

The NLR ATM & Airports Research Infrastructure

NARSIM Radar

The NLR of the Netherlands has developed a real-time Air Traffic Control Research Simulator (NARSIM Radar) to enable research and development in the field of ATM. With NARSIM Radar, the Air Traffic Control process can be simulated with the air traffic controller and the pilot in the loop.

The NARSIM Radar facility has been in operation since its start in 1987, for a wide variety of customers. Based on advanced object-based client/server architecture, NARSIM Radar allows for easy configuration and integration of third party systems whilst maintaining scalability and performance. All software is developed fully in-house with a focus on modularity and configuration, resulting in a platform which can be used to simulate various current and, most important, future ATC concepts and working positions. From large scale validation trials to small scale (even laptop based) prototyping and visualisation, from new ATM concepts and procedures and development of advanced air traffic controller assistance tools to the human factor in air traffic control, NARSIM Radar enables the research and development of NLR's ATM and Airports department.



applications

The NARSIM Radar facility and software infrastructure enables visualisation of new conceptual ideas in a very early stage. Ideas can be quickly evaluated towards operational feasibility and they can be communicated to users and stakeholders in a clear and unambiguous way. Early involvement of the user is generally accepted as the single most important factor for a successful introduction of new or changed ATC system or concept.

The NARSIM software infrastructure facilitates the development, evaluation and validation of advanced ATC tools by defining strict interfaces between modules and guidelines for the development process itself and by providing development tools and a validation methodology. Interfaces defined in NARSIM Interface Definition Language (IDL) and automated code generation hide communication and language specific implementation details, allowing the application developer to focus on the ATC tool development itself.

NARSIM Radar is well suited for applications where the human aspect plays an essential role, such as development of the Human Machine Interface (HMI). Rapid prototyping allows for fast experimental or pre-operational evaluation of new HMI specifications.

The NARSIM Radar facility simulates a realistic environment for the air traffic controller and is used in the development of training as well as in the provision of training itself. Various training courses, from Introduction to Air Traffic Control to Recurrency training, are developed and implemented and provided by NLR.

In the development process of ATM systems, concepts and procedures, real time simulations are a prerequisite for the assessment of air traffic controller workload and acceptance. In the validation of operational components, NARSIM serves as a simulation environment for an operational (sub)system or can be used to perform shadow mode trials. In all these cases, NARSIM Radar facility has proven to be a flexible, scalable and modular ATC simulator.

system Description

The NARSIM Radar facility currently features 8 generic air traffic controller working positions each equipped with one 29 inch TFT display with 2Kx2K resolution and four 21-inch auxiliary panels, equipped with touch sensitive layers. The number of working positions can be scaled up on demand. Depending on the experiment, each working position can be configured with extra touch-input devices, trackballs or mouse and a keyboard. Each working position can act as a tactical, planner or feeder position for controlling en-route, area or approach (terminal area) traffic. An integrated radio/telephony system allows the controller to contact pilots, other controllers or neighbouring sectors or centres. Automated questionnaires for expert opinion feedback, run-time Instantaneous Self Assessment, Eye Point of Gaze (eye and head-tracking equipment) and other physiological parameters to measure the human factors effects are available at every working position. Together with other system performance indicators they are used to analyse the concepts or tools at hand.

The working position and tools used by the experiment leader can be configured based on its needs. The simulation can be controlled from an arbitrary working position. System and human performance metrics can be monitored and recorded at will and several closed circuit cameras observe the experimentation room.

The NARSIM Radar software is designed around advanced object-based client/server architecture and is inherently scalable. It consists of more than 100 different client and/or server modules each developed to accurately simulate an existing or future operational entity or system. This modular design allows running the entire simulation distributed among several independent platforms on a local network or even internet in fast-time or real-time. It supports logging and playback on several levels (network messaging, operational parameters, events, audio and video). Multiple instances of the same module can be easily monitored, started, restarted, or relocated whilst running the simulation.



context

The NARSIM Radar simulation facility is an integral part of NLR's ATM and Airports research infrastructure, whereby all tools and development or validation steps, both run-time and off-line, in the research process are integrated and tuned to each other. The NARSIM Radar facility can interoperate with the NARSIM Tower facilities (a 360 degrees Field of View ATC Tower simulator and a portable mini-Tower simulator) and NLR's Flight Simulators and even NLR's laboratory aircraft to form a single simulation environment in which all parties, from the different ATC roles up to different cockpit crews, can evaluate or validate a concept at the same time.

Adherence to many industrial interoperability standards (e.g. DIS, HLA) provides the means to easily integrate and validate third party systems and sub-systems. These standards include Asterix, OLDI/SYSCO and many datalink applications (CPDLC, ADS, TIS, FIS, etc.)

A separate pseudo pilot area with 12 positions is in use at NLR. Each pseudo pilot working position allows the pseudo pilots to control up to 20 aircraft. The pseudo pilot in its working environment is an important factor in the design and execution of the experiment or training. Each working position can be tailored for its specific role or task and the number of positions can be scaled up on demand.

With the NARSIM Radar simulation facility, NLR is ready for the ATM challenges that await us now and in the future. Contact us for more information or a demonstration of our facility at our location in Amsterdam, the Netherlands.



AT-One combines the strength of NLR and DLR in ATM Research

Please contact us for a free demonstration.

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