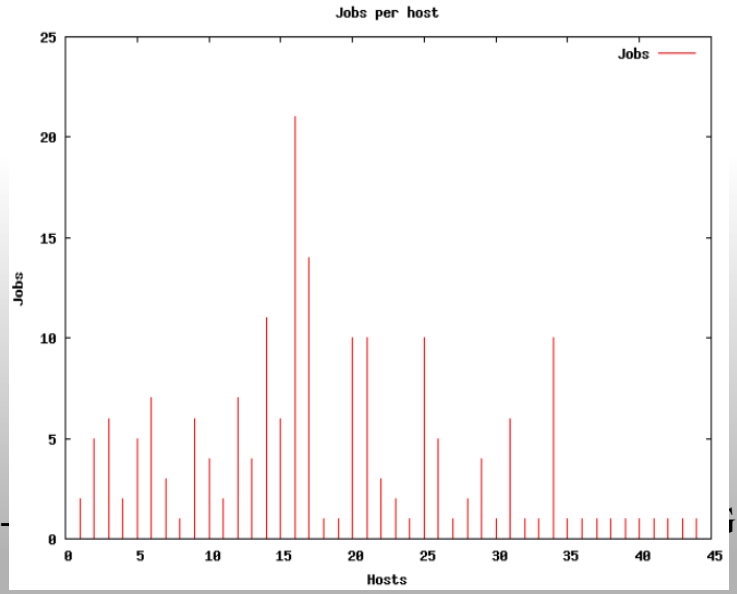
- XtremWeb ensures its own security
- EGEE security level is achieved by user authentication, X.509 certification and sandboxing.
- Applications, parameters and results are secured by:
  - XtremWeb user rights and access rights systems
  - Secured communications

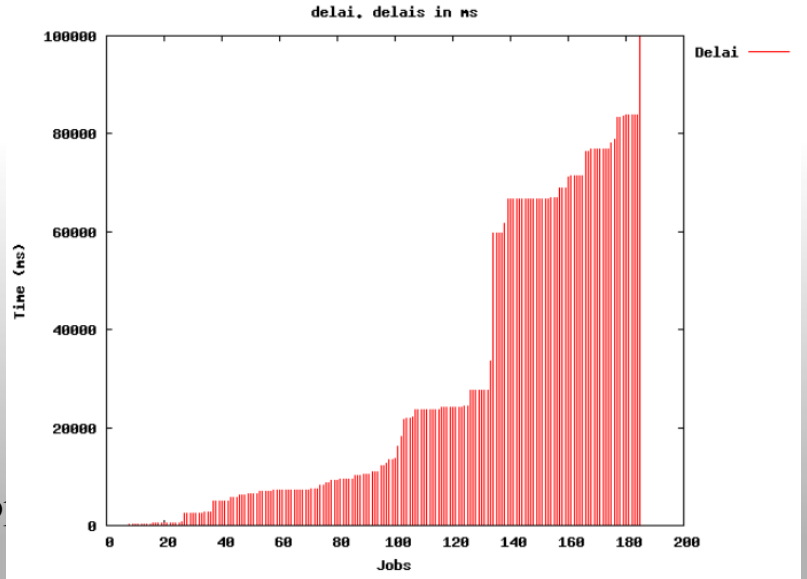
Pilot Job Mechanism



XtremWeb to EGEE Performances

- 185 tasks sent to an XtremWeb platform of 34 volunteer PC's and 10 EGEE worker nodes
- Good distribution of the jobs among ressources
- Execution time depends on type of available ressources (OS, CPU...)





Conclusion

- Gliding-in model may stress SG and DG security requirements
- Our implementation fills these gaps:
  - Anonymous users are segregated from certified ones
  - High security level for both the EGEE grid and volunteer PC's

Thank you...