

07/11/2017







- 5G Infrastructure PPP is an ambitious programme (3 Phases) with ambitious KPIs
- 5G Infrastructure PPP is more than a group of standalone projects
- Pre-Structuring Model (PSM)
 - Ensuring that the right set of projects (portfolio) will work together
 - Intra-phase and through phases (80+ projects in the full programme)
 - Model presenting features and recommendations to guarantee smooth integration of new projects in existing coordinated programme
 - Model focused on PPP Phase 3 projects portfolio and related projects, not on proposals. Model not prescriptive (including on technologies)
 - Model defining recommendations from 5G-IA perspective, enriched through interactions with the overall Community
 - Phase 3(.I) PSM elaborated by 5G-IA Trials WG (open membership)
 - Model taking as reference the EC Work Programme 2018-20
- Model to be widely accepted by the Community and to be recommended by 5G-IA and EC as « reference » platform and guidelines for the further development of proposals
- Evaluation of proposals to consider the Model as background information to the evaluation process
 - Avoiding duplication ("hype effect") and coverage gaps issues in the portfolio







- Phase 3(.I) PSM addressing the following EC WP2018-20 5G Infrastructure PPP Strategic Objectives, related to experimentation and trials
 (http://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-leit-ict_en.pdf)
 - ICT-17-2018: 5G End-to-End Facility (RIA)
 - ICT-18-2018: 5G for Cooperative, Connected and Automated Mobility (CCAM) (IA)
 - ICT-19-2019: Advanced 5G validation trials across multiple vertical industries (RIA and CSA)
 - ICT-21-2018: EU-US Collaboration for advanced wireless platforms (CSA)
 - ICT-22-2018: EU-China 5G Collaboration (RIA)
 - EUJ-02-2018: 5G and beyond (RIA)
 - EUK-02-2018: 5G (RIA)
- The following Strategic objectives will be addressed by the Phase 3(.II) PSM (targeted in February 2018)
 - ICT-20-2019-2020: 5G Long Term Evolution
 - ICT–41-2020: Network innovations with 5G third party services
 - ICT–42-2020: 5G core technologies innovation
 - ICT-23-2019: EU-Taiwan 5G Collaboration
 - ICT-43-2020: EU-Brazil 5G collaboration



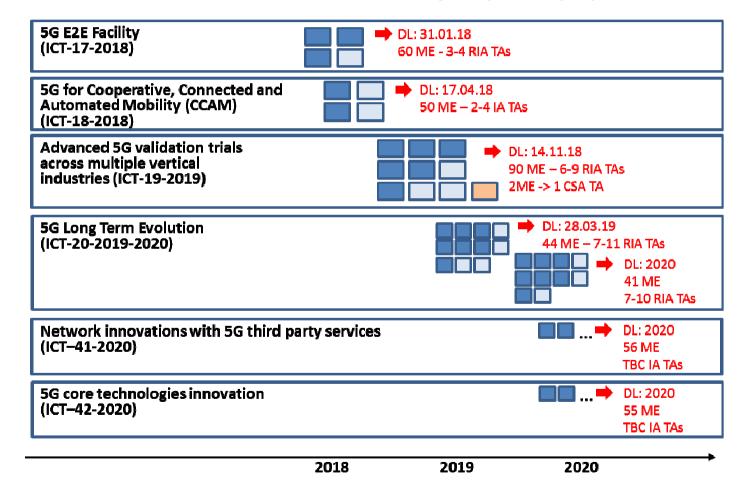
5G PPPEuropean path towards global next generation communication network

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H2020 5G Infrastructure PPP Phase 3(.I) PSM Scope & Coverage (2/3)

EC H2020 5G Infrastructure PPP Phase 3 – Strategic Objectives (1/2)





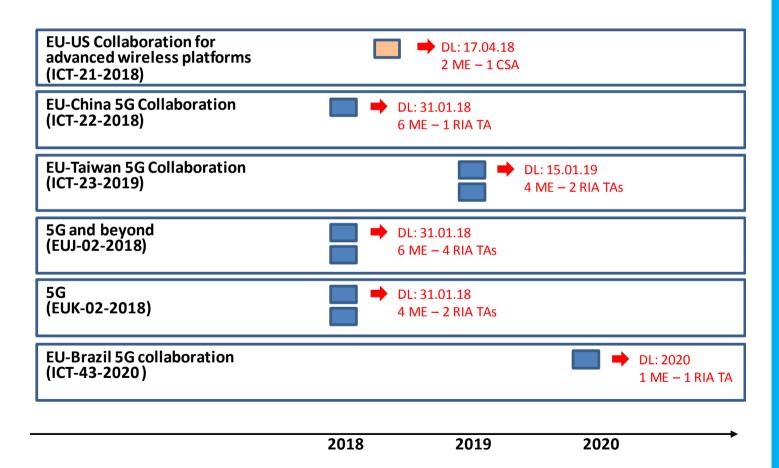
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EC H2020 5G Infrastructure PPP Phase 3 – Strategic Objectives (2/2)



H2020 5G Infrastructure PPP Phase 3(.I) PSM Characteristics

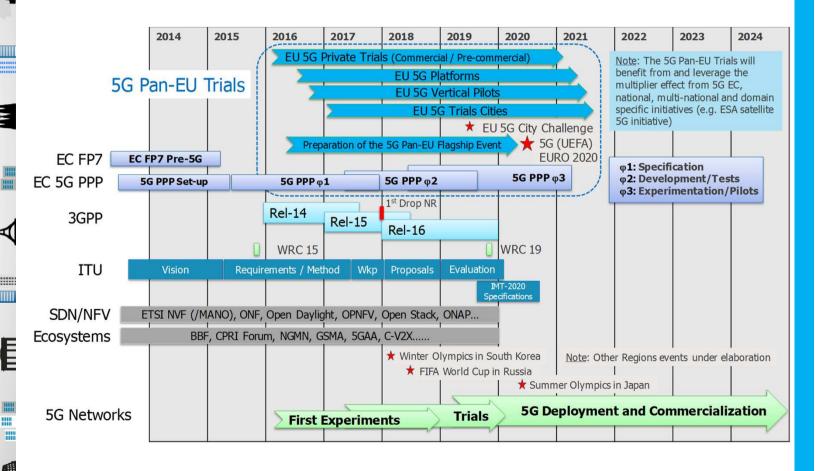


- Phase 3(.I) PSM Characteristics
 - Model providing recommendations by Strategic Objectives
 - Different approach from Phase 1 and Phase 2 Models that were proposing specific individual Targeted Actions (TAs)
 - Considering the specificities of Phase 3(.I) and the focused definition of the related EC WP2018-20 Strategic Objectives
 - Targeting system recommendations to develop future efficient cross-projects cooperation
 - Phase 3(.I) to globally support the 5G Pan-EU Trials Roadmap and related actions (slide 7), beyond 5G private (commercial / pre-commercial) trials and maximizing impact and complementarity with 5G private, national, multinational and domain specific initiatives (incl. e.g. ESA satellite initiative for 5G)
 - Considering the Trials and Pilots specificities
 - Trials: Activities that aim to verify the functionality of a system or parts of it.
 The correct functionality is the primary interest
 - Pilots: Execution of trials including business relationship assumptions, exemplifying a contemplated added value for the end-user of a product. "Vertical pilots" validate the value of 5G technology to industry and the society at large. They target more than technology validation and include business aspects enabling the creation of a new 5G based ecosystem of services



H2020 5G Infrastructure PPP Phase 3(.I) and 5G Pan-EU Trials Roadmap

5G Pan-EU Trials Roadmap





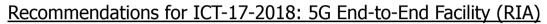




- Phase 3(.I) PSM Planning
 - Model version 1.0 released on 13.10.17
 - Model version 2.0 released on 07.11.17
 - PPP Info Days and Awareness events incl. specific discussions on the Model
 - 17.10.17 in Ljubljana
 - 09-10.11.17 in Budapest
 - Additional awareness events under definition
 - Phase 3(.I) Brokerage Platform under further discussions
 - New Pre-Proposal Check service available as an online tool on the Idealist2018 (Ideal-IST - ICT National Contact Point Network) website (http://www.ideal-ist.eu/pre-proposal-check-tool)







Overall recommendations

- 4 projects shall be targeted in the portfolio
- End-to-End facilities should be representative of the unique 5G network and service capabilities defined in the 5G-PPP vision. Beyond diverse 5G technologies, architectural (i.e slicing) and business-related (including openness to non-ICT ecosystem) issues should be demonstrated
- End-to-End facilities objectives is twofold, on the one hand demonstrate the 5G KPIs and on the other hand serve as enabler of trials / pilots (e.g. ICT-19-2019)
- Integration and validation should be considered at system level. To this aim, availability of open interfaces between the stakeholders should be ensured
- Governance, operations (including support) and access should enable interworking both from vertical point of view 5G-infrastructure users and stakeholders
- Emphasis should be put on the likely impact on standardization in particular addressing gaps with respect to the 5G-PPP vision





H2020 5G Infrastructure PPP Phase 3(.I) PSM – ICT-17-2018 (2/4)

Recommendations for ICT-17-2018: 5G End-to-End Facility (RIA)

Specific recommendations related to programmatic and governance issues

- Complementarity of the platforms should allow overall coverage of the 5G cPPP KPIs (at portfolio level). Coordination through 5G-IA WGs beyond (EC) evaluation is recommended
- The coverage of the 5G scope, including outputs inheritance from Phase 1 and Phase 2, as well as leveraging the multiplier effect from domain specific initiatives, should encompass heterogeneous networks. From diverse technology challenges to architecture (slices) as well as services and business dimensions
- Legal discussions should be enlarged beyond projects Collaboration Agreement overcoming potential IPR issues using in a pre-commercial/competitive environment
- Functional and service descriptions exposure should be provided as well as open APIs allowing interworking within and potentially between platform clusters/projects. The overall governance may be taken in charge, as legal aspects described above, by 5G-IA
- Platforms integration and development should be incremental (for instance through iterative cycles) ensuring availability towards trials experimentation. Provision of a clear delivery planning (when and what) is recommended
- Both for deployment and scientific objectives, reproducibility properties of the experiment are recommended. Amount of efforts required for deployment and integration using common and agreed methodology should not be underestimated





Recommendations for ICT-17-2018: 5G End-to-End Facility (RIA)

Specific recommendations related to (vertical) service support

- Emphasis on the provision of 5G End-to-End slices is recommended as a demonstration of diverse vertical needs support
- Despite expected integration of multiple services on top of 5G infrastructure, it may be recommended to consider clustering of platform capabilities towards a given class of services/type of use cases environment such as eMBB, mMTC or URLLC
- Security threats considerations as well as protection (by design), attack detection, remediation are recommended in order to minimize risk and consequences on trials, demonstrations, events...
- Typical size, topology and scalability of the platforms and their subsystems should be consistent with the functions and services to be demonstrated. Completion and content of the platform may vary as per the demonstration objectives avoiding useless over-complexity
- Additional support to specific verticals could leverage from the domain specific initiatives





H2020 5G Infrastructure PPP Phase 3(.I) PSM – ICT-17-2018 (4/4)

Recommendations for ICT-17-2018: 5G End-to-End Facility (RIA)

Specific recommendations related to KPIs

- 1000X in mobile data volume per geographical area as well as 10 to 100X in user data rate: It may be recommended to demonstrate this KPI with a priority for eMBB 5G services (should consider capacity distribution between mobile broadband and other segments)
- 1000X in number of connected devices: It may be recommended to demonstrate in priority this KPI for mMTC 5G services
- 10 times lower energy consumption: This KPI is of importance for any type of 5G services but it should be key when addressing IoT use cases, thus mMTC 5G services
- End-to-End Latency: It should be recommended to typically associate this KPI with demonstration of 5G URLLC services, at least when targeting mission critical services
- Ubiquitous 5G access including in low density area: Without access there is no 5G services, thus it should be combined with any type of services and enable implementation through heterogeneous networks
- Security: In particular for mMTC and URLLC services, security (by design) should be a common and transverse concern for any platform to be used for mission critical applications (e.g. domain specific KPIs such as fast deployment time for Public Safety)
- 1/5 in network management OPEX and service deployments time: As Security,
 Management is a transverse KPI. In 5G network programmability, slices and service provisioning should be common featured delivered through the various platforms
- Additional and appropriate KPIs should be proposed beyond cPPP KPIs, covering both 5G technologies as well as specific platforms KPIs such as deployment, maturity, regulation or any valuable findings, e.g. addressing requirements from verticals





H2020 5G Infrastructure PPP Phase 3(.I) PSM – ICT-18-2018 (1/2)

Recommendations for ICT-18-2018: 5G for Cooperative, Connected and Automated Mobility (CCAM) (IA)

- Up to 4 projects shall be targeted in the portfolio, addressing different trans-national cross-borders corridors
- Projects shall address "Cooperative, Connected and Automated Mobility (CCAM)"
 V2X use-cases. Other transportation pilots/trials should be addressed in the context of ICT-19-2019
- Relevant application areas for connected cars include safety applications, traffic information and control, automated driving, infotainment, each project should address multiple of these application areas
- Validation shall include the core technological innovation expected from 5G, such as (but not limited to) New Radio, new frequency bands, C-RAN, Mobile Edge Computing, network virtualisation, new network architecture, cross-domain data flows
- The results of the pilots should be used to define options for deployment, taking into account the evolution from earlier cellular technology (e.g. LTE-V2X), and possible co-existence with other technologies (e.g IEEE 802.11p)
- One of the targets in standardization could be the contribution to the definition on how LTE V2X evolution currently developed under the 3GPP 4G Track may eventually converge with the 3GPP 5G Track





H2020 5G Infrastructure PPP Phase 3(.I) PSM – ICT-18-2018 (2/2)

Recommendations for ICT-18-2018: 5G for Cooperative, Connected and Automated Mobility (CCAM) (IA)

- Project validation through cross border trials along 5G corridors
- Projects shall consider the EC policy on CCAM (https://ec.europa.eu/digital-single-market/en/cooperative-connected-and-automated-mobility-Europe)
 - EC, European Ministers and Industry agreed to work together on digital cross-border corridors and started mapping them
 - On 15.09.17, test sections included Metz-Merzig-Luxembourg, Rotterdam-Antwerp-Eindhoven, Porto-Vigo and Merida-Evora (corridor Lisbon Madrid), the E8 "Aurora Borealis" corridor between Tromsø and Oulu and the "Nordic Way" between Sweden, Finland and Norway (https://ec.europa.eu/digital-single-market/en/news/cooperative-connected-and-automated-mobility-stepping-efforts-Frankfurt)
 - Further test sections might be added in the coming months to the set of test sections agreed among MS (e.g. Munich-Brenner-Bologna)



H2020 5G Infrastructure PPP Phase 3(.I) PSM – ICT-19-2019 (1/7)

Recommendations for ICT-19-2019: Advanced 5G validation trials across multiple vertical industries (RIA)

- 6-9 projects shall be targeted in the portfolio
- Vertical trials/pilots shall gather related verticals (grouped in clusters) such that business models for cross vertical services can be explored
- 5 clusters have been identified (smart city, consumer and professional services, industry, digital health and public safety) but further clusters can be added, equally cross cluster trials/pilots may be valuable
- The 5 clusters as well as the potential applications as outlined on slides 16–21 are illustrative only, their purpose is to illustrate possible interactions between verticals as well as across clusters
- Clusters and cross-clusters interactions should explore opportunities along the whole value chain (e.g. B2B2C, B2C) and should possibly and where reasonable address multiple functional requirements and KPIs
- It is assumed that performing the vertical trials/pilots and the experience gained by this activity could be used to define options for deployment, e.g. regarding the coexistence of technologies







- Smart City
 - Public administration
 - Tourism
 - Assisted living
 - People mobility
 - Residential energy management and provisioning
- Consumer and Professional Services (overlap with Smart City)
 - Media & Entertainment (B2C, B2B2C)
 - Personal communications
 - Emergency communications
 - Smart buildings
 - Smart health
 - On the move services

- Industry
 - Factory and process automation
 - Energy
 - Logistics/Transport
 - Farming technology
- Digital Health (eHealth)
 - Smart pharmaceuticals
 - Smart pharmaceuticals augmented with supply chain and cost clearing
 - Medical emergency management
- Public Safety & Digital Divide Resorption
 - Rapid disaster response
 - Public event management
 - Critical asset protection
 - Remote area coverage





Smart City Cluster

- Targeting the following sample, scenarios & areas
 - Public administration
 - Consumers, city administration, local enterprises...
 - Tourism
 - Visitors, tour and transport operators, tourist agencies, local enterprises, restaurants, multimodal people mobility
 - Assisted living
 - Elderly citizens, care providers, doctors, ambulances, local transport, retail...
 - People mobility
 - Multimodal mobility, crowd management , route planning, real-time on-trip assistance
 - Residential energy management and provisioning
 - Energy providers, distributors, facility operators, residents...
- Specific functional communication requirements/KPIs that need to be supported by the 5G platform(s) utilized are
 - mMTC, reliability, privacy, dedicated networks/slices and edge computing, localization, georeferenced databases







Consumer and Professional Services Cluster

- Targeting the following sample, scenarios & areas
 - Media & Entertainment
 - Consumers, content providers, content aggregators and distributors, gaming, rail/maritime/aviation operators
 - Personal communications
 - Consumers, operators, rail/maritime/aviation operators
 - Emergency communications
 - Consumers, blue force institutions, government, regulators
 - Smart buildings
 - Consumers, building societies
 - Smart health
 - Consumers, hospitals, medical insurances, physicians, pharmacy
 - On the move services
 - Consumers, rail/maritime/aviation operators
- Specific functional communication requirements/KPIs that need to be supported by the 5G platform(s) utilized are
 - eMBB, ubiquitous access (coverage), reliability, security, privacy

H2020 5G Infrastructure PPP Phase 3(.I) PSM – ICT-19-2019 (5/7)



Recommendations for ICT-19-2019: Advanced 5G validation trials across multiple vertical industries (RIA)

Industry Cluster

- Targeting the following sample, scenarios & areas
 - Factory and process automation
 - Process optimization inside the factory, in-factory identification and tracing of goods and resources, intra/inter-enterprise collaboration...
 - Energy
 - Self-healing grids with fast fault location, section isolation and power restoration, integration of Distributed Energy Resources (DERs), power grid monitoring and control, optimization of voltage profiles and power flows, forecasting of power generation and consumption...
 - Logistics/Transport
 - Efficient multi-modal mobility of people and goods, mobility as-a-service, digitalization of transport and logistics, control of transport safety, crowd management, railway and train control...
 - Farming technologies Farming 4.0, Vertical Farming
 - Verticals: Farming, farming machine manufacturers, sensor manufacturers, smart cities, energy, lighting manufacturers
 - Stakeholders: Farmers, telecom operators, location information providers
- Specific functional communication requirements/KPIs that need to be supported by the 5G platform(s) utilized are
 - mMTC, URLLC, eMBB
 - Coverage, data rates, reliability, resilience, security, privacy, localization, georeferenced databases





Digital Health Cluster

- Targeting the following sample, scenarios & areas
 - Smart pharmaceuticals
 - Verticals: e-Health, production of medication (manufacturing)
 - Stakeholders: Patient / family and friends, physician / hospital, pharmaceutical company, policy and regulation
 - Smart pharmaceuticals augmented with supply chain and cost clearing
 - Verticals: (in addition to above) Value added services / call centre, logistics, financial
 - Stakeholders: (in addition to above) Health insurance, logistics company, FinTech
 - Medical emergency management
 - Verticals: e-Health, emergency services (including services for mass casualities), hospital administration, telemedicine, traffic control / mobility, financial
 - Stakeholders: Patient, hospital, hospital administration, manufacturing company, health insurance, traffic control system, policy and regulation, FinTech
- Specific functional communication requirements/KPIs that need to be supported by the 5G platform(s) utilized are
 - mMTC, eMBB
 - Reliability, coverage, battery life, connectivity at high speeds & altitudes, dedicated network slices and edge computing (eGenomics)





Public Safety & Digital Divide Resorption Cluster

- Targeting the following sample, scenarios & areas
 - Rapid disaster response: Secure & continuous network deployed quickly in case of natural or man-made disaster, regardless of the state of the existing network infrastructure.
 Stakeholders: Blue light organizations, member states, public institutions, medical organizations (eHealth), insurance companies, network operators
 - Public event management: Targeted network capacity increase combined with user right allocation, 5G broadband surveillance/video, high speed disaster recovery. Main stakeholders beyond the above-mentioned ones: Event organizers
 - Critical asset protection: 5G broadband surveillance/video, proactive/reactive protection of critical assets. Stakeholders beyond the above-mentioned: Utilities, corporate
 - Remote area coverage: Permanent high quality coverage of areas insufficiently covered by existing networks. Goal: Bridge the digital divide to support the economy, education and public services in rural areas across Europe. Counteract any digital divide increase due to the 5G deployment. Stakeholders beyond the above-mentioned: Regional/local authorities
- Specific functional communication requirements/KPIs that need to be supported by the 5G platform(s) utilized are
 - mMTC, URLLC, eMBB
 - Coverage, data rates, reliability, resilience, security, privacy, localization. Minimum reliability 4 "9". Seamless secured connectivity required. Rapid deployment (15 minutes) anywhere, at any time. Interoperability and integration of existing and new radio access technologies in the 5G environment.



H2020 5G Infrastructure PPP Phase 3(.I) PSM – ICT-21-2018



Recommendations for ICT-21-2018: EU-US Collaboration for advanced wireless platforms (CSA)

- Number of projects
 - A single project could cover all the scope described in the EC WP2018-20
- Scope of the CSA
 - To establish EU US collaboration on advanced wireless research beyond 5G
 - Main focus should be to develop common work, research roadmaps, workshops, scientific exchanges, tools for experimentation, cross atlantic trials
 - Proposals to foresee EU 5G and beyond 5G projects entities twinning, in particular with NSF PAWR projects on US side
 - Expected impact: Reinforced cooperation with the US in Wireless research towards beyond 5G connectivity systems and services



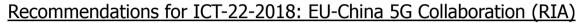


Recommendations for ICT-22-2018 / EUJ-02 / EUK-02

- Overall recommendations
 - Main objective should be to demonstrate system interoperability
 - Integration and validation should be considered at system level facilitated by open interfaces between the stakeholders
 - Security threats considerations as well as protection (by design), attack detection, remediation are recommended in order to minimize risk and consequences on trials, demonstrations, events...
- Programmatic and governance-related recommendations
 - Coordination through 5G-IA will be recommended
 - The overall governance may be taken in charge by the 5G-IA association together with the international counterpart organization
 - Both for deployment and scientific objectives, reproducibility properties of the experiment are recommended. Amount of efforts required for deployment and integration using common and agreed methodology should not be underestimated







- Number of projects
 - A single project should cover all the scope described in the EC WP2018-20
- Technical approach of the RIA
 - External interworking at service level
- Project involvement from the EU side
 - Trial efforts should capitalize on outcomes obtained in 5G PPP Phase 2 projects (funded under ICT-07-2017 and ICT-08-2017)
 - Synergies should be stablished with projects under ICT-17-2018, preferably those clustered around eMBB and URLLC services
- Project involvement from the Chinese side
 - Twinning with the National Science and Technology Major Project (NSTMP)
 "mirror project" launched by China in 2018 is required
- Other recommendations
 - Emphasis should be put on the likely impact on standardization in particular addressing gaps with respect to the 5G-PPP vision
 - Involvement of SME





Recommendations for EUJ-02-2018: 5G and beyond (RIA)

- Number of projects
 - There should be two projects, each one targeting one of the following scope
 - 1. Large-scale demonstrations and trials towards 5G applications
 - 2. Joint research on enabling technologies for beyond 5G
- The following recommendations apply to Scope 1, which is the one aligned with demonstration and trial activities. Scope 2 is focused on technologies beyond 5G
- Technical approach of the RIA
 - External interworking at service level
- Project involvement from the EU side
 - Trial efforts should capitalize on outcomes obtained in EUJ-01-2016 projects
 - Synergies should be stablished with projects under ICT-17-2018, preferably those clustered around eMBB services
- Other recommendations
 - Emphasis should be put on the likely impact on standardization in particular addressing gaps with respect to the 5G-PPP vision
 - Involvement of SME







Recommendations for EUK-02-2018: 5G (RIA)

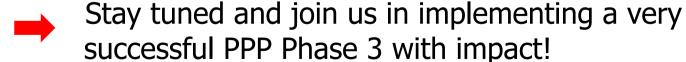
- Number of projects
 - There should be two projects, each one targeting one of the following scopes
 - mmWave and super broadband services
 - Interoperability and integration of 5G vertical testbeds on heterogeneous environments
- Technical approach of the RIA
 - Scope (a): External interworking at service level, KPI benchmarking
 - Scope (b): Internal interworking vertical use cases should focus on those outlined in the 5G PPP whitepaper "5G empowering vertical industries" (Automotive, smart factories, energy, media, smart healthcare) and PPDR
- Project involvement from the EU side
 - Trial efforts should capitalize on outcomes obtained in EUK-01-2016 projects
 - Synergies should be stablished with projects under ICT-17-2018, (preferably those clustered around eMBB services for Scope (a))
- Other recommendations
 - Impact on standardization and spectrum harmonization should be maximized
 - **Involvement of SME**







- PPP Info Days and Awareness events incl. specific discussions on the Model
- Model to be widely accepted by the Community and to be recommended by Association and EC as « reference » platform and guidelines for the further development of Proposals
- Model to be provided as input to the Evaluation
- Phase 3(.I) Brokerage Platform under current discussion
- Solid FAQ webpage to be developed and up-dated until the Calls deadline so that all Community members have access to the latest information
- New Pre-Proposal Check service available as an online tool on the Idealist2018 (Ideal-IST - ICT National Contact Point Network) website (http://www.ideal-ist.eu/pre-proposal-check-tool)





http://5g-ppp.eu



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