Job-Monitoring and Monitoring of Resource Usage in HEPCG

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Motivation: Job Monitoring

- Usual scenario in modern HEP experiments
  - Simulations and analyses run as hundreds or thousands of Jobs in a Grid
- Its hard for the user keep an overview of what is going on with his/her jobs.
    - Which are still working, which crashed, which might hang ?
- Need more information than just status.
  Sufficient information for user to understand the state of his/her jobs.
- Information needs to be arranged that its „user readable“ and even more important „user understandable“.

Job-Monitoring: Goals

- More and better information than current monitoring
  - Currently (LCG 2.7.0) command line tools,
    job ID's needed
    `edg-job-status`
    `https://grid-rb0.desy.de:9000/RRylibl7NaoyGl-n1ZTXDA`
  - `edg-wl-ui-jobmonitor.sh`
    gives simple list of job status, job ID needs to be provided
- Easy and intuitive handling
  - User should not have to know much about the monitoring itself, e.g. job ID's
  - Browser-Access to Monitoring

Job-Monitoring: Goals

- From overviews / summaries to detailed data of single jobs
- Help the users with graphical displays
- Interactive displays
  - click to get more or detailed information
  - zoom into displays (of thousands of jobs)

Motivation: Resource Usage Monitoring

- Provider View:
  - Simulations and Analyses run as Hundreds or Thousands of Jobs
  - What is going on on my machines?
  - Are the resources in our VO sufficient ?
  - Are there any bottlenecks ?
- Its hard for the providers to keep an overview of what is going on the machines in detail.
  - Do the jobs consume all network bandwidth? What disks are they accessing? Do I need more disk space? More network to my disks ?
- Information needs to be arranged that its „provider readable“ and even more important „provider understandable“.

Resource Usage Monitoring: Goals

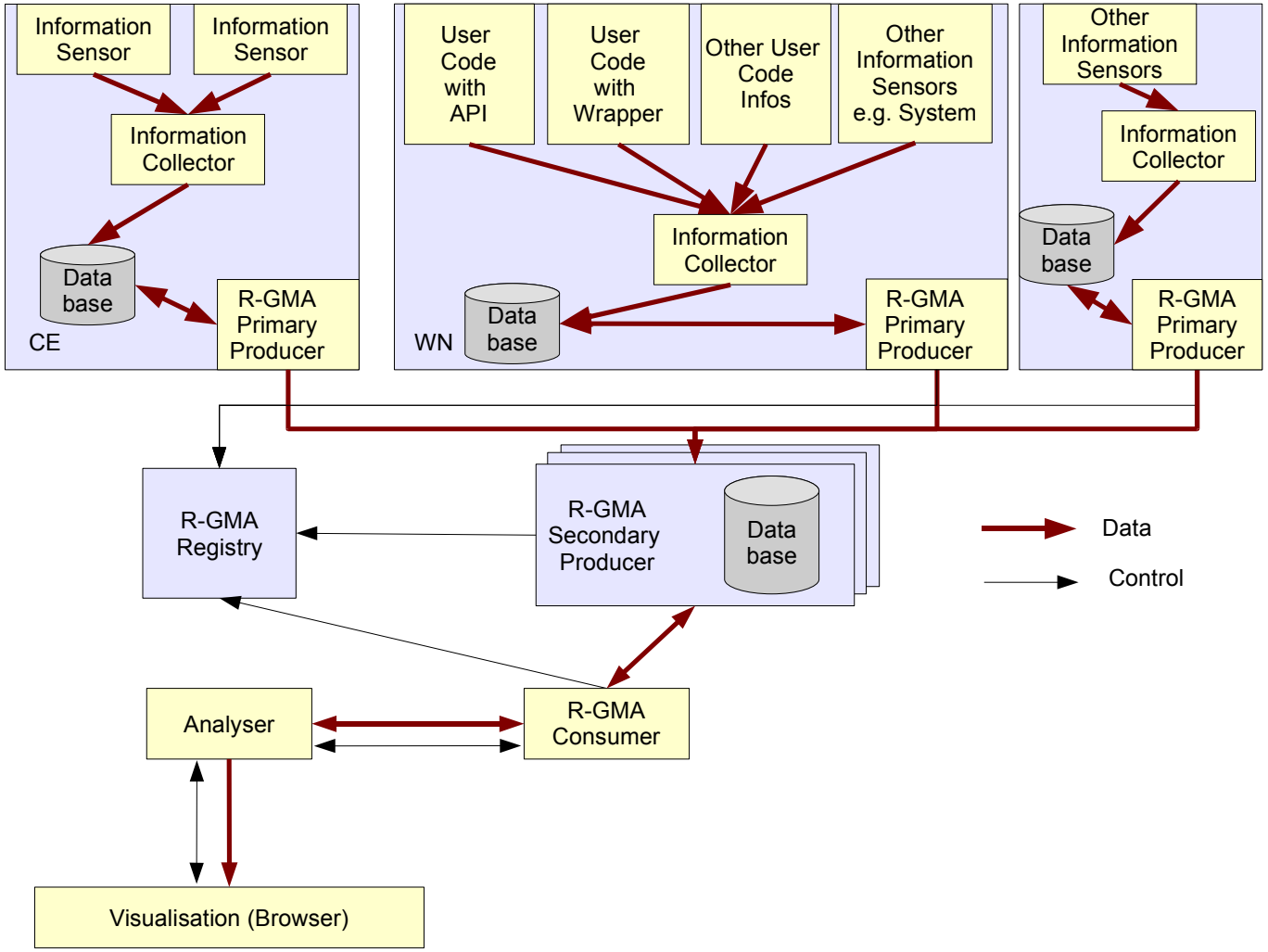
- Information for resource providers about the usage of their resources by user jobs
- Methods to analyse the comprehensive information
- Display job- and resource flows
- Provide information that can be used for planning and managing the Grid infrastructure
- Uniform interface
- Simple handling
- Support by visualisation of information

Resource Usage Monitoring: Goals

- Possible scenario:
  - Provider has to authorize
  - ask for information
    - about specified resources (names) in a time range
    - for a type of resource
    - for specified jobs or VOs
  - graphical presentation of analysed data
    - histograms, time lines, summaries, ...
- Provide preselections of data
- From summaries to detailed information
- Support different access roles

Architecture

- Modular components
  - Information collection and storage
  - Provision and retrieval of information
  - Analysis
  - Visualisation
- Use existing components
  - Use R-GMA for data storage and retrieval
  - Monitoring-Sensors
    e.g. Logging&Bookkeeping for status info,
    Lemon sensors für system info


Information Sensor
Information Sensor
Information Collector
Data base
R-GMA Primary Producer
CE
User Code with API
User Code with Wrapper
Other User Code Infos
Other Information Sensors e.g. System
Information Collector
WN
Data base
R-GMA Primary Producer
Other Information Sensors
Information Collector
Data base
R-GMA Primary Producer
R-GMA Registry
R-GMA Secondary Producer
Data base
Data
Control
Analyser
R-GMA Consumer
Visualisation (Browser)

Information

- Collection: Sampling with variable time intervals
- Persistence
  - defined life time
  - persistent storage of parts of the data for resource usage monitoring - summaries, compression
- Which information?
  - Status, usage information
    - CPU-Load, Memory, Data I/O ...
    - Resource Broker information
- User specified information
  - I/O (stdout, stderr, files ...)
  - Information via a API - numbers, string, e.g. number of processed events
    - API: log4xx, R-GMA, a simple API ...

Analysis and Visualisation

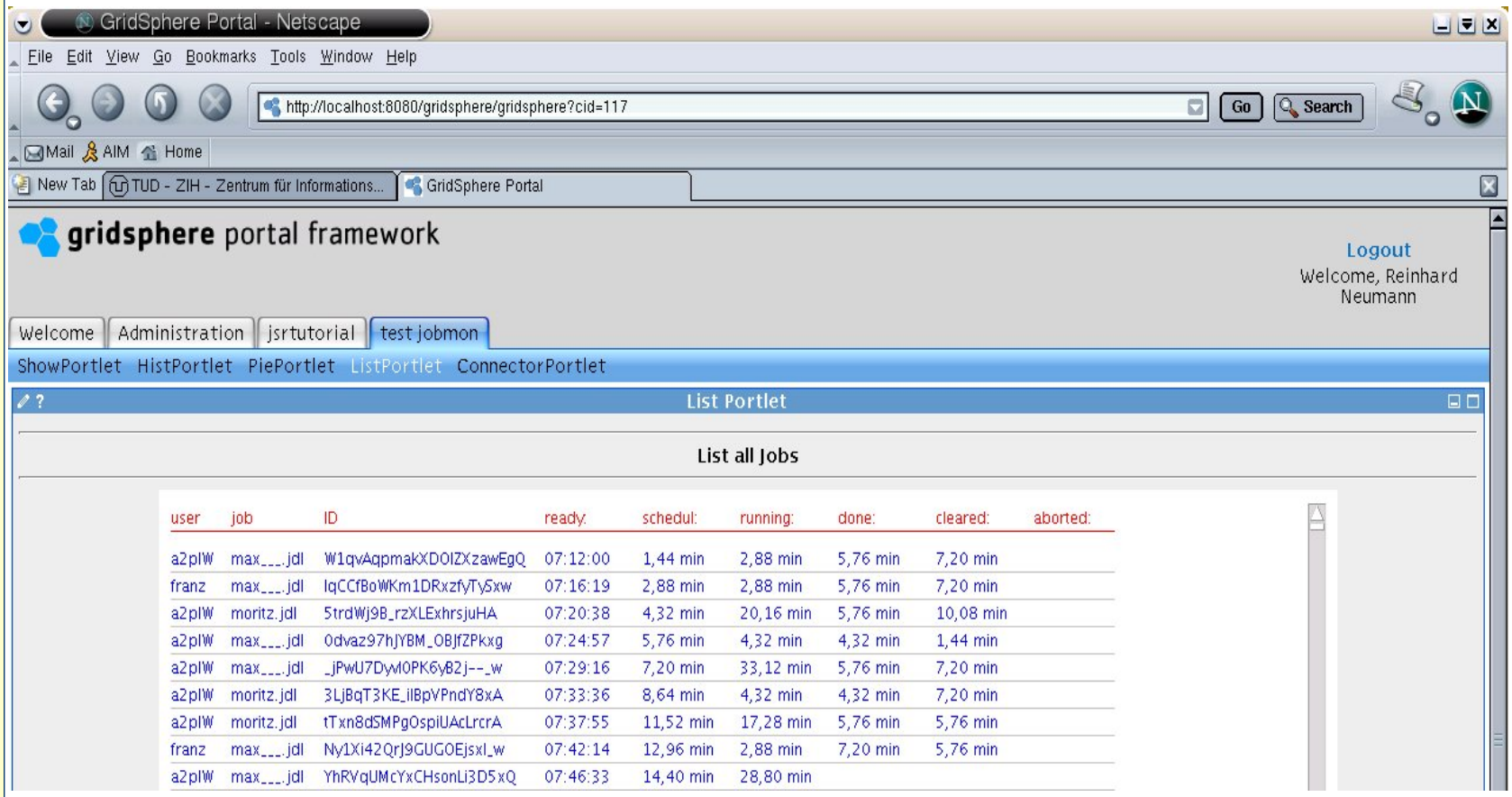
- Separate analysis and visualisation
  - Calculation for analysis should not block visualisation (Web Server)
  - Analyser prepares data for visualisation
- Simple access and handling
  - Via Web-Browser
  - Integrate into Portal - GridSphere
    - uniform interface
    - provides already tools e.g. for authorization
- Interactive graphics
  - No static histograms
  - Get to detailed information by clicking on histogram

Visualisations

- Lists for overviews, sortable
- Diagrams
  - e.g. status, time needed to get to a status ...
  - Zooming necessary when handling hundreds of jobs
- Time lines
  - e.g. status vs time, usage vs. time ...
- Differential displays
  - Changes in time
- Summaries
  - e.g. execution times or data read
- Correlations between metrics
  - e.g. Walltime vs I/O
- Integration of user specific information
- ...

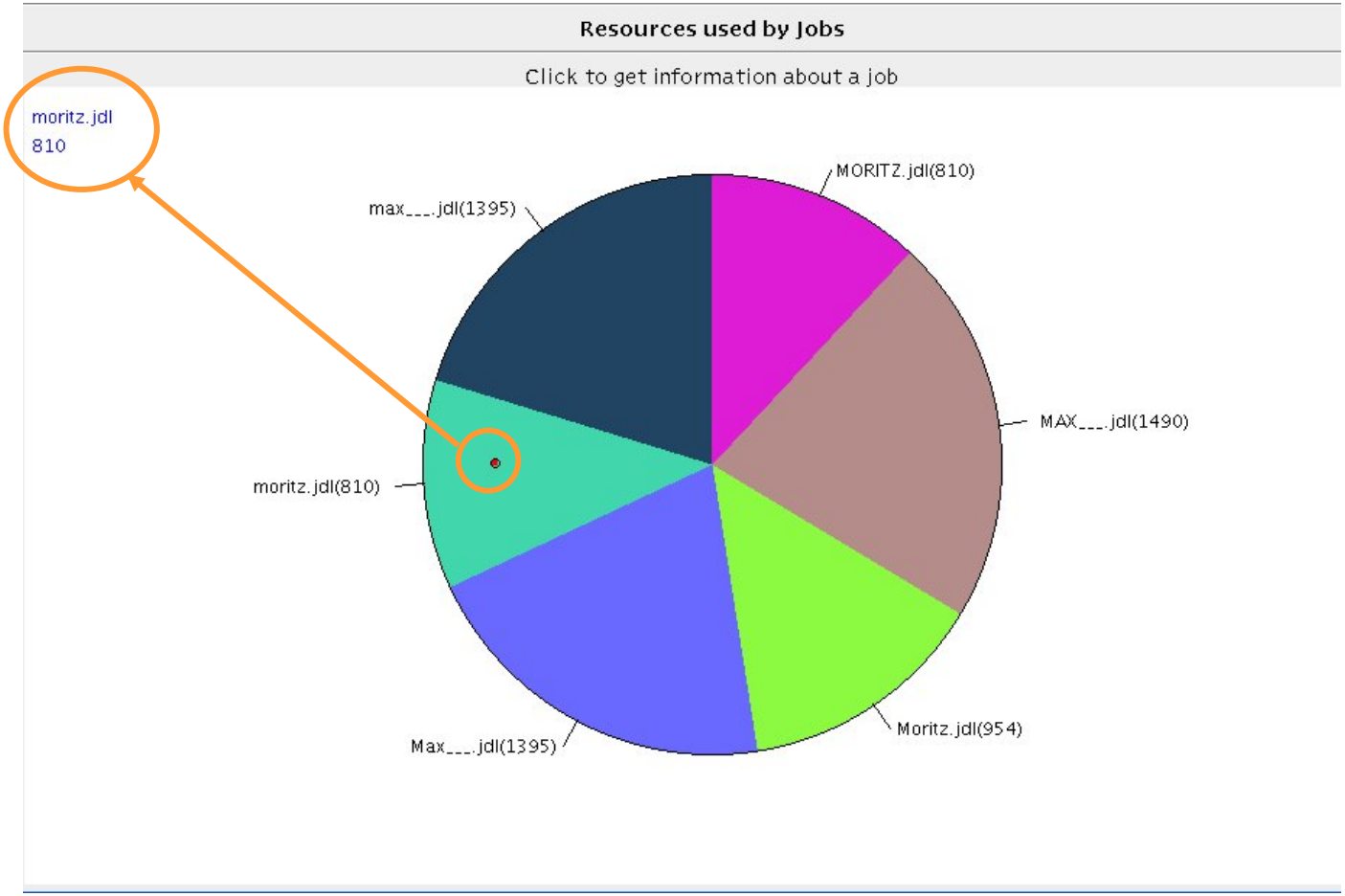
First Shots

- Integration into GridSphere

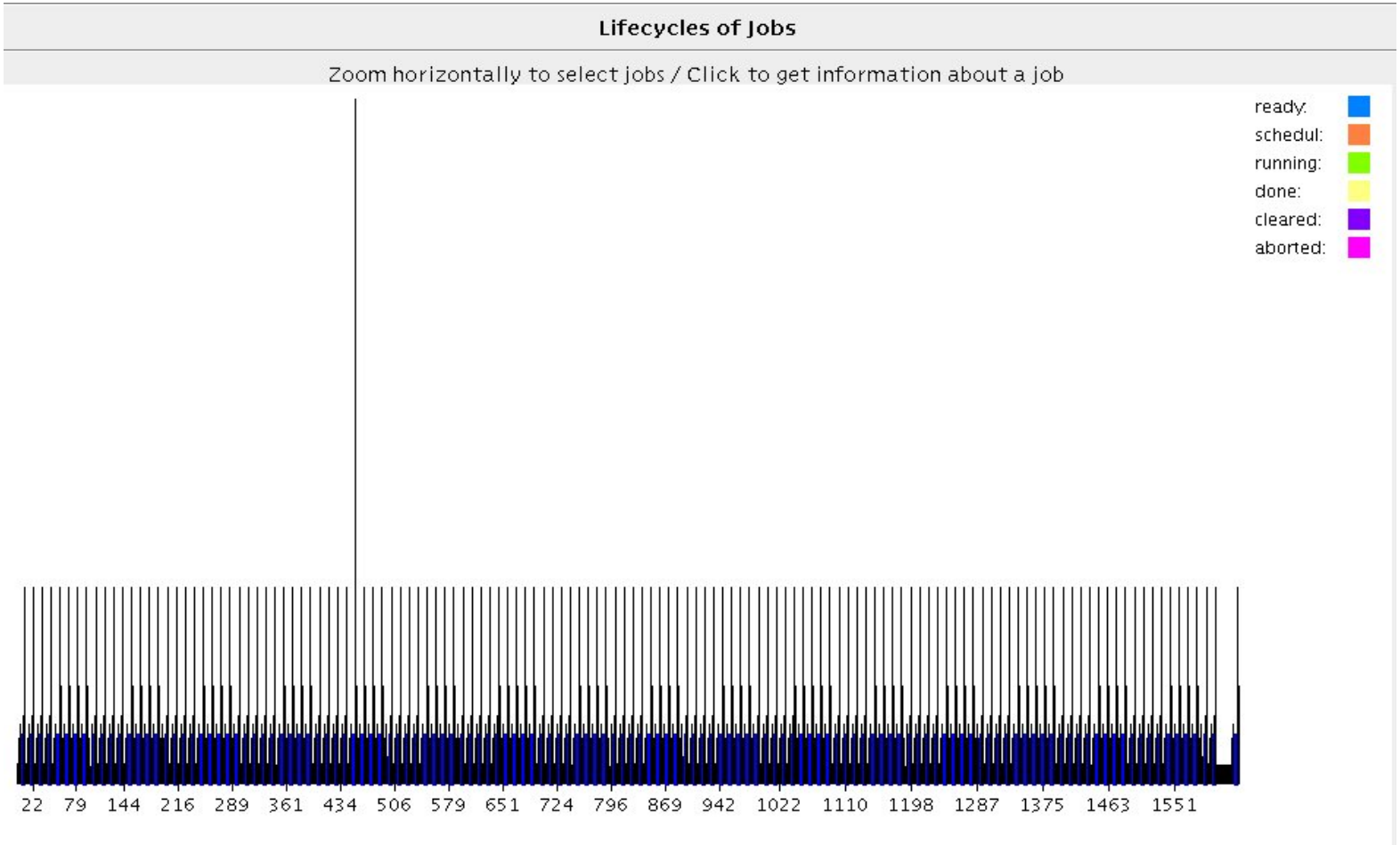


user	job	ID	ready:	schedul:	running:	done:	cleared:	aborted:
a2plW	max___.jdl	W1qvAqpmakXDOIZXzawEgQ	07:12:00	1,44 min	2,88 min	5,76 min	7,20 min	
franz	max___.jdl	IqCCfBoWKm1DRxzfyTy5xw	07:16:19	2,88 min	2,88 min	5,76 min	7,20 min	
a2plW	moritz.jdl	5trdWj9B_rzXLExhrsjuHA	07:20:38	4,32 min	20,16 min	5,76 min	10,08 min	
a2plW	max___.jdl	0dvaz97hJYBM_OBJfZPkxg	07:24:57	5,76 min	4,32 min	4,32 min	1,44 min	
a2plW	max___.jdl	_jPwU7Dyw0PK6yB2j--_w	07:29:16	7,20 min	33,12 min	5,76 min	7,20 min	
a2plW	moritz.jdl	3LjBqT3KE_ilBpVPndY8xA	07:33:36	8,64 min	4,32 min	4,32 min	7,20 min	
a2plW	moritz.jdl	tTxn8dSMPgOspiUAcLrcrA	07:37:55	11,52 min	17,28 min	5,76 min	5,76 min	
franz	max___.jdl	Ny1Xi42QrJ9GUGOEjsxI_w	07:42:14	12,96 min	2,88 min	7,20 min	5,76 min	
a2plW	max___.jdl	YhRVqUMcYxCHsonLi3D5xQ	07:46:33	14,40 min	28,80 min			

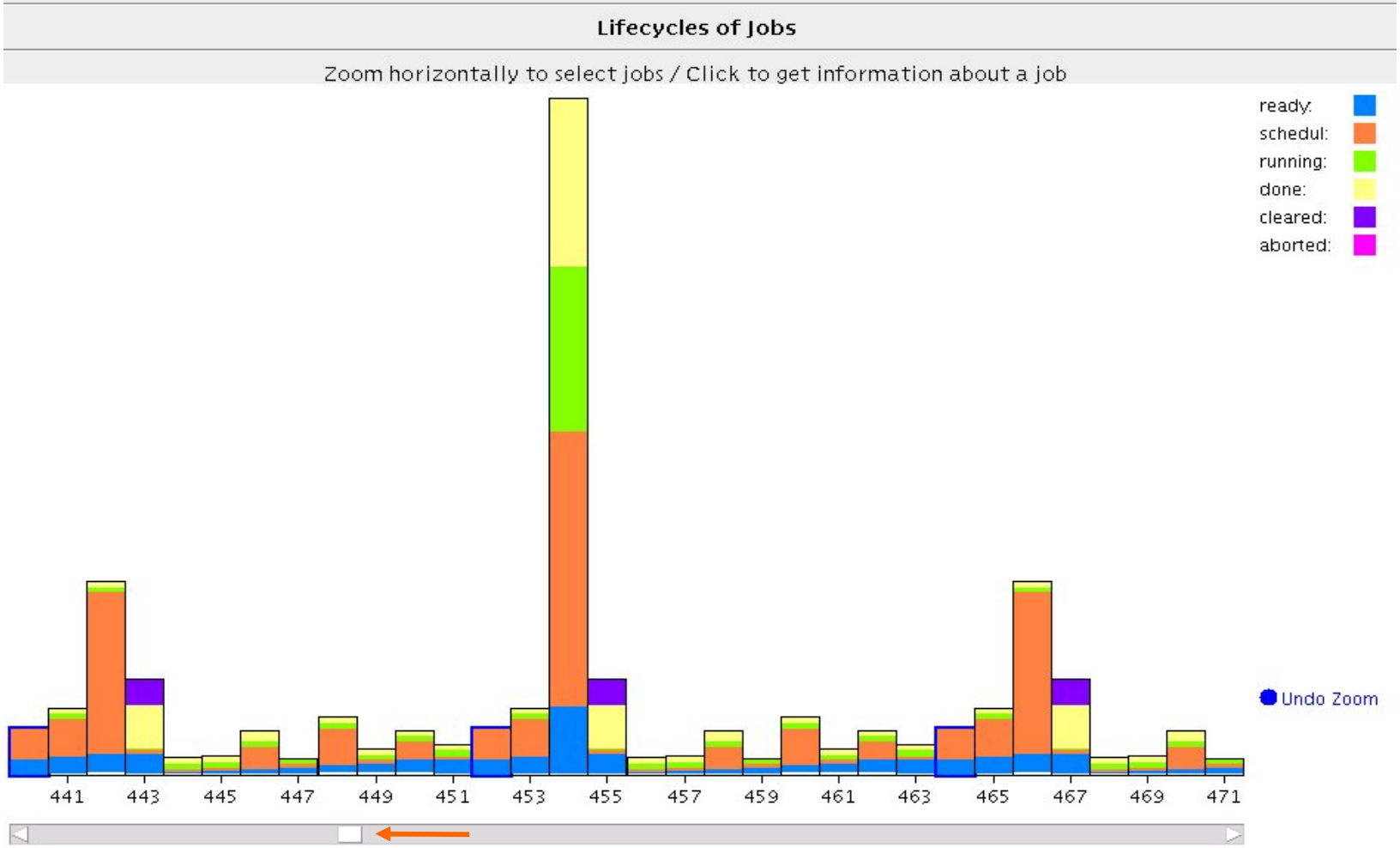
Additional information is available after clicking into one of the sectors



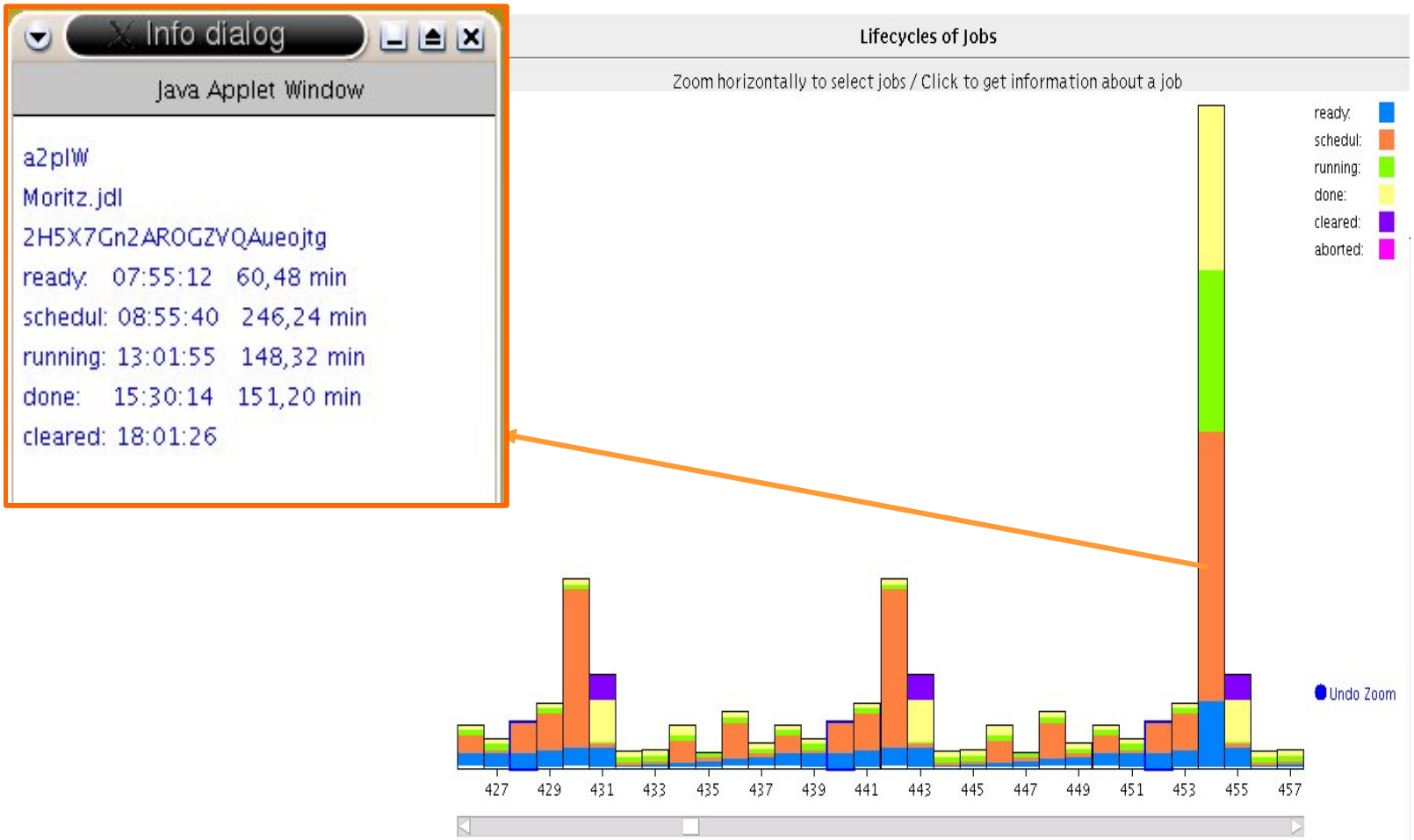
- Status of some hundred jobs – can you see something ?



After horizontal zooming more details are visible:



Clicking into one of the bars gives additional information:



Summary

- Job-Monitoring will provide users with convenient tools to monitor their (hundreds of) jobs
- Resource-Usage Monitoring for provider to support them in managing and planning their resources
- Modular design
- Will provide graphical displays and pre-analysis of information
- Browser access by integrating it into a portal (GridSphere)
- First prototyp planned for September for test users