

Automated scheduling for telescope arrays

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hosted by

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My interests

- Optimisation
 - Combinatorial & dynamic optimisation
 - Multiobjective
 - Heuristics
 - Search space characterisation (!)
- Applications
 - Component deployment problem
 - Aircraft landing (scheduling)
 - Laminate distribution (vehicle routing)
 - Microgrid optimisation for data centres
 - Cloud scheduling

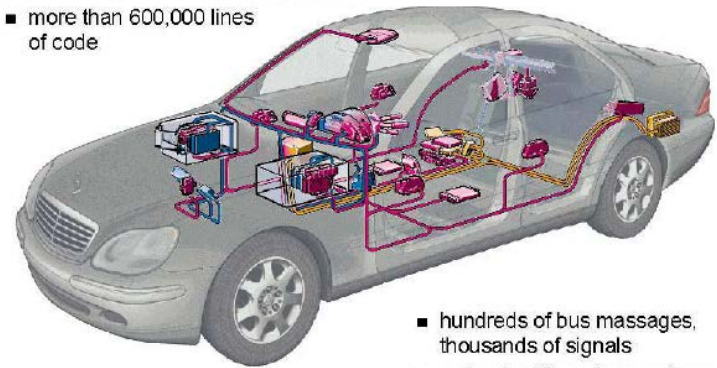
Software deployment in the automotive industry

Electronic Control Units (ECUs) run software components

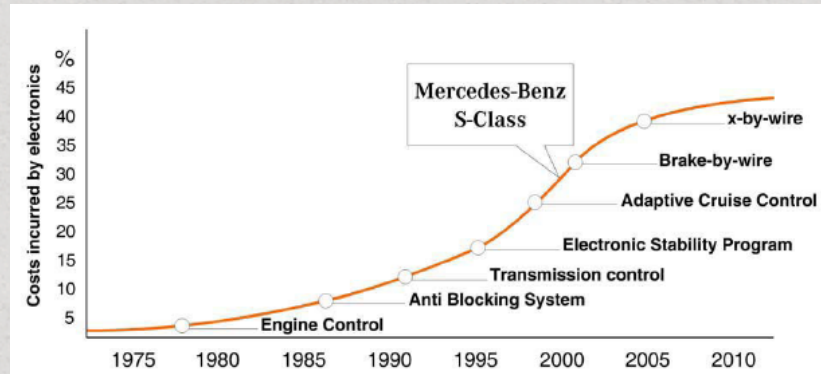
~2012

- 50 – 80 ECUs
- 50 – 250 Components
- 3 – 5 buses

- more than 50 embedded controllers
- more than 600,000 lines of code

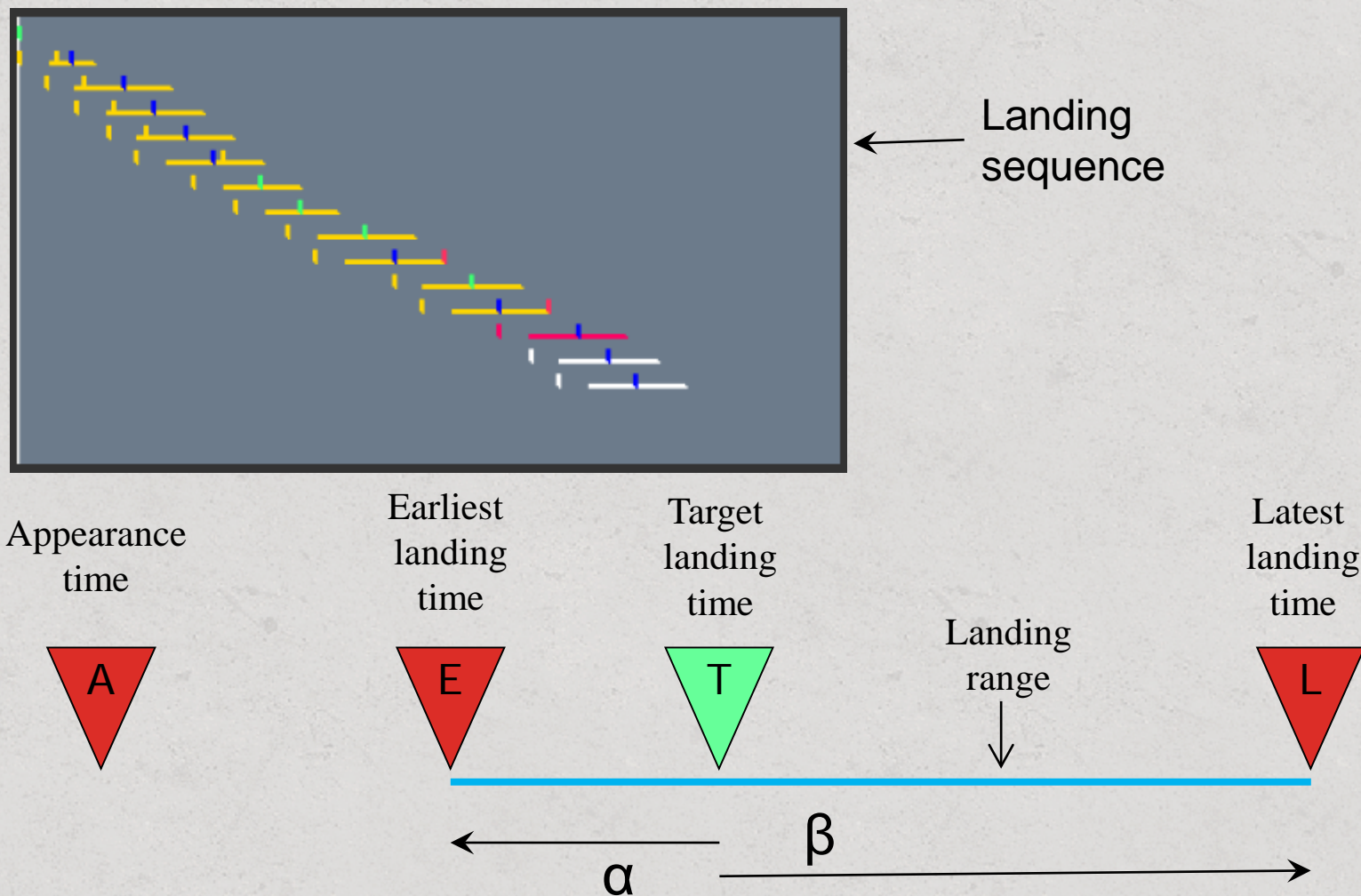


- hundreds of bus messages, thousands of signals
- network of three bus systems

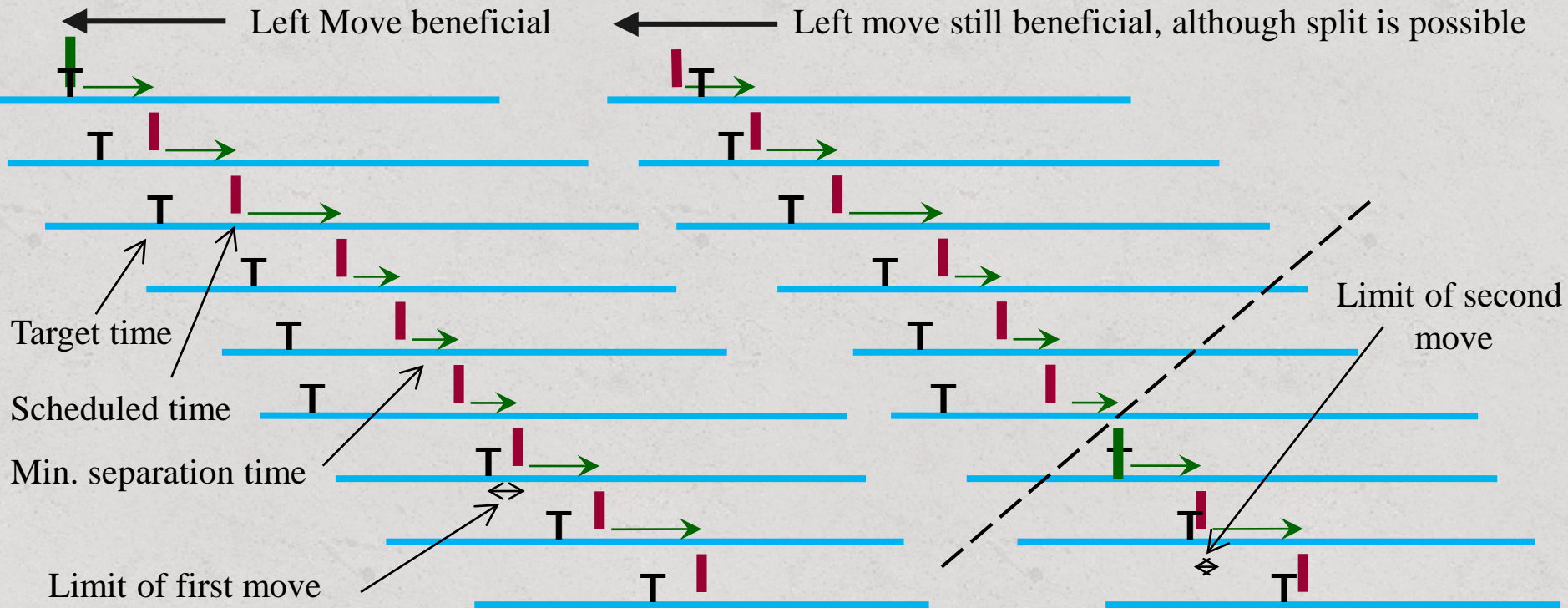


Figures from **Software Technology in an Automotive Company – Major Challenges**, ICSE 2003, Klaus Grimm

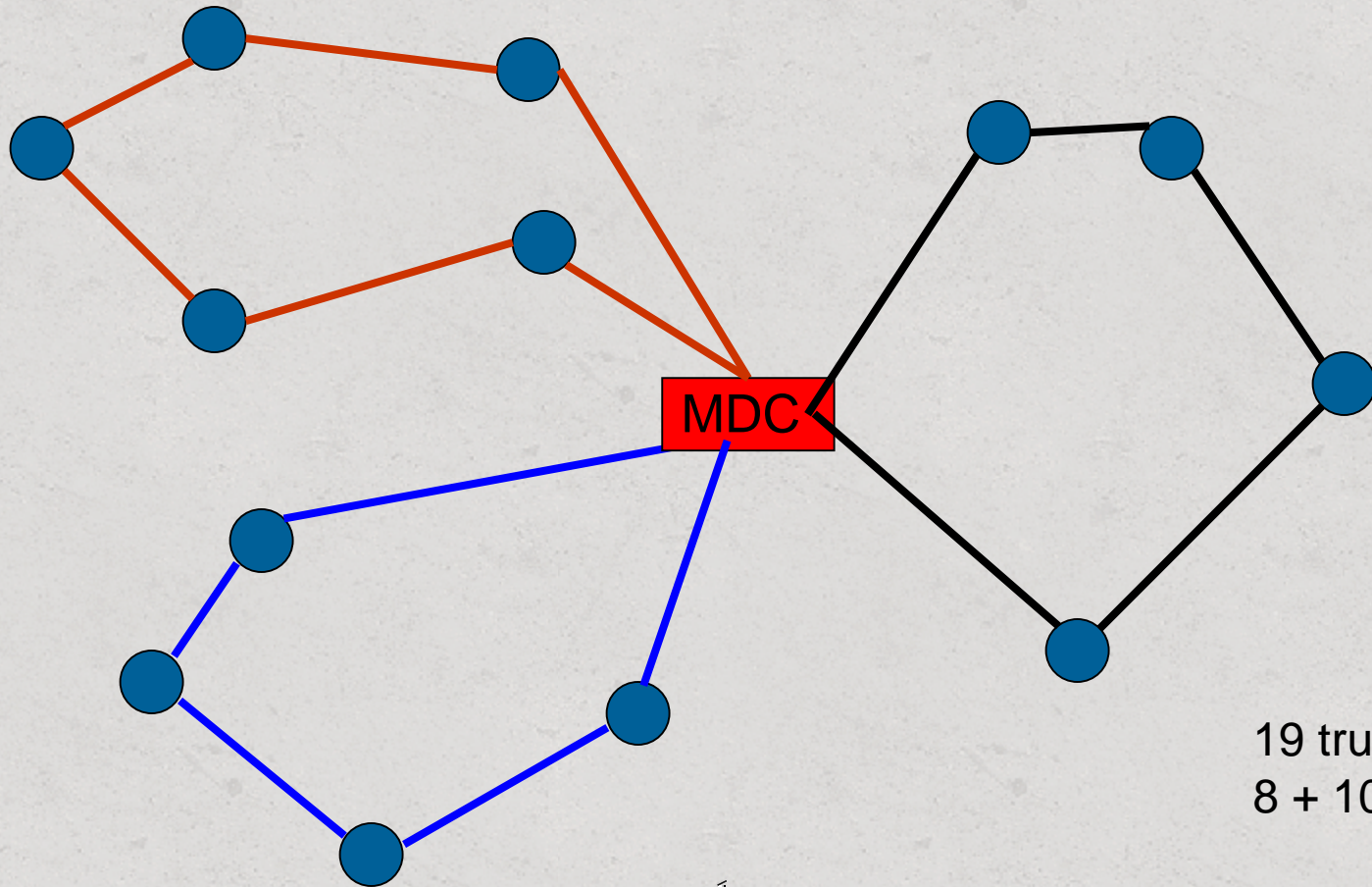
Aircraft landing



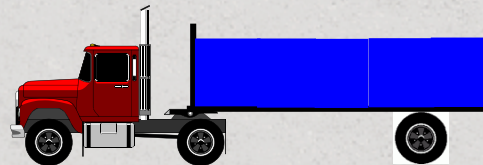
Schedule optimisation



Distributing Laminates



19 trucks
8 + 10 + 1



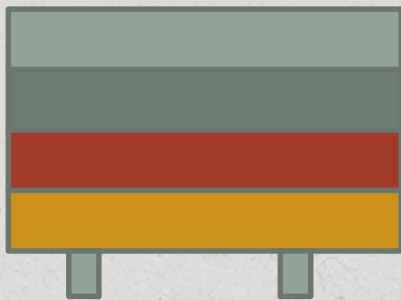
Loading Constraints



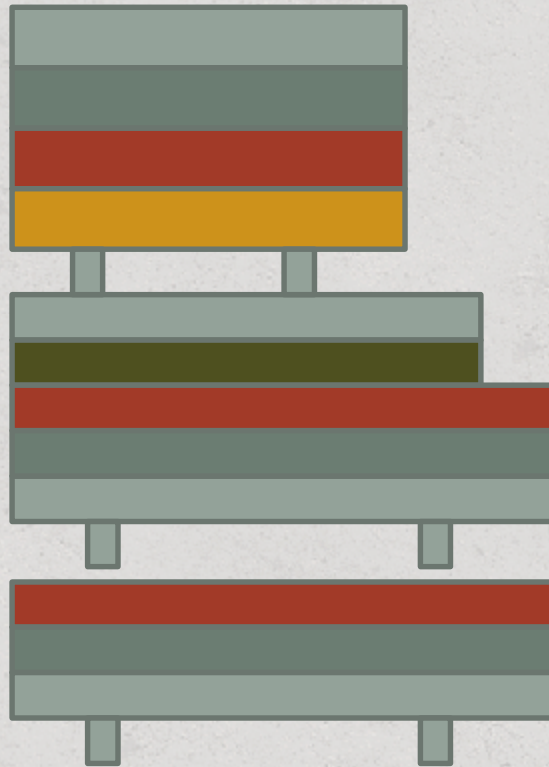
- Back-to-front balance 40-60%
 - (50%-50% also acceptable)
- Side-to-side; max 35% imbalance
- Overhangs?
 - Larger sheets on top of smaller sheets is sometimes acceptable.

Loading

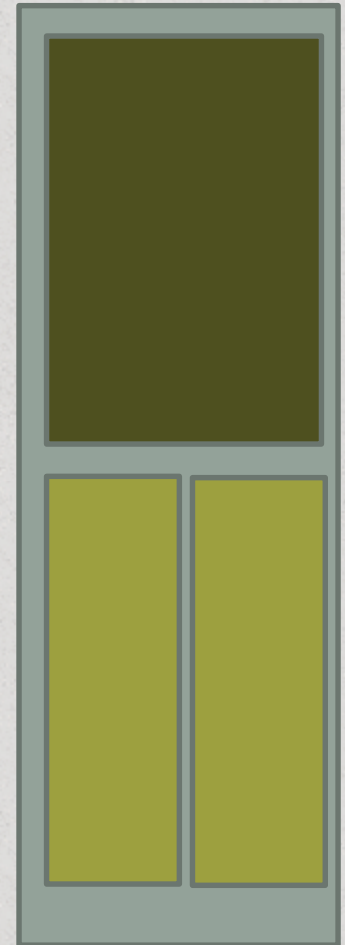
Pack



Stack



Truck platform



Telescope Scheduling

- Objective: reduce slew time
- Items: pulsar, neutral nitrogen, ToO
- Constraints
 - Hard: time windows, priorities, telescope
 - Dynamic: various interferences
 - Soft: opportunity, status of other observations

Scheduling methods for telescopes

Telescope	SPIKE	MOEA	Dispatcher	SWO	LP	DP	EA	TS	SA
HST	✓								
VLT	✓								
Subaru	✓								
JWST	✓	✓							
DSAN		✓							
RTS2		✓							
Gemini			✓						
Liverpool			✓						
STELLA			✓						
TJO			✓						
Mars Rover				✓					
SOFIA				✓					
THEMIS				✓					
GMRT					✓				
GBT						✓			
ALMA							✓	✓	✓

Common Approach

Long term

- Whole semester
- Determine set of observations

Mid-term

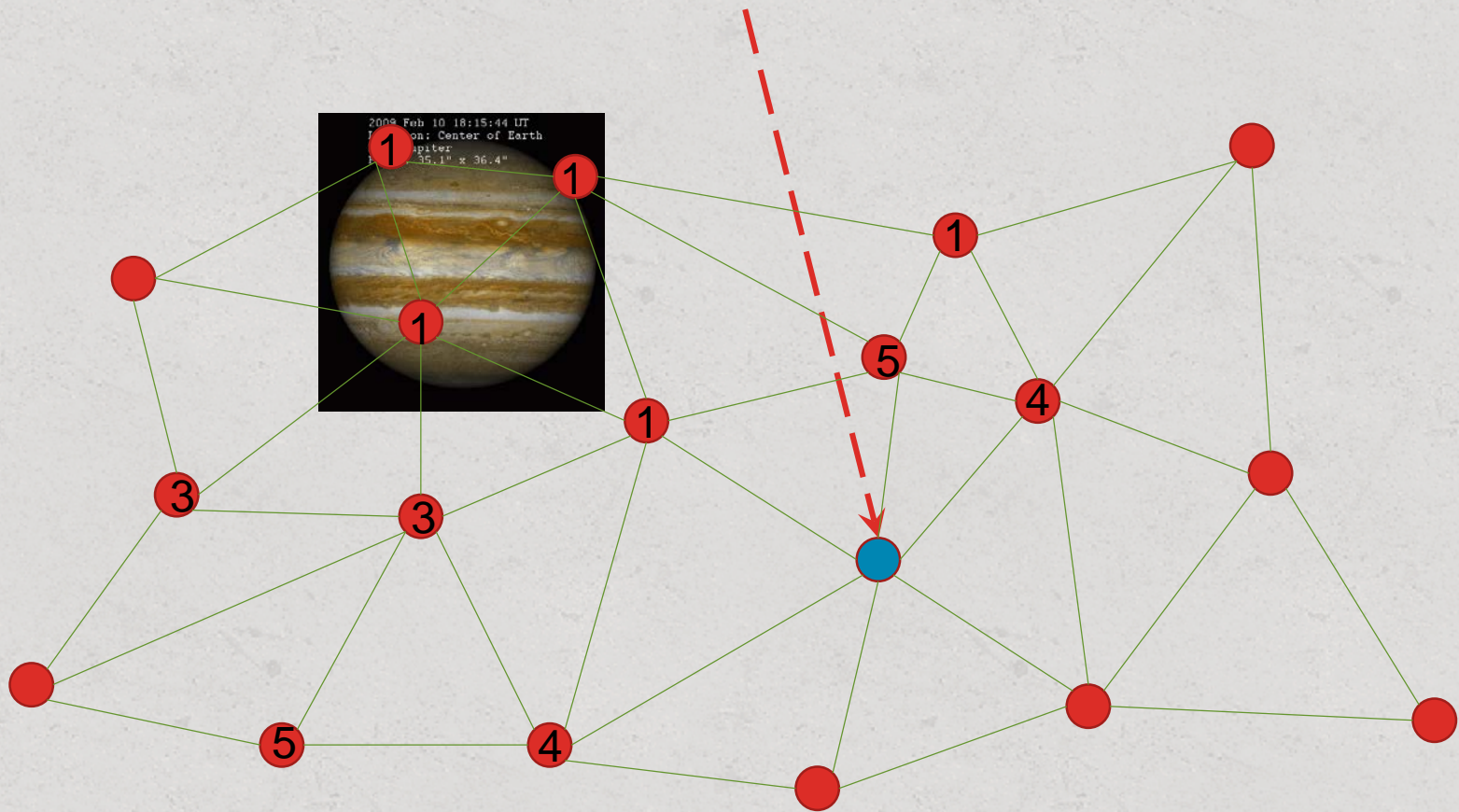
- Next night (mostly optical)
- Select prioritised, overallocate

Short-term

- Ad-hoc changes
- Swap targets when needed

Graph in Euclidean Space

You are here



Thank you.

- Comments?