

BUILDING YOUR OWN GNSS SIMULATOR

Skydel's Power. Your Hardware.



NAVWAR

The Skydel Simulation Engine

Skydel is packed with a rich feature set – multi-constellation/multi-frequency signal generation, remote control from user-defined scripts, and integrated interference generation. Despite all these features, one of Skydel's greatest assets is its open, software-defined architecture. This GNSS simulation approach gives Skydel maximum scalability and flexibility, and provides users with the ability to develop and innovate while not limited by hardware design. With a Skydel software license in hand, users can simply purchase the hardware they need, and start simulating.

GNSS Simulation Hardware Components

This document outlines the necessary hardware for assembling your own Skydel-powered GNSS simulator. Described below are the specifications required for the following hardware components:

- Base Server
- CPU
- RAM
- GPU
- Storage
- Operating System
- Radio / Modulator / SDR
- Timing Source

Building your own GNSS simulator system can be enjoyable, but it requires technical expertise. We provide general guidance and recommendations, but accuracy isn't guaranteed. We hold no responsibility for any issues arising from this information or your build. If you wish to learn more about our turnkey systems, please see our [GNSS products page](#).

NavWar Simulation Build

Building a GNSS simulator for a NavWar simulation requires high-end hardware components. Users of this build are typically focused simulations that involve high dynamics (aerospace and/or defense), advanced HIL (closed loop), multi-vehicle or multi-antenna simulations, advanced jamming and spoofing, and GNSS/IMU integration. In addition, these users will be performing CRPA testing, live sky sync, NAVWAR testing, mission readiness, and cyber security. NavWar builds are targeting the following output specifications:

- over 1000 Signals
- 6 to 8 RF Outputs

In order to achieve this number of signals and RF outputs, Safran has produced this document to help guide users in the assembly of an effective GNSS simulator using your own components.

RF Signals

Radio frequency (RF) outputs in Skydel-based systems are very flexible. Systems with multiple outputs can combine RF signals to a single output or be used individually with a receiver. Each output can be configured with:

- Upper Band GNSS Signals
- Lower Band GNSS Signals
- Interference/Jamming signal
- Used for a separate simulation
- Different amounts of attenuation added on each RF output
- Used for individual simulations (with multi-instance)

Building Your Own System

When undertaking the task of building your own system, it may be difficult to procure some hardware components. It is possible to replace some of the components listed below with those of other manufacturers or slightly different models.

As with any hardware build, it is important to be aware of possible conflicts or incompatibilities between hardware components — especially with regard to the number of PCIe slots available, and the space certain cards can take on the motherboard.

Safran strongly recommends to align your build as closely as possible with the components listed below. It is possible to mix components from the Minimum and Recommended columns, unless stated otherwise in Notes.

Server

The GNSS simulator main server components for a NavWar simulation build are listed below with suggested models and/or specifications.

Component	Minimum Specifications	Notes
Base Server	3U or 4U with at least 10 PCI slots	Model such as: Lenovo ThinkSystem SR675 V3
CPU	32 cores @4 Ghz	Minimum of 16 PCI lanes per PCI slot
Memory	64GB DDR4 3200MHz or 64GB DDR5 4800MHz	This specification can increase if running an increased number of Skydel instances.
Storage	1TB NVMe	
Graphics	Quantity: 2 Nvidia L40 or Nvidia RTX 6000 ADA Gen	See our detailed GPU Guide for further guidance.

Software defined radios can be either internal or external (connected via a network card).

Radio Components	Internal SDR	External SDR	Notes
Software-Defined Radio (SDR)*	Quantity: 8-10 DekTec DTA-2116 NOTE: These components will occupy one PCIe slot per card.	USRP N310 networked SDR or USRP X300 networked SDR	See our Supported Software-Defined Radios article for more details.
Network Card (10Gb)	<i>Not Required for Radio Operation</i>	One 10Gb SFP+ Ubuntu-compatible port per radio	
Clock	N/A		It is recommended to use an external clock for this build. See External Clock below.

*: These SDR cards are the preferred choice for Skydel-based builds.
Safran cannot guarantee the compatibility, operation, or performance of SDR components not listed in this document.

Technical Specifications

SDR (External)

Quantity SDR: 6-8

Quantity Daughterboards: 12-16 (2 per SDR)

Depending on a user's needs, each 10 Gb card has 2 ports so it can drive 2 x SDRs.

- 4 x [Ettus UBX-160](#) daughterboards per SDR.

NOTE: An external SDR is not required if using an internal radio as defined in the Computer specifications above.

External Clock

Safran recommends the following time and frequency reference system:

- [SecureSync 2400](#)

Because these systems only have a single output, a clock distribution module is also for this configuration. We recommend a 1PPS/10MHz model (with 8x or 16x capability) such as one of the following:

- [Epsilon SAS 36E](#)
- Ettus Octoclock CDA-2990

Operating System

Although Skydel supports both Linux and Windows environments. We strongly recommend a Linux operating system for this build.

- Linux Ubuntu 22.04 LTS

Additional Accessories

Users will need additional accessories depending on the usage of their NavWar build.

These items may include:

- Cables
- Coaxial cables
- Combiner
- DC Blocks
- Attenuators

Support

In order to receive Safran support, your system must use the components listed in this document. Simulators using other hardware other than those listed, may not be covered by support.

Support from Safran for «Building Your Own Simulator» is offered on a best-effort basis and includes up to 10 hours of support.

More Information

For additional information on hardware selection, accessories, and installation, the following resources are available:

- [Skydel User Manual \(Hardware Selection\)](#)
- [Skydel User Manual \(Hardware Components\)](#)
- [Skydel Certification Courses](#)
- [Applicaton Note: Measuring a GNSS Signal & Gaussian Noise Power](#)



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