**SEVENTH FRAMEWORK PROGRAMME**
**THEME ICT-1-1.1**
**"Network of the future"**

**Project acronym: EFIPSANS**
**Project full title:** **E**xposing the **F**eatures in **IP** version **S**ix protocols that can be exploited/extended for the purposes of designing/building **A**utonomic **N**etworks and **S**ervices

**Proposal/Contract no.: INFSO-ICT-215549**

# First Report on Standardisation Activities

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**Abstract:**

This Deliverable describes the activities undertaken by the EFIPSANS project for the standardisation efforts during the first 12 months. The standardisation focus has culminated from the strong base of some partners who have been working within ETSI, namely the technical manager of the project, the involvement of one partner in the 3GPP standardisation efforts at board level since its inception, namely the IPv6 Forum based at the University of Luxembourg and the strong industry involved in this project that participate in ETSI and the IETF forming an amazing critical mass to start an innovative approach and space to focus working on formulating novel industry-oriented standards for autonomic networking using IPv6 and its extensions being proposed by EFIPSANS (IPv6++), as well the network architectural extensions being introduced by EFIPSANS.

The platform chosen is the creation within ETSI of an Industry Specification Group (ISG) to be called: Autonomic network engineering for the self-managing Future Internet "(AFI)". EFIPSANS has pioneered this concept for all EU projects to follow if industry standardisation and research results exploitation are supposed to be the outcome of an Integrated Project.

**Keywords:** EFIPSANS**,** Autonomic Networking, Future Internet, IPv6, roadmap, ETSI, Interoperability. Industry decision-makers, ISPs, Mobile Operators and content providers.

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# Copyright

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# Executive Summary

The EFIPSANS Group has taken a bold step in forming an ETSI Industry Specification Group (ISG) after a number of negotiation steps with the ETSI Strategy leader. This initiative is planned to take effect starting January 2009 and will be called: **Autonomic network engineering for the self-managing Future Internet** a.ka. "*Autonomic Future Internet*" (AFI). One of the Sub-Groups of the ISG will focus on the Definition of a viable **roadmap of an evolutionary path** for today's network models, architectures, protocols such as IPv6 (towards IPv6++) and paradigms as necessitated by the GANA Reference Model being introduced by EFIPSANS. The definition of a **roadmap of an evolutionary path** should be achieved through Recommendations that can then be considered by the relevant Bodies towards the evolution of the protocols recommended for evolution or extensions. For this, the ISG would liaise with relevant Bodies such as IETF, 3GPP, etc. For more information on the structure of the ISG, refer to the Terms of Reference (ToR) of the ISG attached at the end of this deliverable.

EFIPSANS has per se pioneered a new concept for all EU projects to follow if industry standardisation and research results exploitation are supposed to be the outcome of an Integrated Project.

The reason for this initiative is that the landscape of autonomic networking is crowded with researchers with no industrial exploitation plans and no vision for business opportunity and lacking a platform for a harmonized and pragmatic strategy towards establishing European leadership in designing the future internet. Other main reasons are documented in the Rationale of the Terms of Reference (ToR) of the ISG, which is attached at the end of this deliverable.

This ISG initiative will facilitate harmonisation towards achieving meaningful Specs on the Self-Managing and Autonomic Future Internet that could be adopted by the industry.

# Table of Contents

# 1. Introduction

EFIPSANS has embarked on establishing focused initiatives towards contribution to standards, such as:

## 1.1. Establishing an ISG in ETSI: Autonomic Network Engineering for Self-Managing Future Networks.

After carrying out a review on today's approaches to autonomic networking and having understood their shortcomings, EFIPSANS has established that in order to produce Autonomic Behaviour Specifications of Decision-Making-Elements (DMEs) meant for diverse networking environments, a *reference* Generic Autonomic Network Architecture (GANA) is required and one must first be worked out if non-exists. Therefore, EFIPSANS has started developing a generic reference model for autonomic networking called GANA. It is an innovation of EFIPSANS since no generic reference model for autonomic networking that satisfies the principles on which GANA is founded existed before.

GANA differs from all other approaches to autonomic network engineering in that, GANA captures the generic principles required for an evolvable autonomic network architecture by defining the autonomic elements (DMEs), self-manageability aspects, abstractions where necessary, the required separations and distinctions between autonomic elements and their managed entities, and management interfaces, control loops, hierarchical, peering and sibling relationships among autonomic Decision-Making-Elements (DMEs) of nodes and the network as a whole. GANA is the kind of architecture that allows for the production of standardisable autonomic behaviour specifications due to the fact that the key founding principle of GANA is: *"clearly separate **specification issues** for autonomic behaviours from **implementation issues** of the specified autonomic behaviours"* i.e. specification issues should not be constrained be implementation issues.

As such, GANA is meant to benefit both the "evolutionary" approaches and "revolutionary/clean-slate" approaches to Future Internet design, in the long run, as GANA becomes adopted as the common reference model for autonomic network engineering. Evolvability of GANA will be assured in two ways: (1) Identifying the interfaces and concepts of GANA that must remain constant to allow new components to be added to the architecture; (2) Application of model-based evolution of the elements of the architecture by ensuring that communication between architects and implementers of GANA should be based on model-based development and evolution of the specifications of all elements. Along with the definition of GANA, EFIPSANS is defining the required *Domain-Specific Meta-Model for the Autonomic Networking Domain* (dubbed the GANA Meta-Model), which defines the concepts and semantics for autonomic network engineering, concepts such as control loops, Decision-Making Elements (DMEs) and their associated Managed Entities, as well as other types of "control-loop information suppliers", interfaces, etc, required by a DME. The GANA Meta-Model will also be contributed as a standard along with the GANA. The GANA Meta-Model allows for the application of advanced state-of-the-art systems/software engineering methodologies such as the OMG's MDA approach. This means that, based on the GANA Meta-Model, model-based systems development tool chains can be developed to support *Modelling* and *Validation* of *Autonomic Behaviours of DMEs* using *Formal Description Techniques* (FDTs) such as the well-known and successful SDL (an ITU standard) including code-generation from formal models of DMEs.

## 1.2. Standardization Bodies and Forums of relevance to EFIPSANS

IETF: EFIPSANS stands for **E**xposing the **F**eatures in **IP** version **S**ix protocols that can be exploited/extended for the purposes of designing/building **A**utonomic **N**etworks and Services. This means EFIPSANS is bound to work closely with the IETF since one of the objectives of EFIPSANS is to produce extensions to IPv6 protocols as necessitated by the autonomic network architectures EFIPSANS is designing. A number of potential extensions to IPv6 protocols are emerging in EFIPSANS, including possible extensions to IPv6 core's Hop-by-Hop Options Header and Destination Options Header, extensions to ICMPv6 family of protocols, SHIM6, MIPv6, DHCPv6, SCTP, BFD, OSPFv3, RIPng. http://www.ietf.org/

ACF: EFIPSANS plans to contribute the Specifications of Autonomic Behaviours of Decision-Making-Elements (DMEs) for selected diverse networking environments, being designed in EFIPSANS, to the ACF (apart from contributing to the ETSI-ISG mentioned earlier). Most of the members of EFIPSANS are key members of the ACF and therefore, EFIPSANS will continue to participate in ACF related developments. http://www.autonomic-communication-forum.org/

3GPP-LTE: EFIPSANS is considering the recommendations put forward by 3GPP-LTE for self-organising, self-configuring and self-optimising (i.e. self-* features) networks in order to incorporate such features into the design of autonomic Decision-Making-Elements (DMEs) for selected diverse networking environments being designed in EFIPSANS. http://www.3gpp.org/.

NGMN: Similarly to the 3GPP-LTE case, EFIPSANS is considering liaising with NGMN so that the issues related to autonomics (self-organising, self-configuring and self-optimising (i.e. self-* features) produced as recommendations by NGMN can be incorporated into the design of autonomic Decision-Making-Elements (DMEs) for selected diverse networking environments being designed in EFIPSANS. http://www.ngmn.org/.

OMG: Following the OMG's MDA approach, EFIPSANS is working on producing the GANA Meta-Model, together with its associated Methodology and Tool chain for model-based systems development that support *Modelling* and *Validation* of *Autonomic Behaviours of DMEs* using *Formal Description Techniques* (FDTs) such as the well-known and successful SDL (an ITU standard), including *code-generation* from formal models of DMEs. http://www.omg.org/.

3G-CDMA: Similarly to the 3GPP-LTE case, EFIPSANS is designing some autonomic Decision-Making-Elements (DMEs) addressing the functionalities being addressed in EFIPSANS. http://www.cdg.org/technology/3g.asp.

ITU: EFIPSANS aims at disseminating the specifications being produced, not only through ETSI and ACF but also to ITU, depending on the needs for liaisons that may emerge in the course of the project or after the project duration. http://www.itu.int.

WLAN-WiFi: Similarly to the 3GPP-LTE and 3G-CDMA cases, EFIPSANS is designing some autonomic Decision-Making-Elements (DMEs) addressing the functionalities being addressed in EFIPSANS. http://www.wi-fi.org/.

## 1.3. Contribution to the Self-Management WG of the Future Internet Assembly

The perspective of focus in EFIPSANS with regards to Future Internet Design is **Self-Management** of the Future Internet as powered by autonomic Decision-Making-Elements (DMEs) embedded within the nodes/devices of the Future Internet architecture. Therefore, EFIPSANS plans to contribute to the Self-Management to be drafted soon.

# 2. ETSI ISG: Autonomic network engineering for the self-managing Future Internet (AFI)

EFIPSANS has achieved its biggest success story by creating the ETSI ISG: **Autonomic network engineering for the self-managing Future Internet (AFI)** :

## 2.1. ETSI ISG: AFI Start-up Steps

The negotiations with ETSI have been finalised successfully with the conclusion of following documents and the outline of the start-up steps.

The following statements are extracted from the e-mail sent to the **AFI_NEGOTIATION@LIST.ETSI.ORG** on Saturday, December 13, 2008 1:08 AM:

The first meeting is planned on Thursday/Friday 26/27 February 2009, at ETSI (rooms are available). We need to announce the first meeting of the ISG by Collective Letter (official notice to all ETSI members) minimum 30 days before that meeting, i.e. at the latest on Monday 26th of January 2009. The ISG is officially created when a minimum of 4 ETSI members sign the ISG agreement. Therefore this needs to happen by Monday 26th of January (more organizations can sign afterwards and during February, but I need at least 4 by that date). But all agreements must be identical, so we need a period beforehand where each organization can review the agreement, and if necessary, request changes which they require in order to be able to sign the agreement (I would discourage any changes). So we need a cut-off date after which organizations can start signing the agreement. I suggest this is Friday 16th of January. No changes can be permitted to the Member agreement after this date, if we are to have our first meeting on 26/27 February.

So here is the outline of next steps and dates:

*From now to 16th of January 2009:*

*I* will circulate the ToR and the Member and Participant Agreements to our Board, for their consultation. They may have an opinion or ask for clarification, but I doubt they'll suggest any changes.

*You* should find the person who should sign the ISG Member agreement (*Draft AFI ETSI ISG Agreement - ETSI Member v02.DOC)* and get them to either agree to this agreement, or identify what changes are necessary in order to be able to sign it. (If you don't know who that is, let me know: we have names of official contacts in your companies, and also some of your companies have been involved in the QKD ISG – I can pass you on the right contact.)

They should also review the Participant agreement, but here we can push the deadline out much closer to the meeting, so there's no urgency with that.

All requests for changes or clarification should be sent to the AFI_Negotiation e-mail list.

*16th of January 2009:*

Closing date for comments/changes to the ISG Agreement (*Draft AFI ETSI ISG Agreement - ETSI Member v02.DOC*).

*19th to 23rd January 2009:*

Signature week. Each ETSI Member organization should make 2 copies of the ISG Agreement for ETSI Members, fill in the missing information marked in green highlight, print and sign both copies and send both copies to me (don't use registered mail: it takes forever. UPS etc. is best). We will have both copies signed by our Director General and return one copy to you.  If you don't manage to get it signed this week, then it's not a problem, but we need at least four to do so.

*Monday 26th of January 2009*

We will launch the Collective Letter announcing the creation of the ISG, and the invitation to ETSI members to join.

*During January 2009*

We will put the ISG into place so that the ETSI Portal (portal.etsi.org) site, e-mail list, meeting registration etc. are all ready by the time the Collective Letter is sent.

*During February 2009*

We can deal with the Participant agreement, in case any changes are required.  We can organise Participant signatures during February, but we have more time for this.

Those organizations who didn't manage to sign the member agreement by the 23rd of January can still return signed agreements up to the meeting date.

## 2.2.  ETSI ISG: AFI Documents ( See Annex)

*The following documents form the basis of the creation of AFI. They are imbedded in the annex to keep this deliverable short and crisp:*

- Draft AFI ISG ToR 12 December 2008 revmarks.doc
- Draft AFI ETSI ISG Agreement - ETSI Member v02.DOC

This is the legal agreement to establish the ISG, updated with changes we agreed in the ToR document.  A copy of this document is intended to be signed by each ETSI Member who wishes to join the ISG.

- AFI vs. QKD ISG Member Agreement.doc

A comparison of the QKD and the AFI member agreements. Only useful if your organization has joined the QKD ISG (list of members here: http://portal.etsi.org/qkd/QKD_List_members.asp).

- Draft AFI ETSI ISG Agreement - ETSI Participant v02.DOC

This is the legal agreement which non-members of ETSI need to sign in order to access the ISG. ETSI Members will never have to sign this document, but should be aware of its contents.

- AFI vs. QKD ISG Participant Agreement.doc

A comparison of the QKD and the AFI participant agreements.  Only useful if your organization has joined the QKD ISG. Otherwise ignore it.

# 3. IETF: Project Proposal to IETF

As part of the EFIPSANS project, we intend to submit drafts to the IETF to extend the IPv6 protocols. The IPv6 protocol allows for 255 predefined extension headers. Currently only six of these have been assigned.

Recently the IETF received an internet draft defining a standard layout for future proposals for IPv6 extension headers (http://tools.ietf.org/html/draft-krishnan-ipv6-exthdr-00). EFIPSANS generally intends to support this move towards a standard extension header format. We will use our relationship with the author of this internet draft to influence the proposed layout based on the needs we have defined in the EFIPSANS project.

In particular we have defined a number of instances where monitored information has to be disseminated either from

- ME to DME up and down the four levels of the GANA architecture.
- DME to DME to cooperate and share information in a peer to peer relationship.
- DME to network management tool. This will help the network manager to visualize the topology of the network and the autonomic activity taking place.

In many cases the best method for dissemination is to use extensions to the IPv6 protocols, although other possibilities are being considered and proposed, based on the merits of each case.

We currently foresee a number of internet drafts coming from the EFIPSANS project. The first of these will be submitted to the IETF in the first half of 2009.

# 4. Liaisons

EFIPSANS established a number of liaisons for exchange of know-how, joint trials such as Federica, dissemination and training events with the US and Japan.

A worldwide cooperation effort with similar Asian projects has been started especially with Korea, India, Taiwan and Australia under the auspices of the IPv6 Forum.

# 5. Usage of EFIPSANS know-how

All EFIPSANS project partners have clear ideas about how to use the know-how obtained from the EFIPSANS project in short term network deployment and operation. **IMPORTANT NOTE:** EFIPSANS partners have already indicated their individual Exploitation Plans, which are described in the EFIPSANS Technical Annex.

This section will present results which are considered by the partners to have potential for exploitation, defined as knowledge[1] having a potential for industrial or commercial application in research activities or for developing, creating or marketing a product or process or for creating or providing a service.

It provides a brief summary, per exploitable result, of how the knowledge could be exploited or used in further research.

As we are at the beginning of the project no exploitable knowledge has been gained yet.

| Exploitable knowledge | Sector | Timetable of commercial use | Patents or other IPR protection | Owner and other partners involved |
|---|---|---|---|---|
|  |  |  |  |  |
|  |  |  |  |  |

**Table 1 Survey of Exploitable knowledge**

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[1] ***Knowledge:*** means the results, including information, whether or not they can be protected, arising from the *project* governed by this *contract*, as well as copyrights or rights pertaining to such results following applications for, or the issue of patents, designs, plant varieties, supplementary protection certificates or similar forms of protection (Article II.1.14 of the contract)

# 6. Dissemination of Knowledge

Many publications have already been made by partners in journals and conferences, during this first reporting period. Others are scheduled for the next reporting period. The following tables summarise the conferences, workshops and publications produced and submitted for future events. The dissemination activities listed in this sub-section include past and future activities in the recommended tabular form.

# 7. Publishable results

The EFIPSANS project is only in its first year to publish officially solid results though a lot of discussions and dissemination have happened between the various stakeholders.

# 8. Conclusion

The project uses several channels for standardisation, dissemination and awareness creation activities to raise the visibility of the project. The scientific and technical achievements of the project are getting a good level of momentum in the right direction, with usage and exploitation routes directly into the development departments of major industrial companies and key people and organisations in the standards arenas.

# 9. Annexes

## 9.1. Letter of Intent from ETSI

ETSI has agreed to the proposal of the EFIPSANS consortium supported by its ETSI members to create an ISG working group to use as a platform for Autonomic **network engineering for self-managing Future Networks** which is confirmed in the following email from Ultan Mulligan, Director, Strategy and New Initiatives, ETSI including the procedure and the ISG agreement to be prepared for the creation of the ISG. One of the Sub-Groups of the ISG will focus on the Definition of a viable **roadmap of an evolutionary path** for today's network models, architectures, protocols such as IPv6 (towards IPv6++) and paradigms as necessitated by the GANA Reference Model being introduced by EFIPSANS. The definition of a **roadmap of an evolutionary path** should be achieved through Recommendations that can then be considered by the relevant Bodies towards the evolution of the protocols recommended for evolution or extensions. For this, the ISG would liaise with relevant Bodies such as IETF, 3GPP, etc. For more information on the structure of the ISG, refer to the Terms of Reference (ToR) of the ISG attached at the end of this deliverable.


From: Ultan Mulligan [mailto:Ultan.Mulligan@etsi.org]
Sent: Wednesday, June 11, 2008 10:11 AM
To: Chaparadza, Ranganai; Andras Toth
Cc: Laurent Vreck
Subject: ETSI ISG detailed documentation

Hello,

I promised Andras to send some detailed information on the establishment of an ISG.

I've attached a set of documents, and here's an explanation of what is what:

ETSI ISG draft ToR.doc is the main document I suggest you start to work on.
In fact, best not to edit this directly, but start by trying to answer some questions which I've listed below.  I'll help you with editing these documents every step of the way.  This ToR document contains a summary of the information and justification for the establishment of the ISG.  The ETSI Director General will need this information to justify establishment of the ISG, and this document will also be sent to the Board for information.

ETSI ISG Agreement - ETSI Member (final).DOC ETSI ISG Agreement - ETSI Participant (final).DOC These are the template legal agreements needed to establish the ISG.  The agreement is between a member and ETSI, and is reasonably straight-forward.  Of course, each member company of the ISG must sign the same agreement.  This agreement lists the detailed rules of the ISG, or rather, any differences from the basic ETSI rules (our Technical Working Procedures).  The ETSI Participant document is to be signed by any non-member of ETSI who wishes to participate in the ISG.  Don't bother trying to go through these documents yet - we will need to put in details which we will develop for the ToR document

ETSI ISG draft Rules of Procedure.doc is a consolidated set of rules for the ISG.  It's a working document of the ISG: when finalised it will contain the ETSI Technical Working Procedures, with the modifications agreed and detailed in the ISG Member agreement.

b57_41r1 Example Group Specification Title Page.doc is a sample cover page of a Group Specification which would be published by an ISG - this is what your documents will look like.

So, you should start by trying to answer the following questions, and based on your answers I can start to edit the ToR document, and work from there onwards:

What is the scope of the ISG?  Probably the most important question. Identify, in 5-10 lines, the intentions and objectives of the ISG.  In particular, try to set outer limits of what it could do, rather than being too precise.   You need enough information to enable anyone not in the ISG to understand if he should or should not join, without providing so much information that the detail becomes a limit for your work.  If you can write this first, I can help you edit it to be something like other ETSI scope statements.  We will also need further general text to highlight why the ISG is important, what other alternatives are available, why it's important for ETSI etc.  But you  probably have much of that in the documentation for the project which you prepared for the Commission.

Who will be involved? i.e. which companies/organisations will be listed as 'founding members' and need to be involved in the negotiation of the ISG agreements (anyone who comes afterwards can only accept/reject the agreements).  You won't have an immediate answer for me, I know.  We need at least 4 ETSI members or applicant members (those who have applied for ETSI membership)..

Who could be convenor of the first meeting?  We need a named individual, and preferrably he should be willing to be a candidate for chairman afterwards.

You should also consider if the chairman, when elected, should be for the default of 1year or should it be for more (often 2 years).

When do you hope to have your first meeting?  Probably time it with a project management or technical meeting in the autumn.

What specifications might you produce?  If you think you can identify working titles of one, two or three specifications which might be published by the ISG (maybe a known deliverable of the project?) then you can list it in the ToR.  This is not binding - you can change these later when the ISG is established.  It's just an indication.  If you can't identify anything yet, then no problem.

Will non-members of ETSI be allowed to participate?  You can choose to permit them, or exclude them.  They will have to pay a per-meeting fee in case they wish to attend (and are permitted).

What about voting etc.?  You can choose to have ETSI weighted voting - the larger companies pay more to  join ETSI, but get a higher voting weight, or more votes.  It means in practice that Ericsson, Alcatel-Lucent and Telefonica together could decide everything in the ISG (assuming they all join).  You can also choose, for example, one member one vote (I'd recommend this).  You can also add a further rule like an attendance requirement in order to be allowed to vote (3GPP do this).  So you could require the organisation to attend one or two of the last 3 meetings, for example, to be allowed to vote in the 4th meeting.

Do you have any other specific rules in mind? If you have something which you'd like to bring in from e.g. your consortium agreement, let me know and I'll see if it's possible.


As I said, I can help you edit and prepare the documents, and even find answers to these questions.

Best regards

Ultan


_____
Ultan Mulligan
Director
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## 9.2. ISG AFI initial Terms of Reference proposal (see next pages and click on them to open the imbedded document)

## 9.3. ISG Participant Agreement

## 9.4. Industry Specification Group Agreement

## 9.5. Exploitation of some features of the IPv6 Protocol: OSPFv3

**From:       ISG AFI (Autonomic network engineering for the self-managing Future Internet) Founding members**

**To:        ETSI Director General, ETSI Board**

**Subject:    ISG AFI (Autonomic network engineering for the self-managing Future Internet) initial Terms of Reference proposal**

## 1      Decision/action requested

> *The Director-General is requested to approve the creation, Terms of Reference, and Membership Agreement for an ISG on Autonomic network engineering for the self-managing Future Internet; and to appoint Mr. Ranganai Chaparadza (Fraunhofer FOKUS) as Convenor for the first meeting.*

## 2      References

ToRs clause 9.3.9       Responsibilities of the Director-General "…taking decisions on the creation or cessation of Industry Specification Groups, approving their terms of reference and reviewing their progress and work programmes…".

TWP clause 3        Operation of Industry Specification Groups

## 3      Rationale and Vision

**A brief review of the field of Autonomics/Self-Management**

The research area of Autonomic Networking/Self-Managing Networks is becoming hot and hot across the industry and academia, thereby calling for a Self-Managing Future Internet design. Momentum on the subject is on the rise. The previous developments and current research in this very vital field of Autonomics and Self-Managing Networks are still not harmonized and we are still sensing conflicting (and even seemingly chaotic) approaches and thinking. There are a number of issues and related developments, however, which can be *harmonized* through a well-focused Special Working Group that should seek to establish a common ground on which to build and capitalize, to establish common understanding on what an *autonomic behavior* is, how an *autonomic/self-managing network should be engineered*, and should serve as a focal point for the development of common specifications and engineering frameworks that guarantee interoperability, etc.

Therefore, there is now a very strong need for the establishment of a dedicated and well focused Special Working Group or an Industry Specification Group (ISG): "**Autonomic Network Engineering for the Self-Managing Future Internet**" within a well-established Standardization Body for the reasons given above and for the following reasons:

**Need for the development of an architectural Reference Model for Self-Management**

Many of the key industrial players and other stakeholders seem to be very much in favor of hearing about *evolution paths for today's network models and paradigms*, than revolutionary approaches, for reasons which are very well-known. Some of the reasons are: the huge costs associated with any revolutionary undertaking, the fear of jeopardizing proven and well satisfying business models, the fear of drowning into complex technologies that might at the end of the day prove to be difficult to test, validate, maintain and even trust, etc. Therefore, unless the following two things happen soon, a lot of key players will not be persuaded to quickly join in the call for the **Self-Managing Future Internet**, even though they like the vision very much. This is because they will not be in a position to quickly understand how the challenges for designing the Self-Managing Future Internet can be addressed and

# ETSI

# ISG Participant Agreement

# relating to the Autonomic network engineering for the self-managing Future Internet (AFI) ISG

**between**

> The European Telecommunications Standards Institute (hereinafter referred to as "ETSI"), a French non-profit making *association* organized under the law of July 1, 1901, located at 650 route des Lucioles, 06921 Sophia Antipolis Cedex, France, represented by its Director-General, Dr. Walter Weigel (hereinafter referred to as the "Director-General")

**and**

> The participant specifically identified in <u>Annex 1</u> hereof (hereinafter referred to as the "Participant").

**Whereas:**

A.     ETSI is a standard-setting organization in the field of telecommunications, officially recognized by the European Commission as a European Standards Organisation;

B.     The Participant is, as specified in <u>Annex 1</u> hereof, either a Counsellor, an Observer, or a person or legal entity which, even though it is not a full or associate member of ETSI or an applicant to full or associate ETSI membership, wishes to participate in the work of the Industry Specification Group identified in <u>Annex 2</u> hereof (hereinafter, the "ISG");

C.     The Director-General has approved the creation of the ISG and its Terms of Reference;

D.     The Participant has applied to attend meetings of the ISG and has been invited or authorized by the Chairman of the ISG to attend such meetings on the condition that the Participant enter into this ISG Participant Agreement, which terms and conditions have been agreed to by the Participant.

**It is agreed as follows:**

1.     **Incorporation by reference and definitions**

1.1     Incorporation by reference

> Subject to Discretionary Decisions, the decision making processes set forth in Article 4 of this ISG Participant Agreement and any authorized deviations from the ETSI Technical Working Procedures provided under Article 6 of this ISG Participant Agreement, the parties hereby agree to be bound by and comply with the terms and rules relating to the creation, organization, operation and cessation applicable to Industry Specification Groups set forth in the ETSI Directives of May 2008, including the ETSI Guidelines for Antitrust Compliance, and their subsequent versions and evolutions (hereinafter, the "ETSI Directives", available at http://portal.etsi.org/directives/home.asp), and the Terms of Reference, which shall be incorporated by reference and form an integral part hereof.

# ETSI

# Industry Specification Group Agreement

# relating to the Autonomic network engineering for the self-managing Future Internet (AFI) ISG

**between**

The European Telecommunications Standards Institute (hereinafter referred to as "ETSI"), a French non-profit making *association* organized under the law of July 1, 1901, located at 650 route des Lucioles, 06921 Sophia Antipolis Cedex, France, represented by its Director-General, Dr. Walter Weigel (hereinafter referred to as the "Director-General")

**and**

The member specifically identified in Annex 1 hereof (hereinafter referred to as the "Member").

**Whereas:**

A.      ETSI is a standard-setting organization in the field of telecommunications, officially recognized by the European Commission as a European Standards Organisation;

B.      The Member is, as specified in Annex 1 hereof, either (i) a full or associate member of ETSI wishing to participate in the work of the Industry Specification Group identified in Annex 2 hereof (hereinafter, the "ISG"), or (ii) has applied for full or associate ETSI membership and has been authorized by the Director-General to participate in the work of the ISG;

C.      The Director-General has approved the creation of the ISG and its Terms of Reference;

D.      The Member wishes to participate in the work of the ISG as a member (as this term is defined below) and, in accordance with clause 3.4 of the ETSI Technical Working Procedures, has agreed to enter into and be bound by the terms of this Industry Specification Group Agreement (hereinafter, the "ISG Agreement").

**It is agreed as follows:**

1.      **Incorporation by reference and definitions**

1.1     Incorporation by reference

Subject to Discretionary Decisions, the decision making processes set forth in Article 5 of this ISG Agreement and any authorized deviations from the ETSI Technical Working Procedures provided under Article 6 of this ISG Agreement, the parties hereby agree to be bound by and comply with the terms and rules relating to the creation, organization, operation and cessation applicable to Industry Specification Groups set forth in the ETSI Directives of May 2008, including the ETSI Guidelines for Antitrust Compliance, and their subsequent versions and evolutions (hereinafter, the "ETSI Directives", available at http://portal.etsi.org/directives/home.asp), and the Terms of Reference, which shall be incorporated by reference and form an integral part hereof. All capitalized terms and expressions not otherwise defined herein shall have the meaning ascribed to them in the ETSI Directives.

| Exploitation of some features of the IPv6 Protocol: OSPFv3 | |
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| Summary of the usage of the Protocol and any of its exploitable features: | OSPFv3 is a link-state routing protocol that is associated with the control plane of today's IP networks. The protocol comes with a management interface that can support the automation of (re)-configuring the protocol's behaviour according to the goals set for the routing behaviour of the network for which OSPFv3 is meant to fulfill. CLI types of (re)-configuration by a human is normally supported by most implementations of OSPFv3. For the management of OSPFv3 by traditional centralised NMS-type of approaches to network management, the OSPFv3 MIB can be used to perform the (re)-configuration of the protocol. Management of the protocol from within the node running an OSPFv3 instance may require some different approach to CLI or MIB types of interfaces. OSPFv3 implements a simple control loop that implements a self-adaptation mechanism to link failures as described later in this table. |
| Mapping the IPv6 protocol to the GANA Functional Planes | OSPFv3 belongs to the Dissemination Plane of GANA. Information such as Routes and link state information is disseminated among OSPFv3 supporting nodes.<br><br>Because OSPv3 implements some control loop, we can loosely associate it with some kind of Decision Element intrinsic to the protocol itself by design. Therefore, we can consider such kind of a protocol intrinsic DE as belonging to the Decision Plane of GANA. Because there is no separation between the decision logic i.e. a DE that implements the control loop intrinsic to OSPFv3 and the rest of the functions of the OSPFv3 that can be considered as regulated (managed) by such a virtual DE, the protocol itself (as a single module at implementation and run-time), as a whole, can be considered as belonging to the Decision Plane of GANA. This means that OSPFv3 is "neutral" to both the Decision Plane and Dissemination Plane of GANA. Note: Some "autonomic protocol" can be designed in such a modular way that it clearly has a "distinct" separation between its protocol-intrinsic DE and the regulated(managed) functions of the protocol that are managed/regulated by the associated protocol-intrinsic DE. In EFIPSANS, it remains to be seen as to whether we will have such kind of "autonomic protocols" per se, designed according to this understanding, since we are most likely going to develop DEs operating on the "abstracted networking functions level" of GANA and up the Hierarchical Control Loops (HCLs) levels through to the network level. |
| Any Self-* Behaviour that can be considered as a feature intrinsic within the protocol | OSPv3 as a link-state routing protocol, supports "Self-Adaptation" by performing failure detection and adaptation to the underlying network topology and link or node failures. After link weights have been configured (typically a manual process), the routing protocol will discover the network topology, disseminate routing information and set up consistent forwarding tables. Additionally, OSPFv3 is capable to adapt to failures: it detects link failures through a variety of methods, such as repeated failures to receive packet acknowledgements. Following failure detection it will reroute, eventually converging on a new valid path. Some forms of "Self-discovery", "Self-description", "Self-advertisement" and "Self-organization" functionality can also be identified in the operation of OSPFv3. |
| Any other Self-* Behaviour that can benefit from using the protocol in general | "Self-optimization" functionality can be achieved by optimizing shortest paths. This involves extending the OSPFv3 LS flooding protocol to convey resource (bandwidth) availability at network links and incorporating OSPFv3 into a control loop that fine-tunes the link costs with respect to monitoring data and actual user demands. This "Self-optimization" functionality can be extended to involve multipath routing (OSPF-OMP). Additionally, proposals exist to facilitate for fast OSPFv3 "Self-healing" (IPFRR). |