

# LTE BROADCAST

## A REVENUE ENABLER IN THE MOBILE MEDIA ERA

LTE Broadcast offers mobile-network operators a profitable business proposition through service differentiation, new revenue opportunities, and more efficient distribution of live and other digital media.

# INTRODUCTION

Mobile-broadband users are demanding spontaneous access to video content, a higher-quality experience and more convergent mobile services than ever before. During the London 2012 Olympic and Paralympic Games, around 50 percent of search requests in the UK were from mobile devices. The US broadcaster NBC (National Broadcasting Company) also reported that more than 45 percent of online video streaming of the games was delivered to mobile devices (Figure 1) [1].

Subscribers like to be able to consume content anytime, anywhere. As a result, new business models are emerging in which the line between fixed and mobile is becoming indistinct. Service providers – especially over-the-top (OTT) players and content aggregators like App stores, Netflix, Amazon and so on – are making premium content available anytime, anywhere on a variety of devices. Mobile network operators (MNOs) are being challenged by the need to give consumers what they want, while preserving the economics of their networks and creating new opportunities for revenue growth.

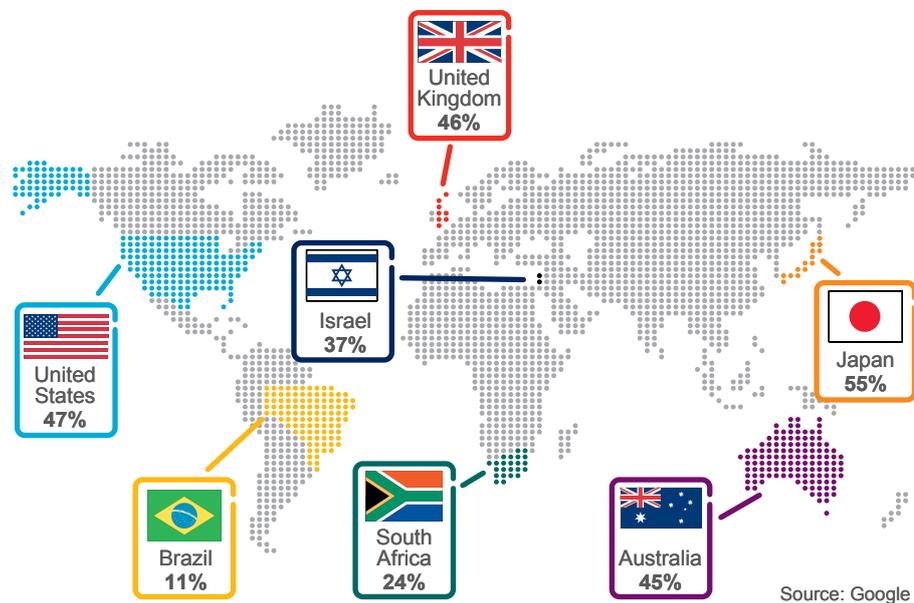


Figure 1: Google analysis revealed that mobile devices trumped desktops in Olympic-related searches during the London 2012 Olympic Games.

### Subscriptions (million)

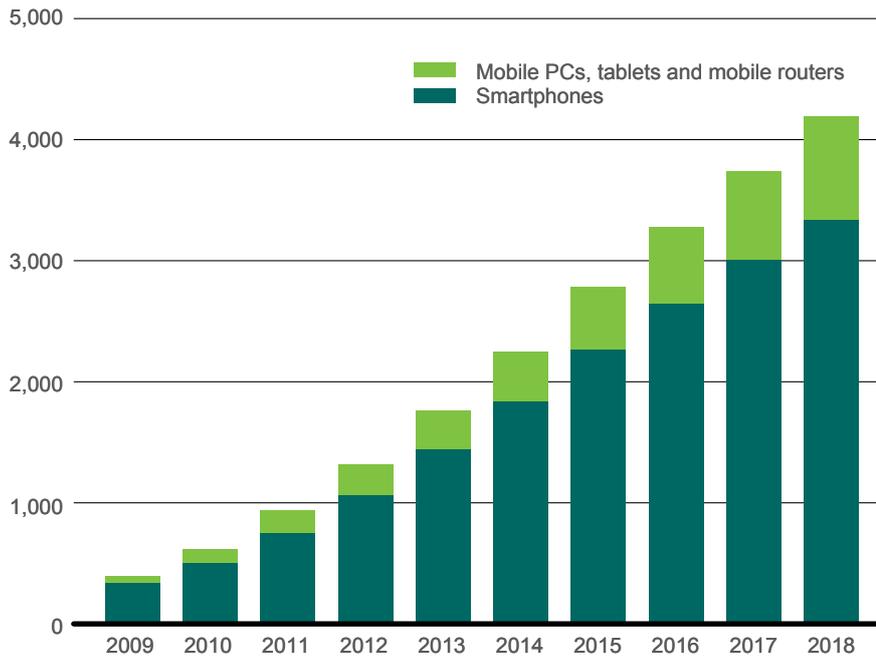


Figure 2: In 2012, smartphone, PC, mobile router and tablet subscriptions were due to grow 3.5-fold by 2018. Source: Ericsson

Owing to the popularity and adoption of smartphones and tablets, mobile data subscriptions are expected to reach 4.2 billion (Figure 2) by 2018. Mobile data traffic is expected to grow 12-fold by the end of 2018 (Figure 3), driven mainly by video [2].

Through deploying LTE Broadcast, MNOs can manage network assets better by allowing multicast for popular content demanded by multiple subscribers, such as live TV and events. MNOs can also utilize off-peak capacity to deliver new service offerings, such as rich media caching or managed software updates. Lastly, broadcast capabilities enable opportunities for monetizing network bandwidth through new business models, such as time-slot auctions. Altogether, MNOs can improve QoS while managing costs and diversifying their potential revenue base.

### Monthly petabytes (10<sup>15</sup> B)

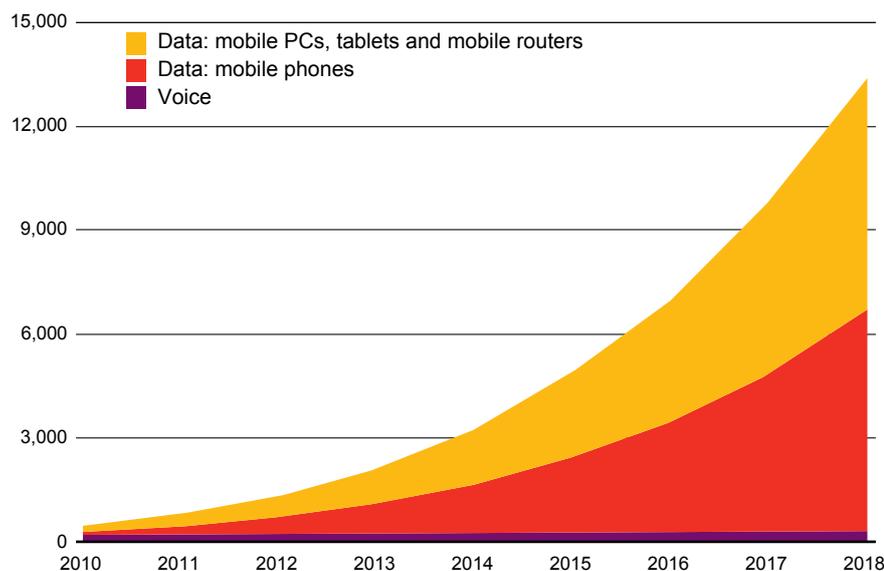


Figure 3: In 2012, total mobile device data traffic (MB/month) was predicted to grow 12-fold by 2018. Source: Ericsson

# LTE BROADCAST TECHNOLOGY

LTE Broadcast is a single-frequency network (SFN) in broadcast mode that is part of the series of 3GPP LTE standards known as evolved Multimedia Broadcast Multicast Service (eMBMS). It extends existing LTE/Evolved Packet Core (EPC) systems with an efficient point-to-multipoint (PMP) distribution feature, enabling multiple users to receive the same content simultaneously. LTE Broadcast functionality is available for commercial launch, beginning with Release 9 and with additional enhancements continuing in future 3GPP releases. LTE Broadcast is supported for all defined bandwidths and formats of LTE, including FDD, TDD, and carrier aggregation (CA) [3].

SFN technology is used to distribute broadcast streams into well-defined broadcast areas where all cells contributing to an SFN send the same data during exactly the same radio time-slots and appear as a single large cell. The area covered by the LTE SFNs can be small, spanning just a few cells; or it can be very large, covering an entire country. Broadcast and unicast radio channels coexist in the same cell, sharing capacity, while the subsets of available radio resources are dynamically assigned to either broadcast or unicast radio channels.

The LTE network can be upgraded by software, and a new media service layer offers a dedicated network element for the implementation of end-to-end LTE Broadcast services. LTE Broadcast provides a more flexible and lower deployment cost compared with previous mobile-broadcast options by leveraging OFDMA (Orthogonal Frequency-Division Multiple Access) and wider bandwidths available in LTE. On user devices, LTE Broadcast requires no separate device chipset and can use common middleware.

LTE Broadcast offers the greatest benefits in the delivery of content demanded by mass audiences. The technology starts to provide network-capacity advantages over unicast in a cell with as few as one to four concurrent users, depending on the deployment characteristics.

LTE Broadcast's flexible service dynamics allow MNOs to offer different services based on service type (live or non-real time), location (venue-specific, local, regional, national), quality (bitrate, QoS), and time of day/duration, and, as a result, charge differently for these.

# BUSINESS OPPORTUNITY

LTE Broadcast supports a range of use cases: live streaming of video for high-demand content, such as live sports and breaking news; background file delivery for popular content (video, music and print), software updates and emergency broadcasts. MNOs may choose to deliver their own content or partner with other content providers.

Below are some of the key use cases associated with LTE Broadcast and potential MNO business models.

Some examples of broadcast services and their economic analyses are presented below.

Services	Description	MNO business models & benefits
Live event streaming	Offer in-venue, local or nationwide coverage of key events such as sports, concerts, highly rated TV shows, awards, elections, and so on	Subscription, pay per view, pay per event, season pass, revenue share from content partners  Save on network expansion, high QoS
Real-time TV streaming	Offer live broadcast of one or more popular TV channels or other curated content	Subscription, pay per view, revenue share from content partners  Save on network expansion, high QoS
News, stock market reports, weather, and sports updates	Provide news, stock market reports, weather and sports updates several times a day, including live broadcasts and on-device caching	Subscription, advertising-supported software, free for premium customers  Increase service breadth and direct demand away from unicast capacity by providing updates throughout the day.
Broadcast music and radio	Deliver broadcast radio and music services	Subscription, advertising-supported, free for premium customers, revenue share from content partners  Direct demand away from unicast capacity, saving network resources and reducing congestion in the network
Off-peak media delivery	Deliver top TV shows, movies, newspapers, magazines, music, YouTube videos, and so on Provide necessary software, app and firmware updates	Subscription, pay per view, revenue share from content partners  Deliver services while not taxing unicast resources, reduce churn

Figure 4: Potential use cases and business models for LTE Broadcast services.

# EVENT SERVICES

It is well established that there are significant spikes in mobile data traffic in many markets across the world due to major sporting events, breaking news, highly watched TV programs and celebrity events – for example, final soccer matches, the Oscars, the Eurovision Song Contest, concerts, royal weddings, and so on. In fact, Google reported that in the first week of the London Olympics in 2012, event-related searches on mobile devices grew 10 times compared with the previous week [4]. The BBC reported that online video-traffic levels during the games were on average 20 times higher than those during the Beijing games four years before [5].

Using LTE Broadcast, MNOs can handle these spikes in mobile usage and also offer premium content service in venues, city centers or nationwide, to create new revenue streams with well-controlled media quality and efficient scalability.

Delivering video streams to hundreds of users in a cell site by using LTE Broadcast will utilize almost the same bandwidth as a single user with the same video quality. The guaranteed quality of experience can increase subscriber loyalty and deliver significant service differentiation compared with the competition.

There are multiple business models that MNOs can use. They can choose to offer their own content. Alternatively, they can offer the service capability in certain time slots in the area to rent to the broadcasters, venue owners or content providers in exchange for a fixed fee or percentage of revenue from their services.

The same business models can apply to a local event, where MNOs can offer managed services to enterprises that need to broadcast content within a venue or to specific locations, such as shopping malls, museums, airports, theme parks, concert halls, and so on.

For instance, if one UK operator with 25 million mobile subscribers had implemented LTE Broadcast in the major cities in the UK and provided premium-content services including multiple in-venue channels in Olympic Park with multiple camera feeds and nationwide broadcasting of quarter-final and semi-final heats, as well as Olympic finals. The MNO could then have offered its subscribers a special pay-per-event package of GBP 4.99 (EUR 6), which would not have been counted as part of the data bucket. With 10 percent penetration, the MNO could potentially have generated up to GBP 12 million (EUR 14 million) during the course of the event. As an additional benefit, the MNO could have extended its relationship with the subscriber, reducing churn and increasing the possibility of providing more services in the future.

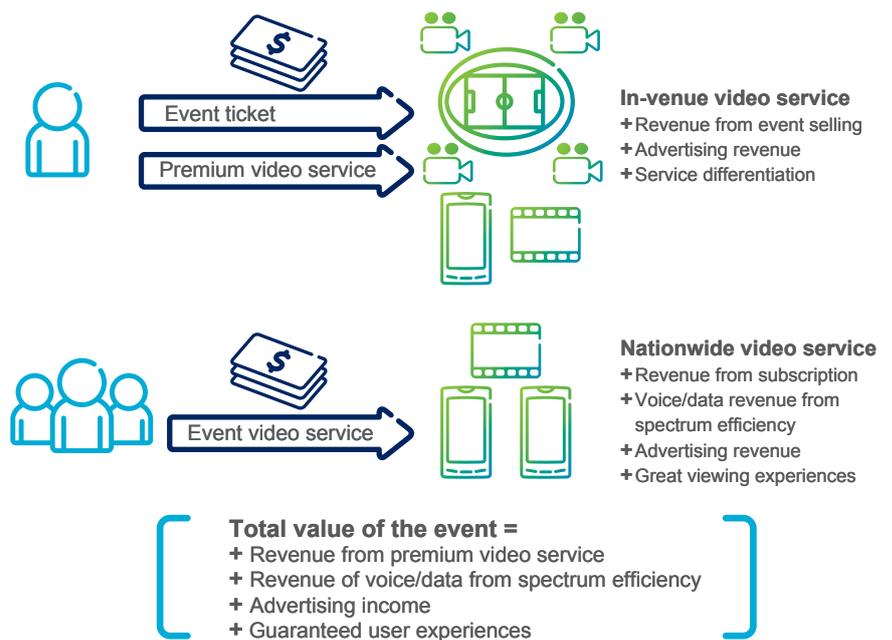


Figure 5: An example of a business case for MNOs: GBP 12 million (EUR 14 million) in revenue from a video service during the London 2012 Olympic Games.

### Allocated cost (depreciation + opex) USD/site/year

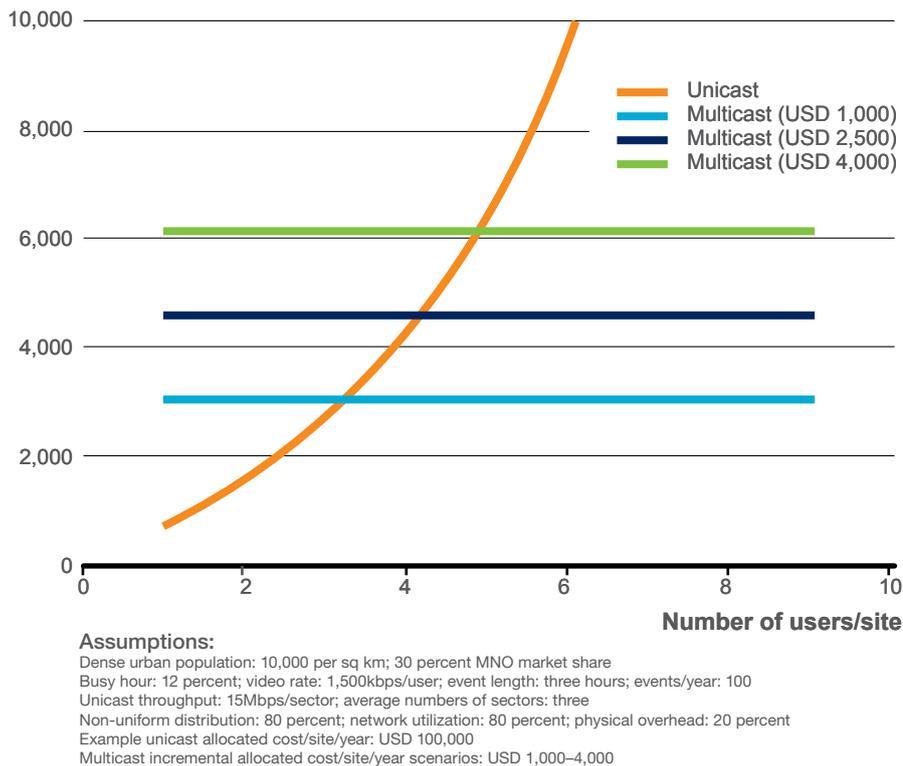


Figure 6: Comparison of unicast and multicast costs for live events, showing breakeven points. Source: Qualcomm Technologies, Inc.

In addition to that, the MNO could have offered mobile advertising and location-based services to targeted subscribers to generate further revenues.

In the London area, the average population density is more than 5,200 per square kilometer, with more than 8 million residents in the greater metropolitan area [6]. If an operator has a 30 percent market share of the covered area, the operator is potentially serving 2 million subscribers. In an Olympic final, with 10 percent of subscribers watching the 800kbps live video streaming (about 1GB of data volume per subscriber in three hours), the traffic payload would have reached more than 250TB. Assuming 30 percent of the viewers were using eMBMS-capable devices and connecting to broadcast channel, there would have been 75TB off-loaded from the network. The saved bandwidth could have been used to provide other telephony or data services, which equals more than 22 billion web page views or more than 800 million song downloads [7].

Another approach to understanding the benefit for an MNO is to look at the cost savings that the MNO realizes when delivering premier-event content to its subscribers using LTE Broadcast. The broadcast of live events such as American football, soccer or cricket across a dense urban coverage area offers a highly cost-effective solution compared with unicast. At similar streaming bitrates, it takes four to five MNO subscribers for multicast to break even, with unicast costs being calculated on a per-site basis.

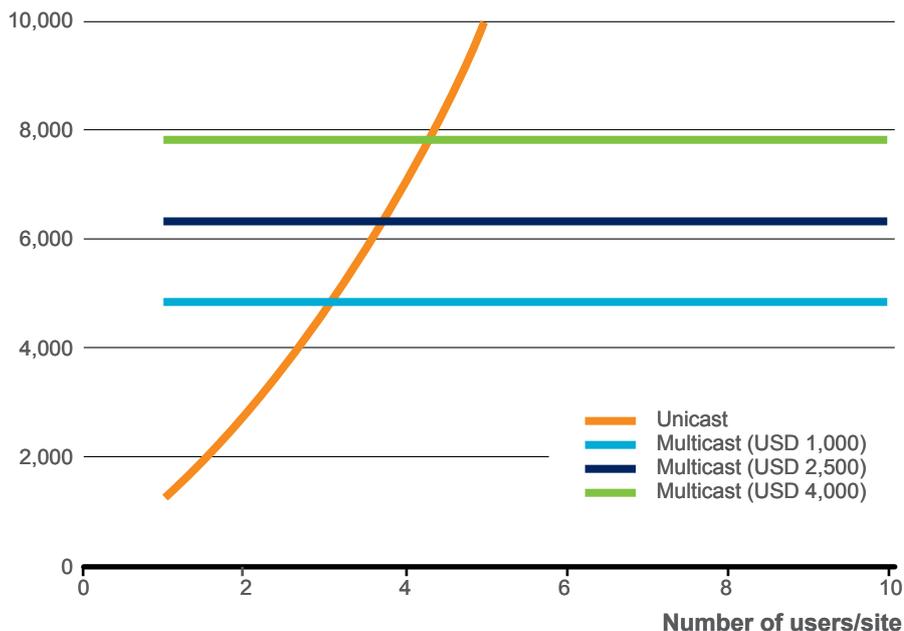
# MEDIA SERVICES, OTT OPTIMIZATION AND DATA OFFLOAD

## REAL-TIME MEDIA SERVICES FOR BREAKING NEWS, SPORTS AND WEATHER REPORTS

Daily breaking-news types of services can be delivered both nationwide and locally. Depending on the content and relevance of the news, an MNO can dynamically select the area and size of the broadcast.

In addition to live events, if an MNO decides to dynamically allocate its LTE-network resources toward news, weather and sports multicasts for a few hours every day, the number of subscribers needed to achieve breakeven cost between unicast and multicast is in the range of three to five in a cell site.

### Allocated cost (depreciation + opex) USD/site/year



#### Assumptions:

Dense urban population: 10,000 per sq km; 30 percent MNO market share  
 Live event: busy hour: 12 percent; video rate: 1,500kbps/user; event length: three hours; events/year: 100  
 Live media services: busy hour: 8 percent; video rate: 800kbps/user; event length: two hours; events/year: 365  
 Unicast throughput: 15Mbps/sector; average number of sectors: three  
 Non-uniform distribution: 80 percent; network utilization: 80 percent; physical overhead: 20 percent  
 Example unicast allocated cost/site/year: USD 100,000  
 Multicast incremental allocated cost/site/year scenarios: USD 1,000–4,000

Figure 7: Comparison of allocated unicast and multicast costs for the combined use cases for live events and live media service. Source: Qualcomm Technologies, Inc.

## OFF-PEAK MEDIA DELIVERY, OTT OPTIMIZATION AND DATA OFFLOAD

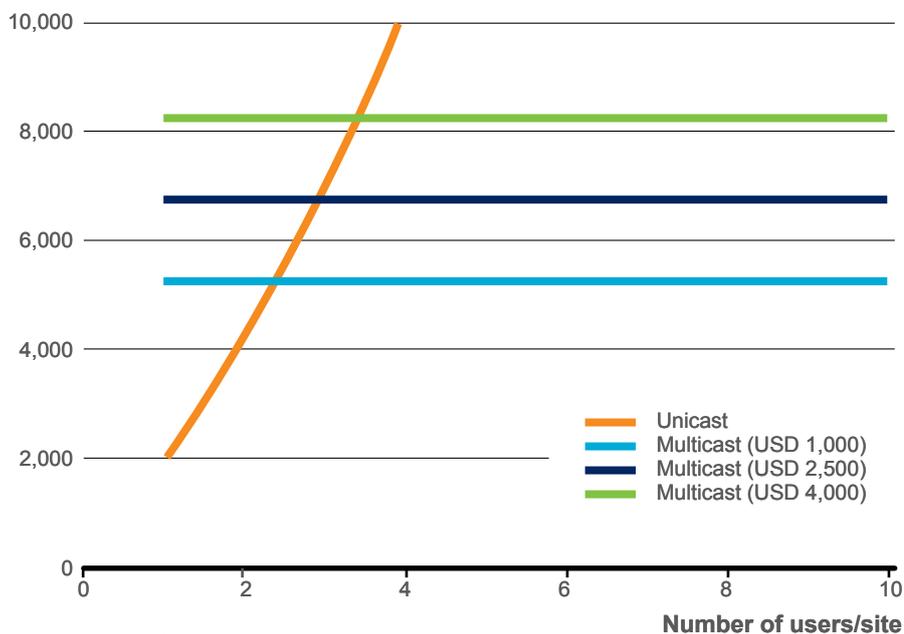
MNOs can provide media-delivery services for things like newspapers, magazines, books, TV shows, top-10 movies, top-10 YouTube clips, top-10 songs and music videos, and other forms of digital media overnight. The content can be cached on the device ready for consumption. Such off-peak media-delivery services will lower constraints on network resources during peak-usage hours, while potentially providing a new source of revenue.

Similarly, OTT service providers can offer location-based information services, coupons and e-advertisements via applications empowered by the operator's LTE Broadcast platform. This can mean both the reach and quality of delivery can be assured and the result will be very efficient delivery to subscribers without Wi-Fi limitation. In addition, MNOs can turn the heavy traffic load from costly into positive.

The media-delivery use case can be extended to file delivery of any kind. Critical software updates and firmware updates can be broadcast to the devices. This method can secure the delivery quality to multiple devices, while using the network resources very efficiently.

When off-peak file delivery using LTE Broadcast is offered in addition to live events and live-media services, LTE Broadcast starts to become more efficient compared with unicast, with as few as three to four users in a cell site.

### Allocated cost (depreciation + opex) USD/site/year



#### Assumptions:

Dense urban population: 10,000 per sq km; 30 percent MNO market share  
 Live event: busy hour: 12 percent; video rate: 1,500kbps/user; event length: three hours; events/year: 100  
 Live media services: busy hour: 8 percent; video rate: 800kbps/user; event length: two hours; events/year: 365  
 Off-peak: busy hour: 6 percent; video rate: 130kbps/user; event length: four hours; events/year: 365; 10GB/month  
 Unicast throughput: 15Mbps/sector; average number of sectors: three  
 Non-uniform distribution: 80 percent; network utilization: 80 percent; physical overhead: 20 percent  
 Example unicast allocated cost/site/year: USD 100,000  
 Multicast incremental allocated cost/site/year scenarios: USD 1,000–4,000

Figure 8: Comparison of estimated allocated unicast and multicast costs for live events, live media services and off-peak file-delivery use cases combined. Off-peak use case is defined as a four-hour broadcast in a day during off-peak hours at 130kbps and 365 events in a year with 6 percent busy hours. Source: Qualcomm Technologies, Inc.

# OTHER USE CASES

While the focus of this white paper so far has been on mobile devices, there are many other applications and use cases that can create new business opportunities for MNOs once LTE Broadcast is deployed. Some more opportunities for LTE Broadcast are listed below.

- > TV terminals inside elevators, waiting halls, airports and bus stops for location-based media services.
- > Automobiles, for content delivery to automobile screens and software updates to various systems.
- > Digital signage for periodical media updates.
- > Emergency alerts, to deliver news and updates in a disaster-recovery situation.
- > Displays in stadiums for in-venue media services and event-related advertising.
- > High-value equipment and appliances that require software and firmware updates.

Once deployed, LTE Broadcast can be used for multiple use cases and allows MNOs to offer new products and services directly to consumers, and enhances their role in the value chain. MNOs can use and monetize their media and network assets and strike deals with content and media partners for new services. From an ROI perspective, revenue generation and cost-savings opportunities are significant and provide an attractive value proposition for MNOs.

# CONCLUSION

LTE Broadcast offers MNOs a profitable business proposition through service differentiation, new revenue opportunities, and more efficient distribution of live and digital media.

To handle mobile device user demands on viewing experiences and upcoming emerging video traffic, MNOs should look into alternative ways to cater to service-level demands and to manage network capacity in addition to continuing investment in network capacity.

LTE Broadcast enables the MNO to charge premium rates for premium content with guaranteed quality by knowing they have the ability to deliver at all times, no matter how popular any certain live event or media offering may become. This certainty allows the MNO and its media partners to offer new services boldly over the mobile networks, using innovative business models, without the fear of congestion or failure to deliver to its customers.

The capability and the flexibility enabled by LTE Broadcast is a very powerful tool for operators wishing to embrace the impact and attraction of media content, and thus to provide new services and business opportunities in the digital mobile era.

# GLOSSARY

CA	carrier aggregation
eMBMS	evolved Multimedia Broadcast Multicast Service
EPC	Evolved Packet Core
MNO	mobile network operator
OFDMA	Orthogonal Frequency-Division Multiple Access
OTT	over-the-top
PMP	point-to-multipoint
ROI	return on investment
SFN	single-frequency network

# REFERENCES

1. <http://blogs.ft.com/tech-blog/2012/08/smart-phones-trump-desktops-in-olympics-viewing/>
2. <http://www.ericsson.com/ericsson-mobility-report>
3. <http://www.3gpp.org>
4. <http://googlemobileads.blogspot.se/2012/02/super-bowl-mvp-mobile-device-41-of.html>
5. [http://www.bbc.co.uk/blogs/internet/posts/olympic\\_statistics\\_traffic\\_week](http://www.bbc.co.uk/blogs/internet/posts/olympic_statistics_traffic_week)
6. <http://en.wikipedia.org/wiki/London>
7. <http://www.istart.co.nz/index/HM20/PC0/PV21902/EX245/AR29116>