In the context of this survey we define a Distributed and Heterogeneous System (DHS) as a set of small independent systems that together form a new distributed system, combining hardware components and software system, possibly involving mobile and cloud-based platforms.

The main goal of this work is to explore the testing of DHS from the point of view of industry practitioners, in order to assess the current state of the practice and identify opportunities and priorities for research and innovation initiatives.

We shared the survey to the participants of two industry-oriented conferences in the software testing area:

- **TESTING Portugal 2015**
- **User Conference on Advanced Automated Testing (UCAAT) 2015**

In total we distributed 250 surveys and we obtained 147 complete and valid answers.

Regarding the conclusions that can be drawn for future work, particularly at the level of research, it becomes clear that there is a significant gap yet to be filled between the current status, shows that there is a significant gap yet to be filled between the current status and the desired status of automatic test case execution.

### Survey Distribution

**In what industry is your company working?**

- **Aerospace**
- **Financial**
- **Telecommunication**
- **Government and Military**
- **Manufacturing/Food**
- **Consumer Goods**
- **Healthcare**
- **Retail**
- **Entertainment/Video**
- **Other**

**Which test levels are performed by your company, if any?**

- **Unit testing**
- **Integration testing**
- **System testing**
- **Acceptance testing**
- **验收**
- **I've never worked with software testing**

**What is the size of your company?**

- **Less than 10 collaborators**
- **10 to 50 collaborators**
- **50 to 100 collaborators**
- **100 to 500 collaborators**
- **More than 500 collaborators**

**Which tools are used?**

- **Microsoft Visual Studio**
- **JUnit**
- **TestNG**
- **PowerBuilder**
- **Other**

**What is your main responsibility in your current position?**

- **Software engineer**
- **Quality assurance engineer**
- **Manager, head of department**
- **Developer**
- **Other**

**How long have you been working with software testing?**

- **Less than 1 year**
- **1 to 3 years**
- **3 to 5 years**
- **5 to 7 years**
- **More than 7 years**

**How long have you been working in your current position?**

- **Less than 1 year**
- **1 to 3 years**
- **3 to 5 years**
- **5 to 7 years**
- **More than 7 years**

**Which software test tools are performed in your company, if any?**

- **Smoke Testing**
- **Integration**
- **Functional**
- **Usability**
- **Regression**
- **I've never worked with software testing**

**Please rate the degree of importance of testing each of the following features of distributed and heterogeneous systems:**

- **Usability of platform**
- **Non-deterministic behavior**
- **Time communication**
- **Resilience and recovery**
- **Interactions between components of the system**
- **Interactions between the system and the environment**

**Please rate the degree of importance of each of the following features of a test automation solution for distributed and heterogeneous systems:**

- **Support for multiple platforms**
- **Support for automated test generation**
- **Support for test execution engines**
- **Support for test management**

### Research Questions

**RQ1: How relevant are DHS in the software testing practice?**

A vast majority of approximately 90% of the companies surveyed (all with software testing activities in general) conducts tests for DHS, in at least one role and at least one test level, hence confirming the high relevance of DHS in software testing practice.

**RQ2: What are the most important features to be tested in DHS?**

‘Interactions between components of the system’, followed by ‘Interactions between the system and the environment’

**RQ3: What is the current status of test automation and tool sourcing for testing DHS?**

The current level of test automation for DHS is still very low, and there is large room for improvement, since 25% of companies in the survey claim that they only perform manual tests, against only 16% who claim to test DHS with a full automatic process.

If we look for companies that have some type of automation in its testing process, we realize that the automation process is requiring a high effort in the creation / adaptation of own tools, because only 31% of companies claim to use a commercial tool to test these types of systems.

**RQ4: What are the most desired features in test automation solutions for DHS?**

Regarding the conclusions that can be drawn for future work, particularly at the level of creating tools that can reduce the effort required to test DHS, we realize that companies identify as key aspects of a tool to test such systems the ability to automate test execution and the support for multiple platforms.

The comparison of the degree of importance attributed to automatic test case execution with the current status, shows that there is a significant gap yet to be filled between the current status and the desired status of automatic test case execution.