Checkmarx

CxSAST v9.3.0

Configuration Guide

Contents

CXSAST CONFIGURATION GUIDE 4

CONFIGURING AUTHENTICATION PROTOCOLS AND USERS 4

Configuring Single Sign-On (SSO) 4

Configuring User Credentials for CxDB Connectivity 5

CONFIGURING CXSAST COMPONENTS 6

Configuring CxConsole to Use a Proxy 6

Changing the Server Name, IP Address or Port for Checkmarx Components 6

Changing Protocols, the Hostname and Ports for Checkmarx Components 8

Use Cases 8

Accessing the Database Table 9

Changing Table Key Value Definitions 9

Configuring the Proxy from the Checkmarx Server 11

Proxy Server Settings 11

Proxy Service Console 11

Linking CxManager to the Database with a separate Client Portal using Windows Authentication 12

Prerequisites 12

Manager Configuration 12

Database Configuration 16

Configuring the Checkmarx Web Portal on a Dedicated Host 17

Configuring the CxSAST Server Web Portal Installed on Dedicated Hosts for Use with the IIS Application 17

Defining a new ActiveMQ Password 23

CXSAST Linux Server 25

CxSAST Engine Configuration Parameters 26

Configuring SSL between the Manager & Engine 29

Windows 29

Linux 31

ENABLING AND CONFIGURING SSL AND TLS 32

Configuring SSL for the Checkmarx Software Exposure Platform 32

Checkmarx Software Exposure Platform (SSL) 32

Configuring SSL 33

Enabling SSL Support on the CxManager 35

CxManager (SSL) 35

Enabling SSL Support 36

Defining HTTPS Settings 38

Enabling HTTP Strict Transport Security (HSTS) 39

Overview 39

Enabling HSTS 39

Enabling TLS Protocol Connection to the ActiveMQ 39

Configuring TLS Protocol Connection for the First Time 40

Upgrading from CxSAST 9.0.0 40

ActiveMQ Clients and URI Mapping 40
Configuring Environment Variables 40
Restarting ActiveMQ Client Services 41
Enabling TLS 1.2 Support and Blocking Weak Ciphers on CxManager 41
CONFIGURING MANAGEMENT AND ORCHESTRATION 45
Configuring Management and Orchestration for SSL and FIPS Compliancy 45
Configuring HTTPS in Apache Tomcat 45
Configuring FIPS Compliancy 47
Configuring the Management and Orchestration SQL Server for Dynamic and Static Port Connectivity 47
Static Port Configuration 48
Dynamic Port Configuration 50
Configuring a Non-default Location for Management and Orchestration and CxSAST Component Data 53
Changing the Management and Orchestration and CxSAST Component Data File Location 53
Configuring a Non-default Location for Management and Orchestration Component Logs 54
Changing the Management and Orchestration Component Log File Location 54
CONFIGURING CXSAST FOR USE 55
Configuring CxSAST for High Availability 55
Configuring Checkmarx Software Exposure Platform for High Availability 55
Configuring ActiveMQ for High Availability Environments 56
Configuring High Availability for the First Time 56
Upgrading from v9.0.0 56
Configuring Environment Variables 56
Restarting ActiveMQ Client Services 57
Configuring Access Control for High Availability Environments 57
Configuring the CxAccessControl Database 57
Configuring the Host Header in the Load Balancer / Proxy 59
Configuring the Connection to a Source Control System 60
Defining Source Control for TFS 61
Defining Source Control for SVN 62
Defining Source Control for GIT 63
Defining Source Control for Perforce 65
Configuring CxSAST for using a non-default Port 66
Changing the Web Server Listening Port 66
Additional CxSAST Configuration 68
Configuring CxSAST for using a non-default User (Network Service) - CxServices & IIS Application Pools 69
Configuring CxSAST for using a non-default User (Network Service) for CxServices & IIS Application Pools 69
Configuration 72
CONFIGURING CXOSA WITH A PROXY SERVER 75
ANT INTEGRATION 76
DISABLING THE SWAGGER UI CLIENT 78

CxSAST Configuration Guide

This section of the Checkmarx Knowledge Center includes advanced configuration procedures and explanations or uncommon scenarios.

Refer to CxSAST Troubleshooting & FAQ for additional information and frequently asked questions.

Configuring Authentication Protocols and Users

This section covers the configuration of authentication protocols and users.

Configuring Single Sign-On (SSO)

You can configure CxSAST to automatically use the Windows credentials of the user that is logged on to Windows, so that registered domain users do not need to independently log into CxSAST.

- Single sign-on authentication is available only to Active Directory users.
- The instructions below apply to IIS 8, 8.5 and 10.

➢ **To configure single sign-on (SSO):**

1. Make sure that the CxSAST server is in the organizational domain.
2. On the CxSAST server, activate IIS Windows Authentication. In a distributed deployment, you have to activate IIS Windows Authentication on the CxManager.
3. Activate IIS Windows Authentication:
    a) Open **Turn Windows features on or off** (you can find it from the Windows search bar) or in **Windows Server Manager > Manage > Add Roles and Features**.
    b) Under **Internet Information Services** > **World Wide Web Services** or **Web Server (IIS) > Web Server**, select **Security > Windows Authentication** and install.
4. Open the IIS Manager, and apply Windows Authentication to the CxSAST web services.

➢ **Do one of the following for CxWebClient, CxWebInterface and CxRestAPI:**

1. In the left-hand Connections pane, navigate to and select the 'Default Web Site' web service and in the IIS section, double-click Authentication.
    - By default the following web applications are installed under **'Default Web Site'** :
      CxRestAPI,
      CxWebClient,
      CxWebInterface
      These applications inherit the changes outlined below.
      If the web applications are on a custom IIS Site, make the change on that site.
2. Right-click Windows Authentication and select Enable.
    - If the Windows authentication is Kerberos:
      a) Right-click Windows Authentication and select Providers.
      b) Under Available Providers, add Negotiate, if not already listed.
      c) Move Negotiate above NTLM.
      d) Click OK.

- In the IIS, set **useAppPoolCredentials** to **True**:
  a) Select the 'Default Web Site'
  b) Under Management, double-click [Configuration Editor] and set 'useAppPoolCredentials' to True under this section: system.webServer/security/authentication/windowsAuthentication

➢ **To continue configuring single sign-on (SSO):**

1. If your Cx Application Pools (CxAccessControl, CxClientPool, CxPool, and CxPoolRestAPI) Login Identity is configured for a 'Custom Domain Service Account' (login service account), modify as follows:
2. On the CxSAST server, open the following file for editing:
   <Installation path>\Checkmarx\CheckmarxWebPortal\Web\web.config, for example C:\Program Files\Checkmarx\CheckmarxWebPortal\Web\web.config
3. Under <appSettings>, navigate to the UseSSOLogin key, and change its value to true as noted below:
   <add key="UseSSOLogin" value="true"/>

CxSAST Active Directory users who are logged on to Windows can now access CxSAST without logging on to CxSAST separately.

Configuring User Credentials for CxDB Connectivity

The purpose of this instruction is to configure the user credentials used for CxDB connectivity.

➢ **To change the user credentials used for CxDB connectivity:**

1. Locate the properties configuration file, found in the Config folder in the Checkmarx Risk Management folder (for example: *C:\Program Files\Checkmarx\Checkmarx Risk Management\Config*).
2. Locate the 2 keys relevant to the CxDB connection: DB_USER and DB_PASSWORD.
3. Enter both new user name and new password, and then save the file.
4. Restart the CxARM service, which will automatically update the values and encrypt the password data in the CxARM DB.

- After updating the user name and password, these values will be deleted from the db.properties file.

Configuring CxSAST Components

This section covers the configuration of specific CxSAST components.

Configuring CxConsole to Use a Proxy

If your network requires a proxy to connect to the CxSAST server, you have to configure CxConsole as follows:

1. Open the following file for editing:**.\CxConsole\runCxConsole.cmd**
2. Locate the following line: **java -jar CxConsolePlugin-CLI-9.00.2.jar %***
3. Change that line to the following:
   java -Xmx1024m -Dhttp.proxyHost=<proxy server> **-Dhttp.proxyPort=**<port> **-DsocksProxyHost=**<proxy server> **-jar CxConsolePlugin-CLI-9.00.2.jar %***
   <proxy server> - IP address or resolvable name of your network proxy server
   <port> - Port at which the proxy server is listening,

   for example **java -Xmx1024m -Dhttp.proxyHost=**10.31.0.128 **-Dhttp.proxyPort=**808 **-DsocksProxyHost=**10.31.0.128 **-jar CxConsolePlugin-CLI-9.00.2.jar %***

- We recommend that, rather than edit our script every time an update is required, setting the following in the global environment, or before calling the script:
  - Linux - export JAVA_TOOL_OPTIONS="-Dhttp.proxyHost=http-proxy -Dhttp.proxyPort=3128 -DproxySet=true"
  - Windows - set JAVA_TOOL_OPTIONS="-Dhttp.proxyHost=http-proxy -Dhttp.proxyPort=3128 -DproxySet=true"

For additional information on connecting via a proxy from a Java command, refer to Java Networking and Proxies at the Oracle website.

Changing the Server Name, IP Address or Port for Checkmarx Components

Since CxSAST 9.0, additional components have been introduced to CxSAST that include Access Control, Management & Orchestration, and ActiveMQ. The definition values for these components are saved in the database (CxDB) as **{Protocol}://{FQDN}:{Port}**. Fully Qualified Domain Name (FQDN) is the complete domain name for the host and consists of the hostname and the domain name, for example **http://mqserver.company.com:5555**. If you want to rename the server, change the IP address or the port, you have to change the key value definitions in the relevant database tables.

Changing the server name, the IP address or ports for Checkmarx components can be performed via the relevant database table and then through the Web Portal. These steps can be performed manually for each server:

1. Insert the new server definitions into the Domain Name System (DNS).
2. Open MS SQL Server Management Studio and connect to the SQL server.

3. Go to **Databases** > **CxDB** > **Tables** > **dbo.CxComponentConfiguration** to update the following database key values
   - **ActiveMessageQueueURL**- {Protocol}://{**Server Name**, **IP**}:{**Port**}
   - **CxARMPolicyURL** - {Protocol}://{**Server Name**, **IP**}:{**Port**}
   - **CxARMURL** - {Protocol}://{**Server Name**, **IP**}:{**Port**}
   - **IdentityAuthority** - {Protocol}://{**Server Name**, **IP**}:{**Port**}/CxRestAPI/auth
   - **EX_SOURCE_PATH** - {dir}:\{CxSrc folder}
   - **SOURCE_PATH** - {dir}:\{CxSRC folder}
   - **WebServer -** {Protocol}://{**Server Name**, **IP**}:{**Port**}
4. Go to **Databases** > **CxDB** > **Tables** > **CxARM** > **dbo.DBSources** and also update the **DB_HOST** database key value.
5. Update the server name, the IP address or the port in the relevant configuration file for each server:
   - For CxManagers/Web Portals:
     - Go to **C:\Program Files\Checkmarx\CheckmarxWebPortal\Web**, open the **web.config** file for editing and using the Search tool, search for '**CxWSResolver.CxWSResolver**' and update accordingly.
     - Go to **C:\Program Files\Checkmarx\Configuration**, open the **DBConnectionData.config** file for editing and using the Search tool, search for '**Data Source**' and update accordingly.
   - For Management and Orchestration (if installed):
     - Go to **C:\Program Files\Checkmarx\Checkmarx Risk Management\Config**, open the **db.properties** file for editing and using the Search tool, search for '**DB_HOST**' and update accordingly.
   - For CxEngines:
     - Go to **C:\Program Files\Checkmarx\Checkmarx Engine Server**, open the **CxSourceAnalyzerEngine.WinService.exe.config** file for editing and using the Search tool, search for '**baseAddress**' and update accordingly.
   - If the port has to be updated, enter the Windows Registry Editor by running '**regedit**' from the Windows command line (CMD), and update the port as required:

     1. Inside the Registry Editor, go to this registry key: **HKEY_LOCAL_MACHINE\SOFTWARE\Checkmarx\Installation**
     2. Update the port number.

6. To update the Java version or the Java path, apply the correct Java settings as follows:
7. Right-click **This PC** and select **Properties** to display the System information and settings.
8. Go to **Advanced System Settings** to open the System Properties dialog box.
9. If not already open, open the Advanced tab.
10. On the Advanced tab, click **Environment Variables...** to open the Environment Variables dialog box.
11. Navigate to **CX_JAVA_HOME** to point to where the JRE folder is located, for example **C:\Program Files\Java\jdk1.8.0_241\jre**.
12. Update the Load Balancer configuration file (e.g. **Nginx.conf**) accordingly.

13. Update Access Control by configuring the appsettings.json file (<dir>:\Program Files\Checkmarx\Checkmarx Access Control\appsettings.json).
    - Update **ExternalListenUrls** to reflect IIS configured bindings:

      http(s)://*(port)
      e.g. **"ExternalListenUrls": "https://*:443"**

    - If more than one binding is configured, use the following syntax:

      http(s)://*(port);http(s)://*(port)
      e.g. **"ExternalListenUrls": "https://*:443;https://*:123"**

14. Restart all Cx Windows Services and the IIS.
15. Log in to the Web Portal and manually update the CxEngine Server name, the IP address or the port according to these instructions.
16. If required, update the IP Address in the TCP/IP Properties in the SQL Server Configuration Manager (see example).

- After completing the steps above, you have to update the Environment Variables. You may use the Silent Reconfiguration option or edit the Environment Variables available under Windows Properties.
- For Distributed Silent Installation and High Availability, you have to reconfigure Access Control after installing ActiveMQ. To do so, refer to Silent Reconfiguration for further information and instructions.

Changing Protocols, the Hostname and Ports for Checkmarx Components

A number of additional components have been introduced (Access Control, CxSAST, Management & Orchestration, and ActiveMQ) to the latest versions of CxSAST. The endpoints for these components are saved in the database (CxDB) as **{Protocol}://{FQDN}:{Port}**. Fully Qualified Domain Name (FQDN) is the complete domain name for the host and consists of the hostname and the domain name (e.g. **http://mqserver.company.com:5555**).

- For clean installations, component endpoints are saved as HTTP by default. Upgrades keep previous component endpoint values.

Use Cases

This instruction defines the procedure for changing component endpoint configurations in the database, in cases where the current configurations need to be changed, The following use cases will determine if and how these component endpoints should to be changed.

- **Use-Case 1**: If the machine is only reachable by the IP and not by the FQDN, for instance, if a DNS Server is not used, you will need to change the table key value definitions in the database.
- **Use-Case 2**: If you change the CxSAST, Management & Orchestration or ActiveMQ ports after installation, you will need to change the table key value definitions in the database.
- **Use-Case 3**: If you manually configured the environment as Secure Sockets Layer (SSL), you may need to change the table key value definitions in the database.

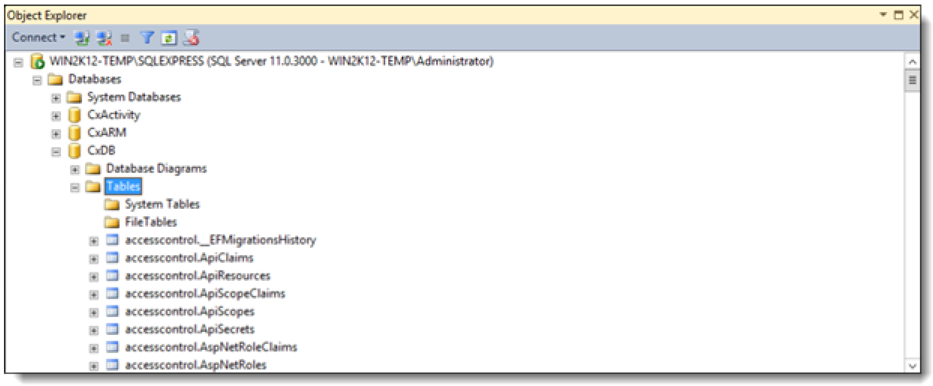
- **Use-Case 4**: If you rename the machine, you will need to change the table key value definitions in the database.
- **Use-Case 5**: If you configured the system to connect users via a corporate proxy server, you will need to change the table key value definitions in the database.
- **Use-Case 6**: If you add a load balancer, for instance, in HA deployments where the load balancer endpoint is used instead of the machine name, you will need to change the table key value definitions in the database.

For further instructions and examples, refer to Accessing the Database Table and Changing Table Key Value Definitions.

Accessing the Database Table

Once the CxSAST environment is installed and fully configured, access the database as follows:

1. Open **MS SQL Server Management Studio.**
2. Connect to the SQL server.
3. Go to **Databases >** **CxDB >** **Tables.**
4. Change the table key value definitions as instructed in the section below.



```
Object Explorer
Connect ▾
⊟ WIN2K12-TEMP\SQLEXPRESS (SQL Server 11.0.3000 - WIN2K12-TEMP\Administrator)
  ⊟ Databases
    ⊞ System Databases
    ⊞ CxActivity
    ⊞ CxARM
    ⊟ CxDB
      ⊞ Database Diagrams
      ⊟ Tables
          System Tables
          FileTables
        ⊞ accesscontrol._EFMigrationsHistory
        ⊞ accesscontrol.ApiClaims
        ⊞ accesscontrol.ApiResources
        ⊞ accesscontrol.ApiScopeClaims
        ⊞ accesscontrol.ApiScopes
        ⊞ accesscontrol.ApiSecrets
        ⊞ accesscontrol.AspNetRoleClaims
        ⊞ accesscontrol.AspNetRoles
```

Changing Table Key Value Definitions

After accessing the database and connecting to the SQL server, do the following:

1. In the **Tables** folder (**Databases >** **CxDB >** **Tables**), right-click the required **Table** according to the Table/Key Value Definitions table below and then select **Edit Top 200 Rows.**
2. For each **Key**, change the **Value** field according to the relevant use case (refer to Use Cases).
3. Save your changes.
4. On the CxManager host, reset the IIS. To do so, run '**iisreset**' from the elevated CMD or run **Restart** for the relevant server in the IIS Console.
5. Restart all Cx Windows Services.

Table	Key	Value
dbo.CxComponentConfiguration	**IdentityAuthority** (i.e. Access Control URL)	{Protocol}://{Machine}:{Port}/CxRestAPI/auth Default HTTP port = 80

Table	Key	Value
		When upgrading to v9.0 from version 8.9 or 8.8, the **IdentityAuthority** value is preserved unless it is empty or set to **localhost**. In these cases, the full URL of your local station is added.
	CxSASTManagerUri (i.e. SAST Manager URI)	{Protocol}://{Machine}:{Port} Default HTTP port = 80
	CxARMURL (i.e.CxAnalytics URL)	{Protocol}://{Machine}:{Port} Default HTTP port = 8080
	CxARMPolicyURL (i.e.Policy Manager URL)	{Protocol}://{Machine}:{Port} Default HTTP port = 8080
	ActiveMessageQueueURL (i.e.ActiveMQ URL)	{Protocol}://{Machine}:{Port} Default TCP port = 61616
config.CxEngineConfigurationKeysMeta	**ACTIVE_MESSAGE_QUEUE_URL** (i.e.ActiveMQ URL)	{Protocol}://{Machine}:{Port} Default TCP port = 61616
accesscontrol.ConfigurationItems	**SERVER_PUBLIC_ORIGIN**	Change according to the following conditions: • If the host is configured for IP, then: **SERVER_PUBLIC_ORIGIN** = {Protocol}://{Machine_IP}:{port} and **IdentityAuthority** = {protocol}://{Machine_IP}:{port}/CxRestAPI/auth • If the host is configured for FQDN and **SERVER_PUBLIC_ORIGIN** is not empty, then: **SERVER_PUBLIC_ORIGIN** = {protocol}://{Machine_FQDN}:{port} and IdentityAuthority = {Protocol}//{Machine_FQDN}:{port}/CxRestAPI/auth • If the host is configured for **FQDN** and **SERVER_PUBLIC_ORIGIN** is empty, leave empty. In all instances, the protocol should be the same for both SERVER_PUBLIC_ORIGIN and IdentityAuthority keys.

Configuring the Proxy from the Checkmarx Server

➢ **To configure the proxy from the Checkmarx Server:**

- In the web configuration file, located under **C:\Program Files\Checkmarx\Checkmarx Web Services\CxWebInterface\web.config**, add the following syntax to the <system.webserver> section.

```
<system.net>
 <defaultProxy enabled="true" useDefaultCredentials="true">
 <module type="Checkmarx.CxInfraSructures.WebProxy.CxWebProxy,
CxInfraSructures"/>
 <proxy bypassonlocal="True" proxyaddress="http://10.31.1.111:8085"/>
<bypasslist>
 <clear/>
 <add address="10.31.8.*"/>
 <add address="10.31.98.*"/>
 </bypasslist>
 </defaultProxy>
</system.net>
```

- **About the XML:** The """" is optional. These are addresses that CxServer can connect to bypass the proxy server.

Proxy Server Settings

- In the Proxy Server Settings dialog, enter the following properties:
  - **Name** - Name of proxy server
  - **Protocol** - Select HTTP Proxy
  - **Client Port** - Select the client port to access
  - **Use HTTP Authentication** - Select Use HTTP Authentication option
  - **Authentication Challenges** - Select Basic
  - **Read Timeout** - Configure to 30 seconds (default)
  - **Connect Timeout** - Configure to 30 seconds (default)
  - **Report all Connects** - Select the check-box
  - **Log File** - Location of the log file

Proxy Service Console

1. In the Proxy Status dialog, enter the following properties:
   - **Current Status** - Service/ console: Running/Non-Running
   - **Service mode** - Start/Stop/Restart
   - **Console mode** - Start/Stop
2. Click <**OK**>.

Linking CxManager to the Database with a separate Client Portal using Windows Authentication

This page explains how to link CxManager to the database with a separate client portal using Windows authentication.

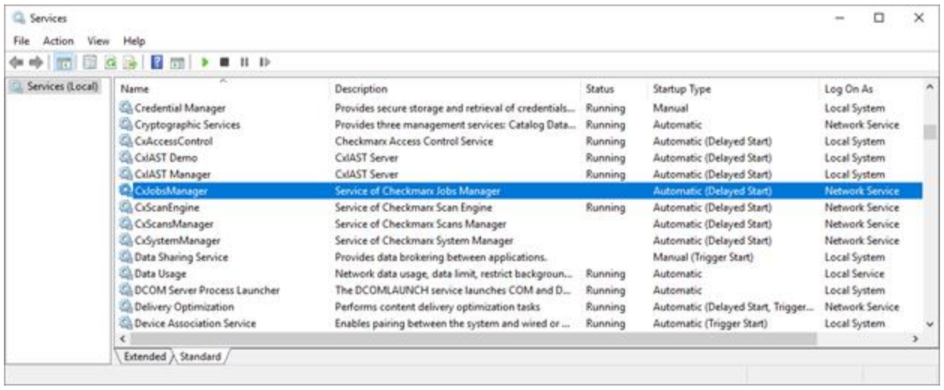
Prerequisites

The following must be in place and available:

- Distributed environment with each component on a separate host (4 hosts in total - Client Portal, Manager, Database and Engine).
- All hosts installed inside a domain with administrator access available
- CxManager host installed with Windows authentication with its own domain user
- Remaining hosts can be configured for regular users

Manager Configuration

1. Once the Manager host is installed, open Services (**Start > Control Panel > System and Security > Administrative Tools > Services**).

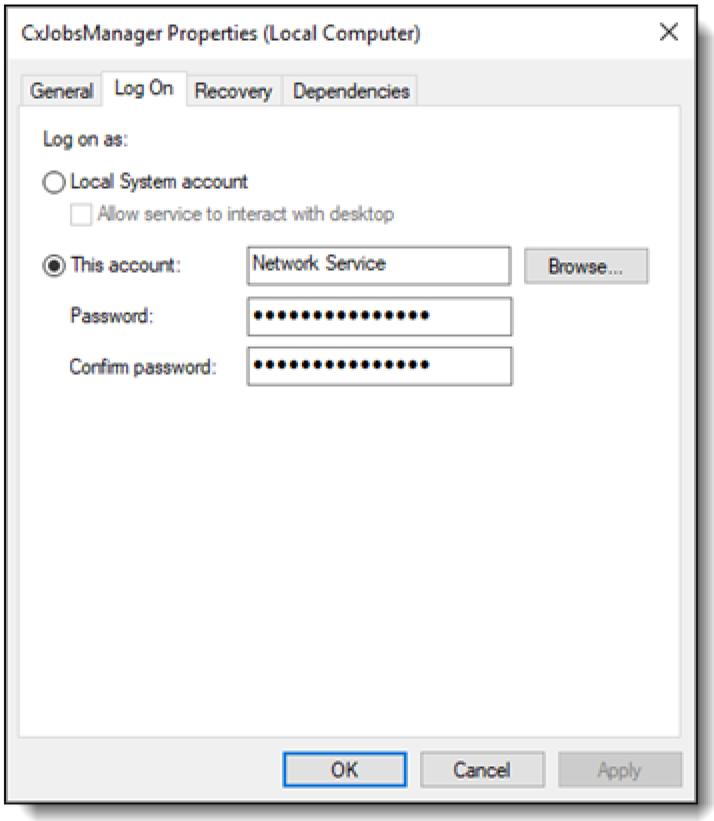


Name	Description	Status	Startup Type	Log On As
Credential Manager	Provides secure storage and retrieval of credentials...	Running	Manual	Local System
Cryptographic Services	Provides three management services: Catalog Data...	Running	Automatic	Network Service
CxAccessControl	Checkmarx Access Control Service	Running	Automatic (Delayed Start)	Local System
CxIAST Demo	CxIAST Server	Running	Automatic (Delayed Start)	Local System
CxIAST Manager	CxIAST Server	Running	Automatic (Delayed Start)	Local System
CxJobsManager	Service of Checkmarx Jobs Manager		Automatic (Delayed Start)	Network Service
CxScanEngine	Service of Checkmarx Scan Engine	Running	Automatic (Delayed Start)	Network Service
CxScansManager	Service of Checkmarx Scans Manager		Automatic (Delayed Start)	Network Service
CxSystemManager	Service of Checkmarx System Manager		Automatic (Delayed Start)	Network Service
Data Sharing Service	Provides data brokering between applications.		Manual (Trigger Start)	Local System
Data Usage	Network data usage, data limit, restrict backgroun...	Running	Automatic	Local Service
DCOM Server Process Launcher	The DCOMLAUNCH service launches COM and D...	Running	Automatic	Local System
Delivery Optimization	Performs content delivery optimization tasks	Running	Automatic (Delayed Start, Trigger...	Network Service
Device Association Service	Enables pairing between the system and wired or ...	Running	Automatic (Trigger Start)	Local System

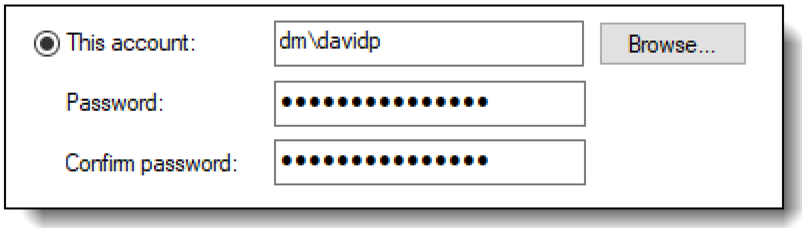
Depending on the CxSAST version installed, the following Cx services are available:

- CxJobsManager (v8.x)
- CxScansManager (v8.x)
- CxSystemManager (v8.x)
- CxSastResults (v9.0 and up)
- CxScanEngine (v8.x)
- CxARM (v8.8 and up)
- CxARMETL (v8.8 and up)
- CxRemediationIntelligence (v9.0 and up)
- CxAccessControl (v9.0 and up)

2. Right-click the first Cx Service, select **Properties** and open the Log On tab.



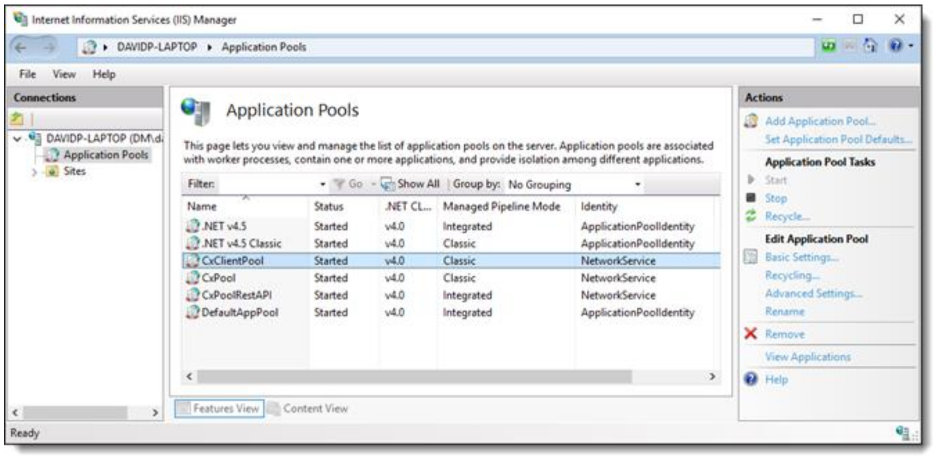
3. Enter the defined domain user (**dm\<username>**) into the 'This account' field.



4. Enter the domain user password into the 'Password' and 'Confirm Password' fields.
5. Click <**Apply**> to save the changes.
6. Perform the same procedure for each of the available Cx Services.

- The availability of Cx Services depends on the CxSAST version installed. Refer to the Cx Service/CxSAST Version information above.

7. Once completed, restart all Cx Services manually.
8. Once the Cx Services have been started, go to the IIS Manager (**Start > Control Panel > System and Security > Administrative Tools > Internet Information Services (IIS) Manager**) and enter **Application Pools**.


Internet Information Services (IIS) Manager

DAVIDP-LAPTOP ▸ Application Pools

Application Pools

This page lets you view and manage the list of application pools on the server. Application pools are associated with worker processes, contain one or more applications, and provide isolation among different applications.

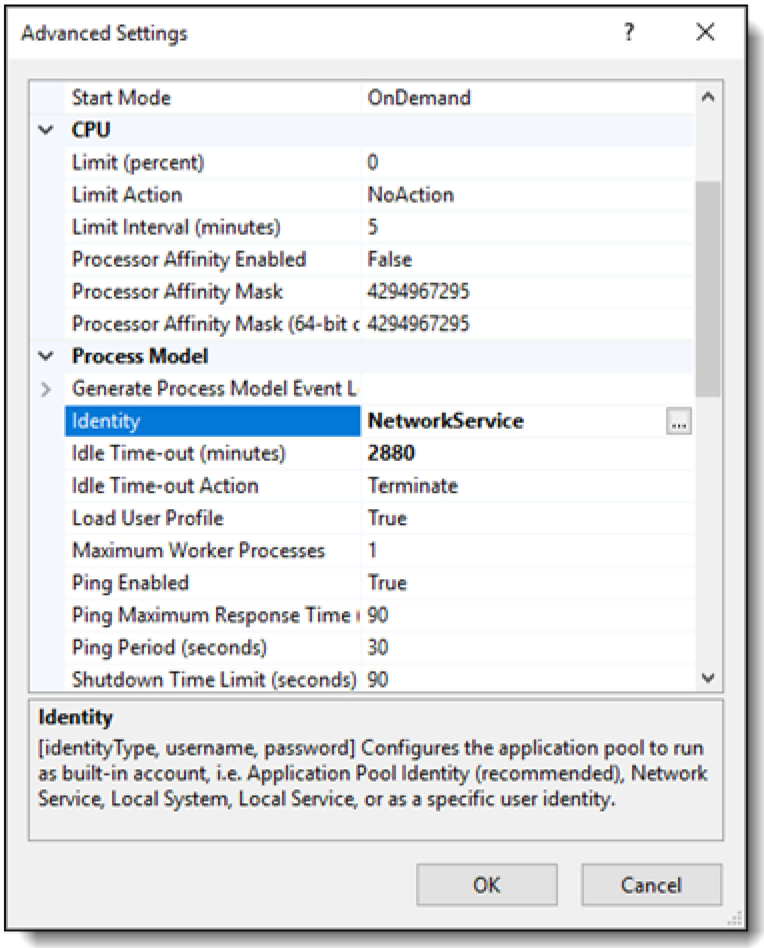
Filter: Go Show All Group by: No Grouping

Name	Status	.NET CL...	Managed Pipeline Mode	Identity
.NET v4.5	Started	v4.0	Integrated	ApplicationPoolIdentity
.NET v4.5 Classic	Started	v4.0	Classic	ApplicationPoolIdentity
CxClientPool	Started	v4.0	Classic	NetworkService
CxPool	Started	v4.0	Classic	NetworkService
CxPoolRestAPI	Started	v4.0	Integrated	NetworkService
DefaultAppPool	Started	v4.0	Integrated	ApplicationPoolIdentity

The following Cx Application Pools are available:

- CxClientPool
- CxPool
- CxRestPool

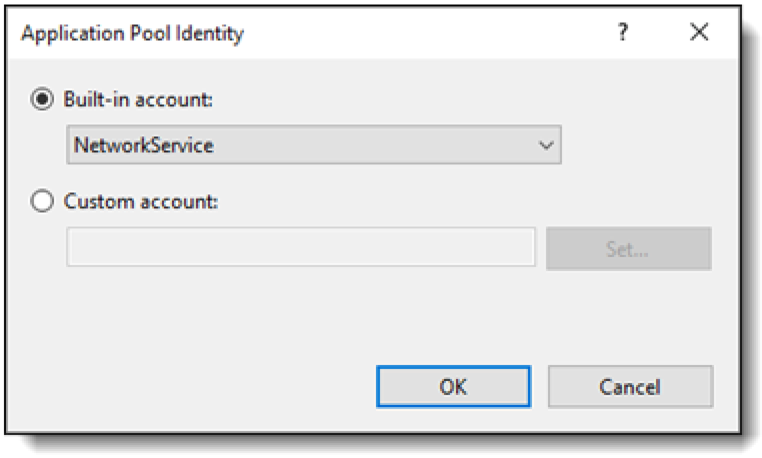
9. Right click the first Cx Application Pool and select **Advanced Settings**.


Advanced Settings

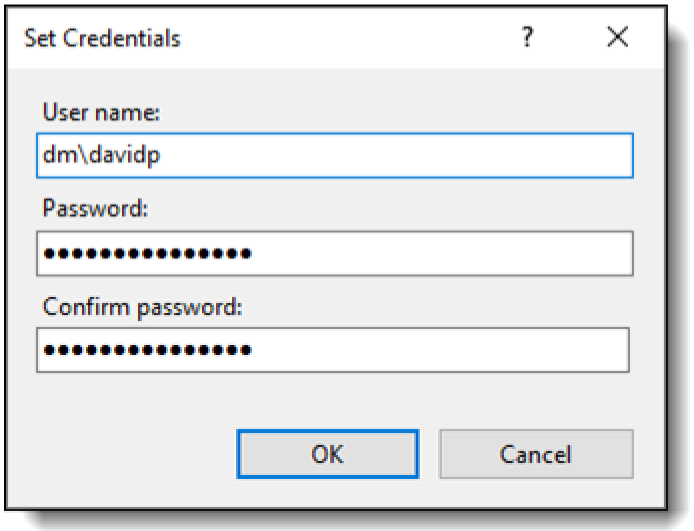
Start Mode	OnDemand
CPU	
Limit (percent)	0
Limit Action	NoAction
Limit Interval (minutes)	5
Processor Affinity Enabled	False
Processor Affinity Mask	4294967295
Processor Affinity Mask (64-bit c	4294967295
Process Model	
Generate Process Model Event L	
Identity	**NetworkService**
Idle Time-out (minutes)	**2880**
Idle Time-out Action	Terminate
Load User Profile	True
Maximum Worker Processes	1
Ping Enabled	True
Ping Maximum Response Time	90
Ping Period (seconds)	30
Shutdown Time Limit (seconds)	90

Identity
[identityType, username, password] Configures the application pool to run as built-in account, i.e. Application Pool Identity (recommended), Network Service, Local System, Local Service, or as a specific user identity.

10. Open the Application Pool Identity account window.



11. Select **Custom account**, click <**Set**> and enter the defined domain user (**dm\<username>**) into the 'User name' field.



User name:
dm\davidp
Password:
●●●●●●●●●●●●●●●
Confirm password:
●●●●●●●●●●●●●●●

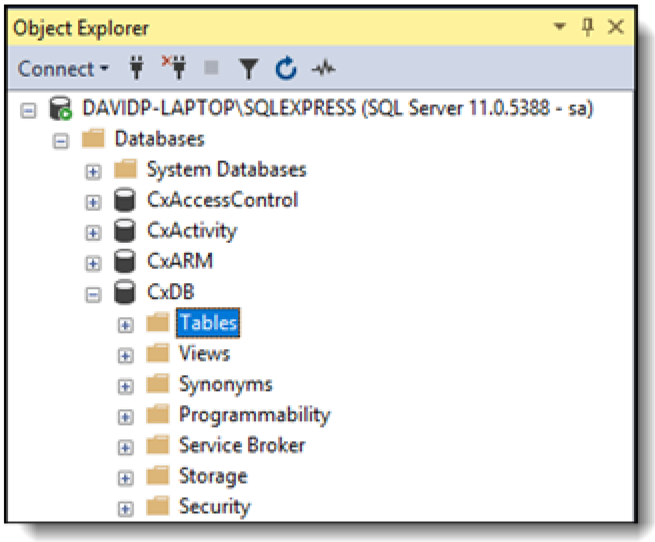
12. Enter the domain user password into the 'Password' and 'Confirm Password' fields.
13. Click <**OK**> to save the changes.
14. Using the CMD, restart the Internet Information Services (IIS) Manager.

Once you have completed the Manager configuration, you can now configure the database.

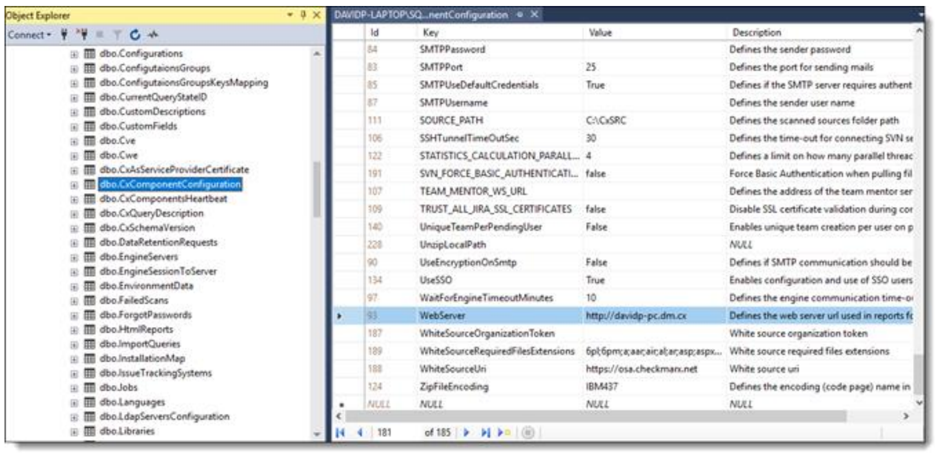
Database Configuration

Once you have completed the Manager configuration, you can now configure the database entries.

1. Open MS SQL Server Management Studio and connect to the SQL server.
2. Go to **Databases >** **CxDB >** **Tables**.



3. Right-click **dbo.CxComponentConfiguration** and select **Edit Rows**.



Id	Key	Value	Description
84	SMTPPassword		Defines the sender password
83	SMTPPort	25	Defines the port for sending mails
85	SMTPUseDefaultCredentials	True	Defines if the SMTP server requires authent
87	SMTPUsername		Defines the sender user name
111	SOURCE_PATH	C:\CxSRC	Defines the scanned sources folder path
106	SSHTunnelTimeOutSec	30	Defines the time-out for connecting SVN se
122	STATISTICS_CALCULATION_PARALL...	4	Defines a limit on how many parallel threac
191	SVN_FORCE_BASIC_AUTHENTICATI...	false	Force Basic Authentication when pulling fil
107	TEAM_MENTOR_WS_URL		Defines the address of the team mentor ser
109	TRUST_ALL_JIRA_SSL_CERTIFICATES	false	Disable SSL certificate validation during cor
140	UniqueTeamPerPendingUser	False	Enables unique team creation per user on p
228	UnzipLocalPath		NULL
90	UseEncryptionOnSmtp	False	Defines if SMTP communication should be
134	UseSSO	True	Enables configuration and use of SSO users
97	WaitForEngineTimeoutMinutes	10	Defines the engine communication time-o
93	WebServer	http://davidp-pc.dm.cx	Defines the web server url used in reports fc
187	WhiteSourceOrganizationToken		White source organization token
189	WhiteSourceRequiredFilesExtensions	6pl;6pm;a;aar;air;al;ar;asp;aspx...	White source required files extensions
188	WhiteSourceUri	https://osa.checkmarx.net	White source uri
124	ZipFileEncoding	IBM437	Defines the encoding (code page) name in
NULL	NULL	NULL	NULL

4. In the WebServer key field, enter the full domain name of the client host as follows:
   `http://{full_client_portal_manchine_name}.dm.cx`
5. Save the database changes.

Configuring the Checkmarx Web Portal on a Dedicated Host

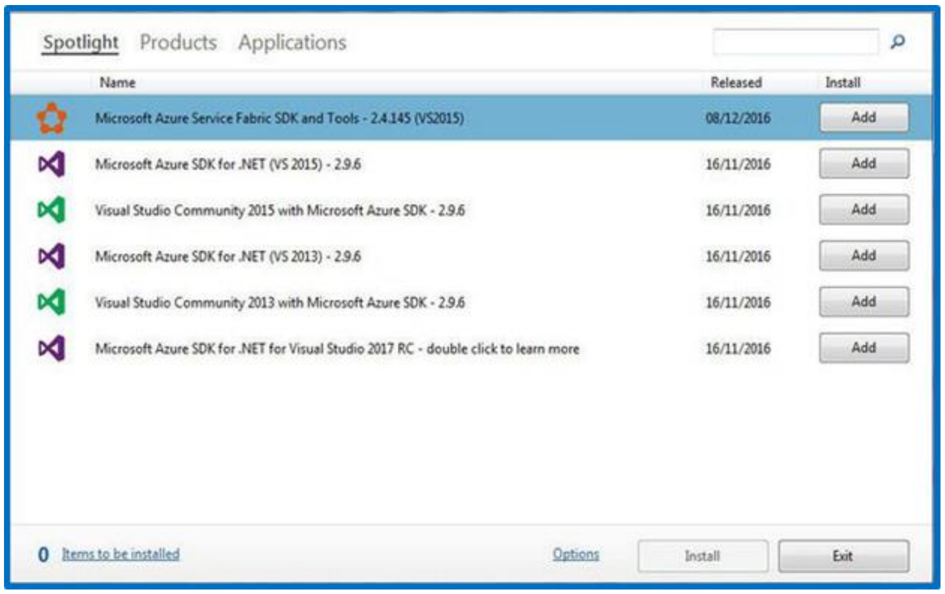
The Checkmarx Software Exposure Platform supports Distributed Architecture, where some or all the Checkmarx Software Exposure Platform components can be installed on a dedicated station (host). This instruction defines the procedure for configuring the Cx Web Portal on a dedicated host. For further information and instructions on configuring the Web Portal on a dedicated host, refer to **Installing and Configuring the Web Portal**.

Configuring the CxSAST Server Web Portal Installed on Dedicated Hosts for Use with the IIS Application

CxSAST supports Distributed Architecture, where any or all of the CxSAST server components are installed on dedicated hosts. The following procedure should be implemented in all CxSAT installations or upgrades to any version that includes the new IIS application.

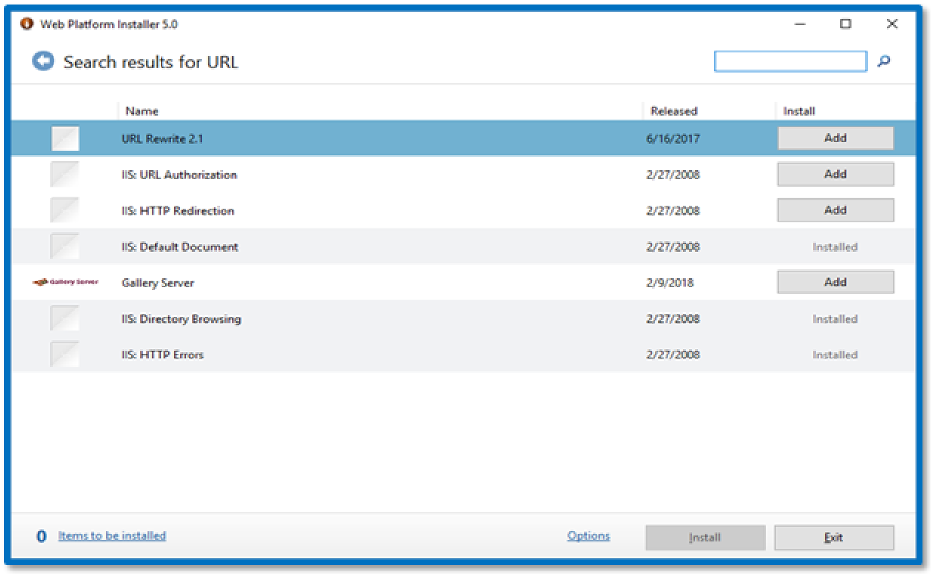
Once the IIS application components of the CxSAST setup have been installed, do the following:

1. Go to the Microsoft Web Platform Installer and click **Install this extension to download the installation file**.
2. Run the **Microsoft Web Platform Installer 5.0** on the **Portal Server**. The **Microsoft Web Platform Installer** is displayed.



Name	Released	Install
Microsoft Azure Service Fabric SDK and Tools - 2.4.145 (VS2015)	08/12/2016	Add
Microsoft Azure SDK for .NET (VS 2015) - 2.9.6	16/11/2016	Add
Visual Studio Community 2015 with Microsoft Azure SDK - 2.9.6	16/11/2016	Add
Microsoft Azure SDK for .NET (VS 2013) - 2.9.6	16/11/2016	Add
Visual Studio Community 2013 with Microsoft Azure SDK - 2.9.6	16/11/2016	Add
Microsoft Azure SDK for .NET for Visual Studio 2017 RC - double click to learn more	16/11/2016	Add

3. Search for the **Add URL Rewrite 2.1** module and click <**Add**>.



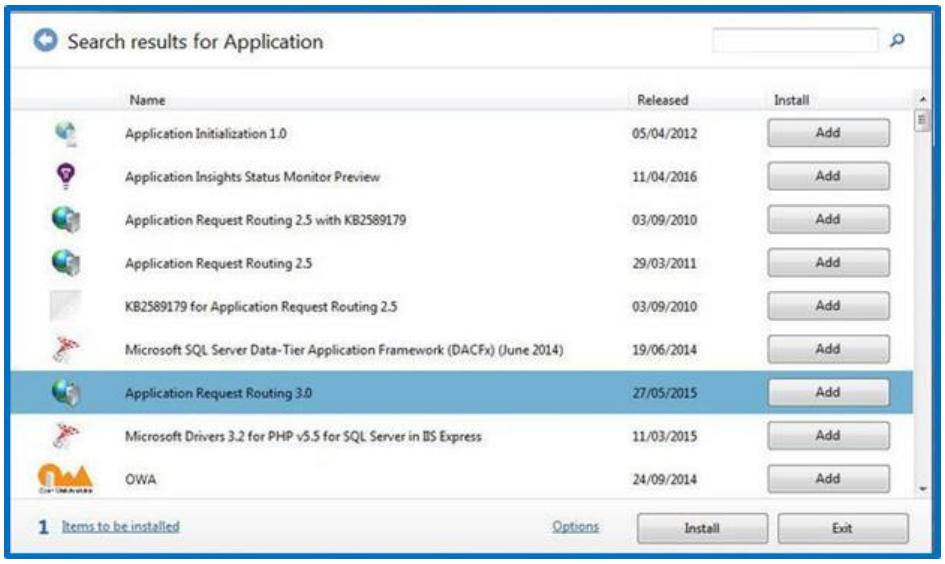
Web Platform Installer 5.0

Search results for URL

Name	Released	Install
URL Rewrite 2.1	6/16/2017	Add
IIS: URL Authorization	2/27/2008	Add
IIS: HTTP Redirection	2/27/2008	Add
IIS: Default Document	2/27/2008	Installed
Gallery Server	2/9/2018	Add
IIS: Directory Browsing	2/27/2008	Installed
IIS: HTTP Errors	2/27/2008	Installed

0 Items to be installed Options Install Exit

4. Search for the **Application Request Routing 3.0** module and click <**Add**>.

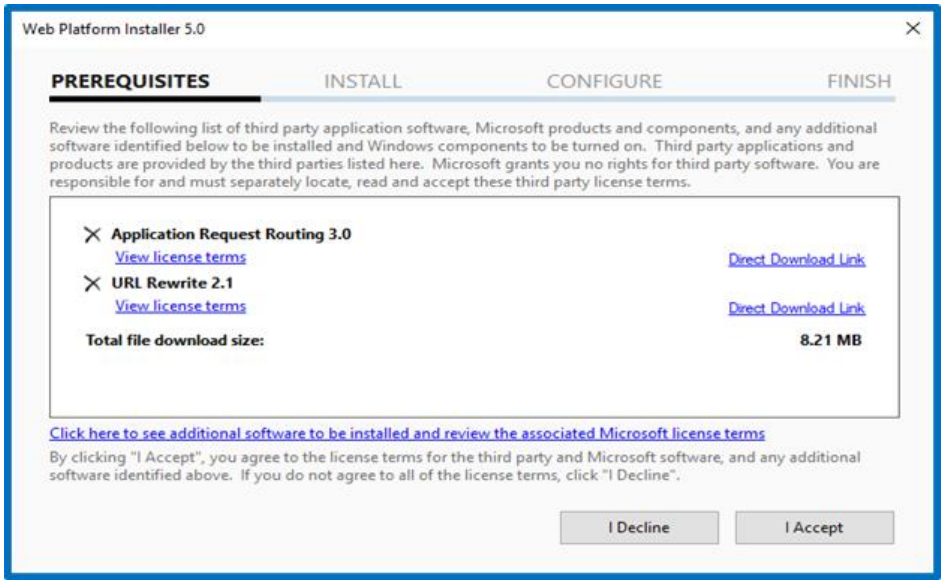


Search results for Application

Name	Released	Install
Application Initialization 1.0	05/04/2012	Add
Application Insights Status Monitor Preview	11/04/2016	Add
Application Request Routing 2.5 with KB2589179	03/09/2010	Add
Application Request Routing 2.5	29/03/2011	Add
KB2589179 for Application Request Routing 2.5	03/09/2010	Add
Microsoft SQL Server Data-Tier Application Framework (DACFx) (June 2014)	19/06/2014	Add
Application Request Routing 3.0	27/05/2015	Add
Microsoft Drivers 3.2 for PHP v5.5 for SQL Server in IIS Express	11/03/2015	Add
OWA	24/09/2014	Add

1 Items to be installed Options Install Exit

5. Click <**Install**>. The prerequisites for Web Platform Installer 5.0 are displayed.


Web Platform Installer 5.0

PREREQUISITES INSTALL CONFIGURE FINISH

Review the following list of third party application software, Microsoft products and components, and any additional software identified below to be installed and Windows components to be turned on. Third party applications and products are provided by the third parties listed here. Microsoft grants you no rights for third party software. You are responsible for and must separately locate, read and accept these third party license terms.

Application Request Routing 3.0
View license terms — Direct Download Link

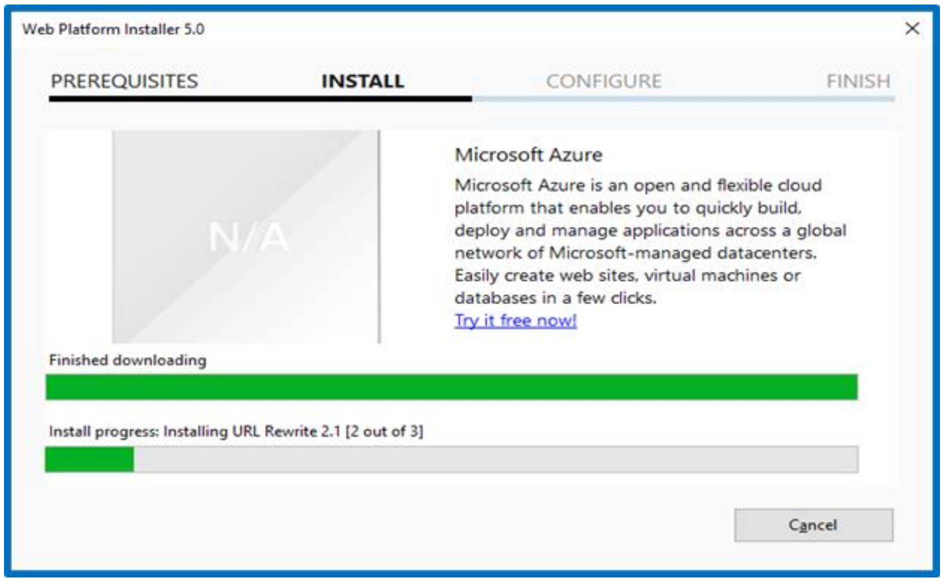
URL Rewrite 2.1
View license terms — Direct Download Link

Total file download size: 8.21 MB

Click here to see additional software to be installed and review the associated Microsoft license terms

By clicking "I Accept", you agree to the license terms for the third party and Microsoft software, and any additional software identified above. If you do not agree to all of the license terms, click "I Decline".

6. Click <**I Accept**>. The installation progress is displayed. You are notified upon successful installation.


Web Platform Installer 5.0

PREREQUISITES INSTALL CONFIGURE FINISH

Microsoft Azure

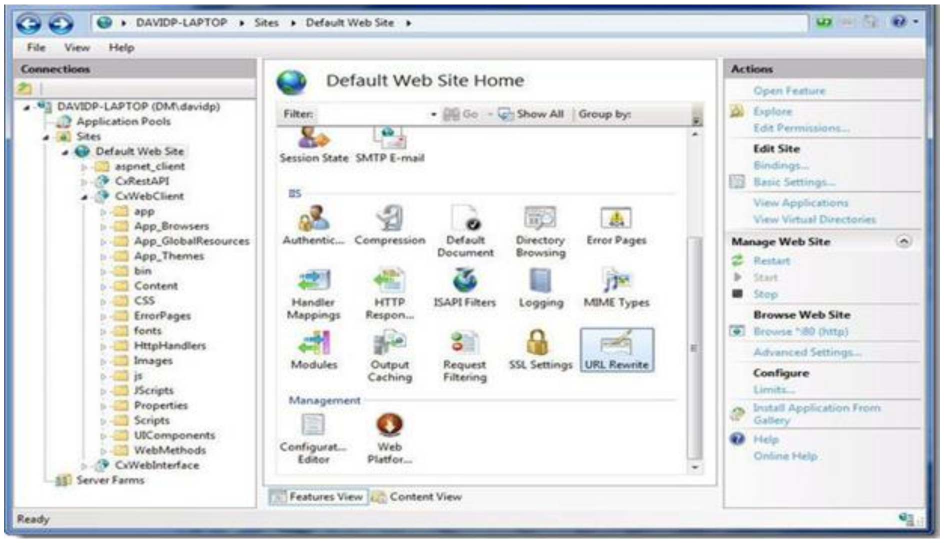
Microsoft Azure is an open and flexible cloud platform that enables you to quickly build, deploy and manage applications across a global network of Microsoft-managed datacenters. Easily create web sites, virtual machines or databases in a few clicks.

Try it free now!

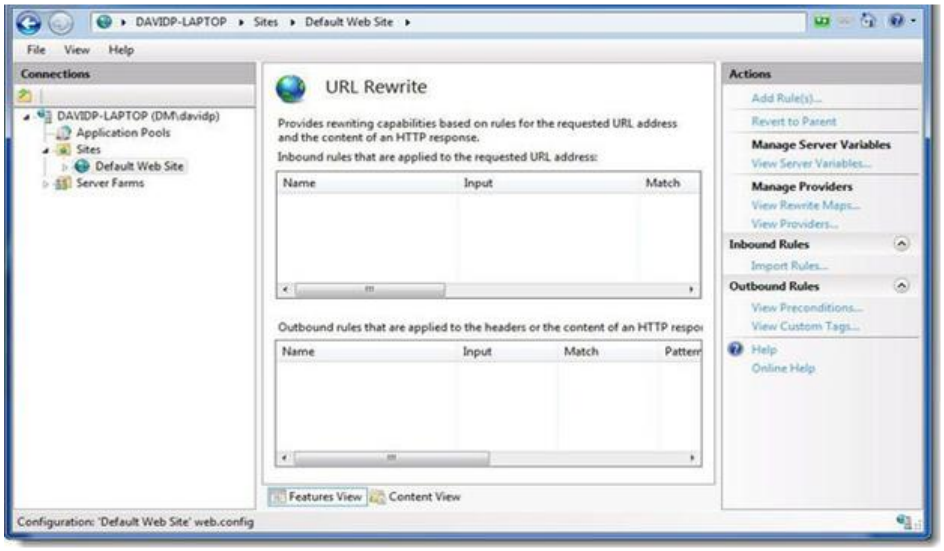
Finished downloading

Install progress: Installing URL Rewrite 2.1 [2 out of 3]

7. Click <**Finish**>.
8. Open the **Internet Information Services (IIS) Manager** on the Portal Server (**IIS Manager > Sites > Default Web Site > IIS > URL Rewrite**).



9. Select **Open Feature**. The **URL Rewrite Rule** is displayed.



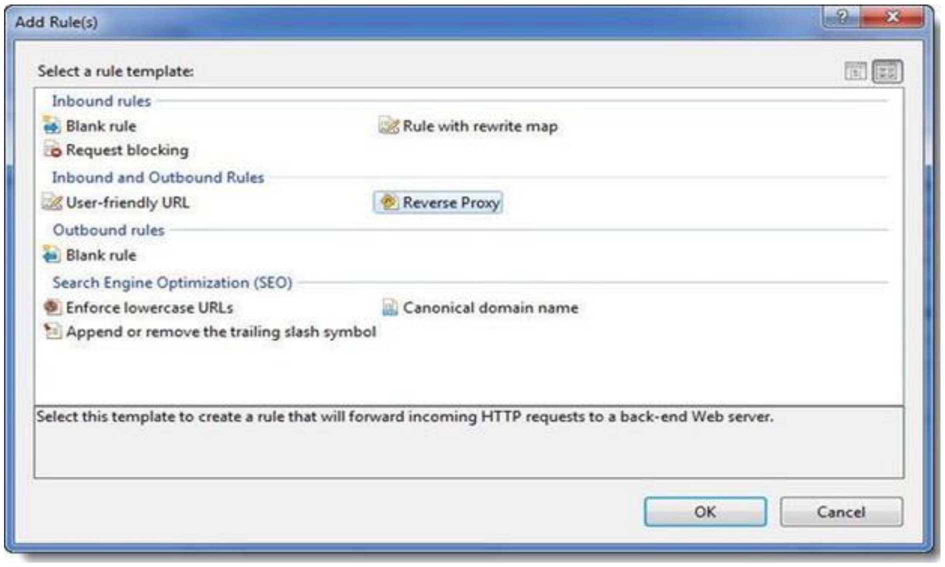
Provides rewriting capabilities based on rules for the requested URL address and the content of an HTTP response.

Inbound rules that are applied to the requested URL address:

Outbound rules that are applied to the headers or the content of an HTTP respo

Configuration: 'Default Web Site' web.config

10. Select **Add Rule(s)**. The **Rule Templates List** is displayed.


Add Rule(s)

Select a rule template:

Inbound rules
- Blank rule
- Rule with rewrite map
- Request blocking

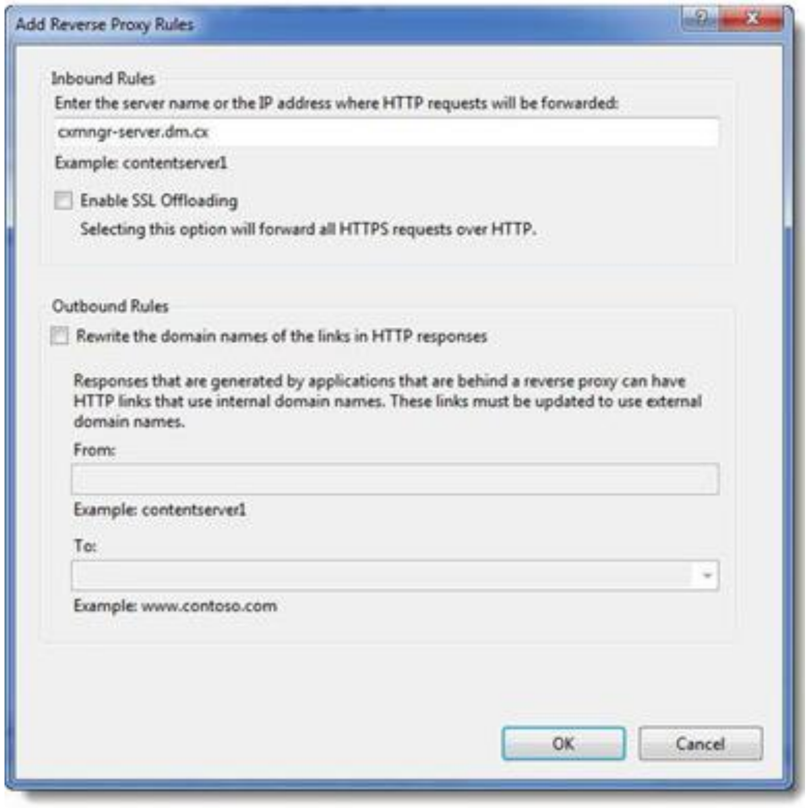
Inbound and Outbound Rules
- User-friendly URL
- Reverse Proxy

Outbound rules
- Blank rule

Search Engine Optimization (SEO)
- Enforce lowercase URLs
- Canonical domain name
- Append or remove the trailing slash symbol

Select this template to create a rule that will forward incoming HTTP requests to a back-end Web server.

11. Select **Reverse Proxy**. The **Add Reverse Proxy Rules** dialog is displayed.


Add Reverse Proxy Rules

Inbound Rules

Enter the server name or the IP address where HTTP requests will be forwarded:

cxmngr-server.dm.cx

Example: contentserver1

☐ Enable SSL Offloading

Selecting this option will forward all HTTPS requests over HTTP.

Outbound Rules

☐ Rewrite the domain names of the links in HTTP responses

Responses that are generated by applications that are behind a reverse proxy can have HTTP links that use internal domain names. These links must be updated to use external domain names.

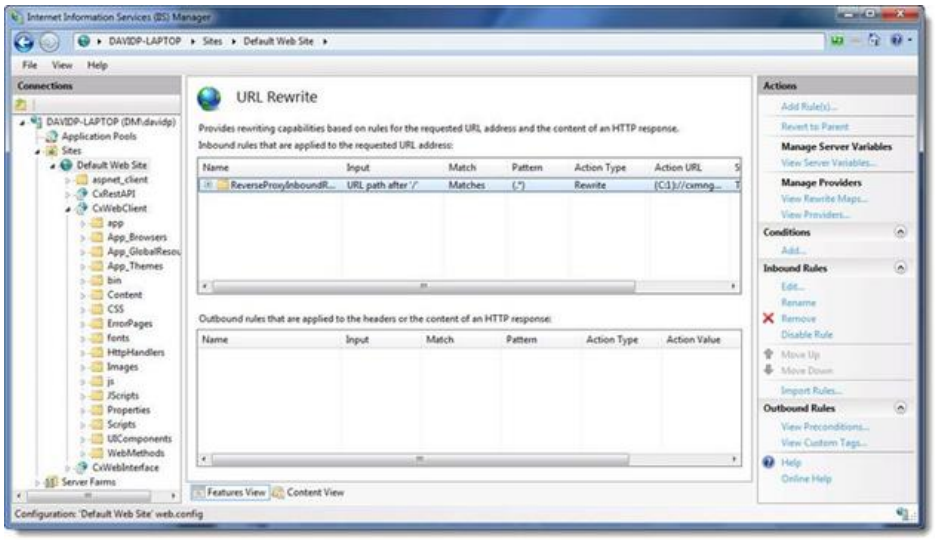
From:

Example: contentserver1

To:

Example: www.contoso.com

12. Enter the **CX Manager Server** name into the **Inbound Rules** field (e.g. cxmngr-server.dm.cx).
13. Disable the **SSL Offloading** option.
14. Click <**OK**> to save the changes.



Internet Information Services (IIS) Manager

DAVIDP-LAPTOP ▸ Sites ▸ Default Web Site ▸

URL Rewrite

Provides rewriting capabilities based on rules for the requested URL address and the content of an HTTP response.

Inbound rules that are applied to the requested URL address:

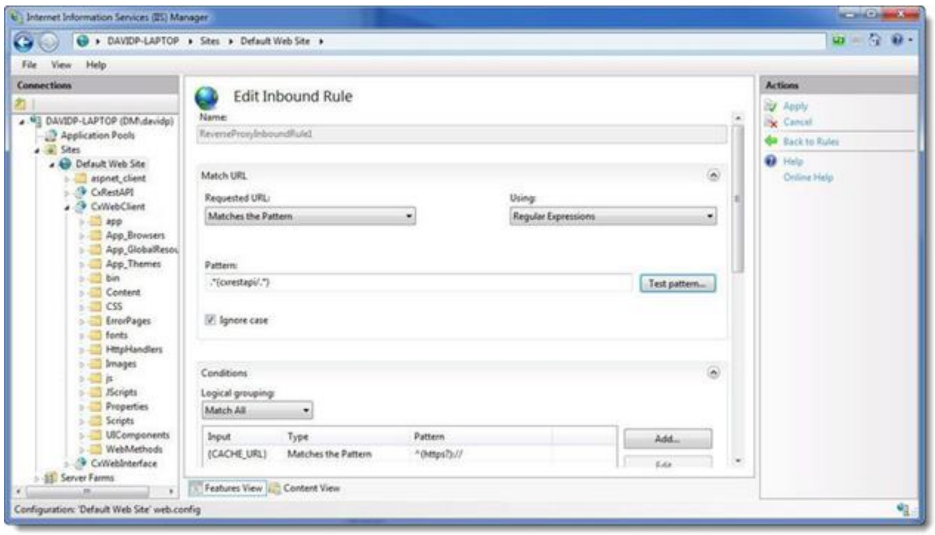
Name	Input	Match	Pattern	Action Type	Action URL
ReverseProxyInboundR...	URL path after '/'	Matches	(.*)	Rewrite	{C:1}://cxmng...

Outbound rules that are applied to the headers or the content of an HTTP response:

Name	Input	Match	Pattern	Action Type	Action Value

Configuration: 'Default Web Site' web.config

15. Select the newly created **Rule** and under Inbound Rules (right pane), click **Edit**. The **Edit Inbound Rule** window is displayed.



Internet Information Services (IIS) Manager

DAVIDP-LAPTOP ▸ Sites ▸ Default Web Site ▸

Edit Inbound Rule

Name: ReverseProxyInboundRule1

Match URL

Requested URL: Matches the Pattern

Using: Regular Expressions

Pattern: .*(cxrestapi/.*)

☑ Ignore case

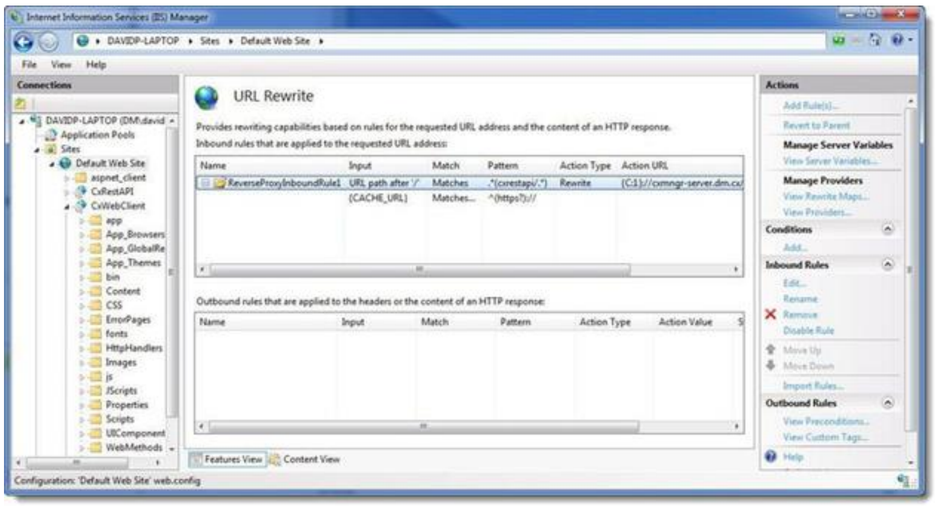
Conditions

Logical grouping: Match All

Input	Type	Pattern
{CACHE_URL}	Matches the Pattern	^(https?)://

Configuration: 'Default Web Site' web.config

16. Change the **Pattern** to .*(cxrestapi/.*) and click **Apply**.
17. Verify the changes in the URL Rewrite rule.


URL Rewrite

Provides rewriting capabilities based on rules for the requested URL address and the content of an HTTP response.

Inbound rules that are applied to the requested URL address:

Name	Input	Match	Pattern	Action Type	Action URL
ReverseProxyInboundRule1	URL path after '/'	Matches	.*(cxrestapi/.*)	Rewrite	{C:1}://cxmngr-server.dm.cx/
	{CACHE_URL}	Matches...	^(https?)://		

Outbound rules that are applied to the headers or the content of an HTTP response:

Name	Input	Match	Pattern	Action Type	Action Value

Configuration: 'Default Web Site' web.config

18. On the Web portal machine (directory: C:\Program Files\Checkmarx\CheckmarxWebPortal\Web) open ‘web.config’ file in editor and update the following the value of “CxWSResolver.CxWSResolver”with the Manager server IP/domain name.

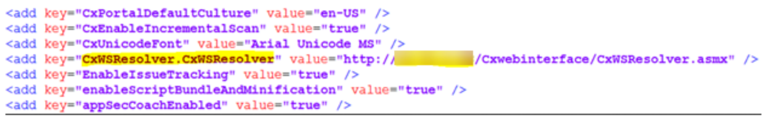
Example:

from....

<add key="CxWSResolver.CxWSResolver" value="http://localhost:80/Cxwebinterface/CxWSResolver.asmx" />

to....

<add key="CxWSResolver.CxWSResolver" value="http://manager-domain-name.com/Cxwebinterface/CxWSResolver.asmx" />


```
<add key="CxPortalDefaultCulture" value="en-US" />
<add key="CxEnableIncrementalScan" value="true" />
<add key="CxUnicodeFont" value="Arial Unicode MS" />
<add key="CxWSResolver.CxWSResolver" value="http://[redacted]/Cxwebinterface/CxWSResolver.asmx" />
<add key="EnableIssueTracking" value="true" />
<add key="enableScriptBundleAndMinification" value="true" />
<add key="appSecCoachEnabled" value="true" />
```

- **For versions 9.0 and higher**: Open the command line interface (CMD) as Administrator and enter the following command:

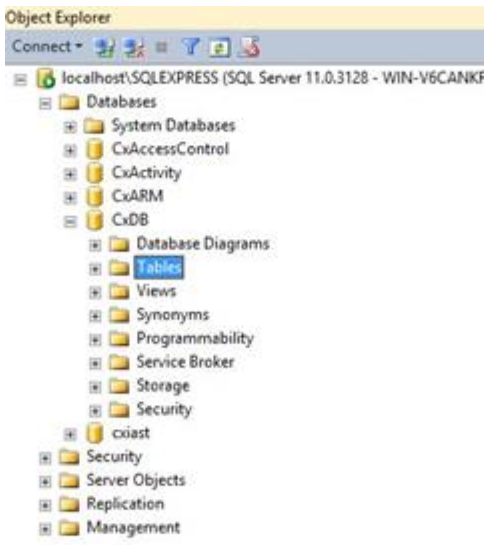
  appcmd.exe set config -section:system.webserver/proxy -preserveHostHeader:true /commit:apphost

19. Test the **CxSAST** application.

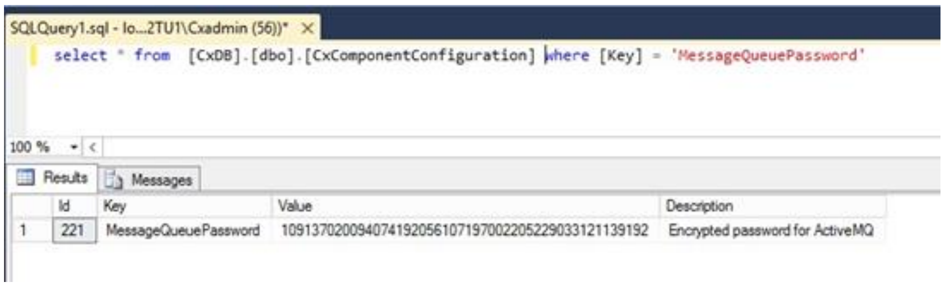
Defining a new ActiveMQ Password

The ActiveMQ **cxuser** account password is stored in the Checkmarx SAST 9.0 Database. To change the default password, the encryption secret must be changed as well. To change the password and the encryption secret, follow the instructions below:

1. Open **MSSQL Server Management Studio**.
2. Connect to the SQL server.
3. Go to **Databases >** **CxDB >** **Tables.**



4. Under Tables, navigate to **[CxDB].[dbo].[CxComponentConfiguration]**.
5. Enter the desired AMQ password (for example ***MyPassword***) in plain text as follows:
   - Update **[CxDB].[dbo].[CxComponentConfiguration] set [Value] = 'MyPassword' where [Key] = 'MessageQueuePassword'**.

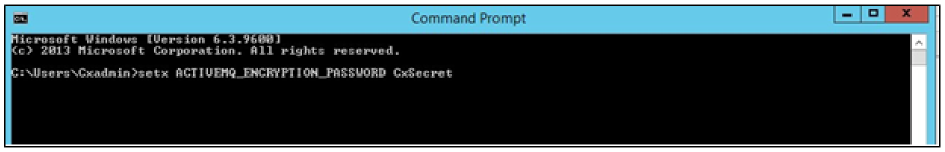


```
select * from [CxDB].[dbo].[CxComponentConfiguration] where [Key] = 'MessageQueuePassword'
```

	Id	Key	Value	Description
1	221	MessageQueuePassword	109137020094074192056107197002205229033121139192	Encrypted password for ActiveMQ

- Restart the IIS Service and browse to the Checkmarx portal to force the clear text password to be encrypted.
- Enter **cmd** in the Windows search field to open the command prompt.
- Change the value of environment variable ACTIVEMQ_ENCRYPTION_PASSWORD to the desired secret in plain text (for example ***CxSecret***):

setx ACTIVEMQ_ENCRYPTION_PASSWORD CxSecret /m



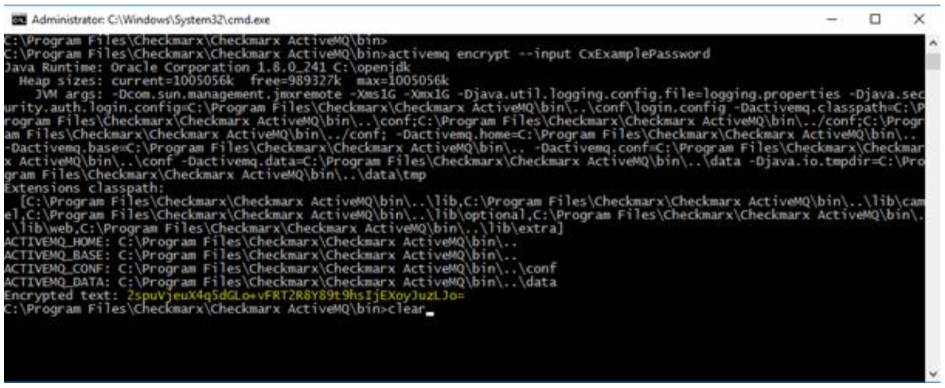
```
Microsoft Windows [Version 6.3.9600]
(c) 2013 Microsoft Corporation. All rights reserved.

C:\Users\Cxadmin>setx ACTIVEMQ_ENCRYPTION_PASSWORD CxSecret
```

- After setting a new environment variable, it is best to restart your machine in order to make sure that ActiveMQ process will load the new value.

6. Run the standard ActiveMQ utility to encrypt the secret by using the previously selected password:

   > cd <Checkmarx Install Folder>\Checkmarx ActiveMQ\bin > activemq encrypt --password CxSecret --input MyPassword

7. Copy the encrypted password from the output (yellow fonts in the example below).



Administrator: C:\Windows\System32\cmd.exe

```
C:\Program Files\Checkmarx\Checkmarx ActiveMQ\bin>
C:\Program Files\Checkmarx\Checkmarx ActiveMQ\bin>activemq encrypt --input CxExamplePassword
Java Runtime: Oracle Corporation 1.8.0_241 C:\openjdk
  Heap sizes: current=1005056k  free=989327k  max=1005056k
    JVM args: -Dcom.sun.management.jmxremote -Xms1G -Xmx1G -Djava.util.logging.config.file=logging.properties -Djava.sec
urity.auth.login.config=C:\Program Files\Checkmarx\Checkmarx ActiveMQ\bin\..\conf\login.config -Dactivemq.classpath=C:\P
rogram Files\Checkmarx\Checkmarx ActiveMQ\bin\..\conf;C:\Program Files\Checkmarx\Checkmarx ActiveMQ\bin\../conf;C:\Progr
am Files\Checkmarx\Checkmarx ActiveMQ\bin\../conf; -Dactivemq.home=C:\Program Files\Checkmarx\Checkmarx ActiveMQ\bin\..
-Dactivemq.base=C:\Program Files\Checkmarx\Checkmarx ActiveMQ\bin\.. -Dactivemq.conf=C:\Program Files\Checkmarx\Checkmar
x ActiveMQ\bin\..\conf -Dactivemq.data=C:\Program Files\Checkmarx\Checkmarx ActiveMQ\bin\..\data -Djava.io.tmpdir=C:\Pro
gram Files\Checkmarx\Checkmarx ActiveMQ\bin\..\data\tmp
Extensions classpath:
  [C:\Program Files\Checkmarx\Checkmarx ActiveMQ\bin\..\lib,C:\Program Files\Checkmarx\Checkmarx ActiveMQ\bin\..\lib\cam
el,C:\Program Files\Checkmarx\Checkmarx ActiveMQ\bin\..\lib\optional,C:\Program Files\Checkmarx\Checkmarx ActiveMQ\bin\.
.\lib\web,C:\Program Files\Checkmarx\Checkmarx ActiveMQ\bin\..\lib\extra]
ACTIVEMQ_HOME: C:\Program Files\Checkmarx\Checkmarx ActiveMQ\bin\..
ACTIVEMQ_BASE: C:\Program Files\Checkmarx\Checkmarx ActiveMQ\bin\..
ACTIVEMQ_CONF: C:\Program Files\Checkmarx\Checkmarx ActiveMQ\bin\..\conf
ACTIVEMQ_DATA: C:\Program Files\Checkmarx\Checkmarx ActiveMQ\bin\..\data
Encrypted text: 2spuVjeuX4q5dGLo+vFRT2R8Y89t9hsIjEXoyJuzLJo=
C:\Program Files\Checkmarx\Checkmarx ActiveMQ\bin>clear_
```

8. Navigate to **C:\Program Files\Checkmarx\Checkmarx ActiveMQ\conf\**
9. Open **credentials-enc.properties** and edit the password variable by changing the value between the brackets () to the new encrypted text.
10. Restart **Checkmarx ActiveMQ service** .
11. Navigate to table: **[Config].[CxEngineConfigurationKeysMeta]**
12. Update the AMQ password for the Engine configuration as follows:

    Update [CxDB].[Config].[CxEngineConfigurationKeysMeta] set [DefaultValue] = (SELECT TOP 1 [Value] FROM [CxDB].[dbo].[CxComponentConfiguration] where [Key] = 'MessageQueuePassword') where [KeyName]='MESSAGE_QUEUE_PASSWORD'

➢ **To update the new AMQ password in the environment variables:**

1. Retrieve the new encrypted password:

   SELECT TOP 1 [Value] FROM [CxDB].[dbo].[CxComponentConfiguration] where [Key] = 'MessageQueuePassword'

2. Set environment variables

   setx MessageQueuePassword {retrieved_password} /m
   setx CX_ES_MESSAGE_QUEUE_PASSWORD {retrieved_password} /m

3. Restart the Checkmarx Services (+ CxEngineService)

CXSAST Linux Server

Do the following to define a new ActiveMQ password under Linux:

1. Replace the password in the container environment file - **server.env** (provided with the package)

   CX_ES_MESSAGE_QUEUE_PASSWORD={retrieved_password}

2. Recreate the container in order to update the new AMQ password environment variable - run the "run.sh" script (supplied within the package)

   Multiple engines: Copy and paste the updated **server.env** file to the relevant Linux engine servers and recreate the containers in order to update the new AMQ password environment variable.

CxSAST Engine Configuration Parameters

The engine configuration parameters have been made available for CxSAST administrators and are provided mainly for information purposes.

It is recommended to consult with Checkmarx support before changing any values.

Parameter Name	**Value Type**	**Default Value**	**Parameter Description**
ABS_INT_RESOLVE_MEMBER_ ACCESSES_LANGUAGES	string	["JavaScript"]	Activate the Abstract Interpretation based resolver to resolve member accesses for specific languages (if ABS_INT_RESOLVE_MEMBER_ACCESSES is set to false).
ACTIVE_MESSAGE_QUEUE_URL	string		Message queue URL.
CALCULATE_CONFIDENCE_LEVEL	bool	true	Calculates the Confidence Level for each result and prints it as well as the additional data needed for ML to the results xml.
CASE_SENSITIVE_FILENAMES	bool	false	For case-sensitive OS (Linux) the value should be true, for non-case-sensitive OS (Windows) it should be false. The value refers to the OS on which the sources compile, not the current OS.
CLIENTS_CONFIDENCE_LEVEL_ COLLECT	string		Used when collecting data of results for confidence level future machine learning model training. The values are 'CxAudit' and/or 'EngineAgent' separated with ';' (e.g. CxAudit;EngineAgent).
CONFIDENCE_LEVEL_COLLECT_ DATA_FILE_PATH	string	C:\\Temp\\ ConfidenceLevel\\	Used when collecting data of results for confidence level future machine learning model training. The location of the resutls data files.
CXAUDIT_TREE_VIEW_FLAT	bool	false	Defines the project Treeview structure as flat or regular.
EXCLUDE_PATH	string	jquery;angular.js; angular-animate.js; angular-aria.js; angular-cookies.js; angular-messages.js; angular-mocks.js; angular-resource.js; angular-route.js;angular-sanitize.js; angular-touch.js; angular-scenario.js; angular-loader.js; angular.min.js; angular-resource.min.js; angular-cookies.min.js; angular-loader.min.js; angular-aria.min.js; angular-messages.min.js; angular-mocks.min.js; angular-route.min.js;	Semicolon separated list of file names to exclude from the scan (e.g. file1;file2;file3). Include only file names, not paths.

Parameter Name	Value Type	Default Value	Parameter Description
		angular-sanitize.min.js; angular-touch.min.js; angular-scenario.min.js; jsoneditor.js; jsoneditor.min.js	
MAX_ALLOWED_RESULTS_ FILE_SIZE_IN_MB	int	100	Max query result file size in MB.
MAX_QUERY_TIME	int	60	Defines part of a formula to calculate the maximum execution time allowed for a single query. After the set time, the query execution is terminated, the result is empty and the log indicates that its execution failed.
MESSAGE_QUEUE_DELAY_ BETWEEN_RETRIES	int	1000	The time delay in milliseconds between retries, when opening a connection or sending a message to the message queue.
MESSAGE_QUEUE_NUMBER_ OF_OPEN_RETRIES	int	10	The number of retries to perform, when opening a message queue connection.
MESSAGE_QUEUE_NUMBER_ OF_SEND_RETRIES	int	90	The number of retries to perform, when sending a message to the message queue.
MESSAGE_QUEUE_ OPEN_TIMEOUT	int	10	The time to wait (in seconds) while trying to open a connection to the queue.
MESSAGE_QUEUE_TTL_DAYS	int	1	The time unclaimed messages will wait in the MQ before being deleted.
NUMBER_OF_RESULTS_FOR_ CONFIDENCE_LEVEL_ DATA_COLLECTION	int	150	Used when collecting data of results for confidence level future machine learning model training. Defines the maximal number of results that are collected per query.
TIME_LIMIT_WAITING_FOR_ CONFIDENCE_LEVEL_ DATA_COLLECTION	int	180000	Limited time in milliseconds to wait for the confidence level data collection tasks.
USE_ROSLYN_PARSER	bool	true	Enable the use of Roslyn parser to scan C# files.
WRITE_CONFIDENCE_ LEVEL_TO_LOG	bool	false	Write confidence level calculation tracing to a file in order to help understand why a certain confidence level was given to a certain result.
ENABLE_SAVE_CPP_ PREPROCESSED_FILES	bool	true	Enable/disable the ability of CPP Preprocessor to save the preprocessed files.
ENCODING	string	utf-8	Character encoding of source files.
LANGUAGE_THRESHOLD	double	2.0	Sub-setting of MULTI_LANGUAGE_MODE. The minimal percentage of complete number of files required to scan a language. Should be set to 0.0 (and MULTI_LANGUAGE_MODE=2) to match the Portal_s Multi-language mode. See MULTI_LANGUAGE_MODE parameter for more details.
MULTI_LANGUAGE_MODE	int	1	Defines which languages the application should scan. 1 = One Primary Language, 2 = All Languages, 3 = Matching Sets, 4 = Selected Languages.
SCAN_BINARIES	bool	false	Whether or not to scan binary files (only available for .jar files – Java – and for .dll files – C#). *Note*: Requires Java to be installed on the machine.
SUPPORTED_LANGUAGES	string	1,32;128,256;4,2048	Sub-setting of MULTI_LANGUAGE_MODE. If MULTI_LANGUAGE_MODE = 1 or 2 ignore/meaningless. If MULTI_LANGUAGE_MODE = 4 then languages are

Parameter Name	Value Type	Default Value	Parameter Description
			separated by commas. See MULTI_LANGUAGE_MODE parameter for more details.
TYPES_TO_DECOMPILE	string	*	When SCAN_BINARIES is set to true, this flag should be used to specify which packages/namespaces should be decompiled and then included in the scan. Format x.y.* can be used to specify that all the types under package/namespace x.y should be decompiled and scanned. The list of packages/namespaces should be separated by a semicolon (;).
PRINT_DEBUG	bool	false	Defines whether writing additional details to application logger with debug orientation is enabled or not. True = Enabled, False = Disabled.
PRINT_LOG	bool	true	Defines whether the output of Function log.Write is printed to the log or not. True = Print, False = Dont Print.
ENABLE_CPP_IBM_DECODE	bool	false	Enable the C++ Preprocessor to search, file by file, for IBM pragma filetag directive, in order to find the correct encode.
BEAUTIFIER_MIN_ NUMBER_OF_ WORDS_IN_ MINIMIZED_LINE	int	500	BEAUTIFIER: If length of line bigger then this value - this is min.js file.
BEAUTIFIER_NUMBER_ OF_ROWS_TO_CHECK	int	3	BEAUTIFIER: number of last rows to check. If they are longer than BEAUTIFIER_MIN_NUMBER_OF_WORDS_IN_MINIMIZED_LINE - this is min.js file.
BEAUTIFIER_TIMEOUT_ IN_SEC	int	180	After this value of seconds, the beautification of single files will be aborted and the original file will returned. Put 0 to disable the watchdog.
MAXFILESIZEKB	int	1000	Files exceeding the set size (in KB) will not be scanned.
PARAMETER_VALUE_ CORES_NUMBER	string	SingleSocket,0;MultiSocket,0	Parameter value for method SetToAllCores in EngineInfrastructure.ProcessAffinityManager class - setting cores number for current process. Different parameter for single and multi-socket (e.g. SingleSocket,0;MultiSocket,0).
PROCESS_AFFINITY_ MANAGER_SETTINGS	string	SingleSocket,NoLimitation; MultiSocket,NoLimitation	Settings for methods of the EngineInfrastructure.ProcessAffinityManager class. Possible values one of OldVersion,NewVersion,NewVersionOneSocketOnly,NoLimitation. Different parameter for single and multi-socket. (e.g. SingleSocket,OldVersion;MultiSocket,NoLimitation).
MAX_PATH_LENGTH	int	57	Defines the maximum amount of flow elements allowed in an influence flow calculation. Paths with length exceeding this number are ignored.
MAX_QUERY_TIME_ PER_100K	int	15	Sub setting of MAX_QUERY_TIME. Defines part of formula to calculate the maximum execution time allowed for a single query. See MAX_QUERY_TIME parameter for more details.
ENABLE_FICTITIOUS_ DEFINITION	bool	false	Enables the use of the Fictitious Definitions inside the Java Resolver.
ABS_INT_LAMBDAS_ IMPLICIT_ INVOCATION	bool	false	Currently, lambda expressions are only processed by AbsInt if they are invoked somewhere. However, in some cases,

Parameter Name	Value Type	Default Value	Parameter Description
			we want to process the lambda expressions even when their invocations are not explicit (eg: partial scans). In order for this to be possible, a flag was added to the Engine configuration: ABS_INT_LAMBDAS_IMPLICIT_INVOCATION (acceptable value is a boolean; default value is false). This functionality is still in the test phase and must therefore be used with caution. Activating this flag may create unexpected flows or unexpected Abstract values because the lambdas are invoked with the context/environment of their declaration rather than their invocation. This flag is linked with ABS_INT_CALL_STACK_DEPTH flag. Since its default value is 3 (levels in stack depth), it might be necessary to increase it in order to find the relevant flows. Be aware that performance will be affected.
ABS_INT_CALL_STACK_DEPTH	int	3	

Configuring SSL between the Manager & Engine

CxSAST supports secure communication between CxManager and CxEngine based on SSL certificates. These instructions take Windows and Linux support for CxEngine into consideration.

The Cx Engine is working on a WCF service that is not managed via the IIS console. The steps below explain how to configure the secure connection on both the CxManager and the CxEngine servers.

The secure connection is established between two servers only, it can be configured with Self Signed Certificates or real CA`s certificates.

Windows

This section explains how to establish a secure connection when running CxEngine under Windows.

CxEngine Host

- It is recommended to use the PowerShell command **New-SelfSignedCertificate** as explained for self-signed certificates.
- The certificate must have the following key usages:
  DigitalSignature, **KeyEncipherment**
  The command's syntax differs between PowerShell versions.

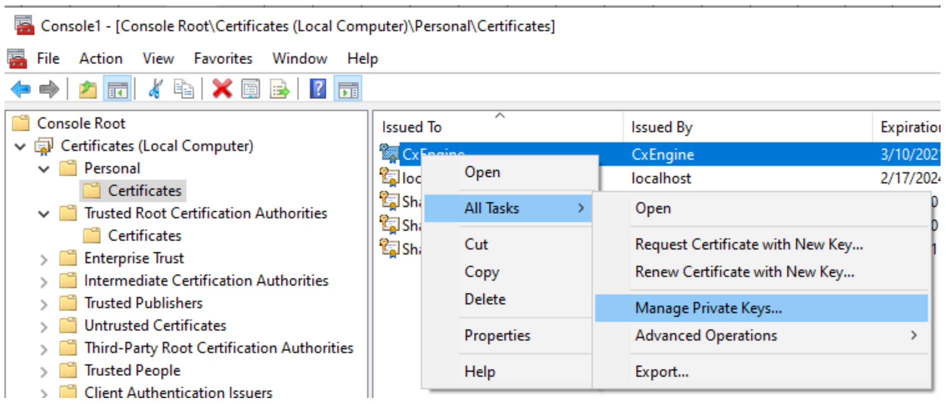
1. Create a certificate (Certificate Authority-CA or self-signed).
2. Place the certificate in the store under **Local Machine\Personal\Certificates** and copy it to **Local Machine\Trusted Root Certification Authority\Certificates**

   Examples: Using the New-SelfSignedCertificate PowerShell command to create a certificate and place it under **Local Machine\Personal\Certificates** (you may also copy the **certificate subject's** name from the output of the command):

   WinServer 2012:
   New-SelfSignedCertificate -DnsName "domain" -CertStoreLocation "cert:\LocalMachine\My"

   WinServer 2016 / Windows-10:
   New-SelfSignedCertificate -DnsName "domain" -CertStoreLocation "cert:\LocalMachine\My" -Subject "CX_SUBJECT" -KeyUsage DigitalSignature, KeyEncipherment

3. Make the private key available to the service. To do so, go to **Local Machine\Personal\Certificates** and then to **Manage Private Keys** on the certificate.
4. Add "**Network Service**" to the list of authorized users. Read permissions are sufficient.

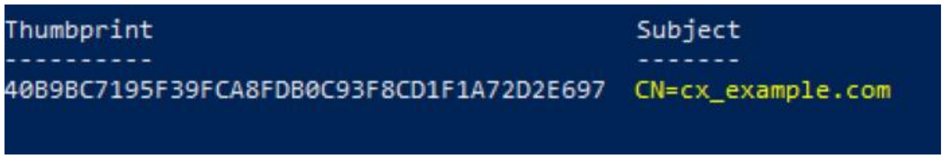

Console1 - [Console Root\Certificates (Local Computer)\Personal\Certificates]
File
Action
View
Favorites
Window
Help
Console Root
Certificates (Local Computer)
Personal
Certificates
Trusted Root Certification Authorities
Certificates
Enterprise Trust
Intermediate Certification Authorities
Trusted Publishers
Untrusted Certificates
Third-Party Root Certification Authorities
Trusted People
Client Authentication Issuers
Issued To
Issued By
Expiration
CxEngine
localhost
3/10/202
2/17/202
Open
All Tasks
Cut
Copy
Delete
Properties
Help
Open
Request Certificate with New Key...
Renew Certificate with New Key...
Manage Private Keys...
Advanced Operations
Export...

5. Set these environment variables on the host (machine) level as explained below.

➢ **To set the environment variables:**

- Before setting the environment variables, you have to know the Certificate-Subject.

1. To obtain the pfx certificate subject name, open the PowerShell and run **Get-PfxCertificate –FilePath <full path of the PFX file>**, for example **Get-PfxCertificate -FilePath "C:\Users\Administrator\Desktop\myCert.pfx"**.
2. Enter your certificate's password when prompted. The **Certificate-Subject** appears as illustrated below.



```
Thumbprint                                Subject
----------                                -------
40B9BC7195F39FCA8FDB0C93F8CD1F1A72D2E697  CN=cx_example.com
```

3. Set the following environment variables as follows which includes entering the certificate subject that you just obtained:
   SETX CX_ENGINE_TLS_ENABLE true /m
   SETX CX_ENGINE_CERTIFICATE_SUBJECT_NAME Certificate-Subject /m, for example
   SETX CX_ENGINE_CERTIFICATE_SUBJECT_NAME CN=cx_example.com /m
4. Restart the **CxEngineService**.

Manager Host

Place the certificate in the **Local Machine\Trusted Root CA** store.

- public only **.cer/.crt** is sufficient.

Linux

Use a pfx (pkcs12) certificate.

Engine Host

The CxEngine server package consists of the components listed below. Additional information is available in the installation instructions for Linux.

- cx-engine-server.tar
- server.env
- run.sh
- readme.md

➢ **To establish a secure connection:**

1. Copy the certificate to the location of your certificates, for example, **/usr/my/certificates**
2. Update the following environment variables in the **server.env** file:
   CX_ENGINE_TLS_ENABLE=true
   CX_ENGINE_CERTIFICATE_SUBJECT_NAME=Certificate-Subject
   - ActiveMQ secure communication TLS (Optional)
     a. Copy the AMQ broker certificate to the location of your certificates, for example, ***/usr/my/certificates/<broker_cert>***
     b. Modify **server.env** file with the following:
        CX_ES_MESSAGE_QUEUE_URL=ssl://<*Active_MQ_host_address*>:<MQ_PORT>?transport.BrokerCertFilename=%2F**usr**%2F**my**%2F**certificates**%2F***<broker_cert>***
        - If the same certificate used for both engine communication and MQ broker simply modify **server.env file** as following:
          CX_ES_MESSAGE_QUEUE_URL=ssl://<*Active_MQ_host_address*>:<MQ_PORT>
3. Volume the certificates location to the container (as shown below)
4. Pass engine certificate arguments to the container (as shown below):
   cert_filepath - the certificate path volume to the container
   cert_password - the certificate password
5. Modify run.sh script “docker run” command as follows:
   docker run --env-file ./server.env -d -p 0.0.0.0:8088:8088 -v /usr/my/certificates:/app/certificate/ cx-engine-server --cert_filepath /app/certificate/certificate.pfx --cert_password my_cert_password
6. Run script **sh run.sh**

Manager Host

Place the certificate in the **Local Machine\Trusted Root CA** store.

- public only **.cer/.crt** is sufficient.

Enabling and Configuring SSL and TLS

This section explains how to enable and configure SSL and TLS for use with CxSAST components.

Configuring SSL for the Checkmarx Software Exposure Platform

SSL (Secure Sockets Layer) is the standard security technology for establishing an encrypted link between a web server and a browser. This link ensures that all data passed between the web server and browsers remain private and intact. To be able to create an SSL connection the web server requires an SSL Certificate.

Checkmarx Software Exposure Platform (SSL)

To secure communications between all Checkmarx Software Exposure Platform components, we recommend that you install signed certificates and enable SSL on all machines/servers to enforce SSL security (HTTPS). These instructions guide you through the procedure to configure the Secure Sockets Layer (SSL) Protocol for the

Checkmarx Software Exposure Platform in Distributed or High Availability environments. They also include links to topics that are directly related to this procedure.

Configuring SSL

SSL can be configured via the Checkmarx Software Exposure Platform components for each machine/server accordingly. To configure the SSL, follow the instructions below:

1. All hosts/servers in the Checkmarx Software Exposure Platform must be part of the same domain and configured in the Domain Name System (DNS), when using machine names.
2. Enable SSL support for Access Control by configuring the **appsettings.json** file (**<dir>:\Program Files\Checkmarx\Checkmarx Access Control\appsettings.json**):

Update *ExternalListenUrls* to reflect IIS configured bindings:

```
    http(s)://*(port)
    Example: "ExternalListenUrls": "https://*:443"
```

If more than one binding is configured:

```
http(s)://*(port);http(s)://*(port)
Example: "ExternalListenUrls": "https://*:443;https://*:123"
```

3. Enable SSL Support on the CxManager as explained under Enabling SSL Support on the CxManager.
4. Configure all Checkmarx Software Exposure Platform components for HTTPS in the DB table **[CxDB].dbo.[cxComponentConfiguration]** as follows:

   Replace **IdentityAuthority, CxARMPolicyURL**, **CxARMURL**, **CxSASTManagerUri** and **WebServer** keys to include HTTPS.

   Queries and example are available below:

   SQL Query to view current values:

```
SELECT * FROM [CxDB].[dbo].[CxComponentConfiguration] WHERE [Key] = 'IdentityAuthority'
SELECT * FROM [CxDB].[dbo].[CxComponentConfiguration] WHERE [Key] = 'CxARMPolicyURL'
SELECT * FROM [CxDB].[dbo].[CxComponentConfiguration] WHERE [Key] = 'CxARMURL'
SELECT * FROM [CxDB].[dbo].[CxComponentConfiguration] WHERE [Key] = 'CxSASTManagerUri'
SELECT * FROM [CxDB].[dbo].[CxComponentConfiguration] WHERE [Key] = 'WebServer'
```

   SQL Queries to set URL's to SSL:

```
UPDATE [CxDB].[dbo].[CxComponentConfiguration]
SET [Value] = 'https://{server FQDN}/CxRestAPI/auth'
WHERE [Key] = 'IdentityAuthority'

UPDATE [CxDB].[dbo].[CxComponentConfiguration]
SET [Value] = 'https://{server FQDN}:8443'
WHERE [Key] = 'CxARMPolicyURL'

UPDATE [CxDB].[dbo].[CxComponentConfiguration]
SET [Value] = 'https://{server FQDN}:8443'
WHERE [Key] = 'CxARMURL'

UPDATE [CxDB].[dbo].[CxComponentConfiguration]
```

```
SET [Value] ='https://{server FQDN}'
WHERE [Key] = 'CxSASTManagerUri'

UPDATE [CxDB].[dbo].[CxComponentConfiguration]
SET [Value] = 'https://{server FQDN}'
WHERE [Key] = 'WebServer'
```

Example:

```
UPDATE [CxDB].[dbo].[CxComponentConfiguration]
SET [Value] = 'https://cxsast.checkmarx.net/CxRestAPI/auth'
WHERE [Key] = 'IdentityAuthority'

UPDATE [CxDB].[dbo].[CxComponentConfiguration]
SET [Value] = 'https://cxsast.checkmarx.net:8443'
WHERE [Key] = 'CxARMURL'
```

5. Enable SSL support on the CxEngine(s) according to these instructions.
6. Restart the ActiveMQ and all CxManager services, for any changes in the database.
7. Enable SSL support on the load balancer according to instructions provided by your vendor. If you are using **Nginx** as the load balancer, you can use the following configuration:

```
worker_processes  1;

events {
    worker_connections  1024;
}

http {
    include       mime.types;
    default_type  application/octet-stream;
    sendfile        on;
    keepalive_timeout  65;

upstream gol-ha2-lb.cxquality.com {
        ip_hash;
        server gol-ha2-mn1.cxquality.com:443;
        server gol-ha2-mn2.cxquality.com:443;
}

    server {
        listen       80;
        listen       443 ssl;
        server_name gol-ha2-lb.cxquality.com;

        ssl_certificate Cert/newcert.cer;
        ssl_certificate_key Cert/newkey2.key;
        ssl_protocols TLSv1.2;
        ssl_ciphers ECDHE-RSA-AES256-GCM-SHA512:DHE-RSA-AES256-GCM-
SHA512:ECDHE-RSA-AES256-GCM-SHA384:DHE-RSA-AES256-GCM-SHA384:ECDHE-
RSA-AES256-SHA384;
        ssl_prefer_server_ciphers on;
        add_header Strict-Transport-Security "max-age=31536000;
includeSubDomains; preload";

        ssl_session_timeout 5m;
        ssl_session_cache shared:SSL:50m;
        ssl_session_tickets off;
        server_tokens off;

location / {
            root   html;
            index  index.html index.htm;
               proxy_pass https://gol-ha2-lb.cxquality.com/;
        }
    }
}
```

8. Enable TLS support (on all machines/servers) according to these instructions.
9. Enable FIPS compliance (on all machines/servers) according to your supported operating system (see example).
10. Enable SSL support and FIPS compliance for Management & Orchestration (M&O) according to these instructions.

Enabling SSL Support on the CxManager

SSL (Secure Sockets Layer) is the standard security technology for establishing an encrypted link between a web server and a browser. This link ensures that all data passed between the web server and browsers remain private and integral. To be able to create an SSL connection the web server requires an SSL Certificate.

CxManager (SSL)

To secure communications between all Checkmarx Software Exposure Platform components, we recommend that you install a signed certificate and enable SSL on the CxManager to enforce SSL security (HTTPS). The instructions below explain how to enable SSL support on the CxManager.

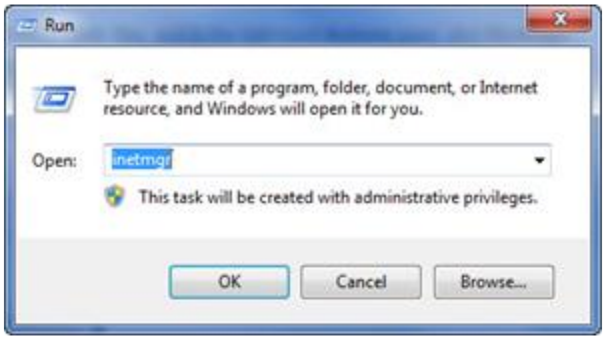
Enabling SSL Support

Support for SSL can be enabled via the IIS Management console on the CxManager server. The enablement steps can be performed manually from the CxManager server:

1. Prepare a **CA certificate** for the Checkmarx Software Exposure Platform Server (in a distributed deployment - for CxManager), signed by a third-party certificate authority such as **VeriSign** and install it on the Server or CxManager.

- Although it is not considered as safe as CA certification, SSL can also be enabled using Self Signed Certificates, see Create a Self-Signed Server Certificate in IIS.

2. From the **Start** menu, select **All Programs**. Click **Accessories**, and then click **Run**. The Run window is displayed.



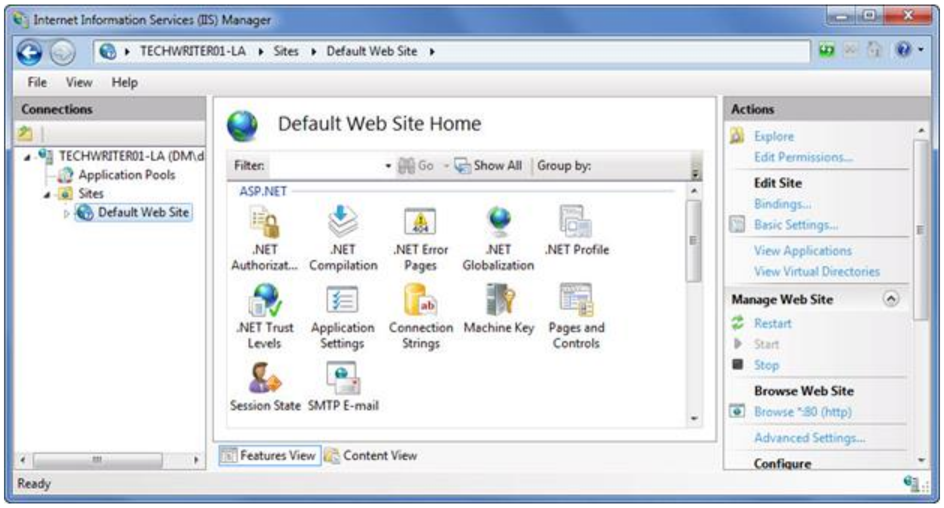
Run

Type the name of a program, folder, document, or Internet resource, and Windows will open it for you.

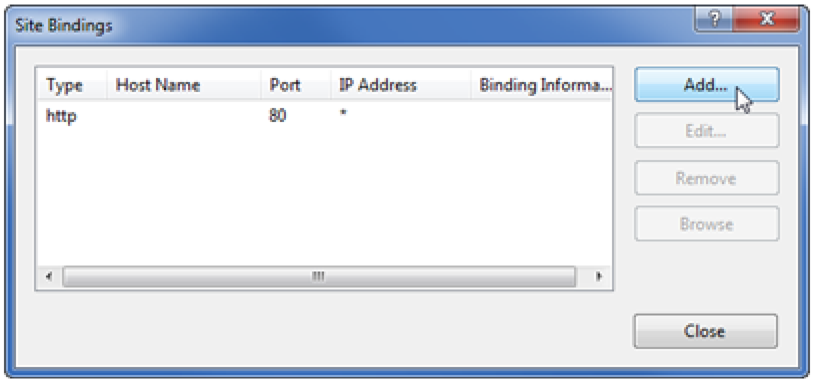
Open: inetmgr

This task will be created with administrative privileges.

3. In the **Open** box, type **inetmgr** and then click <**OK**>. The IIS Manager window is displayed.

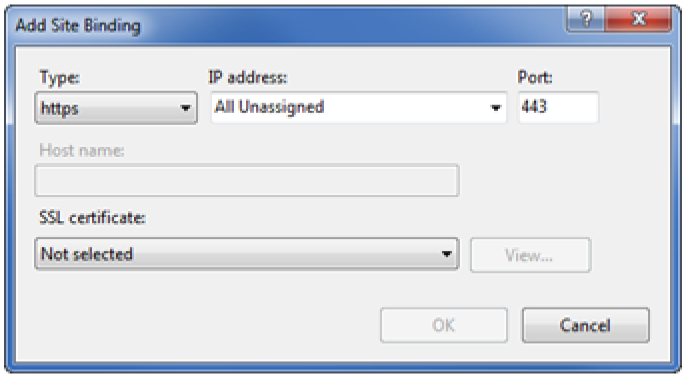


4. Select **Default Web Site** from the **Connections**
5. Select **Bindings** from the **Actions** pane. The Site Bindings window is displayed.



Type	Host Name	Port	IP Address	Binding Informa...
http		80	*	

6. Click <**Add**>. The Add Site Bindings window is displayed.

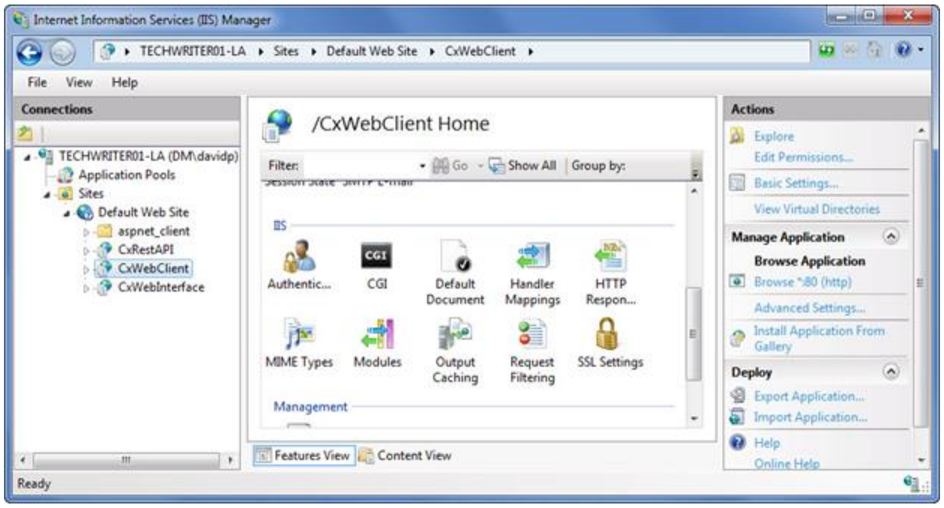


Type: https
IP address: All Unassigned
Port: 443
Host name:
SSL certificate: Not selected

7. Under **Type**, select **https**.
8. Enter the host name of your station.
9. Select the **SSL Certificate** and select the your pre-installed certificate from the list.
10. Click <**OK**> and then <**Close**>.

If you want the Checkmarx Software Exposure Platform users to be able to use **only HTTPS/SSL**, return to the IIS Manager window and, for each relevant web service (CxWebClient, CxWebInterface), perform the following:

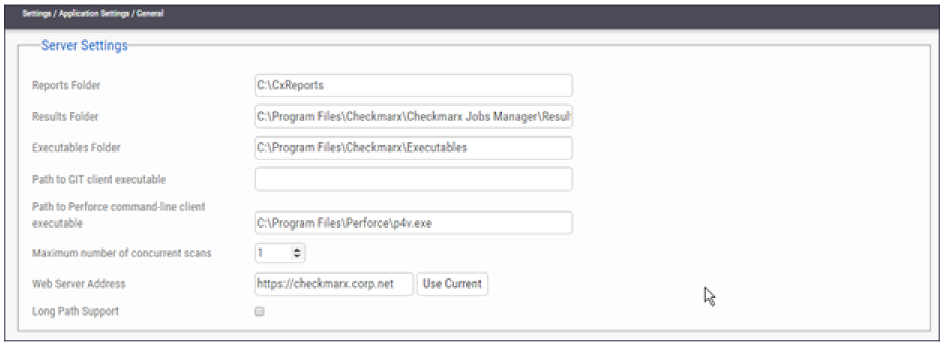
1. In the **Connections** pane, double-click **Default Web Site**.



2. Select **CxWebClient** and double-click on **SSL Settings**.
3. Select **Require SSL** and click **Apply** from the Actions pane.

- Perform the same SSL settings actions for **CxRestAPI** as well as **CxWebInterface**

4. Go to **C:\Program Files\Checkmarx\CheckmarxWebPortal\Web**, open the **web.config** file for editing and using the Search tool, search for "**CxWSResolver.CxWSResolver**".
5. Change the value "**http://**" to "**https://**" and replace the value "**localhost**" (if available) with your pre-installed certificate's <name/subject>.
6. Right-click on the **Server** (highest level in the hierarchical tree) and select **Stop** from the drop-down. Once stopped right-click on the **Server** again and select **Start**.
7. In the **Checkmarx Software Exposure Platform Web** interface, go to **Management > Application Settings > General**. The **General Settings** window is displayed.



Reports Folder	C:\CxReports
Results Folder	C:\Program Files\Checkmarx\Checkmarx Jobs Manager\Resul
Executables Folder	C:\Program Files\Checkmarx\Executables
Path to GIT client executable	
Path to Perforce command-line client executable	C:\Program Files\Perforce\p4v.exe
Maximum number of concurrent scans	1
Web Server Address	https://checkmarx.corp.net
Long Path Support	☐

8. Click <**Edit**>.
9. Enter your **Server URL** (e.g. https://checkmarx.corp.net) into the **Web Server Address**
10. Click <**Update**> to save the changes.
11. In addition to the above changes, for CxSAST version 9.3 and above, the following environment variables must be updated from HTTP:// to HTTPS://, and the hostname should be replaced according to the certificate:
    - CX_ES_ACCESS_CONTROL_URL
    - CX_ES_END_POINT

    Change the value of the following environment variable from "false" to "true":
    - CX_ENGINE_TLS_ENABLE

Defining HTTPS Settings

After installing CxSAST, define the IIS bindings at the **ExternalListenUrls** key in the **appsettings json** file. If, for example, port 80 (HTTP) and port 443 (HTTPS) have to be bound, the syntax looks as follows: **"ExternalListenUrls": http://*:80;https://*:443** . The **appsettings json** file resides in the **Checkmarx Access Control** folder.

Enabling HTTP Strict Transport Security (HSTS)

When moving to HTTPS, users should consider enabling HSTS to avoid redirecting users from HTTP to HTTPS.

Overview

HSTS is an Internet standard, defined to force browsers to always connect to a website over HTTPS. HSTS avoids the need for the unsecure practice of redirecting users from HTTP to HTTPS. If a browser 'knows' that a domain has HSTS enabled, it responds as follows:

- Always uses an https:// connection, even when following an http:// link or after typing a domain into the URL address field without specifying a protocol.
- Removes the ability for users to click through warnings about invalid certificates.

HSTS is implemented by adding an HTTP header on each response to a browser request. In its simplest form, the policy tells a browser to enable HSTS for that exact domain or subdomain/site, and to remember it for a given number of seconds (max-age):

```
Strict-Transport-Security: max-age=31536000;
```

In its strongest and recommended form, the HSTS policy includes all subdomains, and indicates a willingness to be “preloaded” into browsers:

```
mnStrict-Transport-Security: max-age=31536000; includeSubDomains; preload
```

- When using the ‘preload’ directive, be aware that you may not be able to revert this choice once the directive has been propagated and stored on client browsers for a long period of time.

Additional information on the HSTS protocol can be found in the following resources:

- https://cheatsheetseries.owasp.org/cheatsheets/HTTP_Strict_Transport_Security_Cheat_Sheet.html
- https://tools.ietf.org/html/rfc6797

Enabling HSTS

By default, CxSAST is not configured for HTTPS, therefore it does not have the HSTS headers built in. The solution is to instruct IIS to intercept each request/response and add the HSTS header to each response as a result. Depending on the IIS version, this may be achieved by one of the following:

- Using the Microsoft URL Rewrite Module for IIS 7 or higher
- Using the latest IIS 10.0 versions with built-in support for HSTS

Detailed IIS instructions can be found in these Microsoft documents:

- https://docs.microsoft.com/en-us/iis/get-started/whats-new-in-iis-10-version-1709/iis-10-version-1709-hsts
- https://docs.microsoft.com/en-us/iis/extensions/url-rewrite-module/using-the-url-rewrite-module

Enabling TLS Protocol Connection to the ActiveMQ

TLS (Transport Layer Security) and SSL (Secure Sockets Layer) are cryptographic protocols designed to provide communication security over networks. Websites can use TLS to secure all communications between their servers and web browsers. TLS aims primarily to provide privacy and data integrity between two or more communicating applications.

ActiveMQ supports secure communication channels. The most common way to establish a secure communication channel is to associate a certificate with the target (broker). This section provides instructions on how to enable the TLS protocol connection to the ActiveMQ. The instructions include links to topics that are directly related to this procedure.

The instructions below define the procedure for enabling the TLS protocol connection to the ActiveMQ.

Configuring TLS Protocol Connection for the First Time

Follow the instructions provided for v9.0.0, available at **Enabling TLS Protocol Connection to the ActiveMQ (v9.0.0)** in Confluence.

Upgrading from CxSAST 9.0.0

During the upgrade, the following two files are backed up in the **..\Checkmarx\Checkmarx ActiveMQ\conf** path as follows:

- **activemq.xml** is backed up as **activemq_backup.xml**
- **credentials-enc.properties** is backed up as **credentials-enc_backup**

Changes in the files above are automatically merged during the upgrade process.

ActiveMQ Clients and URI Mapping

The list below covers all Active MQ clients and from where each one reads the ActiveMQ URI:

- **Access Control (IIS)** → Environment Variable (new)
- **Scans Manager Service** → [dbo].[CxComponentConfiguration]
- **Results Service** → [dbo].[CxComponentConfiguration]
- **Engine Service** → Environment Variable (new)
- **Legacy Engine Service** → [Config].[CxEngineConfigurationKeysMeta]
- **Engine Configuration Exporter Tool (not a service)** → [Config].[CxEngineConfigurationKeysMeta]

Configuring Database values

The steps to configure database values in the **[dbo].[CxComponentConfiguration]** and **[Config].[CxEngineConfigurationKeysMeta]** are covered in the ActiveMQ TLS guide referred to above.

Configuring Environment Variables

In version 9.3.0, several environment variables have been introduced to CxSAST Manager and CxSAST Engine environments.

Access Control Environment Variables

In every Manager environment:

- Set the ActiveMessageQueueURL environment variable with the ActiveMQ URI

Engine Service Environment Variables

In every Engine environment:

- Set the CX_ES_MESSAGE_QUEUE_URL environment variable with the **ActiveMQ URI**

ActiveMQ URI is defined with the ActiveMQ Connection URI Step in the ActiveMQ TLS guide.

Restarting ActiveMQ Client Services

After you finished configuring, you have to restart the services listed below as outlined for changes to take effect:

- After editing database (DB) values:
  - Scans Manager Service
  - Results Service
- After editing Access Control (AC) environment variables:
  - Access Control Service (IIS)
- After editing Engine Services (ES) environment variables:
  - Engine Service

Enabling TLS 1.2 Support and Blocking Weak Ciphers on CxManager

TLS 1.1 is being phased out for all major browsers such as Chrome, Firefox, Safari and Edge.

TLS (Transport Layer Security) and its now-deprecated predecessor, SSL (Secure Sockets Layer) are cryptographic protocols designed to provide communications security over a computer network. Websites can use TLS to secure all communications between their servers and web browsers. The TLS protocol aims primarily to provide privacy and data integrity between two or more communicating computer applications.

Sensitive data such as user credentials and credit card information must be protected when it is transmitted over the network and the ciphers in use during secure communications via SSL and TLS 1.1 are too weak. As a rule of thumb, if data must be protected when it is stored, it must be protected also during transmission. Even if high grade ciphers are supported and used today, some misconfiguration in the server may force users of a weak cipher or no encryption at all to grant access to the supposedly secure communication channel.

Enabling TLS 1.2 Support

Support for TLS 1.2 can be enabled via the Windows registry on the CxManager host. TLS 1.2 can be enabled manually or automatically from the CxManager host as explained below.

- TLS 1.2 requires SQL Server 11.0.5388.0 or higher. Older SQL server versions do not support TLS 1.2.

- It is strongly recommended to disable weak ciphers. The relevant ciphers are listed at the end of this document.

Enabling TLS 1.2 Automatically

1. Download the attached registry file (TLS1.2.reg) to the CxManager desktop.

   TLS1.2.reg - Registry Entries

```
Windows Registry Editor Version 5.00
[HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\.NETFramework\v4.0.30319]
"SchUseStrongCrypto"=dword:00000001
[HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Microsoft\.NETFramework\v4.
0.30319]
"SchUseStrongCrypto"=dword:00000001
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\SecurityProvide
rs\SCHANNEL\Protocols\TLS 1.2]
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\SecurityProvide
rs\SCHANNEL\Protocols\TLS 1.2\Client]
"DisabledByDefault"=dword:00000000
"Enabled"=dword:00000001
```

2. Right click and select **Merge**.
3. Restart the server.

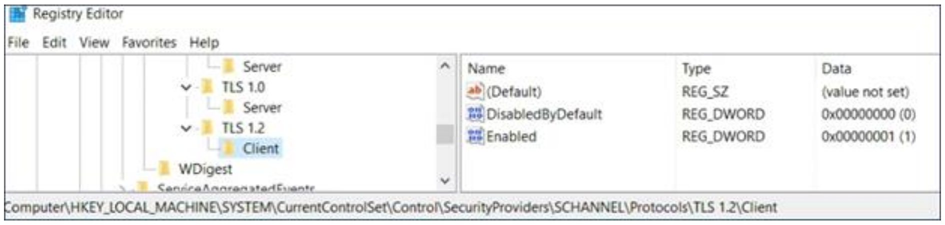
Enabling TLS 1.2 Manually

1. Start the Registry editor. To do so, enter **regedit** in the Windows search field. The Registry Editor appears.
   a) Enable TLS 1.2 client keys

      1. In the Registry Editor, browse to **HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\SecurityProviders\SCHANNEL\Protocols**
      2. Right-click the **Protocols** folder, select **New | Key**. Rename this key/folder **TLS 1.2**.
      3. Right-click the **TLS 1.2** key/folder and select **New | Key** again. Rename this key/folder **Client**.
      4. Right-click the **Client** key/folder and select **New | DWORD (32-bit) Value**. Rename the DWORD to **DisabledByDefault** and make sure that the value is set to **0** as illustrated below.

5. Right-click t **Client** key/folder and select **New | DWORD (32-bit) Value**. Rename the DWORD to **Enabled**. Set th ue to **1**.

   To set the value to 1, right-click **Enabled**, select **Modify...** from the shortcut menu and under **Value Data**, change the value to **1**.



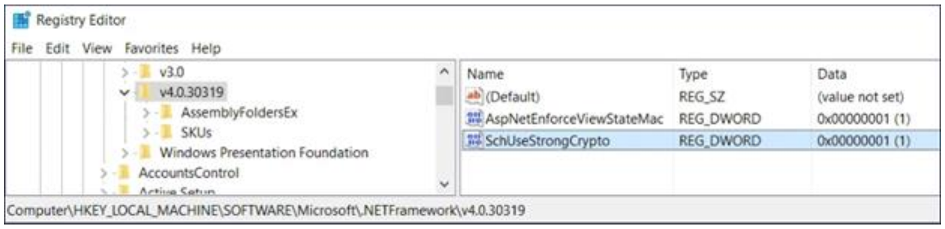
Name	Type	Data
(Default)	REG_SZ	(value not set)
DisabledByDefault	REG_DWORD	0x00000000 (0)
Enabled	REG_DWORD	0x00000001 (1)

Computer\HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\SecurityProviders\SCHANNEL\Protocols\TLS 1.2\Client

b) Configure .NET to use TLS 1.2

1. In the Registry Editor, browse to **HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\.NetFramework\v4.0.30319**
2. Right click inside the right pane and create a new **DWORD (32-bit) Value**. Rename the DWORD to **SchUseStrongCrypto**. Set the value to **1**.

   To set the value to 1, right-click **Enabled**, select **Modify...** from the shortcut menu and under **Value Data**, change the value to **1**.
3. In the Registry Editor, browse to **HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Microsoft\.NetFramework\v4.0.30319**
4. Repeat step 3.b.



Name	Type	Data
(Default)	REG_SZ	(value not set)
AspNetEnforceViewStateMac	REG_DWORD	0x00000001 (1)
SchUseStrongCrypto	REG_DWORD	0x00000001 (1)

Computer\HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\.NETFramework\v4.0.30319

2. Restart the server.

Disabling Weak Ciphers

Contact your administrators or IT personnel to disable the relevant ciphers.

List of ciphers to be disabled

TLS_DHE_RSA_WITH_AES_256_CBC_SHA
TLS_DHE_RSA_WITH_AES_128_CBC_SHA
TLS_RSA_WITH_AES_256_GCM_SHA384
TLS_RSA_WITH_AES_128_GCM_SHA256
TLS_RSA_WITH_AES_256_CBC_SHA256
TLS_RSA_WITH_AES_128_CBC_SHA256
TLS_RSA_WITH_AES_256_CBC_SHA
TLS_RSA_WITH_AES_128_CBC_SHA
TLS_RSA_WITH_3DES_EDE_CBC_SHA
TLS_DHE_DSS_WITH_AES_256_CBC_SHA256
TLS_DHE_DSS_WITH_AES_128_CBC_SHA256
TLS_DHE_DSS_WITH_AES_256_CBC_SHA
TLS_DHE_DSS_WITH_AES_128_CBC_SHA
TLS_DHE_DSS_WITH_3DES_EDE_CBC_SHA
TLS_RSA_WITH_RC4_128_SHA
TLS_RSA_WITH_RC4_128_MD5
TLS_RSA_WITH_NULL_SHA256
TLS_RSA_WITH_NULL_SHA
TLS_PSK_WITH_AES_256_GCM_SHA384
TLS_PSK_WITH_AES_128_GCM_SHA256
TLS_PSK_WITH_AES_256_CBC_SHA384
TLS_PSK_WITH_AES_128_CBC_SHA256
TLS_PSK_WITH_NULL_SHA384
TLS_PSK_WITH_NULL_SHA256

Configuring Management and Orchestration

This section explains how to configure components for Management and Orchestration.

Configuring Management and Orchestration for SSL and FIPS Compliancy

Management and Orchestration should be defined according to the CxSAST secure communication protocol definition. This means that If CxSAST is defined for HTTPS then Management and Orchestration should also be defined in the same way.

The following instructions for running the Management and Orchestration over HTTPS offers a general procedure for configuring HTTPS in Apache Tomcat. If you require more specific instructions, please refer to the Apache Tomcat documentation.

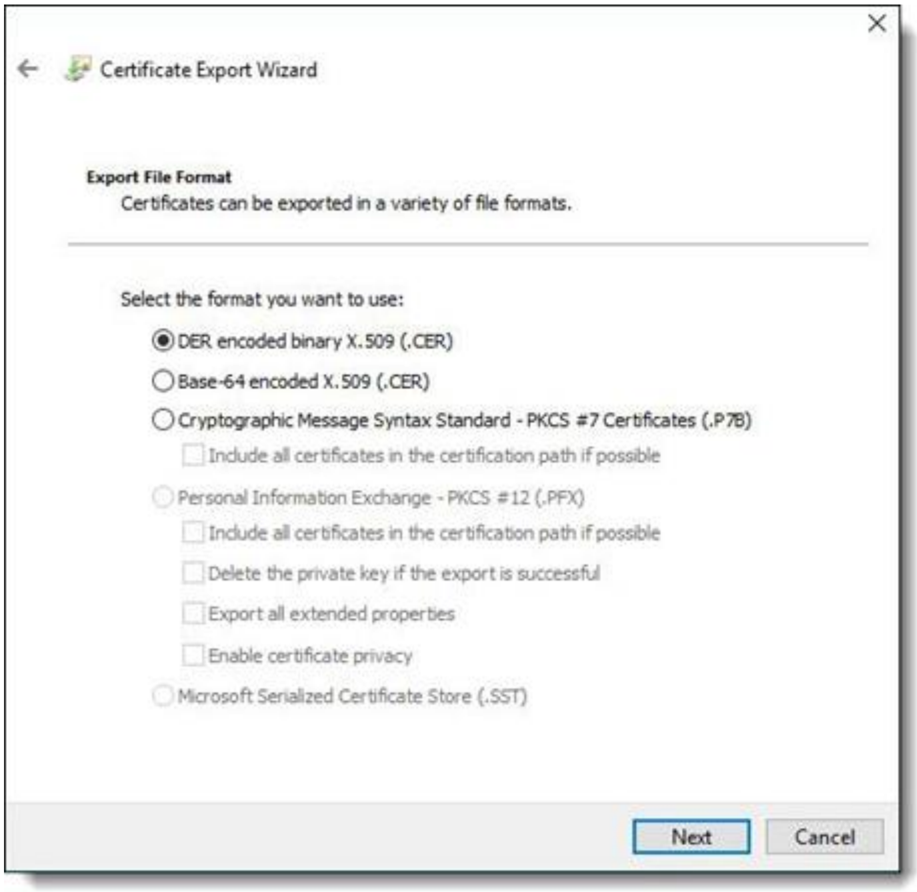
This instruction defines the procedure for configuring Management & Orchestration for SSL and FIPS compliancy.

Configuring HTTPS in Apache Tomcat

➢ **To configure HTTPS in Apache Tomcat:**

1. In order to use the same certificate export the certificate from the IIS as a .pfx file (use the same password that you will use in the Tomcat server.xml file). See here for instructions.
2. Go to M&O Apache Tomcat configuration folder, for example: \Checkmarx\Checkmarx Risk Management\Tomcat\conf
3. In the server.xml configuration file, add the following connector:

   <Connector SSLEnabled="true" acceptCount="100" clientAuth="false" disableUploadTimeout="true" enableLookups="false" maxThreads="25" port="8443" keystoreFile=<Absolute path to the pfx file> keystorePass=<The password used when exported the certificate> keystoreType="PKCS12" protocol="org.apache.coyote.http11.Http11NioProtocol" scheme="https" secure="true" sslProtocol="TLS" />
4. Export the certificate from the browser as a .CER file (select the DER encoded binary X.509 format).



Export File Format
Certificates can be exported in a variety of file formats.

Select the format you want to use:

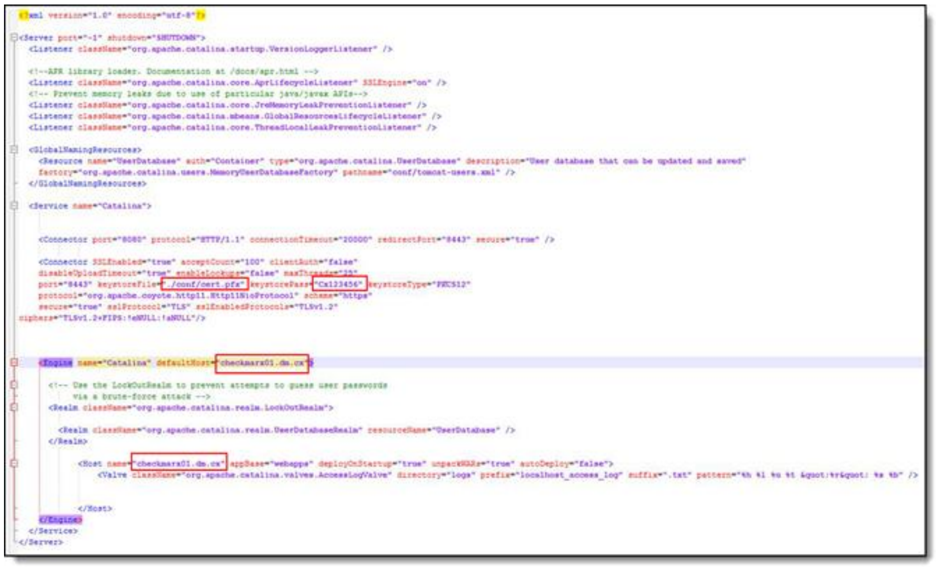
[✓ DER encoded binary X.509 (.CER)]
Base-64 encoded X.509 (.CER)
Cryptographic Message Syntax Standard - PKCS #7 Certificates (.P7B)
Include all certificates in the certification path if possible
Personal Information Exchange - PKCS #12 (.PFX)
Include all certificates in the certification path if possible
Delete the private key if the export is successful
Export all extended properties
Enable certificate privacy
Microsoft Serialized Certificate Store (.SST)

5. Save the .CER file in the following folder: C:\Program Files\Checkmarx\Checkmarx Risk Management\jre\lib\security, and then import the certificate into the cacerts file in order to create chain of trust by entering the following cmd line:

   <keytool location>keytool" -import -alias <alias name> -file <cer file location>MnOManagerH03.cer" -keystore "cacerts

   For example:

   C:\Program Files\Java\jdk1.8.0_201\bin\keytool" -import -alias MnOManagerH03 -file "C:\Program Files\Checkmarx\Checkmarx Risk Management\jre\lib\security\MnOManagerH03.cer" -keystore "cacerts
6. The default password for the cacerts file is **changeit**.
7. Edit the following configuration file in the Checkmarx\Checkmarx Risk Management\tomcat\conf\server.xml:
   - **keystoreFile** – path to the .pfx file
   - **keystorePass** – password used when exporting the certificate
   - **<host name>** – change it in both places to the M&O Server host name



```
<?xml version="1.0" encoding="utf-8"?>

<Server port="-1" shutdown="SHUTDOWN">
  <Listener className="org.apache.catalina.startup.VersionLoggerListener" />

  <!--APR library loader. Documentation at /docs/apr.html -->
  <Listener className="org.apache.catalina.core.AprLifecycleListener" SSLEngine="on" />
  <!-- Prevent memory leaks due to use of particular java/javax APIs-->
  <Listener className="org.apache.catalina.core.JreMemoryLeakPreventionListener" />
  <Listener className="org.apache.catalina.mbeans.GlobalResourcesLifecycleListener" />
  <Listener className="org.apache.catalina.core.ThreadLocalLeakPreventionListener" />

  <GlobalNamingResources>
    <Resource name="UserDatabase" auth="Container" type="org.apache.catalina.UserDatabase" description="User database that can be updated and saved"
    factory="org.apache.catalina.users.MemoryUserDatabaseFactory" pathname="conf/tomcat-users.xml" />
  </GlobalNamingResources>

  <Service name="Catalina">


    <Connector port="8080" protocol="HTTP/1.1" connectionTimeout="20000" redirectPort="8443" secure="true" />

    <Connector SSLEnabled="true" acceptCount="100" clientAuth="false"
    disableUploadTimeout="true" enableLookups="false" maxThreads="25"
    port="8443" keystoreFile="./conf/cert.pfx" keystorePass="Cx123456" keystoreType="PKCS12"
    protocol="org.apache.coyote.http11.Http11NioProtocol" scheme="https"
    secure="true" sslProtocol="TLS" sslEnabledProtocols="TLSv1.2"
ciphers="TLSv1.2+FIPS:!eNULL:!aNULL"/>


    <Engine name="Catalina" defaultHost="checkmarx01.dm.cx">

      <!-- Use the LockOutRealm to prevent attempts to guess user passwords
           via a brute-force attack -->
      <Realm className="org.apache.catalina.realm.LockOutRealm">

        <Realm className="org.apache.catalina.realm.UserDatabaseRealm" resourceName="UserDatabase" />
      </Realm>

          <Host name="checkmarx01.dm.cx" appBase="webapps" deployOnStartup="true" unpackWARs="true" autoDeploy="false">
            <Valve className="org.apache.catalina.valves.AccessLogValve" directory="logs" prefix="localhost_access_log" suffix=".txt" pattern="%h %l %u %t &quot;%r&quot; %s %b" />


          </Host>
    </Engine>
  </Service>
</Server>
```

Configuring FIPS Compliancy

In order to make the Apache Tomcat FIPS compliant, the SSL connector in Tomcat needs to be updated with FIPS-compliant ciphers limitation.

To demonstrate, the following example of SSL connector without ciphers must be changed to the example below:

Connector port="8443" protocol="org.apache.coyote.http11.Http11NioProtocol" connectionTimeout="20000" maxThreads="200" scheme="https" secure="true" SSLEnabled="true" keystoreFile="C:\Program Files\OpenSSL-FIPS\out\iis-cert.pfx"
keystorePass="Cx123456" clientAuth="false" sslProtocol="TLS">
<UpgradeProtocol className="org.apache.coyote.http2.Http2Protocol" />
</Connector>

Example of how it should be changed (changes in red):

<Connector port="8443" protocol="org.apache.coyote.http11.Http11NioProtocol" connectionTimeout="20000" maxThreads="200" scheme="https" secure="true" SSLEnabled="true" keystoreFile="C:\Program Files\OpenSSL-FIPS\out\iis-cert.pfx" keystoreType="PKCS12" keystorePass="Cx123456" clientAuth="false" sslProtocol="TLS" sslEnabledProtocols="TLSv1.2" ciphers="TLSv1.2+FIPS:!eNULL:!aNULL">
<UpgradeProtocol className="org.apache.coyote.http2.Http2Protocol" />
</Connector>

Configuring the Management and Orchestration SQL Server for Dynamic and Static Port Connectivity

This instruction defines the procedure for configuring the Management & Orchestration SQL server for both static and dynamic port connectivity for CxSAST V8.9 RC6 and above.

Static Port Configuration

Prerequisites

The following perquisites apply:

- For Windows authentication machine must be in a domain
- SQL Server service is up and running
- TCP/IP is enabled

Static Port Connection

The Management & Orchestration SQL server installation defines the port connection according to one of the following port connection arrangements:

- Instanced SQL: <host>\<instance>,<port>

  Examples:

  localhost\sqlexpress,1435
  10.0.0.10\sqlexpress,1435
  .\sqlexpress,1435
  10.0.0.10,1435

- Non Instanced SQL: <host>,<port>

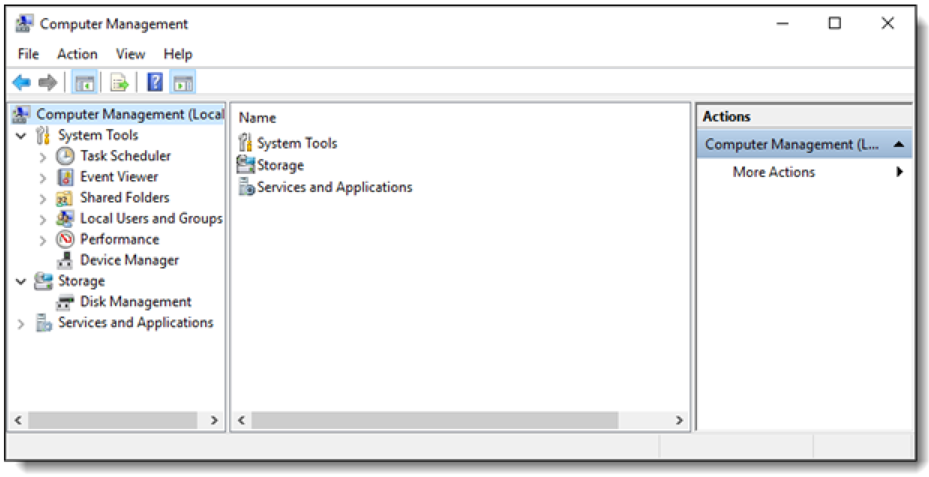
  Examples:

  localhost,1435
  10.0.0.10,1435
  .,1435
  10.0.0.10,1435

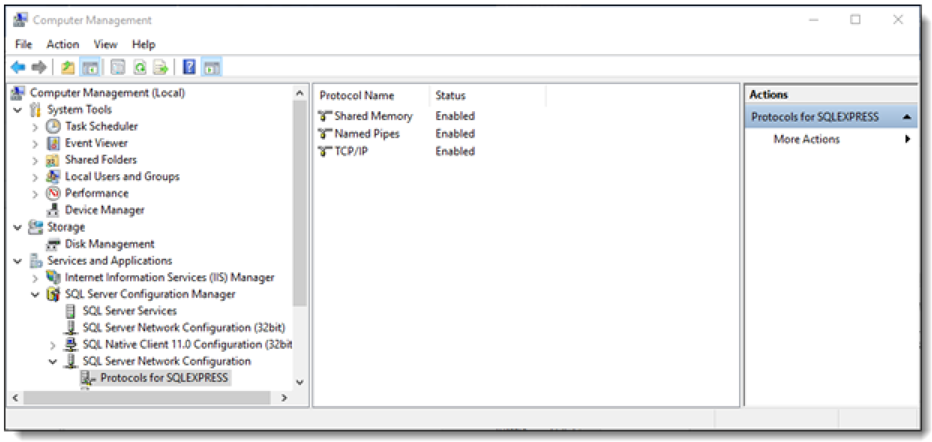
Configure a Static Port

To configure static port connectivity for the Management & Orchestration SQL Server:

1. Go to the Computer Management (**Start > Control Panel > System and Security > Administrative Tools > Computer Management**).

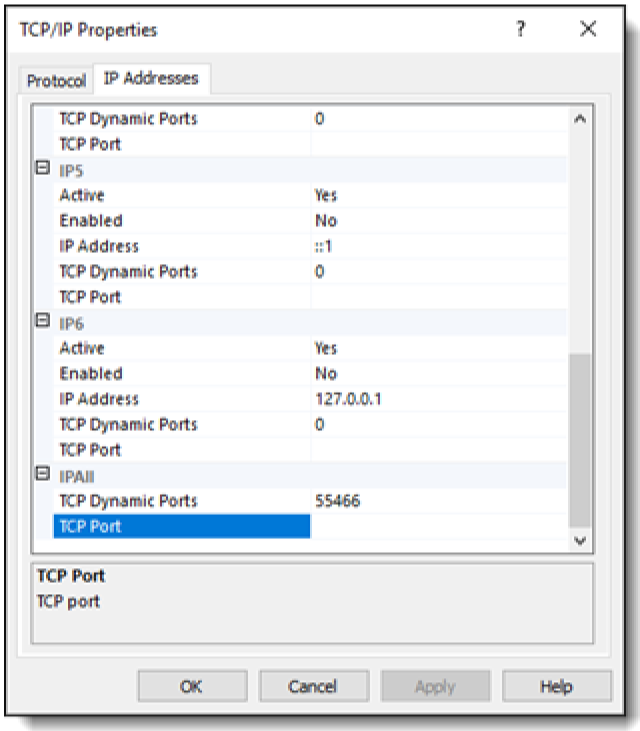


2. Select Services and Applications > SQL Server Configuration Manager > SQL Server Network Configuration > Protocols for <SQLSERVER>.



Protocol Name	Status
Shared Memory	Enabled
Named Pipes	Enabled
TCP/IP	Enabled

3. Right click on TCP/IP, select Properties and click the IP Address tab.



TCP Dynamic Ports	0
TCP Port	
IP5	
Active	Yes
Enabled	No
IP Address	::1
TCP Dynamic Ports	0
TCP Port	
IP6	
Active	Yes
Enabled	No
IP Address	127.0.0.1
TCP Dynamic Ports	0
TCP Port	
IPAll	
TCP Dynamic Ports	55466
TCP Port	

TCP Port
TCP port

4. Select TCP Port under IPALL and define the port as defined in the Management & Orchestration SQL server installation (see Port Connection Arrangement).
5. Click Apply and then OK to complete.
6. Restart the SQL Browser service and then the SQL Server service.

If there are two instances of the SQL Server service, restart that the corresponding instance of SQL Browser service.

Dynamic Port Configuration

Prerequisites

The following perquisites apply:

- For Windows authentication the machine must be in a domain
- SQL Server and SQL Browser services are up and running.

If the SQL Brower service is already running, restart the SQL Server service again. If there are two instances of the SQL Server service, verify that the corresponding instance of the SQL Browser service is running.

- TCP/IP is enabled

Dynamic Port Connection

The Management & Orchestration SQL server installation defines the port connection according to one of the following port connection arrangements:

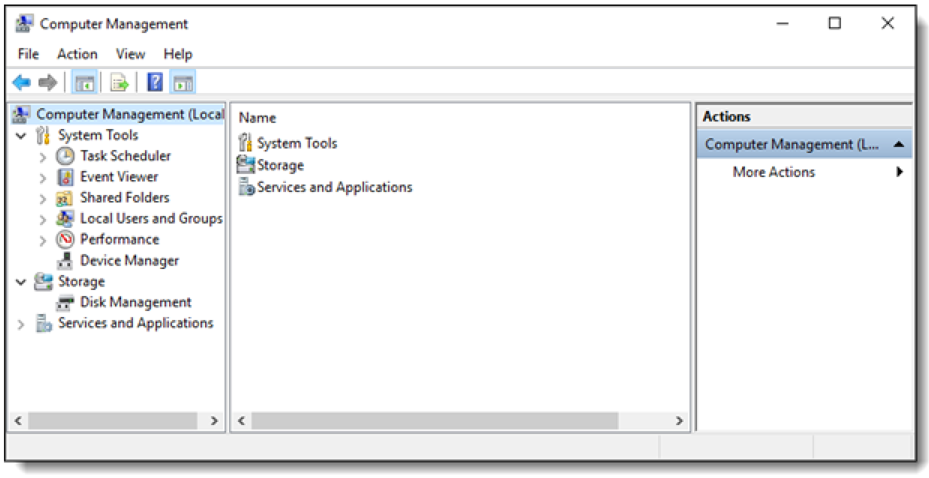
- Instanced SQL: <host>\<instance>
    - Examples:
      localhost\sqlexpress
      10.0.0.10\sqlexpress
      .\sqlexpress
      hostname\ sqlexpress
- Non-instanced SQL: <host>,<port>
    - Examples:
      localhost
      10.0.0.10
      .
      hostname

- For connection arrangements with unnamed instance and without port, <.>, <ip> or <host_name>, the default static port must be set (see Static Port Connection).

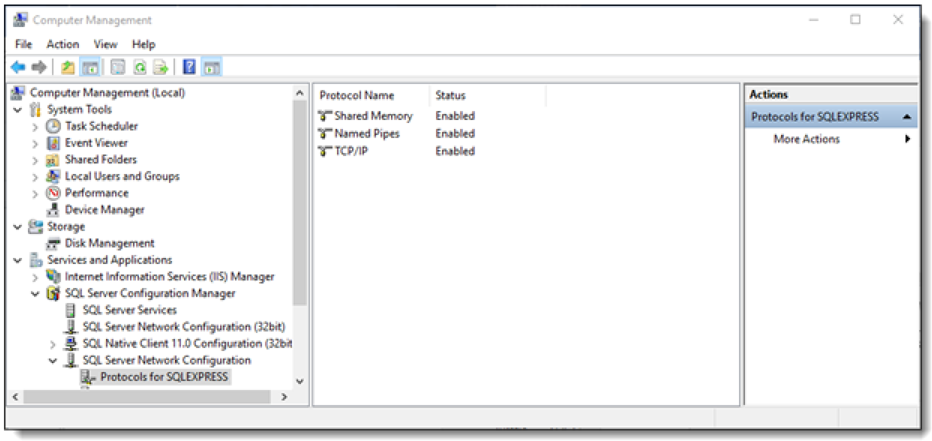
Configuring the Dynamic Port

➢ **To configure dynamic port connectivity for the Management & Orchestration SQL Server:**

1. Go to the Computer Management (Start > Control Panel > System and Security > Administrative Tools > Computer Management).

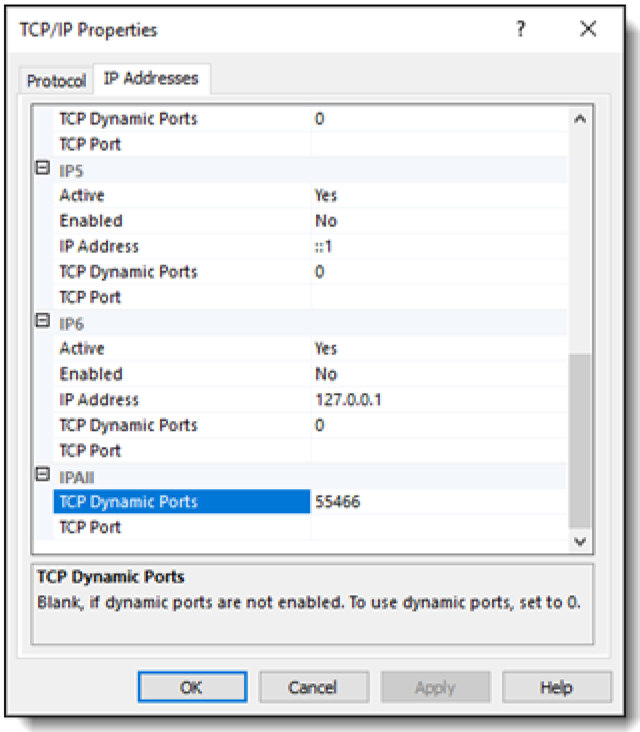


2. Select Services and Applications > SQL Server Configuration Manager > SQL Server Network Configuration > Protocols for <SQLSERVER>.



Protocol Name	Status
Shared Memory	Enabled
Named Pipes	Enabled
TCP/IP	Enabled

3. Right click on TCP/IP, select Properties and click the IP Address tab.



TCP Dynamic Ports	0
TCP Port	
⊟ IP5	
Active	Yes
Enabled	No
IP Address	::1
TCP Dynamic Ports	0
TCP Port	
⊟ IP6	
Active	Yes
Enabled	No
IP Address	127.0.0.1
TCP Dynamic Ports	0
TCP Port	
⊟ IPAll	
TCP Dynamic Ports	55466
TCP Port	

TCP Dynamic Ports
Blank, if dynamic ports are not enabled. To use dynamic ports, set to 0.

4. Select TCP Dynamic Ports under IPALL and define the port as defined in the Management & Orchestration SQL server installation (see Port Connection Arrangement).
5. Click Apply and then OK to complete.
6. Restart the SQL Browser service and then the SQL Server service.

- If there are two instances of the SQL Server service, restart that the corresponding instance of SQL Browser service.

Port Connection Test

The following command can be run to test the port connection:

```
jre\bin\java -cp "etl.jar;Libraries\mssql-jdbc-6.4.0.jre8.jar" -
Djava.library.path="Libraries" com.checkmarx.sync.utl.mainflow.TestConnection
10.31.2.36 null null CxARM SQLEXPRESS
```

- The command should be run from the folder where the etl.jar is located
- You can provide “user” and “password” instead of “null” “null”.
- 10.31.2.36 is the IP of the machine where the database is installed
- SQLEXPRESS is the instance name (“null” can be supplied in unnamed instance)

M&O Connectivity Mitigation

- **Use Case**: Machine not in domain + SQL windows authentication
  Mitigation: Use user + password authentication
- **Use Case**: Dynamic port + SQL Browser service is turned off + SQL Server with named instance
  Mitigation: Configure static port, or turn SQL Browser on
- **Use Case**: TCP/IP disabled
  Limitation: No solution, TCP/IP is a must

Configuring a Non-default Location for Management and Orchestration and CxSAST Component Data

This set of instructions explains how to configure a non-default path location for Management and Orchestration and CxSAST component data (i.e. kahaDB). This can be performed in order to withstand hotfixes and upgrades and can be achieved by changing the component data file path in the associated component ‘.xml’ file with a new data file path.

Changing the Management and Orchestration and CxSAST Component Data File Location

1. Locate the ‘activemq.xml’ file under *C:\Program Files\Checkmarx\Checkmarx ActiveMQ\conf)*. For this example, the kahaDB ‘activeMQ.xml’ file is used.
2. Open the ‘activeMQ.xml’ file and define the <kahaDB> key with the desired path.

- In case of ActiveMQ cluster environment, this new path should be defined for all ActiveMQ instances.

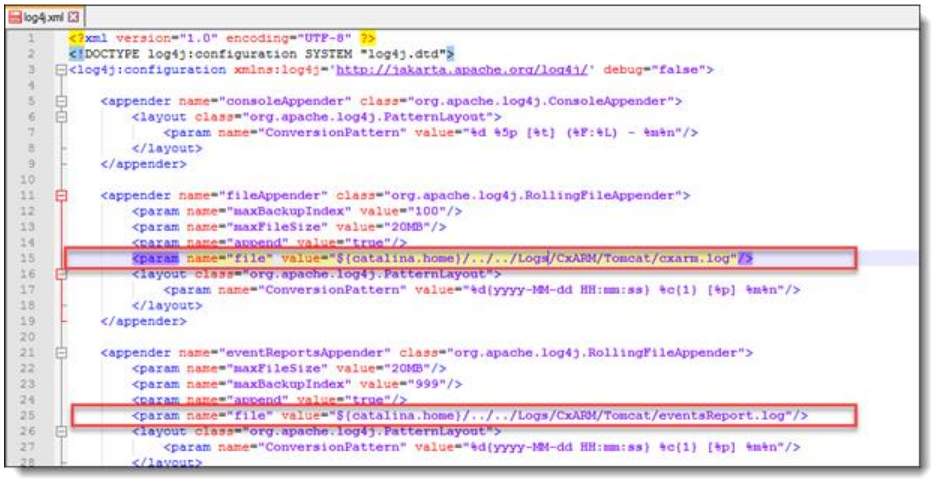
3. Restart the ActiveMQ.

Configuring a Non-default Location for Management and Orchestration Component Logs

The purpose of this instruction is to configure a non-default location for Management and Orchestration component logs (i.e. Policy Manager). This can be performed in order to withstand hotfixes and upgrades and can be achieved by changing the component log file path in the associated component '.xml' file with a new log file path.

Changing the Management and Orchestration Component Log File Location

1. Locate the 'log4j.xml' file under *C:\Program Files\Checkmarx\Checkmarx Risk Management\Tomcat\webapps\cxarm#policymanager\WEB-INF\classes*. For this example, the Policy Manager 'log4j.xml' file is used.
2. Open the 'log4j.xml' file and define the <file> keys with the desired path.



```
<?xml version="1.0" encoding="UTF-8" ?>
<!DOCTYPE log4j:configuration SYSTEM "log4j.dtd">
<log4j:configuration xmlns:log4j='http://jakarta.apache.org/log4j/' debug="false">

    <appender name="consoleAppender" class="org.apache.log4j.ConsoleAppender">
        <layout class="org.apache.log4j.PatternLayout">
            <param name="ConversionPattern" value="%d %5p [%t] (%F:%L) - %m%n"/>
        </layout>
    </appender>

    <appender name="fileAppender" class="org.apache.log4j.RollingFileAppender">
        <param name="maxBackupIndex" value="100"/>
        <param name="maxFileSize" value="20MB"/>
        <param name="append" value="true"/>
        <param name="file" value="${catalina.home}/../../Logs/CxARM/Tomcat/cxarm.log"/>
        <layout class="org.apache.log4j.PatternLayout">
            <param name="ConversionPattern" value="%d{yyyy-MM-dd HH:mm:ss} %c{1} [%p] %m%n"/>
        </layout>
    </appender>

    <appender name="eventReportsAppender" class="org.apache.log4j.RollingFileAppender">
        <param name="maxFileSize" value="20MB"/>
        <param name="maxBackupIndex" value="999"/>
        <param name="append" value="true"/>
        <param name="file" value="${catalina.home}/../../Logs/CxARM/Tomcat/eventsReport.log"/>
        <layout class="org.apache.log4j.PatternLayout">
            <param name="ConversionPattern" value="%d{yyyy-MM-dd HH:mm:ss} %c{1} [%p] %m%n"/>
        </layout>
```

3. Perform the same procedure for all the Management and Orchestration components:
    - **Policy Manager**: *C:\Program Files\Checkmarx\Checkmarx Risk Management\Tomcat\webapps\cxarm#policymanager\WEB-INF\classes*
    - **Dashboard**: *C:\Program Files\Checkmarx Risk Management\Tomcat\webapps\cxarm#dashboardapi\WEB-INF\classes*
    - **Analytics**: *C:\Program Files\Checkmarx Risk Management\Tomcat\webapps\cxarm#cxanalytics\WEB-INF\classes*
    - **ETL**: *C:\Program Files\Checkmarx\Checkmarx Risk Management\ETL*
    - ***Dashboard swagger***: *C:\Program Files\Checkmarx\Checkmarx Risk Management\Tomcat\webapps\cxarm#dashboardapi#swagger\WEB-INF\classes*
    - **Policy Manager swagger**: *C:\Program Files\Checkmarx Risk Management\Tomcat\webapps\cxarm#policymanager#swagger\WEB-INF\classes*
4. Go to the Services (***Start > Control Panel > System and Security > Administrative Tools > Services***) and restart the CxARM service.

Configuring CxSAST for Use

This section explains how to configure CxSAST for use.

Configuring CxSAST for High Availability

This section instructs you on configuring CxSAST for High Availability.

Configuring Checkmarx Software Exposure Platform for High Availability

High availability refers to a system that is durable and operates continuously without failure and is always available to the system users and the clients. Such a high availability system is realized by installing CxSAST in a High Availability architecture, where two or more CxManager servers are installed and run in active-active mode and can access the same database to ensure that the system continues operating, if one CxManager fails. The highly available components are the following and are laid out as illustrated under High Availability Architecture:

- ActiveMQ (active-passive)
- CxEngine (active-active)
- CxManager + Access Control (active-active).

ActiveMQ is configured on two hosts to immediately become available in case of failure of the active host. In addition, this configuration allows for load balancing and not just redundancy. In order to configure CxSAST in high availability mode, you have to use an external load balancer (for example Nginx, AWS etc.).

Once ActiveMQ has been installed and configured on the relevant hosts in Silent mode, you have to return to the CxManager installation to reconfigure Access Control.

Configuring High Availability

High Availability is configured via the Checkmarx Software Exposure Platform components for each machine/server accordingly. The configuration steps can be performed manually using the following steps:

1. Install all Checkmarx Software Exposure Platform components for the High availability environment independently (not in parallel) according to these instructions.
   - Installing Checkmarx Software Exposure Platform components in parallel could cause database locking issues.
   - If required, rename the servers for all Checkmarx Software Exposure Platform components according to these instructions.
2. Manually add the CxEngine Server(s) according to these instructions, and then remove the default (localhost) CxEngine from the Web Portal.
3. Configure all Checkmarx Software Exposure Platform components for **SOURCE_PATH** and **EX_SOURCE_PATH** - DB table **dbo.cxComponentConfiguration**: Replace the local path (**C:\<folder>\...**) with the relevant network path, for example **\\<hostname>\<folder>**.

- Server names must be 12 characters or less and must be a part of the domain.

4. Configuring ActiveMQ for High Availability according to the instructions for distributed installations or according to the instructions for silent distributed installations, depending on the installation type you choose. When having more than one ActiveMQ component, you need to run Silent Reconfiguration after updating the DB with the new ActiveMQ endpoints.
5. Configuring Access Control for High Availability according to these instructions.
    - Once Access Control is configured, create a new environment variable called **SERVER_PUBLIC_ORIGIN** on each CxManager host and assign the same URL to it that you added in the database. For further information, refer to Environment Variables.
6. Configuring the Checkmarx Web Portal on a dedicated host according to these instructions.

Configuring ActiveMQ for High Availability Environments

The ActiveMQ implementation is intended for sending messages between two applications, or two components inside one application. ActiveMQ supports distributed messaging across a network of brokers. This allows a client to connect to any broker in the network and fail over to another broker in case there there is a failure, providing a high availability cluster of brokers from the client's perspective.

This instruction defines the procedure for configuring ActiveMQ in High Availability (Cluster) environments for v9.3.0and up.

Configuring High Availability for the First Time

Follow the instructions provided in **Configuring ActiveMQ for High Availability Environments (v9.0.0)**

Upgrading from v9.0.0

During the upgrade, the following two files are backed up in the ..\Checkmarx\Checkmarx ActiveMQ\conf path:

- **activemq.xml** is backed up in the file: **activemq_backup.xml**
- **credentials-enc.properties** is backed up in the file: **credentials-enc_backup**

Changes in the files above are automatically merged during the upgrade process.

Configuring Environment Variables

In version 9.3.0, several environment variables have been introduced to CxSAST Manager and CxSAST Engine environments.

Access Control Environment Variables

In every Manager environment:

- Set the ActiveMessageQueueURL environment variable with the **ActiveMQ URI**

Engine Service Environment Variables

In every Engine environment:

- Set the CX_ES_MESSAGE_QUEUE_URL environment variable with the **ActiveMQ URI**

ActiveMQ URI is defined with the ActiveMQ Connection URI Step in the ActiveMQ for High Availability Environments guide.

Restarting ActiveMQ Client Services

After you finished configuring, you have to restart the services listed below as outlined for changes to take effect:

- After editing database (DB) values:
  - Scans Manager Service
  - Results Service
- After editing Access Control (AC) environment variables:
  - Access Control Service (IIS)
- After editing Engine Services (ES) environment variables:
  - Engine Service

Configuring Access Control for High Availability Environments

Configuring Access Control for High Availability (HA) in CxSAST v9.0.0 and up ensures optimal operational performance – even at times of high loads and provides failover support in case of CxManager failure to ensure application availability.

This High Availability architecture supports two or more servers (CxManager) installed behind the organization's external network load balancer that allows for accessing the same DB, to ensure full system operability in the event a machine failure.

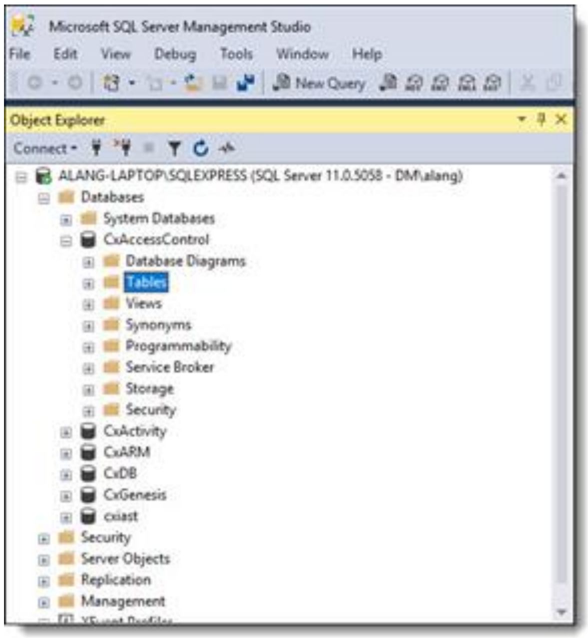
This instruction defines the procedure for configuring Access Control in High Availability environments for v9.0.0 and up.

- High Availability can be configured on a local server, or via a cloud environment.

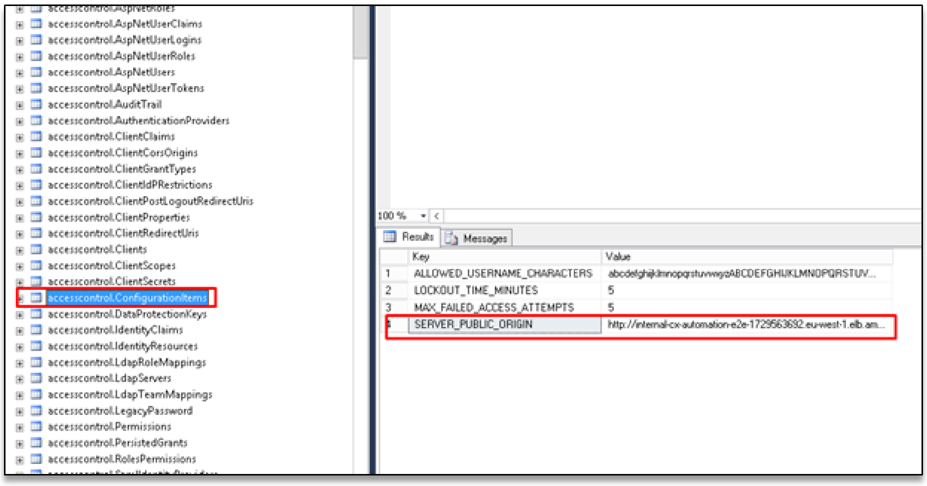
Configuring the CxAccessControl Database

Once the CxSAST v9.0.0 (and up) environment is installed and fully configured, do the following:

1. Open MS SQL Server Management Studio.
2. Connect to the SQL server.
3. Go to: Databases > CxAccessControl > Tables.



4. Right-click on the accesscontrol.ConfigurationItems table and open Edit Top 200 Rows.


accesscontrol.AspNetUserClaims
accesscontrol.AspNetUserLogins
accesscontrol.AspNetUserRoles
accesscontrol.AspNetUsers
accesscontrol.AspNetUserTokens
accesscontrol.AuditTrail
accesscontrol.AuthenticationProviders
accesscontrol.ClientClaims
accesscontrol.ClientCorsOrigins
accesscontrol.ClientGrantTypes
accesscontrol.ClientIdPRestrictions
accesscontrol.ClientPostLogoutRedirectUris
accesscontrol.ClientProperties
accesscontrol.ClientRedirectUris
accesscontrol.Clients
accesscontrol.ClientScopes
accesscontrol.ClientSecrets
accesscontrol.ConfigurationItems
accesscontrol.DataProtectionKeys
accesscontrol.IdentityClaims
accesscontrol.IdentityResources
accesscontrol.LdapRoleMappings
accesscontrol.LdapServers
accesscontrol.LdapTeamMappings
accesscontrol.LegacyPassword
accesscontrol.Permissions
accesscontrol.PersistedGrants
accesscontrol.RolesPermissions
100 %
Results
Messages

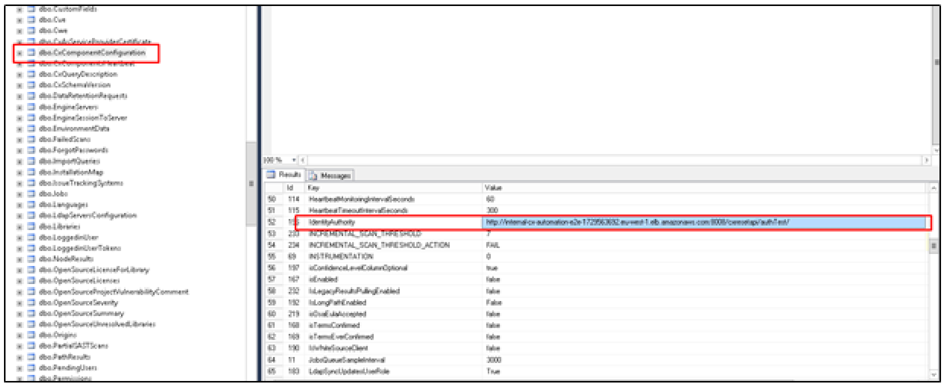
	Key	Value
1	ALLOWED_USERNAME_CHARACTERS	abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUV...
2	LOCKOUT_TIME_MINUTES	5
3	MAX_FAILED_ACCESS_ATTEMPTS	5
4	SERVER_PUBLIC_ORIGIN	http://internal-cx-automation-e2e-1729563692.eu-west-1.elb.am...

5. In the field of the SERVER_PUBLIC_ORIGIN key, and enter the load balancer URL in the Value field as follows:

```
http:// {Access Control URL in Load Balancer: Port}
```

6. Go to **Databases > CxDB > Tables**, right-click the dbo.CxComponentConfiguration table and then open **Edit Top 200 Rows**.
7. Select the IdentityAuthority key and enter the same load balancer URL (the base URL of the identity server) in the Value field as follows:

```
http:// {Access Control URL in Load Balancer: Port} /cxrestapi/auth
```



dbo.CustomFields
dbo.Cve
dbo.Cwe
dbo.CxAcServiceProviderCertificate
dbo.CxComponentConfiguration
dbo.CxComponentHeartbeat
dbo.CxQueryDescription
dbo.CxSchemaVersion
dbo.DataRetentionRequests
dbo.EngineServers
dbo.EngineSessionToServer
dbo.EnvironmentData
dbo.FailedScans
dbo.ForgotPasswords
dbo.ImportQueries
dbo.InstallationMap
dbo.IssueTrackingSystems
dbo.Jobs
dbo.Languages
dbo.LdapServersConfiguration
dbo.Libraries
dbo.LoggedinUser
dbo.LoggedinUserTokens
dbo.NodeResults
dbo.OpenSourceLicenseForLibrary
dbo.OpenSourceLicenses
dbo.OpenSourceProjectVulnerabilityComment
dbo.OpenSourceSeverity
dbo.OpenSourceSummary
dbo.OpenSourceUnresolvedLibraries
dbo.Origins
dbo.PartialSASTScans
dbo.PathResults
dbo.PendingUsers
dbo.Permissions

	Id	Key	Value
50	114	HeartbeatMonitoringIntervalSeconds	60
51	115	HeartbeatTimeoutIntervalSeconds	300
52	[illegible]	IdentityAuthority	http://internal-cx-automation-e2e-1729563692.eu-west-1.elb.amazonaws.com:8008/cxrestapi/auth/Test/
53	233	INCREMENTAL_SCAN_THRESHOLD	7
54	234	INCREMENTAL_SCAN_THRESHOLD_ACTION	FAIL
55	69	INSTRUMENTATION	0
56	197	isConfidenceLevelColumnOptional	true
57	167	isEnabled	false
58	232	IsLegacyResultsPullingEnabled	false
59	192	IsLongPathEnabled	False
60	219	isOsaEulaAccepted	false
61	168	isTermsConfirmed	false
62	169	isTermsEverConfirmed	false
63	190	IsWhiteSourceClient	false
64	11	JobsQueueSampleInterval	3000
65	183	LdapSyncUpdatesUserRole	True

Configuring the Host Header in the Load Balancer / Proxy

When working with a load balancer or proxy it is important that requests that reach the Access Control service contain the original 'Host header'. In certain instances, there may be errors, and this is usually because the 'Host' header contains the address of the backend server instead of its original value. By default, the 'Host header' changes once a new request is created. To fix this, you can manually configure the 'Host header' in the load balancer / proxy configuration. For this example, we will use NGINX as the installed load balancer. To configure the 'Host header' in the load balancer, do the following:

1. Open the NGINX configuration file (**<nginx installation path>/conf/nginx.conf**) using a text editor.
2. Navigate to the 'http.server.location' segment as illustrated in the example below.

```
worker_processes  auto;
        events{
        worker_connections 4096;
        }
        http {
           include    mime.types;
           index    index.html index.htm index.php;
            default_type application/octet-stream;
            sendfile     on;
            tcp_nopush   on;
            server_names_hash_bucket_size 128;
            upstream vm-s-880 {
            server 10.35.0.30;
            server 10.35.0.31;
        }
        server {
        client_max_body_size 1000M;
        listen 8070;
        location / {
        proxy_pass http://vm-s-880;
        proxy_set_header Host vm-s-880;
        proxy_buffer_size          128k;
        proxy_buffers              4 256k;
        proxy_busy_buffers_size    256k;
        }
       }
    }
```

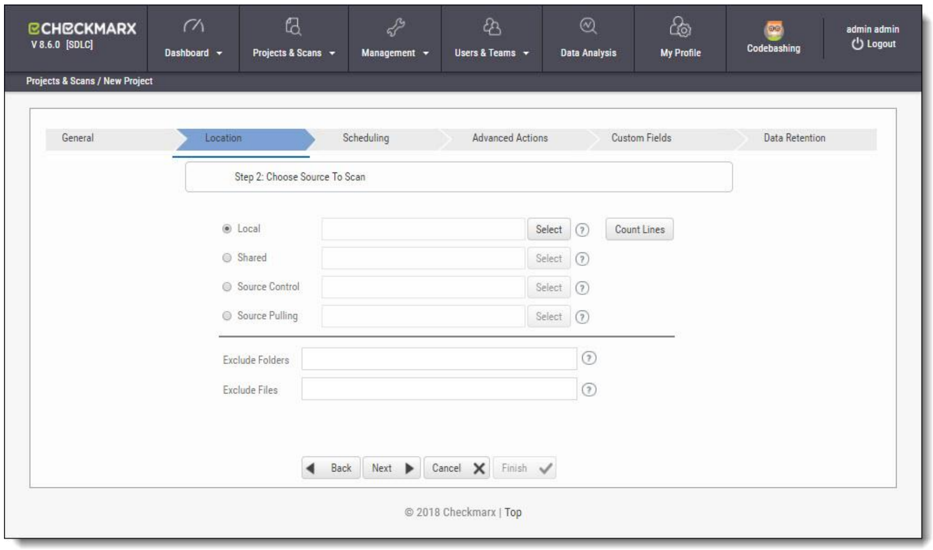
3. Set the ‘Host header under the ‘http.server.location’ segment as: **proxy_set_header** Host {**load_balancer_address**}, where the **load_balancer_address** is defined as the station on which NGINX is installed.

- The ‘Upstream’, **proxy_pass** and **proxy_set_header Host** definitions must match.
- When uploading a large source zip archive to the SAST Portal, make sure that the **client_max_body_size** value is set to at least the size of this zip archive. The example above reflects this value set to 1000 MB.

4. Save the NGINX configuration file and exit the editor.
5. Restart NGINX.

Configuring the Connection to a Source Control System

When creating a project and the source code **Location** is set to **Source Control**, you can define to which source control system to connect by selecting a source control type (TFS, SVN, GIT or Perforce).

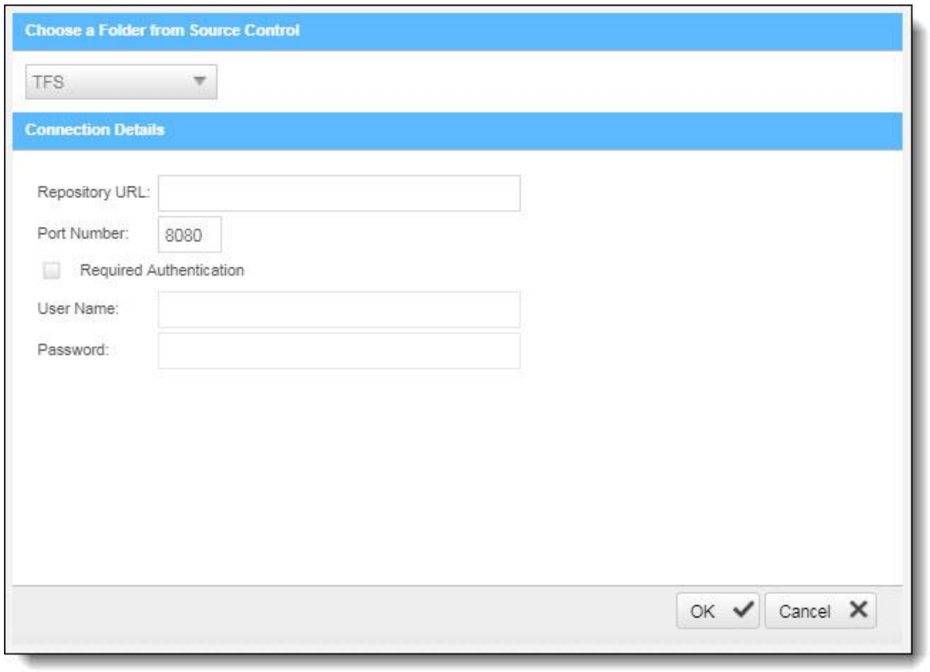


With Source Control option checked, click **Select**. The Source Control window is displayed (see below for connection options).

Files inside a zip file that are located inside a repository will not be sent for scanning. Unzip the contents of the zip file to the repository before scanning.

Defining Source Control for TFS

1. Select **TFS** from the drop-down. The TFS Connection Details panel is displayed.



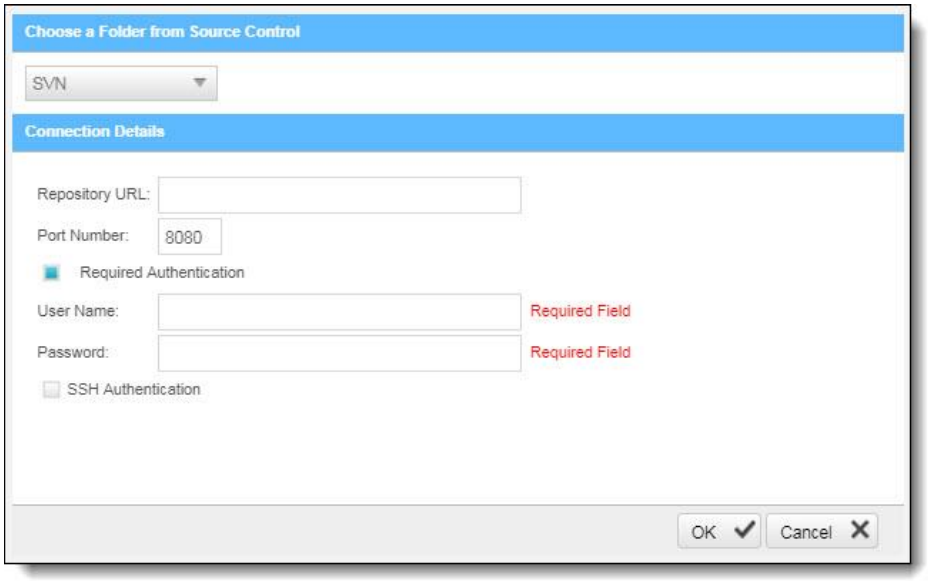
The TFS Connection Details panel includes the following parameters:

- **Repository URL** - the repository URL address (Supports HTTP and HTTPS, i.e. <protocol>://<site name>:<port>/tfs/<Collection> (must point to the repository named <Collection>)).
- **Port Number** - the port number
- **Required Authentication** - select to enforce authentication
- **User Name** - the user name (required with enforced authentication)
- **Password** - the password (required with enforced authentication)

2. Click **OK**.

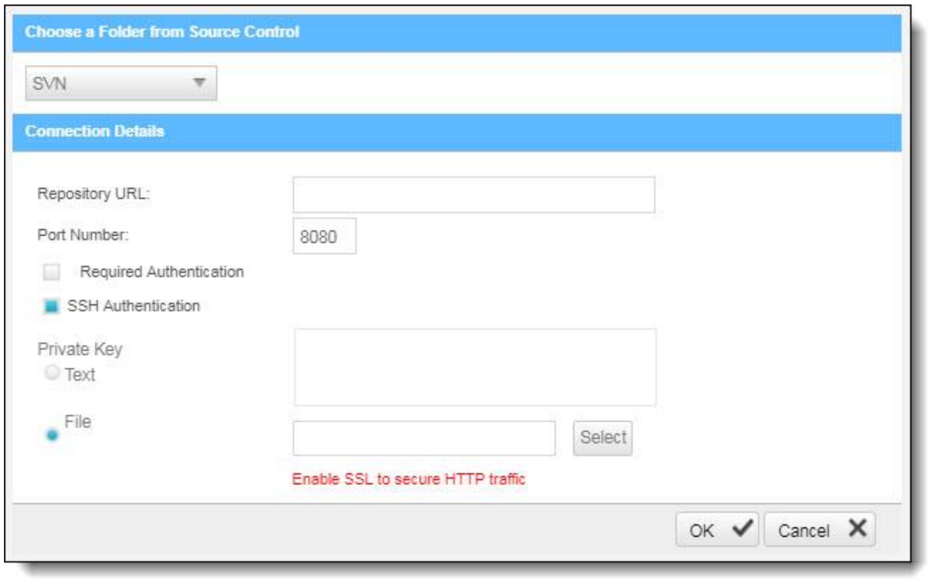
Defining Source Control for SVN

1. Select **SVN** from the drop-down. The SVN Connection Details panel is displayed.



The SVN Connection Details panel includes the following parameters:

- **Repository URL** - the repository URL address (Supports HTTP, HTTPS and SSH private/public key infrastructure, i.e. <protocol>://<server_ip>/<repository_name>)
- **Port Number** - the port number
- **Required Authentication** - select to enforce authentication
- **User Name** - the user name (required with enforced authentication)
- **Password** - the password (required with enforced authentication)
- **SHH Authentication** - select to use secure authentication with SSH



Selecting SHH Authentication displays the following additional parameters:

- **Private Key Text** - add private key text
- **Private Key File** - select and upload a private key file

> - Checkmarx does not support SSH keys with a passphrase.
> - For best results, use ssh-keygen, per these instructions, and not PuTTYgen.

2. Click **OK**.

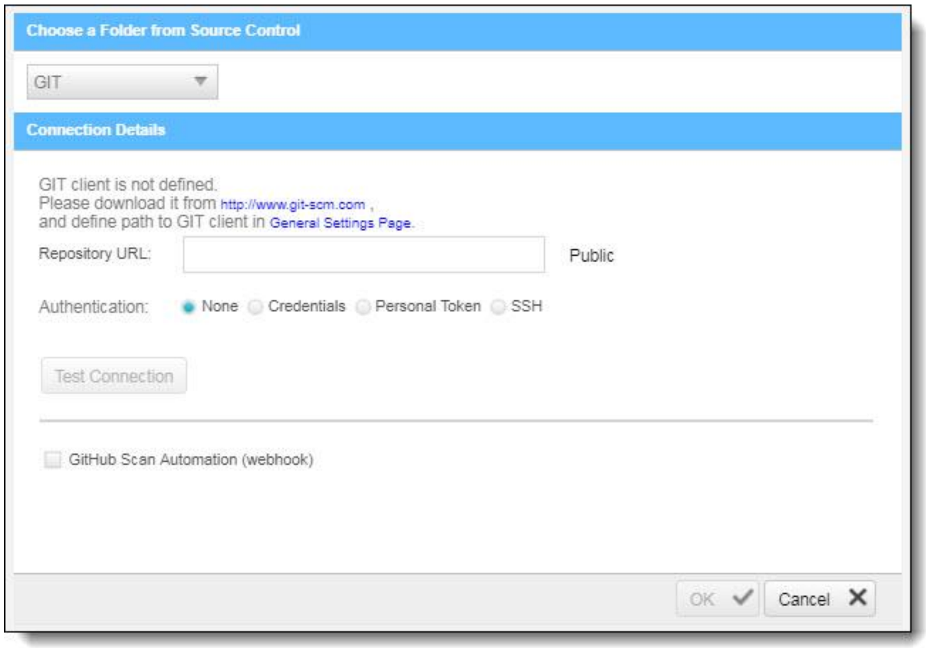
Defining Source Control for GIT

➢ **Requirements for using GIT repository:**

1. Download GIT Installation Package and perform the installation on CxSAST Manager Server (use installation defaults)
2. Define Path+ exe file in CxSAST **Management** > **Application Settings** > **General** > **Path to GIT Client Executable** (i.e. C:\Program Files\Git\bin\git.exe).

➢ **To define the source control:**

1. Select **GIT** from the drop-down. The GIT Connection Details panel is displayed.


Choose a Folder from Source Control
GIT
Connection Details
GIT client is not defined.
Please download it from http://www.git-scm.com ,
and define path to GIT client in General Settings Page.
Repository URL: Public
Authentication: [✓ None] Credentials Personal Token SSH
Test Connection
GitHub Scan Automation (webhook)
OK
Cancel

The GIT Connection Details panel includes the following parameters:

Repository URL - the repository URL address (Supports HTTP, HTTPS, i.e. <protocol>://<user>:<password>@<server_ip>/<repository_name>.git or SSH private/public key infrastructure, i.e. git@<git_site>:<user_name>/<repository_name>.git).

> - If your repository URL contains the character "@", replace it with "%40" (html encoding) before inserting the URL.

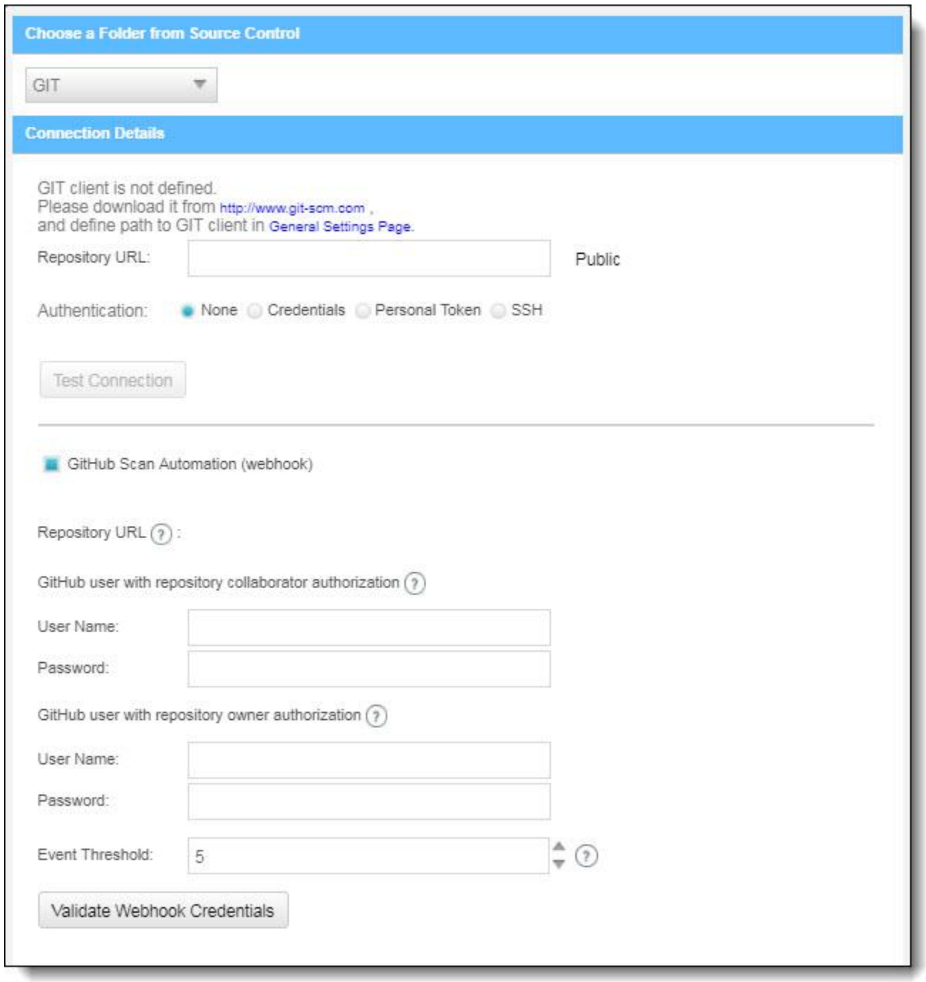
- To locate your GIT Repository URL, refer to GitHub - Tips on Finding Git / GitHub Repository URLs

Authentication - select an authentication method.

For additional information about the various authentication methods, refer to Configuring a Project with Git Integration

2. Click **Test Connection**. Once the 'Connection Successful' message is displayed, you can continue.

GitHub Scan Automation - select to include GitHub Integration.


Choose a Folder from Source Control

GIT

Connection Details

GIT client is not defined.
Please download it from http://www.git-scm.com ,
and define path to GIT client in General Settings Page.

Repository URL: Public

Authentication: [✓ None] Credentials Personal Token SSH

Test Connection

[✓ GitHub Scan Automation (webhook)]

Repository URL (?) :

GitHub user with repository collaborator authorization (?)

User Name:

Password:

GitHub user with repository owner authorization (?)

User Name:

Password:

Event Threshold: 5 (?)

Validate Webhook Credentials

3. Enter the GitHub repository owner and collaborator credentials into the relevant User Name and Password fields.

- The GitHub user with repository owner authorization will be used for creating and using a GitHub WebHook (see GitHub Webhooks).
- The GitHub user with repository collaborator authorization is used to create commit comments.

4. Configure the Event threshold. A scan in Checkmarx CxSAST will be initiated only after this number of events has occurred, since the last triggered scan.

   By default, the event threshold value is set to 5, because triggering a scan after fewer events may overload the system. If the user specifies a lower number, a warning message is displayed.

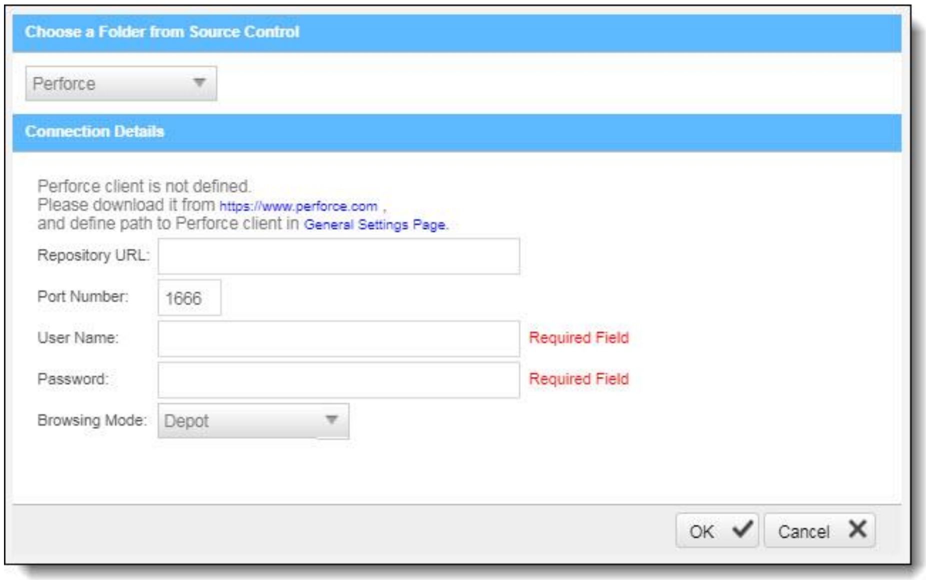
5. Click Validate Webhook Credentials to confirm authentication to the GitHub webhooks works correctly. A 'Server Connection Verified Successfully' message is displayed.
6. Click **OK** to complete procedure.

For more information about the various options for GitHub integration, refer to Github Integration

Defining Source Control for Perforce

Currently, CxSAST is unable to scan code from any system that contains symbolic links.

1. Select **Perforce** from the drop-down. The Perforce Connection Details panel is displayed.



Choose a Folder from Source Control

Perforce

Connection Details

Perforce client is not defined.
Please download it from https://www.perforce.com ,
and define path to Perforce client in General Settings Page.

Repository URL:
Port Number: 1666
User Name: Required Field
Password: Required Field
Browsing Mode: Depot

The Perforce Connection Details panel includes the following parameters:

- **Repository URL** - the repository URL address (i.e. SSL:<server_ip> or <server_ip>)
- **Port Number** - the port number
- **User Name** - the user name
- **Password** - the unique password
- **Browsing Mode** - select **Depot** (for shared file repositories) or **Workspace** (for grouped file repositories).

2. Click **OK**.

To set the Perforce client executable path, refer to the Path to P4 command line client executable parameter in the Server Settings.

You can now continue to configure the project.

For All connections – The connection between CxManager Server and the 3rd party repo server is established with the credentials that have been configured for the CxPool IIS Application Pool.

Configuring CxSAST for using a non-default Port

By default, CxSAST uses port 80 for communications. You can change the port, for example to port 8080.

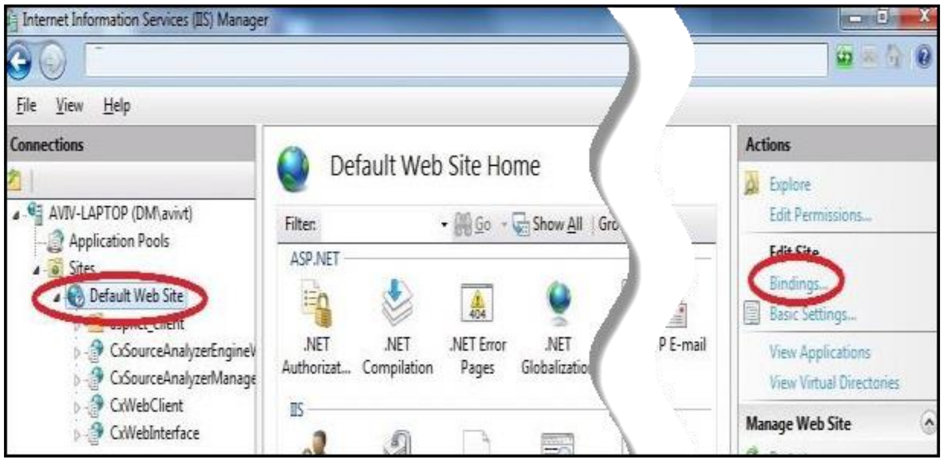
To change the CxSAST communication port, you need to first change the web server listening port, and then perform additional configuration on CxSAST as illustrated in the sections below.

Changing the Web Server Listening Port

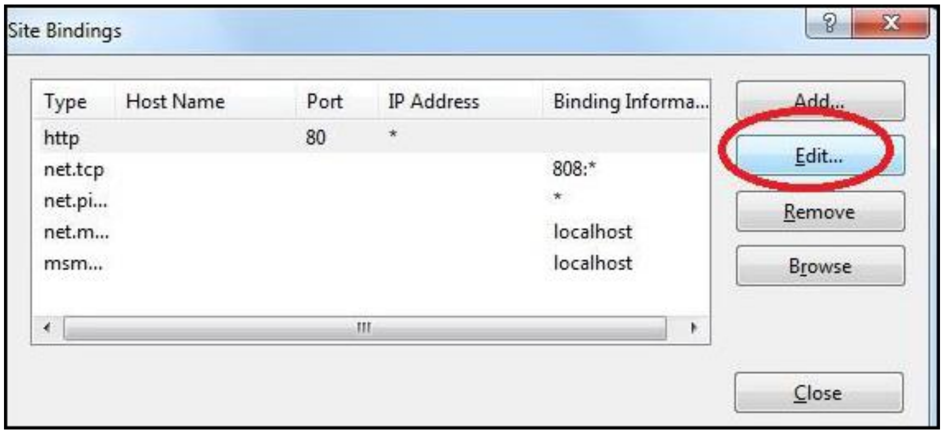
Change the web server listening port according to one of the following procedures, depending on which web server CxSAST is using:

➢ **To change the port on IIS:**

1. On the CxSAST Server or CxManager host, open the IIS Manager.
2. In the left-hand navigation pane, select **Sites** > **Default Web Site**.
3. On the right, under **Actions** > **Edit Sites**, click **Bindings**:

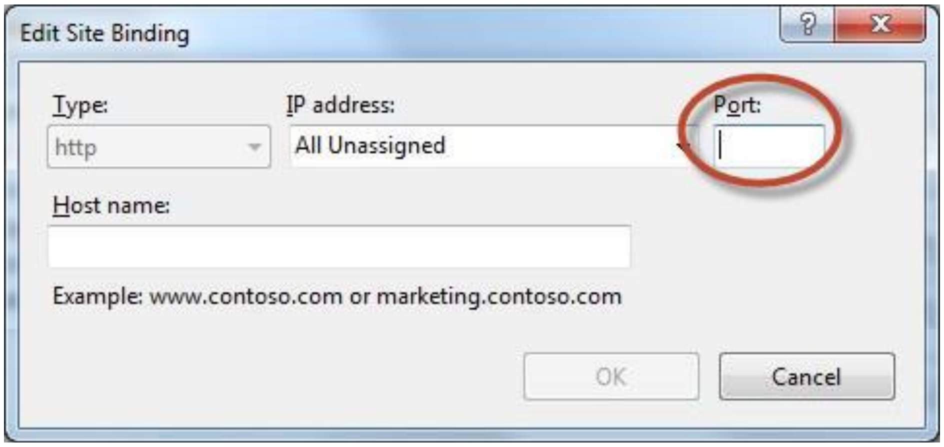


4. Select http and click Edit:


Site Bindings

Type	Host Name	Port	IP Address	Binding Informa...
http		80	*	
net.tcp				808:*
net.pi...				*
net.m...				localhost
msm...				localhost

5. Under Port, type the new number:


Edit Site Binding

Type: http

IP address: All Unassigned

Port:

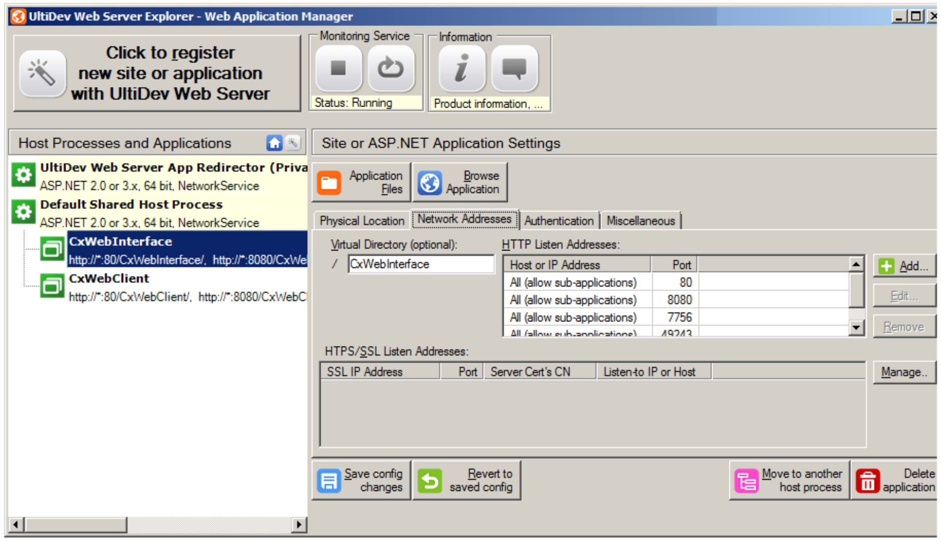
Host name:

Example: www.contoso.com or marketing.contoso.com

6. Click **OK**.

➢ **To change the port on UltiDev:**

1. On the CxSAST Server or CxManager host, open the **UltiDev Web App Explorer** (for example, from the Windows/Start menu).
2. On the left, select **CxWebInterface**, and in the **Network Addresses** tab, click **Add** and add the new port; select **80** and click **Remove**:


UltiDev Web Server Explorer - Web Application Manager

Click to register new site or application with UltiDev Web Server
Monitoring Service
Information

Status: Running

Product information, ...

Host Processes and Applications

UltiDev Web Server App Redirector (Priva
ASP.NET 2.0 or 3.x, 64 bit, NetworkService
Default Shared Host Process
ASP.NET 2.0 or 3.x, 64 bit, NetworkService
CxWebInterface
http://*:80/CxWebInterface/, http://*:8080/CxWe
CxWebClient
http://*:80/CxWebClient/, http://*:8080/CxWebC

Site or ASP.NET Application Settings

Virtual Directory (optional): / CxWebInterface

HTTP Listen Addresses:

Host or IP Address	Port
All (allow sub-applications)	80
All (allow sub-applications)	8080
All (allow sub-applications)	7756
All (allow sub-applications)	49243

HTTPS/SSL Listen Addresses:

SSL IP Address	Port	Server Cert's CN	Listen-to IP or Host

3. Select **CxWebClient**, and in the **Network Addresses** tab, click **Add** and add the new port; select **80** and click **Remove**.
4. Click **Save config changes**.

Additional CxSAST Configuration

Now that that the web server listening port is configured, perform the following CxSAST configuration:

1. Open the following file for editing:
   C:\Program Files\Checkmarx\CheckmarxWebPortal\Web\web.config
2. Find the key **CxWSResolver.CxWSResolver**, and change the line to:
   <add key="CxWSResolver.CxWSResolver" value="http://localhost:<port>**/CxWebInterface/CxWSResolver.asmx" />**
   where <port> is the new port number. For example:
   <add key="CxWebServices.CxWSResolver" value="http://localhost:8080/CxWebInterface/CxWSResolver.asmx" />
3. Open the following file for editing:
   C:\Program Files\Checkmarx\Checkmarx Engine Server\CxSourceAnalyzerEngine.WinService.exe.config
4. Open the following file for editing: **"<Checkmarx Installation Folder>\Checkmarx Engine Server\CxSourceAnalyzerEngine.WinService.exe.config**".
5. Find the phrase "**http://**" and change the line to: **<add baseAddress="http://localhost:<port>/CxSourceAnalyzerEngineWCF/CxEngineWebServices.svc"/>**
   where <port> is the new port number. For example: **<add baseAddress="http://localhost:8080/CxSourceAnalyzerEngineWCF/CxEngineWebServices.svc"/>"**
6. Run the following command in elevated CMD with correct parameters:
   netsh http add urlacl url=http://+:80/CxSourceAnalyzerEngineWCF/CxEngineWebServices.svc user="NT AUTHORITY\NETWORK SERVICE"

- The number 80 in - ".....=http://+:80/Cx...."
  The domain\user in - "....vc user="NT AUTHORITY\NETWORK SERVICE" if the user running the Cx Engine service is not the default "Network Service"

7. In order for CxARM, plugins and the CLI tool to work with the new port, you need to run the following DB query::
   UPDATE [CxDB].[dbo].[CxComponentConfiguration]
   SET Value = '**http(s)://your_cx_portal_hostname:port**'
   WHERE [Key] = 'IdentityAuthority'
8. In the Windows Service Manager, restart the following services:
   CxScanEngine
   CxScanManager
9. In a distributed deployment:
   a) Log into the CxSAST web interface, using the new port number in the browser address bar. For example:
      http://localhost:8080/CxWebClient/login.aspx
   b) Go to **Management** > **Server Settings** > **Installation Information**, and under **Engine Servers**, edit the server address to include the new port number.
10. If you use CxAudit:
    a) On the CxSAST server, open the following file for editing:
       C:\Program Files\Checkmarx\Checkmarx Audit\CxAudit.exe.config
    b) Find the **SERVER_ADDRESS** key, and edit its **value** to include the new port number. For example:
       <add key="SERVER_ADDRESS" value="http://localhost:8080" />
    c) If CxAudit was already run, repeat the previous step on the following file:
       C:\Users\USERNAME\AppData\Local\Checkmarx\CxAudit\CxAudit.exe.config

Configuring CxSAST for using a non-default User (Network Service) - CxServices & IIS Application Pools

The CxSAST is based on IIS Application Pools and CxServices. For each of these the local Network Service is defined as default by the CxSAST installer.

Configuring CxSAST for using a non-default User (Network Service) for CxServices & IIS Application Pools

By default all product services are installed and configured to run with Windows Network Service account. This instructions describes how to configuring CxSAST for use with a non-default user (Network Service) that includes CxServices & IIS Application Pools.

Outline

It is important to differentiate between the components as not all of them are used for the same purpose.

IIS Application Pools

- **CxClientPool** - Application Pool of the Web Portal - the user that is defined here will not influence any external tools.
- **CxPool** - Application Pool of the CxManager - the user that is defined here is used for connection to a third party server, e.g. TFS, GIT, SVN, etc..
- **CxPoolRestAPI** - Application Pool of the RestAPI - the user that is defined here will not influence any external tools.
- **CxAccessControl -** Application Pool of the Access Control portal

The user assigned to the IIS App Pools must have access to the CxDB and CxActivity databases in the SQL Server, if 'Integrated Security=True' in - DBConnectionData.config file.

Services

Services for the CxManager - The user that is defined here (and to the CxPool) is used for the connection to the SQL server (if 'Integrated Security=True' in - DBConnectionData.config file):

- CxSystemManager
- CxJobsManager
- CxScansManager
- CxSastResults

- CxScanEngine
- Web server:
  - World Wide Web Publishing Service
  - IIS Admin Service
  - Access Control
- Management and Orchestration:
  - CxARM
  - CxARMETL
  - CxRemediationIntelligence
- Shared services:
  - **ActiveMQ** – Message Broker (Apache message queue broker) for communicating between Checkmarx products

Service for the CxEngine - The user that is defined here is required to be in the Administrators group of the server or (recommended!) - run the netsh command for this user

- CxScanEngine

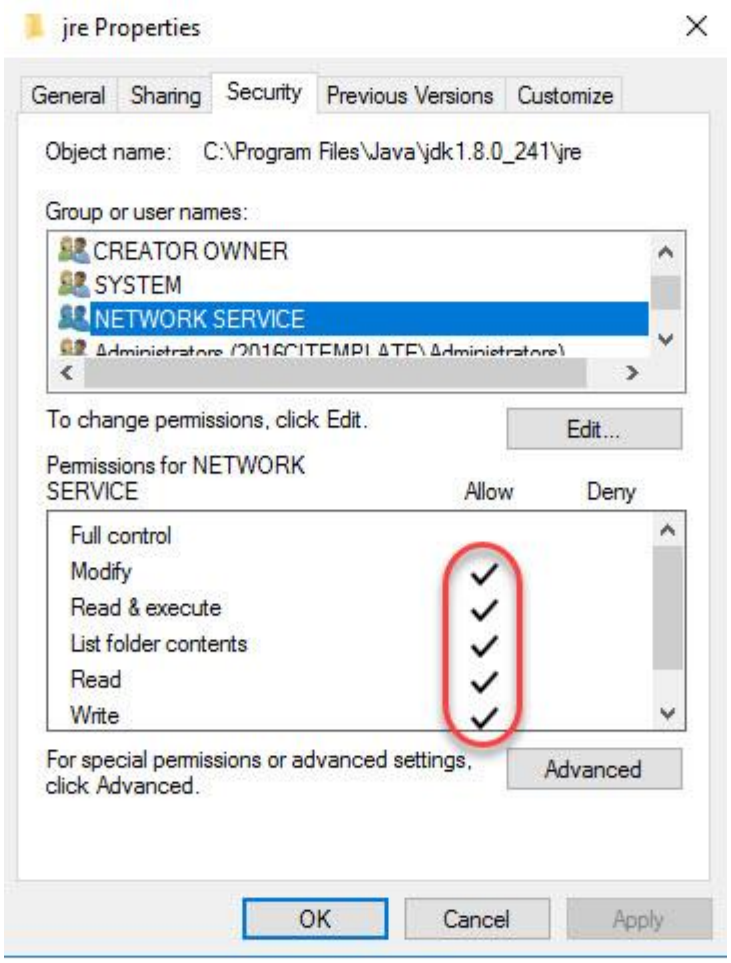
For resolving issues, it is recommended to keep all the CxServices defined with the same user.

Java Folders

In order to allow Cx services to read and write in the Java folder when users use their own non-default service account, the relevant must grant Read/Write/Modify permissions to the Java folders (**<root directory>:\Program Files\Java\jdk1.8.0_241\jre**).

➢ **To grant permissions on the Java folders:**

1. Ensure that the relevant user is logged on to the station with admin rights.
2. Navigate to the **jdk1.8.0_241** folder, which is usually located at **C:\Program Files\Java\jdk1.8.0_241**
3. Right-click **jre** and select **Properties** from the menu to open the jre Properties dialog.


jre Properties

General | Sharing | Security | Previous Versions | Customize

Object name: C:\Program Files\Java\jdk1.8.0_241\jre

Group or user names:

- CREATOR OWNER
- SYSTEM
- NETWORK SERVICE
- Administrators (2016CITEMPLATE\Administrators)

To change permissions, click Edit.

Permissions for NETWORK SERVICE

	Allow	Deny
Full control		
Modify	✓	
Read & execute	✓	
List folder contents	✓	
Read	✓	
Write	✓	

For special permissions or advanced settings, click Advanced.

4. Navigate to the desired non-default service (not the default **Network Services**) and add permissions to read, write and modify. The permission profile must look as illustrated in the jre Properties screen image above.
5. Apply the new settings and close the folders.

Storage Folders

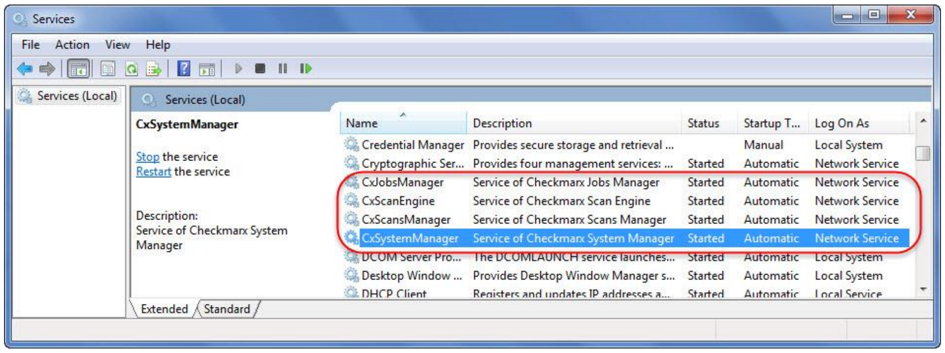
Ensure that the user who accesses the Cx storage folders (**CxSrc**, **CxReports**, **ExtSrc**) has the appropriate read/write permissions.

Configuration

CxServices

1. Ensure that the user running the CxServices has the appropriate authorization, i.e. has domain access, administration rights, etc.
2. In the Service Manager (**services.msc**) you should check the **Log On As** user accounts of each of the following:
    - CxJobsManager
    - CxScanEngine
    - CxScansManager
    - CxSystemManager
    - CxARM
    - CxARMETL
    - CxRemediationIntelligence
    - ActiveMQ

    If any of the CxServices are anything other than the default **Network Service**, make sure you know the user account's full credentials.
3. Open Windows Services:



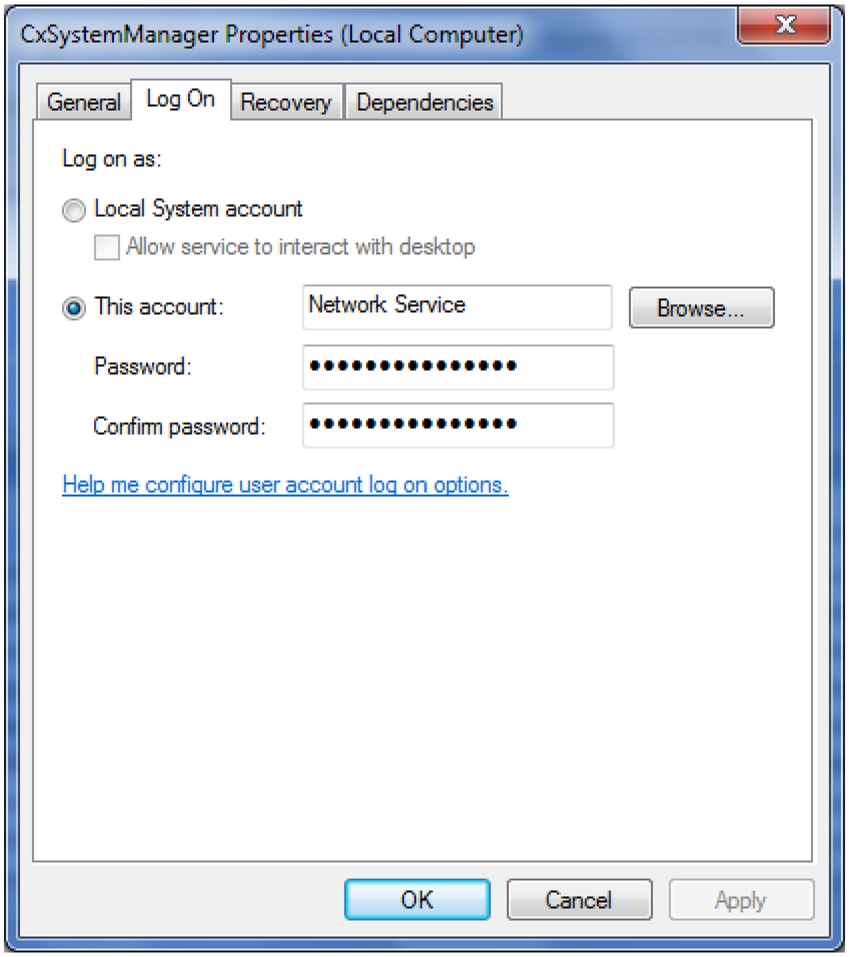
CxSystemManager

Stop the service
Restart the service

Description:
Service of Checkmarx System Manager

Name	Description	Status	Startup T...	Log On As
Credential Manager	Provides secure storage and retrieval ...		Manual	Local System
Cryptographic Ser...	Provides four management services: ...	Started	Automatic	Network Service
CxJobsManager	Service of Checkmarx Jobs Manager	Started	Automatic	Network Service
CxScanEngine	Service of Checkmarx Scan Engine	Started	Automatic	Network Service
CxScansManager	Service of Checkmarx Scans Manager	Started	Automatic	Network Service
CxSystemManager	Service of Checkmarx System Manager	Started	Automatic	Network Service
DCOM Server Pro...	The DCOMLAUNCH service launches...	Started	Automatic	Local System
Desktop Window ...	Provides Desktop Window Manager s...	Started	Automatic	Local System
DHCP Client	Registers and updates IP addresses a...	Started	Automatic	Local Service

4. Right click on a **CxService** and select **Properties**.



Log on as:

( ) Local System account

[ ] Allow service to interact with desktop

(●) This account: Network Service

Password: •••••••••••••••

Confirm password: •••••••••••••••

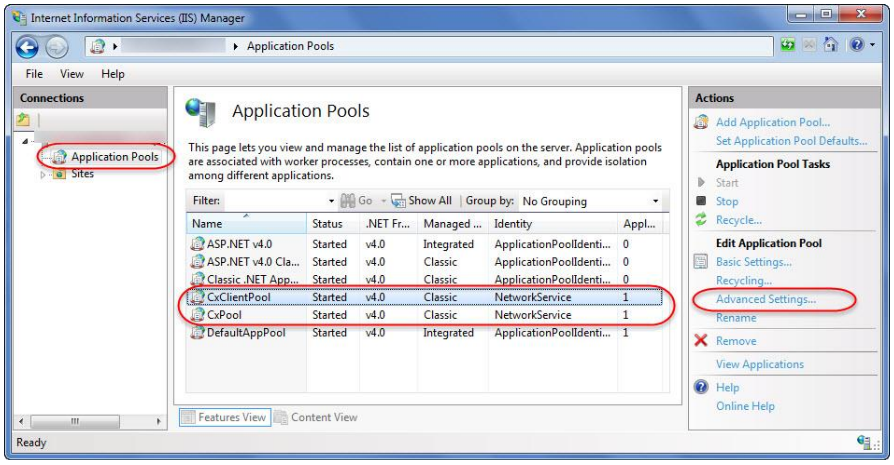
Help me configure user account log on options.

5. Select the **Log On** tab, enter the appropriate user credentials and click **OK**.

IIS (Application Pools)

6. In the IIS Manager, navigate to Application Pools, and check the user Identity of each of the following:
   - CxClientPool
   - CxPool
   - CxPoolRestAPI
   - CxAccessControl

   If any of the Cx Application Pools are anything other than the default **Network Service**, make sure you know the user account's full credentials.
7. Open IIS Manager Console:

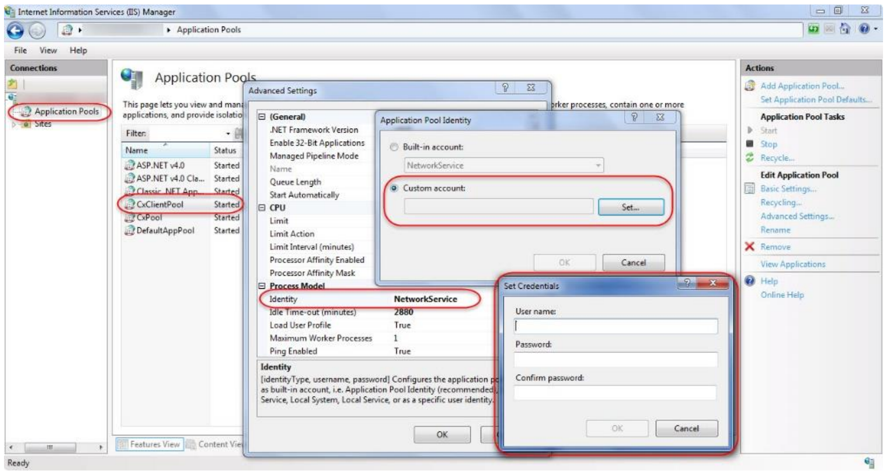


Application Pools

This page lets you view and manage the list of application pools on the server. Application pools are associated with worker processes, contain one or more applications, and provide isolation among different applications.

Name	Status	.NET Fr...	Managed ...	Identity	Appl...
ASP.NET v4.0	Started	v4.0	Integrated	ApplicationPoolIdenti...	0
ASP.NET v4.0 Cla...	Started	v4.0	Classic	ApplicationPoolIdenti...	0
Classic .NET App...	Started	v4.0	Classic	ApplicationPoolIdenti...	0
CxClientPool	Started	v4.0	Classic	NetworkService	1
CxPool	Started	v4.0	Classic	NetworkService	1
DefaultAppPool	Started	v4.0	Integrated	ApplicationPoolIdenti...	1

8. Click **Application Pools** and then select any of the **Cx Application Pools**.
9. Click **Advanced Settings** on the Action menu.



Advanced Settings

(General)	
.NET Framework Version	
Enable 32-Bit Applications	
Managed Pipeline Mode	
Name	
Queue Length	
Start Automatically	
CPU	
Limit	
Limit Action	
Limit Interval (minutes)	
Processor Affinity Enabled	
Processor Affinity Mask	
Process Model	
Identity	NetworkService
Idle Time-out (minutes)	2880
Load User Profile	True
Maximum Worker Processes	1
Ping Enabled	True

Identity
[identityType, username, password] Configures the application p... as built-in account, i.e. Application Pool Identity (recommended)... Service, Local System, Local Service, or as a specific user identity.

Application Pool Identity
Built-in account: NetworkService
Custom account: (selected)

10. In theAdvanced Settings window, scroll to **Identity** (under **Process Model**) and double click the user that is defined.
11. In the Application Pool Identity window, select the **Custom Account** radio button and click **Set**.
12. Enter the appropriate user credentials and click **OK**.

Cx Storage Folders

1. Ensure that the user accessing the Cx storage folders (CxSrc, CxReports, ExtSrc) has the appropriate read/write permissions.
2. To modify the read/write permissions for Cx storage folders:
    a) Navigate to the desired Cx storage folder (**C:\CxSrc**, **C:\CxReports** or **C:\ExtSrc**)
    b) Right-click on the folder, click **Properties**, and then click the **Security** tab.
    c) Click **Edit** and select the user or group that you want to change the permissions for.
    d) Check the permissions that you want to add for that user or group.
    e) For a single manager with local folders, define read/write permissions.
    f) Click **Apply** to save the changes.
3. Repeat this procedure for the remaining Cx storage folders.

Configuring CxOSA with a Proxy Server

In order to run Open Source Analysis (CxOSA) and generate and download analysis result reports (PDF) when using a proxy server, perform the following configuration steps:

➢ **To run CxOSA:**

1. Navigate to C:\Program Files\Checkmarx\Checkmarx Scans Manager\bin\CxScansManagerWinService.exe.config.
2. Insert the <system.net> tag just before the closing </configuration> tag and add the <defaultProxy> tag and contents as follows:

```
<system.net>
  <defaultProxy useDefaultCredentials="true">
    <proxy usesystemdefault="False" proxyaddress="http://<proxy ip
address>:<proxy port>" bypassonlocal="True" />
    <bypasslist>
      <add address="<ip address range regex>" />
    </bypasslist>
  </defaultProxy>
</system.net>
```

- The <bypasslist> parameter is required in situations where the traffic for remote CxEngines should not go through the defined proxy, for example when proxy is used for external communication, but not for internal (in domain) communication.
- The <bypasslist> should include the addresses of the CxEngines and the address of the Access Control service endpoint.
- Symptoms are that after adding this proxy configuration, the CxOSA scans works however the CxSAST scans do not. The add address value in the example below is a regex to capture a range of IP addresses starting 10.65.*.* and range of machines in *.domain.com domain.

Example:

```
<system.net>
  <defaultProxy useDefaultCredentials="true">
    <proxy usesystemdefault="False" proxyaddress="http://127.0.0.1:8888"
bypassonlocal="True" />
    <bypasslist>
      <add address="10\.65\.\d{1,3}\.\d{1,3}" />
      <add address="[a-zA-Z0-9]+\.domain\.com" />
    </bypasslist>
  </defaultProxy>
</system.net>
```

➢ **To generate and download analysis result reports (PDF):**

1. Navigate to C:\Program Files\Checkmarx\Checkmarx Web RestAPI\CxRestAPI\Web.config,
2. Under the <system.net> tag, add the same <defaultProxy> tag and its contents as in running CxOSA, above.
3. Restart all Cx services (CxJobsManager, CxScansManager, CxSystemManager and CxScanEngine services).
4. Restart the IIS web server.

Ant Integration

Apache Ant is a software tool for automating software build processes. It is implemented using the Java language, requires the Java platform, and is best suited to building Java projects. Ant uses XML to describe the build process and its dependencies and by default the XML file is named `build.xml`. Ant is open source software, and is released under the Apache License.

You can integrate CxSAST with any Ant code build process, enabling a project XML file to automatically initiate a Checkmarx CxSAST scan.

1. Integration is achieved with the Checkmarx CxConsole command-line interface plugin. The following procedure explains how to install the plugin and how to customize your project XML file to call a scan. The procedure contains recommendations and examples that may vary according to environment and use case.To customize a code build project to automatically call a CxSAST scan:
2. Go to www.checkmarx.com/plugins, and download the CLI plugin.
3. Extract the downloaded zip archive into a local directory (a directory that does not require Administrator privileges to execute).
4. In the following steps you will customize your project **build.xml** file for CxSAST integration. Here's an example of a full customized build.xml file.

5. Add the following to any part of your project **build.xml** file, inside the <project> XML tag for your source code project (but not inside any lower-level tag).

```
<!-- CxConsole initiation -->
<!-- Mandatory Parameters -->
<property name="ProjectName" value="project_name"/>
<property name="CxServer" value="http://xxx.xxx.xxx.xxx"/>
<property name="CxUser" value="username"/>
<property name="CxPassword" value="password"/>
<property name="Locationtype" value="folder"/>
<property name="locationpath" value="full_path"/>
<!--Optional Scan parameters -->
<property name="preset" value="Default"/>
<!--
Example of CxConsole CLI command:
"C:\Program Files (x86)\Checkmarx\CxConsole_6.2.6.2\runCxConsole.cmd"
Scan -ProjectName Test -CxServer http://localhost -CxUser admin@cx -
CxPassword admin -Locationtype folder -locationpath
:\Users\joe\Desktop\Projects\Java\1_Under_70K\BookStore_Java_21412line
s\BookStore_Java_21412lines\
-->
<target name="CxScan">
    <parallel>
    <!-- runCxConsole.cmd full path -->
        <property name="CxConsole"
location="C:\CxConsole_6.2.6.2\runCxConsole.cmd"/>
        <echo message="Initiating Checkmarx Scan"/>
        <exec executable="${CxConsole}">
            <arg value="Scan"/>
            <arg value="-ProjectName"/>
            <arg value="${ProjectName}"/>
            <arg value="-CxServer"/>
            <arg value="${CxServer}"/>
            <arg value="-CxUser"/>
            <arg value="${CxUser}"/>
            <arg value="-CxPassword"/>
            <arg value="${CxPassword}"/>
            <arg value="-Locationtype"/>
            <arg value="${Locationtype}"/>
            <arg value="-locationpath"/>
            <arg value="${locationpath}"/>
            <arg value="-preset"/>
            <arg value="${preset}"/>
            <arg value="-v"/>
        </exec>
    </parallel>
</target>
```

For more information on `<exec>` syntax, go to ant.apache.org/manual/Tasks/exec.html .

6. In the above added code, change the following parameter values:

Property	Description
ProjectName	CxSAST project name. If the project doesn't yet exist, CxSAST creates a new project with this name.
CxServer	IP address or resolvable name of CxSAST web server.
CxUser	CxSAST account username.
CxPassword	CxSAST account password.
Locationtype	Do not change.
Locationpath	Full path to source code location (folder).
Preset	The named set of queries to be executed.
CxConsole	location should be full path to runCxConsole.cmd .

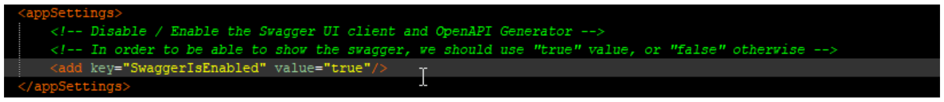
7. Save the changes to **build.xml** .
8. Optionally, test the integration by running:
   `ant CxScan`

Running your build process will now automatically initiate a Checkmarx CxSAST scan.

Disabling the Swagger UI Client

➢ **To disable the Swagger UI:**

1. On the host with CxManager installed, navigate to the Cx installation folder.
2. Under **..\ Checkmarx\Checkmarx Web RestAPI\CxRestAPI\** , edit the web.config file.
3. Search for the **SwaggerIsEnabled** key and change the value to **false**.



```
<appSettings>
    <!-- Disable / Enable the Swagger UI client and OpenAPI Generator -->
    <!-- In order to be able to show the swagger, we should use "true" value, or "false" otherwise -->
    <add key="SwaggerIsEnabled" value="true"/>
</appSettings>
```

4. Restart the CxSystemManager service and IIS.