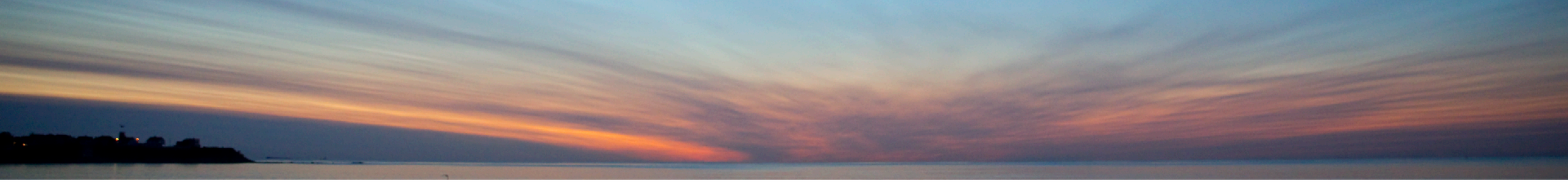

Everything You Need to Know About the IBM i Administration Runtime Expert

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What is the Administration Runtime Expert?

- The Administration Runtime Expert (ARE) allows you to
  - Identify an extensive set of attributes that you want to ensure don't change
  - Run a verification to ensure those attributes have not changed
  - Review reports on the results of the verification
  - Automatically correct a subset of errors
  - Distribute, and optionally apply, PTFs to groups of systems
  - Extend the IBM-provided functionality with your own custom plug-ins

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Why use the Administration Runtime Expert (ARE)?

- Identify attributes that may have changed on a single partition
- Ensure consistency across multiple partitions
  - Environmental settings
  - Application attributes
  - Security settings
- Identify differences between test and production environments
- Track changes to show nothing has changed for audit and compliance requirements
- Ensure PTF consistency
- Distribute and optionally load and apply PTFs
- … and many more

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Attributes that can be Verified

- Application attributes
  - Existence, authorities, any attribute applicable to the object
  - Contents of configuration files
- Products and PTFs
- TCP/IP Configuration and ports
- System values and network attributes, system environment variables
- User Profiles

- Anything you can verify with SQL, CL, or Shell commands
- Anything else with custom plug-ins

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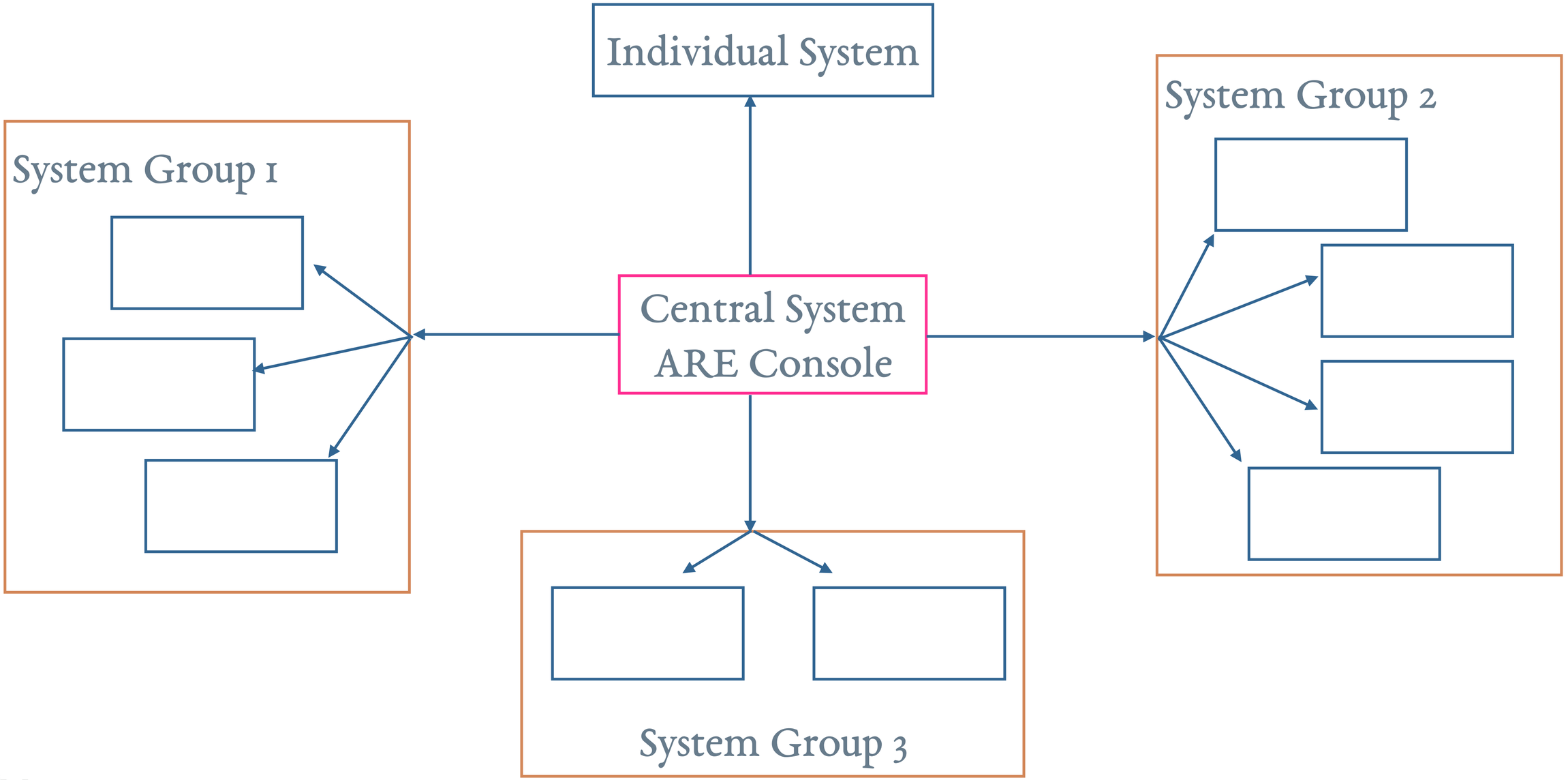
Overview of ARE



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ARE Installation

- ARE consists of two parts:
  - 5733-ARE
    - This product is required to be installed on the central system
    - The ARE LPP provides the graphical user interface
    - You can find the version of the console on the main web page
  - ARE runtime engine (also called the ARE *core*)
    - Shipped with the operating system
    - Used on the endpoints to run verifications

V 3.2.7

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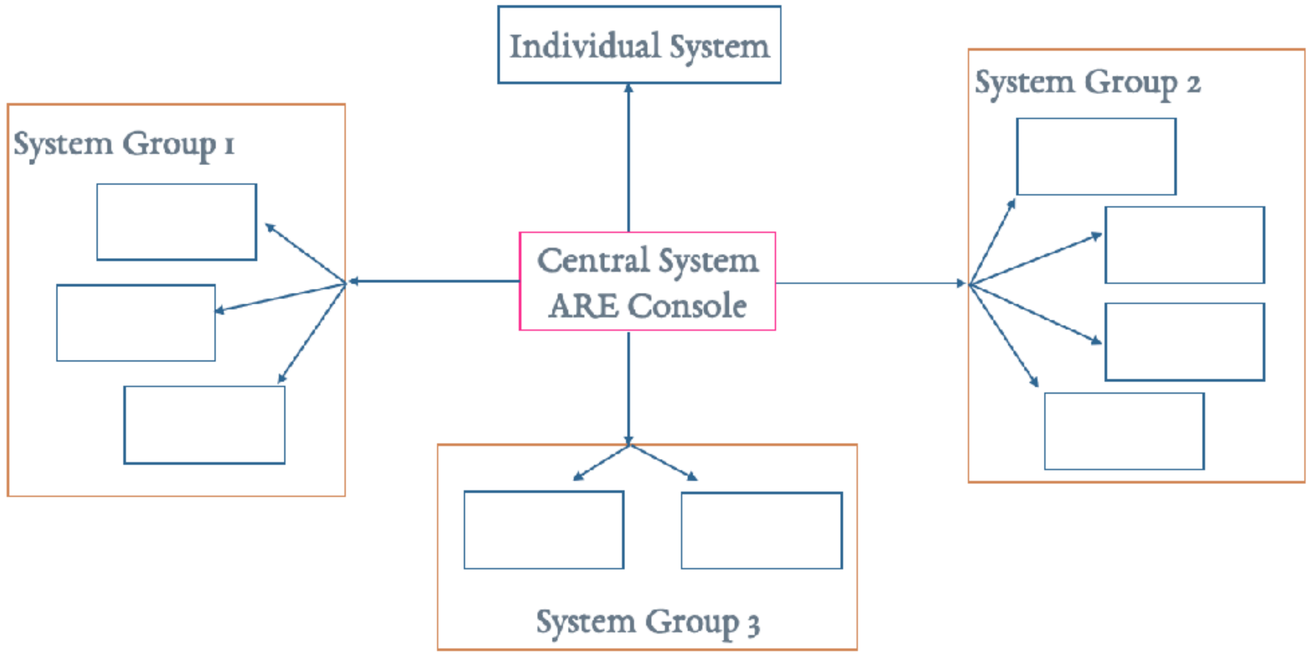
Central System: the ARE Template Editor and Console

- 5733-ARE only needs to be installed on partitions where the GUI will be used
  - Create and edit deployment templates
  - Define target systems and groups
  - Initiate manual verifications
  - Schedule automated verifications
  - Review reports
  - Execute fix actions



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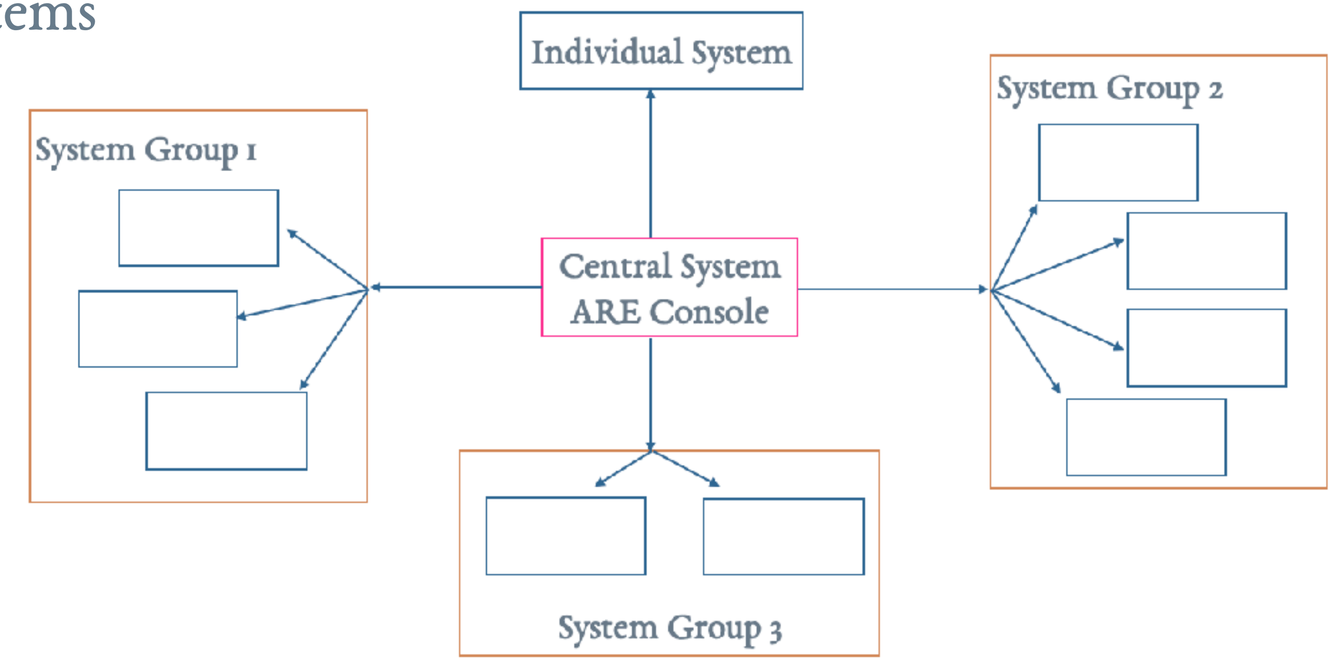
ARE Runtime Engine and Target Systems

- The ARE runtime engine is a set of Java classes used for doing the validation
  - IBM documentation refers to this runtime engine as the *ARE core*

- Shipped as part of the base operating system
  - 5733-ARE is not required on target systems



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Installation and Setup of ARE

- Install 5733-ARE on the central system
- Ensure required ports are available
  - 12401 on the central system
  - Host servers on endpoint systems
- The ARE Console runs in the IBMARE web application server in the QHTTPSVR subsystem
  - `QSYS/STRTCPSVR SERVER(*HTTP) HTTPSVR(IBMARE)`
- Access the Web interface:
  - `http://system_name:12401/are`

- 5770SS1 option 3 - Extended Base Directory Support
- 5770SS1 option 12 - Host Servers
- 5770SS1 option 30 - QShell
- 5770SS1 option 33 - PASE
- 5779JV1 option 16 - Java SE 8 32 bit
- 5770DG1 - IBM HTTP Server for i

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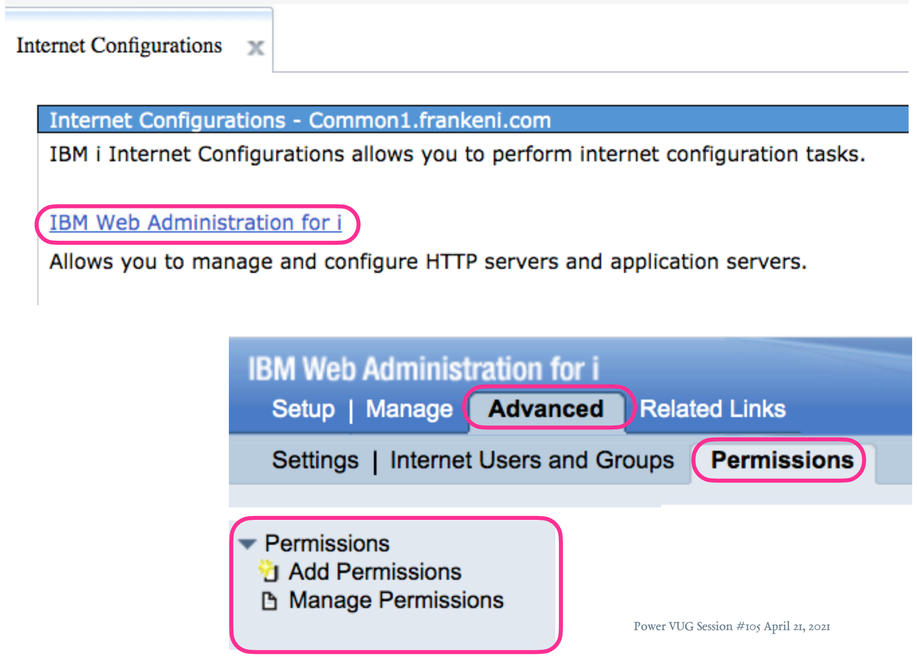
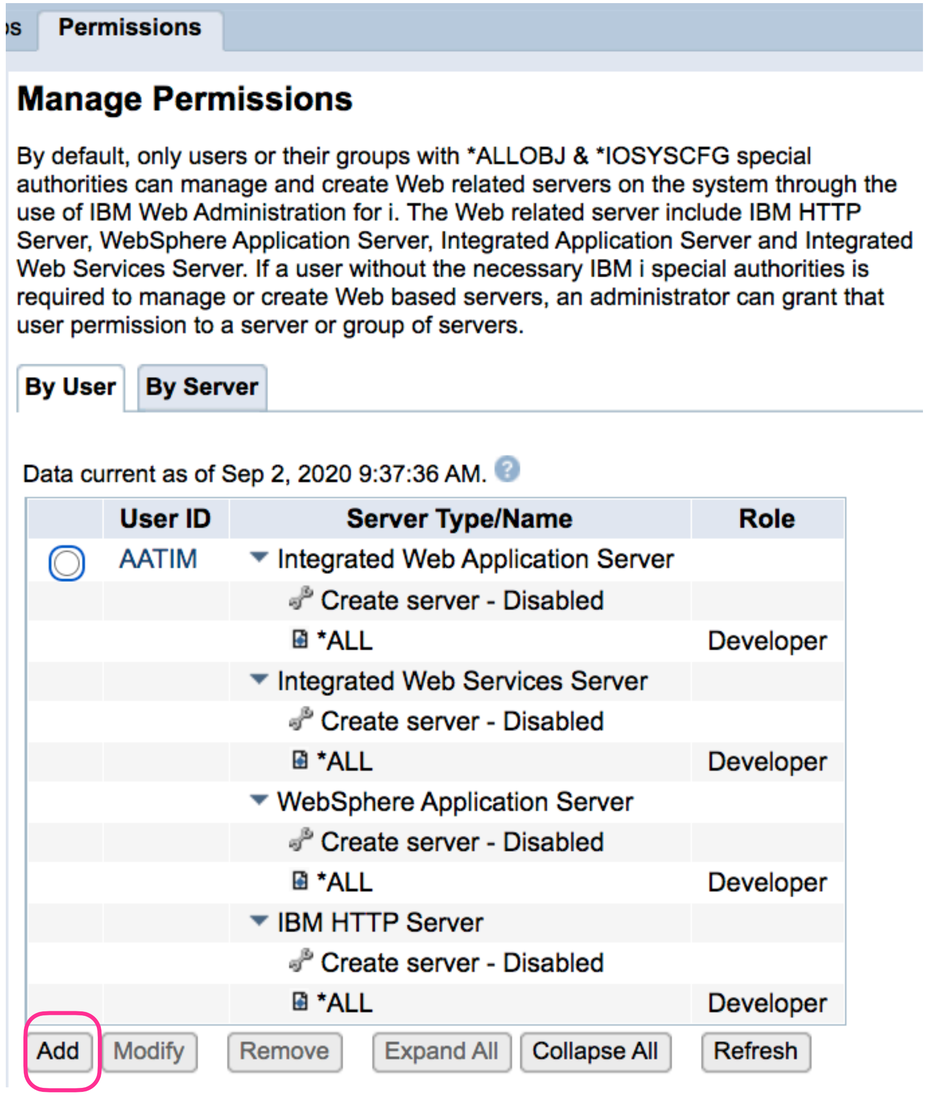
Authority for the ARE Web Console

- ARE user interface requires *ALLOBJ special authority
  - Building a template requires access to many resources

- Using Web Administration for i, you can grant permission for any user to create templates or run verifications





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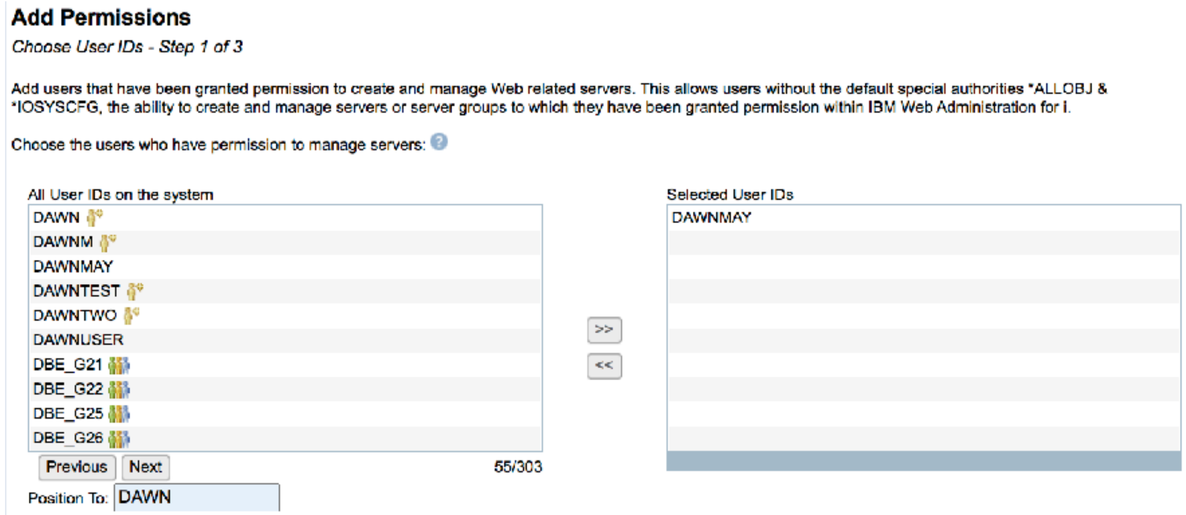
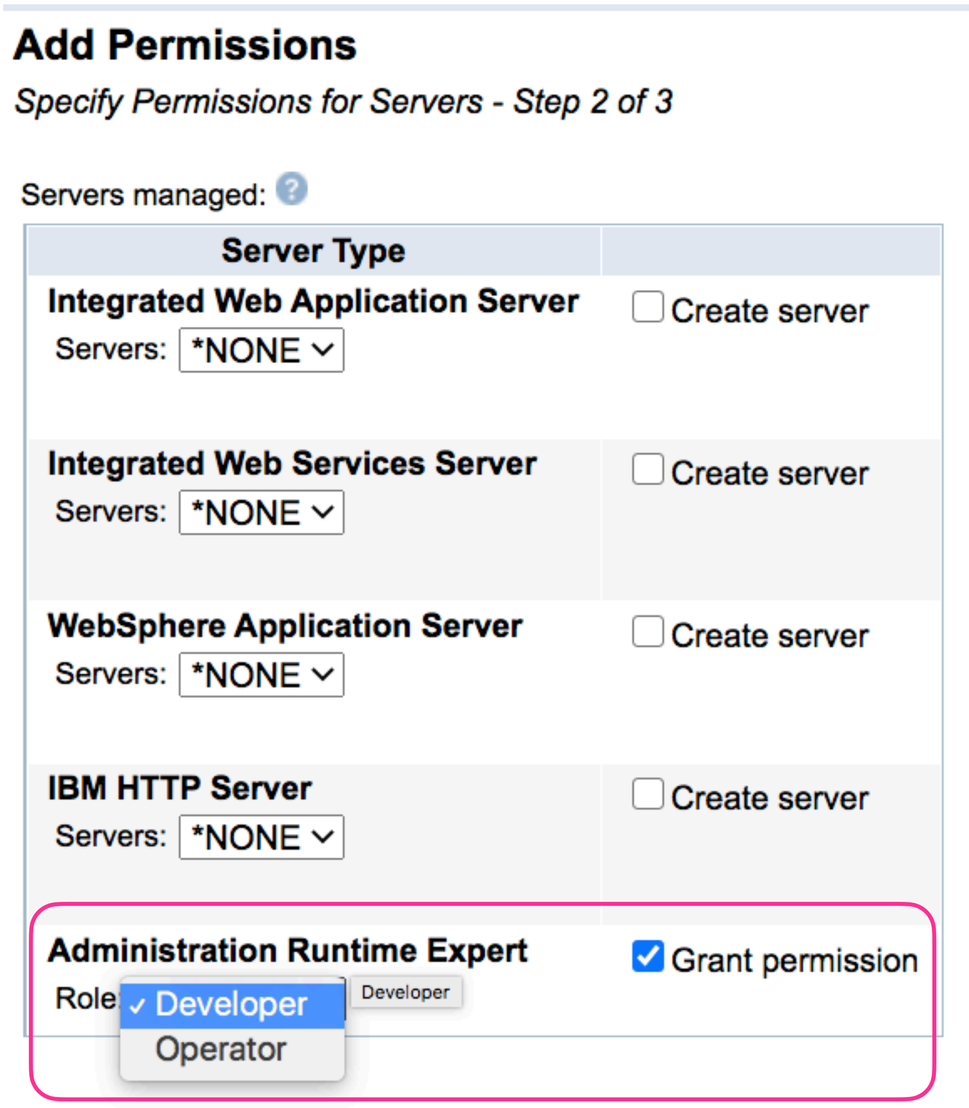
Add Permissions

- Operator
  - Basic capabilities: view, start and stop a server
- Developer
  - Allowed to create, build, copy, delete, edit, export, import, rename a template
  - Not allowed to test the template





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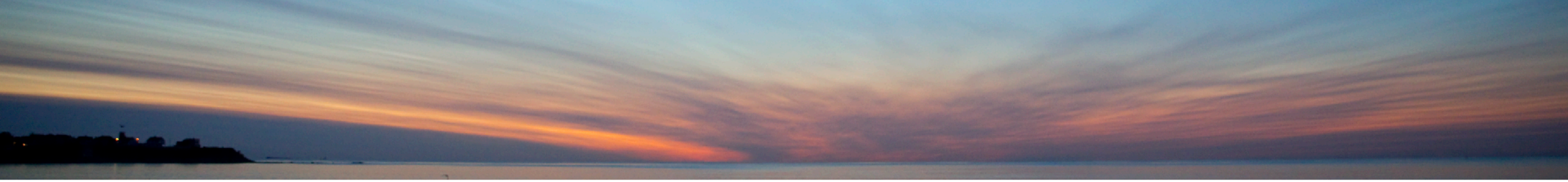

Creating Your First Template

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IBM Administration Runtime Expert for i

IBM

Deployment Template Editor

The Deployment Template Editor allows users to create, edit, import and export deployment templates. The editor enables users to customize their templates. Templates created, imported, or edited using this editor can be used to verify systems using the 'Launch console' button below. Learn more...

Manage templates:

Filter

Name	Last built by
CWOODBURY	TIMMR
Common	TIMMR
Common19	TIMMR
DawnDemo	DAWNM
Dubai	TIMMR
GuruDemo	DAWNM
MyTemplate1	TIMMR
Ocean	TIMMR
OneThing	DAWNM
SimpleTest	DAWNM
Steve	TIMMR
SystemHealth	DAWNM
TechULasVegas	TIMMR
VerifyInteractive	DAWNM
data3	TIMMR
mitec	TIMMR
prague	TIMMR
ptfs	TIMMR
techuH	TIMMR
testFix	TIMMR

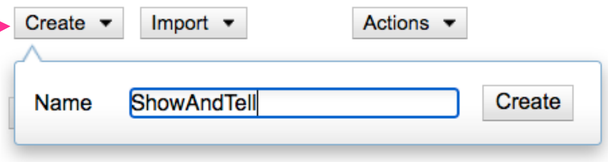
Create | Import | Actions

Launch console

V 3.2.7

Help is available throughout the GUI

Learn more...



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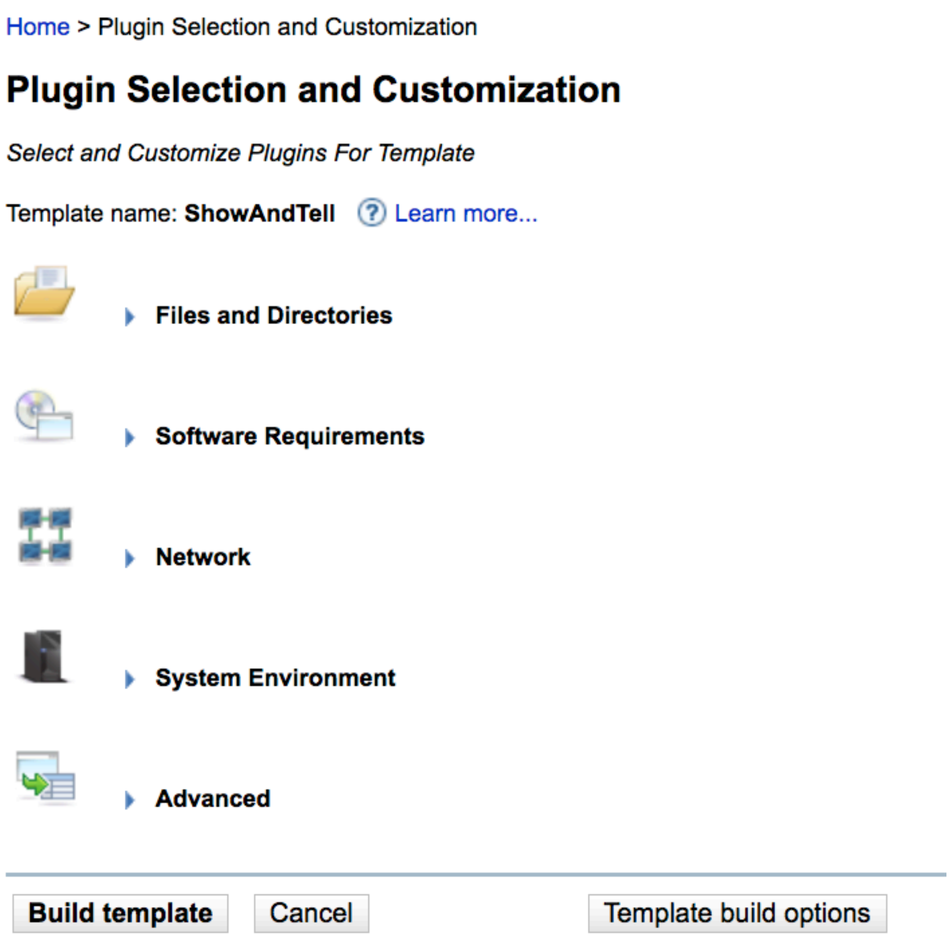
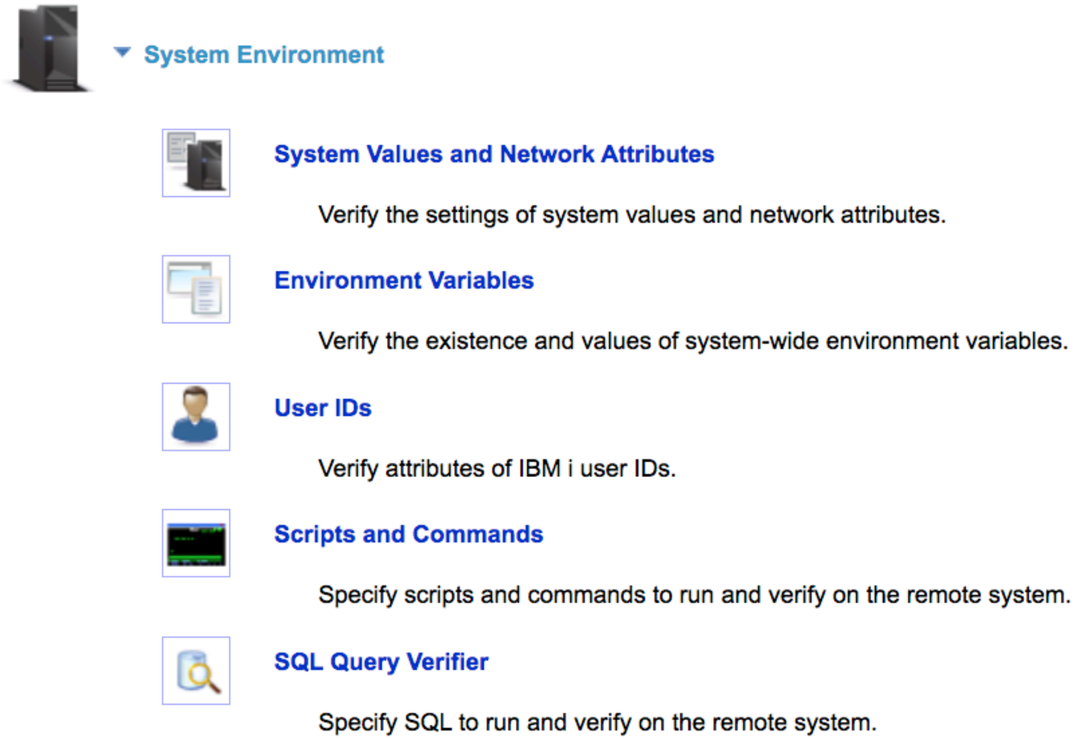
New Template: Plugin Selection



Expand the desired section to access plugins



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File and Directory Attributes

File and Directory Attributes

Create Collections of Files, Directories, and Libraries

Files, directories, and libraries to collect information (?) Learn more...

Collection name	Exists	Type	Size	Last modified	CCSID	Creation time	Specific attributes
Click one of the following buttons to add a collection.							

Add files/directories | Add libraries

Files and Directories

Legend
- The entire directory tree is selected
- Only the directory is selected
- The directory and/or some portions of its sub-tree are selected
- Directory is not selected

Collection name: Collection1

Attributes (?) Learn more...

- ✓ Exists
- ✓ Type
- ☑ Size
- ☐ Last modified
- ☑ CCSID
- ☐ Creation time

Filters: (?) Learn more...

Include:

Exclude:

Example: *.USRPRF; *USXA*

Advanced

Libraries

Legend
- The entire library is selected
- Only the library is selected
- The library and/or some objects within it are selected
- Library is not selected

Collection name: VerifyLibaryDAWNM

Attributes (?) Learn more...

- ✓ Exists
- ✓ Type
- ☑ Size
- ☐ Last modified
- ☑ CCSID
- ☐ Creation time

Additional attributes

Filters: (?) Learn more...

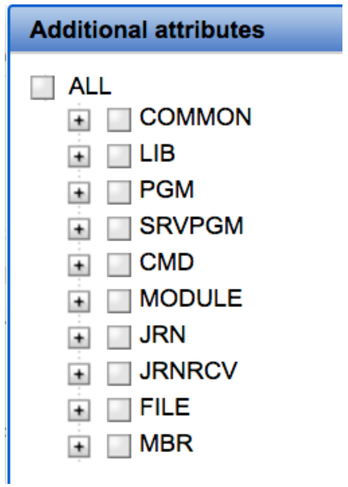
Include:

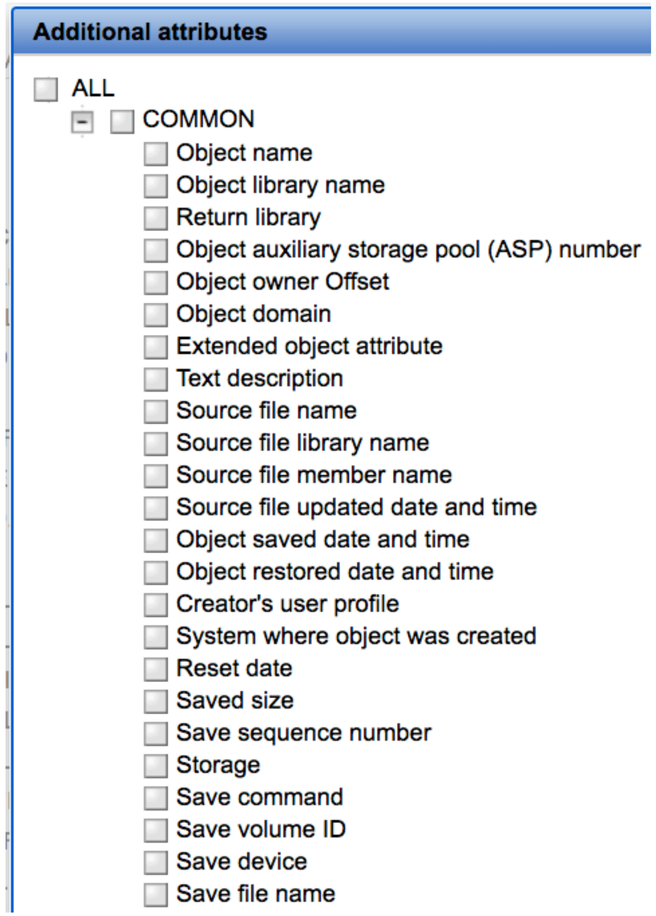
Exclude:

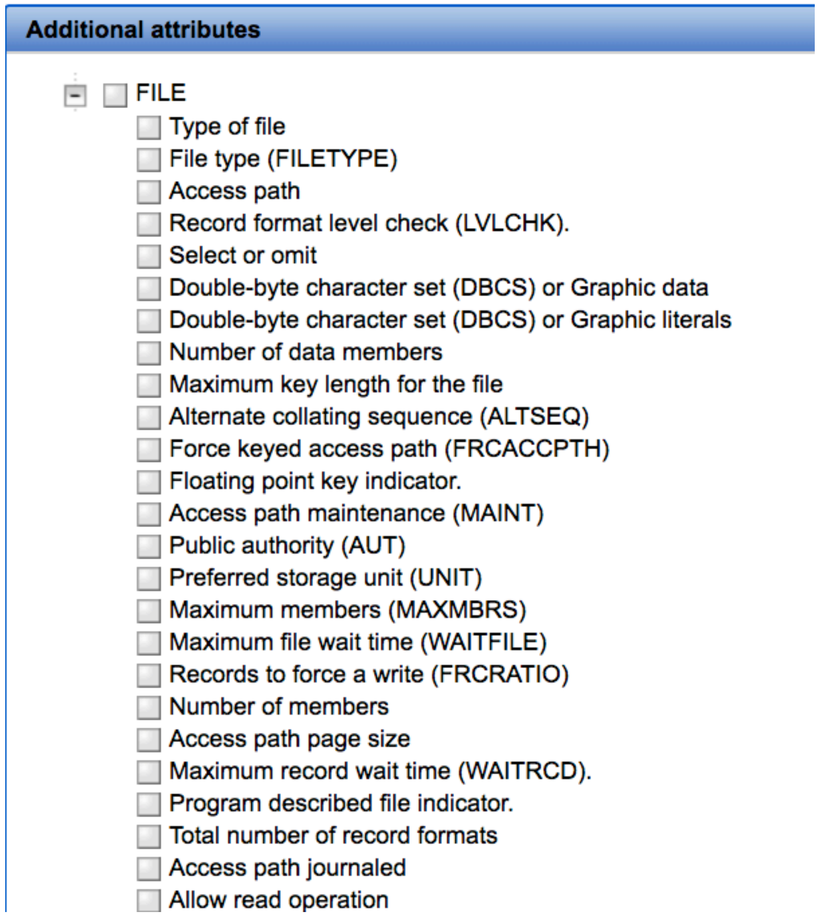
Example: *.USRPRF; *USXA*

Advanced

QSYS.LIB Additional Attributes







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Configuration Files

Configuration Files

Specify Configuration Files to Verify

Configuration files Learn more...

	Configuration file	Type
◉	/www/dawnmay/conf/httpd.conf	HTTP

Add Remove Update Edit XML

Customize Configuration File

Select Configuration Values to Verify

Configuration file: /www/dawnmay/conf/httpd.conf

	Key	Expected value	Edit
☑	Options	-FollowSymLinks	Edit
☑	LogFormat	['"%h %T %l %u %t \"%r\" %>s %b \"%{Referer}i\" \"%{User-Agent}i\"" combined' '"%{Cookie}n \"%r\" %t" cookie' '"%{User-agent}i" agent' '"%{Referer}i -> %U" referer' '"%h %l %u %t \"%r\" %>s %b" common']	Edit
☑	SetEnvIf	['"User-Agent" "Mozilla/2" nokeepalive' '"User-Agent" "JDK/1\.0" force-response-1.0' '"User-Agent" "Java/1\.0" force-response-1.0' '"User-Agent" "RealPlayer 4\.0" force-response-1.0' '"User-Agent" "MSIE 4\.0b2;" nokeepalive' '"User-Agent" "MSIE 4\.0b2;" force-response-1.0']	Edit
☑	#	Configuration originally created by Create HTTP Server wizard on Mon Apr 01 10:09:43 EDT 2019	Edit
☑	DirectoryIndex	index.html	Edit
☑	DocumentRoot	/www/dawnmay/htdocs	Edit
☑	Listen	*:80	Edit
☑	HTTPSubsystemDesc	DAWNM/DAWNMAY	Edit
☑	LogMaint	['logs/access_log 7 0' 'logs/error_log 7 0']	Edit
☑	AccessFileName	.htaccess	Edit
☑	CustomLog	logs/access_log combined	Edit
☑	HTTPStartJobQueue	DAWNM/DAWNMAYJQBAD	Edit
☑	[Directory /www/dawnmay/htdocs]:::Require	all granted	Edit
☑	TraceEnable	Off	Edit
☑	[Directory /]:::Require	all denied	Edit
☑	HTTPStartJobDesc	DAWNM/HTTPJOBD	Edit
☑	HTTPRoutingData	HTTPSVR	Edit

Add Remove Select all Deselect all

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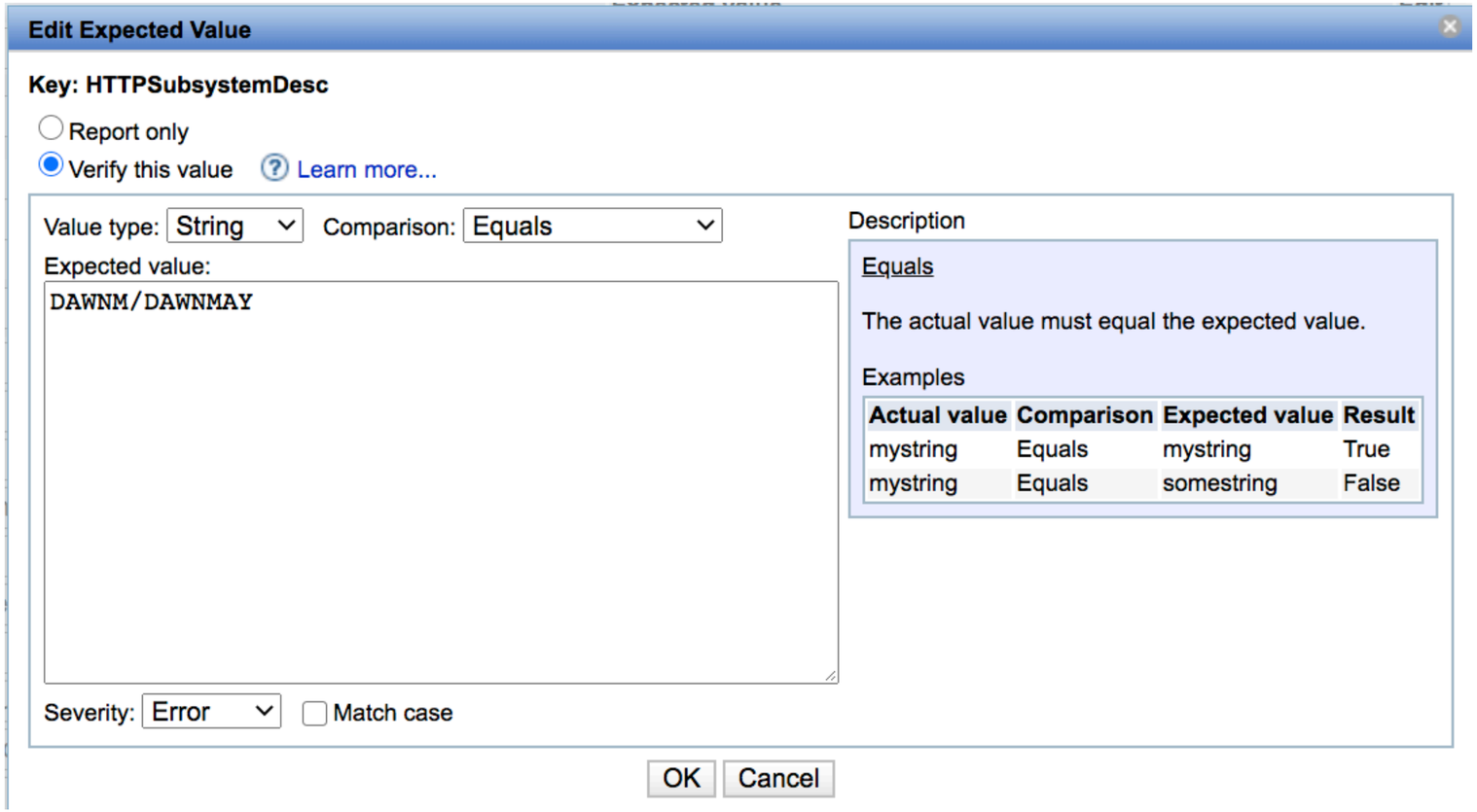
Configuration Files: Edit Expected Values



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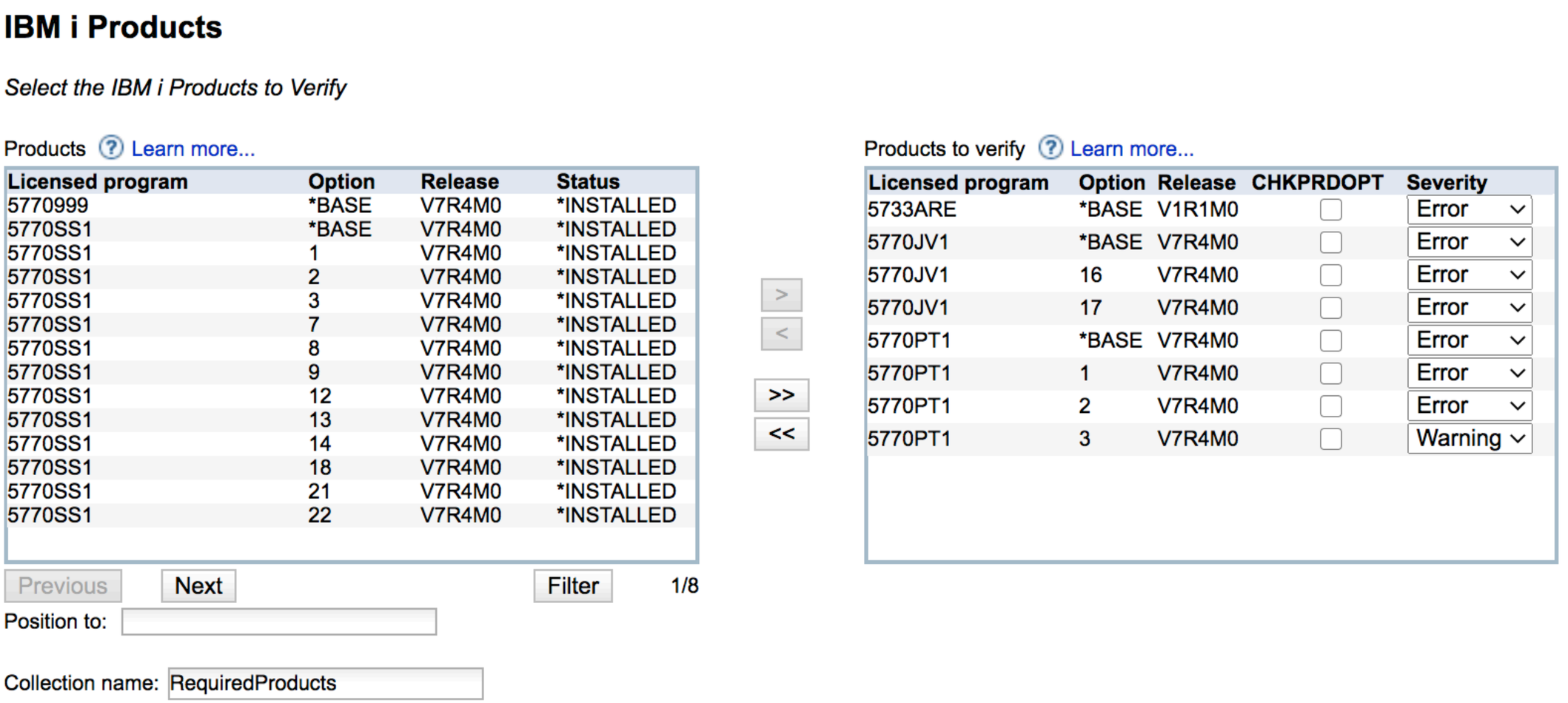
IBM i Products



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Network Configuration and Ports

Network Configuration

Verify IBM i Network Configuration

Verify TCP/IP Configuration

- ✓ Domain information
- ✓ Host table entries
- ✓ Interfaces

Verify DNS Lookup Performance and Correctness

- ✓ Retrieve IP address for local host
- ✓ Retrieve IP address for loopback
- ✓ Retrieve the host name for IP address 127.0.0.1

Ports

Specify Ports to Verify

Port status: (?) Learn more...

	Port	Expected status	Severity
☐	21	In Use	Error
☐	22	In Use	Error
☐	8470	In Use	Error
☐	8471	In Use	Error

Add | Remove all

Restricted port ranges: (?) Learn more...

	Starting port	Ending port	Severity
☐			Error

Add | Remove all

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System Values and Network Attributes

System Values and Network Attributes

Select System Values or Network Attributes to Verify

System values and network attributes to collect information (?) Learn more...

	Collection name
◉	NetworkAttributes
○	SystemValues

Add Remove Update Edit XML Test

System Values and Network Attributes

Select System Values or Network Attributes to Verify

System values and network attributes (?) Learn more...

ALRBCKFP
ALRCTLD
ALRDFTFP
ALRFTR
ALRHLDCNT
ALRLOGSTS
ALRPRIFP
ALRRQSFP
ALRSTS
ALWADDCLU
ALWANYNET
ALWHPRTWR
ALWVRTAPPN
DDMACC
DFTCNNLST

> < >> <<

Values to verify (?) Learn more...

QACTJOB	Edit
QADLACTJ	Edit
QADLTOTJ	Edit
QHSTLOGSIZ	Edit
QJOBMSGQMX	Edit
QMAXJOB	Edit
QMAXSPLF	Edit
QQRYDEGREE	Edit
QTOTJOB	Edit

Previous Next 1/13

Position to:

Collection name: SystemValues

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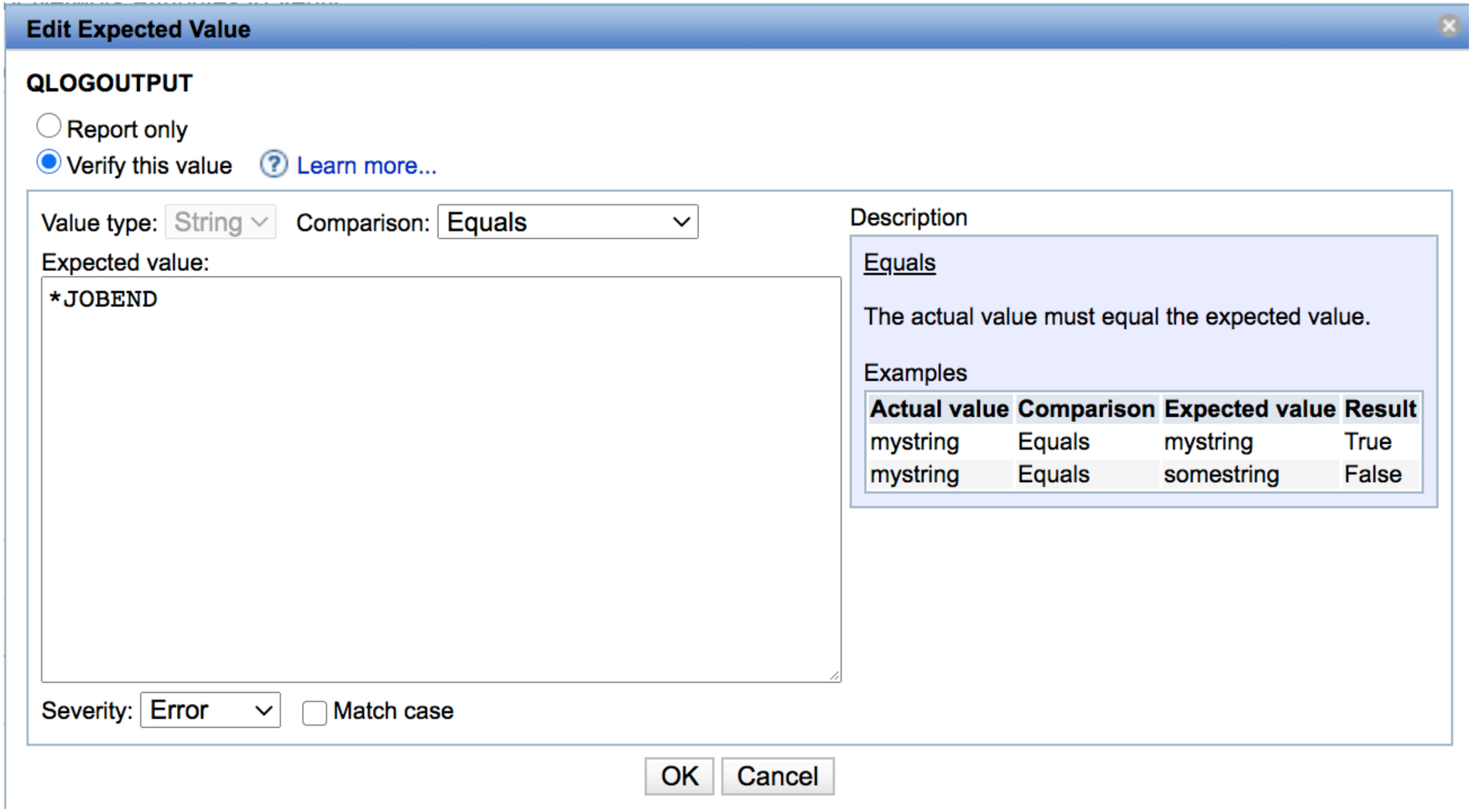
System Values: Edit Expected Value



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Environment Variables

Environment Variables

Specify the Environment Varibles to Verify

System wide environment variables Learn more...

	Environment variable	Value	Check type	Check CCSID	CCSID
◉	QIBM_FTP_PORT_RANGE	54300-54399	Equal	Yes	37
○	QIBM_SRVRMODE_SBS	*SAME	Equal	Yes	37
○	PASE_USRGRP_LIMITED	N			
○	QIBM_MULTI_THREADED	Y			
○	PATH	/usr/bin:.:/QOpenSys/usr/bin			

Add Remove Edit

Add Environment Variable

Name:

○ Do not verify the environment variable value, just include its current value in the report
◉ Verify the environment variable value

The values must: ◉ Equal any of the following values
○ Not equal any of the following values

Value:

CCSID: 65535 ☑ Check CCSID

OK Cancel

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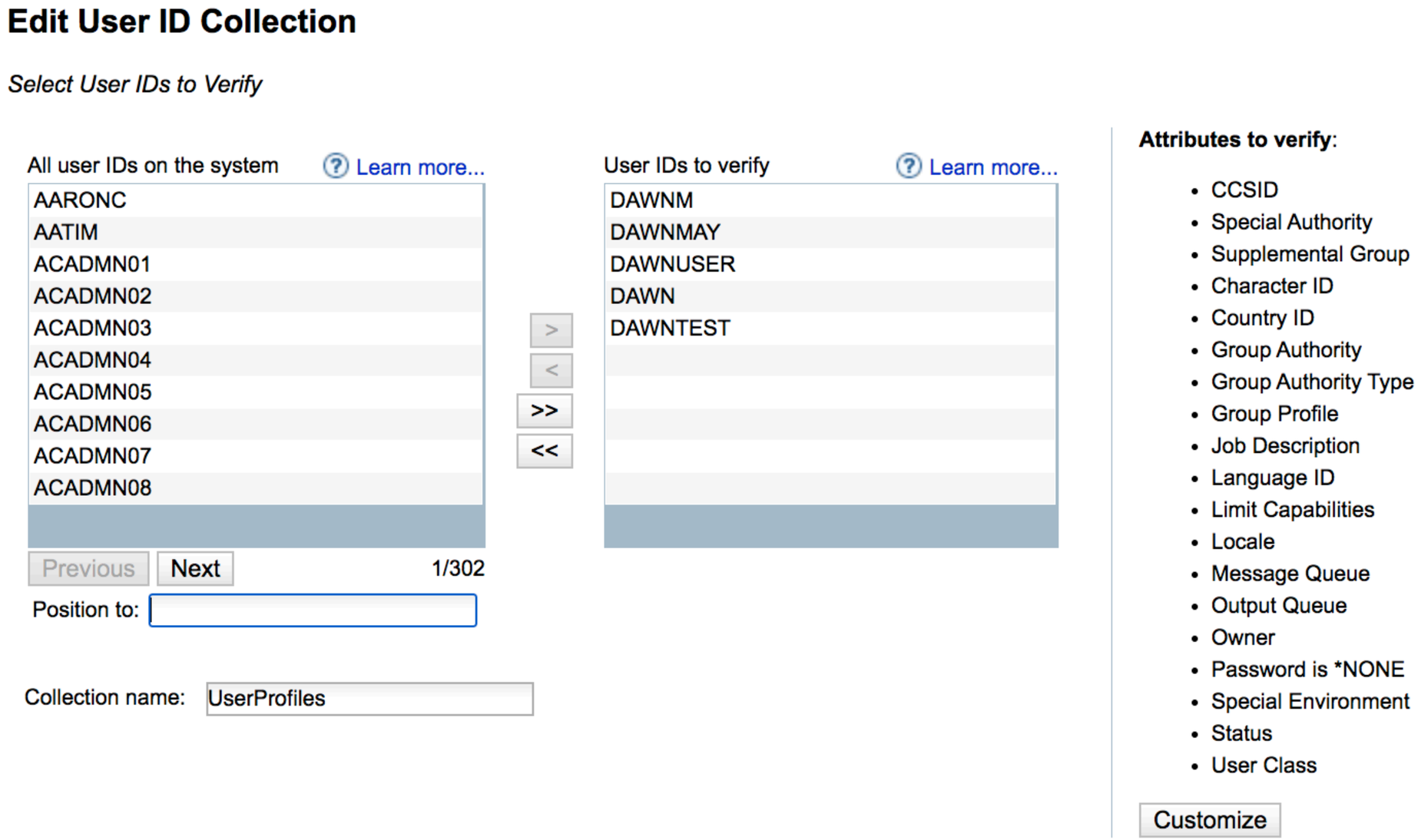
User IDs



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Scripts and Commands: Shell Script

- Run a shell script in QShell
- Can verify information from stdout or stderr

Home > Plugin Selection and Customization > Scripts and Commands > Customize Script or Command

Scripts and Commands

Specify the Script or Command to be Run and Verified

Collection name: Collection1

Program to run and verify Learn more...

Script command to run in QShell

*Example: system "WRKSYSSTS ASTLVL(*ADVANCED)"*

CL command to run

Print the result of the command to the verification report: Yes

Result verification Learn more...

Result verification details

Group	Severity	Source	Expected value
			This table is empty.

Add

Result verification group Learn more...

Name: MyGroup1

Severity: Error

Type:

AND - All conditions in the group must be met for the verification to be successful

OR - Only one of the conditions in the group must be met for the verification to be successful

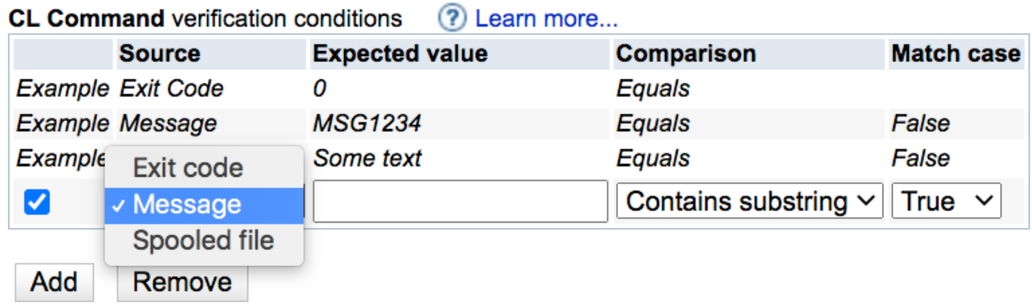
Script verification conditions Learn more...

	Source	Expected value	Comparison	Match case
Example	*Exit Code*	*0*	*Equals*	
Example	*Standard Output*	*Some example*	*Contains*	*False*
Example		*Some value*	*Contains*	*True*
☑	Exit code / ✓ Standard output / Standard error		Contains substring	True

Add Remove

Scripts and Commands: CL Command

- Run a CL Command
- Job will be submitted to batch using the JOBD associated with the user profile
- Can verify information from messages to the job log, information in a spooled file



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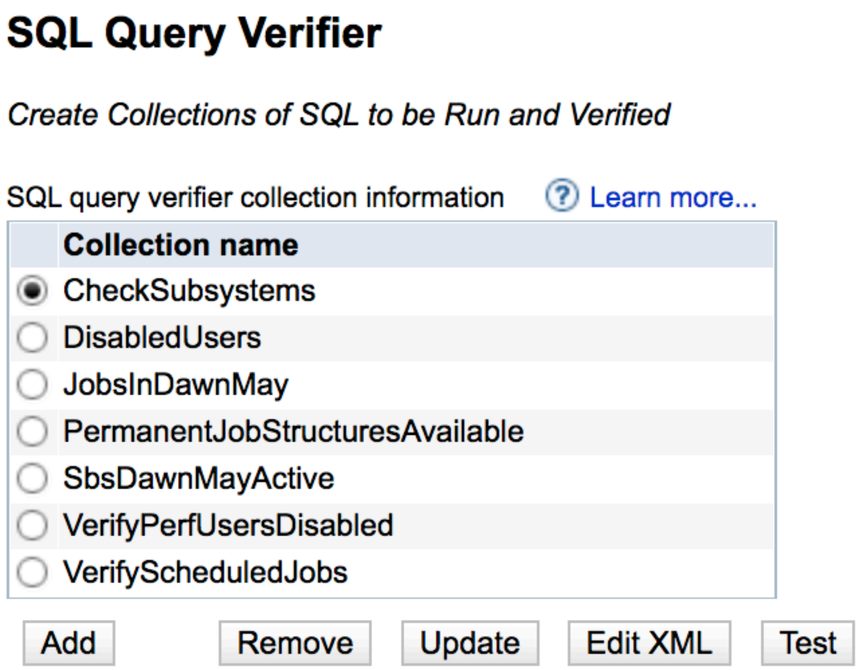
SQL Query Verifier



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A Single SELECT Statement

- Can verify information returned in any column

Customize SQL Query Verifier

Specify the SQL Query and Verifications Details

Collection name: PermanentJobStructuresAvailable

Select statement Learn more...

```
select permanent_job_structures_available from qsys2.system_status_info
```

*Example: SELECT * FROM myDB.myTable*

Print the result set of SQL query to the verification report: Yes

Check the number of records returned for the SQL query Learn more...

Column value verification conditions Learn more...

	Column name	Check class	Expected value	Comparison	Result type	Match case	Severity	Description
Example	*id*	*Numeric*	*6*	*Equals*	*All*	*False*	*Error*	*All ids should equal to 6*
Example	*name*	*String*	*John*	*Contains substring*	*Any*	*True*	*Error*	*Names returned should contain 'John'*
☑	permanent_job_structur	Numeric	10000	Greater than	Any	False	Warning	Sufficient perm stuctures

Add Remove

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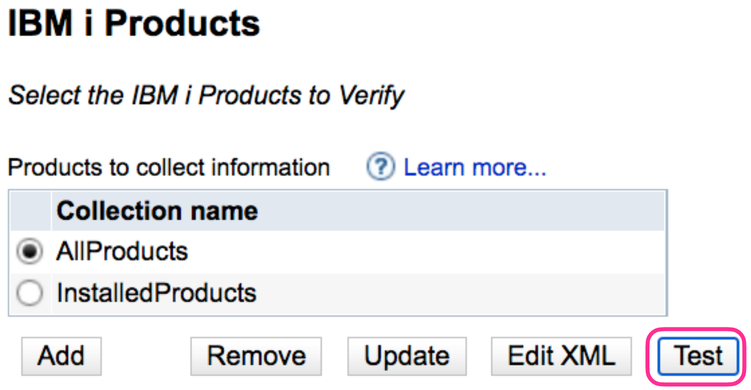
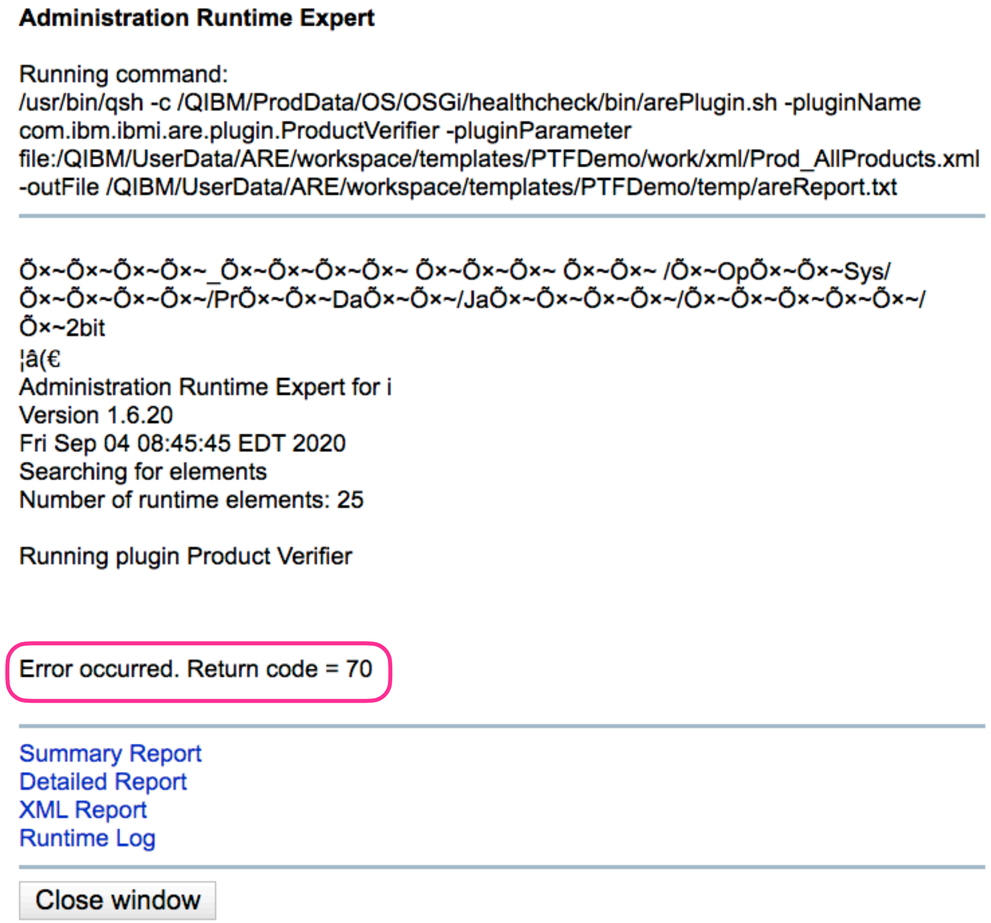
Test a Plugin

- You can test a plugin without building and testing the entire template
- The test opens a new browser window with the results
  - Includes links to the text reports





Return code of 70 indicate an error was found

Administration Runtime Expert completed successfully.

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Edit XML

- You can edit the XML for the validation
- If you edit the XML, you won't be able to edit the plugin in the GUI

```
<?xml version="1.0" encoding="UTF-8"?><ptfLevelSet version="1.0">
    <ptfLevels>
        <ptfLevel type="Specific">
            <ptf description="" errorLevel="ERROR" name="SI71725" type="single">
                <check errorLevel="ERROR" status="installed"/>
            </ptf>
            <ptf description="" errorLevel="ERROR" name="SI72216" type="single">
                <check errorLevel="ERROR" status="installed"/>
            </ptf>
            <ptf description="" errorLevel="ERROR" name="SI72224" type="single">
                <check errorLevel="ERROR" status="installed"/>
            </ptf>
            <ptf description="" errorLevel="ERROR" name="AB98765" type="single">
                <check errorLevel="ERROR" status="installed"/>
            </ptf>
            <ptf description="" errorLevel="Warning" name="SF99653" type="group">
                <check errorLevel="Warning" status="installed"/>
                <check errorLevel="Warning" minimumLevel="6"/>
                <check errorLevel="Warning" recommendedLevel="9"/>
            </ptf>
            <ptf description="" errorLevel="Error" name="SF99661" type="group">
                <check errorLevel="Error" status="installed"/>
                <check errorLevel="Error" minimumLevel="1"/>
                <check errorLevel="Error" recommendedLevel="1"/>
            </ptf>
            <ptf description="" errorLevel="Error" name="SF99662" type="group">
                <check errorLevel="Error" status="installed"/>
                <check errorLevel="Error" minimumLevel="7"/>
                <check errorLevel="Error" recommendedLevel="7"/>
            </ptf>
            <ptf description="" errorLevel="Error" name="SF99663" type="group">
                <check errorLevel="Error" status="installed"/>
                <check errorLevel="Error" minimumLevel="3"/>
                <check errorLevel="Error" recommendedLevel="3"/>
            </ptf>
            <ptf description="" errorLevel="Error" name="SF99664" type="group">
                <check errorLevel="Error" status="installed"/>
                <check errorLevel="Error" minimumLevel="14"/>
                <check errorLevel="Error" recommendedLevel="14"/>
            </ptf>
```


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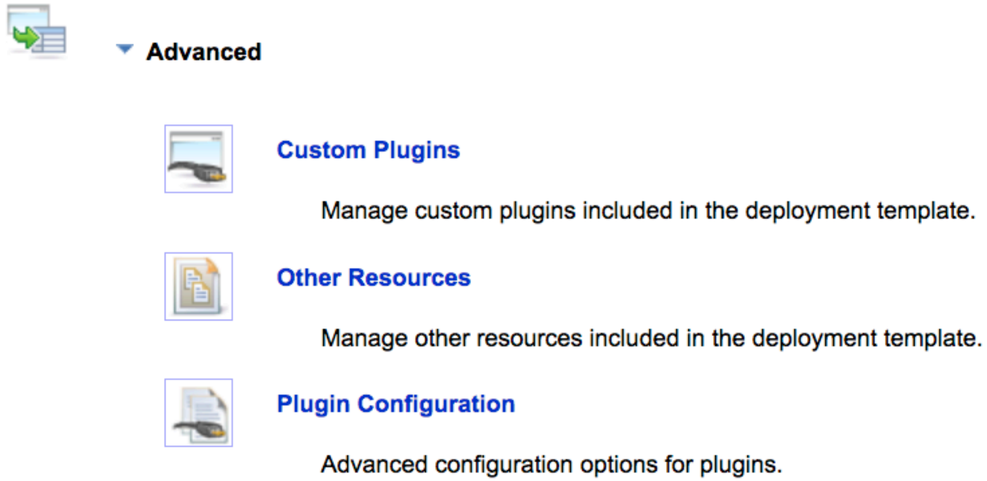
Advanced

- You can create your own custom plugins
- Add additional resources that are sent to the endpoint system within the template
  - Generally used for additional jar files your custom plugin may need
- Plugin Configuration allows you to pass parameters to custom plugins



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Build Template

- You must build the template once you have finished editing the plugins
  - If you do not build the template and exit the template editor, all changes are lost
  - Don’t let your ARE session timeout when working a template!

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Build Template Summary

- Review all your plugins prior to building the template

Summary

Deployment Template Build Summary

Environment Variables | User IDs | Ports | PTFs | Scripts
Other Resources | Plugin Configuration | SQL Query Verifier
File and Directory Authorities | Configuration Files | IBM i Produ
System Values and Network Attributes

Generated template file name: /QIBM/UserData/ARE/workspace/template
Version: 1.0.43
Description: Template created by the IBM Administratio
Runtime core version must be at or higher than: 1.6.15

Features enabled:

✓ Capability to fix detected problems

Build integrated template:

- No - *(The template requires ARE core PTF on the target system to ru*

Summary

Deployment Template Build Summary

Environment Variables | User IDs | Ports | PTFs | Scripts and Commands | Resource Collector | Custom Plugins
Other Resources | Plugin Configuration | SQL Query Verifier | Template Summary | File and Directory Attributes
File and Directory Authorities | Configuration Files | IBM i Products | Network Configuration
System Values and Network Attributes

NetworkAttributes

Value	Value type	Check type	Expected value	Severity	Match case	Description
ALWANYNET	string	equals	*YES	Error	No	Allow AnyNet support
SYSNAME	string	equals	COMMON1	Error	No	Current system name

SystemValues

Value	Value type	Check type	Expected value	Severity	Match case	Description
QACTJOB	numeric	equals	200	Error	No	Initial number of active jobs
QADLACTJ	numeric	equals	30	Error	No	Additional number of active jobs
QADLTOTJ	numeric	equals	30	Error	No	Additional number of total jobs
QHSTLOGSIZ	numeric	equals	-1	Error	No	Maximum history log records
QJOBMSGQMX	numeric	lessThan	16	Error	No	Maximum size of job message queue
QMAXJOB	numeric	equals	163520	Error	No	Maximum number of jobs
QMAXSPLF	numeric	equals	9999	Error	No	Maximum number of spooled files
QTOTJOB	numeric	equals	200	Error	No	Initial total number of jobs
QQRYDEGREE	string	equals	*OPTIMIZE	Error	No	Parallel processing degree

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Template Considerations

- Iterative process to develop templates
- Start simple
  - Add attributes as identified by day-to-day systems management or problem determination
- Develop custom plugins to verify attributes not supported by ARE template editor
  - Some examples:
    - Check NetServer file shares
    - Check Collection Services configuration
    - Prestart job statistics versus prestart job tuning parameters
    - The possibilities are endless

- Templates are never done
  - Like performance tuning, review your templates and modify as the environment or applications change

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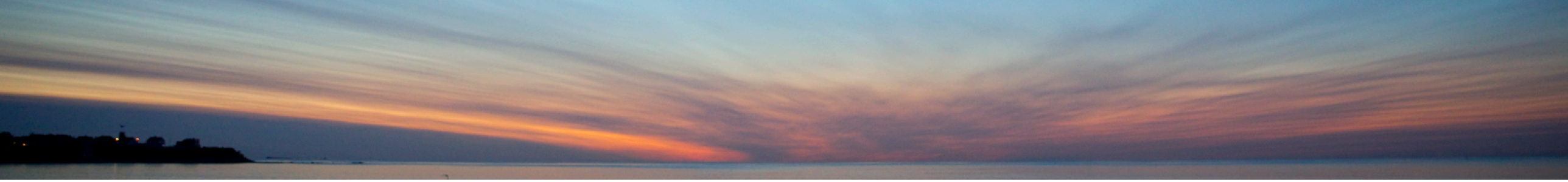

Verifying Systems

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Launch Console

Create ▾ Import ▾ Actions ▾

Operations ▾
- Add
- Delete
- Rename
- Copy

Launch console

Console

The IBM Administration Runtime Expert for i is capable of verifying multiple IBM i systems using a deployment template created or imported using the deployment template editor. Learn more...

Groups:

- Default
- DawnGroup
- DawnNoEmail

Operations ▾

Systems to verify:

	System name	User ID	Password	Template
☑	common1.frankeni.com	dawnm	••••••••	OneThing
☐	DEV740.RZKH.DE	dawnmay		OneThing

Add | Remove | Select all | Deselect all | Runtime properties

Note: Only selected systems are verified. Schedule runs only if IBMARE is running.

Schedule
No schedule.

Verify systems | View previous results

Launch deployment template editor | Import and view report

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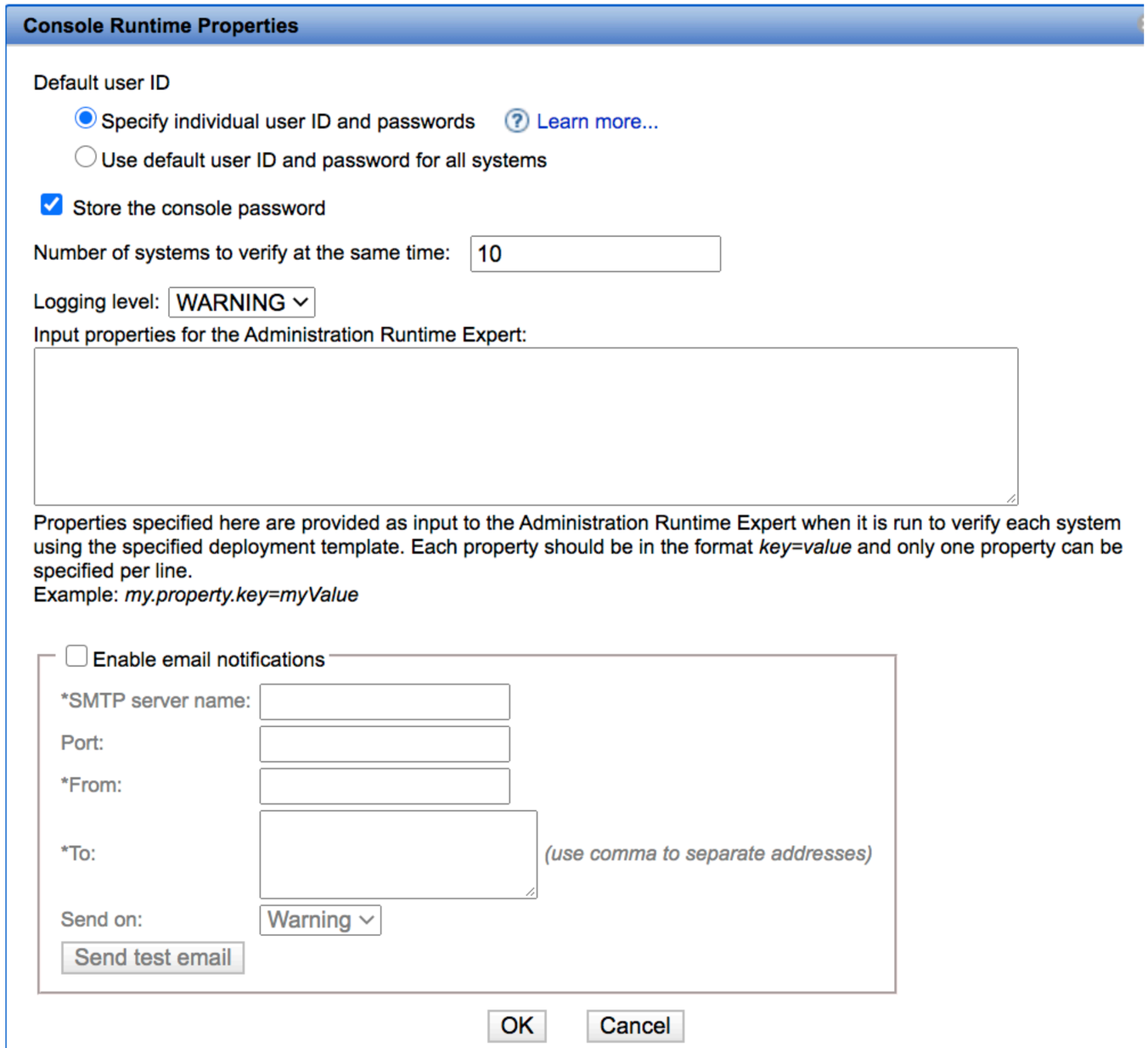
Runtime Properties



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Schedule

Schedule
No schedule.

Schedule Setting

- ○ No schedule
- ○ Daily
- ◉ Weekly
  - Every Sunday At 0 : 0
- ○ Monthly

Note: Only selected systems are verified. Schedule runs only if IBMARE is running. Learn more...

OK Cancel

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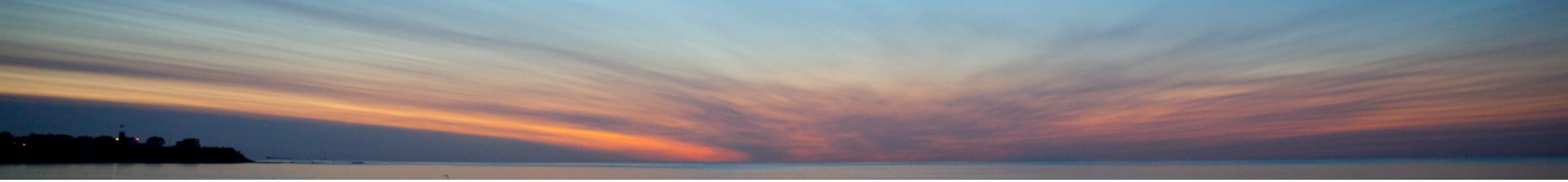

Understanding the Reports

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Summary Report

Summary Report

System name: common1.frankeni.com

Remote core version: 1.6.20

Template: OneThing

User ID: DAWNM

Summary details (?) Learn more...

Plugin name	Attributes verified	Error	Warning	Info	Fix actions
Authority Verifier	40	3	0	0	None
Command Verifier	4	0	0	0	None
DisabledUserProfiles	0	162	0	0	None
NetServerFileShares	0	1	0	0	None
TunePrestartJobEntries	0	0	0		
VerifyCacheBatteries	0	0	0		
VerifyWebSettings	0	1	0		

Summary details (?) Learn more...

Plugin name	Attributes verified	Error	Warning	Info	Fix actions
Authority Verifier	40	3	0	0	None
Command Verifier	4	0	0	0	None
DisabledUserProfiles	0	162	0	0	None
NetServerFileShares	0	1	0	0	None
Description					
/ifslab06 has incorrect permissions /ifslab06 should be READ ONLY					
TunePrestartJobEntries	0	0	0	0	None
VerifyCacheBatteries	0	0	0	0	None
VerifyWebSettings	0	1	0	0	None
Description					
PHP_FCGI_CHILDREN is not set correctly. It is set to 10.					

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Detailed Report

Detailed Report

File: /QIBM/UserData/ARE/workspace/console/temp/DawnNoEmail/20200805142013

IBM Administration Runtime Expert for i
Version 1.6.20
Wed Aug 05 14:20:15 EDT 2020
Using template: file:template.jar (1.0.70)
Number of runtime elements: 30
Running with user: DAWNM
User DAWNM has *ALLOBJ authority

Running plugin Authority Verifier
> A total of 1 XML rule file will be processed
> Processing XML rule file (xml/Auth_Collection1.xml) for object authority
o Checking authority for /home/DAWNM/1.test
- OK: Owner of /home/DAWNM/1.test is DAWNM
- OK: Primary group for /home/DAWNM/1.test is *NONE
- OK: Authorization list set to *NONE for /home/DAWNM/1.test
- OK: User DAWNM has *RWX data authority to /home/DAWNM/1.test
- OK: User DAWNM has *ALL object authority to /home/DAWNM/1.test
- OK: User *PUBLIC has *RWX data authority to /home/DAWNM/1.test
- OK: User *PUBLIC has *ALL object authority to /home/DAWNM/1.test
o Checking authority for /home/DAWNM/2.test
- OK: Owner of /home/DAWNM/2.test is DAWNM
- OK: Primary group for /home/DAWNM/2.test is *NONE

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XML Report

XML Report

File: /QIBM/UserData/ARE/workspace/console/temp/DawnNoEmail/20200805142013_M/common1.frankeni.com_On

```
<?xml version="1.0" encoding="UTF-8"?><applicationRuntimeExpertReport version="1.0">
  <generalInfo>
    <info name="IBM Administration Runtime Expert for i">1.6.20</info>
    <info name="verification time">Wed Aug 05 14:20:15 EDT 2020</info>
    <info name="Runtime element jars">file:template.jar (1.0.70); </info>
    <info name="Number of runtime elements">30</info>
    <info name="userName">DAWNM</info>
    <info name="userProfile.specialAuth">['*ALLOBJ' '*SECADM' '*JOBCTL' '*SPLCTL' '*SAVSYS' '*SERVICE' '
  </generalInfo>
  <reportBody>
    <elementReport className="com.ibm.ibmi.are.plugin.AuthorityVerifier" commonName="Authority Verifier" succ
      <report/>
      <report message="A total of 1 XML rule file will be processed"/>
      <report/>
      <report message="Processing XML rule file (xml/Auth_Collection1.xml) for object authority">
        <report message="Checking authority for /home/DAWNM/1.test" target="/home/DAWNM/1.test">
          <report message="OK: Owner of /home/DAWNM/1.test is DAWNM"/>
          <report message="OK: Primary group for /home/DAWNM/1.test is *NONE"/>
          <report message="OK: Authorization list set to *NONE for /home/DAWNM/1.test"/>
          <report message="OK: User DAWNM has *RWX data authority to /home/DAWNM/1.test"/>
          <report message="OK: User DAWNM has *ALL object authority to /home/DAWNM/1.test"/>
          <report message="OK: User *PUBLIC has *RWX data authority to /home/DAWNM/1.test"/>
          <report message="OK: User *PUBLIC has *ALL object authority to /home/DAWNM/1.test"/>
        </report>
```


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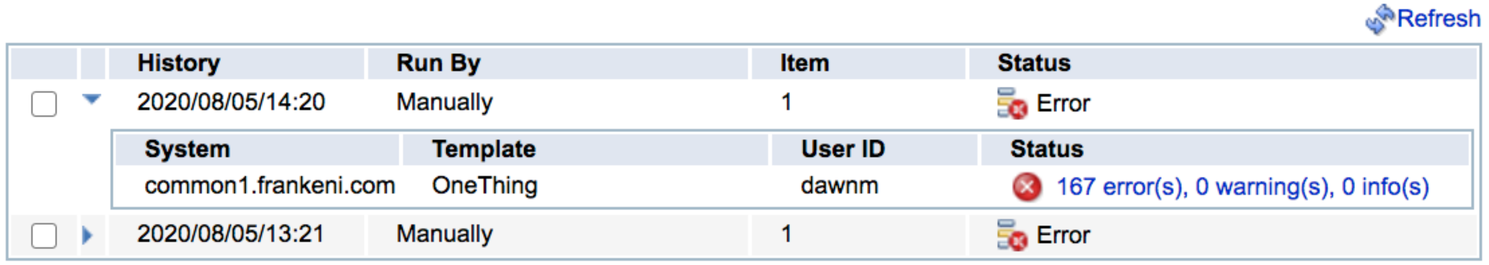
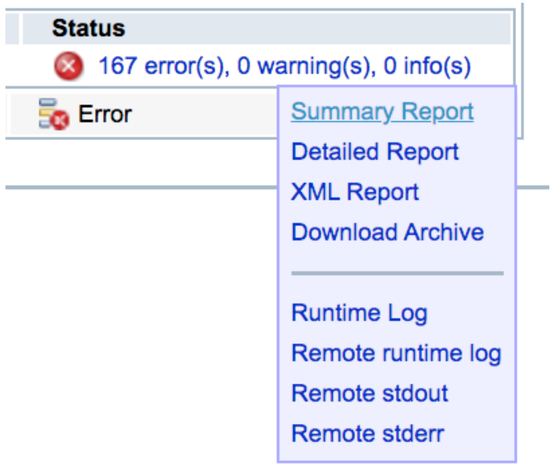
Previous Results





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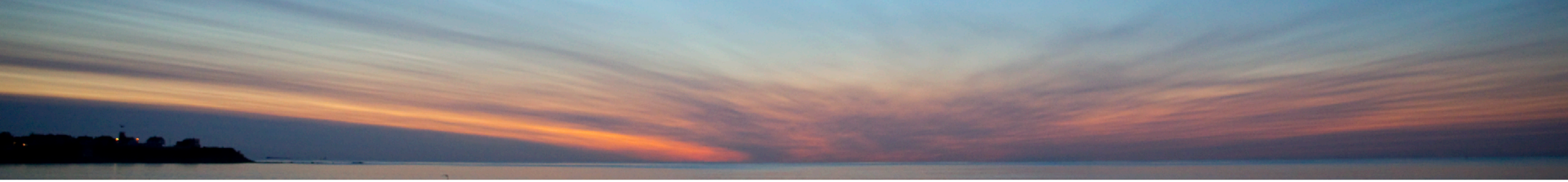

Using ARE for Products and PTFs

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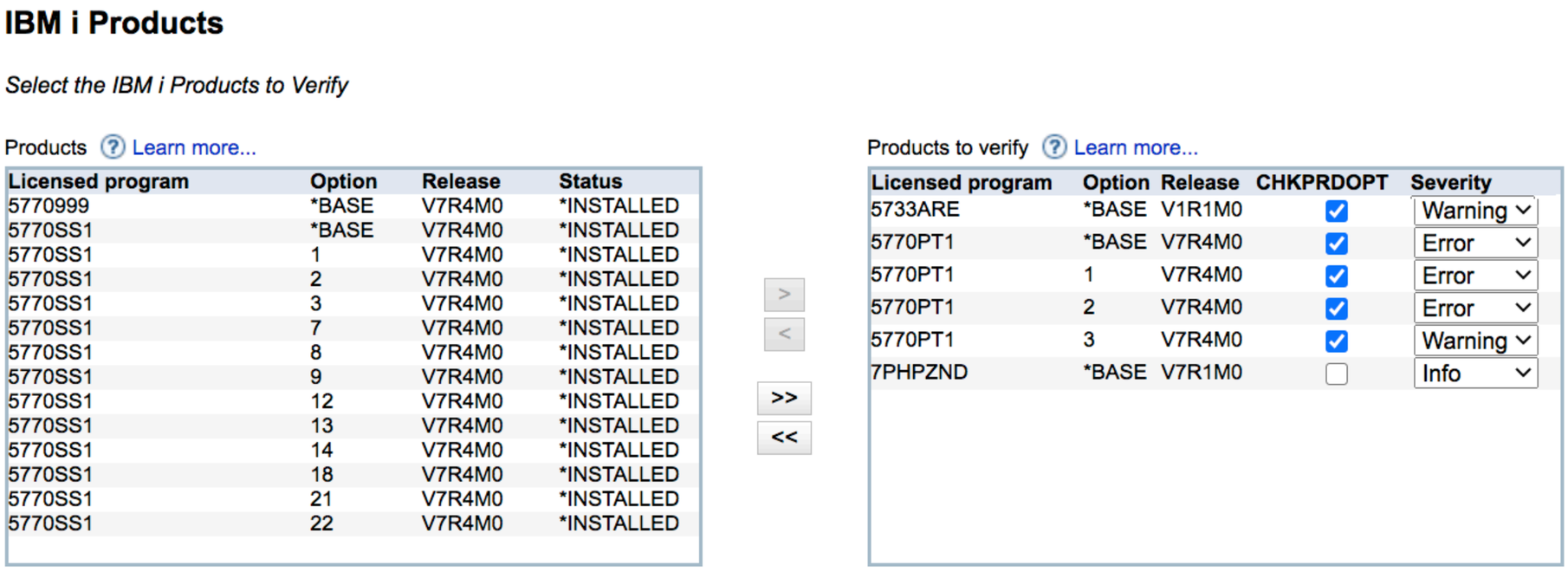
Verify Installed Products

- You can verify the installed products
- The list of products to verify is taken from the products installed on the central system



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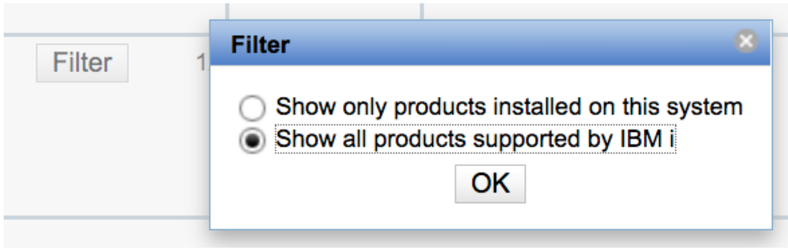
Filter Option to Select from Installed Products or All Products

- Default list is the products installed on the central system
- Filter option to show all products supported by IBM i
- Add option to add other products to the list



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All Products

- Shows products from all supported releases
- Helpful to build templates when the central system does not have the product installed

Select the IBM i Products to Verify

Products (?) Learn more...

Licensed program	Option	Release	Status
5770999	*BASE	V7R2M0	
5770999	*BASE	V7R3M0	
5770999	*BASE	V7R4M0	*INSTALLED
5770SS1	*BASE	V7R2M0	
5770SS1	*BASE	V7R3M0	
5770SS1	*BASE	V7R4M0	*INSTALLED
5770SS1	1	V7R2M0	
5770SS1	1	V7R3M0	
5770SS1	1	V7R4M0	*INSTALLED
5770SS1	2	V7R2M0	
5770SS1	2	V7R3M0	
5770SS1	2	V7R4M0	*INSTALLED
5770SS1	3	V7R2M0	
5770SS1	3	V7R3M0	

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Check Product Option Command

- Can optionally run the CHKPRDOPT command during the verification
- Note that if a problem is found, the product option is put into an *ERROR state

- The problem is logged to the reports

```
IBM Administration Runtime Expert for i
Version 1.6.20
Fri Sep 04 08:45:45 EDT 2020
Number of runtime elements: 25

Running plugin Product Verifier
ERROR! Product 5733OPS option 0004 (V1R1M0) status is not what was expected.  Expected: installed  Actual: Installed
(but in *ERROR state)
ERROR! CHKPRDOPT failed for product 5733OPS option 0004 (V1R1M0)
Details:         : ERROR GETTING STATS FOR '/QOpenSys/usr/bin/python': No such path or directory.
Details: CPF3D98 : Exit program processing found error in product.
Details: CPD0C2B : Product 5733OPS release V1R1M0 option 0004 load 5050 not correctly installed.
Details: CPF0C20 : Errors found by CHKPRDOPT.
ERROR! Product 5770MG1 option *BASE (V7R4M0) is not installed
    > Total number of product items checked: 4

----------------------------------------
Administration Runtime Expert completed with:
    Plugins run: 1
  Items checked: 4
          Error: 3
        Warning: 0
           Info: 0
    Fix actions: 0
----------------------------------------
```


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Summary Report

- In this example, the products are not installed on the system

Products to verify (?) Learn more...

Licensed program	Option	Release	CHKPRDOPT	Severity
5770MG1	*BASE	V7R4M0	☐	Error
5770RD1	*BASE	V7R4M0	☐	Warning
5770SM1	*BASE	V7R4M0	☐	Info

Product Verifier 4

Description
Product 5770PT1 option 0003 (V7R4M0) is not installed
Product 5770PT1 option 0001 (V7R4M0) is not installed
Product 5770PT1 option 0002 (V7R4M0) is not installed

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ARE and PTFs

- ARE can verify install PTFs or PTF Groups
- When doing verification on PTFs, the PTF Groups and PTFs installed on the central system are used as the comparison
- Critical that your central system be correct and clean with PTFs
- PTF comparisons are release-specific

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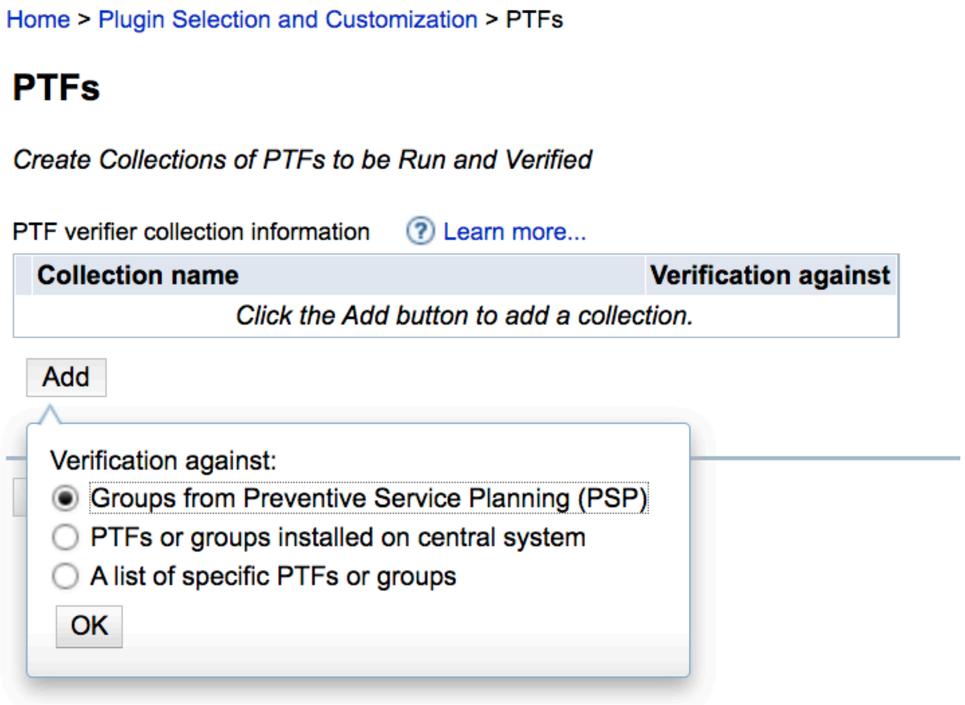
Types of PTF Verifications with ARE

- There are three types of PTF verifications supported by ARE
  - PTF Group Currency
  - PTF Groups
  - Specific PTFs



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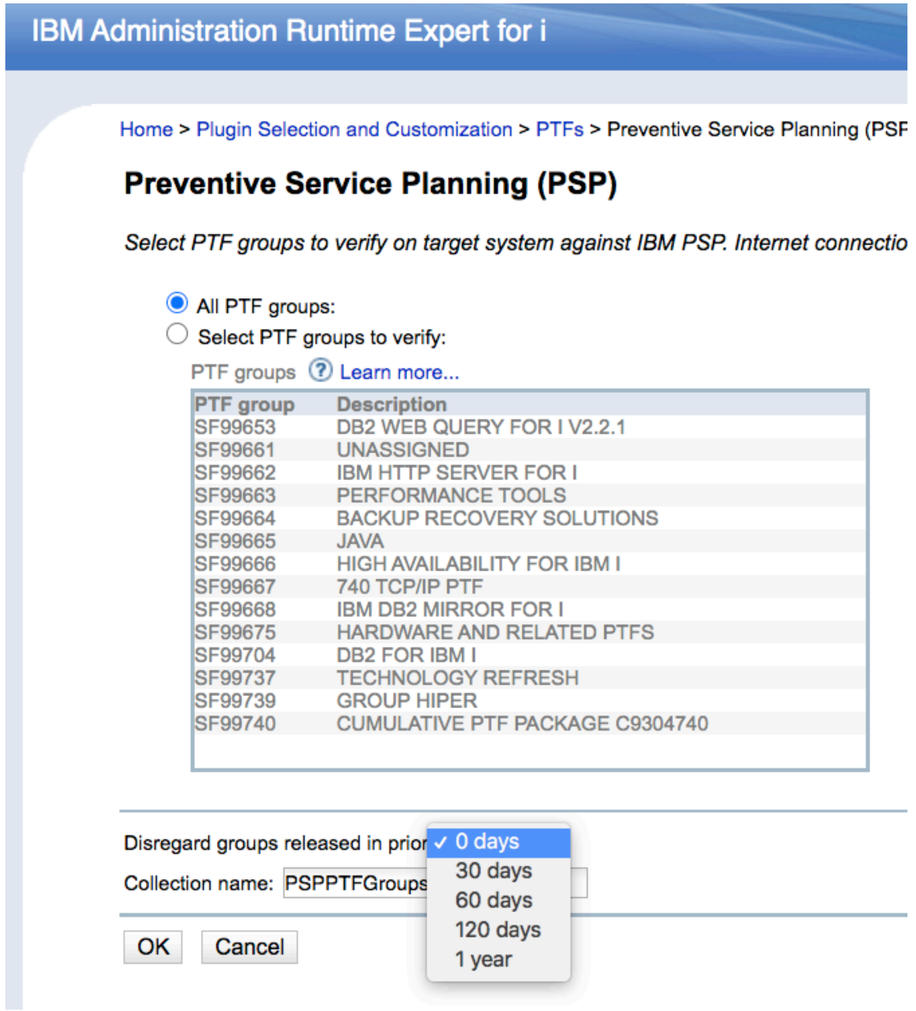
Validate PTF Groups Compared with PTF Groups Available from IBM

- Preventive Service Planning PTF Groups
  - All or a selected set of PTF groups compared with
  - Can specify a timeframe
  - Requires an Internet connection



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PTF Group Currency

Preventive Service Planning (PSP)

Select PTF groups to verify on target system against IBM PSP. Internet connection required.

(•) All PTF groups:
( ) Select PTF groups to verify:

PTF groups (?) Learn more...

PTF group	Description
SF99653	DB2 WEB QUERY FOR I V2.2.1
SF99661	UNASSIGNED
SF99662	IBM HTTP SERVER FOR I
SF99663	PERFORMANCE TOOLS
SF99664	BACKUP RECOVERY SOLUTIONS
SF99665	JAVA
SF99666	HIGH AVAILABILITY FOR IBM I
SF99667	740 TCP/IP PTF
SF99668	IBM DB2 MIRROR FOR I
SF99675	HARDWARE AND RELATED PTFS
SF99704	DB2 FOR IBM I
SF99737	TECHNOLOGY REFRESH
SF99738	GROUP SECURITY
SF99739	GROUP HIPER
SF99740	CUMULATIVE PTF PACKAGE C0121740

> < >> <<

PTF groups to verify (?) Learn more...

PTF group	Description

Add

Disregard groups released in prior: 0 days

Collection name: Collection1

OK Cancel

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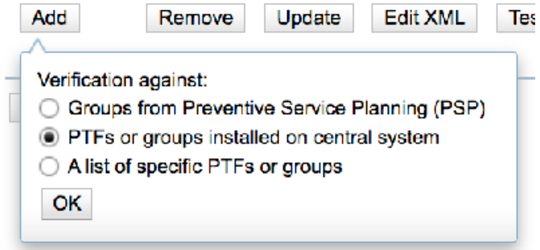
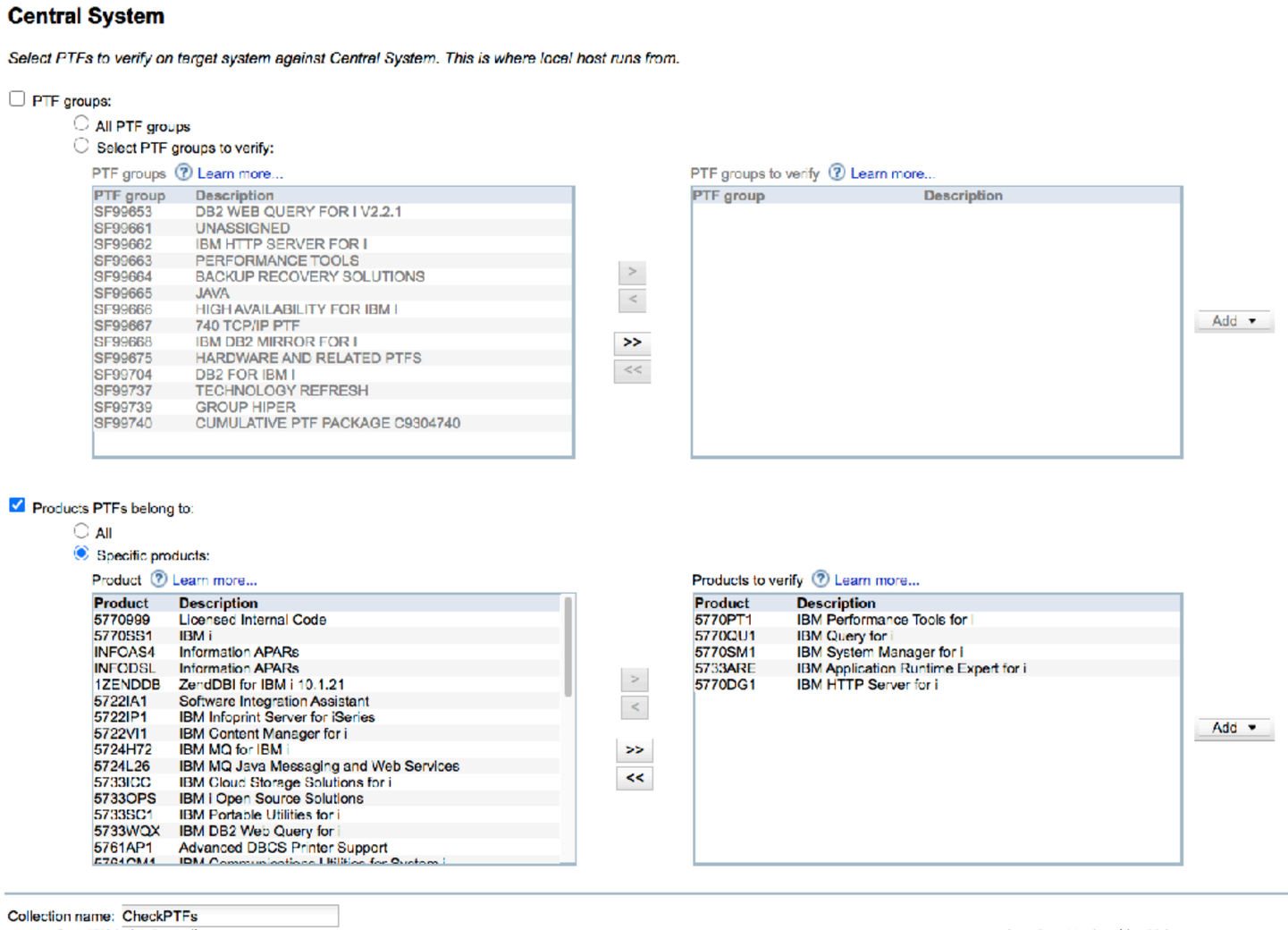
Validate PTF Groups Compared to Central System

- Compare PTF groups installed against the central system
  - By PTF Groups
  - By Products
- Central system and target systems must be on the same release
- Best choice if you want all target systems to be identical to the central system





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PTF Groups

Central System

Select PTFs to verify on target system against Central System. This is where local host runs from.

☑ PTF groups:

- ◉ All PTF groups
- ○ Select PTF groups to verify:

PTF groups (?) Learn more...

PTF group	Description
SF99653	DB2 WEB QUERY FOR I V2.2.1
SF99661	UNASSIGNED
SF99662	IBM HTTP SERVER FOR I
SF99663	PERFORMANCE TOOLS
SF99664	BACKUP RECOVERY SOLUTIONS
SF99665	JAVA
SF99666	HIGH AVAILABILITY FOR IBM I
SF99667	740 TCP/IP PTF
SF99668	IBM DB2 MIRROR FOR I
SF99675	HARDWARE AND RELATED PTFS
SF99704	DB2 FOR IBM I
SF99737	TECHNOLOGY REFRESH
SF99738	GROUP SECURITY
SF99739	GROUP HIPER
SF99740	CUMULATIVE PTF PACKAGE C0121740

> < >> <<

PTF groups to verify (?) Learn more...

PTF group	Description

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Add Your Own PTFs

PTF groups to verify (?) Learn more...

PTF group	Description
SF99653	DB2 WEB QUERY FOR I V2.2.1
SF99661	UNASSIGNED
SF99662	IBM HTTP SERVER FOR I
SF99663	PERFORMANCE TOOLS
SF99664	BACKUP RECOVERY SOLUTIONS
SF99665	JAVA
SF99666	HIGH AVAILABILITY FOR IBM I
SF99667	740 TCP/IP PTF
SF99668	IBM DB2 MIRROR FOR I
SF99675	HARDWARE AND REL
SF99704	DB2 FOR IBM I
SF99737	TECHNOLOGY REFRE
SF99738	GROUP SECURITY
SF99739	GROUP HIPER
SF99740	CUMULATIVE PTF PACKAGE C0121740

Add

Input Name:

AB12345

Add

SF99653	DB2 WEB QUERY FOR I V2.2.1
SF99661	UNASSIGNED
SF99662	IBM HTTP SERVER FOR I
SF99663	PERFORMANCE TOOLS
SF99664	BACKUP RECOVERY SOLUTIONS
SF99665	JAVA
SF99666	HIGH AVAILABILITY FOR IBM I
SF99667	740 TCP/IP PTF
SF99668	IBM DB2 MIRROR FOR I
SF99675	HARDWARE AND RELATED PTFS
SF99704	DB2 FOR IBM I
SF99737	TECHNOLOGY REFRESH
SF99738	GROUP SECURITY
SF99739	GROUP HIPER
SF99740	CUMULATIVE PTF PACKAGE C0121740
AB12345	== PTF group added by user ==

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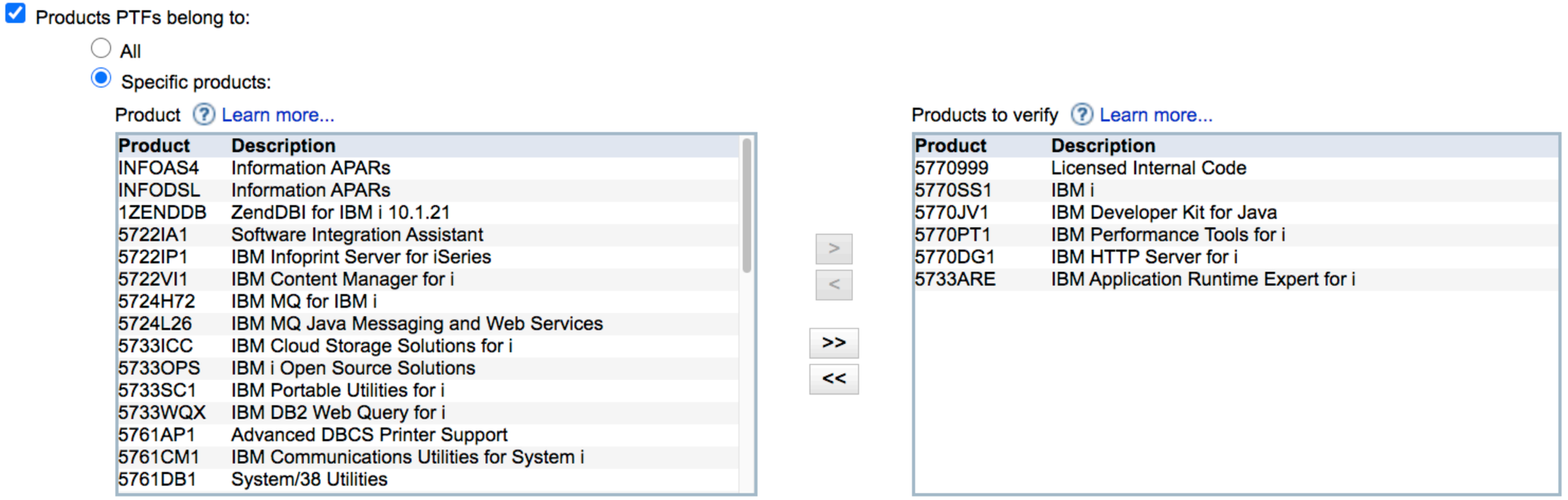
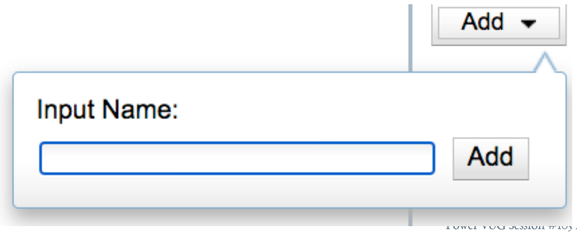
PTF Groups by Product

- Check on PTF Groups for Navigator for i / PDI / ARE





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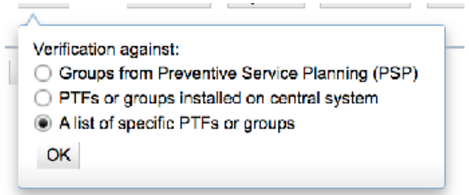
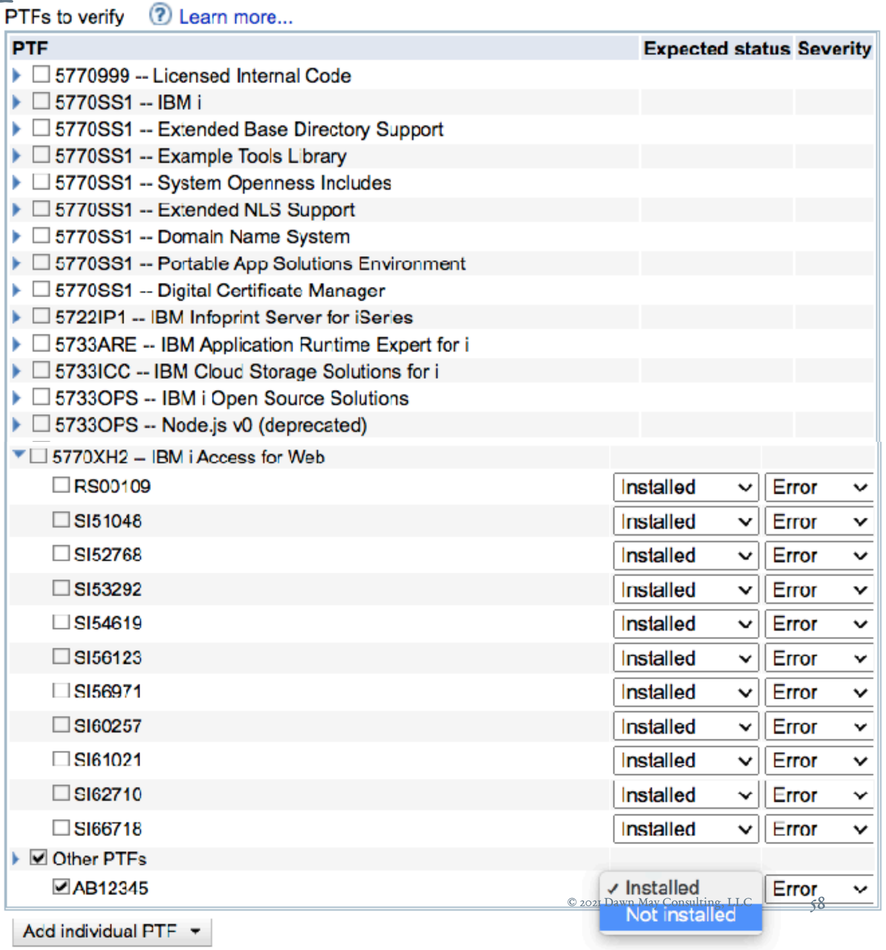
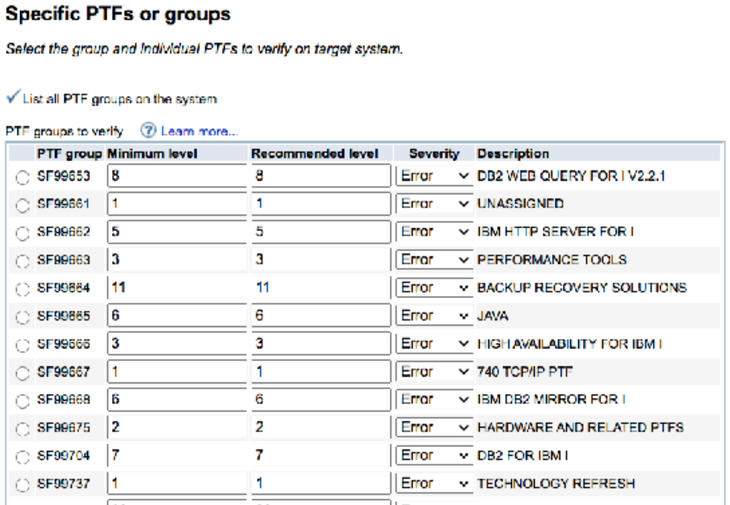
Validate Specific PTFs or PTF Groups Compared to Central System

- Compare PTF groups installed against the central system
  - Can specify minimum and recommended levels
- Compare specific PTFs installed against the central system
  - Expected status of installed or not installed
    - "Not installed" verifies a specific PTF is not installed
- Used to verify specific PTFs on target systems
- Central system and target systems must be on the same release







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Specific List of PTFs

- You can check on specific PTFs
- E.g., upgrading endpoint systems to the next release
  - Ensure all the prerequisite PTFs are installed prior to the upgrade

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Validate Specific Levels of Group PTFs

- You can validate minimum and recommended levels of group PTFs
  - The minimum and recommended levels are pre-filled with the installed levels of the group PTFs

Specific PTFs or groups

Select the group and individual PTFs to verify on target system.

✓ List all PTF groups on the system

PTF groups to verify (?) Learn more...

	PTF group	Minimum level	Recommended level	Severity	Description
○	SF99653	9	9	Error	DB2 WEB QUERY FOR I V2.2.1
○	SF99661	1	1	Error	UNASSIGNED
○	SF99662	7	7	Error	IBM HTTP SERVER FOR I
○	SF99663	3	3	Error	PERFORMANCE TOOLS
○	SF99664	14	14	Error	BACKUP RECOVERY SOLUTIONS
○	SF99665	7	7	Error	JAVA
○	SF99666	4	4	Error	HIGH AVAILABILITY FOR IBM I
○	SF99667	1	1	Error	740 TCP/IP PTF
○	SF99668	7	7	Error	IBM DB2 MIRROR FOR I
○	SF99675	2	2	Error	HARDWARE AND RELATED PTFS
○	SF99704	7	7	Error	DB2 FOR IBM I
○	SF99737	2	2	Error	TECHNOLOGY REFRESH
○	SF99738	10	10	Error	GROUP SECURITY
○	SF99739	29	29	Error	GROUP HIPER
○	SF99740	20121	20121	Error	CUMULATIVE PTF PACKAGE C0121740

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Customize Minimum and Recommended Levels and Severity

✓ List all PTF groups on the system

PTF groups to verify (?) Learn more...

	PTF group	Minimum level	Recommended level	Severity	Description
○	SF99653	6	9	Warning	DB2 WEB QUERY FOR I V2.2.1
○	SF99661	1	1	Error	UNASSIGNED
○	SF99662	7	7	Error	IBM HTTP SERVER FOR I
○	SF99663	3	3	Error	PERFORMANCE TOOLS
○	SF99664	14	14	Error	BACKUP RECOVERY SOLUTIONS
○	SF99665	7	7	Error	JAVA
○	SF99666	4	4	Error	HIGH AVAILABILITY FOR IBM I
○	SF99667	1	1	Error	740 TCP/IP PTF
○	SF99668	6	7	Info	IBM DB2 MIRROR FOR I
○	SF99675	2	2	Error	HARDWARE AND RELATED PTFS
○	SF99704	7	7	Error	DB2 FOR IBM I
○	SF99737	2	2	Error	TECHNOLOGY REFRESH
○	SF99738	10	10	Error	GROUP SECURITY
○	SF99739	29	29	Error	GROUP HIPER
◉	SF99740	20121	20121	Error	CUMULATIVE PTF PACKAGE C0121740

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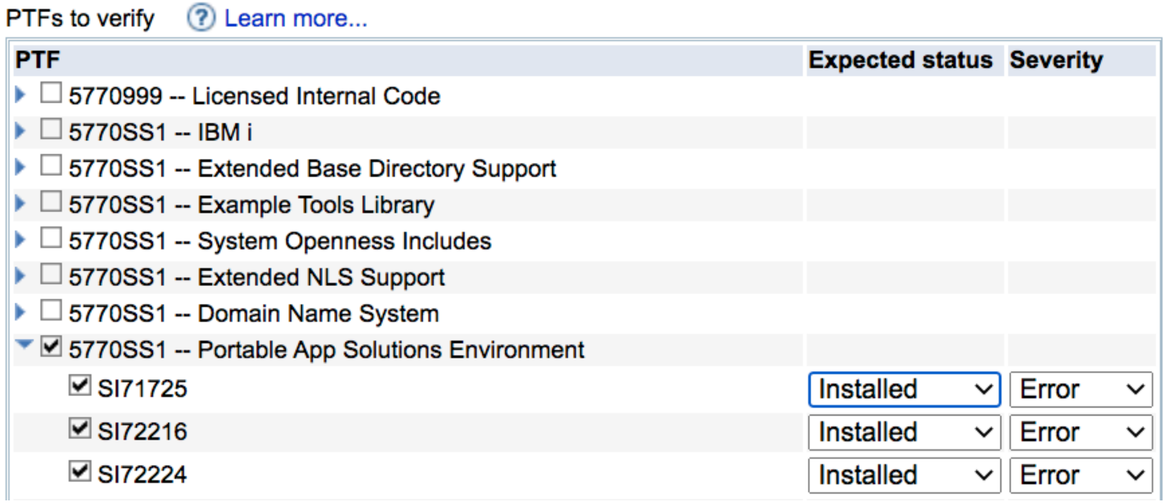
Verify Specific PTFs by Product

- Lists the installed PTFs for each product
- Can select specific PTFs that you want to verify are on the endpoint systems



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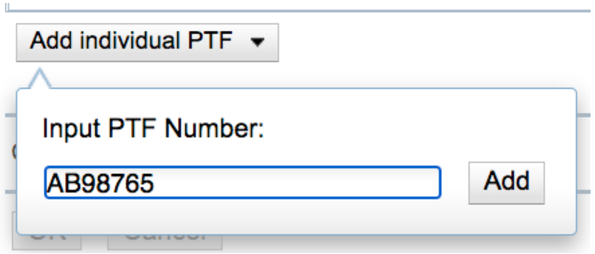
Add Specific PTF

- Add a specific PTF to check

- You can ensure a PTF is NOT Installed
  - For example, unlikely event that you installed a defective PTF



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PTF Summary Report

Console

System verification status: 1/1 complete Refresh

System name	Template	Status	Result
common1.frankeni.com	PTFDemo	Complete	3 error(s), 0 warning(s), 0 info(s)

Summary Report
Detailed Report
XML Report
Download Archive
Runtime Log

Back Stop all

Summary Report

System name: common1.frankeni.com

Remote core version: 1.6.20

Template: PTFDemo

User ID: DAWNM

Summary details Learn more...

Plugin name	Attributes verified	Error	Warning	Info	Fix actions
PTF Verifier	39420	3	0	0	Fix actions (1)
Product Verifier	4	0	0	0	None

Description
Product (unknown) PTF AB98765 status is not what is expected
PTF AB98765 does not exist on the system
Group PTF SF99661 - SF99661 740 WebSphere App Server V8.5 level does not meet group level. Group level: 3 Current level: 1

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Summary Report

Plugin name	Attributes verified	Error	Warning
PTF Verifier	39420	1564	1

Description
Product 5770SS1 PTF SI72224 status is not what is expected
Product (unknown) PTF AB98765 status is not what is expected
Group PTF SF99653 - status is not what is expected. Expected: installed Actual: Related group
Group PTF SF99653 - level does not meet recommended level. Recommended level: 9 Current level: 8
Group PTF SF99662 - status is not what is expected. Expected: installed Actual: Not Installed
Group PTF SF99664 - status is not what is expected. Expected: installed Actual: Not Installed
Group PTF SF99665 - status is not what is expected. Expected: installed Actual: Not Installed
Group PTF SF99666 - level does not meet minimum level. Minimum level: 4 Current level: 3
Group PTF SF99666 - level does not meet recommended level. Recommended level: 4 Current level: 3
Group PTF SF99667 - could not be found on the system
Group PTF SF99668 - level does not meet recommended level. Recommended level: 7 Current level: 6
Group PTF SF99704 - status is not what is expected. Expected: installed Actual: Not Installed
Group PTF SF99737 - status is not what is expected. Expected: installed Actual: Not Installed
Group PTF SF99738 - level does not meet minimum level. Minimum level: 10 Current level: 8
Group PTF SF99738 - level does not meet recommended level. Recommended level: 10 Current level: 8
Group PTF SF99739 - status is not what is expected. Expected: installed Actual: Not Installed

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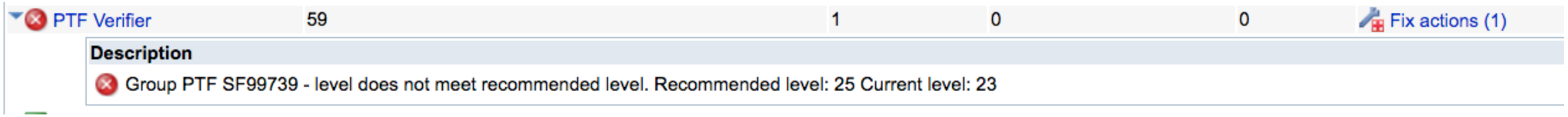
PTF Fix Actions

- Errors found in PTF validation have the ability to be corrected



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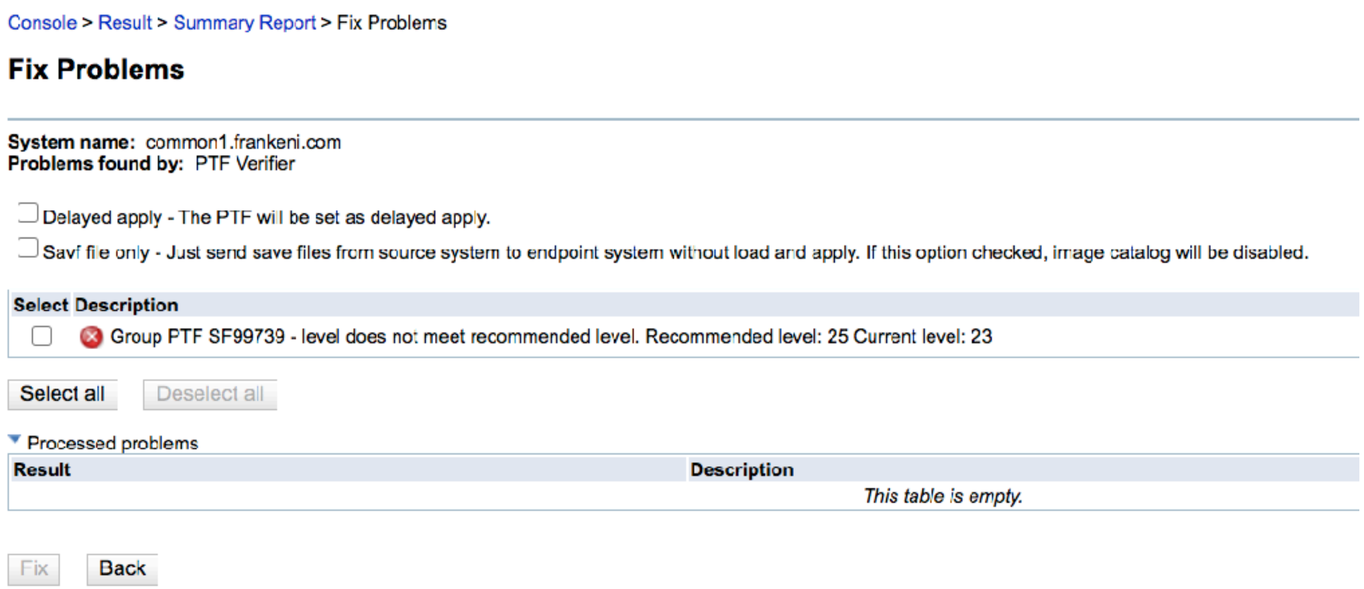
Options to Control PTF Fix Actions

- By default, the fix action is Load and Apply
  - Manual options in the GUI for
    - Delayed apply
    - Save file only



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Fix Actions in XML Report

```
 <report message="OK: Group PTF SF99739 - meets minimum level. Group PTF level is 23"/>
                <problem message=" Group PTF SF99739 - level does not meet recommended
level. Recommended level: 25 Current level: 23" severity="error">
                    <fixAction
className="com.ibm.ibmi.are.xml.rules.ptf.GroupPtfStatusRule$GroupPTFFixAction"
fixMethodReference="_REFERENCE_0" isLocal="true" problemName="GroupPTF"
uniqueId="areFixAction0">
                        <description/>
                        <defineReference
className="com.ibm.ibmi.are.xml.rules.ptf.GroupPtfStatusRule$GroupPTFFixAction"
methodName="loadAndApplyGroupPTF" name="_REFERENCE_0"
type="com.ibm.are.xml.MethodReference">
                            <parameters>
                                <parameter type="literal" value="SF99739"/>
                            </parameters>
                        </defineReference>
                    </fixAction>
                </problem>
```


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Central System and PTF Images

- Central System can distribute PTFs via save files or image catalog
  - Save files require the central system only distribute PTFs to target systems at the same release
  - With an image catalog, the Central System can distribute PTFs to groups of systems of different releases

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PTF Fix Actions

- The fix action will try to do one of these things:
  - Load and apply the fix from a special device name QIBMAREPTF
    - The QIBMAREPTF device needs to be manually created when the virtual optical device is setup on the target system
  - Send and apply the fix from a central system through use of *SAVF
    - The save files are located in QGPL/Q<ptf_id> and PTF save files remain on the target system after the PTF is installed
    - For Group PTFs, the save files are located in QGPL/Q<group_ptf_id> and Group PTF save files are deleted after they have been installed on the target system as they don't need to exist long term
- Neither of these requires Internet access

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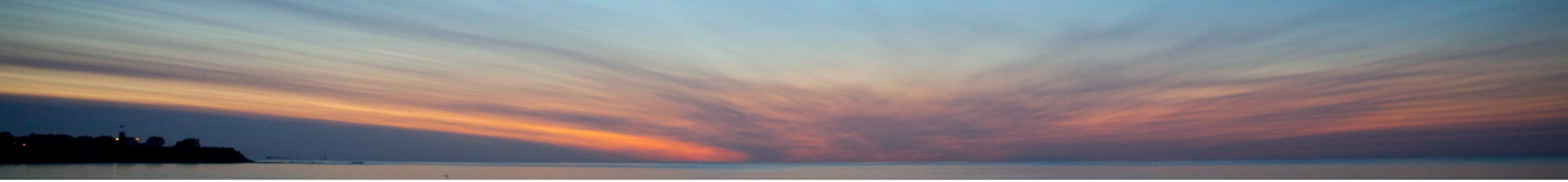

Custom Plug-ins

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Custom Plugins

- Built-in features of ARE are very powerful

- But you may need to write your own custom plugins for unique verifications
  - Can also build in your own fix actions

- ARE plugins are written in Java

- ARE provides sample plugins at
  - /QIBM/UserData/ARE/samples/sample.jar
  - sample.jar is a valid deployment template
  - Source is included in the jar file

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Example Plugins

- Check on NetServer File Shares
  - Report shares and permissions and flag errors if root or /QIBM are shared
  - Java Toolbox: ISeriesNetServer and ISeriesNetServerFileShare
  - IBM i Service QSYS2.SERVER_SHARE_INFO

- Tune Prestart Job Entries
  - Adjust the INLJOBS parameter on prestart job entries dynamically to reflect actual workloads
  - Use QSYS2. PRESTART_JOB_INFO and QSYS2.PRESTART_JOB_STATISTICS

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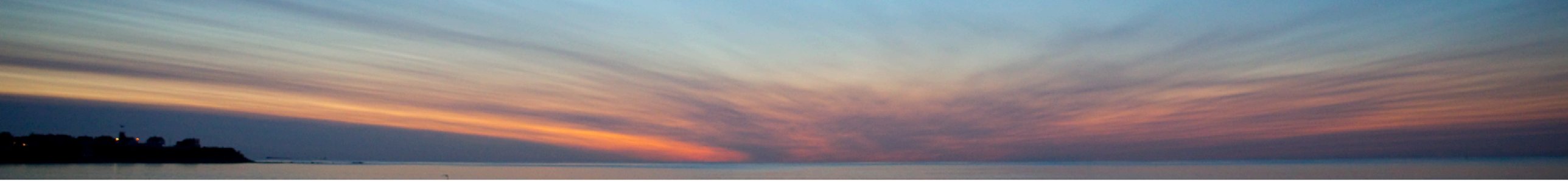

References

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Articles and Blog Posts

- Introduction to the Administration Runtime Expert
  - https://www.itjungle.com/2020/06/01/guru-introduction-to-the-administration-runtime-expert/
- Use the Administration Runtime Expert to Validate Your System Configuration
  - https://www.itjungle.com/2020/06/22/guru-use-the-administration-runtime-expert-to-validate-your-system-configuration/
- Use the Administration Runtime Expert to Validate Your Application Attributes
  - https://www.itjungle.com/2020/08/10/guru-use-the-administration-runtime-expert-to-validate-your-application-attributes/
- Manage PTFs with the Administration Runtime Expert
  - https://www.itjungle.com/2020/11/09/guru-manage-ptfs-with-the-administration-runtime-expert/
- Overview of the IBM i Administration Runtime Expert
  - https://techchannel.com/Trends/03/2021/ibm-i-administration-runtime-expert
- Extend the IBM i Administration Runtime Expert with Custom Plug-ins
  - https://techchannel.com/SMB/03/2021/ibm-i-administration-runtime-expert-plugins
- Managing PTFs with ARE
  - https://dawnmayi.com/2015/09/21/ibm-application-runtime-expert-for-i-managing-ptfs/
- Network Health Checker
  - https://dawnmayi.com/2013/09/04/application-runtime-expert-network-health-checker/
- The Story of Administration Runtime Expert
  - https://dawnmayi.com/2011/11/09/the-story-of-application-runtime-expert/

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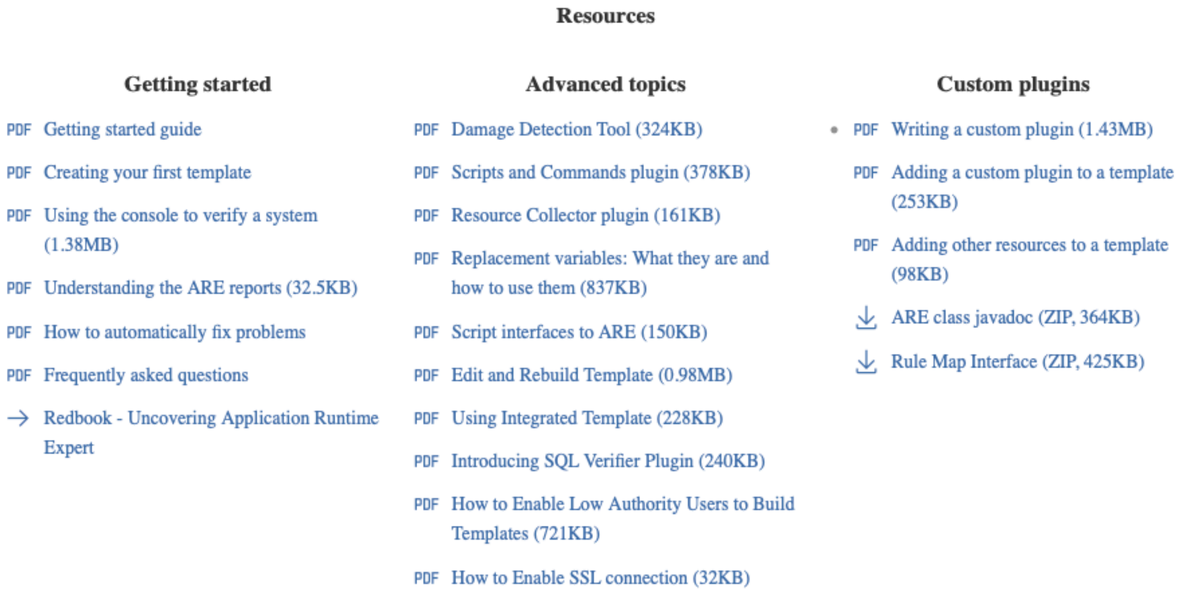
Documentation

- ARE Web Site
  - Many PDF files with documentation can be found on this web site
    - https://www.ibm.com/support/pages/ibm-administration-runtime-expert-i



Resources

Getting started

- PDF Getting started guide
- PDF Creating your first template
- PDF Using the console to verify a system (1.38MB)
- PDF Understanding the ARE reports (32.5KB)
- PDF How to automatically fix problems
- PDF Frequently asked questions
- → Redbook - Uncovering Application Runtime Expert

Advanced topics

- PDF Damage Detection Tool (324KB)
- PDF Scripts and Commands plugin (378KB)
- PDF Resource Collector plugin (161KB)
- PDF Replacement variables: What they are and how to use them (837KB)
- PDF Script interfaces to ARE (150KB)
- PDF Edit and Rebuild Template (0.98MB)
- PDF Using Integrated Template (228KB)
- PDF Introducing SQL Verifier Plugin (240KB)
- PDF How to Enable Low Authority Users to Build Templates (721KB)
- PDF How to Enable SSL connection (32KB)

Custom plugins

- PDF Writing a custom plugin (1.43MB)
- PDF Adding a custom plugin to a template (253KB)
- PDF Adding other resources to a template (98KB)
- ARE class javadoc (ZIP, 364KB)
- Rule Map Interface (ZIP, 425KB)

- Uncovering Application Runtime Expert Redbook
  - http://www.redbooks.ibm.com/redpapers/pdfs/redp4805.pdf

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https://www.ibm.com/it-infrastructure/power/os/ibm-i

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Awesome Run SQL Scripts Enhancements
IBM i Technical Resources Roadmap

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January 2018

About Dawn May

Dawn May Consulting, LLC

Customized education

- General IBM i
- Systems Management
- Performance tools and management
- Work management
- Administration Runtime Expert

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- Recurring performance assessments
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