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Topsector Logistiek

TKI DINALOG
Dutch Institute for Advanced Logistics

TU/e

NWO
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Connekt

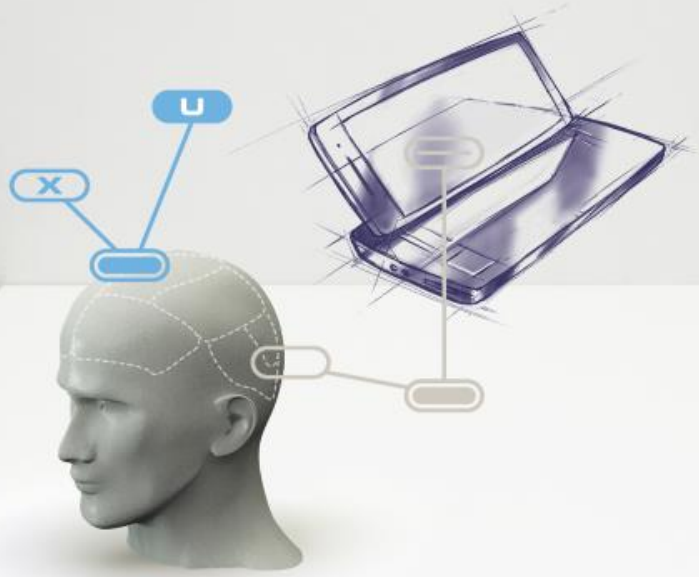
SLF
SERVICE LOGISTICS FORUM

Future Service Logistics

You better start now!

Minou Olde Keizer (CQM)
Collin Drent (TU/e)
Geert-Jan van Houtum (TU/e)

SLF Summit
November 15, 2018



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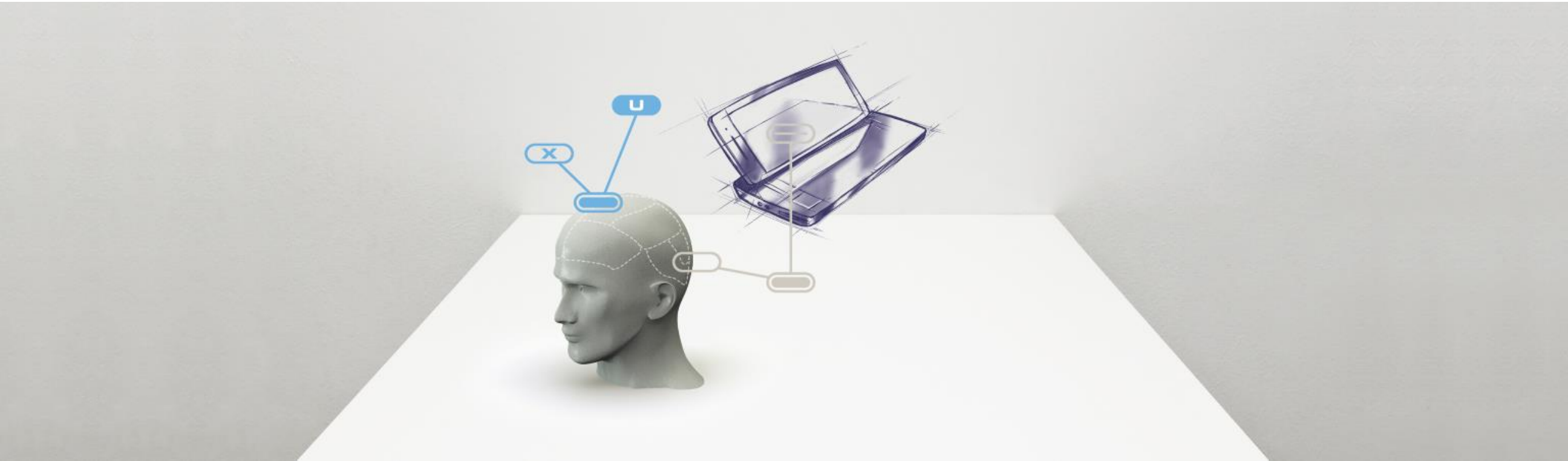
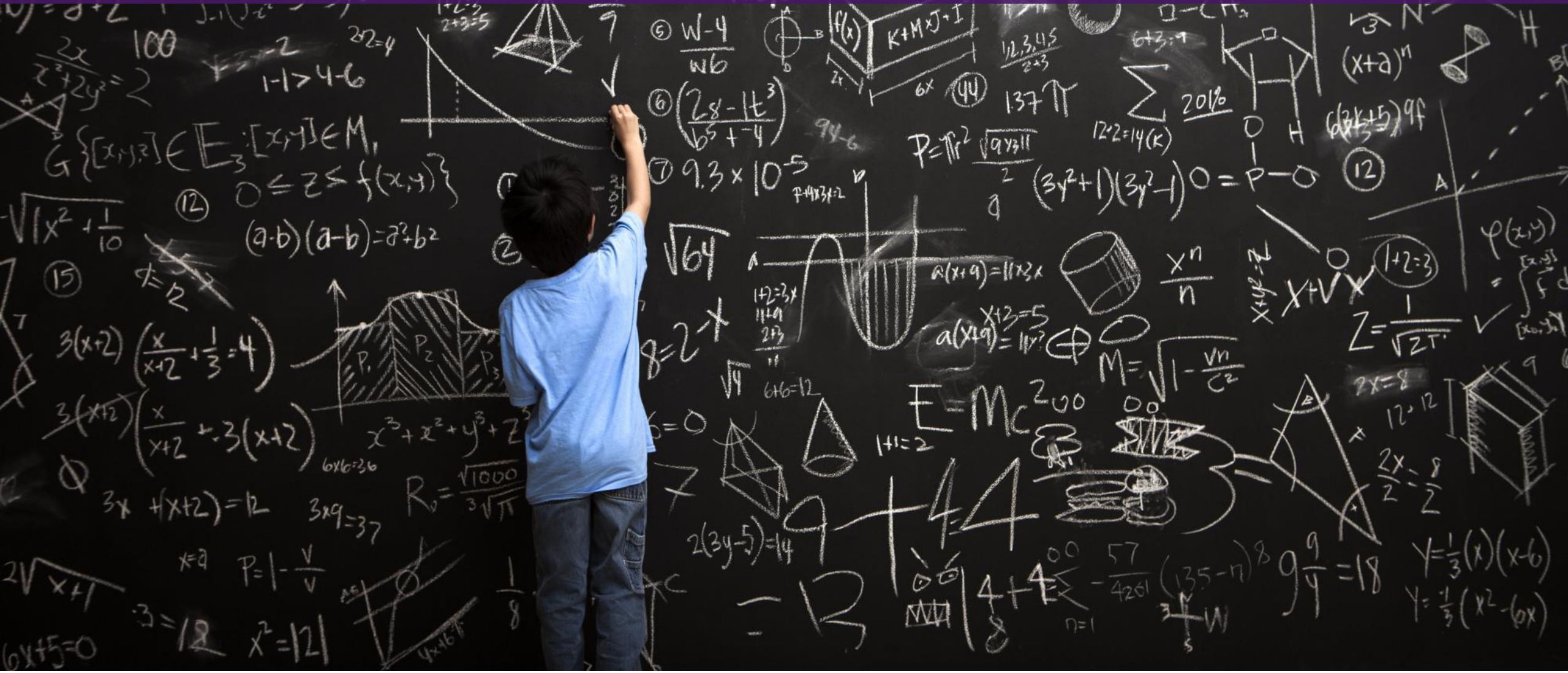


CQM: Data Science Specialists



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Video: Future shore control center

Video…

Service Control Tower: Near future?!

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Scope

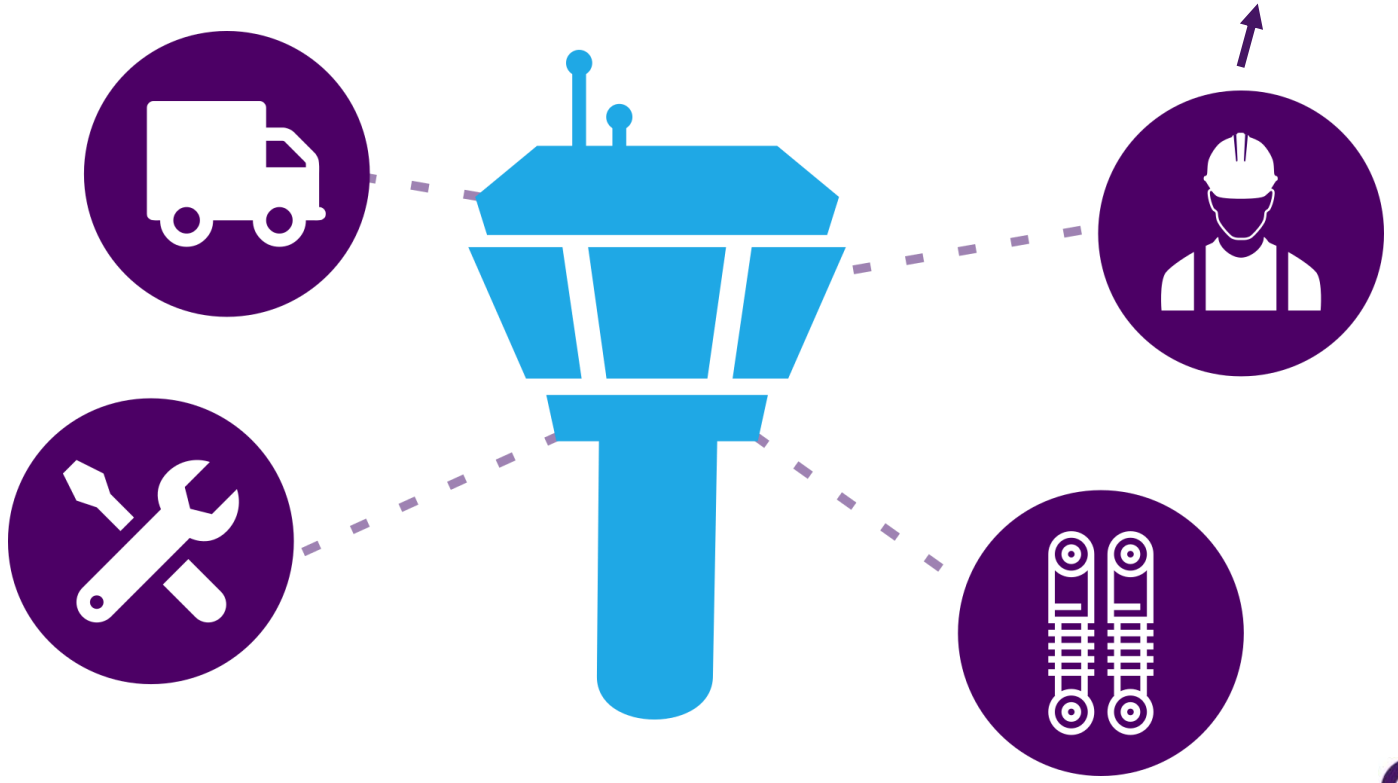
- Companies within the Service Logistics
  - that are involved in maintaining assets, from the start-of-use until the end-of-life

What is a Service Control Tower?

- A centralized system that manages and controls the service logistics of physical assets, by using real-time information

  - Monitoring
  - Anticipating
  - Supporting

Next part of this session:
MSc Thesis Collin Drent



Join?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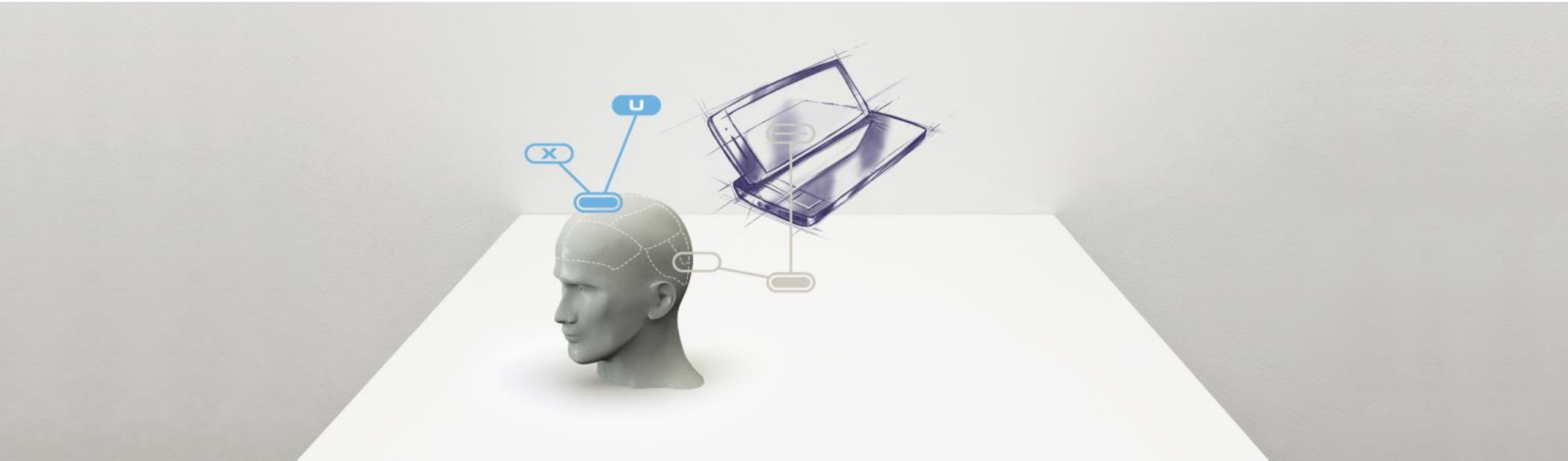
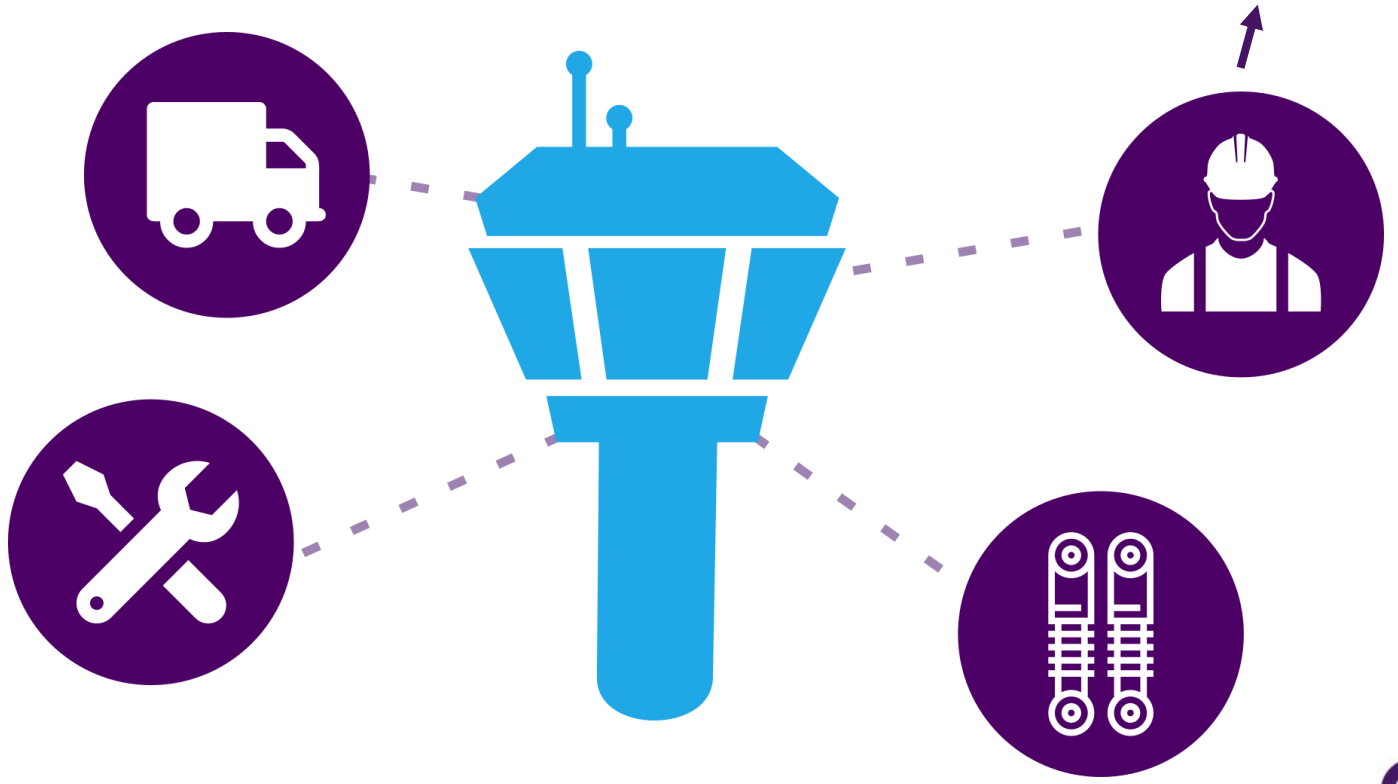


What is a Service Control Tower?

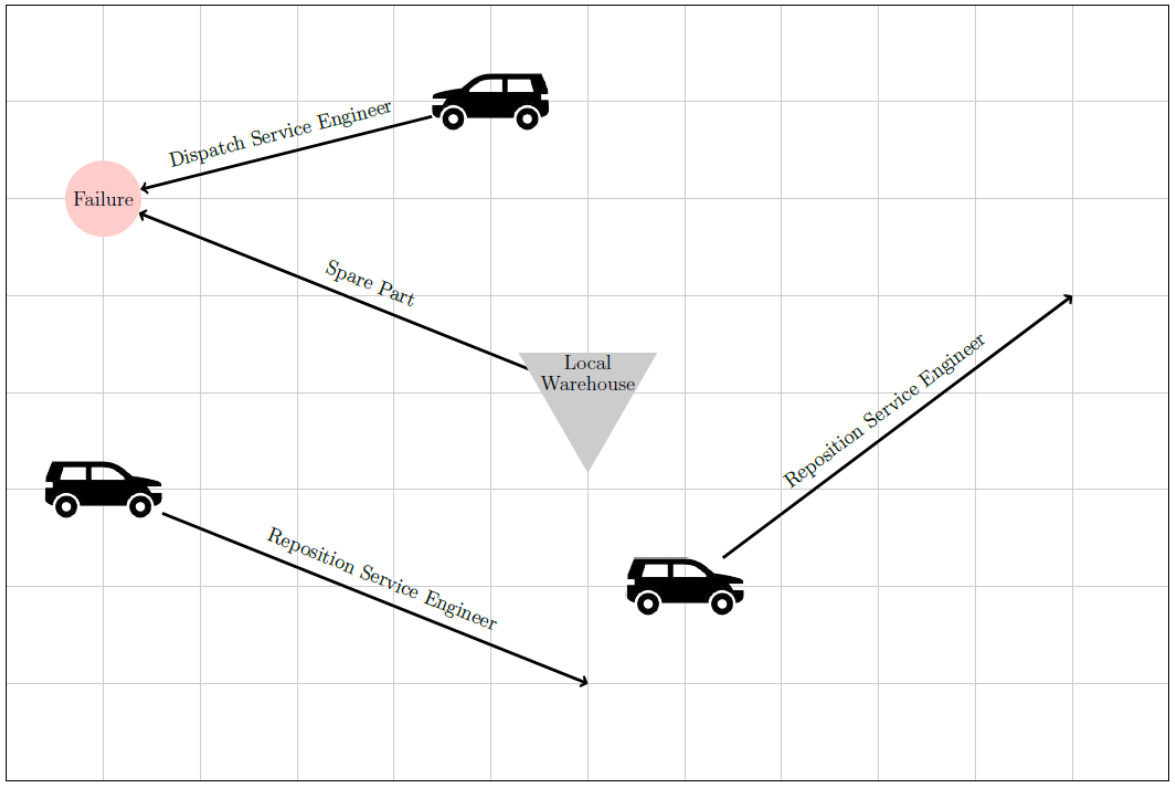
- A centralized system that manages and controls the service logistics of physical assets, by using real-time information

  - Monitoring
  - Anticipating
  - Supporting

Focus of this talk



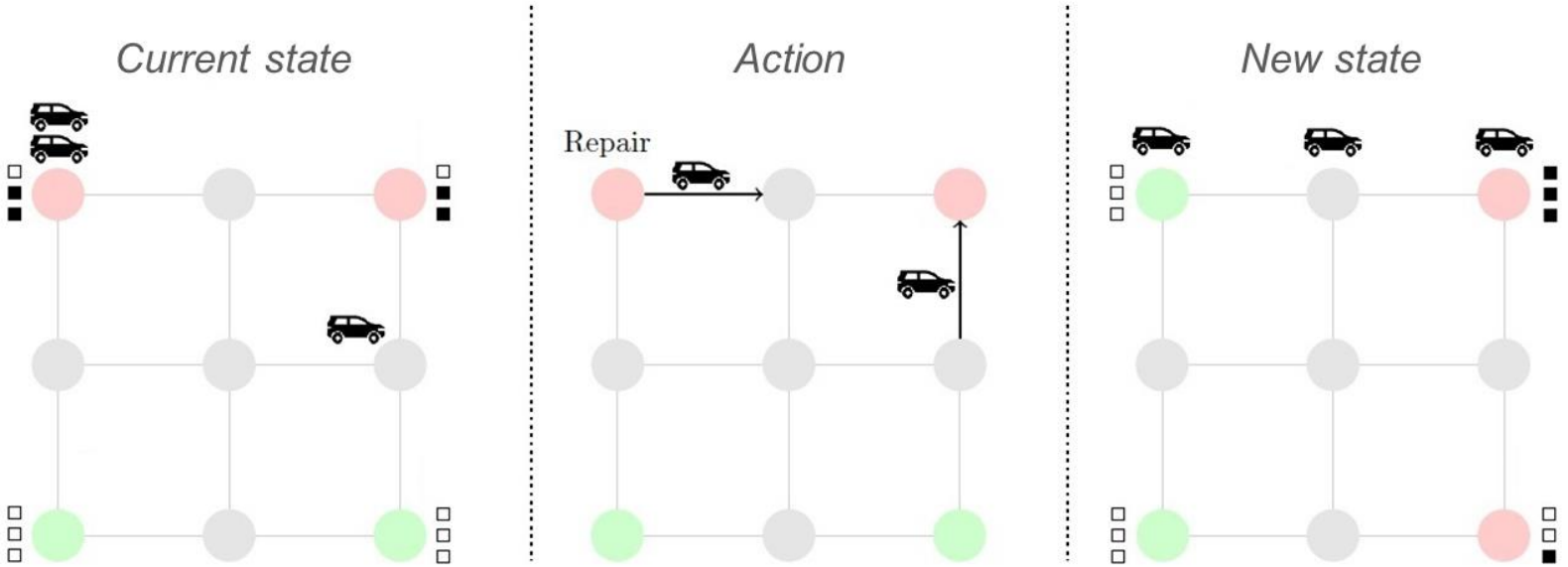
Introduction



- Assumption: perfect remote diagnosis upon failure

- **How to direct service engineers?**
  - Dispatch service engineer upon failure
  - Reposition idle service engineers
  - Reallocate assigned service engineers

Representation of Service Logistics Network



- Small instances: Derive optimal policy
  - Using Markov Decision Theory
- Large instances: Develop scalable heuristics

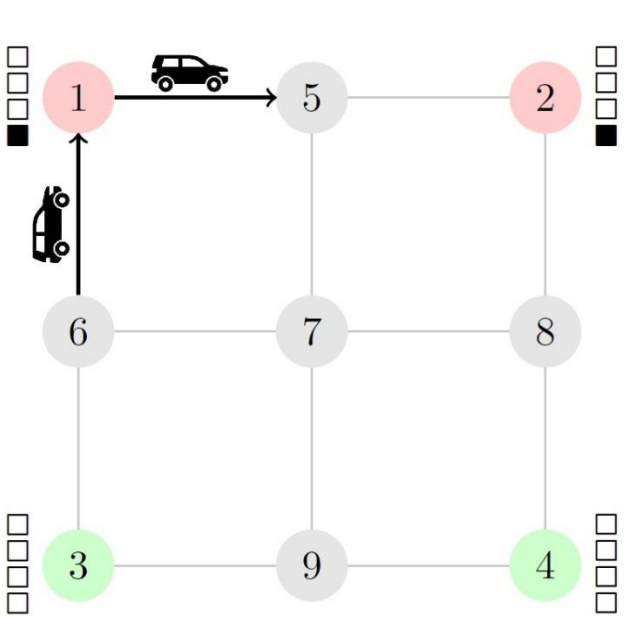
} Obtain insights

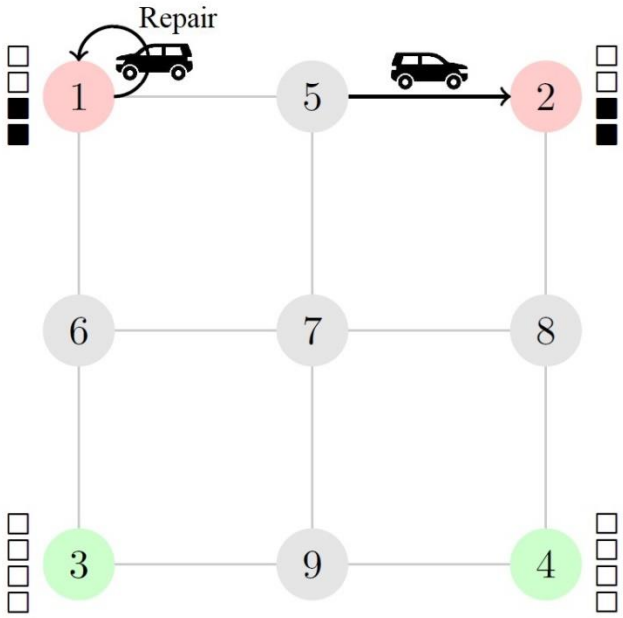
} Quantify effects for real-life networks

Insights

Exact approach
Small instances – Dispatching

- Dispatching from a network perspective





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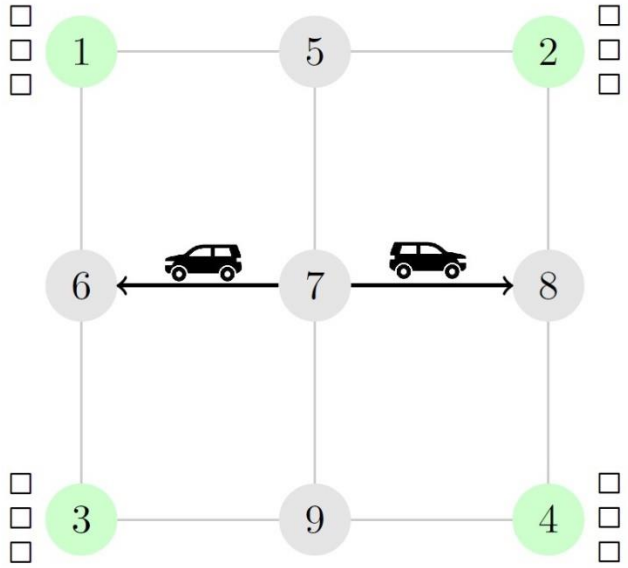
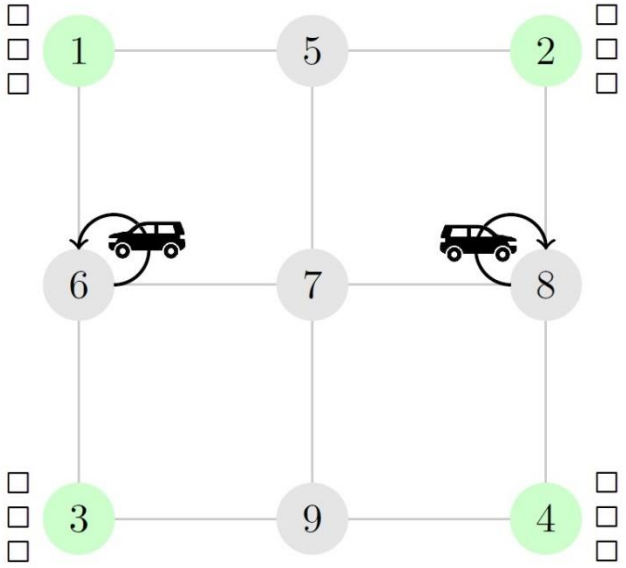
Exact approach
Small instances – Repositioning

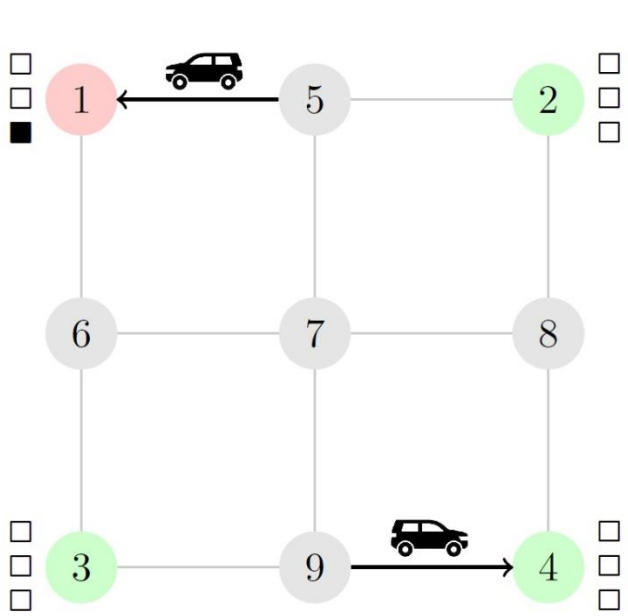
- Repositioning: Static dwell points for idle service engineers

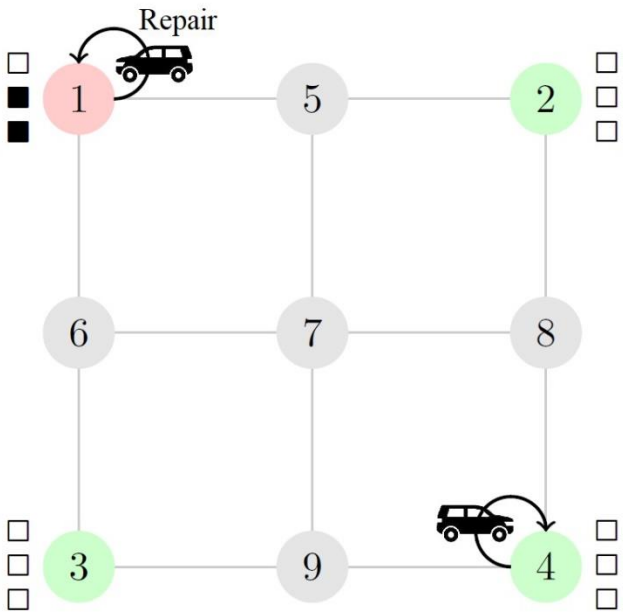




Exact approach
Small instances – Repositioning

- Repositioning: Dynamic dwell points for idle service engineers





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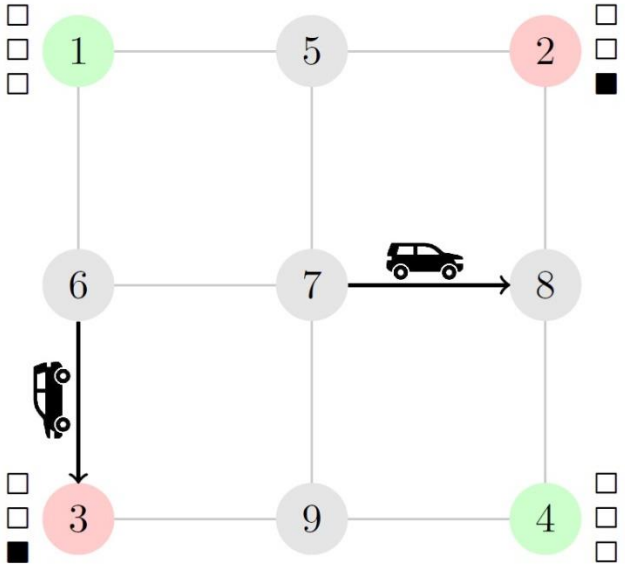
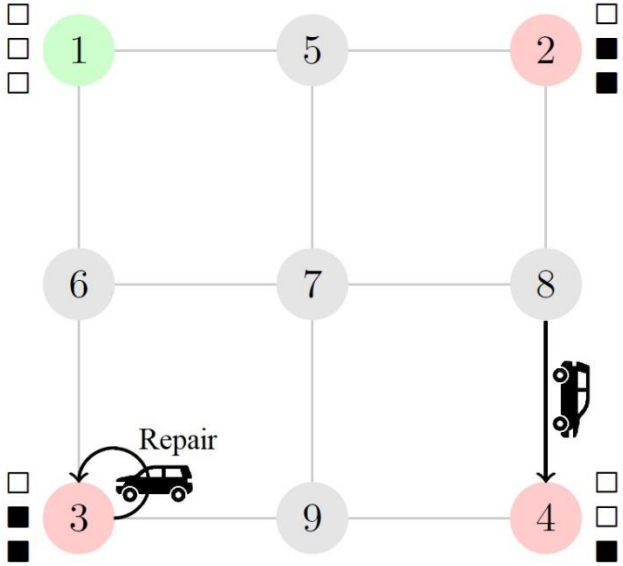
Exact approach
Small instances – Reallocation

- Reallocation: Can be beneficial

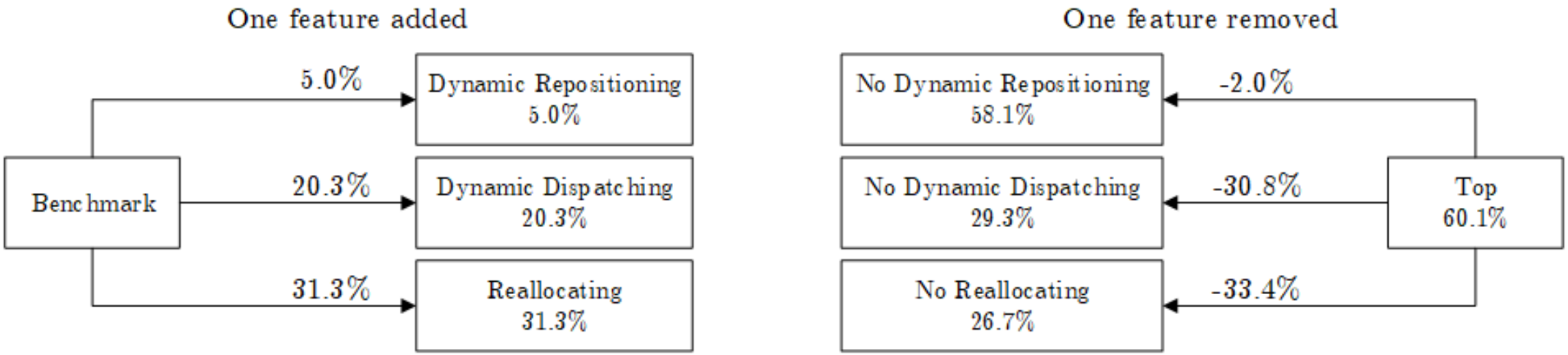




Heuristic approaches

1. Dispatch service engineers to service requests
   a) Benchmark — “closest-idle first”
   b) Top — matching of service requests and idle service engineers
      (through “Minimum Weighted Bipartite Matching problem”)
2. Reposition idle service engineers
   a) Benchmark — send to nearest unoccupied dwell-point
      (determine dwell points with “Maximum Expected Covering Location problem (MEXCLP)”)
   b) Top — send to neighbouring node with highest contribution to coverage in real-time
      (using marginal contribution coverage from MEXCLP)
3. *Reallocation*

Results
Large instances: savings from benchmark in %



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Conclusion

- Academic perspective:
  - First to address a combination of dynamic dispatching and dynamic repositioning with reallocation in a service logistics network
- Practical perspective:
  - Scalable heuristics suitable for real-life networks
  - Dynamic dispatching outperforms widely adopted “closest-idle first” policy
  - Allowing for reallocation can reduce costs significantly

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Discussion

Statement 1

“Future service logistics is impossible without a Service Control Tower”

Also for small and medium-sized companies

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Statement 2

"Future service supply chains require **one** chain coordinator (*ketenregisseur*)"