Abstract

The filamentous fungus *Penicillium chrysogenum* played a significant role in the history of antibiotics and is still a widely used organism for penicillin production. Since its discovery in the early 20th century the optimization of penicillin production by process control and strain improvements has been a major challenge. In order to gain deeper insight into its bioprocesses a wealth of parameters are retrieved by the analysis of drawn samples and measured online during fermentation. In addition, Microarray and qPCR technologies are used to study gene expressions levels. A structured data management system, providing versatile and intuitive data access, is of utmost importance in order to perform a systematic analysis of the collected data.

Therefore an integrative, scaleable, and extendable software platform for managing, visualizing, and analyzing bioprocess and gene expression data of fermentation processes has been established. The newly developed application Prometheus is the central component of the multi-application platform storing fermentation, online, and offline data. It provides access to gene expression data by integrating a microarray and a qPCR database. Prometheus is based on the state-of-the-art software technology Java EE, offers an intuitive web based user interface, and allows data access by external applications through a web service. A central usermanagement system provides a single sign on solution for all applications of the platform and features fined grained data access and sharing mechanisms.

In conclusion, the implemented computational environment offers researchers an application platform for bioprocess and gene expression data management of fermentation processes. The modular and flexible architecture supports the future integration of additional omics data, data sources, and applications.

Keywords: Penicillium chrysogenum, fermentation bioprocess, database, data management, microarray, qPCR, Java EE