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Using Migration Toolkit for Applications: Report analysis, customization, and troubleshooting

July 27, 2022 | Francisco De Melo Junior

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Red Hat's Migration Toolkit for Application (MTA) provides a migration solution for applications in the hybrid cloud environments on Red Hat OpenShift. This is provided via MTA Operator, currently at the seventh version, and other means such as the MTA CLI, Visual Studio Code extension guide, and IntelliJ IDEA plug in guide. For questions regarding the MTA Lifecycle, see this link.

MTA Provides target migrations for Red Hat JBoss Enterprise Application Platform (EAP) 8, containerization, SpringBoot to Quarkus, OpenJDK version migration, Oracle to OpenJDK, Windows to Linux, Jakarta EE 9, JWS 5 to 6, and several more paths. Here is a list of migration paths and use cases.

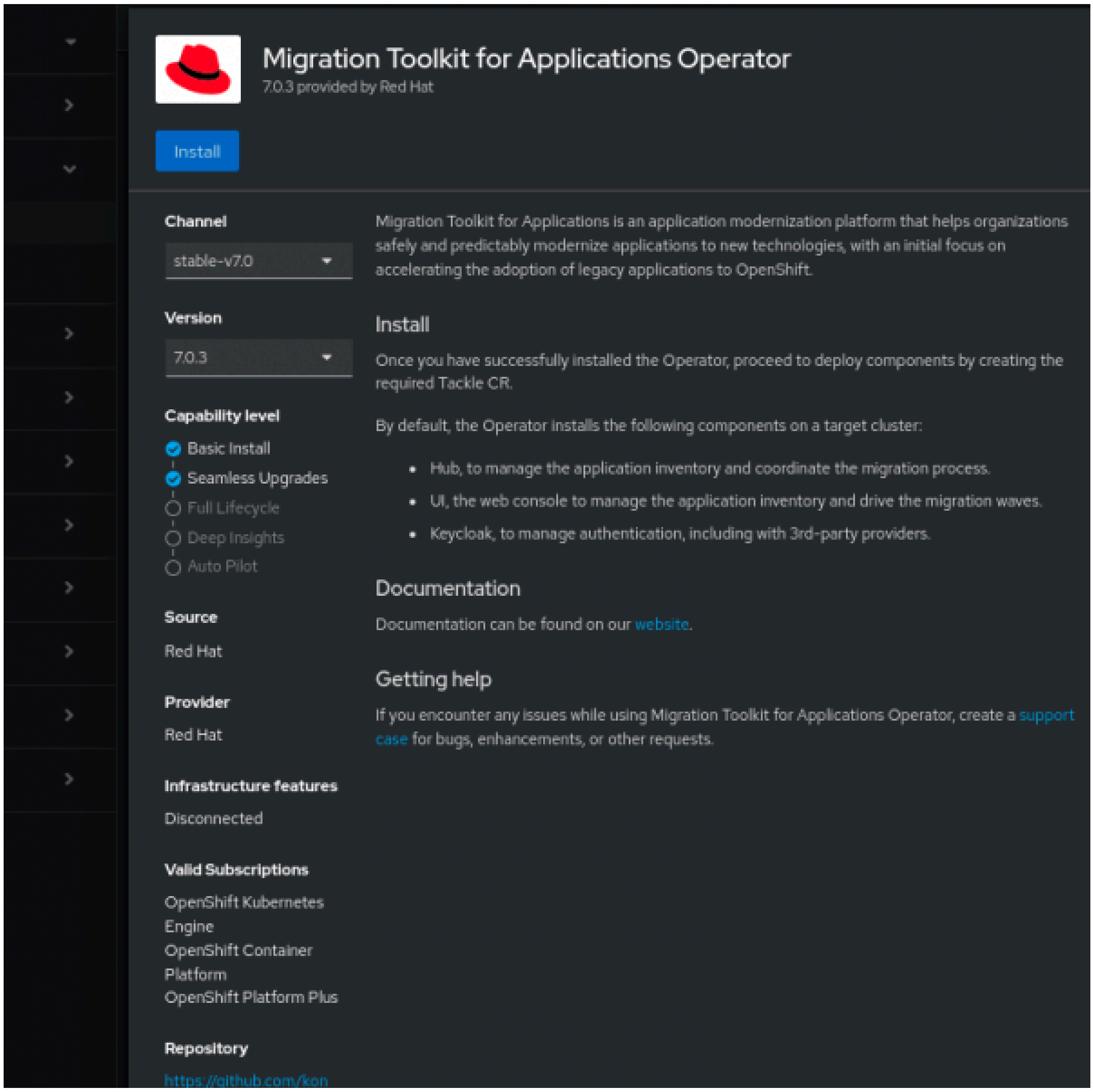
It is very useful and convenient given that many rules were written for the migrations above and each migration path will provide a series of migration rules that are compared with the binary or the source code. MTA also allows the addition of new rules during the analysis part, which can be included directly on the console.

In this matter of migration and its efforts, migrating applications to the cloud or JBoss EAP 8 server (and JBoss EAP 7) deployment can be a huge task—even small applications can be challenging. Also, Red Hat MTA 7 provides features for cloud-ready and application migration such as OpenJDK, therefore contributing to less manual work.

This article will demonstrate how to install the MTA Operator 7, provide an example analysis, show the JBoss EAP 8 migration path and show customizations that can be done, then finish with some troubleshooting hints.

MTA 7 Operator demonstration

The installation of the MTA Operator is done using OpenShift 4 Operator Lifecycle Manager (OLM)'s Subscription YAML creation, either manually creating the YAML or via the user interface. Below is an example installation from the OperatorHub. First, select **Migration Toolkit for Applications Operator**. See Figure 1.


Migration Toolkit for Applications Operator
7.0.3 provided by Red Hat
Install

Channel
stable-v7.0

Version
7.0.3

Capability level
Basic Install ✓
Seamless Upgrades ✓
Full Lifecycle
Deep Insights
Auto Pilot

Source
Red Hat

Provider
Red Hat

Infrastructure features
Disconnected

Valid Subscriptions
OpenShift Kubernetes Engine
OpenShift Container Platform
OpenShift Platform Plus

Repository
https://github.com/kon

Migration Toolkit for Applications is an application modernization platform that helps organizations safely and predictably modernize applications to new technologies, with an initial focus on accelerating the adoption of legacy applications to OpenShift.

Install

Once you have successfully installed the Operator, proceed to deploy components by creating the required Tackle CR.

By default, the Operator installs the following components on a target cluster:

- Hub, to manage the application inventory and coordinate the migration process.
- UI, the web console to manage the application inventory and drive the migration waves.
- Keycloak, to manage authentication, including with 3rd-party providers.

Documentation

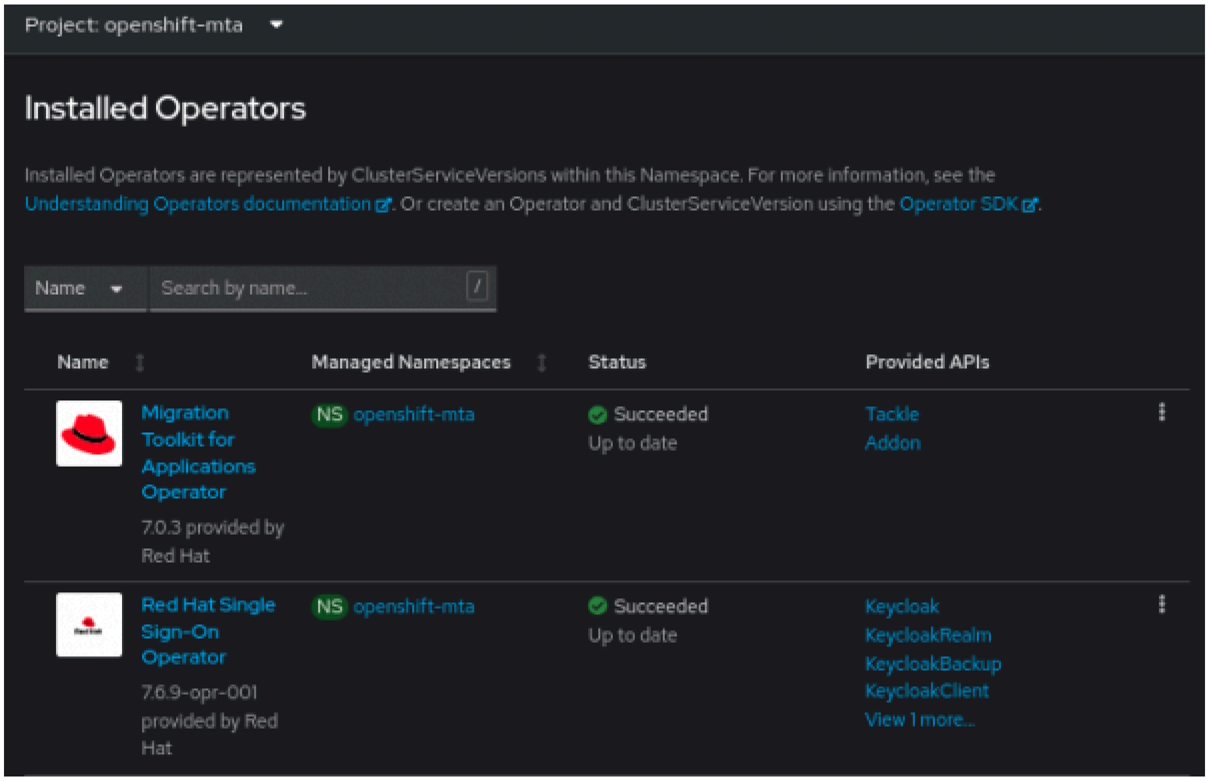
Documentation can be found on our website.

Getting help

If you encounter any issues while using Migration Toolkit for Applications Operator, create a support case for bugs, enhancements, or other requests.

Figure 1: Installation of the MTA 7 Operator.

After confirming the subscription installation, the MTA Operator will be installed on the `openshift-mta` namespace, a new namespace created during the installation. Together with the MTA Operator, the Red Hat Single Sign-On Operator will be installed also in the `openshift-mta` namespace, the result of which is shown in Figure 2.



Installed Operators

Installed Operators are represented by ClusterServiceVersions within this Namespace. For more information, see the Understanding Operators documentation. Or create an Operator and ClusterServiceVersion using the Operator SDK.

Name	Managed Namespaces	Status	Provided APIs
Migration Toolkit for Applications Operator 7.0.3 provided by Red Hat	NS openshift-mta	Succeeded Up to date	Tackle Addon
Red Hat Single Sign-On Operator 7.6.9-opr-001 provided by Red Hat	NS openshift-mta	Succeeded Up to date	Keycloak KeycloakRealm KeycloakBackup KeycloakClient View 1 more...

Figure 2: Operators installed in openshift-mta namespace.

After that, the next phase is to create the Tackle CR, which is required for the analysis. A trivial Tackle CR will be as below:

```
apiVersion: tackle.konveyor.io/v1alpha1
kind: Tackle
metadata:
  name: tackle
  namespace: openshift-mta
spec:
  feature_auth_required: 'true'
...
$ oc get tackle
NAME     AGE
tackle   117s
...
```

Copy snippet

Several settings can be done in the `Tackle.yaml` including container settings, Red Hat Single Sign-On settings, and metrics as well. See the complete list here.

To access MTA Console, get the MTA route as below:

```
$ oc get route
NAME   HOST/PORT
mta    mta-openshift-mta.example.com          mta-ui     <all>
```

Copy snippet

From the above one can deduce, to access MTA Console: `https://mta-openshift-mta.example.com/applications, given https://<route>/applications.`

The default user will be `admin` and the default password will be `Passw0rd!`. Then on the first login, the passcode will need to be changed. Then, the console will open with the Migration option on the MTA Console page, as shown in Figure 3.

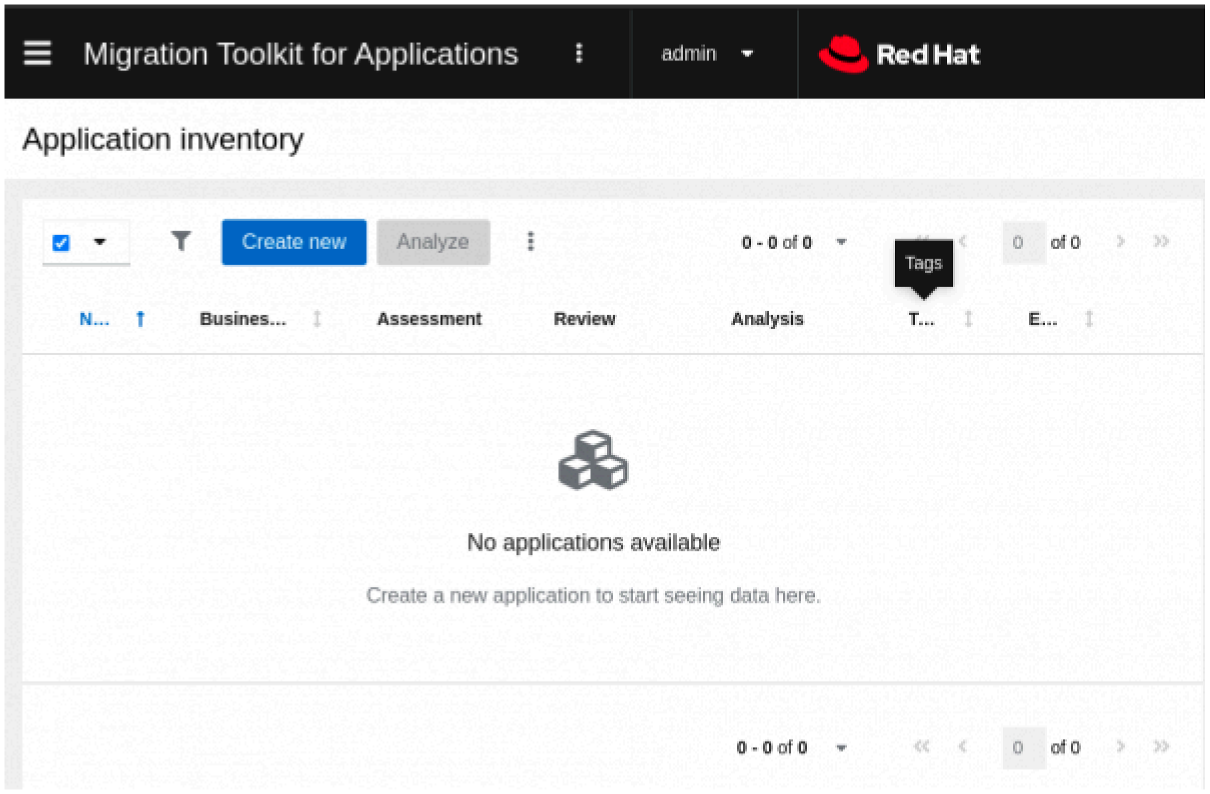


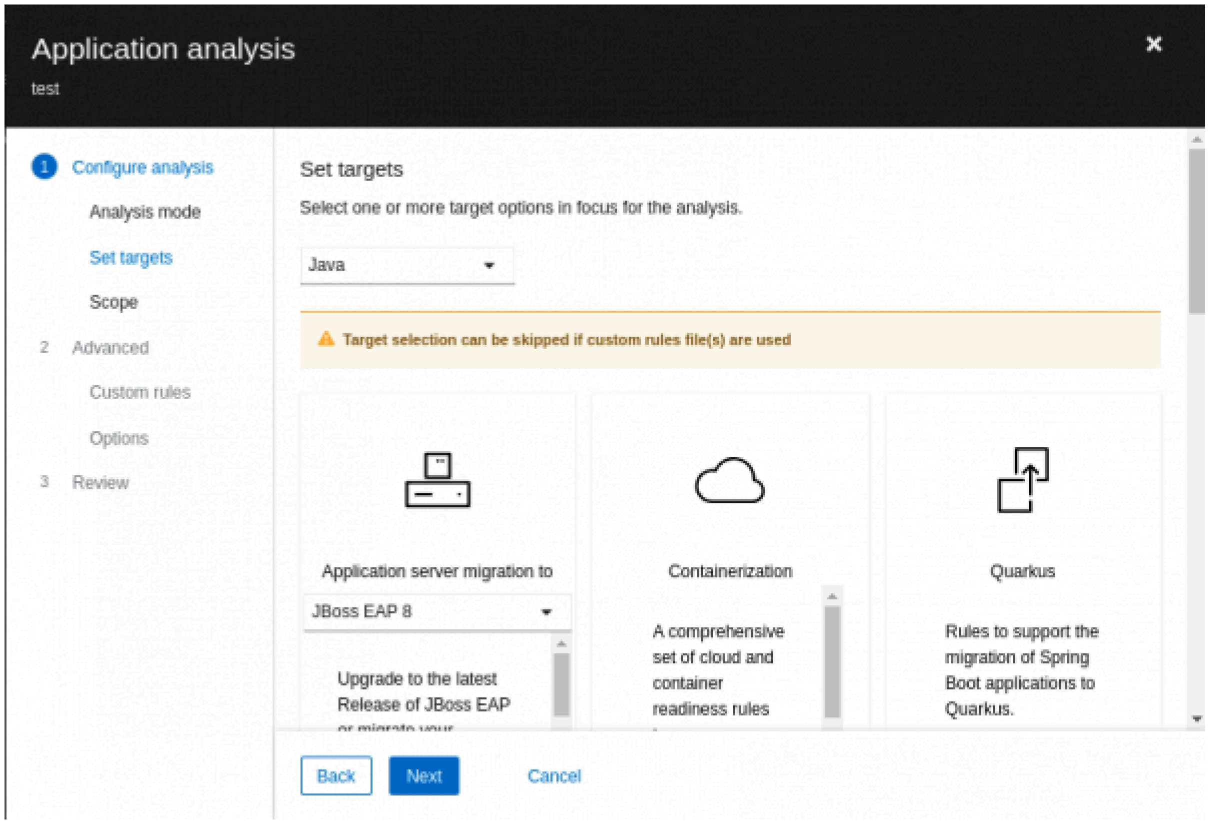
Figure 3: Migration Toolkit for Applications Applications page.

MTA analysis

Example analysis

On MTA's main Migration page—which is the default as shown above—below the Application inventory, click on **Create new** and proceed to fill in details on the application. The application might be an actual binary file, such as `.jar` or a GitHub source for example. This provides more flexibility in case the application is not yet built.

Then click on **Analyze** at the top menu on the side of **Create new** and provide the specific Analysis mode, targets, and Scope. Also, it is on the Analyze part where the user adds custom rules (for details on how to write custom rules see the Rule Development Guide). Example analysis details are shown in Figure 4.



Set targets

Select one or more target options in focus for the analysis.

Java

Target selection can be skipped if custom rules file(s) are used

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JBoss EAP 8

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Quarkus

Rules to support the migration of Spring Boot applications to Quarkus.

Figure 4: Possible targets in MTA.

The analysis will start and the Analysis section will change to Scheduled -> In-progress -> and then Completed (green mark). See Figure 5.

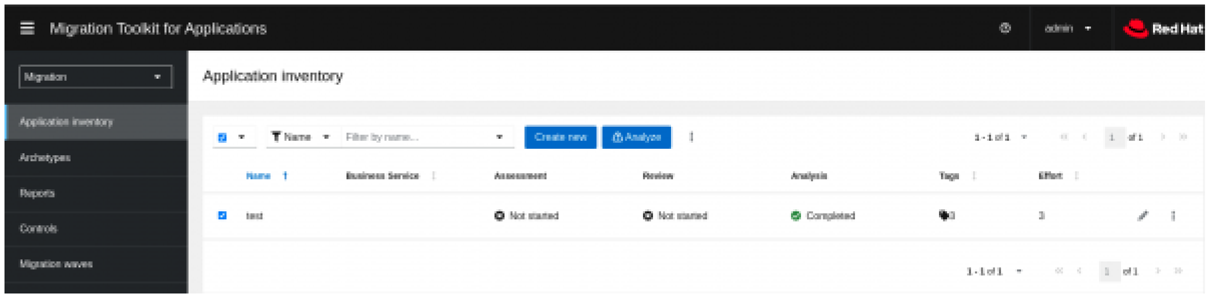


Figure 5: Application inventory Analysis completed.

Report analysis

After the deployment is analyzed and the analysis is completed, the user can do a review. The MTA console user interface will populate the result of the report. If you click the **Issues** tab and you select your given application, you can view the analysis result. Another option is to download the static version of the report if desired, however, viewing the data in the UI allows a more dynamic ability to view the data.

To download the report, go to the MTA Administration (`/general`). Upon downloading the report, which will be downloaded as a `.tar` file, upon the `index.html`.

Figure 6 depicts the Issues tab vs. the index report in a comparative view.

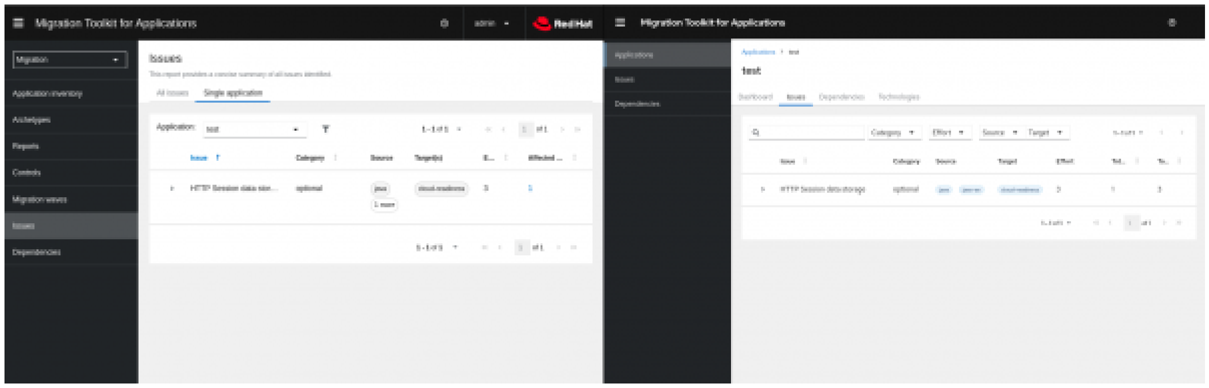


Figure 6: Report comparison—Issues tab (dynamic) vs. static report.

MTA output, as described in this solution, will create the output directory, including the `index.html` with the application name, tags, incidents, and story points.

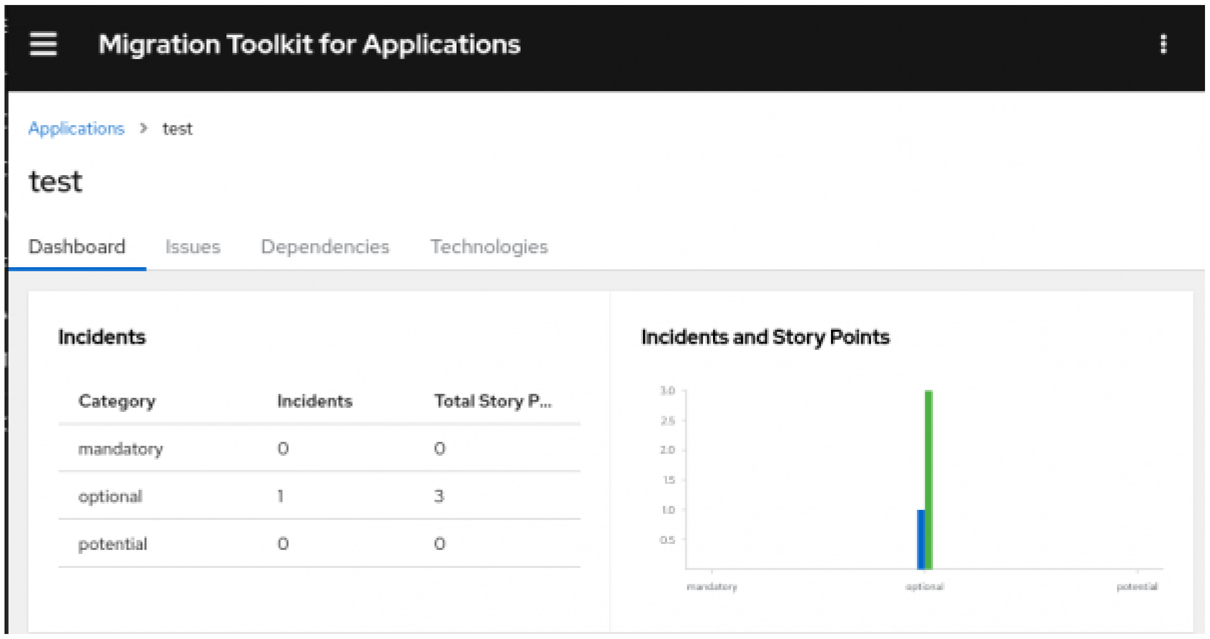
Story points

The report will include an overview and the story points for migration. So MTA output will classify the changes to be done in story points, as in Scrum/Kanbam story points, and classify the changes as mandatory vs. optional vs. potential. Those story points come from a relative measurement of the difficulty in implementing a certain change/update, which can be as trivial as a 1 story point, up to 10+ story points, which are very difficult tasks. Stories are relatively estimated (i.e., 9 is 3 times as much as 3) and measure time for doing certain tasks.

MTA seems to use a classification sequence from 1 onwards, not skipping any number of points nor bringing a Fibonacci clarification for example. In some cases the number of story points is 0, meaning the migration does not require time, but this will be on a case-by-case basis.

Incidents are classified as mandatory, optional, and potential.

Example: The application test has mostly optional changes with 1 to 3 story points as per the report (Figure 7).



Incidents

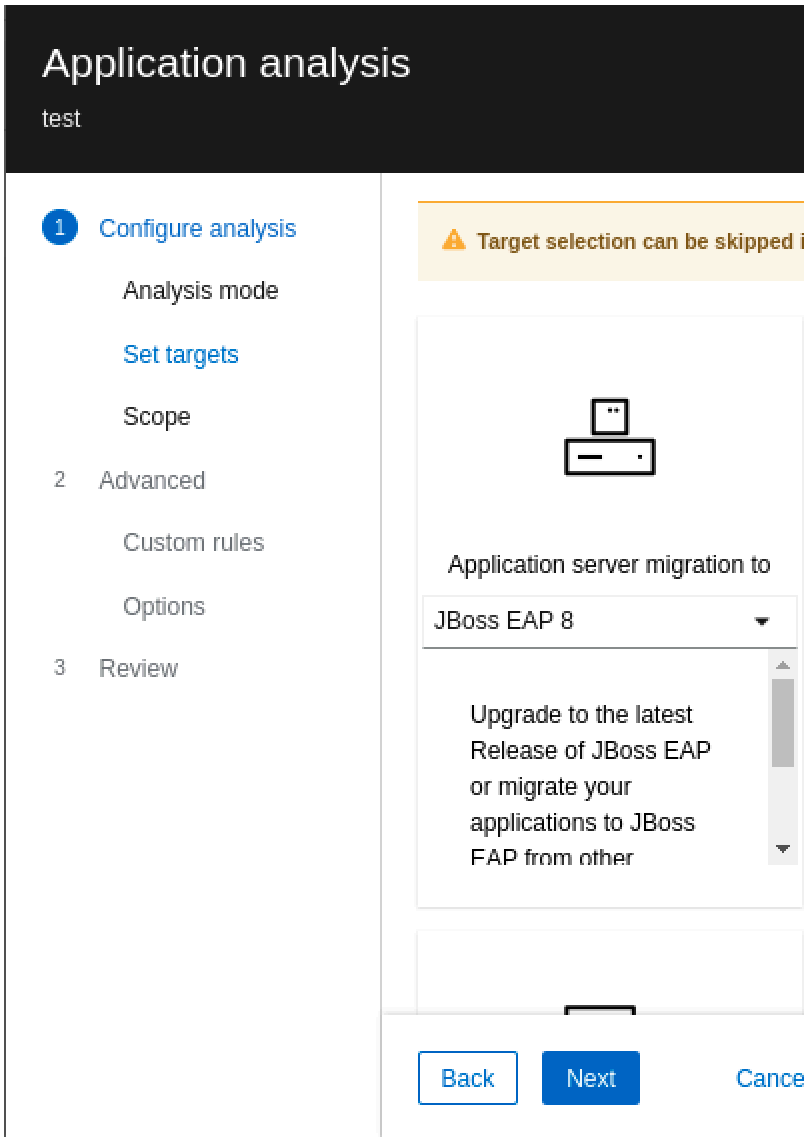
Category	Incidents	Total Story P...
mandatory	0	0
optional	1	3
potential	0	0

Figure 7: Report details with story points.

In the example above, one can see the test application has one optional Incident with 3 story points.

JBoss EAP 7 to JBoss EAP 8 migration

For JBoss EAP 7 to JBoss EAP 8 migration, navigate to the **Configure analysis** tab then click **Set targets** and select the target JBoss EAP 8, as shown in Figure 8.


Application analysis

test

Target selection can be skipped i

Application server migration to

JBoss EAP 8

Upgrade to the latest Release of JBoss EAP or migrate your applications to JBoss EAP from other

Report analysis in-depth

Click on the application name, then go to the Dashboard so you can see the classification of the incidents (i.e., the actual changes that must be done). You will have a graph of the incidents vs story points, as explained above.

Going from left to right you have:

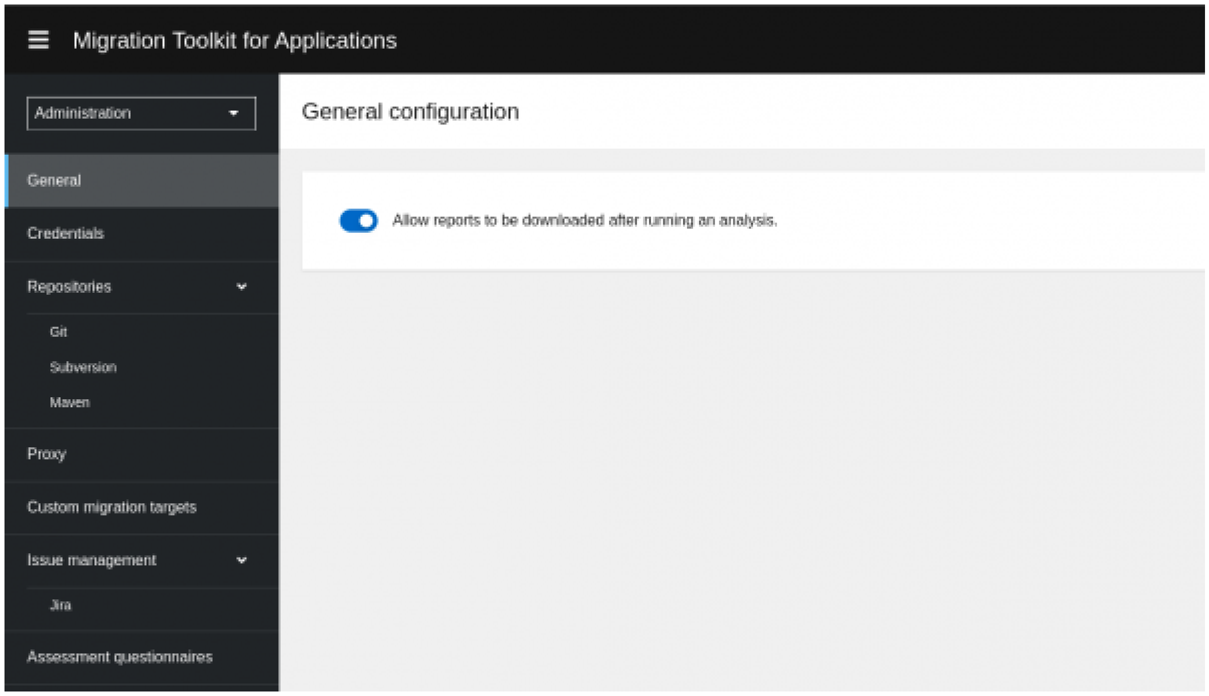
- Dashboard: graphs for incidents vs stories points
- Issues: Complete list of libraries and incidents vs story points level
- Dependencies: List of dependencies jars, with version, sha1 ahs, vendor, and path.
- Technologies: A nice overview of the technologies in the application already classified.

MTA settings

As explained in the Migration Toolkit for Applications (MTA) Guide, the user interface has two views:

- Administration view: `https://<route>/general`
- Migration view: `https://<route>/applications`

Upon opening MTA's main page using `/applications`, the MTA Migration page will open. However, for MTA Administration duties, select **Administration** or open directly `/general` page. Figure 9 depicts what will open.



Allow reports to be downloaded after running an analysis.

Figure 9: MTA Administration Console.

On this Administration page, you can view details and carry out operations such as allowing the report to be downloaded (very useful), credentials, Repositories, custom migration paths, Issue management, and Assessment questionnaires.

Red Hat Single Sign-On settings

As explained in the MTA 7 User Interface Guide, MTA delegates authentication and authorization to the Red Hat Single Sign-On instance, which is installed by the MTA Operator. Therefore in terms of advanced settings, directly access Red Hat Single Sign-On for fine-tuning/adjusting settings rather than the MTA Administration Console (accessed as

In terms of management, given MTA Operator installs the Red Hat Single Sign-On Operator and creates one Keycloak Custom Resource (CR). Then it creates a dedicated realm, called MTA realm, that contains all the roles and permissions that MTA requires. In the matter of CRs, although the Red Hat Single Sign-On provides other CRs, no other Custom Resource will be created by the MTA Operator:

```
$ oc get keycloak
NAME        AGE
mta-rhsso   44m
...
$ oc get KeycloakRealm
No resources found in openshift-mta namespace.
$ oc get KeycloakBackup
No resources found in openshift-mta namespace.
$ oc get KeycloakClient
No resources found in openshift-mta namespace.
```

Copy snippet

All administration processes in SSO should be done directly in SSO and to do that open the main route and access the SSO Console as below:

- MTA Console UI (migration): `https://<route>/applications`
- MTA Console UI (administration): `https://<route>/general`
- SSO Admin Console UI: `https://route>/auth/admin` (this will be the SSO Admin console)

- SSO documentation and SSO Admin console: `https://<route>/auth`

Specific example

To access Red Hat Single Sign-On Console, get the route below:

```
$ oc get route
NAME   HOST/PORT
mta    mta-openshift-mta.example.com         mta-ui     <all>
```

Copy snippet

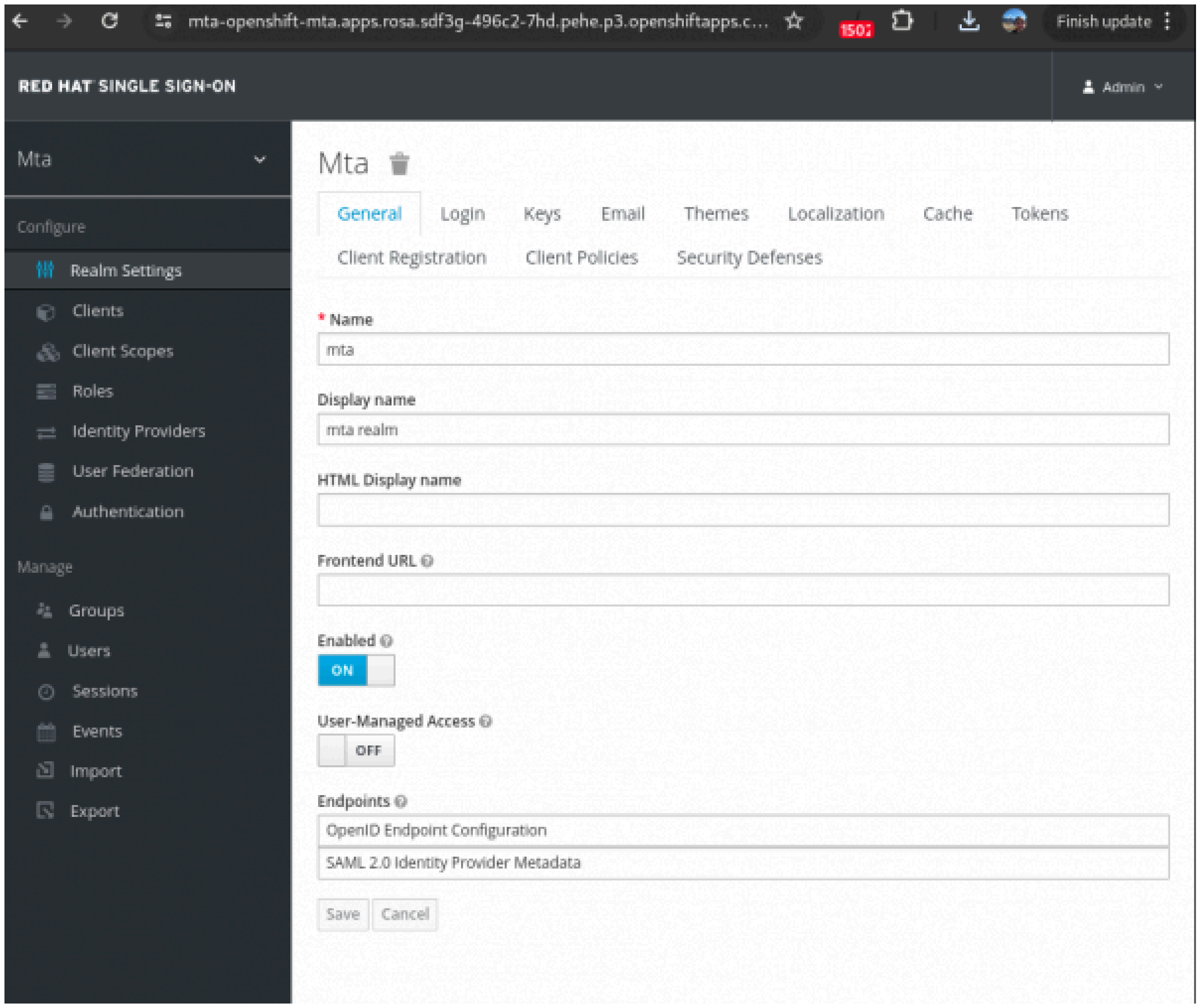
From the above one can deduce the access to Red Hat Single Sign-On Console as: `https://mta-openshift-mta.example.com/auth/admin`.

To access the Red Hat Single Sign-On console, get the user and credentials below:

```
oc get secret credential-mta-rhsso -o yaml
apiVersion: v1
data:
 ADMIN_PASSWORD: SOMETHING== <--- passcode
 ADMIN_USERNAME: YWRtaW4=    <--- this is the hash for admin
```

Copy snippet

The SSO Main console will appear, which will be the Mta realm (instead of Realm Master). See Figure 10.



* Name: mta

Display name: mta realm

HTML Display name:

Frontend URL:

Enabled: ON

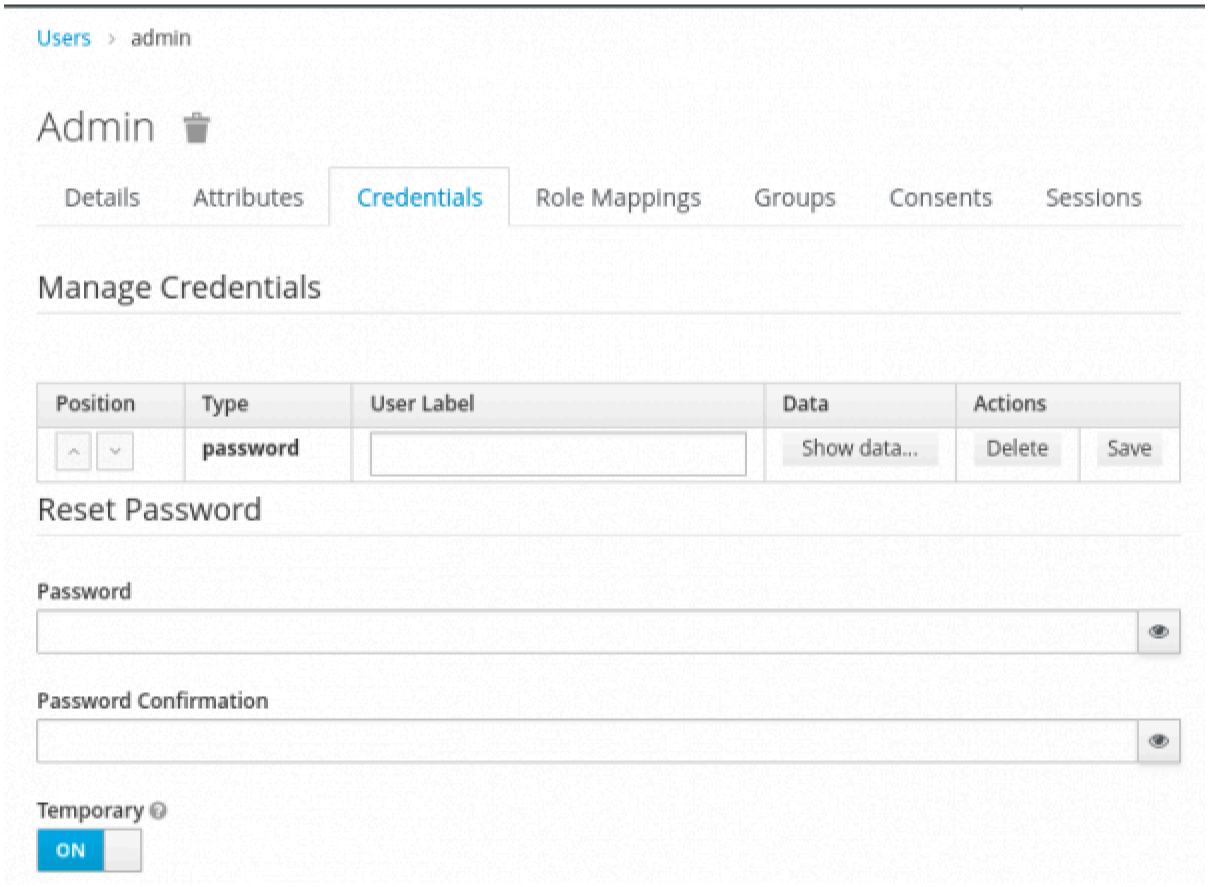
User-Managed Access: OFF

Endpoints: OpenID Endpoint Configuration; SAML 2.0 Identity Provider Metadata

Figure 10: SSO Realm Settings—Mta realm details.

Example of customizations

Change the admin passcode directly in SSO: go into **Manage -> Users -> View all users -> select the first ID (username admin) -> Actions -> Edit -> Credentials** (Figure 11).



Users > admin

Admin

Details | Attributes | Credentials | Role Mappings | Groups | Consents | Sessions

Manage Credentials

Position	Type	User Label	Data	Actions	
^ v	password		Show data...	Delete	Save

Reset Password

Password

Password Confirmation

Temporary

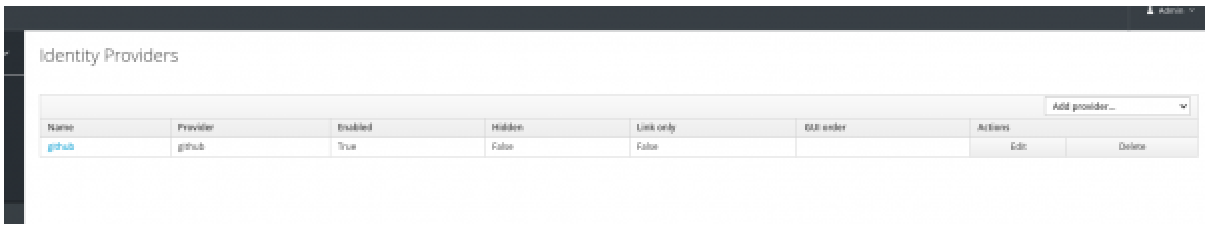
ON

Figure 11: SSO Users admin configuration.

Next, we want to integrate SSO with Github. It is beneficial to integrate with GitHub, and to do that, use Red Hat Single Sign-On GitHub Client, which can be done directly at the Identity Providers section:

1. Go to the Red Hat Single Sign-On main page.
2. Select **Identity Providers** in the left side menu.
3. Select **Add provider** on the corner right.
4. Select Social-> Github.
5. Update the GitHub Client with specific details.
6. Go to the realm login page and should see GitHub button to log in.

Figure 12 shows an example.



Identity Providers

Add provider...

Name	Provider	Enabled	Hidden	Link only	GUI order	Actions	
github	github	True	False	False		Edit	Delete

Figure 12: SSO setting—GitHub identity provider.

Troubleshooting steps

Although not directly related to customization, but also very relevant in terms of approaches in case of issues for troubleshooting purposes, the following data will be relevant in case a support case is required:

- The Tackle Custom Resource, although trivial in some situations can be customized: `$ oc get tackle -o yaml > tackle.yaml`
- The inspect from the `openshift-mta` namespace: `$ oc adm inspect ns/namespace_name`.
- The analysis YAML can be found in the **Application inventory -> Application -> Analysis details.**

Example:

```
id: 1
        createTime: 2024-07-03T17:59:59.395884214Z
        name: test.1.windup
        addon: analyzer
        data:
            mode:
                artifact: ""
                binary: false
                withDeps: true
            rules:
                labels:
                    excluded: []
                    included:
                        - konveyor.io/target=cloud-readiness
```

Copy snippet

MTA 7 version note

Above I discuss MTA 7, which is fairly different than MTA 6.x. MTA 7.0 brings considerable changes and combines the features that previously were split between the Migration Toolkit for Applications (MTA) and the Migration

Toolkit for Runtimes (MTR). MTA 7 was released in Q1 2024, and the Migration Toolkit for Runtimes (MTR) will be moved to End of Life in September 2024.

Therefore, for the Migration Toolkit for Runtimes (MTR) use cases, Red Hat ships the Migration Toolkit for Applications (MTA) CLI for example, which replaces the use case, such as JBoss EAP 8 migration. MTA CLI does not require OpenShift installation as described here.

Conclusion

The article describes the usage of MTA CLI and MTA Operator by going through installation, usage, and report analysis. Finally, it covers the customization part in Red Hat Single Sign-On that is integrated already by Red Hat's Migration Toolkit for Application (MTA), which provides an accessible and powerful tool for a series of migration targets such as application migration for the cloud or JBoss EAP server 8/OpenJDK migration.

The rules that make the migration paths can be customized and the Rule Development Guide is an excellent reference to how to customize them. The customization section about MTA and Red Hat Single Sign-On is also explained with some use cases. Finally, some data related to troubleshooting were explained and can be useful for case handling.

Additional resources

To learn more about the MTA Operator and MTA plugins click here. For Migration Toolkit for Runtime (MTR) see this reference, as again, Migration Toolkit for Runtime (MTR) is already End of Life.

In terms of OpenJDK migration, to learn more read Java 17: What’s new in OpenJDK's container awareness. For container awareness, see the main article How to use Java container awareness in OpenShift 4. For more information on Red Hat Single Sign-On settings, see Red Hat Single Sign-On 7.6.

For any other specific inquiries, please open a case with Red Hat support. Our global team of experts can help you with any issues.

Special thanks to Dylan Murray and Sherman Horton for their critical contributions and collaboration on MTA issues throughout the years. Will Russell, for this article review, and finally the collaboration from Santoshi, Pedro Silva, and Wagner Queiroz for day-to-day Red Hat Single Sign-On and migrations issues/discussions.

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