Inland Revenue
Te Tari Taake

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Build Pack: Prescribed Investor Rate (PIR) Service

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1 Overview

1.1 This solution

Inland Revenue has a suite of digital services available for consumption by our service providers that supports efficient, electronic business interactions with Inland Revenue. This service is an application programming interface (API) that external applications can call in order to request a "suggested" Prescribed Investor Rate (PIR) value for an individual customer. This API is one of a set of calculators that will be exposed via Gateway Services.

It is important to note that this API will only provide the suggested PIR when enough information about the member/investor is stored in START to calculate the rate. Inland Revenue does not know with certainty that the PIR value calculated reflects the customer's current position therefore the customer is entitled to override the value that this API returns.

Before continuing, please consult
www.ird.govt.nz/digital-service-providers/services-catalogue
for business-level context, use cases and links to relevant policy.
The information available here explains how to integrate with
Inland Revenue's services.

1.2 Intended audience

The solution outlined in this document is intended to be used by the Portfolio Investment Entity (PIE) providers. PIE providers are financial institutions and each PIE is a separate legal entity. KiwiSaver schemes are a specialised type of PIE, there investors are referred to as members.

The reader is assumed to have a suitable level of technical knowledge in order to comprehend the information provided. A range of technical terms and abbreviations are used throughout this document, and while most of these will be understood by the intended readers, a glossary is provided at the end.

1.3 Prerequisites

Party	Requirement	Description
Digital Service Provider	Acquire a X.509 certificate from a competent authority for the Test and Production environments	This is required when using mutual TLS with cloud-based service providers or financial institutions. Note that the same certificate cannot be used for the Test and Production environments.

1.3.1 Mutual Transport Layer Security and certificates

Mutual transport layer security (TLS) is implemented for this API. This requires the use of a publicly-issued X509 certificate from one of the trusted certificate authorities. Inland Revenue does not issue certificates to external vendors for web service security implementations.

Inland Revenue has the following minimum requirements for accepting public X509 keys:

- Minimum Key Length: 2048
- Signature Algorithm: SHA256[RSA]
- Self-signed certificates are not accepted
- Certificates issued by a private/internal certificate authority are not accepted.

In general, shorter-lived certificates offer a better security posture since the impact of key compromise is less severe but there is no minimum requirement for certificate expiry periods.

Below is a list for examples of certificate authority providers with no recommendations or rankings incorporated. It is recommended that a business researches which certificate authority meets their requirements:

- Comodo
- GeoTrust
- DigiCert
- GlobalSign
- Symantec
- Thawte
- IdenTrust
- Entrust
- Network Solutions
- RapidSSL
- Entrust Datacard
- GoDaddy.

1.3.1 Authentication options

1.3.1.1 OAuth

When using OAuth the interaction with IR is transacted under the identity of a myIR user. OAuth requires the presence of a myIR user, as this person must be available to supply their user ID, password and consent at run-time in order to be authenticated. OAuth is especially suited to cloud-based applications where the transacting parties are application users rather than providers.

1.3.1.2 JWT

The alternative to OAuth is JWT, which does not require the presence of a myIR user. Authentication is based on the verification of a digital signature that (provably) belongs to a customer. In order to digitally sign their messages, the customer must acquire a digital certificate from a trusted certificate authority, or generate a self-signed certificate, and supply it to Inland Revenue during the on-boarding process.

JWT is therefore appropriate when the following conditions apply:

- The interaction with Inland Revenue is conducted under the identity of an organisation, as opposed to a person AND
- The organisation has the technical and operational capability to securely obtain and manage digital certificates AND
- The organisation's interactions with Inland Revenue can occur in the absence of specific people due to staffing issues such as out-of-hours non-availability, staff turnover and absence from work.

These factors tend to limit the use JWT to larger corporations and public sector organisations. It is not suitable for cloud-based applications as it requires all application users to have their own digital certificates—this is administratively burdensome and requires these users to lodge their private keys with their application provider, which is insecure.

2 Authorisation

2.1 Authorisation header using OAuth2 or JWT

This API will require either an Oauth2 or signed JSON web token (JWT) in the authorisation header. The provided token will be used in order to determine the digital service provider's identity.

2.1.1 OAuth2 authorisation token

Inland Revenue's implementation of the OAuth 2 standard conforms to the authorisation code grant flow described in section 4.1 of RFC 6749. For further details and requirements, please see the Identity and Access Services build pack.

2.1.2 M2M using client signed JWT authorisation

Inland Revenue's machine-to-machine (M2M) authentication mechanism will use client-signed JSON web tokens (JWT). When applying this pattern, the external parties fulfil the following roles:

- **Resource Owner**—this is the party under whose identity the transaction is being undertaken. This has the same meaning as 'Resource Owner' in the OAuth protocol. The resource owner's identity binds to a myIR user ID within START, and from this to START's authorisation rules and the user's access rights. Each service/API call is verified and trusted because it is digitally signed with a public/private key pair belonging to the resource owner using an approved signing algorithm (currently RSA or preferably ECDSA). The resource owner's public key is exchanged during the on-boarding process.

- **Service Provider**—this is the party that operates the application that consumes Inland Revenue's gateway services. This is the equivalent of the client application when using the OAuth protocol. The service provider encrypts the data that they exchange with Inland Revenue.

For further details/requirements please see the Identity and Access Services build pack.

2.2 Authorisation validation

2.2.1 OAuth2 authorisation validation

The myIR logon associated to the OAuth2 token will be used to identify which customers the consumer of service has access to. If the member/investor does not exist in this list, access will be denied.

2.2.2 JWT authorisation validation

The table below describes the two ways in which the JWT token can be validated.

NOTE: If the 'startLogon' claim is not left as null then only the 'startLogon' will be used for validation. If it is left null than only the 'sub' claim will be used for validation.

Validation method	Description
'startLogon' claim	As outlined in the Identity and Access Services build pack, the resource owner can provide a myIR logon for the 'startLogon' claim in the JWT payload. If the start logon is provided there are two validations that take place: 1. To validate an API consumer, one of the following must be true: ○ Customer associated to TLS credential is the same as the customer associated to start logon. ○ Customer associated to TLS credential is a software intermediary and they are linked to the customer associated to the start logon. ○ Customer associated to TLS credential is a tax agent and they are linked to the customer associated to the start logon. ○ Customer associated to TLS credential is a software intermediary and they are linked to a tax agent who is linked to the customer associated to the start logon. 2. To validate start logon has access to the investor/members PIR rate one of the following must be true: ○ The start logon belongs to a KiwiSaver scheme and scheme to member relationship exists. ○ The start logon belongs to a KiwiSaver scheme admin and an admin to scheme to member relationship exists. ○ The start logon belongs to a PIE financial institution and a PIE certificate exists for the PIE institution and investor. ○ Soft-matching of investor IRD number, name, date of birth and address which were provided as optional parameters in request payload.

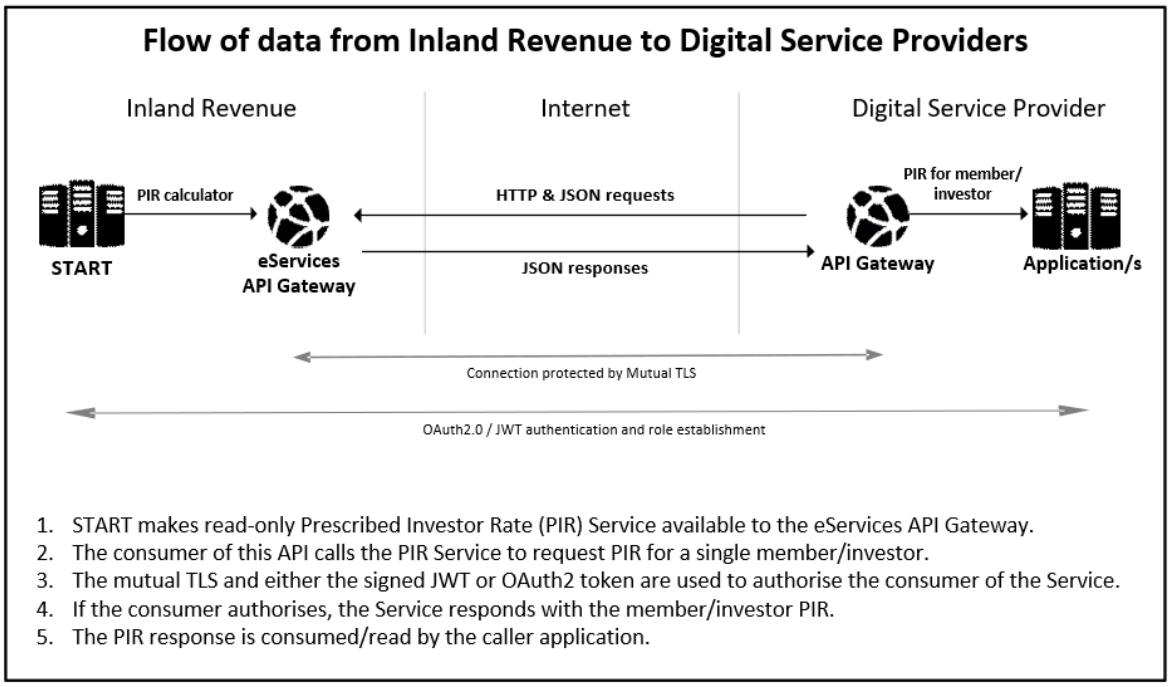
Validation method	Description
'sub' claim:	For this service the resource owner has the option to leave the 'startLogon' claim as null. If this is the case, the 'sub' claim's certificate thumbprint will be used to validate the resource owner. There are two validations that take place: 1. To validate an API consumer, one of the following must be true: ○ Customer associated to TLS credential is the same as the customer associated to JWT credential (signing) ○ Customer associated to TLS credential is a software intermediary and they are linked to the customer associated to the JWT credential. ○ Customer associated to TLS credential is a tax agent and they are linked to the customer associated to the JWT credential. ○ Customer associated to TLS credential is a software intermediary and they are linked to a tax agent who is linked to the customer associated to the JWT credential. 2. To validate relationship between JWT credential customer and member/investor one of the following must be true: ○ The JWT credential belongs to a KiwiSaver scheme and scheme-to-member relationship exists. ○ The JWT credential belongs to a KiwiSaver scheme admin and an admin-to-scheme-to-member relationship exists. ○ The JWT credential belongs to a PIE financial institution and a PIE certificate exists for the PIE institution and investor. ○ Soft-matching of investor IRD number, name, date of birth and address which were provided as optional parameters in request payload.

3 Solution design

3.1 Architecture

Inland Revenue is offering a suite of web applications in order to facilitate interactions via software packages. This API will be used by approved organisations to retrieve prescribed investor rates from Inland Revenue.

The diagram below illustrates the flow of data from Inland Revenue to the Digital Service Providers.



1. START makes read-only Prescribed Investor Rate (PIR) Service available to the eServices API Gateway.
2. The consumer of this API calls the PIR Service to request PIR for a single member/investor.
3. The mutual TLS and either the signed JWT or OAuth2 token are used to authorise the consumer of the Service.
4. If the consumer authorises, the Service responds with the member/investor PIR.
5. The PIR response is consumed/read by the caller application.

3.2 PIR messages

3.2.1 Request payload

Field	Requirement	Description
IRD	Mandatory	Investor IRD number (individuals only). This field is validated to ensure that it exists and is active. The calculated suggested PIR value will be this investor's current PIR. The IRD field will be the PIE investor or KiwiSaver scheme member. • For supported formats. Must comply with Modulus 11 check (see https://www.classic.ird.govt.nz/resources/d/a/dac415c0-456f-4b2f-87b6-0e76cbedd3ec/2020+RWT%26NRWT+Specification+Document+v1.0.pdf) • If IR number is 8 characters, then pad with a leading zero '0' to make a total of 9 characters. Numeric only, any letters or special characters will cause the check digit validation to fail.
PieIRD	Mandatory	PIE IRD number. This field is validated to ensure that it exists, is active and is a PIE entity. The PIE IRD will be either a PIE financial institution or KiwiSaver scheme provider. • For supported formats. Must comply with Modulus 11 check (see https://www.classic.ird.govt.nz/resources/d/a/dac415c0-456f-4b2f-87b6-0e76cbedd3ec/2020+RWT%26NRWT+Specification+Document+v1.0.pdf) • If IR number is 8 characters, then pad with a leading zero '0' to make a total of 9 characters.
FormattedName	Optional	Formatted name of the investor. Used for soft matching.
FirstName	Optional	First name of the investor. Used for soft matching.
MiddleName	Optional	Middle name of the investor. Used for soft matching.
LastName	Optional	Last name of the investor. Used for soft matching.
Dob	Optional	Date of birth of the investor. Used for soft matching.

Field	Requirement	Description
FormattedAddress	Optional	Investor formatted address. Used for soft matching.
Street	Optional	Investor street. Used for soft matching.
City	Optional	Investor city. Used for soft matching.
PostCode	Optional	Investor post code. Used for soft matching.
State	Optional	Investor state. Used for soft matching.
Country	Optional	Investor country, ISO 2A format. Used for soft matching.

3.2.2 Response payload

Field	Description
IRD	Investor IRD number (individuals only). The IRD field will be the PIE investor or KiwiSaver scheme member.
PieIRD	PIE IRD number. The PIE IRD will be either a PIE financial institution or KiwiSaver scheme provider.
SuggestedPirRate	Suggested PIR for investor. Only contained in response when an investor PIR could be calculated.
PirRateNotFound	Only contained in response when an investor PIR could not be calculated.

4 Error codes

4.1 Field validation error codes

Error code	Occurs
EV1000	• No incoming POST content found
EV1100	• Invalid input parameters. Please check documentation.

For field validation errors the HttpStatusCode returned will be '400—bad request'.

4.2 Authentication validation error codes

Error code	Occurs
EV1023	• No customer associated to TLS cert
EV1024	• Authentication error
EV1025	• Missing OAuth or JWT token in the HTTP header
EV1026	• Authentication error—Issued date or expiry date is invalid
EV1027	• Certificate or credential could not be found
EV1028	• Authentication error—JWT signature validation failed
EV1029	• Authentication error—JWT algorithm not configured on credential doc
EV1030	• Unknown authentication error
EV1040	• Start logon associated to OAuth token does not have access to any accounts or customers
EV1041	• Start logon associated to OAuth token does not have access to member/investor customer
EV1042	• Unable to validate API consumer to JWT provided
EV1043	• Unable to validate JWT to member/investor IRD number provided
IR003	• The IRD supplied has been queried too many times within the past 24 hours.

For authentication errors the HttpStatusCode returned will be '401—unauthorised'.

4.3 Other error codes

Error code	Occurs
PIR150—Unknown	• Unknown error occurred while processing

For other errors, the HttpStatusCode returned will be '500—internal server error'.

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5 End points and OpenAPI specifications

5.1 End points

Current environment information for this service—including the end points for each environment—is available within the relevant Software Development Kit (SDK).

To access the SDK, do one of the following:

- Go to https://github.com/InlandRevenue and select this service
- Go to https://developerportal.ird.govt.nz and click the link to the SDK within the Gateway Service documentation (please register first).

5.2 OpenAPI specifications

An OpenAPI file allows for the description of the entire API, end points, operations on each end point, and operation parameters. The included .yaml file can be used along with an OpenAPI editor such as editor.swagger.io to view technical specifications for this operation and generate example client code.

To access the latest OpenAPI definition for this service, please do the following:

- Login to the developer portal at https://developerportal.ird.govt.nz (register first)
- Download and view the OpenAPI definition within the Gateway Service documentation.

6 Glossary

Acronym/term	Definition
API	Application Programming Interface—set of functions and procedures that allow applications to access the data or features of another application, operating system or other service.
Authentication	The process that verifies the identity of the party attempting to access Inland Revenue
Authorisation	The process of determining whether a party is entitled to perform the function or access a resource
End points	A term used to describe a web service that has been implemented
FIPS	Federal Information Processing Standard—a suite of IT standards from the US Federal Government
Gateway	Inland Revenue's web services gateway
HTTP, HTTPS	Hyper Text Transmission Protocol (Secure)—the protocol by which web browsers and servers interact with each other. When implemented over TLS1.2 HTTP becomes HTTPS.
IAMS	Identity and Access Management—a logical component that performs authentication and authorisation. Physically it is a set of discrete hardware and software products, plug-ins and protocols. Usually implemented as separate External IAMS (XIAMS) and Internal IAMS.
IAS	Identity and Access Service
IP	Internet Protocol—the principal communication protocol in the Internet protocol suite for relaying datagrams across networks
IRD	Inland Revenue Department (ie IRD Numbers)
JWT	JSON Web Token—a compact, URL-safe means of representing claims to be transferred between two parties
M2M	Machine-to-machine communication
OAuth	An HTTPS based protocol for authorising access to a resource, currently at version 2
OpenAPI specifications	Formerly known as Swagger specifications—a specification for machine-readable interface files for describing, producing, consuming and visualising RESTful web services.
Payloads	This refers to the data contained within the messages that are exchanged when a web service is invoked. Messages consist of a header and a payload.
Schemas	An XML schema defines the syntax of an XML document, in particular of a payload. The schema specifies what a valid payload must or can contain, as well as validating the payload.
SHA	Secure Hashing Algorithm. There is a family of them that provide different strengths. SHA-2 is currently favoured over SHA-1, which has been compromised.

Acronym/term	Definition
SOAP	Simple Object Access Protocol—a set of standards for specifying web services. GWS uses SOAP version 1.2
SSL	Secure Sockets Layer certificates—used to establish an encrypted connection between a browser or user's computer and a service or website
START	Simplified Taxation and Revenue Technology—IR's new core tax processing application. It is an implementation of the GenTax product from FAST Enterprises.
TLS1.2	Transport Layer Security version 1.2—the protocol that is observed between adjacent servers for encrypting the data that they exchange. Prior versions of TLS and all versions of SSL have been compromised and are superseded by TLS1.2.
URL	Universal Resource Locator—also known as a web address
X.509 certificate	An international standard for encoding and describing a digital certificate. In isolation a public key is just a very large number, the X.509 certificate to which it is bound identifies whose key it is, who issued it, when it expires etc. When a counterparty's X.509 digital certificate is received, the recipient takes their public key out of it and store the key in their own keystore. The recipient can then use this key to encrypt and sign the messages that they exchange with this counterparty.
XIAMS	External IAMS—an instance of IAMS that authenticates and authorises access by external parties, for example customers, trading partners etc, as opposed to internal parties such as staff
YAML	"YAML Ain't Markup Language"—a human-readable data-serialisation language commonly used for configuration files and in applications where data is stored or transmitted.

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7 Change log

This table lists all material changes that have been made to this build pack document since the release of v1.0 (most recent changes listed first). It does not encompass non-material changes, such as to formatting etc.

Version	Date of change	Document section	Description
1.0	21/10/20	1.3.2	• New section added – 'Authentication options'
	11/08/20	2.2.2	• Note added: NOTE: If the 'startLogon' claim is not left as null then only the 'startLogon' will be used for validation. If it is left null than only the 'sub' claim will be used for validation. • Description of 'StartLogon' claim updated
	14/07/20	2.2.2	• Minor typo corrected with numbering in table
	28/05/20	YAML	• PIR calculator YAML updated
		1.1	• Updates made to boxed instructions for where to find additional information such as business-level context, use cases and links to relevant policy.
		5	• Updated entire section with new instructions on where to find end points, YAML files etc.
	09/04/20		• V1.0 released