



# **VideolPath**

Managed Media Services

## **Solution Description**

Rev. E

A large green circular graphic in the bottom right corner, featuring a white circle in the center.

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## Revision history

Current revision of this document is the uppermost in the table below.

Rev.	Repl.	Date	Sign	Change description
E	4	2014-01-03	JIH	Updated for version 3.0
4	3	2012-08-02	JIH	Updated for version 2.0
3	2	2011-11-03	JIH	Minor changes
2	1	2011-06-29	JIH	Minor changes
1	-	2011-04-10	JIH	Initial revision

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## 1 Introduction

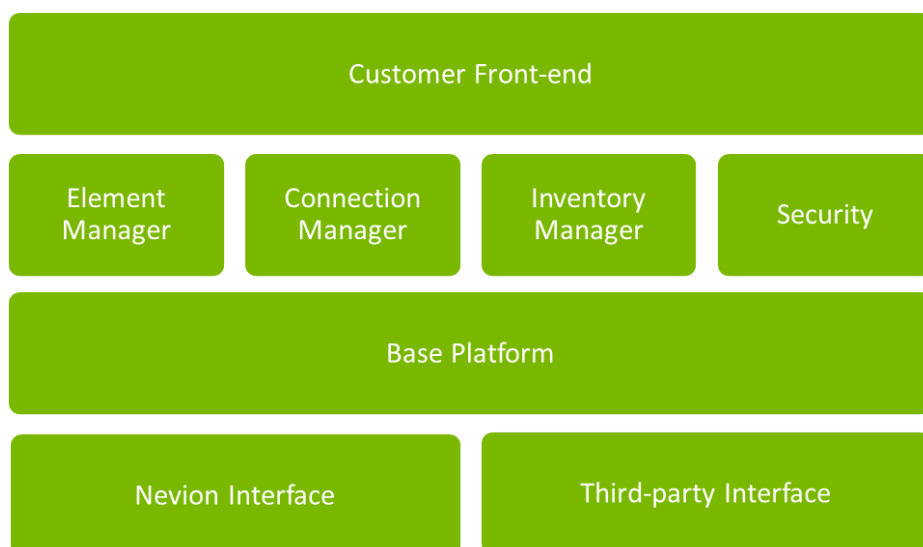
The VideolPath system is providing users with an end-to-end perspective on management of media services for contribution and distribution networks. The system is based on a flexible software platform that may be tailored to support a variety of applications addressing the needs of service providers, broadcasters, DTT, satellite and cable operators. The VideolPath system is modular and may be deployed according to specific customer needs.

The nature of video and audio transport is changing as customers are demanding more flexibility and efficient use of network resources; it is moving from the static, point-to-point reality of the past to a highly dynamic world where set up and tear down of services on demand is required to meet needs that can change within minutes. VideolPath, a comprehensive new platform for managing the audio and video services across IP, SDH/SONET or fiber networks, is a solution for this new reality.

Meeting the challenges of this new reality demands a completely new approach to managing media services. VideolPath is modeled after the world's best information systems we touch every day. Its architecture and approach mimics the highly distributed environment it is managing delivering high availability and high quality services with a true end-to-end perspective. Data organization and processing best practices are employed for user-friendly yet functionally sophisticated Web applications.

### 1.1 Building Blocks

VideolPath provides service provisioning, connection management, monitoring, inventory, fault management and configuration management functions for Nevion and third-party devices. Third-party devices are integrated on a per project basis using a software development kit maintained by Nevion.



At a high level the system may be divided into the following building blocks:

- Inventory management: Gather information about network resources and perform maintenance operations like upgrade, backup and restore.
- Service monitoring: Monitoring of services and network resources including alarm management.
- Connection management: Dynamically connect endpoints as part of a permanent or occasional use type of service.
- Network provisioning: Calculate and provision optimal network paths between endpoints including diverse paths for redundancy purposes.
- Customer front-end: End-user portal for booking of media services. Allows end-users to book services without operator intervention.
- Security: Advanced access control to support different user roles and multi-tenancy.

## 1.2 Value Proposition

We offer a solution...	That helps...
...for <b>monitoring</b> of network elements and alarm management (element management)	...keep track of network status and pro-actively address potentially <b>service affecting</b> issues
...to rapidly establish <b>occasional use</b> media transport services based on changing end-user needs	...automate <b>provisioning</b> and assign resources across IP and baseband network infrastructures
...for service providers that want to enable <b>end-customers</b> to book and manage their services using a self-service portal	...service providers to <b>reduce OPEX</b> by removing the need for manual operator assistance to book and manage services
...to keep track of network <b>inventory</b> and perform pre-planned upgrade of device firmware	...make <b>efficient use</b> of network resources and consistent software and configuration
...with an easy to use <b>web-based</b> user interface that consolidates information from the entire network	...reduce <b>training costs</b> and provides access from any computer that can access the system
...with a <b>security</b> model that allows multiple levels of user access to be defined	... <b>protect</b> critical assets and supports multi-tenant deployments

## 2 Key Features

### 2.1 Inventory

The VideolPath Inventory module auto-detects available nodes and endpoints. The auto-detection is based on a range of IP addresses configured into the system. A node in this context is a device with a number of endpoints. For modular systems like Ventura and Flashlink there is also the concept of slots, which is used for addressing purposes within a node.

When a new node is detected in the network it is added to the inventory and the system starts to retrieve status and configuration data for the node. The user can access the inventory from the user interface and browse or search for particular network elements.

VideolPath centralizes and simplifies upgrades, making it possible to plan, schedule and upgrade multiple network elements at one time, for coordinated roll-out of new firmware releases in the network. Users can monitor the software upgrade process from a central console without any manual intervention at the network element level.

The system also provides backup and restore capabilities for configuration data. Backup and restore may be scheduled and in case of catastrophic failure, VideolPath supports automatic restoration of configuration data when network resources are replaced by spare parts.

The module provides the following features:

- Complete inventory of all network resources auto-detected by the system
- Track network resource changes based on serial number
- Plan and schedule upgrades of multiple network resources simultaneously
- Backup and restore configuration of multiple network resources simultaneously
- Automatic configuration restore to recover quickly from hardware failures

Network Inventory

3.1.29

Search Inventory ...

Show All

Sort by Serial

Ungroup

Group

Browse

Remote Upgrade

0

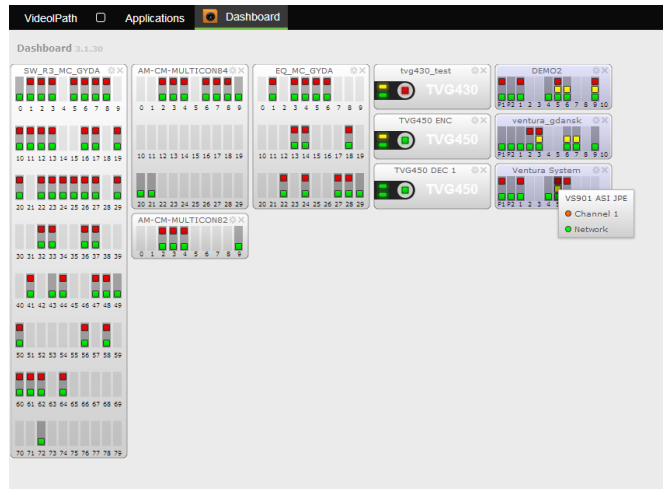
Progress

Chassis Name	Card Name	Card Type	Tags	Version	Slot	Serial
TVG450 DEC 1	TVG450 DEC 1	TVG450		3.9.3	0	TV0501....
TVG450 ENC	TVG450 ENC	TVG450		3.9.3	0	TV0501....
	10.69.27.52.0	TVG430		3.38.19	0	TV0501....
Ventura System	10.69.64.31.3	VS902 JPEG 2000 Decoder		V0.D	3	358631
Ventura System	10.69.64.31.2	VS902 JPEG 2000 Encoder		V0.E	2	358593
Ventura System	10.69.64.31.6	VS904 H.264 Encoder		V1.6	6	358298
Ventura System	10.69.64.31.7	VS904 H.264 Decoder		V1.6	7	358250
Ventura System	10.69.64.31.9	TEST AES		V1.1	9	357632
Ventura System	10.69.64.31.10	VS906 DA		V1.0	10	357156
Ventura System	10.69.64.31.1	FCS183 AEMS		V3.20	1	350371
DEMO2	DEMO2	VS901 VOIP JPEG-2000 Decoder		V5.4	9	174484
DEMO2	DEMO2	VS908 De-Multiplexer, Main		V5.4	4	172927
Ventura System	10.69.7.55.4	VS908 Multiplexer, Main		V5.4	4	172410
Ventura System	10.69.7.55.5	VS901 ASI JPEG-2000 Decoder		V5.4	5	171289
DEMO2	DEMO2	VS901 ASI JPEG-2000 Encoder		V4.4	5	169707
DEMO2	DEMO2	VS901 VOIP JPEG-2000 Decoder		V5.4	10	168923
Total 88 cards						

## 2.2 Service Monitoring

The VideoPath Monitor module provides monitoring functionality for services and network elements. Status information is typically retrieved from network elements using regular polling and notification mechanisms (e.g. SNMP traps). Details concerning how status information is retrieved for a specific device is captured in the driver for the device type.

A dashboard provides a centralized overview of the operational status of all equipment in the network. The dashboard is automatically populated based on detected equipment and the user is able to customize multiple dashboards for different parts of the network (e.g. one dashboard per site).



Alarms are presented in an alarm management user interface that allows the user to manage current alarms and browse or search for historic alarms recorded in the log. Alarms are automatically correlated per service allowing the user to view alarms related to a specific service.

Events Management Tool V3.1.31-b140f6ba				Current Alarm		Alarm Log			
Showing 348 docs / total 348 docs									
<input type="text" value="Search ..."/>						Show All alarms			
Severity	Service	Alarm Name	Alarm Desc.	Node Name	Device Name	Device Type	Status	Received	Last Changed
Normal	SERVICE	Chan 3 Loss of ...	Chan 3 Loss of ...	FC5183 AEMS	V5811 8-Chan ...	V5811 8-Chan ...	New	2013-May-15 Wed 14:14:43	2013-May-15 Wed 14:14:43
Major	SERVICE	Input Channel 2...	Input Channel 2...	FC5183 AEMS	V5906 DA	V5906 DA	New	2013-May-15 Wed 14:14:43	2013-May-15 Wed 14:14:43
Warning	SERVICE	No data received	No data received	TVG430	JPEG2000 Codec	JPEG2000 Codec	New	2013-May-15 Wed 14:14:43	2013-May-15 Wed 14:14:43
Major	SERVICE	West Interface O...	West Interface O...	FC5183 AEMS	V5811 8-Chan ...	V5811 8-Chan ...	New	2013-May-15 Wed 14:14:43	2013-May-15 Wed 14:14:43
Warning	SERVICE	Loss of AES Gro...	Loss of AES Gro...	FC5183 AEMS	Ch 0	V5901 ASI JPEG...	New	2013-May-15 Wed 14:14:43	2013-May-15 Wed 14:14:43
Major	SERVICE	Stream Loss - O...	Stream Loss - O...	FC5183 AEMS	V5902 JPEG 20...	V5902 JPEG 20...	New	2013-May-15 Wed 14:14:43	2013-May-15 Wed 14:14:43
Normal	SERVICE	Chan 2 Loss of ...	Chan 2 Loss of ...	FC5183 AEMS	V5811 8-Chan ...	V5811 8-Chan ...	New	2013-May-15 Wed 14:14:43	2013-May-15 Wed 14:14:43
Warning	SERVICE	Chan 1 Loss of ...	Chan 1 Loss of ...	FC5183 AEMS	V5811 8-Chan ...	V5811 8-Chan ...	New	2013-May-15 Wed 14:14:43	2013-May-15 Wed 14:14:43
Major	SERVICE	Input Channel 1...	Input Channel 1...	FC5183 AEMS	V5906 DA	V5906 DA	New	2013-May-15 Wed 14:14:43	2013-May-15 Wed 14:14:43
Major	SERVICE	Input Channel 2...	Input Channel 2...	FC5183 AEMS	V5906 DA	V5906 DA	New	2013-May-15 Wed 14:14:43	2013-May-15 Wed 14:14:43

The module provides the following features:

- Overview all network elements including operational status
- Manage alarms related to services and network elements
- View the life-cycle of an alarm from it is raised until it is cleared
- Search for historic alarms in the log
- View alarms related to services (based on correlation)

## 2.3 Connection Management

The VideoPath Connect module includes functionality to establish connections between endpoints at the edge of the network. An endpoint in this context is a video or audio port on a network element, which may be transmitting or receiving over an IP, SDH/SONET, fiber or coaxial network interface.

The Connect module addresses the complexity of provisioning services at the edge removing the need for the user to have detailed knowledge concerning the configuration of each network element involved. VideoPath adds an abstraction layer that allows users to provision services without having to consider detailed configuration settings in each network element.

The user is able to create a new service between two or more endpoints and schedule provisioning of this service. The system will automatically setup and tear down the service according to the defined schedule. It is possible to create associations between endpoints in order to connect multiple endpoints in one operations. The system supports both permanent and occasional use services.

Services are provisioned according to the service profile selected. Several pre-defined service profiles may be added to the system for the user to choose from when creating new services. The service profiles contains settings required to configure the network elements required for the service.

The screenshot displays the VideoPath Connect module interface. At the top, there's a navigation bar with 'VideoPath', 'Applications', and 'Connect' tabs. The 'Connect' tab is active, showing a search bar and a list of inputs and outputs. Below the search bar, there are three tabs: 'Studio1', 'Studio2', and 'Studio3'. The 'Studio1' tab is selected, showing a list of inputs and outputs. The 'Inputs' list includes Studio1\_In\_10, Studio1\_In\_11, Studio1\_In\_12 (highlighted), Studio1\_In\_9, Studio2\_In\_10, Studio2\_In\_11, Studio2\_In\_12, Studio2\_In\_9, Studio3\_In\_10, Studio3\_In\_11, Studio3\_In\_12, and Studio3\_In\_9. The 'Outputs' list includes Studio1\_Out\_10, Studio1\_Out\_11, Studio1\_Out\_12, Studio1\_Out\_9, Studio2\_Out\_9, Studio2\_Out\_11 (highlighted), Studio2\_Out\_12, Studio3\_Out\_10, Studio3\_Out\_11, Studio3\_Out\_12, and Studio3\_Out\_9. Below the lists, there's a form to create a new service. The form has fields for INPUT (Studio1\_In\_12), OUTPUT (Studio2\_Out\_11), NAME (Studio1\_In\_12->Studio2\_Out\_11), DESC. (optional), TAGS (optional), START (Now), END (Never), and ROUTING (Point-to-Point). A 'TAKE' button is at the bottom right.

The module provides the following features:

- Planning and scheduling of service booking
- Automatic provisioning of media transport services
- Configuration based on service profiles (templates)



- View and manage scheduled and active services
- Reservation of endpoint resources
- Association of endpoints (grouping)

## 2.4 Customer Access

VideolPath system supports multi-tenant deployments where different customers may access only video and audio ports that have been assigned to them and only view or modify services they have been provisioned. Note that it is also possible to share video and audio ports among customers if desirable to facilitate exchange of content between different customers running over the same network.

The customer self-provisioning interface is based on a subset the standard graphical user interface of the VideolPath system. This user interface provides functionality for monitoring video connections, provisioning new connections and editing existing connections. VideolPath supports a role-based security model where different customers may be setup with access rights that restrict their usage of the system. Typically this includes end-points that are allocated to the broadcaster.

Technically it is possible to deploy customer access on a separate server in a DMZ environment or even at the customer site. It is also possible to limit data access to a subset of the data relevant for a specific customer to provide ultimate protection against unlawful access to other customer data.

It is also possible to implement a custom self-service interface by utilizing the VideolPath API, which provides all the necessary hooks to monitor and provision services. This way the customer self-provisioning interface may be completely custom built according to fit into an existing portal solution. This may be the better approach to create the most user friendly experience for this purpose and perform appropriate branding of the user interface.

## 2.5 Network Provisioning

The VideolPath system allows the user to specify source and destination ports, and let the system decide the optimal media transport path through the network infrastructure (topology) from source to destination(s). The path-finding algorithm is technology agnostic and allows the system to support path-finding at different layers in the network stack. The system supports path-finding at the service (baseband), MPLS or Ethernet layers.

The actual provisioning of paths is dependent on the network technology and the system supports the following configurations:

- Video or audio router tielines (at the service/baseband layer)
- P2MP LSP (Point-to-multipoint Label Switch Path) for Multicast VPN (at the MPLS layer)
- VLAN trunking (at the Ethernet layer)

VideolPath utilizes a shortest path first algorithm to provision the least cost path from source to one or more destinations, and performs diverse path routing to support service layer redundancy mechanisms. The system keeps track of bandwidth allocation on each link within

the core network to avoid any over-provisioning delivering predictable performance for video over IP services.

The system includes a network design tool that allows the administrator to define the network topology consisting of nodes interconnecting links. Each link is assigned a cost and may have constraints like allowed format (e.g. ASI) that are considered by the path-finding algorithm when performing path calculations.

The module provides the following features:

- Path-finding to establish the optimal transport path across the network infrastructure
- Apply constraints like format to the path-finding algorithm (defined per link)
- Least cost path-finding algorithm (each link has an associated cost)
- Provisioning at the service (baseband), MPLS or Ethernet layer
- Management of bandwidth allocation in IP environments (to avoid over provisioning)

Note that provisioning in MPLS environments is highly dependent on the network configuration and is subject to network design prior to installation of a VideoIPath system.

### 3 System Architecture

The VideoPath system is based on a three-tier architecture with client, application and database layers. The client applications are running from a Web browser and communicate with the VideoPath server over HTTP(S).

The VideoPath server includes a security layer, API for communication with the clients, and core platform responsible for server-side processing and communication with the network elements within the video over IP network.

Nevion's VideoPath system is built using the latest available Internet technologies and consists of a number of apps that may be launched from a standard Web browser. The platform allows custom apps to be built for specific purposes.

VideoPath is built on a distributed database and distributed processing model from ground up. The system is based on multiple hardware servers to provide high-redundancy. There is no loss of functionality or performance if one of the servers in a cluster should go down.

Platform characteristics:

- Innovative and modern design
- Ease-of-use
- Distributed computing platform
- Scalable from small to large networks
- Built for redundancy
- Web based Rich Internet Applications
- Based on proven software and hardware

#### 3.1 Security

The VideoPath security model is based on users with associated roles, where the roles defines access rights to the system. The system allows any number of users to be defined and the user interface relies on cookie based authentication to maintain a user session. To prevent interception of login details the system supports HTTPS between the client and server using strong encryption.

The system comes with the following pre-defined roles:

- System administrator with full access to all functionality and resources within the system
- Operator with access to operational functionality (excluding administrative functionality) and read/write access to all resources within the system
- Guest with read-only access to all resources within the system

The system allows additional roles to be defined by the system administrator and assigned to individual users. These customized roles may limit functionality and read or write access to resources. As an example customized roles may be used to limit access to a certain part of the network for operators with responsibilities within a certain region.

VideoPath [ main ] Applications Security 07-Jan-2014 - 23:17:33 sysadmin neviON						
Security 3.5.0						
Users 11 (11) Add Edit Delete Search...						
User ID	Name	Organization	Email	Phone	Description	Active
bt	guest				Default guest (read-only) user account	<input checked="" type="checkbox"/>
jan	Jan Helgesen					<input checked="" type="checkbox"/>
marion						<input checked="" type="checkbox"/>
operator	operator				Default operator user account	<input checked="" type="checkbox"/>
replicator					Only used for replication of databases	<input checked="" type="checkbox"/>
sysadmin	System Admin				System administrator user account (can...	<input checked="" type="checkbox"/>
test						<input checked="" type="checkbox"/>
torgeir						<input checked="" type="checkbox"/>
trond	Trond Elvejord	Nevion	telvejord@neviON.com	+47 33475534		<input checked="" type="checkbox"/>
vikinx						<input checked="" type="checkbox"/>

Roles 7 (7) Search...				
Role ID	Type	Description	Organization	Assigned
admin	Function	Provides system-wide create, read, update and delete privileges		<input type="checkbox"/>
all_endpoints	Function	Provides access to all endpoints and their related connections		<input type="checkbox"/>
bt	Resource			<input type="checkbox"/>
guest	Function	Provides privileges to view endpoint, connection and system status		<input type="checkbox"/>
operator	Function	Provides privileges to manage connections in addition to guest rol...		<input type="checkbox"/>
vikinx	Resource			<input type="checkbox"/>
vs901	Resource			<input type="checkbox"/>

Note that an resource may be assigned to multiple roles to allow shared resources accessible to users with different roles. This is commonly used to allow operators to exchange content using shared resource, e.g. user A and B may have access to a shared resource and can both setup connections originating or terminating with this resource..

The VideoPath system may also be used as a proxy to centrally control access to element managers. It may not be desirable to manage individual user accounts in each element management system, and in such cases the VideoPath system provides a way to lock down unauthorized access using central authentication and authorization of users.

## 3.2 High Availability

The VideoPath system is deployed on hardware with RAID1 mirroring of disks, dual network interfaces and dual power supplies, which means even in a standalone configuration using one server, it is protected against disk, network interface and power supply failures. The system is configured to perform automatic link failover, in case any of the network interfaces fails, and preferably the two network interfaces should be connected to two different switches with independent connectivity to the management network.

VideoPath may be deployed in the following configurations:

- Standalone system on one server
- High-availability (master/slave) system

In a master/slave configuration, the system is protected against catastrophic failure of the master server, and in such an event the slave server will activate functions normally only performed by the master server. Per default only configuration functions are activated on the slave and deactivated on the master during failover.

The master and slave servers runs a standard heartbeat mechanism to elect who is the active master server at any time. It is also possible to configure a virtual IP address that will follow the active server at any time.

The master and slave servers replicate data so that both servers keep a copy of the database at any given time. It is also recommended to perform regular backups of the database. This may be performed using file copy from the server and the database allows a consistent copy to be made at any time.