

Developing a Tool for Testing Compatibility of Websites with ATs

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Abstract

We present a tool for testing compatibility for websites with assistive technologies and discuss key challenges and methods for such testing.

Keywords

Universal design, WCAG, assistive technology compatibility, screen reader compatibility, AT, inclusive design, accessibility testing tools, cloud service

Introduction

The W3C Web Content Accessibility Guidelines 2.0 Guideline 4.1 calls for optimizing compatibility with current and future user agents including assistive technologies (AT) (W3C Consortium 2008). This requirement does not only concern technical accessibility, but also requires that the ICT solution is usable (i.e. perceivable, operable and understandable) with any AT that people are dependent upon (Fuglerud et al. 2014).

Experience shows that adhering to web standards does not necessarily ensure full compatibility at all levels between web sites and assistive technologies. Research also shows that conformance to the WCAG-standard does not guarantee fully usable web experiences for persons using AT (Power et al. 2012) and (Cooper et al. 2012). Therefore, we aim to develop an online tool for testing compatibility between any website and a range of web browsers and AT solutions. The objective is to develop a comprehensive online tool for developers allowing continuous testing of website compatibility with ATs through the entire development process.

In this paper we will present our prototype Virtual Assistive Technology Lab (VATLab), our research leading to the key requirements for this tool and discuss the basic functional aspects of the solution. Furthermore we will give an overview of the accompanying tutorial and information material.

Background

The United Nations Convention of the Rights of People with Disabilities define universal design as, “The design of products, environments, programmes and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design. "Universal design" shall not exclude assistive devices for particular groups of persons with disabilities where this is needed.” (UN 2006). Assistive devices or assistive technology (AT)

can be defined as any equipment, product system, hardware, software or service that is used to increase, maintain or improve capabilities of individuals (ISO/IEC Guide 71).

The information about each element on a website that is exposed to AT by web browsers varies between different brands and versions of these. The way the information conveyed from the web browser is interpreted and output to the user through e.g. speech or braille also varies. In addition to this is the issue of software versions of both screen readers and AT. This leaves us with a complex matrix of web browsers and ATs, as illustrated in figure 1.

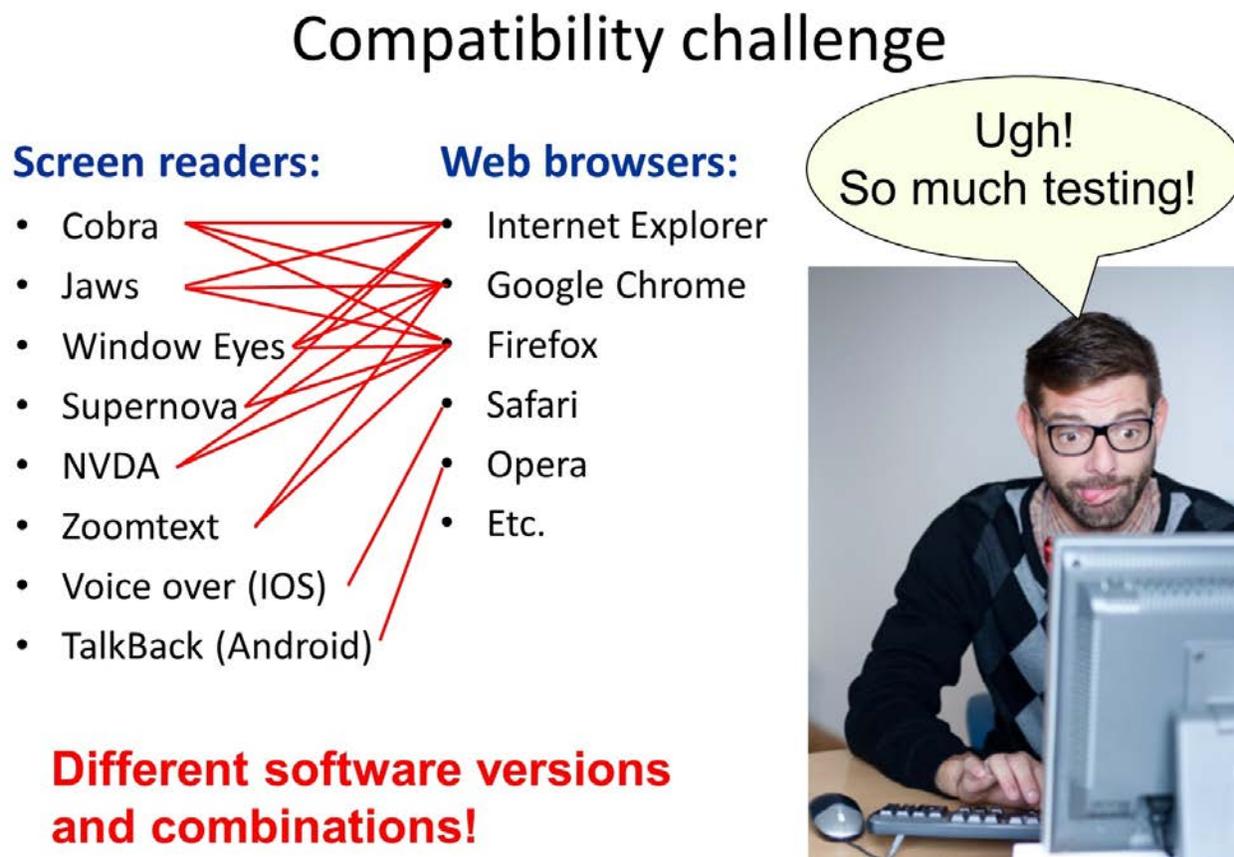


Fig. 1. Compatibility challenge - Screen readers vs. web browsers.

In "Challenges with assistive technology compatibility in universal design"

(Fuglerud:2014) we explored the potential for an online tool to facilitate accessibility testing with different combinations of web browsers and ATs. Additionally we discussed results from

focus group interviews with web designers and developers, both from the private and the public sector. The focus group participants reported that they felt a need for more knowledge, guidance and recommendations about AT compatibility and testing in general. They also found it difficult to adapt the development process to take into account the ever changing versions of browsers and ATs. Lastly, a major challenge in their daily work was that ATs are expensive and complex to install and maintain.

From this we concluded that there is a need among developers for a tool for testing website and AT compatibility and that such a tool must be supported by guidance and information on the operation of the AT as well as include methods for effective testing. In addition to this there was a strong request for documentation on how many and which AT products and versions are in use.

To our knowledge, the only existing source of information on which ATs are currently in use by blind and partially sighted is the Webaim Screen Reader User Survey (Webaim 2015). This survey is aimed at an international audience, and does not necessarily represent screen reader users in Norway. Firstly, only 20, 6% of responses were received from European users, and secondly, the sample is not controlled and thus does not necessarily represent all screen reader users.

Being aware that the situation in Norway most likely would be different than the one represented by this survey, we decided to obtain statistics for Norwegian AT users, especially screen reader and magnifier users. Numbers were collected from the Norwegian Welfare and Labour Administration (NAV) for Assistive Technologies given to users from 2006 until 2012. As these reports consist of vast amounts of information we have simplified and categorized the different products into full licenses and upgrade licenses for each product. Although these

numbers do not indicate which ATs are actually used by the individual users, they give a good overview of the situation. As free and open source ATs, along with ATs built into operating systems become more widely used, these numbers become less precise as they only represent ATs granted by the Norwegian Welfare and Labour Administration.

As seen in table 1, AT usage numbers are quite different from those indicated by the Screen Reader User Survey. This underpins the need for emphasis on thorough research before drawing conclusions on which versions of Web Browsers and ATs to support and/or test.

Table 1. Screen readers and screen magnifiers in Norway in recent years
(numbers from the Norwegian Welfare and Labour Administration).

Type\Year	2006	2007	2008	2009	2010	2011	2012	Sum
Blindows full license	0	2	1	0	0	0	0	3
Bigshott full license	2	2	0	0	0	0	0	4
Cobra full license	0	0	0	0	0	1	1	2
Dolphin guide full license	0	0	0	0	0	1	51	52
Hal or Supernova reader full license	6	5	14	8	5	5	3	46
Hal or Supernova reader upgrade	0	1	6	2	5	3	2	19
JAWS full license	42	56	40	23	21	20	13	215
JAWS upgrade	16	63	61.5	97	177	129	194	737.5
Lunar, Lunar plus or Supernova Magnifier	14	7	14	31	27	23	10	126
Lunar, Lunar plus or Supernova magnifier upgrade	1	2	2	6	1	2	1	15
Magic full license	4	11	5	7	3	1	2	33

Type\Year	2006	2007	2008	2009	2010	2011	2012	Sum
Magic and Jaws full license	5	9	2	13	25	36	27	117
MyStick full license	0	0	2	3	0	0	0	5
Supernova magnifier reader and Access Suite full license	59	74	38	50	74	40	23	358
Supernova upgrade	17	10	49	45	50	31	23	225
Supernova additional license	3	0	0	0	0	0	0	3
BAUM Virgo full license	0	0	0	1	0	0	0	1
Window-Eyes full license	10	15	11	12	15	11	7	81
Window-Eyes upgrade	0	10	2	12	11	12	7	54
Zoomtext full license	221	263	203	250	256	237	223	1653
Zoomtext upgrade	33	51	33	49	48	17	92	323

The Virtual AT Lab (VATLab)

There are several practical obstacles for developers when testing websites for compatibility with AT in realistic settings i.e. with various combinations of ATs and web browsers. Important obstacles have been identified as the costs of acquiring the AT software and hardware, the complexity of installing and maintaining the software and the lack of knowledge and experience on using the AT tools in a way that resembles the average AT user.

The complexity in ensuring compatibility with AT is multifaceted, however one of the key challenges is the varying degree to which the AT manufacturers are implementing the evolving web standards and guidelines e.g. HTML5 and WAI-ARIA into their products. The varying degree of implementations of these standards and guidelines makes it difficult for a

developer to predict the end user experience of a certain design choice or coding technique in websites.

Traditionally a web page consisted of static information. This is no longer the case as most websites includes some dynamic widgets where content changes after the page has been loaded and parsed by the web browser. Other websites or web applications are constructed to replicate the look and feel of a desktop application. Such web pages often rely heavily on the latest additions to web standards and push the limits of what is possible within the framing of HTML and CSS. These solutions typically include interactive dynamic controls that do not utilize standard HTML controls, but are developed through applying specific visual properties and attaching scripts to handle their operation. Such practices requires thorough and systematic compatibility testing with various types of AT.

Another factor contributing to the complexity of ensuring compatibility with different ATs is the multiple layers of communication that exist between the website itself and the AT. The web browser parses the HTML, CSS, scripts and other web content, renders a DOM tree from which information is passed on through an Accessibility Application Programming Interface (API) where it is made available to the AT. Here, incompatibilities may arise on every level and at all entity interfaces.

Recognizing the importance of testing dynamic controls, the VATLab tool must not only access a certain page at a given URL. It should also offer the opportunity to interact with the page and thereby to test compatibility with both static and dynamic content. The aim of developing VATlab is to develop a tool that supports testing of compatibility with AT and consequently focus is on the technical aspects of web accessibility rather than the user experience. However, ensuring compatibility with ATs is not, and cannot be, restricted to

technicalities like semantic markup and focus control. A precondition for accessibility is that the AT user is able to perceive the information conveyed through the web site, operate the web pages controls, and understand how to solve user tasks in an equal manner as users who do not rely on ATs.

This led us to consider two approaches for developing VATlab:

1. Analyzing the behavior of web sites with various combinations of web browsers and ATs in different setups, and based upon this, developing a tool emulating this behavior. This would give a developer a quick way to evaluate compatibility of web sites with a given combination of browsers and ATs.

2. Establishing a technical solution for running the different ATs and web browsers in a cloud-based environment, ensuring that there is a quick way to switch between combinations of ATs and browsers.

To ensure that the VATlab tool accurately reflects the divergences in implementation of standards and guidelines in ATs we selected the approach of designing a cloud based tool where the web developer accesses the real AT and browser software running inside its native environment and on its native platform. This approach also preserves the details in the way that information is passed through and from the web browser to the AT, and thereby gives the user of the VATLab the most realistic experience.

Based on these key requirements we developed a prototype that allows the running of any combination of the installed web browsers and ATs in a virtualized-based cloud environment. The VATlab prototype can be remotely accessed. In this prototype the screen reader NVDA and the screen reader and magnifier Dolphin Supernova Access Suite are installed, but other ATs could easily be added to the platform. We have also installed the web browsers Mozilla Firefox,

Google Chrome, Opera in addition to Internet Explorer.

An easy to use control panel was designed to enable the user of the VATLab to start and stop the different AT software, launch the different web browsers, and access our online tutorial on testing accessibility of websites with ATs.



Fig. 2. Start screen of the VATLab Tool.

Preliminary feedback

The prototype has been tested and evaluated by a team of developers from The Norwegian Directorate of Health, and among their findings are:

- The VATLab is easy to integrate into the current development process

- Using the tool enables them to be more efficient in their development processes due to shorter testing cycles and less demand for external accessibility evaluations.

Because of this they feel that their web solutions have a higher level of accessibility before user testing begins, and thus, user tests can focus more on user experience than technical accessibility and compatibility issues.

Guidance and information

Supported by the conclusions of our focus groups to be useful for the average developer or web designer the VATLab tool must be accompanied by guidance and documentation on

- a) The usage of the tool itself
- b) The operation of the different AT products
- c) General techniques for reading and navigating websites using ATs
- d) Methods for effective accessibility and usability testing with ATs

Taking this into account we developed the “Handbook for VATLab - a tool for technical accessibility testing with Assistive Technologies” to compliment the VATLab tool. This handbook is so far available in Norwegian only and contains:

- What is technical accessibility?
- What kind of ATs exist?
- How do ATs work?
- How to test for technical accessibility/compatibility with ATs?
- Common accessibility problems and suggested solutions

In our search for related work we have not found any methodology for heuristic evaluations of websites specifically from the perspective of an AT. We have therefore identified two possible approaches to such a methodology:

1. Heuristic evaluation with the primary focus on solving user tasks taking into account the actual user experience for users of AT.
2. Systematic testing of all components on a website to ensure that semantic information such as states, roles and properties are properly conveyed to the user of ATs, and that operation of the controls is possible.

A combination of the above testing strategies is believed to be an effective and efficient way to evaluate compatibility between website and combinations of web browsers and ATs, but further research is required to develop a complete methodology for this topic.

Conclusion

Above we have highlighted some of the important factors to consider when designing a tool for developers and designers to ensure compatibility between websites and ATs. We presented a prototype for a tool that we believe can contribute to an increased focus on this aspect of accessibility. Further research is however needed to document the use of different types and versions of ATs among web users with disabilities. Furthermore we have identified a need for research to develop a methodology for accessible user experience evaluations, which would be a natural next step for the VATLab project.

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