Apache ShenYu document

Apache ShenYu

Jul 21, 2023
# Contents

1 Architecture 1

2 What is the Apache ShenYu? 2

3 Why named Apache ShenYu 3

4 Features 4

5 Mindmap 5

6 Quick Start (docker) 6
  6.1 Run Apache ShenYu Admin ........................................... 6
  6.2 Run Apache ShenYu Bootstrap ......................................... 6
  6.3 Set router ................................................................ 6

7 Plugin 8

8 Selector & Rule 9

9 Data Caching & Data Sync 10

10 Prerequisite 12

11 Stargazers over time 13

12 Contributor and Support 14

13 Known Users 15

14 Design 16
  14.1 Design principle ............................................................ 17
  14.1.1 Client .................................................................... 17
  14.1.2 Server .................................................................... 19
  14.2 Http Registry ................................................................. 20
  14.3 Zookeeper Registry ........................................................ 20
15.12 Greeting Nacos .................................................. 40
  15.12.1 Greeting Zookeeper ........................................ 41
15.13 Start Apache ShenYu Admin ................................. 42
15.14 Start Apache ShenYu Bootstrap ......................... 43
15.15 Example 1: Using h2 as a database .................... 43
  15.15.1 1. Create Namespace and ConfigMap ............... 43
  15.15.2 2. Create shenyu-admin ............................. 49
  15.15.3 3. Create shenyu-bootstrap ......................... 51
15.16 Example 2: Use MySQL as the database ............. 52
  15.16.1 1. Create Namespace and ConfigMap ............... 52
  15.16.2 2. Create shenyu-admin ............................. 58
  15.16.3 3. Create shenyu-bootstrap ......................... 60
15.17 Test Access .................................................... 61
15.18 Start Apache ShenYu Admin ............................... 61
15.19 Build your own gateway (recommended) ............ 61
15.20 Environmental preparation ............................... 62
15.21 Download the compiled code ............................. 63
15.22 Create Docker Network .................................... 64
15.23 Start Apache ShenYu Admin ............................... 64
15.24 Start Apache ShenYu Bootstrap ......................... 65
15.25 Environmental preparation ............................... 66
15.26 Start Apache ShenYu Bootstrap ......................... 66
15.27 Selector and rule configuration ......................... 66
15.28 by postman ................................................... 67
15.29 by curl ....................................................... 67
15.30 Database Initialize .......................................... 68
  15.30.1 Mysql .................................................... 68
  15.30.2 PostgreSql ............................................... 69
  15.30.3 Oracle .................................................... 69
16 Quick Start .......................................................... 70
  16.1 Environment to prepare .................................. 70
  16.2 Run the shenyu-examples-brpc project .................. 71
  16.3 Test .......................................................... 72
  16.4 Prepare For Environment .................................. 72
  16.5 Run the shenyu-examples-grpc project ................. 73
  16.6 Test .......................................................... 74
  16.7 Streaming ..................................................... 75
  16.8 Environment to prepare .................................. 79
  16.9 Run the shenyu-examples-websocket project .......... 80
  16.10 Test .......................................................... 80
  16.11 Annexes ...................................................... 80
  16.12 Environment to prepare .................................. 82
  16.13 Run the shenyu-examples-motan project ............. 83
  16.14 Test .......................................................... 84
20 Benchmark Test 155

20.1 Hardware ................................................................. 155
  20.1.1 Back-end Mock Service Server: ......................... 155
  20.1.2 Gateway node server: ......................................... 155

20.2 ShenYu Version ......................................................... 155

20.3 Test Tool ................................................................. 155

20.4 Test Case Description ............................................... 156
  20.4.1 Instruction .......................................................... 156
  20.4.2 JVM Configuration ............................................. 156
  20.4.3 Public Configuration ........................................... 156
  20.4.4 WebClient Configuration .................................... 158
  20.4.5 Netty Client Configuration ................................. 158

20.5 Benchmark Test Results ............................................. 159
  20.5.1 Direct Access to Back-end Test Result .................. 160
     Test Result ............................................................ 160
     Screenshot of Test Result ........................................ 160
  20.5.2 Access to Back-end Services via NettyClient Test Result ............................ 160
     Screenshot of Test Result ........................................ 161
  20.5.3 Access to Back-end Services via WebClient Test Result .................................. 161
     Test Result ............................................................ 161
     Screenshot of Test Result ........................................ 161
What is the Apache ShenYu?

This is an asynchronous, high-performance, cross-language, responsive API gateway.
ShenYu (神禹) is the honorific name of Chinese ancient monarch Xia Yu (also known in later times as Da Yu), who left behind the touching story of the three times he crossed the Yellow River for the benefit of the people and successfully managed the flooding of the river. He is known as one of the three greatest kings of ancient China, along with Yao and Shun.

- Firstly, the name ShenYu is to promote the traditional virtues of our Chinese civilisation.
- Secondly, the most important thing about the gateway is the governance of the traffic.
- Finally, the community will do things in a fair, just, open and meritocratic way, paying tribute to ShenYu while also conforming to the Apache Way.
Features

- Proxy: Support for Apache® Dubbo™, Spring Cloud, gRPC, Motan, SOFA, TARS, WebSocket, MQTT
- Security: Sign, OAuth 2.0, JSON Web Tokens, WAF plugin
- API governance: Request, response, parameter mapping, Hystrix, RateLimiter plugin
- Observability: Tracing, metrics, logging plugin
- Dashboard: Dynamic traffic control, visual backend for user menu permissions
- Extensions: Plugin hot-swapping, dynamic loading
- Cluster: NGINX, Docker, Kubernetes
- Language: provides .NET, Python, Go, Java client for API register
6.1 Run Apache ShenYu Admin

```bash
docker pull apache/shenyu-admin
docker network create shenyu
docker run -d -p 9095:9095 --net shenyu apache/shenyu-admin
```

Default account: **admin**
Default password: **123456**

6.2 Run Apache ShenYu Bootstrap

```bash
docker pull apache/shenyu-bootstrap
docker run -d -p 9195:9195 -e "shenyu.local.enabled=true" --net shenyu apache/shenyu-bootstrap
```

6.3 Set router

- **Real requests**: http://127.0.0.1:8080/helloworld,

```json
{
    "name": "Shenyu",
    "data": "hello world"
}
```

- Set routing rules (Standalone)

Add `localKey`: 123456 to Headers. If you need to customize the localKey, you can use the sha512 tool to generate the key based on plaintext and update the `shenyu.local.sha512Key` property.
curl --location --request POST 'http://localhost:9195/shenyu/plugin/
selectorAndRules' \
--header 'Content-Type: application/json' \
--header 'localKey: 123456' \
--data-raw '{
    "pluginName": "divide",
    "selectorHandler": "[{{"upstreamUrl":"127.0.0.1:8080"}}]",
    "conditionDataList": [{
        "paramType": "uri",
        "operator": "match",
        "paramValue": "/**"
    }],
    "ruleDataList": [{
        "ruleHandler": "{{"loadBalance":"random"}}",
        "conditionDataList": [{
            "paramType": "uri",
            "operator": "match",
            "paramValue": "/**"
        }]
    }]
}'

• Proxy request : http://localhost:9195/helloworld

{  
    "name" : "Shenyu",
    "data" : "hello world"
}
Whenever a request comes in, Apache ShenYu will execute it by all enabled plugins through the chain of responsibility.

As the heart of Apache ShenYu, plugins are extensible and hot-pluggable.

Different plugins do different things.

Of course, users can also customize plugins to meet their own needs.

If you want to customize, see custom-plugin.
According to your HTTP request headers, selectors and rules are used to route your requests.

Selector is your first route, it is coarser grained, for example, at the module level.

Rule is your second route and what do you think your request should do. For example a method level in a module.

The selector and the rule match only once, and the match is returned. So the coarsest granularity should be sorted last.
Data Caching & Data Sync

Since all data have been cached using ConcurrentHashMap in the JVM, it’s very fast. Apache ShenYu dynamically updates the cache by listening to the ZooKeeper node (or WebSocket push, HTTP long polling) when the user changes configuration information in the background management.
10

Prerequisite

- JDK 1.8+
Contribution and Support

- How to Contribute
- Mailing Lists
In order of registration, More access companies are welcome to register at https://github.com/apache/shenyu/issues/68 (For open source users only).

All Users: Known Users
Application client access means to access your microservice to ShenYu gateway, currently supports HTTP, Dubbo, Spring Cloud, gRPC, Motan, Sofa, Tars and other protocols access.

Connecting the application client to ShenYu gateway is realized through the registration center, which involves the registration of the client and the synchronization of the server data. The registry supports HTTP, ZooKeeper, Etc, Consul, and Nacos.

Refer to the client access configuration in the user documentation for Application Client Access Config.
14.1 Design principle

14.1.1 Client

Declare the registry client type, such as HTTP or ZooKeeper, in your microservice configuration. Use SPI to load and initialize the corresponding registry client when the application starts, implement the post-processor interface associated with the Spring Bean, get the service interface information to register in it, and place the obtained information into Disruptor.

The Registry client reads data from the Disruptor and registers the interface information with shenyu-admin, where the Disruptor decouples data from operations for scaling.
14.1.2 Server
Declare the registry server type, such as HTTP or ZooKeeper, in the Shenyu-Admin configuration. When shenyu-admin is started, it will read the configuration type, load and initialize the corresponding registry server, and when the registry server receives the interface information registered by shenyu-client, it will put it into Disruptor, which will trigger the registration processing logic to update the interface information and publish a synchronous event.

Disruptor provides data and operations decoupling for expansion. If there are too many registration requests, resulting in abnormal registration, there is also a data buffer role.

### 14.2 Http Registry

The principle of HTTP service registration is relatively simple. After Shenyu-Client is started, the relevant service registration interface of Shenyu-Admin will be called to upload data for registration.

After receiving the request, shenyu-admin will update the data and publish the data synchronization event to synchronize the interface information to ShenYu Gateway.

### 14.3 Zookeeper Registry

Zookeeper storage struct is:

```plaintext
tree
  shenyu
  ├── register
  │   └── metadata
  │       └── ${rpcType}
  │           └── ${contextPath}
  │               └── ${ruleName} : save metadata data of
  │                   MetaDataRegisterDTO
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14.4 Etcd Registry

Etcd storage struct is:

```
shenyu
├──register
│    ├──metadata
│    │    └──${rpcType}
│    │        └──${contextPath}
│    │            └──$ruleName : save metadata data of MetaDataRegisterDTO
│    ├──uri
│    │    └──${rpcType}
│    │        └──${contextPath}
│    │            └──$ip:port : save uri data of URIRegisterDTO
│    └──$ip:port
```

Shenyu-client starts up, the service interface information (MetaDataRegisterDTO/URIRegisterDTO) wrote in Ephemeral way above Etcd of the node.

Shenyu-admin uses Etcd’s Watch mechanism to monitor events such as data update and deletion, and triggers the corresponding registration processing logic after data changes. Upon receipt of a change to the MetadataRegisterDTO node, the data change and data synchronization event publication of the selector and rule is triggered. Upon receipt of a UriRegisterDTO node change, the upstream of the selector is triggered to publish an update and data synchronization event.

14.5 Consul Registry

Consul register client will save URIRegisterDTO to service instance metadata, and URIRegisterDTO will disappear with service unregister.

And Consul register client will save MetaDataRegisterDTO to Key/Value store, storage struct is:

```
shenyu
├──register
│    └──metadata
```

---

Apache ShenYu document
When shenyu-client is started, the service interface information (MetaDataRegisterDTO/URIRegisterDTO) on the Metadata of the ServiceInstance (URIRegisterDTO) and Key-Value (MetaDataRegisterDTO), Store as described above.

shenyu-admin senses the update and deletion of data by monitoring the change of index of Catalog and KeyValue, and triggers the corresponding registration processing logic after the change of data. Upon receipt of a change to the MetadataregisterDTO node, the data change and data synchronization event publication of the selector and rule is triggered. Upon receipt of a UriRegisterDTO node change, the upstream of the selector is triggered to publish an update and data synchronization event.

### 14.6 Nacos Register

Nacos registration is divided into two parts: URI and Metadata. URI is registered by instance. In case of service exception, the relevant URI data node will be deleted automatically and send events to the subscriber, and the subscriber will carry out relevant offline processing. Metadata is registered by configuration without any related up-down operation. When a URI instance is registered, the Metadata configuration will be published accordingly. The subscriber monitors data changes and carries out update processing.

The URI instance registration command rules are as follows:

```plaintext
shenyu.register.service.${rpcType}
```

Listens on all RpcType nodes initially, and the `{contextPath}` instances registered under them are distinguished by IP and Port, and carry their corresponding contextPath information. After the URI instance is offline, it triggers the update and data synchronization event publication of the selector’s upstream.

When the URI instance goes online, the corresponding Metadata data will be published. The node name command rules are as follows:

```plaintext
shenyu.register.service.${rpcType}.${contextPath}
```

The subscriber side continues to listen for all Metadata configurations, triggering selector and rule data changes and data synchronization events after the initial subscription and configuration update.
14.7 SPI

<table>
<thead>
<tr>
<th>SPI Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ShenyuClientRegisterRepository</td>
<td>ShenYu client register SPI</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Implementation Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HttpClientRegisterRepository</td>
<td>Http client register repository</td>
</tr>
<tr>
<td>ZookeeperClientRegisterRepository</td>
<td>Zookeeper client register repository</td>
</tr>
<tr>
<td>EtcdClientRegisterRepository</td>
<td>Etcd client register repository</td>
</tr>
<tr>
<td>ConsulClientRegisterRepository</td>
<td>Consul client register repository</td>
</tr>
<tr>
<td>NacosClientRegisterRepository</td>
<td>Nacos client register repository</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SPI Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ShenyuServerRegisterRepository</td>
<td>ShenYu server register SPI</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Implementation Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ShenyuHttpRegistryController</td>
<td>Http server repository</td>
</tr>
<tr>
<td>ZookeeperServerRegisterRepository</td>
<td>Zookeeper server registry repository</td>
</tr>
<tr>
<td>EtcdServerRegisterRepository</td>
<td>Etcd server registry repository</td>
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<tr>
<td>ConsulServerRegisterRepository</td>
<td>Consul server registry repository</td>
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<tr>
<td>NacosServerRegisterRepository</td>
<td>Nacos server registry repository</td>
</tr>
</tbody>
</table>

ShenYu gateway realizes flow control through plugins, selectors and rules. For related data structure, please refer to the previous Apache ShenYu Admin Database Design.

14.8 Plugin

In Apache ShenYu Admin System, each plugin uses Handle (JSON format) fields to represent different processing, and the plugin processing is used to manage and edit the custom processing fields in the JSON.

The main purpose of this feature is to enable plugins to handle templated configurations.
14.9 Selector And Rule

Selector and rule are the most soul of Apache ShenYu Gateway. Master it and you can manage any traffic.

A plugin has multiple selectors, and one selector corresponds to multiple rules. The selector is the first level filter of traffic, and the rule is the final filter. For a plugin, we want to meet the traffic criteria based on our configuration before the plugin will be executed. Selectors and rules are designed to allow traffic to perform what we want under certain conditions. The rules need to be understood first.

The execution logic of plugin, selector and rule is as follows. When the traffic enters into ShenYu gateway, it will first judge whether there is a corresponding plugin and whether the plugin is turned on. Then determine whether the traffic matches the selector of the plugin. It then determines whether the traffic matches the rules of the selector. If the request traffic meets the matching criteria, the plugin will be executed. Otherwise, the plugin will not be executed. Process the next one. ShenYu gateway is so through layers of screening to complete the flow control.

14.10 Traffic filtering

Traffic filtering is the soul of the selector and the rule, corresponding to the matching conditions in the selector and the rule. According to different traffic filtering rules, we can deal with various complex scenes. Traffic filtering can fetch data from Http requests such as Header, URI, Query, Cookie, etc. You can then use Match, =, SpEL, Regex, Groovy, Exclude, etc, to Match the desired data. Multi-group matching Adds matching policies that can use And/Or.

Please refer to Selector And Rule Config for details.

Apache Shenyu Admin is the management system of the gateway, which can manage all plugins, selectors and rules visually, set users, roles and resources.

14.11 Plugin, Selector And Rule

- Plugin: ShenYu uses the plugin design idea to realize the hot plug of the plugin, which is easy to expand. Built-in rich plugins, including RPC proxy, circuit breaker and current limiting, authority and certification, monitoring, and more.
- Selector: Each plugin can set multiple selectors to carry out preliminary filtering of traffic.
- Rule: Multiple rules can be set per selector for more fine-grained control of flow.
- The Database Table UML Diagram:
- Detailed design:
  - One plugin corresponds to multiple selectors, one selector corresponds to multiple rules.
  - One selector corresponds to multiple match conditions, one rule corresponds to multiple match conditions.
  - Each rule handles differently in corresponding plugin according to field handler, field handler is a kind of data of JSON string type. You can view detail during the use of shenyu-admin.

### 14.12 Resource Permission

- The resource are the menus and buttons in the shenyu-admin console.
- Resource Permission use database to store user name, role, resource data and relationship.
• The Resource Permission Table UML Diagram:

• Detailed design:
  - one user corresponds to multiple role, one role corresponds to multiple resources.

14.13 Data Permission

• Data Permission use database to store the relationship between users, selectors and rules.
• The Data Permission Table UML Diagram:

• Detailed design:
  – The most important table is `data_permission`, where a user corresponds to multiple data permissions.
  – The field `data_type` distinguishes between different types of data, which corresponds to the following: 0 -> selector, 1 -> rule.
  – The field `data_id` holds the primary key id of the corresponding type.

14.14 Meta Data

• Metadata is used for generic invoke by gateway.
• For each interface method, there is one piece of metadata.
• The Database Table UML Diagram:

• Detailed design:
  – `path`: When the gateway is requested, a piece of data will be matched according to `path`, and then the subsequent process will be carried out.
  – `rpc_ext`: Used to hold extended information for the RPC proxy.
14.15 Dictionary Management

- Dictionary management is used to maintain and manage public data dictionaries.
- The Database Table UML Diagram:

14.16 API Documentation

- The API document tables used to maintain and manage API documents.
- The API document (such as json, md, html, etc.) of common specifications (such as OpenApi3.0 and yapi) can be imported into shenyu-admin and finally stored in the API document tables.
- API documents of other common specifications can be generated through the API document tables.
- The Database Table UML Diagram:
- Detailed design:
  - A tag can have multiple child tags, the level of tags is unlimited, the lowest leaf node is API.
  - Interfaces with the same path but supporting multiple http methods, they are counted as multiple APIs.
  - An API has multiple request parameters and response fields.
  - A parameter/field has its own type (model), and each type have multiple fields.
  - A field has its own type, which corresponds to multiple values.
  - A value can be used as either a request example value, or a response example value (for example, 200 indicates OK, and 400 indicates illegal parameters).
  - The query, header and body, all of them are json stored in mock_request_record, but body does not support special types such as file.
  - The ext of the tag table stores the full amount of json data of its parent tag (including the parent tag of the parent tag, and so on).
  - The ext of the api table may store the IP list and the service name of SpringCloud.
  - The type of the parameter table mainly includes requestUrlParam, requestHeader, requestBody, requestPathVariable, responseHeader, and responseBody; If the returned type is a special type (such as file), do not associate model_id.
  - The ext of the field table stores generic type in json format (convenient for subsequent expansion), such as {"genericTypes": [model_id1, model_id2]}; model_id indicates which type has this field, self_model_id indicates which type of this field.
  - The is_example of detail table indicates whether a value is a request sample value, true is a request sample value, and false is a response value.
SPI, called Service Provider Interface, is a built-in JDK Service that provides discovery function and a dynamic replacement discovery mechanism.

`shenyu-spi` is a custom SPI extension implementation for Apache Shenyu gateway. The design and implementation principles refer to SPI Extension Implementations.

### 14.17 Registry Center

Consul, Etcd, Http, Nacos and Zookeeper are supported. The expansion of the registry including client and server, interface respectively `ShenyuServerRegisterRepository` and `ShenyuClientRegisterRepository`.

### 14.18 Metrics Center

Responsible for service monitoring, loading concrete implementation through SPI, currently support Prometheus, service interface is `MetricsService`.

### 14.19 Load Balance

Select one of the service providers to call. Currently, the supported algorithms are Has, Random, and RoundRobin, and the extended interface is `LoadBalance`.

### 14.20 RateLimiter

In the RateLimiter plugin, which stream limiting algorithm to use, currently supporting Concurrent, LeakyBucket, SlidingWindow and TokenBucket, the extension interface is `RateLimiterAlgorithm`.

### 14.21 Match Strategy

Which matching method to use when adding selectors And rules, currently supports And, Or, And the extension interface is `MatchStrategy`. 
14.22 Parameter Data

Currently, URI, RequestMethod, Query, Post, IP, Host, Cookie, and Header are supported. The extended interface is ParameterData.

14.23 Predicate Judge

Which conditional policy to use when adding selectors and rules currently supports Match, Contains, Equals, Groovy, Regex, SpEL, TimerAfter, TimerBefore and Exclude. The extension interface is PredicateJudge.

Apache ShenYu is a Java native API Gateway for service proxy, protocol conversion and API governance. Currently, ShenYu has good scalability in the Java language. However, ShenYu’s support for multiple languages is still relatively weak.

WASM (WebAssembly) bytecode is designed to be encoded in a size- and load-time-efficient binary format. WebAssembly aims to leverage the common hardware features available on various platforms to execute in browsers at machine code speed.

WASI (WebAssembly System Interface) allows WASM to run in non browser environments such as Linux.

The goal of WASMPlugin is to be able to run WASM bytecode. Other languages, as long as their code can be compiled into WASM bytecode (such as Rust/golang/C++), can be used to write ShenYu plugins.

14.24 Develop Phase

14.25 Prepare Phase

14.26 Runtime Phase

This document explains the principle of data synchronization. Data synchronization refers to the strategy used to synchronize data to ShenYu gateway after shenyu-admin background operation data. ShenYu gateway currently supports ZooKeeper, WebSocket, HTTP Long Polling, Nacos, Etcld and Consul for data synchronization.

See Data Synchronization Configuration for configuration information about data synchronization.
14.27 Preface

Gateway is the entrance of request and it is a very important part in micro service architecture, therefore the importance of gateway high availability is self-evident. When we use gateway, we have to change configuration such as flow rule, route rule for satisfying business requirement. Therefore, the dynamic configuration of the gateway is an important factor to ensure the high availability of the gateway.

In the actual use of Apache ShenYu Gateway, users also feedback some problems:

- Apache ShenYu depends on ZooKeeper, how to use Etcd, Consul, Nacos and other registry center?
- Apache ShenYu depends on Redis and InfluxDB, and do not use limiting plugins or monitoring plugins. Why need these?
- Why not use configuration center for configuration synchronization?
- Why can’t updates be configured dynamically?
- Every time you want to query the database, Redis is a better way.

According to the feedback of users, we have also partially reconstructed ShenYu. The current data synchronization features are as follows:

- All configuration is cached in ShenYu gateway memory, each request uses local cache, which is very fast.
- Users can modify any data in the background of shenyu-admin, and immediately synchronize to the gateway memory.
- Support ShenYu plugin, selector, rule data, metadata, signature data and other data synchronization.
- All plugin selectors and rules are configured dynamically and take effect immediately, no service restart required.
- Data synchronization mode supports Zookeeper, HTTP long polling, Websocket, Nacos, Etcd and Consul.

14.28 Principle Analysis

The following figure shows the process of data synchronization of ShenYu. ShenYu Gateway will synchronize configuration data from configuration service at startup, and support push-pull mode to get configuration change information, and then update local cache. The administrator can change the user permissions, rules, plugins and traffic configuration in the admin system(shenyu-admin), and synchronize the change information to ShenYu Gateway through the push-pull mode. Whether the mode is push or pull depends on the synchronization mode used.

In the original version, the configuration service relied on the Zookeeper implementation to manage the back-end push of changes to the gateway. Now, WebSocket, HTTP long polling, ZooKeeper, Nacos, Etcld, and Consul can now be supported by specifying the corresponding synchronization policy by setting shenyu.sync.${strategy} in the configuration file. The default WebSocket synchronization
policy can be used to achieve second level data synchronization. However, it is important to note that Apache ShenYu Gateway and shenyu-admin must use the same synchronization policy.

As showing picture below, shenyu-admin will issue a configuration change notification through EventPublisher after users change configuration, EventDispatcher will handle this modification and send configuration to corresponding event handler according to configured synchronization strategy.

- If it is a websocket synchronization strategy, it will push modified data to shenyu-web, and corresponding WebsocketDataHandler handler will handle shenyu-admin data push at the gateway layer.
- If it is a zookeeper synchronization strategy, it will push modified data to zookeeper, and the ZookeeperSyncCache will monitor the data changes of zookeeper and process them.
- If it is a http synchronization strategy, shenyu-web proactively initiates long polling requests, 90 seconds timeout by default, if there is no modified data in shenyu-admin, http request will be blocked, if there is a data change, it will respond to the changed data information, if there is no data change after 60 seconds, then respond with empty data, gateway continue to make http request after getting response, this kind of request will repeat.

### 14.28.1 Zookeeper Synchronization

The zookeeper-based synchronization principle is very simple, it mainly depends on zookeeper watch mechanism, shenyu-web will monitor the configured node, when shenyu-admin starts, all the data will be written to zookeeper, it will incrementally update the nodes of zookeeper when data changes, at the same time, shenyu-web will monitor the node for configuration information, and update the local cache once the information changes.

Apache ShenYu writes the configuration information to the zookeeper node, and it is meticulously designed. If you want to learn more about the code implementation, refer to the source code ZookeeperSyncDataService.

### 14.28.2 WebSocket Synchronization

The mechanism of websocket and zookeeper is similar, when the gateway and the shenyu-admin establish a websocket connection, shenyu-admin will push all data at once, it will automatically push incremental data to shenyu-web through websocket when configured data changes.

When we use websocket synchronization, pay attention to reconnect after disconnection, which also called keep heartbeat. Apache ShenYu uses java-websocket, a third-party library, to connect to websocket. If you want to learn more about the code implementation, refer to the source code WebSocketSyncDataService.
Figure 1: Zookeeper Node Design

14.28. Principle Analysis
14.28.3 Http Long Polling

The mechanism of zookeeper and websocket data synchronization is relatively simple, but http synchronization will be relatively complicated. ShenYu borrows the design ideas of Apollo and Nacos and realizes http long polling data synchronization using their advantages. Note that this is not traditional ajax long polling.

http long polling mechanism as above, shenyu-web gateway requests shenyu-admin configuration services, timeout is 90 seconds, it means gateway layer request configuration service will wait at most 90 seconds, this is convenient for shenyu-admin configuration service to respond modified data in time, and therefore we realize near real-time push.

After the http request reaches shenyu-admin, it does not respond immediately, but uses the asynchronous mechanism of Servlet3.0 to asynchronously respond to the data. First of all, put long polling request task LongPollingClient into BlockingQueue, and then start scheduling task, execute after 60 seconds, this aims to remove the long polling request from the queue after 60 seconds, even there is no configured data change. Because even if there is no configuration change, gateway also need to know, otherwise it will wait, and there is a 90 seconds timeout when the gateway requests configuration services.

If the administrator changes the configuration data during this period, the long polling requests in the queue will be removed one by one, and respond which group’s data has changed (we distribute plugins, rules, flow configuration, user configuration data into different groups). After gateway receives response, it only knows which Group has changed its configuration, it need to request again to get group configuration data. Someone may ask, why don’t you write out the changed data directly? We also discussed this issue deeply during development, because the http long polling mechanism can only guarantee quasi real-time, if gateway layer does not handle it in time, or administrator updates configuration frequently, we probably missed some configuration change push. For security, we only inform that a certain Group information has changed.

When shenyu-web gateway layer receives the http response information, pull modified information (if exists), and then request shenyu-admin configuration service again, this will repeatedly execute. If you want to learn more about the code implementation, refer to the source code HttpSyncDataService.

14.28.4 Nacos Synchronization

The synchronization principle of Nacos is basically similar to that of ZooKeeper, and it mainly depends on the configuration management of Nacos. The path of each configuration node is similar to that of ZooKeeper.

ShenYu gateway will monitor the configured node. At startup, if there is no configuration node in Nacos, it will write the synchronous full amount of data into Nacos. When the sequential data send changes, it will update the configuration node in Nacos in full amount. The local cache is updated.

If you want to learn more about the code implementation, please refer to the source code NacosSyncDataService and the official documentation for Nacos.
14.28.5 EtcS Synchronization

Etc data synchronization principle is similar to Zookeeper, mainly relying on Etc’s watch mechanism, and each configuration node path is the same as that of Zookeeper.

The native API for Etc is a bit more complicated to use, so it’s somewhat encapsulated.

ShenYu gateway will listen to the configured node. When startup, if there is no configuration node in Etc, it will write the synchronous full amount of data into Etc. When the sequential data send changes, it will update the configuration node in Etc incrementally.

If you want to learn more about the code implementation, refer to the source EtcSyncDataService.

14.28.6 Consul Synchronization

Consul data synchronization principle is that the gateway regularly polls Consul’s configuration center to get the configuration version number for local comparison.

ShenYu gateway will poll the configured nodes regularly, and the default interval is 1s. When startup, if there is no configuration node in Consul, write the synchronous full amount of data into Consul, then incrementally update the configuration node in Consul when the subsequent data is sent to change. At the same time, Apache ShenYu Gateway will regularly polls the node of configuration information and pull the configuration version number for comparison with the local one. The local cache is updated when the version number is changed.

If you want to learn more about the code implementation, refer to the source ConsulSyncDataService.
This article introduces the use of docker-compose to deploy the Apache ShenYu gateway.

Before you read this document, you need to complete some preparations before deploying ShenYu according to the Deployment Prerequisites document.

### 15.1 Download shell script

```
```

### 15.2 execute script

This script will download the required configuration files and mysql-connector, and can be executed repeatedly if the download fails.

```
sh ./install.sh #The latest configuration is pulled by default. If you need to deploy the released version, you can add a parameter to indicate the version number, such as: v2.4.2 or latest
```

### 15.3 Initialize the shenyu-admin database

Refer to the database initialization documentation to initialize the database.
15.4 Modify the configuration file

Modify the configuration file downloaded by the script to set up configurations such as JDBC.

15.5 Execute docker-compose

```
cd shenyu-$(VERSION)
docker-compose -f ./shenyu-$(VERSION)/docker-compose.yaml up -d
```

Before you read this document, you need to complete some preparations before deploying Shenyu according to the Deployment Prerequisites document.

This article introduces how to deploy the Shenyu gateway in cluster environment.

In this part, you can see ShenYu Binary Packages Deployment before deploying.

15.6 Environmental Preparation

- Two or more Gateway Bootstrap servers, these servers must install JDK1.8+.
- A server for Gateway Admin, this server must install mysql/pgsql/h2 and JDK1.8+.
- A server for nginx.

15.7 Start Apache ShenYu Admin

- download and unzip `apache-shenyu-${current.version}-admin-bin.tar.gz` in your Gateway Admin server.
- config your database, go to the /conf directory, and modify `spring.profiles.active` of the configuration in `application.yaml` to mysql, pg or h2.
- config your way of synchronization, go to the /conf directory, and modify `shenyu.sync` of configuration in `application.yaml` to websocket, http, zookeeper, etcd, consul or nacos.
- start Apache ShenYu Admin in bin directory.

```
> windows: start.bat
> linux: ./start.sh
```
15.8 Start Apache ShenYu Bootstrap

- download and unzip `apache-shenyu-${current.version}-bootstrap-bin.tar.gz` in your Gateway Bootstrap server.
- config your synchronization, go to the `/conf` directory, and modify `shenyu.sync` of configuration in `application.yaml` to `websocket`, `http`, `zookeeper`, `etcd`, `consul` or `nacos`, this configuration must remain the same of ShenYu Admin.
- repeat above-mentioned operations in each ShenYu Bootstrap server.
- start Apache ShenYu Bootstrap in `bin` directory.

```bash
> windwos: start.bat
> linux: ./start.sh
```

After completing these operations, you will deploy ShenYu Bootstrap Cluster.
For example. you will deploy ShenYu Bootstrap in `10.1.1.1` and `10.1.1.2` and deploy nginx in `10.1.1.3`.

15.9 Start Nginx

- download and install `nginx`.
- modify `upstream` and `server` of configuration in `nginx.conf`.

```nginx
upstream shenyu_gateway_cluster {
  ip_hash;
  server 10.1.1.1:9195 max_fails=3 fail_timeout=10s weight=50;
  server 10.1.1.2:9195 max_fails=3 fail_timeout=10s weight=50;
}
server {
  listen 9195;
  location / {
    proxy_pass http://shenyu_gateway_cluster;
    proxy_set_header HOST $host;
    proxy_read_timeout 10s;
    proxy_connect_timeout 10s;
  }
}
```

- start nginx.

```bash
> windows: ./nginx.exe
> linux: /usr/local/nginx/sbin/nginx
```
• verify nginx, looking at your ShenYu Bootstrap log or Nginx log, Where will the verification request go.

Apache ShenYu Nginx Module

This module provided SDK to watch available ShenYu instance list as upstream nodes by Service Register Center for OpenResty. 1. **ETCD** (Supported) 2. **Nacos** (Supported) 3. **Zookeeper** (Supported) 4. Consul (TODO)

In the cluster mode, Apache ShenYu supports the deployment of multiple ShenYu instances, which may have new instances joining or leaving at any time. Hence, Apache ShenYu introduces Service Discovery modules to help client to detect the available instances. Currently, Apache ShenYu Bootstrap already supports Apache Zookeeper, Nacos, Etcd, and consul. Client or LoadBalancer can get the available ShenYu instances by those Service register center.

### 15.9.1 Getting Started

• Prerequisite:
  1. Luarocks
  2. OpenResty

### 15.10 Build from source

The first, clone the source from GitHub.

```bash
git clone https://github.com/apache/shenyu-nginx
```

Then, build from source and install.

```bash
cd shenyu-nginx
luarocks make rockspec/shenyu-nginx-main-0.rockspec
```

### 15.11 Greeting ETCD

Modify the Nginx configure, create and initialize the ShenYu Register to connect to the target register center. The module will fetch the all of ShenYu instances which are registered to Etcd in the same cluster. It works like Etcd client to watch(based on long polling) ShenYu instance lists.

Here is an example for Etcd.

```lua
init_worker_by_lua_block {
    local register = require("shenyu.register.etcd")
    register.init({
        balancer_type = "chash",
```
etcd_base_url = "http://127.0.0.1:2379",
}
}

1. balancer_type specify the balancer. It has supported chash and round robin.
2. etcd_base_url specify the Etcd server. (Currently, authentication is not supported.)

Add an upstream block for ShenYu and enable to update upstream servers dynamically. This case will synchronize the ShenYu instance list with register center. And then pick one up for handling the request.

upstream shenyu {
    server 0.0.0.1; -- bad

    balancer_by_lua_block {
        require("shenyu.register.etcd").pick_and_set_peer()
    }
}

Finally, restart OpenResty.

openresty -s reload

Here is a completed example working with ETCD.

15.12 Greeting Nacos

Modify the Nginx configure, create and initialize the ShenYu Register to connect to target register center. Here is an example for Nacos.

init_worker_by_lua_block {
    local register = require("shenyu.register.nacos")
    register.init({
        shenyu_storage = ngx.shared.shenyu_storage,
        balancer_type = "chash",
        nacos_base_url = "http://127.0.0.1:8848",
        username = "nacos",
        password = "naocs",
    })
}

1. balancer_type specify the balancer. It has supported chash and round robin.
2. nacos_base_url specify the Nacos server address.
3. username specify the username to log in Nacos. (it is only required when Nacos auth enable)
4. password specify the password to log in Nacos.

15.12. Greeting Nacos
Modify the upstream to enable to update upstream servers dynamically. This case will synchronize the ShenYu instance list with register center. And then pick one up for handling the request.

```
upstream shenyu {
    server 0.0.0.1; -- bad

    balancer_by_lua_block {
        require("shenyu.register.nacos").pick_and_set_peer()
    }
}
```

Finally, restart OpenResty.

```
openresty -s reload
```

Here is a completed example working with Nacos.

### 15.12.1 Greeting Zookeeper

Modify the Nginx configure, create and initialize the ShenYu register to connect to target register center. Listen for changes to the node via the zookeeper watch event. Here is an example of the zookeeper configuration.

```
init_worker_by_lua_block {
    local register = require("shenyu.register.zookeeper")
    register.init({
        servers = {"127.0.0.1:2181","127.0.0.1:2182"},
        shenyu_storage = ngx.shared.shenyu_storage,
        balancer_type = "roundrobin"
    });
}
```

1. `servers` zookeeper cluster address.
2. `balancer_type` specify the balancer. It has supported chash and round robin.

Modify the upstream to enable to update upstream servers dynamically. This case will synchronize the ShenYu instance list with register center. And then pick one up for handling the request.

```
upstream shenyu {
    server 0.0.0.1;
    balancer_by_lua_block {
        require("shenyu.register.zookeeper").pick_and_set_peer()
    }
}
```

Finally, restart OpenResty.
Here is a completed example working with Zookeeper.

This article introduces the deployment of the Apache ShenYu gateway using the binary packages.

Before you read this document, you need to complete some preparations before deploying ShenYu according to the Deployment Prerequisites document.

### 15.13 Start Apache ShenYu Admin

- download `apache-shenyu-`{current.version}-admin-bin.tar.gz
- unzip `apache-shenyu-`{current.version}-admin-bin.tar.gz, go to the bin directory.

After version 2.5.1, start.sh started to support custom JVM startup parameters through the environment variable `ADMIN_JVM`.

- use h2 to store data:

  ```
  > windows: start.bat
  > linux: ./start.sh
  ```

- use MySQL to store data, follow the guide document to initialize the database, copy `mysql-connector.jar` to `/$(your_work_dir)/ext-lib`, go to the `/conf` directory, and modify the JDBC configuration in `application-mysql.yml`.

  - Modify `spring.profiles.active in conf/application.yml` to `mysql`

  ```
  > windows: start.bat
  > linux: ./start.sh
  ```

- use PostgreSQL to store data, follow the guide document to initialize the database, go to the `/conf` directory, and modify the JDBC configuration in `application-pg.yml`.

  - Modify `spring.profiles.active in conf/application.yml` to `pg`

  ```
  > windows: start.bat
  > linux: ./start.sh --spring.profiles.active = pg
  ```

- use Oracle to store data, follow the guide document to initialize the database, go to the `/conf` directory, and modify the JDBC configuration in `application-oracle.yml`.

  - Modify `spring.profiles.active in conf/application.yml` to `oracle`

  ```
  > windows: start.bat
  > linux: ./start.sh
  ```
15.14 Start Apache ShenYu Bootstrap

- download `apache-shenyu-${current.version}-bootstrap-bin.tar.gz`
- unzip `apache-shenyu-${current.version}-bootstrap-bin.tar.gz`, go to the bin directory.

After version 2.5.1, `start.sh` started to support custom JVM startup parameters through the environment variable `BOOT_JVM`.

```bash
> windows : start.bat
> linux : ./start.sh
```

Before you read this document, you need to complete some preparations before deploying Shenyu according to the Deployment Prerequisites document.

This article introduces the use of K8s to deploy the Apache ShenYu gateway.

Catalog

Example 1: Using h2 as a database

1. create Namespace and ConfigMap
2. deploying shenyu-admin
3. deploy shenyu-bootstrap

Example 2: Use MySQL as the database

Similar to the h2 process, there are two points to note

1. you need to load `mysql-connector.jar`, the download command is executed when the container is started
2. you need to specify an external MySQL database configuration

The process is as follows.

1. create Namespace and ConfigMap
2. deploy shenyu-admin
3. deploy shenyu-bootstrap

15.15 Example 1: Using h2 as a database

15.15.1 1. Create Namespace and ConfigMap

- create shenyu-ns.yaml
apiVersion: v1
type: Namespace
metadata:
  name: shenyu
  labels:
    name: shenyu
---
apiVersion: v1
type: ConfigMap
metadata:
  name: shenyu-cm
  namespace: shenyu
data:
  shenyu-admin-application.yml: |
    server:
      port: 9095
      address: 0.0.0.0
    spring:
      profiles:
        active: h2
    thymeleaf:
      cache: true
      encoding: utf-8
      enabled: true
      prefix: classpath:/static/
      suffix: .html
    mvc:
      pathmatch:
        matching-strategy: ant_path_matcher
    mybatis:
      config-location: classpath:/mybatis/mybatis-config.xml
      mapper-locations: classpath:/mappers/*.xml
    shenyu:
      register:
        registerType: http
        serverLists: #localhost:2181 #http://localhost:2379 #localhost:8848
      props:
        sessionTimeout: 5000
        connectionTimeout: 2000
        checked: true
        zombieCheckTimes: 5
        scheduledTime: 10
        nacosNameSpace: ShenyuRegisterCenter
      sync:
        websocket:
          enabled: true
          messageMaxSize: 10240

15.15. Example 1: Using h2 as a database
shenyu-bootstrap-svc.shenyu.svc.cluster.local:9195;

ldap:
  enabled: false
  url: ldap://xxxx:xxx
  bind-dn: cn=xxx,dc=xxx,dc=xxx
  password: xxxx
  base-dn: ou=xxx,dc=xxx,dc=xxx
  object-class: person
  login-field: cn

jwt:
  expired-seconds: 86400000

shiro:
  white-list:
    - /
    - /favicon.*
    - /static/**
    - /index**
    - /platform/login
    - /websocket
    - /error
    - /actuator/health
    - /swagger-ui.html
    - /webjars/**
    - /swagger-resources/**
    - /v2/api-docs
    - /csrf

swagger:
  enable: true

apidoc:
  gatewayUrl: http://127.0.0.1:9195

envProps:
  - envLabel: Test environment
    addressLabel: Request Address
    addressUrl: http://127.0.0.1:9195
  - envLabel: Prod environment
    addressLabel: Request Address
    addressUrl: http://127.0.0.1:9195

logging:
  level:
    root: info
    org.springframework.boot: info
    org.apache.ibatis: info
    org.apache.shenyu.bonuspoint: info
    org.apache.shenyu.lottery: info
    org.apache.shenyu: info

shenyu-admin-application-h2.yml: |
  shenyu:
    database:
dialect: h2
init_script: "sql-script/h2/schema.sql"
init_enable: true

spring:
datasource:
  url: jdbc:h2:mem:~/shenyu;DB_CLOSE_DELAY=-1;MODE=MySQL;
  username: sa
  password: sa
  driver-class-name: org.h2.Driver

shenyu-bootstrap-application.yml: |
spring:
  main:
    allow-bean-definition-overriding: true
    allow-circular-references: true
  application:
    name: shenyu-bootstrap
  codec:
    max-in-memory-size: 2MB
cloud:
  discovery:
    enabled: false
  nacos:
    discovery:
      server-addr: 127.0.0.1:8848 # Spring Cloud Alibaba Dubbo use this.
      enabled: false
      namespace: ShenyuRegisterCenter

eureka:
  client:
    enabled: false
    serviceUrl:
      defaultZone: http://localhost:8761/eureka/
  instance:
    prefer-ip-address: true
management:
  health:
    defaults:
      enabled: false
shenyu:
  matchCache:
    selector:
      selectorEnabled: false
      initialCapacity: 10000 # initial capacity in cache
      maximumSize: 10000 # max size in cache
      rule:
        initialCapacity: 10000 # initial capacity in cache
maximumSize: 10000 # max size in cache

trie:
  childrenSize: 10000
  pathVariableSize: 1000
  pathRuleCacheSize: 1000
  matchMode: antPathMatch

netty:
  http:
    # set to false, user can custom the netty tcp server config.
    webServerFactoryEnabled: true
    selectCount: 1
    workerCount: 4
    accessLog: false
    serverSocketChannel:
      soRcvBuf: 87380
      soBackLog: 128
      soReuseAddr: false
      connectTimeoutMillis: 10000
      writeBufferHighWaterMark: 65536
      writeBufferLowWaterMark: 32768
      writeSpinCount: 16
      autoRead: false
      allocType: "pooled"
      messageSizeEstimator: 8
      singleEventExecutorPerGroup: true
    socketChannel:
      soKeepAlive: false
      soReuseAddr: false
      soLinger: -1
      tcpNoDelay: true
      soRcvBuf: 87380
      soSndBuf: 16384
      ipTos: 0
      allowHalfClosure: false
      connectTimeoutMillis: 10000
      writeBufferHighWaterMark: 65536
      writeBufferLowWaterMark: 32768
      writeSpinCount: 16
      autoRead: false
      allocType: "pooled"
      messageSizeEstimator: 8
      singleEventExecutorPerGroup: true

instance:
  enabled: false
  registerType: zookeeper #etcd #consul
  props:
  cross:
enabled: true
allowedHeaders: 
allowedMethods: "*
allowedAnyOrigin: true # the same of Access-Control-Allow-Origin: "*
maxAge: "18000"
allowCredentials: true
switchConfig:
  local: true
file:
  enabled: true
  maxSize : 10
sync:
  websocket:
    urls: ws://shenyu-admin-svc.shenyu.svc.cluster.local:9095/websocket
exclude:
  enabled: false
  paths:
    - /favicon.ico
fallback:
  enabled: false
  paths:
    - /fallback/hystrix
    - /fallback/resilience4j
health:
  enabled: false
  paths:
    - /actuator/health
    - /health_check
extPlugin:
  path:
    enabled: true
    threads: 1
    scheduleTime: 300
    scheduleDelay: 30
  scheduler:
    enabled: false
    type: fixed
    threads: 16
upstreamCheck:
  enabled: false
  timeout: 3000
  healthyThreshold: 1
  unhealthyThreshold: 1
  interval: 5000
  printEnabled: true
  printInterval: 60000

15.15. Example 1: Using h2 as a database
ribbon:
    serverListRefreshInterval: 10000
metrics:
    enabled: false
    name: prometheus
    host: 127.0.0.1
    port: 8090
    jmxConfig:
        props:
            jvm_enabled: true
local:
    enabled: false
    sha512Key:
"BA3253876AEDE6BC22D4A6FF53D8406C6AD864195ED144AB5C87621B6C233B548BAEAE6956DF346EC8C17F5EA10F35EE302
"
logging:
    level:
        root: info
        org.springframework.boot: info
        org.apache.ibatis: info
        org.apache.shenyu.bonuspoint: info
        org.apache.shenyu.lottery: info
        org.apache.shenyu: info

- execute kubectl apply -f shenyu-ns.yaml

15.15.2 2. Create shenyu-admin

- create shenyu-admin.yaml

```yaml
# Example of using the nodeport type to expose ports
apiVersion: v1
kind: Service
metadata:
    namespace: shenyu
    name: shenyu-admin-svc
spec:
    selector:
        app: shenyu-admin
    type: NodePort
    ports:
        - protocol: TCP
          port: 9095
          targetPort: 9095
          nodePort: 31095
---
# shenyu-admin
apiVersion: apps/v1
```
kind: Deployment
metadata:
  namespace: shenyu
  name: shenyu-admin
spec:
  selector:
    matchLabels:
      app: shenyu-admin
  replicas: 1
  template:
    metadata:
      labels:
        app: shenyu-admin
    spec:
      volumes:
      - name: shenyu-admin-application
        configMap:
          name: shenyu-cm
          items:
            - key: shenyu-admin-application.yml
              path: shenyu-admin-application.yml
      - name: shenyu-admin-application-h2
        configMap:
          name: shenyu-cm
          items:
            - key: shenyu-admin-application-h2.yml
              path: shenyu-admin-application-h2.yml
      containers:
      - name: shenyu-admin
        image: apache/shenyu-admin:latest
        imagePullPolicy: Always
        ports:
        - containerPort: 9095
        env:
        - name: 'TZ'
          value: 'Asia/Beijing'
      volumeMounts:
      - name: shenyu-admin-application
        mountPath: /opt/shenyu-admin/conf/application.yml
        subPath: shenyu-admin-application.yml
      - name: shenyu-admin-application-h2
        mountPath: /opt/shenyu-admin/conf/application-h2.yml
        subPath: shenyu-admin-application-h2.yml

• execute kubectl apply -f shenyu-admin.yaml
15.15.3 3. Create shenyu-bootstrap

- create shenyu-bootstrap.yaml

```yaml
# Example of using the nodeport type to expose ports
apiVersion: v1
type: Service
metadata:
  namespace: shenyu
  name: shenyu-bootstrap-svc
spec:
  selector:
    app: shenyu-bootstrap
  type: NodePort
  ports:
    - protocol: TCP
      port: 9195
      targetPort: 9195
      nodePort: 31195
---

# shenyu-bootstrap
apiVersion: apps/v1
type: Deployment
metadata:
  namespace: shenyu
  name: shenyu-bootstrap
spec:
  selector:
    matchLabels:
      app: shenyu-bootstrap
  replicas: 1
  template:
    metadata:
      labels:
        app: shenyu-bootstrap
    spec:
      volumes:
        - name: shenyu-bootstrap-application
          configMap:
            name: shenyu-cm
            items:
              - key: shenyu-bootstrap-application.yml
                path: shenyu-bootstrap-application.yml
        containers:
          - name: shenyu-bootstrap
            image: apache/shenyu-bootstrap:latest
            ports:
              - containerPort: 9195
            env:
```

15.15. Example 1: Using h2 as a database
- name: TZ
  value: Asia/Beijing
volumeMounts:
- name: shenyu-bootstrap-application
  mountPath: /opt/shenyu-bootstrap/conf/application.yml
  subPath: shenyu-bootstrap-application.yml

- execute kubectl apply -f shenyu-bootstrap.yaml

15.16 Example 2: Use MySQL as the database

15.16.1 1. Create Namespace and ConfigMap

- create shenyu-ns.yaml

```yaml
apiVersion: v1
kind: Namespace
metadata:
  name: shenyu
  labels:
    name: shenyu
---
apiVersion: v1
kind: ConfigMap
metadata:
  name: shenyu-cm
  namespace: shenyu
data:
  shenyu-admin-application.yml:
    server:
      port: 9095
      address: 0.0.0.0
    spring:
      profiles:
        active: mysql
      thymeleaf:
        cache: true
        encoding: utf-8
        enabled: true
        prefix: classpath:/static/
        suffix: .html
      mvc:
        pathmatch:
          matching-strategy: ant_path_matcher
      mybatis:
        config-location: classpath:/mybatis/mybatis-config.xml
        mapper-locations: classpath:/mappers/*.xml
```
shenyu:
  register:
    registerType: http # http # zookeeper # etcd # nacos # consul
    props:
      sessionTimeout: 5000
      connectionTimeout: 2000
      checked: true
      zombieCheckTimes: 5
      scheduledTime: 10
      nacosNameSpace: ShenyuRegisterCenter
  sync:
    websocket:
      enabled: true
      messageMaxSize: 10240
  ldap:
    enabled: false
    url: ldap://xxxx:xxx
    bind-dn: cn=xxx,dc=xxx,dc=xxx
    password: xxxx
    base-dn: ou=xxx,dc=xxx,dc=xxx
    object-class: person
    login-field: cn
  jwt:
    expired-seconds: 86400000
  shiro:
    white-list:
      - /
      - /favicon.*
      - /static/**
      - /index**
      - /platform/login
      - /websocket
      - /error
      - /actuator/health
      - /swagger-ui.html
      - /webjars/**
      - /swagger-resources/**
      - /v2/api-docs
      - /csrf
  swagger:
    enable: true
  apidoc:
    gatewayUrl: http://127.0.0.1:9195
    envProps:
      envLabel: Test environment
addressLabel: Request Address  
addressUrl: http://127.0.0.1:9195
- envLabel: Prod environment  
addressLabel: Request Address  
addressUrl: http://127.0.0.1:9195
logging:
  level:
    root: info
    org.springframework.boot: info
    org.apache.ibatis: info
    org.apache.shenyu.bonuspoint: info
    org.apache.shenyu.lottery: info
    org.apache.shenyu: info
shenyu-admin-application-mysql.yml:
shenyu:
  database:
    dialect: mysql
    init_script: "sql-script/mysql/schema.sql"
    init_enable: true
spring:
  datasource:
    url: jdbc:mysql://{your_mysql_ip}:{your_mysql_port}/shenyu?useUnicode=true&characterEncoding=utf-8&useSSL=false
    username: {your_mysql_user}
    password: {your_mysql_password}
    driver-class-name: com.mysql.jdbc.Driver
shenyu-bootstrap-application.yml:
server:
  port: 9195
  address: 0.0.0.0
spring:
  main:
    allow-bean-definition-overriding: true
    allow-circular-references: true
  application:
    name: shenyu-bootstrap
codec:
  max-in-memory-size: 2MB
cloud:
  discovery:
    enabled: false
  nacos:
    discovery:
      server-addr: 127.0.0.1:8848 # Spring Cloud Alibaba Dubbo use this.
      enabled: false
      namespace: ShenyuRegisterCenter
eureka:
  client:
enabled: false
serviceUrl:
    defaultZone: http://localhost:8761/eureka/
instance:
    prefer-ip-address: true
management:
    health:
        defaults:
            enabled: false
shenyu:
    matchCache:
        selector:
            selectorEnabled: false
            initialCapacity: 10000 # initial capacity in cache
            maximumSize: 10000 # max size in cache
        rule:
            initialCapacity: 10000 # initial capacity in cache
            maximumSize: 10000 # max size in cache
trie:
    childrenSize: 10000
    pathVariableSize: 1000
    pathRuleCacheSize: 1000
    matchMode: antPathMatch
netty:
    http:
        # set to false, user can custom the netty tcp server config.
        webServerFactoryEnabled: true
        selectCount: 1
        workerCount: 4
        accessLog: false
        serverSocketChannel:
            soRcvBuf: 87380
            soBackLog: 128
            soReuseAddr: false
            connectTimeoutMillis: 10000
            writeBufferHighWaterMark: 65536
            writeBufferLowWaterMark: 32768
            writeSpinCount: 16
            autoRead: false
            allocType: "pooled"
            messageSizeEstimator: 8
            singleEventExecutorPerGroup: true
        socketChannel:
            soKeepAlive: false
            soReuseAddr: false
            soLinger: -1
            tcpNoDelay: true
            soRcvBuf: 87380

15.16. Example 2: Use MySQL as the database
soSndBuf: 16384
ipTos: 0
allowHalfClosure: false
connectTimeoutMillis: 10000
writeBufferHighWaterMark: 65536
writeBufferLowWaterMark: 32768
writeSpinCount: 16
autoRead: false
allocType: "pooled"
messageSizeEstimator: 8
singleEventExecutorPerGroup: true

instance:
  enabled: false
  registerType: zookeeper # etcd # consul
  props:
    cross:
      enabled: true
      allowedHeaders:
      allowedMethods: "*"
      allowedAnyOrigin: true # the same of Access-Control-Allow-Origin: "*"
      allowedExpose: ""
      maxAge: "18000"
      allowCredentials: true
  switchConfig:
    local: true
  file:
    enabled: true
    maxSize: 10
  sync:
    websocket:
      urls: ws://shenyu-admin-svc.shenyu.svc.cluster.local:9095/websocket
  exclude:
    enabled: false
    paths:
      - /favicon.ico
  fallback:
    enabled: false
    paths:
      - /fallback/hystrix
      - /fallback/resilience4j
  health:
    enabled: false
    paths:
      - /actuator/health
      - /health_check
  extPlugin:
path:
  enabled: true
  threads: 1
  scheduleTime: 300
  scheduleDelay: 30
scheduler:
  enabled: false
  type: fixed
  threads: 16
upstreamCheck:
  enabled: false
  timeout: 3000
  healthyThreshold: 1
  unhealthyThreshold: 1
  interval: 5000
  printEnabled: true
  printInterval: 60000
ribbon:
  serverListRefreshInterval: 10000
metrics:
  enabled: false
  name: prometheus
  host: 127.0.0.1
  port: 8090
  jmxConfig:
    props:
      jvm_enabled: true
local:
  enabled: false
  sha512Key:
"BA3253876AE6D6BC22D4A6FF53D8406C6AD864195ED144AB5C87621B6C233B548BAEA6956DF346EC8C17F5EA10F35EE30C"
logging:
  level:
    root: info
    org.springframework.boot: info
    org.apache.ibatis: info
    org.apache.shenyu.bonuspoint: info
    org.apache.shenyu.lottery: info
    org.apache.shenyu: info

- execute kubectl apply -f shenyu-ns.yaml
15.16.2 2. Create shenyu-admin

- create shenyu-admin.yaml

```yaml
# Example of using the nodeport type to expose ports
apiVersion: v1
kind: Service
metadata:
    namespace: shenyu
    name: shenyu-admin-svc
spec:
    selector:
        app: shenyu-admin
    type: NodePort
    ports:
        - protocol: TCP
          port: 9095
          targetPort: 9095
          nodePort: 31095
---
# shenyu-admin
apiVersion: apps/v1
kind: Deployment
metadata:
    namespace: shenyu
    name: shenyu-admin
spec:
    selector:
        matchLabels:
            app: shenyu-admin
    replicas: 1
    template:
        metadata:
            labels:
                app: shenyu-admin
        spec:
            volumes:
                - name: shenyu-admin-application
                  configMap:
                      name: shenyu-cm
                      items:
                        - key: shenyu-admin-application.yml
                          path: shenyu-admin-application.yml
                - name: shenyu-admin-application-mysql
                  configMap:
                      name: shenyu-cm
                      items:
                        - key: shenyu-admin-application-mysql.yml
                          path: shenyu-admin-application-mysql.yml
```

15.16. Example 2: Use MySQL as the database
- name: mysql-connector-volume
  emptyDir: {}
initContainers:
- name: download-mysql-jar
  image: busybox:1.35.0
  command: [
    "sh",
    "-c"
  ]
  args: [
    "wget https://repo1.maven.org/maven2/mysql/mysql-connector-java/8.0.23/mysql-connector-java-8.0.23.jar; \\
    wget https://repo1.maven.org/maven2/mysql/mysql-connector-java/8.0.23/mysql-connector-java-8.0.23.jar.md5; \\
    if [ $(md5sum mysql-connector-java-8.0.23.jar | cut -d ' ' -f1) = $(cat mysql-connector-java-8.0.23.jar.md5) ]; \\
    then echo success; \\
    else echo failed; \\
    exit 1; \\
    fi; \\
    mv /mysql-connector-java-8.0.23.jar /opt/shenyu-admin/ext-lib/mysql-connector-java.jar"
  ]
volumeMounts:
- name: mysql-connector-volume
  mountPath: /opt/shenyu-admin/ext-lib
containers:
- name: shenyu-admin
  image: apache/shenyu-admin:latest
  imagePullPolicy: Always
  ports:
  - containerPort: 9095
  env:
  - name: 'TZ'
    value: 'Asia/Beijing'
  - name: SPRING_PROFILES_ACTIVE
    value: mysql
volumeMounts:
- name: shenyu-admin-application
  mountPath: /opt/shenyu-admin/conf/application.yml
  subPath: shenyu-admin-application.yml
- name: shenyu-admin-application-mysql
  mountPath: /opt/shenyu-admin/conf/application-mysql.yml
  subPath: shenyu-admin-application-mysql.yml
- name: mysql-connector-volume
  mountPath: /opt/shenyu-admin/ext-lib

execute kubectl apply -f shenyu-admin.yaml
15.16.3 3. Create shenyu-bootstrap

- create shenyu-bootstrap.yaml

```yaml
# Example of using the nodeport type to expose ports
apiVersion: v1
kind: Service
metadata:
  namespace: shenyu
  name: shenyu-bootstrap-svc
spec:
  selector:
    app: shenyu-bootstrap
  type: NodePort
  ports:
    - protocol: TCP
      port: 9195
      targetPort: 9195
      nodePort: 31195

# shenyu-bootstrap
apiVersion: apps/v1
kind: Deployment
metadata:
  namespace: shenyu
  name: shenyu-bootstrap
spec:
  selector:
    matchLabels:
      app: shenyu-bootstrap
  replicas: 1
  template:
    metadata:
      labels:
        app: shenyu-bootstrap
    spec:
      volumes:
        - name: shenyu-bootstrap-application
          configMap:
            name: shenyu-cm
            items:
              - key: shenyu-bootstrap-application.yml
                path: shenyu-bootstrap-application.yml
      containers:
        - name: shenyu-bootstrap
          image: apache/shenyu-bootstrap:latest
          ports:
            - containerPort: 9195
          env:
```

15.16. Example 2: Use MySQL as the database
• execute kubectl apply -f shenyu-bootstrap.yaml

### 15.17 Test Access

**Access Address:** http://[K8S_CLUSTER_IP]:31095/

**Account/password:** admin/123456

This article describes how to build your own gateway based on Apache ShenYu.

Before you read this document, you need to complete some preparations before deploying Shenyu according to the Deployment Prerequisites document.

### 15.18 Start Apache ShenYu Admin

• docker reference docker deployment Apache ShenYu Admin

• linux/windows reference binary packages deployment Apache ShenYu Admin

### 15.19 Build your own gateway (recommended)

• first create an empty springboot project, you can refer to shenyu-bootstrap, or you can create it on spring official website.

• introduce the following jar package:

```xml
<dependencies>
  <dependency>
    <groupId>org.springframework.boot</groupId>
    <artifactId>spring-boot-starter-webflux</artifactId>
    <version>2.2.2.RELEASE</version>
  </dependency>
  <dependency>
    <groupId>org.springframework.boot</groupId>
    <artifactId>spring-boot-starter-actuator</artifactId>
    <version>2.2.2.RELEASE</version>
  </dependency>
  <dependency>
    <groupId>org.apache.shenyu</groupId>
```
among them, ${project.version} please use the current latest version.

- add the following configuration to your application.yaml file:

```yaml
spring:
  main:
    allow-bean-definition-overriding: true
management:
  health:
    defaults:
      enabled: false
shenyu:
  sync:
    websocket:
      urls: ws://localhost:9095/websocket //set to your shenyu-admin address
```

This article introduces how to start the Apache ShenYu gateway in the local environment.

Before you read this document, you need to complete some preparations before deploying Shenyu according to the Deployment Prerequisites document.

## 15.20 Environmental preparation

- Install JDK 1.8+ locally
- Install Git locally
- Install Maven locally
- Choose a development tool, such as IDEA
15.21 Download the compiled code

- Download

```
git clone https://github.com/apache/shenyu.git
cd shenyu
mvn clean install
```

- use the development tool to start `org.apache.shenyu.admin.ShenyuAdminBootstrap`, Visit [http://localhost:9095](http://localhost:9095), the default username and password are: admin and 123456 respectively.

  - If you use h2 for storage, set the variable `--spring.profiles.active = h2` and start the server.

  - If you use MySQL for storage, follow the [guide document](#) to initialize the database and modify the JDBC configuration in `application-mysql.yml`, set the variable `--spring.profiles.active = mysql` and start the server.

  - If you use PostgreSql for storage, follow the [guide document](#) to initialize the database and modify the JDBC configuration in `application-pg.yml`, set the variable `--spring.profiles.active = pg` and start the server.

  - If you use Oracle for storage, follow the [guide document](#) to initialize the database and modify the JDBC configuration in `application-oracle.yml`, set the variable `--spring.profiles.active = oracle`.

- use the development tool to start `org.apache.shenyu.bootstrap.ShenyuBootstrapApplication`.

This article introduces the use of docker to deploy the Apache ShenYu gateway.

Before you read this document, you need to complete some preparations before deploying ShenYu according to the [Deployment Prerequisites document](#).
### 15.22 Create Docker Network

```bash
docker network create shenyu
```

### 15.23 Start Apache ShenYu Admin

```bash
docker pull apache/shenyu-admin:${current.version}
```

After version 2.5.1, when `docker run`, we can customize JVM startup parameters by adding `-e ADMIN_JVM="xxxx"`

- use h2 to store data:

```bash
docker run -d -p 9095:9095 --name shenyu-admin --net shenyu apache/shenyu-admin:${current.version}
```

- use MySQL to store data, follow the guide document to initialize the database, copy `mysql-connector.jar` to `$(your_work_dir)/ext-lib`:

```bash
docker run --name shenyu-admin -v /$(your_work_dir)/ext-lib:/opt/shenyu-admin/ext-lib -e "SPRING_PROFILES_ACTIVE=mysql" -e "spring.datasource.url=jdbc:mysql://$[your_ip_port]/shenyu?useUnicode=true&characterEncoding=utf8&useSSL=false&serverTimezone=Asia/Shanghai&zeroDateTimeBehavior=convertToNull" -e "spring.datasource.username=${your_username}" -e "spring.datasource.password=${your_password}" -d -p 9095:9095 --net shenyu apache/shenyu-admin:${current.version}
```

Another way is to put the application.yml, application-mysql.yml configuration in `$(your_work_dir)/conf` from Configure address, modify the configuration `spring.profiles.active = mysql` in application.yml, and then execute the following statement:

```bash
docker run --name shenyu-admin -v $(your_work_dir)/conf:/opt/shenyu-admin/conf -v /$(your_work_dir)/ext-lib:/opt/shenyu-admin/ext-lib -d -p 9095:9095 --net shenyu apache/shenyu-admin:${current.version}
```

- use PostgreSQL to store data, follow the guide document to initialize the database, execute the following statement:

```bash
docker run --name shenyu-admin -e "SPRING_PROFILES_ACTIVE=pg" -e "spring.datasource.url=jdbc:postgresql://$[your_ip_port]/shenyu?useUnicode=true&characterEncoding=utf8&useSSL=false" -e "spring.datasource.username=${your_username}" -e "spring.datasource.password=${your_password}" -d -p 9095:9095 --net shenyu apache/shenyu-admin:${current.version}
```

Another way is to put the application.yml, application-pg.yml configuration in `$(your_work_dir)/conf`, modify the configuration `spring.profiles.active = pg` in application.yml, and then execute the following statement:
• use Oracle to store data, follow the guide document to initialize the database, execute the following statement:

```
docker run --name shenyu-admin -e "SPRING_PROFILES_ACTIVE=oracle" -e "spring.datasource.url=jdbc:oracle:thin:@localhost:1521/shenyu" -e "spring.datasource.username=${your_username}" -e "spring.datasource.password=${your_password}" -d -p 9095:9095 --net shenyu apache/shenyu-admin:${current.version}
```

another way is to put the application.yml, application-oracle.yml configuration in ${your_work_dir}/conf, modify the configuration spring.profiles.active = oracle in application.yml, and then execute the following statement:

```
docker run --name shenyu-admin -v ${your_work_dir}/conf:/opt/shenyu-admin/conf -d -p 9095:9095 --net shenyu apache/shenyu-admin:${current.version}
```

### 15.24 Start Apache ShenYu Bootstrap

After version 2.5.1, when `docker run`, we can customize JVM startup parameters by adding `-e BOOT_JVM="xxxx"`

First, pull the docker image

```
docker pull apache/shenyu-bootstrap:${current.version}
```

If you don't need to modify the configuration, just use the command below to run the application

```
docker run -d \
  -p 9195:9195 \
  --name shenyu-bootstrap \ 
  --net shenyu \ 
  --env SHENYU_SYNC_WEBSOCKET_URLS=ws://shenyu-admin:9095/websocket \ 
  apache/shenyu-bootstrap:${current.version}
```

`SHENYU_SYNC_WEBSOCKET_URLS` indicates the websocket address that shenyu-bootstrap used to communicate with shenyu-admin

If you need to modify the configuration, copy the configuration from the Github directory where the bootstrap configuration file is located, then recorded it as `$BOOTSTRAP_CONF`. After your modification, execute the command below to run the application

```
docker run -d \
  -p 9195:9195 \
  -v $BOOTSTRAP_CONF:/opt/shenyu-bootstrap/conf \ 
  --name shenyu-bootstrap \ 
  --net shenyu
```
This article introduces how to quickly start the Apache ShenYu gateway in the standalone environment.

Before you read this document, you need to complete some preparations before deploying Shenyu according to the Deployment Prerequisites document.

15.25 Environmental preparation

- Install JDK1.8+ locally

15.26 Start Apache ShenYu Bootstrap

- download \texttt{apache-shenyu-\{current.version\}-bootstrap-bin.tar.gz}
- unzip \texttt{apache-shenyu-\{current.version\}-bootstrap-bin.tar.gz}, go to the bin directory.

```bash
> windwos : start.bat
> linux : ./start.sh
```

15.27 Selector and rule configuration

Please refer to Developer Local Model add the selector and rule.

Example:

- your service address is \texttt{http://127.0.0.1:8080/helloworld} and the response like follow:

```json
{
    "name" : "Shenyu",
    "data" : "hello world"
}
```

- use the follow data to add selector and rule
15.28 by postman

Add localKey: 123456 to Headers. If you need to customize the localKey, you can use the sha512 tool to generate the key based on plaintext and update the shenyu.local.sha512Key property.

POST method, address http://localhost:9195/shenyu/plugin/selectorAndRules, body use raw json content:

Headers
localKey: 123456

```json
{
    "pluginName": "divide",
    "selectorHandler": "[["upstreamUrl":"127.0.0.1:8080\"]]",
    "conditionDataList": [[
        "paramType": "uri",
        "operator": "match",
        "paramValue": "/**"
    ]],
    "ruleDataList": [[
        "ruleHandler": "{"loadBalance":"random\"",
        "conditionDataList": [
            "paramType": "uri",
            "operator": "match",
            "paramValue": "/**"
        ]
    ]]
}
```

15.29 by curl

curl --location --request POST 'http://localhost:9195/shenyu/plugin/selectorAndRules' \ 
--header 'Content-Type: application/json' \ 
--header 'localKey: 123456' \ 
--data-raw '{
    "pluginName": "divide",
    "selectorHandler": "[["upstreamUrl":"127.0.0.1:8080\"]]",
    "conditionDataList": [[
        "paramType": "uri",
        "operator": "match",
        "paramValue": "/**"
    ]],
    "ruleDataList": [
}
```
"ruleHandler": "{"loadBalance":"random"}",
"conditionDataList": [{
    "paramType": "uri",
    "operator": "match",
    "paramValue": "/**"
}]
}

• open http://localhost:9195/helloworld:

```
{
    "name": "Shenyu",
    "data": "hello world"
}
```

This article introduces the use of helm to deploy the Apache ShenYu gateway.

Please refer to Helm Deployment for details.

This article describes some of the prerequisites you need to prepare before deploying the Apache ShenYu gateway.

## 15.30 Database Initialize

Before deploying the Shenyu-admin project, initialize the database it uses (databases currently support: Mysql, PostgreSql, Oracle), which used the script files are stored in db directory project root directory, The following describes the initial steps for each database.

### 15.30.1 Mysql

In the mysql initialization scripts directory found in the initialization script schema.sql, Use the client connection tool to connect to your Mysql service and execute, so you get a database named shenyu, which can later be used as the database for the Shenyu-admin project.

• sql script: https://github.com/apache/shenyu/tree/master/db/init/mysql

• driver:
  - maven repository: https://repo1.maven.org/maven2/mysql/mysql-connector-java/8.0.30/
  - homepage: https://www.mysql.com/products/connector/
15.30.2 PostgreSQL

In the pg initialization scripts directory found in the initialization script `create-database.sql`, `create-table.sql`, and use the client connection tool to connect to your PostgreSQL service. So you get a database named `shenyu`, which can later be used as a database for the Shenyu-admin project.

- sql script: https://github.com/apache/shenyu/tree/master/db/init/pg
- driver:
  - maven repository: https://mvnrepository.com/artifact/org.postgresql/postgresql/42.5.0
  - homepage: https://jdbc.postgresql.org/download/

15.30.3 Oracle

In the oracle initialization scripts directory found in the initialization script `schema.sql`, use the client connection tool to connect to your Oracle service to create a database, execute the `schema.sql` script on this database, and initialize the Shenyu-admin database. After can be project configuration file to adjust your Oracle environment configuration.

- sql script: https://github.com/apache/shenyu/blob/master/db/init/oracle
- driver:
  - maven repository: https://mvnrepository.com/artifact/com.oracle.database.jdbc/ojdbc8/19.3.0.0
This document introduces how to quickly access the Apache ShenYu gateway using Brpc. You can get the code example of this document by clicking here.

### 16.1 Environment to prepare

Please refer to the deployment to select a way to start shenyu-admin. For example, start the Apache ShenYu gateway management system through local deployment.

After successful startup, you need to open the Brpc plugin on in the BasicConfig -> Plugin.

If you are a startup gateway by means of source, can be directly run the ShenyuBootstrapApplication of shenyu-bootstrap module.

Note: Before starting, make sure the gateway has added dependencies.

Import the gateway proxy plugin for Brpc and add the following dependencies to the gateway’s pom.xml file:

```xml
<dependency>
    <groupId>org.apache.shenyu</groupId>
    <artifactId>shenyu-spring-boot-starter-plugin-brpc</artifactId>
    <version>${project.version}</version>
</dependency>
```
16.2 Run the shenyu-examples-brpc project

Download shenyu-examples-brpc.

Run main method of org.apache.shenyu.examples.brpc.service.TestBrpcApplication to start this project.

The following log appears when the startup is successful:

```
"appName": "brpc",
"contextPath": "/brpc",
"path": "/brpc/allName",
"rpcType": "brpc",
"serviceName": org.apache.shenyu.examples.brpc.api.service.BrpcDemoService,
"methodName": "allName",
"ruleName": "/brpc/allName",
"rpcExt": {
"methodInfo": [{
"methodName": "allName",
"paramTypes": []}
]}
},
"enabled": true,
"host": "127.0.0.1",
"port": 8005,
"pluginNames": [],
"registerMetaData": false,
"timeMillis": 1673449777486,
"addPrefixed": false

"appName": "brpc",
"contextPath": "/brpc",
"path": "/brpc/userMap",
"rpcType": "brpc",
"serviceName": org.apache.shenyu.examples.brpc.api.service.BrpcDemoService,
"methodName": "userMap",
"ruleName": "/brpc/userMap",
"parameterTypes": [java.lang.Long, java.lang.String],
"rpcExt": {
"methodInfo": [{
"methodName": "userMap",
"paramTypes": [{
"left": "java.lang.Long",
"right": "userId"}
]}
],
"enabled": true,
"host": "127.0.0.1",
"port": 8005,
"pluginNames": [],
"registerMetaData": false,
"timeMillis": 1673449777487,
"addPrefixed": false

"appName": "brpc",
"contextPath": "/brpc",
"path": "/brpc/getUserByIdAndName",
"rpcType": "brpc",
"serviceName": org.apache.shenyu.examples.brpc.api.service.BrpcDemoService,
"methodName": "getUserByIdAndName",
"ruleName": "/brpc/getUserByIdAndName",
"rpcExt": {
"methodInfo": [{
"methodName": "getUserByIdAndName",
"paramTypes": [{
"left": "java.lang.Long",
"right": "userId"}
]}
],
"enabled": true,
"host": "127.0.0.1",
"port": 8005,
"pluginNames": [],
"registerMetaData": false,
"timeMillis": 1673449777488,
"addPrefixed": false

"appName": "brpc",
"contextPath": "/brpc",
"path": "/brpc/connect",
"rpcType": "brpc",
"serviceName": org.apache.shenyu.examples.brpc.api.service.BrpcDemoService,
"methodName": "connect",
"ruleName": "/brpc/connect",
"rpcExt": {
"methodInfo": [{
"methodName": "connect",
"paramTypes": []}
]}
},
"enabled": true,
"host": "127.0.0.1",
"port": 8005,
"pluginNames": [],
"registerMetaData": false,
"timeMillis": 1673449777487,
"addPrefixed": false

"appName": "brpc",
"contextPath": "/brpc",
"path": "/brpc/getUser",
"rpcType": "brpc",
"serviceName": org.apache.shenyu.examples.brpc.api.service.BrpcDemoService,
"methodName": "getUser",
"ruleName": "/brpc/getUser",
"rpcExt": {
"methodInfo": [{
"methodName": "getUser",
"paramTypes": []}
]}
},
"enabled": true,
"host": "127.0.0.1",
"port": 8005,
"pluginNames": [],
"registerMetaData": false,
"timeMillis": 1673449777486,
"addPrefixed": false
```
16.3 Test

The shenyu-examples-brpc project will automatically register interface methods annotated with @ShenyuBrpcClient in the Apache ShenYu gateway after successful startup.

Open PluginList -> rpc proxy -> brpc to see the list of plugin rule configurations:

Use IDEA HTTP Client Plugin to simulate HTTP to request your Brpc service[Shenyu proxy]:

This document introduces how to quickly access the Apache ShenYu gateway using gRPC. You can get the code example of this document by clicking here.

16.4 Prepare For Environment

Please refer to the deployment to select a way to start shenyu-admin. For example, start the Apache ShenYu gateway management system through local deployment.

After successful startup, you need to open the gRPC plugin on in the BasicConfig -> Plugin.

If you are a startup gateway by means of source, can be directly run the ShenyuBootstrapApplication of shenyu-bootstrap module.
Note: Before starting, make sure the gateway has added dependencies.

Add the following dependencies to the gateway’s pom.xml file:

```xml
<!-- apache shenyu grpc plugin start-->
<dependency>
  <groupId>org.apache.shenyu</groupId>
  <artifactId>shenyu-spring-boot-starter-plugin-grpc</artifactId>
  <version>${project.version}</version>
</dependency>
<!-- apache shenyu grpc plugin end-->
```

### 16.5 Run the shenyu-examples-grpc project

Download `shenyu-examples-grpc`

Run the following command under `shenyu-examples-grpc` to generate Java code:

```
mvn protobuf:compile
mvn protobuf:compile-custom
```

Execute the `org.apache.shenyu.examples.grpc.ShenyuTestGrpcApplication` main method to start project.

The following log appears when the startup is successful:

```
  "appName": "127.0.0.1:8080",
  "contextPath": "/grpc",
  "path": "/grpc/clientStreamingFun",
  "pathDesc": "clientStreamingFun",
  "rpcType": "grpc",
  "serviceName": "stream.StreamService",
  "methodName": "clientStreamingFun",
  "ruleName": "/grpc/clientStreamingFun",
  "parameterTypes": "io.grpc.stub.StreamObserver",
  "rpcExt": "{"timeout":5000, \n  "methodType": "CLIENT_STREAMING\"},\n  "enabled":true,"host":"172.20.10.6","port ":8080,"registerMetaData":false}
```

```
  "appName": "127.0.0.1:8080",
  "contextPath": "/grpc",
  "path": "/grpc/echo",
  "pathDesc": "echo",
  "rpcType": "grpc",
  "serviceName": "echo.EchoService",
  "methodName": "echo",
  "ruleName": "/grpc/echo",
  "parameterTypes": "echo.EchoRequest,io.grpc.stub.StreamObserver",
  "rpcExt": "{"timeout":5000, \n  "methodType": "UNARY\"},\n  "enabled":true,"host":"172.20.10.6","port ":8080,"registerMetaData":false}
```

```
  "appName": "127.0.0.1:8080",
  "contextPath": "/grpc",
  "path": "/grpc/bidiStreamingFun",
  "pathDesc": "bidiStreamingFun",
  "rpcType": "grpc",
  "serviceName": "stream.StreamService",
  "methodName": "bidiStreamingFun",
  "ruleName": "/grpc/bidiStreamingFun",
  "parameterTypes": "io.grpc.stub.StreamObserver",
  "rpcExt": "{"timeout":5000, \n  "methodType": "BIDI_STREAMING\"},\n  "enabled":true,"host":"172.20.10.6","port ":8080,"registerMetaData":false}
```

```
  "appName": "127.0.0.1:8080",
  "contextPath": "/grpc",
  "path": "/grpc/clientStreamingFun",
  "pathDesc": "clientStreamingFun",
  "rpcType": "grpc",
  "serviceName": "stream.StreamService",
  "methodName": "clientStreamingFun",
  "ruleName": "/grpc/clientStreamingFun",
  "parameterTypes": "io.grpc.stub.StreamObserver",
  "rpcExt": "{"timeout":5000, \n  "methodType": "CLIENT_STREAMING\"},\n  "enabled":true,"host":"172.20.10.6","port ":8080,"registerMetaData":false}
```
16.6 Test

The shenyu-examples-grpc project will automatically register interface methods annotated with @ShenyuGrpcClient in the Apache ShenYu gateway after successful startup.

Open PluginList -> rpc proxy -> gRPC to see the list of plugin rule configurations:

Use postman to simulate http to request your gRPC service. The following is the request body.

```json
{
    "data": [
    {
        "message": "hello grpc"
    }
    ]
}
```
The parameters are passed in json format. The name of the key is `data` by default, and you can reset it in `GrpcConstants.JSON_DESCRIPTOR_PROTO_FIELD_NAME`. The input of value is based on the proto file defined by you.

### 16.7 Streaming

The Apache ShenYu can support streaming of gRPC. The following shows the calls of the four method types of gRPC. In streaming, you can pass multiple parameters in the form of an array.

- **UNARY**

The request body like this.

```
{
    "data": [
        {
            "text": "hello grpc"
        }
    ]
}
```

Then, call gRPC service by UNARY method type.
CLIENT_STREAMING

The request body like this.

```
{
    "data": [
    {
        "text": "hello grpc"
    },
    {
        "text": "hello grpc"
    },
    {
        "text": "hello grpc"
    }
    ]
}
```

Then, call gRPC service by CLIENT_STREAMING method type.
**SERVER_STREAMING**

The request body like this.

```json
{
  "data": [
    {
      "text": "hello grpc"
    }
  ]
}
```

Then, call gRPC service by SERVER_STREAMING method type.
The request body like this.

```json
{
    "data": [
        {
            "text": "hello grpc"
        },
        {
            "text": "hello grpc"
        },
        {
            "text": "hello grpc"
        }
    ]
}
```

Then, call gRPC service by BIDI_STREAMING method type.
This document introduces how to quickly access the Apache ShenYu gateway using Websocket.

### 16.8 Environment to prepare

Refer to local deployment to deploy the Shenyu gateway.

1. Deploy the shenyu-admin service.
   - After successful launch, you need to set the Websocket plugin to be enabled in the page’s basic configuration -> Plugin Management.

2. Deploy the shenyu-bootstrap service.
   - After starting, shenyu-bootstrap will synchronize the data via the websocket protocol according to the address configured in shenyu.sync.websocket.url.

   Note: Before starting, make sure that the gateway has introduced the relevant dependency, which is introduced by default.

Import the gateway proxy plugin for Websocket and add the following dependencies to the gateway’s pom.xml file.

```xml
<!--shenyu websocket plugin start-->
<dependency>
    <groupId>org.apache.shenyu</groupId>
    <artifactId>shenyu-spring-boot-starter-plugin-websocket</artifactId>
    <version>${project.version}</version>
</dependency>
<!--shenyu websocket plugin end-->"
16.9 Run the shenyu-examples-websocket project

1. Download shenyu-examples-websocket (native-websocket and reactive-websocket can refer to the subprojects under shenyu-examples-websocket).

2. Run main method of org.apache.shenyu.examples.websocket.TestAnnotationWebsocketApplication to start this project.

- The examples project will synchronize the websocket service information to shenyu-admin via the http protocol according to the address configured in shenyu.register.serverLists, and then to shenyu-bootstrap by shenyu-admin.

log info as follows after starting:

```
2022-08-09 23:37:34.994 INFO 61398 --- [or_consumer_-21] o.a.s.r.client.http.utils.RegisterUtils : metadata client register success: {
    "appName": "ws-annotation",
    "contextPath": "/ws-annotation",
    "path": "/ws-annotation/myWs",
    "rpcType": "websocket",
    "ruleName": "/ws-annotation/myWs",
    "enabled": true,
    "pluginNames": [],
    "registerMetaData": false,
    "timeMillis": 1660059454701
}
    "protocol": "ws://",
    "appName": "ws-annotation",
    "contextPath": "/ws-annotation",
    "rpcType": "websocket",
    "host": "192.168.1.3",
    "port": 8001
}
```

16.10 Test

1. The shenyu-examples-websocket project will automatically register the interface methods annotated with @ShenyuSpringWebSocketClient to the gateway and add selectors and rules after successful start, you can see the information of shenyu-examples-websocket service registration by visiting shenyu-admin page -> PluginList -> Proxy -> Websocket to see the shenyu-examples-websocket service registration information, if not, you can refer to WebSocket plugin to add the configuration manually.

2. The following test code (see attachment) simulates the request method of the Websocket protocol to request your Websocket service.

16.11 Annexes

websocket debugging code

- Create a file called websocket.html and copy the following code into the file.

- Open websocket.html with Chrome.

```html
<!DOCTYPE HTML>
<html>
<head>
```
<meta http-equiv="content-type" content="text/html" />
<title>Shenyu WebSocket Test</title>
<script>
var websocket;
function connect() {
    try {
        websocket = new WebSocket(document.getElementById("url").value);
        websocket.onopen = onOpen;
        websocket.onerror = onError;
        websocket.onmessage = onReceive;
        websocket.onclose = onClose;
    } catch (e) {
        alert('[websocket] establish connection error.');
    }
}
function onOpen() {
    alert('[websocket] connect success.');
}
function onError(e) {
    alert('[websocket] connect error. code: ' + e.code);
}
function onReceive(msg) {
    var show = document.getElementById("show");
    show.innerHTML += '[Server Response] => ' + msg.data + '<br/>';
    show.scrollTop = show.scrollHeight;
}
function onClose(e) {
    console.log('[websocket] connect closed. code: ' + e.code)
    alert('[websocket] connect closed. ');
    document.getElementById("show").innerHTML = "";
    document.getElementById("msg").value = "";
    websocket = null;
}
function buttonClose() {
    if (websocket == null) {
        console.log("Please establish a connection first.")
    } else {
        websocket.close(1000);
        document.getElementById("show").innerHTML = "";
        document.getElementById("msg").value = "";
    }
}
function send() {
    if (websocket == null) {
        alert("Please establish a connection first.")
    } else {
        var msg = document.getElementById("msg").value;
        show.innerHTML += '[Client Request] => ' + msg + '<br/>';
    }
</script>
This document introduces how to quickly access the Apache ShenYu gateway using Motan RPC. You can get the code example of this document by clicking here.

16.12 Environment to prepare

Please refer to the deployment to select a way to start shenyu-admin. For example, start the Apache ShenYu gateway management system through local deployment.

After successful startup, you need to open the Sofa plugin on in the BasicConfig -> Plugin.

If you are a startup gateway by means of source, can be directly run the ShenyuBootstrapApplication of shenyu-bootstrap module.

Note: Before starting, make sure the gateway has added dependencies. Start up zookeeper in local.

Import the gateway proxy plugin for Motan and add the following dependencies to the gateway’s pom.xml file:

```java
websocket.send(msg);
}
</script>
</head>
<body>
<input id="url" type="text" value="ws://localhost:9195/ws-annotation/myWs"><br />
<input id="msg" type="text"><br />
<button id="connect" onclick="connect();">Connect</button>
<button id="send" onclick="send();">Send</button>
<button id="close" onclick="buttonClose();">Close</button>
</body>
</html>

This document introduces how to quickly access the Apache ShenYu gateway using Motan RPC. You can get the code example of this document by clicking here.

16.12 Environment to prepare

Please refer to the deployment to select a way to start shenyu-admin. For example, start the Apache ShenYu gateway management system through local deployment.

After successful startup, you need to open the Sofa plugin on in the BasicConfig -> Plugin.

If you are a startup gateway by means of source, can be directly run the ShenyuBootstrapApplication of shenyu-bootstrap module.

Note: Before starting, make sure the gateway has added dependencies. Start up zookeeper in local.

Import the gateway proxy plugin for Motan and add the following dependencies to the gateway’s pom.xml file:
16.13 Run the shenyu-examples-motan project

Download shenyu-examples-motan.

Run main method of org.apache.shenyu.examples.motan.service.TestMotanApplication to start this project.

log info as follows after starting:

```
TomcatWebServer : Tomcat started on port(s): 8081 (http) with context path '
2021-07-18 16:46:25.393 INFO 96 --- [ main] o.a.s.e.m.service.
TestMotanApplication : Started TestMotanApplication in 3.89 seconds (JVM running for 4.514)
2021-07-18 16:46:25.396 INFO 96 --- [ main] info : [ZookeeperRegistry] Url (null) will set to available to Registry
```
Apache ShenYu document

16.14 Test

The shenyu-examples-motan project will automatically register the @ShenyuMotanClient annotated interface methods with the gateway and add selectors and rules. If not, you can manually add them.

Open PluginList -> rpc proxy -> motan to see the list of plugin rule configurations:

Use PostMan to simulate HTTP to request your Motan service:

This document introduces how to quickly access the Apache ShenYu gateway using Dubbo. You can get the code example of this document by clicking here.

16.15 Environment to prepare

Please refer to the deployment to select a way to start shenyu-admin. For example, start the Apache ShenYu gateway management system through local deployment.

After successful startup, you need to open the Dubbo plugin on in the BasicConfig -> Plugin, and set your registry address. Please make sure the registry center is open locally.

If you are a startup gateway by means of source, can be directly run the ShenyuBootstrapApplication of shenyu-bootstrap module.

Note: Before starting, make sure the gateway has added dependencies.

[zk::localhost:2181/default_rpc/com.weibo.api.motan.registry.RegistryService/1.0/service]
2021-07-18 16:46:25.399 INFO 96 --- [Thread-6] o.a.s.c.c.s.ShenyuClientShutdownHook : hook Thread-0 will sleep 3000ms when it start
2021-07-18 16:46:25.399 INFO 96 --- [Thread-6] o.a.s.c.c.s.ShenyuClientShutdownHook : hook SpringContextShutdownHook will sleep 3000ms when it start
"appName": "motan",
"contextPath": "/motan",
"path": "/motan/hello",
"pathDesc": "",
"rpcType": "motan",
"serviceName": "org.apache.shenyu.examples.motan.service.MotanDemoService",
"methodName": "hello",
"ruleName": "/motan/hello",
"parameterTypes": "java.lang.String",
"rpcExt": "{
"methodInfo": "{"methodName": "hello"},
"params": "{"left": "java.lang.String",
"right": "name"})",
"group": ":motan-shenyu-rpc"},
"enabled": true,
"host": "192.168.220.1",
"port": 8081,
"registerMetaData": false}
If client is apache dubbo, registry center is Zookeeper, please refer to the following configuration:

```xml
<!-- apache shenyu apache dubbo plugin start-->
<dependency>
    <groupId>org.apache.shenyu</groupId>
    <artifactId>shenyu-spring-boot-starter-clientapache-dubbo</artifactId>
    <version>${project.version}</version>
</dependency>
<dependency>
    <groupId>org.apache.dubbo</groupId>
    <artifactId>dubbo</artifactId>
    <version>2.7.5</version>
</dependency>
<!-- Dubbo zookeeper registry dependency start -->
<dependency>
    <groupId>org.apache.curator</groupId>
    <artifactId>curator-client</artifactId>
    <version>4.0.1</version>
    <exclusions>
        <exclusion>
            <artifactId>log4j</artifactId>
            <groupId>log4j</groupId>
        </exclusion>
    </exclusions>
</dependency>
<dependency>
    <groupId>org.apache.curator</groupId>
    <artifactId>curator-framework</artifactId>
    <version>4.0.1</version>
</dependency>
<dependency>
    <groupId>org.apache.curator</groupId>
    <artifactId>curator-recipes</artifactId>
    <version>4.0.1</version>
</dependency>
<!-- Dubbo zookeeper registry dependency end -->
<!-- apache shenyu apache dubbo plugin end-->

If client is alibaba dubbo, registry center is Zookeeper, please refer to the following configuration:

```xml
<!-- apache shenyu alibaba dubbo plugin start-->
<dependency>
    <groupId>org.apache.shenyu</groupId>
    <artifactId>shenyu-spring-boot-starter-clientalibaba-dubbo</artifactId>
    <version>${project.version}</version>
</dependency>
<dependency>
    <groupId>com.alibaba</groupId>
    <artifactId>dubbo</artifactId>
</dependency>
<!-- apache shenyu alibaba dubbo plugin end-->
16.16 Run the shenyu-examples-dubbo project

Download shenyu-examples-dubbo.

replace the register address in shenyu-examples-alibaba-dubbo-service/src/main/resources/spring-dubbo.xml with your local zk address, such as:

```
<dubbo:registry address="zookeeper://localhost:2181"/>
```

Execute the org.apache.shenyu.examples.alibaba.dubbo.service.TestAlibabaDubboApplication main method to start dubbo project.

The following log appears when the startup is successful:

```
2021-02-06 20:58:01.807 INFO 3724 --- [pool-2-thread-1] o.d.s.client.common.utils.RegisterUtils : dubbo client register success: {"appName":"dubbo","contextPath": "/dubbo","path": "/dubbo/insert","pathDesc":"Insert a row of data","rpcType":"dubbo","serviceName":org.dromara.shenyu.examples.dubbo.api.service.DubboTestService","methodName":"insert","ruleName": "/dubbo/insert","parameterTypes":org.dromara.shenyu.examples.dubbo.api.entity.DubboTest", "rpcExt":{"group": ","version": ","loadbalance": "random", "retries":2,"timeout":10000,"url": ","enabled":true}
```
Apache ShenYu document

RegisterUtils: dubbo client register success: {
"appName":"dubbo",
"contextPath":"/dubbo",
"path":"/dubbo/findAll",
"pathDesc":"Get all data",
"rpcType":"dubbo",
"serviceName":"org.dromara.shenyu.examples.dubbo.api.service.DubboMultiParamService",
"methodName":"findAll",
"ruleName":"/dubbo/findAll",
"parameterTypes":"
,"rpcExt":{
"group":"",
"version":"
,"loadbalance":"random",
"retries":2,
"timeout":10000,
"url":"
"},
"enabled":true
}

RegisterUtils: dubbo client register success: {
"appName":"dubbo",
"contextPath":"/dubbo",
"path":"/dubbo/findById",
"pathDesc":"Query by Id",
"rpcType":"dubbo",
"serviceName":"org.dromara.shenyu.examples.dubbo.api.service.DubboMultiParamService",
"methodName":"findById",
"ruleName":"/dubbo/findById",
"parameterTypes":"java.lang.String",
"rpcExt":{
"group":"
,"version":"
,"loadbalance":"random",
"retries":2,
"timeout":10000,
"url":"
"},
"enabled":true
}

RegisterUtils: dubbo client register success: {
"appName":"dubbo",
"contextPath":"/dubbo",
"path":"/dubbo/findByIdListId",
"pathDesc":"
,"rpcType":"dubbo",
"serviceName":"org.dromara.shenyu.examples.dubbo.api.service.DubboMultiParamService",
"methodName":"findByIdListId",
"ruleName":"/dubbo/findByIdListId",
"parameterTypes":"java.util.List,java.lang.String",
"rpcExt":{
"group":"
,"version":"
,"loadbalance":"random",
"retries":2,
"timeout":10000,
"url":"
"},
"enabled":true
}

RegisterUtils: dubbo client register success: {
"appName":"dubbo",
"contextPath":"/dubbo",
"path":"/dubbo/batchSave",
"pathDesc":"
,"rpcType":"dubbo",
"serviceName":"org.dromara.shenyu.examples.dubbo.api.service.DubboMultiParamService",
"methodName":"batchSave",
"ruleName":"/dubbo/batchSave",
"parameterTypes":"
,"rpcExt":{
"group":"
,"version":"
,"loadbalance":"random",
"retries":2,
"timeout":10000,
"url":"
"},
"enabled":true
}

RegisterUtils: dubbo client register success: {
"appName":"dubbo",
"contextPath":"/dubbo",
"path":"/dubbo/findByArrayIdsAndName",
"pathDesc":"
,"rpcType":"dubbo",
"serviceName":"org.dromara.shenyu.examples.dubbo.api.service.DubboMultiParamService",
"methodName":"findByArrayIdsAndName",
"ruleName":"/dubbo/findByArrayIdsAndName",
"parameterTypes":"
,"rpcExt":{
"group":"
,"version":"
,"loadbalance":"random",
"retries":2,
"timeout":10000,
"url":"
"},
"enabled":true
}

RegisterUtils: dubbo client register success: {
"appName":"dubbo",
"contextPath":"/dubbo",
"path":"/dubbo/saveComplexBeanTestAndName",
"pathDesc":"
,"rpcType":"dubbo",
"serviceName":"org.dromara.shenyu.examples.dubbo.api.service.DubboMultiParamService"}
Note: When you need to expose multiple protocols at the same time, please do not configure `shenyu.client.dubbo.props.port`.

### 16.17 Test

The shenyu-examples-dubbo project will automatically register interface methods annotated with `@ShenyuDubboClient` in the Apache ShenYu gateway after successful startup.

Open PluginList -> rpc proxy -> dubbo to see the list of plugin rule configurations:
Use PostMan to simulate HTTP to request your Dubbo service:

```
GET http://localhost:9105/dubbo/findByIds=1
```

Complex multi-parameter example: The related interface implementation class is `org.apache.shenyu.examples.alibaba.dubbo.service.impl.DubboMultiParamServiceImpl#batchSaveAndNameAndId`.

```java
@Override
@ShenyuDubboClient(path = "/batchSaveAndNameAndId")
public DubboTest batchSaveAndNameAndId(List<DubboTest> dubboTestList, String id, String name) {
    DubboTest test = new DubboTest();
    test.setId(id);
    test.setName("hello world shenyu alibaba dubbo param batchSaveAndNameAndId :
      name + ":" + dubboTestList.stream().map(DubboTest::getName).collect(Collectors.joining("-")));
    return test;
}
```
When your arguments do not match, the following exception will occur:

```java
GlobalErrorHandler : [e47b2a2a] Resolved [ShenyuException: org.apache.dubbo.
remoting.RemotingException: java.lang.IllegalArgumentException: args.length !=
types.length
java.lang.IllegalArgumentException: args.length != types.length
    at org.apache.dubbo.common.utils.PojoUtils.realize(PojoUtils.java:91)
    at org.apache.dubbo.rpc.filter.GenericFilter.invoke(GenericFilter.java:82)
invoke(ProtocolFilterWrapper.java:81)
    at org.apache.dubbo.rpc.filter.ClassLoaderFilter.invoke(ClassLoaderFilter.
java:38)
invoke(ProtocolFilterWrapper.java:81)
java:150)
handleRequest(HeaderExchangeHandler.java:100)
received(HeaderExchangeHandler.java:175)
    at org.apache.dubbo.remoting.transport.DecodeHandler.received(DecodeHandler.
java:51)
run(ChannelEventRunnable.java:57)
    at java.util.concurrent.ThreadPoolExecutor.runWorker(ThreadPoolExecutor.
java:1149)
    at java.util.concurrent.ThreadPoolExecutor$Worker.run(ThreadPoolExecutor.
java:624)
```

16.17. Test
This document introduces how to quickly access the Apache ShenYu Gateway using Tars. You can get the code example of this document by clicking here.

### 16.18 Environment to prepare

Please refer to the deployment to select a way to start shenyu-admin. For example, start the Apache ShenYu gateway management system through local deployment.

After successful startup, you need to open the Sofa plugin on in the BasicConfig -> Plugin.

If you are a startup gateway by means of source, can be directly run the ShenyuBootstrapApplication of shenyu-bootstrap module.

Note: Before starting, make sure the gateway has added dependencies.

cshenyu-bootstrap need to import tars dependencies:

```xml
<dependency>
  <groupId>org.apache.shenyu</groupId>
  <artifactId>shenyu-spring-boot-starter-plugin-tars</artifactId>
  <version>${project.version}</version>
</dependency>

<dependency>
  <groupId>com.tencent.tars</groupId>
  <artifactId>tars-client</artifactId>
  <version>1.7.2</version>
</dependency>
```

### 16.19 Run the shenyu-examples-tars project

Download shenyu-examples-tars.

Modify host in application.yml to be your local IP

Modify config src/main/resources/ShenyuExampleServer.ShenyuExampleApp.config.conf:

- It is recommended to make clear the meaning of the main configuration items of config, refer to the development guide
- bind IP in config should pay attention to providing cost machine
- local=⋯, Indicates the open port that the native machine connects to the tarsnode. If there is no tarsnode, this configuration can be dropped
• **locator**: Indicates the address (frame address) of the main control center, which is used to obtain the IP list according to the service name. If Registry is not required to locate the service, this configuration can be dropped.

• **node=tars.tarsnode.ServerObj@xxxx**: Indicates the address of the connected tarsnode. If there is no tarsnode locally, this configuration can be removed.

More config configuration instructions, please refer to [TARS Official Documentation](#).

Execute the `org.apache.shenyu.examples.tars.ShenyuTestTarsApplication` main method to start project.

**Note:** The configuration file address needs to be specified in the startup command when the service starts. `-Dconfig=xxx/ShenyuExampleServer.ShenyuExampleApp.config.conf`

If the `-Dconfig` parameter is not added, the configuration may throw the following exceptions:

```java
com.qq.tars.server.config.ConfigurationException: error occurred on load server config
    at com.qq.tars.server.config.ConfigurationManager.loadServerConfig(ConfigurationManager.java:113)
    at com.qq.tars.server.config.ConfigurationManager.init(ConfigurationManager.java:57)
    at com.qq.tars.server.core.Server.loadServerConfig(Server.java:90)
    at com.qq.tars.server.core.Server.<init>(Server.java:42)
    at com.qq.tars.server.core.Server.<clinit>(Server.java:38)
    at com.qq.tars.spring.bean.PropertiesListener.onApplicationEvent(PropertiesListener.java:37)
    at com.qq.tars.spring.bean.PropertiesListener.onApplicationEvent(PropertiesListener.java:31)
    at org.springframework.context.event.SimpleApplicationEventMulticaster.doInvokeListener(SimpleApplicationEventMulticaster.java:172)
    at org.springframework.context.event.SimpleApplicationEventMulticaster.invokeListener(SimpleApplicationEventMulticaster.java:165)
    at org.springframework.context.event.SimpleApplicationEventMulticaster.multicastEvent(SimpleApplicationEventMulticaster.java:139)
    at org.springframework.context.event.SimpleApplicationEventMulticaster.multicastEvent(SimpleApplicationEventMulticaster.java:127)
    at org.springframework.boot.context.event.EventPublishingRunListener.environmentPrepared(EventPublishingRunListener.java:76)
    at org.springframework.boot.SpringApplicationRunListeners.environmentPrepared(SpringApplicationRunListeners.java:53)
    at org.springframework.boot.SpringApplication.prepareEnvironment(SpringApplication.java:345)
    at org.springframework.boot.SpringApplication.run(SpringApplication.java:308)
    at org.springframework.boot.SpringApplication.run(SpringApplication.java:1226)
    at org.springframework.boot.SpringApplication.run(SpringApplication.java:1215)
    at org.apache.shenyu.examples.tars.ShenyuTestTarsApplication.main(ShenyuTestTarsApplication.java:38)
Caused by: java.lang.NullPointerException
    at java.io.FileInputStream.<init>(FileInputStream.java:130)
```

16.19. Run the shenyu-examples-tars project
The following log appears when the startup is successful:

```java
[SERVER] server starting at tcp -h 127.0.0.1 -p 21715 -t 60000...
[SERVER] server started at tcp -h 127.0.0.1 -p 21715 -t 60000...
[SERVER] server starting at tcp -h 127.0.0.1 -p 21714 -t 3000...
[SERVER] server started at tcp -h 127.0.0.1 -p 21714 -t 3000...
[SERVER] The application started successfully.
[SERVER] The session manager service started...
[SERVER] server is ready...
```

**16.20 Test**

The shenyu-examples-tars project will automatically register interface methods annotated with @ShenyuTarsClient in the Apache ShenYu gateway after successful startup.

Open PluginList -> rpc proxy -> tars to see the list of plugin rule configurations:
Use PostMan to simulate HTTP to request your tars service:

This document introduces how to quickly access the Apache ShenYu gateway using Sofa RPC. You can get the code example of this document by clicking here.

16.21 Environment to prepare

Please refer to the deployment to select a way to start shenyu-admin. For example, start the Apache ShenYu gateway management system through local deployment.

After successful startup, you need to open the Sofa plugin on in the BasicConfig -> Plugin, and set your registry address. Please make sure the registry center is open locally.

If you are a startup gateway by means of source, can be directly run the ShenyuBootstrapApplication of shenyu-bootstrap module.

Note: Before starting, make sure the gateway has added dependencies.

If client is sofa, registry center is Zookeeper, please refer to the following configuration:

```xml
<dependency>
  <groupId>com.alipay.sofa</groupId>
  <artifactId>sofa-rpc-all</artifactId>
  <version>5.7.6</version>
</dependency>
```
16.22 Run the shenyu-examples-sofa project

Download shenyu-examples-sofa, replace the register address in spring-dubbo.xml with your local zk address, such as:

```
com:
  alipay:
    sofa:
      rpc:
        registry-address: zookeeper://127.0.0.1:2181
```

Execute the org.apache.shenyu.examples.sofa.service.TestSofaApplication main method to start sofa service.

The following log appears when the startup is successful:

```
2021-02-10 02:31:45.599 INFO 2156 --- [pool-1-thread-1] o.d.s.client.common.utils. RegisterUtils : sofa client register success: {"appName":"sofa","contextPath":"/sofa","path":"/sofa/insert","pathDesc":"Insert a row of data","rpcType":"sofa","serviceName":"org.dromara.shenyu.examples.sofa.api.service.SofaSingleParamService","methodName":"insert","ruleName":"/sofa/insert","parameterTypes":null,"rpcExt":null,"loadbalance":null,"retries":null,"timeout":null,"enabled":true}
2021-02-10 02:31:45.605 INFO 2156 --- [pool-1-thread-1] o.d.s.client.common.utils.
```
RegisterUtils: sofa client register success: {
  "appName": "sofa",
  "contextPath": "/sofa",
  "path": "/sofa/findById",
  "pathDesc": "Find by Id",
  "rpcType": "sofa",
  "serviceName": ":org.dromara.shenyu.examples.sofa.api.service.SofaSingleParamService",
  "methodName": ":findById",
  "ruleName": "/sofa/findById",
  "parameterTypes": "java.lang.String",
  "rpcExt": "{\"loadbalance\":\"hash\",\"retries\":3,\"timeout\":-1}\",
  "enabled": true
}
2021-02-10 02:31:45.611 INFO 2156 --- [pool-1-thread-1] o.d.s.client.common.utils.
RegisterUtils: sofa client register success: {
  "appName": "sofa",
  "contextPath": "/sofa",
  "path": "/sofa/findAll",
  "pathDesc": "Get all data",
  "rpcType": "sofa",
  "serviceName": ":org.dromara.shenyu.examples.sofa.api.service.SofaSingleParamService",
  "methodName": ":findAll",
  "ruleName": "/sofa/findAll",
  "parameterTypes": ":java.util.List,java.lang.String",
  "rpcExt": "{\"loadbalance\":\"hash\",\"retries\":3,\"timeout\":-1}\",
  "enabled": true
}
2021-02-10 02:31:45.616 INFO 2156 --- [pool-1-thread-1] o.d.s.client.common.utils.
RegisterUtils: sofa client register success: {
  "appName": "sofa",
  "contextPath": "/sofa",
  "path": "/sofa/batchSaveNameAndId",
  "pathDesc": ":",
  "rpcType": "sofa",
  "serviceName": ":org.dromara.shenyu.examples.sofa.api.service.SofaMultiParamService",
  "methodName": ":batchSaveNameAndId",
  "ruleName": "/sofa/batchSaveNameAndId",
  "parameterTypes": "java.util.List,java.lang.String,java.lang.String#org.dromara.shenyu.examples.sofa.api.entity.SofaSimpleTypeBean",
  "rpcExt": "{\"loadbalance\":\"hash\",\"retries\":3,\"timeout\":-1}\",
  "enabled": true
}
2021-02-10 02:31:45.621 INFO 2156 --- [pool-1-thread-1] o.d.s.client.common.utils.
RegisterUtils: sofa client register success: {
  "appName": "sofa",
  "contextPath": "/sofa",
  "path": "sofa/saveComplexBeanAndName",
  "pathDesc": "",
  "rpcType": "sofa",
  "serviceName": "org.dromara.shenyu.examples.sofa.api.service.SofaMultiParamService",
  "methodName": ":saveComplexBeanAndName",
  "ruleName": "/sofa/saveComplexBeanAndName",
  "parameterTypes": "[Ljava.lang.Integer;,java.lang.String",
  "rpcExt": "{\"loadbalance\":\"hash\",\"retries\":3,\"timeout\":-1}\",
  "enabled": true
}
2021-02-10 02:31:45.627 INFO 2156 --- [pool-1-thread-1] o.d.s.client.common.utils.
RegisterUtils: sofa client register success: {
  "appName": "sofa",
  "contextPath": "/sofa",
  "path": "/sofa/findByArrayIdsAndName",
  "pathDesc": "",
  "rpcType": "sofa",
  "serviceName": "org.dromara.shenyu.examples.sofa.api.service.SofaMultiParamService",
  "methodName": ":findByArrayIdsAndName",
  "ruleName": "/sofa/findByArrayIdsAndName",
  "parameterTypes": "[Ljava.lang.String;",
  "rpcExt": "{\"loadbalance\":\"hash\",\"retries\":3,\"timeout\":-1}\",
  "enabled": true
}
2021-02-10 02:31:45.632 INFO 2156 --- [pool-1-thread-1] o.d.s.client.common.utils.
RegisterUtils: sofa client register success: {
  "appName": "sofa",
  "contextPath": "/sofa",
  "path": "sofa/findByStringArray",
  "pathDesc": "",
  "rpcType": "sofa",
  "serviceName": "org.dromara.shenyu.examples.sofa.api.service.SofaMultiParamService",
  "methodName": "findByStringArray",
  "ruleName": "sofa/findByStringArray",
  "parameterTypes": "[Ljava.lang.String;",
  "rpcExt": "{\"loadbalance\":\"hash\",\"retries\":3,\"timeout\":-1}\",
  "enabled": true
}
2021-02-10 02:31:45.637 INFO 2156 --- [pool-1-thread-1] o.d.s.client.common.utils.
RegisterUtils: sofa client register success: {
  "appName": "sofa",
  "contextPath": "/sofa",
  "path": "sofa/saveTwoList",
  "pathDesc": "",
  "rpcType": "sofa",
  "serviceName": "org.dromara.shenyu.examples.sofa.api.service.SofaMultiParamService",
  "methodName": "saveTwoList",
  "ruleName": "sofa/saveTwoList",
  "parameterTypes": "java.util.List,java.util.Map#org.dromara.shenyu.examples.sofa.api.entity.SofaComplexTypeBean",
  "rpcExt": "{\"loadbalance\":\"hash\",\"retries\":3,\"timeout\":-1}\",
  "enabled": true
}
16.22. Run the shenyu-examples-sofa project
repository\org\hibernate\validator\hibernate-validator\6.0.18.Final\hibernate-validator-6.0.18.Final.jar;D:\SOFTWARE\m2\repository\org\jboss\logging\jboss-logging\3.4.1.Final\jboss-logging-3.4.1.Final.jar;D:\SOFTWARE\m2\repository\org\apache\tomcat\embed\tomcat-embed-el\9.0.29\tomcat-embed-el-9.0.29.jar;D:\SOFTWARE\m2\repository\org\springframework\boot\spring-boot-autoconfigure\2.2.2.RELEASE\spring-boot-autoconfigure-2.2.2.RELEASE.jar;D:\SOFTWARE\m2\repository\org\springframework\boot\spring-boot\2.2.2.RELEASE\spring-boot-2.2.2.RELEASE.jar;D:\X\dlm_github\shenyu\shenyu-examples\shenyu-examples-sofa\shenyu-examples-sofa-api\target\classes;D:\SOFTWARE\m2\repository\org\projectlombok\lombok\1.18.10\lombok-1.18.10.jar;D:\X\dlm_github\shenyu\shenyu-spring-boot-starter\shenyu-spring-boot-starter-client\shenyu-spring-boot-starter-client-sofa\target\classes;D:\SOFTWARE\m2\repository\org\springframework\boot\spring-boot-starter\2.2.2.RELEASE\spring-boot-starter-2.2.2.RELEASE.jar;D:\SOFTWARE\m2\repository\org\springframework\boot\spring-boot-starter-logging\2.2.2.RELEASE\spring-boot-starter-logging-2.2.2.RELEASE.jar;D:\SOFTWARE\m2\repository\ch\qos\logback\logback-classic\1.2.3\logback-classic-1.2.3.jar;D:\SOFTWARE\m2\repository\ch\qos\logback\logback-core\1.2.3\logback-core-1.2.3.jar;D:\SOFTWARE\m2\repository\org\apache\logging\log4j\log4j-to-slf4j\2.12.1\log4j-to-slf4j-2.12.1.jar;D:\SOFTWARE\m2\repository\org\apache\logging\log4j\log4j-api\2.12.1\log4j-api-2.12.1.jar;D:\SOFTWARE\m2\repository\org\slf4j\jul-to-slf4j\1.7.29\jul-to-slf4j-1.7.29.jar;D:\SOFTWARE\m2\repository\jakarta\annotation\jakarta.annotation-api\1.3.5\jakarta.annotation-api-1.3.5.jar;D:\SOFTWARE\m2\repository\org\yamllnk\snakeml\1.25\snakeml-1.25.jar;D:\SOFTWARE\m2\repository\org\springframework\boot\spring-boot-starter-json\2.2.2.RELEASE\spring-boot-starter-json-2.2.2.RELEASE.jar;D:\SOFTWARE\m2\repository\com\google\code\gson\gson\2.8.6\gson-2.8.6.jar;D:\SOFTWARE\m2\repository\org\slf4j\slf4j-api\1.7.29\slf4j-api-1.7.29.jar;D:\SOFTWARE\m2\repository\org\slf4j\jcl-over-slf4j\1.7.29\jcl-over-slf4j-1.7.29.jar;C:\Program Files\JetBrains\IntelliJ IDEA 2019.3.3\lib\idea_rt.jar

2021-02-10 02:31:46.060 INFO 2156 --- [ main] org.apache.zookeeper.Client environment:java.library.path=C:\Program Files\Java\jdk1.8.0_211\bin;C:\Windows\Sun\Java\bin;C:\Windows\system32;C:\Windows;C:\Program Files\Common Files\Oracle\Java\javapath;C:\ProgramData\Oracle\Java\javapath;C:\Program Files (x86)\Common Files\Oracle\Java\javapath;C:\Windows\system32;C:\Windows;C:\Windows\System32\Wbem;C:\Windows\System32\WindowsPowerShell\v1.0;C:\Windows\System32\OpenSSH;C:\Program Files\Java\jdk1.8.0_211\bin;C:\Program Files\Java\jdk1.8.0_211\jre\bin;D:\SOFTWARE\apache-maven-3.5.0\bin;C:\Program Files\nodejs\C:\Program Files\Python\Python38\C:\Program Files\OpenSSL-Win64\bin;C:\Program Files\Git\bin;D:\SOFTWARE\protobuf\2.5.0\src\D:\SOFTWARE\zlib-1.2.8;C:\Program Files (x86)\Microsoft SQL Server\100\Tools\<bin>\c:\Program Files\16.22. Run the shenyu-examples-sofa project

100
2021-02-10 02:31:46.060 INFO 2156 --- [ main] org.apache.zookeeper.
ZooKeeper : Client environment:java.io.tmpdir=C:\Users\DLM\AppData\Local\Temp\n
2021-02-10 02:31:46.060 INFO 2156 --- [ main] org.apache.zookeeper.
ZooKeeper : Client environment:java.compiler=<NA>

2021-02-10 02:31:46.060 INFO 2156 --- [ main] org.apache.zookeeper.
ZooKeeper : Client environment:os.name=Windows 10

2021-02-10 02:31:46.060 INFO 2156 --- [ main] org.apache.zookeeper.
ZooKeeper : Client environment:os.arch=amd64

2021-02-10 02:31:46.060 INFO 2156 --- [ main] org.apache.zookeeper.
ZooKeeper : Client environment:os.version=10.0

2021-02-10 02:31:46.060 INFO 2156 --- [ main] org.apache.zookeeper.
ZooKeeper : Client environment:user.name=DLM

2021-02-10 02:31:46.060 INFO 2156 --- [ main] org.apache.zookeeper.
ZooKeeper : Client environment:user.home=C:\Users\DLM

2021-02-10 02:31:46.060 INFO 2156 --- [ main] org.apache.zookeeper.
ZooKeeper : Client environment:user.dir=D:\\dlm\github\shenyu

2021-02-10 02:31:46.061 INFO 2156 --- [ main] org.apache.zookeeper.
ZooKeeper : Initiating client connection, connectString=127.0.0.1:21810
sessionTimeout=60000 watcher=org.apache.curator.ConnectionState@3e850122

2021-02-10 02:31:46.069 INFO 2156 --- [27.0.0.1:21810] org.apache.zookeeper.
ClientCnxn : Opening socket connection to server 127.0.0.1/127.0.0.
1:21810. Will not attempt to authenticate using SASL (unknown error)

2021-02-10 02:31:46.071 INFO 2156 --- [27.0.0.1:21810] org.apache.zookeeper.
ClientCnxn : Socket connection established to 127.0.0.1/127.0.0.1:21810,
initiating session

2021-02-10 02:31:46.078 INFO 2156 --- [27.0.0.1:21810] org.apache.zookeeper.
ClientCnxn : Session establishment complete on server 127.0.0.1/127.0.0.
1:21810, sessionid = 0x10005b0d05e0001, negotiated timeout = 40000

2021-02-10 02:31:46.081 INFO 2156 --- [ain-EventThread] o.a.c.f.state.
ConnectionStateManager : State change: CONNECTED

2021-02-10 02:31:46.093 WARN 2156 --- [ main] org.apache.curator.utils.
ZKPaths : The version of ZooKeeper being used doesn't support Container
nodes. CreateMode.PERSISTENT will be used instead.

2021-02-10 02:31:46.141 INFO 2156 --- [ main] o.d.s.e.s.service.
TestSofaApplication : Started TestSofaApplication in 3.41 seconds (JVM running
for 4.423)
16.23 Test

The shenyu-examples-sofa project will automatically register interface methods annotated with @ShenyuSofaClient in the Apache ShenYu gateway after successful startup.

Open PluginList -> rpc proxy -> sofa to see the list of plugin rule configurations:

Use PostMan to simulate HTTP to request your Sofa service:

Complex multi-parameter example: The related interface implementation class is org.apache.shenyu.examples.sofa.service.impl.SofaMultiParamServiceImpl#batchSaveNameAndId

@Override
@ShenyuSofaClient(path = "/batchSaveNameAndId")
public SofaSimpleTypeBean batchSaveNameAndId(final List<SofaSimpleTypeBean> sofaTestList, final String id, final String name) {
    SofaSimpleTypeBean simpleTypeBean = new SofaSimpleTypeBean();
    simpleTypeBean.setId(id);
    simpleTypeBean.setName("hello world shenyu sofa param batchSaveAndNameAndId :");
}
This document introduces how to quickly access the Apache ShenYu gateway using Http. You can get the code example of this document by clicking here.

16.24 Environment to prepare

Please refer to the deployment to select a way to start shenyu-admin. For example, start the Apache ShenYu gateway management system through local deployment.

After successful startup, you need to open the Divide plugin on in the BasicConfig -> Plugin. In the Apache ShenYu gateway, the HTTP request is handled by the Divide plugin.

If you are a startup gateway by means of source, can be directly run the ShenyuBootstrapApplication of shenyu-bootstrap module.

Note: Before starting, make sure the gateway has added dependencies.

Add the following dependencies to the gateway’s pom.xml file:

```xml
<dependency>
    <groupId>org.apache.shenyu</groupId>
    <artifactId>shenyu-spring-boot-starter-plugin-divide</artifactId>
    <version>${project.version}</version>
</dependency>
```

```xml
<dependency>
    <groupId>org.apache.shenyu</groupId>
    <artifactId>shenyu-spring-boot-starter-plugin-divide</artifactId>
    <version>${project.version}</version>
</dependency>
```

```
<dependency>
    <groupId>org.apache.shenyu</groupId>
    <artifactId>shenyu-spring-boot-starter-plugin-divide</artifactId>
    <version>${project.version}</version>
</dependency>
```
16.25 Run the shenyu-examples-http project

Download shenyu-examples-http

Execute the org.apache.shenyu.examples.http.ShenyuTestHttpApplication main method to start project.

Since 2.4.3, shenyu.client.http.props.port can be non-configured if you like.

The following log appears when the startup is successful:

```
2021-02-10 00:57:07.577 INFO 3700 --- [pool-1-thread-1] o.d.s.client.common.utils.RegisterUtils : http client register success: {"appName":"http","context":"/http","path":"/http/order/save","pathDesc":"Save order","rpcType":"http","host":"192.168.50.13","port":8188,"ruleName":"/http/order/save","enabled":true,"registerMetaData":false}
2021-02-10 00:57:07.587 INFO 3700 --- [pool-1-thread-1] o.d.s.client.common.utils.RegisterUtils : http client register success: {"appName":"http","context":"/http","path":"/http/order/path/**/name","pathDesc":"","rpcType":"http","host":"192.168.50.13","port":8188,"ruleName":"/http/order/path/**/name","enabled":true,"registerMetaData":false}
2021-02-10 00:57:07.596 INFO 3700 --- [pool-1-thread-1] o.d.s.client.common.utils.RegisterUtils : http client register success: {"appName":"http","context":"/http","path":"/http/order/findById","pathDesc":"Find by id","rpcType":"http","host":"192.168.50.13","port":8188,"ruleName":"/http/order/findById","enabled":true,"registerMetaData":false}
2021-02-10 00:57:07.606 INFO 3700 --- [pool-1-thread-1] o.d.s.client.common.utils.RegisterUtils : http client register success: {"appName":"http","context":"/http","path":"/http/order/path/**","pathDesc":"","rpcType":"http","host":"192.168.50.13","port":8188,"ruleName":"/http/order/path/**","enabled":true,"registerMetaData":false}
2021-02-10 00:57:08.023 INFO 3700 --- [main] o.s.b.web.embedded.netty.NettyWebServer : Netty started on port(s): 8188
2021-02-10 00:57:08.026 INFO 3700 --- [main] o.d.s.e.http.ShenyuTestHttpApplication : Started ShenyuTestHttpApplication in 2.555 seconds (JVM running for 3.411)
```
16.26 Test

The shenyu-examples-http project will automatically register interface methods annotated with @ShenyuSpringMvcClient in the Apache ShenYu gateway after successful startup.

Open PluginList -> Proxy -> divide to see the list of plugin rule configurations:

Use PostMan to simulate HTTP to request your http service:

```
POST http://localhost:9195/http/order/save

Body:
```
{
  "id": "123",
  "name": "Test"
}
```

Use IDEA HTTP Client Plugin to simulate HTTP to request your http service[local:no Shenyu proxy]:

```
1 - }
2 - 
3 - "name": "Hello world save order"
4 - 
```
Use IDEA HTTP Client Plugin to simulate HTTP to request your http service[Shenyu proxy]:

POST http://localhost:8189/h?name=Tom

HTTP/1.1 200 OK
Content-Type: application/json; charset=UTF-8
Content-Length: 44

hi! Tom! I'm Shenyu-Gateway System. Welcome!

Response code: 200 (OK); Time: 1139ms; Content length: 44 bytes
This document introduces how to quickly access the Apache ShenYu gateway using Spring Cloud. You can get the code example of this document by clicking here.

16.27 Environment to prepare

Please refer to the deployment to select a way to start shenyu-admin. For example, start the Apache ShenYu gateway management system through local deployment.

After successful startup, you need to open the springCloud plugin on in the BasicConfig -> Plugin.

If you are a startup gateway by means of source, can be directly run the ShenyuBootstrapApplication of shenyu-bootstrap module.

Note: Before starting, make sure the gateway has added dependencies.

Add the gateway proxy plugin for Spring Cloud and add your registry center dependencies:

```xml
<!-- apache shenyu springCloud plugin start-->
<dependency>
  <groupId>org.apache.shenyu</groupId>
  <artifactId>shenyu-spring-boot-starter-plugin-springcloud</artifactId>
</dependency>
<!-- apache shenyu springCloud plugin end-->
```
artifactId>
    <version>${project.version}</version>
</dependency>

<dependency>
    <groupId>org.springframework.cloud</groupId>
    <artifactId>spring-cloud-commons</artifactId>
    <version>2.2.0.RELEASE</version>
</dependency>

<dependency>
    <groupId>org.apache.shenyu</groupId>
    <artifactId>shenyu-spring-boot-starter-plugin-httpclient</artifactId>
    <version>${project.version}</version>
</dependency>

<!-- springCloud if you config register center is eureka please dependency end-->

<dependency>
    <groupId>org.springframework.cloud</groupId>
    <artifactId>spring-cloud-starter-netflix-eureka-client</artifactId>
    <version>2.2.0.RELEASE</version>
</dependency>

<!-- apache shenyu springCloud plugin end-->

eureka config information:

eureka:
    client:
        serviceUrl:
            defaultZone: http://localhost:8761/eureka/
        instance:
            prefer-ip-address: true

Note: Please ensure that the spring Cloud registry service discovery configuration is enabled

  • Configuration method

spring:
    cloud:
        discovery:
            enabled: true

  • code method

@SpringBootApplication
@EnableDiscoveryClient
public class ShenyuBootstrapApplication {

/**
 * Main Entrance.
 * @param args startup arguments
 */

public static void main(final String[] args) {
    SpringApplication.run(ShenyuBootstrapApplication.class, args);
}

Restart the shenyu-bootstrap project.

16.28 Run the shenyu-examples-springcloud project

In the example project we used Eureka as the registry for Spring Cloud. You can use the local Eureka or the application provided in the example.

Download shenyu-examples-eureka, shenyu-examples-springcloud.

Startup the Eureka service: Execute the org.apache.shenyu.examples.eureka.EurekaServerApplication.main method to start project.

Startup the Spring Cloud service: Execute the org.apache.shenyu.examples.springcloud.ShenyuTestSpringCloudApplication.main method to start project.

Since 2.4.3, shenyu.client.springCloud.props.port can be non-configured if you like.

The following log appears when the startup is successful:

```
2021-02-10 14:03:51.301 INFO 2860 --- [ main] o.s.s.concurrent.ThreadPoolTaskExecutor : Initializing ExecutorService 'applicationTaskExecutor'
2021-02-10 14:03:51.669 INFO 2860 --- [pool-1-thread-1] o.d.s.client.common.utils.RegisterUtils : springCloud client register success: {"appName":"springCloud-test","context":"/springcloud","path":"/springcloud/order/save","pathDesc":"","rpcType":"springCloud","ruleName":"/springcloud/order/save","enabled":true}
2021-02-10 14:03:51.676 INFO 2860 --- [pool-1-thread-1] o.d.s.client.common.utils.RegisterUtils : springCloud client register success: {"appName":"springCloud-test","context":"/springcloud","path":"/springcloud/order/path/**","pathDesc":"","rpcType":"springCloud","ruleName":"/springcloud/order/save","enabled":true}
2021-02-10 14:03:51.682 INFO 2860 --- [pool-1-thread-1] o.d.s.client.common.utils.RegisterUtils : springCloud client register success: {"appName":"springCloud-test","context":"/springcloud","path":"/springcloud/order/findById","pathDesc":"","rpcType":"springCloud","ruleName":"/springcloud/order/findById","enabled":true}
2021-02-10 14:03:51.688 INFO 2860 --- [pool-1-thread-1] o.d.s.client.common.utils.RegisterUtils : springCloud client register success: {"appName":"springCloud-test","context":"/springcloud","path":"/springcloud/order/path/**/name","pathDesc":"","rpcType":"springCloud","ruleName":"/springcloud/order/findById","enabled":true}
```
  "appName": "springCloud-test",
  "context": "/springcloud",
  "path": "/springcloud/test/**",
  "pathDesc": "",
  "rpcType": "springCloud",
  "ruleName": "/springcloud/test/**",
  "enabled": true
}
2021-02-10 14:03:52.806 WARN 2860 --- [main] ockingLoadBalancerClientRibbonWarnLogger : You already have RibbonLoadBalancerClient on your classpath. It will be used by default. As Spring Cloud Ribbon is in maintenance mode. We recommend switching to BlockingLoadBalancerClient instead. In order to use it, set the value of `spring.cloud.loadbalancer.ribbon.enabled` to `false` or remove spring-cloud-starter-netflix-ribbon from your project.
2021-02-10 14:03:52.848 WARN 2860 --- [main] iguration$LoadBalancerCaffeineWarnLogger : Spring Cloud LoadBalancer is currently working with default default cache. You can switch to using Caffeine cache, by adding it to the classpath.
2021-02-10 14:03:52.921 INFO 2860 --- [main] o.s.c.n.eureka.InstanceInfoFactory : Setting initial instance status as: STARTING
2021-02-10 14:03:52.949 INFO 2860 --- [main] com.netflix.discovery.DiscoveryClient : Initializing Eureka in region us-east-1
2021-02-10 14:03:53.263 INFO 2860 --- [main] c.n.d.s.r.aws.ConfigClusterResolver : Resolving eureka endpoints via configuration
2021-02-10 14:03:53.547 INFO 2860 --- [main] com.netflix.discovery.DiscoveryClient : Application is null: false
2021-02-10 14:03:53.547 INFO 2860 --- [main] com.netflix.discovery.DiscoveryClient : Registered Applications size is zero: true
2021-02-10 14:03:53.547 INFO 2860 --- [main] com.netflix.discovery.DiscoveryClient : Application version is -1: true
2021-02-10 14:03:53.547 INFO 2860 --- [main] com.netflix.discovery.DiscoveryClient : Getting all instance registry info from the eureka server
2021-02-10 14:03:53.754 INFO 2860 --- [main] com.netflix.discovery.DiscoveryClient : The response status is 200
2021-02-10 14:03:53.756 INFO 2860 --- [main] com.netflix.discovery.DiscoveryClient : Starting heartbeat executor: renew interval is: 30
2021-02-10 14:03:53.758 INFO 2860 --- [main] c.n.discovery.
16.29 Test

The shenyu-examples-springcloud project will automatically register interface methods annotated with @ShenyuSpringCloudClient in the Apache ShenYu gateway after successful startup.

Open PluginList -> rpc proxy -> springCloud to see the list of plugin rule configurations:

Use PostMan to simulate HTTP to request your SpringCloud service:
Use IDEA HTTP Client Plugin to simulate HTTP to request your SpringCloud service[local:no Shenyu proxy]:

Use IDEA HTTP Client Plugin to simulate HTTP to request your SpringCloud service[Shenyu proxy]:

16.29. Test
This article describes how to expose the API documentation to the Apache ShenYu gateway. Before accessing, please start shenyu-admin correctly.

### 17.1 Export API Documentation to shenyu-admin

You can refer to any of the example codes below shenyu-examples. The only thing you need to do is to add @ApiModule and @ApiDoc annotations to your service, here is an example from shenyu-examples-http:

```java
@RestController
@RequestMapping("/order")
@ShenyuSpringMvcClient("/order")
@ApiModule(value = "order")
public class OrderController {

    @GetMapping("/findById")
    @ShenyuSpringMvcClient("/findById")
    @ApiDoc(desc = "findById")
    public OrderDTO findById(@RequestParam("id") final String id) {
        return build(id, "hello world findById");
    }

    private OrderDTO build(final String id, final String name) {
        OrderDTO orderDTO = new OrderDTO();
        orderDTO.setId(id);
        orderDTO.setName(name);
        return orderDTO;
    }
}
```
19.1 Description

- This doc offers examples for customising response structure in Apache ShenYu gateway.
- The response body structure in gateways should be unified, it is recommended for specify yours.

19.2 Default Implementation

- The default implementation class is `org.apache.shenyu.plugin.api.result.DefaultShenyuResult`.
- Following is the response structure:

```java
public class ShenyuDefaultEntity implements Serializable {
    private static final long serialVersionUID = -2792556188993845048L;
    private Integer code;
    private String message;
    private Object data;
}
```

- The returned json as follows:

```json
{
    "code": -100, // response code,
    "message": "Your parameter error, please check the relevant documentation!", // hint messages
    "data": null // business data
}
```
19.3 Extensions

- Declare a new class named CustomShenyuResult and implements org.apache.shenyu.plugin.api.result.ShenyuResult

```java
/**
 * The interface shenyu result.
 */
public interface ShenyuResult<T> {

    /**
     * The response result.
     * @param exchange the exchange
     * @param formatted the formatted object
     * @return the result object
     */
    default Object result(ServerWebExchange exchange, Object formatted) {
        return formatted;
    }

    /**
     * format the origin, default is json format.
     * @param exchange the exchange
     * @param origin the origin
     * @return format origin
     */
    default Object format(ServerWebExchange exchange, Object origin) {
        // basic data
        if (ObjectTypeUtils.isBasicType(origin)) {
            return origin;
        }
        // error result or rpc origin result.
        return JsonUtils.toJson(origin);
    }

    /**
     * the response context type, default is application/json.
     * @param exchange the exchange
     * @param formatted the formatted data that is origin data or byte[] convert string
     * @return the context type
     */
    default MediaType contentType(ServerWebExchange exchange, Object formatted) {
        return MediaType.APPLICATION_JSON;
    }
```
/**
 * Error t.
 * @param code the code
 * @param message the message
 * @param object the object
 * @return the t
 */
T error(int code, String message, Object object);

Processing sequence: format->contextType->result. The format method performs data formatting. If the data is a basic type and returns itself, other types are converted to JSON, and the parameter origin is the original data. Formatting can be performed according to the situation. contextType, if it is a basic type, use text/plain, the default is application/json, the parameter formatted is the data processed by the format method, and can be combined with the return result of format for data type Define processing. The parameter formatted of result is the data processed by the format method, which returns to itself by default, and can be combined with the return result of format for custom processing of the data type.

- T is a generic parameter for your response data.
- Register defined class as a Spring Bean.

```java
@Bean
public ShenyuResult<?> customShenyuResult() {
    return new CustomShenyuResult();
}
```

**19.4 Description**

- This document focuses on how to access gateways for HTTP services in other languages.
- To access the gateway, you need to get the token first, and then you can call the registration service or metadata interface according to your needs.
19.5 Get token

• Request Method
  
  GET

• Request Path
  
  - http://{shenyu-admin}/platform/login
  
  Where shenyu-admin is the ip + port of the admin backend management system.

• Request Params
  
  - query parameter, the account password is the username and password of the admin service.

<table>
<thead>
<tr>
<th>Field</th>
<th>Type</th>
<th>Required</th>
<th>Desc</th>
</tr>
</thead>
<tbody>
<tr>
<td>userName</td>
<td>String</td>
<td>Yes</td>
<td>shenyu admin account</td>
</tr>
<tr>
<td>password</td>
<td>String</td>
<td>Yes</td>
<td>shenyu admin password</td>
</tr>
</tbody>
</table>

• Return Data

<table>
<thead>
<tr>
<th>Field</th>
<th>Type</th>
<th>Desc</th>
</tr>
</thead>
<tbody>
<tr>
<td>code</td>
<td>Integer</td>
<td>Return code</td>
</tr>
<tr>
<td>message</td>
<td>String</td>
<td>Return message</td>
</tr>
<tr>
<td>data</td>
<td>Object</td>
<td>Return data</td>
</tr>
<tr>
<td>id</td>
<td>Integer</td>
<td>user id</td>
</tr>
<tr>
<td>userName</td>
<td>String</td>
<td>account</td>
</tr>
<tr>
<td>role</td>
<td>Integer</td>
<td>role id</td>
</tr>
<tr>
<td>enabled</td>
<td>Boolean</td>
<td>status</td>
</tr>
<tr>
<td>dateCreated</td>
<td>String</td>
<td>create time</td>
</tr>
<tr>
<td>dateUpdated</td>
<td>String</td>
<td>update time</td>
</tr>
<tr>
<td>token</td>
<td>String</td>
<td>token</td>
</tr>
<tr>
<td>expiredTime</td>
<td>Long</td>
<td>timeout time, in milliseconds</td>
</tr>
</tbody>
</table>

Example
19.6 Registration Services

- **Request Method**
  
  POST

- **Request Path**

  - http://{shenyu-admin}/shenyu-client/register-uri

  - Where shenyu-admin is the ip + port of the admin backend management system.

- **Request Params**

  - Header
    
    * contentType: application/json
    * X-Access-Token: {token}, token is the token obtained by Get token.

  - Body, json format

| Field        | Type     | Required | Desc                  |——-|——-|
|--------------|----------|----------|-----------------------|——|——|
| protocol     | String   | Yes      | protocol type         |    |    |
| appName      | String   | Yes      | app name              |    |    |
| contextPath  | String   | Yes      | service path          |    |    |
| rpcType      | String   | Yes      | rpc type, supported type reference RpcTypeEnum |    |    |
| host         | String   | Yes      | service IP            |    |    |
| port         | Integer  | Yes      | service port          |    |    |
### EventTypes

**eventType** | **String** | **Yes** | **event type, supported types reference** EventType |

**Example**

```json
{
    "protocol": "http",
    "appName": "app",
    "contextPath": "/test",
    "rpcType": "http",
    "host": "127.0.0.1",
    "port": "8080",
    "eventType": "REGISTER"
}
```

- **Return Data**

A successful registration returns **success**.

### 19.7 Registration Metadata

- **Request Method**

  POST

- **Request Path**

  - http://{shenyu-admin}/shenyu-client/register-metadata
    
    - Where shenyu-admin is the ip + port of the admin backend management system.

- **Request Params**

  - **Header**
    
      * contentType: application/json
        
      * X-Access-Token: {token}, token is the token obtained by Get token.

  - **Body**, json format

<table>
<thead>
<tr>
<th>Field</th>
<th>Type</th>
<th>Required</th>
<th>Desc</th>
</tr>
</thead>
</table>

| appName     | String  | Yes      | app name                |
| contextPath | String  | Yes      | service path            |
| path        | String  | Yes      | path                    |
| pathDesc    | String  | Yes      | path description        |
| rpcType     | String  | Yes      | rpc type, supported type reference RpcTypeEnum |
| serviceName | String  | Yes      | service name            |
methodName | String | Yes | method name |
ruleName | String | Yes | rule name |
parameterTypes | String | Yes | parameter Type |
rpcExt | String | Yes | rpc expansion parameters |
enabled | Boolean | No | status |
host | String | Yes | service IP |
port | Integer | Yes | service port |
pluginNames | List | No | plugin name list |
registerMetaData | Boolean | No | whether to register metadata |

**examples**

```json
{
    "appName": "app",
    "contextPath": "/",
    "path": "/test",
    "rpcType": "http",
    "serviceName": "test service",
    "parameterTypes": "java.lang.String",
    "pathDesc": "test path",
    "methodName": "test method",
    "ruleName": "test rule",
    "rpcExt": "{"loadbalance":"hash","retries":3,"timeout":-1}",
    "enabled": true,
    "host": "127.0.0.1",
    "port": 8080,
    "pluginNames": [],
    "registerMetaData": true
}
```

**Return Data**

A successful registration returns success.
19.8 Preparation

1. Clone the code of Apache ShenYu.
2. Install and start docker.

19.9 Start integration test locally

1. Build with Maven

```
./mvnw -B clean install -Prelease,docker -Dmaven.javadoc.skip=true -Dmaven.test.skip=true
```

2. Build integrated tests

```
./mvnw -B clean install -Pit -DskipTests -f ./shenyu-integrated-test/pom.xml
```

3. Start docker compose

```
docker-compose -f ./shenyu-integrated-test/${{ matrix.case }}/docker-compose.yml up -d
```

You need to replace ${{ matrix.case }} with the exact directory, such as shenyu-integrated-test-http.

4. Run test

```
./mvnw test -Pit -f ./shenyu-integrated-test/${{ matrix.case }}/pom.xml
```

19.10 Description

- Plugins are core executors of Apache ShenYu gateway. Every plugin handles matched requests when enabled.
- There are two kinds of plugins in the Apache ShenYu gateway.
  - The first type is a chain with single responsibility, and can not custom filtering of traffic.
  - The other one can do its own chain of responsibility for matched traffic.
- You could reference from shenyu-plugin module and develop plugins by yourself. Please fire pull requests of your wonderful plugins without hesitate.
19.11 Single Responsibility Plugins

- Add following dependency:

  ```xml
  <dependency>
  <groupId>org.apache.shenyu</groupId>
  <artifactId>shenyu-plugin-api</artifactId>
  <version>${project.version}</version>
  </dependency>
  ```

- Declare a new class named `MyShenyuPlugin` and implements `org.apache.shenyu.plugin.api.ShenyuPlugin`

```java
public interface ShenyuPlugin {

  /**
   * Process the Web request and (optionally) delegate to the next
   * {@code WebFilter} through the given {@link ShenyuPluginChain}.
   * *
   * @param exchange the current server exchange
   * @param chain provides a way to delegate to the next filter
   * @return {@code Mono<Void>} to indicate when request processing is complete
   */
  Mono<Void> execute(ServerWebExchange exchange, ShenyuPluginChain chain);

  /**
   * return plugin order .
   * This attribute To determine the plugin execution order in the same type plugin.
   *
   * @return int order
   */
  int getOrder();

  /**
   * acquire plugin name.
   * this is plugin name define you must offer the right name.
   * if you impl AbstractShenyuPlugin this attribute not use.
   *
   * @return plugin name.
   */
  default String named() {
    return "";
  }

  /**
   * plugin is execute.
   * if return true this plugin can not execute.
   */
```


```java
* 
* @param exchange the current server exchange 
* @return default false. 
*/

default Boolean skip(ServerWebExchange exchange) {
    return false;
}
}
```

Detailed instruction of interface methods:

- **execute()** core method, you can do any task here freely.
- **getOrder()** get the order of current plugin.
- **named()** acquire the name of specific plugin that uses the Camel Case, eg: dubbo, spring-Cloud.
- **skip()** determines whether this plugin should be skipped under certain conditions.
- **Register plugin in Spring as a Bean, or simply apply @Component in implementation class.**

```java
@Bean
public ShenyuPlugin myShenyuPlugin() {
    return new MyShenyuPlugin();
}
```

### 19.12 Matching Traffic Processing Plugin

- Introduce the following dependency:

  ```xml
  <dependency>
    <groupId>org.apache.shenyu</groupId>
    <artifactId>shenyu-plugin-base</artifactId>
    <version>${project.version}</version>
  </dependency>
  ```

- Add a new class CustomPlugin, inherit from org.apache.shenyu.plugin.base.AbstractShenyuPlugin
- examples down below:

```java
/**
 * This is your custom plugin.
 * He is running in after before plugin, implement your own functionality.
 * extends AbstractShenyuPlugin so you must user shenyu-admin And add related plug-in development.
 * 
 * @author xiaoyu(Myth)
 */
```
public class CustomPlugin extends AbstractShenyuPlugin {

    /**
     * return plugin order.
     * The same plugin he executes in the same order.
     *
     * @return int
     */
    @Override
    public int getOrder() {
        return 0;
    }

    /**
     * acquire plugin name.
     * return you custom plugin name.
     * It must be the same name as the plug-in you added in the admin background.
     *
     * @return plugin name.
     */
    @Override
    public String named() {
        return "shenYu";
    }

    /**
     * plugin is execute.
     * Do I need to skip.
     * if you need skip return true.
     *
     * @param exchange the current server exchange
     * @return default false.
     */
    @Override
    public Boolean skip(final ServerWebExchange exchange) {
        return false;
    }

    /**
     * this is Template Method child has Implement your own logic.
     *
     * @param exchange exchange the current server exchange
     * @param chain chain the current chain
     * @param selector selector
     * @param rule rule
     * @return {@code Mono<Void>} to indicate when request handling is complete
     */
    @Override
}
protected abstract Mono<Void> doExecute(ServerWebExchange exchange, ShenyuPluginChain chain, SelectorData selector, RuleData rule) {
    LOGGER.debug("............ function plugin start............");
    /*
     * Processing after your selector matches the rule.
     * rule.getHandle() is you Customize the json string to be processed.
     * for this example.
     * Convert your custom json string pass to an entity class.
     */
    final String ruleHandle = rule.getHandle();

    final Test test = GsonUtils.getInstance().fromJson(ruleHandle, Test.class);
    /*
     * Then do your own business processing.
     * The last execution chain.execute(exchange).
     * Let it continue on the chain until the end.
     */
    System.out.println(test.toString());
    return chain.execute(exchange);
}

• Detailed explanation:
  – Plugins will match the selector rule for customized plugins inherit from this abstract class.
  – Firstly define a new plugin in shenyu-admin -> BasicConfig -> Plugin, please mind that your plugin name should match the named() method overridden in your class.
  – Re-login shenyu-admin, the plugin you added now showing on plugin-list page, you can choose selectors for matching.
  – There is a field named handler in rules, it is customized json string to be processed. You can process data after acquiring a ruleHandle (final String ruleHandle = rule.getHandle();) in doExecute() method.

• Register plugin in Spring as a Bean, or simply apply @Component in implementation class.

@Bean
public ShenyuPlugin customPlugin() {
    return new CustomPlugin();
}
19.13 Subscribe your plugin data and do customized jobs

- Declare a new class named PluginDataHandler and implements org.apache.shenyu.plugin.base.handler.PluginDataHandler

```java
public interface PluginDataHandler {

    /**
     * Handler plugin.
     * @param pluginData the plugin data
     */
    default void handlerPlugin(PluginData pluginData) {
    }

    /**
     * Remove plugin.
     * @param pluginData the plugin data
     */
    default void removePlugin(PluginData pluginData) {
    }

    /**
     * Handler selector.
     * @param selectorData the selector data
     */
    default void handleSelector(SelectorData selectorData) {
    }

    /**
     * Remove selector.
     * @param selectorData the selector data
     */
    default void removeSelector(SelectorData selectorData) {
    }

    /**
     * Handle rule.
     * @param ruleData the rule data
     */
    default void handleRule(RuleData ruleData) {
    }

    /**
     * 
     */
}
```
* Remove rule.

* @param ruleData the rule data

/**
default void removeRule(RuleData ruleData) {
}

/**
* Plugin named string.
*
* @return the string

*/
String pluginNamed();
}

• Ensure pluginNamed() is same as the plugin name you defined.

• Register defined class as a Spring Bean, or simply apply @Component in implementation class.

@Bean
public PluginDataHandler pluginDataHandler() {
    return new PluginDataHandler();
}

19.14 Dynamic loading

• When using this feature, the above extensions ShenyuPlugin, PluginDataHandler, do not need to be spring bean. You just need to build the jar package of the extension project.

• Config in Yaml:

shenyu:
    extPlugin:
        path: //Load the extension plugin jar package path
        enabled: true //Whether to turn on
        threads: 1 //Number of loading plug-in threads
        scheduleTime: 300 //Cycle time (in seconds)
        scheduleDelay: 30 //How long the shenyu gateway is delayed to load after it starts (in seconds)
19.14.1 Plugin loading path details

- This path is for the directory where the extended plugin jar package is stored.
- Used `-Dplugin-ext=xxxx`, Also used `shenyu.extPlugin.path` in yaml, If neither is configured, the `ext-lib` directory in the apache shenyu gateway boot path will be loaded by default.
- Priority: `-Dplugin-ext=xxxx > shenyu.extPlugin.path > ext-lib (default)`

19.15 Plugin jar upload

- To use this feature, you will need to package the ShenyuPlugin extension as a custom Shenyu-Plugin Jar
- Configure it in ShenyuAdmin
  - use ShenyuAdmin - BasicConfig - Plugin add plugin in pluginJar click upload button
- Custom ShenyuPlugin can be started by loading third-party jars into the `-cp` directory if it depends on other third-party packages in shenyu-bootstrap

Tips:
The Upload jar package plugin supports hot loading If you need to modify the jar online. You can make a new jar. And raise the version number, for example ‘1.0.1’ to ‘1.0.2’

19.16 Description

- Users can customize the convert algorithm of Jwt-plugin to achieve convert.

19.17 Extension

The default implementation is `org.apache.shenyu.plugin.jwt.strategy.DefaultJwtConvertStrategy`. The SPI mechanism is adopted for extension, and the steps are as follows:

1. implements `interface org.apache.shenyu.plugin.jwt.strategy.JwtConvertStrategy`

```java
/**
* Represents a conversion strategy that convert jwt to some attributes of
* serverWebExchange, especially attributes of the request header.
*/
@SPI
public interface JwtConvertStrategy {
```
/**
 * HandleJson needs to be parsed into jwtRuleHandle in order to
 * specify how to convert jwt.
 * @param handleJson handleJson from rule
 * @return jwtRuleHandle
 */
JwtRuleHandle parseHandleJson(String handleJson);

/**
 * Converts jwt to some attributes of serverWebExchange based on
 * jwtRuleHandle.
 * @param jwtRuleHandle jwtRuleHandle
 * @param exchange exchange
 * @param jwtBody jwtBody
 * @return serverWebExchange
 */
ServerWebExchange convert(JwtRuleHandle jwtRuleHandle, ServerWebExchange exchange, Map<String, Object> jwtBody);

@Join
public class CustomJwtConvertStrategy implements JwtConvertStrategy {

@Override
public CustomJwtRuleHandle parseHandleJson(final String handleJson) {
    return GsonUtils.getInstance().fromJson(handleJson, CustomJwtRuleHandle.class);
}

@Override
public ServerWebExchange convert(final JwtRuleHandle jwtRuleHandle, final ServerWebExchange exchange, final Map<String, Object> jwtBody) {
    final CustomJwtRuleHandle customJwtRuleHandle = (CustomJwtRuleHandle) jwtRuleHandle;
    String customConvert = customJwtRuleHandle.getCustomConvert();
    ServerHttpRequest modifiedRequest =
        exchange.getRequest().mutate().header("custom", customConvert).build();

    return exchange.mutate().request(modifiedRequest).build();
}
}

2. Configures SPI
The project would use different conversion strategies based on the `handleType` parameter of `JwtRuleHandle`. For example, for the following `JwtRuleHandle`, the project would use our above `CustomJwtConvertStrategy`. (Note: `handleType` is default or nonexistent, the project would use default `DefaultJwtConvertStrategy`)

```json
{
  "handleType": "custom",
  "customConvert": "customConvert"
}
```

The case code is available for viewing in `org.apache.shenyu.plugin.jwt.strategy.CustomJwtConvertStrategy`.

### 19.18 Description

- This doc shows how to do performance optimization for Apache ShenYu.

### 19.19 Time Consumption

- Apache ShenYu is JVM driven and processing time for a single request is nearly between 1–3 ms.

### 19.20 Netty Optimization

- `spring-webflux` is one of dependencies of ShenYu, and it uses Netty in lower layer.
- The demo down below demonstrates tuning ShenYu by customizing params in Netty.

```java
@Bean
public NettyReactiveWebServerFactory nettyReactiveWebServerFactory() {
    webServerFactory.addServerCustomizers(new EventLoopNettyCustomizer());
    return webServerFactory;
}

private static class EventLoopNettyCustomizer implements NettyServerCustomizer {

    @Override
    public HttpServer apply(final HttpServer httpServer) {
        return httpServer
            .tcpConfiguration(tcpServer -> tcpServer
                .runOn(LoopResources.create("shenyu-netty", 1, DEFAULT_IO_
```
The shenyu-bootstrap module offers this class, you may modify it when benchmarking your app if necessary.

You can get references of business thread model from thread model.

19.21 Description

- Standalone environment, then use the local API to update the apache shenyu gateway data. the yaml config:

```yaml
shenyu:
  local:
    enabled: true
    sha512Key: 123456
```

- Common result:

```mermaid
success
```

- Common preFix: localhost:9095/shenyu
- Common Header: localKey: 123456

19.22 Plugin

19.22.1 saveOrUpdate

save or update plugin data
**Request Method**

**POST**

**Path**

`/plugin/saveOrUpdate`

**Request Parameters**

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PluginData</strong></td>
<td><strong>PluginData</strong></td>
<td>True</td>
<td></td>
<td>Plugin data object (pass Json object inside Body)</td>
</tr>
</tbody>
</table>

**PluginData**

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>id</td>
<td>String</td>
<td>False</td>
<td></td>
<td>plugin id</td>
</tr>
<tr>
<td>name</td>
<td>String</td>
<td>True</td>
<td></td>
<td>plugin name</td>
</tr>
<tr>
<td>config</td>
<td>String</td>
<td>False</td>
<td></td>
<td>plugin configuration (Json format)</td>
</tr>
<tr>
<td>role</td>
<td>String</td>
<td>False</td>
<td></td>
<td>plugin role</td>
</tr>
<tr>
<td>enabled</td>
<td>Boolean</td>
<td>False</td>
<td></td>
<td>whether to turn on</td>
</tr>
</tbody>
</table>

**Example**

**POST body**

```json
{"id":3,"name":"divide","enabled":"true"}
```

**19.22.2 CleanAll**

Clear all data (plugins, selectors, rules)

**Request Method**

**GET**
19.22.3 Clean Plugin

Clear plugin data (selector, rule)

Request Method

GET

Path

/cleanPlugin?name=xxxx

RequestParam

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>String</td>
<td>true</td>
<td></td>
<td>plugin name</td>
</tr>
</tbody>
</table>

19.22.4 Delete plugin

Remove plugin data (not included, the selectors and rules data)

Request Method

GET

Path

/plugin/delete?name=xxxx

RequestParam

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>String</td>
<td>true</td>
<td></td>
<td>plugin name</td>
</tr>
</tbody>
</table>
19.22.5 Delete All Plugin

Remove all plugin data (not included, the selectors and rules data)

Request Method

GET

Path

/plugin/deleteAll

19.22.6 Find plugin by name

Find plugin by name

Request Method

GET

Path

/plugin/findByName?name=xxxx

RequestParam

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>String</td>
<td>true</td>
<td></td>
<td>plugin name</td>
</tr>
</tbody>
</table>

19.22.7 Save or Update Selector

Save or Update Selector
Request Method

POST

Path

/plugin/selector/saveOrUpdate

Request Param

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SelectorData</td>
<td>SelectorData</td>
<td>True</td>
<td></td>
<td>Selector object (pass Json object inside Body)</td>
</tr>
</tbody>
</table>

SelectorData

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>id</td>
<td>String</td>
<td>False</td>
<td>selector id</td>
<td>selector id</td>
</tr>
<tr>
<td>plugin-Name</td>
<td>String</td>
<td>True</td>
<td>plugin name</td>
<td>plugin name</td>
</tr>
<tr>
<td>name</td>
<td>String</td>
<td>False</td>
<td>Selector name (default is plugin:selector+random number if not filled)</td>
<td></td>
</tr>
<tr>
<td>match-Mode</td>
<td>Integer</td>
<td>False</td>
<td>Matching mode (0:and;1:or), not filled with the default generation And mode</td>
<td></td>
</tr>
<tr>
<td>type</td>
<td>Integer</td>
<td>False</td>
<td>Traffic type (0: full traffic; 1: custom traffic) do not fill in the default generation of full traffic</td>
<td></td>
</tr>
<tr>
<td>sort</td>
<td>Integer</td>
<td>False</td>
<td>Sort by, not filled by default generate 10</td>
<td></td>
</tr>
<tr>
<td>enabled</td>
<td>Boolean</td>
<td>False</td>
<td>Whether to turn on, not fill in the default generation true</td>
<td></td>
</tr>
<tr>
<td>logged</td>
<td>Boolean</td>
<td>False</td>
<td>Whether or not to print the log, do not fill in the default generated into false</td>
<td></td>
</tr>
<tr>
<td>handle</td>
<td>String</td>
<td>False</td>
<td>Selector handler (Json objects, depending on each plug-in, different objects are passed)</td>
<td></td>
</tr>
<tr>
<td>conditionList</td>
<td>Condition</td>
<td>False</td>
<td>Conditional collection, custom traffic needs to be passed, full traffic does not need to be passed (Json List object)</td>
<td></td>
</tr>
</tbody>
</table>

Condition
<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>paramName</td>
<td>String</td>
<td>True</td>
<td></td>
<td>param name (The uri parameter type can be passed without)</td>
</tr>
<tr>
<td>paramValue</td>
<td>Integer</td>
<td>False</td>
<td></td>
<td>param value</td>
</tr>
<tr>
<td>paramType</td>
<td>String</td>
<td>True</td>
<td></td>
<td>param type (post, uri, query, host, header, cookie, req_method, domain)</td>
</tr>
<tr>
<td>operator</td>
<td>String</td>
<td>True</td>
<td></td>
<td>operator (match, =, regex, &gt;, &lt;, contains, SpEL, Groovy, TimeBefore, TimeAfter)</td>
</tr>
</tbody>
</table>

Example

POST body

```json
{
  "pluginName": "divide",
  "type": 1,
  "handle": "["upstreamUrl":"127.0.0.1:8089"]",
  "conditionDataList": [{
    "paramType": "uri",
    "operator": "match",
    "paramName": null,
    "paramValue": "/**"
  }]
}
```

Result

Is selector id

xxxxxx

19.22.8 Add Selector And Rules

Add a selector with multiple rules
### Request Method

**POST**

### Path

`/plugin/selectorAndRules`

### RequestParam

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SelectorRulesData</strong></td>
<td><strong>SelectorRulesData</strong></td>
<td>True</td>
<td></td>
<td>Selector rule object (Body inside pass Json object)</td>
</tr>
</tbody>
</table>

**SelectorRulesData**

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>plugin-Name</strong></td>
<td>String</td>
<td>True</td>
<td></td>
<td>plugin name</td>
</tr>
<tr>
<td><strong>selector-Name</strong></td>
<td>String</td>
<td>False</td>
<td></td>
<td>Selector name (if not filled in, it is generated by default plugin:selector+random number)</td>
</tr>
<tr>
<td><strong>match-Mode</strong></td>
<td>Integer</td>
<td>False</td>
<td></td>
<td>Matching mode (0:and;1:or), not filled with the default generation And mode</td>
</tr>
<tr>
<td><strong>selectorHandler</strong></td>
<td>String</td>
<td>False</td>
<td></td>
<td>Selector handler (Json objects, depending on each plug-in, different objects are passed)</td>
</tr>
<tr>
<td><strong>condition-List</strong></td>
<td><strong>ConditionData</strong></td>
<td>True</td>
<td></td>
<td>Selector condition collection (Json List object)</td>
</tr>
<tr>
<td><strong>rule-DataList</strong></td>
<td><strong>RuleLocalData</strong></td>
<td>True</td>
<td></td>
<td>Rule condition collection (Json List object)</td>
</tr>
</tbody>
</table>

**RuleLocalData**
<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ruleName</td>
<td>String</td>
<td>False</td>
<td></td>
<td>rule name</td>
</tr>
<tr>
<td>ruleHandler</td>
<td>String</td>
<td>True</td>
<td></td>
<td>Rule handler (different plugins pass different values)</td>
</tr>
<tr>
<td>matchMode</td>
<td>Integer</td>
<td>False</td>
<td></td>
<td>Matching pattern (0:and;1:or)</td>
</tr>
<tr>
<td>conditionList</td>
<td>Condition-Data</td>
<td>True</td>
<td></td>
<td>Rule condition collection (Json List object)</td>
</tr>
</tbody>
</table>

**ConditionData**

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>paramType</td>
<td>String</td>
<td>True</td>
<td></td>
<td>param type (post, uri, query, host, header, cookie, req_method, domain)</td>
</tr>
<tr>
<td>operator</td>
<td>String</td>
<td>True</td>
<td></td>
<td>operator (match, =, regex, &gt;, &lt;, contains, SpEL, Groovy, TimeBefore, TimeAfter)</td>
</tr>
<tr>
<td>paramName</td>
<td>String</td>
<td>False</td>
<td></td>
<td>param name (The uri parameter type can be passed without)</td>
</tr>
<tr>
<td>paramValue</td>
<td>Integer</td>
<td>False</td>
<td></td>
<td>param value</td>
</tr>
</tbody>
</table>

**Example**

POST body

```json
{
  "pluginName": "divide",
  "selectorHandler": "\"upstreamUrl\":\"127.0.0.1:8089\"\",
  "conditionDataList": [{
    "paramType": "uri",
    "operator": "match",
    "paramValue": "http/**"
  }],
  "ruleDataList": [{
    "ruleHandler": "loadBalance\":\"random\"\",
    "conditionDataList": [{
      "paramType": "uri",
      "operator": "=",
      "paramValue": "http/test/payment"
    }]
  }, {
    "ruleHandler": "loadBalance\":\"random\"",
```
"conditionDataList": [{
   "paramType": "uri",
   "operator": "=",
   "paramValue": "/http/order/save"
}]
]

19.22.9 Delete Selector

Delete selectors based on selector id and plugin name

Request Method
GET

Path
/plugin/selector/delete?pluginName=xxxx&&id=xxxx

RequestParam

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>pluginName</td>
<td>String</td>
<td>true</td>
<td>plugin name</td>
<td></td>
</tr>
<tr>
<td>id</td>
<td>String</td>
<td>true</td>
<td>selector id</td>
<td></td>
</tr>
</tbody>
</table>

19.22.10 Find All Selector

Get all selectors by plugin name

Request Method
GET
Path

/plugin/selector/findList?pluginName=xxxx

RequestParam

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>pluginName</td>
<td>String</td>
<td>true</td>
<td></td>
<td>plugin name</td>
</tr>
</tbody>
</table>

19.22.11 Save or Update Rule Data

Save or Update Rule Data

Request Method

POST

Path

/plugin/rule/saveOrUpdate

RequestParam

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RuleData</td>
<td>RuleData</td>
<td>True</td>
<td></td>
<td>Rule object (pass Json object inside Body)</td>
</tr>
</tbody>
</table>

RuleData
<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>id</td>
<td>String</td>
<td>False</td>
<td>True</td>
<td>rule id</td>
</tr>
<tr>
<td>pluginName</td>
<td>String</td>
<td>True</td>
<td>False</td>
<td>plugin name</td>
</tr>
<tr>
<td>name</td>
<td>String</td>
<td>False</td>
<td>False</td>
<td>Rule name (default generation if not filled plugin:rule+random number)</td>
</tr>
<tr>
<td>selectorId</td>
<td>String</td>
<td>True</td>
<td>False</td>
<td>Selector id</td>
</tr>
<tr>
<td>matchMode</td>
<td>Integer</td>
<td>False</td>
<td>False</td>
<td>Matching mode (0:and;1:or), not filled with the default generation And mode</td>
</tr>
<tr>
<td>sort</td>
<td>Integer</td>
<td>False</td>
<td>False</td>
<td>Sort by, not filled by default generate 10</td>
</tr>
<tr>
<td>enabled</td>
<td>Boolean</td>
<td>False</td>
<td>False</td>
<td>Whether to turn on, not fill in the default generation true</td>
</tr>
<tr>
<td>logged</td>
<td>Boolean</td>
<td>False</td>
<td>False</td>
<td>Whether or not to print the log, do not fill in the default generated false</td>
</tr>
<tr>
<td>handle</td>
<td>String</td>
<td>False</td>
<td>False</td>
<td>Rule handler (Json objects, depending on each plug-in, different objects are passed)</td>
</tr>
<tr>
<td>conditionList</td>
<td>ConditionData</td>
<td>False</td>
<td>True</td>
<td>Conditional collections (Json List objects)</td>
</tr>
</tbody>
</table>

### conditionList

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>paramName</td>
<td>String</td>
<td>False</td>
<td>False</td>
<td>param name (The uri parameter type can be passed without)</td>
</tr>
<tr>
<td>paramType</td>
<td>String</td>
<td>True</td>
<td>False</td>
<td>param type (post, uri, query, host, header, cookie, req_method, domain)</td>
</tr>
<tr>
<td>operator</td>
<td>String</td>
<td>True</td>
<td>False</td>
<td>operator (match, =, regex, &gt;, &lt;, contains, SpEL, Groovy, TimeBefore, TimeAfter)</td>
</tr>
<tr>
<td>paramValue</td>
<td>Integer</td>
<td>False</td>
<td>False</td>
<td>param value</td>
</tr>
</tbody>
</table>

### Example

POST body

```json
{
    "pluginName": "divide",
    "selectorId": 123456,
    "handle": "{{"loadBalance":"random"}}",
    "conditionDataList": [{
```
"paramType": "uri",
"operator": "=",
"paramValue": "/test"
}
]

Result

Is rule id

xxxxx

19.22.12 Delete rule data

Delete rules based on selector id and rule id

Request Method

GET

Path

/plugin/rule/delete?selectorId=xxxx&id=xxxx

RequestParam

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>selectorId</td>
<td>String</td>
<td>true</td>
<td></td>
<td>selector ID</td>
</tr>
<tr>
<td>id</td>
<td>String</td>
<td>true</td>
<td></td>
<td>rule ID</td>
</tr>
</tbody>
</table>

19.22.13 Find Rule data List

Get all rules by selector ID
Request Method
GET

Path
/plugin/rule/findList?selectorId=xxxx

RequestParam

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>selectorId</td>
<td>String</td>
<td>true</td>
<td>selector id</td>
<td></td>
</tr>
</tbody>
</table>

19.23 Meta data

19.23.1 Save Or Update

Save Or Update Meta data

Request Method
POST

Path
/meta/saveOrUpdate

RequestParam

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MetaData</td>
<td>Metadata</td>
<td>True</td>
<td></td>
<td>Metadata object (pass Json object inside Body)</td>
</tr>
</tbody>
</table>

MetaData
### 19.23.2 Delete

Delete Meta data

**Request Method**

GET

**Path**

/meta/delete?rpcType=xxxx&&path=xxx

**RequestParam**

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>rpcType</td>
<td>String</td>
<td>true</td>
<td></td>
<td>rpc type (dubbo, sofa, tars, springCloud, motan, grpc)</td>
</tr>
<tr>
<td>path</td>
<td>String</td>
<td>true</td>
<td></td>
<td>path</td>
</tr>
</tbody>
</table>
19.24 App Sign Data

19.24.1 Save Or Update

Save Or Update App Sign Data

Request Method

POST

Path

/auth/saveOrUpdate

RequestParam

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AppAuthData</td>
<td>AppAuthData</td>
<td>True</td>
<td></td>
<td>Signature object (Json object passed inside the Body)</td>
</tr>
</tbody>
</table>

AppAuthData

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>appKey</td>
<td>String</td>
<td>True</td>
<td></td>
<td>app key</td>
</tr>
<tr>
<td>appSecret</td>
<td>String</td>
<td>True</td>
<td></td>
<td>app secret</td>
</tr>
<tr>
<td>enabled</td>
<td>Boolean</td>
<td>False</td>
<td></td>
<td>Whether to turn on</td>
</tr>
<tr>
<td>open</td>
<td>Boolean</td>
<td>False</td>
<td></td>
<td>is open</td>
</tr>
<tr>
<td>paramDataList</td>
<td>AuthParamData</td>
<td>false</td>
<td></td>
<td>Parameter set, open is true when you need to pass (Json list object)</td>
</tr>
<tr>
<td>AuthPathData</td>
<td>AuthPathData</td>
<td>false</td>
<td></td>
<td>Path collection, open is true when you need to pass (Json list object)</td>
</tr>
</tbody>
</table>

AuthParamData

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>appName</td>
<td>String</td>
<td>True</td>
<td></td>
<td>app name</td>
</tr>
<tr>
<td>appParam</td>
<td>String</td>
<td>True</td>
<td></td>
<td>app param</td>
</tr>
</tbody>
</table>
AuthPathData

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>appName</td>
<td>String</td>
<td>True</td>
<td>appname</td>
<td>app name</td>
</tr>
<tr>
<td>path</td>
<td>String</td>
<td>True</td>
<td>path</td>
<td></td>
</tr>
<tr>
<td>enabled</td>
<td>Boolean</td>
<td>False</td>
<td></td>
<td>Whether to turn on</td>
</tr>
</tbody>
</table>

### 19.24.2 Delete

Delete App Sign Data

**Request Method**

GET

**Path**

/auth/delete?appKey=xxxx

**RequestParam**

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>appKey</td>
<td>String</td>
<td>true</td>
<td></td>
<td>app key</td>
</tr>
</tbody>
</table>

### 19.25 Description

- This doc shows a demo for how to extend `org.springframework.web.server.WebFilter`.

### 19.26 CORS Support

- `org.apache.shenyu.web.filter.CrossFilter` is designed for WebFilter implementation.

```java
public class CrossFilter implements WebFilter {
    private static final String ALLOWED_HEADERS = "x-requested-with, authorization, Content-Type, Authorization, credential, X-XSRF-TOKEN,token,username,client";
```
private static final String ALLOWED_METHODS = "*";

private static final String ALLOWED_ORIGIN = "*";

private static final String ALLOWED_EXPOSE = "*";

private static final String MAX_AGE = "18000";

@override
@SuppressWarnings("all")
public Mono<Void> filter(final ServerWebExchange exchange, final WebFilterChain chain) {
    ServerHttpRequest request = exchange.getRequest();
    if (CorsUtils.isCorsRequest(request)) {
        ServerHttpResponse response = exchange.getResponse();
        HttpHeaders headers = response.getHeaders();
        headers.add("Access-Control-Allow-Origin", ALLOWED_ORIGIN);
        headers.add("Access-Control-Allow-Methods", ALLOWED_METHODS);
        headers.add("Access-Control-Max-Age", MAX_AGE);
        headers.add("Access-Control-Allow-Headers", ALLOWED_HEADERS);
        headers.add("Access-Control-Expose-Headers", ALLOWED_EXPOSE);
        headers.add("Access-Control-Allow-Credentials", "true");
        if (request.getMethod() == HttpMethod.OPTIONS) {
            response.setStatusCode(HttpStatus.OK);
            return Mono.empty();
        }
    }
    return chain.filter(exchange);
}

• Registering CrossFilter as a Spring Bean.

19.27 Filtering Spring Boot health check

• You can control the order by applying @Order to the implementation class.

@Component
@Order(-99)
public final class HealthFilter implements WebFilter {

    private static final String[] FILTER_TAG = {"/actuator/health", "/health_check "};

    @Override
    public Mono<Void> filter(@Nullable final ServerWebExchange exchange, @Nullable final WebFilterChain chain) {

ServerHttpServletRequest request = Objects.requireNonNull(exchange).getRequest();
String urlPath = request.getURI().getPath();
for (String check : FILTER_TAG) {
    if (check.equals(urlPath)) {
        String result = JsonUtils.toJson(
            new Health.Builder().up().
            build());
        DataBuffer dataBuffer = exchange.getResponse().bufferFactory().
            wrap(result.getBytes());
        return exchange.getResponse().writeWith(Mono.just(dataBuffer));
    }
}
return Objects.requireNonNull(chain).filter(exchange);

19.28 Extending

• Add a new class and inherit from org.apache.shenyu.web.filter.AbstractWebFilter.
• Implement abstract methods of parent class.

```java
/**
 * this is Template Method ,children Implement your own filtering logic.
 * @param exchange the current server exchange
 * @param chain provides a way to delegate to the next filter
 * @return {@code Mono< Boolean>} result: TRUE (is pass), and flow next filter; FALSE (is not pass) execute doDenyResponse(ServerWebExchange exchange)
 */
protected abstract Mono< Boolean> doFilter(ServerWebExchange exchange, WebFilterChain chain);

/**
 * this is Template Method ,children Implement your own And response client.
 * @param exchange the current server exchange.
 * @return {@code Mono< Void>} response msg.
 */
protected abstract Mono< Void> doDenyResponse(ServerWebExchange exchange);
```

• if method doFilter returns Mono<true>, this filter is passing, While rejecting, it will call method doDenyResponse and sending infos in response body to frontend.
19.29 Description

- This doc demonstrates how to get correct IP address and host when Apache ShenYu serves behind nginx reverse proxy.
- After fetched real IP and host, you can match them with plugins and selectors.

19.30 Default Implementation

- You need to config X-Forwarded-For in nginx first to get correct IP address and host.

19.31 Implement through a Plugin


```java
public interface RemoteAddressResolver {

    /**
     * Resolve inet socket address.
     *
     * @param exchange the exchange
     * @return the inet socket address
     */
    default InetSocketAddress resolve(ServerWebExchange exchange) {
        return exchange.getRequest().getRemoteAddress();
    }
}
```

- Register defined class as a Spring Bean.

```java
@Bean
public SignService customRemoteAddressResolver() {
    return new CustomRemoteAddressResolver();
}
```
19.32 Description

- This article gives an introduction to thread models in ShenYu and usage in various scenarios.

19.33 IO And Work Thread

- spring-webflux is one of dependencies of ShenYu, and it uses Netty thread model in lower layer.

19.34 Business Thread

- Use scheduling thread to execute by default.
- A fixed thread pool manages business threads, the number of threads is count in this formula: cpu * 2 + 1.

19.35 Type Switching

- reactor.core.scheduler.Schedulers.
- -Dshenyu.scheduler.type=fixed is a default config. If set to other value, a flexible thread pool will take place it.Schedulers.elastic().
- -Dshenyu.work.threads = xx is for configuring number of threads, the default value calculates in following formula cpu * 2 + 1 with a minimum of 16 threads.

19.36 description

- This doc gives a brief description for upload and download files using Apache ShenYu.

19.37 File Upload

- The default file size limit is 10M.
- For custom limitation, use --file.size with an integer variable. e.g. --file.size = 30
- Upload your files just as way you did before
19.38 File Download

- Apache ShenYu supports download files in stream. There is no need to change anything.

19.39 Description

- Users can customize the signature authentication algorithm to achieve verification.

19.40 Extension

- The default implementation is `org.apache.shenyu.plugin.sign.service.ComposableSignService`.

```java
@Bean
@ConditionalOnMissingBean(value = SignService.class, search = SearchStrategy.ALL)
public SignService signService() {
    return new ComposableSignService(new DefaultExtractor(), new DefaultSignProvider());
}
```

- Declare a new class named `CustomSignService` and implements `org.apache.shenyu.plugin.plugin.sign.service.SignService`.

```java
public interface SignService {

    /**
     * Gets verifyResult.
     * @param exchange exchange
     * @param requestBody requestBody
     * @return result
     */
    VerifyResult signatureVerify(ServerWebExchange exchange, String requestBody);

    /**
     * Gets verifyResult.
     * @param exchange exchange
     * @return result
     */
    VerifyResult signatureVerify(ServerWebExchange exchange);
}
```

- When returning is `isSuccess()` of `VerifyResult`, the sign verification passes. If there’s false, the `getReason()` of `VerifyResult` will be return to the frontend to show.

- Register defined class as a Spring Bean.
@Bean
public SignService customSignService() {
    return new CustomSignService();
}
20.1 Hardware

20.1.1 Back-end Mock Service Server:

- CPU: 4 cores and 8 threads Intel Cascade Lake @ 3.0GHz
- RAM: 16G

20.1.2 Gateway node server:

- CPU: 4 cores and 8 threads Intel Cascade Lake @ 3.0GHz
- RAM: 16G

The test tool takes up few resources and is installed on the gateway node server.

20.2 ShenYu Version

- ShenYu Admin: 2.6.0
- ShenYu Bootstrap: 2.6.0

20.3 Test Tool

wrk-4.2.0
20.4 Test Case Description

20.4.1 Instruction

- Use the Mock service to simulate an interface with an average response time of 20ms and about 2k response messages
- Each test lasts 3 minutes
- JDK version: OpenJdk-1.8.0
- The HTTP request side is tested with NettyClient and WebClient respectively
- Log level is set to WARN
- Apache ShenYu Bootstrap deploy mode: standalone
- Apache ShenYu Admin deploy in Back-end Mock Service Server

20.4.2 JVM Configuration

- -Xmx 4g
- -Xms 4g
- -Xmn 1g
- -Xss 512k
- -XX: +DisableExplicitGC
- -XX: LargePageSizeInBytes=128m

20.4.3 Public Configuration

- application.yml

```yaml
matchCache:
  selector:
    selectorEnabled: true
    initialCapacity: 10000 # initial capacity in cache
    maximumSize: 10000 # max size in cache
  rule:
    initialCapacity: 10000 # initial capacity in cache
    maximumSize: 65536 # max size in cache
  trie:
    enabled: true
    childrenSize: 10000
    pathVariableSize: 1000
    pathRuleCacheSize: 1000
    matchMode: antPathMatch
```
netty:
  http:
    # set to false, user can custom the netty tcp server config.
    webServerFactoryEnabled: true
    selectCount: 1
    workerCount: 8
    accessLog: false
    serverSocketChannel:
      soRcvBuf: 87380
      soBackLog: 128
      soReuseAddr: false
      connectTimeoutMillis: 10000
      writeBufferHighWaterMark: 65536
      writeBufferLowWaterMark: 32768
      writeSpinCount: 16
      autoRead: false
      allocType: "pooled"
      messageSizeEstimator: 8
      singleEventExecutorPerGroup: true
    socketChannel:
      soKeepAlive: false
      soReuseAddr: false
      soLinger: -1
      tcpNoDelay: true
      soRcvBuf: 87380
      soSndBuf: 16384
      ipTos: 0
      allowHalfClosure: false
      connectTimeoutMillis: 10000
      writeBufferHighWaterMark: 65536
      writeBufferLowWaterMark: 32768
      writeSpinCount: 16
      autoRead: false
      allocType: "pooled"
      messageSizeEstimator: 8
      singleEventExecutorPerGroup: true

file:
  enabled: false
  maxSize : 10

cross:
  enabled: false

logging:
  level:
    root: warn
Apache ShenYu document

- logback.xml

```xml
<root level="WARN">
  <appender-ref ref="ASYNC_STDOUT"/>
  <appender-ref ref="ASYNC_FILE"/>
  <appender-ref ref="ASYNC_ERROR_FILE"/>
</root>
```

### 20.4.4 WebClient Configuration

```java
httpClient:
  strategy: webClient # netty
  connectTimeout: 45000 # 45000
  responseTimeout: 3000 # 3000
  readerIdleTime: 3000 # 3000
  writerIdleTime: 3000 # 3000
  allIdleTime: 3000 # 3000
  readTimeout: 3000 # 3000
  writeTimeout: 3000 # 3000
  wiretap: false # false
  keepAlive: false # false
  maxInMemorySize: 1 # 1
  pool:
    type: ELASTIC # ELASTIC
    name: proxy # proxy
    maxConnections: 16 # 16
    acquireTimeout: 45000 # 45000
    maxIdleTime: 3000 # 3000
```

### 20.4.5 Netty Client Configuration

```java
httpClient:
  strategy: netty # netty
  connectTimeout: 45000 # 45000
  responseTimeout: 3000 # 3000
  readerIdleTime: 3000 # 3000
  writerIdleTime: 3000 # 3000
  allIdleTime: 3000 # 3000
  readTimeout: 3000 # 3000
  writeTimeout: 3000 # 3000
```

20.4. Test Case Description
**20.5 Benchmark Test Results**

- Direct Access to Back-end Test Result

<table>
<thead>
<tr>
<th>QPS</th>
<th>50% latency (ms)</th>
<th>75% latency (ms)</th>
<th>90% latency (ms)</th>
<th>99% latency (ms)</th>
<th>平均响应时间 (ms)</th>
<th>最大响应时间 (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>28998.2</td>
<td>19.81</td>
<td>23.78</td>
<td>28.26</td>
<td>41.24</td>
<td>20.92</td>
<td>402.90</td>
</tr>
</tbody>
</table>

- netty

<table>
<thead>
<tr>
<th>currency</th>
<th>QPS</th>
<th>50% latency (ms)</th>
<th>75% latency (ms)</th>
<th>90% latency (ms)</th>
<th>99% latency (ms)</th>
<th>平均响应时间 (ms)</th>
<th>最大响应时间 (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>20472.5</td>
<td>19.37</td>
<td>25.36</td>
<td>32.89</td>
<td>69.92</td>
<td>22.09</td>
<td>1043.33</td>
</tr>
<tr>
<td>800</td>
<td>20703.1</td>
<td>23.57</td>
<td>31.32</td>
<td>40.11</td>
<td>77.28</td>
<td>26.11</td>
<td>576.47</td>
</tr>
<tr>
<td>1000</td>
<td>20979.5</td>
<td>29.21</td>
<td>37.86</td>
<td>47.23</td>
<td>80.91</td>
<td>31.20</td>
<td>860.55</td>
</tr>
<tr>
<td>1200</td>
<td>21129.1</td>
<td>32.45</td>
<td>42.40</td>
<td>52.68</td>
<td>96.10</td>
<td>35.06</td>
<td>1070</td>
</tr>
</tbody>
</table>

- webClient
### 20.5.1 Direct Access to Back-end Test Result

#### Test Result

<table>
<thead>
<tr>
<th>QPS</th>
<th>50% latency (ms)</th>
<th>75% latency (ms)</th>
<th>90% latency (ms)</th>
<th>99% latency (ms)</th>
<th>Avg response time (ms)</th>
<th>Max response time (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>28998.2</td>
<td>19.81</td>
<td>23.78</td>
<td>28.26</td>
<td>41.24</td>
<td>20.92</td>
<td>402.90</td>
</tr>
</tbody>
</table>

#### Screenshot of Test Result

### 20.5.2 Access to Back-end Services via NettyClient Test Result

<table>
<thead>
<tr>
<th>currency</th>
<th>QPS</th>
<th>50% latency (ms)</th>
<th>75% latency (ms)</th>
<th>90% latency (ms)</th>
<th>99% latency (ms)</th>
<th>Avg response time (ms)</th>
<th>Max response time (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>600 currency</td>
<td>20472</td>
<td>19.37</td>
<td>25.36</td>
<td>32.89</td>
<td>69.92</td>
<td>22.09</td>
<td>1043.33</td>
</tr>
<tr>
<td>800 currency</td>
<td>20703</td>
<td>23.57</td>
<td>31.32</td>
<td>40.11</td>
<td>77.28</td>
<td>26.11</td>
<td>576.47</td>
</tr>
<tr>
<td>1000 currency</td>
<td>20979</td>
<td>29.21</td>
<td>37.86</td>
<td>47.23</td>
<td>80.91</td>
<td>31.20</td>
<td>860.55</td>
</tr>
<tr>
<td>1200 currency</td>
<td>21129</td>
<td>32.45</td>
<td>42.40</td>
<td>52.68</td>
<td>96.10</td>
<td>35.06</td>
<td>1070</td>
</tr>
</tbody>
</table>
## 20.5.3 Access to Back-end Services via WebClient Test Result

### Test Result

<table>
<thead>
<tr>
<th>concurrency</th>
<th>QPS</th>
<th>50% latency (ms)</th>
<th>75% latency (ms)</th>
<th>90% latency (ms)</th>
<th>99% latency (ms)</th>
<th>Avg response time (ms)</th>
<th>Max response time (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>600 concurrency</td>
<td>18640.</td>
<td>15.77</td>
<td>24.77</td>
<td>38.26</td>
<td>80.31</td>
<td>20.32</td>
<td>852.06</td>
</tr>
<tr>
<td>800 concurrency</td>
<td>18723.</td>
<td>18.12</td>
<td>28.69</td>
<td>44.96</td>
<td>95.3</td>
<td>23.52</td>
<td>765.26</td>
</tr>
<tr>
<td>1000 concurrency</td>
<td>18928.</td>
<td>19.99</td>
<td>31.42</td>
<td>49.09</td>
<td>108.84</td>
<td>25.93</td>
<td>1040</td>
</tr>
<tr>
<td>1200 concurrency</td>
<td>18965.</td>
<td>22.10</td>
<td>34.62</td>
<td>54.48</td>
<td>122.31</td>
<td>28.66</td>
<td>1075</td>
</tr>
</tbody>
</table>