Karlsruhe Institute of Technology

Assuring Grid Accesses in the g-Eclipse Project

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Outline

- Introduction to g-Eclipse
- Quality Control in g-Eclipse
- Metrics Examples
- Hierarchical Testing Concept
- Integration in the Nightly Build System
- Conclusion

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g-Eclipse: A General Framework for Accessing the Grid

- Many application domains start using Grid infrastructures
- But…
  - Grid technology is complex
    - Different systems are used
      - Middleware (Unicore, gLite, Globus, GRIA, …)
      - Many separate tools (i.e for installation, monitoring, …)
  - Different programming paradigms
    - Batch type systems vs. service oriented systems
    - Many programming languages
- e-Users want to interact with the grid infrastructure
  - Without knowing all details (development, deployment, testing, management, …)
- → Tooling is necessary!!
  - Wizards, Editors, …
  - Hide the complexity!!

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g-Eclipse: the Idea

- Provides a general UI framework/eco system for the different grid actors
  - Grid applications users
  - Grid resources providers and operators
  - Grid application developers
- (Re-)use Eclipse and contribute
  - Eclipse is an eco system
    - Build for extension
    - More than a JAVA IDE
    - The biggest “coordinated” Open Source project
  - Gain OS independence (by using JAVA)

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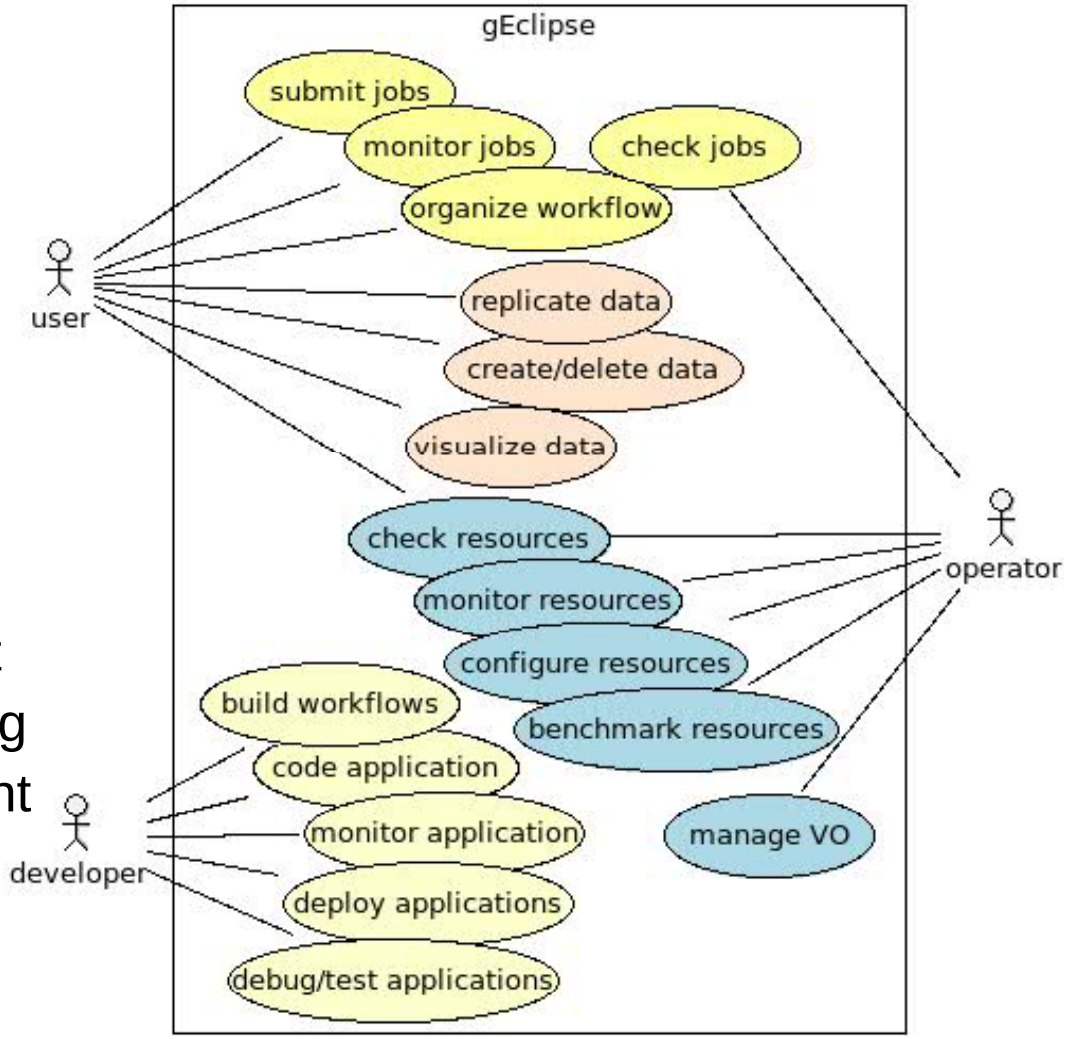
Grid user roles & use cases

- 3 different roles
  - User
  - Operator
  - Developer
- In general...
  - Job management
  - Resource management
    - Files
    - Applications
    - Hardware
  - Application deployment
  - Infrastructure monitoring
  - Application development
  - Visualization tools



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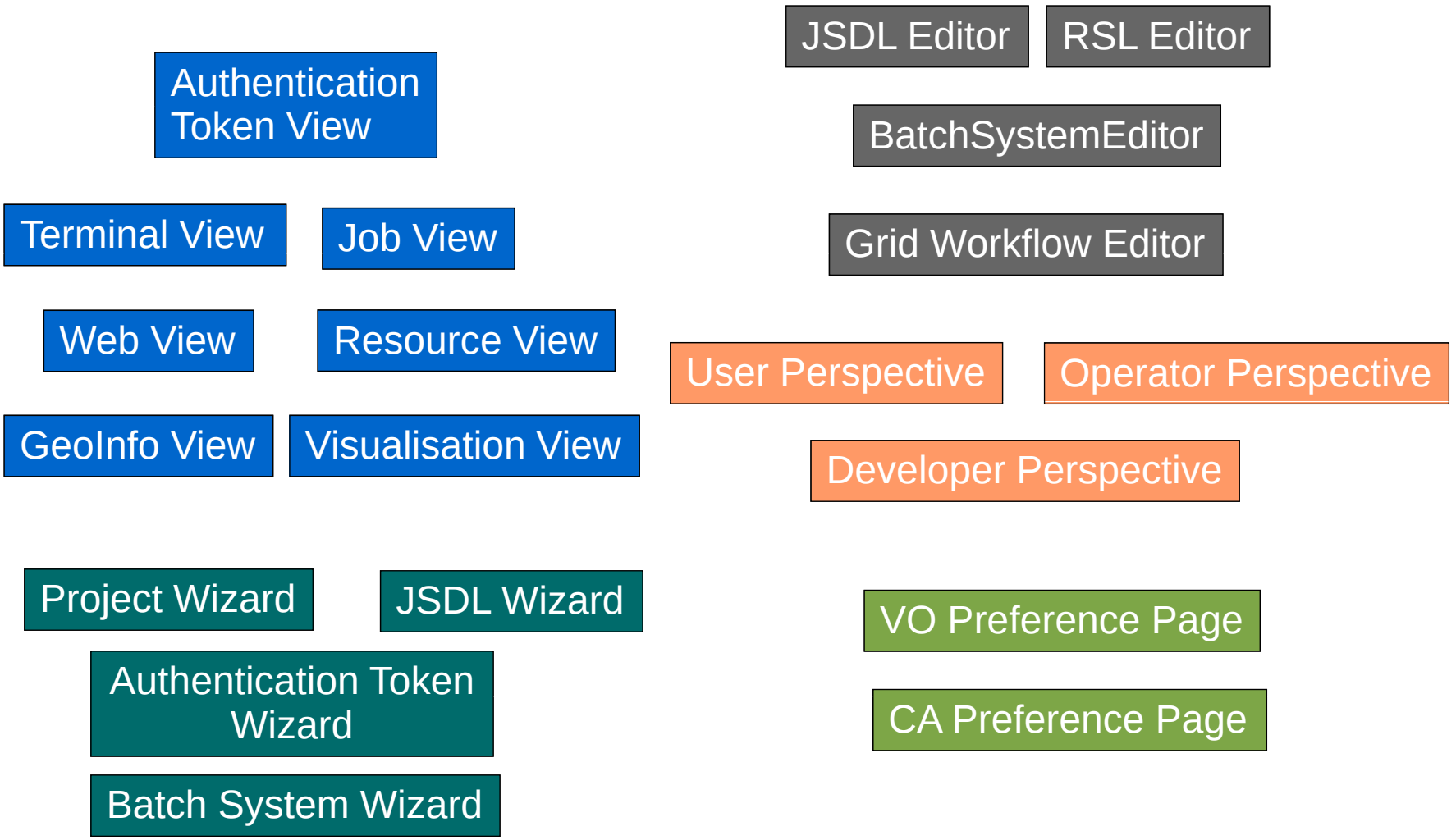
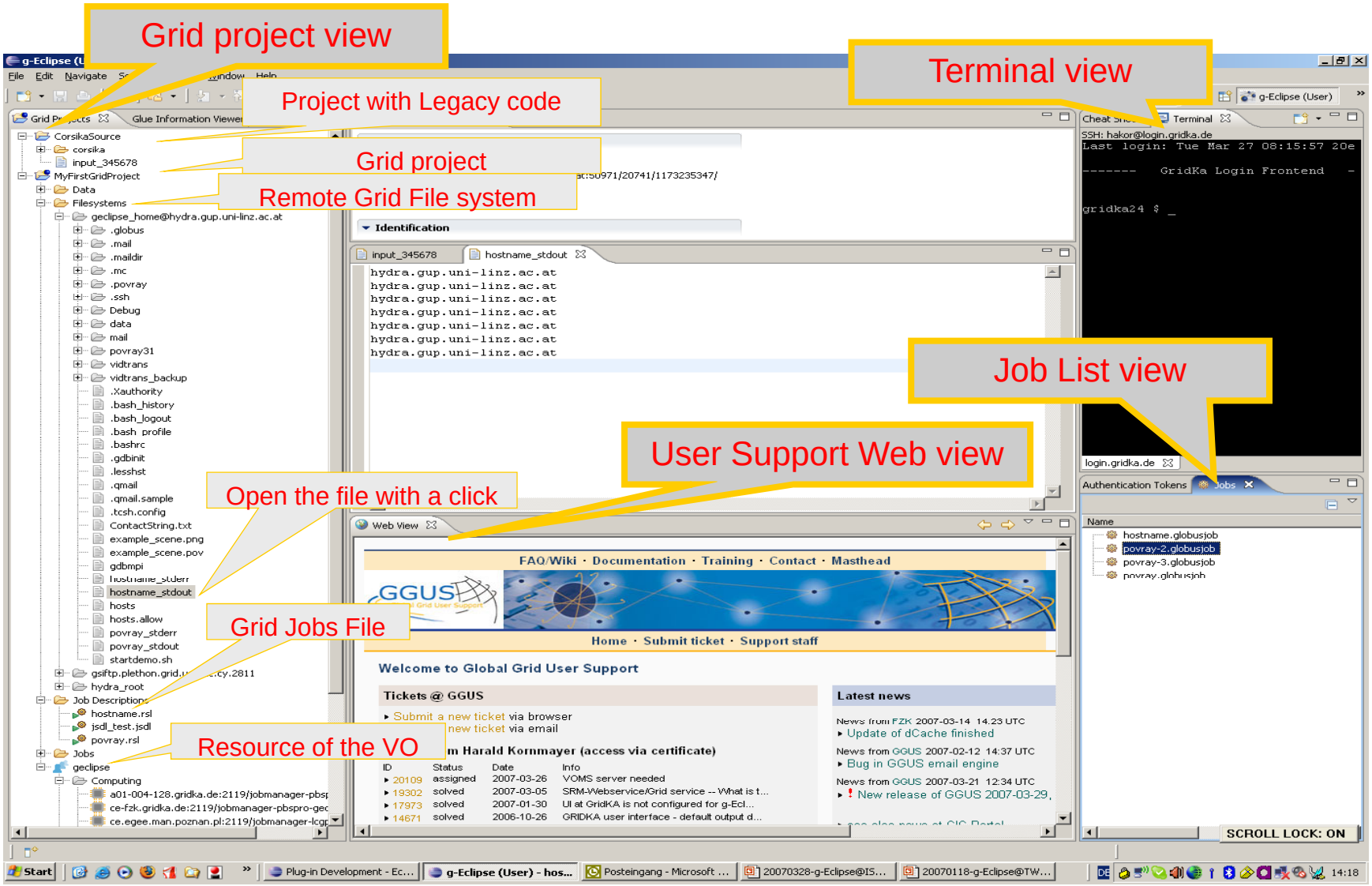
User Interface contributions



Screenshots



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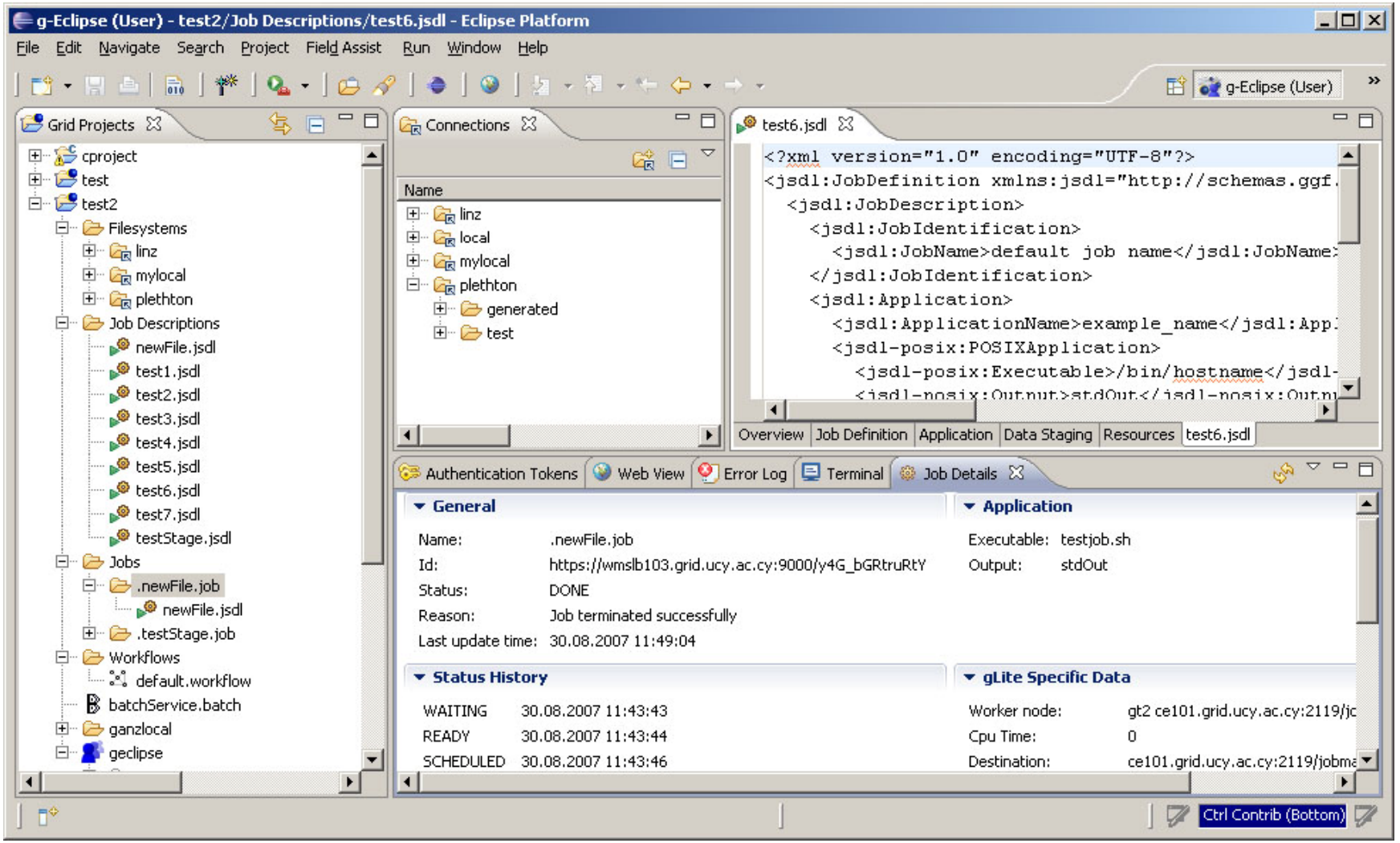
Screenshot



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Quality Control in g-Eclipse

- Code quality
  - Functionality
  - Error/exception handling
  - Efficiency (short code, optimal solution)
  - Simplicity
  - Structure
- Documentation quality
  - User manual (for users)
  - Development roadmap (for developers)
- Programming style
  - Identical view
- Approach: metrics and testing
  - Unit Test
  - Manual test

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Evaluating Code Quality with Metrics

- Cyclomatic Complexity (CC)
  - Evaluates the complexity of a method. A low CC is generally better (<10)
- Size: size of a method
  - Evaluates the understandability of the code
- Weighted Methods per Class (WMC)
  - Number of methods in a class or sum of the complexities of the methods
  - The larger the number of methods in a class, the greater the potential impact on children due to the inheritance
- Response for a Class (RFC)
  - Number of methods that can be invoked in response to a message or by some method in the class
  - Measures the amount of communications with other classes
  - The larger the RFC, the greater the complexity (testing, debugging)

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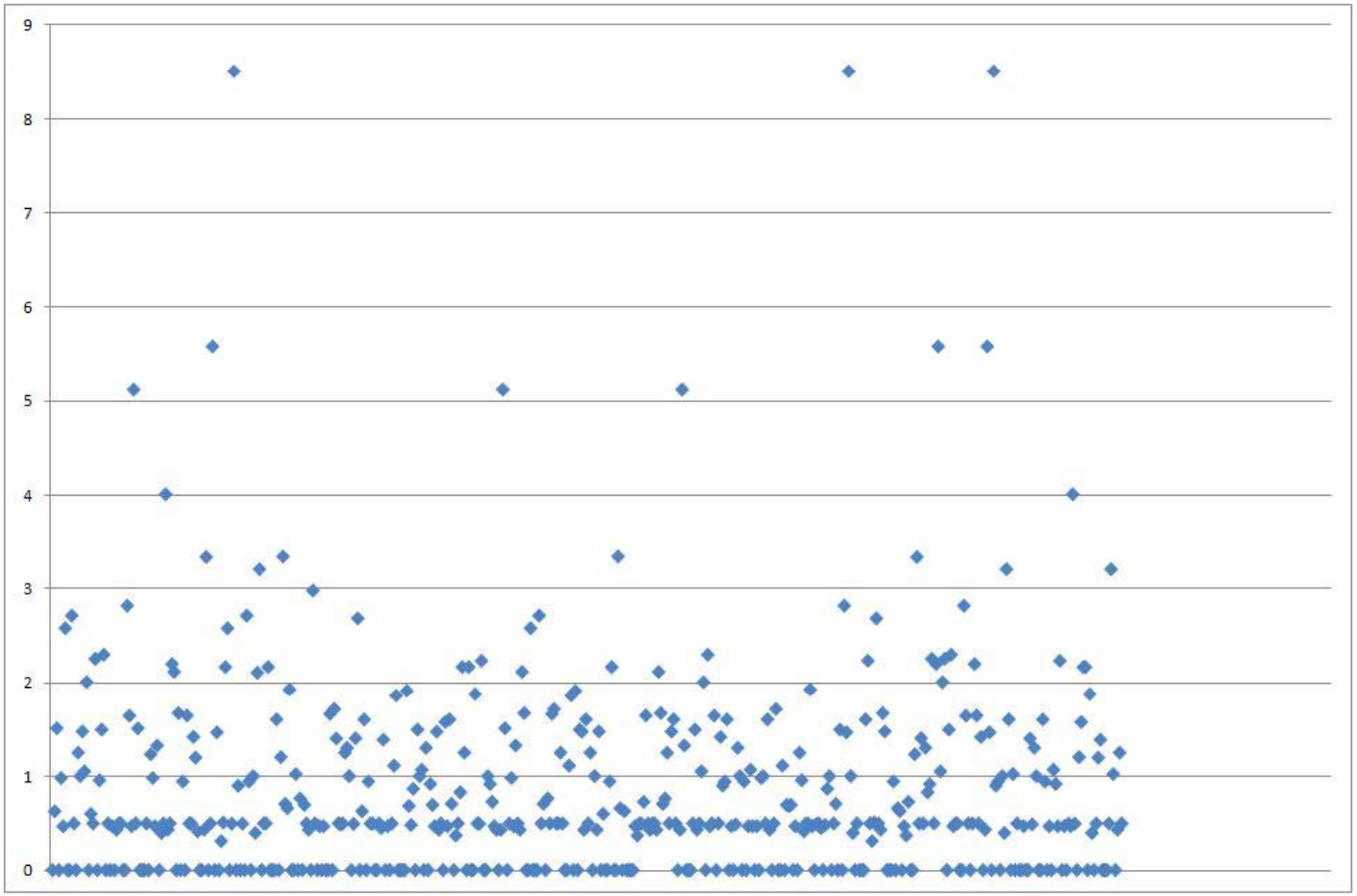
Sample Results (CC)



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Junit Testing

- Junit: a simple testing tool for JAVA
- Junit test method
  - An ordinary method without any parameters
  - Assertion statements indicate success or failure
  - Run using a test runner
- Eclipse unit test
  - Junit integrated
    - Runtime: Java runtime + Junit test classes
  - PDE extension
    - Runtime: Java runtime + Junit test classes +Eclipse runtime
    - Required for testing grid functionality

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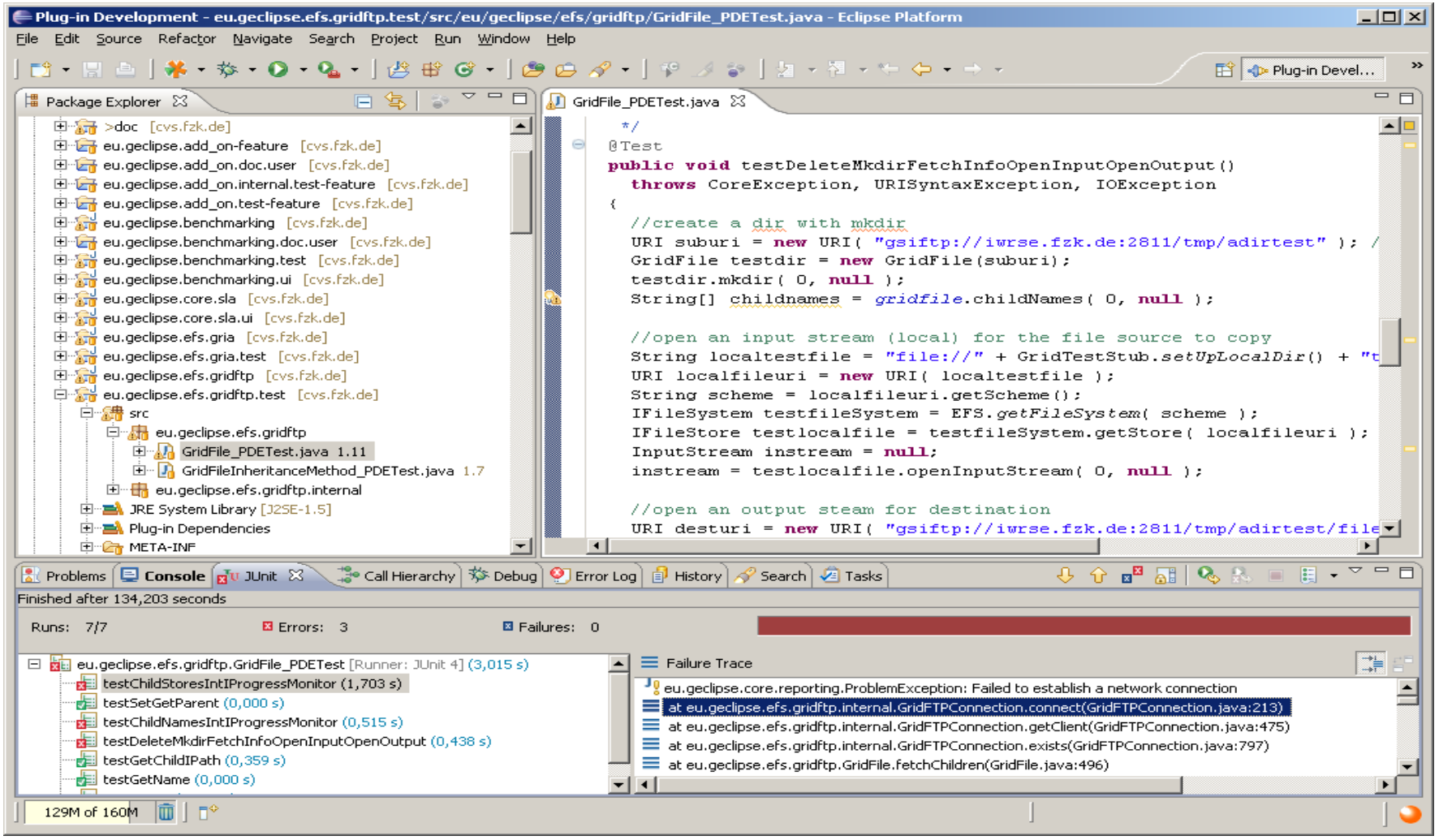
PDE-Test Example



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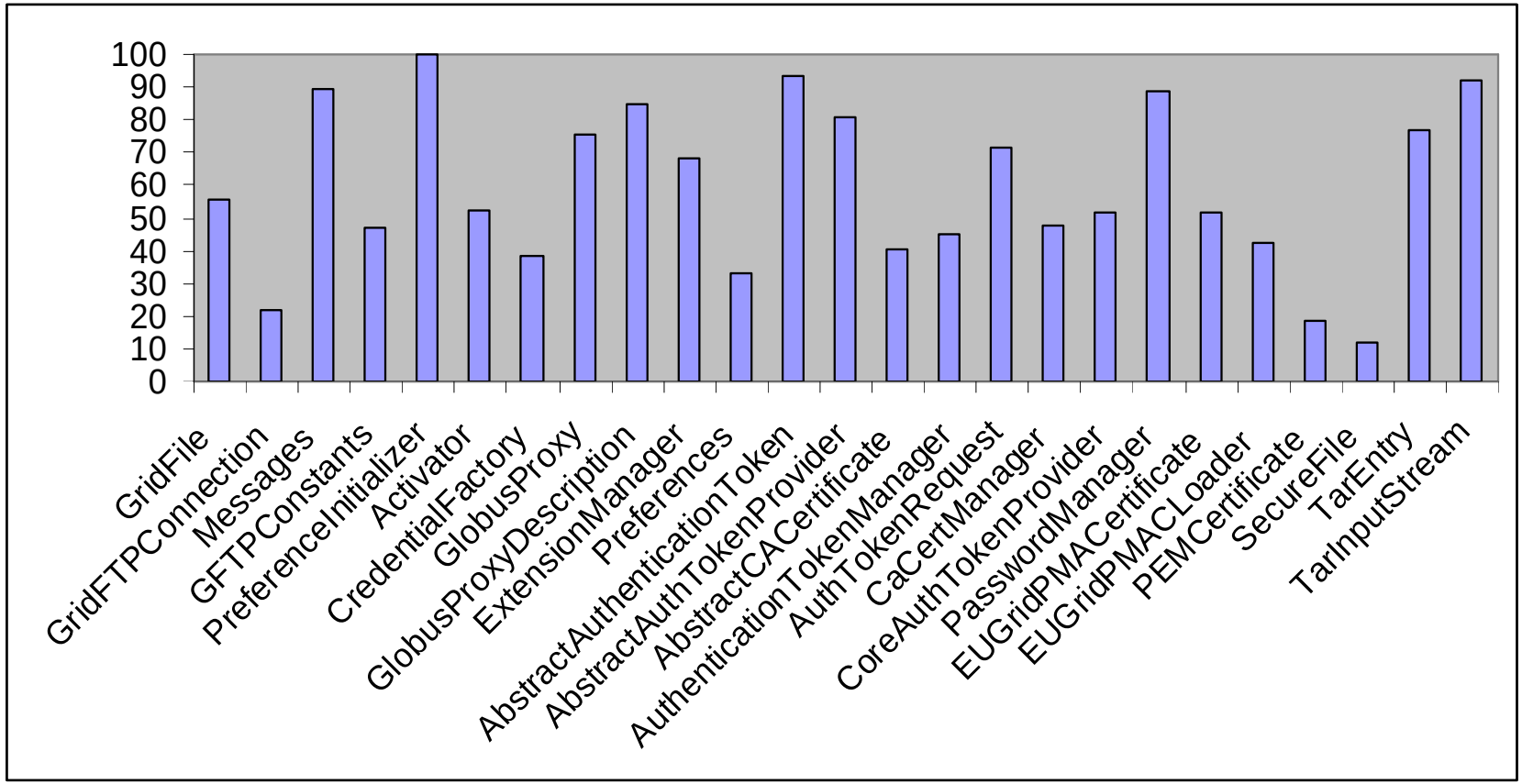
Test Coverage



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Hierarchical Test Concept

- Basis tests
  - Testing the functionality of individual methods
  - Could be simple Junit or PDE test
  - Need sometime a combined test with other methods
- Grid tests
  - Require initial setup of
    - token
    - VO
    - Internet proxy
    - CA
    - ……
  - Could not rely on wizards
  - Automation
- Integration tests
  - Using real workflow

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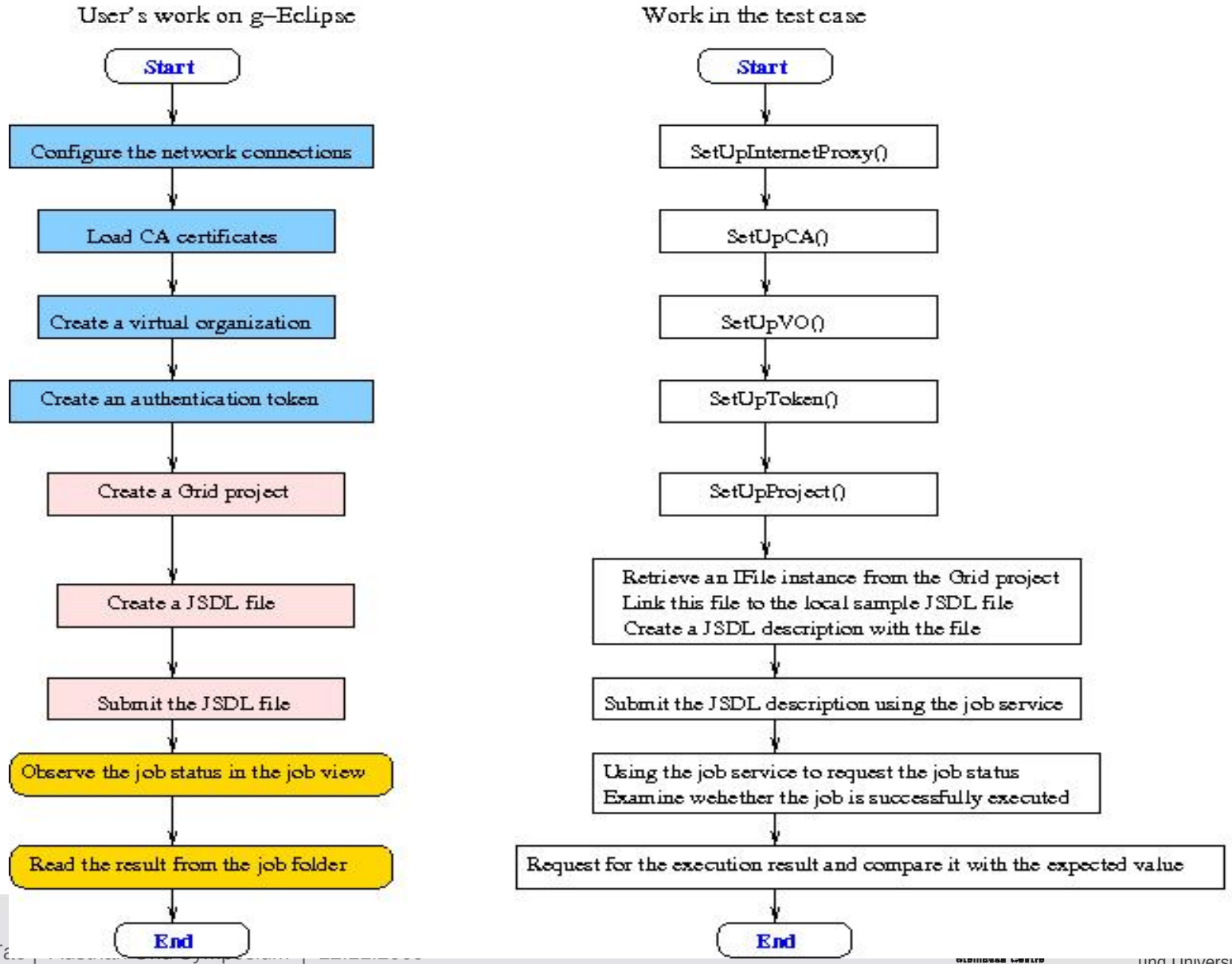
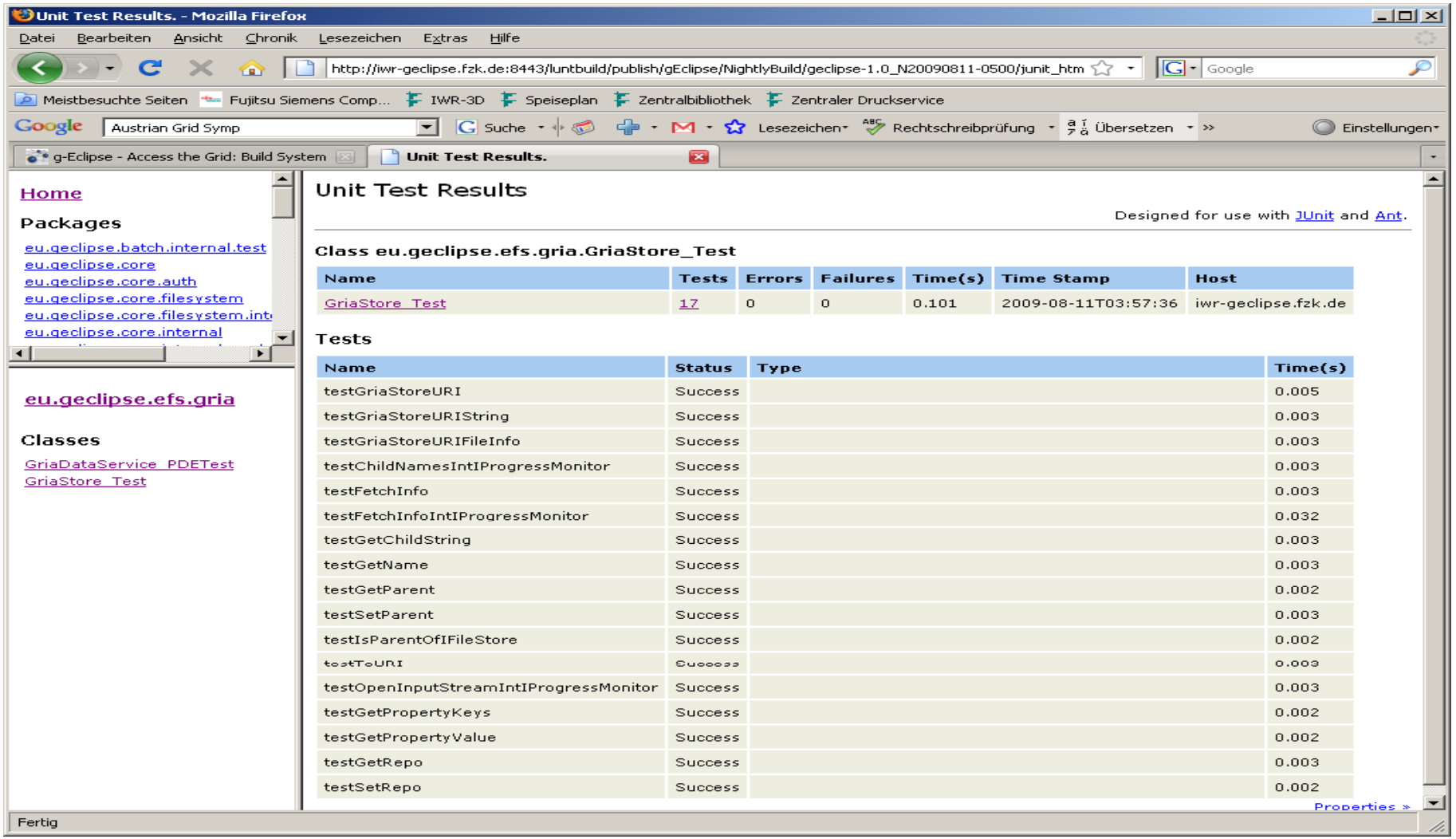
Sample Test Workflow



Integration in the Nightly Build System (I)



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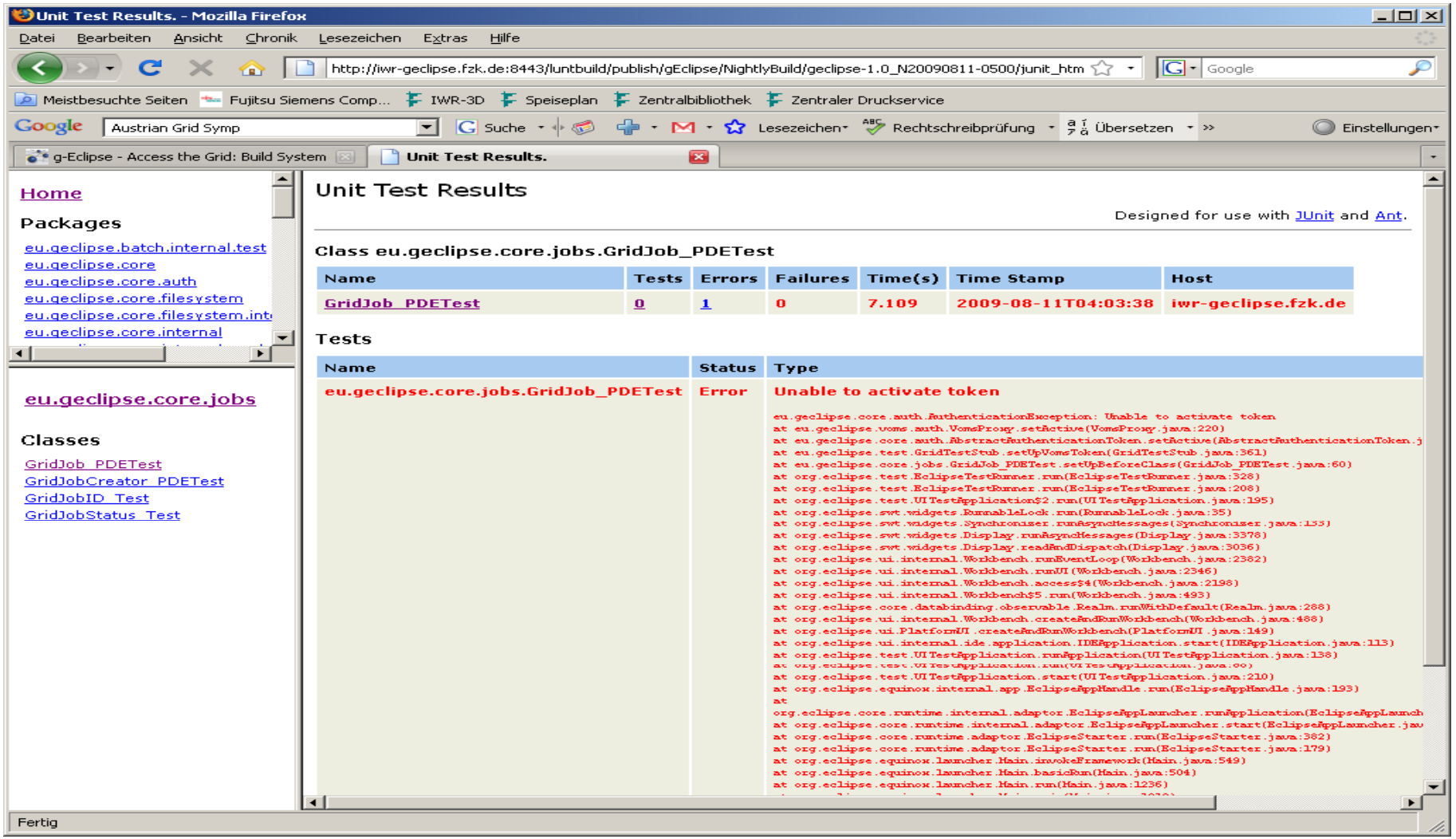
Integration in the Nightly Build System (II)



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Conclusion

- g-Eclipse is a useful tool for simplifying the access to the grids
- Quality assurance is necessary for guaranteeing the functionality
- The approach
  - Coding quality evaluated with metrics
  - Unit tests
- Further work
  - Performance profiling
  - Site availability testing

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