

## **COPE** Project

#### **Dissemination Industrial Committee**

Johan Forsling, BAE Systems C-ITS, 2010-11-30



### Agenda

#### Part 1

- Introduction to the COPE project
- Overview of each technical component

Part 2

• Questions & answers



### Project goals and strategies

Goals

- Improve the Common Operation Picture (situational awareness)
- Use COTS solutions and novel technologies

Strategies

- User driven development
- Reuse of previous and ongoing EU projects
- Trial to demonstrate proof of concept



### **Development fundamentals**



- Tactical Situation Object
- <u>http://www.tacticalsituat</u> ionobject.org/
- Developed by the EU project OASIS
- Tactical Situation Object
  - A view of the situation stored in XML
  - A structured data set representing the major information of the event

Data Dictionary

- The valid values from the TSO model used in COPE
- Additions to TSO
- The process supports integration

COPE	
Gateway	

- Service Oriented
   Architecture (SOA)
- Is a web service
- Possibility to use a network of gateways
- Network of gateways enables communication between units and redundancy
- Data storage



#### **COPE** System Overveiw COPE System of Systems Role COPE hardware & software Incident Commander Decision support Command & Control Other roles Other federates Ambulance Ambulance . Police Police Medical Medical Higher Higher command command Dispatching Dispatching, centre centre Etc Etc. Sector Commander Chain of Command-FRS-C Sensors -Gateway Gateway database Gateway database actical Situation Tactical Situation Object Object (TSO) (TSO) FRS-HW Sensors Fire fighter City and Giana Other clients technologies Webservice Telephone PDA Sensors Etc 2222222 Sensors platform Hardware & simulation 000 00

COPE

### **Communication system**

- Stand-alone system
- Wireless local area adhoc mesh network
  - WLAN 5GHz Wifi 500 m LoS mesh network
  - WLAN 2.4 GHz 100 m LoS client communication
- Sensors are integrated on the network
  - WSN 868 MHz
- Voice comm not included in COPE
  - TETRA system





### **COPE** Sensors overview

- Sensor network
- Plug-and-play connectivity
- Connection to the Gateway via the SIP C2 software



PΕ

## **COPE Sensors types**

- Deployable
  - Tripod
  - Vehicle
- Wearable
  - Standard
  - Indoor navigation based on dead reckoning
- Common functionality
  - Environmental safety (toxic gases, temperature)
  - Localization (GPS)
  - Resource identification (RFID)







Deployable

OPE

able

## Sensor: EMAS

- EMAS Environmental Monitoring and Analysis System
- Main features
  - Rugged housing
  - Types of sensors are configurable
  - Genere purpose data unit
  - Multiple communication options
- COPE adoptations
  - COPE Gateway connection
  - TSO messages





# AQEST

- Air Quality Estimator
- Gas cloud estimation algorithm
- Input
  - Sensor values (simulated or real)
  - Weather information
- Output
  - Gas cloud described as a number of polygons
- Results are sent to the COPE Gateway





### First Responder System – Human Wearable





#### First Responder System - Control



- Tablet PC
- Shoulder worn
- Wireless
- Map, tasking and streaming video



## COPE Command and Control (C2)

- Command and control functionality used by the Incident Commander
- Possibility to connect multiple number of C2 clients
- Two main windows
  - Мар
  - Tasking
- Major functionality
  - Items of interest (victims, medical points, vehicles, rinsing spots etc)
  - Visual planning tools (functional and geographical sectorization, cordoning off)
  - Map support (zoom, pan, layers etc)
  - Tasking (assign goals including handshake)



### C2 Map window





### C2 Tasking window

C 😂	OPE Command and Control 200912041610								
Eile Edit View Navigate Tools Window Help									
1	) 🚰 👪 🖷 🏓 🥙 🥙 🟋 🍞 🕨								
Nop 🗄	TaskAllocation Window								
Nin Vin	Select language english 💌								
ocatio		O 41	0 18	O 31	FB5_CU				
askallo	Accidents	1 + 3	1 + 3	1 + 3	1 + 3				
ř	Generic response				status assigned				
					Clear WE1 and SAR assign				
					11.19 FB6 USAR finish				
	HazMat accident				11.19 FB5 HU cancel				
	openissues								
		generic response 💉 add new task	generic response 🔹 add new task	generic response 💉 add new task	generic response 🕑 add new task				
		generic response v add new task	generic response  add new task FB6 CU1	generic response  add new task FB7 CU1	generic response v add new task				
		generic response ddd new task	generic response  Generic response Gener	generic response  Generic response Gener	generic response  add new task FB3_CU1 1 + 3				
		generic response add new task FB4_CU1 1 + 3 status assigned	generic response  add new task FB6_CU1 1 + 3 status assigned	generic response ddd new task FB7_CU1 1 + 3 status assigned	generic response add new task FB3_CU1 1 + 3 status assigned				
		generic response     add new task       FB4_CU1     1 + 3       status assigned     clear WE4 and SAR	generic response     add new task       FB6_CU1     1 + 3       status assigned     1.119 F86 LU1	generic response     add new task       FB7_CU1       1 + 3       status assigned       Clear SN 13 and SAR	generic response     add new task       FB3_CU1       1 + 3       status assigned       Immediately retreat of all fin assign				
		generic response     add new task       FB4_CU1     1       1     + 3       status assigned       Clear WE4 and SAR       Means allocated since       11.09 FB3 USAR1       finish	generic response     add new task       FB6_CU1     1       1 + 3     status assigned       11.19 F66 LU1     assign       11.19 F66 HU1     finish	generic response     add new task       FB7_CU1     1       1     + 3       status assigned       Clear SN 13 and SAR       Means allocated since       11.29 F67 USAR1       finish	generic response     add new task       FB3_CU1     1       1     + 3       status assigned       immediately retract of all fit emen engaged around the emen engaged around the emonia tower				
		generic response     add new task       FB4_CU1     1       1 + 3     status assigned       Clear WE4 and SAR     assign       Means allocated since     finish       11.05 FB3 USAR1     finish       11.15 FP4 HU1     cancel	generic response     add new task       FB6_CU1     1       1 + 3     status assigned       11.19 FB6 LU1     assign       11.19 FB6 LU1     finish       12 cleared     cancel	generic response     add new task       FB7_CU1     1       1     + 3       status assigned     Elear SN 13 and SAR       Means allocated since     11.29 F87 USAR1       11.29 F87 UJ1     finish       11.29 F87 HU1     cancel	generic response     add new task       FB3_CU1     1       1     + 3       status assigned     mene nengaed around the ammonia tower       finish     finish       cancel				
		generic response     add new task       FB4_CU1     1       1 + 3     status assigned       Elear WE4 and SAR     assign       Means allocated since     finish       11.05 FB4 UJI     finish       11.15 FB4 HUI     cancel       08:18:24     finish time	generic response     add new task       FB6_CU1     1       1 + 3     status assigned       11.19 F66 LU1     assign       11.19 F66 HU1     finish       12.19 F66 HU1     finish       SN 12 cleared     cancel       03:49:26     finish time	generic response     add new task       FB7_CU1     1       1 + 3     status assigned       Clear SN 13 and SAR     assign       Means allocated since     finish       11.29 FB7 USAR1     finish       11.29 FB7 UU1     cancel       08:33:39     finish time	generic response     add new task       FB3_CU1     1       1     + 3       status assigned     mmediately retreat of all fir assign       mmen engaged around the ammonia tower     finish       08:48:12     finish time				
		generic response     add new task       FB4_CU1     1       1 + 3     status assigned       Liear WE4 and SAR     assign       Means allocated since     finish       11.05 FB4 LU1     finish       11.15 FB4 HU1     cancel       08:18:24     finish time	generic response     add new task       FB6_CU1     1       1 + 3     status assigned       11.19 F96 LU1     assign       11.19 F96 LU1     finish       SN 12 cleared     finish       SN 12 cleared     cancel       08:49:26     finish time	generic response     add new task       FB7_CU1     1       1 + 3     status assigned       I = 43     assign       I = 4787 USAR1     finish       I 1.29 FB7 UJ1     finish       I 1.29 FB7 HU1     cancel       08:33:39     finish time	generic response       add new task         FB3_CU1       1 + 3         status assigned       mmediately retreat of all finer         mmonia tower       finish         08:48:12       finish time         status assigned       cancel				
		generic response     add new task       FB4_CU1     1       1 + 3     status assigned       Gear WE4 and SAR     assign       Means allocated since     finish       11.05 FB4 LU1     finish       11.15 FB4 HU1     cancel       08:18:24     finish time	generic response     add new task       FB6_CU1     1       1 + 3     status assigned       11.19 F86 HU1     assign       11.19 F86 HU1     finish       SN 12 cleared     causities rescued       08:49:26     finish time       status completed     status completed	generic response     add new task       FB7_CU1       1 + 3       status assigned       lear SN 13 and SAR       Means allocated since       11.29 FB7 UJA       11.29 FB7 HU1       08:33:39       finish time	generic response       add new task         FB3_CU1       1         1 + 3       status assigned         Immediately retreat of all firemen engaged around the ammonia tower       finish         08:48:12       finish time         status assigned       status assigned         1 + 3       status assigned         1 + 3       finish         1 + 5       finish time         1 + 5       finish time				
		generic response     add new task       FB4_CU1       1 + 3       status assigned       Clear WE4 and SAR       Hears allocated since       11.05 FB4 LU1       11.15 FB4 HU1       08:18:24       finish time	generic response     add new task       FB6_CU1     1       1 + 3     status assigned       11.19 F86 HU1     assign       Results     finish       SN 12 cleared     cancel       08:49:26     finish time       status completed     clear SN12 and SAR       Clear SN12 and SAR     assign	generic response     add new task       FB7_CU1       1 + 3       status assigned       Gear SN 13 and SAR       Means allocated since       11.29 FB7 USAR1       11.29 FB7 U11       11.29 FB7 HU1       08:33:39       finish time	generic response     add new task       FB3_CU1     1       1 + 3     status assigned       Immediately retreat of all finemen engaged around the ammonia tower     finish       08:48:12     finish time       status assigned     status assigned       Status assigned     finish       status assigned     finish       Status assigned     finish       Fit assigned     finish       Fit assigned     fit assign       Fit assigned     fit assign				
		generic response     add new task   FB4_CU1 1 + 3       status assigned       Clear WE4 and SAR       Means allocated since       11.05 FB4 LU1       11.15 FB4 HU1       Classes       08:18:24   finish time	generic response     add new task       FB6_CU1     1       1 + 3     status assigned       11.19 FB6 HU1     assign       Results     finish       S N12 cleared     cancel       08:49:26     finish time       status completed     Clear SN12 and SAR       Means allocated since     11.32 FB3 USAR2       11.32 FB3 USAR2     finish	generic response     add new task       FB7_CU1       1 + 3       status assigned       Clear SN 13 and SAR       Means allocated since       11.29 FB7 USAR1       11.29 FB7 UU1       11.29 FB7 HU1       08:33:39       finish time	generic response     add new task       FB3_CU1     1       1 + 3     status assigned       Immediately retreat of all freemen engaged around the ammonia tower     finish       08:48:12     finish time       status assigned     finish       11.07 FB3 HU1     finish       11.07 FB3 HU1     finish       08:26:42     finish time				
		generic response     add new task       FB4_CU1       1 + 3       status assigned       Clear WE4 and SAR       Bass allocated since       11.09 FB3 USAR1       11.15 FB4 HU1       11.15 FB4 HU1       08:18:24       finish time	generic response     add new task       FB6_CU1     1       1 + 3     status assigned       1.1.9 F06 LU1     assign       1.1.9 F06 HU1     finish       SN 12 cleared     cancel       08:49:26     finish time       status completed     cancel       Clear SN12 and SAR     assign       Means allocated since     finish       11.19 F06 LU1     finish       11.19 F06 LU1     cancel	generic response     add new task       FB7_CU1     1       1 + 3     status assigned       Clear SN 13 and SAR     assign       Means allocated since     finish       11.29 FB7 USAR1     finish       11.29 FB7 UU1     cancel       08:33:39     finish time	generic response     add new task       FB3_CU1     1       1 + 3     status assigned       Immediately retreat of all finemen engaged around the amornia tower     finish       08:48:12     finish time       status assigned     status assigned       status assigned     cancel       08:48:12     finish time       status assigned     finish       status assigned     finish       11.07 Fras Hu1     finish       11.12 FB3 HU2     cancel       08:26:42     finish time				
		generic response     add new task       FB4_CU1     1       1 + 3     status assigned       Clear WE4 and SAR     assign       Means allocated since     finish       11.05 FB3 USAR1     finish       11.15 FB4 UU1     cancel       08:18:24     finish time	generic response     add new task       FB6_CU1     1       1 + 3     status assigned       I + 96 HU1     assign       Results     finish       SN 12 cleared     cancel       08:49:26     finish time       status completed     cancel       Clear SN U2 and SAR     assign       Haar sallocated since     finish       Haar sallocated since     finish       II.19 F96 HU1     cancel       09:34:44     09:54:43	generic response     add new task       FB7_CU1     1       1 + 3     status assigned       Gener SN 13 and SAR     assign       Means allocated since     finish       11.29 FB7 USAR1     finish       11.29 FB7 USAR1     cancel       08:33:39     finish time	generic response     add new task       FB3_CU1     1       1 + 3     status assigned       Immediately retreat of all figers     assign       Immediately retreat of all figers     finish       Immediately retreat of all figers     assign       Immediately retreat of all figers     cancel       08:48:12     finish time       stablish CCP     assign       Means allocated since     finish       11.07 PTB HUI     finish       11.107 PTB HUI     finish       11.23 FB3 CU2     cancel       08:26:42     finish time       status assigned     assign				
		generic response     add new task   FB4_CU1 1 + 3       I + 3         Status assigned         Clear WE4 and SAR         Means allocated since       11.05 FB4 UI         finish         11.15 FB4 HU1         08:18:24   finish time	generic response     add new task       FB6_CU1     1       1 + 3     status assigned       11.19 Fb6 LU1     assign       11.9 Fb6 LU1     finish       12 cleared     cancel       03:49:26     finish time       status completed     cancel       Clear SN12 and SAR     assign       Haars SUSAR2     finish       11.19 Fb6 LU1     cancel       03:34:14     09:54:43	generic response     add new task       FB7_CU1       1 + 3       Status assigned       Clear SN 13 and SAR       Means allocated since       11.29 FB7 USR1       11.29 FB7 UU1       11.29 FB7 UU1       08:33:39       finish time	generic response     add new task       FB3_CU1     1       1 + 3     status assigned       Imme diately retreat of all fine assign     finish       ammonia tower     finish       08:48:12     finish time       status assigned     finish       Establish CCP     assign       Means allocated since     finish       11.07 FB3 HU1     finish       11.23 FB3 HU2     cancel       08:26:42     finish time       status assigned     assign       Assessment of cloud pro     assign       assign     assign				
		generic response     add new task   FB4_CU1 1 + 3       I + 3         status assigned         Clear WE4 and SAR         Means allocated since         11.05 FB4 UJ         11.15 FB4 UJ         11.15 FB4 UJ         08:18:24   finish time       generic response         add new task	generic response     add new task       FB6_CU1     1       1 + 3     status assigned       11.19 F66 LU1     assign       11.9 F66 HU1     finish       12 cleared     cancel       08:49:26     finish time       status completed     cancel       11.2 F66 LU1     finish       11.32 F65 LU1     finish       11.32 F65 LU1     finish       11.32 F65 LU1     finish       11.32 F65 LU1     cancel       08:34:14     09:54:43	generic response       add new task         FB7_CU1       1         1 + 3       status assigned         Clear SN 13 and SAR       assign         Means allocated since       finish         1.29 FB7 USAR1       finish         1.29 FB7 HU1       cancel         08:33:39       finish time         generic response       add new task	generic response       add new task         FB3_CU1       1         1 + 3       status assigned         meme diately retreat of all fines       assign         meme ongoad around the ammonia tower       finish         08:48:12       finish time         status assigned       finish         estatus assigned       finish         Establish CCP       assign         Means allocated since       finish         11:07 PB3 HU1       finish         11:12,7 PB3 HU1       finish         cancel       08:26:42       finish time         status assigned       assign       assign         assessment of cloud pro       assign       assign         generic response       add new task       add new task				
	lowest on 1920x1080	generic response     add new task   FB4_CU1 1 + 3       status assigned       lear WE4 and SAR       Means allocated since       11.05 FB4 U1       11.15 FB4 HU1       08:18:24       finish time   generic response <ul> <li>add new task</li> </ul>	generic response     add new task   FB6_CU1 1 + 3        status assigned       1.19 F66 LU1     assign       1.19 F66 HU1     finish       N1 2 cleared     cancel       03:49:26     finish time   status completed       Clear SN12 and SAR     assign       11.19 F66 LU1     finish       11.2 F63 USAR2     finish       11.39 F66 LU1     cancel       09:34:44     09:54:43       generic response     add new task	generic response       add new task         FB7_CU1       1         1 + 3       status assigned         Bens allocated since       assign         11.29 FB7 USAR1       finish         11.29 FB7 USAR1       finish         11.29 FB7 HU1       cancel         08:33:39       finish time         generic response       add new task	generic response       add new task         FB3_CU1       1         1 + 3       status assigned         meme draged around the annound the ammonia tower       finish         08:48:12       finish time         status assigned       finish         Status assigned       assign         Status assigned       finish         Status assigned       finish         11.07 FB3 HU1       finish         11.23 FB3 CU2       cancel         08:26:42       finish time         status assigned       assign         sessment of cloud pro       assign         generic response       add new task				



## **COPE** Decision Support

- Risk analyser
  - 1. Dynamic risk analysis
  - 2. Analytic risk analysis
- Site map
  - Display of Common Operational Picture
  - Insertion/Removal of HazCons resulting from the Risk Analysis in the COP
- Gateway communication
  - TSO messages



### **COPE Decision Support**

#### Dynamic risk analysis

ntroi measure activation Uynamic Risk Analysis Analytic Risk Analysis				4 P
			^	Control Options
Hazards> Controls		۸		Risk Cards in use 1.01 - Road traffic collisio
Hazard		Control		
Other road users	+	Police assistance, fend off, signs/cones/lights, hi-vis jackets. Dismount safe side.		
	+	If within 200m of a level crossing inform Network Rail.		
Ignition of flammables, LPG, dual fuel vehicles	+	Deploy extinguishing media, make safe.		
Contamination by body fluids	+	PPE, Trigene/Hydrex. Do not commit with cuts/abrasions.		Remove this Risk Card
Vehicles and fireservice equipment - hydraulic oi	+	PPE for al in risk area, protect casualties, cordon - restrict numbers.		Bemoue All Dick Cards
	+	Form RP/010 for high pressure mineral oil injections.		Consider
Slip and trip hazards	+	Supervision, lighting, equipment dump, brief crews.		1.02 - Car and vehicle fin 4.04 - Fuel spillages
Aggressive bystanders/vehicle occupants	+	Police assistance, non-confrontational approach		4.07 - Hazmats
Noise	+	Hearing protection, site noisy equipment away from working area, crew rotation.		
Hazmats, including flouroelastomers	+	Identification, PPE/BA.		
Vehicle construction:seatbelt tensioner, airbags,	+	Supervision, crew positioning, cordins, restrict access, brief crews and other agency staff. Remove/restrict radios/pagers, mobile phones, peel to reveal.		
Lorry tyres may explode violently if they have be	+	Cordon off and allow to cool otherwise brief crews to avoid hazard zone - consider shielding firefighters/casualties.		Add selected Risk Care
	_			
Operational Reminders		*		
🖻 Operational Remainders				
🗄 On approach – consider				
B Salety				



### **COPE Decision Support**

#### Analytic risk analysis

-								-	1.01 - Road traffic collisi	
Ha	zard	Control	Severity		Likelihood		Risk Value	Active		
01	her road users	Police assistance, fend off, signs/cones/lights, hi-vis jackets. Dismount safe side.	8 <b>4</b> %	*	4	~	4			
01	her road users	If within 200m of a level crossing inform Network Rail.	(#1)	~	-	~	-			
Ig	nition of flammables, LPG, dual fuel vehicles	Deploy extinguishing media, make safe.	( <b>1</b> 1)	~	-	~	<u> </u>			
Co	ntamination by body fluids	PPE, Trigene/Hydrex. Do not commit with cuts/abrasions.	Slightly harmful	~	Highly Unlikely	, 💌	Trivial Risk		100	Remove this Risk Car
Ve	hicles and fireservice equipment - hydraulic oil ak at high pressure, traps, cuts, crush injuries	PPE for al in risk area, protect casualties, cordon - restrict numbers.	123	~	<u> 24</u>	~	-			Remove All Risk Card
Ve	hicles and fireservice equipment - hydraulic oil ak at high pressure, traps, cuts, crush injuries	Form RP/010 for high pressure mineral oil injections.		~	24	*	-			Consider 1.02 - Car and vehicle f 4.04 - Evel spillages
Sli	p and trip hazards	Supervision, lighting, equipment dump, brief crews.	Extremely Harmful	*	Likely	~[	ntolerable Risk			4.07 - Hazmats
Ag	gressive bystanders/vehicle occupants	Police assistance, non-confrontational approach	( <b>-</b> ))	~	18	~	-			
No	vise	Hearing protection, site noisy equipment away from working area, crew rotation.	123	~	<u>a</u>	~	<u>~</u>			
Ha	azmats, including flouroelastomers	Identification, PPE/BA.	Harmful	*	Unlikely	, 🔽 !	Moderate Risk		-	
Ve su ac	hicle construction:seatbelt tensioner, airbags, spension units, gas struts, spring brake tuators, rollover protection systems.	Supervision, crew positioning, cordins, restrict access, brief crews and other agency staff. Remove/restrict radios/pagers, mobile phones, peel to reveal.		*	12	~	2			Add selected Risk Ca
Lo be	rry tyres may explode violently if they have en subject to heating or fire.	Cordon off and allow to cool otherwise brief crews to avoid hazard zone - consider shielding firefighters/casualties.	3 <u>1</u> 20	*	8 <u>12</u>	~	22			



### CDS S/W Features – Site Map





### **Questions & answers**

Partner	Area	Present
VTT	Communication	Yes
UTI	Sensors	Yes
BAE UK	First responder equipment	Yes
GMV	Decision support	No
Bofors	Sensors	No
C-ITS	Command & Control	Yes

