

On development of portable distributed computation system middleware

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Abstract. *The paper briefly describes the design and operation technologies of VALERIA distributed computations system. VALERIA middleware is suitable for deployment in scavenging or computational Grid environment. Unlike the prototypes Valeria is extremely light-weight and portable. The distinctive features of developed middleware are dynamic topology scan, failover procedure and automatic reconfiguration of computational resources based on keep-alive tests. The failover procedure is specially designed to be time-effective and suitable for use inside iteration of distributed PDE solvers with message passing interface.*

Keywords

Parallel processing, distributed computation, scavenging GRID systems.

1 System description

Based of ideas of BOINC open source project [1], a system of distributed computations VALERIA has been developed. VALERIA middleware is suitable for deployment in scavenging or computational Grid environment. Unlike the prototypes Valeria is extremely light-weight and portable. Its node runtime does not exceed 1000 lines of C-code. The distinctive features of developed middleware are dynamic topology scan, failover procedure and automatic reconfiguration of computational resources based on keep-alive tests. The failover procedure is specially designed to be time-effective and suitable for use inside iteration of distributed PDE solvers with message passing interface.

The main element of the system VALERIA is a managing router responsible for dynamic configuration and system management, determination of the network topology, user tasks management, authentication and authorization, crypto-protection as well as interaction with other components of the system. The router maintains communication with hierarchy of computational clusters or nodes as well as the database server provides initial data and results storage. For redundancy VALERIA Grid infrastructure could be configured with several backup routers. Compact IRC-like session protocol is used for communication between elements of the system.

Computational nodes must have client runtime software installed capable of executing part of distributed code. The client runtimes are now available for Win32 and Linux operating systems and different processor architectures.

The system performance was tested on a cluster including 20 pcs of Raspberry PI Model B ARMv6-based boards and four SONY PlayStation3 computational nodes under the Linux operating system. Test have shown about linear performance scalability factor and seamless integration of different architecture nodes into distributed computation environment. The full-scale system tests in the campus network of Dnepropetrovsk National University are ongoing.

2 Conclusion

Debugging and testing the user oriented C#-like parallel compiler suitable for deployment in Valeria environment are in our future plans.

References

- [1] BOINC. Open-source software for volunteer computing and grid computing. URL: <http://boinc.berkeley.edu/>