



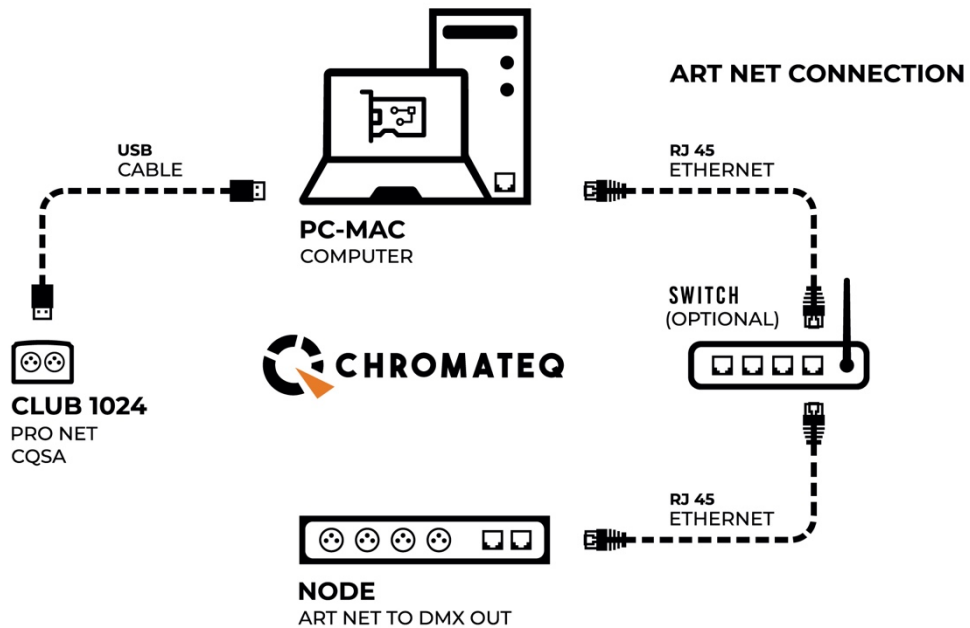
## INTRODUCTION TO ARTNET

During the past two decades, following the trend of increased use of LEDs in entertainment lighting, there has been a shift to visual design that incorporates pixel mapping, which is a method of creating arrays of individual light sources that can be programmed to create dynamic visual surfaces, shapes, patterns and images.

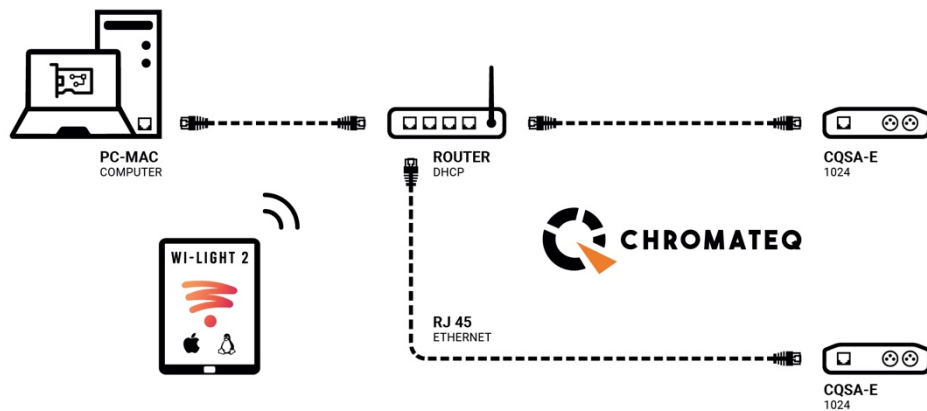


Because pixel-mapped lighting tends to require a large quantity of DMX addresses, new communication protocols have been developed to support its deployment. ArtNet is an industry-standard lighting control protocol that makes it possible to configure and manage multiple DMX universes using standard ethernet LAN and WLAN networking conventions, cable and hardware (routers, switches, bridges, hubs, etc.) by integrating DMX frames into Art-Net frames. ArtNet distributes DMX and RDM data through an ethernet network using UDP-based packets. In such networks, ArtNet nodes (ArtNet-to-DMX converters) are used to send DMX values to lighting fixtures.

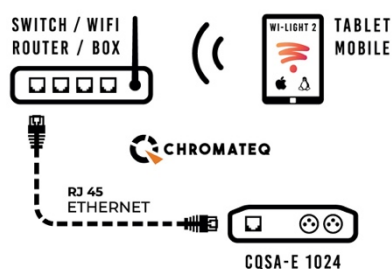
**Illustration 1 :** ArtNet output from computer to Node



**Illustration 2 :** ArtNet output from computer to CQSA-E interface with Wi-Fi remote control via Router + Wi-Light 2 app



**Illustration 3 :** Standalone remote operation of CQSA-E interface via router/switch/hub + Wi-Light 2 app (no computer)



Chromateq software and hardware solutions are designed to facilitate the process of designing and programming ArtNet-based lighting systems. Becoming familiar with the terminology used when describing ArtNet systems will be helpful to understanding the functionality and features of Chromateq control solutions, which are based on industry-standard rules for ArtNet implementation.

## The ArtNet protocol: A brief history

**ArtNet 1** (1998) : Data was broadcast over 10BaseT networks. Configuration was simple but the number of universes was limited by bandwidth constraints.

**ArtNet 2** (2006) : Unicasting was introduced in order to reduce network loads, increase bandwidth and allow control of a greater number of universes.

**ArtNet 3** (2011) : Further increased the number of universes that can be controlled.

**ArtNet 4** (2016) : Enabled use of sACN together with Art-Net (and RDM) to provide enhanced lighting control capabilities.

## Glossary of Terms

Common terms that are key to understanding ArtNet basics:

- **Address Port:** One of the 32,768 available addresses through which it is possible to transmit a DMX packet. The number of total available addresses is determined by the combination of Net + Sub-Net + Universe.

- **ArtNet:** a DMX-over-Ethernet protocol that distributes multiple universes of DMX data and enables the transmission of DMX-512 data over IP-based networks.

- **Broadcast / Unicast / Multicast :** There are three ways that network data can be delivered: broadcast, unicast and multicast. **Broadcast** delivers all data to all devices without exclusion (one-to-all). **Unicast** uses the unique IP address of each device to deliver specific data (one-to-one). **Multicast** is a method in which devices subscribe to the data they need (one-to-many). ArtNet is capable of broadcast and unicast, while sACN is capable of unicast and multicast.

In ArtNet mode, standalone Chromateq interfaces use Broadcast to play recorded shows over the network. In sACN mode, standalone Chromateq interfaces use Multicast to play recorded shows over the network.

- **Controller:** A software or device that generates data.

- **Directed Broadcast:** A packet is sent in broadcast to identify all the nodes. This allows the discovery of the ArtNet network.

- **DHCP:** Dynamic Host Configuration Protocol. If a node or ArtNet device supports DHCP, its IP address can be assigned via the DHCP protocol. In certain network

configurations, it may be useful to use static IP addresses rather than dynamically-assigned addresses.

- **DMX:** The acronym for **D**igital **M**ultiple**X**. Also referred to as **DMX-512**, which references the number of DMX channels available in one DMX « Universe ».
- **DMX Address:** Each fixture in a DMX network includes an onboard decoder that receives and translates the DMX commands received from the controller. Each fixture must be set to a unique ID, i.e., its DMX address. Possible addresses range from DMX channels 001 ~ 512 and this « starting address » is typically selected by DIP switch or an LED/LCD display menu.
- **Firmware:** A piece of software that is stored on a hardware device in order to make it run properly. Firmware is programmed into the read-only memory of a PCB or lighting fixture or lighting controller. Upgrading firmware is typically done to improve a device's performance and/or to update its compatibility with other devices.
- **IP Address:** Device addressing system for managing ArtNet and other IP-based networks.
- **Kiloverse:** A group of 1024 universes.
- **MAC address :** Media Access Control address (or simply, hardware address). In general, when an Art-Net hardware boots, an IP address of the 2.x.x type will be assigned on the 255.0.0.0 network. An addressing strategy exists to avoid collisions with different manufacturers based on the hardware's unique MAC address.
- **Net:** A group of 16 consecutive subnets or 256 universes. There are 128 nets in total.
- **Network switch :** A switch is a device in a computer network that connects other devices together. Multiple data cables are plugged into a switch to enable communication between different networked devices.
- **Node:** A device that transmits DMX packets from or to an Art-Net network. Basically, an Artnet to DMX converter that translates Art-Net messages to standard DMX signals.
- **RDM:** **R**emote **D**evice **M**anagement, an extension of the DMX protocol that supports bi-directional communication with dimmers and fixtures.
- **sACN:** Streaming ACN (**A**dvanced **C**ontrol **N**etwork), a DMX-over-Ethernet protocol that distributes multiple universes of DMX data and enables the transmission of DMX-512 data over IP-based networks.
- **Sub-Net:** A group of 16 consecutive universes (not to be confused with the subnet mask). An ArtNet network carrying 256 DMX universes will be organized into sixteen subnets, each with sixteen universes.
- **Subnet Mask:** Allows you to define the address and configuration of the IP network.

- **UDP** : User Datagram Protocol (one of the main protocols of the transport layer of the TCP/IP protocol)
- **Universe**: Allows to send a simple DMX frame or channels of 512 values, it is the equivalent of a simple DMX network. DMX lighting fixtures are typically linked together via cable networks that connect their DMX IN and OUT ports in a daisy-chain series. DMX commands are sent from the DMX OUT port of a controller that broadcasts up to 512 channels over one cable run to the connected fixtures. A universe represents a group or a line of 512 channels.
- **Wireless Router** : a device that performs the functions of a router and also includes the functions of a wireless access point.

## Basic ArtNet Deployment

### • Configuration:

ArtNet protocol typically requires a subnet mask setting of **255.0.0.0** with an IP address in the range of **2.x.x.x**.

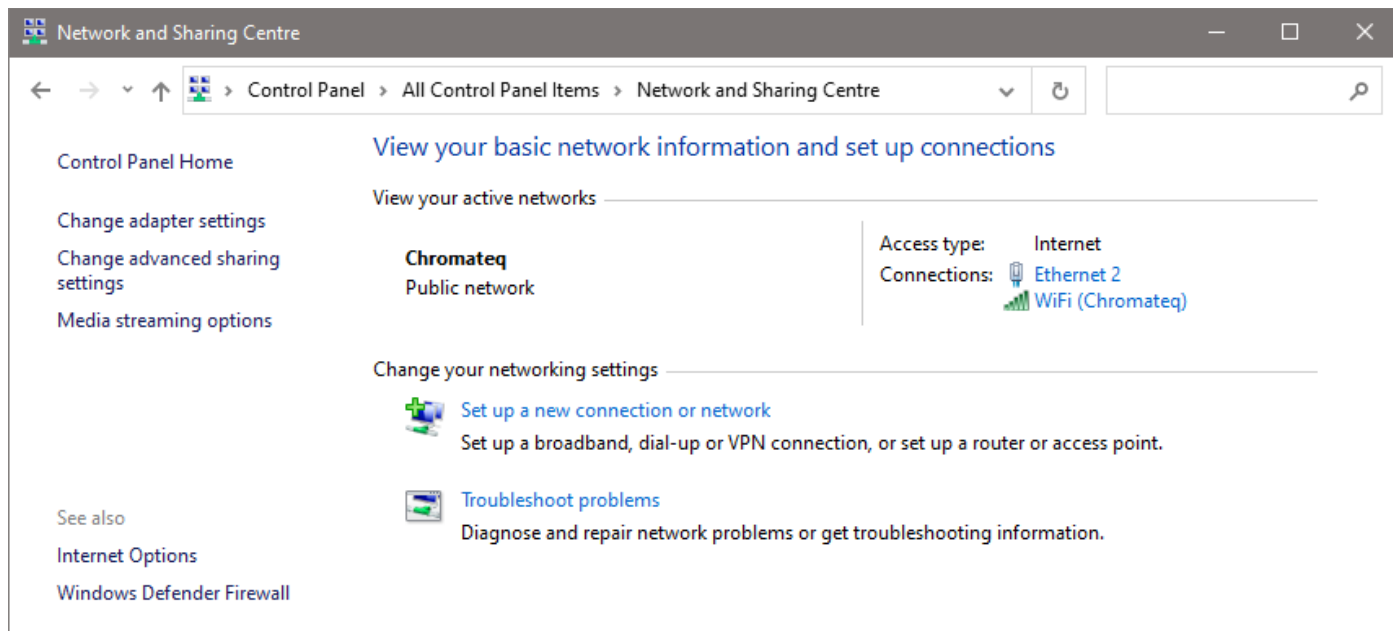
As such, ArtNet compatible fixtures tend to have a default IP address of 2.x.x.x. But, in reality, default addressing may sometimes differ, and for this reason, Chromateq software allows Art-Net frames to be sent over any network configuration. However, it is necessary to check the compatibility between the configuration of your ArtNet fixtures and your computer. Be careful to apply the same subnet mask with common class for each fixture on the network or the fixtures will not be discovered.

Examples:

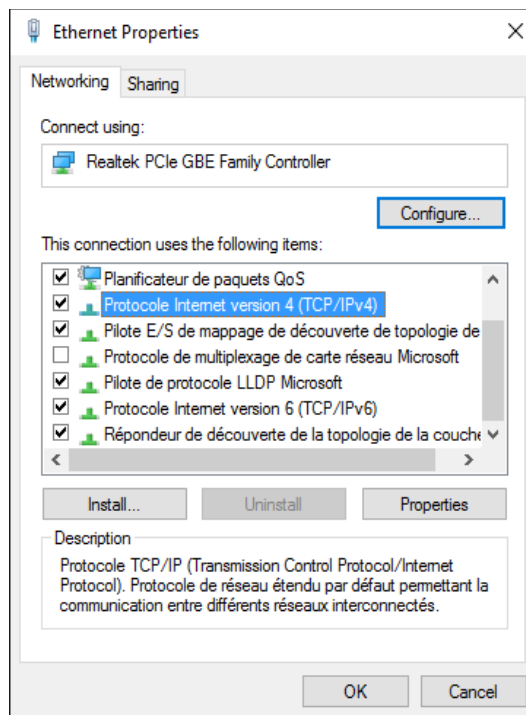
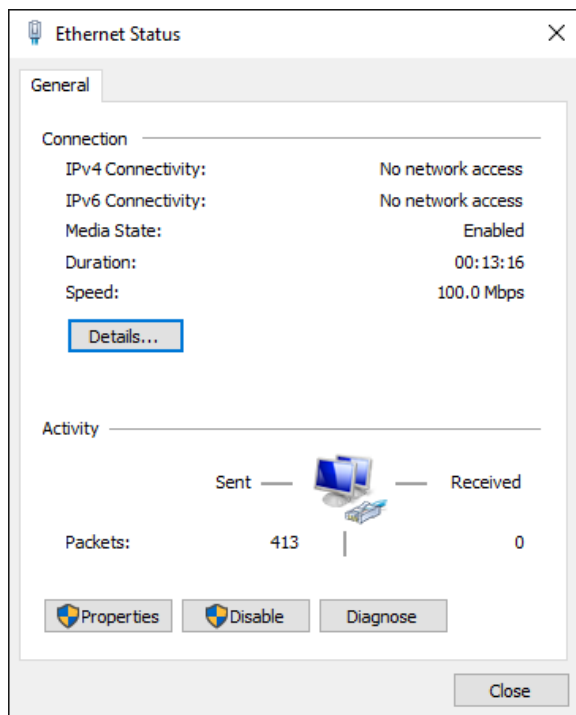
- If you are using an Art-Net fixture with the IP address 2.0.0.4. and a subnet mask of 255.0.0.0, your computer should have a subnet mask of 255.0.0.0 with an IP address 2.x.x.x (for example, 2.0.0.5).
- If you are using an Art-Net fixture with the IP address 192.168.0.4 and a subnet mask of 255.255.255.0, your computer shall have a subnet mask of 255.255.255.0 with an IP address 192.168.0.x (for example, 192.168.0.5).

## CONFIGURATION FROM WINDOWS

Open the **Network and sharing center** and click on the **Ethernet** link (you have to connect a device to the Ethernet port of your computer to allow the Ethernet network to be visible).



Click on **Properties**, then double click on **Internet Protocol version 4 (TCP/IPv4)** :



Finally, select **Use the Following IP address** and enter your IP address and the correct subnet mask :

Protocole Internet version 4 (TCP/IPv4) Properties

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

☐ Obtain an IP address automatically

☒ Use the following IP address:

IP address: 2 . 0 . 0 . 5

Subnet mask: 255 . 0 . 0 . 0

Default gateway: . . .

☐ Obtain DNS server address automatically

☒ Use the following DNS server addresses:

Preferred DNS server: . . .

Alternative DNS server: . . .

☐ Validate settings upon exit

Advanced...

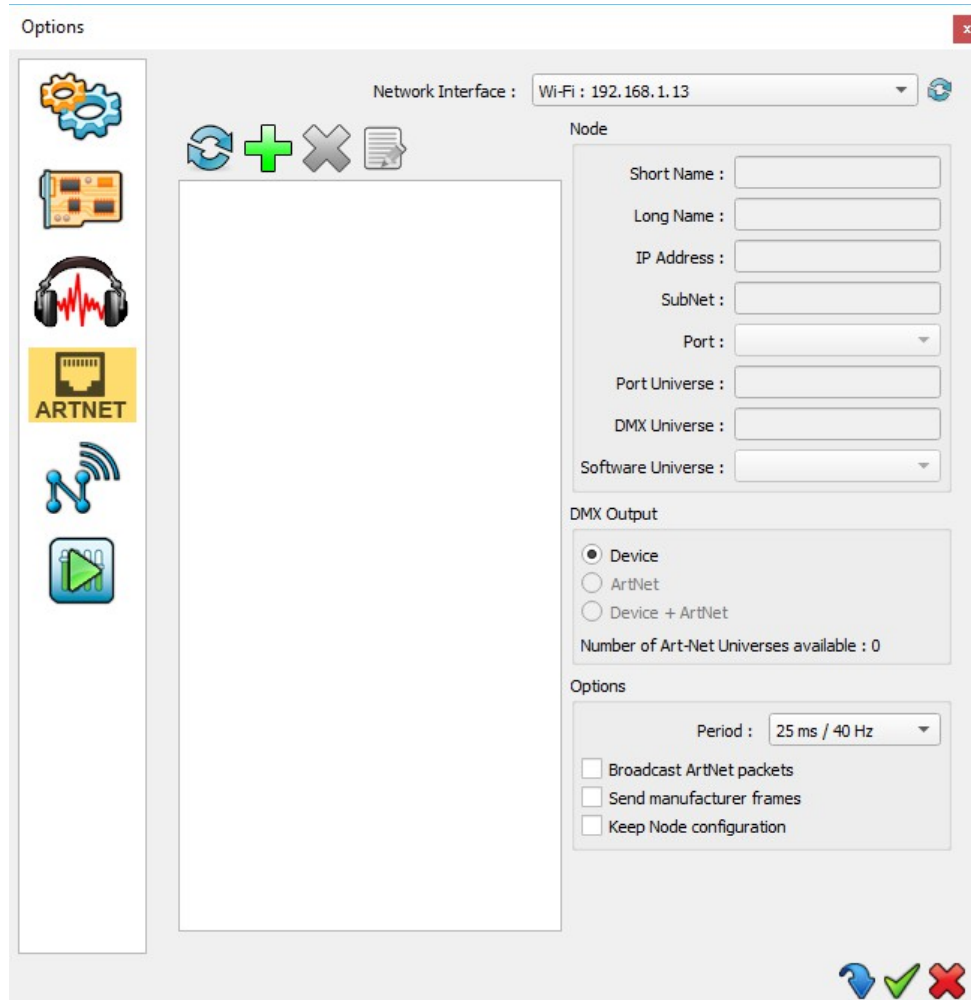
OK Cancel

Your computer is now configured and you can use our software to communicate with Art-Net devices.

## SOFTWARE SETTINGS

From the Tool/Options menu, select the **Art-Net** page.

To detect the devices on the network, click « **Refresh** ».



An Art-Net device is represented by a node which contains many ports, each port can receive 1 DMX universe. A simple Art-Net fixture shall be shown as a single port while an Art-Net convertor/ DMX with 4 DMX outputs for example shall be shown as a 4 ports.

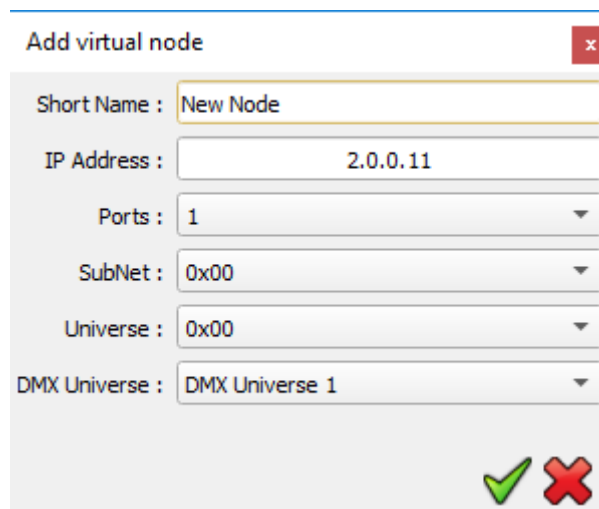


## ADD A VIRTUAL NODE

Add a virtual node will depend on the equipment installed,

It is possible that the Art-Net/DMX converter does not respond to all the node and respond only to its first node (refers to the manufacturer notice). In this case, user must add a virtual node manually from the software to create the other nodes (not detected).

To manually add a virtual node from the software, you must specify the correct IP address of the fixture, its sub network, its Art-Net universe and the number of ports used (Universe DMX).



The screenshot shows a dialog box titled "Add virtual node" with a close button (X) in the top right corner. The dialog contains the following fields:

- Short Name :
- IP Address :
- Ports :
- SubNet :
- Universe :
- DMX Universe :

At the bottom right of the dialog, there are two icons: a green checkmark and a red X.

NB : With a fixture of several node, the Art-Net protocol uses consecutive universes for each of its ports. That is why it is needed to inform one universe only (the one which belongs to the device, same as for the SubNet). However, it is possible to send any software universe to each used port.

## DMX UNIVERSES

For each fixture, you can choose the DMX universes of the software you want to send on the network.

Select the relevant node in the list, then for each port choose which software universe should be applied.