

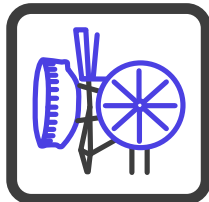
Next-Generation Radio Planning

with the advanced Radio Modelling Toolset in ArcGIS



Mobile | Cellular | IoT
Operators & their
Ecosystem

**ArcGIS based Radio Network
Planning Tools and Network
Dashboard**



Communication
Regulators

**Broadband Data Integration,
Coverage Prediction, Analysis,
Mapping, and Dashboard**



Public Security
& Defense

**ArcGIS based
Communications and
surveillance planning**

CE Desktop for ArcGIS Pro

- Desktop, Single Use Radio Planning system
- Wireless planning tools, together with ArcGIS Pro functionality
- Can be used as a client of CE Express system



CE Desktop is a multifunctional tool containing CE RCP (Radio Coverage Planner), CE RLP (Radio Links Planner), and CE NIR (Non-ionizing Radiation Calculator) modules.

CE RCP enables radio signal prediction calculations, broadband system coverage, and throughput modelling, supporting network planning and optimization for the entire range of wireless technologies in frequencies from 10 kHz to 350 GHz.

CE RLP performs a broad range of fixed radio link planning and optimisation tasks, in point-to-point and point-to-multi-point deployment scenarios, modelling fixed radio link performance across a broad range of frequencies from 1 GHz to 350 GHz and path profile analysis down to sub-meter resolution.

CE NIR evaluates the compliance of transmitters with Non-ionising radiation emission requirements and limits. It enables the easy integration of various background geodata layers, including 3D buildings, deciding on the placement of NIR control points.

Radio Signal Prediction and Model Tuning based on Measurements

- Ultra-fast 3D radio Signal Prediction for any service operating from 10kHz to 350 GHz enables the efficient use of sub-meter resolution data
- Advanced prediction algorithms for modelling mobile radio systems, microwave, point-to-multipoint, and point-to-point signal strength based on the newest ITU-R, 3GPP standards, and recommendations
- Automated Tuning tools for the prediction models using drive test measurements data

Extended Line-of-Sight (LOS), Visibility calculations for Surveillance Planning

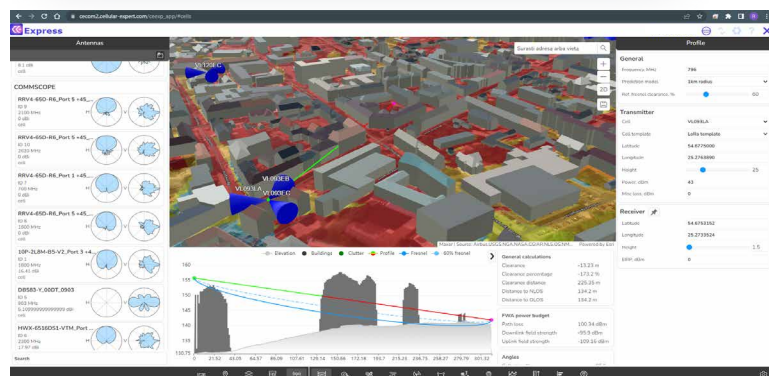
- Extended visibility calculations enable minimum receiver height, clearance, and line of sight calculations
- Fast modelling calculations enable the use of sub-meter resolution data

Indoor coverage modelling with BIM data

- Utilizes the latest ArcGIS capabilities to bring BIM models to GIS
- Models and visualizes indoor radio coverage in various types of buildings

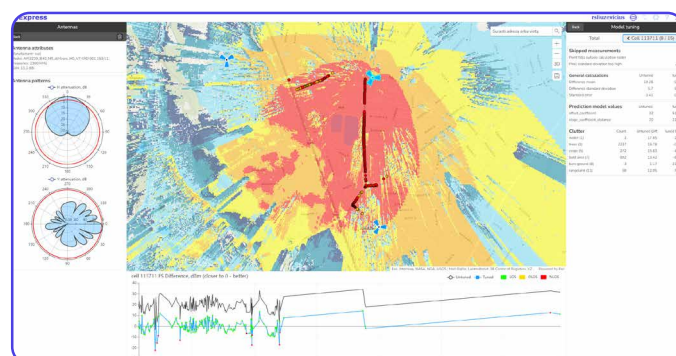
CE Express for ArcGIS Enterprise

- Web-based Radio Planning system
- Server-based, Multi User system
- Includes CE Inventory3D
- Dashboard of Network Coverage Statistics



CE Express is an advanced Radio Planning toolset within the ArcGIS Enterprise system used for planning, engineering, roll-out, operations, and maintenance of communication networks. It is deployable on an organization's internal Cloud or SaaS platform. The system is made up of several modules and engines identical in functionality to CE Desktop, providing a web-based platform and applications for building task-oriented workflows. The CE Express solution provides mobile and fixed network operators with centralized, scalable data storage, improves network data integrity, and delivers multi-user access to users across the organization. The system can be integrated with different telecom enterprise OSS/BSS IT systems, including network monitoring (NMS), customer service, billing, and business intelligence.

CE Express can be configured to aggregate and process different data to calculate the network key performance indicators (KPIs) and help ensure compliance with provisions established in service level agreements (SLAs).



Network Data Management

- Management of base station, antenna, microwave link, and other equipment installation connectivity data
- Import/export network objects, antenna pattern files, and other equipment information using CE and ArcGIS tools

Radio Network Coverage and Quality Modelling

- Modelling of 4G, 5G, CBRS, Fixed Wireless, RRL and other technologies
- Strongest 1st – 5th signal strength and Best Server prediction
- Downlink and Uplink Signal Strength, Throughput and SINR calculation
- RSSI, RSRQ, C/I, C/A interference calculation
- Multi-technology radio planning and optimization

Network Traffic Planning and Analysis

- Theoretically estimated or calculated from NMS data, Network Traffic Load data per Cell can be included in coverage prediction calculations, reflected in the computed Broadband coverage results, like RSSI, RSRQ, or Downlink throughput

Integrated Coverage Statistics calculation for Broadband Network Dashboard

- An unlimited number of separate coverage, interference, and traffic rasters can be created, combined, and/or analyzed together. Flexible, user-defined comparison of rasters, and statistical queries
- Calculation of covered area in percent, square kilometers, and population or Points of Interests (PoI) coverage statistics for each defined signal threshold

Point-to-Point Link Analysis

- Profiling and Radio link budget calculation functions are available for point-to-point analysis. The first Fresnel zone, Earth curvature, and obstacles on the path are displayed in the path profile
- Edit input parameters: the location, height of the Tx or Rx, and frequency, automatically updating the Profile or Radio Link budget calculation
- Dynamic path profiling provides the capability to quickly display a path profile and its main characteristics

3D calculations and visualization

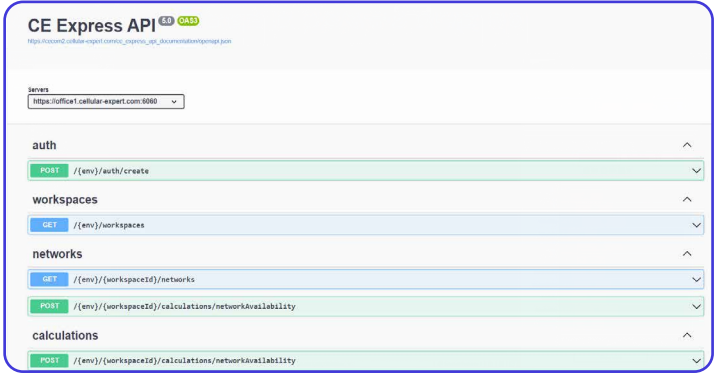
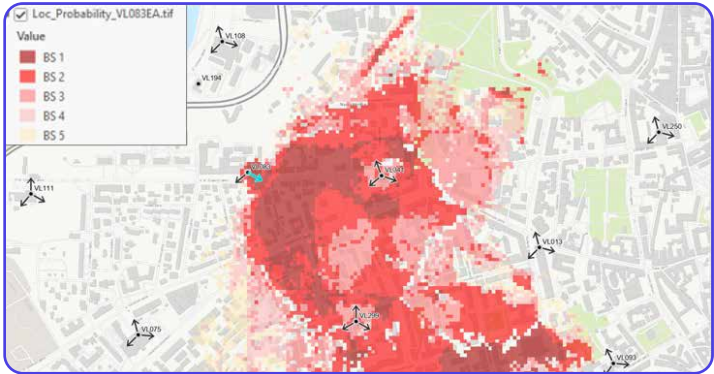
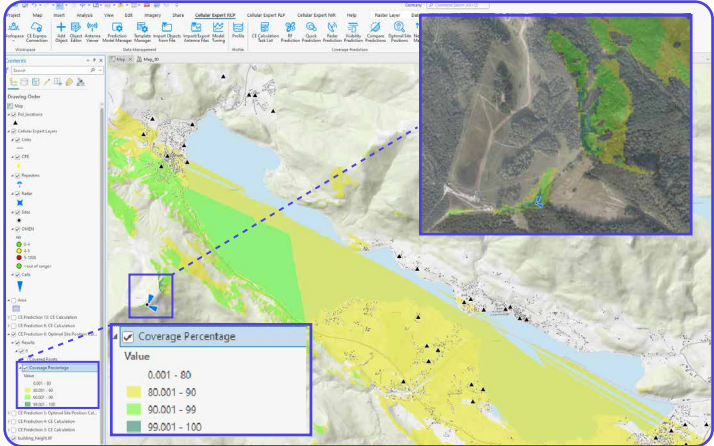
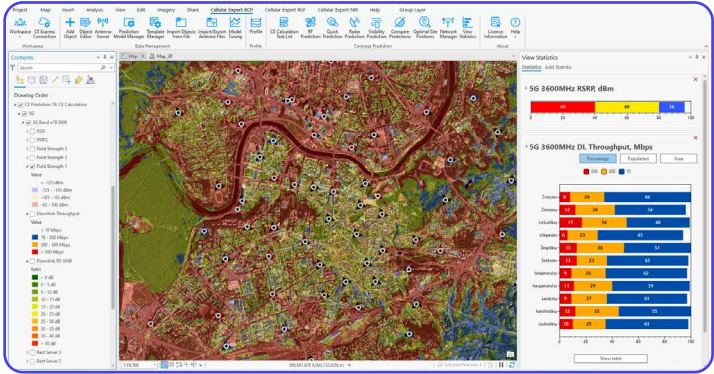
- 3D signal strength calculation for various heights, floors of buildings with produced 3D voxel layer for coverage analysis and visualization
- Analysis of radio link profiles, Radio coverage calculations in ArcGIS 3D environment

Other advanced functions

- Optimal Site position calculation
- Cell coverage and mobile device location probability Heat map
- Real-time coverage simulation for Digital Twins

Available over API

- All functionality available over REST API
- Endpoint documentation and sample requests/responses are provided



Other solutions

CE Inventory3D

CE Inventory3D is a database component of the CE Express system, which can also be deployed as a separate standalone solution for network asset management and business innovation. CE Inventory3D is a specialised database product that can be further tailored to suit the specific operational requirements of a system user. The Inventory3D database solution can be used in telecommunications and other industries for:

- digitising data collection and automating routine data management tasks
- collecting real-time asset information
- providing reminders, alarms, and automating the reporting
- enabling predictive analytics of network status and assets

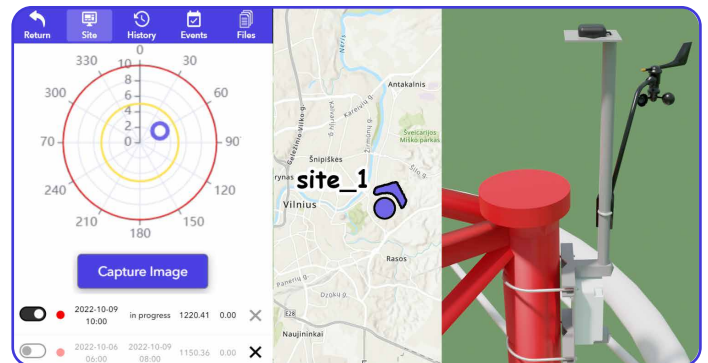
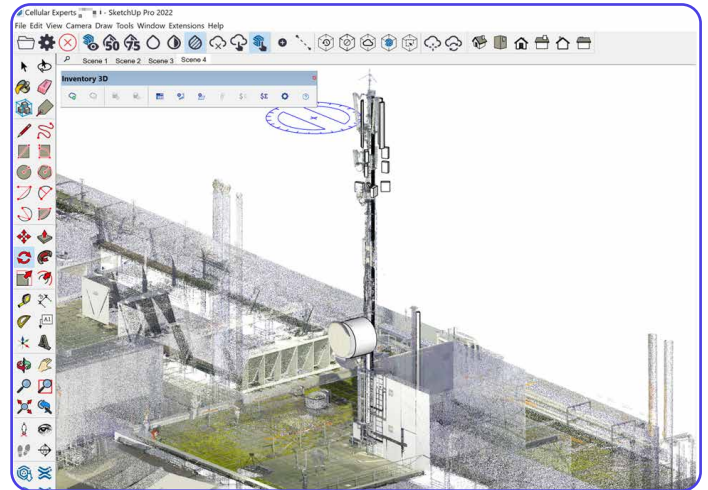
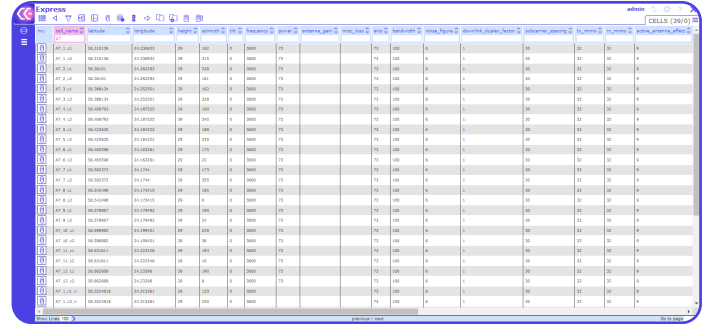
CE Inventory3D Plug-in

CE Inventory3D Plug-in is a special extension component software to link Inventory3D with Trimble's SketchUp design and engineering software. The Plug-in allows the user to:

- link network assets (e.g. telecom towers, antennas, etc.) listed in Inventory3D or Excel table with their corresponding engineering CAD drawings in SketchUp
- describe combinations of network assets as integral system components (e.g., radio base station installation, etc.) with their corresponding entities as Inventory3D or Excel tables with corresponding attributes and synchronise them with objects' physical positioning and other design attributes in SketchUp drawings
- perform calculations using formulas and equations in Inventory3D or Excel & dynamically display the results in SketchUp
- import object design images with GPS-tags to SketchUp and place them in the system design drawing according to the defined geolocation

CE VertiTrack (IoT)

CE VertiTrack IoT module enables real-time high precision GNSS VRS position tracking of a monitored object in all-weather conditions. It is primarily designed to track lateral movement of the tips of telecommunication towers, for the purpose of monitoring their swaying and, thus, their structural health. However, it can be easily employed for objects' motion/deflection tracking in a variety of industries, including but not limited to construction, military, energy and wind power management.



About the company

Cellular Expert is a fast-growing software company, facilitating telecommunication planning and operation enhancement inside ArcGIS.

Cellular Expert provides software products with ultra-fast wave propagation modelling used for planning and optimizing telecom networks, calculating broadband mapping and coverage, and calculating radio/optical visibility.

Cellular Expert enhances the intelligence and business efficiency of more than **170 communication network companies, regulators, and defence organizations** in more than **50 countries**.

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In Telecom GIS

