

White Paper

SIP and SOAP

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Liberating services for the SIP generation™

Introduction

SIP and SOAP – a Technical White Paper

The Internet has changed forever the way people communicate. Services such as the Web, Email and Instant Messaging are valuable forms of communication to millions of users. To support these Web Services, packet based networks have become ubiquitous. For a long time the potential economic benefit from converging such packet based networks with the networks used for Voice Services has been clear. With issues relating to Quality of Service now being solved, the convergence of voice and data networks at the underlying physical layer is becoming a reality. This will in turn allow seamless presentation of Voice and Web Services at the application layer.

A focal point for convergence of Web and Voice Services at the application layer is a new Internet protocol – SIP (Session Initiation Protocol). SIP is changing the way people think about Voice Services on next generation communication networks. Meanwhile, another technology is poised to take Web Services to new heights – SOAP (Simple Object Access Protocol). SOAP makes sophisticated Web Services possible and SIP allows them to be presented within integrated communication applications that include Voice Services.

This paper provides the background to these two exciting technologies and examines what the future holds as they combine to deliver new services.

Session Initiation Protocol (SIP)

We are now seeing leading carriers deploying SIP as the signaling protocol for the creation of high quality voice sessions on packet networks. Whilst there were other protocols they could have chosen, such as H.323, none of them would have offered the same degree of support for services.

SIP is being developed within the Internet Engineering Task Force (IETF) where it is well known that in the Internet age extensibility is critical to the success of any protocol. The speed of innovation on the Internet dictates that adopters must be able to extend supported features without breaking basic interoperability. The flexibility and simplicity of SIP naturally lends itself to the Internet model of rapid innovation. There is already a huge base of developers who drive the evolution of the Web through rapid development and deployment of innovative services. SIP implementers will provide the same type of service creation APIs as exist for HTTP.

Whilst SIP is best known for telephony style sessions the power of its flexibility can be seen through its support for Instant Messaging and Presence. Extensions to SIP to support Instant Messaging and Presence are being standardized within the IETF and will produce an open and interoperable platform for such services for the first time. As you would expect, the IETF has also designed SIP to tightly integrate into the existing technology base of the Internet. Collectively these factors unlock the potential for carrier class Voice Services to be integrated with innovative Web Services.

Simple Object Access Protocol (SOAP)

SOAP is a lightweight protocol, being defined within the World Wide Web Consortium (W3C), for invoking methods on servers. SOAP defines a vocabulary in XML that allows heterogeneous components to collaborate to perform services. The use of XML as the data format for the interfaces to SOAP messages means that implementers are free to represent the data as they see fit in the language of their choice. Generic XML tools can also be used to support SOAP. The increasing adoption of SOAP on the Internet will enable a new generation of Web Services to be developed. Up until now Web Services have relied heavily on technologies such as CGI and Servlets. These take simple information in the form of text from a HTTP request, process it to provide a service and then return a response. The most familiar examples are Web pages that allow users to fill text into forms for submission to the server. SOAP provides a much more powerful interface into such servers allowing users to make more complex method calls to invoke more sophisticated services.

SIP and SOAP

SIP and SOAP are clearly highly compatible technologies that have both been designed to leverage the same proven base of Internet technology, such as the use of URLs, DNS, MIME types and XML. Indeed, HTTP is typically used as the transport mechanism for SOAP, but as the author recently pointed out in an IETF Internet Draft it can make sense for SIP to be used to transport SOAP messages.

As well as the more obvious technical compatibilities there is also a common underlying design philosophy to SIP and SOAP critical to the architecture required for advanced services. SIP and SOAP are both ideal for decentralized and distributed environments where many components collaborate to provide features and functionality. The platforms supporting future services will be decomposed into many specialized components. This allows the specialization of separate service components, such as Text-To-Speech engines, Web Application Servers, VoiceXML servers and Conference Servers. A distributed architecture allows greater scalability, extensibility, more flexible deployment and component resource-sharing between different services.

Such decomposition does have its challenges though, not least the complexity of the many possible interactions. This is where the strengths of SIP and SOAP really come into play. SOAP is ideal as a lightweight protocol for customizable exchange of information in a decentralized, distributed environment. While SIP adds the required capability of component discovery, session duration, and control.

Taking the decomposed architecture for services to its logical conclusion it is clear that a critical component is required for coordinating the overall execution of services. Ubiquity Software Corporation has identified this component as the Helmsman[®] Application Services Broker (ASB). Through both SIP and SOAP the Helmsman Application Services Broker can coordinate a loosely coupled services platform with many components.

These components can be from many vendors and might even be deployed by separate providers on different networks. The Helmsman Application Services Broker oversees the passing of requests for services between components, letting each component perform its own specialized tasks and pass back the results.

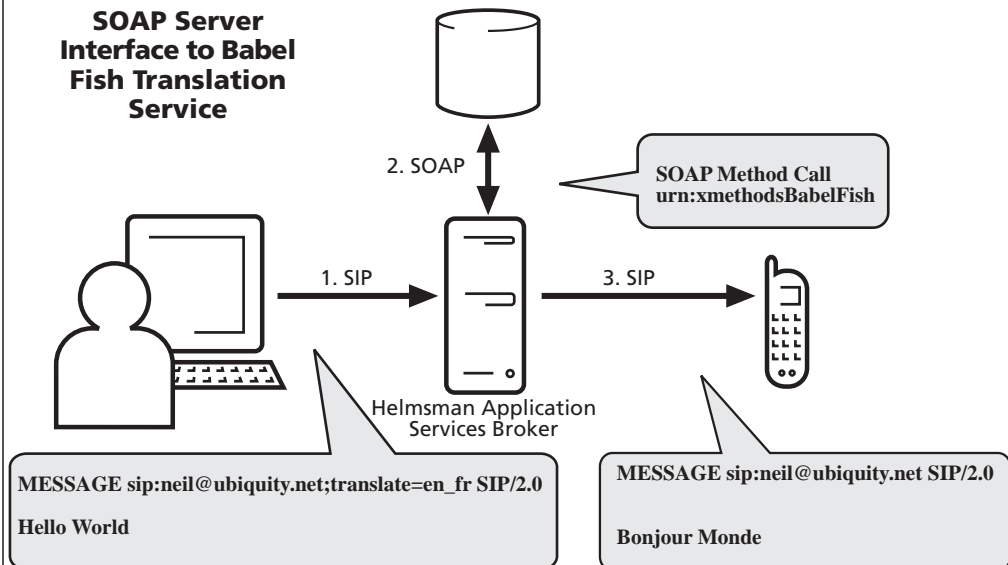
Finally, one of the most eagerly anticipated developments in technology is convergence of Internet and Mobile technology. It is therefore worth noting that SIP has been selected by the Third Generation Partnership Project (3GPP) as the signaling protocol for the IP multimedia domain of third generation mobile networks. Meanwhile, SOAP is a corner stone to the Microsoft .NET framework for the development of Web Services.

Examples

The following section provides some examples of services supported by the approach described in this paper.

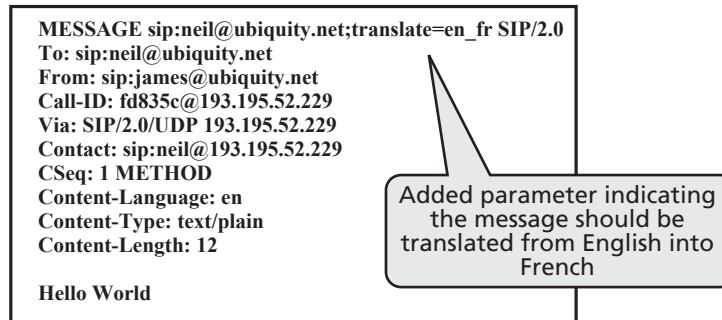
Example 1. Instant Message Translation Service

This service illustrates the potential for the combination of an extension to basic SIP functionality, in this case Instant Messaging, with a Web Service being exposed through SOAP. This example is not just theory. The advanced capability of Ubiquity Software Corporation's services platform allowed this service to actually be built and publicly demonstrated within one day. The translation service being performed via a SOAP server made available by xmethods.net, which has an interface to AltaVista's Babel Fish service.



Examples

A SIP Request modified for the Instant Message Translation Service



This basic example illustrates the following key points:

1. *The extensibility of SIP*

A simple extension has been added to allow this service to be performed – the SIP request carrying the instant message has an added parameter to the protocol's Request URI indicating the required language translation. This extension is a usage convention of standard SIP and does not modify the protocol in any way. Adding information to SIP Request-URIs in this manner is a well-recognized mechanism for providing service context.

2. *The simplicity of SOAP*

SOAP is simple to use and the code to request services can, as was the case here, be written in minutes. To illustrate this, Java source code to make the translation request at the SOAP server is reproduced in full here.

```
Call call = new Call();

call.setEncodingStyleURI(Constants.NS_URI_SOAP_ENC);
call.setTargetObjectURI ("urn:xmethodsBabelFish");
call.setMethodName ("BabelFish");

Vector params=new Vector();
params.addElement (new Parameter ("translationmode",
                                String.class, "en_fr", null));
params.addElement (new Parameter ( "sourcedata", String.class,
                                "Hello World", null));
call.setParams(params);
try
```

Examples

```
{
    URL url =
    new URL("http://services.xmethods.net:80/perl/soaplite.cgi");
        Response resp = call.invoke (url,
        "urn:xmethodsBabelFish#BabelFish");

    if (resp.generatedFault())
    {
        Fault fault=resp.getFault();
        System.out.println(" Fault code: " + fault.getFaultCode());
        System.out.println(" Fault string: "+fault.getFaultString());
    }
    else
    {
        Parameter result=resp.getReturnValue();
        Object o = result.getValue();
        System.out.println("Response " + o);
    }
}
catch(Exception e)
{
    System.out.println(e);
}
```

Example 2. Interactive Customer Response Service

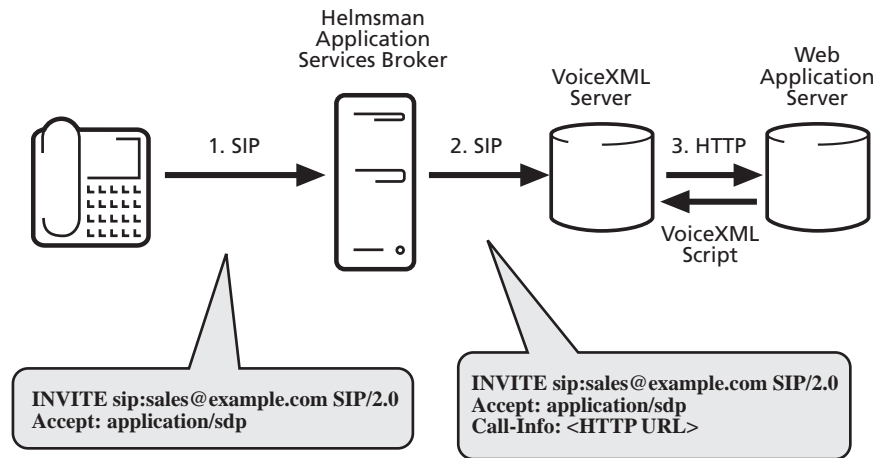
This service illustrates how the flexibility of the distributed component architecture can customize a service to suit the capabilities of the user.

Case 1: Voice Enabled Caller

A caller to a customer service number is using a traditional style phone, which only supports voice. This could be a caller on the PSTN accessing the service via a SIP Gateway. However, a personalized response to the caller is still possible from a VoiceXML server.

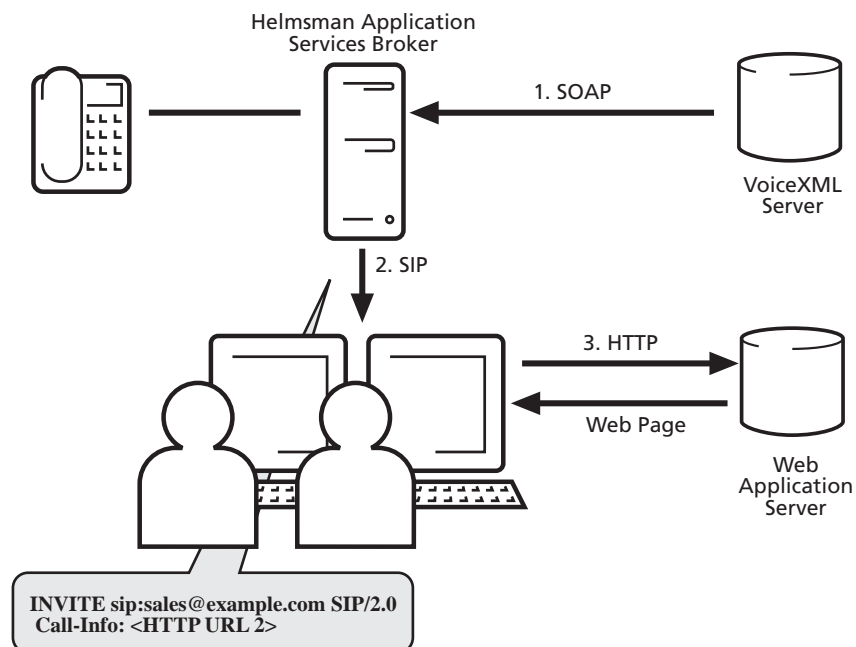
Examples

Case 1. Stage 1: Personalized VoiceXML Script Generated for the Caller



In stage 1, the Helmsman Application Services Broker is aware that the caller is only capable of supporting audio from the SIP Accept header and so customizes the service accordingly. A URL is generated by the ASB from information about the caller, such as their identity, and is added to SIP signaling in the SIP Call-Info header. The ASB then routes the signaling to a SIP enabled VoiceXML Server. This server then extracts the URL from the signaling and uses it to retrieve a customized VoiceXML script from a Web Application Server. This server may have access to information such as the caller's recent orders etc. The VoiceXML script is then used to play a personalized IVR to the caller.

Case 1. Stage 2: Call Transferred to a Customer Representative with Web Page



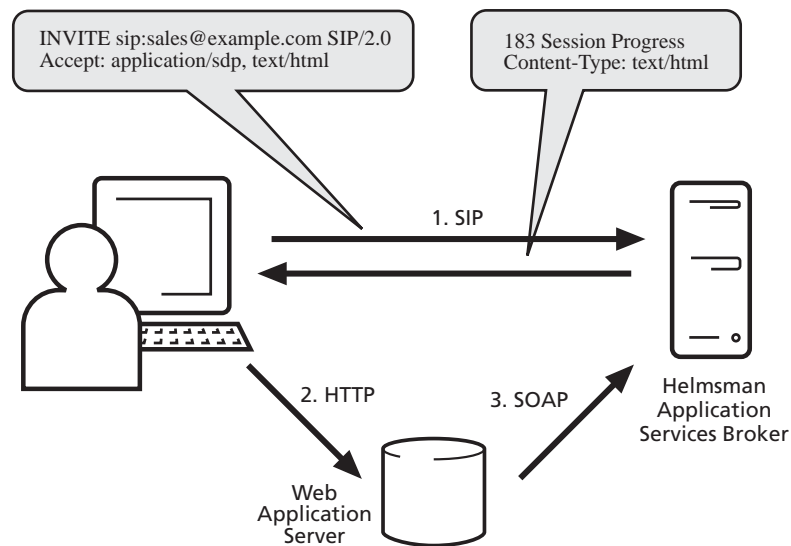
Examples

In stage 2, the VoiceXML Server signals the result of the IVR session to the ASB via a SOAP request. The ASB can then transfer the call to an appropriate customer service representative. When doing so it adds a new URL to the SIP signaling so that the receiving sales call handler receives a screen pop with a web page relating to the call.

Case 2: Voice and Web Enabled Caller

In this case, the caller is using a SIP User Agent that supports Voice and Web media. This allows the same service to be presented through a web page rather than an IVR.

In stage 1, the caller is informed of a Web URL that they can access as part of the initial response to their SIP signaling. Their web enabled user agent can then retrieve this URL and, possibly through navigating links or submitting a form, indicate the customer service representative they need to contact. The Web Application Server relays this information to the ASB in a SOAP request.

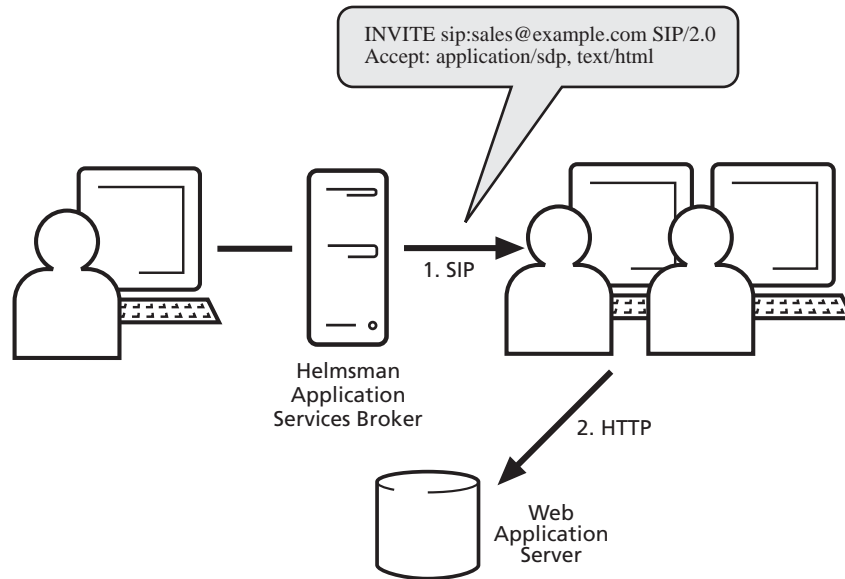


Case 2. Stage 1: Caller Receives Web Page Response

The ASB then completes the SIP signaling to set up the call in stage 2. As before when the call is routed to the correct handling agent additional information can be associated with the call so that the handler receives a screen pop with a web page of information.

Examples

Case 2: Stage 2. Call Transferred to a Customer Representative with Web Page



This example illustrates the following key points:

1. Specialized service components can be flexibly re-used across services

This example illustrates how a distributed platform with specialized components can co-operate to deliver sophisticated services. Components such as the Web Application Server can be reused across the delivery of different services. SOAP provides a standard interface for both the VoiceXML server and a Web Application Server to inform the ASB how to handle the call once the caller's input has been processed.

2. Services can be personalized

The flexibility and dynamic nature of service creation can allow the personalization of services tailored to suit individual users.

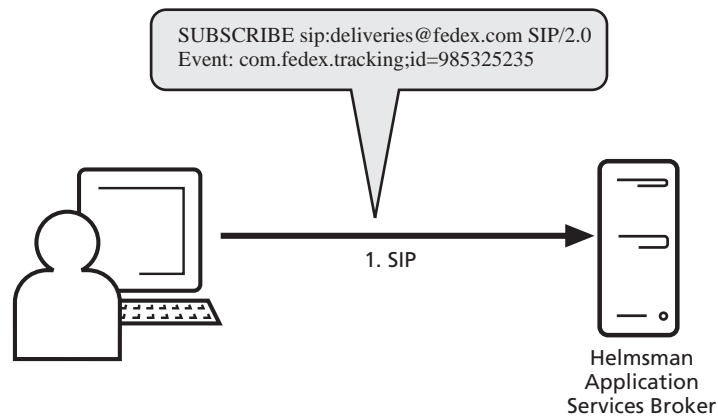
Example 3. Gift Delivery With Callback Service

Finally, this more complex example of a service demonstrates the possible aggregation of many specialized components to provide a Meta-Service. Subscription to an event, in this case the delivery of a gift, can be associated with the ability to set up a voice session through a Click-To-Dial service.

In stage 1, the user subscribes to receive notification of the delivery of a gift.

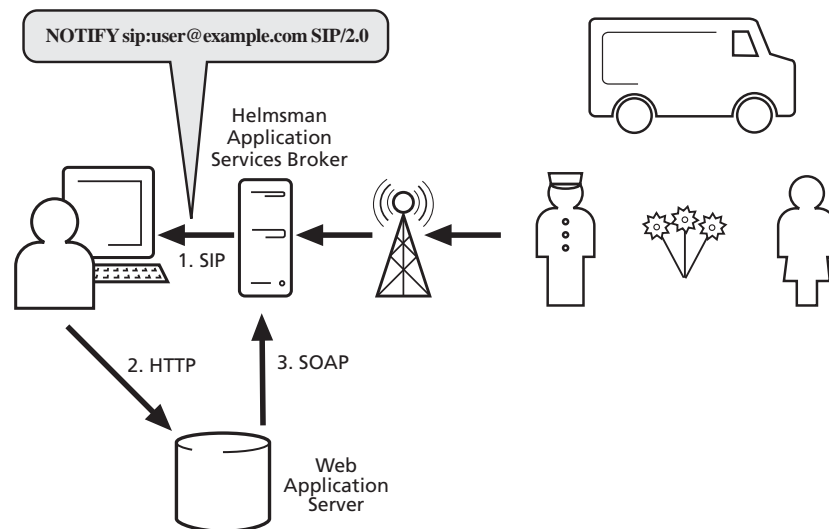
Examples

Stage 1: User Subscribes to Gift Delivery Notification Service



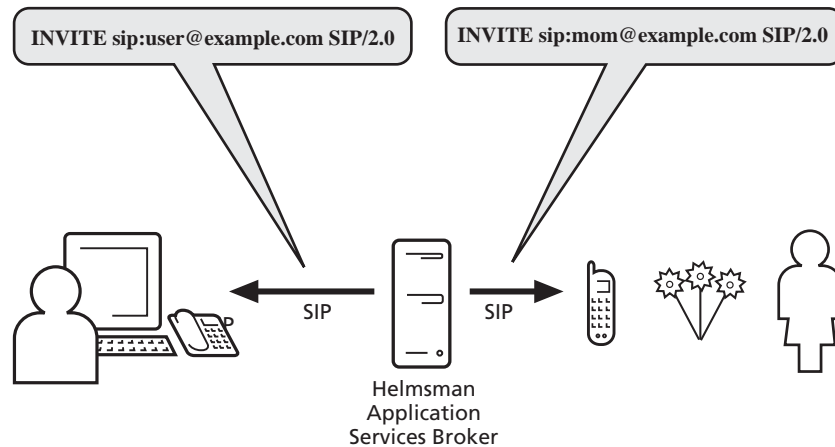
When the gift is delivered the user receives a notification that includes a URL. By loading the URL a web page is displayed which allows the user to request that a call is set up to the gift's recipient. A SOAP request from the Web Application Server triggers call setup by the Helmsman Application Services Broker.

Stage 2: User Receives Notification of Delivery with Click-To-Dial URL



Examples

Stage 3: ASB Creates a Call between the Two Parties.



This example illustrates the following key points:

1. *The creation of Meta-Services*

Aggregating individual services can create complex Meta-Services. Some of the component services may be remote and offered by third parties. In this example the component services might include:

- Package-tracking services from multiple shipping companies.
- A web page personalization service provided by a specialist design agency.
- A user authentication service, such as Microsoft's passport program, could be added.

When combined in this way the value of the Meta-Service transcends the value of the individual service components.

2. *Voice Services are not tied to traditional telephony call event models*

This service also demonstrates how the generic event pattern in SIP allows services involving voice that would not be possible in traditional telephony service creation environments where events are restricted to call state events. In this case the delivery of a package triggers a telephony service.

Summary

SIP and SOAP provide a powerful combination for building sophisticated, converged Voice and Web Services through taking advantage of their shared technology base and design philosophy. Services can aggregate separate specialized components over a distributed architecture, using SOAP for customizable exchange of information and SIP for component discovery, session duration, and control.

Ubiquity Software Corporation is uniquely placed to exploit this through the Helmsman Application Services Broker that integrates both SIP and SOAP to support next generation services.

About Ubiquity Software Corporation

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About the Author

Neil Deason (ndeason@ubiquity.net) graduated with a Masters in Information Technology from University College London in 1997. After working in British Telecom's Research Labs he joined Ubiquity Software Corporation as a Senior Developer. There he championed the adoption of SIP and was responsible for leading the initial implementation of SIP technology. As their Technical Strategist he is now a leading member of Ubiquity's Architecture Group. In his spare time he tries, and fails, to keep up with far too many mailing lists.

About Ubiquity

Ubiquity is a SIP pioneer and a global provider of carrier class end-to-end SIP-based solutions. Ubiquity allows IP communications providers to differentiate through the creation and deployment of next generation converged services. The Helmsman range of award-winning, carrier-class products includes the advanced SIP Network Server; the Application Services Broker; DesignDeck, an advanced toolkit to enable core network and enterprise based service creation; and, SIP User Agents on the desktop.

For additional information: www.ubiquity.net



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