

D2.3.4

Validation Scenario Definition of 3rd Testbed

Version 1.0



WP 2.3 Testbed Definition

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Context

Activity 2	Environment and Requirements
WP 2.3	Within this work package the requirements of the Testbeds will be collected and will provide vital input to the architecture and development work
Task T2.3.2	As part of this task the DHCM testbed will be defined. Part of this definition will be an overall story that delivers the context of the anticipated application scenario. Furthermore this task will work out which existing applications are the candidates to be re-used in this setting and a storyboard that outlines the different phases and interactions on an abstract layer are described. Similar to the corresponding documentation of the eHealth and eLearning testbed the major Use Cases of this application are provided.
Dependencies	This deliverable uses specifically the input of the deliverable D2.3.1 for deriving the scenario descriptions and elements. It bases on the structure of D2.3.2 Validation Scenarios. It will be the basis for the final work to be done in Activities 3, 4 and 5. Furthermore, it is the starting point of the Akogrimo Demonstrator. The Demonstrator will be defined in D2.3.5 Demonstrator Definition and further detailed, implemented and rolled out in WP7.1.

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Executive Summary

This deliverable presents the first step on the transition from the initial scenarios for Disaster Handling and Crisis Management testbed in deliverable D2.3.1 “Testbed Description extension” to the demonstrator that will be rolled-out at the end of the project in a realistic environment.

Following the analysis of Mobile Grid and knowledge processing challenges carried out in the “Testbed Description” document, two visionary scenarios were identified and are used as a starting point for the validation scenarios specified in D2.3.2 Validation Scenarios. These scenarios were “Emergency” scenario from the e-Health testbed and the “Field Trip” scenario from the e-Learning testbed were selected and extended to elaborate the Grid needs more precisely.

In this document we add a third validation scenario “Integrated Emergency Management” for the third testbed: Disaster Handling and Crisis Management (DHCM). Care has been taken to provide Akogrimo with a broad spectrum of use cases and deep requirements to explore.

Within the Validation Scenarios, the behaviour as well as the user interaction is described. For elaborating the requirements and for achieving a unique and clear description of the complex functional interrelationships four artefacts typical to requirements analysis have been applied to analyse the scenarios. These are: storyboard, use-case models, use-case descriptions and user requirements. With the storyboard a narrative description of the overall context of the scenarios and a typical process that can be realized with the particular application could be provided. By using the use case diagram and the detailed use case description functional requirements and conditions for each scenario have been derived. This activity was underpinned by an additional characterization of the involved actors and services the application should provide. The interaction between actors and services was detailed in sequence diagrams that have been created for some scenarios, exemplarily.

During the requirements analysis it turned out that a clear distinction between services provided by the Mobile Grid platform and services provided by the application itself is needed. In order to separate between requirements addressing the application space and those addressing the platform a two-step approach was suggested. This report comprises all requirements on the DHCM application without shaping out particular requirements on the underlying platform.

Analysis is seen from the application user’s point of view. That said, the scenarios are primarily designed to demonstrate the power and flexibility of the Akogrimo framework undertaken in WP4 rather than the applications per-se.

Another useful observation that may be made is that much of the original Akogrimo DHCM white paper [5] maps on to UC-DHCM 06: Establish Common Operational Picture (page 62). This use case is extremely scaleable depending on the type and extent of the disaster. We propose for the response to a Chemical/Biological/Radiological/Nuclear (CBRN) event to focus solely on Silver Ambulance control as being ideal for both Akogrimo’s and the IEM community’s needs as we could not attempt to be comprehensive with the time and resources provided through Akogrimo. Furthermore there is ample opportunity for other Akogrimo testbeds and partners to contribute and enrich UC-DHCM 06 as they see fit.

Building on the original white paper and its recent update [6] technical challenges are provided (pages 30 and 78). Care has been taken to assure exploitation in the demanding DHCM domain and as part of this extensive end user consultation has been undertaken. The intention is to encourage an additional community for both academic and physical uptake. If this strategy is successful there are very real and significant social, economic and environment impacts to be reaped across the EU.

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Abbreviations

Akogrimo	Access To Knowledge through the Grid in a Mobile World
AIO	Ambulance Incident Officer
AP	Affected Populous
BCC	Bristol City Council
BCP	Business Continuity Plan
CBRN	Chemical/Biological/Radiological/Nuclear
CCM	Civil Contingencies Manager – head of the CCU
CCRF	Civil Contingencies Reaction Forces are reserve military forces who assist in emergencies in support of the civil authorities and regular forces
CCU	Civil Contingencies Unit – LA department responsible for EM
CMT	Crisis Management Team
COMAH	Control of Major Accident Hazards - Regulations applying to chemical, explosive and nuclear sites
CO	Commanding Officer
COP	Common Operational Picture
CORAS	An EU IST project focusing on risk management
D	Deliverable
DHCM	Disaster Handling and Crisis Management
EM	Emergency Management
eRIG	Environment Recovery Impact Group
ES	Emergency Service “blue light” organisations e.g. Police
EU	European Union
FT	Field Trip
GIS	Geospatial Information System (e.g. map and proximity displays)
GSB	Gold Silver Bronze
HAZMAT	Hazardous Materials
HMES	Heart Monitoring and Emergency Service
H&S	Health and Safety
HSE	Health and Safety Executive
IEM	Integrated Emergency Management
IP6	Internet Protocol version 6
ISDR	International Strategy for Disaster Reduction
ITCO	IT Coordinating Officers
KB	Knowledge Base (a knowledge store/repository)
KM	Knowledge Management

LA	Local Authority
	Please Note: <i>this means “Local Government” not to be confused with “Public Authorities” as used in other testbed description documents. In this document “ES” is likely to be equivalent to Public Authorities in other testbed description documents.</i>
LO	Liaison Officer
MACC	Military Aid to the Civil Community
MDVO	Mobile Dynamic Virtual Organization
NGO	Non-Government Organization
PAS	Proximity Analysis Service
PTDMS	Persistent Tuneable Data Mining Services
RA	Risk Analysis (2 nd stage of Risk Management)
RAT	Recovery Action Team (Local Authority led analogous to a Bronze command though one per recovery impact type)
RI	Risk Identification (1 st stage of Risk Management in CORAS)
RIG	Recovery Impact Group (Local Authority led analogous to Silver command)
RM	Risk Management
SA	Specialist Advisors
SitRep	Situational Report (a brief of current situation, most commonly from operational roles)
SRG	Strategic Recovery Group (Local Authority led analogous to Gold command)
SS	Scientific Services (part of the Local Authority organization)
TRI	Treatment Resource Instance (a real example of something that is used as help solve unwanted instances in Risk Analysis)
UML	Unified Modelling Language
UC	Use Case
UK	United Kingdom
UN	United Nations
WP	Work Package

1. Introduction

1.1. Document Description

This document takes the scenario definition from the Akogrimo D2.3.2 extension document [4] and specifies scenario details using the chosen Akogrimo artefacts. Document structure corresponds to the structure of D2.3.2 Validation Scenarios [2]. Given the complexity, dynamism and potential scale of the scenario at hand we have added extra sections where we thought this useful.

1.2. Choice of DHCM for 3rd Testbed

The explanation for selection of Disaster Handling and Crisis management (DHCM) was covered in [5]. We remain satisfied in the selection of DHCM for the third testbed and fixed on a terrorist activated Chemical/Biological/Radiological/Nuclear (CBRN) event refined to a dirty bomb scenario. Current media attention reflects the public concerns in regard to the threats posed by terrorism. Increasingly there is an understanding of the potential of technology to combat what is a large scale problem (e.g. [2] cites: 214 terrorist offence convictions in UK in the past 5 years with 98 awaiting trial and significant loss of life, injury as well as financial losses).

Through stakeholder engagement the 3rd Akogrimo testbed DHCM has broadened its perspective to encompass the entire Integrated Emergency Management (IEM) process (details are covered in section 3.1). This means that the planning and recovery phases are included as well as the remit scoped in the original white paper [5] which was primarily what would be thought of as the response phase in IEM.

IEM provides an ideal domain for validating the Akogrimo infrastructure. Knowledge assets can be shared in a secure and managed way using VO capabilities that will enable the cornerstone of IEM a Common Operational Picture (COP) during response. A robust and reliable network and Grid infrastructure that allows for the storage, exchange and processing of various types and amount of data is most suitable to form the backbone for information systems supporting an Integrated Emergency Management. Mobility can deliver knowledge to field workers without hindrance in different contexts all of which are essential for their work. There are rich, deep organizational aspects to explore, with many different actor viewpoints supported.

When implemented and deployed in the field, Akogrimo-based decision support infrastructure could contribute to reducing the threat and impact of real disaster events. We believe that the Akogrimo DHCM testbed has the potential to provide much utility towards harmonizing viewpoints across the IEM phases to the great benefit of UK civil contingency efforts in the first place. Ultimately with continued consultation/dissemination, improvement to civil contingency and business continuity across Europe and further to great social and economic benefit could also be provided.

Interestingly, through stakeholder engagement the full extent of how all aspects of daily Local Authority (LA) business could benefit from Akogrimo are only just starting to emerge. The time approaches for a watershed where, through many e-Government initiatives service delivery is increasingly electronically managed. Thus, the Akogrimo value chain and its technologies could help LAs to become more efficient at handling. This may even change LA business models, thereby providing promise of more opportunities for third parties to contribute, so stimulating commerce. These findings will be fed into WP6.3 for discussion.

1.3. International Perspective

IEM is an increasing international trend towards tackling the demands of disaster reduction and response. The DHCM testbed scenario as it currently stands is suited to a UK perspective, especially in terms of how national legislation and guidance affects the process and organizational interactions. However much of the spirit of the legislation and guidance is borne out of longstanding best practice that holds true in an international perspective. Therefore much of what is described here is in fact salient across the globe. We will pursue international dissemination as part of WP 6.

To mitigate any potential risk that the material presented in this document is too focused on the UK perspective, specialist key stakeholder group members have been solicited. These individuals are also significantly involved in EU led projects (INTERREG projects: Aware, Chain of Safety, time2C & DIP) and international DHCM forums. Continued assistance will be sought during the dissemination program, WP6, of the Akogrimo project and we will engage with equivalent international projects to help prevent idiosyncrasies that may adversely affect demonstration or dissemination.

Specifically, we will seek the further advice in aspects of:

- European equivalence of IEM used in the DHCM testbed
- Related EU projects that we can draw from or contribute towards through Akogrimo
- The further complications that arise through disasters that cross international borders

Our initial consultation and analysis of the United Nations (UN) International Strategy for Disaster Reduction (ISDR) and the recent International Conference on Early Warning [2] leads to believe that Akogrimo DHCM testbed will:

- receive much interest from the related communities
- benefit from the lessons learned and practical guides authored under the ISDR
- be complementary to the projects highlighted by ISDR

The last point is important for capitalising on potential international exploitation. The obvious difference is that the ISDR projects tend to fall into one of two categories: either relatively proven technology base in new (developing) areas, or new technologies that tend to focus on presentation and last mile delivery. This is in contrast to the inter-organizational, mobile, dynamic contexts and rich architecture that Akogrimo aspires to through its challenges even where we address public information and warning systems.

In summary these UK hosted scenarios should not preclude international interest, relevance or exploitation.

1.4. Relationship to Other Testbeds

In part this document provides some indication of the complexity and richness provided to the Akogrimo final demonstration and how aspects of the e-Learning and e-Health testbed can be usefully employed to provide a compelling and cohesive use of mobile grid technology and knowledge services as part of a wider demonstration built on the third testbed. This is dealt with in detail (e.g. in sections 4.1.1 and 5), but before reading section 3, Processes and Scenarios, it would be beneficial to describe this guiding principal at a high level.

1.4.1. e-Health

There is an obvious link to this testbed in that disasters may entail causalities. Also, monitoring could relieve otherwise overstretched human resources. The collaborative aspects of Akogrimo would mean that specialists that were in particular demand would be made more available e.g. Medical Consultants for radiation sickness.

1.4.2. e-Learning

Continual learning and risk driven process/plan refinement is very important to the IEM process used in the DHCM testbed. This is made more complex due to factors such as the multiplicity of organizations/roles/viewpoints that must be dealt with. The commitment to continual inter-organizational learning is evident in the amount of resource dedicated to training and exercises by EM practitioners. We will attempt to pull in as much effort from the e-Learning testbed as is practicable.

1.4.3. Testbed Harmonization

We envisage that the DHCM Testbed will go on to become a DHCM Demonstrator that incorporates the potential synergies described above. This would improve the demonstrator's capability and lend itself to a more cohesive set of offerings from Akogrimo though this will require greater co-ordination than originally planned for. The demonstrator will be enriched by services developed in the e-Health testbed and selected services from the e-Learning domain adapted to support a comprehensive IEM in the final demonstrator.

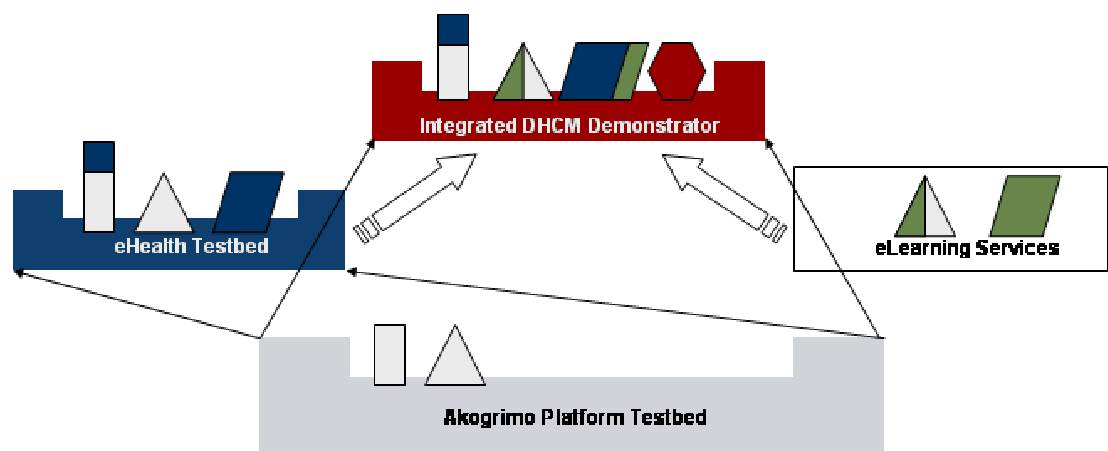


Figure 1: Formation of the DHCM Demonstrator

With this in mind, some project refocusing may be apparent in comparison to [5].

2. Approach and Methodical Procedure

In D2.3.2 Validation Scenarios we elaborated a comprehensive approach to the description of the e-Health and e-Learning validation scenarios and the analysis of the respective requirements. The approach comprises the following artefacts:

- Storyboard
- Use case models
- Use case descriptions
- User requirements / functional and non-functional requirements

A detailed description of the approach and the artefacts can be found in [3] (on page 13 et seq.).

A complementary approach will be applied for the specification of the DHCM validation scenario in the following chapters.

3. Processes and Scenarios

3.1. Storyboard

3.1.1. Introduction & Overall Situation

We felt that to adequately convey the operational benefits to the emergency management community the final demonstration should be sufficiently realistic. This requires the scenarios, use cases and requirements to be more complex than the previous examples. As well as attempting such a goal this section also describes background issues for the Akogrimo partners.

The following diagram attempts to capture some key features of Akogrimo applied to IEM.

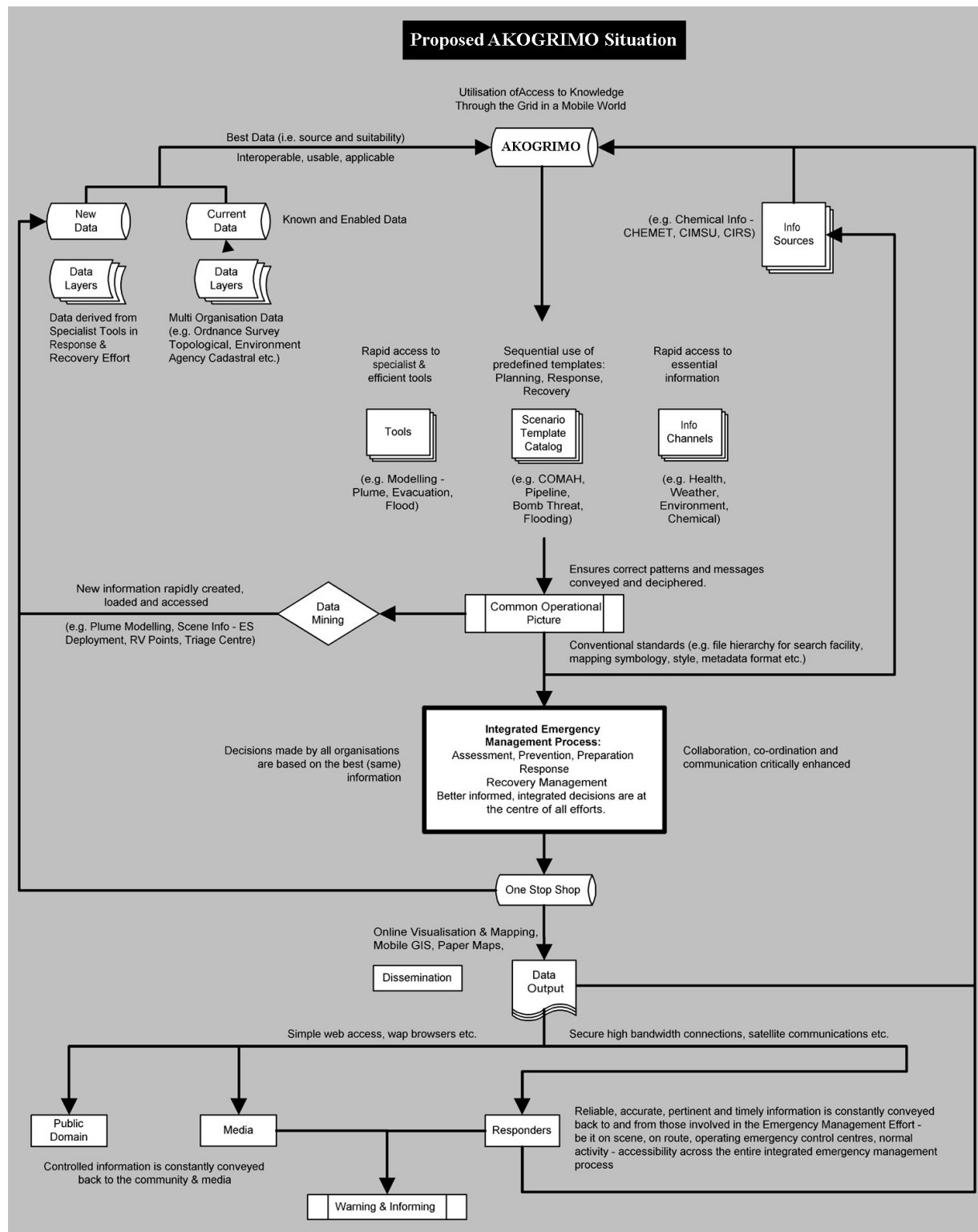


Figure 2: DHCM IEM made “seamless” through Akogrimo (source BCC CCU)

There is significant complexity to be tackled mainly due to the breadth of organizations, roles, responsibilities and processes across which the burden of IEM lies. To attempt to illustrate the complexity in the following paragraphs we separately cover the organizational framework, its phases and how command and information service requirements stem from these.

3.1.2. Top level organization groupings

For the purpose of this description the organizational framework has the following groups:

- Emergency Services (ES)
- Local Authorities (LA)
- Specialist Advisors (SA)
- Affected Populous (AP)

However each group will have several distinct member organizations. For example ES include “blue-light” services: (Police, Ambulance, Fire). However this can also include Other Government Departments; for example military assistance can be called for under the Military Aid to the Civil Community (MACC) system.

We recommend to the reader that the list of actors (chapter 3.4, pg. 42) and the glossary (pg. 81) can be browsed to further appreciate this.

3.1.3. IEM Phasing

This organizational framework operates through well defined phases:

- Planning
- Response
- Recovery

Added complexity arises from the handing over of control to different parties. During planning, organizations are more autonomous than in the following phases, with ES and LA coordinating efforts with guidance from central government and initiatives such as the Regional Resilience Forum and the Local Resilience Forum. Much of their every day business is conducted with Business Continuity in mind; i.e. the risk managed provision of services to the public including the consideration of potential emergency situations.

3.1.4. IEM Planning Phase

Planning includes the following processes:

- Assessment
- Prevention
- Preparation

The following diagram first shows the typical current situation for planning, and secondly how central government guidance and legislation seeks to improve matters. Figures 3,5 and 6 were constructed by BCC in there own terms in light of consideration of current limitations and the potential impact that Akogrimo could bring about.

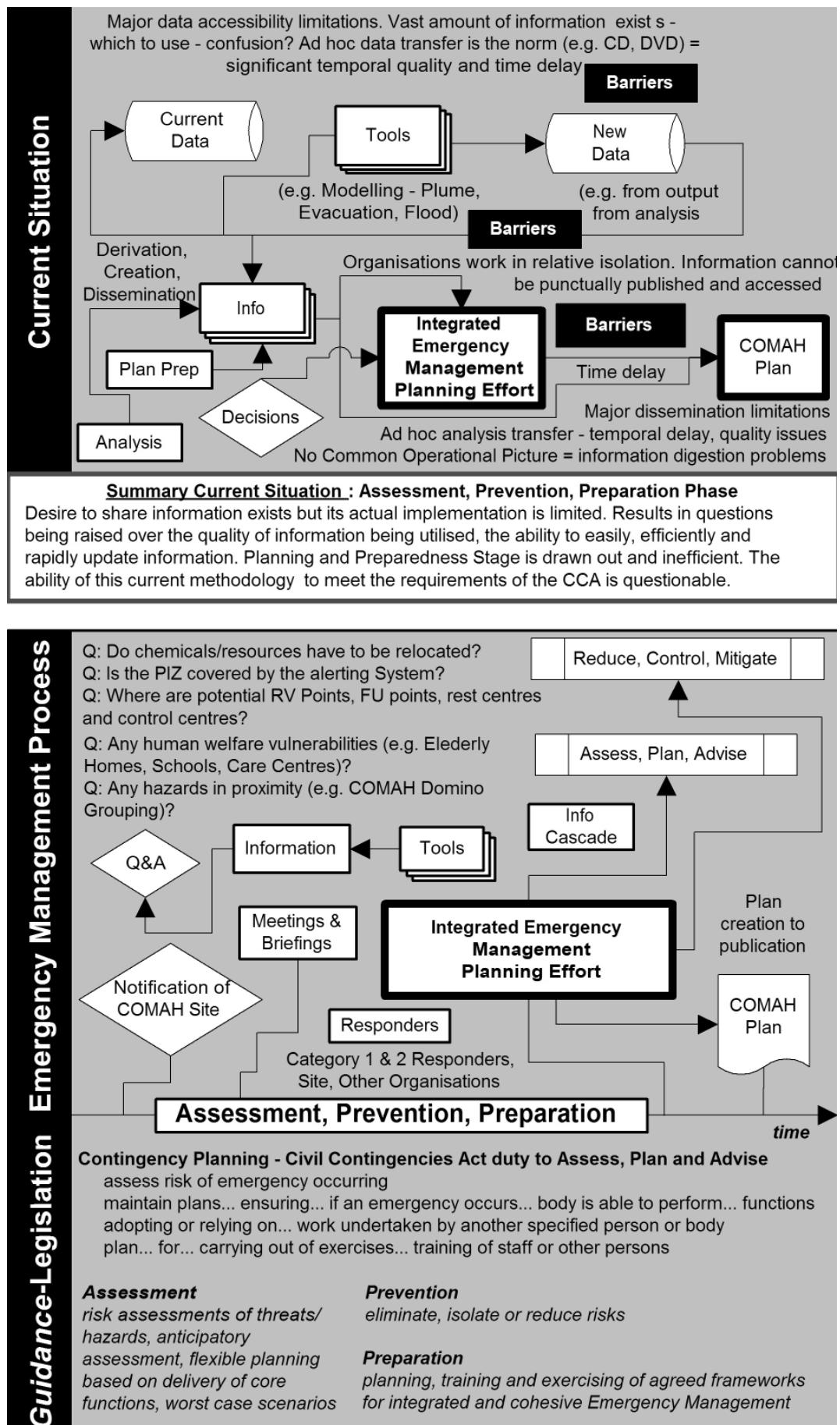


Figure 3: IEM Planning - current and required situation (source BCC CCU)

3.1.5. IEM Response Phase

The resources and actions of the organizational framework in response effort are coordinated through three levels of command Gold, Silver, Bronze (GSB):

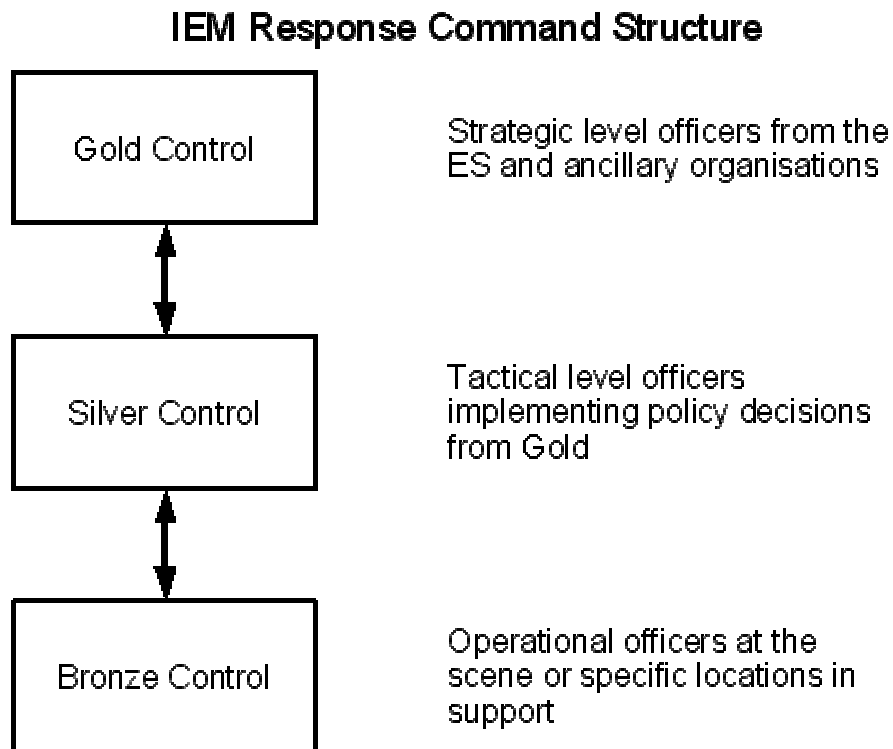


Figure 4: DHCM Response Command Structure

1. Gold (Strategic) control has overall command of each service and is responsible for formulating the strategy for the incident. Each member of Gold has overall command of the resources of their own organization but delegates tactical decisions to their respective Silver(s). At the outset of the incident Gold will determine the strategy and record a strategy statement. This will need to be monitored and subject to ongoing review. In all incidents involving criminal activity such as terrorism, the Gold Commander is vested in the Police Service.
2. Silver (tactical) control will attend the scene, take charge and be responsible for formulating the tactics to be adopted by their service to achieve the strategy set by Gold. Silver should not become personally involved with activities close to the incident, but remain detached.
3. Bronze (operational) control will control and deploy the resources of their respective service within a geographical sector or specific role and implement the tactics defined by Silver. First response units often form the Bronze function, if equipped to do so.

The following diagram first shows the typical current situation for response, and secondly how central government guidance and legislation seeks to improve matters.

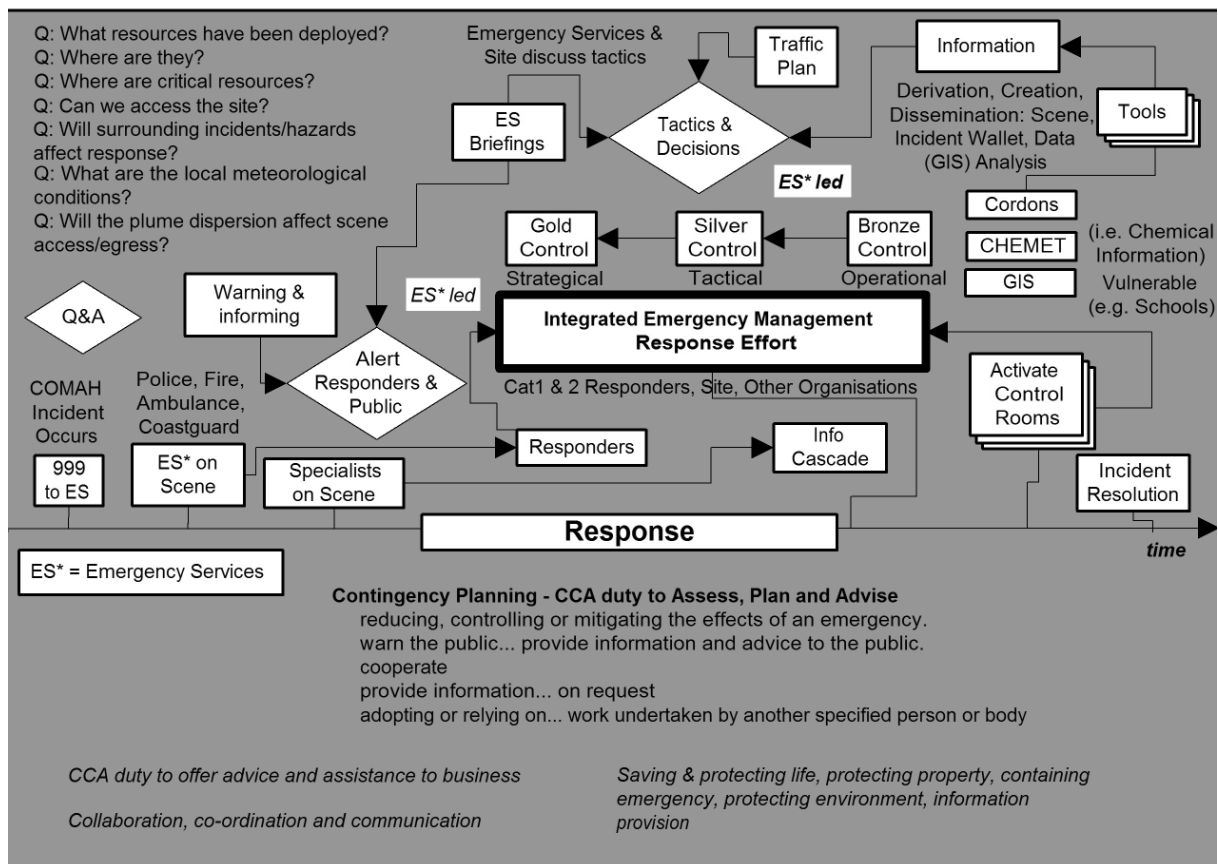
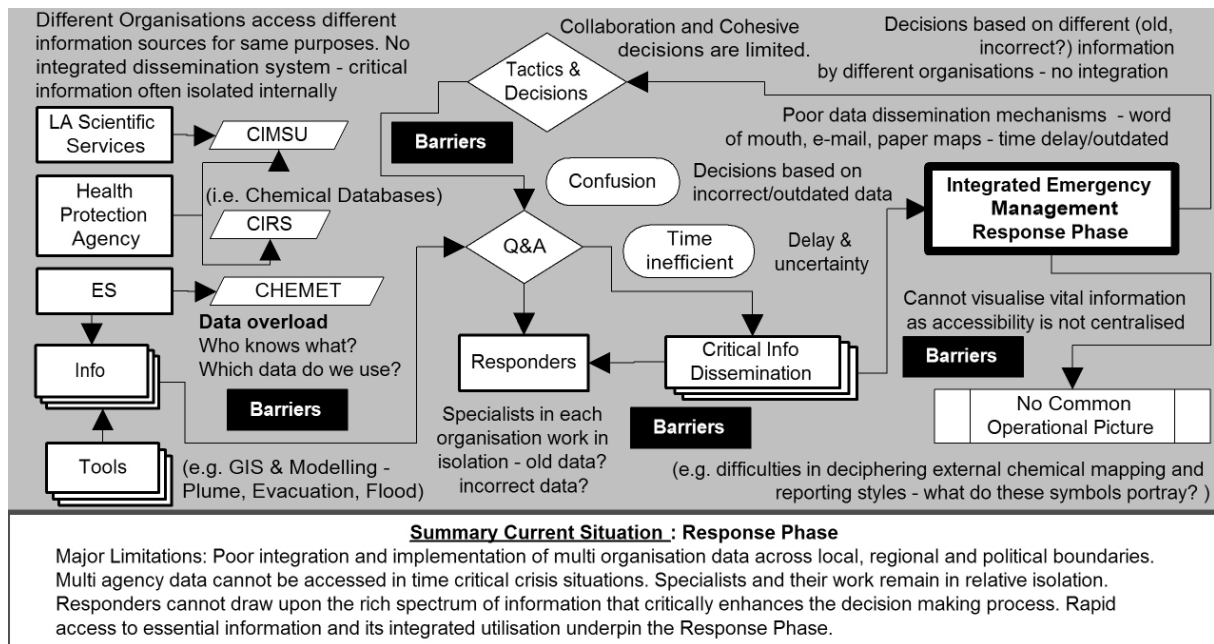


Figure 5: IEM Response - current and required situation (source BCC CCU)

The command hierarchy clearly operates top down but two important points are worth noting. Firstly that the effectiveness of decisions made are largely dependant on the SitReps and related information passed up the chain of command. Secondly that during an event the sequence of

forming the chain of command is in reverse order¹ i.e. Bronze establishes first, Gold last. The following subsections provide a brief description of this:

3.1.5.1. Response – Bronze Command Level

In this process the lead organization dramatically shifts from LA to ES.

The response phase command structure evolves from the type of the event and those the actors first present at the scene. In the first place, first responders immediately prioritise saving life. However it is usual practice that as superior officers arrive to the scene they will relieve those already in place and assume the role of command.

3.1.5.2. Response – Silver Command Level

Silver command is called in to action to provide dominance over the situation when it is considered that first responders will not be able to cope alone with decision making to provide dominance over the situation. This is often characterized by events with multiple cordons and will always be required for CBRN events.

As the incident progresses roles identified in the planning phases come into play. Examples of those commonly found include:

- ES Ambulance loading²
- ES Ambulance parking
- ES Police immediate cordoning
- ES Police immediate evacuation
- ES Fire safety
- ES Fire water provision

These have their own services that can be associated with their role in the COP. The following are distinct types of knowledge brokering through services:

- categorised knowledge through the previous phases and accounted for
- dynamic information that can be predicted as useful but that must be collected as part of the response (e.g. weather)³
- knowledge that cannot be predetermined as useful but could be discovered/searched for during an event⁴

We have decided to focus the most complex and scaleable use case, UC-DHCM 06 (page 57), on this level of command.

¹ This is apparent in Figure 10: DHCM – scenario timeline page 31 if the response phase is examined carefully

² We have decided to focus on Ambulance loading and parking to harmonize with the e-Health testbed. As described in the following paragraph the level of command that Ambulance proposed is Silver.

³ This is an interesting area for context shifts to occur which we intend to exploit in later activity

⁴ We propose that role based stereotype recommenders or machine learning techniques would be useful and we intend to provide these as services for the human actors in the DHCM testbed.

3.1.5.3. Response – Gold Command Level

If it is deemed necessary then the next level up in the chain of command will be introduced. This will certainly be the case in our CBNR scenario.

An interesting feature that will be useful for Akogrimo experimentation and demonstration is that part of the response phase which includes the setting up of the recovery teams and command. In the next sub-section the Strategic Recovery Group is described both in terms of necessary roles and individuals. Next the initial recovery plans are explored, particularly for “quick wins” and “potential pitfalls” that can be identified and built into the response strategy and tactics for GSB to act upon, reducing the overall impact of the disaster.

Usually the IEM network is formed from the constituent networks found within the organizational framework. This raises interesting problems on interdependencies, interoperability, responsibility and authority that will be dealt with by GSB and would be identified as part of the planning phases and well rehearsed through training and exercises. However it is natural for IEM practitioners to use their initiative to exploit possibilities or circumvent difficulties not planned for during the response phase. Thus, it is entirely likely that external commercial offerings such as those from network operators would be taken up, especially where they add unique capability or extra resilience, for example through infrastructure redundancy. Therefore several deployment types could be approached if it is determined to be of interest to the Akogrimo project.

A wide variety of services are relevant to the DHCM testbed, including those already covered by the e-Health and e-Learning testbeds.

3.1.6. IEM Recovery Phase

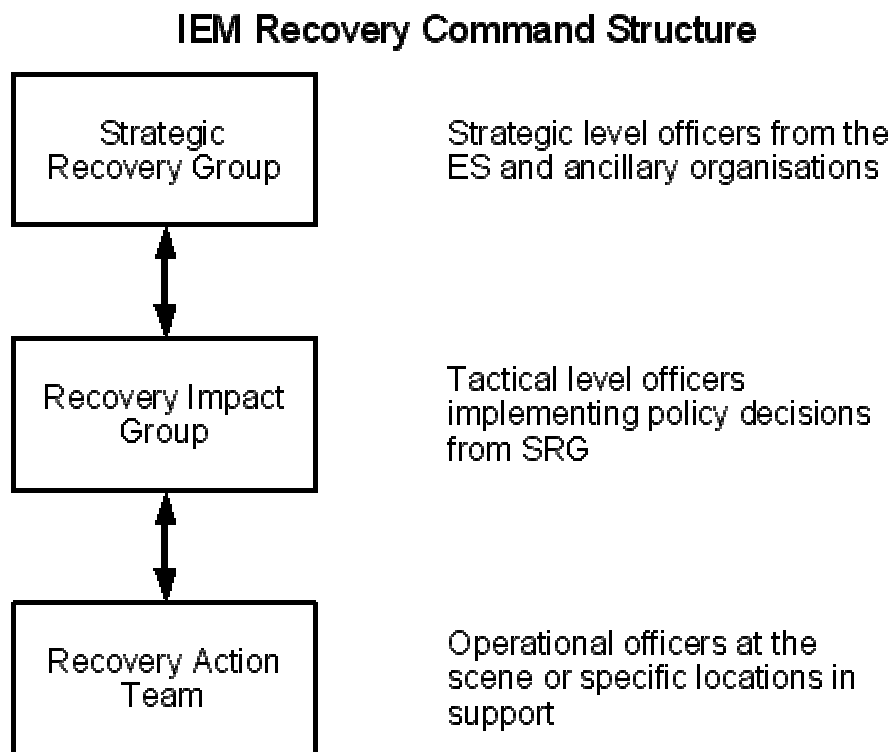
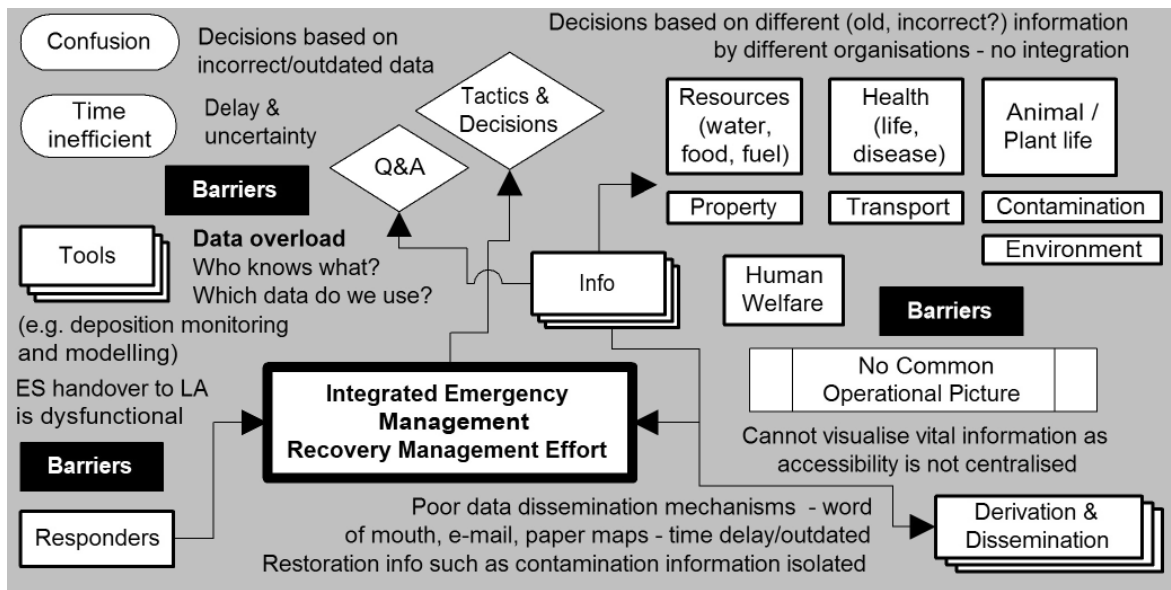


Figure 6: DHCM Recovery Command Structure

The following diagram first shows the typical current situation for recovery, and secondly how central government guidance and legislation seeks to improve matters.



Summary Current Situation : Recovery Management Phase

Handover is not seamless. Accessibility to multi organisation mission data is fragmented, dysfunctional and poorly integrated. Information is not easily accessible by on site Responders (i.e. those most in the information) and relay of information to mass storage locations is slow and tedious. Recovery Management phase is workable but undoubtedly inefficient and disjointed.

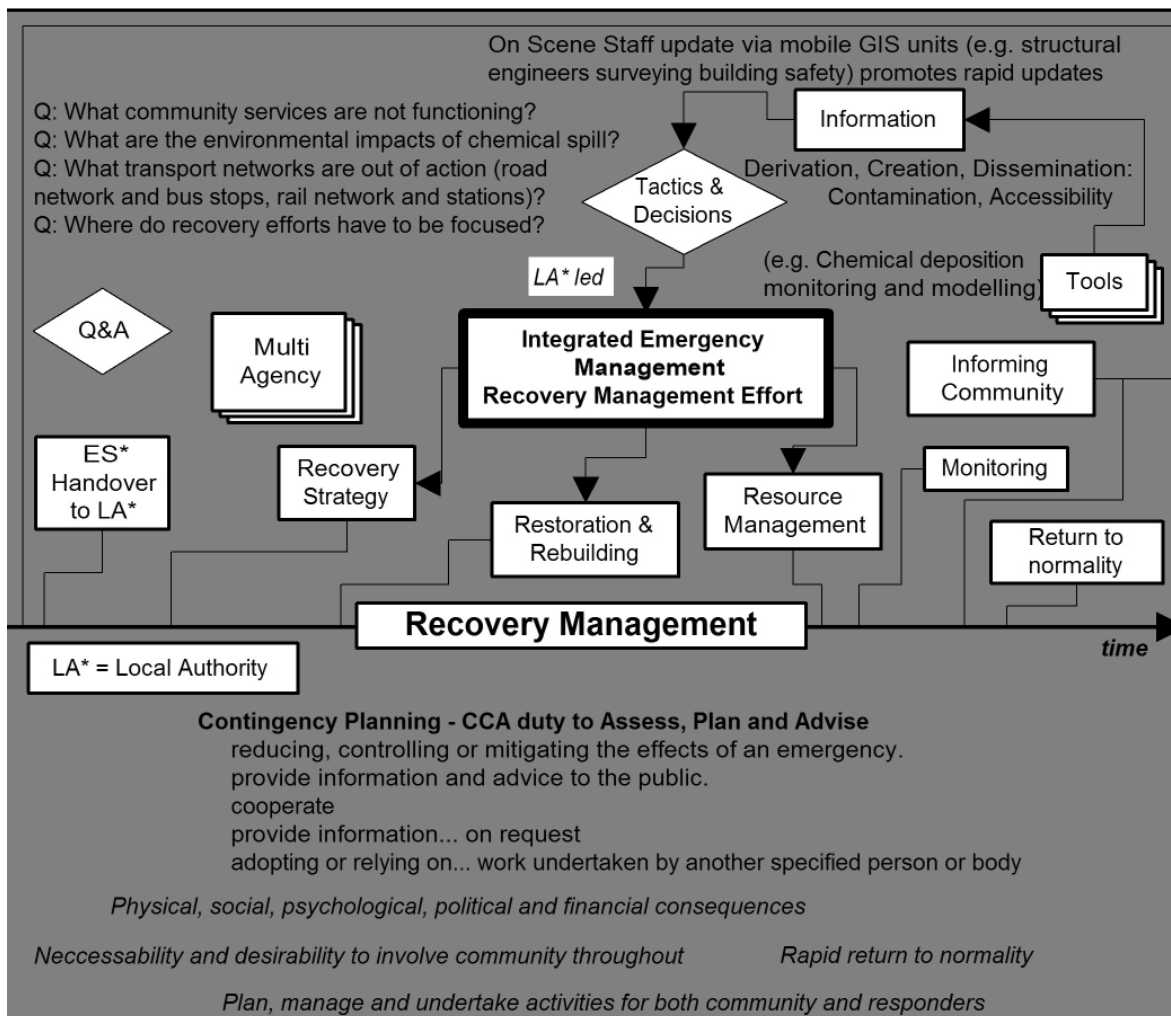


Figure 7: IEM Recovery - current and required situation (source BCC CCU)

There are several Recovery Impact Groups (RIGs) for different aspects of the recovery process. Typically these are:

1. Communications
2. Infrastructure
3. Transportation
4. Environment
5. Health and Welfare
6. Local Commerce
7. Internal LA Business

When all the investigative aspects, i.e. the issues that relate to life saving and evidence gathering, are dealt with then the remaining is coordinated towards the return to normality. This stage of the process is called the Recovery phase sometimes now referred to as Integrated Recovery Management.

Emphasis in this stage is retuned – there is less demands for QoS and immediacy of data, there is less criticality, and interestingly there is increased scope for involvement of NGO, volunteers, community led groups and local businesses.

There is a rough equivalence between Gold Command and the SRG. This commonality in the chain of command between response and recovery continues so that RIGs and Recovery Action Teams (RATs) are roughly equivalent to Silver and Bronze respectively.

We will explore the reuse of services, RA repositories and other content from the previous IEM phases for re-presentation and refinement so the hand over from GSB to recovery is not as problematic as appears at first sight. Knowledge and other content will be structured and organized in ways that are already at the appropriate levels and viewpoints for those leading in this stage.

Furthermore there is a strong reliance on RA in this stage. The recovery effort and the resources that underpin it must be prioritised along several axes including community services (housing, schooling), environmental preservation (natural, cultural etc.), transport and commerce. Effort and other resources are then apportioned according to how they impact on recovery, leading us back into the framework, with all the supporting services and knowledge/content used previously.

There is an opportunity here to pull in RA Business Continuity Plans generated by local commerce. This could be to the extent that the semantic information already entered by businesses as part of their day to day activity are part of the discussions that are undergone.

Although issues of immediacy are less prevalent in the recovery phase in comparison to the response phase, timeliness is still a priority and decision dominance over events is key to success. Services and personnel, especially those from the LA, are greatly overstretched. Also there are changing roles during this stage that is referred to by practitioners as “reallocation of staff responsibilities”. So the context adaptation and personalisation features of Akogrimo will be of great value. These could be guided by pragmatic annotations made during training so that reallocation could be optimised and even automated.

Roles of relevance here relate to the axis of prioritisation and include housing officers, environmental officers, highway officers and so on and the working parties/crews that go to

form the RATs, and of course the management layers that sit above these and report on up to the Chief Executive.

3.1.7. Recovery from CBRN incidents

The Environment Recovery Impact Group (eRIG) will lead on CBRN recovery incidents.

The time-scales for environmental clean-up will depend upon the incident locations, the types of substance used, their persistence in the environment and the severity of contamination. The Health Advisory Team (HAT) will undertake a dynamic risk assessment before any action is taken.

Incidents involving the accidental release of CBRN material or cases of naturally occurring disease outbreaks are likely to be on a more manageable scale than terrorist related incidents. Factors that may mitigate the potential scale of an accidental release include the lack of intent, the limited nature of sites at risk and the safety systems in place.

Due to the wide range and variety of effects, toxicity and concentrations that could be deployed it is difficult to predict the effects of any CBRN incidents, however the principal challenges of chemical, biological and radiological decontamination of the environment are that:

- Chemicals are easy to find and isolate but difficult to destroy and can generate toxic waste by-products;
- Biological substances are easy to destroy but difficult to find and isolate and it is hard to be certain they are fully removed;
- Radiation is easy to find and isolate but impossible to destroy, it can only be removed and containerised.

In practice local constraints, such as intervention actions already undertaken during the emergency phase, may strongly influence the practical choice of recovery techniques, especially where the permitted time-scales for recovery are short because critical national infrastructure is affected.

When making decisions on recovery options there is a balance to be struck between maximising protection of people and protection of the environment, because these constraints may drive accepted levels of clean-up, and their associated environmental impacts, in opposing ways.

The process of remediation may require a phased approach. When deciding between different options the following questions may need to be addressed:

- How effective will the recovery option be?
- Is the recovery option environmentally acceptable?
- What clearance level will adequately protect public health?
- What levels of residual contamination will be acceptable?
- How will the authority establish public confidence in its clean-up strategy?
- How quickly can the option be implemented?
- What resources will be required?
- What wastes will be generated?
- How will they be managed and disposed of?
- What are the environmental impacts of the disposal options?

3.2. Scenario Refinement

In this section, geographical and chronological aspects are first overviewed so as to provide a general impression of what we cover before the detail is presented.

The scenario is a terrorist dirty bomb attack. We have chosen to focus on actors and services that reuse and contribute further to the e-Health and e-Learning testbeds using realistic scenes and interactions. So from within a broad remit initially scoped in 2.3.2 extension document we follow the story of two educational institutions from their daily business that includes Risk Management (RM) through the complete Integrated Emergency Management lifecycle. This form of knowledge content is continually revisited, re-evaluated and reused with a recurring theme of the “Geography of Risk” being explored with a Proximity Analysis Service (PAS) and the RM services.

3.2.1. Scenario Geography

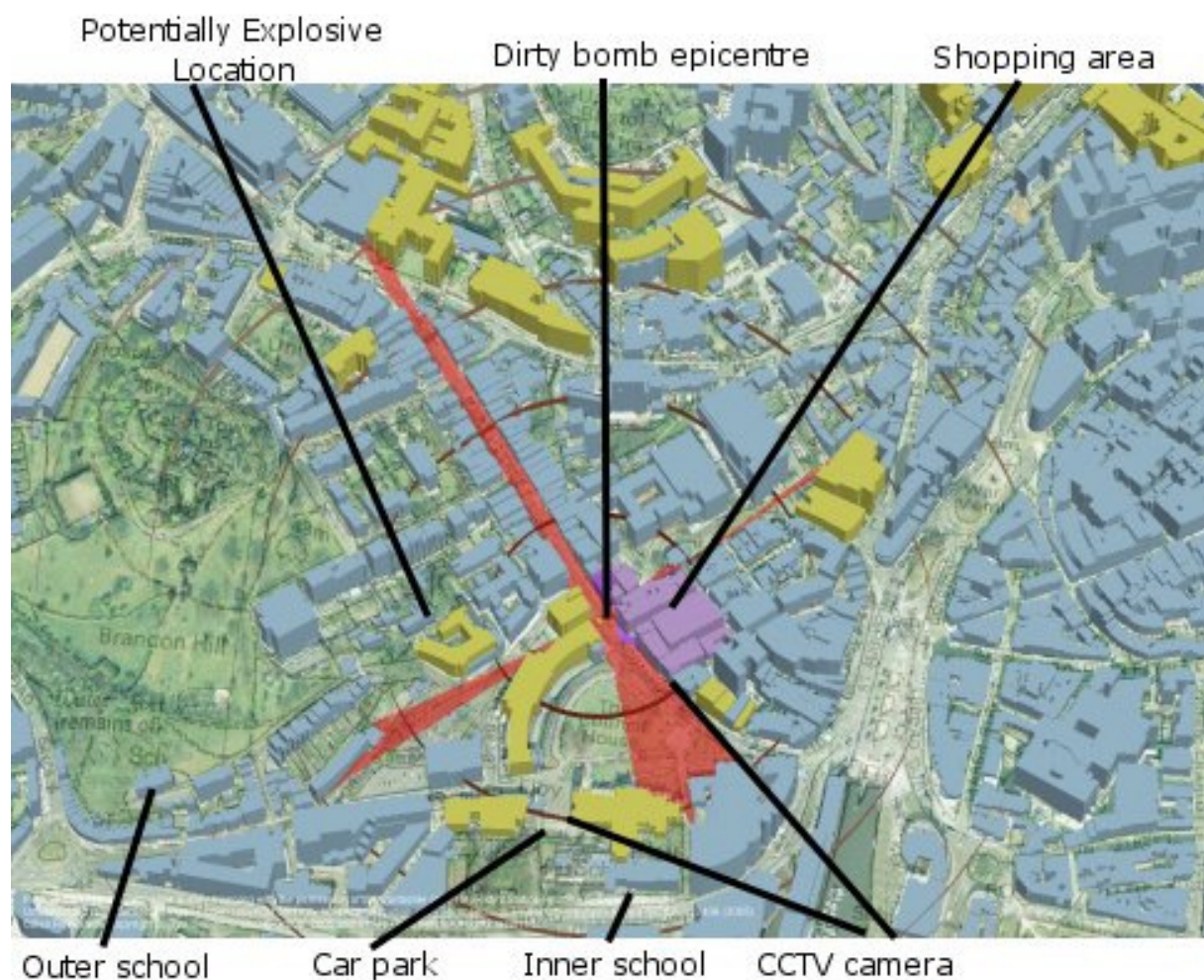


Figure 8: DHCM – scenario geography

Inner institution is in close proximity to the event. During response and most of recovery Treatment Risk Instances (TRI) and other resources are commandeered towards the ensuing EM efforts. Only towards the end of Recovery does normal business of providing education services resume.

Outer institution has less proximity to the event. During initial phases of response as a precautionary measure it may well remain closed. However for most of recovery it is used to accommodate some displaced students in order that they receive their education services. RA services will be used to re-asses much of the risk register in light of the increase in population. We expect that temporary additional mitigations are required.

3.2.2. Scenario Timeline

Here we present the initial timeline for the DHCM scenario. Both figures cover all the three phases of IEM (previously outlined in Akogrimo 2.3.2 extension document), the first one presenting an outline.

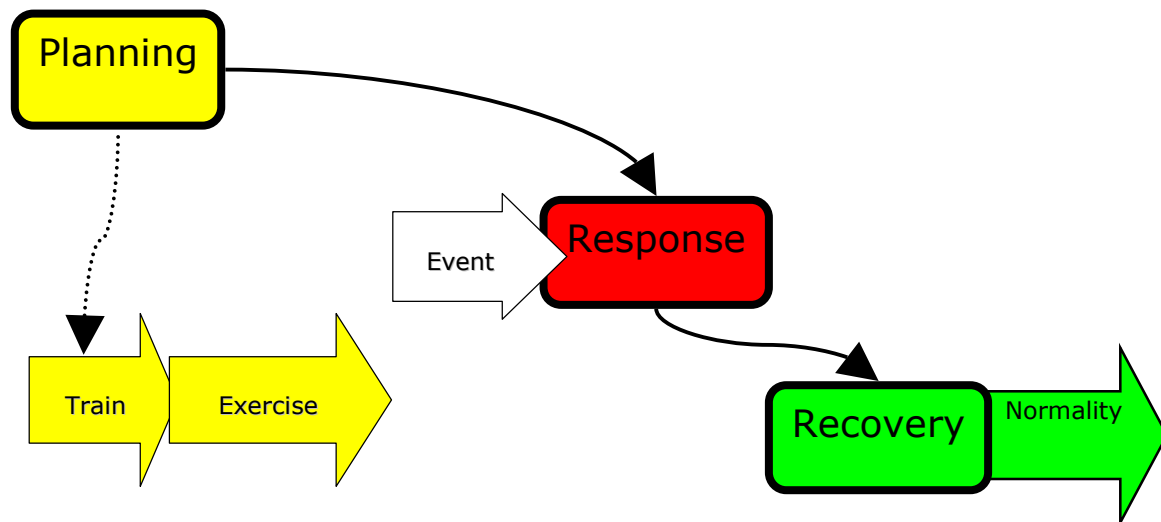


Figure 9: IEM Phase Sequence

We place some key use cases prior to their detailing in section 4 to improve overall clarity. The circles indicate a moment in time where a use case initiates and rectangles represent associated activity.

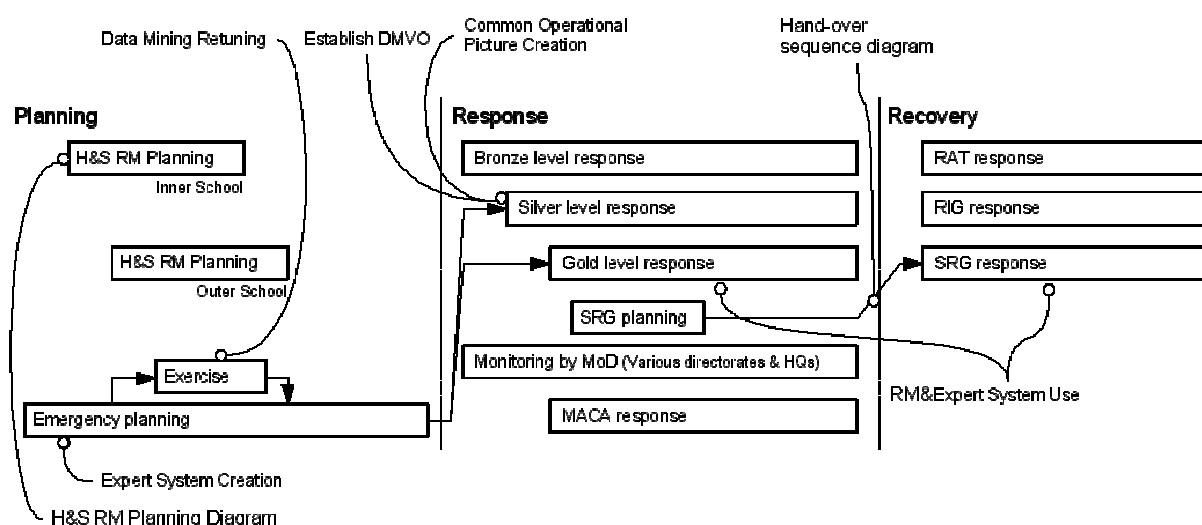


Figure 10: DHCM – scenario timeline

We will return to this diagram in the following Sub process definitions at each phase beginning to signpost the main activities contained in each phase.

3.3. Sub processes

This section contains a list of processes relevant to the storyboard and scenario refinement above. These form the basis for use case analysis and diagrams detailing the involved actors and services initiate the definitions of interactions between the Akogrimo core services provided by the DHCM Platform and those services that are specific to the IEM processes that will require further attention in D5.2.1.

3.3.1. IEM Planning Sub Process: School Health and Safety Risk Assessment

Related use case: UC-DHCM-01 Use Case: School Health and Safety Risk

In figure 11 mobile risk assessors generate RM/RA in response to the requests of their superiors. We envisage that the HSE will provide extra specialist services and guidance to enrich the standardised CORAS services deployed for common LA business use.

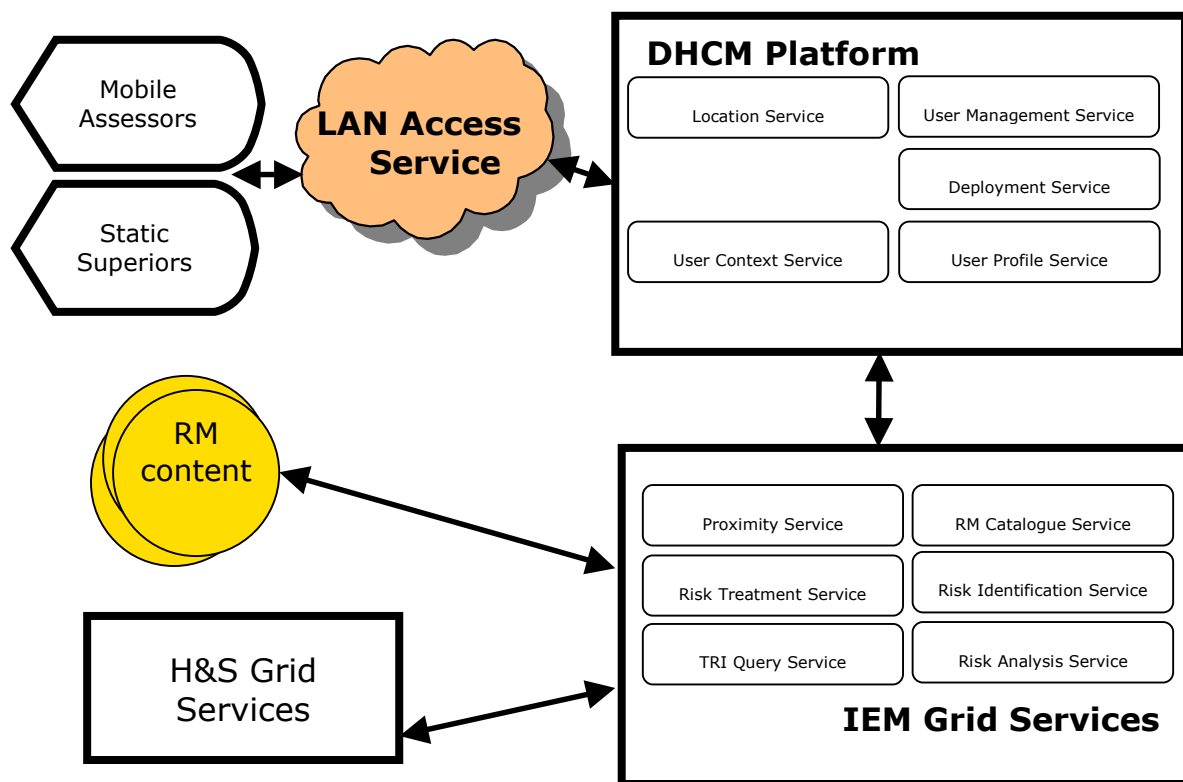


Figure 11: Health and Safety Risk Assessment Involved Actors and Services

Schools are obliged to perform risk assessments as part of their usual business duty of care. In the UK there is a legal obligation to perform this for fire safety as a minimum and the international political climate has resulted in many businesses conducting Business Continuity Plans. A common framework (taken from CORAS) is used by our LA for many risk-driven management activities from their own BCPs to school H&S assessments. The LA, OGD and NGO all contribute and benefit from risk management services delivered through Akogrimo.

In our scenarios the assessments are done with the support of the LA without charge. The LA encourages this because it improves and validates:

- The LA BCP

- IEM emergency plans
- LA Education Officers & HSE officers efforts improved and made easier
- A common approach to risk improves management at all levels (e.g. by providing common language, understanding and reuse of tooling)

We use the risk assessment as a vessel to pull semantically rich knowledge through third parties and into different stages of a Mobile Dynamic Virtual Organisation (MDVO) i.e. from educational institutions during planning (even where orthogonal to IEM) into the COP (UC-DHCM 06) of Recovery and Response stages by the emergency practitioners.

As part of this storyboard the TRI are semantically queried in order that template resources that can help during response and recovery are automatically discovered from third parties with no extra effort on their part. An example is if schools use video cameras in their car parks that are used as part of treating the risk of unauthorised persons gaining access. In our scenario these are tagged as surveillance capabilities as part of the semantic TRI mark-up and are discoverable as Grid resources in the IEM effort where video surveillance would be relevant.

3.3.2. IEM Planning Sub Process: Scientific Services Expert System generation

Related use case: UC-DHCM 02

The generation of Expert Systems is the focus of this use case. These act on the behalf of (predominately human) Scientific Services in the absence of their availability during a disaster. The Expert Systems are also of use throughout the IEM process, for example to plan and evaluate exercises.

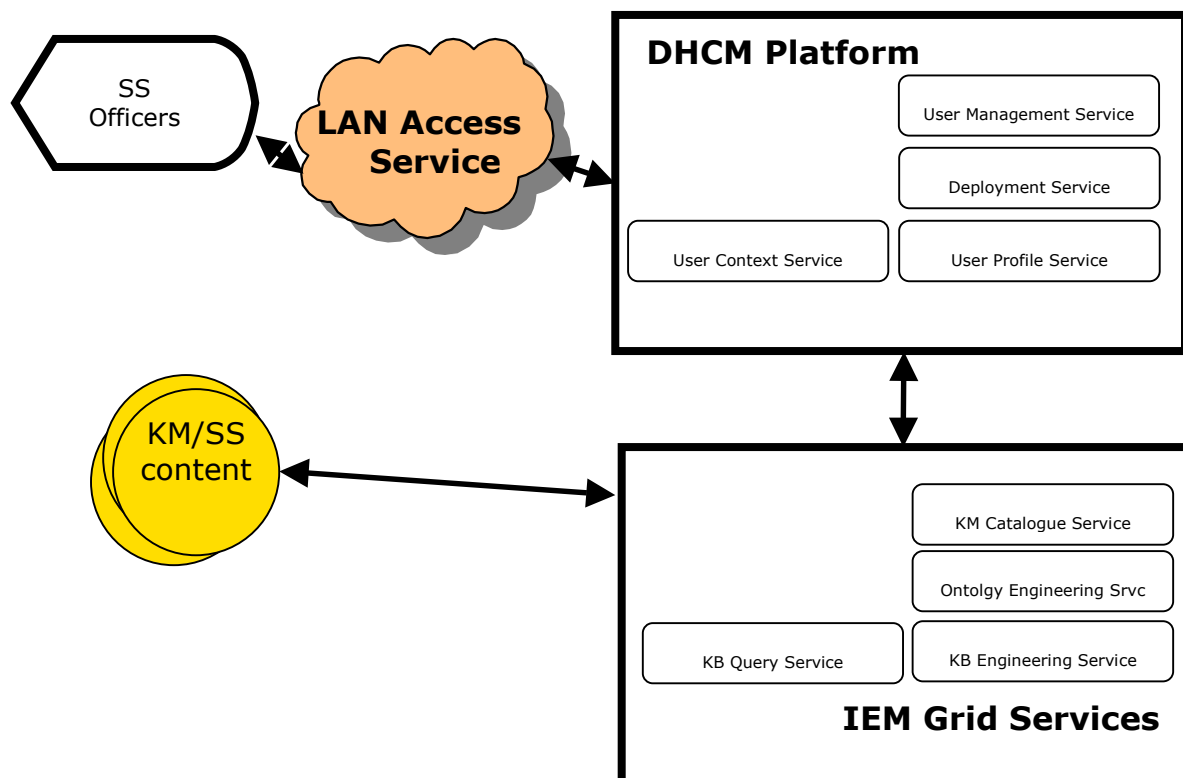


Figure 12: Scientific Services Expert System generation Involved Actors and Services

In our scenarios Expert Systems are made form ontological constructs that include conventional KB content and pragmatically annotated hyperlinks to data sources internal to Akogrimo. We will focus on the following aspects:

- Provision of generalised knowledge services
- Brokering and management of Knowledge Bases (KB) using RDF OWL and Protégé formats
- Exemplar KB that are relevant to our terrorist attack to illustrate the simplicity and accessibility of this type of technology and its practical application through Akogrimo

The latter represent knowledge content that is deemed to be of specific use and is wrapped into individual and tailored services realized through general mechanisms that can be readily reapplied. Tools will be provided to assist this process and may be of significant use in the e-Health and e-Learning testbed.

3.3.3. IEM Planning Sub Process: Data Mining Tuning

Related use case: UC-DHCM 03 & 04 (adapted from UC-EL-FT 03 & 04)

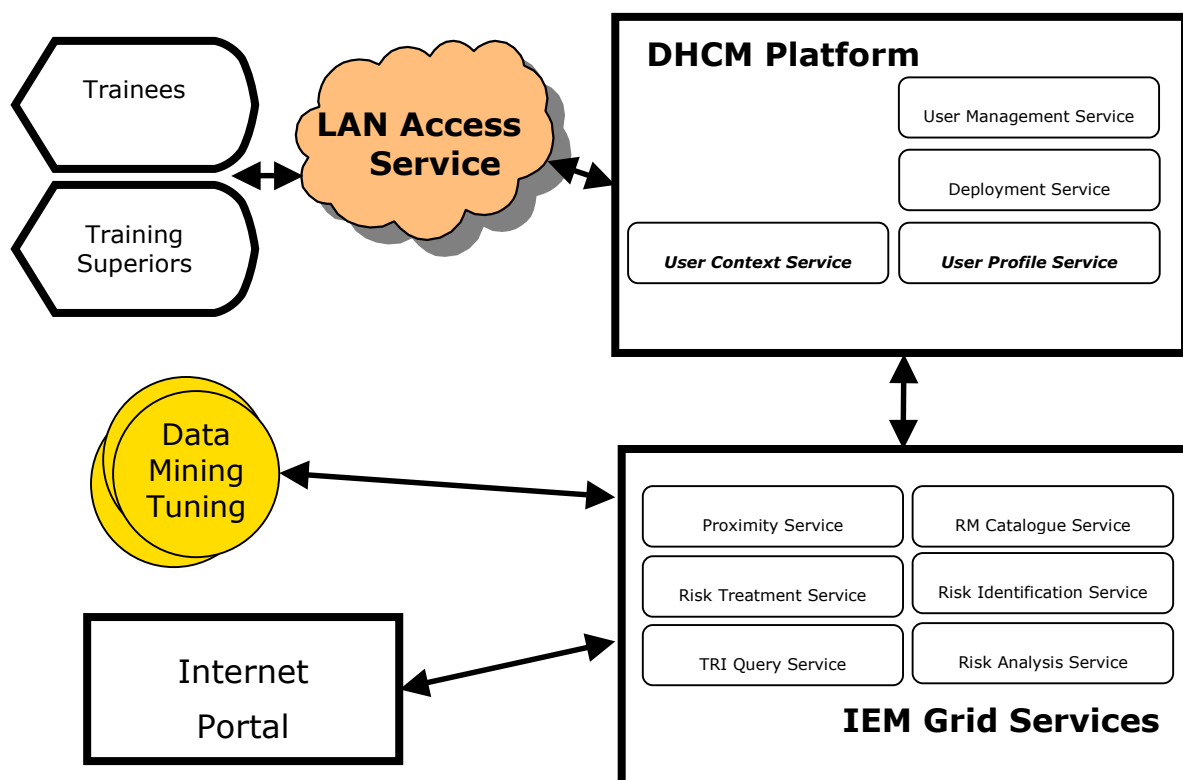


Figure 13: Data Mining Tuning Involved Actors and Services

The approach taken in 3.3.2 above has humans building specialist catalogues of information. This can be error prone, can lead to incompleteness and does not address the issues of knowledge becoming out of date or superseded easily. To mitigate against such potential shortfalls automatic data mining assistants will be tuned for particular subjects and roles within a MDVO.

This tuning activity is undergone as part of training and exercising in the planning stage. The resultant tuned data miners become content that can be wrapped as services in a similar way to

the Expert Systems. However we envisage these to be greater in number, more diverse and relate to roles and in some cases personalised to individuals.

3.3.4. IEM Response Sub Process: Establish MDVO

Related use case: UC-DHCM 05 (adapted from UC-EH-HMES-01)

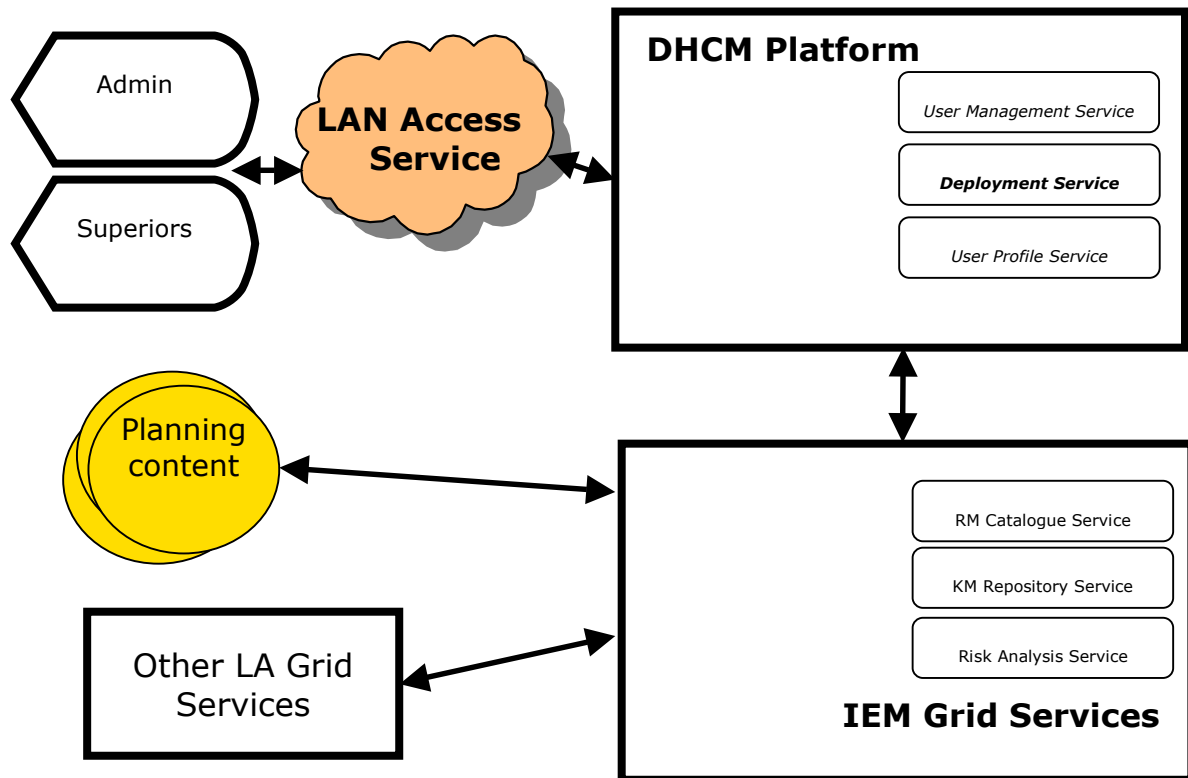


Figure 14: Establish MDVO Involved Actors and Services

This process takes a well established Akogrimo process with analogies from the e-Health and e-Learning testbeds and addresses a wider and more complex mix. This is mainly because of the information flow demands of the COP, the escalating command hierarchies and the problem of handing over control.

3.3.5. IEM Response Sub Process: Establish Common Operational Picture

Related use case: UC-DHCM 06 (adapted from UC-EH-HMES-06)

This is a very involved process as it requires many types of information, flowing to and from many places, across many organizations. As life, property and the environment can be in immediate peril there is a significant urgency to this process. This was the focus of the original Akogrimo whitepaper for DHCM [5]. While this is a worthy cause that is not in contention, we hope to show the benefit of having Akogrimo services embedded across IEM as part of daily business. We wish to explore the following IEM technical challenges in particular:

- Organizations having agile interoperability posture
 - are prepared and correctly configured

- have an involvement with Akogrimo platform through daily processes imparting familiarity
 - are restructured with regard to authority, responsibility and accountability so that an empowered work force can exploit opportunities with the Akogrimo framework in place
- Content is already available for exploitation
 - In the right place
 - Discoverable
 - Semantically encoded in ways also meaningful to human actors
 - Readily amenable to queries
 - Can be managed with diligent levels of husbandry that can be included in transorganizational flows where necessary if the latent risks are suitably treated [11]

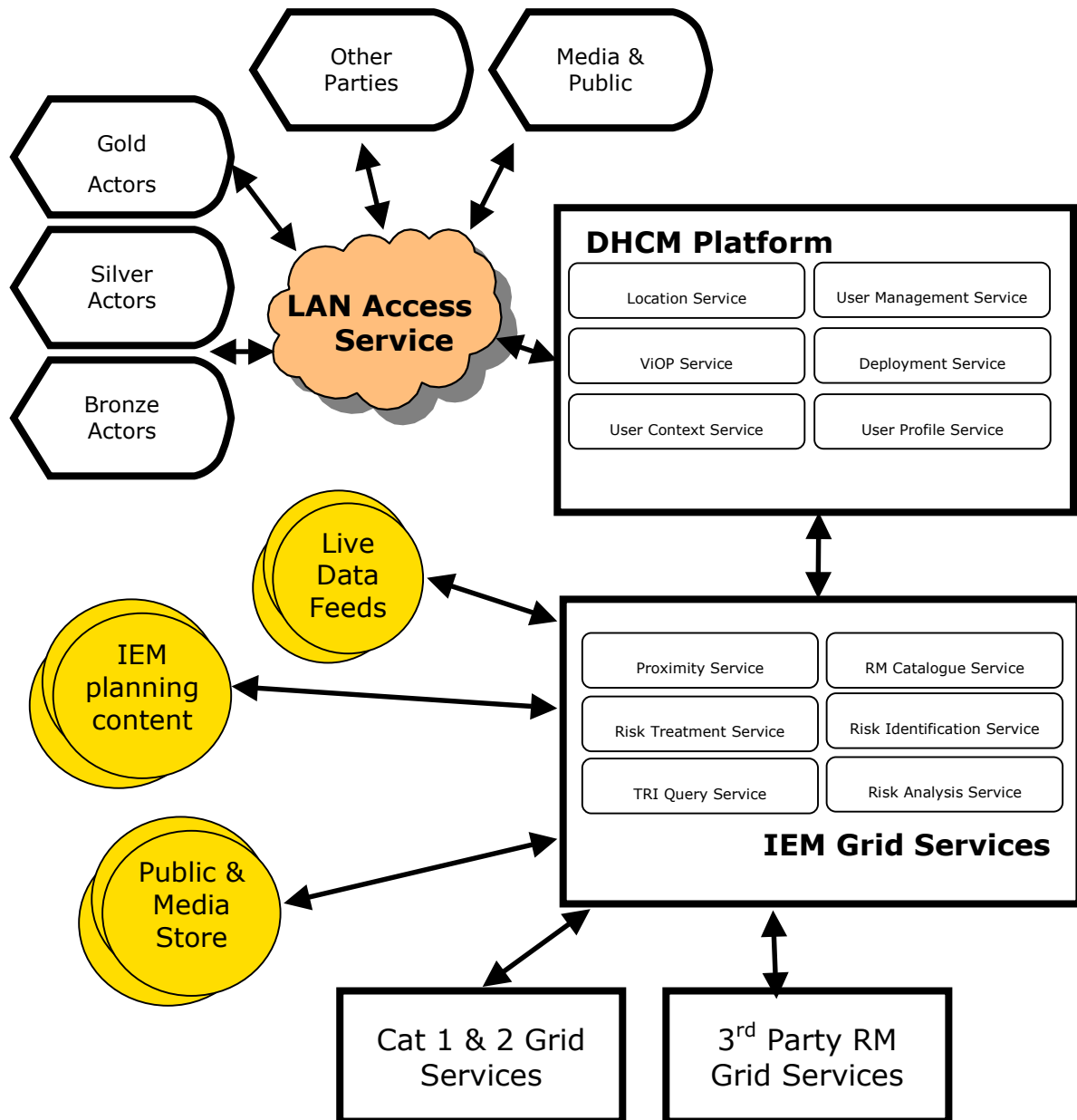


Figure 15: Establish Common Operational Picture Involved Actors and Services

This scene includes *all* Data output types in figure 2: DHCM IEM made “seamless” through Akogrimo on page 20. i.e.:

- feeds to other organizations
- feeds between command levels
- feeds to the media
- public warning and informing systems

These categories can have channels within them that are either:

- fully automatic
- non-repudiated & auditable human sanctioned release after collation assistance

For the DHCM testbed in order to bound scope so that it can be realistically attempted we focus on COP for Silver Ambulance Control. This leads favourably towards inclusion of activity, content and services from e-Health and e-Learning testbed. We have conducted thought experiment workshops that show this sub-process is extremely scalable if the third testbed is ramped up to provide a wider, more comprehensive demonstrator including the other testbeds at a later date.

3.3.6. IEM Response Sub Process: Reuse of RA and expert systems in Response

Related use case: UC-DHCM 07 (adapted from UC_EH_HMES_09)

During the response phase content determined in earlier phases is made use of; we will focus on risk and expert knowledge. For example the camera in the car park of the inner school is discovered and used surveillance to assist evacuation traffic management and later ambulance movements on and off the car park.

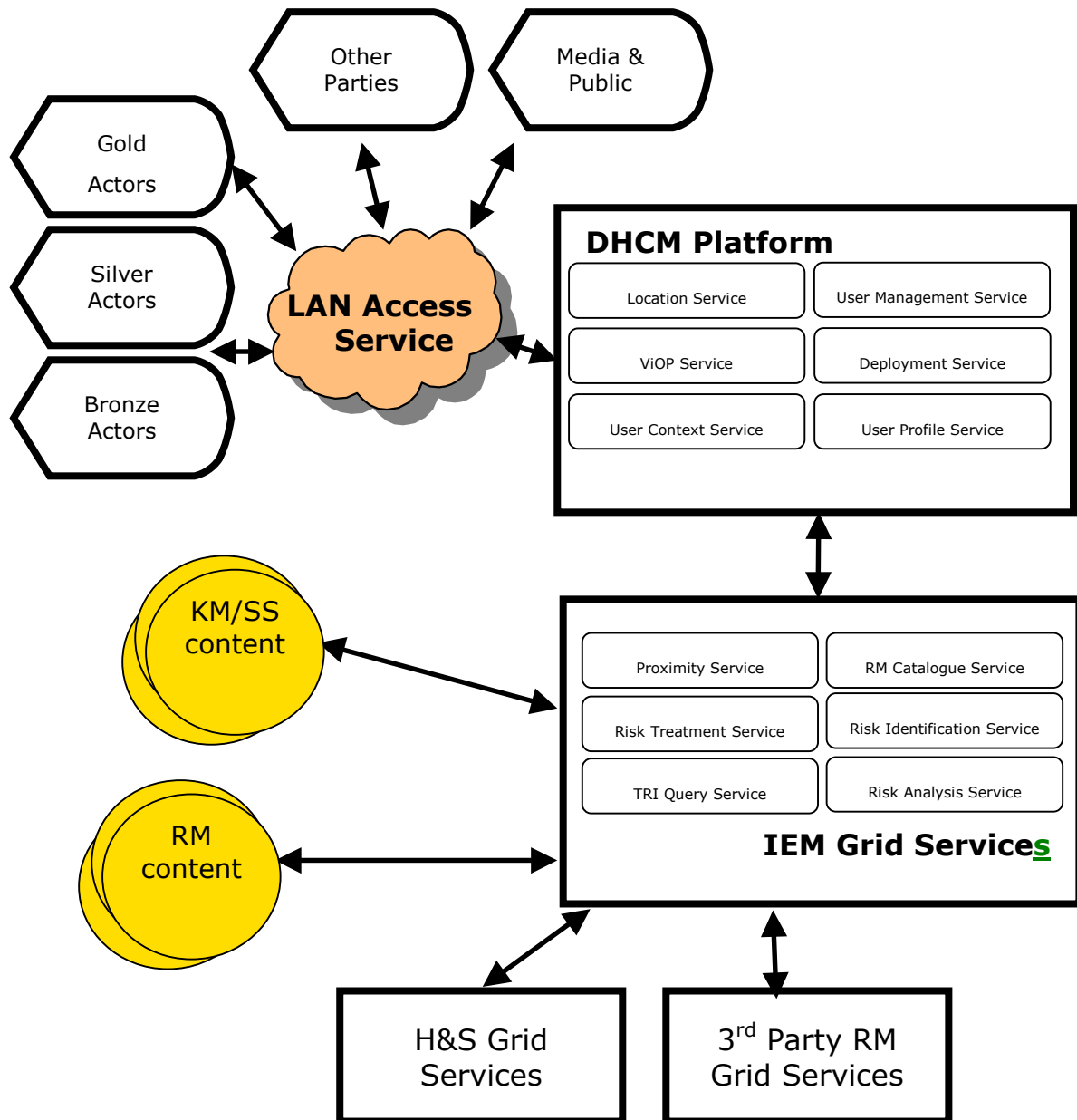


Figure 16: Reuse of RA and expert systems in Response Involved Actors and Services

3.3.7. IEM Recovery Sub Process: Response MDVO to Recovery MDVO Handover

Related Use Case: UC-DHCM 08 (adapted from UC-EH-HMES-04)

The intention of figure 17 diagram is that it is noticeably different from all the others. What is important is that the existing services and content are safely and useful passed on to the recovery stakeholders. This will be a different mix of actors but from the LA perspective what is sought is a seamless process the main change being their assuming control. It may prove to be the case that the simplest implementation for Akogrimo would be two separate MDVO with shared content. That would be acceptable as long as to the main actors in 3.3.6 and 3.3.8 are not made aware of this through loss of capability or unnecessary configuration burdens.

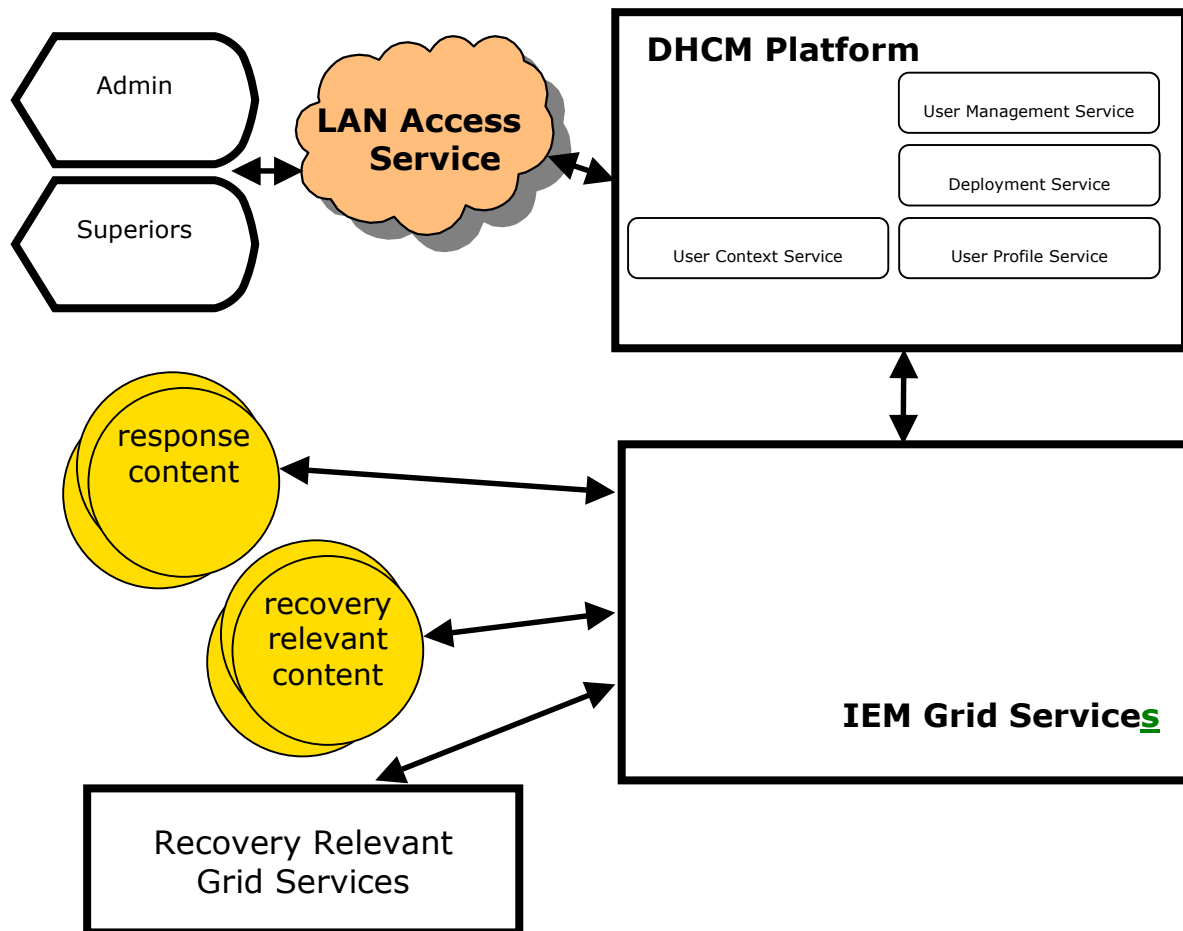


Figure 17: Response MDVO to Recovery MDVO Handover Involved Actors and Services

This handover can be realistically expanded to far more involved than the e-Health equivalent.

3.3.8. IEM Recovery Sub Process: Reuse of RA and expert systems in Recovery

Related Use Case: UC-DHCM 09 (adapted from UC_EH_HMES_09)

In the figure below we include local commerce and their BCPs as part of the available RM content – so the RIGs responsible for local commerce and environment can have better decision support on the economic and how to prioritise actions towards recovery.

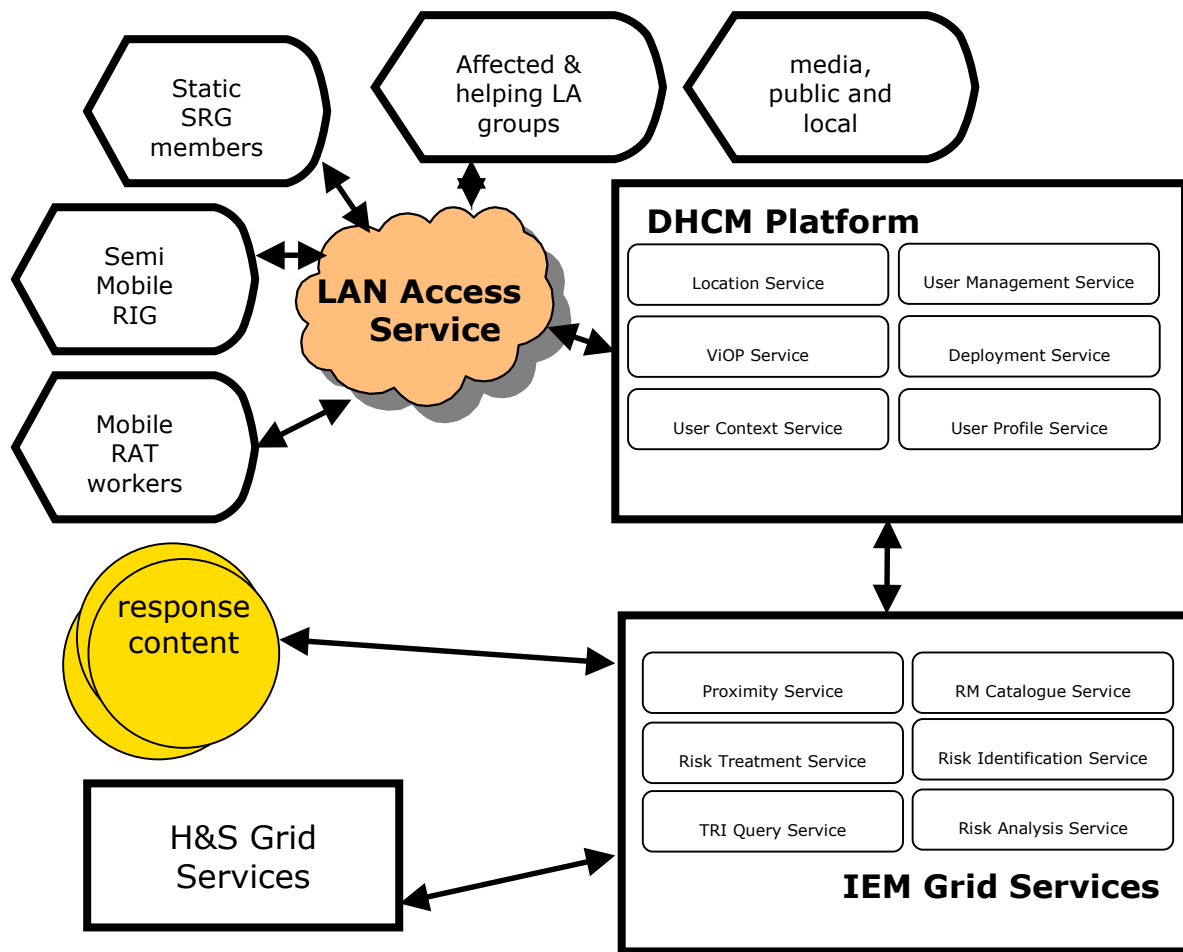


Figure 18: Recovery RA and ES reuse Involved Actors and Services ⁵

A key motivation and feature for this sub process is that the risk and expert knowledge content generated in earlier phases is exploited to measurably reduce the impact the event

For example to speed up return to normality the inner school is used as a RAT depot and the outer school could accommodate overspill students. However both of these need careful risk management; we will exploit the same services and the content created in UC-DHCM 01, and 07 to make this far more likely and far more efficient and effective where such options are sought.

There is bound to be tensions and compromises struck during this phase between the different RIG (section 3.1.5 includes typical RIG types) hence the need for the SRG and we intend to reuse the tooling developed in support of response COP, services that support KM & RM and all prior content to provide a credible and compelling decision support capability.

The RM focus not only develops tighter cohesion within the testbed, and reduces effort through reuse, but, also reflects how IEM practitioners work.

Continual Public information services are expected during recovery, even more so than during the initial stages of response phase. During response the public often understands the imperatives

⁵ We only show the Response Content but that is because we consider this to also include the Planning content as per Figure 15: Establish Common Operational Picture Involved Actors and Services on page 32

the ES face and naturally turn to the media for their information requirements. Luckily many problems and concerns relating to information release will, to an extent, have abated as the sensitivity of the investigative nature of response has passed.

Liaising with the public could be conducted via a web portal collating and forwarding the IEM Grid service content.

3.4. Actor and Role Description

Candidate actors and roles are listed, including some abstract roles that are needed to implement the IEM applications. These roles should be available within the authorization, context adaptation and personalisation concepts. To support the development of these, the main relations between the roles and tasks are briefly explained.

Together these constitute a first-pass palette from which selections can be made for the third testbed and refinements made for realization of the final demonstration programme the full extent, which is left to the reader's imagination.

3.4.1. DHCM Human Actors – Example Roles

Ambulance Incident Officer (AIO) The officer of an ambulance service with overall responsibility for the work of the service at the scene of an emergency. Those in a AIO role work in close liaison with the Medical Incident Officer to ensure effective use of the medical and ambulance resources at the scene.

Category 1 responder A person or body listed in Part 1 of Schedule 1 to the Civil Contingencies Act. These bodies are likely to be at the core of the response to most emergencies. As such, they are subject to the full range of civil protection duties in the Act.

Category 2 responder A person or body listed in Part 3 of Schedule 1 to the Civil Contingencies Act. These are co-operating responders who are less likely to be involved in the heart of multi-agency planning work, but will be heavily involved in preparing for incidents affecting their sectors. The Act requires them to co-operate and share information with other Category 1 and 2 responders.

Chief Executive individual in general charge of the LA.

Family Liaison Officer (FLO) A police officer who is a member of the ante mortem team allocated specific responsibility for one or more families of the deceased.

Media Liaison Officer Representative who has responsibility for liaising with the media on behalf of his/her organization.

Medical Incident Officer (MIO) Medical officer responsible for management of non-ambulance medical resources at the scene of an emergency.

Search and Rescue Mission Co-ordinator The MCA officer assigned to co-ordinate the response to an actual or apparent maritime distress situation.

Senior investigating officer (SIO) The senior detective officer appointed to assume responsibility for all aspects of the police investigation.

Site Incident Officer (SIO) If an incident occurs within the perimeter of an industrial or commercial establishment, public venue, airport or harbour, a representative from the affected organization will liaise with the emergency management structure.

Strategic Recovery Officer (SRO) Following invocation of the Council's City Recovery Plan, the SRO:

- Liaises with the Council's Emergency centre on what short-term recovery issues are being attended to within the response to the incident
- Identifies possible medium to long-term recovery issues resulting from the incident
- Makes recommendations to the CMT on the possible medium to Long-term recovery issues identified and appropriate strategies.

3.4.2. DHCM Human Actors – Example Teams

Ante mortem team Officers responsible for liaising with the next-of-kin on all matters relating to the identification of the deceased.

Crisis Management Team (CMT): Bristol City Council's equivalent to the Strategic Coordinating Group (Gold), which acts to formulate the City Council's strategic response to an emergency. Formed from the Chief Officers Group and chaired by the Chief Executive, CMT will take over the lead role from the police once the emergency phase has passed.

3.4.3. DHCM Human Actors - Organizations

Civil Contingencies Reaction Forces (CCRFs) Drawn from existing reserve forces, CCRFs are military forces capable of being mobilised to assist in dealing with civil emergencies in support of the civil authorities and regular forces.

Civil Contingencies Secretariat, the Cabinet Office secretariat, which provides the central focus for the cross-departmental and cross-agency commitment, co-ordination and co-operation that will enable the UK to deal effectively with disruptive challenges and crises.

Government Decontamination Service, supports capacity to resist and recover from deliberate and accidental releases of CBRN materials, and from major accidental releases of hazardous materials (HAZMAT) by providing advice, guidance, management support and contractual arrangements to support those who will be responsible for decontamination.

Government News Network: The Government News Network (GNN) specialises in providing regional communications expertise to the public sector and the Government, making national issues relevant to local audiences.

Identification Commission Group representing all aspects of the identification process, which is set up to consider and determine the identity of the deceased to the satisfaction of HM Coroner.

Lead Government Department (LGD) Government department which, in the event of an emergency, co-ordinates central government activity. The department that will take the lead depends on the nature of the emergency (i.e. DTI in the event of a disruption in the fuel supply, Defra in relation to flooding). The Government regularly publishes a full list of LGDs.

Local Resilience Forum (LRF) A process for bringing together all the Category 1 and 2 responders within a local police area for the purpose of facilitating co-operation in fulfilment of their duties under the Civil Contingencies Act.

Local Responder Organization, which responds to emergencies at the local level. These may include Category 1 and 2 responders under the Civil Contingencies Act and other organizations not covered by the Act.

Marine Response Centre A co-ordination centre established by the MCA in marine pollution cases requiring a national response.

Maritime Rescue Co-ordination Centre (MRCC) HM Coastguard regional centre responsible for promoting the efficient organization of search and rescue services and for co-ordinating the conduct of search and rescue operations within a search and rescue region.

Maritime Rescue Sub-Centre (MRSC) HM Coastguard unit subordinate to a rescue co-ordination centre and established to complement the latter.

News Co-ordination Centre (NCC) The NCC works with the Lead Government Department to provide co-ordinated media and public communications support during an emergency.

Primary Care Trust (PCT) Primary care is the care provided by those professionals the public normally sees when they have a health problem (e.g. doctor, dentist, optician, pharmacist). These services are managed by PCTs.

Regional Civil Contingencies Committee (RCCC) A committee that meets during an emergency when a regional response or other action at regional level is required.

Regional Nominated Co-ordinator (RNC) Where emergency regulations are used, central government must appoint a Regional Nominated Co-ordinator (or Emergency Co-ordinator in the case of the devolved administrations) in each of the UK regions to which the emergency regulations apply. The post-holder will be appointed to facilitate Coordination of activities under the emergency regulations in line with the response strategy and objectives set by central government.

Regional Resilience Forum (RRF) A forum established by a Government Office to discuss civil protection issues from the regional perspective and to create a stronger link between local and central government on resilience issues.

Regional Resilience Team (RRT) Small team of civil servants within a Government Office for the Region working on civil protection issues, headed by a Regional Resilience Director.

Here we present some material that may be of interest to the reader in regards to typical LA IEM role organisation:

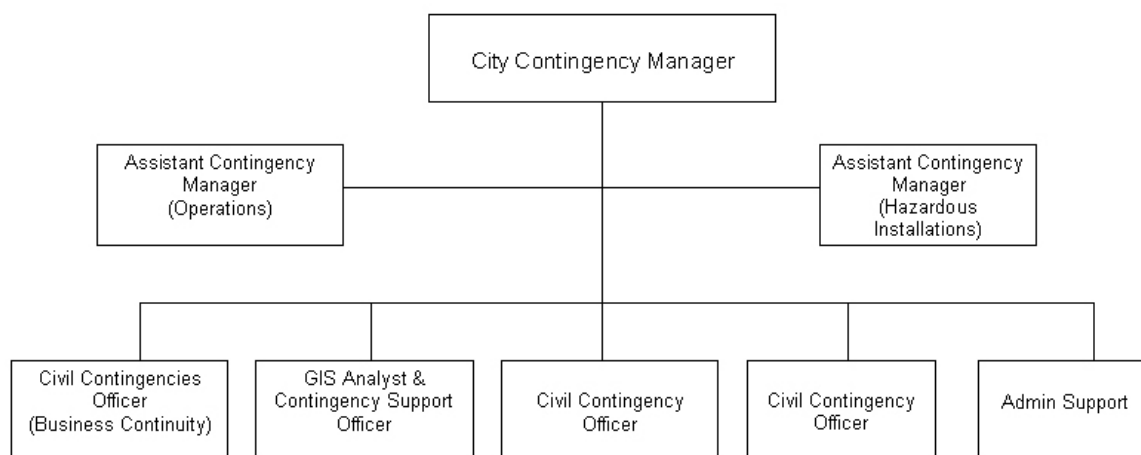


Figure 19: Civil Contingencies Unit Structure (*source BCC CCU*)

Finally how management levels within a LA may relate to IEM

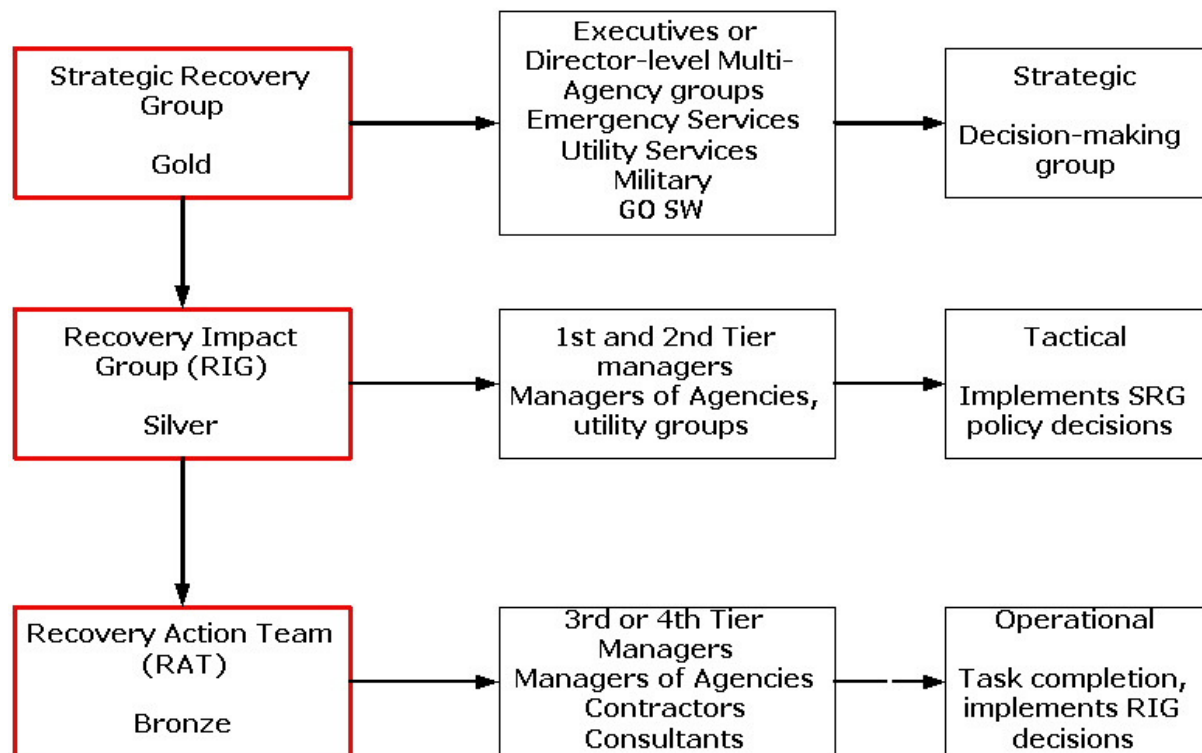


Figure 20: Recovery Integrated Management Structure (*source BCC CCU*)

3.4.3.1. Machine actors

- Affected Populous' Mobile Phone

These devices provide the hardware resources for the surveillance aspects of the Common Operational Picture Service. The mobile phone is gathering the ECG data from the ECG Monitoring Device and forwards the data as requested by the Medical Data Logger Service.

- GSB Control Command Systems (GSBCCS)
- Risk Registration System

This would include services for Risk Identification, Risk Analysis, and Risk Mitigation; as well as content management, repository and discovery functions for example

- Integrated Emergency Planning System
- Specialist Knowledge Repository System
- Knowledge Discovery System

Ontology Maintenance, Knowledge Base engineering, KB catalogue/search c.f. above, Expert systems, CBR and Risk adaptation_E.g. role based stereotypical recommender

- Public Information and Warning Systems (PIWS)
- Traffic Information and Control System

This system provides information about traffic jams and is used by the dynamic navigation system.

- Route Planner

Is a 3rd-party service for route planning that is configured and integrated into the COP bundle to create the dynamic navigation service for Silver Ambulance Control.

- Translation Service

It is a 3rd-party service to recognize the language of medical information and translate them afterwards. The service should be pervasive in IEM.

- Speech to Text Service

Similarly extensive use of this service would allow development of compelling applications through out the IEM process as described in 4.1.1.3.2 Speech data sending & recognition as part of UC-DHCM 04.

4. DHCM Use Cases

4.1. Use Case Diagram

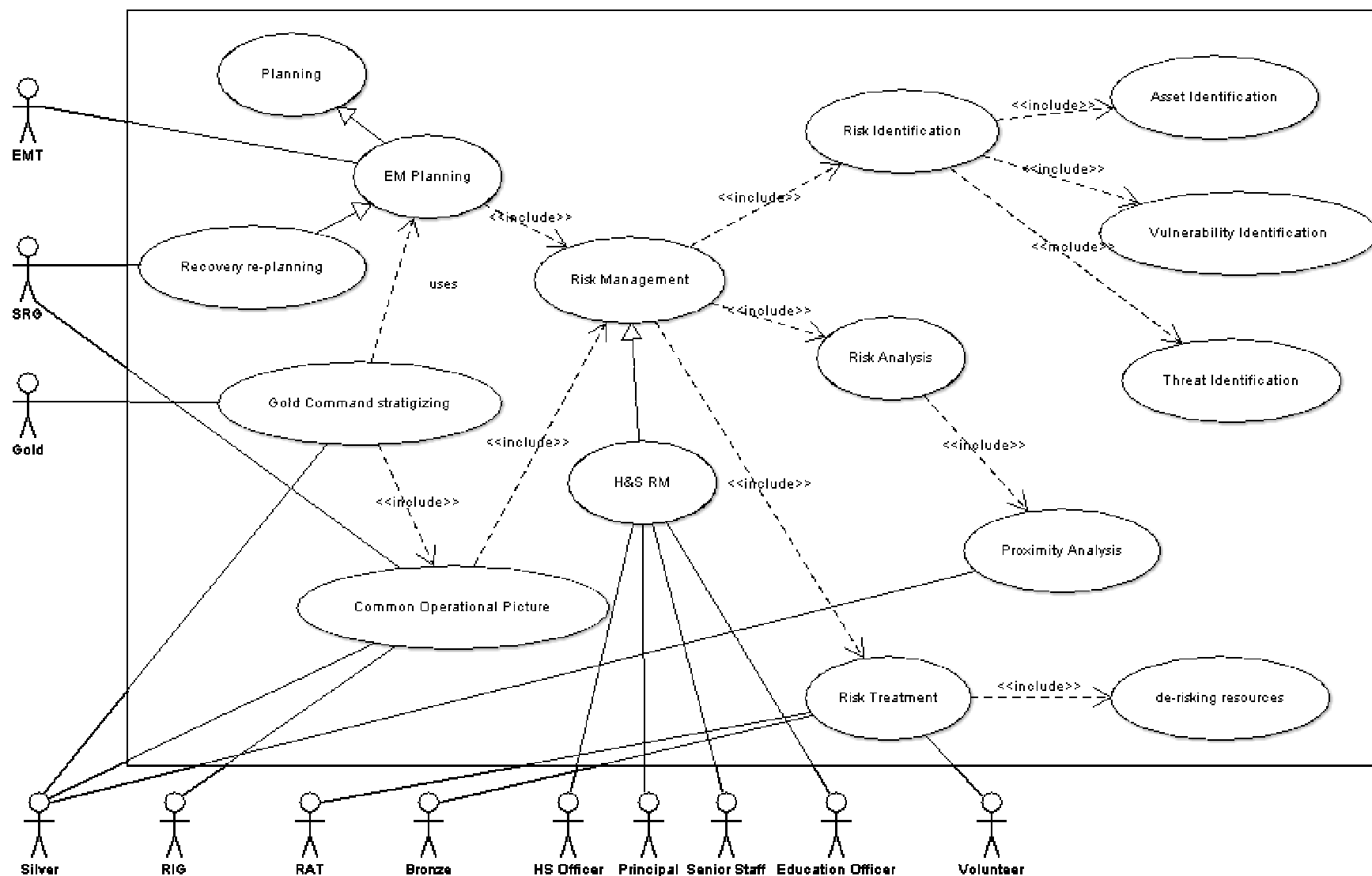


Figure 21: DHCM Main Use Cases

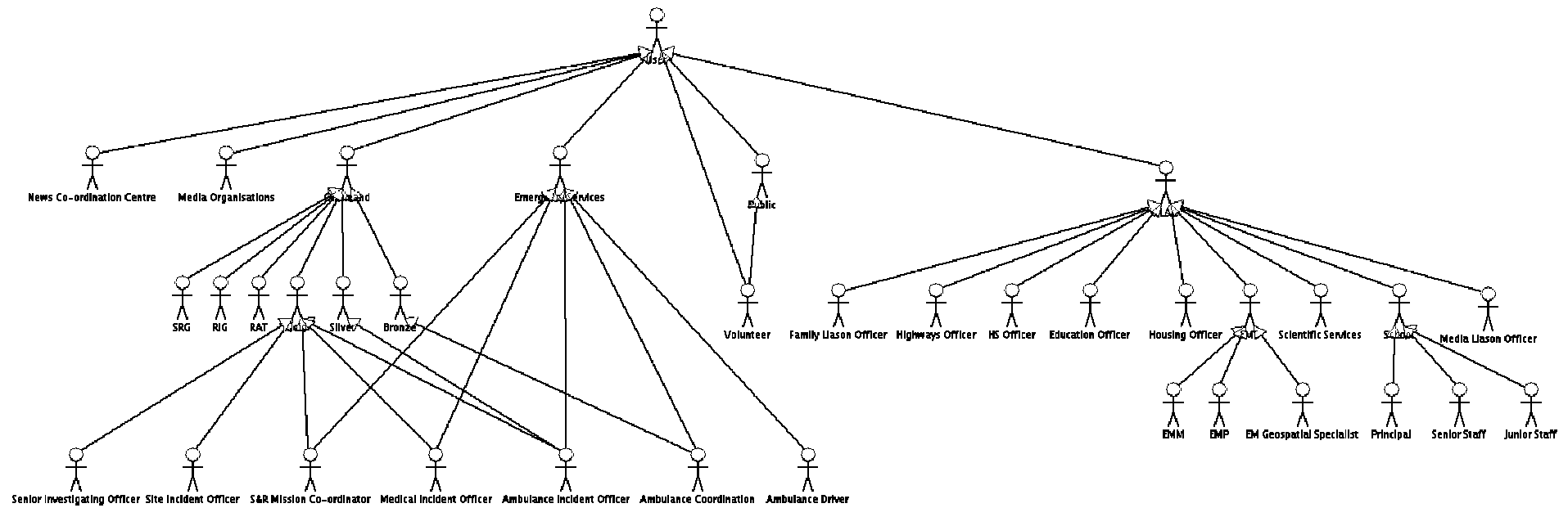


Figure 22: DHCM Human Actors and Roles

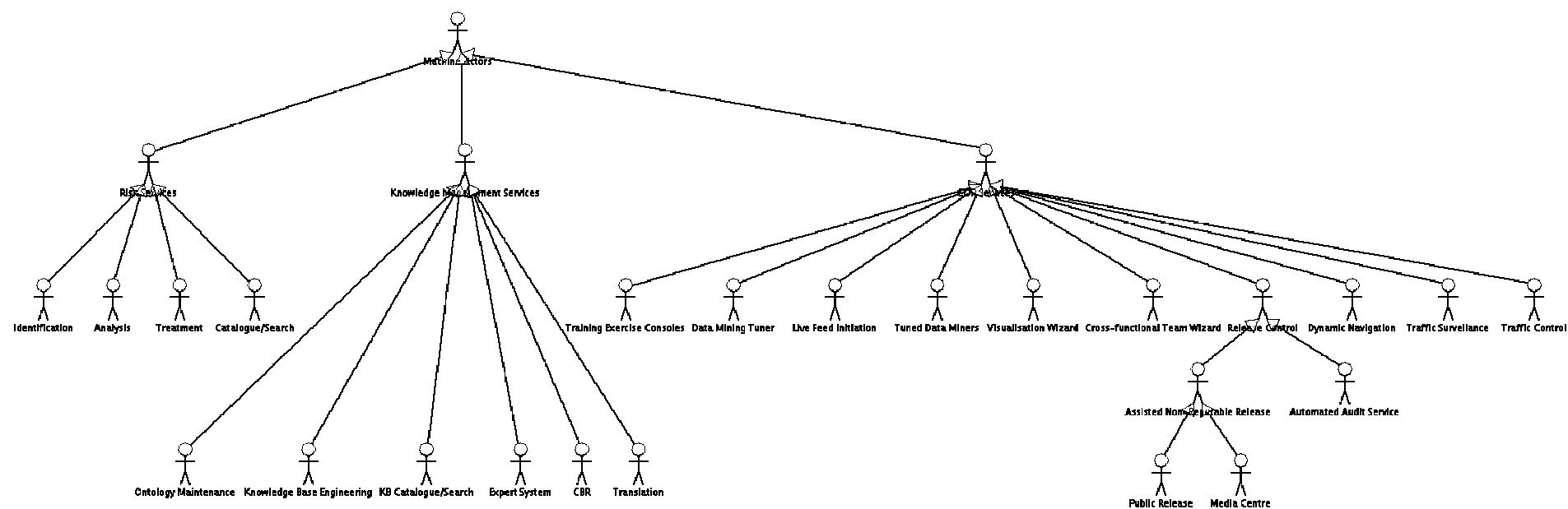


Figure 23: DHCM Machine Actors and Roles

4.1.1. Use Case Descriptions

From the processes identified in section 3.3 we define a set of use cases that reflect the focus of the storyboard and scenario refinement.

4.1.1.1. *Use Case: School Health and Safety Risk Assessment*

Use Case ID	UC-DHCM-01
Use Case Name	School Health and Safety Risk Management
Initiator	Health and Safety Officer
Primary Actor	School Principal
Additional Actors	School Staff, LA Education Officer and as stakeholders EM staff
Description	A school health and safety risk plan is conducted. This has several aspects relevant
Pre-condition	Health and Safety Officer requests a risk assessment.
Post-condition	A completed risk management plan is submitted to the LA's catalogue.
Use Case Functionality	
Sequence	1. H&S officer creates a new catalogue for a new risk management document 2. Education Officers in the H&S jurisdiction receive the request 3. Education Officers pass request conformance from the schools under their care 4. Senior school staff apportion and delegate responsibility for performing risk analysis 5. Risk Analysis is preformed using mobile devices 6. When assessments are deemed complete and acceptable by the RA service they can be logged into the RM catalogue 7. Assessment Findings are provided to the school principal staff 8. A LEA Risk Assessment Report is provided to Education Officers 9. A Risk Assessment Report is provided to the H & S Officer
Alternatives	
Exceptions	KM ⁶ or RM repository has not been instantiated, actors have not been given access rights
Use Cases used	
Akogrimo Relevance	

⁶ Assumes that the RM service will delegate certain services to the KM services

Mobile Grid	School staff may have new roles assigned to them which open access to the RM catalogue service and/or RA service. Application would be better served if it exploited mobile contexts including location of actors. Examples: a risk assessment wizard that uses proximity analysis to assist in risk identification exploiting existing content, an inspectors application that priorities routes in locations to check on frequently problematic aspects (could call on route planning and CBR analysis services) or a smart phone/PDA application that turns the device in to a hazard gauge using audio-visual changes to reflect changes in the surrounding risk environment (e.g. red – bleeping for danger – perhaps CBRN or COMAH/HAZMAT based). Ideally would include predictive / measured temporal variation as well as geographic – one could imagine a mini badge PDA that changed colour with scenario contexts such as changes in risk of route/schedule interruption for an ambulance driver depending on several inputs or health threat to CBRN responders.
Context	Local network with 3G/4G access. Access from Laptop/tablet may be acceptable but a smart phone or smaller device would also have utility depending on required function to specific case.
Further Information	
Particular Requirements	Access to other services for augmented functionality (e.g. location service, proximity analysis, CBR analysis)
Assumptions	
Open Issues	
Information Requirements	Access to Risk Management repository
Non-functional Requirements	Language internationalization on all user interactions

Table 1: UC-DHCM-01: School Health and Safety Risk Assessment

4.1.1.2. Use Case: Scientific Services Expert System generation

Use Case ID	UC-DHCM-02
Use Case Name	Scientific Services Expert System generation
Initiator	Civil Contingencies Manager
Primary Actor	Scientific Services Officer
Additional Actors	CCU in general and LO from other LA departments
Description	Specialists build a set of guidance rules usually during planning for use at any level of command in response or recovery. However there are pertinent examples where this would be especially useful to conduct during recovery or response in light of unforeseen circumstances but is currently be impractical without Akogrimo (or similar).
Pre-condition	Civil Contingencies Manager requests an Expert System
Post-condition	A completed Expert System is submitted to the LA's catalogue.
Use Case Functionality	

Sequence	1. CCM requests a new ES – this could be mid response or recovery in 2. SSO has request delegated to them and receipts this 3. SSO uses existing scenario content, KM services, open resources and PTDMS and own experiences 4. SSO uses virtualized grid resources for violations or conflicts in formulated guidance policy 5. SSO checks the ES in to the KM repository 6. SSO calls upon LOs from other departments to check potential impact where appropriate 7. ES is provided to the CCM
Alternatives	
Exceptions	KM repository has not been instantiated, actors have not been given access rights
Use Cases used	Based on UC-DHCM-01
Akogrimo Relevance	
Mobile Grid	Use of completed expert systems would have similar Mobile Grid issues as per UC-DHCM-01. The creation of expert systems would benefit from the Akogrimo's virtualisation capability but also of interest could be the possibility of querying current Mobile contexts from sensors, PDAs or RFID tags on any resources that guidance is being drawn up for to check for any existing violations or conflicts in policy. Clearly static archived data would be far less meaningful here and would not allow the avoidance of damaging executing workflows elsewhere in the same or other MDVO.
Context	Local network with 3G/4G access for Scientific Services. Smaller pervasive devices for checking current status/violations/conflicts.
Further Information	
Particular Requirements	KM services, open resources and PTDMS and own experiences.
Assumptions	
Open Issues	
Information Requirements	Access to existing scenario content in the Knowledge Management repository – any supporting information on virtualized grid resources and open information sources on the WWW
Non-functional Requirements	Language internationalization on all user interactions

Table 2: UC-DHCM 02: Scientific Services Expert System generation

4.1.1.3. Use Case: Data Mining and Tuning

Information consultation is a generic use case with two different specializations.

As always in the DHCM scenario where actor selection is not curial we will opt for Ambulance Silver control CO.

4.1.1.3.1. Information request

Use Case ID	UC-DHCM 03
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Use Case Name	Information request
Initiator	CCM (through requesting training session/exercise)
Primary Actor	Ambulance Silver Control CO
Additional Actors	CCU and others involved in training or exercise. Training could even be on individual basis, an exercise would involve many organizations and roles.
Description	In this use case the CO wishes to obtain some information about concrete subject, so the COP forwards the student request to the PTDMS and this service processes openly available content and private to the MDVO.
Pre-condition	
Post-condition	Information is obtained
Use Case Functionality	
Sequence	1. The student accesses the e-Learning Portal and selects “Information Request” 2. The e-Learning Portal forwards the request to the Data Indexing Service 3. The Data Indexing Service finds an answer suitable for the given request 4. The data is get from the Multimedia Repository Service and sent back to the student.
Alternatives	
Exceptions	The Field Trip service has not been instantiated The students have not been granted to access the service
Use Cases used	We reapplied this use case from UC-EH-FT-03. Adaptation focuses on highlighting use of techniques complimentary to the more human dependant techniques in UC-DHCM 02 i.e. use fully automatic assistants (PTDMS) that have access to global information resources.
Akogrimo Criteria	
Mobile Gris	A grid is necessary to provide the Field Trip service. Mobility is necessary to access the service from any place.
Context	Local network with 3G/4G access. Access from a PDA or Laptop.
Further Information	
Particular Requirements	
Assumptions	
Open Issues	
Information Requirements	Information query.
Non-functional Requirements	Language internationalization on all user interactions

Table 3: UC-DHCM 03: Information request use case

4.1.1.3.2.

Speech data sending & recognition

Use Case ID	UC-DHCM 04
Use Case Name	Speech data sending & recognition
Initiator	CCM (through requesting training session/exercise)
Primary Actor	Ambulance Silver Control CO
Additional Actors	CCU and others involved in training or exercise. Training could even be on individual basis, an exercise would involve many organizations and roles.
Description	In this use case the student connects to IEM Platform, sending speech data through their smart phone or PDA. The IEM portal forwards the speech data to the COP Service. This service invokes the Speech to Text Service to convert from speech data to text. After this the COP Service records a record of the voice driven annotations. Some speech patterns are voice commands that can request the PTDMS to query IEM MDVO content or information from open sources.
Pre-condition	An IEM MDVO has been instantiated and actors have accessed to its platform and the relevant services
Post-condition	Speech information is processed, recognized and a record of annotation stored, any queries requested are completed.
Use Case Functionality	
Sequence	1. The a DHCM actor (typically acting for Bronze control) accesses the activates “Speech sending and recognition”. This could be as simple as switching on a dedicated smart phone. 2. The actor’s speech is continually sent on to the recognition service if the service cannot be hosted on their device. 3. The Speech to Text Service converts speech data to text. 4. The annotation record service stores spoken words. 5. When appropriate e.g. when specific commands are spoken other services can be requested such as UC-DHCM 03
Alternatives	
Exceptions	The IEM MDVO has not been instantiated The actors or their roles have not been granted to access the service
Use Cases used	Adapted from UC-EL-FT-04
Akogrimo Relevance	
Mobile Grid	A grid is necessary to provide the speech recognition. Mobility is necessary to access the service from any place.
Context	Local network with 3G/4G access. Access from a PDA or Laptop with microphone.
Further Information	
Particular Requirements	
Assumptions	
Open Issues	The speech when available as text could be used more than just to provide an actor’s an event annotation record or to initiate queries. For example they would be a useful live information feed into their relevant command centre e.g. Silver Control Ambulance Command. The idea would be that

	Commanders (or delegated staff) could set up automated continuous queries on information as part of the COP. So in UC-DHCM 06 a commander could request the COP to alert command when Ambulance operators annotations semantically match “nowhere to park”.
Information Requirements	Speech data to be converted.
Non-functional Requirements	Language internationalization on all user interactions

Table 4: UC-DHCM 04: Speech data sending & recognition use case

4.1.1.4. Use Case: Establish Response MDVO

We adapted UC-EH-HMES-01. Implementation differences focus on organizational mix and respecting the inevitable handover to recovery in a positive way as practical.

The recovery MDVO could be either be a separate MDVO or the same MDVO that is adjusted. This is still an open issue as there is benefits in both cases that we continue to explore.

Use Case ID	UC-DHCM 05
Use Case Name	Initialize Service
Initiator	Commanding Officer (CO) of Bronze as that command is initiated.
Primary Actor	The contacted IT service providers, LO from all organizations involved in the initiating command and IT Co-ordinating Officers (ITCO) from same organizations
Additional Actors	IEM MDVO service providers, LO from each organization in the assembled command. Given the dirty bomb i.e. CBNR requirements we will support the richest possible super set of actors.
Description	Set up an MDVO and put the attendants to roles
Pre-condition	Attending Bronze CO is registered with the service
Post-condition	LO from all attending organizations are registered and have delegated to them controlled and suitably tempered authority to extend the IEM MDVO with actors within their own organizations. Previously stored content such as RM from UC-DHCM 01, KM content such as ES UC-DHCM 02 and PTDMS from UC-DHCM 03 are structured appropriately in ways useful to organization, role, individual against needs dictated by particular circumstance.
Use Case Functionality	

Sequence	1. Create the IEM MDVO 2. Attending Bronze CO accesses the IEM MDVO and is authenticated by the system. 3. Attending Bronze CO starts an administration function to identify and activate response partners binding key LO roles to individuals. 4. New accounts can be created and administrative data provided if existing roles or individuals do not suffice. 5. LO specifies a means of identification/authentication on the LO hot desk assigned to them – this could be password and/or physical key such as an ID card (swipe/RFID tag). 6. Systems activate the user accounts 7. System registers the Bronze CO as the attending commander 8. LO accesses the DHCM application and content download services through their devices authenticated by the system 9. LO starts an administration function to download an Remote DHCM Grid Service (the COP) on his devices 10. System provides the remote service and installs it on the devices 11. LO logs out of the DHCM application download service. 12. LO starts the COP Service and is asked for authentication information see 3.3.5
Alternatives	
Exceptions	
Use Cases used	Adapted from UC-EH-HMES-01
Akogrimo Relevance	
Mobile Grid	A new VO-member can be added if a Single Sign On Capability is exploited; an existing VO member (CO) can add a new VO member (LO)
Context	Secure environment in IEM Attending LO uses significantly equipped terminal with a very large display that acts as a focal point in the command centre Attending LOs use a regular terminal or tablet pc with a display in sufficient size
Further Information	
Particular Requirements	Attending CO information system provides a Grid data service to import the LO organization content and feeds that will augment the COP
Assumptions	Download of a Remote Service (a mobile service) is possible
Open Issues	This may not be the ideal approach – new partners will review after the platform training sessions in late 2006.
Information Requirements	
Non-functional Requirements	Language internationalization on all user interactions

Table 5: UC-DHCM 05 - Initialize Service use case

4.1.1.5. Use Case: Establish Common Operational Picture

For this use case we have adapted UC-EH-HMES-06. Implementation differences focus on tailored views for each level of command and supporting those dependent on information but that are not active MDVO contributors during planning i.e. the media and the public. As

indicated earlier, in the first place for the test bed we shall only address the Silver Ambulance Control. We would like to see this expanded upon for the final demonstration programme.

An open issue is the extent to which the media and public could be MDVO members. A web portal could be used to disseminate information and that may suffice. However by accepting actors of these types there are definite benefits that could be reaped; for example:

- media audio/visual feeds could be made available to the MDVO other than just those broadcast – providing more “eyes and ears” on the ground
- members of the public could register as volunteers, request assistance or provide their own information feeds⁷ [10]

In this use case many types and sources of information could be relevant and several aspect

- separate controls for automatic transorganizational flows and separately
- services that exploit knowledge from the planning phase through services and content developed under its use cases
- exploring the “geography of risk”
- dynamic visualisation that adapts to personalization, and contexts such as location and local resource⁸

Use Case ID	UC-DHCM 06 (adapted from UC-EH-HMES-06)
Use Case Name	Establish Common Operational Picture
Initiator	Bronze or Silver Commander (when aberration detected)
Primary Actor	IEM Platform Administrator
Additional Actors	Commanders EM staff ES staff Administrator Staff

⁷ Physical assistance may not be appropriate for all areas during response – certainly not for CBRN but there is also the recovery phase to consider Furthermore such could be conducted via dedicated organizations such as the Red Cross or Red Crescent rather than through individuals. Nevertheless as Akogrimo seeks to tap and manage human resources, not just computing resources, there is much scope for the use of technology in disaster situations by improving communication and engagement with communities and volunteers.

⁸ Of particular interest are those contexts that are part of the “geography of risk”; some types of contexts: hazards close by, vulnerabilities close by, resources (including services/other responders) that are potentially useful to current workflow and position.

Description	Initiate and manage the emergency handling when an emergency is triggered. Create a IEM MDVO, in which all information needed for the management of a disaster is made available. Service for further diagnosis support, medical simulation, search of medical resources and navigation support are made available. Clerk joins the IEM MDVO to handle this specific case. Start different workflows. Make available (from Planning MDVO) Decision Support services to process the DHCM response phase this particular event.
Pre-condition	Lead organization (Police for CBRN) initiates COP when the situation is understood to require it⁹. The following services must be available: * network service * telephony service - SIP session management * IEM MDVO * context information (including his nationality, languages spoken etc.) * translator service * speech to text service * services involved in display personalization/ context adoption * service discovery - services have to be found by using a service discovery mechanism Or the emergency alert is triggered by system itself (more detailed by a medical ECG analysis service)
Post-condition	In rough order of priority: • Communication links between Category 1 response organizations activated ○ These are refined from templates made during Planning against event type/context ○ Those already in place from the first on the scene are identified, subsumed and exploited¹⁰ • Lead organization at each level of command has the individual currently in the command actor role authorized and on-line. • Initial information requirements for decision support identified and made available ○ Visualization adapted for personalization, and available contexts ○ Priority automatic transorganization information flows activated ○ Communication links between Category 2 response organizations activated • Assisted non-repudiated release feeds identified and primed for Media and the public

⁹ A fine grain (minute by minute) timeline will be produced for input to WP5.1 designed to detail at what point after an event the MDVO Common Operational Picture would be pursued and what resources would already have been brought into play by that point.

Use Case Functionality	
Sequence	1. A COP is created to handle the response phase for the event. 2. Clerk for the lead response organisation or by starting a specialized emergency software client on the his mobile phone; system receives the call 3. Context information of the responders is retrieved (e.g. language and location) 4. Audio links of various cardinalities are established between various roles with proper translation such that both parties understand the dialogue (this can be one-to-one, broadcast or multicast of various numbers) 5. With transcribing services automatic event logs are generated and semantically filtered triggers put in place for key spoken phrases 6. System finds an available actor suited for this particular case 7. IEM MDVO COP Clerk gives the actor basic instructions about the situation 8. All information needed for decision making is made available through the COP. This information can available to parties involved in all subsequent processes dependant on their authorization 9. System searches services in COP to assist diagnosis support on a case by case basis 10. IEM MDVO COP Clerk acquires and manages further information on request 11. Clerk manages the further emergency handling process by starting respective services and workflows.
Alternatives	A* 4a. Further, a translation service has been activated such that both parties understand the conversation.
Exceptions	IEM MDVO operator not available Some of the required services are not found (e.g. translation between language A and B, transcription, network service not available, network not able to support Akogrimo service)
Use Cases used	
Akogrimo Relevance	

¹⁰ Akogrimo brings with it the promise of being able to exploit content from between the event and initiation of the IEM command structure. Current state of practice has responders providing Situation Reports (SitReps) manually. With Akogrimo in place, and used for day-to-day business, then captured audio could be automatically transcribed as SitReps and potentially data mined, meta-data tagged, and visualized in ways to make particular features vivid; without hindrance to those in the field. Of course these would require some form of validation but effectiveness and efficiency could be greatly improved.

Mobile Grid	This use case requires finding services through semantics (emergency service, translation service, the RM content etc). The responders need to use service discovery to find the relevant services. Context information is required to locate salient content and other Grid resources. Furthermore, context information is also required to find humans available (e.g. roles, presence, and locations) and to enable exploring the geography of risk. Each service needs to identify and authenticate requesting actors. Delegation of authority into other organizations is facilitated by liaison officers and is a key requirement for the COP Many actions that go to set up the COP could be templated and handled by workflow using resources in a Virtual organization. The network must support real-time interactive communication services (telephony, video, urgent messages etc) to allow teams of people work closely together. This requires support for collaboration among individuals who have different roles and responsibilities. It is required to find specialist staff to handle specific queries and problems. It is required to share many resources of many types across several different organizations and administrative domains. The handling of the IEM MDVO COP will include resources from many different organisations, domains and physical locations.
Context	The following context information is required for this use case: IEM MDVO COP Clerk: • Contact information (name, address, e-mail, phone number) • Role, Availability • Prior Authority to access and further delegate Virtual Organisation Grid resources beyond own organisation (may vary with contexts such as risk environment and severity of circumstances) Liaison Officer: • Contact information (name, address, e-mail, phone number) • Organisation, Roles, Spoken languages, Location • Authority to delegate Grid Resources from own organisation for use by other actors • Terminal capabilities, Local services, Network capabilities Silver Ambulance Control: • Contact information (name, address, e-mail, phone number) • Role, Availability, Spoken languages, Location • Facilitating function with in command chain (content bundles provide/consumed) • Terminal capabilities, Local services, Network capabilities
Further Information	

Particular Requirements	IEM MDVO needs to identify and authenticate the caller. The COP represents a domain specific tool for collaboration and cooperation is required (e.g. instant messaging, blackboards, document sharing, geographical information system, audio (and video) sessions, medical records, medical diagnosis etc.). Log emergency calls. Transfer/delegation of access authority. Transcribing functions for logs and semantically filtered triggering
Assumptions	Grid based management of audio links Merging of Virtual Organizations
Open Issues	
Information Requirements	Audio (and video) stream, patient data (text, images), binary streaming data (ECG), text based data in message format
Non-functional Requirements	Language internationalization on all user interactions Transcribing of speech from identified actors (especially in the inner cordon).

Table 6: UC-DHCM 06: Establish Common Operational Picture

4.1.1.6. Reuse of RA and expert systems in Response

For this use case we have adapted UC-EH-HMES-09. Implementation differences focus on finding TRI (Grid resources that are already mitigating risks) through semantic discovery and adapting their use to the case at hand e.g. the car park surveillance system being used for Ambulance Parking Control.

Use Case ID	UC-DHCM 07 (adapted from UC_EH_HMES_09)
Use Case Name	Reuse of RA and expert systems in Response
Initiator	Response LA actors (primarily focus being at RIG level)
Primary Actor	Response LA actors (primarily focus being at RIG level)
Additional Actors	LA actors, supporting agencies, public, local commerce
Description	The key concern is that risk and expert knowledge content generated in earlier phases is exploited to measurably reduce the impact the event. The resources are identified on specific context information (e.g. proximity, the availability (network, engagement in other processes), relationship to the Recovery priorities. RIG actors can readily semantically discover and adapt prior content in order to better manage the return to normality
Pre-condition	The investigative aspects of the recovery phase are complete and control is handed over from ES to LA
Post-condition	The disaster is declared over.
Use Case Functionality	
Sequence	1. System specifies the need for a resource that is needed to continue any critical running processes and workflow from response 2. Additional resources required to manage the return to normality 3. Recovery MDVO Operator initiates a search for needed resources by specifying the specific semantic search criteria. 4. Recovery MDVO Operator selects the most suitable resource for the task and receives a confirmation that it will be assigned

	5. Recovery MDVO Operator joins the resource to the Recovery COP with proper access rights. 6. Selected resource will be involved in the requesting process or workflow and receives necessary information (patient situation, location etc).
Alternatives	A* 2a.-4a. all steps are realized by a particular search service without the involvement of the Recovery MDVO Operator (Clerk)
Exceptions	
Use Cases used	
Akogrimo Criteria	
Mobile Grid	It is required to find RM resources and relevant Expert Systems in repositories by context information (e.g. event type, role, presence, proximity etc.). Some of the addressed resources are mobile. The Recovery MDVO resources must be allowed to access services and contribute to the Recovery COP. Which service and content that can be accessed depends on the intended role of the resource in the process and the technical context the resource is situated in (e.g. network security) The services offered to human actors must be adjusted according to mobile platform capabilities and role/individual context adaptation and personalization. The Grid resources used provide essential services needed to accomplish the return to normality successfully across all the RIG types in accordance with the SRG priorities through delegation and tasking of RATs.
Context	To find a suitable services, the following context information is needed: SRG member: • Contact information (name, address, e-mail, phone number) • Role (e.g. LA Chief Executive), Availability, Spoken languages • Location (mapped to street address), Terminal capabilities, • Local services, Network capabilities RIG: • Contact information (name, address, e-mail, phone number), Location (mapped to street address), distance to the emergency site, and the time to reach the emergency site • Role (paramedic, physician etc.), Availability, Spoken languages • Mapping of SRG priorities to current RIG/RAT workflow • Recovery COP service consumption/provision • Direct and delegatable access rights • Terminal capabilities, Medical Equipment, Network capabilities RAT: • Contact information (name, address, e-mail, phone number), Location (mapped to street address), distance to the emergency site, and the time to reach the hospital respectively

	• Service requirements from recovery COP • Assigned workflows and actions • Availability and current activity Local Commerce: • Contact information (name, address, e-mail, phone number), Location (mapped to street address), proximity, specialist services offered (e.g. containment/decontamination), availability, pricing Public: • Spoken languages, information interests (grouped by RIG type) • Terminal capabilities, Local services, Network capabilities
Further Information	
Particular Requirements	
Assumptions	Search requests to a system's directory service can contain parameters describing the context of the requested service. Thus context information are permanently updated in the directory or requested from the service provides transparent to the requesting service or workflow.
Open Issues	
Information Requirements	Text based context information
Non-functional Requirements	

Table 7: UC-DHCM 07: Reuse of RA and expert systems in Response

4.1.1.7. Use Case: Response MDVO to Recovery MDVO Handover

This use case has been reapplied to IEM and the response IEM MDVO this use case and focus on the handover between two MDVO rather than two roles within one.

Use Case ID	UC-DHCM 08 (adapted from UC-EH-HMES-04)
Use Case Name	Response MDVO to Recovery MDVO Handover
Initiator	Lead response organization commander (Police for CBRN events – and with SRG/RIG command acquiescence)
Primary Actor	Clerks/administrators for Response and Recovery organisations. We focus on Clerk to Silver Ambulance Command to provide clarity and bound scope.
Additional Actors	Potentially all actors in Response and Recovery phases. Key stakeholders being SRG and RIG command

Description	Soon after the life saving and evidence gathering duties are complete for the lead organisation there will be a move to embark on recovery. Recovery will typically be lead by the LA. Although an open issue, in this scenario the best approach seems to be to use two MDVO and to replicate content and resources in both rather than to modify and continue the Response MDVO. Some content and resources will be redundant in the Recovery MDVO (for example the Silver Ambulance Control version of the COP), some will continue (video surveillance of the car park) and new content and resources will join – including new actors such as local commerce that is employed in the recovery effort. This use case is designed to highlight the features of Akogrimo that can contribute to tackling this challenging problem.
Pre-condition	• Key Recovery actors are identified and authenticated (SRG/RIG) • Response COP Grid resources are discoverable/available • LA resources for RAT formation are discoverable/available • Local commerce specialist services are discoverable/available for paid RAT assistance through sub-contraction • Web portals for public dissemination initiated
Post-condition	• Return to normality guaranteed • Public information requirements satisfied
Use Case Functionality	
Sequence	1. SRG team engaged and take receipt of relevant Response COP resources 2. RIG teams coordinated access rights to Recovery COP resources granted 3. Members of the public can subscribe to RIG channel information 4. SRG response priorities issued 5. RIG initiate required RATs and delegate access control where appropriate/necessary 6. RIG discover local commerce specialist services that can contribute to RAT activity and SRG priorities 7. RAT actor adds the local specialist service actor's device as a new feed consumer device (e.g. for risk proximity detection/alerts in recovery operations) 8. Continuously updates the Recovery COP 9. Continuously, the Recovery COP is analysed for diagnosis support 10. RAT device is switched off 11. RIG device is switched off 12. SRG device is switched off 13. Public device is switched off
Alternatives	
Exceptions	

Use Cases used	UC DHCM 06
Akogrimo Relevance	
Mobile Grid	Session hand-over from the RIG device to the RAT device
Context	Availability of additional monitoring devices Availability of visualization and interaction devices
Further Information	
Particular Requirements	
Assumptions	Session can be handed-over from devices and roles
Open Issues	
Information Requirements	
Non-functional Requirements	Language internationalization on all user interactions

Table 8: UC-DHCM 08: Reuse of RA and expert systems in Response

4.1.2. Relationships and Interactions between the Actors and Services

In this section we present some UML sequence diagrams that show related interactions

First from UC-DHCM 01 we show the interactions between the different LA staff and services that would be DHCM core services. In a later document we will investigate further how the KM services could be used to help manage RM services in an attempt to provide some useful levels of abstraction.

Content includes:

- RM catalogues
- Assessment Log Details – providing provenance
- Assessment Findings – traceable individual risk statements
- Assessment Reports – automatically generated from templates and above content

Assessment reports will be personalised to role; for example an H&S officer may not require all the detail compared to that of education institution Senior Staff of a particular department. Assessment Reports that have been personalised may include only high impact or untreated risks.

The mobility aspect of Akogrimo will be invaluable to the staff conducting RA. PDAs with a location services and forms to assist assessment will be investigated.

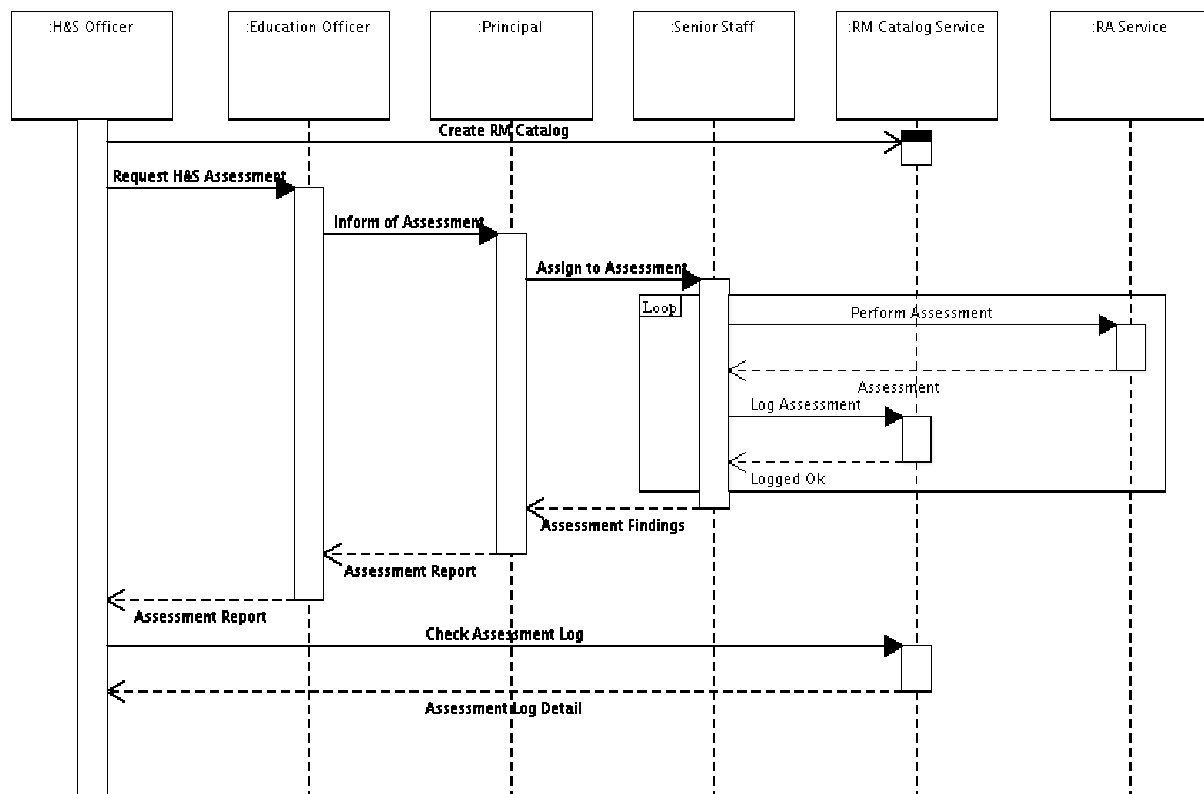


Figure 24: UC-DHCM 01 School Health and Safety Risk Analysis sequence

The next sequence diagrams deals with establishing the COP and handing over the IEM MDVO from the response phase to the recovery phase.

The COP represents a complex and significant body of work. For simplicity sake at this initial stage we have focused on discovering, searching and reusing the RM content derived in UC-DHCM 01. Other areas of interest is exploring the “Geography of Risk” which place the content shown in the COP establishment interaction diagram into layered GIS displays and involve further services such as those to determine route or proximity.

The MDVO response to recovery handover top level sequence diagram shows the interactions of the human actors with an authenticating service. We may later explore how to interact with core workflow services to enrich this diagram with aspects that address the dynamic and robust adaptation of workflows as they execute.

The COP will contain content still in use and still being developed; views, workflows etc. This handover will be a significant task and there is the opportunity to scale this interaction diagram up many times.

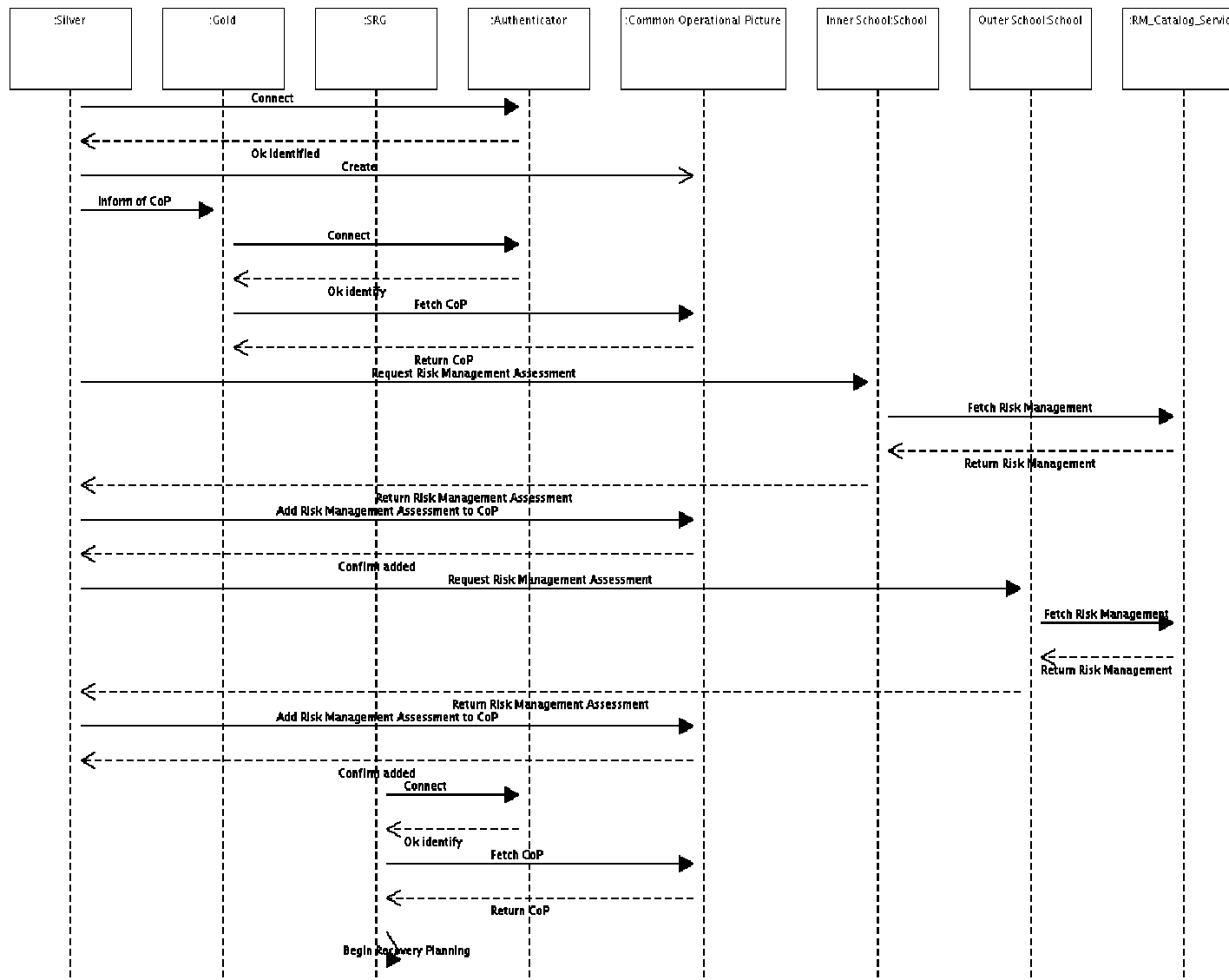


Figure 25: Establish Common Operational Picture

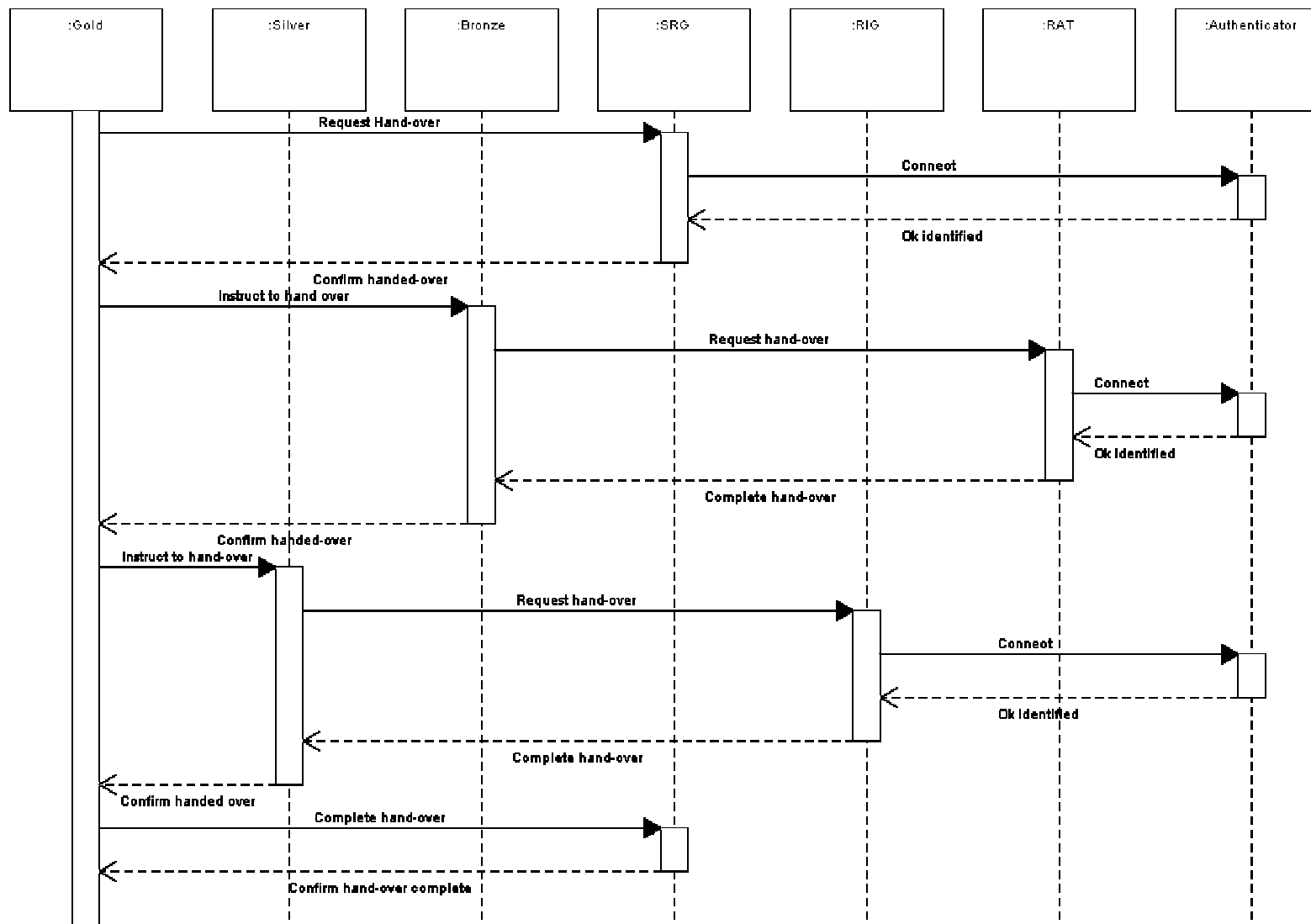


Figure 26: MDVO response to recovery handover top level sequence

The final diagram in this section shows our initial thoughts on the reuse of the e-Health use case UC-EH-HMES-05 – “Manage Audio Links”. We would like to explore different multiplicity than on the e-Health testbed whereby the Silver Command could engage with several Bronze operational staff.

Of particular interest would be by preceding this with the e-Learning use case UC-EL-FT-05 “Speech data sending & recognition”. This would be useful for allowing responders (and RATs during recovery) to dictate actions into the event log to provide records for later audit. We can see the potential of allowing Silver Command to exploit these during runtime in order to allow them to search and set up filters in order to automatically alert higher command of certain event log items and go on to suggest setting up communications where appropriate. We return to this idea in section 5.

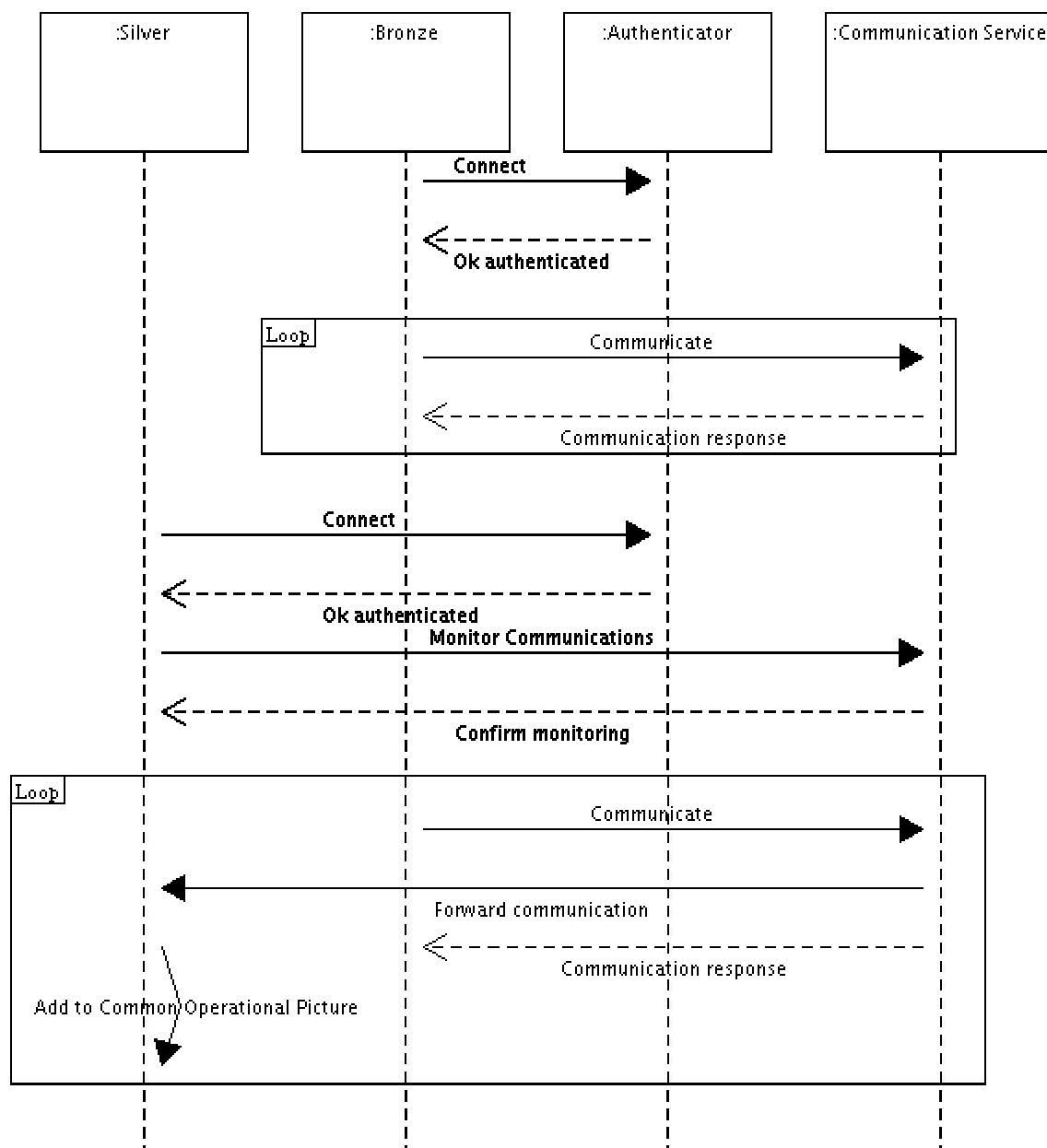


Figure 27: MDVO response to recovery handover top level sequence

5. Requirements Definition

5.1. Approach

In accordance with the aspirations of the synergy and complementarity with the e-Health and e-Learning testbeds highlighted in section 1.4, in this chapter we begin by reflecting on the requirements already stated for those testbeds. In this section we review each requirement stating one of the following:

- the requirement **applies** as is to the third test bed
- there is an **analogous** requirement in the third test bed
- the requirement is **irrelevant** to the third testbed

Our motivation here is to identify potential co-development that could be sought for the sake of cost reduction, research resource re-alignment (scenarios, services, content) and increased cohesion during demonstration and subsequent exploitation.

We conclude the chapter with thoughts of what could be common services used across all three testbeds where services can be generalized and remain useful (e.g. specialisation can be achieved with the content they consume and/or produce) and point to any services that must remain particular to the third testbed.

5.2. DHCM reflection on e-Health Application Requirements

The e-Health application will collect different types of data from a wide variety of services and/or applications and present them in an appropriate way to users of the system; different users may have different roles. As such, it will require the availability of a number of services:

This is even more the case for DHCM

- The patient's local monitoring equipment.

Applies/Analogous: Feeds of live data that impact critically on life/death issues will also appear in DHCM testbed through information services that go to constitute the COP. The multiplicity will be different in DHCM i.e. one feed could be critical to many lives. This could include the use of sensors or Bronze SitReps/automated audio audit annotations for example. See Figure 2 on page 20.

- The various patient's partial medical records held by multiple organizations

Applies/Analogous: The spread of information across multiple organizations is one of the major knowledge challenges cited by BCC. Although not immediately apparent privacy issues are also incumbent here. For example the location, nature and care required/currently administered to vulnerable groups is salient to the scenario and a current concern to BCC [9].

- A location service, which can be provided by a satellite or by triangulation of the patient's mobile phone. This service will also track participants other than the patient (e.g. the ambulance).

Applies: *There are several applications/subjects of such a service: Those in exercise or training during planning, ES (Bronze) during response and RAT members during recovery. This would improve situational awareness and emphasize mobile aspects. It would be useful in context adaptation that could be driven to improve resource management and the general auditing and accountability aspects. Another possibility is to use downloaded applications on the affected population's mobile phones for mutual benefit: a risk monitoring device for the holder and making the device integral to the MDVO could assist in monitoring and managing evacuation and other COP applications.*

- A service for determining the hospital the patient should be taken to, taking into account the bed space of nearby hospitals.

Applicable: *fully appropriate especially as we wish to focus on Silver Ambulance Control for the COP during response.*

- Language recognition and translation service for translating medical data of foreign patients.

Applies/Analogous: *especially for CBRN aspects of our scenario. Bristol's port is of international significance and contributes to the Domino Group (see Annex A) status risk management difficulties. As a result the scenario would greatly benefit from a translation services.*

- A filter which will search through the entire patient's record and choose only the information which is relevant for the pertaining emergency.

Analogous: *The COP needs to be flexible in terms of what information is assembled and made available through it. Our approach here is to rely on Semantic Web techniques to exploit content derived in planning phase or discover/mine data from live feeds including open, public sources. See Figure 2 on page 20.*

- A service for obtaining the patient's symptoms in an optimal fashion, considering the available emergency information.

Possibly Analogous: *high-level COHMA and CBRN expert systems (e.g.: symptoms, diagnosis, treatment, containment) will be developed that could be driven by live feeds [9]*

- A diagnostic service which will use all the information available to reach an initial diagnosis. This information must be made available to the medical team waiting for the patient in the hospital prior to his arrival.

Possibly Analogous: *high-level COHMA and CBRN expert systems (e.g.: symptoms, diagnosis, treatment, containment) will be developed that could be driven by live feeds [9]*

For the communication of the participants, the application must:

- Provide a heterogeneous mobile environment with quality of service
 - Allow the use of various kinds of devices, such as mobile phones, PDAs, portable computers and desktop computers.
 - Allow access to the application from virtually anywhere.
 - Ensure that high priority data flows will not be affected by other lower priority flows.
- Allow the sharing of different kinds of data among the participants.

- Provide an infrastructure for audio (and video) conferencing among the participants.
- Provide an organized working environment in which every participant can know his role, as well as the current status of the process he is involved with.

(All Applicable)

In addition the following requirements are typical for all kind of e-Health application:

- Reduce the usage and transport of patient data on a minimum

Applicable/Analogous (not specific to patient data)

- Make patient data pseudonymous or anonymous whenever possible

Possibly Analogous: not yet fully understood (of some concern but CCA [1] allows waiving of data protection act but this is untested by litigation). However the desensitising of information before passing on to public or media is very relevant – the question remains if services could be made general enough and is of use in both circumstances. See Figure 2 on page 20, 82[8] and [9].

- Assure the patient's consent when patient related data are transferred or processed

Applicable/Analogous: non repudiation and auditability of information release is a key concern

- Encrypt and sign patient data during transfer

Applicable: to ensure trust in the MDVO information and services

- Assure the correctness of provided, visualized medical data and images

Applicable: the validity and consistency of information is of particular concern in the COP (see Figure 5)

Be compliant to medical data exchange standards HL7 and DICOM

Irrelevant: except for direct use of e-Health within DHCM. Other standards used in e-Government are applicable especially GML. CAP and TpegELA are standards we would wish to employ for the betterment of public information dissemination and warning [15] including recovery [9] as well as the obvious requirements during response [8].

Assure non-repudiability of functions executed by the HMES

Applicable: to ensure trust in the MDVO information and services

5.3. DHCM reflection on e-Learning Application Requirements

During the writing of this deliverable the new role of the e-Learning application was still in discussion. We are aware that the services listed below will only be implemented partially and with an adjusted scope focussing the requirements of an IEM application. Therefore, the analysis

is still done on the basis of the service requirements given in D2.3.2 Validation Scenarios. The alignment of specific e-Learning services with the DHCM testbed will be revised and finally defined in the Demonstrator Definition.

An e-Learning application is intended as the end global service which collects other simpler services and is provided to the user (students, teacher and experts) through web portal. These simpler services are such as:

Analogous: *in general, to the “one stop shop” in Figure 2 on page 20*

- Service which collects user information (preferences and profiles) and provides user information about other students group with affinity to Field Trip project in order to share experiences and similar projects info.

Possibly Analogous: *it would be interesting if we could explore the idea of assembly cross functional teams based on plans/workflows/available resources for operations in any IEM phase. This would require more refinement and rigor than above stated requirement but could be abstracted to similar types of service.*

- E-Learning service that adapts the learning process to the specific user based on collected user information.

Applicable/Analogous: *personalization in light of current context is an exciting prospect from Akogrimo. Perhaps the work conducted here would be especially useful in the training and exercise activities*

- Information search service, which allows users get some information from a multimedia repository and from the Web.

Applicable: *see 4.1.1.3 Use Case: Data Mining and Tuning on page 53.*

- Simulation services to understand better the concepts and knowledge shared by all students.

Irrelevant: *given limited resources and a broad and challenging remit we have decided to focus on knowledge services at the expense of simulation services. However we do acknowledge the clear utility of simulations to IEM and is illustrated as such in Figure 2 on page 20 and Figure 5 on 24.*

- Text to speech service which allows send speech data through user device (for instance, through PDA device).

Applicable/Analogous: *personalization in light of current context is an exciting prospect from Akogrimo.*

- Digital libraries consulting service that provides the students a way to fill all the gaps in their knowledge.

Applicable: *This is extremely relevant to UC-DHCM 02. Here we will use Knowledge Management services to build up libraries of expert systems with specific ontologies. Analogous: to an extent will be UC-DHCM 03 but rather than libraries as such it will be the training of data mining agents that will be pursued. We envisage that this will be very useful to the e-Learning testbed too.*

- Meeting services, that is, collaborative tools for students to discuss some issues with other course students, teachers, experts, etc.

Analogous: and should be beneficial to UC-DHCM 05 but rather than libraries as such it will be the training of data mining agents that will be pursued. We envisage that the DHCM data mining service will be very useful to the e-Learning testbed; and the collaboration services from the e-Learning testbed useful to the DHCM COP.

- E-Learning service that evaluates the status of the learning process through direct and indirect user feedback and adapt the workflow accordingly.

Applicable: IEM practitioners are dedicated to continual learning. This service would be useful to deploy alongside the library/KM system and data mining services as part of an exercise system on the DHCM demonstrator. This would allow improvements to be captured as “lessons learnt” which could be about the services, the graphical interfaces or about what hampered/improved the IEM process being exercised.

With respect to the users, the e-Learning application has to provide an environment where:

- Users learn with interactive methods based on the use of multimedia technologies and Internet.
- Users are authenticated, using their preferences and profiles to adapt the learning process to each user.
- Users can exchange information and collaborate with other students with affinities to the Field Trip project.
- Users can meet via videoconference.
- Users can access the grid system from different devices (mobile phones, PDA, laptops and PCs) to upload process and download multimedia data.
- Users can access the system from any place

Analogous: all should be beneficial to the COP in UC-DHCM 05 and we will seek to re-use effort from the e-Learning where applicable.

With respect to the information, the e-Learning application has to be deployed on a platform where:

- Information can be integrated from different sources.
- Information can be indexed with semantic metadata.
- Information can be searched efficiently.
- Information can be stored in a multimedia repository
- Speech information can be recognized and translated to text.
- Information can be taken to perform simulations
- Information about sessions and context awareness is handled.

Analogous: again all should be beneficial to the COP in UC-DHCM 05 and we will seek to re-use effort from the e-Learning where applicable.

The COP would benefit from using multiple speech to text feeds going from Bronze to Silver. This would allow Silver to monitor either live or by triggering from filters – we would suggest reusing some of the ontologies from UC-DHCM 02 and the data-mining services from UC-DHCM 03. An interesting turn of events would be if textual triggers then went to prompt the initiation of audio links (after conformation) through SIP as per UC-EH-HMES-05 - Manage Audio Links. This could include changing multiplicity and directivity e.g. some one in silver can monitor several in bronze including actual responders – communication between responders is archived for audit

and those higher in command chain have eyes (e.g. include helmet mounted camera) & ears on ground and can interrupt if not high priority and they think they can add value.

5.4. DHCM Application Areas

We have, through careful consideration in engineering this scenario, attempted to minimise the requirements specific to DHCM in order to improve the value and impact of demonstration programme and the project as a whole. Our thoughts on what remains to be specific to the DHCM are as follows:

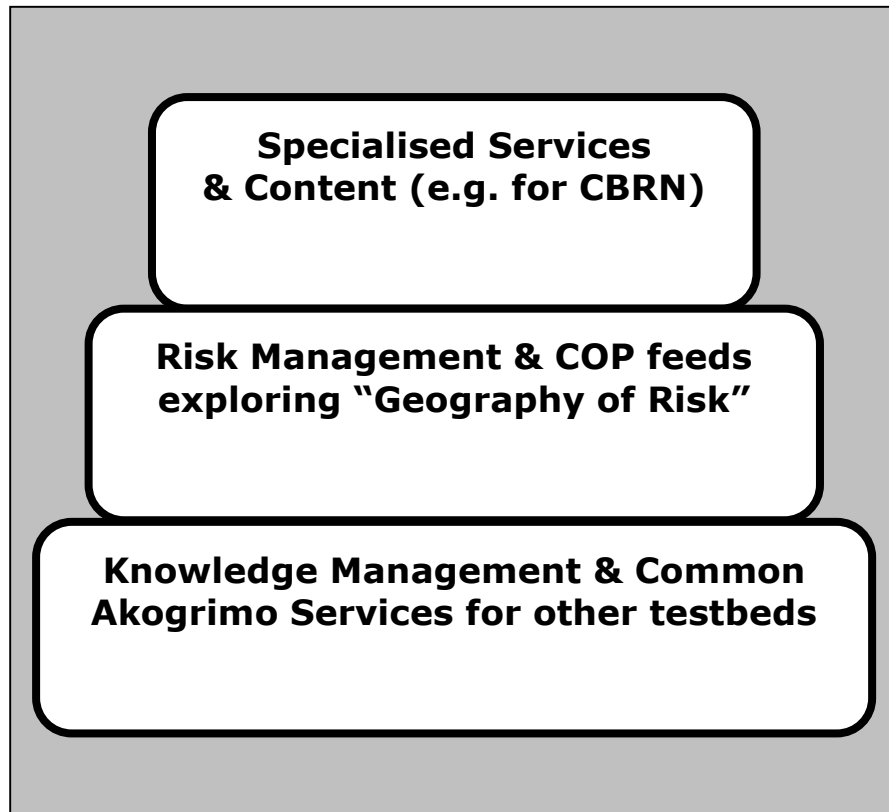


Figure 28: Service & Application Groupings

5.4.1. Knowledge Management

This is the most generalised area addressed in the DHCM application space. Indeed, RM services will delegate many of these operations to the KM services. We will examine the potential of using the KM inventions being developed under Akogrimo and in particular under e-Learning testbed. However it may be more efficient, less risk entailed and a richer set of services produced if existing products in this area were deployed by the new partners in the DHCM testbed.

The following use cases will involve Knowledge Management:

UC-DHCM-01 Health and Safety Risk Assessment

Underpinning the RM services

UC-DHCM 02 Scientific Services Expert System generation

The Scientific Services of the LA will be represented as guiding specialist policy in the guise of Expert Systems.

UC-DHCM 06 Establish Common Operational Picture

The Scientific Services from UC-DHCM 02 will be called upon to be part of the static services available in the COP.

UC-DHCM 07 Reuse of RA and expert systems in Response

The Scientific Services from UC-DHCM 02 will be interacted with by responders predominately, but not exclusively from Silver. Silver may be on desktop or tablet computer so some interaction with Bronze would be desirable where smaller and more mobile devices are required; and in a way that does not hamper operations.

UC-DHCM 09 Reuse of RA and expert systems in Recovery

The Scientific Services from UC-DHCM 02 will be interacted with by responders predominately, but not exclusively from Silver. Silver may be on desktop or tablet computer so some interaction with Bronze would be desirable where smaller and more mobile devices are required; and in a way that does not hamper operations.

For specific service details please see the relevant use case.

5.4.2. Risk Management & Planning

Risk Management and Planning functions will exploit the KM services to de-risk and reduce the development effort as detailed above.

The following use cases will focus on Risk Management:

UC-DHCM-01 Health and Safety Risk Assessment

UC-DHCM 02 Scientific Services Expert System generation

UC-DHCM 07 Reuse of RA and expert systems in Response

UC-DHCM 09 Reuse of RA and expert systems in Recovery

5.4.3. Persistent Tuneable Data Mining

This will interact with and complement the KM services. It will be realised as specialised and personalised content seated at the top level of figure 28. We would like to explore the possibility of using context adaptation as well as the personalisation aspects if possible.

UC-DHCM 02 Scientific Services Expert System generation

UC-DHCM 03 & UC-DHCM 04 Data Mining Tuning

UC-DHCM 05 Establish MDVO

UC-DHCM 06 Establish Common Operational Picture

UC-DHCM 07 Reuse of RA and expert systems in Response

UC-DHCM 09 Reuse of RA and expert systems in Recovery

5.4.4. Requirements from the Challenges from the IEM process as a whole

Akogrimo is ideally placed and well timed to address the residual IEM technical capability gaps and barriers that clearly remain across all phases but are most demanding during response.

These include:

- Simultaneous treatment of fundamental constraints such as resilience *and* agility
- Uncertainty of where/how to find resources
- Making transorganizational resources secure, punctual, appropriate, non-reputable, auditable, (there are special cases relating to public/media information releases)
- Provide insight of provenance, trust and accuracy when conflicts in content are encountered
- Preventing isolation due to organizational boundaries
- Address regional and political boundaries
- Optimising the brokering of finite expert and specialist resources (including human)
- Improving integration and interoperability of resources and workflows in extremely heterogeneous environments
- Safely handing over control of active workflows between phases and organizations
- Detecting and managing context changes (often subtle and risk driven in IEM)
- Dealing with rapid shifts in priority and activity modes (through adaptive workflows)
- Identifying and obtaining best utilisation of prior investment (training, infrastructure) for all activities in all phases
- Exploit latent advantages of the number of skilled mobile resources

Existing technology is at best questionable in the extent to which it allows resources to assemble, assimilate and act regardless of resource nature and parent organisation, let alone to do this safely, simply and seamlessly.

The technology arising through the Akogrimo project has diverse resources that include both human and non-human, both mobile and static; and on our networks both as services and content. The Akogrimo project calls such an arrangement of resources, along with the required providers, infrastructure, workflow etc. a MDVO.

6. Summary and Conclusion

This report is the third step in the definition of the validation scenarios for the Akogrimo platform. After describing visionary scenarios from various fields and detailed validation scenarios for the e-Health and e-Learning testbed, this report completes Task 2.3.2 Validation Scenario Definition by clearly defining the capabilities an Integrated Emergency Management application will have and by specifying the requirements on the Disaster Handling and Crisis Management testbed.

In the report we apply the same methodology and approach as done in the specification of the validation scenarios for the e-Health and e-Learning testbed. In the first step we give a description of processes to be carried out in IEM that was developed together with potential end-users of the Bristol City Council Civil Contingencies Unit. This end-user view was translated into a set of use cases that describe the interaction of human/organizational actors and technical services in the planning, response and recovery phase of the integrated emergency management. Throughout the whole document we address two major issues: a) in what kind does the DHCM testbed requires access to mobile or fixed grid services over mobile networks to make knowledge sources accessible; b) which additional capabilities of the Akogrimo Mobile Grid Platform will the DHCM testbed validate compared to the e-Health and e-Learning validation scenario. During the preparation of this deliverable the new reduced role of the e-Learning testbed was still in discussion. Therefore, the analysis is still done on the basis of the requirements given in D2.3.2 Validation Scenarios. The alignment of specific e-Learning services with the DHCM testbed will be revised and defined in the Demonstrator Definition.

Finally, this report is the first step towards the definition of the final Akogrimo demonstrator. On this way the DHCM testbed will be extended by services taken from the e-Health testbed to enrich the response phase with additional functionalities needed for the treatment of casualties and services from the e-Learning domain defined to support the planning phase in the IEM application. ID2.3.3 will explicitly focus on the alignment of the e-Health testbed and the DHCM testbed, and it will examine to what extend e-Learning services can be reused. The results of this report at hand and ID2.3.3 will brought together in D2.3.5 Demonstrator Definition. Besides, adjusted integrated use cases, the Demonstrator Definition will focus on the logical distribution of the five architectural domains (Customer/Home, OpVO, BaseVO, Service Provider, Access/Core Network Provider) and the deployment of application specific services.

Annex A. Acknowledgments

We are very grateful for the expert advice, information and graphical contributions kindly provided by Bristol City Council Civil Contingencies Unit in the production of this document.

Working groups involving Akogrimo partners and Emergency Managers from various Local Authorities have contributed thus far. However, in these initial phases however we have focused on Bristol City Council for the following reasons:

- multiple hazard sites of multiple types including chemical, petrochemical and radiological risks
- transport system is diverse across many types coastal, port, road, rail systems and air
- some hazards of particular concern and media interest are also mobile; making the “geography of risk” dynamic
- diverse range of large commercial and industrial interests in the area
- designation as a Domino Group status recognising that risks must be considered where effects are propagated between sites that may result in multiple disaster incidents and complications
- Bristol City Council have a proven track record in thought leadership in innovative risk management systems and are often early adopters of technology
- a proven working relationship we have enjoyed through previous related endeavours providing rapid and effective communications

Glossary

Ambulance loading point An area, preferably hard standing, in close proximity to the casualty clearing station, where ambulances can be manoeuvred and patients placed in ambulances for transfer to hospital. Helicopter landing provision may also be needed.

Body holding area An area close to the scene of an emergency where the dead can be held temporarily before transfer to the emergency mortuary or mortuary.

Casualty bureau The purpose of the casualty bureau is to provide the initial point of contact for the receiving and assessing of information relating to persons believed to be involved in the emergency. The primary objectives of a casualty bureau are: inform the investigation process relating to the incident; trace and identify people involved in the incident; and reconcile missing persons and collate accurate information in relation to the above for dissemination to appropriate parties.

Casualty clearing station An area set up at the scene of an emergency by the ambulance service in liaison with the Medical Incident Officer to assess, triage and treat casualties and direct their evacuation.

Control centre Operations centre from which the management and co-ordination of the response to an emergency is carried out.

Control of Major Accident Hazards Regulations 1998 (COMAH)

Regulations applying to the chemical industry and to some storage activities, explosives and nuclear sites where threshold quantities of dangerous substances, as identified in the Regulations, are kept or used.

Cordon – inner Surrounds and protects the immediate scene of an incident.

Cordon – outer Seals off a controlled area around an incident to which unauthorised persons are not allowed access.

Emergency Control: The NHS Department's 24-hour emergency call-centre which, in the initial phases of the emergency, may be used to receive and pass on to Council Silver Control information relating to the emergency

Emergency mortuary Demountable (temporary) structures or conversion of existing structures whose function is to provide an area where post-mortem and identification examinations of victims can take place and, where necessary, provide body holding capability prior to bodies being released for funeral arrangements to be made. Also known as a temporary mortuary.

Evacuation assembly point Building or area to which evacuees are directed for transfer/transportation to a reception centre or rest centre.

Family and Friends Reception Centre Secure area set aside for use and interview of friends and relatives arriving at the scene, (or location associated with an incident, such as an airport or port).

Family Assistance Centres A one-stop-shop for survivors, families, friends and all those impacted by the emergency, through which they can access support, care and advice.

Forward control point Each service's command and control facility nearest the scene of the incident – responsible for immediate direction, deployment and security.

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