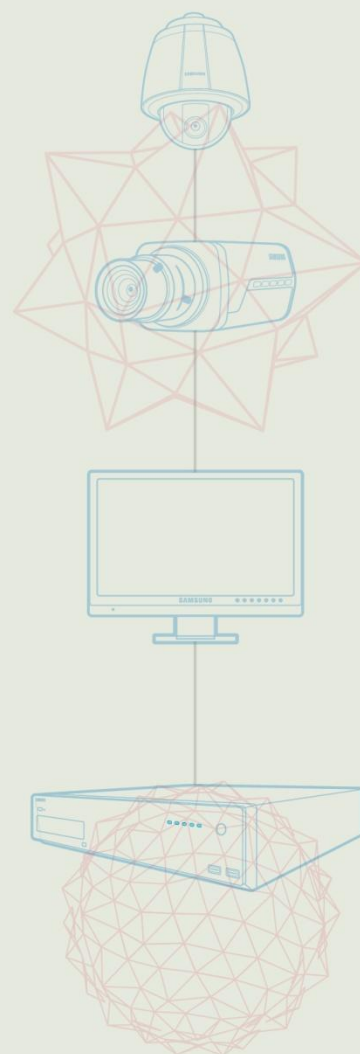


Establishing the Network Connection

This chapter explains how network devices can be connected for communication.



Overview

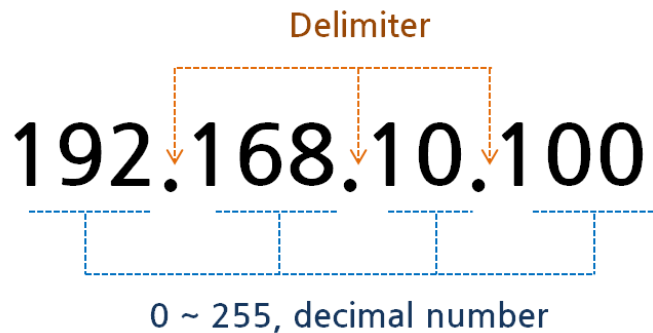
This document explains how the destination is distinguished (IP address, subnet mask, gateway) and how data is transferred according to the transmission mode (UDP/TCP, Unicast/Broadcast/Multicast). It helps to understand characteristics of each network settings, and helps configuring the network appropriately.

IP Address

IP address is a unique identifier of a device that is connected to a network. When transferring data from/to each network device, a unique address is required to send data to the exact destination device and allows no duplication. Hence, the very first task when adding a device to a network is assigning the IP address of the device.

As for now (early 2012), the commonly used IP address conforms to the IPv4 (IP version 4) regulation. IPv4 defines an address as 4 decimal numbers of 0 ~ 255, delimited by full stop (.).

Fig 1. IPv4 Address



For proper communication, the network device should be assigned with IP address and satisfy two conditions described below:

First, network devices should be connected with each other, either 1:1 physically by using a network cable, or through a network hub, switch or router device to construct a network. To connect network devices physically, you can connect devices 1:1 with network cable, or use hub, switch and router devices to expand the network for multiple network devices.

Secondly, even if network devices are physically connected, all connected devices should be assigned with addresses properly to distinguish each other logically (with assigned addresses). At the moment, you can group network devices recognizable to each other with defining the Subnet Mask. A network ID can be found by combining the subnet mask and IP address, and network devices having the same ID can be recognized as the same group for communication.

When constructing a small sized network not connecting to an external network, you can assign the same 3 beginning address fields for IP addresses of connected devices only distinguished with the last 4th address field, with using the subnet mask of 255.255.255.0.

Fig 2. Identifying addresses with subnet masking

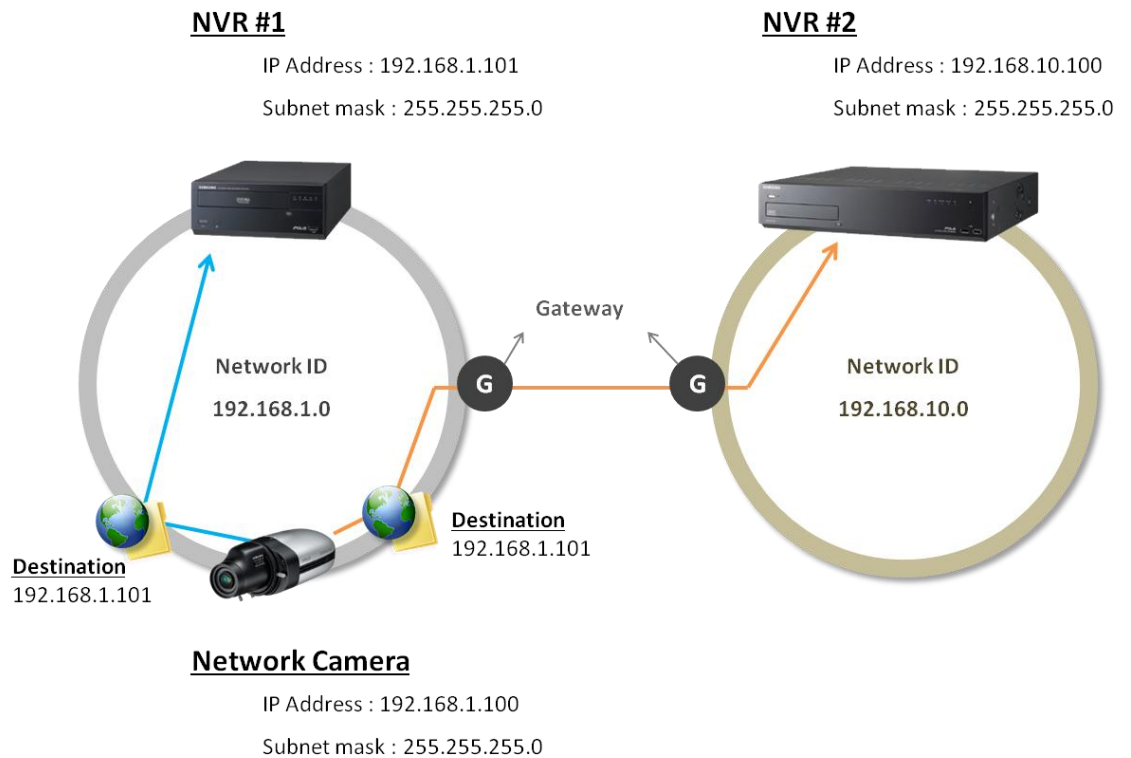
IP Address	Decimal	192	.	168	.	10	.	100
	Binary	11000000		10101000		00001010		01100100
Subnet Mask	Decimal	255	.	255	.	255	.	0
	Binary	11111111		11111111		11111111		00000000
Network ID	Decimal	11000000		10101000		00001010		00000000
	Binary	192	.	168	.	10	.	0

} Bit-wise AND Operation

A Gateway device is used to communicate to a network device of different network ID. As the name Gateway represents, it provides a passage to an external network. All network devices within the same local network share the same gateway, and a data packet designated to an external destination instead of internal destination having the same network ID will be sent out through this gateway.

- Outbound data transfer procedures:
 1. Check the destination network address whether it falls within the same network
 2. If confirmed to be using the same network ID, it is internal communication and sent to the destination.
 3. If confirmed for a different network ID, it is for outbound communication and sent out to an external network through the gateway.

Fig 3. Outbound communication to a different network ID through a Gateway



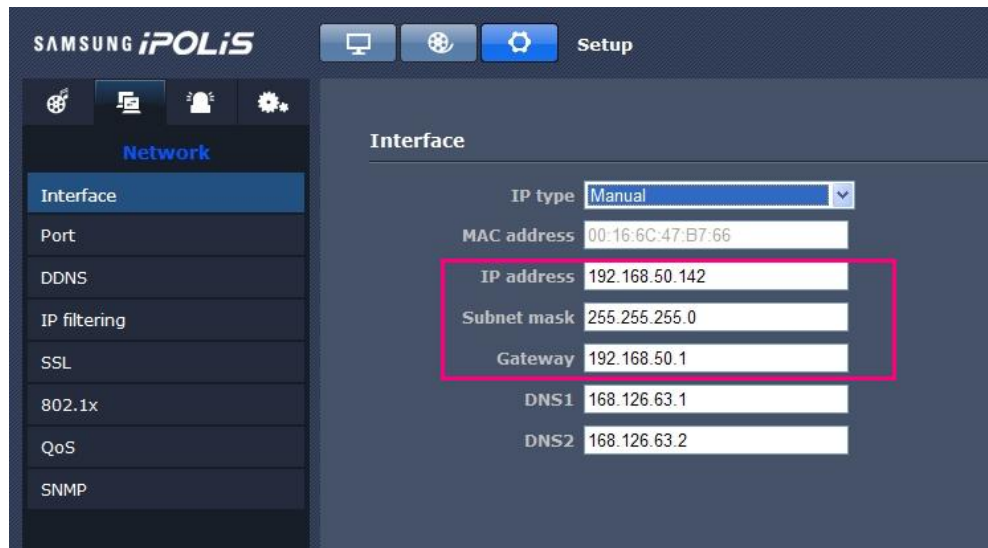
You can configure IP address, subnet mask and gateway of Samsung Network Camera in [Settings] > [Network] > [Interface]. First, select the IP address type of the camera. Samsung

Network Camera supports IP address type of static, DHCP and PPPoE.

Static IP address is manually assigned as well as the subnet mask and gateway address with considering the connected network’s configuration.

On the other hand, DHCP and PPPoE IP address, subnet mask and gateway address are assigned automatically by the connected router / modem from the available addresses. For DHCP addresses, the router automatically allocates an IP address from the pool and requires no user’s interaction. For PPPoE configuration of cameras connected to a modem such as ADSL provided by ISP (Internet Service Provider), it requires user ID and password. It is handy to have dynamically an allocated IP address and other network configurations since it requires no user’s attention but the allocated address can be replaced later by the router/modem in using. In such cases of address replacement by the router/modem, a user cannot notice the changed address at the moment, it is useful to combine DDNS(*) service for accessing cameras of such configuration.

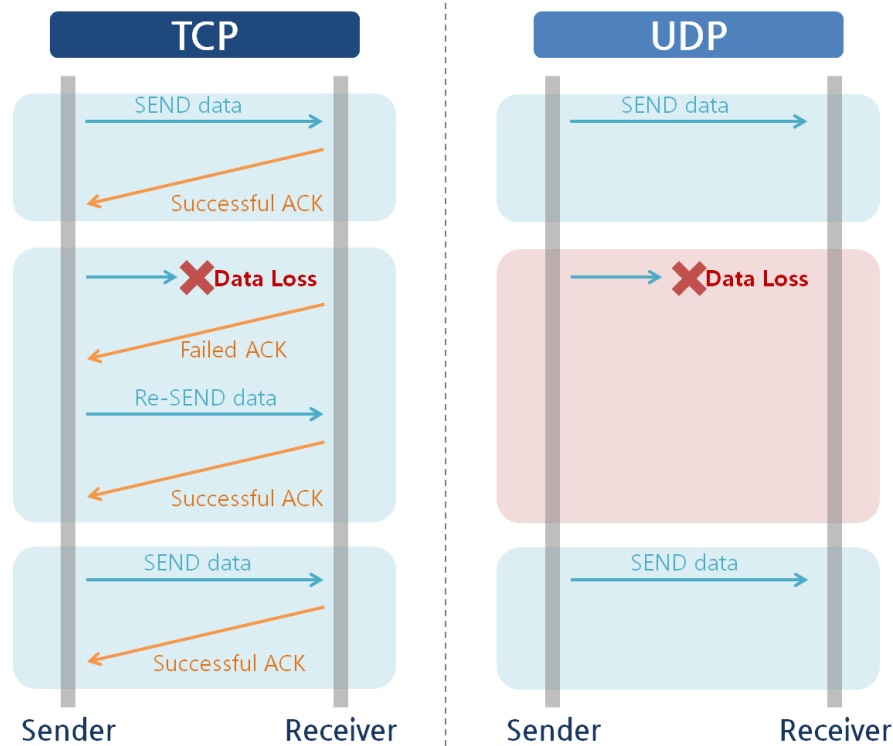
Fig 4. Samsung Network Camera IP Address Setup Page



TCP/UDP

TCP/UDP protocols define how the data through a network is transported. In TCP (Transmission Control Protocol), sender transmits data and asks receiver to acknowledge/confirm the transmission, while in UDP (User Datagram Protocol), the sender keeps sending data and requires no response from the receiver.

Fig 5. Data transmission flows in TCP / UDP



TCP guarantees lossless communication with controlled handshaking protocol that confirms data reception from the receiver, by resending missing data if requested from the receiver. On the other hand, control communication requires more transmission time and burdens with overhead which results in less efficiency in terms of real-time communication compared to UDP.

In UDP communication, the sender sends out data and does not care whether the data reached its destination. The sender cannot confirm the data reached the destination and this communication lacks of data integrity in such terms, yet it's efficient in real-time applications by saving the control flow and not using time and resources for data control.

With considering such characteristics of each transmission protocols of TCP and UDP, user can select appropriate data transmission for the purpose intended and network environment. In general, it is recommended to use TCP in environments expected to have more data loss (ex. WAN) or required lossless communication. For applications used within the same local LAN that assures low data loss or real-time focused communications, UDP communication is recommended.

Unicast/Broadcast/Multicast

Unicast/broadcast/multicast defines how data is transported from the sender to receivers in a network.

Unicast is the most common 1:1 communication method used. The sender limits the data

transmission to only one recipient address. Hence, the sender transfers data to one destination device at a time. This method wastes nothing for transferring data. But the load of the sending device grows as number of destination devices grow for multiple recipients, since it has to connect to each destination device for data communication.

Fig 6. Unicast communication



On the other hand, Broadcast method sends data to all recipients connected to the network instead of designated destination device. In broadcasting, the sender marks “FF-FF-FF-FF-FF-FF” as the destination MAC address when sending a data packet. Such data is transferred to every device connected to the network and the receiving device decides whether the data is accepted or not. Not having to know the recipient address is simple for sending but it wastes unintended receiving device’s resources as well as occupying unnecessary network bandwidth.

Fig 7. Broadcast communication



In multicast communication, one sender device can send data to a group of multiple destination devices at one time. Using multicast communication, the sending device can send data to multiple devices at once instead of transferring data one by one to each destination. Recipient devices for multicast communication are grouped to a multicast group IP, and the sender device transfers data to that group IP. To utilize multicast communication, the router or switch device controls the network should support multicast function. Check whether the device supports multicast function before applying to your case.

Fig 8. Multicast communication





SAMSUNG TECHWIN

- Functions and specifications on this document are subject to change without prior notice for improved performance and quality.

You can find more information from the "Online Tutorial" at Samsung Techwin's CCTV site.

<http://www.samsungcctv.com>