

Building New World Networks with Unlicensed Wireless Spectrum

Using U-NII Spectrum to Penetrate the Broadband Market

Executive Summary

Demand is exploding rapidly across the globe for broadband services. Reports estimate that by 2010, the global market for broadband services will grow to US \$580 billion (Source: Comsys, The Broadband Report, April 2000). Cisco has long offered industry-leading products to deliver broadband services over cable and digital subscriber line (DSL) networks. Now Cisco has seamlessly integrated into its end-to-end network technology a crucial third medium—broadband fixed wireless (BBFW)—to help service providers reach business and residential customers with an economical, fast-to-deploy broadband service.

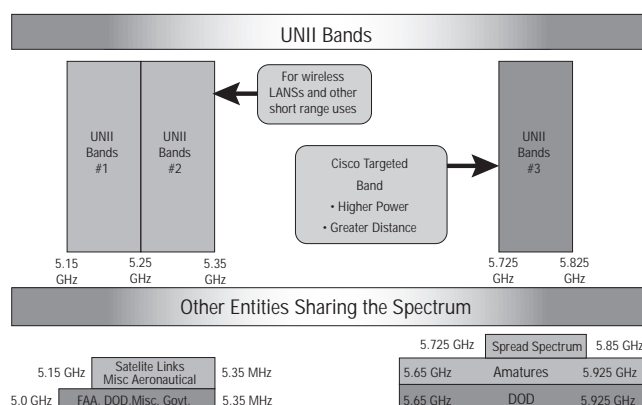
Supporting a wide range of business plans and deployment strategies, the Cisco WT2700 wireless solution includes both the Cisco WT2750 Multipoint Broadband Wireless System and the Cisco WT2710 Point-to-Point Broadband Wireless System. These systems deliver uncompromised performance, wireline-grade link availability, end-to-end quality of service (QoS), security, provisioning, and management support. Designed for carrier-class scalability, flexibility, and reliability, products in the Cisco WT2700 wireless solution easily meet mission-critical needs for broadband network access in the BBFW market.

The Cisco WT2700 wireless solution also enables an industry first: delivery of carrier-class broadband services in the Unlicensed National Information Infrastructure (U-NII) bands for fast system deployment with minimal capital investment compared to licensed bands.

What is U-NII?

In January 1997, the Federal Communications Commission (FCC) set aside 300 MHz of spectrum in the 5 GHz band for U-NII service. Three bands are defined in this spectrum: 5.15 to 5.25 GHz (U-NII band #1) and 5.25 to 5.35 GHz (U-NII band #2), which are designated for wireless LAN and other short-range use; and 5.725 to 5.825 GHz (U-NII band #3) for wide-area networking that reaches a greater distance with higher power. The Cisco BBFW products operate in U-NII band #3 (see Figure 1).

Figure 1 Spectrum Allocation for U-NII Bands



The BBFW Value Proposition

For service providers, BBFW offers several distinct advantages over traditional wireline technologies:

- Faster time to market at a lower cost
- Reach into under-served markets
- Efficient deployment
- Freedom from using wireline local loops

Faster Time, Lower Cost to Market

BBFW systems can be deployed rapidly and inexpensively because they require no wiring or cabling to a customer's neighborhood or premises. Faster deployment of BBFW systems leads to faster market penetration and faster revenue generation for service providers. Wireline operators often must wait for large sections of infrastructure to be completed before service can be delivered to any one customer. In contrast, each hub in a BBFW system can function on its own without waiting for completion of other hubs.

Broadband cable and fiber-optic services can require costly and time-consuming installation of under-the-ground infrastructure to serve customers within a specific geographic area. In addition to the extended length of time required to install this infrastructure throughout a market, Telephony magazine estimates the cost of connecting an individual office building to a fiber network is between \$300,000 and \$500,000 and predicts that only between 5 percent and 7 percent of the 750,000 office buildings in the U.S. will be connected with fiber during the next decade. (Source: Fixed, a supplement to Telephony magazine, May 22, 2000.)

Compare these fiber costs to the total cost of a Cisco WT2750 Multipoint Broadband Wireless System, which can be deployed for less than \$200,000. Each base station can support hundreds of business customers and thousands of residential customers for an even lower per-subscriber capital cost compared to wireline networks. Depending on the selected model of customer premises equipment (CPE), an individual building can be attached to the BBFW network for as little as a few thousand dollars for a business customer or a few hundred dollars for a single residential household.

Reach Into Under-Served Markets

BBFW systems can be deployed in areas that are not feasible or are uneconomical to serve with other broadband technologies. For example, customers in suburban and rural areas may be located beyond the reach of DSL lines. Office parks or other business customer sites may not be wired for cable. In addition, it may not be economically feasible in rural markets to lay the fiber-optic and coaxial cable required for a two-way broadband cable network.

Efficient Use of Financial Resources

Some wireline technologies such as fiber optics must deploy an enormous volume of bandwidth initially, then wait for customer demand to gradually fill the fiber's capacity. This slow buildup in utilization means the invested capital can yield little if any return during a market's infancy. By offering the ability to add sectors and channels to individual hubs as demand increases, BBFW technology allows service providers to match capital investments much more precisely to the actual demand in a given market.

Freedom from Wireline Local Loops

With some wireline technologies, particularly DSL, service providers must reach customers through the local loops owned by incumbent local exchange carriers (ILECs). This requirement means the speed and rate of market penetration by a BBFW service provider is dependent upon the ILEC's timeliness for provisioning individual customer loops. Delays can also be encountered when attempting to collocate equipment in an ILEC's central offices.

The one-time and recurring monthly fees charged by ILECs for use of their lines add to the operational expense of the wireless provider. Because these fees can often be many tens of dollars per customer per month, they can potentially limit a service provider's ability to achieve and maintain profitability in a highly competitive market.

The Value Proposition for U-NII

By using the U-NII bands, a service provider can enhance the strengths of the overall BBFW strategy with the advantages of unlicensed operation and minimal capital investment.

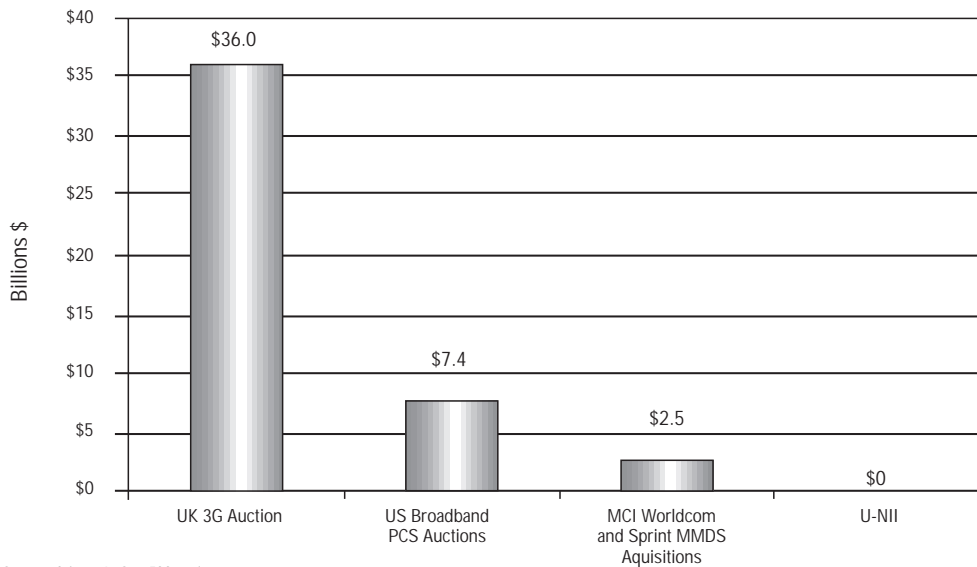
No License Required

No Federal Communications Commission (FCC) license is required for systems operating in the U-NII bands, a factor that speeds service deployment and opens the market to any provider. Rules for license allocation create barriers to entry in other BBFW spectrum bands such as Local Multipoint Distribution Service (LMDS) and Multipoint Multichannel Distribution Service (MMDS). For these bands, lengthy FCC rule making and spectrum auction proceedings, as well as potential negotiations with incumbent license holders in each market, can create significant delays for service rollouts.

No Capital Required for Spectrum

By using unlicensed spectrum, a U-NII service provider can avoid spending millions of dollars just to obtain air rights (see Figure 2). Instead, the service provider can use these funds to deploy and market actual BBFW services.

Figure 2 The High Cost of Different Spectrum Bands



The Result: Many Scenarios for Success

The right choice of BBFW technology can enable a wide range of business plans for a variety of service providers and individual enterprises, for example:

- Pure-play U-NII providers: Offer symmetrical broadband services to high-margin customers.
- Licensed BBFW providers: Enter the market with an unlicensed solution while waiting to resolve licensing issues with the FCC or incumbent license holders. Or, use longer-range, licensed spectrum to target residential areas that need greater geographic coverage in order to achieve profitability, and deploy U-NII to target business customers located in urban and suburban areas.
- DSL providers: Target communities that are unable to receive DSL service, such as those located too far from ILEC central offices or those with high penetrations of digital loop carriers (DLCs).
- Cable providers: Target business customers in areas, such as office parks, where no hybrid fiber-coaxial (HFC) cable plant is installed. Or, offer data services to customers without the expense of upgrading old coaxial cable plant.
- Individual enterprises: Extend an existing network infrastructure with a flexible, robust, and highly secured wireless access technology to meet growing network needs and avoid the expense of monthly charges for wireline services. Both point-to-point and multipoint wireless solutions are well suited to office parks, multi-building manufacturing plants, school districts, and similar local-area installations.

Solutions for U-NII Broadband Fixed Wireless from Cisco Systems

The Cisco WT2700 wireless solution enables service providers to offer carrier-class data, voice, and video services to customers in the 5.7 GHz U-NII band. This suite includes a wireless interface for the Cisco uBR7200 series universal broadband routers, a wireless transverter, a wireless modem card, a duplexer, and a power-feed panel. These products can deliver data rates of up to 44 Mbps across 5 to 7 miles for point-to-point applications and up to 22 Mbps across 4 to 6 miles for a multipoint application.

The Cisco uBR7200 series is a proven platform for delivering integrated voice, data, and video services with high quality performance and reliability. Already a leading product for deployment in cable headends, the Cisco uBR7200 series is equally suited to BBFW service delivery.

To enhance its BBFW offerings, Cisco has created a New World wireless ecosystem to enlist leading vendors for all aspects of the wireless solution, including radio frequency (RF) design, application-specific integrated circuit (ASIC) development, network design, and system integration. This alliance of outstanding vendors will facilitate market adoption of BBFW through open standards, fast time-to-market, and lower cost of ownership for service provider and enterprise solutions.

The Cisco WT2700 wireless solution offers several advantages for service delivery in the U-NII band, including interference resistance, spectrum efficiency, and fast provisioning.

High Resistance to Interference

Because the U-NII bands are open to any user, BBFW systems will likely share the spectrum with other types of wireless equipment. While shared spectrum opens the possibility of interference, this obstacle can be easily overcome by using equipment designed with advanced features for handling interference. Products in the Cisco WT2700 wireless solution suite incorporate a number of features for interference resistance, including the following:

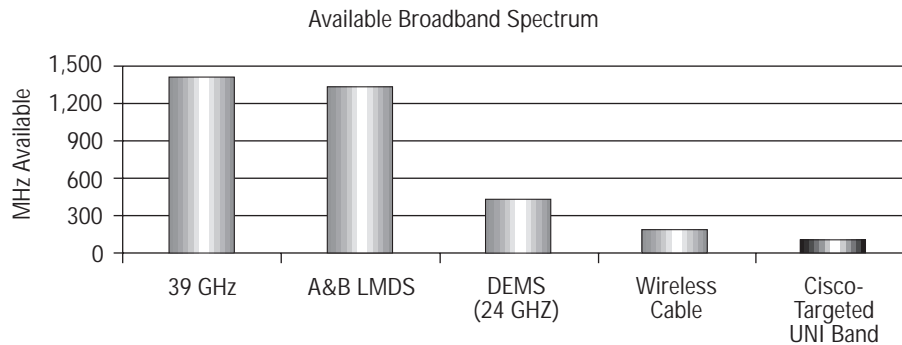
- The Cisco Vector Orthogonal Frequency Division Multiplexing (VOFDM) technology offers extremely high spectral efficiency, allowing the Cisco WT2700 wireless solution to transmit signals over narrower channels than those used by many competitors' products. This efficiency and flexibility for spectrum use enables service providers to design networks around portions of the U-NII band that may have more interference than others.
- The Cisco WT2700 wireless solution products support a range of throughput settings, giving users the option of trading some amount of throughput in order to gain higher resistance to interference.
- The Cisco VOFDM technology employs multitone transmission techniques for signal processing, which allows a Cisco WT2700 wireless solution to detect interference in specific tones within its signal and transmit around those tones. These techniques make a Cisco WT2700 wireless solution system highly resistant to narrowband interference.

Efficient Use of a Scarce Resource

One of the many strengths of the Internet Protocol (IP) is the ability to expand and contract its use of limited transmission resources in order to meet the exact bandwidth needs of different users. This adaptability is particularly critical in the U-NII band, which has less spectrum available than other broadband fixed wireless bands (see Figure 3). While some bands have as much as 1 GHz available for service delivery, the U-NII band is limited to 100 MHz.

This smaller spectrum amount makes IP the ideal choice for service delivery in the U-NII band. The Cisco WT2700 wireless solution includes the powerful capabilities for IP networking developed by Cisco as part of the Cisco IOS® software.

Figure 3 Spectrum Availability in Different Wireless Bands



Source: FCC

Fast Provisioning of New World Data, Voice, and Video Services

Customers increasingly require on-demand access to a complete range of data, voice, and video services. Service providers can meet this demand and create new revenue streams with broadband, IP-based, New World networks.

To deploy New World networks and deliver broadband services profitably, service providers must be able to perform several activities transparently to customers, including the following:

- Offer innovative services across an existing infrastructure
- Provision those services quickly and efficiently
- Manage all network elements to guarantee and maintain high quality of service (QoS).

To enable fast and efficient service provisioning, the Cisco WT2700 wireless solution offers a complete set of software features and optional tools for subscriber registration and wireless network management.

Providing New World Services with Cisco IOS Software

The Cisco IOS software at the core of the Cisco WT2700 wireless solution enables wireless service providers to offer customers a wide range of data, voice, and video services. Examples include virtual private networks (VPNs), voice over IP (VoIP), and multicast audio and video.

As technology evolves in the future, the Cisco IOS software will allow new services to be delivered as a simple software upgrade. This upgrade capability protects equipment investments for both the service provider and the customer, and minimizes service disruptions.

Automated Provisioning with the Cisco Subscriber Registration Center

Fast and efficient service provisioning is essential for speeding a service provider's revenue growth, reducing operating expenses, and driving profitability. The Cisco Subscriber Registration Center (CSRC) is a highly reliable and scalable subscriber self-registration system that automatically configures the customer's equipment based on user-selected services.

CSRC component products allow service providers to utilize policy-related features to streamline new network service rollout and reduce the need for technician visits to customer sites. These components also automate provisioning of subscriber services such as VoIP, e-mail, Web access, and configuration of the subscriber's wireless access equipment.

Managing the Network with Cisco Wireless Manager

Guaranteeing customers high QoS requires the ability to maintain a high level of network control and monitoring. Cisco Wireless Manager is a client-server management system designed specifically for wireless networks. This system supports element configuration, performance monitoring, troubleshooting and diagnostics, and network inventory.

Designed for use in a network operation center, Cisco Wireless Manager allows a service provider to minimize truck rolls by remotely monitoring, controlling, and testing each component in a BBFW network. This control extends from Cisco uBR7200 routers, wireless modem cards, and wireless outdoor units at the base stations to outdoor and indoor components at customer sites.

Summary

- BBFW enables service providers to deliver New World network services to small and midsize businesses that cannot be reached by DSL or cable networks.
- The U-NII band offers the advantages of fast and efficient deployment, and freedom from using wireline local loops to speed market reach and revenue capture for service providers.
- U-NII requires no license for operation and lower capital investment than other spectrum bands for faster service launch.
- The Cisco WT2700 wireless solution delivers the advantages of BBFW in a complete solution for service provisioning, delivery, and management in a variety of customer environments and applications.

To learn more about Cisco solutions for broadband fixed wireless services, contact your local Cisco representative or visit our web site at: <http://www.cisco.com/go/wireless>



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