Appendix B

- TrustSec Configurations, on page 1

TrustSec Configurations

The following configurations are required to deploy TrustSec on the network:

Figure 1: User Interface for TrustSec Configuration

Configuration Item	Configuration Target	Configuration Tool*
Define and create SGTs and Policies	ISE	Cisco DNA Center or ISE
Define ISE as AAA server on network settings	Industrial switches and ISE	Cisco DNA Center or Industrial switch and ISE
Enable device tracking on access ports	Industrial switches	Cisco DNA Center or Industrial switch
Port-based Authentication	Industrial switches	Cisco DNA Center (templates) or Industrial switch
Fall back policy and static entries	Enforcement switches (Distribution switch or Industrial switch)	Cisco DNA Center (templates) or switch
Propagation (SXP or inline tagging)	Industrial switches, Distribution switch and ISE	Cisco DNA Center (templates) and ISE or switch and ISE
Enable enforcement	Distribution switch or Industrial switch	Cisco DNA Center (templates) or Industrial switch
Profiling and profiling rules	ISE	ISE
Authentication and authorization policies	ISE	ISE
Cyber Vision sensor	Cyber Vision Center and switch	Cyber Vision Sensor Management Extension and Cisco DNA Center (templates) or switch

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* Method used for the CVD.

Define and Create SGTs and Policies Using Cisco DNA Center

1. From the Cisco DNA Center web interface, navigate to **Policy** > **Group-Based Access Control**.
2. Click the **Security Groups** tab.
3. Click **Create Security Group**.

4. Fill out **Name** and optional **Tag Value**.
5. Click **Save Now**.
6. Click the **Deploy** link.

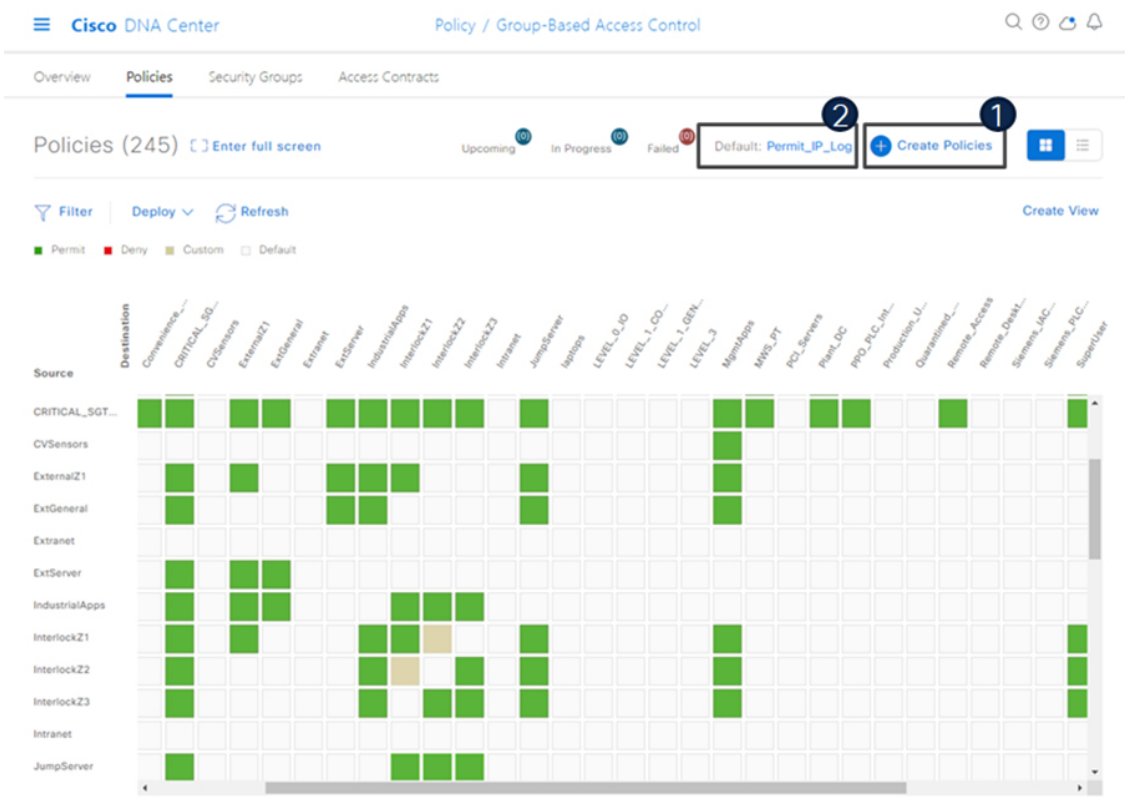
After creating the SGTs in Cisco DNA Center, the policy matrix can be updated to suit the enforcement intent. To make changes to the TrustSec policy matrix in DNA Center, do the following:

1. From the Cisco DNA Center web interface, navigate to **Policy > Group-Based Access Control**.
2. Click the **Policies** tab.
3. Click the square of the source and destination pair for which there needs to be a permit or deny contract.
4. On the **Create Policy** slide-in pane, click the **Change Contract** link and choose the appropriate option (**Permit IP, Deny IP**, and so on). Click the **Change** button.
5. Click the **Deploy** link at the top of the matrix.

The following figure shows the TrustSec policy matrix in Cisco DNA Center. The **Create Policies** button (1) is used to create a new policy and the **Default** link (2) allows you to change the default action on the policy. For a default deny policy, choose the **Deny_IP** default action.

Warning: Don't change default action to deny until all TrustSec elements have been configured and the policy has been tested with monitoring mode or log analysis.

Figure 2: TrustSec Policy Matrix in Cisco DNA Center



Define ISE as the AAA Server using Cisco DNA Center

When a device is provisioned in the inventory, Cisco DNA Center configures AAA server information, CTS authorization commands, and RADIUS server groups. In addition, Cisco DNA Center configures the device on the ISE PAN and propagates any subsequent updates for the device to the ISE PAN.

*Note: AAA server (ISE) settings for a given area should be configured in **Design > Network Settings > Network.***

1. From the DNA Center web interface, navigate to **Provision > Network Devices > Inventory**.
2. From the device list, check the box for the device to be provisioned.
3. From the **Actions** drop-down list, choose **Provision > Provision device**.
4. If the device is not assigned to a site, the wizard will show the **Assign Site** page. Click the **Choose a site** link and choose the desired Site. Click the **Save** button, then click the **Next** button. (Note that if Site assignment was done previously no action is needed here).
5. On the **Advanced Configuration** step, choose the device from the **Devices** list if there are any template settings to be configured. When finished, or if no template is applied, click the **Next** button.
6. On the **Summary** page, review the configuration to be added to the device. Click the **Deploy** button.

After the device has been provisioned, it will be in the device list of the specified Site.

Note: Provisioning a device that has already been configured with AAA before being discovered will fail. Remove any AAA configuration before pushing AAA using Cisco DNA Center.

Enable Device Tracking on Access Ports using Cisco DNA Center

Cisco DNA Center will automatically configure device tracking when a device is assigned to a site that has the wired client data collection enabled in its Telemetry settings (enabled by default). To verify the current setting, navigate to **Design > Network Settings > Telemetry**.

Configure Port-Based Authentication on the Access Switches

The following CLI output is provided as an example of policy. It can be deployed using Cisco DNA Center templates.

Example AAA Policy

```
class-map type control subscriber match-all
AAA_SVR_DOWN_AUTHD_HOST
match result-type aaa-timeout
match authorization-status authorized
!
class-map type control subscriber match-all
AAA_SVR_DOWN_UNAUTHD_HOST
match result-type aaa-timeout
match authorization-status unauthorized
!
class-map type control subscriber match-all
AI_IN_CRITICALSGT_AUTH
match activated-service-template IA_CRITICAL_SGT
!
class-map type control subscriber match-none
AI_NOT_IN_CRITICALSGT_AUTH
match activated-service-template IA_CRITICAL_SGT
!
class-map type control subscriber match-all DOT1X
match method dot1x
```

```
!
class-map type control subscriber match-all DOT1X_FAILED
match method dot1x
match result-type method dot1x authoritative
!
class-map type control subscriber match-all
DOT1X_MEDIUM_PRIO
match authorizing-method-priority gt 20
!
class-map type control subscriber match-all DOT1X_NO_RESP
match method dot1x
match result-type method dot1x agent-not-found
!
class-map type control subscriber match-all DOT1X_TIMEOUT
match method dot1x
match result-type method dot1x method-timeout
!
class-map type control subscriber match-any
IA_CRITICAL_SGT
match activated-service-template IA_CRITICAL_SGT
!
class-map type control subscriber match-all MAB
match method mab
!
class-map type control subscriber match-all MAB_FAILED
match method mab
match result-type method mab authoritative
!
policy-map type control subscriber IA_DOT1X_MAB_POLICIES
event session-started match-all
10 class always do-until-failure
10 authenticate using mab retries 3 retry-time 0 priority
10
20 authenticate using dot1x retries 3 retry-time 0
event authentication-failure match-first
5 class DOT1X_FAILED do-until-failure
10 terminate dot1x
20 authenticate using mab priority 20
10 class AAA_SVR_DOWN_UNAUTHD_HOST do-until-failure
10 activate service-template IA_CRITICAL_SGT
20 authorize
30 authentication-restart 60
40 pause reauthentication
20 class AAA_SVR_DOWN_AUTHD_HOST do-until-failure
10 authentication-restart 5
20 authorize
30 class DOT1X_NO_RESP do-until-failure
10 terminate dot1x
20 authenticate using mab priority 20
40 class MAB_FAILED do-until-failure
10 terminate mab
20 authentication-restart 60
60 class always do-until-failure
10 terminate dot1x
20 terminate mab
30 authentication-restart 60
event agent-found match-all
10 class always do-until-failure
10 terminate mab
20 authenticate using dot1x priority 10
event aaa-available match-first
10 class AI_IN_CRITICALSGT_AUTH do-until-failure
10 clear-session
20 class AI_NOT_IN_CRITICALSGT_AUTH do-until-failure
```

```
10 resume reauthentication
event violation match-all
10 class always do-until-failure
10 restrict
```

Example Interface Configuration using 'foreach' loops

```
#foreach($interface in $accessInterfaces)
interface $interface.portName
description endpoint
switchport access vlan $dataVlan
switchport mode access
device-tracking attach-policy IPDT_POLICY
#if($netflowPolicy)
ip flow monitor dnacmonitor input
#end
access-session port-control auto
mab
dot1x pae authenticator
spanning-tree portfast
service-policy type control subscriber
IA_DOT1X_MAB_POLICIES
service-policy input CIP-PTP-Traffic
service-policy output PTP-Event-Priority
#if($stormControl)
storm-control broadcast level 3 1
#end
exit
vlan $dataVlan
#end
```

```
#foreach($uplinkInterface in $trunkInterfaces)
interface $uplinkInterface.portName
description trunk
switchport trunk allowed vlan $vlans
switchport mode trunk
#if($cts)
cts manual
policy static sgt $uplinkSGT trusted
exit
exit
#end
vlan $vlans
#end
```

Configure Static Entries and Fallback Policy to Allow Communication in the event of an ISE error

The following configurations are recommended for a default deny policy to guarantee connectivity for critical services:

Change the SGT assigned to switches from "Unknown" to "TrustSec Devices" in ISE

By default, the "Unknown" SGT is configured for network device authorization and changing it to "TrustSec Device" gives more visibility and helps to create SGACLs specifically for switchinitiated traffic.

- From the ISE web UI, navigate to **Work Centers > TrustSec > TrustSec Policy > Network Device Authorization** and click the **Edit** link to update the Security Group.

Create static IP to SGT mappings on the TrustSec domain switches

Having local IP to SGT mappings ensures connectivity is up and connectivity to the critical resources are intact if connectivity to ISE is interrupted. In the example below ISE, DNAC, and the enforcement switch IP addresses are assigned the SGT for TrustSec devices (in this example 9043). Optionally, the subnet for the Cell/Area zone is assigned tag 911 to allow inter-Cell/Area zone communication for all devices when ISE is

not reachable. Once ISE is reachable again, mappings from ISE learned via SXP will take priority. The 911 tag should only be used when ISE is not available.

```
cts role-based sgt-map 10.13.48.132 sgt 9043
cts role-based sgt-map 10.13.48.184 sgt 9043
cts role-based sgt-map 10.17.10.1 sgt 9043
cts role-based sgt-map 10.17.10.0/24 sgt 911
```

Create a Fallback SGACL in the event ISE communication is lost

An SGT mapping is of no use until a relevant SGACL is assigned and hence our next step would be to create an SGACL that acts as a local Fallback in case ISE nodes go down (when ISE services are down, SGACLs and IP SGT mappings are not downloaded dynamically). In the example below we allow communication from the enforcement switch to critical services (ISE and DNA Center). Optionally, policies are created to allow external communication for all devices in the Cell/Area zone (911 tag).

```
ip access-list role-based FALLBACK
permit ip
cts role-based permissions from 9043 to 9043 FALLBACK
cts role-based permissions from 911 to 0 FALLBACK
cts role-based permissions from 0 to 911 FALLBACK
cts role-based permissions from 911 to 911 FALLBACK
cts role-based permissions from 9043 to 911 FALLBACK
cts role-based permissions from 911 to 9043 FALLBACK
```

Propagation on Distribution Switches and Core Switches

To ensure the SGT remains inside the packet throughout the TrustSec domain, configure inline tagging on links between the core and distribution switches.

Note: that this process may be disruptive since the interface bounces when configuring inline tagging. Plan accordingly to disrupt a single link at a time. When using port channels, remove the interfaces from the port channel, add configuration, and then add interfaces to the port channel again.

```
interface $uplinkInterface.portName
description trunk
switchport trunk allowed vlan $vlans
switchport mode trunk
cts manual
policy static sgt $uplinkSGT trusted
```

Each switch within the TrustSec domain must also be configured as an SXP listener. The speaker may be ISE or access switches connected below.

```
cts sxp enable
cts sxp default password 0 $sharedKey
cts sxp connection peer $peerIP source
$sourceIP.ipv4Address password default mode local listener
hold-time 0 0
```

Propagation on Industrial Switches

If using inline tagging in the industrial switches (for example, when using L2NAT), configure inline tagging on both ports of the link.

Note: that this process may be disruptive because the interface bounces when configuring inline tagging. To ensure connectivity is not lost, configure the farther switch first or use out of band connectivity. If configuring a port channel, links need to be removed from the port channel first and add back after configuration is completed.

```
interface $uplinkInterface.portName
description trunk
switchport trunk allowed vlan $vlans
switchport mode trunk
```

```
cts manual
policy static sgt $uplinkSGT trusted
```

If configuring SXP, refer to the following configurations:

- **Trustsec SXP – Speaker role, used when communicating bindings to upstream switches**

```
cts sxp enable
cts sxp default password 0 $sharedKey
cts sxp connection peer $peerIP source
$sourceIP.ipv4Address password default mode local speaker
hold-time 0 0
```

- **Trustsec SXP – Listener role, used when receiving bindings from ISE or access switches**

```
cts sxp enable
cts sxp default password 0 $sharedKey
cts sxp connection peer $peerIP source
$sourceIP.ipv4Address password default mode local listener
hold-time 0 0
```

Configure SXP in ISE

The following configuration creates a domain filter and adds an SXP device.

1. From the ISE web UI, navigate to **Work Centers > TrustSec > SXP > SXP Devices**.
2. Click the **Assign SXP Domain** link, even if no SXP devices are present.
3. On the **SXP Domain Assignment** window, click the **Create New SXP Domain** link.
4. Enter a name for the new domain.
5. Click the **Create** button.
6. Navigate to **Work Centers > TrustSec > SXP > SXP Devices**.
7. Click the **Add** button.
8. Enter the device details: name, IP address, SXP role (speaker), password type, SXP version, and connected PSNs for the peer device. You must also specify the SXP domain to which the peer device is connected.
9. Click the **Save** button.

Add an SXP Domain Filter

By default, session mappings learned from the network devices are sent only to the default group. You can create SXP domain filters to send the mappings to different SXP domains.

1. Navigate to **Work Centers > TrustSec > SXP > All SXP Mappings**.
2. Click the **Add SXP Domain Filter** link.
3. Enter the subnet details. The session mappings of the network devices with IP addresses from this subnet are sent to the SXP domain selected from the SXP Domain drop-down list.
4. From the **SXP Domain** drop-down list, choose the SXP domain to which the mappings must be sent.
5. Click **Save**.

Add IP-SGT Mappings to ISE

1. Navigate to **Work Centers > TrustSec > Components > IP SGT Static Mapping**.

2. Click the **Add** button.
3. Enter the IP address or hostname for a single device or use CIDR notation for subnets.
4. The **Map to SGT individually** radio button is chosen by default.
   a. From the **SGT** drop-down list, choose the SGT name.
   b. From the **Send to SXP Domain** drop-down list, choose the SXP Domain name. If left blank, the default domain is used.
   c. From the **Deploy to devices** drop-down list, select the grouping of devices to which the mapping should be deployed.
5. Click the **Save** button.

Enable TrustSec Enforcement on a Switch

```
cts role-based enforcement
cts role-based enforcement vlan-list $vlanList
```

Disable enforcement on uplink ports

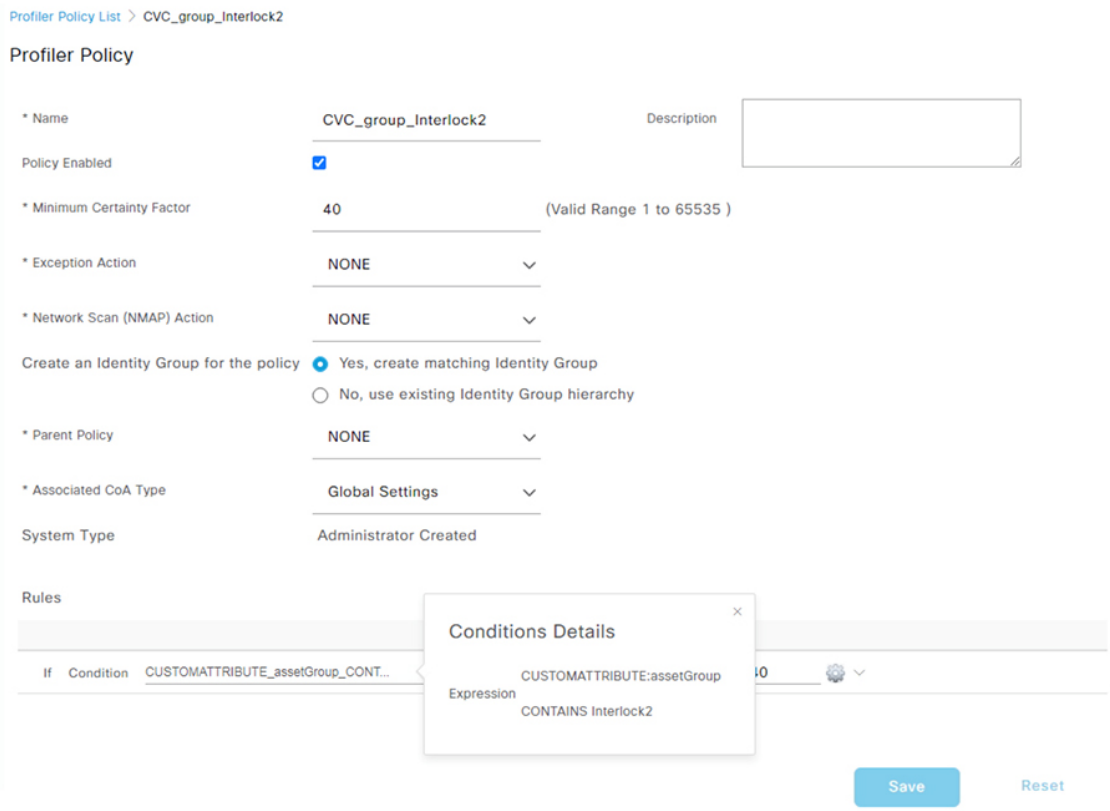
```
interface $uplinkInterface.portName
no cts role-based enforcement
end
```

Create Profiling Rules in ISE

In this procedure, a custom Profiler Policy will be created for devices matching a specific Cyber Vision group.

1. Navigate to **Work Centers > Profiler > Profiling Policies** and click the **Add** button. The **Profiler Policy** page appears.
2. Complete the Profiler Policy form as follows:
   a. Assign a name.
   b. Chaeck the **Policy Enabled** check box
   c. Assign a certainty factor.
   d. Under **Rules**, from the **Conditions** drop-down list choose **Create New Condition** (**Advance Option**).
      1. From the **Expression** drop-down list, choose **Custom Attribute > assetGroup**.
      2. From the logic drop-down list, choose **Contains**.
      3. In the text field, enter the Cyber Vision group value. In this example the Cyber Vision group name is Interlock2.
   e. Enter the Certainty Factor value to be added if the Condition has been met.
3. Click **Submit**.

Figure 3: ISE Profiling Policy using Cyber Vision Group Data



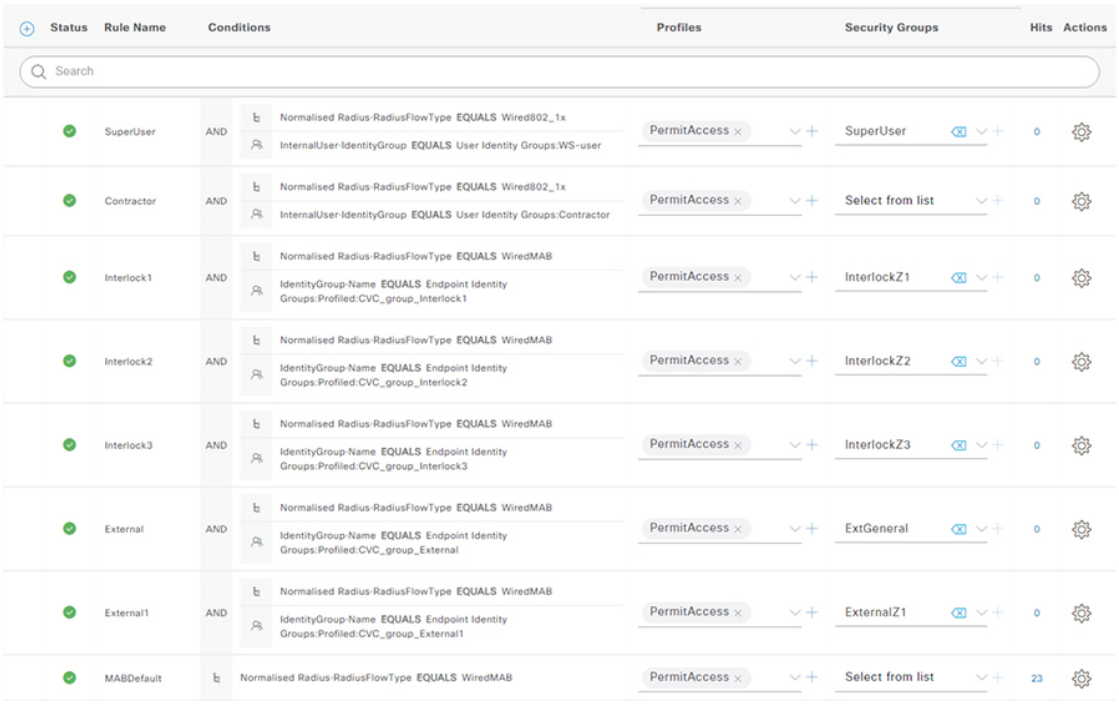
Note: follow the Integrating Cisco Cyber Vision with Cisco Identity Services Engine (ISE) via pxGrid *document to use Cisco Cyber Vision attributes for ISE profiling.*

Create Authentication and Authorization Policies on ISE

To configure the authorization policy in ISE, navigate to **Policy > Policy Sets > Default** and then choose **Authorization Policy**.

The following figure shows examples of authorization policies. The SuperUser rule (1) is an example of a policy that matches a user and assigns an SGT. The Interlock1 rule (2) is an example that matches an endpoint profile and assigns an SGT accordingly. The MABDefault rule (3) shows the default policy, which does not assign an SGT, so endpoints matching this rule will not override the default SGT assigned to the subnet of the Cell/Area zone.

Figure 4: Example Authorization Policies in ISE



Cyber Vision Sensor

The following template can be used to provision the industrial switch to prepare for Cisco Cyber Vision sensor installation. For actual sensor deployment refer to Cisco Cyber Vision documentation.

```
#if ($enable_iox == 1)

iox

#MODE_ENABLE

terminal shell

sleep 30

sleep 30

terminal no shell

#MODE_END_ENABLE

#end

vlan 2

remote-span

interface AppGigabitEthernet 1/1

switchport mode trunk

exit

monitor session 1 source interface $intRange
```

```
monitor session 1 destination remote vlan 2

monitor session 1 destination format-erspan 169.254.1.2
```