

What's Up MÄK

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Interoperable, Protocol Independent, Easy to Use: VR-Link Stands the Test of Time



The VR-Link toolkit provides an easy way to network simulators and other virtual reality applications.

More than 20 years ago, VT MÄK stepped into the Modeling and Simulation community and introduced our flagship simulation networking software, **VR-Link**. Since then, MÄK has remained focused on both our dedication to interoperability and the needs of our customers. We've been active participants in the development of industry standards and protocols through the **Simulation Interoperability Standards Organization (SISO)** and have built our products to ensure our customers can use the protocol of their choice. This has consistently made VR-Link the top HLA-DIS networking toolkit on the market and VT MÄK the top choice for distributed simulation software.

Continuing the MÄK tradition of listening, learning, and evolving, we've recently added even more capabilities to meet the growing needs of VR-Link users. Here is some of what you'll find in VR-Link 5.1:

- **New C# library of objects and interactions** – While a lot of our customers use C++ to build DIS or HLA compliant applications, many new projects are started using C# — a simple, modern, and object-oriented programming language. VR-Link now empowers customers to use a library of C# objects and interactions with our VR-Link protocol-independent API. (Learn how MÄK is keeping pace with **modern programming languages** like C#!)
- **Continued focus on performance** – Performance is a top priority at MÄK. We've put a lot of effort in VR-Link to ensure our customers can take advantage of multithreaded publisher lists; this enables users to tick all publishers with a single call, allowing them to update as fast as possible.
- **Easier FOM extensions** – Enjoy a simpler way to access FOM extensions. If you have a FOM where one or more new attributes have been added, you can now easily access the attribute without writing any new code at all.
- **API Improvements** – We have significantly simplified our API for transferring ownership in HLA, as well as for configuring dead reckoners and smoothers. This will greatly speed up development for our VR-Link customers.
- **Compliant with RPR FOM 2.0, Draft 20** – You can rely on VR-Link to remain up-to-date with major standards. VR-Link now supports the latest draft of the soon-to-be-finalized **RPR FOM 2.0 standard**, defining HLA classes, attributes, and parameters that are appropriate for real-time, platform-level simulations.

This issue of *What's Up MÄK* celebrates all things VR-Link. Take a look around, learn how VR-Link is designed to simplify the job of networking simulators, and then **reach out to us** if you'd like to know more. 🌸

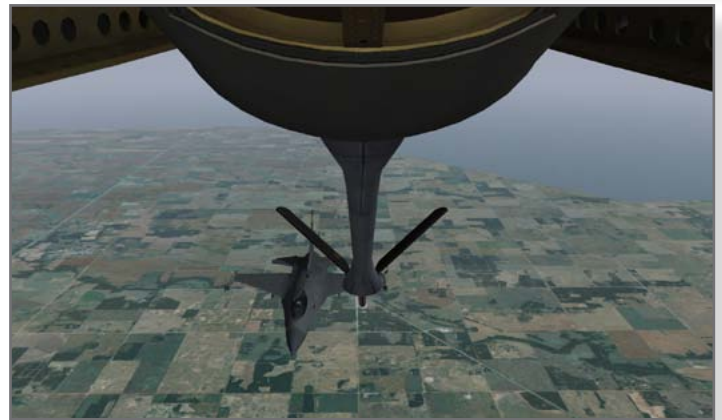
QuantaDyn Corporation Chooses MÄK's VR-Link for DIS Protocol in Aerial Refueling Simulator

Ever have trouble getting the gas nozzle into the tank of your car? Imagine trying to do that in mid-air where the gas station is flying and so is your car (well, airplane). Mid-flight fuel transfer is complicated by the fact that everything is in motion, the gas hose is dangling out of one plane, and the pilot has to maneuver his plane into exactly the correct position to connect. Simulating this maneuver in a networked environment is difficult because the relative positions, velocities, and accelerations of the two aircraft have to be communicated precisely. Delays in network messages can't be allowed to sabotage the whole operation. **QuantaDyn Corporation**, an engineering firm specializing in training simulations, has developed a technical solution for networked aerial refueling training, using MÄK's VR-Link for DIS standard protocol.

The "dead reckoning" technique normally used struggles when two entities are moving so fast and so close together. As time goes by, entities using dead reckoning compute the location of remote aircraft each frame until they receive a position update from the remote trainer. This approach avoids flooding the network with position updates every frame, but poses a dilemma for close proximity training. For example, at 275 knots an aircraft will move almost 8ft in 1/60th of a second — the typical frame rate of the pilots visual scene. Standard dead reckoning only sends position updates when an aircraft goes outside of a certain threshold and can result in a jump of a foot or two when a new position update is received. When refueling mid-flight, those few feet can make a huge difference. Avoiding this dead reckoning gap is the main issue facing aerial refueling training.

MÄK's VR-Link allows QuantaDyn to modify the way they use standard DIS packets without having to update the DIS interface. They are able to send relative position, velocity, and acceleration updates instead of standard position, velocity, and acceleration updates by altering the information given to the VR-Link software and selecting an alternative dead reckoning algorithm. So instead of moving 8 feet per update relative to the world, the plane being fueled is barely moving at all relative to the tanker aircraft. VR-Link provides the necessary "gateway" to send and receive data to and from the DIS network.

"MÄK was chosen because it is an industry leader in HLA and DIS simulation networking and has many years of experience providing solutions and services in this area. With VR-Link, we were able to focus our full development effort towards a technical solution for Networked Aerial Refueling (AR) Training," explained Michael Parker, Project Engineer for QuantaDyn. "MÄK took care of packaging and format-



These are screenshots from a QuantaDyn trainer, built with a MetaVR IG, performing an Aerial Refueling Mission. The top graphic is from the receiver looking up at the tanker and the bottom is from the tanker side looking down on the receiver.

ting the data to send across the network and receiving and unpacking the data from the network. We could then use this data and focus our efforts in our area of expertise and develop a solid solution for AR training over the DIS network."

In addition to using VR-Link to network aerial refueling simulations, QuantaDyn also used it for a Distributed Missions Operations (DMO) upgrade to their low-cost desktop Boom Operator Simulation System, the Micro-BOSS. The MicroBOSS brings the high fidelity simulation of a full size trainer to small form application.

When asked if and why QuantaDyn would recommend MÄK products and services to other organizations, Parker stated that, "MÄK products work just like MÄK says they will. They are easily modified for unique applications and all areas of the MÄK team are top notch from sales to technical support." ❀

More than just C++

VR-Link keeps pace with modern programming languages

Programming languages have been evolving since the first computer was created. Early languages, including Autocode, FORTRAN, and FlowMatic, made way for many of today's modern languages. The era of the C language introduced better structure and access to low-level system functions and devices. Then came C++, adding object oriented programming constructs. Now we have a whole class of simple, modern, general-purpose, object-oriented programming languages, like C# (pronounced C sharp), that are gaining popularity.

VR-Link has been with you since the beginning and we plan to be with you to the end. So – drum roll please – we are excited to introduce C# support for VR-Link! Because our C# implementation of VR-Link is built as a Common Language Infrastructure (CLI) library, you can build your applications using C# or any other language that conforms to the CLI standard. There are currently 32 separate languages that are a part of the CLI standard, including Python, Ruby, and Visual Basic, as well as functional languages like F# and Lisp. (Functional languages provide an incredible amount of power when manipulating objects or groups of objects - [read more about programming with F#](#).)

MÄK wants to make your life easier and we hope that by adding C# and other CLI-compliant languages, we have. If you have questions or requests, get in touch with us at info@mak.com! 🌸



Bring your virtual environment to life.

Enjoy the realism of water. Watch rain hit the windscreen, bead up, and drip away — each drop refracting the virtual environment. Depth of field effects give scenes a rich and natural look as you move through dense vegetation. Gaze up at a sky full of stars, each in their proper position with relative brightness, and then see shadows come and go as morning rolls in.

[Watch this and other videos](#) with stunning visuals and [let us know](#) how we can bring your virtual environment to life.

Tips & Techniques

HLA Ownership Management in VR-Link 5.1

Transferring control in simulations is a complicated dance. Both the relinquishing and the receiving simulations have to agree in principal and then exchange lots of complicated transactions to make the exchange. The complexity leaves most who attempt it frustrated and hopeless.

It doesn't have to be that way. In VR-Link 5.1, MÄK offers you a technique to make the transfer of objects pre-approved and thus easy. Each participating simulation starts by agreeing to take any objects offered and agreeing to relinquish any objects asked for. With the approval steps out of the way, only a single message is needed to take control of another simulation's airplane, for example. Similarly, with a single message your simulation can give back control when you are finished. We've included examples in VR-Link to illustrate this technique. So give it a try — it's actually kind of fun.

Avoid the mess of countless complicated interactions when all you want is to give up control of a specific entity. You don't have to be afraid of ownership transfer anymore because we made an easy way to do it.

Have questions? You know the drill – info@mak.com. 🌸

MÄK's Command Staff Training Approach



Commanders, like all good leaders, are responsible for the people below them. But they can't do it alone. A commander's staff exists to support the commander, work as a team, and deliver information to help make good, informed decisions.

Training and preparation enable the command staff team to function efficiently and properly in challenging situations; training allows the commander and his team to assess the situation, make decisions, and communicate those decisions.

Simulation plays an important role in command staff training; it's job is to stimulate those situations where learning takes place. The simulation content depends on the echelon (level) of the staff being trained. For example, captains need entity-level simulation to train for situations involving specific individuals and roles while General Officers need aggregate level simulations to model larger scale exercises.

To model the activity and behavior of opposing forces, the background civilian population, the political and social environment — any and all of the elements needed to stimulate a command staff — is a huge endeavor. To make it happen,

commanders either need role players acting out the parts of each unit/entity/vehicle/person or a very powerful, believable, and capable artificial intelligence (AI). Or training tasks need to be focused into lessons that are manageable subsets of a real environment.

MÄK's **simulation tools** help command staff groups manage this daunting task. **VR-Forces** can use Aggregate Level Simulation to model at the brigade and above echelons; it can also model at Entity Level Simulations at brigade and below echelons. **EcoSIM** specializes in simulating individual human characters and **Battle Command** is a command staff training application. All three have AI to help automate the behavior of units/entities/people and are interactive — allowing the command staff and/or role players dynamically control the scenario.

MÄK's simulation software is designed to work in live, constructive, or virtual simulation environments and they scale from a single computer to distributed networked simulation systems with sites across the world. We have application-level tools that are ready to configure for training and we offer software tools to build new training systems, to integrate into your training systems, or to stimulate Mission Command systems. 🌸

MÄKer Spotlight: Jeff Cohen

Director of Information Technology



This month the spotlight shines on Jeff Cohen, MÄK's Director of Information Technology. Responsible for the entire IT infrastructure of our company, Jeff has a lot going on. He spends his days designing, planning, deploying, maintaining, and upgrading all of MÄK's IT systems; these include workstations, servers, applications, databases, networks, and security measures.

Jeff's past jobs include IT Manager for GeoPartners Research, Inc. Jeff graduated from Clark University with a degree in Computer Science; he also holds a degree from Berklee College of Music with a focus on the guitar.

For a short time in the 90's Jeff played bass for a number of R&B groups that were at the top of the charts in the 50's and 60's including The Drifters, The Coasters, The Marvelettes, and the Platters. They performed at festivals and concerts along the east coast. Currently, Jeff is performing with the Beatles tribute band Glass Onion.

Another tidbit about Jeff's musical past — in his junior year of high school he co-wrote the music for "Downwardyl: A Rock, Murder-Mystery, Musical Comedy", an original musical performed by a local high school's drama department (with his band providing the live accompaniment, of course).

In his free time, Jeff enjoys skiing and collecting vintage pro audio equipment. He also likes to record and produce bands/singer-songwriters. The next chart topping song you hear might have been influenced by Jeff! We hope this piques your interest in our community here VT MÄK. Stay tuned to the **MÄK blog** and **Twitter** for more updates from us! 🌸