# Experiments with Web Services at Combined Endeavor 2009

**Frank T. Johnsen**
**Trude Hafsøe**

**Norwegian Defence Research Establishment (FFI)**

**ICCRTS 2010**

FFI Forsvarets forskningsinstitutt
Norwegian Defence Research Establishment

# Combined Endeavor is an annual multi-national event featuring NATO and Partnership for Peace nations

**NATO**

BELGIUM
FRANCE
LITHUANIA
ROMANIA
UNITED STATES
CANADA
GERMANY
NORWAY
SLOVAKIA
CZECH REP
HUNGARY
NETHERLANDS
SLOVENIA
DENMARK
ITALY
POLAND
TURKEY
ESTONIA
LATVIA
PORTUGAL
UNITED KINGDOM

AUSTRIA
FINLAND
IRELAND
SWEDEN
SWITZERLAND

**PfP**

ALBANIA
ARMENIA
BOSNIA and HERZEGOVINA
CROATIA
GEORGIA
MACEDONIA
MOLDOVA
MONTENEGRO
SERBIA
UKRAINE

# This presentation focuses on Web services and interoperability between fixed and mobile networks

**Mobile users collect information.**

**The deployed HQ gathers information.**

**Result: A common operational picture.**

# ile users use heterogeneous communications pment

**mobile users take an active part in a mission, reporting ents back to the HQ.**

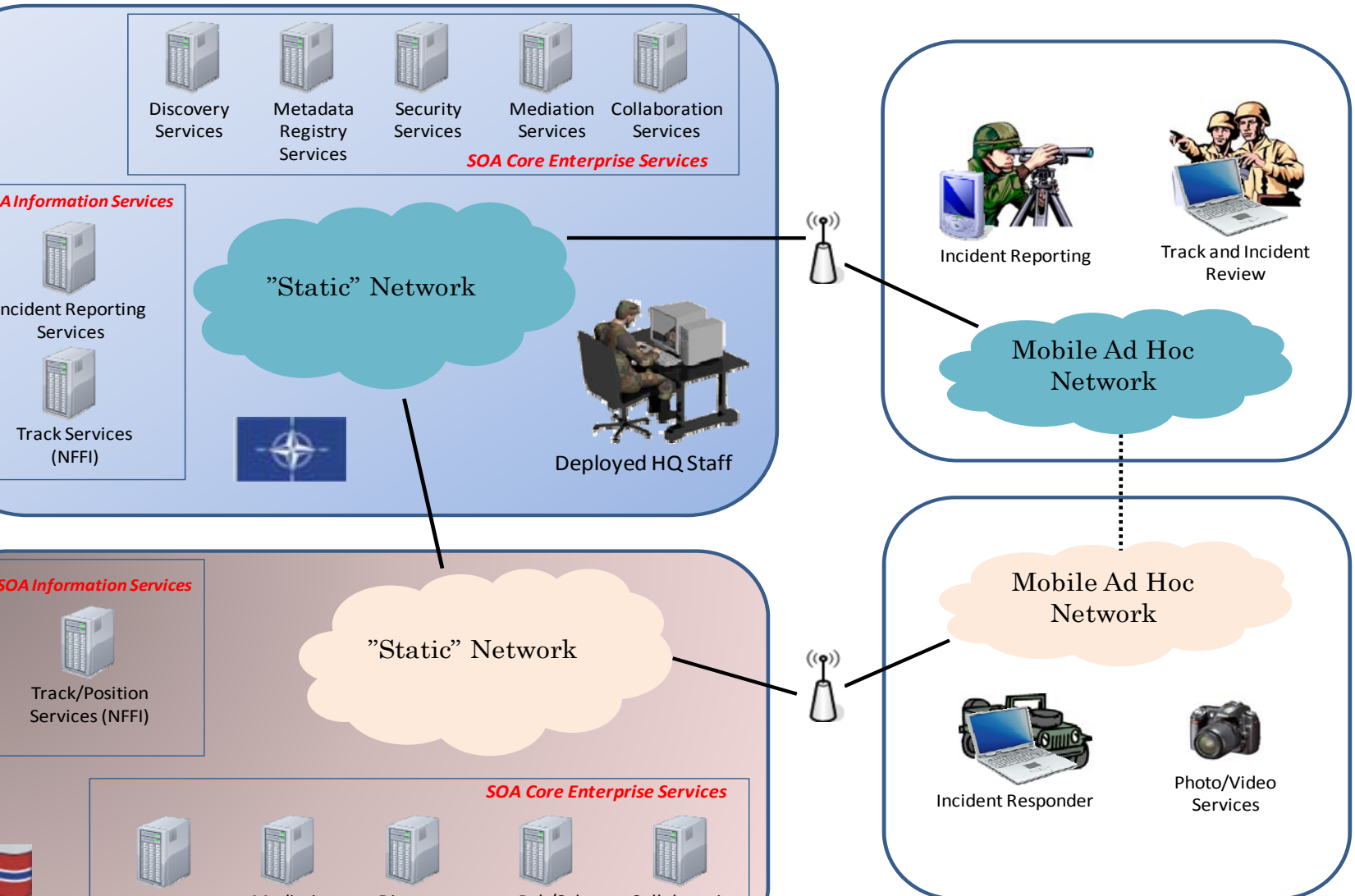
# HQ gathers information and shares it with other oyed networks.

Q has fixed infrastructure, and ays to the mobile users.

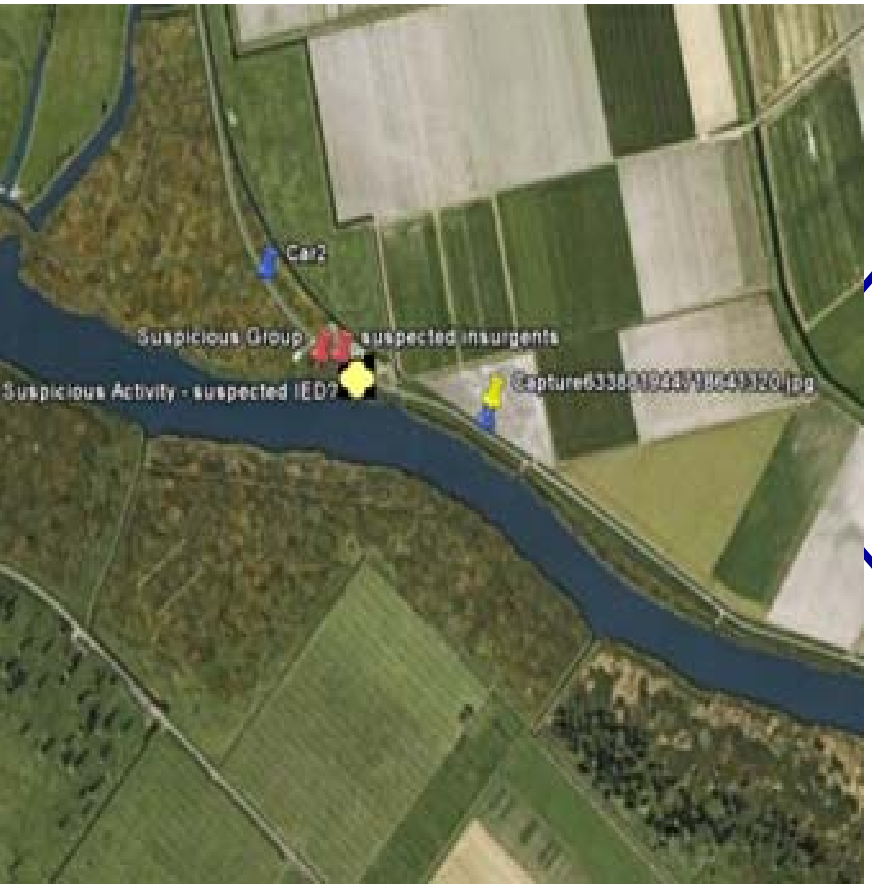
Interoperability across networks is ensured using back-to-back IP radios.

Web services provide application level interoperability.

# NC3A – Norway network interconnections and rmation sharing



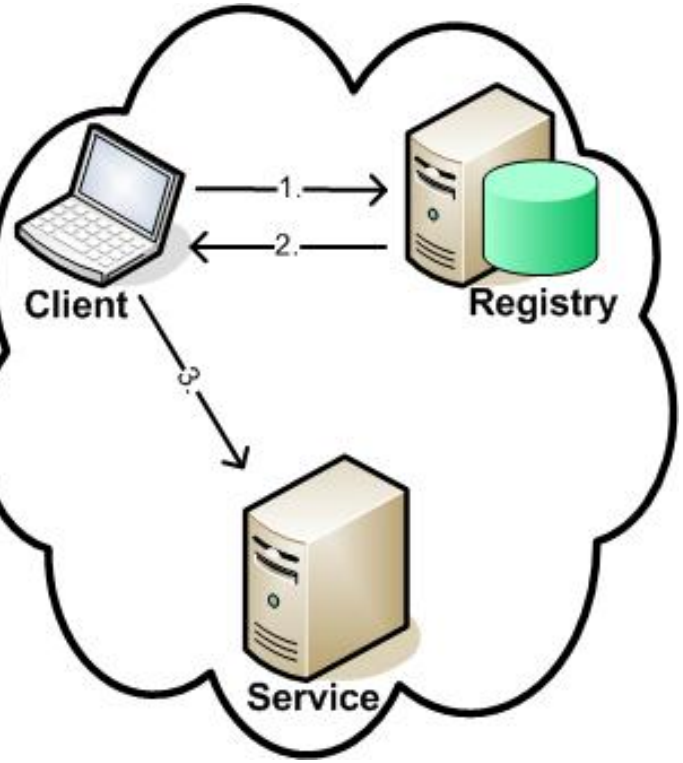
**aks to network and application interoperability, we can te a common operational picture.**




**Mobile users report incidents back to the HQ.**

**The HQ is able to gather and visualize this information.**

# ice Registries

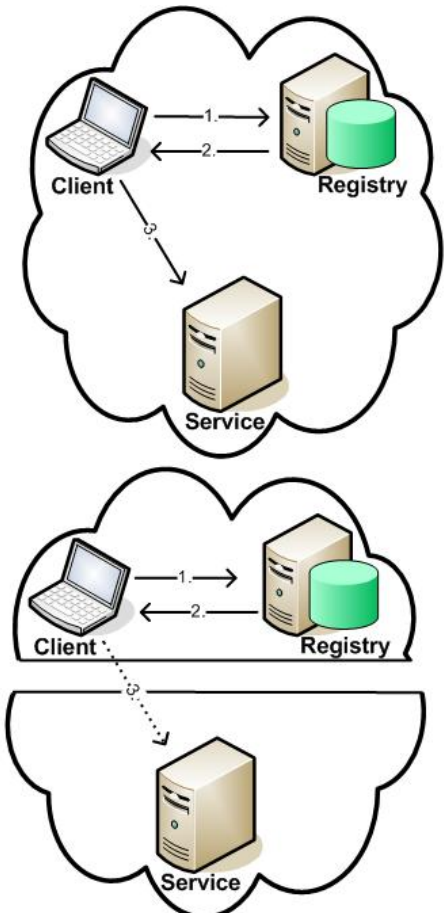



**Communication between client, registry and service:**

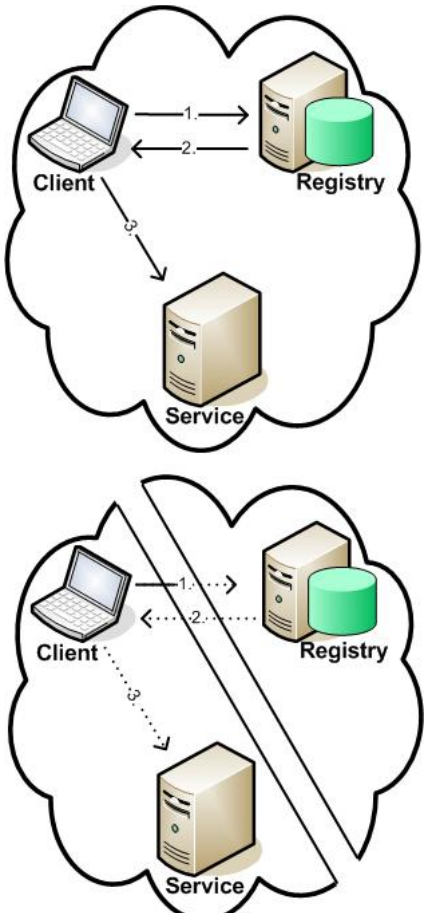
1. **Look-up/Search**
2. **Response**
3. **Contacting the service**

# ervice Registries

## The liveness problem




## The availability problem



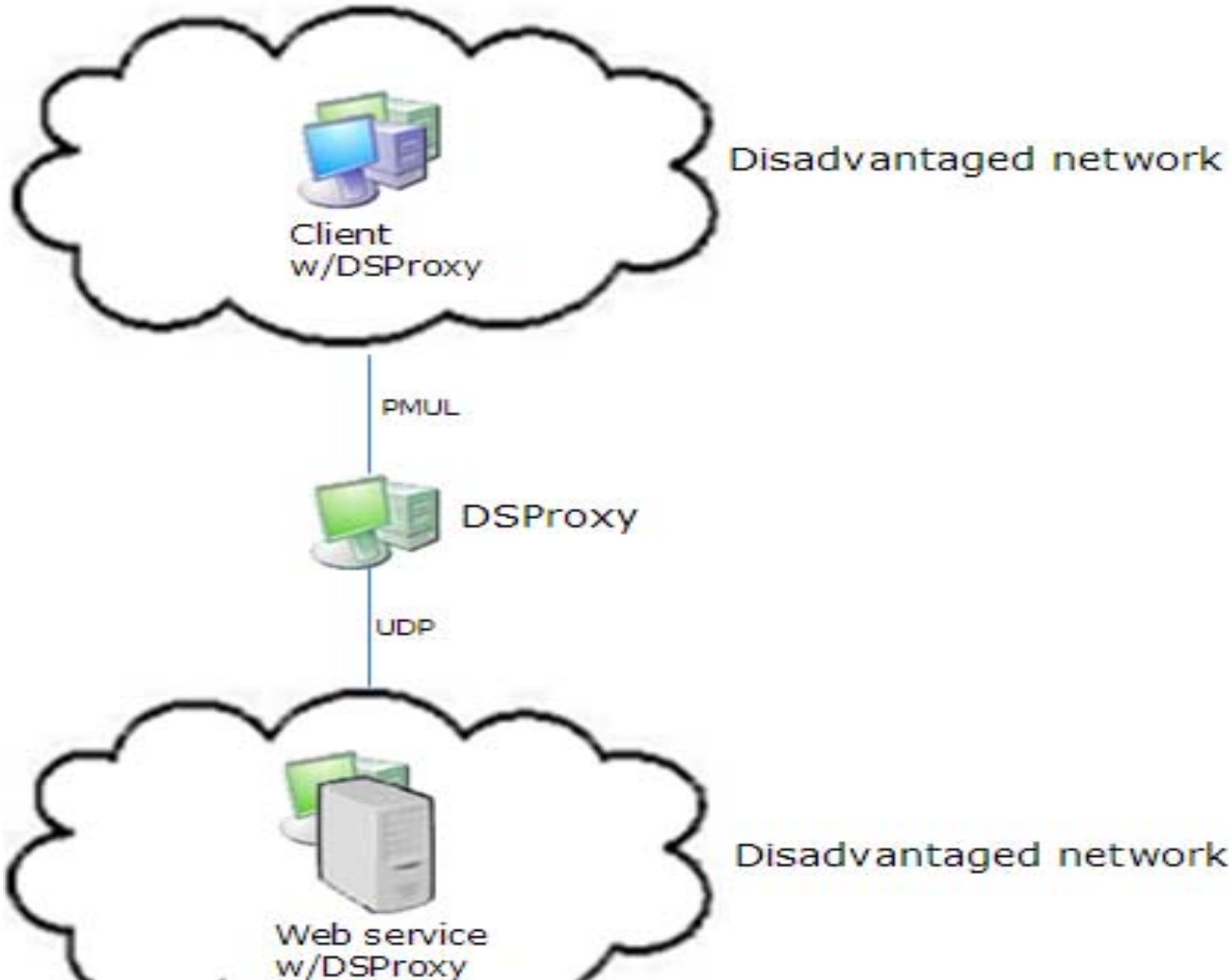
**entralized solutions are usually more “chatty” than ralized solutions: Need to optimize data rate uirements!**

- Piggybacking
- Data compression
- Caching & timeouts

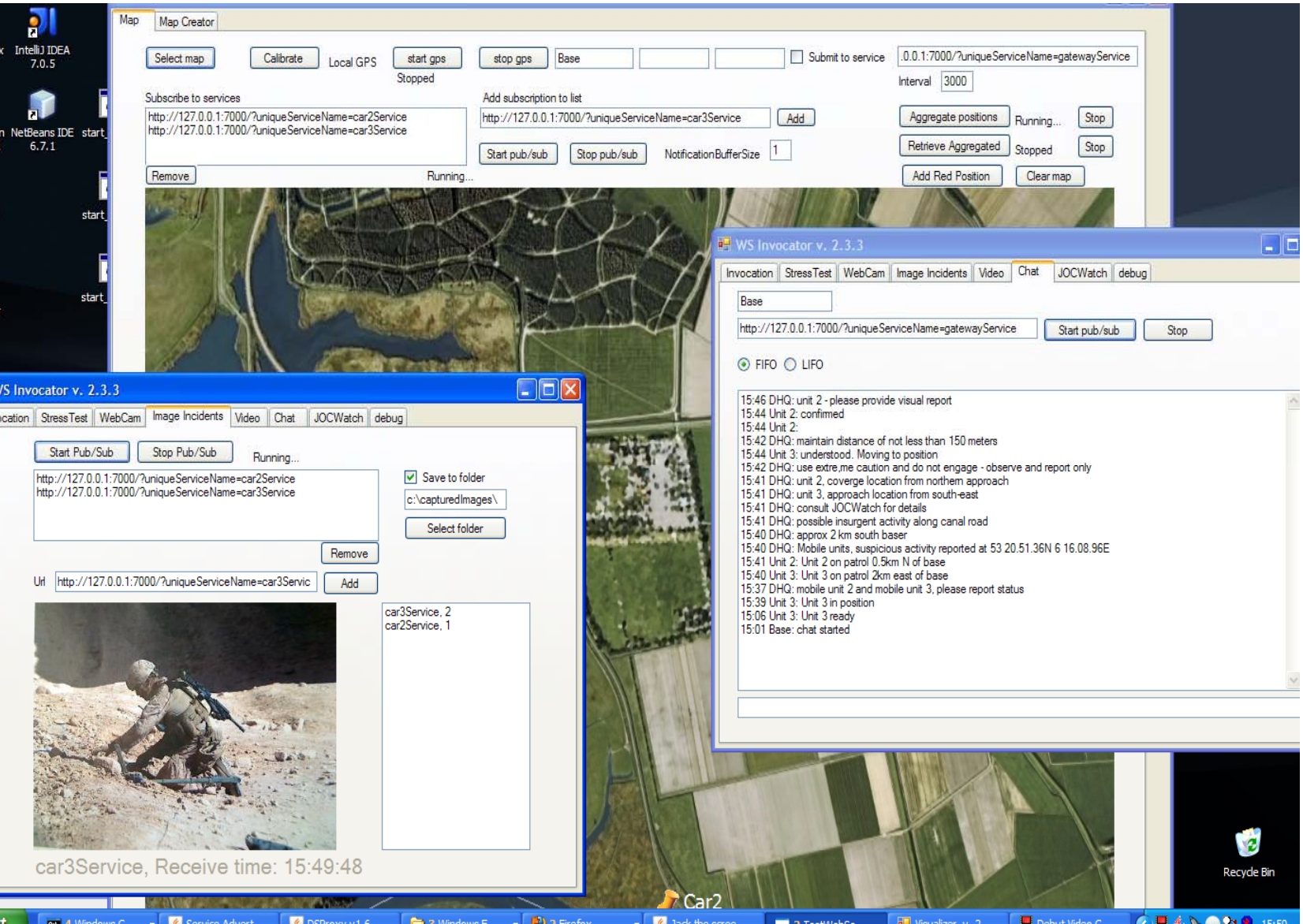
## ice discovery in different networks requires different tions.

| vork type | Discovery technology | NC3A mechanisms at CE | NOR mechanisms at CE |
|---|---|---|---|
| cal deployed vork (HQ) | Federated registry | NATO Metadata Registry and Repository (NMRR) | The ebXML reference implementation, aka ”Omar” |
| cal mobile vork | Ad hoc discovery | Experimental mechanism: ”SAM” | Experimental mechanism: ”SOP” |

**DSProxy provides disruption tolerance, assuring that**
**e you have discovered a Web service, it can be invoked.**



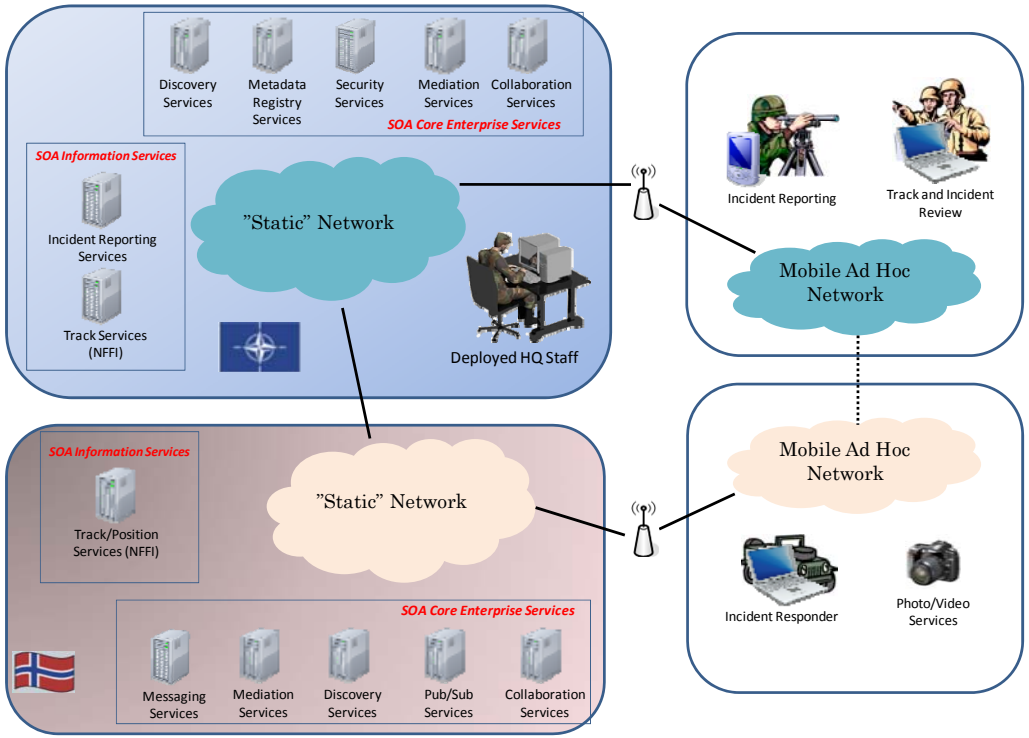
# enshot from the Norwegian HQ



# ummary, we were able to interconnect mobile users deployed HQs using Web services for interoperability

vides network level perability.

ervices provide application nteroperability.




Questions?