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GROUP

CASE STUDY

# NETWORK DESIGN FOR MANAGING CAPEX

## Delivering services and technical evaluations for network operators worldwide

Qualcomm Engineering Services Group (ESG) accelerates the adoption of mobile technologies through initiatives, professional services and technical education. By analyzing and recommending technology evolution solutions, optimizing network design and deployments, educating via technical training and customized workshops, and collaborating with key industry groups, Qualcomm ESG also enables operators to efficiently migrate to next-gen technologies. The following case study recounts how an operator, facing a proposed network design that far exceeded its budget, collaborated with Qualcomm ESG to develop effective forward-looking engineering solutions.

### AT ISSUE

**Improving network design improves the bottom line**

Network design is driven by coverage and capacity requirements. Design is heavily dependent on the quality of inputs into the design tool. Network traffic growth assumptions and parameters influence design and can lead to variations. Therefore, network design accuracy is paramount. Accurate network design processes help ensure a high-quality user experience, and optimal network design minimizes CAPEX / OPEX for the operator.

### THE CHALLENGE

**Reigning in CAPEX and future OPEX**

A CDMA operator in North America was engaged in a greenfield design of two markets covering a total population of 2.3 million subscribers. The operator hired a vender to perform an RF propagation model tuning and to prepare a detailed network design. The vendor's proposal included the expansion of a large number of sites; these additional sites far exceeded the operator's budget.

The operator approached Qualcomm ESG to independently review the model tuning process and design and to verify the proposed site additions.

### COMPANY

- CDMA operator in North America
- Project targeted two markets (subscriber base 2.3M)

### SITUATION

- **Greenfield design for the operator network**
- **Vendor-proposed network design exceeded operator budget**

### SOLUTION

- **Analyze proposed network design**
- **Discover inconsistencies in the RF propagation model-tuning process**
- **Recommend improved network design and best practices propagation model-tuning process**

### RESULTS

- **Reduced required site count by 33%**
- **Potential CAPEX / OPEX annual savings of $34M**

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## THE SOLUTION

### Getting a new perspective from ESG

The project management required coordination and information exchange between Qualcomm ESG and the operator's engineering team. Using network design analysis and software licenses, a Qualcomm subject matter expert (SME) provided off-site support. Qualcomm ESG collaborated with the operator to understand the process and design constraints from the existing design.

Analysis showed that the existing design had been based on omni-antenna propagation model tuning. Failure to include a vertical pattern resulted in a conservative RF propagation model (reflecting a smaller coverage span), especially in the operator's frequency band.

Further analysis showed that the proposed design relied on a single-slope model, which underestimated near-cell coverage and overestimated far-cell coverage. It was also revealed that the proposed design initially used multiple models per clutter category with individual data sets. The coefficients were then averaged to yield a single representative model.

Together, these factors produced very conservative RF propagation models, poor mean error and standard deviation, resulting in an excess number of recommended sites and rising CAPEX / OPEX costs.

After replicating the existing RF propagation models and network design, Qualcomm engineers reviewed the model, applying Qualcomm's own internal guidelines and best practices procedures. This involved appropriate correction for antenna vertical pattern, use of a breakpoint model, and the development of a single representative model per morphology, using the entire set of Continuous Waveform (CW) data.

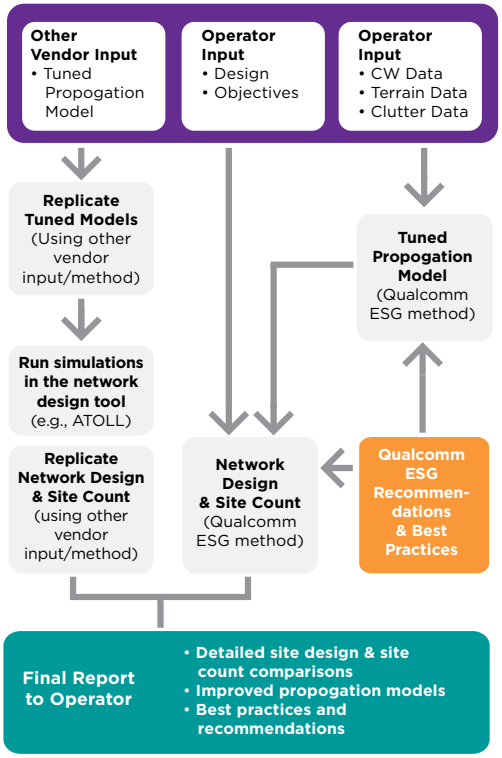
Qualcomm's assessment yielded more realistic propagation models and significantly reduced the estimated site count. The step-by-step process for the entire project is presented in Figure 1.

## RESULTS

Qualcomm provided the operator with a recommended propagation model-tuning process and design-procedure best practices for application in future network designs. This revision enabled the operator to use more realistic propagation criteria.

Based on the improved process and propagation model, the operator was able to reduce the overall site count by approximately 33% (see Figure 2), resulting in potential CAPEX / OPEX saving of approximately $34 million per annum.

**Figure 1: Network Design Optimzation for CAPEX Savings**



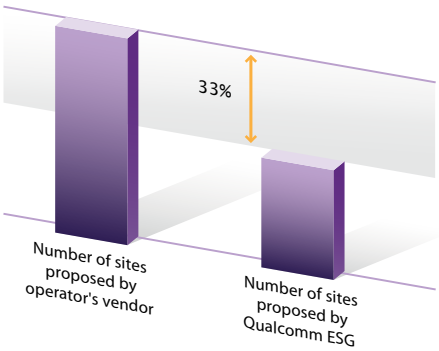


**Figure 2: Reducing Number of Sites = Potential Cost Savings (example)**