CORPORATE ENGINEERING

ESG

CASE STUDY

1XEV-DO 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 events poses a unique problem. The large concentration of smartphones with a usage profile of frequent, short data connections increases the Rise-over-Thermal (RoT) and lowers accessibility. This causes low call completion rates, frequent dropped calls, suboptimal response times, and low throughputs. The resulting degraded user experience can lead to subscriber churn and often visible, public backlash.

CHALLENGE

Optimizing network performance during events

When a large number of simultaneous users are connected to a 1xEV-DO network, the Reverse Link (RL) data throughput performance is low and connection blocking is high, creating increased RoT primarily due to the RL Pilot and MAC channel overhead contribution from many simultaneously connected users. Accessibility may also degrade from inefficient resource utilization due to longer than necessary connection hold times.

Operators have attempted to address these unique challenges and improve user experience by augmenting network capacity. This can be accomplished with additional carriers or additional cell sites. These augmentation solutions require a significant investment, which can prove inefficient for an event venue that is infrequently used. And often, these solutions do not adequately improve the network performance to meet the unique demand for 3G high speed data during events.

SOLUTION

Achieve maximum network capacity

Qualcomm ESG collaborated with the operator to perform a comprehensive assessment of several event venues. The goal was to reduce both RoT and connection blocking by reducing the overhead channel gains and shortening the inactivity timer.

EVENT CHARACTERISTICS

- **4** hours duration
- **60,000**+ attendance
- **300,000** to 1 million data connections
- Heavy use of picture/video messaging, live streaming and internet browsing

SITUATION

- **Thousands of 1xEV-DO subscribers simultaneously access the 3G network during events.**
- **>70% of connections are from smartphones, which generate the majority of signaling and data volume.**
- **Data throughput is low and connection blocking is high due to the Reverse Link Pilot and MAC channel overhead contribution.**
- **Continual data traffic increases network load, causing a degraded user experience.**

SOLUTION

- **Performed smartphone profiling, parameter and capacity studies.**
- **Recommended specific network parameter optimization settings to improve connection performance, minimize RL interference and maximize system capacity.**
- **Validated recommendations with field testing.**

RESULTS

- **95% improvement in MMS delivery rate with controlled RoT.**
- **3.2x reduction in RL interference.**

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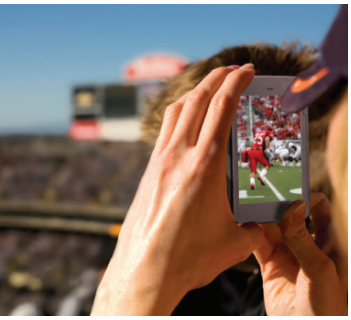
CASE STUDY

1XEV-DO NETWORK OPTIMIZATION AT EVENT VENUES



Simulations using existing system parameters and traffic profiles from these venues resulted in an optimal set of parameters designed to improve the user experience and the system capacity.

1xEV-DO Parameter optimizations for event venues:

- Dormancy (Inactivity) Timer optimization
- Reverse Link Pilot and overhead gain reduction
- Access Attempt interference reduction
- Reverse Link MAC optimizations

RESULTS

Improved user experience leads to increased data traffic

Through novel parameter optimization techniques, Qualcomm ESG optimized numerous event venues to improve connection performance, minimize the interference contribution of many simultaneously connected users, and maximize system capacity. With these parameter changes, network performance and user experience improvements were substantial.

A key observation was made – as the user experience improved with parameter optimization; subscribers used the 3G network even more, increasing the overall data demand. Conversely, when the user experience was poor; subscribers used the 3G network significantly less, reducing the overall data demand.

Parameter changes were assessed in live field trials and consistently yielded the following results:

- Improved MMS delivery rate
- Reduction in failed connection attempts
- Reduction in RoT (dB)
- Increased reverse link throughputs
- Decreased EV-DO to 1X hand downs

TABLE 1: Summary of Event Optimization

Football Game (hrly avg – 4 hrs total)	**Pre-optimized**	**Optimized**
MMS Failure (%)	16.8%	4.1%
Hand-downs to 1X	17303	5696
EV-DO Connection Attempts	17299	19122
Simultaneous Connections	54.6	31.3
Reverse Data Volume (MB)	96.81	93.23
Forward Data Volume (MB)	150.88	203.23
Rvs Data Rate - Sector (kbps)	27.10	66.00
Fwd Data Rate - Sector (kbps)	1383	1468
Rise-over-Thermal (dB)	10.18	5.05
Connection Blocking Rate	24 blocks	0.4 blocks
% Failed Connection Attempts	1.13	0.31

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