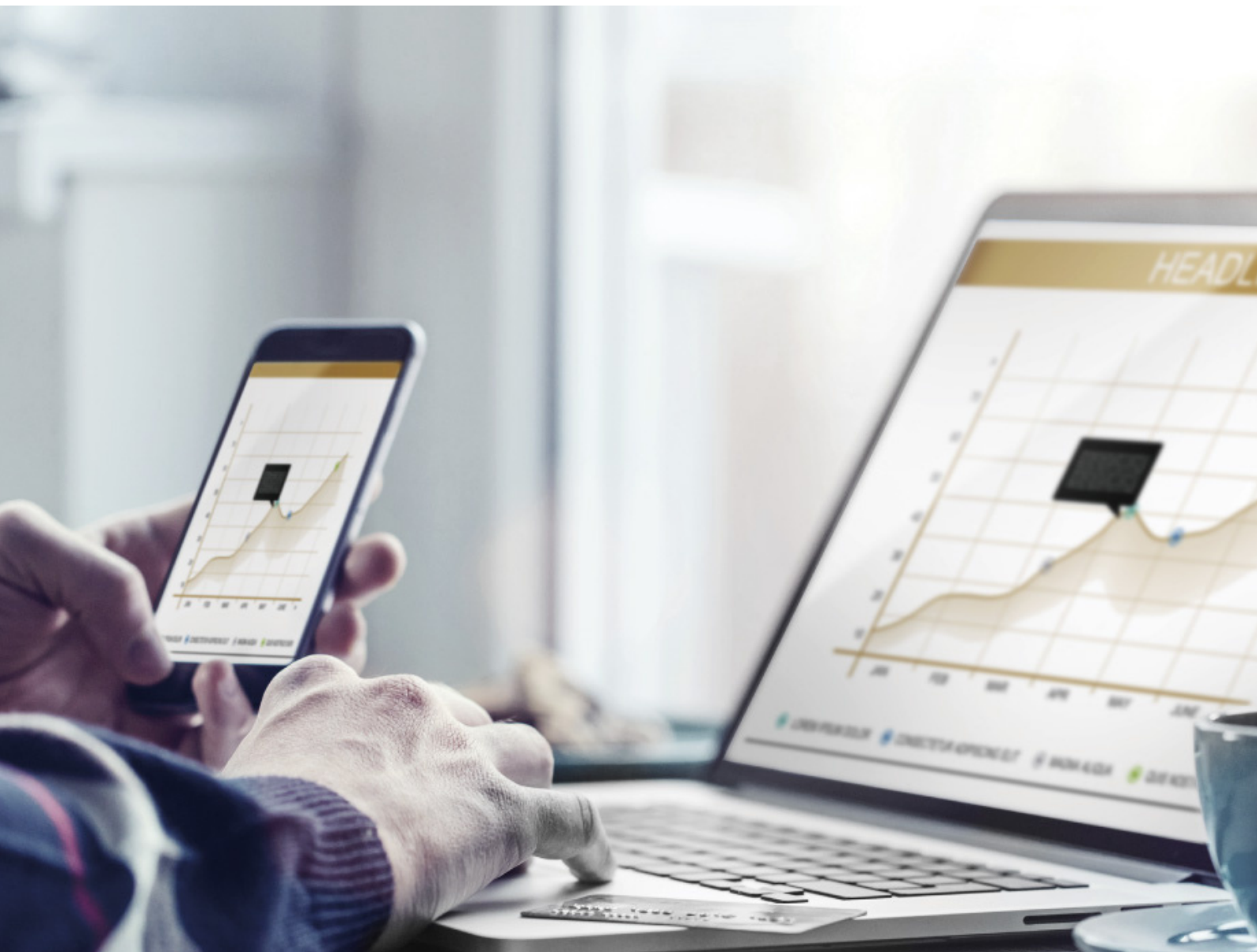# MIRACAST OVERINFRASTRUCTURE
WHITEPAPER

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EXECUTIVE OVERVIEW

"Our costumers appreciate the stability that goes along with the content. According to them the content shareability has become of great importance in the recent years."

EZCast series is designed to transform traditional workspace into smart workspace. EZCast devices are natively equipped with multiple protocols, including Miracast. With multiple standards, EZCast devices count with very high compatibility with various devices (smartphones, tablets, laptops) and allow users to share their screens on different displays.

Recently EZCast has extended the ability to send a Miracast stream over a local network (overinfrastructure) rather than over a direct wireless link (P2P mode). This functionality is based on the Miracast over Infrastructure Connection Establishment Protocol (MS-MICE). Our transition to Miracast Infrastructure began in 2020, after Windows 10 began supporting infrastructure mode. Devices like EZCast Ultra, EZCast 2, EZCast Band 1, andEZCast MiniBox support this upgraded version of Miracast.

This early adoption has allowed EZCast to provide a seamless connection with improved stability and quality as well as multiple other benefits. Overtime, the Miracast infrastructure mode is constantly increasing in importance. As the digital era advances, growing companies have increased the use of wireless devices. This include a wide variaty of employee apparatus, smartphones, laptops, and wireless displays. Our use of Miracast infrastructure helps to improve employee mobility, and productivity by delivering a stable connection at a faster and lower cost. Regardless of your device EZCast is committed to facilitate and upgrade source to display transmission.

Miracast Definition

Miracast also known as Wi-Fi CERTIFIED Miracast enables seamless display of multimedia content between Miracast devices. Miracast is based on the Wi-Fi Display (WFD) technology which implements an interoperable mechanism to discover, pair, connect and render multimedia content from a source device to a sink device.

This protocol allows two devices to be detected, to connect, and to mirror the screen of one on the other. It can roughly be described as "HDMI over Wi-Fi", replacing the cable from the device to the display. Miracast uses peer-to-peer network for wirelessly sending screencasts made up of Wi-Fi Direct connections in a similar way to what Bluetooth does.

The use of Miracast Overinfrastructure in our devices helps to improve employee mobility, productivity by delivering a stable connection at a faster and lower cost.

MIRACAST:
SCREEN
MIRRORING

Miracast Peer-to-Peer

WiFi Peer to Peer: (P2P) aka WiFi Direct enables devices to communicate with each other in a peer to peer manner without requiring any Access Point at typical WiFi speed with WPA2 security.

T**DLS, or Tunneled Direct Link Setup**, is "a seamless way to stream media and other data faster between devices already on the same Wi-Fi network." Devices using it communicate directly with one another, without involving the wireless network's router.

WFD version 1 uses Wi-Fi Peer-to-Peer (P2P) wireless direct or TDLS to setup the wireless connection path. Miracast P2P connections can be shared without the requirement of an access point (AP) intermediate or internet connection. The device connects wirelessly to the network, and then connects wirelessly to the dongle. The main problem is that this mode can be unstable because to execute this process your laptop antenna is constantly fluctuating back and forth between an internal network, an additional ad hoc network and wireless direct connection. The quality would decrease in response to bandwidth issues or laptop power settings. The bandwidth and signal are connecting with only a percentage of the power with the existing company network and the other percentage with the Miracast receiver.

Currently most of the market products only support P2P connection as it is simple and easy to use. After setting up a Wi-Fi data path IP addresses should be assigned to source and sink devices.

WFD Data Path

WFD has a control and a data path. The control path is based on RTSP/TCP while the data path usually depends on RTP/UDP. WFD uses RTSP packets to exchange control messages like capability negotiation, session management data etc. Audio and Video data packets are encapsulated in MPEG-TS and sent over RTP/UDP. Audio and Video data may also be encrypted via HDCP to ensure security.

Miracast P2P Disadvantages

From the previous description, the first thing for WFD source and sink to do is to setup a Wi-Fi P2P connection. This has advantages and disadvantages. The most obvious advantage is that it's very-easy-to-use. From the user's point, just open the Miracast application and click the device to interoperate and that's it. Besides the Wi-Fi P2P sets up a direct link between source and sink devices, as a result, it can choose a cleaner Wi-Fi channel which improves the performance. But Wi-Fi P2P also has disadvantages. Consider the following scenarios:

1) A mobile device usually has only one Wi-Fi chip and most of the time user will connect it to a home router and surfing on Internet. Then if the user use Miracast to share his/her screen, the mobile device must share Wi-Fi chip between the P2P connection for Miracast and the Infrastructure connection for Internet. This may decrease the Wi-Fi performance.

2) A device capable of Ethernet only will not benefit from Miracast because of the lack of Wi-Fi P2P. Ethernet can be more stable and extends far more distant than Wi-Fi. It's technically very appropriate to transmit high bandwidth audio/video data. But WFD version 1 excludes this usage.

3) Wi-Fi P2P typically takes several seconds to setup which may seem too long for impatient users. The WFD version 2 fixes these issues and allows Miracast over Infrastructure mode. Infrastructure means using the already existed network connections, e.g. devices connect to the same Wi-Fi router, or devices connect to each other via Ethernet.

Figure 1 shows the WFD version 2 protocol architecture. Most of the technical items are the same except for a few.
1. WFD version 2 adds Infrastructure discovery.
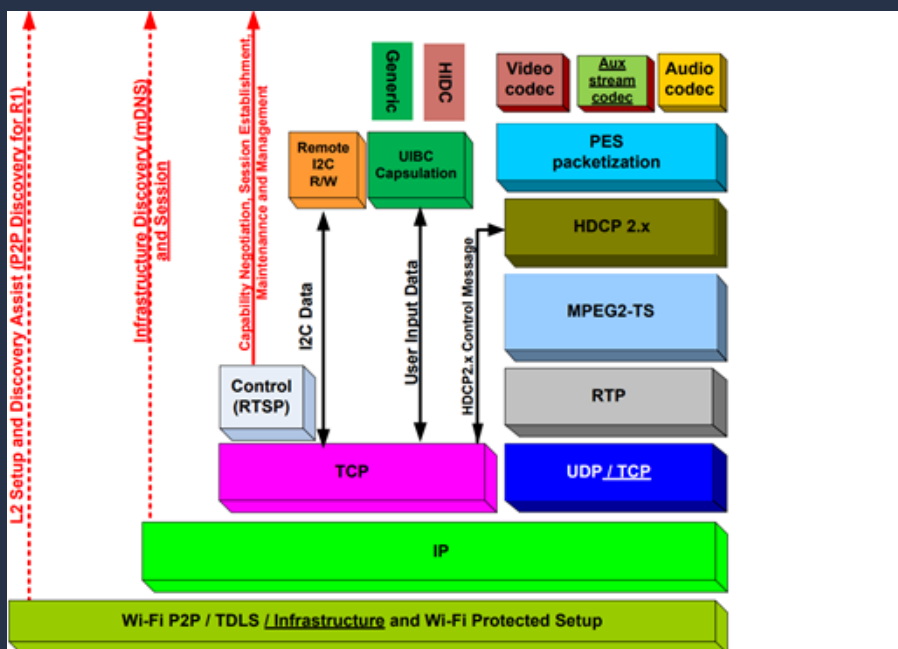2. Audio/Video data can also be transmitted via RTP/TCP.

Figure 1:Block diagram of technologies and protocols involved in WFD
Source: ProgrammerSought

Miracast Over Infrastructure

The main advantage of Miracast Over Infrastructure is that using it improves the quality by eliminating the toggling between the two separate networks. MS-MICE, the extension made by Microsoft available only for Microsoft (doesn't exist on Android) extends the functionality of Miracast. When using Miracast Over Infrastructure, if you are already connected to an existing network, and on this network there's also a Miracast receiver, this connection will be used to stream the video stream and the audio stream to your Miracast receiver.

For Miracast over Infrastructure, Miracast devices perform discovery using multicast DNS(mDNS) and DNS Service Discovery(DNS-SD) over the already connected IP network. This does not depend on Wi-Fi P2P or even Wi-Fi itself. Connection speed accelerates greatly and users may even not notice the process. Ethernet users can benefit this protocol now.
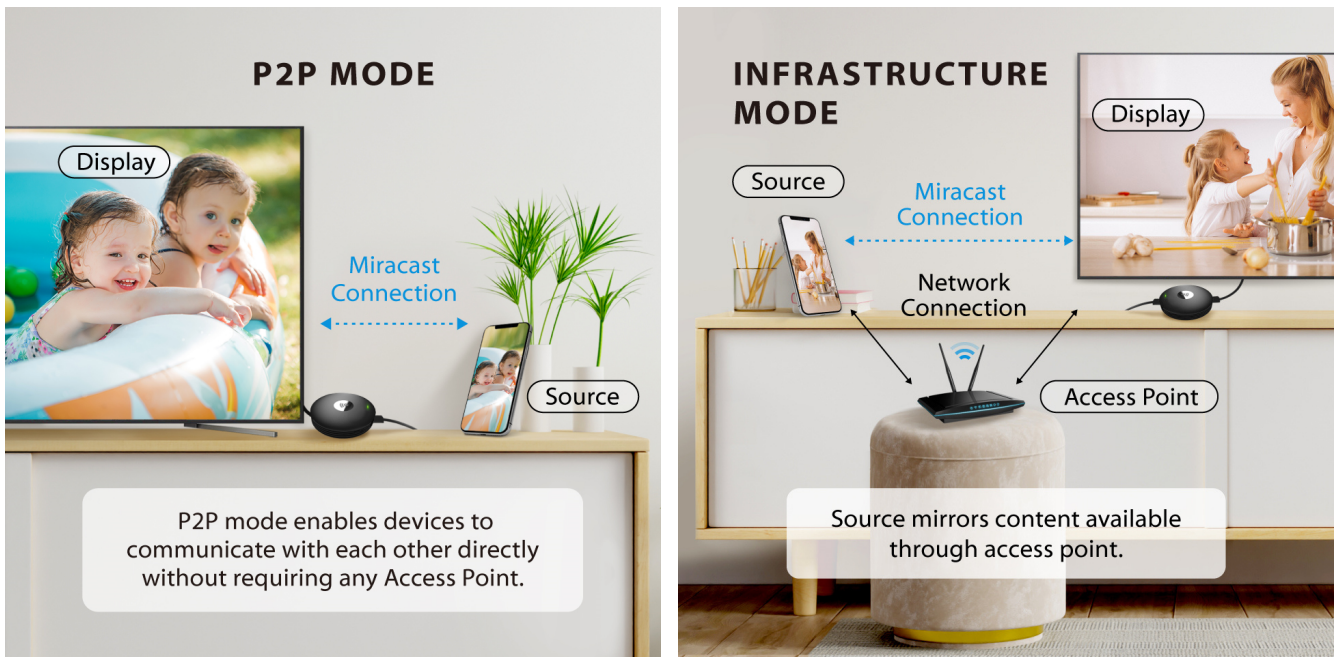
Miracast Over Infrastructure on Windows 10

Microsoft Windows 10 supports Miracast over Infrastructure. But the Windows 10 currently supports a modified version which still relies on Wi-Fi P2P feature. For most Windows 10 notebooks, as they have build-in Wi-Fi chip, this is not a problem. But for some desktop PCs, it may lack this feature.

Miracast over infrastructure network is available on Windows 10 (build 1703 up) only with different kinds of functionalities included. As it is a Microsoft extension it only works on products that support MS-MICE as well. EZCast products that support Miracast over Infrastructure include EZCast Ultra, EZCast 2 and 1, and EZCast Mini Box.

The main advantage of using Miracast over infrastructure is that when using it, there is an increased reliability of the local network. The device used won't have the requirement of constantly switching between two Wi-Fi receivers. Consequently, this will result in a higher quality when casting content.

How Does it Work?

First the person tries to cast through Miracast receiver as they usually did. Then, Windows 10 will automatically recognize if the receiver has the capability to support a connection through over infrastructure instead of P2P. At the point when the person chooses a Miracast receiver, Windows 10 will endeavor to determine the device's hostname via standard DNS, as well as via multicast DNS (mDNS). In the case that that the name isn't available through either DNS method, Windows 10 will retrieve to use Miracast P2P instead of Miracast Over Infrastructure.

Miracast Over Infrastructure Advantages

·   Provides Steady connection.

·   Windows 10 will recognize when casting is over this method is applicable

·   Windows will only select this method when the connection is through Ethernet or a secure Wi-Fi network.

·   User will connect to a Miracast receiver the way they are used to. No change is needed.

·   No adjustments to current wireless drivers or PC hardware are needed.

·   It use a current association which both decreases the amount of time in a connection.

Conclusion

EZCast Products supporting Miracast over infrastructure will allow the user to take advantage of a stable connection.

This article gives some basic information about Miracast and its new Miracast over Infrastructure mode. For further knowledge, please refer to the concrete WFD specifications and Microsoft Miracast over Infrastructure specification.