SAP applications can often comprise the core of IT operations in large enterprises. Companies that outsource their SAP landscape and basic operation to a private cloud can manage their resources flexibly in a way that meets demand and saves costs. Dynamic Services for SAP Solutions* and Application Operations for SAP Solutions* form a private cloud solution from T-Systems which comprises both the technical infrastructure and the operation of SAP applications.

To provide its customers with even more attractive offers in the future, T-Systems is constantly in the process of optimizing the overall costs incurred for SAP HANA in the private cloud environment. A component of this private cloud is a SAP HANA scale-out appliance based on the Dell PowerEdge R920* platform with Intel® Xeon® processor E7 v2 family. Around 200 customers are currently using more than 5,000 standardized and industrialized SAP components via this environment.1

**SAP HANA** Appliance

Efficient operation in a private cloud environment

SAP applications from the Private Cloud

SAP applications often comprise the core of IT operations. More and more companies are now outsourcing their technical infrastructure and SAP applications to a private cloud. The most common motives for this being cost reduction, a focus on the company’s core competence, plus the desire to manage resources flexibly and dynamically. As a result, companies are able to react quickly to the changing requirements applied to SAP applications which can arise through peak loads, growth and restructuring or company acquisitions.

SAP operation in the private cloud means more than simply providing infrastructure. Additional services such as monitoring, IT security and support are required to ensure stable operation and a transparent service. T-Systems facilitates the needs-oriented integration of SAP applications into companies using its Application Operations for SAP Solutions* (AOfSAP). AOifSAP integrates Dynamic Services for SAP solutions, a globally available, virtualized and extremely efficient solution for the operation of SAP systems and components with the efficiency of in-memory technology. This is made widely available by SAP HANA.

Around 200 customers currently use more than 5,000 SAP components that are standardized and industrialized via the Dynamic Services platform provided by T-Systems. Customers only pay for the resources they have actually used (pay per use). System performance, number of users, function range and service constantly adapt to suit the company’s needs. Consequently, peak loads can be easily managed and usually without any delay. T-Systems’ private cloud is subject to strict German data protection law and complies with all compliance requirements. Companies access hosted SAP applications exclusively via VPN/MPLS (virtual private networks/multiprotocol label switching) which guarantees data protection.
Optimize operating costs through standardization and increased efficiency

**Technical basis: SAP HANA**

T-Systems’ Dynamic Services customers benefit from SAP HANA platform performance as part of Application Operations for SAP Solutions. The core of SAP HANA is the SAP in-memory computing engine which stores the data directly to the RAM of the server and not to external hard drives or flash memory. Data is therefore accessed more quickly since it does not have to be reloaded or rewritten. In addition, a computer’s RAM has a considerably faster access time than the hard drives in classic databases which allows in-memory solutions to work considerably faster.

When starting up the database, SAP HANA loads the entire data pool from the hard drive into the memory (not only in cache) so that no more data has to be uploaded once the system is up and running. This simplifies the access algorithms and increases the application’s performance. To guarantee that data stored to volatile RAMs is unaffected even when malfunctions or disruptions occur, the solution makes use of technology such as snapshots, transaction logs and replications which regularly store the data to conventional hard drive systems. Moreover, SAP HANA reduces memory consumption by implementing specific compression algorithms and data structures.

The second cornerstone to SAP HANA, besides in-memory computing, is the type of data storage used. SAP uses a hybrid model in HANA which allows data to be stored in rows and columns. Classic relational data bases are row-oriented where the information for customer records is entered consecutively: Name, place, country. This is then followed by the next customer record. Column-oriented data bases follow different principle. They first enter all of the names consecutively before entering other items of information such as place and country.

HANA thus combines the best of both worlds. Row-oriented data storage enables faster writing access. However, it takes longer for the data to be read since the system has to spring through data entries when searching for a particular name. As a result, this type of data base is suited primarily to OLTP systems (online transactional processing) such as ERP from which a high volume of information is continually fed into the data base.

Column-oriented data bases are more advantageous for read access. When searching for a name, the data base simply selects the relevant column in sequence without jumping between entries. The process is extremely fast. This is why column-oriented data bases are mostly integrated into OLAP systems (online analytical processing), such as data warehouses and other systems that have been specialized to conduct assessments and analyses.

Up to now, T-Systems has relied on two manufacturers – both of whom are SAP-certified – to produce its AOFSAP and SAP HANA appliances. The company’s aim in cooperating with Dell on this project, however, was to optimize the overall costs for SAP HANA in the private cloud environment and so to provide its customers with an even more attractive offering. Increased standardization, faster allocation and a more efficient operation all needed to feature in this offer. To do this the appliance must be integrated deeply into T-Systems’ Dynamic Services infrastructure.

**The solution: Dell appliance with Intel Xeon processors E7 v2**

As a result, T-Systems launched a market analysis in August 2013 and conversed with various providers. After three months the decision was made to go with an SAP HANA scale-out appliance based on the Dell PowerEdge R920 platform with Intel Xeon processors E7 v2. Next, T-Systems simulated test scenarios for its Dynamic Services on a reference architecture as part of a proof-of-concept (PoC) phase. The Dell appliance is now available in T-Systems’ SAP HANA shopping basket. For example, the company’s private cloud environment currently hosts 15 SAP BW system via SAP HANA appliances for a major client with a total of around 55 TB SAP A HANA memories.

In practice, T-Systems integrates Dell appliances in a scale-out configuration using four Intel Xeon processors E7 v2 4880/90 and 1 TB RAM per server. The solution is scalable for memories of at least 2 and up to 16 TB. Compellent array is also used to store a copy of data on the server memory. All of these components are installed for servers that have been developed specifically for HANA which in turn are based on fast Intel Xeon processors E7 v2. The Intel Xeon E7 v2 is the only certified CPU platform for live operation with SAP HANA at present (January 2015).
In-memory technology guarantees to make full use of CPU power since developers at Intel have been working closely together with SAP for some years to optimize the SAP HANA code for the Xeon processor E7 v2 family. Another result of this long-standing partnership between SAP and Intel is the high degree of reliability through the use of RAS features in SAP HANA.

The memory capacity of Intel Xeon E7 v2 processors, which are fitted with up to 15 cores, is up to 1.5 TB per socket. This means that many companies are able to load their entire customer data base into the memory. The result is a very fast and exhaustive data analysis. Intel® Integrated I/O and Intel® Data Direct I/O supply high bandwidths for data transfer. Additional PCIe® 3.0 interfaces allow for more capacity to be added for both memory and network connections. Intel Xeon E7 v2 processors also integrate Intel RAS functions for increased reliability, availability and serviceability.

At the same time, the energy-saving function, Intel® Intelligent Power technology, reduces energy consumption when the chip is in idle mode. In practice this means that energy consumption is determined dynamically by the workload. SAP HANA is thus able to use energy extremely efficiently. Intel® Streaming SIMD Extensions (instruction set extensions) for the Xeon processors (Intel® SSE, Intel® SSE2, Intel® SSE3, Intel® SSSE3, Intel® SSE4.1 and Intel® SSE4.2) also contribute towards increased SAP HANA performance because they accelerate decompression and the search through data records by increasing parallelization.

**Deep Integration**

Given that SAP validates and certifies SAP HANA appliances and thus sets defined (performance) requirements for its components and for configuration, the scope available for tailoring them to customers’ requirements is limited. The challenge facing Dell was therefore to integrate its SAP HANA appliance seamlessly into the private cloud SAP operating platform. This deep integration into the IT infrastructure and IT processes is necessary to enable T-Systems to offer its customers attractive conditions for operating AOFSAP in the private cloud. Consequently, Dell had to open the SAP HANA appliance to T-System’s specific requirements while ensuring the appliance’s continued compliance with SAP certification provisions after customization. This ensures that SAP provides comprehensive support for the complete solution.

The T-Systems network infrastructure includes several networks that are physically separated from one another: customer network, admin network, backup network, SAP HANA. These networks entail various different authorization structures and login processes and have to be designed redundantly. This raised a number of key questions: How can the Dell appliance be integrated into this special network infrastructure? How can SAP HANA be monitored in the admin network? How is the customer granted access to SAP HANA without impairing performance? How do you create quick access to storage backup and restore processes?

Dell came up with corresponding answers in partnership with T-Systems. For example, both companies replaced active network components (switches) for the uplink ports that protrude from the appliance with direct network connections; the network infrastructure for HANA internal communication remained unaltered. In this way, the appliance can now be used in the Dynamic Service infrastructure as an extremely large node with SAP HANA functionality. T-Systems is thus able to fully incorporate the technical components on the outer edge of the HANA appliance in its automation, provision and configuration concepts. VLAN, name and address space designs can be connected directly to HANA interfaces.

The appliance also had to be integrated into ITIL management processes for monitoring, event and incident management. An important feature here is that an alert is generated as soon as problems arise with the software or hardware (e.g. SAP events or operating system). The monitoring system is based on OpenManage Essentials™ – system administration software – from Dell which proactively identifies potential hardware malfunctions in T-System’s IT environment. This allows the support division to replace components before they cease to function. The customer is not at all aware of the malfunction. Moreover, participating companies have implemented an automated application management methodology. Since SAP HANA is initially activated here, the appliance is already available as a data base server before running the application stack.

Through careful planning and integration, T-Systems has created seamless processes and is able to design its private cloud operating processes extremely efficiently around SAP HANA and SAP applications. This means that the company leverages all the advantages of a sophisticated, SAP-certified appliance. Conversely, there is no end to the way in which customers benefit from high-performance SAP HANA in-memory technology and the attractive conditions available through outsourcing SAP applications.
T-Systems is the Key Accounts Division of Deutsche Telekom. Drawing on a global infrastructure of data centers and networks, T-Systems operates information and communication technology (ICT) systems for multinational corporations and public sector institutions. With around 50,000 employees, T-Systems generated approximately EUR 9.5 billion in revenue during the 2013 fiscal year.

T-Systems provides the infrastructure and concept for cloud platform technology and conducts extensive tests when integrating the Dell appliance.


Dell listens to its customers and offers innovative, reliable IT solutions and services that are based on industry standards. They are fully customized to suit the user’s individual requirements and enable companies to be more successful. More information available at www.dell.de and www.dell.de/d2dblog. You can also contact Dell directly at www.dell.com/conversations.

Dell provides the SAP HANA scale-out appliance which is based on the Dell PowerEdge R920 platform and was responsible for implementing and integrating the appliance into the infrastructure of T-Systems’ Dynamic Services. Proactive support services also come under Dell’s area of responsibility.

Intel (NASDAQ: INTC) is a world leader in computing innovation. The company designs and builds the essential technologies that serve as the foundation for the world’s computing devices. As a leader in corporate responsibility and sustainability, Intel also manufactures the world’s first commercially available “conflict-free” microprocessors. Additional information about Intel is available at newsroom.intel.com and blogs.intel.com, and about Intel’s conflict-free efforts at conflictfree.intel.com.

With its Intel Xeon processor E7 v2 family and various network cards, Dell delivers important hardware components for the SAP HANA appliance from Dell. The Intel Xeon E7 v2 is the only certified CPU platform for productive mode using SAP HANA as per Intel at present (January 2015) and is the fruit of a longstanding partnership between Intel and SAP.