Heterogenous Scheduling and Rostering

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SICS/ISL/DSPS
(*) Industrilogik L4i AB

CLP/CCP systems from SICS

- SICStus Prolog
  - classical LP
  - global constraints
- Mozart–Oz
  - networked programs
  - multiparadigm, oo+cp
  - higher order
  - constraint solvers

Scheduling and rostering

- reasoning (with constraints) over time
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- scheduling – to determine time–tables for tasks
- rostering – to allocate resources to tasks

ISL/DSPS: Decision support planning/scheduling

– Focus on applications

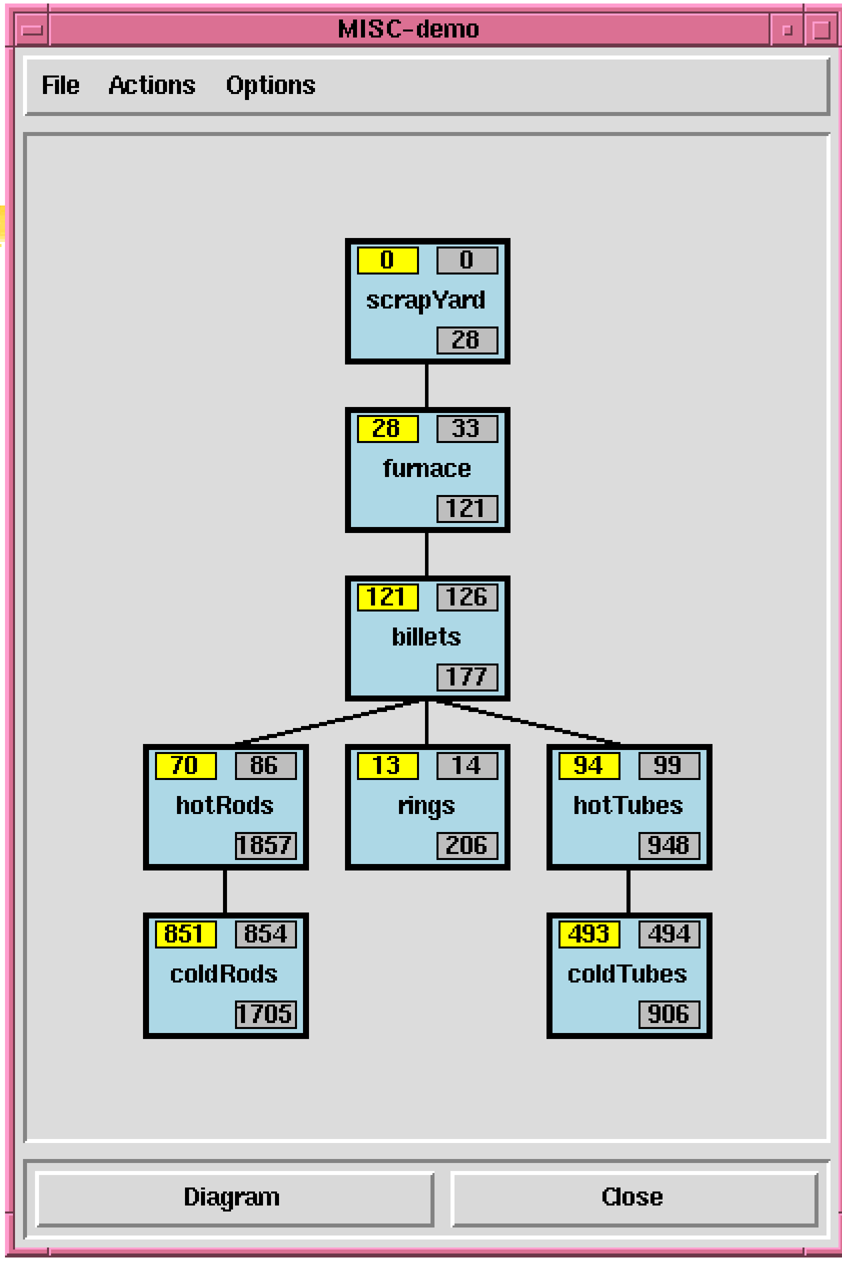
  – **scheduling and planning** in
  transportation and semi–continuous production

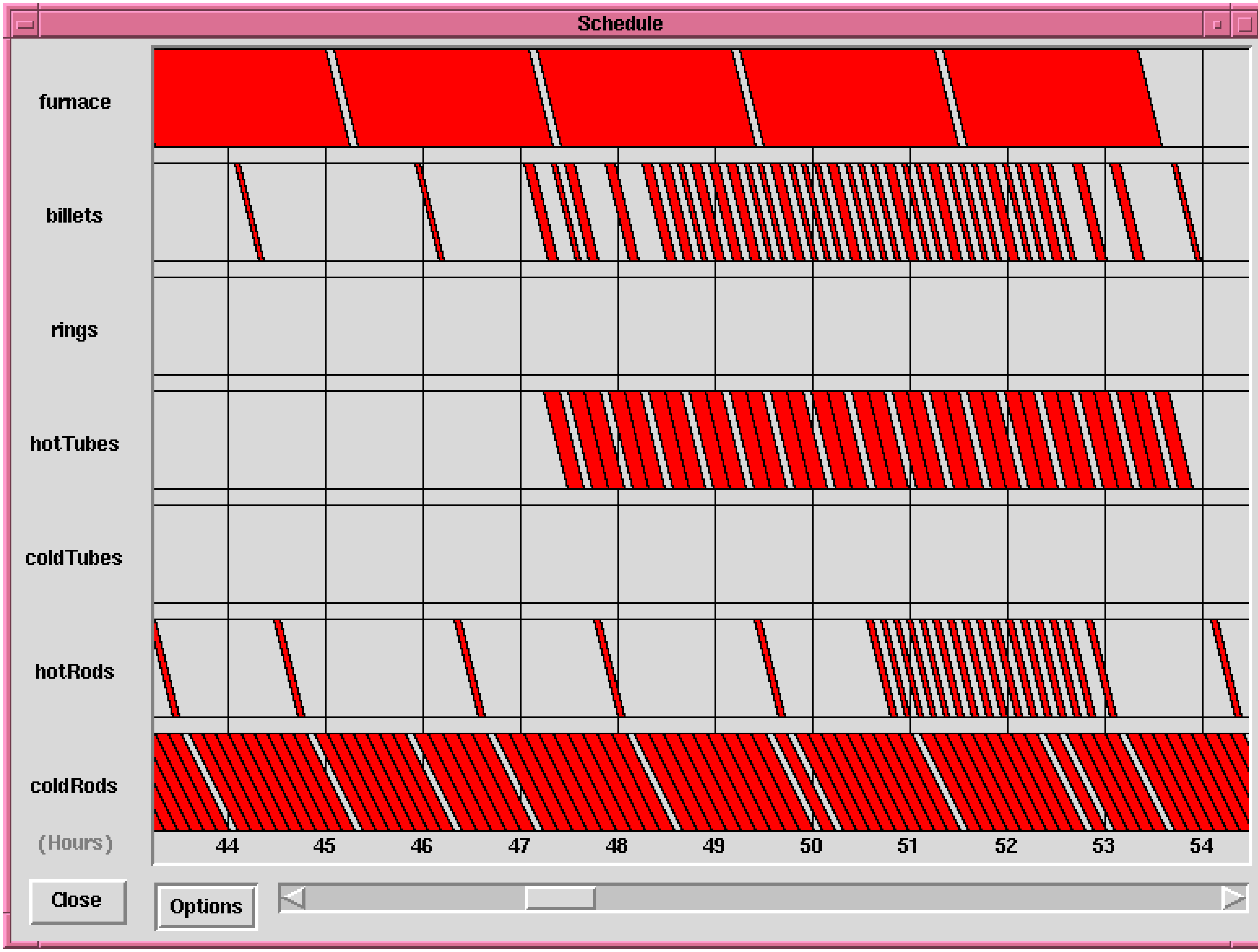
– Uses

  – hybrid constraints
    OR–models + global constraints

Steel Production Planning

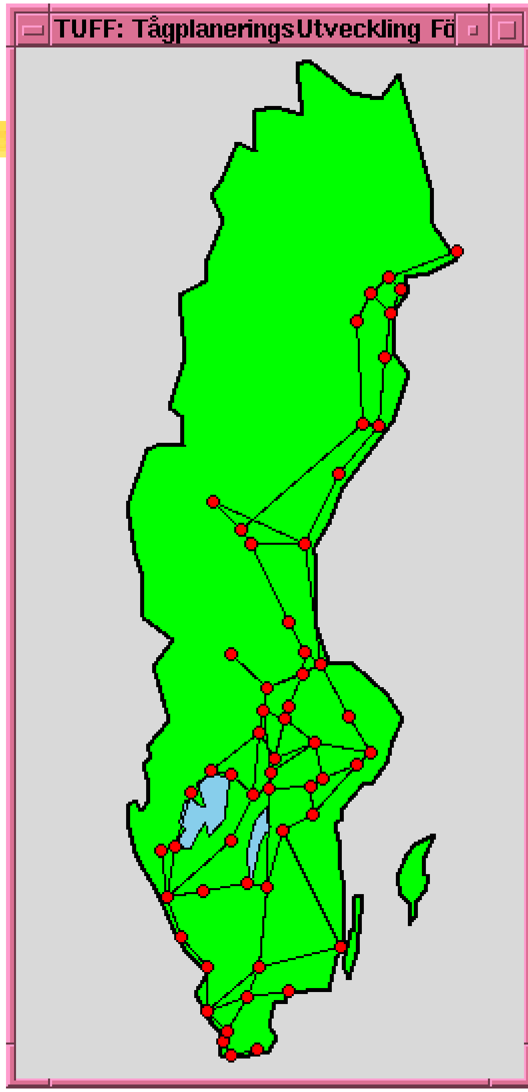
- ESPRIT trial application project TACIT
  - Prolog, constraints
- Applications in the production planning area at Ovako Steel

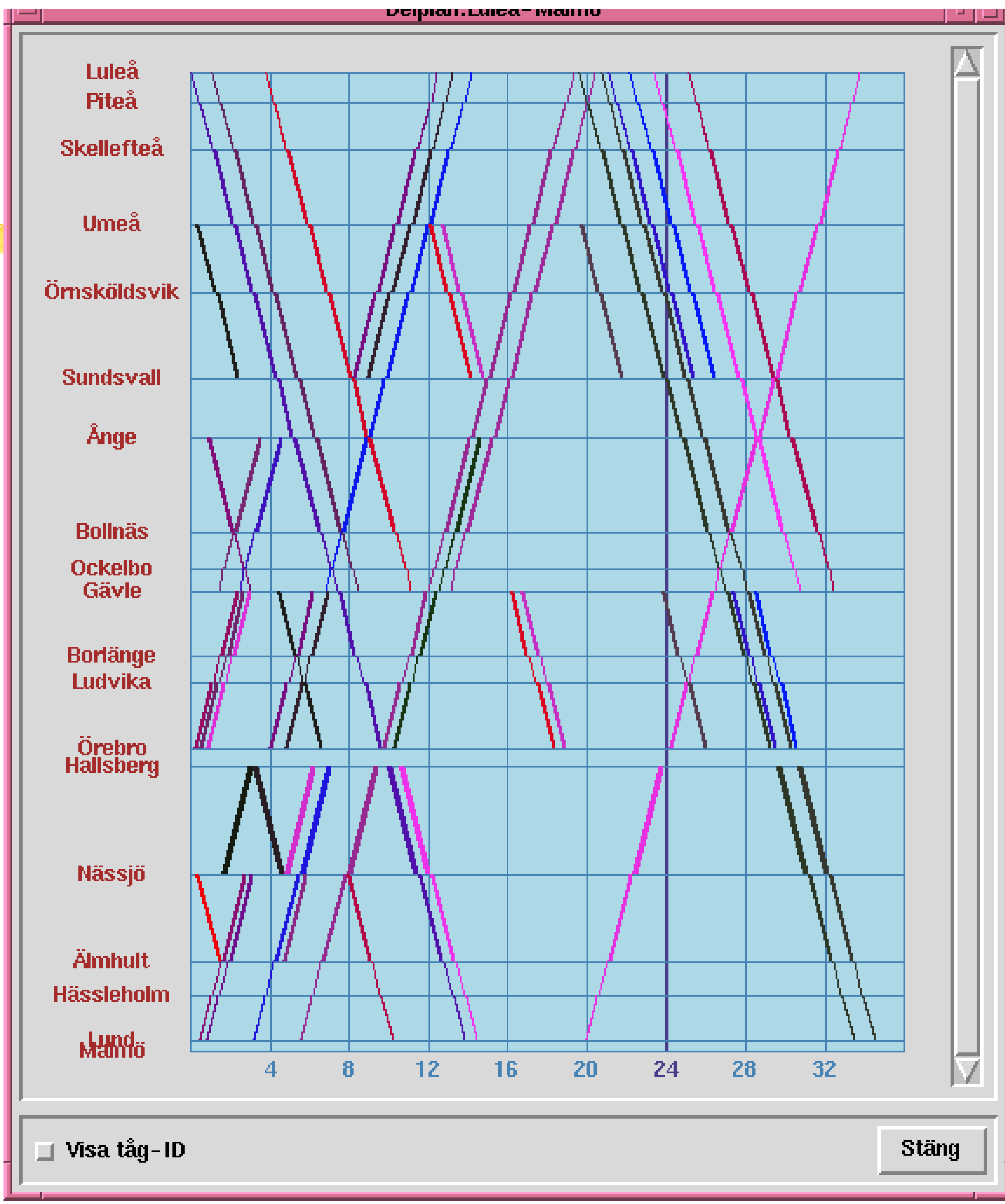

MISC-demo
File
Actions
Options
0
0
scrapYard
28
28
33
furnace
121
121
126
billets
177
70
86
hotRods
1857
13
14
rings
206
94
99
hotTubes
948
851
854
coldRods
1705
493
494
coldTubes
906
Diagram
Close


Schedule
furnace
billets
rings
hotTubes
coldTubes
hotRods
coldRods
(Hours)
44
45
46
47
48
49
50
51
52
53
54
Close
Options

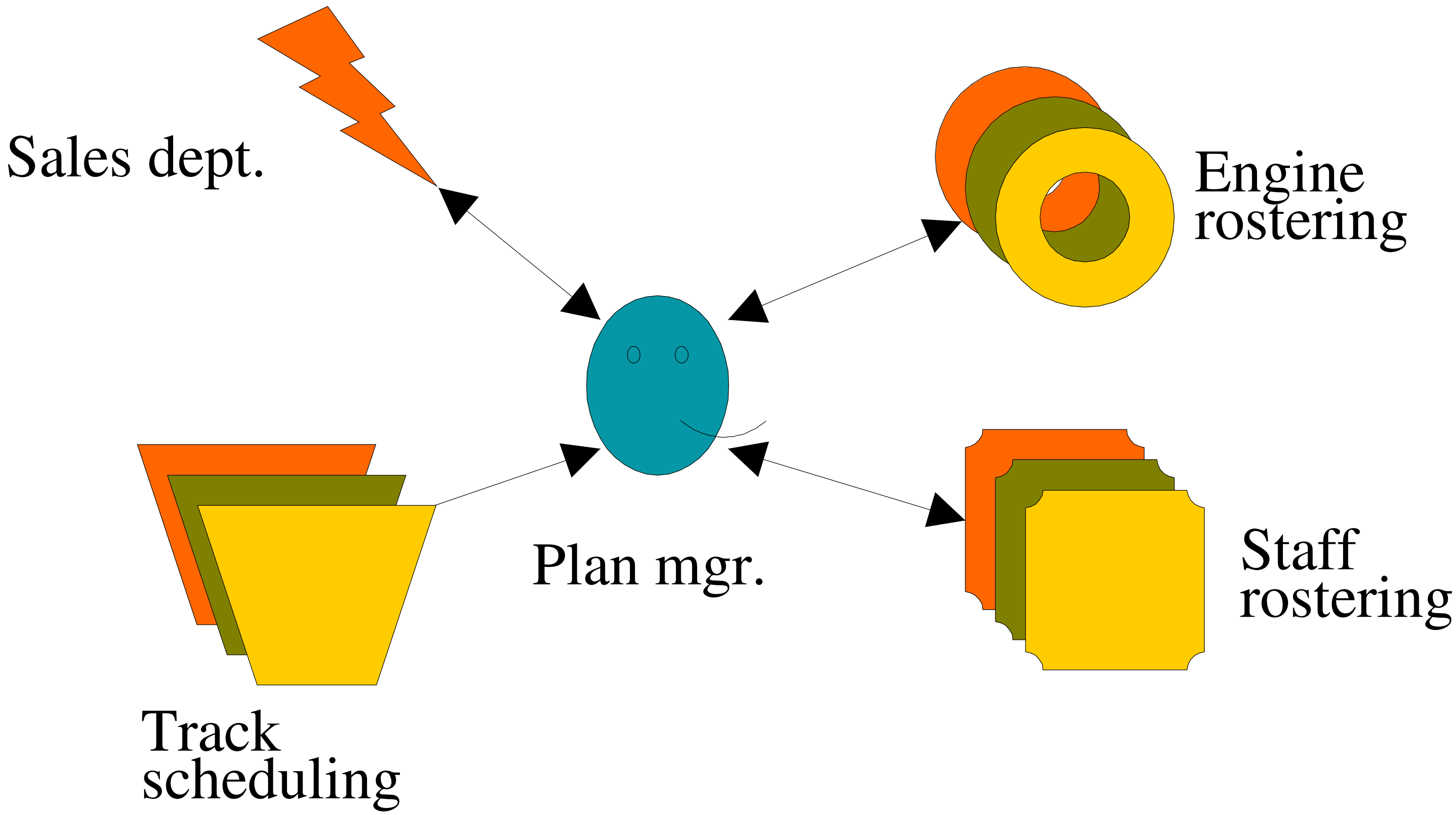
Railway Application TUFF

- Tool for planning of goods transports
  - Mozart–Oz, SICStus, CPLEX
  - FD–constraints, global constraints, OR
  - Agent model
  - Hierarchy of abstractions for efficiency


TUFF: TågplaneringsUtveckling Fö

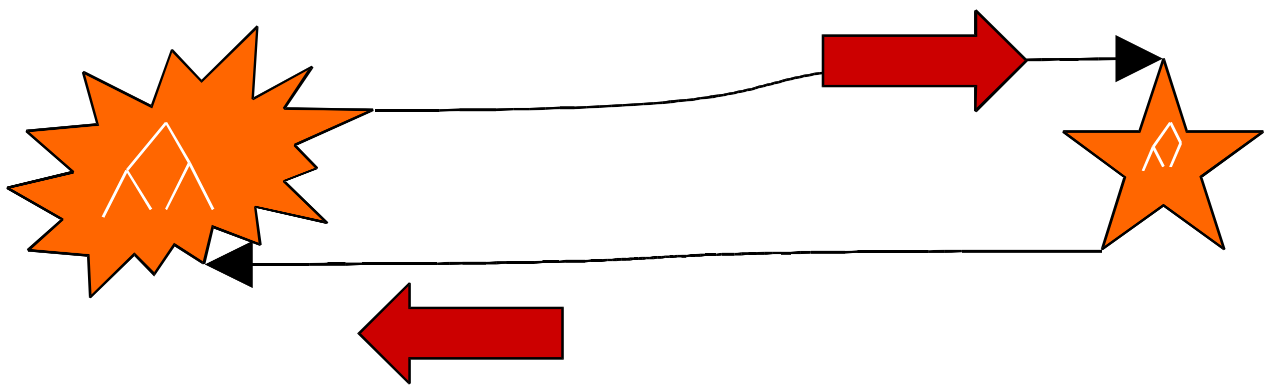

Delplan:Luleå-Malmö
Luleå
Piteå
Skellefteå
Umeå
Örnsköldsvik
Sundsvall
Ånge
Bollnäs
Ockelbo
Gävle
Borlänge
Ludvika
Örebro
Hallsberg
Nässjö
Älmhult
Hässleholm
Lund
Malmö
4
8
12
16
20
24
28
32
Visa tåg-ID
Stäng

Agent Model


Sales dept.
Engine rostering
Plan mgr.
Staff rostering
Track scheduling

Abstract Constraint Programming

- Translation with abstraction
  - Formally motivated abstract models
  - More efficient search
    - complemented with concrete search



Tested abstractions

- **fewer timepoints** in the intervals described by the finite domain variables (granularity)
- **simpler network** – only nodes with significant operations considered

Conclusion

- Planning and scheduling with constraints
- can be practical (combined with OR)
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- Agent model useful
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- Abstraction makes constraints efficient
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