Elastic desktop grids with (J)OCaml

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Naclgrid-ec2, an elastic desktop grid engine I

Context

Desktop grid

grid built with heterogenous resources

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grid built with heterogenous resources

Success cases

Folding@home, Seti@home : BOINC-based grids.

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Aggregate various powersources

- Dedicated servers

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- Local computers (from the administration, etc etc)

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- Dedicated servers
- Local computers (from the administration, etc etc)
- Extra servers rented/started on the fly

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- heterogeneity : computers are not clones, nodes might be connected through the internet, loose connection
- simplicity: scalabilty, easy to port existing software

What are we going to discuss?

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- An application of naclgrid-ec2: the corefarm

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Workflow

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1 | type task = { application: string; entry: string; input: string }
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cons

- Risk of deadlock
- Inertness

Life and death of a job

Naclgrid server	Node A	Node B	Node C
0 job	idle	idle	idle
0 job	initiate a job	idle	idle
1 job with 0 tasks and 0 results	compute alone	idle	idle
1 job with 0 tasks and 0 results	fork 2 tasks	idle	idle
1 job with 2 tasks and 0 results	compute	process a task	process a task
1 job with 2 results	fetch results	idle	idle
1 job	closing job	idle	idle
0 job	idle	idle	idle

Naclgrid REST API

Uri	GET params	POST params	result
new_job		application	job_id
drop_file	job_id	file	
start_job	job_id	input	
fork	job_id	entry, input	
fetch	job_id	slot	result
stop_job	job_id		
pop			task
ack	job_id	slot, result	

Additionnaly, each connector is protected by credentials. Of course developers don't direclty use this API but the C / C++ / OCaml APIs.

What can you do with this pattern?

- Data mining
- 3D rendering

Time	Master node	Agents
1	preprocessing	idle
2	build kd-tree	idle
3	split image in tiles	idle
4	process tiles	process tiles
5	assemble results	idle

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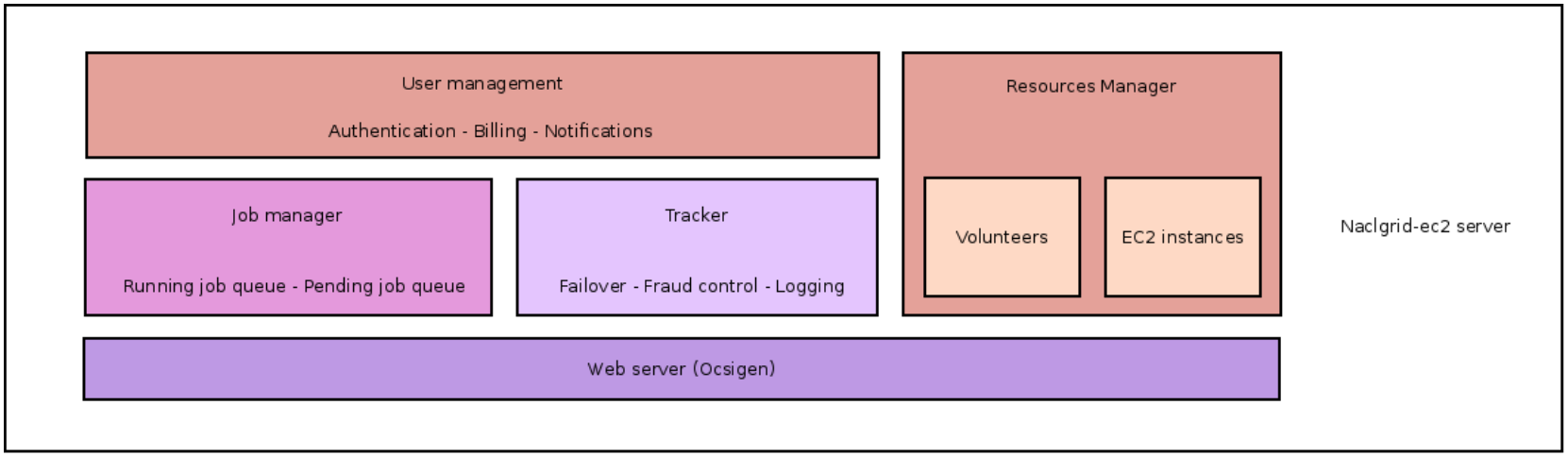
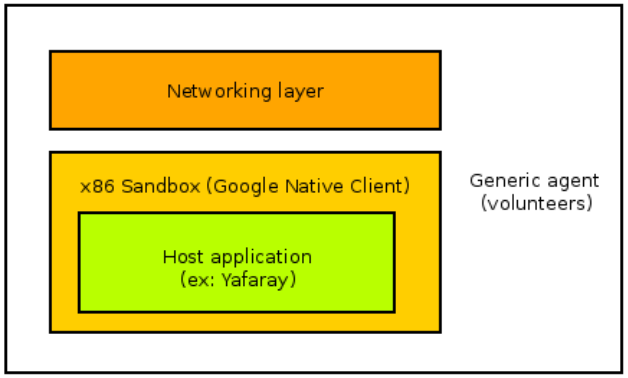
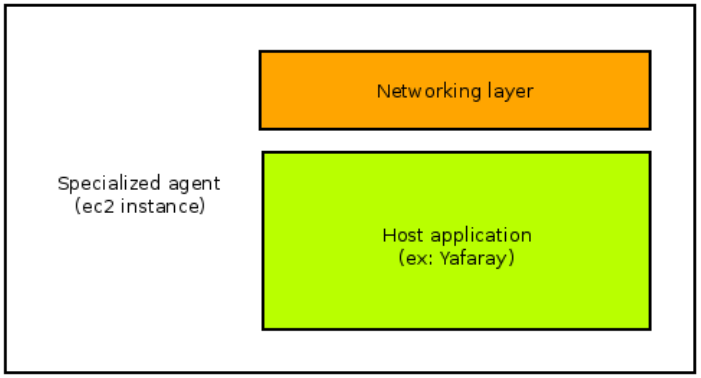
Components


User management
Authentication - Billing - Notifications
Resources Manager
Job manager
Running job queue - Pending job queue
Tracker
Failover - Fraud control - Logging
Volunteers
EC2 instances
Naclgrid-ec2 server
Web server (Ocsigen)


Networking layer
x86 Sandbox (Google Native Client)
Host application
(ex: Yafaray)
Generic agent
(volunteers)


Networking layer
Specialized agent
(ec2 instance)
Host application
(ex: Yafaray)

Client side

Current client is Naclys (http://code.google.com/p/naclys/)

- Sandboxing with the Google Native client (http://code.google.com/p/nativeclient/)
- C++ code to get contributions (QT gui)

Server side

Server side is implemented as a module for Ocsigen (www.ocsigen.org).
JOCaml implementation. JOCaml (http://jocaml.inria.fr/) is OCaml + join calculus.

- concurrent features to organize job queues
- distribution features enforce the stability

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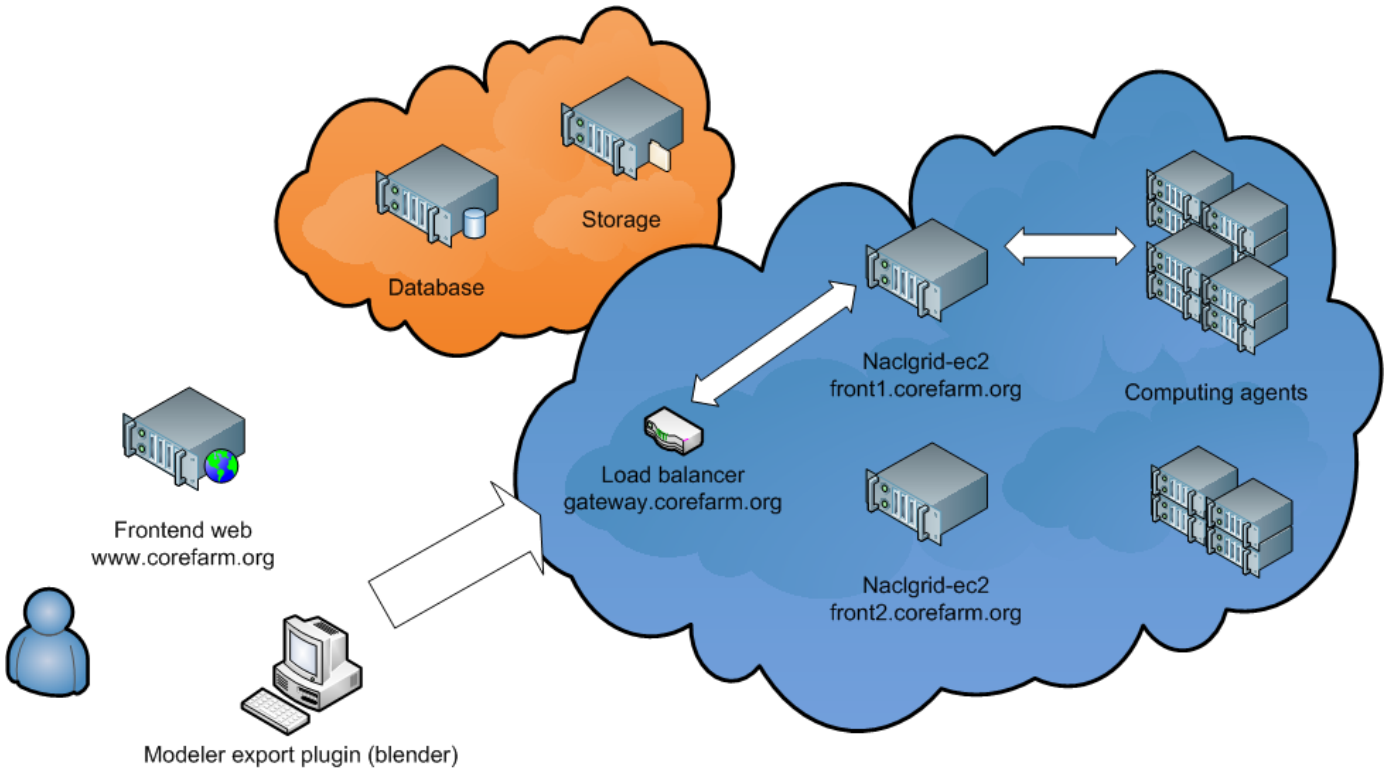
OCaml in the cloud



The collaborative rendering farm

Several frontends for naclgrid-ec2

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- Rendering desktop grid, based on Yafaray

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- 30M seconds exchanged

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Your application?

Almost anyone can develop for the grid and take advantage to the elastic power plant. The developer website is not ready yet, but we can already get in touch!

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Why OCaml?

- Development time is shorter (compared to C++)
- Clean software, easy to explain to non-developers

But it's difficult to find contributors.. (and to hire?)

Thanks

Thanks to Gallium and PPS for those amazing tools!

Questions

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