
Apache ShenYu document

Apache ShenYu

Sep 14, 2023

Contents

1	Architecture	1
2	What is the Apache ShenYu?	2
3	Why named Apache ShenYu	3
4	Features	4
5	Mind map	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	Registry Center	16
14.2	Metrics Center	16
14.3	Load Balance	16
14.4	RateLimiter	17
14.5	Match Strategy	17

14.6	Parameter Data	17
14.7	Predicate Judge	17
14.8	Plugin	17
14.9	Selector And Rule	18
14.10	Traffic filtering	18
14.11	Plugin, Selector And Rule	18
14.12	Resource Permission	19
14.13	Data Permission	20
14.14	Meta Data	21
14.15	Dictionary Management	22
14.16	API Documentation	22
14.17	Design principle	23
14.17.1	Client	23
14.17.2	Server	25
14.18	Http Registry	26
14.19	Zookeeper Registry	26
14.20	Etcd Registry	27
14.21	Consul Registry	27
14.22	Nacos Register	28
14.23	SPI	29
14.24	Develop Phase	30
14.25	Prepare Phase	30
14.26	Runtime Phase	30
14.27	Preface	30
14.28	Principle Analysis	31
14.28.1	Zookeeper Synchronization	31
14.28.2	WebSocket Synchronization	33
14.28.3	Http Long Polling	33
14.28.4	Nacos Synchronization	34
14.28.5	Etcd Synchronization	34
14.28.6	Consul Synchronization	34
15	Deployment	35
15.1	Start Apache ShenYu Admin	35
15.2	Start Apache ShenYu Bootstrap	36
15.3	Environmental preparation	37
15.4	Download the compiled code	37
15.5	Download shell script	38
15.6	execute script	38
15.7	Initialize the shenyu-admin database	38
15.8	Modify the configuration file	38
15.9	Execute docker-compose	38
15.10	Example 1: Using h2 as a database	39
15.10.1	1. Create Namespace and ConfigMap	39
15.10.2	2. Create shenyu-admin	45

15.10.3 3. Create shenyu-bootstrap	46
15.11 Example 2: Use MySQL as the database	47
15.11.1 1. Create Namespace and ConfigMap	47
15.11.2 2. Create shenyu-admin	53
15.11.3 3. Create shenyu-bootstrap	55
15.12 Test Access	56
15.13 Database Initialize	56
15.13.1 Mysql	57
15.13.2 PostgreSql	57
15.13.3 Oracle	57
15.13.4 OpenGauss	58
15.14 Environmental preparation	58
15.15 Start Apache ShenYu Bootstrap	58
15.16 Selector and rule configuration	58
15.17 by postman	59
15.18 by curl	59
15.19 Create Docker Network	60
15.20 Start Apache ShenYu Admin	60
15.21 Start Apache ShenYu Bootstrap	62
15.22 Environmental Preparation	63
15.23 Start Apache ShenYu Admin	63
15.24 Start Apache ShenYu Boostrap	63
15.25 Start Nginx	64
15.25.1 Getting Started	65
15.26 Build from source	65
15.27 Greeting ETCD	65
15.28 Greeting Nacos	66
15.28.1 Greeting Zookeeper	67
15.29 Start Apache ShenYu Admin	67
15.30 Build your own gateway (recommended)	68
16 Quick Start	69
16.1 Environment to prepare	69
16.2 Run the shenyu-examples-websocket project	70
16.3 Test	70
16.4 Annexes	70
16.5 Environment to prepare	72
16.6 Run the shenyu-examples-tars project	73
16.7 Test	75
16.8 Environment to prepare	76
16.9 Run the shenyu-examples-motan project	77
16.10 Test	77
16.11 Environment to prepare	78
16.12 Run the shenyu-examples-sofa project	79
16.13 Test	85

16.14 Environment to prepare	87
16.15 Run the shenyu-examples-brpc project	87
16.16 Test	88
16.17 Environment to prepare	89
16.18 Run the shenyu-examples-dubbo project	91
16.19 Test	93
16.20 Prepare For Environment	95
16.21 Run the shenyu-examples-grpc project	96
16.22 Test	97
16.23 Streaming	98
16.24 Environment to prepare	102
16.25 Run the shenyu-examples-http project	103
16.26 Test	104
16.27 Environment to prepare	106
16.28 Run the shenyu-examples-springcloud project	108
16.29 Test	110
17 User Guide	113
18 Plugin Center	114
19 Developer	115
19.1 Description	115
19.2 Default Implementation	115
19.3 Implement through a Plugin	115
19.4 Description	116
19.5 IO And Work Thread	116
19.6 Business Thread	116
19.7 Type Switching	116
19.8 Description	117
19.9 Extension	117
19.10 Preparation	118
19.11 Start integration test locally	118
19.12 Description	118
19.13 Get token	118
19.14 Registration Services	120
19.15 Registration Metadata	121
19.16 description	122
19.17 File Upload	122
19.18 File Download	122
19.19 Description	123
19.20 Extension	123
19.21 Description	124
19.22 Default Implementation	125
19.23 Extensions	125
19.24 Description	127

19.25 CORS Support	127
19.26 Filtering Spring Boot health check	128
19.27 Extending org.apache.shenyu.web.filter.AbstractWebFilter	129
19.28 Description	129
19.29 Single Responsibility Plugins	130
19.30 Matching Traffic Processing Plugin	131
19.31 Subscribe your plugin data and do customized jobs	134
19.32 Dynamic loading	135
19.32.1 Plugin loading path details	136
19.33 Plugin jar upload	136
19.34 Description	136
19.35 Plugin	137
19.35.1 saveOrUpdate	137
Request Method	137
Path	137
Request Parameters	137
Example	137
19.35.2 CleanAll	138
Request Method	138
Path	138
19.35.3 Clean Plugin	138
Request Method	138
Path	138
RequestParam	138
19.35.4 Delete plugin	138
Request Method	139
Path	139
RequestParam	139
19.35.5 Delete All Plugin	139
Request Method	139
Path	139
19.35.6 Find plugin by name	139
Request Method	139
Path	139
RequestParam	140
19.35.7 Save or Update Selector	140
Request Method	140
Path	140
RequestParam	140
Example	142
Result	142
19.35.8 Add Selector And Rules	142
Request Method	142
Path	142
RequestParam	142

Example	144
19.35.9 Delete Selector	144
Request Method	144
Path	144
RequestParam	145
19.35.10 Find All Selector	145
Request Method	145
Path	145
RequestParam	145
19.35.11 Save or Update Rule Data	145
Request Method	145
Path	145
RequestParam	146
Example	147
Result	147
19.35.12 Delete rule data	147
Request Method	147
Path	147
RequestParam	147
19.35.13 Find Rule data List	148
Request Method	148
Path	148
RequestParam	148
19.36 Meta data	148
19.36.1 Save Or Update	148
Request Method	148
Path	148
RequestParam	148
19.36.2 Delete	149
Request Method	149
Path	149
RequestParam	149
19.37 App Sign Data	150
19.37.1 Save Or Update	150
Request Method	150
Path	150
RequestParam	150
19.37.2 Delete	151
Request Method	151
Path	151
RequestParam	151
19.38 Description	151
19.39 Time Consumption	151
19.40 Netty Optimization	152

20 Benchmark Test	153
20.1 Hardware	153
20.1.1 Back-end Mock Service Server:	153
20.1.2 Gateway node server:	153
20.2 ShenYu Version	153
20.3 Test Tool	153
20.4 Test Case Description	154
20.4.1 Instruction	154
20.4.2 JVM Configuration	154
20.4.3 Public Configuration	154
20.4.4 WebClient Configuration	156
20.4.5 Netty Client Configuration	156
20.5 Benchmark Test Results	157
20.5.1 Direct Access to Back-end Test Result	158
Test Result	158
Screenshot of Test Result	158
20.5.2 Access to Back-end Services via NettyClient Test Result	158
Screenshot of Test Result	159
20.5.3 Access to Back-end Services via WebClient Test Result	159
Test Result	159
Screenshot of Test Result	159

Architecture



2

What is the Apache ShenYu?

This is an asynchronous, high-performance, cross-language, responsive API gateway.

3

Why named Apache ShenYu

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.
-

4

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
-

Mind map



Quick Start (docker)

6.1 Run Apache ShenYu Admin

```
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

```
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>,

```
{
  "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"
}
```

Plugin

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](#).

8

Selector & Rule

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+
-

11

Stargazers over time

12

Contributor and Support

- How to Contribute
 - Mailing Lists
-

13

Known Users

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

14

Design

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](#).

14.1 Registry Center

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

14.2 Metrics Center

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

14.3 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`.

14.4 RateLimiter

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

14.5 Match Strategy

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

14.6 Parameter Data

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

14.7 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.

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.

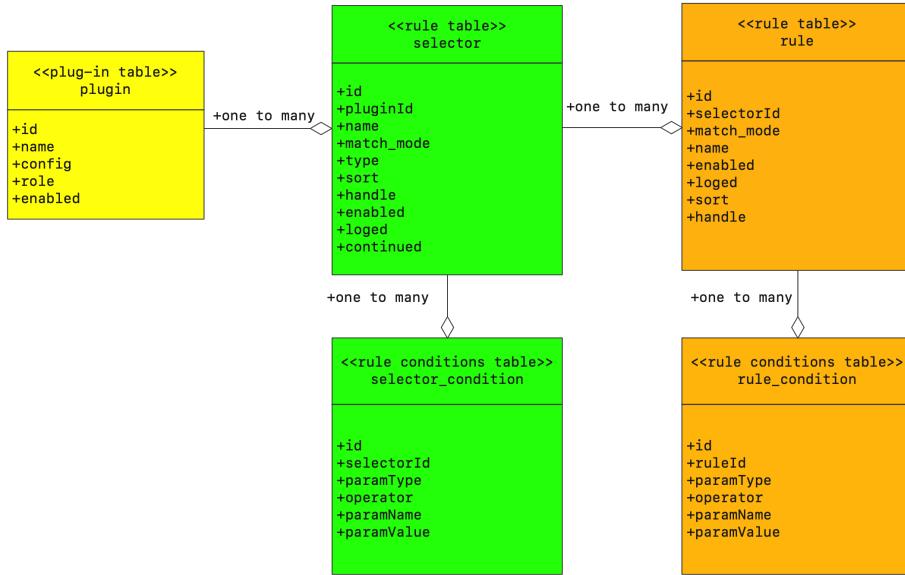
You can then use Match, =, SpEL, Regex, Groovy, Exclude, etc, to Match the desired data. Multi-group matching Adds matching policies that can use And/Or.

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

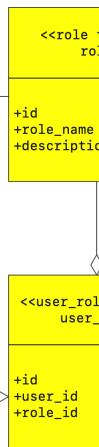
- **Plugin:** ShenYu uses the plugin design idea to realize the hot plug of the plugin, which is easy to expand. Built-in rich plugins, including RPC proxy, circuit breaker and current limiting, authority and certification, monitoring, and more.
- **Selector:** Each plugin can set multiple selectors 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

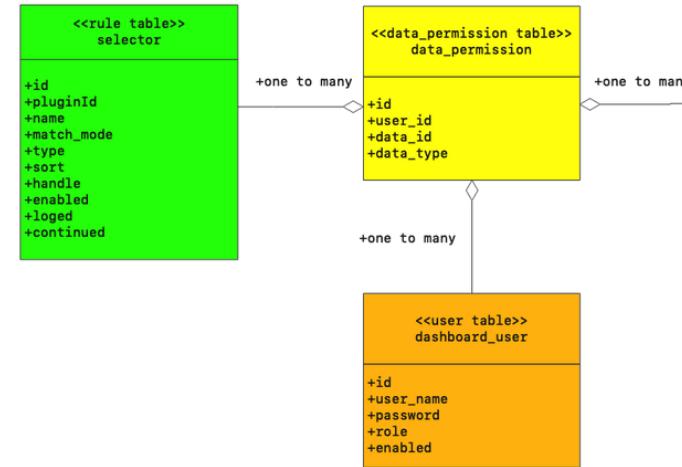
- The resource are the menus and buttons in the shenyu-admin console.
- Resource Permission use database to store user name, role, resource data and relationship.



- 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.

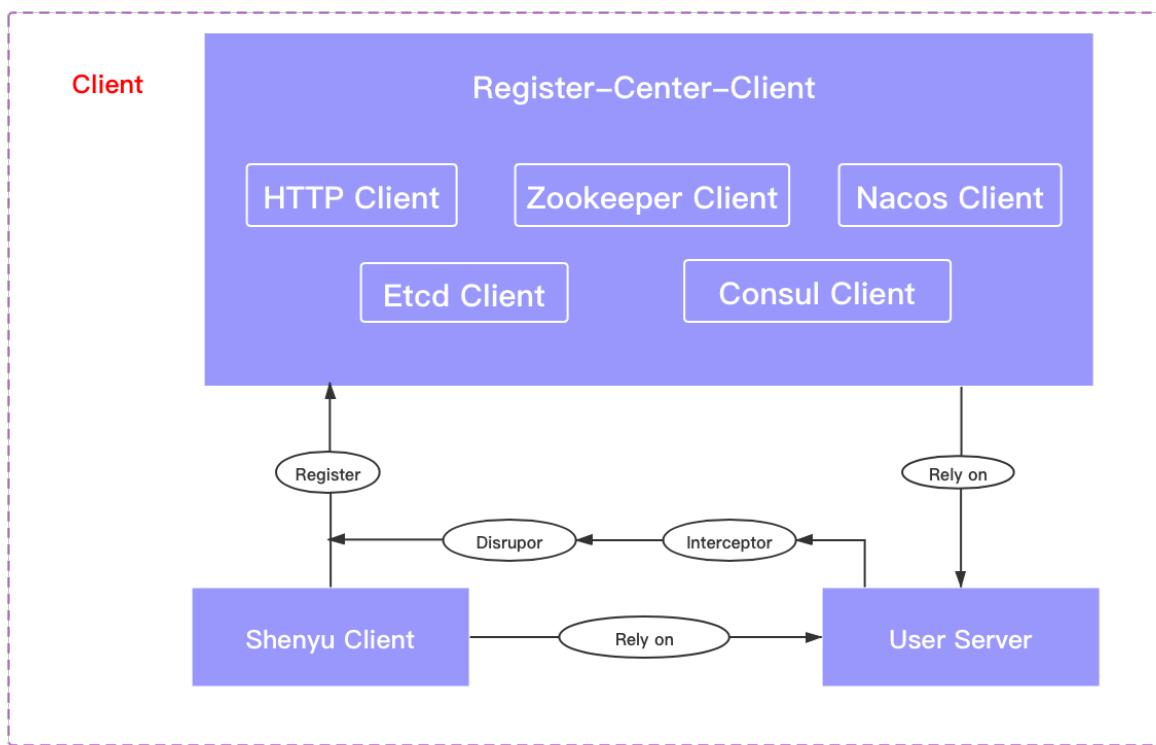
Application client access means to access your microservice to ShenYu gateway, currently supports HTTP, Dubbo, Spring Cloud, gRPC, Motan, Sofa, Tars and other protocols access.

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, Etcd, Consul, and Nacos.

Refer to the client access configuration in the user documentation for [Application Client Access Config](#)

14.17 Design principle

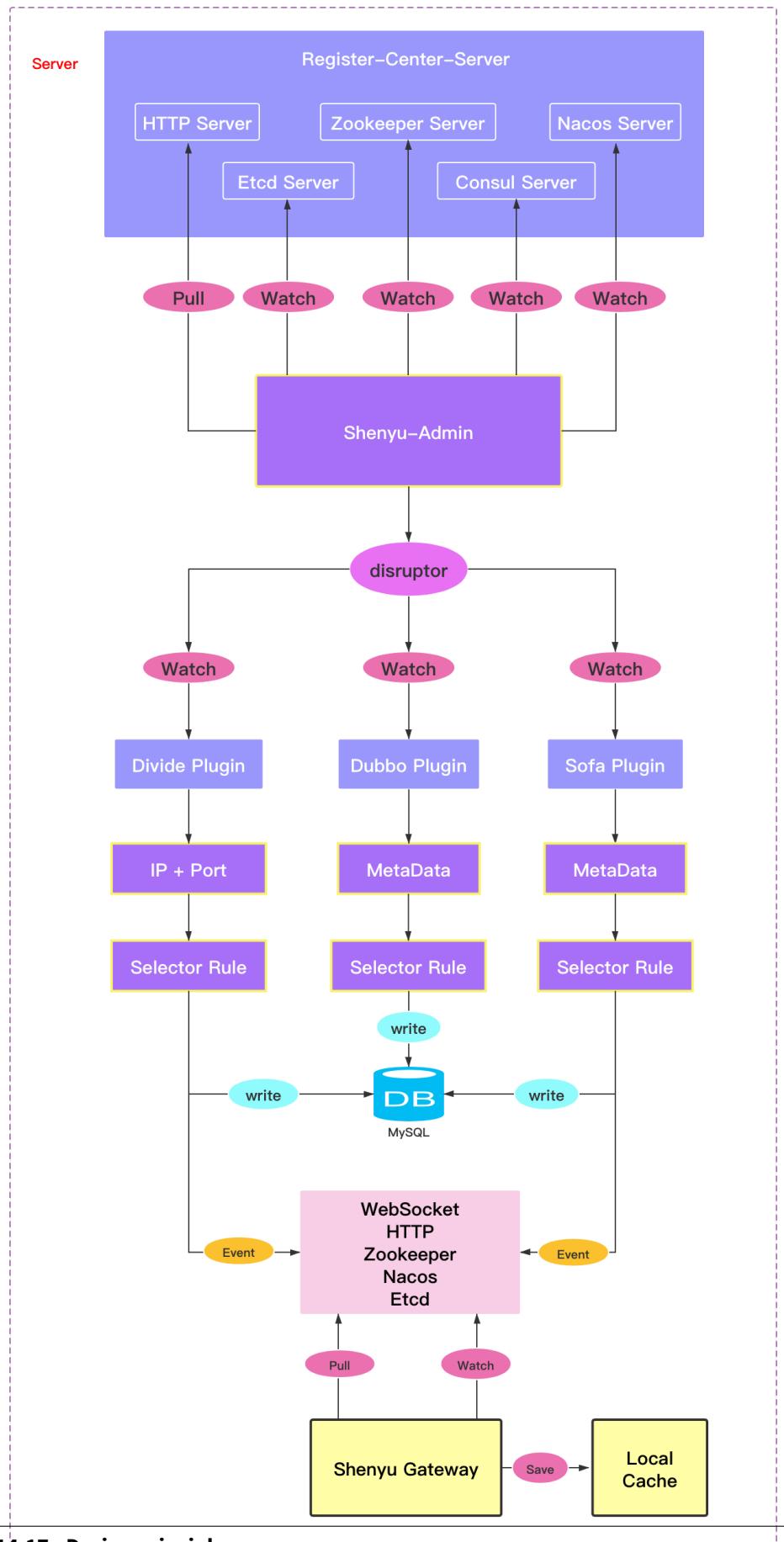
14.17.1 Client



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.

14.17.2 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.

14.18 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.

14.19 Zookeeper Registry

Zookeeper 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 above the Zookeeper nodes.

shenyu-admin uses the Watch mechanism of Zookeeper 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.

14.20 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.

14.21 Consul Registry

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

Key	Value
url	["appName":"http","contextPath":"/http","rpcType":"http","host":192.168.3.125,"port":8189}]

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

```

shenyu
  +-- register
    +-- metadata

```

```

    |   |   |
    |   |   +-- ${rpcType}
    |   |   |
    |   |   +-- ${contextPath}
    |   |
    |   +-- ${ruleName} : save metadata data of
MetaDataRegisterDTO
  
```

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 MetadateregisterDTO 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.

14.22 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:

```
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:

```
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.

14.23 SPI

<i>SPI Name</i>	<i>Description</i>
ShenyuClientRegisterRepository	ShenYu client register SPI

<i>Implementation Class</i>	<i>Description</i>
HttpClientRegisterRepository	Http client register repository
ZookeeperClientRegisterRepository	Zookeeper client register repository
EtcdClientRegisterRepository	Etcd client register repository
ConsulClientRegisterRepository	Consul client register repository
NacosClientRegisterRepository	Nacos client register repository

<i>SPI Name</i>	<i>Description</i>
ShenyuServerRegisterRepository	ShenYu server register SPI

<i>Implementation Class</i>	<i>Description</i>
ShenyuHttpRegistryController	Http server repository
ZookeeperServerRegisterRepository	Zookeeper server registry repository
EtcdServerRegisterRepository	Etcd server registry repository
ConsulServerRegisterRepository	Consul server registry repository
NacosServerRegisterRepository	Nacos server registry repository

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, Etcd 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, Etcd, 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.

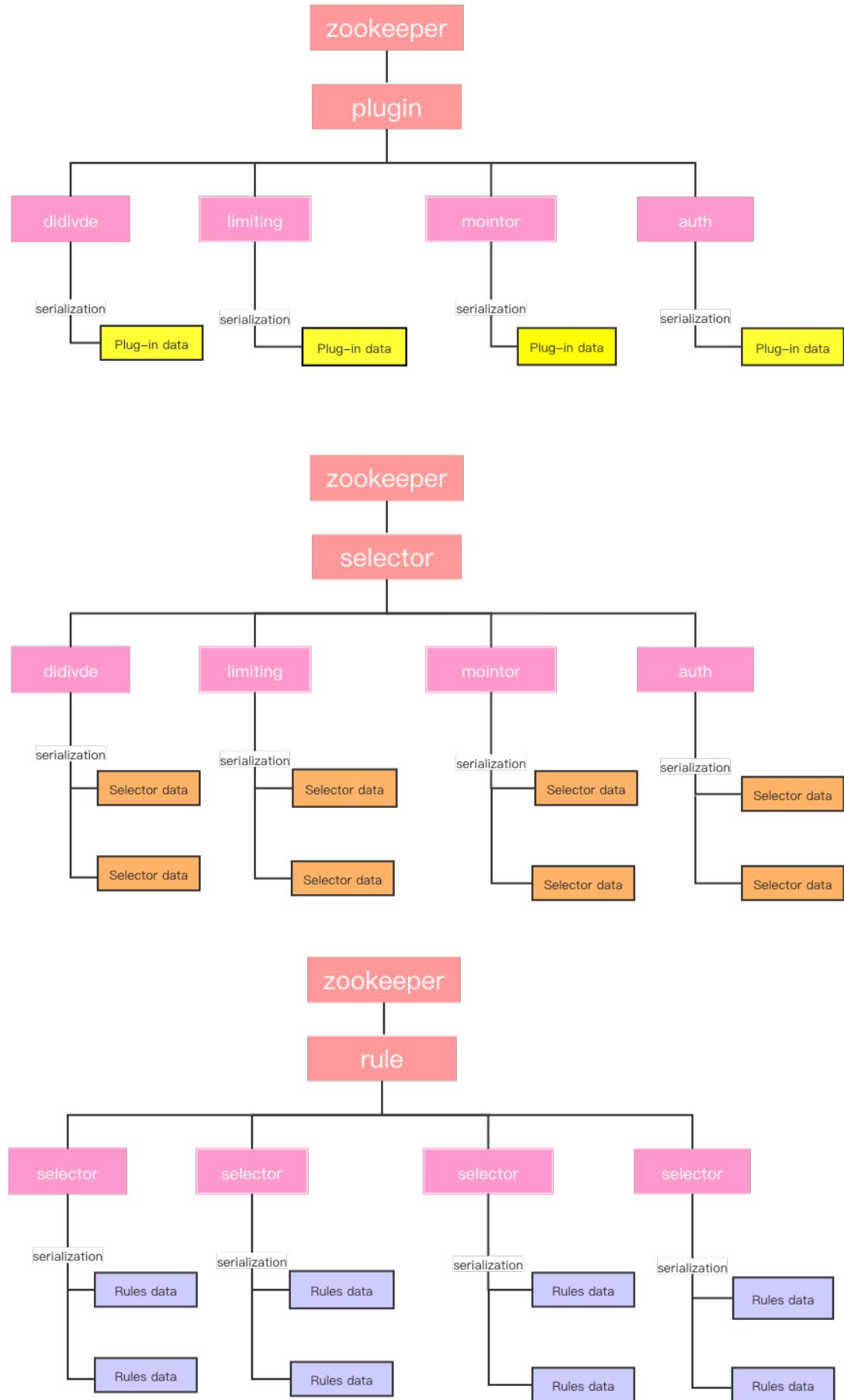
As showing picture below, shenyu-admin will issue a configuration change notification through EventPublisher after users change configuration, EventDispatcher will handle this modification and send configuration to corresponding event handler according to configured synchronization strategy.

- 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 is 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`.

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 `BlochingQueue`, 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 needs 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 needs 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 Etcd Synchronization

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

The native API for Etcd 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 Etcd, it will write the synchronous full amount of data into Etcd. When the sequential data send changes, it will update the configuration node in Etcd incrementally.

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

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 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](#).

15.1 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
```

- use OpenGauss to store data, follow the [guide document](#) to initialize the database, go to the /conf directory, and modify the JDBC configuration in application-og.yml.
- Modify spring.profiles.active in conf/application.yml to og

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

15.2 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.

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

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.

15.3 Environmental preparation

- Install JDK1.8+ locally
- Install Git locally
- Install Maven locally
- Choose a development tool, such as IDEA

15.4 Download the compiled code

- Download

```
git clone https://github.com/apache/shenyu.git
cd shenyu
mvn clean install '-Dmaven.javadoc.skip=true' '-B' '-Drat.skip=true' '-Djacoco.
skip=true' '-DskipITs' '-DskipTests'
```

- use the development tool to start `org.apache.shenyu.admin.ShenyuAdminBootstrap`, Visit <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`.
 - If you use OpenGuass for storage, follow the [guide document](#) to initialize the database and modify the JDBC configuration in `application-og.yml`, set the variable `--spring.profiles.active = og`.
- use the development tool to start `org.apache.shenyu.bootstrap.ShenyuBootstrapApplication`.

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

Please refer to [Helm Deployment](#) for details.

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](#).

15.5 Download shell script

```
curl -O https://raw.githubusercontent.com/apache/shenyu/master/shenyu-dist/shenyu-docker-compose-dist/src/main/resources/install.sh
```

15.6 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
```

15.7 Initialize the shenyu-admin database

Refer to the database initialization documentation to initialize the database.

15.8 Modify the configuration file

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

15.9 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 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

15.10 Example 1: Using h2 as a database

15.10.1 1. Create Namespace and ConfigMap

- create shenyu-ns.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: 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 #http #zookeeper #etcd #nacos #consul  
        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  
            allowOrigins: ws://shenyu-admin-svc.shenyu.svc.cluster.local:9095;ws://  
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: |
  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
        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
    serverLists: localhost:2181 #http://localhost:2379 #localhost:8848
    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
        allowOrigin: ws://shenyu-bootstrap-svc.shenyu.svc.cluster.local:9195
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:
"BA3253876AED6BC22D4A6FF53D8406C6AD864195ED144AB5C87621B6C233B548BAEAE6956DF346EC8C17F5EA10F35EE3"
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`

15.10.2 2. Create shenyu-admin

- create shenyu-admin.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`

15.10.3 3. Create shenyu-bootstrap

- create `shenyu-bootstrap.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:
        - 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`

15.11 Example 2: Use MySQL as the database

15.11.1 1. Create Namespace and ConfigMap

- create `shenyu-ns.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  
                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  
                    allowOrigins: ws://shenyu-admin-svc.shenyu.svc.cluster.local:9095;ws://  
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-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
    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
    serverLists: localhost:2181 #http://localhost:2379 #localhost:8848
    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
    allowOrigin: ws://shenyu-bootstrap-svc.shenyu.svc.cluster.local:9195
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:
"BA3253876AED6BC22D4A6FF53D8406C6AD864195ED144AB5C87621B6C233B548BAEAE6956DF346EC8C17F5EA10F35EE3
"
    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`

15.11.2 2. Create shenyu-admin

- create `shenyu-admin.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
    - 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`

15.11.3 3. Create shenyu-bootstrap

- create `shenyu-bootstrap.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:
        - 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`

15.12 Test Access

Access Address: `http://{K8S_CLUSTER_IP}:31095/`

Account/password: admin/123456

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

15.13 Database Initialize

Before deploying the Shenyu-admin project, initialize the database it uses (databases currently supported: 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.

15.13.1 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/>

15.13.2 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/>

15.13.3 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>
 - homepage: <https://www.oracle.com/database/technologies/appdev/jdbc-downloads.html>

15.13.4 OpenGauss

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

- sql script: <https://github.com/apache/shenyu/blob/master/db/init/og>
- driver:
 - maven repository: <https://mvnrepository.com/artifact/org.opengauss/opengauss-jdbc/5.0.0-og>
 - homepage: <https://gitee.com/opengauss/openGauss-connector-jdbc>

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.

15.14 Environmental preparation

- Install JDK1.8+ locally

15.15 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.

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

15.16 Selector and rule configuration

please refer to [Developer Local Model](#) add the selector and rule.

example:

- your service address is `http://127.0.0.1:8080/helloworld` and the response like follow:

```
{
  "name" : "Shenyu",
```

```
    "data" : "hello world"  
}
```

- use the follow data to add selector and rule

15.17 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

```
{  
    "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": "/**"  
        }]  
    }]  
}
```

15.18 by curl

```

"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 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.

15.19 Create Docker Network

```
docker network create shenyu
```

15.20 Start Apache ShenYu Admin

```
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:

```
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`:

```
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=utf-8&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:

```
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:

```
docker run --name shenyu-admin -e "SPRING_PROFILES_ACTIVE=pg" -e "spring.datasource.url=jdbc:postgresql://${your_ip_port}/shenyu?useUnicode=true&characterEncoding=utf-8&useSSL=false" -e "spring.datasource.username=${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:

```
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}
```

- 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}
```

- use OpenGauss to store data, follow the [guide document](#) to initialize the database, execute the following statement:

```
docker run --name shenyu-admin -e "SPRING_PROFILES_ACTIVE=og" -e "spring.datasource.url=jdbc:opengauss://localhost:5432/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-og.yml configuration in \${your_work_dir}/conf, modify the configuration spring.profiles.active = og 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}
```

15.21 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 $BOOTSTRAP_CONF:/opt/shenyu-bootstrap/conf \
--name shenyu-bootstrap \
--net shenyu \
--env SHENYU_SYNC_WEBSOCKET_URLS=ws://shenyu-admin:9095/websocket \
apache/shenyu-bootstrap:${current.version}
```

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.

15.22 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.

15.23 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
```

15.24 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.

```
> windows : 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.

15.25 Start Nginx

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

```
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.

```
> 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.

15.25.1 Getting Started

- Prerequisite:
 1. Luarocks
 2. OpenResty

15.26 Build from source

The first, clone the source from GitHub.

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

Then, build from source and install.

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

15.27 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.

```
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.

15.28 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 = "hash",
        nacos_base_url = "http://127.0.0.1:8848",
        username = "nacos",
        password = "naocs",
    })
}
```

1. `balancer_type` specify the balancer. It has supported `hash` 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.

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.

15.28.1 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.

```
openresty -s reload
```

Here is a completed [example](#) working with Zookeeper.

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.

15.29 Start Apache ShenYu Admin

- docker reference docker deployment Apache ShenYu Admin
- liunx/windows reference binary packages deployment Apache ShenYu Admin

15.30 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:

```
<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>
        <artifactId>shenyu-spring-boot-starter-gateway</artifactId>
        <version>${current.version}</version>
    </dependency>
    <dependency>
        <groupId>org.apache.shenyu</groupId>
        <artifactId>shenyu-spring-boot-starter-sync-data-websocket</artifactId>
        <version>${current.version}</version>
    </dependency>
</dependencies>
```

among them, \${project.version} please use the current latest version.

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

```
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
      allowOrigin: ws://localhost:9195
```

16

Quick Start

This document introduces how to quickly access the Apache ShenYu gateway using Websocket.

16.1 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.

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

16.2 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}
2022-08-09 23:37:35.019 INFO 61398 --- [or_consumer_-18] o.a.s.r.client.http.utils.RegisterUtils : uri client register success: {"protocol":"ws://","appName":"ws-annotation","contextPath":"/ws-annotation","rpcType":"websocket","host":"192.168.1.3","port":8001}
```

16.3 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.

16.4 Annexes

websocket debugging code

- Create a file called `websocket.html` and copy the following code into the file.
- Open `websocket.html` with Chrome.

```
<!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/>";
        }
    }

```

```

        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><br>
    <div id="show" class="show"></div>
</body>
</html>
<style>
    input {
        width: 400px;
        margin-bottom: 10px;
    }
    .show {
        width: 600px;
        height: 400px;
        overflow-y: auto;
        border: 1px solid #333;
        margin-top: 10px;
    }
</style>

```

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](#).

16.5 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.

shenyu-bootstrap need to import tars dependencies:

```
<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>

```

16.6 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:

```

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)
at java.io.FileInputStream.<init>(FileInputStream.java:93)
at com.qq.tars.common.util.Config.parseFile(Config.java:211)
at com.qq.tars.server.config.ConfigurationManager.
loadServerConfig(ConfigurationManager.java:63)
... 17 more
The exception occurred at load server config

```

The following log appears when the startup is successful:

```

[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.
The session manager service started...
[SERVER] server is ready...
2021-02-09 13:28:24.643  INFO 16016 --- [           main] o.s.b.w.embedded.tomcat.
TomcatWebServer : Tomcat started on port(s): 55290 (http) with context path ''
2021-02-09 13:28:24.645  INFO 16016 --- [           main] o.d.s.e.tars.
ShenyuTestTarsApplication      : Started ShenyuTestTarsApplication in 4.232 seconds
(JVM running for 5.1)
2021-02-09 13:28:24.828  INFO 16016 --- [pool-2-thread-1] o.d.s.client.common.

```

```

utils.RegisterUtils : tars client register success: {"appName":"127.0.0.1:21715",
"contextPath":"/tars","path":"/tars/helloInt","pathDesc":"","rpcType":"tars",
"serviceName": "ShenyuExampleServer.ShenyuExampleApp.HelloObj","methodName":
"helloInt","ruleName": "/tars/helloInt","parameterTypes": "int,java.lang.String",
"rpcExt": "{\"methodInfo\": [{\"methodName\": \"helloInt\", \"params\": [{}], \"returnType\": \"java.lang.Integer\"}, {\"methodName\": \"hello\", \"params\": [{}], \"returnType\": \"java.lang.String\"}]}", "enabled": true}
2021-02-09 13:28:24.837 INFO 16016 --- [pool-2-thread-1] o.d.s.client.common.
utils.RegisterUtils : tars client register success: {"appName":"127.0.0.1:21715",
"contextPath":"/tars","path":"/tars/hello","pathDesc":"","rpcType":"tars",
"serviceName": "ShenyuExampleServer.ShenyuExampleApp.HelloObj","methodName": "hello",
"ruleName": "/tars/hello","parameterTypes": "int,java.lang.String", "rpcExt": "{\"methodInfo\": [{\"methodName\": \"helloInt\", \"params\": [{}], \"returnType\": \"java.lang.Integer\"}, {\"methodName\": \"hello\", \"params\": [{}], \"returnType\": \"java.lang.String\"}]}", "enabled": true}

```

16.7 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:

Name	Open	Operation	RuleName	Open	UpdateTime	Operation
/tars	Open	Modify Delete	/tars/helloInt	Open	2021-02-09 13:15:27	Modify Delete
			/tars/Hello	Open	2021-02-09 13:15:27	Modify Delete

Use PostMan to simulate HTTP to request your tars service:

POST http://localhost:9195/tars/Hello

Body (1)

```

1 * {
2   "no": "123",
3   "name": "test"
4 }
5

```

Status: 200 OK Time: 30 ms

Pretty Raw Preview JSON

```

1 * [
2   "code": 200,
3   "message": "Access to success!",
4   "data": "hello no=123, name=test, time=1612867753446"
5 ]

```

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](#).

16.8 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:

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

<dependency>
    <groupId>com.weibo</groupId>
    <artifactId>motan-core</artifactId>
    <version>1.1.9</version>
</dependency>

<dependency>
    <groupId>com.weibo</groupId>
    <artifactId>motan-registry-zookeeper</artifactId>
    <version>1.1.9</version>
</dependency>

<dependency>
    <groupId>com.weibo</groupId>
    <artifactId>motan-transport-netty4</artifactId>
    <version>1.1.9</version>
</dependency>

<dependency>
    <groupId>com.weibo</groupId>
    <artifactId>motan-springsupport</artifactId>
    <version>1.1.9</version>
</dependency>
```

16.9 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:

```
2021-07-18 16:46:25.388 INFO 96 --- [           main] o.s.b.w.embedded.tomcat.
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
[zookeeper://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
2021-07-18 16:46:25.445 INFO 96 --- [ntLoopGroup-3-2] info
: NettyChannelHandler channelActive: remote=/192.168.1.8:49740 local=/
192.168.1.8:8002
2021-07-18 16:46:25.445 INFO 96 --- [ntLoopGroup-3-1] info
: NettyChannelHandler channelActive: remote=/192.168.1.8:49739 local=/
192.168.1.8:8002
2021-07-18 16:46:25.925 INFO 96 --- [or_consumer_-17] o.a.s.r.client.http.utils.
RegisterUtils : motan client register success: {"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}
```

16.10 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 Sofa RPC. You can get the code example of this document by clicking [here](#).

16.11 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:

```
<!-- apache shenyu sofa plugin start-->
<dependency>
    <groupId>com.alipay.sofa</groupId>
    <artifactId>sofa-rpc-all</artifactId>
    <version>5.7.6</version>
</dependency>
<dependency>
    <groupId>org.apache.curator</groupId>
    <artifactId>curator-client</artifactId>
    <version>4.0.1</version>
</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>

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

16.12 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":"org.dromara.shenyu.examples.sofa.api.entity.SofaSimpleTypeBean","rpcExt": "{\"loadbalance\":\"hash\", \"retries\":3, \"timeout\":-1}","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":"","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":"org.dromara.shenyu.examples.sofa.api.entity.SofaComplexTypeBean,
```

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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/findByIdsAndName","pathDesc":"","rpcType":"sofa",
"serviceName":"org.dromara.shenyu.examples.sofa.api.service.SofaMultiParamService",
"methodName":"findByIdsAndName","ruleName":"/sofa/findByIdsAndName",
"parameterTypes":"[Ljava.lang.Integer;,java.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}
2021-02-10 02:31:45.642 INFO 2156 --- [pool-1-thread-1] o.d.s.client.common.utils.
RegisterUtils : sofa client register success: {"appName":"sofa","contextPath":"/
sofa","path":"/sofa/batchSave","pathDesc":"","rpcType":"sofa","serviceName":"org.
dromara.shenyu.examples.sofa.api.service.SofaMultiParamService","methodName":
"batchSave","ruleName":"/sofa/batchSave","parameterTypes":"java.util.List#org.
dromara.shenyu.examples.sofa.api.entity.SofaSimpleTypeBean","rpcExt":"{\ \
"loadbalance\":\"hash\",\\\"retries\":3,\\\"timeout\\\":-1}","enabled":true}
2021-02-10 02:31:45.647 INFO 2156 --- [pool-1-thread-1] o.d.s.client.common.utils.
RegisterUtils : sofa client register success: {"appName":"sofa","contextPath":"/
sofa","path":"/sofa/findByIdList","pathDesc":"","rpcType":"sofa","serviceName":
"org.dromara.shenyu.examples.sofa.api.service.SofaMultiParamService","methodName":
"findByIdList","ruleName":"/sofa/findByIdList","parameterTypes":"java.util.List",
"rpcExt":"{\\"loadbalance\":\"hash\",\\\"retries\":3,\\\"timeout\\\":-1}","enabled":true}
2021-02-10 02:31:45.653 INFO 2156 --- [pool-1-thread-1] o.d.s.client.common.utils.
RegisterUtils : sofa client register success: {"appName":"sofa","contextPath":"/
sofa","path":"/sofa/saveComplexBean","pathDesc":"","rpcType":"sofa","serviceName":
"org.dromara.shenyu.examples.sofa.api.service.SofaMultiParamService","methodName":
"saveComplexBean","ruleName":"/sofa/saveComplexBean","parameterTypes":"org.dromara.
shenyu.examples.sofa.api.entity.SofaComplexTypeBean","rpcExt":"{\\"loadbalance\\":\
\"hash\",\\\"retries\":3,\\\"timeout\\\":-1}","enabled":true}
2021-02-10 02:31:45.660 INFO 2156 --- [pool-1-thread-1] o.d.s.client.common.utils.
RegisterUtils : sofa client register success: {"appName":"sofa","contextPath":"/
sofa","path":"/sofa/findByIdsAndName","pathDesc":"","rpcType":"sofa","serviceName":
"org.dromara.shenyu.examples.sofa.api.service.SofaMultiParamService","methodName":
"findByIdsAndName","ruleName":"/sofa/findByIdsAndName","parameterTypes":"java.util.

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List,java.lang.String","rpcExt":"{\"loadbalance\":\"hash\",\"retries\":3,\"timeout\"
\":-1\"},\"enabled\":true}
2021-02-10 02:31:46.055 INFO 2156 --- [           main] o.a.c.f.imps.
CuratorFrameworkImpl      : Starting
2021-02-10 02:31:46.059 INFO 2156 --- [           main] org.apache.zookeeper.
ZooKeeper      : Client environment:zookeeper.version=3.4.6-1569965, built on
02/20/2014 09:09 GMT
2021-02-10 02:31:46.059 INFO 2156 --- [           main] org.apache.zookeeper.
ZooKeeper      : Client environment:host.name=host.docker.internal
2021-02-10 02:31:46.059 INFO 2156 --- [           main] org.apache.zookeeper.
ZooKeeper      : Client environment:java.version=1.8.0_211
2021-02-10 02:31:46.059 INFO 2156 --- [           main] org.apache.zookeeper.
ZooKeeper      : Client environment:java.vendor=Oracle Corporation
2021-02-10 02:31:46.059 INFO 2156 --- [           main] org.apache.zookeeper.
ZooKeeper      : Client environment:java.home=C:\Program Files\Java\jdk1.8.0_
211\jre
2021-02-10 02:31:46.059 INFO 2156 --- [           main] org.apache.zookeeper.
ZooKeeper      : Client environment:java.class.path=C:\Program Files\Java\
jdk1.8.0_211\jre\lib\charsets.jar;C:\Program Files\Java\jdk1.8.0_211\jre\lib\
deploy.jar;C:\Program Files\Java\jdk1.8.0_211\jre\lib\ext\access-bridge-64.jar;C:\\
Program Files\Java\jdk1.8.0_211\jre\lib\ext\cldrdata.jar;C:\Program Files\Java\
jdk1.8.0_211\jre\lib\ext\dnsns.jar;C:\Program Files\Java\jdk1.8.0_211\jre\lib\ext\
jaccess.jar;C:\Program Files\Java\jdk1.8.0_211\jre\lib\ext\jfxrt.jar;C:\Program
Files\Java\jdk1.8.0_211\jre\lib\ext\localizedata.jar;C:\Program Files\Java\jdk1.8.0_
211\jre\lib\ext\nashorn.jar;C:\Program Files\Java\jdk1.8.0_211\jre\lib\ext\sunec.
jar;C:\Program Files\Java\jdk1.8.0_211\jre\lib\ext\sunjce_provider.jar;C:\Program
Files\Java\jdk1.8.0_211\jre\lib\ext\sunmscapi.jar;C:\Program Files\Java\jdk1.8.0_
211\jre\lib\ext\sunpkcs11.jar;C:\Program Files\Java\jdk1.8.0_211\jre\lib\ext\zipfs.
jar;C:\Program Files\Java\jdk1.8.0_211\jre\lib\javaws.jar;C:\Program Files\Java\
jdk1.8.0_211\jre\lib\jce.jar;C:\Program Files\Java\jdk1.8.0_211\jre\lib\jfr.jar;C:\\
Program Files\Java\jdk1.8.0_211\jre\lib\jfxswt.jar;C:\Program Files\Java\jdk1.8.0_
211\jre\lib\jsse.jar;C:\Program Files\Java\jdk1.8.0_211\jre\lib\management-agent.
jar;C:\Program Files\Java\jdk1.8.0_211\jre\lib\plugin.jar;C:\Program Files\Java\
jdk1.8.0_211\jre\lib\resources.jar;C:\Program Files\Java\jdk1.8.0_211\jre\lib\rt.
jar;D:\\X\\dlm_github\\shenyu\\shenyu-examples\\shenyu-examples-sofa\\shenyu-examples-
sofa-service\\target\\classes;D:\\SOFT\\m2\\repository\\com\\alipay\\sofa\\rpc-sofa-boot-
starter\\6.0.4\\rpc-sofa-boot-starter-6.0.4.jar;D:\\SOFT\\m2\\repository\\com\\alipay\\
sofa\\rpc-sofa-boot-core\\6.0.4\\rpc-sofa-boot-core-6.0.4.jar;D:\\SOFT\\m2\\repository\\
com\\alipay\\sofa\\sofa-rpc-all\\5.5.7\\sofa-rpc-all-5.5.7.jar;D:\\SOFT\\m2\\repository\\
com\\alipay\\sofa\\bolt\\1.4.6\\bolt-1.4.6.jar;D:\\SOFT\\m2\\repository\\org\\javassist\\
javassist\\3.20.0-GA\\javassist-3.20.0-GA.jar;D:\\SOFT\\m2\\repository\\io\\netty\\netty-
all\\4.1.43.Final\\netty-all-4.1.43.Final.jar;D:\\SOFT\\m2\\repository\\com\\alipay\\sofa\\
hessian\\3.3.6\\hessian-3.3.6.jar;D:\\SOFT\\m2\\repository\\com\\alipay\\sofa\\tracer-core\\
2.1.2\\tracer-core-2.1.2.jar;D:\\SOFT\\m2\\repository\\io\\opentracing\\opentracing-api\\0.
22.0\\opentracing-api-0.22.0.jar;D:\\SOFT\\m2\\repository\\io\\opentracing\\opentracing-
noop\\0.22.0\\opentracing-noop-0.22.0.jar;D:\\SOFT\\m2\\repository\\io\\opentracing\\
opentracing-mock\\0.22.0\\opentracing-mock-0.22.0.jar;D:\\SOFT\\m2\\repository\\io\\
opentracing\\opentracing-util\\0.22.0\\opentracing-util-0.22.0.jar;D:\\SOFT\\m2\\

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repository\com\alipay\sofa\lookout\lookout-api\1.4.1\lookout-api-1.4.1.jar;D:\SOFT\m2\repository\com\alipay\sofa\runtime-sofa-boot-starter\3.1.4\runtime-sofa-boot-starter-3.1.4.jar;D:\SOFT\m2\repository\org\apache\curator\curator-client\2.9.1\curator-client-2.9.1.jar;D:\SOFT\m2\repository\org\apache\zookeeper\zookeeper\3.4.6\zookeeper-3.4.6.jar;D:\SOFT\m2\repository\log4j\log4j\1.2.16\log4j-1.2.16.jar;D:\SOFT\m2\repository\jline\jline\0.9.94\jline-0.9.94.jar;D:\SOFT\m2\repository\io\netty\netty\3.7.0.Final\netty-3.7.0.Final.jar;D:\SOFT\m2\repository\com\google\guava\guava\16.0.1\guava-16.0.1.jar;D:\SOFT\m2\repository\org\apache\curator\curator-framework\2.9.1\curator-framework-2.9.1.jar;D:\SOFT\m2\repository\org\apache\curator\curator-recipes\2.9.1\curator-recipes-2.9.1.jar;D:\SOFT\m2\repository\org\jboss\resteasy\resteasy-jaxrs\3.0.12.Final\resteasy-jaxrs-3.0.12.Final.jar;D:\SOFT\m2\repository\org\jboss\spec\javax\annotation\jboss-annotations-api_1.1_spec\1.0.1.Final\jboss-annotations-api_1.1_spec-1.0.1.Final.jar;D:\SOFT\m2\repository\javax\activation\activation\1.1.1\activation-1.1.1.jar;D:\SOFT\m2\repository\org\apache\httpcomponents\httpclient\4.5.10\httpclient-4.5.10.jar;D:\SOFT\m2\repository\org\apache\httpcomponents\httpcore\4.4.12\httpcore-4.4.12.jar;D:\SOFT\m2\repository\org\commons-io\commons-io\2.1\commons-io-2.1.jar;D:\SOFT\m2\repository\net\jcip\jcip-annotations\1.0\jcip-annotations-1.0.jar;D:\SOFT\m2\repository\org\jboss\resteasy\resteasy-client\3.0.12.Final\resteasy-client-3.0.12.Final.jar;D:\SOFT\m2\repository\org\jboss\resteasy\resteasy-jackson-provider\3.0.12.Final\resteasy-jackson-provider-3.0.12.Final.jar;D:\SOFT\m2\repository\org\codehaus\jackson\jackson-core-asl\1.9.12\jackson-core-asl-1.9.12.jar;D:\SOFT\m2\repository\org\codehaus\jackson\jackson-mapper-asl\1.9.12\jackson-mapper-asl-1.9.12.jar;D:\SOFT\m2\repository\org\codehaus\jackson\jackson-jaxrs\1.9.12\jackson-jaxrs-1.9.12.jar;D:\SOFT\m2\repository\org\codehaus\jackson\jackson-xc\1.9.12\jackson-xc-1.9.12.jar;D:\SOFT\m2\repository\org\jboss\resteasy\resteasy-netty4\3.0.12.Final\resteasy-netty4-3.0.12.Final.jar;D:\SOFT\m2\repository\org\jboss\resteasy\resteasy-validator-provider-11\3.0.12.Final\resteasy-validator-provider-11-3.0.12.Final.jar;D:\SOFT\m2\repository\com\fasterxml\classmate\1.5.1\classmate-1.5.1.jar;D:\SOFT\m2\repository\org\jboss\resteasy\resteasy-jaxrs-api\3.0.12.Final\jaxrs-api-3.0.12.Final.jar;D:\SOFT\m2\repository\org\jboss\resteasy\resteasy-multipart-provider\3.0.12.Final\resteasy-multipart-provider-3.0.12.Final.jar;D:\SOFT\m2\repository\org\jboss\resteasy\resteasy-jaxb-provider\3.0.12.Final\resteasy-jaxb-provider-3.0.12.Final.jar;D:\SOFT\m2\repository\com\sun\xml\bind\jaxb-impl\2.2.7\jaxb-impl-2.2.7.jar;D:\SOFT\m2\repository\com\sun\xml\bind\jaxb-core\2.2.7\jaxb-core-2.2.7.jar;D:\SOFT\m2\repository\javax\xml\bind\jaxb-api\2.3.1\jaxb-api-2.3.1.jar;D:\SOFT\m2\repository\javax\activation\javax.activation-api\1.2.0\javax.activation-api-1.2.0.jar;D:\SOFT\m2\repository\com\sun\istack\istack-commons-runtime\2.16\istack-commons-runtime-2.16.jar;D:\SOFT\m2\repository\com\sun\xml\fastinfoset\FastInfoset\1.2.12\FastInfoset-1.2.12.jar;D:\SOFT\m2\repository\javax\xml\bind\jsr173_api\1.0\jsr173_api-1.0.jar;D:\SOFT\m2\repository\javax\mail\mail\1.5.0-b01\mail-1.5.0-b01.jar;D:\SOFT\m2\repository\org\apache\james\apache-mime4j\0.6\apache-mime4j-0.6.jar;D:\SOFT\m2\repository\commons-logging\commons-logging\1.1.1\commons-logging-1.1.1.jar;D:\SOFT\m2\repository\com\alibaba\dubbo\2.4.10\dubbo-2.4.10.jar;D:\SOFT\m2\repository\org\jboss\netty\netty\3.2.5.Final\netty-3.2.5.Final.jar;D:\SOFT\m2\repository\com\101tec\zkclient\0.10\zkclient-0.10.jar;D:\SOFT\m2\repository\com\alibaba\nacos\nacos-api\1.0.0\nacos-api-1.0.0.jar;D:\SOFT\m2\repository\com\alibaba\fastjson\1.2.47\fastjson-1.2.47.jar;D:\SOFT\m2\repository\org\apache\
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commons\commons-lang3\3.9\commons-lang3-3.9.jar;D:\SOFT\m2\repository\com\alibaba\nacos\nacos-client\1.0.0\nacos-client-1.0.0.jar;D:\SOFT\m2\repository\com\alibaba\nacos\nacos-common\1.0.0\nacos-common-1.0.0.jar;D:\SOFT\m2\repository\commons-codec\commons-codec\1.13\commons-codec-1.13.jar;D:\SOFT\m2\repository\com\fasterxml\jackson\core\jackson-core\2.10.1\jackson-core-2.10.1.jar;D:\SOFT\m2\repository\com\fasterxml\jackson\core\jackson-databind\2.10.1\jackson-databind-2.10.1.jar;D:\SOFT\m2\repository\com\fasterxml\jackson\core\jackson-annotations\2.10.1\jackson-annotations-2.10.1.jar;D:\SOFT\m2\repository\io\prometheus\simpleclient\0.5.0\simpleclient-0.5.0.jar;D:\SOFT\m2\repository\org\springframework\spring-beans\5.2.2.RELEASE\spring-beans-5.2.2.RELEASE.jar;D:\SOFT\m2\repository\org\springframework\spring-core\5.2.2.RELEASE\spring-core-5.2.2.RELEASE.jar;D:\SOFT\m2\repository\org\springframework\spring-jcl\5.2.2.RELEASE\spring-jcl-5.2.2.RELEASE.jar;D:\SOFT\m2\repository\com\alipay\sofa\infra-sofa-boot-starter\3.1.4\infra-sofa-boot-starter-3.1.4.jar;D:\SOFT\m2\repository\com\alipay\sofa\common\log-sofa-boot-starter\1.0.18\log-sofa-boot-starter-1.0.18.jar;D:\SOFT\m2\repository\org\springframework\spring-context\5.2.2.RELEASE\spring-context-5.2.2.RELEASE.jar;D:\SOFT\m2\repository\org\springframework\spring-aop\5.2.2.RELEASE\spring-aop-5.2.2.RELEASE.jar;D:\SOFT\m2\repository\org\springframework\spring-expression\5.2.2.RELEASE\spring-expression-5.2.2.RELEASE.jar;D:\SOFT\m2\repository\com\alipay\sofa\common\sofa-common-tools\1.0.18\sofa-common-tools-1.0.18.jar;D:\SOFT\m2\repository\org\springframework\boot\spring-boot-starter-validation\2.2.2.RELEASE\spring-boot-starter-validation-2.2.2.RELEASE.jar;D:\SOFT\m2\repository\jakarta\validation\jakarta.validation-api\2.0.1\jakarta.validation-api-2.0.1.jar;D:\SOFT\m2\repository\org\hibernate\validator\hibernate-validator\6.0.18.Final\hibernate-validator-6.0.18.Final.jar;D:\SOFT\m2\repository\org\jboss\logging\jboss-logging\3.4.1.Final\jboss-logging-3.4.1.Final.jar;D:\SOFT\m2\repository\org\apache\tomcat\embed\tomcat-embed-el\9.0.29\tomcat-embed-el-9.0.29.jar;D:\SOFT\m2\repository\org\springframework\boot\spring-boot-autoconfigure\2.2.2.RELEASE\spring-boot-autoconfigure-2.2.2.RELEASE.jar;D:\SOFT\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:\SOFT\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:\SOFT\m2\repository\org\springframework\boot\spring-boot-starter\2.2.2.RELEASE\spring-boot-starter-2.2.2.RELEASE.jar;D:\SOFT\m2\repository\org\springframework\boot\spring-boot-starter-logging\2.2.2.RELEASE\spring-boot-starter-logging-2.2.2.RELEASE.jar;D:\SOFT\m2\repository\ch\qos\logback\logback-classic\1.2.3\logback-classic-1.2.3.jar;D:\SOFT\m2\repository\ch\qos\logback\logback-core\1.2.3\logback-core-1.2.3.jar;D:\SOFT\m2\repository\org\apache\logging\log4j\log4j-to-slf4j\2.12.1\log4j-to-slf4j-2.12.1.jar;D:\SOFT\m2\repository\org\apache\logging\log4j\log4j-api\2.12.1\log4j-api-2.12.1.jar;D:\SOFT\m2\repository\org\slf4j\jul-to-slf4j\1.7.29\jul-to-slf4j-1.7.29.jar;D:\SOFT\m2\repository\jakarta\annotation\jakarta.annotation-api\1.3.5\jakarta.annotation-api-1.3.5.jar;D:\SOFT\m2\repository\org\yaml\snakeyaml\1.25\snakeyaml-1.25.jar;D:\X\dlm_github\shenyu\shenyu-client\shenyu-client-sofa\target\classes;D:\X\dlm_github\shenyu\shenyu-client\shenyu-client-common\target\classes;D:\X\dlm_github\shenyu\shenyu-common\target\classes;D:\SOFT\m2\repository\org\springframework\boot\spring-boot-starter-json\2.2.2.RELEASE\spring-boot-starter-

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json-2.2.2.RELEASE.jar;D:\SOFT\m2\repository\org\springframework\spring-web\5.2.2.
RELEASE\spring-web-5.2.2.RELEASE.jar;D:\SOFT\m2\repository\com\fasterxml\jackson\
datatype\jackson-datatype-jdk8\2.10.1\jackson-datatype-jdk8-2.10.1.jar;D:\SOFT\m2\
repository\com\fasterxml\jackson\datatype\jackson-datatype-jsr310\2.10.1\jackson-
datatype-jsr310-2.10.1.jar;D:\SOFT\m2\repository\com\fasterxml\jackson\module\
jackson-module-parameter-names\2.10.1\jackson-module-parameter-names-2.10.1.jar;D:\\
SOFT\m2\repository\com\.squareup\okhttp3\okhttp\3.14.4\okhttp-3.14.4.jar;D:\SOFT\m2\
repository\com\.squareup\okio\okio\1.17.2\okio-1.17.2.jar;D:\SOFT\m2\repository\com\
google\code\gson\gson\2.8.6\gson-2.8.6.jar;D:\SOFT\m2\repository\org\slf4j\slf4j-
api\1.7.29\slf4j-api-1.7.29.jar;D:\SOFT\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.
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:\SOFT\apache-maven-3.5.0\bin;C:\Program Files\Go\bin;
C:\Program Files\nodejs\;C:\Program Files\Python\Python38\;C:\Program Files\
OpenSSL-Win64\bin;C:\Program Files\Git\bin;D:\SOFT\protobuf-2.5.0\src;D:\SOFT\zlib-
1.2.8;c:\Program Files (x86)\Microsoft SQL Server\100\Tools\Binn\;c:\Program Files\
Microsoft SQL Server\100\Tools\Binn\;c:\Program Files\Microsoft SQL Server\100\DTs\
Binn\;C:\Program Files\Docker\Docker\resources\bin;C:\ProgramData\DockerDesktop\
version-bin;D:\SOFT\gradle-6.0-all\gradle-6.0\bin;C:\Program Files\mingw-w64\x86_
64-8.1.0-posix-seh-rt_v6-rev0\mingw64\bin;D:\SOFT\hugo_extended_0.55.5_Windows-
64bit;C:\Users\DL\AppData\Local\Microsoft\WindowsApps;C:\Users\DL\go\bin;C:\\
Users\DL\AppData\Roaming\npm\;C:\Program Files\Microsoft VS Code\bin;C:\Program
Files\rimba\cli\bin;.
2021-02-10 02:31:46.060 INFO 2156 --- [           main] org.apache.zookeeper.
ZooKeeper          : Client environment:java.io.tmpdir=C:\Users\DL\AppData\Local\
Temp\
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=DL
2021-02-10 02:31:46.060 INFO 2156 --- [           main] org.apache.zookeeper.
ZooKeeper          : Client environment:user.home=C:\Users\DL
2021-02-10 02:31:46.060 INFO 2156 --- [           main] org.apache.zookeeper.
ZooKeeper          : Client environment:user.dir=D:\X\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)

```

16.13 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:

SelectorList			Add	RulesList			C Synchronous sofa	Add	
Name	Open	Operation				RuleName	Open	UpdateTime	Operation
/sofa	Open	Modify Delete	<	1	>	/sofa/insert	Open	2021-02-10 02:16:12	Modify Delete
			+			/sofa/findByld	Open	2021-02-10 02:16:12	Modify Delete
			+			/sofa/findAll	Open	2021-02-10 02:16:12	Modify Delete
			+			/sofa/batchSaveNameAndId	Open	2021-02-10 02:16:12	Modify Delete
			+			/sofa/saveComplexBeanAndName	Open	2021-02-10 02:16:12	Modify Delete
			+			/sofa/findByArrayIdsAndName	Open	2021-02-10 02:16:12	Modify Delete
			+			/sofa/findByStringArray	Open	2021-02-10 02:16:12	Modify Delete
			+			/sofa/saveTwoList	Open	2021-02-10 02:16:12	Modify Delete
			+			/sofa/batchSave	Open	2021-02-10 02:16:12	Modify Delete
			+			/sofa/findByIdsAndName	Open	2021-02-10 02:16:12	Modify Delete
			+			/sofa/saveComplexBean	Open	2021-02-10 02:16:12	Modify Delete
			+			/sofa/findByListId	Open	2021-02-10 02:16:12	Modify Delete

Use PostMan to simulate HTTP to request your Sofa service:

The screenshot shows a Postman interface with a POST request to `http://localhost:9195/sofa/findById`. The request body is set to `JSON (application/json)` and contains the following JSON:

```

1 {
2   "id": "123"
3 }

```

The response tab shows the result of the request. The status is `200 OK` and the time taken is `954 ms`. The response body is:

```

1 {
2   "code": 200,
3   "message": "Access to success!",
4   "data": [
5     {
6       "id": "123",
7       "name": "hello world Soul Sofa, findById"
8     }
9 ]

```

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 :" +
+ name + ":" + sofaTestList.stream().map(SofaSimpleTypeBean::getName) .
collect(Collectors.joining("-")));
    return simpleTypeBean;
}

```

The screenshot shows a Postman interface with a POST request to `http://localhost:9195/sofa/batchSaveNameAndId`. The request body is set to `JSON (application/json)` and contains the following JSON:

```

1 {
2   "sofaTestList": [
3     {
4       "id": "123",
5       "name": "test"
6     },
7     {
8       "id": "134",
9       "name": "test1"
10    }
11 ]

```

The response tab shows the result of the request. The status is `200 OK` and the time taken is `30 ms`. The response body is:

```

1 [
2   {
3     "code": 200,
4     "message": "Access to success!",
5     "data": [
6       {
7         "id": "134",
8         "name": "hello world soul sofa param batchSaveAndNameAndId :test1:test"
9       }
10    ]
11 ]

```

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](#).

16.14 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:

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

16.15 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:

```
2023-01-11 23:09:37.593 INFO 96741 --- [or_consumer_-19] o.a.s.r.client.http.utils.RegisterUtils : metadata client register success: {"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":1673449777487, "addPrefixed":false}
2023-01-11 23:09:37.611 INFO 96741 --- [or_consumer_-21] o.a.s.r.client.http.utils.RegisterUtils : metadata client register success: {"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", "rpcExt": "{\"methodInfo\": [{\"methodName\":\"userMap\", \"paramTypes\": [{\"left\":\"java.lang.Long\", \"right\":\"userId\"}]}]}", "enabled":true, "host":"127.0.0.1", "port":8005,
```

```

"pluginNames":[],"registerMetaData":false,"timeMillis":1673449777488,"addPrefixed
":false}
2023-01-11 23:09:37.611 INFO 96741 --- [or_consumer_-17] o.a.s.r.client.http.
utils.RegisterUtils : uri client register success: {"appName":"brpc","contextPath
":"/brpc","rpcType":"brpc","host":"127.0.0.1","port":8005}
2023-01-11 23:09:37.612 INFO 96741 --- [or_consumer_-20] o.a.s.r.client.http.
utils.RegisterUtils : metadata client register success: {"appName":"brpc",
"contextPath":"/brpc","path":"/brpc/getUserByIdAndName","rpcType":"brpc",
"serviceName":"org.apache.shenyu.examples.brpc.api.service.BrpcDemoService",
"methodName":"getUserByIdAndName","ruleName":"/brpc/getUserByIdAndName",
"parameterTypes":"java.lang.Long,java.lang.String","rpcExt":"{\\"methodInfo\":[{\\"
methodName\":\"getUserByIdAndName\",\\\"paramTypes\":[{\\\"left\\\":\"java.lang.Long\\\",\\
\"right\\\":\"userId\\\"},{\\\"left\\\":\"java.lang.String\\\",\\\"right\\\":\"name\\\"}]}]}",
"enabled":true,"host":"127.0.0.1","port":8005,"pluginNames":[],"registerMetaData
":false,"timeMillis":1673449777488,"addPrefixed":false}
2023-01-11 23:09:37.611 INFO 96741 --- [or_consumer_-18] o.a.s.r.client.http.
utils.RegisterUtils : metadata client register success: {"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":1673449777486,"addPrefixed":false}
2023-01-11 23:09:37.612 INFO 96741 --- [or_consumer_-22] o.a.s.r.client.http.
utils.RegisterUtils : metadata client register success: {"appName":"brpc",
"contextPath":"/brpc","path":"/brpc/getUser","rpcType":"brpc","serviceName":"org.
apache.shenyu.examples.brpc.api.service.BrpcDemoService","methodName":"getUser",
"ruleName":"/brpc/getUser","parameterTypes":"java.lang.Long","rpcExt":"{\\"
methodInfo\":[{\\"methodName\":\"getUser\",\\\"paramTypes\":[{\\\"left\\\":\"java.lang.
Long\\\",\\\"right\\\":\"userId\\\"}]}]}","enabled":true,"host":"127.0.0.1","port":8005,
"pluginNames":[],"registerMetaData":false,"timeMillis":1673449777489,"addPrefixed
":false}

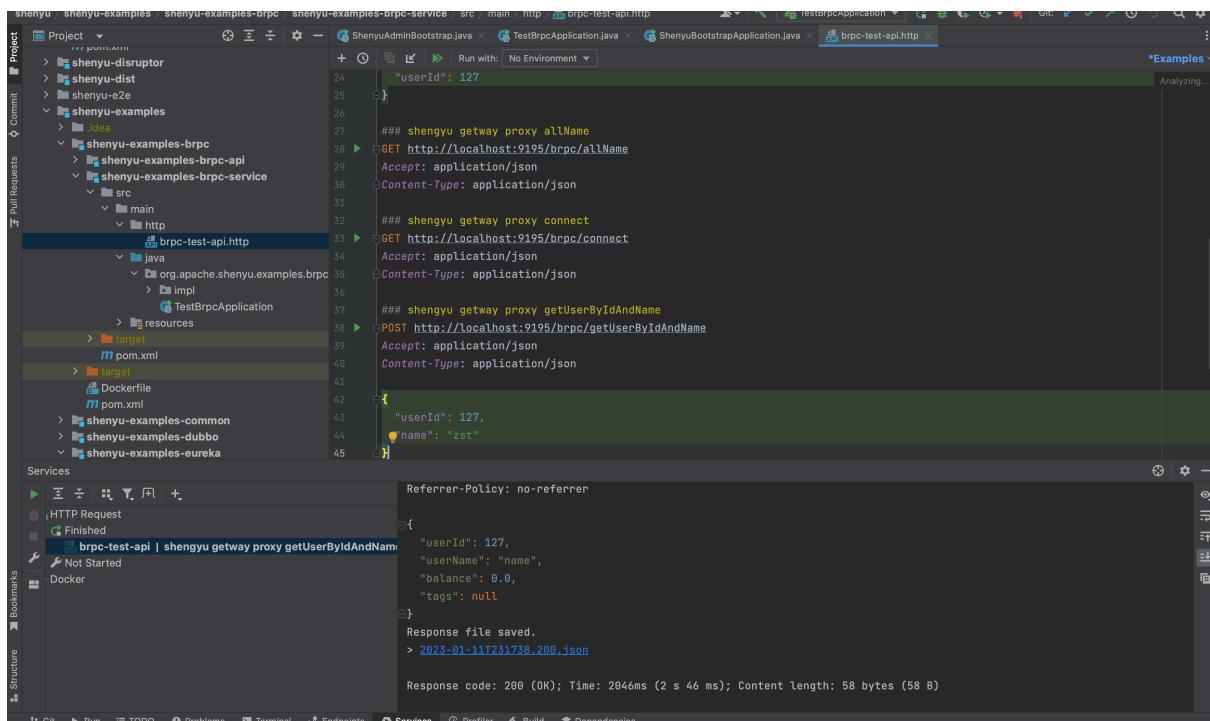
```

16.16 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 Dubbo. You can get the code example of this document by clicking [here](#).

16.17 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.

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

```
<!-- apache shenyu apache dubbo plugin start-->
<dependency>
    <groupId>org.apache.shenyu</groupId>
    <artifactId>shenyu-spring-boot-starter-client-apache-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:

```

<!-- apache shenyu alibaba dubbo plugin start-->
<dependency>
    <groupId>org.apache.shenyu</groupId>
    <artifactId>shenyu-spring-boot-starter-client-alibaba-dubbo</artifactId>
    <version>${project.version}</version>
</dependency>
<dependency>
    <groupId>com.alibaba</groupId>
    <artifactId>dubbo</artifactId>
    <version>${alibaba.dubbo.version}</version>
</dependency>
<dependency>
    <groupId>org.apache.curator</groupId>
    <artifactId>curator-client</artifactId>
    <version>${curator.version}</version>
    <exclusions>
        <exclusion>
            <artifactId>log4j</artifactId>
            <groupId>log4j</groupId>
        </exclusion>
    </exclusions>

```

```

</dependency>
<dependency>
    <groupId>org.apache.curator</groupId>
    <artifactId>curator-framework</artifactId>
    <version>${curator.version}</version>
</dependency>
<dependency>
    <groupId>org.apache.curator</groupId>
    <artifactId>curator-recipes</artifactId>
    <version>${curator.version}</version>
</dependency>
<!-- apache shenyu alibaba dubbo plugin end-->
```

16.18 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}
2021-02-06 20:58:01.821 INFO 3724 --- [pool-2-thread-1] o.d.s.client.common.utils.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.DubboTestService","methodName":"findAll","ruleName":"/dubbo/findAll","parameterTypes":","", "rpcExt":"{\\"group\\\":\\\",\\\"version\\\":\\\",\\\"loadbalance\\\":\\\"random\\\",\\\"retries\\\":2,\\\"timeout\\\":10000,\\\"url\\\":\\\"\\\"}", "enabled":true}
2021-02-06 20:58:01.833 INFO 3724 --- [pool-2-thread-1] o.d.s.client.common.utils.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.DubboTestService","methodName":"findById","ruleName":"/dubbo/findById","parameterTypes":"java.lang.
```

```

String","rpcExt":"{\\"group\\\":\\\"\\\",\\\"version\\\":\\\"\\\",\\\"loadbalance\\\":\\\"random\\\",\\
"retries\\":2,\\\"timeout\\\":10000,\\\"url\\\":\\\"\\\"}","enabled":true}
2021-02-06 20:58:01.844 INFO 3724 --- [pool-2-thread-1] o.d.s.client.common.utils.
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
","rpcExt":"{\\"group\\\":\\\"\\\",\\\"version\\\":\\\"\\\",\\\"loadbalance\\\":\\\"random\\\",\\\"retries\"
":2,\\\"timeout\\\":10000,\\\"url\\\":\\\"\\\"}","enabled":true}
2021-02-06 20:58:01.855 INFO 3724 --- [pool-2-thread-1] o.d.s.client.common.utils.
RegisterUtils : dubbo client register success: {"appName":"dubbo","contextPath":"/
dubbo","path":"/dubbo/findByIdsAndName","pathDesc":"","rpcType":"dubbo",
"serviceName":"org.dromara.shenyu.examples.dubbo.api.service.DubboMultiParamService
","methodName":"findByIdsAndName","ruleName":"/dubbo/findByIdsAndName",
"parameterTypes":"java.util.List,java.lang.String","rpcExt":"{\\"group\\\":\\\"\\\",\\
\"version\\\":\\\"\\\",\\\"loadbalance\\\":\\\"random\\\",\\\"retries\\":2,\\\"timeout\\\":10000,\\\"url\
\\\":\\\"\\\"}","enabled":true}
2021-02-06 20:58:01.866 INFO 3724 --- [pool-2-thread-1] o.d.s.client.common.utils.
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":"java.util.List",
"rpcExt":"{\\"group\\\":\\\"\\\",\\\"version\\\":\\\"\\\",\\\"loadbalance\\\":\\\"random\\\",\\\"retries\"
":2,\\\"timeout\\\":10000,\\\"url\\\":\\\"\\\"}","enabled":true}
2021-02-06 20:58:01.876 INFO 3724 --- [pool-2-thread-1] o.d.s.client.common.utils.
RegisterUtils : dubbo client register success: {"appName":"dubbo","contextPath":"/
dubbo","path":"/dubbo/findByIdArrayIdsAndName","pathDesc":"","rpcType":"dubbo",
"serviceName":"org.dromara.shenyu.examples.dubbo.api.service.DubboMultiParamService
","methodName":"findByIdArrayIdsAndName","ruleName":"/dubbo/findByIdArrayIdsAndName",
"parameterTypes":"[Ljava.lang.Integer;,java.lang.String","rpcExt":"{\\"group\\\":\\\"\\\",
\"version\\\":\\\"\\\",\\\"loadbalance\\\":\\\"random\\\",\\\"retries\\":2,\\\"timeout\\\":10000,\\\"url\
\\\":\\\"\\\"}","enabled":true}
2021-02-06 20:58:01.889 INFO 3724 --- [pool-2-thread-1] o.d.s.client.common.utils.
RegisterUtils : dubbo client register success: {"appName":"dubbo","contextPath":"/
dubbo","path":"/dubbo/saveComplexBeanTestAndName","pathDesc":"","rpcType":"dubbo",
"serviceName":"org.dromara.shenyu.examples.dubbo.api.service.DubboMultiParamService
","methodName":"saveComplexBeanTestAndName","ruleName":"/dubbo/
saveComplexBeanTestAndName","parameterTypes":"org.dromara.shenyu.examples.dubbo.
api.entity.ComplexBeanTest,java.lang.String","rpcExt":"{\\"group\\\":\\\"\\\",\\\"version\"
:\\\"\\\",\\\"loadbalance\\\":\\\"random\\\",\\\"retries\\":2,\\\"timeout\\\":10000,\\\"url\\\":\\\"\\\"}",
"enabled":true}
2021-02-06 20:58:01.901 INFO 3724 --- [pool-2-thread-1] o.d.s.client.common.utils.
RegisterUtils : dubbo client register success: {"appName":"dubbo","contextPath":"/
dubbo","path":"/dubbo/batchSaveAndNameAndId","pathDesc":"","rpcType":"dubbo",
"serviceName":"org.dromara.shenyu.examples.dubbo.api.service.DubboMultiParamService
","methodName":"batchSaveAndNameAndId","ruleName":"/dubbo/batchSaveAndNameAndId",
"parameterTypes":"java.util.List,java.lang.String,java.lang.String","rpcExt":"{\
"group\\\":\\\"\\\",\\\"version\\\":\\\"\\\",\\\"loadbalance\\\":\\\"random\\\",\\\"retries\\":2,\\\"timeout\"

```

```

":10000,\"url\":\"\"},\"enabled\":true}
2021-02-06 20:58:01.911  INFO 3724 --- [pool-2-thread-1] o.d.s.client.common.utils.RegisterUtils : dubbo client register success: {"appName":"dubbo","contextPath":"/dubbo","path":"/dubbo/saveComplexBeanTest","pathDesc":"","rpcType":"dubbo","serviceName":"org.dromara.shenyu.examples.dubbo.api.service.DubboMultiParamService","methodName":"saveComplexBeanTest","ruleName":"/dubbo/saveComplexBeanTest","parameterTypes":"org.dromara.shenyu.examples.dubbo.api.entity.ComplexBeanTest","rpcExt":"{\\"group\\":\"\",\\"version\\":\"\",\\"loadbalance\\":\"random\",\\"retries\\":2,\\"timeout\\":10000,\\"url\\\":\"\"},\"enabled\":true}
2021-02-06 20:58:01.922  INFO 3724 --- [pool-2-thread-1] o.d.s.client.common.utils.RegisterUtils : dubbo client register success: {"appName":"dubbo","contextPath":"/dubbo","path":"/dubbo/findByStringArray","pathDesc":"","rpcType":"dubbo","serviceName":"org.dromara.shenyu.examples.dubbo.api.service.DubboMultiParamService","methodName":"findByStringArray","ruleName":"/dubbo/findByStringArray","parameterTypes":"[Ljava.lang.String;","rpcExt":"{\\"group\\":\"\",\\"version\\":\"\",\\"loadbalance\\":\"random\",\\"retries\\":2,\\"timeout\\":10000,\\"url\\\":\"\"},\"enabled\":true}

```

Note: When you need to expose multiple protocols at the same time, please do not configure shenyu.client.dubbo.props.port.

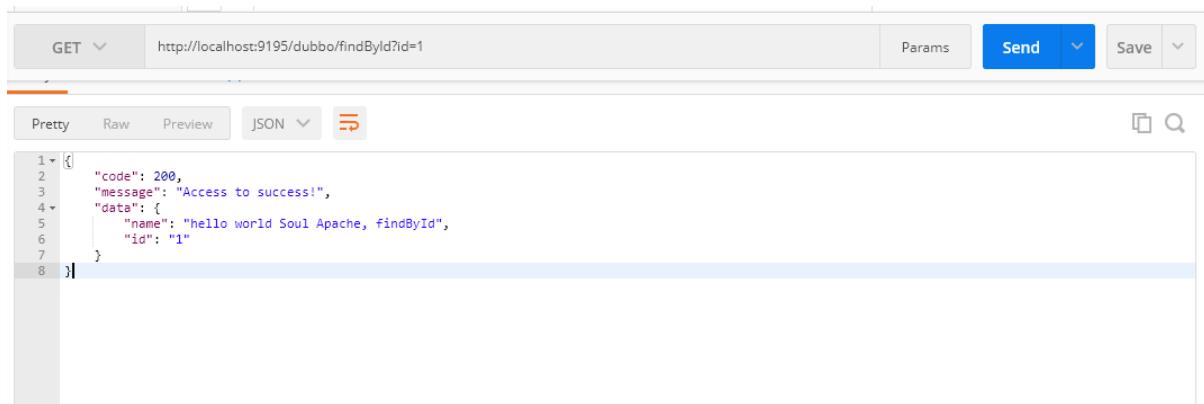
16.19 Test

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:

SelectorList			Add	RulesList C Synchronous dubbo			Add
Name	Open	Operation		RuleName	Open	UpdateTime	Operation
/dubbo	Open	Modify Delete	< 1 >	/dubbo/insert	Open	2021-02-06 20:58:01	Modify Delete
				/dubbo/findAll	Open	2021-02-06 20:58:01	Modify Delete
				/dubbo/findById	Open	2021-02-06 20:58:01	Modify Delete
				/dubbo/findByIdAndId	Open	2021-02-06 20:58:01	Modify Delete
				/dubbo/findByIdsAndName	Open	2021-02-06 20:58:01	Modify Delete
				/dubbo/batchSave	Open	2021-02-06 20:58:01	Modify Delete
				/dubbo/findByArrayIdsAndName	Open	2021-02-06 20:58:01	Modify Delete
				/dubbo/saveComplexBeanTestAndName	Open	2021-02-06 20:58:01	Modify Delete
				/dubbo/batchSaveAndNameAndId	Open	2021-02-06 20:58:01	Modify Delete
				/dubbo/saveComplexBeanTest	Open	2021-02-06 20:58:01	Modify Delete
				/dubbo/findByStringArray	Open	2021-02-06 20:58:01	Modify Delete

Use PostMan to simulate HTTP to request your Dubbo service:

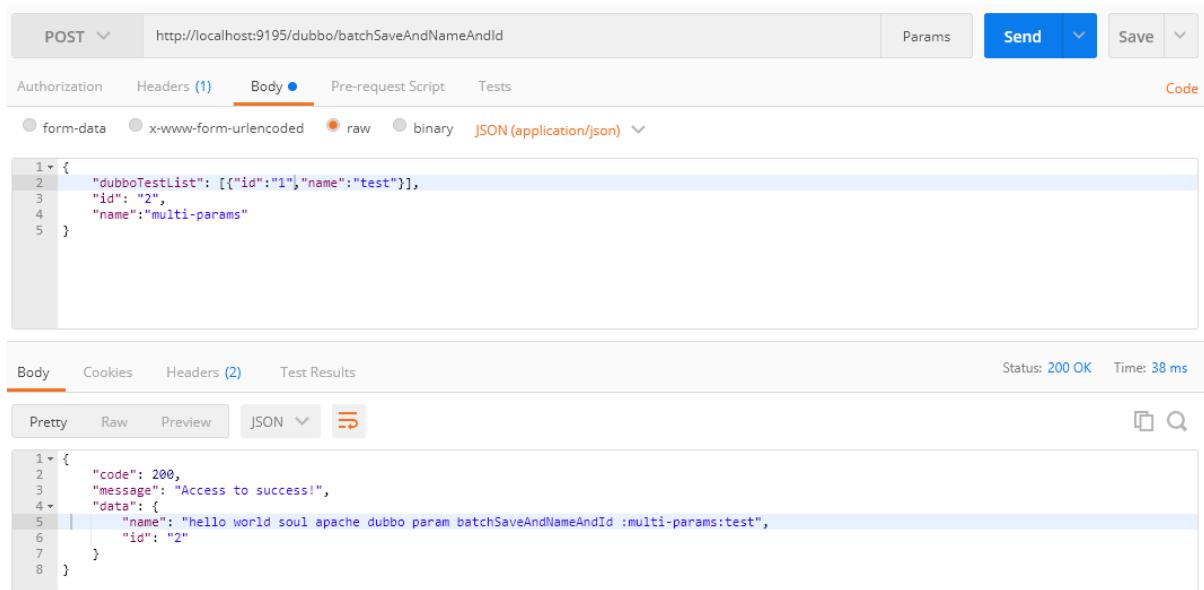


Complex multi-parameter example: The related interface implementation class is org.apache.shenyu.examples.alibaba.dubbo.service.impl.DubboMultiParamServiceImpl#batchSaveAndNameAndId.

```

@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:

```

2021-02-07 22:24:04.015 ERROR 14860 --- [:20888-thread-3] o.d.shenyu.web.handler.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)
    at org.apache.dubbo.rpc.protocol.ProtocolFilterWrapper$1.
invoke(ProtocolFilterWrapper.java:81)
    at org.apache.dubbo.rpc.filter.ClassLoaderFilter.invoke(ClassLoaderFilter.
java:38)
    at org.apache.dubbo.rpc.protocol.ProtocolFilterWrapper$1.
invoke(ProtocolFilterWrapper.java:81)
    at org.apache.dubbo.rpc.filter.EchoFilter.invoke(EchoFilter.java:41)
    at org.apache.dubbo.rpc.protocol.ProtocolFilterWrapper$1.
invoke(ProtocolFilterWrapper.java:81)
    at org.apache.dubbo.rpc.protocol.dubbo.DubboProtocol$1.reply(DubboProtocol.
java:150)
    at org.apache.dubbo.remoting.exchange.support.header.HeaderExchangeHandler.
handleRequest(HeaderExchangeHandler.java:100)
    at org.apache.dubbo.remoting.exchange.support.header.HeaderExchangeHandler.
received(HeaderExchangeHandler.java:175)
    at org.apache.dubbo.remoting.transport.DecodeHandler.received(DecodeHandler.
java:51)
    at org.apache.dubbo.remoting.transport.dispatcher.ChannelEventRunnable.
run(ChannelEventRunnable.java:57)
    at java.util.concurrent.ThreadPoolExecutor.runWorker(ThreadPoolExecutor.
java:1149)
    at java.util.concurrent.ThreadPoolExecutor$Worker.run(ThreadPoolExecutor.
java:624)
    at java.lang.Thread.run(Thread.java:748)
] for HTTP POST /dubbo/batchSaveAndNameAndId

```

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](#).

16.20 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:

```
<!-- 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-->
```

16.21 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:

```
2021-06-18 19:33:32.866 INFO 11004 --- [or_consumer_-19] o.a.s.r.client.http.utils.RegisterUtils : grpc client register success: {"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, \"methodType\":\"CLIENT_STREAMING\"}", "enabled": true, "host": "172.20.10.6", "port": 8080, "registerMetaData": false}
2021-06-18 19:33:32.866 INFO 11004 --- [or_consumer_-17] o.a.s.r.client.http.utils.RegisterUtils : grpc client register success: {"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, \"methodType\": \"UNARY\"}", "enabled": true, "host": "172.20.10.6", "port": 8080, "registerMetaData": false}
2021-06-18 19:33:32.866 INFO 11004 --- [or_consumer_-20] o.a.s.r.client.http.utils.RegisterUtils : grpc client register success: {"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, \"methodType\": \"BIDI_STREAMING\"}", "enabled": true, "host": "172.20.10.6", "port": 8080, "registerMetaData": false}
2021-06-18 19:33:32.866 INFO 11004 --- [or_consumer_-21] o.a.s.r.client.http.utils.RegisterUtils : grpc client register success: {"appName": "127.0.0.1:8080", "contextPath": "/grpc", "path": "/grpc/unaryFun", "pathDesc": "unaryFun", "rpcType": "grpc"
```

```

    , "serviceName": "stream.StreamService", "methodName": "unaryFun", "ruleName": "/grpc/
unaryFun", "parameterTypes": "stream.RequestData, io.grpc.stub.StreamObserver", "rpcExt":
":{\"timeout\":5000, \"methodType\":\"UNARY\"}", "enabled": true, "host": "172.20.10.6
", "port": 8080, "registerMetaData": false}
2021-06-18 19:33:32.866 INFO 11004 --- [or_consumer_-18] o.a.s.r.client.http.
utils.RegisterUtils : grpc client register success: {"appName": "127.0.0.1:8080",
"contextPath": "/grpc", "path": "/grpc/serverStreamingFun", "pathDesc":
"serverStreamingFun", "rpcType": "grpc", "serviceName": "stream.StreamService",
"methodName": "serverStreamingFun", "ruleName": "/grpc/serverStreamingFun",
"parameterTypes": "stream.RequestData, io.grpc.stub.StreamObserver", "rpcExt": "{\
"timeout":5000, \"methodType\":\"SERVER_STREAMING\"}", "enabled": true, "host": "172.
20.10.6", "port": 8080, "registerMetaData": false}

```

16.22 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:

The screenshot shows the Apache ShenYu PluginList interface. On the left, there's a sidebar with a 'Selector' dropdown set to 'N..', a 'Query' button, and an 'Add' button. In the center, there's a 'RulesList' section with a 'C Synchronous grpc' checkbox checked. Below it is a table with the following columns: Name, Open, Operation, RuleName, Open, UpdateTime, and Operation. The table contains five rows, each with a '+' icon in the first column and a 'Modify Delete' link in the last column. The rows represent different gRPC methods: /grpc/unaryFun, /grpc/serverStreamingFun, /grpc/clientStreamingFun, /grpc/bidiStreamingFun, and /grpc/echo. The 'UpdateTime' column shows the timestamp '2021-06-18 13:27:37' for all rows.

Name	Open	Operation	RuleName	Open	UpdateTime	Operation
/grpc	Open	Modify Delete	/grpc/unaryFun	Open	2021-06-18 13:27:37	Modify Delete
			/grpc/serverStreamingFun	Open	2021-06-18 13:27:37	Modify Delete
			/grpc/clientStreamingFun	Open	2021-06-18 13:27:37	Modify Delete
			/grpc/bidiStreamingFun	Open	2021-06-18 13:27:37	Modify Delete
			/grpc/echo	Open	2021-06-18 13:27:37	Modify Delete

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

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

The screenshot shows a Postman request to `http://localhost:9195/grpc/echo`. The request method is POST. The Headers tab shows 9 items. The Body tab is selected, containing the JSON payload:

```

1  [{"data": [{"message": "hello grpc"}]}]

```

The response status is 200 OK, with a message of "Access to success!", code 200, and a host of "LAPTOP-7P4PA12J(172.20.10.6)". The response body is:

```

1  {
2      "code": 200,
3      "message": "Access to success!",
4      "data": [
5          {"\n              \"message\": \"ReceivedHELLO\",\\n              \"traces\": [\n                  {\n                      \"host\": \"LAPTOP-7P4PA12J(172.20.10.6)\"\n                  }\n              ]\n          }
6      ]
7  }

```

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.

16.23 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.

The screenshot shows a Postman request configuration for a POST method to the URL `http://localhost:9195/grpc/unaryFun`. The 'Body' tab is selected, showing a JSON payload with one element: `{"data": [{"text": "hello grpc"}]}`. The response status is 200 OK, time is 26 ms, and size is 178 B.

The screenshot shows the JSON response body from the previous request. It contains the following data:

```

1 {
2   "code": 200,
3   "message": "Access to success!",
4   "data": [
5     {
6       "\n         \"text\": \"unaryFun response: hello gRPC\\n\""
7     }
]

```

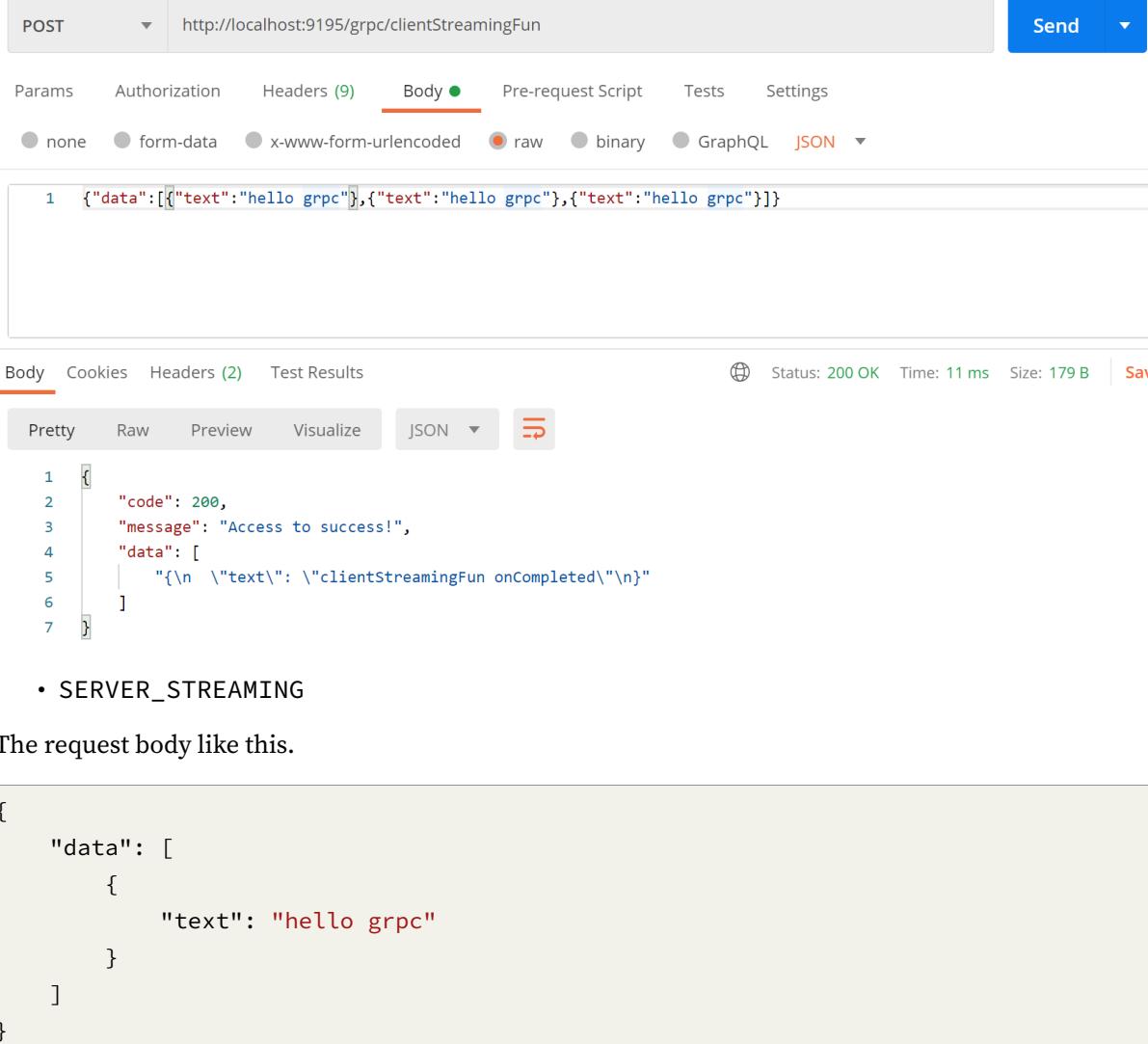
- **CLIENT_STREAMING**

The request body like this.

The screenshot shows the JSON request body for a CLIENT_STREAMING gRPC service. It consists of an array of objects, each with a 'text' field containing the value 'hello grpc':

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

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



The request body like this.

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

Then, call gRPC service by SERVER_STREAMING method type.

The screenshot shows a Postman request configuration for a POST method to the URL `http://localhost:9195/grpc/serverStreamingFun`. The 'Body' tab is selected, showing the raw JSON input:

```

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

```

The response status is 200 OK with a time of 25 ms and a size of 734 B. The response body is displayed in JSON format:

```

2  "code": 200,
3  "message": "Access to success!",
4  "data": [
5      "{\"text\": \"serverStreamingFun response: hello 0\\n\"}",
6      "{\"text\": \"serverStreamingFun response: hello 1\\n\"}",
7      "{\"text\": \"serverStreamingFun response: hello 2\\n\"}",
8      "{\"text\": \"serverStreamingFun response: hello 3\\n\"}",
9      "{\"text\": \"serverStreamingFun response: hello 4\\n\"}",
10     "{\"text\": \"serverStreamingFun response: hello 5\\n\"}",
11     "{\"text\": \"serverStreamingFun response: hello 6\\n\"}",
12     "{\"text\": \"serverStreamingFun response: hello 7\\n\"}",
13     "{\"text\": \"serverStreamingFun response: hello 8\\n\"}",
14     "{\"text\": \"serverStreamingFun response: hello 9\\n\"}"
15   ]
16 }

```

- **BIDI_STREAMING**

The request body like this.

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

Then, call gRPC service by BIDI_STREAMING method type.

POST http://localhost:9195/grpc/bidiStreamingFun Send

Params Authorization Headers (9) Body Pre-request Script Tests Settings

Body (1) none form-data x-www-form-urlencoded raw binary GraphQL JSON

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

Body Cookies Headers (2) Test Results Status: 200 OK Time: 15 ms Size: 348 B Save

Pretty Raw Preview Visualize JSON

```
1 {
2   "code": 200,
3   "message": "Access to success!",
4   "data": [
5     {"\n   \"text\": \"bidiStreamingFun response: hello\\n\"},
6     {"\n   \"text\": \"bidiStreamingFun response: hello\\n\"},
7     {"\n   \"text\": \"bidiStreamingFun response: hello\\n\"},
8     {"\n   \"text\": \"bidiStreamingFun onCompleted\\n\""}
9   ]
10 }
```

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:

```
<!--if you use http proxy start this-->
<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-httpclient</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 00:57:07.561 INFO 3700 --- [pool-1-thread-1] o.d.s.client.common.utils.RegisterUtils : http client register success: {"appName":"http","context":"/http","path":"/http/test/**","pathDesc":"","rpcType":"http","host":"192.168.50.13","port":8188,"ruleName":"/http/test/**","enabled":true,"registerMetaData":false}
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:

RuleName	Open	UpdateTime	Operation
/http/test/**	Open	2021-02-10 00:57:07	Modify Delete
/http/order/save	Open	2021-02-10 00:57:07	Modify Delete
/http/order/path/**/name	Open	2021-02-10 00:57:07	Modify Delete
/http/order/findById	Open	2021-02-10 00:57:07	Modify Delete
/http/order/path/**	Open	2021-02-10 00:57:07	Modify Delete

Use PostMan to simulate HTTP to request your http service:

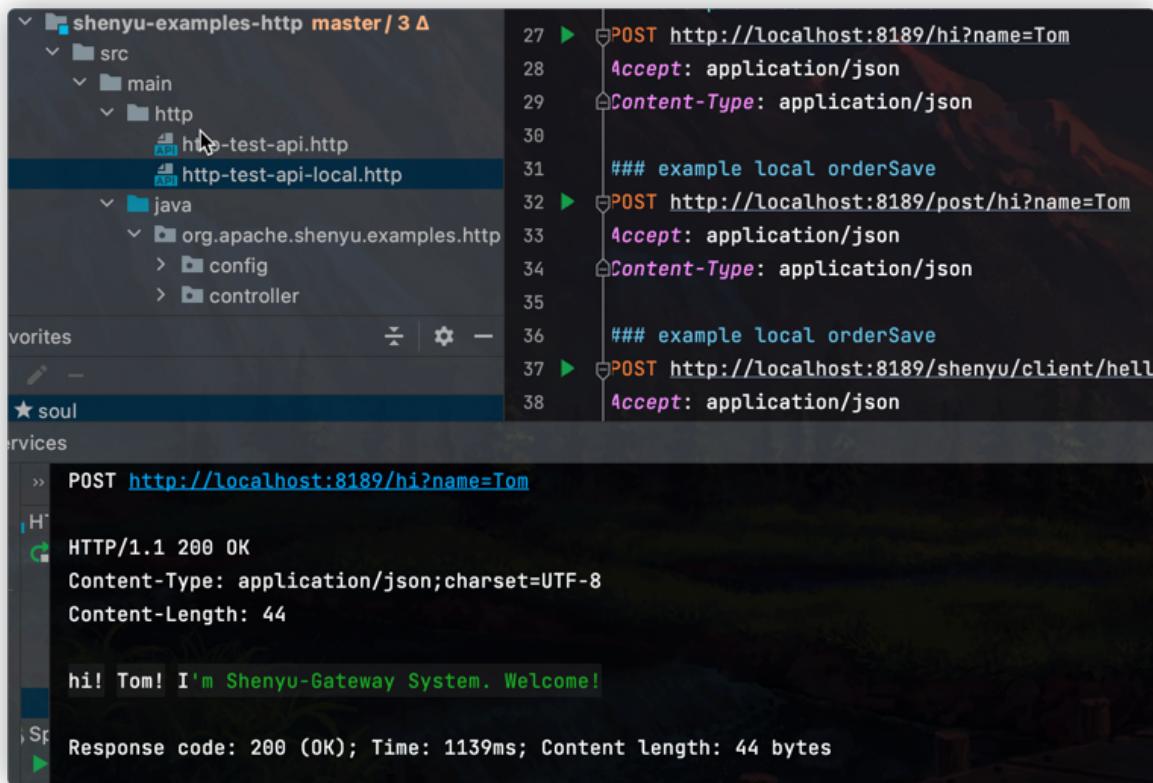
```

1 { "id": "123", "name": "test" }
2
3
4
5
    
```

```

1 { "id": "123", "name": "hello world save order" }
2
3
4
    
```

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



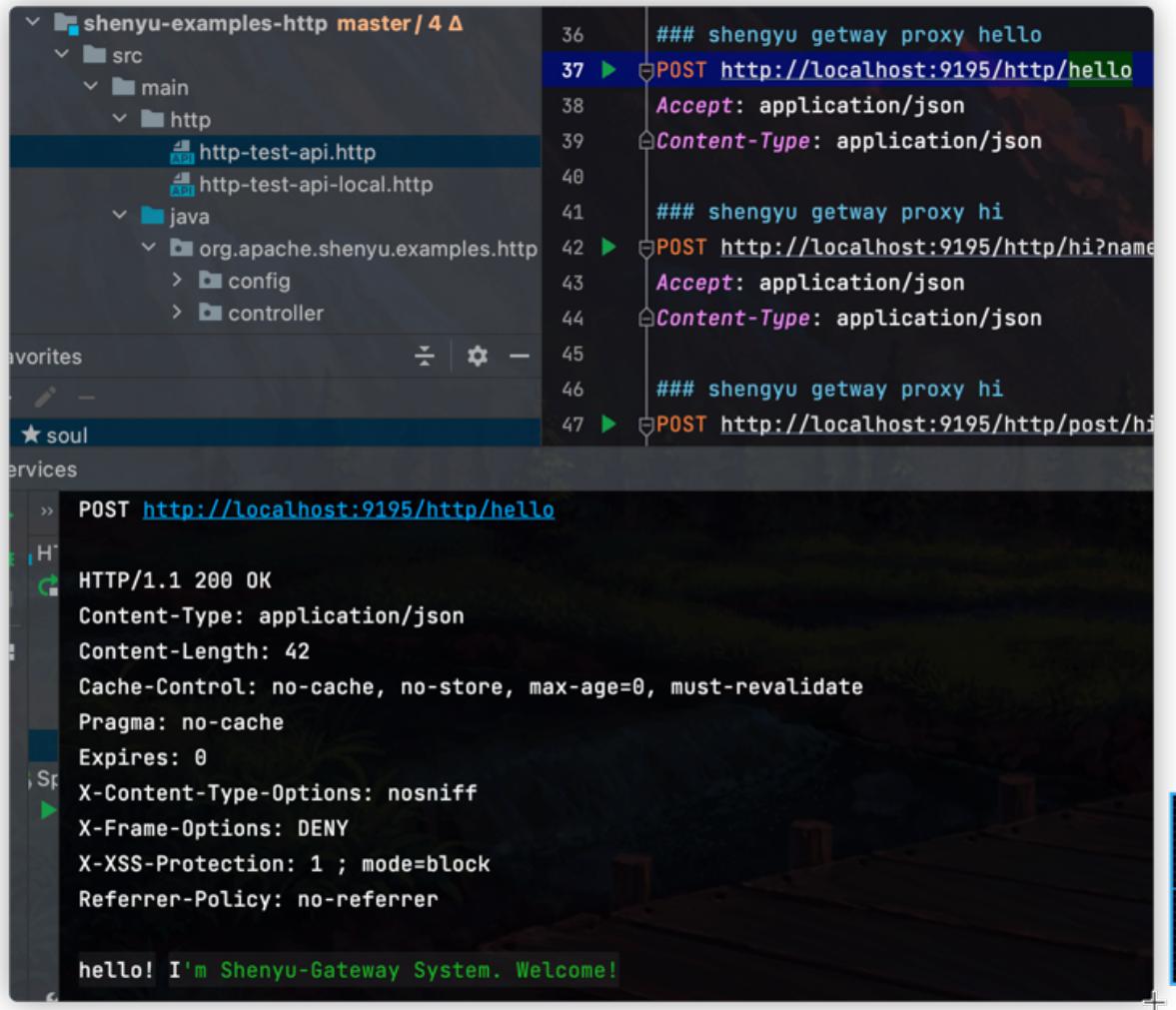
The screenshot shows the IDEA IDE interface. On the left, the project tree for 'shenyu-examples-http' is visible, containing 'src' (with 'main' and 'http' subfolders), 'java' (with 'org.apache.shenyu.examples.http' package), and 'services'. In the center, an 'HTTP' tab of the IDEA HTTP Client is open, showing a POST request to 'http://localhost:8189/hi?name=Tom'. The response status is 'HTTP/1.1 200 OK', with headers 'Content-Type: application/json; charset=UTF-8' and 'Content-Length: 44'. The response body contains the message 'hi! Tom! I'm ShenYu-Gateway System. Welcome!'.

```
27 ➤ POST http://localhost:8189/hi?name=Tom
28   Accept: application/json
29   Content-Type: application/json
30
31   ### example local orderSave
32 ➤ POST http://localhost:8189/post/hi?name=Tom
33   Accept: application/json
34   Content-Type: application/json
35
36   ### example local orderSave
37 ➤ POST http://localhost:8189/shenyu/client/hell
38   Accept: application/json
```

```
POST http://localhost:8189/hi?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
```

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



The screenshot shows a terminal window with a file tree on the left and log output on the right.

File Tree:

```

shenyu-examples-http master/ 4 △
  +-- src
    +-- main
      +-- http
        +-- http-test-api.http
        +-- http-test-api-local.http
      +-- java
        +-- org.apache.shenyu.examples.http
          +-- config
          +-- controller

```

Log Output (Lines 36-47):

```

36     ### shengyu getway proxy hello
37  POST http://localhost:9195/http/hello
38   Accept: application/json
39   Content-Type: application/json
40
41     ### shengyu getway proxy hi
42  POST http://localhost:9195/http/hi?name
43   Accept: application/json
44   Content-Type: application/json
45
46     ### shengyu getway proxy hi
47  POST http://localhost:9195/http/post/hi

```

Terminal Session (Bottom):

```

POST http://localhost:9195/http/hello
HTTP/1.1 200 OK
Content-Type: application/json
Content-Length: 42
Cache-Control: no-cache, no-store, max-age=0, must-revalidate
Pragma: no-cache
Expires: 0
X-Content-Type-Options: nosniff
X-Frame-Options: DENY
X-XSS-Protection: 1 ; mode=block
Referrer-Policy: no-referrer

hello! I'm Shenyu-Gateway System. Welcome!

```

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:

```
<!-- apache shenyu springCloud plugin start-->
<dependency>
  <groupId>org.apache.shenyu</groupId>
  <artifactId>shenyu-spring-boot-starter-plugin-springcloud</artifactId>
</dependency>
```

```

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/path/**","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/path/**/name","enabled":true}

```

```

2021-02-10 14:03:51.692 INFO 2860 --- [pool-1-thread-1] o.d.s.client.common.utils.RegisterUtils : springCloud client register success: {"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] igation $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 14:03:53.006 INFO 2860 --- [           main] c.n.d.provider.DiscoveryJerseyProvider : Using JSON encoding codec LegacyJacksonJson
2021-02-10 14:03:53.006 INFO 2860 --- [           main] c.n.d.provider.DiscoveryJerseyProvider : Using JSON decoding codec LegacyJacksonJson
2021-02-10 14:03:53.110 INFO 2860 --- [           main] c.n.d.provider.DiscoveryJerseyProvider : Using XML encoding codec XStreamXml
2021-02-10 14:03:53.110 INFO 2860 --- [           main] c.n.d.provider.DiscoveryJerseyProvider : Using XML decoding codec XStreamXml
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 14:03:53.546 INFO 2860 --- [           main] com.netflix.discovery.DiscoveryClient : Disable delta property : false
2021-02-10 14:03:53.546 INFO 2860 --- [           main] com.netflix.discovery.DiscoveryClient : Single vip registry refresh property : null
2021-02-10 14:03:53.547 INFO 2860 --- [           main] com.netflix.discovery.DiscoveryClient : Force full registry fetch : false
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.

```

```

InstanceInfoReplicator      : InstanceInfoReplicator onDemand update allowed rate
per min is 4
2021-02-10 14:03:53.761 INFO 2860 --- [           main] com.netflix.discovery.
DiscoveryClient      : Discovery Client initialized at timestamp 1612937033760 with
initial instances count: 0
2021-02-10 14:03:53.762 INFO 2860 --- [           main] o.s.c.n.e.s.
EurekaServiceRegistry      : Registering application SPRINGCLOUD-TEST with eureka
with status UP
2021-02-10 14:03:53.763 INFO 2860 --- [           main] com.netflix.discovery.
DiscoveryClient      : Saw local status change event StatusChangeEvent
[timestamp=1612937033763, current=UP, previous=STARTING]
2021-02-10 14:03:53.765 INFO 2860 --- [nfoReplicator-0] com.netflix.discovery.
DiscoveryClient      : DiscoveryClient_SPRINGCLOUD-TEST/host.docker.
internal:springCloud-test:8884: registering service...
2021-02-10 14:03:53.805 INFO 2860 --- [           main] o.s.b.w.embedded.tomcat.
TomcatWebServer      : Tomcat started on port(s): 8884 (http) with context path ''
2021-02-10 14:03:53.807 INFO 2860 --- [           main] .s.c.n.e.s.
EurekaAutoServiceRegistration : Updating port to 8884
2021-02-10 14:03:53.837 INFO 2860 --- [nfoReplicator-0] com.netflix.discovery.
DiscoveryClient      : DiscoveryClient_SPRINGCLOUD-TEST/host.docker.
internal:springCloud-test:8884 - registration status: 204
2021-02-10 14:03:54.231 INFO 2860 --- [           main] o.d.s.e.s.
ShenyuTestSpringCloudApplication : Started ShenyuTestSpringCloudApplication in 6.
338 seconds (JVM running for 7.361)

```

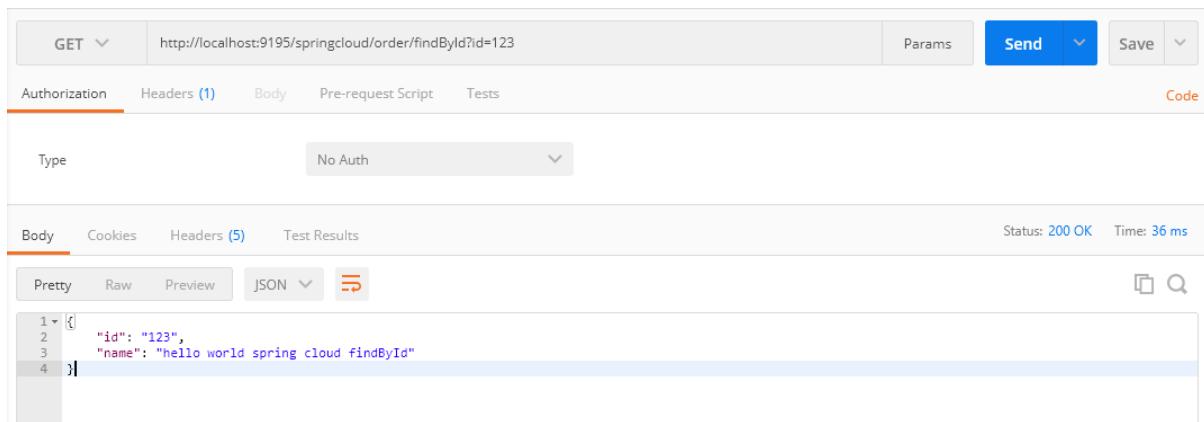
16.29 Test

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:

Name	Open	Operation	RuleName	Open	UpdateTime	Operation
/springCloud	Open	Modify Delete	/springCloud/order/save	Open	2021-02-10 14:00:04	Modify Delete
			/springCloud/order/path/**/name	Open	2021-02-10 14:00:04	Modify Delete
			/springCloud/order/findById	Open	2021-02-10 14:00:04	Modify Delete
			/springCloud/order/path/**	Open	2021-02-10 14:00:04	Modify Delete
			/springCloud/test/**	Open	2021-02-10 14:00:04	Modify Delete

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]:

The screenshot shows the IDEA HTTP Client Plugin interface with the following details:

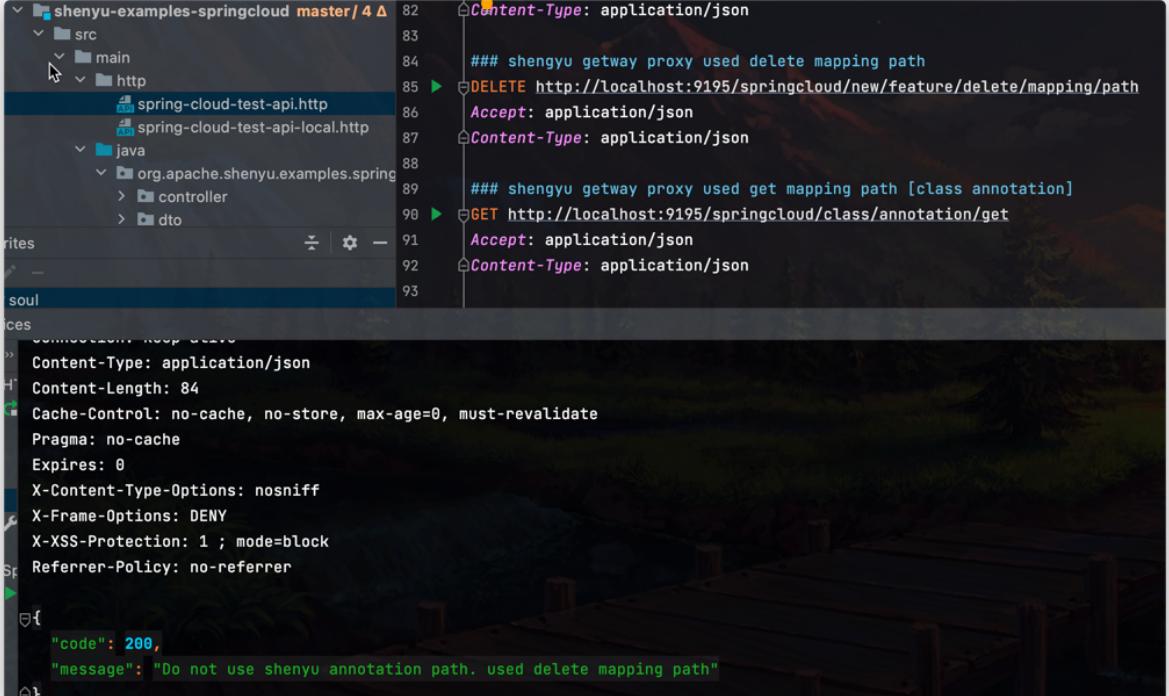
- Project: shenyu-examples-springcloud master / 3
- Request URL: POST http://localhost:8884/class/annotation/post
- Headers:
 - Content-Type: application/json
 - Accept: application/json
 - Content-Type: application/json
- Response:
 - HTTP/1.1 200
 - Content-Type: application/json
 - Transfer-Encoding: chunked
 - Date: Tue, 04 Jan 2022 15:16:24 GMT
 - Keep-Alive: timeout=60
 - Connection: keep-alive
- ResponseBody:


```

{
  "code": 200,
  "message": "[class annotation] Do not use shenyu annotation path. used post mapping path"
}

```
- Response code: 200; Time: 1245ms; Content length: 101 bytes

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



The screenshot shows a terminal window with a file tree on the left and a code editor on the right. The file tree includes 'shenyu-examples-springcloud' at the root, with 'src' and 'main' subfolders. Under 'main', there's a 'http' folder containing 'spring-cloud-test-api.http' and 'spring-cloud-test-api-local.http'. The code editor displays a Java file with annotations and a JSON response.

```
shenyu-examples-springcloud master/ 4 Δ
  ↘ src
    ↘ main
      ↘ http
        spring-cloud-test-api.http
        spring-cloud-test-api-local.http
      ↘ java
        org.apache.shenyu.examples.spring
          controller
          dto
    sites
    soul
    ces
    connection... keep alive
  Content-Type: application/json
  Content-Length: 84
  Cache-Control: no-cache, no-store, max-age=0, must-revalidate
  Pragma: no-cache
  Expires: 0
  X-Content-Type-Options: nosniff
  X-Frame-Options: DENY
  X-XSS-Protection: 1 ; mode=block
  Referrer-Policy: no-referrer
  {
    "code": 200,
    "message": "Do not use shenyu annotation path, used delete mapping path"
}
```

17

User Guide

18

Plugin Center

19.1 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.

19.2 Default Implementation

- The embedded implementation in Apache ShenYu is `:org.apache.shenyu.web.forward.ForwardedRemoteAddressResolver`.
- You need to config `X-Forwarded-For` in nginx first to get correct IP address and host.

19.3 Implement through a Plugin

- Declare a new class named `CustomRemoteAddressResolver` and implements `org.apache.shenyu.plugin.api.RemoteAddressResolver`.

```
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.

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

19.4 Description

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

19.5 IO And Work Thread

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

19.6 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: $\text{cpu} * 2 + 1$.

19.7 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 $\text{cpu} * 2 + 1$ with a minimum of 16 threads.

19.8 Description

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

19.9 Extension

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

```
@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.

```
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();
}
```

19.10 Preparation

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

19.11 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
```

19.12 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.

19.13 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.

Field	Type	Required	Desc
userName	String	Yes	shenyu admin account
password	String	Yes	shenyu admin password

- **Return Data**

Field	Type	Desc
code	Integer	Return code
message	String	Return message
data		Return data
id	Integer	user id
userName	String	account
role	Integer	role id
enabled	Boolean	status
dateCreated	String	create time
dateUpdated	String	update time
token	String	token
expiredTime	Long	timeout time, in milliseconds

Example

```
{
    "code": 200,
    "message": "login dashboard user success",
    "data": {
        "id": "1",
        "userName": "admin",
        "role": 1,
        "enabled": true,
        "dateCreated": "2022-09-07 22:08:23",
        "dateUpdated": "2022-09-07 22:08:23",
        "token": "eyJ1c2VyTmFtZSI6ImFkbWluIiwidXhwIjoxNjYyNjQ2MzU5fQ.
eyJ1c2VyTmFtZSI6ImFkbWluIiwidXhwIjoxNjYyNjQ2MzU5fQ.
```

```
WBXBgCcGsnnC00pRbD0tqCVoAaZr8MKH6WE6kY-NGaI",
    "expiredTime": 86400000
}
}
```

19.14 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 <code>RpcTypeEnum</code>
host	String	Yes	service IP
port	Integer	Yes	service port
eventType	String	Yes	event type, supported types reference <code>EventType</code>

Example

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

```
"eventType": "REGISTER"
}
```

- **Return Data**

A successful registration returns `success`.

19.15 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.

Field	Type	Required	Desc	-----	-----
app Name	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 <code>RpcTypeEnum</code>		
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		

app Name	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 <code>RpcTypeEnum</code>		
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

```
{  
    "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`.

19.16 description

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

19.17 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

19.18 File Download

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

19.19 Description

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

19.20 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:

- Implements interface org.apache.shenyu.plugin.jwt.strategy.JwtConvertStrategy

```
/**
 * 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

```
custom=org.apache.shenyu.plugin.jwt.strategy.CustomJwtConvertStrategy
```

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`)

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

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

19.21 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.

19.22 Default Implementation

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

```
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:

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

19.23 Extensions

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

```
/**
 * 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.

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

19.24 Description

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

19.25 CORS Support

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

```
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.

19.26 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) {
        ServerHttpRequest 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);
    }
}

```

19.27 Extending `org.apache.shenyu.web.filter.AbstractWebFilter`

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

```
/**
 * 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.

19.28 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.

19.29 Single Responsibility Plugins

- Add following dependency:

```
<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

```
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.
     */
}
```

```

    *
    * @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.

```

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

```

19.30 Matching Traffic Processing Plugin

- Introduce the following dependency:

```

<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:

```

/**
 * 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();
}

```

19.31 Subscribe your plugin data and do customized jobs

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

```
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 handlerSelector(SelectorData selectorData) {
    }

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

    /**
     * Handler rule.
     *
     * @param ruleData the rule data
     */
    default void handlerRule(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();
}

```

19.32 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)

```

19.32.1 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)

19.33 Plugin jar upload

- To use this feature, you will need to package the ShenyuPlugin extension as a custom ShenyuPlugin 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’

19.34 Description

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

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

- Common result:

```
success
```

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

19.35 Plugin

19.35.1 saveOrUpdate

save or update plugin data

Request Method

POST

Path

/plugin/saveOrUpdate

Request Parameters

Name	Type	Required	Default	Description
PluginData	<i>PluginData</i>	True		Plugin data object (pass Json object inside Body)

PluginData

Name	Type	Required	Default	Description
id	String	False		plugin id
name	String	True		plugin name
config	String	False		plugin configuration (Json format)
role	String	False		plugin role
enabled	Boolean	False		whether to turn on

Example

POST body

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

19.35.2 CleanAll

Clear all data (plugins, selectors, rules)

Request Method

GET

Path

/cleanAll

19.35.3 Clean Plugin

Clear plugin data (selector, rule)

Request Method

GET

Path

/cleanPlugin?name = xxxx

RequestParam

Name	Type	Required	Default	Description
name	String	true		plugin name

19.35.4 Delete plugin

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

Request Method

GET

Path

/plugin/delete?name = xxxx

RequestParam

Name	Type	Required	Default	Description
name	String	true		plugin name

19.35.5 Delete All Plugin

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

Request Method

GET

Path

/plugin/deleteAll

19.35.6 Find plugin by name

Find plugin by name

Request Method

GET

Path

/plugin/findByName?name=xxxx

RequestParam

Name	Type	Required	Default	Description
name	String	true		plugin name

19.35.7 Save or Update Selector

Save or Update Selector

Request Method

POST

Path

/plugin/selector/saveOrUpdate

RequestParam

Name	Type	Required	Default	Description
SelectorData	<i>SelectorData</i>	True		Selector object (pass Json object inside Body)

SelectorData

Name	Type	Re- quired	De- fault	Description
id	String	False		selector id
plugin- Name	String	True		plugin name
name	String	False		Selector name (default is plugin:selector+random number if not filled)
match- Mode	Inte- ger	False		Matching mode (0:and;1:or), not filled with the default generation And mode
type	Inte- ger	False		Traffic type (0: full traffic; 1: custom traffic) do not fill in the default generation of full traffic
sort	Inte- ger	False		Sort by, not filled by default generate 10
en- abled	Boolea	False		Whether to turn on, not fill in the default generation true
logged	Boolea	False		Whether or not to print the log, do not fill in the default generated into false
handle	String	False		Selector handler (Json objects, depending on each plug-in, different objects are passed)
condi- tionList	Con- di- tion	False		Conditional collection, custom traffic needs to be passed, full traffic does not need to be passed (Json List object)

Condition

Name	Type	Re- quired	De- fault	Description
param- Type	String	True		param type (post, uri, query, host, header, cookie, req_method, domain)
opera- tor	String	True		operator (match, =, regex, >, <, contains, SpEL, Groovy, TimeBefore, TimeAfter)
param- Name	String	False		param name (The uri parameter type can be passed without)
param- Value	Inte- ger	False		param value

Example

POST body

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

Result

Is selector id

```
xxxxx
```

19.35.8 Add Selector And Rules

Add a selector with multiple rules

Request Method

POST

Path

/plugin/selectorAndRules

RequestParam

Name	Type	Re- quired	De- fault	Description
SelectorRules- Data	<i>SelectorRules- Data</i>	True		Selector rule object (Body inside pass Json object)

SelectorRulesData

Name	Type	Re- quired	De- fault	Description
plugin- Name	String	True		plugin name
selector- Name	String	False		Selector name (if not filled in, it is generated by default plugin:selector+random number)
match- Mode	Integer	False		Matching mode (0:and;1:or), not filled with the default generation And mode
selec- torHan- dler	String	False		Selector handler (Json objects, depending on each plug-in, different objects are passed)
condition- List	ConditionData	True		Selector condition collection (Json List object)
rule- DataList	RuleLoc- alData	True		Rule condition collection (Json List object)

RuleLocalData

Name	Type	Re- quired	De- fault	Description
ruleName	String	False		rule name
ruleHan- dler	String	True		Rule handler (different plugins pass different values))
matchMode	Integer	False		Matching pattern (0:and;1:or)
condition- List	Condition- Data	True		Rule condition collection (Json List object)

ConditionData

Name	Type	Re- quired	De- fault	Description
param- Type	String	True		param type (post, uri, query, host, header, cookie, req_method, domain)
opera- tor	String	True		operator (match, =, regex, >, <, contains, SpEL, Groovy, TimeBefore, TimeAfter)
param- Name	String	False		param name (The uri parameter type can be passed without)
param- Value	Inte- ger	False		param value

Example

POST body

```
{  
    "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"  
        }]  
    }]  
}
```

19.35.9 Delete Selector

Delete selectors based on selector id and plugin name

Request Method

GET

Path

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

RequestParam

Name	Type	Required	Default	Description
pluginName	String	true		plugin name
id	String	true		selector id

19.35.10 Find All Selector

Get all selectors by plugin name

Request Method

GET

Path

/plugin/selector/findList?pluginName=xxxx

RequestParam

Name	Type	Required	Default	Description
pluginName	String	true		plugin name

19.35.11 Save or Update Rule Data

Save or Update Rule Data

Request Method

POST

Path

/plugin/rule/saveOrUpdate

RequestParam

Name	Type	Required	Default	Description
RuleData	<i>RuleData</i>	True		Rule object (pass Json object inside Body)

RuleData

Name	Type	Re- quired	De- fault	Description
id	String	False		rule id
plugin- Name	String	True		plugin name
name	String	False		Rule name (default generation if not filled plugin:rule+random number)
selec- torId	String	True		Selector id
match- Mode	Integer	False		Matching mode (0:and;1:or), not filled with the default generation And mode
sort	Integer	False		Sort by , not filled by default generate 10
enabled	Boolean	False		Whether to turn on, not fill in the default generation true
logged	Boolean	False		Whether or not to print the log, do not fill in the default generated into false
handle	String	False		Rule handler (Json objects, depending on each plug-in, different objects are passed)
condi- tionList	<i>ConditionData</i>	False		Conditional collections (Json List objects)

conditionList

Name	Type	Re- quired	De- fault	Description
param- Type	String	True		param type (post, uri, query, host, header, cookie, req_method, domain)
opera- tor	String	True		operator (match, =, regex, >, <, contains, SpEL, Groovy, TimeBefore, TimeAfter)
param- Name	String	False		param name (The uri parameter type can be passed without)
param- Value	Inte- ger	False		param value

Example

POST body

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

Result

Is rule id

```
xxxxx
```

19.35.12 Delete rule data

Delete rules based on selector id and rule id

Request Method

GET

Path

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

RequestParam

Name	Type	Required	Default	Description
selectorId	String	true		selector ID
id	String	true		rule ID

19.35.13 Find Rule data List

Get all rules by selector ID

Request Method

GET

Path

/plugin/rule/findList?selectorId=xxxx

RequestParam

Name	Type	Required	Default	Description
selectorId	String	true		selector id

19.36 Meta data

19.36.1 Save Or Update

Save Or Update Meta data

Request Method

POST

Path

/meta/saveOrUpdate

RequestParam

Name	Type	Required	Default	Description
MetaData	Metadata	True		Metadata object (pass Json object inside Body)

MetaData

Name	Type	Re-required	De-fault	Description
id	String	False		ID
appName	String	True		app name
contextPath	String	True		contextPath
path	String	True		path
rpcType	String	True		rpc type (dubbo, sofa, tars, springCloud, motan, grpc)
serviceName	String	True		service name
methodName	String	True		method name
parameter- Types	String	True		parameter types
rpcExt	String	False		rpc extension parameters (json objects)
enabled	Boolean	False		Whether to turn on

19.36.2 Delete

Delete Meta data

Request Method

GET

Path

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

RequestParam

Name	Type	Re-required	De-fault	Description
rpc- Type	String	true		rpc type (dubbo, sofa, tars, springCloud, motan, grpc)
path	String	true		path

19.37 App Sign Data

19.37.1 Save Or Update

Save Or Update App Sign Data

Request Method

POST

Path

/auth/saveOrUpdate

RequestParam

Name	Type	Re- quired	De- fault	Description
AppAuth- Data	<i>AppAuth- Data</i>	True		Signature object (Json object passed inside the Body)

AppAuthData

Name	Type	Re- quired	De- fault	Description
appKey	String	True		app key
appSecret	String	True		app secret
enabled	Boolean	False		Whether to turn on
open	Boolean	False		is open
param- DataList	<i>AuthParam- Data</i>	false		Parameter set, open is true when you need to pass (Json list object)
AuthPath- Data	<i>AuthPath- Data</i>	false		Path collection, open is true when you need to pass (Json list object)

AuthParamData

Name	Type	Required	Default	Description
appName	String	True		app name
appParam	String	True		app param

AuthPathData

Name	Type	Required	Default	Description
appName	String	True		app name
path	String	True		path
enabled	Boolean	False		Whether to turn on

19.37.2 Delete

Delete App Sign Data

Request Method

GET

Path

/auth/delete?appKey=xxxx

RequestParam

Name	Type	Required	Default	Description
appKey	String	true		app key

19.38 Description

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

19.39 Time Consumption

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

19.40 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.

```

@Bean
public NettyReactiveWebServerFactory nettyReactiveWebServerFactory() {
    NettyReactiveWebServerFactory webServerFactory = new
    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_
WORKER_COUNT, true), false)
                .selectorOption(ChannelOption.SO_REUSEADDR, true)
                .selectorOption(ChannelOption.ALLOCATOR,
PooledByteBufAllocator.DEFAULT)
                .option(ChannelOption.TCP_NODELAY, true)
                .option(ChannelOption.ALLOCATOR, PooledByteBufAllocator.
DEFAULT));
    }
}

```

- 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](#)

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

```
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
```

```
org.springframework.boot: warn
org.apache.ibatis: warn
org.apache.shenyu.bonuspoint: warn
org.apache.shenyu.lottery: warn
org.apache.shenyu: warn
```

- logback.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

```
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

```
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
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

```

20.5 Benchmark Test Results

- Direct Access to Back-end Test Result

QPS	50% latency (ms)	75% latency (ms)	90% latency (ms)	99% latency (ms)	平均响应时间 (ms)	最大响应时间 (ms)
28998.2	19.81	23.78	28.26	41.24	20.92	402.90

- netty

currency	QPS	50% latency (ms)	75% latency (ms)	90% latency (ms)	99% latency (ms)	平均响应时间 (ms)	最大响应时间 (ms)
600 currency	20472.9	19.37	25.36	32.89	69.92	22.09	1043.33
800 currency	20703.5	23.57	31.32	40.11	77.28	26.11	576.47
1000 currency	20979.9	29.21	37.86	47.23	80.91	31.20	860.55
1200 currency	21129.8	32.45	42.40	52.68	96.10	35.06	1070

- webClient

currency	QPS	50% latency (ms)	75% latency (ms)	90% latency (ms)	99% latency (ms)	平均响应时间 (ms)	最大响应时间 (ms)
600 currency	18640.4	15.77	24.77	38.26	80.31	20.32	852.06
800 currency	18723.4	18.12	28.69	44.96	95.3	23.52	765.26
1000 currency	18928.9	19.99	31.42	49.09	108.84	25.93	1040
1200 currency	18965.3	22.10	34.62	54.48	122.31	28.66	1075

20.5.1 Direct Access to Back-end Test Result

Test Result

QPS	50% latency (ms)	75% latency (ms)	90% latency (ms)	99% latency (ms)	Avg response time (ms)	Max response time (ms)
28998.2	19.81	23.78	28.26	41.24	20.92	402.90

Screenshot of Test Result

20.5.2 Access to Back-end Services via NettyClient Test Result

currency	QPS	50% latency (ms)	75% latency (ms)	90% latency (ms)	99% latency (ms)	Avg response time (ms)	Max response time (ms)
600 currency	20472.	19.37	25.36	32.89	69.92	22.09	1043.33
800 currency	20703.	23.57	31.32	40.11	77.28	26.11	576.47
1000 currency	20979.	29.21	37.86	47.23	80.91	31.20	860.55
1200 currency	21129.	32.45	42.40	52.68	96.10	35.06	1070

Screenshot of Test Result

600 concurrency

800 concurrency

1000 concurrency

1200 concurrency

20.5.3 Access to Back-end Services via WebClient Test Result

Test Result

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

Screenshot of Test Result

600 concurrency

800 concurrency

1000 concurrency

1200 concurrency