Prosperity 4all

Ecosystem infrastructure for smart and personalised inclusion and PROSPERITY for ALL stakeholders

D301.3 Applications for improved access to technology for dementia sufferers /carers enhanced with P4A tools

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4	05/11/2017	Steve Lee	OpenDir	Rework according to reviews

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Executive Summary

This deliverable presents the work of OpenDirective and outcomes of task T301.2: Improving access to technology for dementia sufferers/carers. T301.2 attempts to enhance Brian, an open source project designed to enable people with dementia and their carers to easily access and share media and communications. The enhancements make Brian more suitable for the target users and adds new features provided by tools found in the DSpace. The exercise also provides useful example usage of the DSpace.

During the project time spent by OpenDirective on this task we assessed the suitability of various tools from SP2 that are available in the DSpace. We searched for those that could potentially be used for enhancing the Brian application. The set of potential tools was then narrowed down to a shortlist. Then, selected tools were successfully integrated into Brian, thus improving the user experience.

The SP2 SteppingStones Framework and the Assistance on Demand tool were both found to add significant value to the project and will enhance the planned commercial product. OpenDirective are thus happy that the DSpace is a valuable tool for other developers looking to build or enhance assistive technology.

1 Contribution to the global architecture

As shown in the figure below, the work covered by this deliverable contributes to the global P4All architecture by integrating resources developed in SP2 and offered through Dspace. It utilizes outputs from several of the SP2 teams including another work package by OpenDirective. This package also provided feedback to other work packages and the DSpace itself. The enhanced Brian and eventual commercial project will also become part of the DSpace (and the related Unified Listing), thus adding more value to the ecosystem of Assistive Technology developers and users.

During the project we also interacted with the SP4 evaluation and SP5 market teams through discussion etc. OpenDirective are extremely keen to take advantage the SP1 and SP5 outputs to inform us how we might successfully take Brian to market.

Figure 1: Overall Picture of Prosperity4all
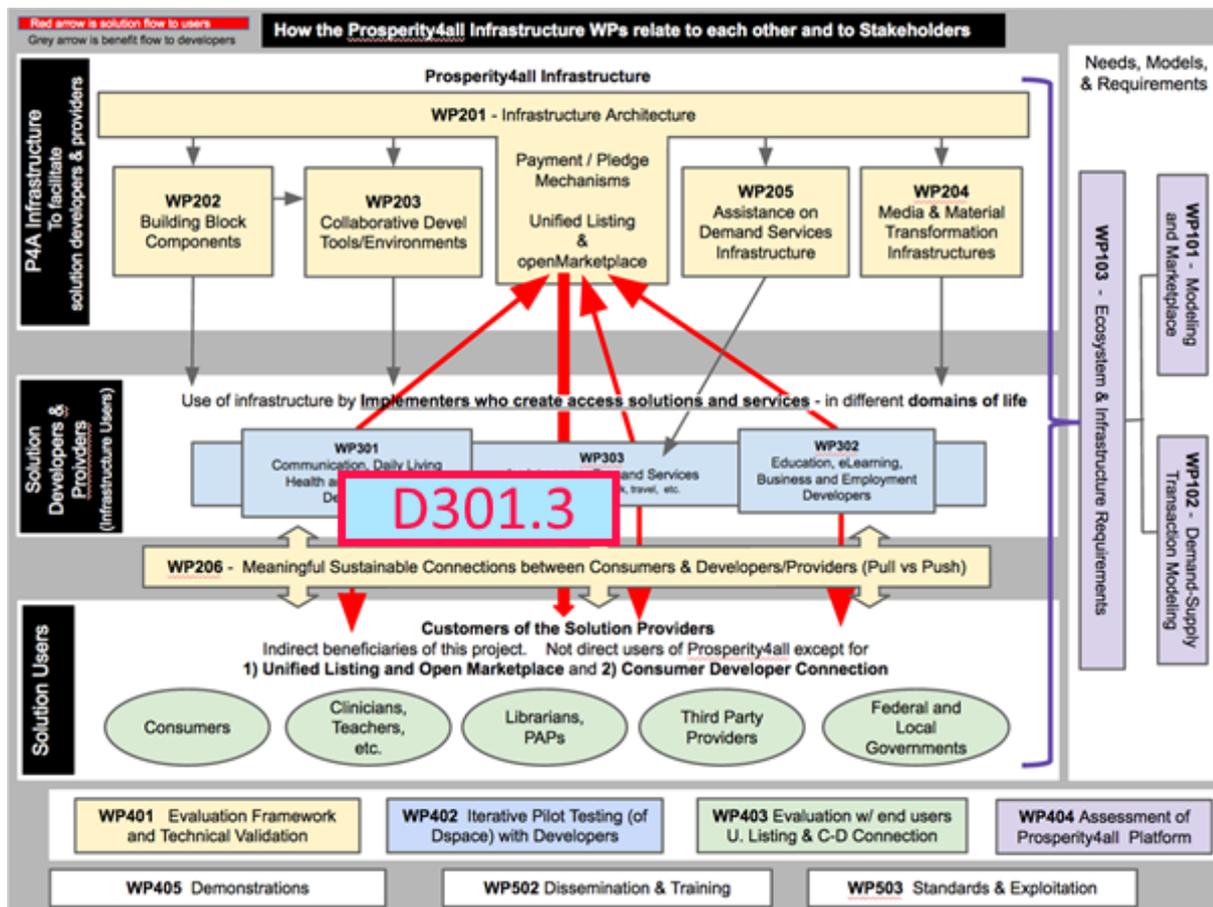
2   Introduction

OpenDirective is a micro SME working in open accessibility with a focus on tools for people with cognitive disabilities such as dementia. In addition to consultancy services we are also developing projects and are planning to release a commercial product.

Brian is an open source project designed to enable people with dementia and their carers to easily access or share media and to readily communicate. The Brian project is based on research and requirements experience gained by OpenDirective in developing Maavis which was also funded by an EU project. Incidentally, Maavis was also featured In the Cloud4All EU project as an example to demonstrate the integration of the GPII Automatic Personalisation from Preferences framework. OpenDirective also plan to make Brian into a commercial Software as a Service (SaaS) product. This requires hardening and adding extra support and features to the open source project.

Prior to Prosperity4All, OpenDirective had implemented a photograph viewer and organisation feature presenting photographs captured on a portable device (iPad). Photos were organised in a hierarchy with captions in a way that provided easy access by people with dementia. Synthetic Text To Speech provided reading support of the photo descriptions. A supporter or carer was able to select, caption and arrange the photographs.

With Prosperity4All, the opportunity arose to enhance this base functionality through improved guidelines and tools providing features of value for the end users. Tools were selected from those available in the DSpace with subsequent technical interactions directly with the teams who had added them. While several tools were carefully evaluated the following were selected for integration with Brian during this task

- SteppingStones (T203.4 Development guidelines and starting frameworks for low cognitive and stepping stone applications for low digital literacy) to guide the addition of features directly useful to the target users and make their experience much more enjoyable.
- Assistance on Demand (T205.1: Creation of an open-source generalizable Assistance on Demand Service Infrastructure) to provide flexible and expandable assistance facilities for users requiring help with either the software or otherwise.

OpenDirective gained much experience of available technology tools through using the DSpace and being involved in its various phases of development. The connection to developer teams who added tools and content to the DSpace proved invaluable. Brian has been significantly enhanced and is now a step closer to being a product.

3   Description of the Solution

3.1   Brian before Prosperity4All

Brian is an open source project designed to provide a service for people with dementia and supporters, especially families. The project goal is to provide a useful application, a collaborative open source activity centre for developing practice and new solutions for users with cognitive disabilities. OpenDirective's long term goal is to provide a full featured commercial product based on the open source project, supporting access to various activities such as media access and communication.

As a 1st phase, Brian included a photo viewing activity providing easy selection of photos and related photos (arranged in a hierarchy). A simplistic UI of large clear buttons made it easy to use. An assistant is able to configure the photos by selecting from files on the device and can arrange them in a suitable hierarchy, while also providing descriptive text titles.

At this stage the photograph viewer provided access to files on the local device, rather than any on the cloud. It was designed for situations where a person reviews photos either by themselves or with others in order to encourage active discussion.

User Features

- Select a larger view of one photograph from four on the display
- Select a photo description so it is read with synthetic speech
- Display up to 4 more photos related to a photo (cat - > more cats)
- Return to a previous photo

Assistant features

- As above
- Edit the photo to be a new image file
- Edit the photo to select change the description
- Add a new photo
- Remove a photo

Figure 2 shows the view of a screen. This is considerably complex and unsuitable for some users as described in SteppingStones.

Figure 2 Brian before P4A – photo viewer
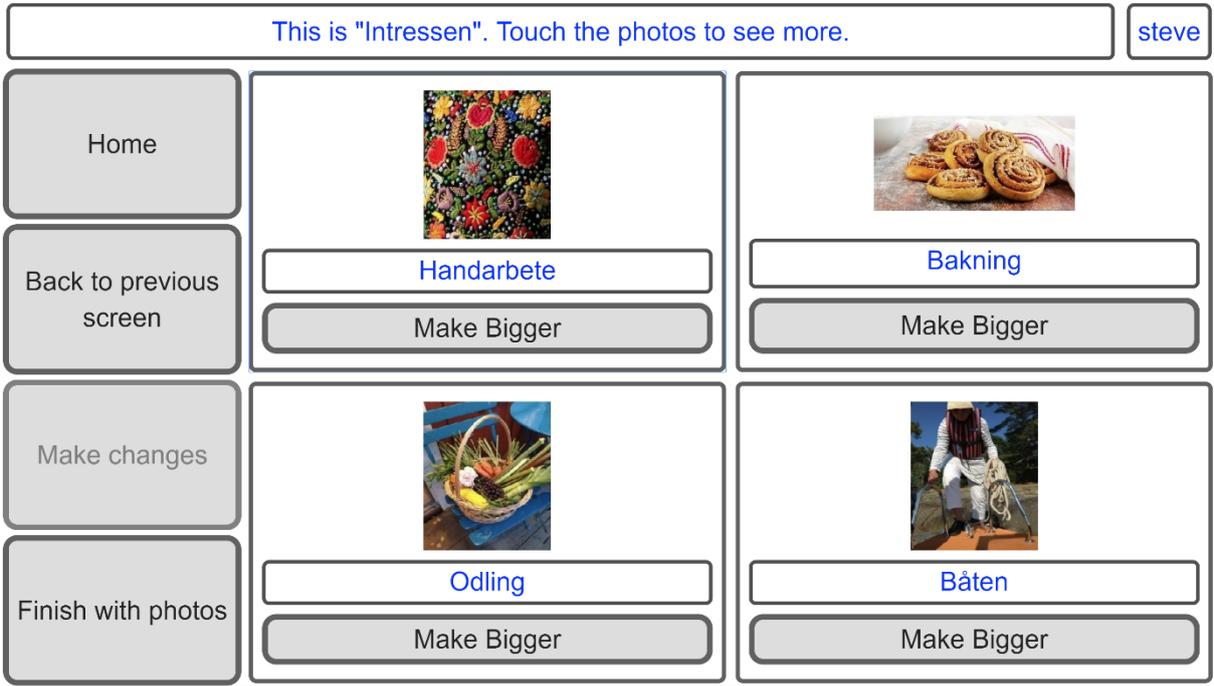
For a 2nd phase of work we started moving to cloud storage so photos could be selected and viewed by remote participants, e.g. a parent with dementia and a relative. Whilst doing this work we wanted to enhance Brian with tools from P4A found in the DSpace.

4 Interaction with the Developer Space

The Developer Space (DSpace) is designed to provide easy to use search facilities for finding tools and useful summaries of the items with links to full project details info and contact information.

OpenDirective found it is easy to explore and find potential tools and then examine them in more detail for interest, value to us and suitability for use in out projects and products. In addition, the DSpace provides informative general information articles that provide useful accessibility information that is relevant to developer.

Due to project timing we reviewed early prototypes of the DSpace and provided feedback. We also provided some items and previewed tools and content being developed by consortium members before they had been submitted to the final prototype DSpace.

Having previously been part of Assistive Technology portal projects such as the OATSoft Open Assistive Technology Software website we are familiar with many of the features of what makes a good portal for user and developers, as well as some of the problems. We found DSpace works really well and feel it will help support a vibrant ecosystem. However, its utility will depend on people engaging with it in an active and regular fashion. We found the DSpace to be easy to navigate and then explore the various tools and information on offer. We were able to quickly find interesting tools and triage them for use suitability for using in Brian.

4.1 Finding suitable tools

During the Prosperity4All project we were able to explore and discuss various tools that appear in the DSpace. Some were 'seed' tools being developed by P4A consortium members in SP2. Others where tools developed by P4A consortium members outside of P4A, yet still considered useful enough to be included in DSpace. Others were tools found by consortium members and considered to be of interest and sufficient value to be added to the DSpace.

Through our Face to Face P4A meetings and subsequent skype and email 'chats' we were able to ascertain which tools would be most useful for Brian. Critically we could find out if there was a good technology fit for integration to be feasible.

While it might have been possible to perform much of this activity without the DSpace, it provides an effective 'meeting place' to find and explore useful assistive technology tools. As more projects are added to the DSpace this usefulness will improve.

4.2   DSpace Tools adopted for enhancing Brian

As a result of searching the DSpace and talking to the project teams we decide to use the following tools to further enhance Brian during its 2nd phase of development. Both happened to be developed during P4A SP2 activities.

4.2.1 D203.3 SteppingStone starting frameworks for low cognitive and low ICT literacy

We had identified that the 1st phase Brian has a fairly complex UI presenting a level of cognitive load which some users would find difficult, while others would find it straight forward. It was felt to be important to include features designed for people with cognitive disabilities, but also to allow the complexity of the user experience to be varied according to user preferences.

OpenDirective also worked on D203.3 which provides both guidelines and a framework for supporting people with cognitive disabilities such as dementia. This includes the ability to provide various level of complexity. Thus, SteppingStones was a natural fit for this phase of Brian development. Integrating this work not only enhanced Brian but also provided useful 'real world use' feedback for SteppingStones.

4.2.2 D205.1 & D205.2 Assistance on Demand infrastructure and configuration

We also identified the strong need for easy access to assistance by users, both when using the Brian software itself and also to fulfil a general need where Brian simply provides an access mechanism.

Having explored the wide range of possibilities with the excellent Assistance on Demand Packages it became clear that Brian could easily add access to the service with a simple UI addition of a, 'Assistance' button. After reading the SP2 deliverables and further discussion with the team it became clear that the flexible service support of AoD could also be very useful in the commercial service based on Brian. There are options for a wide variety of configurations for selecting which support to request. Further extensions such as micro payments are very attractive for later addition into the commercial product

4.3   Other Useful Tools in the DSpace that were not used.

A number of other potentially useful tools in the DSpace were explored but eventually eliminated during the Prosperity4All phase of development. The reason for rejection was purely from perspective of Brian, usually for purely technical reasons. These are all excellent components and we shortlisted them. They may very well prove useful in other projects or even later phases of Brian.

4.3.1 Cloud4All Automatic Personalisation from Preferences

Open Directive were involved in integrating the Automatic Personalisation from Preferences (APfP) into the Maavis Application during the Cloud4All project so we are very aware of what a powerful feature this is for users. It is a major contribution for ensuring users get the best possible experience of a user interface, one that closely matches their personal preferences, such as font size. OpenDirective have every intention of including APfP from the DSpace once it has reached a greater level of maturity and so is more suitable for use in a commercial product. We understand this will be around 18 months from now. But while it is very effective, due to time and resource imitations we decided to concentrate our efforts on the SteppingStones and AoD features in order to ensure the best chance of successful integration with Brian during the P4A project lifetime. The fact that its status can be monitored via the DSpace is very helpful for tracking developments.

4.3.2 Identity & Access Management solution (IAM)

Authentication and authorisation are a critical part of most applications and due to the complexity, it is extremely difficult to get right. The Identity and Access Management (IAM) component in DSpace provides ready-to-use and easy-to-configure functionality related to user or service authentication and authorization. Thus, it is very attractive for use in Brian login and API access control, especially as it implements the popular OAuth2 and OpenID standards that we had already selected for use with Brian. IAM allows a user account to be managed and used in other applications in a delegated and federated way, avoiding the user having multiple sign-ins.

However, we had already prototyped Brian authentication needs using the commercial Auth0 service for which a client-side component exists for our JavaScript framework. Using a component reduces the work involved in providing a UI for login in and ensure correct message flows. We also know Auth0 works when a user logs in via Google to access their photos, an extra level of complexity above the document IAM use cases.

Given the complexity of authentication we finally decided to continue using Auth0 for initial phases of Brian development and later exploring the IAM solution in detail. We certainly feel the DSpace IAM solution will be useful for common authentication and authorisation needs.

4.3.3 IDRC Nexus

The fascinating Nexus provides a way to weave together heterogeneous components to create new applications though interconnecting them using HTTP protocols. While this looks extremely interesting for future Brian development, say connecting new components to extend Brian functionality in interesting ways, it has little to do with the specific requirements we have currently identified. Accordingly, we put use of the Nexus "on the backburner" as something to keep in mind for later use.

4.3.4 IDRC Quality Infrastructure development workflow tool (QI)

The Quality Infrastructure provides tooling to automatically provision a standardized development environment and then automatically build and test software. This provides consistent build and deploy structure for development environments and supports Continuous Integration based workflows. This is attractive as a lot of work is spent setting up and then tuning development environments. Modern web stacks in particular use complex development tooling.

However, as Brian development for this task progressed it became clear that development tooling moving in a divergent direction from the QI. In particular, the majority of development stack setup is managed with as npm modules and the back end uses a cloud based Serverless architecture which has its own deployment and CI tooling.

So, we decided that while the QI would add some value, the extra complexity did not warrant it's use, at least not for now.

5   Development and Integration

As mentioned above, the integration effort in the task focussed on 2 tools found in the DSpace:

- Stepping Stones starting framework for cognitive and low digital literacy
- Assistance on Demand service

5.1   Using Stepping Stones

Using the Stepping Stones guidelines and components involved substantially more effort than a relatively simple integration exercise might involve. As previously described, we decided that phase 2 of Brian development would add access to photos found on line in Google Photos rather than files on the local device. So, we decided to take advantage of the necessary rework to also incorporate the Stepping Stones guidelines developing photo viewer component that could then be shared via SteppingStones.

Both the 1st phase Brian and Stepping Stones components are based on the CycleJS 'Framework' and built using nodejs tools so there was a good fit without the need for a lot of reimplementation of the frontend in order to use the SteppingStone components.

5.1.1 Back End selection

Whereas the 1st phase of Brian was basically a statically served Single Page Application (SPA), we now also needed a proper backend for securely access various 3rd party services. This would also require stronger user authentication along with API access authorisation.

We eventually settled on the relatively young Microsoft Azure Serverless provision which greatly simplifies the back end stack complexity (see the text box). We found that the back end code really describes the 'Business logic' that matches the frontend components and could provide useful examples when using the Stepping stone front end components.

We thus plan to contribute this code back to the opensource Stepping Stone components. This will enhance their value for others, if only by providing example code to match the components. This will be continuation activity after P4A but be made available via the DSpace.

> **Serverless** is the term given to a compute cloud service where developers only provide the business logic and the cloud provider supplies all the infrastructure required to support and run it. This gives an event driven architecture which is automatically scaled according to demand. Payment is usually "pay per use" offering considerable savings in low demand situations. Microsoft currently provide both the more common code-based Function as a Service and a novel Workflow as a Service solution providing a declarative compute service with a graphical editor.

5.1.2 Incorporating the D203.3 Guidelines

The guidelines from SteppingStones describe how to provide a UX suitable for people with cognitive disabilities or low digital literacy. Brian integrates the guidelines into the photo viewer component as follows:

5.1.2.1 Non-intimidating

The screens are less cluttered with fewer simple shapes organised in a grid layout. Friendly colours have been chosen. This required reorganising the screen to be less complex.

5.1.2.2 Clarity

Each screen provides a single task of viewing photos and that task is obvious when viewing the screen. The controls such as 'Pause' or 'Next' have obvious relation to actions when viewing the photos. Buttons are all similarly visually designed to look like buttons and they all operate in the same way. This required simplifying and reorganising the screens.

5.1.2.3 Clear Consequences

Buttons do one thing when pressed as clear described by the button text. There is no ambiguity about what will happen. The simple navigation scheme is used consistently. Currently there is no need for an undo as actions are of a view only nature, not editing. This mostly required ensuring the navigation was very simple.

5.1.2.4 Orientation

Buttons perform actions immediately. Any possible delay due to network lag is clearly explained. Navigation is very simple and a "back" is provided with a clear destination (view more photos). A long press on a button causes it to speak a description of what it does. For this, we added the ability to speak in the rework for this deliverable.

5.1.2.5 User Preferences.

The screens are provided in several versions with differing levels of complexity. This provides the SteppingStones matching to user preference of cognitive load, including the option to vary the complexity over time. This required providing several new screens for the levels.

Figure 3 The simplest version of the photo viewer – a slideshow

Figure 4 The next level of complexity of the photo viewer

5.2   Assistance on Demand

We chose the simplest possible integration with the AoD as the initial attempt: by adding a button to open the AoD website in an iFrame.

This work included:

- Adding a webview component
- Creating a new Brian Page with the webview component and a return button
- Providing a 'Help' Button in the Brian UI at strategic places
- Wiring up the button and page into the routing
- Configuring the web page to show the AoD website
- Installing and configuring an instance of the AoD in an Ubuntu Linux VM
- Setting up accounts for the user and assistance in the AoD
- Configuring support options in the AoD

The changes to the frontend of Brian where fairly straight forward due to the architecture. The new button was added to the photo level screens and a new Assistance on Demand Screen was added with correct routing from the new buttons.

Figure 5 Assistance OnDemand running in an iFrame in Brian
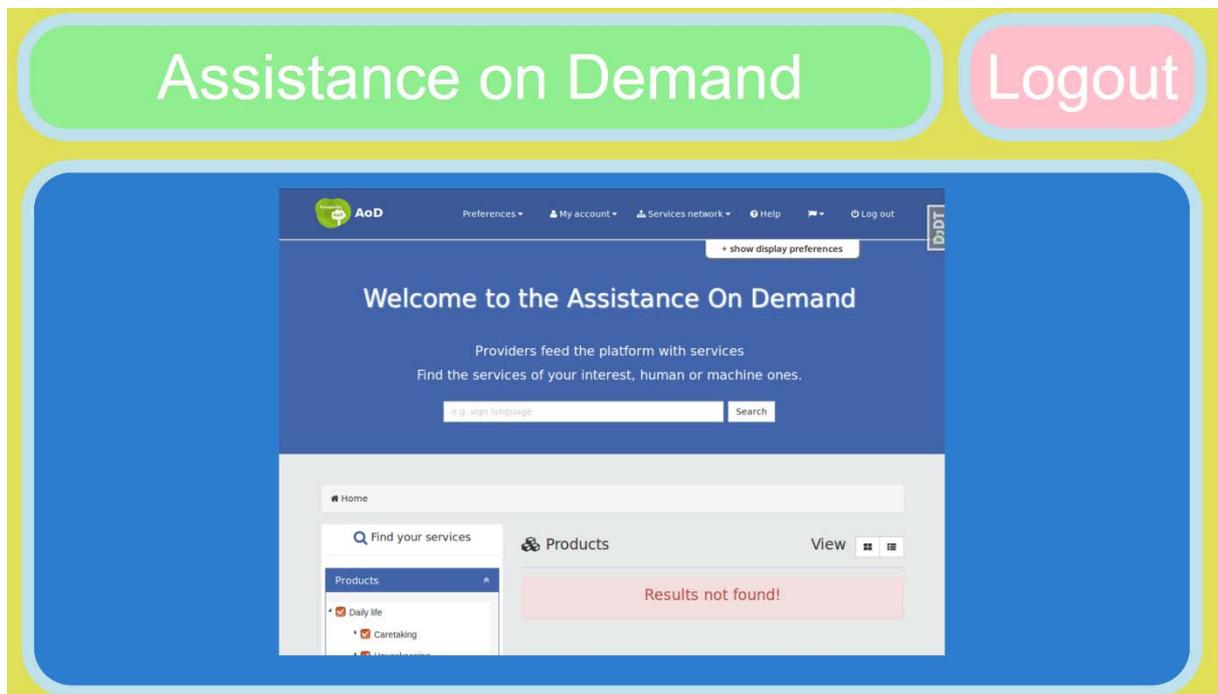
Currently the installation of the AoD service requires a complex installation and configuration, which is understandable given its features and scope. Eventually a live instance of the AoD will be available with good Service Level agreements etc as required of a system that is relied on. The setup steps required include installing:

- Ubuntu
- Apache
- Python
- Django
- MySQL
- Image processing libraries
- AoD itself
- AoD configuration

One minor issue was that several items in the AoD config files had to be set to avoid errors, even though we were not using those features. Setting up the email was fiddly and a few errors had crept into the the README instructions. As the AoD is open source we were able to contribute back issues and pull requests to the project, thus improving it for others.

5.2.1 User Testing

It is of course important to validate the improvements through user testing of the new Brian to ensure it does indeed better match user requirements. We plan to do this with a group of adults with Dementia and to also show them the previous version of Brian.

6 Conclusions and future Work

In this task OpenDirective explored the DSpace and integrated 2 items found in the DSpace. DSpace provides an easy to use way to search for and find both tools and interesting content. For it to live up to its promise as a platform supporting a viable ecosystem we need people to added and maintain content. Then it can be a truly useful tool for developers of assistive technology.

6.1 Assistance on Demand

One of the integrations, the Assistance on Demand, was relatively easy to integrate but the user experience can be improved through using another integration approach. Integrating the AoD into Brian UI has the disadvantage of exposing the user to a different environment and one that has not been design to the same guidelines as Brian. Thus, we intend to revisit this before this would be included in a commercial service. However, the AoD provides a very valuable addition to Brian, allowing users to access support and assistance through a network configured by an assistant or carer.

Specifically, the disadvantage of the web page in iFrame approach is the user is taken out of the Brian environment and presented with the raw AoD UI. This gives small text as the AoD UI is not responsive enough for Brian and the user has to scroll. It will also be confusing to users due to differences from Brian's UI and will be too complex for some as it doesn't match their complexity 'level' preference.

We therefore need a solution that allows a user to request assistance that fully supports the Stepping Stones guidelines and matches the user's preferences.

Thus, as a next phase of Brian development we will provide more of the help access UI directly in Brian and call the AoD REST APIs. This will ensure the user stays within the Brian environment with a level of complexity appropriate to their preferences.

We have now discussed this with the AoD developer and they have added couple of new REST APIs for us so we can obtain from the AoD a list of carer contacts that the assistant has setup for the user. These carers will then be presented to the user to choose from and they will be emailed.

6.2   SteppingStones

Integrating Steppings Stones was much more detailed as it required UI changes to be made designed and implemented. We did this during rework for phase 2 of Brian development so it was not so difficult as it might have been. We believe this has greatly improved Brian's usability by people with Dementia and the Assistance feature will be useful. The changes made to the viewer component will be fed back to SteppingStones. Future phases of Brian will add more components and provide backend logic functions.

7   References

Maavis - http://maavis.fullmeasure.co.uk/

Cloud4All APfP architecture - http://www.cloud4all.info/architecture/

OATSoft - http://www.oatsoft.org/

IDRC Nexus - https://ds.gpii.net/content/nexus

IDRC Quality Infrastructure - https://ds.gpii.net/content/qi-development-environments

AoD - https://ds.gpii.net/content/assistance-demand-0

IAM - https://ds.gpii.net/content/identity-access-management-0

Azure Azure Serverless - https://azure.microsoft.com/en-us/overview/serverless-computing/

SteppingStones - https://ds.gpii.net/content/stepping-stones

Annex I: Glossary

[Please check **http://tinyurl.com/GPII-GLOSSARY** for initial content and add further content, as appropriate.]

Abbreviation	Full form
AAL	Ambient Assisted Living
ACS	AsteRICS Configuration Suite
AoD	Assistance on Demand
API	Application Program Interface
APfP	Automatic Personalisation from Preferences
AsteRICS	Assistive Technology Rapid Integration & Construction Set
AT	Assistive Technology
C4A	Cloud4All
D	Deliverable
DoW	Description of Work
DSpace	DeveloperSpace
GUI	Graphical User Interface
GPII	Global Public Inclusive Infrastructure
ICT	Information and Communications Technology
IDE	Integrated Development Environment
ISO	International Organization for Standardization
IT	Information Technology
KPI	Key Performance Indicator
P4A	Prosperity4all
R&D	Research and Development
SP	Sub-Project
UI	User Interface
UX	User Experience
WP	Work Package