

The rXg installation at the Indian Wells Tennis Garden consists of a highly available fault tolerant gateway cluster with support for 16,000 simultaneous users. The system fits into 7U of rack space and takes the place a full rack management equipment that would otherwise cost more than a million dollars and incur hundreds of thousands of dollars a year in ongoing maintenance, support contracts and integration costs. The lead network administrator from one of the grand slam tennis tournaments he could not believe what he was seeing when he came to take a look at the IWTG datacenter during the 2014 BNP Paribas Open. He said “I’ve got two racks of stuff to do what you guys are doing in those three boxes and my solution would never scale to what you’ve got.”

Simple, reliable, scalable, affordable. Perfection, it is what we strive to achieve every day at RG Nets. “The rXg is the most amazing product we have ever seen” is what network administrators at IWTG say when people ask about the rXg. We couldn’t possible say it better ourselves.



about RG Nets Inc.
RG Nets is the leading provider of gateways and centralized-authentication appliances designed to manage, provision, and protect revenue-generating networks. rXg turn-key gateways offer customer networks of all sizes a single integrated network-provisioning appliance for cost-effective and scalable network deployments. All of the functions and features required in today’s revenue-generating policy-enforcement networks are bundled in one rXg device. Headquartered in Carson City, NV, RG Nets has a worldwide sales and technical support organization, along with a global network of resellers and integrators. For more information about RG Nets, please visit <http://rgnets.com>.



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rXg turn-key gateway provides total control, clear communication and complete cognizance solution for extreme density deployment

success story

Indian Wells Tennis Garden
BNP Paribas Open
Palm Desert, California



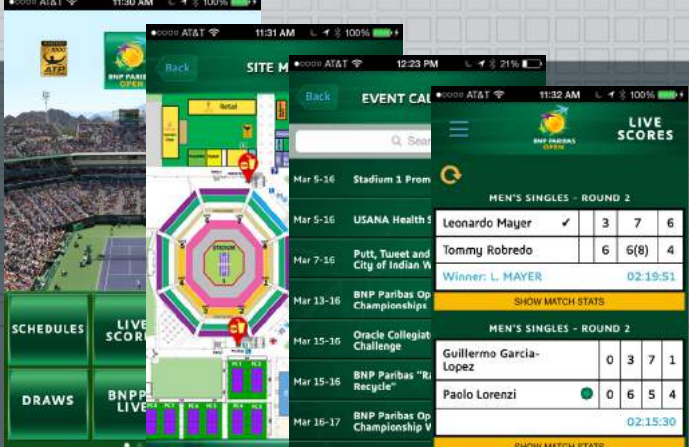
The Indian Wells Tennis Garden, home of the BNP Paribas Open tournament, sits on 88 acres and includes the second largest tennis-specific stadium in the world with 16,100 seats. The BNP Paribas Open is the largest ATP World Tour Masters 1000 and WTA Premier Mandatory combined event with prize money totaling over \$10M. The 2014 event was attended by a record breaking 431,000 fans with over 31,700 coming in on a single day. In addition, the 2014 event opened the IWTG's new 8,000 seat Stadium 2, part of a \$70M site expansion that includes three world-class restaurants and 16 acres of new turf with new practice courts, box offices, a 19,000 square foot shade structure, parking facilities and a high performance public access WiFi system that spans the entire venue.

Sixteen of the most exciting tennis matches that can be experienced between thirty-two of the world's best tennis athletes are going on simultaneously. Another thirty two of the world's best tennis athlete are practicing and a dozen of those are hitting balls with fans on the practice courts. It's a pure adrenaline rush with unrivaled excitement for tennis fans that pay upwards of \$6,000 per person for the privilege of coming to a major tennis event. It's also an extremely frustrating experience because nobody knows what's happening on the various courts at any given time.

Tennis matches may end in an hour, or three hours, or six hours, so it's impossible for tournament operations to prearrange all schedules. Athletes may choose to randomly warm up and practice at any given time. Fans want to watch and certainly would love to hit a few balls with their favorite athletes, but how do they figure out where to go? Everything has been tried from massive video screens broadcasting the latest information to manned kiosks situated around the venue. They all have their problems ranging from losing your highly coveted seat to check a schedule to never having exactly the right information at the right time. Ultimately it's a huge damper on what is otherwise a fantastic experience.

The obvious thing to do given the ubiquitous availability of smartphones is to have a tournament app. The problem is that getting connectivity to the phones is harder than it looks. High density venues are well known to be problematic for wireless communications. Most stadiums and event venues are cellular dead zones despite tremendous infrastructure expenses. An extraordinarily expensive and complicated array of equipment that includes numerous repeaters, microcells, directed antenna systems and other proprietary equipment is required to bring cellular service to high density venues. In fact, the first question that is often asked between network administrators to gauge the density of an event is how many temporary cell sites the major providers brought in.

A properly deployed WiFi network is the only approach that allows an event venue to take complete control of the situation and address the wireless communications dead zone problem from end-to-end. The compatibility of WiFi is universal because WiFi client ratios are an ubiquitous presence in every consumer wireless electronic device and independent of the cellular service.



Furthermore WiFi infrastructure access points are dramatically more cost effective than any kind of electronic equipment related to cellular technology. The tremendously lower cost enables event venues to engage in mass deployment of WiFi WAPs. Overcoming the wireless dead zone problem with WiFi is achieved by applying the gain-bandwidth product principle. Venues minimize the average client to infrastructure radio distance as well as the ratio of client radios to infrastructure radios to achieve solid signal.

Solving the physical layer problem exposes serious problems at L2+. Most L2/L3 problems that plague networks with large volumes of BYOD transients are a result of having too many devices on a single broadcast domain. CSMA/CA simply breaks down when there are too many devices on the same broadcast domain. Further up the stack there are IP address conflicts to contend with. The most common form of this problem arises as end-user devices continuously attach and detach from a single broadcast domain. Devices have a tendency to hang on to IP addresses that they have been previously assigned. This results in a conflict when an address has been leased to a different device. A less common though far more problematic form of this problem occurs when a rogue DHCP server shows up. The most catastrophic form of this problem occurs when an end-user device takes over the IP of the default gateway.

The RG Nets revenue eXtraction gateway is the only single unified solution that completely addresses the full spectrum of possibilities that come about when dealing with large scale high transient networks. The rXg provides facilities for deploying per-device VLANs, a unique capability that completely solves all known L2 and L3 issues that arise in complex heterogeneous networks. This technology is different from the solutions present in WLAN controllers in that it is the only truly comprehensive solution that addresses problems that have yet to be discovered.

The rXg per-user VLAN technology enabled the network administrators at the Indian Wells Tennis Garden to partition their single, very large and problematic network into smaller, more reasonably sized networks while maintaining the ability to roam across the venue and keeping the architecture simple with zero management overhead. Mark McComas, VP of West Coast Networking, the lead system integrator on the project said "We called up everybody, all



the big names. They all drew up really complicated solutions. One of them wanted to put in 20+ of their boxes and then we would need to add 10 other things to do all the stuff that they didn't do. Another wanted more than a million dollars to put in 7 different pieces of equipment in the back-end and then another million for their advanced services group to make it work. Everything everybody else proposed was really out of control. RG Nets came in with a single box turn-key solution with a unified GUI and a network design so simple that the diagram, with all the important details, fit onto a cocktail napkin. It was a no-brainer."

Deploying a WiFi network in a high density environment that supports even basic web traffic is extremely difficult, but that is only the beginning of the story at Indian Wells Tennis Garden. The public access WiFi network at IWTG also has the added challenge of being required to support thousands of simultaneous video streams. The 2014 BNP Paribas tournament introduced a mobile app for attendees that included live video streaming of matches at the Indian Wells Tennis Garden. This feature enabled fans to watch real-time feeds from one of several courts while they waited for the action to begin at the court they were at or while they enjoyed the world class dining. More than 46,000 people downloaded the app and nearly 8 million screen views were recorded.

The rXg's integrated traffic shaping system was specifically configured to provide the best possible user experience for the video streaming app while simultaneously keeping bandwidth costs under control. The rXg's unique hierarchal fair-share queueing system with bursting capability allowed the venue to deliver a fantastic user experience that required less than 2 seconds of clock time to load a 10 second buffer of the live feed for all clients while utilizing less than 500 Mbps of uplink bandwidth, a fraction of the 20 Gbps that Octoshape, the video streaming provider, believed was needed. When combined with the rXg per-user VLAN capability, the infrastructure enabled more than 12,000 devices to get onto the network each day of the event. More than 7,000 devices were actively transmitting and receiving data at any given time with hundreds of those simultaneously watching live streaming video.



Furthermore the ATP has strict regulations regarding gambling at tournament sites. Internet connectivity provided by the venue must deny access to online casinos and other gambling websites. The rXg integrated content filtering capability was employed to comply with the ATP and WTC regulations that prohibit attendee access to gambling sites while on the tournament premises.

Regulators came to the tournament and continually attempted to circumvent the rXg powered content filtering system to no avail. Mark McComas said "if we hadn't gone with rXg we would have had to install a lot more equipment, like several Barracudas, to do the filtering. That would have meant more problems, more management consoles, more complexity and more headaches. Barracuda actually flew an airplane over the tournament site towing an ad, which I thought was particularly funny considering that their solution would not work for this venue."

The rXg enabled the wireless network to work flawlessly during the extremely high load of the tournament. Each and every device could utilize their full allocation of 20 Mbps despite the extremely challenging conditions with thousands of connected devices. Attendees were able to access the video streams from anywhere within the grounds of the tennis garden. Sports Illustrated said "The site has been equipped with fairly reliable free public Wi-Fi and the tournament app is the best that I've used at any tournament, Slam or non-Slam" and that "the tournament's Wi-Fi network allows streaming of high-quality video from four show courts, an ambitious service given the potential bandwidth issues."

Everything worked so well that Mark McComas, VP of West Coast Networking, the lead integrator involved in the WiFi installation said "I had a meeting scheduled with ATP, but that got cancelled because they came to check on the network and everything worked perfectly and had nothing to talk about." Steve Simon, tournament director of the BNP Paribas Open said "We've put in what I term a true WiFi. A lot of places you can get connectivity, but you don't get real connectivity. It spins or takes 30 minutes to download a PDF."



extreme density
content filtering
unparalleled performance

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