Apache ShenYu document

Apache ShenYu

Oct 20, 2022
Contents

1 Architecture 1
2 Why named Apache ShenYu 2
3 Features 3
4 Mind map 4
5 Quick Start (docker) 5
  5.1 Run Apache ShenYu Admin 5
  5.2 Run Apache ShenYu Bootstrap 5
  5.3 Set router 5
6 Plugin 7
7 Selector & Rule 8
8 Data Caching & Data Sync 9
9 Prerequisite 11
10 Stargazers over time 12
11 Contributor and Support 13
12 Known Users 14
13 Design 15
  13.1 Registry Center 15
  13.2 Metrics Center 15
  13.3 Load Balance 15
  13.4 RateLimiter 16
  13.5 Match Strategy 16
  13.6 Parameter Data 16
  13.7 Predicate Judge 16
13.8 Design principle .................................................. 17
  13.8.1 Client ................................................................. 17
  13.8.2 Server ................................................................. 19
13.9 Http Registry .......................................................... 20
13.10 Zookeeper Registry .................................................. 20
13.11 Etcd Registry ......................................................... 21
13.12 Consul Registry ....................................................... 21
13.13 Nacos Register ....................................................... 22
13.14 SPI .......................................................... 23
13.15 Plugin, Selector And Rule ........................................... 23
13.16 Resource Permission ................................................ 24
13.17 Data Permission ..................................................... 25
13.18 Meta Data ............................................................. 26
13.19 Dictionary Management ............................................. 27
13.20 API Documentation .................................................. 27
13.21 Preface ............................................................... 28
13.22 Principle Analysis .................................................... 29
  13.22.1 Zookeeper Synchronization ...................................... 29
  13.22.2 WebSocket Synchronization ..................................... 31
  13.22.3 Http Long Polling ................................................ 31
  13.22.4 Nacos Synchronization .......................................... 32
  13.22.5 Etcd Synchronization ............................................ 32
  13.22.6 Consul Synchronization ......................................... 32
13.23 Plugin ............................................................... 33
13.24 Selector And Rule .................................................... 33
13.25 Traffic filtering ....................................................... 33

14 Deployment ......................................................... 34
  14.1 Environmental preparation ........................................ 34
  14.2 Download the compiled code ...................................... 34
  14.3 Add Helm repository ................................................ 35
  14.4 Install ................................................................. 35
    14.4.1 Deployment prerequisites ..................................... 35
    14.4.2 Instructions ....................................................... 35
    14.4.3 h2 as database .................................................. 36
    14.4.4 MySQL as database .............................................. 36
  14.5 PostgreSQL as database (Version of ShenYu > 2.5.0) .......... 36
  14.6 Q&A ................................................................. 36
    14.6.1 1. you need to modify a lot of configuration information, such as modify the application.yaml, how to install ........................................... 36
    14.6.2 2. How to install only admin or bootstrap .................... 37
    14.6.3 3. How to install old version ShenYu ......................... 37
    14.6.4 How to configure JVM options and modify Kubernetes resource quotas (Version of ShenYu > 2.5.0) ........................................... 37
  14.7 Values configuration instructions ................................ 38
18.22.1 saveOrUpdate .......................................................... 164
  Request Method ......................................................... 164
  Path ................................................................. 164
  Request Parameters .................................................... 164
  Example ............................................................. 165
18.22.2 CleanAll ............................................................ 165
  Request Method ......................................................... 165
  Path ................................................................. 165
18.22.3 Clean Plugin .......................................................... 165
  Request Method .......................................................... 165
  Path ................................................................. 165
  RequestParam .......................................................... 166
18.22.4 Delete plugin ......................................................... 166
  Request Method ......................................................... 166
  Path ................................................................. 166
  RequestParam .......................................................... 166
18.22.5 Delete All Plugin ....................................................... 166
  Request Method ......................................................... 166
  Path ................................................................. 166
18.22.6 Find plugin by name .................................................. 167
  Request Method ......................................................... 167
  Path ................................................................. 167
  RequestParam .......................................................... 167
18.22.7 Save or Update Selector ............................................. 167
  Request Method ......................................................... 167
  Path ................................................................. 167
  RequestParam .......................................................... 167
  Example ............................................................. 169
  Result ............................................................... 169
18.22.8 Add Selector And Rules ............................................. 169
  Request Method ......................................................... 169
  Path ................................................................. 169
  RequestParam .......................................................... 169
  Example ............................................................. 171
18.22.9 Delete Selector ......................................................... 171
  Request Method ......................................................... 171
  Path ................................................................. 171
  RequestParam .......................................................... 172
18.22.10 Find All Selector .................................................... 172
  Request Method ......................................................... 172
  Path ................................................................. 172
  RequestParam .......................................................... 172
18.22.11 Save or Update Rule Data ........................................ 172
  Request Method ......................................................... 172
  Path ................................................................. 172
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.
• 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
5.1 Run Apache ShenYu Admin

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

Default account: admin
Default password: 123456

5.2 Run Apache ShenYu Bootstrap

```bash
> 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,

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

- **Set routing rules (Standalone)**

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

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

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

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

Different plugins do different things.

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

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

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

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

The selector and the rule match only once, and the match is returned. So the coarsest granularity should be sorted last.
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.
Prerequisite

- JDK 1.8+
Stargazers over time
Contributor and Support

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

All Users: Known Users
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 im-
plementation 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 *ShenyuClient-
RegisterRepository*.

### 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, LeakyBucke, SlidingWindow and TokenBucket, the extension interface is RateLimiter-Algorithm.

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
```

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.

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

```
shenyu
  └── register
      └── metadata
```

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

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

## 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

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

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

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

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

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 Permission

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

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

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.
Figure 1: Zookeeper Node Design

13.22. Principle Analysis
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 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 BlockingQueue, and then start scheduling task, execute after 60 seconds, this aims to remove the long polling request from the queue after 60 seconds, even there is no configured data change. Because even if there is no configuration change, gateway also need to know, otherwise it will wait, and there is a 90 seconds timeout when the gateway requests configuration services.

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

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

```bash
> 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.

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

### 14.3 Add Helm repository

```bash
helm repo add shenyu https://apache.github.io/shenyu-helm-chart
helm repo update
```

### 14.4 Install

#### 14.4.1 Deployment prerequisites

Before reading this document, you need to read Deployment prerequisites to complete the environment preparation before deploying ShenYu.

#### 14.4.2 Instructions

- **Install the application**: By default, both admin and bootstrap are installed.
- **Service Exposure**: Use NodePort to expose the service, the default port is 31095 for admin and 31195 for bootstrap.
- **Database**: Currently supports h2, MySQL, PostgreSQL as database. Default is h2.
### 14.4.3  h2 as database

Running the following command will install admin and bootstrap under shenyu namespace and create namespace.

```
helm install shenyu shenyu/shenyu -n=shenyu --create-namespace
```

### 14.4.4  MySQL as database

Modify and copy the following command and execute.

```
helm install shenyu shenyu/shenyu -n=shenyu --create-namespace \\
  --set dataSource.active=mysql \\
  --set dataSource.mysql.ip=127.0.0.1 \\
  --set dataSource.mysql.port=3306 \\
  --set dataSource.mysql.username=root \\
  --set dataSource.mysql.password=123456
```

### 14.5  PostgreSQL as database (Version of ShenYu > 2.5.0)

Modify the following command and copy it to execute.

```
helm install shenyu shenyu/shenyu -n=shenyu --create-namespace \\
  --set dataSource.active=pg \\
  --set dataSource.pg.ip=127.0.0.1 \\
  --set dataSource.pg.port=5432 \\
  --set dataSource.pg.username=postgres \\
  --set dataSource.pg.password=123456
```

### 14.6  Q&A

#### 14.6.1  1. you need to modify a lot of configuration information, such as modify the application.yaml, how to install

1. download the complete values.yaml
   
   - Latest chart version: `helm show values shenyu/shenyu` > `values.yaml`
   
   - Specific chart version, e.g. 0.2.0: `helm show values shenyu/shenyu --version=0.2.0` > `values.yaml`

2. modify the values.yaml file
3. Change the corresponding configuration and execute the `helm install` command with the format `-f values.yaml`. For example: `helm install shenyu shenyu/shenyu -n=shenyu --create-namespace -f values.yaml`

### 14.6.2 2. How to install only admin or bootstrap

- Install only admin: add `-set bootstrap.enabled=false` to the end of the `helm install` command
- Install only bootstrap: add `--set admin.enabled=false` to the end of the `helm install` command

### 14.6.3 3. How to install old version ShenYu

```
helm search repo shenyu -l
```

You will get output similar to

<table>
<thead>
<tr>
<th>NAME</th>
<th>CHART</th>
<th>VERSION</th>
<th>APP VERSION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>shenyu/shenyu</td>
<td>0.2.0</td>
<td>2.5.0</td>
<td>2.5.0</td>
<td>Helm Chart for deploying Apache ShenYu in Kubernetes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

where APP_VERSION is the version of ShenYu and CHART_VERSION is the version of Helm Chart.

Select the corresponding Chart version according to the version of ShenYu you want to install, and add the `--version=CHART_VERSION` parameter at the end of the command. For example

```
helm install shenyu shenyu/shenyu -n=shenyu --version=0.2.0 --create-namespace
```

### 14.6.4 How to configure JVM options and modify Kubernetes resource quotas (Version of ShenYu > 2.5.0)

- Configure JVM parameters via `admin.jvmOpts` and `bootstrap.jvmOpts`
- Configure Kubernetes resource quotas via `admin.resources` and `bootstrap.resources`

E.g.

```
helm install shenyu shenyu/shenyu -n=shenyu --create-namespace \
--set admin.javaOpts="-Xms256m -Xmx512m" \
--set admin.resources.requests.memory=512Mi \
--set admin.resources.limits.memory=1Gi \
--set admin.resources.requests.cpu=500m \
--set admin.resources.limits.cpu=1 \
```
14.7 Values configuration instructions

14.7.1 Global Configuration

<table>
<thead>
<tr>
<th>configuration item</th>
<th>type</th>
<th>default</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>replicas</td>
<td>int</td>
<td>1</td>
<td>Number of replicas</td>
</tr>
<tr>
<td>version</td>
<td>string</td>
<td>&quot;2.5.0&quot;</td>
<td>shenyu version, it is not recommended to modify, please install the corresponding version directly</td>
</tr>
</tbody>
</table>

14.7.2 shenyu-admin configuration

<table>
<thead>
<tr>
<th>configuration item</th>
<th>type</th>
<th>default</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>admin.nodePort</td>
<td>int</td>
<td>31095</td>
<td>NodePort port</td>
</tr>
<tr>
<td>admin.javaOpts</td>
<td>string</td>
<td>see here</td>
<td>JVM parameters</td>
</tr>
<tr>
<td>admin.resources</td>
<td>dict</td>
<td>omit</td>
<td>K8s resource quota</td>
</tr>
</tbody>
</table>

14.7.3 shenyu-bootstrap configuration

<table>
<thead>
<tr>
<th>configuration item</th>
<th>type</th>
<th>default</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>bootstrap.nodePort</td>
<td>int</td>
<td>31195</td>
<td>NodePort Port</td>
</tr>
<tr>
<td>bootstrap.javaOpts</td>
<td>string</td>
<td>see here</td>
<td>JVM parameters</td>
</tr>
<tr>
<td>bootstrap.resources</td>
<td>dict</td>
<td>{}</td>
<td>K8s resource quota</td>
</tr>
</tbody>
</table>

14.7.4 Database configuration

General database configuration

<table>
<thead>
<tr>
<th>configuration-item</th>
<th>type</th>
<th>default</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dataSource.active</td>
<td>string</td>
<td>&quot;h2&quot;</td>
<td>Database to use, supports h2, mysql, pg</td>
</tr>
<tr>
<td>dataSource.initEnabled</td>
<td>bool</td>
<td>true</td>
<td>Initialize the database, only h2 is available</td>
</tr>
</tbody>
</table>
### h2

<table>
<thead>
<tr>
<th>configuration item</th>
<th>type</th>
<th>default</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dataSource.h2.username</td>
<td>string</td>
<td>&quot;sa&quot;</td>
<td>username</td>
</tr>
<tr>
<td>dataSource.h2.password</td>
<td>string</td>
<td>&quot;sa&quot;</td>
<td>password</td>
</tr>
</tbody>
</table>

### MySQL

<table>
<thead>
<tr>
<th>Configuration Item</th>
<th>Type</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dataSource.mysql.ip</td>
<td>string</td>
<td>&quot;&quot;</td>
<td>IP</td>
</tr>
<tr>
<td>dataSource.mysql.port</td>
<td>int</td>
<td>3306</td>
<td>port</td>
</tr>
<tr>
<td>dataSource.mysql.username</td>
<td>string</td>
<td>&quot;root&quot;</td>
<td>Username</td>
</tr>
<tr>
<td>dataSource.mysql.password</td>
<td>string</td>
<td>&quot;&quot;</td>
<td>Password</td>
</tr>
<tr>
<td>dataSource.mysql.driverClass</td>
<td>string</td>
<td>&quot;com.mysql.cj.jdbc.Driver&quot;</td>
<td>mysql driver class name</td>
</tr>
<tr>
<td>dataSource.mysql.connectorVersion</td>
<td>string</td>
<td>&quot;8.0.23&quot;</td>
<td>connector version (maven connector list)</td>
</tr>
</tbody>
</table>

### PostgreSQL

<table>
<thead>
<tr>
<th>configuration-item</th>
<th>type</th>
<th>default</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dataSource.pg.ip</td>
<td>string</td>
<td>&quot;&quot;</td>
<td>IP</td>
</tr>
<tr>
<td>dataSource.pg.port</td>
<td>int</td>
<td>5432</td>
<td>port</td>
</tr>
<tr>
<td>dataSource.pg.username</td>
<td>string</td>
<td>&quot;postgres&quot;</td>
<td>username</td>
</tr>
<tr>
<td>dataSource.pg.password</td>
<td>string</td>
<td>&quot;postgres&quot;</td>
<td>password</td>
</tr>
<tr>
<td>dataSource.pg.driverClass</td>
<td>string</td>
<td>&quot;org.postgresql.Driver&quot;</td>
<td>PostgreSQL driver class name</td>
</tr>
<tr>
<td>dataSource.pg.connectorVersion</td>
<td>string</td>
<td>&quot;42.2.18&quot;</td>
<td>connector version (maven connector list)</td>
</tr>
</tbody>
</table>

### 14.7.6 application.yml configuration

<table>
<thead>
<tr>
<th>configuration-item</th>
<th>type</th>
<th>default</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>applicationConfig.bootstrap</td>
<td>string</td>
<td>slightly</td>
<td>bootstrap configuration, bootstrap configuration description</td>
</tr>
<tr>
<td>applicationConfig.admin</td>
<td>string</td>
<td>omit</td>
<td>admin configuration, admin configuration description</td>
</tr>
</tbody>
</table>

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.

14.8 Create Docker Network

```bash
> docker network create shenyu
```

14.9 Start Apache Shenyu Admin

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

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

- use h2 to store data:

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

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

```bash
docker run --name shenyu-admin -v /${your_work_dir}/ext-lib:/opt/shenyu-admin/ext-lib -e "SPRING_PROFILES_ACTIVE=mysql" -e "spring.datasource.url=jdbc:mysql://${your_ip_port}/shenyu?useUnicode=true&characterEncoding=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`, and `application-pg.yml`, `application-oracle.yml` configuration in `/${your_work_dir}/conf/` and then execute the following statement:

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

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

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

```bash
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:

```bash
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:

```bash
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}
```

### 14.10 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

```bash
> 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

```bash
> 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
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.

### 14.11 Environmental preparation

- Install JDK 1.8+ locally

### 14.12 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.

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

### 14.13 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
**14.14 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:

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

**14.15 by curl**

```bash
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": "/**"
                }
            ]
        }
    ]
}'
```
This article describes some of the prerequisites you need to prepare before deploying the Apache ShenYu gateway.

### 14.16 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.

#### 14.16.1 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](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/](https://repo1.maven.org/maven2/mysql/mysql-connector-java/8.0.30/)
  - homepage: [https://www.mysql.com/products/connector/](https://www.mysql.com/products/connector/)
14.16.2 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 PostgresSql 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/

14.16.3 Oracle

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

- sql script: https://github.com/apache/shenyu/blob/master/db/init/oracle
- driver:
  - maven repository: https://mvnrepository.com/artifact/com.oracle.database.jdbc/ojdbc8/19.3.0.0

This 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.

14.17 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

14.18 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.
14.19 Download shell script

```
```

14.20 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
```

14.21 Initialize the shenyu-admin database

Refer to the database initialization documentation to initialize the database.

14.22 Modify the configuration file

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

14.23 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

### 14.24 Example 1: Using h2 as a database

#### 14.24.1 1. Create Namespace and ConfigMap

- create shenyu-ns.yaml

```yaml
apiVersion: v1
kind: Namespace
metadata:
  name: shenyu
  labels:
    name: shenyu
---
apiVersion: v1
kind: ConfigMap
metadata:
  name: shenyu-cm
  namespace: shenyu
data:
  shenyu-admin-application.yml: |
    server:
      port: 9095
      address: 0.0.0.0
    spring:
      profiles:
        active: h2
    thymeleaf:
      cache: true
      encoding: utf-8
      enabled: true
      prefix: classpath:/static/
      suffix: .html
    mvc:
      pathmatch:
```

14.24. Example 1: Using h2 as a database 48
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
  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

14.24. Example 1: Using h2 as a database
apicdoc:
gatewayUrl: http://127.0.0.1:9195
envProps:
  - envLabel: Test environment
    addressLabel: Request Address
    addressUrl: http://127.0.0.1:9195
  - envLabel: Prod environment
    addressLabel: Request Address
    addressUrl: http://127.0.0.1:9195
logging:
  level:
    root: info
    org.springframework.boot: info
    org.apache.ibatis: info
    org.apache.shenyu.bonuspoint: info
    org.apache.shenyu.lottery: info
    org.apache.shenyu: info
shenyu-admin-application-h2.yml:
  shenyu:
    database:
      dialect: h2
      init_script: "sql-script/h2/schema.sql"
      init_enable: true
  spring:
    datasource:
      url: jdbc:h2:mem:~/shenyu;DB_CLOSE_DELAY=-1;MODE=MySQL;
      username: sa
      password: sa
    driver-class-name: org.h2.Driver
shenyu-bootstrap-application.yml:
  server:
    port: 9195
    address: 0.0.0.0
  spring:
    main:
      allow-bean-definition-overriding: true
      allow-circular-references: true
    application:
      name: shenyu-bootstrap
    codec:
      max-in-memory-size: 2MB
  cloud:
    discovery:
      enabled: false
    nacos:
      discovery:
        server-addr: 127.0.0.1:8848 # Spring Cloud Alibaba Dubbo use this.
        enabled: false

14.24. Example 1: Using h2 as a database
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
dictType: "pooled"
messageSizeEstimator: 8
singleEventExecutorPerGroup: true
instance:
  enabled: false
registerType: zookeeper # etcd # consul
props:
cross:
  enabled: true
  allowedHeaders:
    allowedMethods: "*"
  allowedAnyOrigin: true # the same of Access-Control-Allow-Origin: "*"
  allowedExpose: ""
  maxAge: "18000"
  allowCredentials: true
switchConfig:
  local: true
file:
  enabled: true
  maxSize: 10
sync:
  websocket:
    urls: ws://shenyu-admin-svc.shenyu.svc.cluster.local:9095/websocket
exclude:
  enabled: false
  paths:
    - /favicon.ico
fallback:
  enabled: false
  paths:
    - /fallback/hystrix
    - /fallback/resilience4j
health:
  enabled: false
  paths:
    - /actuator/health
    - /health_check
extPlugin:
  path:
    enabled: true
    threads: 1
    scheduleTime: 300
    scheduleDelay: 30
scheduler:
  enabled: false

14.24. Example 1: Using h2 as a database
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:
  "BA3253876ADE6BC22D4A6FF53D8406C6AD864195ED144AB5C87621B6C233B548BAEAE6956DF346EC8C17F5EA10F35EE30"
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

### 14.24.2 2. Create shenyu-admin

- create shenyu-admin.yaml

```yaml
# Example of using the nodeport type to expose ports
apiVersion: v1
kind: Service
metadata:
  namespace: shenyu
  name: shenyu-admin-svc
spec:
  selector:
```

#### 14.24. Example 1: Using h2 as a database
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:
      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

14.24. Example 1: Using h2 as a database
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

### 14.24.3 3. Create shenyu-bootstrap

- create shenyu-bootstrap.yaml

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

# shenyu-bootstrap
apiVersion: apps/v1
kind: Deployment
metadata:
  namespace: shenyu
  name: shenyu-bootstrap
spec:
  selector:
    matchLabels:
      app: shenyu-bootstrap
  replicas: 1
  template:
    metadata:
      labels:
        app: shenyu-bootstrap
    spec:
      volumes:
      - name: shenyu-bootstrap-application
        configMap:
          name: shenyu-cm
```

14.24. Example 1: Using h2 as a database
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

14.25 Example 2: Use MySQL as the database

14.25.1 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
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
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/**

14.25. Example 2: Use MySQL as the database
- /swagger-resources/**
- /v2/api-docs
- /csrf

```json
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:
```

14.25. Example 2: Use MySQL as the database
discovery:
    enabled: false
nacos:
    discovery:
        server-addr: 127.0.0.1:8848 # Spring Cloud Alibaba Dubbo use this.
        enabled: false
        namespace: ShenyuRegisterCenter
eureka:
    client:
        enabled: false
        serviceUrl:
            defaultZone: http://localhost:8761/eureka/
    instance:
        prefer-ip-address: true
management:
    health:
        defaults:
            enabled: false
shenyu:
    matchCache:
        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

14.25. Example 2: Use MySQL as the database
ipTos: 0
allowHalfClosure: false
connectTimeoutMillis: 10000
writeBufferHighWaterMark: 65536
writeBufferLowWaterMark: 32768
writeSpinCount: 16
autoRead: false
allocType: "pooled"
messageSizeEstimator: 8
singleEventExecutorPerGroup: true
instance:
  enabled: false
  registerType: zookeeper # etcd # consul
  props:
    cross:
      enabled: true
      allowedHeaders:
      allowedMethods: "*
      allowedAnyOrigin: true # the same of Access-Control-Allow-Origin: "*
      allowedExpose: ""
      maxAge: "18000"
      allowCredentials: true
  switchConfig:
    local: true
  file:
    enabled: true
    maxSize : 10
  sync:
    websocket:
      urls: ws://shenyu-admin-svc.shenyu.svc.cluster.local:9095/websocket
  exclude:
    enabled: false
    paths:
      - /favicon.ico
  fallback:
    enabled: false
    paths:
      - /fallback/hystrix
      - /fallback/resilience4j
  health:
    enabled: false
    paths:
      - /actuator/health
      - /health_check
  extPlugin:
    path:
enabled: true
threads: 1
scheduleTime: 300
scheduleDelay: 30
scheduler:
  enabled: false
type: fixed
threads: 16
upstreamCheck:
  enabled: false
timeout: 3000
healthyThreshold: 1
unhealthyThreshold: 1
interval: 5000
printEnabled: true
printInterval: 60000
ribbon:
  serverListRefreshInterval: 10000
metrics:
  enabled: false
name: prometheus
host: 127.0.0.1
port: 8090
jmxConfig:
  props:
    jvm_enabled: true
local:
  enabled: false
sha512Key:

"BA3253876AE6D6BC22D4A6FF53D8406C6AD864195ED144AB5C87621B6C233B548BAEAE6956DF346EC8C17F5EA10F35EE3C4C"

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
14.25.2 2. Create Endpoints to represent MySQL

- Init database Deployment Prerequisites document.
- create shenyu-ep.yaml

```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`

14.25.3 3. Create shenyu-admin

- create shenyu-admin.yaml

```yaml
# Example of using the nodeport type to expose ports
apiVersion: v1
kind: Service
metadata:
  namespace: shenyu
  name: shenyu-admin-svc
spec:
  selector:
    app: shenyu-admin
  type: NodePort
  ports:
  - protocol: TCP
    port: 9095
    targetPort: 9095
```

14.25. Example 2: Use MySQL as the database
```yaml
---

# 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" ]
```

14.25. Example 2: Use MySQL as the database
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

14.25.4 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

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

14.26 Test Access

Access Address:  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.
14.27  Enviromental 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.

14.28  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

14.29  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.

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

After completing these operations, you will deploy ShenYu Bootstrap Cluster.

For example. you will deploy ShenYu Bootstrap in 10.1.1.1 and 10.1.1.2 and deploy nginx in 10.1.1.3.
14.30 Start Nginx

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

```nginx
upstream shenyu_gateway_cluster {
  ip_hash;
  server 10.1.1.1:9195 max_fails=3 fail_timeout=10s weight=50;
  server 10.1.1.2:9195 max_fails=3 fail_timeout=10s weight=50;
}

server {
  listen 9195;
  location / {
    proxy_pass http://shenyu_gateway_cluster;
    proxy_set_header HOST $host;
    proxy_read_timeout 10s;
    proxy_connect_timeout 10s;
  }
}
```

- start nginx.

  > 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, Etc, and consul. Client or LoadBalancer can get the available ShenYu instances by those Service register center.
14.30.1 Getting Started

- Prerequisite:
  1. Luarocks
  2. OpenResty

14.31 Build from source

The first, clone the source from GitHub.

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

Then, build from source and install.

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

14.32 Greeting ETCD

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

Here is an example for Etcd.

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

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

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

```bash
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.

### 14.33 Greeting Nacos

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

```lua
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.

```lua
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.
14.33.1 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.

```lua
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.

```lua
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.

14.34 Start Apache ShenYu Admin

- docker reference docker deployment Apache ShenYu Admin
- liinux/windows reference binary packages deployment Apache ShenYu Admin
14.35 Build your own gateway (recommended)

• first create an empty springboot project, you can refer to shenyu-bootstrap, or you can create it on spring official website.
• introduce the following jar package:

```xml
<dependencies>
  <dependency>
    <groupId>org.springframework.boot</groupId>
    <artifactId>spring-boot-starter-webflux</artifactId>
    <version>2.2.2.RELEASE</version>
  </dependency>
  <dependency>
    <groupId>org.springframework.boot</groupId>
    <artifactId>spring-boot-starter-actuator</artifactId>
    <version>2.2.2.RELEASE</version>
  </dependency>
  <dependency>
    <groupId>org.apache.shenyu</groupId>
    <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:

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

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

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

```java
com.qq.tars.server.config.ConfigurationException: error occurred on load server config
    at com.qq.tars.server.config.ConfigurationManager.<init>(ConfigurationManager.java:57)
    at com.qq.tars.server.core.Server.<init>(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)
```
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)

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 '


  "appName": "127.0.0.1:21715",
  "contextPath": "/tars",
  "path": "/tars/helloInt",
  "methodName": "helloInt",
  "ruleName": "/tars/helloInt",
  "parameterTypes": "int,java.lang.String",
  "rpcExt": 
    "returnType": "java.lang.Integer",
    "enabled": true
}

  "appName": "127.0.0.1:21715",
  "contextPath": "/tars",
  "path": "/tars/hello",
  "methodName": "hello",
  "ruleName": "/tars/hello",
  "parameterTypes": "int,java.lang.String",
  "rpcExt": 
    "returnType": "java.lang.String",
    "enabled": true
}

15.2. Run the shenyu-examples-tars project
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:

Use PostMan to simulate HTTP to request your tars service:

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:

```xml
<!-- 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 16:46:25.399 INFO 96 --- [Thread-6] o.a.s.c.c.s.ShenyuClientShutdownHook : hook Thread-0 will sleep 3000ms when it start
2021-07-18 16:46:25.399 INFO 96 --- [Thread-6] o.a.s.c.c.s.ShenyuClientShutdownHook : hook SpringContextShutdownHook will sleep 3000ms when it start
  "appName":"motan","contextPath":"/motan","path":"/motan/hello","pathDesc":null,"rpcType":"motan","serviceName":"org.apache.shenyu.examples.motan.service.MotanDemoService","methodName":"hello",
  "ruleName":"motan/hello","parameterTypes":"java.lang.String","rpcExt":{
}
```

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:

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

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:

```
  "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}
```
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.

  ```json
  {
    "data": [
      {
        "text": "hello grpc"
      }
    ]
  }
  
  Then, call gRPC service by UNARY method type.

  ![POST Request Example](http://localhost:9195/grpc/unaryFun)

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

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

- **CLIENT_STREAMING**

  The request body like this.

  ```json
  {
    "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

<table>
<thead>
<tr>
<th>Params</th>
<th>Authorization</th>
<th>Headers (9)</th>
<th>Body</th>
<th>Pre-request Script</th>
<th>Tests</th>
<th>Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>none</td>
<td>form-data</td>
<td>x-www-form-urlencoded</td>
<td>raw</td>
<td>binary</td>
<td>GraphQL</td>
<td>JSON</td>
</tr>
</tbody>
</table>

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

• SERVER_STREAMING

The request body like this.

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

Then, call gRPC service by SERVER_STREAMING method type.
There is the request body like this.

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

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

```xml
<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>
```
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.service.SofaSingleParamService","methodName":"insert","ruleName":"/sofa/insert","parameterTypes":"org.dromara.shenyu.examples.sofa.api.entity.SofaSimpleTypeBean","rpcExt":{"loadbalance":"hash","retries":3,"timeout":-1},"enabled":true}
2021-02-10 02:31:45.605 INFO 2156 --- [pool-1-thread-1] o.d.s.client.common.utils.RegisterUtils : sofa client register success: {"appName":"sofa","contextPath":"/sofa","path":"/sofa/findById","pathDesc":"Find by Id","rpcType":"sofa","serviceName":"org.dromara.shenyu.examples.sofa.api.service.SofaSingleParamService","methodName":"findById","ruleName":"/sofa/findById","parameterTypes":"java.lang.String",  
```
"rpcExt":{""loadbalance":"hash",""retries":3,""timeout":-1"},"enabled":true}
2021-02-10 02:31:45.611 INFO 2156 --- [pool-1-thread-1] o.d.s.client.common.utils.
RegisterUtils : sofa client register success: {"appName":"sofa","contextPath":"/sofa","path":"/sofa/findAll","pathDesc":"Get all data","rpcType":"sofa","serviceName":"org.dromara.shenyu.examples.sofa.api.service.SofaSingleParamService ","methodName":"findAll","ruleName":"/sofa/findAll","parameterTypes":","rpcExt":{""loadbalance":"hash",""retries":3,""timeout":-1"},"enabled":true}
2021-02-10 02:31:45.616 INFO 2156 --- [pool-1-thread-1] o.d.s.client.common.utils.
RegisterUtils : sofa client register success: {"appName":"sofa","contextPath="/sofa","path":"/sofa/batchSaveNameAndId","pathDesc":","rpcType":"sofa","serviceName "org.dromara.shenyu.examples.sofa.api.service.SofaMultiParamService","methodName ":"batchSaveNameAndId","ruleName":"/sofa/batchSaveNameAndId","parameterTypes": "java.util.List,java.lang.String,java.lang.String#org.dromara.shenyu.examples.sofa.api.entity.SofaSimpleTypeBean","rpcExt":{""loadbalance":"hash",""retries":3,""timeout":-1"},"enabled":true}
2021-02-10 02:31:45.621 INFO 2156 --- [pool-1-thread-1] o.d.s.client.common.utils.
RegisterUtils : sofa client register success: {"appName":"sofa","contextPath":"/sofa","path":"/sofa/saveComplexBeanAndName","pathDesc":","rpcType":"sofa","serviceName "org.dromara.shenyu.examples.sofa.api.service.SofaMultiParamService","methodName ":"saveComplexBeanAndName","ruleName":"/sofa/saveComplexBeanAndName","parameterTypes": "org.dromara.shenyu.examples.sofa.api.entity.SofaComplexTypeBean,"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;","rpcExt":{""loadbalance":"hash",""retries":3,""timeout":-1"},"enabled":true}
2021-02-10 02:31:45.632 INFO 2156 --- [pool-1-thread-1] o.d.s.client.common.utils.
RegisterUtils : sofa client register success: {"appName":"sofa","contextPath":"/sofa","path":"/sofa/findByStringArray","pathDesc":","rpcType":"sofa","serviceName "org.dromara.shenyu.examples.sofa.api.service.SofaMultiParamService","methodName ":"findByStringArray","ruleName":"/sofa/findByStringArray","parameterTypes": "[Ljava.lang.String;","rpcExt":{""loadbalance":"hash",""retries":3,""timeout":-1"},"enabled":true}
2021-02-10 02:31:45.637 INFO 2156 --- [pool-1-thread-1] o.d.s.client.common.utils.
RegisterUtils : sofa client register success: {"appName":"sofa","contextPath":"/sofa","path":"/sofa/saveTwoList","pathDesc":","rpcType":"sofa","serviceName "org.dromara.shenyu.examples.sofa.api.service.SofaMultiParamService","methodName ":"saveTwoList","ruleName":"/sofa/saveTwoList","parameterTypes": "java.util.List,java.util.Map#org.dromara.shenyu.examples.sofa.api.entity.SofaComplexTypeBean","rpcExt":{""loadbalance":"hash",""retries":3,""timeout":-1"},"enabled":true}
2021-02-10 02:31:45.642 INFO 2156 --- [pool-1-thread-1] o.d.s.client.common.utils.
RegisterUtils : sofa client register success: {"appName":"sofa","contextPath":"/sofa","path":"/sofa/batchSave","pathDesc":","rpcType":"sofa","serviceName "org.dromara.shenyu.examples.sofa.api.service.SofaMultiParamService","methodName ":"batchSave","ruleName":"/sofa/batchSave","parameterTypes": "java.util.List,java.util.Map#org.dromara.shenyu.examples.sofa.api.entity.SofaSimpleTypeBean","rpcExt":{""loadbalance":"hash",""retries":3,""timeout":-1"},"enabled":true}
"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/findByListId","pathDesc":","rpcType":"sofa","serviceName":
"org.dromara.shenyu.examples.sofa.api.service.SofaMultiParamService","methodName":
"findByListId","ruleName":"/sofa/findByListId","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\jfr\lib\jfrdeploy.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\jaccess.jar:C:\Program Files\Java\jdk1.8.0_211\jre\lib\ext\jass.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\sunscapi.jar:C:\Program Files\Java\jdk1.8.0_211\jre\lib\ext\sunmscapi.jar"
15.12. Run the shenyu-examples-sofa project
15.12. Run the shenyu-examples-sofa project
Run the shenyu-examples-sofa project
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:

Use PostMan to simulate HTTP to request your Sofa service:

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

```java
@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);
    return simpleTypeBean;
}
```
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:

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

---

93
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:

```
  "appName": "http",
  "context": "/http",
  "path": "/http/test/**",
  "pathDesc": "",
  "rpcType": "http",
  "host": "192.168.50.13",
  "port": 8188,
  "ruleName": "/http/test/**",
  "enabled": true,
  "registerMetaData": false
}
  "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
}
  "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
}
  "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:

Use PostMan to simulate HTTP to request your http service:

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

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

```
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
```
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>
<!-- apache shenyu apache dubbo plugin end-->
If client is alibaba dubo, registry center is Zookeeper, please refer to the following configuration:
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:

```
   "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
}
```

```
   "appName":"dubbo",
   "contextPath": "/dubbo",
   "path": "/dubbo/findAll",
   "pathDesc": "Get all data",
```
Apache ShenYu document

15.18. Run the shenyu-examples-dubbo project

ApacheShenYu document
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:
Use PostMan to simulate HTTP to request your Dubbo service:

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

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

```
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.filter.ClassLoaderFilter.invoke(ClassLoaderFilter.java:38)
handleRequest(HeaderExchangeHandler.java:100)
received(HeaderExchangeHandler.java:175)
   at org.apache.dubbo.remoting.transport.DecodeHandler.received(DecodeHandler.
java:51)
run(ChannelEventRunnable.java:57)
   at java.util.concurrent.ThreadPoolExecutor.runWorker(ThreadPoolExecutor.
java:1149)
   at java.util.concurrent.ThreadPoolExecutor$Worker.run(ThreadPoolExecutor.
java:624)
```
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:

```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.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:

```yaml
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

```yaml
spring:
  cloud:
    discovery:
      enabled: true
```

- code method

```java
@SpringBootApplication
@EnableDiscoveryClient
public class ShenyuBootstrapApplication {

  /**
   * Main Entrance.
   *
   * @param args startup arguments
   */
  public static void main(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'
  "appName": "springCloud-test",
  "context": "/springcloud",
  "path": "/springcloud/order/save",
  "pathDesc": "",
  "rpcType": "springCloud",
  "ruleName": "/springcloud/order/save",
  "enabled": true
}
```

The log indicates successful registeration of various services and endpoints. It shows that ShenYu is able to register different services and routes, which is a key feature for a distributed service mesh like ShenYu to manage和服务 discovery and traffic routing.
Apache ShenYu document

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
DiscoveryClient : Disable delta property : false
DiscoveryClient : Single vip registry refresh property : null
DiscoveryClient : Force full registry fetch : false
DiscoveryClient : Application is null : false
DiscoveryClient : Registered Applications size is zero : true
DiscoveryClient : Application version is -1: true
DiscoveryClient : Getting all instance registry info from the eureka server
DiscoveryClient : The response status is 200
DiscoveryClient : Starting heartbeat executor: renew interval is: 30
InstanceInfoReplicator : InstanceInfoReplicator onDemand update allowed rate per min is 4
DiscoveryClient : Discovery Client initialized at timestamp 1612937033760 with initial instances count: 0
2021-02-10 14:03:53.763 INFO 2860 --- [ main] o.s.c.n.e.s.
EurekaServiceRegistry : Registering application SPRINGCLOUD-TEST with eureka with status UP
DiscoveryClient : Saw local status change event StatusChangeEvent [timestamp=1612937033763, current=UP, previous=STARTING]
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
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:

![Image of PluginList](image1)

Use PostMan to simulate HTTP to request your SpringCloud service:

![Image of PostMan](image2)

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

![Image of IDEA HTTP Client Plugin](image3)
Use IDEA HTTP Client Plugin to simulate HTTP to request your SpringCloud service[Shenyu proxy]:

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.

```xml
<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.

```html
<!DOCTYPE HTML>
<html>
<head>
    <meta http-equiv="content-type" content="text/html" />
    <title>Shenyu WebSocket Test</title>
    <script>
        var websocket;
        function connect() {
            try {
                websocket = new WebSocket(document.getElementById("url").value);
                websocket.onopen = onOpen;
                websocket.onerror = onError;
                websocket.onmessage = onReceive;
                websocket.onclose = onClose;
            } catch (e) {
                alert('[websocket] establish connection error.');
            }
        }
        function onOpen() {
            alert('[websocket] connect success. ');
        }
        function onError(e) {
            alert('[websocket] connect error. code: ' + e.code);
        }
        function onReceive(msg) {
            var show = document.getElementById("show");
            show.innerHTML += "[Server Response] => " + msg.data + "<br/>";
            show.scrollTop = show.scrollHeight;
        }
    </script>
</head>
<body>
    <input type="text" id="url" placeholder="WebSocket URL"/>
    <button onclick="connect()">Connect</button>
    <div id="show"></div>
</body>
</html>
```
```javascript
function onClose(e) {
  console.log("[websocket] connect closed. code: " + e.code);
  alert("[websocket] connect closed.");
  document.getElementById("show").innerHTML = "";
  document.getElementById("msg").value = "";
  websocket = null;
}

function buttonClose() {
  if (websocket == null) {
    console.log("Please establish a connection first.");
  } else {
    websocket.close(1000);
    document.getElementById("show").innerHTML = "";
    document.getElementById("msg").value = "";
  }
}

function send() {
  if (websocket == null) {
    alert("Please establish a connection first.");
  } else {
    var msg = document.getElementById("msg").value;
    show.innerHTML += "[Client Request] => " + msg + "<br/>";
    websocket.send(msg);
  }
}
</script>
</head>
<body>
  <input id="url" type="text" value="ws://localhost:9195/ws-annotation/myWs"><br />
  <input id="msg" type="text"><br />
  <button id="connect" onclick="connect();">Connect</button>
  <button id="send" onclick="send();">Send</button>
  <button id="close" onclick="buttonClose();">Close</button></br>
  <div id="show" class="show"></div>
</body>
</html>
```

```css
input {
  width: 400px;
  margin-bottom: 10px;
}
.show {
  width: 600px;
  height: 400px;
  overflow-y: auto;
  border: 1px solid #333;
}
```
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:

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

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

- 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:

```xml
<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:

```yaml
shenyu:
  register:
    registerType: http #zookeeper #etcd #nacos #consul
#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:

```java
@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")
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:

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

<dependency>
  <groupId>org.apache.shenyu</groupId>
  <artifactId>shenyu-spring-boot-starter-plugin-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:

    ```xml
    <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:

    ```yaml
    shenyu:
    register:
      registerType: http
      serverLists: http://localhost:9095
    props:
      username: admin
      password: 123456
    client:
      http:
        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:

  ```xml
  <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:

  ```xml
  <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/findByUserId 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("/findByUserId")
    public UserDTO findByUserId(@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/findBy 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("/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 get 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:

```xml
<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

```yaml
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
      # 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.

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

16.9. Sofa service access gateway
4. Add the @ShenyuSofaClient annotation to the interface

```java
@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.

    ```java
    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.

    ```java
    @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:

```xml
<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:

```xml
<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:

```yaml
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:

```java
@ShenyuSpringWebSocketClient("/myWs")
@ServerEndpoint("/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:

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

```xml
<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:

```yaml
shenyu:
  register:
    registerType: http #zookeeper #etcd #nacos #consul
    #localhost:8848
  props:
    username: admin
    password: 123456
  client:
    motan:
```

16.15. Motan service access gateway
Apache ShenYu document

```java
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:

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

- 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:

```xml
<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`:

```yaml
shenyu:
    register:
        registerType: http  #zookeeper #etcd #nacos #consul
        #localhost:8848
        props:
            username: admin
            password: 123456
    client:
```
3. 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:

```java
@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("Received HELLO")
        .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:

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

So the request parameters look like this:

```json
{
  "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"
    }
  ]
}
```
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:

```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-->
```
If you use eureka as Spring Cloud registry center, add these dependencies:

```xml
<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:

```
eyureka:
  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:

```xml
<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

```yaml
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:

```xml
<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/findByUserId will be handled by gateway.

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

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

    @GetMapping("/findByUserId")
    public UserDTO findByUserId(@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")
    @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): isFull: true represents that all service will be represented by the gateway.

shenyu:
    register:
        registerType: http # zookeeper # etcd # nacos # consul
        # localhost:8848
        props:
            username: admin
            password: 123456
    client:
        springCloud:
            props:
                contextPath: /springcloud
                isFull: true
            # port: 8884
            # registerType: service register 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.

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

```xml
<!-- apache shenyu alibaba dubbo plugin start-->
<dependency>
  <groupId>com.alibaba</groupId>
  <artifactId>dubbo</artifactId>
  <version>2.6.5</version>
</dependency>
<!-- apache shenyu alibaba dubbo plugin end-->
```

16.23. Add dubbo plugin in gateway
Apache dubbo user, configure the dubbo version and registry center with yours.

```xml
<!-- 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.

16.23. Add dubbo plugin in gateway
16.24 Dubbo service access gateway

Dubbo integration with gateway, please refer to: shenyu-examples-dubbo.

- Alibaba Dubbo User
  - Spring Boot
    Add these dependencies:

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

  - Spring
    Add these dependencies:

    ```xml
    <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:

    ```xml
    <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

  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>

  Inject these properties into your Spring beans XML file:
```xml
<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
```

16.24. Dubbo service access gateway
16.25 Dubbo configuration

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

```json
{"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.

```bash
# 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:

```yaml
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.

```java
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.

```java
@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

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

- Error message

```json
{
  "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`

```java
@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.

```json
{"id": "1234", "name": "XIA05y"}
```

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

```json
{}
```

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

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

- **Return Data**
### Field | Type | Desc
---|---|---
code | Integer | Return code
message | String | Return message
data | Object | Return data

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

```json
{
   "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.
      eyJ1c2VyTmFtZSI6IiIsImV4cCI6MTY0MjY5MjYxNn0.
      "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**

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

- **Return Data**

  A successful registration returns success.
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.

<table>
<thead>
<tr>
<th>Field</th>
<th>Type</th>
<th>Required</th>
<th>Desc</th>
</tr>
</thead>
<tbody>
<tr>
<td>appName</td>
<td>String</td>
<td>Yes</td>
<td>app name</td>
</tr>
<tr>
<td>contextPath</td>
<td>String</td>
<td>Yes</td>
<td>service path</td>
</tr>
<tr>
<td>path</td>
<td>String</td>
<td>Yes</td>
<td>path</td>
</tr>
<tr>
<td>pathDesc</td>
<td>String</td>
<td>Yes</td>
<td>path description</td>
</tr>
<tr>
<td>rpcType</td>
<td>String</td>
<td>Yes</td>
<td>rpc type, supported type reference <code>RpcTypeEnum</code></td>
</tr>
<tr>
<td>serviceName</td>
<td>String</td>
<td>Yes</td>
<td>service name</td>
</tr>
<tr>
<td>methodName</td>
<td>String</td>
<td>Yes</td>
<td>method name</td>
</tr>
<tr>
<td>ruleName</td>
<td>String</td>
<td>Yes</td>
<td>rule name</td>
</tr>
<tr>
<td>parameterTypes</td>
<td>String</td>
<td>Yes</td>
<td>parameter Type</td>
</tr>
<tr>
<td>rpcExt</td>
<td>String</td>
<td>Yes</td>
<td>rpc expansion parameters</td>
</tr>
<tr>
<td>enabled</td>
<td>Boolean</td>
<td>No</td>
<td>status</td>
</tr>
<tr>
<td>host</td>
<td>String</td>
<td>Yes</td>
<td>service IP</td>
</tr>
<tr>
<td>port</td>
<td>Integer</td>
<td>Yes</td>
<td>service port</td>
</tr>
<tr>
<td>pluginNames</td>
<td>List</td>
<td>No</td>
<td>plugin name list</td>
</tr>
<tr>
<td>registerMetaData</td>
<td>Boolean</td>
<td>No</td>
<td>whether to register metadata</td>
</tr>
</tbody>
</table>

**examples**

```json
{
    "appName": "app",
    "contextPath": "/",
```
• 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:

```java
public class ShenyuDefaultEntity implements Serializable {

    private static final long serialVersionUID = -2792556188993845048L;

    private Integer code;
    private String message;
    private Object data;
}
```

- The returned JSON as follows:

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

18.10 Extensions

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

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

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

/**
 * the response context type, default is application/json.
 * @param exchange the exchange
 * @param formatted the formatted data that is origin data or byte[] convert string
 * @return the context type
 */
default MediaType contentType(ServerWebExchange exchange, Object formatted) {
    return MediaType.APPLICATION_JSON;
}

/**
 * Error t.
 * @param code the code
 * @param message the message
 * @param object the object
 * @return the t
 */
T error(int code, String message, Object object);
```

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

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

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

**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**


```java
public interface RemoteAddressResolver {

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

- Register defined class as a Spring Bean.
```java
@Bean
public SignService customRemoteAddressResolver() {
    return new CustomRemoteAddressResolver();
}
```

### 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

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

2. Build integrated tests

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

3. Start docker compose

   ```bash
   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

   ```bash
   ./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 cannot 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 the following dependency:

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

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

```java
public interface ShenyuPlugin {

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

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

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

  /**
   * plugin is execute.
   * if return true this plugin can not execute.
   */
}
```
```java
default Boolean skip(ServerWebExchange exchange) {
    return false;
}
```

Detailed instruction of interface methods:

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

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

### 18.18 Matching Traffic Processing Plugin

- Introduce the following dependency:

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

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

```java
/**
 * This is your custom plugin.
 * He is running in after before plugin, implement your own functionality.
 * extends AbstractShenyuPlugin so you must user shenyu-admin And add related plug-in development.
 */
```
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

18.18. Matching Traffic Processing Plugin

Apache ShenYu document
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**

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

PluginData
### Example

**POST body**

```json
{"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
18.22.4 Delete plugin

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

Request Method

GET

Path

/plugin/delete?name=xxxx

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**

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

### 18.22.7 Save or Update Selector

Save or Update Selector

**Request Method**

POST

**Path**

/plugin/selector/saveOrUpdate

**RequestParam**

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

SelectorData
### Apache ShenYu document

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

### Condition

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

POST body

```json
{
   "pluginName": "divide",
   "type": 1,
   "handle": "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

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

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

### RuleLocalData

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

### ConditionData

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

POST body

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

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

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

18.22.10 Find All Selector

Get all selectors by plugin name

RequestParam

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

18.22.11 Save or Update Rule Data

Save or Update Rule Data

RequestParam

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

18.22. Plugin
## RequestParam

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

### RuleData

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

### conditionList

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

18.22. Plugin
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

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

Get all rules by selector ID

Request Method

GET

Path

/plugin/rule/findList?selectorId=xxxx

RequestParam

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

18.23  Meta data

18.23.1  Save Or Update

Save Or Update Meta data

Request Method

POST

Path

/meta/saveOrUpdate

RequestParam

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

MetaData
<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Re-quired</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>id</td>
<td>String</td>
<td>False</td>
<td></td>
<td>ID</td>
</tr>
<tr>
<td>appName</td>
<td>String</td>
<td>True</td>
<td></td>
<td>app name</td>
</tr>
<tr>
<td>contextPath</td>
<td>String</td>
<td>True</td>
<td></td>
<td>contextPath</td>
</tr>
<tr>
<td>path</td>
<td>String</td>
<td>True</td>
<td></td>
<td>path</td>
</tr>
<tr>
<td>rpcType</td>
<td>String</td>
<td>True</td>
<td></td>
<td>rpc type (dubbo, sofa, tars, springCloud, motan, grpc)</td>
</tr>
<tr>
<td>serviceName</td>
<td>String</td>
<td>True</td>
<td></td>
<td>service name</td>
</tr>
<tr>
<td>methodName</td>
<td>String</td>
<td>True</td>
<td></td>
<td>method name</td>
</tr>
<tr>
<td>parameterTypes</td>
<td>String</td>
<td>True</td>
<td></td>
<td>parameter types</td>
</tr>
<tr>
<td>rpcExt</td>
<td>String</td>
<td>False</td>
<td></td>
<td>rpc extension parameters (json objects)</td>
</tr>
<tr>
<td>enabled</td>
<td>Boolean</td>
<td>False</td>
<td></td>
<td>Whether to turn on</td>
</tr>
</tbody>
</table>

### 18.23.2 Delete

Delete Meta data

#### Request Method

GET

#### Path

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

#### RequestParam

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

18.24.1 Save Or Update

Save Or Update App Sign Data

Request Method

POST

Path

/auth/saveOrUpdate

RequestParam

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

AppAuthData

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

AuthParamData

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

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

18.24.2 Delete

Delete App Sign Data

Request Method

GET

Path

/auth/delete?appKey=xxxx

RequestParam

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

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 itSchedulers.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.

```java
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.

```java
/**
 * 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

```java
@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.

```java
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-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.

```java
@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

- Implement abstract methods of parent class.

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

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

### 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.

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

private static class EventLoopNettyCustomizer implements NettyServerCustomizer {
    @Override
    public HttpServer apply(final HttpServer httpServer) {
        return httpServer
            .tcpConfiguration(tcpServer -> tcpServer
                .runOn(LoopResources.create("shenyu-netty", 1, DEFAULT_IO_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