

Smart railroad maintenance via stochastic model checking



1. Project goals

How can we efficiently model and analyse big railway systems and:

- compare the effects of different maintenance strategies?
- automatically synthesize maintenance strategies?
- obtain smart maintenance strategies?
- improve reliability and availability?



2. Railroad and Dependability

Safety-critical systems like railroad infrastructures are required to be reliable and to satisfy a high availability and a safe operation:

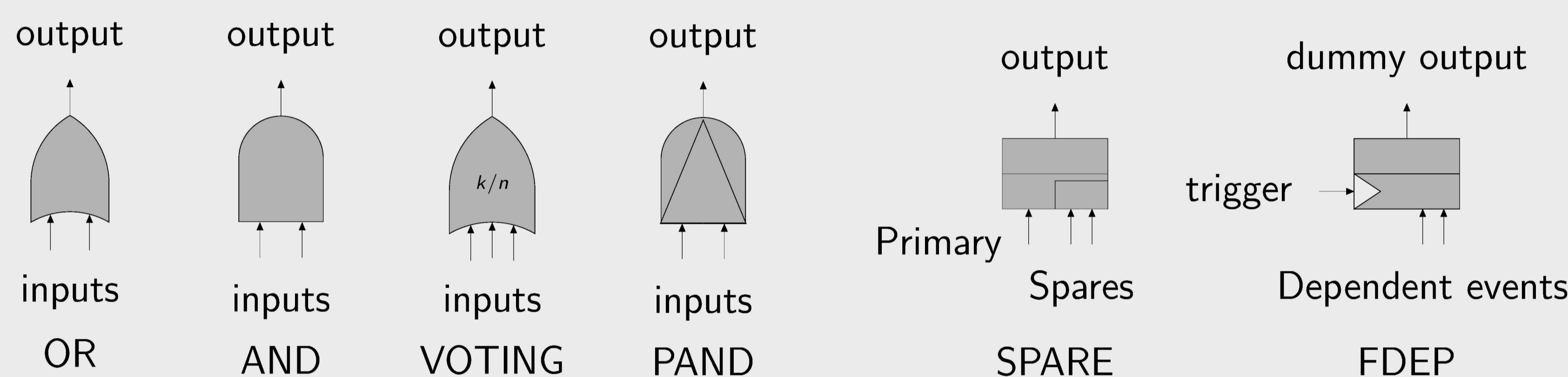
- RAMS (Reliability, Availability, Maintenance and Safety) is required by law
- ProRail demands for high availability and reliability
- Maintenance decisions have high impact

3. Infrastructure and Assets



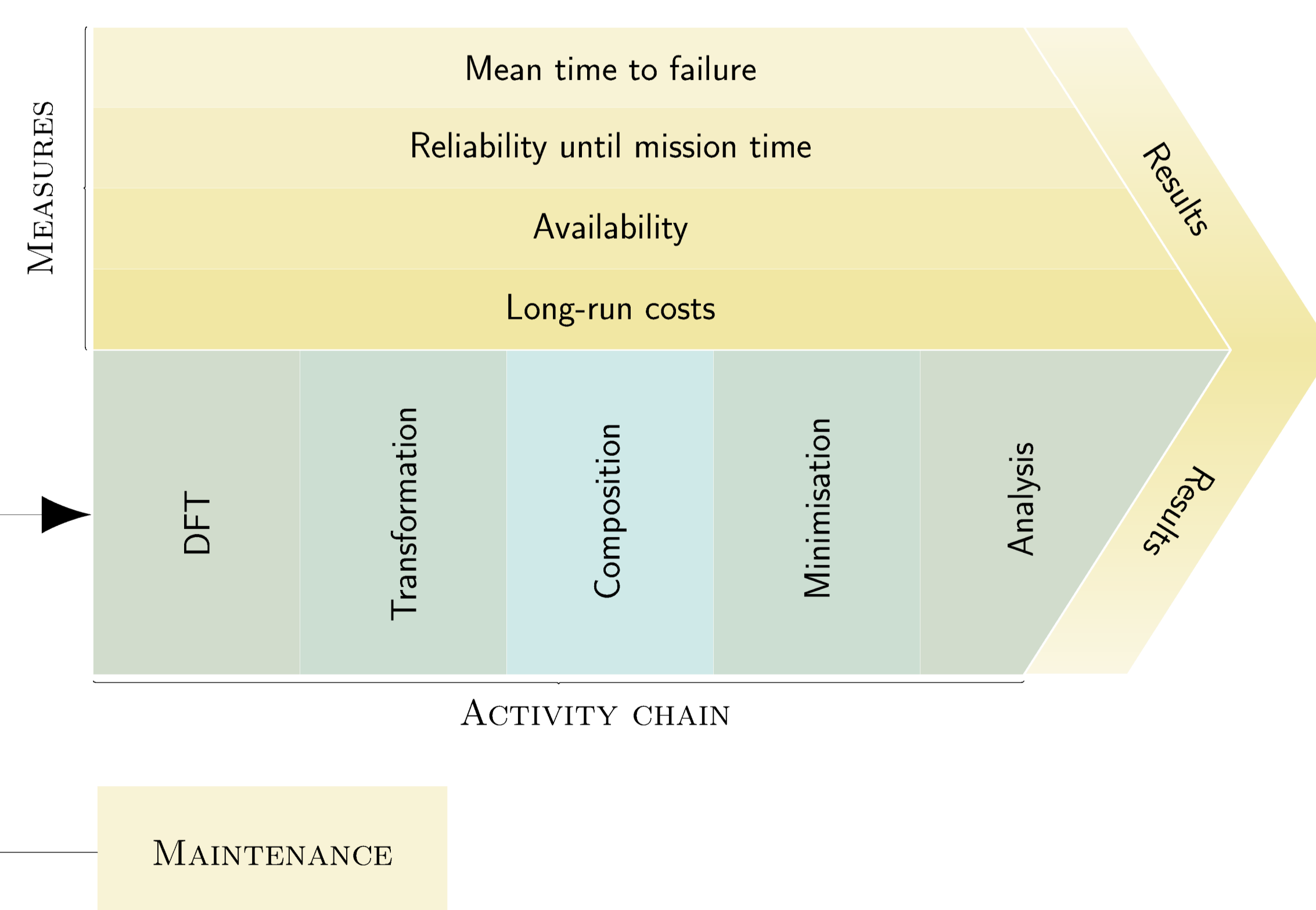
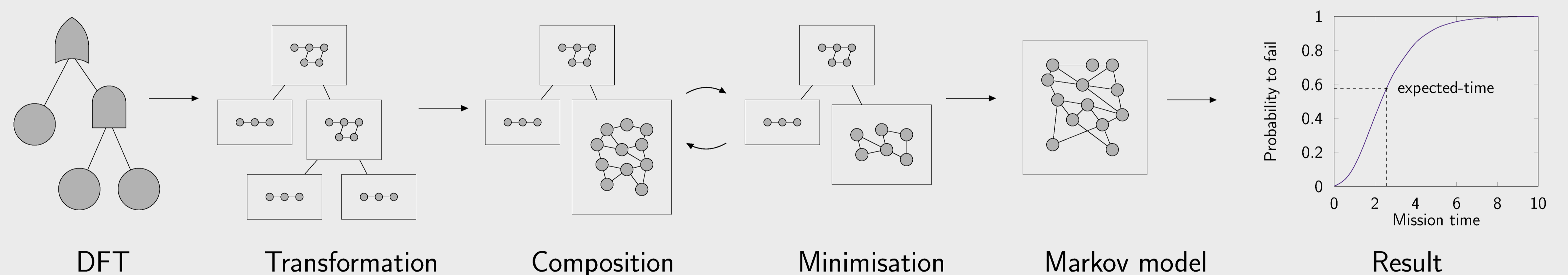
- Signals: 11.683
- Rails: 7.033km
- Netlength: 3.063km
- Switches: 7.195
- Crossings: 2.731
- Stations: 404
- Bridges: 56
- Tunnels: 17
- Trankilometers: 150 mil.

4. Dynamic Fault Trees (DFTs)



- Graphical technique.
- Widely used in industry (ProRail, NASA, ESA, KEMA, ...).
- Logic gates.
- How component failures lead to system failures.

5. Methods: compositional aggregation and stochastic model checking



6. Discussion

- How can we quantify the balance between safety and cost?
- What is the best way to link measurements to maintenance activities?
- What kind of maintenance should be given as input?
- How to validate maintenance strategies?
- Could the tool offer suggestions for design modifications as well as maintenance plans?

7. Acknowledgement

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