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# *Application note*

## Multiple LAN support for C2IP

### 1 Introduction

The C2IP control system currently has the restriction that all devices must be located within one IP subnet or LAN. This document describes the C2IP name server solution that was created to enable C2IP control across multiple LAN networks.

### 2 Background information

The C2IP control system was introduced in 2003 as a replacement for the S9000 control system. One of the innovating features of the C2IP control system was the use of standard Ethernet and IP technology as an interface between C2IP devices. Even though standard IP technology is used, the C2IP control system is designed in such a way that the user does not need to configure any IP setting when installing or using the C2IP control system.

This absence of IP configuration is based on two basic design choices:

- Use of AutoIP mode to ensure automatic configuration of IP addresses for each device;
- Assignment of OCPs to camera systems based on camera number selection.

The AutoIP mode ensures that each device automatically gets a unique IP address upon connection to the C2IP Ethernet network. When the device is connected, AutoIP selects a random IP address within a fixed IP address range (169.254.x.x). The AutoIP system ensures that the selected IP address is not in use by any other device.

The user can make a connection between an OCP and a camera system by selecting the camera number on the OCP. By selecting a camera number, the OCP resolves the IP address of the selected camera number by itself. The user does not need to configure an IP address to establish a connection between OCP and camera. This big advantage is achieved by using Ethernet broadcast messages when searching for the corresponding camera system on the C2IP network.

### 3 Using multiple LANs

Both design choices result in the limitation that all C2IP devices must be within a single LAN:

- AutoIP address resolution does only work within a single LAN.
- The OCP will not find a camera system in a different LAN as the search method to find camera systems uses Ethernet broadcast messages.

IP routers (used to connect different LANs) generally block Ethernet broadcast messages.

When the C2IP control system needs to be used across multiple LANs, first of all the IP configuration of each individual C2IP device requires attention. AutoIP mode cannot be used in this situation, so each device needs to be manually configured with its unique IP address, subnet mask and default gateway.

The use of multiple LANs does also block the search for camera systems from the OCP when the camera system is in a different LAN. This problem is solved with the introduction of the C2IP name server. The C2IP name server will be a central point in the C2IP control system, where IP address information about all

available C2IP devices is known. The OCP/MCP can request the C2IP name server for the IP address of a specific camera system and establish a connection to it.

## 4 C2IP name server

In case of a multi-LAN environment, a C2IP name server is required to establish connections between OCP and camera systems.

The name server dynamically builds a list of all available C2IP devices, which can be spread over multiple LANs. The information in this list is based on all C2IP devices which announce their (IP address) information towards the name server. When a C2IP device wants to know the IP address of another device it can ask the name server for it.

Using the C2IP name server requires configuration of each individual C2IP device with the IP address of this name server. The C2IP device will use this name server IP address for announcing its own information and to request information of other devices. Each C2IP device will announce itself every 30 seconds to the name server.

Availability of a C2IP name server is critical during the setup of a connection between two C2IP devices in different LANs. Once the connection is established, the devices have a direct connection and the name server is not used anymore. To ensure availability of a C2IP name server, it is possible to use redundant C2IP name servers. Each C2IP device can be configured with two name server IP addresses.

## 5 Configuring C2IP devices

To use the C2IP control system across multiple LANs the following manual configuration settings need to be done for each C2IP device:

- IP address
- Subnet mask
- Default gateway
- Name server IP address

### 5.1 Setting up the OCP

The IP settings can be found in the OCP Setup Menu: Setup |> OCP > IP CONFIG

Menu	Selection(s)	Function	Possible values
IP CONFIG	IP Mode	IP Address configuration Mode	AutoIP/Manual
	Apply	—	—
	Subnet Mask	Subnet mask selection	Press button to activate the new IP Settings
	Subnet Mask	Subnet mask selection	Press button to activate the new IP Settings
Next	IP Byte 1	IP Address Byte 1	1..250
	IP Byte 2	IP Address Byte 2	0..255
	IP Byte 3	IP Address Byte 3	0..255
	IP Byte 4	IP Address Byte 4	1..254

Menu	Selection(s)	Function	Possible values
Next	Def GW 1	Default Gateway Byte 1	1..250
	Def GW 2	Default Gateway Byte 2	0..255
	Def GW 3	Default Gateway Byte 3	0..255
	Def GW 4	Default Gateway Byte 4	1..254

The IP Mode must be set to Manual. The IP address, subnet mask and default gateway must filled with the settings for that specific OCP.

The C2IP name server settings can also be found in the OCP Setup Menu: Setup | OCP | NAME SRVR

Menu	Selection(s)	Function	Possible values
NAME SRVR	SERVER 1	Settings for first C2IP Nameserver	
	SERVER 2	Settings for second C2IP Nameserver	

Menu	Selection(s)	Function	Possible values
SERVER X	Use Srvr x	Enable/Disable use of Nameserver	Yes/No
	Apply		Press button to activate the new Nameserver Settings
	Status	Indication of Nameserver status	— / Unknown / Unavail / Active
Next	IP Byte 1	Nameserver IP Address Byte 1	1..250
	IP Byte 2	Nameserver IP Address Byte 2	0..255
	IP Byte 3	Nameserver IP Address Byte 3	0..255
	IP Byte 4	Nameserver IP Address Byte 4	1..254

The OCP can be set up for two individual C2IP name servers. Each name server can be enabled or disabled. Use the name server status indication to monitor the connection to the name server. Note that this indication may have some delay in status changes.



#### Note

Always press the Apply button to store and activate the changed settings.

## 5.2 Setting up the XCU

The IP and C2IP name server settings can be found in the XCU menu: Menu > Install > Network

Menu item	Values	Description
<b>Network</b>		
IP Settings		
IP Mode	IP Address configuration Mode	Auto/Manual
Subnet Mask	Subnet mask	0.0.0.0 - 255.255.255.254
BS IP digit 1	Basestation IP address byte 1	1..250
BS IP digit 2	Basestation IP address byte 2	0..255
BS IP digit 3	Basestation IP address byte 3	0..255
BS IP digit 4	Basestation IP address byte 4	1..254
CAM IP digit 1	Camera IP address byte 1	1..250
CAM IP digit 2	Camera IP address byte 2	0..255
CAM IP digit 3	Camera IP address byte 3	0..255
CAM IP digit 4	Camera IP address byte 4	1..254
Def Gw digit 1	Default gateway byte 1	1..250
Def Gw digit 2	Default gateway byte 2	0..255
Def Gw digit 3	Default gateway byte 3	0..255
Def Gw digit 4	Default gateway byte 4	1..254
Apply IP settings	Apply changed IP settings	Exec
Nameserver 1		
Use server	Enable/Disable use of Nameserver	Yes/No
Status	Indication of Nameserver status	— / Unknown / Unavail / Active
IP digit 1	Nameserver IP Address Byte 1	1..250
IP digit 2	Nameserver IP Address Byte 2	0..255
IP digit 3	Nameserver IP Address Byte 3	0..255
IP digit 4	Nameserver IP Address Byte 4	1..254
Apply setttings	Apply changed Nameserver settings	
Nameserver 2		
Use server	Enable/Disable use of Nameserver	Yes/No
Status	Indication of Nameserver status	— / Unknown / Unavail / Active
IP digit 1	Nameserver IP Address Byte 1	1..250
IP digit 2	Nameserver IP Address Byte 2	0..255
IP digit 3	Nameserver IP Address Byte 3	0..255
IP digit 4	Nameserver IP Address Byte 4	1..254
Apply setttings	Apply changed Nameserver settings	

The IP mode must be set to Manual. The XCU must be configured with two IP addresses, one for the XCU and one for the Camera.

Each name server can be enabled or disabled. Use the name server status indication to monitor the connection to the name server. Note that this indication may have some delay in status changes.


**Note**

Always press the Apply button to store and activate the changed settings.

### 5.3 Setting up the camera

Camera set-up is only required for LDX Compact Series cameras or when a camera is used without an XCU (standalone).

The IP and C2IP name server settings can be found in the camera's system menu: Menu > Configuration > Network

Menu item	Values	Description
<b>Network</b>		
IP Settings		
IP Mode	IP Address configuration Mode	Auto/Manual
Subnet Mask	Subnet mask	0.0.0.0 - 255.255.255.254
IP digit 1	IP address byte 1	1..250
IP digit 2	IP address byte 2	0..255
IP digit 3	IP address byte 3	0..255
IP digit 4	IP address byte 4	1..254
Def Gw digit 1	Default gateway byte 1	1..250
Def Gw digit 2	Default gateway byte 2	0..255
Def Gw digit 3	Default gateway byte 3	0..255
Def Gw digit 4	Default gateway byte 4	1..254
Apply IP settings	Apply changed IP settings	Exec
Nameserver 1		
Use server	Enable/Disable use of Nameserver	Yes/No
Status	Indication of Name server status	-- / Unknown / Unavail / Active
IP digit 1	Name server IP Address Byte 1	1..250
IP digit 2	Name server IP Address Byte 2	0..255
IP digit 3	Name server IP Address Byte 3	0..255
IP digit 4	Name server IP Address Byte 4	1..254
Apply setttings	Apply changed Name server settings	
Nameserver 2		
Use server	Enable/Disable use of Nameserver	Yes/No
Status	Indication of Name server status	-- / Unknown / Unavail / Active
IP digit 1	Name server IP Address Byte 1	1..250
IP digit 2	Name server IP Address Byte 2	0..255
IP digit 3	Name server IP Address Byte 3	0..255
IP digit 4	Name server IP Address Byte 4	1..254
Apply setttings	Apply changed Name server settings	

The IP Mode must be set to Manual. The IP address, subnet mask and default gateway must be set for each specific camera.

The camera can be set up for two individual C2IP name servers. Each name server can be enabled or disabled. Use the name server status indication to monitor the connection to the name server. Note that this indication may have some delay in status changes.



#### Note

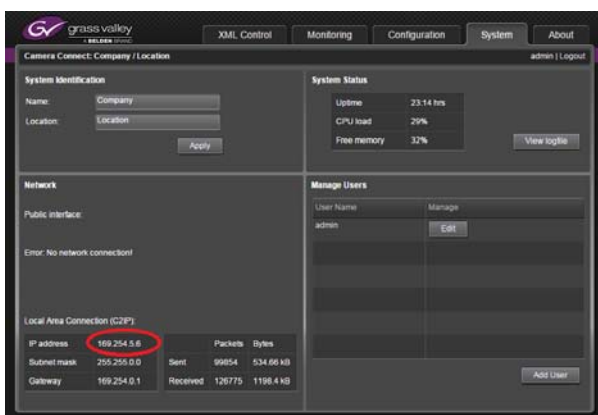
Always press the Apply button to store and activate the changed settings.

## 5.4 Configuring the C2IP name server

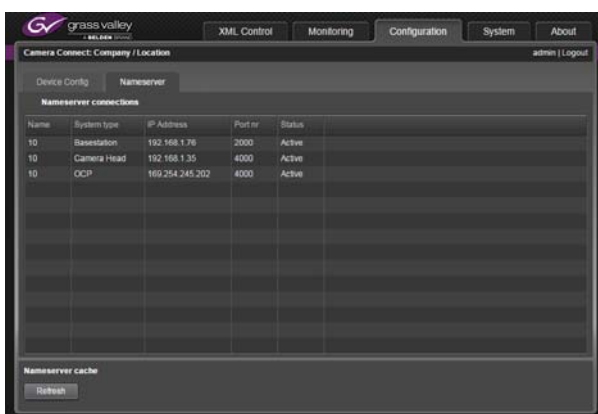
Configuration of the C2IP name server only consists of the IP settings configuration of the Box Computer. The name server uses the C2IP Network interface of the Box Computer. The IP configuration of this interface can be done through the standard Windows network settings.

The Camera Connect application provides a web interface for monitoring and configuring the C2IP network. You can access the web interface using Internet Explorer running on the Box Computer by entering `http://localhost` into the browser's address field.

The web interface is also accessible from any PC that is connected to the C2IP network by entering the IP address of the Box Computer into the browser address field. After accessing the web interface a login screen appears. The default login user name is: **admin** and the password is: **admin**.

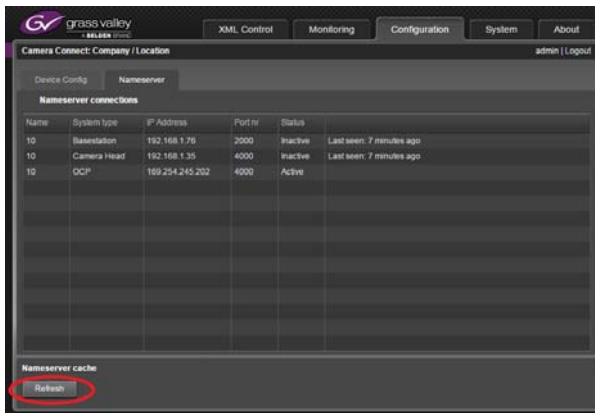


The IP address of the C2IP name server is shown on the System page.



The C2IP name server has its own (sub) page on the Configuration page. This page provides an overview of all C2IP devices that are set up to use this name server. Use the overview to check if all C2IP devices are properly configured.

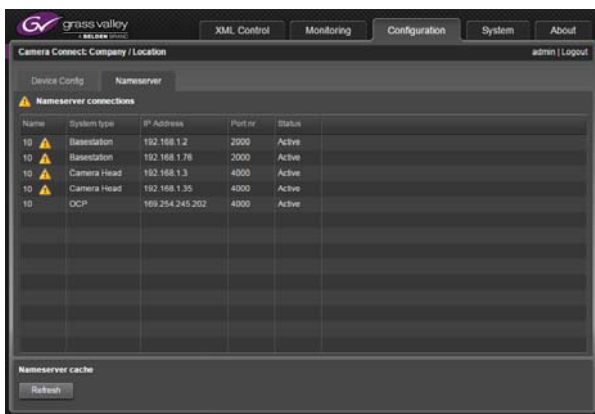
C2IP devices are listed with their name, system type and IP address. The status field indicates if a C2IP device is currently active. Status information is based on the frequent announcements of each C2IP device with its information.



When the name server has not received any updates for more than one minute, the status changes to "Inactive".

The name server keeps "Inactive" C2IP device information alive for 10 minutes in its cache before removing them.

To rebuild the name server list (and remove all "Inactive" items), it is possible to Refresh the name server cache by pressing the button on the web page. It may take about 30 seconds before all active items are displayed again.



When the C2IP network contains camera systems with identical camera names/numbers, a warning icon next to the camera name/number is shown.

## Note

Duplicate names may appear as a result of recent IP configuration changes. These duplicates are only temporary: after a while the "old" name entry becomes "Inactive". You can force removal of the duplicates by clicking the Refresh button so the name server's cache is cleared.

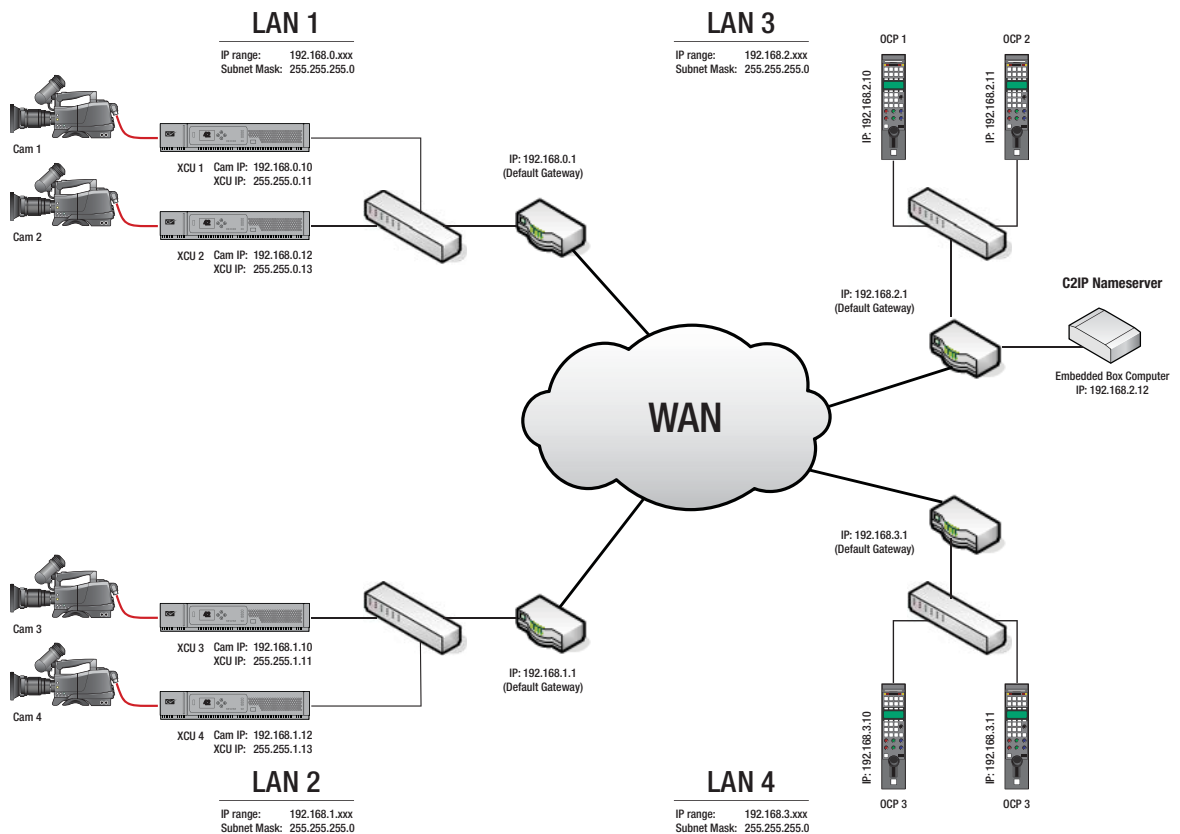
"Camera Head" system types are displayed in the name server connection list, even when they are not connected or switched on. This is caused by the fact that Camera Head IP configuration is stored in the XCU.

The C2IP name server may be located anywhere in a multiple LAN environment. However, the most logical location is in the same LAN as where the OCPs are located.

When the second network interface of the Embedded Box PC is already in use, it may be required to manually add IP routes to the Windows network stack. These route(s) are needed to ensure that the correct network interface is used to connect to the multiple C2IP LANs.

## 6 Example configuration

This is an example configuration of a C2IP system extending over four LANs with a single C2IP name server running on a Embedded Box Computer:



The following steps are required for the configuration of this C2IP system:

1. Make sure that all LAN networks are connected.
2. Complete the configuration of the C2IP name server by setting the following items:
  - IP address
  - Subnet mask
  - Default gateway
3. Complete the configuration of each XCU by setting the following items:
  - XCU IP address
  - CAM IP address
  - Subnet mask (of the respective LAN)
  - Default gateway (of the respective LAN)
4. Configure each XCU by setting the C2IP name server IP address and verify the status indication.
5. Configure the IP settings of all OCPs with:
  - OCP IP Address
  - Subnet mask (of the respective LAN)



- Default gateway (of the respective LAN)
6. Configure all OCPs with the:
    - C2IP name server IP address
    - Verify the status indications.
  7. Verify the availability of each C2IP device on the web page of the C2IP name server.
  8. Now you it is possible to assign any OCP to any camera system.

