



Posten Bring AS is a Nordic postal and logistics group that develops and delivers comprehensive solutions to meet Norway's postal service needs.

Location: Europe

Use Case(s): Logistics

Website: www.postenbring.no

Results

- A geographically balanced district network and ongoing optimization efforts offer Posten Bring the opportunity to realize cost savings of up to 15% across its Scandinavian delivery services.
- Strategic resource allocation and optimized delivery promote greater inclusivity and equitable access to vital services.

Optimizing Postal Service Logistics for More Efficient and Equitable Service

With Gurobi, Posten Bring can support the optimization of high-quality service delivery and ensure more equitable access to essential services.

As a leading Scandinavian logistics operator and the national postal service for Norway, Posten Bring handles hundreds of millions of deliveries each year, encompassing letters, packages, and goods.

The company is deeply committed to providing efficient and equitable service across its diverse geographic footprint—an effort that would not be possible without continuous optimization.

Balancing cost efficiency with socioeconomic considerations requires careful geographic partitioning, or districting. This demands in-depth analysis and customized solutions that encompass a multitude of factors, from evolving infrastructure and population density to the practicalities of sorting and fulfilling deliveries.

Addressing the Challenges of Multi-Echelon Logistics

Traditional postal code allocations often fail to reflect changing infrastructure and demographics, and are not always suitable for the specific needs of individual services within a multi-echelon network.

Efficiently handling packages of different sizes and weights within such a system requires robust sorting operations that effectively consolidate packages while considering both sorting space and vehicle capacity.

Terminal capacity and sorting area limitations are two key constraints that must be considered in order to form manageable units that strike a balance between compactness and organizational feasibility. This makes



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Eirik Hagen, Operations Research Analyst, Posten Bring

the districting process a complex and demanding exercise from an operations research perspective.

This task is further complicated by the asynchronous nature of package arrivals, which makes it difficult to efficiently sequence packages based on their destination or other relevant factors. The unpredictable flow of packages impedes the optimization of sorting processes and vehicle loading, leading to potential inefficiencies in the overall logistics chain.

In response to these challenges, Posten Bring is developing a flexible solution to create spatially compact districts that allow for optimized sorting and last-mile distribution while ensuring equitable service delivery.

Modeling the Problem

While the need for optimal districting is clear, there's no single, universally applicable “districting problem”. This

is because the challenges involved in districting can vary so widely based on geographic context, organizational and political priorities, service types, delivery network complexities, and other factors.

Nevertheless, there are some clear and meaningful goals that can be considered universal. For example, there is a need for compact and balanced areas that make sense logically, visually, and from a service-equity perspective.

This can be formulated as an optimization problem where the goal is to partition a large number of waypoints (with each representing a Voronoi site) into geographically natural districts.

The problem formulation should consider several, potentially contradictory, objectives:

■ **Minimizing total travel distance and maximizing district compactness:**

This ensures efficient delivery routes and minimal operational costs.

■ **Creating manageable districts while balancing workloads across them:**

This ensures operational efficiency by allowing for effective management without overloading specific areas. District sizes should typically be considered relative to volume and can be combined like building blocks, making upper limits particularly important. Stochastic models can be employed to account for workload variability across districts.

■ **Respecting terminal capacity and sorting area limitations:**

This ensures that the proposed districts are realistic, given the physical constraints of the logistical network.

■ **Maintaining homogeneity within each district:**

This often plays a significant role in districting, as it can help ensure that districts are comprised of similar characteristics and interests.

■ **Avoiding overlap between areas:**

Districting should aim for clear and unambiguous boundaries to prevent confusion and disputes, especially when dealing with geographic features that might create a sense of overlap.

These districting goals can be modeled using linear programming techniques and incorporating specialized algorithms together in hybrid approaches to handle the inherent complexities.



An automated districting solution generated by Posten Bring, applied to a “fractal-like” region outside Utrecht, Netherlands. The left image displays a satellite view of the target area, highlighting its intricate geographical layout. The right image presents the resulting districting plan, featuring 24 partitions generated solely on the natural structure provided by the road network. This solution emphasizes a purely “geometric approach,” prioritizing compact road network structures for district delineation without considering operational factors.

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Operations Research Analyst
Posten Bring

Posten Bring has utilized these techniques, employing Gurobi's solver to effectively prototype and explore objective functions, scenarios, and parameter adjustments.

As a leader in mixed integer linear programming technology, Gurobi also provides a strong benchmark for optimality, serving as a trusted point of reference for measuring and validating solutions. By leveraging Gurobi's power, Posten Bring can gain valuable insights into the optimal districting configurations for its evolving needs and maximize logistical efficiency while ensuring high-quality service for its customers.

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An Optimized Plan That Cuts Costs and Improves Efficiency

By leveraging operations research techniques backed by Gurobi and complementing these tools with careful fine-tuning and adaptation by operational teams, Posten Bring can create highly efficient and effective districting solutions.



This optimized districting plan offers several potential benefits:

- **Cost Reduction:** Geographically balanced districts are designed to streamline operations and reduce overall travel. In some cases, this could result in savings of up to 15% on delivery costs across various delivery services in Scandinavia.
- **Enhanced Service Delivery:** This optimized approach ensures a more balanced distribution of population density and customer demand, promoting fairness and inclusivity within newly defined districts.
- **Socioeconomic Impact:** Posten Bring plays a crucial role in ensuring equitable access to essential services for all Norwegian citizens. Strategic resource allocation and optimized delivery through districting contribute directly to this goal. Efficient distribution of essential resources, such as package lockers and pickup points, along with optimized delivery routes, minimize travel distance and time for individuals, promoting more inclusivity and equitable access to vital services.

Districting enables efficient resource allocation and service delivery, but also provides a crucial framework for service provision, ensuring that operations are conducted within defined boundaries

and that resources are targeted effectively.

The districting work undertaken for Posten Bring highlights the versatility and significance of practical geographic optimization in addressing common challenges across industries. By ensuring a fair allocation of resources and services, districting can benefit sectors such as transportation, public safety, healthcare, and education.

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