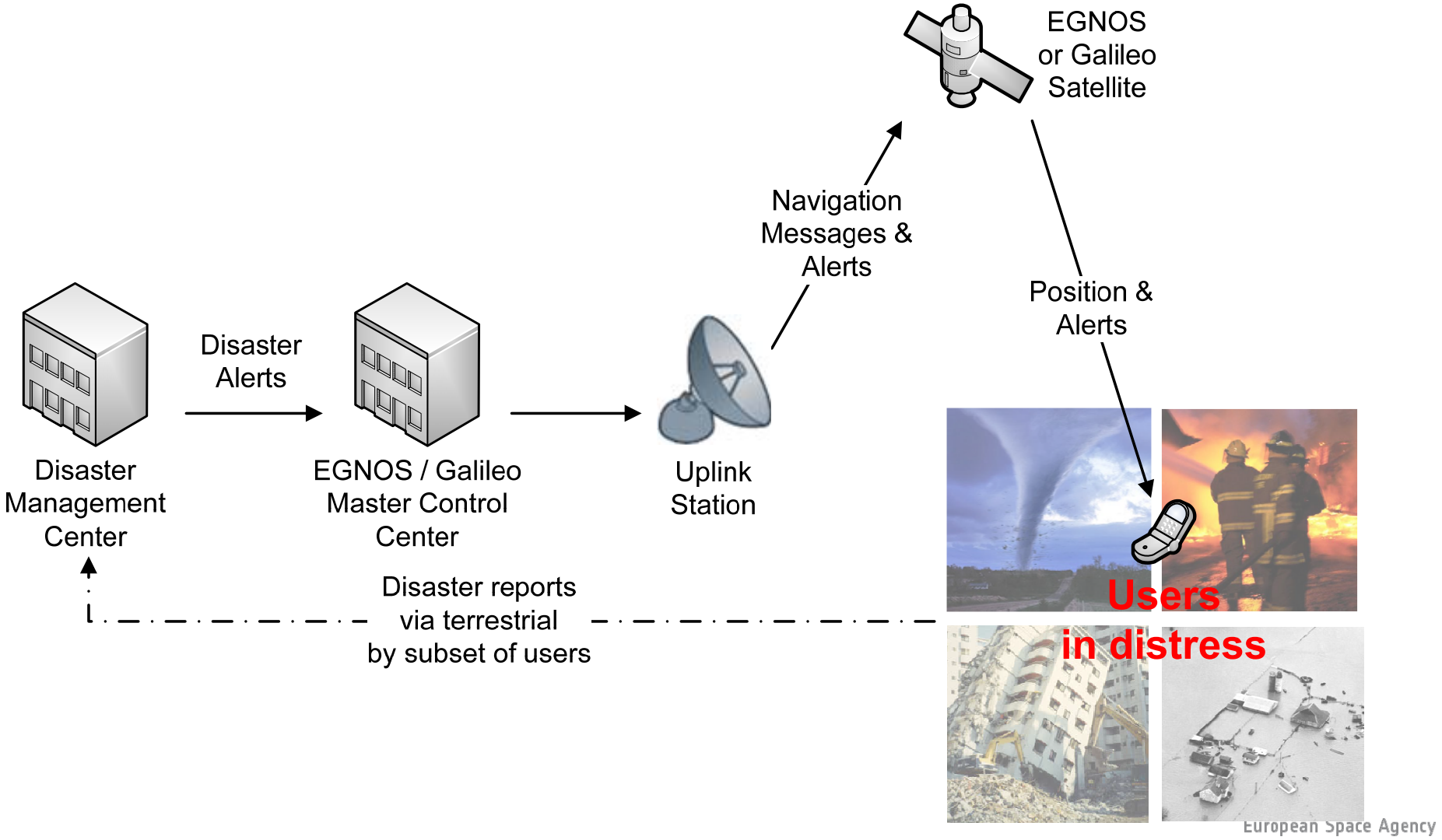
European GNSS Evolutions
GNSS Emergency Service - Scope & Test bed

Directorate of Galileo programme
and navigation-related activities

European Space Agency

GNSS Emergency Service Concept



Main Actors Emergency Services

- World wide
  - United Nations
    - OCHA - Office for Coordination Humanitarian Aid
    - UNESCO - UN Educational Scientific & Cultural Organisation
    - UNESCO IOC - Intergovernmental Oceanic Commission
  - International Telecommunication Union
    - ITU-D Emergency Telecoms
    - ITU-S Standards
- Continental
  - Europe:
    - EC MIC - Monitoring and Information Center
    - EC JRC GDACS - Global Disaster Alert and Coordination System
  - USA
    - NRW - NOAA Weather Radio
    - FCC AES - Early Alert System
  - Japan
    - Japanese Meteorological Agency (JMA)
  - ...
- National
  - European National Governmental Civil Protection Agencies
  - Netherlands: National Crisis Centre
  - ...

Benefits of concept with current SBAS / EGNOS

- The three existing SBAS together provide a **global GEO broadcast coverage**;
- SBAS receivers are based on GPS receivers and share the same **worldwide accepted** standards; we may consider that GPS/SBAS is the most popular “satellite communication” (meaning able to receive communication information through satellite) receiver worldwide;
- SBAS GPS receivers can **combine the possibility of warning with the ability to determine the location** of the receiver in the same equipment (key feature);
- The SBAS systems, having been conceived as safety of life systems with integrity, include the necessary built-in features to **guarantee** adequate message broadcast, integrity of messages, confirmation of transmission; acknowledge messages to sending organizations, etc;
- It is estimated that there is **sufficient transmission bandwidth** available to accommodate the proposed function;
- Any other satellite based emergency system will be **more expensive** (GNSS chip <1$).

Draft EGNOS Message Format

Field	Sub-field	Units	Description	Range	Size (bits)	
Preamble	---	N/A	See [RD-3]	N/A	8	8
Message type	---	N/A	Used to select the priority level of the alarm	60, 62	6	6
Geographical Criteria	Latitude_NS	N/A	Latitude North or South	0-1	1	42
	Latitude_D	Degrees	Latitude degrees	0-89	7	
	Latitude_M	Minutes	Latitude minutes	0-59	6	
	Latitude_F	Frac. of minute	Latitude minute fraction	0-15	4	
	Longitude_EW	N/A	Longitude East or West	0-1	1	
	Longitude_D	Degrees	Longitude degrees	0-179	8	
	Longitude_M	Minutes	Longitude minutes	0-59	6	
	Longitude_F	Frac. of minute	Longitude minute fraction	0-15	4	
	Radius	Index	Radius of the alarm	0-31	5	
Type of Disaster	---	N/A	Identifier of a disaster type according to a catalogue	0-511	9	9
Validity Time	Day	days	Day of the month	1-31	5	26
	Month	Months	Month of the year	0-11	4	
	Year	Years	Year since 2000	0-63	6	
	Hour	Hours	Hour of the day	0-23	5	
	Min	minutes	minutes	0-59	6	
Important Directives	---	N/A	Important directives identifier extracted from a catalogue	0-511	9	9
Location / Evacuation info	---	N/A	Spare capacity for text message	N/A	126	126
Parity	---	N/A	See [RD-3]	N/A	24	24
TOTAL					250	250

Draft Galileo Message Format (CS channel)

Field	Sub-field	Units	Description	Encript	Range	Size (bits)	
Message Id	---	N/A	Identifier of the message	No	0-31	5	5
Target Group	---	N/A	Group/es to whom the msg is addressed	No	0-15	4	4
Alert Level	---	N/A	Alert Level	Yes	0-3	2	2
Originator	---	N/A	Originator of the alert	Yes	0-16383	14	14
Geographical Criteria	Type	N/A	Type of area	Yes	0-1	1	54
	Latitude_NS	N/A	Latitude North or South	Yes	0-1	1	
	Latitude_D	Degrees	Latitude degrees	Yes	0-89	7	
	Latitude_M	Minutes	Latitude minutes	Yes	0-59	6	
	Latitude_F	Frac. of minute	Latitude minute fraction	Yes	0-15	4	
	Longitude_EW	N/A	Longitude East or West	Yes	0-1	1	
	Longitude_D	Degrees	Longitude degrees	Yes	0-179	8	
	Longitude_M	Minutes	Longitude minutes	Yes	0-59	6	
	Longitude_F	Frac. of minute	Longitude minute fraction	Yes	0-15	4	
	R_Width	Index	Width of the rectangular area	Yes	0-31	5	
	R_Height	Index	Height of the rectangular area	Yes	0-31	5	
	Angle	frac. Of degrees	rotation angle fraction	Yes	0-63	6	
Type of Disaster	---	N/A	Identifier of a disaster type according to a catalogue	Yes	0-511	9	9
Validity Time	Next Week Flag	N/A	Flag to indicate if starting point refers to this week of the next one	Yes	0-1	1	27
	TOW_0	min	Time of Week (start)	Yes	0-16383	14	
	Duration	min	Duration	Yes	0-4095	12	
Important Directives	---	N/A	Important directives identifier extracted from a catalogue	Yes	0-511	9	9
Location / Evacuation info	---	N/A	Spare capacity for text message	Yes	N/A	322	322
Reserved						4	4
TOTAL						**448**	**448**

Description running Test Bed activity in EGEP Programme

2011 - 2012

GNSS Emergency Service Test Bed - Objectives

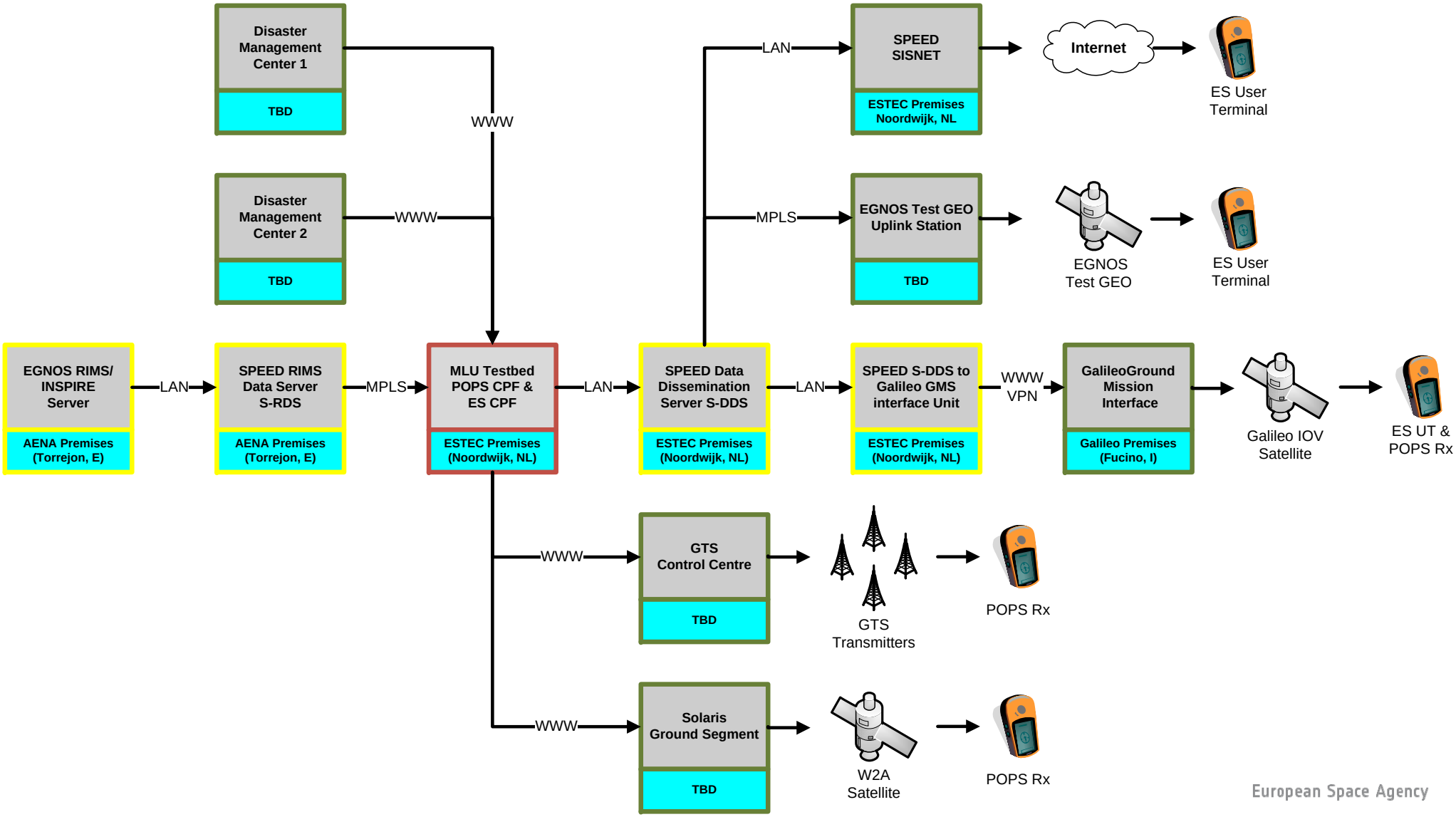
- To demonstrate and generate interest in an GNSS ES. Cooperation with JRC GDACS system and national civil protection agencies in NL, DE and UK.

- To define the ES SBAS Message Standard in cooperation with Disaster Management Centre entities.

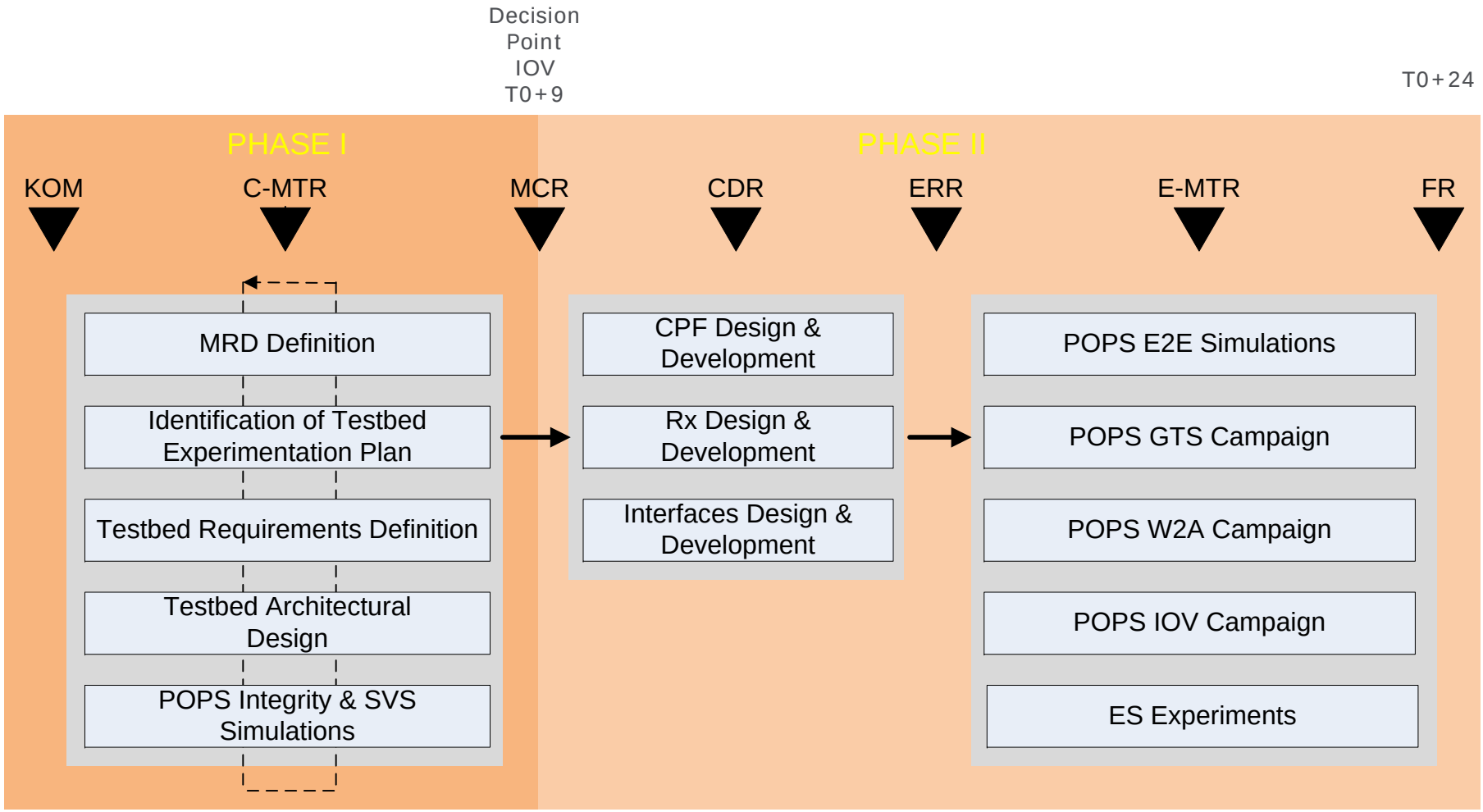
- End to end demonstration of the service with SBAS SISNET, EGNOS GEO and with Galileo IOV / FOC.

- To develop dedicated ES receivers and update handheld phones to receive and handle ES messages.

GNSS Emergency Service Test Bed - Architecture



GNSS Emergency Service Test Bed
Development logic (T0 = Dec 2010)



Conclusions

- Emergency service provision via GNSS/SBAS is considered to be an efficient way to provide affected persons with emergency related information
  - Unidirectional link
  - GNSS/multiregional SBAS achieve almost worldwide coverage
  - Cheap implementation at user segment possible
- Data handling needs to be worked on
- Testbed activities ongoing within ESA EGEP (European GNSS Evolution Programme)