



**ICNS 2006**



# **SERVICE ORIENTED COMMUNICATION ARCHITECTURES IN SAFETY CRITICAL ENVIRONMENTS**

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**FREQUENTIS GMBH**





# Agenda

- Introduction
- Dependability
- Infrastructure
- Service Orientation
- Service Interface
- EUROCAE WG67



# Decision Making Cycle

## → Information presented to the operator

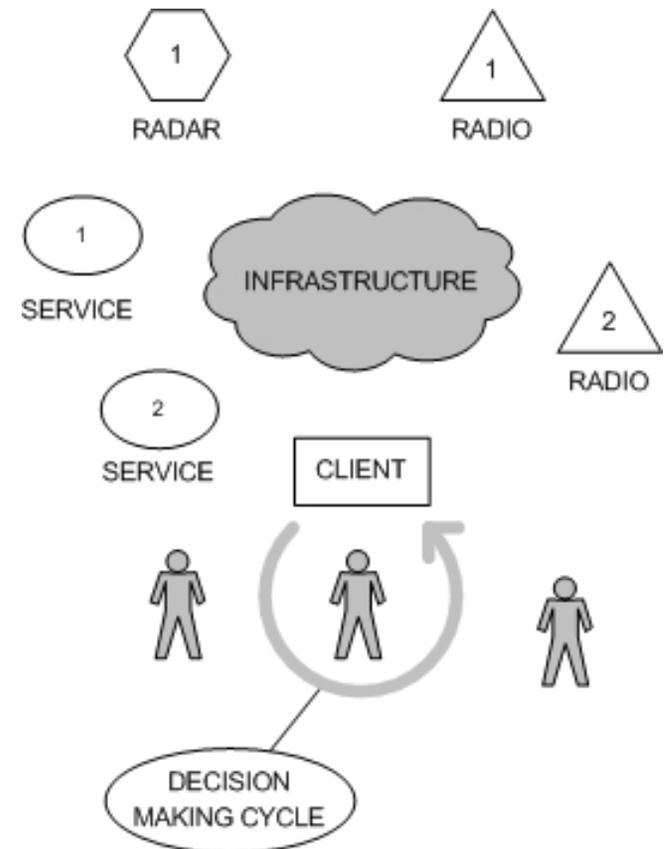
- reliable delivery
- stringent timing requirements

## → Different devices

- display systems
- service entities
- voice and/or data

## → Protocols

- some standard based
- most vendor specific





# Dependability

## → Clients access peripheral elements

- direct, or via service entities
- using an infrastructure

## → Rule of thumb:

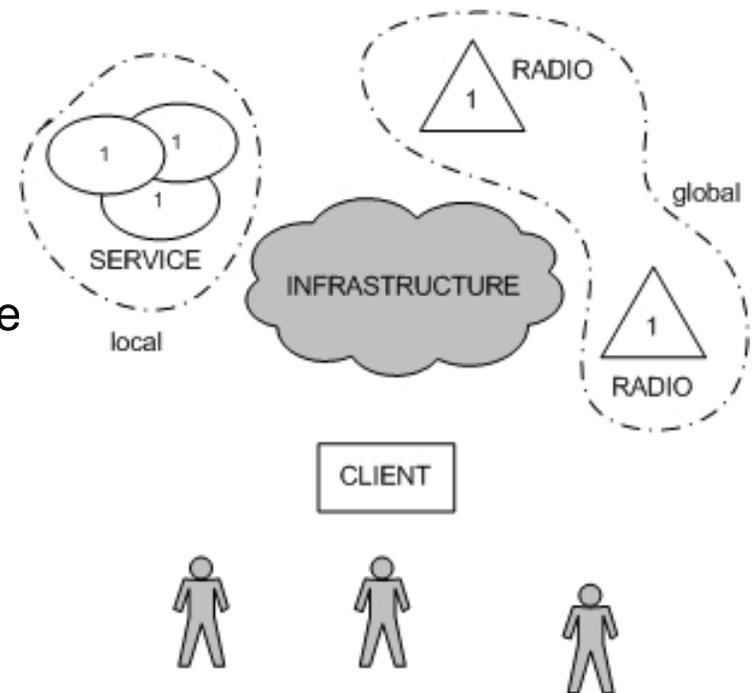
- the more complex the less reliable

## → Build some redundancy

- local (internal, cluster)
- global (many “service provider”)

## → Fail-over

- transparent vs. client triggered





# Infrastructure

## → Clear separation of service and infrastructure

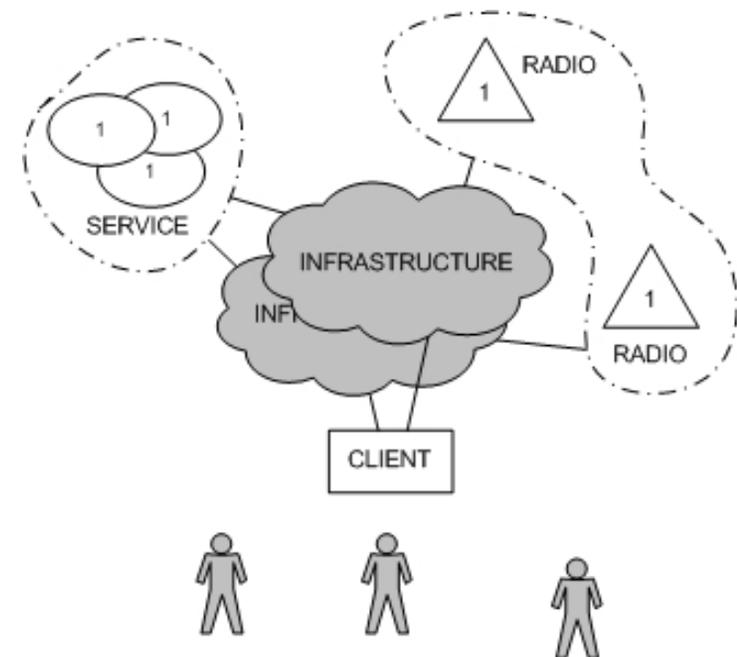
- IP model (layered architecture)
- allows different solutions (meshing, link aggregation ...)

## → Fail-over mechanisms

- MPLS (fast re-route)
- Resilient Packet Ring (RPR)

## → First-hop redundancy

- host feature
- aggregation, teaming





# Service Oriented Architecture (SOA)

## → Reusable service components

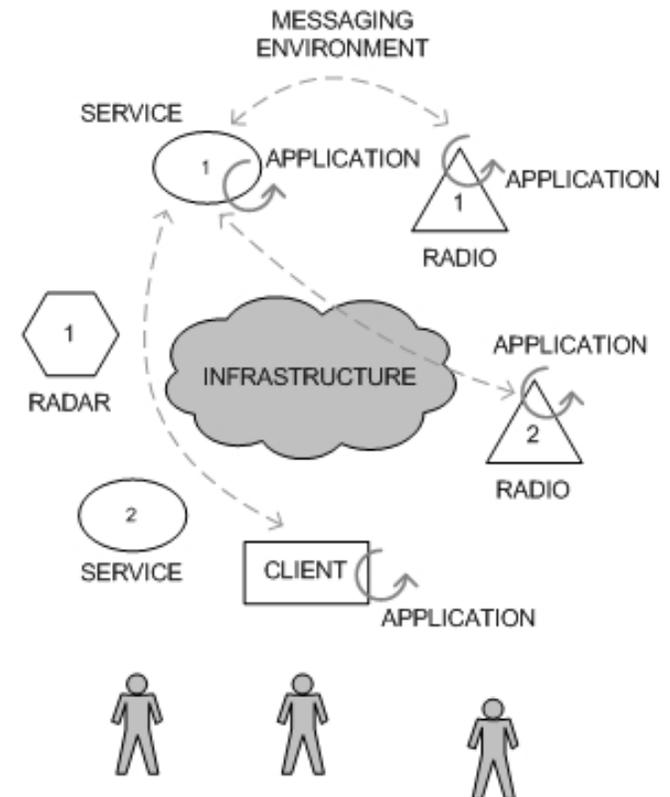
- service dispersion throughout the network
- replication for redundancy purposes

## → Loose coupling

- relationship between applications
- shared semantic framework
- sessions (SIP)

## → Messaging environment

- message header
- message body





# Service Scalability

## → Performance characteristics

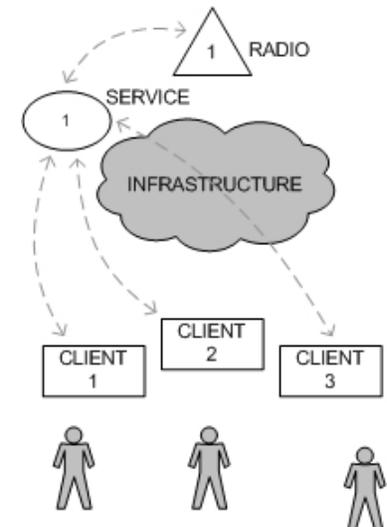
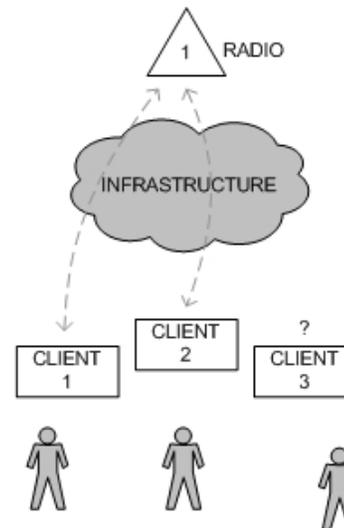
- infrastructure (throughput ...)
- host (processing capability ...)

## → Service multiplication, e.g.

- Client – Radio
- Client – Service – Radio

## → Graceful degradation

- service failure, but some
- direct access (e.g. one radio / client)
- reduced service set (no loss!)





# Service Host

→ Services can be anywhere in the network (basically)

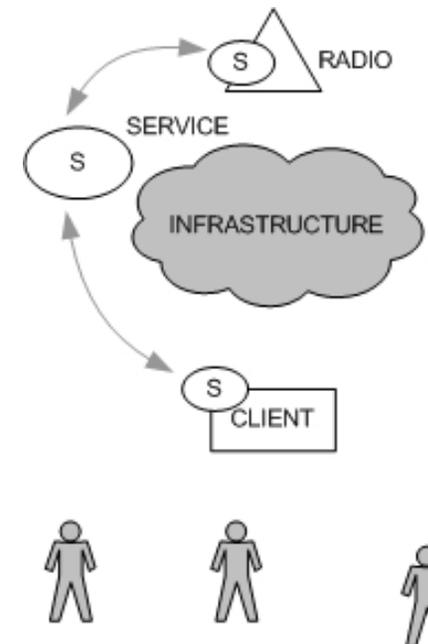
- homogeneous infrastructure
- no processing limitations

→ SOA enables service dispersion

- example: “radio channel access”
- conceivable locations are:
  - radio gateway
  - service host
  - operator position

→ Flexible addressing scheme

- e.g. URI
- location independent





# Service Interface

## → Messaging environment

- session related data
- service specific trunks

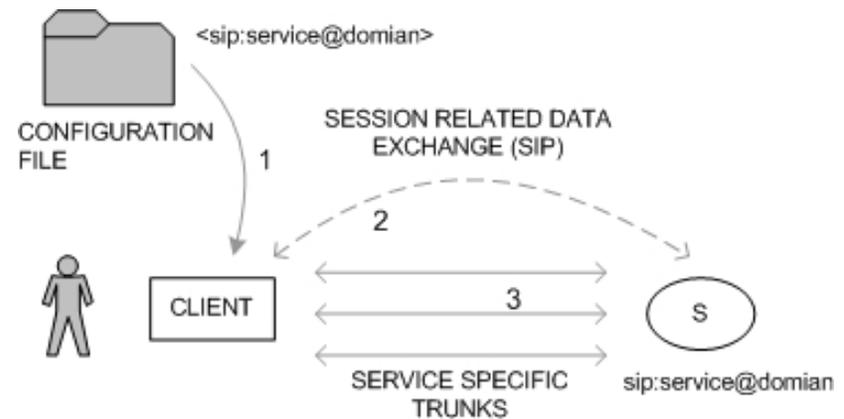
## → Session

- SIP (RFC 3261)
- SDP (RFC 2327)

## → Service specific

- audio/video (media transport)
- application specific (e.g. radio signaling)

## → Single addressing scheme for multiple services





# EUROCAE WG67

- EUROCAE is European partner to RTCA
- Working Group 67
  - topic: Voice over IP in ATM
  - chair: Guy Potiron, DSNA (French ANSP)
  - FAA delegate: Leon Sayadian
- Sub-Groups:
  - ground/ground communication interface
  - air/ground communication interface (ground part only)
  - infrastructure
- First step towards SOA



## Summary

- Today's communication systems have grown to a point of complexity which has now become the bottleneck of innovation and change.
- A step towards a reduced set of complexity is the implementation of service orientation (SOA).
- SOA can boost safety and efficiency in safety critical environments.
- In general, SOA requires an new way of thinking and designing applications.



Thank you!



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