SOOTHSAYER™

SELF-HOSTED RF PLANNING FOR PRIVATE NETWORKS

Radio Planning Today

ACCURATE	POWERFUL	SCALABLE

cloudrf.com/soothsayer

Overview

SOOTHSAYER is an accurate and mature RF planning engine built for the modern world. It uses templates and APIs to simplify the complexity of radio simulation powered by field-tested models using high resolution terrain, clutter, antenna patterns and live noise data.

Built for performance and enterprise scale, SOOTHSAYER benefits from 14 years of development and testing via the public service, CloudRF.com. GPU acceleration enables automation workflows for rapid planning or live RF mapping with APIs capable of simulating entire networks in seconds.

Cross-platform interfaces, multi-user support with enterprise authentication and deployment options for private cloud, private infrastructure or edge hardware make SOOTHSAYER a modern solution for **scaling RF planning** across an enterprise.

Accurate

SOOTHSAYER is built from 14 years of intensive testing as the API behind CloudRF.com. As well as daily interface and API testing, it is regularly field-tested offline against real-world measurements to validate and improve its data and models.

Our continuous and improving test results demonstrate SOOTHSAYER's ability to simulate measured RF power levels with 5dB of error across **diverse environments and communications technologies.**

3.0 dB	4.4 dB	4.6 dB	5.2 dB
RMSE	RMSE	RMSE	RMSE
Calibrated LTE modelling over a 7 km line-of-sight route.	UHF RF antenna drive testing across rolling rural terrain.	Long-range testing in mountainous terrain with advanced diffraction.	Calibrated LTE modelling in a village with stone buildings.

ACCURACY THAT IMPROVES

SOOTHSAYER's field-testing programme has progressively improved modelling accuracy through advances in **propagation models, terrain and clutter data, diffraction modelling and drive-survey calibration tools**. Through the public API at CloudRF.com, it gets more usage and scrutiny than legacy tools.

"The agreement between the predictions and on-the-ground measurements is excellent"

BBC RESEARCH AND DEVELOPMENT PRIVATE-5G WHITE PAPER

Field-test reports: `cloudrf.com/accuracy`

High resolution data for complex environments

Modern accurate RF planning demands more than line-of-sight. Buildings, Tree canopy data, Landcover data and local RF noise impact coverage, quality and capacity.

SOOTHSAYER combines high-resolution elevation models, detailed clutter modelling and measured noise data to accurately simulate both coverage and quality.

HIGH-RESOLUTION TERRAIN

SOOTHSAYER supports high-resolution **LiDAR surface data and Digital Terrain Models (DTM)** providing detailed representation of buildings, trees and other features that can obstruct RF paths. LiDAR is essential for precise **line-of-sight, rooftop and elevated-site planning**, with LiDAR available at 1m resolution in supported areas.

High resolution DTM supports accurate NLOS planning through forests when paired with our tree canopy data.

CONFIGURABLE CLUTTER

Terrain is complemented by SOOTHSAYER's **clutter and land-cover modelling**, allowing the RF characteristics of buildings, trees and custom obstacles to be simulated.

SOOTHSAYER provides global land-cover and building data, while users can **create or import their own clutter** for temporary obstacles. Custom clutter profiles allow heights and attenuation to be assigned to represent building materials, tree species as well as weather seasons.

REAL-WORLD NOISE

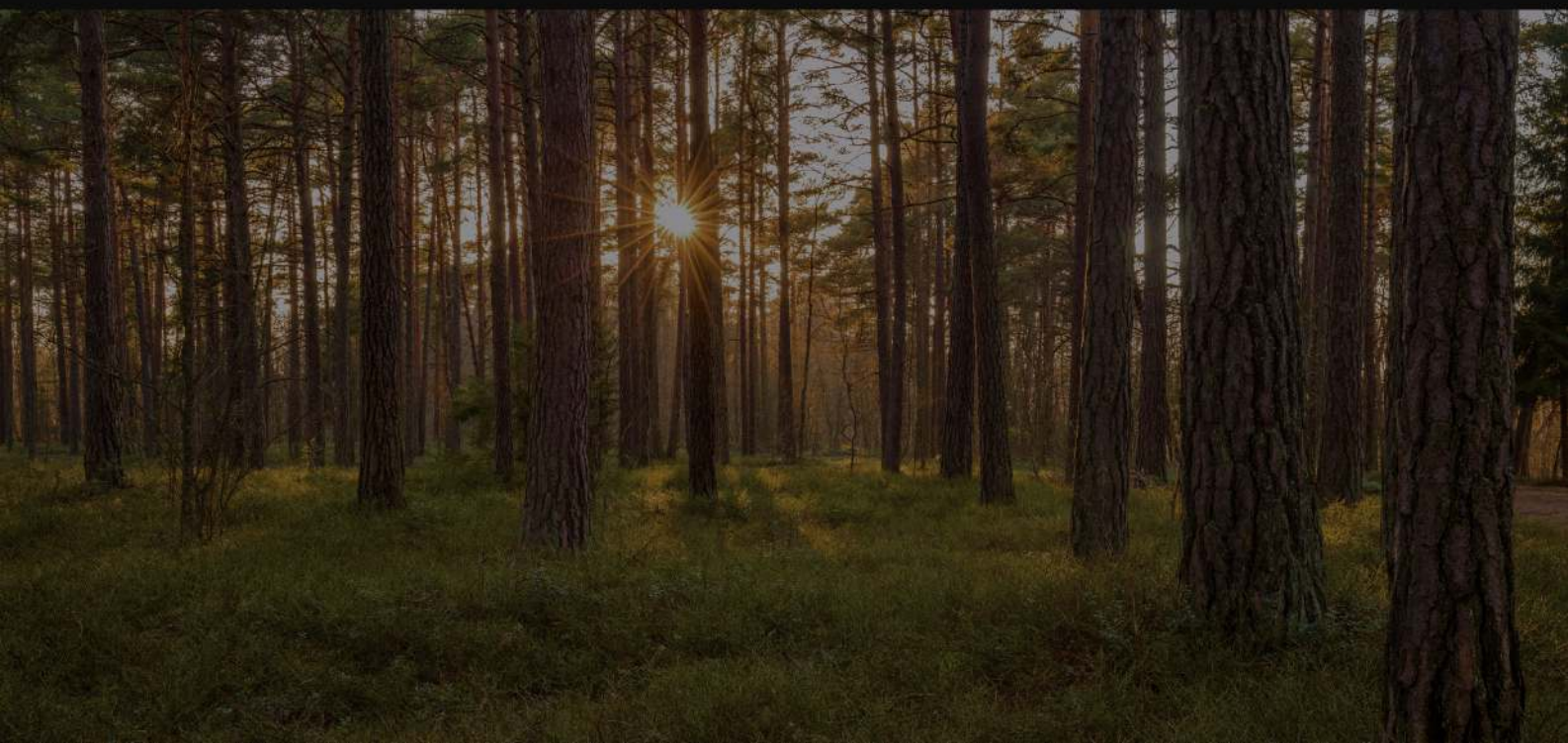
Signal strength alone does not equal signal quality. **The noise environment varies significantly from one street, site or frequency to another.**

SOOTHSAYER's **noise database and noise-map capability** allows measured RF noise to be incorporated directly into simulations. The system uses discrete measurement points, with interpolation at high resolution making it suitable for dense urban planning.

DRIVE SURVEY MEASUREMENTS

SOOTHSAYER can integrate survey data from **Software Defined Radios and Signal mapping apps**, allowing calibration of models and clutter to improve accuracy. Once a single route has been calibrated, coverage for a wider area can be assured with an accuracy score. Routes can be loaded in as files and analysed to determine the route coverage as percent.

`api.cloudrf.com/coverage-explorer`



Powerful

GPU-powered RF planning, at scale

Modern networks can involve thousands of potential radio sites.
SOOTHSAYER's GPU-accelerated engine and APIs provide the automation to model them efficiently, compare deployment options and search large areas for optimal radio locations.

MODEL MANY SITES AT ONCE

SOOTHSAYER's **Multisite API** can model multiple transmitters simultaneously, returning a combined coverage layer for a network in minimal time.

FIND THE BEST SITE, IN SECONDS

SOOTHSAYER's **Best Site Analysis (BSA)** uses GPU-accelerated Monte Carlo analysis to rapidly test **hundreds of candidate locations** within a defined area.

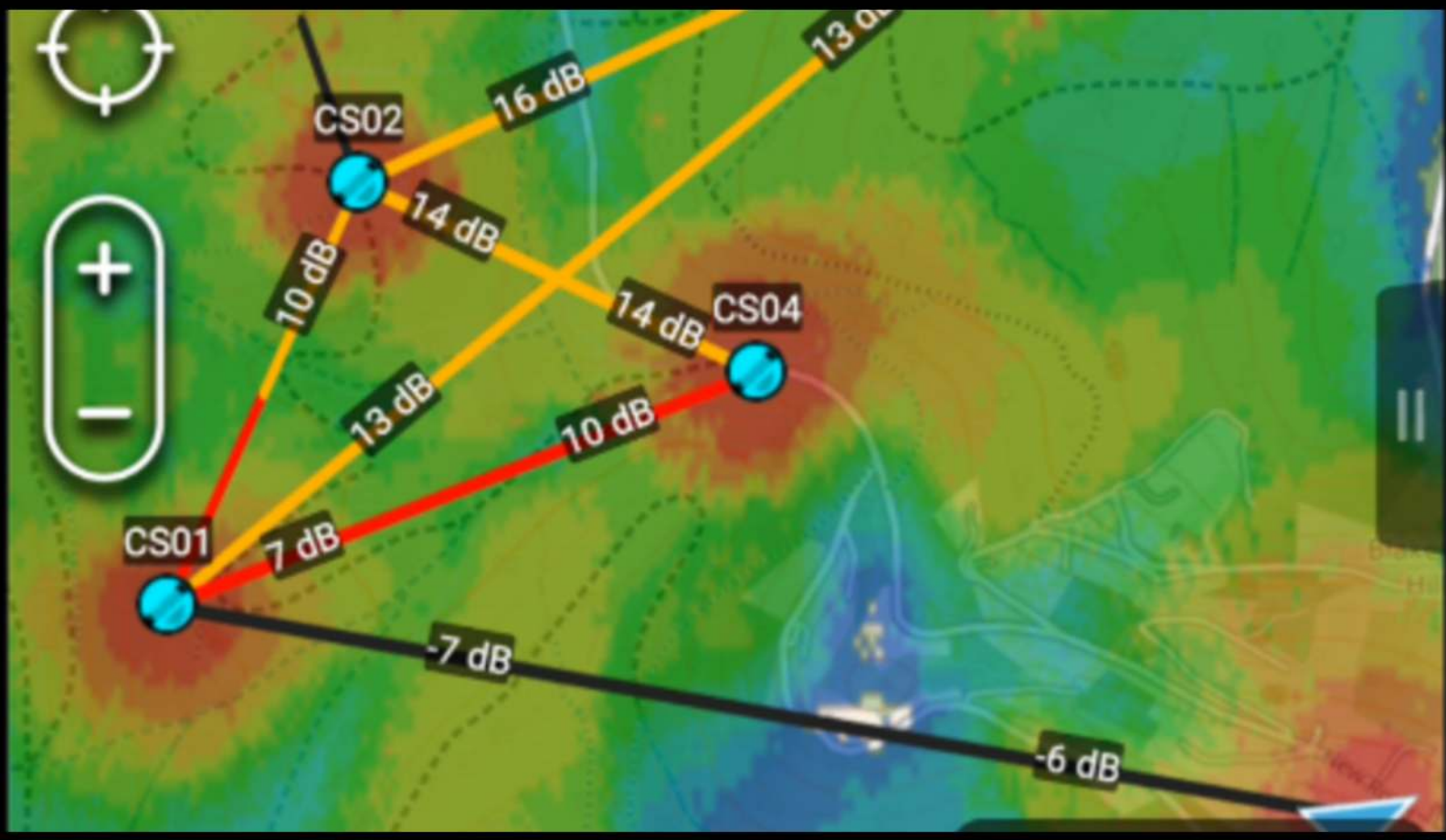
BSA searches the area and scores locations with the strongest radio intervisibility for the specified transmitter and receiver configuration. Results are presented as a heatmap, allowing high-performing, and low-performing, areas to be quickly identified.

20×

FASTER THAN A MULTI-THREADED CPU

HIGH-RESOLUTION, WITHOUT THE WAIT

SOOTHSAYER's GPU engine is designed for high-resolution propagation modelling and is **up to 20× faster than a multi-threaded CPU engine**. The speed makes high-resolution calculations practical and enables rapid analysis of complex scenarios on mobile devices.



Scalable

Enterprise RF planning through a mature API

SOOTHSAYER provides a **mature, documented API for RF propagation modelling**, giving developers direct access to the same capabilities which power its interfaces.

With 14 years maturity as the **original RF simulation API**, it uses standard JSON requests and responses and is supported by a published Open API specification.

It pairs well with cognitive radios, LLMs, C2 applications, spectrum management systems, GIS platforms, platform tracking and RF sensors.

</> BUILT FOR INTEGRATION, NOT ISOLATION

SOOTHSAYER is designed around a **client-server architecture**: computationally intensive RF calculations are performed at the server while client apps provide the user experience and workflow.

This design enables RF modelling for **web browsers, mobile devices, scripts, GIS tools and third party plugins like ATAK**. The same API powers multiple interfaces and applications across an organisation.

SCALE TO COMPLETE NETWORKS

The API supports everything from individual point-to-point paths and coverage calculations through to **multisite and multilink network analysis**.

Its Multisite and Multilink endpoints support distinct tower configurations including antennas for maximum efficiency.

PRIVATE CLOUD OR LOCALHOST

Organisations can host the software on a standalone computer or in the cloud. SOOTHSAYER provides the same API architecture within a private network, with support for multiple users, Active Directory authentication and customer-controlled maps and terrain data.

Self-hosting the service keeps sensitive operational data within the organisation.

AN RF ENGINE YOU CAN INTEGRATE

SOOTHSAYER is more than another standalone planning application. Its **published API, cross-platform interfaces, GPU acceleration and client-server architecture** allow organisations to embed RF intelligence directly into their existing products and workflows.

Developer's API

SOOTHSAYER provides a **mature, published developer API** for integrating RF propagation modelling into applications and operational systems. It uses a documented **OpenAPI 3** specification, JSON requests/responses and a scalable service architecture, allowing developers to automate calculations, build custom workflows and integrate RF analysis into existing software.

The API has been developed since 2012 and is also available through the public service at CloudRF.com.

API GROUP	ENDPOINT	SHORT DESCRIPTION
Create	`/area`	Create point-to-multipoint **coverage heatmaps** for a transmitter and defined area.
	`/path`	Create a **point-to-point link analysis** to find obstructions on a path.
	`/multisite`	Model **multiple transmitters in a single request**, returning a combined layer.
	`/points`	Analyse **multiple transmitter links to one receiver** in a single request.
	`/multilink`	Analyse **many-to-many radio links** for mesh networks with diverse antennas.
	`/hf/area`	Create a **HF skywave coverage map** for a given frequency and time.
	`/hf/prediction`	Get **HF propagation predictions** to compare frequencies over time.
Analyse	`/bsa`	**Best Site Analysis** of a defined area to identify the best radio intervisibility.
	`/interference`	Analyse **Co-site interference for adjacent networks** including signal bandwidth.
	`/trilateration`	Analyse received power measurements to **geo-locate an emitter**.
3D	`/3d`	Perform **3D ray-tracing** for indoor models with phase tracking for multipath.
	`/3d/model/upload`	Upload a **GLB 3D model** or 3D simulations.
Satellite	`/satellite/query`	Query SOOTHSAYER's **satellite database**, containing public TLE data.
	`/satellite/area`	**Satellite coverage** for a named satellite from TLE data.
	`/spotbeam`	Model **satellite spot-beam coverage** for a ground terminal.

The OpenAPI 3 specification documents full requests and responses with examples.
`cloudrf.com/documentation/developer`

Integrations

Integrate RF intelligence wherever you need it

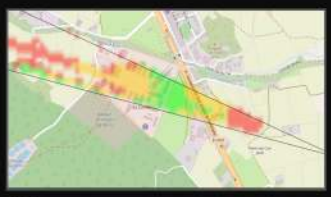
SOOTHSAYER is designed to be integrated, not isolated. Its public API client library demonstrates how the platform can be embedded into **web applications, mapping systems, scripts, operational tools and specialist RF workflows**.

Our public scripts and examples make SOOTHSAYER easy to automate and integrate into existing data-processing and engineering workflows, while the JSON templates and CSV inputs support repeatable, parameterised planning, at scale.

For web and GIS applications, SOOTHSAYER provides examples using **popular map libraries**, enabling RF coverage and analysis to be displayed directly alongside geographic information.

Our API has been integrated with live data sources like ADS-B and AIS, 3D modelling applications like Blender and Revit, Software-Defined-Radios like RFeye and SignalHound, Cognitve radio APIs, Digital radios via USB and Bluetooth and Spectrum Management standards like SSRF.

The cost-benefit is equivalent to the salaries of a team of full-time RF engineers and developers, multiplied by at least 5 years.



01 · DIRECTION FINDING

02 · DRONE DETECTION

03 · RADAR INTERFERENCE

04 · CO-SITE INTERFERENCE

05 · TRILATERATION

06 · INTERFERENCE

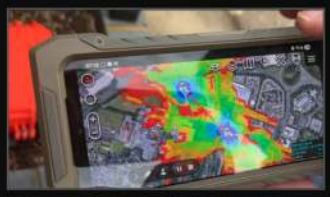
07 · LIVE RAINFALL

08 · BLENDER PLUGIN

09 · ATAK PLUGIN

10 · DTC RADIO API

11 · TAIT RADIOS



12 · TRELLISWARE API

Demo gallery: cloud-rf.github.io/CloudRF-API-clients/gallery

Models

SOOTHSAYER supports most communications technologies from HF Skywave to mmWave. The model library has classic empirical models for regulators, modern ITU models for accuracy and special purpose models for technologies like Radar. All can be enhanced with a selection of diffraction models and tuned with fade margins and contexts. We recommend **ITU-R P.1812 with Deygout 94 diffraction for most terrestrial communications**.

MODEL	FREQUENCY RANGE	TYPICAL APPLICATION
HF NVIS	2 – 20 MHz	Near vertical incidence skywave for up to 500 km.
HF Skywave	2 – 20 MHz	Long-range ionospheric communication up to 10,000 km. VOACAP.
ITU-R P.525	2 MHz - 100 GHz	Free-space reference propagation and unobstructed links.
Egli	VHF - 1.5 GHz	High-to-low base stations in open/rural environments.
General Purpose	VHF – 100 GHz	Generic model for portable radio systems at ground height.
Longley-Rice / ITM	20 MHz – 20 GHz	Long-range, mixed and irregular terrain. Integrated diffraction.
ITU-R P.1812	30 MHz – 6 GHz	VHF/UHF/SHF terrestrial point-to-area services.
Okumura-Hata	150 MHz – 1.5 GHz	Traditional urban cellular planning for High-Low networks.
COST-231	150 MHz - 2 GHz	Enhanced urban cellular planning for High-Low networks.
Ericsson 9999	150 MHz - 1.9 GHz	Empirical cellular planning with an environmental context.
RADAR with RCS	2 MHz – 100 GHz	Radar with a radar cross section (RCS) value for the target.
SUI	1.9 GHz - 11 GHz	Higher-frequency wireless systems. Conservative.

DIFFRACTION MODELS

MODEL	DESCRIPTION
Single Knife Edge	Basic Huygens geometric formula which considers the first obstacle only. Optimistic.
Epstein-Peterson ’53	Sequential multi-obstacle model. Can be conservative.
Bullington ’77	Fast multi-obstacle model with approximation between two obstacles only.
Giovanelli ’84	Multi-obstacle model with good accuracy and an additional combining factor.
Deygout ’94	Advanced multi-obstacle model with priority logic based upon most prominent obstacle. Recognised as the **most accurate** from field test results.

Antennas & custom data

Pattern files or buid-your-own

SOOTHSAYER provides flexible antenna modelling with **hundreds of antenna patterns** searchable by manufacturer, model, frequency and gain. Patterns can be selected from the database and configured for the required **gain, polarisation, azimuth, tilt and orientation**, as they are deployed.

Users can **upload their own measured or manufacturer-supplied patterns**. SOOTHSAYER supports industry-standard **ADF/NSMA (TIA/EIA-804-B), MSI and ANT formats**, with interactive tools to validate, convert, flip, swap and rotate funky pattern data.

The platform also provides a **custom-pattern workflow**, allowing users to create directional patterns from parameters such as horizontal and vertical beamwidth, gain and front-to-back ratio. This gives planners a practical way to model an antenna from a datasheet.

Crucially, antenna pattern data is **open and editable**, allowing organisations to adapt pattern files to their own equipment, measurements and modelling requirements.

ADF / NSMA | TIA/EIA-804-B | MSI | ANT | CUSTOM PATTERN | TILT

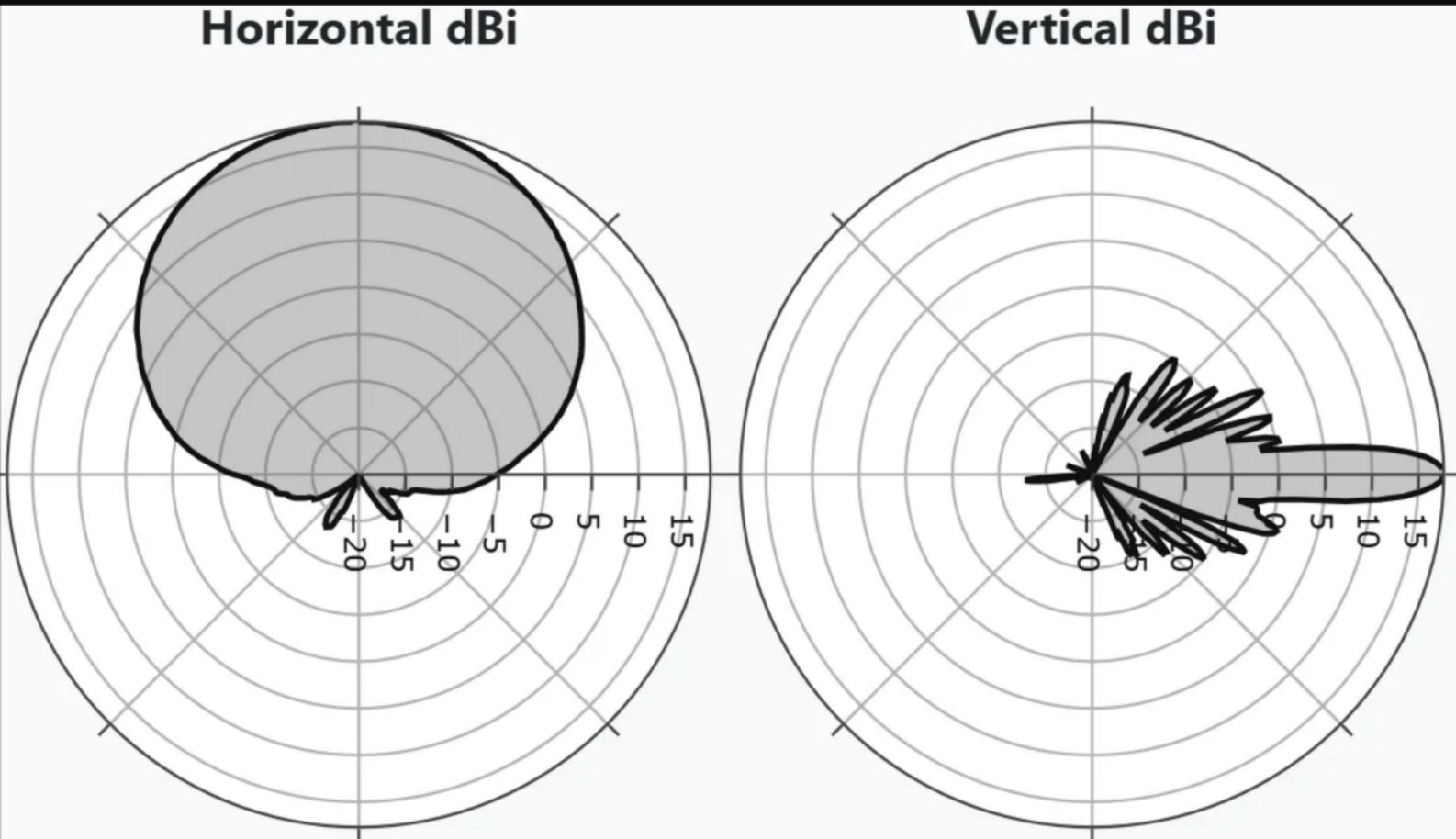
Your terrain data on your terms

SOOTHSAYER is designed to work with a wide range of **Digital Elevation Models (DEMs)**, from global terrain datasets through to high-resolution local LiDAR and surface models. The engine can work with both **bare-earth terrain (DTM)** and **surface models (DSM)**, allowing planners to represent both the underlying terrain or the real-world surface including buildings and vegetation.

The platform is **BYO by design**. Organisations are not locked into a proprietary terrain database: third party elevation datasets can be incorporated alongside supplied reference data. This makes it possible to use authoritative national datasets, locally surveyed terrain, drone photogrammetry, LiDAR or other project-specific data where greater detail or currency is required. SOOTHSAYER's terrain engine can combine diverse datasets into a seamless mesh.

Terrain can be loaded into the folder structure as GeoTIFF tiles in WGS-84 projection.

GEOTIFF | WGS-84 | 16-BIT | LIDAR | DTM | WMS | WMTS



Security

Enterprise Security, with unmatched testing.

SOOTHSAYER is built on more than 14 years of continuous real-world testing. Its foundation is the public CloudRF.com service, which has been exposed to hundreds of users every day, thousands of different client devices and malicious internet traffic since 2012.

This provides an unusually broad and continuous test environment, exercising the API, interfaces and underlying infrastructure under real-world conditions.

Security is built into the platform at multiple levels. **TLS 1.3** protects communications, while **role-based accounts and LDAP integration** support enterprise identity and access management. Password controls, rate limiting and application-level protection against brute-force attacks provide additional safeguards around authentication.

SOOTHSAYER supports modern software assurance practices. A machine-readable **Software Bill of Materials (SBOM)** provides visibility of third-party components, rootless containers mitigate risk, while automated **CVE scanning** helps identify vulnerabilities during the development and release process.

For organisations requiring control of their infrastructure and data, SOOTHSAYER is designed to operate offline as a **self-hosted, isolated system.** Internet access is optional. User data is isolated in mapped host storage and the platform can be deployed using customer-controlled containers and infrastructure.

TLS 1.3 | LDAP | ROLE-BASED ACCOUNTS | SBOM | CVE SCANNING

OFFLINE CAPABLE | RATE LIMITING | PASSWORD CONTROLS | LOGGING | ROOTLESS

SOOTHSAYER combines the security hardening gained from operating a busy public service with the control, isolation and authentication capabilities expected from an enterprise self-hosted platform.

Deployment options

SOOTHSAYER adapts to your infrastructure, not the other way around. Its containerised architecture provides a consistent RF planning platform that can be deployed across cloud infrastructure, private networks or a standalone computer. Docker and Podman support, x86-64 and ARM64 architectures, and compatibility with platforms including AWS, Azure, Proxmox, Linux laptops and NVIDIA Jetson systems give organisations freedom to choose the deployment that fits their mission.

DEPLOYMENT	TYPICAL USE	HARDWARE	KEY BENEFITS
Cloud	Enterprise cloud and distributed teams	Rack server with enterprise GPU	Scalable infrastructure, shared access, Enterprise GPU support and integration with existing cloud platforms
Local network	Enterprise, government and secure environments	Rack server or work-station	Private-network operation, centralised data and users, Active Directory integration, and operation without internet access
Standalone	Field, vehicle, laboratory or edge deployment.	Desktop, laptop or NVIDIA Jetson	Self-contained RF planning with local data and processing; suitable for laptops with consumer GPUs and embedded GPU platforms

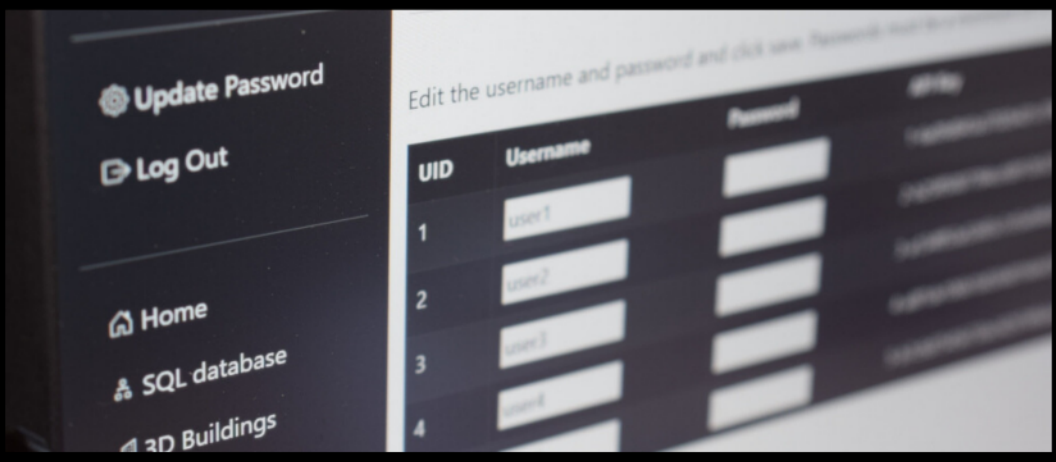
FLEXIBLE CONTAINERS AND LICENSING

SOOTHSAYER's **container architecture** makes deployment portable and repeatable. Services can be installed using Docker or Podman and moved between different host platforms. Windows, Enterprise and consumer Linux compatible. License keys work offline and are not tied to your hardware so you are free to upgrade hardware without a penalty. More users can be added with a new license key so it grows effortlessly.

TRAINING AND SUPPORT

Installation support is included with premium support available for helping prepare data for use with the system.

In-person (UK) or remote training for system integrators and operators is available on request.



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