ATP: Run-Time Analysis & Improved Punctuality

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About GIRO

• Industry leader with 30+ years of innovation
  – Extensive collaboration with clients and researchers

• HASTUS™: Integrated software solution
  – Scheduling and operations
  – Customer information
  – Planning and analysis
  – All modes and types
Why use HASTUS-ATP?

• Improve adherence to planned schedules
• Improve punctuality at relief & meet points
• Increase passenger satisfaction
• Minimize performance penalties (contracted services)
• Reduce operator stress
• Shorten the scheduling/run-time analysis cycle through integration with scheduling
History of ATP

• 1997: Version developed for Mulhouse in France
  – Link-by-link analysis
  – Calculations based on deviation attributes

• 2007: New algorithm developed with TMB & Professor Salicrú from University of Barcelona
  – Optimization for a complete route
  – Sophisticated evaluation of punctuality
History of ATP (cont’d)

• 2009-2011: Improvements to generalize the “Barcelona” approach
  – New version of algorithm
  – Enhanced integration and flexibility
  – Smoothing method considered
  – Comparison tools
ATP Model

• Run-time analysis path
  – Sequence of timing points to analyze

• Run-time segment
  – Two consecutive timing points on path

• Run-time profiles
  – From the origin to each timing point on path
  – Allow users to evaluate punctuality
ATP Model (cont’d)

- Measurements
  - Collected from ticketing, AVL, or manually
  - Any stop can be considered in analysis
  - Contains passing time at stop, wait time, and measurement device
ATP Model (cont’d)
ATP Algorithm

• Automatically generates:
  – Periods
  – Run times
  – Minimum layovers

• Can be used to control:
  – Periods
  – Punctuality criteria
  – Minimum layover
ATP Algorithm (cont’d)

• Period control (can also be fixed)
  – Minimum length and increment
  – Minimum/maximum count

• Punctuality and minimum layover control
  – For each profile
  – Evaluation method (attribute) and ranges
  – Run-time profile: usually a range attribute (e.g. -1 + 3)
  – Layover: usually a percent below attribute (e.g. 90%)
Practical Issues

• Defining objectives is difficult
  – Passengers want punctuality and speed
  – Operators want to minimize cost
  – Organizing authorities want both
  – Drivers prefer longer layovers

• Decisions can have important impacts on:
  – Timetabling, vehicle & crew scheduling

• Quality of measurements is essential
Results

• Can be fine-tuned interactively
• Complete set of analysis tools available
• Can be saved in a new run-time version
• User can save times as network- or route-specific run times
Integration with HASTUS allows users to:
- Load schedules with new run times to analyze the impact of run-time changes
- Adjust public timetables quickly
- Produce new vehicle & crew schedules

The cycle time and effort required for analysis/scheduling are significantly reduced
Conclusions

• Run-time analysis is essential for well-run public transportation companies
  – Minimizes operational costs
  – Increases user satisfaction
  – Helps make operations smoother

• New ATP version is flexible and efficient

• Integration with HASTUS greatly reduces schedule production cycle times
Conclusions (cont’d)

• ATP is a key module for many clients
• 64 customers currently have this module
• ATP’s flexibility meets requirements around the world
• Much interest from public transport industry
• New installations result in rapid improvement of punctuality