Numericanal Project

Technical Evaluation of the Pilots

The Architecture Analysis for the Application of Waterrecreatie Nederland

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References

[1]	ISO/IEC 25000, System and Software Quality Requirements and Evaluation (SQuaRE). 2014.
[2]	Kruchten, Philippe (1995, November). Architectural Blueprints — The "4+1" View Model of Software Architecture. IEEE Software 12 (6), pp. 42-50.
[3]	"OMG Unified Modeling Language (OMG UML), Superstructure. Version 2.4.1". Object Management Group. 2014.

Confidentiality Level

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Confidential (for CETIC members only)	

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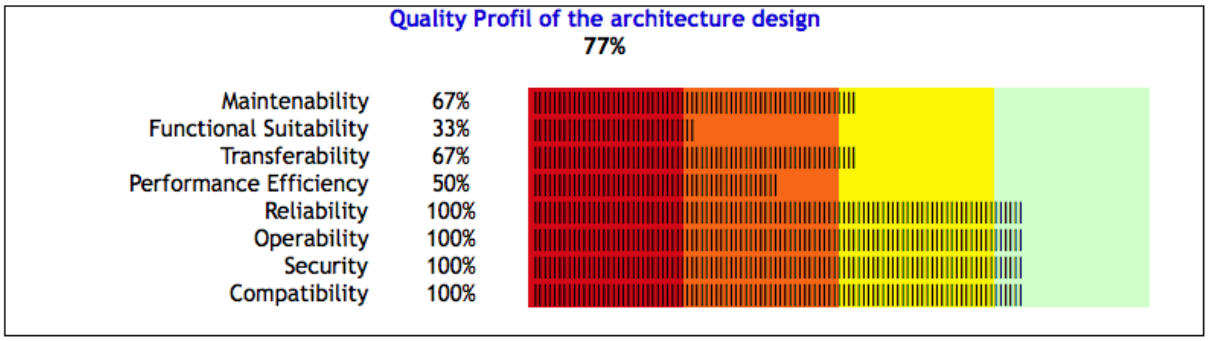
Executive Summary

Waterrecreatie Nederland Application Architecture Maturity



Caption: Risques **Very High** **High** **Medium** **Low**

Introduction

This document presents the results of a quality evaluation (called "Archicheck") of the VNF application architecture. This evaluation is based on a set of questions asked (interview) to one or more designer and developers of the application. Archicheck helps to quickly provide a quality evaluation report by relying on the software quality standard: ISO25000 [1]. The result of this evaluation allows identifying the strengths and weaknesses of the application architecture. In addition, the evaluation report helps to identify recommendations to improve the architecture as well as further analysis tracks. Archicheck considers on the following criteria:

- **Functional Suitability:** The capability of the software product to provide functions, which meet stated and implied needs when the software is used under specified conditions (what the software does to fulfil needs).
- **Reliability:** The capability of the software product to maintain its level of performance under stated conditions for a stated period of time.
- **Performance Efficiency:** The capability of the software product to provide appropriate performance, relative to the amount of resources used, under stated conditions.
- **Usability:** The capability of the software product to be understood learned, used and attractive to the user, when used under specified conditions (the effort needed for use).
- **Security:** The capability of the software product to protect system components from accidental or malicious use: access, modification, destruction or disclosure.
- **Compatibility:** The capacity of two or more software components to exchange information and / or perform their functions by sharing the same hardware or software environment.
- **Maintainability:** The capability of the software product to be modified. Modifications may include corrections, improvements or adaptations of the software to changes in the environment and in the requirements and functional specifications (the effort needed to be modified).
- **Transferability:** The capability of the software product to be transferred from one environment to another. The environment may include organizational, hardware or software environment.

Context

The evaluation described in the report concerns the application architecture of Waterrecreatie Nederland.
Evaluation data: 01/06/2015.
People interviewed: Richard BANK (Solitnet).

Participants: Manon VAN MEER (Waterrecreatie Nederland) and Mohamed BOUKHEBOUZE (CETIC).

Observations

- In general, the results are good for an overall score of 77%.
  - 4 criteria are well supported: operability, security, reliability and compatibility.
  - 3 criteria can be improved: performance efficiency, maintainability and transferability.
  - 1 criterion indicates an alarming situation: functional suitability (score below of 50%).
- The development of the Waterrecreatie Nederland application is based on the Mapbox framework[1]. This framework allows creating and sharing Web maps. The framework provides allows a SDK to develop an iOS and Android applications.
- The functional suitability criteria of the application are well covered since a data dictionary is available in order to describe all information about data objects or items in the database. In addition, the maturity of the developed components is determined (see Section 1).
- The reliability of the application is ensured since an exception-handling component is implemented. Moreover, a restore mechanism that reduces downtime of the service is implemented (see Section 2).
- The performance efficiency criteria of the application are well covered since the resources consumption and the workload variation are controlled (see Section 3).
- The application favours a good usability since it relies on standard user interface widgets, which makes the applications more intuitive (see Section 4).
- The application covers the security criteria: The security components are implemented. In addition, the application log traceability is taken into account, which helps identifying the cause of issues and application problems (see Section 5).
- All best practices are followed to ensure the compatibility since the list of alternatives third-party components is identified (see Section 6).
- The transferability of the architecture is ensured since a physical view of the system is defined. Moreover, The detailed network image of the architecture is available (see Section 8).

Recommendations

- Improve the documentation of the architecture by describing the 4+1 views of the architecture [3] (Section **Error! Reference source not found.** and Section 8):
  - **Logical view** is concerned with the functionality that the system provides to end-users.
  - **Development view** illustrates a system from a programmer's perspective and is concerned with software management.
  - **Process view** deals with the dynamic aspects of the system, explains the system processes and how they communicate, and focuses on the runtime 5ehaviour of the system.
  - **Physical view** depicts the system from a system engineer's point of view. It is concerned with the topology of software components on the physical layer, as well as the physical connections between these components.
  - **Scenarios** describe sequences of interactions between objects, and between processes.
- Improve the functional suitability by describing the data dictionary of specifique for the application (Section 1).
- Improve the reliability by implementing a mechanism for restoring solution reduces downtime of the service (Section 2).
- Improve the performance efficiency by estimating the time spent by each component for

[1] https://www.mapbox.com

the use of the resources (Section 3).

- Improve the maintainability by documenting the different aspect of the architecture (Section 7). This documentation should rely on standard description language (UML [2]). So that, handover of the architecture to new developers becomes easier.

1. Functional Suitability

The capability of the software product to provide functions, which meet stated and implied needs when the software is used under specified conditions (what the software does to fulfil needs).

Strengths

The maturity of the developed components was determined.

The maturity of the application depends on the maturity of the Mapbox framework. This framework is built on well-developed open source components like OpenStreetMap, CouchDB and Node.js. These components are maintained by a huge community. For this reason, the Mapbox framework is mature and adopted by major websites such as Foursquare, Pinterest, Evernote and National Geografic.

The identification of the maturity level (beta, stable, etc.) of each implemented component helps to indicate the expected quality the concerned component. This indication can be used to define the development roadmap and putting into production. An example of the level of maturity establishment is the analysis of the comments "TODO" or "FIXME" in the source code.

Recommendations

Write the architecture documentation.

The functional documentation is available. In addition, the Mapbox framework is well documented. However, it is suitable to document the specifique architecture of the application in order to justify the use of the MapBox framework for example.

A software architecture documentation gathers all the details of the software structure: the architectural views, the software components, properties of those components, and the relationships between them, etc. Documenting software architecture facilitates communication between stakeholders, captures early decisions about the high-level design, and allows reuse of design components between projects.

Prepare a data dictionary specifique for the application.

The data model of the application is defined by on the generic model of the Mapbox framework. The generic model of Mapbox is well documented and available online. However, it is suitable to also document the specific data model of the application in order to highlight the specific objects of the application.

A data dictionary allows describing all information about data objects or items in a data model: meaning, relationships to other data, origin, usage, and format. A data dictionary can be used to understand where a data item fits in the structure, what values it may contain, and basically what the data item means in real-world terms.

2. Reliability

The capability of the software product to maintain its level of performance under stated conditions for a stated period of time.

Strengths

An exception-handling component is available.

Mapbox relies on several exception-handling mechanisms to ensure the reliability of the application.

A component that handles exceptions allows ensuring that the application is running in controlled manner. Such a component should ensure that for unexpected inputs the application remains operational. This is very important especially when the application is available in SaaS mode because the error caused by a user can impact the user experience of other users.

A restore mechanism for the solution is available.

The Mapbox framework guaranties the high-level of performance. In addition, the framework enables to export data into local database. Based on this functionality, the data of the Waterrecreatie Nederland application are backuped into local database as well as JSON and KML files. This backup is done periodically using a script.

A mechanism for restoring solution reduces downtime of the service. This mechanism should ensure that all the necessary components and services are correctly restarted, in the correct order and without major loss of information.

The infrastructure support contract is available.

Mapbox provides a dedicated support for enterprises.

An infrastructure support contract helps to know on which aspects to focus when managing the infrastructure as third-party. Such a contract allows ensuring the availability of the application when the infrastructure is managed by a third-party company.

Recommendations

None.

3. Performance Efficiency

The capability of the software product to provide appropriate performance, relative to the amount of resources used, under stated conditions.

Strengths

A mechanism for resources consumption estimation is available.

The Mapbox framework enables the monitoring of the resources consumption.

A mechanism for measuring the consumption of resources allows planning the investments based on statistics and projections. In the case of SaaS solutions, this mechanism allows providing operating cost elements for determining the pricing of the service.

Recommendations

Estimate the time spent by each component for the use of the resources.

The time spent by each component for the use of the resources is not available.

Performing a profiling application can identify which parts of the application (modules, and treatments algorithms, etc.) require a longer running time. These parts should be played special attention during the optimization phase.

4. Usability

The capability of the software product to be understood learned, used and attractive to the user, when used under specified conditions (the effort needed for use).

Strengths

A help section is available in the application.

Some functionalities description is available. In addition, the mobile applications relay on standard user interface widgets, which makes the applications more intuitive.

Define a help in the application facilitates the handling and understanding of the application and contributes to user satisfaction.

A user interface modelling is available.

The user interface sketch is available.

A user interface modelling allows validating the sequence of screens (navigation diagram), and taking into account the interactions of the user interface with the business layer.

Recommendations

None.

5. Security

The capability of the software product to protect system components from accidental or malicious use: access, modification, destruction or disclosure.

Strengths

A security management component is available.

The security components are implemented. In addition, Mapbox supports SSL protocol that is a necessity for every secure application.

A security management component is important whatever the application. The level and type of security that are managed by this component depends on the application context. These levels and types of security should be described in the component documentation.

The application log traceability is taken into account.

The application relies on the traceability mechanisms provided by the Mapbox framework.

The traceability of the application log is useful for identifying the cause of issues and application problems. The application log can also be used to establish application usage statistics. This traceability should be pondered to ensure that consistent information is reported when using logging mechanisms (log4j, log4net, etc.).

Recommendations

None.

6. Compatibility

The capacity of two or more software components to exchange information and / or perform their functions by sharing the same hardware or software environment.

Strengths

An Application Programming Interface is implemented.

Mapbox APIs can be used to exchange data with the Waterrecreatie Nederland application.

An Application Programming Interface (API) enables data sharing between internal IT systems and between one organisation and another. API also allows ensuring interoperability, usability, and reusability.

A list of alternatives external components is available

A list of alternative map engines is identified.

The identification of the alternatives external components allows ensuring an alternative solution in case one of them becomes unavailable. These alternatives should be compatible with the exiting architecture components.

Recommendations

None.

7. Maintainability

The capability of the software product to be modified. Modifications may include corrections, improvements or adaptations of the software to changes in the environment and in the requirements and functional specifications (the effort needed to be modified).

Strengths

The licenses of the tiers components are available.

The Mapbox license is available.

Having licenses on third-party components is important to avoid legal problems, branding, negative campaigning, etc. A support contract should be concluded and the conditions properly analyzed, mainly in terms of availability, time management and bug fixing time.

Middleware software is used to connect software components or enterprise applications.

The application relies on the middleware layer of Mapbox to integrate the different components.

A middleware layer provides uniform, standard, high-level interfaces to the application developers and integrators, so that applications can be easily maintained, composed, reused, ported, and made to interoperate.

Recommendations

Use UML diagrams to describe the architecture.

UML language is not used to describe the architecture [3].

UML is the standard language for documenting and modelling system. UML provides multi-level diagrams to describe the structure and the dynamic aspect of the architecture in understandable way. So that, handover the architecture to new team becomes easier. In addition, The development of the UML diagrams can be reduced by using the different UML support tools that are available on the market.

8. Transferability

The capability of the software product to be transferred from one environment to another. The environment may include organizational, hardware or software environment.

Strengths

A setup mechanism is available.

The iOS and Android applications are available on App Store (Apple application store) and Google Play (Google application store) respectively. The setup of the application is managed by these stores. In addition, documentation is available to describe the setup process of the test version of the iOS and Android applications.

A setup mechanism allows automating (part of) the installation of the solution. This mechanism enables to simplify and speed up the installation of a new version of the solution.

Recommendations

Define a physical view (deployment diagram) of the system.

A deployment diagram is not available.

A physical view depicts the system from a system engineer's point of view. It is concerned with the topology of software components on the physical layer, as well as the physical connections between these components. This view is also known as the deployment view. UML Diagrams used to represent physical view include the Deployment diagram. (Source: Wikipedia)