Independent Assessment of
Call ICT 14 / H2020-ICT-2014-2

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Executive Summary

Scope and context

We report on the outcomes of an independent assessment of Call ICT 14 (*aka* H2020-ICT-2014-2). More specifically, key issues addressed in the assessment were:

1. Coverage of the Call by the project proposals eventually retained for funding (19 RIAs and 3 IAs);
2. Coverage, by the same proposals, of the 5G PPP Pre-Structuring Model V2.0;

Furthermore, for all identified gaps an assessment has been made of the additional coverage that each of the four other project proposals evaluated above-threshold (3 RIAs and 1 IA) would have provided, had they been retained;

It is to be stressed that coverage of a given topic is not intended here only in the sense that it is generically addressed in the proposal text, but that there is also sufficient evidence, in the proposal workplan, of activities aimed at advancing its SotA towards the Call specific challenges. Excellence, quality and credibility of the proposed work, instead, are not within the scope of this assessment, as they already were the specific objective of the Call evaluation process.

Unavoidably, an assessment of this nature cannot be fully objective, even if the reviewers are making their best endeavours to ensure that the outcomes are arrived at as impartially and transparently as possible. Therefore, diversity in the assessment methodology independently adopted by each reviewer was welcome, and was eventually exploited to minimise unwanted bias, and to increase confidence in the consensus results.

Although both Call and Model use the same high level 4-Strand challenge structure (Figures 1 & 2), to ensure adequate accuracy (especially with respect to the assessment of the four non-retained projects), both methodologies required the fine grain identification and classification of the many (>>100) specific topics and sub-topics that are more or less explicitly embedded in each of the Call and Model macro-challenges. Intentionally, this classification too was not entirely unified, and, beyond the first Topic/Project level, it was left to the discretion of the individual reviewer.

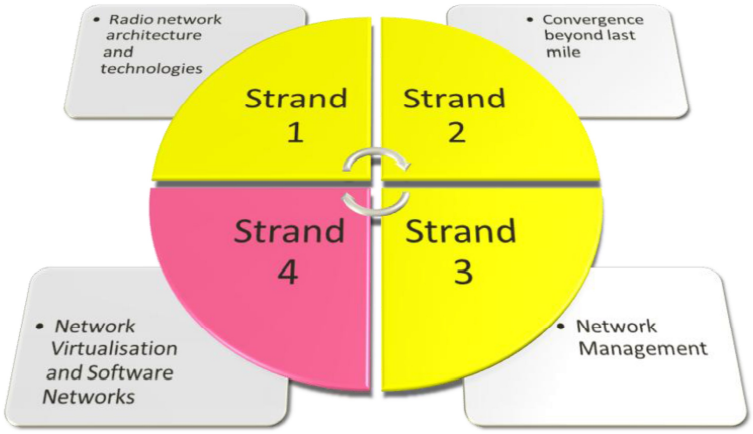


Fig.1 – High level structure of Call ICT 14

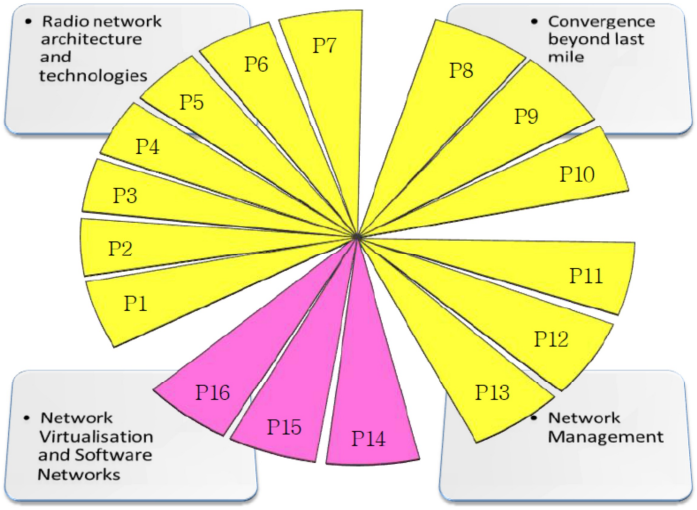


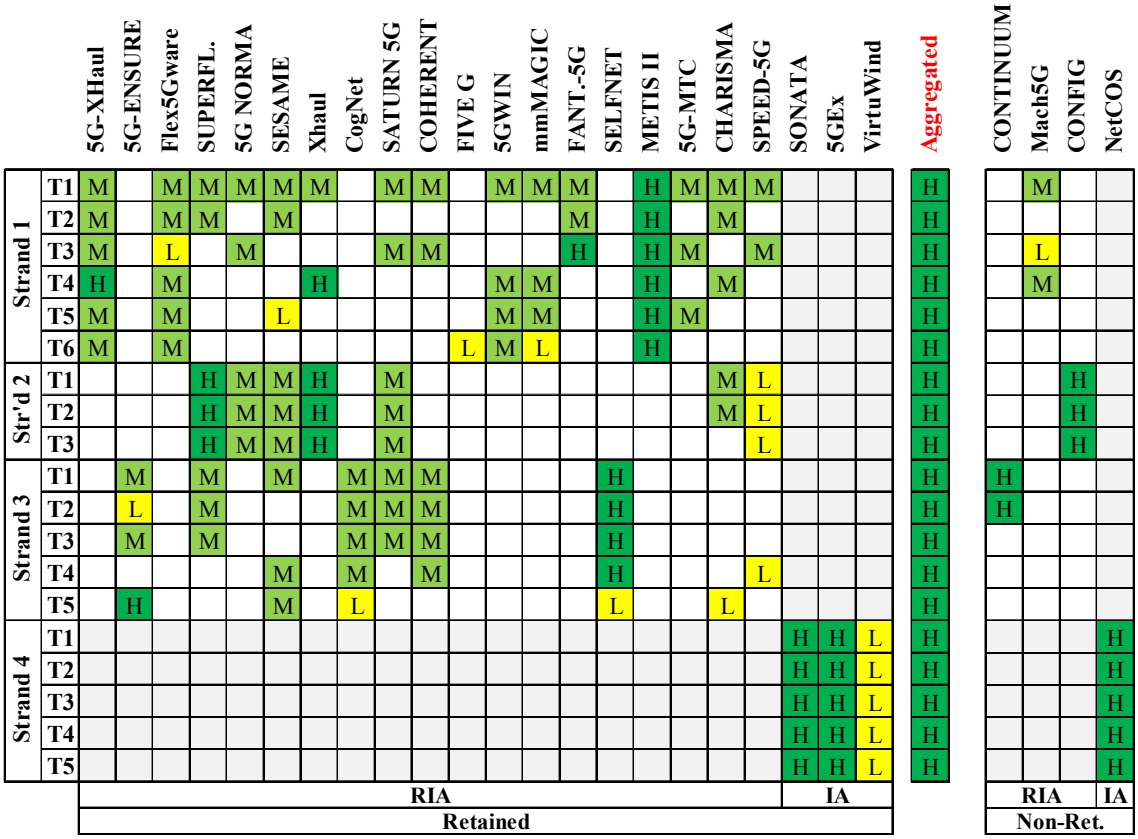
Fig.2 – 5G PPP Model predefined projects

The independent assessment reports are attached. Each report includes: a description of the specific assessment methodology adopted; the detailed assessment of each examined proposal; reasoned estimates of the coverage these provide, severally and jointly, of the Call and of the Model; and, the conclusions of the individual evaluator.

Individual findings and conclusions were then compared and discussed by the evaluators by e-mail and in a face-to-face meeting. By and large, it was found that there was good overall agreement, especially at the high level, and that the few differences found could be clearly explained and justified. Eventually, a consensus position was agreed for all of them.

Coverage of Call ICT 14

Individual and joint coverage of the Call by the 19 RIA and 3 IA project proposals eventually retained for funding, as well as individual coverage by the 3 RIA and 1 IA non-retained proposals is summarized in the figure below (Fig. 3).



		5G-XHaul	5G-ENSURE	Flex5Gware	SUPERFL.	5G NORMA	SESAME	Xhaul	CogNet	SATURN 5G	COHERENT	FIVE G	5GWIN	mmMAGIC	FANT.-5G	SELFNET	METIS II	5G-MTC	CHARISMA	SPEED-5G	SONATA	5GEx	VirtuWind	Aggregated	CONTINUUM	Mach5G	CONFIG	NetCOS
Strand 1	T1	M		M	M	M	M	M		M	M		M	M	M		H	M	M	M				H		M		
	T2	M		M	M		M								M		H		M					H				
	T3	M		L		M				M	M				H		H	M		M				H		L		
	T4	H		M				H					M	M			H		M					H		M		
	T5	M		M			L						M	M			H	M						H				
	T6	M		M								L	M	L			H							H				
Str'd 2	T1				H	M	M	H		M									M	L				H			H	
	T2				H	M	M	H		M									M	L				H			H	
	T3				H	M	M	H		M										L				H			H	
Strand 3	T1		M		M		M		M	M	M					H								H	H			
	T2		L		M				M	M	M					H								H	H			
	T3		M		M				M	M	M					H								H				
	T4						M		M		M					H				L				H				
	T5		H				M		L							L			L					H				
Strand 4	T1																				H	H	L	H				H
	T2																				H	H	L	H				H
	T3																				H	H	L	H				H
	T4																				H	H	L	H				H
	T5																				H	H	L	H				H
		RIA																			IA				RIA			IA
		Retained																							Non-Ret.			

L *Low/Marginal* M *Medium/Partial* H *High/Total*

Strand 1	T1	*Network architecture, protocols and radio technologies*
	T2	*Novel requirements*
	T3	*Versatile low-cost ubiquitous radio access*
	T4	*Flexible and efficient back-/front-haul integration*
	T5	*Innovative architecture for 5G transceivers and micro-servers*
	T6	*Experiment based research*
Str'd 2	T1	*Management of heterogeneous technologies and protoocols*
	T2	*Optimized reuse of (possibly virtualized) functionalities*
	T3	*Optimized reuse and sharing of infrastructures*
Strand 3	T1	*Novel simplified (low OPEX) approaches*
	T2	*Network level management*
	T3	*Service level management*
	T4	*Combination of autonomic resource management and SDN*
	T5	*Network security in multiple virtualized or SDN domains*
Strand 4	T1	*Virtualization of network functionalities at infrastructure level*
	T2	*Virtualization of the implementation of network services*
	T3	*Orchestration logic (SDN)*
	T4	*Tighter integration between application/service and networking layers*
	T5	*Support of dynamic integration with 3rd party and OTT cloud environments*

Fig.3 – Call ICT 14 Coverage by Above-Threshold Proposals

From the picture, it is immediately evident that retained proposals jointly provide a good coverage of all of the Call challenges, and that all topics are covered multiple times. In fact, full coverage (according to category "High/Total") could be achieved through just 4 of the RIA proposals (5G-ENSURE, SUPERFLUIDITY or Xhaul, METIS-II, and SELFNET) and 1 of the IA ones (5GEx or SONATA).

This however is largely due to the fact that the Call text, in its broadness of scope, is relatively generic, and leaves ample space for alternative approaches to the solution of each individual challenge. Therefore, redundancy is not to be seen as a synonym of duplication and, in the specific case, it is judged very positive. In addition, the specific focus on the 5G-PPP Model themes varied between the projects mentioned above and therefore they complement each other.

It is also to be noted, however, that several RIA proposals (partly and *pro parte*) address topics in multiple Strands. This is mainly because, on the one side, the chosen Strand structure is consistent with a layered network view and, on the other side, the Call text implicitly fosters projects that are vertically integrated and self-contained. Hence, coverage complementarity is not *per se* guaranteed.

Finally, the Fig. 3 provides evidence that all four non-retained proposals address topics that are already fully and redundantly covered by retained ones. Furthermore, this has been found to be true also at the lower sub-topic level. Therefore, it is concluded that, if retained, they would have not improved the coverage of the Call.

Coverage of the 5G PPP Pre-Structuring Model V2.0

Individual and joint coverage of the 5G PPP Model by the 19 RIA and 3 IA project proposals eventually retained for funding, as well as individual coverage by the 3 RIA and 1 IA non-retained proposals is summarized in the figure below (Fig. 4).

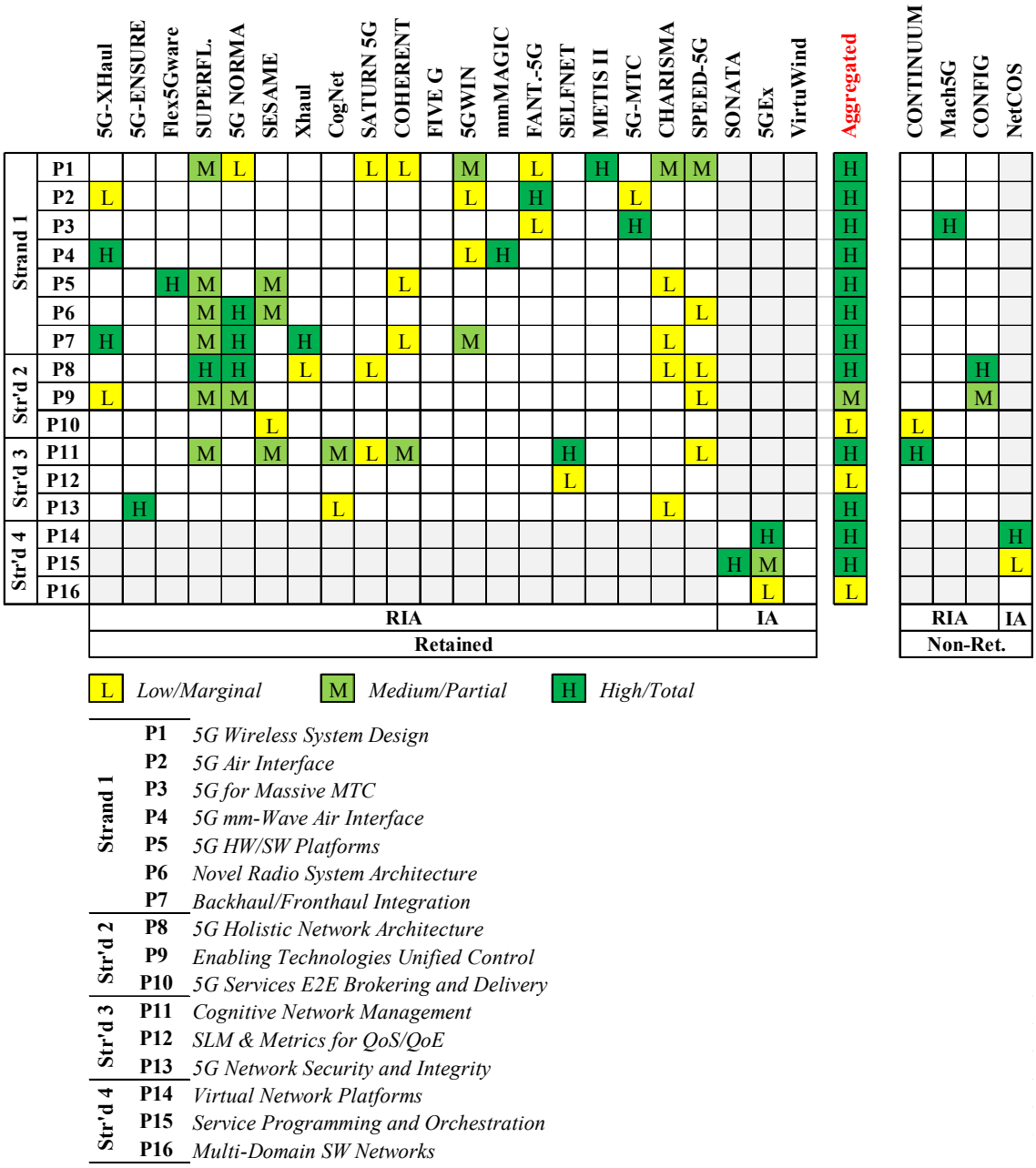


Fig.4 – 5G PPP Pre-Structuring Model Coverage by Above-Threshold Proposals

From the picture, it is immediately evident that Call and Model coverage, by the same proposals, is not the same, and, in particular, that Model coverage is overall less redundant, and also presents some gaps. This, however, does not come as a surprise, and is mainly due to the specificity and relative narrow focus of the Model objectives, which are often detailed down to the sub-sub-topic level. Consequently, proposals proposing approaches and solutions different from those specified in the Model could not always be positively assessed.

A more positive view is offered by the following pictures, which respectively indicate how many times a given topic (that is, one of the 16 pre-identified projects in the Model) is addressed in individual proposals (Fig. 5), and, conversely, how many projects are addressed by each proposal (Fig. 6).

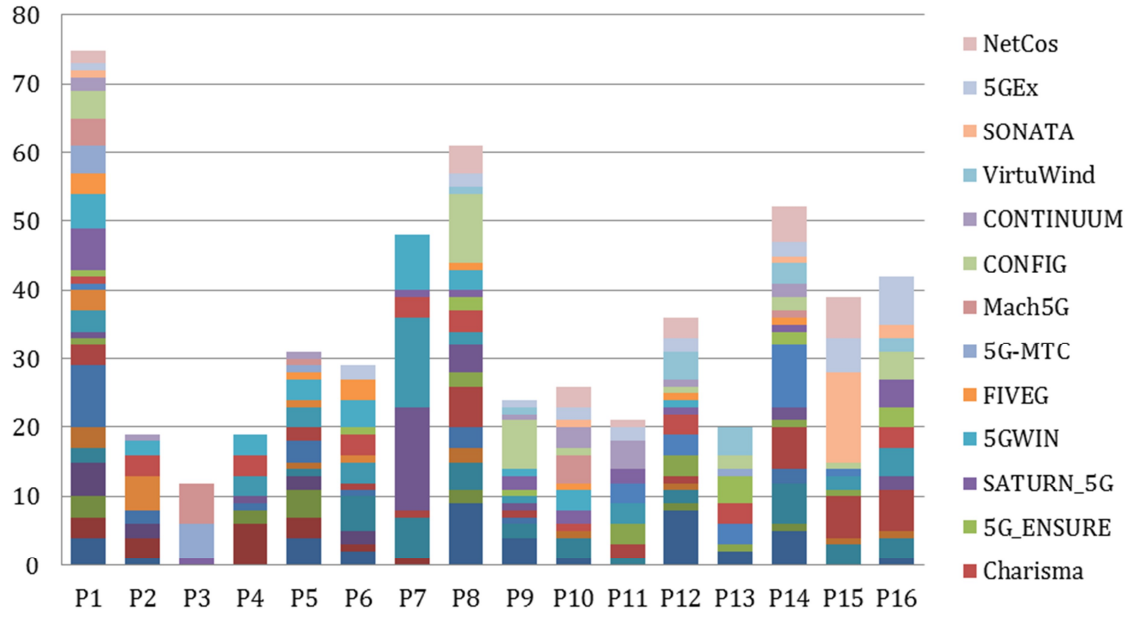


Fig.5 – 5G PPP Pre-Structuring Model Referencing – Model Projects View

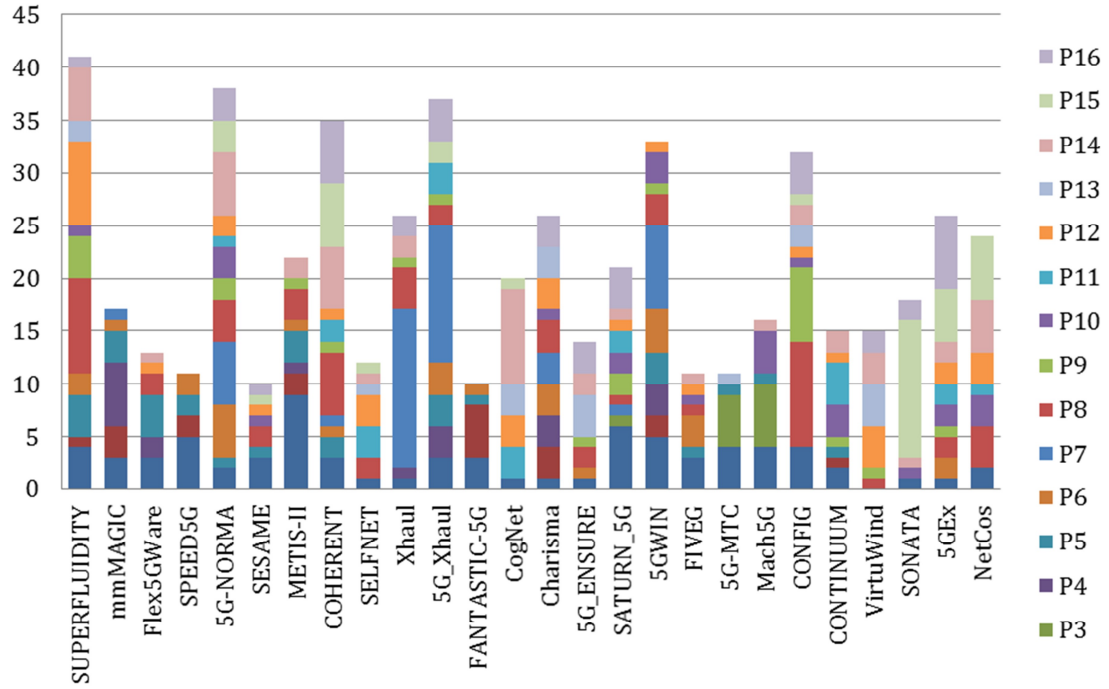


Fig.6 – 5G PPP Pre-Structuring Model Referencing – Proposals View

Both Fig. 5 and Fig. 6 must be read with caution. Neither is normalised: for example project P3 in Fig. 5 has only 6 sub-topics that were covered in aggregate by 3 proposals (12 "hits" in

total, each sub-topic being addressed at least by two of the retained proposals). Furthermore, P9 has 19 sub-topics that were covered in only a limited way by 13 proposals, with a maximum of 4 sub-topics addressed by multiple retained proposals – most addressed only one sub-topic. Thus it can be concluded that in fact P9 is not adequately addressed. A similar argument can be made about the coverage of P10, and 8 sub-topics were not addressed at all in this project.

Taking this into consideration, in particular, Fig.5 would suggest a significant level of redundancy in the coverage of all of the Model pre-defined projects. It is to be noted, however, that in this analysis addressing of a Model project by a proposal extends also to its referencing as significant for the scope of the same proposal, and, therefore, does not necessarily imply full coverage of the same in terms of actual contribution. This is implicitly confirmed by Fig. 6, which shows how, with the same assumption, all proposals do in fact address multiple Model projects.

Assessing actual coverage is further complicated by the fact that, with very few exceptions, proposals do not contain explicit reference to the Model, or, if they do, this is in rather generic terms. Necessarily, this has implied working on a finer granularity level, well below the project one.

Eventually, however, in the above analysis it was found that only 12 out of 168 identified sub-topics (that is ~7%) has not been addressed at all by retained proposals.

According to the same analysis, additional coverage from the four non-retained proposals (namely, CONTINUUM, Mach5G, CONFIG and NetCOS) would be limited to 3 out of these sub-topics, as indicated in the following table (Table 1).

Type of Action	Proposal Acronym	Model Project	R&D Sub-Topic
RIA	Mach5G	P3	Navigation support for mobile devices
	CONTINUUM	P10	Network resource transparency to the user
IA	NetCOS	*(P10)*	Local vs. distributed policy-based decisions considering scalability issues

Table 1 – 5G PPP Sub-Topics Covered Uniquely by Non-Retained Proposals

The CONFIG proposal does not address any sub-topic uniquely. The NetCOS proposal addresses a sub-topic in P10 uniquely, but it is not a RIA. All other sub-topics are addressed by one or more retained proposal.

Therefore, here too it can be concluded that, if retained, none of the four proposals would have significantly improved the coverage of the 5G PPP Pre-Structuring Model.

Gaps

The topics addressed by the 5G-PPP Model projects overlap in many ways and it is difficult to identify genuine gaps where topics are not covered at all. The following topics seemed evident on initial study.

Control plane

There is in fact no shortage of proposed research to address control plane topics. Given the large number of topics in different projects related to the control plane, it is not clear what the gap is or if it could be filled.

It is concluded that this is a topic that is very well addressed but accept that a coherent solution may be difficult to find. It is recommended that issues concerning control planes be considered in alignment with software defined networks, the network operating system, as well as non-functional aspects such as QoS or QoE.

Machine-to-machine

The fragmentation of application domains in the area of MTC systems is legendary. The 5G-PPP model does not highlight this adequately because it focusses on the support of large numbers of devices at lower layers, e.g. in project P3. Although device and service diversity is included in other projects, the coverage is limited.

Network operating system

It is considered that the relevant issues are addressed by CogNet and COHERENT. Although the non-retained IA proposal NetCos could be seen to be more focussed, there are no gaps in coverage.

Holistic network management

The sub-topics of the 5G-PPP model are relevant to network management in many ways and, given the generally good coverage, it can be argued that network management (and also service management which is closely linked to the control plane), is properly covered. But it is not approached in a holistic way.

It is not evident that a holistic approach to network management is a “killer” solution: every application has distinct management requirements. It may be possible to distil global requirements that would lead to a holistic approach and it is recommended that this should be considered in future calls.

To conclude, topics that are not covered, or not well covered, in themes P9, P10 and, to some extent, P12, are those that integrate the control plane with processes that monitor the performance of the system and manage end-to-end delivery via the user-plane. It is considered that this is the most significant gap in coverage. In general the control plane and network management are addressed comprehensively: it is their integration and the closure of the monitoring loop that is missing.

Comparative Mapping of Above Threshold Proposals

In the next figure (Fig. 7) we summarize how above-threshold proposals map onto the 5G PPP Pre-Structuring Model according to the two independent coverage assessments described in the previous paragraph, and how this compares with the 5G PPP Association view.

For a correct interpretation it is however important to point out that:

- Different from Fig. 4, whose purpose is to assess coverage of specific R&I topics, independent of their positioning in the Model, Fig. 7 reports only the proposals' main focus with respect to the 16 pre-defined Projects.
- As already indicated above, differences in the outcomes of the two independent evaluations are not per se significant and mainly depend on the different methodologies and definitions adopted.
- The 5G PPP Association view is limited to the 15 RIA and 3 IA proposals officially included in the 5G PPP Phase I Portfolio that is reported on the 5G PPP website.

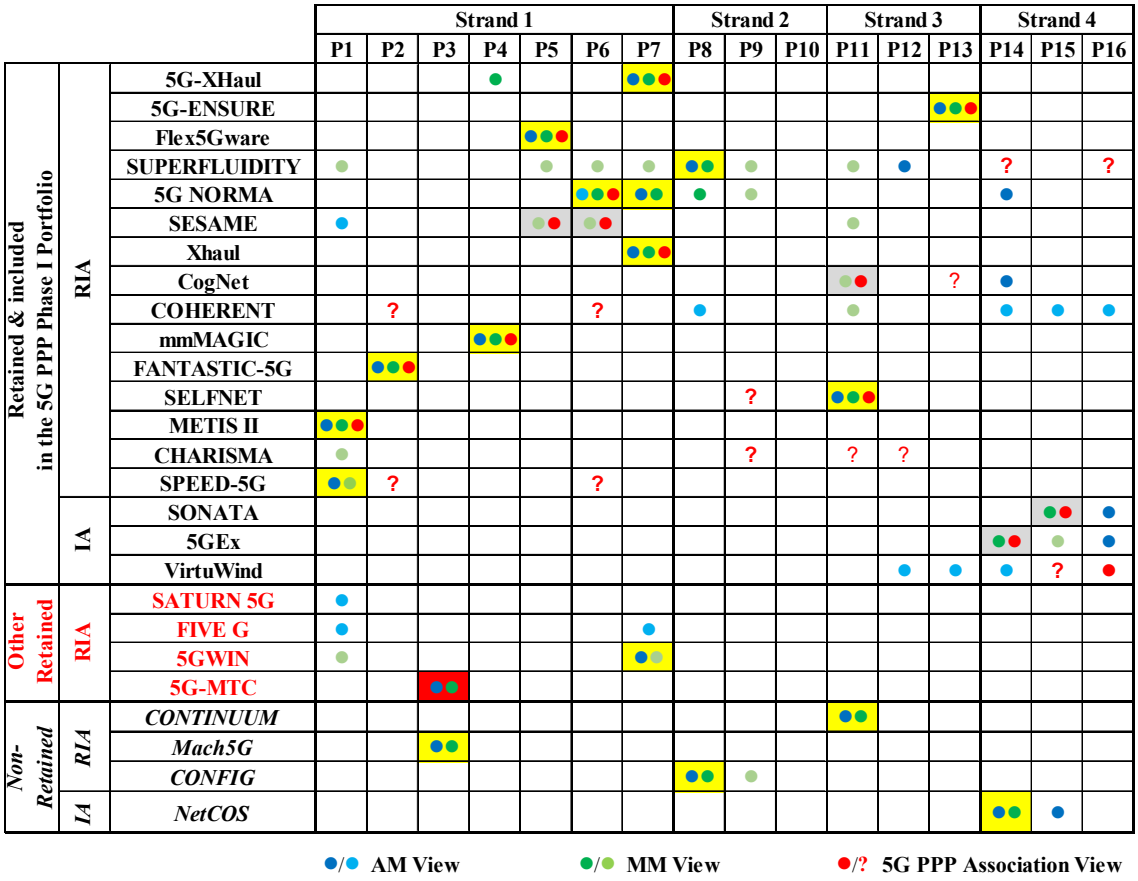


Fig.7 – Comparative Mapping of all Above-Threshold Proposals on the 5G PPP Model

From the Figure, it is immediately evident that most of the proposals have a clear focus, and that there is good agreement on what this is.

There are also several cases, however, in which the focus is not well evident, as the assessors' views would seem to indicate a considerable level of disagreement. However, the views are mostly in agreement on the main topics addressed by the proposals.

For SUPERFLUIDITY, for example, the uncertainty can be directly referred to the broadness of scope of the proposal, which explicitly addresses correlated topics in multiple Strands and

Projects. However, both assessors agreed that P8 was the primary focus, by contrast with the Association and the proposers themselves who identified P14 and P16 as the targeted projects.

In the case of COHERENT and CHARISMA both assessors agreed on a general lack of focus, which makes it difficult to clearly match them to any of the predefined Projects. However, both assessments indicate agreement with the evaluation outcome.

VirtuWind, SATURN 5G and FIVE G are special cases, which simply do not fit well into the Model vision.

Last but not least, it is to be noted that 5G MTC, which is currently not included in the 5G PPP Phase I Portfolio, is the only retained proposal specifically addressing (and covering) P3 in Strand 1.