HUAWEI CLOUD Microservice Tool Improves Development Efficiency

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Advantages of the Microservice Architecture

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Major Difficulty in Building the Microservice Architecture: How to Split an Application into Microservices?

• Factors
  › Team size
  › Delivery cycle
  › Business direction
  › Fault scope
  › Data scale
  › Throughput
  › Consistency
  › ...


Possible Problems Caused by Improper Splitting

• Possible problems:
  › Services increase explosively, making service O&M more complex.
  › Too few services are available, which cannot be flexibly used.
  › One user story may affect multiple services.
  › APIs change frequently.
  › A massive number of association queries are performed.
  › The system architecture complexity increases.
Tool for Splitting Monolithic Applications into Microservices Improves Development Efficiency

Typical Process of Transforming Applications to Microservices

Supported processes
- Application to the cloud + IaaS
- Transformation of applications to microservices + PaaS
- Service innovation e.g. AI

Current method
- Slow
- Expensive
- Difficult

Methodology
- ThoughtWorks 5 Steps and 1 Phase
- DDD aggregation
- Event Sourcing
- Command Query Responsibility Segregation (CQRS)

Service reconstruction
- Massive investment

Build inputs
- Convert into service independence

View
- XX UIs

Control
- Service orchestration

Model
- DAO object
- SQL statement

Key technology: toolkit for transforming applications to microservices

Challenges: The rebuilding process is highly business-related and time-consuming, and it requires participation of business and microservice experts.

Major difficulty: identifying relevant code modifications
Core technology: application-level formal verification

Cloud-based applications

Traditional enterprise IT

Distributed
- Scalable
- Horizontally scalable

Massive investment

Service reconstruction

Transform data tables

Split UIs and service logic

Build inputs

Service rebuilding model

Automatic sharding

Automatically generate microservice code

Read service logs to identify the service access frequency.

Scan the Model layer to identify JOIN table sizes.
Tool for Splitting Applications to Microservices — Automatic Sharding

Step 1: Extract all SQL statements in the system.
Step 2: Create syntax trees using SQL statements.
Step 3: Analyze the table correlations in each syntax tree and generate a weighted graph.
Step 4: Shard data tables to databases by means of the graph segmentation algorithm and heuristic rule.

Principle: loosely coupled and highly cohesive
Coupling: sum of weights of the edges connecting microservices after an application is split into microservices
Cohesion: sum of weights of the edges between tables in a microservice after an application is split into microservices

Heuristic rule (customizable) for splitting microservices using the graph searching algorithm:
Rule 1: greedy algorithm
Rule 2: An independent table can belong to any microservice or be an independent microservice.
Rule 3: The number of tables belonging to the same microservice cannot be less than 5 (configurable).
Rule 4: Tables whose correlation is greater than 10 (configurable) belong to the same microservice.
Tool for Splitting Monolithic Applications into Microservices

Step 1: Based on the SQL correlation and using times, identify the table with the highest correlation and classify the table as a microservice.

Step 2: Decouple databases by adjusting the table structure to prevent a microservice from accessing different databases (denormalized database, service rebuilding).

Step 3: Horizontally shard tables with large volumes of data to horizontally scale up capacity and improve the access speed (partitioning and sharding).

Step 4: Automatically adjust SQL statements such as DDL/CRUD based on table structure changes to generate Java data access services.

Step 5: Execute data tables and migrate data.

Reversely deduce the policy for splitting monolithic applications into microservices based on the table correlation and usage.
Principle for Splitting Monolithic Applications into Microservices

1. Specify the code path. 
/home/xxx/project
2. Specify the algorithm (greedy algorithm by default).
3. Specify the SQL rule. (MySQL is used by default, and intelligent analysis will be used in the future.)

Preprocessing during development:
Use the Antlr4 to generate objects of parsing rules that are recognizable to Java, and embed the objects into the source code.

MySQL/Oracle rule file
Case 1: Analysis on Splitting Legacy System 1 into Microservices (Using the Graph Searching Algorithm)

The picture shows offering library, template library, and discrete tables from left to right. The offering library and template library come from the rebuilt legacy system. The discrete tables are introduced by the system to associate with external systems and are stored in a separate library.
Case 2: Analysis on Splitting Legacy System 2 into Microservices (Using the Graph Searching Algorithm)

The picture shows extended attribute services, model/model instance services, catalog services, and discrete table services from left to right. The discrete table services in red should be classified into the model/model instance services, but are automatically identified as independent services. This is because the SQL does not present the correlation between these discrete table services and model/model instances.
API Management and Control Challenges in Microservice Architecture

• Explosive growth of APIs in the microservice architecture
• Mobile Internet, and IoT
• An API is equivalent to a contract.
• API First, a developer for decoupling services
ServiceStage Contract Management Tool — Separation of Management and Control

This is a sample server Petstore server.

Swagger Petstore

This is a sample server Petstore server. You can find out more about Swagger at http://swagger.io or on irc.freenode.net, #swagger. For this sample, you can use the api key special-key to test the authorization filters.

Terms of service

Contact the developer

Apache 2.0

Find out more about Swagger

```
---
pet

Everything about your Pets

* Find out more about your store
  
  `url`: "http://store.swagger.io"

* Collection
  
  `collection`: ["http", "http://store.swagger.io"]

* Tag
  
  `tags`: ["pet"]

* Pet
  
  `post`

  - `tags`: ["pet"]
  
  `summary`: "Add a new pet to the store"
  
  `description":
```

Thank you.

把数字世界带入每个人、每个家庭、每个组织，构建万物互联的智能世界。
Bring digital to every person, home and organization for a fully connected, intelligent world.

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