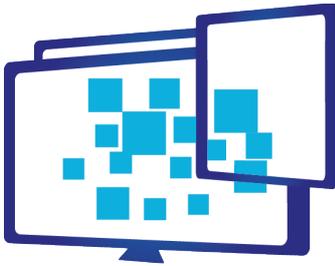


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MediaScape

Dynamic Media Service Creation,
Adaptation and Publishing on Every Device

WP2 – DESIGN – Design and specification

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1. Introduction

This document describes the prototype testing methodologies and metrics applied in WP6. The guidelines considered in this document are the basis for the evaluation of prototype testing and as well as for the required output documentation of WP6. Even more, the testing methodologies presented in this document are also applicable to all the developed components within WP3, WP4 and WP5.

Predefined prototypes are the basis for the evaluation and validation of MediaScope capabilities. On the one hand, these prototypes implement the scenarios described in T2.1 that cover the objectives to be achieved in the project; on the other hand, the prototypes can also represent concrete components developed in WP3, WP4 and WP5 that are considered highly relevant for MediaScope. The basic methodology defined in this document aims at enabling validation and testing; it will also be possible to obtain detailed metrics depending on the type of testing being performed. These metrics are not limited to those defined here, as the definition of the prototype itself will determine exactly which metrics are used in each case.

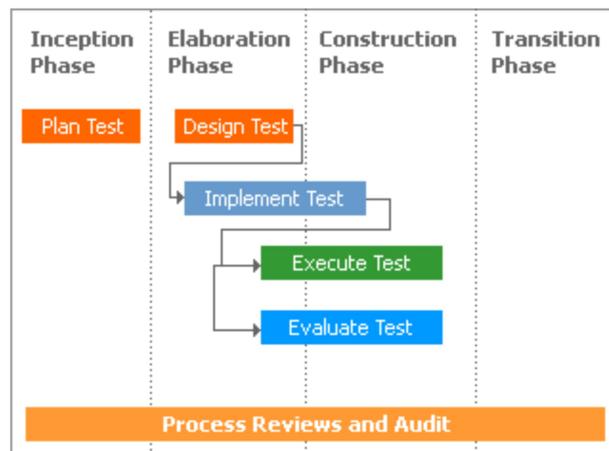


Figure 1: Sequence of Testing processes

To validate the prototypes in depth, testing is considered from two different perspectives: testing of prototype components that encompass both the technical and functional testing, and testing of end-user facing components.

- Prototype components testing
 - *Technical testing* is based on the defined prototype or components
 - *Functional testing* is based on the use cases defined in Task 2.1
- End-user experience testing estimates the usability of the prototype

In general, there are several steps that must be fulfilled in a validation process in order to ensure its completeness:

- Identifying existing project information and the prototype/components that should be tested.
- Listing the recommended test requirements (high level).
- Describing the testing strategies to be employed.
- Identifying the required resources and providing an estimate of the test efforts.
- Listing the expected outcomes of the test activities.

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The last four steps must be done for the two levels of the testing process. To go further, a continuous integration process is useful to ensure that the software passes successfully all test cases when code written by individual developers is integrated together. This often forms part of an automated continuous build and deployment process that the Mediascape project is considering.

As stated in the project work plan, testing and validation tasks are taking place in two different periods:

- First, starting with the initial prototypes defined in D6.1; the results obtaining after the testing will feed the prototyping and testing tasks in the following period, moving forward to the endorsement of MediaScape capabilities.
- These second period prototypes, described in D6.2, will be the basis for the final testing process of the project. In this final stage, the completeness of the validation process will increase, and its results will be captured in the final D6.4 and D6.5 deliverables.

2. Prototype components testing

In this section, the technical and functional prototype testing methodologies are described. As stated above, these methodologies describe the procedure to do the process but they don't describe the testing process itself as testing is considered as inherent to each prototype. Remark the need of an iterative process for a successful achievement of the project.

In addition, the conclusions extracted from the first end-user experience testing will permit the redefinition of the technical and functional aspects to be analyzed, becoming the prototype testing an integral process.

2.1. Technical prototype testing

The technical prototype testing will be made based on the prototypes defined in T6.1 that are expected to fit as partial solutions of the user scenarios.

Prototyping consists on the integration of the modules developed in WP3, WP4 and WP5, guided by the documentation exposed in the respective technical deliverable. Each responsible of the development of a given module is in charge of the definition of the technical testing metrics, in order to assure the alignment between development and testing. These tests are particularly important as the components are libraries and software developed across multiple sites and organisations.

Components of prototypes and other pieces of software developed during the project will have automated unit tests created alongside the code, to verify that the code behaves as expected. This can be done following a test-driven or behaviour-driven development method, or tests may be written after the initial code has been developed.

The listing below identifies some items that have been identified as targets for technical testing. This list is not meant to be exhaustive, and new metrics will be included for modules taking into account their nature and design.

- Performance testing: The goal of performance testing is to verify and validate that the performance requirements have been achieved. Performance testing is usually executed several times, each using a different "background load" on the system. The initial test should be performed with a "nominal" load, similar to the normal load experienced (or anticipated) on the target system. A second performance test is run using a peak load. The following metrics are typically considered:
 - Response time
 - Latency
 - Access time to external systems
 - Load testing
 - Concurrency
 - Consistency
- Stress testing

- Volume testing
- Security and Access Control testing
- Fail over / Recovery Testing
- Errors management (logging)
- ...

For each prototype module this table must be filled out, that represents the metrics that must be validated technically for each module. Therefore, this table will sum up all the metrics that has to be considered when prototype testing phase.

Prototype 1:

	Concurrency	Latency	Error management	Consistency	...	
Module 1 (WPx)	X					
		X				
Module n (WPx)		X				

During the final testing period, the results for each metric will be captured and all the information will be gathered in the deliverable D6.4 Final functional and technical testing report.

2.2. Functional prototype testing

While technical testing is based on the modules that constitute the defined prototypes, functional testing is based on the functional aspects of the selected use cases. Testing of the application should focus on any target requirements that can be traced directly to use cases. The goals of these tests are to verify proper data acceptance, processing, and retrieval, and the appropriate implementation of the use cases. This type of testing is based upon black box techniques: functions are fed with an input and their output is examined, omitting the internal structure.

Three main steps are considered for the functional testing:

1. **Identify and prioritise functional blocks:** Identify the functional blocks associated with the solution being studied. Each block should represent one aspect of the concept to be tested. These blocks don't need to match exactly with the modules isolated for the technical testing.

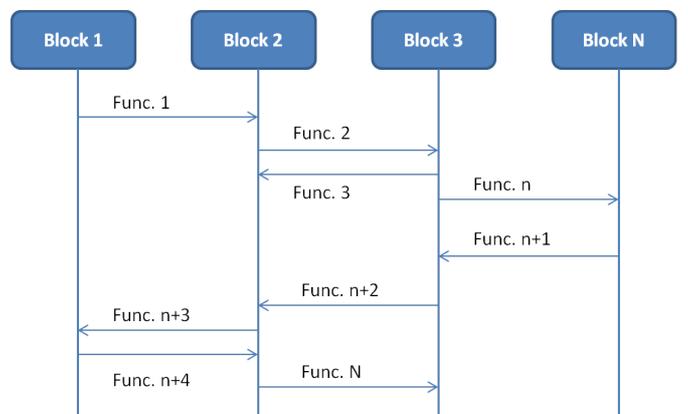


Figure 2: Sequence of Testing processes

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2. **Define the functional sequence for each use case:** Once the blocks have been identified, it is necessary to define the sequence of the functions that is going to be tested along the blocks.
3. **Objectives of the test (based on the functional sequence):** The objectives must correspond with the requirements designated for the completion of the use cases, adapted to the sequence of functions based on blocks. Namely, each of the function is going to have its relevant objective.

3. End-user experience prototype testing

The objective of MediaScape prototyping task is to have a set of prototypes that enhance the output of the project. Therefore, end-users testing is a very relevant task that can evaluate the completion of Mediascape goals. The testing methodology determines that end-user testing will be focused to three different agents: broadcasters, developers and users and depending on the needs of them the defined metric will be different. The following section presents some of the metrics that can be considered when testing. These metrics are general metrics, that can be adapted to the testing of different agents. In the next section, there are the main testing concepts to take into account when end-user testing.

As already mentioned in the previous sections, not all the prototypes should perform the tsting from the perspective of the three different agents. Depending on the nature of the prototype the responsible of the prototype will determine which of the testing are covered.

3.1. End-user testing of prototypes of different fidelities

As we iteratively develop prototypes it is useful to evaluate them at multiple points in the development process. This can mean evaluation and low, medium or high level of fidelity or finished-ness.

A description of evaluation at different levels of fidelity with the purpose, advantages and disadvantages of each of the levels. This description is aimed at web-based prototypes, but can be used more broadly. We address the particular issues of physical device prototypes below.

3.1.1. Sketching

Sketches and walkthroughs of a scenario, stages of a service experience, or steps a user takes to complete a task.

Purpose:

- To quickly evaluate ideas with users
- Evaluate multiple solutions
- To get an overview of the whole service

Advantages

- Fastest to develop and easy to iterate
- Collaborative (can involve all project team, stakeholders & customers)

Disadvantages

- Linear, not interactive
- Not all people feel confident about drawing skills. Can use templates to aid

3.1.2. Lo-fidelity prototypes

Lo-fidelity paper or physical prototypes that users can 'experience'.

Purpose:

- To evaluate a concept with users

Advantages

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- Rapid and easy to iterate something users can experience
- Users feel more comfortable giving honest feedback

Disadvantages

- Need someone to facilitate the study with users and to operate the prototype
- Limited scope with presentation and interactivity

3.1.3. Clickable demonstrators

- Clickable demonstrator; scripted paths
- Smoke and mirrors

Purpose:

- To evaluate a concept with users
- Focus on breadth or depth of the service, i.e. specific feature/s or user tasks, not whole system

Advantages

- Interactive
- User operated
- Can be experienced on the intended device

Disadvantages

- Not as quick to develop or as easy to iterate; can't be used 'in the wild'
- Not fully functioning
- Need a facilitator to explain limitations
- Sets high expectations which may not be met

3.1.4. Part- or fully-functioning prototype

- Part- or fully-functioning prototype to be used in a more natural situation
- Real code, real or canned data

Purpose

- Testing the concept in the wild
- Longitudinal study
- Technical proof of concept

Advantages

- Can test how it fits into people's lives and how it is used over time

Disadvantages

- Harder to iterate when build time has been invested
- The focus of users attention may shift to superficial aspects rather than the content

3.1.5. Evaluation

At the end of the process of prototype creation, there are a number of formal evaluation techniques that can be used for the end-user experience testing:

1) Questionnaires and surveys:

A large sample can be contacted quickly and cheaply. Online tools can help gather and analyse data.

2) Semi-structured interviews

The interviews are structured around a topic guide to ensure that the main research objectives are covered;

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anything relevant for the study can be covered.

3) Focus groups

Similar to semi-structured interviews – except carried out with a larger group, to help gain insights into participants' motivations and thinking processes.

4) Experience prototyping

Participants experience what it is like to use your system by using low fidelity prototypes. You will learn about assumptions and beliefs around using a system.

3.2. Testing from the perspective of different actors

The previous subsections detail the testing metrics from end user perspective taken into consideration for MediaScape first iteration developments. But these testing metrics are not divided in different scenarios where the perspective of different actors such as MediaScape users, developers or broadcasters are taken into consideration. Even though Section 3.1 lists some of the metrics that can be adaptable to the kind of end-user that different testing processes imply.; still there is a need of adapting the testing metrics to the different actors. In order to define these metrics, the testing methodology will be based on the identification and validation of the benefits that MediaScape solution can contribute to the users. In deliverable D2.1 Usage Scenarios and Requirements, some of these benefits are already mentioned.

Below, there are some main aspects that can be considered for the testing of the different actors. These are some basic guidelines with the aim of having some common metrics.

- **User perspective**
 - Personalization → Has been the application adapted to his/her characteristics?
 - Social immersion → Permits the application having social immersive activities? And creating groups of interest? Is the interaction permitted? How good is the social experience?
 - Mobility → In order to validate if the can move around and continue with the application.
 - Control → How easy is to control the application? Permits moving the controls from one device to another?
 - Experiences → What about user-experience?
 - Content distribution → Can be the content be distributed.
 - Easiness → Identify how easy is to use these applications.
- **Developer perspective**
 - Standardization → Are MediaScape prototypes based on current standards?
 - Testability → Can the code be tested easily?
 - Transferable skills → Can the skills learn during the development of MediaScape application be transferable to elsewhere?
 - Abstraction → Do MediaScape technologies permit the abstraction from the how to do question in order to focus on the what?
 - Creativity → Can developers let fly their creativity or do they have tight requirements of MediaScape technologies that don't allow them to develop by their wills?
 - Innovation --> Related with the creativity. How innovative are the applications that can be created using MediaScape technologies?
- **Broadcasters perspectives**
 - Reach → Will the developments of the applications based on MediaScape technologies permit to reach new audience groups?
 - Accessibility → Are applications accessible to all the audience groups? How accesible they are?
 - Reuse → Can the content be reused by new applications? How much of this content can be reused? Is possible to repurpose the current content?
 - Attention keeping → Do the developed applications permit keeping the audience attention focused on the media? Are the users changing to other medias in their second devices? Or are they keeping their focus on our media content?

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- Share → Do the applications permit maintaining the market share?

3.3. The challenges of working with physical objects

For testing physical devices (prototype TVs, radios and other objects in combination with each other), the types of prototypes are similar, but hardware development takes longer and so iterative testing of low-fidelity prototypes and experience prototyping becomes more important. In order to get early feedback and not waste time on prototypes that are not useful, stages of "pretyping" (interacting around non-functional, lo-fidelity prototypes) may form a larger proportion of the testing effort.

For similar reasons, the use of participatory design workshops may make the process more efficient, by helping us discard ideas for prototypes that are not useful early in the process. Experience prototyping at events (such as Maker Faire or Mozilla Festival) may make the gathering of feedback more efficient.

4. Conclusions

As aforementioned, during the first iteration of the project, mostly technical prototypes will be developed and tested. Therefore, each prototype will define its own testing metrics accordingly to their requisites. During this period, the testing metrics will be very diverse as the testing methodology determines the methodology of how to proceed but doesn't fix the concrete metrics that each of the prototypes needs to test. This concludes in a set of independent prototypes that have their own testing results. As this stage of the prototyping, testing results will show the progress of these developments, permitting the identification of new

During second iteration, prototyping will evolve forward a more integrated and end user perspective solutions which will entail the need of the definition of testing metrics adapted to different end user perspective. Even more, the prototypes will be based on the scenarios defined during the specification phase, so therefore, the definition of the metrics should assure that the objectives of each of the scenarios are overtaken from the perspective of different agents.

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