



IBM Software Group

# IBM® WebSphere® Application Server V6

## *Transport Channel Service*



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This presentation will cover the Transport Channel Service.

## Goals

- Introduce the Transport Channel Service
- Explain the benefits
  - ▶ Networking code reuse
  - ▶ Port sharing
  - ▶ Configurable thread pools
  - ▶ Web Container scalability



The goals of this presentation are to introduce the Transport Channel Service, and explain some of the resulting benefits to the WebSphere Application Server environment.

# *Overview*

This section will discuss the Transport Channel Service at a high level.

## Overview

- A new framework for creating and facilitating transports
- Common network transport services available to all components
  - ▶ Takes advantage of Java™ 1.4 non-blocking I/O
- Enables common dispatching and threading model

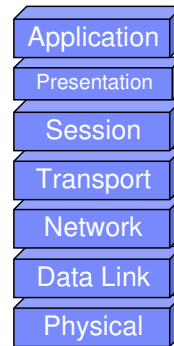


The Transport Channel Service is a rewritten network transport layer for WebSphere Application Server. It provides common network transport services that utilize Java 1.4 non-blocking I/O, and also provides common dispatching and threading services.

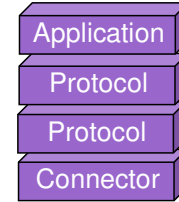
## Conceptual Model

- Extends the Open System Interconnection (OSI) network protocol stack model into the Application Server
- Each layer is a Channel
- Channels are modular, and get assembled into Chains
  - ▶ Lowest level is the Connector Channel
  - ▶ Highest level is the Application Channel

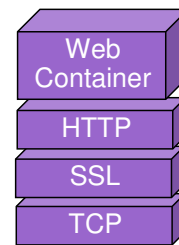
OSI Reference Model



Transport Channel Service



v6.0 Example



Conceptually, the Transport Channel Service extends the OSI Reference Model into the Application Server. Inside the Application Server, each layer is referred to as a Channel. These Channels are modular, and are assembled functional protocol stacks called Chains.

In the example chain shown here, the connector Channel, TCP, is linked to the Application Channel, the Web Container, by two protocol Channels, SSL and HTTP.

## Channels and Chains

- The Transport Channel Service is responsible for channel creation and lifecycle
- Each channel is responsible for handling particular tasks, then passing the connection to the next channel in the chain
  - ▶ For example, the SSL Channel deals with SSL encryption and decryption



The Transport Channel Service is the Application Server component responsible for managing the lifecycle of the individual channels. Each channel handles a particular task (such as SSL encryption and decryption), then passes the connection to the next channel in the transport chain. Through this chain, the connection travels from the Connector channel (TCP) to the Application Channel that is the ultimate destination of the connection.

## Transport Channel Service Utilization

- Many services make use of the Transport Channel Service
  - ▶ Web Container
  - ▶ IBM Service Integration Technologies (messaging)
  - ▶ Distribution and Consistency Services (DCS)
  - ▶ Web Services SOAP/HTTP client
  
- Some services do not yet use the Transport Channel Service
  - ▶ Object Request Broker (ORB), Java Management Extensions (JMX) connector



In WebSphere Application Server V6, several services utilize the Transport Channel Service, including the Web Container; the messaging and Web Services capabilities provided by IBM Service Integration Technologies; the protocol used for many server-to-server communications, called DCS; and the Web Services SOAP/HTTP client.

Not all services take advantage of the Transport Channel Service at this time. For example, the ORB and the JMX connector do not use the Transport Channel Service.

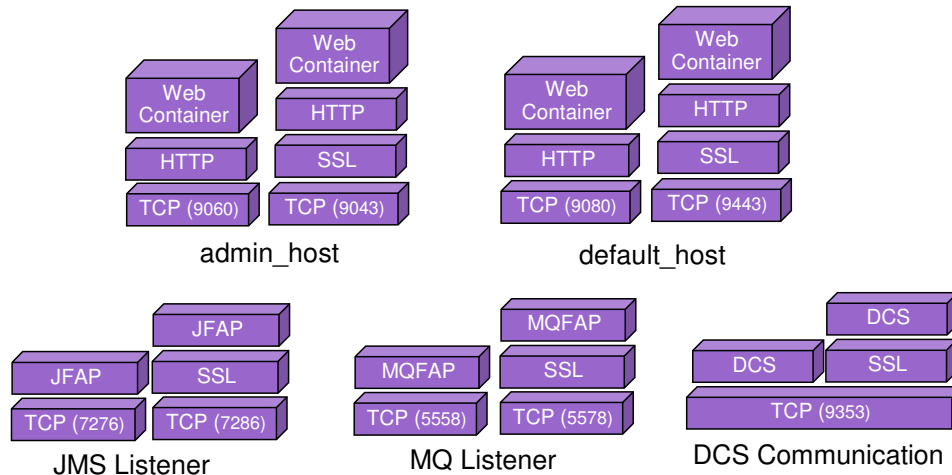
## Channels

Channel	Requires	Provides	Description
TCP	-	TCP	Manages sockets, timeouts, reads and writes, timeouts, initial thread handling
SSL	TCP	TCP	Handles SSL encryption and decryption
HTTP	TCP	HTTP	Implements HTTP 1.0 and 1.1 logic, access and error logging
HTTP Tunnel	HTTP	TCP	Transparently tunnels TCP data through an HTTP connection
DCS	TCP	DCS	Provides the communication layer for HA Manager, Data Replication Service, and Core Group Bridge service
JFAP	TCP	-	Implements formats and protocols for JMS messaging
MQFAP	TCP	-	Implements MQ formats and protocols for JMS messaging over MQ links
Web Container	HTTP	-	Connects an inbound HTTP channel to the Servlet and JSP engine
HA Manager	DCS	-	Connects the High Availability Manager with a DCS channel

This table shows a list of available channels and the interfaces that they require and provide. The interfaces define how channels can be assembled. The HTTP Tunnel channel is of particular interest. It can transparently tunnel any of the channels that require a TCP interface through an HTTP connection.



## Default Inbound Chain Configurations



The inbound chains that are created with a default installation are shown here. A basic installation has four Web Container chains; both `admin_host` and `default_host` have a secure and an insecure chain. The Default Messaging Provider has inbound chains for JFAP connections as well as JFAP over SSL. There are also secure and insecure chains for the MQ Link. Lastly, DCS has an interesting default setup. There are chains for both secure and insecure DCS traffic, but they share a TCP port. This is because they have their TCP channel in common.

## *Benefits*

This section will discuss the benefits of the Transport Channel Service.

## Benefits Summary

- Improved Web Container scalability
- Services can share ports
- Assignable thread pools
- Allow/deny connections based on IP address or hostname



The Transport Channel Service gives WebSphere Application Server V6 many advantages over previous releases. These benefits include improved Web Container scalability, port sharing among services, assignable thread pools, and connection filtering.

## Improved Web Container Scalability

- Use of non-blocking I/O increases the number of connections that can be simultaneously handled by the Web Container
  - ▶ No longer limited by size of Web Container thread pool
  - ▶ Maximum open connections is specified on a TCP transport
    - Default (highest allowed) value is 20,000
- Default Web Container thread pool size:
  - ▶ Minimum: 10
  - ▶ Maximum: 50



The use of non-blocking I/O in the Transport Channel Service has resulted in a dramatic increase in the number of connections that can be handled by the Web Container. In previous releases of WebSphere Application Server, the number of incoming HTTP connections was limited by the size of the Web Container thread pool. In V6, thread pool size is no longer a limiting factor, and most servers can manage thousands of simultaneous connections to the Web Container.

## Port Sharing

- Channels can share lower-level channels with channels in other chains
- Therefore services can share TCP ports
  - ▶ For example, Web Container and messaging can both listen on port 80
- Channel to which the connection is passed is determined based on protocol
  - ▶ There is some performance cost to this
- Port sharing can only be configured using wsadmin
  - ▶ Not configurable with the Administrative Console

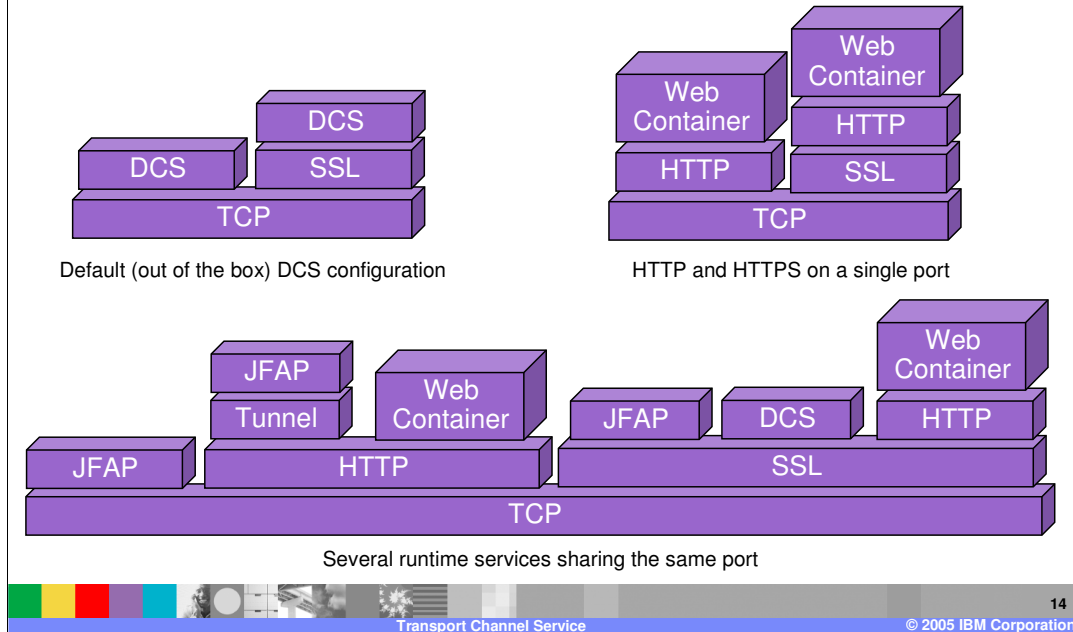


Another advantage of the Transport Channel Service is that services can now share TCP ports. This is because channels can share lower-level channels with channels in other chains. For instance, a Web Container chain and a JFAP messaging chain might share a TCP channel that listens on port 80.

In a case like this, the channel to which the connection is passed is determined based on the protocol of the connection. Obviously, there is a performance cost to this protocol discrimination, so services that share a port will not perform quite as well as those that do not.

Note that port sharing is an advanced concept that can only be configured using wsadmin. There is no capability for configuring port sharing through the Administrative Console.

## Port Sharing Examples



The first example shown here is the default configuration for DCS. Both plain DCS traffic and secured DCS traffic travel over the same port. You could also create the configuration shown in the second example, where the Web Container listens for both HTTP and HTTPS traffic on a single port. The third example is considerably more complicated, but is fully supported. It shows several services sharing a single TCP channel, and therefore a single TCP port.

## Protocol Discrimination

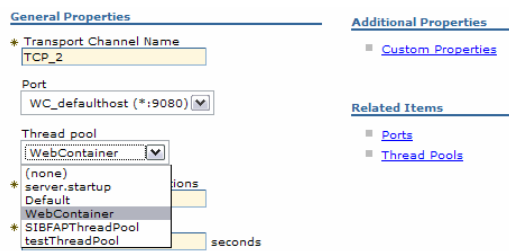
- Channels have configurable priority that determines the discrimination order
  - ▶ Lowest number (1) gets first chance to claim the traffic
  - ▶ Best practice: assign higher numbers to more complicated channels (e.g. SSL) for better performance



Each channel has a configurable priority that determines the order in which it has the opportunity to accept a connection when sharing a port. The channel with the lowest number has the first option to accept the connection. It is recommended that more complicated protocols, such as SSL, have higher values. This results in slightly better performance since the more expensive operations only have to be performed on connections intended for that channel.

## Assignable Thread Pools

- Each TCP channel can be assigned a thread pool
- Thread pools can be shared by multiple services
- Enables per-application thread pools (if each Web application uses a different HTTP port)



**General Properties**

\* Transport Channel Name  
TCP\_2

Port  
WC\_defaulthost (\*:9080)

Thread pool  
WebContainer

(none)      utions  
\* server.startup      utions  
Default      utions  
WebContainer      utions  
\* SIBFAPThreadPool      seconds  
testThreadPool      seconds

**Additional Properties**

- Custom Properties

**Related Items**

- Ports
- Thread Pools

Assignable thread pools are another benefit for services that utilize the Transport Channel Service. Thread pools can be created administratively, and each TCP channel is assigned to a thread pool. You can decide whether each service will have its own thread pool, or if multiple services will share a thread pool. By configuring your Web applications to use virtual hosts that have different transport chains, you can even allocate individual thread pools to your Web applications.

Remember that assignable thread pools are not available to services that do not utilize the Transport Channel Service, such as the ORB.



## Include and Exclude Lists

- TCP Channels can explicitly allow or deny connections
  - ▶ By IP address (shown at right)
    - IPv4 or IPv6
  - ▶ By hostname
- Wildcards are valid
- An address that appears in both an include list and an exclude list will be excluded



### General Properties

* Transport Channel Name	<input type="text" value="TCP_2"/>
Port	<input type="text" value="WC_defaultthost (*:9080)"/>
Thread pool	<input type="text" value="WebContainer"/>
* Maximum open connections	<input type="text" value="20000"/>
* Inactivity timeout	<input type="text" value="60"/> seconds
Address exclude list	<input type="text" value="192.168.1.*"/>
Address include list	<input type="text"/>



TCP channels have the capability to explicitly allow or deny connections based on IP address or hostname. You can also block entire ranges of addresses or hostnames using an asterisk as a wildcard. An address that appears in both an include list and an exclude list will be excluded.

## Transport Chains in the Administrative Console

- **Configuring transport chains:** 
  - ▶ Chains are created based on XML templates
  - ▶ Templates for the most common chains are automatically installed
  
- **Creating a thread pool:** 



Transport Chains are created using XML templates. The first “Show Me” link on this page will show you how to configure transport chains using the Administrative Console. The second link shows you how to use the Administrative Console to create a thread pool.

## Summary

- The Transport Channel Service provides a common, modular network layer
  - ▶ Utilized by Web Container, messaging, DCS, Web services client
- Benefits
  - ▶ Improved Web Container scalability
  - ▶ Port sharing
  - ▶ Flexible thread pool configuration
  - ▶ Connection filtering



In summary, the Transport Channel Service provides a common network transport layer that is utilized by several components. The implementation of the Transport Channel Service has resulted in many benefits, including improved Web Container scalability, TCP port sharing, assignable thread pools, and connection filtering based on IP address or hostname.

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