Identifying standardization opportunities of an operator-driven framework for unifying autonomic network and service management

Paper Authors: K. Tsagkaris, A.Galani, P.Demestichas, G.Nguengang, M.Bouet, I.GridaBenYahia, C.Destre, S.Ghamri-Doudane and L.Ciavaglia

Presenter: Samir Ghamri-Doudane – Alcatel-Lucent Bell Labs France

On behalf of the UniverSelf project partners

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Overview

- **The UniverSelf Project**

- **Some Concepts: UMF and NEM**

- **Specification of the UMF Core Blocks**

- **Standardization Needs and Opportunities**

- **Next Steps**

The UniverSelf Project

RATIONALE → Network Transformation:

- Operational complexity is growing.
- Cost structure is not sustainable.
- Legacy management architecture is no longer adapted.

OBJECTIVE:

Realize carrier-grade autonomic management

→ Multi-facet unification

- Federation and unification of existing architectures and management principles across multiple technological contexts.

→ Network empowerment

- Embed intelligence within networks to achieve self-management

→ Industry impact

- Demonstrate deployability, assess impacts and develop strategies for network operators to adopt autonomic solutions

→ Trust and confidence

- Demonstrate the reliability of every autonomic solution and Develop standard testing and certification processes

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The UniverSelf Consortium:

17 Partners in Europe

FP7 Integrated Project Funded by the European Commission.

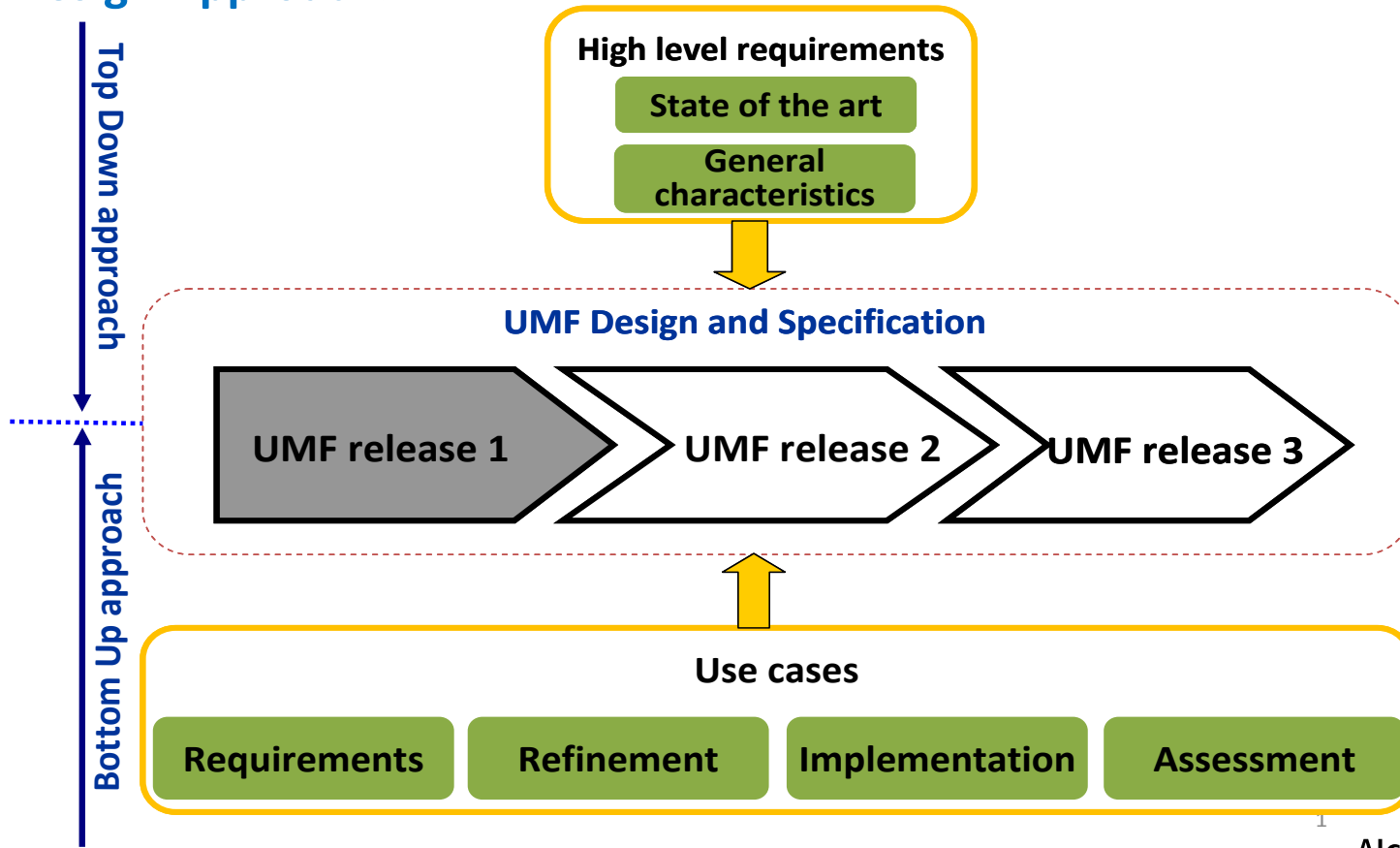**Start date: September 2010.**

Duration: 36 months.

Website: www.univerself-project.eu

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UMF – a Unified Management Framework

As a mean to achieve unification and establishment of autonomics in the management of networks and services.

➔ **In this context, standardization is a must!**

UMF Design Approach:

NEM – Network Empowerment Mechanism

Achieve a self-management function, basically a control loop, with a specific purpose:
- **an operational problem to be solved,**
- **a performance objective to be achieved,**
- **a network segment or service infrastructure to be targeted.**

→ kind of atomic component for autonomic network management.

Design approach: use the relevant method to solve a concrete operational problem in a specific networking environment

So, NEM = method + objective + context
- use of Bayesian inference for fault diagnosis in FTTH environments
- use of genetic algorithm for interference coordination in LTE networks

There is no need for more to design and implement a NEM!
- **Usual research approach: identify a problem within a specific context and then find/design the relevant method to address it (right key to the lock).**

UMF vs. NEMs

Then, when a NEM is deployed, it has to deal with its environment: the operator, the network/service equipments, the legacy management systems and also the other NEMs.

So, if we target a seamless deployment and trustworthy interworking of a large number of NEMs, we need more:

- Tools to deploy, drive and track progress of NEMs → Governance/Human-to-Network tools.
- Tools to avoid conflicts, ensure stability and performance when several NEMs are concurrently working → Coordination/Orchestration mechanisms.
- Tools to make NEMs find, formulate and share relevant information to enable or improve their functioning → Knowledge management.
- Tools to Allow NEMs getting monitoring data and enforcing configuration actions at equipment level → specific adaptors.

3 challenging research topics are outlined above: governance, coordination and knowledge management.

- **The need to focus on these challenges led us to define the UMF Core.**

UMF Core specification and Standardization

Objective of the UMF Core:
Seamless and trustworthy deployment of NEMs
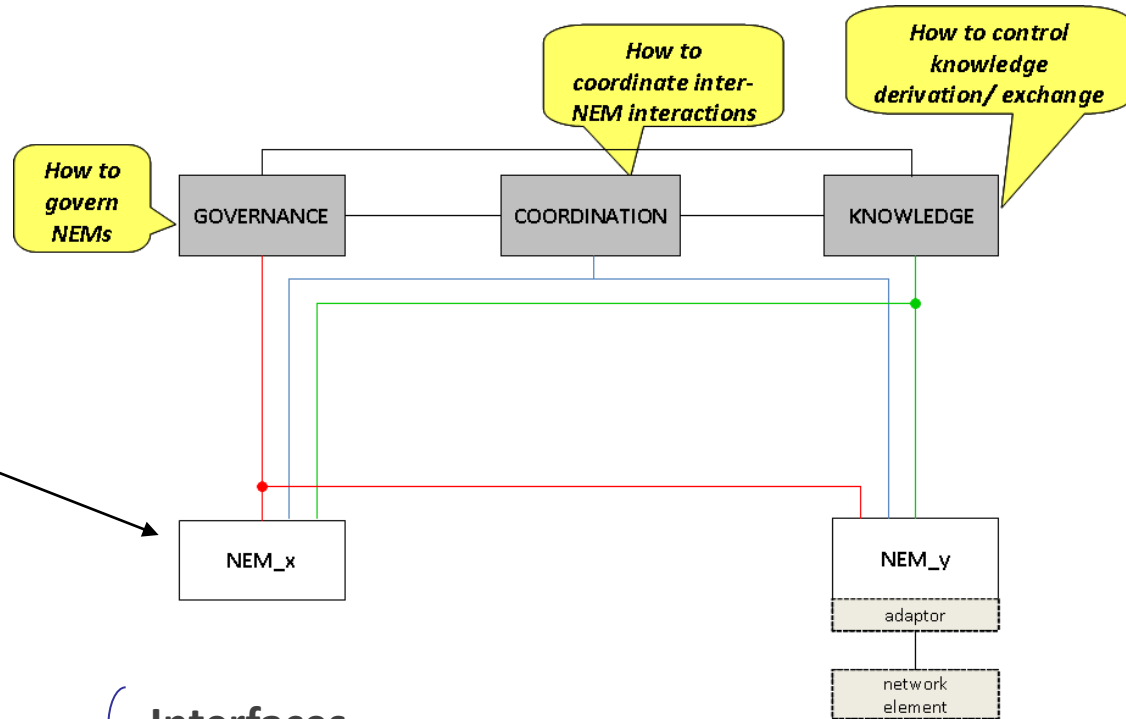
Accomplishment by specification, and then standardization, of:

- Interfaces
- Coordination schemes
- Communication patterns
- Knowledge structures
- Policy translation levels
- Ontology
- Recommendations for Development of NEMs (lifecycle, generic structure, …)

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UMF Core Blocks – Governance

Responsible for:

- The interaction between human operator and its network→ express business goals report on critical states of self-managed operations/devices

- Driving NEMs' behavior→ policy-based framework for translating business-level, service specific goals/requests into low level, policies and configuration commands
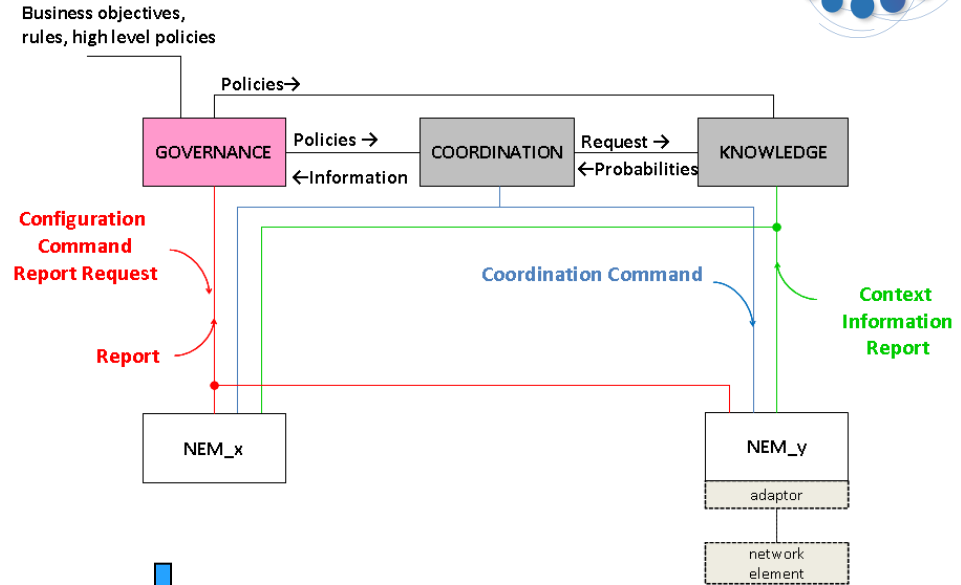
GOV ←→ NEM:

- Commands to set NEM's status/mode (e.g. active, idle, stopped) and configure its operational parameters.

- Report on the NEM's operational conditions and configuration characteristics (e,g. performance indicators, capabilities/behaviour, interaction with other NEMs).

Functional Decomposition
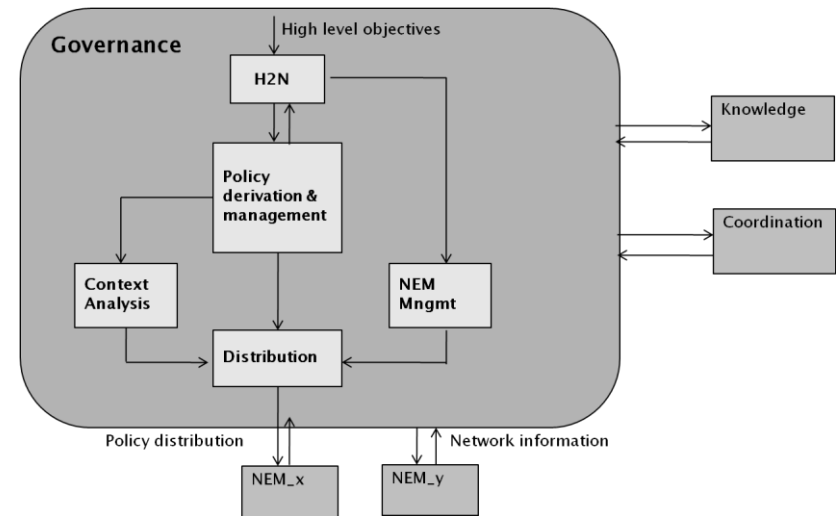
UMF Core Blocks – Coordination
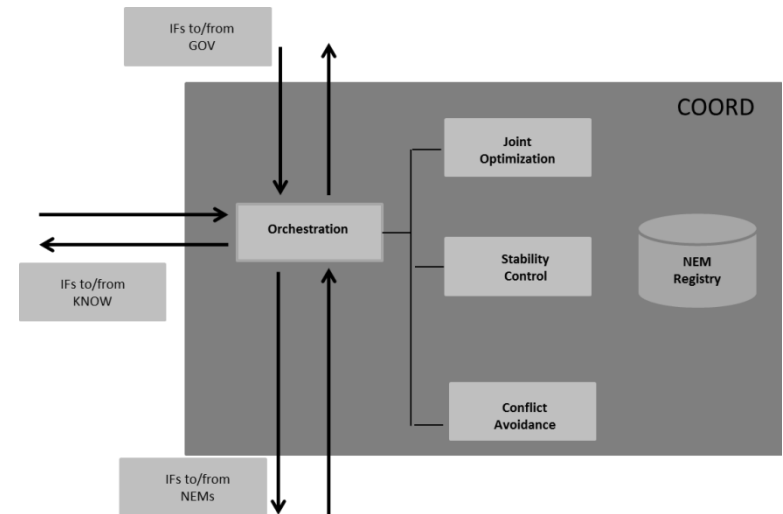
Responsible for:

- Ensuring the proper sequence in triggering of NEMs and the conditions under which they will be invoked taking into account:
  - ✓ Operator and service requirements,
  - ✓ Needs for Conflict avoidance, joint optimization and stability control.
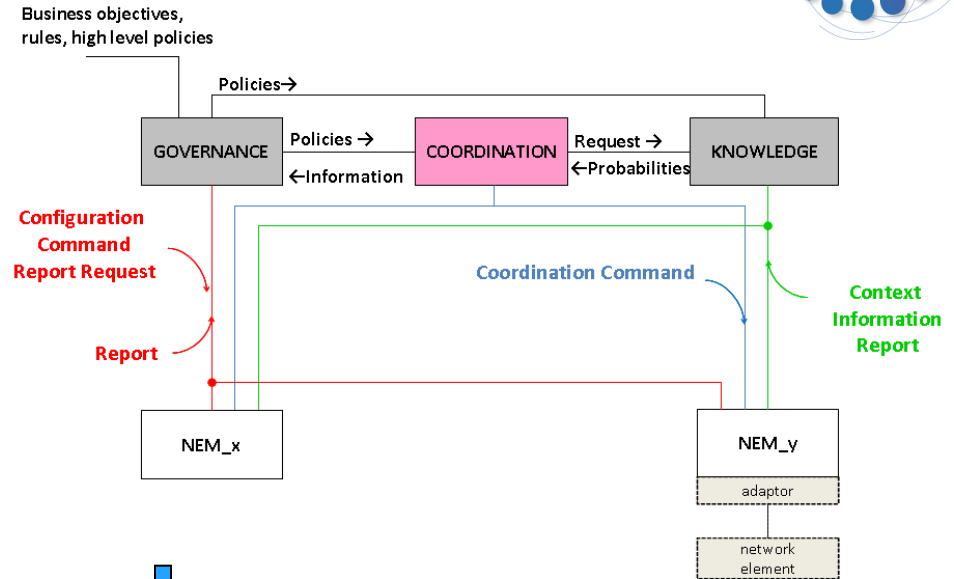
**Functional Decomposition**

COORD ⟵⟶ NEM:

- Commands to drive coordination including: tokens, timing, constraints, status (active/idle), etc.

- Information on the NEMs operation including: parameters, metrics, scope, utility functions, etc.

UMF Core Blocks – Knowledge

Responsible for:

- Providing the suitable probabilistic models methods and mechanisms for derivation and exchange of Knowledge, based on :

  - ✓ Context and configuration information from NEMs,
  - ✓ Policies from Governance,
  - ✓ Information on NEM interactions from coordination
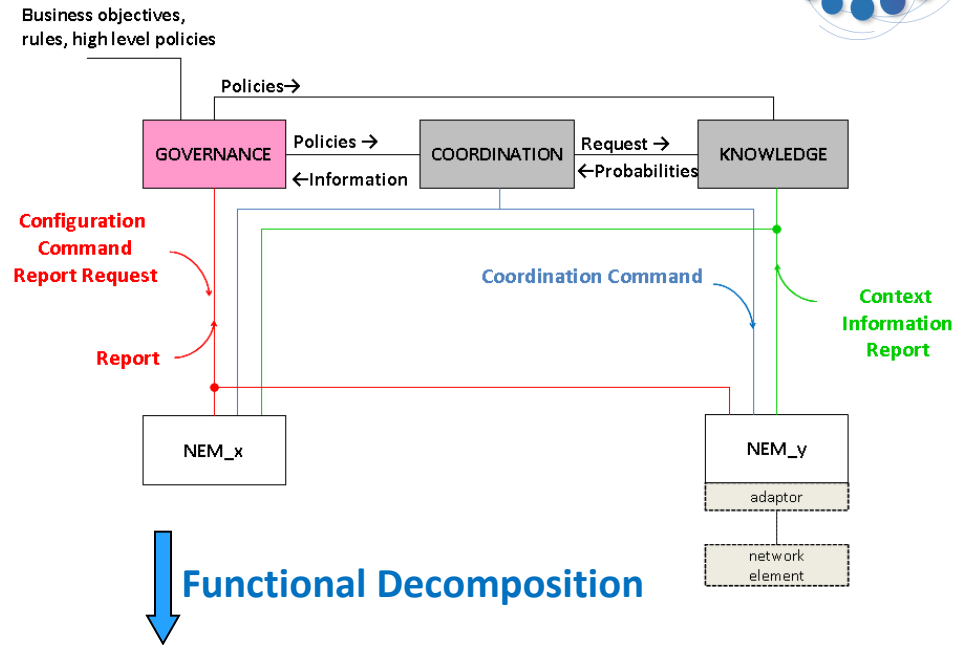
KNOW ←→ NEM:

- Commands to retrieve, share, derive and manage knowledge including: publish, subscribe, push, pull, request, store, notify … messages.
- Registration of NEMs.

Functional Decomposition
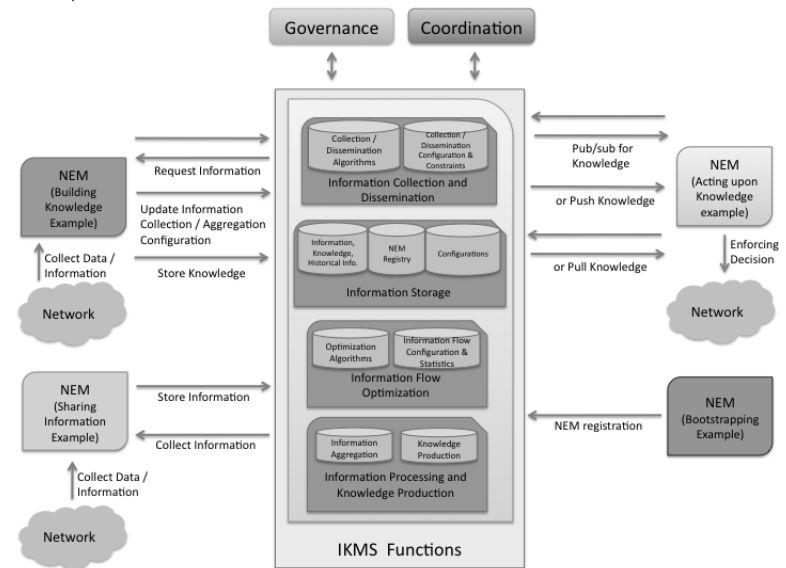
UMF → Standardization Bodies/Groups

AFI ISG

WI#2 — Architectural Reference Model for Autonomic Networking

Scenarios, Use Cases, and Requirements for Autonomic/Self-Managing Future Internet

WI#1

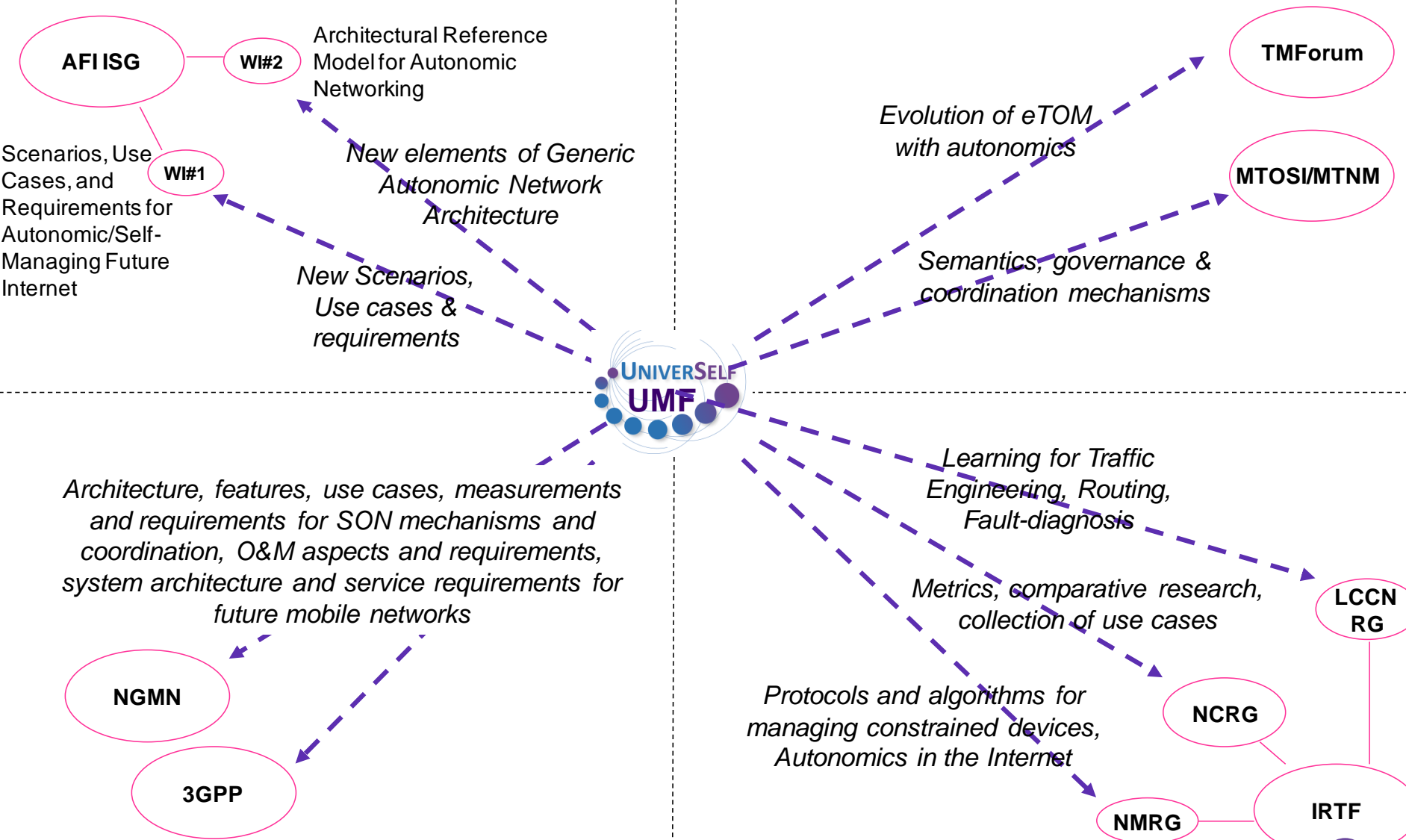*New elements of Generic Autonomic Network Architecture*

New Scenarios, Use cases & requirements

TMForum

Evolution of eTOM with autonomics

MTOSI/MTNM

Semantics, governance & coordination mechanisms

UNIVERSELF UMF

Architecture, features, use cases, measurements and requirements for SON mechanisms and coordination, O&M aspects and requirements, system architecture and service requirements for future mobile networks

NGMN

3GPP

Learning for Traffic Engineering, Routing, Fault-diagnosis

Metrics, comparative research, collection of use cases

Protocols and algorithms for managing constrained devices, Autonomics in the Internet

LCCN RG

NCRG

NMRG

IRTF

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UMF – Current and Next Steps

 Finalize the UMF specification Work: functions/operations of the core blocks, interfaces, workflows, design patterns.
   → UMF release 2 to be published by July 2012.

 Capture and accommodate future use cases, as a means to prove a great level of reusability of functional blocks and/or interfaces and, hence, to support standardization work.

 Design and evaluation of the UMF supporting tools: ontologies, knowledge structures, knowledge management/sharing infrastructures, network governance mechanisms, human-to-network tools, coordination mechanisms, intelligence embodiment methods.

 Sustain the efforts towards UMF standardization and development of certification procedures.

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Thank You!

The research leading to these results has been performed within the UniverSelf project (www.univerself-project.eu) and received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 257513