Three Industrial Transportation Problems Solved with Constraint Programming

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Three Case Studies

- Logistics with Depots
  Wincanton Transport

- Patrol Despatcher
  RAC

- Flight Schedule Retimer
  BA
Logistics with Depots

Control:
- View Deliveries
- View Collections
- View Routes

Delivery Points:
- All
- Selected
- ABERDEEN | ARGARY

Collection Points:
- All
- Selected
- ANDOVER | BENNETT

Routes:
- By Depot
- Combo1
- By Id

Previous | Next
Clear
Logistics with Depots: Role

- **Marketing/Customer Interface**
  Assess impact of new customer business on operational costs

- **Business Planning**
  Renegotiation of existing contracts
  Fleet planning

- **Timescales**
  Weeks/months before operation
Logistics with Depots: Summary

- **Objectives**
  - Generate feasible schedule
  - Minimise driver/vehicle/travel costs

- **Constraints**
  - Collection and delivery time windows
  - Vehicle capacity data
  - Travel time data
  - Vehicle load/unload time data
  - Driver shift data

- **Business Benefits**
  - Strategy – which customers to take
  - Profitability – how much to charge
Patrol Despatcher

The RAC’s Birmingham Despatch Centre
Patrol Despatcher: Role

- **Strategic Despatcher**
  - Negotiation with patrols
  - Fleet planning
  - Explore business process
  - Balance business objectives

- **Timescales**
  - 1 year ahead

- **Operational Despatcher**
  - Support despatcher
  - Interface to call takers and patrols
  - Improve despatching decisions
  - Improve responsiveness to management

- **Timescales**
  - Real time
Patrol Despatcher: Summary

● Strategic Objectives
  Despatch a years’ worth of jobs
  Simulate the company’s operation
  Meet constraints/business criteria

● Business Benefits
  Negotiation with patrols
  Test benefits of onsite protocol
  Test different resource levels
  Test different objectives (cost/QoS)

● Operational Objectives
  Meet real-time requirements
  Decisions match business goals
  Handle larger regions
  Consistency, completeness

● Business Benefits (planned)
  Cost savings
  Quick, fair decisions
  Better despatching at “borders”
  Flexible business process
Flight Schedule Retimer: Role

- Operations/Marketing Interface
  Financial arguments for not doing marketing’s bidding

- Negotiation with other Airlines
  Exploring scenarios during IATA meetings

- Timescales
  6-12 months before schedule season
Flight Schedule Retimer: Summary

- Objectives
  - Retime scheduled *flights*
  - Observing *constraints*
  - Minimising *changes* to existing schedule

- Business Benefits
  - Aircraft utilisation gains
  - Slot profile change
  - Punctuality improvement
Project Management
Client Project Management Role

- Liaise during development
- Identify & involve user
- Provide data
- Evaluate results
- Interface with Client Systems

3-4 week RAD timeboxes
Project Plan – Example from an Actual Time Box Meeting

- Specification
- Modeling
- Algorithms
- Delivery
Algorithm Development

Problem Analysis
- Operational Constraints
- Detailed study of problem components

Identification of Algorithms
- Potential solvers for problem components
- Heuristics

Construction of Algorithms
- Coding alternative configurations

Evaluation of Algorithms
Constraint Programming – Nature and Scope
New Projects

- **STI**
  National Centre for Advanced Packaging and Supply Chain Logistics (Monash)
  Consortium for Optimisation of Industrial and Logistics Systems (Monash, Melbourne and Deakin)

- **Centre of Excellence (NICTA)**
  The NICTA Constraint Programming Platform

- **Industrial**
  Crew rostering (CTI)
  Distributed Inventory Optimisation (IBM)
  + Integrated airline scheduling, truck fleet scheduling, integrated manufacturing and logistics