
**Digital Video Switching Application
Design Specification**



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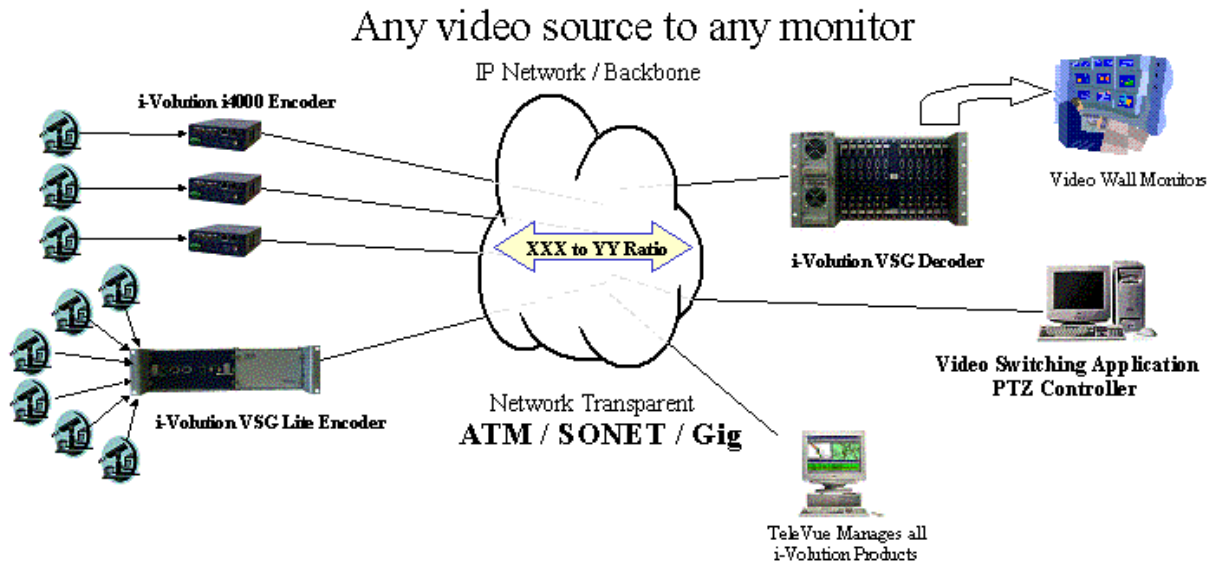
1 INTRODUCTION

iMPath's i-Volution series of digital video encoders and decoders provides video transmission and monitoring for a number of applications. When a small number of cameras are deployed an external analog video switcher is used to select what will be displayed on any given monitor. As the number of video ports increases, so does the cost of an elaborate video switcher. The alternative is to take advantage of the flexibility of Video over IP (in Multicast mode) and use an IP network to perform video switching. iMPath's solution has the entire feature set built into the i-Volution series of products to perform the video switching commands traditionally available only on analog video switchers.

For additional details on iMPath i-Volution product flexibility using a Video Switching Application, please refer to the Flexibility and Scalability document on the iMPath web site.

Video switching requirements are different for each customer and often require customization for specific projects. iMPath offers the user an open interface to control the video switching of the iMPath Encoder and Decoder via an application that is managed by the user.

Digital Video Switching



- ?? A traditional analog video matrix switcher is not required in an i-Volution network.
- ?? PC-based application software lets the user select any of the video sources to be displayed on any monitor connected to the i-Volution VSG decoder ports.

1.1 The intent of this document

This document describes the essential functions and information on how the iMPath i-Volution solution can be controlled by application software and eliminate the need for an expensive video matrix switcher.

2 Solution description

The functions described and prioritized in this document provide examples to the user of what can be accomplished with the iMPath i-Volution solution. We have classified three sets of commands that should be considered for your **Video Switching Application (VSA)** in order of importance. They are the *Mandatory*, *Desirable* and *Secondary* commands that are most requested by our customers.

This solution can be used for both Multicast and Unicast applications. Considering that this application will be used to perform video switching on an IP network, it is more suitable for Multicast applications. The example described in this document is designed for a Multicast application but can be customized for Unicast.

2.1 Communication Protocol

The i-Volution products support SNMPv2 GETs and SETs for all configurable and status parameters. Everything that is available from the i-Volution Network Management System (NMS) is available via SNMP. This includes the ability to read the LED status display of the cards and standalone equipment.

2.2 Video Switching Application

For every function that will be performed by the VSA, IP addresses and parameters of the equipment are needed. A table must be built as part of the VSA. The information may be entered manually by the user or may be automatically filled by the application. The table consists of the following parameters (to name a few). *[The following table is provided as an example of the information that is needed to perform video switching.]*

For every video source (Encoder) port

Camera Name	Encoder IP Address	Socket	Port ID	Multicast Data	Contact Sensor name	PTZ Socket	PTZ Port	PTZ Manufacturer
							Entered manually by user	
Camera 55	192.168.30.23	3000	1	224.22.25.23		4000	1	Pelco

Camera 56	192.168.30.39	3000	1	224.22.25.39	Door #55	4000	1	Vicon
Camera 57	192.168.30.41	3000	1	224.22.25.41		4000	1	Pelco
Camera 58	192.168.30.41	3000	2	224.22.25.42		4002	2	Javelin

For every video output (Decoder) port

Monitor Name	Decoder IP Address	Port ID
Main	192.168.31.2	1
Wall Display	192.168.31.2	2
Security Alert 1	192.168.31.3	1
Security Alert 2	192.168.31.4	1

Switching application example:

The user selects a specific camera <camera 55> and points to the output of the Video Matrix <Wall Display>.

The application will refer to the table and will send a SNMP command to the decoder.

<SNMP MIB SET for IP 192.168.31.2 – port 2> set Multicast address <224.22.25.23>.

(Refer to SNMP MIB for the exact syntax)

3 Active and Persistent configuration setting

The encoders and decoders have two-configuration modes for most settings. The first mode saves a configuration setting that will be remembered on power-up. This is called the “persistent memory” or the “non-volatile” memory. The second mode provides the ability to save a configuration setting temporarily without affecting the default power-up setting. This is called the “active memory” or the “volatile” memory.

When used for a VSA as in this case, all application configuration settings should be saved in the “ACTIVE” configuration mode. i-Volution NMS (TeleVue) operator sets the default power-up setting in the “PERSISTENT” configuration mode. This will simplify the development cycle of the VSA.

NOTE: The VSA should carry out the video switching actions using the "Active" configuration mode. Writing to "volatile" (i.e. Active) memory is a common practice when making temporary or frequent changes in the equipment's configuration.

?? **Switching performance is optimized when switching actions are saved in the “Active” configuration mode.**

The iMPath SNMP MIBs include separate instances for most variables (i.e. configuration settings). The variables that can use Active and Persistent modes will have an instance for each mode. The VSA developer should use the corresponding active instance of the variable when making transient configuration changes and the persistent variable instance for storing a permanent configuration to be remembered after a power up.

4 Product Functionality

The following list provides a quick description of the functionality essential for solution integration. The list is separated into 3 sections for prioritization. We classified them as:

?? **Mandatory Requirements:**

Minimal functions desired for a video switching application

?? **Desirable Requirements:**

Functions that are viewed as “important” as they offer customers added value to the integrated solution.

?? **Secondary requirements:**

These are not considered essential for this initial system integration, but should be considered in the system design.

This list consists of examples of how a video switching application can be developed for the i-Volution series. Customers are free to add any other functions that are supported by iMPath SNMP MIBs. As mentioned earlier, all product parameters and status information is available on MIBs to meet any customer requirements.

4.1 **Mandatory Requirements:**

Minimal functions desired for a video switching application

4.1.1 Auto Discovery

?? Have the ability to auto discover all of the information in the iMPath Encoder and Decoder to fill in the boxes of the table above. Several commands are essential to fill in these boxes.

- SNMP discovers iMPath devices. This will identify the IP addresses of encoders and the decoders presently deployed in the network.

~~///~~ By Range

?? From IP address _____ to IP address _____

~~///~~ By single unit addition

?? IP address of new unit to add.

- With the information received, the VSA will send specific enquiries to each specific device to:

~~///~~ Determine if this is an Encoder or Decoder

~~///~~ Determine the number of Video ports on this product variant

~~///~~ Determine the number of Data ports on this product variant

By implementing auto discovery, it eliminate the need to keep track of the model number to know what number of ports. By relying on the MIBs, this will provide the most accurate representation of the product. iMPath has several different models available under the i-Volution product series. They are:

?? i4000 Stand-alone Encoder (1 Video-2 Data)

?? i1000 Stand-alone Encoder (2 Video-2 Data)

?? i1000 Stand-alone Decoder (2 Video-2 Data)

?? i1400 Stand-alone Quad Encoder (4 Video- 2 Data) ***

?? VSG MPEG Encoder (2 Video-2 Data)

?? VSG MPEG Decoder (2 Video-2 Data)

*** The i1400 Quad Encoder encodes a single video stream using a single multicast address. The VSA has the ability to select any one of the 4 independent video inputs to view each of them individually at full D1 resolution. In addition, the VSA can enable the quad view image of the 4 video streams simultaneously with full motion and full D1 resolution.

When building your video switching application, the application should not be concerned with the product name and variant. This should eliminate VSA changes when new i-Volution product variants are added by iMPath.

The following example represents some of the specific info needed to fill in your database.

- VSG MPEG Encoder
 - ~~///~~ SNMP gets camera name on port 1 (optional)
 - ~~///~~ SNMP gets camera name on port 2 (optional)
 - ~~///~~ SNMP gets socket number on port 1
 - ~~///~~ SNMP gets socket number on port 2
 - ~~///~~ SNMP gets multicast Address port 1
 - ~~///~~ SNMP gets multicast Address port 2
 - ~~///~~ SNMP gets name of contact sensor alarm (optional)
- VSG MEG Decoder
 - ~~///~~ SNMP gets monitor name on port 1 (optional)
 - ~~///~~ SNMP gets monitor name on port 2 (optional)

4.1.2 Graphical User Interface

?? Have the ability to select a camera via a graphical interface or by text, and state which monitor should receive the video.

- The application will refer to the table and issue the following command.
 - ~~///~~ i.e. “Camera 55” to monitor “Wall Display”
 - ~~///~~ <SNMP MIB SET for IP 192.168.31.2 – port 2>set Multicast address<224.22.25.23>. (Refer to SNMP MIB for the exact syntax)

4.1.3 Video Tours (optional)

?? Have the ability to create and run Tours going on multiple monitors at any time.

- Tour # 1 to monitor xyz where Tour # 1 has all of the cameras identified for this tour.
 - ~~///~~ The VSA performs all the touring functionality.
 - ?? List of camera for each tours
 - ?? Time interval between camera switching
 - ~~///~~ The VSA will send SNMP Set commands to the i-Volution product to perform each and individual video switch.
 - ~~///~~ i.e. “Camera 55” to monitor “Wall Display”
 - ?? <SNMP MIB SET for IP 192.168.31.2 – port 2>set Multicast address<224.22.25.23>.

- ~~✍~~ i.e. “Camera 56” to monitor “Wall Display”
 - ?? <SNMP MIB SET for IP 192.168.31.2 – port 2>set Multicast address<224.22.25.29>. PTZ Control
- ~~✍~~ i.e. “Camera 57” to monitor “Wall Display”
 - ?? <SNMP MIB SET for IP 192.168.31.2 – port 2>set Multicast address<224.22.25.41>. PTZ Control

4.1.4 PTZ Control

- ?? By selecting a camera, the user has PTZ control from the application.
 - i.e. “Camera 55” to monitor “Wall Display”
 - ~~✍~~ The application will set-up an IP connection to the encoder IP address <192.168.30.23> Socket #<4001>
 - ~~✍~~ Using the camera specific PTZ drivers (Pelco, Vicon...), the VSA will send all PTZ data signals on the IP connection to the remote encoder serial interface. (The interface will already be pre-configured for the speed and interface type by TeleVue).
 - ~~✍~~ By selecting a different camera, this IP connection will be **disconnected**.
 - NOTE: PTZ drivers are available from the PTZ manufacturer.

4.1.5 Event Triggered Video Switching (optional)

- ?? Alarm triggered events such as Motion Detection or Contact Closure will automatically select a camera to display it on a specific monitor
 - The remote encoder has the ability to generate SNMP Traps (alarms) based on motion detection or contact sensors.
 - The encoder will be programmed to send SNMP Traps to the IP address of the VSA station.
 - ~~✍~~ SNMP Trap <event camera 56 IP Address Motion Detected @ time and date>
 - ~~✍~~ SNMP Trap <event “Door # 55” IP Address @ time and date>
 - ~~✍~~ The VSA will automatically select camera 56 and display the video on Monitor “Security Alert 1”

4.2 Desirable Requirements:

Functions that are viewed as “important” as they offer customers added value to the integrated solution. These are not essential for the system operation, but can be added.

4.2.1 Video Quality On-Demand

- ?? Have the ability to control video quality on demand and on alert.
 - The intent is to run the encoder at a lower bit rate and to increase the video bit rate when needed to obtain a higher video quality
 - Changing the bit rate setting could involve a series of MPEG parameters. Since there are several parameters that need to be sent to the encoder, this function interrupts the video stream when this takes place (<500ms). This task might be performed on user acknowledgment.

- In order to perform this task, reference tables are needed in the VSA.
iMPath’s recommended setting are shown below.

Parameters	Lowest	Low	Nominal	High	Highest	Lowest Latency	Customer Preferred Setting
IPB	IPB	IPB	IPB	IPB	IPB	IP	
M next P	3	3	3	3	3	1	
N next I	15	15	15	15	15	3	
VBV Buffer	20	35	45	70	112	70	
Bit Rate	350 K	1 Meg	2 Meg	4 Meg	6 Meg	6 Meg	
Max Bit Rate	350 K	1 Meg	2 Meg	4 Meg	6 Meg	6 Meg	
Resolution	SIF	HHR	Full	Full	Full	Full	
Comp. Type	MPEG-1	MPEG-2	MPEG-2	MPEG-2	MPEG-2	MPEG-2	
Intra DC	8	10	10	10	10	10	
Rate Type	CBR	CBR	CBR	CBR	CBR	CBR	

- Additional fields will be required in the camera table and monitor table

Camera Name	Encoder IP Address	Socket	Port ID	Multicast Data	Default Video Quality	Maximum Video quality for this site	Contact Sensor name	PTZ Socket	PTZ Port	PTZ Manufacturer
					Entered manually by user				Entered manually by user	
Camera 55	192.168.30.23	3000	1	224.22.25.23	Nominal	High		4000	1	Pelco
Camera 56	192.168.30.39	3000	1	224.22.25.39	Low	High	Door # 55	4000	1	Vicon
Camera 57	192.168.30.41	3000	1	224.22.25.41	Low	High		4000	1	Pelco
Camera 58	192.168.30.41	3000	2	224.22.25.42	Lowest	Low		4002	2	Javelin

For every Video output (Decoder) ports

Monitor Name	Decoder IP Address	Port ID	Incident quality Setting
			Entered manually by user
Main	192.168.31.2	1	
Wall Display	192.168.31.2	2	Maximum
Security Alert 1	192.168.31.3	1	
Security Alert 2	192.168.31.4	1	

- In normal mode, the video quality will always be set to the default value from the camera table. Bit rate will not be changed unless the user selects to do so.
- When a user selects to increase the bit rate on a specific monitor, the VSA will perform the following task: (taking for granted the video switching was already done)
 - ✍ Determine what is the maximum bit rate allowed for this camera is based on the pre-set setting for this camera site.
 - ✍ Refer to the pre-set table and issue an SNMP set command for each and every parameter associated with this pre-set configuration setting
 - ?? <SNMP MIB SET for IP 192.168.31.2 – port 2>set bit rate
 - ?? <SNMP MIB SET for IP 192.168.31.2 – port 2>set compression
 - ?? <SNMP MIB SET for IP 192.168.31.2 – port 2>set resolution
 - ?? <SNMP MIB SET for IP 192.168.31.2 – port 2>set IPB Frame rate
 - ?? More...

- ✍ Once the user selects another camera on this monitor or specifies to view at the default bit rate, the application will refer to the camera table and issue SNMP commands to set the bit rate back to its **default** configuration.
Performed automatically to reduce network demand when video is not in use.
 - ?? <SNMP MIB SET for IP 192.168.31.2 – port 2>set bit rate
 - ?? <SNMP MIB SET for IP 192.168.31.2 – port 2>set compression
 - ?? <SNMP MIB SET for IP 192.168.31.2 – port 2>set resolution
 - ?? <SNMP MIB SET for IP 192.168.31.2 – port 2>set IPB Frame rate
 - ?? More...

4.3 Secondary requirements:

These are not considered essential, but are added functionality that can be implemented in your VSA application.

4.3.1 On Screen Character Display

- ?? Have the ability to set/control the On Screen Character Display of every encoder.
 - ?? The encoder has the ability to include text to identify the camera information. This feature might be available in some cameras and video switches of different manufacturers. Considering that this solution replaces the analog video matrix, the i-Volution Encoders can provide On Screen Display (OSD) when cameras do not offer this function.
 - ?? The intent is to let a management system control all of the various parameters such as color blending and position and to allow the user the ability to define the information text field directly from the VSA application.
 - A series of SNMP commands are required to define this text field in the encoders.
 - ?? This could be extended to provide the ability to the VSA to control what is displayed depending on the camera position. (To be used when this function is not supported by the camera)

4.3.2 Video Input status LED

- ?? Have the ability to illustrate to the user if a video signal is present at the source encoder.
 - ?? Based on a request by the operator, the VSA could confirm if a video signal is present at the encoder input .
 - ?? The application could display an LED color state to show dark gray for not present or green when the video signal is present.
 - SNMP Get command is sent to the specific encoder IP address for LED status.

4.3.3 Video output status LED

- ?? Have the ability to illustrate to the user if a video signal is present at the monitor output.
 - ?? Based on a request by the operator, the VSA could confirm if a video signal is present at the decoder video output or not.
 - ?? The application could display an LED color state to show dark gray for not present or green when the video signal is present.
 - A SNMP Get command is sent to the specific decoder IP address for LED status.

4.3.4 ClientVue Integration

?? Integration of the iMPath ClientVue application within the VSA application.

?? The objective would be to have the VSA application decode the video signal directly from the IP stream. This would represent some cost savings to the customer. CPU power consideration is required.

?? The user would click and drag any camera source and the ClientVue application would start automatically.

- o The ClientVue application will reside on the same workstation as the VSA.
- o Application integration will be required
 1. iMPath's SDK is available for integration.

4.3.5 Display Video Mapping

?? The capability to map on the VSA screen what video camera is presently mapped to what monitor name.

5 iMPath product descriptions

Detailed specifications are available iMPath's web site impathnetworks.com.

6 iMPath specific MIBs

iMPath MIB available on request.

7 iMPath contacts

For additional information on this solution or any other of our iMPath systems, feel free to contact any of the following representatives.

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