

Research of Service Evolutionary Strategy Based on Agency Mode

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Abstract

The traditional service means doing things for others and gets or doesn't get paid. It is not to provide material objects but to work and meet others' specific requirements. Service in operating system means carrying out the procedures, routines and processes in specific system to support other procedures, especially the underlying procedure close to hardware. When providing service by internet, services could be issued in Active Directory so as to promote managements and uses with service as the center. Service in broad sense is like the application program which runs in background. The service application program usually could offer some helps locally or through internet, such as the application programs in client-side or server, Web server, database server and other application programs based on servers. Web Service is based on internet and is distributed modularity elements. It carries out specific tasks and obeys the technical manuals which make Web Service interoperating with other compatible elements. The service talked in this thesis is mainly Web Service.

Keywords

Service, evolutionary, agency mode.

1. Service evolution strategy

The service evolution is a process of preservation and evolution[1], by developing the existing Web service to meet new requirements and technologies. Service is designed for those users. We call those service users as service consumers and the service providers are the entities providing service[2]. Since the requirements of service consumers change all the time and the development of technology makes the technologies used by service providers changed as well, the service would change correspondingly when the service consumers use service. The process of redesigning and improving the continuous service resulted in the appearance of service evolution problems[3].

Shuying Wang came up with four service strategies[4] to help service providers to estimate the influence to service consumers of changing service[5], thus could help service providers solve the problems of service evolution. The four service modes are compatible mode, conversion mode, division mode and combining mode. The compatible mode is a common strategy, no involving changes of application programs. Its limitation is that only limited change could be compatible to all the service consumers. The conversion mode reduces such failing risk of related consumers. But it should maintain the changes of abandoned operations in the supplier side. The division mode could reduce the impact to consumers. However, the division operations of consumers need manual application and service transformation. The combining mode needs manual application in consumer side. In the long term, it would reduce influences to consumer and the future changes would focus on single service.

The four service strategies to help service providers to estimate the influence to service consumers of changing service, thus could help service providers solve the problems of service evolution. However,

they have limitations to both service providers and consumers. Changes in the consumer side would lower usage experience. Tedious maintenance in the providers' side would limit service upgrading and affect the use of consumers. This thesis comes up with the service development strategy based on agency mode, which could reduce the maintenance in the providers' side and also study the influence of consumers.

2. An New Service Evolutionary Strategy Base On Agency Mode

2.1 Agency Mode

The idea of agency mode means an agency service between the practical service and service consumers. It would provide extra service or different operations in agency services. The use of agency mode makes the maintenance in the providers' side more simple and convenient.

With the agency mode, calls of service are as shown in Figure 1. In Figure 1, the Service Consumer is the service user. Service Consumer could visit the Target in Service to get corresponding service. Target is the part needed to be agented in Service. Joinpoint is the points intercepted. Pointcut is the definition to intercept which points. Advice is the matters after Joinpoint. Weaving is the process of creating new agency service by enhancing Target. Proxy Service is the Service after Weaving.

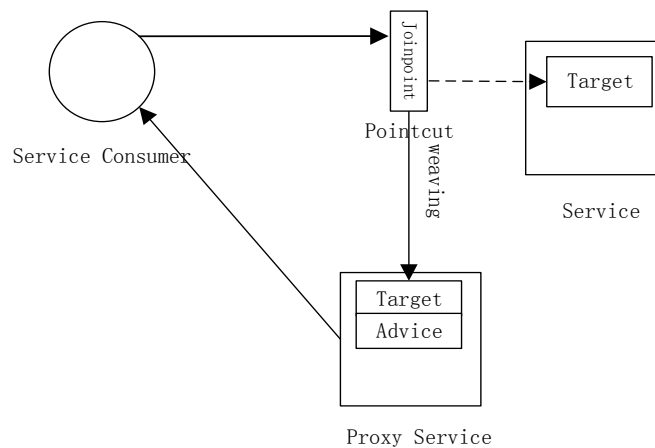


Fig. 1 The route chart of agency mode

2.2 The Service Evolution Model Of Agency Mode

Quintuple model $\langle p, U, dep, \Delta, t \rangle$

p is the service being analyzed.

U is the set of dependent service consumers.

For each $u \in U$, $dep(p, u) = \{dep(e_i, e_j) \mid \exists e_i \in p, \exists e_j \in u\}$. $dep(e_i, e_j)$ indicates that a consumer's element e_j consumes the service provider's element e_i .

$\Delta = \{c_1, \dots, c_k\}$ is the set of changes applied on the service p . p' represents the updated service p with the changes applied.

u' represents the modifications required in agent service to adapt to the evolved service p' . u'' represents the modifications required in consumers' applications to adapt to the evolved service p' .

$t'(u)$ is the transition set for service consumer u . This set represents the modifications required in consumers' applications to adapt to the evolved service p' . For each dependent service consumer u , the impact analysis is performed to estimate the necessary changes. The transition set t is defined as: $t'(u) = impact(\Delta, dep(p, u))$. In the same way, $t''(u) = impact(\Delta, dep(p, u))$.

In agent model, $t'(u) = impact(\Delta, dep(p, u)) \neq \emptyset, \Delta \neq \emptyset$ & $t''(u) = impact(\Delta, dep(p, u)) = \emptyset, \Delta \neq \emptyset$.

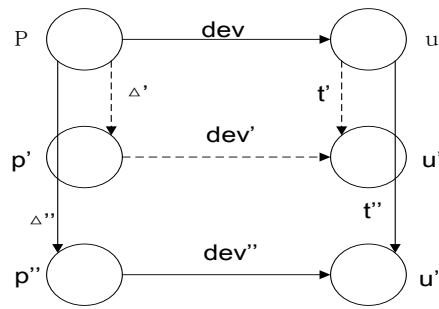


Fig. 2 Service evolution model

2.3 The Analysis Of Proxy Pattern Strategy

Strategy Analysis of Agency Mode Agency mode is not an intrusive mode. It just change some related functions in agency service, but not change the original service. Using agency mode could make the maintenance in the providers' side more simple and convenient. Meanwhile, since the original service would not change, the dependence of consumers to service would not change as well. Figure 3.a contains a WSDL(Web Services Description Language) snippet containing two operations ("OrderInterface" and "ItemInterface"), and four elements used in the definition of the messaes: "OrderRequest", "OrderResult", "ItemId", and "ItemResult". The "OrderRequest" is an element of the type "OrderRequestType"; the schema is presenting the WSDL snippet, from Figure 3.a, is depicted in Figure 3.d. In this graph, a service root node connects to each of its nested definition parts, and the definition parts are connected to each other based on their relations and references. Figure 3.c shows a SOAP(Simple Object Access Protocol) request snippet that invokes the "OrderInterface" service. This type of request can be obtained by monitoring the service interface, and was used to estimate the dependencies of a consumer application. Figure 3.e shows the corresponding dependency graph inferred from this request. Notice how the eleents e2,e5,e6,s2,s3,s4 and s5 were preserved, while the elements with indirect dependencies, e1 and e4, were removed. Of all of these changes for service p, does not affect the figure 3. e service dependencies in the diagram.

```

...
e1: <message name="OrderProcessRequest">
e2,e3: <part name="OrderRequeust"
      type="tns:OrderRequestType"/>
</message>
e4: <message name="OrderProcessResponse">
e5,e6: <part name="OrderResult" type="xsd:string"/>
</message>
e7: <message name="ItemRequest">
e8,e9: <part name="ItemId" type="xsd:string"/>
</message>
e10: <message name="ItemResponse">
e11,e12: <part name="ItemResult" type="xsd:string"/>
</message>
e13: <portType name="OrderInterface">
e14: <operation name="OrderProcess">
e15: <input message="tns:OrderProcessRequest"/>
e16: <output message="tns:OrderProcessResponse"/>
</operation>
</portType>
e17: <portType name="ItemInterface">
e18: <operation name="Item">
e19: <input message="tns:ItemRequest"/>
e20: <output message="tns:ItemResponse"/>
</operation>
</portType>
...

```

Fig. 3.a Service interface

```

...
s1: <complexType name="OrderRequestType">
  <sequence>
s2,s3: <element name="OrderId" type="xsd:string"/>
s4,s5: <element name="ShippingAddress" type="xsd:string"/>
s6,s7: <element name="BillingAddress" type="xsd:string"/></element>
  </sequence>
  </complexType>
...

```

Fig. 3.b Schema definition

```

POST/OrderInterface
...
<soap:Body>
  <OrderProcess>
    <OrderId>1000</OrderId>
    <ShippingAddress>1000 Western Rd</ShippingAddress>
  </OrderProcess>
</soap:Body>
...

```

Fig. 3.c SOAP request

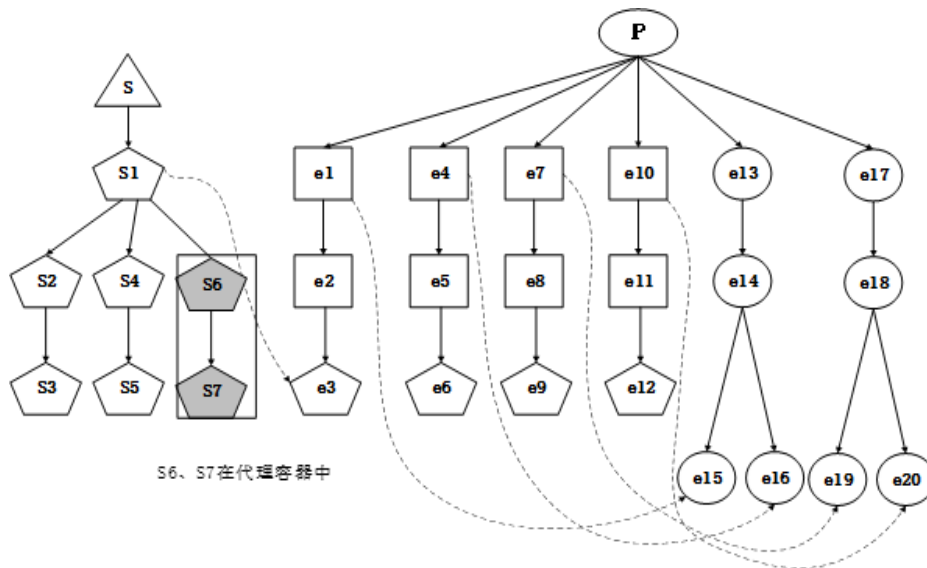


Fig. 3.d Service structure graph

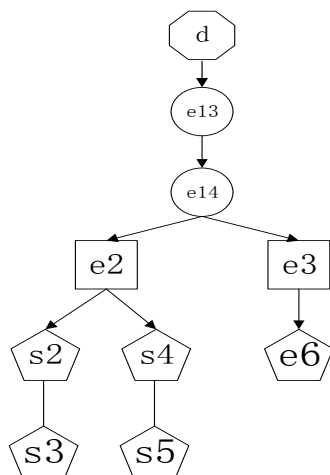


Fig. 3.e Service dependency graph

3. Conclusion

This thesis introduces a new service evolutionary strategy --- agency mode. Agency mode has better compatibility and maintenance ability in providers' side. However, what needs to concentrate is that agency mode is not suitable to all operations. For example, it may need to intrusively modify the original service to operate deletion by agency mode, which would greatly reduce the compatibility of service.

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