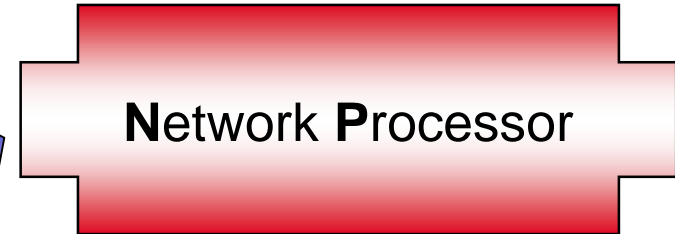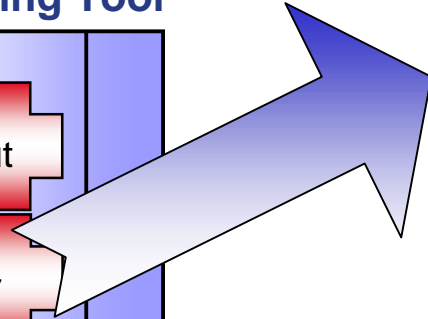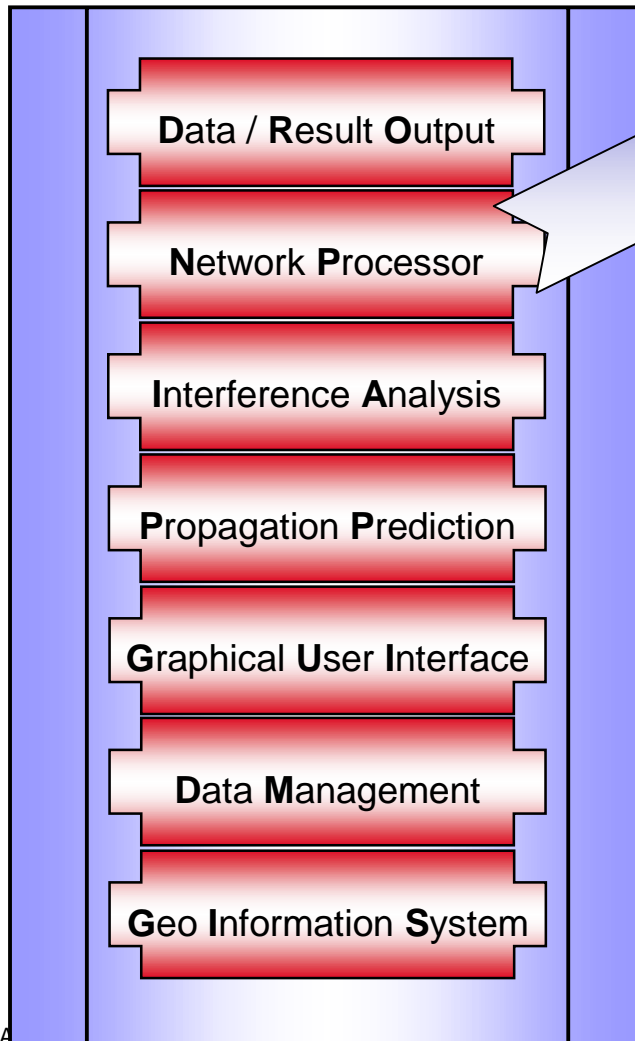**Session 5.9**

Supporting Network Planning Tools III

Roland Götz
LS telcom AG / Spectrocan

Radio Network Planning Tool

Network **P**rocessor
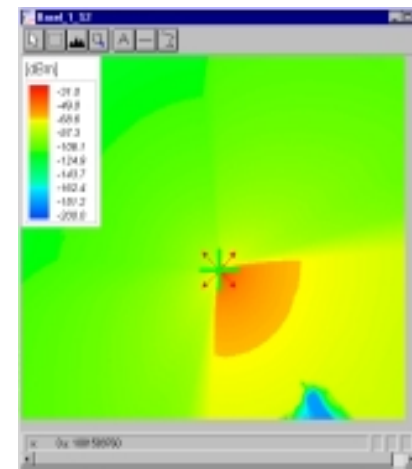
- **D**ata / **R**esult **O**utput
- **N**etwork **P**rocessor
- **I**nterference **A**nalysis
- **P**ropagation **P**rediction
- **G**raphical **U**ser **I**nterface
- **D**ata **M**anagement
- **G**eo **I**nformation **S**ystem

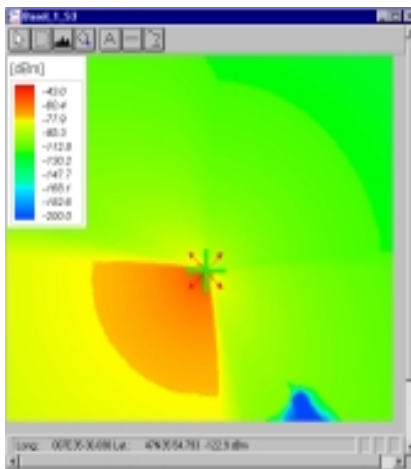**Network Planning Tools**
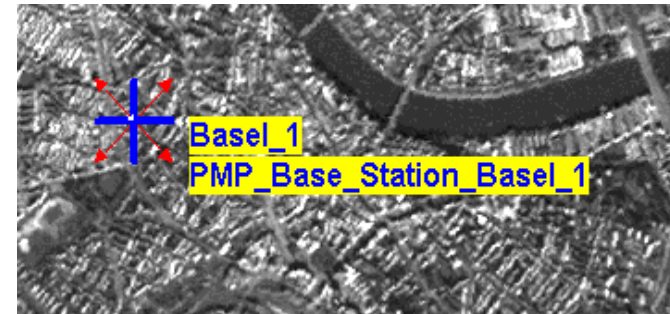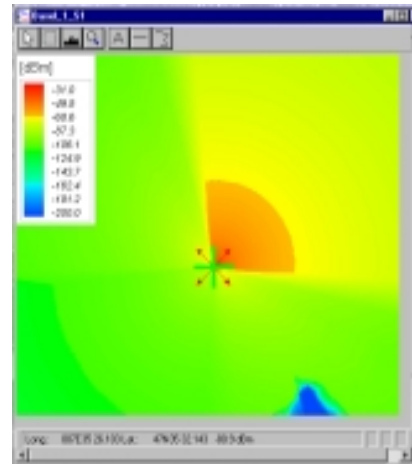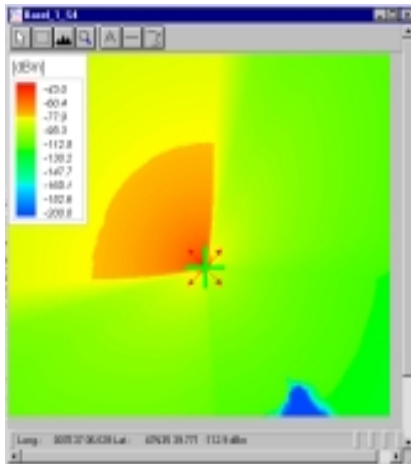
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The Network Processor

- **produces network-wide results out of the single-cell-based results**
- **allows to analyse the radio network**
- **allows to simulate changes of the network parameter**
- **allows to simulate changes of the network design**
- **allows to optimise the radio network**
- **allows to plan the future roll-out phases**
- **produces statistics on the selected results**

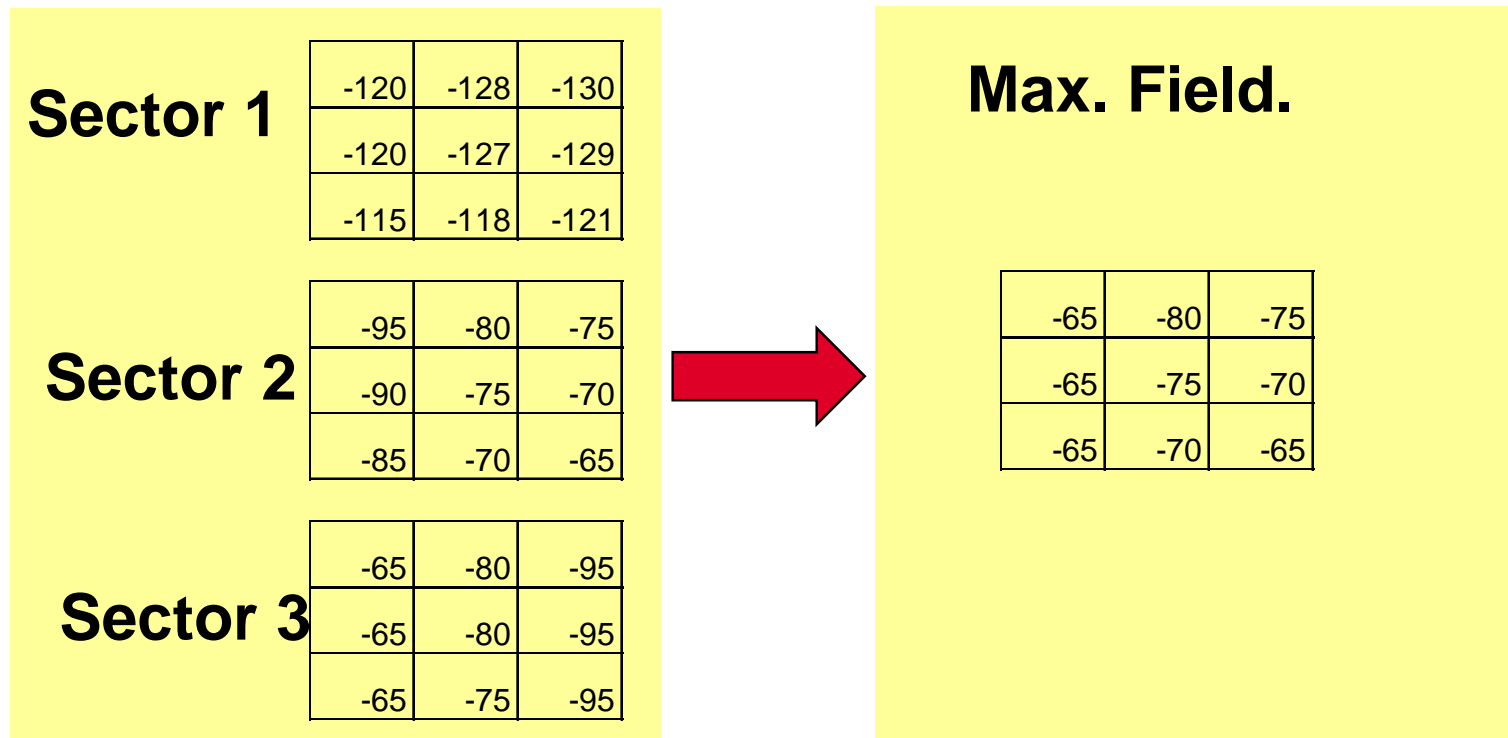**Each Service needs an own service-specific Network Processor**

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Network **P**rocessor

Supporting Network Planning Tools

Spectrocan

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Network **P**rocessor

Principle of calculation:

Combination of different single results

Result for *BS 1*

Result *for BS 2*

Result for *BS 3*

Combined *result*
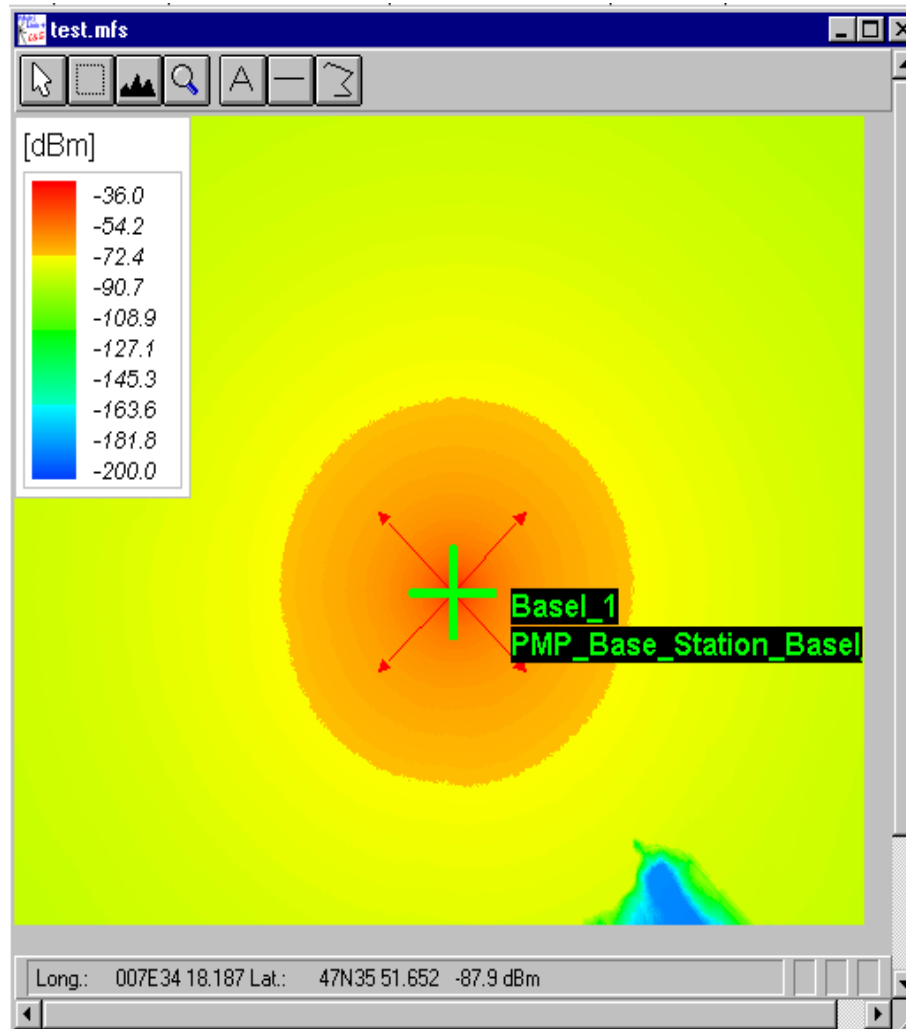
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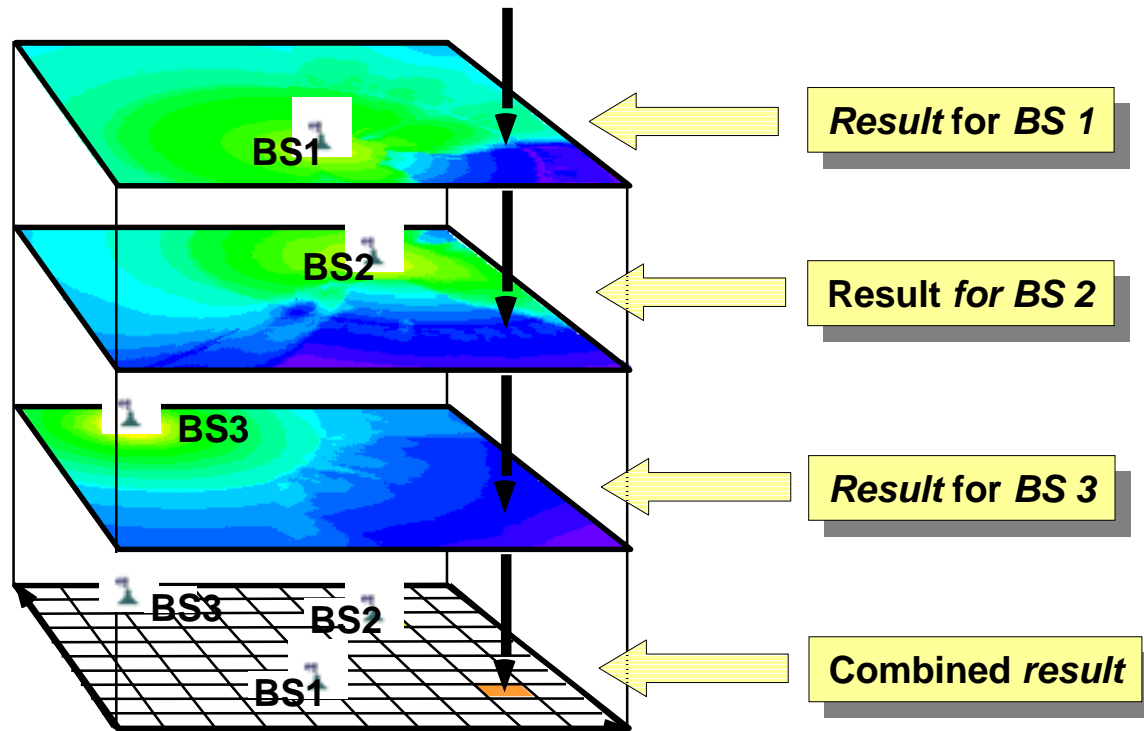
Network **P**rocessor

Maximum Field Strength:

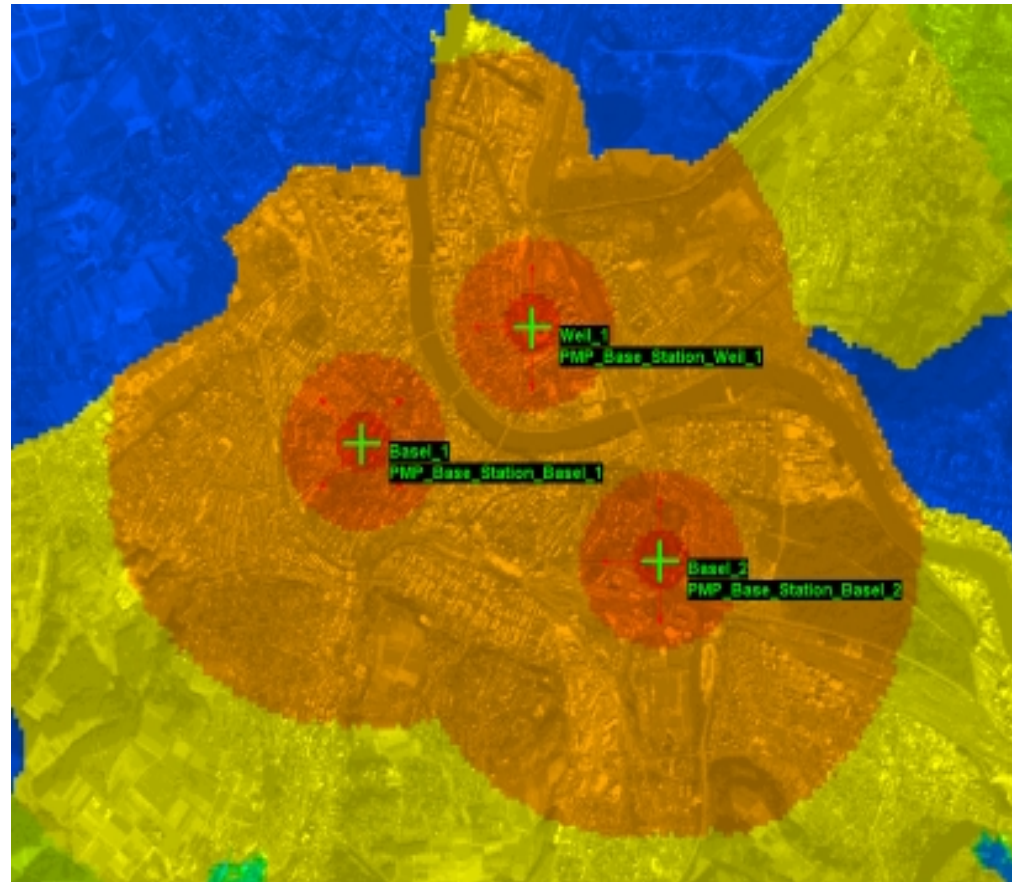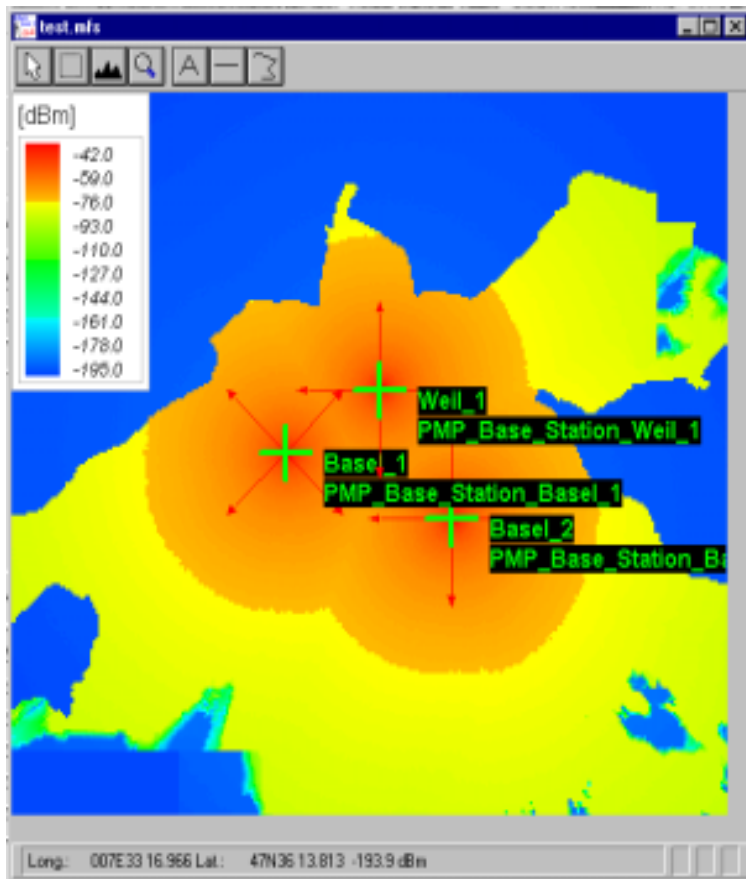For every pixel, this plot shows the signal level of the cell/transmitter producing the maximum single field strength.

Sector 1

-120	-128	-130
-120	-127	-129
-115	-118	-121

Sector 2

-95	-80	-75
-90	-75	-70
-85	-70	-65

Sector 3

-65	-80	-95
-65	-80	-95
-65	-75	-95

Max. Field.

-65	-80	-75
-65	-75	-70
-65	-70	-65

Maximum Field Strength

Network **P**rocessor

Supporting Network Planning Tools

Network Processor

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Network Processor

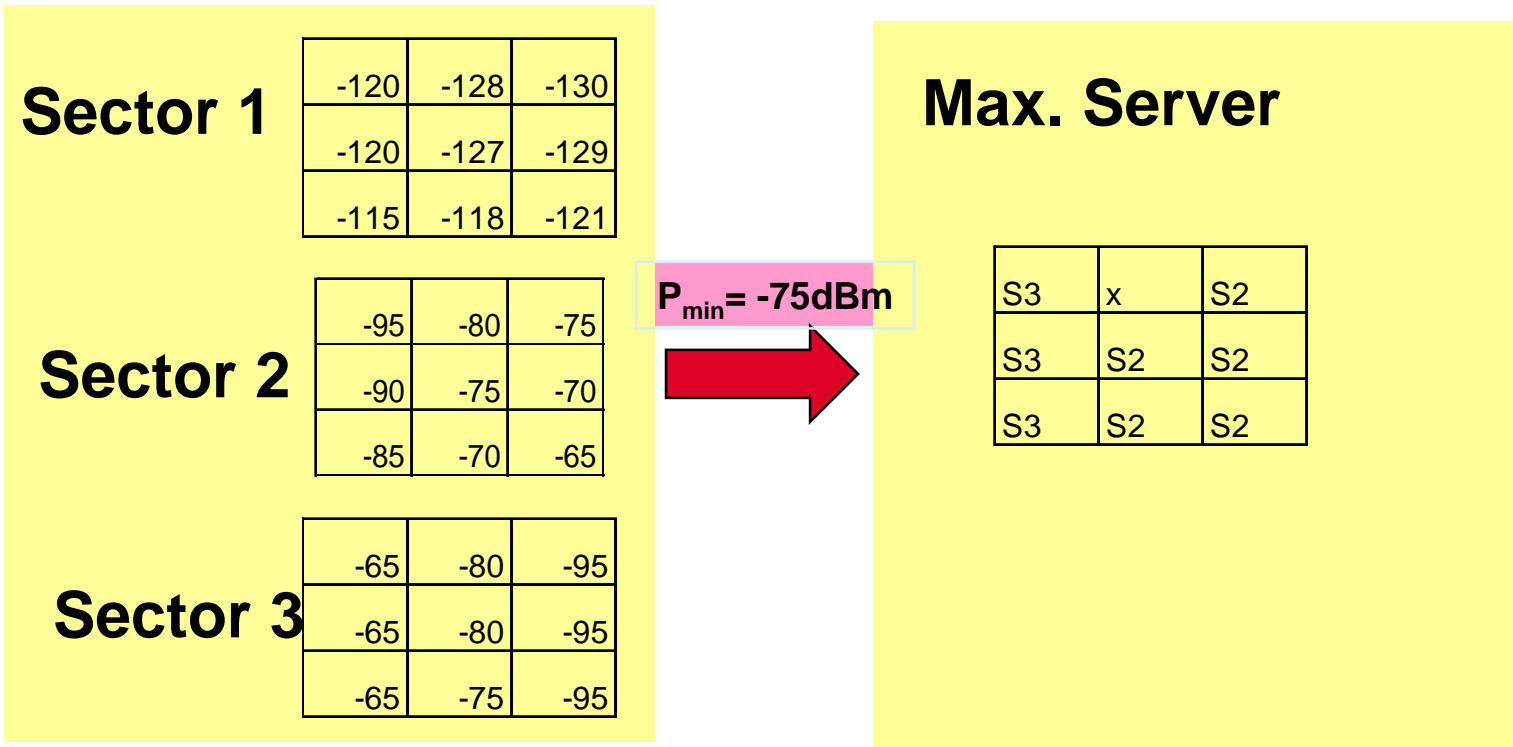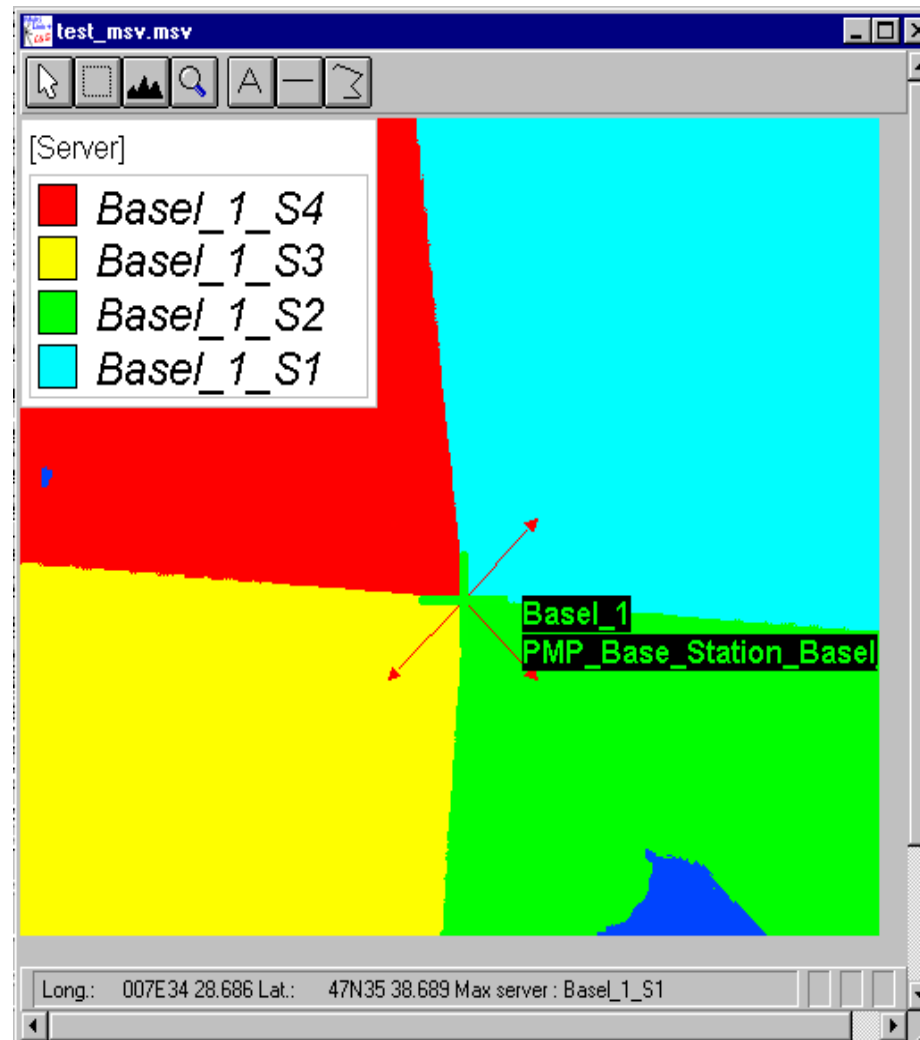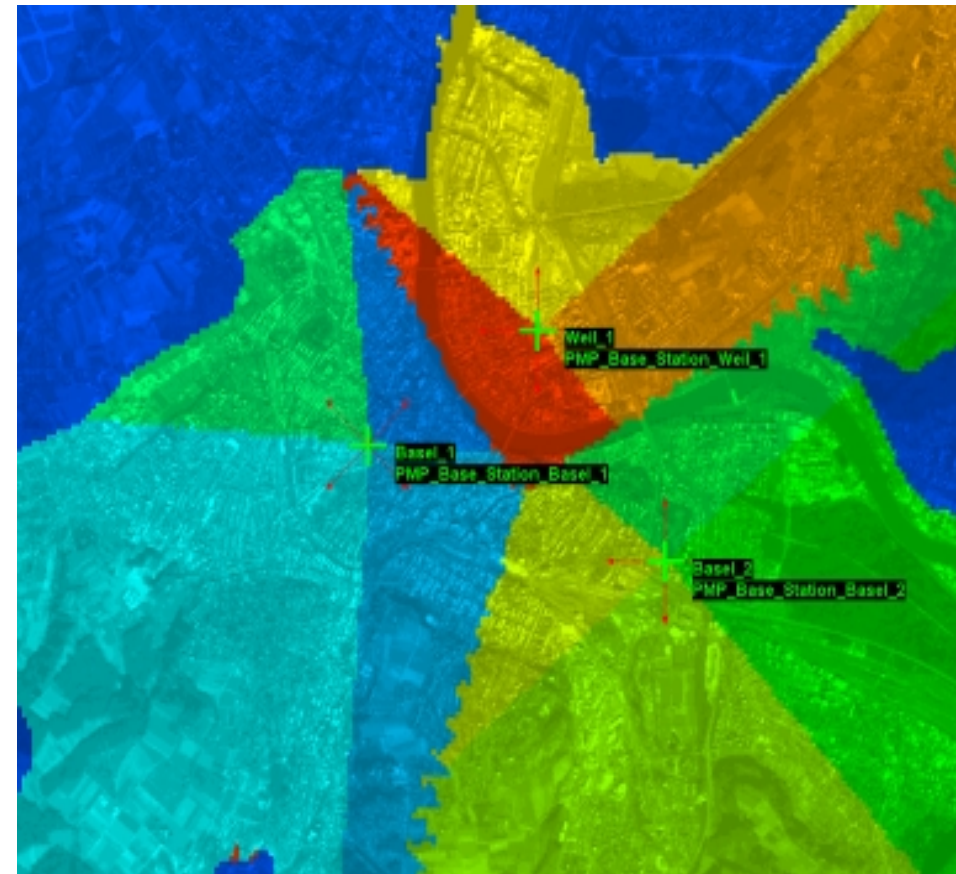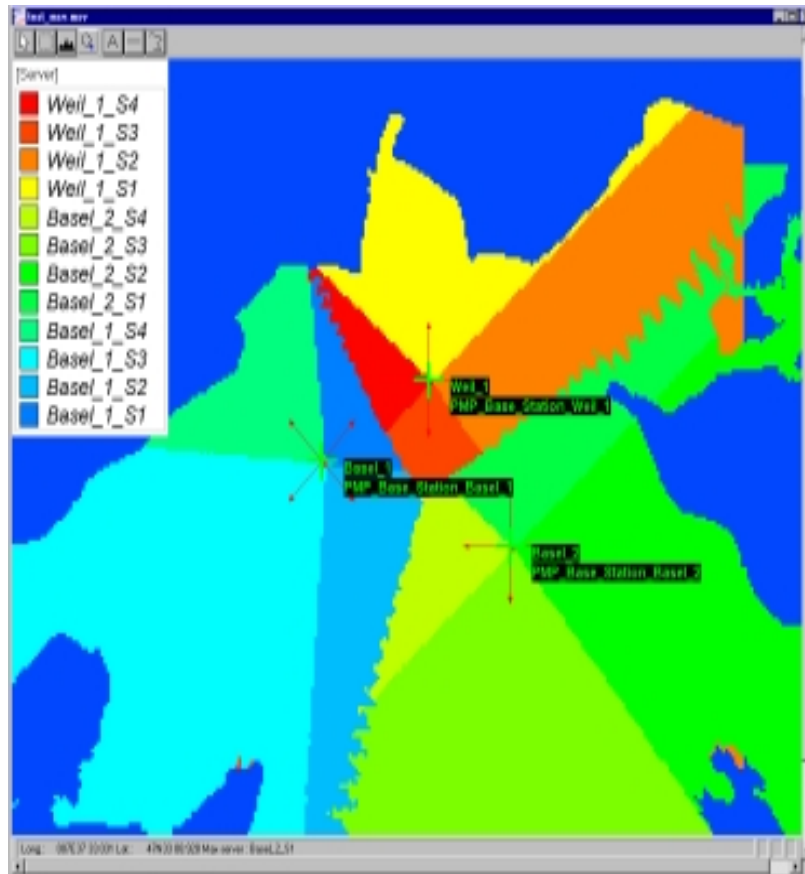## Maximum Server:

The maximum server plot shows, for a certain pixel, the name of the transmitter featuring the maximum signal; its field strength must exceed the minimum field strength required for coverage, $E_{min\ equiv}$.
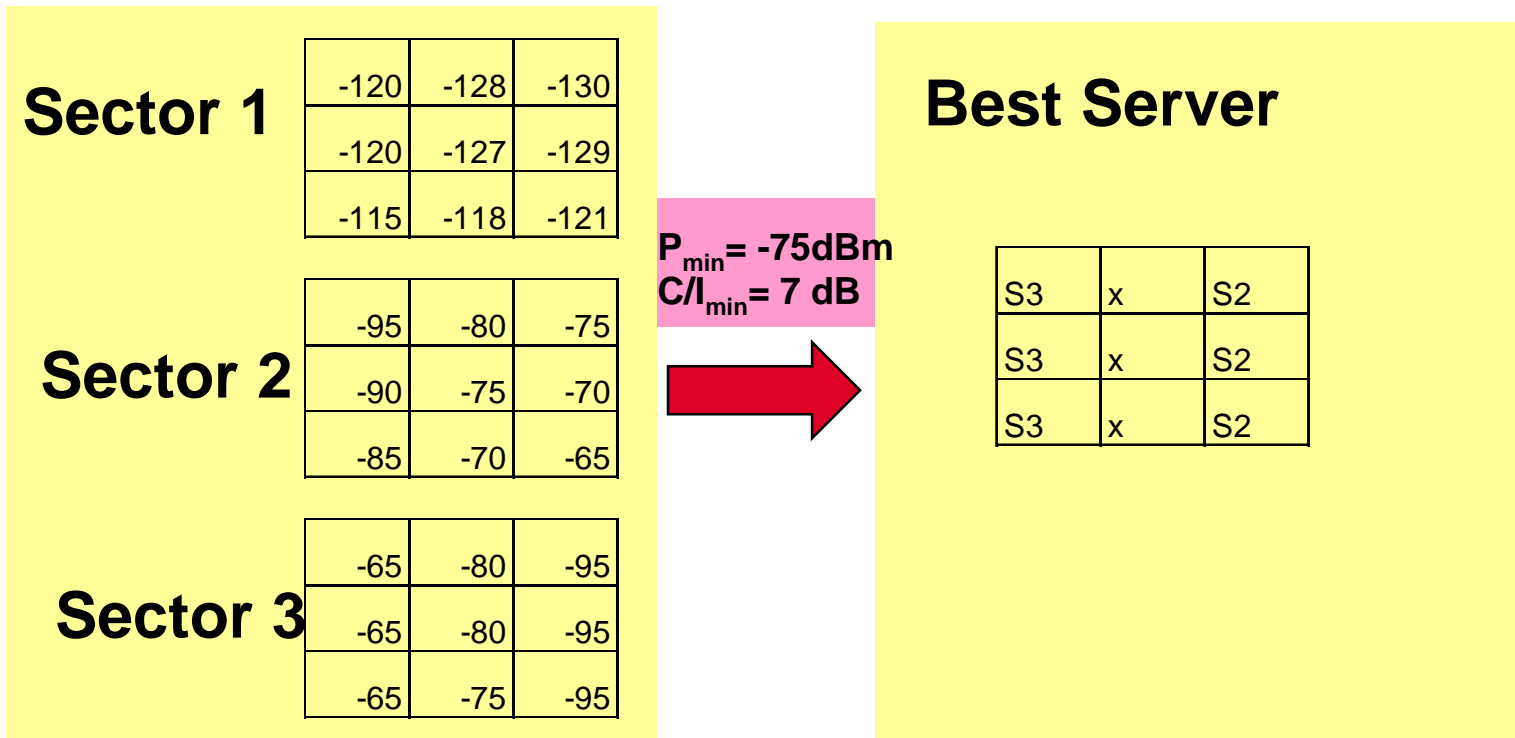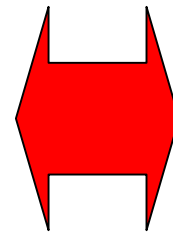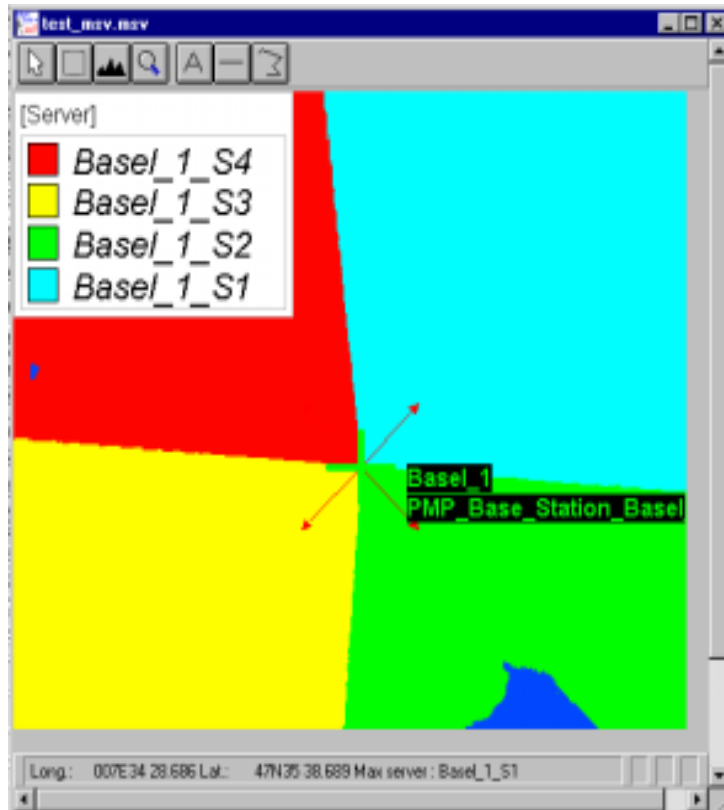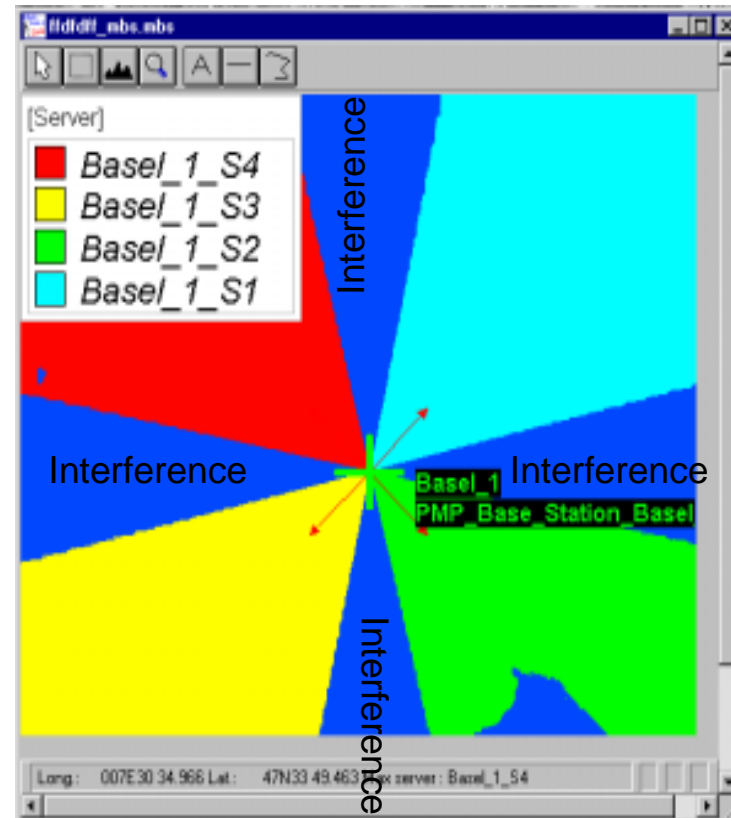
Sector 1

-120	-128	-130
-120	-127	-129
-115	-118	-121

Sector 2

-95	-80	-75
-90	-75	-70
-85	-70	-65

Sector 3

-65	-80	-95
-65	-80	-95
-65	-75	-95

P_{min}= -75dBm

Max. Server

S3	x	S2
S3	S2	S2
S3	S2	S2

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test_msv.msv

[Server]
- Basel_1_S4
- Basel_1_S3
- Basel_1_S2
- Basel_1_S1

Basel_1
PMP_Base_Station_Basel

Long.: 007E34 28.686 Lat.: 47N35 38.689 Max server : Basel_1_S1

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Network Processor

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Network **P**rocessor

Best Server:

The maximum server plot shows, for a certain pixel, the name of the transmitter featuring the maximum signal; its field strength must exceed the minimum field strength required for coverage, $E_{min\ equiv}$ and the Minimum C/I

Sector 1

-120	-128	-130
-120	-127	-129
-115	-118	-121

Sector 2

-95	-80	-75
-90	-75	-70
-85	-70	-65

Sector 3

-65	-80	-95
-65	-80	-95
-65	-75	-95

P_{min}= -75dBm
C/I_{min}= 7 dB

Best Server

S3	x	S2
S3	x	S2
S3	x	S2

Network Processor

Maximum Server

Best Server

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Network Processor

Maximum Server

Best Server

Supporting Network Planning Tools

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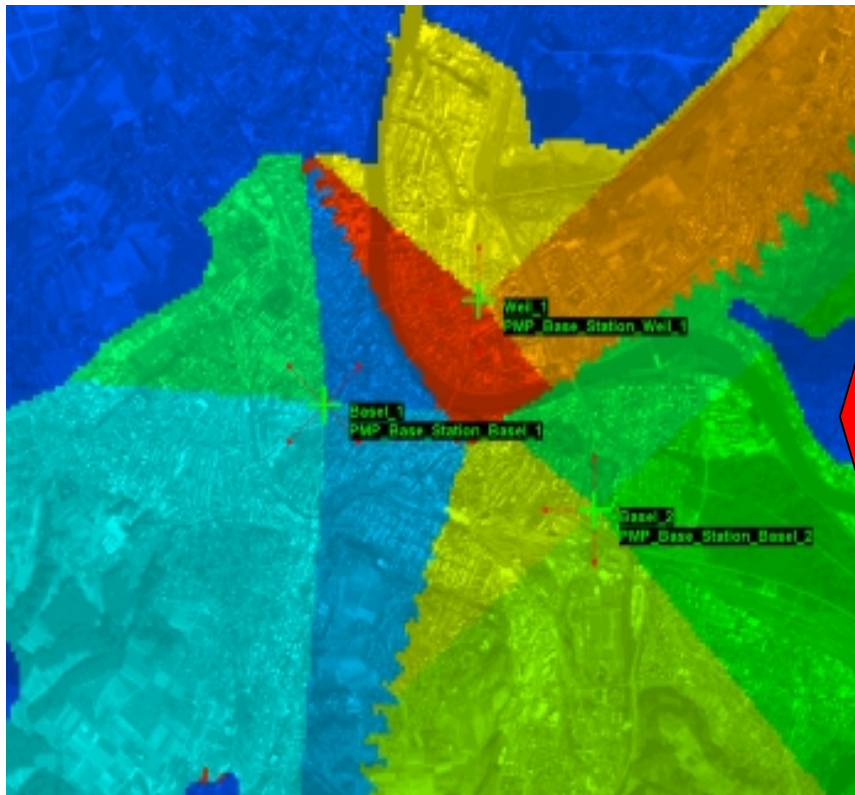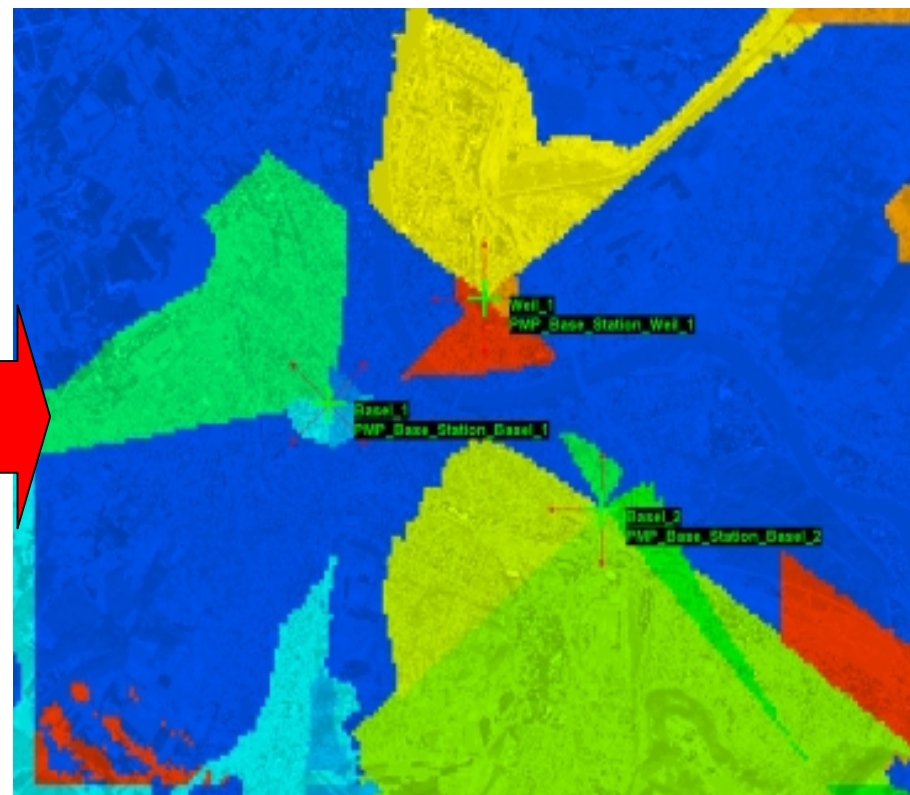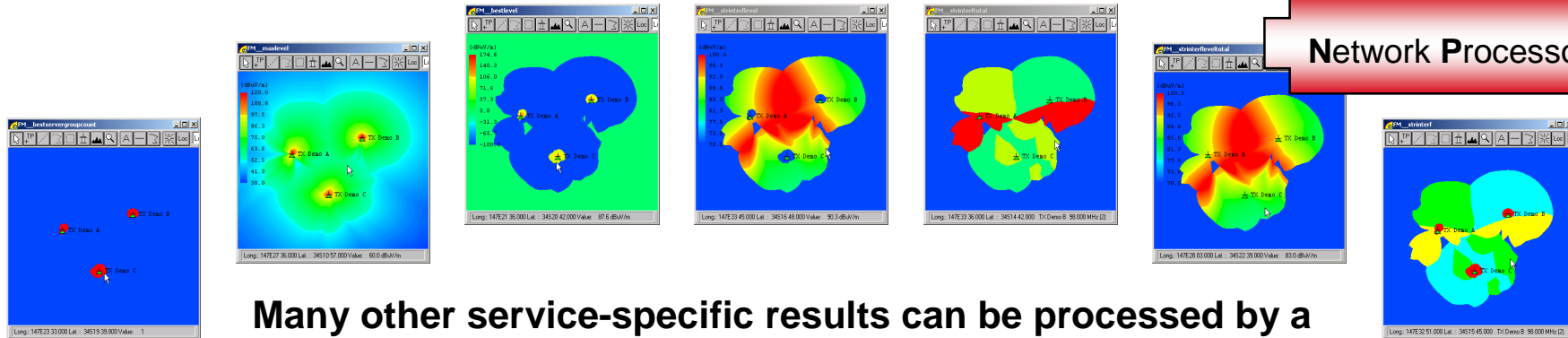
Network **P**rocessor

Many other service-specific results can be processed by a powerful Network Processor, like:

- Number of Max Sever
- Number Best Server
- Strongest Interferer
- Level of Strongest Interferer
- Coverage Probability
- Coverage Reserve

- Power Difference
- Assignment Probability
- Handover Zone
- Requeired Channels
- Coding Sheme Area (GPRS)
- SFN Level Gain
- ...

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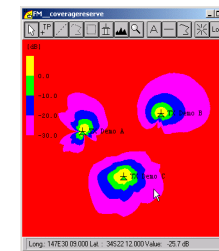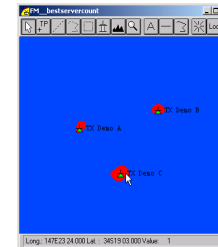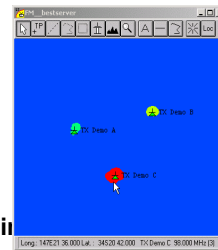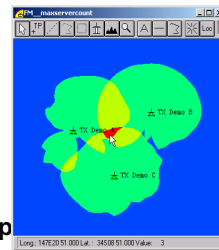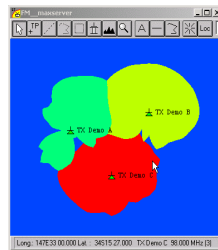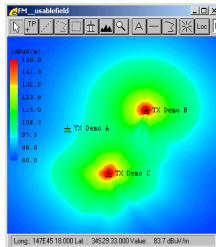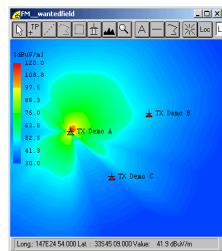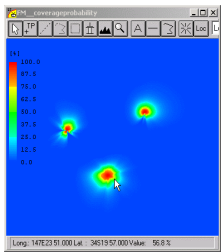
Automissed Frequency / Channel Assignment

Interference Analysis

Network wide parameter

Frequency spectrum

Cell specific parameter

Number of required carriers *Channel constraints*

Cell relations

Neighbour relations *Channel separation matrix*
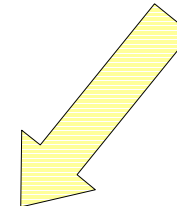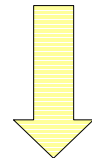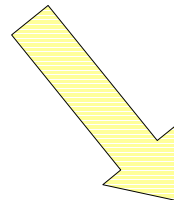
Interference Analysis
Interference Matrix

Allocation algorithm

- LS Box algorithm
- Simulated annealing algorithm

Channel allocation

Supporting Network Planning Tools

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Live
Planning Tool Demonstration

„MULTIlink"
Design Tool for Engineering Microwave Links
and PMP / WLL / LMDS Planning

Radio Network Planning Tool

Data / **R**esult **O**utput

Network **P**rocessor

Interference **A**nalysis

Propagation **P**rediction

Graphical **U**ser Interface

Data **M**anagement

Geo **I**nformation **S**ystem

Data / **R**esult **O**utput

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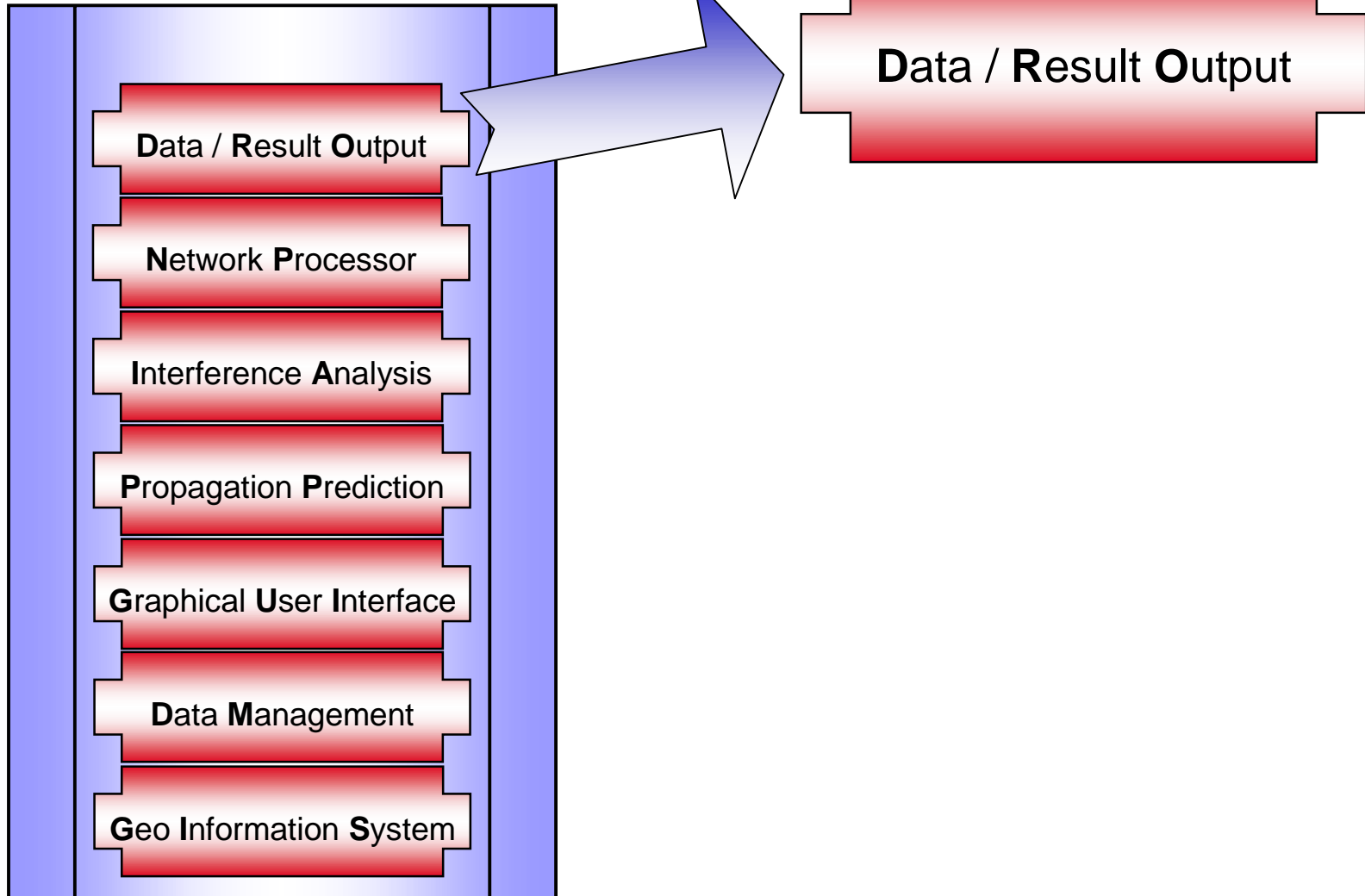
Data / **R**esult **O**utput

Import and Export of

Databases and Tables (Sites, Antennas,…)
Result Files
Measurement Data

Should be possible in several formats (.txt, .xls, ASCII, .jpg, …)

**Planning Tool
Database**

Export

Import

Antenna.txt
CALC_PARAMETERS.TXT
COL_LAYOUTS.TXT
DEFAULT_LINK_PLAN.TXT
Devices.txt
DIVERSITY.TXT
DIVERSITY_PLAN.TXT
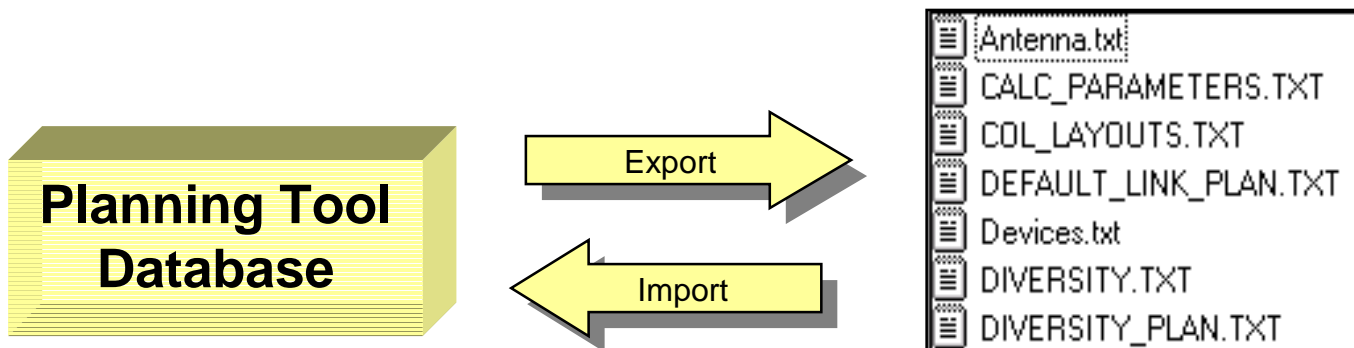
Import measurement data

- Analogue
- Digital
- BER

Evaluation of measurement data

- Rohde&Schwarz,
- Alcatel, Ericsson TEMS, generic ASCII

Plotting of measurement data

Calibration

- Path loss fit
- Calibration of extended OH model

Data / Result Output

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Printing of Maps and Result Plots

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Data / **R**esult **O**utput

Print Process Preview

☞ Application specific frame

☞ Legend

☞ Print in specific map scale

☞ Specify margins and borders

☞ Multiple printing

☞ Support various paper sizes

☞ Add site specific information

Printing of Database Lists

Data / **R**esult **O**utput

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Example

Network Optimization

Current network coverage

Legend

- indoor urban
- indoor suburban
- outdoor urban
- outdoor
- rural
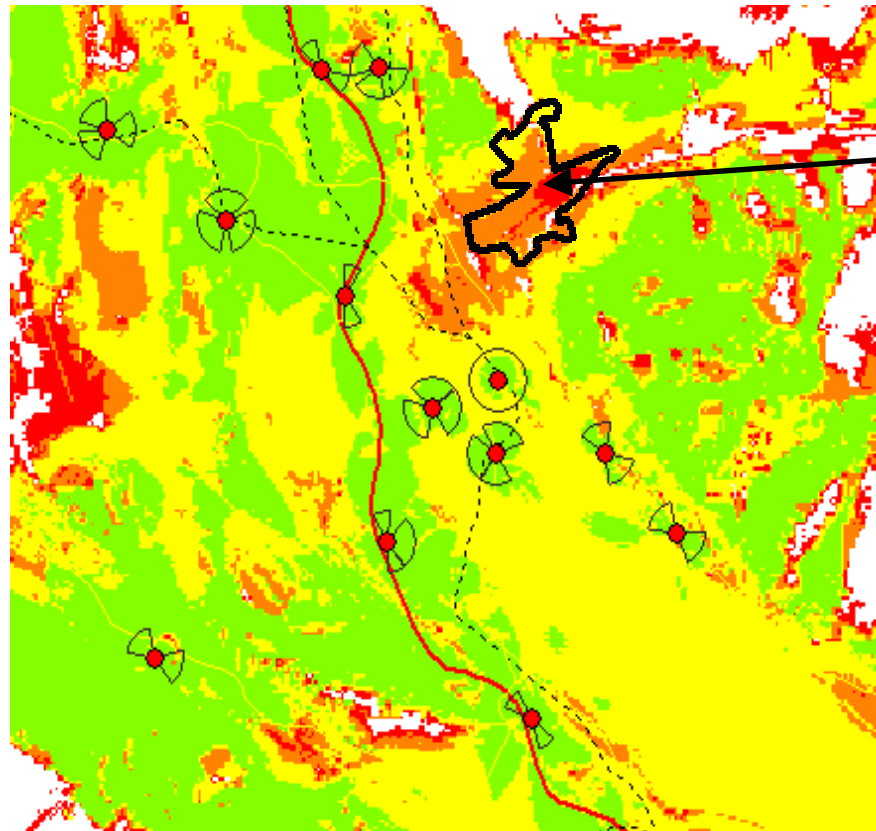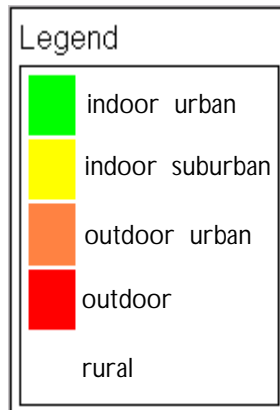
Now, we want to improve the coverage in this region.

Supporting Network Planning Tools

Network **P**rocessor

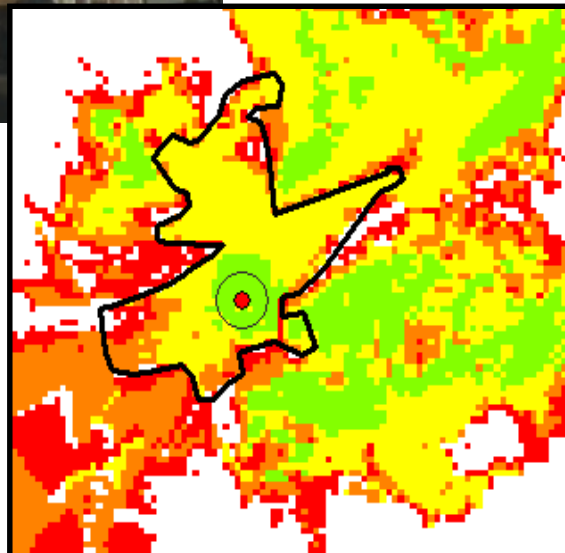**Candidate Steffisburg A**

00°
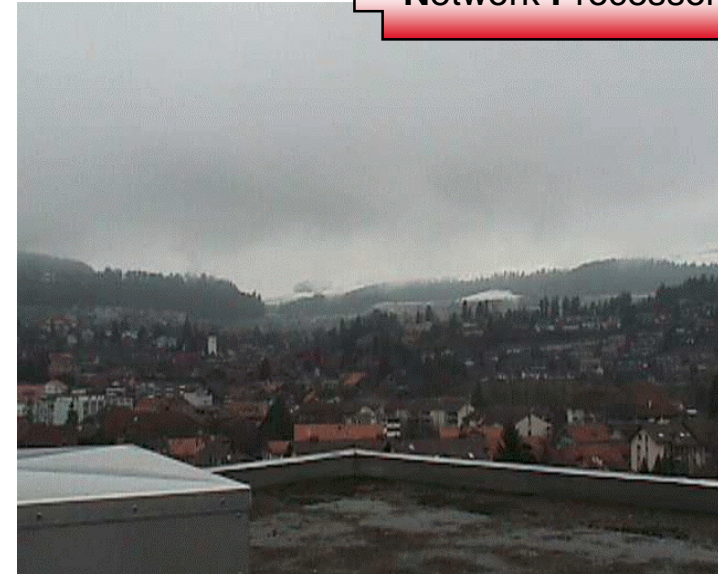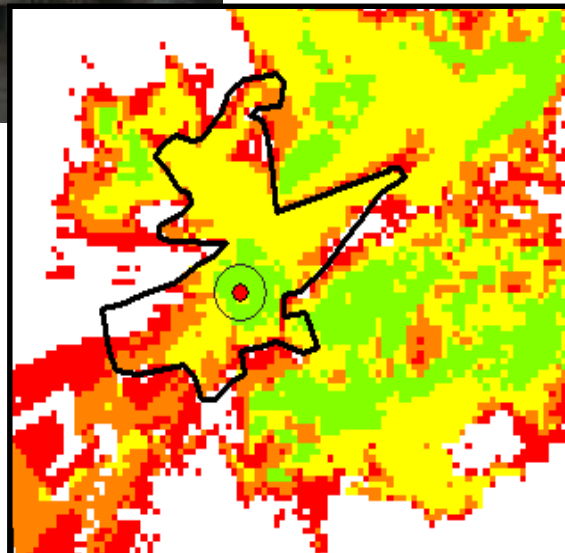
Network Processor

Candidate Steffisburg B

00°

Network Processor

Candidate Steffisburg C

00°
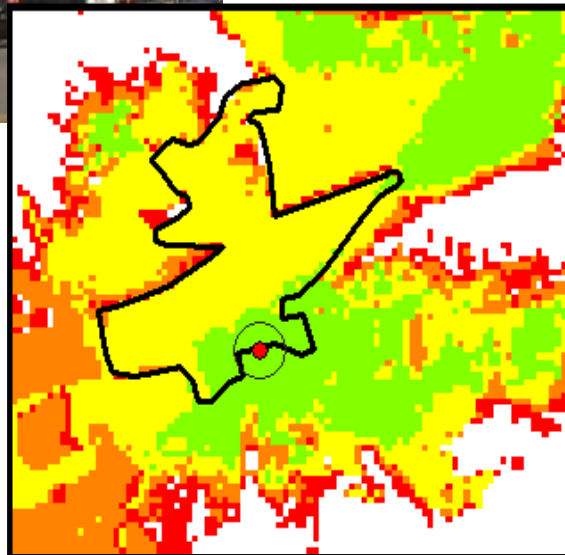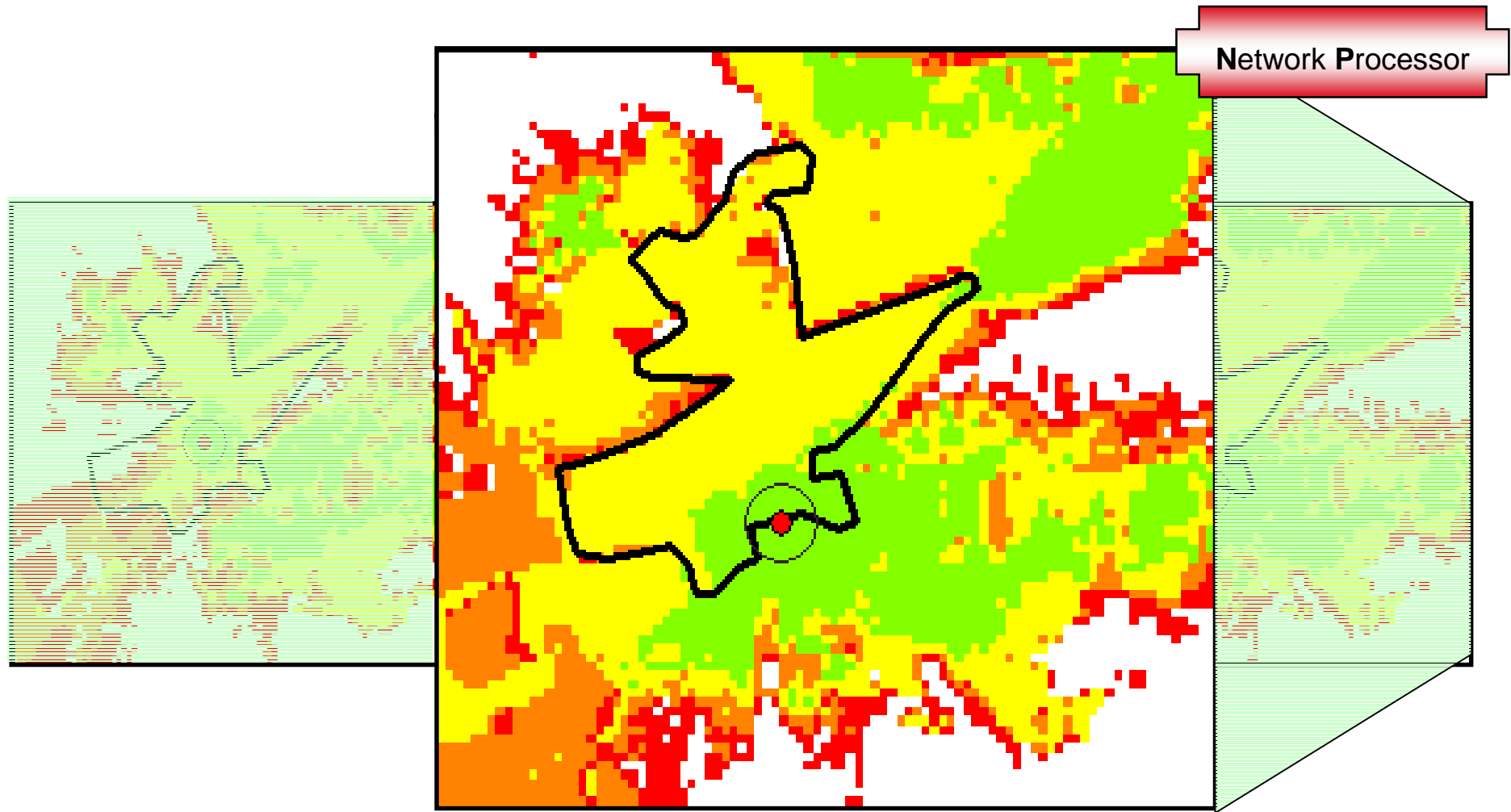
Network Processor

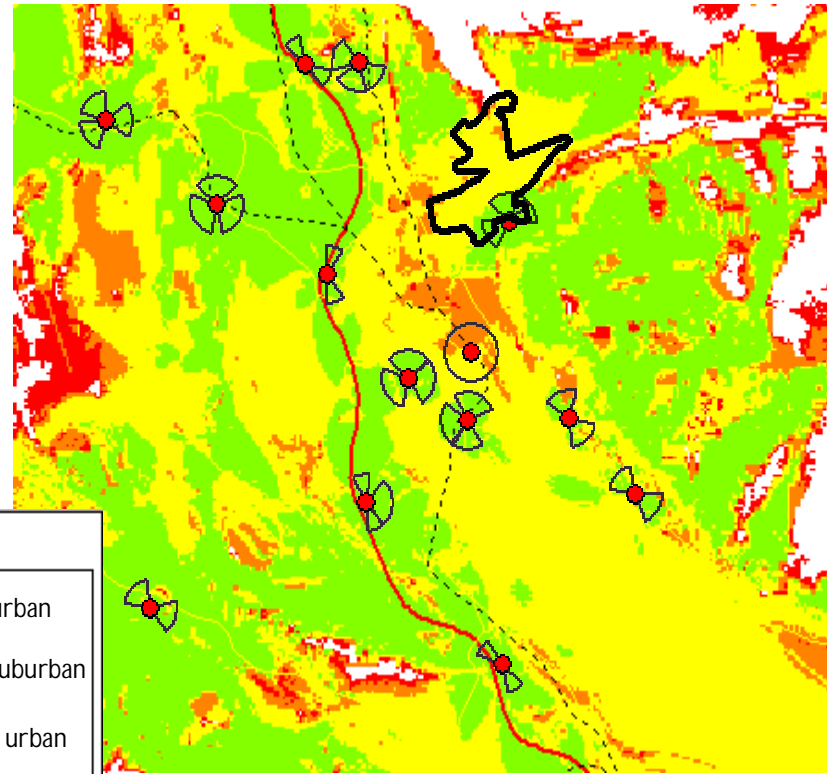**Selection of Candidate Steffisburg C**

Example: Coverage Optimisation GSM Network

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Network **P**rocessor

Previous coverage

Improved coverage

Legend

- indoor urban
- indoor suburban
- outdoor urban
- outdoor
- rural

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Software Tools

Engineering Services

Training Consultancy
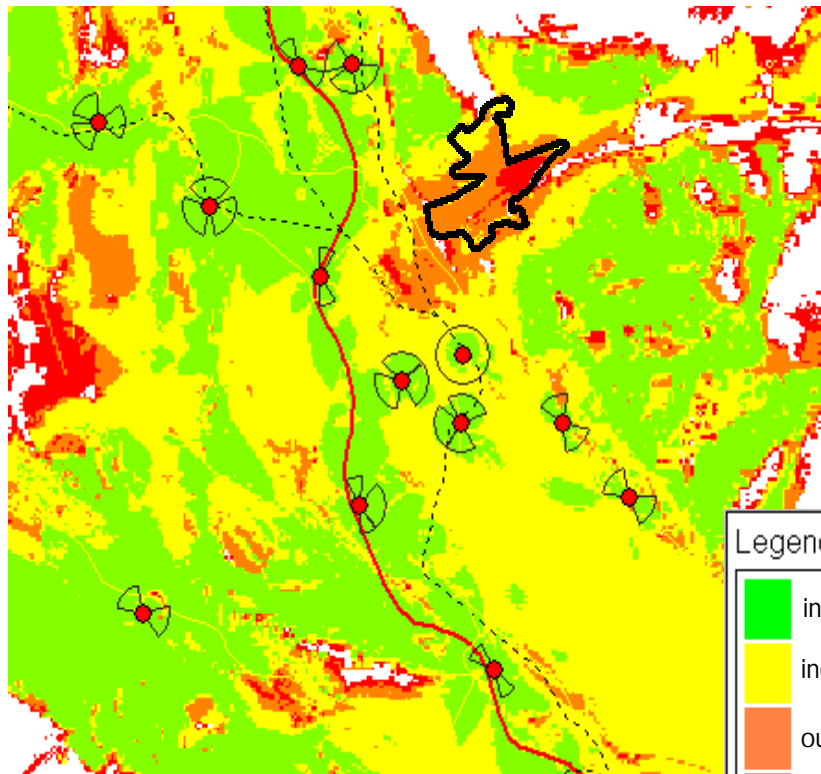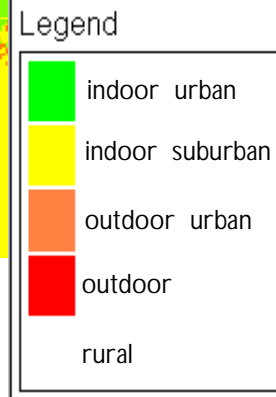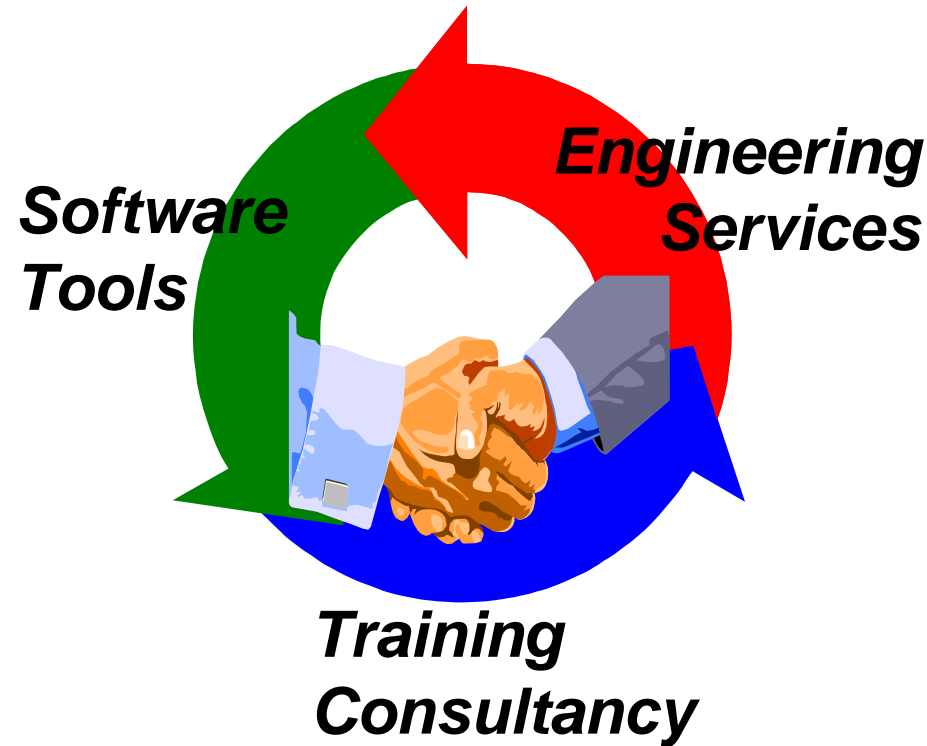
Solutions for Spectrum Management, GSM900, GSM1800, Microwave Links, PMP, LMDS, Radio/TV Broadcast, DVB, DAB, Trunked Radio, TETRA, Paging, Satellite Services

Spectrocan

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Thank you for your attention

For more information:

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