Atoll

Wireless Network Engineering Software

version 3.3

Prediction and Measurement-based Planning and Optimisation

Advanced 5G Capabilities

Multi-RAT Network Modelling

In-built Customisation Capabilities

High Performance GIS

Forsk

Atoll Overview

Atoll is a multi-technology wireless network design and optimisation platform that supports wireless operators throughout the network lifecycle, from initial design to densification and optimisation.

Atoll includes integrated single RAN–multiple RAT network design capabilities for both 3GPP and 3GPP2 radio access technologies including 5G, LTE, NB-IoT, UMTS, GSM, and CDMA. It provides operators and vendors with a powerful framework for designing and optimising current and future integrated multi-technology networks. Atoll supports multi-technology C-RAN deployment, small cell planning, and also provides dedicated IoT network planning and optimisation capabilities. Atoll supports the latest technology advances such as massive MIMO, 3D beamforming, and mmWave propagation for the design and roll-out of 5G networks.

The Atoll Live module allows integrating live network data such as KPIs, UE/cell/MDT traces, and CEM data with predictions and adds open-loop SON capabilities to Atoll.

Atoll's integration and customisation features help operators smoothly streamline planning and optimisation processes through flexible scripting and a software development kit (SDK). Atoll supports a wide range of implementation scenarios, from standalone to enterprise-wide server-based configurations.

With more than 9000 active licenses installed with 500+ customers in 140 countries, Atoll has become the industry standard for radio network planning and optimisation.

Supported **Technologies**

• 5G	• LTE/LTE-A Pro	• NB-IoT
• UMTS	• GSM	• CDMA
• TD-SCDMA	• LPWA	• Wi-Fi
• WiMAX	• Microwave Backhaul	

Atoll Highlights

Atoll uniquely combines architectural and functional features that provide operators with a powerful, scalable, and flexible framework for streamlining their network design and optimisation processes.

Multi-technology **Network Modelling**

Atoll is a comprehensive multi-technology radio planning and optimisation platform which includes unified multi-technology traffic models, Monte Carlo simulators, and automatic cell planning (ACP). Atoll can model the traffic-related aspects of multi-technology networks and dynamically spread traffic across 2G, 3G, 4G, and 5G network layers comprising macro, micro, small cells, and Wi-Fi hot spots.

5G Network **Design**

Atoll's modular and advanced radio technology modelling capabilities, along with the support for mmWave propagation, massive MIMO, and 3D beamforming, provide operators with a complete and evolutive framework for the design and deployment of 5G networks. Since early 2017, major operators and vendors have been using Atoll for the very first deployments of 5G wireless access networks, as well as for R&D activities.

Prediction and Measurement-based **Planning and Optimisation**

Atoll offers unique capabilities of using both predictions and live network data throughout the network planning and optimisation process. Live-network data (KPIs, UE/cell/MDT traces, and CEM data) add real-world information to predictions allowing for enhanced modelling of traffic evolution, hot-spot identification, and radio signal propagation. Live-network data can also be used in Atoll to drive the planning process (small cell selection) and to steer the optimisation algorithms of the AFP and the ACP.

High Performance **GIS**

Atoll incorporates a high-performance built-in geographic information system (GIS) exclusively designed for radio network planning and optimisation. Atoll's 64-bit GIS engine allows working with high-resolution and large-scale geo data while delivering high performance in data manipulation and display. Atoll supports web map services, online maps (Bing, OSM, etc.), and standard formats including BIL, TIF, BMP, Vertical Mapper, ArcView, MapInfo, etc. Atoll smoothly interfaces with commonly used desktop GIS such as MapInfo and ArcView.

In-built **Customisation Capabilities**

Atoll's in-built task scripting and integration capabilities enable data as well as service-level integration, allowing operators to streamline network optimisation. Moreover, Atoll's C++ software development kit (SDK) allows customisation and implementation of functional value-added modules for Atoll.

Atoll ..... Modular Configuration

Atoll is based on a modular architecture that makes it adaptable to operators' configurations, technologies, and functional requirements.

Atoll Core is the central module that supports the user interface, GIS features, the propagation modelling engine, data management services, interfaces, and software development tools. All technology modules run on top of Atoll Core.

Atoll Live module allows combining live network data such as KPIs, UE/cell/MDT traces, and CEM data with predictions and adds open-loop SON capabilities to Atoll. Using the Live module, the Atoll Automatic Cell Planning (ACP) can integrate KPIs, UE/cell/MDT traces, and CEM data to drive site selection, optimisation, and configuration processes.

Atoll Microwave is a comprehensive microwave link planning software. It is based on the Atoll Core platform and can be integrated with Atoll radio-planning configurations. Atoll Microwave includes nLOS/NLOS capabilities for small cell backhaul, as well as advanced LOS modelling.

Aster and Aster mmWave, both part of the same package, are advanced ray-tracing propagation models that support multiple propagation scenarios and frequencies both below and above 6Ghz.
CrossWave is a universal high-performance propagation model developed by Orange Labs. It supports all wireless technologies and all types of environments, from rural to dense urban areas.

ATOLL MODULES / TECHNOLOGIES	GSM/EDGE	UMTS/HSPA	LTE/LTE-A	NB-IoT	CDMA2000 1xRTT/EV-DO	TD-SCDMA	WiMAX	Wi-Fi	Non-3GPP IoT	Microwave Links
Atoll Core	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Live	✓	✓	✓	✓						
GSM	✔									
UMTS		✔								
LTE			✔	✔						
NB-IoT				✔						
CDMA					✔					
TD-SCDMA						✔				
WiMAX/BWA							✔	✔		
LPWA									✔	
Microwave Links										✔
Measurements	✓	✓	✓	✓	✓	✓	✓	✓	✓	
AFP	✓		✓	✓			✓	✓		
ACP	✓	✓	✓	✓	✓		✓	✓	✓	
ASP	✓	✓	✓	✓	✓		✓			
Aster	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CrossWave	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Backhaul Capacity Planning										✓

✔ Required ✓ Optional for the selected technology

Atoll 5G Capabilities

Atoll's modular and advanced radio technology modelling capabilities, along with the support for mmWave propagation, massive MIMO, and 3D beamforming, provide operators with a flexible and evolutionary framework for the design and deployment of 5G networks. Since early 2017, major operators and vendors have been using Atoll for the very first deployments of 5G wireless access networks, as well as for R&D activities.

Atoll 5G Features

- Support for 5G frequency bands above and below 6GHz, and wideband carriers
- mmWave propagation modelling
- Support for 3D beamforming & massive MIMO
- Support for "last-mile" fixed wireless deployment
- Automatic small cell selection
- Support for cross-band carrier aggregation

5G is introducing a new paradigm for radio planning and optimisation activities, as operators are looking for process automation involving huge amounts of predicted and live-network data. As an example, automatic planning and configuration of new cell sites in mmWave frequencies requires evaluating large numbers of candidates and generates intensive AI-based calculations to select the best configuration parameters at the design stage.

The Atoll platform has been designed to handle extremely large amounts of data involved in the radio planning process: site and network database, geographic data, path loss matrices, CW measurements and drive test data, as well as KPIs, UE/cell/MDT traces and CEM data. Atoll includes advanced data management, processing and display techniques to support the higher order of magnitude in data volume that comes with 5G projects and real-network data such as UE/cell/MDT traces and CEM data.

Atoll Live

Atoll and its Live module combine prediction-based and measurement-based planning and optimisation techniques into a unique hybrid solution. Atoll allows incorporating KPIs and UE/cell/MDT traces, and CEM data in order to add real-world information to predictions in a number of planning and optimisation tasks, hence extending both accuracy and scope of use.

KPIs

- Support for multi-technology KPIs
- Import and management of KPIs from various sources (flat files and database connections)
- KPI editor allowing user-definable thresholds and combinations
- KPI display on map as transmitter or cell coverage/service/interference attribute
- Multi-vendor GSM OSS interference and traffic data import

UE/Cell/MDT Traces and CEM Data

- Support for multi-technology UE/cell/MDT traces and CEM data
- Live connections to multiple UE/cell/MDT trace and CEM data sources (flat files and database connections)
- UE/cell trace geolocation
- Location and measurement display on map

Radio Propagation and Coverage Plots

- Combination of predicted path losses with path losses extracted from UE/cell trace measurements
- Combined prediction and measurement-based coverage and service plots
- Measurement-based coverage plots

Neighbour Planning

- Prediction and KPI-based automatic neighbour planning
- KPI-based tuning of black, white, and neighbour lists

Traffic Modelling and Heat Maps

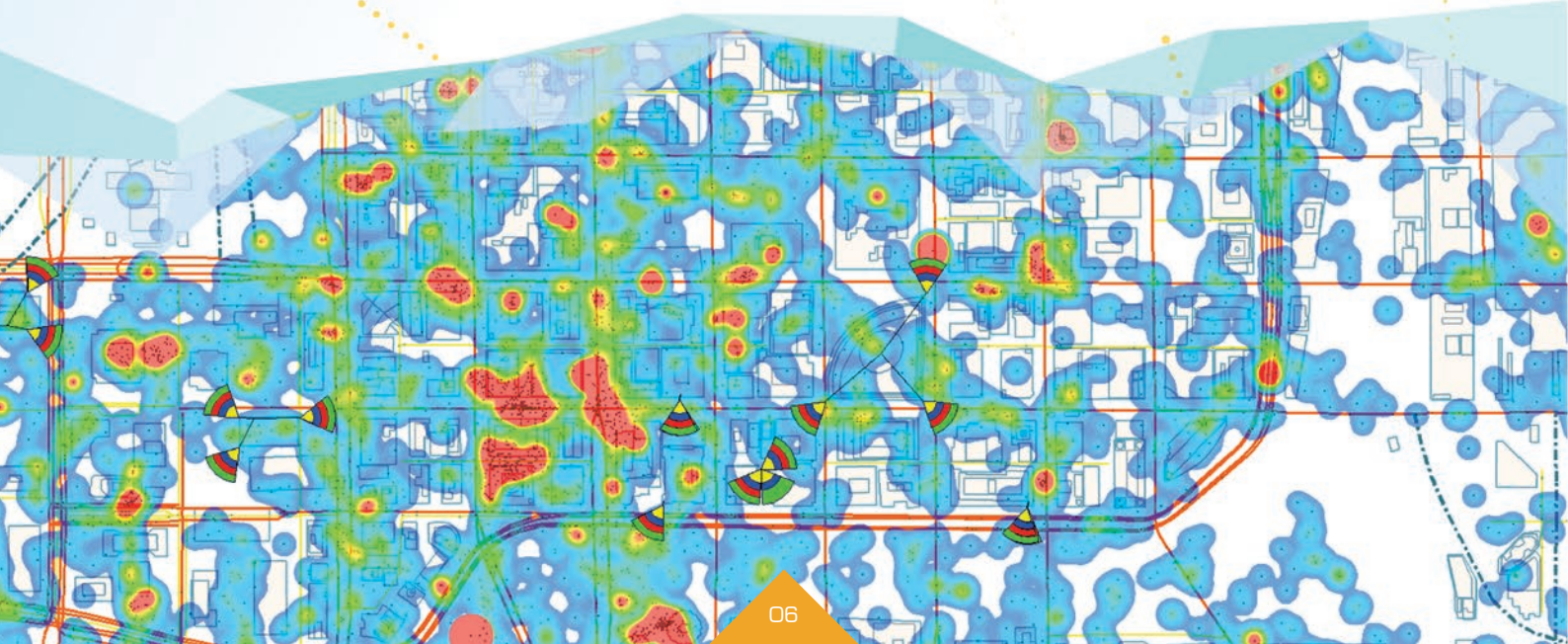
- KPI-based traffic demand map combining cell statistics and coverage plots
- Weighting (heat) maps from UE/cell/MDT traces and CEM data
- Traffic maps based on UE/cell/MDT traces and CEM data

Automated Cell Planning (ACP)

- Prediction and KPI-based site selection and optimisation objectives
- Prediction and measurement-based heat maps and traffic maps
- Prediction and measurement-based cost function/driving function

Automated Frequency Planning (AFP)

- Prediction, KPI, and measurement-based automatic PCI/NPCI planning
- Prediction, KPI, and measurement-based automatic PRACH RSI planning
- Prediction, KPI, and measurement-based automatic frequency planning



About **us**

Forsk is an independent software company providing operators and vendors with wireless network design and optimisation products. Atoll, Forsk's flagship product, is a multi-technology wireless network design and optimisation software that allows operators to streamline planning and optimisation activities by combining predictions and live network data. With more than 9000 active licenses installed with 500+ customers in 140 countries, Atoll has become the industry standard for wireless network design and optimisation.

Forsk distributes and supports Atoll directly from offices and technical support centres in France, USA, and China as well as through a worldwide network of distributors and partners.

Forsk **at your side**

Since the first release of Atoll, Forsk has been known for its capability to deliver tailored and turn-key radio planning and optimisation environments based on Atoll.

To help operators streamline their radio planning and optimisation processes, Forsk provides a complete range of implementation services, including integration with existing IT infrastructure, customisation, as well as data migration, installation, and training services.

- Head Office

7, rue des Briquetiers
31700 Blagnac - France
Tel: +33 562 747 210
Fax: +33 562 747 211

- US Office

200 South Wacker Drive - Suite 3100
Chicago, IL 60606 - USA
Tel: +1 312 674 4800
Fax: +1 312 674 4847

- China Office

Suite 302, 3/F, West Tower, Jiadu Commercial Building,
N°.66 Jianzhong Road, Tianhe Hi-Tech Industrial Zone
Guangzhou, 510665 P.R. of China
Tel: +86 20 8553 8938 **Fax:** +86 20 8553 8285

www.forsk.com

February 2018 – Geo Data: Courtesy of EGS Technologies and Geoimage Conception Graphique Comm'IN