TESTING MICRO SERVICES

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DEFINING MICRO SERVICES?

DESIGNING FLEXIBLE, EXTENDABLE SYSTEMS

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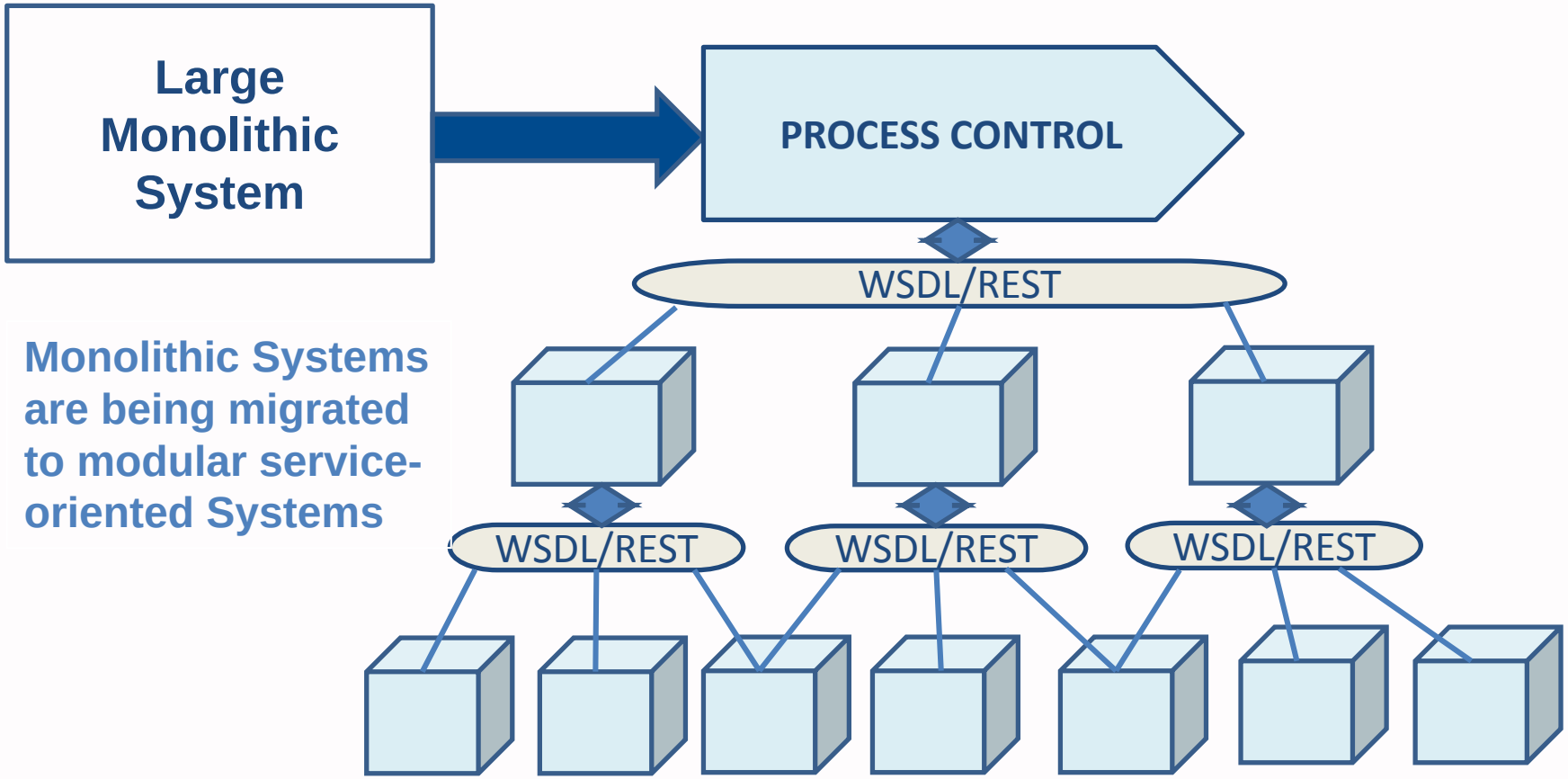
FROM MONOLITHIC TO MODULAR SYSTEMS

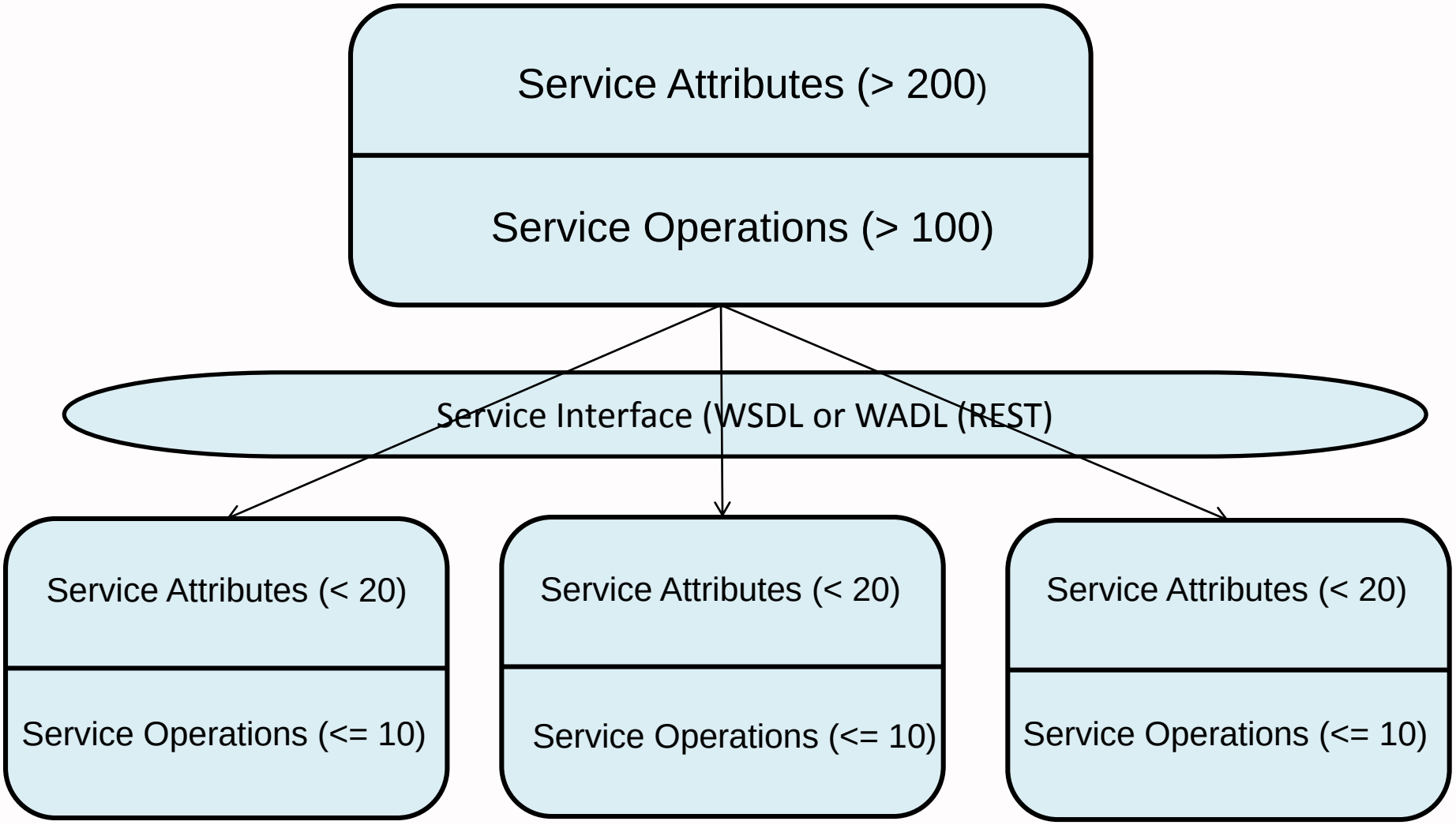


Monolithic Systems are being migrated to modular service-oriented Systems

CREATING TESTABLE SERVICES

- The goal is to be able to develop and test a service within a week
- Since testing makes up for at least 50% of the costs, a micro service should be testable with 3 days.
- Based on the current test productivity and the desired level of test coverage, no service should require more than n test cases.
- The number of test cases is determined by the number of parameters and operations. Within one service they must be limited.

LIMITING THE SIZE OF SERVICES



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TESTING MICRO SERVICES

CHALLENGE OF SERVICE TESTING

DEGREES OF MICRO SERVICE COVERAGE

TESTING A MONOLITHIC WEB SERVICE

TESTING A SET OF MICRO SERVICES

MICRO SERVICE TEST PROCESS

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CHALLENGES FOR THE SERVICE TEST

- Testing Levels
  - Micro-Services are minute self-contained software components with a standard message-oriented interface (REST or WSDL) which allows them to be connected with one another.
  - They have to first be tested independently via their interface with selected parameters.
  - They are then tested in interconnected groups – components via an integration interface
  - Finally, they are tested as a whole as part of a larger system via the user interface

DEGREES OF MICRO SERVICE COVERAGE

- testing each individual operation in a service (non-modal testing)
- testing all combinations of operations in a service, i.e. all paths (semi-modal testing)
- testing each individual operation with all relevant states (quasi-modal testing)
- testing all sequences of all operations with all combinations of relevant states (modal-testing).

Robert Binder in Object-oriented Testing [Binder1995]:

TESTING A MONOLITHIC WEB SERVICE

A Java micro service for managing an account contains

- 3495 statements
- 51 classes
- 202 methods
- 28 interfaces.

The static analysis of this service reveals

- 1309 branches
- 644 paths.

The Test with Selenium requires

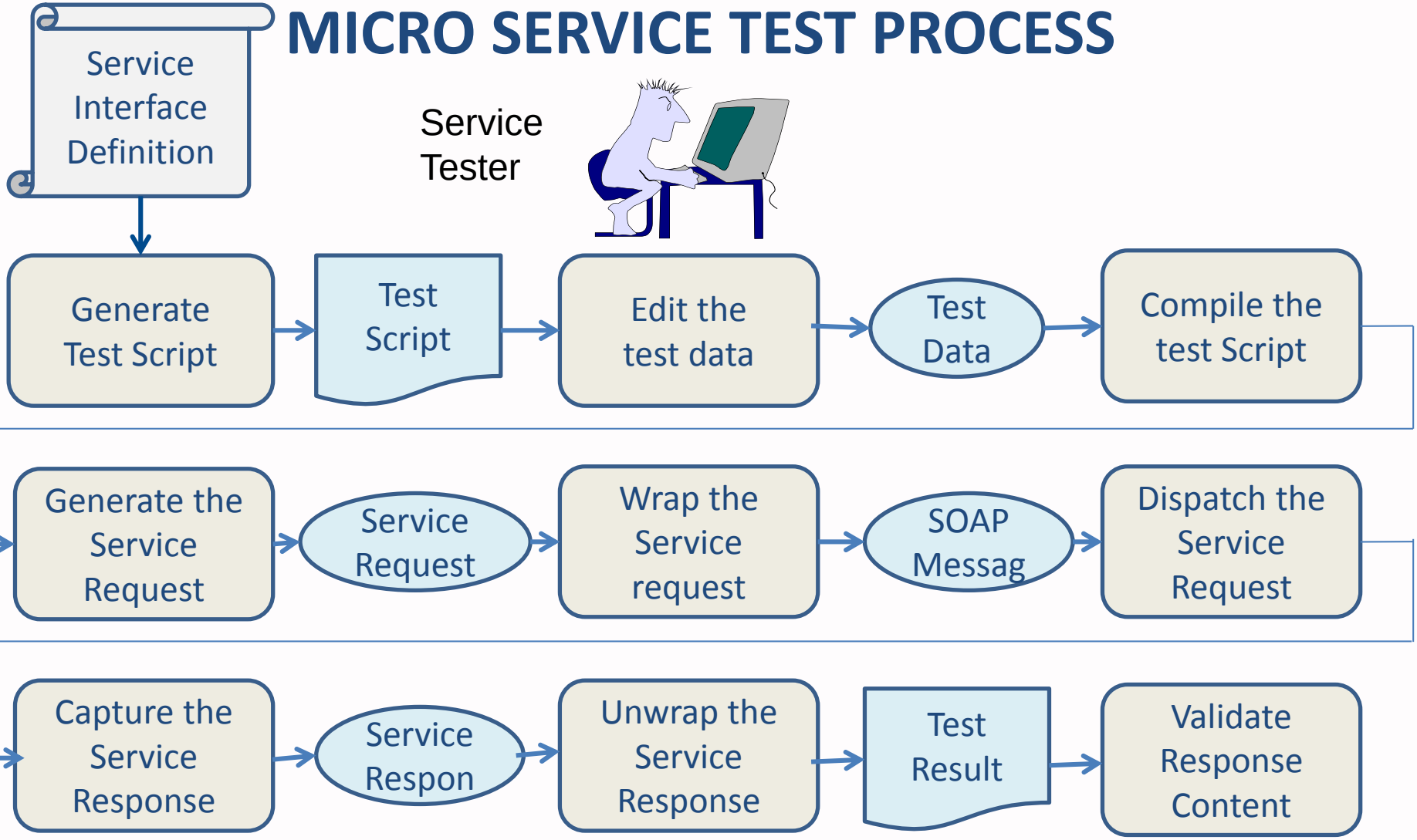
- 16 Person days
- for the 640 test cases

TESTING A SET OF MICRO SERVICES

The same Java Web Service is broken down into

- 5 Micro Services, each with <= 700 statements
- It requires an average of 144 test cases per service
- Each service can be tested within 3,5 days
- With Selenium it takes 17,5 person days to test the whole
- With ServTest it takes less than 2 days to test each service
- All 720 test cases can be tested within 10 days or 2 Weeks
- That corresponds to 72 test cases per tester day
- With Selenium the test productivity was 40 test cases per day.
- The difference is due to the automated simulation of the service interfaces.

MICRO SERVICE TEST PROCESS



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TESTING MICRO SERVICES WITH TESTSERV

STARTING WITH THE SERVICE INTERFACE DEFINITION

SERVICE TEST DATA FLOW

SERVICE TEST SCRIPT

SERVICE TEST RESULT

SERVICE TEST DASHBOARD

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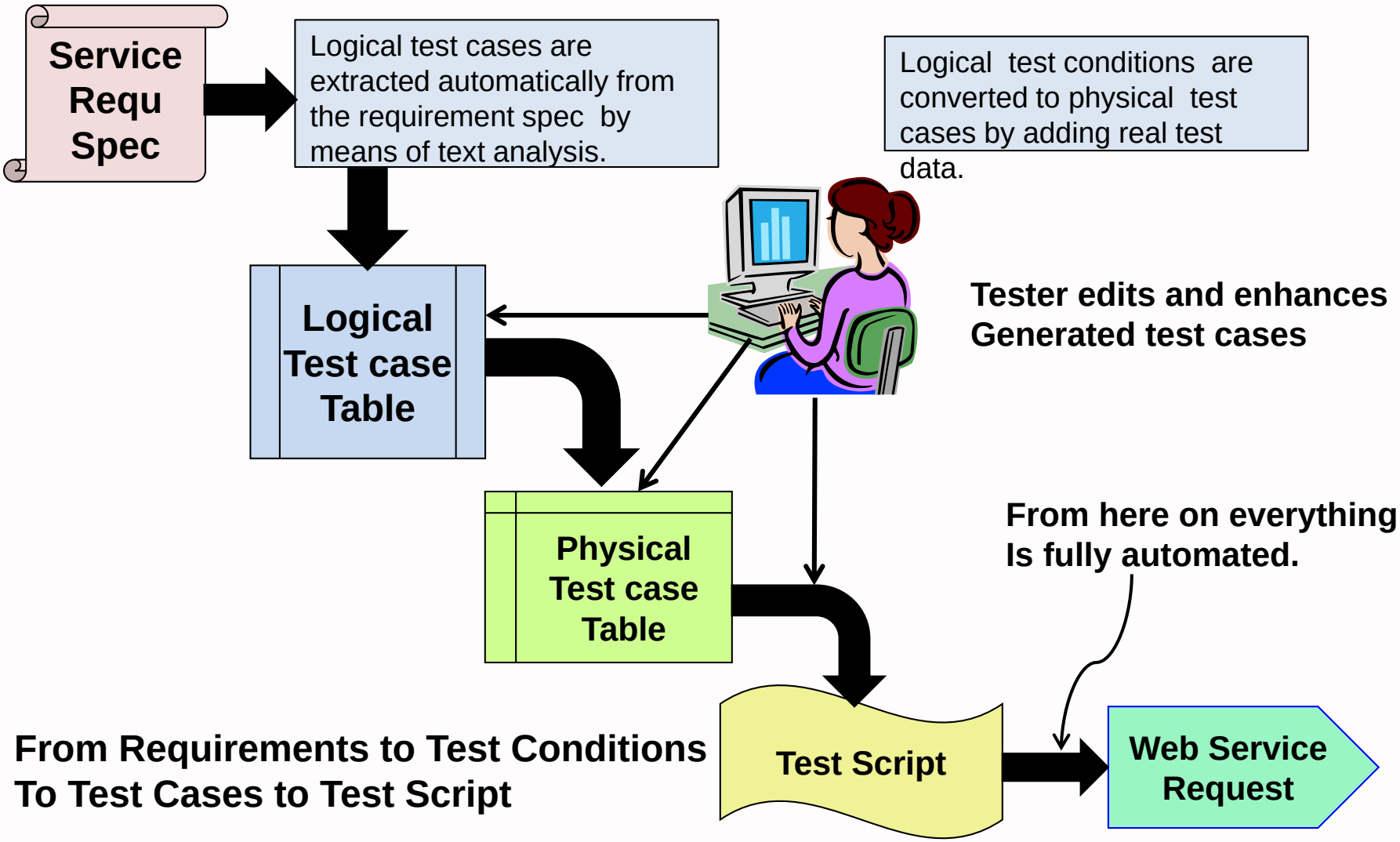
SERVICE INTERFACE DEFINITION

```
<complexType name="ArticleItem">
                <sequence>
                    <element name="ResponseArtNo" type="xs:string"/>
                    <element name="ResponseArtType" type="xs:string"/>
                    <element name="ResponseArtName" type="xs:string"/>
                    <element name="ResponseArtPrice" type="xs:double"/>
                </sequence>
            </complexType>
            <complexType name="Order">
                <sequence>
                    <element name="CustNo" type="xs:string"/>
                    <element name="OrderNo" type="xs:int"/>
                    <element name="DeliveryMode" type="xs:string"/>
                    <element name="PaymentMode" type="xs:string"/>
                    <element name="Orders" type="ns1:ArrayofOrderItem"/>
                </sequence>
            </complexType>
            <complexType name="OrderItem">
                <sequence>
                    <element name="OrderArtNo" type="xs:string"/>
                    <element name="OrderArtType" type="xs:string"/>
                    <element name="OrderArtName" type="xs:string"/>
                    <element name="OrderArtAmount" type="xs:int"/>
                </sequence>
            </complexType>
        </schema>
    </types>
```

SERVICE TEST DATA FLOW



From Requirements to Test Conditions To Test Cases to Test Script

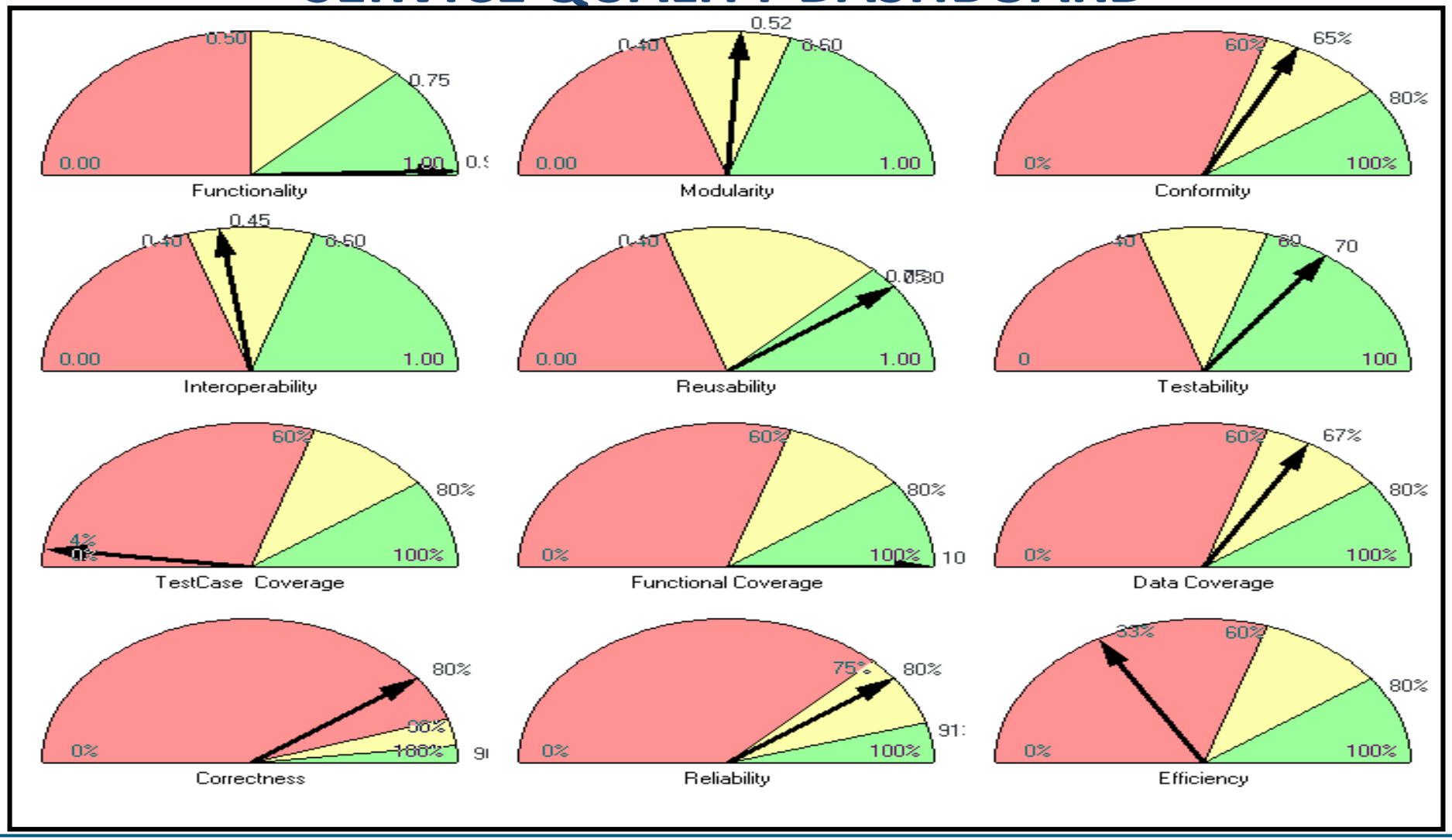
MICRO SERVICE TEST SCRIPT

```
//  First Request to Frontend to order Articles
      if ( operation =   "GetTypes");
         if ( request  =   "GetTypes1Request");
            assert inp.GetTypes1Request_DummyParam  = "?";
         endRequest ;
         if ( response  =   "GetTypes1Response");
            assert out.$ResponseTime < "1000";
            if ( object = "return" occurs = "2");
               assert out.item[1]  = old.item[1];
           endObject;
         endResponse ;
      endOperation;
      if ( operation =   "QueryAvailableProducts");
         if ( request  =   "QueryAvailableProducts2Request");
            assert inp.CustNo  = "009999";
            assert inp.ArtType  = "BOOK";
         endRequest ;
         if ( response  =   "QueryAvailableProducts2Response");
           assert out.$ResponseTime < "1000";
```

SERVICE TEST RESULT

Non-Matching Params	Non-Matching Values
Resp-Id: GetTypes1Response_003	
Ist: $ResponseTime	2059
Soll:Asserted_Value	<1000
Resp-Id: GetTypes1Response_003_return	
Ist: item[2]	BOOK
Soll:Asserted_Value	=NEWS
Ist: item[3]	0
Soll:Asserted_Value	=BOOK
Resp-Id: QueryAvailableProducts2Response_003	
Ist: $ResponseTime	2580
Soll:Asserted_Value	<1000
Resp-Id: QueryAvailableProducts2Response_003_return_item[1]	
Ist: ResponseArtNo	9999
Soll:Asserted_Value	=4711

SERVICE QUALITY DASHBOARD



SUMMARY

- MICRO SERVICES IS THE CURRENT TREND IN SOFTWARE DEVELOPMENT
- MICRO SERVICES MUST BE DESIGNED TO BE TESTABLE
- THE SERVICES MUST BE KEPT SMALL AND SIMPLE
- THE SERVICE TEST MUST BE AUTOMATED
- SERVTEST IS AVAILABLE FREE OF COST ON THE SORING WEBSITE