A National Computing Grid: FGI

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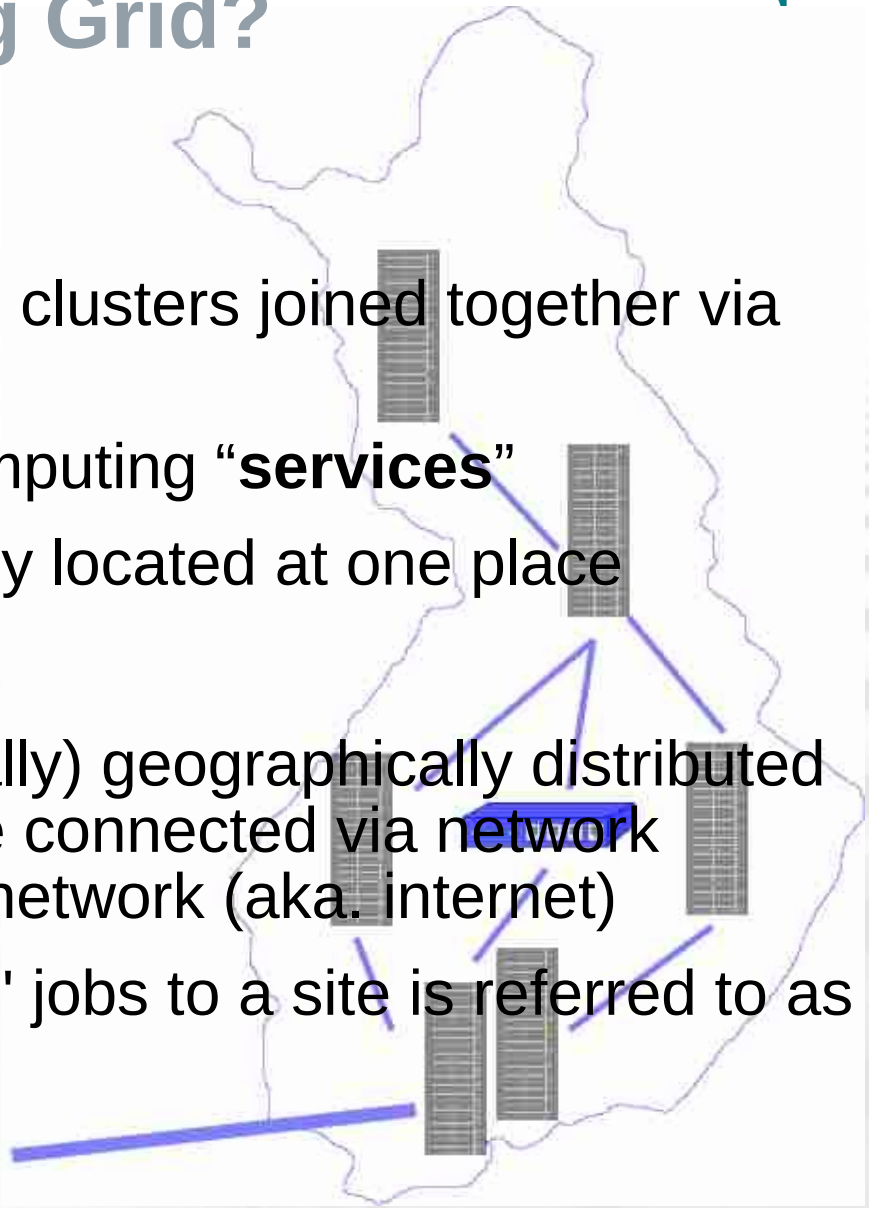
What is a computing Grid?

- **Site:**
  - One or more computing clusters joined together via network interfaces
  - Can also host other computing "**services**"
  - Generally geographically located at one place
- **Computing GRID:**
  - A number of sites (usually) geographically distributed where the frontends are connected via network interfaces to the GRID network (aka. internet)
  - Software to direct users' jobs to a site is referred to as **Grid Middleware**

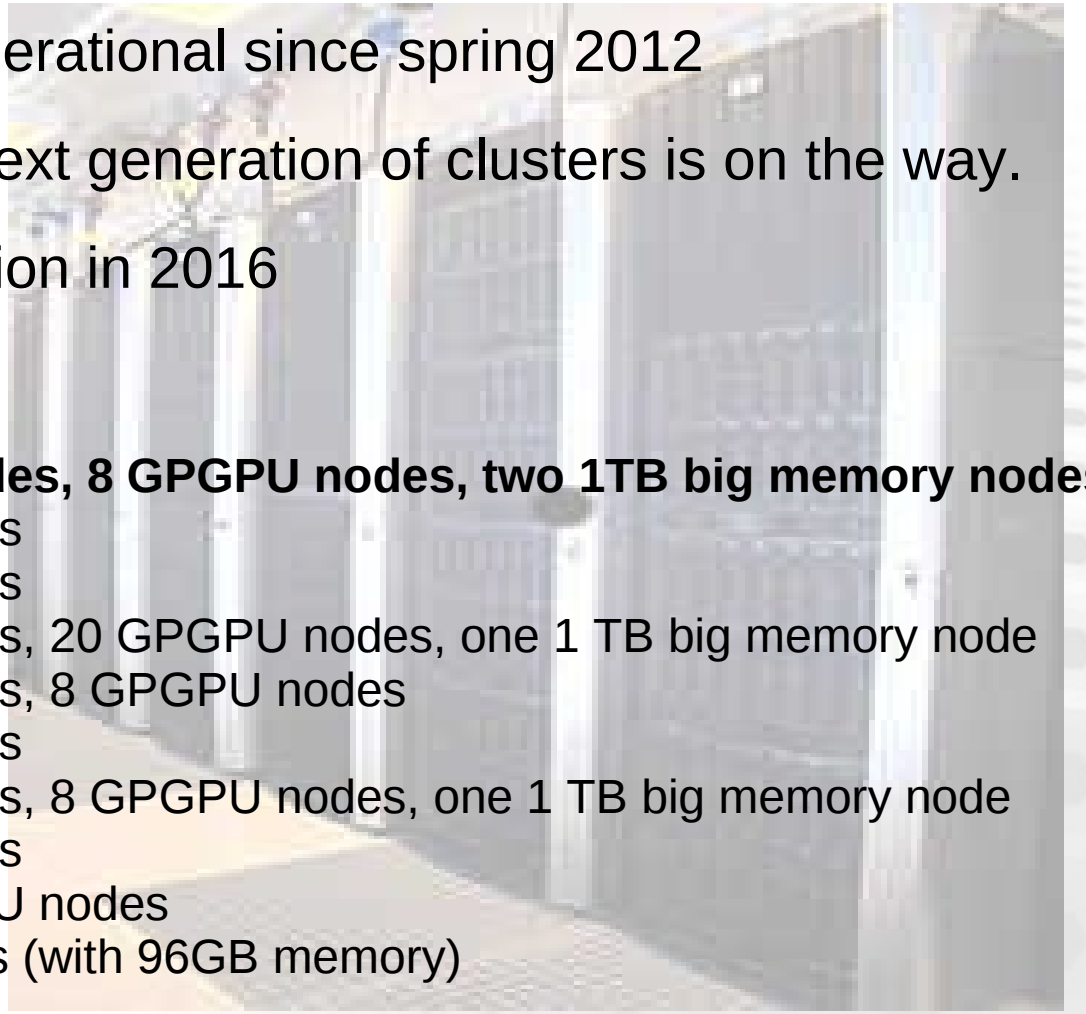


- **Virtual Organisation (VO):**
  - A community which has a common research or software requirement
    - Not geographically bound
    - Existing VOs can be easily joined
    - New VOs can be easily created

    (more on VOs further on)

FGI - Backgroud

- FGI has been fully operational since spring 2012
- Procurement of the next generation of clusters is on the way.
- New FCGI in production in 2016

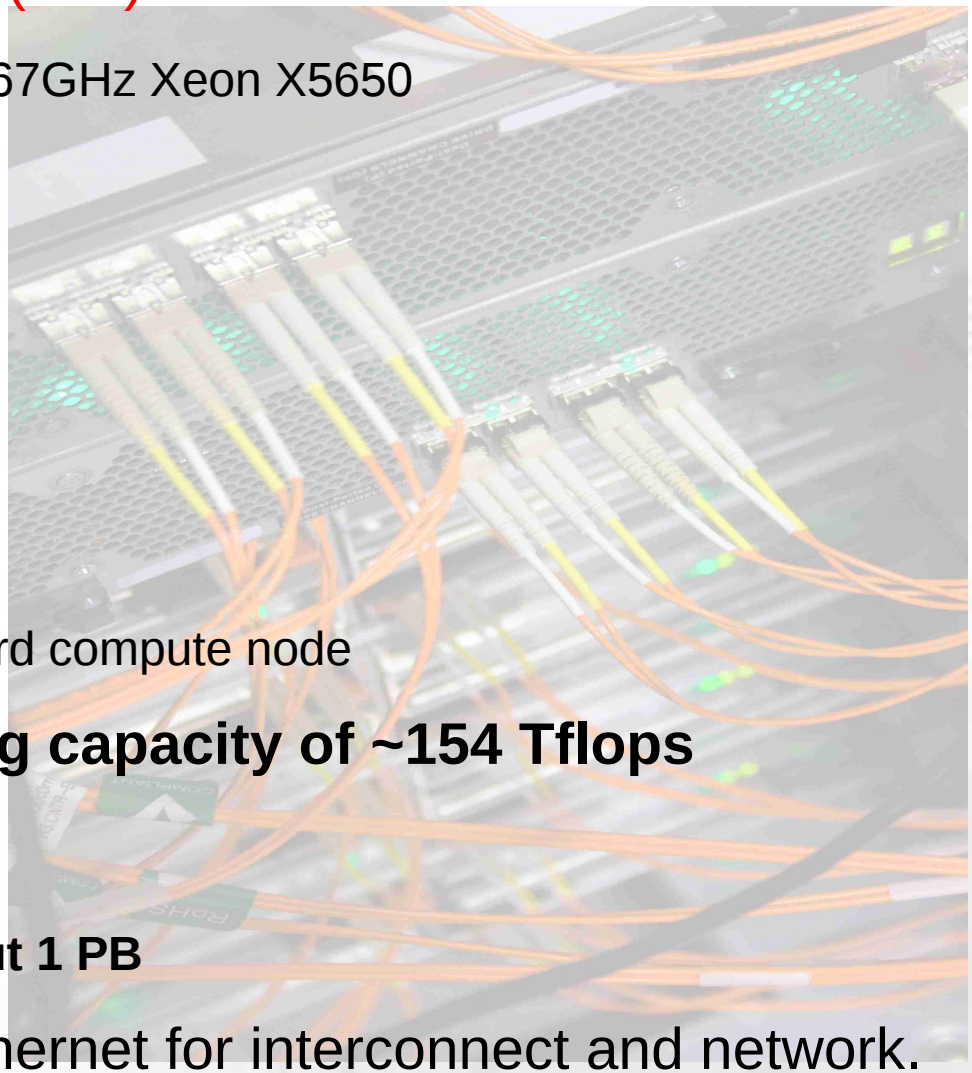


Current setup

Aalto:	**112 nodes, 8 GPGPU nodes, two 1TB big memory nodes**
Lappeenranta:	16 nodes
Eastern Finland:	64 nodes
Helsinki:	49 nodes, 20 GPGPU nodes, one 1 TB big memory node
Jyväskylä:	48 nodes, 8 GPGPU nodes
Oulu:	30 nodes
Tampere (TUT):	37 nodes, 8 GPGPU nodes, one 1 TB big memory node
Turku:	20 nodes
Åbo Akademi:	8 GPGPU nodes
CSC:	24 nodes (with 96GB memory)

FGI - Thechnology

- Standard node configuration (408)
  - HP SG7 scaleout dual 6 core 2.67GHz Xeon X5650
  - 24 GB memory (min.)
- Big Memory nodes (4)
  - HP Proliant DL 580 G7 server
  - 1 TB memory
- GPGPU nodes (52)
  - 2 Nvidia Tesla cards in a standard compute node
- **Theoretical peak computing capacity of ~154 Tflops**
- **Disk servers:**
  - **Total storage capacity of about 1 PB**
- QDR InfiniBand & Gigabit ethernet for interconnect and network.



FGI - Background

- Local use is open at all sites
- Sites maintain their own clusters:
  - Site administrators are encouraged to collaborate and communicate
    - Weekly meetings
    - Providing grid software support for users
    - Becoming part of the FGI community
- Small team from CSC manage the general administration

Gridifying

- CSC manages the FGI grid environment
- CSC represents Finland as the National Grid Provider in EGI (European Grid Infrastructure)
  - FGI is connected to EGI through common tools, protocols and agreements
- FGI uses the ARC middleware
  - Developed by NorduGrid, part of the European Middleware Initiative (EMI)
- Grid functionality is fully operational across all sites.

What FGI can offer you:

- Hardware resources
  - More resources than a single University can offer
  - Distributed nature means better availability even when the local cluster is full
  - Local account is not required!
- Software
  - There are a number of software packages already available for use via the grid
    - Runtime environments list is available at

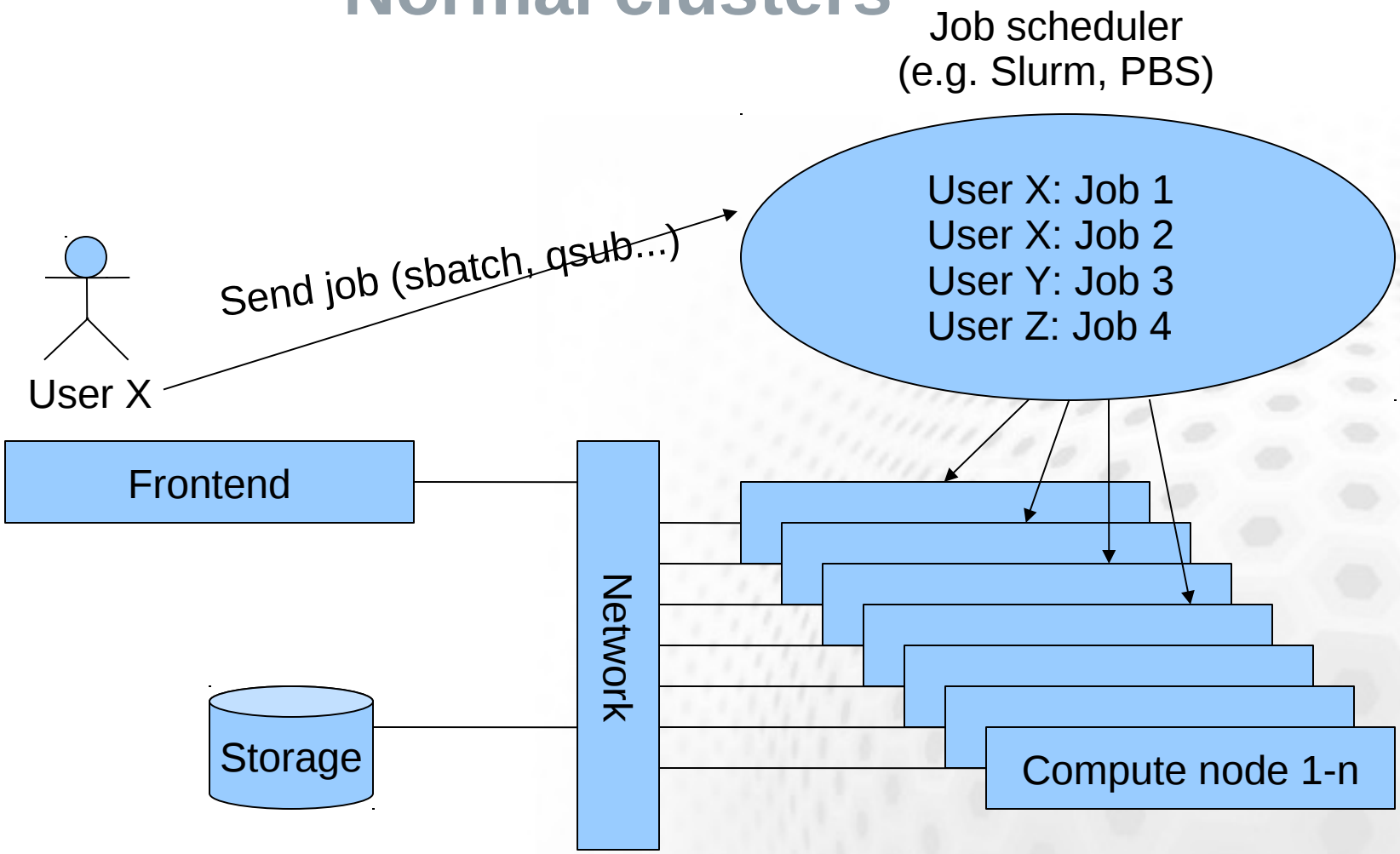
https://confluence.csc.fi/display/fgi/Grid+Runtime+Environments

- Support
  - CSC provides GRID administrative support, software AND user support

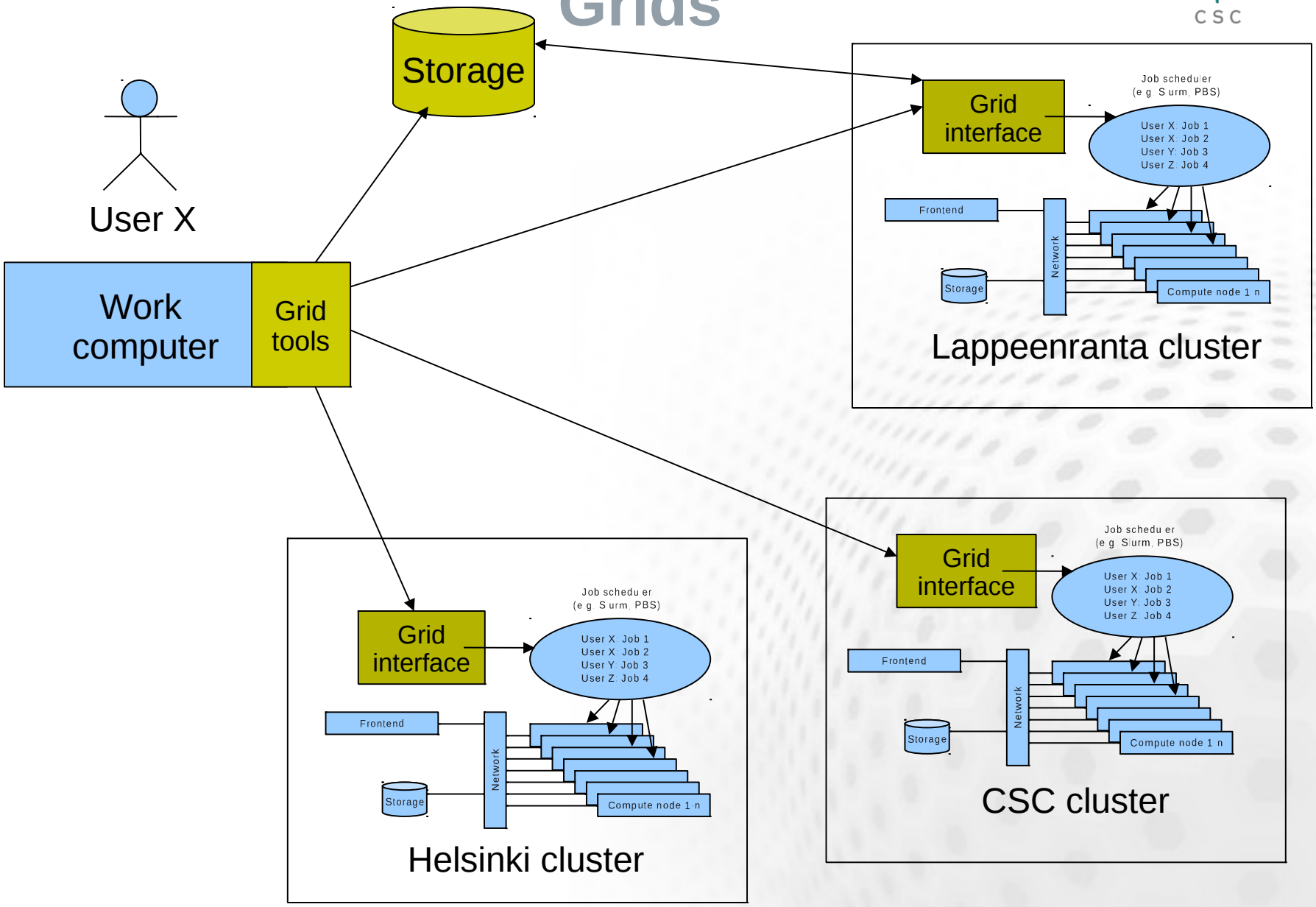
send an email to : helpdesk@csc.fi

Grid Technologies: The ARC middleware

Normal clusters



Grids


Storage
User X
Work computer
Grid tools
Grid interface
Job scheduler (e.g. Slurm, PBS)
User X: Job 1
User X: Job 2
User Y: Job 3
User Z: Job 4
Frontend
Network
Storage
Compute node 1..n
Lappeenranta cluster
Grid interface
Job scheduler (e.g. Slurm, PBS)
User X: Job 1
User X: Job 2
User Y: Job 3
User Z: Job 4
Frontend
Network
Storage
Compute node 1..n
Helsinki cluster
Grid interface
Job scheduler (e.g. Slurm, PBS)
User X: Job 1
User X: Job 2
User Y: Job 3
User Z: Job 4
Frontend
Network
Storage
Compute node 1..n
CSC cluster

Grids and ARC

- The ARC middleware is used in FGI
  - Server side
  - Client tools
- Also other grid middleware used in Europe
  - gLite
  - Unicore
  - condor

User accounts in grids

- Grids do not use usernames and passwords
- Users authenticated using x509 certificates
  - Easy to get a certificate (HAKA + Terena)
- FGI Users must join **fgi.csc.fi VO**
  - Resources give access to **VOs** not users
  - In Finland we use the fgi.csc.fi VO
  - Simple to join (https://research.csc.fi/fgi-user-guide)

What do you need?

- Certificate
- VO membership
- The ARC client tools
  - Installable on
    - most Linux versions
    - MAC OSX
  - ARC is available at CSC in Taito.csc.fi
    - Also available on your local cluster login node

Starting with FGI

- FGI User guide: https://research.csc.fi/fgi-user-guide
- FGI user pages: http://confluence.csc.fi/display/FGI
  - Central place for all documentation and information about FGI
  - Getting started
  - Available software, and how to use it
- helpdesk@csc.fi
  - Problems? Requests?

Software in FGI

- Some scientific software is pre-installed
  - Primarily open source software
- Runtime environment defines a software setup

(analogous to *environment modules* in clusters)

https://confluence.csc.fi/display/fgi/Runtime+Environments

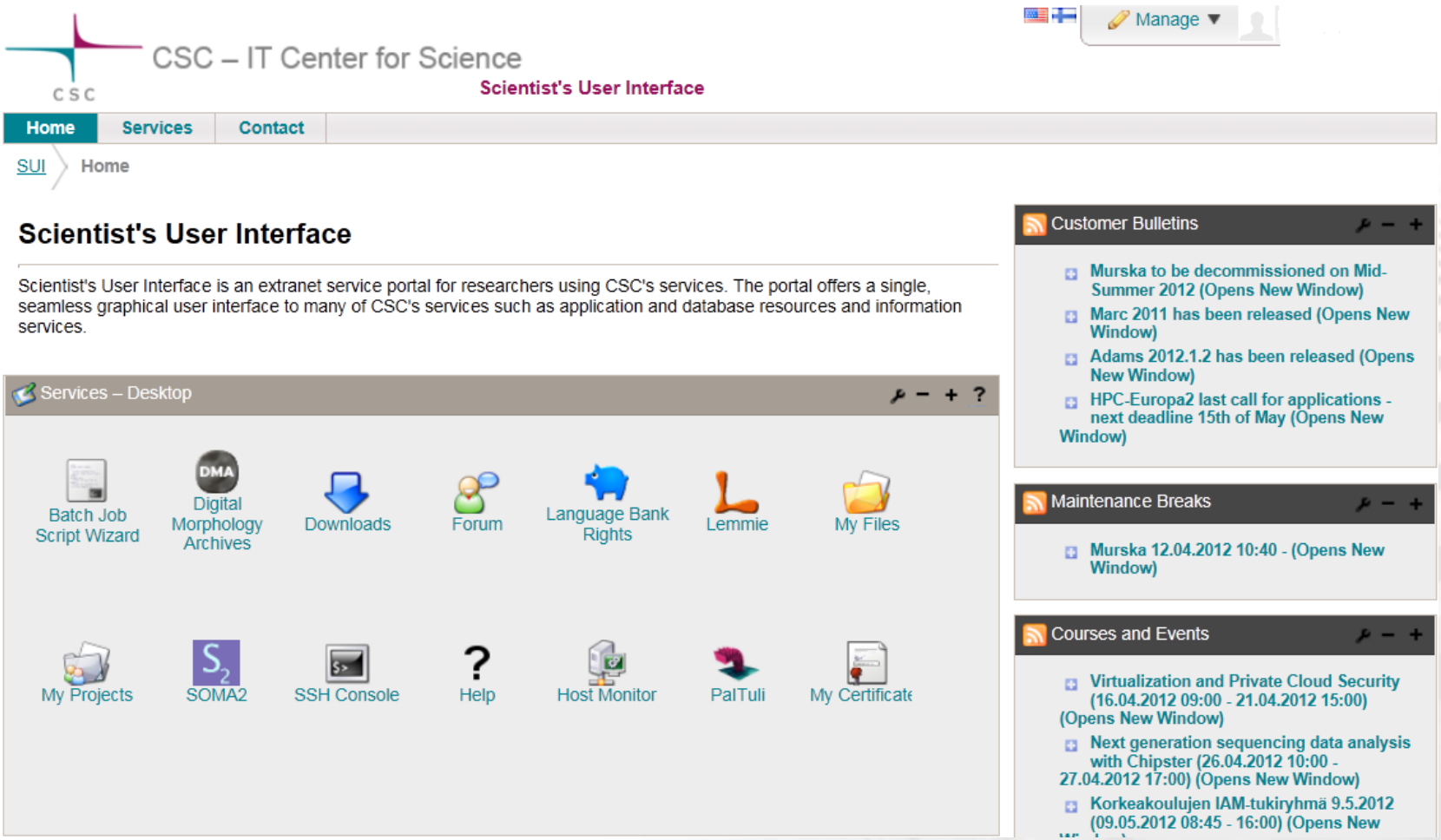
- You can also run your own programs in FGI
- If you have suggestions, contact us

Other ways to use the FGI

- Arcrunner: automatic job submission tool for large grid-job sets
- Automatic command line interfaces for: AutoDock, BLAST, BWA, BOWTIE2, InterPro, SHRIMP and Exonerate
- Matlab Compiler Runtime
- batch script wizard on SUI!

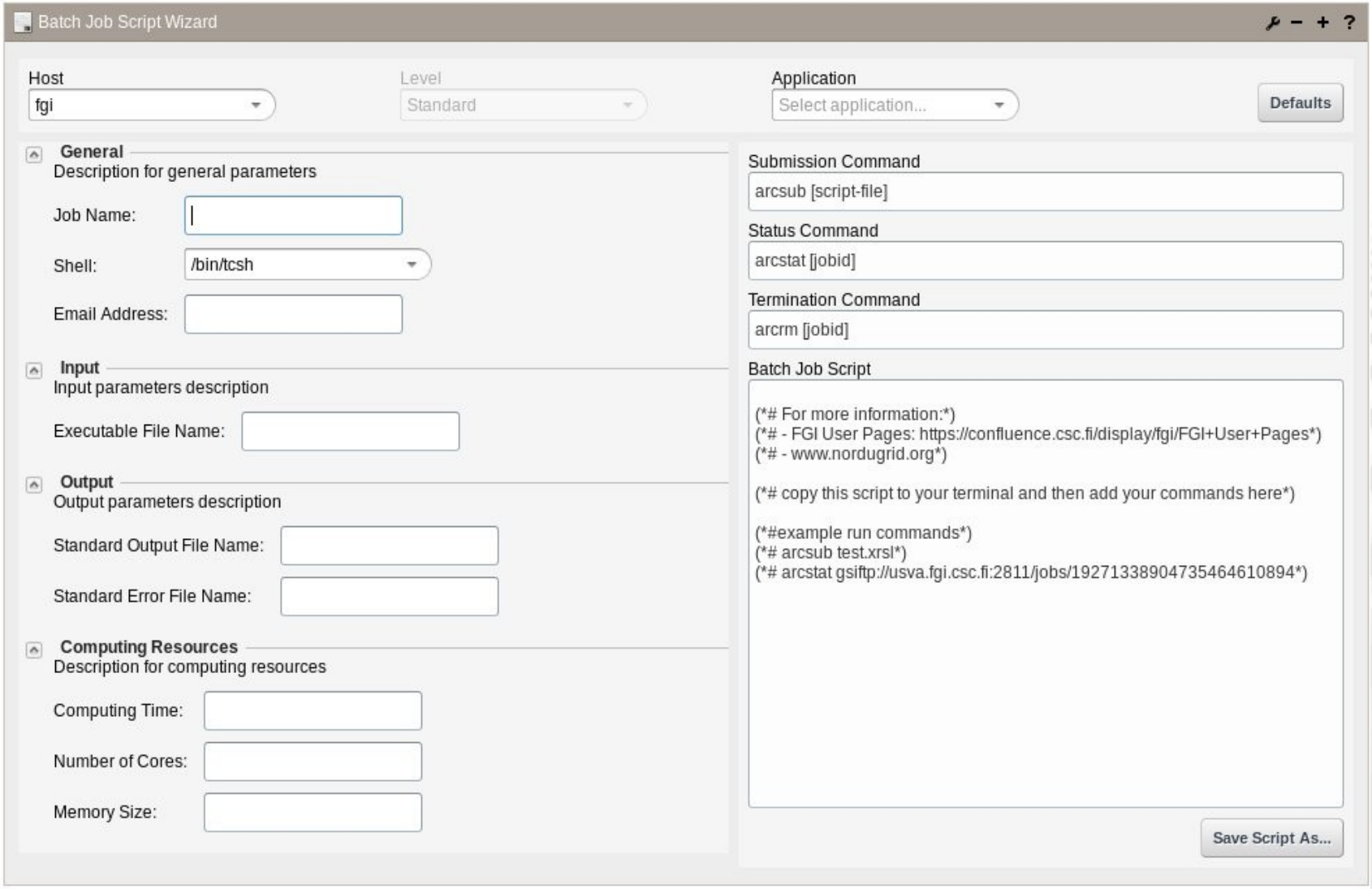
Scientist's User Interface: SUI

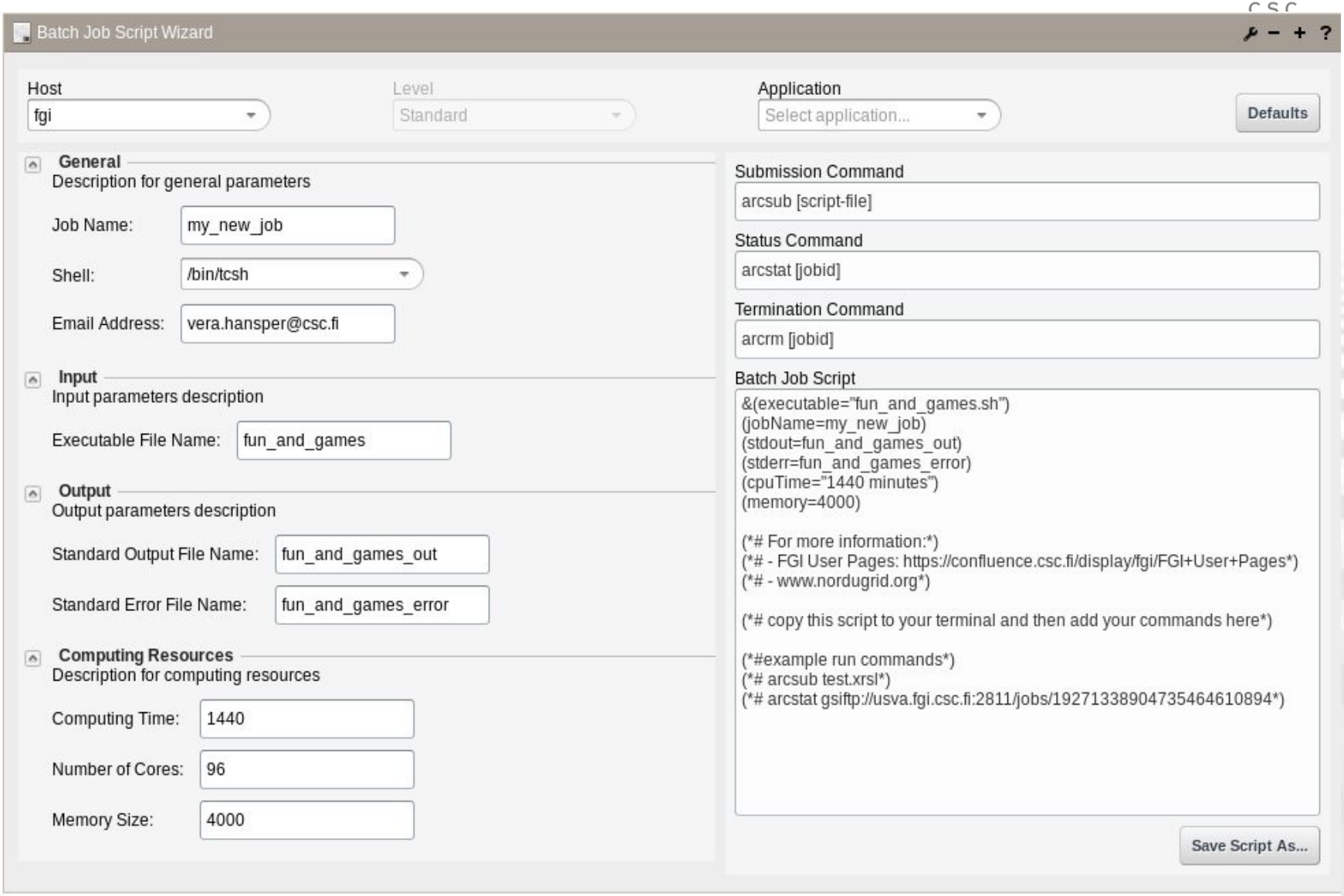
http://sui.csc.fi



More info at: http://www.csc.fi/english/research/SUI_presentation/download

Batch job wizard




Batch Job Script Wizard
Host
fgi
Level
Standard
Application
Select application...
Defaults
General
Description for general parameters
Job Name:
my_new_job
Shell:
/bin/tcsh
Email Address:
vera.hansper@csc.fi
Input
Input parameters description
Executable File Name:
fun_and_games
Output
Output parameters description
Standard Output File Name:
fun_and_games_out
Standard Error File Name:
fun_and_games_error
Computing Resources
Description for computing resources
Computing Time:
1440
Number of Cores:
96
Memory Size:
4000
Submission Command
arcsub [script-file]
Status Command
arcstat [jobid]
Termination Command
arcrm [jobid]
Batch Job Script
&(executable="fun_and_games.sh")
(jobName=my_new_job)
(stdout=fun_and_games_out)
(stderr=fun_and_games_error)
(cpuTime="1440 minutes")
(memory=4000)
(*# For more information:*)
(*# - FGI User Pages: https://confluence.csc.fi/display/fgi/FGI+User+Pages*)
(*# - www.nordugrid.org*)
(*# copy this script to your terminal and then add your commands here*)
(*#example run commands*)
(*# arcsub test.xrsl*)
(*# arcstat gsiftp://usva.fgi.csc.fi:2811/jobs/19271338904735464610894*)
Save Script As...


FGI
FINNISH GRID
INFRASTRUCTURE
A NEW FINNISH NATIONAL GRID
Tartun yliopisto
University of Tartu
egi
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