Quality Assurance of Micro-Services

When to trust your micro-service test results?
Dipl.-Ing. Theofanis Vassiliou-Gioles
Trust?

\ Definition 1: Trust is the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other party will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party.

\ Definition 2: Trustworthiness (of an IT service) is the demonstrated ability of the IT service provider to perform a specified action while adhering to a set of stated principles. [3]

Micro Services / Web-Service

There’s no simple definition but some agreed properties …
- Highly maintainable and testable
- Loosely coupled
- Independently deployable

- Organized around business capabilities
- Owned by a small team

Deployed as standalone services or service functions (e.g., AWS lambdas) in self-hosted or managed environments and

Accessed directly or via gateways

Static or dynamic addressing via service registries
How testing of microservices is been seen in the field

Tweet: https://twitter.com/unclebobmartin/status/1157713308801048577

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Micro Service Example

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Micro Service Example
Micro Service Example

Client

Gateway

F0

G0

H0

µS A

µS B

µS C

µS C

µS C

µS C

Registry

F()

G()

H()
Micro Service Example

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How are microservices seen?

Raposog @raposoguillermo - Aug 3, 2019
Just discussing yesterday something related but about soft architecture; what’s your opinion about microservices?

Uncle Bob Martin @unclebobmartin - Aug 3, 2019
Microservices are not an architecture, they are a deployment strategy. The decoupling and partitioning could (and should) be accomplished irrespective of whether the service boundary is imposed.

Raposog @raposoguillermo - Aug 3, 2019
Thx; i have some doubts about a full microservices app/solution (e.g., how easily you can troubleshoot)

Mark Sparhawk @sparhawk - Aug 3, 2019
Troubleshooting distributed systems is incredibly challenging and requires new tools and skill sets.

At a certain size engineering team, a monolithic service will experience “too many cooks in the kitchen” class problems.
Microservices give you more kitchens

QHibernator @blau2006 - Aug 4, 2019
More kitchens implies more potential for grease fire 😊

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Key issues that limit the testability of service–oriented systems

\ \ Lack of observability
  \ \ \ \ For users and system integrators they are just interfaces

\ \ Dynamicity and adaptiveness
  \ \ \ \ Inability to determine the component invoked

\ \ Lack of control
  \ \ \ \ Executed on independent infrastructure and developed & operated by independent teams

\ \ Lack of trust
  \ \ \ \ Uncertainty whether provided ”documentation” corresponds to the truth

\ \ Cost of testing
  \ \ \ \ Monetary and technical barriers for repeatedly executed tests

Simple Integration Testing Question

Has the integration of “μSC” with “μSA” been successful?
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The (integration) test cases passes if the tester can successfully call F() at µSA, as µSA must use H() from µSC in order to compute the answer for F().
Difficult answer in the real world

Has the integration of “\(\mu SC\)” with “\(\mu SA\)” been successful?

The (integration) test cases passes if the tester can successfully call \(F()\) at \(\mu SA\), as \(\mu SA\) must use \(H()\) from \(\mu SC\) in order to compute the answer for \(F()\).
Difficult answer in the real world

Has the integration of “μSC” with “μSA” been successful?

Which service is contributing to my service request?

The (integration) test cases passes if the tester can successfully call $F()$ at $μSA$, as $μSA$ must use $H()$ from $μSC$ in order to compute the answer for $F()$. 
Trust?

\ Definition 1: **Trust** is the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other party will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party.

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Identity?

What *is* the identity of a microservice?
Instance ID

An instance should be identified by
- Name (µSA, µSC, etc.)
- Version (v1.0.1)
- Epoch Time (5s, 5456327s)

→ Micro-Service Instance ID (MIID)

List of contributing service instances (µSB+µSC)
→ Complete IID (CIID)
IID Protocol
For HTTP based communication

• Requesting an IID via Request Header:
  X-Instance-ID

• Responding to Request via Response Header:
  X-Instance-ID

• Optional Elements for RequestsID
  • IIDKey for Authentication

• Optional Elements for Responses
  • Additional Information <vA>

X-Instance-ID: empty | key=<IIDKey>

Structure of an HTTP IID request header

CIID := MIID [ "( " UIDs+ " )" ]
UIDs := CIID ["+" CIID]+
MIID := <sN>/"<vN>[/"<vA>]/"<t>"s"["<t>"s"

X-Instance-ID: CIID
Structure of an HTTP IID response header

MIID(µSA): msA/1.1.3/src%12s
MIID(µSB): msB/3.0/%77s
MIID(µSC): msC/2.1.1%4071s

CIID(µSA): msA/1.1.3/src%12s(
  msB/3.0/dev-9987efa%77s +
  msC/2.1.1%4071s
)
Think it a little bit bigger

Underlying principle: *Increasing trustworthiness by sharing information*

Structured, human and machine processable format

Include this into various type of applications, like mobile applications or IoT services

Disclose information about used
  - External services
  - AI models?
  - Algorithms?
  - Patents?

Like what SPDX is trying to solve for source-code licensing and license compliance
Conclusion

„A computer will do what you tell it to do, but that may be much different from what you had in mind.“
– Joseph Weizenbaum

Key takeaway
Whenever you design, implement or run a technical system, don’t promise only that your system is trustworthy. Document for and communicate to the end-user which components, services, models or algorithms your technical system is using or applying.
Further Questions?

\ If you liked the presentation or would like to comment
  - Use the comment sections

\ If you have questions or would like to discuss the topic
  - Contact me: vassiliou-gioles@tu-berlin.de
References


