

# Microservices

## and RESTful APIs

YEGOR BUGAYENKO

Lecture #11 out of 16

80 minutes

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Service-Oriented Architecture (SOA)

Microservices and RESTful API

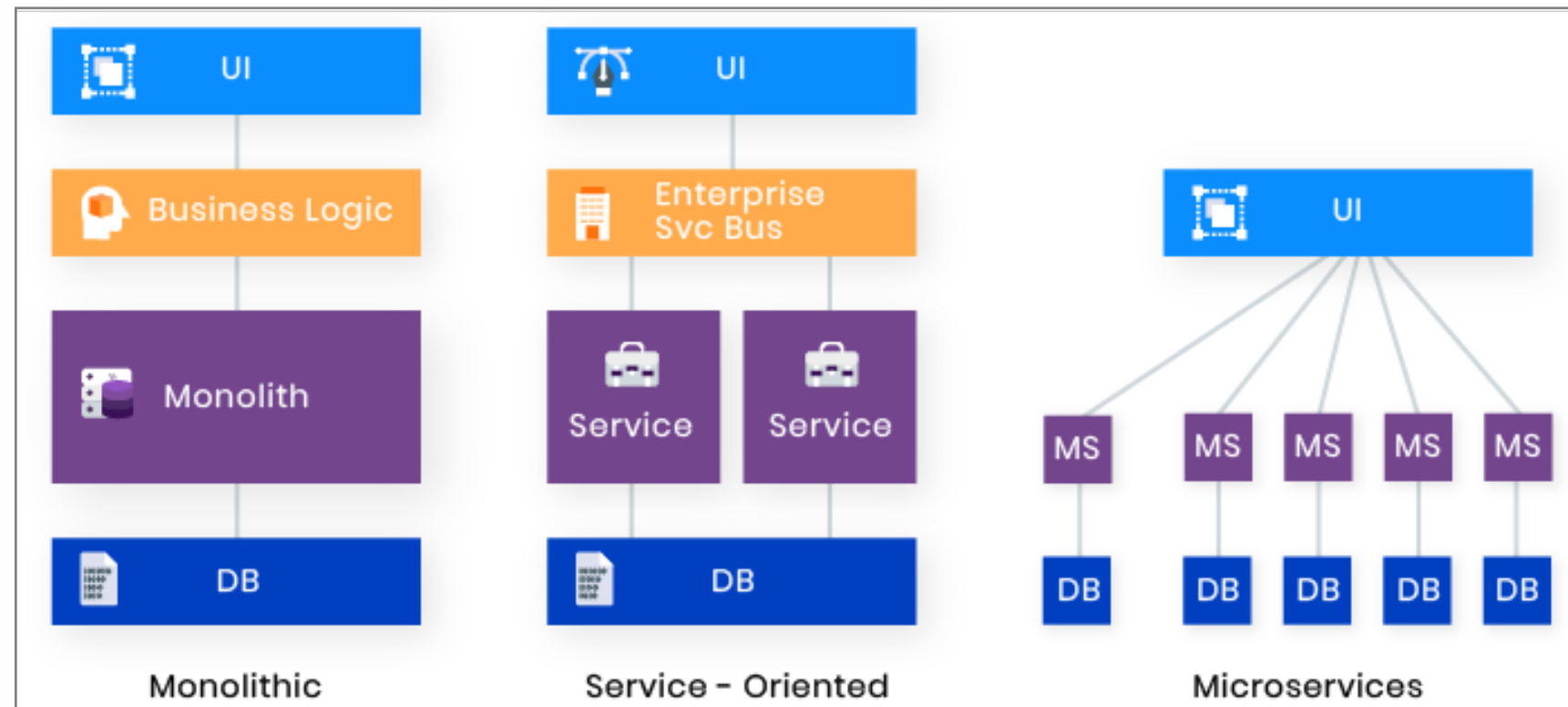
Protobuf and gRPC

Internet of Things (IoT)

Books, Venues, Call-to-Action

Chapter #1:

# Service-Oriented Architecture (SOA)



## XML RPC

An example of a typical XML-RPC request would be:

```
<?xml version="1.0"?>
<methodCall>
  <methodName>examples.getStateName</methodName>
  <params>
    <param>
      <value><i4>40</i4></value>
    </param>
  </params>
</methodCall>
```

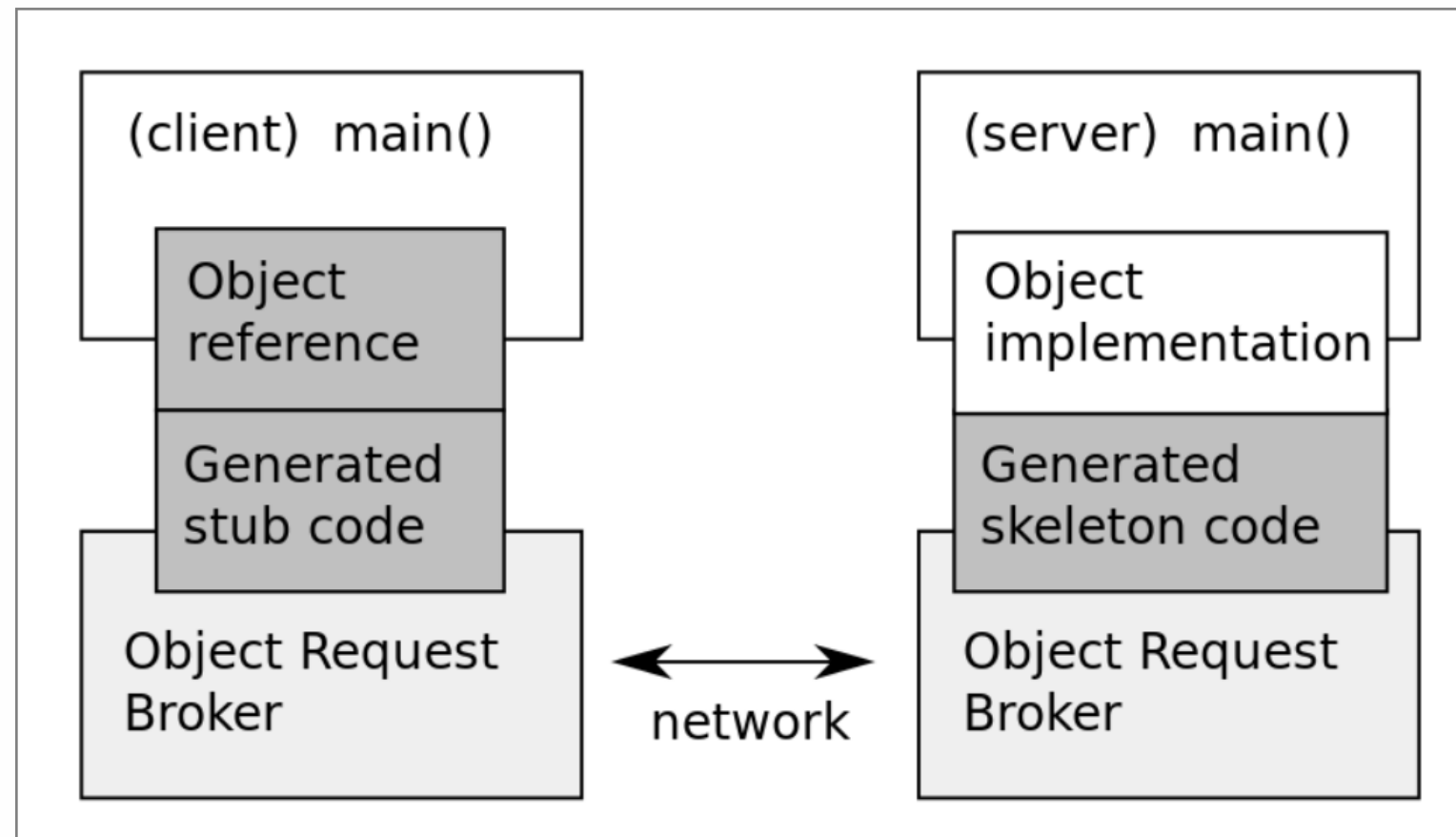
An example of a typical XML-RPC response would be:

```
<?xml version="1.0"?>
<methodResponse>
  <params>
    <param>
      <value><string>South Dakota</string></value>
    </param>
  </params>
</methodResponse>
```

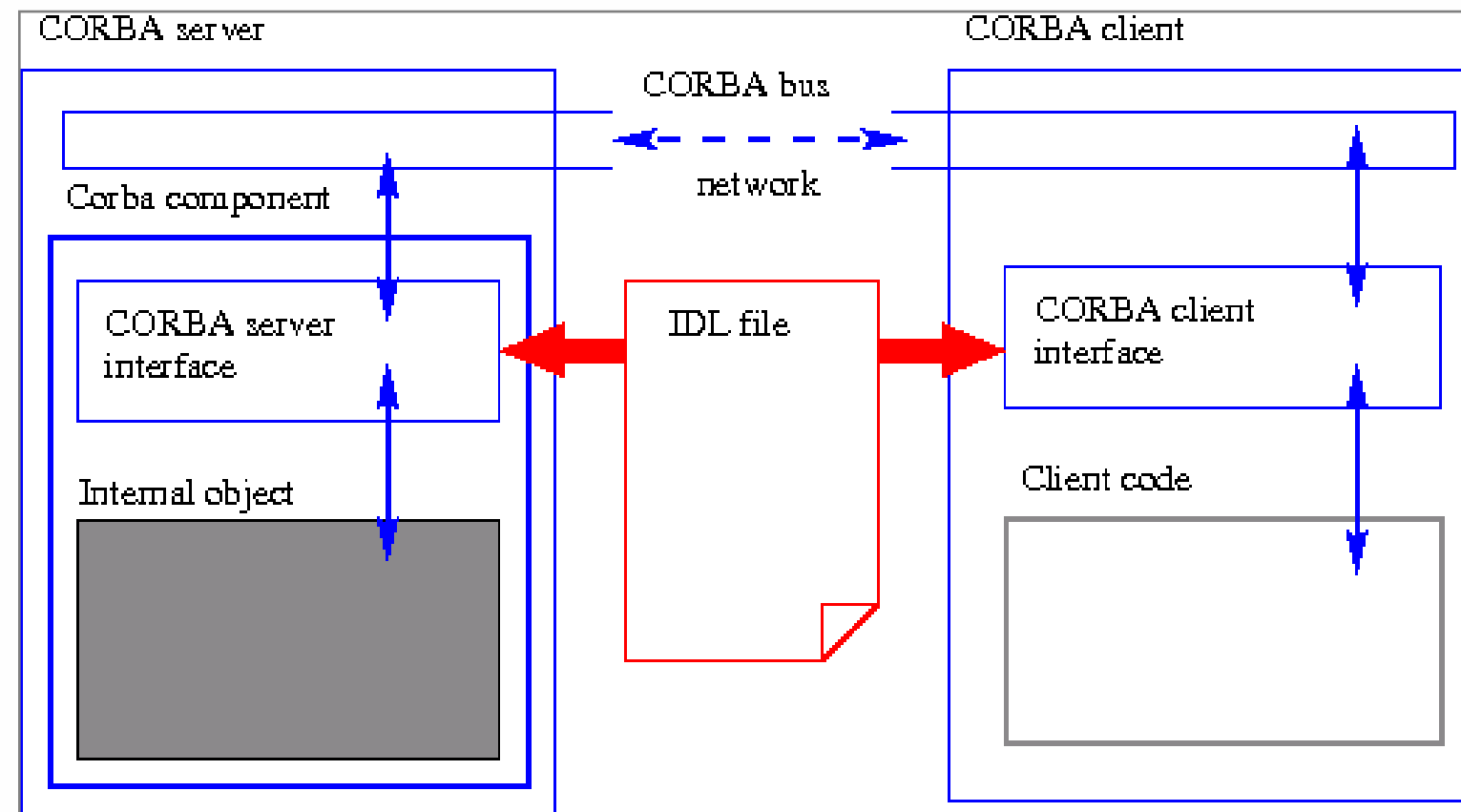
## Simple Object Access Protocol (SOAP)

```
<?xml version='1.0' Encoding='UTF-8' ?>
<env:Envelope xmlns:env="http://www.w3.org/2003/05/soap-envelope">
  <env:Header>
    <m:reservation xmlns:m="http://travelcompany.example.org/reservation"
      env:role="http://www.w3.org/2003/05/soap-envelope/role/next">
      <m:reference>uuid:093a2da1-q345-739r-ba5d-pqff98fe8j7d</m:reference>
      <m:dateAndTime>2007-11-29T13:20:00.000-05:00</m:dateAndTime>
    </m:reservation>
    <n:passenger xmlns:n="http://mycompany.example.com/employees"
      env:role="http://www.w3.org/2003/05/soap-envelope/role/next">
      <n:name>Fred Bloggs</n:name>
    </n:passenger>
  </env:Header>
  <env:Body>
    <p:itinerary xmlns:p="http://travelcompany.example.org/reservation/travel">
      <p:departure>
        <p:departing>New York</p:departing>
        <p:arriving>Los Angeles</p:arriving>
        <p:departureDate>2007-12-14</p:departureDate>
        <p:departureTime>late afternoon</p:departureTime>
        <p:seatPreference>aisle</p:seatPreference>
      </p:departure>
      <p:return>
        <p:departing>Los Angeles</p:departing>
        <p:arriving>New York</p:arriving>
        <p:departureDate>2007-12-20</p:departureDate>
        <p:departureTime>mid-morning</p:departureTime>
        <p:seatPreference></p:seatPreference>
      </p:return>
    </p:itinerary>
  </env:Body>
</env:Envelope>
```

## Common Object Request Broker Architecture (CORBA)

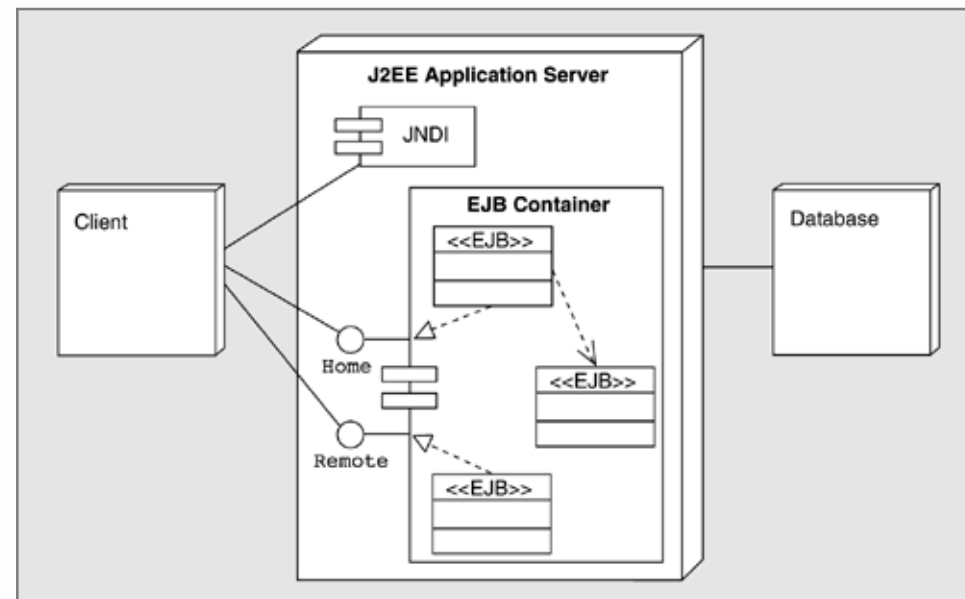


## Interface Description Language (IDL)





## Enterprise Java Beans (EJB)



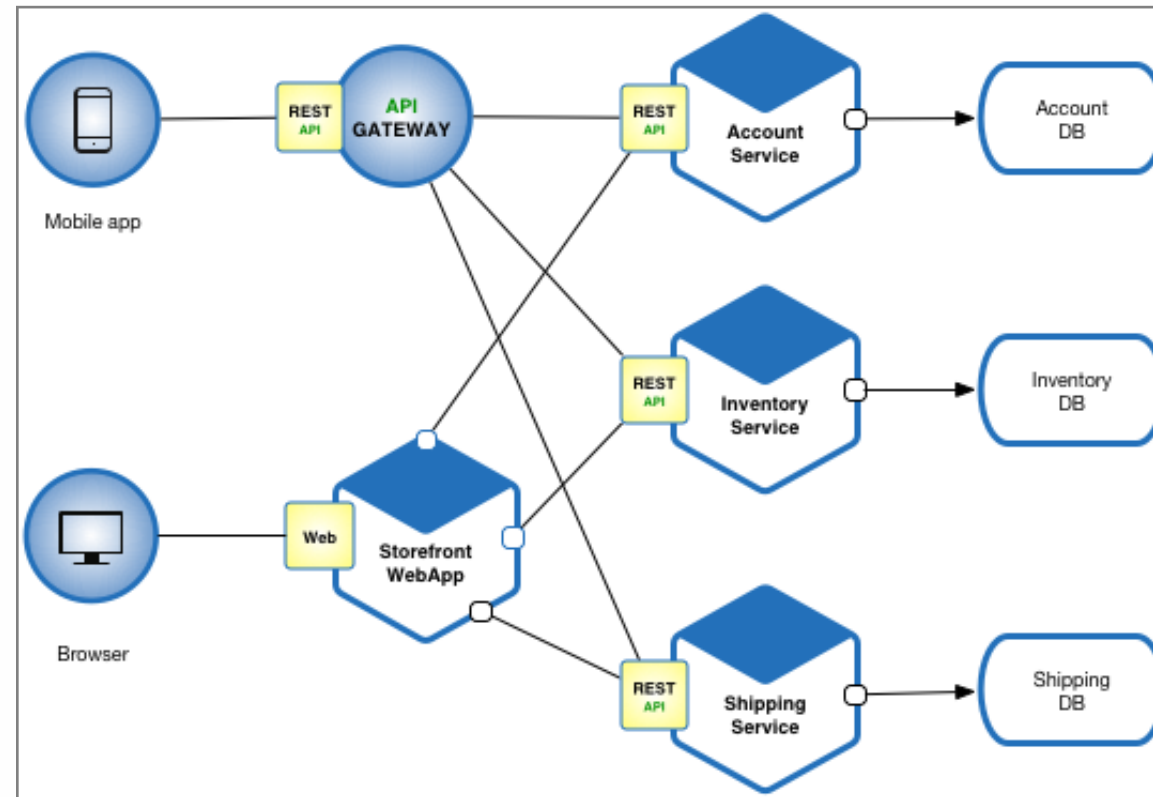
Java Naming and Directory Interface (JNDI) is an API that provides naming and directory functionality to applications written using the Java.

Remote Method Invocation (RMI) is a Java API that performs remote method invocation, the object-oriented equivalent of remote procedure calls, with support for direct transfer of serialized Java classes and distributed garbage-collection.

Chapter #2:

## Microservices and RESTful API

## Microservices



“Microservices are a modern interpretation of service-oriented architectures used to build distributed software systems.” — Wikipedia

## Stateless vs. Stateful Architecture

“A stateless process or application can be understood in isolation. There is no stored knowledge of or reference to past transactions. Each transaction is made as if from scratch for the first time.” — [RedHat](#)

# Representational State Transfer (REST)

Task	Method	Path
Create a new customer	POST	/customers
Delete an existing customer	DELETE	/customers/{id}
Get a specific customer	GET	/customers/{id}
Search for customers	GET	/customers
Update an existing customer	PUT	/customers/{id}

Request Method

Request URI

POSThttps://sis-ext.ap-southeast-3.myhuaweicloud.com/v1/{project\_id}/asr/short-audio

Content-Type: application/json  
X-Auth-Token: MIINRwYJKoZIhvcNAQcCollINOD...

Request Header

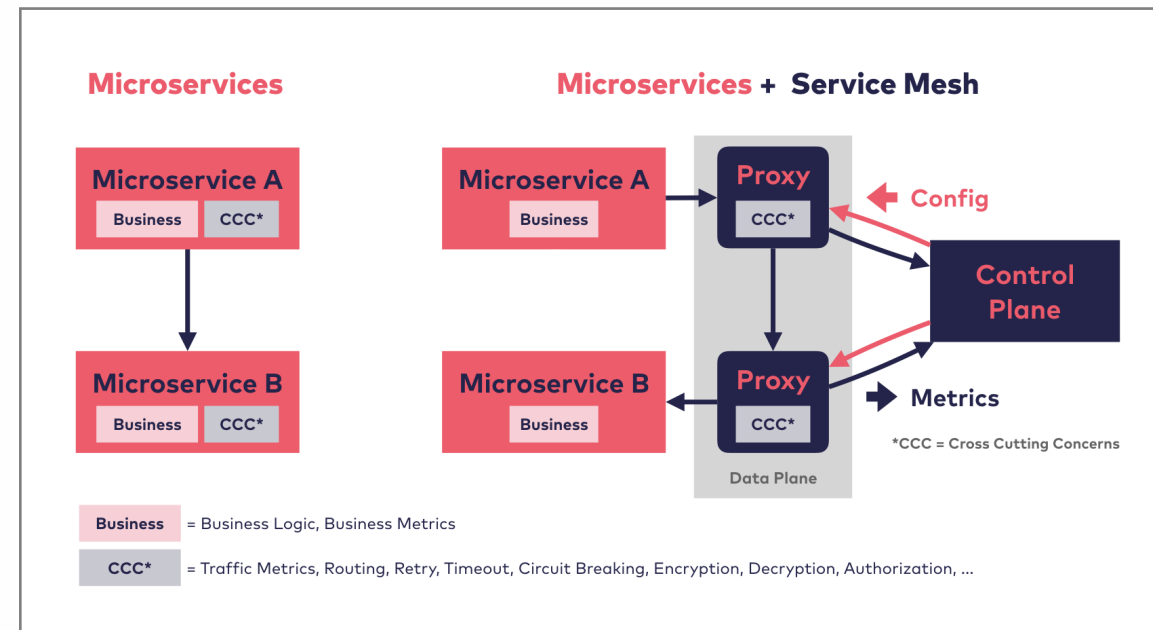
{  
 "data": "encode audio by Base64",  
 "config": {  
 "audio\_format": "wav",  
 "property": "english\_8k\_common"  
 }  
}

Request Body

# Hypermedia As The Engine Of Application State (HATEOAS)



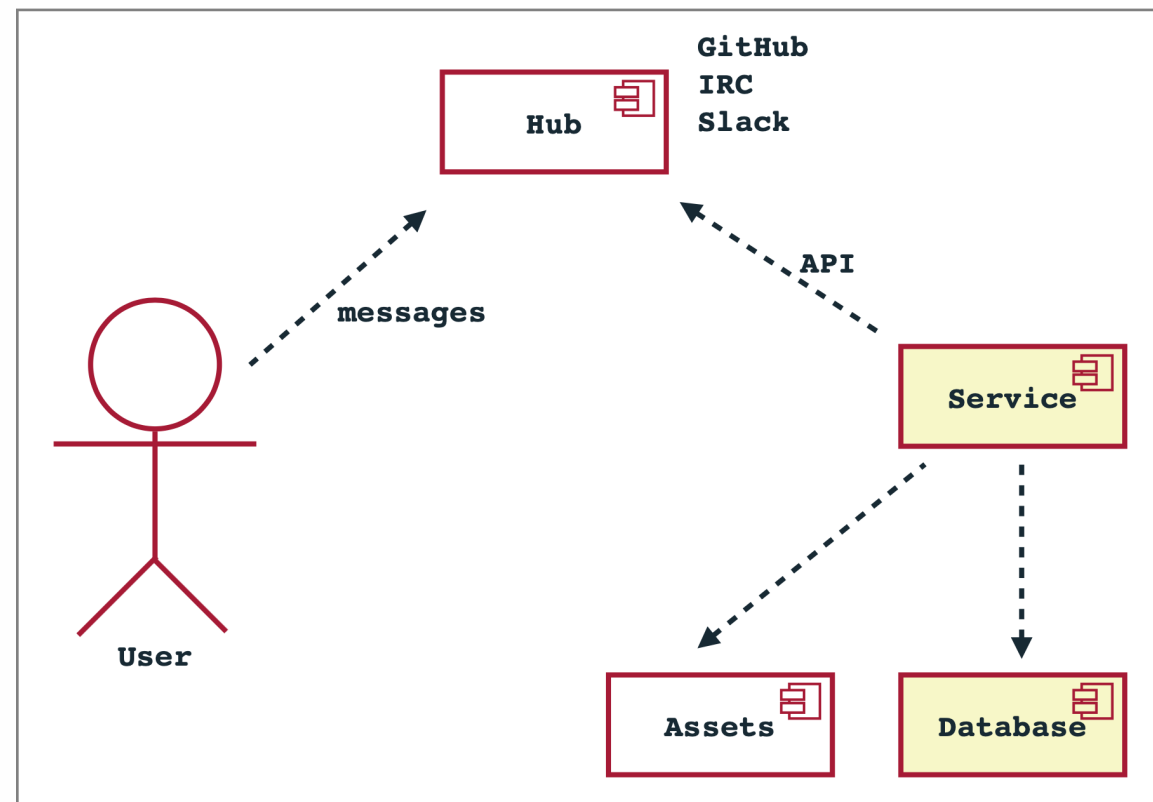
## Service Mesh



“A service mesh is a dedicated infrastructure layer for facilitating service-to-service communications between services or microservices, using a proxy” — Wikipedia



## Chatbots

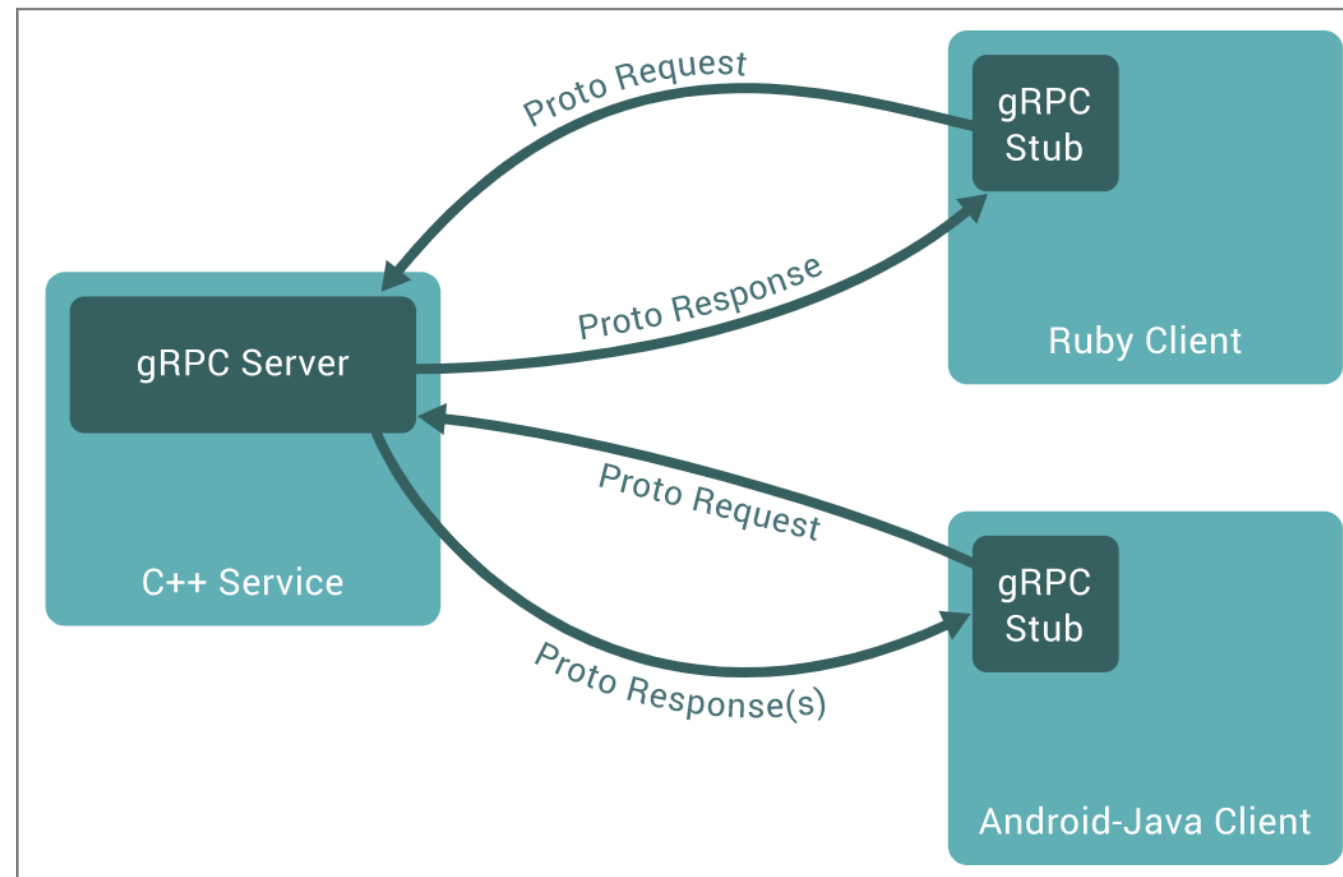


Chapter #3:

## Protobuf and gRPC

[ [gRPC](#) Protobuf ]

## gRPC



[ [gRPC](#) [Protobuf](#) ]

# Protobuf

```
syntax = "proto2";

package tutorial;

message Person {
  optional string name = 1;
  optional int32 id = 2;
  optional string email = 3;

  enum PhoneType {
    MOBILE = 0;
    HOME = 1;
    WORK = 2;
  }

  message PhoneNumber {
    optional string number = 1;
    optional PhoneType type = 2 [default = HOME];
  }

  repeated PhoneNumber phones = 4;
}

message AddressBook {
  repeated Person people = 1;
}
```

```
// name
inline bool has_name() const;
inline void clear_name();
inline const ::std::string& name() const;
inline void set_name(const ::std::string& value);
inline void set_name(const char* value);
inline ::std::string* mutable_name();

// id
inline bool has_id() const;
inline void clear_id();
inline int32_t id() const;
inline void set_id(int32_t value);

// email
inline bool has_email() const;
inline void clear_email();
inline const ::std::string& email() const;
inline void set_email(const ::std::string& value);
inline void set_email(const char* value);
inline ::std::string* mutable_email();
```

SOA RESTful [gRPC](#) IoT B.V.C.

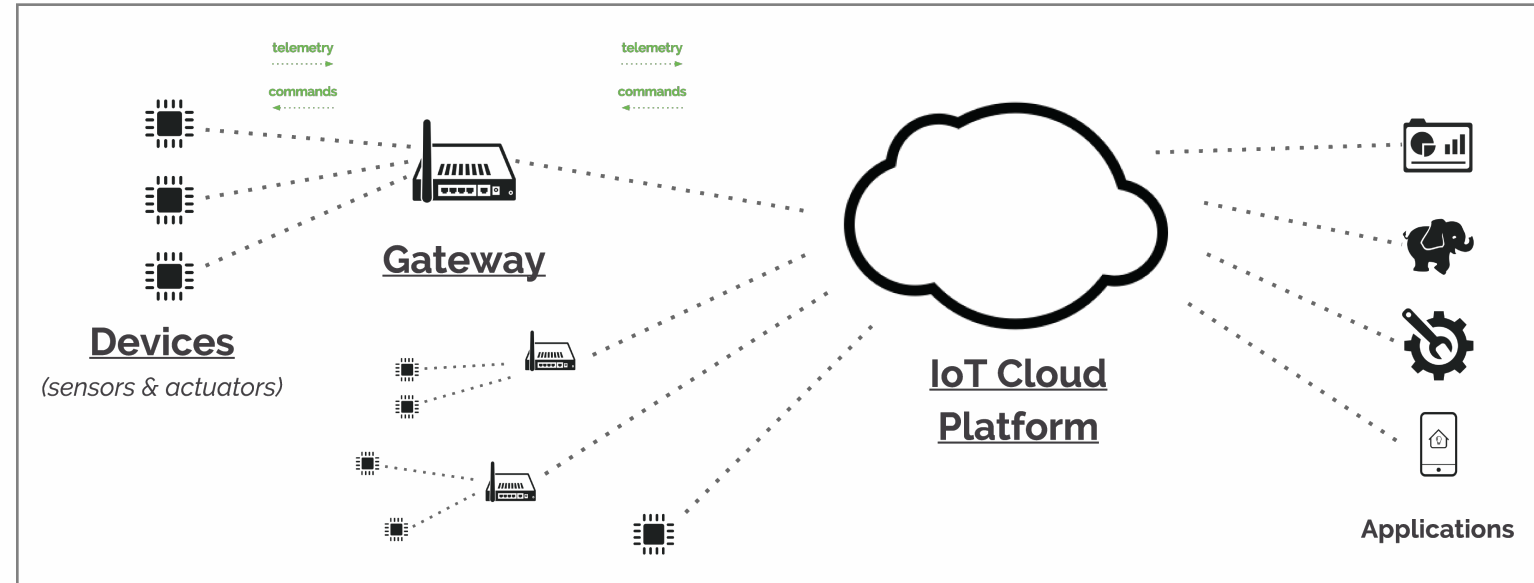
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[ [gRPC](#) [Protobuf](#) ]



Chapter #4:

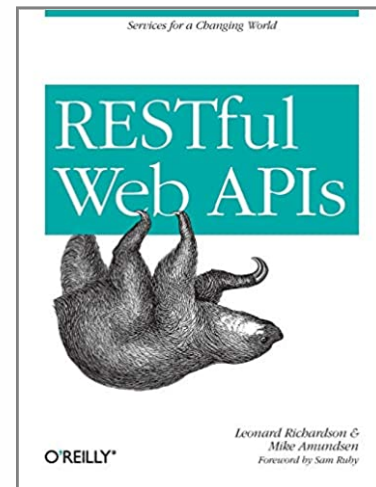
## Internet of Things (IoT)



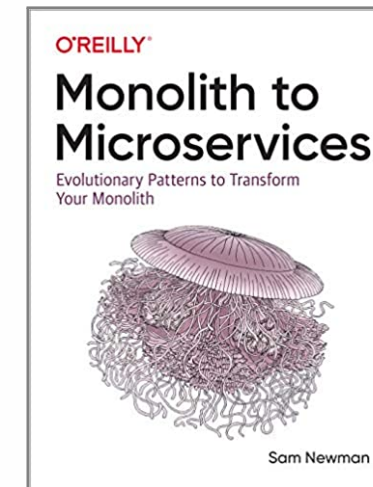
Chapter #5:

## Books, Venues, Call-to-Action





Leonard Richardson, Mike Amundsen, and Sam Ruby.  
*RESTful Web APIs: Services for a Changing World.*  
O'Reilly Media, 2013



Sam Newman. *Monolith to Microservices: Evolutionary Patterns to Transform Your Monolith.* O'Reilly Media, 2019

Where to go:

IEEE International Conference on Software Architecture (ICSA)

## Call to Action:

Design your own RESTful API and publish it at [rapidapi.com](https://rapidapi.com) or similar place, where APIs are “published.”

### Still unresolved issues:

- How to validate an API?
- How to generate an API from object model?
- How to test API automatically?
- How to spot integration mistakes between APIs?

# Bibliography

Sam Newman. *Monolith to Microservices: Evolutionary Patterns to Transform Your Monolith*. O'Reilly Media,

2019.

Leonard Richardson, Mike Amundsen, and Sam Ruby.  
*RESTful Web APIs: Services for a Changing World*.  
O'Reilly Media, 2013.