

# Environment Canada Computing Grid

## Using Gridmon

# What is Gridmon?

- A front-end tool for monitoring and controlling computing resources managed by one or more queuing systems (e.g., SGE, LoadLeveler)
- A consumer and provider of specialized web information
- A replacement for batchmon

# Computing Cell

- Cell: a managed collection of interconnected computing resources
  - Cell  $\neq$  cluster, though it may contain clusters
- Independently operated
  - Availability, accessibility, reliability, ownership, and purpose may be distinct from other cells

# Computing Grid

- EC Grid: a collection of interconnected computing cells
  - Resource management and job scheduling are handled by each cell
- Real world limitations
  - Extent – Which cells make up my grid?
    - Depends on user access
  - Reachability – Can I get there from here?
    - Depends on network access

# Current Cells

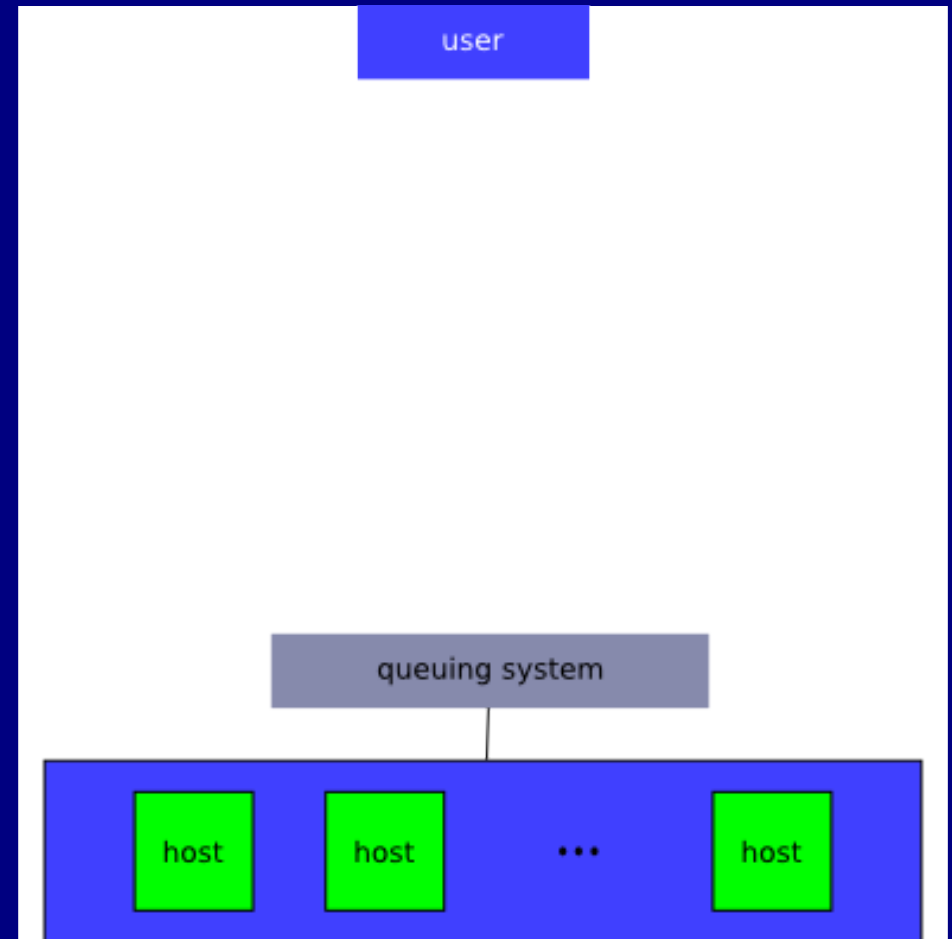
- Dorval
  - Linux-only cells: `dorval-ib.cmc.ec.gc.ca`, `dorval-ib2.cmc.ec.gc.ca`\*
  - Mixed: `dorval-central.cmc.ec.gc.ca`, `sgemaster.cmc.ec.gc.ca`
  - IBM/LoadLeveler: `maia.cmc.ec.gc.ca`, `naos.cmc.ec.gc.ca`, `rigel.cmc.ec.gc.ca`
- Regions
  - Coming this summer

# Backend Services and Tools

- Queuing system – Resource management
- gmttools – QS-independent front-end to QS commands
- cellmon – Resource monitoring

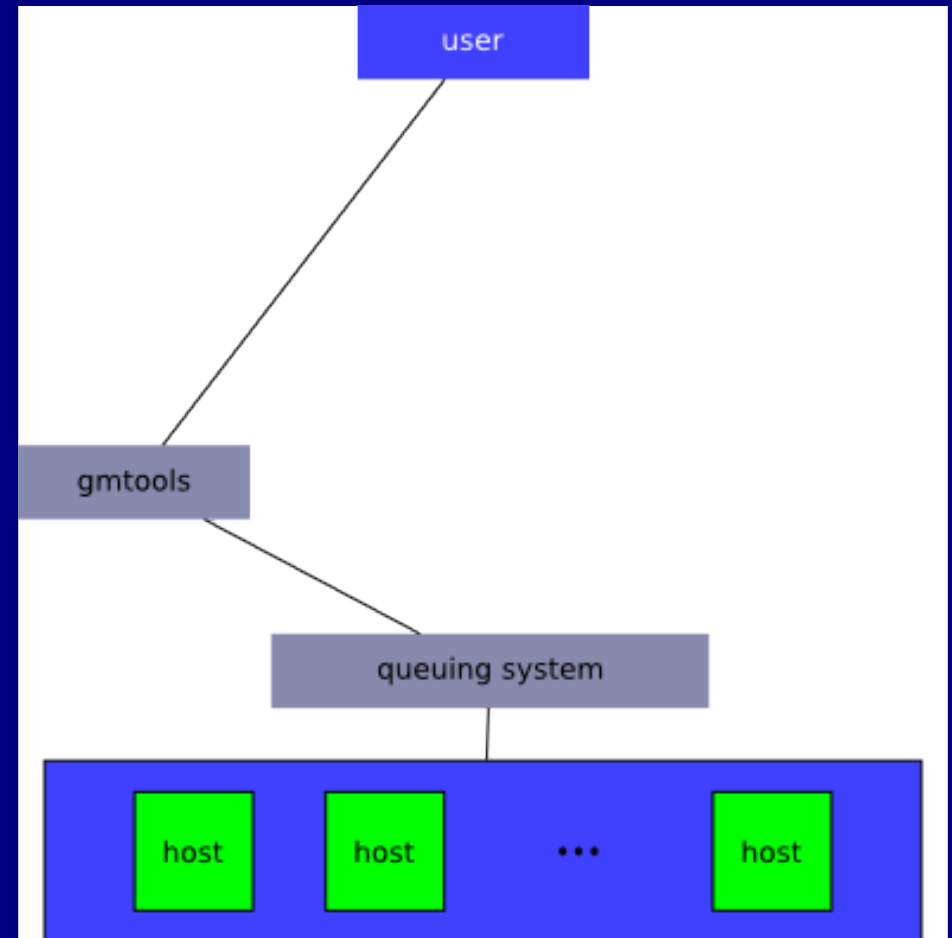
# Queuing System – Resource Mgmt

- Resource allocation
- Job scheduling
- Access control
- Queue mgmt
- In use/supported
  - SGE (except IBM)
  - LoadLeveler (IBM)



# gertools – QS Front-end

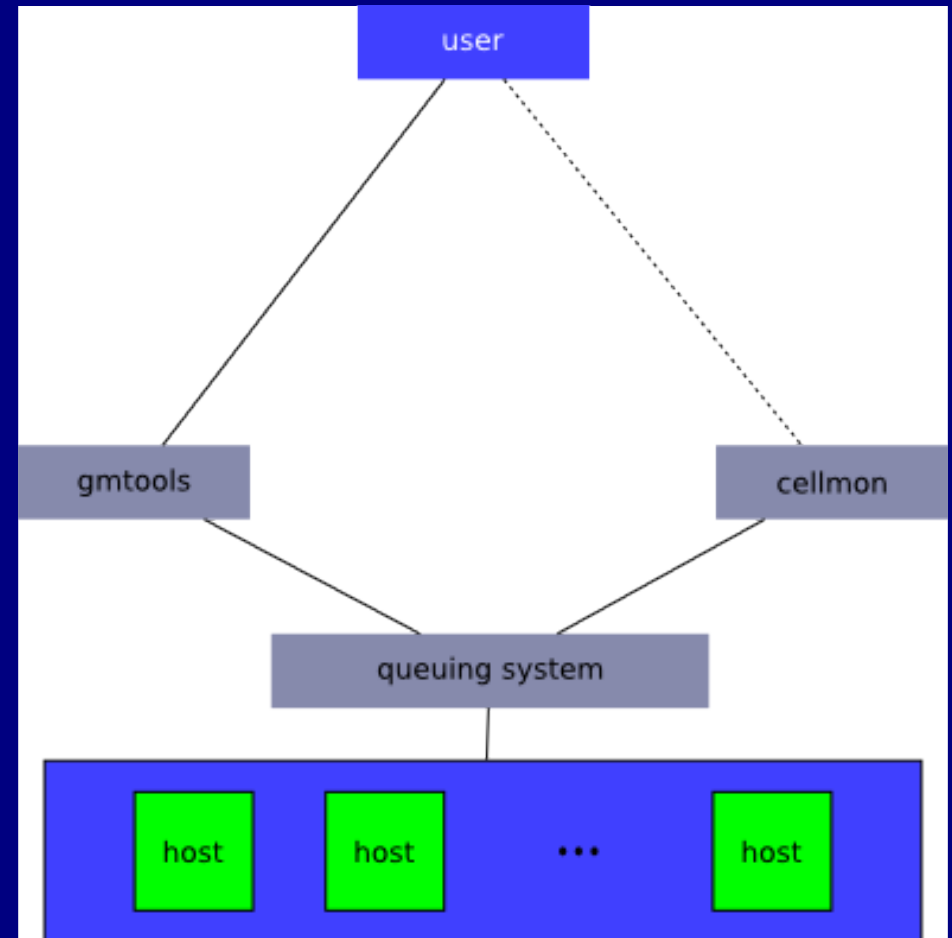
- *Forwards* requests to the backend QS
  - Gets the request to its destination!
  - Local QS install not required!
- Cmd line tools
  - gmjob, gmqueue, gmhost
- Uses ssh (opt. rsh)





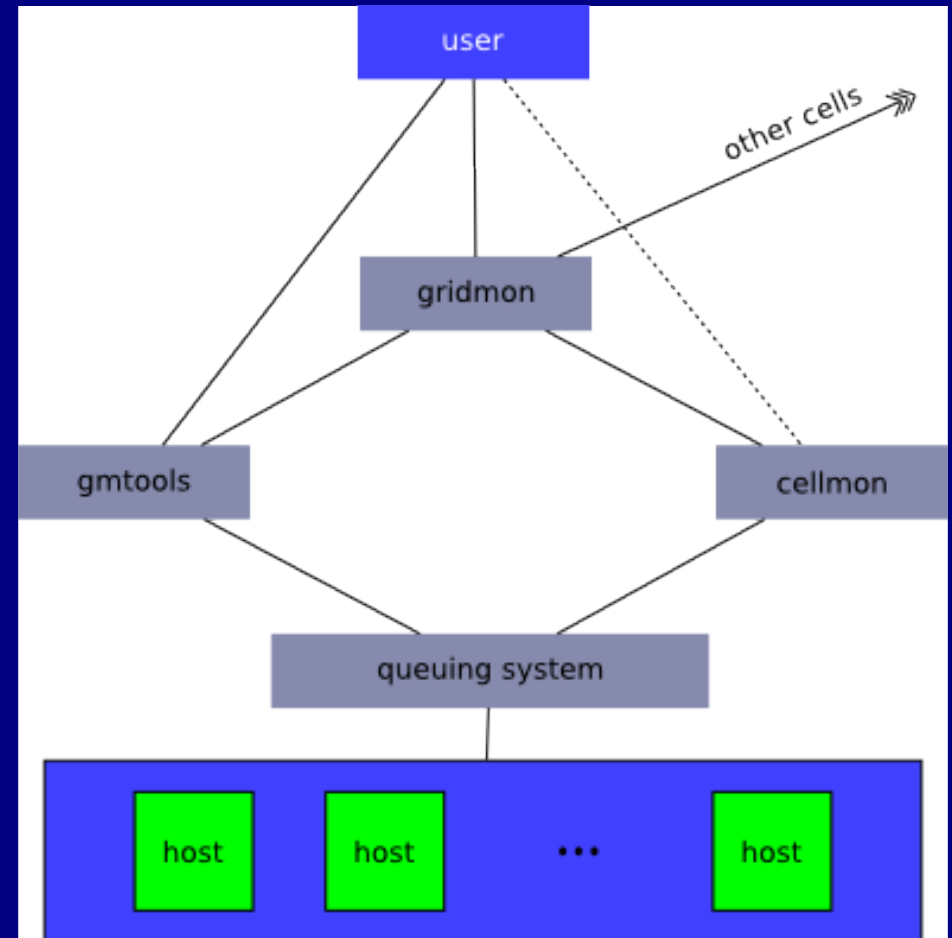
# cellmon – Resource Monitoring

- Monitors jobs, queues, hosts
- Provides a subset of QS information
- Supports filtering, sorting
- Web friendly
  - Produces HTML and XML



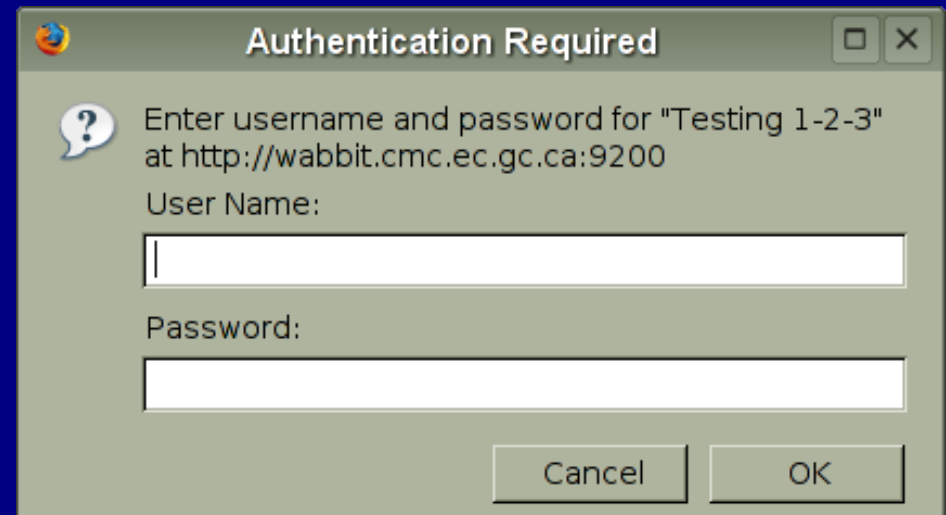
# gridmon – Grid Monitoring and Control

- Monitors *one or more* cells
- *Controls* one or more cells
- Web browser as user interface
- Configurable
- Secure



# Security – Web (1)

- http traffic is in clear text
- Username+ password provides authentication
- https encrypts traffic
- *http+username+password is insecure!*



# Security – Web (2)

- Gridmon provides two modes
  - Local – Only the local host is allowed to connect
  - Remote – Remote hosts may be allowed to connect (depending on settings)
- By default, Gridmon runs in “local” mode with single-use credentials
  - Safe to use `http+username+password`
  - But, don't reveal your `username+password`

# Security - Application

- Gridmon executes with user privileges
  - No escalation of privileges
  - Potential “damage” limited according to user privileges
- gmttools operations execute with user privileges
  - Remote access via ssh as secure as ssh setup
    - Protect your keys under `~/.ssh` (mode 700)

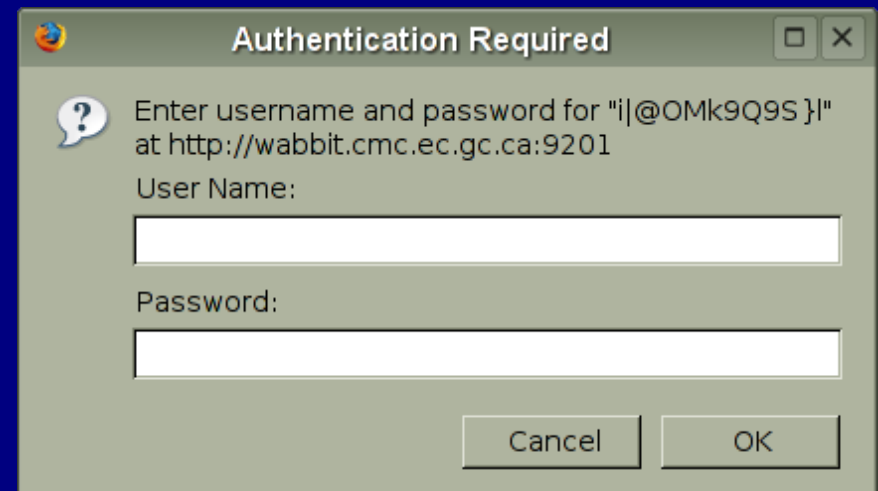
# Starting Gridmon (1)

- Sorry!
  - eval "`ssmuse sh -d /opt/ssm/gridmon`"
  - Will not be necessary shortly
- Execute the program (choose your browser)
  - gridmon-pwa
  - gridmon-pwa --browser firefox
  - gridmon-pwa --browser konqueror

# Starting Gridmon (2)

- Gridmon generates random, single-use strings (top)
  - Realm Name
  - User Id
  - Password
- Enter the User Id and Password into the authentication window (bottom)

```
Starting server...
    Starting URI: http://wabbit.cmc.ec.gc.ca:9201/keepalive
Single Use Realm Name: i|@OMk9Q9S}l
Single Use User Id: ?$'@}w$'F@L4{]}%g
Single Use Password: Q%v%*#}<2ev" (~f~>OSI`&=~ip1=*a9Q
*** SECURITY: Only allowing access from local host.
    Allow/Deny Order: deny
    Allowed Hosts: []
    Allowed Addresses: ['127.0.0.1', '142.135.7.77']
    Denied Hosts:: []
    Denied Addresses: []
```



Authentication Required

Enter username and password for "i|@OMk9Q9S }|" at http://wabbit.cmc.ec.gc.ca:9201

User Name:

Password:

Cancel OK

# Keepalive Page

- Tells Gridmon that you are still using the application
- Automatically reloads (e.g., every 30s)
- Gridmon will shut down if left idle for too long (e.g. 60s)
- For security

## Gridmon Keepalive Page

This application requires that this page remains open in a browser window during the entire time that it runs.

Every 30 seconds, an update of this page is requested thereby notifying the application that the user is still using it. Once the window containing this page is closed, the application will count down 60 seconds and then exit. At that point, the application will no longer be running but will have to be restarted.

Security: This feature exists to close unused/idle applications to prevent unwanted and unauthorized use by potential attackers.

### Welcome Page

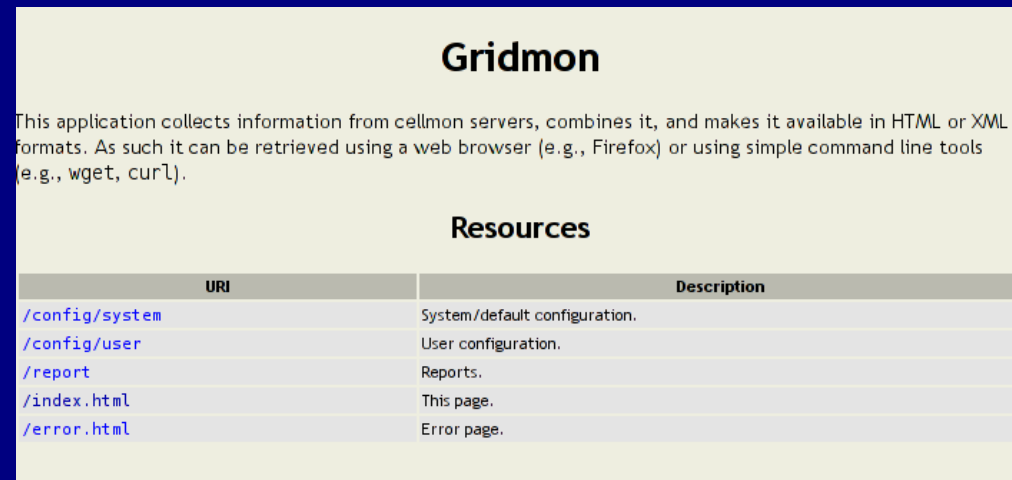
The following link will open the welcome page in a separate window:

<http://wabbit.cmc.ec.gc.ca:9200/index.html>



# Welcome Page

- All site navigation starts here
- [/report](#) is a link to the Reports list page
- There are links to the [/config/\\*](#) pages (advanced)



The screenshot shows the Gridmon welcome page. At the top, the title "Gridmon" is centered. Below it, a paragraph explains that the application collects information from cellmon servers and provides it in HTML or XML formats, accessible via web browsers or command-line tools. A "Resources" section follows, containing a table with two columns: "URI" and "Description". The table lists several URIs and their corresponding descriptions.

URI	Description
<a href="#">/config/system</a>	System/default configuration.
<a href="#">/config/user</a>	User configuration.
<a href="#">/report</a>	Reports.
<a href="#">/index.html</a>	This page.
<a href="#">/error.html</a>	Error page.

# Reports List Page

- Predefined reports suitable to our users
- Follow the links
- May be enhanced
  - Commonly used reports could be made default
  - Roll your own (advanced)

Reports		
Hosts	Jobs	Queues
<a href="#">all_hosts</a>	<a href="#">all_jobs</a>	<a href="#">all_queues</a>
All Hosts	All Jobs	All Queues
<a href="#">unavailable_hosts</a>	<a href="#">error_jobs</a>	<a href="#">error_queues</a>
Unavailable Hosts	Jobs in Error	Queues in Error
	<a href="#">normal_runs</a>	<a href="#">unavailable_queues</a>
	Normal Runs	Unavailable Queues
	<a href="#">operations</a>	
	Operations	
	<a href="#">parallel_runs</a>	
	Parallel Runs	
	<a href="#">sgemaster_jobs</a>	
	sgemaster (default) Cell Jobs	
	<a href="#">ulyссе_jobs</a>	
	Ulyссе Jobs	
	<a href="#">urgence_jobs</a>	
	Urgence Jobs	

# Generating a Report

- Get list of cells to contact
- Get query to submit to each cellmon
- Request information from each cell (in XML format)
- Collect and collate data
- Generate report (HTML or XML)
- Send report to client (e.g., web browser)

# Example – All Jobs

Pause Refresh

### All Jobs

Cell Name <a href="#">up/down</a>	Job Id <a href="#">up/down</a>	Job Name <a href="#">up/down</a>	Queue Name <a href="#">up/down</a>	Owner Name <a href="#">up/down</a>	State <a href="#">up/down</a>	Cpu Time <a href="#">up/down</a>	Start Time <a href="#">up/down</a>
dorval-ib.cmc.ec.gc.ca	80571	OPA	<a href="#">development@ib-be023.cmc.ec.gc.ca</a>	armnzwa	r	00:00:00	Mon Apr 23 11:18:24 2007
dorval-ib.cmc.ec.gc.ca	80591	ARCTIC1	<a href="#">development@ib-be001.cmc.ec.gc.ca</a>	armname	r	00:00:00	Mon Apr 23 17:07:42 2007
dorval-ib.cmc.ec.gc.ca	80607	lance_g3	<a href="#">development@ib-be030.cmc.ec.gc.ca</a>	afsgfro	r	00:00:00	Mon Apr 23 21:46:41 2007
dorval-ib.cmc.ec.gc.ca	80608	lance_g5	<a href="#">development@ib-be015.cmc.ec.gc.ca</a>	afsgfro	r	00:00:00	Mon Apr 23 22:44:26 2007
dorval-ib.cmc.ec.gc.ca	80609	lance_g6	<a href="#">development@ib-be039.cmc.ec.gc.ca</a>	afsgfro	r	00:00:00	Mon Apr 23 22:45:22 2007
dorval-ib.cmc.ec.gc.ca	80610	lance_g4	<a href="#">development@ib-be040.cmc.ec.gc.ca</a>	afsgfro	r	00:00:00	Mon Apr 23 22:50:54 2007
dorval-ib.cmc.ec.gc.ca	80611	lance_g1	<a href="#">development@ib-be012.cmc.ec.gc.ca</a>	afsgfro	r	00:00:00	Mon Apr 23 23:31:10 2007
dorval-ib.cmc.ec.gc.ca	80612	lance_g2	<a href="#">development@ib-be013.cmc.ec.gc.ca</a>	afsgfro	r	00:00:00	Mon Apr 23 23:43:01 2007
maia.cmc.ec.gc.ca	<a href="#">c4f08p2g.178940</a>	GEM_AUR2_M	<a href="#">development</a>	afaocfa	I	00:00:00	
maia.cmc.ec.gc.ca	<a href="#">c4f08p2g.182511</a>	urls_eqtad3_01	<a href="#">development</a>	acrnrls	R	19:10:35	Mon Apr 23 22:11:24 2007
maia.cmc.ec.gc.ca	<a href="#">c4f08p2g.182545</a>	mc_drc053_1488	<a href="#">development</a>	acrnrdr	R	00:35:55	Mon Apr 23 22:43:06 2007
maia.cmc.ec.gc.ca	<a href="#">c4f08p2g.182575</a>	GEM_bd_1aa01_r1ugj01_maia_M	<a href="#">development</a>	armnbde	R	09:57:17	Mon Apr 23 23:46:47 2007
maia.cmc.ec.gc.ca	<a href="#">c4f08p2g.182587</a>	l4dv.K4H7CB80	<a href="#">development</a>	afsdabe	R	00:00:00	Mon Apr 23 23:56:34 2007
maia.cmc.ec.gc.ca	<a href="#">c4f08p2g.182589</a>	mf_bp01_11976b	<a href="#">development</a>	acrnrbp	R	09:29:41	Mon Apr 23 23:12:22 2007
maia.cmc.ec.gc.ca	<a href="#">c4f08p2g.182593</a>	l4dv.K4E06CNT	<a href="#">development</a>	afsdpak	I	00:00:00	
maia.cmc.ec.gc.ca	<a href="#">c4f08p2g.182595</a>	aurams_BAU2015_noPTEST.114954991	<a href="#">development</a>	afsusno	R	01:09:48	Mon Apr 23 23:16:09 2007
maia.cmc.ec.gc.ca	<a href="#">c4f08p2g.182601</a>	mc_bp02_sip000	<a href="#">development</a>	acrnrbp	R	05:03:08	Mon Apr 23 23:35:14 2007

- All\* jobs from all Dorval cells
- Selected fields
- Column sorting
- “Pause Refresh” link to toggle auto page refresh
- Some items have links

# Example – All Jobs w/Controls

- Items of interest are selectable (checkbox)
- Action applies to selected items (button)
- Disable auto refresh to allow easy selections

Pause Refresh

### All Jobs

<a href="#">Clear Error</a> <a href="#">Delete</a> <a href="#">Hold (Operator)</a> <a href="#">Hold (System)</a> <a href="#">Hold (User)</a> <a href="#">Release (Operator)</a> <a href="#">Release (System)</a> <a href="#">Release (User)</a> <a href="#">Reschedule</a> <a href="#">Resubmit</a>									
<a href="#">Suspend</a> <a href="#">Unsuspend</a>									
Select	Cell Name <a href="#">up/down</a>	Job Id <a href="#">up/down</a>	Job Name <a href="#">up/down</a>	Queue Name <a href="#">up/down</a>	Owner Name <a href="#">up/down</a>	State <a href="#">up/down</a>	Cpu Time <a href="#">up/down</a>	Start Time <a href="#">up/down</a>	
<input type="checkbox"/>	dorval-ib.cmc.ec.gc.ca	80571	OPA	development@ib-be023.cmc.ec.gc.ca	armnzwa	r	00:00:00	Mon Apr 23 11:18:24 2007	
<input type="checkbox"/>	dorval-ib.cmc.ec.gc.ca	80591	ARCTIC1	development@ib-be001.cmc.ec.gc.ca	armname	r	00:00:00	Mon Apr 23 17:07:42 2007	
<input type="checkbox"/>	dorval-ib.cmc.ec.gc.ca	80607	lance_g3	development@ib-be030.cmc.ec.gc.ca	afsgfro	r	00:00:00	Mon Apr 23 21:46:41 2007	
<input type="checkbox"/>	dorval-ib.cmc.ec.gc.ca	80608	lance_g5	development@ib-be015.cmc.ec.gc.ca	afsgfro	r	00:00:00	Mon Apr 23 22:44:26 2007	
<input type="checkbox"/>	dorval-ib.cmc.ec.gc.ca	80609	lance_g6	development@ib-be039.cmc.ec.gc.ca	afsgfro	r	00:00:00	Mon Apr 23 22:45:22 2007	
<input type="checkbox"/>	dorval-ib.cmc.ec.gc.ca	80610	lance_g4	development@ib-be040.cmc.ec.gc.ca	afsgfro	r	00:00:00	Mon Apr 23 22:50:54 2007	
<input type="checkbox"/>	dorval-ib.cmc.ec.gc.ca	80611	lance_g1	development@ib-be012.cmc.ec.gc.ca	afsgfro	r	00:00:00	Mon Apr 23 23:31:10 2007	
<input type="checkbox"/>	dorval-ib.cmc.ec.gc.ca	80612	lance_g2	development@ib-be013.cmc.ec.gc.ca	afsgfro	r	00:00:00	Mon Apr 23 23:43:01 2007	
<input type="checkbox"/>	maia.cmc.ec.gc.ca	c-4f08p2g, 178940	GEM_AUR2_M	development	afaocfa	I	00:00:00		
<input type="checkbox"/>	maia.cmc.ec.gc.ca	c-4f08p2g, 182511	urls_eqtd3_01	development	acrnrls	R	21:14:21	Mon Apr 23 22:11:24 2007	
<input type="checkbox"/>	maia.cmc.ec.gc.ca	c-4f08p2g, 182545	mc_drc053_1488	development	acrnrdr	R	02:20:58	Mon Apr 23 22:43:06 2007	
<input type="checkbox"/>	maia.cmc.ec.gc.ca	c-4f08p2g, 182575	GEM_bd_raa01_r1ugj01_maia_M	development	armnbde	R	15:43:00	Mon Apr 23 23:46:47 2007	
<input type="checkbox"/>	maia.cmc.ec.gc.ca	c-4f08p2g, 182587	l4dv_K4H7CB80	development	afsdabe	R	03:30:36	Mon Apr 23 23:56:34 2007	
<input type="checkbox"/>	maia.cmc.ec.gc.ca	c-4f08p2g, 182589	mf_bp01_i1976b	development	acrnrbp	R	10:35:00	Mon Apr 23 23:12:22 2007	
<input type="checkbox"/>	maia.cmc.ec.gc.ca	c-4f08p2g, 182593	l4dv_K4E06CNT	development	afsdpij	I	00:00:00		
<input type="checkbox"/>	maia.cmc.ec.gc.ca	c-4f08p2g, 182595	aurams_BAU2015_noPTEST.114954991	development	afsusno	R	01:20:31	Mon Apr 23 23:16:09 2007	
<input type="checkbox"/>	maia.cmc.ec.gc.ca	c-4f08p2g, 182602	l1gemnt_00	development	afsderv	R	00:41:50	Mon Apr 23 23:17:23 2007	
<input type="checkbox"/>	maia.cmc.ec.gc.ca	c-4f08p2g, 182604	l4dv_KT4CND6	development	armastl	I	00:00:00		
<input type="checkbox"/>	maia.cmc.ec.gc.ca	c-4f08p2g, 182605	GEM_ibmon7wkdycmbnemsTFHTAP_M	development	argmqso	R	00:00:00	Tue Apr 24 00:01:32 2007	
<input type="checkbox"/>	maia.cmc.ec.gc.ca	c-4f08p2g, 182616	mm_su1850_105_	development	acrnmcrc	I	00:00:00		
Select	Cell Name <a href="#">up/down</a>	Job Id <a href="#">up/down</a>	Job Name <a href="#">up/down</a>	Queue Name <a href="#">up/down</a>	Owner Name <a href="#">up/down</a>	State <a href="#">up/down</a>	Cpu Time <a href="#">up/down</a>	Start Time <a href="#">up/down</a>	
<input type="checkbox"/>	maia.cmc.ec.gc.ca	c-4f08p2g, 182617	cmamintjob_ipyfgatc.178579008	development	armasrb	R	01:21:29	Mon Apr 23 23:40:22 2007	
<input type="checkbox"/>	maia.cmc.ec.gc.ca	c-4f08p2g, 182618	aurams_BAU2015_noPrairies.154296928	development	afsusno	I	00:00:00		
<input type="checkbox"/>	maia.cmc.ec.gc.ca	c-4f08p2g, 182621	l2bhtub_00	development	afsdery	I	00:00:00		

# Report URI Overrides

- Some URI query string attributes override report settings
  - Pause refresh – `pause=0|1`
  - Controls – `controls=0|1`
- See cellmon documentation for more
- E.g.,  
`http://wabbit.cmc.ec.gc.ca:9002/report/all_jobs?controls=1`

# Acting on Selected Items

## Results

Result	Action	Object
Failed (gmttools not enabled.)	Delete	dorval-ib.cmc.ec.gc.ca/sge6/jobs/80571
Failed (gmttools not enabled.)	Delete	dorval-ib.cmc.ec.gc.ca/sge6/jobs/80591
Failed (gmttools not enabled.)	Delete	dorval-ib.cmc.ec.gc.ca/sge6/jobs/80607
Failed (gmttools not enabled.)	Delete	dorval-ib.cmc.ec.gc.ca/sge6/jobs/80609
Failed (gmttools not enabled.)	Delete	maia.cmc.ec.gc.ca/LL/jobs/c4f08p2g.178940
Result	Action	Object

[Return to report.](#)

## Results

Result	Action	Object
Requested Delete		dorval-ib.cmc.ec.gc.ca/sge6/jobs/80617
Result	Action	Object

[Return to report.](#)

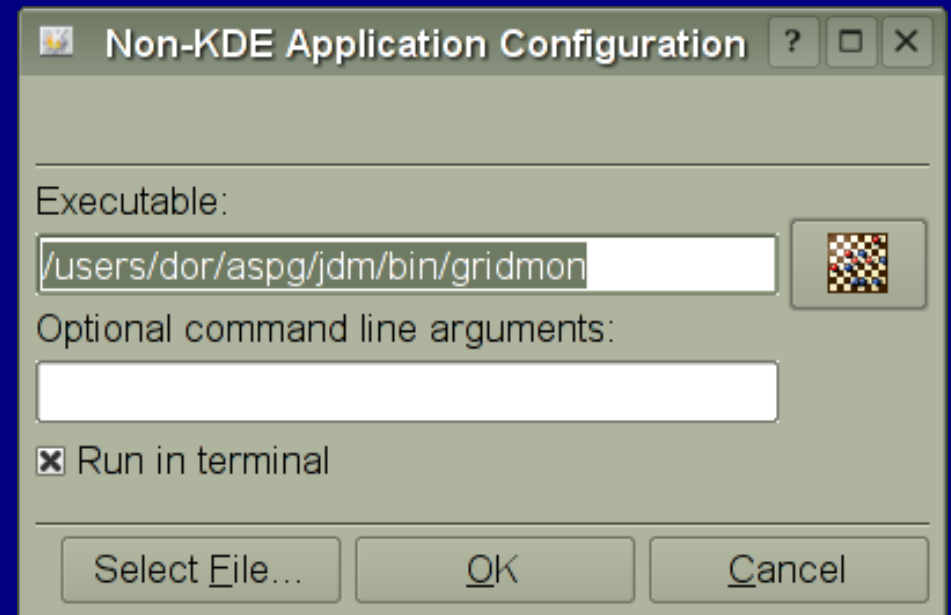
- E.g., Delete
  - Actions require gmttools
  - Requests are forwarded but *not* guaranteed
- Caution: There is currently no action verification step!

# KDE Panel Item

- Create script
- Right mouse-click on panel
- Select *Add-> Special Button-> Non-KDE Application* from menu
- Check “Run in Terminal” to keep startup display

```
#!/bin/sh
#
# gridmon

eval "`ssmuse sh -d /opt/ssm/gridmon`"
gridmon-pwa --user -y --browser firefox
sleep 60
```





# Configuration

- Advanced
- Refer to
  - The Gridmon PWA
  - Gridmon 1.0 (Presentation)

# Troubleshooting (1)

- Gridmon does not start
  - Cannot find a free communication port to use
- Gridmon does not answer
  - May have exited
    - Is the keepalive page still up?
    - Look for 'gridmon-pwa' in process list
    - Look for gridmon in 'lspwa' output
  - Check the URI being used
  - Is access allowed from your machine?
    - Are you local to the running Gridmon program?

# Troubleshooting (2)

- Gridmon shows a blank report page
  - May be a problem with a configuration file
- Gridmon is slow
  - Browser or machine may be heavily loaded
  - Network may be slow/down
  - A cellmon server may be down
    - Skipped after retries and timeouts
- Information is out of date
  - May be a problem with a cellmon server

# Troubleshooting (3)

- Actions (e.g., Delete) does not work
  - gmtools are not installed
    - Run gmttest
  - Request was rejected because of insufficient privileges
  - Problem with the queuing system

# Extras

- Gridmon and cellmon do not require or use Javascript
  - They play nice with browsers w/o Javascript support, and text-based browsers (e.g., elinks)
- Gridmon and cellmon are HTML *and* XML producers
  - Their data can be used by other applications

# Future

- Enable job submission directly from Gridmon
- Incorporate additional reports to the default set based on user requests
- Simplify updating of configuration, especially for reports
- Tailor some reports for small devices (e.g., Blackberry)

# Feedback

- Comments and questions are welcome
- Email: [John.Marshall@ec.gc.ca](mailto:John.Marshall@ec.gc.ca)

# References (1)

- *The Gridmon PWA – Documentation*  
(<http://cmiss.cmc.ec.gc.ca/~aspgjdm/The%20Gridmon%20PWA>)
- *Gridmon 1.0 (Presentation) – Some advanced topics covered, e.g., configuration*  
(<http://cmiss.cmc.ec.gc.ca/~aspgjdm/Gridmon%201.0.pdf>)



## References (2)

- *Introduction to the EC Computing Grid* – Provides information on gmttools and the current status of known EC cells (<http://cmiss.cmc.ec.gc.ca/~aspgjdm/Introduction%20to%20the%20Environment%20Canada%20Computing%20Grid.html>)
- cellmon – Connect to a cellmon site (e.g., <http://dorval-ib.cmc.ec.gc.ca:8002/>)
- gmttools – See help (-h or --help) for each tool