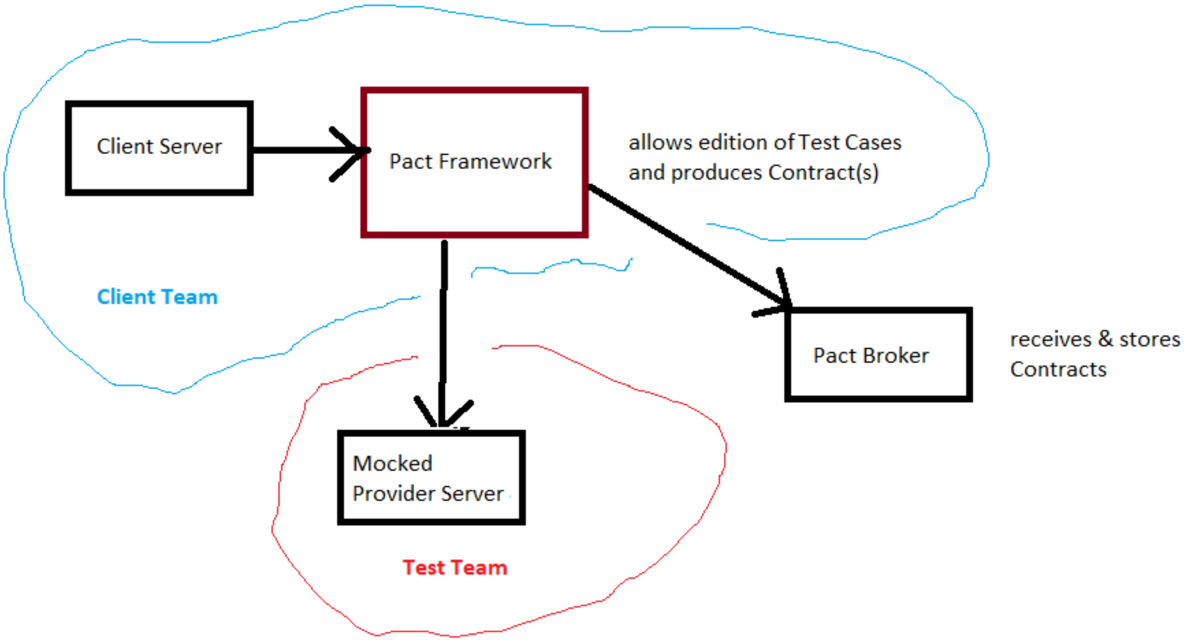
Client Driven Contract Testing with Pact Broker
Consumer-Driven Contract (**CDC**)

Examples with OpenAI and Copilot



In the previous articles the focus was given to adhering to Client Driven Contract Testing in the absence of contributions from Client DevOps team. Such approach is classified as Bi-Directional Contract Testing by SmartBear's Pactflow.io. However, the main idea of Client Driven is that the team responsible for the Client server is vividly interested in driving the development.

In the nominal SDLC for Client Driven approach the Client server is operational before the Provider server is. To verify not only the contract itself but the wiring between participants the duty to provide the mocked Provider server, at minimum its stub, or the best its spy falls on the shoulders of the Test Team. Is it within Azure Service Fabric, AWS App Mesh, Google Istio, IBM Cloud App Connect Enterprise, Oracle API Gateway, Alibaba Cloud Service Mesh (ASM), VMware Tanzu Service Mesh, or any other Cloud service where Containers can live the communication between them night be subject to unexpected effects therefore the thorough Contract testing should expand beyond verification of the adherence to the letter of the Contract.

On Azure Cloud WireMock can be deployed as an Azure App Service or as a Docker container. Wiring to the Client and traffic observability will be impacted by the above decision. Azure App Service provides Application Insights and Log Streaming while Docker option provides Docker Stats and Docker Logs.

Let us concentrate on Contract. In the previous articles the Test Team was in charge of all activities related to the Client. The Test team relied heavily on specifications provided by the integration focused Business Analyst. In current situation Test team relies on Client Teams Business Analyst and is focused on building mocked Provider that would satisfy the contracts. While mocked Provider is a disposable service its correctness and completeness go in hand with supporting Client team in producing a complete set of Contracts worth enforcing in later stages of testing.

Manually writing or generating a Pact file from something like a Swagger document would be like marking your own exam, and would do nothing to ensure that the code in the consumer and provider are compatible with each other.

Something that could be useful, however, is to generate skeleton Pact test code from a Swagger document.

Pact-Foundation's Pact itself supports two discern worlds:

1. Pact.NET (C#) and

2. Other languages (C, Node, PHP, Proto, Python, Ruby, Rust)

Support of Pact nevest versions, V3 and V4 might give certain indication where the industry is going:

Implementation	**v1**	**v1.1**	**v2**	**v3**	**v4**
Pact-rust				☐	☐
Pact-jvm			0	☐	☐
Pact-ruby			☐		
Pact-js			☐	☐	☐*
Pact-net			☐	☐	☐*
Pact-python			☐		
Pact-php			☐		
Pact-go			☐	☐	☐*
Pact-C++			☐	☐	
scala (scala-pact)			☐		
scala (pact4s)				☐	☐*

Simple implementation diagrams

RUST (2006, a multi-paradigm, general-purpose programming language that emphasizes performance, type safety, and concurrency). Supported by WireMock.

JVM (1994, Java 8, 2014 lambda expressions, streams, and default methods). JVM 2.22.2 supportsed byWireMock

RUBY (1993, Ruby 3.3.0 2023) Note that, because Pact is written in Ruby the support for V3 and V4 are present. Requires gem wrapper to work with WireMock.

Multiple provider states (pact **verification**) and Publish pacts to **Pact Broker** are offered for every language (except for C++). However, Multiple provider states (pact **creation**) is supported only by JVM, JS, Go and Swift.

NODE (2009, Node.js 21.4 2023). Supported by MockWire.

.NET (2002, .NET 8, 2023). PactNet is a .NET implementation of the Pact contract testing library. Supported by WireMock. . The latest version of WireMock.NET is 1.5.46.

Python (1991, Python 3.x 2023). Supported by WireMock.

Golang (2007, Golang 1.21 2023). Suported by WireMock.

Scala (2001, Scala 2.12.13 2019) Supported by WireMock.

Ready to use Container Images:

pactfoundation/pact-cli

pactfoundation/pact-broker

pactfoundation/pact-ref-verifier

pactfoundation/pact-ref-mock-server

pactfoundation/pact-mock-service

pactflow/demo-consumer-node

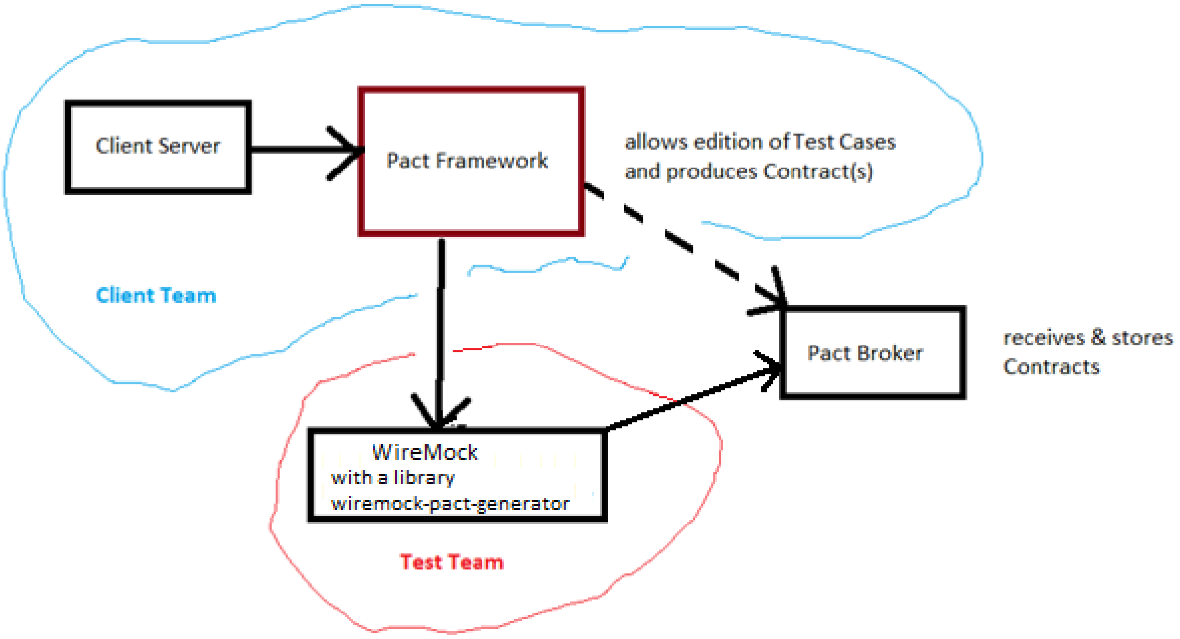
wiremock/wiremock

sheyenrath/wiremock.net

sheyenrath/wiremock.net-nano

selenium/node-chrome

mbrzozow/pactflow-swagger-mock-validator Doc


Client Server
Pact Framework
allows edition of Test Cases and produces Contract(s)
Client Team
Pact Broker
receives & stores Contracts
WireMock with a library wiremock-pact-generator
Test Team

Note that Pacts are language neutral. However to run the library you need Java 1.8.

For example:

```
{
  "consumer": {
    "name": "your-consumer-name"
  },
  "provider": {
    "name": "your-provider-name"
  },
  "interactions": [
    {
      "description": "your-description",
      "request": {
        "method": "your-method",
        "path": "your-path",
        "headers": {
          "your-header": "your-header-value"
        },
        "body": {
          "your-body": "your-body-value"
        }
      },
      "response": {
        "status": 200,
        "headers": {
          "your-header": "your-header-value"
        },
        "body": {
          "your-body": "your-body-value"
        }
      }
    }
  ],
  "metadata": {
    "pactSpecification": {
      "version": "3.0.0"
    }
  }
}
```

Note as well, that .NET MockServer-Client-netwas not updated for four years and never included a functionality to generate Pact Contracts.

Note as well that instead of using Pact Framework or WireMock library the BA team can use simply ChatGPT or Copilot to generate contracts. In these situations OpenAI simply works as syntax formatted statement corrector, and the content needs to come from Client’s team BA.

Here is AI example:

Question:

Generate Pact Contract for requrst that contains only name and response that contains length, width, weight, humidity and price, a distance to North Pole from my current location and taysys exchange rate CHF to CDN.

ChatGPT feeds bacj Node.js code:

ChatGPT:

```
provider.addInteraction({
  state: 'provider accepts a request with name and returns dimensions, price, distance to North Pole, and CHF to CDN exchange rate',
  uponReceiving: 'a request for dimensions, price, distance to North Pole, and CHF to CDN exchange rate',
  withRequest: {
    method: 'POST',
    path: '/data',
    headers: {
      'Content-Type': 'application/json',
    },
    body: {
      name: like('John Doe'), // Example of a 'name' field in the request
    },
  },
  willRespondWith: {
    status: 200,
    headers: {
      'Content-Type': 'application/json',
    },
    body: {
      length: like(10), // Example of 'length' in the response
      width: like(5), // Example of 'width' in the response
      weight: like(15), // Example of 'weight' in the response
      humidity: like('20%'), // Example of 'humidity' in the response
      price: like(100), // Example of 'price' in the response
      distanceToNorthPole: like('5000 km'), // Example of 'distanceToNorthPole' in the response
      CHFToCDNExchangeRate: like(0.9), // Example of 'CHFToCDNExchangeRate' in the response
    },
  },
});
```

```
provider.finalize();
```

But, catches up when prompted:

Query:

Could you please express it as JSON formatted contract?

ChatGPT:

```
{
  "consumer": {
    "name": "Consumer"
  },
  "provider": {
    "name": "Provider"
  },
  "interactions": [
    {
      "description": "provider accepts a request with name and returns dimensions, price, distance to North Pole, and CHF to CDN exchange rate",
      "providerState": "provider accepts a request with name and returns dimensions, price, distance to North Pole, and CHF to CDN exchange rate",
      "request": {
        "method": "POST",
        "path": "/data",
        "headers": {
          "Content-Type": "application/json"
        },
        "body": {
          "name": "John Doe"
        }
      },
      "response": {
        "status": 200,
        "headers": {
          "Content-Type": "application/json"
        },
        "body": {
          "length": 10,
          "width": 5,
          "weight": 15,
          "humidity": "20%",
          "price": 100,
          "distanceToNorthPole": "5000 km",
          "CHFToCDNExchangeRate": 0.9
        }
      }
    }
  ],
  "metadata": {
    "pactSpecification": {
      "version": "3.0.0"
    }
  }
}
```

On the other hand, Edge’s Copilot generates immediately JSON file formatted Pact Contract. However it singles out a distance to north Pole and exchange rate between Swiss Francs and Canadian Dollars and presents them as separate items not included in the JSON file.

Copilot:

```
{
  "request": {
    "method": "GET",
    "path": "/",
    "query": {
      "name": "string"
    }
  },
  "response": {
    "status": 200,
    "headers": {
      "Content-Type": "application/json"
    },
    "body": {
      "length": "string",
      "width": "string",
      "weight": "string",
      "humidity": "string",
      "price": "string"
    }
  }
}
```

To get the distance from your current location to the North Pole, I need access to your location data. Please enable location access in your browser settings and try again.
The exchange rate of Swiss Franc (CHF) to Canadian Dollar (CAD) is 1 CHF = 1.57 CAD. Please note that exchange rates are subject to change and the rate mentioned here is for informational purposes only.

Therefore the author tweaks the question to Copilot:

Query:

Generate Pact Contract for request that contains only name and response that contains length, width, weight, humidity and price, as well as an approximate distance to North Pole from Mississauga, Ontario named FarFarAway and with the value you will find and include in JSON as well today's exchange rate from CHF to CDN.

Copilot, however, insists on getting details it does not need and dodges inclusion of the last two items in JSON file:

Copilot:

To get the distance from Mississauga, Ontario to the North Pole, I need access to your location data. Please enable location access in your browser settings and try again.
The exchange rate of Swiss Franc (CHF) to Canadian Dollar (CAD) as of December 31, 2023 is 1 CHF = 1.57 CAD. Please note that exchange rates are subject to change and the rate mentioned here is for informational purposes only.

In the above round ChatGPT demonstrated superiority over Copilot by including ‘Provider State’ and “Description’ in generated Pact Contracts.

So, on basis of the above real life examples, my conclusion here is: AI is still a few miles before any project could rely on it. However, I would not hesitate to encourage Business Analysts to use ChatGPT to vet their English while writing specifications. The formalism of Gherkin with GIVEN, WHEN, THEN provides some incentives to gather thoughts but does NOT guarantee the clarity of specification. OpenAI is still too immature to rely on it but is more likely to challenge one’s English in a constructive way and its usage will grow if AI continues advance to next maturity levels.

Now let us become Gherkin style structured:

Query:

GIVEN that I am in Tampa, Florida, and you have access to the internet
WHEN I ask to generate a Pact Contract formated as JSON file
in which the Request contains only names of items
and in which the response contains length, width, weight, humidity and price, as well as, an approximate distance to North Pole from Mississauga, Ontario ,as well as, today's exchange rate from CHF to CDN.
THEN
Generated Pact Contract will contain in the Request only names of items
AND the Response will contain items named length, width, weight, humidity, price, FarFarAway and CHF-TO-CDN
AND an approximate distance to North Pole from Mississauga, Ontario will be a value CHF-TO-CDN, named FarFarAway
AND the today's exchange rate from CHF to CDN is up to date and named CHF-TO-CDN.

Copilot

```
{
  "consumer": {
    "name": "Consumer"
  },
  "provider": {
    "name": "Provider"
  },
  "interactions": [
    {
      "description": "Request contains only names of items",
      "request": {
        "method": "POST",
        "path": "/items",
        "headers": {
          "Content-Type": "application/json"
        },
        "body": {
          "items": ["item1", "item2", "item3"]
        }
      },
      "response": {
        "status": 200,
        "headers": {
          "Content-Type": "application/json"
        },
        "body": {
          "length": 10,
          "width": 5,
          "weight": 2,
          "humidity": 50,
          "price": 100,
          "FarFarAway": "5,160.76 km",
          "CHF-TO-CDN": 1.57
        }
      }
    }
  ],
  "metadata": {
    "pactSpecification": {
      "version": "3.0.0"
    }
  }
}
```

ChatGPT

```
{
  "provider": {
    "name": "ProviderName"
  },
  "consumer": {
    "name": "ConsumerName"
  },
  "interactions": [
    {
      "description": "Request for item names",
      "request": {
        "method": "GET",
        "path": "/items"
      },
      "response": {
        "status": 200,
        "headers": {
          "Content-Type": "application/json"
        },
        "body": {
          "items": ["item1", "item2", "item3"]
        }
      }
    },
    {
      "description": "Response with details for items",
      "request": {
        "method": "GET",
        "path": "/item-details"
      },
      "response": {
        "status": 200,
        "headers": {
          "Content-Type": "application/json"
        },
        "body": {
          "length": 10,
          "width": 5,
          "weight": 15,
          "humidity": 70,
          "price": 50,
          "FarFarAway": "Approximate distance to North Pole from Mississauga, Ontario",
          "CHF-TO-CDN": "Today's exchange rate from CHF to CDN"
        }
      }
    }
  ],
  "metadata": {
    "pactSpecification": {
      "version": "3.0.0"
    }
  }
}
```

I don't know which AI is the winner of this round ☺

In any case, it seems like AI is a good place to start, but human review is necessary regardless of whether the contract comes from AI, the Pact Framework, or the WireMock library. Also, this has not been proven, but it has been experimented with so far: tweaking the English statements to pass them to IA would take more work than writing a test case in Pact Framework or using the WireMock library.