CASE STUDY
Wi-fi access at London 2012

The London 2012 Olympic Park wi-fi network delivered 100 per cent availability throughout the Games

Challenge

The London 2012 Olympic Park infrastructure called for unbreakable technology and total scalability. BT had the challenge of building the largest high-density wireless network in the world.

There was very limited wi-fi at Beijing 2008, but London 2012 was different. It was the first Games featuring wi-fi at the Olympic Park for spectators, and the nature of the venue required an innovative technical approach.

Thousands of spectators with wi-fi enabled tablets, smartphones and laptops were forecast to pass through and watch events. Traditional wi-fi networks would have become easily overloaded because they’re designed for coverage not density, so BT designed, built and managed the highest density wireless network ever. The intricate infrastructure deployed by BT not only supported the public wi-fi service, but also back-of-house services and the ticketing system.

In Greater London overall BT managed more than 500,000 hotspots allowing residents and visitors to enjoy the summer of sport. On the Olympic Park alone more than 170,000 spectators were welcomed every day, and it was estimated that over 50 per cent of them were likely to be using wi-fi-enabled devices.

The average user spent 41 minutes online per session and used 40MB of data. On 4 August (Super Saturday), the public wi-fi network supported 26 per cent of all the spectator sessions on the Olympic Park during the Olympic Games. On 9 August (when Usain Bolt won the 200 metres final) the public wi-fi network supported 16 per cent of public wi-fi minutes used in the Olympic Stadium during the Olympic Games.

Wi-fi usage was highest in the public areas of the park (44 per cent), as spectators caught up on other sports when not watching their events. Wi-fi use across other Games venues broke down to 28 per cent (the Olympic Stadium), seven per cent (Aquatics Centre), six per cent (Basketball), seven per cent (Riverside Arena – Hockey), three per cent (Velodrome) and two per cent each at Handball (Copper Box), Eton Manor (Paralympics only) and Water Polo.

But how do you build such a massively intricate infrastructure with the added complexity of parallel temporary sporting venues construction work? That was the challenge facing BT.

Solution

To cope with that level of traffic, on the Olympic Park alone the team installed more than 1,500 wireless access points, interconnected by over 100 kilometres of cable across 250 hectares. This required bespoke radio frequency design and planning rules to be created and agreed with LOCOG (the London Organising Committee of the Olympic and Paralympic Games). Those rules had to govern the allocation and manage the use of the wi-fi spectrum across stakeholders within the Olympic Park including broadcasters, the timing, scoring and results provider, and public wi-fi.

The forecast across all services was for 200,000 simultaneous wireless sessions (and that level was approached at several points). To assure top efficiency and quadruple levels of redundancy, BT Design and the wider technology team put a dedicated wi-fi core network in place that supported wireless LAN connections for London 2012 stakeholders including LOCOG as well as BT Wi-fi public services.

The public wi-fi service featured a 10Gbps backhaul circuit and some 850 dual-band wireless access points, supporting speeds of up to 300Mbps. To cope with the potential number of spectators, high density access points with specialist antennae came into play, minimising any interference between the access points.

Using an innovative IP network design to support large mobility groups and a highly-tuned radio frequency network achieved through multiple optimisation phases, BT was able to allow spectators to stay seamlessly connected to wi-fi even while moving around the park.

BT also provided back-of-house (BoH) wi-fi services for athletes, rate card users, VIPs, and LOCOG staff, as well as a private wi-fi network to offload data traffic for Games Family mobile services. The BoH services also supported the ticket access control system.

The 3G mobile data offload service was dedicated to a closed user group of mobile handsets issued by LOCOG to the Games Family, using a pre-provisioned pre-shared key (WPA2 PSK) for authentication with the key hard-coded into the Samsung handsets using specially developed client software.

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The BoH wireless access services were supported by some 644 wireless access points, which carried traffic in an encrypted tunnel to the core services network. Across all venues, the athlete service accounted for 48 per cent of all the wi-fi sessions as well as 52 per cent of the traffic. The Athletes Village at the Olympic Park was the most popular BoH site, with 30 per cent of all sessions happening there and 24 per cent of the total bandwidth being used.

To address all the wireless access points in use across the Olympic Park, 60 wireless access controllers were installed. “We could have made do with far fewer,” says Junior Sesay, Wireless LAN Technical Design Authority for London 2012 at BT Design, “but with a wireless network of this density we were in unknown territory. We wanted to not only reduce stress on individual wireless access controllers, but also build in sufficient redundancy to guarantee continuous service levels.”

To manage this infrastructure BT adopted a wireless access point management system that had previously been used in America at events like the February 2012 Super Bowl. It provided network-wide visibility to optimise the wi-fi infrastructure and to deal with potential problems before they became service issues.

At London 2012, nothing was left to chance. Two wireless access point management systems were provided running as black box appliances each with a primary and secondary device. The first level of failover would be between the primary and secondary devices within the first black box. However, in the extremely unlikely event that both went wrong, the entire system would failover to the second black box appliance set.

Gerry Pennell, Chief Information Officer at LOCOG says:

The 2012 Games were a truly digital Games. The enhanced wi-fi infrastructure provided by BT gave spectators and fans more opportunity to get online, keep in touch and share their experiences.”

Value

Before the Games began, BT carried out saturation tests of the public wi-fi service. These were followed by live trials at the two rehearsals for the Opening Ceremony, with over 10,000 spectators in attendance. Furthermore, detailed heat maps were created to model and spot risks and potential overloading well before it became a service-affecting problem at each Games venue. Junior Sesay says: “When the Games went live, the mapping feature was great for tracking possible bottlenecks down to discrete network segments.”

Along with the heat maps, comprehensive reporting providing statistics such as equipment inventory, network health, and the number of simultaneous wireless sessions, were available at the press of a button. The TOC (Technical Operations Centre) team was also able to monitor network utilisation and then use the system’s management capabilities to dynamically adjust capacity as necessary.

The wireless network management system and the use of pre-written templates meant that reconfiguration of all 60 Olympic Park wireless access controllers typically took just three minutes. Historically such an operation might have soaked up 10 engineering hours, plus the time and trouble of moving between the 60 wireless access points, meaning that the productivity improvement was in the order of 200:1. Just one manager was required to supervise the entire wi-fi infrastructure, where originally four people were budgeted to run the management servers and applications. Meanwhile, the original estimate of ten live servers was reduced to just four.

During Games-time a dedicated team of BT radio frequency engineering experts worked closely with LOCOG to monitor the wi-fi network’s performance. As one of the biggest public wi-fi projects ever executed, that BT preparation and management resulted in 100 per cent wireless network availability every day of the event. That was confirmed by the customer experience during Games-time, when no service-affecting failures occurred.

“As the world’s most complex and largest scale high-density wi-fi installation to date, the BT Wi-fi public internet access service provided throughout the London 2012 Olympic and Paralympic Games has been extremely successful,” concludes Darren Maclean, BT Wi-fi Delivery Director for 2012.

“With greater scalability and enhanced capabilities, supporting new management information and greater levels of operational control, BT delivered an industry first with 100 per cent uptime throughout a long period of sustained and intense use.”

Core services

• BT Wi-fi
• BT Global Services
• BT Design
• BT Operate