tyco | American Dynamics

VideoEdge v5.6

Hardening guide

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Rev C

Johnson Controls

Introduction

Our solution provides peace of mind to our customers with a holistic cyber mind set beginning at initial design concept, continues through product development, and is supported through deployment, including a rapid incident response to meet comprehensive and evolving cybersecurity environments.

The Hardening Guide intends to provide cybersecurity guidance used in planning, deployment and maintenance periods.

As cybersecurity threats affect all connected devices, it is important to ensure that cybersecurity is considered throughout the planning, deployment and maintenance phases associated with a solution’s functional operation.

This guide provides hardening guidance for configuration and maintenance, including the operating system, user accounts, permissions and roles, backup and restore, redundancy, and patch management.

Legal disclaimer

The cybersecurity practices described in this guide are recommended practices to facilitate the secure installation and configuration of the products described herein. However, Johnson Controls cannot guaranty that the implementation of the cybersecurity practices or recommendations described in this guide will ensure the security of the relevant product or system, or prevent, or alter the potential impact of, any unauthorized access or damage caused by a cybersecurity incident. This guide is provided “as is”, and Johnson Controls makes no representation or warranty, express or implied, as to the efficacy of the cybersecurity practices or recommendations described in this guide. Johnson Controls disclaims all liability for any damages that may occur as a result of, or despite, reliance on this guide or compliance with any cybersecurity practices or recommendations set forth herein.

Contents

1 Planning

This section is designed to help plan for the deployment of VideoEdge. The contents within this section are useful in several planning stage functions:

- Assuring compliance with the cybersecurity criteria that governs the target environment.
- Designing the deployment architecture
- Providing a reference for settings made during deployment

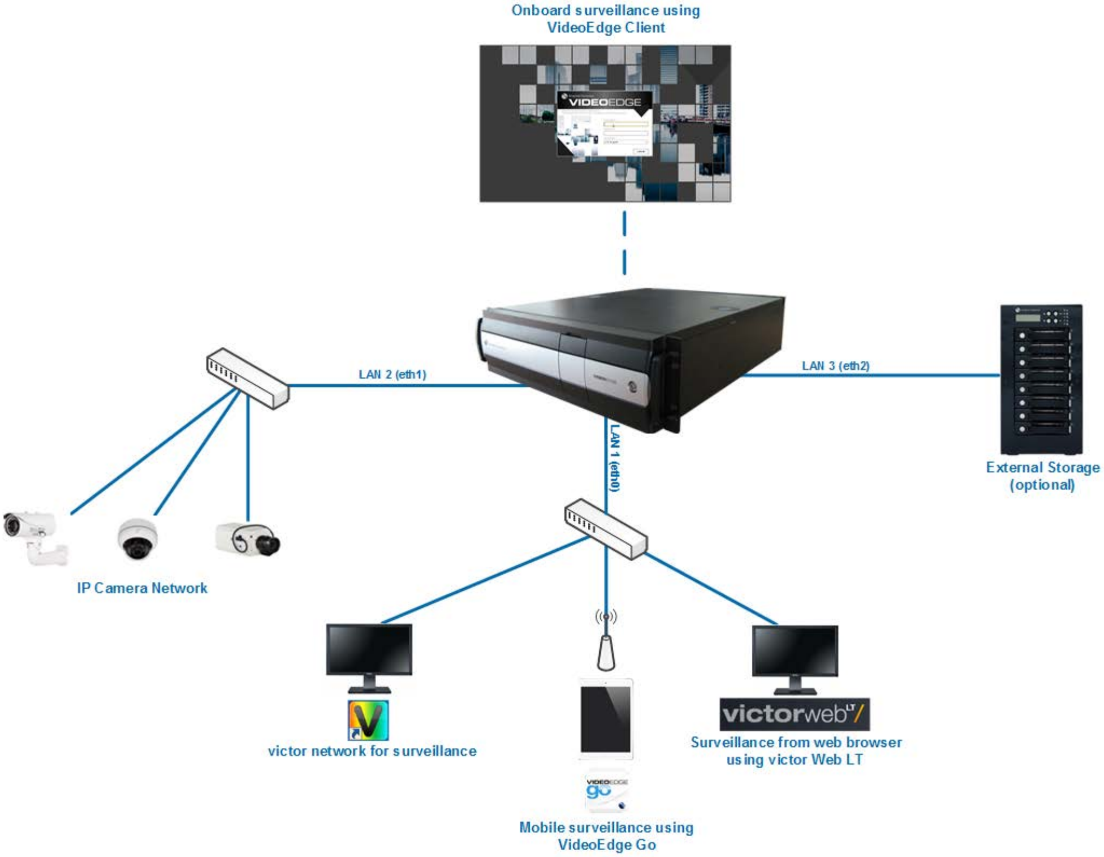
1.1.0 VideoEdge overview

VideoEdge is a network video recorder (NVR), available with a full range of intuitive clients to manage surveillance in very active environments with both onsite and remote accessibility options. VideoEdge is scalable from a single NVR, to a large multi-site architecture. Users can easily deploy any number of cameras, adding licenses at any time. You can use built-in intelligence to tailor viewing conditions. Users can receive multiple live, recorded, alarm, and meta-data collection video streams. VideoEdge has optimized video streaming that requires less network bandwidth, CPU, and memory resources than comparable systems. Multicast video streams further reduce the bandwidth required for streaming high-quality video.

When a victor client connects with VideoEdge NVRs, it can leverage high-performance video streaming capabilities, while gaining access to the expansive feature set of VideoEdge, including audio and motion meta-data. Visit the victor web page for more information on the victor solution deployment architecture.

1.1.1 Deployment architecture

Figure 1


Onboard surveillance using VideoEdge Client
VIDEOEDGE
LAN 2 (eth1)
LAN 3 (eth2)
LAN 1 (eth0)
External Storage (optional)
IP Camera Network
victor network for surveillance
victorweb LT
Surveillance from web browser using victor Web LT
VIDEOEDGE go
Mobile surveillance using VideoEdge Go

1.1.2 Components

The VideoEdge v5.6 application is available as several different models that share the same cybersecurity capabilities. This guide covers all variations of VideoEdge models.

VideoEdge 1U NVR

- Equipped with 16 embedded PoE Ports
- Ideally suited for small to medium sized locations
- Scalable up to 24 TB of storage
- RAID support

VideoEdge 2U NVR

- Supports up to 64 IP Cameras
- Records video in RAID or JBOD storage configurations
- Equipped with redundant power supplies

VideoEdge Desktop NVR

- Instantly view a real-time camera feed
- Provides up to 6TB of storage
- Combines with the victor VMS to create a Master Application Server

VideoEdge Micro NVR

- Requires no additional hardware with embedded PoE ports
- Acts as a standalone appliance to reduce costs
- Easily troubleshoot and update software through remote client

VideoEdge Rack Mount NVR

- 128TB of on-board storage, with the option to add up to 128 TB of external storage (with 2 RAID 5 arrays)
- Video throughput up to 600 Mbps for large camera deployments
- iSCSI, Fiber (HBA Adaptor Kit required)
- Next business day on-site service for critical uptime applications

VideoEdge Hybrid 2U NVR

- Supports up 16 analog and 16 IP cameras, or 32 IP cameras
- 200 Mbps video recording throughput
- Up to 30 TB of on-board storage

VideoEdge Hybrid 3U NVR

- Supports up to 32 analog and 32 IP cameras, or 64 IP cameras
- 300 Mbps video recording throughput
- Offers RAID or JBOD storage configurations in forward-facing drives

VideoEdge Hybrid Desktop NVR

- Deploy in either a rack mount or desktop server
- Connects a CCTV monitor to instantly view a real-time camera feed
- Add and reassign licenses to both analog and IP cameras

1.1.3 Supporting components

VideoEdge is designed to be compatible with standard IP video and networking components which are often included as part of the deployment architecture:

IP Camera – An IP camera is a surveillance camera that communicates over the Ethernet using IP addressing. While VideoEdge supports third-party IP cameras, Illustra IP cameras offer enhanced functionality when coupled with a VideoEdge NVR. (Refer to Illustra Security Hardening Guide for more details).

IP Transcoder - An IP Transcoder converts an analog surveillance camera signal to a digital signal, and is able to stream the resulting digital signal over Ethernet using an IP address.

PoE Camera - An IP enabled surveillance camera that receives its power from the Ethernet cable – Power over Ethernet (PoE).

Network Switch - A VideoEdge system can utilize standard off the shelf networking switches that are rated for the communication speeds of the IP video streams.

PoE Switch - A PoE Camera may be powered by a standard off the shelf PoE Switch rated for the speed and power requirements of the PoE.

1.2.0 Security feature set

All VideoEdge models support the following features:

Table 1: Feature summary table

SECTION	TYPE	FEATURE NAME	NEW FEATURE
1.2.1	Easy security configuration	Security Dashboard	-
		Enhanced security mode	v5.3
1.2.2	Human user account safeguards	No backdoor passwords	-
		User account password policy	-
		Password policy	-
		Enhanced password validation	-
1.2.3	User authentication safeguards	Hidden password entry	-
		Maximum log on attempts	-
		Local user authentication	-
		LDAP support	-
		Active Directory support	-
1.2.4	Camera authentication	(as supported by camera)	-
1.2.5	User authorization	Role Based Access Control (RBAC)	-
		Role based camera access	v5.3
		Object level permissions	-
1.2.6	Camera authorization	(as supported by camera)	-
1.2.7	Secure communications	Configurable network ports	-
		Configurable web server	-
		Remote access controls	v5.1
		Isolated camera LAN	-
		Firewall	-
		SNMP v2c support	-
		SSH support (disabled by default)	v5.1
		TLS v1.0 and v1.2 support	v5.1
		HTTPS support	-
1.2.8	Digital certificate management	View certificates	-
		Third party certificate support	-
1.2.9	Audit logs	Audit logs	-

		- enabled by default	-
		- time synchronized	-
		- delete protected	-
		- no removable storage	-
1.2.10	Availability assurance	Redundancy failover	-
		Backup and restore	-
1.2.11	Alarms and alerts	Real-time notifications	-
		Tamper detection	-
1.2.12	Media encryption	Supports media encryption	v5.4
1.2.13	Software updates	Camera firmware mass update	v5.3
1.2.14	Certifications	UL2900 2-3 (Level 3)	-
		US Safety Act designation	-
1.2.15	Compliance “Ready”	FISMA	-
		NERC CIP v5	-
		DISA	-

1.2.1 Easy security configuration

Security Dashboard - View, monitor and assess the security of VideoEdge from a common dashboard.

Enhanced security mode – a single setting in the installation wizard can force the replacement of the default user accounts, activate additional password security measures, and disable HTTP and UPnP access.

Upon initial install https-only by default, certificate creation performed in the install wizard.

1.2.2 Human user account safeguards

No backdoor passwords – VideoEdge does not have a backdoor password.

User account password policy – VideoEdge contains rules which govern password formation, expiration, reuse and other restrictions including password length, history, and complexity.

Enhanced password validation – a mode that enforces restrictions when setting or changing passwords:

- Passwords must be different than the previous three passwords
- Passwords must differ from the previous password by a minimum of three characters
- Passwords must be a minimum of eight characters long and must contain a mixture of upper and lower case letters, numbers, and special characters

Linux user passwords cannot contain the username, permutations of a dictionary word, or be comprised of trivial patterns. These restrictions apply in enhanced and standard security modes. NVR passwords cannot contain the username, and in enhanced security mode are subject to the rules in **Enhanced password validation**, cannot be permutations of a dictionary word, or be comprised of trivial patterns.

Upon initial install forced password change on all accounts, stricter password validation.

1.2.3 User authentication safeguards

Hidden password entry - password entries are hidden from view as the user enters them.

Maximum log on attempts - restricts the user to the configured number of consecutive authentication attempts allowed before that account is locked from further authentication retries.

Microsoft Active Directory support - enables centralized authentication using a Microsoft Active Directory server for the management of user accounts and logon authentication by LDAP (see LDAP support).

LDAP support – enables centralized authentication using a Lightweight Directory Access Protocol (LDAP) compliant authentication server for the management of user accounts and logon authentication. VideoEdge implementation of LDAP provides the following functions:

- LDAP authentication and authorization for admin GUI
  - LDAP and Microsoft Active Directory support
- Secure connections using TLS

1.2.4 Camera authentication

As supported by camera - VideoEdge authenticates with a connected camera using a username and password stored in the camera.

1.2.5 User authorization

Role Based Access Control (RBAC) – Authorizations can be assigned to a role which users are members of. The user inherits the authorizations of each role they are a member of.

Role based camera access - Camera permissions to restrict camera access to specific VideoEdge roles: viewer1, viewer2, and viewer3. These camera permissions are enforced for all applicable clients including VideoEdge 'Local' Client, victor Web LT, and VideoEdge GO.

Object level permissions – administrators can assign authorizations to individual objects within VideoEdge.

1.2.6 Camera authorization

As supported by camera - Authorizations for a connected camera are restricted to the functions authorized for that camera user account that is being used to connect with VideoEdge.

1.2.7 Secure communications

Configurable network ports – Administrators can manage the settings of network ports.

Configurable web server – Administrators can enable / disable the web server.

Remote access controls – Administrators can control remote access by enabling/disabling Remote Desktop Protocol (xRDP), which is disabled by default.

Isolated camera LAN – VideoEdge can be deployed so that connected cameras are on an isolated local area network (LAN).

Firewall – VideoEdge includes a firewall that you can configure with security rules to monitor and control incoming and outgoing network traffic.

SNMP v2c support – You can use Simple Network Management Protocol (SNMP) for network management and monitoring of VideoEdge by network monitoring tools. SNMP version 2c provides a level of security not available in SNMP version 1. SNMP v2c is also used on the VideoEdge server to monitor status of optional VideoEdge functions, such as failover and connectivity with victor clients.

SSH - VideoEdge uses Secure Shell (SSH) for remote access to the server, and is also used for failover functionality status monitoring. SSH is disabled by default.

TLS v1.0 and v1.2 – VideoEdge uses Transport Layer Security (TLS) for encrypted communication including web-based HTTPS communications. TLS versions 1.0 and 1.2 are supported with only version 1.2 enabled by default.

Note: As of version 5.0, the VNC communication protocol is no longer available.

1.2.8 Digital certificate management

Administrators can view the details of the installed certificate: subject, issuer name, and validity dates. Administrators can generate a self-signed certificate, or upload a certificate signed by a trusted third party.

Important: It is the customer's responsibility to deploy a suitable security certificate.

1.2.9 Audit logs

Audit logs - Activity and events from VideoEdge are stored in audit log records that administrators can access to view evidence of the activities that have affected the system at affected the system and indicate the timestamped operation, procedure or event. System, boot logs are recorded along with the logs from the VideoEdge application.

- Enabled by default – VideoEdge is preconfigured to record activity and events in an audit log.
- Time synchronized – VideoEdge audit log timestamps are synchronized to a common reference clock for the system.
- Delete protected – VideoEdge audit logs are protected from deletion.
- No removable storage – VideoEdge prevents the storage of audit logs on removable storage.

1.2.10 Availability assurance

Redundancy failover – You can configure a backup VideoEdge server to maintain a real-time copy of the VideoEdge configuration and run-time data whereby its services can continue using an automatic failover process if the primary system is not available.

Backup and Restore – A backup copy of the VideoEdge configuration and run-time data that can restore a VideoEdge server.

1.2.11 Alarms and alerts

Real-time notifications – VideoEdge provides real-time notification of alarms and alerts by email that may indicated a condition that may impact the secure operation of VideoEdge including:

- Analog Handler Reboot
- Archive
- Audio Malfunction
- Blur Detection
- Camera Dark Frame
- Camera Processing Malfunction
- Camera Video Loss
- Device Not Recording
- Dry Contact
- Face Detection
- Failover
- Log Storage Space Low
- Motion Detection
- Security Alert
- Security Configuration Change
- Storage
- Storage Activation
- Storage Configuration Change
- Storage Retention
- System
- System Reboot
- Tamper detection

- Text Stream

Tamper detection – VideoEdge can provide notification of a detection camera tamper alert received from the camera.

1.2.12 Media encryption

VideoEdge supports media encryption on freshly-installed systems. We also provide a procedure for enabling encryption in the RAID card if you have deployed self-encrypting drives.

1.2.13 Software updates

Camera firmware mass update – Using the camera firmware update page the user can select one or cameras of the same model (limited to Illustra using iAPI3), upload the desired firmware, and then perform an upgrade. They can cancel an update, this will complete the current update, and remove any queued updates.

1.2.14 Certification

UL 2900 2-3 (Level 3) – VideoEdge has been certified by Underwriters Laboratories (UL) as compliant with UL 2900 -2-3 at level 3.

US Safety Act designation – VideoEdge has received US Safety Act designation which is intended to encourage the development of products, services, software or other types of intellectual property that can help officials identify, detect, deter, respond to or mitigate acts of terror.

1.2.15 Compliance “ready”

The VideoEdge NVR has been deployed in many sites that require accreditation. Here you can find overviews of accreditations and resources that may be used to assist in meeting the requirements of each.

FISMA – You can configure the VideoEdge system to support the controls necessary for overall FISMA compliance. These controls include:

- Authenticated system access
- Account log on/log out management
- Role-based separation of capabilities, permissions, and privileges
- System event and configuration change auditing, alerting, and management
- Restriction of ports, protocols, and services to only those required
- Encrypted communications

For more information, refer to the VideoEdge FISMA-Ready Compliance Guide available on the Cyber Protection website.

NERC CIP v5 - The VideoEdge NERC-CIP V5 READY Compliance Guide provides an overview of the NERC-CIP standard and describes how VideoEdge may be configured to meet the requirements of the NERC-CIP v5 requirements. When used in conjunction with VideoEdge installation and configuration guides, this information should assist in the installation of a compliant system and provide the necessary information for an audit.

For more information, refer to the VideoEdge NERC-CIP v5 Compliance Guide available on the Cyber Protection website.

DISA - To assist installations within the Department of Defense in meeting the security hardening requirements of the Defense Information Systems Agency (DISA), Tyco Security Products has developed this System Security Requirements guide based on the DISA General Purpose operating Systems STG, Version 1, Release 3 published 22 January 2016, for the sole purposes of meeting said requirements for the VideoEdge Network Video Recorder (NVR) appliance. We have provided the 250 technical control requirements of the General Purpose Operating System Security Requirements Guide (SRG) and a description of how a

VideoEdge device meets the technical controls or if it is does not meet the controls, guidance has been provided so the customer can configure VideoEdge to meet the requirements.

For more information, refer to the VideoEdge - DISA Security Requirements available on the Cyber Protection website.

1.2.16 Encryption ciphers

The minimum supported encryption key strength in VideoEdge is 256 bits.

By default VideoEdge only supports ciphers with perfect forward secrecy and strong encryption algorithms. Specifically:

- ECDHE-RSA-CHACHA20-POLY1305
- ECDHE-RSA-AES256-GCM-SHA384
- ECDHE-RSA-AES128-GCM-SHA256
- DHE-RSA-AES256-GCM-SHA384
- DHE-RSA-AES128-GCM-SHA256

With TLS v1.0 enabled, the cipher suite is:

- ECDHE-RSA-AES256-SHA
- ECDHE-RSA-AES256-GCM-SHA384
- ECDHE-RSA-AES256-SHA384
- DHE-RSA-AES256-GCM-SHA384
- AES256-GCM-SHA384
- AES256-SHA256

TLS v1.0 will not be supported in future releases. Update any connected systems that require TLS v1.0.

1.3.0 Intended environment

The VideoEdge server is installed on premise within a data center equipment rack with restricted access.

1.3.1 Internet connectivity

This product does not require Internet access.

1.3.2 Integration with IT networks

The server components for this system are often deployed on a dedicated and isolated networks. VLANs may be used to a share infrastructure but maintain isolation. It is typical for clients to be installed on shared IT networks.

1.3.3 Integration with external systems

VideoEdge may optional integrated with Microsoft Active Directory and the victor video management system.

1.4.0 Hardening methodology

While VideoEdge provides many onboard security safeguards, including many secure-by-default settings, we recommend that the device is hardened according to the guidance outlined in section 2, deployment.

Generally a defense-in-depth strategy employing standard IT hardening methods and compensating controls as needed to compliment the base security features of each component.

1.4.1 User management best practices

Following best practices for managing user accounts, their credentials and authorizations (permissions) can greatly improve the security for the system. Some guidance is presented in this section. For additional guidance NIST standards such as SP 800-63 Digital Identity Guidelines may be consulted.

You can create unique user accounts for each operator of VideoEdge. A role-based access control (RBAC) controls the operator functions in VideoEdge. With RBAC, a user is assigned a role in which they acquire the permissions associated with that role.

The proper configuration of individual user accounts assures that security best practices are followed and that all user actions cannot be repudiated. Best practices for account management include:

1.4.1.1 No shared accounts

Unique accounts should be used during all phases of operation for VideoEdge. Installers, technicians, auditors and other deployment phase users should never share common user accounts to assure a non-reputable audit trail of their actions.

When user accounts are shared, it no longer becomes possible to determine which specific operator performed actions on VideoEdge. While VideoEdge still logs user’s actions, the user can repudiate that they used VideoEdge at that time. Furthermore, sharing of user accounts makes the application of least privilege and separation of duties more challenging.

1.4.1.2 Remove or rename default user accounts (as permitted)

By removing or renaming default user accounts, the ability to gain unauthorized access to the system will be reduced as those attempting to do so will need to enter an unpublished username which is much harder to gain knowledge of. When a default user account cannot be removed or renamed, the best practice is to at least change their default passwords (see 1.4.1.3 Change default passwords).

1.4.1.3 Change default passwords

Default passwords should be changed as these published defaults are easily guessed by unauthorized users and automated scripts can use them to gain access.

1.4.1.4 Least privilege

When assigning access rights users should only be given access to what they need to access to do their job. The VideoEdge NVR assist with least privilege management by using role-based authorization for actions such as operator access, general system configuration, software installation, access to PTZ, and clip export features. This way, users may be assigned only responsibilities required for their function.

1.4.1.5 Separation of duties

No single user should have full access rights to perform all administrative actions. By separating duties among multiple operators, the amount of power held by a single person is restricted and aids in preventing fraud. Examples of separation of administrative duties - by site, building, sub-system (Fire, HVAC, security), building owner vs. integrator role, functions (operations vs network management vs. backup). Active Directory groupings can facilitate this. This reduces the risk of insiders successfully committing fraud.

1.4.1.6 Centralized user account management

Identity Management Systems (IDMS) offer enhanced security over the local management of users within VideoEdge. An IDMS, such as Microsoft Active Directory or a Lightweight Directory Access Protocol (LDAP) capable IDMS, can provide user account management for multiple devices or systems, including a VideoEdge NVR. By centrally managing user accounts, an administrator can assure consistency throughout the domain the IDMS manages. This assures that when an account is disabled in the domain, access by that user is disabled everywhere in the domain including all connected VideoEdge NVRs. Furthermore, IDMS provides a centralized location to manage password policies which dictates password formation rules including, length, capitalization, reuse, and expiration.

1.4.1.7 Strong passwords

Strong passwords should be used to minimize the risk of password guessing. Automated forms of password guessing such as "dictionary attacks" and "rainbow tables" can run through commonly used passwords and can be successful if strong passwords are not used. You can strengthen a password with length and complexity. The length of a password has the biggest impact on making password guessing difficult. VideoEdge provides a configurable password policy which you can use to achieve the desired level of password strength. Password policies are often governed by local policies. VideoEdge is enabled by default with a password policy which may be strengthen as required.

1.4.1.8 Password aging

Password aging is a technique used to reduce to possibility of password exploitation. When enabled the user is forced to change their password after a set time period has elapsed.

1.4.1.9 Password history

Password histories are used to mitigate against password reuse.

1.4.1.10 Password policy

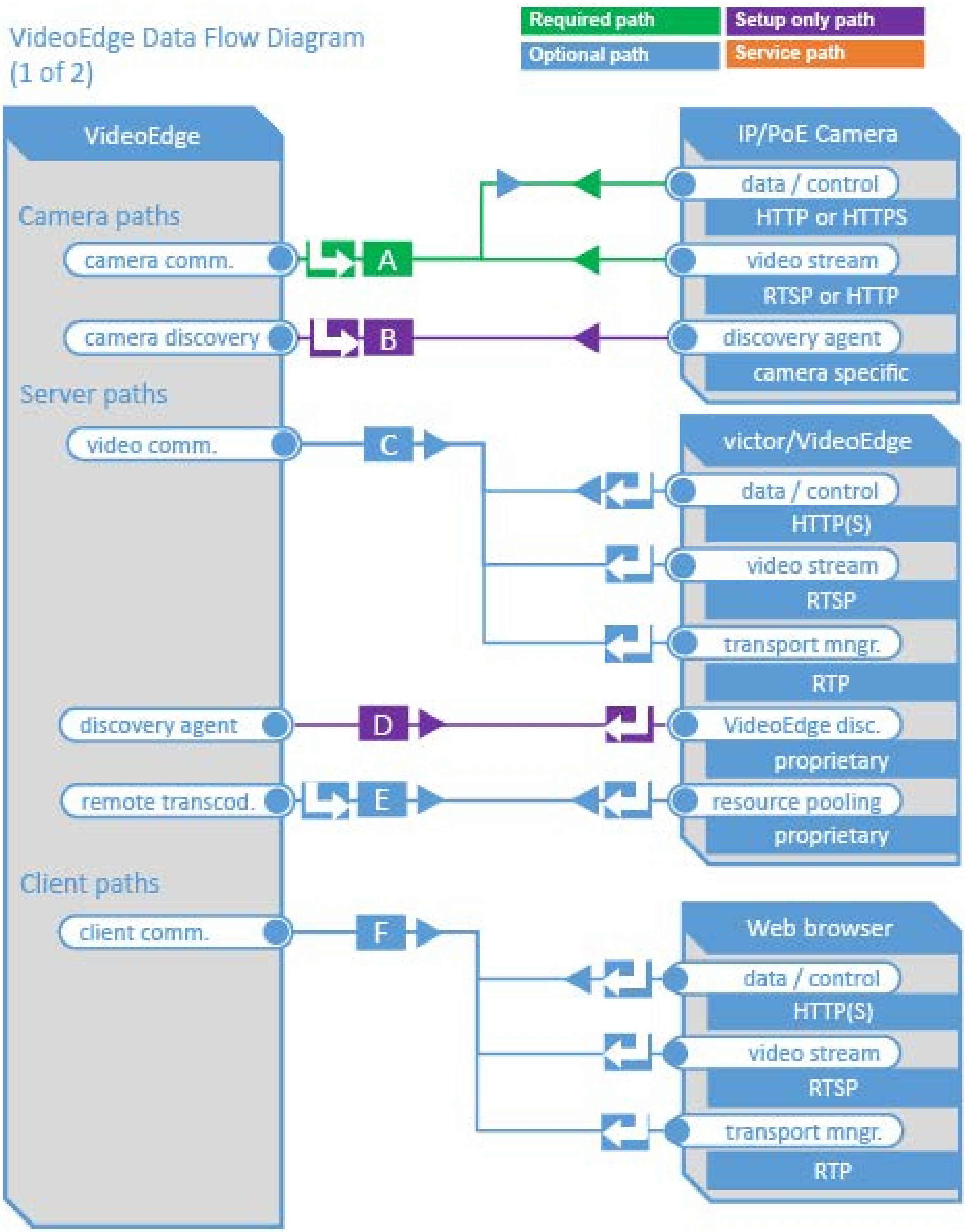
It is important to have a password policy. Customers often have password policies that all systems must support.

1.4.1.11 Account expiration

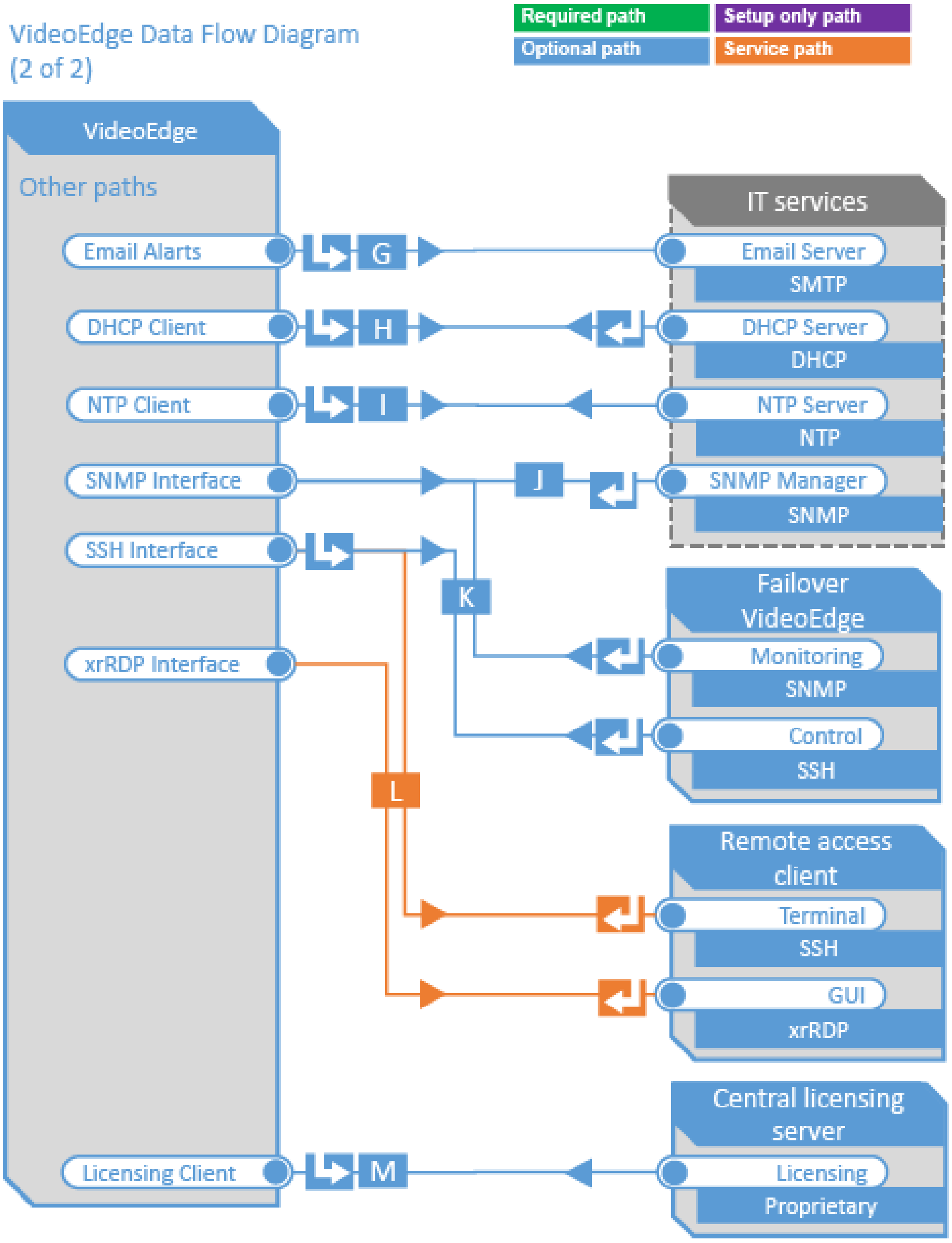
Automatic account expiration for known temporary usage.

1.5.0 VideoEdge data flow diagram

Figure 2



VideoEdge Data Flow Diagram (2 of 2)



1.5.1 Communication paths table

Table 2: Communications paths table Table 2: Communications paths table

Path	VideoEdge					Direction / use requirement[2]	Connecting Component			Notes
	Function	Interface	Default Port Assignment	Default Port State[1, 2]	Port Activity (if enabled)		Default Port Assignment[1, 3]	Protocol	Internet access[4]	
A	**Camera communications**					Required	IP/PoE Camera			
	data and control (non-secure)	HTTP Client	Dynamic	*if standard mode*	∞	↳ ▶[5] ◀	80	TCP	-	*select between HTTP or HTTPS*[4,6]
	data and control (secure)	HTTPS Client	Dynamic	Enabled	∞	↳ ▶[5] ◀	443	TCP	-	
	video stream	RTSP Client	Dynamic	Enabled	∞	↳ ◀	554	TCP	-	*select between RTSP or HTTP*[6]
	video stream	HTTP Client	Dynamic	Enabled	∞	↳ ◀	80	TCP	-	
B	**camera discovery**					Commissioning only	IP/PoE Camera			
	veAutoDiscSSDP	camera discovery	32200-65535	Enabled	On demand	↳ ◀	1900	UDP	-	
	nvrupnpn	camera discovery	32200-65535	Disabled	On demand	↳ ◀	1900	UDP	-	
	veAutoDiscScanPort	camera discovery	32200-65535	Enabled	On demand	↳ ◀	2980	UDP	-	
	veAutoDiscMDNS	camera discovery	32200-65535	Enabled	On demand	↳ ◀	5353	UDP	-	
	veAutoDiscMDNS	camera discovery	5353	Enabled	On demand	▶ ↵	32200-65535	UDP	-	
	veAutoDiscWSDiscovery	camera discovery	34918	Enabled	On demand	↳ ◀	3702	UDP	-	
	veAutoDiscADPort8848	camera discovery	8848	Enabled	On demand	↳ ◀		UDP	-	
	veAutoDiscADPort12345	camera discovery	12345	Enabled	On demand	↳ ◀		UDP	-	
C	**victor communications**					Optional	victor			
	data and control	HTTP(S) Server	443	Enabled	∞	▶ ◀↵	Dynamic	TCP	-	*Required if connected with victor*
	video stream	RTSP Server	554	Enabled	∞	▶ ↵	Dynamic	TCP	-	
	transmit manager	RTP	55555	Enabled	∞	▶ ↵		TCP	-	
D	**videoEdge discovery**					Commissioning only	VideoEdge			
	veAutoDiscSSDP	VE Discovery	32200-65535	Enabled	On demand	↳ ◀	1900	UDP	-	
	nvrupnpn	VE Discovery	32200-65535	Disabled	On demand	↳ ◀	1900	UDP	-	
	veAutoDiscScanPort	VE Discovery	32200-65535	Enabled	On demand	↳ ◀	2980	UDP	-	
	veAutoDiscMDNS	VE Discovery	32200-65535	Enabled	On demand	↳ ◀	5353	UDP	-	
	veAutoDiscWSDiscovery	VE Discovery	34918	Enabled	On demand	↳ ◀	3702	UDP	-	
	veAutoDiscADPort8848	VE Discovery	8848	Enabled	On demand	↳ ◀		UDP	-	
	veAutoDiscADPort12345	VE Discovery	12345	Enabled	On demand	↳ ◀		UDP	-	
E	**Resource pooling**		**VideoEdge**			Optional	**VideoEdge**			
	Remote transcoding		55555	Disabled	∞	↳▶ ◀↵	1900	UDP	-	-

E	**Resource pooling**		**VideoEdge**			**Optional**		**VideoEdge**			
	Remote transcoding		55555	Disabled	∞	↳ ▶	◀ ↵	1900	UDP	-	-
F	**web browser communication**					**Optional**		**web browswer**			
	data/control non-secure	HTTP Server	80	Enabled	∞	▶	◀ ↵	Dynamic	TCP	-	*[7] these services not required for commissioning / admin web*
	data/control secure	HTTPS Server	443		∞	▶	◀ ↵	Dynamic	TCP	-	
	video stream [7]	RTSP Server	554	Enabled	∞	▶	↵	Dynamic	TCP	-	
	transmit manager [7]	RTP	55555	Enabled	∞	▶	↵		TCP	-	
G	**Email alerts**					**Optional**		**Mail Server**			
	email	SMTP Client		Disabled	On demand	↳ ▶	⦿	25	TCP	Optional	
H	**IP address**					**Optional**		**DHCP Server**			
		DHCP Client	68	Enabled	∞	↳ ▶	◀ ↵	68	UDP	-	-
I	**Time sync**					**Optional**		**NTP Server**			
		NTP Client	123	Disabled	∞	↳ ▶	◀	123	UDP	Optional	-
J	**Network Monitoring**					**Optional**		**SNMP manager**			
	monitor	SNMP Server	161	Disabled	∞	▶	↵		UDP	-	-
K	**Redundant server failover**					**Optional**		**VideoEdge (failover server)**			
	ssnmpd	SNMP Server	161	Disabled	∞	↳ ▶	◀ ↵	161	UDP	-	-
		SSH Server	22	Disabled	∞	↳ ▶	◀ ↵	22	TCP	-	-
	VEAPI	HTTPS	443	Disabled	∞	↳ ▶	◀ ↵	443	TCP	-	-
L	**Remote access**					**Service**		**Remote client**			
	terminal	SSH Server	22	Disabled	∞	▶	↵	22	TCP	Optional	-
	GUI	xrRDP	623	Disabled	∞	▶	↵	3389	UDP	Optional	*if client is Windows*
M	**Centralized licensing**		**VideoEdge**			**Optional**		**Licensing Server**			
	VideoEdge			Disabled	∞	↳	◀	27000	TCP	-	*Option to local licensing*

1. Yellow fill color denotes that the port number and port state that VideoEdge will use is configurable from within VideoEdge.
2. Application requirements are representated by the following color codes and symbols:

🟩	Green = required path
🟦	Blue = optional path
🟪	Purple = Commissioning-only path
🟧	Orange = Service path
↳ or ↵	These arrows indicate that the component can initiate communication in the direction of the arrow
▶ or ◀	These arrows indicate that the component can send data in this direction of the arrow
⦿	This symbol indicates that the component only consumes data from this path.

3. Typical default setting for connecting components, VideoEdge settings must match
4. Any Internet access, if used should be indirect and managed through a firewall
5. Data flow if VideoEdge is controlling cameras functions such as PTZ positioning
6. Use depends on protocol supported by camera

Note: VNC is no longer supported by VideoEdge

1.6.0 Network planning

Video surveillance systems transmit, collect, process and, store sensitive data that will disclose sensitive information if accessed by unauthorized users. While several security controls are inherent to the VideoEdge system to limit access to authorized users, it is best practice for the network design to provide additional layers of defense.

When designing a network for a video management system, first determine which components will be included in the full scope of the system required to provide all the planned functions for that system, for example, video cameras, network video recorders, clients, service connections, and remote access points.

With the full scope of components and functions in mind you can build the appropriate level of protection into the network design to protect both the network and end-points. Keep in mind that some of the system components, while compatible with VideoEdge, may not support the same level of protection as VideoEdge. In those cases, compensating controls may be utilized within the network design to reduce risk.

Important: The network infrastructure security is the customer’s responsibility.

1.6.1 Trust boundaries overview

A trust boundary within a system is the boundary in which data is passed between components that do not share an equal level of trust. Products that are not part of the VideoEdge system or do not provide methods to sufficiently authenticate a component or user may be regarded as having a lower of level of trust. Networks may also have different levels of trust. For example, an isolated network with only video cameras and NVRs is usually trusted more than a shared use network such as the corporate IT network or a remote network.

When the trust deviation is beyond the risk tolerance, it is best to control the flow of data between trusted and untested network using a switch or router with data flow control capabilities, such as a firewall.

1.6.2 Network protection

Isolating the VideoEdge system from networks of lower trust is recommended.

1.6.2.1 Isolated Camera LAN

The VideoEdge NVR has dedicated camera LAN ports to isolate the camera network from the network used at the system level.

1.6.2.2 Demilitarized Zone (DMZ)

When communications to or from the VideoEdge NVR is required from an untrusted network (from the perspective of VideoEdge), such as a corporate LAN, a demilitarized zone (DMZ) may be established to provide a high degree of data flow control and prevent direct access to resources on the VideoEdge network.

Use of a DMZ is strongly recommended with providing remote connectivity in conjunction with other safeguards such as a VPN and multi-factor authentication.

1.6.2.3 VLANs

A Virtual Local Area Network (VLAN) provides the ability to share the networking infrastructure while maintaining separation between trusted and untrusted networks. The use of VLANs reduce deployment costs by removing the need to run dedicated cabling and networking equipment for the VideoEdge system.

If physical access to the cabling used for the VLAN is possible by authorized users, it is recommended that the VLAN switches are configured for to protect eavesdropping by employing encryption technology.

1.6.2.4 Firewalls

Routers and switches which are used to bridge trust boundaries should employ firewalls.

1.6.2.5 Remote access

Remote access points should be protected and always treated as access from an untrusted network.

1.6.2.6 VPN

A Virtual Private Network (VPN), should always be used to provide encrypted and authenticated communication for remote access connections. VPN technologies that are enabled for multi-factor authentication are recommended. Victor Web is intended for internal network use and therefore if used over the internet, must be done through a VPN connection.

1.6.3 End point protection support

The operating system of the VideoEdge NVR includes a firewall that you can enable and configure.

1.7.0 Anti-virus

The VideoEdge NVR does not include pre-installed Anti-virus software. As specific Linux compatible anti-virus software is not pre-qualified for use with the VideoEdge NVR, it is recommended that the anti-virus software compatibility is tested in a controlled, non-production environment.

1.8.0 Hardware and software requirements

Most VideoEdge NVR models are sold as a pre-configured appliance which meets all the hardware and software requirements for the VideoEdge application.

VideoEdge is an embedded video server appliance built upon the openSUSE Linux distribution Leap.

The Operating System VideoEdge OS is built on an openSUSE Linux distribution which has been customized to contain only the components and services needed for the operation of VideoEdge. The number of vulnerabilities is reduced as unnecessary components are removed.

You can perform administration of the operating system by logging on to the NVR either through a terminal window on the NVR or through SSH, and then elevating your privileges to root. You can perform administration through the GUI using YAST or by opening a terminal and then running the “su” command and entering the root password.

For convenience, some of the Linux settings are available within the VideoEdge System Configuration menu.

The **VideoEdge Software Only NVR** is the exception as this model requires that computer hardware to be sourced separately. That computer hardware must meet the requirements outlined in this section.

1.8.1.1 Central Processing Unit (CPU)

- Up to 32 Cameras - Core I3-6100, 3.7Ghz
- Up to 64 Cameras – Core I7-6700, 4Ghz
- Up to 128 Cameras – Xeon E5-2620 v3, 2.40 Ghz

Note: Xeon processors do not support Hardware Transcoding of video streams

1.8.1.2 Memory

- Up to 64 Cameras – 8 GB DDR4 (2133 Mhz)
- Up to 128 Cameras – 16 GB DDR4 (2133 Mhz)

1.8.1.3 Hard disk space

- The hard disk supporting the Operating System must have a minimum speciation of: 500GB, 7200 RPM, 128BM Cache
- Video data storage drive to be sized according to the needs of the application.

1.8.1.4 Supported operating systems

- SUSE Linux JeOS, SLES 12 SP2

1.8.1.5 Network Interface

- Three 1 GBE NICs

1.8.1.6 RAID Controller

- MegaRAID sAS 9361-8I

1.8.1.7 External Storage

- ISCSI, USB, Enterprise 7200 SATA

1.8.1.8 Video Recording (write to disc)

- Up to 32 Cameras - Maximum 100 Mbps
- Up to 64 Cameras – Maximum 300 Mbps
- Up to 128 Cameras – Maximum 600 Mbps

1.8.2 Required services

Required services for VideoEdge operations are set up by default with the correct settings. These services must stay enabled for continuous operations.

1.8.3 Internet service table

The VideoEdge application does not utilize Internet services.

2 Deployment

This section is designed to help execute the deployment of VideoEdge. The contents within this section address how to initiate secure deployment for new installations, how to harden VideoEdge and additional steps after commissioning required before the VideoEdge is turned over to runtime operations.

2.1.0 Deployment overview

Security hardening of VideoEdge begins prior to deployment with careful planning as outlined in section 1 of this guide. It is a good practice to review section prior to deployment to fully under the security feature set of VideoEdge, its architecture, data flow and requirements before physically installing and making application specific configuration changes.

In this section more details are provided to help the installer prepare for deployment:

- Physical installation considerations
- Default security behavior
- Resetting factory defaults
- Considerations for commissioning
- Recommended knowledge level

2.1.1 Getting started

Before you install VideoEdge and power it on, consider the guidance in the following sections.

It is recommended that the configuration and use of VideoEdge is conducted using remote clients and not from the local hardware interfaces.

2.1.2 Physical installation considerations

Install the VideoEdge hardware using the instructions provided in the installation guide. Keep in mind that the physical access to the device and physical installation of the device can impact the cybersecurity.

Physical access to this device enables actions that cannot be authenticated and logged electronically through the capabilities of this product. To prevent unauthorized access, be sure to place the device in a room, cabinet or enclosure that can restrict access (for example, mechanical lock or physical access control). The device is equipped with an optical tamper switch that you can use to send and log electronic alerts regarding physical tampering of the installation. Consider using protective electric wire conduits when communication wires with paths through areas of lower trust.

2.1.3 Default security behavior

On the initial startup of VideoEdge, the following functions will be enabled to facilitate the most common commissioning tasks including camera discovery:

- Configuration webpage
- Camera discovery

There are built-in user accounts and passwords that may be used to initially log on to VideoEdge. On first startup of the VideoEdge hardware, the ‘set the password for the Root User account” page appears. (See Hardening Step 6, in Section 2.2.6 User management overview)

On first logon by an administrator, the user will be prompted to select standard or enhanced password validation.

When Enhance Password Validation is enabled the following configurable policy is applied by default:

- Password must consist of a minimum of eight characters
- Password must not be a duplicate of the previous three passwords associated with that credential
- Password must differ by a minimum of three characters from the previously assigned password
- Password must obey at least three of the following rules -
- Must contain an uppercase letter
- Must contain a lowercase letter
- Must contain a number
- Must contain one of the following special characters [ ] { } ( ) ^ $ #+ _ - ~ ! * %

2.1.4 Resetting factory defaults

If the device was previously used as part of another installation or test environment, the unit should be reset to factory defaults before being put into service in a new deployment. See 3 Maintain for details on how to reset to factory defaults.

2.1.5 Considerations for commission

In some applications the default settings may not be sufficient to fully commission the system. Functions that will not be used during the commissioning process should be disabled.

In the commissioning phase, a less secure configuration may be used before the full infrastructure is available to speed up the deployment process (for example, using wireless). Once the commissioning phase is complete, be sure to remove the temporary infrastructure and harden the system further before turning over to full runtime operations.

2.1.6 Recommended knowledge level

The person confirming that the proper hardening steps are executed should be experienced in VideoEdge administration and networking technologies. Completion of the VideoEdge basic and advance installation courses is recommended.

2.2.0 Hardening

While VideoEdge has several secure-by-default safeguards, VideoEdge should be harden to meet the security requirements of the target environment.

In this section configuration settings labelled as “minimum baseline protection” is provided as general guidance and may not be sufficient for the target application. It is important to apply to the correct level of protection as warranted by policies and regulations that may govern the application security settings for a deployment instance of VideoEdge.

2.2.1 Hardening checklist

2.2.2 Administration

As VideoEdge has been designed as an appliance, users do not need to log on to VideoEdge operating system directly for most operations. You can conduct software access to VideoEdge from a remote application or webpage. Some administrators may choose to log on to the Operating system directly to deploy operating system level updates. In such cases, unique operating system level accounts are recommended.

2.2.2.1 BIOS administration

BIOS administrator requires direct access to the VideoEdge NVR.

To enter the BIOS configuration complete the following steps:

1. Turn on the computer.
2. Within 10 seconds of startup press the F2 button on the keyboard.
3. Enter into **Advanced mode**.

Note: each hardware platform may have a slight deviation.

2.2.2.2 Operating System administration

You can access Operating System administration locally or remotely. For remote access additional services are required to be enabled as indicated by each interface type.

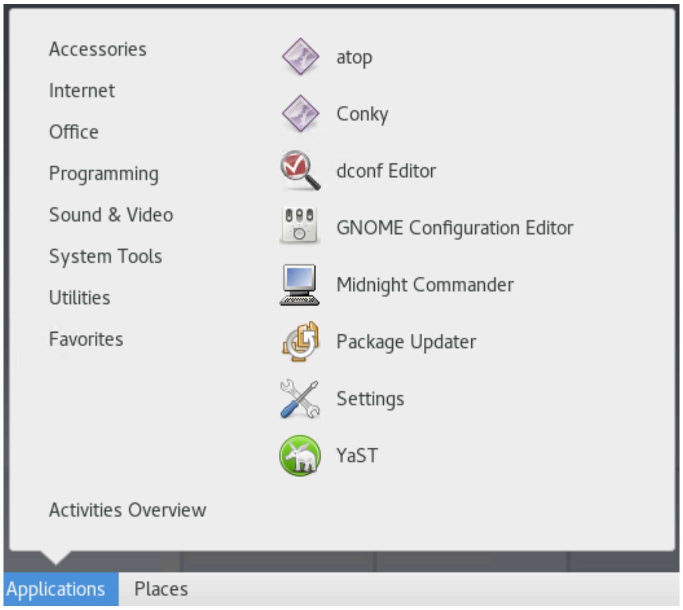
YaST Graphical User Interface

The VideoEdge operating system comes with the Yet another Setup Tool (YaST) to aid with configuration.

To use YaST remotely, RDP must be enabled. See 2.4.0 Software updates

You can find YaST from the operating system level under applications, system tools:

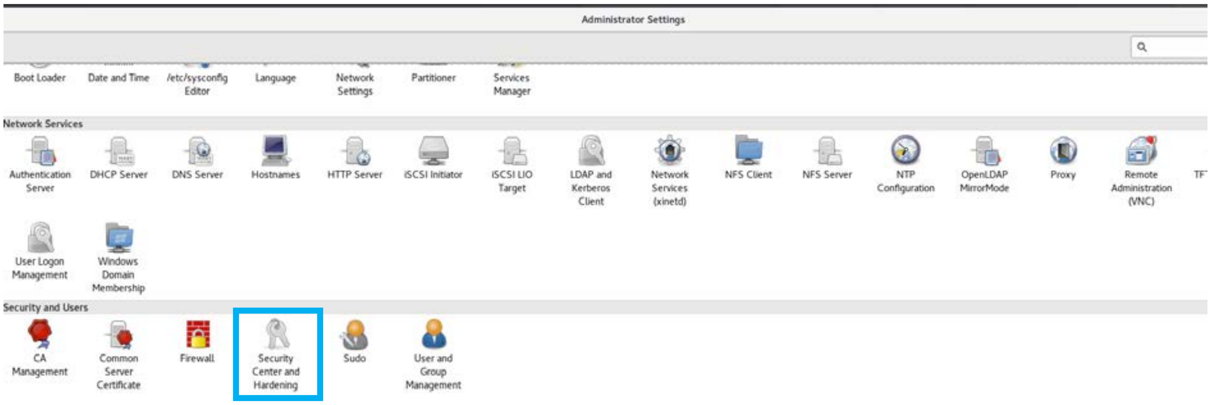
Figure 3



Once opened, YaST provides access to the operating system configuration settings. The Security Center and Hardening tool within YaST provides administrative functions to configure predefined security configurations, password settings, boot settings, and log on settings among other settings.

You can access the Security Center and Hardening tool from the YaST administrator settings, Security User section:

Figure 4



Command Line User Interface

Some administrators prefer to a command line user interface for configuring the operating system security settings.

To use the command line remotely, SSH must be enabled. (See 2.5.0 Communication hardening)

Locally the command line may be accessed as follows:

1. To open a terminal, click Application > Utilities.
2. In the terminal window type su – enter root password.

2.2.2.3 *VideoEdge administration*

The following administration tools are available for the VideoEdge application:

VideoEdge Administrator

You can complete administration for VideoEdge through the VideoEdge administrator a web-based application accessible on the NVR itself or by simply entering the IP address of the NVR into any browser.

Local access - Locally launch the VideoEdge Administrator by selecting the VideoEdge Administrator desktop icon. This will launch Mozilla Firefox ESR with the VideoEdge Administration Interface log on page loaded.

Remote access (preferred interface) - From the web browser of a Windows PC with network connectivity to the VideoEdge. Enter the IP address of the VideoEdge in the address bar of your web browser. Supported browsers are Microsoft Internet Explorer (9+), Google Chrome (latest version) and Mozilla Firefox (latest version).

First-time access - VideoEdge Setup Wizard - The first time accessing the Administration Interface after installation you will be automatically be directed to the Setup Wizard. The Setup Wizard will present some of the security settings available to the administrator. Once the Setup Wizard completes, VideoEdge security settings the normal VideoEdge Administrator user interface will display.

VideoEdge Administrator - System menu – Using the System menu within the administrator you can configure the NVR's basic system settings; Users and Roles, Licensing, Template files, Backup/Restore, software updates, Serial Protocols and the NVR's Security Configuration.

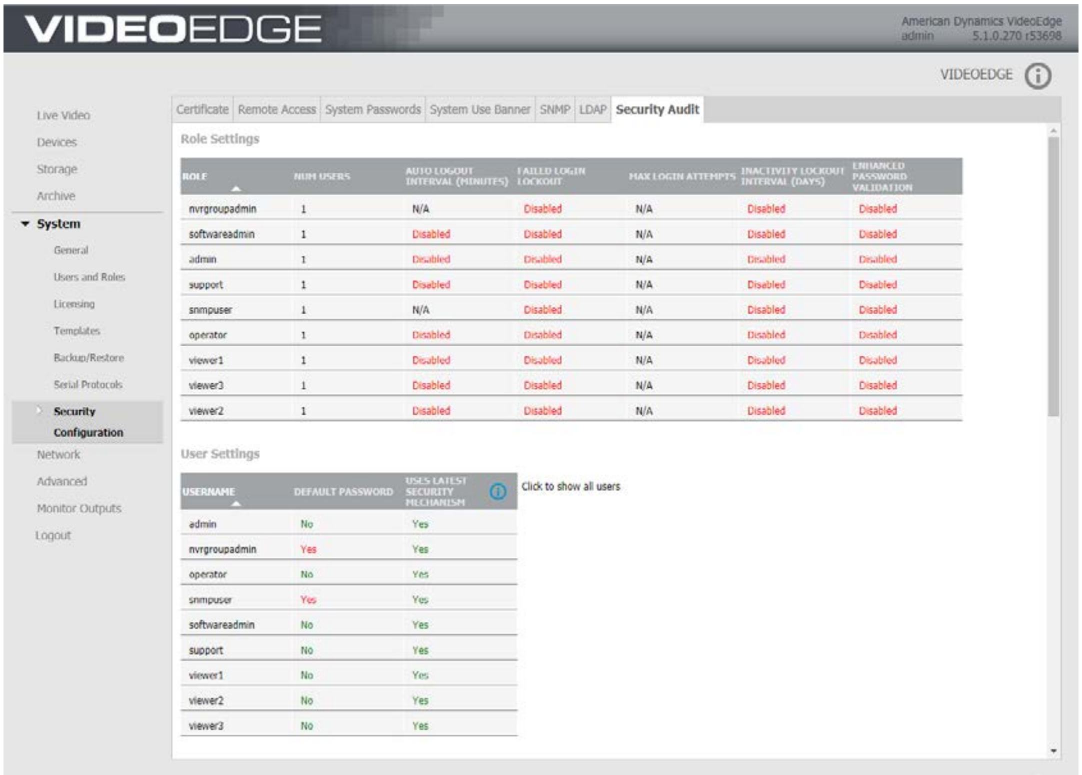
VideoEdge Administrator – Security Audit page - The Security Audit page contains a dashboard showing a read-only status of several key security settings.

The Security Audit page contains a read-only status summary for the following NVR settings:

- Role Settings
- User Settings
- Linux user Settings
- Web Server Ports and protocols
- Remote Access
- Certificate settings
- Certificate Authority settings
- System Robustness

You can find the Security Audit page in VideoEdge under System, Security Configuration:

Figure 5



Role Settings

ROLE	NUM USERS	AUTO LOGOUT INTERVAL (MINUTES)	FAILED LOGIN LOCKOUT	MAX LOGIN ATTEMPTS	INACTIVITY LOCKOUT INTERVAL (DAYS)	ENHANCED PASSWORD VALIDATION
nvrgroupadmin	1	N/A	Disabled	N/A	Disabled	Disabled
softwareadmin	1	Disabled	Disabled	N/A	Disabled	Disabled
admin	1	Disabled	Disabled	N/A	Disabled	Disabled
support	1	Disabled	Disabled	N/A	Disabled	Disabled
snmpuser	1	N/A	Disabled	N/A	Disabled	Disabled
operator	1	Disabled	Disabled	N/A	Disabled	Disabled
viewer1	1	Disabled	Disabled	N/A	Disabled	Disabled
viewer3	1	Disabled	Disabled	N/A	Disabled	Disabled
viewer2	1	Disabled	Disabled	N/A	Disabled	Disabled

User Settings

USERNAME	DEFAULT PASSWORD	USES LATEST SECURITY MECHANISM
admin	No	Yes
nvrgroupadmin	Yes	Yes
operator	No	Yes
snmpuser	Yes	Yes
softwareadmin	No	Yes
support	No	Yes
viewer1	No	Yes
viewer2	No	Yes
viewer3	No	Yes

In addition, the NVR settings that are shown on the Security Audit page are color-coded. The color assigned indicates if recommendation for changing the setting is required.

- Black - The setting does not require assessment.
- Red - The setting is not secure. It is strongly recommended that you change this setting.
- Amber - The setting is partially secure. It is strongly recommended that you change this setting.

Note: You should review the Security Audit page every time you change your VideoEdge security settings.

2.2.3 BIOS configuration

Hardening step 1: Configure BIOS

It is important to protect the BIOS configuration from being modified by unauthorized users.

Note: BIOS menus can vary between versions and models of VideoEdge. The following steps are based on the BIOS menus available when this guide was created.

Hardening step 1.1: Enable BIOS password

Enable password protection of the VideoEdge BIOS and set the password. This password should only be known to administrators that have been authorized.

How to set a BIOS password:

1. Turn on the computer.
2. Within 10 seconds of startup press the F2 button on the keyboard.
3. Enter into **Advanced mode**.
4. Click the **Security** tab.
5. Set a new Administrator password and a user password.

Note: You need the user password on start up. You need the administrator password when any BIOS changes are made

2.2.4 Set boot sequence

The boot sequence should prevent boot up by USB devices as it is a possible for USB devices to inject malicious code without warning.

Hardening step 1.2: Prevent USB boot

How to disable USB ports:

1. Turn on the computer.
2. Within 10 seconds of startup press the F2 button on the keyboard.
3. Enter into **Advanced mode**.
4. In the **Advanced** tab click **USB Configuration.**
5. Click on **USB Single Port Control.**
6. Notice all the USB ports are listed as “Enabled”.
7. Change all the ports that are not required to “Disabled”.
8. Save and restart the machine.

Note: Take note to know which ports are being used prior to disabling. This would be done by using the `lsusb –v` command in a terminal.

An end user should have the ability to restrict ability to interact with physical interfaces. The USB port is an important technical interface that would allow for a malicious user to upload corrupted files or download information.

2.2.5 User management

In this section you can find information on user management.

2.2.5.1 Operating system level user accounts (interactive)

You can access VideoEdge NVR operating system using one of the following accounts.

Table 3

User	Description
root	Root (Administrator) account for the Linux operating system. Full administrative access to the VideoEdge NVR's operating system
VideoEdge	VideoEdge is the default account to access the Linux OS.
support	Used for remote technical support.

The support account

The support user on the VideoEdge NVR operating system is intended for the use by American Dynamics Technical Support, as the account has full sudo access. The password for this account is unique to each NVR device and can only be derived by American Dynamics Technical Support when provided with the unique support ID. You can disable remote access by disabling the SSH remote access.

Hardening step 2: Configure operating system user accounts

Changing default system Root and VideoEdge user account passwords and making them unique enhances the security of the product.

Note: the root System and VideoEdge user account password must be changed before you can enable the remote access services (SSH and RDP).

Security Mode

In Standard Security Mode, you do not need to change the default passwords. All changes on the User Accounts page are optional in Standard Security Mode. Standard Security Mode enables universal plug and play (UPnP) by default.

In Enhanced Security Mode, you must create new user accounts and passwords. With the exception of the Optional NVR Account, all account changes on the User Accounts page are mandatory in Enhanced Security Mode.

In Enhanced Security Mode, UPnP is disabled by default. HTTPS-only mode is enforced in Enhanced Security Mode.

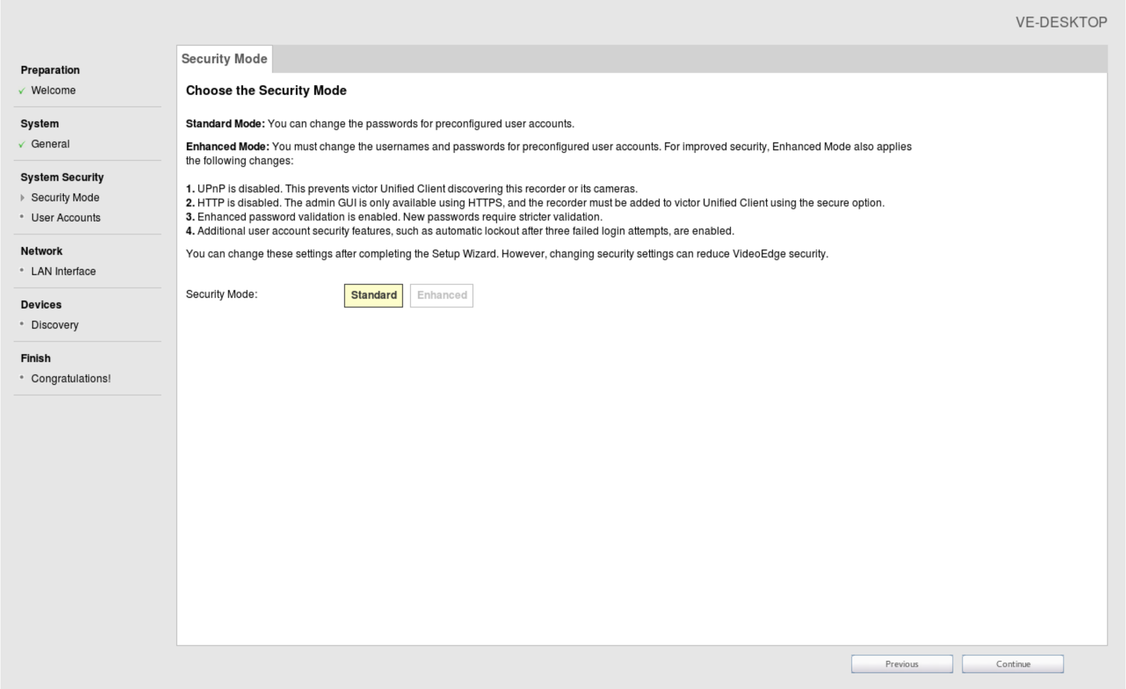
Access for the Linux support user account is enabled by default in Standard Security mode, and disabled by default in Enhanced Security Mode. Enable or disable access for the Linux support user account in the Linux User Access: support section on the System Passwords page.

Hardening step 2.1: Set the Security Mode to Enhanced

Caution: Upon completing the Setup Wizard, the selected Security Mode is final. Ensure that you have selected the appropriate mode. If Security Mode is set to standard, it is still possible to manually configure the VideoEdge with the same settings as Enhanced Mode.

VideoEdge Setup Wizard. On the Security Mode page, select **Enhanced.**

Figure 6



Choose the Security Mode

Standard Mode: You can change the passwords for preconfigured user accounts.

Enhanced Mode: You must change the usernames and passwords for preconfigured user accounts. For improved security, Enhanced Mode also applies the following changes:

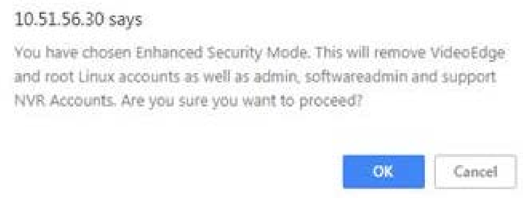
1. UPnP is disabled. This prevents victor Unified Client discovering this recorder or its cameras.
2. HTTP is disabled. The admin GUI is only available using HTTPS, and the recorder must be added to victor Unified Client using the secure option.
3. Enhanced password validation is enabled. New passwords require stricter validation.
4. Additional user account security features, such as automatic lockout after three failed login attempts, are enabled.

You can change these settings after completing the Setup Wizard. However, changing security settings can reduce VideoEdge security.

Security Mode: [✓ Standard] Enhanced

Note: When **Enhanced Security** is selected, in the last step of the Setup Wizard remove the default Linux accounts or the system will revert back to Standard Security mode. Select **OK** to finalize the Enhanced Security mode process:

Figure 7



10.51.56.30 says

You have chosen Enhanced Security Mode. This will remove VideoEdge and root Linux accounts as well as admin, softwareadmin and support NVR Accounts. Are you sure you want to proceed?

Hardening step 2.2: Enabling media encryption

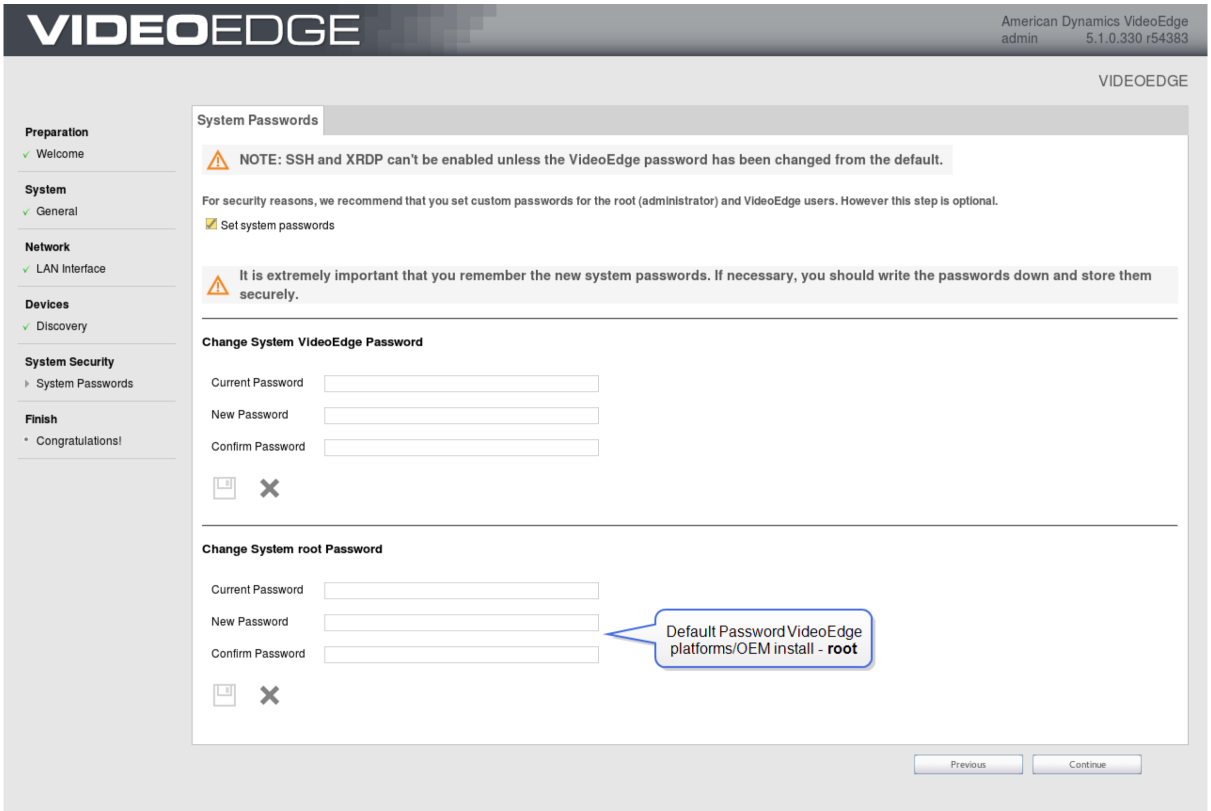
To enable media encryption tick the Encrypt Media check box in the installation wizard.

Hardening step 2.3: Change System user account passwords

Change user account passwords using the VideoEdge Setup Wizard

The VideoEdge Setup Wizard includes the ability to change the System VideoEdge and System root passwords. These passwords must conform to the active password policy of the operating system. The System Security page will display after the System page within the Setup Wizard. If **Enhanced Security Mode** is selected, change the passwords to continue to the next step.

Figure 8



⚠ NOTE: SSH and XRDP can't be enabled unless the VideoEdge password has been changed from the default.

For security reasons, we recommend that you set custom passwords for the root (administrator) and VideoEdge users. However this step is optional.

☑ Set system passwords

⚠ It is extremely important that you remember the new system passwords. If necessary, you should write the passwords down and store them securely.

Change System VideoEdge Password

Current Password

New Password

Confirm Password

Change System root Password

Current Password

New Password

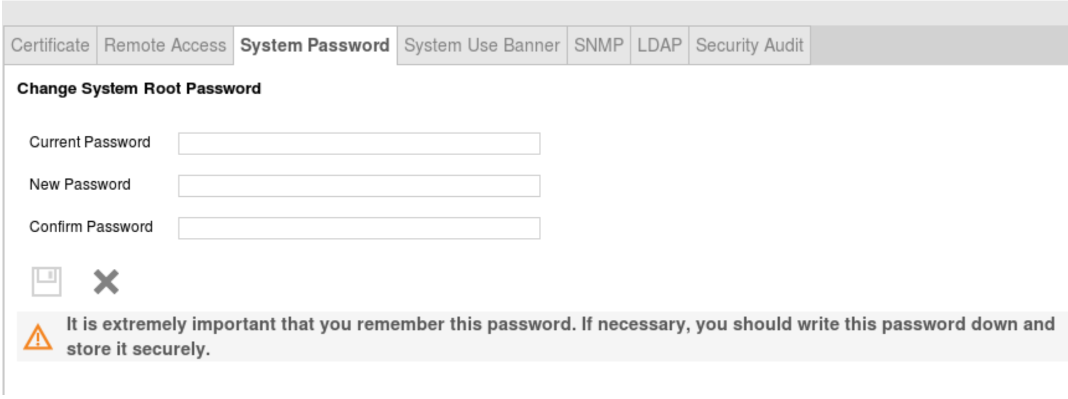
Confirm Password

Default Password VideoEdge platforms/OEM install - **root**

Change user account passwords using VideoEdge Administrator

To change the system password from the normal VideoEdge Administrator, access the System Password tab within the System Configuration menu:

Figure 9



Change System Root Password

Current Password

New Password

Confirm Password

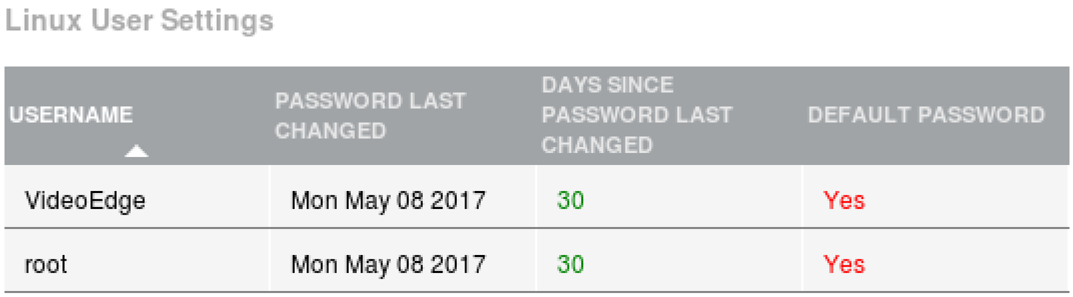
⚠ It is extremely important that you remember this password. If necessary, you should write this password down and store it securely.

Note: It is critical that the new password be recorded and kept secure as it cannot be recovered. The web UI has a warning to this effect.

With both methods, enter current password for the system root user account, provide the new password and re-enter the password in the Confirm Password field and save.

Note: From VideoEdge Administrator, the Security Audit page *Linux User Settings* section displays the Operating System accounts and when the passwords were last changed and whether they are still using the default password.

Figure 10



Linux User Settings

USERNAME	PASSWORD LAST CHANGED	DAYS SINCE PASSWORD LAST CHANGED	DEFAULT PASSWORD
VideoEdge	Mon May 08 2017	30	Yes
root	Mon May 08 2017	30	Yes

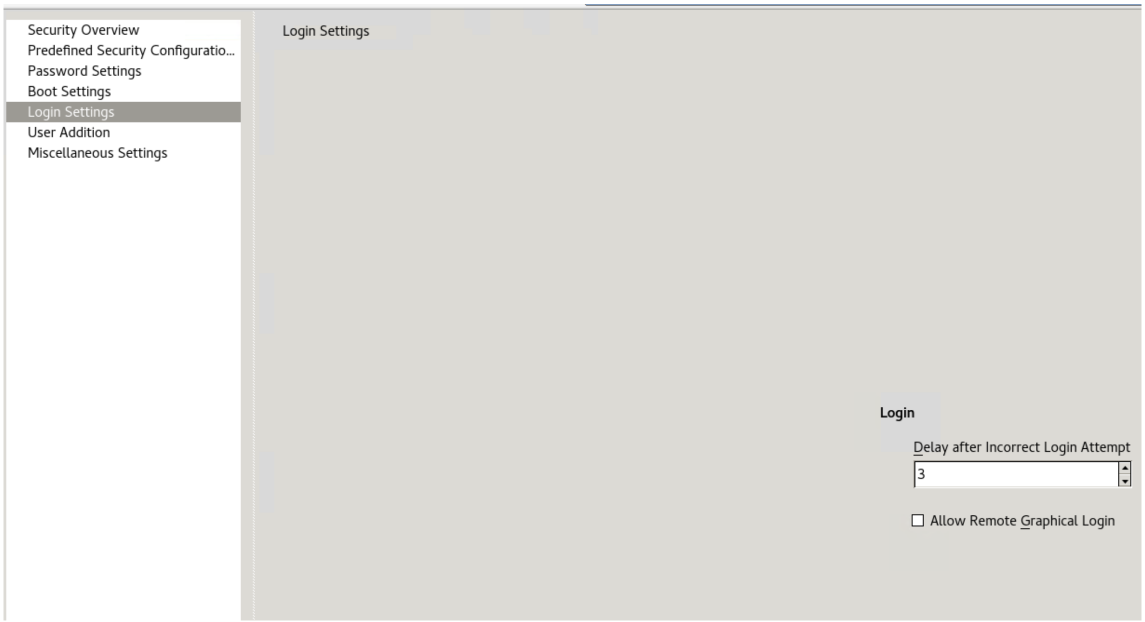
Hardening step 2.4: Set invalid attempt user lockout policy

Configure invalid attempt lockout policy to prevent the use of a user account when the lockout is engaged to protect against brute force attacks. The operating system supports invalid attempt lockout. When the invalid attempt lockout is engaged when a configurable number of invalid operating system log on attempts are attempted. This rule may be configured as a temporary lockout (automatically reset after a configurable time period).

Set invalid attempt user lockout policy using the YaST Graphical User Interface

In **Login settings** there is the capability to set the delay after incorrect log on attempts.

Figure 11



Login Settings

Login

Delay after Incorrect Login Attempt

3

☐ Allow Remote Graphical Login

Set invalid attempt user lockout policy using the command Line User Interface

- Modify the /etc/pam.d/login file to the following:

```
auth required pam_tally2.so onerr=fail no_magic_root
account required pam_tally2.so per_user deny=3 no_magic_root reset
```

- The first line counts failed log on and failed su attempts for each user. The default location for attempted accesses is recorded in/var/log/faillog.
- The second line specifies to lock accounts automatically after 5 failed log on or su attempts (deny=5). The counter will be reset to 0 (reset) on successful entry if deny=*n* was not exceeded. But you don't want system or shared accounts to be locked after too many log on failures (denial of service attack).
- It is also possible to add the lock_time=*n* parameter, and then optionally the unlock_time=*n* parameter. For example, setting the lock_time=60 would deny access for 60 seconds after a failed attempt. The unlock_time=*n* option would then allow access after n seconds after an account has been locked. If this option is used the user will be locked out for the specified amount of time after he exceeded his maximum allowed attempts. Otherwise the account is locked until the system administrator removes the lock manually. Refer to the pam_tally man page for more information.
- To exempt system and shared accounts from the deny=*n* parameter, the per_user parameter was added to the module. The per_user parameter instructs the module *not* to use the deny=*n* limit for accounts where the maximum number of log on failures is set explicitly. For example:

```
jupiter:~ # faillog -u oracle -m -1
Username   Failures  Maximum  Latest
oracle     0         -1       Fri Dec 10 23:57:55 -0600 2005 on unknown
```

- The faillog command with the option -m -1 has the effect of not placing a limit on the number of failed log ons—effectively disabling the option. To instruct the module to activate the deny=*n* limit for this account again, run:

```
faillog -u oracle -m 0
```

- By default, the maximum number of log on failures for each account is set to zero (0) which instructs pam_tally to leverage the deny=*n*parameter. To see failed log on attempts, run:

```
faillog
```

- To unlock a locked account (after too many log on failures), use the -r option:

```
faillog -u user -r
```

- Make sure to test these changes (and *any* changes – for that matter) thoroughly on your system using ssh and su, and make sure the root id does not get locked! To lock/unlock accounts manually, you can run one of the following commands:

Locking

```
passwd -l user
         usermod -L user
```

Unlocking

```
passwd -u user
usermod -U user
```

Hardening step 2.5: Set the inactivity log out policy

Inactive sessions should be configured to with an auto-log out disconnection to minimum the risk of unauthorized access.

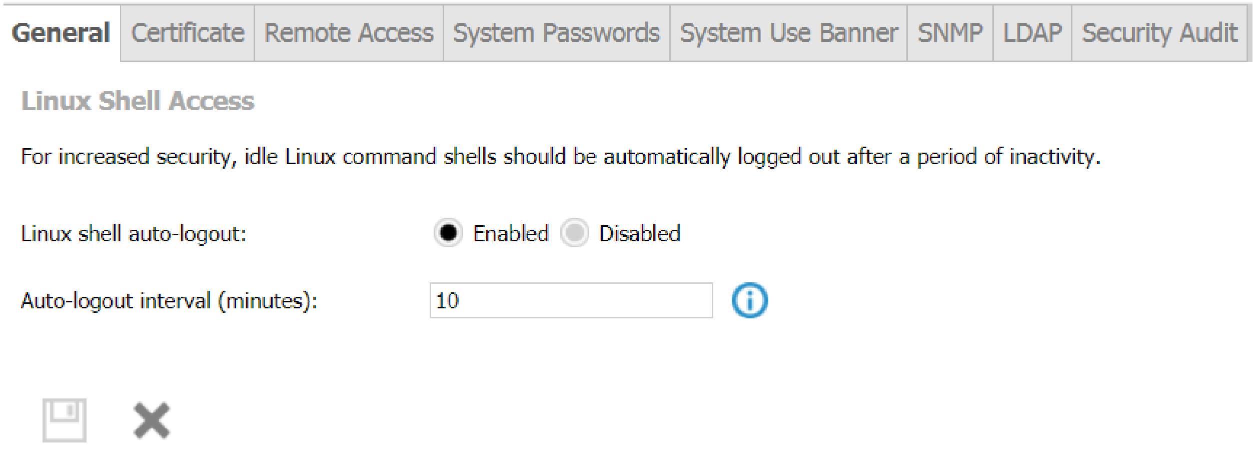
Configure remote access timeout

Table 4

	MINIMUM BASELINE PROTECTION	TO STRENGTHEN PROTECTION
LINUX SHELL AUTO-LOG OUT:	⦿ (selected)	⦿ (selected) is the strongest setting
AUTO-LOG OUT INTERVAL (MINUTES):	10	*Lower the interval to strengthen*

You can configure this setting from the VideoEdge Administrator System Configuration General tab.

Figure 12



Linux Shell Access

For increased security, idle Linux command shells should be automatically logged out after a period of inactivity.

Linux shell auto-logout: ● Enabled ○ Disabled

Auto-logout interval (minutes): 10

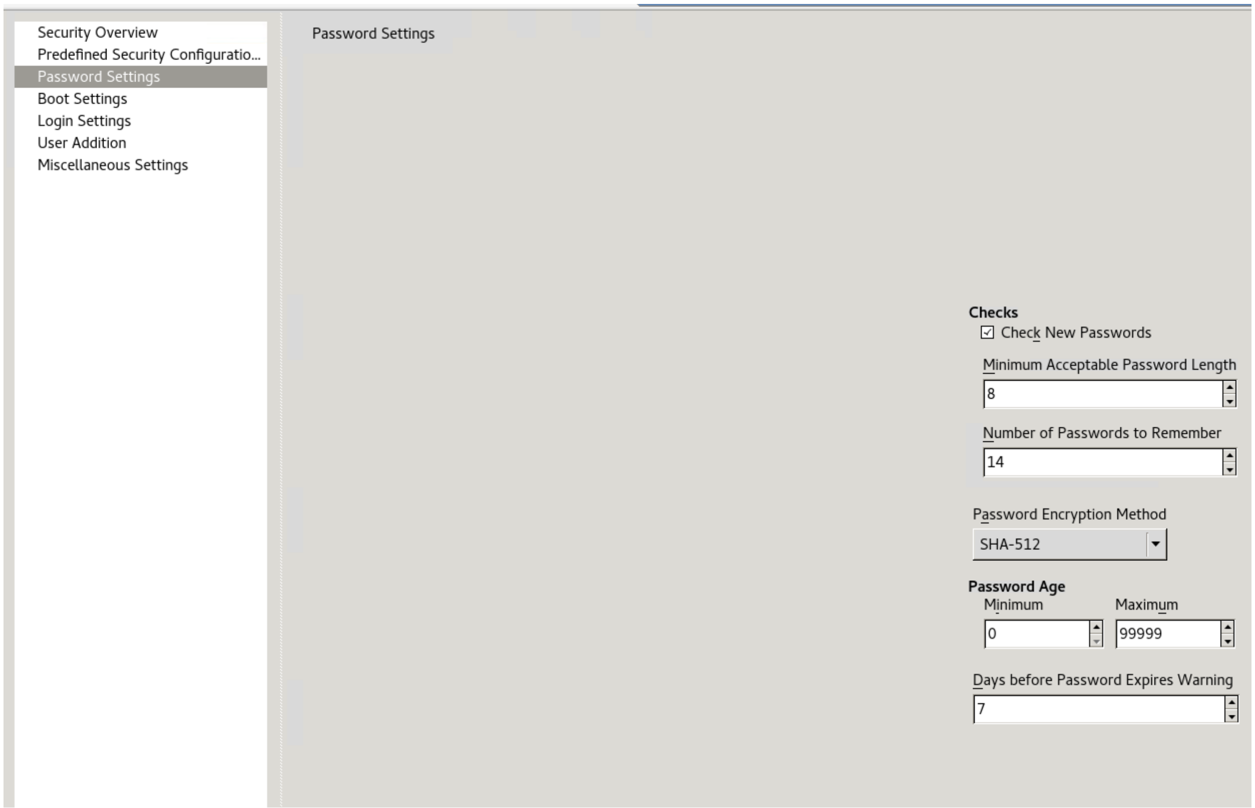
Hardening Step 2.6: Set the password complexity policy

Configure the Operating Systems password length, number of passwords to remember, password encryption method, minimum and maximum password age, and number of days before to give a warning for when a password is about to expire.

Set the password complexity policy using the YaST Graphical User Interface

From Security Center and Hardening tool, select “Password Settings”:

Figure 13



Password Settings

Checks

☑ Check New Passwords

Minimum Acceptable Password Length: 8

Number of Passwords to Remember: 14

Password Encryption Method: SHA-512

Password Age

Minimum: 0

Maximum: 99999

Days before Password Expires Warning: 7

Table 5

	MINIMUM BASELINE PROTECTION	TO STRENGTHEN PROTECTION
CHECK NEW PASSWORDS	☑ (checked)	☑ (checked) is the strongest setting
MINIMUM ACCEPTABLE PASSWORD LENGTH	14	*increase length*
PASSWORD ENCRYPTION METHOD	SHA-512	SHA-512 is the strongest setting
PASSWORD AGE MINIMUM	no guidance - consult with local policy / preference	
PASSWORD AGE MAXIMUM	90	*shorten length*
DAYS BEFORE PASSWORD EXPIRES WARNING	no guidance - consult with local policy / preference	

Set the password complexity using the Command Line User Interface

Input the following commands into the command line interface:

```
pam-config -a --cracklib --cracklib-minlen=8 --cracklib-lcredit=-1 --cracklib-ucredit=-1
--cracklib-dcredit=-1 --cracklib-ocredit=-1
```

Once set using either method, the use of simple passwords will not be allowed. The system will only accept passwords which satisfy these parameters.

2.2.5.2 VideoEdge roles

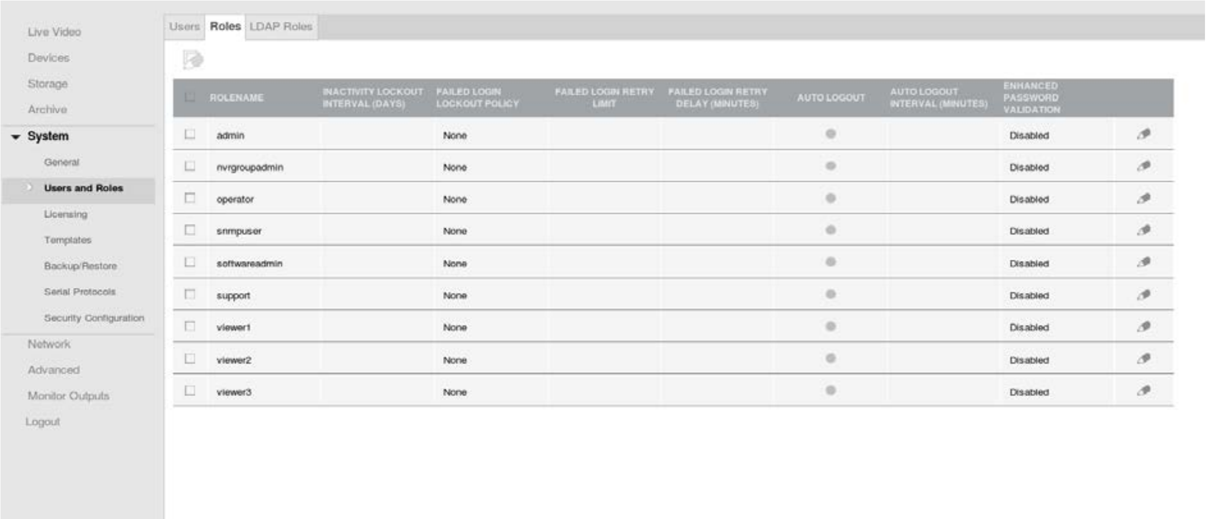
Each role must be configured to assure the desired account lockout, inactivity log out and enhanced password validation policies are applied because they can be configured independently.

The Role configuration tab within the Video Administrator System User and Roles provides access to configure the roles local to VideoEdge.

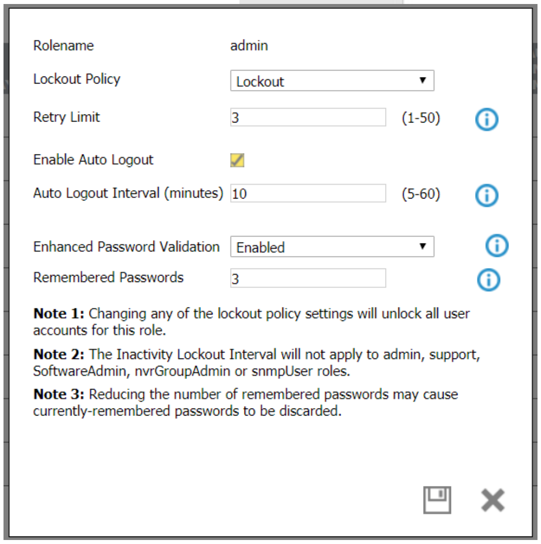
System menu - Role configuration

Figure 14

Figure 15



☐	ROLENAME	INACTIVITY LOCKOUT INTERVAL (DAYS)	FAILED LOGIN LOCKOUT POLICY	FAILED LOGIN RETRY LIMIT	FAILED LOGIN RETRY DELAY (MINUTES)	AUTO LOGOUT	AUTO LOGOUT INTERVAL (MINUTES)	ENHANCED PASSWORD VALIDATION	
☐	admin		None			●		Disabled	✎
☐	nvrgroupadmin		None			●		Disabled	✎
☐	operator		None			●		Disabled	✎
☐	snmpuser		None			●		Disabled	✎
☐	softwareadmin		None			●		Disabled	✎
☐	support		None			●		Disabled	✎
☐	viewer1		None			●		Disabled	✎
☐	viewer2		None			●		Disabled	✎
☐	viewer3		None			●		Disabled	✎



Rolename	admin		
Lockout Policy	Lockout ▾		
Retry Limit	3	(1-50)	ⓘ
Enable Auto Logout	☑		
Auto Logout Interval (minutes)	10	(5-60)	ⓘ
Enhanced Password Validation	Enabled ▾		ⓘ
Remembered Passwords	3		ⓘ

Note 1: Changing any of the lockout policy settings will unlock all user accounts for this role.

Note 2: The Inactivity Lockout Interval will not apply to admin, support, SoftwareAdmin, nvrGroupAdmin or snmpUser roles.

Note 3: Reducing the number of remembered passwords may cause currently-remembered passwords to be discarded.

Hardening step 3: Configure roles

Hardening step 3.1: Set account lockout policy

Configure the account lockout policy to prevent the use of a user account when the lockout is engaged. VideoEdge supports two types of account lockout:

Invalid attempt lockout – is engaged when a configurable number of invalid log on attempts are attempted within a VideoEdge client interface (included VideoEdge Administrator and VideoEdge Client). This rule may be configured as permanent (requiring administrator to reset) or temporary (automatically reset after a configurable time period).

Hardening guidance for invalid attempt lockout is as follows:

Table 6

ROLE SETTINGS	MINIMUM BASELINE PROTECTION	TO STRENGTHEN PROTECTION
LOCKOUT POLICY	Delay *automatically resets lockout*	Lockout *forces manual reset by administrator*
RETRY LIMIT	3	*lower retry limit*
RETRY DELAY (MINUTES)	10	*increase retry delay*

Inactive account lockout - Accounts may also be set to automatically lock if not used within a set period of time 30, 60 or 90 days, for example, to ensure ex-employee accounts are disabled. When log on is attempted after this time period, the account is locked and may only be unlocked by an administrator.

Table 7

ROLE SETTINGS	MINIMUM BASELINE PROTECTION	TO STRENGTHEN PROTECTION
LOCKOUT INTERVAL (DAYS)	90 days	*lower lockout interval period*

Note 1: Permanent and temporary account lockouts are capable of generating an email alert.

Note 2: Changing any of the lockout policy settings will unlock all user accounts for this role that were previously locked. Therefore, it is important to configure this setting when the system is initialized.

Hardening step 3.2: Set the inactivity log out policy

Configure the session inactivity log out policy to reduce risk of unattended user sessions.

Table 8

	MINIMUM BASELINE PROTECTION	TO STRENGTHEN PROTECTION
ENABLED AUTO LOG OUT	☑ (checked)	☑ (checked) is the strongest setting
AUTO LOG OUT INTERVAL (MINUTES)	10	*lower auto log out interval*

Note 1: The Inactivity lockout interval cannot be enabled for admin, support, Softwareadmin, nvrGroupAdmin or snmpUser roles.

Hardening step 3.3: Set the Enhanced Password Validation

Enabling the Enhanced Password Validation assures that the password policy is enabled for the role.

Table 9

	MINIMUM BASELINE PROTECTION	TO STRENGTHEN PROTECTION
ENHANCED PASSWORD VALIDATION	Enabled	*Enabled is the strongest setting*

Hardening step 3.4: Set the Password History policy

The password history setting prevents a user from changing their password to a recently used password.

Table 10

	MINIMUM BASELINE PROTECTION	TO STRENGTHEN PROTECTION
REMEMBERED PASSWORDS	3	increase the number of remembered passwords

Note 1: Reducing the value of the Remembered Passwords setting may cause the password history to be cleared from memory.

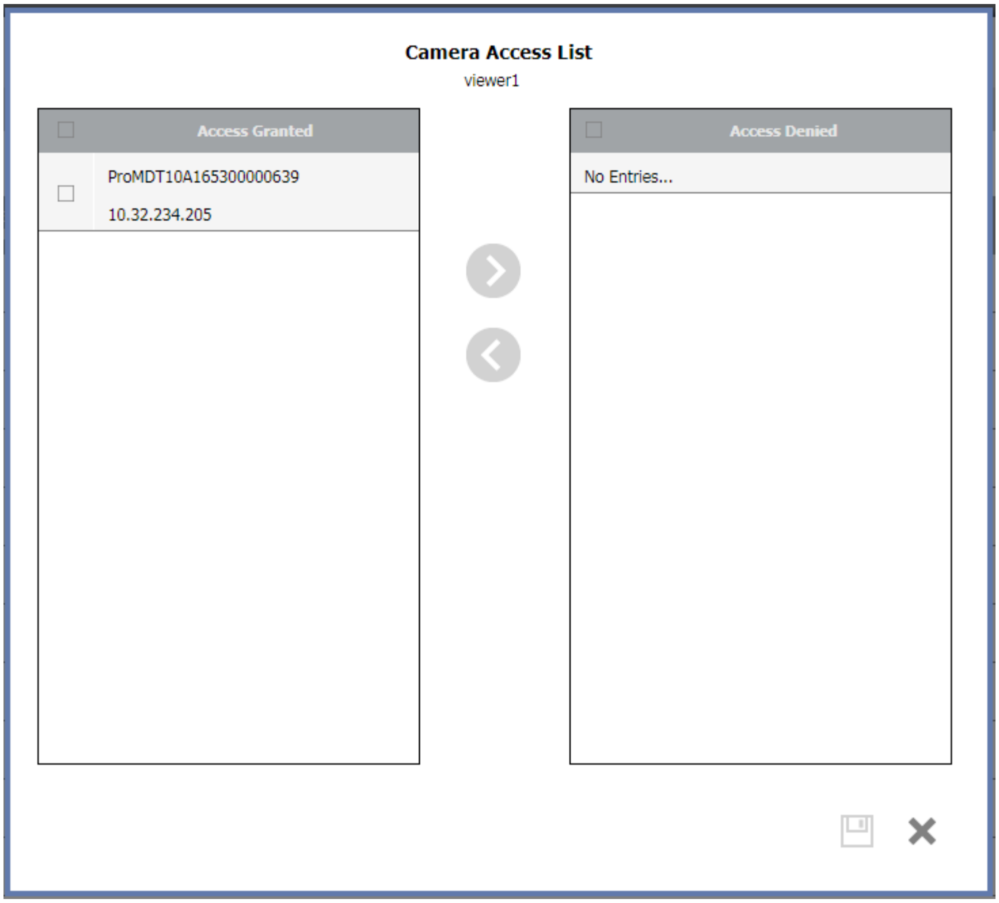
Hardening step 3.5: Set role-based camera access permissions

Use the **Roles** page to configure camera access for the viewer1, viewer2, and viewer3 roles. Filter camera permissions using the **Camera Access** list window. The **Access Granted** list features cameras that the role currently has access to, and the **Access Denied** list features cameras currently hidden from the role.

Select a role to open its **Camera Access** list window and select the checkboxes of the cameras you want to grant or deny access to.

Click the right arrow to move the camera to the **Access Denied** list or click the left arrow to move the camera to the **Access Granted** list.

Figure 16



Camera Access List

viewer1

□ Access Granted	□ Access Denied
□ ProMDT10A165300000639 10.32.234.205	No Entries...

2.2.5.3 *VideoEdge user accounts*

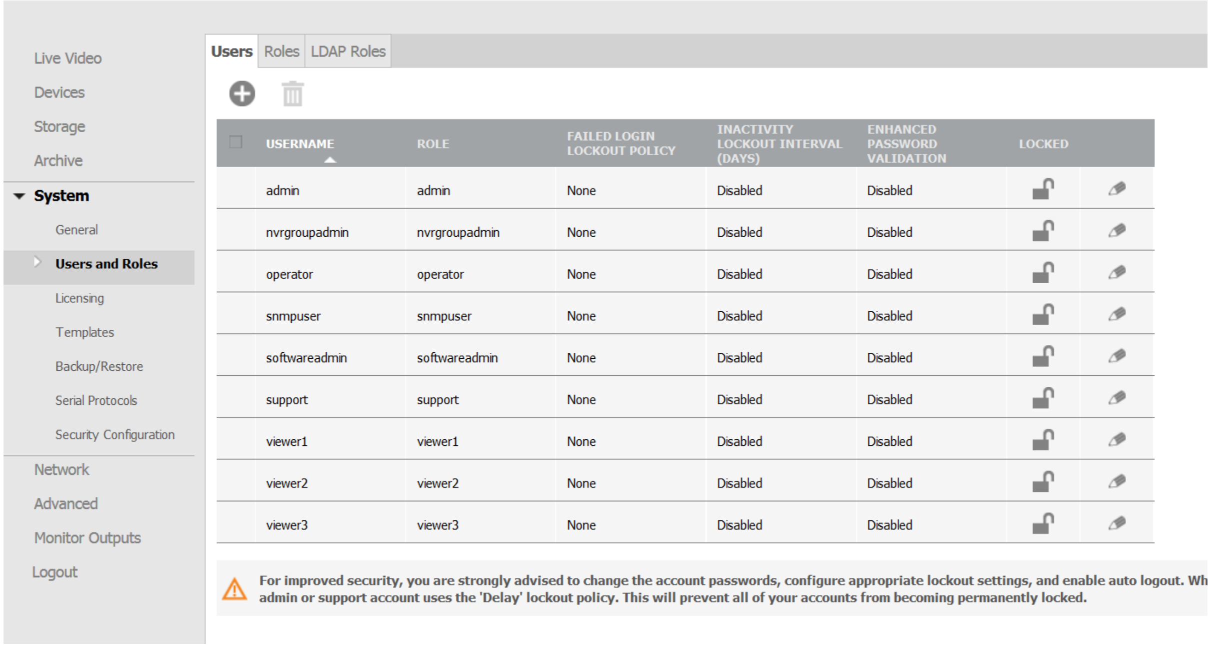
From the VideoEdge administrator you can create new user accounts, edit existing accounts, apply lockout polices and auto log out (lockout and log out polices are ON by default if enhanced security mode is enabled).You can also designate role types for LDAP groups. You can also configure role permissions for LDAP groups which have been configured on your LDAP server.

The user configuration tab within the System User and Roles provides access to configure the user account local to VideoEdge

System menu - User configuration

By default, the VideoEdge NVR comes with the following interactive administrator accounts for use with the VideoEdge Administration Interface.

Figure 17



USERNAME	ROLE	FAILED LOGIN LOCKOUT POLICY	INACTIVITY LOCKOUT INTERVAL (DAYS)	ENHANCED PASSWORD VALIDATION	LOCKED	
admin	admin	None	Disabled	Disabled	🔓	✎
nvrgroupadmin	nvrgroupadmin	None	Disabled	Disabled	🔓	✎
operator	operator	None	Disabled	Disabled	🔓	✎
snmpuser	snmpuser	None	Disabled	Disabled	🔓	✎
softwareadmin	softwareadmin	None	Disabled	Disabled	🔓	✎
support	support	None	Disabled	Disabled	🔓	✎
viewer1	viewer1	None	Disabled	Disabled	🔓	✎
viewer2	viewer2	None	Disabled	Disabled	🔓	✎
viewer3	viewer3	None	Disabled	Disabled	🔓	✎

⚠ For improved security, you are strongly advised to change the account passwords, configure appropriate lockout settings, and enable auto logout. Wh admin or support account uses the 'Delay' lockout policy. This will prevent all of your accounts from becoming permanently locked.

Table 11

USER AND ROLES	DESCRIPTION
ADMIN	Using this account you can view and edit the VideoEdge Administration Interface and full functionality of the VideoEdge Client.
OPERATOR	Using this account you can view the VideoEdge Administration Interface and full functionality of the VideoEdge Client.
SOFTWAREADMIN	Using this account you can access software updates including camera handler packs.
SUPPORT	This account is intended for the use by American Dynamics Technical Support, this account password may be changed and the role is bound by the same access control mechanisms available in the user’s page.
NVRGROUPADMIN	This account is used for communication between NVRs in a group which is done using CGIs.
SNMPUSER	This account is used for SNMP communication between NVRs in a group.

The default interactive viewer accounts are only allowed log on into the VideoEdge Client and unable to view or edit the VideoEdge Administration Interface.

Table 12

USER	DESCRIPTION
VIEWER1	With this account you have full functionality of the VideoEdge Client.
VIEWER2	With this account you have full functionality of the VideoEdge Client with exception of Analog (Real) PTZ.
VIEWER3	With this account you have full functionality of the VideoEdge Client with exception of Analog (Real) and Digital PTZ, Still Image Capture and Clip Export.

Hardening step 4: Configure VideoEdge user accounts

In this section you can find information on configuring user accounts.

Hardening step 4.1: Create unique user accounts for each user

Each VideoEdge user should have their own dedicated account. An operator must not use built-in accounts.

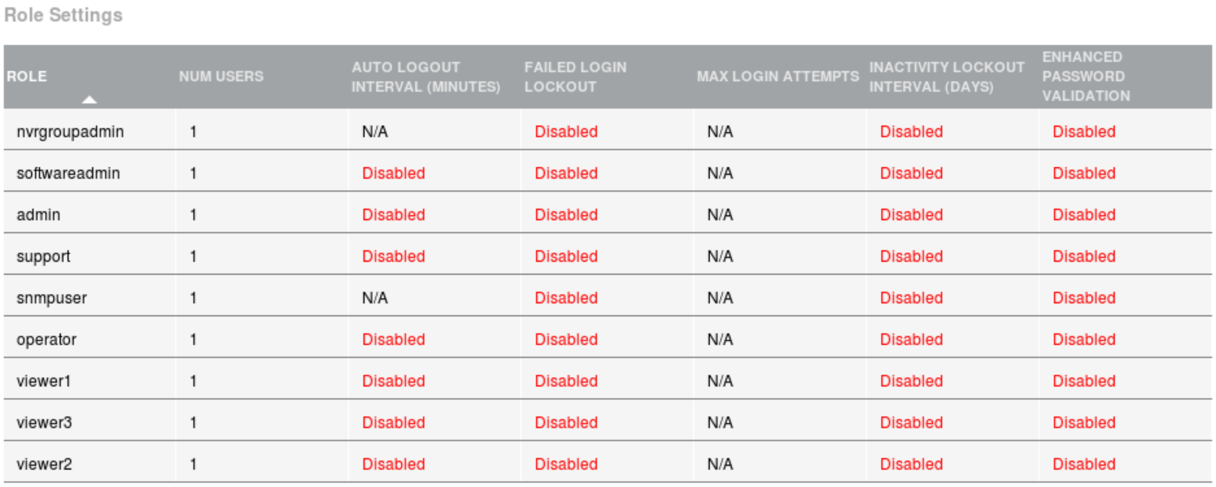
Note: If an LDAP server is handling VideoEdge authentication this step is not recommended because providing multiple accounts (one for LDAP and one local account) will introduce a security risk.

Hardening step 4.2: Assign roles

Roles should be assign to users to assure the best practices for user management are followed. The assignment of the role to users sets their authorizations. Therefore, role assignment should take into account what a user “needs to have access to” following the principles of least privilege and separate of duties. The definition of roles will be configured in hardening step 2, Configure Roles.

The **Security Audit** page **Role Settings** displays which roles have features such as Auto Log out and **Failed Login Lockout** enabled and the number of users within that role.

Figure 18



Role Settings

ROLE	NUM USERS	AUTO LOGOUT INTERVAL (MINUTES)	FAILED LOGIN LOCKOUT	MAX LOGIN ATTEMPTS	INACTIVITY LOCKOUT INTERVAL (DAYS)	ENHANCED PASSWORD VALIDATION
nvrgroupadmin	1	N/A	Disabled	N/A	Disabled	Disabled
softwareadmin	1	Disabled	Disabled	N/A	Disabled	Disabled
admin	1	Disabled	Disabled	N/A	Disabled	Disabled
support	1	Disabled	Disabled	N/A	Disabled	Disabled
snmpuser	1	N/A	Disabled	N/A	Disabled	Disabled
operator	1	Disabled	Disabled	N/A	Disabled	Disabled
viewer1	1	Disabled	Disabled	N/A	Disabled	Disabled
viewer3	1	Disabled	Disabled	N/A	Disabled	Disabled
viewer2	1	Disabled	Disabled	N/A	Disabled	Disabled

Hardening step 4.3: Lock built-in accounts

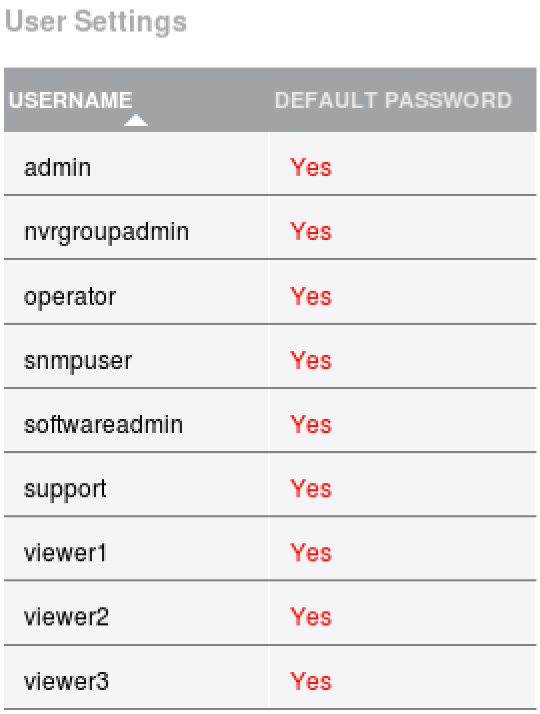
Built-in accounts should be set to “locked” after they are replaced with unique accounts for each user. It is important that there is a user assigned to each of the required roles before disabling the built-in user accounts.

Hardening step 4.4: Change passwords of built-in accounts

All default passwords should be changed even if an account is locked. This will assure that even if the account is inadvertently enabled, access will not be granted if a default password is entered on logon.

TIP: The Security Audit page **User Settings** displays the status of default passwords in use by comparing the default hash against the stored hash. If there is a match, the test will be red indicating the default password is still being used.

Figure 19



User Settings

USERNAME	DEFAULT PASSWORD
admin	Yes
nvrgroupadmin	Yes
operator	Yes
snmpuser	Yes
softwareadmin	Yes
support	Yes
viewer1	Yes
viewer2	Yes
viewer3	Yes

2.2.5.4 *VideoEdge LDAP Authentication*

Hardening step 5: Configure LDAP and LDAP roles

The configuration and use of a Lightweight Directory Access Protocol (LDAP) server to authenticate users of both the VideoEdge Administration Interface and VideoEdge Client is recommended. This minimizes configuration of users on VideoEdge and enables multiple NVRs to share one centralized server for user management.

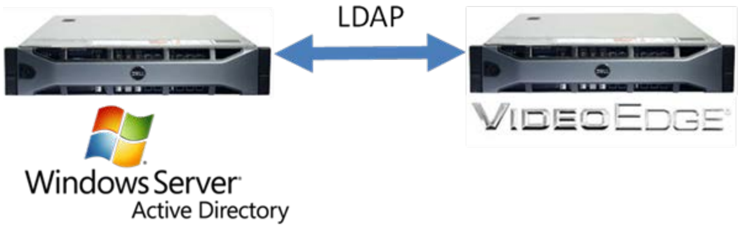
When integrating with Microsoft Active Directory, a secure connection using a Certificate Authority certificate for the LDAP server is recommended.

It is recommended that you establish a secure connection before you perform the following actions:

- Logging on to the VideoEdge as an LDAP user.
- Retrieving a list of LDAP groups on the LDAP Roles page.

VideoEdge integrates with LDAP servers as shown in the following Microsoft Windows Server Active Directory example:

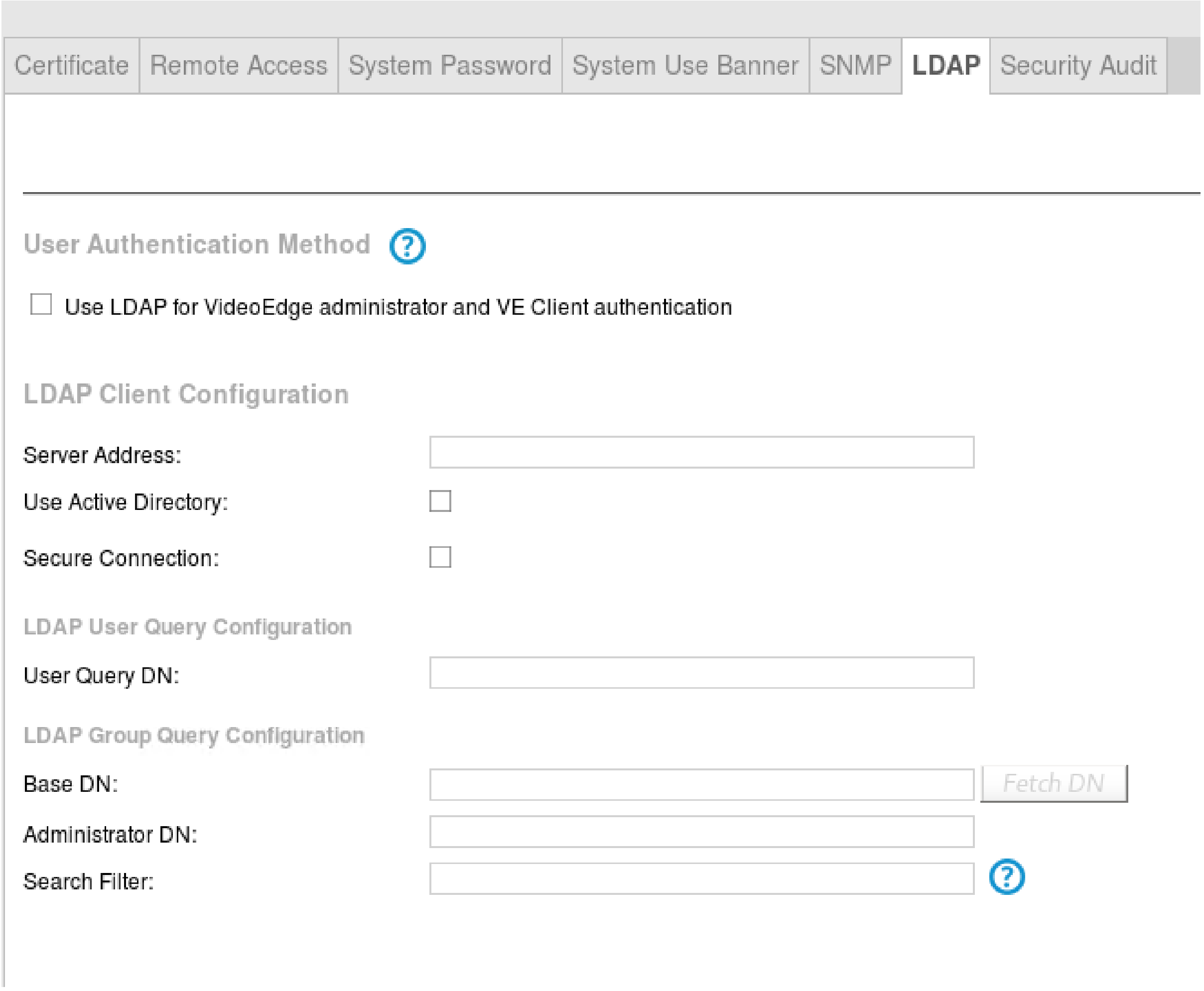
Figure 20



To enable LDAP authentication, including configurations for Active Directory, in VideoEdge access the Security configuration, LDAP tab of the VideoEdge system menu and complete the configuration form.

- From the **System menu**, click **Security configuration**, then click the **LDAP** tab.

System menu – Security configuration – LDAP tab
Figure 21



User Authentication Method

□ Use LDAP for VideoEdge administrator and VE Client authentication

LDAP Client Configuration

Server Address:	
Use Active Directory:	□
Secure Connection:	□

LDAP User Query Configuration

User Query DN:	

LDAP Group Query Configuration

Base DN:	
Administrator DN:	
Search Filter:	

Hardening step 5.1: Configure LDAP

LDAP may be enabled for VideoEdge administrator and VideoEdge Client authentication. It is recommended that the LDAP communication utilize the secure connection setting which validates the presence of a Certificate Authority signed certificate.

Table 13

	MINIMUM BASELINE PROTECTION	TO STRENGTHEN PROTECTION
Use LDAP for VideoEdge administrator and VE client authentication	☑ (checked)	☑ (checked) is the strongest setting
Secure connection	☑ (checked)	☑ (checked) is the strongest setting

Note: If the LDAP server is offline, access to the VideoEdge Administration Interface/VideoEdge Client can only be achieved using the local on board credentials.

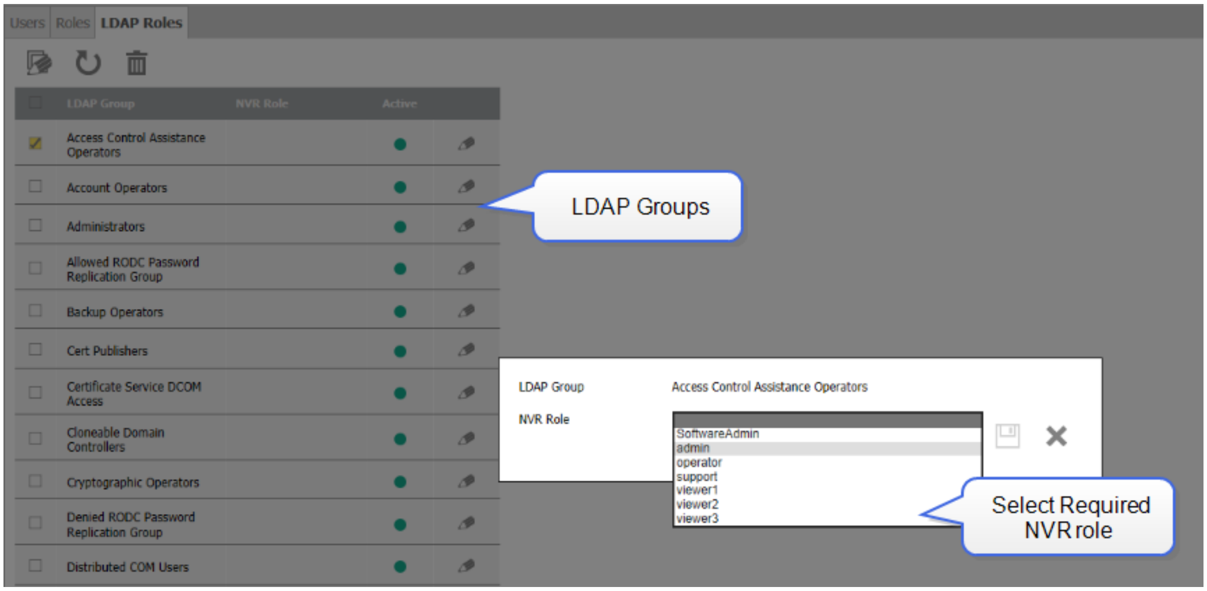
System menu - LDAP Role configuration

Once an LDAP server has been configured on VideoEdge, you can link LDAP Groups to VideoEdge Roles. This means that all users in the LDAP Group will be assigned the linked role on VideoEdge.

Hardening step 5.2: Configure LDAP Roles

Map each role within VideoEdge that will support LDAP users to the respective LDAP group.

Figure 22



☐	LDAP Group	NVR Role	Active	
☑	Access Control Assistance Operators		●	✎
☐	Account Operators		●	✎
☐	Administrators		●	✎
☐	Allowed RODC Password Replication Group		●	✎
☐	Backup Operators		●	✎
☐	Cert Publishers		●	✎
☐	Certificate Service DCOM Access		●	✎
☐	Cloneable Domain Controllers		●	✎
☐	Cryptographic Operators		●	✎
☐	Denied RODC Password Replication Group		●	✎
☐	Distributed COM Users		●	✎

LDAP Group Access Control Assistance Operators

NVR Role

- SoftwareAdmin
- admin
- operator
- support
- viewer1
- viewer2
- viewer3

2.2.6 User management overview

As VideoEdge has been designed as an appliance, users do not need to log on to VideoEdge operating system directly. Software access to VideoEdge is conducted from a remote application or webpage. Some administrators may choose to log on to the Operating system directly to deploy operating system level updates. In such cases, unique operating system level accounts are recommended.

You can create unique user accounts for each operator of the VideoEdge application or webpage. These interfaces support either local accounts or accounts managed by an LDAP compliant server, such as Active Directory.

Operator functions in VideoEdge are controlled by a role-based access control (RBAC) feature set. With RBAC, a user is assigned a role in which they acquire the permissions associated with that role.

The proper configuration of individual user accounts assures that security best practices are followed and that all user actions cannot be repudiated.

2.2.6.1 Password policy configuration

The built-in VideoEdge password policy in non-configurable. In Enhanced Security Mode, you are required to create new user accounts and passwords to replace the default root and VideoEdge accounts.

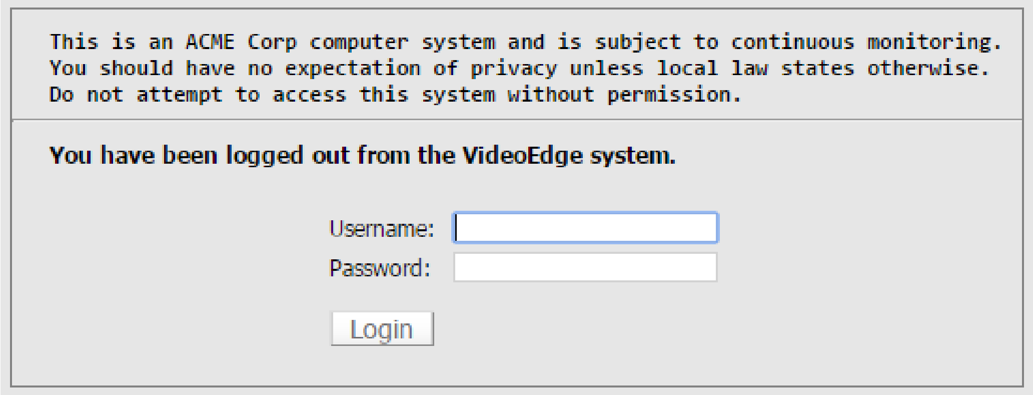
2.2.6.2 System use banner

A System Use Banner provides the operator with details on the system use policy they must comply with in other to use the system. The banner message text needs to be consistent with applicable laws, executive orders, directives, polices, regulations, standards, and guidance that governs the system use.

This message is displayed prior to the user logon. By logging on to the system the user is acknowledging their acceptance of the policy outlined in the banner

Example:

Figure 23



```
This is an ACME Corp computer system and is subject to continuous monitoring.
You should have no expectation of privacy unless local law states otherwise.
Do not attempt to access this system without permission.
```

You have been logged out from the VideoEdge system.

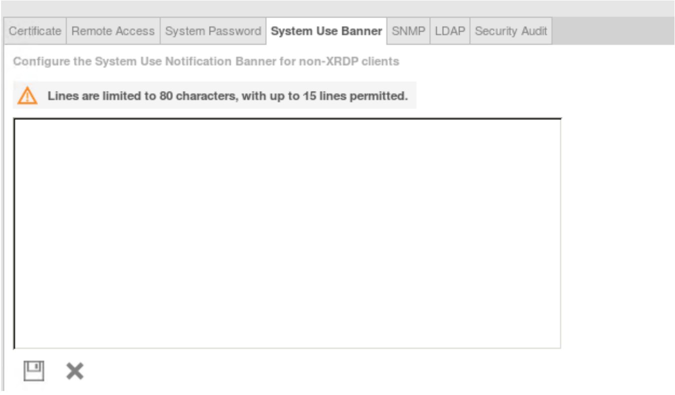
Username:

Password:

Hardening step 6: Configure the system use banner

You can configure the system use banner from the System Configuration menu, System Use Banner tab. Entry of the message can utilize text or an image.

Figure 24



Configure the System Use Notification Banner for non-XRDP clients

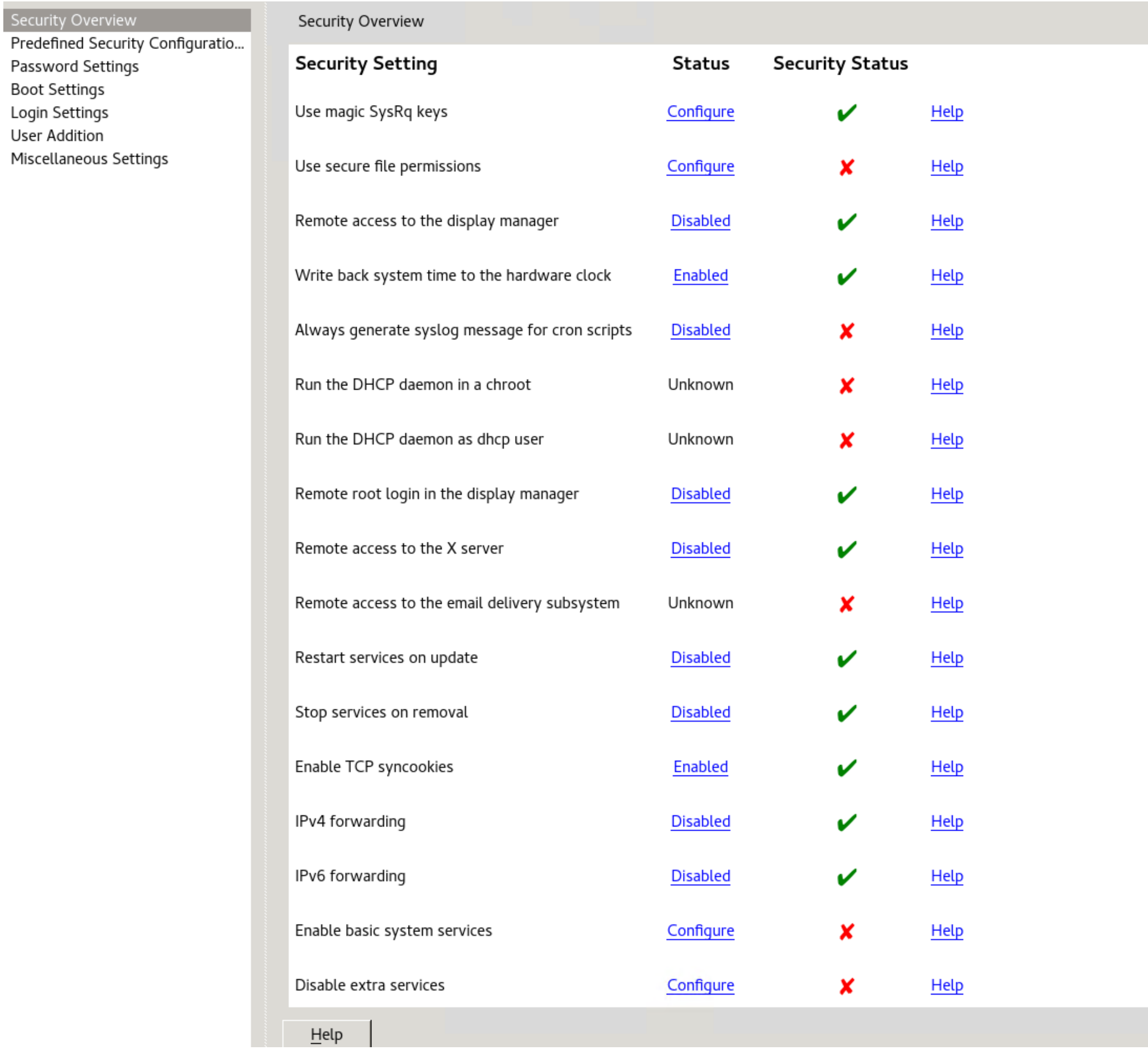
⚠ Lines are limited to 80 characters, with up to 15 lines permitted.

2.3.0 Additional operating system hardening

You can perform additional operating system hardening using YaST.

When the Security Center and Hardening tool is opened, it displays a security overview by default showing the status of the security features as either enabled or disabled:

Figure 25



Security Setting	Status	Security Status	
Use magic SysRq keys	Configure	✓	Help
Use secure file permissions	Configure	✗	Help
Remote access to the display manager	Disabled	✓	Help
Write back system time to the hardware clock	Enabled	✓	Help
Always generate syslog message for cron scripts	Disabled	✗	Help
Run the DHCP daemon in a chroot	Unknown	✗	Help
Run the DHCP daemon as dhcp user	Unknown	✗	Help
Remote root login in the display manager	Disabled	✓	Help
Remote access to the X server	Disabled	✓	Help
Remote access to the email delivery subsystem	Unknown	✗	Help
Restart services on update	Disabled	✓	Help
Stop services on removal	Disabled	✓	Help
Enable TCP syncookies	Enabled	✓	Help
IPv4 forwarding	Disabled	✓	Help
IPv6 forwarding	Disabled	✓	Help
Enable basic system services	Configure	✗	Help
Disable extra services	Configure	✗	Help

To refresh the status, the security center and hardening tool will need to be closed and re-launched.

Hardening step 7: Security center and hardening configuration

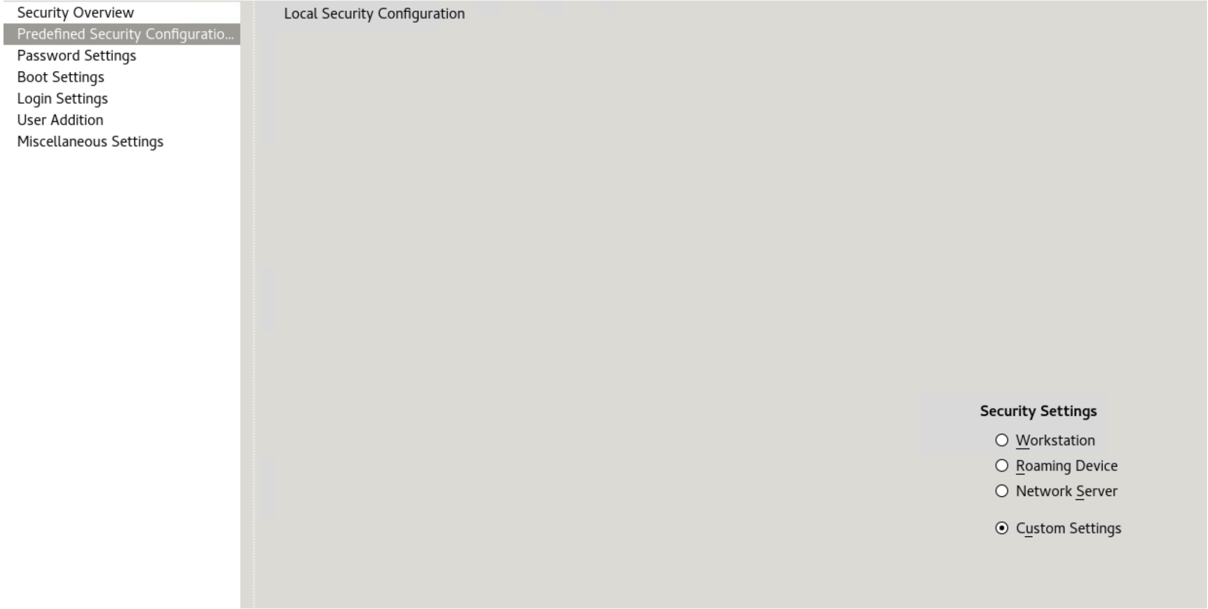
In this section you can find information on the security center and hardening configuration

Hardening step 7.1: Select a predefined or custom security configuration

There are four predefined security configurations to choose from: **Workstation, Roaming Device, Network Server** or **Custom Settings**.

1. From Security Center and Hardening tool, select **Predefined Security Configuration**.

Figure 26



Local Security Configuration

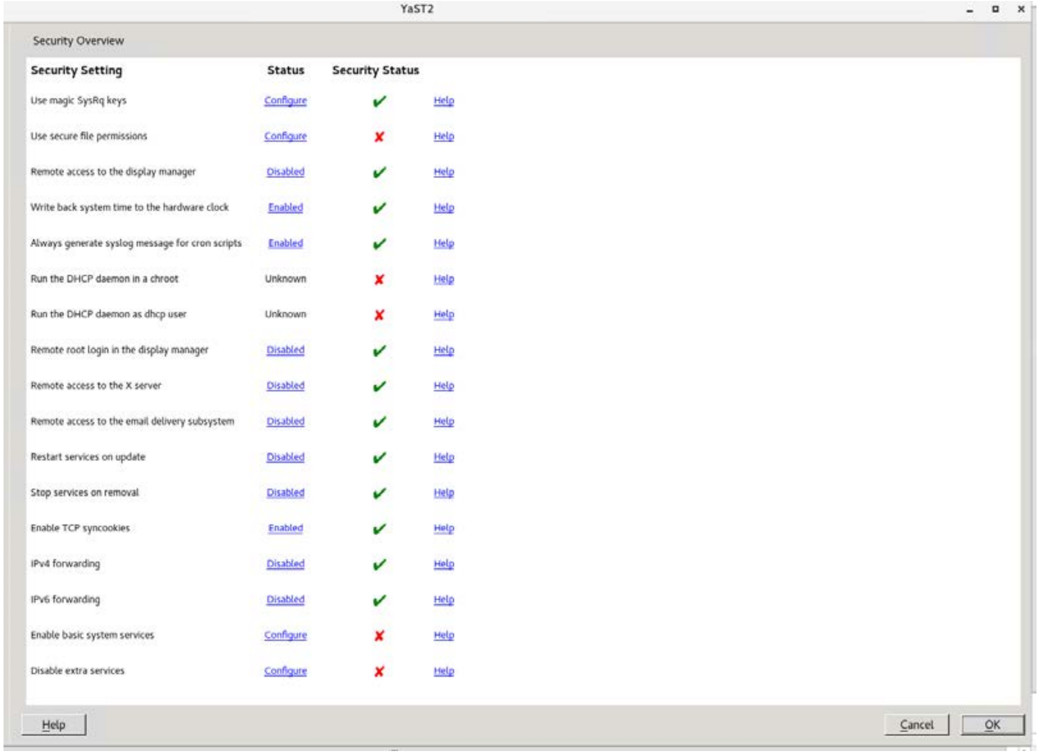
Security Settings

○ Workstation
○ Roaming Device
○ Network Server

● Custom Settings

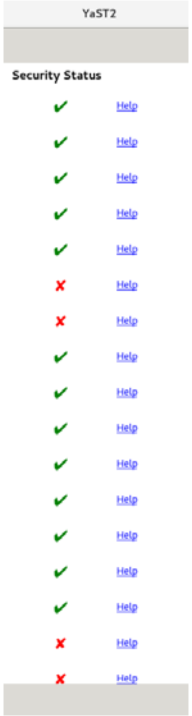
2. Configure your workstation and network to the following settings:

Figure 27



Security Overview

Security Setting	Status	Security Status	
Use magic SysRq keys	Configure	✓	Help
Use secure file permissions	Configure	✗	Help
Remote access to the display manager	Disabled	✓	Help
Write back system time to the hardware clock	Enabled	✓	Help
Always generate syslog message for cron scripts	Enabled	✓	Help
Run the DHCP daemon in a chroot	Unknown	✗	Help
Run the DHCP daemon as dhcp user	Unknown	✗	Help
Remote root login in the display manager	Disabled	✓	Help
Remote access to the X server	Disabled	✓	Help
Remote access to the email delivery subsystem	Disabled	✓	Help
Restart services on update	Disabled	✓	Help
Stop services on removal	Disabled	✓	Help
Enable TCP syncookies	Enabled	✓	Help
IPv4 forwarding	Disabled	✓	Help
IPv6 forwarding	Disabled	✓	Help
Enable basic system services	Configure	✗	Help
Disable extra services	Configure	✗	Help



Security Status	
✓	Help
✓	Help
✓	Help
✓	Help
✓	Help
✗	Help
✗	Help
✓	Help
✓	Help
✓	Help
✓	Help
✓	Help
✓	Help
✓	Help
✓	Help
✗	Help
✗	Help

Table 14

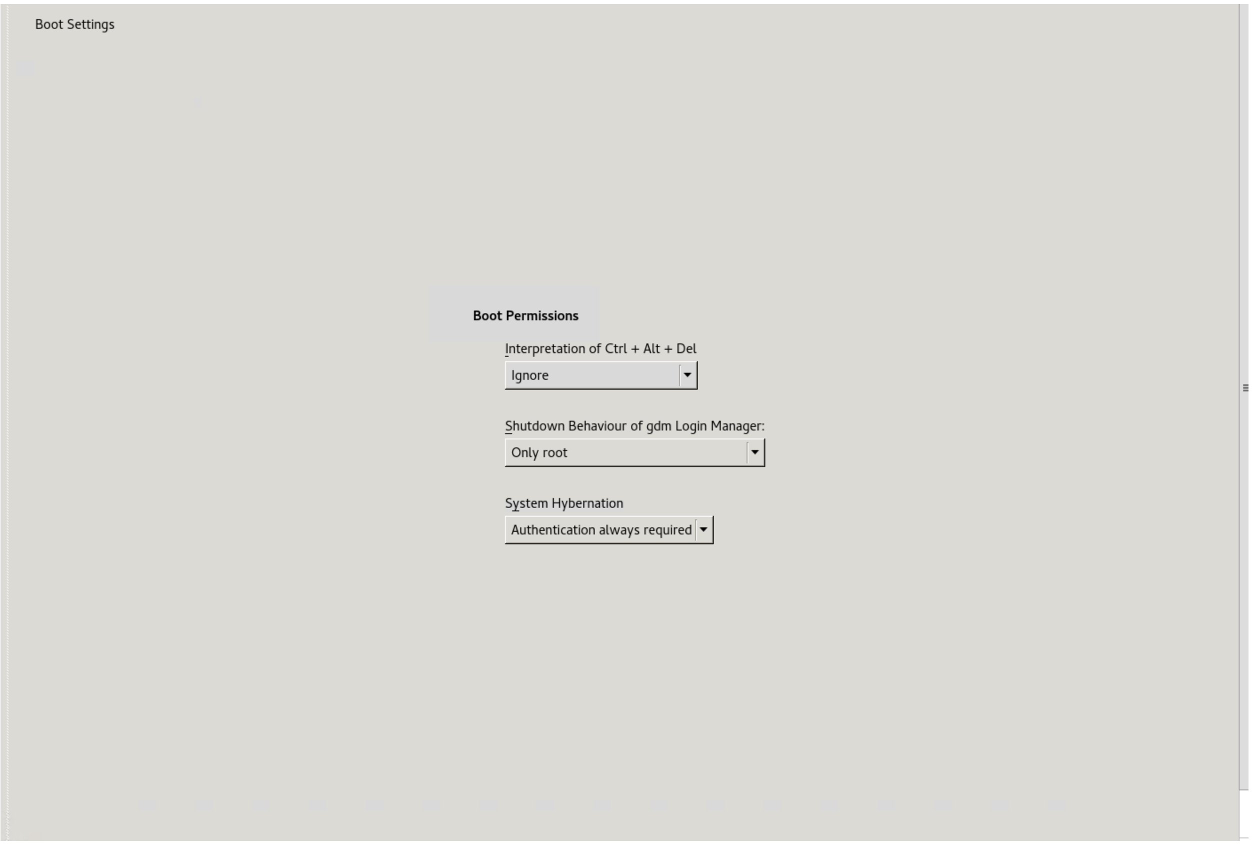
	MINIMUM BASELINE PROTECTION	TO STRENGTHEN PROTECTION
CHECK NEW PASSWORDS	☑ Network Server	☑ Custom Settings select Network Server + additional protection

The network configuration adds in use of secure file permissions of the workstation profile. A custom profile provides the flexibility to configure specific settings tailored for the target environment. The **Roaming Device** profile is not suitable because the VideoEdge hardware is stationary.

Hardening step 7.2: Set boot permissions

In the security center and hardening you can set boot permissions. The administrator is able to set what the system will do when a user executes Ctrl+Alt+Delete. You can restrict shutdown to root only and set the system to require authentication in order to hibernate the NVR.

Figure 28



Boot Settings

Boot Permissions

Interpretation of Ctrl + Alt + Del: Ignore

Shutdown Behaviour of gdm Login Manager: Only root

System Hybernation: Authentication always required

Table 15

	MINIMUM BASELINE PROTECTION	TO STRENGTHEN PROTECTION
INTERPRETATION OF CTRL + ALT + DEL	Reboot	Ignore
SHUTDOWN BEHAVIOR OF GDM	Only root	Only root is the strongest setting
SYSTEM HYBERNATION	User on console	Authentication always required

Hardening step 8: Modify TLS version

Integrated Driver Service only supports TLS 1.2 and above. To modify the TLS version in Windows complete the following steps:

1. In Windows open the **Control Panel**.
2. Click **Control Panel** > **Internet Options**.
3. Click **Advanced**.
4. Enable the appropriate TLS version for VideoEdge and any other applications.
5. Click **Apply**.
6. Click **OK**.

2.4.0 Software updates

Here you can find information on software updates including operating system updates, VideoEdge application updates, and camera updates.

2.4.1 Operating System updates

Hardening step 9: Update software

VideoEdge should be updated to the current released version with all applicable patches applied during and after the commissioning process. Applying security patches assists in mitigating known vulnerabilities. It is important that any known issue is addressed, even during the commissioning process.

Hardening step 9.1: Update operating system software

Operating system updates are distributed with each release of VideoEdge. To update the operating system, run the most current update of VideoEdge. Refer to Hardening step 8.2, Update VideoEdge software, to update the operating system to latest supported version.

2.4.2 VideoEdge application updates

You can apply VideoEdge software updates or patches using the softwareadmin user credential.

The current version of the installed software is displayed. To update the software you must upload a new software package and then install the update.

Caution: NVR Services cease during a software update; this results in a pause in recording until the operation is completed and the system reboots. You will be prompted to reboot the VideoEdge when the update completes.

Hardening step 9.2: Update VideoEdge software

1. Log on using the Softwareadmin user credential.
2. Enter **softwareadmin** in the **username** field.
3. Enter your password.

Note: The default password for the softwareadmin user credential is softwareadmin. This password will have been changed with successful completion of hardening step 4.4

The Update Software page opens.

4. Click **Browse**.
5. Select the update or patch file and click **Open**.
6. The name and file path of the patch file appears in the **Upload New Package** field.
7. Click **Upload**.
8. The uploaded package is displayed in the **Uploaded Packages** list.
9. Select the new package from the list and click **Install**.

Note: The software upgrade process will interrupt recording and the recorder will automatically reboot, as necessary.

1. Once the NVR has been rebooted, select the uploaded package and click **Delete**.
2. Select **Logout**.
3. A dialog box opens asking 'Are you sure you want to logout?'
4. Click **OK**.

2.4.3 Camera updates

Hardening step 9.3: Update camera firmware

To apply firmware updates navigate to the **Video Edge Administrator Update Camera Firmware** page, and enter the **softwareadmin** user credential. The **Update Camera Firmware** page lists the cameras currently added to the VideoEdge whose firmware can be updated. To update camera firmware, upload a new camera firmware package and install the update. A progress status displays to the right of the camera table.

Note: Firmware uploaded for a camera model is deleted and replaced with any firmware subsequently uploaded for that same model.

2.5.0 Communication hardening

Communication hardening limits an attacker's ability to gain access to VideoEdge. Attackers look for weakness in communication protocols, and communications that is left on encrypted and unauthenticated include the risk that the attacker will be successful in their efforts. Employ techniques to harden the communication interfaces and the transmission of data within this section.

2.5.1 Communication management best practices

Communication to and from the VideoEdge NVR should be configured according to the principal of least functionality.

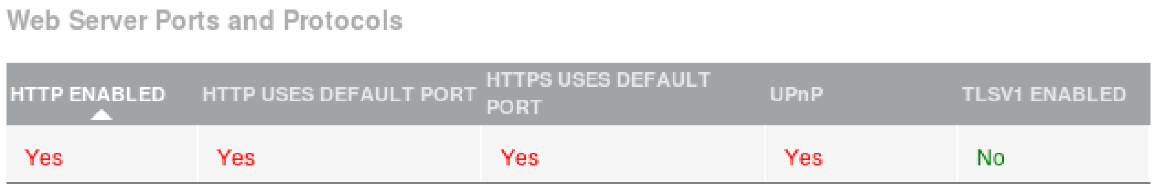
Least functionality is a security measure designed to limit functions only to those required for the target application and communication sessions used at a given time. In configuring components in this manner, the attack surface is reduced and with it the risk of a cybersecurity breach is minimized.

2.5.2 Communication port and encryption configuration

The communication ports settings for VideoEdge are available within the System and Network pages of VideoEdge administrator.

Note: The Security Audit page, Ports and Protocols section displays of summary of which ports and protocols are enabled.

Figure 32



Web Server Ports and Protocols

HTTP ENABLED	HTTP USES DEFAULT PORT	HTTPS USES DEFAULT PORT	UPnP	TLSV1 ENABLED
Yes	Yes	Yes	Yes	No

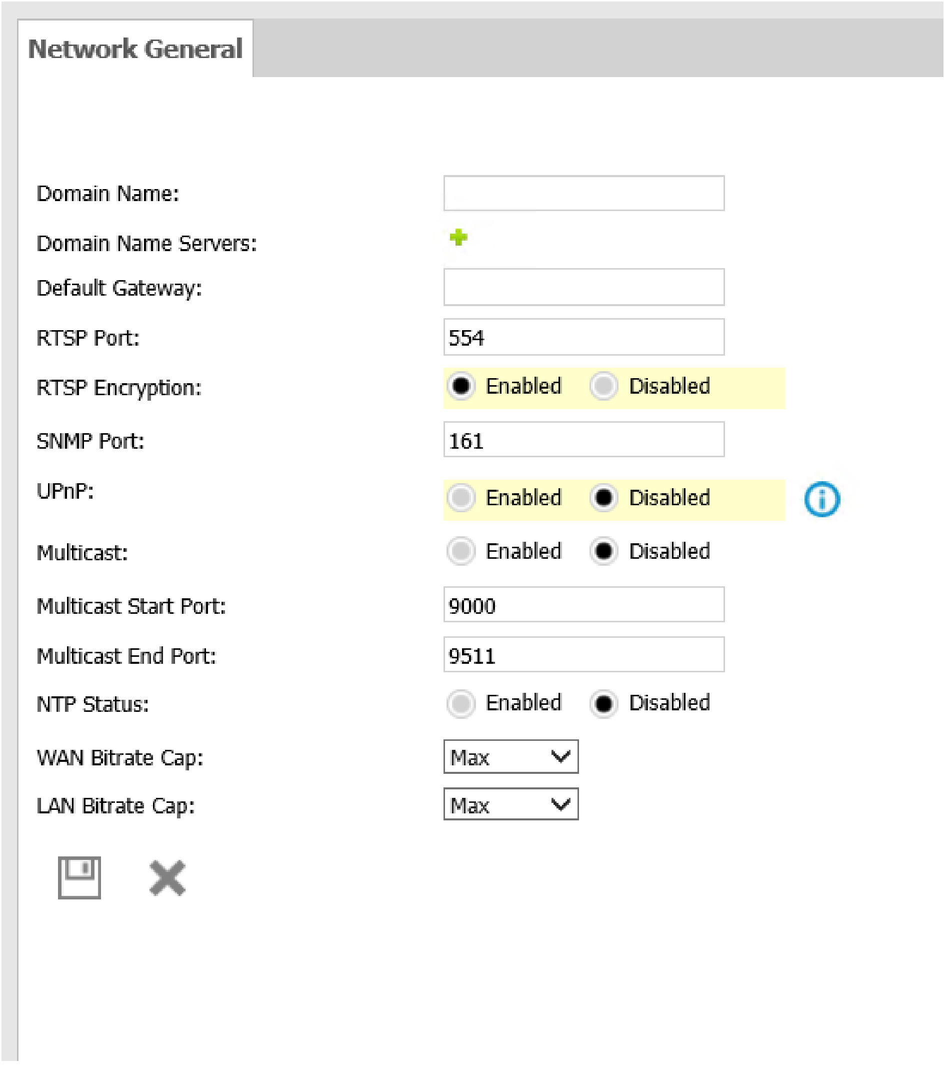
Hardening Step 10: Configure communication ports and encryption

In this section you can find information on configuring communication ports and encryption.

Hardening step 10.1: Configure ports using the network, general page

From the Network General page, it is possible to configure the PTSP port, SNMP, UpnP, Multicast, NTP ports:

Figure 33



Network General

Domain Name:	
Domain Name Servers:	
Default Gateway:	
RTSP Port:	554
RTSP Encryption:	● Enabled ○ Disabled
SNMP Port:	161
UPnP:	○ Enabled ● Disabled
Multicast:	○ Enabled ● Disabled
Multicast Start Port:	9000
Multicast End Port:	9511
NTP Status:	○ Enabled ● Disabled
WAN Bitrate Cap:	Max
LAN Bitrate Cap:	Max

RTSP Port – This port is required for communications with cameras that are configured to stream video over RTSP. The default port value of 554 is configurable.

RTSP Encryption – Using the RTSP Encryption feature victor and VideoEdge NVR can transmit RTSP credentials and RTSP commands (Describe, Options, Setup, Play, Teardown, and Announce) over a secure, encrypted TLS tunnel. Additionally, authentication is done through TLS certificates.

SNMP Port – This is the port that the Simple Network Management Protocol (SNMP) is sent over. The NVR uses SNMP for communication purposes when using the NVR Groups functionality. If required you can modify the default SNMP port for your NVR to conform to your network rules. The default port value of 161 is configurable.

UPnP – Should only be used during commissioning to aid with the discovery process. Once devices are discover, UPnP should be disabled. By default the NVR sends UPnP advertisements to allow victor unified client to discover it on a network.

Multicast – Is used to provide streams to connected clients. However, its use can utilize more network resources and can impact system availability. Use of multicast is generally discouraged from a hardening perspective because it can impact system availability. When multicast is enabled the port range is defined by the configurable start and end port fields.

NTP – Is used to synchronize time throughout the network to an external NTP server. Its use is encouraged for system hardening because it assures that all logs are referencing the same time. When enable NTP will use port 123.

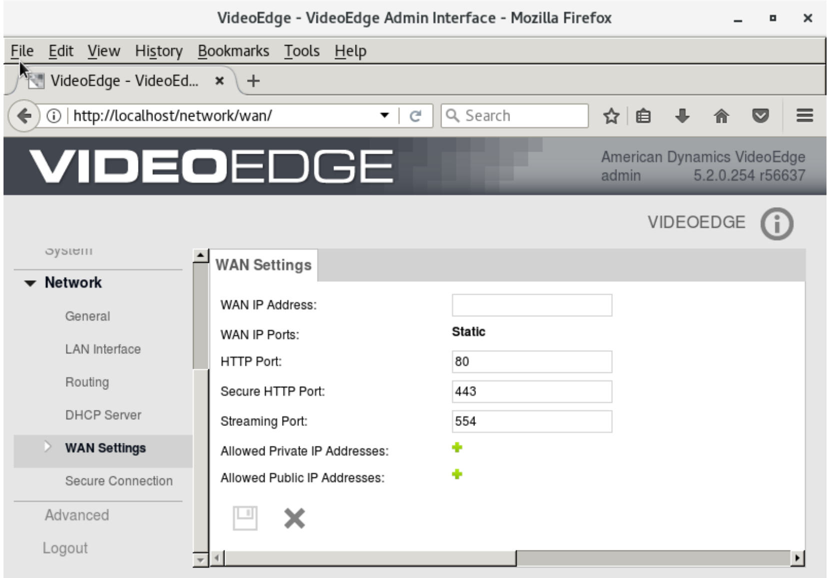
Table 16

	MINIMUM BASELINE PROTECTION	TO STRENGTHEN PROTECTION
RTSP ENCRYPTION	⦿ (Enabled)	⦿ (Enabled) is the strongest setting
UPNP	⦿ (Enabled) during commissioning only	⦿ (Disabled) after commissioning
MULTICAST	Use if required	⦿ (Disabled)
NTP STATUS	⦿ (Enabled)	⦿ (Enabled) is the strongest setting

WAN and LAN Bitrate Caps - To assist network balancing you can assign both a WAN and LAN bitrate cap. A bitrate cap limits the amount of streaming data (video) leaving the NVR to remote clients or clients connected using VPN. You can set the WAN and LAN bitrate caps to either a predefined value from the dropdown menus or alternatively you can enter a custom value in the field.

Hardening step 10.2: Configure ports using the network, WAN Settings page

Figure 34



WAN Settings

WAN IP Address:

WAN IP Ports: Static

HTTP Port: 80

Secure HTTP Port: 443

Streaming Port: 554

Allowed Private IP Addresses:

Allowed Public IP Addresses:

HTTP Port – This port is used for all non-secure web communications. The default value of 80 is configurable.

Secure HTTP Port – This port is used for all secure web communications. The default value of 443 is configurable.

Streaming Port – This is the port number used for the real time streaming protocol (RTSP) connection to this NVR if more than one NVR is behind the NAT firewall, when video is being streamed to a client programmatically by RTSP. Port 554 is the default port for RTSP connection. However, if two NVRs are behind the same NAT firewall, they are both exposed as the same public address, so the only way to distinguish between them is to set up port forwarding rules at the firewall level. This means that both NVRs listen on port 554 for HTTPS requests but that publicly NVR1 might be contactable as https://70.30.22.81:554, while NVR2 is contactable as https://70.30.22.81:100554. The firewall is configured to accept NVR2 requests at https://70.30.22.81:100554 and forward them to https://<NVR2 private IP>:554.

This field must be set in scenarios where multiple NVRs are situated behind the same NAT firewall. In this example, this field on NVR2 must be set to 10554.

Allowed Private IP - These are the private IP addresses that are permitted for use with the VideoEdge:

- 10.0.0.0 - 10.255.255.255
- 172.16.0.0 - 172.31.255.255
- 192.168.0.0 - 192.168.255.255

You can add a maximum of 20 Allowed IP Addresses to the VideoEdge.

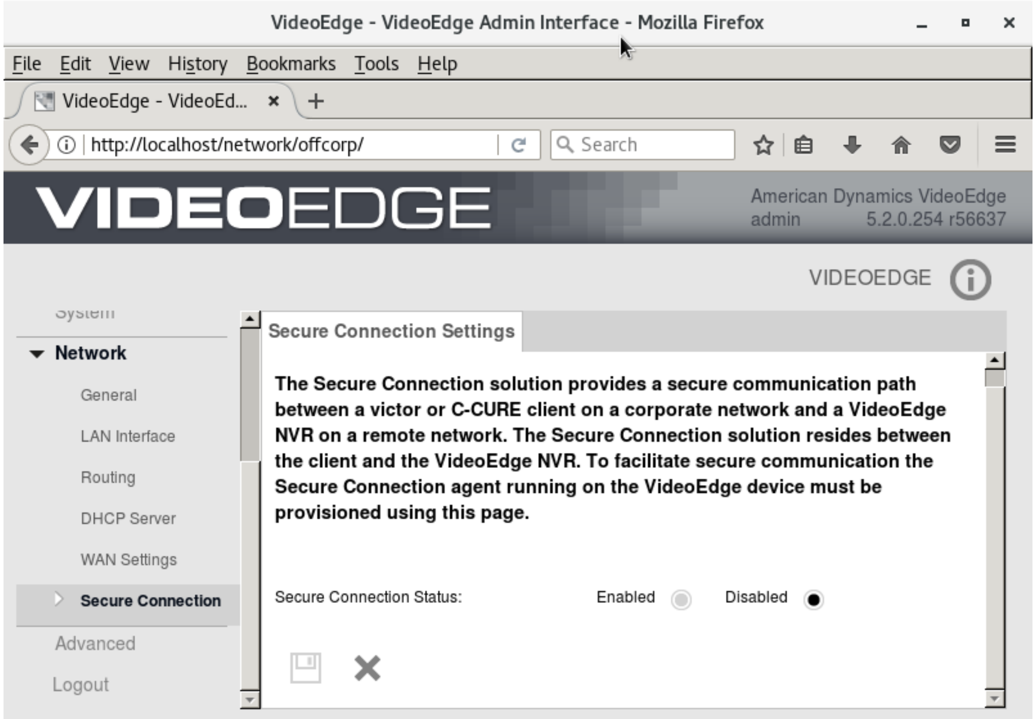
Public IP Addresses - A public IP address is one that is not within the Private IP ranges

Hardening step 10.3: Configure ports using the network, secure connect page

From the Secure Connection page, you can enable or disable victor Secure Connection software.

This system provides a secure communication path between a victor Security System Server on a corporate network and a VideoEdge NVR on a remote network.

Figure 35



Secure Connection Settings

The Secure Connection solution provides a secure communication path between a victor or C-CURE client on a corporate network and a VideoEdge NVR on a remote network. The Secure Connection solution resides between the client and the VideoEdge NVR. To facilitate secure communication the Secure Connection agent running on the VideoEdge device must be provisioned using this page.

Secure Connection Status: Enabled ○ Disabled ●

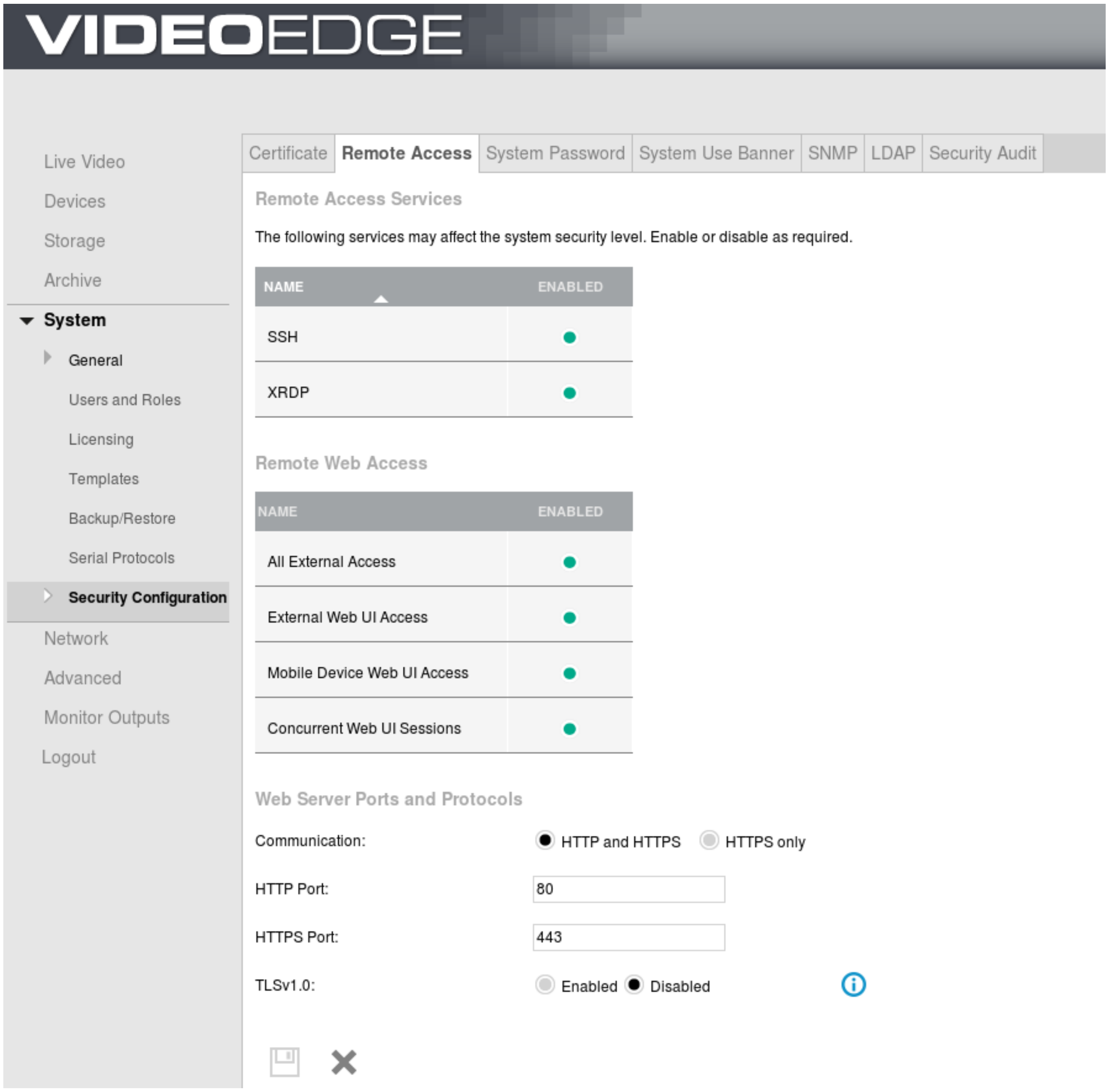
Table 17

	MINIMUM BASELINE PROTECTION	TO STRENGTHEN PROTECTION
SECURE CONNECTION STATUS	⦿ (Enabled) if connecting with victor or C-Cure, otherwise disabled.	

Hardening step 10.4: Configure ports using the system page, remote access tab

Using the remote access tab the administrator can enable or disable remote access services, restrict or disable web and mobile access, and change ports used for HTTP and HTTPS communications.

Figure 36



Remote Access Services

The following services may affect the system security level. Enable or disable as required.

NAME	ENABLED
SSH	●
XRDP	●

Remote Web Access

NAME	ENABLED
All External Access	●
External Web UI Access	●
Mobile Device Web UI Access	●
Concurrent Web UI Sessions	●

Web Server Ports and Protocols

Communication: ● HTTP and HTTPS ○ HTTPS only

HTTP Port: 80

HTTPS Port: 443

TLSv1.0: ○ Enabled ● Disabled

The remote access services VideoEdge supports are SSH and RDP

SSH (Secure Shell) - is an encrypted network protocol for text based sessions on remote machines (for example, VideoEdge) from another machine that has network access. 'PuTTY' is a common piece of software used to access remote machines by SSH.

To avoid having to logon to the VideoEdge server directly, the SSH interface can provide remote administrative access for those familiar with command line interfaces.

RDP (Remote Desktop Protocol) - is a graphical desktop sharing protocol developed by Microsoft. It allows control of remote machines (for example, VideoEdge) from another machine that has network access. Using the 'Remote Desktop Connection' available in Windows you can access remote machines using the VideoEdge's XRDP client.

To avoid having to logon to the VideoEdge server directly, the XRDP can provide remote administrative access.

HTTPS is the secure version of HTTP, the protocol over which data is sent between your browser and the website that you are connected to. The 'S' at the end of HTTPS stands for 'Secure'. It means all communications between your browser and the website are encrypted. It is recommend that you use HTTPS only. It is also recommended that you change default ports to help defend against non-targeted attacks.

Table 18

	MINIMUM BASELINE PROTECTION	TO STRENGTHEN PROTECTION
RTSP ENCRYPTION	⦿ (Enabled)	⦿ (Enabled) is the strongest setting
UPNP	⦿ (Enabled) during commissioning only	⦿ (Disabled) after commissioning
MULTICAST	Use if required	⦿ (Disabled)
NTP STATUS	⦿ (Enabled)	⦿ (Enabled) is the strongest setting

Tip: The Security Audit tab, *Remote Access* section displays which remote access protocols are enabled, what the current certificate setting are. It also displays if a certificate Authority is installed, SNMP settings and system robustness.

SSH: Secure Shell is a cryptographic network protocol for secure data communication. Using the SSH protocol on the VideoEdge NVR you can get remote access to the server, and is also used for failover functionality. (default port 22 – not configurable, disabled by default)
xRDP: Using Microsoft Remote Desktop Protocol you can get remote desktop access to the VideoEdge NVR. (default port 3389- not configurable, disabled by default)
TLS: Transport Layer Security is a protocol used for encrypted communication such as HTTPS. It replaces the SSL (Secure Socket Layer) protocol now obsolete. (default port 443 – configurable, TLS 1.2 enabled by default, TLS 1.0 disabled by default)

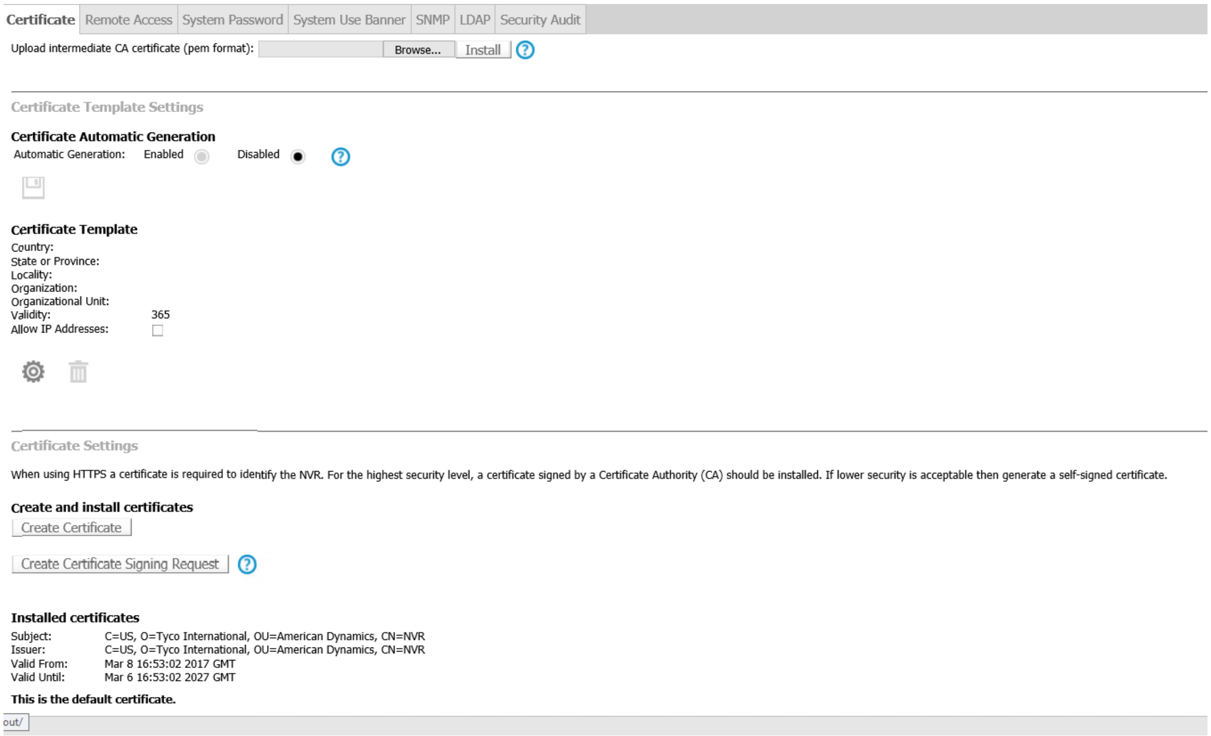
2.5.3 Communication certificate support

HTTPS encrypts web traffic, but does not verify the identity of the remote host without a properly configured digital certificate. VideoEdge NVRs allow you to create a certificate that is unique to the individual NVR so your web browser or victor client can verify its identity. The certificate can be self-signed, or for more security-conscious customers, a trusted certificate authority can sign it. VideoEdge certificates use 2048-bit keys.

Victor Client can use the digital certificate feature in VideoEdge NVRs to ensure that communications between the two are secure and to verify the identity of recorders added to victor Client. To get instructions on how to install Device Authentication and certificates refer to VideoEdge *NVR Installation and User Guide.*

Hardening step 11: Configure Communication Certificate

Figure 37



Upload intermediate CA certificate (pem format):

Certificate Template Settings

Certificate Automatic Generation

Automatic Generation: Enabled ○ Disabled ●

Certificate Template

Country:
State or Province:
Locality:
Organization:
Organizational Unit:
Validity: 365
Allow IP Addresses: □

Certificate Settings

When using HTTPS a certificate is required to identify the NVR. For the highest security level, a certificate signed by a Certificate Authority (CA) should be installed. If lower security is acceptable then generate a self-signed certificate.

Create and install certificates

Create Certificate

Create Certificate Signing Request

Installed certificates

Subject:	C=US, O=Tyco International, OU=American Dynamics, CN=NVR
Issuer:	C=US, O=Tyco International, OU=American Dynamics, CN=NVR
Valid From:	Mar 8 16:53:02 2017 GMT
Valid Until:	Mar 6 16:53:02 2027 GMT

This is the default certificate.

1. Select the type of certificate to use; automatically generated or from a trusted certificate authority (CA). If using CA generated certificate disable automatic generation and install the CA generated certificate.

Table 19

	MINIMUM BASELINE PROTECTION	TO STRENGTHEN PROTECTION
AUTOMATIC GENERATION	Enabled ◉	Disabled ◉ *(must install signed certificate from trusted certificate authority if disabled)*

2. To verify that the certificate is successfully installed view the Installed certificates details. The valid date range should encompass the current date.

Network protection

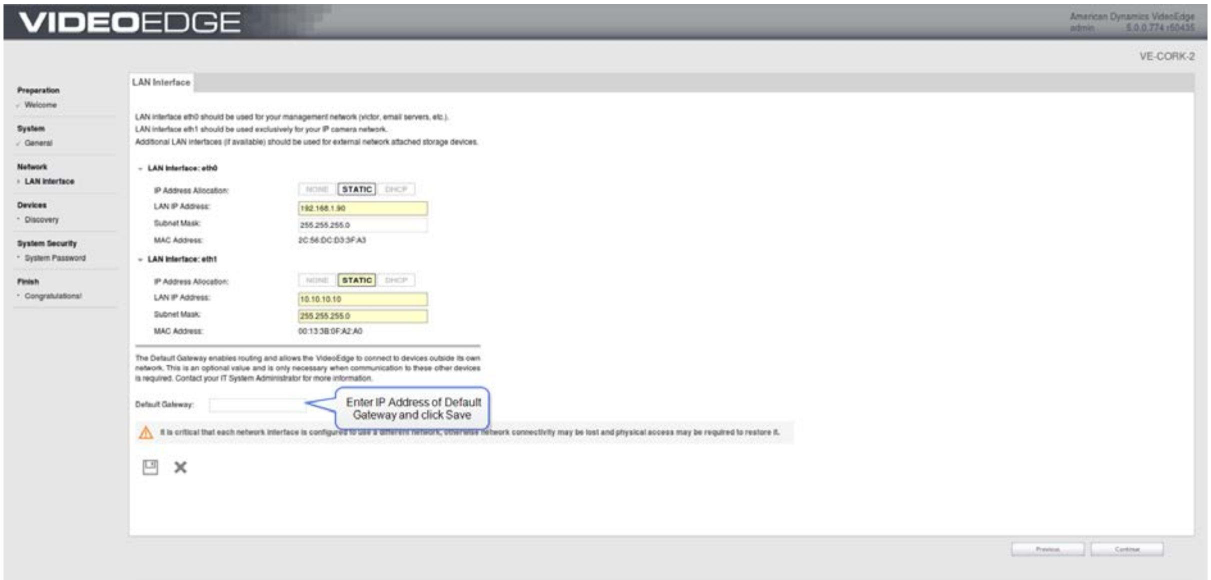
A VideoEdge NVR has multiple network interface controllers (NICs). The NICs are both physically and logically separated by default and can only be bridged by a Linux administrator allowing the NVR to act as a barrier between the camera network and the management network.

Potentially vulnerable cameras are protected from an attack initiated on the production network. Also, if a camera is located where a physical attack is possible, this separation prevents an attacker from gaining access to the production network if the camera port is compromised.

Hardening step 12: Assure cameras are connected to the protected LAN

The protected LAN port is labeled as “eth1.” This port is configured using the VideoEdge Administrator. On first startup the **VideoEdge Setup Wizard** is present this setting:

Figure 38



LAN Interface

LAN interface eth0 should be used for your management network (victor, email servers, etc.).
LAN interface eth1 should be used exclusively for your IP camera network.
Additional LAN interfaces (if available) should be used for external network attached storage devices.

LAN Interface: eth0

IP Address Allocation:	NONE [✓ STATIC] DHCP
LAN IP Address:	192.168.1.90
Subnet Mask:	255.255.255.0
MAC Address:	2C:56:DC:D3:3F:A3

LAN Interface: eth1

IP Address Allocation:	NONE [✓ STATIC] DHCP
LAN IP Address:	10.10.10.10
Subnet Mask:	255.255.255.0
MAC Address:	00:13:3B:0F:A2:A0

The Default Gateway enables routing and allows the VideoEdge to connect to devices outside its own network. This is an optional value and is only necessary when communication to these other devices is required. Contact your IT System Administrator for more information.

Default Gateway:

Enter IP Address of Default Gateway and click Save

⚠ It is critical that each network interface is configured to use a different network, otherwise network connectivity may be lost and physical access may be required to restore it.

Camera security settings

When an IP camera is added to a NVR, the server uses the manufacturer’s default communication and security settings to communicate with the camera.

Administrators can change the default settings of the connected cameras. However, when these are changed the NVR will lose communications with the camera as the NVR will utilize default passwords and non-encrypted communications unless configured manually to match the camera settings.

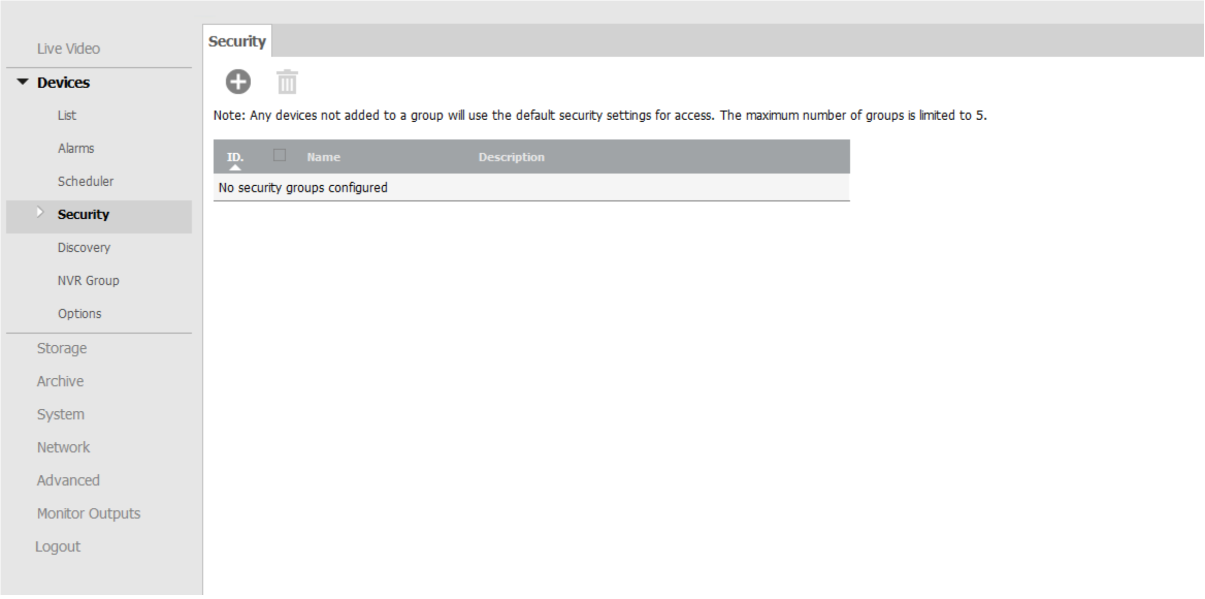
Hardening step 13: Configure camera security settings

To harden camera communications, change the default passwords on all cameras. If a camera supports an encrypted communications method that VideoEdge also supports, such as HTTPS using TLS 1.2, encryption should also be enabled on those cameras.

Once the camera configuration has been changed, through web interfaces, you need to configure VideoEdge with matching settings.

In VideoEdge, a security group is used to simplify the connection of multiple cameras with the same settings and is required to change the communication settings used to connect cameras that are not used default settings. The security group is added from the VideoEdge Administrator Devices Security page.

Figure 39



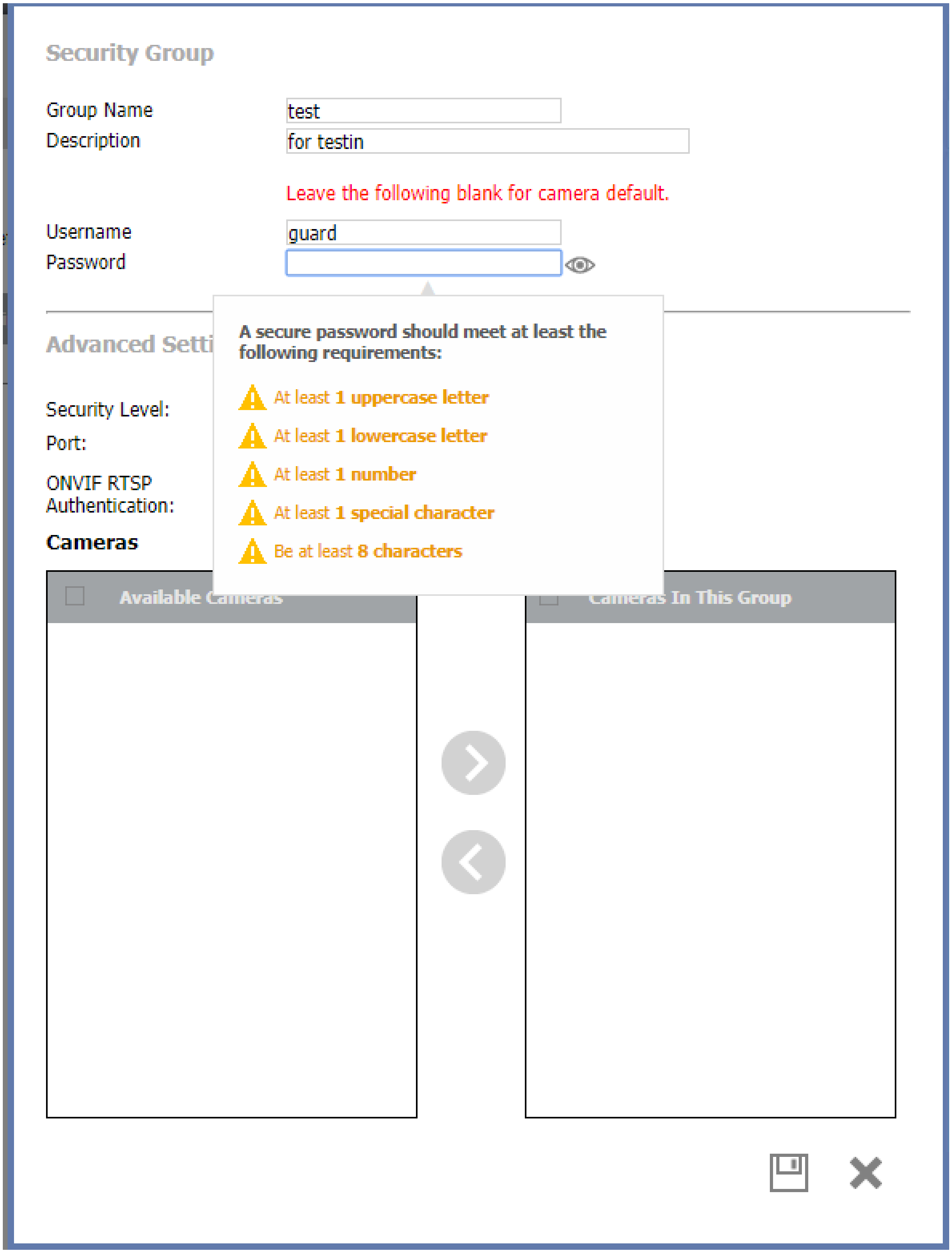
Note: Any devices not added to a group will use the default security settings for access. The maximum number of groups is limited to 5.

ID.	□	Name	Description
No security groups configured			

Once a security group is created, the new password and communication method (labeled as “Security Level” with settings of HTTP/Basic, HTTP/Digest or HTTPS) may be assigned and cameras with the same settings added to that group.

Note: The camera security groups feature is applicable to IP cameras and encoders only. Analog cameras connected directly to the NVR do not have password capabilities.

Figure 40



Security Group

Group Name: test

Description: for testin

Leave the following blank for camera default.

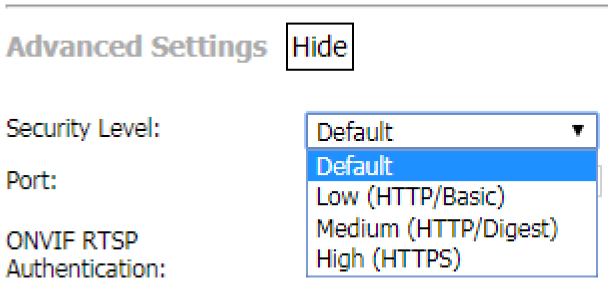
Username: guard

Password:

A secure password should meet at least the following requirements:

- At least **1 uppercase letter**
- At least **1 lowercase letter**
- At least **1 number**
- At least **1 special character**
- Be at least **8 characters**

Figure 41



Security Level: Default

2.5.4 FIPS 140-2 support

Enabling FIPS on 5.6

The 5.0 VideoEdge release includes FIPS packages to allow the OS to run in a FIPS enabled mode. The VideoEdge product is not classified as FIPS compliant and has NOT been through a certification/validation process.

The Federal Information Processing Standard (FIPS) Publication 140-2, (FIPS PUB 140-2), is a U.S. government computer security standard used to approve cryptographic modules. The title is Security Requirements for Cryptographic Modules.

A FIPS module is a cryptographic module which may be comprised of hardware, firmware or software that implements cryptographic functions such as encryption, decryption, digital signatures, authentication techniques and random number generation.

Hardening step 14: Enable FIPS

When FIPS is enabled, both the Linux kernel and some libraries perform extra integrity checks to ensure they have not been tampered with. Additionally, only FIPS compliant crypto algorithms will be allowed. For example, OpenSSL will not allow the use of the deprecated MD5 hash.

FIPS packages are included beginning in VideoEdge NVR version 5.1. However additional command line steps are needed to enable FIPS.

1. Log on to VideoEdge
2. Open a terminal type su – then enter root password
3. Query the current status: /opt/americandynamics/venvr/bin/fipsmode
4. Enable FIPS mode /opt/americandynamics/venvr/bin/fipsmode 1
5. Disable FIPS mode /opt/americandynamics/venvr/bin/fipsmode 0

Changes will take effect upon the next reboot.

2.6.0 Configuring security monitoring features

In this section you can find information on configuring security monitoring features.

2.6.1 Audit logs

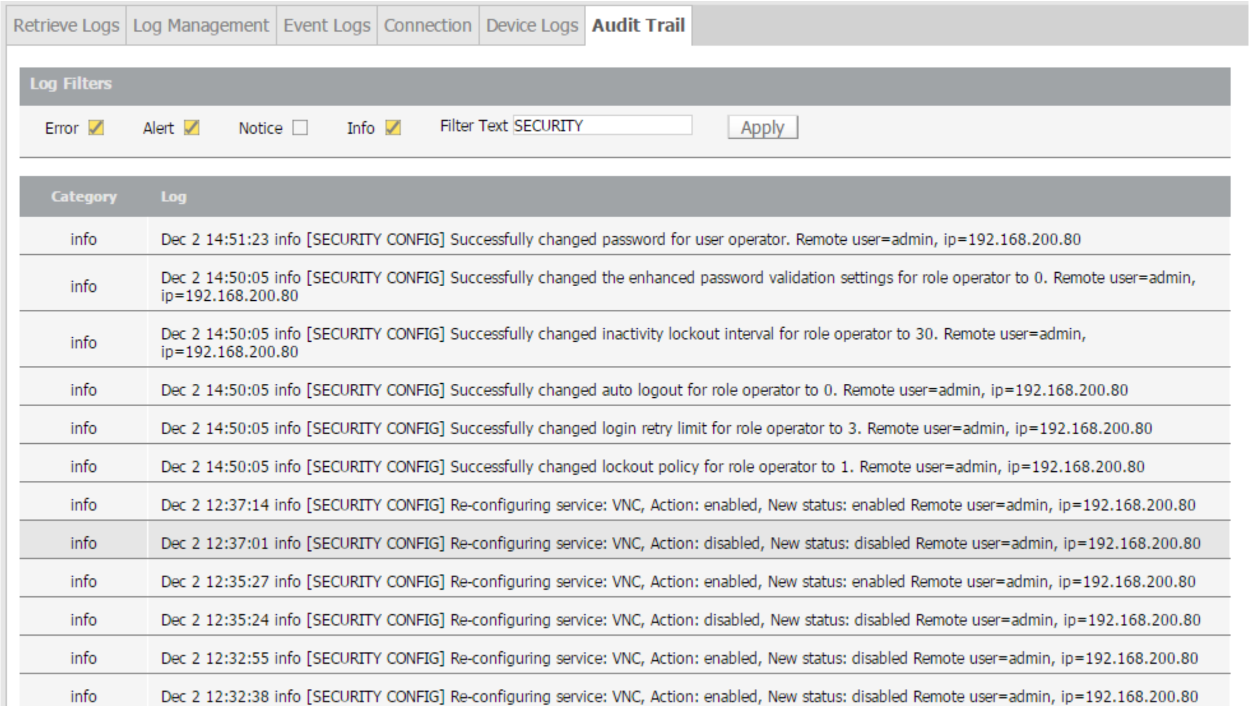
The NVR tracks important types of system events and system operation and stores the data in logs which are useful for troubleshooting and incident investigation. You can view logs data containing administrative changes, camera alerts, changes to cameras, and system events.

The Linux operating system of the NVR generates a number of different log files specific to each function such as general system operation, web server operation, web server errors, and Network time Protocol (NTP) operation.

The VideoEdge server also generates a number of application-specific log files to aid in diagnosing areas such as camera communication and video playback events.

These audit trails keep track of system configuration operations including the configuration of information security controls. An audit log interrogation tool is provided as part of the VideoEdge Administrator Interface. Using the audit log interrogation tool, you can audit events to be queried by severity and searched using a text filter.

Figure 42



Error ☑ Alert ☑ Notice □ Info ☑ Filter Text SECURITY

Category	Log
info	Dec 2 14:51:23 info [SECURITY CONFIG] Successfully changed password for user operator. Remote user=admin, ip=192.168.200.80
info	Dec 2 14:50:05 info [SECURITY CONFIG] Successfully changed the enhanced password validation settings for role operator to 0. Remote user=admin, ip=192.168.200.80
info	Dec 2 14:50:05 info [SECURITY CONFIG] Successfully changed inactivity lockout interval for role operator to 30. Remote user=admin, ip=192.168.200.80
info	Dec 2 14:50:05 info [SECURITY CONFIG] Successfully changed auto logout for role operator to 0. Remote user=admin, ip=192.168.200.80
info	Dec 2 14:50:05 info [SECURITY CONFIG] Successfully changed login retry limit for role operator to 3. Remote user=admin, ip=192.168.200.80
info	Dec 2 14:50:05 info [SECURITY CONFIG] Successfully changed lockout policy for role operator to 1. Remote user=admin, ip=192.168.200.80
info	Dec 2 12:37:14 info [SECURITY CONFIG] Re-configuring service: VNC, Action: enabled, New status: enabled Remote user=admin, ip=192.168.200.80
info	Dec 2 12:37:01 info [SECURITY CONFIG] Re-configuring service: VNC, Action: disabled, New status: disabled Remote user=admin, ip=192.168.200.80
info	Dec 2 12:35:27 info [SECURITY CONFIG] Re-configuring service: VNC, Action: enabled, New status: enabled Remote user=admin, ip=192.168.200.80
info	Dec 2 12:35:24 info [SECURITY CONFIG] Re-configuring service: VNC, Action: disabled, New status: disabled Remote user=admin, ip=192.168.200.80
info	Dec 2 12:32:55 info [SECURITY CONFIG] Re-configuring service: VNC, Action: enabled, New status: disabled Remote user=admin, ip=192.168.200.80
info	Dec 2 12:32:38 info [SECURITY CONFIG] Re-configuring service: VNC, Action: enabled, New status: disabled Remote user=admin, ip=192.168.200.80

2.6.2 SIEM integration

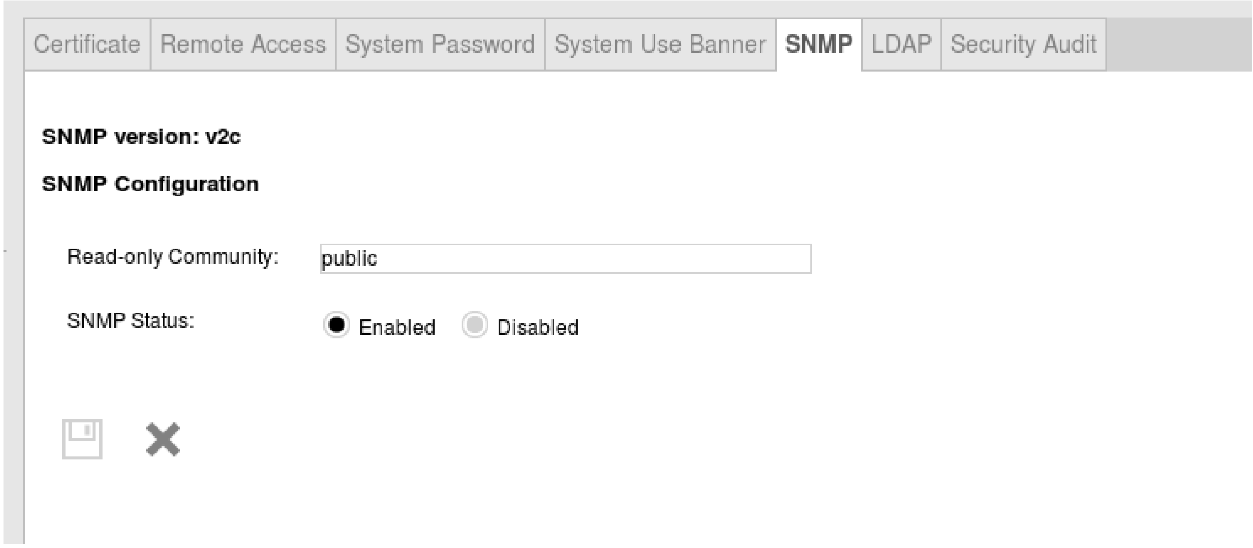
Using a third-party System Information and Event Monitoring (SIEM) tool, it is possible to collect syslog data from VideoEdge.

2.6.3 SNMP

Simple Network Management Protocol (SNMP) governs network management and monitors network devices. It is used on the VideoEdge NVR to monitor the NVR’s status for victor Client health monitoring and failover functionality. VideoEdge uses SNMP v2c for NVR groups, failover, and the various dashboards. It is highly recommended that the community string is changed from public.

Hardening step 15: Configure SNMP

Figure 43



SNMP version: v2c

SNMP Configuration

Read-only Community: public

SNMP Status: ● Enabled ○ Disabled

2.6.4 Security alerts

You can generate security alerts by email under various configurable categories. Email alerts can use authenticated SMTP servers (including Microsoft Exchange) and can encrypt emails using TLS. You can configure these alerts to assist or expand the capabilities of existing security policies including video data retention, camera malfunction, and user access control.

Hardening step 16: Configure alerts

Hardening step 16.1: Configure image tamper detection

To help determine when a camera is being tampered with, the VideoEdge NVR automatically performs an image detection test on every camera to determine if a camera has lost network connection or is broadcasting black video. If this occurs the NVR can send alerts.

This feature should be used in areas where IP cameras are used and at high risk of physical attack. If an IP camera is removed, an attacker can gain access to the network cable connecting the camera. However, when this occurs, VideoEdge can trigger an alarm.

Figure 44

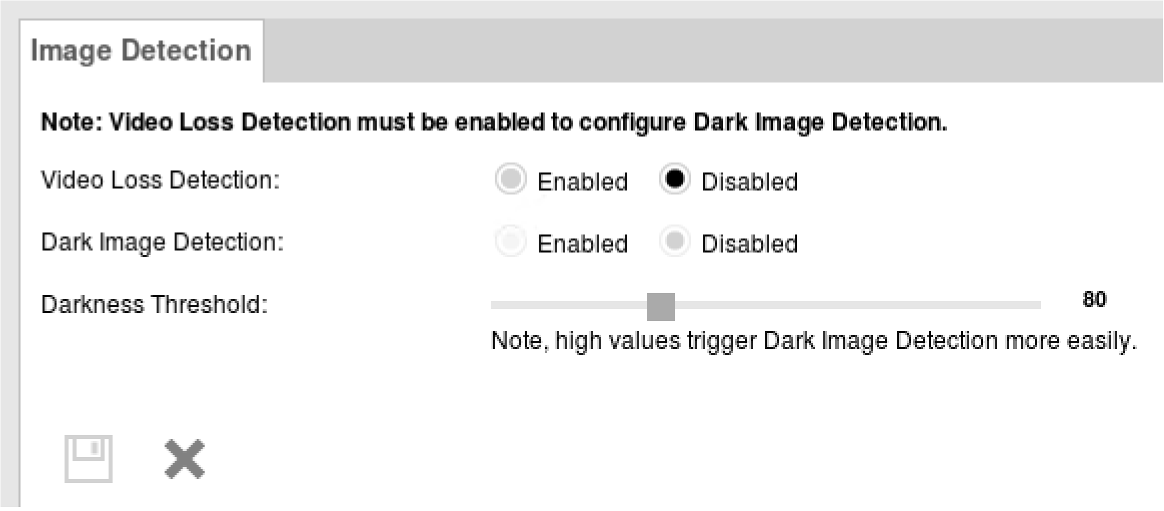


Image Detection

Note: Video Loss Detection must be enabled to configure Dark Image Detection.

Video Loss Detection: ○ Enabled ● Disabled

Dark Image Detection: ○ Enabled ○ Disabled

Darkness Threshold: 80

Note, high values trigger Dark Image Detection more easily.

Table 20

	MINIMUM BASELINE PROTECTION	TO STRENGTHEN PROTECTION
VIDEO LOSS DETECTION	Enabled ⦿	Enabled ⦿ *is the strongest setting*
DARK IMAGE DETECTION	Enabled ⦿	Enabled ⦿ *is the strongest setting*
DARKNESS THRESHOLD	Configure to maximize detection, but minimize false positives. This setting will vary based on camera and lighting conditions.	

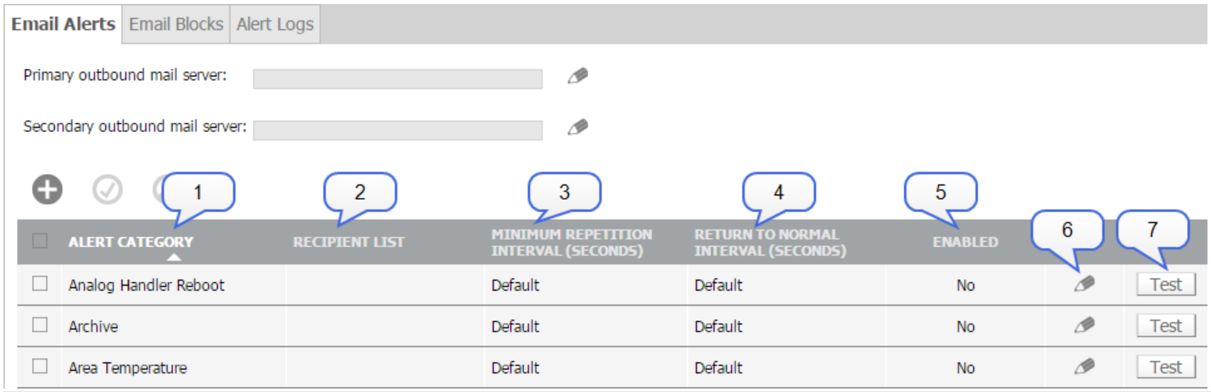
Hardening step 16.2 – Configure email alerts

The **Email Alerts** page consists of the **Email Alerts** tab, the **Email Blocks** tab and the **Alert Logs** tab. You can set up **Email Alerts** in the NVR to send notifications to selected email addresses regarding several different categories.

The **Email Blocks** tab is used to block specified email alerts being sent from specified devices.

Email alerts are configured using the advanced **Email Alerts** tab within VideoEdge Administrator.

Figure 45



Primary outbound mail server:

Secondary outbound mail server:

□	ALERT CATEGORY	RECIPIENT LIST	MINIMUM REPETITION INTERVAL (SECONDS)	RETURN TO NORMAL INTERVAL (SECONDS)	ENABLED		
□	Analog Handler Reboot		Default	Default	No	✎	Test
□	Archive		Default	Default	No	✎	Test
□	Area Temperature		Default	Default	No	✎	Test

Table 21: Email alerts list summary table

FIELD	DESCRIPTION
1. ALERT CATEGORY	Displays the name of the alert type.
2. RECIPIENT	List Displays any recipient email addresses associated with the alert.
3. MINIMUM REPETITION INTERVAL	The minimum time (in seconds) between sending repeat alert emails
4. RETURN TO NORMAL INTERVAL	The time to wait before sending out the "return to normal" email. The alert itself may already have cleared.
5. ENABLED	Displays "Yes" if the alert is enabled.
6. EDIT	Select the edit icon to edit the alert settings.
7. TEST	Select the "Test" button to send a test alert email to the assigned recipients

The Alert Logs tab displays all of the email alerts that have been transmitted. To setup email alerts, refer to VideoEdge *User Guide*. For a full lists of available alerts, see ANNEX D - Email Alerts

2.6.5 Availability hardening

VideoEdge provides a critical function and its continuous operation may be essential for the safety of the building occupants and the contents of the facility. Therefore, it is important that VideoEdge is continuously available for operation.

The backup and restore, and failover server features of VideoEdge help to assure that the system is continuously available.

2.6.6 Backup/Restore

Making frequent backups of the VideoEdge configuration during the commissioning phase can be beneficial if an error is made or lost due to a hardware failure. Once the system is made operational, being able to restore from a good backup minimizes the downtime of the system.

VideoEdge configuration

VideoEdge has a built-in utility to backup and restore the NVR server configuration data. In the event of a system failure, the NVR may be restored to the saved configuration.

Operating system configuration

While Operating System (OS) settings cannot be stored in the configuration backup file, the system will automatically export a text file containing the OS settings once you click the back button. You can use the text file as reference for manually configuring the OS settings.

Video data

Video data, which in not backed up through the built-in utility, should be backed up using archiving (refer to VideoEdge Installation and User Manual page 182).

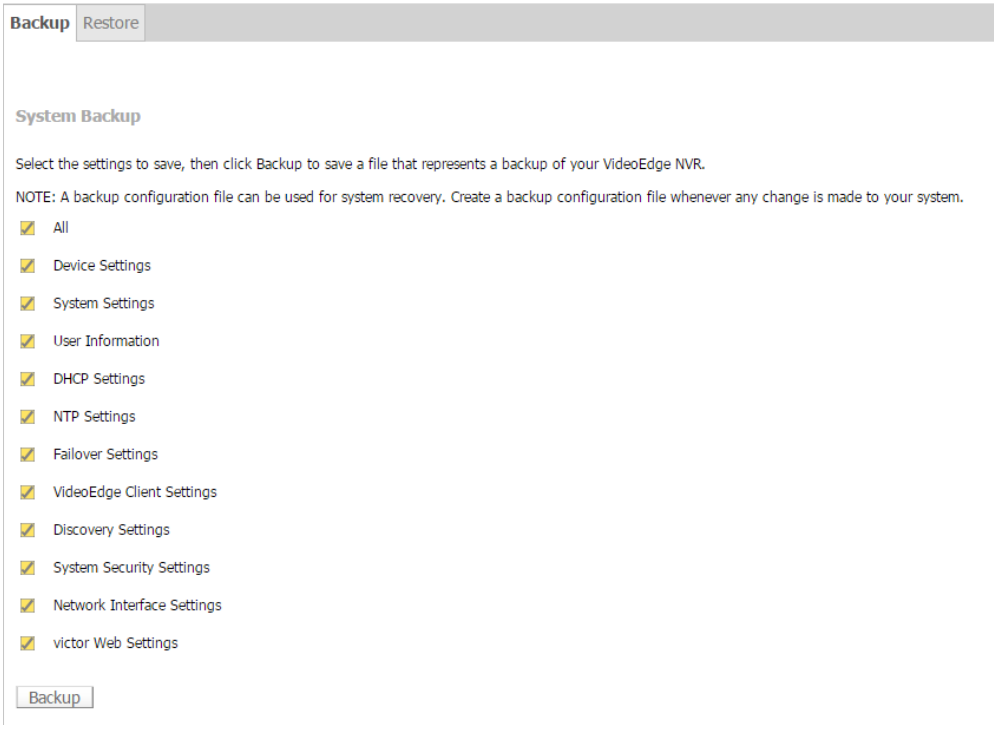
Best practices for backup storage

Copies for the backup files should be stored externally from the server and ideally in a remote location to assure all the necessary backup files will still be available if there is a hardware failure or disaster at the site. Backup should be protected from unauthorized access using encryption.

Hardening step 17: Backup VideoEdge configuration and data

- To access the built-in VideoEdge Backup utility click the **Backup** tab.

Figure 46



System Backup

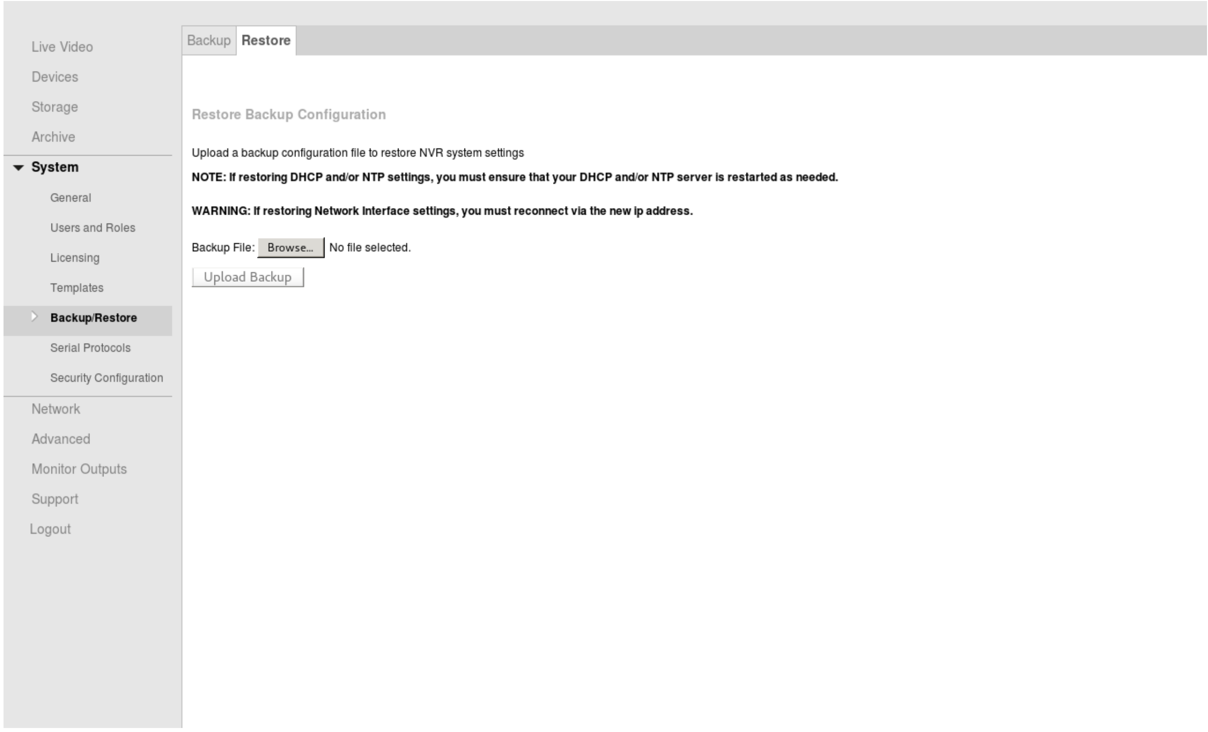
Select the settings to save, then click Backup to save a file that represents a backup of your VideoEdge NVR.

NOTE: A backup configuration file can be used for system recovery. Create a backup configuration file whenever any change is made to your system.

☑ All
☑ Device Settings
☑ System Settings
☑ User Information
☑ DHCP Settings
☑ NTP Settings
☑ Failover Settings
☑ VideoEdge Client Settings
☑ Discovery Settings
☑ System Security Settings
☑ Network Interface Settings
☑ victor Web Settings

- To access the built-in VideoEdge Restore utility click the **Restore** tab.

Figure 47



Restore Backup Configuration

Upload a backup configuration file to restore NVR system settings

NOTE: If restoring DHCP and/or NTP settings, you must ensure that your DHCP and/or NTP server is restarted as needed.

WARNING: If restoring Network Interface settings, you must reconnect via the new ip address.

Backup File: Browse... No file selected.

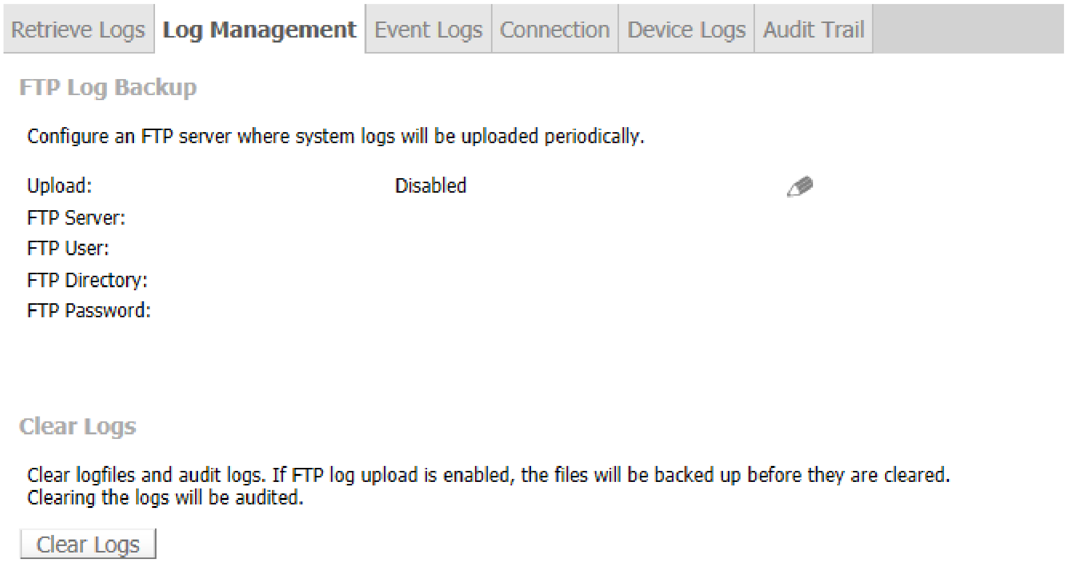
FTP Log backup

Using the **Log Management** page you can configure FTP server settings where system logs will be uploaded periodically. The **Event Log** is rotated (all entries are cleared) when it is full. To preserve the **Events Log** this function should be configured and enabled.

Note: Only syslog files are uploaded when using this feature.

Using the Log Management page you can input the FTP server IP Address, FTP Username, remote FTP Directory and FTP Password.

Figure 48



FTP Log Backup

Configure an FTP server where system logs will be uploaded periodically.

Upload: Disabled
FTP Server:
FTP User:
FTP Directory:
FTP Password:

Clear Logs

Clear logfiles and audit logs. If FTP log upload is enabled, the files will be backed up before they are cleared.
Clearing the logs will be audited.

Hardening step 18: Configure the Log FTP server

1. Click **Advanced**.
2. Click **Logs**.
3. Click the **Log Management** tab.

The **Log Management** page opens.

4. Select the Enabled option button to enable Event Log upload to the FTP Server.
5. Enter the IP Address in the FTP Server field.
6. Enter the username in the FTP User field.
7. Enter the directory in the FTP Directory field.
8. Enter the password in the FTP Password field.
9. Enter the password again in the Confirm Password field.

Note: When FTP Log upload is enabled, a **Test Upload** button displays. Use this button to verify the FTP server settings. A successful upload test will create a test file on the specified location of the FTP Server.

2.6.7 Redundant server failover

When configured as a secondary NVR, VideoEdge will monitor other VideoEdge NVRs that have been added to its server monitoring list. In the event that a primary NVR fails, the secondary NVR will detect the failure after approximately 30 seconds and will assume the role of the primary NVR.

During this failover period, the NVR will not be receiving video from cameras and video loss will occur. However, Illustra cameras have a video backfill feature which provides the capability for the VideoEdge NVR to fill in the gaps in recorded video.

Note: SNMP and SSH are required for VideoEdge NVRs to be configured for failover. It is recommended that the SNMP Read-only community string to something unique and change the SSH password.

Hardening step 19: Configure VideoEdge with a failover server

To utilize the failover feature, at least one other VideoEdge NVR must be configured on the network. Once the failover VideoEdge NVR has been established, the NVR group may be configured.

An NVR that is going to be used as a secondary NVR must be installed and configured in the same way as you would for a primary NVR. You need to configure media folders and storage sets. It is important to note when you are configuring storage for a secondary NVR, the storage configuration must be able to support recording of any camera configurations set up on any of the primary NVRs it is monitoring.

The secondary NVR must have at least the same processing power as the largest primary NVR it is protecting and must be licensed for at least as many cameras as the largest associated primary NVR.

For VideoEdge Hybrid NVRs, the secondary NVR must have at least as many analog inputs as the largest primary NVR.

The network connection of the secondary NVR should have the same capability as the network connection from the primary NVRs to the client. If, for example, the secondary NVR is connected through a lower bandwidth connection than the primary NVR, you will notice a difference in performance when the secondary NVR is active if the primary NVR fails.

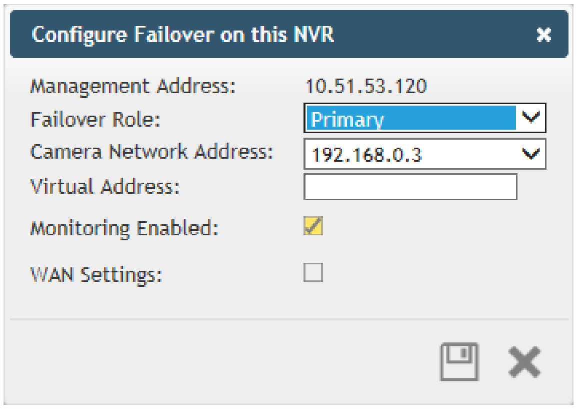
An NVR group can contain 14 NVRs (up to 12 primary and 2 secondary). Within a group, NVRs can be assigned the following status Configure an NVR group with up to 2 secondary VideoEdge NVRs

Primary NVRs - NVRs which are monitored by the designated secondary NVRs. Primary NVRs can share their available transcode resources and the transcode resources of other NVRs within the group.

Secondary NVRs - NVRs which monitor the primary NVRs to provide redundancy should a primary fail. Secondary NVRs can share their available transcode resources with the other NVRs within the group. Should a secondary NVR enter failover mode, victor unified client may be required to restart playback on the streams which have been transcoded using the secondary's available resources. Victor unified client will automatically restart playback if required.

1. From **Devices, NVR Group** select in the table entry for the NVR you want to assign a new status.

Figure 49



Configure Failover on this NVR

Management Address: 10.51.53.120

Failover Role: Primary

Camera Network Address: 192.168.0.3

Virtual Address:

Monitoring Enabled: ☑

WAN Settings: □

2. Select **Primary** or **Secondary** from the **Failover Role** dropdown.
3. Enter the **CameraNetworkAddress** in the field or select from the dropdown.
4. Enter a **Virtual IP Address** or a **hostname** in the field.
5. Enter a **Virtual IP Address** or a **hostname** in the field.

2.6.8 RAID storage

While there is no hardening step associated with RAID storage, you may want to review it details on how to configured and manage RAID drives and other storage options. (Refer to Storage section of VideoEdge Installation and User Manual).

2.6.8.1 Network isolation

VideoEdge firewall

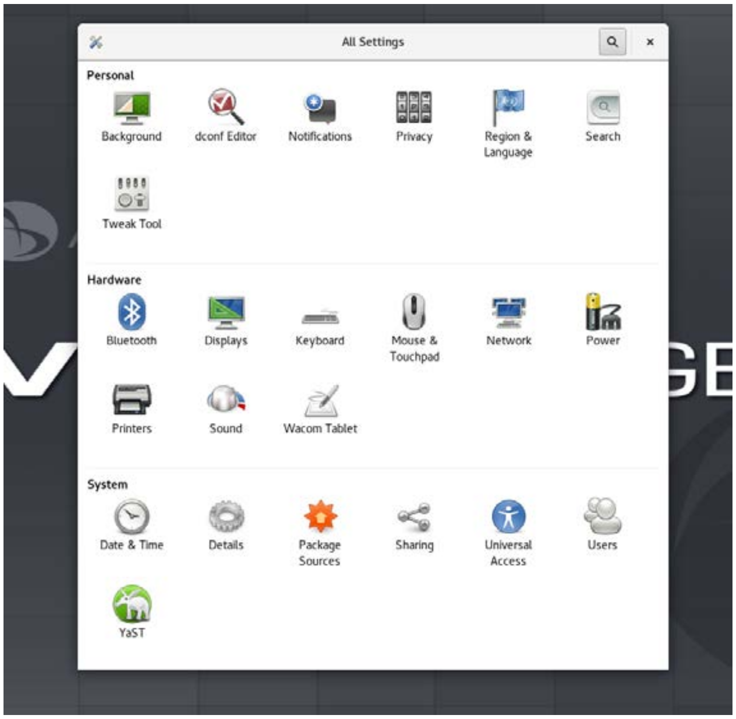
A firewall is an important feature that should be utilized. A firewall is a network security system that monitors and controls incoming and outgoing network traffic based on predetermined security rules. Using a predefined set of rules it can disallow malicious activity from intruding into the system.

Hardening step 20: Configure VideoEdge firewall

To enable the VideoEdge firewall, complete the following steps:

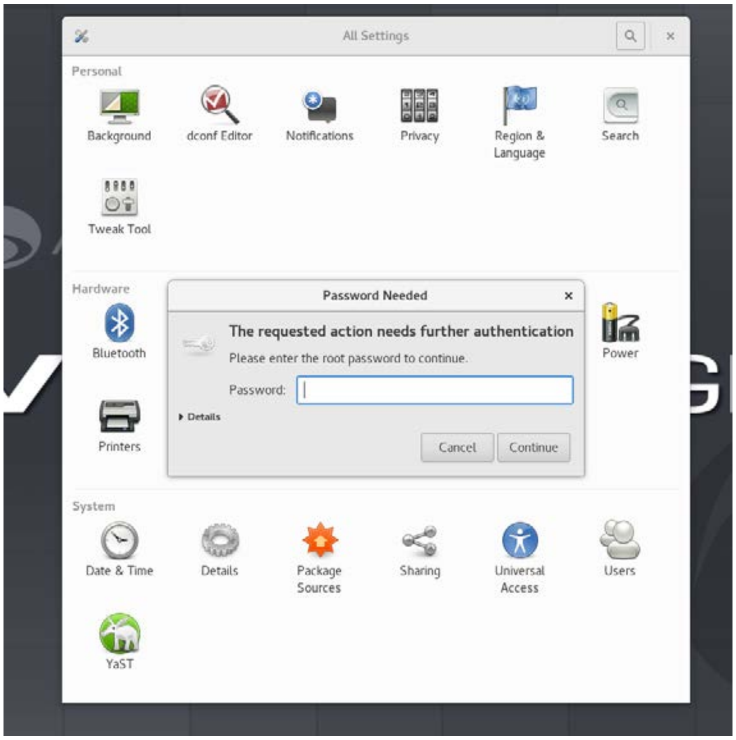
1. Connect to the local desktop.
2. Press the power button. This brings up the menu in figure 45.

Figure 50



3. Enter the root user password.

Figure 51



Password Needed

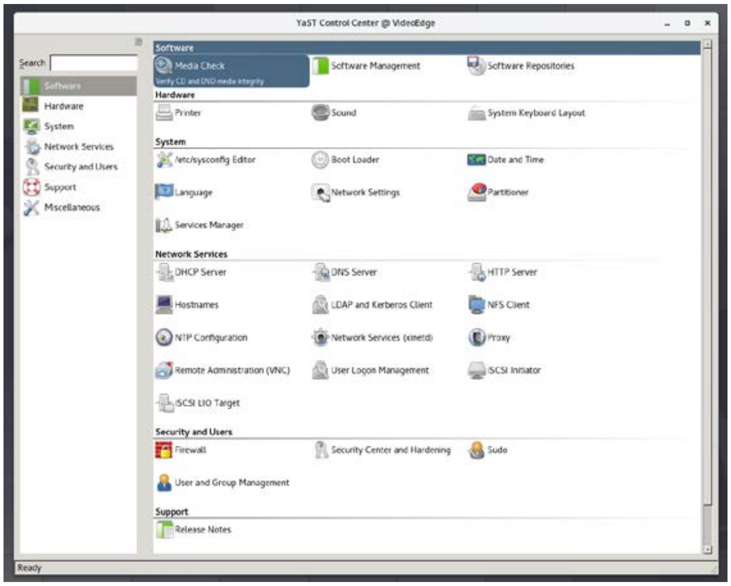
The requested action needs further authentication

Please enter the root password to continue.

Password:

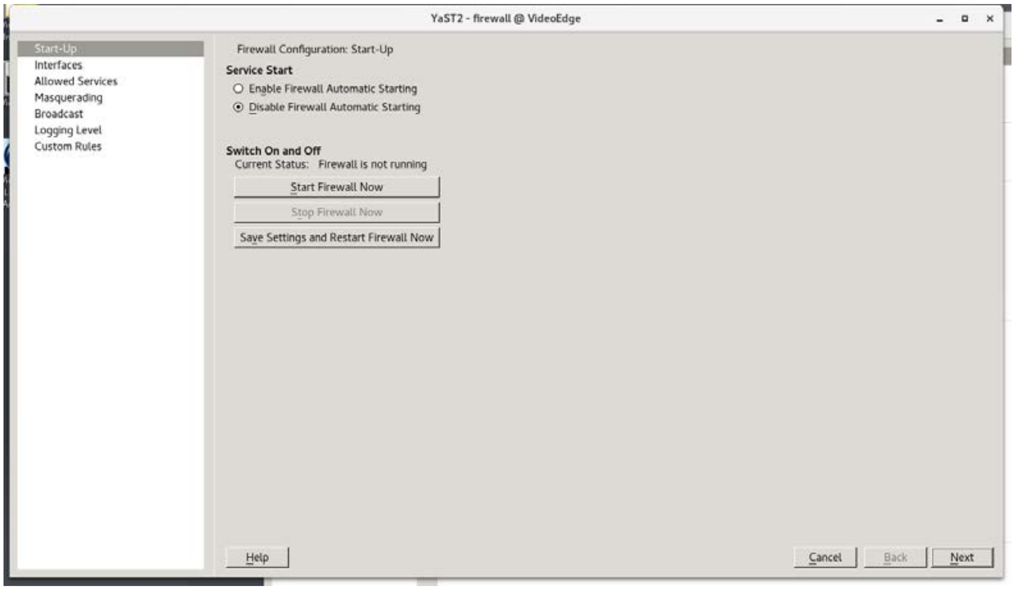
4. Click **Firewall**.

Figure 52



5. Enable or disable the firewall.

Figure 53



Service Start

○ Enable Firewall Automatic Starting

● Disable Firewall Automatic Starting

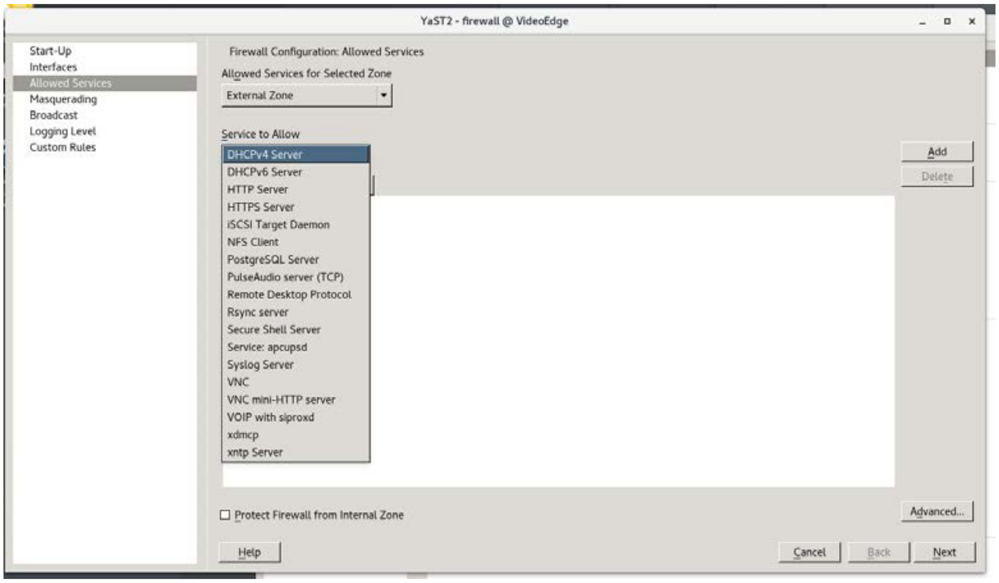
Switch On and Off

Current Status: Firewall is not running

6. On the side bar click on **Allowed Services.**

Note: You can add default services for External/Internal/DMZ Zones.

Figure 54



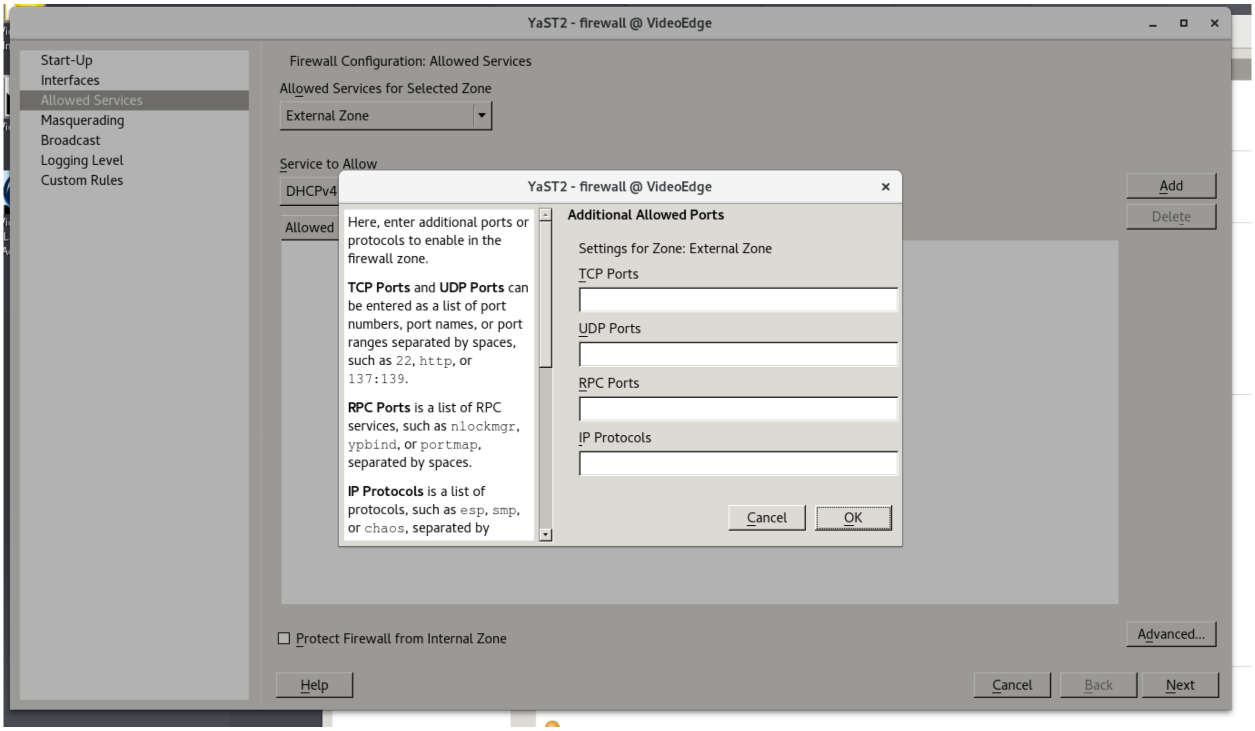
Firewall Configuration: Allowed Services

Allowed Services for Selected Zone: External Zone

7. To add ports that do not show in the default list, click **Advanced**.

Note: Refer to the VideoEdge port document for specific port number and protocols.

Figure 55



Firewall Configuration: Allowed Services

Allowed Services for Selected Zone: External Zone

Settings for Zone: External Zone

Here, enter additional ports or protocols to enable in the firewall zone.

TCP Ports and **UDP Ports** can be entered as a list of port numbers, port names, or port ranges separated by spaces, such as `22`, `http`, or `137:139`.

RPC Ports is a list of RPC services, such as `nlockmgr`, `ypbind`, or `portmap`, separated by spaces.

IP Protocols is a list of protocols, such as `esp`, `smp`, or `chaos`, separated by

2.7.0 Security audits and documentation

A well-documented deployment of VideoEdge will be useful in security audits, and a security audit can expose errors in the system documentation and identifying gaps in protection. Each task feeds the other and it may be necessary to repeat hardening step 19, after an audit is complete and the gaps are addressed.

2.7.1 Security documentation

Document deployment once hardening is sufficient for run-time operations. When updates are released or security advisories are published this documentation will be useful. The documentation will allow for quick assessment to determine if the deployment is impacted by the issues described in a security advisory and requires a configuration change, software update or patch.

Hardening step 21: Security documentation

Include the following details in creating as-built security documentation:

- As-built architecture drawing of system
- For all system components (NVRs, clients, and cameras) record:
    - Component identification
        - Name
        - Description
        - Device Type
        - Location
        - Vendor
        - Model
        - IP address
        - MAC address
    - Support details
        - Software version
        - Hardware version
        - Licenses
        - Installation date
    - Communication configuration details
        - Enabled Ports and protocols
        - Encryption settings

2.7.2 Security audit checklist

An audit of the security configuration will help reveal any missed steps and will allow for further hardening of the system. This will be particularly important if a less secure configuration was utilized to facilitate efficient deployment before the full infrastructure was available. Use the security gaps identified with the audit to tighten security to the appropriate levels of protection for the target environment before turning over the system to run-time operations.

Hardening step 22: Perform a security configuration audit

The security audit must be conducted by someone who was not involved with the initial hardening of the system. An independent reviewer is more likely to find the security gaps the audit is intended to reveal.

The Hardening checklist outlined in this section must be used as the basis for the security audit checklist. (Section 2.2.1 Hardening checklist).

3 Maintain

The contents within this section address how to monitor for potential cybersecurity issues and maintain protection levels because conditions change.

An audit that produces a report indicating low cybersecurity risk is a very positive result and suggests that the deployment was conducted with a high degree of care and consideration. However, new attack vectors combined with enhanced hacking tools and more advanced testing techniques may, in the future, disclose vulnerabilities with the technologies used.

The impacted technologies and their implementation may have been previously well regarded by cybersecurity experts. The discovery of vulnerabilities post the final deployment audit may not reflect the quality of that audit.

You may require a higher degree of protection for the environment that VideoEdge is serving because policies, regulations and guidance may change over time.

3.1.0 Cybersecurity maintenance checklist

Continuously or periodically practice the following cybersecurity maintenance items. The frequency of their execution will depend on the policies and regulations which govern the site. The typical maintenance periods provided are a starting point and adjusted to best suit the target conditions of the deployed environment:

1	*Backup runtime data*	*Daily*
2	*Backup configuration data*	*Weekly*
3	*Test backup data*	*Quarterly*
4	*Assure failover solutions are operating*	*Quarterly*
5	*Lock user accounts of terminated employees*	*Immediately*
6	*Remove inactive user accounts*	*Monthly*
7	*Update user account roles*	*Quarterly*
8	*Disable unused features, ports and services*	*Quarterly*
9	*Check for and prioritize advisories*	*Weekly*
10	*Plan and execute advisory recommendations*	*Based on priority*
11	*Check and prioritize software patches and updates*	*Weekly*
12	*Plan and execute software patches and updates*	*Based on priority*
13	*Review updates to organizational policies*	*Annually*
14	*Review updates to regulations*	*Annually*

15	*Update as build documentation*	*As changes are made or annually*
16	*Conduct security audits*	*Annually*
17	*Update password policies*	*Annually*
18	*Update standard operating procedures*	*Annually*
19	*Update logon banners*	*Annually*
20	*Renew licensing agreements*	*Annually (or as required)*
21	*Renew support contracts*	*Annually*
22	*Check for end-of-life announcements and plan for replacements*	*quarterly*
23	*Periodically delete sensitive data in accordance to policies or regulations*	*As required*
24	*Monitor for cyber attacks*	*Continuously*

3.1.1 Backup runtime data

Runtime data, including video recordings and logs, can be considered to be the most valuable assets within the VideoEdge system. You can replace or reconstruct everything else. Confirm that the following backup steps are being executed:

Table 22

ACTION	DETAILS	SUGGESTED FREQUENCY
VIDEO ARCHIVING	See 2.6.6 Backup/Restore and the VideoEdge Installation and refer to the User Manual v5.4 page 182	Daily
FTP LOG BACKUP	See 2.6.6 Backup/Restore	Daily

3.1.2 Backup configuration data

If you need to restore or replace a component it is important to have a backup of its configuration data to minimize the time required to restore its functions. If you need to restore or replace a component it is important to have a backup of its configuration data to minimize the time required to restore its functions. Please not that a manual record of the encryption configuration will help assure that the system can be reconstituted should a self-encrypting drive need to be restored.

Table 23

ACTION	DETAILS	SUGGESTED FREQUENCY
BACKUP CONFIGURATION DATA	See 2.6.6 Backup/Restore	Daily

3.1.3 Test backup data

Test backups to provide assurance that the data backups contain the expected data and integrity.

Table 24

ACTION	DETAILS	SUGGESTED FREQUENCY
TEST BACKUP DATA	Load data from backup media into a non-production VideoEdge NVR	Quarterly

3.1.4 Assure failover solutions are operating

Backup solutions that provide continuity of operations through a hardware failure, such as redundant server failover and RAID, should be inspected to assure that they are operating properly.

Table 25

ACTION	DETAILS	SUGGESTED FREQUENCY
REDUNDANT SERVER FAILOVER	See Section 2.6.7 Redundant server failure	Quarterly
RAID STORAGE	See Section 2.6.8 RAID storage	Quarterly

3.1.5 Lock accounts on termination of employment

Disable user accounts of personnel who voluntarily or non-voluntarily are terminated from employment immediately.

Table 26

ACTION	DETAILS	SUGGESTED FREQUENCY
LOCK ACCOUNTS	See 2.2.5.3 VideoEdge user accounts, refer to VideoEdge Installation and User manual Procedure 168 Locking accounts from the Users table p. 214	Immediately

3.1.6 Remove inactive user accounts

While an employee may still be employed by an organization in which the system is owned, managed, serviced or used by, they may not have utilized it for a long period. This suggests that independent of being authorized to use the system, they do not have a need to use the system and you should remove their user account. This is sometimes referred to as a use it, or lose it policy. This best practice reduced the amount of active user accounts in the system and therefore lowers the potential attack footprint.

Table 27

ACTION	DETAILS	SUGGESTED FREQUENCY
LOCK ACCOUNTS	See 2.2.5.3 VideoEdge user accounts. Refer to VideoEdge Installation and User Manual, Procedure 171 Removing a User, p.215	Immediately

3.1.7 Update user account roles

While an employee may still be employed by an organization in which the system is owned, managed, serviced or used by, they may have changed roles or have increased or decrease their need to utilize the system. When adding a role or a permission to a user's account when that user has been granted new authorizations due to an organizational role change, be sure to remove the VideoEdge roles and permissions no longer required or utilized in their new role.

Table 28

ACTION	DETAILS	SUGGESTED FREQUENCY
UPDATE USER ACCOUNT ROLES	See 2.2.5.2 VideoEdge roles. Refer to VideoEdge Installation and User Manual, Procedure 172 Configuring additional security on roles, p.217	Quarterly

3.1.8 Disable unused features, ports and services

Reassess the need for optional features, ports, and services that are not required, and disable them. This practice will lower the attack surface of VideoEdge resulting in a higher level of protection.

Table 29

ACTION	DETAILS	SUGGESTED FREQUENCY
DISABLED UNUSED FEATURES	See 2.2.4 Set boot sequence, 2.5.2 Communication port and encryption configuration	Quarterly

3.1.9 Check for and prioritize advisories

You can find security advisories for VideoEdge on the Cyber Protection website. Access is provided once you have registered a user account with that site. User account registration is open to JCI customers and authorized representatives. Determine if VideoEdge is impacted by the conditions outlined in the advisories. Based on how the VideoEdge system is deployed, configured and used, the advisory may not be of concern. Referring to as-built documentation of the VideoEdge system will help with this assessment. A good set of as-built documentation will help you identify the number of components impacted and where they are located. While advisories call attention to a cybersecurity issue, it is not always possible to take immediate action or execute the full recommendation described in the advisories. If so, prioritization will aid in your planning to ensure that any issue impacting your system is fully and appropriately addressed in order of priority. Check for advisories from third party components such as networking equipment and operating systems by consulting with the respective vendor.

Table 30

ACTION	DETAILS	SUGGESTED FREQUENCY
CHECK FOR AND PRIORITIZE ADVISORIES	Refer to https://tycosecurityproducts.com/CyberProtection/SecurityAdvisories.aspx	Weekly

3.1.10 Plan and execute advisory recommendations

Follow the plan determined in maintenance step 9.

Table 31

ACTION	DETAILS	SUGGESTED FREQUENCY
PLAN AND EXECUTE ADVISORY RECOMMENDATIONS	As determined in maintenance step 9	Based on priority

3.1.11 Check and prioritize patches and updates

While a VideoEdge patch or update may or may not relate to a security advisory, it is always best practice to apply the most current patches and updates. These patches and updates can include cybersecurity enhancements also fixes to known issues. Review the release notes and prioritize the benefits of the patch or update. The overall benefit should include the improved protection that will aid in lowering the cybersecurity risk. Be sure also to check for updates and patches of third party components such as networking equipment and operating systems by consulting with the respective vendor.

Table 32

ACTION	DETAILS	SUGGESTED FREQUENCY
CHECK FOR AND PRIORITIZE ADVISORIES	Refer to http://www.americandynamics.net/Products/VideoEdge_NVR.aspx	Weekly

3.1.12 Plan and execute software patches and updates

Follow the plan determined in maintenance step 9.

Table 33

Action	Details	Suggested frequency
Plan and execute advisory recommendations	As determined in maintenance step 9. Follow update process as outlined in Section 2.4.1 Operating System updates, Section 2.4.2 VideoEdge application updates and Section 2.4.3 for camera firmware updates.	Based on priority

3.1.13 Review organizational policy updates

Organizations may update their policies which include cybersecurity requirements. Changes to these policies can impact systems which were in compliance prior to the change. Periodically check to see if policy changes were made and re-assess compliance with those policies.

Table 34

ACTION	DETAILS	SUGGESTED FREQUENCY
REVIEW ORGANIZATIONAL POLICY UPDATES	Collect most recent security policies for your organization	Annually

3.1.14 Review updates to regulations

If VideoEdge is deployed in a location that is governed by regulation, it is important to check to see if there are any updates to those regulations. In some cases, new regulations are introduced. Whether it is a review of an updated regulation to maintain compliance and a new regulation, an assessment of the changes should be conducted periodically.

Table 35

ACTION	DETAILS	SUGGESTED FREQUENCY
REVIEW UPDATES TO REGULATIONS	Collect most recent copies of regulations as applicable. Perform a gap analysis against the deployed configuration.	Annually

3.1.15 Update as-build documentation

Update as-built documentation if the deployment architecture or component configuration changes. Some configuration changes happen without a formal project or plan and if such cases it may be common to negate updating the as-built documentation. Schedule a full update of the as-built documentation on a regular basis to ensure that all changes are documented.

Table 36

ACTION	DETAILS	SUGGESTED FREQUENCY
UPDATE AS-BUILD DOCUMENTATION	See section 2.7.1 Security documentation	As changes are made or annually

3.1.16 Conduct security audits

Periodic security audits are necessary as cybersecurity guidance, organizational policies, regulations, auditing processes, system use and configuration and threats have likely changed since the last audit. By conducting periodic security audits, the latest knowledge and conditions can be applied revealing gaps in protection previously undetected or created by changes in system use of configuration.

Table 37

ACTION	DETAILS	SUGGESTED FREQUENCY
CONDUCT SECURITY AUDITS	See section 2.7.2 Security audit checklist	Annually

3.1.17 Update password policies

Guidance on password policies has been evolving. Password policies should be re-assessed periodically to make sure the right policy in place for the target environment based on current organizational policies, regulations and guidance from standards organizations such as NIST.

Table 38

ACTION	DETAILS	SUGGESTED FREQUENCY
UPDATE PASSWORD POLICIES	See section 2.2.5.1 Operating system level user accounts (interactive) and 2.2.5.2 VideoEdge roles	Annually

3.1.18 Update standard operating procedures

Including best practices for cybersecurity within standard operating procedures can complement the protection that the system can deliver on its own. Depending on the procedures an operator uses, a gap in protection can be created, prevented or closed. Therefore, it is important to update standard operating procedures periodically.

Table 39

ACTION	DETAILS	SUGGESTED FREQUENCY
UPDATE STANDARD OPERATING PROCEDURES	Collect standard operating procedures for use of VideoEdge within the organization	Annually

3.1.19 Update logon banners

The system use policy details included on logon banners can change over time. Review and update as required.

Table 40

ACTION	DETAILS	SUGGESTED FREQUENCY
UPDATE LOGON BANNERS	See section 2.2.6.2 System use banner	Annually

3.1.20 Renew licensing agreements

Assure that your VideoEdge software license supports the necessary functions

Table 41

ACTION	DETAILS	SUGGESTED FREQUENCY
RENEW LICENSING AGREEMENTS	Collect active licensing details.	Annually

3.1.21 Renew support contracts

Assure that your VideoEdge software support agreement (SSA) is up to date.

Table 42

ACTION	DETAILS	SUGGESTED FREQUENCY
RENEW SUPPORT CONTRACTS	Collect SSA details	Annually

3.1.22 Check for end-of-life announcements and plan for replacements

Review product announcements to determine if any of the components of VideoEdge have a planned end-of-life announcement, including cameras.

Table 43

ACTION	DETAILS	SUGGESTED FREQUENCY
CHECK FOR END-OF-LIFE ANNOUNCEMENTS AND PLAN FOR REPLACEMENTS	Collect end-of-life details	Quarterly

3.1.23 Periodically delete sensitive data in accordance to policies or regulations

Table 44

ACTION	DETAILS	SUGGESTED FREQUENCY
PERIODICALLY DELETE SENSITIVE DATA IN ACCORDANCE TO POLICIES OR REGULATIONS	Collect details on policies and regulations that apply to your VideoEdge location	As required

3.1.24 Monitor for cyber attacks

Monitoring site perimeters, networks and end-points for cyber-attacks is a part of good cybersecurity operation. Many tools are available to assist with real-time analytics-based detection.

Table 45

ACTION	DETAILS	SUGGESTED FREQUENCY
MONITOR FOR CYBER ATTACKS	Determine which security monitoring tools and services to implement	Run continuously once implemented

3.2.0 Patch policy

The policy documented here sets forth the current internal operating guidelines and process in regards to VideoEdge, which may change from time to time at the sole discretion of Johnson Controls. Johnson Controls employs commercially reasonable efforts to pursue the operating guidelines and process described herein. However, other mitigating factors may prevent complete adherence to this policy, as determined by Johnson Controls at its discretion. Regardless, Johnson Controls endeavors to address issues that arise within VideoEdge with the severity that they warrant.

When CRITICAL security vulnerabilities are discovered within VideoEdge, Johnson Controls will use commercially reasonable efforts to issue a Critical Service Pack for the current version of VideoEdge as soon as is reasonably practicable.

When non-CRITICAL vulnerabilities are discovered within VideoEdge, Johnson Controls will use commercially reasonable efforts to:

- Apply fixes for HIGH severity vulnerabilities in the next immediate release of VideoEdge
- Apply fixes for LOW and MEDIUM vulnerabilities within one of the next two available releases of VideoEdge

Note: The VideoEdge does not have a back port policy. Updates are only applied to latest version of the released product.

When CRITICAL security vulnerabilities are discovered within VideoEdge, American Dynamics will use commercially reasonable efforts to issue a Critical Service Pack for the current version of VideoEdge as soon as is reasonably practicable.

When non-CRITICAL vulnerabilities are discovered within VideoEdge, American Dynamics will use commercially reasonable efforts to:

- Apply fixes for HIGH severity vulnerabilities in the next immediate release of VideoEdge
- Apply fixes for LOW and MEDIUM vulnerabilities within one of the next two available releases of VideoEdge

Note: The VideoEdge NVR does not have a backport policy. Updates are only applied to latest version of the released product.

3.3.0 Release schedule

An update to VideoEdge including new features and security fixes is released approximately every 6-8 months.

An interim update that will include only updates for the operating system will be released approximately three months after each release, unless there is VideoEdge release within this timeframe.

No VideoEdge update will be released without undergoing extensive quality assurance testing.

An update to the VideoEdge NVR including new features and security fixes is released approximately every 6-8 months.

3.4.0 Recovery and factory reset

If recovery is necessary see section 2.1.4 Resetting factory defaults

3.5.0 VideoEdge testing process

As part of the requirements of the Product Security Program, the VideoEdge NVR receives regular vulnerability and penetration testing from our internal product security engineers. The VideoEdge NVR is also subjected to third party penetration testing annually and at milestone releases.

See ANNEX F for letters of attestation from the vendors.

3.6.0 Customer specific testing

If a customer requires specific testing (for example, deployed architecture and configuration) on a VideoEdge NVR, the Cyber Protection Team is available to provide consultation and response directly to the testing team. For assistance, contact TSPCyberProtection@jci.com

The VideoEdge NVR regularly undergoes repeated security tests during the development process including network vulnerability scans. Web application scans are done on a regular maintenance schedule. Web applications are also tested during development to identify flaws such as cross-site injection points and missing security flags. Proprietary code is analyzed during the development cycle for items such as buffer overflow points, null dereference points and memory leaks. Third party and open source code is continuously scanned to identify released security flaws.

3.6.1 Vulnerability assessment

Vulnerabilities discovered in VideoEdge proprietary software are assessed on the CVSS v3 score.

CVSS v3 Score, Assessment

≥ 9, Critical

≥ 7, High0

< 7, Medium

3.6.2 Vulnerability assessment – third party components

Vulnerabilities discovered in VideoEdge proprietary software are assessed on the CVSS v3 score.

CVSS v3 Score	Assessment
≥ 9	Critical
≥ 7	High
< 7	Medium

3.6.3 Vulnerability assessment – third party software

American Dynamics must use commercially reasonable efforts to monitor third party and open source software included within the VideoEdge NVR for disclosed vulnerabilities from the product vendors and open source communities. Vulnerabilities that are discovered and disclosed will be assessed first on its assigned CVSS v3 score from the product vendor or the National Vulnerability Database and then on the ability to be exploited within the VideoEdge NVR.

CVSS v3 Score	Exploitability	Assessment
≥ 9	Exploitable	Critical

≥ 9	Not Exploitable	High
≥ 7	Exploitable	High
≥ 7	Not Exploitable	Medium
< 7	Exploitable	Medium
< 7	Not Exploitable	Low

If a patch is not available to correct the vulnerability, American Dynamics will use commercially reasonable efforts to mitigate the vulnerability within its capabilities.

3.6.4 VideoEdge vulnerability reporting

To better protect our customers and honor the trust they put in us, we are firm believers in responsible coordinated disclosure. Security Researchers, consultants and others who believe they may have found a potential security vulnerability in a Security Product can make immediate notice to our Cyber Protection Team through email to **TSPCyberProtection@jci.com** or by the **Building Products Vulnerability Reporting** webpage to make immediate notice to our Product Security Incident Response Team (PSIRT).

Those working directly on behalf of a Security Products customer should also notify their local Security Products representative. Thank you for your partnership with us in creating a smarter, safer more sustainable world

Additionally, American Dynamics Technical Support staff have direct access to the Cyber Protection team to help assess and resolve any issues.

Appendix A Third party attestations and certificates

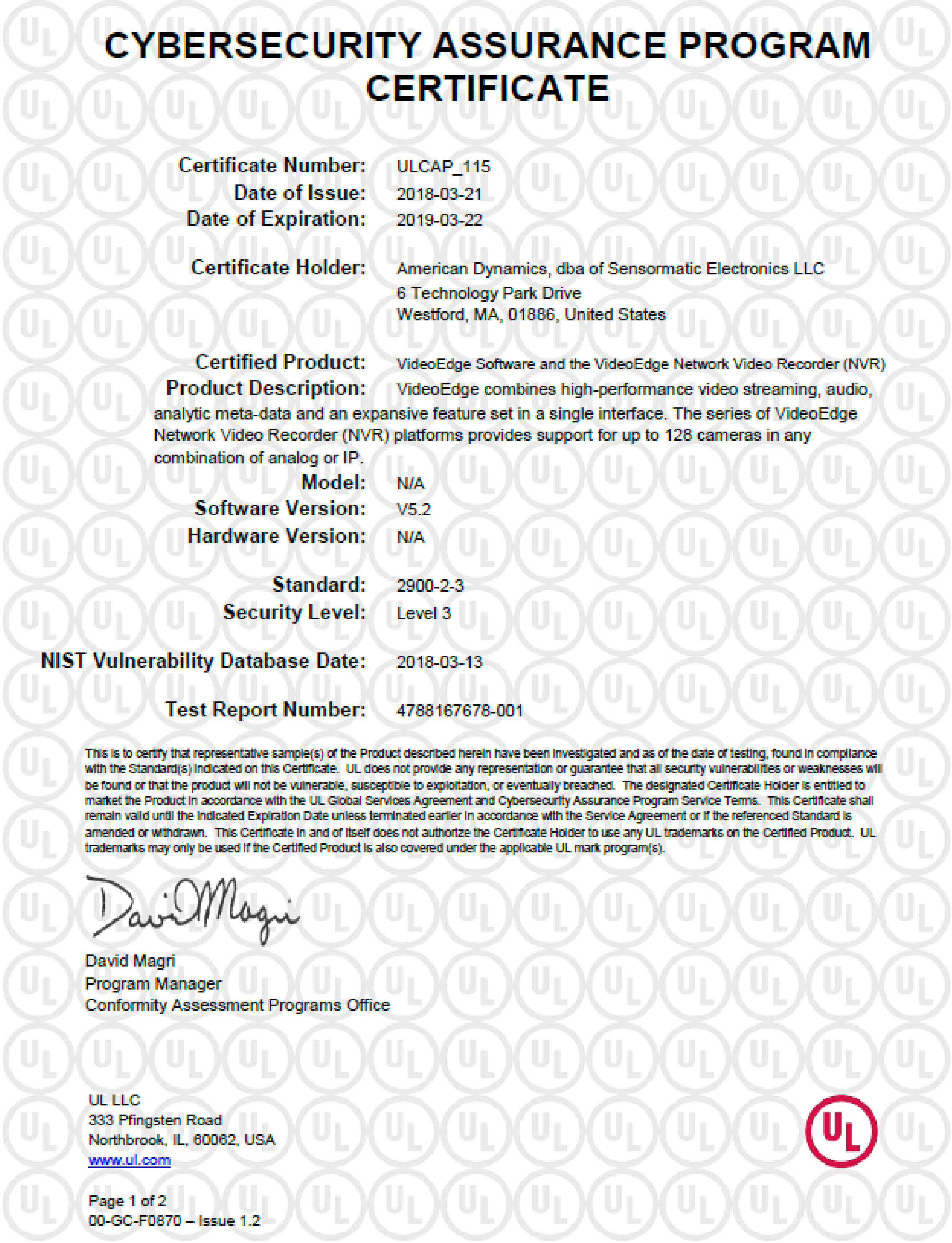
VideoEdge has undergone review by third party organizations resulting in the following certifications:

UL 2900-2-3 (Level 3) – VideoEdge was certified March22, 2018 by Underwriter Laboratories (UL), Cybersecurity Assurance Program (CAP) as compliant with UL 2900-2-3. This cybersecurity standard is specific to life safety and physical security. The level 3 assessment that was conducted by UL evaluated the business practices of Johnson Controls and the security capabilities of the product with knowledge of internal security controls.

DHS SAFETY Act Designation – The VideoEdge technology was included in a certificate of SAFETY Act Designation issued on March 19, 2018 by the United States Department of Homeland Security. This designation is described as follows:

March 19, 2018 – Johnson Controls International plc, Sensormatic Electronics, LLC, and Tyco International Management Company, provide VideoEdge, victor, and Illustra (the "Technology"). The Technology is a scalable video management system consisting of video recorder hardware and management software supporting the integration of cameras and third-party devices, enabling management through a single interface. This Designation will expire on April 30, 2023.

Appendix A.1 Certificates



CYBERSECURITY ASSURANCE PROGRAM CERTIFICATE

Certificate Number:	ULCAP_115
Date of Issue:	2018-03-21
Date of Expiration:	2019-03-22
Certificate Holder:	American Dynamics, dba of Sensormatic Electronics LLC 6 Technology Park Drive Westford, MA, 01886, United States
Certified Product:	VideoEdge Software and the VideoEdge Network Video Recorder (NVR)
Product Description:	VideoEdge combines high-performance video streaming, audio, analytic meta-data and an expansive feature set in a single interface. The series of VideoEdge Network Video Recorder (NVR) platforms provides support for up to 128 cameras in any combination of analog or IP.
Model:	N/A
Software Version:	V5.2
Hardware Version:	N/A
Standard:	2900-2-3
Security Level:	Level 3
NIST Vulnerability Database Date:	2018-03-13
Test Report Number:	4788167678-001

This is to certify that representative sample(s) of the Product described herein have been investigated and as of the date of testing, found in compliance with the Standard(s) indicated on this Certificate. UL does not provide any representation or guarantee that all security vulnerabilities or weaknesses will be found or that the product will not be vulnerable, susceptible to exploitation, or eventually breached. The designated Certificate Holder is entitled to market the Product in accordance with the UL Global Services Agreement and Cybersecurity Assurance Program Service Terms. This Certificate shall remain valid until the indicated Expiration Date unless terminated earlier in accordance with the Service Agreement or if the referenced Standard is amended or withdrawn. This Certificate in and of itself does not authorize the Certificate Holder to use any UL trademarks on the Certified Product. UL trademarks may only be used if the Certified Product is also covered under the applicable UL mark program(s).

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Page 1 of 2
00-GC-F0870 – Issue 1.2

Appendix B Third party security approvals

The VideoEdge NVR has been installed in many installations that require accreditation. Here you can find an overview of accreditations and resources that may be used to assist in meeting the requirements of each.

FISMA

You can configure the VideoEdge system to support the controls necessary for overall FISMA compliance. These controls include:

- Authenticated system access
- Account log on/log out management
- Role-based separation of capabilities, permissions, and privileges
- System event and configuration change auditing, alerting, and management
- Restriction of ports, protocols, and services to only those required
- Encrypted communications

For more information, refer to the *VideoEdge FISMA-Ready Compliance Guide available on the Cyber Protection website.*

NERC CIP v5

The *VideoEdge NERC-CIP V5 READY Compliance Guide* provides an overview of the NERC-CIP standard and describes how VideoEdge may be configured to meet the requirements of the NERC-CIP v5 requirements. When used in conjunction with VideoEdge installation and configuration guides, this information should assist in the installation of a compliant system and provide the necessary information for an audit.

For more information, refer to the *VideoEdge NERC-CIP v5 Compliance Guide available on the Cyber Protection website.*

DISA

To assist installations within the Department of Defense in meeting the security hardening requirements of the Defense Information Systems Agency (DISA), Tyco Security Products has developed this System Security Requirements guide based on the DISA General Purpose operating Systems STG, Version 1, Release 3 published 22 January 2016, for the sole purposes of meeting said requirements for the VideoEdge Network Video Recorder (NVR) appliance. We have provided the 250 technical control requirements of the General Purpose Operating System Security Requirements Guide (SRG) and a description of how a VideoEdge device meets the technical controls or if it is does not meet the controls, guidance has been provided so the customer can configure VideoEdge to meet the requirements.

For more information, refer to the *VideoEdge - DISA Security Requirements available on the Cyber Protection website.*

Appendix C.1 Operating system level user accounts (non-interactive)

The following built-in operating system level user accounts are used for non-interactive processes:

Known Limitation: The VideoEdge NVR has Linux built-in accounts present on the operating system. These accounts are non-interactive and there is no log on to these accounts. *LP, mail, news, uucp, games, nobody, epmd, polkitd, rtkit*

User	Description
Bin	a standard subdirectory of the root directory in Unix-like operating systems that contains the executable (ready to run) applications that must be available in order to attain minimal functionality for the purposes of booting (starting) and repairing a system.
daemon	Is used to run as a processes in the background.
lp	This account is used for printer systems.
mail	Handles aspects of electronic mail. Used by sendmail and postfix daemons.
news	Used for Usenet news.
uucp	Controls ownership of the Unix serial ports.
games	This account allows some games to run as user "game" under the principle of least privilege.
man	This account is used to run the man page.
ftp	This account is intended to run ftp server software.
Nobody	Owns no files and is used as a default user for unprivileged operations.
messagebus	This account is a combination of a common data model, a common command set, and a messaging infrastructure to allow different systems to communicate through a shared set of interfaces.
rpc	This account is used to route requests between clients and servers.
statd	It is used by the NFS file locking service, rpc.lockd, to implement lock recovery when the NFS server machine crashes and reboots.
epmd	This account maps symbolic node names to machine addresses.
usbmux	This account is used for multiplexing connections over USB to an iOS device.
ntp	Account is used by the operating system which sets and maintains the system time of day.
sshd	Performs unprivileged operations for the OpenSSH Secure Shell daemon.
scard	Account is for integrated support for smart card readers.
dhcpd	Account is used by the dhcp server daemon.
hacluster	Account is used for the nvr groups feature. It controls the virtual ip address.

oprofile	A system-wide statistical profiling tool for Linux.
polkitd	This account provides the org.freedesktop.PolicyKit1 D-Bus service on the system message bus.
rtkit	Realtime Policy and Watchdog Daemon. **RealtimeKit** is a D-Bus system service that changes the scheduling policy of user processes/threads to SCHED_RR (realtime scheduling mode) on request.
pulse	Account is for the pulse audio daemon. It is used for the push-to-talk audio feature.
gdm	Account is used for the display manager
nvr	The NVR service account. Most services run as this (or wwwrun, which is synonymous).

Appendix C.2 Operating system level service accounts (non-interactive)

Operating system level service accounts (non-interactive)

The following accounts are non-interactive and only used to run VideoEdge services on the operating system.

User	Description
postgres	Used to run the database server.
wwwrun	This account is used to run Apache and all NVR application services.
pgbouncer	Used for database connection pooling. A connection pool is a cache of database connections maintained so that the connections can be reused when future requests to the database are required.
couchdb	Used for the victorWeb database.
stunnel	This is automatically created by the stunnel service and is the service account for RTSP TLS.

ANNEX D - Email Alerts

To setup email alerts, refer to *VideoEdge User Guide*.

Alert Category	Description
Analog Handler Reboot	Sent when any device controller stops responding. The device handler will be automatically restarted to re-establish communication with the camera.
Archive	Sent when the archive is unhealthy, the archive is falling behind, data deleted before being archived and when archive is nearing full

Audio Malfunction	Sent when audio malfunctions occur.
Blur Detection	Generated when a configured camera becomes out of focus.
Camera Dark Frame	Sent when the camera images cross a configured threshold of darkness. This alert indicates that the camera may be obscured.
Camera Processing Malfunction	Sent when a camera refuses to respond.
Camera Video Loss	Sent when the record pipeline detects that there is no video coming from the camera.
Device Not Recording	Generated when recording does not occur on one or more cameras.
Dry Contact	Sent when a dry contact is triggered.
Face Detection	Generated when a face is present in a camera's configured view.
Failover	Sent when a failover is detected. The IP address of the NVR which has failed will be included.
Log Storage Space Low	Sent when less than 5% of the log storage area is available.
Motion Detection	Generated by motion detection alerts. Does not include image attachments.
Security Alert	Sent when a user is temporarily and permanently locked out of their account.
Security Config Change	Sent if any security settings on the system are changed.
Storage	Transmitted when storage is not healthy.
Storage Activation	Generated when no storage can be activated.
Storage Config	Sent when storage configuration errors occur.
Storage Retention	Transmitted when storage capacity is almost reached.
System	All general system alerts not included in other categories.
System Reboot	Sent when the system is rebooted.
Text Stream	Sent when user defined Text Stream exception rules are met.
Video Intelligence	Generated by video intelligence alerts.