# SAP HANA Software Development Process

## *- zero warnings in 11 million lines of code -*

**SAP HANA** is a development and integration platform for software applications. At its core, it consists of one of the first commercially used in-memory columnar storage databases. The development was stimulated by promising research results on DBMS around 2010. This research was motivated by the observation of current hardware trends, especially the increased availability and decreasing cost of main memory and the shift to parallel processing on multi-core systems. It turned out that many data workloads could soon be handled completely in memory.

**The SAP HANA Development Team** is located at six international sites, which are concentrated at three main hubs in Canada, Germany and Korea with the most employees. A total of about 1,100 [1] employees are part of the HANA development team. This results in a multicultural team. For this reason, when hiring new employees, they pay particular attention to social aspects and good English skills in addition to professional competence.

**Customer Requirements** HANA customers rely on a database that is the core of their business application. Therefore it must be very stable and fault-tolerant to satisfy the meanwhile more than 11,500 [2] customers. Nevertheless, SAP is constantly working on the further development of HANA and thus delivers a major update every year as well as monthly cloud-releases. Therefore it is important to find a good balance between implementing new features and providing a highly stable, complex DBMS. Consequently, using the traditional waterfall model for this software development is not sustainable, as the development, integration and testing phases cannot be separated.

## HANA's Tool Landscape

### Development Environment

HANA is written in C++ and includes 11 million loc. Builds are released via linux-based systems. In all other parts, developers are free to choose their development environment and code editors.

### Project Management

Problem tracking is mainly done through the JIRA service. There, requirements and the backlog are defined.

Git is used for version control management.

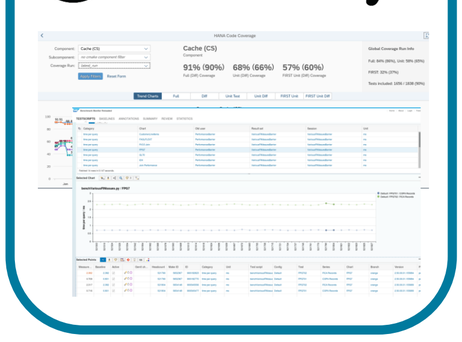
The internal documentation for architecture and design decisions is stored in a Wiki.

### Code Management & Review

The high customer requirements made a fast integration of changes necessary. Therefore it was found that a separation of development and integration as in conventional software projects is not possible. For this reason, HANA development is based on continuous integration, which is supported by Jenkins.

In the development phase they focus on test-driven development. Due to many different tests, it is therefore possible to merge into the mainline several times a day. Also the mainline branch is always in a shippable state.

### Build, Testing & Code Quality




Every day, about 1,500 commits and builds are created during the work. To keep the probability of errors as low as possible, various tests are used.

Coverity is used to ensure the code quality. Hereby the 210 test packages with over 33,000 KPI's can be analytically checked. The metadata of the tests alone add up to more than 100 TB over years.

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**References**

[1] Talk & Slides by Dr. Alexander Böhm at HPI at 17th of December in 2019 (https://www.tele-task.de/lecture/video/7892/)

[2] Handelsblatt – Article about SPA HANA: http://bit.ly/37HNhcM [Christof Kerkmann | accessed on 27.01.2019]

SAP Logo: https://images.app.goo.gl/VhaTPDXyRP3vYunA7