

# New Zealand ORCID Working Group: High-Level Technology Requirements Sub-Group Report and Recommendations

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## Summary of Key Findings

New Zealand’s research organisations provide scientific and scholarly knowledge and leadership to the nation and to the world. ORCID provides a reliable way to connect New Zealand’s researchers with the outputs of their work, with their research organisations, and with their collaborators. The New Zealand ORCID Consortium must, if it is to realise fully the benefits of ORCID for the New Zealand research system, be inclusive in enabling all research organisations in New Zealand to participate effectively with ORCID. As research organisations in New Zealand vary widely in their size and in their technology capability, providing a scalable solution that enables the smallest research organisations as thoroughly as it empowers the largest research organisations is essential.

To achieve the best outcome from the investment in establishing the New Zealand ORCID Consortium, the sub-group strongly recommends the creation of a New Zealand ORCID Hub offering easy-to-use ORCID functions that provide the base level of ORCID integration as a service. The New Zealand ORCID Hub ensures the lowest-possible barriers to participation in terms of ease-of-use, user experience, cost, and functional capability.

The ORCID High-Level Technology Requirements Sub-Group is pleased to present this report to the New Zealand ORCID Working Group, and sees clearly the vision and the value that establishing the New Zealand ORCID Consortium offers New Zealand.

## Purpose

At its meeting of 31 March 2016, the New Zealand ORCID Working Group established a sub-group to examine the high-level technology requirements for New Zealand research organisations to use ORCID. Members of the working group wished to gain a better understanding of the following:

1. The base requirements for use of ORCID by a research organisation
2. The various systems into which ORCID could be integrated, and whether there was a hierarchy of integration or desirable phasing of integrations
3. What ORCID integration might mean for those organisations with few or no internal systems or technology-delivery capability
4. The cost of the main uses of ORCID for small, medium, and large research organisations in New Zealand, and whether the benefits demonstrated overseas for large organisations also applied to small organisations[1]
5. The approaches adopted by those New Zealand research organisations (Auckland, Canterbury, Lincoln, and Waikato) that have already begun to adopt ORCID[2]

The sub-group was to prepare a report to the wider working group for its next-scheduled meeting, on 14 June 2016. The report would contain information on the above points in order to inform members on their use of ORCID. The sub-group was also asked to provide recommendations to the working group on the technical support services required for the national consortium.

## Approach

The sub-group developed its approach to understand the current and anticipated use of ORCID in New Zealand research organisations. Additionally, the sub-group sought to gauge the technology capability required for research organisations to participate effectively in a New Zealand ORCID Consortium and to achieve the integration of ORCID with their own business applications and other systems.

The approach taken used several techniques to learn about research organisations, and was designed to understand the needs and capabilities of the smallest research organisations as thoroughly as those of the largest. The techniques used included:

- *Community Survey*: A survey of research organisations was designed to assess current and anticipated use of ORCID, the business applications being used internally, and the technology capability available to them.
- *Current Use*: Discussions were held with organisations already using ORCID (i.e., The University of Auckland, The University of Waikato, and Lincoln University).
- *Smaller Organisations*: Detailed discussions were held with three smaller Independent Research Organisations to understand what the use of ORCID would mean for them, and to understand the technology capability available to them. These research organisations were chosen for convenience, as all are Wellington-based, and for their representativeness of other independent research organisations in New Zealand.

- *Global Benchmarking*: The design and operation of international ORCID consortia (e.g., Australia, Italy, and the United Kingdom) were assessed and considered in the New Zealand context.
- *ORCID Capabilities*: Members of the sub-group undertook extensive research and discussion concerning ORCID technical capabilities and good practices. This activity included discussions with architecture and technology peers, and with the ORCID Foundation.

## The Primacy of Scalability

The New Zealand ORCID Working Group recognises as essential that the benefits of participating in the New Zealand ORCID Consortium be accessible to all research organisations in New Zealand, from the largest to the smallest.

To successfully support the business case for establishing the New Zealand ORCID Consortium and to facilitate effective uptake throughout the Research System, there must be very low barriers for research organisations to achieve at least base-level participation.

Potential barriers to participation include:

- Prohibitive cost of the service
- Inability to use the service because of lack of technical capability
- Labour-intensiveness
- Poor user experience

Equally, the New Zealand ORCID Consortium must provide useful services that are sufficiently relevant and effective at large scale to attract full support and utilisation by the nation's largest and most technology-capable research organisations.

In particular, the New Zealand ORCID Consortium must provide a range of services that are scalable to the extent they will accommodate the wide range of requirements and capabilities of research organisations in New Zealand.

## Survey of Current Use and Technology Capability

### Survey

The sub-group issued a survey to all New Zealand universities and Crown Research Institutes to gauge their current and anticipated use of ORCID, to understand the range of business applications used to manage people, employees, and research, and to assess the technology capability resident in research organisations, such as might be required to integrate with ORCID.

The survey received a modest response, with participation from four of the eight universities and six of the seven CRIs. These are medium- to large-scale research organisations. A valuable picture of ORCID use and of technology capability was provided by the survey responses. In overview:

- *Current ORCID Use*: Only one organisation reported current integrations with ORCID.
- *Future ORCID Use*: Nine of the ten organisations indicated future plans to implement ORCID integration, mostly at a basic level, though with some organisations aiming for deep integration.
- *Business Applications*: Very little commonality of core business applications exists across the research organisations.

- *Research Applications*: Some commonality of research-related applications exists in the four universities, most of which are using Symplectic (research outputs) and DSpace (digital repository).
- *Technology Capability*: A good level of technology capability is available to the respondents, as is a ready ability to make changes to IT systems and their integrations.

A summary of the responses is provided in the table below.

Topic	Summary
Number of Researchers	The smallest organisation that responded to the survey has 120 researchers, and the largest has 2,500. All four universities have more than 600 researchers (three of the four have more than 1,000), and the largest of the CRIs has 630 researchers.
Number of Research Outputs	The number of research outputs published annually was reported by the respondents as being difficult to gauge precisely. Of the numbers reported, the fewest was 300 research outputs annually, and the greatest was more than 8,000.
Current ORCID Use	Only one research organisation declared current institutional use of ORCID, though four others recognised ad hoc use of ORCID by their researchers.
Future ORCID Use	Nine of the ten research organisations responded positively that they do or will likely develop plans or projects to implement ORCID for their researchers. For those nine organisations, the level of ORCID integration expected was “basic” (six organisations) or “deep” (three organisations).
Centralised Login	The systems used to manage researchers’ usernames and passwords include Microsoft Active Directory in nine of the ten research organisations, and the Tuakiri New Zealand Access Federation was mentioned by seven respondents.
Business Applications	Very little commonality was found in the business applications being used by these research organisations — for example, almost none use the same business application for Identity Management, Human Resources, Research Proposal Development, or Research Project Management (i.e., there were two pairs of organisations that are using the same HRMS).
Research Applications	Very little commonality was found across the CRIs in the applications used to manage research outputs or the solutions used to provide digital repositories, though most of the universities are using Symplectic to manage researcher and research-output information and using DSpace as a digital repository (often integrated with Symplectic).

Topic	Summary
Collaboration Platforms	The use of cloud-based collaboration platforms such as Dropbox, Google Apps, and Microsoft OneDrive was low and variable across the research organisations. No endorsed use of these platforms was reported by eight of the ten organisations, though ad hoc use by researchers was noted, despite the use of Dropbox being actively discouraged. Four of the research organisations not currently using these platforms indicated they were preparing to establish formal support for the Microsoft Office365 / OneDrive platform. Two of the four universities are using these platforms formally, one based on the Microsoft offering, and one based on the Google Apps offering.
Technology Capability	The technology capability available to seven of the ten research organisations was rated as being enterprise-grade and offering a full IT capability. Two others reported access to full development services (e.g., able to create bespoke solutions), and one reported the ability to integrate between systems.
Ability to Change Systems	Seven of the ten research organisations indicated they were readily able to make changes to their IT systems and integrations: the other three indicated they were somewhat able to make changes.

## Established use of ORCID in New Zealand Universities

Four universities in New Zealand have become subscribed members of the ORCID Foundation. The use of ORCID made to date by those universities is summarised below:

- The University of Auckland established a local hub for ORCID that guides its researchers through the process of establishing or locating their ORCID profile and granting permission for the University to read information from their ORCID profile. The ORCID iD and the ORCID access token are returned to and saved in the University's identity-management business applications. To date, some eight-hundred of the University's researchers have completed this process successfully.
- The University of Canterbury has joined ORCID and promotes the use of ORCID to its researchers, but is not yet integrating with ORCID.
- Lincoln University asks its researchers to manage their ORCID through Symplectic Elements.
- Waikato University asks its researchers to manage their ORCID through Symplectic Elements.

## Three Smaller Independent Research Organisations

Interviews with representatives from three Wellington-based smaller independent research organisations gave the following understanding, which was strikingly similar in each case study.

All three organisations are supportive of ORCID and see clearly the benefits of participation, providing the burden is not too high upon them administratively, and in particular upon their research staff. These organisations are also sensitive to the financial implications of integrating with ORCID.

Their information-technology capability and ability to change are very limited and match the scale of their organisations. They also each believe that their capability is at an appropriate level, and more would be

overinvesting. They do not generally have systems that could be integrated, let alone the capability to integrate them.

However, they each indicated they would be happy to use administrative staff to manage ORCID participation at the base level described below.

## Base Requirements for ORCID Use

### Business Requirements for ORCID Use

Entries on an ORCID profile are labelled with their source. Where an individual has entered information such as employment history into their ORCID profile, the individual is identified as its source. Where the information has been provided by integration or harvesting, such as from one of the major research databases, that organisation is identified as the source of the information, and may be considered authoritative. To establish authoritative affiliation between a researcher and a research organisation, the affiliation would have to be updated to the researcher's ORCID profile not by individual self-service, but by the research organisation.

In order to participate in ORCID as a national resource, research organisations will need the ability to assert authoritatively that a researcher's ORCID record is affiliated with them. This is the base business requirement for participation in the New Zealand ORCID Consortium.

Part of the value proposition for researchers and for research organisations is ORCID's ability to hold authoritatively-asserted details of research outputs and other activities not already posted to one of the major research databases pre-integrated with ORCID (such as Scopus, Web of Science, PubMed, and CrossRef).

Establishing these authoritative assertions of affiliation and of research output is important and valuable because doing so:

- helps create a trusted network across New Zealand's research community
- smooths the process when researchers move from one institution to another
- assists funders that want certainty they are using the correct ORCID iD when posting funding data and when using ORCID records for reporting purposes
- creates a more complete, usable record of productivity in New Zealand's research system

### Functional Requirements for ORCID Use

To achieve the base-level business requirements above, the New Zealand ORCID Consortium must have certain capabilities and must offer certain services to researchers and to research organisations. The primary technology capability required is:

- onboarding research organisations to the ORCID Consortium, to enable each research organisation to obtain access tokens to read from and to write to the ORCID profiles of their researchers[3]

At this base level, the burden is placed upon each research organisation to provide mechanisms and processes that guide their researchers to establish appropriately-affiliated ORCID profiles. It also leaves the responsibility of managing, presenting, and using its own researchers' access tokens (to read from and write to their ORCID profiles) with each research organisation.

If the service offering of the New Zealand ORCID Consortium is limited to onboarding member organisations, then base-level ORCID integration is likely to be beyond the reach of many New Zealand research organisations.

Access to ORCID integration and its benefits would be made available to a much greater range of research organisations if additional tools and services were provided by the Consortium. Two primary approaches to achieving this have been considered:

1. providing a range of tools and advisory services that research organisations may choose to make use of to assist their independent efforts to integrate with ORCID
2. providing a national ORCID Hub facility, offering easy-to-use ORCID functions that manage the base level of ORCID technical integration as a service

A national ORCID Hub consists of a web application that mediates between researchers, research organisations, and ORCID, facilitates the creation of authoritative affiliations, and manages the process of obtaining permissions from individual researchers and storing access tokens for later use. The ORCID Hub is underpinned by a small collection of well-designed services that enable research organisations to create their own integrations directly with ORCID, if they wish to do so.

Using the ORCID Hub, all research organisations, large and small, can integrate with ORCID and gain access programmatically to ORCID data and functionality. While each research organisation could deploy its own ORCID integration portal, the New Zealand ORCID Hub can avoid this duplication of effort, making the benefits of ORCID accessible effectively and easily to all research organisations, including smaller organisations that would otherwise be unable to establish their own ORCID integration portal.

In addition to asserting authoritative organisational affiliations for researchers and making their funding applications easier to process, the benefits of the New Zealand ORCID Hub include improved reporting on research outputs and increased efficiency when creating research-activity and outcome reporting within each research organisation. This benefit is due partly to leveraging the research-output gathering that ORCID makes happen automatically, therefore avoiding duplicate and error-prone manual entry.

The sub-group strongly recommends that the ORCID Hub approach be taken, as only that approach will ensure base-level access is available to ORCID to all research organisations in New Zealand, regardless of their scale or the level of technical capability that they have. The remainder of this report is predicated upon the concept of a national ORCID Hub.

At a high level, the functional requirements for the New Zealand ORCID Hub are:

- *Onboarding Research Organisations:* For a research organisation to make use of ORCID and read from and write to its researchers' ORCID profiles, each research organisation must first be onboarded as a consortium member. Onboarding establishes the research organisation as an ORCID entity that can request permission to read and update researcher profiles, establishes the relationships with the New Zealand ORCID Consortium, and establishes access privileges for the New Zealand ORCID Hub.
- *Obtaining Researcher Permissions:* Researchers must individually grant their research organisations permission to read from or write to their ORCID profiles. The process of establishing authoritative affiliations between researchers and their research organisations, and the process of obtaining and recording each researcher's granting of permission, is a core functional capability of the New Zealand ORCID Hub.
- *Managing Access Tokens:* When a researcher grants read or write permission on their ORCID profile to a research organisation, ORCID provides that research organisation with an access

token for the researcher. The access token must be saved and managed for any future use. These access tokens are secret keys that provide secure programmatic access to a specific ORCID profile for a specific research organisation. The New Zealand ORCID Hub will provide a secure store of access tokens, segregated by research organisation, and a secure means by which research organisations may retrieve access tokens in order to present them to ORCID to interact with their researchers' ORCID profiles.

- *Updating Researcher Profiles:* The base-level capability for the New Zealand ORCID Consortium involves updating ORCID profiles to record authoritative affiliations between researchers and research organisations. Providing a mechanism to establish those affiliations reliably and effectively for all research organisations is a major benefit of establishing the New Zealand ORCID Hub. Additionally, the ability for smaller research organisations to update research outputs upon the ORCID profiles of their affiliated researchers will create business value and will be a core driver of uptake.

## The New Zealand ORCID Hub

### Technical Capabilities Needed

#### Overview

The strong recommendation of the sub-group is to establish a national ORCID capability, as only that approach will provide the scalability necessary to enable every research organisation in New Zealand to achieve base-level integration with ORCID. The technical capabilities the proposed New Zealand ORCID Hub requires are neither extensive, exotic, nor complex. These technical capabilities are outlined below.

ORCID does not provide a user interface for an administrator representing a research organisation to manage information on a researcher's profile, such as employment history and research outputs. The only way to read from or to update authoritatively the information on a researcher's ORCID profile is to use an integration or a custom application to access ORCID profiles through ORCID's Application Programming Interface (API).

Larger organisations will likely prefer to do their own integration, but that approach is likely to be out of reach for smaller ones. Larger organisations will need a method of collecting permission to act via the API on the ORCID records of their researchers, and the New Zealand ORCID Hub provides everything needed to manage the permission-acquisition process and the storage and management of the API access tokens required for subsequent reading from and writing to ORCID profiles.

#### Authentication and Access Management

Some people will need to login to the New Zealand ORCID Hub to achieve tasks such as linking their ORCID Profiles with their research organisation and managing research organisation privileges. The primary groups of people that will need to login to the New Zealand ORCID Hub are:

- *Researchers:* For researchers working with research organisations that use Tuakiri New Zealand Access Federation, login to the New Zealand ORCID Hub through Tuakiri will establish an authoritative affiliation between the researcher and the research organisation.
- *Research Organisation Administrators:* Each research organisation will have one or more administrators nominated to perform more-privileged actions in the New Zealand ORCID Hub. These activities include the creation of direct invitations to researchers working with smaller research organisations, and managing privileges to the store of access tokens for larger research organisations.



- *Hub Administrators*: Operating on behalf of the New Zealand ORCID Consortium, a small number of people will have the ability to administer the New Zealand ORCID Hub, performing activities such as onboarding and configuring research organisations and the access privileges for their nominated organisational administrators.

Tuakiri is the recommended mechanism to facilitate the login (i.e., the authentication and authorisation) for the New Zealand ORCID Hub. Tuakiri is recommended because it is an existing, widely-used, and robust national capability for researchers that leverages the home credentials of its users.

Additionally, Tuakiri has the Virtual Home Organisation capability established and ready to use in support of the smaller research organisations and their access to the New Zealand ORCID Hub. The Tuakiri Virtual Home Organisation (VHO) is a simple and reliable identity-management solution that can be used by smaller research organisations that do not have an identity-management capability of their own, or do not, or cannot, run a standalone Identity Provider (IdP). These institutions would have the option to host their identities at the Tuakiri VHO, with identity-management administrative rights delegated to people with appropriate authority within the research organisation — often somebody from Human Resources.

Using the Tuakiri VHO enables researchers from smaller research organisations to access the New Zealand ORCID Hub, and to access other research and Tuakiri-enabled resources such as digital repositories and collaboration spaces. This capability will create a bridge that will make it much easier for researchers from smaller research organisations using the VHO to collaborate effectively with colleagues from Crown Research Institutes and universities, and from international federation partners.

It is worthwhile noting that ORCID is now supporting institutional logins through the eduGAIN global identity federation. Tuakiri will be joining the eduGAIN federation later this year. This means researchers working with research organisations that are members of Tuakiri, or with organisations that use the Tuakiri Virtual Home Organisation service, will be able to login to their ORCID profile using their home (or their virtual-home) username and password. Coupled with the ability to access other federation-enabled services for researchers, this development could make the VHO approach a more attractive option for smaller research organisations to manage their researchers' identities.

## Access Token Management

When a researcher grants permission to their research organisation to read from and write to their ORCID profile, ORCID returns an access token to their research organisation. The access token must be saved and managed so that it can be retrieved and presented programmatically by the research organisation to ORCID for subsequent uses. In the context of the New Zealand ORCID Hub, there are several scenarios in which these access tokens, which provide secure access to the ORCID Application Programming Interface (API), will be required:

- *Administrative Updates*: Research-organisation administrators will be able to access the ORCID profiles of their affiliated researchers using simple human-usable web applications made available to them on the New Zealand ORCID Hub. For example, an administrator may use the facilities available through the New Zealand ORCID Hub to add research outputs to one of their affiliated researchers' ORCID profiles. These simple web applications will mediate the interaction between the New Zealand ORCID Hub and ORCID by managing the acquisition and presentation of researchers' access tokens. The administrator will not need any awareness that this mediation and the underlying secure exchange of access tokens between the New Zealand ORCID Hub and ORCID is occurring. This feature is anticipated to be of most value to smaller research organisations.
- *Programmatic Updates*: Research-organisation integrators will be able to obtain on demand from the New Zealand ORCID Hub the access tokens for their affiliated researchers. To do so, the

research organisation will require secure access to the New Zealand ORCID Hub's store of researcher access tokens. That access will be managed through a secure API offered by the New Zealand ORCID Hub. For example, a research organisation may choose to update the employment information on the ORCID profiles of their affiliated researchers by creating an integration service that runs from their Human Resources business applications. To do so, the integration service would need to obtain securely the access token for each researcher whose employment information was being written to ORCID, and present the appropriate token to the ORCID API with the data to be updated. This feature is anticipated to be of most value to larger research organisations.

The access tokens provided by ORCID enable read or write access to specific attributes on the ORCID profile of the researcher to whom they are bound, and the researcher will have granted permission to those attributes specifically when affiliating with the research organisation. For example, an access token may provide a research organisation with the ability to read anything from its affiliated researchers' ORCID profiles, but to update only employment history and research outputs. The New Zealand ORCID Hub will require some configurability to determine the scope of information for which it seeks permission from researchers, and about whether it is seeking only to read information, or to read and write information to researcher ORCID profiles. The sub-group envisages two levels of access-token privilege, configurable on a per-research-organisation basis. These two levels of access would, initially, provide the ability to read anything and:

- *base level*: the ability to update employment history and to update research outputs
- *next level*: the ability to update employment history and to update research outputs and to update additional information (e.g., biographical information, funding awards, and potentially anything updateable through the ORCID API)

Note that the effective permissions available to a particular access token may be reduced by the individual preferences that a researcher has set upon their ORCID profile. For example, a researcher could mark their biographical information as private, and an access token would no longer be able to access that researcher's biographical information for reading or for writing.

## Process Flow

### Onboarding Research Organisations

Beyond the business process of enrolling a research organisation with the ORCID Foundation, the New Zealand ORCID Hub also has onboarding requirements to establish each research organisation with the administrative and the technical capabilities it requires. This includes:

- *Tuakiri Federation Registry*: For those research organisations that are not members of the Tuakiri New Zealand Access Federation, REANNZ will expedite the membership process and connect their organisational identity-management system to a Tuakiri Identity Provider (IdP).

For those small-to-medium research organisations that do not have an identity-management system, an entry for the organisation will be created in the Tuakiri Federation Registry. This registration will also create a Virtual Home Organisation (VHO) to which administrators from each research organisation may be added for the purpose of managing Tuakiri user accounts for their researchers to use when interacting with the New Zealand ORCID Hub and with other Tuakiri-enabled services, such as research repositories and collaboration spaces.

- *New Zealand ORCID Hub*: Every research organisation, large or small, will require some form of administrative access to the New Zealand ORCID Hub. It is recommended this administrative

access will be secured by Tuakiri federated authentication, either through existing membership arrangements or through the establishment of VHO credentials. Tuakiri has been chosen on the basis that rigour is needed around the account-creation and provisioning of administrators working on behalf of research organisations. The established Tuakiri capability fulfils this requirement well.

## Administrative Privileges in the New Zealand ORCID Hub

Within the New Zealand ORCID Hub, each research organisation will have one or more nominated administrators provided with access to manage aspects of their ORCID integration. These privileges will enable administrators to perform beneficial and enabling functions, including those outlined below, and will provide a capability platform upon which further functionality may be developed, such as research-organisation-specific reporting and analytics of their researchers' ORCID profiles.

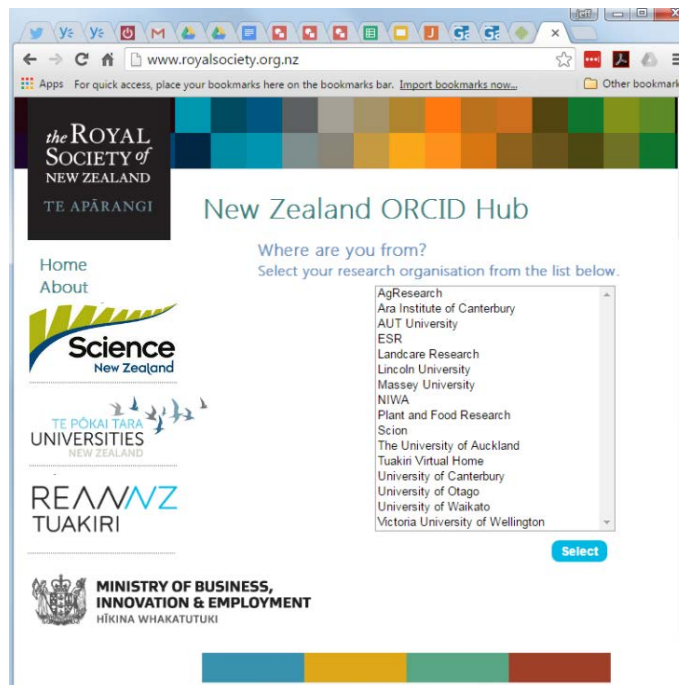
Function	Audience	Description
Managing Access Tokens	Larger research organisations	Research organisations wishing to establish programmatic integration from their systems of record to ORCID must acquire the relevant access tokens for their researchers. Secure and segregated mechanisms are required for the New Zealand ORCID Hub to provide research organisations with the access tokens associated with their affiliated researchers.
Inviting Researchers	Smaller research organisations	Smaller research organisations that cannot use either the native Tuakiri access-federation service or the Tuakiri VHO will require an alternative mechanism to establish authoritative affiliations with their researchers. The New Zealand ORCID Hub is expected to support a mechanism that enables organisational administrators to issue one-time-only invitations to nominated researchers. When those invitations are accepted, the researchers enter the same post-authentication flow at the New Zealand ORCID Hub as do regular Tuakiri users. This flow is indicated in the diagrams presented later in this report.
Entering Research Outputs	Smaller research organisations	In addition to establishing authoritative affiliation, the New Zealand ORCID Hub will also support the manual administrative entry of research outputs. The proposal is that research-organisation administrators will be provided with screens that enable either the direct entry of individual research outputs associated with a researcher, or the bulk entry of research outputs. The greatest value here is available to research outputs that are not published into the global digital repositories, and for smaller research organisations.

## Onboarding Individual Researchers

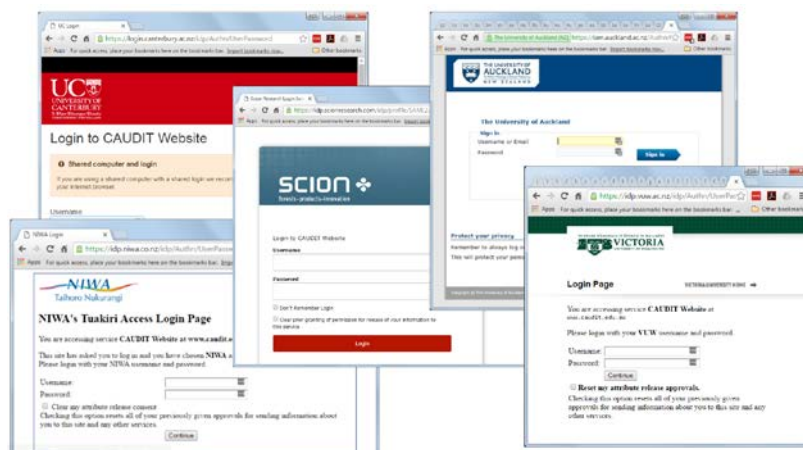
### Authentication and Identification

#### TUAKIRI: RESEARCHER-DRIVEN

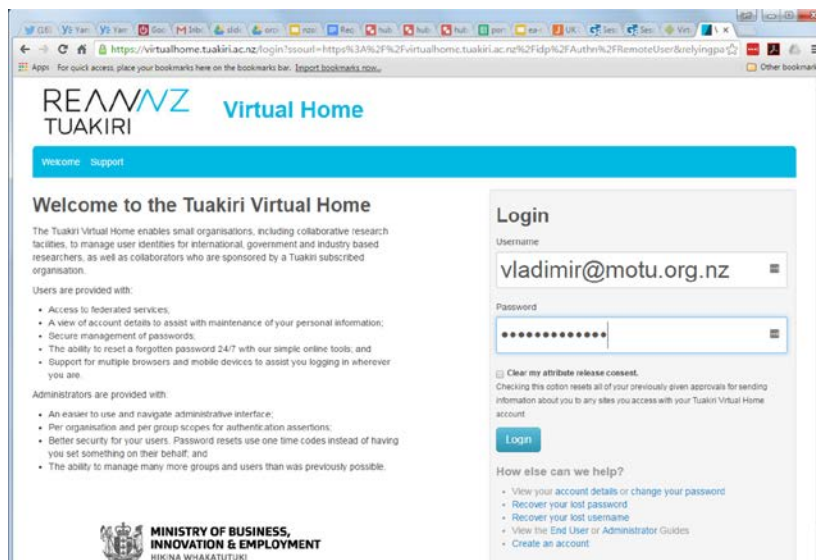
*Narrative 1:* A researcher wishing to associate an ORCID profile with a research organisation will visit the New Zealand ORCID Hub and select the intended research organisation from the embedded Tuakiri Discovery Service, as illustrated in the mock-up here:



*Narrative 2:* After selecting the research organisation the researcher wishes to become affiliated with, the researcher is redirected by Tuakiri to login, either through their home organisation's identity provider and a consent process for their identity information to be released, such as the selected examples illustrated here...:



Narrative 3: ...or through the Tuakiri Virtual Home Organisation (VHO), as illustrated here:



### ADMINISTRATIVE REGISTRATION

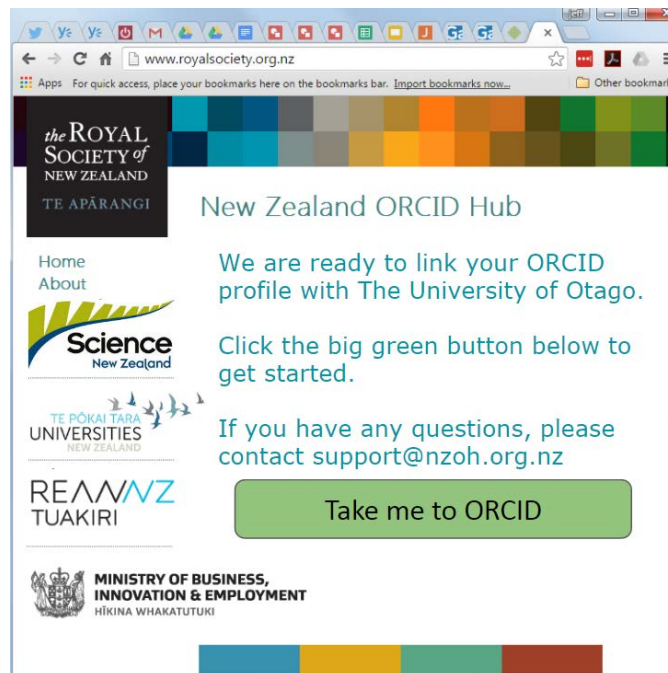
Narrative 4: Alternatively, for researchers who have a relationship with a smaller research organisation that is neither a Tuakiri member nor choosing to operate a Tuakiri VHO, an administrator for that research organisation would create invitations to their researchers, asking them to become affiliated through the New Zealand ORCID Hub.

The invitations take the form of a secure one-time-use-only link emailed to the invited researchers, or provided to them by other means. In the illustration below, an email has been sent from the New Zealand ORCID Hub inviting a researcher to become affiliated with a research organisation:

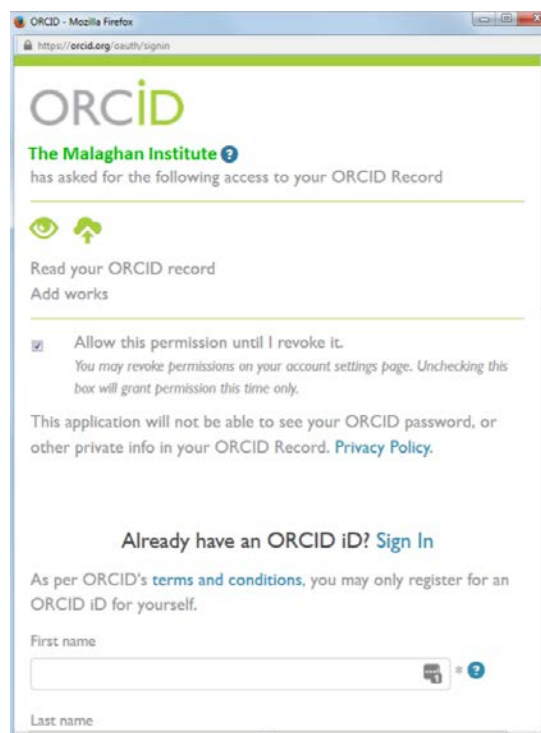


## Researcher Guidance and Permissioning

*Narrative 5:* For all researchers, whether entering the affiliation and permissioning process through the Tuakiri member route, through the Tuakiri VHO route, or through the one-time-use-only direct invitation, after login they are delivered to a landing page in the New Zealand ORCID Hub to confirm the process:

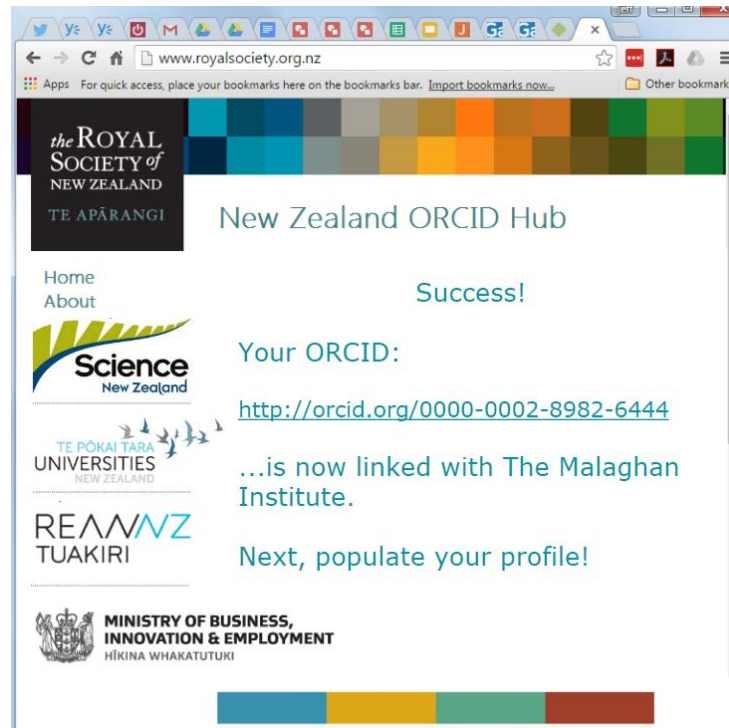


*Narrative 6:* After acknowledging the landing page, the researcher is directed to ORCID, where the researcher's permission is sought for their research organisation to read from and write to their ORCID profile, as seen here:



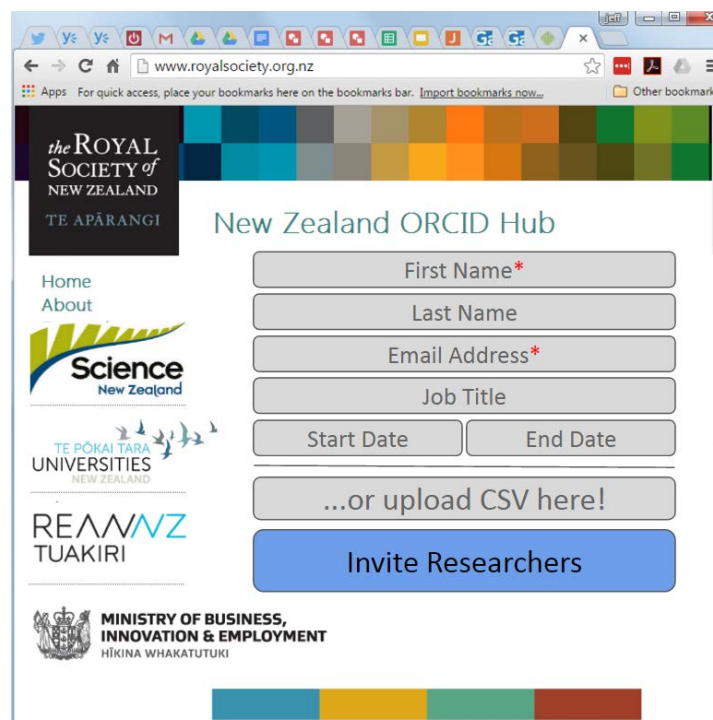


Narrative 7: Success and a call to action are communicated to the researcher after the ORCID profile has been created or claimed, permission granted, and the researcher returned to the New Zealand ORCID Hub:

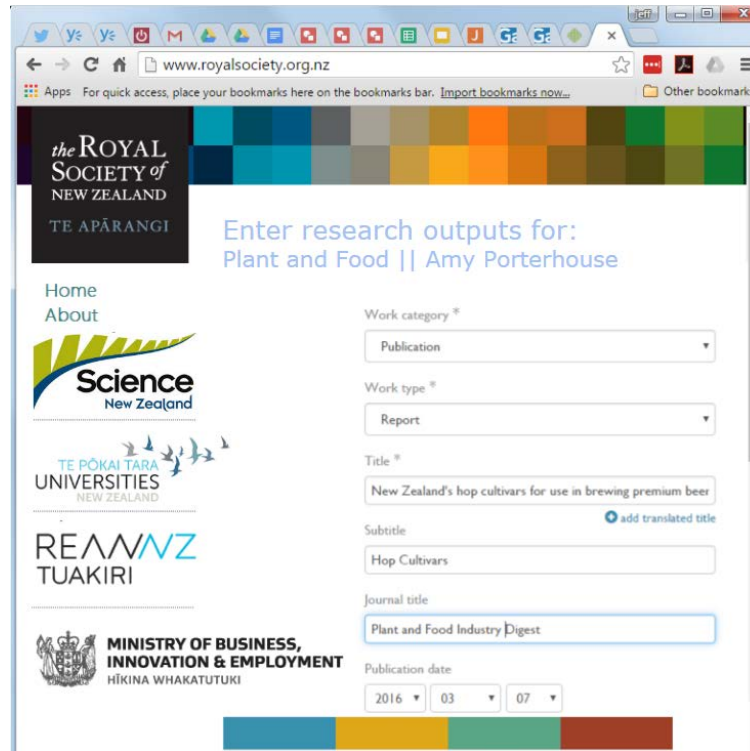


#### Manual Administration and Maintenance

Narrative 8: Privileged administrators may enter the details of individual researchers or upload a batch of researchers to receive invitations to become affiliated authoritatively with their research organisation. After providing the details of the researchers being sponsored for affiliation, the New Zealand ORCID Hub will send an email notification to the researchers that contains the link they are to follow to establish their researcher affiliation. A mock-up of the invitation screen is shown below.

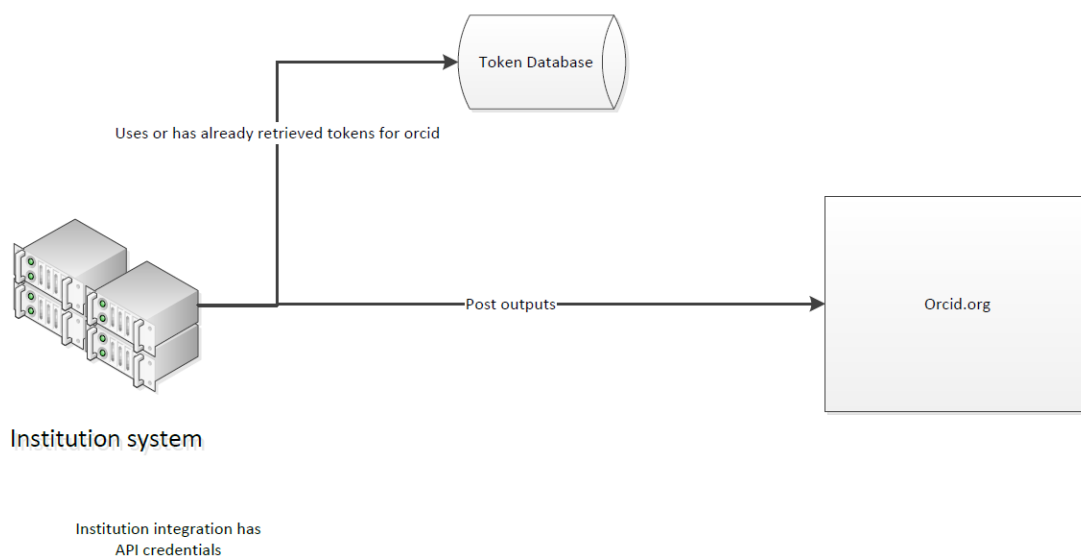


Narrative 9: Administrators may also use the New Zealand ORCID Hub as a front-end means of updating research outputs for their affiliated researchers.



## Research Organisations Integrating With ORCID

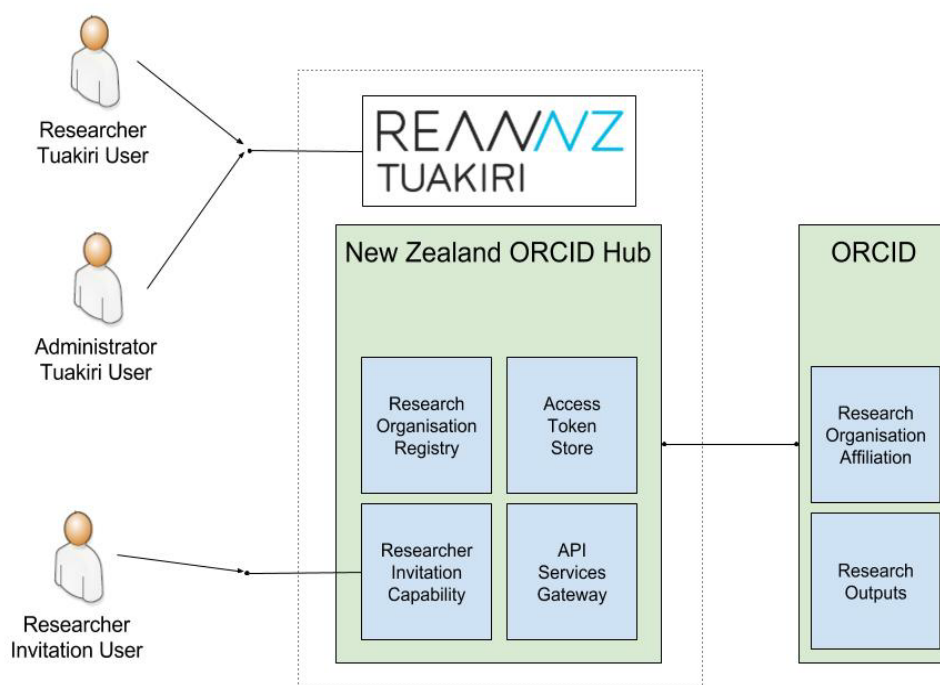
Narrative 10: Some researcher organisations, particularly those of medium-to-large scale, may choose to implement their own integrations with ORCID. To achieve this, those organisations must interact with the New Zealand ORCID Hub to obtain researchers' access keys and present them to ORCID. Doing this enables a research organisation to provide automated updates of ORCID profiles using the research organisation's own integration capability. This is likely to be an attractive option for larger research organisations.





## Conceptual Architecture

To implement the technical requirements outlined above, a solution is required that will enable the researcher-initiated and the administrative human workflows needed to deliver the base-level requirements for ORCID integration. Additionally, the solution must support those research organisations wishing to create direct integrations with ORCID by providing a secure repository of access tokens. The sub-group has created the conceptual solutions architecture, illustrated below, of a fit-for-purpose New Zealand ORCID Hub.



The solution components needed to create an effective, sustainable New Zealand ORCID Hub are all common and well-understood. Outlines of the primary components and their purpose are given in the table below

Component	Purpose
Web Application	Researchers and administrators will interact with the New Zealand ORCID Hub through a simple web application that provides an intuitive and well-designed user interface built to function seamlessly on a wide range of devices.
Identity Management	<p>Login to the New Zealand ORCID Hub will be provided by the Tuakiri New Zealand Access Federation.</p> <ul style="list-style-type: none"> <li>For researchers, login will seed the creation of an authoritative affiliation with their research organisation.</li> <li>For administrators, Tuakiri will provide a level of assurance that privileged Hub operations are being performed only by entitled persons.</li> </ul>

Component	Purpose
Access Token Store	A robust store of access tokens provides the means by which either the New Zealand ORCID Hub (when administrators update their researchers' ORCID profiles authoritatively, acting on behalf of their research organisations) or a research organisation (with its own integration services) can read from or write to its researchers' ORCID profiles. The access store will be segregated by research organisation.
Data Store	A simple data store in the New Zealand ORCID Hub will persist some configuration, roles, and a research organisation registry. The data store will also manage records of administrator-initiated invitations sent to researchers.
Invitation Capability	The administrator-initiated researcher-invitation workflow requires web-application functionality, the ability to ingest, validate, and process a structured data file, and the ability to send invitations to individual researchers' nominated email addresses.
API Services Gateway	A lightweight API Services Gateway is included in the conceptual design of the New Zealand ORCID Hub. The purpose of this component is to manage interactions between the New Zealand ORCID Hub and ORCID, and to provide a secure and easy-to-use mechanism for research organisations to obtain access tokens for their affiliated researchers from the access token store.
Research Organisation Registry	The registry of research organisations contained within the New Zealand ORCID Hub will mirror the contents of the Tuakiri Federation Registry for research organisations, will determine the roles and the scope available to administrators, and will provide structure to the segregated access token store.

## Cost of the ORCID Consortium

### Cost Overview

On 18 April 2016, MBIE informed the Working Group that Minister Joyce had agreed for MBIE to provide financial support to the NZ ORCID Consortium. The commitment of financial support includes the annual consortium-membership subscription to ORCID and the provision of technical support to New Zealand research organisations to assist and facilitate their interactions ORCID services.

### Cost of the Consortium

The overview of costs provided by the high-level technology-requirements sub-group are of a necessarily-indicative nature, and are therefore offered with the expectation that due diligence and adequate cost-modelling be undertaken. In overview, the costs are associated with three classes of activity:

1. *ORCID Consortium Membership Fees*: This is a known quantity, and the level of consortium subscription required to cover all New Zealand research organisations costs USD\$135,000 annually.
2. *New Zealand ORCID Consortium Technical Partner*: The lead agency for the New Zealand ORCID Consortium has been determined as The Royal Society of New Zealand. A technical partner to

the New Zealand ORCID Consortium has yet to be identified. The anticipated scope of services, responsibilities, and expertise the technical partner is to provide can be modelled on the equivalent offering within the Australian ORCID Consortium, led by the Australian Access Federation. An initial attempt to scope the role of the technical partner is offered later in this report. A funding-and-support model requires development and validation for the establishment of a technical partner for the New Zealand ORCID Consortium to provide support to researchers and to research organisations, provide consultancy and expertise where required, and will provide maintenance, upkeep, and support to the New Zealand ORCID Hub.

3. *New Zealand ORCID Hub*: The conceptual solution architecture described above has been used to gauge the indicative cost of designing and delivering the New Zealand ORCID Hub. The indicative estimated cost of creating the New Zealand ORCID Hub is \$50,000. This cost was determined by various approaches, including lightweight modelling of the development iterations that would be needed to create the New Zealand ORCID Hub. The starting-point for the development will be relatively mature, as existing hub-like approaches, such as the Italian solution and the MyORCID hub at the University of Auckland, may be used to inform the approach, as might enabling tools from other ORCID consortia. Ongoing costs relating to the maintenance, upkeep, and enhancement of the New Zealand ORCID Hub would need to be determined in conjunction with the technical partner of the New Zealand ORCID Consortium. Additionally, wherever the New Zealand ORCID Hub is deployed, whether in a research organisation's data centre, in a co-hosting facility, or on one of the increasingly-capable platform-as-a-service offerings, there will need to be some provision made for the ongoing costs associated with hosting.

## Cost of Integration with the New Zealand ORCID Hub

The design of the proposed New Zealand ORCID Hub is predicated on offering the lowest-possible barriers to all research organisations achieving base-level integration with ORCID. Appropriate funding and operational models will need to be determined to ensure that goal is met sustainably.

Over and above establishing base-level integration, some of the larger research organisations may choose to integrate a much-wider range of authoritative information to their researchers' ORCID profiles. This could include data detailing research outputs, funding and grants, biographical information, and employment history.

Smaller research organisations may, and will be likely to, elect to manage their interactions with ORCID manually through the administrative functionality provided by the New Zealand ORCID Hub.

## Cost of Integration with Internal Business Applications

Establishing base-level integration with the New Zealand ORCID Consortium does not require a research organisation to integrate, consume, or process any new information with its internal business applications. Each research organisation can choose the extent of integration with its internal business applications, and the costs of doing this will vary widely from one organisation to another.

There is no suggestion that the New Zealand ORCID Consortium would bear or contribute these costs of integrating ORCID with a research organisation's internal business applications, though the consortium's technical-support service would provide consultancy and advice as to how such integrations might best be achieved.

However, worthwhile benefits are available to those research organisations that do choose to integrate ORCID information with their internal business applications. Those benefits typically result from increases in the efficiency and effectiveness of business processes underpinning research management and

research-outputs management. The sub-group acknowledges and anticipates that it will likely be only the larger and more-technically-capable research organisations that will undertake the integration of ORCID information with their internal business applications.

While there is no hierarchy or ideal phasing for the implementation of ORCID integration with a research organisation's internal business applications, the first step is usually to obtain the ORCID iD for each affiliated researcher and to store that in whatever is used as the research organisation's identity-management system. With the ORCID available, subsequent integrations may be determined as valuable with internal business applications such as:

- Institutional repositories of research outputs
- Research management systems
- Researcher profiling systems such as VIVO
- Identity Management and Human Resources systems in order to automate the management of ORCIDs
- Financial Management systems
- Enterprise Data Warehouse

Institutional repositories such as DSpace, which is used by all New Zealand universities and by AgResearch, are used to manage and preserve all types of digital content, and are deployed widely throughout the academic and research communities. Integration with institutional repositories like DSpace will be cost-effective and beneficial for those organisations with such repositories, although some development is required for this additional functionality. With the relationship established reliably between a research output and an affiliated researcher, a research organisation will be able to use the proposed base-level functionality of the New Zealand ORCID Hub to create and update authoritative research-outputs information on each of its affiliated researchers' ORCID profile.

The cost of implementing integrations such as these depends entirely upon the business applications involved, the integration and middleware capabilities available to implement the integration, and the integration pattern selected. For example, some research-management systems (e.g., Elsevier *Pure*, Digital Science *Symplectic*) have inbuilt ORCID integration, so the cost of establishing this integration is limited to minor configuration, and is therefore insignificant, providing an existing organisational subscription exists. For commercial-off-the-shelf business applications outside of the research domain (e.g., Financial Management or Human Resources systems) and for home-built systems, integration costs will vary widely.

## Technical Partner for the New Zealand ORCID Consortium

The proposed functional deliverables to be provided by the technical partner to the New Zealand ORCID Consortium are outlined below. These functional deliverables have been informed by the corresponding services provided by the Australian Access Federation to the Australian ORCID Consortium and its members, and also by the technical-partner expertise of REANNZ (Research and Education Advanced Network New Zealand).

Function	Deliverables
Member Technical Support	<ul style="list-style-type: none"> <li>• <i>Self-Service</i>: Service Desk, Knowledge Base, Tier 1-2 Technical Remote Support</li> <li>• <i>Onboarding</i>: provisioning and deprovisioning of research organisations and administrators</li> <li>• <i>New Zealand ORCID Hub</i>: Technical Support</li> <li>• <i>Operational &amp; Maintenance</i>: updates and patching, source-code management, GitHub, repositories, and documentation</li> <li>• <i>Communication</i>: Technical ambassador and community engagement workshop/events</li> </ul>
Identity Management	<ul style="list-style-type: none"> <li>• Single-sign-on to the New Zealand ORCID Hub with Tuakiri Federated Authentication for all New Zealand Research and Education institutions (IdP)</li> <li>• Tuakiri Virtual Home Organisation Identity Provider Service for small-medium research organisations</li> <li>• Research Repository - Service Providers (SP) connect only once</li> <li>• National and global scale research collaboration support – implementation of eduPersonOrcid Attribute</li> <li>• Federated access to orcid.org via eduGAIN (in the near future)</li> </ul>
Service Development and Innovation	<ul style="list-style-type: none"> <li>• Continue to develop and enhance customer/researcher experience</li> <li>• New Zealand ORCID Hub service life-cycle: continue to operate as an ongoing concern</li> <li>• Innovate along with orcid.org technology roadmap</li> <li>• Business continuity - continued development to mitigate risk and security issues</li> </ul>
Professional Services and Consultancy (add-on services)	<ul style="list-style-type: none"> <li>• On-demand Membership or Prospective-membership Tier 3-4 Technical Support: <ul style="list-style-type: none"> <li>• Skill-gap resourcing</li> <li>• Advanced authentication and service integration</li> <li>• Support crown funded research initiatives – reduce complexity and expedite project delivery</li> </ul> </li> </ul>

## Further Information

### Sub-Group Members

Name	Role	Organisation	Position
Clinton Watson	Sponsor	MBIE	Principal Policy Advisor
jeff kennedy	Chair	The University of Auckland	Enterprise Architecture Manager
Andrew Watkins	Member	NIWA	General Manager for Information Technology
Lee Dowsett	Member	MBIE	Enterprise Architect
Matt Plummer	Member	Victoria University of Wellington	Customer Relationship Coordinator
Michele Napier	Member	Plant & Food	Knowledge Navigator Team Leader
Sat Mandri	Member	REANNZ	Tuakiri Service Manager
Vladimir Mencl	Advisor	REANNZ	Senior Solution Engineer

### References and Links

- Tuakiri New Zealand Access Federation and the Virtual Home Organisation:
  - Guide for Users: <https://tuakiri.ac.nz/confluence/display/Tuakiri/Virtual+Home+User+Guide>
  - Guide for Administrators: <https://tuakiri.ac.nz/confluence/display/Tuakiri/Virtual+Home+Administrator+Guide>
- Australian ORCID Consortium, <https://aaf.edu.au/orcid/>
- UK ORCID Consortium, <https://www.jisc.ac.uk/orcid>
- Italian National ORCID Hub, <https://orcidhub.cineca.it/orcidhub/>
- eduGAIN, <http://services.geant.net/edugain/>

### Notes

1. Working Group members noted that overseas studies were based on large universities that have thousands of researchers and various internal systems.
2. The University of Canterbury has recently become a member of ORCID, but has yet to implement ORCID.
3. Individual researchers must first establish an ORCID profile and then give permission to their research organisations to update that profile on their behalf.

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