A BRIEF HISTORY OF THE FUTURE OF THE API

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BRIEF HISTORY

- 1970s to now

APPLICATION PROGRAMMING INTERFACE

1970s

- Message Oriented Middleware (MOM)
- ISAM

- Object Oriented Programming
- Shared Libraries
  - DLL, OCX, Shared Objects
- Dynamic Data Exchange (DDE)
- Sockets

1980s

- Client-Server
- Common Object Request Broker Architecture (CORBA)
- Component Object Model (COM)
  - DCOM, COM+
- World Wide Web
- Service Oriented Architecture (SOA)
- SOAP

1990s

“Architectural Styles and the Design of Network-based Software Architectures”

Roy Thomas Fielding, UC Irvine

2000

- XMLHttpRequest
- JSON
- Windows Communication Foundation (WCF)
- ReST
- Mobile devices

2000s

- eBay API
- Amazon
- Twitter
- Facebook Platform

2000s

- Cloud computing
- Amazon Web Services
- Microsoft Azure

2000s

- Microservices
- Containers
- Kubernetes
- Web Sockets

2010s

WIRE FORMATS

```
0x47 0x49 0x4f 0x50 -> GIOP, the key
0x01 0x00           -> GIOP_version
0x00                -> Byte order (big endian)
0x00                -> Message type (Request message)
0x00 0x00 0x00 0x2c -> Message size (44)
0x00 0x00 0x00 0x00 -> Service context
0x00 0x00 0x00 0x01 -> Request ID
0x01                -> Response expected
0x00 0x00 0x00 0x24 -> Object key length in octets (36)
0xab 0xac 0xab 0x31 0x39 0x36 0x31 0x30
0x30 0x35 0x38 0x31 0x36 0x00 0x5f 0x52
0x6f 0x6f 0x74 0x50 0x4f 0x41 0x00 0x00
0xca 0xfe 0xba 0xbe 0x39 0x47 0xc8 0xf8
0x00 0x00 0x00 0x00 -> Object key defined by vendor
0x00 0x00 0x00 0x04 -> Operation name length (4 octets long)
0x61 0x64 0x64 0x00 -> Value of operation name ("add")
0x20                -> Padding bytes to align next value
```

CORBA
General Inter-ORB Protocol

https://www.ibm.com/developerworks/library/ws-underhood/index.html

```
<?xml version="1.0" encoding="utf-8"?>
<Books>
  <Book Year="1979">
    <Title>The Hitchhiker&apos;s Guide to the Galaxy</Title>
    <Author>Douglas Adams</Author>
  </Book>
  <Book Year="1983">
    <Title>The Colour of Magic</Title>
    <Author>Terry Pratchett</Author>
  </Book>
</Books>
```

XML

```
<?xml version="1.0"?>
<soap:Envelope
      xmlns:soap="http://www.w3.org/2003/05/soap-envelope/"
      soap:encodingStyle="http://www.w3.org/2003/05/soap-encoding">
  <soap:Body xmlns:m="http://books.org/books>
    <m:Books>
      <m:Book Year="1979">
        <m:Title>The Hitchhiker&apos;s Guide to the Galaxy</m:Title>
        <m:Author>Douglas Adams</m:Author>
      </m:Book>
      <m:Book Year="1983">
        <m:Title>The Colour of Magic</m:Title>
        <m:Author>Terry Pratchett</m:Author>
      </m:Book>
    </m:Books>
  </soap:Body>
</soap:Envelope>
```

SOAP

```
{ "Books": [
    {
      "Title": "The Hitchhiker's Guide to the Galaxy",
      "Author": "Douglas Adams",
      "Year": 1979
    },
    {
      "Title": "The Colour of Magic",
      "Author": "Terry Pratchett",
      "Year": 1983
    }
  ]
}
```

JSON

```
syntax = "proto2";

message Book {
  string title = 1;
  string author = 2;
  int32 year = 3;
}
```

Protobuf

```
0A 38 0A 24 54 68 65 20 48 69 74 63 68 68 69 6B
65 72 27 73 20 47 75 69 64 65 20 74 6F 20 74 68
65 20 47 61 6C 61 78 79 12 0D 44 6F 75 67 6C 61
73 20 41 64 61 6D 73 18 BB 0F 0A 29 0A 13 54 68
65 20 43 6F 6C 6F 75 72 20 6F 66 20 4D 61 67 69
63 12 0F 54 65 72 72 79 20 50 72 61 74 63 68 65
74 74 18 BF 0F
```

Protobuf

OTHER WIRE FORMATS

- Thrift
- Avro
- MessagePack
- BERT
- BSON

PROTOCOLS

TCP/IP

- Raw, fast and painful

HTTP 1.1

- Text-based
- Headers
- Body

- Over HTTP
- Hypermedia

Representational State Transfer
aka ReST

NETTCP

- Binary
- Fast
- Windows Communication Foundation
- Proprietary to Microsoft

STUBBY

- Binary
- Fast
- Internal to Google

gRPC

- Binary
- Fast
- HTTP/2
- Open-sourced by Google

- JSON
- Efficient
- Flexible

GraphQL

RSOCKET

- Reactive Streams semantics
- Lower-level
- RSocket-RPC

WCF vs gRPC

2006 vs 2020

WCF vs gRPC

WCF

- Wire formats
  - SOAP
  - NetTCP encoding
- C# or VB.NET
- Windows-only
- Interop via SOAP
- WSDL or native stub generator

gRPC

- Wire formats
  - Protobuf
  - Customizable
- C++, Java, Python, C#, Go, Node…
- Cross-platform
- Interop as standard
- Protobuf stub generator

gRPC Language Support

Official

- C++
- Java
- C#
- Python
- Go
- Ruby
- Node.js
- Objective-C
- Dart (beta)

3rd Party

- Rust
- Haskell
- Erlang
- Elixir
- Elm
- TypeScript
- Scala
- Kotlin
- Perl

WCF example

It's always a Calculator…

gRPC example

Still a Calculator…

THE FUTURE

THE FUTURE

- 5G networks
- Satellite internet
- New devices
  - Wearables
  - Mixed Reality
  - Voice
  - IoT

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