Internal Collection Dynamic Application (ICDA) Development

Skylar One version 12.5.1

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Chapter 1

Introduction

Overview

This manual describes how to use Internal Collection Dynamic Applications (ICDAs) to gather data from devices that do not support SNMP or to perform customized processing on collected SNMP data.

This manual does not cover elements of Dynamic Application development that are common to all Dynamic Application types. You should be familiar with the common elements and concepts of Dynamic Applications before reading this manual. For general information on planning, designing, using, and troubleshooting Dynamic Applications, see the manual ***Dynamic Application Development***.

Use the following menu options to navigate the Skylar One user interface:

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- To view a page containing all of the menu options, click the Advanced menu icon ( ).

This chapter provides an overview of ICDAs. It contains the following topics:

This chapter covers the following topics:

What is an Internal Collection Dynamic Application?

Skylar One has traditionally used SNMP and an internal process called "internal collection" to collect the following data for each device:

- Availability and latency
- System description, system uptime, and system local
- Filesystem inventory and performance
- Interface inventory and performance

However, you might need to monitor device data that is partially available through SNMP, or not available at all through SNMP.

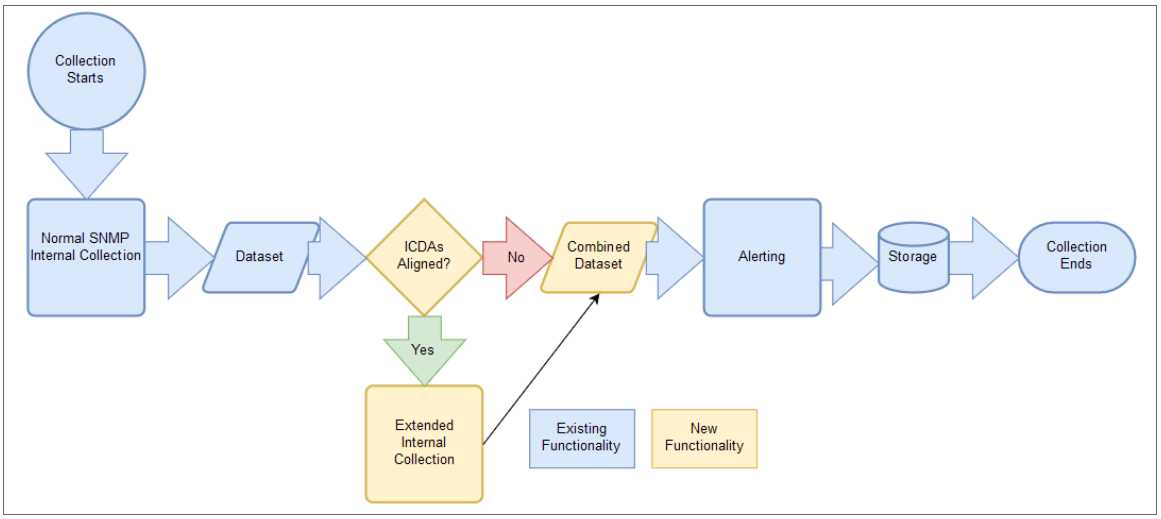
For devices that do *not* support SNMP, Skylar One provides an additional method to collect this data called ***Internal Collection Dynamic Applications (ICDAs).*** ICDAs combine the efficiency of internal collection with the flexibility of dynamic applications, ensuring uniform data across Skylar One.

How Do ICDAs Work?

Internal Collection Dynamic Applications align to devices in the same way as other Dynamic Applications. If the ICDA includes a discovery object, the ICDA automatically aligns with devices during discovery. You can also manually align ICDAs to devices and include ICDAs in device templates.

When Skylar One begins an internal collection, it checks to see if any ICDAs are aligned. If ICDAs are aligned, Skylar One performs an "Extended Internal Collection". The platform combines data it collected using ICDAs with data it collected using an internal SNMP process, and then the platform completes the collection process.

The following illustration highlights the ICDA functionality in the collection process:



NOTE: If Skylar One collects this data using the SNMP-based internal collection and also collects this data using ICDAs, the data from ICDAs takes precedence.

The ICDA data that Skylar One collects is stored in a database that is separate from the dynamic application database. ICDA results are stored where the corresponding internal collection would store its results.

ICDAs do not include presentation objects, thresholds, or alerts. Skylar One evaluates alerts and events in exactly the same way as for standard internal collection.

Types of ICDAs

There are two types of Internal Collection Dynamic Applications:

- *Internal Collection Inventory*. These ICDAs collect configuration data about filesystems, such as storage size, filesystem type, and storage used. These ICDAs also collect configuration data about interfaces, such as physical address, operational status, and IP addresses. In Skylar One, the available Data Models for this Application Type are Filesystem Inventory and Interface Inventory. Use these ICDAs to monitor inventory processes, like **process_collect.py**, which runs every 2 hours.
- *Internal Collection Performance*. Collects data about availability and latency, device information (system description, system uptime, system local), filesystem performance, and interface performance. In Skylar One, the available Data Models for this Application Type are Availability, Filesystem Performance, SNMP Detail (includes Uptime, Description, and Locale), and Interface Performance. Use these ICDAs to monitor performance collection processes, like **process_check.py**, which runs every 5 minutes.

NOTE: The names for the ICDA Data Models follow the existing naming conventions used by the internal collection processes.

Snippets and Execution Environments

Internal Collection Dynamic Applications collect data by executing one or more blocks of Python code, called ***snippets***. Skylar One passes credential and other configuration information to the snippet, and at the end of execution, the snippet must pass collected data back to Skylar One. The Dynamic Application developer defines snippet code that collects data and processes data.

One way in which Dynamic Applications that use snippets are unique from most other types of Dynamic Applications is that they can be aligned with a specific execution environment.

In the Skylar One user interface, an ***execution environment*** is a list of one or more ScienceLogic libraries. When a Dynamic Application snippet, Run Book Automation snippet, or credential test is executed, the execution environment defines a virtual Python environment that is deployed on-demand and includes all of the ScienceLogic libraries aligned with it for use during snippet execution.

When you create an Internal Collection Dynamic Application, you must select an execution environment to align with that Dynamic Application. All of the snippets contained in the Dynamic Application will then use that execution environment whenever the Dynamic Application runs. If you do not specify an execution environment, Skylar One will align the Dynamic Application with the default *System* environment.

You can create and manage execution environments on the **Environment Manager** page (System > Customize > ScienceLogic Libraries > Actions > Execution Environments). For more information about creating and managing execution environments, see the ***ScienceLogic Libraries and Execution Environments*** manual.

Data Collected by ICDAs

This section lists the collection objects included in each type of Data Model.

NOTE: For each Data Model, this list also describes how to index the collection objects so they can be merged with values from the internal, SNMP-based collection process. Ensure that you follow the indexing format. Improper indexing could result in duplicated entities if the two types of data cannot be merged.

The ICDA data takes precedence over any data collected during SNMP-based internal collection.

Internal Collection Inventory Application Types

Use these ICDAs to monitor inventory processes, like **process_collect.py**, which runs every 2 hours.

Filesystem Inventory

Index: ***Filesystem Name***, such as `/dev/sda1`.

Objects:

- ***Storage Size***. Measured in storage units.
- ***Filesystem Type***. Type of filesystem, such as `ext4`.
- ***Storage Used***. Measured in storage units.
- ***Storage Units***. Measured in bytes per storage units.
- ***Media Type***. Type of media, such as CD, hard drive, or flash drive.

Interface Inventory

Index: SNMP interface index or user-defined unique index if only ICDA collects the data for the interface.

Objects:

- ***Name***. String.
- ***Alias***. String.
- ***Descr***. String.
- ***Type***. Interface type as defined in IF-MIB.
- **Phys Address**. String for the MAC Address.
- ***Speed***. Measured in bps.
- ***High Speed***. Measured in Megabits per second, or Mbps.
- ***Admin Status***. Integer: up [1], down [2], testing[3].
- ***Operational Status***. Integer: up [1], down [2], testing[3], unknown [4], dormant [5], not present [6], lower layer down [7].
- ***Connector Present***. Integer.
- ***64-bit Support***. True or false.
- ***Blade***. Blade number.
- ***Port***. Port number.
- ***IP Addresses***. IP Address and Subnet, such as [(1.2.3.4, 255.255.255.0), (2.3.4.5, 255.255.255.128)].

Internal Collection Performance Application Types

Use these ICDAs to monitor performance collection processes, like **process_check.py**, which runs every five minutes.

Availability

Index: None (this impacts the entire device, so there can only be only value per index).

Objects:

- ***Availability***. True or false, depending on whether the device is available.
- ***Latency***. Measures uptime in 10 millisecond increments.

SNMP Detail

Index: None (this impacts the entire device, so there can only be only value per index).

Objects:

- ***System Description***. String.
- ***System Uptime***. Measured in 10-millisecond increments.
- ***System Locale***. String.

Filesystem Performance

Index: ***Filesystem Name***, such as `/dev/sda1`.

Objects:

- ***Storage Used***. Measured in storage units.
- ***Storage Units***. Measured in bytes per storage units.
- ***Percent Used***. Measured in percentage of storage used.

Interface Performance

Index: SNMP interface index or user-defined unique index if only ICDA collects data for the interface.

Objects:

- ***Phys Address***. String for the MAC Address.
- ***Admin Status***. Integer: up [1], down [2], testing[3].
- ***Operational Status***. Integer: up [1], down [2], testing[3], unknown [4], dormant [5], not present [6], lower layer down [7].
- ***ifInOctets***. Interface Inbound Traffic in octets.
- ***ifOutOctets***. Interface Outbound Traffic in octets.
- ***ifInDiscards***. Interface Inbound Discards.
- ***ifOutDiscards***. Interface Outbound Discards.
- ***ifOutErrors***. Interface Outbound Errors.
- ***ifInErrors***. Interface Inbound Errors.

Port Performance

Index: Data pair of port number and port protocol: TCP (0), UDP (1)

Objects:

- ***State***. Port state, up or down.

Process Inventory

NOTE: ICDA process data does not merge with agent-collected data.

Index: Process Pid number

Objects:

- ***Name***. String for the Process Name.
- ***Arguments***. String for the Process Arguments.
- ***Path***. String for the Process Path.
- ***User***. String for the Process User.
- ***CPU Time***. Integer.

- ***Memory Use***. Integer.
- ***State***. Integer.

Process Performance

> **NOTE**: ICDA process data does not merge with agent-collected data.

Index: Process Pid number

Objects:

- ***Name***. String for the Process Name.
- ***Arguments***. String for the Process Arguments.
- ***Path***. String for the Process Path.
- ***User***. String for the Process User.
- ***CPU Time***. Integer.
- ***Memory Use***. Integer.
- ***State***. Integer.

Service Inventory

Index: Service Name

Objects:

- ***Start Mode***. String: Auto, Manual, Disabled, Anything Else.
- ***State***. Integer: 0 (running), 1 (not running).

Service Performance

Index: Service Name

Objects:

- ***Start Mode***. String: Auto, Manual, Disabled, Anything Else.
- ***State***. Integer: 0 (running), 1 (not running).

Chapter 2

Creating Internal Collection Dynamic Applications

Overview

This chapter describes how to create and use create Internal Collection Dynamic Applications (ICDAs).

Use the following menu options to navigate the Skylar One user interface:

- To view a pop-out list of menu options, click the menu icon ( ).
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This chapter includes the following topics:

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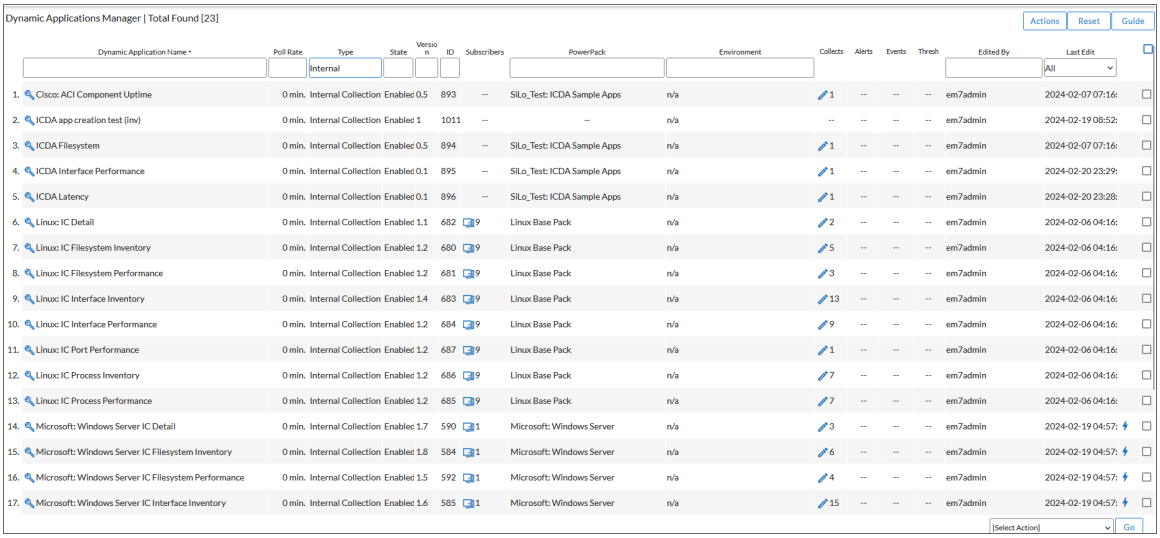
Viewing the List of ICDAs

You can view all Internal Collection Dynamic Applications on the Dynamic Applications Manager page (System > Manage > Dynamic Applications) by typing "Internal" in the ***Type*** filter-while-you-type field:



TIP: To ensure the consistency of your data, do not use an ICDA to collect data on a device that was previously monitored by another type of Dynamic Application.

Creating an ICDA

You can create custom Internal Collection Dynamic Applications (ICDAs) to gather data on devices that do not support SNMP. Currently, ICDAs support only the ***snippet*** protocol.

NOTE: If you create an ICDA with a Data Model of *Interface Inventory* and the ICDA includes a discovery Collection Object, the ICDA aligns with the device after the platform discovery runs. As a result, Skylar One does not discover interfaces until either the nightly discovery runs or the user re-discovers the device manually by running the discovery session again, creating a new discovery session, or initiating an ad hoc discovery.

To create an ICDA:

1. Go to the **Dynamic Applications Manager** page (System > Manage > Applications).
2. Click the **[Actions]** button and select *Create New Dynamic Application*. The **Dynamic Applications**

Create New Application page appears.

3. Complete the following fields:
    - ***Application Name***. Type a name for this ICDA.
    - ***Application Type***. Your options for ICDAs include *Internal Collection Inventory* or *Internal Collection Performance*.
4. Click the **[Save]** button. The **[Properties]** tab updates to show the relevant fields for the ICDA.
5. In the ***Data Model*** drop-down list, select the type of data you want to collect with this ICDA. The values in the drop-down are dependent on the value in the ***Application Type*** field. The value in the ***Data Model*** field list determines the available options in the ***Object Link*** drop-down list on the **[Collections]** tab. For example, if you select *Availability* for the Data Model, then you can choose only *Availability* or *Latency*in the ***Object Link*** drop-down list.
    - If you selected *Internal Collection Inventory* as the ***Application Type***, the ***Data Model*** drop-down includes:
        - ***Filesystem Inventory***. Monitors Storage Size, Filesystem Type, Storage Used, Storage Units, or Media Type.
        - ***Interface Inventory***. Monitors Name, Alias, Description, Type, Physical Address, Speed, High Speed, Admin Status, Operational Status, Connector Present, 64-bit Support, Blade, Port, or IP Address.
    - If you selected *Internal Collection Performance* as the ***Application Type***, the ***Data Model*** drop-down includes:
        - ***Availability***. Monitors Availability or Latency.
        - ***Filesystem Performance***. Monitors Storage Used, Storage Units, or Percentage Used.
        - ***SNMP Detail***. Monitors System Description, System Uptime, or System Locale.
        - ***Interface Performance***. Monitors Octets In, Octets Out, Errors In, Errors Out, Discards In, Discards Out, Physical Address, Admin Status, or Operational Status.
6. Update the remaining fields as needed, and then click the **[Save]** button.
7. Next, create a container for your ICDA snippet code.

Creating a Container for the ICDA Snippet

In Snippet Dynamic Applications, each collection object must be associated with a snippet. Therefore, in ICDAs you must create the container for the snippet code before creating the collection objects for this ICDA.

To create a container for the snippet code:

1. Click the **[Snippets]** tab.
2. Complete the following fields:
    - ***Snippet Name***. The name of the snippet.
    - ***Active State***. Specifies whether the snippet should be executed by Skylar One when performing collection for the ICDA.

- ***Required***. Specifies whether this snippet is required for successful collection of all other snippet requests. Choices are:
    - *Required - Stop Collection*. If this snippet request fails, the platform will not attempt to execute any other snippet requests in this ICDA. Dynamic Applications that consume the cache of this ICDA will halt collection.
    - *Not Required - Continue Collection*. If this snippet request fails, the platform will continue executing all remaining snippet requests in this ICDA. Dynamic Applications that consume the cache of this ICDA will continue collection.
- ***Snippet Code***. The python code that will be executed when Skylar One performs collection for this ICDA. You will add the snippet code later.

3. Click the **[Save]** button.
4. Repeat this process for each collection you want to use in conjunction with a snippet.
5. Next, create the collection objects for your ICDA.

Creating the Collection Objects

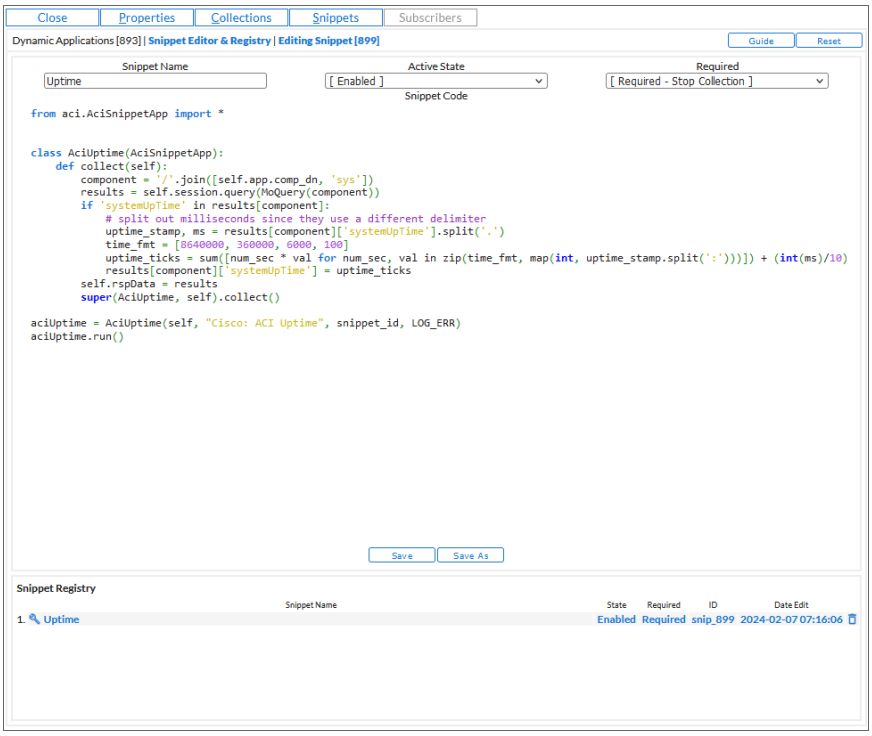
To create the collection object or objects for this ICDA:

1. Click the **[Collections]** tab.
2. Complete the following fields to create the collection object:
    - ***Object Name***. Type the name of the collection object.
    - ***Snippet Arguments***. Specify any arguments you want to pass to the snippet.
    - ***Class Type***. Depending on the type of collection object you want to create, select *[33] ICDA Object* or *[100] Discovery*.
    - ***String Type***. Define the string type for this snippet. Select *Standard* or *Hex Code*.
    - ***Object Link***. Select the specific type of data you want to collect with this ICDA. The options in this drop-down list are based on your selection for the ***Data Model*** field on the **[Properties]** tab.
    - ***Snippet***. Select the name of the snippet you created in the previous process.
3. Update the remaining fields as needed, and then click the **[Save]** button.
4. Repeat these steps to create additional collection objects you want to use in conjunction with a snippet.
5. Next, add the snippet code for your new ICDA.

Adding the Snippet Code

To add the snippet code to a new ICDA:

1. Click the **[Snippets]** tab.
2. In the **Snippet Registry** pane, select the relevant snippet and click its wrench icon (). Information about that snippet appears in the top pane:



3. In the ***Snippet Code*** field, type or paste your python code for the collection object.
4. Click the **[Save]** button and close the modal page for the ICDA.

Snippet Examples for ICDAs

The following snippets were created by ScienceLogic to use as sample snippets for ICDAs.

Availability

```
from silo_builtin_caching import get_cached_request_result

Windows_Server_Uptime_REQ_GUID = '32CA377A59190A6AB83DC5EDB05CA7E7'

result = {

    'if': get_cached_request_result(self, Windows_Server_Uptime_REQ_
    GUID)

}

print "*****************************************************"
```

```
print result

for grp_id, grp in self.oids.iteritems():

  for obj_id, obj in grp.iteritems():

    try:

      (req, oid) = obj['oid'].split('.')

      result_list = result[req].get(oid, {}).values()

    except ValueError:

      self.logger.ui_debug('Skipping OID %d' % obj_id)

      continue

    if len(result_list) >= 1 and float(result_list[0]) > 0.0:

      obj['result'] = [(0, True)]

    #obj['result'] = [(0, True if len(result_list) >= 1 and float
    (result_list[0]) > 0.0 else False)]

    print obj
```

Discovery

```
from sl_credentials.constant import CRED_SSH

import paramiko

if self.cred_details['cred_type'] == CRED_SSH:

  host = self.cred_details['cred_host']

  user = self.cred_details['cred_user']

  passwd = self.cred_details['cred_pwd']

  timeout = self.cred_details['cred_timeout'] / 1000

  port = self.cred_details['cred_port']

  ssh = paramiko.SSHClient()
```

```
    ssh.set_missing_host_key_policy(paramiko.AutoAddPolicy())
    ssh.connect(host, username=user, password=passwd, port=port,
    timeout=timeout)
    stdin, stdout, stderr = ssh.exec_command("uname")
    os = stdout.readlines()
    if os[0].startswith("Linux"):
      result_handler['disc'] = True
    ssh.close()
else:
    self.logger.debug("ICDA Filesystem | DID %s: Incorrect credential type
    aligned, must be SSH" % self.did)
```

Filesystem Inventory

```
from silo_builtin_caching import get_cached_request_result
import re
#Enum to translate drive type to string
FS_ENUM_TYPES={
    0: 'Unknown',
    1: 'No Root Directory',
    2: 'Removable Disk',
    3: 'Local Disk',
    4: 'Network Drive',
    5: 'Compact Disc',
    6: 'RAM Disk'
}
```

```
result = get_cached_request_result(self, WINDOWS_SERVER_DISK_
CONFIGURATION_REQ_GUID)

indexes = set()

units_object = {}

for grp_id, grp in self.oids.iteritems():
    for obj_id, obj in grp.iteritems():
    oid = obj['oid']
    result_list = result.get(oid, {}).items()
    #Keep track of all the indexes (which are the filesystem names)
    #Rewrite the results list to clean up filesystem names
    for (i, (k, v)) in enumerate(result_list):
      #An empty string index will attempt to use the label first,
      #and fall back to " " if there is no label
      if k == '':
        k = result.get('label',{}).get('',' ')
        result_list[i] = (k, v)
      #Add a backslash to drive letters to match the output from SNMP
      elif re.match('[A-Z]:$', k):
        k += '\\'
        result_list[i] = (k, v)
      indexes.add(k)
    #If this is the 'units' object, set it aside for later processing
    if obj['oid'] == 'units':
      units_object = obj
```

```
        continue

    #Translate the drivetype enum to a string

    if obj['oid'] == 'drivetype':

        result_list = [(index, FS_ENUM_TYPES.get(int(value), value)) for
        index, value in result_list]

    obj['result'] = result_list

#Do the processing for the units object (all units are 1 - bytes)

units_object['result'] = [(i, 1) for i in indexes]
```

Filesystem Type

```
from sl_credentials.constant import CRED_SSH

import paramiko

if self.cred_details['cred_type'] == CRED_SSH:

  host = self.cred_details['cred_host']

  user = self.cred_details['cred_user']

  passwd = self.cred_details['cred_pwd']

  timeout = self.cred_details['cred_timeout'] / 1000

  port = self.cred_details['cred_port']

  ssh = paramiko.SSHClient()

  ssh.set_missing_host_key_policy(paramiko.AutoAddPolicy())

  ssh.connect(host, username=user, password=passwd, port=port,
  timeout=timeout)

  stdin, stdout, stderr = ssh.exec_command("df --output=target,fstype",
  timeout=timeout)

  results = []

  lines = stdout.readlines()[1:]
```

```
    for line in lines:
        fs_name, fs_type = map(lambda line: line.strip(), line.split(' ', 1))
        results.append((fs_name, fs_type))
    result_handler['fs_type'] = results
    ssh.close()
else:
    self.logger.debug("ICDA Filesystem | DID %s: Incorrect credential type
    aligned, must be SSH" % self.did)
```

Interface Octets

```
from sl_credentials.snmp import snmph_from_cred_array
from sl_snmp.silo.snmp import SnmpError
OID_ifInOctets = '.1.3.6.1.2.1.2.2.1.10'
results = []
try:
    snmp_h = snmph_from_cred_array(self.cred_details, self.ip)
    octets_in_walk = snmp_h.walk(OID_ifInOctets)
    for oid, value in octets_in_walk:
        if_index = oid.split('.')[-1]
        # offset to make this differentiable from the value returned by normal
        internal collection
        if_in_octets = int(value) + 100000
        results.append((if_index, if_in_octets))
except SnmpError, err:
```

```
    self.logger.ui_debug("An SNMP error occurred during interface
    performance collection")
finally:
    result_handler['ifInOctets'] = results
```

Latency

```
from silo_collect.tools import latency_ping
from silo_common.network import ip
ip_obj = ip(self.ip)
# add large offset to make ICDA data stand out
result_handler['latency'] = [('0', latency_ping(ip_obj,
logger=self.logger) + 5000)]
```

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