



# **EW using a Software Defined Platform**

**NATO task group SCI-222**

CAN, DEN, DEU, ESP, FIN, GBR, ITA, NED, NOR, SWE, TUR, USA





## Summary

- › Electronic Warfare (EW) functionality will be increasingly defined in software
  - › Civilian "systems" show the way
- › Procurement should focus on interfaces
  - › Open definition, or even standards
    - › Interoperability
    - › Exchangeability
  - › Start thinking about requirements now
    - › Or benefits will not arrive
- › Industry to profit offering compatible equipment & software



## Definitions

- › **Electronic Warfare (EW):** Military action that exploits the EM spectrum to provide situational awareness and achieve offensive and defensive effects.
- › **Software Defined Radio:** Radio communication system where some or all of the *physical layer* functions (according to the OSI reference model) are implemented in software
- › **Software Defined EW:** Electronic Warfare system where some or all the functions used to exploit the EM spectrum for offensive and defensive effects are implemented in software



## Trend towards software

- › Made possible by technological advances
- › Preference of manufacturers for modular approach
  - › Advantages in development
  - › Multiple functions on same hardware possible
- › Civilian "systems" lead the way:
  - › Smartphones & tablets with "Apps"
  - › Software defined TV-tuners
  - › etc.



## How was the work performed?

- › NATO Research task group
  - › Defence and industry scientists and researchers from 12 countries
- › Background review on SDR; EW
- › How to implement EW using SDR concepts?
  - › Requirements for hardware & software
  - › Definition of generic Architecture
- › Benefits of implementing EW using SDR
- › Experimentation



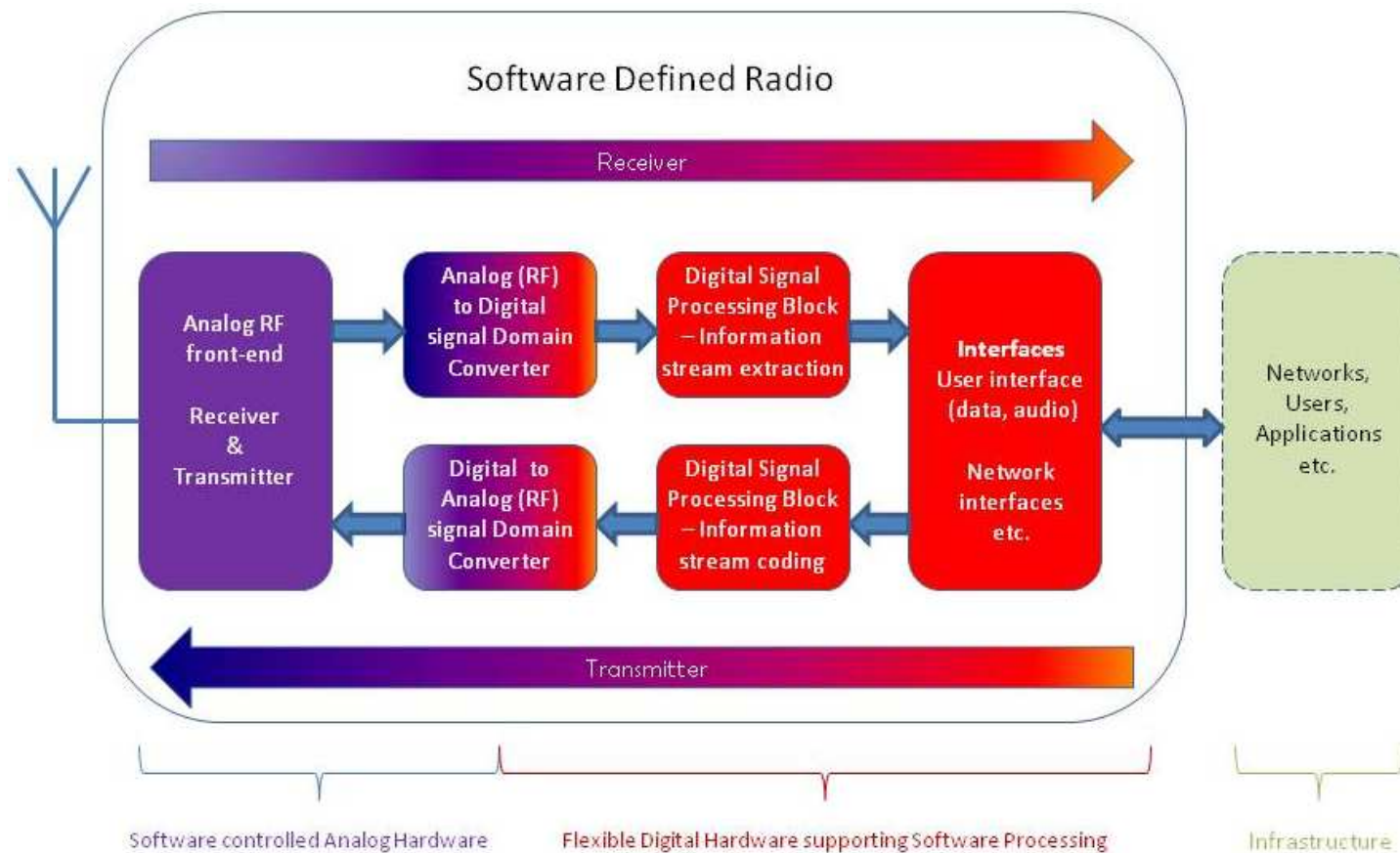
## Common Experiment

- › Proof-of-Concept
- › SDR: USRP
  - › Eight sensors
  - › Different USRP versions
  - › Identical software functionality
- › Results show feasibility of using same software on several sensors from different countries!





## SDR / SDEW Architecture





## Sample SDEW Requirements

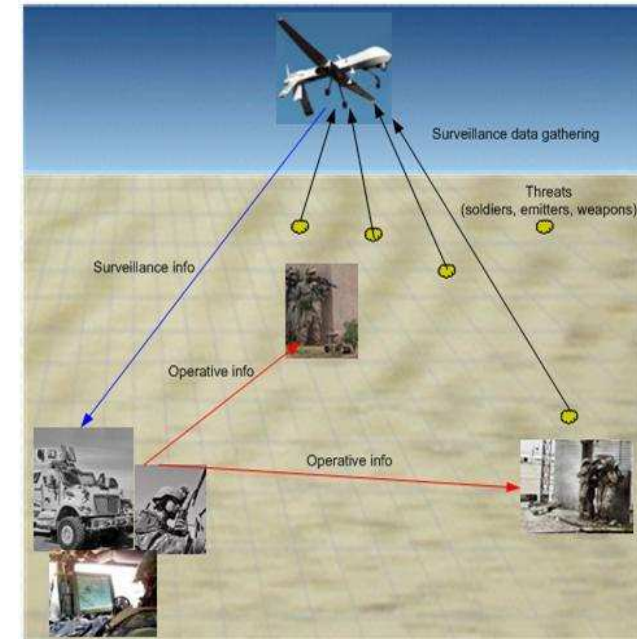
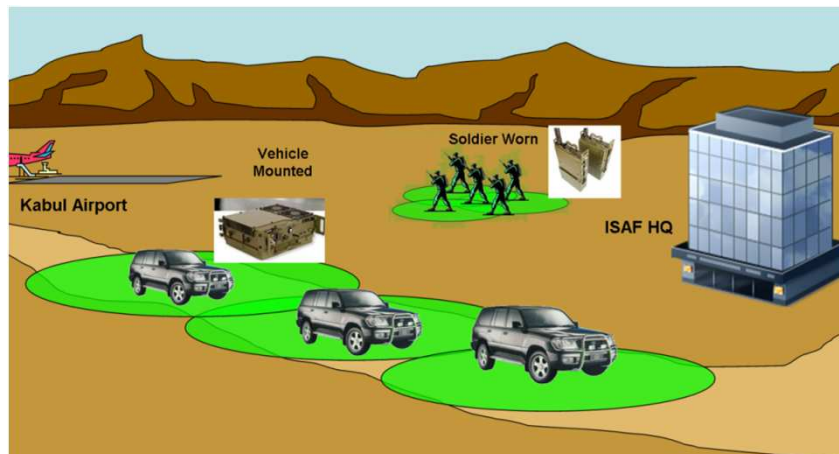
- › Receiver front ends
  - › Bandwidth, tuning range, sensitivity
- › Scan rate
- › Processing
  - › Several algorithms simultaneously for one signal
  - › High speed
- › Security
  - › Red/black separation in hardware & software
- › Logging of intermediate stages & storage
- › Cueing of internal algorithms
  - › e.g. Hand-off to demodulate after modulation detection





## Benefits of SDEW (I)

- › Multiple EW functions, in multiple scenarios, using multiple hardware components





## Benefits of SDEW (II)

### › SDEW

- › Realization of EW functions with Software
- › EW Counterpart of Software Defined Radio
- › At least the same EW features as legacy EW equipment
- › Same customers and user groups

### › EW on SDR

- › Complement SDR with selected EW features to support comms
- › The radio remains a radio
- › Requires special attention not to influence the comms negatively
- › Customers and users need to adapt



## Benefits of SDEW (III)

- › Equipment easily tailored to mission
  - › Modular approach, interface standards
- › Equipment "upgradeable"
  - › New hardware *or* software
  - › Cognitive Radio concepts
- › Different equipment more easily combined
  - › On-board processing, databases
  - › Only data-interface standards required
- › Equipment can also function autonomously, communicate
  - › "Standalone" information collection
  - › Distributed EW



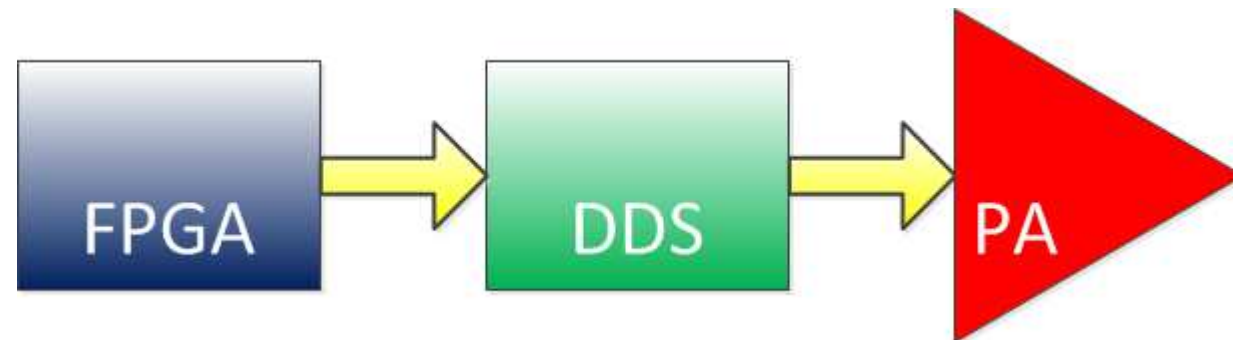
## Challenges

- › Performance
  - › Efficiency is important – but will suffer with "general purpose processing"
- › Legacy equipment
  - › Compatibility with equipment that is not yet phased out
- › Costs
  - › Keeping costs down is not the first driver for this development
- › Security
  - › Separation of red/black through hardware & software boundaries
- › Operation
  - › More functionality available, possibly even Comms & EW



## Way forward (I)

- › Compare with SDR
  - › Manufacturers will go down this route for production reasons
  - › Tx example:



- › EW-specific requirements should be addressed



## Way forward (II)

- › Attention needed now
  - › To reach maximum advantage for procurement & users
    - › Interoperability
    - › Exchangeability
    - › Standards are helpful!
- › Interface standards for benefits to procurement & users
  - › Manufacturers will benefit as well
    - › If they can offer what the customers need!