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# A Demonstrator for Command and Control Technology Experimentation

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# Outline of the presentation

- Motivation
- Demonstrator
  - Infrastructure
  - Synthetic environment
- Sample experiments
  - Measurement of middleware performance over HF radio and satcom links
  - A recognized maritime picture (RMP) production demonstrator
- Ongoing/planned activities
- Conclusion

# Motivation

- Mixed approach to C2IS development: Both top-down and bottom-up.
- Top-down approach:
  - founded on the use of architectures
  - helps separate different perspectives and issues of concern
- Bottom-up approach (experimentation/demonstrations):
  - reduce risk
  - supports an iterative development process
  - shows ideas and concepts to people in managerial and operational positions

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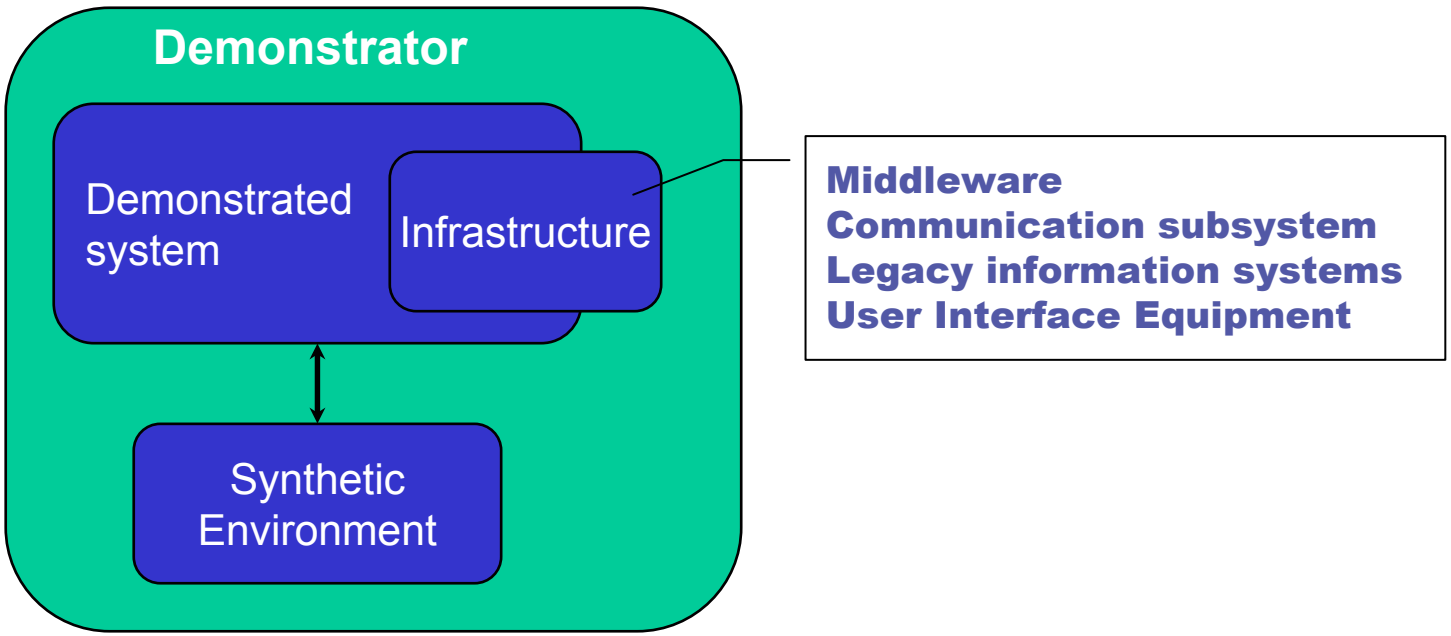
# Technology demonstrator



# Demonstrator infrastructure
## Middleware

- Ties the demonstrator together
- Enables studying the use of middleware in C2ISs
- Middleware technologies in the demonstrator:
  - Common Object Request Broker Architecture (CORBA)
  - Jini
  - Control of Agent Based Systems (CoABS) Grid
  - JXTA

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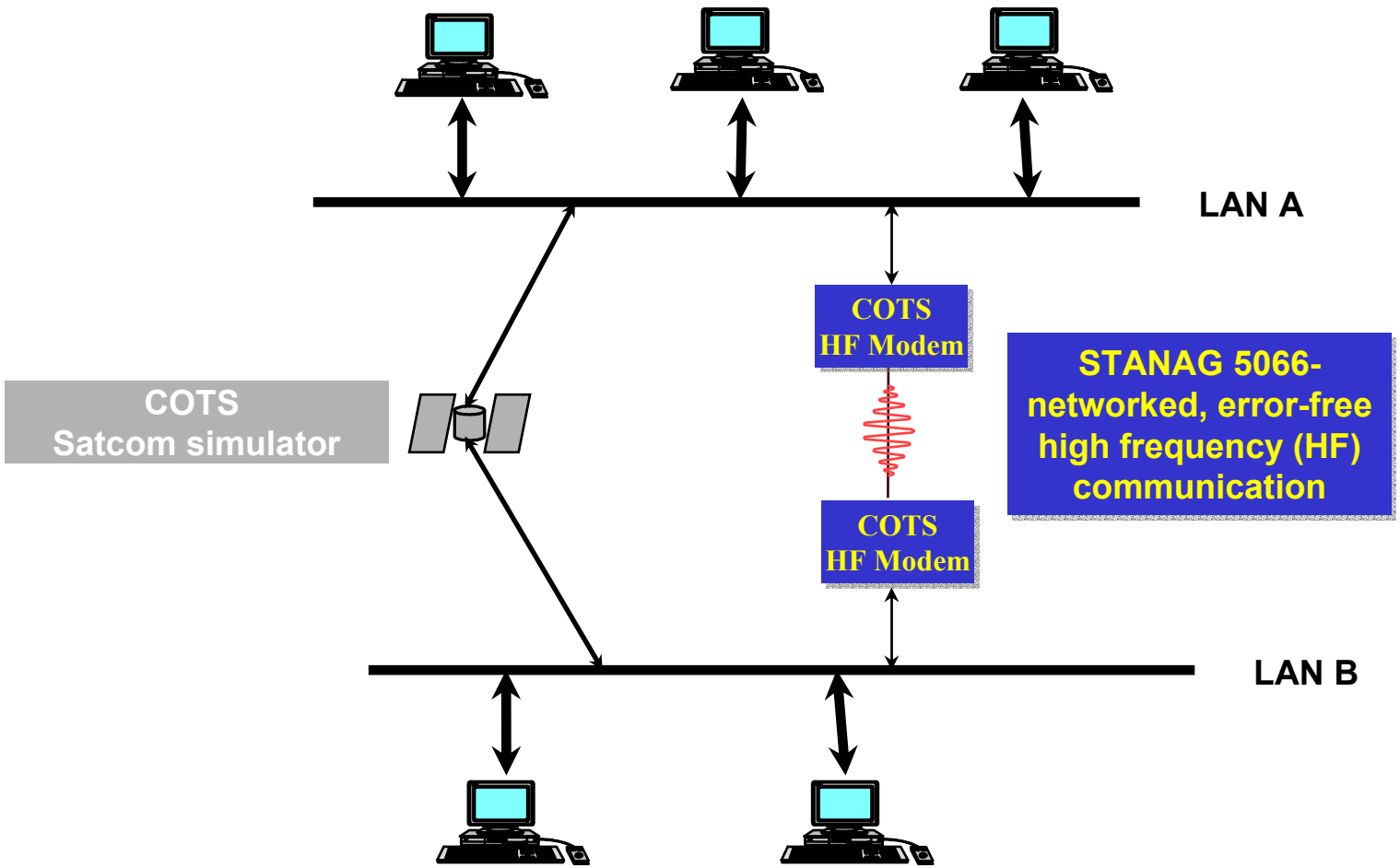
# Demonstrator Infrastructure

## Communication Subsystem



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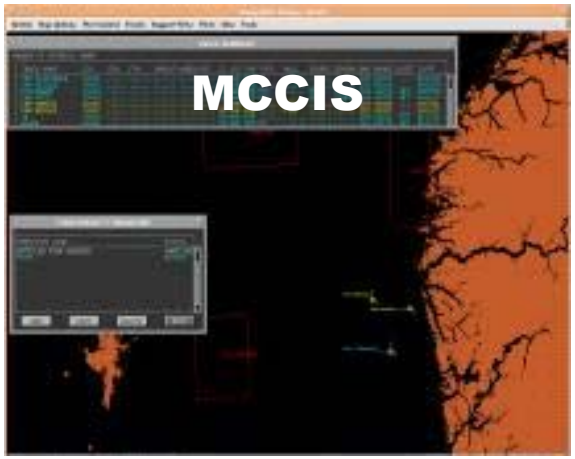
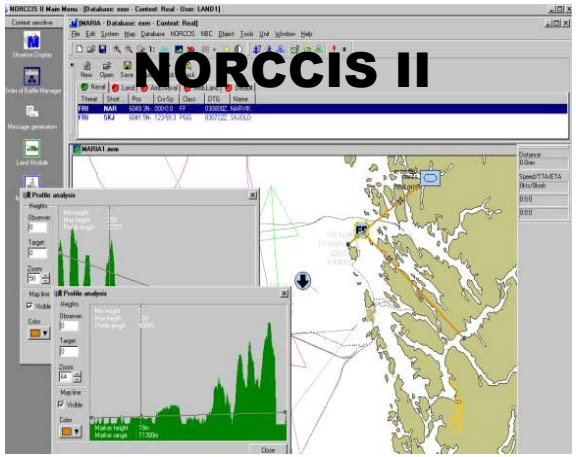
# Demonstrator Infrastructure

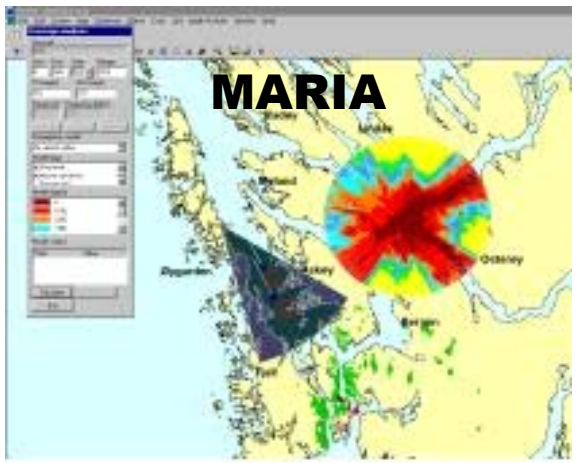
## Legacy Information Systems



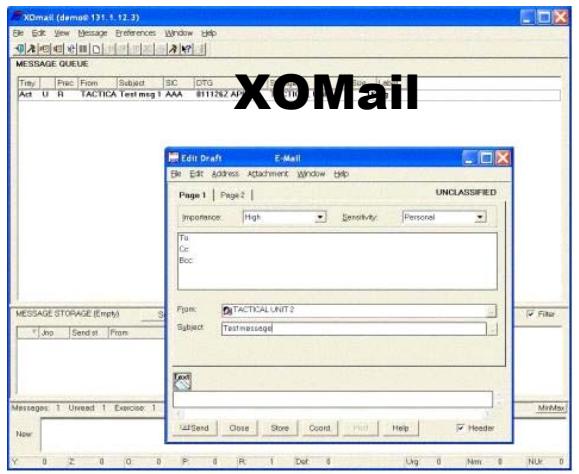

- MCCIS
  - NATO C2IS for RMP production




- NORCCIS II
  - Norwegian joint C2IS




- MARIA
  - map application




- XOMail
  - Tactical military message handling system

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# Demonstrator Infrastructure

## User Interface Equipment

- Visualization of situation pictures
- Studying shared situation awareness both within a command node and between geographically distributed command nodes

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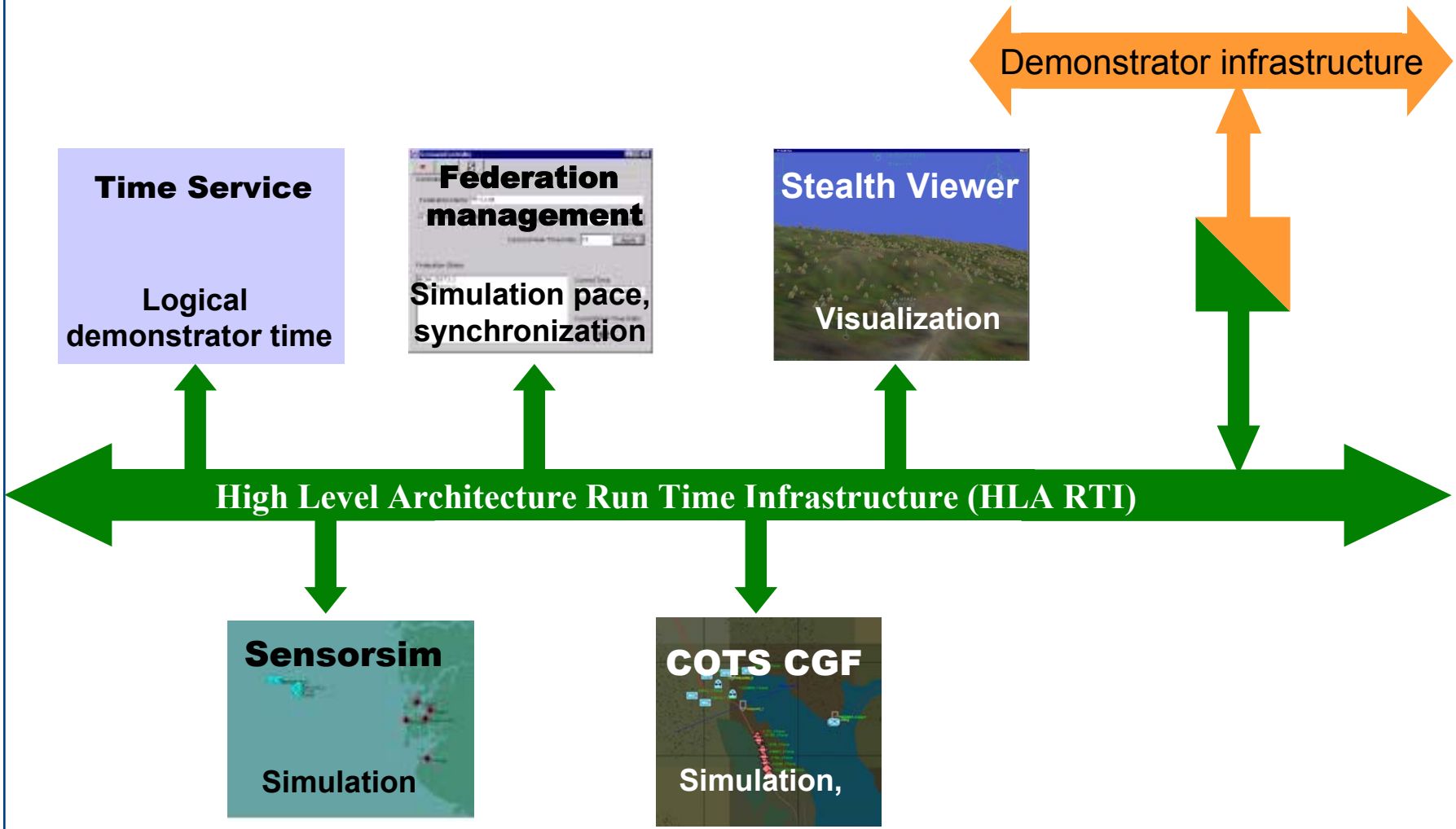
# Synthetic Environment



# Sample Experiments

- Examples of the kinds of experiments supported by the demonstrator
  - Measurement of middleware performance over HF radio and satcom links
  - A recognized maritime picture (RMP) production demonstrator

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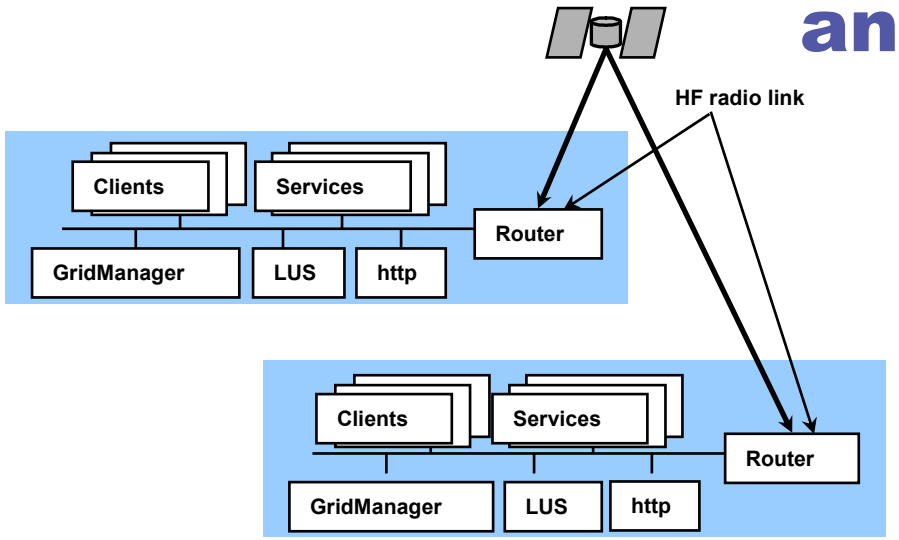
# Measurement of Middleware Performance over HF Radio and Satcom Links




## Motivation

- Testing the performance of the CoABS Grid over HF radio and satcom links
- Geographically distributed picture compilation

## Results

- Jini (CoABS Grid) well suited for systems with bandwidth down to 600 bit/s
- Necessary to have a tailor made protocol for such low bandwidths

Rose, Hansen, Leere (2002): 'Measurement of Middleware Performance over HF Radio and Satcom Links', Proceedings of the 7th International Command and Control Research and Technology Symposium

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# RMP Production Demonstrator

- **Main objectives:**
  - **advantages and flexibilities of modern software architectures (service based/component based systems)**
  - **integration of functionality from legacy systems**
  - **potential of data fusion techniques**
  - **situation picture presentation and user interface equipment to enhance the understanding of the situation**

Veum, Hafnor, Mevassvik (2001): 'Information systems leveraging legacy systems and developments in infrastructure technologies', Proceedings of the 6th Command and control research and technology symposium

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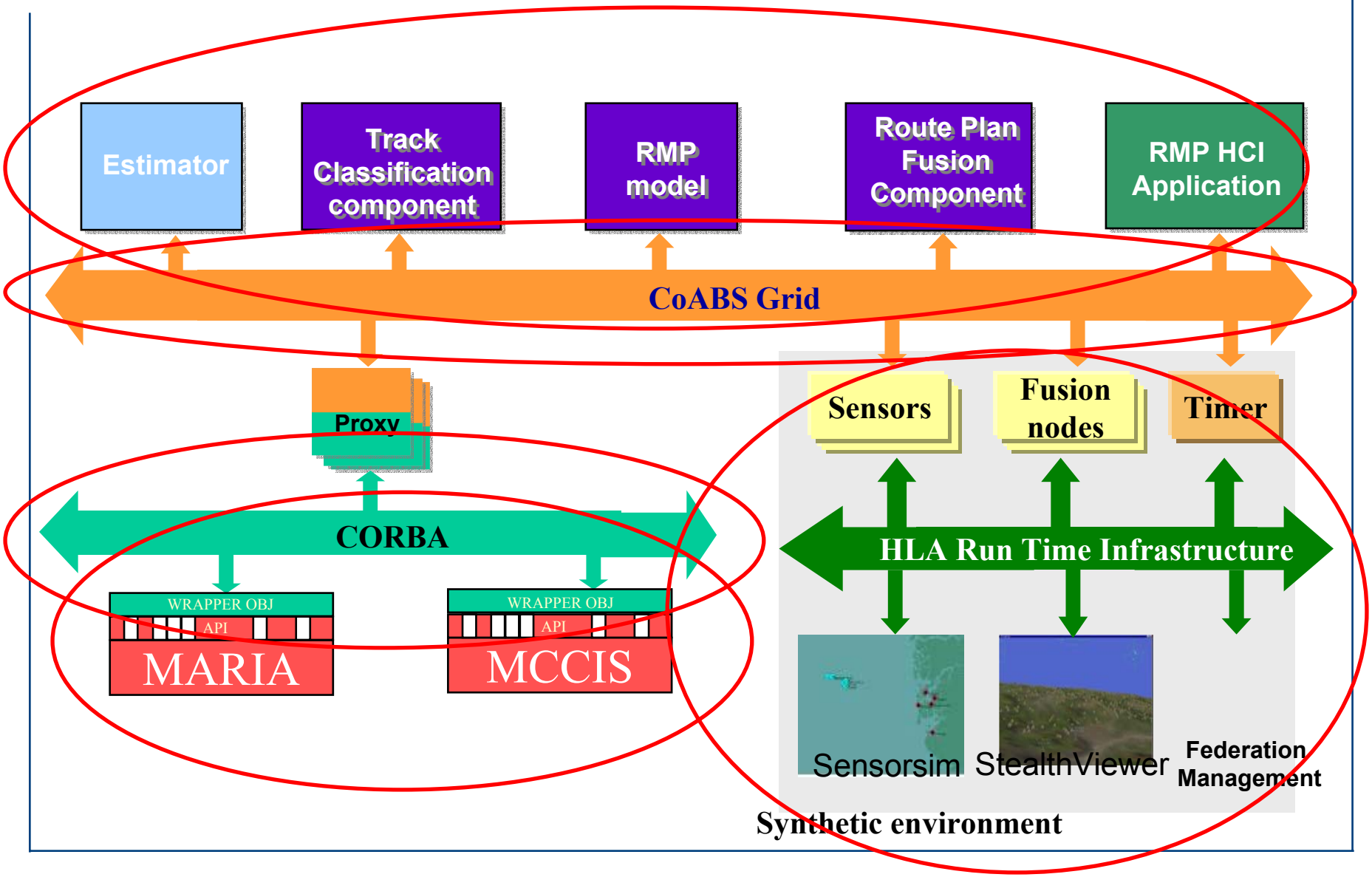
# RMP Production Demonstrator



# Ongoing/Planned Work

- Develop the RMP production demonstrator in a joint and network-based direction
- Picture compilation strategies for network-based defence
- Use of peer-to-peer technology (JXTA) in geographically distributed picture compilation
- Distributed simulation

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# Distributed Network-based Defence Battle Lab

- A distributed battle lab to support experimentation for transformation towards a network-based defence is under development in Norway
- Enabling experimentation with coalition partners through the Combined Federated Battle Lab Net (CFBLNet).
- The demonstrator will constitute an important part of an FFI node in the battle lab.

# Conclusion

- A flexible demonstrator for experimentation with C2IS technologies established at FFI
- Norwegian distributed network-based defence battle lab is being established
- With this demonstrator we are prepared to investigate technologies for future network-centric C2ISs

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# Questions?