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# Automated Site Selection and Antenna Optimization of Single Frequency Networks

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Background and Motivation

SFN Network Planning

Optimization Targets and Parameters

Automated Site Selection

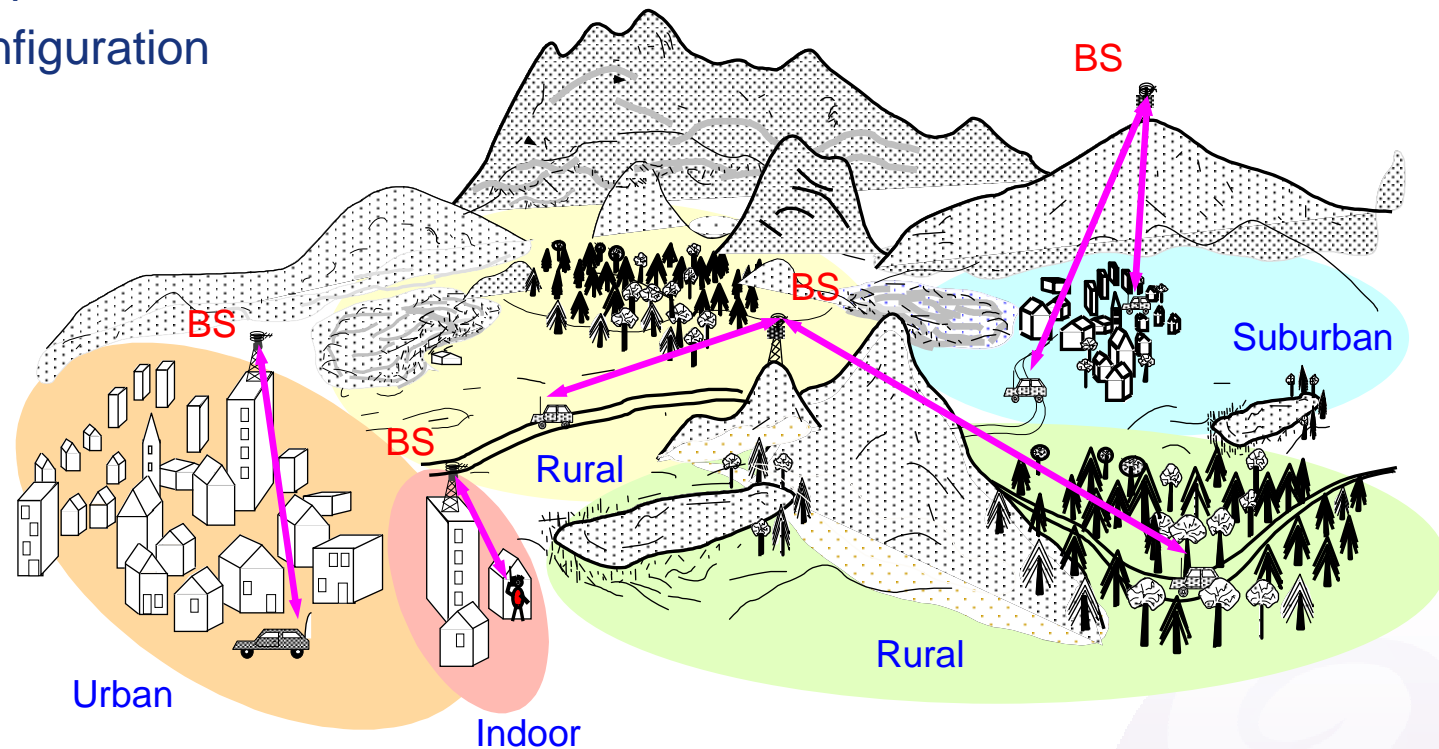
Methods for Antenna Optimization

Case Study: Shanghai

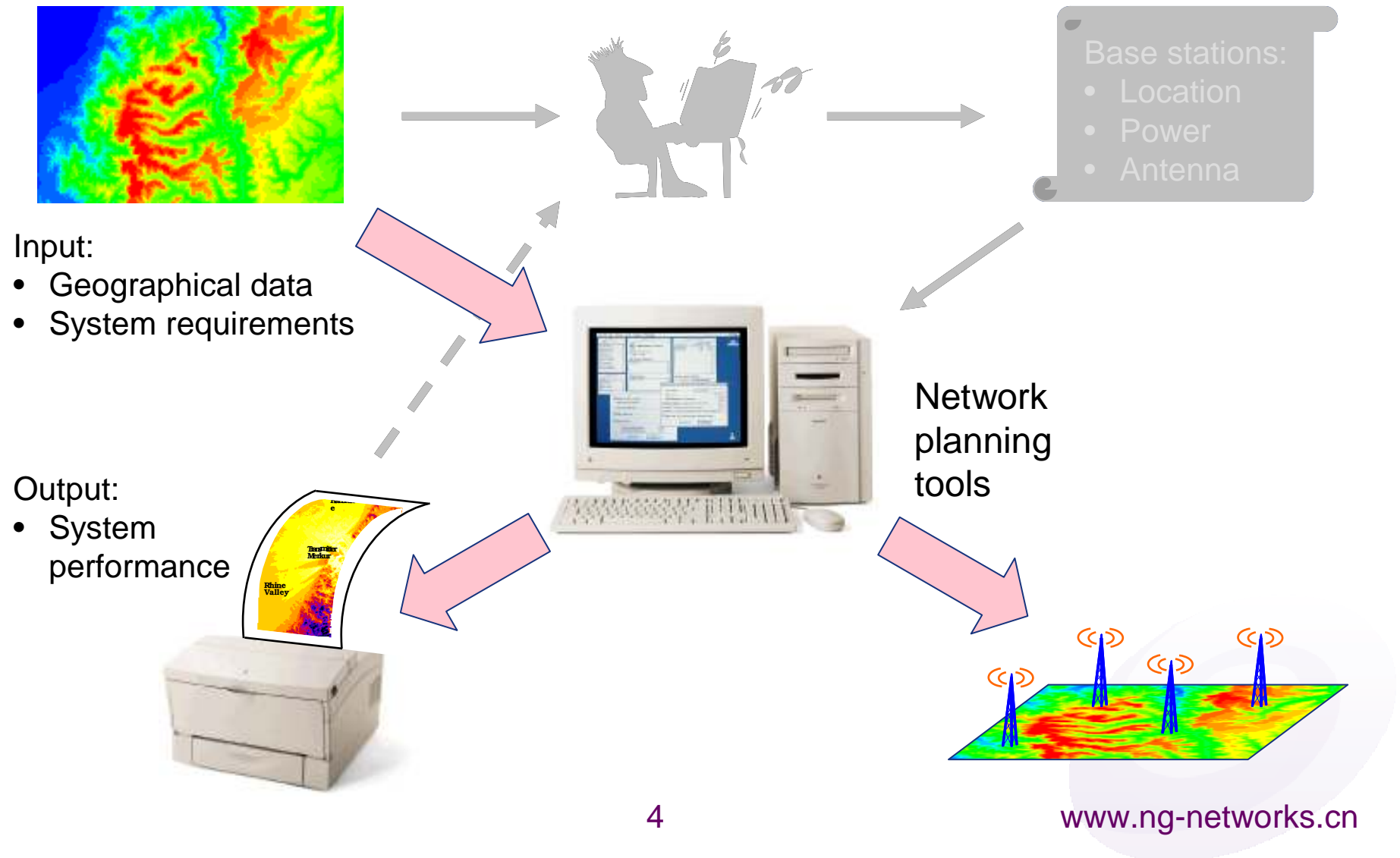
- Where to place a base station (BS)?
- How to specify BS parameters?

Transmitted power

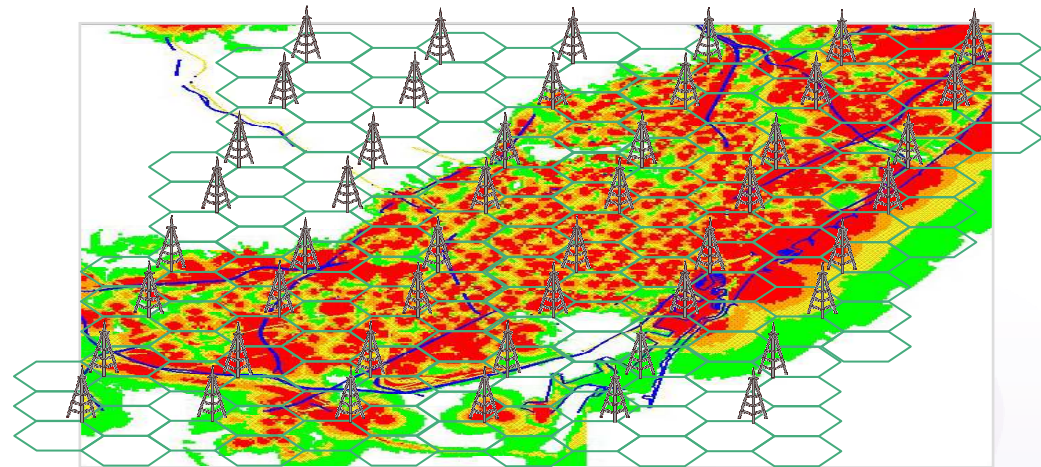
Antenna configuration



# Why Automated Optimization?



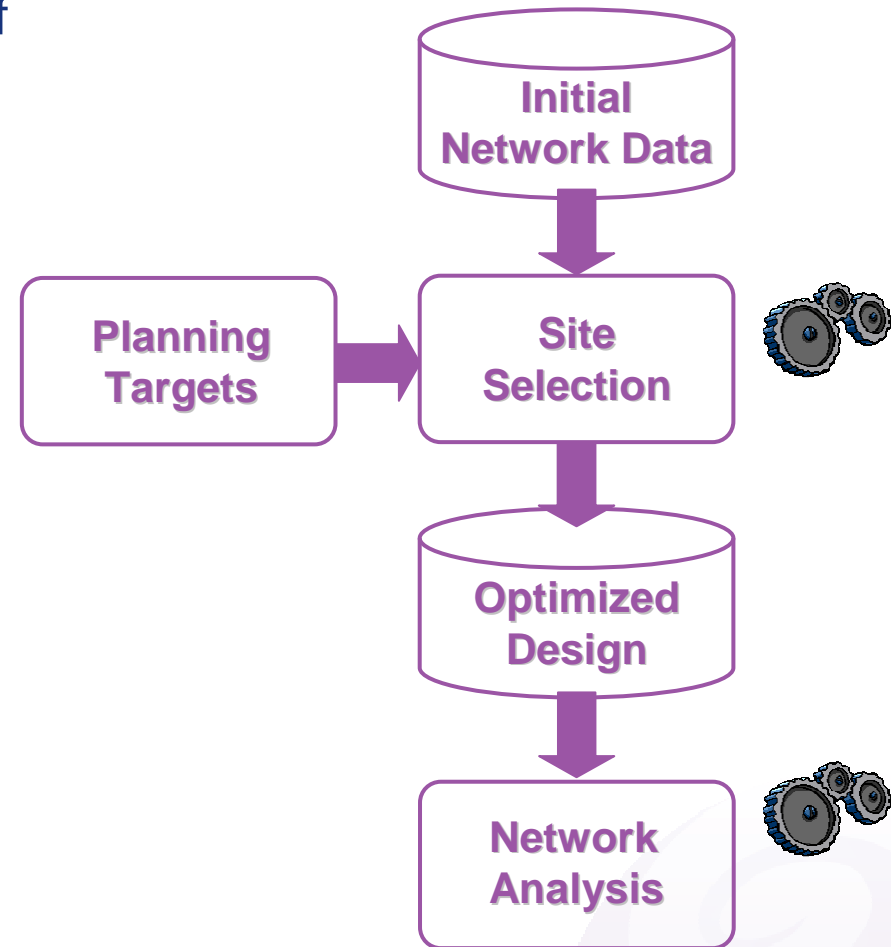
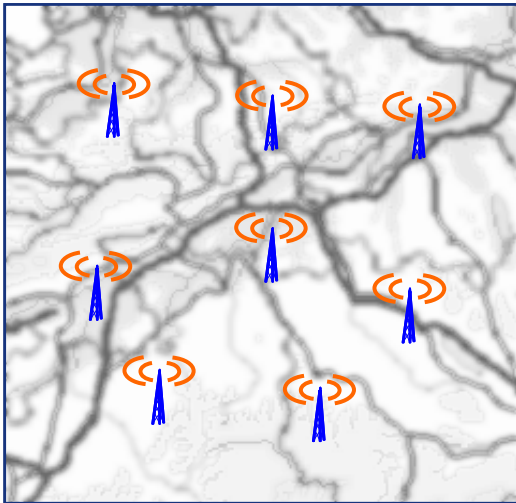
- SFN network planning is more challenging
  - Mobile reception
  - Indoor coverage
  - More senders are required
- The tasks of SFN planning include
  - Calculate SFN coverage area
  - Calculate the overlapping area
  - Calculate the time delay

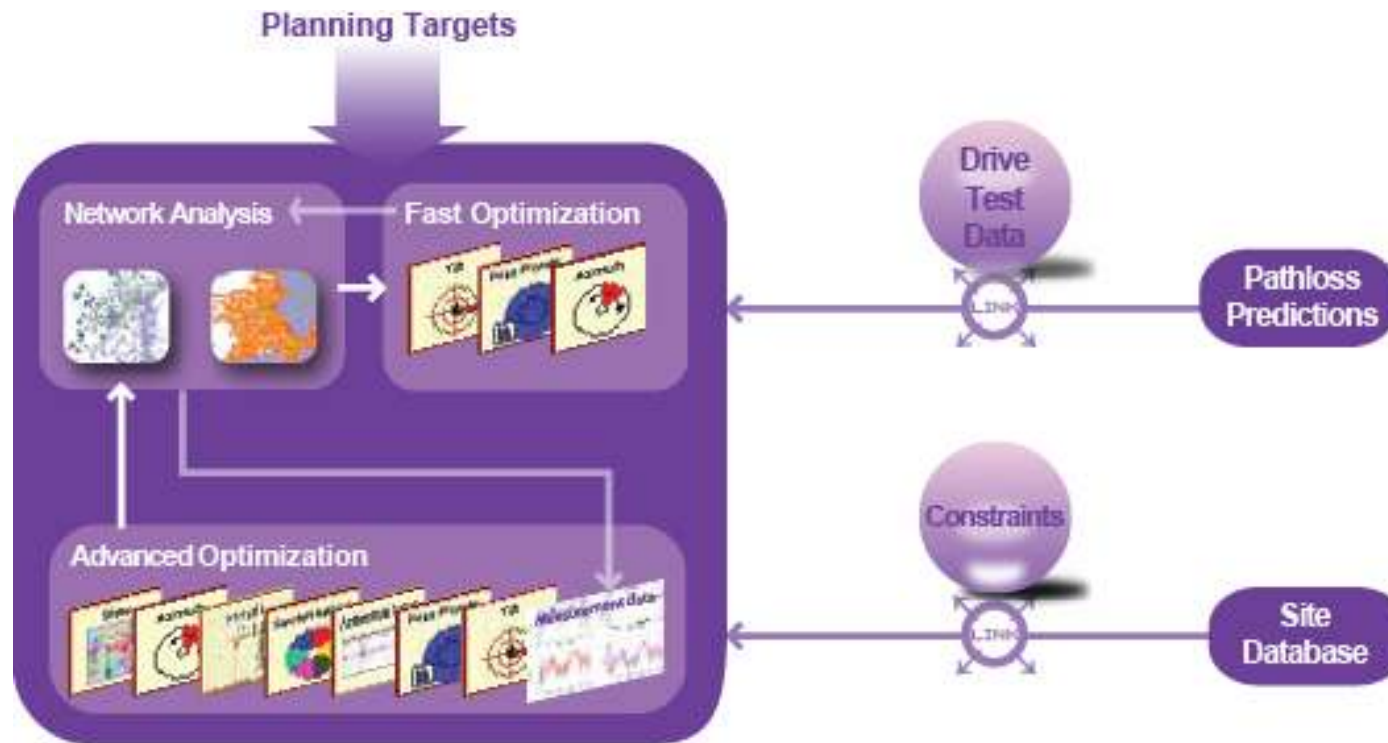


- Optimization targets
  - Maximize coverage
  - Minimize costs
  - Minimize power
- Optimization parameters
  - Site location
  - Transmitted power
  - Antenna parameters (type, height, orientation)
- Optimization criteria
  - Coverage rate
  - Cost limit
  - Performance-to-cost ratio

**Tradeoff between the coverage and costs**

- Selection of optimum sites out of candidates based on coverage and costs criteria

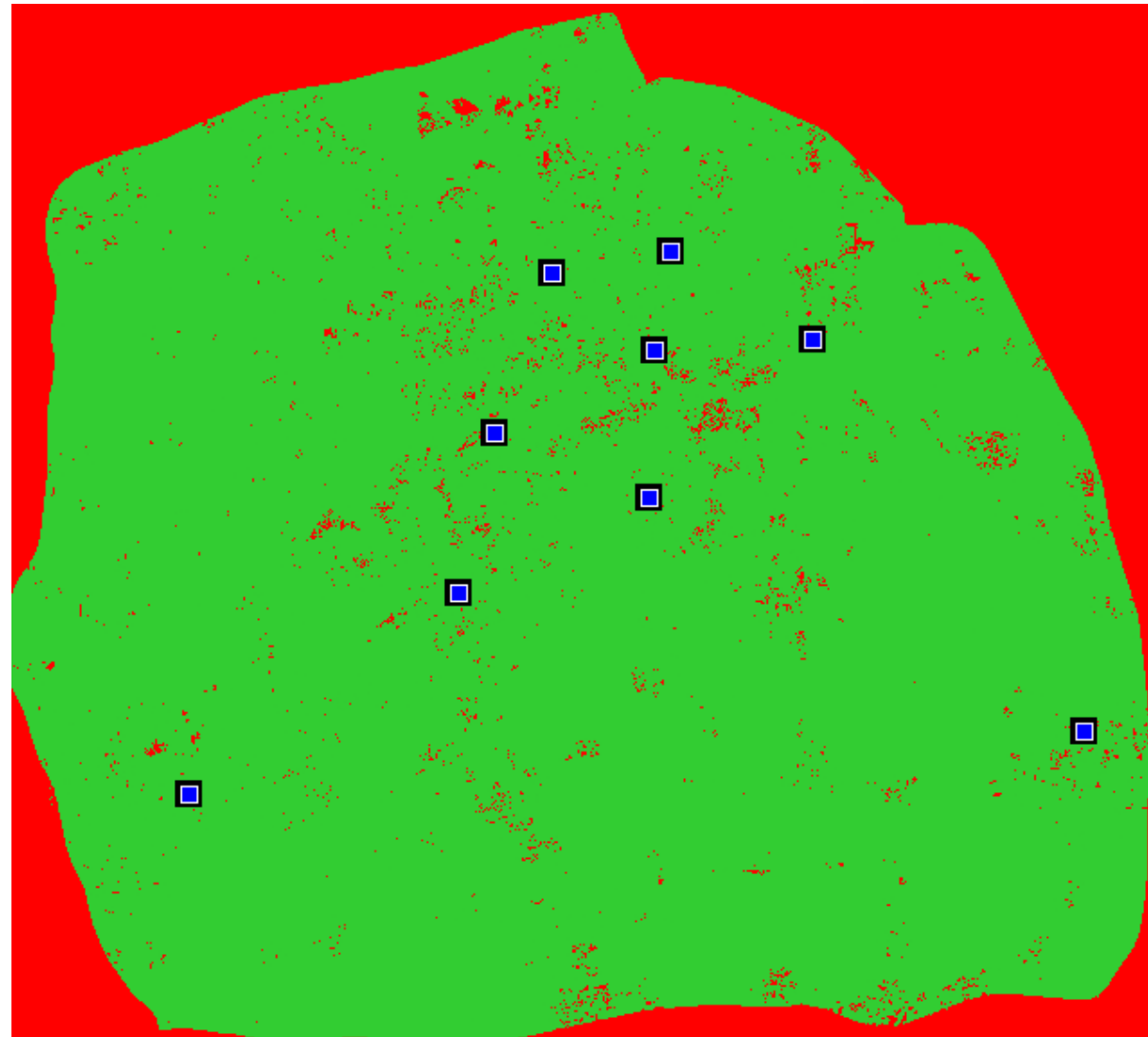




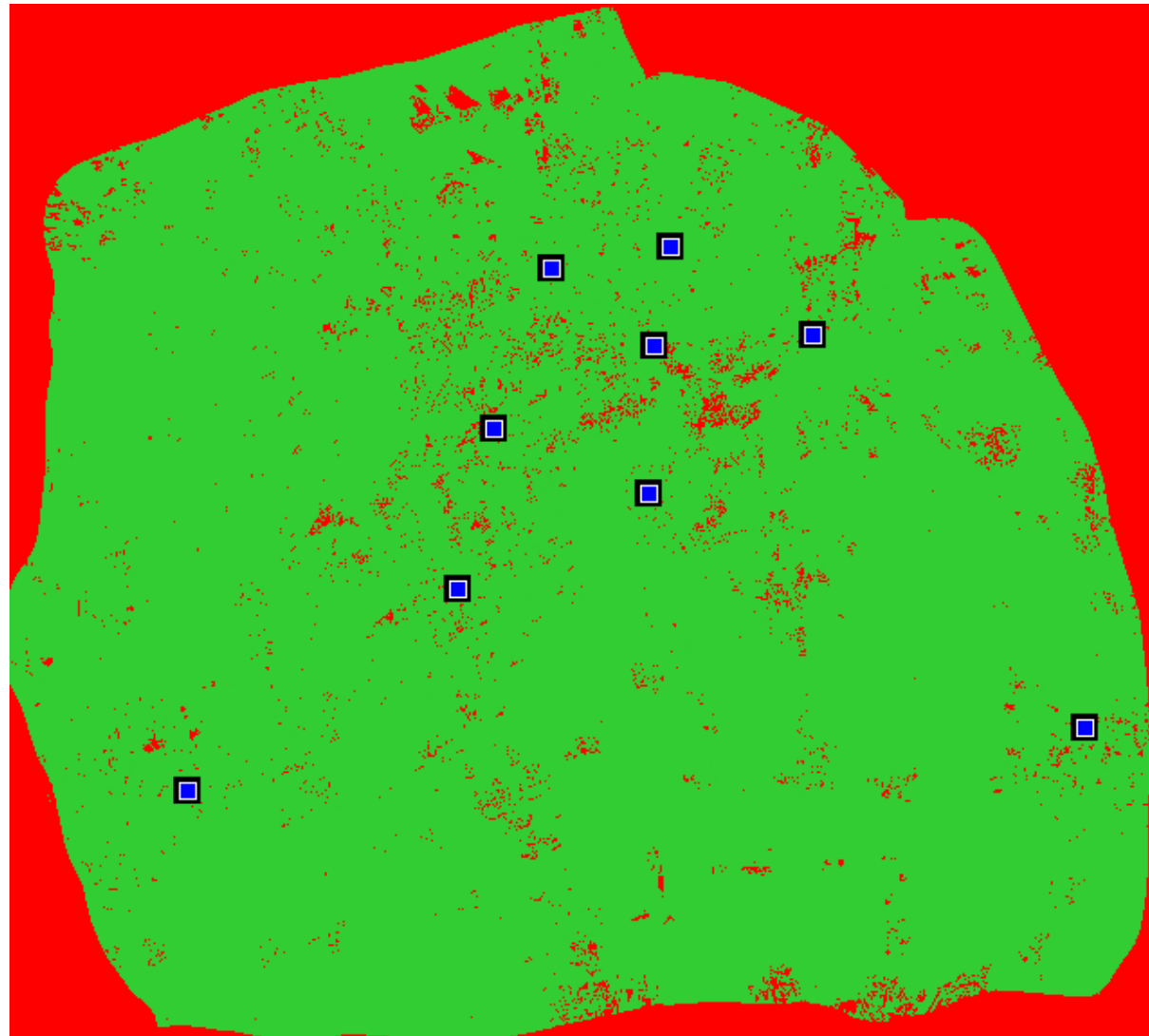
- Automated adaptation of the transmitted power and antenna configurations to achieve better coverage



- Running time of site selection: 70 min.
- 9 sites are selected
- Targets achieved:  
Area coverage = 93.42%  
Pop. coverage = 95.73%



- Initial Tx power is 1000 W for all senders
- Tx power of five senders are reduced to 300 W
- The coverage changed slightly:  
Area coverage = 92.35%  
Pop. coverage = 95.16%



- The challenge
  - SFN network planning is more challenging
  - More senders are required
- The solution
  - Automated site selection
  - Power optimization
  - Antenna configuration
- The benefit
  - Dramatically reduce the time needed for the planning job
  - Cost efficient solution
  - Achieve better network performance
  - Energy saving due to power optimization



# *Thank You*

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