Using JSON to Simplify Mobile Applications with CICS

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What is JSON?

JavaScript Object Notation

- Lightweight, Human readable, *text based format for data*
- Simple structure
- Native JavaScript support
- Widely adopted by the industry

An alternative to XML

- Heavyweight structure
- Support usually provided by XML specific parsers (Eg. DOM/SAX)

```
var invocationData = {
            adapter: “GENAPPInquire”,
            procedure: “getCustomerDetails”,
            parameters: [otherUsername]
};
```

JavaScript Example

Bit more about JSON…

JavaScript Object Notation

- JSON represents data as name-value pairs (Eg. “name” : “Andy”)
- *Ideal format for data interchange*

Objects

```
var personObject = {
            "name":"John Johnson",
            "street":"Oslo West 555”,
            "age":33,
            "phone":"555 1234567”
};
var personAge = personObject.age;
```

Simple data access

Arrays

```
var employeesArray = [
            { "firstName":"John”, “lastName”:"Doe" },
            { "firstName":"Anna”, “lastName":"Smith" },
            { "firstName":"Peter”, "lastName": "Jones" }
];
var employeeName = employeesArray[1].lastName;
```

How does XML compare to JSON?

XML

```
<employees>
        <employee>
                <firstName>John</firstName>
                <lastName>Doe</lastName>
        </employee>
        <employee>
                <firstName>Anna</firstName>
                <lastName>Smith</lastName>
        </employee>
        <employee>
                <firstName>Peter</firstName>
                <lastName>Jones</lastName>
        </employee>
</employees>
```

300 Bytes Approx.

50,000 Example customer records:

XML: ~14 MB
JSON: ~7 MB

JSON

```
var employeesArray = [
  { "firstName":"John" , "lastName":"Doe" },
  { "firstName":"Anna" , "lastName":"Smith" },
  { "firstName":"Peter" , "lastName": "Jones" }
];
```

150 Bytes Approx.

It’s the same data, *but 50% smaller!*

JSON brings lots of benefits

The benefits of JSON data

- Describes the same data with less meta-information (tags)
- Processing is simpler, ideal for mobile devices
- Natively supported in Javascript - easy for application developersE
- Easy for Human’s to read – helps with application development
- Support is available in many languages ***(but not COBOL)***

This is all very well, but I have a question…

So why don’t we just use XML?

So why don’t we just use XML?

JSON is the mobile format of choice

- The growth in mobile helped boost the popularity of JSON
- The lightweight data format is ideally suited to mobile data transfer
- As a result numerous tools and frameworks now support JSON…

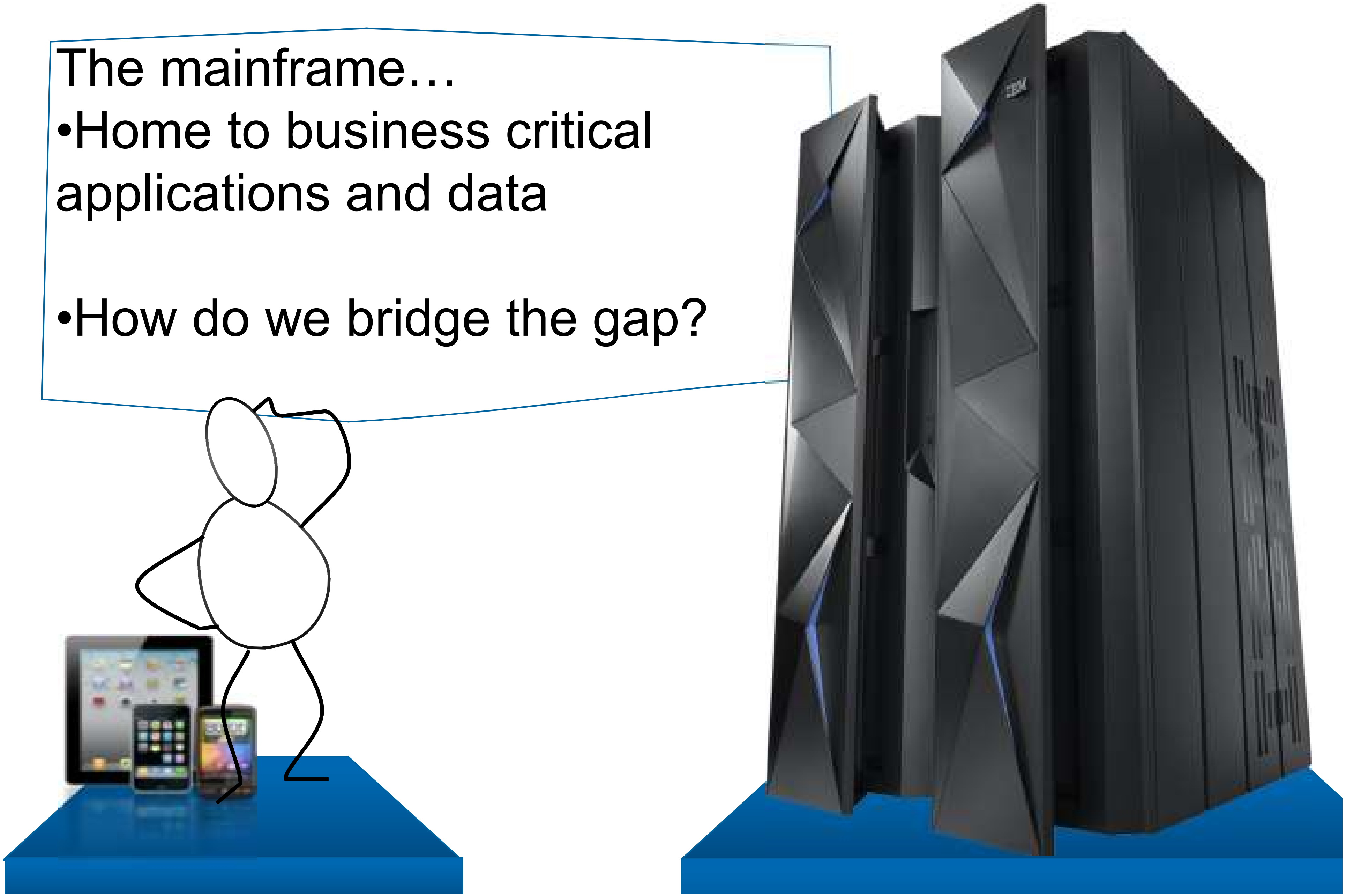
IBM Worklight uses JSON:

- For communication between a mobile application and the Worklight Server
- Provides a JSON Store for offline storage of data
- Automatically converts Webservice SOAP replies into JSON

Numerous other frameworks depend upon JSON data…

Eg. jQuery & dojo use JSON:
•JSON Store
•Ajax calls
•All data interchange

What about the mainframe?



The mainframe…

- Home to business critical applications and data

- How do we bridge the gap?

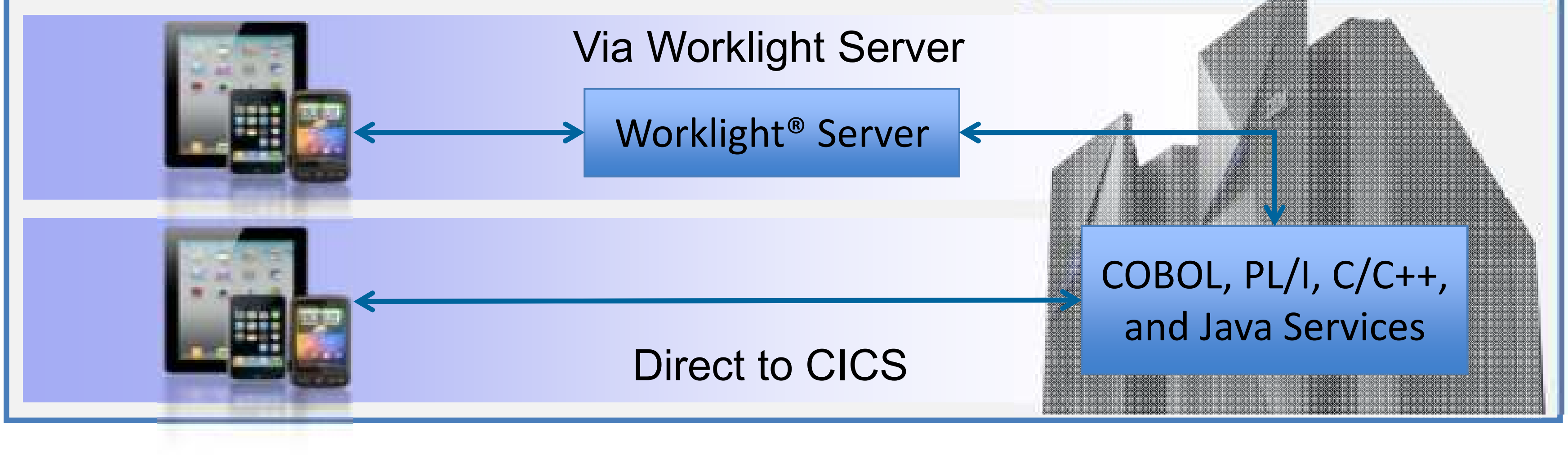
Bridging the gap between mobile and CICS

Available 2Q 2013 on CICS TS V4.2 & V5.1

Mobile extensions – simplified integration with mobile devices

CICS Transaction Server Feature Pack for Mobile Extensions

Agile integration	*Service enablement*	*Scalable platform*
JSON data and RESTful interface makes integration with mobile devices simple and efficient	*COBOL, C/C++, PL/I and Java programs can be RESTful service providers*	*CICS TS V5.1's advanced scalability makes it the ideal platform for managing mobile workloads*



What is REST?

The basics of RESTful services

- REST is an architectural style, unlike SOAP which is a protocol
- Typically use JSON to describe the data for the request
- Uses the HTTP verbs (below) to indicate the nature of an operation
- Uses the URI to determine the resource(s) to operate upon

Create	**Read**	**Update**	**Delete**
HTTP **Post**	HTTP **Get**	HTTP **Put**	HTTP **Delete**

Example URIs

A collection

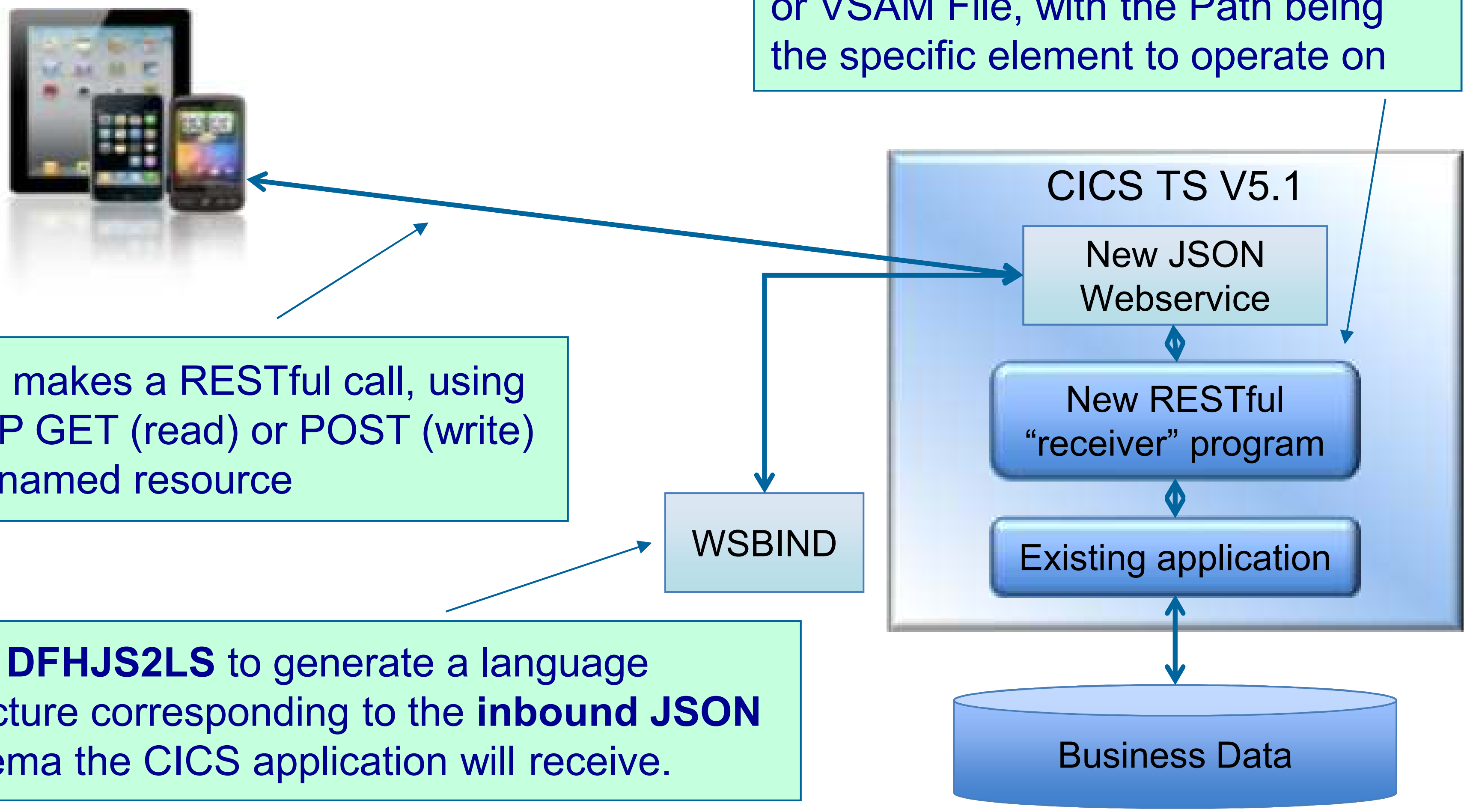
http://my.cics.example/resources/

http://my.cics.example/resources/specific_resource

A Top down scenario… Starting with existing JSON

Connect a mobile application to CICS using the RESTful JSON interface

Wrapper application in CICS uses the URL to identify the resource, DB or VSAM File, with the Path being the specific element to operate on



App. makes a RESTful call, using HTTP GET (read) or POST (write) to a named resource

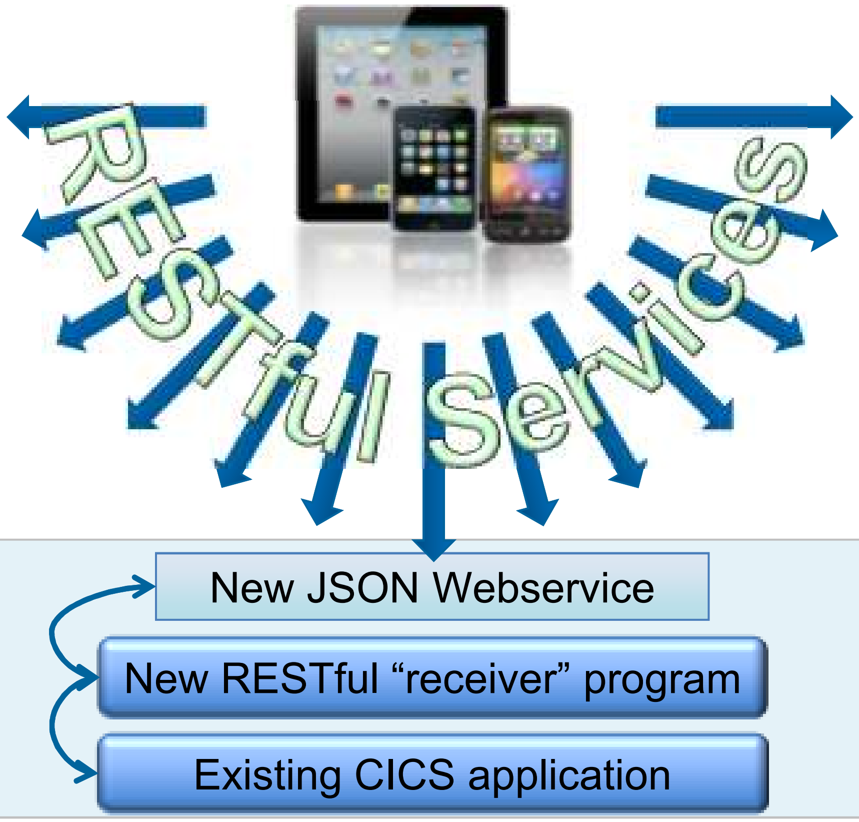
Use DFHJS2LS to generate a language structure corresponding to the **inbound JSON** schema the CICS application will receive.

Top down scenario

Goal:
Integrate mainframe into existing mobile application

"To help us deliver world class services we will standardize our service delivery on a RESTful architecture, promoting a uniform interface to all our consumers." – An IT Architect might mandate

Current environment:
Deployed mobile Apps have standardized the JSON service request interface, but the mainframe has been unable to consume it



New JSON Webservice

New RESTful "receiver" program

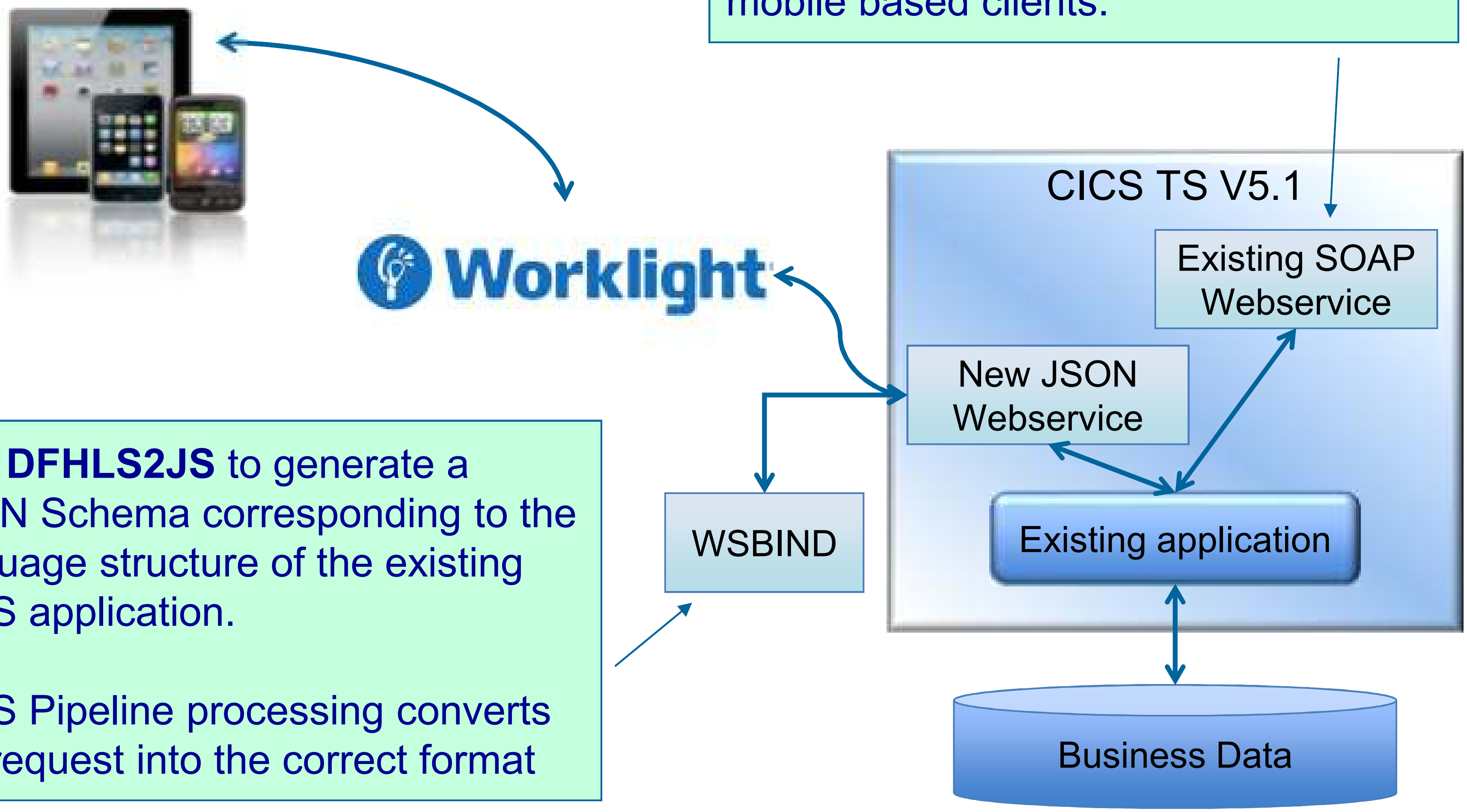
Existing CICS application

Solution:
Use top-down approach to consume standardized JSON

Bottom up scenario - start with language structure

Exposing an existing CICS application as a JSON callable service

Existing SOAP Webservices remain unaffected by the introduction of new mobile based clients.



Use DFHLS2JS to generate a JSON Schema corresponding to the language structure of the existing CICS application.

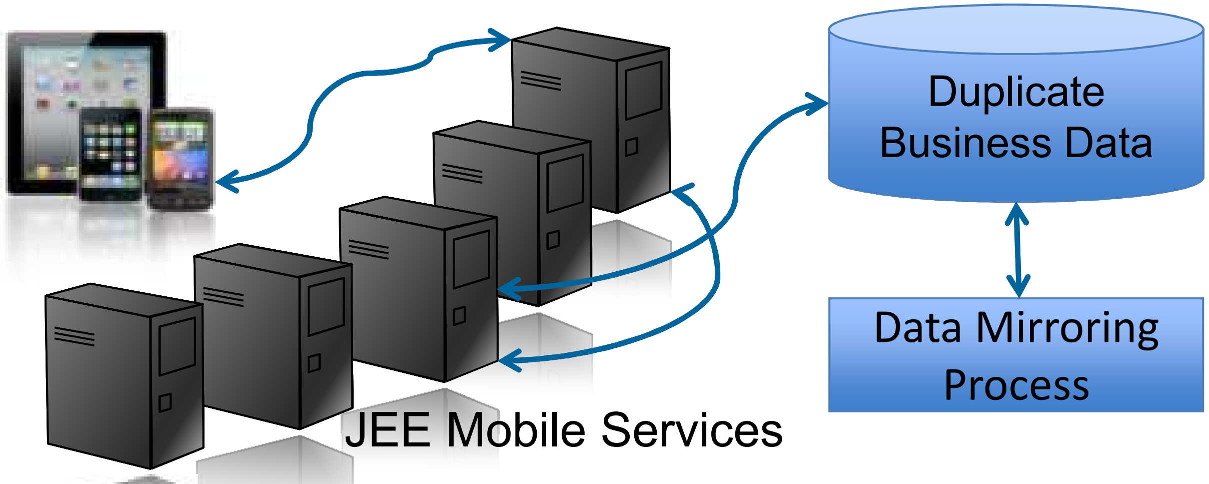
CICS Pipeline processing converts the request into the correct format

Bottom up scenario

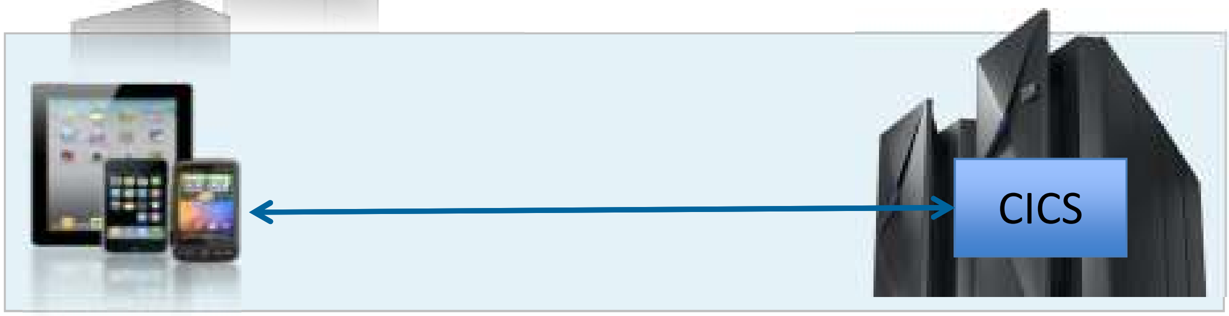
Goal:
Deliver mobile solution and remove data and service duplication

"The quick solution we implemented in order to get to market faster creates a headache for us in terms of duplicate data and services.
We must transform our mobile offering into a well architected solution." – An IT Architect might mandate

Current environment:
Mobile solution exists in parallel and duplicates data and services to support the mobile offering



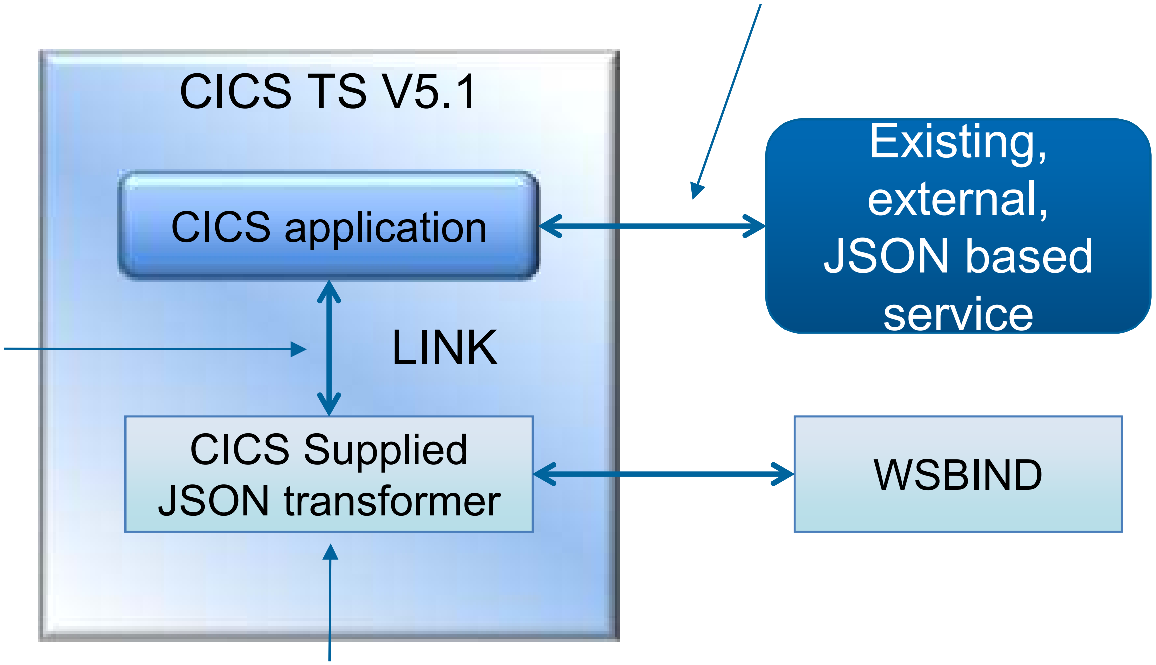
Solution:
Consolidate mobile solution onto the mainframe



Call a service to convert data into JSON format

A CICS application wants to convert data into JSON format to call an external service

Use a EXEC CICS WEB OPEN call to invoke the target external service passing the transformed JSON data


CICS TS V5.1
CICS application
LINK
CICS Supplied JSON transformer
Existing, external, JSON based service
WSBIND

Analogous to using the **XML Transform API**, the CICS application LINKs to the JSON transformer to convert binary data into the desired JSON format

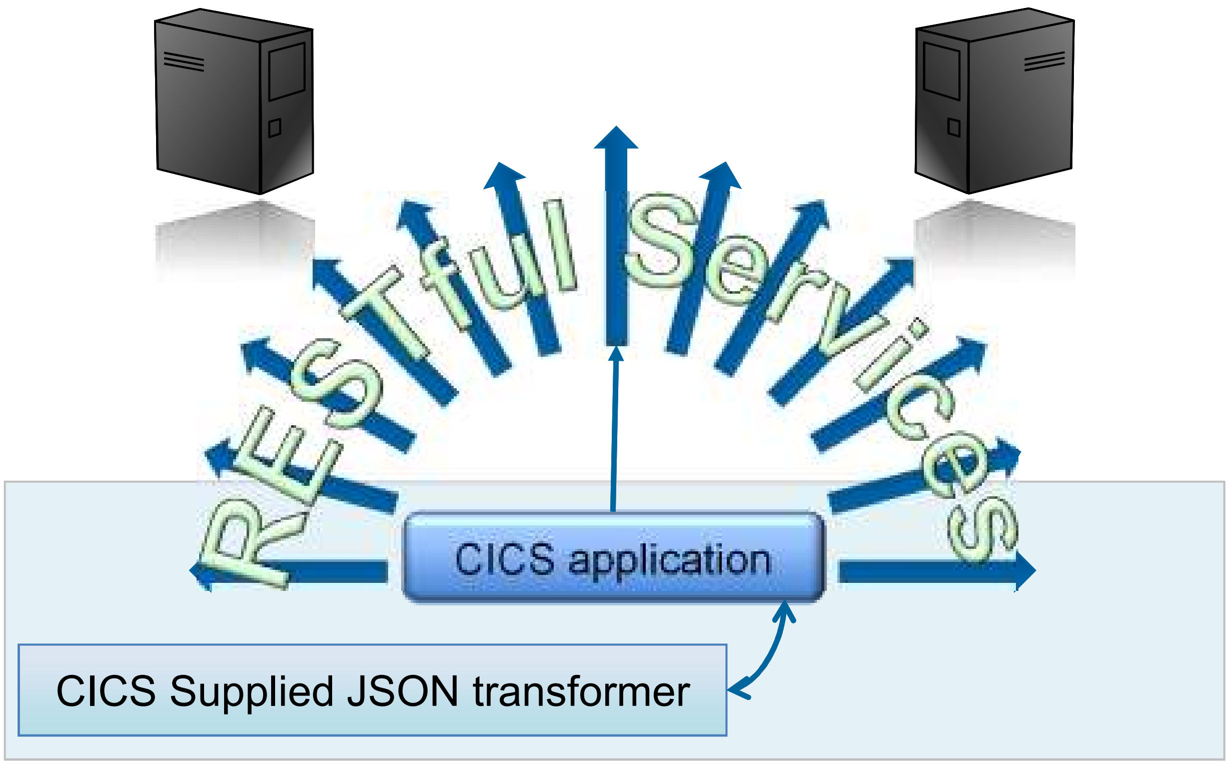
The JSON transformer works both ways…
Pass in **JSON to** generate **binary** data.
Pass in **binary** data **to** generate **JSON** data.

Service call scenario

Goal:
Exploit internal services that are only available through a RESTful interface

"We've standardized our internal service delivery model on RESTful interfaces and need to phase out our old and difficult to maintain alternatives. Key to our success is integrating our mainframe into this solution." – An IT Architect might mandate

Current environment:
RESTful services are deployed throughout the organisation. Mainframe applications need to exploit these services



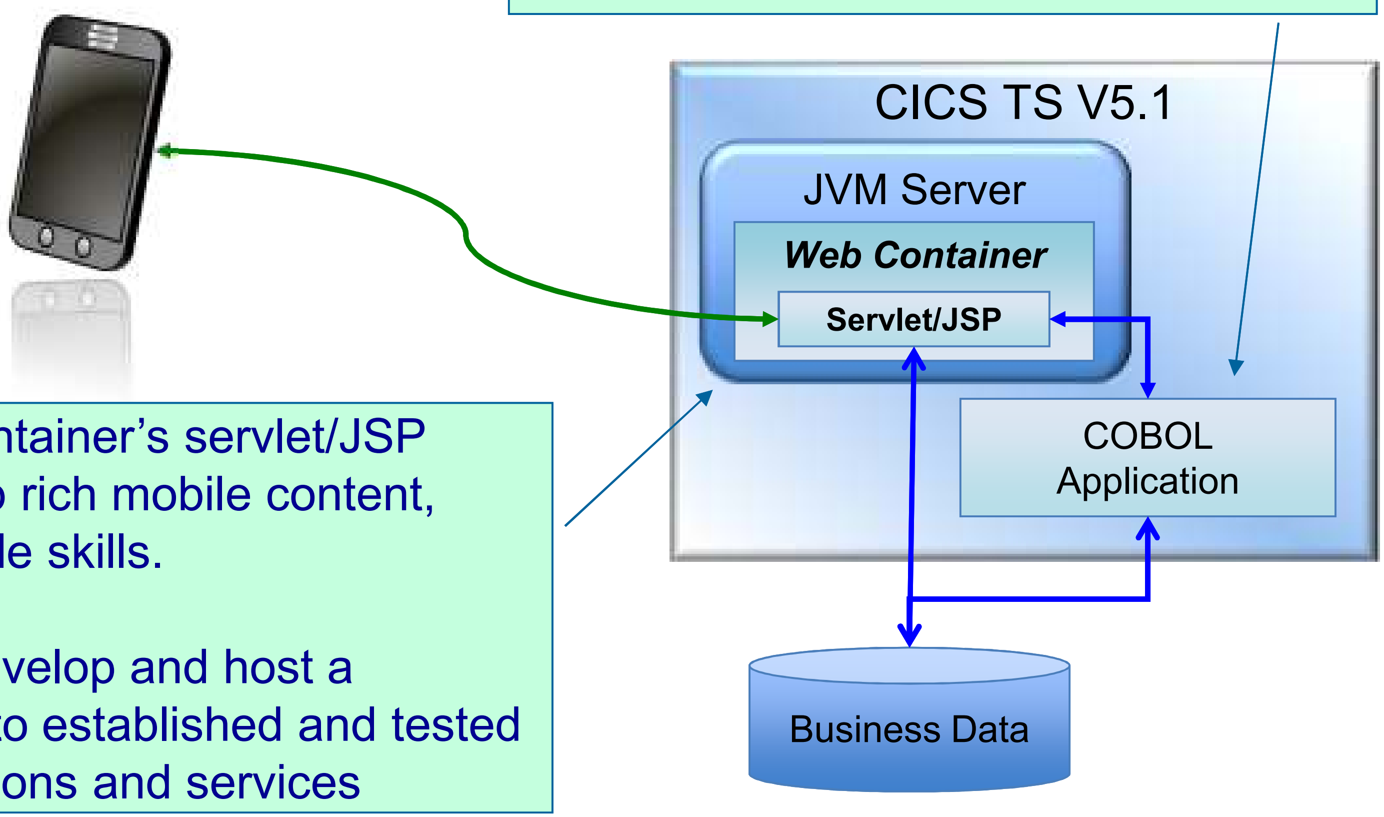
Solution:

Use JSON transformer to consume services

Doing it all Java style – Liberty Profile

RESTful services can now be hosted within the CICS Web Container, with new support for the JAX-RS API

Link to existing C/C++, COBOL, PL/I, and Java applications to exploit existing enterprise applications and services



Exploit the web container's servlet/JSP features to develop rich mobile content, building on available skills.

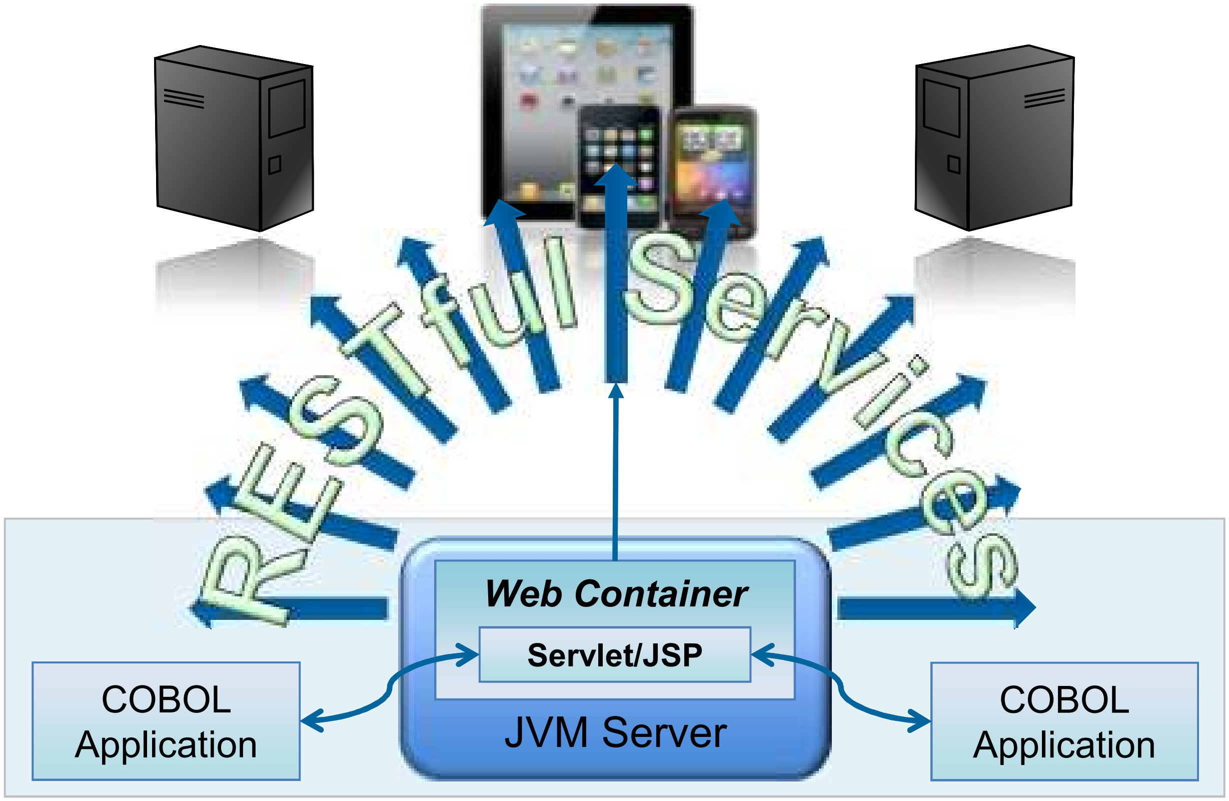
Ideal location to develop and host a RESTful interface to established and tested enterprise applications and services

Web Container Scenario

Goal:
Create a RESTful interface layer to existing mainframe services

"We've standardized our internal service delivery model on RESTful interfaces and need to phase out our old and difficult to maintain alternatives. Key to our success is integrating our mainframe into this solution." – An IT Architect might mandate

Current environment:
Enterprise services have been developed piecemeal and do not have a standardized interface



Solution:
Create standard RESTful interface to CICS services

Why CICS and Mobile makes sense

CICS is the ideal environment for hosting mobile applications

- CICS hosts key business applications
- CICS already provides service enablement of applications
- CICS is the broker of key business data

Agile

CICS' Service Agility features help your mobile applications keep pace with the market

Dynamic

CICS Event Processing lets you augment applications without code changes

Scalable

CICS provides phenomenal workload management capable of dealing with increased mobile workload

Mobile extensions – simplified integration with mobile devices

CICS Transaction Server Feature Pack for Mobile Extensions

Scalable platform

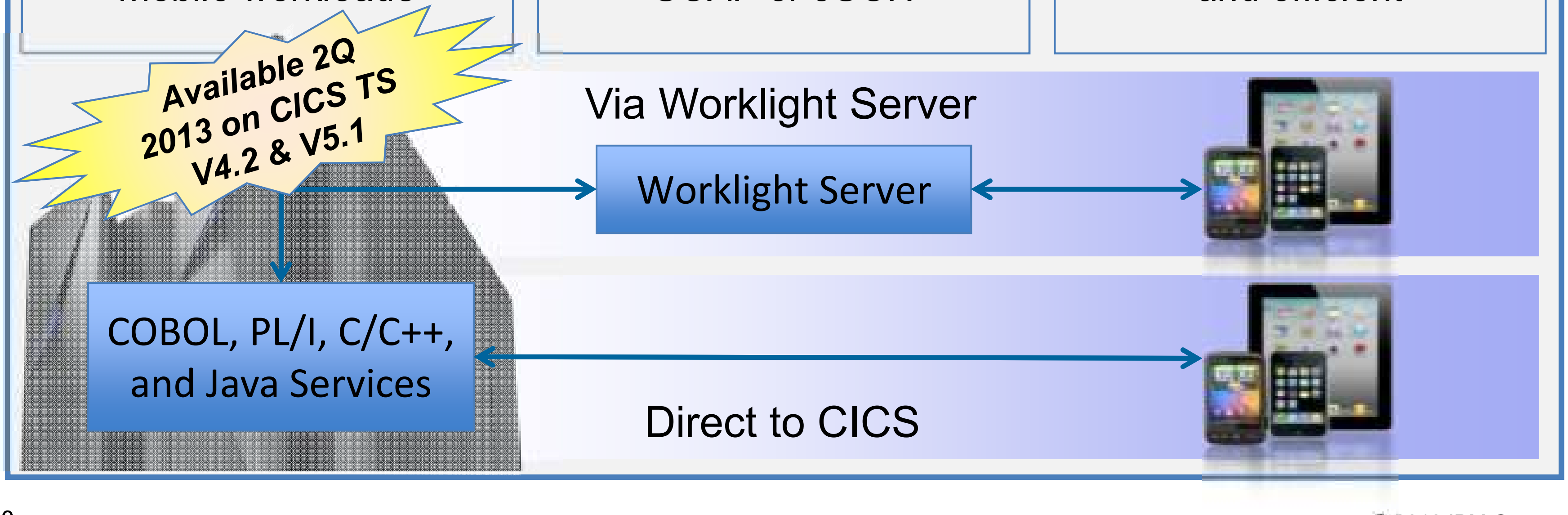
CICS TS V5.1's advanced scalability makes it the ideal platform for managing mobile workloads

Service enablement

Service enable existing COBOL, C/C++, PL/I and Java programs using either SOAP or JSON

Agile integration

JSON data and RESTful interface makes integration with mobile devices simple and efficient



Available 2Q 2013 on CICS TS V4.2 & V5.1

Via Worklight Server

Worklight Server

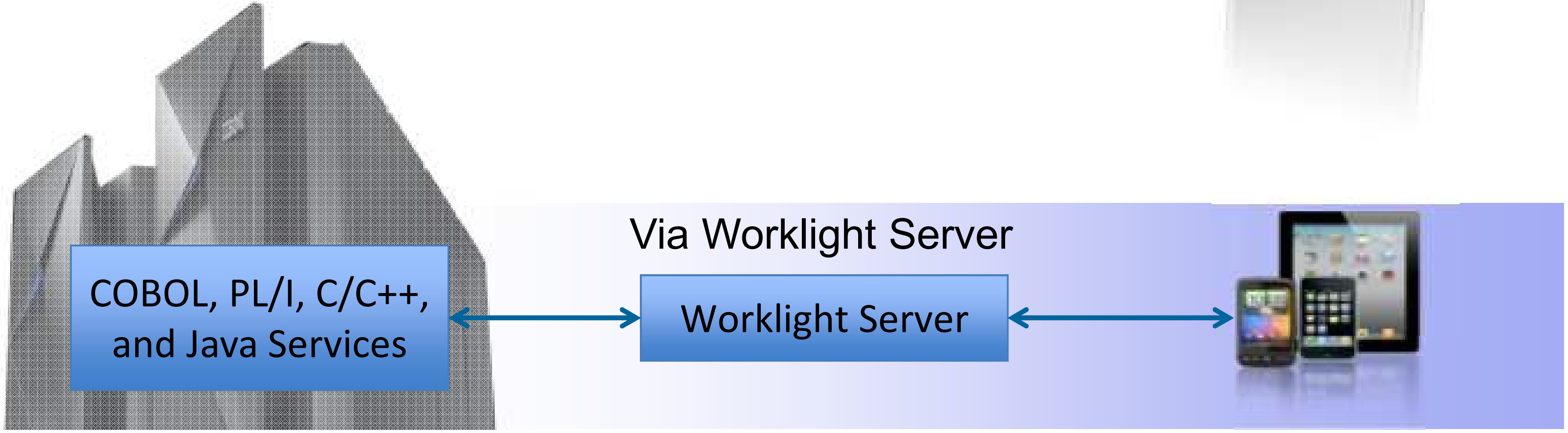
COBOL, PL/I, C/C++, and Java Services

Direct to CICS

CICS Transaction Server

Let’s see an example of how easy it is to connect a mobile device to CICS TS V5.1, via Worklight Server.

Mobile DEMO

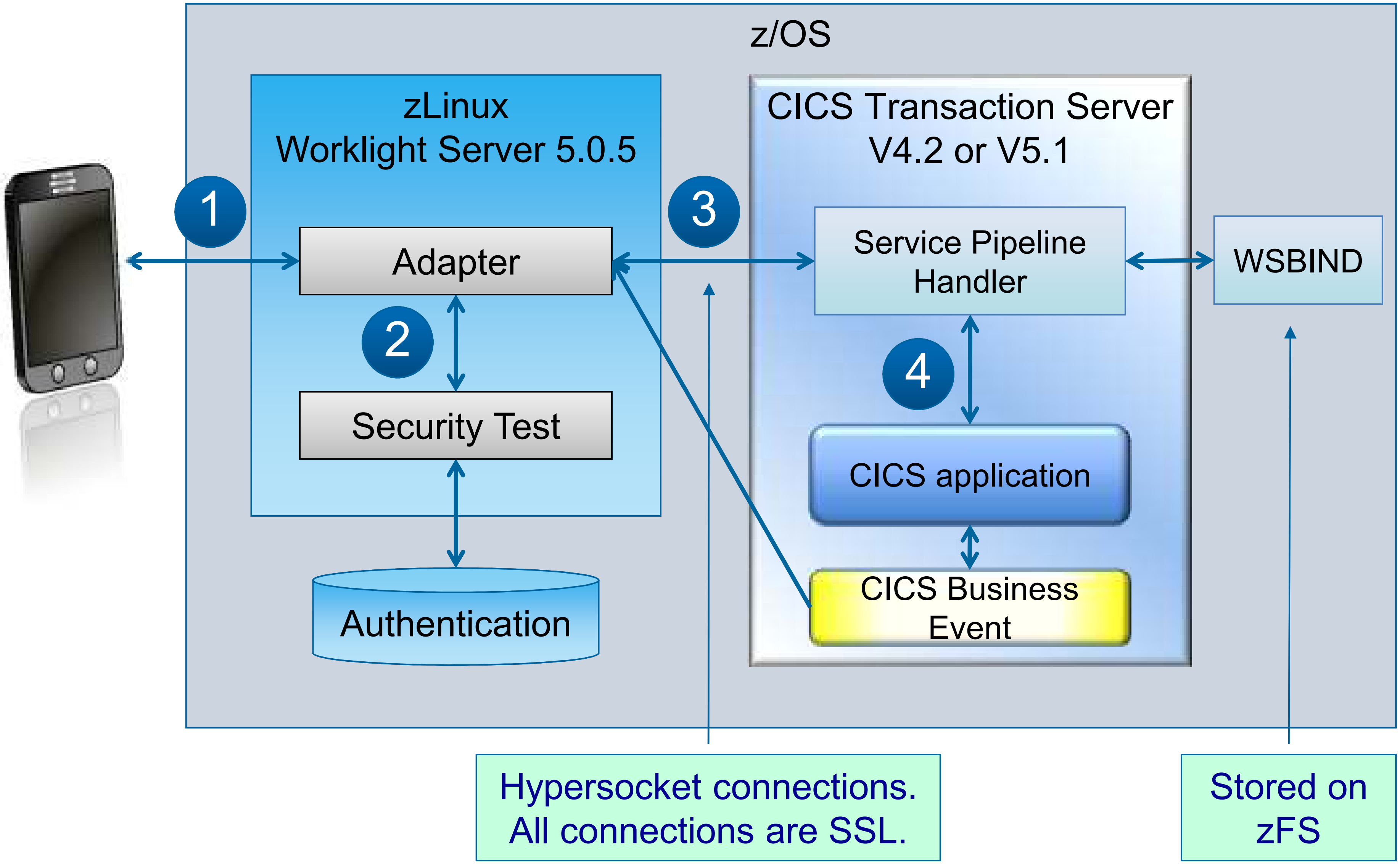


Via Worklight Server

COBOL, PL/I, C/C++, and Java Services

Worklight Server

Mobile Demo – Architecture and basic call flow

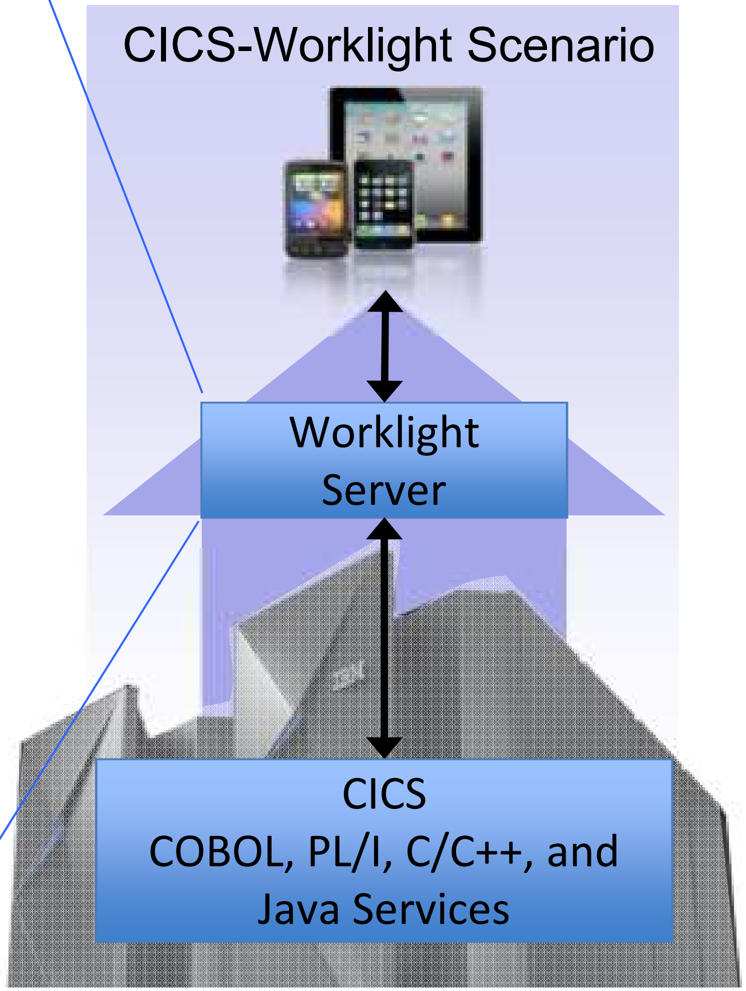


Hypersocket connections.
All connections are SSL.

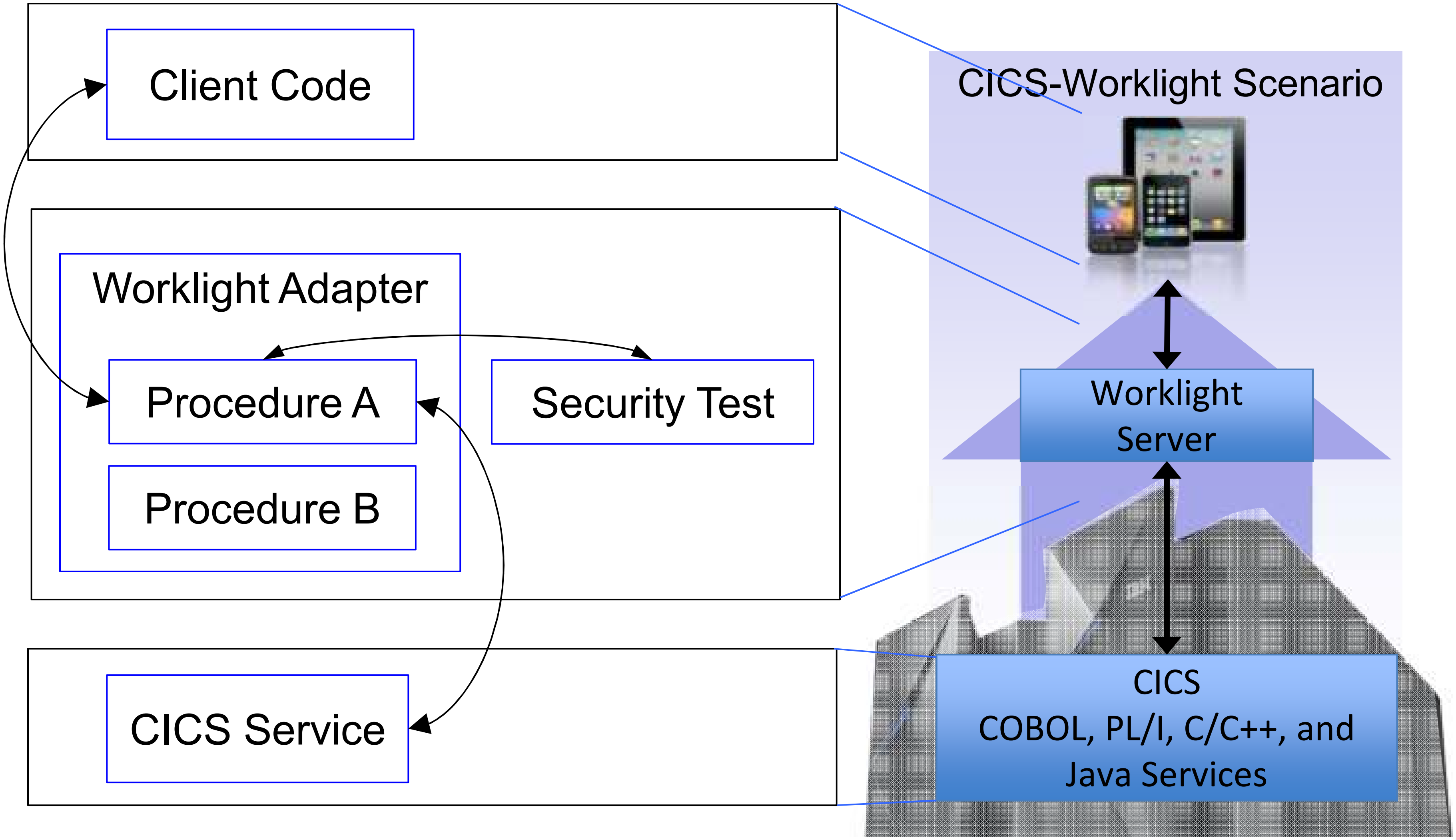
Stored on
zFS

IBM Worklight - Server

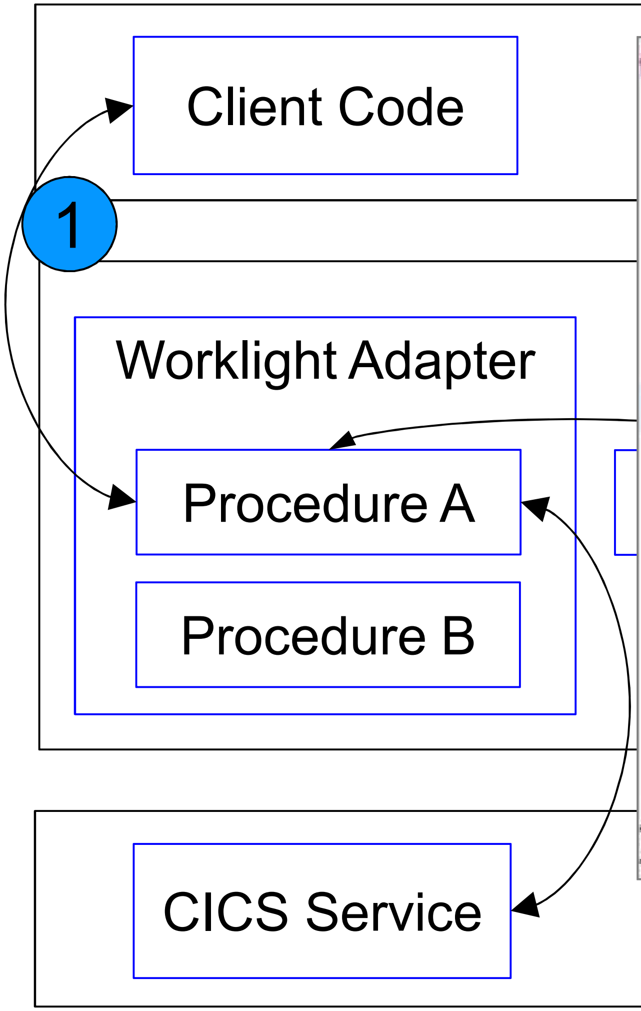
- Supports major mobile platforms
- Production ready private app store
- Define complex mashups from multiple data sources to reduce overall traffic
- Push notifications to client device
- Security-rich architecture enabled by server managed security challenges
- 2 tier architecture zLinux + CICS

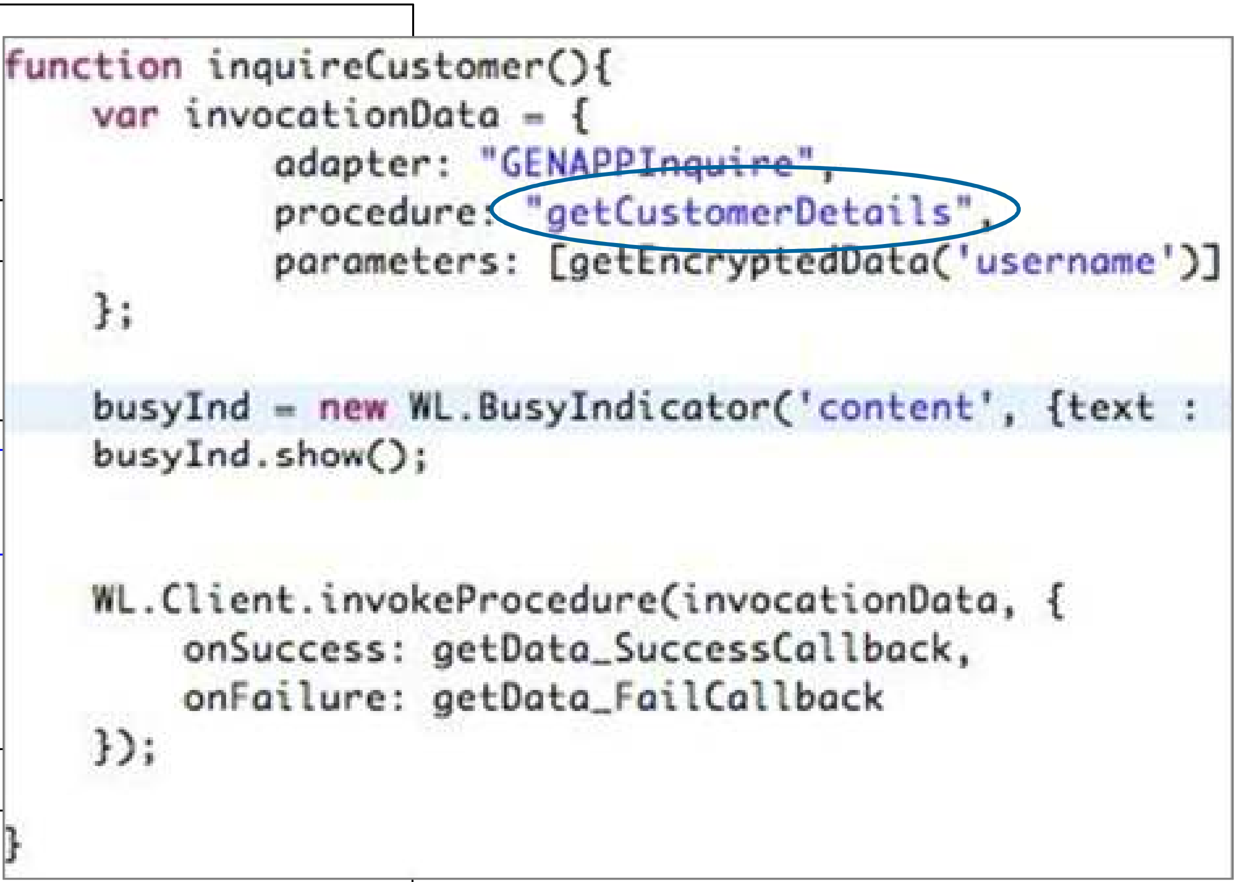


Worklight Components – basic flow



Worklight Components – Client call





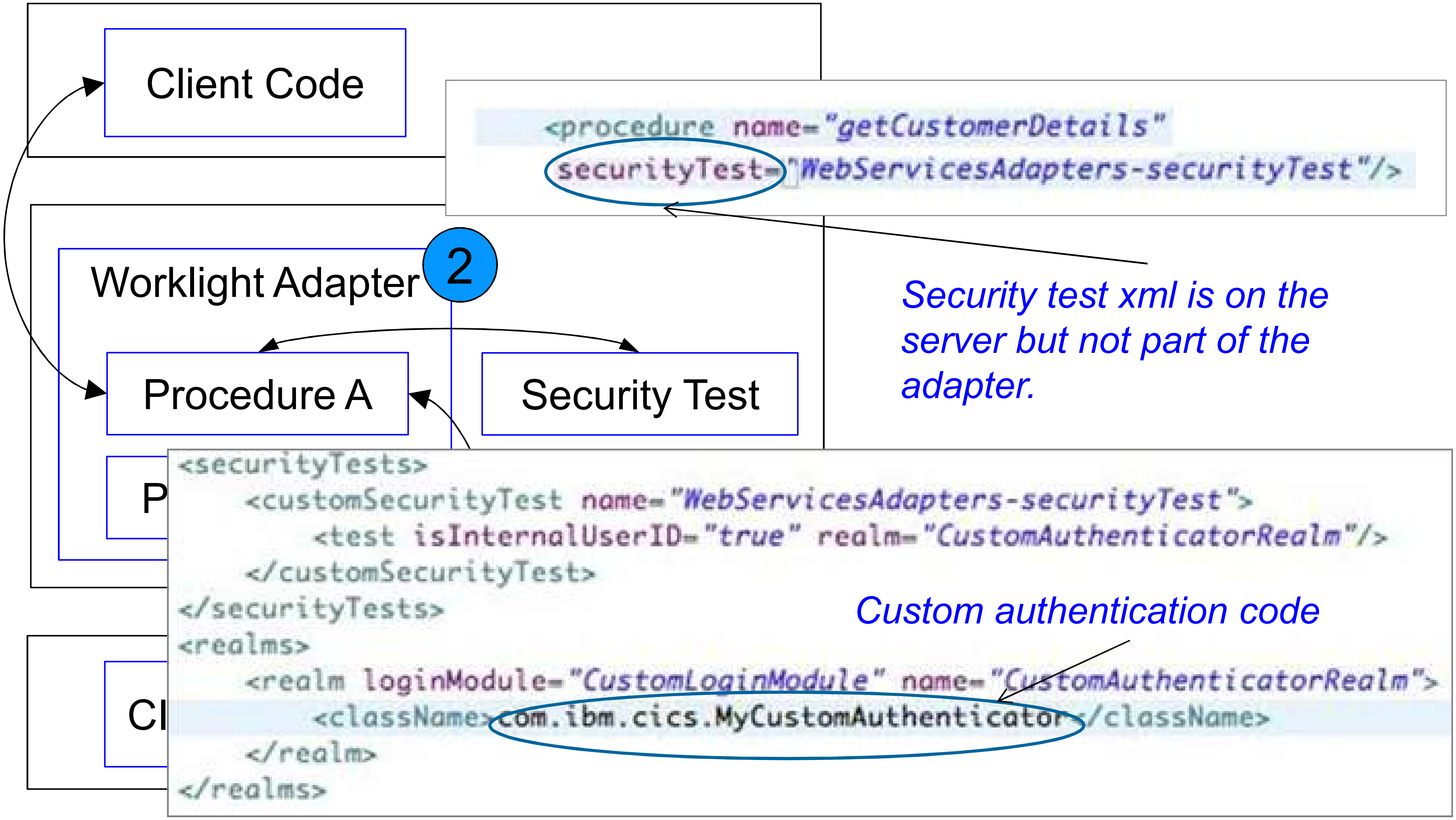
```
function inquireCustomer(){
    var invocationData = {
            adapter: "GENAPPInquire",
            procedure: "getCustomerDetails",
            parameters: [getEncryptedData('username')]
    };

    busyInd = new WL.BusyIndicator('content', {text :
    busyInd.show();


    WL.Client.invokeProcedure(invocationData, {
        onSuccess: getData_SuccessCallback,
        onFailure: getData_FailCallback
    });

}
```

Worklight Components – security check



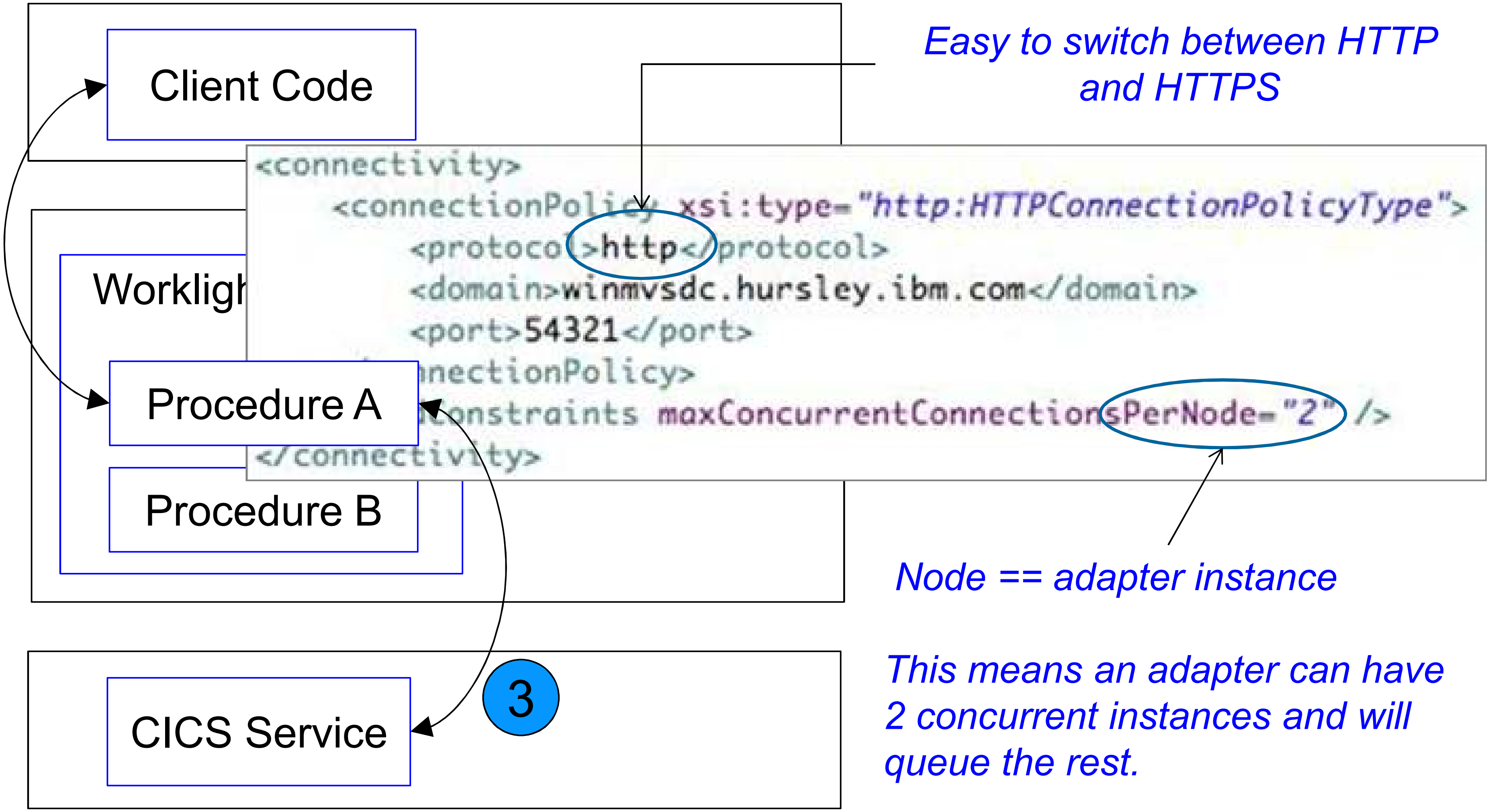
```
<procedure name="getCustomerDetails"
    securityTest="WebServicesAdapters-securityTest"/>
```

Security test xml is on the server but not part of the adapter.

```
<securityTests>
    <customSecurityTest name="WebServicesAdapters-securityTest">
        <test isInternalUserID="true" realm="CustomAuthenticatorRealm"/>
    </customSecurityTest>
</securityTests>
<realms>
    <realm loginModule="CustomLoginModule" name="CustomAuthenticatorRealm">
        <className>com.ibm.cics.MyCustomAuthenticator</className>
    </realm>
</realms>
```

Custom authentication code

Worklight Components – basic flow



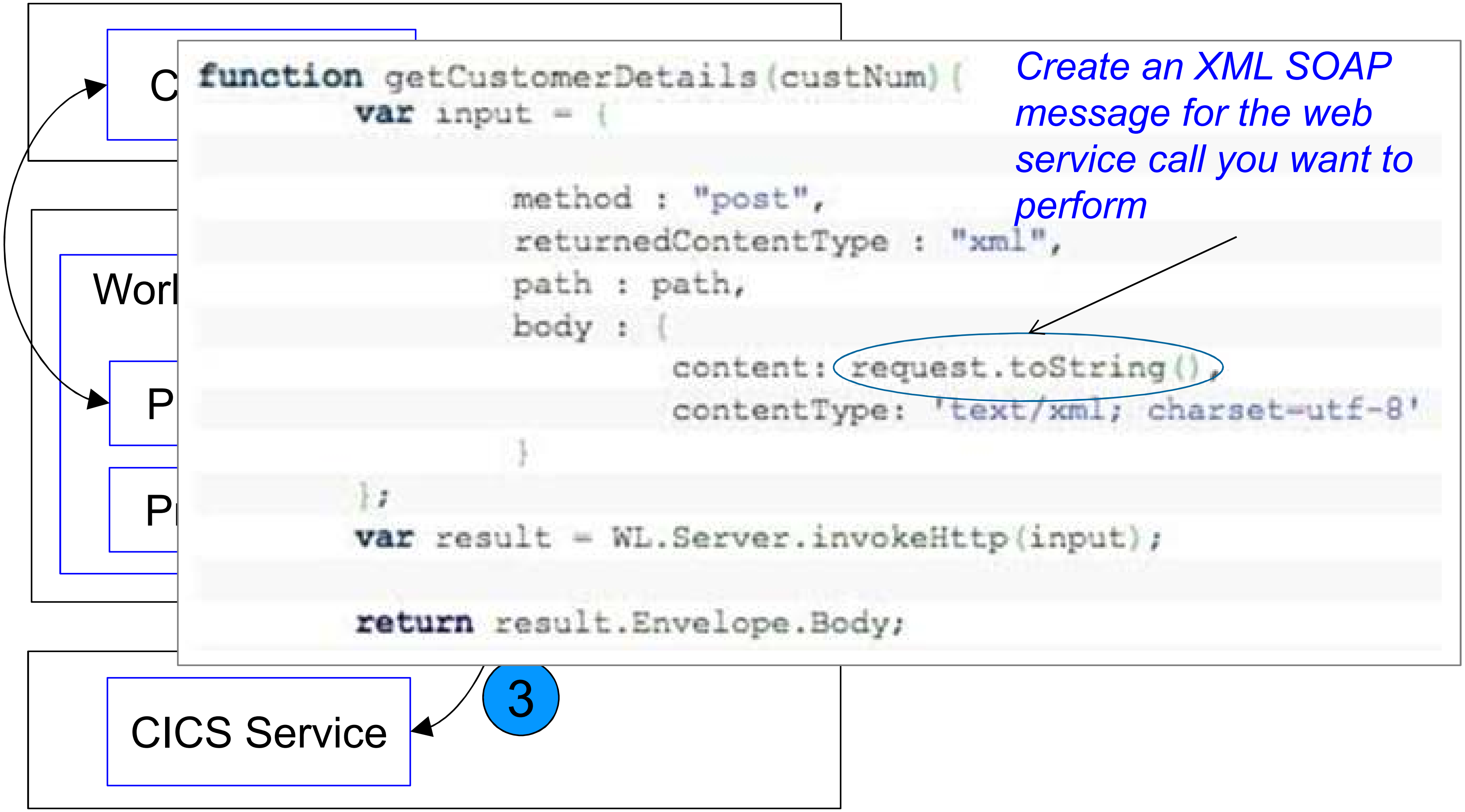
```
<connectivity>
    <connectionPolicy xsi:type="http:HTTPConnectionPolicyType">
        <protocol>http</protocol>
        <domain>winmvsdc.hursley.ibm.com</domain>
        <port>54321</port>
    </connectionPolicy>
    <loadConstraints maxConcurrentConnectionsPerNode="2" />
</connectivity>
```

Easy to switch between HTTP and HTTPS

Node == adapter instance

This means an adapter can have 2 concurrent instances and will queue the rest.

Worklight Components – basic flow



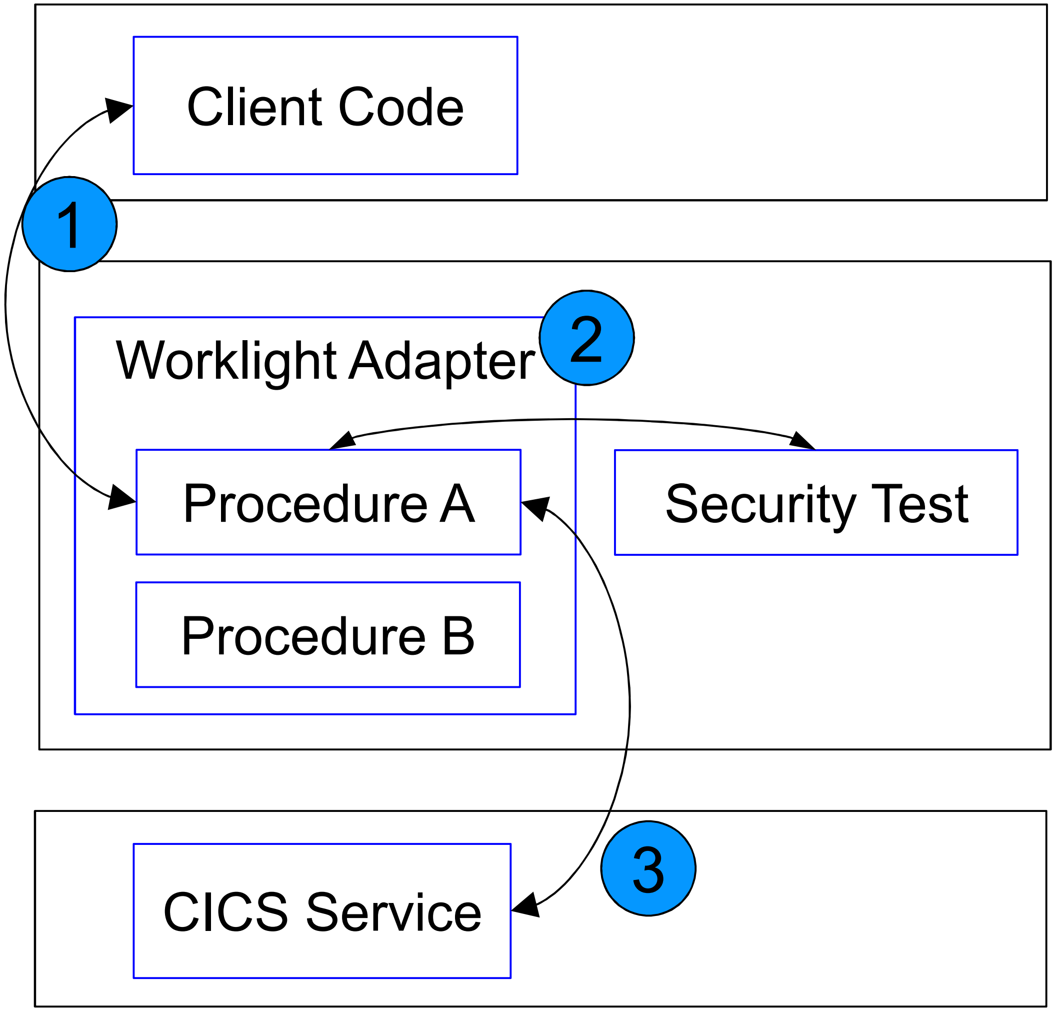
```
function getCustomerDetails(custNum){
        var input = {

                method : "post",
                returnedContentType : "xml",
                path : path,
                body : {
                        content: request.toString(),
                        contentType: 'text/xml; charset=utf-8'
                }
        };
        var result = WL.Server.invokeHttp(input);

        return result.Envelope.Body;
```

Create an XML SOAP message for the web service call you want to perform

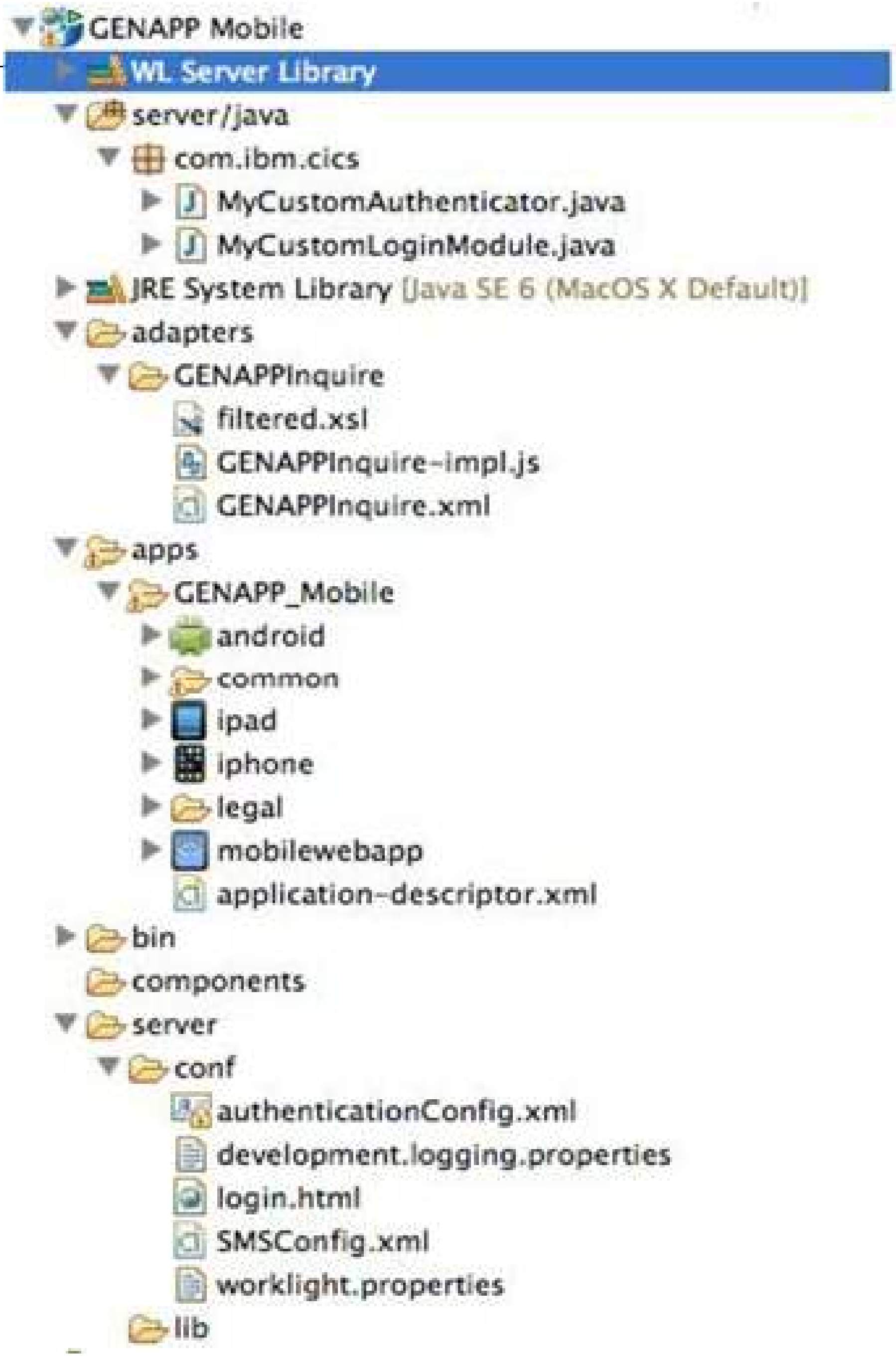
Worklight Components – basic flow



Worklight server provides separation, security, and a variety of mobile services, helping control the impact mobile has on CICS Transaction Server

Worklight Resources

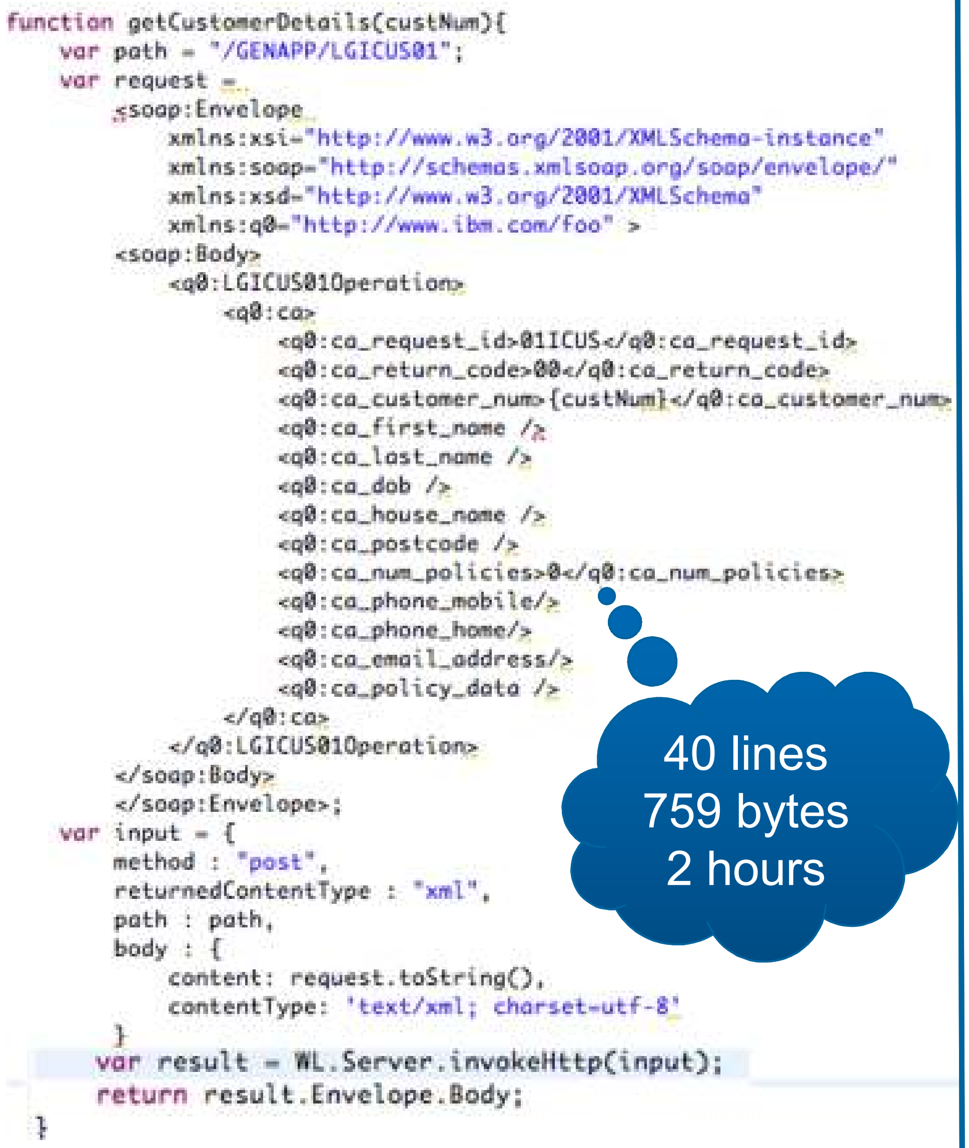
- Worklight development environment helps manage all the resources for your mobile project



```
GENAPP Mobile
  WL Server Library
  server/java
    com.ibm.cics
      MyCustomAuthenticator.java
      MyCustomLoginModule.java
  JRE System Library [Java SE 6 (MacOS X Default)]
  adapters
    GENAPPInquire
      filtered.xsl
      GENAPPInquire-impl.js
      GENAPPInquire.xml
  apps
    GENAPP_Mobile
      android
      common
      ipad
      iphone
      legal
      mobilewebapp
      application-descriptor.xml
  bin
  components
  server
    conf
      authenticationConfig.xml
      development.logging.properties
      login.html
      SMSConfig.xml
      worklight.properties
    lib
```

getCustomerDetails – a closer look

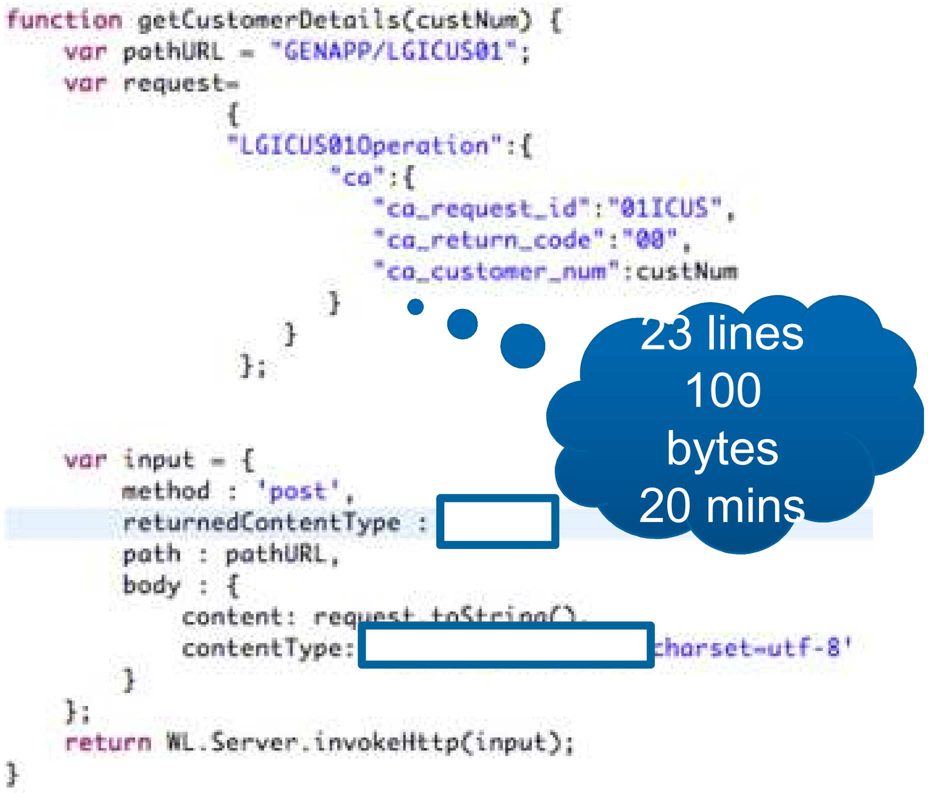
- SOAP adapter – CICS Web Service



```
function getCustomerDetails(custNum){
    var path = "/GENAPP/LGICUS01";
    var request =
        <soap:Envelope
            xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
            xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/"
            xmlns:xsd="http://www.w3.org/2001/XMLSchema"
            xmlns:q0="http://www.ibm.com/foo" >
        <soap:Body>
            <q0:LGICUS01Operation>
                <q0:ca>
                    <q0:ca_request_id>01ICUS</q0:ca_request_id>
                    <q0:ca_return_code>00</q0:ca_return_code>
                    <q0:ca_customer_num>{custNum}</q0:ca_customer_num>
                    <q0:ca_first_name />
                    <q0:ca_last_name />
                    <q0:ca_dob />
                    <q0:ca_house_name />
                    <q0:ca_postcode />
                    <q0:ca_num_policies>0</q0:ca_num_policies>
                    <q0:ca_phone_mobile/>
                    <q0:ca_phone_home/>
                    <q0:ca_email_address/>
                    <q0:ca_policy_data />
                </q0:ca>
            </q0:LGICUS01Operation>
        </soap:Body>
        </soap:Envelope>;
    var input = {
        method : "post",
        returnedContentType : "xml",
        path : path,
        body : {
            content: request.toString(),
            contentType: 'text/xml; charset=utf-8'
        }
    var result = WL.Server.invokeHttp(input);
    return result.Envelope.Body;
 }
```

40 lines
759 bytes
2 hours

CICS JSON support



```
function getCustomerDetails(custNum) {
    var pathURL = "GENAPP/LGICUS01";
    var request=
            {
            "LGICUS01Operation":{
                "ca":{
                    "ca_request_id":"01ICUS",
                    "ca_return_code":"00",
                    "ca_customer_num":custNum
                }
            }
        };


    var input = {
        method : 'post',
        returnedContentType :
        path : pathURL,
        body : {
            content: request.toString(),
            contentType:                    charset=utf-8'
        }
    };
    return WL.Server.invokeHttp(input);
}
```

23 lines
100
bytes
20 mins

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