

What's Up MÄK

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3 Ways to Simplify the Construction of Large HLA Exercises

Felix Rodriguez, MÄK's Link Team Lead, shares how the MÄK RTI saves time and bandwidth when connecting large and complicated HLA Exercises



TACTIS is a powerful tactical and technical simulation platform tailored for combined forces instruction and training.

When the Thales Group was contracted by the Royal Netherlands Army to build a multilevel technical instruction and tactical training system for the **TACTIS program**, they needed a strong and dependable solution to network each of the many simulators and hundreds of computers. By choosing the MÄK RTI for the job, they called upon MÄK's expertise in connecting distributed simulation systems and built a program that enables its many federates to successfully communicate.

Every distributed simulation requires a way for its federates to communicate. When building extremely large HLA exercises with hundreds of federates, like TACTIS, the need for an efficient and simple tool that can keep CPU, bandwidth, and memory requirements to an absolute minimum is imperative.

For more than 15 years, MÄK has led the pack of Run Time Infrastructures, the middleware necessary to support the communication between federates, with our MÄK RTI. While the MÄK RTI has proven itself time and again as the right tool for any size HLA simulation system out-of-the-box, its power, speed, and flexibility really shine in large-scale systems.

How can you take advantage of the MÄK RTI to connect your large-scale HLA simulation system? We'll show you.

1) Reduce Your Network Load

- **Use Forwarders**

HLA Forwarders (also called boosters or extenders) normally connect separate wide area networks (WANs) within the same HLA exercise. Even if your exercise is not on separate WANs, Forwarders divide your exercise into smaller parts and reduce both the network load and the CPU requirements of each federate; by using just one extra Forwarder, you can reduce your network load by close to half.

With the MÄK RTI, Forwarders are completely free, regardless of whether your simulation has one forwarder or ten. If you have a large number of federates, why not add a few more Forwarders in your simulation and save yourself some bandwidth?

- **Use Smart Forwarding**

The MÄK RTI's Smart Forwarding only sends messages to federates that need them. When you enable Smart Forwarding, each federate adds bits of transportation information to each message making it easy for those federates to determine where messages should be sent. This does add an extra processing cost since federates have to create the sending message, but it may greatly reduce a network load bottleneck. In federations where federates selectively subscribe only to data subsets, there will be a net savings in processing power, because the receiving federates will not have to read and dismiss messages they are not interested in. ➔

Connecting large exercises with the MÄK RTI

- **Enable Compression/Bundling**

Another way to reduce network load is to enable compression. This will make the MÄK RTI compress all packets before sending them on the network and decompress them on the other side. You can balance the load by setting up to 10 increasing values of compression; a higher value means more CPU time dedicated to reducing packet size.

You can also enable Packet Bundling, which is the ability to take multiple HLA messages and merge them together into one. This feature can be used to improve performance on federates that send large numbers of updates at the same time. This can reduce both processing and network load.

Both of these values can be set on a per node basis (federate, rtiexec, or Forwarder), giving you full control over how much processing power you want to spend to reduce network load.

2) Pre-plan and Reorganize Your Exercise

- **Take advantage of class-specific multicast filtering**

With a little bit of pre-planning, the MÄK RTI can be configured to place certain object and interaction types in separate multicast addresses. By taking the time to know what objects/interactions each federate is interested in, you can instruct those federates to only subscribe to the needed multicast addresses. This will cut down on processing unneeded data and thus speed up the interactions between your federates.

- **Subscribe early and in order**

One of the most costly tasks that can be done in an HLA network is a federate joining in the middle of an exercise. When this happens, it sends a message to every other federate notifying its status and subscription requirements. Subsequently, every federate must send a message in return, notifying the new federate of subscription status and information on every existing object it publishes. As you might expect, this is an incredibly large number of messages. By reorganizing your exercise and making sure everyone begins an exercise together, you will save a large number of messages right from the start. To save even more, remember that order matters. Every federate should first subscribe to whatever it needs before beginning an exercise. Then, all the federates can publish without the cascade of setup messages.

MÄK understands that sometimes late joiners are inevitable, so we've included a few settings in the MÄK RTI that will spread out your network load by delaying messages for some amount of time. This means that it will take a little longer for your new federate to get up to speed, but there will be less of a spike in load on the network.

3) Understand Problems from All Angles

- **Try the RTI Assistant**

MÄK knows that managing large systems can be extremely complicated, so we've built the MÄK RTI to be your complete solution – helping you not only solve problems, but to identify them as well. After all, understanding the problem is half the solution. As our last and simplest suggestion, we recommend you upgrade to the MÄK RTI 4.2. With version 4.2 comes a new RTI Assistant, which features a lot of information about the messages the RTI is sending out and receiving over the network. The Assistant allows you to graph this information over time, helping pinpoint any bottlenecks in your system. Once you know the bottleneck, you can take the steps to fix it! 🐞

Are you building a large exercise? Get started with the MÄK RTI today.

Contact us at info@mak.com.

Free VR-Forces Training!

If you're a VR-Forces customer, MÄK invites you to take advantage of our free VR-Forces Training Course the week of September 9! Check out the [MÄK Events Calendar](#) to learn more.

Have questions? Contact your sales person or info@mak.com.



Customer Win!

Naval Air Warfare Center Chooses VT MÄK's Products to Support Unmanned Systems and Autonomy Research at the Human-Computer Interaction Laboratory (HCIL)

MÄK products key to a research, development, test, and evaluation (RDT&E) environment to expand role of Human-Machine Interface (HMI) automation in unmanned systems

The Naval Air Warfare Center Aircraft Division (NAWCAD) has selected MÄK's  Link,  Simulation, and  Visualization products for the HCIL's Unmanned Aerial Systems (UAS) Human-Computer Interaction RDT&E Environment for Autonomy Integration. The MÄK suite of tools includes **VR-Forces**, **B-HAVE**, **VR-Vantage**, **VR-Link**, **the MÄK RTI**, and **the MÄK Data Logger**.

MÄK products provide the robust M&S environment and scenario-creation capability required for the lab's UAS mission simulations. VR-Forces is the engine for flexible scenario generation and implements semi-automated forces, such as soldiers, vehicles, and aircraft; B-HAVE, a module for VR-Forces, enables users to create complex "Patterns of Life," that allow the semi-automated forces to follow context-sensitive patterns, providing more complex and realistic behaviors. VR-Vantage, MÄK's visualization solution, drives the tactical displays and simulates electro-optical (EO) and infrared (IR) sensor feeds. VR-Link and the MÄK RTI distribute mission simulations across networks and the MÄK Data Logger captures measures of performance (MOPs) and measures of effectiveness (MOEs) for analysis and design evaluation. The MÄK tools are open architecture, come with a perpetual license, and allow for a high-degree of extensibility.

The goal of the UAS HCI RDT&E Environment for Autonomy Integration is to assess and compare man-machine performance for developmental, autonomy-enhanced UAS HMIs in various mission scenarios, including surveillance, maritime patrol, battle management, and penetrating strike profiles. The project aims to establish a flexible partnership between the operator and the intelligent system that leverages the strengths of each to enhance the total system capability. This will ultimately expand the role of automation to reduce operator workload and minimize crew complement, to control unmanned vehicles, to broaden mission capabilities for future requirements, and to improve decision-making in the initial stages of the system development life cycle. 🌟

To learn more, contact info@mak.com.

MÄKer Spotlight: Dan West

Link Team Software Engineer



Have you ever wondered why MÄK products link so well with everything?

If so, here's your answer - our Software Engineers! They take care of all the behind-the-scenes work that enables our products to be so strong, flexible, and interoperable. We're happy to introduce one of our Link Team Software Engineers, Dan West, as our spotlighted MÄKer this month. As a Link Team Engineer, Dan works on feature enhancements to VR-Exchange and VR-Link. He also handles support requests and licensing support issues.

Before he joined the Link Team, Dan worked as an engineer for the VR-Vantage team, adding features like sensor volumes, radio communication lines, and track history configuration options, as well as handling general support tasks.

Mr. West holds a B.S. in Computer Science and Math from the Rensselaer Polytechnic Institute of New York. While in college, he exercised his creative side by joining the photography club where he learned how to compose an excellent shot and develop his own photos.

When Dan isn't supporting customers and developing new features at work, he enjoys playing video games with friends. He's also very interested in learning about space and the latest advances in space exploration; he even recently acquired his very own telescope and is exploring firsthand the natural science of astronomy.

We hope we've piqued your interest in our Software Engineers! For more info visit www.mak.com. 🌟