FMETP STREAM (Guide)

Version: 1.327



Forum: <u>https://forum.unity.com/threads/670270/</u> Website: <u>http://www.frozenmist.com/</u> Support: thelghome@gmail.com

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FMETP STREAM is a plugin for Unity3D, which aims for sharing your game view, remote assistance and VR Interactive application. In local area network, it can achieve low–latency live streaming between Unity3D apps.

The encode module and network module are totally separated. In the encode module, it includes Visual and Audio encoders. Meanwhile, our package provides few customized networking systems, which are FM Network UDP, FM WebSocket and FM Network Action(TCP & UDP). Besides those networking systems, our encode module is compatible with 3rd party networking system.

As the source code are developed based on Unity3D C#, it is compatible with most of Unity3D build platforms. For example, it supports iOS, Android, Mac, Windows and Linux. Since FM WebSocket can communicate via the Internet, our package supports Unity3D WebGL Build and HTML website.

In this version, native encoding solution is included in our encode module, which does hugely improve the performance on mobile devices. It solves the bottleneck on low-end devices. For instance, 720P(24fps) Live streaming content runs smoothly on iPhone 5 in our previous testing.

Technically, our plugin can be separated into two parts:

- 1) Encode Module
- 2) Network Module

In order to keep the flexibility for users, below is the logic of our core components.

Game View Encoder -> Network Manager -> Game View Decoder Audio / Mic Encoder -> Network Manager -> Audio Decoder

In our package, we provided 3 different types of networking system.

- FM Network UDP (LAN): Server-Clients Structure, based on UDP
- FM WebSocket (Internet): Server-Clients Structure, based on WebSocket
- FM Network Action (LAN): Server-Clients Structure, based on TCP & UDP(deprecated)



Since the network manager is replaceable, our streaming solution is also compatible with other networking system, for example: UNet, Photon, Mirror...etc

Use Cases:

Share Game View, Video Chat, Remote Assist, Teaching & Learning, Research, VR Monitoring, Streaming for Immersive projection system

Hardware Requirement(Minimum):

Processor: 1.1 GHz Processor Memory: 1 GB RAM

Supported OS: iOS, Android, Mac, Windows, Linux

Software Requirement: Unity3D Version 2017.4.32f1 (Older version may also work)

Tested Platform: iOS / Android / Mac / PC / Linux / WebGL / HTML / AR / VR



Example: Streaming Game View from Unity3D Editor(Left) to iPhone XS AR world(Right)

Example: Streaming Game View from Unity3D Editor(Left) to Web browser(Right)



Example: Webcam Streaming between iOS & Android Devices



Demo Scenes are included in our package:

You could open and run demo scene "Demo_NetworkingMain" for your first test.

Networking Demo Scene					
FMNetwork Basic	FMNetwork Stream				
WebSocket Network	WebSocket Stream				
Network Action (old)	TCP Stream (old)				
Back Thread: 2 / 12 Network Type: Server	FPS: 61 Streaming Server				
Local IP: 192 1980.101 Connection Count: 1 Async Listener: False Use Main Thread Sender: False connected [p: 192 168.0.104 last seen: -668146096	Senain Hole (Vir August in Hole). Senain Mir (Nin August in Hole).				



Create Empty Game Object and Add Component: FM Network Manager



Choose Network Type as Server

🥫 🗹 FM Network Manag	jer	(Script)	a \$,
– Networking			
Auto Init			
	\checkmark	Server	
+ Server Settings		Client	
+ Client Settings			

• Create Game View Encoder



Choose Render Camera Mode

🥡 🔽 Game View Encodei	r (S	cript)	2	1
– Mode	_			
Capture Mode	\checkmark	Render Cam		
render texture with free a		Main Cam		
		Full Screen		J

Add Camera Object, and rename as "RenderCam"

Create 👻 🔍 All	📬 🔽 RenderCam 🗆 St	tatic 🔻
▼ 🛠 Server_sender* •=		
Main Camera	Tag Untagged = Layer Delault	
Directional Light	▶↓ Transform	2, \$
FMNetworkManager	▶ 🖦 🔽 Camera	[2] \$,
▼ GameViewEncoder	📑 🔽 Elare Laver	🛐 🔅.
RenderCam		
	Audio Listener	10 St

- Assign RenderCam into Settings: RenderCam
 Game View Encoder (Script)
 Mode
 Capture Mode
 Render Cam
 render texture with free aspect
 Settings
 RenderCam
 RenderCam
 RenderCam (Camera)
 Resolution
 X 512
 Y 512
 MatchScreenAspect
- Add Event: Assign FMNetworkManager into "OnDataByteReadyEvent()"

– Encoded		
Preview (Empty)		
OnDataDutaDaduEvant (Duta[])		
Runtime Only + No Function		
🍞 FMNetworkManag 💿		
	+	-

• Pass Byte[] data into FM Network Manager > SendToOthers()

	Dynamic Byte[]	
	Action_SyncNetworkObjectTransform	
	SendToAll	
~	SendToOthers	
	SendToServer	
	Static Parameters	
	bool enabled	
	string name	
	bool runInEditMode	/ent (Byte[])
	string tag	FMNetworkManager.SendToOthers ‡
	bool useGUILayout	No Function
	Action_InitAsClient ()	
	Action_InitAsServer ()	GameObject 🕨 🕨
	Action_ReloadScene ()	Transform 🕨
	BroadcastMessage (string)	FMNetworkManager
	Cancellovoke (string)	

Create Empty Game Object and Add Component: FM Network Manager



Choose Network Type as Client

	🤬 🔽 FM Network Mana	ger	(Script)	2	\$,
	– Networking				
	Auto Init		Server		
		\checkmark	Client		
	+ Server Settings				
	+ Client Settings				

Create Game View Decoder



FM Network Manager > Receiver > Assign Game View Decoder in OnReceivedByteDataEvent()

– Receiver			
OnReceivedByteDataEven	t (Byte[])		
Runtime Only 🛔	No Function		
🍞 GameViewDecode 💿			
·		+	-

• Pass data to GameViewDecoder > Action_ProcessingImageData

	OnReceivedByteDataEve	nt (Byte[])	
	Runtime Only 🛔	GameViewDecoder.Action_ProcessImageData	
	GameViewDecode 💿	No Function	
	OnReceivedStringDataE	GameObject Transform	
Dy	namic Byte[]	GameViewDecoder	
✓ Ac	tion_ProcessImageData		

FMETP STREAM (Basic Setup with FMNetworkUDP: Client Scene)

Result on Game View Enco	der	
– Settings		
RenderCam Resolution MatchScreenAspect	 RenderCam (Camera) X 1280 Y 720 	
Quality StreamFPS		10 20
Fast Encode Mode Experiment for Mac, Windo	ows, Android (Forced Enabled on iOS)	
– Encoded Preview(1280 x 720)		
OnDataByteReadyEvent (By	/te[])	
Runtime Only +	FMNetworkManager.SendToOthers	
		+ -

Result on GameViewDecoder Inspector You can pass Texture2D data by creating an Event(Texture2D)

-rou can pass resturezo data by creating an Event(resturezo)						
	🕼 🔽 Game View Decoder (Script)					
	– Decoded					
	Fast Decode Mode Experiment for Mac, Windows, A	ndroid (Forced Enabled on iOS)				
	Preview (1280 x 720)					
	ReceivedTexture	-				
	OnReceivedTexture2D (Texture2D)					
	List is Empty					
		+				
	TestQuadProp	None (Game Object)				
	TestImgProp	None (Raw Image)				
	Dain Encoder & Dacada					
	– Pair Encoder & Decoder					
	label	1001				

9

Create Empty Game Object and Add Component: FMSocketIOManager

FMSocketIO Tag Untagged	Manager				
▼ 人 Transform					2
Position				Z	
Rotation				Z	
Scale				Z	
	Ar Q FM\$ocket G FM Socket I New Script	dd Compone tIOManager Search O Manager	8)		

• Choose Network Type as Server

-	/1	_		
▼ (4	▼ FM Socket IO Manager (Sc	rip	t)	ې 🔝
-				
A	Auto Init	\checkmark		
٩		\checkmark	Server	
			Client	
F				

• Create Game View Encoder



• Choose Render Camera Mode



• Add Camera Object, and rename as "RenderCam"

Create + Q_AII	📬 🔽 R	ende	rCam				Sta	tic 🔻
▼ 🛠 FMWebSocket_Server_sender+≡		Intago	nd 4			faul		
Main Camera	Tay C	тауу	jeu =		Layer De	laui		
Directional Light	▼人 Tra	nsfo	rm					💽 🌣,
FMSocketIOManager	Position	Х	0	Y	0	Ζ	0	
▼ GameViewEncoder	Rotation	Х	0	Y	0	Ζ	0	
RenderCam	Scale	Х		Y		Ζ		
	🕨 🛸 🔽 Can	nera						a .
								1
		e La	yer					101 m
	O Auc	lio Li	istener					a \$,

– Mode	
Capture Mode	Render Cam
render texture with free aspe	ct
– Settings	
RenderCam	🛳 RenderCam (Camera)
Resolution	X 512 Y 512

OnDataByteReadyEv	Event (Byte[])	
Runtime Only	+ No Function	
💗 FMSocketIOMan	•	

Pass Byte[] data into FM Network Manager > SendToOthers()

Dynamic Byte[]	\checkmark
Action_OnReceivedData	
SendToAll	
✓ SendToOthers	20
SendToServer	
	ndows, Android (Forced Enabled on iOS)
Static Parameters	
bool enabled	
string name	
bool runInEditMode	
string tag	
bool useGUILayout	
Action_OnReceivedData (string)	
Action_SetIP (string)	
Action_SetPort (string)	
BroadcastMessage (string)	
Cancellnvoke (string)	
Cancellnvoke ()	(Byte[])
Close ()	FMSocketIOManager.SendToOthers +
Connect ()	No Eurotion
Emit (string)	
Init ()	GameObject
InitAsClient ()	Transform
InitAsServer ()	FMSocketlOManager
SendMessage (string)	

Create Empty Game Object and Add Component: FMNetworkManager



Choose Network Type as Client

• Create Game View Decoder

.



FMSocketIOManager > Receiver > Assign Game View Decoder in OnReceivedByteDataEvent()

– Receiver		
OnReceivedByteDataE	vent (Byte[])	
Runtime Only	No Function	
📦 GameViewDecode		

• Pass data to GameViewDecoder > Action_ProcessingImageData

	OnReceivedByteDataEve	nt (Byte[])	
	Runtime Only +	GameViewDecoder.Action_ProcessImageData	
	🛛 GameViewDecode 💿	No Function	
	OpPocoivodStringDataEv	GameObject	
Dypa	mic Byte[]	Transform GameViewDecoder	
✓ Actio	n_ProcessImageData	GameviewDecoder	

- 1) Install npm + node.js
 download and install all necessary components: <u>https://nodejs.org/en/download/</u>
- 2) install socket io

 open terminal/cmd and type:
 npm install socket.io
- 3) Install express

 open terminal/cmd and type:
 npm init
 //press Enter...
 npm install express --save
- 4) Finish & Test on localhost: demo server is in FMWebSocket/"TestServer.zip"
 Copy & Unzip the demo server into other location, cannot be in Asset folder
 open terminal/cmd and type: node /[path]/index.js
- 5) IP & Port of node.js server should match the settings in FMSocketIOManager.
- Step-by-step Video Tutorial: <u>https://youtu.be/Zjm5KGHyceU</u>

Networking		
Auto Init	\checkmark	
NetworkType	Client	
– Settings		
IP	127.0.0.1	
Port	3000	
Ssl Enabled		
Reconnect Delay	5	
Ack Expiration Time	1800	
Ping Interval	25	
Ping Timeout	60	
Socket ID		

• Result on GameViewEncoder Inspector

– Settings			
RenderCam Resolution MatchScreenAspect	 RenderCam (Camera) X 1280 Y 720 		
Quality StreamFPS		40 20	
Fast Encode Mode Experiment for Mac, Wind	dows, Android (Forced Enabled on iOS)		
– Encoded Preview(1280 x 720)			
OnDataByteReadyEvent ((Byte[])		
Runtime Only + @ FMNetworkManag ©	FMNetworkManager.SendToOthers		
		+ -	-

Result on GameViewDecoder Inspector You can pass Texture2D data by creating an Event(Texture2D)

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	🕝 🔽 Game View Decoder (Scrip	pt)	a 🕈				
	– Decoded						
	Fast Decode Mode Experiment for Mac, Windows, A	ndroid (Forced Enabled on iOS)					
Preview (1280 × 720)							
	ReceivedTexture	-					
	OnReceivedTexture2D (Texture	e2D)					
	List is Empty						
		+					
	TestQuadProp	None (Game Object)					
	TestImgProp	None (Raw Image)					
	– Pair Encoder & Decoder						
	label	1001					

FMETP STREAM (Audio Streaming)

• Create Empty Game Object and Add Component: Audio Encoder

👕 🔽 AudioEnd	coder					🔲 Static 🔻
Tag Untagged		ŧ Laye	er (Default		
▼						💽 🌣,
Position	Х	0	Y	0	Z	0
Rotation	Х	0	Y	0	Z	0
Scale	Х	1	Y	1	Z	1
	Ac	dd Componen	t			
	Q AudioEnc	oder		8		
		Search				
	🕝 Audio Enco	der				
	New Script			►		

 Assign FMNetworkManager or FMSocketIOManager into "OnDataByteReadyEvent()" Pass Byte[] data into FM Network Manager or FMSocketIOManager > SendToOthers()

V 🕼 🔽 Audio Encoder (Script)		₽ \$,
- Capture			
Stream Game Sound	\checkmark		
– Audio Info			
Output Channels: 2			
Output Sample Rate: 48000			
– Encoded			
StreamFPS	•	20	
OnDataByteReadyEvent (By	te[])		
Runtime Only + FM	INetworkManager.SendToOthers		
₀ FMNetworkMana 💿			
		+	_
– Pair Encoder & Decoder			
label	2001		
Encoded Size(byte)	0		

FMETP STREAM (Audio Streaming)

• Create Empty Game Object and Add Component: Audio Decoder

👕 🔽 AudioDe	coder					Sta	atic 🔻
Tag Untagged		‡ Laye	er [Default			
▼ 人 Transform	ı						(
Position	х	0	Y	0	Z	0	
Rotation	x	0	Y	0	Z	0	
Scale	X	1	Y	1	Z	1	
	Ac	dd Componen	it				
	Q AudioDec	coder		8			
		Search					
	👍 Audio Deco	oder					
	New Script			٠			
Audio Source will auto	matically added						-
🕨 🦰 🔽 Audio Sou	irce						2 2 ,
🔻 🕼 🗸 Audio De	coder (Script)						1
– Audio Info							
Source Sample	Rate: 48000						
Source Channe	ls: 1						
Device Sample	Rate: 48000						
– Pair Encoder &	& Decoder						
label		2001					

 In FMNetworkManager or FMSocketIOManager: Pass data to Audio Decoder > Action_ProcessingData()

– Receiver		
OnReceivedByteDataEvent (Byte[])		
Runtime Only + AudioDecoder.Action_ProcessData a AudioDecoder a		
	+	-

FMETP STREAM (Microphone Streaming)

• Create Empty Game Object and Add Component: Mic Encoder

🎁 🔽 MicEnco	der				🔲 Static 🔻
Tag Untagged		+ Layer	Default		
▼ 人 Transform	i				🔄 🌣,
Position	X 0	Y	0	Z	0
Rotation	X 0	Y	0	Z	0
Scale	X 1	Y	1	Z	1
	Add	Component			
	Q MicEncoder				
		Search			
	🕼 Mic Encoder				
	New Script		►		

 Assign FMNetworkManager or FMSocketIOManager into "OnDataByteReadyEvent()" Pass Byte[] data into FM Network Manager or FMSocketIOManager > SendToOthers()

🧃 🔽 Mic Encoder (Script)		2	\$
– Capture			
Stream Game Sound	\checkmark		
Audio Info			
Output Channels	1		
Output Sample Rate	11025		
– Encoded			
StreamFPS	20		
OnDataByteReadyEvent (Byte	[])		
Runtime Only 🛔 FMN	etworkManager.SendToOthers		
G FMNetworkMana 💿			
	+	-	
- Pair Encoder & Decoder			
label	2001		
Encoded Size(byte)	0		

FMETP STREAM (Microphone Streaming)

• Create Empty Game Object and Add Component: Audio Decoder

Tag Untagged + Layer Default Position X Position X Notation X Q Y Q AudioDecoder Q AudioDecoder New Script Audio Source Q Audio Decoder New Script Audio Decoder (Script) Audio Info Source Sample Rate: 48000 Source Channels: 1 Device Sample Rate: 48000 Source Channels: 1 Device Sample Rate: 48000	👕 🔽 AudioDe	coder					St.	atic 🔻
▼ Transform Position X Notation X Q Y O Z Cale X 1 Y 1 Z Add Component Q AudioDecoder Image: Search I	Tag Untagged		ŧ Laye	er 🛛	Default			
Position X 0 Y 0 Z 0 Rotation X 0 Y 0 Z 0 Scale X 1 Y 1 Z 1 Add Component Q AudioDecoder Search Q Audio Decoder New Script Audio Source will automatically added Audio Decoder (Script) - Audio Info Source Sample Rate: 48000 Source Channels: 1 Device Sample Rate: 48000 Source Channels: 1 Source Cha	▼ 人 Transform	1						🔯 🌣,
Rotation X 0 Y 0 Z 0 Scale X 1 Y 1 Z 1 Add Component Q AudioDecoder Q AudioDecoder New Script Audio Source will automatically added Audio Decoder (Script) Audio Decoder (Script) Audio Info Source Sample Rate: 48000 Source Channels: 1 Device Sample Rate: 48000	Position	x	0	Y	0	Z	0	
Scale X 1 Y 1 Z 1 Add Component Add Component Add Component Add Component AddioDecoder Search Addio Decoder New Script Audio Source will automatically added Audio Source Will automatically added Audio Source (Script) - Audio Decoder (Script) - Audio Info Source Sample Rate: 48000 Source Channels: 1 Device Sample Rate: 48000 - Pair Encoder & Decoder Iabel 2001	Rotation	X	0	Y	0	Z	0	
Add Component Q. AudioDecoder Search Q. Audio Decoder New Script	Scale	X	1	Y	1	Z	1	
AudioDecoder Search Audio Decoder New Script Audio Source will automatically added		A	dd Componen	nt				
Search Audio Decoder New Script Audio Source will automatically added Audio Source Audio Decoder (Script) - Audio Info Source Sample Rate: 48000 Source Channels: 1 Device Sample Rate: 48000 Source Sample Rate: 48000 Source Sample Rate: 48000 Source Sample Rate: 48000		Q AudioDeo	coder		8			
Audio Decoder New Script Audio Source will automatically added Audio Source Audio Decoder (Script) Audio Info Source Sample Rate: 48000 Source Channels: 1 Device Sample Rate: 48000 Pair Encoder & Decoder Iabel 2001			Search					
New Script Audio Source will automatically added Audio Source Audio Decoder (Script) Audio Info Source Sample Rate: 48000 Source Channels: 1 Device Sample Rate: 48000 Source Sample Rate: 48000 Source Channels: 1 Device Sample Rate: 48000		👍 Audio Decc	oder					
Audio Source will automatically added Audio Source Audio Source Audio Decoder (Script) - Audio Info Source Sample Rate: 48000 Source Channels: 1 Device Sample Rate: 48000 - Pair Encoder & Decoder Iabel 2001		New Script			►			
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 Audio Decoder (Script) Audio Info Source Sample Rate: 48000 Source Channels: 1 Device Sample Rate: 48000 - Pair Encoder & Decoder [abe] 2001 	Audio Sou	irce						1 1 2 ,
 Audio Info Source Sample Rate: 48000 Source Channels: 1 Device Sample Rate: 48000 - Pair Encoder & Decoder Iabel 2001 	V 🕼 🗸 Audio Dec	coder (Script)						1 <u>8</u> 8 ,
Source Sample Rate: 48000 Source Channels: 1 Device Sample Rate: 48000 - Pair Encoder & Decoder label 2001	– Audio Info							
Source Channels: 1 Device Sample Rate: 48000 - Pair Encoder & Decoder label 2001	Source Sample	Rate: 48000						
Device Sample Rate: 48000 - Pair Encoder & Decoder label 2001	Source Channe	ls: 1						
- Pair Encoder & Decoder label 2001	Device Sample	Rate: 48000						
- Pair Encoder & Decoder								
label 2001	– Pair Encoder &	a Decoder						
	label		2001					

 In FMNetworkManager or FMSocketIOManager: Pass data to Audio Decoder > Action_ProcessingData()

– Receiver		
OnReceivedByteDataEvent (Byte[])		
Runtime Only + AudioDecoder.Action_ProcessData AudioDecoder •		
	+	_

FMETP STREAM (Properties in Core Scripts)

Game View Encoder

- Capture Mode: Different methods of capturing game view
- Resolution: streaming resolution
- Quality: streaming quality
- StreamFPS: streaming framerate
- OnDataByteReadyEvent(byte[]): invoke when the streaming bytes are ready
- Label: Pair Encoder & Decoder

Game View Decoder

- Received Texture: decoded Texture2D
- OnReceivedTexture2D(Texture2D): invoke when the received Texture2D is ready
- Label: Pair Encoder & Decoder

Audio Encoder

- Stream Game Sound(bool): capture and stream audio when enable
- Audio Info: information (Output Channels, Output Sample Rate)
- StreamFPS: streaming framerate
- OnDataByteReadyEvent(byte[]): invoke when the streaming bytes are ready
- Label: Pair Encoder & Decoder

Audio Decoder

- Audio Source will be added automatically after adding Audio Decoder
- Audio Info: information (Source Channels, Source Sample Rate, Device Sample Rate)
- Label: Pair Encoder & Decoder

FMETP STREAM (Properties in Core Scripts)

FM Network Manager

- Auto Init: auto initialize FM Network when enable - other functions: Action_InitAsServer(), Action_InitAsClient()
- Network Type: Server/Client
- Server Settings:
 - Server Listen Port: default is 3333
 - Use Async Listener: if disabled, a separated thread will be used
 - Use Main Thread Sender: if disabled, a separated thread will be used
 - Connection Count: the number of connected clients
- Client Settings:
 - Client Listen Port: default is 3334
 - Use Main Thread Sender: if disabled, a separated thread will be used
 - Auto Network Discovery: if disabled, Server IP is required
 - Server IP: target Server IP, or connected Server IP
 - Is Connected: status of connection
- Network Objects
 - Sync transformation of game objects, with the order of array
 - Sync FPS: framerate of syncing via network
- Receiver:
 - OnReceivedByteDataEvent(Byte[]): invoke when received byte data
 - OnReceivedStringDataEvent(String): invoke when received string data
 - GetRawReceivedData(Byte[]): invoke when received any data
- Other functions & Example:
 - FMNetworkManager.instance.SendToAll()
 - FMNetworkManager.instance.SendToOthers()
 - FMNetworkManager.instance.SendToServer()
 - FMNetworkManager.instance.SendToTarget()

FM Socket IO Manager

- Auto Init: auto initialize FM Network when enable
 other functions: Action_InitAsServer(), Action_InitAsClient()
- Network Type: Server/Client
- Settings:
 - IP: IP address of WebSocket server(node.js server)
 - Port: default is 3000
 - Ssl Enabled: true for "https" or "wss", false for "http" or "ws"
- Ready: true when connected to server
- Receiver:
 - OnReceivedByteDataEvent(Byte[]): invoke when received byte data
 - OnReceivedStringDataEvent(String): invoke when received string data
- Other functions & Example:
 - FMSocketIOManager.instance.SendToAll()
 - FMSocketIOManager.instance.SendToOthers()
 - FMSocketIOManager.instance.SendToServer()

Create Empty Game Object and Add Component: FM Network Manager



Choose Network Type as Server/Client

🧃 🗹 FM Network Manag	er	(Script)	\$
– Networking			
Auto Init	~		
	\checkmark	Server	
+ Server Settings		Client	
+ Client Settings			

• Example functions for sending Data: Send to (All / Others / Server / Target)

	string Message = "Hello World!";
	<pre>FMNetworkManager.instance.SendToAll(Message);</pre>
	<pre>FMNetworkManager.instance.SendToOthers(Message);</pre>
	<pre>FMNetworkManager.instance.SendToServer(Message);</pre>
	<pre>FMNetworkManager.instance.SendToTarget(Message, "127.0.0.1");</pre>
	<pre>byte[] ByteData = new byte[1234];</pre>
	FMNetworkManager.instance.SendToAll(ByteData);
	FMNetworkManager.instance.SendToOthers(ByteData);
	<pre>FMNetworkManager.instance.SendToServer(ByteData);</pre>
	<pre>FMNetworkManager.instance.SendToTarget(ByteData, "127.0.0.1");</pre>
_	

Events will be invoked when received data

On Received Byte Data Event (Byte[])		
Runtime Only		
G FMNetwork_Demo (Fl 💿		
	+	-
On Received String Data Event (String)		
Runtime Only		
G FMNetwork_Demo (Fl 💿		
	+	-
Get Raw Received Data (Byte[])		
Runtime Only + FMNetwork_Demo.Action_ShowRawByteLength		÷
G FMNetwork_Demo (Fl 💿		
	+	-

• Example functions of processing received data



• Sync the transformation of Game Objects, Option

🔻 🖬 🔽 FM Network Manager (Scrip	t)	2	1	\$,
- Networking				
Auto Init				
NetworkType	Server			
+ Server Settings				
+ Client Settings				
- Sync Transformation from Server				
– NetworkObjects: 2				
Size	2			
Element 0	Totwork Object] Cube		O	
Element 1	Tetwork Object] Cube		C	
SyncFPS	2	0		

FM Network Manager

- Auto Init: auto initialize FM Network when enable - other functions: Action_InitAsServer(), Action_InitAsClient()
- Network Type: Server/Client
- Create Empty Game Object and Add Component: FMNetworkManager



Choose Network Type as Server/Client

🕼 🗹 FM Socket IO Manager (Sc	rip	t)	2 \$,
	\checkmark	Server	
		Client	

• Example functions for sending Data: Send to (All / Others / Server)

<pre>string Message = "Hello World!"; FMSocketIOManager.instance.SendToAll(Message); FMSocketIOManager.instance.SendToServer(Message); FMSocketIOManager.instance.SendToOthers(Message);</pre>
<pre>byte[] ByteData = new byte[1234]; FMSocketIOManager.instance.SendToAll(ByteData); FMSocketIOManager.instance.SendToServer(ByteData); FMSocketIOManager.instance.SendToOthers(ByteData);</pre>
Events will be invoked when received data

On Received Byte Data Event (Byte[])					
Runtime Only		FMWebSocketNetwork_debug.Action_OnReceivedData			
G FMSocketlOComponent					
			÷	-	
On Received String Data Event (String)					
Runtime Only		FMWebSocketNetwork_debug.Action_OnReceivedData			
G FMSocketIOComponent					
			+	_	

• Example functions of processing received data



Node.js Server setup:

- 1) Install npm + node.js
 download and install all necessary components: <u>https://nodejs.org/en/download/</u>
- 2) install socket io
 open terminal/cmd and type:
 npm install socket.io
- 3) Install express

 open terminal/cmd and type:
 npm init
 //press Enter...
 npm install express --save
- 4) Finish & Test on localhost: demo server is in FMWebSocket/"TestServer.zip"
 Copy & Unzip the demo server into other location, cannot be in Asset folder
 open terminal/cmd and type: node /[path]/index.js
- 5) IP & Port of node.js server should match the settings in FMSocketIOManager.
- Step-by-step Video Tutorial: <u>https://youtu.be/Zjm5KGHyceU</u>

General Questions:

- Mobile App crash when turn on webcam
 - iOS: add Camera Usage Description in Player Setting
 - Android: check your webcam permission on devices
 - FM Network doesn't work, cannot connect in local network
 - Windows 10: disable firewall, enable network discovery
 - Router: some advanced security setting used in University/Company router, will filter the data
 - Virtual Machines: it may cause connection trouble.

Known Issues:

- Auto Network Discovery doesn't work, when FMNetworkUDP server is on Google Pixel2, Pixel3

 you have to grant multi-broadcast permission from devices. Otherwise, the server on Google
 Pixel Phones cannot receive UDP broadcast message from clients.
- EncodeToJPG() not working on iOS
 - As we applied native encoding method, which does not match Unity3D default jpeg library version. Thus, it will crash due to mismatching.
 - The alternative solution will be using FMEncodeToJPG(), we will try to fix this bug in future.
- Unity2020 WebGL(FM WebSocket) connection issue:
 - FM WebSocket may not work properly in WebGL Build from Unity2020, due to missing "gameInstance" or "unityInstance" is not defined.
 - Solution:

- Ref: https://forum.unity.com/threads/unity-2020-1-sendmessage-no-longer-works-help.842209/

1) After building WebGL from Unity, please open index.html, and add below line.

```
window.gameInstance = unityInstance;
```

2) after adding this line:

```
var script = document.createElement("script");
    script.src = loaderUrl;
    script.onload = () => {
        createUnityInstance(canvas, config, (progress) => {
            progressBarFull.style.width = 100 * progress + "%";
        }).then((unityInstance) => {
            window.gameInstance = unityInstance;
            loadingBar.style.display = "none";
            fullscreenButton.onclick = () => {
            unityInstance.SetFullscreen(1);
        };
     }).catch((message) => {
            alert(message);
        });
     };
```