
SMS4DC
Spectrum Management System for Develping Countries
István Bozsóki
Head of Division
BDT/IEE/TND
INTRODUCTION
System architecture
Functions
MSIP Project
Versions
International meeting
Administrative functions
Projects
Further Reading

INTRODUCTION

ITU Spectrum Management System for Developing Countries (SMS4DC)

- SMS4DC is software designed by ITU based on ITU recommendations
- Developed to assist the administrations of developing countries to undertake their spectrum management responsibilities more effectively;
- SMS4DC covers terrestrial fixed, mobile, sound and television broadcasting services in the bands above 30 MHz, including GE-06 as well as frequency coordination of Earth stations

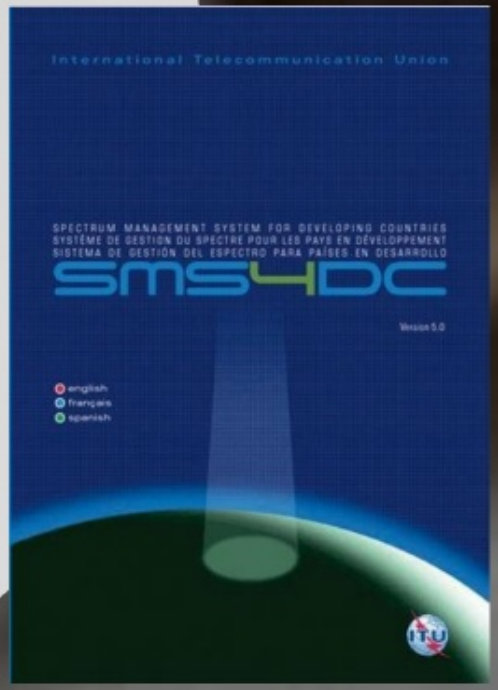
Computer aided spectrum management

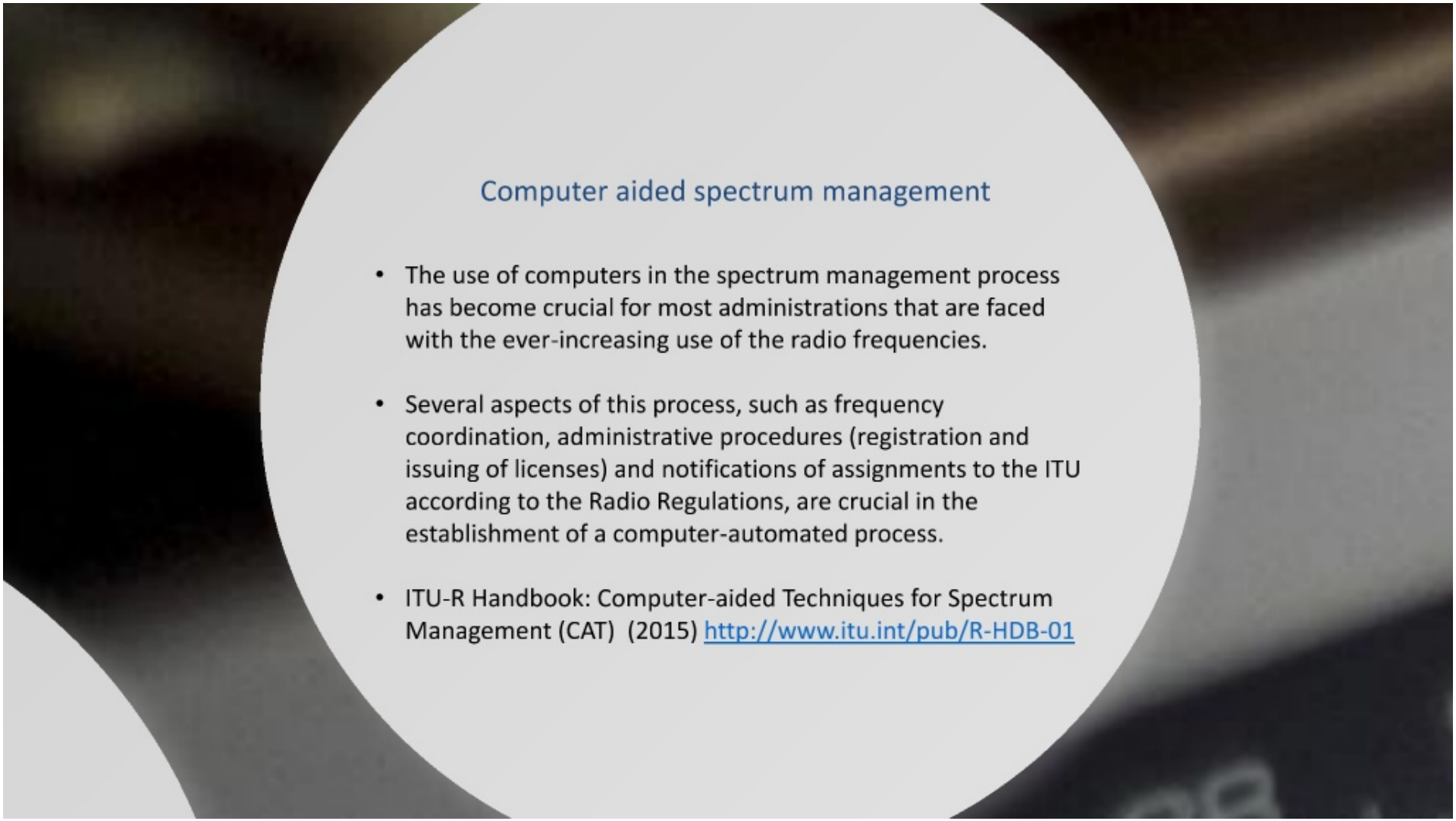
- The use of computers in the spectrum management process has become crucial for most administrations that are faced with the ever-increasing use of the radio frequencies.
- Several aspects of this process, such as frequency coordination, administrative procedures (registration and issuing of licenses) and notifications of assignments to the ITU according to the Radio Regulations, are crucial in the establishment of a computer-automated process.
- ITU-R Handbook: Computer-aided Techniques for Spectrum Management (CAT) (2015) http://www.itu.int/pub/R-HDB-01

National Spectrum Management

ITU Spectrum Management System for Developing Countries (SMS4DC)

- SMS4DC is software designed by ITU based on ITU recommendations
- Developed to assist the administrations of developing countries to undertake their spectrum management responsibilities more effectively;
- SMS4DC covers terrestrial fixed, mobile, sound and television broadcasting services in the bands above 30 MHz, including GE-06 as well as frequency coordination of Earth stations




Computer aided spectrum management
• The use of computers in the spectrum management process has become crucial for most administrations that are faced with the ever-increasing use of the radio frequencies.
• Several aspects of this process, such as frequency coordination, administrative procedures (registration and issuing of licenses) and notifications of assignments to the ITU according to the Radio Regulations, are crucial in the establishment of a computer-automated process.
• ITU-R Handbook: Computer-aided Techniques for Spectrum Management (CAT) (2015) http://www.itu.int/pub/R-HDB-01

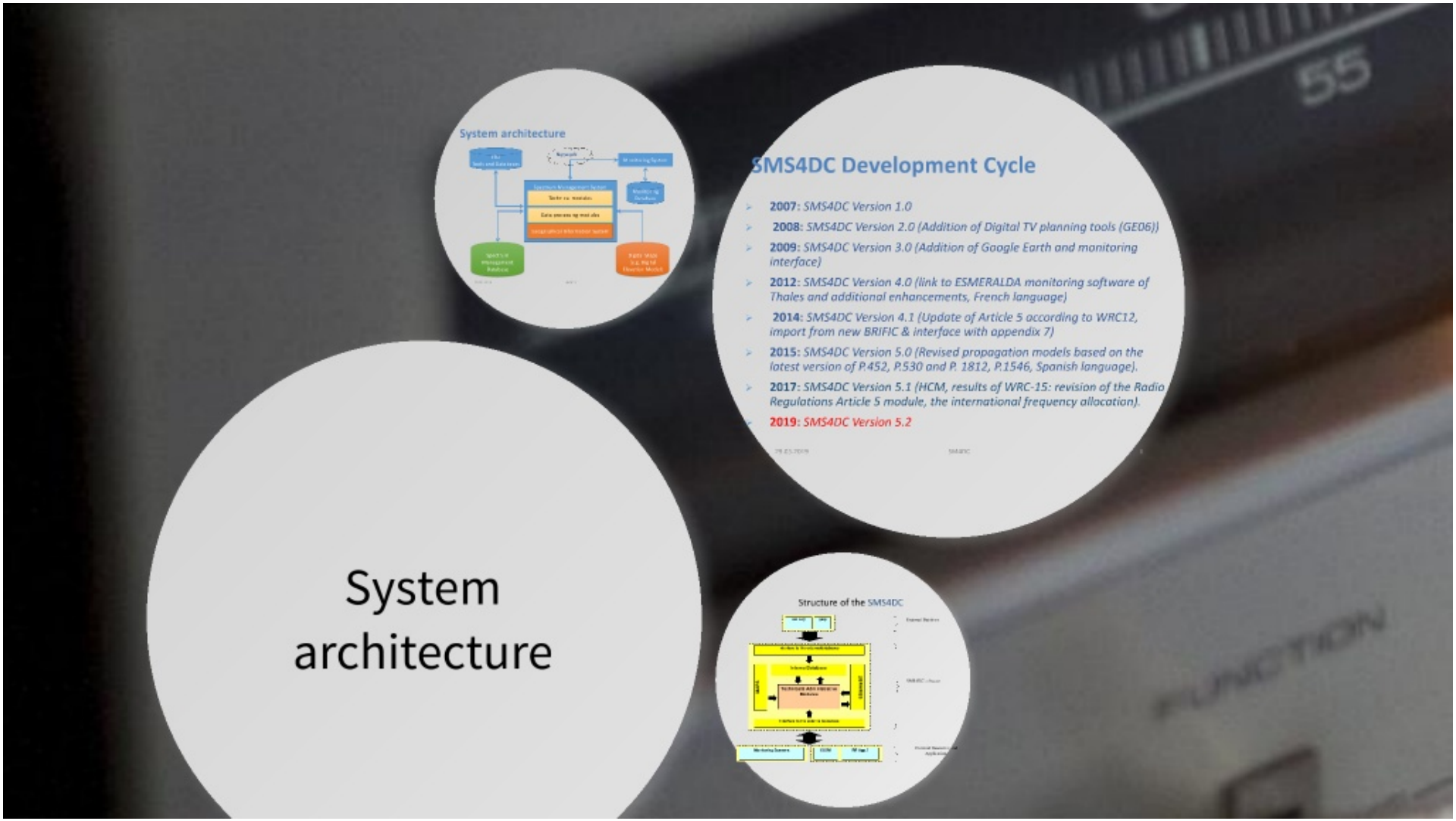
Elements of Spectrum Management

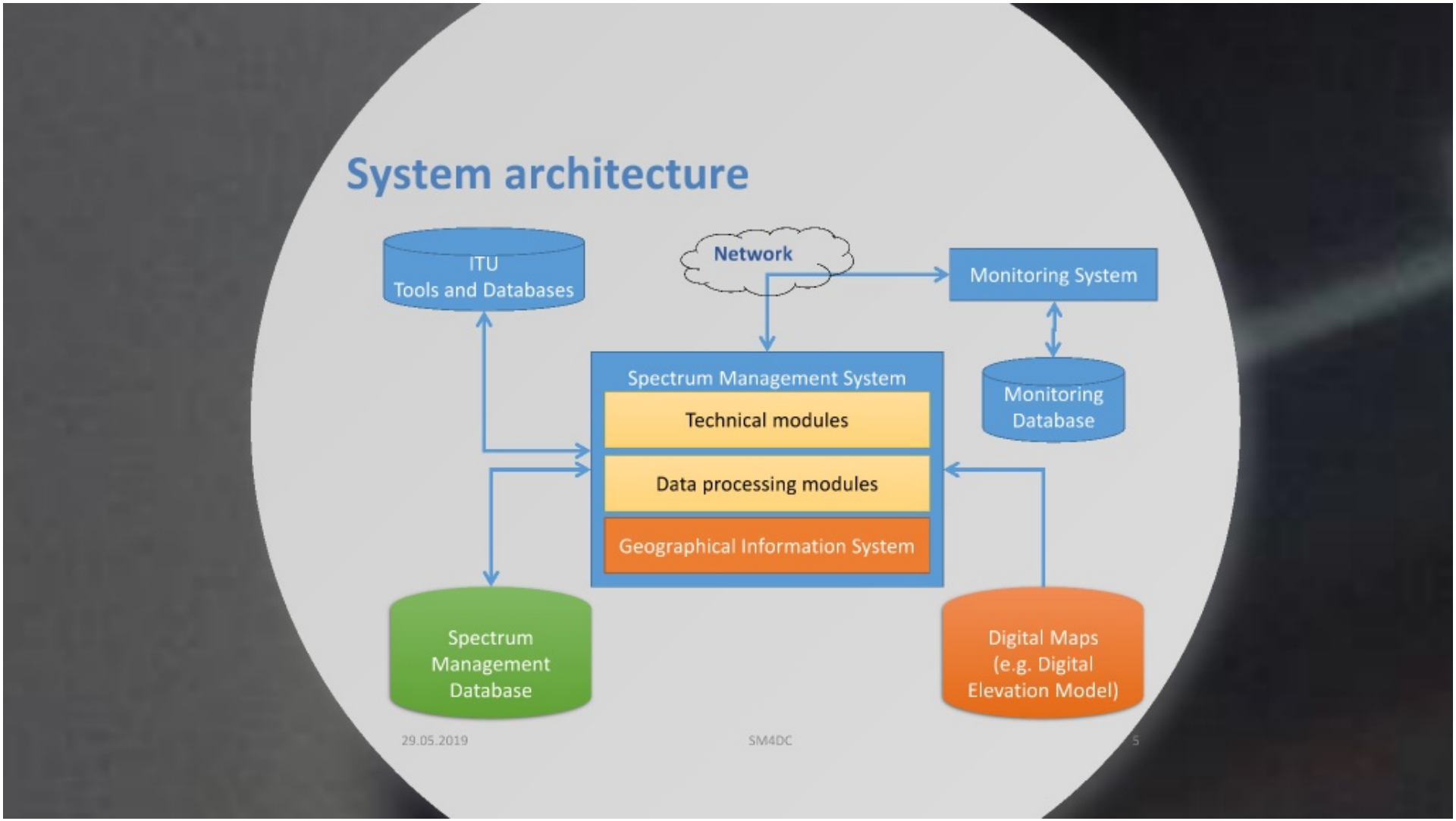
National Spectrum Management

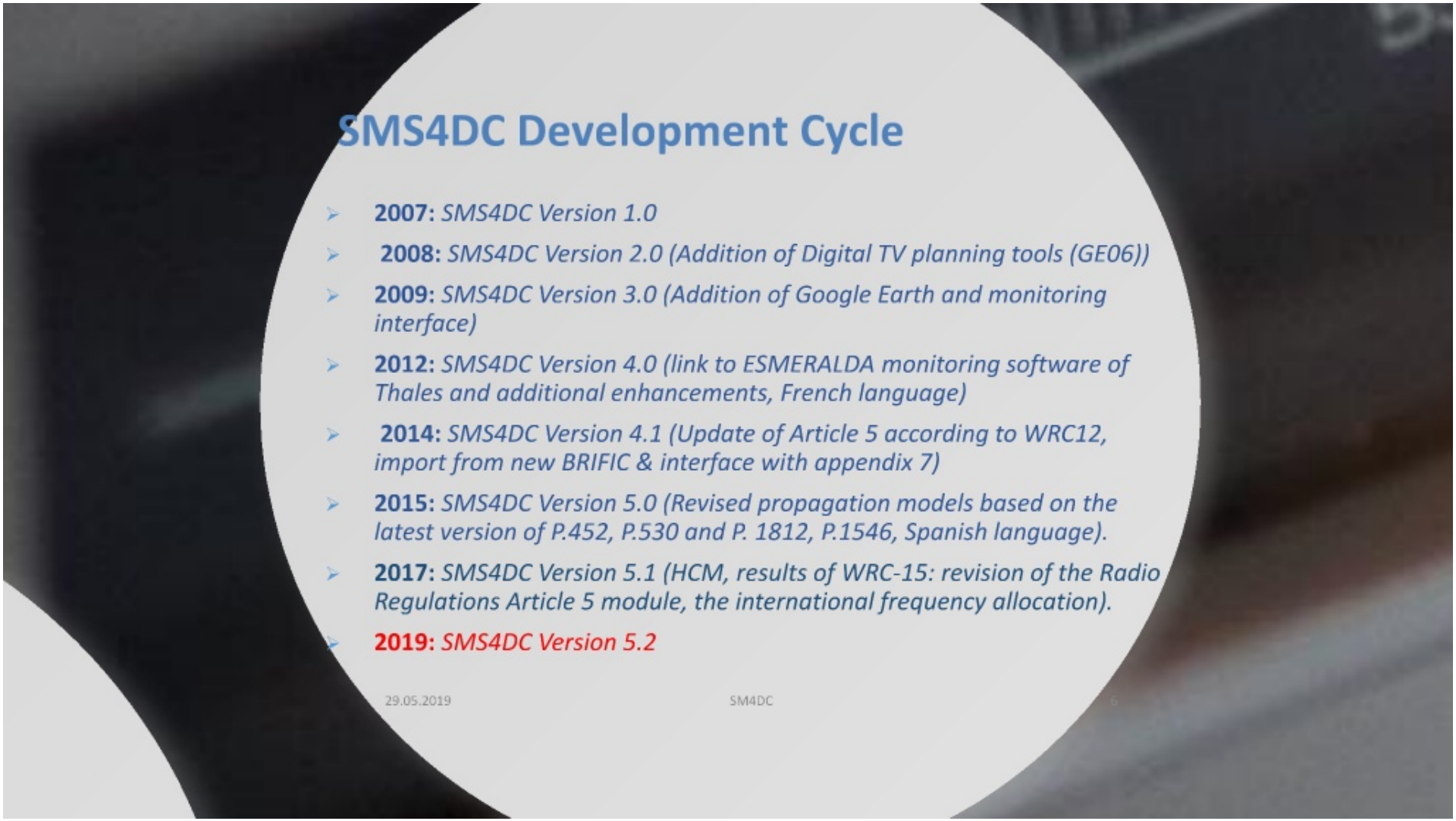
Spectrum management is a combination of administrative and technical activities for efficient utilization of spectrum by users without causing harmful interference in their service area

29.05.2019 SM4DC 4

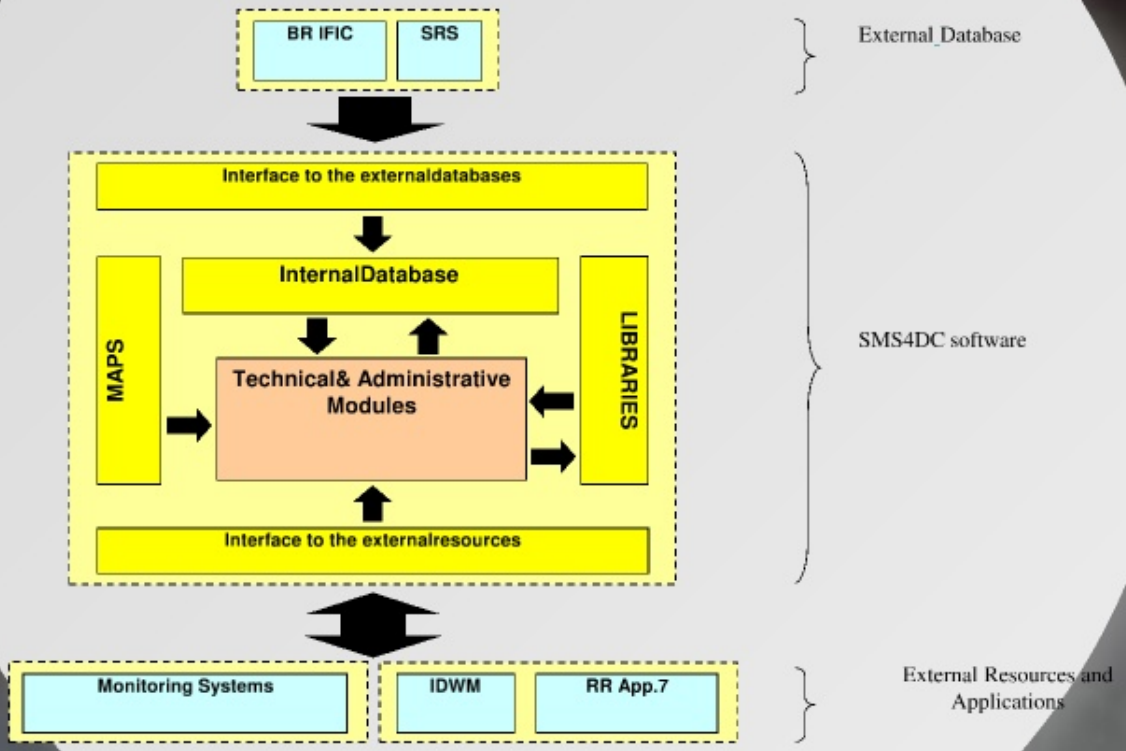

SMS4DC
Spectrum Management System for Develping Countries
István Bozsóki
Head of Division
BDT/IEE/TND
INTRODUCTION
System architecture
Functions
MSIP Project
Versions
International meeting
Administrative functions
Projects
Further Reading


System architecture
SMS4DC Development Cycle
2007: SMS4DC Version 1.0
2008: SMS4DC Version 2.0 (Addition of Digital TV planning tools (GE06))
2009: SMS4DC Version 3.0 (Addition of Google Earth and monitoring interface)
2012: SMS4DC Version 4.0 (link to ESMERALDA monitoring software of Thales and additional enhancements, French language)
2014: SMS4DC Version 4.1 (Update of Article 5 according to WRC12, import from new BRIFIC & interface with appendix 7)
2015: SMS4DC Version 5.0 (Revised propagation models based on the latest version of P.452, P.530 and P. 1812, P.1546, Spanish language).
2017: SMS4DC Version 5.1 (HCM, results of WRC-15: revision of the Radio Regulations Article 5 module, the international frequency allocation).
2019: SMS4DC Version 5.2
System architecture
Structure of the SMS4DC


System architecture
ITU
Tools and Databases
Network
Monitoring System
Monitoring
Database
Spectrum Management System
Technical modules
Data processing modules
Geographical Information System
Spectrum
Management
Database
Digital Maps
(e.g. Digital
Elevation Model)
29.05.2019
SM4DC
5

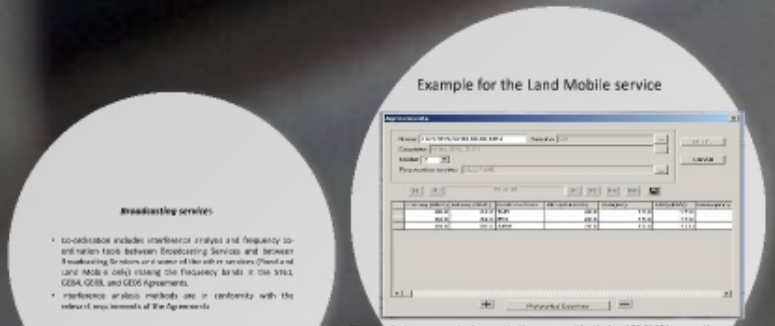

SMS4DC Development Cycle
2007: SMS4DC Version 1.0
2008: SMS4DC Version 2.0 (Addition of Digital TV planning tools (GE06))
2009: SMS4DC Version 3.0 (Addition of Google Earth and monitoring interface)
2012: SMS4DC Version 4.0 (link to ESMERALDA monitoring software of Thales and additional enhancements, French language)
2014: SMS4DC Version 4.1 (Update of Article 5 according to WRC12, import from new BRIFIC & interface with appendix 7)
2015: SMS4DC Version 5.0 (Revised propagation models based on the latest version of P.452, P.530 and P. 1812, P.1546, Spanish language).
2017: SMS4DC Version 5.1 (HCM, results of WRC-15: revision of the Radio Regulations Article 5 module, the international frequency allocation).
2019: SMS4DC Version 5.2
29.05.2019
SM4DC

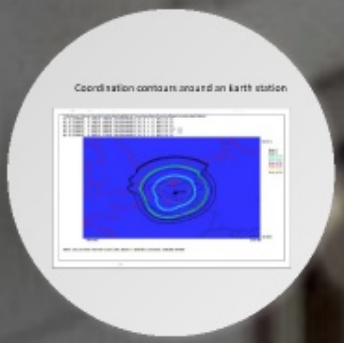
Structure of the SMS4DC



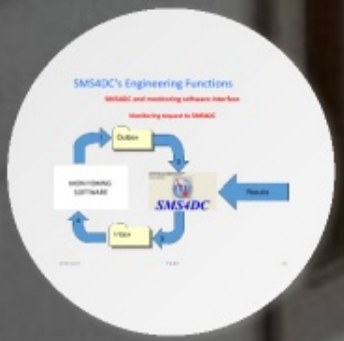

SMS4DC
Spectrum Management System for Develping Countries
István Bozsóki
Head of Division
BDT/IEE/TND
INTRODUCTION
System architecture
Functions
MSIP Project
Versions
International meeting
Administrative functions
Projects
Further Reading

Functions


Example for the Land Mobile service


Coordination contours around an Earth station

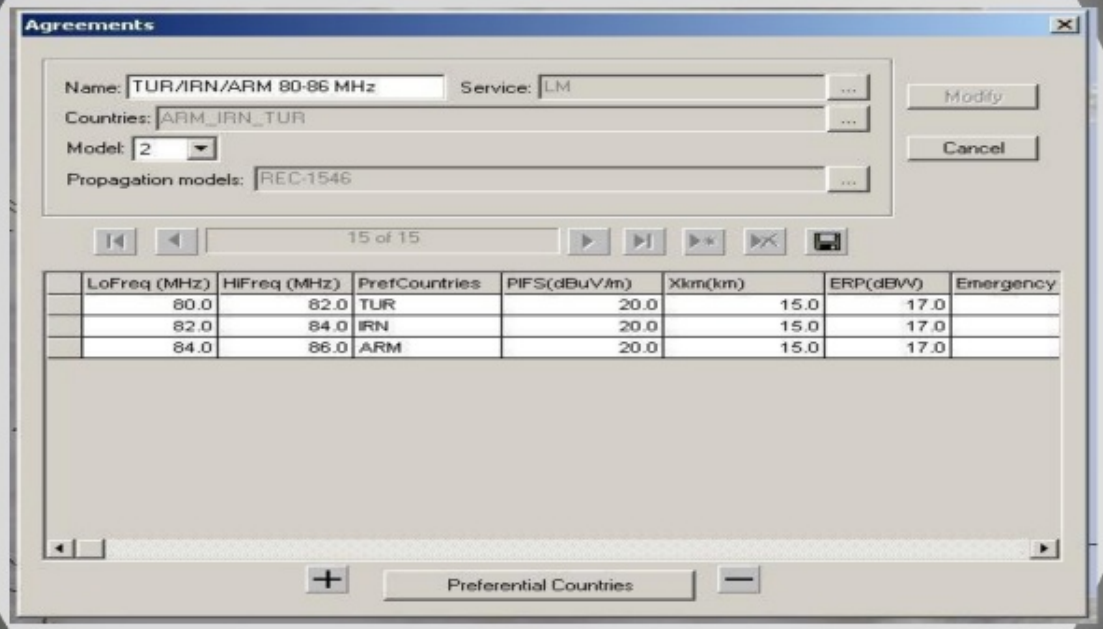

SMS4DC's Engineering Functions


SMS4DC's Engineering Functions
SMS4DC

Broadcasting services

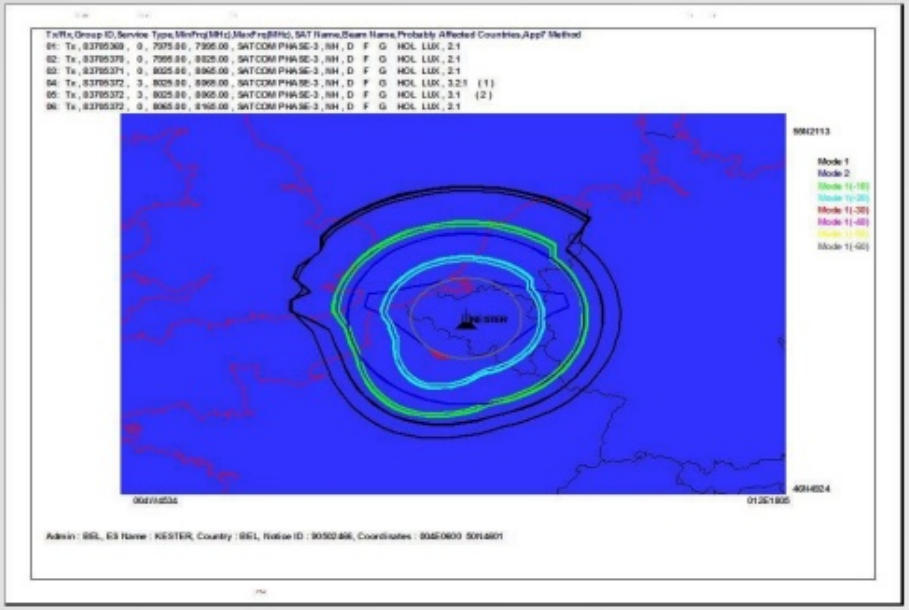
- Co-ordination includes interference analysis and frequency co-ordination tools between Broadcasting Services and between Broadcasting Services and some of the other services (Fixed and Land Mobile only) sharing the frequency bands in the ST61, GE84, GE89, and GE06 Agreements.
- Interference analysis methods are in conformity with the relevant requirements of the Agreements

Example for the Land Mobile service



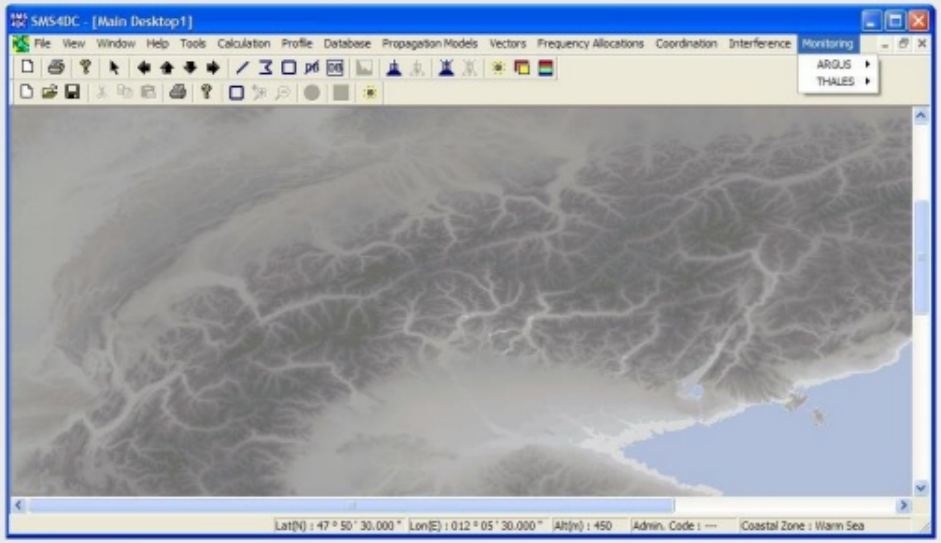
The example shows a cross border coordination agreement for the band 80-86 MHz among three administrations. Three sub-bands are established, one for each country, giving preferential assignment rights. The limits of the preferential rights are 20 dbuV/m measured at 15 km across the border. For coordination of receivers, a reference transmitter with e.r.p. of 17 dBW is used.

Coordination contours around an Earth station

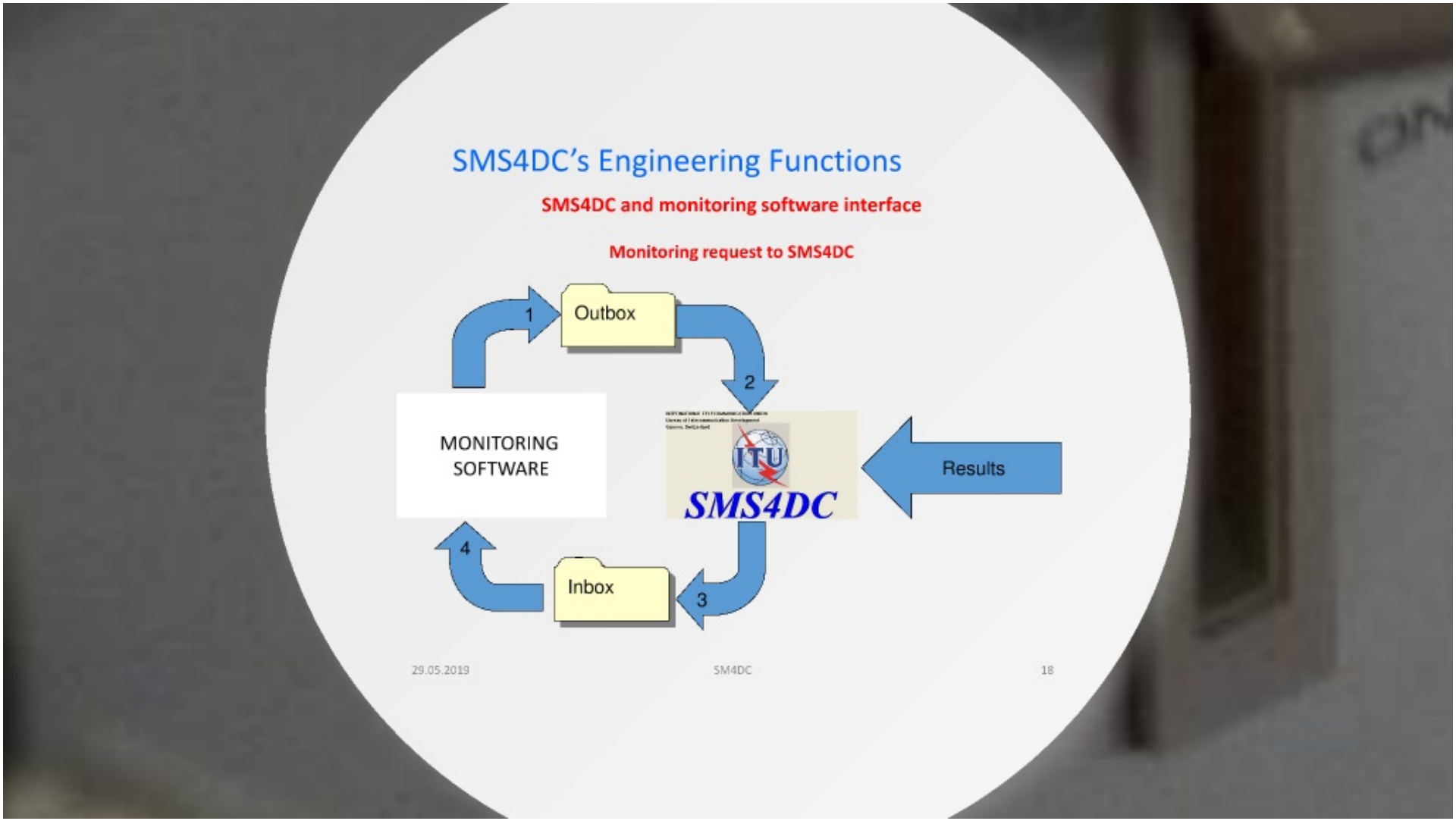


SMS4DC's Engineering Functions

SMS4DC and monitoring software interface



29.05.2019 SM4DC 17


SMS4DC's Engineering Functions
SMS4DC and monitoring software interface
Monitoring request to SMS4DC
1
Outbox
2
MONITORING SOFTWARE
ITU
SMS4DC
Results
4
Inbox
3
29.05.2019
SM4DC
18


SMS4DC
Spectrum Management System for Develping Countries
István Bozsóki
Head of Division
BDT/IEE/TND
INTRODUCTION
System architecture
Functions
MSIP Project
Versions
International meeting
Administrative functions
Projects
Further Reading


MSIP Project
MSIP (Republic of Korea) and ITU project
V5 released at the end of 2015
Adding propagation models based on the latest version of
P.452(-16), Prediction procedure for the evaluation of interference between stations on the surface of the Earth at frequencies above about 0.1 GHz
P.530(-16), Propagation data and prediction methods required for the design of terrestrial line-of-sight systems
P.1546 (-5) (Method for point-to-area prediction for terrestrial services in frequency range 30 MHz to 3000 MHz)
P. 1812 (-4) (A path specific propagation prediction method for point-to-area terrestrial services in VHF and UHF bands);
Intermodulation: calculating interference caused by intermodulation products up to 7th order by using ITU-R SM1134-1 and other resources
General interface between SMS4DC and monitoring software (based on the guidelines prepared for and presented to ITU-R WP1C of the SG1)
Further development of built-in and user specified administrative reports;
Preparation of a general method to import data to SMS4DC
Spanish language added
Preparation of time limited version as a demo tool which can be used for introduction of SMS4DC;
Preparation of the training material for assisting self-learning training of the software.
Train-the-trainer workshop 24 November-2 December 2106, Addis, for around 10 new trainers (English, French and Arabic speaking), in close cooperation with the AHI office

MSIP (Republic of Korea) and ITU project

V5 released at the end of 2015

- Adding propagation models based on the latest version of
  - P.452(-16), Prediction procedure for the evaluation of interference between stations on the surface of the Earth at frequencies above about 0.1 GHz
  - P.530(-16), Propagation data and prediction methods required for the design of terrestrial line-of-sight systems
  - P.1546 (-5) (Method for point to area prediction for terrestrial services in frequency range 30 MHz to 3000 MHz)
  - P. 1812 (-4) (A path specific propagation prediction method for point-to-area terrestrial services in VHF and UHF bands);
- Intermodulation: calculating interference caused by intermodulation products up to 7th order by using ITU-R SM1134-1 and other resources
- General interface between SMS4DC and monitoring software (based on the guidelines prepared for and presented to ITU-R WP1C of the SG1)
- Further development of built-in and user specified administrative reports;
- Preparation of a general method to import data to SMS4DC
- Spanish language added
- Preparation of time limited version as a demo tool which can be used for introduction of SMS4DC;
- Preparation of the training material for assisting self-learning training of the software.
- Train-the-trainer workshop 24 November-2 December 2106, Addis, for around 10 new trainers (English, French and Arabic speaking), in close cooperation with the AFR office


SMS4DC
Spectrum Management System for Develping Countries
István Bozsóki
Head of Division
BDT/IEE/TND
INTRODUCTION
System architecture
Functions
MSIP Project
Versions
International meeting
Administrative functions
Projects
Further Reading

Versions

Version 5.1

- V5.1 of SMS4DC released in 2017 (3rd Quarter)
  - Inclusion of Harmonised Calculation Method (HCM);
  - Implementation of the WRC-15 results

Overview

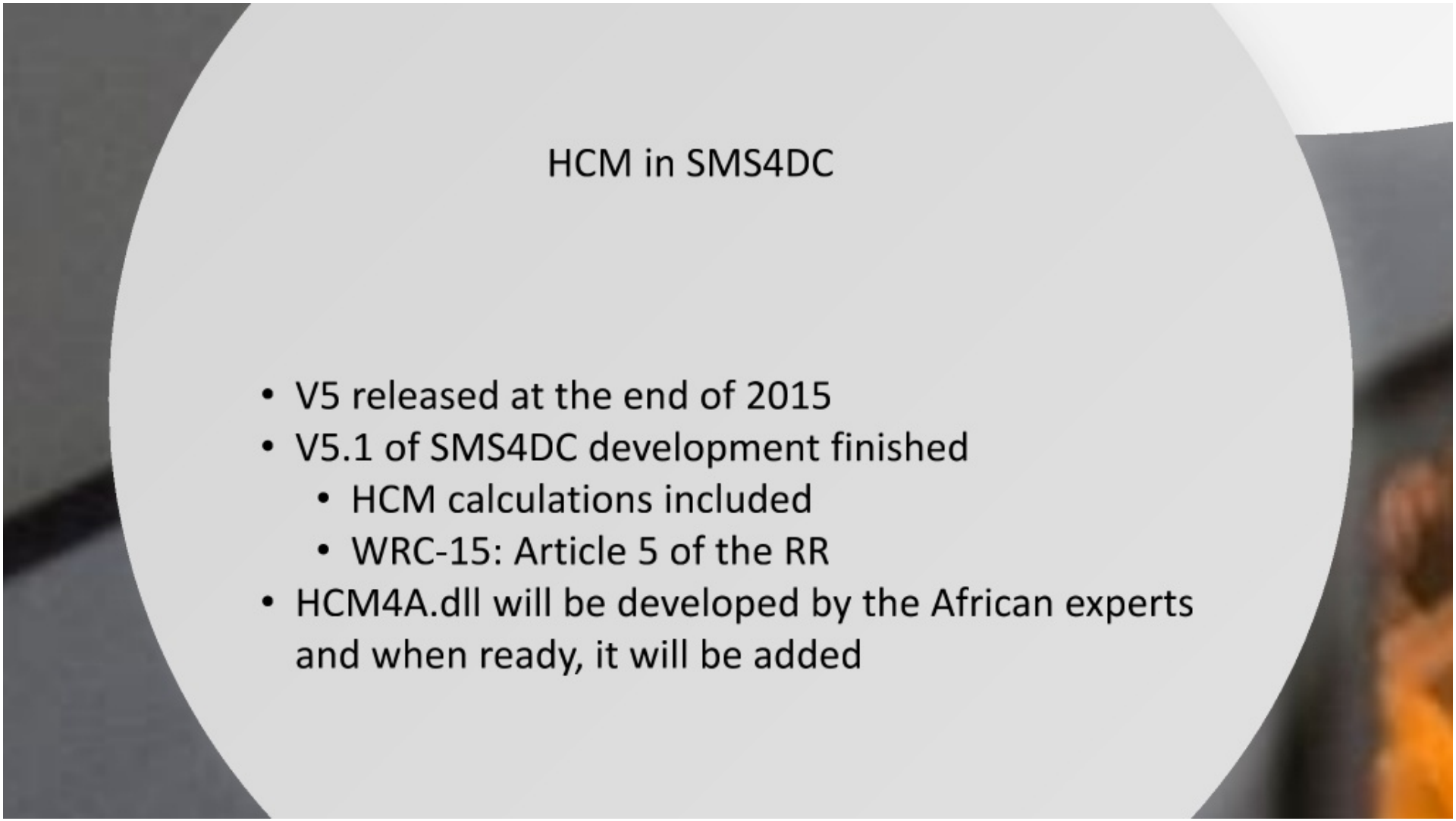
In order to further develop the tool, it is necessary to collect the opinions and expectations of users and potential users. To this end, the meeting will be organized with the following aims:
•summarizing why computerized spectrum management is required;
•analysing the main functions of the SMS4DC;
•proposing further developments;
•understanding the needs, proposals and experiences of targeted users in order to meet their requirements.
The meeting will focus on:
•highlighting the main functions and structure of spectrum management organization and necessary information for efficient spectrum management;
•the role of computer-aided spectrum management;
•overview of the SMS4DC, including its structure, main features and different functions;
•practical examples;
•country presentations from SMS4DC users: how to use the tool and description of their experiences;
•requirements, needs, proposals and remarks for further developing the tool.

HCM in SMS4DC

- V5 released at the end of 2015
- V5.1 of SMS4DC development finished
  - HCM calculations included
  - WRC-15: Article 5 of the RR
- HCM4A.dll will be developed by the African experts and when ready, it will be added

Version 5.1

- V5.1 of SMS4DC released in 2017 (3rd Quarter)
  - Inclusion of Harmonised Calculation Method (HCM);
  - Implementation of the WRC-15 results


HCM in SMS4DC
• V5 released at the end of 2015
• V5.1 of SMS4DC development finished
• HCM calculations included
• WRC-15: Article 5 of the RR
• HCM4A.dll will be developed by the African experts and when ready, it will be added

International Meeting of SMS4DC Users

http://www.itu.int/en/ITU-D/Spectrum-Broadcasting/Pages/International-SMS4DC-Users-Meeting_Geneva_December16.aspx

Overview

In order to further develop the tool, it is necessary to collect the opinions and expectations of users and potential users. To this end, the meeting will be organized with the following aims:

- summarizing why computerized spectrum management is required;
- analysing the main functions of the SMS4DC;
- proposing further developments;
- understanding the needs, proposals and experiences of targeted users in order to meet their requirements.

The meeting will focus on:

- highlighting the main functions and structure of spectrum management organization and necessary information for efficient spectrum management;
- the role of computer-aided spectrum management;
- overview of the SMS4DC, including its structure, main features and different functions;
- practical examples;
- country presentations from SMS4DC users: how to use the tool and description of their experiences;
- requirements, needs, proposals and remarks for further developing the tool.


SMS4DC
Spectrum Management System for Develping Countries
István Bozsóki
Head of Division
BDT/IEE/TND
INTRODUCTION
System architecture
Functions
MSIP Project
Versions
International meeting
Administrative functions
Projects
Further Reading

International meeting

SMS4DC subscriptions before the Workshop

Participants

Around 40 participants (registered 50) from 15 countries.

Presentations: 3 BDT, R&S, ITU Sales, experience of a trainer

Country presentations: Hungary, Switzerland (including HCM), Burundi, Colombia, Myanmar, Sudan

Oral presentations: Timor Leste, Bhutan, Cameroon, PNG, 15

Comments by e-mail: experiences of Pacific Islands

Participants

Participating countries/entities of the Workshop: Afghanistan, Albania, Bhutan, Burkina Faso, Burundi, Cameroon, Chad, Cuba, Djibouti, Egypt, Haiti, Hungary, Lao PDR, Libya, Mali, Moldova, Mongolia, Myanmar, Switzerland, Timor-Leste, Togo, Senegal, Germany, Colombia, Sudan

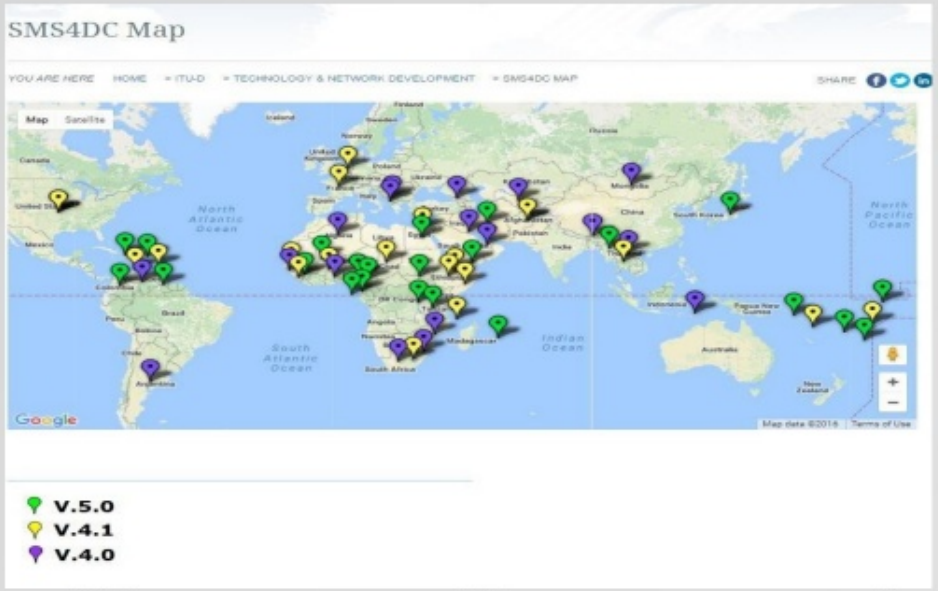
Final conclusions

The participants expressed their view on the usefulness of the software but it can be even better with some improvements. In addition they supported the idea to have this type of meeting once per year and if possible, have also regional meetings of the users.

International Meeting of SMS4DC Users

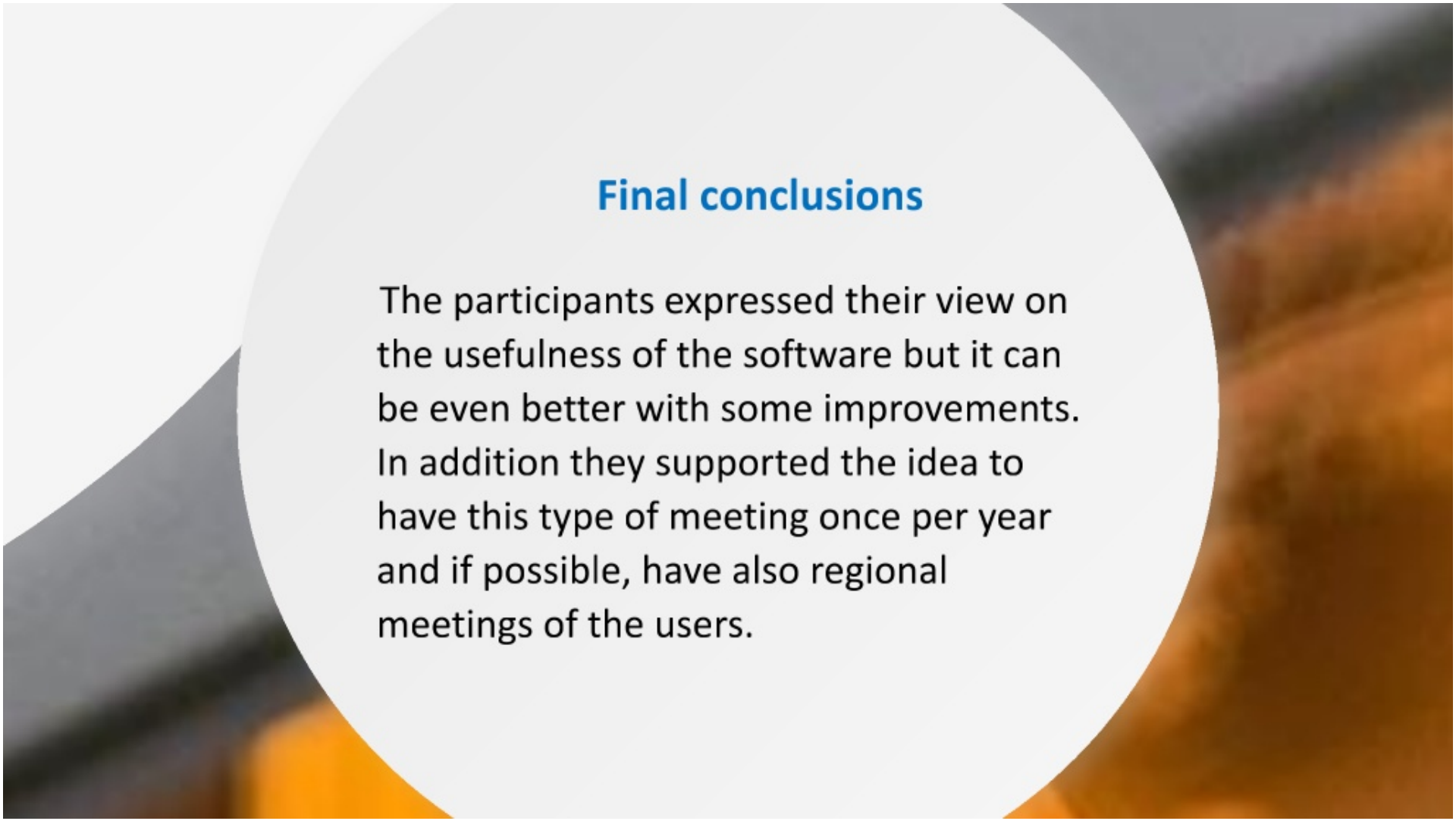
http://www.itu.int/en/ITU-D/Spectrum-Broadcasting/Pages/International-SMS4DC-Users-Meeting_Geneva_December16.aspx

SMS4DC subscriptions before the Workshop




Participants
Around 40 participants (registered 50) from 25 countries.
Presentations: 3 BDT, R&S, ITU Sales, experience of a trainer
Country presentations: Hungary, Switzerland (including HCM), Burundi, Colombia, Myanmar, Sudan
Oral presentations: Timor Leste, Bhutan, Cameroon, PNG, LS
Comments by e-mail: experiences of Pacific Islands

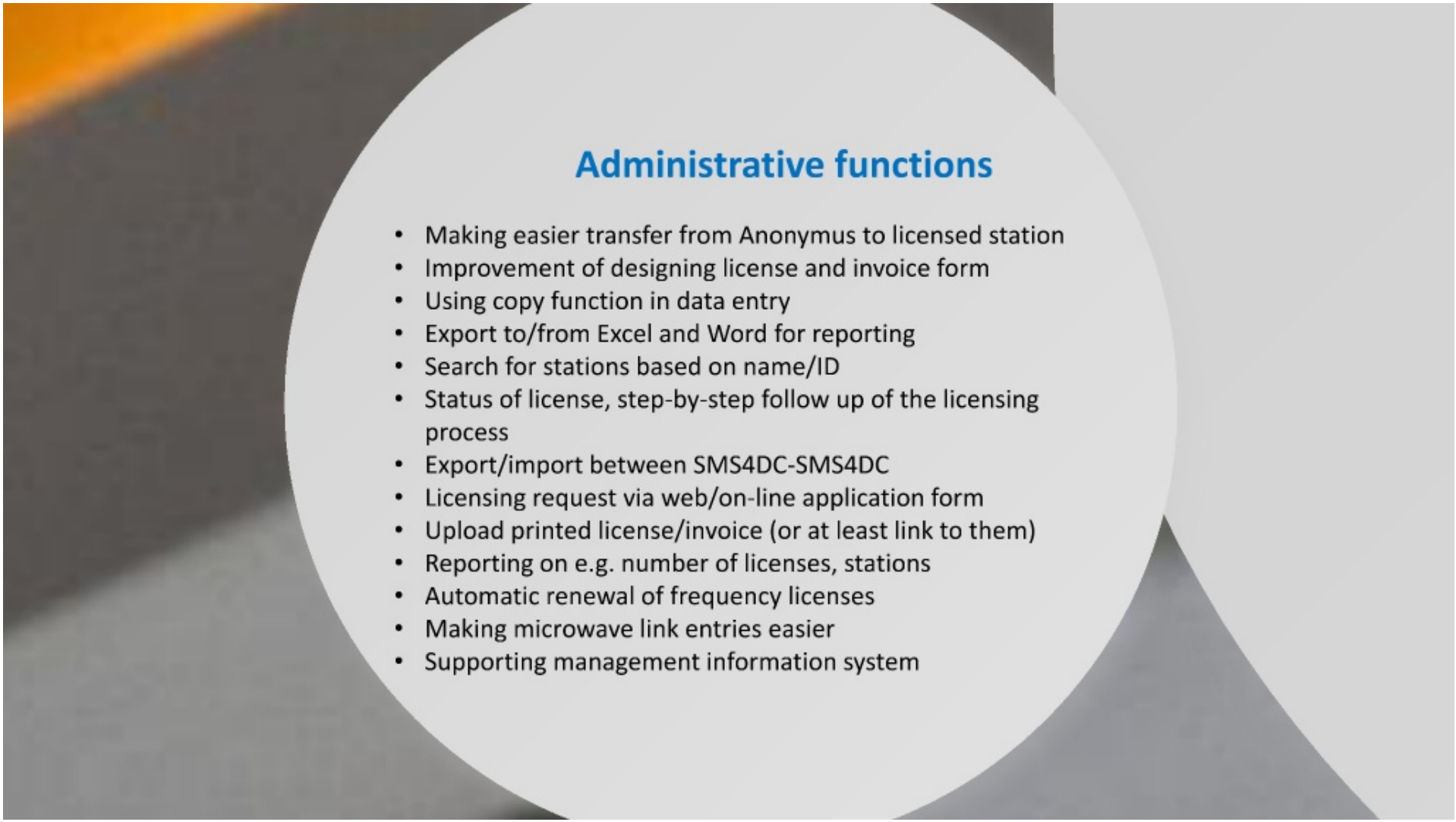

Participants
Participating countries/entities of the Workshop:
Afghanistan, Albania, Bhutan, Burkina Faso, Burundi,
Cameroon, Chad, Cuba, Djibouti, Egypt, Haiti, Hungary,
Lao PDR, Libya, Mali, Moldova, Mongolia, Myanmar,
Switzerland, Timor-Leste, Togo, Senegal, Germany,
Colombia, Sudan

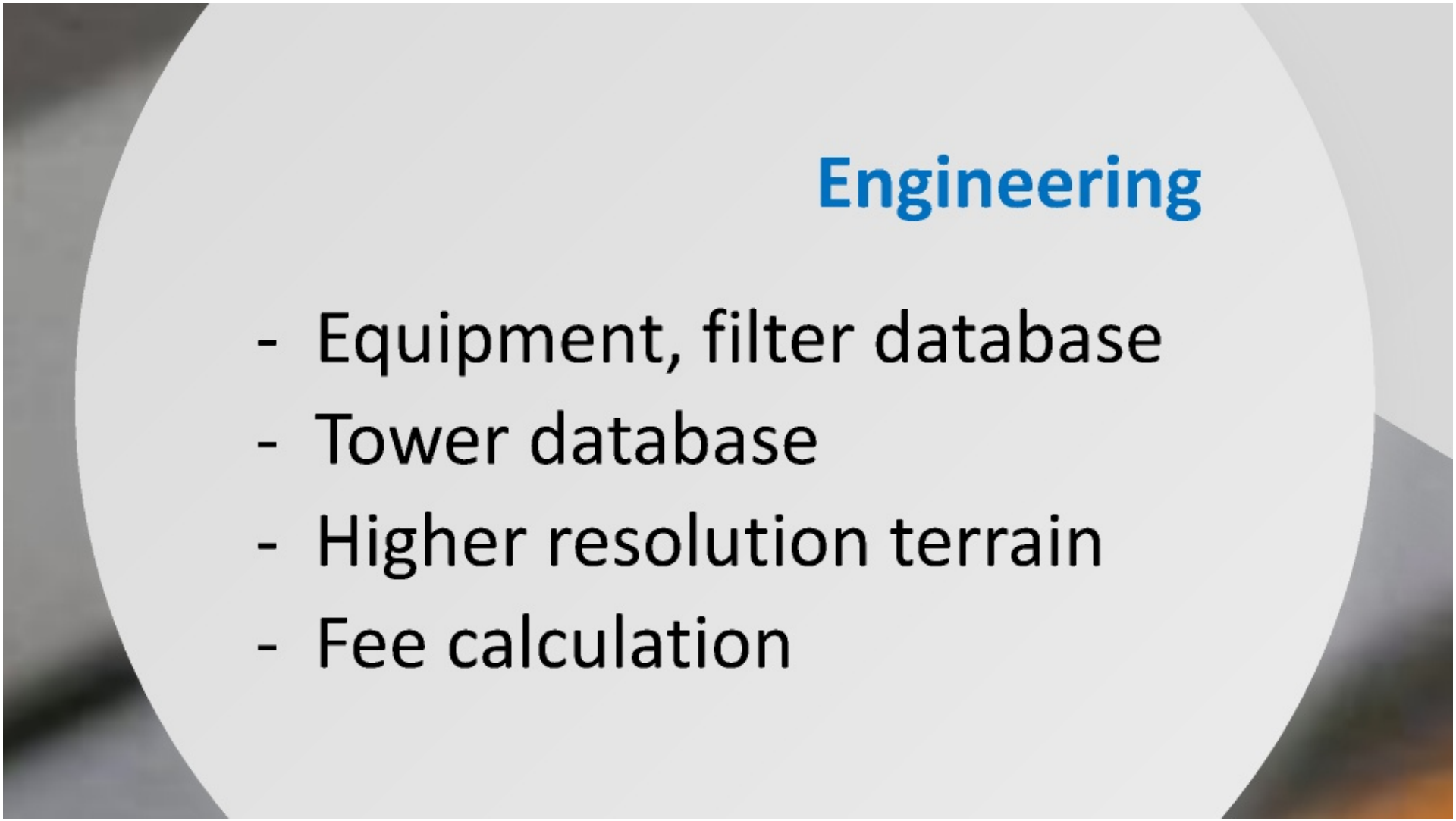

Final conclusions
The participants expressed their view on the usefulness of the software but it can be even better with some improvements. In addition they supported the idea to have this type of meeting once per year and if possible, have also regional meetings of the users.


SMS4DC
Spectrum Management System for Develping Countries
István Bozsóki
Head of Division
BDT/IEE/TND
INTRODUCTION
System architecture
Functions
MSIP Project
Versions
International meeting
Administrative functions
Projects
Further Reading

Administrative functions


Proposals for improvements, additions
• Administrative functions
• Engineering
• Graphical
• Training
• Support
• Software
• Promotion


Administrative functions
• Making easier transfer from Anonymus to licensed station
• Improvement of designing license and invoice form
• Using copy function in data entry
• Export to/from Excel and Word for reporting
• Search for stations based on name/ID
• Status of license, step-by-step follow up of the licensing process
• Export/import between SMS4DC-SMS4DC
• Licensing request via web/on-line application form
• Upload printed license/invoice (or at least link to them)
• Reporting on e.g. number of licenses, stations
• Automatic renewal of frequency licenses
• Making microwave link entries easier
• Supporting management information system


Engineering
- Equipment, filter database
- Tower database
- Higher resolution terrain
- Fee calculation

Graphical

- Revise the graphical interface
- Icons to add/move/remove stations
- Frequency allocation chart

Training

- Preliminary questionnaire to participants
- Preparing more training materials
- Background presentations, video on the functions
- More spectrum management training is required
- Training curriculum
- Starting/tutorial/basic information
- Training on You Tube
- Modular trainings (e.g. engineering/data entry/licensing)
- Small demo on the functions for a smaller area

Support

- Ticketing for help request
- Web/online support
- FAQ
- Forum for users and forum for developers

Software

- Checking other operational system than Windows
- Mobile/tablet application
- Pre-defined workflow (like e.g. in the Executive overview)
- Modular utilization
- Checking the possibility of other solution than dongle for authorized utilization

Promotion

- Presentations during workshops
- Web page
- During meetings of Regional Organizations
- Flyers, brochures
- Packing together with other spectrum management assistance
- Distributing information video/tutorial by a BDT Circular
- Using BRIFICs for distribution of information about SMS4DC
- Regional roadshows (1-2 days, back-to-back with other workshops)
- Presentations during WRS and RRS


SMS4DC
Spectrum Management System for Develping Countries
István Bozsóki
Head of Division
BDT/IEE/TND
INTRODUCTION
System architecture
Functions
MSIP Project
Versions
International meeting
Administrative functions
Projects
Further Reading


PIRRC project (Pacific Islands)
Projects
Additional experts for development
Republic of Korea and ITU project
Project activities
To improve administrative function and user interface for spectrum management, functions below listed should be newly made or improved:
• Improvement of designing license and invoice of fee form
• Adding copy function in data entry to avoid repeating same data
• Improvement of data export and import function to Excel, Word and other commercial software
• Adding search function for stations based on name or ID
• Export and Import data between SMS4DC – SMS4DC
• To make on-line license application possible, set up sample license web pages and link applicant's data to SMS4DC database
• Upload of printed license or invoice(pdf or jpg format) to SMS4DC database or provide a link function to the documents saved in separate place
• Macro function or simplified process for repeated similar stations' licensing
Republic of Korea and ITU project - new
For better radio communication engineering and easy work for licensing, functions below listed should be newly made or improved:
• Based on the user country's request, provision of non-commercial higher resolution(around 90 m) map based on freely available data
• Adding new database of filter, tower and other available commercial products database of radio communication equipment
• To calculate licensing fee, adding formula configuration and calculation function for licensing fee or importing formula function from other program i.e. Excel, based on the country's law and regulation
• Improving graphical user interface, i.e. add icon of linking and removing linked stations etc.
• For data protection, adding automatic back up menu to separate storage device
Republic of Korea and ITU project - new
To closely support users and exchange useful information and experiences of users
• closed on-line forum should be operated and this forum may include FAQ, bulletin board and other necessary functions for users. To facilitate this forum, the developers and experts of SMS4DC should participate in it and timely provide answers for users' questions.
Preparation of additional training materials
• Making video with e.g. recording of training classes for SMS4DC software and uploading the videos to You Tube and other sharing site for learners
• Preparation of the training videos as a multimedia DVD and releasing it for assisting self-learning users
Final approval test of the revised version of SMS4DC software package:
• Preparation of a protocol for testing and test the revised version of the SMS4DC software
• Execution of the approval test of the SMS4DC software on the basis of such test protocol, with the participation of the SMS4DC developers, experts and trainers, and ITU staff from BR and BDT

PIRRC project (Pacific Islands)

While most of the smaller islands are considering or have procured the SMS4DC systems only few have implemented it as their spectrum management system.
The problems include the lack of the basic like:

1) Absence of a national frequency allocation table;
2) Absence of resources for systematic spectrum management;
3) Lack of training.
4) All countries who have responded to the survey indicate that while they will adopt SMS4DC they need additional training and more importantly training material that would allow them to work and learn on the system with limited supervision.

The PIRRC Project will be conducting additional training in the first quarter of 2017 and will include the preparation of training aids for the users.

Direct beneficiaries of PIRRC are FSM; Kiribati; Marshall Islands; PNG; Samoa; Solomon Islands; Tonga; Tuvalu and Vanuatu.
Countries that are not are beneficiaries Cook Islands; Fiji; Nauru; Niue; Tokelau and Palau.

Purchased SMS4DC for 10 users
Provided higher resolution map (in 2018)

Republic of Korea and ITU project

Project activities

To improve **administrative function** and user interface for spectrum management, functions below listed should be newly made or improved:

- Improvement of designing license and invoice of fee form
- Adding copy function in data entry to avoid repeating same data
- Improvement of data export and import function to Excel, Word and other commercial software
- Adding search function for stations based on name or ID
- Export and Import data between SMS4DC – SMS4DC
- To make on-line license application possible, set up sample license web pages and link applicant's data to SMS4DC database
- Upload of printed license or invoice(pdf or jpg format) to SMS4DC database or provide a link function to the documents saved in separate place
- Macro function or simplified process for repeated similar stations' licensing

Republic of Korea and ITU project - new

For better radio communication **engineering** and easy work for **licensing**, functions below listed should be newly made or improved:

- Based on the user country's request, provision of non-commercial higher resolution(around 90 m) map based on freely available data
- Adding new database of filter, tower and other available commercial products database of radio communication equipment
- To calculate licensing fee, adding formula configuration and calculation function for licensing fee or importing formula function from other program i.e. Excel, based on the country's law and regulation
- Improving graphical user interface, i.e. add icon of linking and removing linked stations etc.
- For data protection, adding automatic back up menu to separate storage device

Republic of Korea and ITU project - new

To closely **support users** and **exchange useful information** and experiences of users

- closed on-line forum should be operated and this forum may include FAQ, bulletin board and other necessary functions for users. To facilitate this forum, the developers and experts of SMS4DC should participate in it and timely provide answers for users' questions.

Preparation of additional **training materials**

- Making video with e.g. recording of training classes for SMS4DC software and uploading the videos to You Tube and other sharing site for learners
- Preparation of the training videos as a multimedia DVD and releasing it for assisting self-learning users

Final approval test of the revised version of SMS4DC software package:

- Preparation of a protocol for testing and test the revised version of the SMS4DC software
- Execution of the approval test of the SMS4DC software on the basis of such test protocol, with the participation of the SMS4DC developers, experts and trainers, and ITU staff from BR and BDT

Additional experts for development

- New experts can be involved in developing stand-alone modules
- These modules will be added to the software by the existing experts
    - Example: HCM module developed by an expert from Lithuania and inserted to the SW by the present experts.


SMS4DC
Spectrum Management System for Develping Countries
István Bozsóki
Head of Division
BDT/IEE/TND
INTRODUCTION
System architecture
Functions
MSIP Project
Versions
International meeting
Administrative functions
Projects
Further Reading

For further reading:

- ITU Handbook - Computer-Aided Techniques for Spectrum Management (CAT), 2015
- ITU Handbook on National Spectrum Management, 2015
- SMS4DC 5.0 User Guide
- ITU Handbook on Spectrum Monitoring, 2011
- Recommendation ITU-R SM.1370-2 (08/2013)
  - Design guidelines for developing automated spectrum management systems
- Recommendation ITU-R SM.1537 (08/2013)
  - Automation and integration of spectrum monitoring systems with automated spectrum management
- Recommendation ITU-R SM.1604 (02/2003)
  - Guidelines for an upgraded spectrum management system for developing countries


SMS4DC
Spectrum Management System for Develping Countries
István Bozsóki
Head of Division
BDT/IEE/TND
INTRODUCTION
System architecture
Functions
MSIP Project
Versions
International meeting
Administrative functions
Projects
Further Reading


THANK YOU
Istvan Bozsoki
Head Telecommunciation Networks and
Spectrum Management


SMS4DC
Spectrum Management System for Develping Countries
István Bozsóki
Head of Division
BDT/IEE/TND
INTRODUCTION
System architecture
Functions
MSIP Project
Versions
International meeting
Administrative functions
Projects
Further Reading