
Watchmaker Documentation

Release 0.27.2

Plus3 IT Systems

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Applied Configuration Management

OVERVIEW

Watchmaker is intended to help provision a system from its initial installation to its final configuration. It was inspired by a desire to eliminate static system images with embedded configuration settings (e.g. gold disks) and the pain associated with maintaining them.

Watchmaker works as a sort of task runner. It consists of “*managers*” and “*workers*”. A *manager* implements common methods for multiple platforms (Linux, Windows, etc). A *worker* exposes functionality to a user that helps bootstrap and configure the system. *Managers* are primarily internal constructs; *workers* expose configuration artifacts to users. Watchmaker then uses a common *configuration file* to determine what *workers* to execute on each platform.

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2.1 Installation

2.1.1 From Python Package Index

The preferred method to install `watchmaker` is from the Python Package Index (PyPi), using `pip`. Without any other options, this will always install the most recent stable release.

```
python3 -m pip install watchmaker
```

If you do not have Python or `pip`, this [Python installation guide](#) can guide you through the process.

Note: Versions 10 and later of `pip` do not support Python 2.6. On CentOS 6 and RHEL 6, Python 2.6 is the system version of Python. If you are using Python 2.6 with `watchmaker`, you will need to restrict the `pip` install such that a version earlier than 10 is installed. See the relevant question in the [\[FAQ\]\(faq.html\)](#) for more details.

2.1.2 From source

Watchmaker can also be built and installed from source, using `git` and `pip`. The source for `watchmaker` are available from the [GitHub repo](#).

1. First clone the public repository to pull the code to your local machine:

```
git clone https://github.com/plus3it/watchmaker.git --recursive && cd watchmaker
```

This project uses submodules, so it's easiest to use the `--recursive` flag, as above. If you don't, you will need to pull in the submodules as well:

```
git submodule update --init --recursive
```

2. If you want to install a specific branch or tag, check it out before installing Watchmaker:

```
git checkout <branch-tag-foo>
```

3. Then you can install Watchmaker:

```
python3 -m pip install .
```

2.1.3 From standalone executable

Watchmaker can also be downloaded and executed in an all-in-one package containing Watchmaker's dependencies, such as Python and necessary Python packages. Packages are available for Windows and Linux.

1. Retrieve the Watchmaker standalone package for your desired platform from GitHub Releases or the [Cloudarmor repo](#).

- [GitHub Releases](#) shows the available Watchmaker versions and includes links to the Windows and Linux packages, and their SHA256 hashes.

- The [latest release](#) can also be directly accessed on GitHub:

- <https://github.com/plus3it/watchmaker/releases/latest/>

- The [Cloudarmor repo](#) also contains versioned Watchmaker packages and corresponding SHA256 hashes. You can [browse the repo](#), or construct the URL to the files using these patterns:

- [https://watchmaker.cloudarmor.io/releases/\\${VERSION}/watchmaker-\\${VERSION}-standalone-linux-x86_64](https://watchmaker.cloudarmor.io/releases/${VERSION}/watchmaker-${VERSION}-standalone-linux-x86_64)

- [https://watchmaker.cloudarmor.io/releases/\\${VERSION}/watchmaker-\\${VERSION}-sha256-linux-x86_64.json](https://watchmaker.cloudarmor.io/releases/${VERSION}/watchmaker-${VERSION}-sha256-linux-x86_64.json)

- [https://watchmaker.cloudarmor.io/releases/\\${VERSION}/watchmaker-\\${VERSION}-standalone-windows-amd64.exe](https://watchmaker.cloudarmor.io/releases/${VERSION}/watchmaker-${VERSION}-standalone-windows-amd64.exe)

- [https://watchmaker.cloudarmor.io/releases/\\${VERSION}/watchmaker-\\${VERSION}-sha256-windows-amd64.json](https://watchmaker.cloudarmor.io/releases/${VERSION}/watchmaker-${VERSION}-sha256-windows-amd64.json)

- The [latest release](#) is always available on the Cloudarmor repo at these URLs:

- https://watchmaker.cloudarmor.io/releases/latest/watchmaker-latest-standalone-linux-x86_64

- https://watchmaker.cloudarmor.io/releases/latest/watchmaker-latest-sha256-linux-x86_64.json

- <https://watchmaker.cloudarmor.io/releases/latest/watchmaker-latest-standalone-windows-amd64.exe>

- <https://watchmaker.cloudarmor.io/releases/latest/watchmaker-latest-sha256-windows-amd64.json>

- From PowerShell, the Windows package can be downloaded as follows:

```
PS C:\wam> $url = "https://watchmaker.cloudarmor.io/releases/latest/watchmaker-
↪latest-standalone-windows-amd64.exe"
PS C:\wam> (New-Object System.Net.WebClient).DownloadFile($url, "watchmaker.exe
↪")
```

- From the command line, the Linux package can be downloaded as follows:

```
# curl -so watchmaker https://watchmaker.cloudarmor.io/releases/latest/
↪watchmaker-latest-standalone-linux-x86_64
```

- For the latest package, the version of Watchmaker can be determined by viewing the contents of the SHA256 hash file or by executing the package with the `--version` flag.

2. Verify the integrity of the standalone package.

Compare the SHA256 hash contained in the downloaded hash file to a hash you compute for the package.

For Linux, execute this command to compute the SHA256 hash:

```
# shasum -a 256 watchmaker-latest-standalone-linux-x86_64
```

For Windows, execute this command to compute the SHA256 hash:

```
PS C:\wam> Get-FileHash watchmaker-latest-standalone-windows-amd64.exe | Format-List
```

3. Set executable access permission.

For Linux, you will need to set the access permissions to allow the standalone executable to run. Below is an example:

```
# chmod +x watchmaker-latest-standalone-linux-x86_64
```

2.1.4 Prerequisites for features specific to AWS and Azure

Watchmaker has some features specific to AWS and Azure:

- * AWS:
 - * Download files in config references from Amazon S3
 - * Tag Amazon EC2 instances with Watchmaker status
- * Azure:
 - * Tag Azure Virtual Machines with Watchmaker status

If you are using the source install from PyPi, and if your config uses any of those features, be sure to also install the SDKs those features are built on. If you are using the standalone package, these dependencies are part of the package and no further action or install is needed.

For AWS features, install the boto3 library:

```
# python3 pip -m install boto3
```

For Azure features, install the azure libraries:

```
# python3 pip -m install azure-core azure-identity azure-mgmt-resource
```



2.2 Configuration

Watchmaker is configured using a [YAML](#) file. Watchmaker's default `config.yaml` file should work out-of-the-box for most systems and environments. You can also use it as an example to create your own configuration file. The default config file will install Salt and use the bundled Salt formulas to harden the system according to the DISA STIG.

The configuration is a dictionary. The parent nodes (keys) are: `all`, `linux`, or `windows`. The parent nodes contain a list of workers to execute, and each worker contains parameters specific to that worker. The `all` node is applied to every system, and `linux` and `windows` are applied only to their respective systems.

You can create a file using the above format with your own set of standard values and use that file for Watchmaker. Pass the CLI parameter `--config` to point to that file.

2.2.1 Configuration Precedence

In addition to passing values in the configuration file, watchmaker supports passing arguments on the *cli*. The order of precedence for arguments is, from least to most:

- configuration file
- cli argument

In other words, providing a value as a cli argument will override the same value provided in the configuration file.

2.2.2 config.yaml Parent Nodes

`watchmaker_version`

If used, this optional node constrains the version of Watchmaker that can be used with the configuration. The `watchmaker_version` node is recommended for all configurations used with versions of Watchmaker 0.17+.

This is an example of using the `watchmaker_version` node:

```
watchmaker_version: "== 0.17.0"
```

Any [PEP440-compatible version specifier](#) can be used in the `watchmaker_version` node. Each version clause should include a comparison operator, such as `~=`, `==`, `!=`, `<=`, `>=`, `<`, `>`, or `===`. Multiple clauses can be included, separated by commas. Below are examples of version specifiers.

```
watchmaker_version: "~= 0.17.0"
watchmaker_version: "> 0.16.5"
watchmaker_version: ">= 0.17.0, <= 0.18.9, != 0.17.2"
```

Attempting to use a configuration with an incompatible version of Watchmaker will result in an error.

all

Section for Worker configurations that affect the deployment of all platforms. The `all` section will override parameters that are set in the OS-specific sections of `config.yaml`.

linux

Section for Worker configurations that should only be applied to Linux-based systems.

windows

Section for Worker configurations that should only be applied to Windows-based systems.

status

Watchmaker supports posting the watchmaker status to status providers. Watchmaker status values are one of: 'Running', 'Failed', or 'Completed'. Each status provider defines what it means to "post the status". Currently, the supported provider types include: 'aws' and 'azure'. These status providers both post the status as a tag to the instance/VM.

Providers have the ability to detect whether the system is compatible with the provider type. In order to post status, the system running watchmaker must be compatible with the status provider type. For example, the 'azure' provider will be skipped when watchmaker is running on an AWS EC2 instance, and vice versa.

See the [installation](#) page for prerequisites for using this feature.

- **IAM Role and Policy** An AWS Role and Policy that allows the instance to create tags must be attached to the instance. The minimal policy below has been tested in commercial and govcloud.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "VisualEditor0",
      "Effect": "Allow",
      "Action": "ec2:CreateTags",
      "Resource": "arn:<PARTITION>:ec2:<REGION>:<ACCOUNT_ID>:instance/$
↪{ec2:InstanceId}",
      "Condition": {
        "StringLike": {
          "ec2:SourceInstanceARN": "arn:<PARTITION>:ec2:<REGION>:<ACCOUNT_ID>
↪:instance/${ec2:InstanceId}"
        }
      }
    }
  ]
}
```

- **Policy** Policy that allows adding or replacing tag on resource see [Microsoft Azure Tag Policy](#) for more info.

Note: Note: Support for the 'azure' status provider is provisional. If you use it and encounter problems, please open an issue on the GitHub repository!

Parameters supported by status

- **providers** ((list of maps)): List of providers
 - **key** (*string*): Status key to use e.g. `WatchmakerStatus`
 - **required** (*boolean*): Required status, when `True` and `provider_type` is detected, watchmaker raises an error if unable to update status
 - **provider_type** (*string*): Environment provider type e.g. `aws` or `azure`

Example:

```
status:
  providers:
    - key: 'WatchmakerStatus'
      required: False
      provider_type: 'aws'
    - key: 'WatchmakerStatus'
      required: False
      provider_type: 'azure'
```

2.2.3 Config.yaml Worker Nodes

Watchmaker includes the *workers* listed below. See the corresponding sections for details on their configuration parameters.

- *salt*
- *yum (linux-only)*

salt worker

Parameters supported by the Salt Worker:

- **admin_groups** (*list*): The group(s) that you would like the admin accounts placed within.
- **admin_users** (*list*): The user(s) that would be created as admins.
- **computer_name** (*string*): The computer or hostname that should be applied.
- **environment** (*string*): Set for the environment in which the system is being built.
- **valid_environments** (*list*): The list of environments considered valid for the environment parameter.
- **ou_path** (*string*): Specifies the full DN of the OU where the computer account will be created when joining a domain.

```
ou_path: "OU=Super Cool App,DC=example,DC=com"
```

- **pip_install** (*list*): The Python package(s) that formulas require.

```
pip_install:
  - hvac
  - numpy
```

- **pip_args** (*list*): Options to pass to `salt pip.install` when installing python packages. See the [salt docs](#) for all options.

```
linux:
  - salt:
    pip_args:
      - pre_releases=True
```

- `pip_index` (*string*): Base URL of Python Package Index.
- `salt_states` (*string, comma-separated*): User-defined salt states to apply.

```
salt_states: highstate,foo,bar
```

- `exclude_states` (*string, comma-separated*): States to exclude from execution of salt states.
- `user_formulas` (*dict*): Map of formula names and URLs to zip archives of salt formulas. These formulas will be downloaded, extracted, and added to the salt file roots. The zip archive must contain a top-level directory that, itself, contains the actual salt formula. To “overwrite” bundled submodule formulas, make sure the formula name matches the submodule name.

```
user_formulas:
  foo-formula: https://path/to/foo.zip
```

- `salt_debug_log` (*string*): Path to the debug logfile that salt will write to.
- `salt_content` (*string*): URL to the Salt content file that contains further configuration specific to the salt install.
- `salt_content_path` (*string*): The path within the Salt content file specified using `salt_content` where salt files are located. Can be used to provide the path within the archive file where the Salt configuration files are located.
- `install_method` (*string*): (Linux-only) The method used to install Salt. Currently supports: `yum`, `git`
- `bootstrap_source` (*string*): (Linux-only) URL to the salt bootstrap script. This is required if `install_method` is set to `git`.
- `git_repo` (*string*): (Linux-only) URL to the salt git repo. This is required if `install_method` is set to `git`.
- `salt_version` (*string*): (Linux-only) A git reference present in `git_repo`, such as a commit or a tag. If not specified, the HEAD of the default branch will be used.
- `installer_url` (*string*): (Windows-only) URL to the Salt Minion installer for Windows.

yum worker (linux-only)

Parameters supported by the Yum Worker:

- `repo_map` (list of maps): There be dragons here! Please be careful making changes to the default config. Thoroughly test your configuration. The default config specifies yum repos that contain the salt-minion. If the default repos are not included, and the salt-minion is not available, the Salt Worker will fail. You can add repos here that you would like enabled, but be wary of removing the default repos. Each map must contain the following keys:
 - `dist` (*list*): Distributions that would install this repo. Some repos are supported by multiple distros. (Currently supported distros are redhat, centos, and amazon.)
 - `el_version` (*string*): The Enterprise Linux version for this repo, as in el6 or el7. Expected values are '6' or '7'.
 - `url` (*string*): URL location of the repo file to be added to the system. This file will be copied to `/etc/yum.repos.d/`

Example:

```
repo_map:
  - dist:
      - redhat
      - centos
    el_version: 6
    url: http://someplace.com/my.repo
```

2.2.4 Downloading config files from Amazon S3

Watchmaker has support for downloading files from Amazon S3. This is useful for implementations where parts of the Watchmaker config are hosted privately. In order to use this feature, be sure the necessary prerequisites are installed (see the [installation page](#)).

This feature simply uses the “S3 URL” of the object in the S3 bucket. Such URLs take the form: `s3://<bucket>/<key>`. For example, if you wanted to host a custom config and custom salt content, you could include the salt-content S3 URL in your Watchmaker config:

```
all:
  - salt:
      salt_content: s3://path/to/salt-content.zip
```

And then call Watchmaker on the CLI with the `--config` argument:

```
watchmaker --config s3://path/to/config.yaml
```

2.2.5 Example config.yaml

This example can be used to construct your own `config.yaml` file. The [Cloudarmor repo](#) provides yum repo definitions and installers for a few salt versions.

```
watchmaker_version: ">= 0.24.0.dev"
all:
  - salt:
      admin_groups: null
      admin_users: null
      computer_name: null
      environment: null
      ou_path: null
      salt_content: null
      salt_states: Highstate
      user_formulas:
        # To add extra formulas, specify them as a map of
        #   <formula_name>: <archive_url>
        # The <formula_name> is the name of the directory in the salt file_root
        # where the formula will be placed. The <archive_url> must be a zip
        # file, and the zip must contain a top-level directory that, itself,
        # contains the actual salt formula. To "overwrite" submodule formulas,
        # make sure <formula_name> matches submodule names. E.g.:
        #ash-linux-formula: https://s3.amazonaws.com/salt-formulas/ash-linux-formula-
↪master.zip
        #scap-formula: https://s3.amazonaws.com/salt-formulas/scap-formula-master.zip
```

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```

linux:
  - yum:
      repo_map:
        #SaltEL6:
        - dist:
            - redhat
            - centos
            el_version: 6
            url: https://watchmaker.cloudarmor.io/yum.defs/saltstack/salt/2019.2.8/salt-
↪reposync-el6.repo
        - dist: amazon
            el_version: 6
            url: https://watchmaker.cloudarmor.io/yum.defs/saltstack/salt/2019.2.8/salt-
↪reposync-amzn.repo
        #SaltEL7:
        - dist:
            - redhat
            - centos
            el_version: 7
            url: https://watchmaker.cloudarmor.io/yum.defs/saltstack/salt/3004.2/salt-
↪reposync-el7-python3.repo
      - salt:
          salt_debug_log: null
          install_method: yum
          bootstrap_source: null
          git_repo: null
          salt_version: null

windows:
  - salt:
      salt_debug_log: null
      installer_url: https://watchmaker.cloudarmor.io/repo/saltstack/salt/windows/Salt-
↪Minion-3004.2-1-Py3-AMD64-Setup.exe

status:
  providers:
    - key: 'WatchmakerStatus'
      required: False
      provider_type: 'aws'
    - key: 'WatchmakerStatus'
      required: False
      provider_type: 'azure'

```



2.3 Usage

2.3.1 watchmaker from the CLI

Once Watchmaker is *installed* and a *configuration file* has been created (or you have decided to use the default configuration), using Watchmaker as a CLI utility is as simple as executing `watchmaker`. Below is the output of `watchmaker --help`, showing the CLI options.

In addition to the below options, any setting supported by the *configuration file* can be passed on the CLI. Some settings from the configuration file are not listed in the `--help` output, which displays only the most frequently used options. To pass any such “hidden” CLI argument, just precede it with `--` and convert an underscore to a dash. For example, to pass the `salt_content` argument on the CLI, use `watchmaker <other options> --salt-content <content-url>`. Arguments passed on the CLI always override the corresponding setting in the configuration file (see *configuration* for precedence).

```
# watchmaker --help
Usage: watchmaker [OPTIONS]

Entry point for Watchmaker cli.

Options:
  --version                Show the version and exit.
  -c, --config TEXT        Path or URL to the config.yaml file.
  -l, --log-level [info|debug|critical|warning|error]
                           Set the log level. Case-insensitive.
  -d, --log-dir DIRECTORY  Path to the directory where Watchmaker log
                           files will be saved.
  -n, --no-reboot           If this flag is not passed, Watchmaker will
                           reboot the system upon success. This flag
                           suppresses that behavior. Watchmaker
                           suppresses the reboot automatically if it
                           encounters a failure.
  -s, --salt-states TEXT    Comma-separated string of salt states to
                           apply. A value of 'None' will not apply any
                           salt states. A value of 'Highstate' will
                           apply the salt highstate.
  -A, --admin-groups TEXT   Set a salt grain that specifies the domain
                           groups that should have root privileges on
                           Linux or admin privileges on Windows. Value
                           must be a colon-separated string. E.g.
                           "group1:group2"
  -a, --admin-users TEXT    Set a salt grain that specifies the domain
                           users that should have root privileges on
                           Linux or admin privileges on Windows. Value
                           must be a colon-separated string. E.g.
                           "user1:user2"
  -t, --computer-name TEXT  Set a salt grain that specifies the
                           computername to apply to the system.
  -e, --env TEXT            Set a salt grain that specifies the
                           environment in which the system is being
                           built. E.g. dev, test, or prod
  -p, --ou-path TEXT        Set a salt grain that specifies the full DN
                           of the OU where the computer account will be
```

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```
--help
created when joining a domain. E.g.
"OU=SuperCoolApp,DC=example,DC=com"
Show this message and exit.
```

2.3.2 watchmaker as a standalone package (Beta feature)

Standalone packages are a beta feature and may not function in all environments.

Once a Watchmaker standalone executable has been *downloaded* and a *configuration file* has been created (or you have decided to use the default configuration), use Watchmaker similarly to the CLI utility.

For example, on Linux, you can view the CLI options (shown above) using the same flag.

```
# ./watchmaker --help
```

From Windows, similarly, execute Watchmaker by running it from the command line:

```
PS C:\wam> watchmaker.exe --help
```

2.3.3 watchmaker in AWS

watchmaker as EC2 userdata

Calling Watchmaker via EC2 userdata is a variation on using it as a CLI utility. The main difference is that you must account for installing Watchmaker first, as part of the userdata. Since the userdata syntax and dependency installation differ a bit on Linux and Windows, we provide methods for each as examples.

Note: The pip commands in the examples are a bit more complex than necessarily needed, depending on your use case. In these examples, we are taking into account limitations in FIPS support in the default PyPi repo. This way the same pip command works for all platforms.

Linux

For **Linux**, you must ensure pip is installed, and then you can install watchmaker from PyPi. After that, run watchmaker using any option available on the *CLI*. Here is an example:

```
#!/bin/sh
PYPI_URL=https://pypi.org/simple

# Setup terminal support for UTF-8
export LC_ALL=en_US.UTF-8
export LANG=en_US.UTF-8

# Install pip
python3 -m ensurepip

# Install setup dependencies
python3 -m pip install --index-url="$PYPI_URL" --upgrade pip setuptools
```

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```
# Install Watchmaker
python3 -m pip install --index-url="$PYPI_URL" --upgrade watchmaker

# Run Watchmaker
watchmaker --log-level debug --log-dir=/var/log/watchmaker
```

Alternatively, cloud-config directives can also be used on **Linux**:

```
#cloud-config

runcmd:
- |
  PYPI_URL=https://pypi.org/simple

  # Setup terminal support for UTF-8
  export LC_ALL=en_US.UTF-8
  export LANG=en_US.UTF-8

  # Install pip
  python3 -m ensurepip

  # Install setup dependencies
  python3 -m pip install --index-url="$PYPI_URL" --upgrade pip setuptools

  # Install Watchmaker
  python3 -m pip install --index-url="$PYPI_URL" --upgrade watchmaker

  # Run Watchmaker
  watchmaker --log-level debug --log-dir=/var/log/watchmaker
```

Windows

For **Windows**, the first step is to install Python. Watchmaker provides a simple bootstrap script to do that for you. After installing Python, install watchmaker using pip and then run it.

```
<powershell>
$BootstrapUrl = "https://watchmaker.cloudarmor.io/releases/latest/watchmaker-bootstrap.
↪ps1"
$PythonUrl = "https://www.python.org/ftp/python/3.10.11/python-3.10.11-amd64.exe"
$PypiUrl = "https://pypi.org/simple"

# Use TLS 1.2+
[Net.ServicePointManager]::SecurityProtocol = "Tls12, Tls13"

# Download bootstrap file
$BootstrapFile = "${Env:Temp}\${($BootstrapUrl).split('/')[-1]}"
(New-Object System.Net.WebClient).DownloadFile("$BootstrapUrl", "$BootstrapFile")

# Install python
& "$BootstrapFile" -PythonUrl "$PythonUrl" -Verbose -ErrorAction Stop
```

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```
# Install Watchmaker
python -m pip install --index-url="$PypiUrl" --upgrade pip setuptools
python -m pip install --index-url="$PypiUrl" --upgrade watchmaker

# Run Watchmaker
watchmaker --log-level debug --log-dir=C:\Watchmaker\Logs
</powershell>
```

watchmaker as a CloudFormation template

Watchmaker can be integrated into a CloudFormation template as well. This project provides a handful of CloudFormation templates that launch instances or create autoscaling groups, and that install and execute Watchmaker during the launch. These templates are intended as examples for you to modify and extend as you need.

Sometimes it is helpful to define the parameters for a template in a file, and pass those to CloudFormation along with the template. We call those “parameter maps”, and provide one for each of the CFN templates.

Cloudformation templates

- [Linux Autoscale Group](#)
- [Linux Instance](#)
- [Windows Autoscale Group](#)
- [Windows Instance](#)

watchmaker in a Terraform module

Watchmaker can also be used with Terraform by utilizing the [Watchmaker AWS Terraform modules](#) and passing the required parameters.

Terraform Modules

- [Linux Autoscale Group](#)
- [Linux Instance](#)
- [Windows Autoscale Group](#)
- [Windows Instance](#)

Note: Each corresponding Terraform module and CloudFormation template are grouped together in the same directory.

The CloudFormation templates are integrated within their respective Terraform module, so they become deployable and manageable from within the Terraform cli.

Variables can be input interactively via the Terraform console or directly to the Terraform module. An example Terraform file that calls the `lx-autoscale` module is shown below.

```
provider "aws" {}

module "test-lx-instance" {
  source = "git::https://github.com/plus3it/terraform-aws-watchmaker//modules/lx-
instance/"

  Name      = "tf-watchmaker-lx-autoscale"
  AmiId     = "__AMIID__"
  AmiDistro = "__AMIDISTRO__"
}
```

Additional Watchmaker Terraform examples

- [Linux Autoscale Example](#)
- [Linux Instance Example](#)
- [Windows Autoscale Example](#)
- [Windows Instance Example](#)

2.3.4 watchmaker in Azure

watchmaker as Custom Script Extension

Custom Script Extension downloads and executes scripts on Azure virtual machines. For Linux, you run the bash script shown in the section on [Linux](#). You can store the bash script in Azure Storage or a publicly available url (such as with S3). Then you execute the stored script with a command. For example, a JSON string could contain

```
{
  "fileUri": ["https://path-to-bash-script/run_watchmaker.sh"],
  "commandToExecute": "./run_watchmaker.sh"
}
```

These parameters can be passed in via Azure CLI or within a Resource Management Template. For more in-depth information, see Microsoft's [documentation on Linux](#).

For Windows, you would execute a PowerShell script in a similar manner as for [Windows](#) (but without the powershell tags). Then you would have the following parameters:

```
{
  "fileUri": ["https://path-to-bash-script/run_watchmaker.ps1"],
  "commandToExecute": "powershell -ExecutionPolicy Unrestricted -File run_watchmaker.ps1"
}
```

For more in-depth information on using Custom Script Extension for Windows, see Microsoft's [documentation on Windows](#).

2.3.5 watchmaker as a library

Watchmaker can also be used as a library, as part of another python application.

```
import watchmaker

arguments = watchmaker.Arguments()
arguments.config_path = None
arguments.no_reboot = False
arguments.salt_states = None

client = watchmaker.Client(arguments)
client.install()
```

Note: This demonstrates only a few of the arguments that are available for the `watchmaker.Arguments()` object. For details on all arguments, see the [API Reference](#).



2.4 Common Scan Findings

There is frequently more than one way to achieve a given hardening-recommendation. As such, generic security scanners may produce alerts/findings that are at odds with the actual system state implemented by Watchmaker. The following are frequently-cited findings and explanations for why a scanner may alert on the Watchmaker-managed configuration-state.

2.4.1 Common Scan Findings for EL7



Findings Summary-Table

Finding Summary	Finding Identifiers	
<i>Use Only FIPS 140-2 Validated Ciphers</i>	SV-86845 RHEL-07-040110	
<i>Use Only FIPS 140-2 Validated MACs</i>	SV-86877 RHEL-07-040400	
<i>Modify the System Login Banner</i>	SV-86487 RHEL-07-010050	
<i>Enable Smart Card Login</i>	SV-86589 RHEL-07-010500	
<i>Configure the Firewall Ports</i>	SV-86843 RHEL-07-040100	
<i>Set Default firewall Zone for Incoming Packets</i>	SV-86939 RHEL-07-040810	
<i>Disable Kernel Parameter for IP Forwarding</i>	SV-86933 RHEL-07-040740	
<i>The Installed Operating System Is Vendor Supported</i>	SV-86621 RHEL-07-020250	
<i>Install McAfee Virus Scanning Software</i>	SV-86837 RHEL-07-032000	
<i>Enable FIPS Mode in GRUB2</i>	SV-86691 RHEL-07-021350	
<i>Configure AIDE to Use FIPS 140-2 for Validating Hashes</i>	SV-86697 RHEL-07-021620	
<i>Verify and Correct Ownership with RPM</i>	SV-86473 RHEL-07-010010	
<i>Verify and Correct File Permissions with RPM</i>	SV-86473 RHEL-07-010010	
<i>Ensure Users Re-Authenticate for Privilege Escalation - sudo NOPASSWD</i>	SV-86571 RHEL-07-010340	
<i>Operating system must display the date and time of the last successful account logon upon logon</i>	SV-86899 RHEL-07-040530	
<i>Operating system must be configured so that the audit system takes appropriate action when the audit storage volume is full</i>	SV-86711 RHEL-07-030320	
<i>Operating system must be configured to off-load audit logs onto a different system or storage media from the system being audited</i>	SV-95729 RHEL-07-030201	
<i>User Must Not Be Allowed To Change Password More-frequently than once per 24 hours</i>	SV-86551 RHEL-07-010240	

2.4. Common Scan Findings

Use Only FIPS 140-2 Validated Ciphers

Invalid Finding:

Watchmaker implements setting valid through EL7 STIGv2R6 (released: October 2019)

Use Only FIPS 140-2 Validated MACs

Invalid Finding: Watchmaker implements setting valid through EL7 STIGv2R6 (released: October 2019)

Modify the System Login Banner

Invalid Finding:

Watchmaker implements site-prescribed banner. Scan-profile's regex may not be flexible enough to match the site-prescribed banner as implemented by watchmaker.

Enable Smart Card Login

Conditionally-Valid Finding:

Smart Card Login use and configuration is site-specific. Site has not provided specification for implementing this setting within scanned context.

Configure the FirewallD Ports

Invalid Finding:

Watchmaker implements setting. However, scanner regex may not be sufficiently-flexible in its specification.

Set Default firewallD Zone for Incoming Packets

Conditionally-Valid Finding:

Enabling “drop” as the default firewallD zone breaks things like ping-sweeps (used by some IPAM solutions, security-scanners, etc.). Some sites will request the “drop” zone not be used. Scan-profiles should be updated to reflect the need to not have “drop” be the active zone.

Disable Kernel Parameter for IP Forwarding

Invalid Finding:

The prescribed `net.ipv4.ip_forward` value is set by watchmaker in `/etc/sysctl.d/99-sysctl.conf`. Executing `sysctl net.ipv4.ip_forward` on watchmaker-hardened system returns expected `net.ipv4.ip_forward = 0` result

The Installed Operating System Is Vendor Supported

Invalid Finding:

No programmatic validation or remediation prescribed or universally-implementable: requires manual validation with OS-vendor lifecycle information page(s).

Install McAfee Virus Scanning Software

Conditionally-Valid Finding:

- Where configured to do so, watchmaker will install HBSS or VSEL. Any scan-findings on systems watchmaker has been configured to install HBSS or VSEL are typically due to version mismatches between installed and scanned-for versions
- Where required/scanned for but not installed, site will need to specify automatable installation-method that will produce match against scanned-for configuration
- Where not required, scanner should either be reconfigured not to scan for presence or scan-results should be ignored

Enable FIPS Mode in GRUB2

Conditionally-Valid Finding:

Both spel and watchmaker implement `fips=1` by default. If finding occurs, either:

- There is an error in scanner's validation-method
- System has been intentionally de-configured for FIPS — typically due to hosted-software's requirements — and scanned-system will need to be granted a deployment security-exception.

Configure AIDE to Use FIPS 140-2 for Validating Hashes

Invalid Finding:

Because there is more than one way to implement this setting, scanners typically do not perform a real scan for this setting. Instead some scanners implement a null-test to flag the configuration-item to try to force a manual review. Watchmaker implements this configuration-item by setting `NORMAL = FIPSR+sha512` in the `/etc/aide.conf` file: may be manually validated by executing `grep NORMAL\ = /etc/aide.conf`.

Verify and Correct Ownership with RPM

Invalid Finding:

- Flags on system-journal ownership: Journal ownership settings are automatically reset by systemd (upon reboot) after hardening has run. Currently, no means of permanently remediating is possible.
- Similarly, if HBSS or VSEL is installed, scan may flag on user-ownership depending on how site specifies installation of HBSS or VSEL. One would reasonably expect similar for other, third-party packages. "Fixing" (per STIG guidance) would likely break the functioning of the HBSS/VSEL (or third-party) software

Verify and Correct File Permissions with RPM

Invalid Finding:

- Flags on system-journal ownership: Journal ownership settings are automatically reset by systemd (upon reboot) after hardening has run. Currently, no means of permanently remediating is possible.
- May also flag on vendor-delivered CA-trust files which are dynamically-injected into relevant trust-stores. Currently, no known means of permanently remediating is possible.
- May flag on third-party tools' (e.g., Splunk) config, log and other files

Ensure Users Re-Authenticate for Privilege Escalation - sudo NOPASSWD

Conditionally-Valid Finding:

Flagged-configuration is frequently required for properly enabling a “break-glass” account at provisioning-time. This is especially so in consoleless environments (like AWS). Disable scan or ignore scan-findings when such accounts are required.

Operating system must display the date and time of the last successful account logon upon logon

Invalid Finding:

Some scanners implement a scan equivalent to:

```
grep -P '^[\s]*[^\s#]+[ \t]+([\[\]\w=]+[ \t]+pam_lastlog\.so[ \t]+([\S \t]+\s*$)' /etc/
↪pam.d/postlogin
```

To try to determine if PAM’s showfailed module is properly activated. These scanners typically only expect a single line of output that looks like:

session	required	pam_lastlog.so showfailed
---------	----------	---------------------------

However, on a system that watchmaker has been applied to, the scan-return will typically look like:

session	required	pam_lastlog.so showfailed
session	[default=1]	pam_lastlog.so nowtmp showfailed
session	optional	pam_lastlog.so silent noupdate showfailed

If the scanner does not properly handle this multi-line output, it will report a failure even though the required configuration-fixes are actually in place and functioning as desired.

Operating system must be configured so that the audit system takes appropriate action when the audit storage volume is full

Invalid Finding:

The `disk_full_action` is configured. However, it is not configured where scanners may be configured to look for it. The STIG-prescribed method expects configuration through the `audisp-remote` subsystem. Since configuration of the `audisp-remote` subsystem is inherently site-specific, generic executions of watchmaker do not attempt to configure it. Instead, watchmaker handles the `disk_full_action` configuration-item via the `main` audit subsystem. This can be confirmed by executing:

```
( find /etc/audisp -type f ; find /etc/audit -type f ) | xargs grep disk_full_action
```

Executing the above *should* return something like:

```
/etc/audit/auditd.conf:disk_full_action = SUSPEND
```

Operating system must be configured to off-load audit logs onto a different system or storage media from the system being audited

Invalid Finding:

Configuration of the `audisp-remote` subsystem is inherently site-specific: quite frequently, the `audisp-remote` subsystem is wholly supplanted by other offload-methods (e.g., Splunk, FluentBit, CloudWatch Logs, etc.). Therefore, neither generic executions of watchmaker nor executions that include configuration of `audisp-remote` alternatives will attempt to configure it.

User Must Not Be Allowed To Change Password More-Frequently than once per 24 hours

Typically caused when a user is created via a service/process like `cloud-init`: the resulting user may not have its `password-aging mindays` parameter (field #4 in `/etc/shadow`) set

User Must Change Password At Least Once Every Sixty Days

Typically caused when a user is created via a service/process like `cloud-init`: the resulting user may not have its `password-aging maxdays` parameter (field #5 in `/etc/shadow`) set

User Must Be Provided Adequate Warning Of Password-Expiration

Typically caused when a user is created via a service/process like `cloud-init`: the resulting user may not have its `password-aging warndays` parameter (field #6 in `/etc/shadow`) set

User Account Must Be Expired N Days After Password Has Expired

Typically caused when a user is created via a service/process like `cloud-init`: the resulting user may not have its `password-aging inactivedays` parameter (field #7 in `/etc/shadow`) set

2.4.2 Common Scan Findings for EL8



Findings Summary-Table

Finding Summary	Finding Identifiers
<i>Prevent System Daemons From Using Kerberos For Authentication</i>	V-230238 RHEL-08-010161
<i>Users Must Provide A Password For Privilege Escalation</i>	V-230271 RHEL-08-010380
<i>A Separate Filesystem Must Be Used For the /tmp Directory</i>	V-230295 RHEL-08-010543
<i>The OS must mount /tmp with the nodev option</i>	V-230511 RHEL-08-040123
<i>The OS must mount /tmp with the nosuid option</i>	V-230512 RHEL-08-040124
<i>The OS must mount /tmp with the noexec option</i>	V-230514 RHEL-08-040125
<i>The OS Must Ensure Session Control Is Automatically Started At Shell Initialization</i>	V-230349 RHEL-08-020041
<i>User Account Passwords Must Be Restricted To A 60-Day Maximum Lifetime</i>	V-230367 RHEL-08-020210
<i>OS Must Prohibit Password Reuse For A Minimum Of Five Generations</i>	V-230368 RHEL-08-020220
<i>The Installed Operating System Is Not Vendor Supported</i>	V-230221 RHEL-08-010000
<i>All Content In A User's Home Directory Must Be Group-Owned By The Primary User</i>	V-244532 RHEL-08-010741
<i>"Only Authorized Local User Accounts Exist on Operating System" is always flagged</i>	V-230379 RHEL-08-020320
<i>All Interactive User Home Directory Files Must Be Mode 0750 Or Less Permissive</i>	V-244531 RHEL-08-010731
<i>Add nosuid Option to /boot</i>	V-230300 RHEL-08-010571
<i>Configure Multiple DNS Servers in /etc/resolv.conf</i>	V-230316 RHEL-08-010680
<i>Enable Certmap in SSSD</i>	V-230355 RHEL-08-020090
<i>Verify that Shared Library Directories Have Root Ownership</i>	V-251709 RHEL-08-010351
<i>Oracle Linux 8 STIGs Specify Conflicting ClientAliveCountMax values</i>	V-248552 OL08-00-010200
<i>Record Events When Privileged Executables Are Run</i>	V-248722 OL08-00-030000

Prevent System Daemons From Using Kerberos For Authentication

Conditionally-valid Finding:

If an EL8 system is bound to Active Directory – or other Kerberos-enabled centralized authentication-source – or is *acting as* a Kerberos domain controller (KDC), the presence of an `/etc/krb5.keytab` file is mandatory.

If the scanned system does not have the `krb5-workstation` or `krb5-server` packages installed and *any* `.keytab` files are found in the `/etc` directory, this is a valid finding.

Users Must Provide A Password For Privilege Escalation

Conditionally-valid Finding:

If a `sudo`-enabled user is password-enabled, they should be prompted for that password in order to escalate privileges.

If a `sudo`-enabled user is *not* password-enabled (e.g, if the user is used only with key- or token-based authentication), they should not be prompted for any password. Forcing use of passwords for `sudo`-enabled users that do not have passwords will render those user-accounts unable to escalate privileges. Failure to exempt such users will render “break glass” and similar accounts not usable for their intended function.

A Separate Filesystem Must Be Used For the `/tmp` Directory

Invalid Finding:

When using Amazon Machine Images, Azure VM-templates, or the like, that have been built using the [spel automation](#), the `/tmp` directory in the resultant EC2 (VM, etc.) is hosted on a psuedo-filesystem of type `tmpfs`. This is done using the `tmp.mount` systemd unit. Many security-scanning tools that look for `/tmp`-related mount-information do not know how to properly scan when `tmp` is used this way and will, as a result, report a (spurious) finding.

Proof of Correctness:

To validate that the required-setting is *actually* present, execute:

```
grep -w /tmp /proc/mounts
```

If this returns null, the scan-result is valid; otherwise the scan-result is *invalid*.

The OS must mount `/tmp` with the `nodev` option

Invalid Finding:

When using Amazon Machine Images, Azure VM-templates, or the like, that have been built using the [spel automation](#), the `tmp.mount` systemd unit is used to manage mounting of the `tmpfs`-based `/tmp` directory. Mount options – such as `nodev` – are defined through two files:

- `/usr/lib/systemd/system/tmp.mount`: This file contains the vendor-defined defaults and is installed via the `systemd` RPM
- `/etc/systemd/system/tmp.mount.d/options.conf`: This file is installed via watchmaker’s state-handler, `ash-linux.el8.STIGbyID.cat2.RHEL-08-040123`. This file overrides the values held in the vendor-managed `systemd` RPM’s file

Many security-scanners do not know how to find the mount-options for the `/tmp` (pseudo) filesystem when it is managed via `systemd` and uses these files to set the mount options. As a result, such scanners will report a (spurious) finding

Proof of Correctness:

To validate that the required-setting is *actually* present, execute:

```
grep -w /tmp /proc/mounts | grep nodev
```

If this returns null, the scan-result is valid; otherwise the scan-result is *invalid*.

The OS must mount /tmp with the nosuid option

Invalid Finding:

As with the “The OS must mount /tmp with the nodev option” finding, this finding is due to an incompatibility between how the scanner checks for the setting and how the setting is actually implemented.

Proof of Correctness:

To validate that the required-setting is *actually* present, execute:

```
grep -w /tmp /proc/mounts | grep nosuid
```

If this returns null, the scan-result is valid; otherwise the scan-result is *invalid*.

The OS must mount /tmp with the noexec option

Invalid Finding:

As with the “The OS must mount /tmp with the nodev option” finding, this finding is due to an incompatibility between how the scanner checks for the setting and how the setting is actually implemented.

Proof of Correctness:

To validate that the required-setting is *actually* present, execute:

```
grep -w /tmp /proc/mounts | grep noexec
```

If this returns null, the scan-result is valid; otherwise the scan-result is *invalid*.

The OS Must Ensure Session Control Is Automatically Started At Shell Initialization

Invalid Finding:

As implemented, watchmaker places an `/etc/profile.d/tmux.sh` file that looks like:

```
# Check if shell is interactive
if [[ $- == *i* ]] && [[ $( rpm --quiet -q tmux )$? -eq 0 ]]
then
    parent=$( ps -o ppid= -p $$ )
    name=$( ps -o comm= -p $parent )

    # Check if controlling-process is target-value
    case "$name" in
        sshd|login)
            exec tmux
            ;;
    esac
fi
```


This file addresses the concerns of the STIG finding-ID, but does so in a functionally-safer way. The additional ‘safing’ included in the watchmaker-placed script may cause scanners that are too-inflexibly coded to spuriously declare a finding.

User Account Passwords Must Be Restricted To A 60-Day Maximum Lifetime

Invalid Finding:

Some, locally-managed user’s accounts are configured *only* for token-based logins (SSH keys, GSSAPI, etc.). The accounts are typically configured with no passwords. Some of these accounts also serve a “break-glass” function. If passwordless accounts are configured with password-expiry enabled, they may become no longer fit for purpose once they’ve reached their expiry.

Many scanners are not adequately configured to differentiate between passwordless and password-enabled locally-managed accounts. Typically, poorly-configured scanners will execute a compliance-test equivalent to:

```
awk -F: '$5 > 60 { print $1 " " $5 }' /etc/shadow
awk -F: '$5 <= 0 { print $1 " " $5 }' /etc/shadow
```

Or, expressed more compactly:

```
awk -F: '$5 > 60 || $5 <= 0 { print $0 }' /etc/shadow
```

If so, such scanners will assert a finding that is not actually valid for locked-password accounts.

Proof of Correctness:

To validate that passwordless accounts are properly configured, instead execute:

```
awk -F: '$2 !~ /^[!*]*/ && ( $5 > 60 || $5 <= 0 ) { print $0 }' /etc/shadow
```

The above adds the further check of each line of the /etc/shadow file’s second field (hashed password string) for the tokens indicating a locked-password account (! and/or *). Adding this further check should yield a null return

OS Must Prohibit Password Reuse For A Minimum Of Five Generations

Invalid Finding:

This is a spurious finding. Per the STIG, watchmaker updates the /etc/pam.d/password-auth file to ensure the presence of a `remember=5` token on the file’s `password required pam_pwhistory.so` line:

- If a line exists starting with `password required pam_pwhistory.so` but has a non-conformant value for the `remember=` token, the non-conformant value is replaced with 5
- If a line exists starting with `password required pam_pwhistory.so` but has no `remember=` token, one with a suitable value is appended
- If a line starting with `password required pam_pwhistory.so` does not exist, one is created with *only* the `remember=5` token present

Some scanners *may* be configured to look for a greater number of tokens set than *just* the `remember=5` token. E.g., some may look for something more like:

```
password required pam_pwhistory.so use_authtok remember=5 retry=3
```

Proof of Correctness:

To validate that the required `remember=5` is present, execute:

```
grep -l -n remember=5 $( readlink -f /etc/pam.d/password-auth )
```

The above *should* return either `/etc/authselect/password-auth` or `/etc/pam.d/password-auth`; if the above has a null return, re-execute the `ash-linux.el8.STIGbyID.cat2.RHEL-08-020221` Saltstack state and re-validate.

The Installed Operating System Is Not Vendor Supported

Expected Finding:

This rule effects primarily “free” versions of the Red Hat Enterprise Linux operating system. This result is expected on the CentOS 8 – “Core” or “Stream” – Rocky and Alma linux distributions. Scanners that highlight this finding are looking for the presence of any *one* of the following RPMs:

- `redhat-release-client`
- `redhat-release-server`
- `redhat-release-workstation`
- `redhat-release-computenode`
- `redhat-release-virtualization-host`
- `oraclelinux-release`
- `sled-release`
- `sles-release`

And an `/etc/redhat-release` file with contents that aligns to one that’s delivered with any of the preceding RPM. The various “free” versions of the Red Hat Enterprise Linux operating system will not have any of the above RPMs present.

If using a vendor-supported Linux and this scan finding occurs, it’s likely that either the `release-` RPM is missing or damaged, something has unexpectedly altered the target’s `/etc/redhat-release` file or the scanner is looking for a wildcarded `release` file under the `/etc` directory and there’s an unexpected filename found.

All Content In A User’s Home Directory Must Be Group-Owned By The Primary User

Expected Finding:

At initial scan, this finding is typically triggered by the installation of some standard “enterprise” services. Some of these services, due to how they execute, will create *some* of their files with `root` as the user- and/or (more importantly for this finding) group-owner.

The oscap content for this finding includes the caveat:

Due to OVAL limitation, this rule can report a false negative in a specific situation where two interactive users swap the group-ownership of folders or files in their respective home directories.

While not a 100% overlap to the reason offered here, the caveat covers a common scenario. Other common scenarios may include:

- Unpacking of archive files authored on a different system
- Restoration of a user’s `${HOME}` from another system to the current (scanned) system

In either of these further cases, such will most typically only show up on lifecycle scans and not provisioning-time scans

“Only Authorized Local User Accounts Exist on Operating System” is always flagged

Expected Finding:

Per the STIG notes:

Automatic remediation of this control is not available due to the unique requirements of each system.

While-automation *could* be authored that would leverage a site- or host-specific allowed-users list to disable or delete forbidden accounts, there exists an extremely-high likelihood that scanners used against such configuration-controlled operating environments would not contain the scanning logic necessary to validate compliance. As such – and with or without user-controlling automation-content – STIG scanners would still flag systems that are *technically* compliant.

All Interactive User Home Directory Files Must Be Mode 0750 Or Less Permissive

Expected Finding:

Some scanners will erroneously alert on this for either/both of two reasons:

- The scanner is looking for files that have mode-zero for their “all” field regardless of owning-directory’s mode-setting: in this case, the result is *technically* a correct finding but, from an *effective* security perspective is non-problematic
- The scanner may be confused if the “failed” file’s group-permission is zero: in this case, the result is simply not valid

Add nosuid Option to /boot

Invalid Finding:

Some scanners will check to see what the mount-option is for the filesystem containing the /boot directory without first ensuring that /boot directory is actually a standalone filesystem. When /boot is not a standalone filesystem, it gets the same boot-options as the / filesystem and, therefore, cannot have the nosuid mount-option set.

Configure Multiple DNS Servers in /etc/resolv.conf

Expected Finding:

When deploying EL8 systems into environments with highly-available DNS servers, the system will typically only have *one* DNS server configured.

Enable Certmap in SSSD

Invalid Finding:

This finding is intended to result in a manual configuration-validation of the target system. Scanners that flag this finding typically include a note like:

Automatic remediation of this control is not available since all of the settings in the certmap need to be customized

Further, configuration of the sssd certmap is typically required only for systems that are configured for *direct* authentication via client-certificate. This configuration-method is typically done only for systems with locally-attached SmartCard/PIV readers. “Remote” systems (such as those hosted with a CSP like AWS or Azure) typically *indirectly* authenticate with client-certificates (either through SSH key-forwarding or GSSAPI token-forwarding).

Verify that Shared Library Directories Have Root Ownership

Expected Finding:

Some applications and/or enterprise-integration tools may install private shared-libraries that are user- or group- owned by the installed-application. The scanner may identify these as insecure/improperly-owned, regardless of permission-setting on higher-level directories.

Oracle Linux 8 STIGs Specify Conflicting ClientAliveCountMax values

Conflicting Guidance:

As of the time of this section's writing, there is a disagreement between the DISA STIG's target-value for the SSH daemon's ClientAliveCountMax value and that specified via the STIG's upstream content-project, Compliance As Code. The former specifies that the parameter's value should be 1; the latter specifies that it should be 0. This project's hardening implements the former as that is also the value specified by both the DISA STIG's and Compliance As Code project's recommended setting for Red Hat Linux 8.

Record Events When Privileged Executables Are Run

Invalid Finding:

Some security-scanners misidentify the compliance-state of target-systems for vulnerability-ID, V-248722 (OL08-00-030000). The relevant STIG check-text should be either or both of:

- `grep execve /etc/audit/audit.rules`
- `grep -r execve /etc/audit/rules.d`

After watchmaker is applied, the former returns:

```
-a always,exit -F arch=b32 -S execve -C gid!=egid -F key=setgid
-a always,exit -F arch=b64 -S execve -C gid!=egid -F key=setgid
-a always,exit -F arch=b32 -S execve -C uid!=euid -F key=setuid
-a always,exit -F arch=b64 -S execve -C uid!=euid -F key=setuid
```

While the latter returns:

```
/etc/audit/rules.d/setuid.rules:-a always,exit -F arch=b32 -S execve -C uid!=euid -F
↪key=setuid
/etc/audit/rules.d/setuid.rules:-a always,exit -F arch=b64 -S execve -C uid!=euid -F
↪key=setuid
/etc/audit/rules.d/setgid.rules:-a always,exit -F arch=b32 -S execve -C gid!=egid -F
↪key=setgid
/etc/audit/rules.d/setgid.rules:-a always,exit -F arch=b64 -S execve -C gid!=egid -F
↪key=setgid
```

It is the presence of the content in the file in the `/etc/audit/rules.d/` directory that results in – by way of the `augenrules` service – the presence of the correct content in the `/etc/audit/audit.rules` file.



2.5 Supported SCAP Benchmarks

2.5.1 Windows

- Microsoft Windows Server STIG Benchmark (2019)
- Microsoft Windows Server STIG Benchmark (2016)
- Microsoft Windows Server STIG Benchmark (2012-r2)
- Microsoft Windows STIG Benchmark (10)
- Microsoft .NET Framework 4 Benchmark
- Internet Explorer STIG Benchmark

2.5.2 Linux

- Red Hat Enterprise Linux STIG Benchmark (EL7 and EL8)
 - OpenSCAP Security Guide (EL7 and EL8)
- New benchmark versions are incorporated as they are released



2.6 Frequently Asked Questions

2.6.1 How do I know if watchmaker has installed?

To determine whether watchmaker is installed, the simplest method is to run the command `watchmaker --help`. If it displays the cli help page, watchmaker is installed. Another option is to check `pip list | grep watchmaker`.

2.6.2 What do I do if watchmaker failed to install?

First, review the [installation](#) document. Then double-check the output of a failed installation. Usually, the output points pretty clearly at the source of the problem. Watchmaker can be re-installed over itself with no problem, so once the root cause is resolved, simply re-install watchmaker.

2.6.3 Why does the watchmaker install fail if my system is FIPS enabled?

This is primarily a question for Red Hat (and derived distributions). As of this writing, the `pip` utility in all Red Hat releases up through 7.4.1708, default to looking for pypi packages signed with MD5 signatures. If you've enabled FIPS (or are using a build that has FIPS pre-enabled), MD5 is disabled in the kernel (due to being a weak hashing-method). You can either disable FIPS (not recommended) or explicitly force `pip` to use a different signature-index. The latter is detailed in the Linux section of the [usage](#) document.

2.6.4 How do I know if watchmaker has completed without errors?

By default, watchmaker will reboot the system after a successful execution. Therefore, if the system reboots, watchmaker executed successfully. If you are investigating sometime after watchmaker completed, check the logs for errors. If anything fails, watchmaker will suppress the reboot. (Though note that the `--no-reboot` flag can be used to suppress the reboot even after a successful execution.)

You can also test the watchmaker exit code programmatically. If watchmaker fails, it will return a non-zero exit code. If watchmaker completes successfully, it will return an exit code of zero. You would typically pass the `--no-reboot` flag if you intend to test the exit code and determine what to do from there.

2.6.5 What do I do if watchmaker failed to complete or completes with errors?

Start by checking the logs generated by watchmaker. The logs are stored in the directory specified by the `--log-dir` argument. Search the log for entries that have `[ERROR]`, this will give you a starting point to begin troubleshooting. Also, if a salt state failed, look for the pattern `Result: False`. If it is not an obvious or simple issue, feel free to create an issue on the watchmaker github page. If there is a `salt_call.debug.log` in the watchmaker log directory, you can look for `[ERROR]` messages in there as well. However, this log file can be very noisy and a message with the error label may not be related to the error you are encountering.

2.6.6 Does watchmaker support Enterprise Linux 7?

Watchmaker is supported on RedHat 7 and CentOS 7. See the [index](#) page for a list of all supported operating systems.

2.6.7 Does watchmaker support Enterprise Linux 8?

Watchmaker is supported on RedHat 8, CentOS 8 Stream, and Oracle Linux 8. See the [index](#) page for a list of all supported operating systems.

2.6.8 How can I exclude salt states when executing watchmaker?

The Salt worker in Watchmaker supports an `exclude_states` argument. When present, the value is passed directly to the `exclude` option of the [salt highstate execution module](#). To use this option with watchmaker from the command line, pass the argument `--exclude-states <sls_glob>`. For example:

```
# Exclude the state "foo" with an exact match
watchmaker --exclude-states foo

# Exclude all state names that begin with "foo"
watchmaker --exclude-states foo*

# Exclude multiple states "foo" and "bar" with an exact match
watchmaker --exclude-states foo,bar
```

2.6.9 Can I use the underlying salt functionality directly?

Yes, by passing watchmaker's salt configuration directory to the salt command, using the `-c|--config-dir` argument:

- Linux: `/opt/watchmaker/salt`
- Windows: `C:\Watchmaker\salt\conf`

For example:

```
# -c/--config-dir
salt-call -c /opt/watchmaker/salt state.show_top
```

2.6.10 Can I use watchmaker to toggle my RedHat/Centos host's FIPS mode?

Yes, indirectly. Because watchmaker implements most of its functionality via [SaltStack](#) modules, you can directly-use the underlying SaltStack functionality to effect the desired change. This is done from the commandline - as root - by executing:

- Disable FIPS-mode: `salt-call -c /opt/watchmaker/salt ash.fips_disable`
- Enable FIPS-mode: `salt-call -c /opt/watchmaker/salt ash.fips_enable`

And then rebooting the system.

2.6.11 How do I install watchmaker when I am using Python 2.6?

While Watchmaker no longer officially supports Python 2.6, you may use the last version where it was tested, Watchmaker 0.21.7. That version includes pins on dependencies that will work for Python 2.6.

However, there are three python "setup" packages needed just to install watchmaker, and these packages cannot be platform-restricted within the watchmaker package specification.

Below is the list of packages in question, and the versions that no longer support Python 2.6:

- `pip>=10`
- `wheel>=0.30.0`
- `setuptools>=37`

In order to install pip in Python 2.6, you can get it from:

- <https://bootstrap.pypa.io/pip/2.6/get-pip.py>

Once a Python 2.6-compatible pip version is installed, you can install compatible versions of the other packages like this:

```
python -m pip install --upgrade "pip<10" "wheel<0.30.0" "setuptools<37"
```

You can then *install watchmaker* by restricting the watchmaker version to the last version tested with Python 2.6:

```
python -m pip install "watchmaker==0.21.7"
```

2.6.12 How do I get Watchmaker release/project notifications?

Users may use an RSS reader of their choice to subscribe to the Watchmaker Release feed to get notifications on Watchmaker releases. The Watchmaker RSS release feed is <https://github.com/plus3it/watchmaker/releases.atom>.

Users can also “watch” the GitHub project to receive notifications on all project activity, <https://github.com/plus3it/watchmaker/subscription>.



2.7 API Reference

2.7.1 watchmaker

Watchmaker module.

```
class watchmaker.Arguments(config_path=None, log_dir=None, no_reboot=False, log_level=None, *args,  
                           **kwargs)
```

Bases: `dict`

Create an arguments object for the `watchmaker.Client`.

Parameters

- **config_path** – (`str`) Path or URL to the Watchmaker configuration file. If `None`, the default config.yaml file is used. (*Default: None*)
- **log_dir** – (`str`) Path to a directory. If set, Watchmaker logs to a file named `watchmaker.log` in the specified directory. Both the directory and the file will be created if necessary. If the file already exists, Watchmaker appends to it rather than overwriting it. If this argument evaluates to `False`, then logging to a file is disabled. Watchmaker will always output to stdout/stderr. Additionally, Watchmaker workers may use this directory to keep other log files. (*Default: None*)
- **no_reboot** – (`bool`) Switch to control whether to reboot the system upon a successful execution of `watchmaker.Client.install()`. When this parameter is set, Watchmaker will suppress the reboot. Watchmaker automatically suppresses the reboot if it encounters an error. (*Default: False*)
- **log_level** – (`str`) Level to log at. Case-insensitive. Valid options include, from least to most verbose:
 - `critical`
 - `error`
 - `warning`
 - `info`
 - `debug`

Important: For all **Keyword Arguments**, below, the default value of `None` means Watchmaker will get the value from the configuration file. Be aware that `None` and `'None'` are two different values, with different meanings and effects.

Keyword Arguments

- **admin_groups** – (`str`) Set a salt grain that specifies the domain `_groups_` that should have root privileges on Linux or admin privileges on Windows. Value must be a colon-separated string. On Linux, use the `^` to denote spaces in the group name. (*Default: None*)

```
admin_groups = "group1:group2"

# (Linux only) The group names must be lowercased. Also, if
# there are spaces in a group name, replace the spaces with a
# '^'.
admin_groups = "space^out"

# (Windows only) No special capitalization nor syntax
# requirements.
admin_groups = "Space Out"
```

- **admin_users** – (`str`) Set a salt grain that specifies the domain `_users_` that should have root privileges on Linux or admin privileges on Windows. Value must be a colon-separated string. (*Default: None*)

```
admin_users = "user1:user2"
```

- **computer_name** – (`str`) Set a salt grain that specifies the computername to apply to the system. (*Default: None*)
- **environment** – (`str`) Set a salt grain that specifies the environment in which the system is being built. For example: `dev`, `test`, or `prod`. (*Default: None*)
- **salt_states** – (`str`) Comma-separated string of salt states to apply. A value of `None` will not apply any salt states. A value of `'Highstate'` will apply the salt highstate. (*Default: None*)
- **ou_path** – (`str`) Set a salt grain that specifies the full DN of the OU where the computer account will be created when joining a domain. (*Default: None*)

```
ou_path="OU=Super Cool App,DC=example,DC=com"
```

- **extra_arguments** – (`list`) A list of extra arguments to be merged into the worker configurations. The list must be formed as pairs of named arguments and values. Any leading hyphens in the argument name are stripped. (*Default: []*)

```
extra_arguments=['--arg1', 'value1', '--arg2', 'value2']

# This list would be converted to the following dict and merged
# into the parameters passed to the worker configurations:
{'arg1': 'value1', 'arg2': 'value2'}
```

`class watchmaker.Client(arguments)`

Bases: `object`

Prepare a system for setup and installation.

Keyword Arguments

arguments – (*Arguments*) A dictionary of arguments. See *watchmaker.Arguments*.

install()

Execute the watchmaker workers against the system.

Upon successful execution, the system will be properly provisioned, according to the defined configuration and workers.

watchmaker.managers

Watchmaker managers module.

watchmaker.managers.platform

Watchmaker base manager.

class `watchmaker.managers.platform.PlatformManagerBase`(*system_params*, *args, **kwargs)

Bases: `object`

Base class for operating system managers.

All child classes will have access to methods unless overridden by an identically-named method in the child class.

Parameters

system_params – (`dict`) Attributes, mostly file-paths, specific to the system-type (Linux or Windows). The dict keys are as follows:

prepdirt:

Directory where Watchmaker will keep files on the system.

readyfile:

Path to a file that will be created upon successful completion.

logdir:

Directory to store log files.

workingdir:

Directory to store temporary files. Deleted upon successful completion.

restart:

Command to use to restart the system upon successful completion.

shutdown_path:

(Windows-only) Path to the Windows `shutdown.exe` command.

retrieve_file(*url*, *filename*)

Retrieve a file from a provided URL.

Supports all `urllib.request` handlers, as well as S3 buckets.

Parameters

- **url** – (`str`) URL to a file.
- **filename** – (`str`) Path where the file will be saved.

create_working_dir(*basedir*, *prefix*)

Create a directory in *basedir* with a prefix of *prefix*.

Parameters

- **prefix** – (*str*) Prefix to prepend to the working directory.
- **basedir** – (*str*) The directory in which to create the working directory.

Returns

Path to the working directory.

Return type

str

call_process(*cmd*, *log_pipe*='all', *raise_error*=True)

Execute a shell command.

Parameters

- **cmd** – (*list*) Command to execute.
- **log_pipe** – (*str*) Controls what to log from the command output. Supports three values: *stdout*, *stderr*, *all*. (*Default*: *all*)
- **raise_error** – (*bool*) Switch to control whether to raise if the command return code is non-zero. (*Default*: *True*)

Returns

Dictionary containing three keys: *retcode* (*int*), *stdout* (*bytes*), and *stderr* (*bytes*).

Return type

dict

cleanup()

Delete working directory.

extract_contents(*filepath*, *to_directory*, *create_dir*=False)

Extract a compressed archive to the specified directory.

Parameters

- **filepath** – (*str*) Path to the compressed file. Supported file extensions:
 - *.zip*
 - *.tar.gz*
 - *.tgz*
 - *.tar.bz2*
 - *.tbz*
- **to_directory** – (*str*) Path to the target directory
- **create_dir** – (*bool*) Switch to control the creation of a subdirectory within *to_directory* named for the filename of the compressed file. (*Default*: *False*)

class watchmaker.managers.platform.**LinuxPlatformManager**(*system_params*, **args*, ***kwargs*)

Bases: *PlatformManagerBase*

Base class for Linux Platforms.

Serves as a foundational class to keep OS consistency.

class watchmaker.managers.platform.WindowsPlatformManager(*system_params*, *args, **kwargs)

Bases: *PlatformManagerBase*

Base class for Windows Platform.

Serves as a foundational class to keep OS consistency.

watchmaker.managers.worker_manager

Watchmaker workers manager.

class watchmaker.managers.worker_manager.WorkersManagerBase(*system_params*, *workers*, *args, **kwargs)

Bases: *object*

Base class for worker managers.

Parameters

- **system_params** – (*dict*) Attributes, mostly file-paths, specific to the system-type (Linux or Windows).
- **workers** – (*collections.OrderedDict*) Workers to run and associated configuration data.

worker_cadence()

Manage worker cadence.

class watchmaker.managers.worker_manager.LinuxWorkersManager(*system_params*, *workers*, *args, **kwargs)

Bases: *WorkersManagerBase*

Manage the worker cadence for Linux systems.

cleanup()

Execute cleanup function.

class watchmaker.managers.worker_manager.WindowsWorkersManager(*system_params*, *workers*, *args, **kwargs)

Bases: *WorkersManagerBase*

Manage the worker cadence for Windows systems.

cleanup()

Execute cleanup function.

watchmaker.workers

Watchmaker workers module.

watchmaker.workers.base

Watchmaker base worker.

```
class watchmaker.workers.base.WorkerBase(system_params, *args, **kwargs)
```

Bases: `object`

Define the architecture of a Worker.

```
abstract before_install()
```

Add before_install method to all child classes.

```
abstract install()
```

Add install method to all child classes.

watchmaker.workers.salt

Watchmaker salt worker.

```
class watchmaker.workers.salt.SaltBase(*args, **kwargs)
```

Bases: `WorkerBase`, `PlatformManagerBase`

Cross-platform worker for running salt.

Parameters

- **salt_debug_log** – (`list`) Filesystem path to a file where the salt debug output should be saved. When unset, the salt debug log is saved to the Watchmaker log directory. (*Default:* `''`)
- **salt_content** – (`str`) URL to a salt content archive (zip file) that will be uncompressed in the watchmaker salt “srv” directory. This typically is used to create a top.sls file and to populate salt’s file_roots. (*Default:* `''`)
 - *Linux:* `/srv/watchmaker/salt`
 - *Windows:* `C:\Watchmaker\Salt\srv`
- **salt_content_path** – (`str`) Used in conjunction with the “salt_content” arg. Glob pattern for the location of salt content files inside the provided salt_content archive. To be used when salt content files are located within a sub-path of the archive, rather than at its top-level. Multiple paths matching the given pattern will result in error. E.g. `salt_content_path='*/'` (*Default:* `''`)
- **salt_states** – (`str`) Comma-separated string of salt states to execute. When “highstate” is included with additional states, “highstate” runs first, then the other states. Accepts two special keywords (case-insensitive): (*Default:* `'highstate'`)
 - `none`: Do not apply any salt states.
 - `highstate`: Apply the salt “highstate”.
- **exclude_states** – (`str`) Comma-separated string of states to exclude from execution. (*Default:* `''`)
- **user_formulas** – (`dict`) Map of formula names and URLs to zip archives of salt formulas. These formulas will be downloaded, extracted, and added to the salt file roots. The zip archive must contain a top-level directory that, itself, contains the actual salt formula. To “overwrite” bundled submodule formulas, make sure the formula name matches the submodule name. (*Default:* `{}`)

- **admin_groups** – (`str`) Sets a salt grain that specifies the domain groups that should have root privileges on Linux or admin privileges on Windows. Value must be a colon-separated string. E.g. "group1:group2" (*Default: ''*)
- **admin_users** – (`str`) Sets a salt grain that specifies the domain users that should have root privileges on Linux or admin privileges on Windows. Value must be a colon-separated string. E.g. "user1:user2" (*Default: ''*)
- **environment** – (`str`) Sets a salt grain that specifies the environment in which the system is being built. E.g. dev, test, prod, etc. (*Default: ''*)
- **ou_path** – (`str`) Sets a salt grain that specifies the full DN of the OU where the computer account will be created when joining a domain. E.g. "OU=SuperCoolApp,DC=example,DC=com" (*Default: ''*)
- **pip_install** – (`list`) Python packages to be installed prior to applying the high state. (*Default: []*)
- **pip_args** – (`list`) Options to pass to pip when installing packages. (*Default: []*)
- **pip_index** – (`str`) URL used for an index by pip. (*Default: https://pypi.org/simple*)

before_install()

Validate configuration before starting install.

install()

Install Salt.

run_salt(command, **kwargs)

Execute salt command.

Parameters

command – (`str` or `list`) Salt options and a salt module to be executed by salt-call. Watchmaker will always begin the command with the options `--local`, `--retcode-passthrough`, and `--no-color`, so do not specify those options in the command.

service_status(service)

Get the service status using salt.

Parameters

service – (`obj:str`) Name of the service to query.

Returns

(`'running'`, `'enabled'`)

First element is the service running status. Second element is the service enabled status. Each element is a `bool` representing whether the service is running or enabled.

Return type

`tuple`

service_stop(service)

Stop a service status using salt.

Parameters

service – (`str`) Name of the service to stop.

Returns

True if the service was stopped. False if the service could not be stopped.

Return type`bool`**service_start(service)**

Start a service status using salt.

Parameters

service – (`str`) Name of the service to start.

Returns

True if the service was started. False if the service could not be started.

Return type`bool`**service_disable(service)**

Disable a service using salt.

Parameters

service – (`str`) Name of the service to disable.

Returns

True if the service was disabled. False if the service could not be disabled.

Return type`bool`**service_enable(service)**

Enable a service using salt.

Parameters

service – (`str`) Name of the service to enable.

Returns

True if the service was enabled. False if the service could not be enabled.

Return type`bool`**process_grains()**

Set salt grains.

process_states(states, exclude)

Apply salt states but exclude certain states.

Parameters

- **states** – (`str`) Comma-separated string of salt states to execute. When “highstate” is included with additional states, “highstate” runs first, then the other states. Accepts two special keywords (case-insensitive):
 - none: Do not apply any salt states.
 - highstate: Apply the salt “highstate”.
- **exclude** – (`str`) Comma-separated string of states to exclude from execution.

class watchmaker.workers.salt.SaltLinux(*args, **kwargs)

Bases: `SaltBase`, `LinuxPlatformManager`

Run salt on Linux.

Parameters

- **install_method** – (**str**) **Required**. Method to use to install salt. (*Default: yum*)
 - yum: Install salt from an RPM using yum.
 - git: Install salt from source, using the salt bootstrap.
- **bootstrap_source** – (**str**) URL to the salt bootstrap script. Required if **install_method** is git. (*Default: ''*)
- **git_repo** – (**str**) URL to the salt git repo. Required if **install_method** is git. (*Default: ''*)
- **salt_version** – (**str**) A git reference present in **git_repo**, such as a commit or a tag. If not specified, the HEAD of the default branch is used. (*Default: ''*)

install()

Install salt and execute salt states.

class watchmaker.workers.salt.SaltWindows(*args, **kwargs)

Bases: [SaltBase](#), [WindowsPlatformManager](#)

Run salt on Windows.

Parameters

- **installer_url** – (**str**) **Required**. URL to the salt installer for Windows. (*Default: ''*)
- **ash_role** – (**str**) Sets a salt grain that specifies the role used by the ash-windows salt formula. E.g. "MemberServer", "DomainController", or "Workstation" (*Default: ''*)

install()

Install salt and execute salt states.

watchmaker.workers.yum

Watchmaker yum worker.

class watchmaker.workers.yum.Yum(*args, **kwargs)

Bases: [WorkerBase](#), [LinuxPlatformManager](#)

Install yum repos.

Parameters

- **repo_map** – (**list**) List of dictionaries containing a map of yum repo files to systems. (*Default: []*)

get_dist_info()

Validate the Linux distro and return info about the distribution.

get_mapped_dist_name()

Return a normalized dist-name value.

before_install()

Validate configuration before starting install.

install()

Install yum repos defined in config file.

2.8 Contributing

Contributions are welcome, and they are greatly appreciated! Every little bit helps, and credit will always be given.

2.8.1 Bug Reports

When [reporting a bug](#) please include:

- Your operating system name and version.
- Any details about your local setup that might be helpful in troubleshooting.
- Detailed steps to reproduce the bug.

2.8.2 Documentation Improvements

Watchmaker could always use more documentation, whether as part of the official Watchmaker docs, in docstrings, or even on the web in blog posts, articles, and such. The official documentation is maintained within this project in docstrings or in the [docs](#) directory. Contributions are welcome, and are made the same way as any other code. See [Development](#) guide.

2.8.3 Feature Requests and Feedback

The best way to send feedback is to [file an issue](#) on GitHub.

If you are proposing a feature:

- Explain in detail how it would work.
- Keep the scope as narrow as possible, to make it easier to implement.
- Remember that this is a community-driven, open-source project, and that code contributions are welcome. :)

2.8.4 Development Guide

To set up `watchmaker` for local development:

1. Fork [watchmaker](#) (look for the “Fork” button).
2. Clone your fork locally and update the submodules:

```
git clone https://github.com/your_name_here/watchmaker.git && cd watchmaker
git submodule update --init --recursive
```

3. Create a branch for local development:

```
git checkout -b name-of-your-bugfix-or-feature
```

4. Now you can make your changes locally.
5. When you're done making changes, use [tox](#) to run the linter, the tests, and the doc builder:

```
tox
```

NOTE: This will test the package in all versions of Python listed in `tox.ini`. If `tox` cannot find the interpreter for the version, the test will fail with an `InterpreterNotFound` error. This is ok, as long as at least one interpreter runs and the tests pass. You can also specify which *tox environments* to execute, which can be used to restrict the Python version required.

You can also rely on Travis and Appveyor to [run the tests](#) after opening the pull request. They will be slower though...

6. In addition to building the package and running the tests, `tox` will build any docs associated with the change. They will be located in the `dist/docs` directory. Navigate to the folder, open `index.html` in your browser, and verify that the doc text and formatting are as you intended.

If you *only* want to build the docs, run:

```
tox -e docs
```

Note: depending on your development environment, your browser may not be able to locate to above-created, rendered content. If so, it will be necessary to copy or relocate the documentation to location that your preferred-browser *can* access them.

7. Commit your changes and push your branch to GitHub:

```
git add .
git commit -m "Your detailed description of your changes."
git push origin name-of-your-bugfix-or-feature
```

8. Submit a pull request through the GitHub website.

2.8.5 Pull Request Guidelines

If you need some code review or feedback while you are developing the code just open the pull request.

For pull request acceptance, you should:

1. Include passing tests (Ensure `tox` is successful).
2. Update documentation whenever making changes to the API or functionality.
3. Add a note to `CHANGELOG.md` about the changes. Include a link to the pull request.

2.8.6 Tox Tips

1. The *primary* tox environments for `watchmaker` include:

- `check`
- `docs`
- `py26`
- `py27`
- `py35`
- `py36`

2. To run a subset of environments:

```
tox -e <env1>,<env2>,<env3>,etc
```

3. To run a subset of tests:

```
tox -e <environment> -- py.test -k <test_myfeature>
```

4. To run all the test environments in *parallel*, use detox:

```
pip install detox
detox
```

2.8.7 Build a Development Branch in EC2

To install and run a development branch of watchmaker on a new EC2 instance, specify something like this for EC2 userdata:

- **For Linux:** Modify GIT_REPO and GIT_BRANCH to reflect working values for your development build. Modify PIP_URL and PYPI_URL as needed.

```
#!/bin/sh
GIT_REPO=https://github.com/<your-github-username>/watchmaker.git
GIT_BRANCH=<your-branch>

PYPI_URL=https://pypi.org/simple

# Setup terminal support for UTF-8
export LC_ALL=en_US.UTF-8
export LANG=en_US.UTF-8

# Install pip
python3 -m ensurepip

# Install git
yum -y install git

# Upgrade pip and setuptools
python3 -m pip install --index-url="$PYPI_URL" --upgrade pip setuptools

# Clone watchmaker
git clone "$GIT_REPO" --branch "$GIT_BRANCH" --recursive

# Install watchmaker
cd watchmaker
python3 -m pip install --index-url "$PYPI_URL" --editable .

# Run watchmaker
watchmaker --log-level debug --log-dir=/var/log/watchmaker
```

- **For Windows:** Modify GitRepo and GitBranch to reflect working values for your development build. Optionally modify BootstrapUrl, PythonUrl, GitUrl, and PypiUrl as needed.

```
<powershell>
$GitRepo = "https://github.com/<your-github-username>/watchmaker.git"
$GitBranch = "<your-branch>"
```

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```

$BootstrapUrl = "https://watchmaker.cloudarmor.io/releases/latest/watchmaker-
↳bootstrap.ps1"
$PythonUrl = "https://www.python.org/ftp/python/3.10.11/python-3.10.11-amd64.exe"
$GitUrl = "https://github.com/git-for-windows/git/releases/download/v2.40.1.windows.
↳1/Git-2.40.1-64-bit.exe"
$PypiUrl = "https://pypi.org/simple"

# Use TLS 1.2+
[Net.ServicePointManager]::SecurityProtocol = "Tls12, Tls13"

# Download bootstrap file
$BootstrapFile = "${Env:Temp}\${($BootstrapUrl}.split("/")[-1])"
(New-Object System.Net.WebClient).DownloadFile($BootstrapUrl, $BootstrapFile)

# Install python and git
& "$BootstrapFile" `
    -PythonUrl "$PythonUrl" `
    -GitUrl "$GitUrl" `
    -Verbose -ErrorAction Stop

# Upgrade pip and setuptools
python -m pip install --index-url="$PypiUrl" --upgrade pip setuptools

# Clone watchmaker
git clone "$GitRepo" --branch "$GitBranch" --recursive

# Install watchmaker
cd watchmaker
python -m pip install --index-url "$PypiUrl" --editable .

# Run watchmaker
watchmaker --log-level debug --log-dir=C:\Watchmaker\Logs
</powershell>

```

2.9 Changelog

2.9.1 0.27.2

Released: 2023.05.18

Summary:

- Adds support for salt 3006
- Builds standalone executable using Python 3.10
- Documents additional expected findings for EL8 systems
- Uses Python 3.10 in all documentation references
- Updates default config to use salt 3006.1
- Uses SCC 5.7.1 in default salt content

- ash-linux-formula
 - Simplifies logic for managing faillock.conf
- ash-windows-formula
 - Updates custom modules for compatibility with Salt 3006 while remaining backwards compatible with salt 3005 and earlier
- splunkforwarder-formula
 - Sets splunk user/group on files and directories, eliminating “Changes” when re-executing the formula

2.9.2 0.27.1

Released: 2023.05.08

Summary:

- Fixes typo in upload of Windows standalone binary to GitHub Releases
- Documents known/spurious EL8 findings that scanning utilities may flag erroneously
- Fixes the check that skips reinstalling salt when the correct version is already installed
- Publishes EL8 scap scans as a release artifact to `watchmaker.cloudarmor.io`, alongside the standalone binaries
- Updates scap pillar in default salt content to run scans properly on CentOS Stream and scap version 1.3
- ash-linux-formula
 - Fixes oscap remediation on CentOS Stream 8 and Oracle Linux 8
 - Addresses numerous additional STIG findings on EL8 systems that were not addressed with oscap remediation
 - Attempts to address EL8 issue with aws-cli, where fapolicyd blocks execution
- forescout-secure-connector-formula
 - Establishes symlink so logs are written to `/var/log` partition
- scap-formula
 - Updates openscap content to v0.1.67, using scap 1.3 datastreams. This also addresses issues with expiry on passwordless local users

2.9.3 0.27.0

Released: 2023.03.31

Summary:

- Releases support for EL8 platforms, to include Red Hat 8, CentOS 8 Stream, and Oracle Linux 8. Future work may also add support for Rocky Linux 8 and Alma Linux 8
 - CAVEAT: With this release, on FIPS-enabled EL8 systems, please use the [PyPi install](#) or the [source install methods](#). Currently, the standalone method for EL8 **does not** work when the system is FIPS-enabled. The problem is not yet entirely understood. Further investigation is needed before this issue can be resolved
- Updates salt worker to avoid re-installing salt when `salt-call --version` matches the `salt_version` in the Watchmaker config

- Updates EL7 findings documentation to line up with latest stig version
- Installs `dnspython` package when using default Watchmaker config, to support the join-domain `nsupdate` state
- `ash-linux-formula`
 - Adds handlers to address findings in latest stig versions and increase coverage
- `mcafee-agent-formula`
 - Adds a `trellix-agent` salt state to support the new name for the software
- `join-domain-formula`
 - Linux: Adds an `nsupdate` salt state that will register forward and reverse dns records
 - Windows: Updates collision handling and join actions to use the same domain controller
 - Windows: Supports collision handling where an existing computer object was created by a different service account than is now specified for the join action
- `winrepo`: Adds a `trellix-agent` package definition

2.9.4 0.26.5

Released: 2023.03.10

Summary:

- `join-domain-formula`
 - Linux: Output `journald` logs on join-domain failures
 - Linux: Re-order `sssd` conf file Salt states and explicitly set `replace` setting to `false`
 - Linux: Patch `find-collision.sh` script to fix computer-object search

2.9.5 0.26.4

Released: 2023.03.03

Summary:

- Attempts to fix the release automation so the Windows standalone is published to GitHub Releases
- Validates functionality with salt 3005.1 and updates default config to use salt 3005.1
- `join-domain-formula`
 - Windows: Provides pillar options to configure DNS registration settings, to support registration of reverse DNS records

2.9.6 0.26.3

Released: 2023.02.27

Summary:

- Skips provider detection when provider requirements are not installed
- Updates watchmaker salt log config to avoid capturing sensitive data in salt log
- forescout-secure-connector-formula
 - Adds support for EL8 when FIPS is enabled
- name-computer-formula
 - Sets hostname as fqdn when dns_domain is provided
- join-domain-formula
 - Runs fix-collision script when using sssd
 - Updates fix-collision to avoid capturing sensitive values in salt log
 - Updates sssd method to set extra os attributes only when requested
 - Updates windows join script to avoid capturing sensitive values in salt log

2.9.7 0.26.2

Released: 2023.02.13

Summary:

- Fixes publishing of Windows standalone to GitHub Releases
- docs
 - Provides guidance on using S3 URL feature in config references
 - Describes prerequisites for using AWS and Azure features
 - Removes references to EL6 and Python 2.6
 - Removes references to deprecated `--s3-url` argument
- join-domain-formula
 - Adds support for EL8, using sssd to perform the domain-join

2.9.8 0.26.1

Released: 2023.02.08

Summary:

- Uses pyinstaller directly to build standalone packages, eliminating dependency on gravitybee
- Uses new python apis to reference package metadata and resources, improving support for alternative packaging methods, like in-memory runtimes (pyoxidizer) or ziparchives
- Adds PEP517 package metadata

- [Alpha] Allows watchmaker to run on Red Hat Enterprise Linux 8, Centos 8 Stream, Oracle Linux 8, Alma Linux 8, and Rocky Linux 8. Currently on the ash-linux hardening formula will work; none of the other salt formulas have yet been updated for EL8 support
- ash-windows
 - Fixes warning in lgpo module about using `is` instead of `==` to compare string-literal values

2.9.9 0.26.0

Commit Delta: [Change from 0.25.0 release](#)

Released: 2022.12.21

Summary:

- Adds support for posting to a status provider. Initial capability supports AWS and will post the Watchmaker status to an EC2 instance tag. Status values include “Running”, “Completed”, or “Failed”. For more information on this feature, see <https://watchmaker.cloudarmor.io/en/stable/configuration.html#status>.
- [Alpha] Support posting status to Azure as a Virtual Machine tag
- [Alpha] Support for EL8 platforms is improving but still in development. Targeted platforms include: Red Hat Enterprise Linux 8, Centos 8 Stream, Oracle Linux 8, Alma Linux 8, and Rocky Linux 8
- ash-linux-formula
 - Supports EL8 platforms
- join-domain-formula
 - Fixes hostname logic so automatic renaming works correctly
- scap-formula
 - Supports EL8 platforms

2.9.10 0.25.0

Commit Delta: [Change from 0.24.3 release](#)

Released: 2022.10.05

Summary:

- [Alpha] Begins initial preparation to support running watchmaker on EL8 platforms
- forescout-secure-connector-formula
 - First release that packages a formula for ForeScout Secure Connector

2.9.11 0.24.3

Commit Delta: [Change from 0.24.2 release](#)

Released: 2022.09.16

Summary:

- ash-linux-formula
 - Adds check to ensure root account password is set to not expire
- join-domain-formula
 - Removes PAM Lsass login re-configuration

2.9.12 0.24.2

Commit Delta: [Change from 0.24.1 release](#)

Released: 2022.08.16

Summary:

- scap-formula
 - Updates OpenSCAP and DISA STIG content
 - Linux: Adds EL8 content
- watchmaker-salt-content
 - Windows: Re-adds scap scan using public distributable SCC 5.5

2.9.13 0.24.1

Commit Delta: [Change from 0.24.0 release](#)

Released: 2022.07.27

Summary:

- Builds Linux standalone with python 3.8
- Updates default config to use Salt 3004.2
- Updates Windows usage docs with requirement to enforce modern TLS versions
- join-domain-formula
 - Windows: Quotes path when running scripts to configure local admin group
- ash-linux-formula
 - Tests if grub.cfg exists before attempting to modify it

2.9.14 0.24.0

Commit Delta: [Change from 0.23.4 release](#)

Released: 2022.03.09

Summary:

- Updates default config to use Salt 3004
- scap-formula
 - Fixes invalid requisite reference for scap.scan

2.9.15 0.23.4

Commit Delta: [Change from 0.23.3 release](#)

Released: 2021.12.20

Summary:

- ash-windows: Adds baseline `ash-windows.cis_1_3_0`
- Builds python 3.8 into standalone binary instead of python 3.6
- Uses SERVER_AUTH for ssl context, fixing bug resulting from incorrect use of CLIENT_AUTH previously

2.9.16 0.23.3

Commit Delta: [Change from 0.23.2 release](#)

Released: 2021.09.28

Summary:

- Added publishing of SCAP reports for Linux systems with each release
- Fixed CLI behavior when passing 'none' value, e.g. `--salt-states none`
- Updated default config to use Salt 3003.3
- mcafee-agent-formula
 - (Linux) Refactored to allow install over an existing installation

2.9.17 0.23.2

Commit Delta: [Change from 0.23.1 release](#)

Released: 2021.08.11

Summary:

- Patched Salt worker to be case-sensitive when processing Salt states
- Refactored Salt states handling between CLI and config.yaml
- Standalone packages are now based on EL7 and are no longer compatible with EL6 (EL6 hasn't been supported for a while now)

2.9.18 0.23.1

Commit Delta: [Change from 0.23.0 release](#)

Released: 2021.07.15

Summary:

- ash-linux-formula
 - Supports managing FIPS when / and /boot are on the same partition
 - Allows oscap remediate to exit non-zero on valid errors
- Supports parsing extra_arguments when passed using = as the separator
 - E.g. `--user-formulas='{"foo-formula": "https://url-to/foo-formula.zip"}'`

2.9.19 0.23.0

Commit Delta: [Change from 0.22.2 release](#)

Released: 2021.07.08

Summary:

- Adds capability to run extra states after highstate
 - E.g. from cli, `--salt-states highstate,foo,bar`
 - E.g. in config file, `salt_states: highstate,foo,bar`
- Adds capability to pass complex worker arguments on the cli as JSON or YAML
 - E.g. `--user-formulas '{"foo-formula": "https://url-to/foo-formula.zip"}'`

2.9.20 0.22.2

Commit Delta: [Change from 0.22.1 release](#)

Released: 2021.06.17

Summary:

- ash-linux-formula
 - Patches RHEL-07-040810 to apply to only iptables-services RPM and not core-package iptables RPM

2.9.21 0.22.1

Commit Delta: [Change from 0.22.0 release](#)

Released: 2021.05.11

Summary:

- ash-linux-formula/nessus-agent-formula
 - Patches maxdepth parameter to use integer type to support Jinja rendering in Salt 3003

2.9.22 0.22.0

Commit Delta: [Change from 0.21.9 release](#)

Released: 2021.05.07

Summary:

- Updates default config.yaml to use Salt 3003
- ash-linux-formula
 - Adds ability to selectively skip extra EL7 STIG handlers
- nessus-agent-formula
 - (Linux) Updates nessus-agent to call install and configure states

2.9.23 0.21.9

Commit Delta: [Change from 0.21.8 release](#)

Released: 2021.04.26

Summary:

- Provides support for Salt 3003
- ash-linux-formula
 - Updates syntax to support Salt 3003
 - RHEL-07-040160 - Ensure no (competing) attempts to set TMOUT
 - RHEL-07-040860 - Adds ability to handle lack of /etc/sysct.conf file
- nessus-agent-formula
 - Separate agent install and configuration to support baked-in Nessus agent installations
- join-domain-formula
 - (Windows) Add double-quotes to Members parameter in order for startup task state to work with Salt 3003

2.9.24 0.21.8

Commit Delta: [Change from 0.21.7 release](#)

Released: 2021.03.11

Summary:

- Updated CI configs to set the correct version for the Windows standalone package. Effectively, this version is the same as 0.21.7.

2.9.25 0.21.7

Commit Delta: [Change from 0.21.6 release](#)

Released: 2021.03.10

Summary:

- ash-linux-formula
 - Coordinates sshd service restarts across all states that modify `/etc/ssh_config`, so the service restarts only once. This avoids systemd failures when the service restarts too frequently. See [ash-linux-formula PR #303](#).

2.9.26 0.21.6

Commit Delta: [Change from 0.21.5 release](#)

Released: 2021.03.03

Summary:

- ash-linux-formula
 - Adds patch to re-enable NOPASSWD sudo for users in `/etc/sudoers.d/` after oscap remediation.

2.9.27 0.21.5

Commit Delta: [Change from 0.21.4 release](#)

Released: 2021.02.25

Summary:

- ash-linux-formula
 - Replace `watch` with `listen` to restart the sshd service a single time
 - Make state `RHEL-07-040560` more resilient when the yum group info is missing
- scap-formula
 - Updates SCAP content from DISA (as of February 2021) and OpenSCAP (v0.1.54)
- Update watchmaker default `config.yaml` to use salt v2019.2.8
- Ability to browse [Watchmaker Cloudarmor repo](#)

2.9.28 0.21.4

Commit Delta: [Change from 0.21.3 release](#)

Released: 2020.12.04

Summary:

- nessus-agent-formula
 - (Linux) Switch to using Salt service state to ensure Nessus agent service is running

2.9.29 0.21.3

Commit Delta: [Change from 0.21.2 release](#)

Released: 2020.10.26

Summary:

- watchmaker-salt-content
 - (Linux) Updates scap-formula pillar to use alternative stig profile parameter for Red Hat

2.9.30 0.21.2

Commit Delta: [Change from 0.21.1 release](#)

Released: 2020.10.05

Summary:

- (Windows) Removes winrepo.genrepo usage in Salt worker since it's no longer required

2.9.31 0.21.1

Commit Delta: [Change from 0.21.0 release](#)

Released: 2020.08.20

Summary:

- splunkforwarder-formula
 - (Linux) Patches splunkforwarder state to work with Splunk Universal Forwarder v7.3.6

2.9.32 0.21.0

Commit Delta: [Change from 0.20.5 release](#)

Released: 2020.08.12

Summary:

- Updates default watchmaker config.yaml to use salt 2019.2.5

2.9.33 0.20.5

Commit Delta: [Change from 0.20.4 release](#)

Released: 2020.07.16

Summary:

- splunkforwarder-formula
 - (Linux) Patches splunkforwarder state to work with salt 2019.2.5

2.9.34 0.20.4

Commit Delta: [Change from 0.20.3 release](#)

Released: 2020.07.15

Summary:

- splunkforwarder-formula
 - (Windows) Patches splunkforwarder state to work with salt 2019.2.5

2.9.35 0.20.3

Commit Delta: [Change from 0.20.2 release](#)

Released: 2020.07.07

Summary:

- join-domain-formula
 - (Linux) Fixes issue with admin users not being able to sudo

2.9.36 0.20.2

Commit Delta: [Change from 0.20.1 release](#)

Released: 2020.07.01

Summary:

- scap-formula
 - Updates SCAP content from DISA (as of June 2020) and OpenSCAP (v0.1.50)

2.9.37 0.20.1

Commit Delta: [Change from 0.20.0 release](#)

Released: 2020.05.19

Summary:

- ash-linux-formula
 - Fixes issue with Postfix occasionally failing to start

2.9.38 0.20.0

Commit Delta: [Change from 0.19.0 release](#)

Released: 2020.05.06

Summary:

- Adds capability to install Python packages using Pip in Salt's Python interpreter

2.9.39 0.19.0

Commit Delta: [Change from 0.18.2 release](#)

Released: 2020.05.01

Summary:

- Updates Watchmaker file permissions and makes them more restrictive
- Adds new SaltWorker optional argument `--salt-content-path` that allows specifying glob pattern for salt files located within salt archive file

2.9.40 0.18.2

Commit Delta: [Change from 0.18.1 release](#)

Released: 2020.04.02

Summary:

- vault-auth-formula
 - Rename state to vault-auth
 - Add url keyword argument to read_secret execution module

2.9.41 0.18.1

Commit Delta: [Change from 0.18.0 release](#)

Released: 2020.03.23

Summary:

- Updates version constraint in default config to allow newer versions

2.9.42 0.18.0

Commit Delta: [Change from 0.17.5 release](#)

Released: 2020.03.23

Summary:

- Removes deprecated `emet-formula` and `dotnet4-formula` submodules
- Adds new `vault-auth-formula` submodule
- ash-windows-formula
 - Replaces usage of `Apply_LGPO_Delta.exe` with native python and salt functionality
 - Addresses additional findings for domain-joined systems
 - Removes deprecated baselines from Windows Server 2008 R2, 8.1, and IE 8, 9, and 10

2.9.43 0.17.5

Commit Delta: [Change from 0.17.4 release](#)

Released: 2020.03.13

Summary:

- join-domain-formula
 - Allow use of password with Linux join domain capability

2.9.44 0.17.4

Commit Delta: [Change from 0.17.3 release](#)

Released: 2020.02.28

Summary:

- ash-linux-formula
 - Updates custom STIGbyID baseline to address several scan findings.
- Add content for RHEL-07-040530/SV-86899

2.9.45 0.17.3

Commit Delta: [Change from 0.17.2 release](#)

Released: 2020.02.26

Summary:

- dotnet4-formula
 - Fix compatibility with Windows Server 2019 by using 2019 hotfixes
- ash-linux-formula
 - Improvements for STIGv2r6
 - Fix collisions caused by cat2 IDs and DISA numbering change
 - Use Salt Stack version 2019.2-2

2.9.46 0.17.2

Commit Delta: [Change from 0.17.1 release](#)

Released: 2020.02.25

Summary:

- Documents configuration vs cli argument handling and precedence
- Provides a table mapping common scan findings to an associated Finding ID
- Restores propagation of the None value on the cli to the workers
- ash-linux-formula
 - Ensures aide configuration complies with FIPS requirements

- ash-windows-formula
 - Adds missing sls to restore support for Windows 10
- join-domain-formula
 - Suppresses join-domain command in salt log output
 - (Windows) Supports using salt-native pillar security for the password value
- nessus-agent-formula
 - (Linux) Suppresses gpg verification so the pkg can be installed from a URL

2.9.47 0.17.1

Commit Delta: [Change from 0.17.0 release](#)

Released: 2020.01.28

Summary:

- Fixes release date in changelog for 0.17.0
- Removes salt worker special handling for `salt_states` since it is now handled properly in the `Arguments()` class
- pshelp-formula
 - Updates PowerShell help content, including Windows Server 2019

2.9.48 0.17.0

Commit Delta: [Change from 0.16.7 release](#)

Released: 2020.01.21

Summary:

- Add support for Windows Server 2019
- Use native markdown processing for PyPI long description
- Deprecate use of 'None' (string) in `config.yaml`
- Add optional `watchmaker_version` node to configuration
- Use Salt 2018.3.4 in default configuration

2.9.49 0.16.7

Commit Delta: [Change from 0.16.6 release](#)

Released: 2020.01.06

Summary:

- Pins PyYAML dependency when running on Python 3.4 or earlier

2.9.50 0.16.6

Commit Delta: [Change from 0.16.5 release](#)

Released: 2019.12.04

Summary:

- Uses CDN URLs for watchmaker config and content, instead of direct S3 URLs
- Pins backoff dependency when running on Python 3.4 or earlier

2.9.51 0.16.5

Commit Delta: [Change from 0.16.4 release](#)

Released: 2019.09.23

Summary:

- join-domain-formula
 - Add support for restricting Active Directory sites that will be consulted if the `ad_site_name` key-value is set in the pillar
- ash-linux-formula
 - Fix issue with log spamming by `systemd` related to file permissions
- ash-windows-formula
 - Update STIG baselines for 2019-07 SCAP content
- scap-formula
 - Rename DISA content files to reflect SCAP version
 - Update DISA SCAP content to July 2019 release
- salt-content
 - Update SCAP pillar to match filename changes in SCAP formula

2.9.52 0.16.4

Commit Delta: [Change from 0.16.3 release](#)

Released: 2019.08.23

Summary:

- Updates documentation on pip usage in Linux to always use `python3 -m pip...`
- dotnet4-formula
 - Adds .NET Framework 4.8 version and associated KB to lookup tables
- fup-formula
 - New salt formula to install packages via URL
- scap-formula
 - (Windows) Adds configuration to allow scan results to be generated when using SCC v5.0.2 and higher
- watchmaker-salt-content

- (Windows) Adds .NET Framework 4.8 info to dotnet winrepo package content

2.9.53 0.16.3

Commit Delta: [Change from 0.16.2 release](#)

Released: 2019.08.7

Summary:

- join-domain-formula
 - (Linux) Modifies method used to retrieve hostname to avoid issues with `hostname -f`
 - (Linux) Improves error messaging if tooling dependencies are not installed
 - (Linux) Modifies domain controller search mechanism to preserve compatibility with EL6
 - (Linux) Logs the computer name in the domain-join output
- mcafee-agent-formula
 - (Linux) Adds a pillar option to pass args to the mcafee agent installer
 - (Linux) Fixes match on OS version to ensure firewall ports are opened
- name-computer-formula
 - (Linux) Updates `/etc/hosts` with hostname fqdn, when the domain name is provided

2.9.54 0.16.2

Commit Delta: [Change from 0.16.1 release](#)

Released: 2019.07.11

Summary:

- join-domain-formula
 - Fixes detection of running system's join state, searches for shortname, and retries joins
 - Improves compatibility with strict Bash
 - Adds option to skip GPG check
- amazon-inspector-formula
 - Adds option to skip GPG check
- splunkforwarder-formula
 - Redirects splunk log folder with symlink
 - Adds option to skip GPG check

2.9.55 0.16.1

Commit Delta: [Change from 0.16.0 release](#)

Released: 2019.06.21

Summary:

- join-domain-formula
 - Updates find-collision.sh ldap search to include uppercase and lowercase versions of provided hostname
- scap-formula
 - Adds script to build OSCAP content with ‘stig’ profile included for CentOS
 - Updates OSCAP content to v0.1.44
- watchmaker-salt-content
 - Switches Linux scap profile pillar settings to ‘stig’

2.9.56 0.16.0

Commit Delta: [Change from 0.15.2 release](#)

Released: 2019.05.10

Summary:

- Adds salt content locally as a submodule to better support Watchmaker standalone packages
- dotnet4-formula
 - Updates formula to support the use of Python3 versions of Salt
- join-domain-formula
 - Adds additional enhancements and logic to better handle the domin-join process in Linux

2.9.57 0.15.2

Commit Delta: [Change from 0.15.1 release](#)

Released: 2019.04.12

Summary:

- ash-linux-formula
 - Removes outdated and conflicting states to allow setting of custom banner text
- join-domain-formula
 - Fixes issue with improper handling of admin names with spaces in Windows

2.9.58 0.15.1

Commit Delta: [Change from 0.15.0 release](#)

Released: 2019.04.05

Summary:

- join-domain-formula
 - (Linux) Avoids `unique` jinja filter to preserve compatibility for older versions of salt

2.9.59 0.15.0

Commit Delta: [Change from 0.14.2 release](#)

Released: 2019.04.04

Summary:

- Updates documentation to install pip using `ensurepip` module instead of external `get-pip.py`
- ash-linux-formula
 - Adds pillar option to set content for `/etc/issue` login banner
- join-domain-formula
 - (Linux) Adds pillar option to pass a list of domains to add to the trust list

2.9.60 0.14.2

Commit Delta: [Change from 0.14.1 release](#)

Released: 2019.03.26

Summary:

- join-domain-formula
 - Corrects regression on Windows to support adding admin groups that have spaces in the name

2.9.61 0.14.1

Commit Delta: [Change from 0.14.0 release](#)

Released: 2019.03.18

Summary:

- Fixes Python 2.6 incompatibility introduced by new version of PyYAML
- join-domain-formula
 - Fixes issue adding admin groups/users to Windows systems with recent versions of Salt

2.9.62 0.14.0

Commit Delta: [Change from 0.13.0 release](#)

Released: 2019.03.06

Summary:

- Adds additional documentation to answer common EL7 security scan findings
- ash-linux-formula
 - Implements additional Salt states to address security scan issues
 - * Capability to manage GRUB password configuration
 - * IgnoreRhosts setting in SSH daemon configuration
 - * CIS remediation handlers (CIS 5.2.3, CIS 5.2.5)
 - Adds Salt state to update audit-rule changes without a system reboot
- scap-formula
 - Updates SCAP Security Guide content to v0.1.41

2.9.63 0.13.0

Commit Delta: [Change from 0.12.1 release](#)

Released: 2019.01.29

Summary:

- amazon-inspector-formula
 - New salt formula distributed with watchmaker
 - Installs amazon-inspector agent
- Refactor watchmaker
 - Change naming mechanism from LinuxManager to LinuxPlatformManager
 - Change naming mechanism from WindowsManager to WindowsPlatformManager
 - Change naming mechanism from Manager to PlatformManager
 - Added abstract class WorkerBase for Workers to inherit from
- ash-linux-formula
 - Change ipv6 check to use if_inet6 file
 - Import correct source of fopen function
 - Configure Postfix to only use ipv4 when ipv6 is disabled

2.9.64 0.12.1

Commit Delta: [Change from 0.12.0 release](#)

Released: 2018.12.17

Summary:

- ash-windows-formula
 - Corrects yaml syntax error in win2016 DC baseline

2.9.65 0.12.0

Commit Delta: [Change from 0.11.0 release](#)

Released: 2018.12.13

Summary:

- Adds `valid_environments` option to config to allow for the restriction of environment selection

2.9.66 0.11.0

Commit Delta: [Change from 0.10.3 release](#)

Released: 2018.11.08

Summary:

- Adds enhancement to ensure `--admin-groups` parameters are lowercase on Linux systems
- Adds additional information to the `--version` flag
- Default values are now shown in help output
- scap-formula
 - Incorporates content from latest DISA SCAP benchmarks
 - * Microsoft .Net Framework 4 STIG Benchmark - Ver 1, Rel 5
 - * Microsoft Windows 2008 R2 DC STIG Benchmark - Ver 1, Rel 5
 - * Microsoft Windows 2008 R2 MS STIG Benchmark - Ver 1, Rel 30
 - * Microsoft Windows Server 2016 STIG Benchmark - Ver 1, Rel 31
 - * Red Hat 6 STIG Benchmark - Ver 1, Rel 21
 - * Red Hat 7 STIG Benchmark - Ver 2, Rel 1

2.9.67 0.10.3

Commit Delta: [Change from 0.10.2 release](#)

Released: 2018.10.18

Summary:

- ash-windows-formula
 - Updates Formula to Support Salt 2017.7.x and 2018.3.x
 - Removed admin account rename from delta state

2.9.68 0.10.2

Commit Delta: [Change from 0.10.1 release](#)

Released: 2018.09.27

Summary:

- Adds a gitlab-ci pages config to build Watchmaker docs
- Uses new hosting location to retrieve Salt packages
- Restricts click version on py2.6
- ash-windows-formula
 - New hosting location being used for all packages
- pshelp-formula
 - Removed byte-order-mark unicode character at beginning of init.sls file

2.9.69 0.10.1

Commit Delta: [Change from 0.10.0 release](#)

Released: 2018.08.09

Summary:

- No functional changes; just patches the CI/release configuration

2.9.70 0.10.0

Commit Delta: [Change from 0.9.6 release](#)

Released: 2018.08.08

Summary:

- Provides standalone packages that bundle the Python runtime together with Watchmaker and its dependencies
 - See <https://watchmaker.cloudarmor.io/en/stable/installation.html>
- ash-linux-formula
 - (el7) Ensures packages are up-to-date
 - (el7) Ensures firewalld is installed and running

- splunk-forwarder-formula
 - (linux) Uses a symlink to ensure logs are in the /var/log partition
- dotnet4-formula
 - Adds support for .NET 4.7.2
- nessus-agent-formula
 - New salt formula distributed with Watchmaker

2.9.71 0.9.6

Commit Delta: [Change from 0.9.5 release](#)

Released: 2018.05.16

Summary:

- windows-update-agent-formula
 - Supports new windows update settings, `AlwaysAutoRebootAtScheduledTime` and `AlwaysAutoRebootAtScheduledTimeMinutes`
- scap-formula
 - Incorporates content from OpenSCAP Security Guide v0.1.39-1

2.9.72 0.9.5

Commit Delta: [Change from 0.9.4 release](#)

Released: 2018.04.11

Summary:

- [\[PR #574\]](#) Updates Windows userdata example to execute pip using `python -m` when upgrading pip
- windows-update-agent-formula
 - Uses newer arguments for reg state, vname and vdata
 - Reduces duplication in windows update data model
 - Nests the windows update pillar options under the standard lookup key

2.9.73 0.9.4

Commit Delta: [Change from 0.9.3 release](#)

Released: 2018.04.09

Summary:

- ash-windows-formula
 - Updates STIG baselines to address all findings in latest SCAP benchmarks

2.9.74 0.9.3

Commit Delta: [Change from 0.9.2 release](#)

Released: 2018.03.08

Summary:

- scap-formula
 - Incorporates content from OpenSCAP Security Guide v0.1.38-1
 - Incorporates content from latest DISA SCAP benchmarks
 - * Microsoft Internet Explorer 11 STIG Benchmark - Ver 1, Rel 11
 - * Microsoft Windows 10 STIG Benchmark - Ver 1, Rel 10
 - * Microsoft Windows 2008 R2 DC STIG Benchmark - Ver 1, Rel 27
 - * Microsoft Windows 2008 R2 MS STIG Benchmark - Ver 1, Rel 28
 - * Microsoft Windows 2012 and 2012 R2 DC STIG Benchmark - Ver 2, Rel 11
 - * Microsoft Windows 2012 and 2012 R2 MS STIG Benchmark - Ver 2, Rel 11
 - * Microsoft Windows 8/8.1 STIG Benchmark - Ver 1, Rel 21
 - * Microsoft Windows Server 2016 STIG Benchmark - Ver 1, Rel 4
 - * Red Hat 6 STIG Benchmark - Ver 1, Rel 18
 - * Red Hat 7 STIG Benchmark - Ver 1, Rel 2
- dotnet4-formula
 - Skips dotnet4 hotfix install if a newer version is already installed
 - Creates per-OS maps for hotfix updates, since the hotfix id varies per OS

2.9.75 0.9.2

Commit Delta: [Change from 0.9.1 release](#)

Released: 2018.02.20

Summary:

- dotnet4-formula
 - Passes version correctly to module.run

2.9.76 0.9.1

Commit Delta: [Change from 0.9.0 release](#)

Released: 2018.02.17

Summary:

- This version was effectively a no-op, as the submodule was not updated as intended
- ~dotnet4-formula~
 - ~Passes version correctly to module.run~

2.9.77 0.9.0

Commit Delta: [Change from 0.8.0 release](#)

Released: 2018.02.12

Summary:

- [\[Issue #499\]](#)[\[PR #513\]](#) Includes additional details about the platform and python version in the watchmaker log
- [\[Issue #500\]](#)[\[PR #512\]](#) Retries file retrieval up to 5 times
- [\[Issue #501\]](#)[\[PR #507\]](#) Uses urllib handlers to retrieve all files
 - Deprecates the argument `--s3-source`; to retrieve a file from an S3 bucket use the syntax: `s3://<bucket>/<key>`
 - Local files may be specified as absolute or relative paths, and may or may not be prefixed with `file://`
- [\[PR #496\]](#) Moves CloudFormation and Terraform templates to their own project, [terraform-aws-watchmaker](#)
- [\[PR #491\]](#) Improves compatibility of the watchmaker bootstrap.ps1 script when executed by an Azure custom script extension
- [\[Issue #430\]](#)[\[PR #487\]](#) Writes watchmaker salt config to a custom path:
 - Windows: `C:\Watchmaker\Salt\conf`
 - Linux: `/opt/watchmaker/salt`
- scap-formula
 - Incorporates content from OpenSCAP Security Guide v0.1.37-1

2.9.78 0.8.0

Commit Delta: [Change from 0.7.2 release](#)

Released: 2018.01.02

Summary:

- [\[Issue #415\]](#)[\[PR #458\]](#) Forwards watchmaker log entries from the Windows Event Log to the EC2 System Log (Windows-only)
- [\[PR #425\]](#) Adds a log handler that writes watchmaker log entries to the Windows Event Log (Windows-only)
- [\[Issue #434\]](#)[\[PR #457\]](#) Updates doc build to replace `recommonmark` functionality entirely with `m2r`
- [\[PR #437\]](#) Modifies CloudFormation templates to use aws cli utility to retrieve the appscript rather than use the functionality built-in to the cfn bootstrap
- [\[PR #467\]](#) Sets environment variables for aws cli when executing the appscript option in the watchmaker CloudFormation templates

2.9.79 0.7.2

Commit Delta: [Change from 0.7.1 release](#)

Released: 2017.12.13

Summary:

- Installs futures only on Python 2 – no functional changes

2.9.80 0.7.1

Commit Delta: [Change from 0.7.0 release](#)

Released: 2017.12.04

Summary:

- Fixes readthedocs build – no functional changes

2.9.81 0.7.0

Commit Delta: [Change from 0.6.6 release](#)

Released: 2017.11.21

Summary:

- [\[PR #409\]](#) Provides terraform modules that deploy the watchmaker CloudFormation templates
- [\[Issue #418\]](#)[\[PR #419\]](#) Adds an `exclude-states` argument to the SaltWorker; specified states will be excluded from the salt state execution
- ash-windows-formula
 - Incorporates security settings from the DISA October quarterly release
- join-domain-formula
 - (Windows) Adds WMI method to set DNS search suffix
 - (Windows) Tests for the EC2Config XML settings file before modifying it
- scap-formula
 - (Linux) Distributes scap content from SCAP Security Guide v0.1.36-1
 - Distributes scap content from the DISA October quarterly release
- splunkforwarder-formula
 - Supports configuration of splunk log sources from pillar and grains inputs

2.9.82 0.6.6

Commit Delta: [Change from 0.6.5 release](#)

Released: 2017.10.18

Summary:

- ash-linux-formula
 - (el7) Fixes typos in the firewalld “safety” scripts that resulted in a failure when firewalld was reloaded
- mcafee-agent-formula
 - (el7) Adds required inbound ports to all firewalld zones, to support the event where the default zone is modified from “public”
- splunkforwarder-formula
 - (el7) Adds required outbound ports to the OUTPUT chain; previously, they were mistakenly being added as inbound rules

2.9.83 0.6.5

Commit Delta: [Change from 0.6.4 release](#)

Released: 2017.09.29

Summary:

- [\[PR #391\]](#) Updates CloudFormation templates with a parameter that exposes the option to use the S3 API and the instance role to retrieve the Watchmaker content archive
- ash-linux-formula
 - (el7) Updates firewalld “safety” state so that firewalld remains in the active state; the prior approach left firewalld dead/inactive, until the service was restarted or the system was rebooted

2.9.84 0.6.4

Commit Delta: [Change from 0.6.3 release](#)

Released: 2017.09.22

Summary:

- [\[PR #381\]](#) Restricts wheel version on Python 2.6 to be less than or equal to 0.29.0, as wheel 0.30.0 removed support for py26.

2.9.85 0.6.3

Commit Delta: [Change from 0.6.2 release](#)

Released: 2017.08.11

Summary:

- ash-linux-formula
 - (el7) Includes a “safety” state for firewalld that ensures SSH inbound access will remain available, in the event the default zone is set to “drop”

2.9.86 0.6.2

Commit Delta: [Change from 0.6.1 release](#)

Released: 2017.08.07

Summary:

- ash-linux-formula
 - (el6) Improve the method of disabling the systemctl option `ip_forward`, to account for the behavior of the `aws-vpc-nat` rpm
- scap-formula
 - (elX) Updates openscap security guide content to version 0.1.34-1

2.9.87 0.6.1

Commit Delta: [Change from 0.6.0 release](#)

Released: 2017.08.01

Summary:

- ash-linux-formula
 - Modified the FIPS custom execution module to discover the boot partition and add the `boot=` line to the grub configuration

2.9.88 0.6.0

Commit Delta: [Change from 0.5.1 release](#)

Released: 2017.07.25

Summary:

- ash-linux-formula
 - Updates the EL7 stig baseline to manage the FIPS state. The state defaults to `enabled` but can be overridden via a pillar or grain, `ash-linux:lookup:fips-state`. The grain takes precedence over the pillar. Valid values are `enabled` or `disabled`
- ash-windows-formula
 - Updates the STIG baselines for Windows Server 2016 member servers and domain controllers with SCAP content from the DISA v1r1 SCAP benchmark release
- join-domain-formula
 - Fixes an issue when joining Windows 2016 servers to a domain, where the `Set-DnsSearchSuffix.ps1` helper would fail because the builtin PowerShell version does not work when `$null` is used in a `ValidateSet`. The equivalent value must now be passed as the string, `"null"`
- scap-formula
 - Adds SCAP content for the Window Server 2016 SCAP v1r1 Benchmark

2.9.89 0.5.1

Commit Delta: [Change from 0.5.0 release](#)

Released: 2017.07.08

Summary:

- [\[Issue #341\]](#)[\[PR #342\]](#) Manages selinux around salt state execution. In some non-interactive execution scenarios, if selinux is enforcing it can interfere with the execution of privileged commands (that otherwise work fine when executed interactively). Watchmaker now detects if selinux is enforcing and temporarily sets it to permissive for the duration of the salt state execution

2.9.90 0.5.0

Commit Delta: [Change from 0.4.4 release](#)

Released: 2017.06.27

Summary:

- [\[Issue #331\]](#)[\[PR #332\]](#) Writes the `role` grain to the key expected by the `ash-windows` formula. Fixes usage of the `--ash-role` option in the salt worker
- [\[Issue #329\]](#)[\[PR #330\]](#) Outputs watchmaker version at the debug log level
- [\[Issue #322\]](#)[\[PR #323\]](#)[\[PR #324\]](#) Fixes py2/py3 compatibility bug in how the yum worker handles file opening to check the Linux distro
- [\[Issue #316\]](#)[\[PR #320\]](#) Improves logging when salt state execution fails due to failed a state. The salt output is now returned to the salt worker, which processes the output, identifies the failed state, and raises an exception with the state failure
- `join-domain-formula`
 - (Linux) Reworks the `pbis` config states to make the logged output more readable

2.9.91 0.4.4

Commit Delta: [Change from 0.4.3 release](#)

Released: 2017.05.30

Summary:

- `join-domain-formula`
 - (Linux) Ignores a bad exit code from `pbis` config utility. The utility will return exit code 5 when modifying the `NssEnumerationEnabled` setting, but still sets the requested value. This exit code is now ignored

2.9.92 0.4.3

Commit Delta: [Change from 0.4.2 release](#)

Released: 2017.05.25

Summary:

- name-computer-formula
 - (Linux) Uses an alternate method of working around a bad code-path in salt that does not handle quoted values in `/etc/sysconfig/network`.

2.9.93 0.4.2

Commit Delta: [Change from 0.4.1 release](#)

Released: 2017.05.19

Summary:

- [\[PR #301\]](#) Sets the grains for `admin_groups` and `admin_users` so the keys are named as expected by the `join-domain` formula
- ash-linux-formula
 - Adds a custom module that lists users from the shadow file
 - Gets local users from the shadow file rather than `user.list_users`. Prevents a domain-joined system from attempting to iterate over all domain users (and potentially deadlocking on especially large domains)
- join-domain-formula
 - Modifies PBIS install method to use RPMs directly, rather than the SHAR installer
 - Updates approaches to checking for collisions and current join status to better handle various scenarios: not joined, no collision; not joined, collision; joined, computer object present; joined, computer object missing
 - Disables NSS enumeration to prevent PBIS from querying user info from the domain for every call to `getent` (or equivalents); domain-based user authentication still works fine
- name-computer-formula
 - (Linux) Does not attempt to retain network settings, to avoid a bug in salt; will be revisited when a patched salt version has been released

2.9.94 0.4.1

Commit Delta: [Change from 0.4.0 release](#)

Released: 2017.05.09

Summary:

- (EL7) Running *watchmaker* against EL7 systems will now pin the resulting configuration to the *watchmaker* version. See the updates to the two formulas in this version. Previously, *ash-linux* always used the content from the *scap-security-guide* rpm, which was updated out-of-sync with *watchmaker*, and so the resulting configuration could not be pinned by pinning the *watchmaker* version. With this version, *ash-linux* uses content distributed by *watchmaker*, via *scap-formula*, and so the resulting configuration will always be same on EL7 for a given version of *watchmaker* (as has always been the case for the other supported operating systems).
- ash-linux-formula

- Supports getting scap content locations from pillar
- scap-formula
 - Updates stig content with latest benchmark versions
 - Adds openscap ds.xml content, used to support remediate actions

2.9.95 0.4.0

Commit Delta: [Change from 0.3.1 release](#)

Released: 2017.05.06

Summary:

- [\[PR #286\]](#) Sets the computername grain with the correct key expected by the formula
- [\[PR #284\]](#) Converts cli argument parsing from argparse to click. This modifies the watchmaker dependencies, which warranted a 0.x.0 version bump. Cli and API arguments remain the same, so the change should be backwards-compatible.
- name-computer-formula
 - Adds support for getting the computername from pillar
 - Adds support for validating the specified computername against a pattern
- pshelp-formula
 - Attempts to address occasional stack overflow exception when updating powershell help

2.9.96 0.3.1

Commit Delta: [Change from 0.3.0 release](#)

Released: 2017.05.01

Summary:

- [\[PR #280\]](#) Modifies the dynamic import of boto3 to use only absolute imports, as the previous approach (attempt absolute and relative import) was deprecated in Python 3.3
- ntp-client-windows-formula:
 - Stops using deprecated arguments on reg.present states, which cleans up extraneous log messages in watchmaker runs under some configurations
- join-domain-formula:
 - (Windows) Sets the DNS search suffix when joining the domain, including a new pillar config option, ec2config to enable/disable the EC2Config option that also modifies the DNS suffix list.

2.9.97 0.3.0

Commit Delta: [Change from 0.2.4 release](#)

Released: 2017.04.24

Summary:

- [\[Issue #270\]](#) Defaults to a platform-specific log directory when call from the CLI:
 - Windows: `${Env:SystemDrive}\Watchmaker\Logs`
 - Linux: `/var/log/watchmaker`
- [\[PR #271\]](#) Modifies CLI arguments to use explicit log-levels rather than a verbosity count. Arguments have been adjusted to better accommodate the semantics of this approach:
 - Uses `-l|--log-level` instead of `-v|--verbose`
 - `-v` and `-V` are now both used for `--version`
 - `-d` is now used for `--log-dir`

2.9.98 0.2.4

Commit Delta: [Change from 0.2.3 release](#)

Released: 2017.04.20

Summary:

- Fixes a bad version string

2.9.99 0.2.3

Commit Delta: [Change from 0.2.2 release](#)

Released: 2017.04.20

Summary:

- [\[Issue #262\]](#) Merges lists in pillar files, rather than overwriting them
- [\[Issue #261\]](#) Manages the enabled/disabled state of the salt-minion service, before and after the install
- `splunkforwarder-formula`
 - (Windows) Ignores false bad exits from `Splunk clone-prep-clear-config`

2.9.100 0.2.2

Commit Delta: [Change from 0.2.1 release](#)

Released: 2017.04.15

Summary:

- [\[PR #251\]](#) Adds CloudFormation templates that integrate Watchmaker with an EC2 instance or Autoscale Group
- `join-domain-formula`
 - (Linux) Corrects tests that determine whether the instance is already joined to the domain

2.9.101 0.2.1

Commit Delta: [Change from 0.2.0 release](#)

Released: 2017.04.10

Summary:

- ash-linux-formula
 - Reduces spurious stderr output
 - Removes notify script flagged by McAfee scans
- splunkforwarder-formula
 - (Windows) Clears system name entries from local Splunk config files

2.9.102 0.2.0

Commit Delta: [Change from 0.1.7 release](#)

Released: 2017.04.06

Summary:

- [\[Issue #238\]](#) Captures all unhandled exceptions and logs them
- [\[Issue #234\]](#) Stops the salt service prior to managing salt formulas, to ensure that the filesystem does not throw any errors about the files being locked
- [\[Issue #72\]](#) Manages salt service so the service state after watchmaker completes is the same as it was prior to running watchmaker. If the service was running beforehand, it remains running afterwards. If the service was stopped (or non-existent) beforehand, the service remains stopped afterwards
- [\[Issue #163\]](#) Modifies the `user_formulas` config option to support a map of `<formula_name>:<formula_url>`
- [\[PR #235\]](#) Extracts salt content to the same target `srv` location for both Window and Linux. Previously, the salt content was extracted to different points in the filesystem hierarchy, which required different content for Windows and Linux. Now the same salt content archive can be used for both
- [\[PR #242\]](#) Renames salt worker param `content_source` to `salt_content`
- systemprep-formula
 - Deprecated and removed. Replaced by new salt content structure that uses native salt capabilities to map states to a system
- scc-formula
 - Deprecated and removed. Replaced by scap-formula
- scap-formula
 - New bundled salt formula. Provides SCAP scans using either openscap or scc
- pshelp-formula
 - New bundled salt formula. Installs updated PowerShell help content to Windows systems

2.9.103 0.1.7

Commit Delta: [Change from 0.1.6 release](#)

Released: 2017.03.23

Summary:

- Uses threads to stream stdout and stderr to the watchmaker log when executing a command via subprocess
- [\[Issue #226\]](#) Minimizes salt output of successful states, to make it easier to identify failed states
- join-domain-formula
 - (Linux) Exits with stateful failure on a bad decryption error
- mcafee-agent-formula
 - (Linux) Avoids attempting to diff a binary file
 - (Linux) Installs ed as a dependency of the McAfee VSEL agent
- scc-formula
 - Retries scan up to 5 times if scc exits with an error

2.9.104 0.1.6

Commit Delta: [Change from 0.1.5 release](#)

Released: 2017.03.16

Summary:

- ash-linux-formula
 - Provides same baseline states for both EL6 and EL7

2.9.105 0.1.5

Commit Delta: [Change from 0.1.4 release](#)

Released: 2017.03.15

Summary:

- ash-linux-formula
 - Adds policies to disable insecure Ciphers and MACs in sshd_config
- ash-windows-formula
 - Adds scm and stig baselines for Windows 10
 - Adds scm baseline for Windows Server 2016 (Alpha)
 - Updates all scm and stig baselines with latest content
- mcafee-agent-formula
 - Uses firewalld on EL7 rather than iptables
- scc-formula
 - Skips verification of GPG key when install SCC RPM

- splunkforwarder-formula
 - Uses firewalld on EL7 rather than iptables

2.9.106 0.1.4

Commit Delta: [Change from 0.1.3 release](#)

Released: 2017.03.09

Summary:

- [\[Issue #180\]](#) Fixes bug where file_roots did not contain formula paths

2.9.107 0.1.3

Commit Delta: [Change from 0.1.2 release](#)

Released: 2017.03.08

Summary:

- [\[Issue #164\]](#) Aligns cli syntax for extra_arguments with other cli opts
- [\[Issue #165\]](#) Removes ash_role from default config file
- [\[Issue #173\]](#) Fixes exception when re-running watchmaker

2.9.108 0.1.2

Commit Delta: [Change from 0.1.1 release](#)

Released: 2017.03.07

Summary:

- Adds a FAQ page to the docs
- Moves salt formulas to the correct location on the local filesystem
- join-domain-formula:
 - (Linux) Modifies decryption routine for FIPS compliance
- ash-linux-formula:
 - Removes several error exits in favor of warnings
 - (EL7-alpha) Various patches to improve support for EL7
- dotnet4-formula:
 - Adds support for .NET 4.6.2
 - Adds support for Windows Server 2016
- emet-formula:
 - Adds support for EMET 5.52

2.9.109 0.1.1

Commit Delta: [Change from 0.1.0 release](#)

Released: 2017.02.28

Summary:

- Adds more logging messages when downloading files

2.9.110 0.1.0

Commit Delta: N/A

Released: 2017.02.22

Summary:

- Initial release!

SUPPORTED OPERATING SYSTEMS

- Enterprise Linux 8 (RHEL/CentOS Stream/Oracle Linux)
- Enterprise Linux 7 (RHEL/CentOS)
- Windows Server 2019
- Windows Server 2016
- Windows Server 2012 R2
- Windows 10
- Windows 8.1

SUPPORTED PYTHON VERSIONS

- Python 3.6 and later
- Python 2.7 and later

SUPPORTED SALT VERSIONS

- Salt 2018.3, from 2018.3.4 and later
- Salt 2019.2, from 2019.2.5 and later
- Salt 300x, from 3003 and later

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