Real Time Systems – SS2016

Prof. Dr. Karsten Weronek
Faculty 2
Computer Science and Engineering

Basic Model for Real-Time-Systems

Example: Flight-Radar

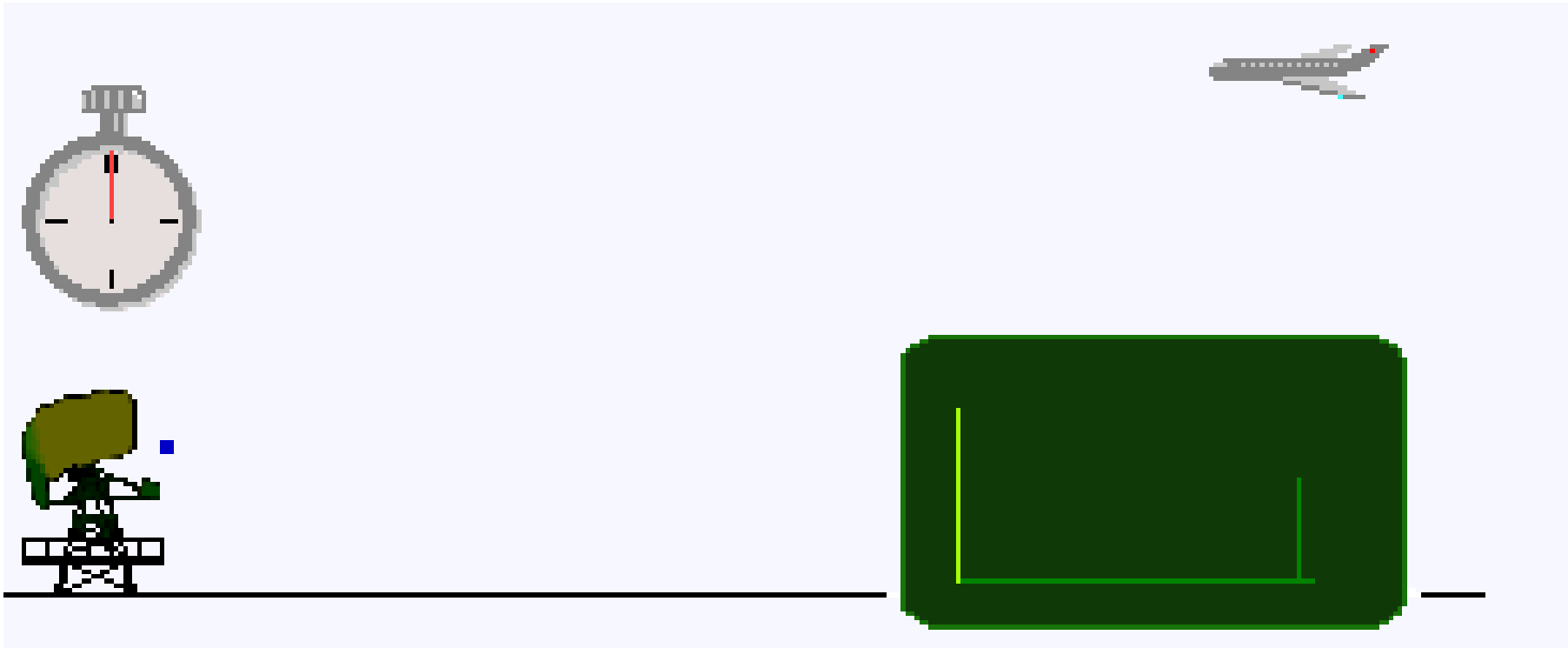
NASA-Video: Satellite view of 24hr Air Traffic:

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

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- 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:

- zeitgesteuerte Echtzeit
- eventgesteuerte Echtzeit
- Sequenciality und concurrency (Nebenläufigkeit)

→ Requirements for RTOS

Requirements for RT-Systems (1/2)

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

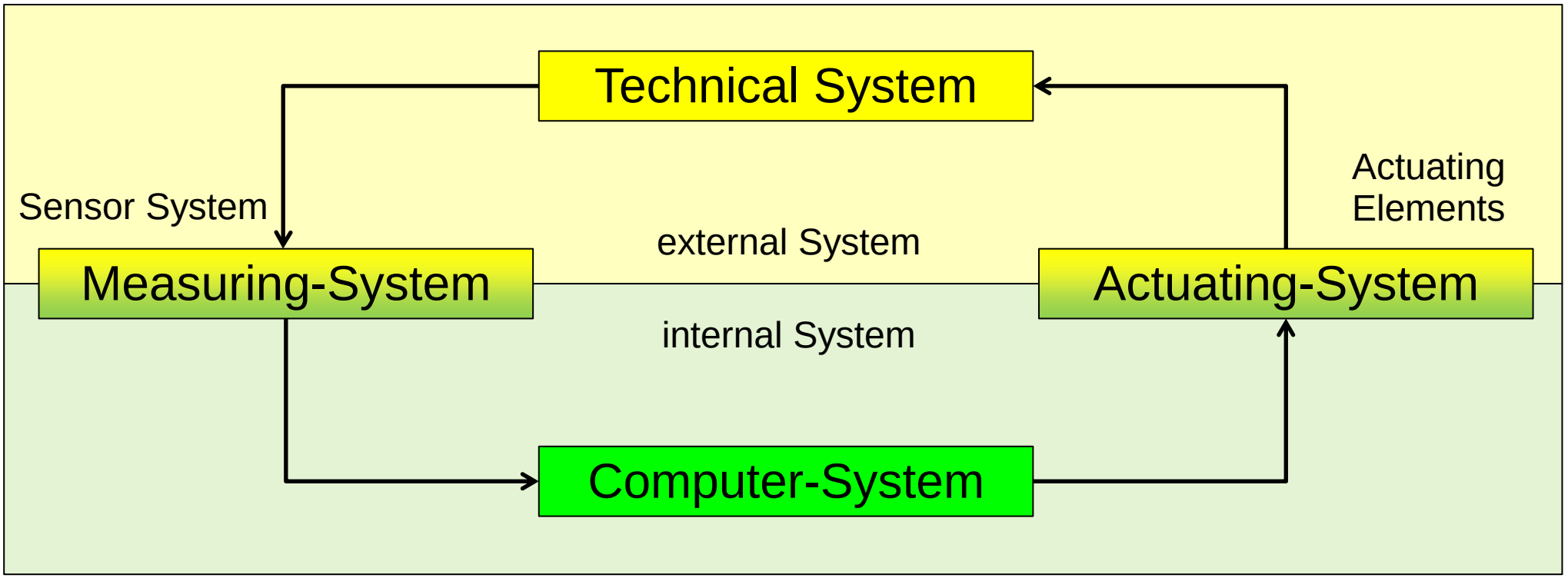
  RTS:
  determinability (it comes to an well defined end!)
  predictability (when it comes to the end!)
  (Determinierbarkeit/Vorhersagbarkeit/Vorhersehbarkeit)

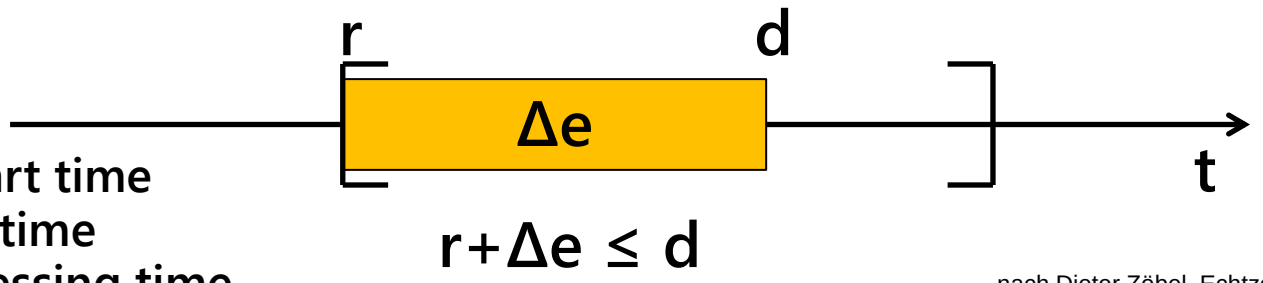
- Reliability (Zuverlässigkeit)

- Defined response time, but also quick response times (change of context)

Basic model for a Real-Time-System

Real-Time-System





$r + \Delta e \leq d$

r : earliest start time
d : latest end time
Δe : max. processing time

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

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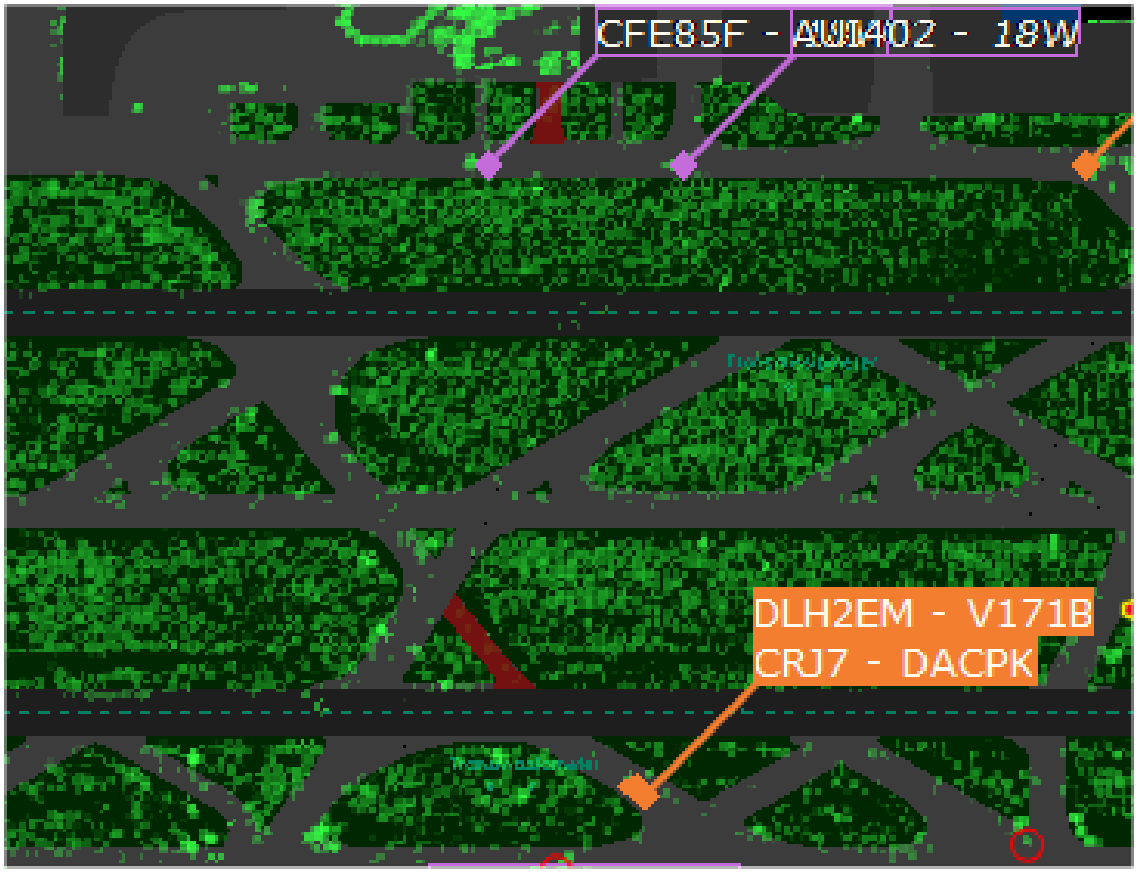
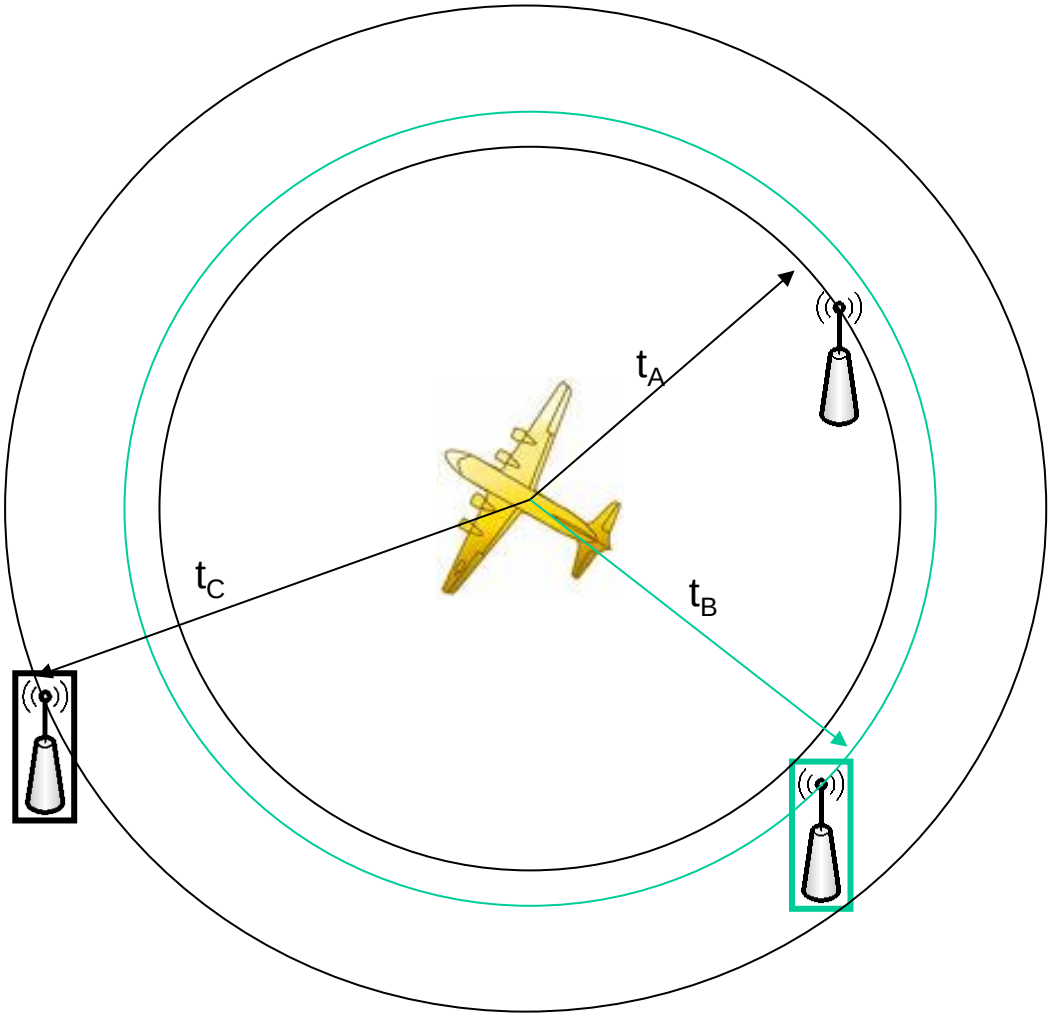
Screenshot FAST MS

Digitised Radarvideo and merged tracks combined with the airport map:



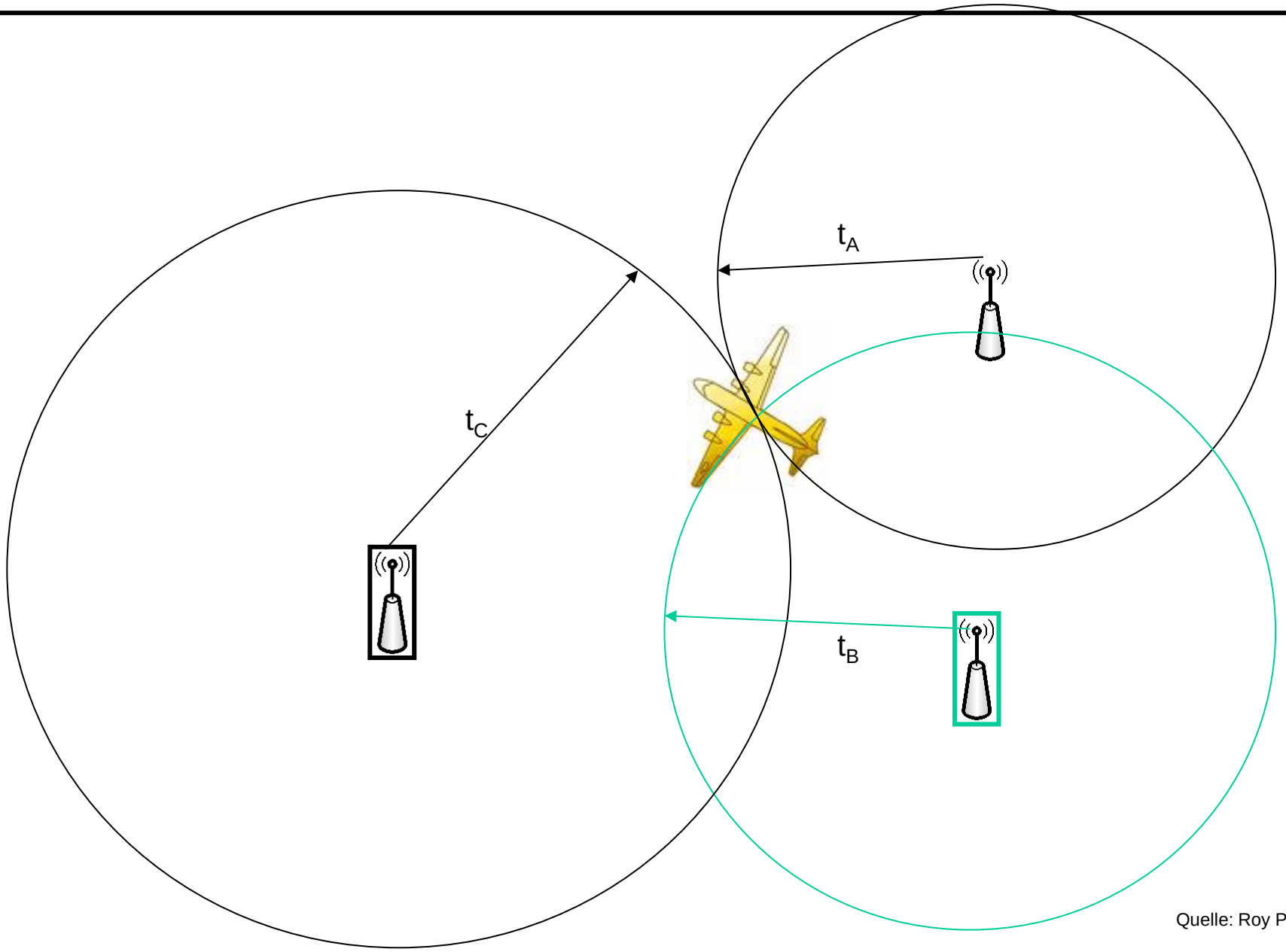
Quelle: Roy Posern, Fraport AG, IUK-AF1

Sensordata Multilateration (ADS-B)



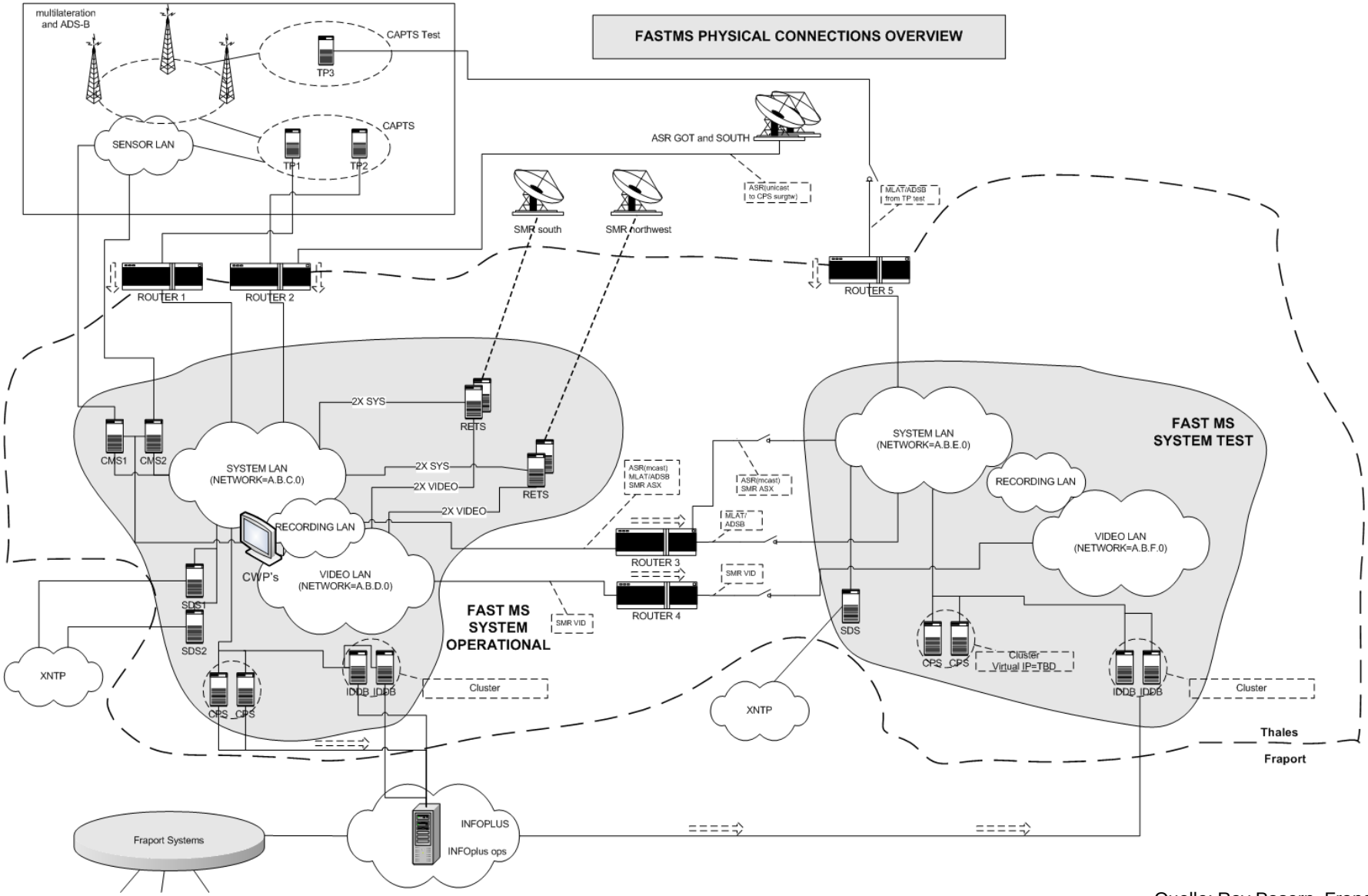
Quelle: Roy Posern, Fraport AG, IUK-AF1

Sensordatenverarbeitung Multilateration



Quelle: Roy Posern, Fraport AG, IUK-AF1

Systemverbund ASMGCS



Quelle: Roy Posern, Fraport AG, IUK-AF1

Merged

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