CORPORATE ENGINEERING

ESG

CASE STUDY

UMTS NETWORK OPTIMIZATION FOR EVENT VENUES

Delivering technical evaluations and services to operators

Qualcomm Corporate Engineering's ESG provides venue optimization services for events such as concerts, conventions, and sporting events to help operators maximize network capacity and maintain a high quality user experience.

SITUATION

Maintaining a consistent, high quality user experience at events

The performance of 3G wireless networks during special poses a unique problem. The large concentration of smartphones with a usage profile of frequent, short data connections reduces network efficiency and lowers downlink and uplink capacity. This causes low call completion rates, frequent dropped calls, suboptimal response times, and low throughputs. The degraded user experience can lead to subscriber churn and often visible, public backlash.

CHALLENGE

Optimizing network performance during events

The goal was to estimate the capacity demand, accurately dimension the network resources, develop the best possible network design, and optimize the system parameters to maximize the capacity for the unique RF conditions of events.

Estimating voice and data traffic demand during a event, and properly modeling the estimation to predict user experience with the deployed capacity is quite complex. This is compounded by the capacity lost due to large amounts of Radio Resource Control (RRC) signaling generated by the "*always connected*" smartphones, a factor which traditional network dimensioning techniques often overlook. Figure 1 illustrates the impact of excessive signaling at an under-dimensioned venue: very low voice and R99 data traffic with very high non-HS power consumption due to signaling that impacts connection accessibility and retainability.

With inputs such as data usage, device mix, traffic patterns and application type, the network resources can be dimensioned and then optimized for an improved user experience during events.

SOLUTION

Achieve maximum network capacity

QUEST was used to estimate the user experience for the forecasted traffic and the deployed capacity at the event venues. This validated the deployed distributed antennae systems (DAS) design for the venues. Real-world network data wasused for a given mix of inputs such as morphology, device mix, traffic patterns, and application type. With this, QUEST accurately simulated the smartphone traffic typically seen during events and predicted the resulting traffic signaling.

Optimizing stadiums for the 2010 FIFA World Cup™ with MTN South Africa

"The growth of 3G-capable smart phones is allowing more people to enjoy wireless data services while attending sporting events," says Sameer Dave, chief technology officer of MTN South Africa. "This trend brings unique network demands in supporting large groups of subscribers in a small geographic area.
Qualcomm's engineering support was instrumental in helping us ensure that spectators received the reliable, high-speed voice and data services they have come to expect from MTN South Africa."

- Aug 17, 2010 www.qualcomm.com/press

SITUATION

- **Large concentrations of subscribers simultaneously access the 3G network during special events.**
- **Smartphones' frequent, short data connections increase network load, causing a degraded user experience.**
- **Estimating voice and data traffic demand during events is challenging.**

SOLUTION

- **Estimated data traffic demand with QUEST™ simulation tool and validated user experience based on the deployed capacity.**
- **Recommended specific network parameter optimization settings to reduce RRC connections**

RESULTS FROM SELECTED VENUES

- **90% reduction in inter-RAT related RRC connections.**
- **30% reduction in number of PS connections.**
- **50% reduction in number of FACH-to-HS transitions.**
- **Optimized data throughput and capacity management.**

QUALCOMM®

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UMTS NETWORK OPTIMIZATION AT EVENT VENUES

ESG also analyzed the performance counters from prior events at each of the venues. The analysis revealed ping-pongs between WCDMA and GSM networks, inefficient usage of RRC states in data calls, and a significant number of registrations.

The excessive traffic generated due to registrations was minimized by streamlining the periodic registration timers and inter-RAT cell reselection parameters (both WCDMA to GSM and GSM to WCDMA). The PS connections were reduced, thereby maximizing system capacity, by optimizing the (Forward Access Channel) FACH-Idle inactivity timer, FACH buffer thresholds, and HSDPA cell change timer parameters

RESULTS

Increasing capacity, providing uniform coverage and improving user experience

Comprehensive reports were delivered to the operators detailing the issues, root causes and specific recommendations that were tested at the event venues to achieve the below results.

- Actual user throughput estimated within 10% accuracy by using QUEST simulation tool. See Figure 2.
- 90% reduction in registration and inter-RAT related RRC connections by increasing the periodic registration timer from 1 hour to 3 hours and aggressively setting inter-RAT cell reselections.
- 10% reduction in number of PS connections by increasing FACH-Idle inactivity timer from 10 to 30 seconds.
- >30% reduction in number of PS connections by increasing FACH-Idle inactivity timer from 10 to 300 seconds.
- Approximately 50% reduction in number of FACH-to-HS transitions by increasing FACH to DCH/HS up-switch thresholds.
- Actual user throughput estimated within 10% accuracy by using QUEST simulation tool. See Figure 2 Actual user throughput estimated within 10% accuracy by using QUEST simulation tool. See Figure 2

FIGURE 1: DL Power Utilization vs. Traffic

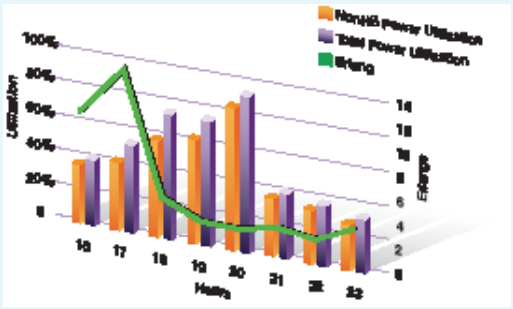


FIGURE 2: QUEST™ estimates actual user throughput within 10% accuracy

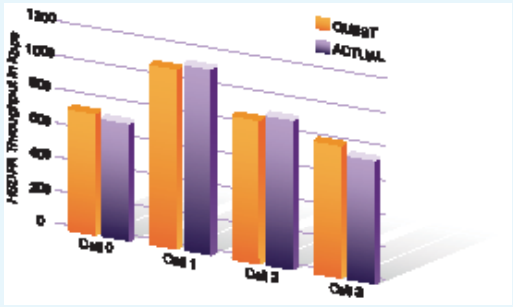
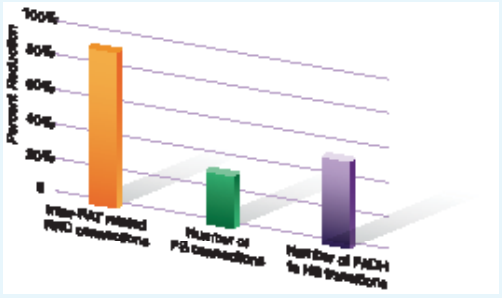


FIGURE 3: Results from selected venues



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