Home Care Rostering and Scheduling Optimisation

Solution Overview

Biarri commercial mathematics

ACCPA ASSOCIATE PARTNER 2024-25

Background

Since 2022, Biarri has worked in partnership with Australian Unity's Home Health business to support operational optimisation across their national footprint.

As part of this engagement, Biarri developed **a fully customised rostering and scheduling software solution**, complete with highly advanced optimisation algorithms that optimise care worker rosters and visit schedules.

The software and algorithms have been tailored to support the **Australian home care industry**, **operational constraints** and **regulations**.

They improve the planning and execution of home care services to enable:

Better coverage of visits using salaried workforce (and without requiring agency staff)

Reduced cost to serve each home

Improved client satisfaction and reduced churn

Improved care worker morale and reduced churn

Solution Overview

The Biarri solution is a **cloud-based SaaS application**. It consists of two modules, each providing access to an **advanced optimisation engine** that automates and optimises the rostering and scheduling process.

Roster Creation Module

Provides access to a **Roster Creation Engine**.

Allows providers to auto-generate fresh master roster patterns and schedules from scratch.

Roster Maintenance Module

Provides access to a **Roster Maintenance Engine**.

Allows providers to manage changes, exceptions and disruptions to rosters and schedules, auto-updating the roster & schedule **within** a roster period and **between** roster periods.

The engines perform a **global optimisation** for each provider's branch. This means that they consider all contributing factors, constraints and objectives **in concert** and **prescribe rosters and schedules across all care workers simultaneously**, determining not just the most efficient routes, but also the best timing of visits, the best allocation of client visits to care workers and care worker rosters.

Roster Creation Module

From time-to-time, a provider may desire to create a master roster pattern and schedule from a blank slate, such as in the event of a branch restructuring, or perhaps on a 6-12 month cycle to re-optimise a degraded roster.

The Roster Creation module supports providers to perform this endeavour. The advanced optimisation engine can consume a broad set of inputs to determine the optimal master roster pattern and schedule for a branch.

Client Visit Bookings

- Client & client visit ID
- Gender
- Start and end time
- Candidate windows
- Location
- Grade
- Priority
- Current allocated care worker
- Qualification requirements
- Delegated care worker list
- Blacklisted care worker list
- Service type
- Number of care workers needed
- [Optional] Meal break included
- [Optional] Previous care workers history
- [Optional] Revenue

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Care Workers

- Care worker ID
- Availability
- Gender
- Location
- Branch
- Walker or driver
- Anchor points for walkers
- Min & max contracted hours
- Qualifications & grade
- Pay rates
- Employment type
- [Optional] Award rules to use (e.g. retirement living workers require tea breaks, minimum shift lengths, fatigue rules)
- [Optional] Preferred hours

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Other

- [Optional] Parking time
- [Optional] Team meetings (including online meetings)
- [Optional] Fixed activities (such as fixed times for training)
- [Optional] Current breaks in rosters (e.g. meal breaks, break of engagements).

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Optimised Master Roster Pattern

- Which care worker works on which day,
- The time each visit occurs
- Which care worker is allocated to the visit
- Each care worker's schedule, including shift start/end times, breaks, travel and meetings

Performance KPIs

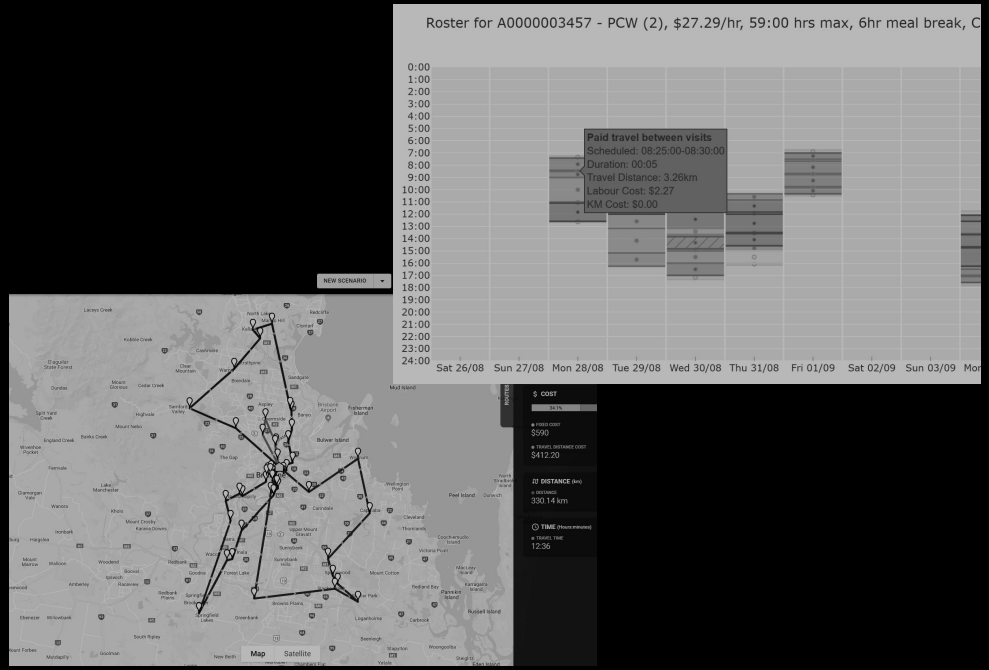
The result is a highly detailed set of rosters and schedules for the branch's care workers. This includes a detailed schedule for each care worker, including scheduled breaks, travel and team meetings.

Roster Creation Engine - Objectives

The optimisation performed by the Roster Creation engine involves balancing **multiple competing objectives**:

- Minimising unallocated visits
- Prioritising allocation of higher priority code visits
- Minimising total costs including:
  - Shifts costed at the minimum paid duration
  - Casual shifts costed using their penalty rates (e.g. weekends)
  - Care worker's grade cost including working higher duties on specific visits
  - Break of engagement travel costs
  - Overtime penalty rates
- Prioritising allocation of care workers to customers they are familiar with
- Allocating similar portions of high grade services to all workers who are qualified
- Ensuring the number of care workers that attend a client home is an appropriate ratio
- Minimising undesirable shifts (e.g. short shifts, shifts with breaks of engagement, weekend shifts, public holiday shifts)
- Minimising travel, even when it is unpaid

This complex balancing of objectives allows providers to **optimally balance cost-savings** with **client** and **care worker experience**, ensuring standardisation across the organisation according to policy rather than the bias of individual planners.



Roster Maintenance Module

Providers must continuously manage changes and disruptions to their roster pattern day-to-day in the lead up to the day of operations. These include changes such as clients or care workers departing or starting, cancellation of visits (both ongoing and one-off) and care workers going on personal or annual leave.

In order to maintain the optimised roster pattern, the Roster Maintenance engine in the Roster Maintenance module finds the optimal changes to rosters and schedules to:

- Minimise disruption of the existing roster;
- Minimise the impact on clients and care workers; and
- Minimise the cost impacts and service impacts.

The Roster Maintenance module has three modes of use:

Mode	Suggested Frequency	Use Case
Update Roster Pattern	Weekly	Make changes to the ongoing pattern while trying to maintain it as similar as possible (e.g. handle new customer/care worker, etc).
Create Roster Period	Every Roster Cycle (e.g. fortnightly)	Using the patterned roster as a template, create the roster that will be executed in the roster period, taking into account leave, public holidays and any one-off events while minimising disruptions. Include casual workers.
Maintain Roster Period	Daily	Take into account changes that affect the current roster period outside of the next few days, such as workers calling in sick or clients making cancellations for later in the week

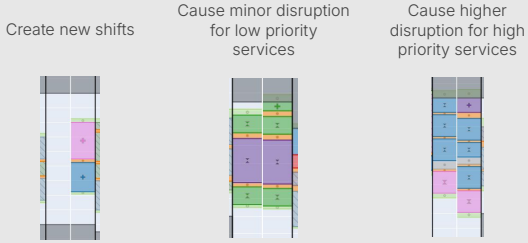
Roster Maintenance Engine - Objectives

Just as with the Roster Creation engine, the Roster Maintenance engine can be configured to balance a broad set of competing objectives.

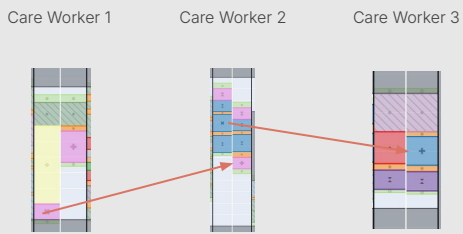
Area	Objective
Coverage	• Minimise unallocated visits • Prioritise allocation of higher priority code visits
Care Worker	• Impact as few care workers' shifts as possible
Client	• Minimise the number of client visits moved either in time or to a different care worker • Prioritise avoiding disruption of higher revenue clients
Cost	• Minimise total roster cost
Roster quality	• Maintain high quality shifts for care workers (e.g avoid short shifts, public holiday shifts, etc)

Roster Maintenance Engine - Examples of Optimal Decisions

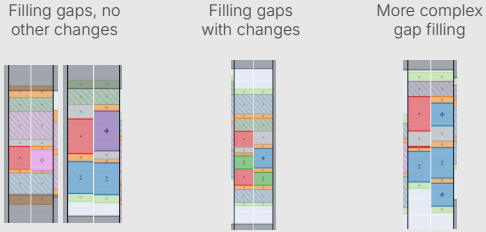
By setting objectives as desired, the Roster Maintenance engine can make a broad variety of decisions to maintain the optimality of a roster. Examples include:



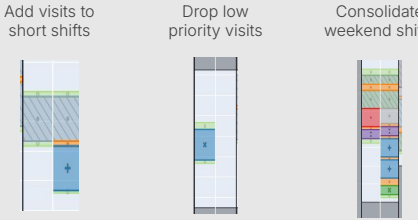
Improve coverage



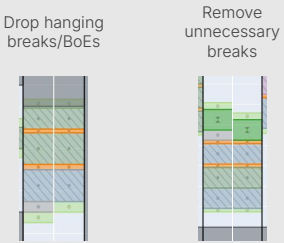
Make complex moves



Fill idle time



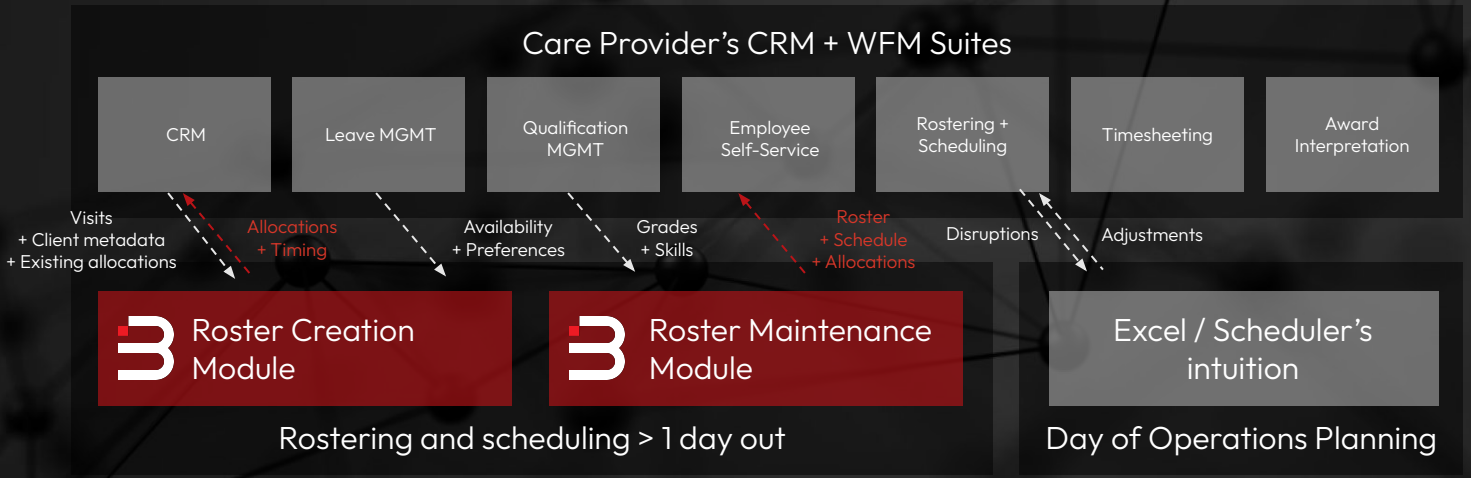
Minimise undesirable shifts



Fix or reduce rule breakages

Solution Architecture

The Biarri solution will pull information from a provider's CRM and WFM components of their tech stack. Depending on their downstream business processes (e.g. publishing rosters to care workers), the solution can be customised to transmit rosters, schedules and allocations to a provider's downstream systems.



Note that the Biarri solution does not currently optimise on the day-of-operations.

Outcomes for Australian Unity

Supported by Biarri, Australian Unity transformed the Home Health business through:

- Investing in improving the quality and accuracy of required data
- Integrating Biarri software into the Australian Unity technology stack
- Effective change management
- Implementation of a Biarri roster maintenance engine that maintains the benefits of an optimised roster

Australian Unity is now rolling out roster optimisation across their national footprint. As of March 2024, rolled-out branches have achieved average performance improvements of:

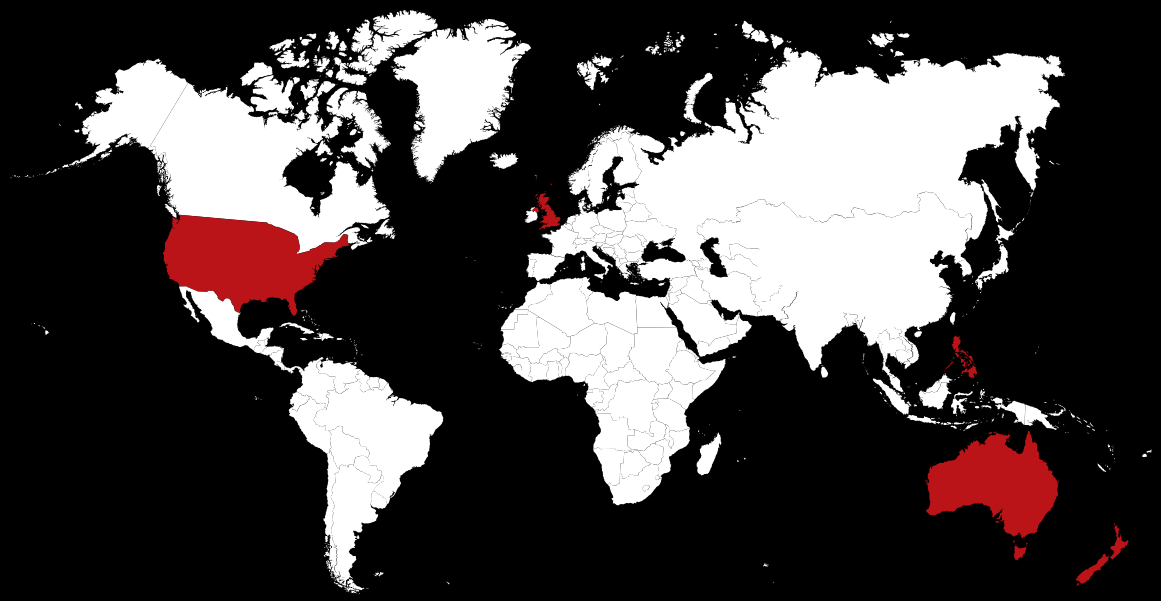
15% reduction in the cost to service a home visit.

15% reduction in average travel minutes per visit.

Increase in number of visits delivered as planned - **from 60% to 90%**

An Introduction to Biarri

B2B Software Company	we build bespoke solutions for operational planning, scheduling and rostering.
The Biarri Difference	our technology empowers planners with **mathematical optimisation**: automating planning processes and optimising planning & execution.
Benefits and Value	our software establishes operational efficiencies for our customers, improving operating profit and/or planner productivity.
Biarri Workbench	despite the custom nature of our solutions, our core technology (the **Biarri Workbench**) enables us to build and deploy solutions rapidly and cost-effectively.
15 Year History	Since 2009, Biarri has spawned a family of companies (the **Biarri Group**), with ~200 employees across the group and offices in US, UK, Australia and Philippines.
Cross-functional Team	we are a team of 40 software engineers, mathematicians, data scientists and ML engineers, predominantly in client-facing or consultative roles.



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