

Design and Implementation of a Data-Driven, Provider-Independent Test Service for Banking APIs

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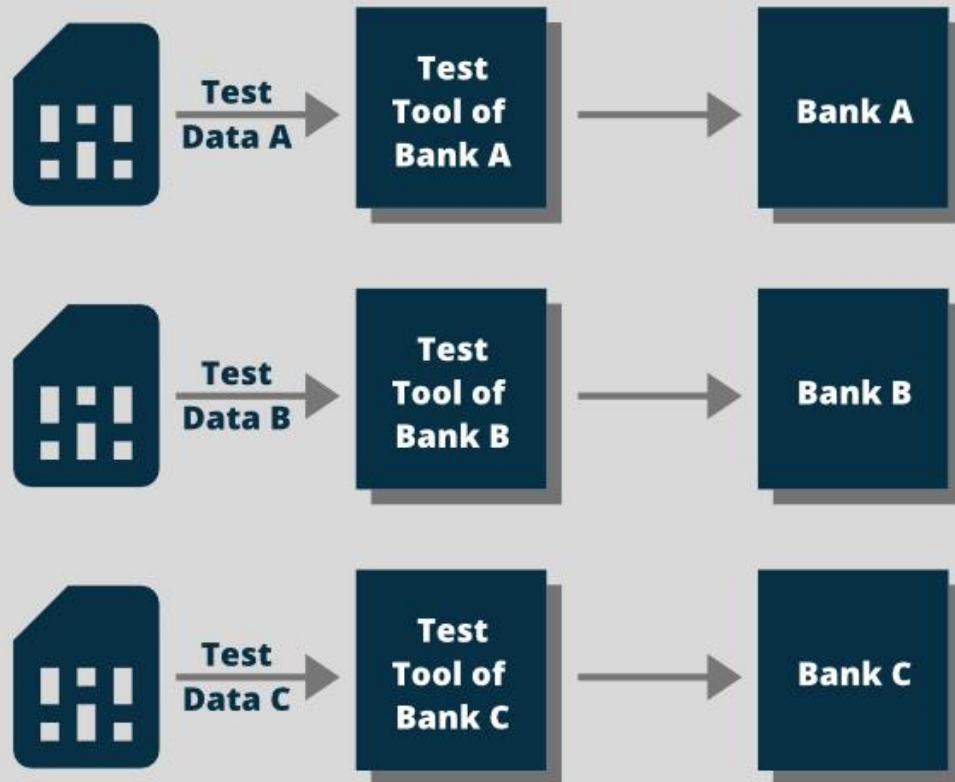
- Motivation
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 - Overview of Test Tool Process
 - Test Case Mapping
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**Second Payment
Service Directive
(PSD2)
+
Investigation
by British Competition
Market Authority**

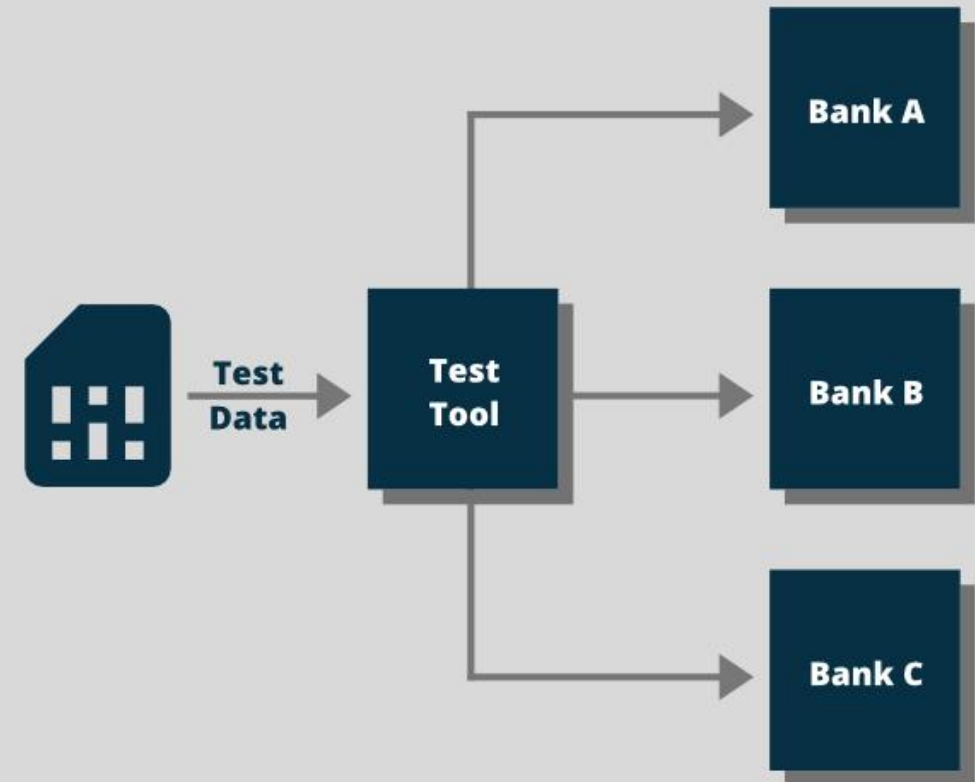


- **Third Party Providers get right to access user accounts**
- **Strong customer authentication**
- **Improved consumer data protection**
- **Foster competition and innovation**
- **Interface for Third Party Provider**

Current Test Approach



Proposed Test Approach



How can an efficient test process be performed using a data-driven and vendor-independent test tool?

Overall goal and research questions

Goal: Establishment of an efficient test process for PSD2-compliant APIs by using regression tests in a data-driven and provider independent test tool

Research Question 1	What are the requirements for a data-driven and vendor-independent regression testing tool for PSD2-compliant APIs?	Literature Review + Interviews
Research Question 2	How could the design and implementation of a regression testing tool for PSD2-compliant APIs look like?	Implementation
Research Question 3	How easy could the test tool be extended to check the functionality and correctness of the entire banking API?	Analysis + Interviews

How were the requirements elicited?

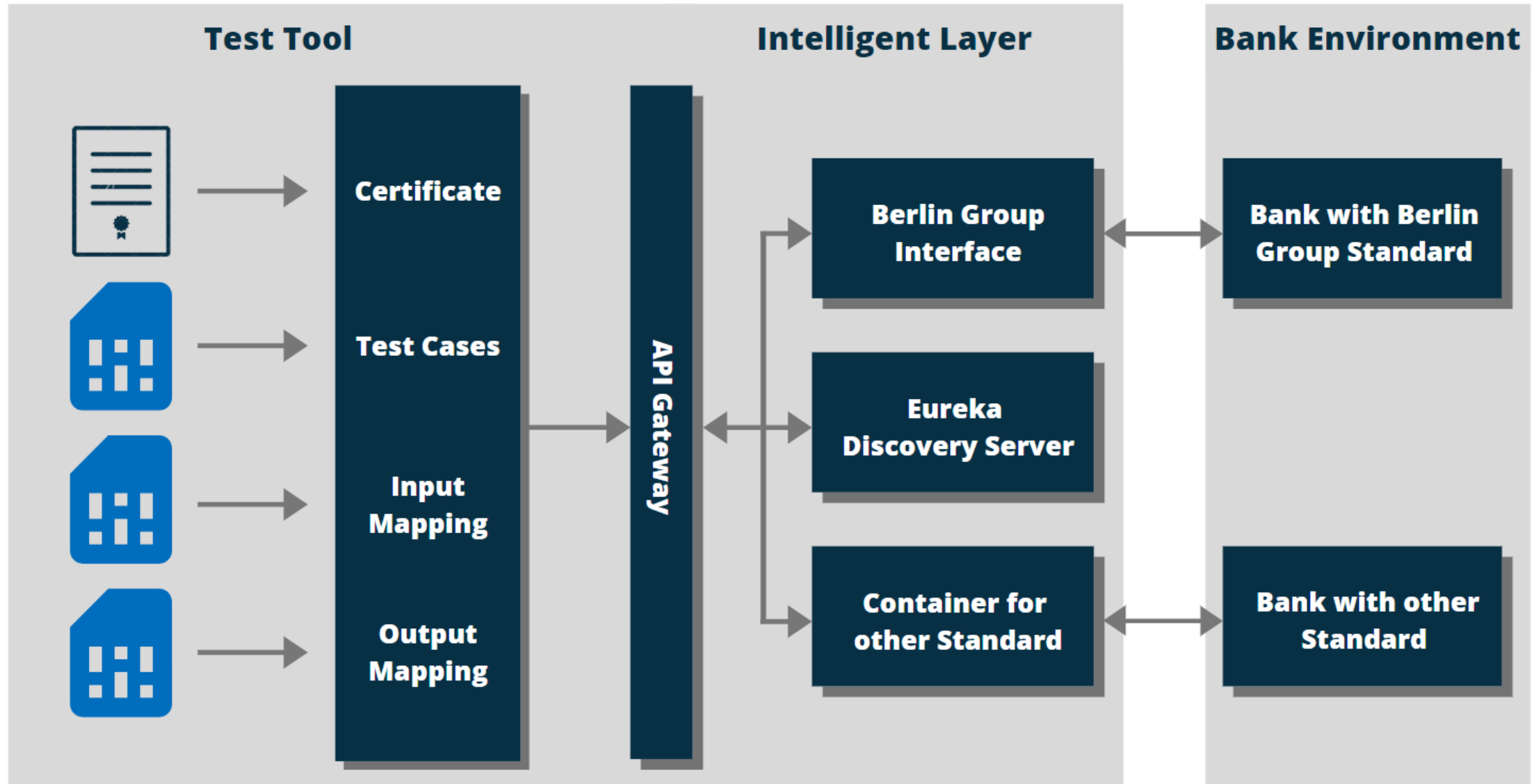
- English and German literature about:
 - Relevant publications on PSD2 and software testing
 - Official paper of the European Union
- Five interviewee contributed know-how and insights to the functional and technical parts of this thesis

ID	Role	Duration [hh:mm]
Interview1	Vice President Marketing / Sales	0:45
Interview2	Head of Test and Quality Assurance Department	0:44
Interview3	Process Analyst and Project Management, Test Management	2:44
Interview4	Head of Software Engineering & Application Management	0:54
Interview5	Managing Director Financial Startup	0:17

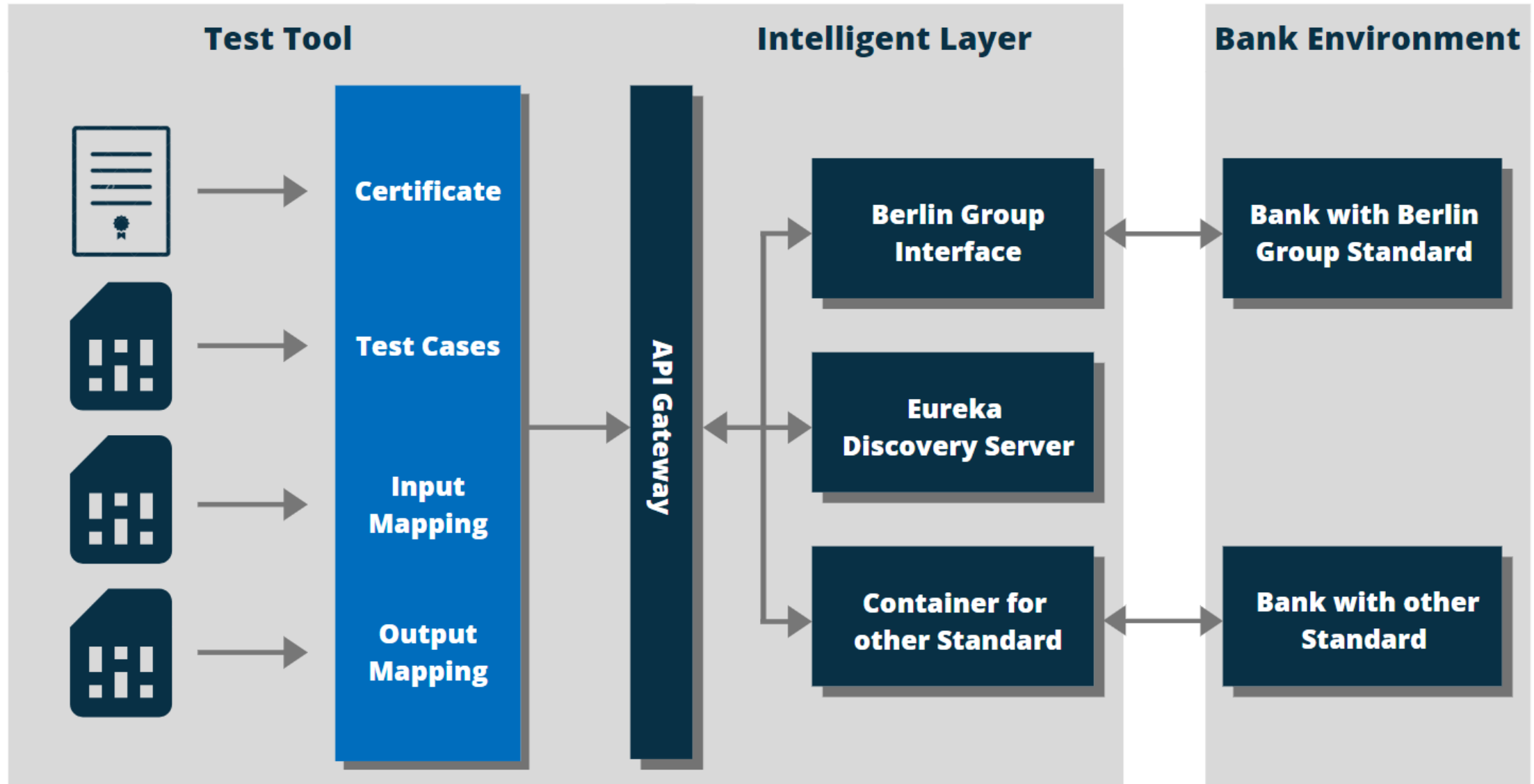
Test Tool Requirements

- Functional requirements:
 - Simple and uncomplicated integration of test cases
 - Automated test procedure
 - Reassessment of correctly evaluated test cases → regression testing
 - Separation of test data and test cases → data-driven testing
 - Efficient method for evaluating test cases
- Non-functional requirements:
 - Simple and understandable user interface with an intuitive user guidance
 - Powerful and reliable execution of test cases
 - Very good expandability of the test tool

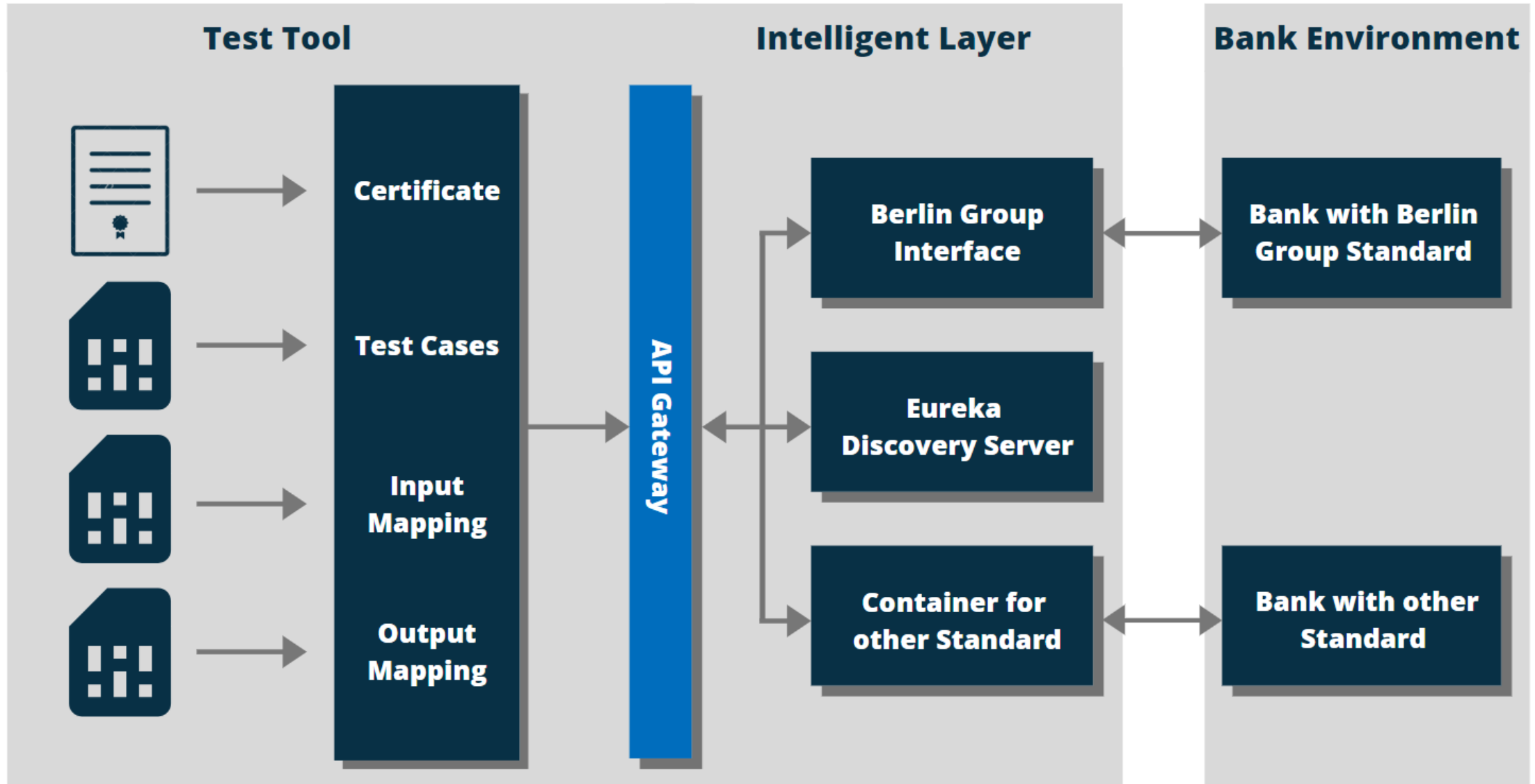
Overview of Test Tool Process



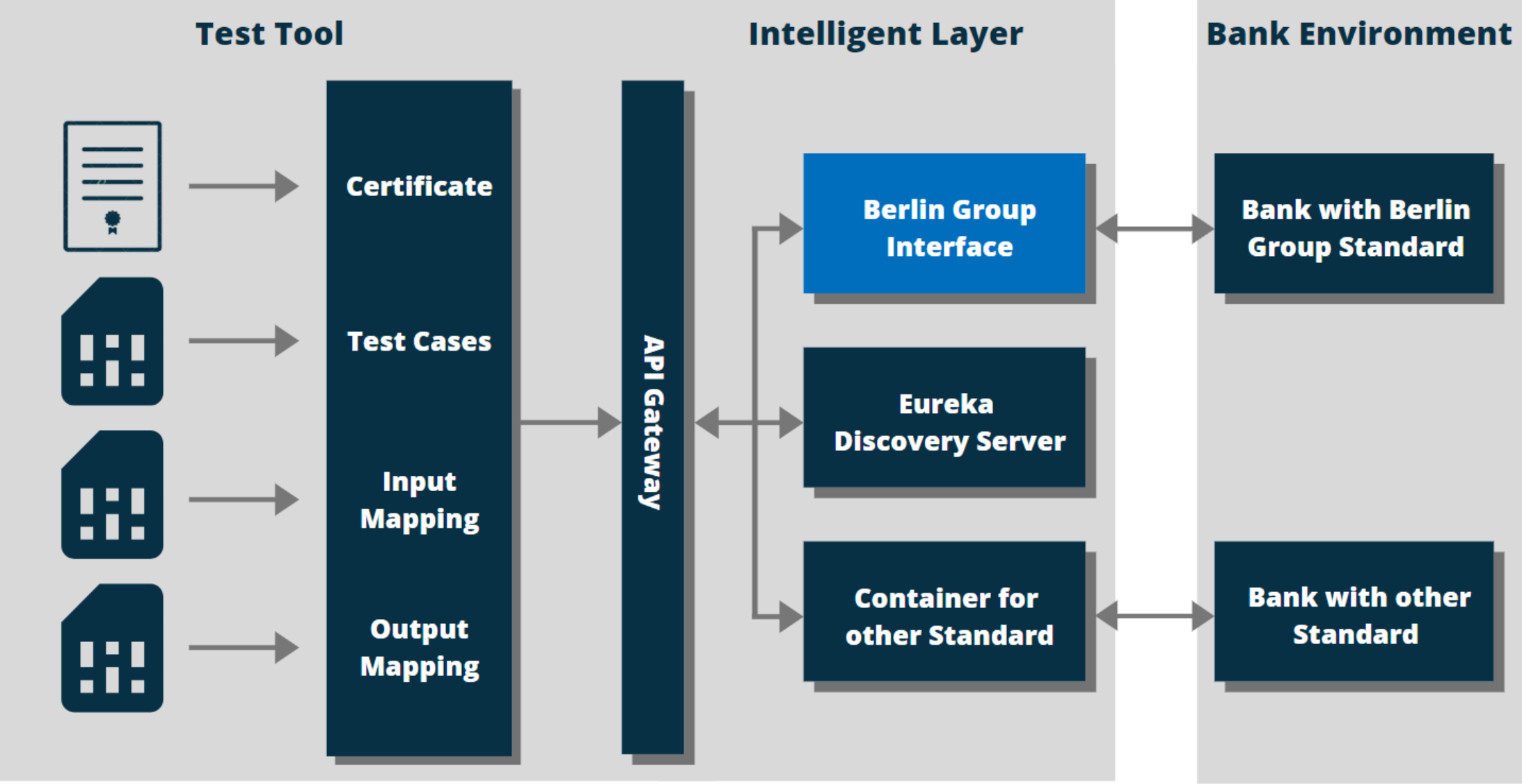
Overview of Test Tool Process



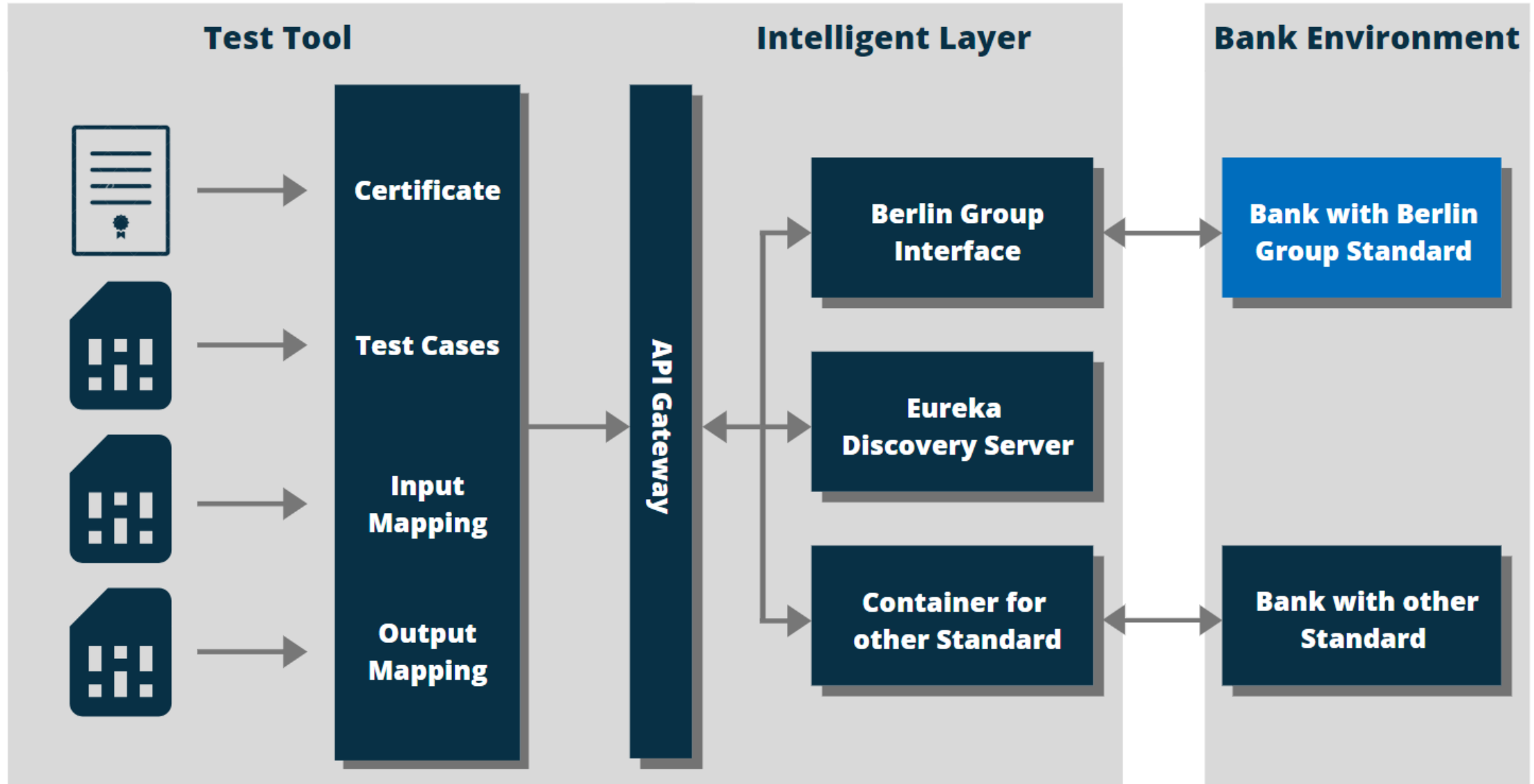
Overview of Test Tool Process



Overview of Test Tool Process



Overview of Test Tool Process



Test Case Structure (1)

```
1 //file: input.json
2
3 {
4   "nameOfAPIEndpoint" : [
5     {
6       "testId" : " ",
7       "testName" : " ",
8       "testDescription" : " ",
9       "testConnectionId" : " ",
10      "header" : {
11
12        //add header information here
13      },
14      "body" : {
15
16        //add body information here
17      },
18      "result" : {
19
20        //add expected results here
21      }
22    }
23  ]
24 }
```

Test Case Structure (2)

```
6      "header" : {
7          "x-request-id" : "abc123a1-a12a-1234-abc1-a1ab1a12345a"
8      },
9      "body" : {
10         "objectA" : {
11             "arrayB" : [
12                 {
13                     "keyC" : "valueC"
14                 },
15                 {
16                     "keyC" : "valueC"
17                 }
18             ],
19             "objectB" : {
20
21             },
22             "keyB" : "valueB"
23         },
24         "arrayA" : [
25
26         ],
27         "keyA" : "valueA"
28     }
```

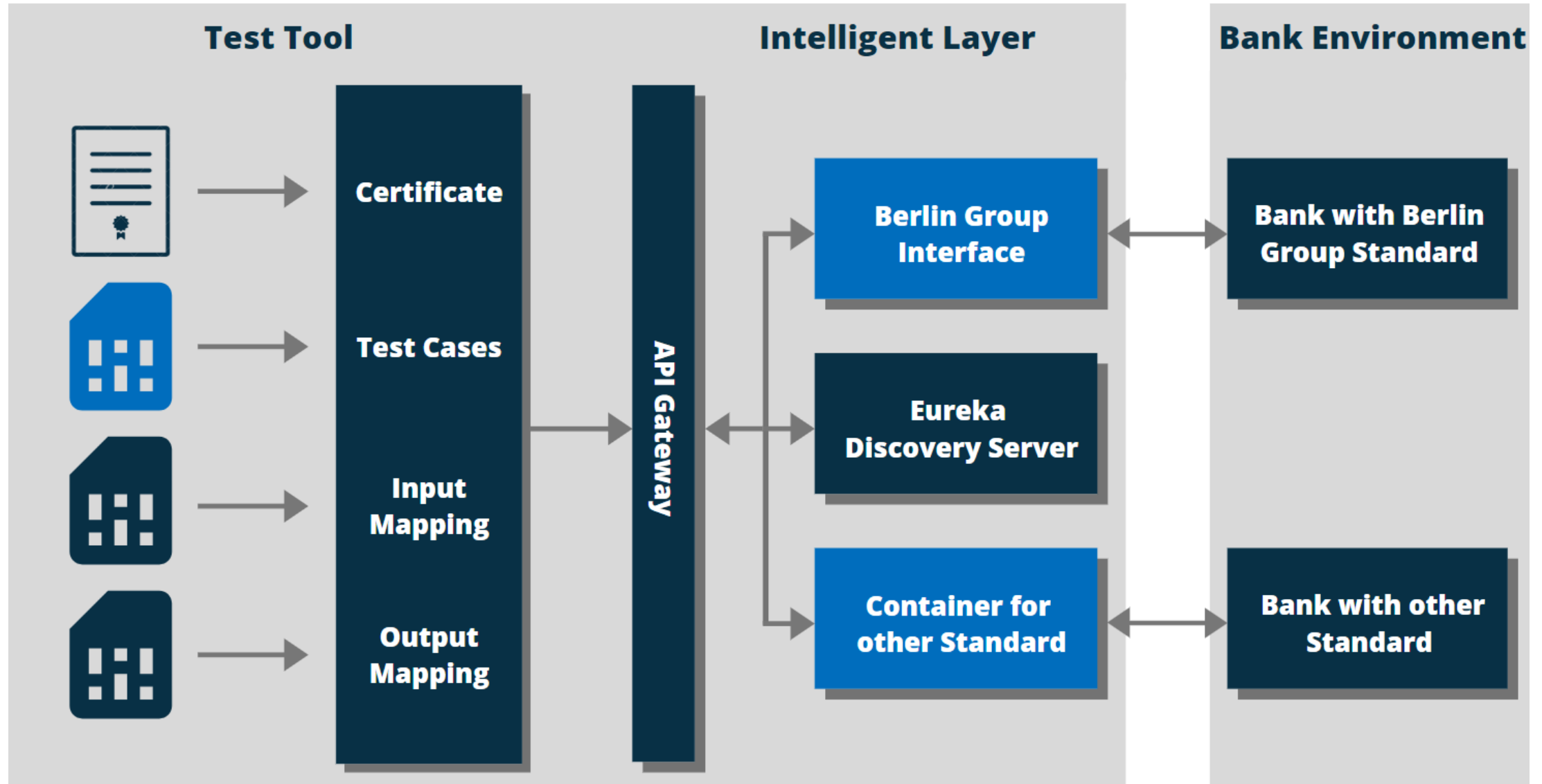
```
1 //file: input_mapping.json
2
3 {
4   "nameOfAPIEndpoint" : {
5     "header" : {
6       "x-request-id" : "y-request-id"
7     },
8     "body" : {
9       ".arrayA:" : ".arrayA.",
10      ".keyA" : ".objectA.objectB.keyC",
11      ".objectA.arrayB:0.keyC" : ".objectA.arrayB.keyC0",
12      ".objectA.arrayB:1.keyC" : ".objectA.arrayB.keyC1",
13      ".objectA.keyB" : ".objectA.keyB"
14      ".objectA.objectB." : ".objectA.objectB.",
15    }
16  }
17 }
```

Encountered Problems during the access of a PSD2-compliant interface



Test Tool Evaluation from a User Perspective

- Evaluation of the software quality based on ISO 9126 / 25010:2011
 - This approach considers the following aspects:
 - Functionality
 - Reliability
 - Usability
 - Efficiency
 - Maintainability
 - Portability
- Overview of the usability and practicability of the test tool
- Test tool performed very well in terms of functionality, reliability, efficiency, maintainability and portability
- The non-functional requirements, which are mainly dealt with under the usability aspect of the ISO standard, are not fully met



- Summary:
 - Overview of requirements and a potential approach to build and extend a test tool for bank interfaces
 - Presentation of a mapping mechanism with the ability to adapt test cases to various PSD2-compliant interfaces
 - Improved efficiency and simplified test procedure for PSD2-compliant interfaces through proposed test tool
- Outlook:
 - Only a fraction of the functionalities defined by the Berlin Group standard are covered
→ Addition of other API calls
 - Assessment of further Berlin Group compliant bank interfaces
 - Addition of further authentication methods
 - Evaluation and integration of additional PSD2-compliant standards

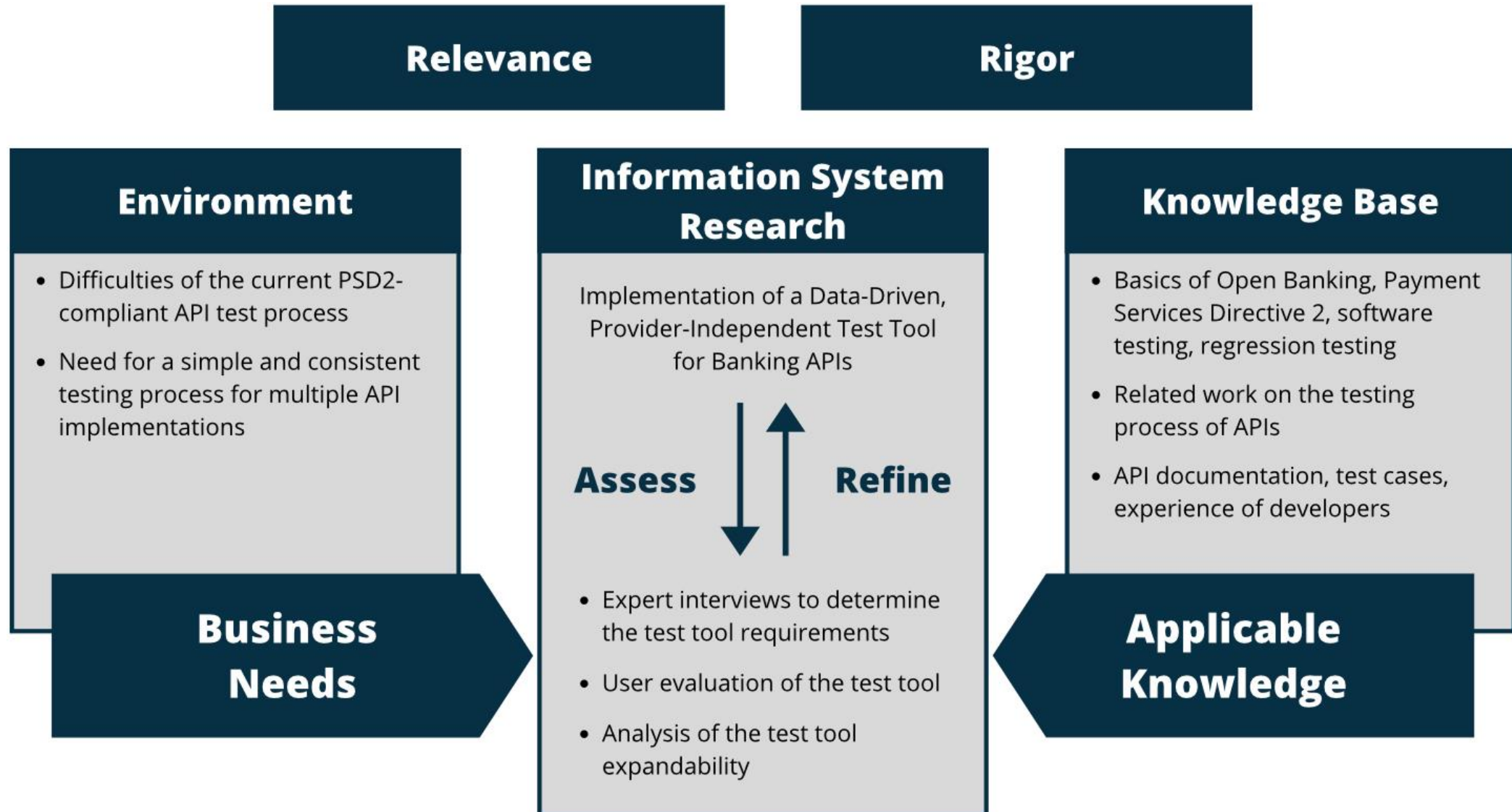
Thank you for your attention!

this work was conducted in cooperation with



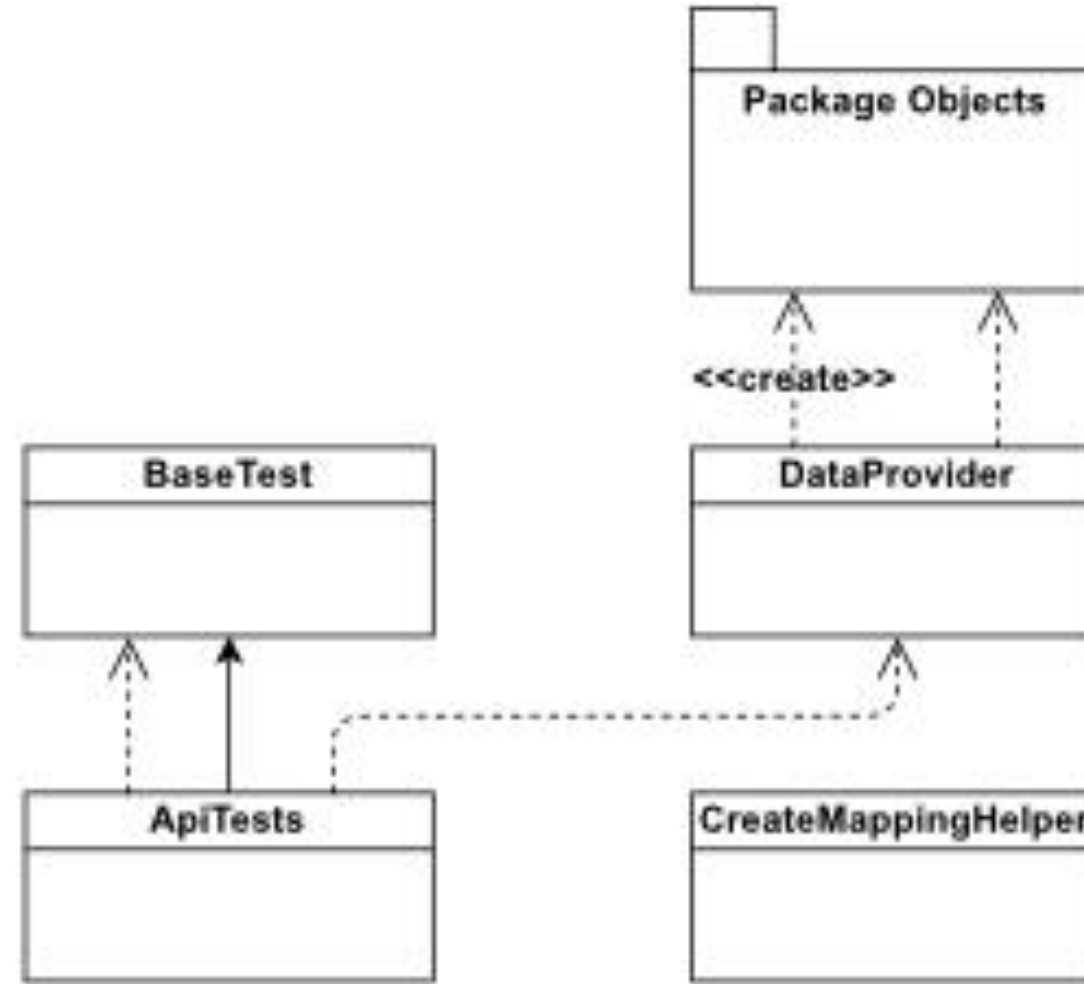
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- [12] ISO / IEC 9126 <https://www.iso.org/standard/22749.html>
- [13] Interview Partner 1
- [14] Interview Partner 2
- [15] Interview Partner 3
- [16] Interview Partner 4

Backup



Translated Request

```
1 //translated request for bank interface
2
3 {
4   "nameOfAPIEndpoint" : [
5     {
6       "header" : {
7         "y-request-id" : "abc123a1-a12a-1234-abc1-a1ab1a12345a"
8       },
9       "body" : {
10        "objectA" : {
11          "arrayB" : {
12            "keyC0" : "valueC"
13            "keyC1" : "valueC"
14          },
15          "objectB" : {
16            "keyC" : "valueA"
17          },
18          "keyB" : "valueB"
19        },
20        "arrayA" : {
21
22        }
23      }
24    }
25  ]
26 }
```



Architecture BerlinGroupInterface Module

