



# Empowering Successful Bids for PPP Provision and Maintenance of Rolling Stock Through the Use of Simulation Software

Len Pearson, Executive Director

3rd Annual  
MODERN RAILWAYS



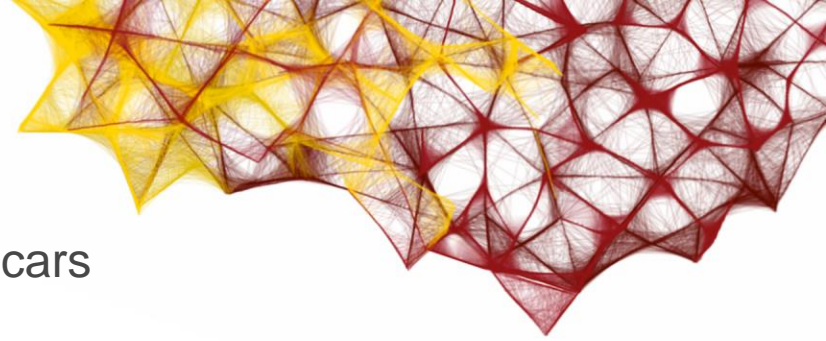


## Overview

- About InterDynamics
- Overview of Case Studies
- Common objectives and challenges
- Methodologies and tools
- Overview of the MSID simulation model
- MSID in detail:
  - Vehicles and operations
  - Maintenance and repairs
  - System outputs
- Outcomes of the Case Studies
- Testimonial

## About InterDynamics

- Commenced business August 1992.
- Developed own logistics simulation platform – Planimate®.
- Specialising in management tools supporting:
  - Planning,
  - Scheduling, and
  - Improving operational profitability.
- Major clients include Alcoa, Aurizon (QR National), BHP Billiton, BMA, Coles Myer, DSTO, EDI Rail, Hitachi Europe, Inteplan, Pacific National, Perth Urban Rail, PANYNJ, Victorian Regional Channels Authority.



## CASE STUDY 1

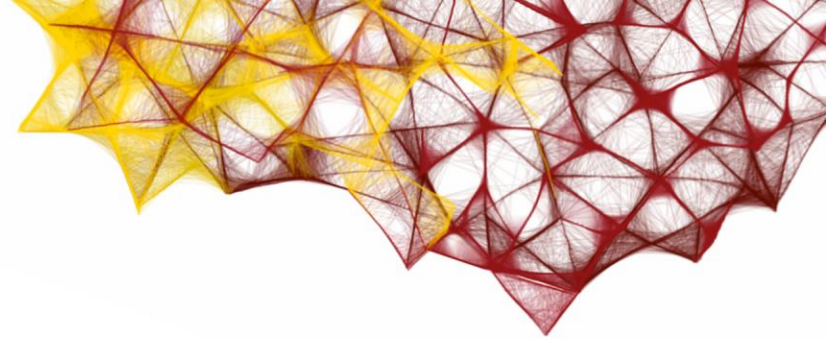
### PPP with RailCorp NSW for passenger railcars

Largest rolling stock order ever by an Australian rail operator.

The scope of the PPP project:

- Financing, designing, manufacturing and maintenance.
- Required to make 72 trains available for timetabled services each day for 30-years.
- Fleet maintenance.
- Associated design, construction and maintenance of a technologically advanced maintenance centre.
- Provision of simulators for crew training.

TENDERER - Reliance Rail (Downer Group et al)



## CASE STUDY 2

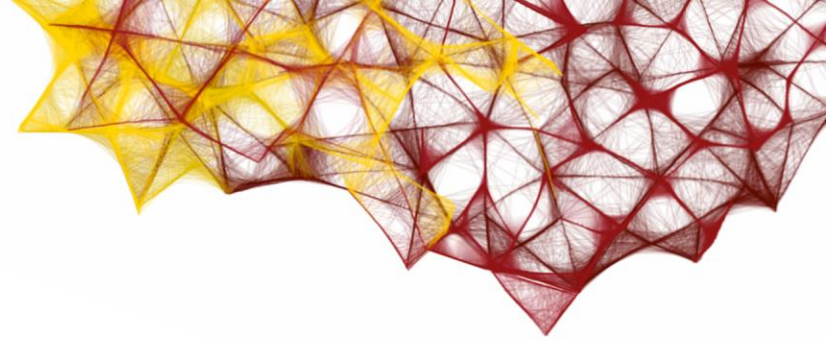
PPP with United Kingdom, Department for Transport, for high speed passenger trains

Replacement of 40-year-old high speed diesel-powered fleets throughout the UK.

The scope of the PPP project:

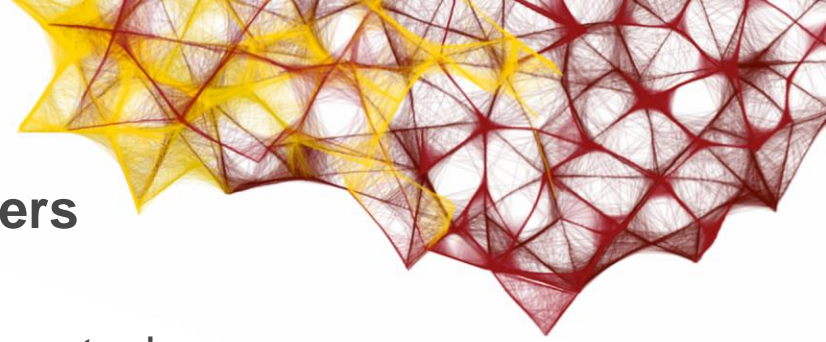
- The trains are a combination of fully electric and bi-mode trains, the latter have diesel and electric propulsion.
- The trains can travel at up to 125 mph, in various formations from five to ten cars.
- Great Western Main Line comprises 369 carriages which form to deliver 57 trains.
- East Coast Main Line involves up to 497 carriages which form to deliver 65 trains.
- Trains to be designed, manufactured and maintained for 27.5 years.

TENDERER - Agility Trains (Hitachi Group et al)



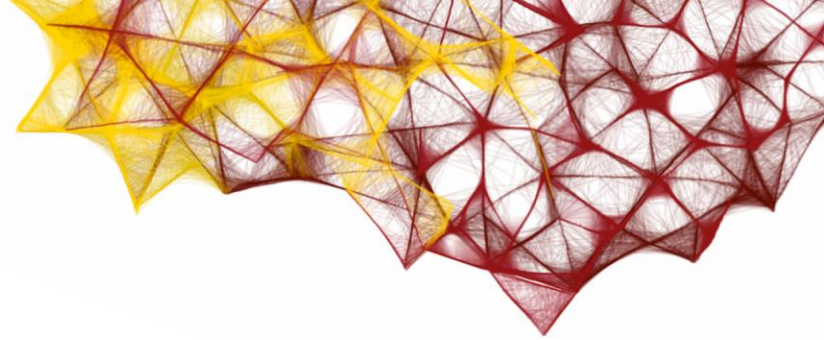
## Common Government Objectives

- Procure availability and reliability.
- Whole of life cost optimisation over 30-35 years.
- Commercial approach based on local and international precedents.
- Bankable, efficient and appropriate risk allocation.
- Clear and pragmatic procurement process.
- Single procurement for bundled manufacturer, maintainer and financier.
- Tenderer takes delivery risk (and decides how to allocate risk through sub-contracts).
- An asset acceptance and availability regime which promotes whole life asset management.



## Common Challenges for the Tenderers

- Responsible for service quality and rolling stock maintenance for up to 30 years.
- Responsibility for design and manufacture.
- Responsibility for design, provisioning and operating maintenance facilities.
- Responsibility for determining spares and replacement policy.
- Projecting or “modeling” future operating costs - maintenance, repairs and contract performance penalties.
- Balancing capital expenditure against operating costs.
- Financial modeling over project life (30 years).
- Assessing risks.
- Convincing the tendering body (consortia), government and financiers that the solution is viable, efficient and that risk is understood and treated or managed appropriately.



## Methodologies and tools

### Traditional

- Simple extrapolation of deterministic outcomes.
- Spreadsheets.

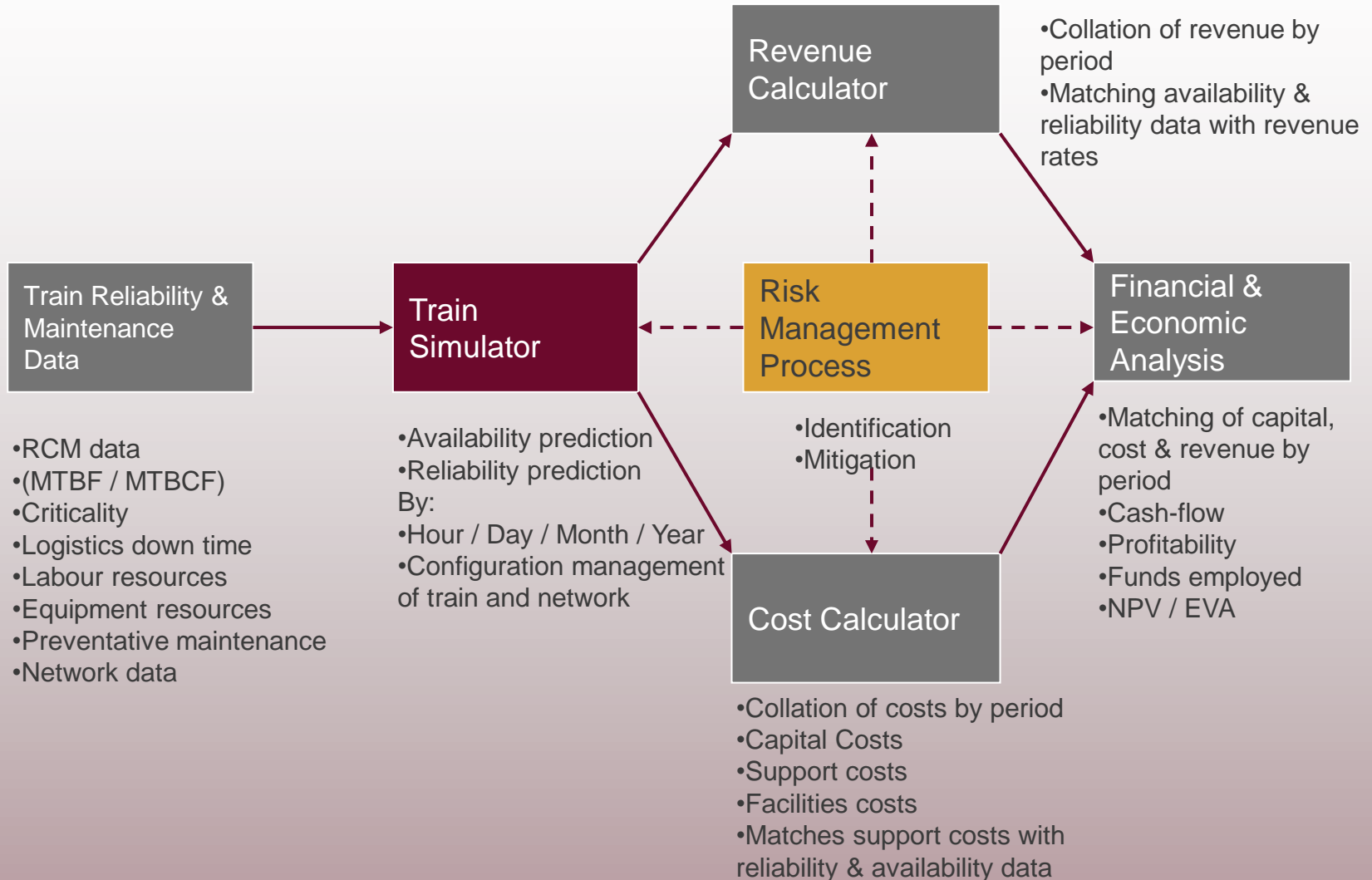
Simulation modeling solution sought in both these case studies

- Utilising simulation to model system performance, maintenance requirements, operational demands and likely failure points.
- Enabling an understanding of how the complex system behaves dynamically.
- Assisting a better evaluation of the alternative capital and operating costs and associated risks.

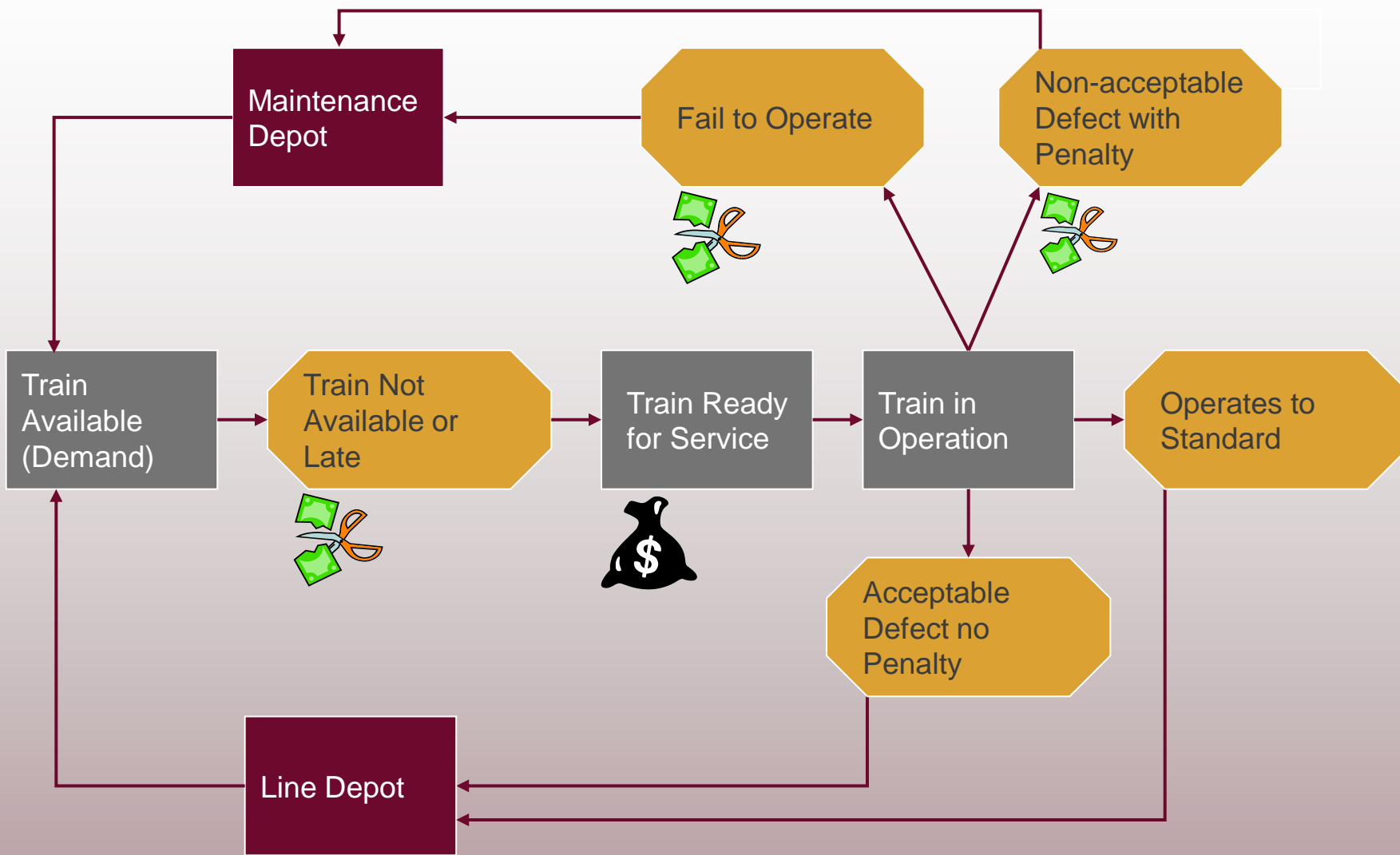
The following 3 slides show the use and function of the simulation model as required by Agility Trains:



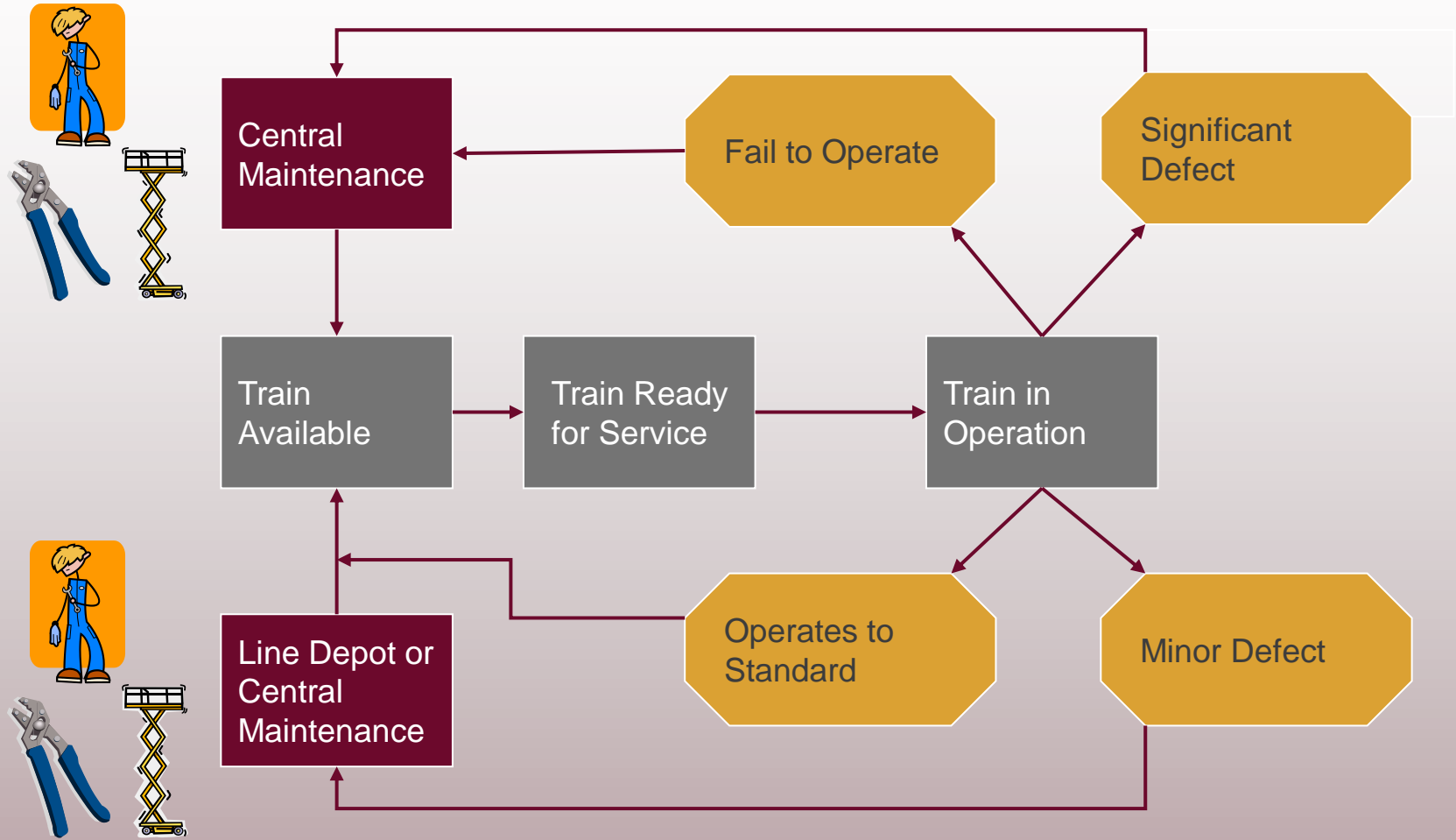
# Project Costing Methodology - Life Cycle Modelling



# Train Simulator – Flow of Revenue & Penalties



# Train Simulator – Maintenance Activities

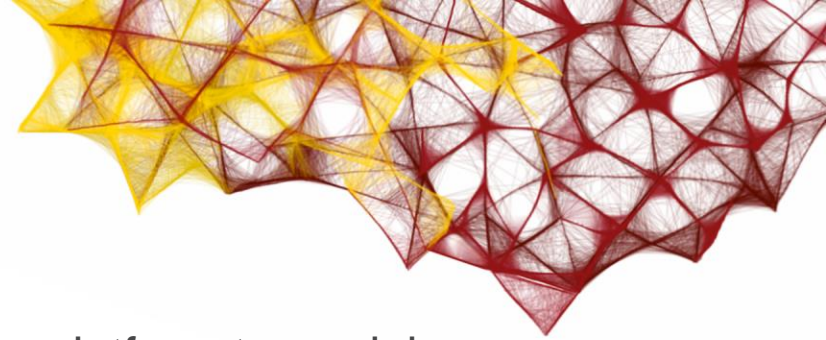


# Decision Support Solutions

MSID – A Materiel Sustainability Tool

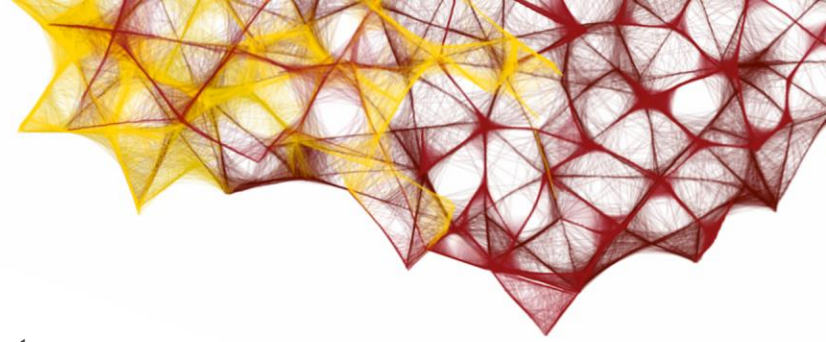
by InterDynamics





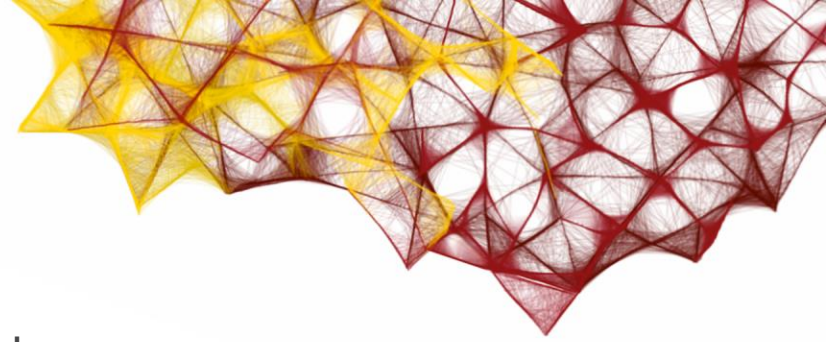
## MSID - Overview

- Utilizes the Planimate logistics simulation platform to model the system behaviour over the project life.
- Modelled assets and activities include:
  - Vehicles deployed on services across the rail network.
  - Vehicle component breakdown and response.
  - Maintenance facility capability and activity for:
    - Vehicle scheduled maintenance.
    - Vehicle breakdown repairs.
- System performance and contractual compliance.



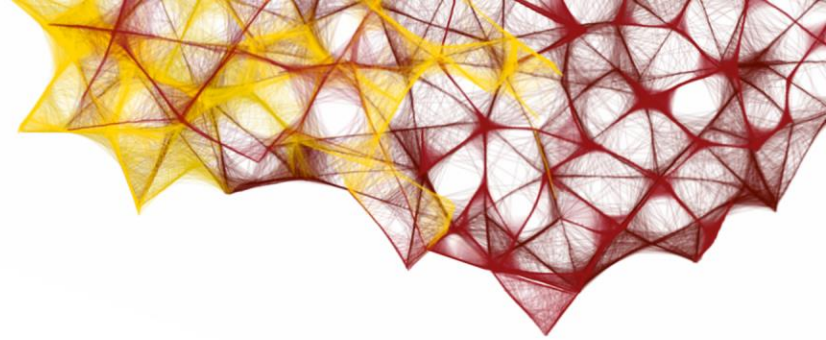
## MSID - Vehicles

- Hierarchical equipment component structure.
- Component failure rates (MTBF and distribution).
- Component repair requirements (time, resources, parts, rotables).
- Vehicle delivery schedule (production plan).
- Schedule and rules for planned maintenance.



## MSID – Vehicle operations

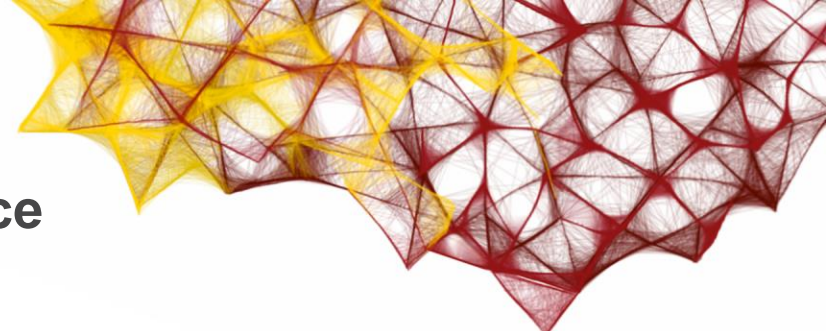
- Deployment schedules or on-demand rules.
- Network layout and transit rules.
- Failure degradation rules:
  - Immediate repair or repair after current deployment.
  - Parallel and backup components.
- Breakdown transport rules:
  - How to assign repairs and transport the vehicle to the facility.



## MSID – Maintenance facilities

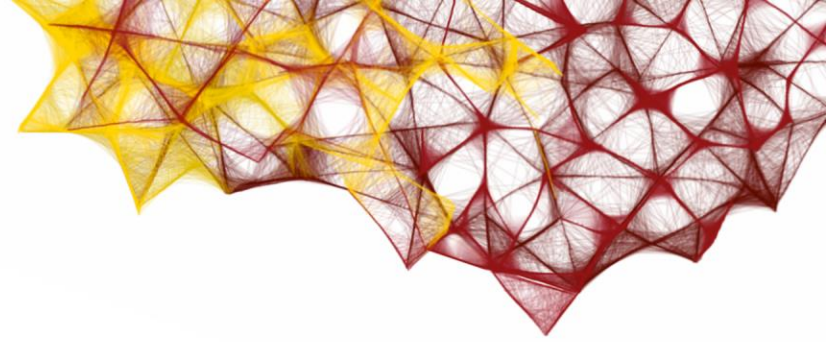
- Number and type of bays.
- Specialist repair equipment.
- Staffing.
- Spare part holding policy.
- Rotable components.
- External contracted activities.
- Schedule of operations – time of day and day of week.





## MSID – System/contract performance

- Service quality measures.
- Contract penalty clauses.
- Vehicle utilisation.
- Vehicle failure statistics.
- Maintenance activity logging.
- Maintenance equipment utilisation.
- Spare part and rotatable consumption.



## MSID – Use and outputs

- Time based outputs of all cost drivers.
- Sensitivity analysis available against:
  - any asset attributes and,
  - all operation parameters.
- Multiple runs with random variation provides:
  - probability distribution of any KPI output, and
  - thereby supports robust risk assessments.

## Case Studies - outcomes

### RailCorp NSW

- Reliance Rail (Downer Group et al) utilised MSID and won a competitive tender process which included 4 parties. Project successfully financially closed and train currently being delivered. Maintenance activities are currently underway.

### United Kingdom, Department for Transport

- Agility Trains (Hitachi Group et al) utilised MSID and won a competitive tender process against 3 other train manufacturing and maintenance consortia. In July 2012, the DfT signed the contract with Agility Trains. The first stage, West Coast Main Line has been financially closed, with the financial closure of East Coast main Line due shortly.

## Testimonial

*“I consider the InterDynamics MSID product to be leading world class in its field. Should any potential client of InterDynamics wish to contact me directly I would be happy to discuss my views direct.”*

Andrew Bolton

Bid Consultant for Hitachi Rail and Downer EDI Rail



## Our Unique Approach

The capability InterDynamics' offers our clients is unique.

By providing both decision support solutions and risk-based fatigue management, we can deliver holistic solutions to both operational and strategic business challenges.

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