



Grid Resource Brokers

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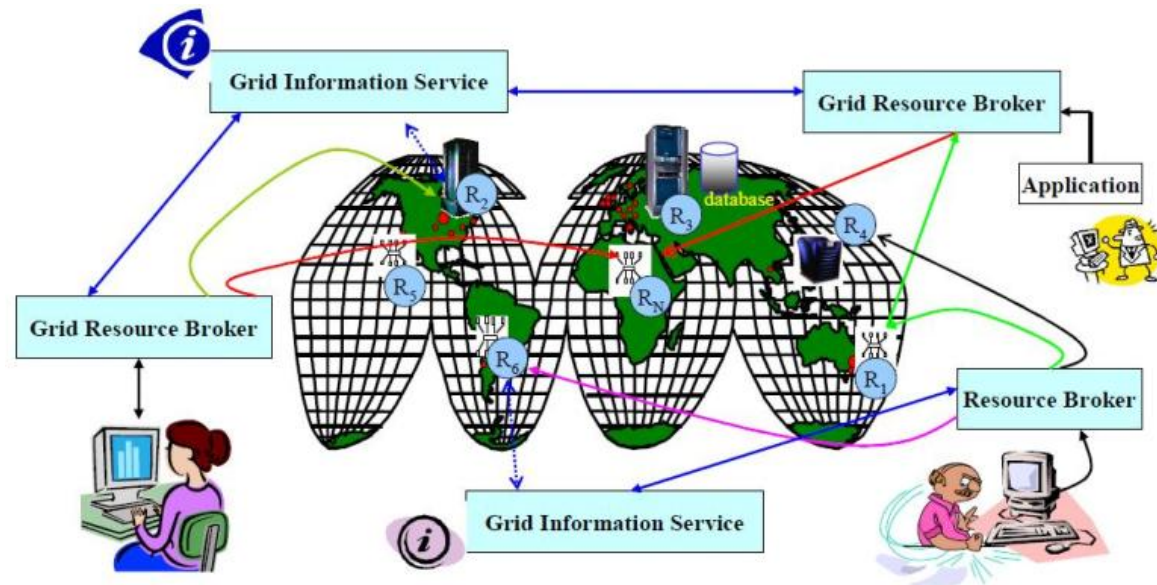
Facultatea de Automatica si Calculatoare

Cuprins

- Descriere
- Componente
- Task-urile GRB
- Algoritm
- Exemple GRB: studiu de caz eNANOS
- Bibliografie

Descriere

- tool folosit la potrivirea resurselor grid-ului cu cerintele utilizatorului
- metoda de a descoperi, de a planifica si monitoriza cele mai bune resurse care sa indeplineasca cerintele userului





Descriere - Tehnologie si software

- C / Unix system calls
- HTML
- CGI
- HTTPS
- COOKIES
- LDAP

Componente

- *Job Control Agent*

- controlul job-urilor

- interactiune client, scheduler adviser

- *Scheduler Adviser*

- identificarea, selectarea si asignarea job-urilor catre resurse

- *Grid Explorer*

- tine o evidenta a starii resurselor gridului

- descoperirea resurselor

- *Deployment Agen*

- activare executie job-uri aflate in coada de asteptare

- trimite update-uri periodice catre Job Control Agent cu statusul job-urilor



Task-urile unui GRB

- Resource discovery
- Resource selection
- Resource monitoring
- Job submission
- Job monitoring
- Historical storage

Task – Resource Discovery

- identificare resurse disponibile folosind algoritmi ce interactioneaza cu:
 - MDS – monitor and discover services
 - GIS – grid information services
- filtrare lista initiala pentru a indeplini cerintele minime ale aplicatiei: HW, SO, RAM, etc.

Task – Resource Selection

- selectarea resurselor ce indeplinesc constrangerile de timp si cost
- NWS (Network Weather Service)
- GRACE (Grid Architecture for Computational Economy)
 - suita de protocoale ce permite tranzactionarea costului resurselor in functie de durata de utilizare, RAM folosit, etc.

Task – Planificarea job-urilor

- Mapare job-uri cu resursele fizice identificate: probleme NP-complete

Abordari:

a) Performance-guided schedulers

-minimizare timp de executie program

-algoritmi utilizati: greedy, alg. genetici, cautare tabulara

b) Economy-guided schedulers

-costul resurselor ca si criteriu de optimizare

Task – Monitorizarea si Migrarea

- detectarea si solutionarea situatiilor critice
- informatiile sunt trimise la replanificator
- decizie daca job-ul este mutat sau nu pe alta resursa
- periodic sunt realizate snapshot-uri a.i. job-ul sa poata fi reluat din starea curenta la o posibila migrare

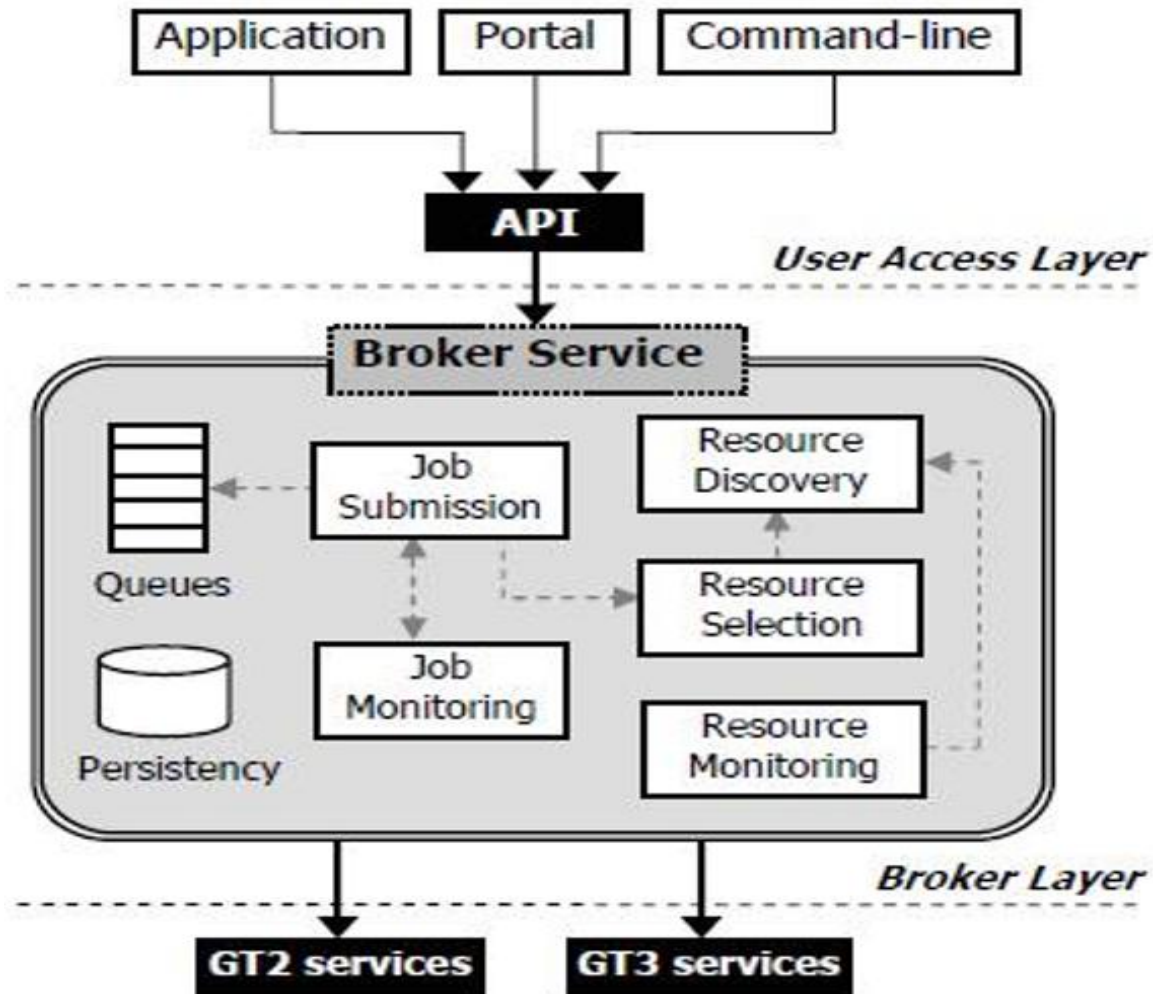
Algorithm GRB

- Input :- one or more job request
 - Action :- Select and submit job to most appropriate resources.
 - Output: none
1. Contact GUIS server(s) to obtain a list of available clusters.
 2. Contact each resource's GRIS for static for and dynamic resource information(hardware and software characteristics, current queue and load, etc.)
 3. For each job :-
 - (a) Select the cluster to which the job will be submitted.
 - i. Filter out clusters that do not fulfill the requirements on memory, disk space architecture etc, and clusters that the user are not authorize to use.
 - ii. Estimate the Total Time to Delivery (TTD) for each remaining resource.
 - iii. Select the cluster with the shortest predicted TTD.
 - (b) Submit the job to the selected resource.
 - (c) Release any reservation made to non selected clusters.

Grid Resource Brokers – exemple

- **JSS RB** [4]: G4-based, interoperable, WSRF, JSDL, GLUE, WS-Agreement, Advance reservation, benchmark-based scheduling
- **GGB** [7]: GT3-based, P2P-based *resource discovery*, SOA-based resources, scheduling (random and round-robin)
- **HPC RB** [6]: GT2-based, centralized topology, MPI-based oriented applications
- **GRIP** [9]: **UNICORE**-based (able to define VO boundaries), Ontology engine (via AJO)
- **eNANOS** [2]: GT3-based, dynamic policy management, fault tolerance (reschedule and checkpointing)
- **GRUBER** [3]: GT3-based, SLA policies, scheduling (round-robin, least used, last recently used)
- **Nimrod/G** [5]: economy-driven, interoperable, parameter sweep application oriented

eNANOS – Studiu de caz



eNANOS – Studiu de caz

- RSL – Resource Specification language
 - folosit la descrierea unui job
 - format XML
 - resursele necesare pentru rulare program

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    <Attribute Name="ClockSpeed" Operator=">=" Value="500" Type="INTEGER" Importance="SOFT" Priority="7" />
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  <FileSystem-OperatingSystem>
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  </FileSystem-OperatingSystem>
  <Others>
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    <Attribute Name="MaxQueueTime" Operator="==" Value="3600" Type="STRING" Importance="SOFT" Priority="1" />
  </Others>
</CRITERIA>
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Bibliografie

- [1] Buyya, R., Abramson, D., Giddy, J.: An Economy Driven Resource Management Architecture for Global Computational Power Grids. International Conference on Parallel and Distributed Processing Techniques and Applications (2000)
- [2] Abramson, D., Buyya, R., Giddy, J.: A Computational Economy for Grid Computing and its Implementation in the Nimrod-G Resource Broker. Future Generation Computer Systems Journal, Volume 18, Issue 8, Elsevier Science (2002) 1061-1074
- [3] Abraham, A., Buyya, R., Nath, B.: Nature's Heuristics for Scheduling Jobs on Computational Grids. International Conference on Advanced Computing and Communications (2000)
- [4] Erik Elmroth and Johan Tordsson : Grid Resource Brokering Algorithms Enabling Advance Reservations and Resource Selection Based on Performance Predictions
- [5] <http://www.cloudbus.org/broker/>
- [6] Ivan Rodero, Julita Corbalán, Rosa M. Badia, and Jesús Labarta: eNANOS Grid Resource Broker

