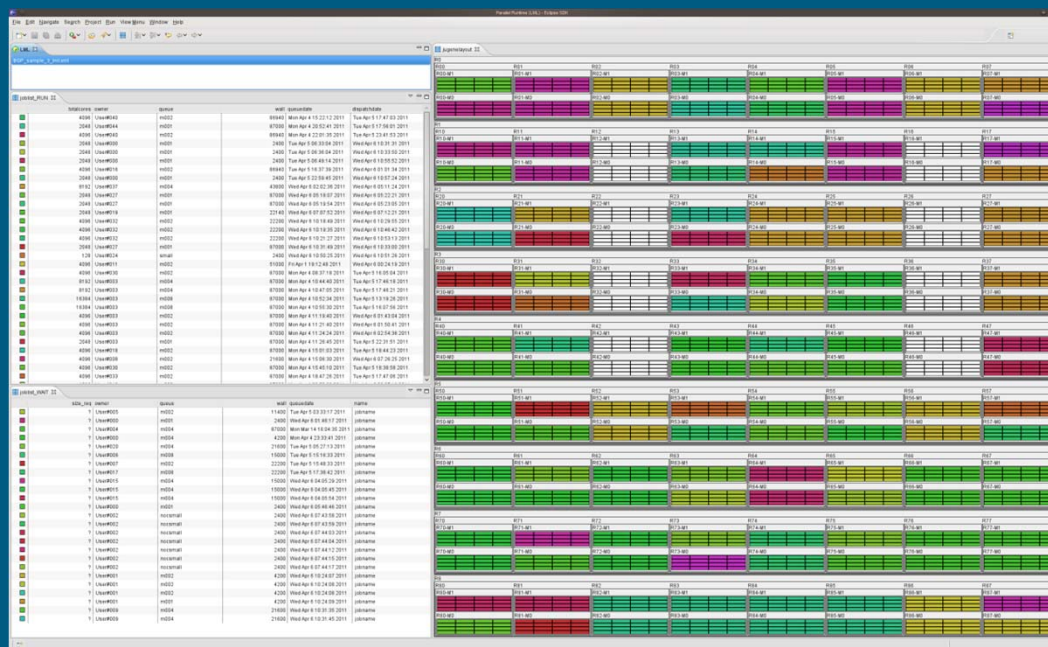


# Scalable System Monitoring

## with Eclipse Parallel Tools Platform

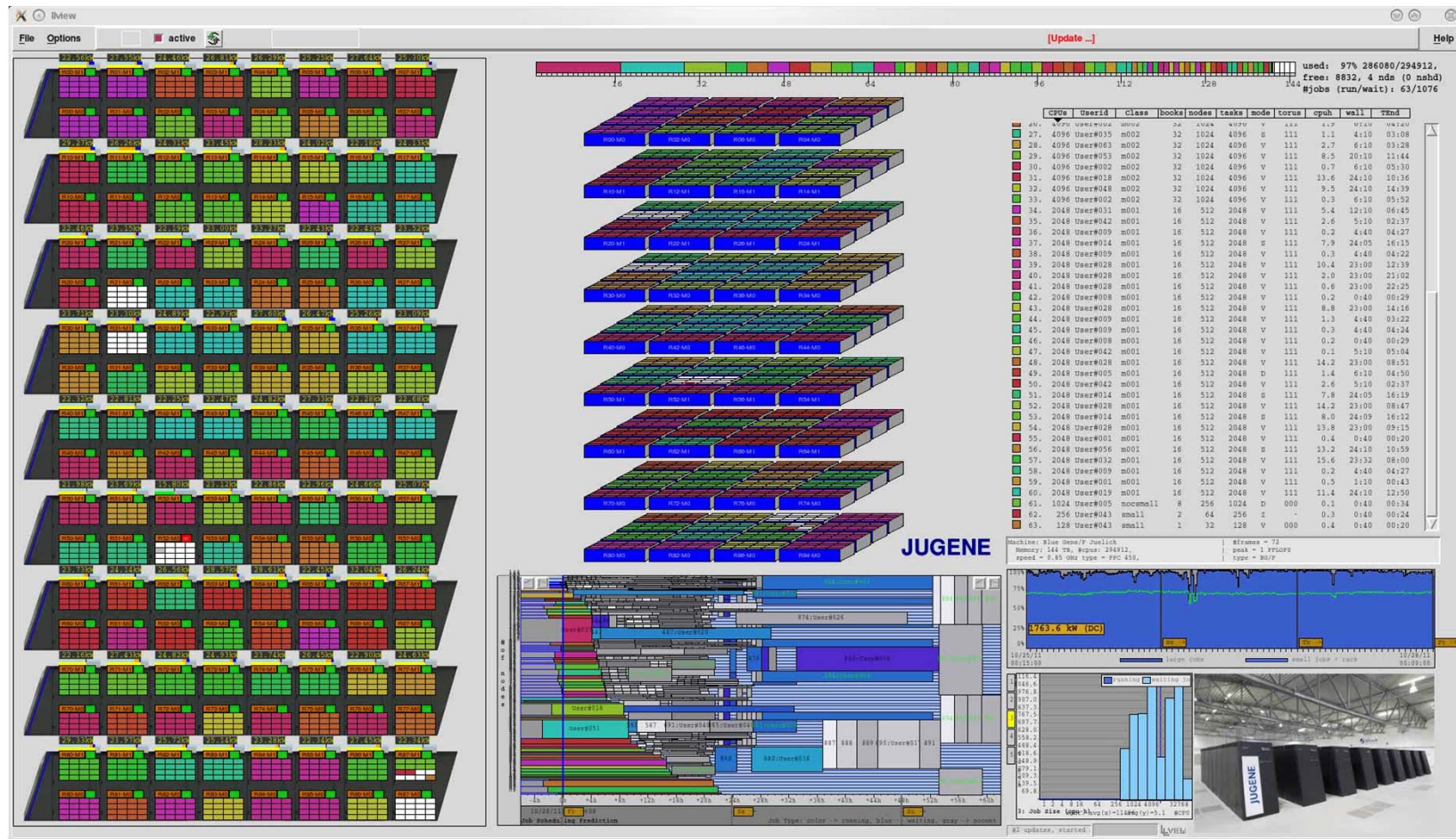
Wolfgang Frings  
Jülich Supercomputing Centre



# Why System Monitoring in an IDE?

- Eclipse/PTP: Development, execution and debugging of parallel programs on remote systems
- Information about remote system status:
  - Where is my job running?
  - What's going on remote system?
  - Why is my job not running?
- Monitoring parallel programs on remote system:
  - Eclipse/PTP version of llq / qstat
    - LLview batch system monitoring tool
- LLview: graphical monitoring, mapping of jobs to system resources

# Sample: Iview client, JUGENE



# LLview and Eclipse PTP

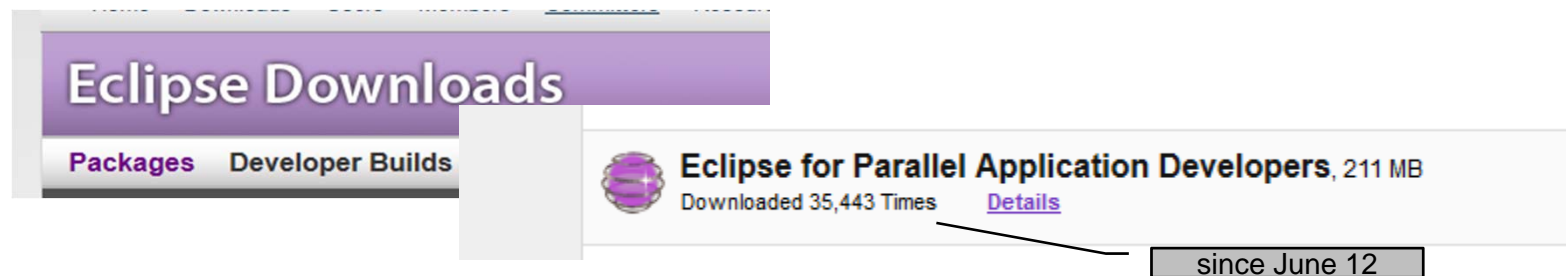
PTP: Eclipse Parallel Tools Platform

- Remote system monitoring
- New implementation using LML, LLview components and LML adapters



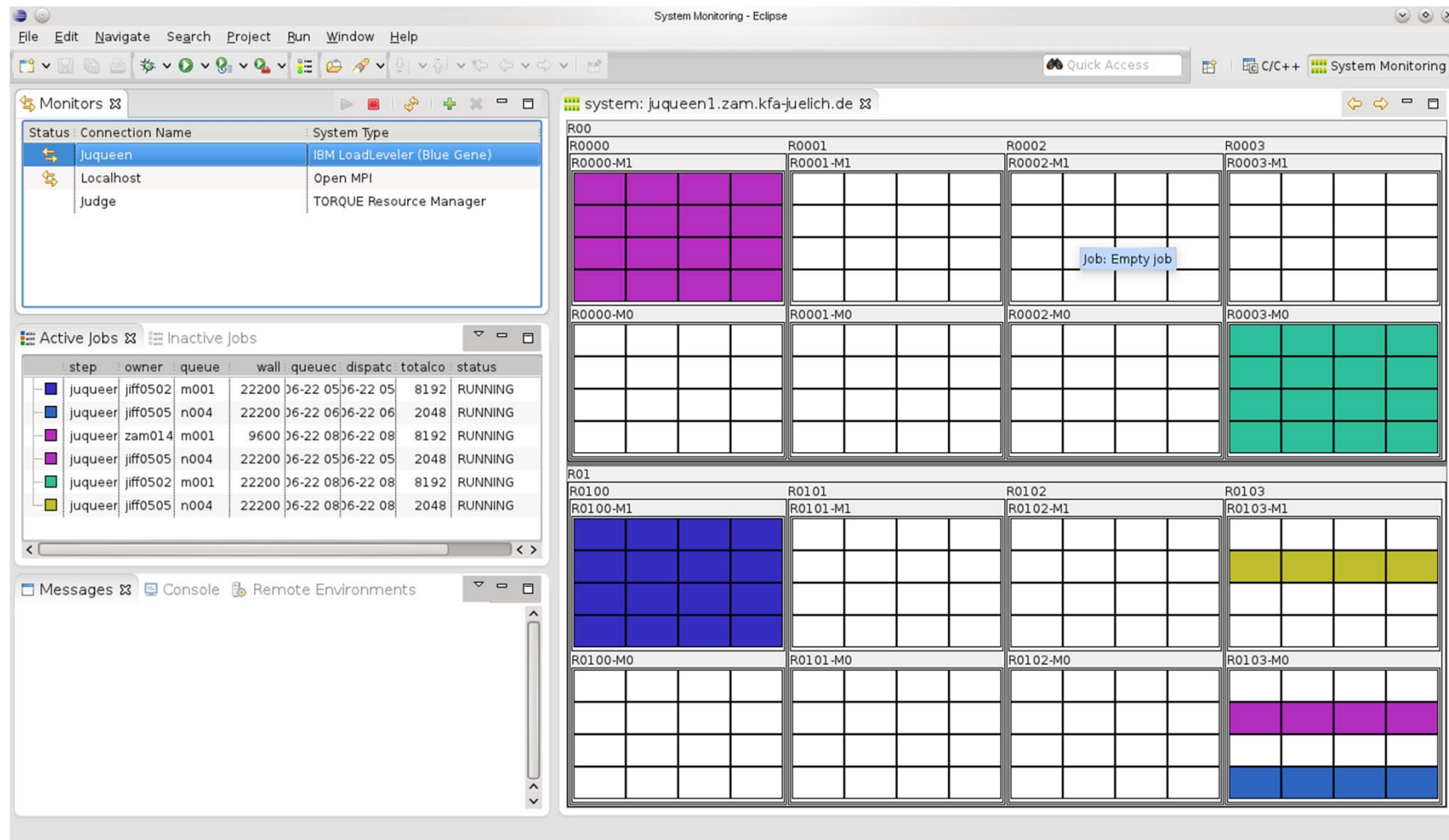
Project „A Scalable Development Environment for Peta-Scale Computing“

- 3-years project, started September 2009, DOE funded
- JSC contribution:
  - *System and application monitoring*
  - *LLview components integration, part of Eclipse/PTP (since June 2011)*

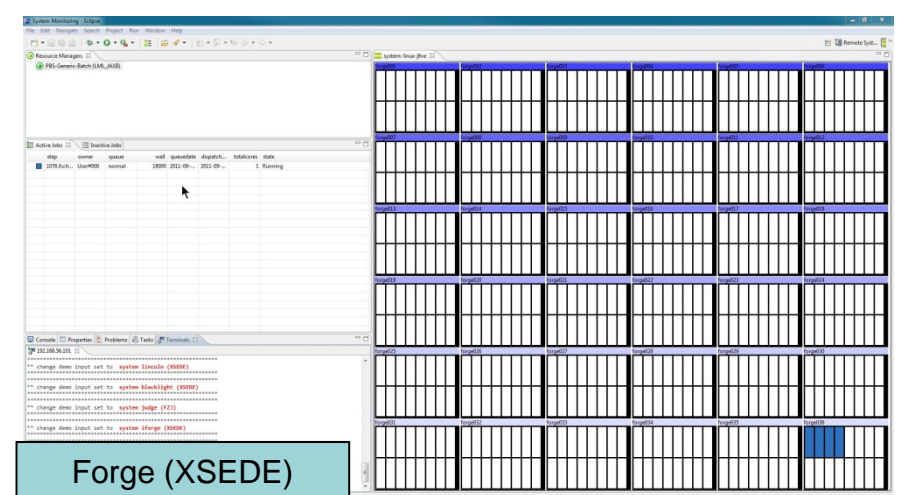
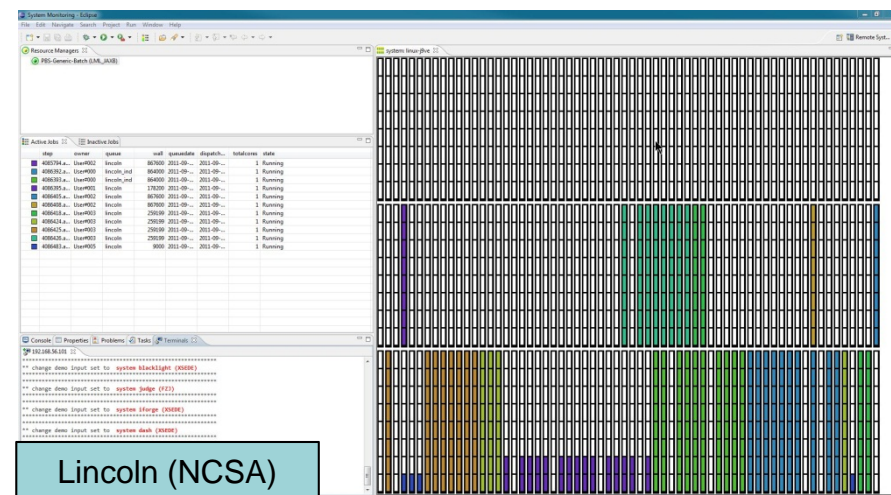




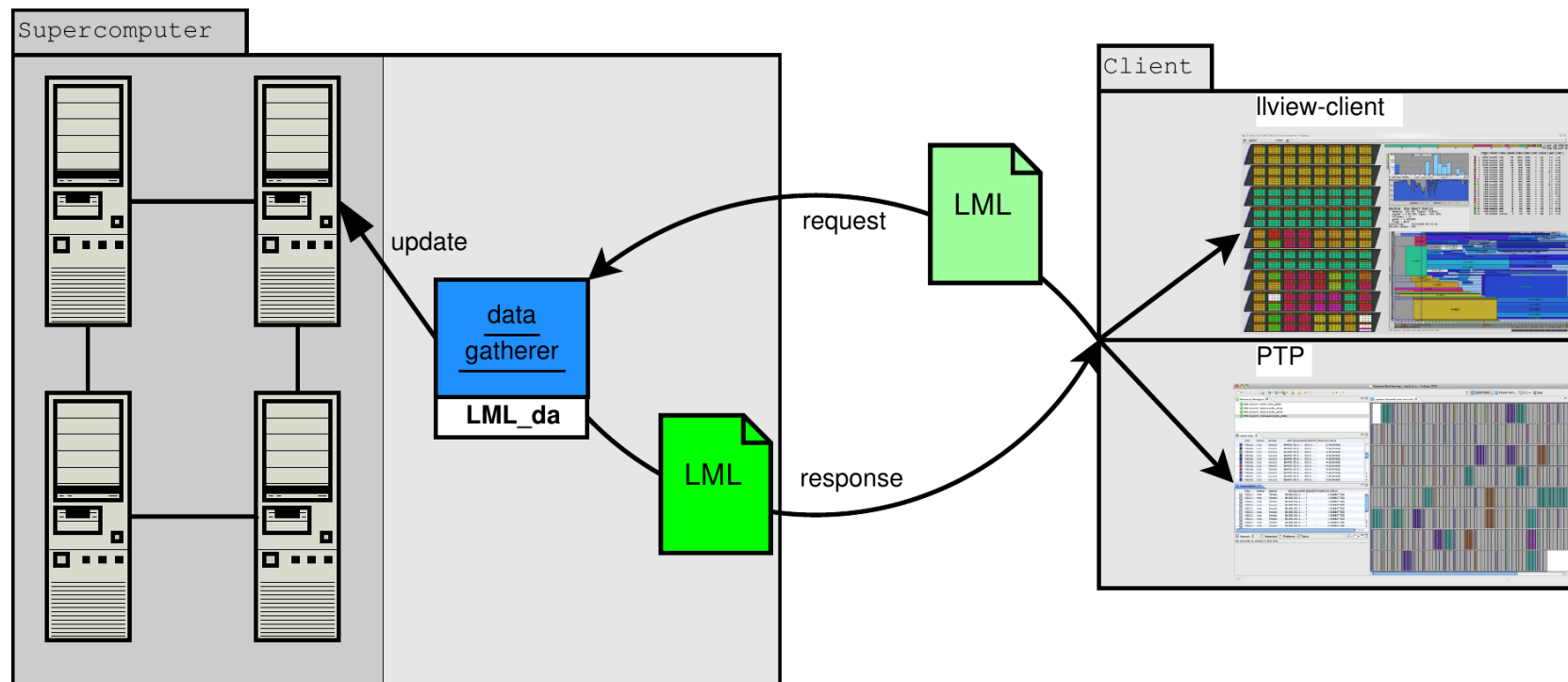
# PTP Monitoring: Example JUQUEEN



# PTP Monitoring: Further Examples



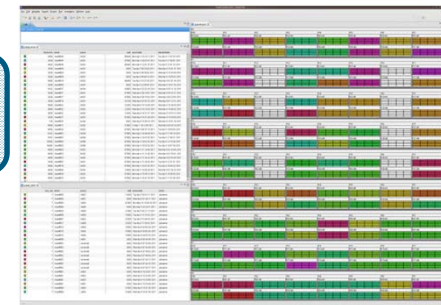
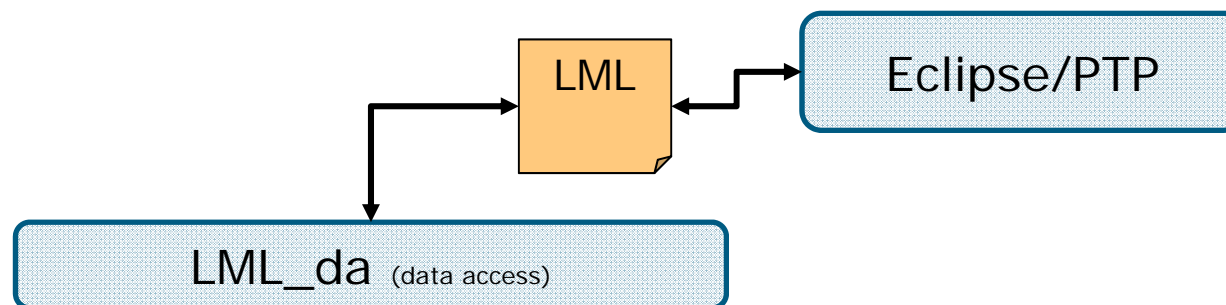
# Monitoring System Dataflow



- LML\_da
  - Implements distributed workflow for data acquisition and data processing
- LML-Request: describes data to visualize in client
  - Implements server-side filtering and support for level-of-details

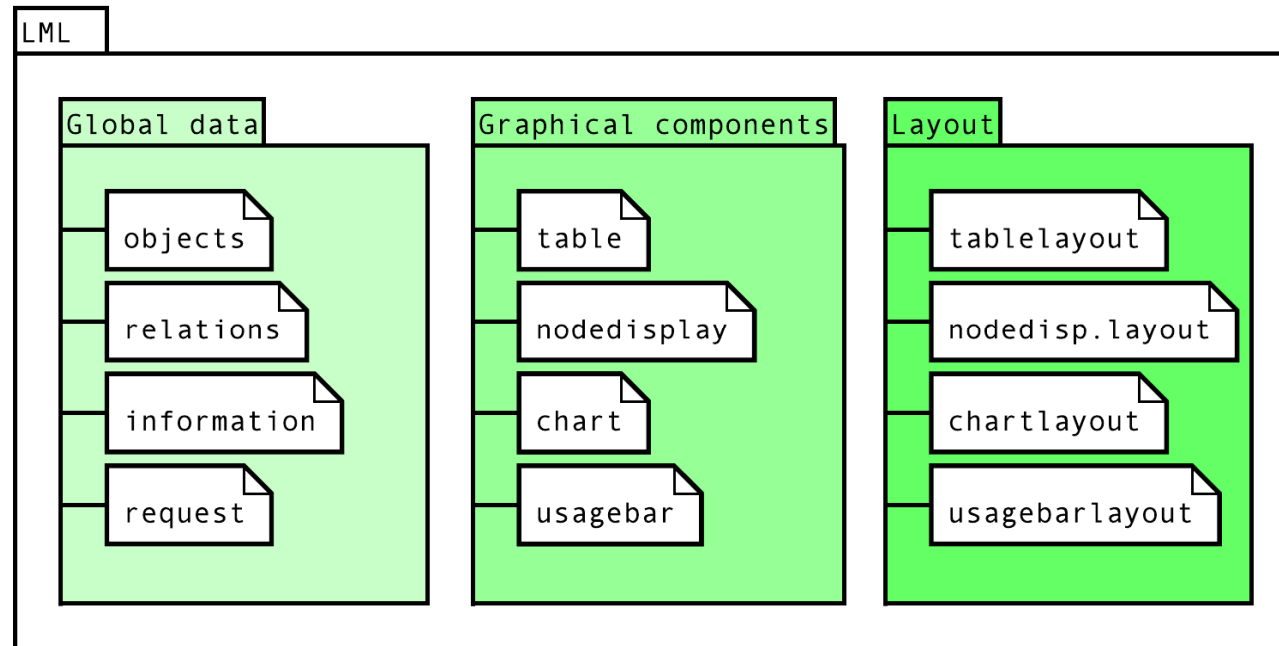
# Large-scale system Markup Language

- LML: Markup language for description of **supercomputer's status**
- Interface between LML\_da and visualization clients
- Describes all graphical components available in LLview (job-list, nodedisplay, charts ...)
- **Logical an system independent description** of current status, which can easily be converted into graphical output
- Implemented in XML, validation against **XML-Schema**



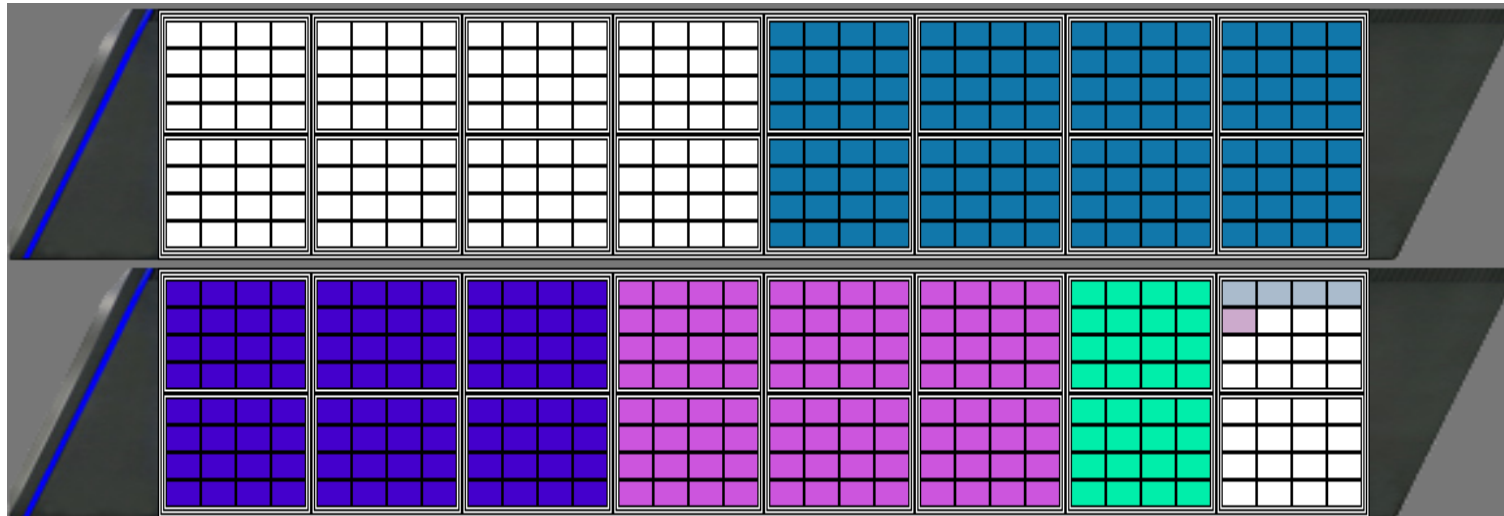


# LML Structure



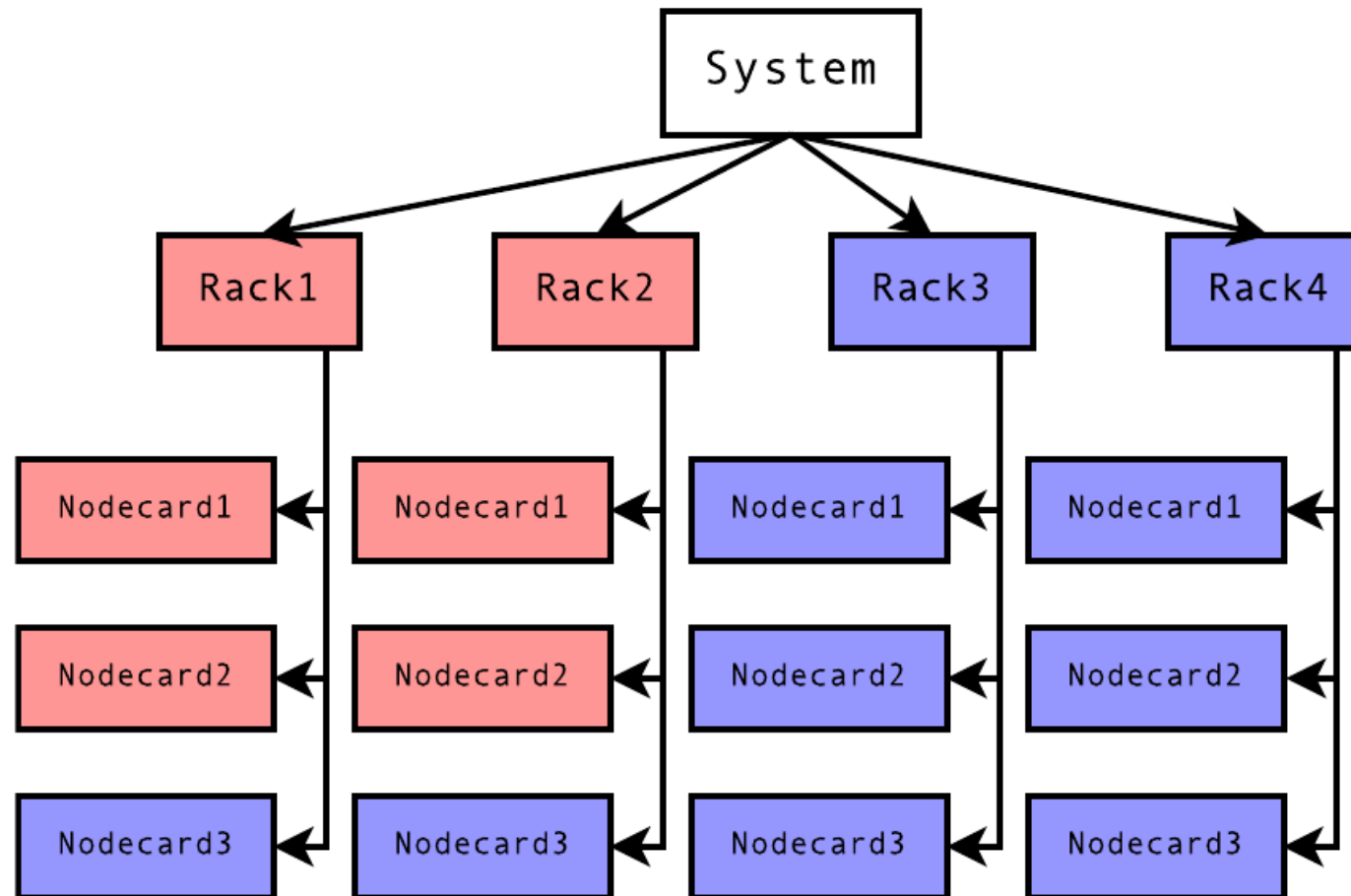
- **Global data:** intermediate data format, scheduling objects
- **Graphical components:** data for visualization components
- **Layout:** hints for visualization

# Node Display



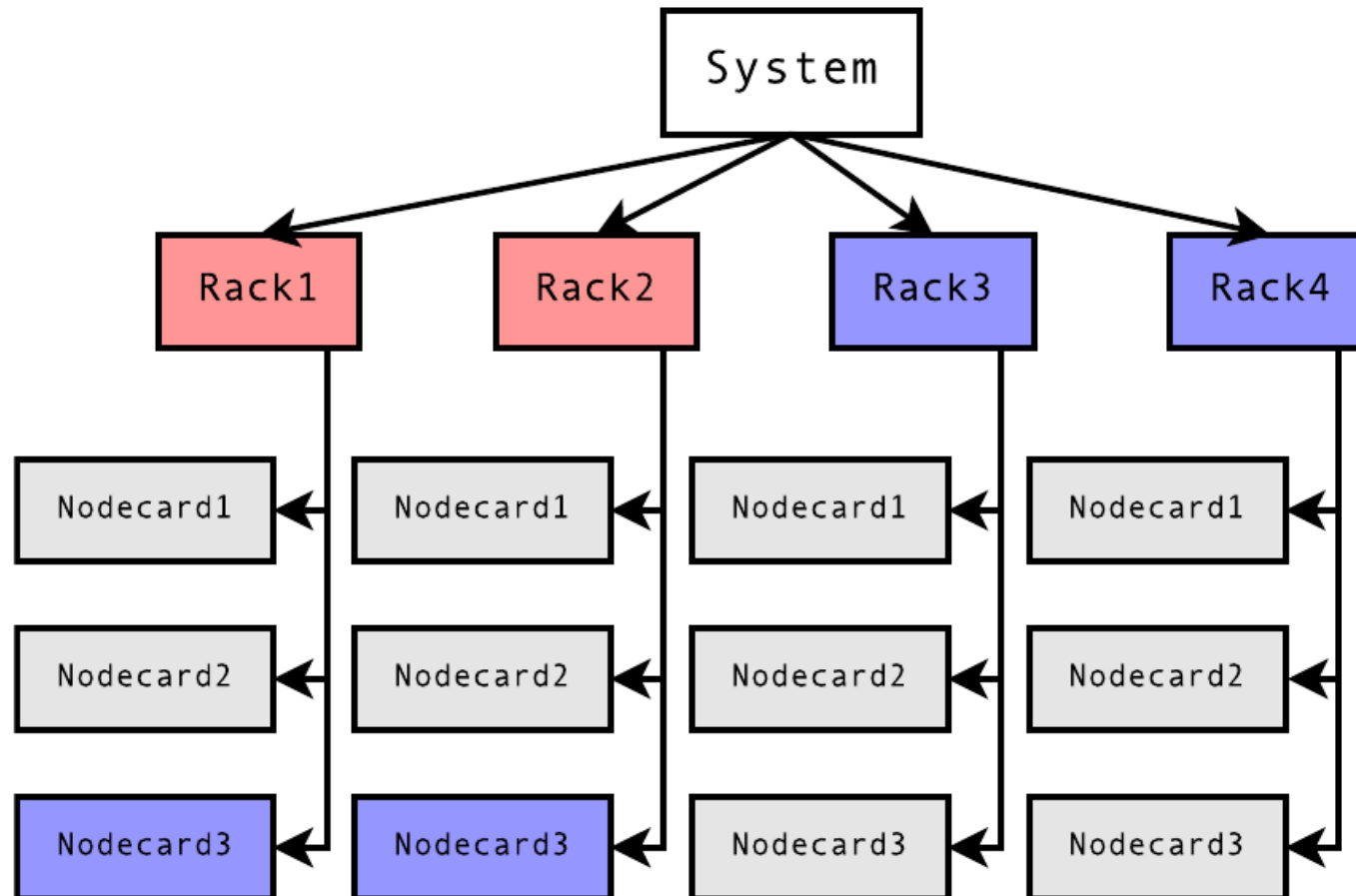
- Description of the supercomputer's architecture
- Maps jobs to compute resources (nodes, CPUs)
- **Challenge:** description of large systems  
(e.g. JUQUEEN: 131072 CPUs)
- **Targets:** data compression, avoid redundancy

# Node Display – Compression



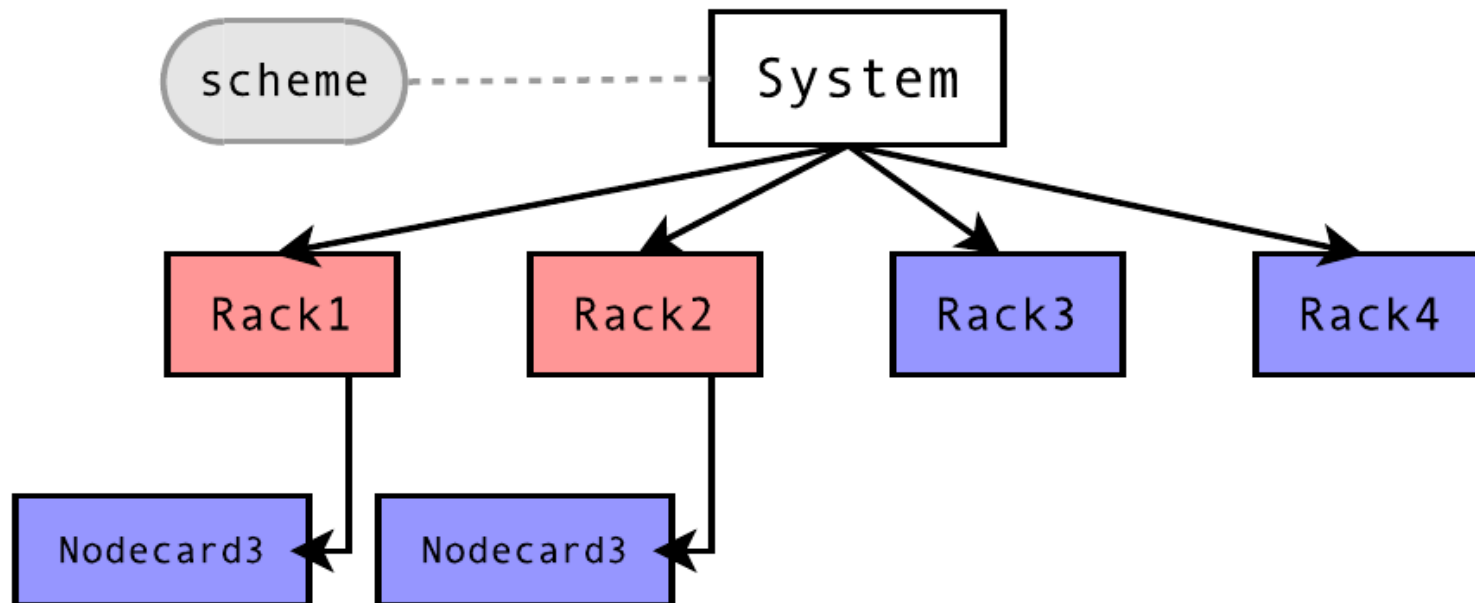
# Node Display – Compression

## Attribute inheritance



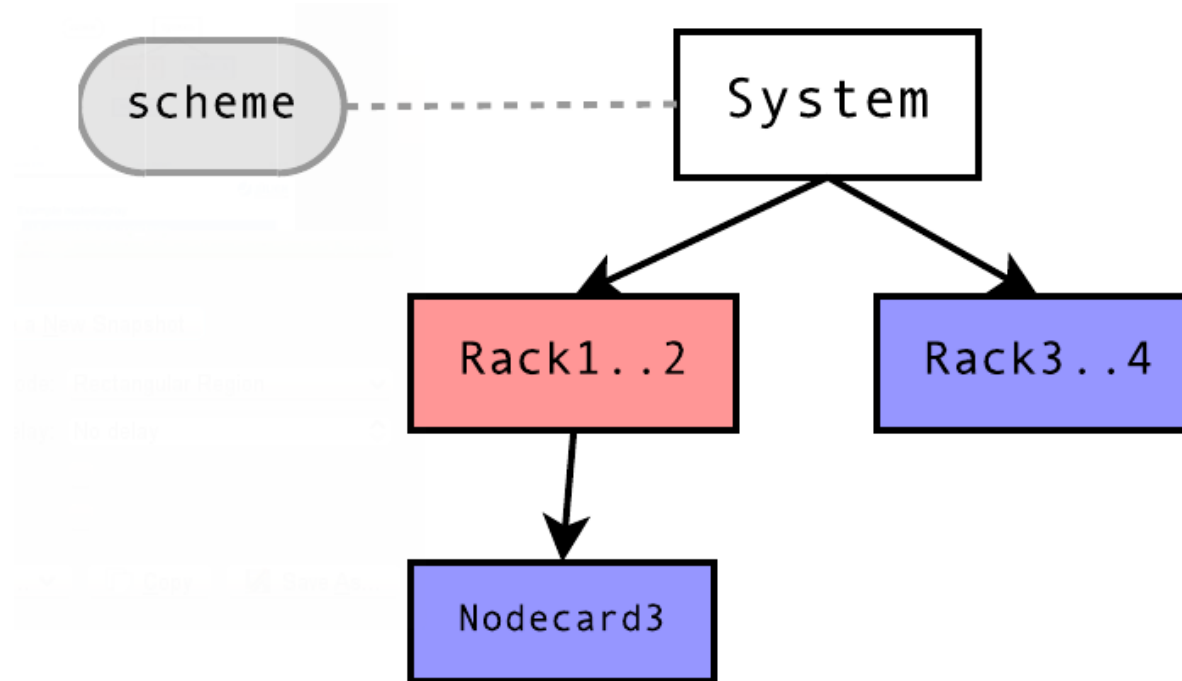


# Node Display – Compression



- **Scheme:** defines architecture of empty system

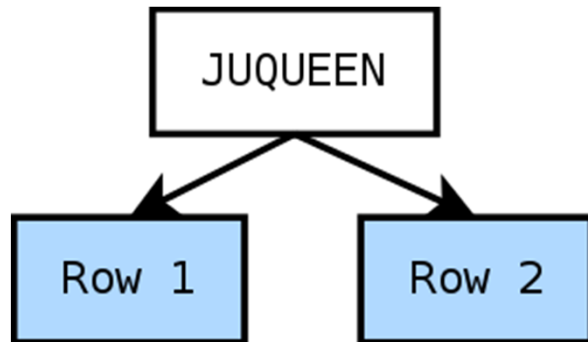
# Node Display – Compression Ranges



→ 3 objects instead of 16

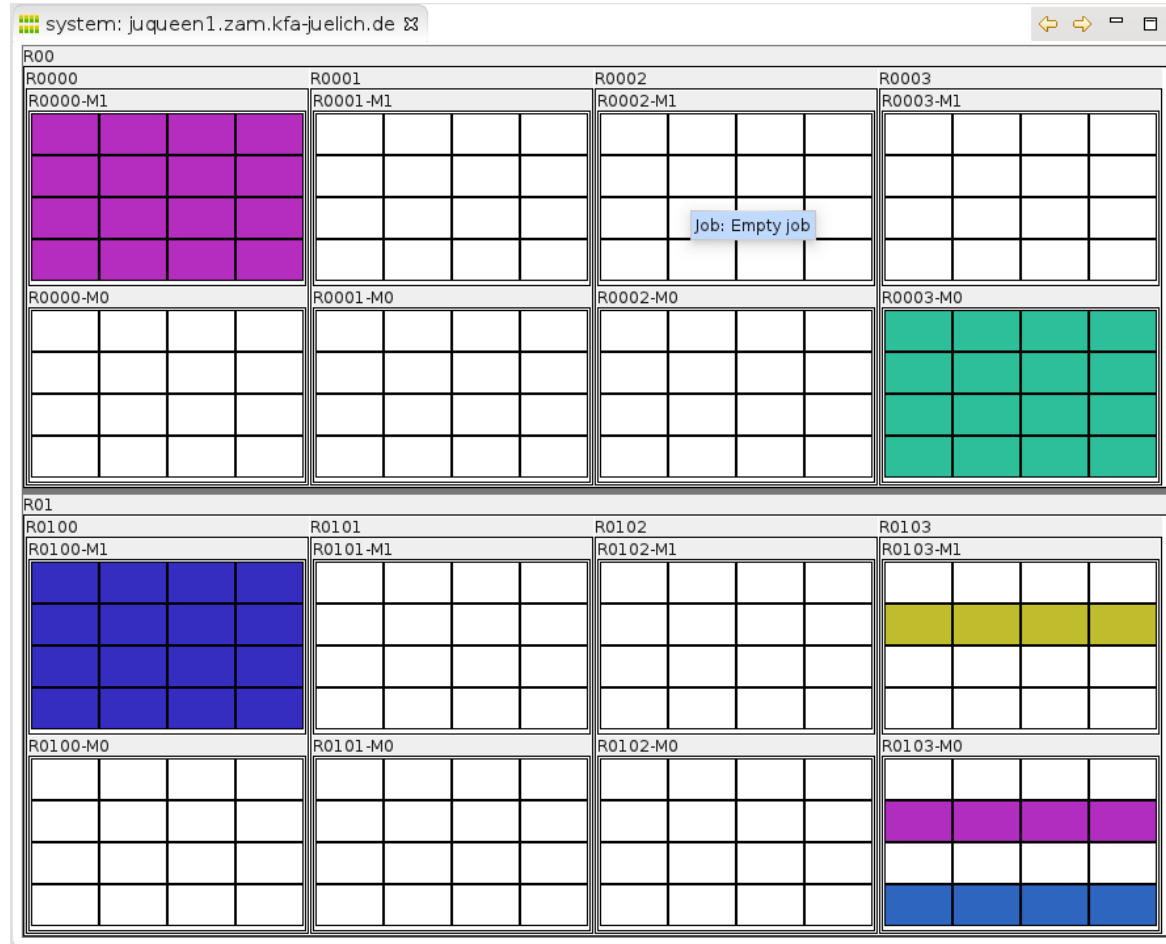
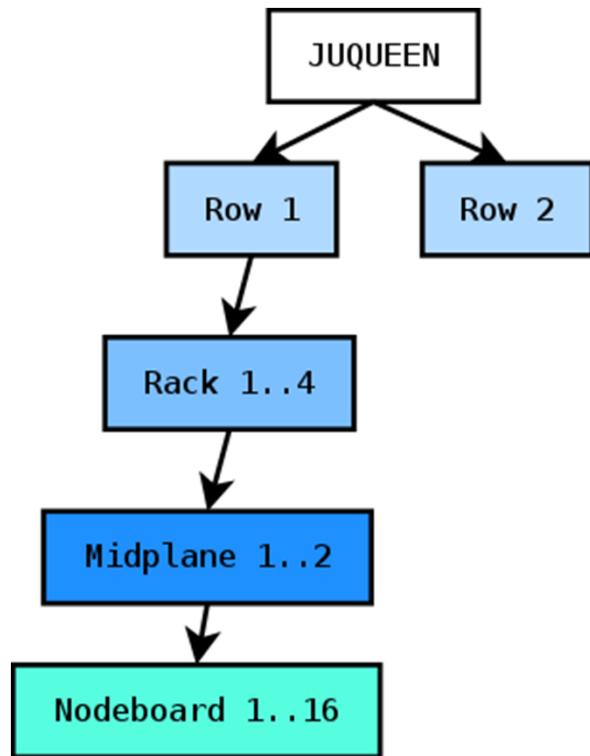
# Scalable Visualization

## – Row level



# Scalable Visualization

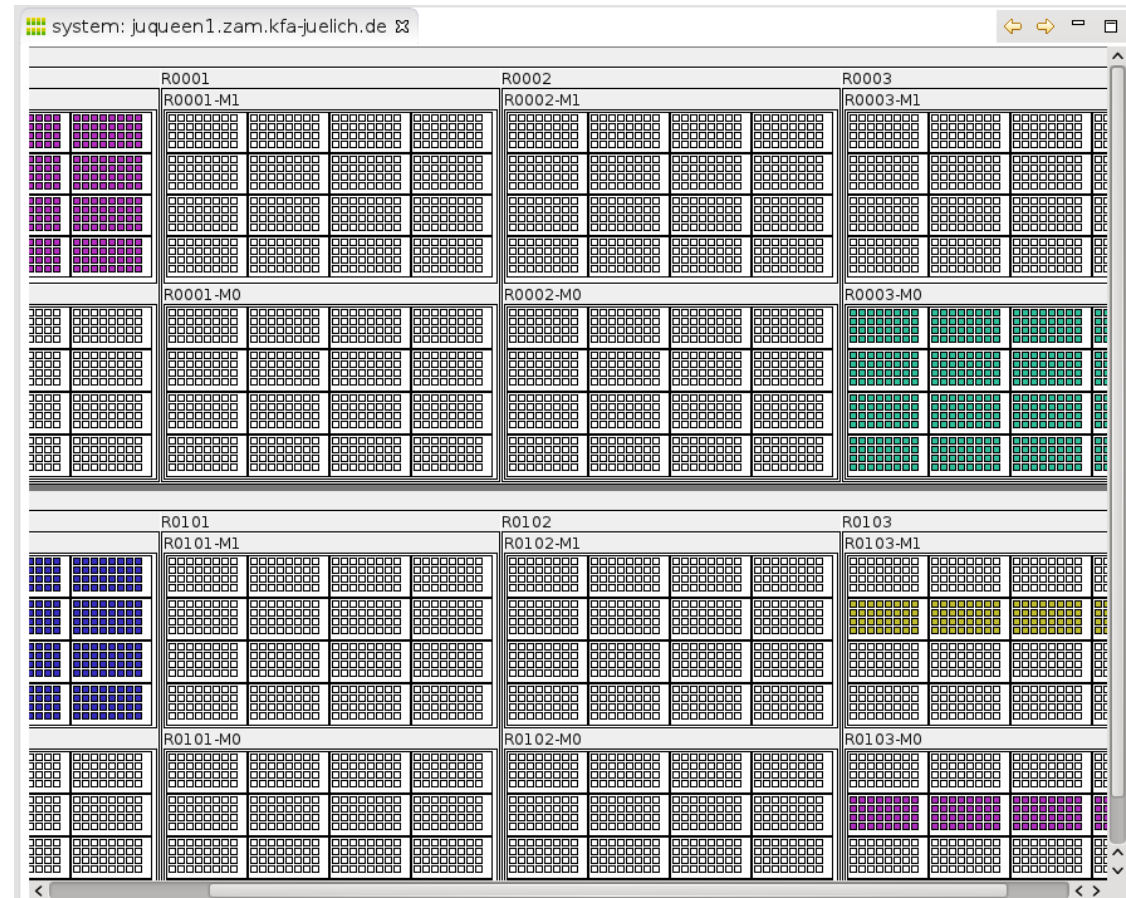
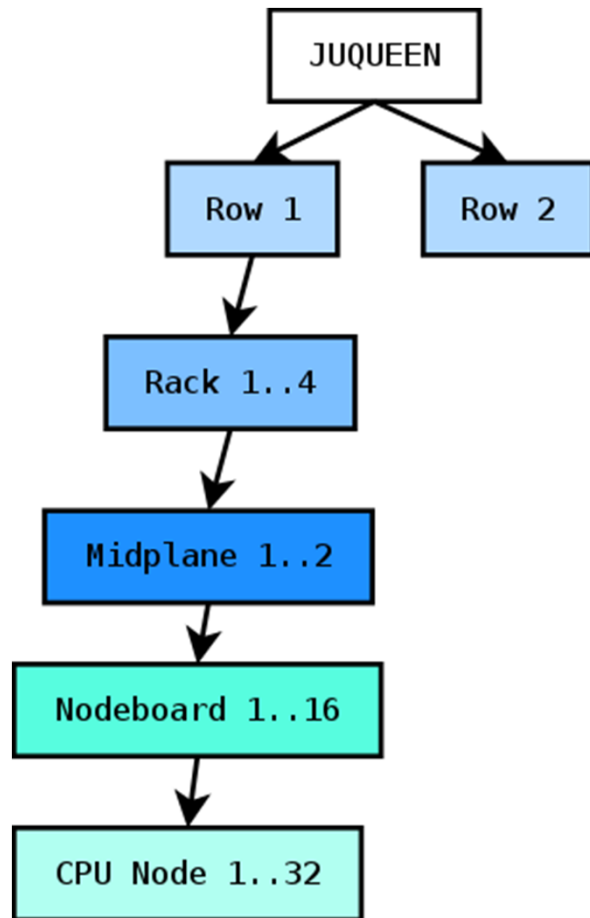
## – Nodeboard level





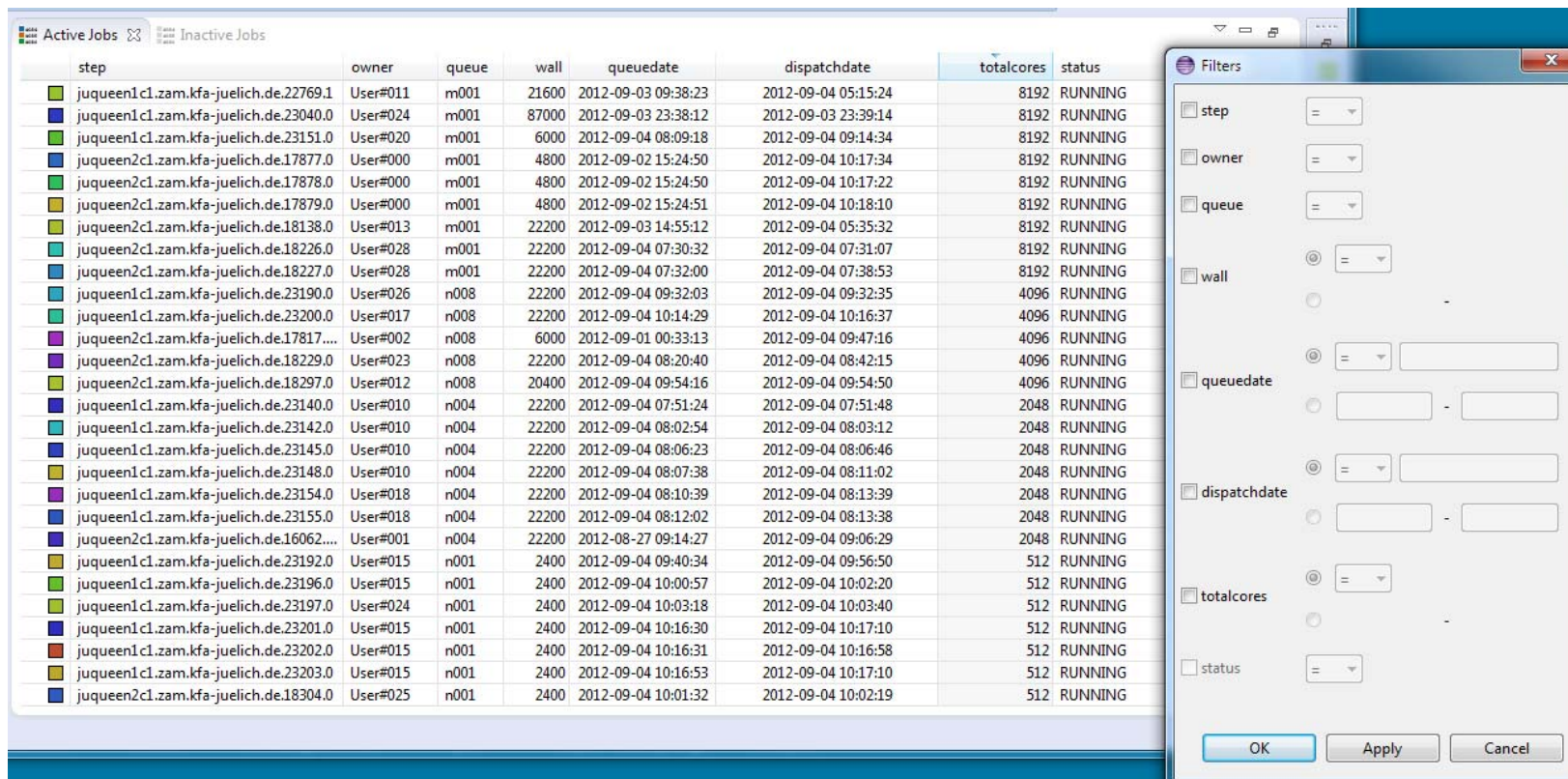
# Scalable Visualization

## – CPU Node level



# Table Filtering

- Scalability of job data display
- Filtering by specification of attributes values/ranges
- Server- and client-side filtering



The screenshot shows a window titled 'Active Jobs' with a table of job data. A 'Filters' dialog box is open on the right, allowing users to filter the table by various attributes.

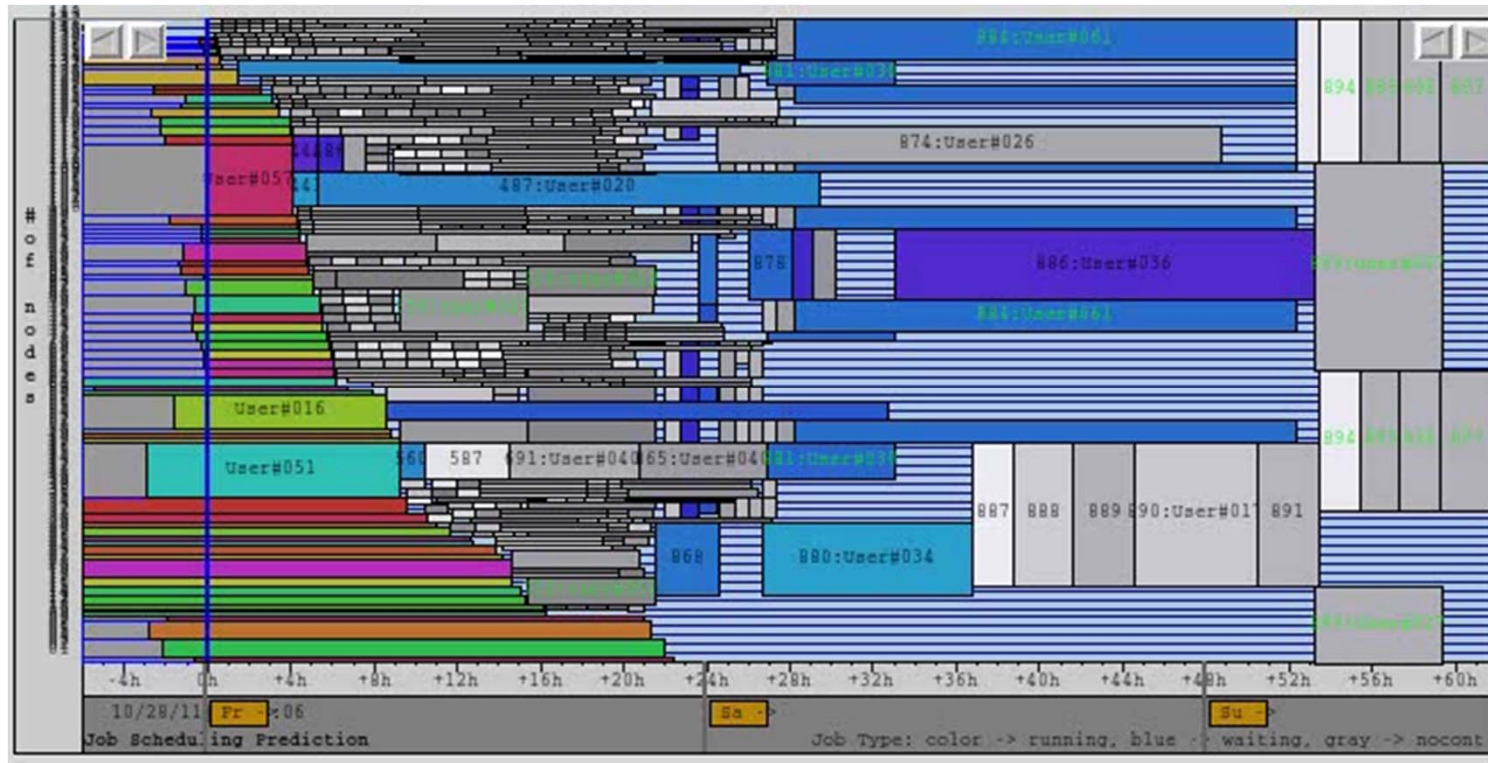
step	owner	queue	wall	queuedate	dispatchdate	totalcores	status
juqueen1c1.zam.kfa-juelich.de.22769.1	User#011	m001	21600	2012-09-03 09:38:23	2012-09-04 05:15:24	8192	RUNNING
juqueen1c1.zam.kfa-juelich.de.23040.0	User#024	m001	87000	2012-09-03 23:38:12	2012-09-03 23:39:14	8192	RUNNING
juqueen1c1.zam.kfa-juelich.de.23151.0	User#020	m001	6000	2012-09-04 08:09:18	2012-09-04 09:14:34	8192	RUNNING
juqueen2c1.zam.kfa-juelich.de.17877.0	User#000	m001	4800	2012-09-02 15:24:50	2012-09-04 10:17:34	8192	RUNNING
juqueen2c1.zam.kfa-juelich.de.17878.0	User#000	m001	4800	2012-09-02 15:24:50	2012-09-04 10:17:22	8192	RUNNING
juqueen2c1.zam.kfa-juelich.de.17879.0	User#000	m001	4800	2012-09-02 15:24:51	2012-09-04 10:18:10	8192	RUNNING
juqueen2c1.zam.kfa-juelich.de.18138.0	User#013	m001	22200	2012-09-03 14:55:12	2012-09-04 05:35:32	8192	RUNNING
juqueen2c1.zam.kfa-juelich.de.18226.0	User#028	m001	22200	2012-09-04 07:30:32	2012-09-04 07:31:07	8192	RUNNING
juqueen2c1.zam.kfa-juelich.de.18227.0	User#028	m001	22200	2012-09-04 07:32:00	2012-09-04 07:38:53	8192	RUNNING
juqueen1c1.zam.kfa-juelich.de.23190.0	User#026	n008	22200	2012-09-04 09:32:03	2012-09-04 09:32:35	4096	RUNNING
juqueen1c1.zam.kfa-juelich.de.23200.0	User#017	n008	22200	2012-09-04 10:14:29	2012-09-04 10:16:37	4096	RUNNING
juqueen2c1.zam.kfa-juelich.de.17817....	User#002	n008	6000	2012-09-01 00:33:13	2012-09-04 09:47:16	4096	RUNNING
juqueen2c1.zam.kfa-juelich.de.18229.0	User#023	n008	22200	2012-09-04 08:20:40	2012-09-04 08:42:15	4096	RUNNING
juqueen2c1.zam.kfa-juelich.de.18297.0	User#012	n008	20400	2012-09-04 09:54:16	2012-09-04 09:54:50	4096	RUNNING
juqueen1c1.zam.kfa-juelich.de.23140.0	User#010	n004	22200	2012-09-04 07:51:24	2012-09-04 07:51:48	2048	RUNNING
juqueen1c1.zam.kfa-juelich.de.23142.0	User#010	n004	22200	2012-09-04 08:02:54	2012-09-04 08:03:12	2048	RUNNING
juqueen1c1.zam.kfa-juelich.de.23145.0	User#010	n004	22200	2012-09-04 08:06:23	2012-09-04 08:06:46	2048	RUNNING
juqueen1c1.zam.kfa-juelich.de.23148.0	User#010	n004	22200	2012-09-04 08:07:38	2012-09-04 08:11:02	2048	RUNNING
juqueen1c1.zam.kfa-juelich.de.23154.0	User#018	n004	22200	2012-09-04 08:10:39	2012-09-04 08:13:39	2048	RUNNING
juqueen1c1.zam.kfa-juelich.de.23155.0	User#018	n004	22200	2012-09-04 08:12:02	2012-09-04 08:13:38	2048	RUNNING
juqueen2c1.zam.kfa-juelich.de.16062....	User#001	n004	22200	2012-08-27 09:14:27	2012-09-04 09:06:29	2048	RUNNING
juqueen1c1.zam.kfa-juelich.de.23192.0	User#015	n001	2400	2012-09-04 09:40:34	2012-09-04 09:56:50	512	RUNNING
juqueen1c1.zam.kfa-juelich.de.23196.0	User#015	n001	2400	2012-09-04 10:00:57	2012-09-04 10:02:20	512	RUNNING
juqueen1c1.zam.kfa-juelich.de.23197.0	User#024	n001	2400	2012-09-04 10:03:18	2012-09-04 10:03:40	512	RUNNING
juqueen1c1.zam.kfa-juelich.de.23201.0	User#015	n001	2400	2012-09-04 10:16:30	2012-09-04 10:17:10	512	RUNNING
juqueen1c1.zam.kfa-juelich.de.23202.0	User#015	n001	2400	2012-09-04 10:16:31	2012-09-04 10:16:58	512	RUNNING
juqueen1c1.zam.kfa-juelich.de.23203.0	User#015	n001	2400	2012-09-04 10:16:53	2012-09-04 10:17:10	512	RUNNING
juqueen2c1.zam.kfa-juelich.de.18304.0	User#025	n001	2400	2012-09-04 10:01:32	2012-09-04 10:02:19	512	RUNNING

The 'Filters' dialog box contains the following fields:

- step: =
- owner: =
- queue: =
- wall: =
- queuedate: =
- dispatchdate: =
- totalcores: =
- status: =

# Prediction of system usage (JuFo)

- Online simulation for **job schedulers** on supercomputers (JuFo: Juelich Forecast)
- Independent module using **intermediate LML** as data interface
- Target system independent prediction of job start dates
- Visualisation: Gantt chart



Carsten Karbach, JSC

## Conclusion

- Eclipse PTP:
  - Integration tool to develop parallel codes on remote system
    - *Code + Execution + Debugging*
  - System monitoring to control program execution
- Scalability
  - Scalable data acquisition
  - Scalable data format
  - Scalable data presentation
- Flexibility and portability
  - System independent data format
  - Small system and scheduler related drivers
  - Eclipse/PTP integration



# Questions?

