

Deliverable

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# Collaboration with External Initiatives

**WP13** Collaboration

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Involved

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V.1.0

## TrustCom

*A trust and Contract Management framework enabling secure collaborative business processing in on-demand created, self-managed, scalable, and highly dynamic Virtual Organisations*

SIXTH FRAMEWORK  
PROGRAMME

PRIORITY IST-2002-2.3.1.9



**Deliverable datasheet**

**Project acronym:** TrustCom

**Project full title:** A trust and Contract Management framework enabling secure collaborative business processing in on-demand created, self-managed, scalable, and highly dynamic VO

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## Table of Content

|   |    |
|---|----|
| <i>Actual publication date:</i> .....                         | 2  |
| <i>Table of Content</i> .....                                 | 4  |
| <b>1 Executive Summary</b> .....                              | 5  |
| <b>1.1 Collaboration Summary</b> .....                        | 6  |
| Criteria for Collaborations .....                             | 6  |
| Collaboration Categories.....                                 | 7  |
| Classification of Collaborations .....                        | 8  |
| <b>1.2 Summary and Recommendations</b> .....                  | 9  |
| <b>2 Collaboration Approach and Summary</b> .....             | 13 |
| <b>2.1 Services Engineering and Management</b> .....          | 13 |
| <b>2.2 Cluster Interoperability and Integration</b> .....     | 13 |
| <b>2.3 Standards based collaboration</b> .....                | 15 |
| <b>2.4 NSF and Non-EU based collaborations</b> .....          | 16 |
| <b>2.5 Grid initiatives and Collaboration in Europe</b> ..... | 17 |
| <b>3 Market Study and its Impact on Collaboration</b> .....   | 19 |
| <b>4 Nature of Collaborations</b> .....                       | 21 |
| <b>4.1 Semantic Web Services</b> .....                        | 21 |
| <b>4.2 Security Services</b> .....                            | 22 |
| <b>4.3 Grid Computing and VO Management</b> .....             | 22 |
| NextGrid.....   | 22 |
| Akogrimo .....  | 22 |
| <b>4.4 Grid application specific Collaborations</b> .....     | 23 |
| VIROLAB .....   | 23 |
| BEINGRID.....   | 23 |
| BREIN .....   | 23 |
| <b>4.5 Trust &amp; Reputation Services</b> .....              | 24 |
| <b>4.6 Contract Management and Services</b> .....             | 24 |
| <b>4.7 VO Management</b> .....                                | 24 |
| <b>4.8 Secure Collaborative Business Process Models</b> ..... | 25 |
| <b>5 Conclusion and Next steps</b> .....                      | 26 |

# 1 Executive Summary

One of the main goals of WP 13 is to ensure the active collaboration of TrustCom in research and business within Europe and other parts of the Globe. In the context of the TrustCom project as a whole, we have identified and pursued potential collaboration opportunities within the EU and elsewhere. The TrustCom consortium's goal is to transform the identified collaborations into concretely defined contributions. During early 2005, there was a strong request from the EU-IST agencies to ensure collaboration and interoperability of technologies within and across cluster projects.

The goal of this document is to present the recent collaborations and the structure of the collaborations with various research and commercial communities in Europe and elsewhere. The nature of the collaborations have been based on TrustCom concepts, architectures, protocols, software tools, hardware specifications, social and legal studies, and complete business models.

The overall mission of the TrustCom project is to provide a trust and contract management framework enabling the definition and secure enactment of collaborative business processes within Virtual Organisations that are formed on-demand, are self-managed and evolve dynamically, sharing computation, data, information and knowledge across enterprise boundaries.

The collaboration document addresses the most fundamental questions, which are the following: Which consortia should be collaborate with? Which EU projects in the cluster should be work with? Which non-EU projects and agencies should be partner with? What technologies for VO model of collaboration, interaction and sharing between businesses provide better profitability, efficiency and reduced costs for real deployments? Will the models and technologies built and designed built by TrustCom consortium provide a basis for next generation of technologies for Europe in general and academic and industrial partners in the consortium.

As per the current models and implementation designs, the technologies and standards based implementations for Trust and Security in VO frameworks do provide a foundation for building advanced collaborative environments for business processes within and across multiple enterprise organizations. The following are four main areas for collaborations.

1. **Standards and Open Systems:** TrustCom collaboration on standards such as Web Services, W3C, IETF, OMG, OASIS, GGF and others are critical and crucial for success. A focus on collaboration with industry specific standards such as RosettaNet and others is needed in order to enable various instances of the TrustCom framework in specific domains
2. **EU ICT Environments:** We consider that TrustCom is ahead of other research and literature dedicated to ICT support for VO, where we consider other sources to be rather incomplete or very weak. TrustCom currently

collaborates with various cluster projects involved in similar initiatives (e.g. interoperability within the cluster).

3. **SME Framework and Integration:** TrustCom has conceptualised a framework based on open standards, which can be implemented using off-the-shelf and “low-cost” software and technologies, thereby enabling the creation and management of virtual organizations easily. Collaboration with the right cluster projects such as GGF, DBE and Athena and others are critical.
4. **Services Engineering and Management:** TrustCom has conceptualized Virtual Organizations as offering services to a collection of enterprises and businesses wishing to work together on a joint set of business or social objectives. TrustCom is beginning to disseminate and collaborate with the Services Initiatives such as NESSI, IST-Software, IST-FET and NGG3 communities which have begun active projects in this space.

## 1.1 Collaboration Summary

In section 2, the collaboration types and a summary of the nature of collaboration and next steps are described. In section 3 descriptions of the key collaborations in TrustCom are described and summarized. The collaborations are in various forms and strengths, which include software, services, methodologies, mechanisms, security, algorithms, tools and others. The criteria are based on typically industry processes for exploiting emerging technologies. Industries and academia have to invest time and effort to identify the appropriate technologies and maturity of the technologies before exploiting them to the fullest extent. The global community benefits when the collaboration are done with a view to enhance the state of the art, reduce costs for building secure collaborative applications, improve interoperability and enhance the current capabilities for enabling secure business collaboration over the Internet for businesses of all kinds (small and large).

### Criteria for Collaborations

TrustCom project has already made an impact in terms of technical publications, external presentations and is now collaborating with academic, standard bodies and industrial communities for sharing knowledge. In addition, TrustCom has begun in a strong way two-way collaboration with EU cluster projects, grid initiatives, services engineering and others. The main criteria are as follows for collaboration:

- **Standards** (new and existing): Did the technology or methodology have an impact on existing standards or did new standards emerge because of the methodology and need. Collaboration with the right standards groups is needed for building the right Infrastructure.
- **Industry best practices** to show adoption of business practices through industry collaboration. Currently industry within the consortium is providing sufficient guidance. Will the new pilots, experiments, business scenarios and application development provide best practices for the industrial community to exploit in the future?
- **Advanced Technology and Services** and systems. Is the business case for exploitation of the tools and systems (Grid, Security, Web Services, Tools and others) viable for companies (large and small) to exploit the technology to the maximum extent. In the market study (done earlier), the market for TrustCom was not in the base Technology (which is growing), but in the technology for enabling services around VO management, business collaboration and others.
- **Interoperability and compatibility.** TrustCom is a part of a cluster of projects involved in e-Business and ecosystems. Collaboration with cluster projects is critical to ensure sharing of concepts and integration of systems at the lowest levels of the technology layers.
- **VO concepts and Value Chain** solutions for TrustCom's VO lifecycle management are critical requirements for collaboration and exploitation. The business case should demonstrate that irrespective of the underlying technologies should enable business collaboration over the Internet.

## Collaboration Categories

The figure below captures the collaborations (one-way and two-way). The one-way collaborations are dissemination related that will turn into a two-way collaboration over the course of the months leading to M30. The collaborations are categorised into the following groups:

1. **EU Cluster Projects.** Collaborative engineering, ad-hoc collaboration, Enhanced Meta-Campus all provide a strong basis for methods and best practices for using the TrustCom technology over Secure Web Services and VO frameworks.
2. **Grid** initiatives. The base technology innovations are in security negotiation services, models, trust and reputation implementation, enhanced tools and policy.
3. **Services** Engineering and Management. The technologies here include collaborative business process models, VO management, trust and reputation services.

4. **NSF and Non-EU** partnerships. The collaborations with NSF and Universities World-wide.
5. **Standards:** The main groups involved are OMG, OASIS (e.g. XACML), IETF, ISO, GRID and others.
6. **Cluster Interoperability and Integration.** Recently TrustCom participated in an interoperability workshop with various cluster projects in eBusiness and other related IST projects. This is one of the key criteria for collaboration on security, infrastructure, business models and implementation tools.

### Classification of Collaborations

Based on the criteria, the following table provides a summary of the details of the classes of collaborations that are relevant for TrustCom.

| Group and classification Name    | Description  | Type of Collaboration  | Business Value & Case   | Short or Long-Term Value   |
|----------------------------------|--|--|---|----------------------------|
| EU Cluster Projects              | DBE, ATHENA and other projects in eBusiness Cluster              | Best Practice for secure interoperability and integration              | Very good Business and Technical Collaboration                        | <b>Medium to Long-term</b> |
| Standards                        | WS*, GGF, IETF, ISO-IET, and OASIS                               | Best Practices for programming, infrastructure and secure operations   | Security, Trust, Agreements and others                                | <b>Medium to Long-Term</b> |
| Services Engineering and Science | NESSI, NGG3 and Services Science (FET)                           | Services methodology, engineering and science                          | Major value for transforming into Services for Europe                 | <b>Long-Term</b>           |
| Interoperability and integration | Interoperability Consortia involved in eBusiness and integration | Implementation of security, trust and business models interoperability | The value is enabling new business models and secure interoperability | <b>Medium to Long-Term</b> |
| GRID computing and services      | NGG3, GGF, NextGrid, CoreGrid, and others                        | Influencing the Grid architecture and standards                        | Enabling VO concepts over Grids                                       | <b>Medium to Long-Term</b> |
| External Non-EU (NSF and others) | NCSU, Carnegie Mellon and others                                 | Implementation and standards influence                                 | The negotiation protocol is the main value and influencing standards  | Long-Term                  |



## 1.2 Summary and Recommendations

TrustCom project has created multiple innovations in various categories of the projects. The medium and long-term innovations provide tremendous ground for collaboration as summarized in the table above. The main recommendations are to use the business criteria set aside to decide on the collaborations with the right partners and initiatives as described:

- Collaboration with initiatives (e.g. NESSI, EU cluster, Grid, Software and others) will provide a longer and deeper exposure to and integration of TrustCom results than our dissemination in order to encourage others to adopt our results and to prepare a larger market for possible exploitation after the project.
- Trustcom has always planned to influence standards bodies as a route to promoting the adoption of the Trustcom results, without committing large amounts of project resources to standards development. This approach continues.
- Collaborations between specific technical partners in Trustcom and NSF funded groups focussed on specific research topics is underway and could result in technical advances that neither would make alone - but these are just advances in narrow technical areas, even though they may be essential to realise the Trustcom vision.

Further next steps are described in the conclusion section (section 5) in this document. We next summarize (graphically) the relationships and collaborations between TrustCom and other initiatives within Europe and elsewhere. The two figures below illustrate the current **Collaboration Map of TrustCom activities** with external projects, initiatives, cluster activities and non-EU projects (e.g. NSF and US universities). The first figure illustrates the main areas of collaboration, and the core projects within each area of collaboration. The collaboration has been two-way between TrustCom and the external projects. The figure illustrates the strong and emerging relationships. For example for Services Engineering (which is an emerging discipline in Europe), there have been some initial meetings and presentations on role of Virtual Organizations and Security in enabling services in Europe. This relationship was brought forward by the core NESSI partners: IBM, SAP, BT & ATOS. In addition, CCLRC and HRLS participated as academic participants on reviews of NESSI technical documents. This collaboration is expected to grow in the coming months.

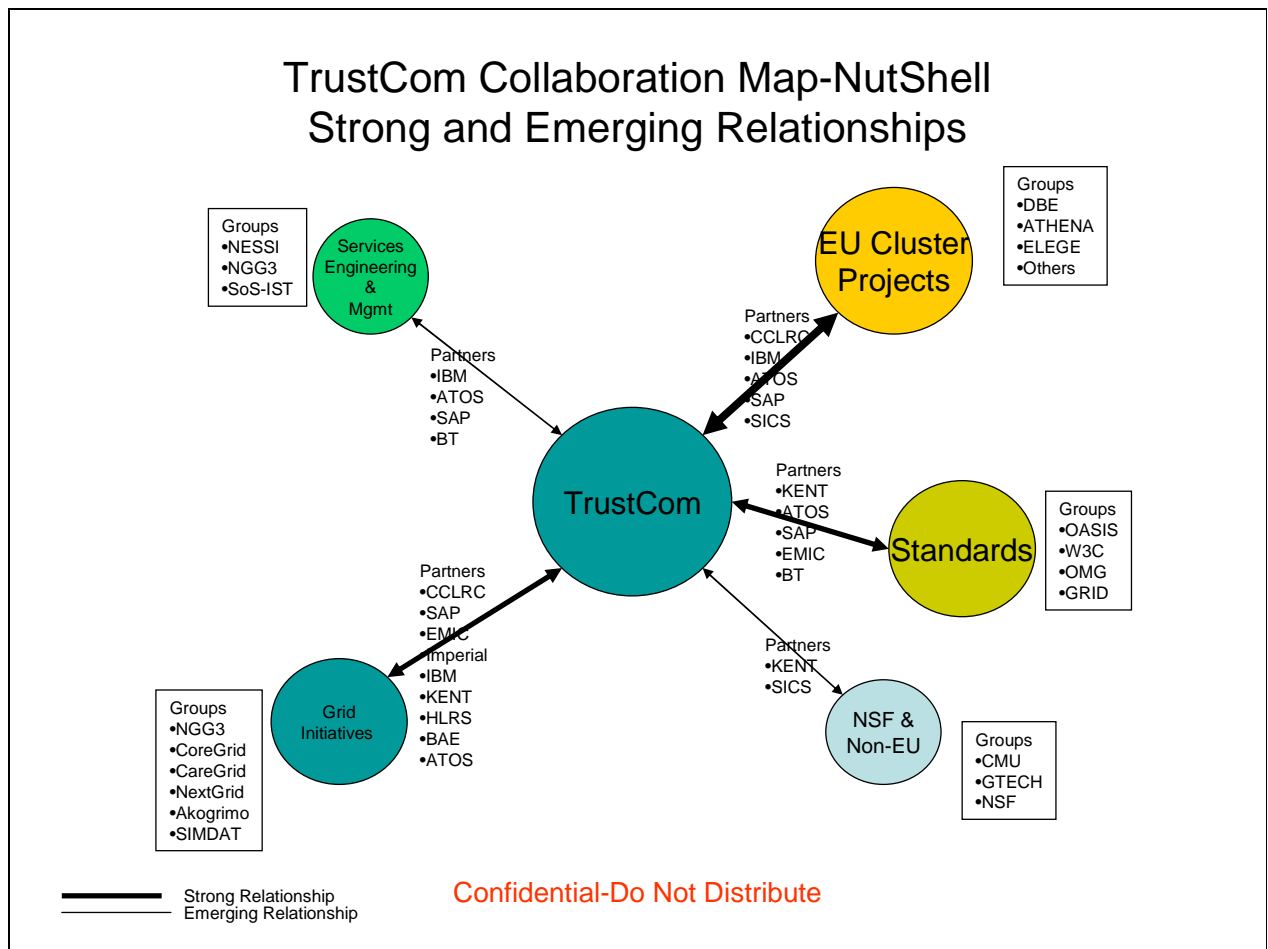


Figure 1: Strong and Emerging Collaboration Relationships

The following figure 2 illustrates the nature of the areas of collaboration between TrustCom and external projects within EU and across the globe. The areas are as follows:

- Services Engineering:** The collaboration is on the emerging field of Services management where VO services to enable supply chains or value chains requires new ways of ensuring security and trust in offering services and accounting for the services. The EU is beginning to invest time and effort in enabling a Services Computing for European Software and Services Industry. The collaboration is currently being done through IBM, ATOS, BT and SAP who are core members of NESSI. In addition there is collaboration with NGG3 and SoS (Services Science workshops) through the same partners. In addition, CCLRC and HLRS are involved in the NESSI and Services collaboration. TrustCom can be seen as offering a collection of services for SMB and other entities to leverage and use for their business or social activities.

- Grid Initiative. TrustCom has built a very strong relationship with various Grid initiatives through several partners (CCLRC, ATOS ORIGIN, KENT, HLRS, BT, BAE, SAP, EMIC, IMPERIAL and others). The relationship will continue to ensure that there is collaboration and active Collaboration of TrustCom concepts and technologies.

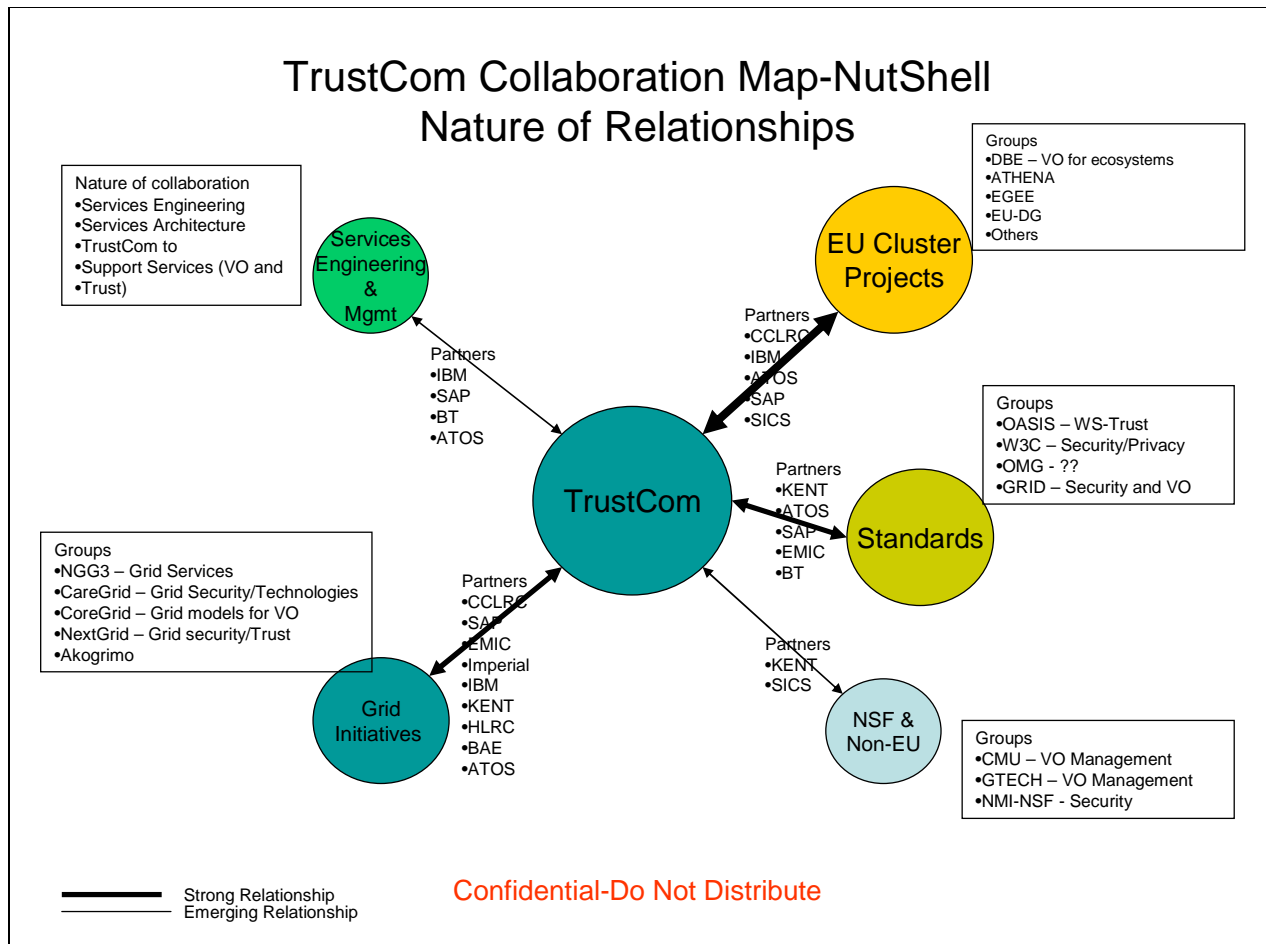


Figure 2: Nature of the Collaborations with Various Groups

- TrustCom has also built strong relationships with EU cluster projects for interoperability of Technologies and concepts. The main relationships were built through CCLRC, ATOS, IBM, SAP, BT, SICS and others. The projects involved ATHENA, DBE, ELEGE and others. The outcomes have been stronger in terms of collaboration for interoperability and sharing of VO concepts, security and Trust. Further collaboration is underway for 2006.
- TrustCom has built external relationships with non-EU projects and initiatives. These include NSF and US universities who are working on related topics such as VO management, security, Trust and others. The relationships were established by U. KENT (UK) and SICS with CMU and Georgia Tech in the US.

- TrustCom has had a strong relationship with various Standards groups involved in Grid, OMG, OASIS (WS\*), W3C and others. The standards interactions are very critical for ensuring that there is a strong two-way communication and collaboration (e.g. WS-Agreement) and activities within TrustCom related to Policies, Transactions, Coordination, Contracts, Agreements, Security and Trust.

## 2 Collaboration Approach and Summary

The collaboration approach is one of classification and importance of the nature of the collaboration with the various initiatives within the EU. As mentioned earlier, the classification is done in the same lines as the TrustCom activities and sub-groups.

In the following subsections, we provide a summary of the collaboration based on the classification done earlier.

### 2.1 Services Engineering and Management

There is a growing interest in Services Engineering, Standards and Grid related collaboration. With services playing a key role in EU economy and research, TrustCom is positioned properly to take advantage early on in collaboration and partnering with initiatives such as NGG3, NESSI and others that are promoting actively Services related research and technology platforms.

| Project or Group name | Region and Type                                       | Meeting date or planned dates (for collaboration)         | Outcome of collaboration   | Description of specific collaboration   |
|-----------------------|---|---|--|---|
| NGGV3                 | EU Services Initiatives                               | Dec 8 <sup>th</sup> , 2005                                | VO Concepts are common to NGG3. SOKU models for VO Mgmt              | Further Collaboration on Service Oriented Principles for VO. SOKU models for VO mgmt and interoperability                       |
| NESSI                 | EU Wide Corporate initiative on Services and Software | Nov, 2005, Jan, 2006 (NESSI FORUM – IBM, SAP, ATOS & BT). | VO Concept, trust, Security and standards                            | Further collaboration is needed with NESSI  |
| SoS and IST-Software  | EU Service Science activities for Long-term Research  | Jan, 2006 (IBM and BT)                                    | Services Management and Offerings around VOs                         | Further collaboration is needed   |
| DBE                   | EU cluster Project                                    | October, 2005   | VO concepts for SMB and creation of Marketplace for sharing services | Further collaboration is planned for SMB services. Sharing of software and components for VO services for SMB is being planned. |
|                       |   |   |  |   |

### 2.2 Cluster Interoperability and Integration

The table below describes the interoperability based integration for TrustCom with other EU cluster projects in the eBusiness and related areas

| Project or Group name                            | Region and Type  | Meeting date or planned dates (for collaboration)  | Outcome of collaboration  | Description of specific collaboration  |
|--|--|--|---|--|
| EU-DG INFISO cluster                             | EU –Feb 2006   | Feb 2006, Planned for joint collaboration  | Outcome is expected in february   | None right now   |
| DBE  | EU cluster Project                                     | October, 2005  | VO concepts for SMB and creation of Marketplace for sharing services  | Further collaboration is planned for SMB services. Sharing of software and components for VO services for SMB is being planned.  |
| ATHENA   | EU cluster Project                                     | 2005 (May)   | VO concepts for SMB and creation of Marketplace for sharing services  | Further collaboration is planned. Some of the concepts are being used in VO mgmt in TrustCom   |
| EGEE   | EU   | Occasional meetings within CCLRC.  | Outcome: Agreement that the VO management in EGEE could follow the TrustCom contractual approach in a future release                                      | Presentaiton of the TrustCom approach and comparison with the EGEE VOMS approach showing that Trust lies ahead on a roadmap od VO management development.  |
| EU DG INFISO Enterprise Interoperability Cluster | Many meetings in 2005 and final meeting in March, 2006 | Meeting dates - 5 meetings throughout 2005, final public workshops in January and March 2006 | Outcome: Report of a roadmap for future research on enterprise interoperability as input into EC decisions on FW7 planning.                               | Description - the document has been edited in sections by representatives of different projects (e.g. Interop, Eureka etc.) who meet together every 10 weeks to synchronize development. The document was issued to the public by the EC in Dec 2005, and then commented on at workshops in 2006.  |
| ITAIDE   | EU.  | Planned In 2006.   | Within this collaboration effort, TrustCom is a prominent candidate contributor to the technical working group on cross-domain trust and security issues. | The objective of the ITAIDE project is to redesign procedures leading to a fundamental simplification of taxation and customs systems, while providing greater control, security, transparency and accessibility to data. ITAIDE will deliver an integrated set of development tools across technical, procedural and organizational network layers. |
| <b>GUIDE</b>                                     | EU Cluster   | Preliminary Meetings.  | BT Is actively participating and collaborating with the Guide Team (within BT)  | The BT TrustCoM team has been providing active assistance to BT colleagues working on the GUIDE FP6 project using knowledge and  |

|       |   |   |  |   |
|-------|---|---|--|---|
|       |   |   |  | skills gained in TrustCoM. The assistance concerned application of federation architectures and related XML-based standards to a pan-European federated identity infrastructure for delivery of eGovernment services. |
| PRIME | PRIME is a European RTD Integrated Project under the FP6/IST Programme. | There is strong need for collaboration between TrustCom and PRIME. TrustCom focuses on Security and Trust in Collaborative Environments, and Prime focuses on User Identity and Privacy in a networked world. | Progress has been made here in collaborating with the PRIME group. Invited Presentations have been done. | It addresses research issues of digital identity management and privacy in the information society.   |

## 2.3 Standards based collaboration

In the table below we summarize the collaboration between TrustCom and various standards groups.

| Project or Group name | Region and Type                               | Meeting date or planned dates (for collaboration) | Outcome of collaboration   | Description of specific collaboration  |
|-----------------------|---|---|--|--|
| OMG                   | EU Services Initiatives                       | Dec 8 <sup>th</sup> , 2005                        | VO Concepts are common to OMG  | VO security and trust  |
| COPRAS                | EU Wide Corporate initiative Interoperability | Nov, 2005   | TrustCom has participated in the COPRAS kick-off meeting, and a clustering activity with BioSec <sup>1</sup> , eMayor <sup>2</sup> , SECOQC <sup>3</sup> , and Digital Passport <sup>4</sup> has been explored but not pursued further. Bilateral contacts have been opened up though, and TrustCom has indicated that it could benefit from general COPRAS support. | Cooperation Platform for Research and Standards – is a 3-year Support Action under the European Commission's Information Society Technologies (IST) Programme. The members of the COPRAS consortium are the officially recognized European Standards Organizations - CEN, CENELEC, ETSI, together with The Open Group and the World Wide Web |

<sup>1</sup> BioSec. <http://www.biosec.org/>.

<sup>2</sup> eMayor. <http://www.emayor.org/>.

<sup>3</sup> SECOQC. <http://www.secoqc.net/>.

<sup>4</sup> Digital Passport. <http://www.eudigitalpassport.com/>.

|                 |   |   |  |   |
|-----------------|---|---|--|---|
|                 |   |   |  | Consortium (W3C).   |
| GRID            | EU cluster Project                      | October, 2005   | VO concepts for SMB and creation of Marketplace for sharing services | Next generation Grid technologies   |
| OASIS           | US primarily but worldwide contributors | No meetings planned yet, but collaboration is to being with WS-* involved in Agreements | Publicity and distribution of software outputs                       | Security and Trust- Mainly related to WS-Agreement. SICS is involved in XACML standards very actively.  |
| DIADEM FIREWALL | EU                                      |   | Alignment of Policy models.  | DIADEM firewall aims to develop a comprehensive security solution for secure broadband services. This includes programmability and policy-driven control of firewalls and perimeter protection devices for protection and attack countermeasures. By attempting to align the policy models we aim to apply similar approaches to service protection and perimeter protection as the latter is not explicitly addressed in TrustCom. |
|                 |   |   |  |   |

## 2.4 NSF and Non-EU based collaborations

In the table below we present the non-EU collaborations with NSF and US Universities. The main topic of interest and collaboration has been on Virtual Organizations and Security.

| Project or Group name           | Region and Type                         | Meeting date or planned dates (for collaboration) | Outcome of collaboration                       | Description of specific collaboration   |
|---------------------------------|---|---|--|---|
| NSF Project                     | Non-EU (US collaboration)               | NCSU  | VO concepts and management                     | Policy in VO management   |
| NMI (NSF Middleware Initiative) | US primarily but worldwide contributors | No meetings                                       | Publicity and distribution of software outputs | NMI is a central point for distributing middleware to Internet2 and Grid developers. By participating, NMI publicise their releases, publicise members contributions, and |



|   |  |                          |  |  |
|---|--|--------------------------|--|--|
|   |  |                          |  | generally raise the profile of what you are doing  |
| MASCHINE (MultiAttribute Supply CHaln Negotiation.) | US Carnegie Mellon and Michigan Universities | One Meeting already done | Awareness and interaction on Semantic Web Services | The collaboration opportunity we have identified could be referred to as "Semantic Web Infrastructure for Decentralized Trust Management in Dynamic Virtual Organizations" |
|   |  |                          |  |  |

## 2.5 Grid initiatives and Collaboration in Europe

The table below provides the various Grid related collaborations between TrustCom and Grid projects in the EU (including UK).

| Project or Group name | Region and Type    | Meeting date or planned dates (for collaboration)   | Outcome of collaboration   | Description of specific collaboration   |
|-----------------------|--------------------|---|--|---|
| CoreGrid Network      | EU Grid project    | 2005 (many meetings)  | Outcome: Alignment of the CoreGrid, ExtremeOS and GridTrust approaches to trust and security with those proposed in TrustCom   | Security and Trust Related integration and collaboration  |
| CareGrid              | Non-EU (UK EPSRC)  |   | Trust-based security interactions  | CareGrid is a joint project between Imperial College and Cambridge University which will investigate interactions across autonomous trust domains for pervasive health-care applications. The project has only recently started but a number of issues relating to trust-mediated interactions have relevance in both projects. |
| GRID                  | EU cluster Project | October, 2005   | VO concepts for SMB and creation of Marketplace for sharing services   | Next generation Grid technologies   |
| NextGRID              | EU                 | Grid Trust & Security concertation, Brussels, 17 September 2004 (CCLRC-EMIC)<br><br>Grid intermediate Trust and Security concertation, Amsterdam, 17 February 2005 – (EMIC) | Security, Policies and Trust in VO Grids. Exchange of VO concepts and SLA models. Exchange of concepts for the security models | In particular the partners EMIC (for security) and HLRS (for VO models and SLAs) have established a cross-project information exchange through overlapping partnership  |

**D40 – Collaboration Plans v1 - TrustCom**

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|----------|----|--|--|--|
|          |    | <p>&amp; (CCLRC)</p> <p>Grid Trust and Security concertation, Brussels, 2 June 2005 – BT, ATOS, EMIC and CCLRC</p> |  |  |
| AKOGRIMO | EU | <p>Similar to NextGrid</p> <p>December 2005, Madrid Presentation (BAC) – Presented by Atos Origin.</p>             | <p>The TrustCom VO Model and SLA models.</p> | <p><b>Exchange has been established with the technical manager of Akogrimo HLRS.</b></p> <p>For the SLA realization an exchange of program code between SICS and HLRS has been agreed.</p> |

### 3 Market Study and its Impact on Collaboration

This section explains how the market study results are related to the identified TrustCom innovations and required collaborations. TrustCom addresses new requirements for scalability, responsiveness and adaptability that necessitate the on-demand creation and self-management of dynamically evolving virtual organisations (VO) spanning national and enterprise borders, where the participating entities (enterprises or individuals) pool resources, information and knowledge in order to achieve common objectives.

The relationships between TrustCom Market-Study activity and the rest of the activities are described with an emphasis on what the Market study has recommended and the innovations that TrustCom is creating.

Market study recommended that TrustCom keep a focus on Standards, tools, methods and technologies for VO lifecycle management which included the technology components and services component. The Market study found that there is tremendous growth in Business Collaboration technology services when compared to the technology itself. For example the SCM technology market is around 1.5 Billion, but the SCM services market is around 38 Billion for 2005 alone.

AL1: Market Study considered as input the Virtual Organization lifecycle model, the generic processes, security and trust models, and the VO framework definitions as defined in AL1 workpackages. The market study has provided as input a technology assessment for AL1, and is recommending a strong emphasis on simpler yet rich enough trust and security models, and using industry defined standards for virtual organization models.

AL3: The Market Study provided input to the demonstrations and business scenarios for AL3 activity. Market Study provides input on what needs to be considered in AL3 in order to exploit through demonstrations the value behind the TrustCom framework and technologies. The demonstrations play an important part in showing the **best practices** for doing business collaboration in a VO setting.

AL2: Market Study considered as input the Business scenarios from Aerospace industry, Supply-chain and adhoc-collaboration community frameworks. The Market study provides input on the VO definitions and processes that are needed to make TrustCom marketable and viable for real-deployments (see sections on Barriers, Technology assessments). Collaboration with industry standards groups and industry is critical in ensuring that TrustCom technology appeal to the industry value and supply chains.

The collaboration measures are as follows:

- Collaboration in commercializing some of the VO tools and techniques for VO management, VO reputation, contract metrics and more importantly VO services. The market study has indicated very clearly that the revenue and demand for services in “supply-chain management”, “consumer relationship management” and others are very high. Services tools for managing and enabling VOs in the specific areas is prime candidate for take up and exploitation.
- Collaboration in commercial parts of the TrustCom activities such as VO reputation mechanisms, contracts, contract management, and corresponding standards activities is of importance for take up and exploitation. With TrustCom’s role in enabling contract driven trust and security and standards around that, it will become easier and simpler for take up and exploitation. The recommendation is to drive more standards in the Web Services areas for exploitation.

## 4 Nature of Collaborations

This section describes the identified innovations of the TrustCom project. For each description this section answers the following three questions:

- What is the problem to be solved through collaboration?
- What areas are important for Collaboration?
- What is the innovation is expected from the collaboration?

### 4.1 Semantic Web Services

Problems regarding trust, security and contract management arise from the following:

Issues arise in relations between:

- The customer for the VOs services and the VO as an entity
- The customer and individual partners
- Partners within the VO
- Partners and the VO as an entity

MASCHINE. The collaboration opportunity we have identified could be referred to as "Semantic Web Infrastructure for Decentralized Trust Management in Dynamic Virtual Organizations". The idea is to develop and evaluate a Semantic Web Infrastructure for Decentralized Trust Management that is capable of enforcing context-sensitive access control and confidentiality policies.

Context includes the nature of the relationships between companies (e.g. from prospective supplier to actual supplier to preferred supplier to former supplier) as well as conditions that may have to be verified with third parties (e.g. credit worthiness, delivery performance, etc.). The project will develop ontologies of relevant concepts and demonstrate semantic web reasoning functionality that is capable of enforcing these policies, including policies that requiring checking facts with external sources of information (e.g. financial organizations, business partners, etc.). This work will directly build on supply chain negotiation protocols studied in the MASCHINE project as well as Semantic Web technologies for privacy and security developed at Carnegie Mellon University Mellon. It will leverage business scenarios and solutions developed in the TrustCom project. Work will be carried out through a combination of site visits, exchange of software and regular phone conferences.

We still need to figure how to deal with IPR issues. It has been suggested that we agree to give each other royalty-free, research-only licenses to technologies needed for our collaboration for the duration of the project. Technologies developed by CMU or the U of Michigan remain the property of CMU or the U of Michigan. Technologies developed by TrustCom partners is managed

according to the TrustCom consortium agreement we already have in place. We can also add a sentence saying that issues of ownership of any valuable Intellectual Property developed by a combination of EU and US partners will be resolved within 6 months of the development of the IP and will be made available to members of the NSF project and the EU consortium – again royalty-free, research-only licenses for the duration of the project.

## 4.2 Security Services

*What is the problem to be solved in dynamic VOs with respect to "Security Services? Collaboration with Standards?"*

The WS-Trust and WS-Federation specifications define protocols for interaction with so-called Security Token Services. In dynamic virtual organizations, many resources, processes and users from participating organizations must be able to collaborate with each other. The main security-related problem to be solved is: "How can we have a security management that is flexible and that appropriately reflects the different authorities of the VO participants?" TrustCom collaborated with OMG, OASIS, W3C, Grid related and other standards bodies for Security, Trust, Directory Services and others.

## 4.3 Grid Computing and VO Management

*What is the problem to be solved in dynamic VOs with respect to "Grid Virtualization and VO Management"?*

### NextGrid

NextGrid is an Integrated Project from the F2/Grid Unit. Further information is available at <http://www.nextgrid.org>. Common partners are EMIC (Security), HLRS (Architecture & SLAs).

The task leadership for the VO Model of NextGrid is under the responsibility of HLRS. Furthermore HLRS is the leader of the architecture Workpackage of NextGrid. As HLRS is leading the architecture workpackage in TrustCom an exchange of ideas and concepts between the projects had been established through presentations and exchange of public documents. NextGrid has started in September 2004 and is currently at the end of the first major cycle a more elaborated level of exchange can be expected if NextGrid has finalized its initial version of the architecture.

### Akogrimo

Akogrimo is an Integrated Project from the F2/Grid Unit. Further information are available at <http://www.mobilegrids.org>. Beside HLRS (technical management), common partners with TrustCom are CCLRC and ATOSOrigin

So far the established collaboration is mainly limited to the exchange of public documents and reference implementations that are provided under an open source license. Akogrimo is aiming, similar to TrustCom, on the establishment of dynamic virtual organization. The Akogrimo model is however targeting more on the integration of mobile devices and users into such Virtual Organisations. For this purpose Akogrimo has performed an analysis of several application scenarios including mobile users and highly dynamic VOs. This document has been provided to TrustCom as input for the definition and design of the second testbed.

Beside the Virtual Organisation management and lifecycle support a common working area are Service Level Agreements. The research focus is rather orthogonal and provides potential for collaboration. Whereas TrustCom contributes to the areas of negotiations of SLAs and the definition of the structure in order to reflect legal boundaries Akogrimo has its focus on the enactment of SLAs in volatile environments such as mobile access networks. An initial exchange of open source reference implementations has been agreed between SICS and HLRS.

#### **4.4 Grid application specific Collaborations**

Beside the already established collaborations mentioned above the TrustCom consortium has already identified potential collaborations for projects that are starting soon.

##### **VIROLAB**

Virolab is a Strategic Targeted Research Project in the eHealth domain. Virolab is aiming beside other objectives on a virtual laboratory for hospitals. It is expected to establish collaboration with this project in the domain of models for Virtual Organisations. The project will start on the 1<sup>st</sup> of March.

##### **BEINGRID**

The BEINGRID project is currently under contract negotiations in the unit F2. BEINGRID has as one of its major targets the realization of a software repository for take-up of service based frameworks and Grid middleware by industry. The potential collaboration between TrustCom and BEINGRID could be in the area of exploitation as the repository might be the right place for disseminating and communicating the reference framework.

There are several common partners with TrustCom, most notable ATOS Origin is the coordinator of BEINGRID.

##### **BREIN**

The BREIN project is aiming at the integration of Agents, Grid and Ontologies and is currently under contract negotiations in the unit F2.

Potential collaborations could be established most likely in the area of security models and the Management of Service Level Agreements. Most notably the BREIN focus on Service Provider internal infrastructure components could build a natural extension to the TrustCom framework on the Service Provider side.

## 4.5 Trust & Reputation Services

*What is the problem to be solved in dynamic VOs with respect to "Trust & Reputation Services"?*

The nature of dynamic virtual organisations is such that the organisations involved in forming the VO will potentially have had little or no previous experience in dealing with each other. This clearly raises concerns as to a) how the organisations, as potential members of a VO, are to decide to on their potential partners for that VO, and b) how those organisations are to decide whether their potential partners in the VO are reputable enough to trust with the possibly sensitive information that will need to be exchanged in order to facilitate the formation of the VO. These problems present very practical hurdles to VO formation; without addressing these issues an architecture to enable dynamically evolving virtual organisations is certainly possible, but would have little uptake in real world scenarios. TrustCom collaborated with OMG, OASIS, W3C, Grid related and other standards bodies for Security, Trust, Directory Services and others.

## 4.6 Contract Management and Services

Business in the current world operate based on short and long-term contracts. These contracts help built trust and reputation in the business community between the partners involved in the contracts and in general the partner reputation in the marketplace. In the TrustCom project there was limited emphasis on "Business Contracts" and the role it plays in Trust and Reputation. Workpackage 8 and others are bridging the gap are focussing on Business Contracts, Economics of Contracts, Metrics for contract enforcement at the business level, and attributes for reputation based on the contract terms and conditions. These metrics and attributes play a very strong role in enabling reputation scores for VO members in a VO supply chain. Collaboration with OASIS (WS\*), NESSI, EU-Cluster and others is critical to share the notion of contracts for industry and academia.

## 4.7 VO Management

*What is the problem to be solved in dynamic VOs with respect to "VO Management"?*



A Virtual Organization Management system in a dynamic VO environment needs to deal with complex, long-term business interactions with multilateral agreements. The challenge in complex and dynamic B2B business scenarios like VOs is to find out how to specify, configure, monitor and validate this ICT-centric solution before runtime, given the following requirements:

- Likely that all services and resources will not be locally available in a single administrative domain, yet expensive paper-based processes are not desirable
- Actual partners in business collaboration are not known at design time and can be dynamically changed
- There are particular constraints to be specified on membership and conditions of system at runtime, which are already established at design time

TrustCom collaborated with standards (OMG, OASIS, W3C, and GGF), Grid, EU Cluster and NSF and other standards bodies for Security, Trust, Directory Services and others.

## 4.8 Secure Collaborative Business Process Models

*What is the innovation in the area of "Secure Collaborative Business Process Models"?*

Allowing for the business process to control TSC management on the service layer, we extended the chosen process model of ATHENA project by a so-called TSC task and a TSC context on the process level. ATHENA's collaborative business process model addresses security requirements in VO business process collaborations on a very basic level. Only exposure/privacy of entire private processes is addressed, which is not enough for realizing secure dynamic VOs. Secure business process enactment in a VO requires a more flexible security model that can dynamically react to events from other VO subsystems altering the process flow during runtime. Such events may originate from the monitoring subsystem, generating notification events, or policy subsystem allowing adapted policies. TrustCom collaborated with Grid initiatives: NGG3, W3C, Grid related and other standards bodies for Security, Trust, Directory Services and others.

## 5 Conclusion and Next steps

TrustCom will continue to invest time and effort in doing active collaboration with existing projects and emerging initiatives such as Services Engineering and Management.

- Continue working with NGG3, IST-Services, IST-Software and NESSI initiatives
- Continue working on Interoperability and Integration clusters with EU projects such as Athena, DBE and others.
- Continue working with Industry Specific groups involved in Value chains and supply chains (e.g. NESSI, SCOR). Contribute to and learn from the standards groups the issues and challenges faced by the industry in doing daily business transactions

TrustCom so far has done extremely well in bridging relationships with various initiatives such as Grid, Standards, EU Cluster interoperability and other EU projects. Additional work needs to be done in strengthening the collaboration with “Services Engineering and Management” and “Non-EU projects related to Security, VOs and Trust). Further Next steps

- Collaboration with initiatives (e.g. NESSI) will provide a longer and deeper exposure to Trustcom results than our dissemination in order to encourage others to adopt our results and to prepare a larger market for possible exploitation after the project.
- Trustcom has always planned to influence standards bodies as a route to promoting the adoption of the Trustcom results, without committing large amounts of project resources to standards development. This approach continues.
- Collaborations between specific technical partners in Trustcom and NSF funded groups focussed on specific research topics is underway and could result in technical advances that neither would make alone - but these are just advances in narrow technical areas, even though they may be essential to realise the Trustcom vision.
- Trustcom partners are willing to contribute to working groups, networks or clusters as routes to disseminating the Trustcom vision, results, and establishing common roadmaps including common timetables for further work - especially if this results in future funding opportunities for the Trustcom partners.
- Trustcom supports the idea that it cannot stand alone, and is willing to learn from others. The the importance of issues at the early stage of VO formation, the enterprise network, the role of SMEs and why organisations should join have all been highlighted by other projects. However, other projects have there own timescales for delivery, and their own IPR arrangements.