QUANTIFYING CAPACITY IMPACT OF LANDING HEAVY HAUL TRAINS ON BUSY CORRIDORS

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Introduction

Understanding the true capacity of a freight rail corridor or terminal requires more than track counts and headways—it demands a framework that integrates infrastructure, operating plans, and train mix into a unified metric. The Capacity Marketplace provides such a framework by expressing supply and demand in a common currency of capacity units, each representing the ability to move one train over one track segment per unit time. Developed by DB E.C.O., the model translates raw operational data—such as OS timestamps—into actionable measures of network utilization. This approach bridges the gap between planning-level analysis and day-to-day dispatching, allowing infrastructure agencies and operators to evaluate how staging, variability, and maintenance windows consume usable capacity.

Experimental work / Methodology

The Capacity Marketplace uses four analytical stages: (1) define the unit of capacity through measured headways; (2) map physical supply from track charts and employee timetables; (3) quantify demand by parsing OS data for freight and passenger movements (if any); and (4) iterate supply and demand to reveal where consumption exceeds available capacity. Each activity that occupies mainline time (train movements, staging, maintenance, or yard entry) incurs an opportunity cost expressed in capacity units. Applying this to the 12 different subdivisions, we typically leverage OS data, growth projections, and maintenance assumptions to create a corridor-wide “market” where every train, delay, and work window competes for limited slots.

Results

Across the twelve study corridors, analysis showed that non-movement factor (especially maintenance-of-way (MOW) windows and mainline staging) regularly consume 25–35 % of theoretical capacity. Visualization through bar-chart “market-balance” diagrams highlights where available slots are lost to variability or staging dwell. A variability factor, derived from the ratio of 70th- to 10th-percentile run times, adjusts throughput to reflect dispatch-day conditions. The resulting capacity map enables direct comparison of operational policies, infrastructure upgrades, and scheduling strategies within one transparent numerical system.

Conclusions

The Capacity Marketplace establishes a standardized, transparent framework for measuring and valuing rail capacity. By converting operating data into an exchangeable metric, it bridges engineering analysis and economic decision-making—showing how each minute of terminal or mainline occupancy affects overall throughput. The methodology scales across corridors and is particularly suited to heavy-haul corridors, where long trains, variable dwell, and mixed operations amplify network interactions. Future research will extend the model to dynamic “auction” simulations in which infrastructure and operating plans are optimized simultaneously.

Beyond individual findings, the study demonstrated a methodology that can, within two weeks, pinpoint network bottlenecks purely from historical data—no simulation required. The Capacity Marketplace learns from history, translating observed operating patterns into a quantified picture of how and where trains actually consume capacity. The resulting map enables agencies and operators to compare operational policies, infrastructure upgrades, and scheduling strategies within a single, transparent numerical system. This model has been used and tested by 5 different railroads in the US.

Acknowledgments

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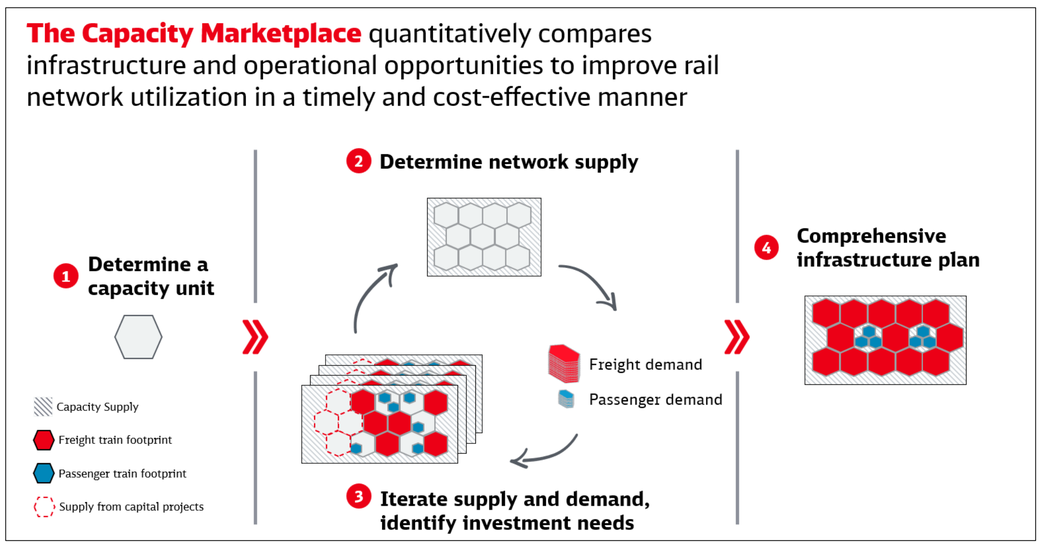

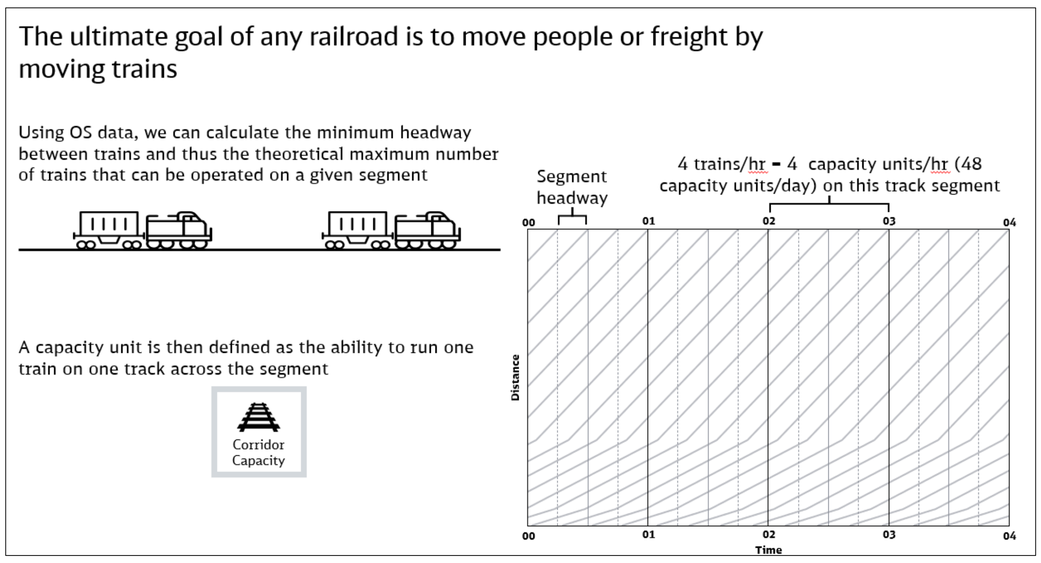

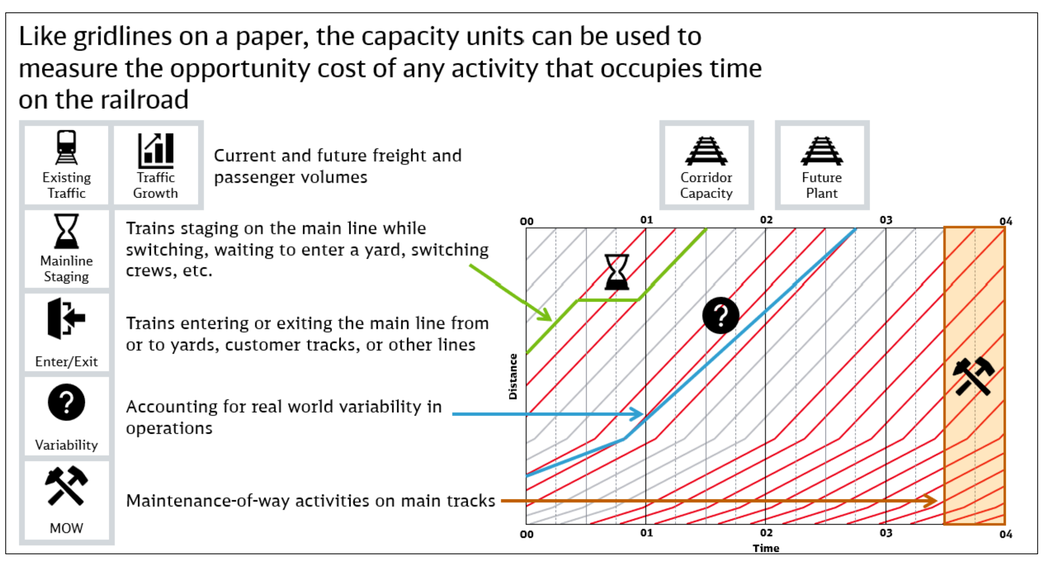

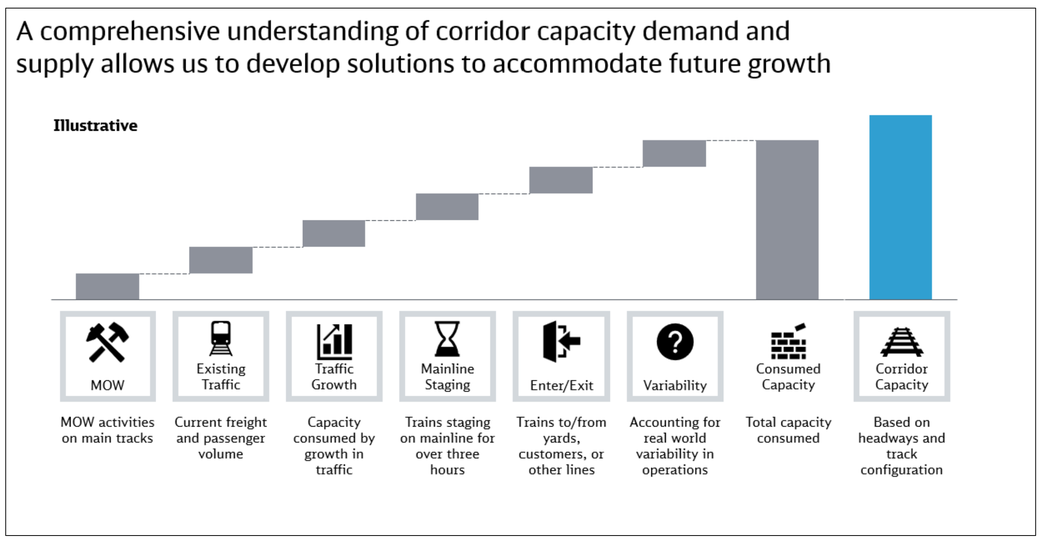

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