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

D201.2 First Prototype Unified Listing with Mainstream Product Feature capability

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List of Abbreviations

Abbreviation	Full form
API	Application Program Interface
AT	Assistive Technology
C4A	Cloud4All
D	Deliverable
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
P4A	Prosperity4all
UI	User Interface
UL	Unified Listing
UX	User Experience
WP	Work Package

Executive Summary

In this document we will briefly review the current state of the Unified Listing, and cover the upcoming work that will allow manufacturers and community members to directly contribute new information.

The Unified Listing is a database of assistive technologies (AT) and mainstream products with accessibility features. It brings together AT and mainstream product databases internationally into a single federated database that both draws from and feeds the other databases.   The Unified Listing software currently consists of:

1. Database structures and associated views.
2. An API to manage adding, editing, and retrieving information.
3. Import scripts that pull information from EASTIN and GARI, our first federation members.
4. A mechanism to notify federated database managers of new information from other vendors that is not already reflected in their dataset.
5. A front-end UI provided by the Semantic Alignment Tool: http://sat.gpii.net/

In Prosperity4All we will add:

1. An improved editor's UI for adding, editing, and retrieving information
2. A mechanism for identifying manufacturers and identifying their special relationship with products in the Unified Listing.
3. A web UI to allow manufacturers to view, add and edit their products.
4. A mechanism to notify manufacturers when other parties (community members, database vendors) update information related to their products.
5. Import scripts for other databases that affiliate
   a. For example ABLEDATA (US) and The ARC (focusing on cognitive disabilities)
6. An improved mechanism for notifying federated database managers of new information from other vendors that is not already reflected in their dataset (based on feedback from them going forward.
7. The mechanisms for user feedback and feedforward to product developers and vendors – and feed-sideways to other users.

We will also be coordinating with work by other (non-Prosperity4All) partners on enhancements to the Unified Listing

1. The Shopping / Alerting interface for the Unified Listing being developed by the Universal Interface and Information Technology Access Rehabilitation Engineering Research Center.
2. The Consumer Electronics Association Foundation efforts to enhance mainstream products in the Unified Listing

1   Contribution to the global architecture

The Unified Listing is a core element in the prosperity for all infrastructure. First, it is core to the auto personalization components since it contains all of the information on accessibility features and mainstream products and assistive technologies. This information on all the products is compiled from Unified Listing into a compact form called the solutions registry. This solutions registry is used by the matchmakers – who use this information to match user needs and preferences to the accessibility settings on each device.

The Unified Listing is also core to the Developer Space. It is a primary mechanism for developers to reach their customers internationally. There is no cost to list products in the unified listing nor to use it. It is also the most comprehensive listing internationally – because it is a compilation or federation of existing databases plus additional information. As it comes online it will become a primary source for any developer, especially new developers, to be able to reach a broad audience, effectively and economically. In addition, the unified listing is combined with GPII technologies from other projects such as the Shopping and Learning Aid being developed by the UIITA-RERC that can take an individual's needs and preferences and use them to help find all of the relevant products and features in the database. In addition, users can ask the Shopping/Alerting aid to alert them to any new products or features that would appear and meet their needs.

Figure 1: Overall Picture of Prosperity4all
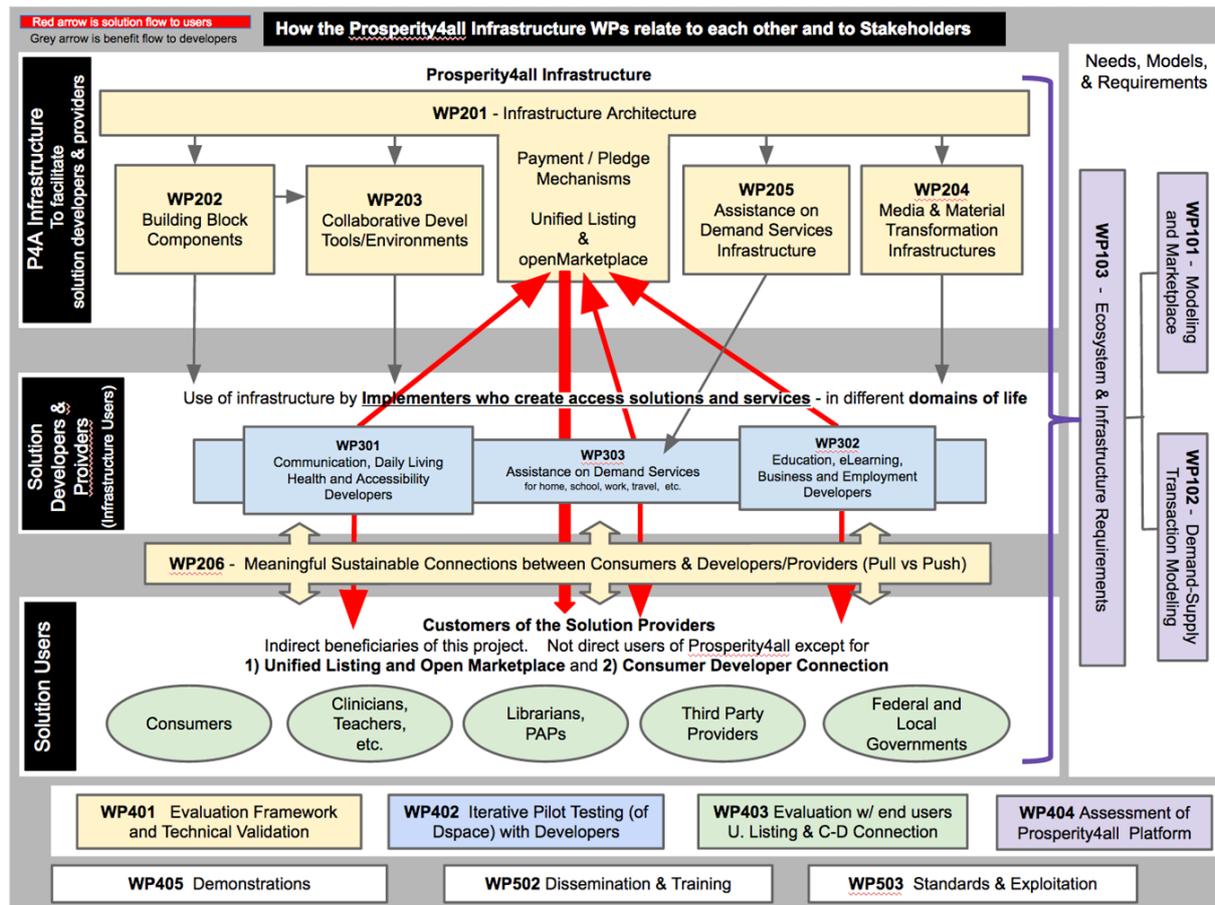
 A variant of the Unified Listing, will also be used within the developer space to list all of the components, frameworks, service infrastructures etc. available to developers.

The openMarketplace is separate from, but attached to, the Unified Listing. The openMarketplace is simply a way that developers can sell their products if they do not have any other mechanism for selling their products and/or handling international purchases already. There will be a commission for selling products through the openMarketplace but there is no commission for having them listed in the Unified Listing. Products in the openMarketplace are listed in the Unified Listing alongside all other products and receive no special consideration or treatment.

This work is part of WP 201. The Unified Listing would be used by all of the SP3 projects in that they are either assistive technologies or mainstream technologies with accessibility features and whether they are products or services. It also relates to SP1 (meeting identified needs) and SP4 where it will be evaluated. Finally, the consumer connection and feedback aspects are being carried out in connection with WP206.

2 Background information on the Unified Listing

2.1 What is the Unified Listing?

The Unified Listing is a central database that stores information about AT solutions and mainstream products with built-in accessibility features. It brings together AT and mainstream product databases internationally into a single federated database that both draws from and feeds the other databases. The work in progress is available on the web at: http://ul.gpii.net/

2.2 Who does the Unified Listing serve?

The Unified Listing has a number of different types of users:

1. End users of AT solutions and mainstream devices with accessibility features.
2. Caregivers of the above.
3. Therapists and other AT professionals.
4. Manufacturers of AT solutions and mainstream devices with AT features.
5. Integrators and third-parties building solutions on top of the Unified listing.
6. Developers and vendors

In addition to serving a broad range of communities, the Unified Listing is also intended to help users from around the world, and supports multiple languages.

2.3 What does the Unified Listing help users do?

The users described above have two broad use cases:

1. They want to locate existing solutions.
   a. For themselves,
   b. To understand the field and what is available,
   c. For market and competition research
2. They want to provide information about solutions.
   a. About their products (developers/vendors)
   b. About products (users)

2.4 Who contributes information to the Unified Listing?

The Unified Listing currently contains information pulled from database vendors like EASTIN, the EASTIN federation members, GARI and soon ABLEDATA. To continue growing and updating both the Unified Listing and its federated databases, the the Unified Listing will also enable manufacturers and community members to contribute directly.

2.5 How is the information in the Unified Listing used?

There are a number of projects working to meet the two key use cases outlined above, entering solution information and using solution information.

2.5.1 Federated Databases

The Federated Databases are both producers and consumers of the data in the Unified Listing. First, the databases provide source records, which are regularly synchronized with the Unified Listing. The data coming from EASTIN and GARI provided the initial dataset we have available.

The Unified Listing also contains services.   Among the services will be Assistance on Demand (AOD), and document and media transformation services. The Prosperity4All AOD listing will also provide AOD services as part of its function – and will therefore function as a federated database –as well as a developer tool for those creating new AOD services,

The Unified Listing is both broader (includes AT and Mainstream products) and narrower (it focuses on ICT related products while the federated databases often cover all types of AT) than the databases it federates with. Although the foci of the databases are different we have worked out a way for the flow of information to to be two-way. The Unified Listing provides federation members with services and tools that make them aware of new solutions as well as updated information about existing solutions, so that they bothboth feed and are fed by the Unified Listing.

The Unified Listing also introduces some unique features such as the Universal Product ID that allows the other database federations to consolidate search results, and a one-stop update function for developers/vendors that can provide greater incentive for them to update their product data rather than requiring database managers to do so.

2.5.2 Third-party integrators

The open-API of the Unified Listing allows others to use the information in still new and expanded ways.

The Universal Identifier of the Unified Listing also provides way of uniquely identifying a specific solution even if described in different ways using different names in different databases. Integrators can use the Universal Identifier in the Unified Listing to collect information like features, settings, and user reviews without collecting duplicate information about the solution itself.

2.5.3 End users

Today, end users can search and view the data in the Unified Listing via the Semantic Alignment Tool (from Cloud4all), which is integrated with the Unified Listing. The Semantic Alignment tool organizes the raw data found in the Unified Listing using a hierarchical ontology, and allows users to browse the data set. The Semantic Alignment Tool can be found at http://sat.gpii.net.   As the other interfaces come online (such as the Shopping/Alerting Aid being developed by UIITA-RERC) end users will have other options as well.

3   Adding the ability to add and edit records in the Unified Listing

For the most recent Cloud4All review, the initial REST API for the Unified Listing was created, and was used to import data from EASTIN, and to integrate with the Semantic Alignment Tool.

In Prosperity4All we are proposing to create an editing interface that can be used by all users to add and edit data, but which provides a special interface designed and optimized for manufacturers.

3.1   The special role of manufacturers

Manufacturers play a special role in describing their products. They can provide the clearest guidance about what a product is intended to do, what its features are, and where to find additional information. However, theirs is not the only voice. To provide a truly inclusive community, we need to allow and encourage everyone to contribute information about solutions they are aware of.

3.2   Balancing manufacturer and community input

We need to recognize the special role of manufacturers and the data they provide without preventing the larger community from participating. We propose to do this by establishing a special relationship between a manufacturer and the solution they provide. This relationship would initially be managed on a case-by-case basis by site administrators. Eventually, we would build tools to manage this relationship through the web interface. Once the relationship has been established, a manufacturer would be able to create and edit records for products they own in a new way.

3.2.1 Manufactures as a distinct data source

The Unified Listing already has the concept of data sources, which we use to distinguish data coming from individual databases.

One type of data source is the different federated databases.

A second type of source is the manufacturer/vendor provided data. For the products they produce, manufacturers add entries where they do not already exist.

Users and others are a third type – though they usually provide leads that have to be followed up on to get complete information.

New information from any of these sources would be moderated (as with all entries), entered, and fed to the other federated databases.

3.2.2 Data sources and the unified record

Source records are each associated with a Unified Listing base record, which is record unique to the Unified Listing and created by curating data from one or more source records from federated databases, manufacturers, and/or the community. This "unified" record is created by a group referred to as UL moderators or curators. These are volunteers and paid individuals who maintain the Unified Listing using a meritocracy. Their job is to take into account and balance the input of all contributors, while removing any superlatives such as "best", "only", "fastest" etc. that are not supportable or are temporal.

This model allows and encourages manufacturers to monitor and contribute to information about their products, but also serves a wider set of use cases. As an example, a manufacturer who stops working in a given market may wish to withdraw their entry. We would rather keep the unified record as a reference point for existing users, and to assist people in moving from an older product they may have used to newer alternatives. Also people often spend much time looking for something that has been dropped by a manufacturer – and it is important they can find it and see that it is no longer available. To accommodate both audiences, we preserve the product in the database but mark it appropriately (e.g. 'no longer sold by manufacturer', 'no longer supported by manufacturer', etc.)

3.3   The Manufacturer workflow

Let's talk through the workflow manufacturers would use, beginning with adding a record.

3.3.1 Adding a Record

When we originally imported data from the EASTIN databases and GARI, we began with source data from one or more of these sources, and then created the "unified" record. The original "source" records are preserved in their entirety, and are associated with the "unified" record such that we can present all the different listings from different federated databases at once.

Individual contributors (including manufacturers) would follow a similar process. They would contribute an entry for a new product or an update for an existing product. These are reviewed, and incorporated into the "unified" record by moderators. The only difference is that the companies or community member's original un-curated submission, is not viewable by all database viewers as are the curated entries from the federated databases. This is done because we do not want to be responsible (or liable) for claims made by companies or raw descriptions from community members. Un-curated entries are therefore treated as "leads" and "input" to the Unified Listing curators' construction of a new entry in the Unified Listing.   Submissions by companies or individuals can be in any language – though English is

preferred when possible to maximize the ability of curators from different countries to read it directly.

Each federated database may contribute in whatever language(s) they choose, and these entries, in their original language, will be visible to all users. In addition, authorized translators can also go through the database and create translations of the entries there, if there is a desire to have the entries in another language directly (and not rely only on the auto-translator function in the Unified Listing). The end result is a web of related records describing the same product, which are visible to the end user (sometimes directly in different languages, and sometimes only through auto-translators).

Here is the proposed workflow for a manufacturer adding a record*:

1. A manufacturer or user adds a new "lead" record describing a product not in the database.
2. The Unified Listing's curators create a "unified" record for the product.
3. The Managers of the Federated Databases are notified that a new record has been created (see below).
4. The Managers of the Federated Databases create new records in their databases as appropriate.
5. On the next sync, the new Federated Database records are detected and using the Universal ID provided by the Unified Listing (when the entry was sent to the Managers of the Federated Databases in step3) is matched to the "unified" record in the Unified Listing, and added as another "source" record associated with the same "unified" record.

* This will be subject to any changes in the proposed 24751 standard.

3.3.2 Manufacturer review of an entry.

Much of the data we have imported from EASTIN, GARI, and other Federated Databases will initially lack detailed manufacturer/product information needed by the Unified Listing and the Solutions Registry.   In these cases, the workflow will be something like the following:

1. A manufacturer encounters an existing record for their product.
2. They review the record and submit any updates or suggested edits
3. Any additional information needed by the Unified Listing for the solutions registry.
4. Curators of the Unified Listing are notified of the update (see below).
5. Curators incorporate any new information into the "unified" record as needed.
6. Manufacturers are notified of the update to the "unified" record.
7. Federated databases are notified of the update to the "unified" record.

3.4   The Community Member workflow

A community member's workflow is the same as that outlined for manufacturers.

3.5   The Review workflow for Curators

The information from the different sources (manufacturers, consumers, practitioners, etc.) within the Unified Listing is curated by Unified Listing moderators (also referred to as curators) to ensure accuracy, quality and decorum.

Manufacturers, community members, and database vendors may all supply information to the Unified Listing, which are incorporated appropriately and fed to the other federated databases as per the federated databases wishes and needs.

Table 1: Sample status values.

Status	Description
Unreviewed	A record has been created but has not been reviewed.
Incomplete	These may be displayed if felt to be largely complete and appropriate, but will clearly be flagged.
Active	The record has been reviewed as complete and safe for use and is displayed without warnings or other qualifications.
Needs Review	The record is visible to the public, but is flagged as potentially needing update in some manner – which is noted.
Invisible	The record has been marked invisible and will only be visible to editors. This is likely to only be used during the initial review or when managing duplicate records.

Each status is a step in the workflow, and changing the status indicates how reliable the record is. The full set of statuses will be expanded upon by the review committee as they begin regularly reviewing records.

3.6   What data are in an entry?

3.6.1 Basic information

The minimum data required to construct a Unified Listing entry are as follows:

1. The name of the solution (its title).
2. The description of the solution.

3. One or more images that represent the solution. (if missing, the entry would be listed but marked as incomplete)
4. The language in which this record is written.

In addition, to facilitate the collection of new data like pricing and features (see below), for this milestone we will add a "notes" field, which can be used to enter additional information not covered above.

3.6.2 Data regarding certifications or other country specific data

There may be information that varies from country to country such as certifications (safety, funding, etc.) Initially we will handle these all in the text field. Later we will look to see if some type of country specific field(s) is warranted or not.

3.6.3 Data using GPII specific terminology

Manufacturers would enter both the basic information for the products they produce and the detailed information on access features of the products that is needed by the Solutions Registry. The Unified Listing curators would then work with them over time to add the additional data needed.

3.6.4 Feature data

One of the key challenges in the Unified Listing is to take the various ways that people have used to describe solutions, and standardize that so that we can help users find solutions across the whole Unified Listing.

We are supplied with a range of feature data by the federated databases that contribute to the Unified Listing. ISO 9999 is used by the EASTIN federated database to categorize all AT solutions it lists. Although this information is helpful to AT professionals, it is not fine grained enough, and is not categorized in terms of user needs. For example, screen readers are categorized either as "special output software" or "alternate input device".

GARI, on the other hand, uses its own structured vocabulary to map user needs to product features. For all entries, this information is separated into five broad categories:

1. Dexterity
2. Vision
3. Hearing/Speech
4. Cognition
5. Hardware

The first four categories are described in terms of the help they provide. The fifth concerns features that may be of interest, but which do not generally help in one of the other areas. A good example is the device's battery life.

GARI has a full list of features that are tracked, which are each categorized into one of these five categories. Each mobile device has metadata to indicate whether it has a feature, doesn't have a feature, or whether no data is available.

Although GARI's feature data is fine-grained, it is largely specific to phones and tablets. These are divided into broad categories according to what kind of support they provide (dexterity, vision, hearing, speech, cognition). This type of coarse-grained categorization is less specific, but can more easily be applied to a range of solutions

We need something which is detailed enough to be useful in finding solutions to specific problems, but general enough that we can expect manufacturers to enter the data. As we do not have anything like this, for this milestone we are simply collecting information about features in free text form. This problem is being explored as part of a parallel project at the UIITA-RERC based out of the Trace Center in the US as part of the Shopping and Alerting Aid project (a companion search and alert interface to the Unified Listing). As this work is completed it will be tapped and incorporated as an alternate interface to the current "Semantic Alignment Tool" interface.

3.6.5 Pricing data

Pricing data is an important aspect of the buying decision. Unfortunately, it is difficult to collect this data in a way that is both accurate and timely.

For software, this is complicated enough. Many of the solutions we list operate in a number of markets, some based on location, some based on industry (educational versus commercial, for example). There may a dozen prices for a single solution, and they may be based on criteria that are difficult to compare (for example, bulk licensing arrangements).

Pricing for physical devices is also problematic. Devices such as phones may be available at reduced cost with a phone contract, but the up-front cost is not the full cost. Devices you can purchase outright may only be available from a single country, in which case shipping and customs can add significant costs when purchasing from elsewhere in the world. There are also discount schemes, reseller programs, and general retail markup to consider, each of which can add a lot of variety in the final price a consumer pays. Prices are even used as an experimental variable in "A/B testing", and may not even be the same for two visitors buying the same exact product from the same store on the same day.

3.6.6 Application Data

In addition to the general product information, we will also be adding features to allow users to attach application information. These notes, which will be moderated for appropriateness, spam, and decorum, can vary widely from compatibility information, to alternate uses for the product, to tricks for implementing special functionality. This work will

be carried out in conjunction with WP206 on maintaining the user connection with manufacturers and the development and application of new and existing solutions

4   Coordinating and communicating changes

As outlined previously, many parties can provide new information about a single solution. To assist each of these groups in coordinating with each other, and to help ensure that data is kept up to date, we are proposing to extend the "updates" report and notification mechanism developed during the Cloud4All grant.

For all edits through the web interface or updates made via an import script, the date at which the record was updated is recorded. We also track the source for each record. With this information, we can do things like:

1. Notify manufacturers when someone else adds new information about the solutions they provide.
2. Make moderators aware of new records that need to be reviewed.
3. Make federated database owners aware of new solutions as they are added by manufacturers, the community, or other database vendors.
4. Make federated database owners aware when a manufacturer provides new information about products the database vendor already knows about.
5. Make moderators aware of changes that may need to be incorporated into the "unified" record.
6. Allow users to be able to track certain types of products and be alerted when new ones appear or existing ones change.

This information is available as a live report whose parameters (which sources, what time period, etc.) can be updated through the web interface. There is also a script that runs nightly and emails a summary of recent updates. Clicking the link within the summary email opens the full detailed report on the web.

For the initial Cloud4All deliverables, the focus was on federated AT databases. This Prosperity4All deliverable includes work to extend this concept to cover mainstream devices and manufacturer and community input. For this deliverable, the process of configuring update reports will be manual. Beyond the scope of this deliverable, this feature would likely evolve into a preference that can be controlled directly by manufacturers in their site settings.

5   Key Links

One front-end to the Unified Listing is the Cloud4all's Semantic Alignment Tool at http://sat.gpii.net/

A direct link to the Unified Listing 'work in progress' is http://ul.gpii.net. When complete the Unified Listing Shopping and Alerting aid will appear at this URL as well.