

(a) the full closure report relating to the Proof of Concept for Entitlement Calculation Engine (RFQDM21-615s), said report being entitled Proof of Concept 10: Machine-Enabled Legislative Transposition Closure Report;

Proof of Concept 10: Machine-Enabled Legislative Transposition Closure Report

Services Australia & SecureFast

Document Version History

Version	Version Date	Description	Updates made by
0.1	2022-07-05	Initial version for review by Services Australia	Personal Information
0.2	2022-07-13	Personal Information comments to v0.1	
0.3	2022-07-25	SecureFast additional updates (inclusion of most attachments)	
0.4	2022-07-26	Personal Information comments	
1.0	2022-07-27	SecureFast addressing feedback throughout.	
1.1	2022-08-01	Personal Information adjustments	

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Problem / Opportunity Statement

Implement a solution that will replace the eligibility and entitlement rules of the Income Security Integrated System (ISIS) system with a rules-based system that is flexible, accessible and adaptable to future policy changes.

Hypothesis

A machine-enabled legislation transposition solution that will permit true policy agility by:

- Top-down approach to convert business rules within legislation, policy guidelines and operational blueprints into executable decision logic
- A decision logic in a human-readable format, streamlining the business rule testing processes
- Increasing ICT delivery and accuracy by providing a detailed data model and rule graph specification
- Ensuring that all rules are documented for future use. For example: notification handler (NOHL) rules

Scope Summary

A unique Policy Hub capability was established in the Services Australia environment by SecureFast to demonstrate machine-enabled legislative transposition.

The SecureFast Policy Hub brings an integrated specialised legislative transposition technology, tailored by a top-down delivery approach, purposely designed to accelerate the pace of rule ingestion and digitisation, associated with complex business rules from a myriad of rule artefacts.

The cloud agnostic design of the SecureFast Policy Hub platform allowed the SecureFast team to deploy the platform across the Services Australia [Cyber sensitivities](#) for development purposes, as well as an instance of a Services Australia-managed [Cyber sensitivities](#) infrastructure for SIT for mass verification testing of Age Pension (AP) and Disability Support Pension (DSP) benefits.

Notable In-Scope Items

The SecureFast Proof-of-Concept (PoC) scope was split across two stages covering a 4-month period. This included:

- **Stage 1:** primarily focused on digitising the AP benefit rules, subject matter expert (SME) elaboration and verification, and deploying the technology platform; and
- **Stage 2:** primarily focused on completing AP (specifically around understanding and ingesting the majority of NOHL rules), commencing Disability Support Pension (DSP) through re-use, and finalising a complete integration between the SecureFast platform and SAP.
 - Mass verification of SecureFast's Policy Engine was also undertaken during Stage 2. The process required collaborative efforts to both integrate the platforms as well as manually investigate non-matching calculation results to discover rule incongruities.

Notable Out-of-Scope Items

SecureFast was instructed to apply rules from 2015 onwards to align with the broader Entitlements Calculation Engine (ECE) program scope. Two additional notable areas were flagged as 'out of scope', which included:

- Department of Veterans' Affairs (DVA) related rules
- 'International Agreement' related rules

Note: These were removed to ensure that the PoC could meet its contractual timeframes.

Experiment Detail

Detailed Services Australia's approach to implementing and using SecureFast Solution.

The SecureFast PoC was measured against several facets to evaluate its long-term feasibility within Services Australia. They were:

Business Suitability Criteria

- **Rule Digitisation Pace:** Accelerated rule digitisation of an entire benefit, with the ability to support complex business rules logic across legislation, guides, and operational blueprints, including rules that require different interpretations over time.
- **Rule Flexibility:** Improved policy agility across the end-to-end customer lifecycle to enable Services Australia to improve decision making and decision transparency on eligibility and payment criteria for a given benefit. This includes flexibility to apply operational requirements and rules that are not resident within legislation, such as the ability to apply complex 'Notification Handler' operational rules and calculate both a claimant, and their partner's eligibility within a single calculation request.
- **Rule Accuracy:** Ability to process real-world customer new claim and re-assessment scenarios provided by Customer First and return assessment results in accordance with legislation, policy, operational blueprints, and various undocumented rules. Ensuring these results match those provided by ISIS, the current entitlement calculations engine.
- **Rule Performance:** Ability to process and return assessments within 500 millisecond against the expected volumes and data complexity of AP and DSP real-world scenarios. Ensuring that all processing and meets the quality, availability, and audit requirements.

Technology Suitability Criteria

- **Deployability:** Ability to deploy and run the SecureFast platform within the existing Services Australia technology environment. Ensuring that the platform can deal with future infrastructure changes.
- **Integratability:** Ability to integrate with existing Services Australia systems, such as SAP to receive assessment requests and return assessment results. Ensuring the ability to receive and return data from these existing systems in their preferred data formats to maintain downstream business processes and ensure that there is no degradation to those processes and they have all information required.

Business Suitability Criteria

Rule Digitisation Pace

A key measure of the SecureFast platform was the ability to ingest source business rule artefacts at pace and produce digital decision logic that could be verified against Services Australia business scenarios. To achieve this, SecureFast leveraged its top-down rules digitisation methodology to ingest source rule artefacts, including publicly available legislation, policy guidelines, internal operational blueprints, and other relevant items. This process involved technical expertise from SecureFast Policy Analysts and collaborative efforts between both SecureFast and Services Australia SMEs. The team was able to conduct this process in a highly dynamic and accelerated fashion, with the ingestion of two entitlements (Aged Pension and Disability Support Payments) completed in timeframes that were significantly faster than other methods applied within Services Australia.

The SecureFast rule digitisation methodology was adapted to suit the Services Australia operating environment and consisted of several key steps, as outlined in the below table. Step 1 was completed at the beginning of this project in relative isolation by SecureFast, whilst Steps 2-4 were conducted across each fortnightly sprint in alignment to a specific set of Aged Pension business scenarios.

Approach**Result****Attachment¹****Step 1: Top-down legislation transposition**

Without assistance from Services Australia, a SecureFast rules analyst was able to digitise the AP business rules from publicly available source artefacts such as the Social Security Act and the DSS Policy Guide.

In this approach, a business rules analyst imported the relevant source artefacts into the SecureFast Policy Hub platform, maintaining the original structure and format. From here, the analyst then articulated which parts of the natural language represent rules to be digitised. As the work was being performed, the platform automatically generated a digital version of these rules. This machine-enabled approach significantly reduced the time, effort and number of resources required to digitise these business rules than more traditional low-code platforms.

Within the first two sprints (4-weeks), one senior SecureFast rules analyst was able to transpose all relevant and in-scope AP rules from legislation and guides. Services Australia SME's were able to assist in the identification of minor differences between legislation and the operational blueprints, as well as provide clarity on the interpretation of rules.

The result was a comprehensive digital version of the AP business rules, where the natural language in the source legislation and guides is the underlying 'source code'. This enabled business and policy subject matter experts with the ability to fully understand the entire digital rule logic, as it is maintained in a form that exactly mimics the legislation and guidelines. As outlined in other parts of this document, this largely eliminated the need for technical resources to understand and interpret the digital logic.

As a result of this ingestion and analysis work, SecureFast was able to sign off 72% of the business scenarios within the first two Sprints of the PoC.

The output of this effort resulted in the following key technical artefacts being automatically generated:

- **Rule graph:** The rule graph is the visual representation of the inter-connectedness between rules within the various pieces of legislation, policy, blueprints and guides.
- **Data model:** The data model as expressed based on the legislative intent. That is, it matched the way the legislation was designed and reflects the structure inherit in those rules. Additional mapping rules are applied using the same natural language form to align (where feasible) the data model to that of the system of record: SAP. This allows for full transparency of how data from the source system is transformed into the natural language data model.

Note: Some technical data transformation was conducted to structure the data formats between systems.

Codified Documents Summary
Screenshot:
SecureFast Documents view (Source Rules)

¹ Attachments can be found in the Appendix.

- **Integration API²:** A decision API to query any part of the generated decision rule logic, such as determining a person's entitlement to age pension. This API is designed to support multiple integration requirements, such as batch processing, or interview forms.

Commencing Sprint 2, SecureFast conducted Steps 2-4 in parallel.

Step 2: Operational rules analysis

SecureFast conducted analysis of Services Australia's operational artefacts such as the SAP CRM Data Model and Operational Blueprints.

This step involved elaboration with select Services Australia's subject matter experts to identify relevant source materials and to provide SecureFast with guidance to a series of questions on the interpretation of the SAP Data Model and internal operational rules.

A SecureFast rules analyst was able to verify which specific Operational Blueprints contained additional rules that were not expressed in legislation and guides. This allowed SecureFast to baseline specific rule components that required elaboration with Services Australia. Within 2 sprints, this rules analyst was able to review and cross check over >450 blueprints against the rules ingested from legislation and guides to identify additional rules or rule nuances.

SecureFast and Services Australia's subject matter experts were then able to establish an effective elaboration approach, one that required the least number of experts being engaged. In most circumstances SecureFast would document targeted questions and assumptions on specific rule component areas, such as Residencies, in advance of these elaborations. This provided the subject matter experts sufficient time to provide input based on their knowledge and/or conduct internal research with other experts where required. SecureFast and Services Australia jointly refined these documents into knowledge-based artefacts.

In parallel a technical business analyst from SecureFast reviewed the SAP CRM data payload that was to be sent to SecureFast. This payload was unable to be modified from its original design, so the SecureFast needed to design additional rules, in the natural language form, to transform the SAP data into the data format definition as expressed by legislation and guides (those automatically generated from the legislation transposition). Some technical mapping transformation design was completed to address specific technical nuances between the SecureFast platform and SAP, such as data formats. This design was applied to the internal data format transformation capability to transform request and response payloads with SAP. SecureFast worked closely with a number of Services

Codified Documents Summary
Example Q&A Document

² API: Application Programming Interface

Australia SMEs to understand the incoming payload, how it related to the attributes required by the rules, and to review the mapping by running test payloads.

Overall, this step provided SecureFast an understanding of additional AP operational rules that were needed to be digitised and synthesised with the rules transposed from legislation. It also provided Services Australia's subject matter experts with an understanding on the type of information that SecureFast requires to progress decisions.

Step 3: Operational rules transposition

Similar to Step 1, SecureFast's rules analyst transposed AP processing rules from internal source artefacts, such as the Operational Blueprints.

SecureFast rules analysts ingested all additional AP processing rules elaborated in Step 2, whilst maintaining alignment to the rules expressed from legislation and guides.

Screenshot:
SecureFast
Documents
View (System
Rules)

These operational and mapping rules were maintained in natural language for all eligibility calculations to ensure they remained in a form that non-technical specialists would understand.

Step 3 was conducted in parallel to Step 2, with the rule analysts ingesting additional operational and mapping rules as sections of AP, such as Residency, where finalised.

Step 4: Rules refinement through scenario testing

SecureFast and Services Australia's subject matter experts jointly developed circumstance data for the AP business scenarios and then carried out testing to validate the outcomes of the decisions.

With these comprehensive AP rules in place, SecureFast was able to achieve 97.5% business verification sign-off against 40 AP business scenarios across Stage 1 as follows:

- Sprint 1: 42%
- Sprint 2: 72%
- Sprint 3: 97.5%

System
Demonstration
Video: [LINK](#)

Initially, SecureFast's rule accuracy against ISIS was measured by having SecureFast and Services Australia's subject matter experts manually input circumstance data for each business scenario into their respective systems (SecureFast platform and CustomerFirst/ISIS). SecureFast would confirm its result and provide it to the subject matter experts first.

Note: This approach was taken as formal integration between SAP and SecureFast could not take place until the end of Stage 1.

After Stage 1, integration between SAP and SecureFast was completed, allowing Services Australia to request the SecureFast platform to process real-world customer

scenarios and return a decision result. This allowed decisions to be triggered and 'compared' using the Services Australia comparator tool to compare the result between ISIS and SecureFast for a match.

Step 5: Rules re-use analysis

To prove that the SecureFast platform could re-use rules that overlapped other similar entitlements, SecureFast was tasked with identifying level of re-use it could achieve within the DSP benefit. Services Australia SMEs provided the indicative, prioritised list of DSP scenarios, to focus SecureFast efforts on the most useful elements of the DSP legislation.

SecureFast then conducted a top-down review (from legislation, to guides, to operational blueprints) of DSP to identify the rules transposed for AP that could be re-used in DSP.

SecureFast documented all components of DSP to show the level of rule re-use versus new rules required.

With the level of possible re-use identified, SecureFast could move to Step 6.

DSP Rules Re-Use Snapshot

SecureFast was able to verify that approximately 50% of the AP rules could be re-used for DSP.

SecureFast designed a 2 sprint (4-week) digitisation plan to establish a comprehensive DSP rules model. This plan included the transposition of new rules, specific to this benefit type, required to perform end-to-end eligibility check, and leveraging at least 80% of the re-usable rules.

Note: This approach did not 'fully ingest' the entirety of the DSP legislation as this was out of scope for the PoC due to time constraints.

Step 6: Apply rule re-use

Similar to Step 1, SecureFast established a digitised rules model for DSP within the same AP rule model.

The initial focus was to establish the rules framework required to complete a simple end-to-end qualification calculation. With the baseline framework established, the team could move on to re-using AP rules wherever possible. With that work complete, other DSP specific rules were transposed.

SecureFast did not 'fully ingest' the entirety of the DSP legislation, instead

DSP Walkthrough
Video: [LINK](#)

SecureFast was able to leverage the work completed for AP when implementing the DSP. This included ~80% use of re-usable rules, and transposing 10 new DSP-specific rule elements (such as specific rules around level of disability, additional pension calculators etc.). SecureFast was able to continue the pace of digitisation as evidence in the earlier steps, with the benefit of re-use enabling the SecureFast rule analysts to focus only on new rules.

Services Australia SMEs continued to provide input and assistance to identify additional rules, provide guidance on the correct interpretation of those rules and answer specific questions SecureFast rule analysts uncovered.

DSP Rules Re-Use Snapshot

As a result of this effort, SecureFast was in a position to verify ~50% of the DSP test business scenarios within

focusing on reaching the target 50% of business scenarios, with priority given to rules which were re-used from AP.

the condensed timeframe.

While the original timeline for DSP ingestion was 4 weeks, once verification activities commenced, the team required additional time to adjust the rules to account for the Services Australia manual processing tasks, assessment complexities, and available data.

Rule Flexibility

SecureFast enables rule flexibility by treating rules as a digital artefact that can be consumed and leveraged by any system, in a variety of different ways. With its use of natural language to express rules, SecureFast provides the flexibility for rule authors to easily understand, expand and override rules as required.

As part of its top-down methodology, SecureFast seeks to broadly analyse relevant source rules artefacts and system data models with an overall context in mind to establish key data concepts and relationships, and ensure the overarching rules model is future proofed and providing ongoing business and downstream system flexibility. This includes SecureFast confirming where in existing and proposed system(s) and processes the digital rules will be leveraged, which API(s) are available, and the underlying corporate system of record structure. With this context, SecureFast rules analysts are able to design a rules architecture that can flexibly integrate with broader enterprise processes and systems.

This element of the POC demonstrated how the team was able to conduct this process in a highly dynamic and accelerated fashion. Steps 2-4 were conducted across each fortnightly sprint in alignment to a specific set of AP business scenarios.

SecureFast was able to incorporate and demonstrate rule flexibility through a variety of means, including technical means (such as leveraging in-built mapping to consume an external API definition into one that is aligned with the way legislation represents the information), and non-technical means (such as demonstrating re-use for DSP, ingesting a variety of rule document types, and quickly adapting rule changes such as new financial year CPI adjusted rates).

SecureFast's top-down methodology, combined with Services Australia SMEs from both business and technical teams has enabled a flexible rule system that can be consumed in different ways, can fit into a broader architecture, and can respond to the changing and dynamic needs of SA rule requirements.

Approach	Result	Attachment ³
Step 1: Establish business rule flexibility <p>As part of the transposition process, SecureFast considers the type of business rule (policy) change that can occur, and the frequency of this change. SecureFast applies this information to structure particular rule documents in a way that enables</p>	<p>SecureFast has developed a rules model architecture that allows policy, rate, and other changes to be applied in a rapid fashion, using a natural language.</p> <p>As an example, there have been several changes to rate tables and deeming rates throughout the PoC. SecureFast has typically been able to apply these within less than 30 minutes, and have them immediately operationalised.</p> <p>SecureFast has also demonstrated the ability to</p>	<p>Screenshots: Adding new deeming rates (example)</p>

³ Attachments can be found in the Appendix.

ongoing policy agility at pace.

continually evolve the rules model to introduce more rules, without needing to replace previously established rules. This is evidenced through the number of rules and source artefacts used, the ability for SecureFast to refine its implementation of rules by ingesting additional source rule material found in Operational Blueprints, and through the in-built capabilities of the platform to handle 'Grandfathering' or time-based enablement of rules.

Note: 'Grandfathering' functionality was not leveraged within the PoC due to scope requirements, but has been previously demonstrated.

SecureFast's approach provides additional flexibility as its data model and API definition are dynamically generated based on the actual intent of legislation and rules. In contrast, traditional business rules systems typically rely on the establishment of a fixed data model from the outset, and the introduction of new rules (particularly complex ones) often requires significant rework and restructuring of the underlying data model and configured rules. SecureFast is able to mitigate this, as the business rules are automatically digitised as new rules are applied, allowing the machine to automate any reconstruction required at the digital level.

Step 2: Establish system rule flexibility

As traditional IT systems, such as SAP have not been designed to understand (and interact) directly with natural language source material, SecureFast establishes a rule model architecture that captures systems rules that are designed to provide a mapping translation between the source business rules (legislation and guides) and system rules (including data codes).

SecureFast was able to establish, in clear natural language, procedural and system level rules to bridge between the natural language and IT "code speak".

For example, SAP and ISIS use three-letter codes for several data input fields (not reflected in legislation or guides). SecureFast was able to capture these codes and transparently map them to their natural language equivalents. This has demonstrated multiple advantages:

- Business rule owners (e.g. non-technical people) have the flexibility to change/add codes as downstream systems change; or as policies update. (e.g. adding a new Visa class code for specific eligibility). A traditional business rules system will build these type of rules (and code mappings) at a 'system' level, making it difficult for business users to adjust, and more difficult to diagnose decision mismatches.
- These mapping rules are captured in the detailed decision report, in plain English, to

Screenshots:
System Rules
for Mapping
Codes (e.g.
Accommodation
and Marital
Status)

streamline decision analysis. This has also been useful at supporting verification and explainable difference activities.

Ultimately SecureFast demonstrated that it is able to integrate flexibility with an existing IT system, without modifying or simplifying the legislative rules, degrading the quality or accuracy of decisions, or forcing existing systems to change, whilst still providing a fully transparent audit trail.

Note: SecureFast encountered a constraint within the PoC. The rule architecture was not originally designed to return both a Claimant and their Partner's entitlements in a single calculation request. This was not stipulated within the legislation itself and was identified as an operational requirement towards the end of the PoC. While SecureFast is processing Partner information and calculating their entitlement, the rules are not surfacing this in a way that it can be included in the response payload to SAP. A solution has been developed, however, due to time limitations within the PoC it was not included as part of the Mass Verification process.

Rule Accuracy

The accuracy of decisions produced by SecureFast is paramount. SecureFast was able to achieve a high-level of accuracy for the provided business scenarios it was requested to process. This was achieved through the effective use of Services Australia SMEs to provide guidance and assistance to SecureFast, as well as through the use of key technical components of the platform to validate and review the rules implemented.

The table below outlines the SecureFast platform capabilities used to support rule debugging and testing to achieve rule accuracy.

Function	Result	Attachment ⁴
Rule Graph Debugging SecureFast offers a Rule Graph Debugging capability wherein Subject Matter Experts, Rule Authors and Testers can assemble test payloads which will execute immediately against the rule logic within the platform.	Having this detailed, repeatable, and explainable test system available within the SecureFast platform enabled the SecureFast team, with Services Australia SMEs, to rapidly debug rule configurations, understanding why results may not have been matching ISIS outputs, or why certain rules might not have been triggered. Ultimately this visibility significantly increased the velocity at which the SecureFast team was able to	

⁴ Attachments can be found in the Appendix.

There are three variations of the Graph Debugging capability offered: Guided, Compact, and Raw. Each method is used for different testing approaches and enable the tester to understand how the rule graph is calculating specific test cases.

reach a high level of accuracy by facilitating rapid diagnoses and repeatable testing of results. It has been extremely effective at identifying explainable difference rapidly.

Graph Testing

Typically used as a late-stage rule testing capability, SecureFast offers the Graph Testing capability. This capability automatically generates Rule Unit Tests as transposition occurs. This allows Subject Matter Experts to manually validate the input and output of each rule that has been transposed.

The Graph Test step was bypassed for majority of the PoC. This was due to the testing approach being mostly focused upon either payload testing (through the Graph Debugging), or validation through the Business Scenarios or Live Integration. However, SecureFast was able to demonstrate an ability to automatically generate unit tests for over 600 transposed rules.

Screenshot:
SecureFast's
Graph Test
Functionality

With a full Production implementation, it is expected that Services Australia SMEs would use the Graph Testing capability as one of the final validation mechanisms for finding edge case scenarios and signing off rule accuracy.

Decision Reports

SecureFast automatically generates a detailed decision report for each eligibility calculation performed by the rules engine.

These decision reports provide, in plain English and in alignment the source rules artefacts, a detailed breakdown of each rule used and calculation performed. This allows SecureFast and SMEs to quickly identify explainable differences when testing end to end business scenarios.

SecureFast was able to demonstrate the ability to provide a full decision audit trail that was linked directly to the source rules transposed from legislation, guides, blueprints, and other system rules.

Screenshot:
SecureFast's
Decision Report
Functionality

This has proven to be highly effective capability when performing live transactions between SAP and SecureFast. Services Australia's Comparator tool provides a good initial first pass match check. When there is a mismatch on a specific part of the calculation, these Decision Reports allow SecureFast to rapidly identify the difference(s).

Sprint Closure
Reports #1, #2,
and #3.

Outlined in the table below are the testing approaches that were used to demonstrate rule accuracy.

Approach	Result	Attachment ⁵
Test Process 1: Business scenario manual validation Leveraging the Graph Debugging and Decision Report capability, SecureFast conducted extensive manual validation testing with the Services Australia SMEs. Using the provided Business Scenarios as a launch pad, SecureFast and Services Australia team members collaboratively designed test data payloads to run through the SecureFast rules engine. These test payloads simulated live data of varying complexities, which would specifically target the various functions described within the Business Scenarios. Typically the test scenarios would be built concurrently within both SecureFast and SAP (or CustomerFirst). Once each test scenario was run, the results of the systems would be manually compared to identify discrepancies (with a specific focus on the entitlement component amounts).	SecureFast and the Services Australia team were able to quickly and confidently sign off rules accuracy in a manual fashion whilst the integration between SecureFast and SAP (and the Comparator tool) was being developed. SecureFast and the Services Australia SMEs were able to achieve 100% accuracy and verification sign-off on a small sample of in-scope business scenarios in Stage 1 with two exclusions: <ol style="list-style-type: none"> 1. NOHL rules required more extensive testing in Stage 2. 2. Pension Bonus Scheme could not be verified due to SAP data limitations that existed at the time. Leveraging a collaborative approach from the outset of business scenario verification testing, SecureFast's top-down ingestion of legislation and guides yielded strong results, with 100% accuracy on simple and medium complexity scenarios. As more complex scenarios were tested, the majority of the explainable differences were captured within minutes, and SecureFast was able to quickly resolve these differences, often within hours or days. When there was an error, SecureFast's ability to immediately visualise the decision graph enabled a rapid, iterative approach to discovering solutions to discrepancies between systems. Many of the initial explainable difference were due to some of the transposition work around the operational and system mapping rules.	Sprint Closure Reports #1, #2, and #3
Test Process 2: Live integration (Comparator) After completing the full integration between SecureFast and SAP during the first half of Stage 2, business scenario testing evolved into live testing. The integration allowed the Services Australia team to begin using the Comparator tool to further	Upon achieving the initial integration (and as was expected by both teams), initial batch testing identified numerous technical issues within the SecureFast data transformation script, the SAP system, and the Comparator tool. SecureFast and Services Australia were able to work in a high collaboratively fashion to assist each party identify, and resolve these issues. The result was an even further streamlined approach to verification testing against live SAP data and more	

⁵ Attachments can be found in the Appendix.

streamline rule accuracy testing.

The Comparator tool is a custom-built tool within SAP that was designed to automatically compare results from ISIS with those returned by SecureFast.

Batches of test payloads were issued by the SAP system automatically to both ISIS and SecureFast, with the results of the tests then automatically compared.

thorough results comparison. This resulted in SecureFast and Services Australia moving towards mass verification activities.

Whenever mismatches between ISIS and SecureFast results were discovered, they were rapidly diagnosed using SecureFast Decision Reports.

Commercially sensitive

Rule Performance

For SecureFast to be a viable option for calculating entitlements for Services Australia, it needed to be able to achieve appropriately high throughput of calculation requests. Services Australia sought to evaluate and understand SecureFast's ability to calculate large volumes of transactions, at an appropriate performance level.

Approach	Result	Attachment ⁶
<p>Live Performance Testing:</p> <p>Services Australia gave SecureFast a target of <500ms for end-to-end transaction durations.</p> <p>The original intention of the PoC was to deploy SecureFast into the 'PST' environment (Performance & Stress Testing). Due to time limitations, SecureFast was ultimately deployed to Services Australia's 'DEV' (Development) and 'SIT' (System Integration Test) environments.</p> <p>While large-scale performance testing was not conducted by Services Australia, performance was monitored during the large batch runs in the SIT environment.</p>	<p>The SecureFast platform has been designed to handle high throughput decision making processes. With a horizontally scalable architecture, the platform is able to scale out to meet the needs of calling systems, without user intervention.</p> <p>With standard logging configured, and SecureFast's high performance mode enabled, SecureFast is able to process a typical Aged Pension decision in less than Commercially sensitive</p>	
		<p>These times are approximated from usage within the SIT environment provided to SecureFast running on the Cyber sensitivities The end-to-end time for a single transaction ranged between Commercially sensitive</p>

⁶ Attachments can be found in the Appendix.

Further optimisations can be made to reduce the overall time to complete a decision, including refinement of the input mapping process, compression of audit reports (to reduce latency and storage time), and more fine-tuning of the underlying infrastructure. In addition, alternate modes of communication including batch and asynchronous modes could further increase overall performance.

Engaging a **Cyber sensitivities** engineer to review the deployment with SecureFast in the **Cyber sensitivities** cloud is recommended to assist in optimising performance further.

Technology Suitability

Deployment

Beyond the SecureFast Policy Hub's ability to effectively process the complex rules and calculations required by Services Australia, it needed to also function within the Services Australia technology infrastructure, complying with the relevant cyber security principles and system design regulations.

Approach	Result	Attachment ⁷
Engagement with Services Australia technical team members.	The SecureFast technical team worked closely with Siddhartha Sengupta of Services Australia. This involved regular semi-daily status meetings, and collaboration through Microsoft Teams as required.	
Deployment to the Services Australia Cyber sensitivities (DEV)	<p>The SecureFast Policy platform was deployed into two data centres within Cyber sensitivities. This was accessible within the Services Australia network and was integrated into an appropriate SAP Dev system.</p> <p>Deployment was completed by SecureFast resources using the automated build tooling within the platform.</p>	

⁷ Attachments can be found in the Appendix.

Deployment to the Services Australia
Cyber sensitivitiesEnvironment (SIT)

The SecureFast Policy platform was deployed into the Services Australia **Cyber sensitivities** and marked as SIT). As with the DEV instances, this was deployed using the automated build tooling within the platform.

Screenshot:
SecureFast
deployed into
Cyber sensitivities

SAP integration to the platform was tested and messages were able to move between environments as required.

Note: The SIT deployment is functionally the same as the proposed environment for PST, however the PST environment has additional optimisations for speed and performance. These include higher capacity nodes for the cluster to support the Decision API, and additional scaling configuration.

Deployment Automation

SecureFast leveraged the build automation tooling already present with the SecureFast platform to build and deploy the solution into the Services Australia infrastructure, covering three distinct environments (2 **Cyber sensitivities**)

Deployment
Architecture
document

The integrated automation tooling allows deployment and lifecycle events (start, stop, restart etc.) for all required services. Components are delivered through containerised images, either from a central repository maintained by SecureFast, or through an internal Services Australia **Cyber sensitivities** instance (through mirroring of the public repository). To meet Services Australia cyber-security guidelines the **Cyber sensitivities** approach was leveraged in this implementation.

These components are part of the overall delivery and are available for integration into Services Australia build processes.

Integration

SecureFast sought to validate that the SecureFast Policy Hub could be integrated with Services Australia's chosen System of Engagement and System of Record (namely SAP).

Approach	Result	Attachment ⁸
Connection to send/receive basic responses over a RESTful API	The SecureFast Policy platform provides a REST API endpoint that other systems can use to access the	Screenshot: SecureFast API

⁸ Attachments can be found in the Appendix.

platforms capability. For this PoC the only integration point leveraged is the 'Decision API' endpoint, which provides access to the decision processing capabilities of the platform.

operating

Traditionally customers call this API directly and provide configuration parameters to suit their payloads that are being sent. In this case of this PoC, the input and output payloads required could not be changed by Services Australia and had to conform to a pre-defined standard. To allow this, a custom API was provisioned within the SecureFast API gateway that mapped the format provided by Services Australia into the one expected by the SecureFast platform. This handled configuring the API to support the needs of this PoC (setting the correct project goal, and setting which mapping files to leverage – see mapping below). This was handled by adding additional configuration to the inbuilt API gateway and has no major impact on the performance or stability of the solution. In future, if the input payload can be modified, this additional configuration may not be required.

Mapping of input payload

The SecureFast platform ingests rules/legislation and determines a data model that is based on these rules/legislation. However, in many cases customers already have a data format that needs to be handled. For this PoC SecureFast implemented a mapping file that took the Services Australia SAP data format and mapped into a format that the SecureFast API can understand. This mapping file dealt with restricting the SAP JSON format into a SecureFast JSON format and the specific nuances between SAP and SecureFast (for example, how dates are formatted).

Request &
Response
Mapping File
(Integration)

This mapping exercise was successfully completed, as evidenced by the mass verification testing (as the mass testing required a valid input format).

Mapping of output payload

As above, the SecureFast platform produces a specific response format that needs to be converted into a format agreed by Services Australia. This used the same mechanism as above, but was applied to the output (response payload).

Request &
Response
Mapping File
(Integration)

This mapping exercise was successfully completed, as evidenced by the mass verification testing (as the mass testing required a valid response format).

Data Analysed

Results of the testing of SecureFast.

Documentation Codified

Legislation

Throughout the project, SecureFast transposed business rules from a large volume of legislation directly into its platform. SecureFast's approach for building out a new benefit is 'top-down' and works directly from the legislation, and then down to the guides, operational blueprint, and system rules. Accordingly, legislation is transposed effectively word-for-word into the platform. This approach preserves the explainability of entitlement determinations, empowered subject matter experts to take a more active role in verification activities, and enables simplified long-term policy agility, flexibility, transparency.

Please see the Codified Documents Summary in the appendix for a detailed view of the various legislative components ingested for both the AP benefit, and the DSP benefit.

Other Documents

In addition to the raw legislation, SecureFast also ingests supporting documentation. In this particular project, we were provided with two additional key documentation repositories:

- Social Security Guide
- Operational Blueprints

While these resources are invaluable to the operational team members, in most cases SecureFast found that they did not provide additional rules already expressed in legislation, and instead they served as reference materials to assist with interpreting the legislation.

With the above noted, there were several instances where additional data was ingested directly from these additional documents. Those instances have been noted in the appendix item: Codified Documents Summary.

Business Scenarios (Manual Verification)

At the commencement of the project, Services Australia shared a list of 38 AP Business Scenarios with SecureFast. Throughout the project, 6 scenarios were identified as out of scope for the project due to various factors, with 8 scenarios being added.

Ultimately, 40 AP Business Scenarios were implemented, with 39 being successfully verified as complete through a manual verification process.

The manual verification process involved the SecureFast team collaborating with the Services Australia SMEs to craft:

- Test customers within the 'CustomerFirst' application which would trigger one or more of the Business Scenarios (such as 'A6 Remote Area Allowance Basic').
- A matching (SecureFast-format) payload which mirrored the customer's circumstances in CustomerFirst.

The two systems were then run concurrently, and the results compared for accuracy. Where discrepancies were discovered, the team troubleshooted and revised rules/configuration until the errors were resolved and the results matched. There was a limited number of refinements that were identified, and where they did occur, it was typically due to specific nuances occurring between legislation and guides/operational blueprints.

This process was captured in the three Sprint Closure Reports (available in the Appendix). Business Scenarios were also utilised as a guide for the work on the DSP. However, manual verification was not completed for the DSP items. A significant amount of the rule functionality used within DSP was re-used from AP. The implemented functionality for DSP was tested as part of a second round of Automated Mass Verification.

Automated Mass Verification

SecureFast and Services Australia conducted an Automated Mass Verification process for AP. This was conducted:

- Over the period of 22 June to 30 June.
- With over 1,000 unique entitlement calculation requests processed in the SecureFast platform.
- With SecureFast achieving an accuracy of 95% in its last test run.

Preparation

Prior to the Automated Mass Verification test runs taking place, there was a significant preparation exercise undertaken. The following items were completed:

Infrastructure Preparation

With the support of Services Australia, SecureFast installed and configured the Policy Hub platform to run on the Services Australia-managed **Cyber sensitivities**

Concurrently, Services Australia prepared the 'DEV' instance of SAP for the purpose of the test runs.

Integration (Request and Response Payloads)

In order to test the SecureFast platform at scale, it had to be integrated with the Services Australia SAP system. This integration enabled SAP to send requests to SecureFast and receive entitlement calculations in response.

The request and response payloads were collaboratively designed by Services Australia and SecureFast. For the purposes of this project the payload design was suitable. However, should the PoC be industrialised in the future, a formal design process across various benefits would be a suitable step to increase velocity.

Results Comparator

The Services Australia team developed a Comparator specifically to compare the outputs of the ISIS system with the SecureFast's outputs to automate the mass verification process. The items compared were:

- Entitlement Status (e.g. 'CUR' for a current pension)
- Entitlement Component amounts (e.g. RA = \$10.4143 for a current rent assistance payment)
- For each of the data points, the dates for their applicability

Testing Process

Recognising that new integration and verification processes can surface discrepancies, Services Australia and SecureFast agreed to a progressively ramp up the testing process wherein test runs would include increasingly large quantities of test cases.

Accordingly, after the initial integration work was completed and small batch runs were functioning correctly from a technical perspective, a batch of 40 transactions was triggered. As each batch was run, SecureFast and Services Australia would work together to identify any non-matching transactions, seeking to understand the cause. SecureFast would release rule and integration updates multiple times daily to close out any discrepancies discovered.

The single largest batch that was run during this Automated Mass Verification process encompassed over 1,000 unique entitlement calculation requests. The results summary of the testing are available in the Excel file attached in the appendix.

Results

The results of the PoC have been detailed throughout this document. Please refer to:

- Section: **Experiment Detail**
- Section: **Automated Mass Verification**
- Attachments: **Sprint Closure Reports #1, #2, and #3**

Conclusions

Overarching results of the PoC.

An agile, experienced and focused team, comprising personnel from Services Australia and SecureFast were able to demonstrate the use of the SecureFast Policy Hub as a viable rules engine for complex entitlement calculation processes. Using a top-down, legislative-based approach to entitlement calculations, the PoC was able to demonstrate the ability to digitise business rules at a greater pace than traditional business rules engines, whilst achieving a high level of rule accuracy against a number of AP and DSP related scenarios. The platform was able to demonstrate technical flexibility (co-existence within the existing technical landscape) and policy flexibility by allowing business rule re-use for similar entitlements, such as Disability Support Pension while maintaining a high level of rule accuracy.

SecureFast was able to ingest the Age Pension legislation, operational blueprints and other related rules logic during the first sprints of the PoC (4 weeks). Manual and then automated verification showed that SecureFast was able to achieve a greater than 90% level of accuracy across a variety of real-world business scenarios. With the assistance of Services Australia SMEs, SecureFast was able to quickly come to understand, and then implement, the complex rules that comprise the Age Pension and Disability Support Pension frameworks.

SecureFast's approach to rules digitisation was able to handle the complexities of entitlement calculations as defined across legislation, guides, operational blueprints, and other rule artefacts. The platform was able to receive, transform, process, and return assessment results for highly complex real-world customer scenarios via a live integration with SAP. Additionally, it was able to automatically scale, processing large batch volumes whilst returning results back to SAP within 500ms (the target threshold defined by Services Australia).

SecureFast was able to successfully adapt to Services Australia's complex technical and operational environment throughout the project, including the deployment into two separate technology stacks **Cyber sensitivities** and then later **Cyber sensitivities**. This flexibility of technology stack allowed SecureFast to adapt to a changing environment and scale capability as required. Further, SecureFast's API-first design methodology and integrated data transformation tools, enabled Services Australia to quickly integrate the solution with minimal changes to existing integrations.

By demonstrating the ingestion process, and then high level of accuracy with Age Pension and Disability Support Payments, the PoC has successfully demonstrated:

- That a top-down, legislative-driven approach can be achieved and produces high levels of accuracy and a high rate of ingestion.
- The SecureFast platform provided capability is well suited to non-technical people, such as Services Australia SMEs, and thus minimises the number of resources required to support rule interpretation and rule verification activities.
- The SecureFast platform provides a flexible legislative transposition capability that handles the complexities of Services Australia's legislative environment.
- The SecureFast platform can co-exist within Services Australia's existing business processes, ICT landscape, and varying cloud infrastructure options.
- The SecureFast platform can complete end-to-end entitlement calculation within the required time frame (<500ms), with further optimisations and performance in production expected.
- The SecureFast platform allows rules ingested into the platform to be quickly updated, version controlled, and secured, allowing for a high level of confidence in the process of bringing the solution into Production.
- That SecureFast platform allows previously ingested rules to be re-used across multiple entitlements, greatly reducing the time to implement subsequent entitlements, and continuing a high level of accuracy in implemented rules.

In summary, the PoC has validated that using the SecureFast top-down methodology and the SecureFast platform would allow Services Australia to significantly streamline its delivery of the Entitlement Calculation Engine using significant fewer business and technical resources, whilst delivering at a greater pace and level of

assurance for accurate processing of entitlements within acceptable business timeframes.

Observations & Questions

The outcome of the PoC suggests that the SecureFast platform would be suitable for a 'Shadow Mode' implementation, allowing for a test of rules implementation across a broader set of scenarios, and ensuring the levels of accuracy and performance will continue in a 'production' environment.

A larger scale mass verification process, in a pre-production environment, would be beneficial for the Agency. This would ensure that all undocumented rules associated with Notifcation Handler (NOHL) could be surfaced and verified for accuracy. Also the SecureFast solution could be tested thoroughly for partnered AP recipient assessments and reassessments.

The PoC demonstrated that a small team of personnel were able to ingest the highest levels of rule digitation (across a broad swath of legislation and other source rule artefacts), whilst achieving high levels of rule accuracy. This is further compounded with the demonstrated re-use of rules, which should reduce the time taken to implement subsequent entitlements.

Special note should be made of the 'Decision Report' feature of SecureFast that provides a detailed audit trail at the completion of the decision making process. This report provides the Agency additional value in determining why decisions were made and were proven very useful during the rule verification and refinement activities. This capability provides an in-depth description of why an individual is entitled, with every intermediate step calculated and displayed. In comparison to other solutions, this enabled rapid diagnosis of issues in either SAP payloads, and/or rules interpolation. These reports would be ideal in production scenarios to explain to Agency personnel why decisions were made, by providing personnel with far greater decision transparency.

Full-scale performance testing was unable to be achieved within the timeframes of the PoC. Current test payloads are processing within the agreed time budget (of <500ms), and limited load testing was carried out to provide an estimate of future performance and confirm that the platform could automatically scale as throughput increased. Moving to a 'production' like environment and with appropriate scale should be carried out. Given the performance of the current implementation and the potential for future optimisation (in particular higher performant infrastructure, as the current implementation has been tuned for development purposes), it is foreseeable that the solution will continue to provide the level of performance required.

Lessons Learned

Key learnings from throughout the project.

The entire Proof of Concept exercise has been highly valuable exercise for both Services Australia and SecureFast. Documented in the tables below are the most impactful lessons that have been learned throughout the project.

Future engagements can leverage these to optimise implementation velocity and ways of working.

What went well

What went well	How would you improve (if applicable)
<p>Reserved Collaboration Windows Daily</p> <p>Reserving a reasonable amount (e.g. 2 hours total) daily enabled the team to collaborate effectively and reliably.</p> <p>One session was established per work stream (to cover Technical vs Rule questions).</p> <p>The sessions were optionally cancelled if there were no outstanding discussion points from either team.</p>	<p>Early in the PoC, competing priorities placed time constraints on the availability of some team members. With dedicated/reserved resources this would likely be alleviated.</p>
<p>Top-down Rules Ingestion</p> <p>SecureFast working largely independently initially to establish an initial rules model from a top-down perspective proved effective in minimising the impact on subject matter experts during initial elaboration sessions. Specifically, SecureFast's approach and platform allowed SecureFast to become deeply knowledgeable, and engage in more informed discussions.</p>	<p>Ensuring any key operational requirements that are not defined within legislation are flagged with SecureFast up front. For instance, the need to process and return the person and the person's partners entitlement in the same transaction.</p> <p>Whilst the SecureFast platform is flexible enough to accommodate any type of change in requirement, having this knowledge up front would further increase the delivery pace.</p>
<p>Document-Driven Elaboration Sessions</p> <p>Mid-way through Stage 1, SecureFast pivoted to creating (and providing to Services Australia) summary documents prior to elaboration sessions.</p> <p>These summary documents streamlined discussions and enabled the Services Australia SMEs to work independently to answer questions, leaving the elaboration sessions to be more focused discussions and explanations.</p>	<p>Establish a preferred documentation format to ensure that the information captured can be captured as knowledge articles that other Services Australia divisions can leverage.</p>
<p>Manual Business Scenario Validation</p> <p>This verification method proved effective for elaborating with SMEs on specific complex circumstances and edge cases. It provided a highly agile approach to validating and</p>	<p>This process would have been even more impactful if the detailed Business Scenarios were made available to the SecureFast team prior to ingesting the rules.</p> <p>While technical payloads may not be ready early on, having</p>

refining operational rules. It also provided both SecureFast and the SMEs high confidence in rule accuracy before entering the Automated Mass Verification stage.

specific Business Scenarios enables the team to focus efforts earlier on and can uncover unique complexities and edge-cases faster.

What did not go well (Rules & Business)

What did not go well

Un-Documented Rules (NOHL)

During the implementation of the Age Pension rules, the team discovered unexpected complexity within the Notification Handler (NOHL) rules.

Further investigation led to a conclusion that the deep complexity of NOHLs were compounded by a loss of internal documentation that occurred previously (noted by a NOHL SME engaged by the Services Australia team).

The specific implementation of NOHL processing within the SecureFast engine has been developed by the Project team to match (as closely as possible) the ISIS implementation.

How would you improve next time?

Conducting the legislation analysis earlier would have helped unveil the NOHL complexities earlier in the project.

Involvement in the API design process (rather than utilising the pre-existing Pega API) could have also potentially provided more data to SecureFast to assist with processing NOHL records earlier.

Note: Access to work directly with NOHL SMEs is likely to be required to achieve 100% accuracy against ISIS.

Holistic Rule Architecture Planning

Business rules typically fall under several types/categories. Some rules require procedurally calculated data (such as Work Bonus and NOHLs). These procedurally calculated rules can impact the overarching rule base structure.

Not designing the Age Pension rule base for these procedurally calculated rules in the outset caused re-work when they were factored into the design later in Stage 1.

During the DSP rule ingestion, inefficiencies would have been reduced by having input data questions answered prior to the large-scale ingestion.

By collaboratively conducting a detailed legislation and operational blueprint analysis prior to the bulk ingestion of rules, SecureFast would be able to design the rule base holistically to support the procedural rules.

Engagement with policy subject matter experts is essential to understand the type of rule and policy changes that can occur, and the frequency of these. Having this information early in the transposition phase will ensure that SecureFast establish the most agile policy framework.

Rule Digitisation (Step 4)

Using this method to validate all business scenarios was a resource intensive exercise which ultimately didn't result in equivalent value realisation.

It's recommended that manual scenario validation is used as a support tool to validate complex use cases. Validating the wide range of possible business scenarios should be undertaken at scale using the Comparator tool and automated mechanisms.

What did not go well (Technical)

What did not go well

How would you improve next time?

Commence Integration Early

Integration is often one of the most challenging aspects of a technology project. This PoC was no different. Integration works commenced in the second half of Stage 1. While originally scoped for Stage 2, even though integration works started earlier than originally planned, they took longer than expected.

It would have been beneficial to commence integration works at the outset of the project.

Receiving payloads through the integration provided a critical aspect to finalising the implementation of the rules (especially operational rules). Having this information available earlier would have increased the overall project velocity.

Reusing the Existing API

SecureFast's initial integration was developed against the extant Pega API. This posed two challenges for the team:

1. API Suitability: SecureFast's legislation-driven top-down approach is fundamentally different to the approach previously applied to the ECE project. Accordingly by re-using existing Pega API design, key inefficiencies were realised that required additional development effort by SecureFast to account for the API limitations.
2. API Changes: With the API still in development for Pega, the SecureFast team would often see broken or changed data without warning or reason. This caused frequent re-work over the life of the PoC.

Given a broader scope, SecureFast would seek to collaborate with Services Australia on an alternative data payload structure, which better aligns with the way the legislation expresses the data model. By taking the current (in development) API as a guide, a normalisation process could occur that would align the API definition. This would speed up the mapping and integration process, as less work would need to be done to implement this mapping, and would improve overall performance, as time is not spent mapping each decision as it is consumed. This would further increase policy agility as new rules (or amended) rules are applied overtime.

Clearly Defined Integration Responsibilities

SecureFast did not anticipate the level of implementation effort required to integrate the platforms. The originally planned scope positioned Services Australia leading the integration efforts, with SecureFast to provide support where relevant.

The end result has been that SecureFast has been required to complete the majority of integration, including developing complex request and response data payload transformation scripts, as well as manipulating the input data to suit Services Australia's needs.

More detailed integration planning needs to be completed prior to the commencement of works, with a flexible approach considered by both Services Australia and SecureFast.

A dedicated data translation layer should be considered long-term (prior to a Production implementation).

Commercially sensitive

Commercially sensitive

INNOVATION & DESIGN BRANCH / TECHNOLOGY STRATEGY & ARCHITECTURE DIVISION

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(b) a detailed summary of all expenditure relating to the Entitlement Calculation Engine, including but not limited to funding received by Pegasystems, made after the delivery of the abovementioned report.

Proof of Concept 10: Machine-Enabled Legislative Transposition Closure Report was finalised at v1.1 on 1 August 2022.

Subsequent to the finalisation of this report for the period 1 August 2022 to 30 June 2023, the Agency incurred \$52.557M total costs for the Entitlement Calculation Engine.

Of which Pega Systems was \$2.161 million.