Vessel Traffic Service (VTS) as contributor to traffic management: attempts to highlight everyday performance in maritime traffic management

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Outline

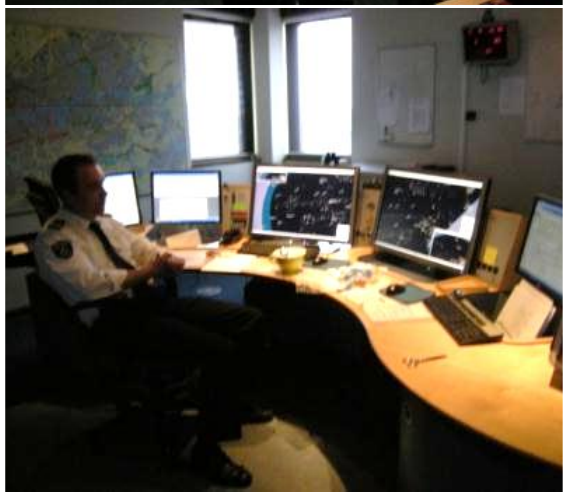
- What is Vessel Traffic Service (VTS)?
- Why study VTS?
- Aim and research questions

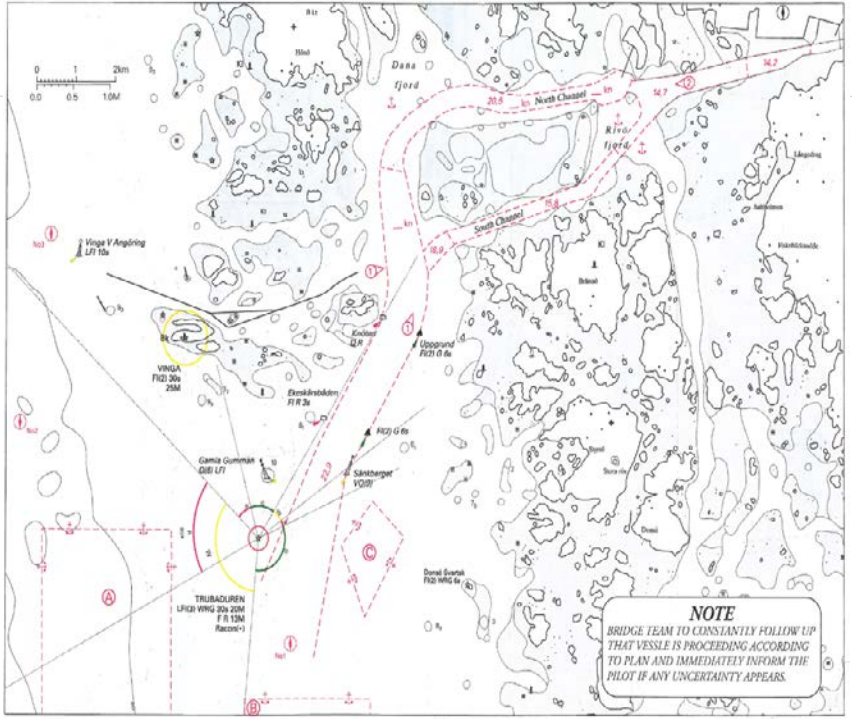
- Theoretical frame of reference
- Methodological approach
- Results so far

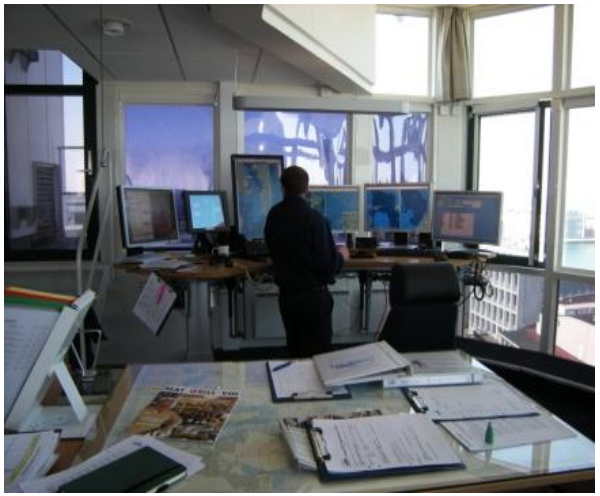
- What now?

What is Vessel Traffic Service (VTS)?

- **Shore-side service** to the maritime community implemented by the Competent Authority
  - **Promote** safety
  - **Improve** efficiency of vessel traffic
  - **Protect** the environment
- 3 services
  - Information Service (INS)
  - Traffic Organisation (TOS)
  - Navigational Advice and Assistance (NAS)
- Port/Coastal, and River VTS
- Shaped by international guidelines, but implemented locally




Dana fjord
North Channel
South Channel
Vinga V Angöring
VINGA
Uppgrund
Gamla Gumman
Sänkberget
TRUBADUREN
NOTE
BRIDGE TEAM TO CONSIANTLY FOLLOW UP THAT VESSLE IS PROCEEDING ACCORDING TO PLAN AND IMMEDIATELY INFORM THE PILOT IF ANY UNCERTAINTY APPEARS.



Why study VTS?

- System undergoing large changes
  - Increase in size and number of traffic limits the manoeuvrability of all participants
- Increased demand from authorities for more ”control” of traffic, including tracking of traffic movements
  - E-Navigation, Motorways of the Sea…
- Increased demand for efficient port operations
  - Chain planning among actors (vessel, pilot service, harbour master) with VTS as coordinator
- Research within VTS rather limited
  - Mostly either mathematical modelling or measurement of Situation Awareness

Research aim and questions

Aim

- Understand the preconditions for safe and efficient traffic movements within the VTS domain
- Contribute to the debate on how maritime traffic management can be designed

- **Research questions**
  - What are the current needs regarding traffic management within the VTS domain?
  - What are the preconditions for safe and efficient traffic movements within the VTS domain? (today and in the future)
  - How can these preconditions be used to inform the design of a traffic management system?

Theoretical frame of reference

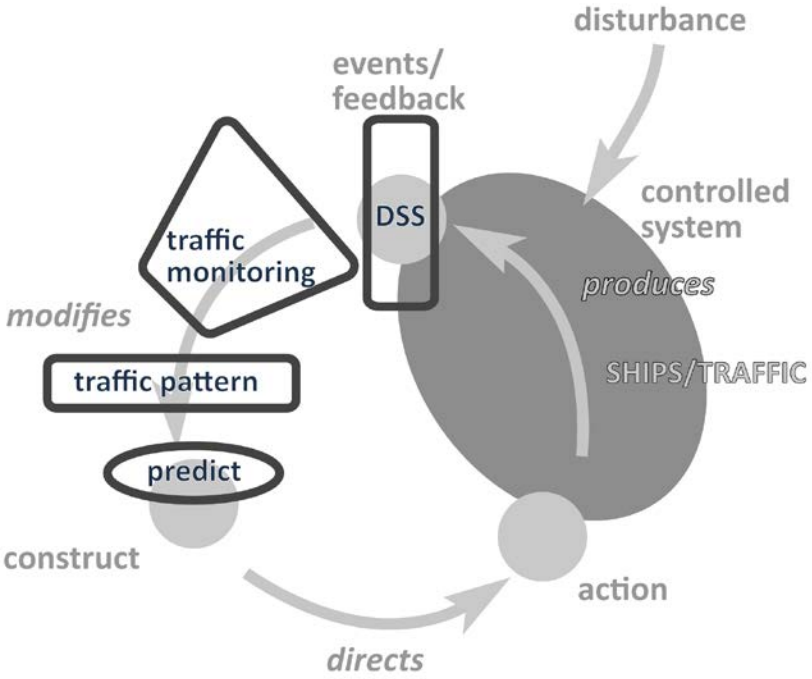
- Cognitive Systems Engineering
  - Joint Cognitive System
  - Control = ability to produce stable performance output over time
- Resilience Engineering
  - Learn, monitor, respond & anticipate

Methodological Approach

- Ethnographically inspired field studies
- Interviews & focus groups (VTS operators, supervisors & mangers, bridge officers, representatives for the maritime cluster)
- Observations
  - On board & at VTS centre (IJmuiden, Rotterdam, Flushing, Malmö, Gothenburg, Horten & Kvitsoy)
- Grounded theory for qualitative data analysis
- Functional Resonance Analysis Method (FRAM) for modelling of the VTS system

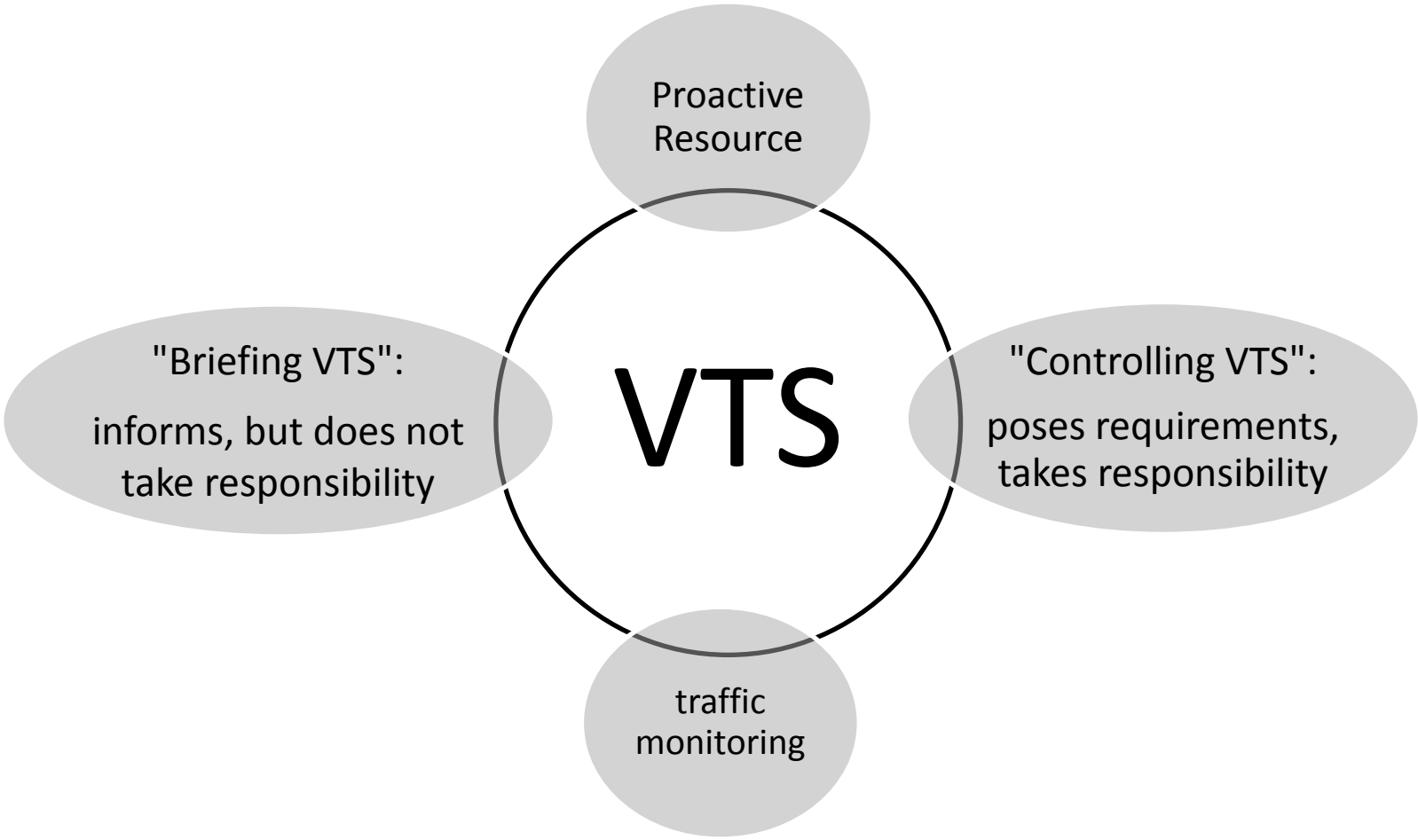
RESULTS SO FAR...

The VTS as Joint Cognitive System



- VTS is a JCS
  - Operators & decision support system
  - Goal: safety & fluency
- Traffic monitoring most essential contribution for safety
  - Vessel-side and shore-side equally important
- Situation-as-it-was
- Mostly opportunistic control, little or no strategic control

The function of the VTS from a vessel perspective



VTS – A contributor to maritime traffic management ?

- VTS JCS maintains control over environment, maritime traffic
- Safety emerges as property when system is in control (being able to produce a stable performance output)
- operating in a ”grey zone”
- VTS appreciated by mariners, but ambiguity about VTS operations
  - “Briefing” vs. “Controlling”
- Lack of strategic control needs to be addressed
  - Re-evaluation of the goals, purposes and legal mandate of the VTS
  - Re-evaluate the relation between ship and shore

WHAT NOW?

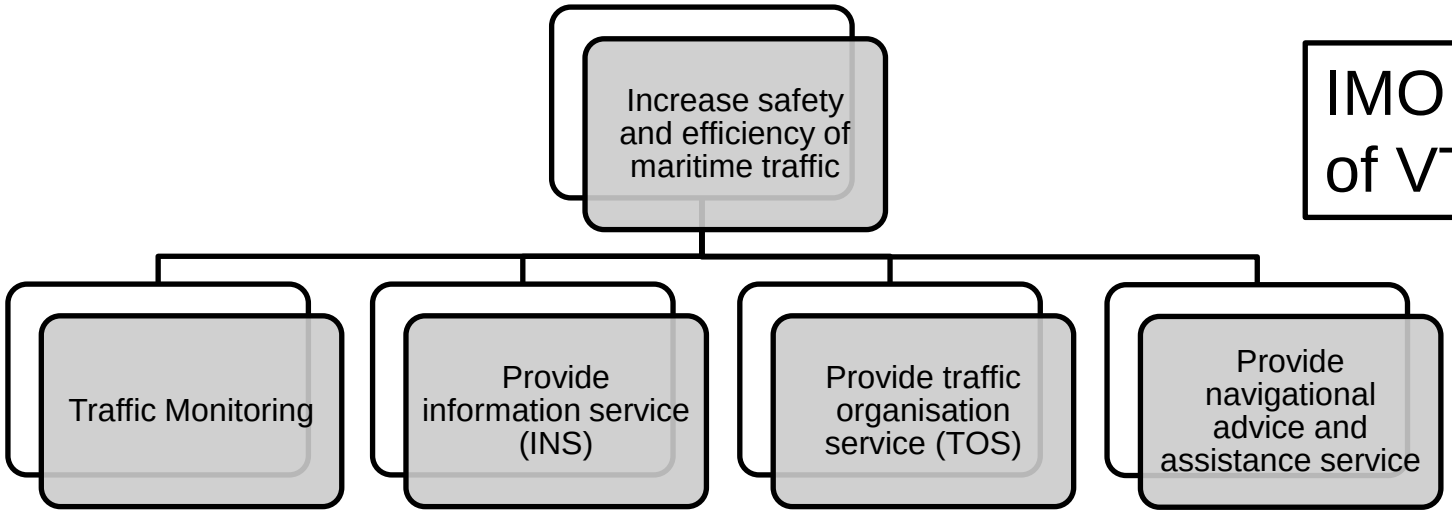
Model ”the system”, but how?

- How to model a system that does not exist, yet?
  - How can changes in the locus of control be modelled to anticipate possible consequences?
  - Turn to aviation to learn how about advantages and disadvantages about centralised control?

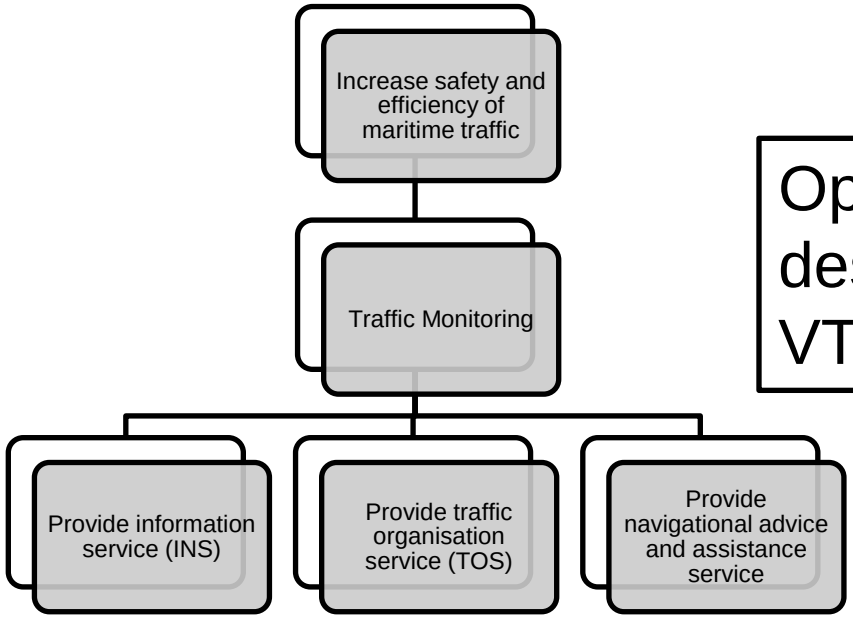
First steps...

- Use of Functional Resonance Analysis Method (FRAM)
  - ….but is it really applicable for design?

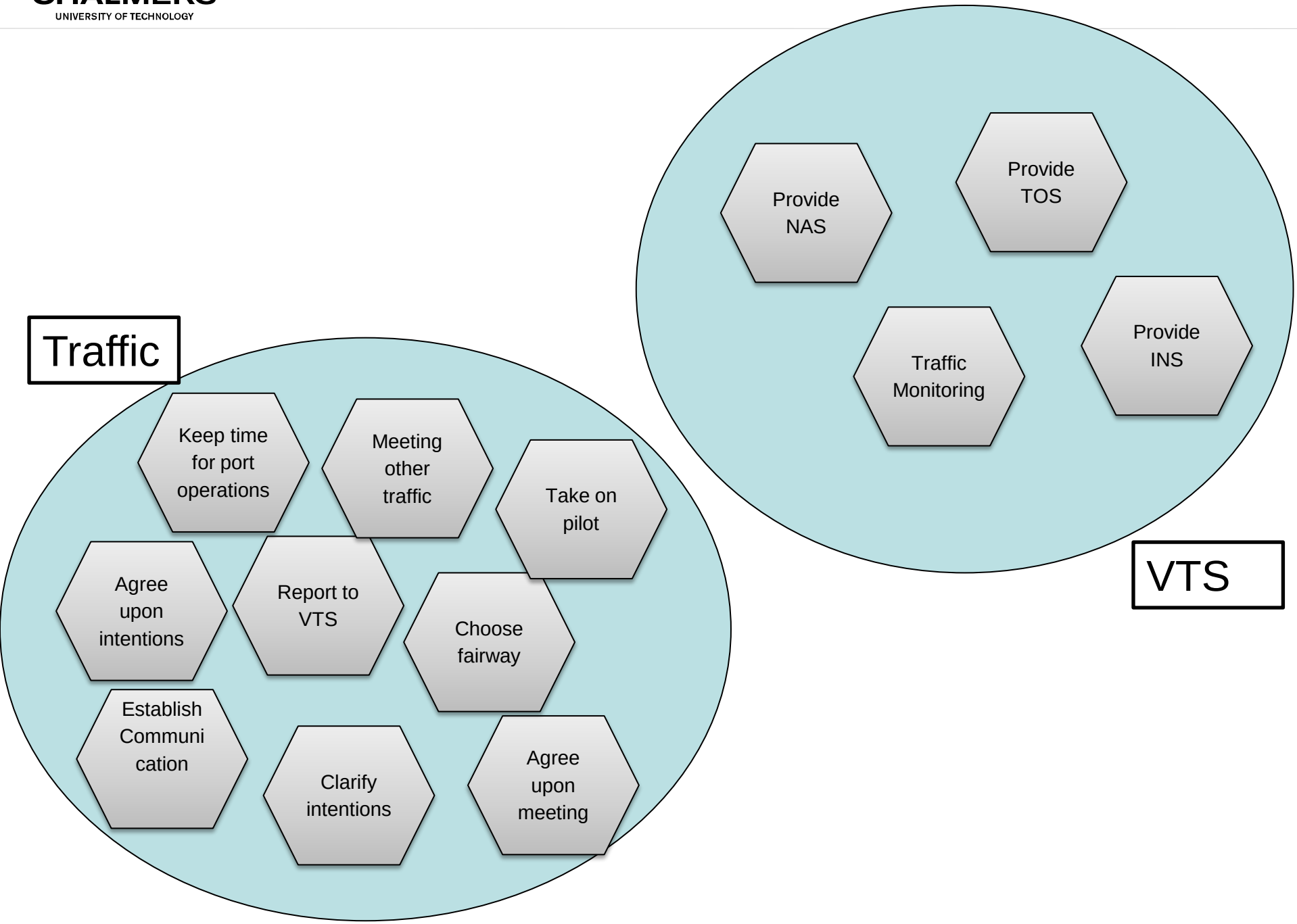
- **Aim**
  - To identify functional units & their relation in the VTS system
  - See how functions are affected in various operational conditions
  - Model traffic management centralised, distributed, and partially centralised
    - ”resilient traffic managment” ?



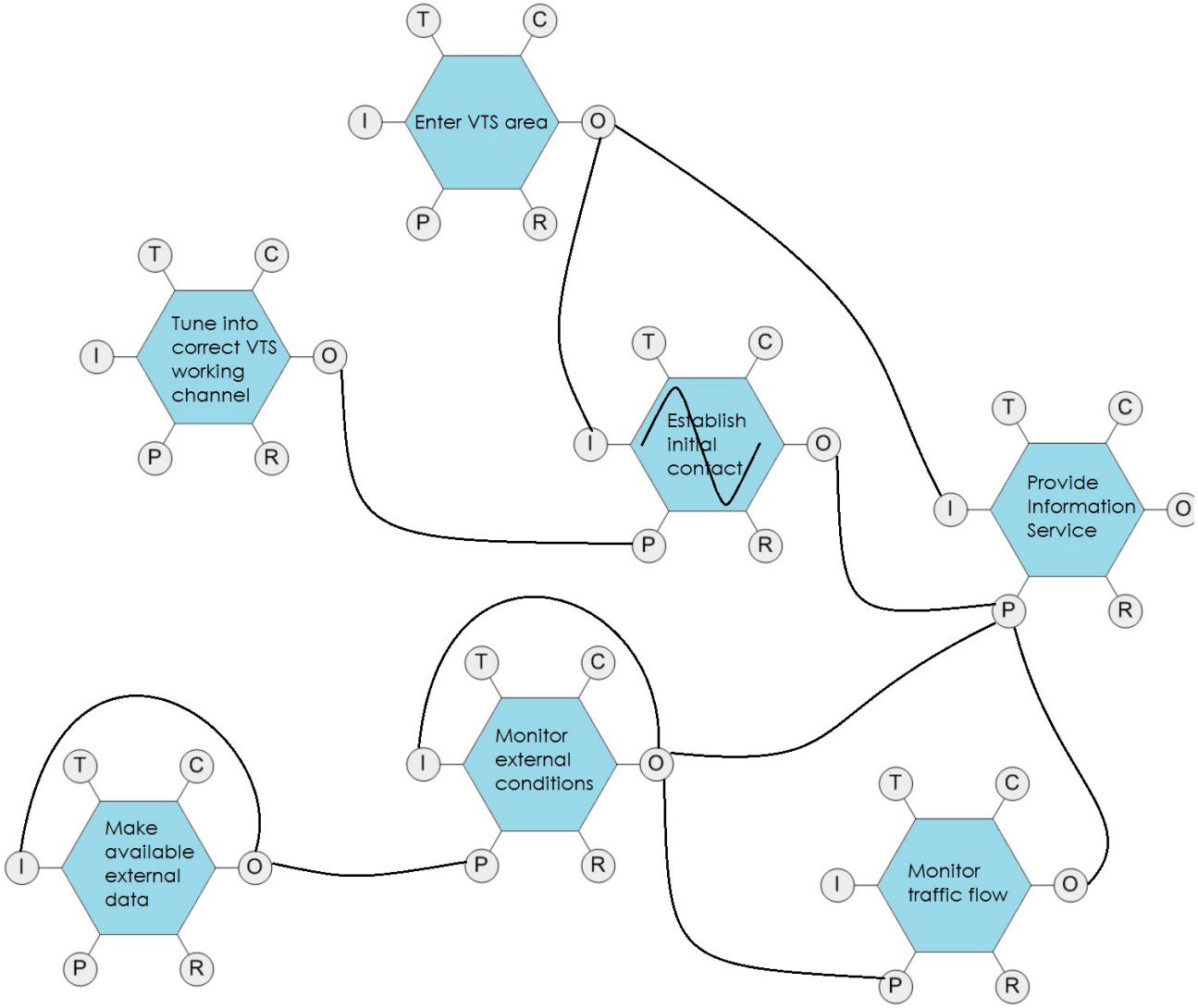
IMO definition of VTS



Operators' description of VTS


Provide NAS
Provide TOS
Traffic Monitoring
Provide INS
VTS
Traffic
Keep time for port operations
Meeting other traffic
Take on pilot
Agree upon intentions
Report to VTS
Choose fairway
Establish Communi cation
Clarify intentions
Agree upon meeting

How it is done.....



Provide information service

What's next?

- Identify functions related to the system's goals and overall functions
  - How are TOS and NAS realised?
  - What characterises everyday performance
  -
- Iterate the model

Questions

- Can FRAM help to design a resilient traffic management system?
  - Can FRAM be used to determine system's *" ability to/ degree of"* resilience?
  - How can FRAM inform the modelling of control in system design?
    - Centralised, distributed or polycentric?
  - How do I know that the outcome will aggregate in a good/bad way?
    - We do accident analyses, but that already implies functional resonance…..
  - Robustness versus resilience?
    - Managing, monitoring or eliminating performance variabilty?

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Thank you for your attention!