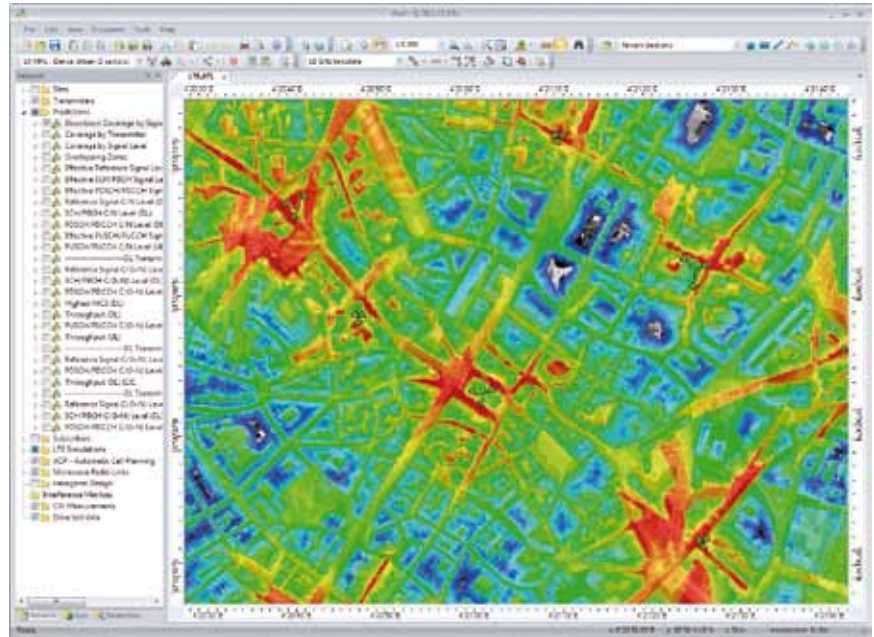


# Atoll

Radio Planning & Optimisation Software



**Forsk**

version **3.1**

GSM/GPRS/EDGE

UMTS/HSPA

LTE

CDMA2000 1xRTT/EV-DO

WiMAX/BWA

TD-SCDMA

Microwave Links



## experts in radio network planning & optimisation software

Forsk is an independent company providing radio planning and optimisation software solutions to the wireless industry since 1987. We are completely independent from equipment suppliers and telecom operators.

In 1997, we released the first version of Atoll, our flagship radio planning software. Since then, Atoll has remained the most advanced radio planning and optimisation platform available and, with more than 4500 installed licenses worldwide, has reached the leading position on the global market.

### Forsk's success with Atoll has come from our commitment to 5 key factors:

#### Independence

Forsk's commercial success and strong financial position has ensured its independence of operators, equipment suppliers, and financial institutions. Being independent, Forsk is able to maintain a long-term strategy for the development of Atoll and its relationships with customers and partners.

#### R&D

Forsk is fully focused on developing wireless network design and optimisation software. We have a strong and committed R&D team which both keeps Atoll in line with the latest developments in the industry and maintains joint R&D projects for Atoll with a number of operators, equipment suppliers and partners. This R&D effort allowed us to be the 1<sup>st</sup> on the market with a 3G radio planning software in 2000, and the 1<sup>st</sup> on the market with an LTE planning software in 2008. In 2011, with Atoll 3.1, we deliver a fully integrated multi-technology planning and optimisation environment.

#### Software Development Expertise

Forsk uniquely combines in-depth knowledge of network design and software development expertise. Our team has an unmatched experience in developing wireless network design and optimisation software, which enables us to provide our customers with powerful, scalable, and user-friendly radio planning and optimisation products.

#### Open Platform Concept

Atoll is an open and flexible platform able to distribute, centralise and automate calculation and prediction tasks. Since the first version of Atoll, Forsk has been delivering development tools and partnering with 3<sup>rd</sup> party developers in order to create an ecosystem of specialised complementary solutions.

#### Customer Support

We aim at building and maintaining long-term relationships with its customers in their use of Atoll. The quality and reactivity of our technical support are key elements of these relationships.

This unique combination of strengths and a long and consistent record make the Forsk difference.

Today, Forsk is a global supplier with 250+ customers in 70 countries and strategic partnerships with major players in the industry including AT&T, Telefonica O2, Vodafone, Alcatel-Lucent and Huawei.



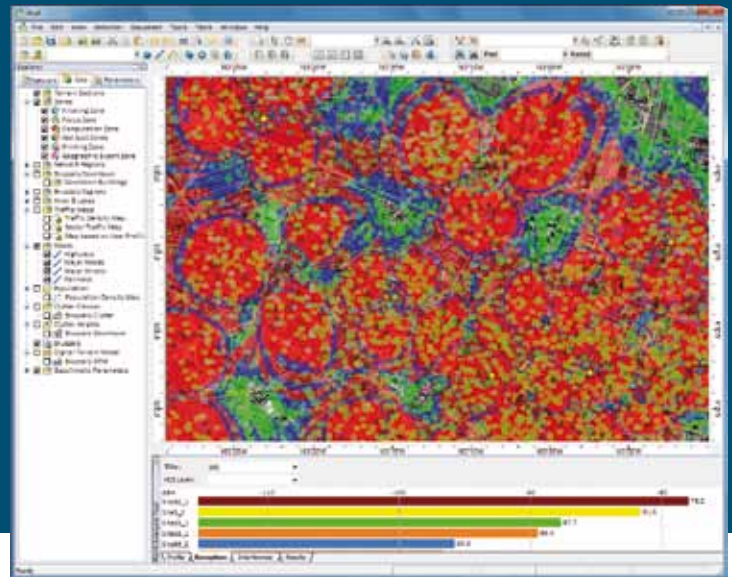
Forsk distributes and supports Atoll directly from offices and technical support centres in France, USA, and China and also through a world-wide network of distributors and partners.

## leading multi-technology radio network planning & optimisation software

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

Atoll version 3.1 further extends the technical features that have made Atoll the leading radio planning and optimisation software on the market with integrated "single RAN - multiple RAT" network design capabilities. It provides operators and vendors today with a powerful framework for the design and optimisation of current and future integrated 2G/3G/4G networks. Atoll version 3.1 streamlines multi-technology planning and optimisation through combined GSM/UMTS/LTE modelling, simulation and optimisation functionalities. Atoll 3.1 also incorporates an updated architecture and a new user interface that deliver enhanced data management and calculation performance.

Atoll supports a wide range of implementation scenarios, from standalone to enterprise-wide server-based configurations using distributed and multi-threaded computing.



## Highlights

### Advanced Network Design Features

Atoll includes advanced multi-technology network planning features (e.g. GSM/UMTS/LTE, CDMA2000/LTE), and a combined Single-RAN Multi-RAT GSM/UMTS/LTE Monte-Carlo simulator and traffic model. Atoll supports GSM/GPRS/EDGE, UMTS/HSPA, LTE, CDMA2000 1xRTT/EV-DO, TD-SCDMA, WiMAX, and Microwave link networks; it also includes a high-performance propagation calculation engine, and state-of-the-art network planning and analysis features.

### Integrated Optimisation Tools

Atoll includes a set of fully integrated AFP (Automatic Frequency Planning) and ACP (Automatic Cell Planning) tools, allowing operators to perform design and optimisation tasks seamlessly within Atoll using a single database and IT infrastructure.

### Open and Flexible Architecture

Atoll supports multi-user environments through a database architecture that provides user rights management, data sharing, data integrity management, and easy integration with other IT systems. Atoll enables task automation through a standard macro language, and includes an advanced C++ Software Development Kit (SDK) that facilitates customisation and IT integration. Atoll also has the largest range of compatible 3<sup>rd</sup> party products on the market.

### State-of-the-art GIS Features

Atoll supports multi-format/multi-resolution geographical data. High-resolution urban and country-wide datasets are supported and displayed interactively as multiple layers including engineering and prediction plots. Atoll also features an integrated vector/raster cartography editor and integrates with leading GIS tools such as MapInfo and ArcView.

### Distributed Computing and Multi-Threading

Atoll allows distributing calculations over several computers and supports parallel computing on multi-core/processor servers, thus dramatically reducing calculation times and getting the most out of the hardware.

## modular configuration

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

Atoll 3.1 features Automatic Frequency Planning and Automatic Cell Planning tools that provide comprehensive and integrated multi-technology automatic network design and optimisation functionalities.

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. See the Atoll Microwave brochure for more information about this product.

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.

The technology matrix below shows the modules suitable for each technology. Several technology modules can be combined in the same Atoll configuration for planning integrated multi-technology projects.

		TECHNOLOGIES						
		GSM/GPRS/EDGE	UMTS/HSPA	LTE	CDMA2000 1xRTT/EV-DO	TD-SCDMA	WiMAX/BWA	Microwave Links
ATOLL MODULES	Atoll Core	Required	Required	Required	Required	Required	Required	Required
	GSM	Required						
	UMTS		Required					
	LTE			Required				
	CDMA2000				Required			
	TD-SCDMA					Required		
	WiMAX						Required	
	Microwave Links							Required
	Measurements	Optional	Optional	Optional	Optional	Optional	Optional	Optional
	AFP	Optional	Optional	Optional	Optional	Optional	Optional	Optional
ACP	Optional	Optional	Optional	Optional	Optional	Optional	Optional	
CrossWave	Optional	Optional	Optional	Optional	Optional	Optional	Optional	

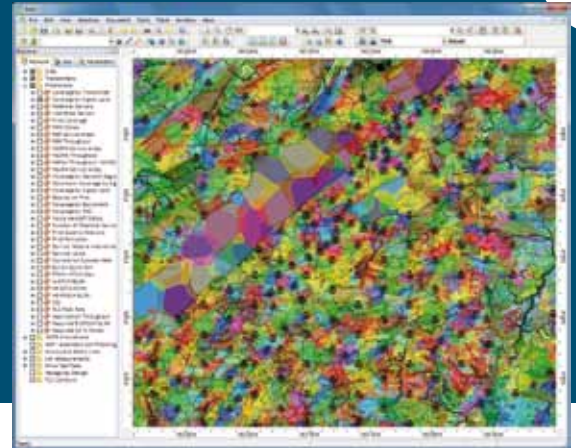
○ Required      ○ Optional for the selected technology

## powerful radio planning & optimisation platform

Used together with one or several technology modules, Atoll Core delivers the general features shared by all Atoll modules, customised developments, and 3<sup>rd</sup> party products.

Based on an object-oriented architecture and designed for radio planning and optimisation, Atoll Core is a robust and scalable platform that supports very large projects while remaining user-friendly and easy to administrate.

The Atoll platform enables the integration of live network data into the planning and optimisation process, allowing users to combine predicted and real network data. Supported data include CW measurements, drive test data, interference matrices, and OSS KPIs.



### GIS Features

- Optimised cartographic database supporting digital elevation models, clutter data (type and height), 3D building data (vector/raster), traffic data, scanned maps, vector data, population, and climate data
- Integrated cartography editor (vector/raster)
- Interface with GIS tools: MapInfo, ArcView, Google Earth
- Support for Web Map Services (WMS)

### Propagation Modelling

- Comprehensive integrated propagation model library
- Full support for multi-resolution prediction plots
- Automatic propagation model tuning using CW or drive test data
- Pathloss matrix adjustment using prediction/drive test interpolation
- CrossWave high-performance propagation model (optional)
- Integration of external propagation models through an API and a C++ development kit

### User and Database Management

- Advanced administration module supporting data access and user privilege management
- Flexible database structure allowing integration of user-defined parameters and custom fields
- Multi-user support including database consistency management, data synchronisation, and user disconnection/reconnection from/to the database
- Support for standalone/centralised/distributed configurations
- Advanced import/export features allowing quick data migration from other radio planning software

### Task Automation and Scripting

- Scripting language allowing integration of user-defined macros
- User-defined calculation batch based on macros and scripts

### Distributed Computing and Multi-Threading

- Multi-threading/parallel computing on multi-processor systems
- Distributed computing on networked workstations and servers

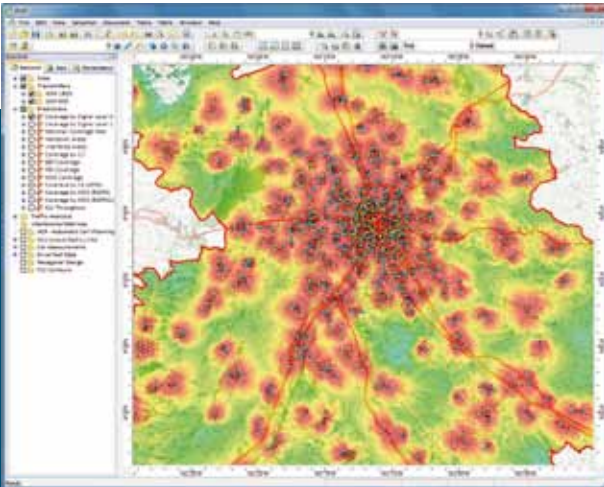
### Printing and Reports

- Flexible report generator including traffic, population, and clutter-based statistics
- User-defined reports based on macros
- Export of reports and prediction plots to other software
- Printers and plotters up to A0 format

### Measurements Module

- CW measurements
  - Import, display, and analysis of CW data
  - Prediction/measurements comparison and statistical analysis
  - Automatic propagation model tuning using CW measurements
- Drive test data
  - Import, display, and analysis of drive test data
  - Call events display and analysis
  - Automatic propagation model tuning using drive test data
  - Pathloss matrix adjustment using prediction/drive test interpolation

## GSM/GPRS/EDGE



Atoll GSM/GPRS/EDGE module provides a comprehensive and accurate modelling of voice and data services, including full support of HCS and frequency hopping. Optimised multi-resolution predictions and interference calculations facilitate planning as well as optimising mature networks that have a large number of sites and country-wide coverage.

Atoll 3.1 supports integrated network planning for GSM/UMTS/LTE radio access technologies. It features a multi-technology network database, a unified traffic model, and a combined GSM/UMTS/LTE Monte Carlo simulator that provide operators with a comprehensive and evolutionary framework for the planning and analysis of multi-technology networks.

### Network Modelling

- Support of dual-band networks
- Support of HCS (Hierarchical Cell Structure)
- Support for frequency hopping (baseband and synthesised), DTX, and AMR
- Modelling of GPRS, EDGE, EDGE Evolution
- Advanced service modelling

### Service Planning and Analysis

- Cell and network coverage analysis
- GPRS/EDGE/EDGE Evolution prediction plots
- Interference analysis
- QoS analysis
- Neighbour planning and handover analysis

### Traffic Analysis

- Multi-service traffic map generation from multiple sources: vector, raster, and live traffic data
- Traffic spreading between cell layers with traffic overflow modelling
- Cell dimensioning for mixed voice/data traffic and timeslot configurations
- Calculation of KPIs such as packet delay, blocking rate, etc.

### Interference Matrix Generation

- Prediction, OMC-R and drive test-based interference matrices
- Support of TRX type-based (e.g., BCCH, TCH) quality thresholds
- Open format allowing editing and modifying interference matrices using 3<sup>rd</sup> party applications

### GSM/UMTS/LTE Co-planning

- Unified GSM/UMTS/LTE network database with site and antenna sharing
- Unified GSM/UMTS/LTE multi-service traffic model
- Combined GSM/UMTS/LTE Monte-Carlo simulator
- Simultaneous display and analysis of GSM/UMTS/LTE layers
- Inter-technology handover modelling
- Inter-technology interference analysis (e.g., GSM 900 and UMTS 900)

### Automatic Frequency Planning - AFP

- User-definable constraints and editable cost function
- Allocation of frequency hopping parameters (HSN, MAIO, MAL)
- Combined automatic/interactive frequency planning

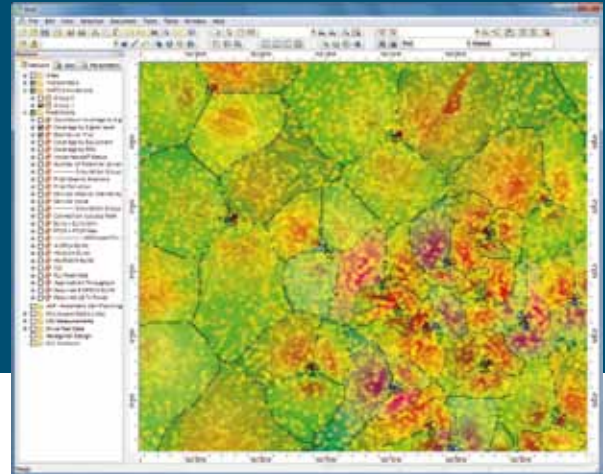
### Automatic Cell Planning - ACP

- Automatic optimisation of network parameters to increase coverage and capacity
- Site selection and activation for greenfield and densification scenarios
- Antenna selection and parameter optimisation (height, azimuth, and tilt)

## UMTS/HSPA

Atoll was the first UMTS network planning software on the market. Since then it has stayed ahead of the competition with continuous improvements made through close cooperation with GSM, UMTS, and LTE operators.

Atoll 3.1 supports integrated network planning for GSM/UMTS/LTE radio access technologies. It features a multi-technology network database, a unified traffic model, and a combined GSM/UMTS/LTE Monte Carlo simulator that provide operators with a comprehensive and evolutionary framework for the planning and analysis of multi-technology networks.



### Network Modelling

- Support for multiple carriers and frequency bands (e.g., UMTS 900/1800/1900/2100)
- UMTS equipment modelling including RRM and inter-carrier power sharing
- Advanced bearer and service modelling
- HSPA and HSPA+ modelling
- Dual-Cell HSPA support
- MBMS modelling
- MIMO modelling
- VoIP modelling

### Traffic Modelling

- Modelling of voice and data services
- Modelling of user equipment, user profiles, and environment types
- Multi-service traffic map generation from multiple sources: vector, raster, and live traffic data

### Simulation and Analysis

- State-of-the-art Monte Carlo UMTS/HSPA/MBMS simulator including DL and UL power control, RRM, HSPA to R99 downgrading and carrier allocation algorithms
- Generation of prediction plots, based on simulations or on user-defined cell load figures, including:
  - Ec/Io prediction plots
  - Downlink and uplink Eb/Nt prediction plots
  - Service areas
  - Number of servers
  - Handover areas
  - Interference and pilot pollution
  - BER/FER/BLER
  - HSPA prediction plots
  - MBMS service area

### Neighbour and Scrambling Code Planning

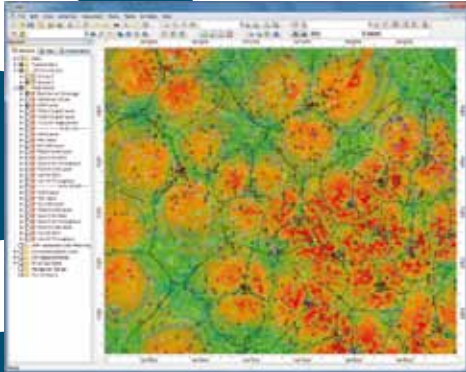
- Manual and automatic multi-carrier neighbour planning
- Automatic scrambling code allocation supporting various allocation strategies
- Scrambling code allocation analysis tool including SC interference plots

### GSM/UMTS/LTE Co-planning

- Unified GSM/UMTS/LTE network database with site and antenna sharing
- Unified GSM/UMTS/LTE multi-service traffic model
- Combined GSM/UMTS/LTE Monte-Carlo simulator
- Simultaneous display and analysis of GSM/UMTS/LTE layers
- Inter-technology handover modelling
- Inter-technology interference analysis (e.g., GSM 900 and UMTS 900)

### Automatic Cell Planning - ACP

- Automatic optimisation of network parameters to increase coverage and capacity
- Site selection and activation for greenfield and densification scenarios
- Antenna selection and parameter optimisation (height, azimuth, and tilt)



In 2008, Atoll LTE was the first LTE network planning software available on the market. It has since then been used on a number of projects worldwide. Atoll 3.1 is a comprehensive framework for operators who need to plan evolution towards LTE. It allows planning and analysing integrated GSM/UMTS/LTE and CDMA2000/LTE networks

This module is the result of a strong R&D program in 4G technologies which Forsk is conducting with strategic partners including world-leading equipment vendors and operators.

### Network and Radio Parameter Modelling

- Support of all frequency bands, carrier bandwidths, and sampling frequencies
- Support of TDD and FDD duplexing methods
- Support of LTE OFDMA (DL) and SC-FDMA (UL) parameters and frame structures:
  - Frames, subframes, slots, OFDM symbols, cyclic prefixes
  - Carriers, resource blocks, subcarriers, resource elements
  - Control channels: RS, SS, PBCH, PDCCH, PUCCH
- Support for multiple modulation types and coding schemes
- MIMO modelling: transmit diversity, spatial multiplexing (SU-MIMO), uplink collaborative MIMO (MU-MIMO), adaptive MIMO switching (AMS)

### Traffic Modelling

- Modelling of voice and data services
- Modelling of UE categories
- Multi-service traffic demand maps generated from multiple sources: vector, raster, and live traffic data
- Subscriber traffic modelling

### Simulation and Analysis

- LTE Monte-Carlo simulator including power control, IoT control, advanced RRM and scheduling algorithms, and MIMO
- Inter-cell Interference Coordination (ICIC) support
- Generation of prediction plots, based on simulation results or user-defined cell load figures, including:
  - Cell and network coverage analysis
  - Effective service area analysis
  - Uplink and downlink interference analysis
  - Uplink and downlink bearer coverage predictions
  - Uplink and downlink throughput coverage predictions
  - Uplink and downlink quality indicator prediction plot
  - Aggregate throughput prediction plot
- Capacity planning

### Neighbour Planning

- Manual and automatic neighbour planning
- Inter-frequency and intra-frequency neighbour planning

### GSM/UMTS/LTE Co-planning

- Unified GSM/UMTS/LTE network database with site and antenna sharing
- Unified GSM/UMTS/LTE multi-service traffic model
- Combined GSM/UMTS/LTE Monte-Carlo simulator
- Simultaneous display and analysis of GSM/UMTS/LTE layers
- Inter-technology handover modelling
- Inter-technology interference analysis

### CDMA2000/LTE Co-planning

- Site sharing
- Simultaneous display and analysis of CDMA2000 and LTE networks
- Inter-technology handover modelling
- Inter-technology interference analysis

### Automatic Frequency Planning - AFP

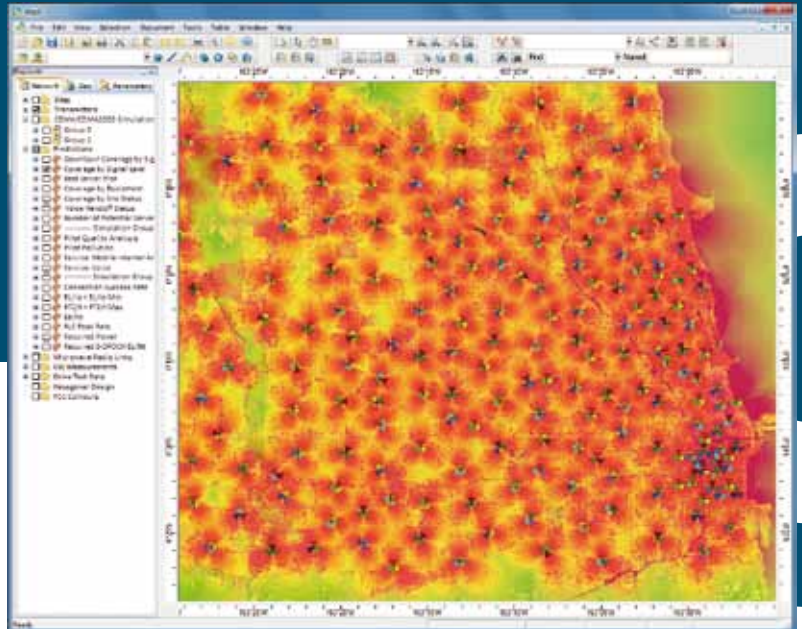
- Generation, import, edition, storage, and use of interference matrices
- User-definable constraints and editable cost function
- Allocation of carriers and fractional frequency planning (FFP)
- Automatic physical cell ID planning

### Automatic Cell Planning - ACP

- Automatic optimisation of network parameters to increase coverage and capacity
- Site selection and activation for greenfield and densification scenarios
- Antenna selection and parameter optimisation (height, azimuth, and tilt)

## CDMA2000 1xRTT/EV-DO

Forsk has been working with market leaders in North America and Asia to deliver state-of-the-art CDMA2000 planning features, including a combined 1xRTT/1xEV-DO traffic model. Atoll fully supports EV-DO Rev. A. and EV-DO Rev.B. Atoll supports CDMA2000/LTE co-planning, and allows CDMA operators to plan and analyse the evolution of their networks towards LTE.



### Network and Radio Parameter Modelling

- Network database
- Support for repeaters
- Radio configuration and channel modelling
- Radio Resource Management (RRM)
- Support for multiple carriers and frequency bands
- Carrier type modelling (1xEV-DO, 1xRTT)
- EV-DO Rev.B multi-carrier operation (RRM + frequency diversity gain)
- Full 1xRTT, EV-DO Rel.0, Rev.A, Rev.B physical channels management
- Forward/reverse Rev.A, Rev.B radio bearer modelling
- Hybrid-ARQ modelling

### Traffic Modelling

- Modelling of voice and data services
- Support for multiple sources of traffic data:
  - User distribution maps
  - Live traffic data per service per cell
  - Service demand maps (raster/vector)

### Simulation and Analysis

- State-of-the-art Monte Carlo CDMA simulator including RRM, rate downgrading, and multi-carrier allocation algorithms
- Modelling of mixed 1xRTT/1xEV-DO traffic
- Generation of prediction plots, based on simulations or on user-defined cell load figures, including:
  - Ec/Io pilot prediction plots
  - Forward and reverse link Eb/Nt prediction plots
  - Forward and reverse link 1xRTT SCH rate prediction plots
  - Forward and reverse link 1xEV-DO (Rev.0 and Rev.A) data rate prediction plots

- Service areas (pilot + forward and reverse link traffic)
- Handoff status prediction plots
- Number of servers
- Pilot pollution prediction plots
- Total forward link noise and noise rise prediction plots

### CDMA2000/LTE Co-planning

- Site sharing
- Simultaneous display and analysis of CDMA2000 and LTE networks
- Inter-technology handover modelling
- Inter-technology interference analysis

### Neighbour and PN-offset Planning

- Manual and automatic neighbour planning
- Multi-carrier neighbour planning
- Automatic PN-offset allocation
- PN-offset allocation analysis

### Automatic Cell Planning - ACP

- Automatic optimisation of network parameters to increase coverage and capacity
- Site selection and activation for greenfield and densification scenarios
- Antenna selection and parameter optimisation (height, azimuth, and tilt)

## WiMAX/BWA



Atoll WiMAX is a state-of-the-art WiMAX and Broadband Wireless Access (BWA) network planning software developed in cooperation with WiMAX equipment manufacturers.

### Network and Radio Parameter Modelling

- Support for TDD and FDD PMP networks
- Support for multiple frequency bands
- Subcarrier configuration and frame structure modelling
- Support for different permutation zones and subchannel allocation modes
- Smart antenna modelling: conventional and optimum beamforming antennas
- MIMO modelling: transmit diversity, spatial multiplexing (SU-MIMO), uplink collaborative MIMO (MU-MIMO), adaptive MIMO switching (AMS)
- Support for repeaters and remote antennas
- Site database can be shared with Atoll Microwave for backhaul planning

### Traffic Modelling

- Modelling of voice and data services
- Support for all WiMAX QoS classes (UGS, rtPS, ErtPS, nrtPS, and BE)
- Modelling of customer premises equipment and user profiles
- Multi-service traffic demand maps generated from multiple sources: vector, raster, and live traffic data
- Fixed subscriber traffic modelling

### Subscriber Modelling

- Fixed subscribers database
- Subscriber display on map
- Automatic and manual connection of subscribers to serving cells
- Analysis of received signal level, interference, bearer (adaptive MCS) and throughput for each subscriber

### Simulation and Analysis

- WiMAX Monte-Carlo simulator including power control, advanced RRM and scheduling algorithms, support for adaptive antenna systems, and MIMO
- Support for fractional frequency reuse (segmentation)
- Generation of prediction plots, based on simulation results or on user-defined cell load figures, including:
  - Cell and network coverage analysis
  - Effective service area analysis
  - Uplink and downlink interference analysis
  - Uplink and downlink bearer coverage predictions
  - Uplink and downlink throughput coverage predictions
  - Uplink and downlink quality prediction plot
  - Aggregate throughput prediction plot
- Capacity planning

### Neighbour Planning

- Manual and automatic multi-carrier neighbour planning
- Inter-carrier and intra-carrier neighbour planning

### Automatic Frequency Planning - AFP

- Generation, import, edition, storage, and use of interference matrices
- User-definable constraints and editable cost function
- Allocation of carriers and fractional frequency planning (FFP)
- Automatic preamble index planning
- Automatic downlink/uplink permabase planning

### Automatic Cell Planning - ACP

- Automatic optimisation of network parameters to increase coverage and capacity
- Site selection and activation for greenfield and densification scenarios
- Antenna selection and parameter optimisation (height, azimuth, and tilt)

Atoll TD-SCDMA has been developed in partnership with major players in the TD-SCDMA scene in China, and is the most advanced and most widely used TD-SCDMA planning software on the market.

Atoll supports TD-SCDMA/TD-LTE co-planning, and allows TD-SCDMA operators to plan and analyse the evolution of their networks towards TD-LTE. Atoll also supports 2G/TD-SCDMA co-planning.



### Network Modelling

- Support for N-Frequency mode
- TD-SCDMA equipment modelling including RRM and capacity parameters
- Smart antenna modelling
- HSDPA modelling
- UpPCH shifting modelling
- MBMS modelling

### Traffic Modelling

- Modelling of voice and data services
- Modelling of user equipment, user profiles, and environment types
- Multi-service traffic map generation from multiple sources: vector, raster, and live traffic data

### Simulation and Analysis

- TD-SCDMA Monte-Carlo simulator including timeslot modelling, smart antenna modelling, and Dynamic Channel Allocation (DCA) modelling
- Generation of prediction plots, based on simulations or on user-defined per-timeslot cell load figures, including:
  - DL and UL Eb/Nt coverage
  - Required power
  - Effective service areas
  - Cell-to-cell interference
  - UpPCH interference
  - P-CCPCH pollution
  - Offered/required capacity per cell
  - DwPCH and UpPCH coverage
  - Baton handover
  - HSDPA prediction plots: CQI, RLC, MAC, and application throughput per pixel
  - MBMS service area

### Neighbour and Scrambling Code Planning

- Manual and automatic multi-carrier neighbour planning
- Automatic scrambling code allocation supporting various allocation strategies
- Scrambling code allocation analysis tool
- Automatic carrier allocation

### 2G/TD-SCDMA Co-planning

- Site sharing
- Simultaneous display and analysis of 2G and TD-SCDMA networks
- Inter-technology handover modelling

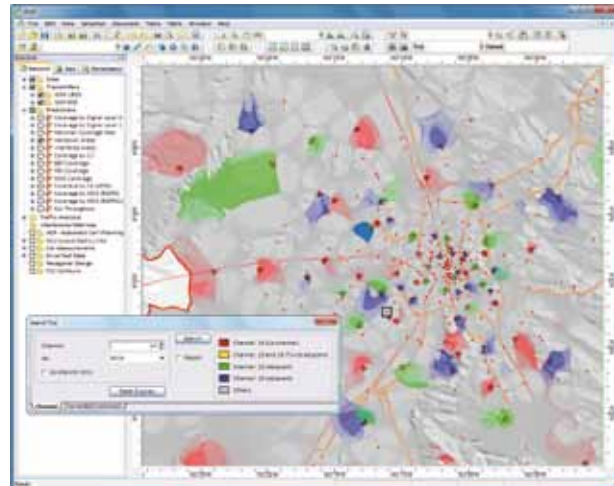
### TD-SCDMA/TD-LTE Co-planning

- Site sharing
- Simultaneous display and analysis of TD-SCDMA and TD-LTE networks
- Inter-technology handover modelling

## Automatic Frequency Planning (AFP)

Atoll includes a powerful and flexible GSM AFP module that is being used by a large number of operators worldwide. It is based on sophisticated optimisation techniques and includes advanced features such as combined automatic/interactive frequency planning and optimisation of TRX allocation vs. interference conditions. The Atoll GSM AFP module allows for the combination of multiple interference matrices generated from predictions and real network data.

Atoll also includes dedicated WiMAX and LTE AFP modules that support technology-specific allocation features.



### GSM AFP

- Modelling of frequency bands, carrier layers, and border constraints
- Support for vendor equipment constraints/features
- Generation, import, edition, storage, and combination of interference matrices
- User-definable constraints and editable cost function
- Allocation of frequency hopping parameters (MAL, HSN, MAIO)
- Combined automatic/Interactive frequency planning on map (IFP)
- Optimisation of TRX allocation vs. interference conditions
- BSIC planning

### LTE AFP

- Full and fractional automatic frequency planning
- Interference-based frequency plan optimisation target (cost function)
  - Interference matrices
  - Neighbours, neighbours of neighbours, co-neighbours
  - Reuse distance
- User-definable constraints and editable cost function
- Generation, import, edition, storage, and use of interference matrices
- Support for multi-carrier and multi-band networks
- Automatic physical cell ID, SSS ID, and PSS ID planning

### WiMAX AFP

- Full and fractional automatic frequency planning
- Interference-based frequency plan optimisation target (cost function)
  - Interference matrices
  - Neighbours, neighbours of neighbours, co-neighbours
  - Reuse distance
- User-definable constraints and editable cost function
- Generation, import, edition, storage, and use of interference matrices
- Support for multi-carrier and multi-band networks
- Automatic preamble index planning, downlink and uplink perbase planning



## Development Tools



Atoll is an open platform and includes development tools that allow operators or 3<sup>rd</sup> party developers to customise their working environment and easily integrate Atoll with other applications. This key feature provides flexibility and a capacity to quickly add customised modules that no other radio planning and optimisation software delivers.

### Atoll Scripting Language

Atoll includes a powerful VBScript-based macro language that allows automation and scheduling tasks such as nation-wide coverage predictions and reporting, propagation calculation automation and monitoring, etc. The Atoll macro language also enables administrators to implement data management rules and controls, such as naming conventions and consistency checks.

### Atoll Software Development Kit

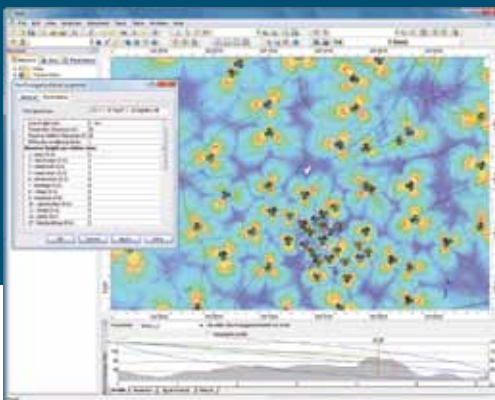
The Atoll SDK is a set of C++ resources that provide developers with a complete development environment for the development of Atoll extensions and plug-ins. The SDK includes a general programming interface and some dedicated interfaces.

The general interface provides access to all Atoll project data allowing developers to add their own functions to the Atoll user interface. This extremely powerful feature enables the integration of a wide range of applications with Atoll, including simulation, optimisation, and configuration tools.

Dedicated interfaces allow the integration of specialised modules such as propagation models, smart antenna models, and frequency planning and optimisation applications.

Forsk offers training courses and dedicated support services for developers.

*Example of propagation model and profile display developed with the Atoll SDK.*



*Example of customised export function developed with the Atoll SDK.*





## Training & Services



Forsk offers a complete range of services to operators for a quick implementation of Atoll and in-depth knowledge transfer to users. These services enable operators to benefit from the increase in productivity delivered by Atoll in the shortest period of time. Once the implementation phase is complete, users get assistance through our helpdesk and we can also provide on-site assistance when needed.

### Implementation

Forsk can provide a turn-key implementation of Atoll on operator premises, including software installation and system configuration. Forsk can migrate data from a previous planning software into Atoll and perform propagation model calibration hence delivering a solution that is 'ready to use' right after the installation.

### Training

Forsk has a comprehensive training course portfolio that covers all activities related to Atoll: user training, administrator training, technology module and specialised module training (e.g., propagation model calibration).

Training courses can be delivered at our training centres in Europe, North-America and Asia as well as on customer premises. Forsk can also deliver customised training courses upon request. Check the Training section at [www.forsk.com](http://www.forsk.com) for updated public course schedules and programs.

### Mentoring

We provide on-site post-training support in order to help operators within their first few weeks of operational use of Atoll. During this phase, operators get a comprehensive knowledge transfer from Atoll experts with long experience of similar situations.

### Custom Software Development

Forsk can develop additional modules for Atoll, in order to meet specific integration or functional requirements. Such modules are developed using the standard Atoll Software Development Kit (SDK) in order to achieve full integration and make future evolutions and maintenance easy.

### Helpdesk and Support Portal

Once the Atoll implementation project has been completed, operators get a continuous access to Forsk support through the Atoll Helpdesk and the Support Portal. The Atoll support portal provides access to a set of online resources and allows users to log technical questions to the Forsk helpdesk/support team.



○ Operating Systems

- Microsoft Windows XP, Windows Vista, Windows 7 (32/64 bits)
- Microsoft Windows 2003 server, Windows 2008 server (32/64 bits)

○ Relational Database Management System (not required for standalone configurations)

- Oracle 9i, 10g and 11g
- Sybase Adaptive Server V12.5
- Microsoft SQL Server 2005
- Microsoft Access

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