

Atoll

Global RF Planning Solution

VERSION 2.2

GSM
TDMA
cdmaOne
GPRS/EDGE
W-CDMA/UMTS
CDMA2000
Microwave links

Forsk



developing and marketing RF planning tools since 1987

Forsk is an independent company providing RF planning software to the wireless industry. Owned by its founders, Forsk is completely independent of equipment suppliers and telecom operators.

Forsk began in 1987 as a software company providing customized RF planning solutions to the telecommunications industry, and was involved in the early stages of the GSM technology.

In 1997, Forsk released the first version of Atoll, its Windows-based RF planning solution. In 2000, Forsk was the first on the market to offer a commercial 3G planning tool (Atoll 3G module).

In 2001, Atoll was the first software to include an integrated 2G/3G RF planning solution (Atoll co-planning features).

In 2002, Forsk added full support of CDMA2000 (1xRTT, 1xEvDO) into Atoll. Released in 2003, Atoll version 2.2 is setting a new standard in radio planning with new innovative features such as a unified multi-technology traffic model and multi-resolution propagation modelling.

Forsk is now a global leader in the RF planning software market, with a large base of Atoll users in more than 45 countries.

Forsk also has strategic partnerships with major players in the industry including Vodafone, Nortel Networks and Alcatel.

Forsk distributes and supports Atoll directly and through a world-wide network of distributors and partners.



Atoll

leading multi-technology RF planning solution

ATOLL is a comprehensive Windows-based multi-technology and user-friendly radio planning environment that supports wireless telecom operators throughout the entire network lifecycle, from initial design to densification and optimisation.

Apart from its engineering capabilities, Atoll is an open, scalable and flexible technical information system that integrates easily with other IT systems, increases productivity and shortens lead time. In addition, Atoll provides an open interface platform to support any customised requirements.

Atoll is designed to work in a very wide range of implementation scenarios, from standalone to enterprise-wide server-based configurations using distributed and parallel computing.

Highlights

- **Advanced network design features:**

high-performance propagation calculation engine, multi-layer and hierarchical networks supported, traffic modelling, automatic frequency/code planning and network optimisation.

Complete support for GSM/TDMA, GPRS/EDGE, cdmaOne, W-CDMA/UMTS, CDMA2000. Planning of integrated multiple technology networks (GSM/UMTS, GSM/GPRS, CDMA/CDMA2000...).

- **Distributed and parallel computing:**

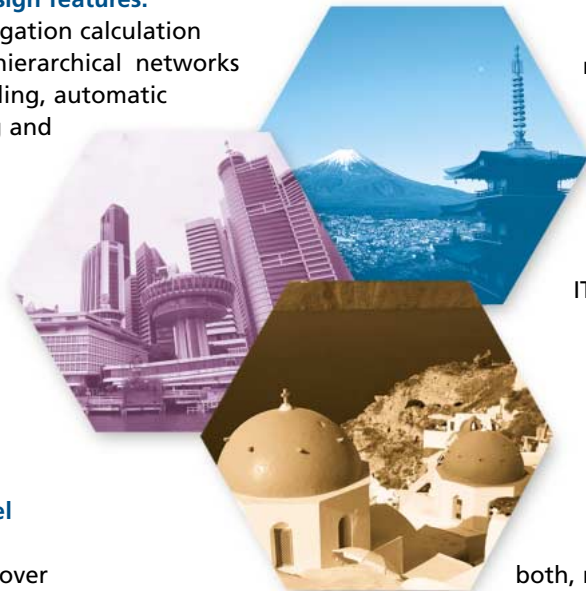
Atoll allows distributing calculations over multiple workstations and supports parallel computing on multi-processor servers, thus dramatically reducing calculation times and getting the most out of the hardware.

- **Open and flexible architecture:**

supports multi-user environments through an innovative database architecture that provides data sharing, data integrity management and easy integration with other IT systems. Integration of 3rd party or proprietary modules through a set of programming interfaces (API).

- **State-of-the-art GIS features:**

Atoll supports both, multi-format and multi-resolution, geographical data and integration with GIS tools. Large, dense urban and countrywide databases are supported and displayed interactively in multiple layers including engineering and prediction studies. Atoll also features an integrated raster and vector editor.



Atoll modular configuration

Atoll has an open architecture, with a core module around which additional modules can be installed. The technology matrix below shows the modules for each technology.

	GSM-TDMA	cdmaOne	GPRS/EDGE	UMTS/W-CDMA	CDMA2000
Atoll 2.2	●	●	●	●	●
3G module		●		●	●
Measurement module	●	●	●	●	●
AFP module	●		●		
Microwave module	●	●	●	●	●

● Required
● Optional for the selected technology

In addition to the modules developed by Forsk, additional products are available from 3rd party partners for specific applications (3D ray-tracing propagation models, optimisation tools, etc.)

General Features

GIS features

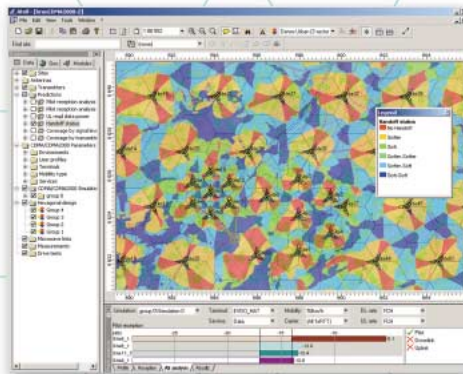
- Optimised cartographic database supporting:
 - Digital Elevation Models
 - Clutter data (type and height)
 - 3D building data
 - Traffic data
 - Scanned maps
 - Vector data
 - Population data
- Integrated cartography editor (vector/raster)
- Interface with GIS tools: MapInfo, ArcView

Propagation modelling

- Intelligent calculation engine with incremental updates of predictions
- Full support for multi-resolution predictions
- Integrated propagation model library including macrocell and microcell models
- 3rd party 3D ray-tracing propagation models (optional)
- Automatic model tuning using measurement data
- Integration of external propagation models through an API and a C++ Software Development Kit

Microwave Module (optional)

- Microwave planning according to the ITU 530-8 recommendation
- Equipment database
 - Path profile and link reliability analysis
 - Interference analysis



User and database management

- Flexible database structure
- Security and user management
- True multi-user support including database consistency management
- Handles disconnection and reconnection with the reference database
- Support for standalone/distributed/centralised configurations
- Advanced import/export features enabling quick migration from existing RF planning tools

Distributed and parallel computing

- Distributed Computing on networked workstations
- Parallel Computing on multi-processor machines
- Background calculation

Measurement Module (optional)

- CW measurements
 - Import and display of CW data
 - Prediction/Measurements comparison and statistical analysis
 - Automatic propagation model tuning using CW measurements
- Test Mobile data
 - Import, display and analysis of test mobile data (GSM/GPRS, UMTS, cdmaOne/CDMA2000)
 - Graphical replay on map combined with user-defined graphs
 - Analysis and display of call events

Printing and reports

- Flexible report generator for statistical and other reports
- Export of reports and plots in other software
- Direct access to the database for customized reports
- Any printing device supported up to A0 format

GSM/TDMA features

Atoll version 2.2 includes a number of new features for GSM/TDMA planning and again sets a new standard in the industry. A unified traffic model provides a comprehensive and accurate modelling of voice and data services (GPRS/EDGE). Multi-resolution predictions and optimised interference calculations allow planning & optimising mature GSM and TDMA networks having a large number of sites and country-wide coverages.

Support of hierarchical cell structure (HCS) and concentric cells

- Prioritisation of serving cells and traffic spreading between layers
- Full support of dual band networks

Service planning

- Cell and network coverage analysis
- Interference analysis
- Handover analysis

Traffic analysis and planning

- Supports vector raster and live traffic data
- Voice and data traffic modelling
- Cell dimensioning with GPRS/EDGE traffic and HCS
- Traffic analysis and reports

Neighbour planning

- Manual and automatic neighbour planning
- Multi-layer neighbour planning
- Inter-technology neighbour planning (GSM-TDMA, GSM-UMTS...)

Automatic frequency planning

- Management of layer level frequency re-use strategies (MRP, super re-use layer, ...)
- Supports frequency hopping (MAL, HSN and MAIO allocation) and fractional load
- BSIC allocation
- Complete integration of 3rd party AFP modules through an open API

GPRS/EDGE

- E-GPRS equipment and transmitter modelling
- Coding scheme selection and data rate vs. interference modelling
- Coding scheme and rate/time-slot predictions



UMTS/W-CDMA features

The 3G module of Atoll was the first 3G planning solution ever available in the market. Since then, it has stayed ahead of the competition with continuous improvements being made through close co-operation with major wireless operators and equipment suppliers.

UMTS network database

- Supports multiple carriers
- UMTS equipment database including RRM and capacity parameters
- Site and transmitter database
- Repeater modelling

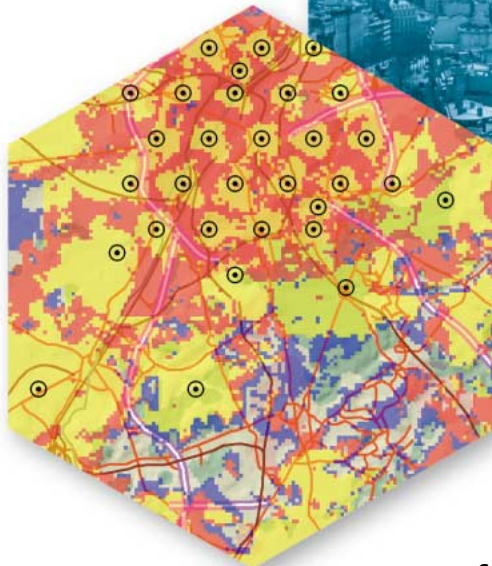


Traffic modelling

- Modelling of multiple circuit and packet switched services
 - Multi-service traffic database including modelling of user profiles
 - Supports multiple sources of traffic data
 - user distribution maps
 - live traffic data per service per cell
 - service demand maps (raster/vector) per service

Simulation and Analysis

- State-of-the-art Monte-Carlo based W-CDMA simulator including RRM and carrier allocation algorithms
- Prediction studies, based on simulations or on user-defined cell load figures, including:
 - service areas
 - handover areas
 - interference and pilot pollution areas
- Statistical analysis and reports



Neighbour and code planning

- Manual and automatic neighbour planning
- Multi-carrier neighbour planning
- Scrambling code allocation algorithm supporting allocation constraints
- Scrambling code allocation analysis (conflict/interference analysis)

GSM/UMTS co-planning

- Simultaneous display and planning of GSM and UMTS networks
- Site sharing
- Inter-technology handover planning

cdmaOne/CDMA2000 features

Forsk has been working with market leaders in North-America and Asia to deliver state-of-the-art CDMA2000 planning features, including a mixed 1xRTT/1xEV-DO traffic model.

Network and Radio Parameter Modelling

- Network database
- Repeater modelling
- Radio configuration and channel modelling
- Radio resource modelling
- Support for multiple carriers and bands

Traffic modelling

- Modelling of circuit switched and packet switched services
- Supports multiple sources of traffic data
- User distribution maps
- Live traffic data per service per cell
- Service demand maps (raster/vector) per service

CDMA simulation

- State-of-the-art Monte-Carlo based CDMA simulator including RRM and carrier allocation algorithms
- Forward and reverse link power control
- Carrier selection modelling

CDMA prediction studies

Based on Monte-Carlo simulation results or on user-defined load figures

- E_c/I_0 based pilot coverage plots
- Forward and reverse E_b/N_t coverage maps
- Service areas (pilot + forward & reverse traffic)
- Handoff status plots
- Number of serving cells
- Pilot pollution plots
- Total forward link noise and noise rise plots

Neighbour and code planning

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

Additional features for CDMA2000

Network and Radio Parameter Modelling

- Carrier type modelling (1xEV-DO, 1xRTT)
- FCH and SCH modelling
- Additional radio configurations (RC3, RC4, RC5)

Data services modelling

- FCH activity factor/SCH variable rate modelling
- SCH and FCH forward/reverse E_b/N_t thresholds
- 1xEV-DO quality tables (C/I vs. forward data rate)
- Reverse 1xEV-DO physical channels modelling

1xRTT simulation and prediction studies

- Extended multi-service Monte Carlo simulations
- SCH and FCH power control modelling
- Reverse and forward link SCH data rate downgrading modelling
- Forward and reverse coverage per SCH rate
- Reports

1xEV-DO simulation and prediction studies

- Modelling of mixed 1xRTT / 1xEV-DO traffic
- Reverse power control simulation including data rate downgrading
- Cell forward link capacity calculation
- Forward and reverse coverage plots per data rate



Hardware and software requirement

- Atoll workstation configuration:
 - PC Pentium III with 256 MB of RAM
 - Windows NT Workstation 4.0, Windows NT 2000 Professional, Windows XP
- Relational Database Management System (not required for standalone configurations):
 - Oracle 8.1.7 or above
 - Sybase Adaptive Server V11.5
 - Microsoft SQL Server
 - Microsoft Access

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