User Needs and Major Challenges for Defence against Terrorism – Results of SeNTRE Study for European Commission Preparatory Action on Security Research

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ABSTRACT

The SeNTRE Consortium led by the AeroSpace and Defence Industries Association of Europe (ASD) completed in January 2006 a 14 month study under the first call of the Preparatory Action for Security Research (PASR 2004), issued by the European Commission. The SeNTRE study developed and proposed a Strategy for Security Research to the European Commission, Directorate-General Enterprise & Industry. This paper presents the SeNTRE methodology, the outputs as well as the major results relevant to tactical decision making and situational awareness for defence against terrorism. It focuses on the main challenges and user needs as identified in SeNTRE through a series of capability and technology workshops each covering specific security related themes and involving a large community of users, industry representatives and academia. A more detailed reference to SeNTRE results concerning crisis management is being made and specific implementation perspectives are proposed.

Introduction

The SeNTRE Consortium led by the AeroSpace and Defence Industries Association of Europe (ASD) completed in January 2006 a 14 month study under the first call of the Preparatory Action for Security Research (PASR 2004) issued by the European Commission. The SeNTRE study developed and proposed a Strategy for Security Research to the Commission, Directorate-General Enterprise & Industry. This paper consists of two parts. Part 1 presents the SeNTRE methodology and major outputs as identified by the consortium[1] during the 15 months of the project work. Part 2 presents the major results relevant to tactical decision making and situational awareness for defence against terrorism, with a more detailed reference to crisis management. At the end, specific implementation perspectives are proposed.

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[1] **ASD** (European Association of Aerospace and Defence Industries) ; NTO (Nederlandse Organisatie voor toegepast-Totalförsvarets forskningsinstitut natuurwetenschappelijk onderzoek), IABG (Industrieanlagen-Betriebsgesellschaft mbH), QinetiQ, IPSC (Joint Research Centre – Institute for Protection and Security of the Citizen), IAI (Istituto Affari Internatiozionale), FRS (Istituto Affari Internatiozionale), AR (Austrian Research Centers), DGA (Délégation Générale de l'Armement (Centre d'Etude du Bouchet), FhG (Fraunhofer-Gesellschaft), VTT (VTT Technical Research Centre of Finland), EADS Astrium, Finmeccanica, Dassault Aviation, Sagem, Rheinmetall, EADS, Thales Avionique, Herstal Group, Saab Ericsson Space, BAE Systems

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**User Needs and Major Challenges for Defence against Terrorism – Results of
SeNTRE Study for European Commission Preparatory Action on Security Research**

Part 1

A. METHODOLOGY

The key elements of SeNTRE methodology are the following:

- Identification of 10 security missions:

-Protection of Sites and Infrastructures

-Border and Coastline Surveillance and Control

-Protection of Transportation

-Protection of Distributed Networks

-Population protection

-Disarmament and Verification

-Support to External Affairs Policy

- CBRNE

-Crisis Management

-Economic and Financial Protection

- Engagement of users and creation of a large security network comprising representatives of industry, academia and users through capability and technology workshops.

The SeNTRE approach has been top down and bottom up. As a part of the process to establish the capability needs an extensive consultation has taken place with users at national and European levels in workshops and through interviews. This consultation gave a robust base on which the study was based.

After the analysis of the capability workshops results, a series of technology workshops identified technological solutions and key priorities in order to cover the capability needs expressed.

- Assessment of priorities

Through the capability and the technological workshops, the SeNTRE consortium tried to gather a view on the priorities associated to each of the proposed actions. Within the study it was not possible to follow a strictly analytical approach with each activity being assessed against identified criteria. However, the criteria were identified and debated at the workshops so as to guide the experts within the team towards an assessment of the priorities based on consensus.

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- Elaboration of a Strategic Research Plan (SSRP)

In each security mission, capability needs are directly associated with relevant supporting technologies, following FP work programme structure. The SSRP contains also a list of prioritized short, medium and long term actions (keu issues) and examples of proposed future demonstrations.

Synthetic table of SeNTRE methodology
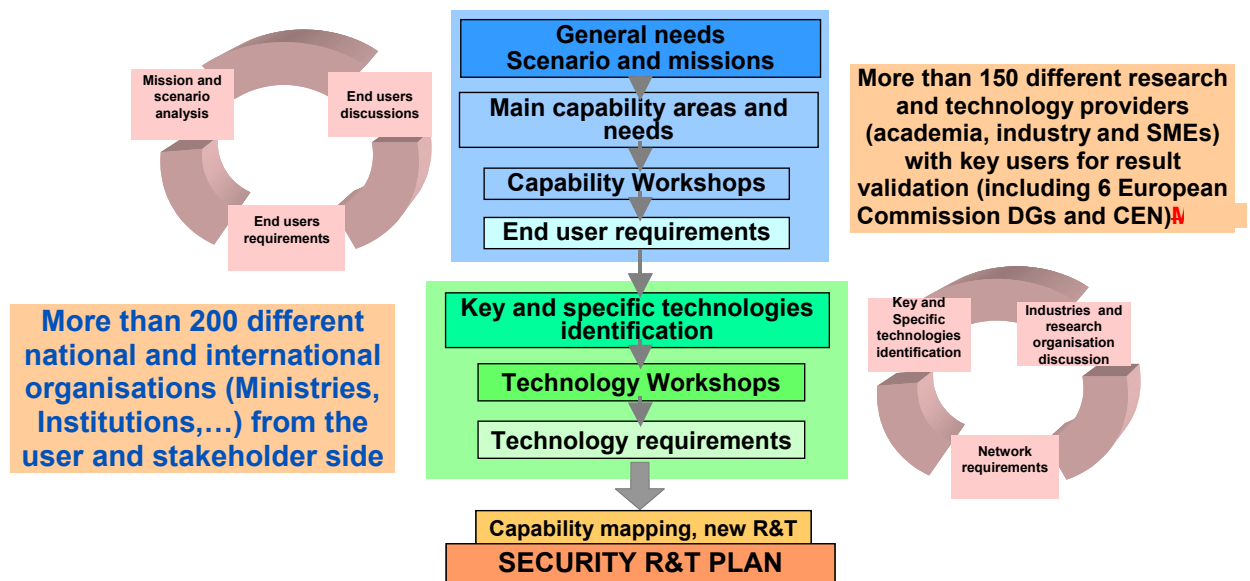
B. SENTRE MAJOR OUTPUTS

The major outputs of the SeNTRE project are:

- Development of a methodology to investigate systematically each of the ten security missions (with related security functions) and the capability needs and related technologies which could meet those needs. (*methodology*)

- Development of a set of scenarios and a typology for classification of threats (vignettes), allowing a comprehensive analysis of security missions. (*threats and mission classification*)

- A comprehensive survey of capability needs drawing on users across Europe through a number of workshops each covering specific security related themes. (*capability needs survey*)

- A parallel approach was undertaken in order to investigate technology driven opportunities. An expert panel representing relevant technology competences within SeNTRE reported on technologies and systems that have the potential to be of interest in security related development and design of products neds systems. (*survey*)

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SeNTRE Study for European Commission Preparatory Action on Security Research**

- A survey of relevant technology trends and security related innovations and applications was conducted through a second set of workshops with leading experts from all over Europe. (***technology driven innovations and priorities***)

- Development of a security research related common language in the form of a taxonomy for capabilities and a taxonomy for technologies, the latter being a revision of the WEAG (Western European Armaments Group) technology taxonomy. These two security taxonomies are submitted as part of the SeNTRE SSRP with the recommendation to the European Commission that they are made available for use in the public domain. (***taxonomies***)

- Development of a database to present the work undertaken in a comprehensive way. This database was created to allow cross-analysis between missions, capabilities and technologies. The database is a key tool for analysis and systematic overview. (***database of missions, capabilities and technologies***)

- The result of the capability driven investigation using this methodology, which are reported extensively in the SeNTRE Strategic Research Plan. Summary statements have been developed– one for each mission area – in which the priorities for development of different technologies and technology demonstrations at short/medium and long term time perspectives are presented. (***capability driven priorities for development of technologies for security applications***)

Limitations of the SeNTRE study

- Requirements clearly are dependent on the predicted intensity-level of possible catastrophes, and SeNTRE focussed on more canonical needs below the level of high-intensity crises. Requirements will also depend on the level of integration, and in a long-term perspective the impact of different levels of integration and different levels of crisis should to be considered. Important trade-offs shall exist between instant or mid-term solutions at the expense of intermediate approaches. (***requirements evolution, ability to upgrade***)

- SeNTRE strongly benefited from the involvement of Users to qualify the needs. A fundamental SeNTRE output has been the genesis of a network of experts and users who can identify both key issues and potential solutions. However, it has to be stressed that whilst in the timescales of the SeNTRE study, this process has been initiated, that the true benefits will come from extending this dialogue in the future, as communities have just started to share a general framework. (***User involvement***)

- As already mentioned, the SeNTRE study has elaborated a set of scenarios and a typology for the classification of threats (vignettes), This list is certainly not exhaustive. The future development and ongoing review of flexible scenarios, adapted to new threats and taking into account new technological opportunities is considered necessary for fully developed research strategy.

These limitations do not minimize the utility of the SeNTRE approach, but rather, subsequent efforts to address these broader issues will find SeNTRE results a comprehensive base to build on.

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Part II

A. SENTRE MAJOR RESULTS (KEY ISSUES) PER SECURITY MISSION

(Indication in blue colour of what is more relevant to Tactical Decision Making and Situational
Awareness)

1) Protection of Sites and Infrastructures

Continuous research activities

1. Need for research activities on risks and vulnerabilities assessment

Mid Term objectives

1.Risk reduction

- Physical protection in network nodes with a minimum risk architecture
- Prevention of « domino effect »

2. Protection against information attacks

- Cyber security

     -Secured networks

- Surveillance, detection, tracking

3. Protection against physical attacks

- Surveillance, detection, tracking

     -Reliable, low cost sensors and

     -networks of sensors

- Data exploitation

Long term objectives

- **-**Complex remote protection, control and operations (integration of information and physical
  protection and control)
- **-** Digital power (integration of energy supply and integrated control)

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SeNTRE Study for European Commission Preparatory Action on Security Research**

2) Border and Coastline Surveillance and Control

Continuous research activities

1. Conformity and performance of border equipment

- • Standardization

- • Testing, evaluation and certification

- • Interoperability and systems integration

2.Logistics and training

- • Education and training for operators and citizens

- • Better co-ordination and interoperability between services

3. Command, control, communications and computers

- • Privacy

- • Identity management

- • Integrated, end to end communications security

- • Information availability, correlation and fusion

- • Robust and continuous connectivity

4. Risk assessment, intelligence and related preventive measures at external borders

- • Threat and vulnerability assessment

- • Reinforcement of external borders

5. Immigration (control of fluxes of people)

- • Better co-ordination and interoperability between services

- • Privacy and ethical concerns

6. Illicit trafficking (control of fluxes of goods)

- • Better co-ordination and interoperability between services

Mid term objectives

1. Land, air, maritime and underwater surveillance

- • Land surveillance

     -Wide land area surveillance (including extended border lines and large regions)

       -Small land area surveillance (border crossing points, buildings and compounds associated with border crossing points)

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• Air surveillance

- -3D surveillance

- -Link to ATM systems

- -Maritime surveillance

- -Wide sea area surveillance (Extended Economic Zones and beyond)

- -Small sea area surveillance (ports and harbours)

• Underwater surveillance

2. Logistics and training

- • • Simulation tools
- • • Decision support

3. Risk assessment, intelligence and related preventive measures at external borders

- • • Intelligence collection, gathering and dissemination
- • • Data mining

4. Immigration (control of fluxes of people)

- • • Identification (profiling, access control, biometry)
- • • Detection, recognition, localization and tracking
- • • Remote identification, anomalous behaviour
- • • Screening and scanning

5. Illicit trafficking (control of fluxes of goods)

- • • Screening and scanning for substances (drugs, CBRNE, food, currency) carried by humans, in baggage, in post parcels and in containers, trucks and air cargo
- • • Trusted drivers and vehicles
- • • Whole chain integrated platforms
- • • Innovative logistic processes
- • • New approach to shipping containers control

    -Smart containers (Seal integrity programme; Micro-devices integration)

    -Modernization of the customs code and e-customs

Long term objectives

1. Illicit trafficking (control of fluxes of goods)

- • • 100% scanning (at equal cost at the whole chain level and fast): Low false alarms rate in

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SeNTRE Study for European Commission Preparatory Action on Security Research**

- motion and in the full chain
- • Intermodal supply chain security

3) Protection of Transportation

Continuous research activities

1. Surveillance and protection of transport facilities (CIP) e.g railway stations, ports, airports

Control fluxes of people respecting privacy and ethical concerns

2. Large databases indexing and securing, High performance Information processing

Mid term objectives

1.Surveillance and protection of transport facilities (CIP) e.g railway stations, ports, airports

- • Real time, low cost identification, integrating face, voice, 3D, iris, language, behaviour, with respect to
- ethical issues ("gaits")
- • Integration of sensors and automatic recognition of threats

2.Control fluxes of people (respecting privacy and ethical concerns)

- Real time, low cost identification, integrating face, voice, 3D, iris, language, behaviour, with respect to ethical issues **("gaits")**

3. Protection of vehicles

- • Detection/identification of potential threats (unplanned positions, abnormal behaviours, hazardous materials e.g. mines, bombs, missiles)
- • Remote control and Neutralisation

4.Control material fluxes

- • Whole chain integrated platforms
- • IT platforms (High rate data analysis, data fusion)
- • Innovative logistic processes (New approach to shipping containers control)
- • Smart containers (end-to-end security)
- • Modernization of the customs code and e-customs
- Standardisation combined with testing, evaluation and certification and proper implementation of the developed standards.

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Long term objectives

1.Control material fluxes

- 100% scanning (at equal cost at the whole chain level and fast): Low false alarms rate in motion and in the full chain

- • Intermodal supply chain security

- • Standardisation combined with testing, evaluation and certification and proper implementation of the developed standards.

2. Control fluxes of people

- In motion / non cooperative recognition and identification

- Bio agent detection and identification (viruses, bacteria…) Ref (CBRNE)

- Low cost, reliable, portable DNA identification systems , using European databanks information (Micro devices for rapid DNA analysis)

4) Protection of Distributed Networks

See Protection of Sites and Infrastructures mission.

5) Population protection

Continuous research activities

1.Human and social Factors

- Human Sciences (individual and population behaviour, cultural differences, cognitive Sciences)
- Physiology sciences (medical preparation)

2. Intervention forces

- -Exercise, new training methods
- -simulation (including fatigue and human performance modelling)
- -Situation assessment

3.Rescue logistics infrastructure

- -Physical (communication under all conditions/underground; Interoperable, wireless secure systems;

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- -Alert systems « Semantic space »: Communication between different cultures, multistakeholders

4. Neutralisation (CBRNE; vehicles (EM ; people – less than lethal weapons,…)

6) Disarmament and Verification

Continuous research activities

1.Marking/tracing

- -Integration of sensors
- -Positioning/Localisation

2.Social factors

- -language processing
- -Multistakeholders issues (e.g training, support, multi-lingualism)

Mid term objectives

1.Surveillance and detection

- Space and UAV surveillance: Active and semi-active antennas; Optical, IR, Hyperspectral sensors;SAR, MTI radars

2. Information

- Data mining / High performance data processing Technologies; High data rate, data compression and storage

Long term objectives

1. Bio-security

- Stand off B detection and identification when possible

7) CBRNE

Continuous research activities

Strong connection with C4ISR and Human factors

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SeNTRE Study for European Commission Preparatory Action on Security Research**

Mid Term objectives

1 Reduce detection and identification time for B and C

- Stand off C identification in a few seconds
- B identification in a few hours

2 Search and Rescue Operations/ Medical treatment / decontamination in a CBRNE attacked environment

- Organization in case of emergency (protection, Search and Rescue immediate action)
- Improve the equipment of personnel involved (protection, communication)

Long term objectives

1 Reduce detection and identification time for B and C

- Stand off B and C detection

 2 Search and Rescue Operations/ Medical treatment / decontamination in a CBRNE attacked environment

Genome Engineering (vaccine, serum…)

8) Crisis Management

Continuous research activities

1. Anticipation of what is needed for the next crisis in an adaptive, reactive and dynamic environment

2. **Communication under all conditions, underground** (wireless and mobile world, kinematics)

3. **Interoperability / multi-organisation management (for DNP)**

4. **Cultural interoperability** (multi linguism, cultural differences…)

5. **Situation awareness at all levels in large and complex crisis**

6. **Common operational picture**/Common situation awareness

7. Information management

8. Data mining/processing, **automatic image interpretation**

9. **Real time capability of voice and image analysis**

10. Human factors in crisis management

11. **Surveillance; search and rescue** in contaminated areas

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Mid term objectives

1. Information availability, security and reliability

- Information management: data mining and processing, heuristic algorithms, automatic image interpretation, data distribution
- New data concepts (e.g. post Google world/ archiving, indexing, securing, retrieving spatiotemporal data storage)
- Cryptography (including quantum based)
- "True" Grids network capability and security (2008)
- Communication (including ad-hoc systems)
- Networks vulnerability identification
- Multicast communications

Long term objectives

- **Integration of Quantum, Biology, Nanotechnology, and Digital world**

9) Support to EU External Relations

Continuous research activities

1. Intelligence, Surveillance

- Holistic approach for information collection
- Data mining /Data management and processing/Data fusion
- Software/Middleware agent technologies
- Cryptography
- Air, space, underwater detection/ surveillance

2. Risk and vulnerabilities assessment

- Situation awareness
- Crisis recognition

3. Deployment

- Exercise simulation, training of intervention forces
- Mobility, interoperability

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4. Communication

- Communication under all conditions, underground (including space communications)
- Interoperable , secure systems
- Wireless and mobile world (kinematics)
- Broadband wireless communication
- Multicast communications

5. Search and rescue

- Evacuation (integrated platforms including helicopters)
- Physiology sciences (telemedicine and medical preparation)

6. Human and social sciences

- Human behavior analysis and modeling
- Individual and population behavior
- Cultural differences
- Cognitive sciences

7. Human Factors for crisis management

- Prediction of mass behavior
- Human information processing
- Human performance enhancement
- Stress and human performance modeling

10) Economic and Financial Protection

Continuous research activities

1. Intelligence

- Holistic approach for information collection
- Data management and processing/Data mining and fusion to detect organized crime

2. Cyber security (secured networks)

- Info systems global protection
- Wide-Band data link secured / WB wireless secured
- **Vulnerability analysis, core knowledge identification, safer organisation and recovery process (business continuity)**

3. Human factors

- • Impact of human factors on Business Continuity

B. SYNTHETIC EXAMPLE OF SENTRE RESULTS ON CRISIS MANAGEMENT

Capability needs; key issues, key technologies

Capability needs

- To identify and evaluate the vulnerabilities in socio-technical environment
- **Crisis prevention**
- **Crisis preparedness and protection systems on local, regional, national and international level**
- To provide systems that support inter-organisational and international collaboration
- **To ensure the communication capabilities in a crisis situation**
- Cost Issues in Crisis Management
- To provide exercise and simulation facilities (including test, evaluations, certifications)
- To detect explosives, weapons, drugs, dangerous goods, CBRN detection, human detection, snipers, intrusion detection
- Surveillance (space, UAV, maritime and coastline, border, crowd)
- Positioning/Localisation
- **To provide computing infrastructures**
- **Intelligence :Strategic and economic Intelligence, Communications intelligence, Watch techniques**
- **Systems that support complex systems analysis**
- **C3, interoperability, interconnection/ C4ISR, decision making support (also deployable**)
- **Multi service co-ordination and inter service co-operation**
- **C3I/ Available, secured, hardened telecommunication systems**
- **Security systems architecture (Rights control systems, positions and movement control systems, protection systems, intelligence systems)**
- **Information and information systems protection**
- **Information management; Large volume of data collection and analysis (data fusion)**
- **To provide capabilities for data mining/automatic information processing**
- **To provide systems that support real-time information gathering and distribution**
- **To provide capabilities for alert broadcasting/information (early warning/ alert maritime, coastline networks**
- **To support interorganisational and international emergency and rescue operations**
- Neutralization of persons, Communication jamming
- To provide effective decontamination, depollution and disinfections means
- **Damage assessment and evaluation, investigation**
- *all the above deployable / transportable / mobile / self sustained ways*

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Key Issues identified

Continuous

1. Anticipation of what is needed for the **next crisis** in an adaptive, reactive and dynamic environment
2. **Communication under all conditions, underground** (wireless and mobile world, kinematics)
3. **Interoperability / multi-organisation management (for DNP)**
4. **Cultural interoperability** (multi linguism, cultural differences…)
5. **Situation awareness at all levels in large and complex crisis**
6. **Common operational picture**/Common situation awareness
7. Information management
8. Data mining/processing, **automatic image interpretation**
9. **Real time capability of voice and image analysis**
10. Human factors in crisis management
11. **Surveillance**; **search and rescue** in contaminated areas

Mid term

1. Information availability, security and reliability
• Information management: data mining and processing, heuristic algorithms, automatic image interpretation, data distribution
• New data concepts (e.g. post Google world/ archiving, indexing, securing, retrieving spatiotemporal data storage)
• Cryptography (including quantum based)
• "True" Grids network capability and security (2008)
• Communication (including ad-hoc systems)
• Networks vulnerability identification
• Multicast communications
• Information and Information security and reliability

Long term:
• **Integration of Quantum, Biology, Nanotechnology, and Digital world**

Specific key technologies

I. Technology-Components
• Human sciences (C3, Protection):
o Soft Value Analysis
o Usability and user-oriented systems
o Coalition Crisis
• Management Language (C-CML); Cognitive sciences; Individual and population behaviour
• Artificial intelligence and decision support: Inferential engines for classification and decision support (Intelligence)
• Information security technologies: cryptography, IP technologies (Protection)
• Computing technologies: trusted computing, Middleware/ Software agent technologies (Intelligence)
• Sensor technologies: Nanotechnology & genomic (invisible); CBRN and explosives detection (Search and detection)
• Security technology: security for multicast systems (Protection)
II. Equipment
• Sensors equipment (Search and detection):
o smart cooperating sensors
o large sensor networks
• Information networks and architectures: secure, large, decentralised databases (Intelligence)
• Biometry: biometric authentication
III. Systems-Services-Functions
• Risk and vulnerabilities assessment: vulnerabilities identification (on current systems and existing environments); dynamic risk assessment

Conclusion

Implementation perspectives and recommendations

Based on the experience of SeNTRE, especially the capability and the technology workshops results

and organisation, a few recommendations can be made for the further steps towards ESRP definition

and implementation:

1) Some more work is needed to precise the security research roadmap in order to identify the timescale and the necessary budget related to the main projects and demonstrators. This will be needed during the whole duration of ESRP too to propose the future work programme priorities and to coordinate with the other actions conducted in Europe (security related research programmes in FP7 outside ESRP and at national level).

2) Create and operate a security research network with users and experts based on the SeNTRE community of users and experts enlarged to other sectors if needed, in order to refine and pursue the need assessment between users with the support of experts, and the technology and systems validation by users. The principle of technical fora around a homogeneous domain as proposed in the technological workshops could be applied.

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Specialised discussions on human/social factors are essential in this process.

This network should involve the key stakeholders especially the other EC involved representatives

(DG Research, DG Infso, user DGs such as JLS, TREN, ….).

The secretariat of the network could be conducted by a neutral organization such as one or a group

of professional/ scientific associations.

3) Link with CEN for standardization issue in all fora especially from the user side.

4) To support the security technology and industrial base in Europe:

conduct first a mapping of European main security related competencies in industry including SMEs and in academia (to identify the "starting point"), under good confidentiality conditions, propose specific measures to encourage the creation of a "European security equipment market" (by identifying common needs and responses, by developing networks of competence, by facilitating common acquisitions, etc…).

5) Refine the SeNTRE technology taxonomy in order to distinguish what is civil more or less underpinning), defence specific and security specific at component to system level.

6) Concerning specifically the contents of ESRP:

A) ESRP should be security mission driven for the large projects, validated and orientated by the users involved in the security research network,

B) ESRP should support R&D of specific security technologies that are not covered in other FP7 themes as well as large demonstration projects,

C) Human/social factors should be embedded in all key projects, especially in those with crisis management dimensions,

D) A specific section of ESRP should be devoted to New and Emerging Sciences and Technologies ("NEST") allowing also a bottom-up flexible approach.

SCI-174 Tactical Decision Making and Situational Awareness for Defence Against Terrorism

"User needs and major challenges for Defence Against Terrorism

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for European Commission preparatory action on security research."

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SCI-174 Tactical Decision Making and Situational Awareness for Defence Against Terrorism

Content

- **SeNTRE Context and Objectives**

- **SeNTRE Methodology and outputs**

- **Major results per security mission**

- **Synthetic example on Crisis Management mission**

- **Implementation perspectives and recommendations**

"User needs and major challenges for Defence Against Terrorism-Results of SeNTRE study for European Commission preparatory action on security research."

SeNTRE (<u>Se</u>curity <u>N</u>etwork for <u>T</u>echnological <u>R</u>esearch in <u>E</u>urope) is a Strategic Study whose main objective is to support the European Commission to define the strategic research agenda for Security *(in support of and to link with the European Security Research Advisory Board -ESRAB)*

- **Funded under the PASR first call (March 2004)**
- **Co-ordinated by ASD**
- **Duration 14 months (December 2004 - February 2006)**
- **22 first level partners (including partners from ASD, ESDAG, Eurotech, FRS/IAI, JRC)**

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SeNTRE 22 first level partners

European Association of Aerospace Industries	AECMA	Europe
Totalförsvarets forskningsinstitut	FOI	Suède
Nederlandse Organisatie voor toegepast-natuurwetenschappelijk onderzoek	TNO	NL
Industrieanlagen-Betriebsgesellschaft mbH	IABG	Allemagne
QinetiQ	QinetiQ	UK
Joint Research Centre Institute for Protection & Security of the Citizen	IPSC	Europe
Istituto Affari Internatiozionale	IAI	Italie
Foundation for Strategic Research	FRS	France
Austrian Research Centers	AR	Autriche
Délégation Générale de l'Armement (Centre d'Etude du Bouchet)	DGA	France
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Herstal Group	FN	Belgique
Saab Ericsson Space	SES	Suède
BAE Systems	BAE	UK

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SeNTRE Methodology

- **Identification of 10 security missions and elaboration of scenarios/vignettes**

- **Engagement of users and creation of a large security network comprising representatives of industry, academia and users through capability and technology workshops.**

- **Creation of a capability taxonomy and a technology taxonomy**

- **Priorities assessment of capabilities and technologies and elaboration of key issues per mission**

- **Elaboration of a Strategic Research Plan (SSRP)**

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SeNTRE: Focus on Global Security

Focus of Security

- **Organized Crime** ↔ **Catastrophic Terrorism** ↔ **Unintended Catastrophies** (industrial& natural)

Missions

| Protection of sites | Border and coastline surveillance and control | Protection of transportation | Protection of distributed networks | Protection of the population | Disarmament Verification /WMD | Support to EU External Relations |

CBRNE

Crisis Management

Economic and financial system protection

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SeNTRE − An organized platform of users

- **A wide variety of security tasks**

  - CBRNE, ICT, Transport, Protection of critical infrastructures, Legal and ethical issues,…

- **Addressed in large number of national and European capability workshops**

  - National
    - 20 workshops and interviews in 12 countries
    - 115 different national organisations (Ministries, Institutions,…)
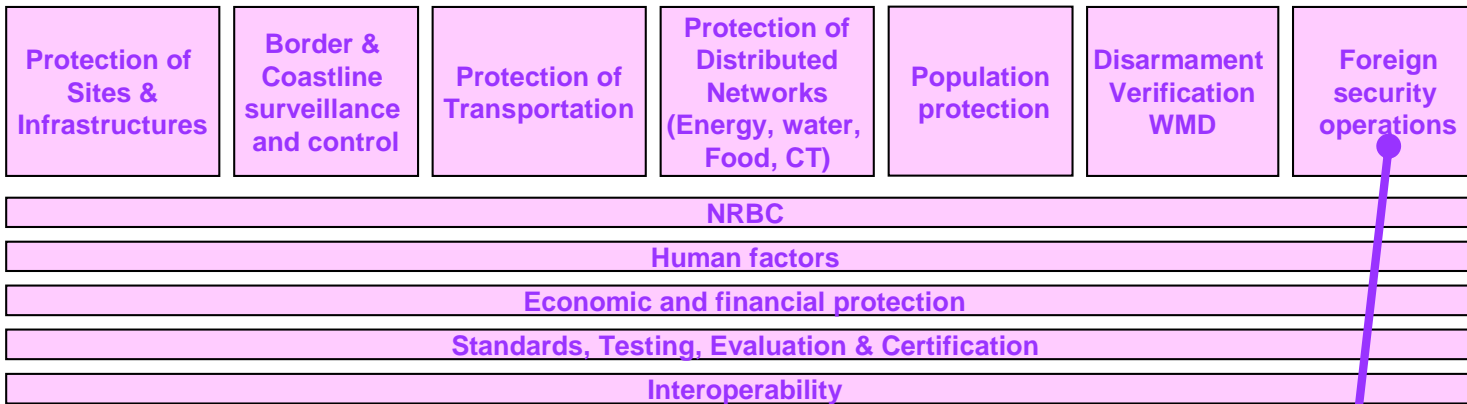
  - European
    - 11 workshops and interviews

More than 200 different national and international organisations (Ministries, Institutions,…) from the user and stakeholder side

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SeNTRE − A database of missions and capability needs

COMPREHENSIVE SECURITY MISSIONS

Protection of Sites & Infrastructures	Border & Coastline surveillance and control	Protection of Transportation	Protection of Distributed Networks (Energy, water, Food, CT)	Population protection	Disarmament Verification WMD	Foreign security operations

NRBC
Human factors
Economic and financial protection
Standards, Testing, Evaluation & Certification
Interoperability

DIFFERENT PHASES OF THE SECURITY MISSIONS

Prevention	Protection	Crisis management	Consequence management
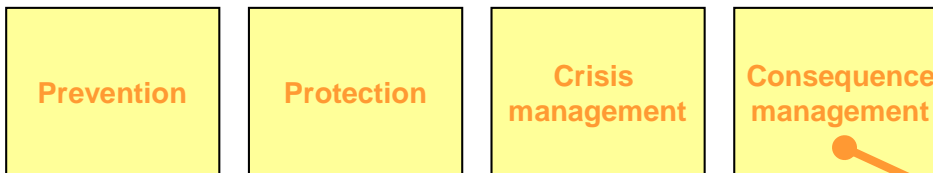
DIFFERENT FUNCTIONS OF THE DECISION CYCLE

Preparedness	Information gathering	Decision Making	Response

MISSIONS

PHASES

FUNCTIONS

Elementary capabilities & user needs

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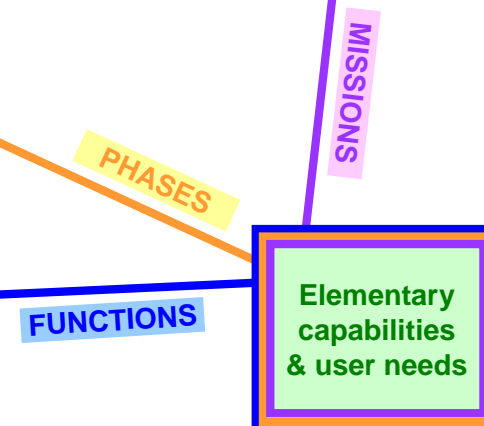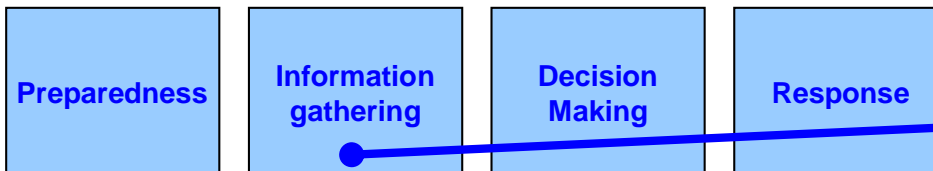
SeNTRE – An organized platform of technology experts

A wide range of technologies addressed in workshops with Experts, Industry and End Users clustered around security tasks

- Movement of goods including Containers transport
- CBRNE (detection, protection, decontamination, modelling, medical aspect)
- Movement of people / Identification/ Biometry / Surveillance
- Critical Network and Infrastructure protection and Cyber security
- Information/ Communication/ Crisis Management
- Space technologies for security
- Human/Ethical factors-Social/Legal issues

More than 150 different research and technology providers (academia, industry and SMEs) with key users for result validation (including 6 European Commission DGs and CEN)

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SeNTRE – A database of technologies – Taxonomy

- **Technology Taxonomy in five major sections/levels**

  - ➢ I. Technologies – Components
  - ➢ II. Equipment – Systems
  - ➢ III. Systems – Services – Functions
  - ➢ IV. Design – Manufacturing
  - ➢ V. Policy and Support

- **Technology Readiness Levels are used to define the maturity of the technologies and the level of research investment need.**
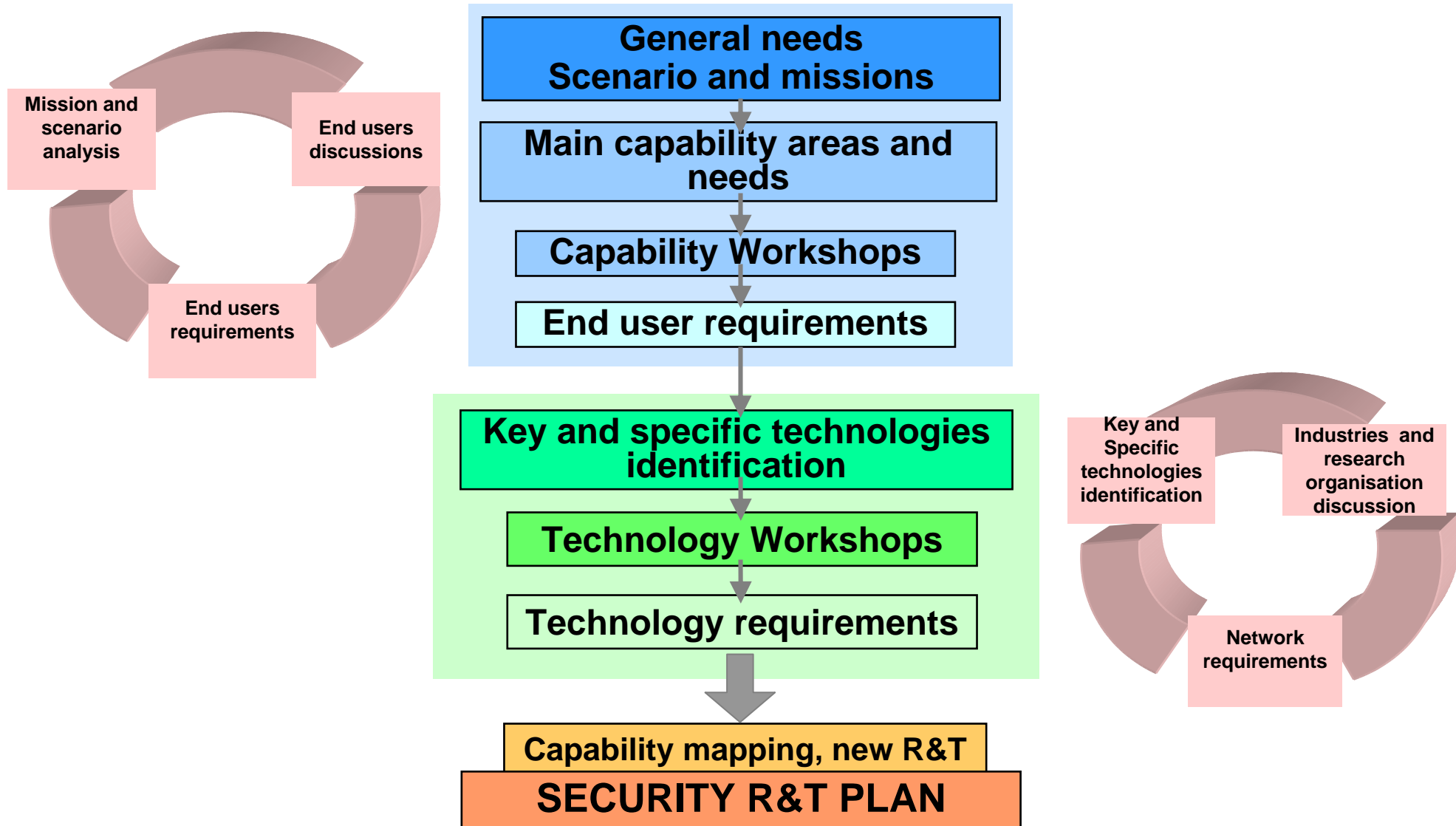
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SeNTRE − A Strategic Research Plan

- **It contains a list of prioritized short, medium and long term actions**

- **These priorities take into account various aspects and criteria**

  - ➢ Social and legal issues
  - ➢ Co-operation and regulatory framework
  - ➢ Human factors and interaction between sciences and technologies
  - ➢ Industrial impact
  - ➢ Security versus defence
  - ➢ Application oriented research versus basic research

- **In each security mission, capability needs are directly associated with relevant supporting technologies, following FP work programme structure, e.g.**

  - ➢ **To detect explosives, weapons, drugs, dangerous goods, CBRN detection, human detection, snipers, intrusion detection, detection of abnormal situations and behavior.**

    Contributing technologies include: Sensor technologies; Passive (background) monitoring; Portable detection systems; Vision systems; Image processing technologies; Tags (e.g. RFID); Identification technologies (e.g. biometry).

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SeNTRE Methodology (synthetic table)

General needs Scenario and missions

Main capability areas and needs

Capability Workshops

End user requirements

Mission and scenario analysis

End users discussions

End users requirements

Key and specific technologies identification

Technology Workshops

Technology requirements

Key and Specific technologies identification

Industries and research organisation discussion

Network requirements

Capability mapping, new R&T

SECURITY R&T PLAN

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SeNTRE Major Outputs

- **A methodology on security research**

- **Threats and mission classification**

- **User needs survey in capability workshops**

- **Technological survey within SeNTRE consortium**

- **Identification of technology driven innovations and priorities in technology workshops**

- **Creation of a capability taxonomy and a technology taxonomy**

- **Capability driven priorities for technologies with security applications**

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SeNTRE- Major Results

"Key issues"
per security mission

(indication in blue colour of what is more relevant to Tactical Decision Making and Situational Awareness)

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Protection of Sites and Infrastructures

Continuous research activities

Need for research activities on risks and vulnerabilities assessment

Mid Term objectives

1.Risk reduction

- Physical protection in network nodes with a minimum risk architecture
- Prevention of « domino effect »

2.Protection against information attacks

- Cyber security
    - Secured networks

Idem for Distributed Networks Protection mission

- Surveillance, detection, tracking

3. Protection against physical attacks

- Surveillance, detection, tracking
    - Reliable, low cost sensors and
    - networks of sensors
- Data exploitation

Long term objectives:

- Complex remote protection, control and operations (integration of information and physical protection and control)
- Digital power (integration of energy supply and integrated control)

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Border and Coastline Surveillance and Control (1/3)

Continuous research activities

1. Conformity and performance of border equipment
-Standardization
-Testing, evaluation and certification
-Interoperability and systems integration

2.Logistics and training
- Education and training for operators and citizens
-Better co-ordination and interoperability between services

3. Command, control, communications and computers
- Privacy
- Identity management
- Integrated, end to end communications security
- Information availability, correlation and fusion
- Robust and continuous connectivity

4. Risk assessment, intelligence and related preventive measures at external borders
- Threat and vulnerability assessment
- Reinforcement of external borders

5. Immigration (control of fluxes of people)
- Better co-ordination and interoperability between services
- Privacy and ethical concerns

6. Illicit trafficking (control of fluxes of goods)
- Better co-ordination and interoperability between services

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Border and Coastline Surveillance and Control (2/3)

Mid term objectives

1. Land, air, maritime and underwater surveillance

-Land surveillance

•Wide land area surveillance (including extended border lines and large regions)

•Small land area surveillance (border crossing points, buildings and compounds associated with border crossing points)

•Air surveillance

•3D surveillance

•Link to ATM systems

•Maritime surveillance

•Wide sea area surveillance (Extended Economic Zones and beyond)

•Small sea area surveillance (ports and harbours)

• Underwater surveillance

2. Logistics and training

• Simulation tools

• Decision support

3. Risk assessment, intelligence and related preventive measures at external borders

• Intelligence collection, gathering and dissemination

• Data mining

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Border and Coastline Surveillance and Control (3/3)

Mid term objectives

4. Immigration (control of fluxes of people)

• Identification (profiling, access control, biometry)

• Detection, recognition, localization and tracking

• Remote identification, anomalous behaviour

• Screening and scanning

5. Illicit trafficking (control of fluxes of goods)

• Screening and scanning for substances (drugs, CBRNE, food, currency) carried by humans, in baggage, in post parcels and in containers, trucks and air cargo

• Trusted drivers and vehicles

• Whole chain integrated platforms

• Innovative logistic processes

• New approach to shipping containers control

-Smart containers (Seal integrity programme; Micro-devices integration)

-Modernization of the customs code and e-customs

Long term objectives

1. Illicit trafficking (control of fluxes of goods)

• 100% scanning (at equal cost at the whole chain level and fast): Low false alarms rate in motion and in the full chain

• Intermodal supply chain security

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Protection of Transportation (1/2)

Continuous research activities

1. Surveillance and protection of transport facilities (CIP) e.g railway stations, ports, airports

Control fluxes of people respecting privacy and ethical concerns

2. Large databases indexing and securing, High performance Information processing

Mid term objectives

1.Surveillance and protection of transport facilities (CIP) e.g railway stations, ports, airports

• Real time, low cost identification, integrating face, voice, 3D, iris, language, behaviour, with respect to ethical issues ("gaits")

• Integration of sensors and automatic recognition of threats

2.Control fluxes of people (respecting privacy and ethical concerns)

Real time, low cost identification, integrating face, voice, 3D, iris, language, behaviour, with respect to ethical issues ("gaits")

3. Protection of vehicles

• Detection/identification of potential threats (unplanned positions, abnormal behaviours, hazardous materials e.g. mines, bombs, missiles)

• Remote control and Neutralisation

4.Control material fluxes

• Whole chain integrated platforms

• IT platforms (High rate data analysis, data fusion)

• Innovative logistic processes (New approach to shipping containers control)

Protection of Transportation (2/2)

Mid term objectives

• Smart containers (end-to-end security)

• Modernization of the customs code and e-customs
 Standardisation combined with testing, evaluation and certification and proper implementation of the developed standards.

Long term objectives

1.Control material fluxes

•100% scanning (at equal cost at the whole chain level and fast): Low false alarms rate in motion and in the full chain

• Inter-modal supply chain security

• Standardisation combined with testing, evaluation and certification and proper implementation of the developed standards.

2. Control fluxes of people

•In motion / non cooperative recognition and identification

•Bio agent detection and identification (viruses, bacteria…) Ref (CBRNE)

•Low cost, reliable, portable DNA identification systems , using European databanks information (Micro devices for rapid DNA analysis)

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Population Protection

Continuous research activities

1.Human and social Factors

•Human Sciences (individual and population behaviour, cultural differences, cognitive Sciences)

•Physiology sciences (medical preparation)

2. Intervention forces

•Exercise, new training methods

•simulation (including fatigue and human performance modelling)

•Situation assessment

3.Rescue logistics infrastructure

•Physical (communication under all conditions/underground; Interoperable, wireless secure systems;

• Alert systems « Semantic space »: Communication between different cultures, multi-stakeholders

4. Neutralisation (CBRNE; vehicles (EM ; people – less than lethal weapons,…)

Disarmament and Verification

Continuous research activities

1.Marking/tracing

•Integration of sensors

•Positioning/Localisation

2.Social factors

•language processing

•Multi-stakeholders issues (e.g. training, support, multi-language issues)

Mid term objectives

1.Surveillance and detection

Space and UAV surveillance: Active and semi-active antennas; Optical, IR, Hyperspectral sensors; SAR, MTI radars

2. Information

Data mining / High performance data processing Technologies; High data rate, data compression and storage

Long term objectives :

1. Bio-security

Stand off B detection and identification when possible

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CBRNE

Continuous research activities

Strong connection with C4ISR and Human factors

Mid Term objectives

1 Reduce detection and identification time for B and C
•Stand off C identification in a few seconds
•B identification in a few hours
2 Search and Rescue Operations/ Medical treatment / decontamination in a CBRNE attacked environment
Organization in case of emergency (protection, Search and Rescue immediate action)
Improve the equipment of personnel involved (protection, communication)

Long term objectives:

1 Reduce detection and identification time for B and C
Stand off B and C detection
2 Search and Rescue Operations/ Medical treatment / decontamination in a CBRNE attacked environment
Genome Engineering (vaccine, serum…)

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Crisis Management (1/2)

Continuous research activities

1. Anticipation of what is needed for the **next crisis** in an adaptive, reactive and dynamic environment
2. **Communication under all conditions, underground** (wireless and mobile world, kinematics)
3. **Interoperability / multi-organisation management** (for DNP)
4. **Cultural interoperability (multi language issues, cultural differences…)**
5. **Situation awareness at all levels in large and complex crisis**
6. **Common operational picture/Common situation awareness**
7. Information management
8. Data mining/processing, **automatic image interpretation**
9. **Real time capability of voice and image analysis**
10. Human factors in crisis management
11. **Surveillance; search and rescue** in contaminated areas

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Crisis Management (2/2)

Mid term objectives

1. Information availability, security and reliability

• Information management: data mining and processing, heuristic algorithms, automatic image interpretation, data distribution

• New data concepts (e.g. post Google world/ archiving, indexing, securing, retrieving spatiotemporal
data storage)

• Cryptography (including quantum based)

• "True" Grids network capability and security (2008)

• Communication (including ad-hoc systems)

• Networks vulnerability identification

• Multicast communications

Long term objectives:

• **Integration of Quantum, Biology, Nanotechnology, and Digital world**

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Support to External Relations (1/2)

Continuous research activities

1. Intelligence, Surveillance
- Holistic approach for information collection
- Data mining /Data management and processing/Data fusion
- Software/Middleware agent technologies
- Cryptography
- Air, space, underwater detection/ surveillance

2. Risk and vulnerabilities assessment
- Situation awareness
- Crisis recognition

3. Deployment
- Exercise simulation, training of intervention forces
- Mobility, interoperability

4. Communication
- Communication under all conditions, underground (including space communications)
- Interoperable , secure systems
- Wireless and mobile world (kinematics)
- Broadband wireless communication
- Multicast communications

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Support to External Relations (2/2)

Continuous research activities

5. Search and rescue
- Evacuation (integrated platforms including helicopters)
- Physiology sciences (telemedicine and medical preparation)

6. Human and social sciences
- Human behavior analysis and modeling
- Individual and population behavior
- Cultural differences
- Cognitive sciences
- *7. Human Factors for crisis management*
- Prediction of mass behavior
- Human information processing
- Human performance enhancement
- Stress and human performance modeling

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Economic and Financial System Protection

__Continuous research activities__

1. Intelligence
- Holistic approach for information collection
- Data management and processing/Data mining and fusion to detect organized crime

2. Cyber security (secured networks)
- -Info systems global protection
- -Wide-Band data link secured / WB wireless secured
- Vulnerability analysis, core knowledge identification, safer organisation and recovery process (business continuity)

3. Human factors
- Impact of human factors on Business Continuity

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SeNTRE-major results

A Synthetic Example of SeNTRE results- Crisis Management mission

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Capability needs

-To identify and evaluate the vulnerabilities in socio-technical environment
-**Crisis prevention**
-**Crisis preparedness and protection systems on local, regional, national and international level**
-To provide systems that support inter-organisational and international collaboration
-**To ensure the communication capabilities in a crisis situation**
-Cost Issues in Crisis Management
-To provide exercise and simulation facilities (including test, evaluations, certifications)
-To detect explosives, weapons, drugs, dangerous goods, CBRN detection, human detection, snipers, intrusion detection
-Surveillance (space, UAV, maritime and coastline, border, crowd)
- Positioning/Localisation
-**To provide computing infrastructures**
-**Intelligence :Strategic and economic Intelligence, Communications intelligence, Watch techniques**
-**Systems that support complex systems analysis**
-**C3, interoperability, interconnection/ C4ISR, decision making support (also deployable**)
-**Multi service co-ordination and inter service co-operation**
-**C3I/ Available, secured, hardened telecommunication systems**
-**Security systems architecture (Rights control systems, positions and movement control systems, protection systems, intelligence systems)**
-**Information and information systems protection**
-**Information management; Large volume of data collection and analysis (data fusion)**
-**To provide capabilities for data mining/automatic information processing**
-**To provide systems that support real-time information gathering and distribution**
-**To provide capabilities for alert broadcasting/information (early warning/ alert maritime, coastline networks**
-**To support inter-organisational and international emergency and rescue operations**
-Neutralization of persons, Communication jamming
-To provide effective decontamination, depollution and disinfections means
-**Damage assessment and evaluation, investigation**
 all the above deployable / transportable / mobile / self sustained ways

Key Issues identified

Continuous

1. Anticipation of what is needed for the **next crisis** in an adaptive, reactive and dynamic environment
2. **Communication under all conditions, underground** (wireless and mobile world, kinematics)
3. **Interoperability / multi-organisation management (for DNP)**
4. **Cultural interoperability** (multi language issues, cultural differences…)
5. **Situation awareness at all levels in large and complex crisis**
6. **Common operational picture**/Common situation awareness
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10. Human factors in crisis management
11. **Surveillance**; **search and rescue** in contaminated areas

Mid term

1. **Information availability, security and reliability**
- Information management: data mining and processing, heuristic algorithms, automatic image interpretation, data distribution
- New data concepts (e.g. post Google world/ archiving, indexing, securing, retrieving spatiotemporal data storage)
- Cryptography (including quantum based)
- "True" Grids network capability and security (2008)
- Communication (including ad-hoc systems)
- Networks vulnerability identification
- Multicast communications
- Information and Information security and reliability

Long term:
- **Integration of Quantum, Biology, Nanotechnology, and Digital world**

Specific key technologies

I. Technology-Components
- Human sciences (C3, Protection):
o Soft Value Analysis
o Usability and user-oriented systems
o Coalition Crisis
- Management Language (C-CML); Cognitive sciences; Individual and population behaviour
- Artificial intelligence and decision support: Inferential engines for classification and decision support (Intelligence)
- Information security technologies: cryptography, IP technologies (Protection)
- Computing technologies: trusted computing, Middleware/ Software agent technologies (Intelligence)
- Sensor technologies: Nanotechnology & genomic (invisible); CBRN and explosives detection (Search and detection)
- Security technology: security for multicast systems (Protection)

II. Equipment
- Sensors equipment (Search and detection):
o smart cooperating sensors
o large sensor networks
- Information networks and architectures: secure, large, decentralised databases (Intelligence)
- Biometry: biometric authentication

III. Systems-Services-Functions
- Risk and vulnerabilities assessment: vulnerabilities identification (on current systems and existing environments); dynamic risk assessment

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SeNTRE *Implementation perspectives and recommendations*

1) **Precise the security research roadmap** in order to identify the timescale and the **necessary budget related to the main projects and demonstrators**

2) Create and operate a **security research network** with users and experts based on the SeNTRE community of users and experts, enlarged to other sectors if needed and comprising as well the **other EC involved representatives** (DG Research, DG Infso, user DGs such as JLS, TREN, ….)

3) **Link with CEN** for standardization issues

4) Support the security technology and industrial base in Europe

5) **Refine the SeNTRE technology taxonomy**

6) **Human/social factors should be embedded in all key projects**, especially in those with crisis management dimensions

7) Concerning the ESRP: it should be **security mission driven and support R&D of specific security technologies that are not covered in other FP7 themes as well as large demonstration projects**

8) A specific section of ESRP should be devoted to New and Emerging Sciences and Technologies ("NEST") allowing also a bottom-up flexible approach.

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SeNTRE Presentation

Back Up

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Criteria for prioritizing technologies and research areas in SeNTRE technology workshops

1. Link with capability needs

-The technology contributes significantly to the capability needs (as expressed in the capability workshop and interviews) and solves important security problems to the EU (including regional security issues).

2. Link with the market

-Existing or favourable conditions to create a market (there are possible buyers, lack of competitive technologies)

-The technology strengthens the industrial development and export of complementary technologies outside the EU.

3. Feasibility within the EU base

- Affordability
- Maturity level, time of availability
- Is there any industry or companies that can produce the technology?
- Link with available/ future technologies and technical risk
- Impact on the confidence of security enough to establish an environment for economic growth.

4. Link with EU research needs

-More research needed, possibly in the FP7 framework and possible spin offs to other areas in society that can motivate projects within FP 7.

- Does the technology give European co operations advantage in competition?

5. Transversal issues

- Usefulness of technology (in civilian security or para military applications, fulfilment of human aspect needs, contribution to the benefit of networks systems or organizations beside the immediate purpose, possible impact on environment, infrastructure, etc…)
- Multi-function aspect or dual use possibility
- Simplicity of conditions of use
- Legal issues /Possible political support to implement the technology

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