CUSTOMER SNAPSHOT

Volkswagen V-Charge Collaboration

Solving the Research Collaboration Challenge in Driverless Valet Parking

Customer Overview

Researchers at ETH Zurich and the universities of Braunschweig, Oxford and Parma recently embarked on a cooperative research program called V-Charge with industrial partners Bosch and Volkswagen AG. To work together effectively, they decided that every collaborator should be able to use the computers, operating systems and software they were most comfortable and experienced with. No one should be forced to change their tools, because that would impose unfair costs on some collaborators.

Consequently, architectural flexibility and system configurability had to be addressed before integration work could begin. Decoupling applications and modules turned out to be an inspired decision that would save time and improve the quality of research.

"Using DDS simplified the integration challenge every research program has to address when dealing with multiple collaborators. We'd recommend any research program to look closely at the benefits derived from a decoupled communications infrastructure."

Wojciech Derendarz

Project Manager for VW,

V-Charge *collaborative program*

Project Details

Volkswagen V-Charge is a project investigating driverless valet parking that is fully automated through the command interface of a mobile phone application. The end goal is to be able to automatically park an electric car in a large parking garage with centimeter accuracy at an induction-based recharging station.

Automated and driverless parking in a multi-story car park cannot rely on GPS to facilitate navigational guidance. Instead, a suite of 2 stereo cameras, 4 mono-cameras and 12 or more sensors in the car compare their information against a pre-mapped car park layout to determine location. For safety, the system must recognize other static and moving objects, and adjust automated drive control appropriately. To see the automated valet parking in action, visit http://youtu.be/7xQfKTAtyNU

The Research Collaboration Challenge

Volkswagen AG was primarily responsible for integrating all these sensors and the drive control. This meant integrating the 8 computers from the partner universities and Bosch with the CANbus driver control system. The computers were

heterogeneous and networked with Gbit Ethernet. The impedance mismatch between the CANbus and Ethernet bus architectures had to be seamlessly addressed for drive control to occur.

In research programs, the compute intensity of any specific module cannot be determined ahead of time and is subject to continuous change; the ability of one compute engine to manage its load cannot be determined until runtime. The infrastructure needs to provide clear feedback when communication deadlines are not being met by connected modules. This requires the ability to rapidly and easily reallocate modules to networked nodes. In other words, modules should be able to be reorganized around the distributed architecture without the time and effort of reconfiguring the underlying network integration. This way, researchers can stay focused on application level issues rather than dealing with system architecture problems created by changes in systems integration.

Solution

To enable the compute intensive sensor integration across the distributed environment, the team needed a common way to deliver data between modules and sub-systems that integrated with existing software toolchains. As the integration partner, VW selected RTI Connext DDS as the integration middleware.

DDS enables the decoupling of the applications from the underlying communication infrastructure. This means that any process or module can be moved around the network completely unchanged. DDS discovers the modules new location at boot time and routes communication as needed. No IP reconfiguration or network interface changes are required by the application.

DDS includes a Quality of Service (QoS) capability that ensures that the data needs of each and every communicating process and module are being met. If they are not, the discrepancy between publisher and subscriber is noted and both applications are informed. No application module needs to know about any other – it just needs to know it requires specific data within certain timing and delivery constraints and to know when those constraints are not being met.

Benefits

Researchers are independent by nature; they need the freedom to change their minds or alter their systems configuration as interim research results indicate alternative or superior approaches.

DDS enables decoupling of the application from the physical communication infrastructure as well as between application modules or processes, wherever they are located in a distributed system. This facilitates independent development by the disparate and disconnected collaborating team members. Each research team can focus on their specific area of expertise rather than having to become communication experts and network topology managers. Ultimately, this creates a focused team that can get more research development done in less time.

About RTI

Real-Time Innovations (RTI) is the Industrial Internet of Things (IIoT) connectivity company. The RTI Connext® databus is a software framework that shares information in real time, making applications work together as one, integrated system. It connects across field, fog and cloud. Its reliability, security, performance and scalability are proven in the most demanding industrial systems. Deployed systems include medical devices and imaging; wind, hydro and solar power; autonomous planes, trains and cars; traffic control; Oil and Gas; robotics, ships and defense.

RTI is the largest vendor of products based on the Object Management Group (OMG) Data Distribution Service™ (DDS) standard. RTI is privately held and headquartered in Sunnyvale, California.

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