# I got my REST API for z/OS Connect

Now what?

Haley Fung IMS Mobile and APIM Development Lead hfung@us.ibm.com

Evgeni Liakhovich IMS Software Developer evgueni@us.ibm.com

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## Cloud / Mobile topics at the Symposium

# IMS Connect: Much more than a TCP/IP Gateway!

 IMS Connect as foundational to cloud and mobile alignment

# Evolving mobile systems of engagement in your enterprise

 Discussion of strategic mobile enablement options in IMS

A02

#### **B02**

#### Mix it up: How your enterprise assets fit perfectly with Bluemix

 Covers publishing z assets as REST services in z/OS Connect all the way to Bluemix and using the secure gateway and API Management services to access the z services

#### I got my REST API for z/OS Connect – Now What?

 Using the IBM MobileFirst platform to build a hybrid mobile application consuming REST/JSON services hosted on the z platform

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# **Evolution of Web Services**

#### From SOAP/WSDL to REST/JSON



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#### Evolution of Web Services – SOAP/WSDL

- Over the last decade, enterprises adopted traditional Web Services (e.g., SOAP over HTTP)
  - Business-to-business (B2B) and business-to-consumer (B2C) interaction
- SOAP WS are described using Web Services Definition Language (WSDL)
- Input and output messages are described using XML Schema (XSD)
- Provide very rich description of services, demanding "high ceremony" approach
- Problem: We tried to use them for everything



#### **Evolution of Web Services – REST/JSON**

- For mobile and cloud applications, SOAP eventually lost favor to "*low-ceremony*" services that use the REST architectural style
  - RESTful services rely more on the basic convention of the web
  - For example, instead of using specialized registry, they rely on existing common means to locate resources (URL)
- RESTful services prefer to use JSON over XML as the wire format
- JSON has been referred to as "The fat-free alternative XML"
  - JSON documents are typically more compact than XML that describe the same data, and JSON closely resembles the data structures that it will be marshaled into



#### JSON / REST / HTTP

# **IMS Mobile Strategy**

**Mobile Feature Pack** 



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#### **IMS Mobile Business**

- The IMS mobile strategy gives our customers a mobile foundation they can depend on
- Expand IMS ecosystem via delivery of mobile infrastructure
- **New**: IMS Mobile Feature Pack (Enterprise Suite 3.1 GA June 2014)
  - Offer an integrated platform for full discovery, modeling, deployment and execution of both transaction and data assets for mobile consumption
  - REST interface with JSON wire protocol
  - A singular approach for System z clients using WAS, CICS, IMS and DB2



**74% of CIOS** say mobile solutions are part of their vision for increasing competitiveness

l

#### IMS Mobile Feature Pack ...

- Supports
  - -Discovery of IMS assets
  - -Modeling of asset metadata
  - Ability to publish those assets as RESTful services
- Once published, those services are hosted by IMS Mobile for discovery by mobile and cloud application developers
- Associated tooling is delivered via IMS Explorer for Development



## Secure and Consistent Enterprise Connectivity for Mobile and Cloud

Systems of Engagement



- IBM WebSphere Liberty z/OS Connect Shipped with WAS, CICS, and IMS
- Unifies z/OS connectors a common solutions for mobile, cloud, and web
- Simplified integration Hide complexity of connecting to z/OS using REST



Systems of Record

10

#### **Enable IMS Transactions as REST Services**

 Using IMS Explorer (E4D), resources that comprise a service are defined and stored seamlessly on the IMS Mobile Server

6	Create an IMS Mobi	ile Transac	tion Service				3		Services	R	Create an IMS mob	ile transaction ser	vice
C	reate an IMS Mobi	i <b>le Transa</b> on to creat	e an IMS transaction	on service on a	mobile ser	ver.				_			
*	Service name:	IVTNOS	ervice		*Service	type: REST	•						
ſ	Message metadata											-	
	*Transaction code:	IVTNO				Browse	🚺 🕝 Specify Trai	nsaction	Metadata		×		
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*1	nteraction properties Connection profiles		nteraction Properti	ies 🔹	·		*Transaction *Input messa *Output mess	name: <sup>®</sup> ge: sage:	IVTNO IVTNO - INPUT IVTNO - OUTPUT		•		
	Name		Host Name	Port Nu	Use SSL	Add							
	IVTNO Connection	Profile	127.0.0.1	9999	No	Remove Move Up	?			OK	Cancel		
	?		< Back	Next >	Finish	Cancel							

IMS Gateway Navigator 🛛

IMS Gateway Servers

ec01042a.vmec.svl.ibm.com

IMS Connection profiles

N IVTNO Connection Profile

IMS interaction properties profiles
 IVTNO Interaction Properties

### Unit test REST services

 Unit testing an IMS Mobile service using E4D is easy and does not require knowledge of JSON

1S Input and Output Mess	ages						
nput or Output Message	Inclu	Default Field V	Field Length	Data Type	Include		
a 🚽 IVTNO - INPUT					Remove		
a 🖶 Segment 1					Kentove		
🛛 INPUT_MSG	~		59	STRUCT	Edit		
🖾 IN_LL			2	SHORT			
🔛 IN_ZZ			2	SHORT			
🔛 IN_TRCD		IVTNO	10	CHAR			
🖾 IN_CMD		DISPLAY	8	CHAR	Edit Value		
🔛 IN_NAME1	$\checkmark$		10	CHAR			
🔛 IN_NAME2	$\checkmark$		10	CHAR	Data ty		
🔛 IN_EXTN	$\checkmark$		10	CHAR	Field ve		
🖾 IN_ZIP	$\checkmark$		7	CHAR	Tield Va		
b 🚍 Segment 2							
a 🔿 IVTNO - OUTPUT							
🖻 🖶 Segment 1							
b 🖶 Segment 2							
				•			

Runtime configuration: IVTNOServiceTest	▼ Test case name: IVTNOServiceTest1.stc ▼
nput messages	
Input and Output Message Pair	Field value
🖾 INPUT_MSG	
🖾 IN_LL	
🖾 IN_ZZ	
🖾 IN_TRCD	IVTNO
	DISPLAY
IN_NAME1	LAST2
IN_ZIP  IN_ZIP  Cutput messages  View output message with: IVTNO - OUTPL	
IN_ZIP  IN_ZIP  Cutput messages View output message with: IVTNO - OUTPU Input and Output Message Pair	T Field value
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IN_EATIN     IN_ZIP     IN_ZIP     ✓     In_ZIP     ✓     In_ZIP     ✓     In_ut messages     //////     Input and Output Message Pair          OUTPUT_MSG          OUTPUT_LL          OUT_ZZ	T Field value
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IN_ZIP  IN_ZIP  Cutput messages  View output message with: IVTNO - OUTPL  Input and Output Message Pair  OUTPUT_MSG OUT_LL  OUT_ZZ OUT_MSG OUT_CMD	T Field value Field value ENTRY WAS DISPLAYED DISPLAY
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IN_ZIP         IN_ZIP         IN_ZIP         Input messages         View output message with:         Input and Output Message Pair         OUTPUT_MSG         OUT_LL         OUT_ZZ         OUT_CMD         OUT_CMD         OUT_NAME1         OUT_NAME2	T Field value Field value ENTRY WAS DISPLAYED DISPLAY LAST2 FIRST2 FIRST2
IN_ZIP         ✓         Dutput messages         /iew output message with:         IN_TNO - OUTPL         Input and Output Message Pair         〇         OUTPUT_MSG         〇         〇UT_LL         〇         〇UT_ZZ         〇         〇UT_CMD         〇         <	T Field value ENTRY WAS DISPLAYED DISPLAY LAST2 FIRST2 8-111-2222
IN_ZIP         ✓         Dutput messages         //iew output message with:         IN_ZIP         ✓         Input and Output Message Pair         ☑       OUTPUT_MSG         ☑       OUT_LL         ☑       OUT_ZZ         ☑       OUT_MSG         ☑       OUT_CMD         ☑       OUT_NAME1         ☑       OUT_EXTN         ☑       OUT_ZIP	T Field value ENTRY WAS DISPLAYED DISPLAY LAST2 FIRST2 8-111-2222 D02/R02
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## Considerations – Enabling IMS transactions as REST

- REST is stateless
- Best for simple request response type of interaction
- Additional preparation work needed for
  - MFS, Conversational, or generated-COBOL code
  - You may need to hand-code the COBOL copybook for your transaction for E4D tooling
  - You may need to create a simple COBOL code wrapper or convert your conversational transaction to be non-transactional
  - You may to remove the MFS dependency in your application

# So, what now?

#### You published and tested web service – what's next?



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### **IMS Mobile Feature Pack**



Enable mobile and cloud clients to access IMS transactions as REST/JSON services

#### IBM Mobile First Platform architecture formerly known as Worklight

#### 3 (¢ **Device Runtime** Worklight Studio 🛈 6 Cross-platform **iOS SDK** Stores HTML5, Hybrid, and Native Compatibility Layer Application Code Coding Android Server Integration SDK Private App Build Engine Framework **Optimization Framework** Blackberry SDK Þ Encrypted Storage Windows 6 Integrated Device SDKs SDK Public and Windows 8 **Runtime Skinning** 3<sup>rd</sup>-Party Library Integration Java ME Reporting for Statistics and Diagnostics Enterprise Backend systems and Cloud Services Ele Litz Yew Higtory Bookmarks Iools Help 6 Worklight Server (2) 🖗 Worklight Console 4 Client-side App Resources Stats Aggregation Application Version Management **Direct Update JSON Translation Push Management** Mobile Authentication Web Apps **Reporting and Analytics** Unified Push Adapter Library -01 Notifications

IBM MobileFirst

## IBM MobileFirst...

- Supports the development of mobile apps in four ways
  - Web Apps Quick and low-cost development effort
    - Written entirely in HTML5, CSS and JavaScript code
    - Executed by the mobile browser and therefore cross-platform by default, but less powerful than native apps

IBM MobileFirst

- Hybrid Apps (Web) The app's source code consists of web code executed within a native container that is provided by Worklight and consists of native libraries
- Hybrid Apps (Mix) The web code is augmented with native language to create unique features and access native APIs that are not yet available via JavaScript, such as AR, NFC and others
- Native Apps Platform-specific requiring unique expertise and knowledge
  - Pricey and time consuming to develop but delivers the highest user experience



#### **MobileFirst Server-Adapters**

#### Information S<sub>ystems</sub> <sup>n</sup> Databases Applications Querv Response Update 3 2 data **Caching Mechanism** WS HTTP SQL **MobileFirst** Invoke Data/Result adapter as JSON procedure FCB \$619.82 \$4.472.39 \$1.400.05 QQ 9147 \$610.85

Worklight includes **Adapters** with support for SAP, SOAP, **REST**, SQL, JMS, CASTIRON, LDAP & more

IBM MobileFirst

#### Worklight HTTP Adapter

- Works with RESTful and SOAP-based services
  - Can read structured HTTP sources, for example RSS feeds
  - Allows sending a GET or POST HTTP request and retrieves data from the response headers and body
  - Easily customizable with simple serverside JavaScript
  - Optional server-side filtering
  - Retrieved data can be in XML, HTML, JSON, or plain text formats

### Project: Create mobile app based on IMS service



## **Create Worklight Project**

File	Edit Source Refactor Nav	igate Search Project R	tun Wind	dow Help			
	New	Alt+Shift+	N 🕨 🌍	Worklight Project			In the Eclipse menu
1	Accept Team Invitation		2	Project	45		
	Open File			Worklight Hybrid Application		inta	select FIIe > New >
	Close	Ctrl+	w 🗖	Worklight Inner Application		Lue:	Worklight Project
	Close All	Ctrl+Shift+	w 🔲	Worklight Shell Component		ext,	
	Save	Ctrl	New	Worklight Project		/ali	
	Save As			Tronkinght Hoject			
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	D .		Create	a new Worklight project.			
	Entor project p	ama kaan					
			Name:	zContacts			
	the default Pro	ject	Drainet	Tenanlaten			
	Templates sele	ction for	Project	Tempiates:	- Hv	hrid An	plication
	Lybrid Applie	ation than		Hybrid Application	Cre	eates a \	Worklight project containing an initial Hybrid
				Inner Application	ap	plication	n. A Hybrid application can target multiple
	click <b>Next</b>				car	vironme n be exte	ended with native code. It can access device
~				Shared Templates	car	<u>abiliti</u> e	s through a JavaScript API.
۲	New Worklight Project						
н	brid Application			13			<b>—</b>
	onfigure the hybrid applicatio	n that will be created alor	a with th	e Worklight project	$(p^{\epsilon})$	- 11'	Enter application name
	Hybrid Application	Application name					
	- Hybrid Application	Application name.				- 11	Libraries and select the
		contacts					Add Dojo toolkit check box
-		Optional JavaScript Libra	aries: non	e			then click Finish
				Configure JavaScript	Libraries.		1989) 1999

### **Add Environments**

In the Project right click the application a New > Wor Environme

Desktop

Web

?

1

Windows Phone 8

📃 < Adobe AIR

Windows 8 desktop and tablets

n the <i>Project Explorer</i> ight click the <b>Contacts</b> application and select	<ul> <li>✓ () imsContacts</li> <li>▷ ⇒ Java Resources</li> <li>⇒ JavaScript Resources</li> <li>▷ adapters</li> <li>△ ▷ apps</li> <li>∠ ○ Contacts</li> </ul>			
	🔺 🗁 comr 🛛 New	•	C)	Project
Environment	o Ima Alt+Shift+W≯		File Folder	
New Worklight Environment				
Worklight Environment		Ctrl+C		Web Page
Create application folders for new environments.		Ctrl+V	E dah dojo	DOH Unit Test Dojo Class
Project name: imsContacts		Delete		Dojo Custom Build Dojo Widget
Create folders for: Mobile			Ö E	Worklight Adapter Worklight Application Skin
🔽 🇱 iPhone			Worklight Environment	
<ul> <li>Android phones and tablets</li> <li>BlackBerry 6 and 7</li> <li>BlackBerry 10</li> </ul>		In the Worklight Envir	oni	ment dialog, select

iPhone, Android phones and tablets, and Mobile web app then click Finish

## Retrieving Data with a Worklight Adapter

- A Worklight adapter is hosted on the Worklight server, and interacts with remote data sources, retrieving data or performing actions
- The Worklight client runtime provides a simple, common JavaScript interface to invoke the adapter and exchange data from a mobile application



## Configure adapter and add procedures

index.html	👍 main.js	👍 Contac	tsHTTP	ir 🙆	ndex.html	😬 ContactsH	TTP 🛛	index.html	» <u>1</u>	- 8
Adapter Ed	Adapter Editor									
Overview					Details					L+
type filter te	đ				Protocol:		https			
🔺 👑 Adap	Adapter "ContactsHTTPAdapter" Add Connectivity Remove				Domain*:	in*: zserveros.demos.ibm.co				
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=	E Connection P	olicy			SSL Certifica	te Alias:				
					The alias of	r key-store				
			Down		Cookie polic	y:	BEST_MA	тсн		-
				Sets how the HTTP adapter handles cookies arriving from the ba application					ck-end	

index.html	🔒 main.js	👍 Conta	ctsHTTP	٢
Adapter Ed	litor			
Overview				
type filter t	ext			
🔺 凿 Ada	pter "ContactsH	TTPAdapter"	Add	
⊿ 🔊	Connectivity		Remove	
	Connection P	olicy		
ទីភ្លូទិ	Procedure "Brow	seContact"	Up	
468	Procedure "Creat	eContact"		
4 <u>6</u> 22	Procedure "Delet	eContact"	Down	
	Procedure "Show	50Contact"		
	Procedure "Upda	teContact"		

- Select the Design tab of the ContactsHTTPAdapter.xml.xml editor > Connectivity > Connection Policy to edit the HTTP connection details
- Click Add... button to add a Procedure, add one procedure for every IMS Transaction Service

### How to invoke IMS service from adapter procedure??

- We have some investigating to do…
- So, we have our services published on zosConnect server:



We need to find out what JSON request schema looks like for each service...

#### **Obtain JSON Request Schema**

- We will use good old Web Browser to fetch the schema
  - Open your favorite browser and type in URL that follows this format:



### **JSON Request Schema to Procedure Payload**

#### Result should look something like this:

```
숬
← → C & https://zserveros.demos.ibm.com:33616/zosConnect/services/phonebookAdd?action=getRequestSchema
                                                                                                  Ξ
{"INPUT_MSG":{"IN_FIRST_NAME":{"maxLength":10,"type":"string"},"IN_LAST_NAME":{"maxLength":10,"type":"string"},"IN_EXTENSION":
{"maxLength":10,"type":"string"},"IN ZIPCODE":{"maxLength":7,"type":"string"}}}
Formatted schema:
                                                              Let's map this to a JavaScript
                                                                variable:
                                                              var payload = {
{"INPUT MSG":
                                                                "SERVICE INPUT" : {
                                                                   "INPUT MSG" : {
    "IN FIRST NAME":{"maxLength":10,"type":"string"},
                                                                     "IN FIRST NAME" : first,
    "IN LAST NAME":{"maxLength":10,"type":"string"},
                                                                     "IN LAST NAME" : last,
    "IN EXTENSION":{"maxLength":10,"type":"string"},
                                                                     "IN EXTENSION" : ext,
    "IN ZIPCODE":{"maxLength":7,"type":"string"}
                                                                     "IN ZIP CODE" : zip
                                                              };
```

#### **HTTP Adapter Procedure**

Finally, we implement the procedure in the ContactsHTTPAdapter-impl.js:

```
function CreateContact(first, last, ext, zip) {
    var payload = {
      "SERVICE_INPUT" : {
        "MOBILE DEMO_INPUT_MSG" : {
          "IN FIRST NAME" : first,
          "IN LAST_NAME" : last,
          "IN EXTENSION" : ext,
          "IN ZIP CODE" : zip
                                             Service invocation syntax for zosConnect
    };
    var data = JSON.stringify(payload);
    var input = {
          path: '/zosConnect/services/phonebookAdd?action=invoke'
          method: 'PUT',
          headers: {
            'Authorization': 'Basic SU1QT1QwMTpJQk0wN1BPVA==',
            'Content-Type': 'application/json'
          },
          body: {
            'contentType' : 'application/json',
                                                          What's this?
            'content' : data
    };
    return WL.Server.invokeHttp(input);
}
```

#### Credentials are encoded in Base64

- Authorization header contains the string Basic , followed by a Base64 encoded string of the username, a colon character, and the password

   In our example, the credentials IMPOT01:IMS07POT are base64 encoded into
  - the string SU1QT1QwMTpJQk0wN1BPVA==
- Web sites like <u>www.base64encode.org/</u> can do encoding for you:

*	← → C https://www.base64encode.org						
	BASE64 Decode and Encode	Have to deal with Base64 format? Then this site is made for Yo encode Your data. If You're interested about the inner workings the bottom of the page. Welcome!					
	Decode	Encode					
	Encode to Base64 forr Simply use the form below	nat 🔓					
	IMPOT01:IBM07POT						
	> ENCODE < UTF-8	▼ (You may also select output charset.)					
	SU1QT1QwMTpJQk0wN1BPVA=	=					

#### **Test Adapter Procedure**

Right click ContactsHTTPAdapter.xml, Run As > Invoke Worklight Procedure

<ul> <li>&gt; WobleEnterpriseConAndroid</li> <li>&gt; 🔁 Worklight Development Server</li> </ul>	Run As		•	Ö	1 Deploy Worklight Adapter	
⊿ 💮 zContacts	Team		►	*	2 Invoke Worklight Procedure	N
<ul> <li>Java Resources</li> <li>JavaScript Resources</li> </ul>	Compare With		•	<b>N</b>	3 Run on Server	Ålt+Shift+X, R
a 🔁 adapters	Replace With				Run Configurations	
a 🚌 ContactsHTTPAdapter	Source		. ► I	<b>.</b>		
ContactsHTTPAdapter-im ContactsHTTPAdapter.xm	Properties	Alt+Ente	er	Dkei	Http(input);	
iltered.xsl	<pre> function CreateContact(first, last, ext, zip) { </pre>					

Enter parameter value(s) and click Run:

#### Your browser should display result:

ligh

Thyoke Worklight Procedure	Invocation Result of procedure: 'BrowseContact' from the Worl
Procedure name : BrowseContact	{     "SERVICE_OUTPUT": {         "MOBILE_DEMO_OUTPUT_AREA": {             "OUT_EXTENSION": "5035785327",             "OUT_FIRST_NAME": "EVGENT",             "OUT_FIRST_NAME", "EVGENT, "EVGENT",             "OUT_FIRST_NAME", "EVGENT, "EVGENT, "EV
Signature:	"OUT_MESSAGE": "ENTRY WAS DISPLAYED",
BrowseContact (name)	}
Parameters (comma-separated): "LIAKHOVICH"	<pre>}, "isSuccessful": true, "responseHeaders": {     "Content-Language": "en-US",     "Content-Length": "191",     "Content-Type": "application\/json",     "Date": "Wed, 11 Mar 2015 22:11:03 GMT",     "X-Powerd-By": "Servlet\/3.0"</pre>
Run Cancel	<pre>}, "responselime": 334, "statusCode": 200, "statusReason": "OK", "totalTime": 334</pre>

#### Time to make this look pretty

- Now we have a set of working adapter procedures in the Worklight server. They
  fetch data from IMS services. Let's create a simple mobile user interface.
- Open index.html (follow the path displayed on the screen below):



#### Design user interface

 Using Dojo Mobile, jQuery or similar HTML5 framework, we can visually design user interface for the mobile application



### Add logic to the client

main.js contains client side logic written in JavaScript:



## Getting results in JavaScript



```
showDetails = function(itemIndex) {
```

};

currentItemIndex = itemIndex; // Store the current itemIndex

```
// Set all of the textBox fields to the selected item's data
registry.byId("last").set("value",catalogResults.invocationRes
registry.byId("first").set("value",catalogResults.invocationRe
registry.byId("ext").set("value",catalogResults.invocationResu
registry.byId("zip").set("value",catalogResults.invocationResu
```

```
if (catalogResults.invocationResult.SERVICE_OUTPUT.MOBILE_DEMO
    registry.byId("itemDetails").show();
else
```

```
registry.byId("error_message").show();
```

registry.byId("last").set("value",catalogResults. invocationResult.SERVICE\_OUTPUT.MOBILE\_DEMO\_OUTPU T\_AREA.OUT\_LAST\_NAME); // this is how we get values from the output JSON



#### zContacts in screenshots



#### **Additional Information**

- Mobile Feature Pack documentation: <u>http://www-01.ibm.com/support/knowledgecenter/SS9NWR\_3.1.0/</u> <u>com.ibm.ims.mobile31.doc/mobile\_intro.htm</u>
- MobileFirst Platform Getting Started: https://developer.ibm.com/mobilefirstplatform/documentation/gettingstarted/
- Technical article on IMS Mobile solution: <a href="https://www-304.ibm.com/connections/blogs/systemz/entry/">https://www-304.ibm.com/connections/blogs/systemz/entry/</a> <a href="https://www-304.ibm.com/connections/blogs/systemz/entry/">https://www-304.ibm.com/connections/blogs/systemz/entry/</a> <a href="https://www-304.ibm.com/connections/blogs/systemz/entry/">https://www-304.ibm.com/connections/blogs/systemz/entry/</a> <a href="https://www-304.ibm.com/connections/blogs/systemz/entry/">https://www-304.ibm.com/connections/blogs/systemz/entry/</a> <a href="https://www-announces-mobile\_solution-for\_accessing-ims-assets-using-rest-and\_json?lang=en\_us">https://www-announces-mobile\_solution-for\_accessing-ims-assets-using-rest-and\_json?lang=en\_us</a>

# Thank you!

Your feedback is important to us!



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