Real Time Systems – SS2016

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Basic Model for Real-Time-Systems

Example: Flight-Radar

Intro

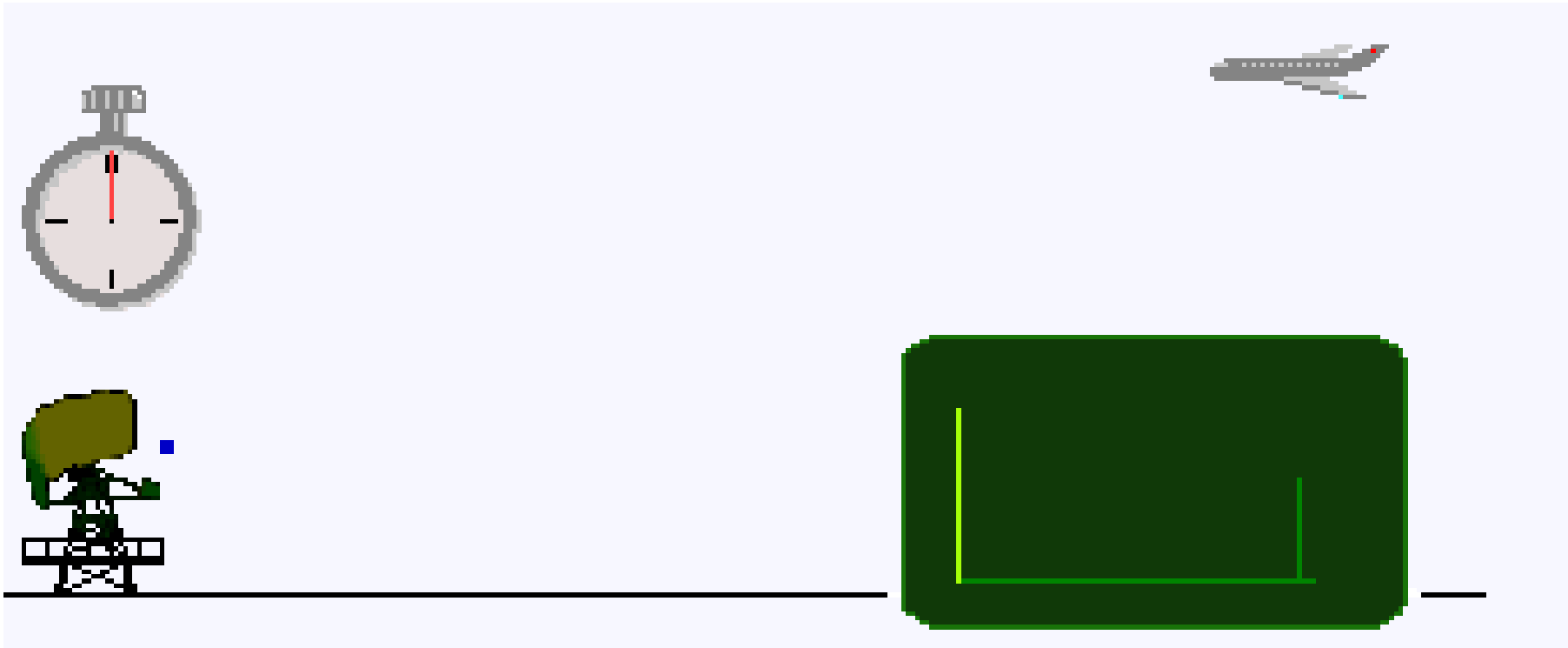
NASA-Video: Satellite view of 24hr Air Traffic:

Fundstelle: https://www.youtube.com/watch?v=4gkJTJIPWqo

EUROCONTROL-Video: One day traffic over Europe

Fundstelle: https://www.youtube.com/watch?v=BI4jrAq6idI

Primärradar



Quelle: http://commons.wikimedia.org/wiki/File:Radaroperation.gif

Tasks of the radar system

- Send periodical pulses to radar transmitter
- Switch between transmit and recieve mode
- Detect points in time of recieving reflected radar pulses
- Detect the absolute angle of the antenna
- Delete „old“ measurement points
- Set „new“ measurement points
- Generate of „space picture“ or other presentation views

relevant aspects:

- time-controlled Realtime
- eventcontrolled Echtzeit
- Sequenciality (Reihenfolge) und concurrency (Nebenläufigkeit)

→ Requirements for RTS

Requirements for RT-Systems (1/2)

- For all systems: functional requirements have to be met!

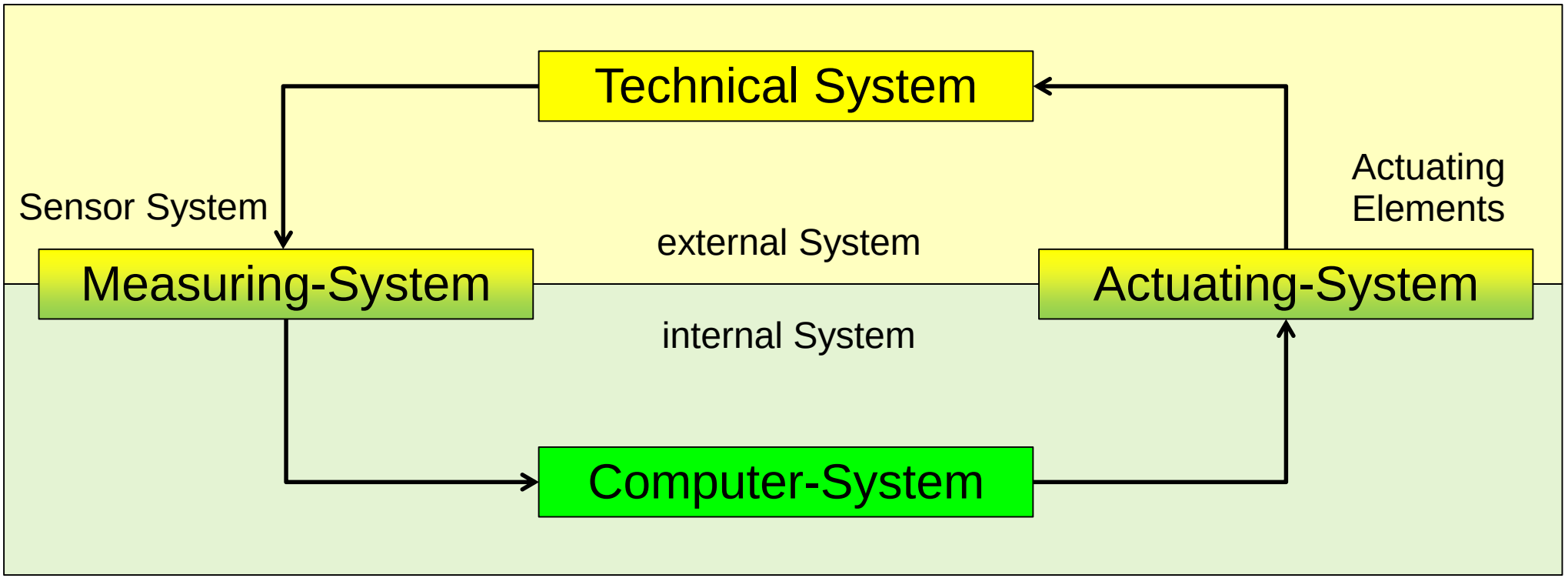
  RTS:
  determinability (it comes to an well defined end!)
  predictability (when it comes to the end!)
  (Determinierbarkeit/Vorhersagbarkeit/Vorhersehbarkeit)

- Reliability (Zuverlässigkeit)

- Defined response time
  minimize the time for systems tasks (e.g. context switch/Kontextwechsel)

Basic model for a Real-Time-System

Real-Time-System



t(S) : earliest start time
t(C) : latest completion time
Δt_{proc} : max. processing time

$$t(S) + \Delta t_{proc} \leq t(C)$$

nach Dieter Zöbel, Echtzeitsysteme Grundlagen der Planung, Springer-Verlag Berlin Heidelberg, 2008, ISBN 978-3-540-76395-6

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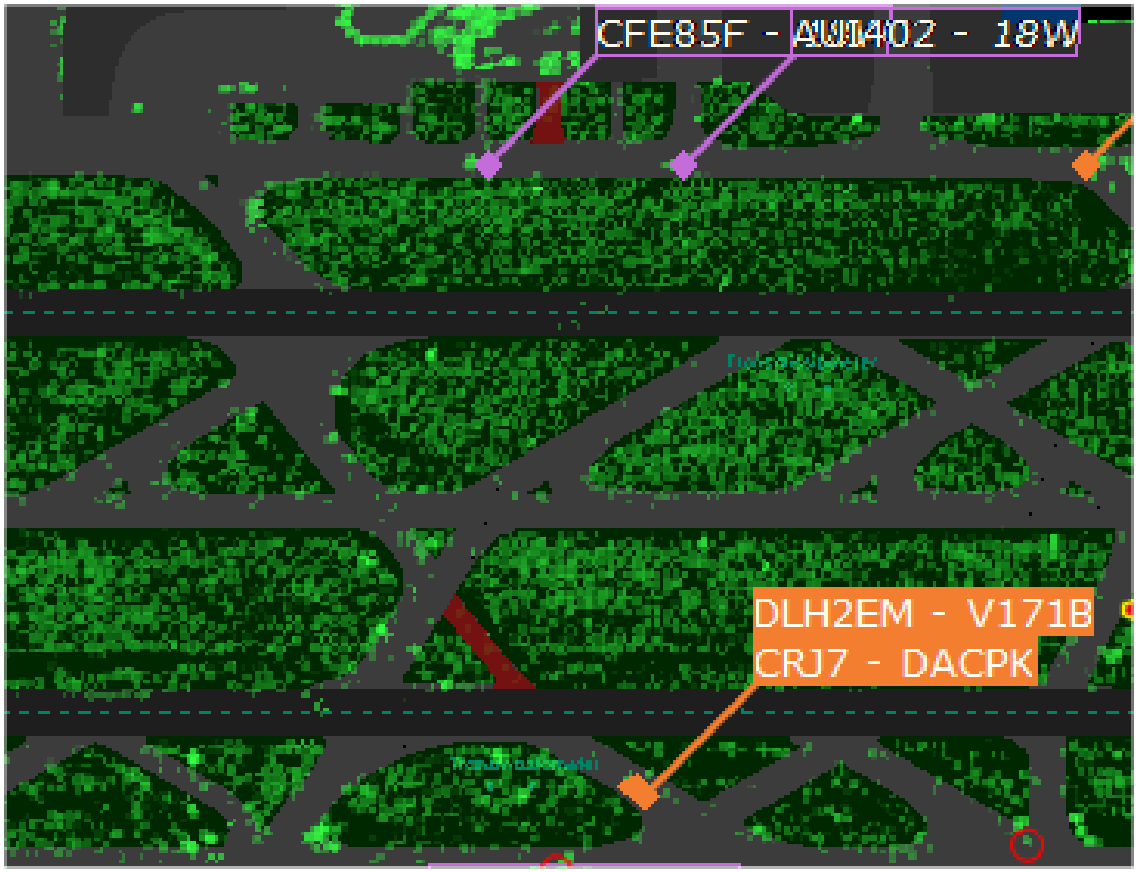
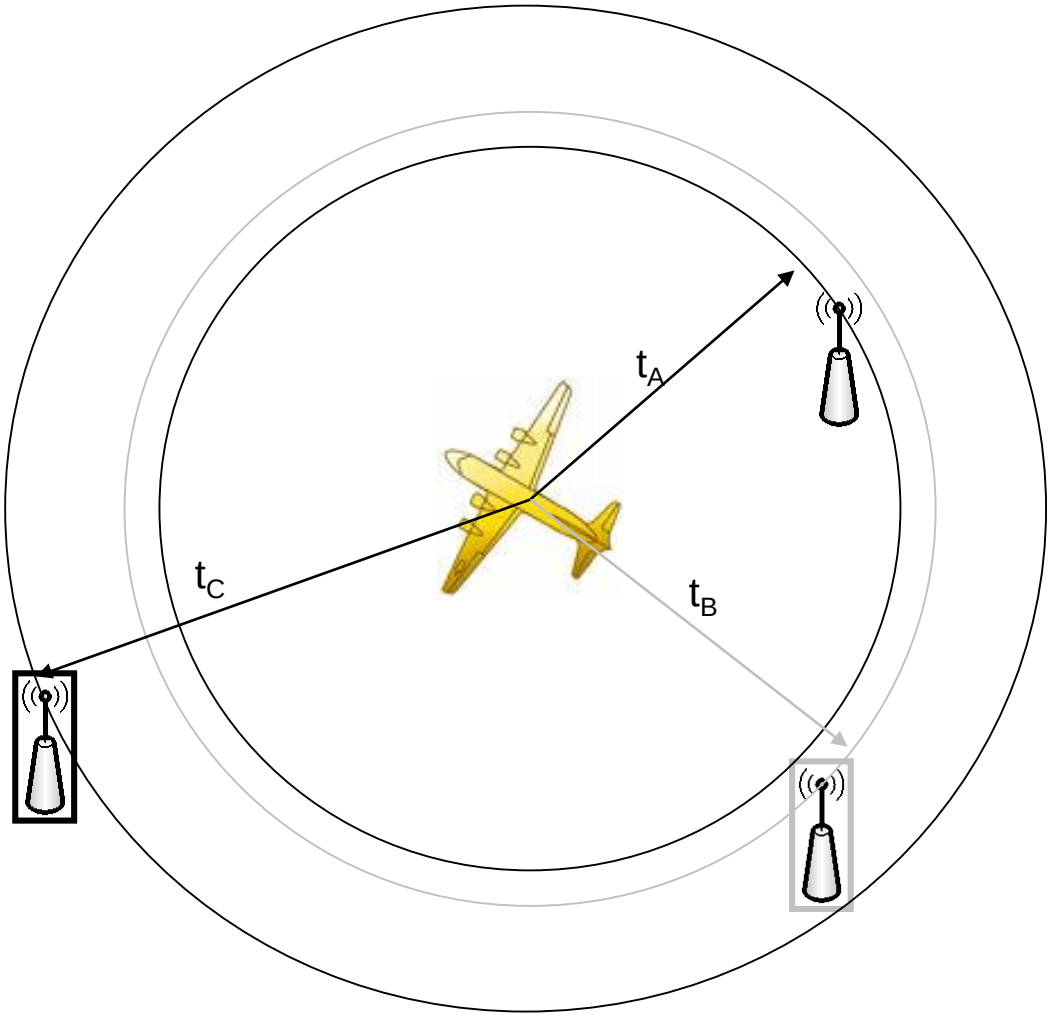
Screenshot FAST MS

Digitised Radarvideo and merged tracks combined with the airport map:



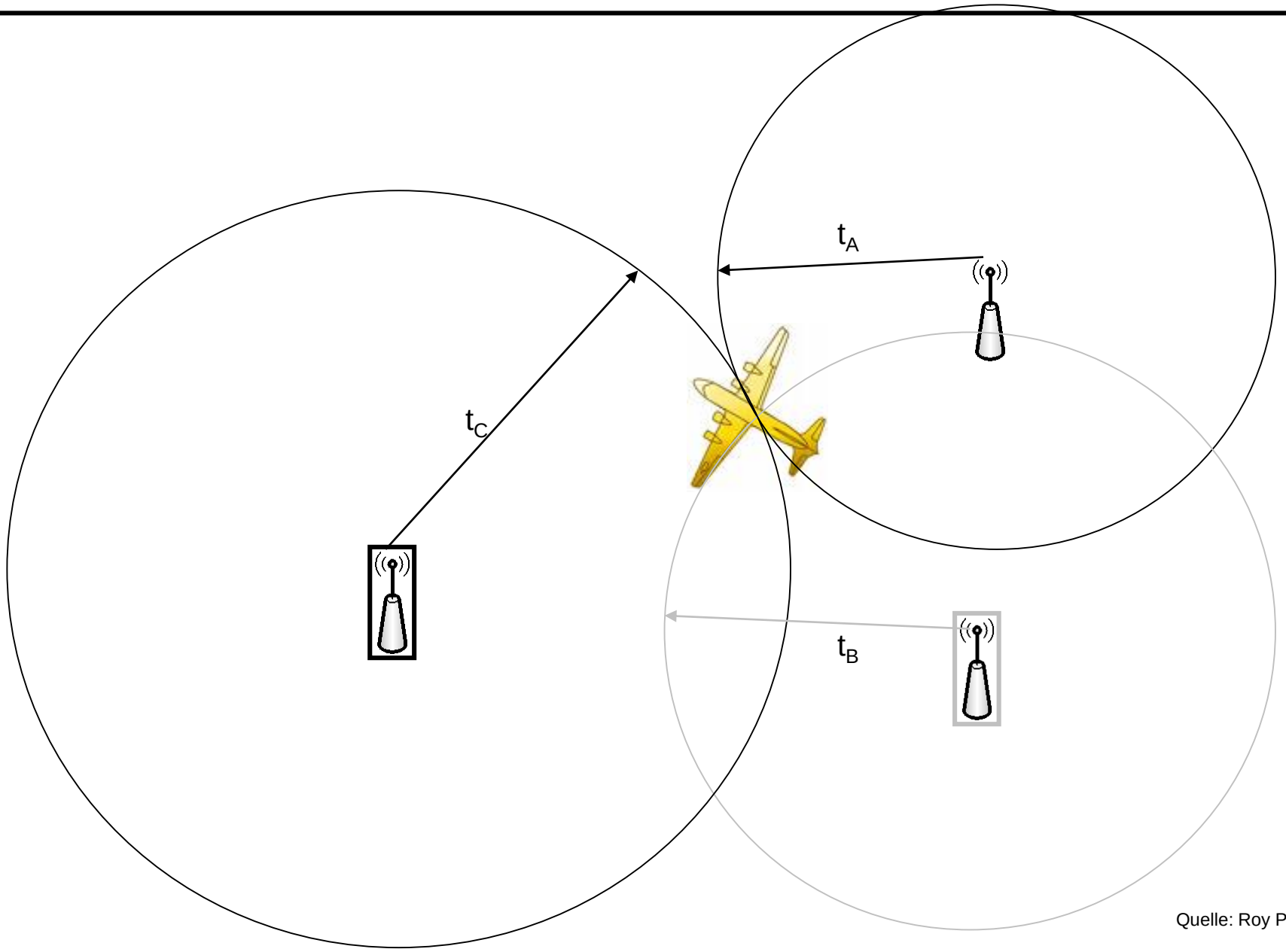
Quelle: Roy Posern, Fraport AG, IUK-AF1

Sensordata Multilateration (ADS-B)



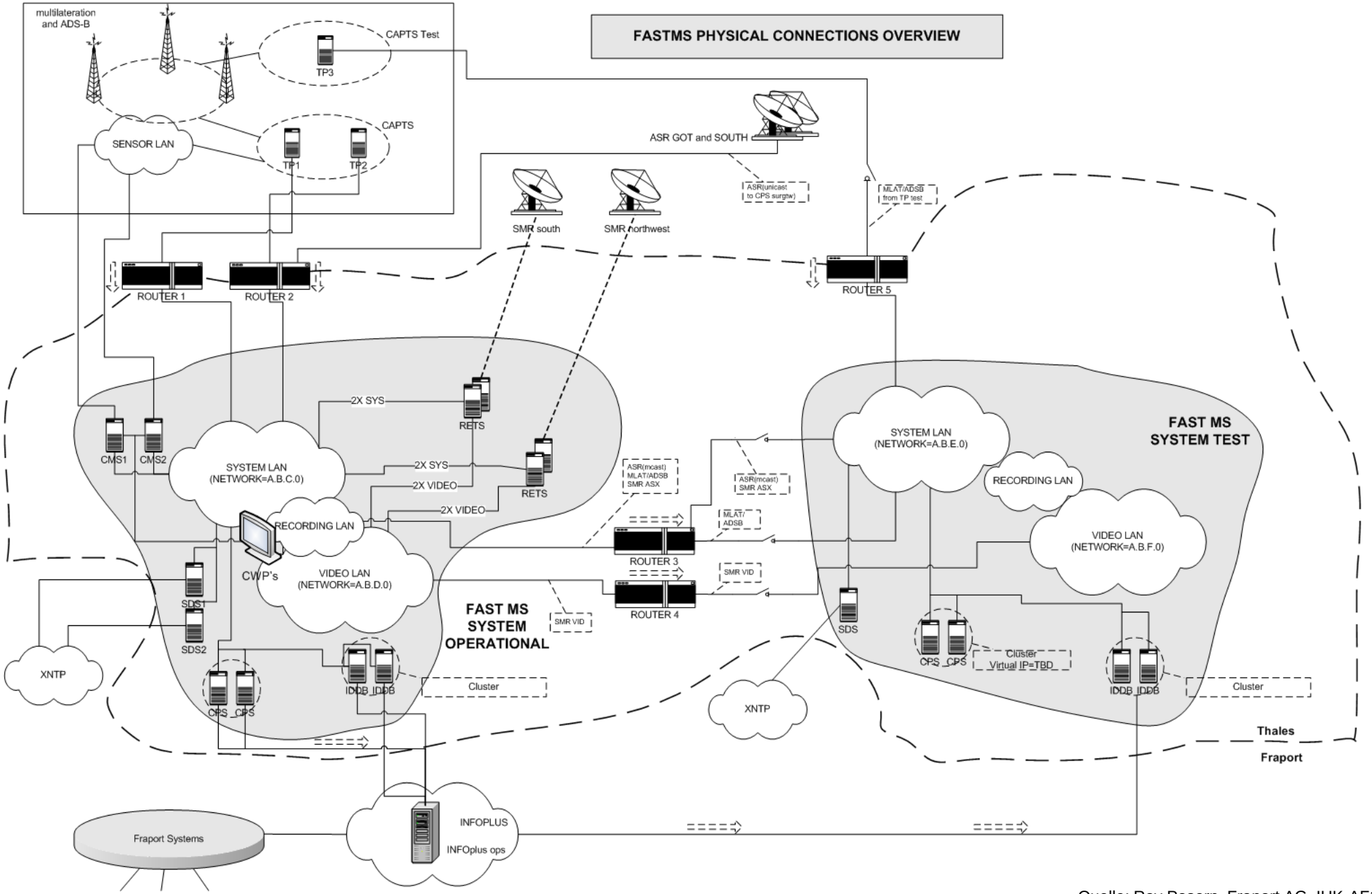
Quelle: Roy Posern, Fraport AG, IUK-AF1

Sensordatenverarbeitung Multilateration



Quelle: Roy Posern, Fraport AG, IUK-AF1

Systemverbund ASMGCS



Quelle: Roy Posern, Fraport AG, IUK-AF1

Merged

Airplanes with flight number and type on the airport map –
Inbound (orange), Outbound (magenta), tow traffic (blue) and unidentified targets (black):