
Apache ShenYu document

Apache ShenYu

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Architecture



2

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.
-

3

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
-

4

Mind map



Quick Start (docker)

5.1 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**

5.2 Run Apache ShenYu Bootstrap

```
> docker network create shenyu
> docker pull apache/shenyu-bootstrap
> docker run -d -p 9195:9195 --net shenyu apache/shenyu-bootstrap
```

5.3 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"
}
```

6

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](#) .

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.

8

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.





9

Prerequisite

- JDK 1.8+
-

10

Stargazers over time

11

Contributor and Support

- How to Contribute
 - Mailing Lists
-

12

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

13

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](#).

13.1 Registry Center

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

13.2 Metrics Center

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

13.3 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`.

13.4 RateLimiter

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

13.5 Match Strategy

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

13.6 Parameter Data

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

13.7 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.

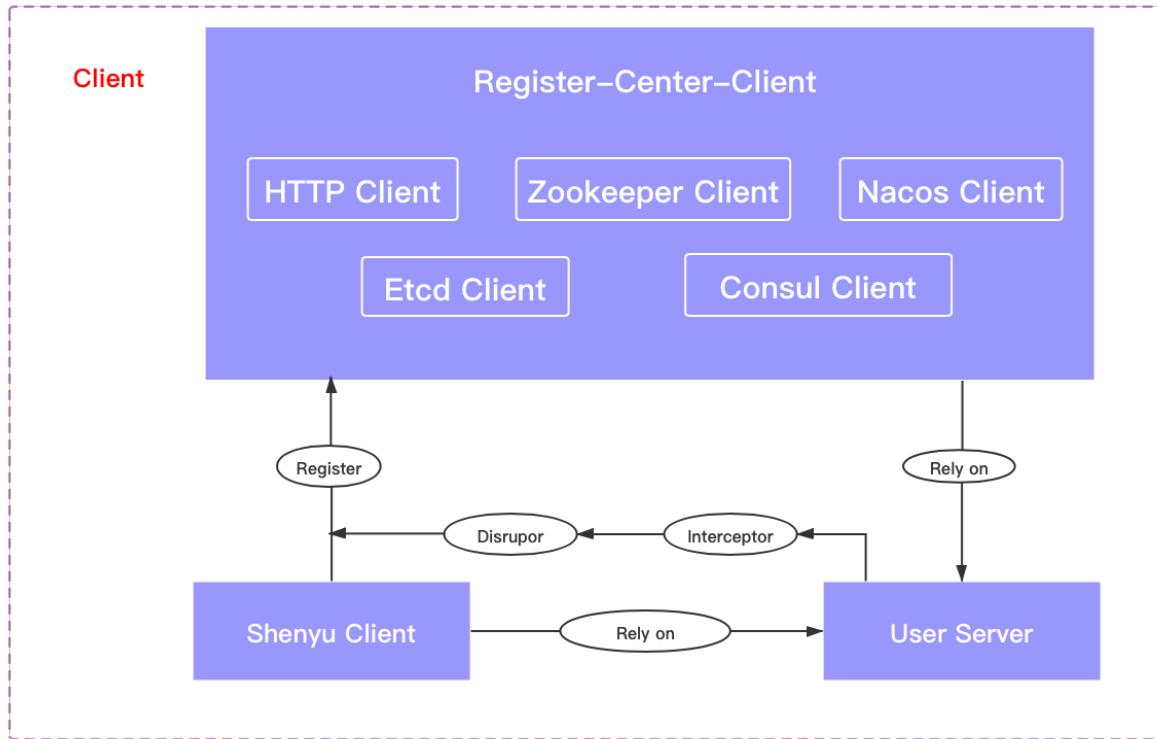
Application client access means to access your microservice to ShenYu gateway, currently supports HTTP, Dubbo, Spring Cloud, gRPC, Motan, Sofa, Tars and other protocols access.

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](#).

13.8 Design principle

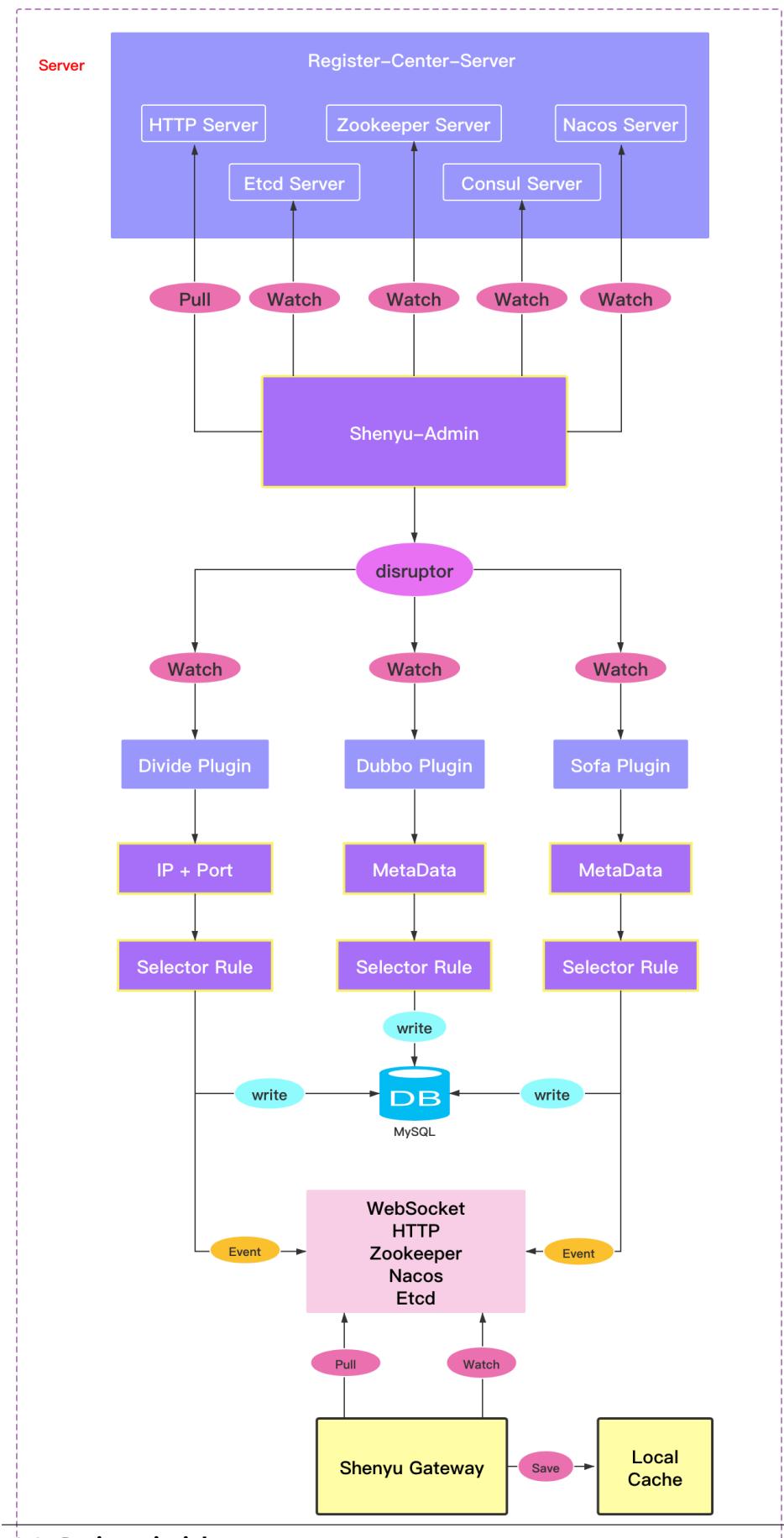
13.8.1 Client



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.

13.8.2 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.

13.9 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.

13.10 Zookeeper Registry

Zookeeper storage struct is:

```

shenyu
  register
    metadata
      ${rpcType}
        ${contextPath}
          ${ruleName} : save metadata data of
  MetaDataRegisterDTO
    uri
      ${rpcType}
        ${contextPath}
          ${ip:prot} : save uri data of UriRegisterDTO
          ${ip:prot}

```

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.

13.11 Etcd Registry

Etcd storage struct is:

```

shenyu
  +-- register
    +-- metadata
      +-- ${rpcType}
        +-- ${contextPath}
          +-- ${ruleName} : save metadata data of
  MetaDataRegisterDTO
    +-- uri
      +-- ${rpcType}
        +-- ${contextPath}
          +-- ${ip:prot} : save uri data of UriRegisterDTO
            +-- ${ip:prot}

```

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.

13.12 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.

13.13 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.

13.14 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

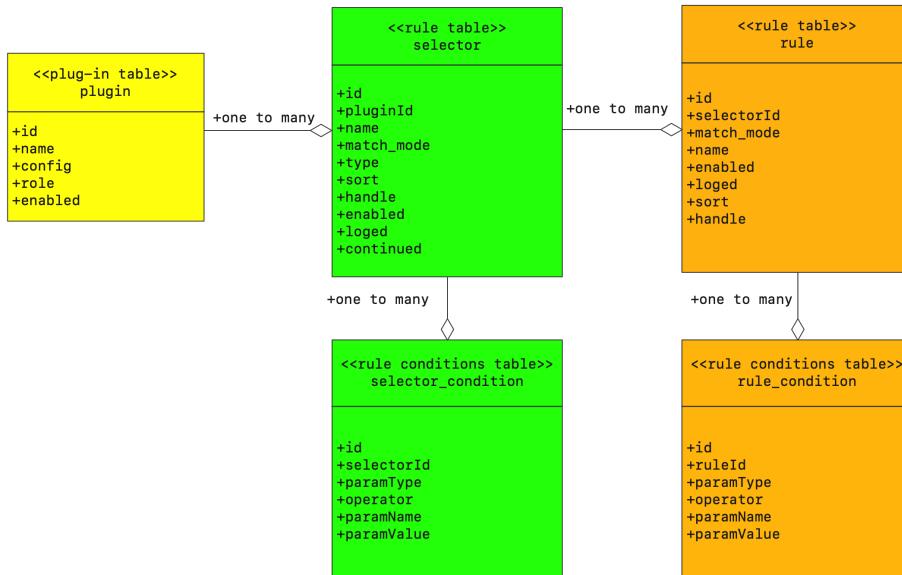
<i>SPI Name</i>	<i>Description</i>
ShenyuServerRegisterRepository	ShenYu server register SPI

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

13.15 Plugin, Selector And Rule

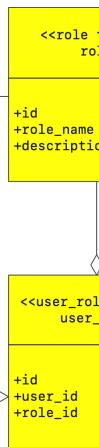
- **Plugin:** ShenYu uses the plugin design idea to realize the hot plug of the plugin, which is easy to expand. Built-in rich plugins, including RPC proxy, circuit breaker and current limiting, authority and certification, monitoring, and more.
- **Selector:** Each plugin can set multiple selectors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

13.16 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.

13.17 Data Permissin

- 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.

13.18 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.

13.19 Dictionary Management

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

13.20 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.

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.

13.21 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.

13.22 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.

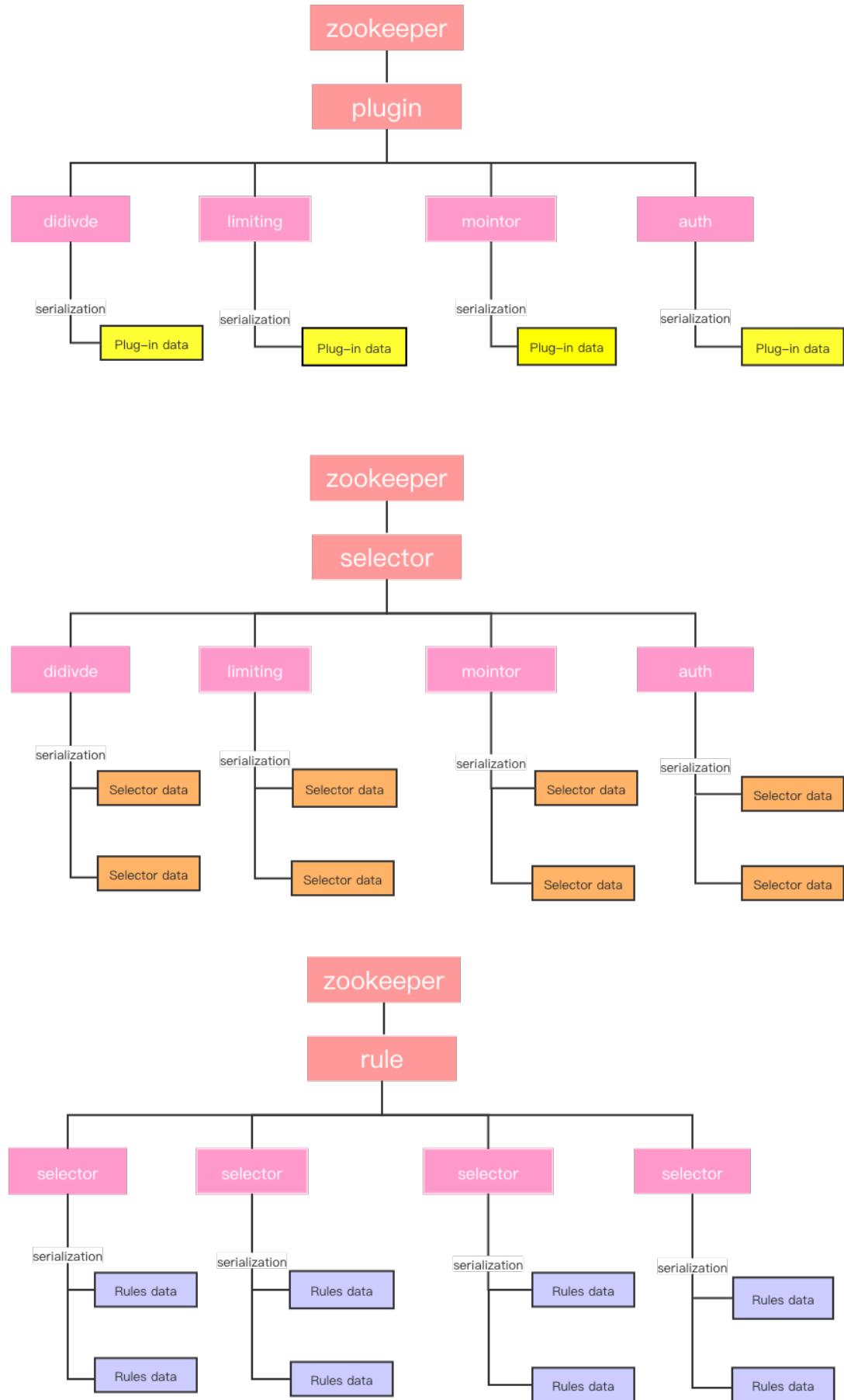
As showing picture below, shenyu-admin will issue a configuration change notification through EventPublisher after users change configuration, EventDispatcher will handle this modification and send configuration to corresponding event handler according to configured synchronization strategy.

- 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.

13.22.1 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.



13.22.2 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`.

13.22.3 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`.

13.22.4 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](#).

13.22.5 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`.

13.22.6 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`.

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

13.23 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.

13.24 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.

13.25 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 refre to [Selector And Rule Config](#) for details.

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](#).

14.1 Environmental preparation

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

14.2 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`.
- 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` 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.

14.3 Create Docker Network

```
> docker network create shenyu
```

14.4 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`, `application-pg.yml`, `application-oracle.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-mysql.yml`、`application-pg.yml`、`application-oracle.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-mysql.yml`、`application-pg.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}
```

14.5 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}
```

This article introduces how to quick 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.

14.6 Environmental preparation

- Install JDK1.8+ locally

14.7 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
```

14.8 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

14.9 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": "/**"
        }
      ]
    }
  ]
}
```

14.10 by curl

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

- open <http://localhost:9195/helloworld>:

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

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

14.11 Database Initialize

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

14.11.1 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/>

14.11.2 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/>

14.11.3 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>

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.

14.12 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
```

14.13 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 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.

14.14 Download shell script

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

14.15 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
```

14.16 Initialize the shenyu-admin database

Refer to the database initialization documentation to initialize the database.

14.17 Modify the configuration file

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

14.18 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 to proxy the external MySQL database via Endpoints

The process is as follows.

1. create Namespace and ConfigMap
2. create Endpoints to proxy external MySQL
3. deploy shenyu-admin
4. deploy shenyu-bootstrap

14.19 Example 1: Using h2 as a database

14.19.1 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 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:
```

```
enabled: false
maxFreeMemory: 256 # 256MB
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:
"BA3253876AED6BC22D4A6FF53D8406C6AD864195ED144AB5C87621B6C233B548BAEAE6956DF346EC8C17F5EA10F35EE30
"
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`

14.19.2 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`

14.19.3 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`

14.20 Example 2: Use MySQL as the database

14.20.1 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://mysql.shenyu.svc.cluster.local:3306/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 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:
    enabled: false
    maxFreeMemory: 256 # 256MB
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:
      "BA3253876AED6BC22D4A6FF53D8406C6AD864195ED144AB5C87621B6C233B548BAEAE6956DF346EC8C17F5EA10F35EE30"
  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`

14.20.2 2. Create Endpoints to represent MySQL

- Init database [Deployment Prerequisites](#) document.
- create `shenyu-ep.yaml`

```

kind: Service
apiVersion: v1
metadata:
  name: mysql
  namespace: shenyu
spec:
  ports:
    - port: 3306
      name: mysql

```

```

    targetPort: {your_mysql_port}
---

kind: Endpoints
apiVersion: v1
metadata:
  name: mysql
  namespace: shenyu
subsets:
- addresses:
  - ip: {your_mysql_ip}
  ports:
  - port: {your_mysql_port}
  name: mysql

```

- execute `kubectl apply -f shenyu-ep.yaml`

14.20.3 3. 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`

14.20.4 4. 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`

14.21 Test Access

Access Address: [http://\[K8S_CLUSTER_IP\]:31095/](http://[K8S_CLUSTER_IP]:31095/)

Account/password: admin/123456

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.

14.22 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.

14.23 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
```

14.24 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.

14.25 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.

14.25.1 Getting Started

- Prerequisite:
 1. Luarocks
 2. OpenResty

14.26 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
```

14.27 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.

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

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

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.

14.28.1 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.

14.29 Start Apache ShenYu Admin

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

14.30 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
```

15

Quick Start

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](#).

15.1 Environment to prepare

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

After successful startup, you need to open the 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>
```

15.2 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}
```

15.3 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:

Body	Cookies	Headers (2)	Test Results	Status: 200 OK	Time: 30 ms
Body Authorization Headers (1) Body (raw) Pre-request Script Tests form-data x-www-form-urlencoded raw binary JSON (application/json)					
<pre> 1 * { 2 "no": "123", 3 "name": "test" 4 } 5 </pre>					
Pretty Raw Preview JSON					
<pre> 1 {< 2 "code": 200, 3 "message": "Access to success!", 4 "data": "Hello no=123, name=test, time=1612867753446" 5 } </pre>					

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](#).

15.4 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>
```

15.5 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}
```

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

15.7 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-->
```

15.8 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": "{}\n
"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": "{}\n"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
": "{}\n"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": "{}\n
"timeout\":5000,\\"methodType\":\\"SERVER_STREAMING\\\"", "enabled":true,"host":"172.
20.10.6","port":8080,"registerMetaData":false}

```

15.9 Test

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

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

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

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

The parameters are passed in json format. The name of the key is data by default, and you can reset it in `GrpcConstants.JSON_DESCRIPTOR_PROTO_FIELD_NAME`. The input of value is based on the proto file defined by you.

15.10 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.

POST http://localhost:9195/grpc/unaryFun

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

none form-data x-www-form-urlencoded raw binary GraphQL **JSON**

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

Body Cookies Headers (2) Test Results Status: 200 OK Time: 26 ms Size: 178 B Save

Pretty Raw Preview Visualize JSON ↴

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

- CLIENT_STREAMING

The request body like this.

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

```

        "text": "hello grpc"
    }
]
}

```

Then, call gRPC service by CLIENT_STREAMING method type.

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

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

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: 11 ms Size: 179 B Save

Pretty Raw Preview Visualize **JSON**

```

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

```

- SERVER_STREAMING

The request body like this.

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

Then, call gRPC service by SERVER_STREAMING method type.

```

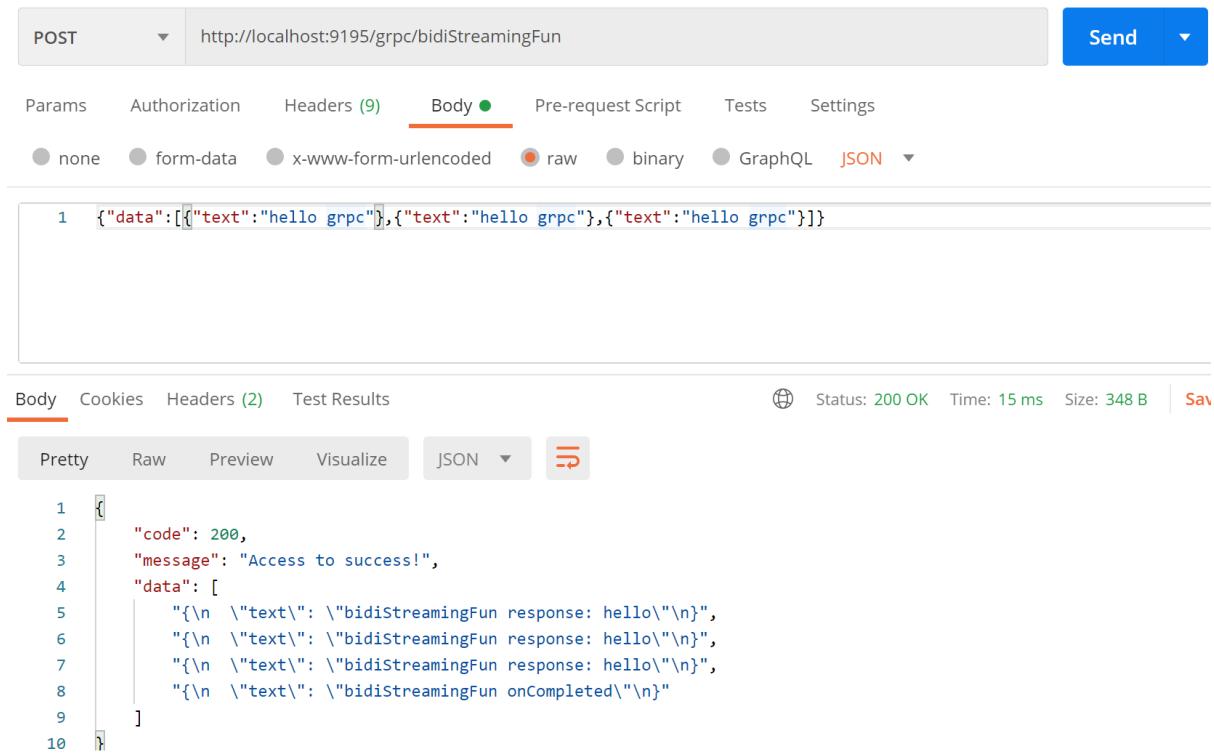
1  [{"data": [{"text": "hello grpc"}]}]
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
    
```

- 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.



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](#).

15.11 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-->

```

15.12 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\":3,\"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,
java.lang.String","rpcExt":"{\\"loadbalance\\":\\"hash\\",\\"retries\\":3,\\"timeout\\":1
}","enabled":true}
2021-02-10 02:31:45.627 INFO 2156 --- [pool-1-thread-1] o.d.s.client.common.utils.
RegisterUtils : sofa client register success: {"appName":"sofa","contextPath":"/
sofa","path":"/sofa/findByArrayIdsAndName","pathDesc":"","rpcType":"sofa",
"serviceName":"org.dromara.shenyu.examples.sofa.api.service.SofaMultiParamService",
"methodName":"findByArrayIdsAndName","ruleName":"/sofa/findByArrayIdsAndName",
"parameterTypes":"[Ljava.lang.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":
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"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.
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\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\jfxrt.jar;C:\Program Files\Java\jdk1.8.0_211\jre\lib\ext\.localedata.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_

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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\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\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\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\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\
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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\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\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\

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springframework\boot\spring-boot-autoconfigure\2.2.2.RELEASE\spring-boot-
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spring-boot\2.2.2.RELEASE\spring-boot-2.2.2.RELEASE.jar;D:\X\dlm_github\shenyu\
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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\DT\Binn\;C:\Program Files\Docker\Dockers\resources\bin;C:\ProgramData\Dockers\Dockers\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\l\AppData\Local\Microsoft\WindowsApps;C:\Users\DL\go\bin;C:\Users\DL\l\AppData\Roaming\npm;;C:\Program Files\Microsoft VS Code\bin;C:\Program Files\nimbell-a-cl\bin;.

2021-02-10 02:31:46.060 INFO 2156 --- [           main] org.apache.zookeeper.ZooKeeper      : Client environment:java.io.tmpdir=C:\Users\DL\l\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=DLM

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

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)

```

15.13 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:

	RuleName	Open	UpdateTime	Operation
[+]	/sofa/insert	Open	2021-02-10 02:16:12	Modify Delete
[+]	/sofa/findById	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:

Body	Cookies	Headers (2)	Test Results	Status: 200 OK Time: 954 ms
POST Send Save Authorization Headers (1) Body Params Code form-data x-www-form-urlencoded raw binary JSON (application/json) <pre> 1 { 2 "id": "123" 3 } 4 </pre>				
Body Pretty Raw Preview JSON - <pre> 1 { 2 "code": 200, 3 "message": "Access to success!", 4 "data": [5 { 6 "id": "123", 7 "name": "hello world Soul Sofa, findById" 8 } 9] </pre>				

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 POST request to `http://localhost:9195/sofa/batchSaveNameAndId`. The request body is a JSON object with two entries:

```

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

```

The response status is 200 OK, and the response body is:

```

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

```

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](#).

15.14 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 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>
```

15.15 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)
```

15.16 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:

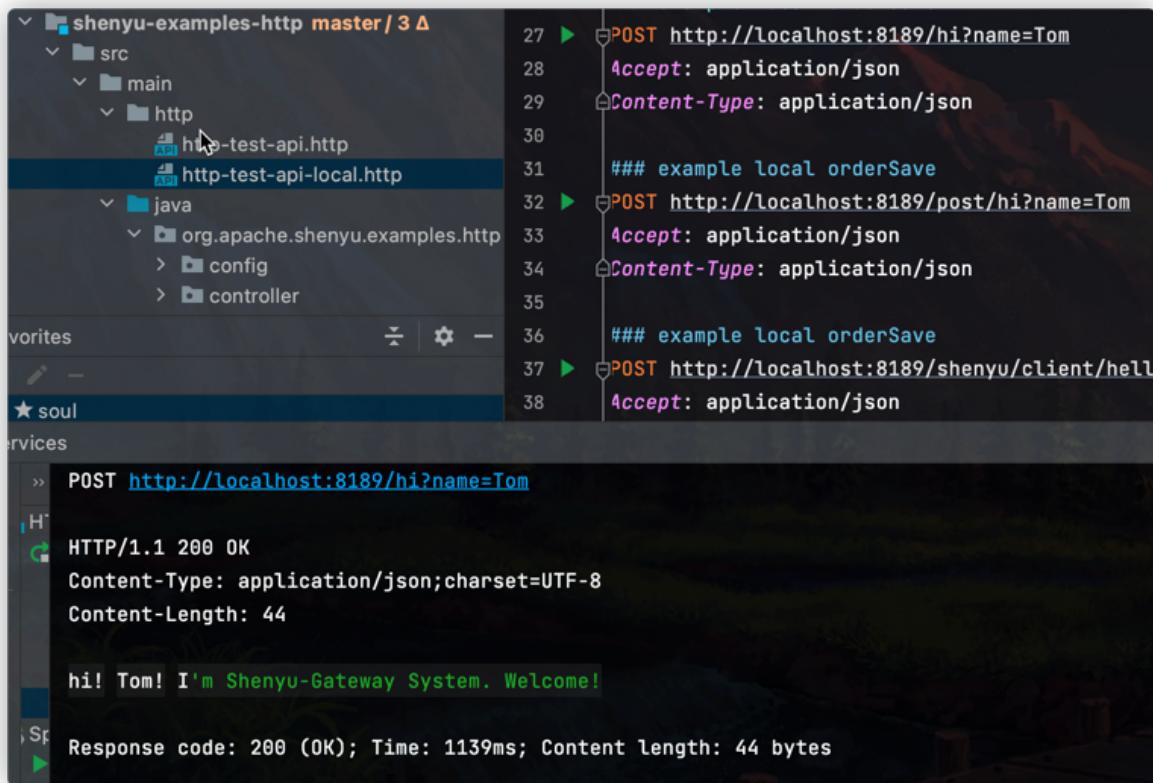
```

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 the following details:

- Project Structure:** The terminal shows the directory structure of `shenyu-examples-http` with files like `http-test-api.http`, `http-test-api-local.http`, and Java code in `org.apache.shenyu.examples.http`.
- Logs/Output:** The right side of the terminal displays several log entries. The first entry is a POST request to `http://localhost:9195/http/hello`. Subsequent entries show responses from the gateway, including headers like `Content-Type: application/json` and body content like "hello! I'm Shenyu-Gateway System. Welcome!".
- Terminal Bottom:** The bottom of the terminal shows a command prompt: `POST http://localhost:9195/http/hello`.

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](#).

15.17 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-plugin-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-plugin-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-->

```

15.18 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.

15.19 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:

Name	Open	Operation	RuleName	Open	UpdateTime	Operation
/dubbo	Open	Modify Delete	/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/findByListId	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:

GET http://localhost:9195/dubbo/findById?id=1

Params

Pretty Raw Preview JSON

```

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

```

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;
}

```

The screenshot shows a Postman request configuration and its response. The request method is POST, the URL is <http://localhost:9195/dubbo/batchSaveAndNameAndId>, and the body is a JSON object:

```

1 {  
2   "dubboTestList": [{"id":"1","name":"test"}],  
3   "id": "2",  
4   "name":"multi-params"  
5 }

```

The response status is 200 OK, and the response body is:

```

1 {  
2   "code": 200,  
3   "message": "Access to success!",  
4   "data": {  
5     "name": "hello world soul apache dubbo param batchSaveAndNameAndId :multi-params:test",  
6     "id": "2"  
7   }  
8 }

```

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

15.20 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 the your registry center dependencies:

```

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

15.21 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] o.c.l.b.c.RibbonLoadBalancerClientWarnLogger : 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] c.l.b.c.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)

```

15.22 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:

The screenshot shows the Apache ShenYu interface for managing plugin rules. At the top, there are tabs for 'SelectorList' and 'RulesList'. The 'RulesList' tab is selected, showing a table with the following columns: Name, Open, Operation, RuleName, Open, UpdateTime, and Operation. There are five rows of data, each with a '+' icon to its left. The first row, '/springcloud', has 'Open' and 'Modify Delete' buttons. The other four rows have 'Open' and 'Modify Delete' buttons. Below the table are navigation arrows: '< [1] >' and '< [1] >'.

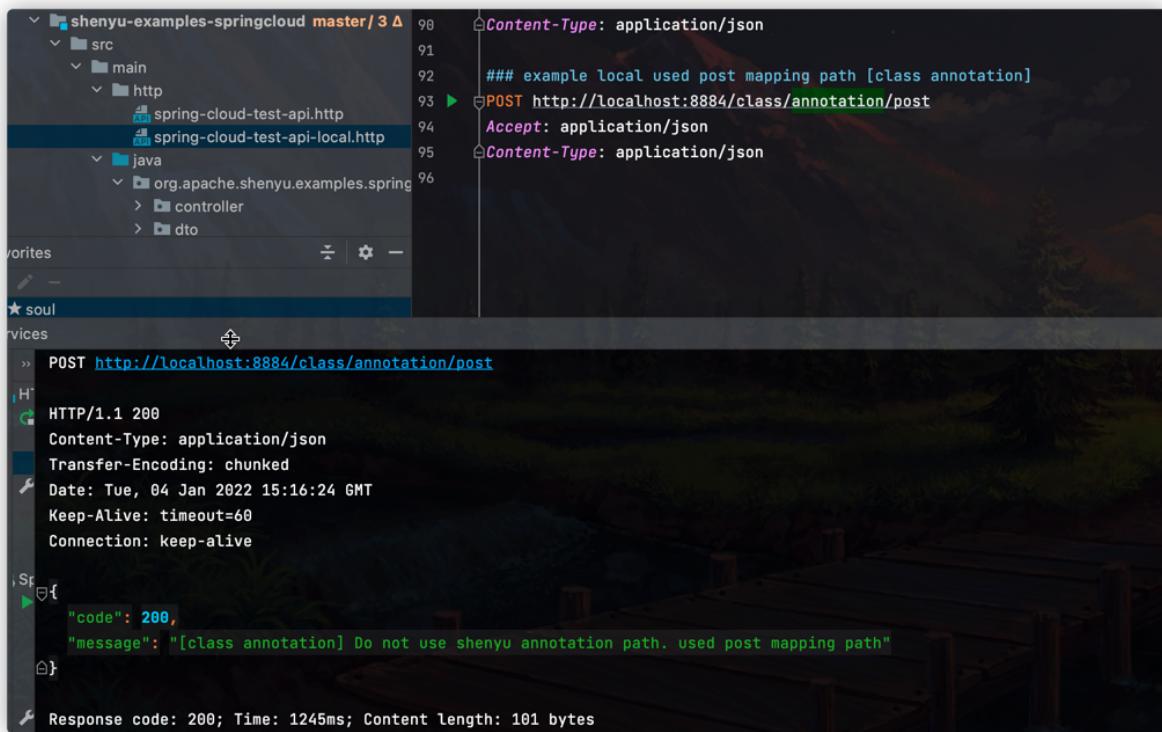
Name	Open	Operation	RuleName	Open	UpdateTime	Operation
/springcloud	Open	Modify Delete	/springcloud/order/save	Open	2021-02-10 14:00:04	Modify Delete
			/springcloud/order/path/**/name	Open	2021-02-10 14:00:04	Modify Delete
			/springcloud/order/findById	Open	2021-02-10 14:00:04	Modify Delete
			/springcloud/order/path/**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

The screenshot shows the PostMan interface. The request method is 'GET', the URL is 'http://localhost:9195/springcloud/order/findById?id=123', and the status is '200 OK' with a response time of '36 ms'. The response body is displayed in JSON format, showing a single object with an id of 123 and a name of 'hello world spring cloud findById'.

Body	Cookies	Headers (5)	Test Results	Status: 200 OK	Time: 36 ms
Pretty	Raw	Preview	JSON		
1 ↴ [{ 2 "id": "123", 3 "name": "hello world spring cloud findById" 4 }]					

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



```

shenyu-examples-springcloud master/3 △
  src
    main
      http
        spring-cloud-test-api.http
        spring-cloud-test-api-local.http
      java
        org.apache.shenyu.examples.spring
          controller
          dto
  soul
  vices
  services
  soul
  Response code: 200; Time: 1245ms; Content length: 101 bytes

```

Content-Type: application/json
 ### example local used post mapping path [class annotation]
 POST http://localhost:8884/class/annotation/post
 Accept: application/json
 Content-Type: application/json

```

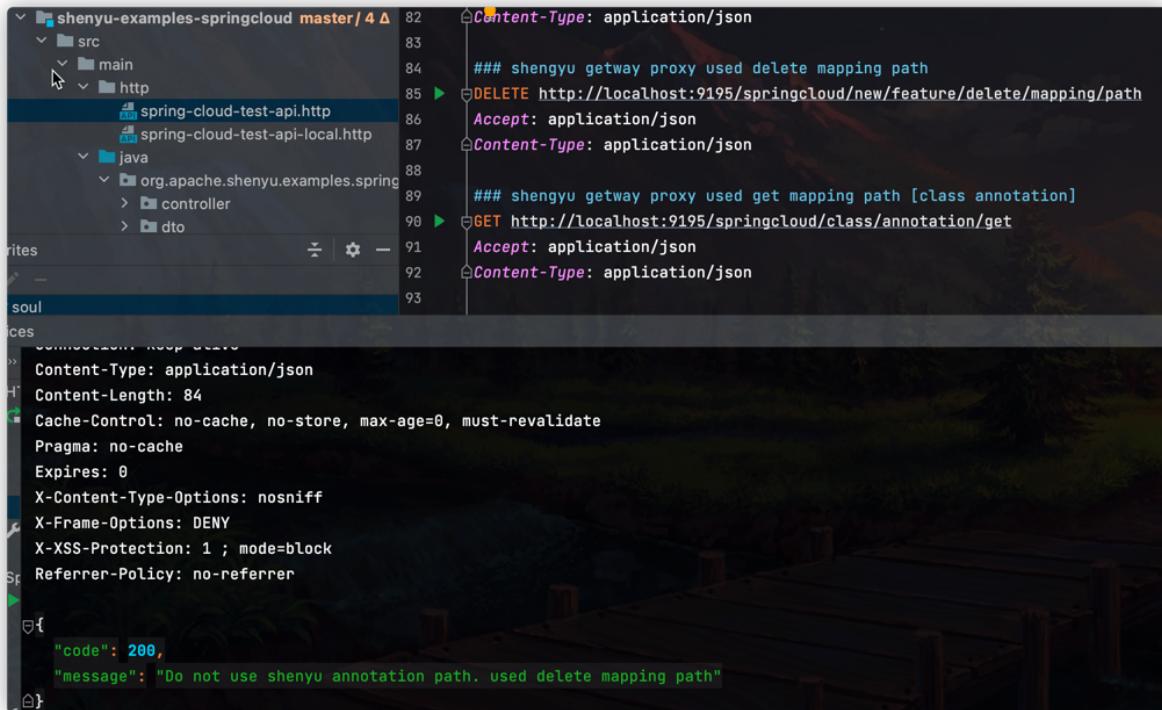
POST http://localhost:8884/class/annotation/post

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

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

```

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



```

shenyu-examples-springcloud master/4 △
  src
    main
      http
        spring-cloud-test-api.http
        spring-cloud-test-api-local.http
      java
        org.apache.shenyu.examples.spring
          controller
          dto
  soul
  vices
  services
  soul
  Response code: 200; Time: 1245ms; Content length: 101 bytes

```

Content-Type: application/json
 ### shenyu getway proxy used delete mapping path
 DELETE http://localhost:9195/springcloud/new/feature/delete/mapping/path
 Accept: application/json
 Content-Type: application/json

```

DELETE http://localhost:9195/springcloud/new/feature/delete/mapping/path

HTTP/1.1 200
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"
}

```

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

15.23 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>
```

15.24 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}
```

15.25 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.

15.26 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;
        }
    </script>
</head>
<body>
    <input type="text" id="url" value="ws://127.0.0.1:8080/shenyu-admin/test/websocket" />
    <button type="button" onclick="connect();">Connect</button>
    <div id="show" style="border: 1px solid black; padding: 10px; height: 100px; overflow-y: scroll;">
```

```

        }
        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">

<input id="msg" type="text">

<button id="connect" onclick="connect();">Connect</button>

<button id="send" onclick="send();">Send</button>

<button id="close" onclick="buttonClose();">Close</button>

<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 is intended to help the Tars service access the Apache ShenYu gateway. The Apache ShenYu gateway uses the tars plugin to handle tars service.

Before the connection, start shenyu-admin correctly, start tars plugin, and add related dependencies on the gateway and tars application client. Refer to the previous [Quick start with Tars](#).

For details about client access configuration, see [Application Client Access Config](#).

For details about data synchronization configurations, see [Data Synchronization Config](#).

16.1 Add tars plugin in gateway

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

```
<!-- apache shenyu tars plugin start-->
<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>
<!-- apache shenyu tars plugin end-->
```

- Restart your gateway service.

16.2 Tars service access gateway

Please refer to: shenyu-examples-tars

1. In the microservice built by Tars, add the following dependencies:

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

2. Add the following configuration to the application.yaml configuration file:

```
shenyu:
  register:
    registerType: http #zookeeper #etcd #nacos #consul
    serverLists: http://localhost:9095 #localhost:2181 #http://localhost:2379
#localhost:8848
  props:
    username: admin
    password: 123456
  client:
    tars:
      props:
        contextPath: /tars
        appName: tars
        port: 21715
        host: 192.168.41.103
```

3. Add @ShenyuTarsService Annotation on the tars service interface implementation class and @ShenyuTarsClient on the method, start your service provider, and register successfully. In the background management system, enter PluginList -> rpc proxy -> tars, you will see the automatic registration of selectors and rules information.

Example:

```
@TarsServant("HelloObj")
@ShenyuTarsService(serviceName = "ShenyuExampleServer.ShenyuExampleApp.HelloObj")
public class HelloServantImpl implements HelloServant {
    @Override
    @ShenyuTarsClient(path = "/hello", desc = "hello")
    public String hello(int no, String name) {
        return String.format("hello no=%s, name=%s, time=%s", no, name, System.
currentTimeMillis());
    }

    @Override
    @ShenyuTarsClient(path = "/helloInt", desc = "helloInt")
```

```

public int helloInt(int no, String name) {
    return 1;
}
}

```

16.3 User Request

You can request your tars service by Http. The Apache ShenYu gateway needs to have a route prefix which is the contextPath configured by the access gateway. For example: `http://localhost:9195/tars/hello`.

This document is intended to help the Http service access the Apache ShenYu gateway. The Apache ShenYu gateway uses the Divide plugin to handle Http requests.

Before the connection, start shenyu-admin correctly, start Divide plugin, and add related dependencies on the gateway and Http application client. Refer to the previous [Quick start with Http](#).

For details about client access configuration, see [Application Client Access Config](#).

For details about data synchronization configurations, see [Data Synchronization Config](#).

16.4 Add divide plugin in gateway

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

```

<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>

```

16.5 Http request access gateway (for springMvc)

- SpringBoot

Please refer this: [shenyu-examples-http](#)

1. Add the following dependencies to the pom.xml file in your Http service:

```
<dependency>
    <groupId>org.apache.shenyu</groupId>
    <artifactId>shenyu-spring-boot-starter-client-springmvc</artifactId>
    <version>${shenyu.version}</version>
</dependency>
```

2. Add the following configuration to application.yaml:

```
shenyu:
  register:
    registerType: http #zookeeper #etcd #nacos #consul
    serverLists: http://localhost:9095 #localhost:2181 #http://localhost:2379
#localhost:8848
  props:
    username: admin
    password: 123456
  client:
    http:
      props:
        contextPath: /http
        appName: http
#      port: 8189
```

- SpringMvc

Please refer this: [shenyu-examples-springmvc](#)

Add the following dependencies to the pom.xml file in your Http service:

```
<dependency>
    <groupId>org.apache.shenyu</groupId>
    <artifactId>shenyu-client-springmvc</artifactId>
    <version>${shenyu.version}</version>
</dependency>
```

Add the following to the XML file defined by your bean :

```
<bean id="springMvcClientBeanPostProcessor" class="org.apache.shenyu.client.springmvc.init.SpringMvcClientBeanPostProcessor">
    <constructor-arg ref="clientPropertiesConfig"/>
    <constructor-arg ref="clientRegisterRepository"/>
</bean>
```

```

<!-- Config register center according to your register type-->
<bean id="shenyuRegisterCenterConfig" class="org.apache.shenyu.register.common.config.ShenyuRegisterCenterConfig">
    <property name="registerType" value="http"/>
    <property name="serverLists" value="http://localhost:9095"/>
</bean>

<!-- Client properties config -->
<bean id="clientPropertiesConfig"
      class="org.apache.shenyu.register.common.config.ShenyuClientConfig.ClientPropertiesConfig">
    <property name="props">
        <map>
            <entry key="contextPath" value="/your contextPath"/>
            <entry key="appName" value="your appName"/>
            <entry key="port" value="your port"/>
            <entry key="isFull" value="false"/>
        </map>
    </property>
</bean>

<!-- Config register repository according to your register type -->
<bean id="clientRegisterRepository" class="org.apache.shenyu.register.client.http.HttpClientRegisterRepository">
    <constructor-arg ref="shenyuRegisterCenterConfig"/>
</bean>

<bean id="shenyuClientShutdownHook" class="org.apache.shenyu.client.core.shutdown.ShenyuClientShutdownHook">
    <constructor-arg ref="shenyuRegisterCenterConfig"/>
    <constructor-arg ref="clientRegisterRepository"/>
</bean>

<bean id="contextRegisterListener" class="org.apache.shenyu.client.springmvc.init.ContextRegisterListener">
    <constructor-arg ref="clientPropertiesConfig"/>
</bean>

```

Add this annotation `@ShenyuSpringMvcClient` in your controller interface.

You can apply the annotation to class-level in a controller. The name of the path variable is prefix and `/**` will apply proxy for entire interfaces.

Example(1)

The following indicates that `/test/payment`, `/test/findUserId` will be proxy by the gateway.

```

@RestController
@RequestMapping("/test")
@ShenyuSpringMvcClient(path = "/test/**")

```

```

public class HttpTestController {

    @PostMapping("/payment")
    public UserDTO post(@RequestBody final UserDTO userDTO) {
        return userDTO;
    }

    @GetMapping("/findById")
    public UserDTO findById(@RequestParam("userId") final String userId) {
        UserDTO userDTO = new UserDTO();
        userDTO.setUserId(userId);
        userDTO.setUserName("hello world");
        return userDTO;
    }
}

```

Example(2)

The following indicates that /order/save is proxied by the gateway, while /order/findById is not.

```

@RestController
@RequestMapping("/order")
@ShenyuSpringMvcClient(path = "/order")
public class OrderController {

    @PostMapping("/save")
    @ShenyuSpringMvcClient(path = "/save")
    public OrderDTO save(@RequestBody final OrderDTO orderDTO) {
        orderDTO.setName("hello world save order");
        return orderDTO;
    }

    @GetMapping("/findById")
    public OrderDTO findById(@RequestParam("id") final String id) {
        OrderDTO orderDTO = new OrderDTO();
        orderDTO.setId(id);
        orderDTO.setName("hello world findById");
        return orderDTO;
    }
}

```

example (3): This is a simplified way to use it, just need a simple annotation to register to the gateway using metadata. Special note: currently only supports @RequestMapping, @GetMapping, @PostMapping, @DeleteMapping, @PutMapping annotations, and only valid for the first path in @XXXMapping

```

@RestController
@RequestMapping("new/feature")
public class NewFeatureController {

```

```
/**  
 * no support gateway access api.  
 *  
 * @return result  
 */  
@RequestMapping("/gateway/not")  
public EntityResult noSupportGateway() {  
    return new EntityResult(200, "no support gateway access");  
}  
  
/**  
 * Do not use shenyu annotation path. used request mapping path.  
 *  
 * @return result  
 */  
@RequestMapping("/requst/mapping/path")  
@ShenyuSpringCloudClient  
public EntityResult requestMappingUrl() {  
    return new EntityResult(200, "Do not use shenyu annotation path. used request  
mapping path");  
}  
  
/**  
 * Do not use shenyu annotation path. used post mapping path.  
 *  
 * @return result  
 */  
@PostMapping("/post/mapping/path")  
@ShenyuSpringCloudClient  
public EntityResult postMappingUrl() {  
    return new EntityResult(200, "Do not use shenyu annotation path. used post  
mapping path");  
}  
  
/**  
 * Do not use shenyu annotation path. used post mapping path.  
 *  
 * @return result  
 */  
@GetMapping("/get/mapping/path")  
@ShenyuSpringCloudClient  
public EntityResult getMappingUrl() {  
    return new EntityResult(200, "Do not use shenyu annotation path. used get  
mapping path");  
}  
}
```

- Start your project, your service interface is connected to the gateway, go to the shenyu-admin management system plugin list -> HTTP process -> Divide, see automatically created selectors and rules.

16.6 Http request access gateway(other framework)

- First, find divide plugin in shenyu-admin, add selector, and rules, and filter traffic matching.
- If you don't know how to configure, please refer to [Selector Detailed Explanation](#).
- You can also develop your customized http-client, refer to [multi-language Http client development](#).

16.7 User request

- Send the request as before, only two points need to notice.
- Firstly, the domain name that requested before in your service, now need to replace with gateway's domain name.
- Secondly, Apache ShenYu Gateway needs a route prefix which comes from contextPath, it configured during the integration with gateway, you can change it freely in divide plugin of shenyu-admin, if you are familiar with it.
 - for example, if you have an order service, and it has an interface, the request url: `http://localhost:8080/test/save`
 - Now need to change to: `http://localhost:9195/order/test/save`
 - We can see `localhost:9195` is your gateway's ip port, default port number is 9195 , `/order` is your contextPath which you configured with gateway.
 - Other parameters doesn't change in request method.
- Then you can visit, very easy and simple.

This document is intended to help the Sofa service access the Apache ShenYu gateway. The Apache ShenYu gateway uses the Sofa plugin to handle sofa service.

Before the connection, start shenyu-admin correctly, start Sofa plugin, and add related dependencies on the gateway and Sofa application client. Refer to the previous [Quick start with Sofa](#) .

For the use of the plugin, see: [Sofa Plugin](#)

For details about client access configuration, see [Application Client Access Config](#) .

For details about data synchronization configurations, see [Data Synchronization Config](#) .

16.8 Add sofa plugin in gateway

In the current version, this dependency has been introduced by default.

1. Add the following dependencies in the gateway's pom.xml file:

```
<dependency>
    <groupId>com.alipay.sofa</groupId>
    <artifactId>sofa-rpc-all</artifactId>
    <version>5.7.6</version>
    <exclusions>
        <exclusion>
            <groupId>net.jcip</groupId>
            <artifactId>jcip-annotations</artifactId>
        </exclusion>
    </exclusions>
</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>
```

2. Restart the gateway service.

16.9 Sofa service access gateway

Please refer to: shenyu-examples-sofa

1. Based on the springboot project, Introduce the following dependencies:

```
<dependency>
    <groupId>com.alipay.sofa</groupId>
    <artifactId>rpc-sofa-boot-starter</artifactId>
    <version>${rpc-sofa-boot-starter.version}</version>
</dependency>
    <dependency>
        <groupId>org.apache.shenyu</groupId>
        <artifactId>shenyu-spring-boot-starter-client-sofa</artifactId>
        <version>${shenyu.version}</version>
</dependency>
```

2. Configure in application.yml

```
com:
  alipay:
    sofa:
      rpc:
        registry-address: zookeeper://127.0.0.1:2181 # consul # nacos
        bolt-port: 8888
shenyu:
  register:
    registerType: http #zookeeper #etcd #nacos #consul
    serverLists: http://localhost:9095 #localhost:2181 #http://localhost:2379
#localhost:8848
  props:
    username: admin
    password: 123456
client:
  sofa:
    props:
      contextPath: /sofa
      ipAndPort: sofa
      appName: sofa
      port: 8888
```

3. Configure the service interface exposed by the sofa service in the xml file in the resources.

```
<beans xmlns="http://www.springframework.org/schema/beans"
       xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
       xmlns:sofa="http://sofastack.io/schema/sofaboot"
       xsi:schemaLocation="http://www.springframework.org/schema/beans http://www.
springframework.org/schema/beans/spring-beans.xsd
                      http://sofastack.io/schema/sofaboot https://sofastack.io/schema/
```

```

sofaboot.xsd"
    default-autowire="byName">
    <sofa:service ref="sofaSingleParamService" interface="org.apache.shenyu.
examples.sofa.api.service.SofaSingleParamService">
        <sofa:binding.bolt/>
    </sofa:service>
    <sofa:service ref="sofaMultiParamService" interface="org.apache.shenyu.
examples.sofa.api.service.SofaMultiParamService">
        <sofa:binding.bolt/>
    </sofa:service>
</beans>

```

4. Add the @ShenyuSofaClient annotation to the interface

```

@ShenyuSofaClient("/demo")
@Service
public class SofaClientMultiParamServiceImpl implements SofaClientMultiParamService
{

    @Override
    @ShenyuSofaClient("/findByIdsAndName")
    public SofaSimpleTypeBean findByIdsAndName(final List<Integer> ids, final
String name) {
        return new SofaSimpleTypeBean(ids.toString(), "hello world shenyu sofa
param findByIdsAndName : " + name);
    }
}

```

5. Start the sofa service, and after successful registration:

- Go to PluginList -> Proxy -> Sofa in the backend management system, you will see the information of auto-registered selectors and rules.
- Go to BasicConfig -> Metadata and search by app name . You will see the metadata of sofa, each sofa interface method, will correspond to a metadata.

16.10 User request and parameter description

- The gateway can be requested by means of http to request your sofa service.
 - ShenYu gateway needs to have a routing prefix, this routing prefix is for you to access the project for configuration contextPath .

For example, if you have an order service, it has an interface and its registration path /order/test/save

Now it's to request the gateway via post: <http://localhost:9195/order/test/save>

Where localhost:9195 is the IP port of the gateway, default port is 9195, /order is the contextPath of your sofa access gateway configuration.

- Parameter passing:
 - Access the gateway through http post, and pass through body and json.
 - For more parameter type transfer, please refer to the interface definition in [shenyu-examples-sofa](#) and the parameter transfer method.
- Single java bean parameter type (default)
- Customize multi-parameter support:
- In the gateway project you built, add a new class `MySofaParamResolveService`, implements `org.apache.shenyu.plugin.api.sofa.SofaParamResolveService`.

```
public interface SofaParamResolveService {

    /**
     * Build parameter pair.
     * this is Resolve http body to get sofa param.
     *
     * @param body          the body
     * @param parameterTypes the parameter types
     * @return the pair
     */
    Pair<String[], Object[]> buildParameter(String body, String parameterTypes);
}
```

- `body` is the json string passed by body in http.
- `parameterTypes`: list of matched method parameter types, If there are multiple, use , to separate.
- In `Pair`, left is the parameter type, and right is the parameter value. This is the standard for sofa generalization calls.
- Register your class as a String bean and override the default implementation.

```
@Bean
public SofaParamResolveService mySofaParamResolveService() {
    return new MySofaParamResolveService();
}
```

This document is intended to help the `Websocket` service access the Apache `ShenYu` gateway. The Apache `ShenYu` gateway uses the `Websocket` plugin to handle `Websocket` service.

Before the connection, start `shenyu-admin` correctly, start `Websocket` plugin, and add related dependencies on the gateway and `Websocket` application client. Refer to the previous [Quick start with Websocket](#).

For details about client access configuration, see [Application Client Access Config](#).

For details about data synchronization configurations, see [Data Synchronization Config](#).

16.11 Add Websocket plugin in gateway

Add the following dependencies to the gateway's pom.xml file, which is introduced by default:

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

- Restart your gateway service.

16.12 Websocket service access gateway

Please refer to: [shenyu-examples-websocket](#), Contains examples of the three implementations of annotation websocket, spring native websocket, spring reactive websocket

1. In the Websocket service, add the following dependencies:

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

2. Add the following configuration to the application.yaml configuration file:

```
shenyu:
  register:
    registerType: http
    serverLists: http://localhost:9095 # shenyu-admin ip and port
    props:
      username: admin
      password: 123456
  client:
    websocket:
      props:
        contextPath: /ws-annotation
        appName: ws-annotation
        port: 8001 # need to be consistent with the service port
```

3. Add @ShenyuSpringWebSocketClient annotation to the Websocket service interface implementation class, start your service and after successful registration, go to Client List -> Proxy -> Websocket in the shenyu-admin management system and you will see the auto-registered selector and rule information.

示例：

```
@ShenyuSpringWebSocketClient("/myWs")
@SetterEndpoint("/myWs")
public class WsServerEndpoint {
    @OnOpen
    public void onOpen(@Final Session session) {
        LOG.info("connect successful");
    }

    @OnClose
    public void onClose(@Final Session session) {
        LOG.info("connect closed");
    }

    @OnMessage
    public String onMsg(@Final String text) {
        return "server send message: " + text;
    }
}
```

16.13 User Request

You need to request your Websocket service via the ws protocol. The Apache ShenYu gateway will configure a routing prefix which is the contextPath in the access gateway configuration file. For example: ws://localhost:9195/ws-annotation/myWs, after which you can establish a connection to send and receive messages normally.

This document is intended to help the Motan service access the Apache ShenYu gateway. The Apache ShenYu gateway uses the Motan plugin to handle motan service.

Before the connection, start shenyu-admin correctly, start Motan plugin, and add related dependencies on the gateway and Motan application client. Refer to the previous [Quick start with Motan](#).

For details about client access configuration, see [Application Client Access Config](#).

For details about data synchronization configurations, see [Data Synchronization Config](#).

16.14 Add motan plugin in gateway

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>

```

- Restart your gateway service.

16.15 Motan service access gateway

Please refer to: [shenyu-examples-motan](#)

1. In the microservice built by Motan, add the following dependencies:

```

<dependency>
    <groupId>org.apache.shenyu</groupId>
    <artifactId>shenyu-spring-boot-starter-client-motan</artifactId>
    <version>${shenyu.version}</version>
</dependency>

```

2. Add the following configuration to the application.yaml configuration file:

```

shenyu:
  register:
    registerType: http #zookeeper #etcd #nacos #consul
    serverLists: http://localhost:9095 #localhost:2181 #http://localhost:2379
#localhost:8848
  props:
    username: admin
    password: 123456
  client:
    motan:

```

```

props:
  contextPath: /motan
  ipAndPort: motan
  appName: motan
  port: 8081
  package-path: org.apache.shenyu.examples.motan.service
  basicServiceConfig:
    exportPort: 8002

motan:
  registry:
    protocol: zookeeper
    address: 127.0.0.1:2181

```

3. Add @ShenyuMotanClient annotation to the method of Motan service interface implementation class, start your service provider, after successful registration, go to PluginList -> rpc proxy -> motan in the background management system, you will see automatic registration of selectors and rules information.

Example:

```

@MotanService(export = "demoMotan:8002")
public class MotanDemoServiceImpl implements MotanDemoService {
    @Override
    @ShenyuMotanClient(path = "/hello")
    public String hello(String name) {
        return "hello " + name;
    }
}

```

16.16 User Request

You can request your motan service by Http. The Apache ShenYu gateway needs to have a route prefix which is the contextPath configured by the access gateway. For example: `http://localhost:9195/motan/hello`.

This document is intended to help the gRPC service access the Apache ShenYu gateway. The Apache ShenYu gateway uses the gRPC plugin to handle gRPC service.

Before the connection, start shenyu-admin correctly, start gRPC plugin, and add related dependencies on the gateway and gRPC application client. Refer to the previous [Quick start with gRPC](#).

For details about client access configuration, see [Application Client Access Config](#).

For details about data synchronization configurations, see [Data Synchronization Config](#).

16.17 Add gRPC plugin in gateway

Add the following dependencies in 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-->
```

- Restart the gateway service.

16.18 gRPC service access gateway

You can refer to: [shenyu-examples-grpc](#).

1. In the microservice built by gRPC, add the following dependencies:

```
<dependency>
    <groupId>org.apache.shenyu</groupId>
    <artifactId>shenyu-spring-boot-starter-client-grpc</artifactId>
    <version>${shenyu.version}</version>
    <exclusions>
        <exclusion>
            <artifactId>guava</artifactId>
            <groupId>com.google.guava</groupId>
        </exclusion>
    </exclusions>
</dependency>
```

Execute command to generate java code in shenyu-examples-grpc project.

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

2. Add the following configuration to application.yaml:

```
shenyu:
  register:
    registerType: http #zookeeper #etcd #nacos #consul
    serverLists: http://localhost:9095 #localhost:2181 #http://localhost:2379
#localhost:8848
  props:
    username: admin
    password: 123456
  client:
```

```
grpc:
  props:
    contextPath: /grpc
    appName: grpc
    ipAndPort: 127.0.0.1:38080
    port: 38080
```

- Add @ShenyuGrpcClient Annotation on the gRPC service interface implementation class. Start your service provider, after successful registration, in the background management system go to PluginList -> rpc proxy -> gRPC, you will see automatic registration of selectors and rules information.

Example:

```
@Override
@ShenyuGrpcClient(path = "/echo", desc = "echo")
public void echo(EchoRequest request, StreamObserver<EchoResponse>
responseObserver) {
    System.out.println("Received: " + request.getMessage());
    EchoResponse.Builder response = EchoResponse.newBuilder()
        .setMessage("ReceivedHELLO")
        .addTraces(Trace.newBuilder().setHost(getHostname()).build());
    responseObserver.onNext(response.build());
    responseObserver.onCompleted();
}
```

16.19 User Request

You can request your gRPC service by Http. The Apache ShenYu gateway needs to have a route prefix that you access to configure contextPath.

If your proto file is defined as follows:

```
message EchoRequest {
  string message = 1;
}
```

So the request parameters look like this:

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

The parameters are currently passed in json format, and the name of key defaults to data, which you can reset in `GrpcConstants.JSON_DESCRIPTOR_PROTO_FIELD_NAME`; The value is passed in according to the proto file you define.

the Apache ShenYu can support streaming calls to gRPC service, passing multiple arguments in the form of an array.

If your proto file is defined as follows:

```
message RequestData {
    string text = 1;
}
```

The corresponding method call request parameters are as follows:

- UNARY

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

- CLIENT_STREAMING

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

- SERVER_STREAMING

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

- BIDI_STREAMING

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

This document is intended to help the Spring Cloud service access the Apache ShenYu gateway. The Apache ShenYu gateway uses the `springCloud` plugin to handle Spring Cloud service.

Before the connection, start `shenyu-admin` correctly, start `springCloud` plugin, and add related dependencies on the gateway and `springCloud` application client. Refer to the previous [Quick start with Spring Cloud](#).

For details about client access configuration, see [Application Client Access Config](#).

For details about data synchronization configurations, see [Data Synchronization Config](#).

16.20 Add springcloud plugin in gateway

- add these dependencies in gateway's pom.xml:

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

<dependency>
  <groupId>org.springframework.cloud</groupId>
  <artifactId>spring-cloud-commons</artifactId>
```

```
<version>2.2.0.RELEASE</version>
</dependency>
```

- If you use eureka as SpringCloud registry center.

add these dependencies:

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

add these config values in gateway's yaml file:

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

- if you use nacos as Spring Cloud registry center.

add these dependencies:

```
<dependency>
    <groupId>com.alibaba.cloud</groupId>
    <artifactId>spring-cloud-starter-alibaba-nacos-discovery</artifactId>
    <version>2.1.0.RELEASE</version>
</dependency>
```

add these config values in gateway's yaml file:

```
spring:
  cloud:
    nacos:
      discovery:
        server-addr: 127.0.0.1:8848 # your nacos address
```

Special 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 your gateway service.

16.21 SpringCloud service access gateway

Please refer to [shenyu-examples-springcloud](#)

- Add the following dependencies to your Spring Cloud microservice :

```

<dependency>
    <groupId>org.apache.shenyu</groupId>
    <artifactId>shenyu-spring-boot-starter-client-springcloud</artifactId>
    <version>${shenyu.version}</version>
</dependency>

```

- Add the annotation `@ShenyuSpringCloudClient` in your controller interface. you can apply the annotation to class-level in a controller.the name of the path variable is prefix and ' `/**`' will apply proxy for entire interfaces.
- example (1): both `/test/payment` and `/test/findUserId` will be handled by gateway.

```

@RestController
@RequestMapping("/test")
@ShenyuSpringCloudClient(path = "/test/**")
public class HttpTestController {

    @PostMapping("/payment")
    public UserDTO post(@RequestBody final UserDTO userDTO) {
        return userDTO;
    }

    @GetMapping("/findUserId")
    public UserDTO findUserId(@RequestParam("userId") final String userId) {
        UserDTO userDTO = new UserDTO();
        userDTO.setUserId(userId);
    }
}

```

```

        userDTO.setUserName("hello world");
        return userDTO;
    }
}

```

example (2): /order/save will be handled by gateway, and /order/findById won't.

```

@RestController
@RequestMapping("/order")
@ShenyuSpringCloudClient(path = "/order")
public class OrderController {

    @PostMapping("/save")
    @ShenyuMvcClient(path = "/save")
    public OrderDTO save(@RequestBody final OrderDTO orderDTO) {
        orderDTO.setName("hello world save order");
        return orderDTO;
    }

    @GetMapping("/findById")
    public OrderDTO findById(@RequestParam("id") final String id) {
        OrderDTO orderDTO = new OrderDTO();
        orderDTO.setId(id);
        orderDTO.setName("hello world findById");
        return orderDTO;
    }
}

```

example (3): `isFull: true` represents that all service will be represented by the gateway.

```

shenyu:
  register:
    registerType: http #zookeeper #etcd #nacos #consul
    serverLists: http://localhost:9095 #localhost:2181 #http://localhost:2379
#localhost:8848
  props:
    username: admin
    password: 123456
  client:
    springCloud:
      props:
        contextPath: /springcloud
        isFull: true
#        port: 8884
# registerType : service registre type, see the application client access document
# serverList: server list, see the application client access document
# contextPath: route prefix for your project in ShenYu gateway.
# isFull: set true to proxy your all service and false to proxy some of your
controllers

```

```

@RestController
@RequestMapping("/order")
public class OrderController {

    @PostMapping("/save")
    @ShenyuSpringMvcClient(path = "/save")
    public OrderDTO save(@RequestBody final OrderDTO orderDTO) {
        orderDTO.setName("hello world save order");
        return orderDTO;
    }

    @GetMapping("/findById")
    public OrderDTO findById(@RequestParam("id") final String id) {
        OrderDTO orderDTO = new OrderDTO();
        orderDTO.setId(id);
        orderDTO.setName("hello world findById");
        return orderDTO;
    }
}

```

example (4): This is a simplified way to use it, just need a simple annotation to register to the gateway using metadata. Special note: currently only supports @RequestMapping, @GetMapping, @PostMapping, @DeleteMapping, @PutMapping annotations, and only valid for the first path in @XXXMapping.

```

@RestController
@RequestMapping("new/feature")
public class NewFeatureController {

    /**
     * no support gateway access api.
     *
     * @return result
     */
    @RequestMapping("/gateway/not")
    public EntityResult noSupportGateway() {
        return new EntityResult(200, "no support gateway access");
    }

    /**
     * Do not use shenyu annotation path. used request mapping path.
     *
     * @return result
     */
    @RequestMapping("/request/mapping/path")
    @ShenyuSpringCloudClient
    public EntityResult requestMappingUrl() {

```

```

        return new EntityResult(200, "Do not use shenyu annotation path. used request
mapping path");
    }

/**
 * Do not use shenyu annotation path. used post mapping path.
 *
 * @return result
 */
@PostMapping("/post/mapping/path")
@ShenyuSpringCloudClient
public EntityResult postMappingUrl() {
    return new EntityResult(200, "Do not use shenyu annotation path. used post
mapping path");
}

/**
 * Do not use shenyu annotation path. used post mapping path.
 *
 * @return result
 */
@GetMapping("/get/mapping/path")
@ShenyuSpringCloudClient
public EntityResult getMappingUrl() {
    return new EntityResult(200, "Do not use shenyu annotation path. used get
mapping path");
}
}

```

- After successfully registering your service, go to the backend management system PluginList -> rpc proxy -> springCloud' , you will see the automatic registration of selectors and rules information.

16.22 User Request

- Send the request as before, only two points need to notice.
- firstly, the domain name that requested before in your service, now need to replace with gateway's domain name.
- secondly, Apache ShenYu gateway needs a route prefix which comes from contextPath, it configured during the integration with gateway, you can change it freely in divide plugin of shenyu-admin, if your familiar with it.

For example, your have an order service and it has a interface, the request url: `http://localhost:8080/test/save`.

Now need to change to: `http://localhost:9195/order/test/save`.

We can see `localhost:9195` is the gateway's ip port, default port number is `9195` , `/order` is the `contextPath` in your config yaml file.

The request of other parameters doesn't change. Then you can visit, very easy and simple.

This document is intended to help the Dubbo service access the Apache ShenYu gateway. The Apache ShenYu gateway uses the Dubbo plugin to handle dubbo service.

Support Alibaba Dubbo(< 2.7.x) and Apache Dubbo (>=2.7.x).

Before the connection, start `shenyu-admin` correctly, start Dubbo plugin, and add related dependencies on the gateway and Dubbo application client. Refer to the previous [Quick start with Dubbo](#).

For details about client access configuration, see [Application Client Access Config](#).

For details about data synchronization configurations, see [Data Synchronization Config](#).

16.23 Add dubbo plugin in gateway

Add these dependencies in gateway's `pom.xml`.

Alibaba dubbo user, configure the dubbo version and registry center with yours.

```
<!-- apache shenyu alibaba dubbo plugin start-->
<dependency>
    <groupId>org.apache.shenyu</groupId>
    <artifactId>shenyu-spring-boot-starter-plugin-alibaba-dubbo</artifactId>
    <version>${project.version}</version>
</dependency>
<!-- apache shenyu alibaba dubbo plugin end-->
<dependency>
    <groupId>com.alibaba</groupId>
    <artifactId>dubbo</artifactId>
    <version>2.6.5</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>
```

Apache dubbo user, configure the dubbo version and registry center with yours.

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

<dependency>
    <groupId>org.apache.dubbo</groupId>
    <artifactId>dubbo</artifactId>
    <version>2.7.5</version>
</dependency>
<!-- Dubbo Nacos registry dependency start -->
<dependency>
    <groupId>org.apache.dubbo</groupId>
    <artifactId>dubbo-registry-nacos</artifactId>
    <version>2.7.5</version>
</dependency>
<dependency>
    <groupId>com.alibaba.nacos</groupId>
    <artifactId>nacos-client</artifactId>
    <version>1.1.4</version>
</dependency>
<!-- Dubbo Nacos registry dependency end-->

<!-- Dubbo zookeeper registry dependency start-->
<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>
<!-- Dubbo zookeeper registry dependency end -->
```

- restart gateway service.

16.24 Dubbo service access gateway

Dubbo integration with gateway, please refer to : [shenyu-examples-dubbo](#) .

- Alibaba Dubbo User

- SpringBoot

Add these dependencies:

```
<dependency>
    <groupId>org.apache.shenyu</groupId>
    <artifactId>shenyu-spring-boot-starter-client-alibaba-dubbo</artifactId>
    <version>${shenyu.version}</version>
</dependency>
```

- Spring

Add these dependencies:

```
<dependency>
    <groupId>org.apache.shenyu</groupId>
    <artifactId>shenyu-client-alibaba-dubbo</artifactId>
    <version>${shenyu.version}</version>
</dependency>
```

Inject these properties into your Spring beans XML file:

```
<bean id="clientConfig" class="org.apache.shenyu.register.common.config.PropertiesConfig">
    <property name="props">
        <map>
            <entry key="contextPath" value="/你的 contextPath"/>
            <entry key="appName" value=" 你的名字"/>
        </map>
    </property>
</bean>

<bean id="shenyuRegisterCenterConfig" class="org.apache.shenyu.register.common.config.ShenyuRegisterCenterConfig">
    <property name="registerType" value="http"/>
    <property name="serverList" value="http://localhost:9095"/>
</bean>

<bean id="shenyuClientRegisterRepository" class="org.apache.shenyu.client.core.register.ShenyuClientRegisterRepositoryFactory" factory-method="newInstance">
    <property name="shenyuRegisterCenterConfig" ref="shenyuRegisterCenterConfig"/>
</bean>
```

```
<bean id ="alibabaDubboServiceBeanListener" class ="org.apache.shenyu.client.alibaba.dubbo.AlibabaDubboServiceBeanListener">
    <constructor-arg name="clientConfig" ref="clientConfig"/>
    <constructor-arg name="shenyuClientRegisterRepository" ref="shenyuClientRegisterRepository"/>
</bean>
```

- Apache Dubbo User

- SpringBoot

Add these dependencies:

```
<dependency>
    <groupId>org.apache.shenyu</groupId>
    <artifactId>shenyu-spring-boot-starter-client-apache-dubbo</artifactId>
    <version>${shenyu.version}</version>
</dependency>
```

Add these in your client project's application.yml:

```
dubbo:
  registry:
    address: dubbo register address
    port: dubbo service port

shenyu:
  register:
    registerType: shenyu service register type #http #zookeeper #etcd
    #nacos #consul
    serverLists: shenyu service register address #http://localhost:9095
    #localhost:2181 #http://localhost:2379 #localhost:8848
  client:
    dubbo:
      props:
        contextPath: /your contextPath
        appName: your app name
```

- Spring

Add these dependencies:

```
<dependency>
    <groupId>org.apache.shenyu</groupId>
    <artifactId>shenyu-client-apache-dubbo</artifactId>
    <version>${shenyu.version}</version>
</dependency>
```

Injecct these properties into your Spring beans XML file:

```

<bean id = "apacheDubboServiceBeanListener" class="org.apache.shenyu.
client.apache.dubbo.ApacheDubboServiceBeanListener">
    <constructor-arg ref="clientPropertiesConfig"/>
    <constructor-arg ref="clientRegisterRepository"/>
</bean>

<!-- Config register repository according to your register type -->
<bean id="shenyuRegisterCenterConfig" class="org.apache.shenyu.register.
common.config.ShenyuRegisterCenterConfig">
    <property name="registerType" value="your service registerType"/>
    <property name="serverLists" value="your service register serverLists
"/>
</bean>

<!-- Client properties config -->
<bean id="clientPropertiesConfig"
      class="org.apache.shenyu.register.common.config.ShenyuClientConfig.
ClientPropertiesConfig">
    <property name="props">
        <map>
            <entry key="contextPath" value="/your contextPath"/>
            <entry key="appName" value="your appName"/>
        </map>
    </property>
</bean>

<!-- Config register repository according to your register type -->
<bean id="clientRegisterRepository" class="org.apache.shenyu.register.
client.http.HttpClientRegisterRepository">
    <constructor-arg ref="shenyuRegisterCenterConfig"/>
</bean>

<bean id="shenyuClientShutdownHook" class="org.apache.shenyu.client.core.
shutdown.ShenyuClientShutdownHook">
    <constructor-arg ref="shenyuRegisterCenterConfig"/>
    <constructor-arg ref="clientRegisterRepository"/>
</bean>

```

Add these in your client project's application.yml:

```

dubbo:
  registry:
    address: dubbo register address
    port: dubbo service port

```

16.25 Dubbo configuration

- Enable dubbo option in shenyu-admin.
- Configure your registry address in dubbo.

```
{"register":"zookeeper://localhost:2181"} or {"register":"nacos://localhost:8848"}
```

16.25.1 Configure the interface with gateway

- you can add the annotation `@ShenyuDubboClient` to your dubbo service implementation class, so that the interface method will be configured with gateway.
- Start your provider. After successful startup, go to PluginList -> rpc Proxy -> dubbo in the backend management system. You will see auto-registered selectors and rules information.

16.25.2 Dubbo user request and parameter explanation.

- Communicate with dubbo service through Http transport protocol.
- Apache ShenYu gateway need a route prefix which configured when accessing the project.

```
# for example: you have an order service and it has a interface, registry address:  
/order/test/save  
  
# now we can communicate with gateway through POST request http://localhost:9195/  
order/test/save  
  
# localhost:9195 is gateway's ip port, default port is 9195 , /order is the  
contextPath you set through gateway.
```

- parameter deliver:
 - communicate with gateway through body or json of http post request.
 - more parameter types, please refer to the interface definition in [shenyu-examples-dubbo](#) and parameter passing method.
- Single java bean parameter type (`default`).
- Multi-parameter type support, add this config value in gateway's yaml file:

```
shenyu:  
  dubbo:  
    parameter: multi
```

- Support for customized multi-parameter type

- Create a new implementation class MyDubboParamResolveService in your gateway project of org.apache.shenyu.web.dubbo.DubboParamResolveService.

```
public interface DubboParamResolveService {

    /**
     * Build parameter pair.
     * this is Resolve http body to get dubbo param.
     *
     * @param body          the body
     * @param parameterTypes the parameter types
     * @return the pair
     */
    Pair<String[], Object[]> buildParameter(String body, String parameterTypes);
}
```

- body is the json string in http request.
- parameterTypes: the list of method parameter types that are matched, split with ,.
- in Pair, left is parameter type, right is parameter value, it's the standard of dubbo generalization calls.
- Inject your class into Spring bean, cover the default implementation.

```
@Bean
public DubboParamResolveService myDubboParamResolveService() {
    return new MyDubboParamResolveService();
}
```

16.26 Service governance

- Tag route
 - Add Dubbo_Tag_Route when send request, the current request will be routed to the provider of the specified tag, which is only valid for the current request.
- Explicit Target
 - Set the url property in the annotation @ShenyuDubboClient.
 - Update the configuration in Admin.
 - It's valid for all request.
- Param valid and ShenyuException
 - Set validation="shenyuValidation".
 - When ShenyuException is thrown in the interface, exception information will be returned. It should be noted that ShenyuException is thrown explicitly.

```

@Service(validation = "shenyuValidation")
public class TestServiceImpl implements TestService {

    @Override
    @ShenyuDubboClient(path = "/test", desc = "test method")
    public String test(@Valid HelloServiceRequest name) throws
ShenyuException {
        if (true){
            throw new ShenyuException("Param binding error.");
        }
        return "Hello " + name.getName();
    }
}

```

- Request param

```

public class HelloServiceRequest implements Serializable {

    private static final long serialVersionUID = -5968745817846710197L;

    @NotEmpty(message = "name cannot be empty")
    private String name;

    @NotNull(message = "age cannot be null")
    private Integer age;

    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    public Integer getAge() {
        return age;
    }

    public void setAge(Integer age) {
        this.age = age;
    }
}

```

- Send request

```
{
    "name": ""
}
```

- Response

```
{
  "code": 500,
  "message": "Internal Server Error",
  "data": "name cannot be empty,age cannot be null"
}
```

- Error message

```
{
  "code": 500,
  "message": "Internal Server Error",
  "data": "Param binding error."
}
```

16.27 Http → Gateway → Dubbo Provider

It basically switches from HTTP request to Dubbo protocol, then invoke Dubbo service and return to the result. Two things need to notice after integration with gateway, one is the added annotation `@ShenyuDubboClient`, another is a path used to specify the request path. And you added a config value of `contextPath`.

If you have a function like this, the config value in `contextPath` is `/dubbo`

```
@Override
@ShenyuDubboClient(path = "/insert", desc = "insert data")
public DubboTest insert(final DubboTest dubboTest) {
    return dubboTest;
}
```

So our request path is: `http://localhost:9195/dubbo/insert`, localhost:9195 is the gateway's domain name, if you changed before, so does with yours here..

`DubboTest` is a java bean object, has 2 parameters, `id` and `name`, so we can transfer the value's json type through request body.

```
{"id":"1234","name":"XIAO5y"}
```

If your interface has no parameter, then the value is:

```
[]
```

If the interface has multiple parameters, refer to the multi-parameter type support described above.

17

Plugin Center

18.1 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.

18.2 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		Object	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": "eyJ0eXAiOiJKV1QiLCJhbGciOiJIUzI1NiJ9.eyJ1c2VyTmFtZSI6ImFkbWluIiwidXhwIjoxNjYyNjQ2MzU5fQ.WBXBgCcGsnnC00pRbD0tqCVoAaZr8MKH6WE6kY-NGaI",
        "expiredTime": 86400000
    }
}
```

18.3 Registration Services

- **Request Method**

POST

- **Request Path**

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

- **Request Params**

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

Field	Type	Required	Desc
protocol	String	Yes	protocol type
appName	String	Yes	app name
contextPath	String	Yes	service path
rpcType	String	Yes	rpc type, supported type reference RpcTypeEnum
host	String	Yes	service IP
port	Integer	Yes	service port
eventType	String	Yes	event type, supported types reference EventType

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`.

18.4 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
			----- -----
			- -----

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

examples

```
{
    "appName": "app",
    "contextPath": "/",
    "path": "/",
    "pathDesc": "path desc",
    "rpcType": "RPC_TYPE",
    "serviceName": "service name",
    "methodName": "method name",
    "ruleName": "rule name",
    "parameterTypes": "parameter type",
    "rpcExt": "rpc ext",
    "enabled": true,
    "host": "127.0.0.1",
    "port": 8080,
    "pluginNames": ["plugin1", "plugin2"],
    "registerMetaData": true
}
```

```
"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`.

18.5 description

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

18.6 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

18.7 File Download

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

18.8 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.

18.9 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
}
```

18.10 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();
}
```

18.11 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.

18.12 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.

18.13 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();
}

```

18.14 Preparation

1. Clone the code of [Apache ShenYu](#).
2. Install and start docker.

18.15 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

```

18.16 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.

18.17 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();
}

```

18.18 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();
}

```

18.19 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();
}

```

18.20 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)

```

18.20.1 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)

18.21 Description

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

success

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

18.22 Plugin

18.22.1 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"}
```

18.22.2 CleanAll

Clear all data (plugins, selectors, rules)

Request Method

GET

Path

/cleanAll

18.22.3 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

18.22.4 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

18.22.5 Delete All Plugin

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

Request Method

GET

Path

/plugin/deleteAll

18.22.6 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

18.22.7 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-required	De-default	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	Integer	False		Matching mode (0:and;1:or), not filled with the default generation And mode
type	Integer	False		Traffic type(0: full traffic; 1: custom traffic) do not fill in the default generation of full traffic
sort	Integer	False		Sort by, not filled by default generate 10
en-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		Selector handler (Json objects, depending on each plug-in, different objects are passed)
condi-tionList	Condition	False		Conditional collection, custom traffic needs to be passed, full traffic does not need to be passed (Json List object)

Condition

Name	Type	Re-required	De-default	Description
param-Type	String	True		param type (post, uri, query, host, header, cookie, req_method, domain)
operator	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	Integer	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
```

18.22.8 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-required	De-default	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
selectorHandler	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	RuleLocalData	True		Rule condition collection (Json List object)

RuleLocalData

Name	Type	Re-required	De-default	Description
ruleName	String	False		rule name
ruleHandler	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-required	De-default	Description
param-Type	String	True		param type (post, uri, query, host, header, cookie, req_method, domain)
operator	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	Integer	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"  
        }]  
    }]  
}
```

18.22.9 Delete Selector

Delete selectors based on selector id and plugin name

Request Method

GET

Path

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

RequestParam

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

18.22.10 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

18.22.11 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>Condi- tionData</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
```

18.22.12 Delete rule data

Delete rules based on selector id and rule id

Request Method

GET

Path

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

RequestParam

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

18.22.13 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

18.23 Meta data

18.23.1 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- quired	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

18.23.2 Delete

Delete Meta data

Request Method

GET

Path

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

RequestParam

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

18.24 App Sign Data

18.24.1 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

18.24.2 Delete

Delete App Sign Data

Request Method

GET

Path

/auth/delete?appKey=xxxx

RequestParam

Name	Type	Required	Default	Description
appKey	String	true		app key

18.25 Description

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

18.26 IO And Work Thread

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

18.27 Business Thread

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

18.28 Type Switching

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

18.29 Description

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

18.30 Extension

- The default implementation is org.apache.shenyu.plugin.sign.service.DefaultSignService.
- Declare a new class named CustomSignService and implements org.apache.shenyu.plugin.sign.api.SignService.

```
public interface SignService {
    /**
     * Sign verify pair.
     *
     * @param exchange the exchange
     * @return the pair
     */
    Pair<Boolean, String> signVerify(ServerWebExchange exchange);
}
```

- When returning true in Pair, the sign verification passes. If there's false, the String in Pair will be return to the frontend to show.
- Register defined class as a Spring Bean.

```
@Bean
public SignService customSignService() {
    return new CustomSignService();
}
```

18.30.1 Others

If you only want to modify the signature algorithm, refer to the following.

- The default implementation of the signature algorithm is `org.apache.shenyu.common.utils.SignUtils#generateSign`.
- Declare a new class named `CustomSignProvider` and implements `org.apache.shenyu.plugin.sign.api.SignProvider`.

```
/**
 * The Sign plugin sign provider.
 */
public interface SignProvider {

    /**
     * acquired sign.
     *
     * @param signKey sign key
     * @param params  params
     * @return sign
     */
    String generateSign(String signKey, Map<String, String> params);
}
```

- Put `CustomSignProvider` to Spring IoC

```
@Bean
public SignProvider customSignProvider() {
    return new CustomSignProvider();
}
```

18.31 Description

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

18.32 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.

18.33 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);
    }
}
```

18.34 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.

18.35 Description

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

18.36 Time Consumption

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

18.37 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`