LANCOM™ Techpaper Active Radio Control

Introduction

The rapid increase of WLAN-enabled end devices proves: the advantages of a flexible design of wireless networks gain in popularity – especially in enterprises. However, the more clients have to be supplied with WLAN, the more complex the required WLAN infrastructure becomes. For an efficient, wireless workflow a professional WLAN management is essential in order to provide a high-performance throughput for clients and to prevent sources of interference. However, network administrators are faced with multiple challenges:

- Many WLANs overlap each other on individual channels
- WLAN clients compete for the available bandwidth
- Foreign WLANs disturb the proprietary radio field
- Other non-WLAN sources of interference temporarily compromise the performance of the WLAN – up to total failure

With the intelligent WLAN optimization concept LANCOM Active Radio Control (ARC) you optimize your radio field and proactively prevent sources of interference in the WLAN. Active Radio Control comprises several, complementary functionalities in the LANCOM firmware LCOS, enabling you to sustainably improve the performance of your WLAN.

This techpaper introduces the functionalities of Active Radio Control and provides short instructions to professionally optimize WLAN infrastructures.

ARC Active Radio Control

Full control over the WLAN

LANCOM Active Radio Control provides the following professional and practical functionalities that optimize the WLAN radio field:

- RF Optimization
- Adaptive Noise Immunity
- Band Steering
- Spectral Scan

They give the network administrator full control over the configuration of complex WLAN environments for a proactive prevention of sources of interference. Other fully automated WLAN optimization tools have the disadvantage that program-controlled and potentially undesired configuration changes may occur, depending on the nature of the malfunction – giving the admin hardly any control of these changes. In contrast to that, LANCOM Active Radio Control attributes the admin full control. On top of that, all ARC functionalities are included free of charge in the LANCOM firmware LCOS and can be operated via the respective management systems.

RF Optimization

By choosing a WLAN channel, the part of the frequency band an access point uses for its logical WLANs is defined. In order to flawlessly operate a WLAN in reach of another access point, each access point should be using a separate channel – otherwise the WLANs have to share the bandwidth of the channel (shared medium). With RF Optimization LANCOM WLAN controllers automatically configure optimal channels for the access points in the 2.4 GHz frequency band. In the first step, the channel lists of the access points are deleted and prepared for a new definition. After that, the WLAN modules are shut off and successively turned on again. In turning on, the modules automatically search for a free channel and thus optimize the distribution of the channels in the radio field. The modul with the highest measured interference is prioritized for channel selection. RF Optimization can be activated for all access points managed by a WLAN controller or specifically for individual devices.
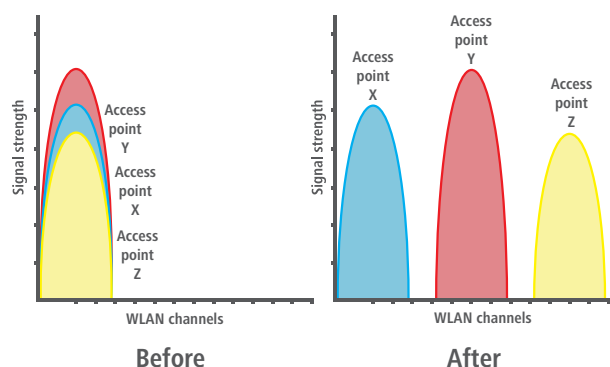

Figure 1: RF Optimization

Configuration

RF Optimization is started easily via LANmonitor: with a right mouse click on the list of active access points or on a specific device you choose "Start automatic radio field optimization" from the context menu.

Band Steering

Due to the higher distribution of clients supporting 2.4 GHz WLAN, a WLAN operating on this frequency band can be heavily loaded by a large number of clients. This is further increased by clients which do support 5 GHz but preferably log in via 2.4 GHz. In consequence the available bandwidth at 2.4 GHz is shared by many clients, while there is still enough capacity at 5 GHz. In order to achieve a more equal load in the WLAN and thus a more stable and faster connection for all clients, Band Steering is an efficient solution. The access points have to transmit the same SSID at both 2.4 GHz and 5 GHz. Therefore Band Steering can only be utilized by access points with two radio modules.When a client establishes contact, the access point checks its internal data whether the client has already been seen in the 5 GHz frequency. If this is the case, the access point will not answer probe requests of the client at 2.4 GHz and instead only answer via 5 GHz. This way, the client is effectively steered towards the 5 GHz frequency band.

Configuration

The configuration of Band Steering for LANCOM access points or WLAN controllers is conducted comfortably

2.4 GHz

5 GHz

Figure 2: Band Steering

via LANconfig. The necessary settings are found under Wireless-LAN > Band Steering. Here you can choose the preferred frequency band and activate Band Steering. Note: Make sure that the same SSID is configured on both 2.4 GHz and 5 GHz.

Adaptive Noise Immunity

WLANs often operate in challenging environments with many different sources of interference, compromising the performance of the own WLAN. Potential sources of interference may be other WLAN signals or other radio signals such as Bluetooth devices, wireless cameras, and microwave ovens which may have significant influence on the WLAN. By activating Adaptive Noise Immunity, an access point ignores sources of interference in the radio field and only focuses on WLAN clients with sufficient signal strength. This process is based on measured values of the WLAN module with regard to interferences in the radio field. If a defined threshold is exceeded, the reception sensitivity of the WLAN module will be reduced by LCOS respectively. Therefore, the probability is increased that the WLAN module will ignore intereferences while searching a free transmission slot, due to the "Carrier Sense Multiple Access / Collision Avoidance" procedure. These adaptive changes of the reception sensitivity, based on the permanent check of the radio field, the optimal operation of the WLAN module is induced.

Configuration

You can activate or deactivate Adaptive Noise Immunity with just one click in LANconfig under Wireless-LAN > General > Interfaces > Physical WLAN settings. Adaptive Noise Immunity is activated for both the 2.4 GHz and 5 GHz frequency bands by default.

Spectral Scan

Despite activated Adaptive Noise Immunity, the WLAN performance may be compromised by further sources of interference, especially in the 2.4 GHz frequency band. Interferences range from microwave ovens, wireless phones, Bluetooth devices or video transmitters, sending signals via 2.4 GHz. Such interferences can lead to the loss of data packets or of entire connections. If the overlap is too strong, the result may even be total failure of the WLAN. Spectral Scan enables a professional analysis of the radio field. The load of individual channels at a certain point of time is graphically illustrated and can be monitored historically. This way, the administrator can detect that a certain channel in the 2.4 GHz frequency band is heavily loaded during a certain time period. The conclusion could be that a source of interference has been operating during this time period, for instance a microwave oven during lunch time or a gaming console. With this information the administrator can take countermeasures by changing the used channel or by eliminating the source of interference. In contrast to a
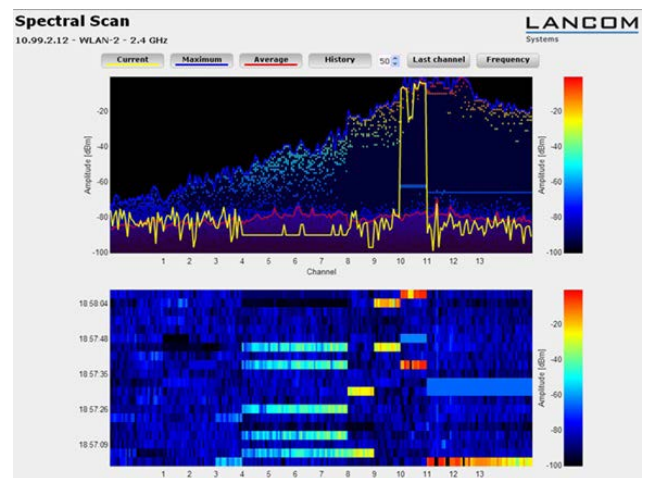

Figure 3: Adaptive Noise Immunity

Figure 4: Spectral Scan

fully automated, program-controlled switching of channels, this active intervention by the administrator has clear advantages: no undesirable configuration changes occur, for instance by switching to an already heavily loaded channel. Another advantage is the possibility to start Spectral Scan via WEBconfig – ideal for a remote operation without a technician on-site.

Configuration

Spectral Scan can be easily started via LANmonitor. Right-click the respective device in the list and select "Show Spectral Scan" in the context menu. Here you select the WLAN module to be analyzed as well as the sub-band, if necessary. With a click on "Start" you activate Spectral Scan. Note: During the analysis the scanning WLAN module neither transmits any data, nor an SSID.

Outlook

A professional WLAN optimization does not have to be complicated or expensive. All features of LANCOM Active Radio Control are included in the LANCOM firmware LCOS and are easily operated via the respective management tools. Thus they are free of charge and updated regularly. On top of that, Active Radio Control will be extended by additional features in future LCOS versions: Client Steering, for example, will significantly contribute to an advanced WLAN optimization by an active steering of clients towards the access point that makes most sense to them.

www.lancom.eu

LANCOM Systems GmbH I Adenauerstr. 20/B2 I 52146 Wuerselen I Germany I E-Mail info@lancom.de

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