CASE STUDY

INTER-RAT OPTIMIZATION IN OVERLAYS

Delivering technical evaluations and services to operators

Qualcomm Corporate Engineering's ESG provides operators with comprehensive, cost-and resource-efficient network optimization plans. This tier 1 operator partnered with ESG to develop an inter-RAT (Radio Access Technology) optimization process.

SITUATION
Optimization of the UMTS/HSPA network overlay

UMTS or HSPA networks overlay existing GSM networks. Successful inter-RAT handovers from UTMS/HSPA to GSM (3G to 2G) are critical to ensuring a positive end-user experience. Sub-optimal inter-RAT design also degrades network capacity.

CHALLENGE
Solving inter-RAT related capacity and performance issues

A tier 1 operator in the Americas faced inter-RAT related performance issues in a large metropolitan area. Their network was over used and subscriber complaints were on the rise. Based on results from drive testing, the operator's optimization process was inefficient and didn't allow them to capture inter-RAT failures acurately or determine their root cause.

SOLUTION
Applying best practices from Qualcomm experts

Executing this project required access to performance data on the operator's network and close coordination with the their engineering team. To ensure smooth communication and efficient data collection and analysis, ESG subject matter experts worked onsite with the operator.

To isolate root causes, ESG drew upon Qualcomm best practices and past experience to design a top-down process using performance management (PM) counters, network probe traces and field testing (see Figure 1).

Performance mangement counters were used to detect inter-RAT handover failures. Specialized reports were generated to identify the HSPA (UMTS) cells with the most inter-RAT failures and assess causes. These analyses were used to create a list of cells with the most inter-RAT handover failures. Prioritizing these

COMPANY
- Tier 1 operator
- Nationwide deployment of HSPA
- Solution benefits all markets

SITUATION
▸ High inter-RAT handover failure rates
▸ 3G-2G handover problems and network capacity degradation
▸ Poor end user experience caused by dropped calls
▸ Extensive time and resources spent on field testing

SOLUTION
▸ Analyzed and identified root causes with network probes, RF and neighbor list analysis
▸ Prioritized problem areas and isolated root causes through network evaluation
▸ Developed process based on performance counters and network probes
▸ Designed specialized reports to regularly monitor performance
▸ Recommended the operator reduce its drive testing, isolate and repair inter-RAT problems

RESULTS
▸ Eliminated approximately 3% of inter-RAT failures in a metropolitan area

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INTER-RAT OPTIMIZATION IN OVERLAYS

cells allowed the operator to minimize future inter-RAT handover failures.

The PM counter reports specified that many failures were attributed to GSM channel setup. To confirm and further analyze the operator's inter-RAT failures, ESG evaluated network probe traces for the cells. The investigation verified that the cells were experiencing GSM channel setup failure. Performing this assessment helped narrow the GSM network coverage analysis and better identify neighbor lists for cells with high GSM channel setup failure.

As a final step, drive test logs were collected around the cells. An RF analysis showed that the target GSM cell had fragmented coverage and was overshooting, preventing other GSM cells from inter-RAT handovers. As a result, inter-RAT handovers were attempted from the incorrect GSM cell, increasing the risk of failure. ESG recommended the operator remove its GSM cell from the HSPA (UMTS) cell neighbor list (see Figure 2).

RESULTS

Reduction in inter-RAT failures and in OpEx

Qualcomm Corporate Engineering's ESG delivered specialized PM counter reports and decision flow charts, suggesting network improvements.

The process developed by ESG enabled the operator to reduce its OpEs by eliminating extensive drive testing requirements and reducing the amount of time spent isolating and correcting inter-RAT performance issues.

The optimization process eliminated approximately 3% of inter-RAT failures in this particular metropolitan area.

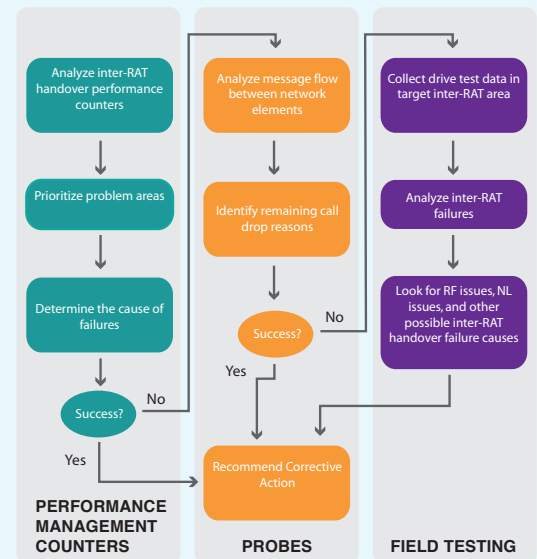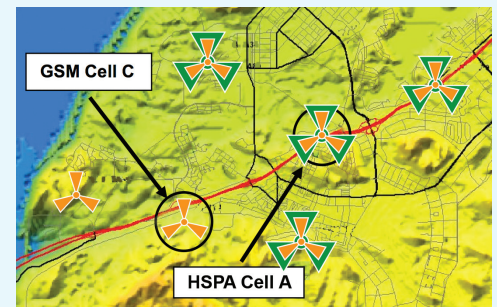**Figure 1: High-level inter-RAT Optimization Process**

PERFORMANCE MANAGEMENT COUNTERS

- Analyze inter-RAT handover performance counters
- Prioritize problem areas
- Determine the cause of failures
- Success? No / Yes

PROBES

- Analyze message flow between network elements
- Identify remaining call drop reasons
- Success? No / Yes
- Recommend Corrective Action

FIELD TESTING

- Collect drive test data in target inter-RAT area
- Analyze inter-RAT failures
- Look for RF issues, NL issues, and other possible inter-RAT handover failure causes

Figure 2: Inter-RAT Optimization Results (example)

GSM Cell C

HSPA Cell A

The recommended action deleted GSM Cell C from inter-RAT neighbor list of HSPA Cell A

LEGEND:

HSPA cells   GSM cells