

Adaptive Streaming

Due to the importance of host-participant communication within DisplayNote, making sure you are using an appropriate network configuration for the number of participants connecting is paramount.

The aim of this document is to provide as much relevant information to achieve optimum performance.

Streaming Quality Profiles

DisplayNote version 1.7 can stream to participants in one of three set video profiles. These were designed to allow networks to support more connections by reducing the volume of data being transferred.

These make changes to the number of frames per second and the bitrate of the stream. The frames per second will affect the smoothness of any motion on the screen.

Higher Frames Per Second = Smoother video = Higher bandwidth used

- **High Quality Profile – 7 Frames per Second stream, 512kb/s bitrate**
- **Medium Quality Profile – 3.5 Frames per Second stream, 256kb/s bitrate**
- **Low Quality Profile – 1 Frame per Second stream, 70kb/s bitrate**

The presenter device always receives the High Quality Profile; it doesn't change as the participants connect.

We have setup the software to set its streaming profile dependent on the number of participants connected to the session. The default number of connected participant devices for each profile are (running default bitrate):

<11 Participants – High Streaming Profile – Expected Bandwidth <10Mb/s + 1Mb/s Presenter

11-20 Participants – Medium Streaming Profile – Expected Bandwidth <12Mb/s + 1Mb/s Presenter

>20 Participants – Low Streaming Profile – Expected Bandwidth <12Mb/s + 1Mb/s Presenter

Unicast vs Multicast

DisplayNote streams the information to connected participant in 2 ways. Each method has its own associated positive and negative points described below.

Unicast

Unicast is the default method DisplayNote streams to connected participants. In unicast for each connected participant device there will be an individual stream of information. This means that as the number of devices increases, so too will the network bandwidth used.

Example - 1 Participant bandwidth = 700kb/s, 2 Participants bandwidth = 1400kb/s

All networks support Unicast so compatibility is guaranteed, however, the increasing bandwidth usage can cause issues. A standard domestic router running in the high quality profile we expect to connect and stream to approximately 10 devices using unicast method.

Default Usage Expectations and Recommendations – Unicast

Minimum Network Requirement –

- Performance Wireless-N Router – Home router recommended for video streaming or gaming
- Good Wi-Fi connection strength on participant devices
- Wired Network connection for Presenter Computer
- Minimal interference on wireless channel of router – Use Wireless analyser to see breakdown of nearby networks and channels, 5GHz frequency band can be beneficial in wireless congested areas.
- Minimal TCP Traffic on network – TCP traffic caused by file transfer/downloading, streaming video from web etc.

Examples of routers:

- Netgear WNDR 4500
- Cisco Linksys E3000
- Belkin Play N750 DB

	<10 Devices	11 - 20 Devices	21 - 40 Devices
Method of Streaming	Unicast	Unicast	Unicast
Maximum Expected Bandwidth	10Mb/s + 1Mb/s Presenter	12Mb/s + 1Mb/s Presenter	10Mb/s + 1Mb/s Presenter
Frames per Second	7FPS	3.5FPS	1FPS
Bitrate	512	256	75

DisplayNote can support a maximum of 64 participants in unicast mode. This will be dependent on the network running the software and the presenting computer. It is recommended that for over 40 connections you use the multicast method.

Multicast

Multicast is a method of sending network information that only requires 1 stream of data for all connected participants. When using this method of streaming connecting additional participants does not correlate to increased bandwidth usage.

Example – 1 Participant bandwidth = 700kb/s, 10 Participants bandwidth = 700kb/s

Multicast's main drawback is that not all network devices will be able to support the streaming in this format. Network switches are required to support **IGMP-Snooping** for multicast to function. For this reason multicast has to be manually activated within the configuration file (will be replaced by settings menu in future update).

Currently Multicast defaults to 1FPS this will be adjustable in a future update.

Default Usage Expectations and Recommendations - Multicast

Minimum Network Requirement –

- Network Switch with support for IGMP-Snooping
- Good Wi-Fi connection strength on participant devices
- Wired Network connection for Presenter Computer
- Minimal interference on wireless channel of router – Use Wireless analyser to see breakdown of nearby networks and channels, 5GHz frequency band can be beneficial in wireless congested areas.
- Minimal TCP Traffic on network – TCP traffic caused by file transfer/downloading, streaming video from web etc. Multicast is more sensitive to packet loss on the network.

1 – 40+ Devices

Method of Streaming – Multicast

Maximum Expected Bandwidth – <1.0Mb/s + <1.0Mb/s for Connected Presenter

FPS & Bitrate - 1FPS, 0.5 Mb/s

DisplayNote Version 1.7

	Unicast	Multicast ¹
Example Network Hardware	Cisco Linksys E3000 ²	Ruckus ZoneDirector 1100 ³ with Zoneflex ZF7363 ⁴
10 or less devices connected	≈10Mb/s	≈1Mb/s
Frames Per Second for Participants	7FPS	1FPS
Frames Per Second for Presenter	7FPS	7FPS
10 – 20 devices connected	≈12Mb/s	≈1Mb/s
Frames Per Second	3.5FPS	1FPS
Frames Per Second for Presenter	7FPS	7FPS
20 – 40 devices connected	≈15Mb/s	≈1Mb/s
Frames Per Second	1FPS	1FPS
Frames Per Second for Presenter	7FPS	7FPS
Maximum Supported Devices	64	>64 (Network Dependent)

¹ Please check with network administrator to see if your network supports multicast

² http://downloads.linksys.com/downloads/others/1224668711215/Specifications-NA-APAC-ANZ-EMEA-LATAM_NC-web_3425-00116.0.pdf

³ <http://www.ruckuswireless.com/products/controllers/zonedirector1100>

⁴ <http://www.ruckuswireless.com/products/zoneflex-indoor/7363>

DisplayNote Advanced Configuration

Further configuration of DisplayNote is available through the editing of the 'props.json' file.

This file can be found at the following location:

Win 7 –

C:\Users\{USERNAME}\AppData\Roaming\DisplayNote Technologies Ltd\DisplayNote\

Quickly access folder by typing '%appdata%' (without quotes) in any Windows Explorer window or Start Menu search bar.

Mac OS X –

Library\Application Support\DisplayNote

Library folder accessed by holding 'alt' key when clicking the 'Go' menu of Finder.

To add a setting to the configuration file, open the 'props.json' file using Notepad on Windows or TextEdit on Mac. Place a comma (,) and then add the setting you wish to have in the configuration file.

“app.multicast”:”on” – Adding this to the configuration will make DisplayNote run in Multicast mode. This is only recommended on networks where multicast support is assured, on un-supported network devices this could dramatically hinder performance.

“app.mediumBand”:”#” – Replacing # with the number of devices that the high quality will act on before switching to medium.

e.g. “app.mediumBand”:”6” - <6 devices connect, High Quality profile active, Once 6th device connects, Medium Quality Profile activates.

“app.lowBand”:”#” – Replacing # with the number of devices where the low quality profile will activate.

e.g. “app.lowBand”:”10” - > Up to 10 devices connected will be in the Medium Quality profile, the 11th device will activate the Low Quality Profile.

Example of configured JSON, setting more than 20 connected devices to be low quality, fewer than 10 connected devices to be high quality and values between to be medium quality.

Before	After
{“lang”: “en”}	{“lang”: “en”, “app.mediumBand”: “10”, “app.lowBand”: “20” }

Device Advice

Routers

The following advice is relating to devices working as a standalone network. When part of a larger network the performance is affected by other factors e.g. other network hardware, number of people on network, TCP traffic etc.

When selecting a router for the purpose of running DisplayNote we suggest looking for the following features:

- Wireless-N recommended, Wireless-G minimum, Wireless-B is not suitable.
- Optimised for HD Video Streaming or Online Gaming. These devices are designed to have minimal latency when transferring network data.
- Dual band support where there is a lot of wireless congestion, 5GHz frequency usually more isolated.

Android

As Android devices vary in specification we recommend the use of a benchmark tool that can be found here:

http://www.androidbenchmark.net/passmark_chart.html

This rates the devices based on their specifications and assigns them a score. We recommend Android devices should score **>1500** for good performance.

Examples of devices used by DisplayNote:

- Asus Nexus 7
- Samsung Galaxy Tab 2
- Motorola Xoom 2 ME
- Samsung Galaxy S3
- Samsung Galaxy S2

iPad

For use with DisplayNote app we recommend the use of iPad 2 or newer with iOS 5.0 or newer installed.