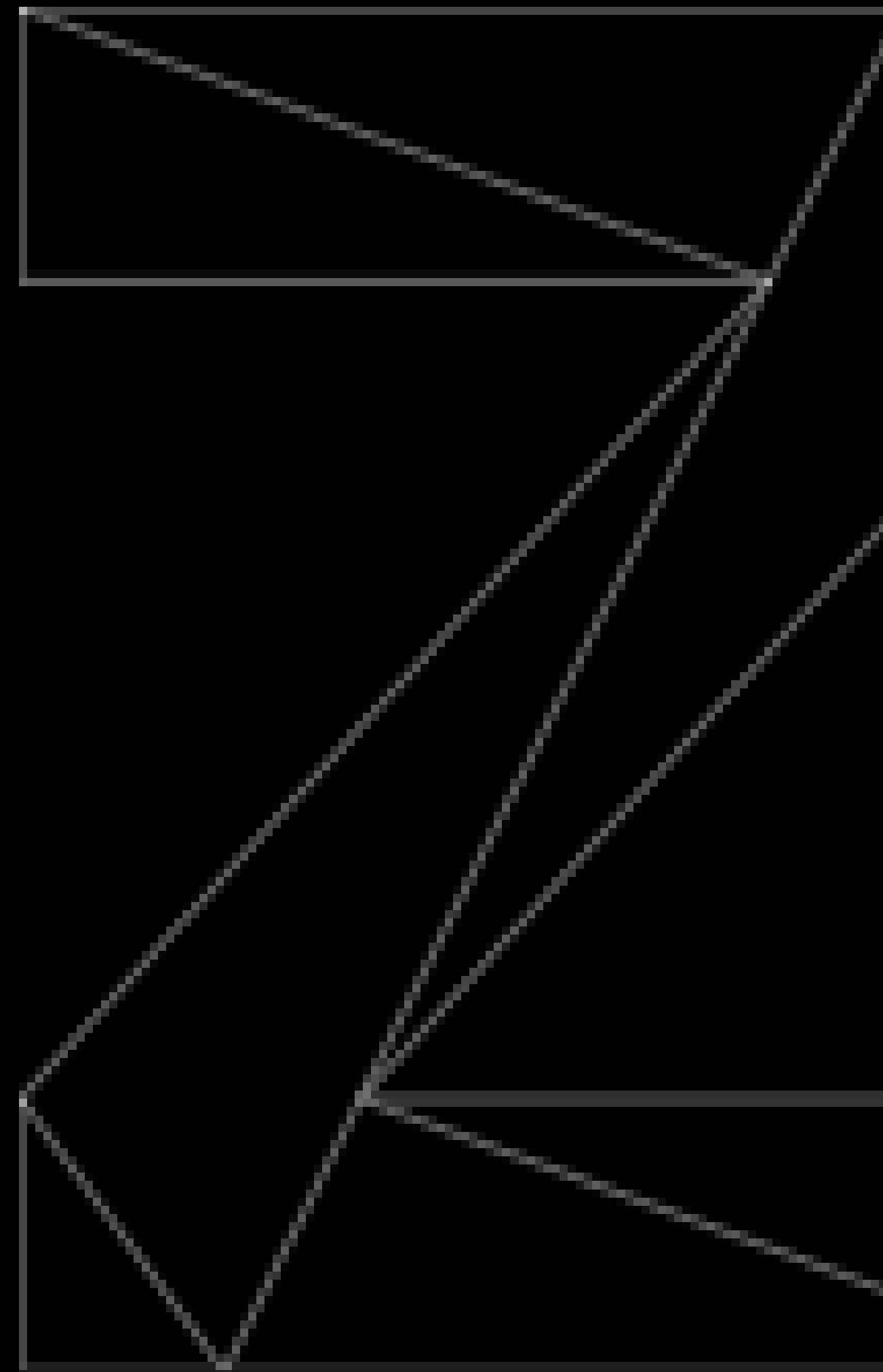

Reusable Configuration and Symbols

IBM Z



Introduction to Reusable Configuration

Many customers use INCLUDE files in their TCP/IP profiles to help manage common configuration across multiple stacks.

Examples of INCLUDE file use cases:

- Common PORT and AUTOLOG definitions
- Common INTERFACE definitions
- Common configuration options
 - For example: GLOBALCONFIG, IPCONFIG, etc.

In Network Configuration Assistant, this is handled using objects known as **Reusable Configuration**.

Reusable configuration, continued

Welcome xConfiguration A... x

Configuration Assistant (Home) TCP/IP ProfileHelp

V2R2 Current Backing Store is MJF_DEMO

Select a TCP/IP technology to configure : TCP/IP ProfileTools

SystemsReusable ConfigurationSecurity Reusable ResourcesChange Sets

Actions

No filter applied

	System Group or Sysplex / System Image / Stack Filter	Type Filter	Status Filter	Install Status	Release Filter	Description
<input type="radio"/>	<input type="checkbox"/> Default	System Group	Complete			
<input type="radio"/>	<input type="checkbox"/> DEFIMG	System Image	Complete	Not applicable	V2R2	
<input type="radio"/>	DEFSTK	Stack	Complete	Needs install	V2R2	
<input type="radio"/>	<input type="checkbox"/> PLEX1	Sysplex	Complete	Synchronized		
<input type="radio"/>	<input type="checkbox"/> LPAR1	System Image	Complete	Not applicable	V2R2	

Total: 10 Selected: 0

HomeSave

Reusable configuration objects are accessed from their own tab on the main TCP/IP systems tree.

A reusable configuration object is a set of configuration that will be used by multiple TCP/IP stacks in the Network Configuration Assistant.

Creating reusable configuration

Welcome x Configuration A... x

Configuration Assistant (Home) > TCP/IP Profile > Reusable Configuration

New Reusable Configuration

➡ Name and Description
Select Systems

Name and Description

Reusable Configurations can be defined to contain TCP/IP configuration that can be reused. Once created, include the configuration into one or more TCP/IP stacks.

* Name:

Description:

< Back Next > Finish Cancel

In this example we will create a reusable configuration for common port definitions. First you give the RC (Reusable Configuration) a name...

Creating reusable configuration, cont.

Welcome x Configuration A... x

Configuration Assistant (Home) > TCP/IP Profile > Reusable Configuration

New Reusable Configuration

✓ Name and Description
➡ Select Systems

Select Systems

Select the Systems

Actions ▾

	System Group or Sysplex / System Image / Stack
<input checked="" type="checkbox"/>	PLEX1
<input checked="" type="checkbox"/>	LPAR1.STACK1
<input checked="" type="checkbox"/>	LPAR2.STACK2
<input checked="" type="checkbox"/>	LPAR3.STACK3
<input type="checkbox"/>	Default
<input type="checkbox"/>	DEFIMG.DEFSTK

Total: 6 Selected: 4

< Back Next > Finish Cancel

Then you select which stacks will use this RC. These are the stacks that will make use of the common configuration that you create in the RC. In this example, we are creating common PORT definitions that will be used by all the stacks in PLEX1.

Once the RC is created we are prompted to configure it.

Proceed to the Next Step?

? Continue and configure TCP/IP resources for the reusable configuration?

Cancel Proceed

Next page

Configuring reusable configuration

Welcome x Configuration A... x

Configuration Assistant (Home) ▶ TCP/IP Profile ▶ Reusable Configuration : PORTS

Configure Resources for Reusable Configuration PORTS

Configure

Reusable Configurations can be defined to contain TCP/IP configuration that can be reused. Once created, include the Reusable Configuration into one or more TCP/IP stacks.

TCP/IP Stack Resources	Status
Interfaces: Attach to networks	Not configured
Routes: Connect to other systems	Not configured
Ports: Reserve ports for TCP/IP applications	Not configured
Security: Control network access to and from the System	Not configured
Source IP Addressing: Control outbound connection source IP addressing	Not configured
Performance and Protocol: Tune your TCP/IP stack	Not configured
Management and Traces: Enable TCP/IP stack systems management and diagnosis	Not configured

Close Save

You configure reusable configuration just like any other TCP/IP configuration, using the same panels.

- There are some exceptions that will be touched on later

In this case we are configuring common ports, so we select port definitions from the main resource screen.

Next page

RC Port configuration example

Welcome x Configuration A... x

Configuration Assistant (Home) TCP/IP Profile Reusable Configuration : PORTS Ports

Control Access to Ports

Global Settings and Configuration States

Settings	Status
Global Port Properties	Not configured
Global Autolog Properties	Not configured
Reserve	Not configured
Control Unreserved	Not configured
Autolog	Not configured

Reserve Control Unreserved Autolog

Port Reservations

Actions

View Details

Modify...

Delete

New... Reserve a Port or Port Range...

Hide Filter Row

Clear Sorts

Close Save

Reservation	Protocol	Jobname	Status	Description
			✓	

Welcome x Configuration A... x

Configuration Assistant (Home) TCP/IP Profile Reusable Configuration : PORTS Ports Reserved Port

Reserve a Port or Port Range

Description

standard Telnet port

Port Selection

☒ * Port Number

23

☐ Port Range

* First Port:

* Total number of ports:

Protocol Selection

☒ TCP

☐ UDP

Jobname

* Jobname that will use the port(s):

TELNET

Advanced Settings...

OK Cancel

In this example, we have created a reservation for the standard telnet port.

Next page



RC Port configuration example

Welcome x

Configuration A... x

Configuration Assistant (Home)

TCP/IP Profile

Reusable Configuration : PORTS

Ports

Control Access to Ports

Autolog

Not configured

Reserve

Control Unreserved

Autolog

Port Reservations

Actions

No filter applied

	Port/Port Range Filter	Reservation Filter	Protocol Filter	Jobname Filter	Status Filter	Description Filter
<input type="radio"/>	1-22	Available	TCP		✓	
<input checked="" type="radio"/>	23	Reserved	TCP	TELNET	✓	standard Telnet port
<input type="radio"/>	24-65535	Available	TCP		✓	
<input type="radio"/>	1-65535	Available	UDP		✓	

Close

Save

In this example, we have created a reservation for the standard telnet port in this reusable configuration.

Push the reusable configuration to stacks

Welcome x Configuration A... x

Configuration Assistant (Home) ▶ TCP/IP Profile

V2R2 Current Backing Store is MJF_DEMO

Select a TCP/IP technology to configure : TCP/IP Profile ▼

Systems Reusable Configuration Security Reusable Resources Change Sets

Actions ▼

➡ No filter applied

Name Filter	Install Status	Status	Description Filter
PORTS	Never installed		
SV	Installed	Complete	
Tur	Installed	Complete	

Configure...
Modify...
Delete
Copy...
Promote to installed
Manage stacks
View Details
View Details on installed
Show Where Used

Total: 3

Home Save

Once the reusable configuration is created, you push it to the stacks that use this RC by performing the “Promote to installed” action.

This does two things:

1. Validates the reusable configuration against each stack (e.g., ensures no conflicts like duplicate names)
2. If 1 is successful, adds the configuration from the RC to all the using stacks.

Information

i All of stacks are promoted successfully. The RC has been included in all selected stacks.

OK

Note: reusable configuration cannot be modified from within the using stacks. It must be modified in the RC interface, and then reinstalled.

Installed reusable configuration

Welcome x Configuration A... x

Configuration Assistant (Home) TCP/IP Profile

V2R2 Current Backing Store is MJF_DEMO

Select a TCP/IP technology to configure : TCP/IP Profile

Systems

Reusable Configuration

Security Reusable Resources

Change Sets

Actions

No filter applied

Name Filter	Install Status	Status	Description Filter
<input checked="" type="radio"/> PORTS	Installed	Complete	
<input type="radio"/> SVIPAS	Installed	Complete	
<input type="radio"/> Tuning	Installed	Complete	

Total: 3 Selected: 1

Home

Save

In the **Reusable Configuration** panel, a status of Installed indicates that the contents of the RC have been pushed to all using stacks.

Welcome x Configuration A... x

Configuration Assistant (Home) TCP/IP Profile TCP/IP Profile : PLEX1.LPAR1.STACK1 Ports

Control Access to Ports

Autolog Not configured

Reserve

Control Unreserved

Autolog

Port Reservations

Actions

No filter applied

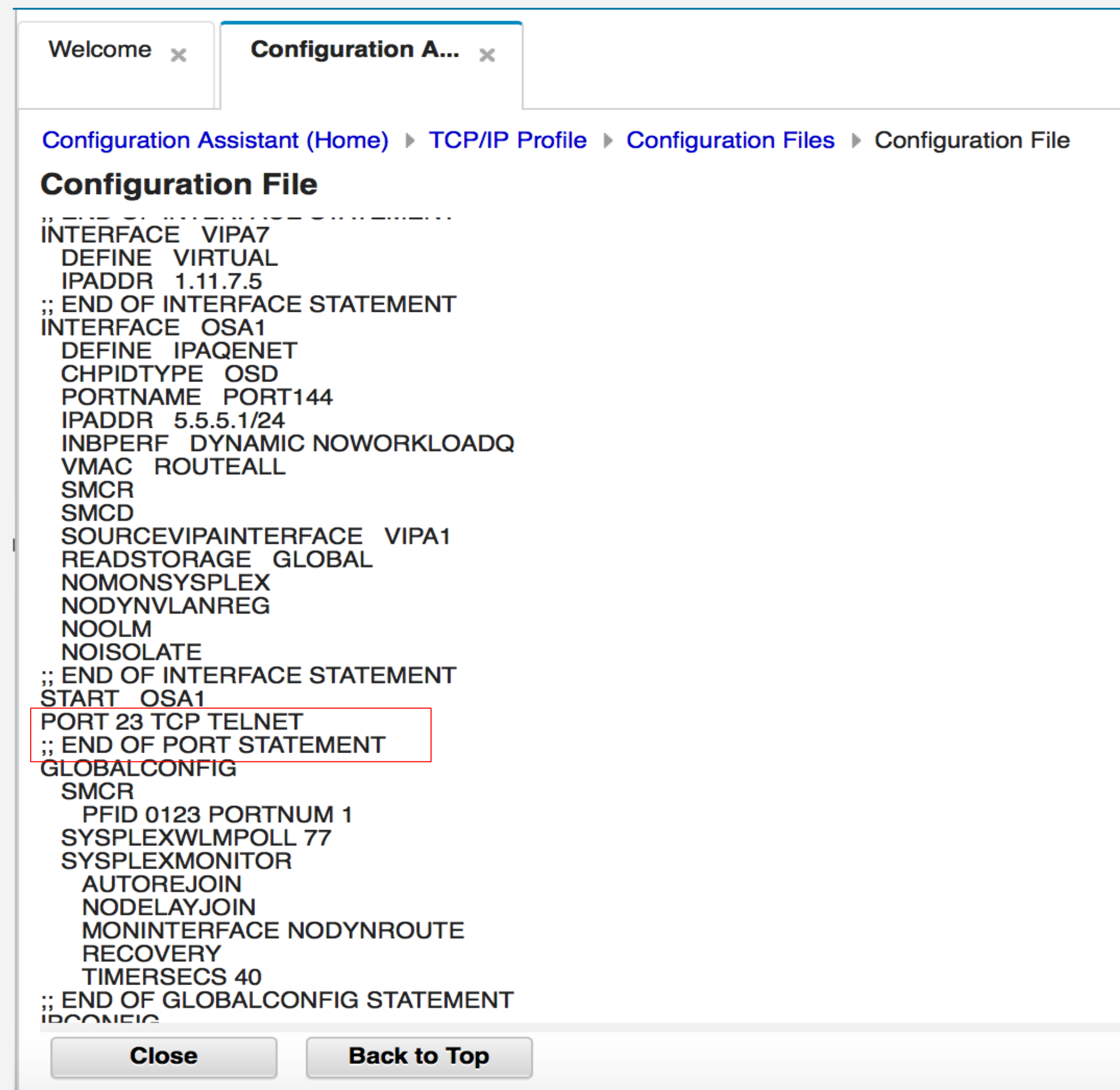
Port/Port Range Filter	Origin Reusable Configuration Filter	Reservation Filter	Protocol Filter	Jobname Filter	Status Filter	Description Filter
<input type="radio"/> 1-22		Available	TCP		✓	
<input type="radio"/> 23	PORTS	Reserved	TCP	TELNET	✓	standard Telnet port
<input type="radio"/> 24-65535		Available	TCP		✓	
<input type="radio"/> 1-65535		Available	UDP		✓	

Close

Save

This is the port configuration panel for STACK1. You can see that the port 23 reservation came from reusable configuration PORTS. If you want to modify this definition, you must do it in the RC, not here.

Reusable configuration generated files



```
Configuration Assistant (Home) > TCP/IP Profile > Configuration Files > Configuration File
Configuration File
-----
INTERFACE VIPA7
  DEFINE VIRTUAL
  IPADDR 1.11.7.5
;; END OF INTERFACE STATEMENT
INTERFACE OSA1
  DEFINE IPAQENET
  CHPIDTYPE OSD
  PORTNAME PORT144
  IPADDR 5.5.5.1/24
  INBPERF DYNAMIC NOWORKLOADQ
  VMAC ROUTEALL
  SMCR
  SMCD
  SOURCEVIPAINTEFACE VIPA1
  READSTORAGE GLOBAL
  NOMONSYSPLEX
  NODYNVLANREG
  NOOLM
  NOISOLATE
;; END OF INTERFACE STATEMENT
START OSA1
PORT 23 TCP TELNET
;; END OF PORT STATEMENT
GLOBALCONFIG
  SMCR
  PFID 0123 PORTNUM 1
  SYSPLEXWLMPOLL 77
  SYSPLEXMONITOR
  AUTOREJOIN
  NODELAYJOIN
  MONINTERFACE NODYNROUTE
  RECOVERY
  TIMERSECS 40
;; END OF GLOBALCONFIG STATEMENT
IPCONFIG
```

Network Configuration Assistant combines all configuration into a single TCP/IP profile when installing files, so the reusable resources are simply included in the profile, not maintained by NCA as separate include files.

Network Configuration Assistant system symbols

- Customers often use MVS system symbols along with include files to manage common configuration. Common use cases for MVS system symbols include:
 - Interface name and/or IP address for an interface that is in a common include file, for example:
 - 1.1.1.&HOST.
 - OSA&CHPID.
- Network Configuration Assistant implements its own system symbols.
 - NCA system symbols have the same syntax as MVS system symbols (&SYMBOL_NAME.)
 - NCA does not access MVS system symbol values
 - When importing TCP/IP configuration (covered in a later lesson) MVS system symbols are converted to NCA system symbols
 - NCA system symbols are created and resolved within the Network Configuration Assistant and are used when configuring stacks
 - NCA system symbols are **defined in reusable configuration** and then given values for each stack that uses that reusable configuration

Network Configuration Assistant system symbols, continued

- Network Configuration Assistant then generates TCP/IP profiles with all symbols resolved
 - A stack with unresolved NCA system symbols is incomplete and cannot be installed until all referenced symbols are resolved.
- NCA system symbols are defined in Reusable Configuration
 - Value can vary across stacks that use that Reusable Configuration
- NCA system symbols are supported in the following fields:
 - Interface name
 - Interface IP address
 - Rule: because interfaces can't have the same IP address across stacks, it is mandatory to use an NCA system symbol in the IP address of any interface that is defined in Reusable Configuration.
 - Interface TRLE port name
 - Interface VLAN identifier
 - SRCIP IP address
 - Static route next hop address (starting with V2R3 APAR PI97737)
- These fields were chosen based on customer use case feedback.
 - If NCA system symbol support is needed in additional fields, please open an RFE against the z/OS Communications Server team

Defining an NCA system symbol

Welcome x Configuration A... x

Configuration Assistant (Home) > TCP/IP Profile > Reusable Configuration : osas > Network Interfaces > Interface

New Network Interface

➔ Name and Type
Connectivity
Additional Properties

Name and Type

* Name:
OSA&HOST.

Description:

Select the type of network interface:

- ☐ Static Virtual IP Address (VIPA)
- ☒ Ethernet LAN (OSA CHPID type OSD)
- ☐ HiperSockets
- ☐ Intra-Ensemble Data Network (OSA CHPID type OSX)
- ☐ MPCPTP - High Performance Data Transfer (HPDT)
- ☐ Channel-to-Channel (CTC)
- ☐ LAN Channel Station (LCS)

Select the IP address type of network interface:

- ☒ IPv4 interface
- ☐ IPv6 interface

< Back Next > Finish Cancel

- To define an NCA system symbol, simply enter it into a supported field **in a reusable configuration.**
- In this example, NCA system symbol &HOST. is being created.

Special symbol rule for reusable interfaces

Welcome x Configuration A... x

Configuration Assistant (Home) > TCP/IP Profile > Reusable Configuration : osas > Network Interfaces > Interface Help

New Network Interface OSA&HOST.

✓ Name and Type
➔ Connectivity
Additional Properties

Connectivity

Network interfaces defined in a reusable configuration have special considerations:

- The name property for the interface in the reusable configuration provides a symbolic representation of the interface that will be defined across multiple stacks.
- The IP address property is not defined for the interface at this time. After the reusable configuration is included in a stack, define the IP address for the stack using Stack Symbols. Perform this for each stack that includes this reusable configuration.
[Learn more...](#)

* IP Address

☐ Use generated CA system symbol &interfacename_IPADDR for this IP address.

☒ Provide IP address value. Must contain at least one CA system symbol.

1.1.1.&HOST.

* Subnet prefix length:

24

* PORT name from the TRLE definition

PORT&HOST.

☐ Virtual LAN Identifier (VLAN ID):

Range is 1 - 4094.

☐ The adapter should register this VLAN ID with the switch

Source VIPA interface

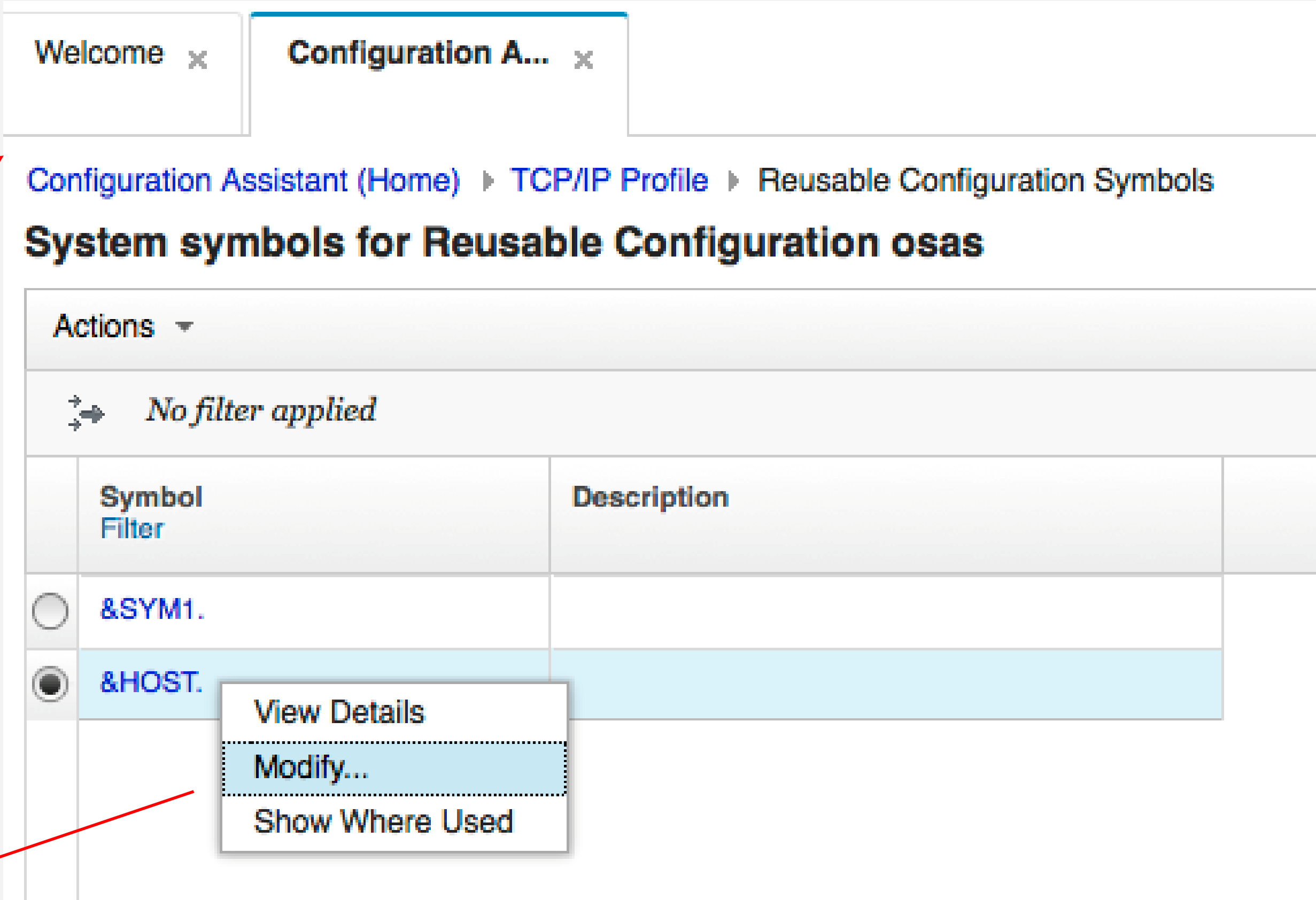
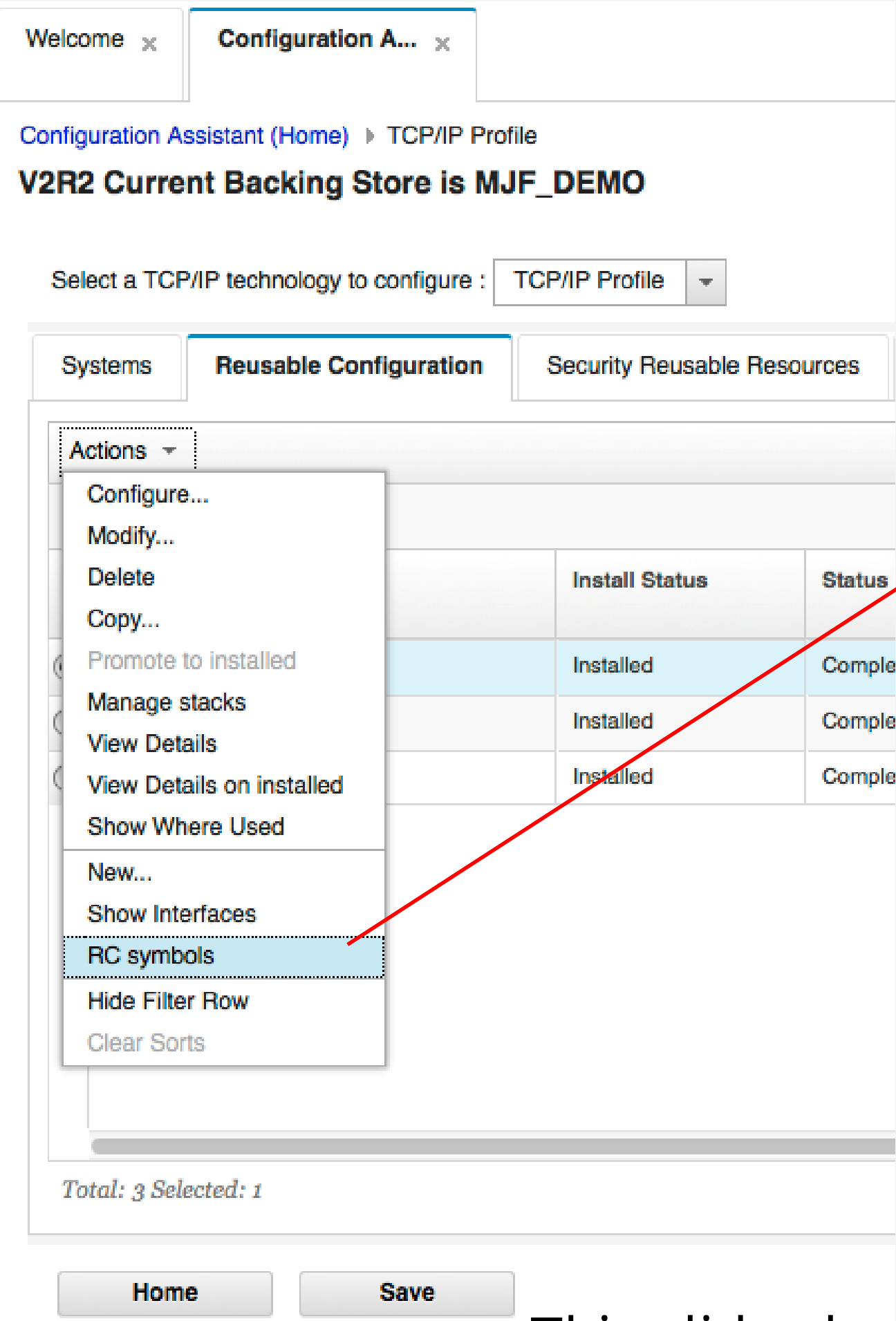
No virtual interface selected

< Back Next > Finish Cancel

The IP address of an interface defined in reusable configuration must be or contain an NCA system symbol.

- This is because reusable interfaces are meant to be included into multiple stacks, and you can't use the same IP address in multiple stacks! Have to be able to set the IP address per stack.
- You can instruct NCA to create a default IP address symbol, or you can specify the IP address with a symbol.
 - The default IP address symbol for this interface would be &OSAHOST_IPADDR.
- You can specify a new symbol here, or as in this example, reuse a symbol that's already been created.
 - Note that the symbol &HOST. is also used in the TRLE port name

Resolving symbol values: via the RC



Next page

- This slide shows an example of setting a symbol through the reusable configuration that defines/ uses it.
- This interface gives you easy access to all stacks that need a value defined for this symbol.

Resolving symbol values: via the RC, continued

Welcome x Configuration A... x

Configuration Assistant (Home) > TCP/IP Profile > Reusable Configuration Symbols > Stack Symbol

Modify Reusable Configuration Symbol

* Name:
 &HOST.

Description:

Associated Stacks

Actions ▾

↔ No filter applied

	Stack Filter	Value	Status
<input type="radio"/>	PLEX1.LPAR3.STACK3	3	Configured
<input type="radio"/>	PLEX1.LPAR2.STACK2	2	Configured
<input checked="" type="radio"/>	PLEX1.LPAR1.STACK1	1	Configured

Modify...

Total: 3 Selected: 1

OK Cancel

Welcome x Configuration A... x

Configuration Assistant (Home) > TCP/IP Profile > Reusable Configuration Symbols > Stack Symbol > &HOST.

Modify Reusable Configuration Symbol for a stack

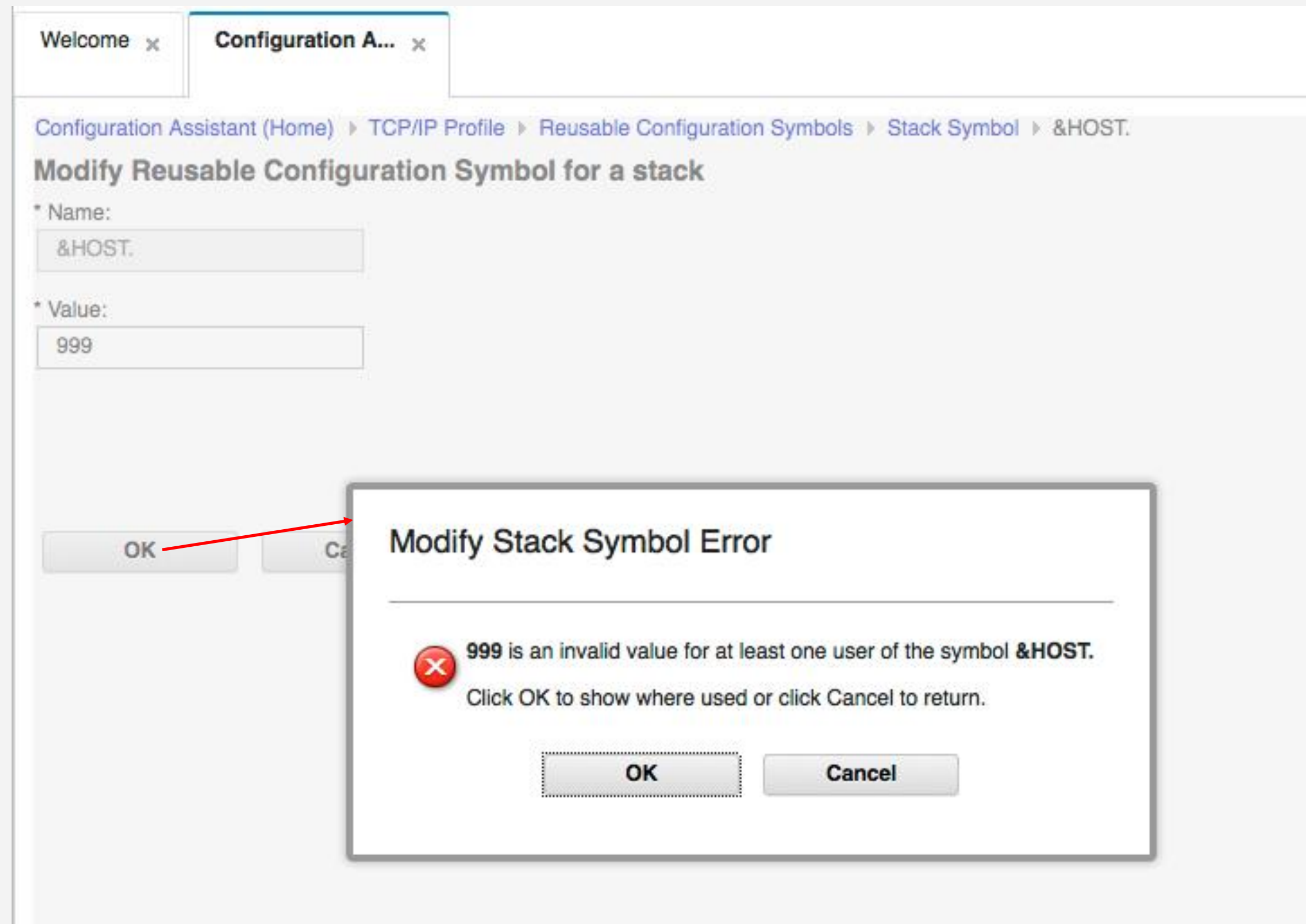
* Name:
 &HOST.

* Value:
 1

OK Cancel

- This slide shows an example of setting a symbol through the reusable configuration that defines/ uses it.
- This interface gives you easy access to all stacks that need a value defined for this symbol.

Symbols: automatic error checking



When you set a NCA stack symbol value, NCA verifies that the value you select won't cause any errors. This helps cut down on configuration errors!

- In this example, the user attempted to set &HOST. to 999.
 - Because &HOST. is used as an IP address octet, it cannot accept this value. Clicking OK on this error dialog shows all users of the symbol, to help you debug this error.

Resolving symbol values: via the stack

The screenshot shows the Configuration Assistant interface. At the top, there are tabs for 'Welcome' and 'Configuration A...'. Below the tabs, the breadcrumb 'Configuration Assistant (Home) > TCP/IP Profile' is visible, along with a 'Help' link. The main heading is 'V2R2 Current Backing Store is MJF_DEMO'. A dropdown menu for 'Select a TCP/IP technology to configure' is set to 'TCP/IP Profile', and a 'Tools' button is next to it. Below this, there are tabs for 'Systems', 'Reusable Configuration', 'Security Reusable Resources', and 'Change Sets'. The 'Systems' tab is active, showing a table of system configurations. A context menu is open over the 'STACK1' row, with 'Stack Symbols...' selected. A red arrow points from this menu item to the text 'Next page'.

System Group or Sysplex / System Image / Stack Filter	Type Filter	Status Filter	Install Status
<input type="radio"/> Default	System Group	Complete	
<input type="radio"/> DEFIMG	System Image	Complete	Not applicable
<input type="radio"/> DEFSTK	Stack	Complete	Needs install
<input type="radio"/> PLEX1	Sysplex	Complete	Synchronized
<input type="radio"/> LPAR1	System Image	Complete	Not applicable
<input checked="" type="radio"/> STACK1	Stack	Complete	Needs install
<input type="radio"/> LPAR2	System Image	Complete	Not applicable
<input type="radio"/> STAK	Stack	Complete	Needs install

Total: 10 Selected.

Home

Next page

- This example shows how to resolve and update symbol values for a stack
- This interface gives access to all symbols used by a stack, across multiple reusable configurations



Resolving symbol values: via the stack, continued

Welcome x Configuration A... x

Configuration Assistant (Home) > TCP/IP Profile > TCP/IP Stack

Stack Symbols for System Image LPAR1, Stack STACK1

Symbols

Symbol Migration report

Actions

No filter applied

	Symbol Filter	Value	Required	Reusable Configurat
<input type="radio"/>	&internalSysplexv6.	2001:DB8:1:1::1	Yes	
<input type="radio"/>	&SYM1.	5	Yes	osas
<input checked="" type="radio"/>	&HOST.	1	Yes	osas
<input type="radio"/>	&int	1.1.1.1	Yes	

View Details

Modify...

Show Where Used

Total: 4 Selected: 1

Close

Save

Welcome x Configuration A... x

Configuration Assistant (Home) > TCP/IP Profile > TCP/IP Stack > Stack Symbol

Modify Stack Symbol

* Name:

&HOST.

* Value:

1

Description:

OK

Cancel

Resolved symbols: generated configuration

Welcome x Configuration A... x

Configuration Assistant (Home) TCP/IP Profile TCP/IP Profile : PLEX1.LPAR1.STACK1 Network Interfaces

Define Network Interfaces

Global Settings and Configuration Status

Settings	Status
Global Interface Properties	Configured
Define Loopback Addresses (IPv4 or IPv6)...	Not configured
* Default local host...	Configured

(Only required when an IPv4 interface is defined)

Interfaces

Actions

No filter applied

Name Filter	Origin Reusable Configuration Filter	Type Filter	IP Address Filter	Source VIPA Filter	VLAN ID Filter	Status Filter
<input type="radio"/> VIPA1	osas	VIRTUAL	4.4.4.1 (4.4.4.&HOST.)			✓
<input type="radio"/> VIPA7	osas	VIRTUAL	1.11.7.5 (1.11.7.&SYM1.)			✓
<input type="radio"/> OSA1		IPAQENET/OSD	5.5.5.1/24	VIPA1		✓

Close

Save

- Network Configuration Assistant generates a TCP/IP profile with all NCA system symbols resolved.

Welcome x Configuration A... x

Configuration Assistant (Home) TCP/IP Profile Configuration Files Configuration File

Configuration File

Close

Printable page

```
::
:: TCP/IP Profile Configuration file for:
::   Image: LPAR1
::   Stack: STACK1
::
:: Created by the IBM Configuration Assistant for z/OS Communications Server
:: Version 2 Release 2
:: Backing Store = MJF_DEMO
:: Install History:
:: 2017-02-14 12:41:18 : Save To Disk
:: 2017-02-09 16:15:02 : Save To Disk
:: 2017-02-02 10:59:19 : Save To Disk
:: 2017-02-02 10:41:54 : Save To Disk
:: 2017-01-27 17:47:00 : Save To Disk
:: 2017-01-27 17:25:21 : Save To Disk
:: 2017-01-26 15:48:56 : Save To Disk
:: 2017-01-11 16:28:17 : Save To Disk
:: 2017-01-03 17:18:15 : Save To Disk
:: 2016-12-01 12:15:38 : Save To Disk
:: 2016-11-14 12:34:39 : Save To Disk
:: 2016-11-09 08:46:12 : Save To Disk
:: 2016-11-08 16:50:39 : Save To Disk
:: End of Configuration Assistant information
INTERFACE VIPA1
  DEFINE VIRTUAL
  IPADDR 4.4.4.1
:: END OF INTERFACE STATEMENT
INTERFACE VIPA7
  DEFINE VIRTUAL
  IPADDR 1.11.7.5
:: END OF INTERFACE STATEMENT
INTERFACE OSA1
  DEFINE IPAQENET
  CHPIDTYPE OSD
  PORTNAME PORT144
  IPADDR 5.5.5.1/24
  INBPERF DYNAMIC NOWORKLOADQ
```

Close

Back to Top

