IP1: Cost-efficient and reliable trains, including high-capacity trains and high-speed trains

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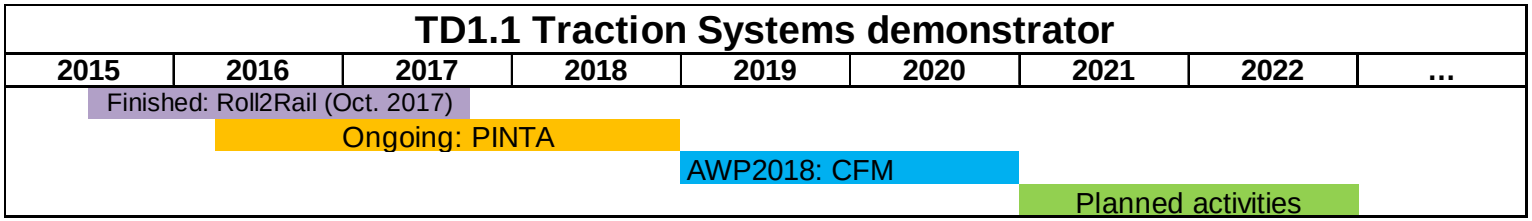
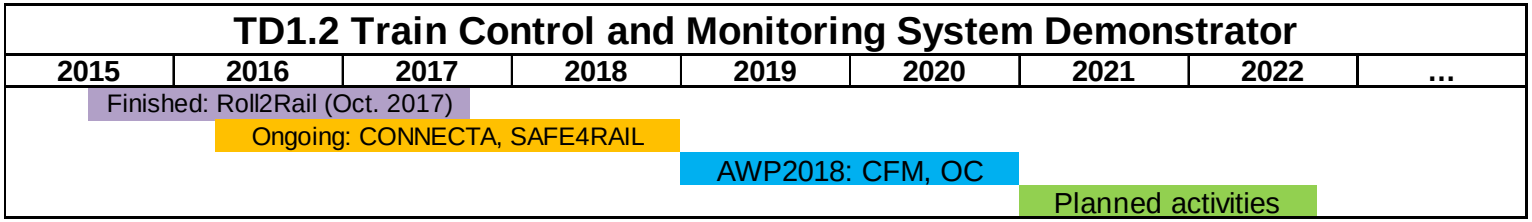
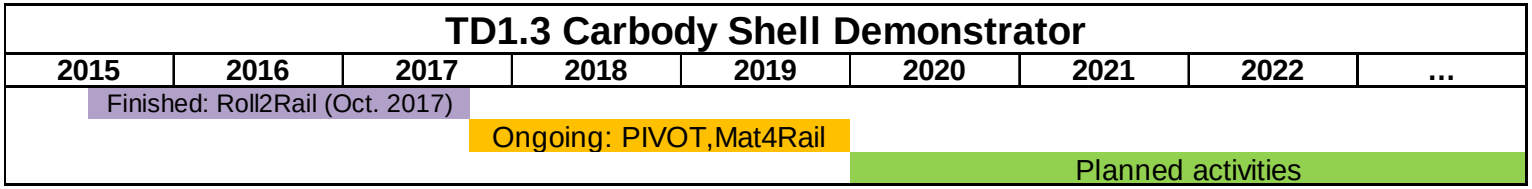
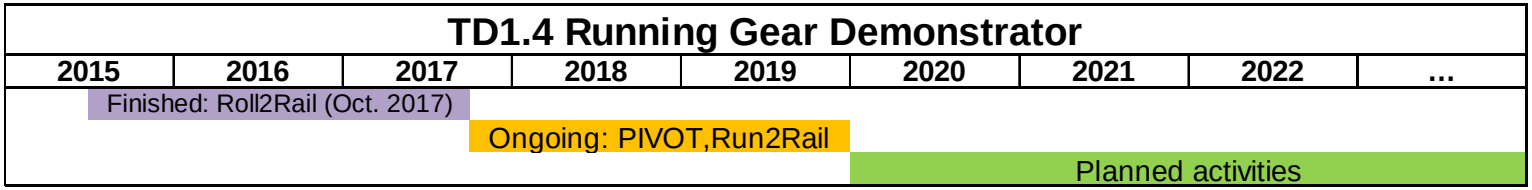
IP1: Planning of activities per TD









IP1: Planning of activities per TD

TD1.5 Brake Systems Demonstrator								
2015	2016	2017	2018	2019	2020	2021	2022	...
Finished: Roll2Rail (Oct. 2017)								
	Ongoing: CONNECTA, PINTA, SAFE4RAIL, PIVOT							
					Planned activities			

TD1.6: Doors and Access Systems Demonstrator								
2015	2016	2017	2018	2019	2020	2021	2022	...
			Ongoing: PIVOT,Run2Rail					
					Planned activities			

TD1.7: Train Modularity In Use (TMIU)								
2015	2016	2017	2018	2019	2020	2021	2022	...
Finished: Roll2Rail (Oct. 2017)								
			Ongoing: PIVOT,Mat4Rail					
					Planned activities			

IP1: Open Calls 2018

Topic number - IP	Topic name	Expected TRL	Type of action	Maximum S2R Co-funding EUR	Complementarity
S2R-OC-IP1-01-2018	**Technical solutions for the next generation of TCMS**	4/5	RIA	4,000,000	S2R-CFM-**IP1**-02-2018: Implementing new technologies for the TCMS S2R-CFM-**IP2**-01-2018: Advanced Signalling, Automation and Communication System S2R-CFM-**CCA**-01-2018: Virtual certification & Smart Planning

IP1: Open Calls 2018

The work expected concerning research on the next generation TCMS should address ALL the activities below (details provided in the call text):

- research activities, reaching TRL 3-4, should be carried out for the **wireless TCMS**, based on **LTE communication technologies** based on the predecessor activities in projects ROLL2RAIL, CONNECTA, SAFE4RAIL and X2RAIL-1 (link to the public deliverables in the call text)
- participate in the set-up of **two laboratory demonstrators** and address R&I activities (TRL4/5)
- carry out **applicability studies** (TRL 2) for supporting the Virtual Coupling concept (link to TD 2.8)
- organise two meetings of a **joint advisory group**, which should include experts from 3GPP and 5G PPP amongst others

IP2: Advanced Traffic Management and Control Systems

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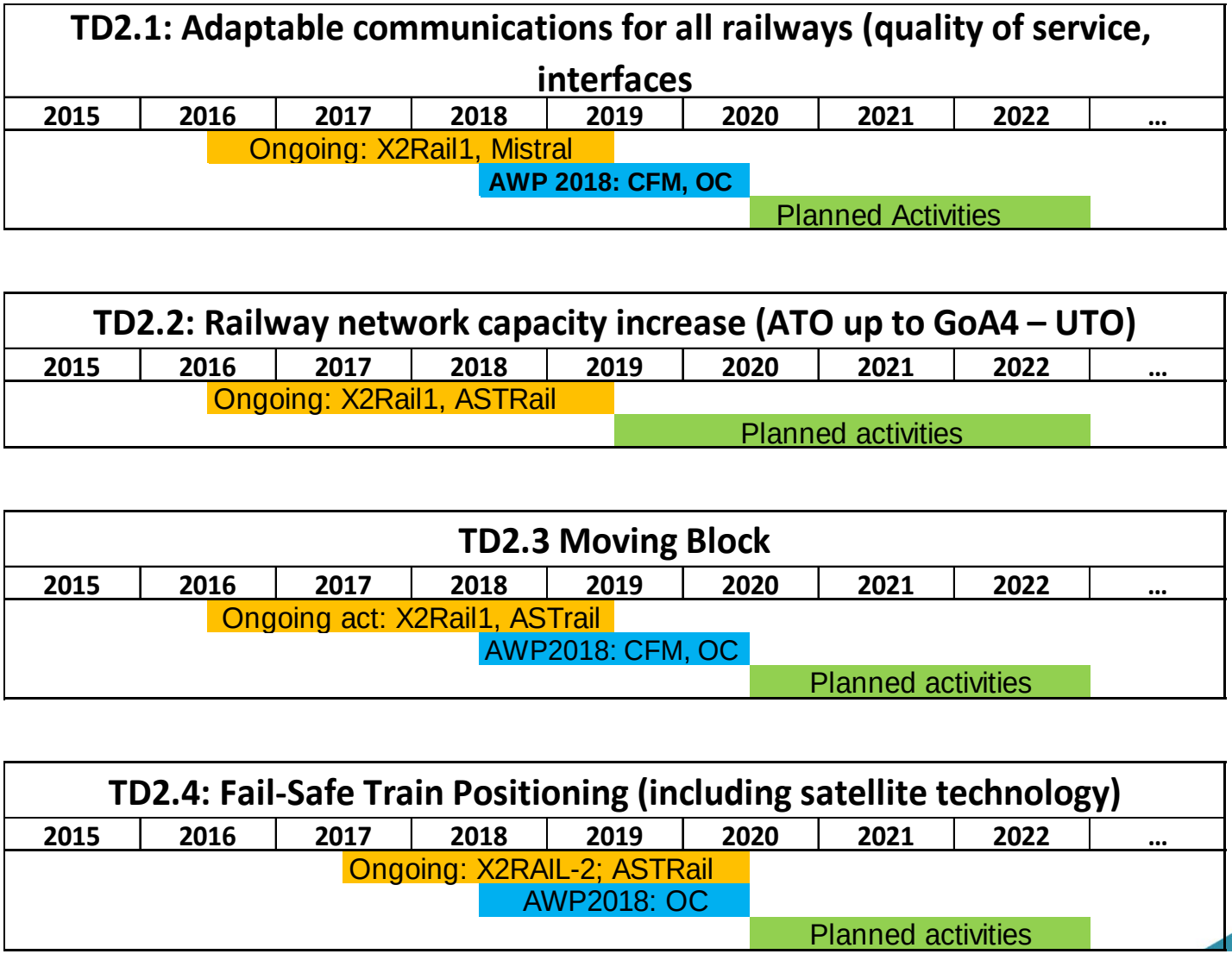
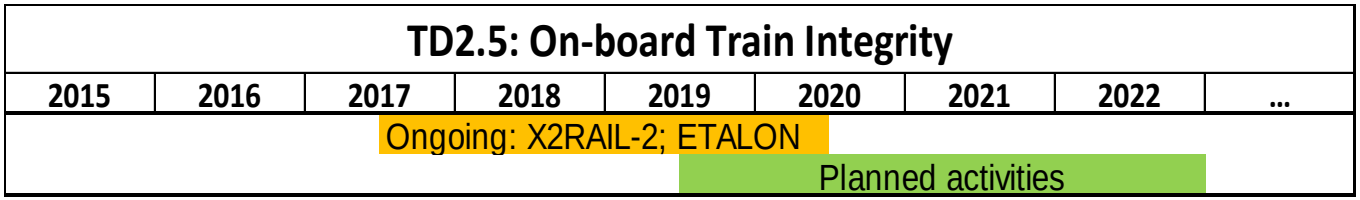
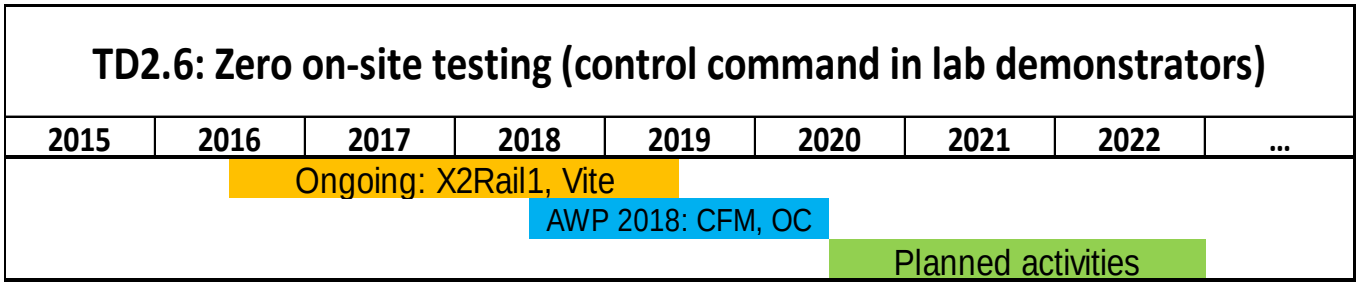
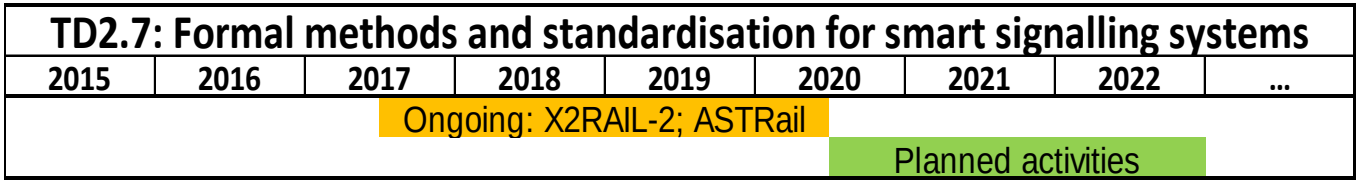
IP2: Planning of activities per TD

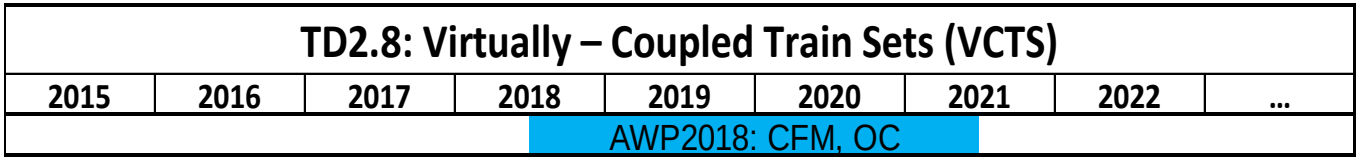


IP2: Planning of activities per TD

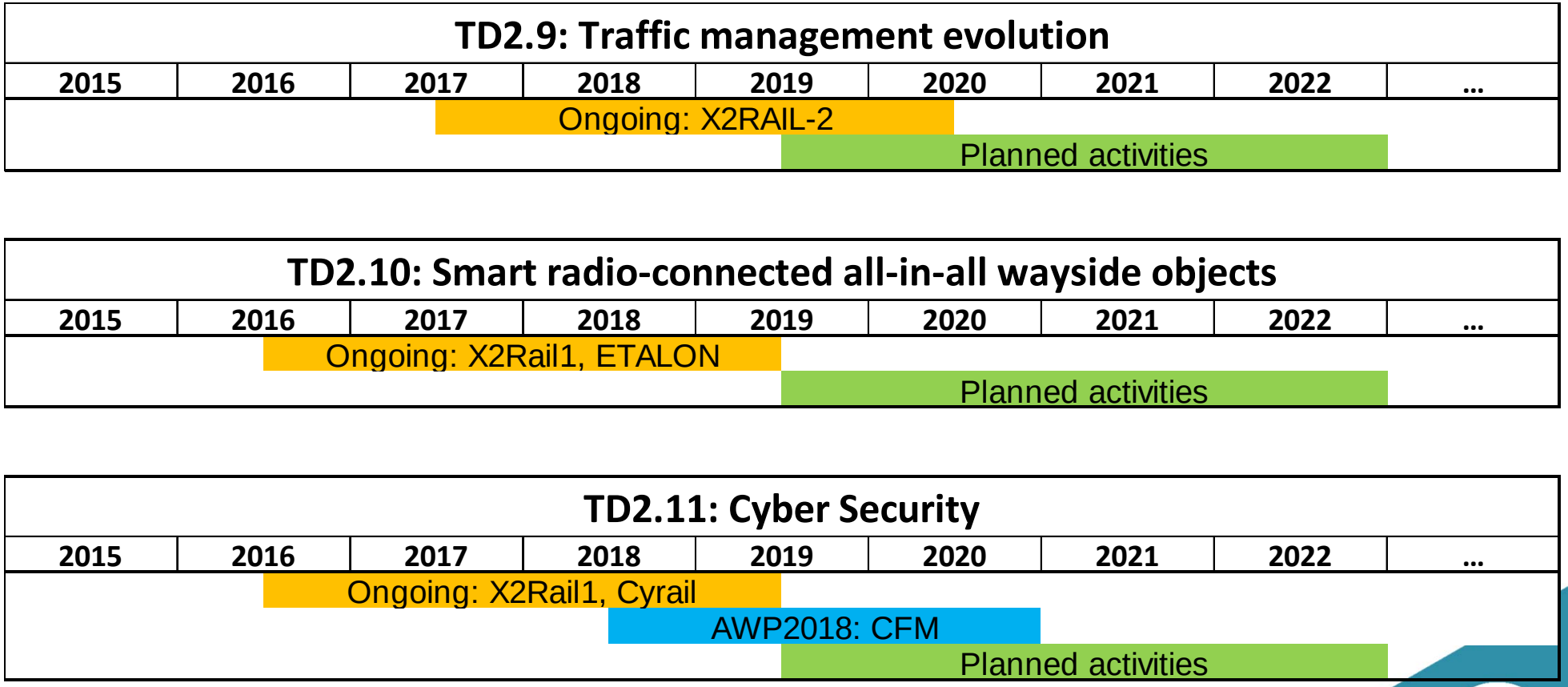








IP2: Planning of activities per TD



IP2: Open Calls 2018

Topic number - IP	Topic name	Expected TRL	Type of action	Maximum S2R co-funding EUR	Complementarity
S2R-OC-IP2-01-2018	**Analysis for Moving Block and implementation of Virtual Coupling concept**	3	RIA	1,300,000	S2R-CFM-**IP2**-01-2018 S2R-CFM-**IP1**-02-2018 S2R-CFM-**IP2**-01-2015 (X2Rail-1)
S2R-OC-IP2-02-2018	**Modern methodologies and verifications for GNSS in Railways and virtual test environment**	3	RIA	1,020,000	S2R-CFM-**IP2**-01-2018 S2R-CFM-**IP2**-01-2017 (X2Rail-2)
S2R-OC-IP2-03-2018	**Communication environment assessment and validation**	5/6	RIA	750,000	S2R-CFM-**IP2**-01-2018

IP2 Open Call: S2R-OC-IP2-01-2018

The work expected in **work stream 1** concerning Moving Block should include (TD 2.3):

- To **identify and assess** the most suitable methodology in order to test and bring into service Moving or Fixed Virtual Block contributing to the definition of the Operational Procedures:
  - Define **approaches to the testing** of Moving Block
  - Provide **feedback on the Moving Block Operational and Engineering Rules**

The work expected in **work stream 2** concerning VCTS should include (TD 2.8):

- To analyse the **potential business and market** response thanks to the application of the Virtual Coupling concept. To **assess the needs and work done for the Train-to-Train (T2T)** (IP1 and IP2) and propose convergence of technical communication solution(s).

  - Produce the Business Case analysis for the application of the Virtually Coupled Train Sets VCTS concept;
  - Investigate the use of new communication structure for allowing the communication between trains within the train convoy;
  - Investigate the application, solutions and dynamics of automated car driving to evaluate the applicability in the railway field.

IP2 Open Call: S2R-OC-IP2-02-2018

The work expected in **work stream 1** concerning Satellite positioning should include (TD2.4):

- Identify and develop a Simulation Environment able to characterize the Railway and the GNSS infrastructures and to evaluate the performance of the GNSS application;
- Setup of a geographically distributed verification infrastructure able to exploit the features of existing complex and expensive laboratories.

The work expected in **work stream 2** concerning zero on-site testing should include (TD2.6):

- Develop a concept for the automated update of test environments due to multiple changes;
- Develop a concept for continuous integration as well as automated test repetition and automated evaluation of these tests, ensuring the concept can be approved by an Independent Safety Assessor.

IP2 Open Call: S2R-OC-IP2-03-2018

The work expected should include (TD2.1):

- **Analysis of communication characteristics** perceivable by the applications and services using the communication bearer (like throughput, packet loss, jitter etc.).
- **Assessment of communication capabilities** of existing radio access networks (including LTE, LTE-A, 5G, GSM-R, WiFi/802.11, SatCom etc.) and how these could be emulated.
- **Investigation of communication scenarios** covering degraded modes, outages, overload scenarios, interferences and other perturbations with occur in the railway environment or can be expected in the future.
- Definition of **elements** which should be variable, configurable and programmable in the **radio access emulation tool**.
- **Design and implementation of the radio access emulation tool.**
- Support for **integration** of the **radio access emulation tool** in the **verification labs**.

IP3: Cost-Efficient and Reliable High-Capacity Infrastructure

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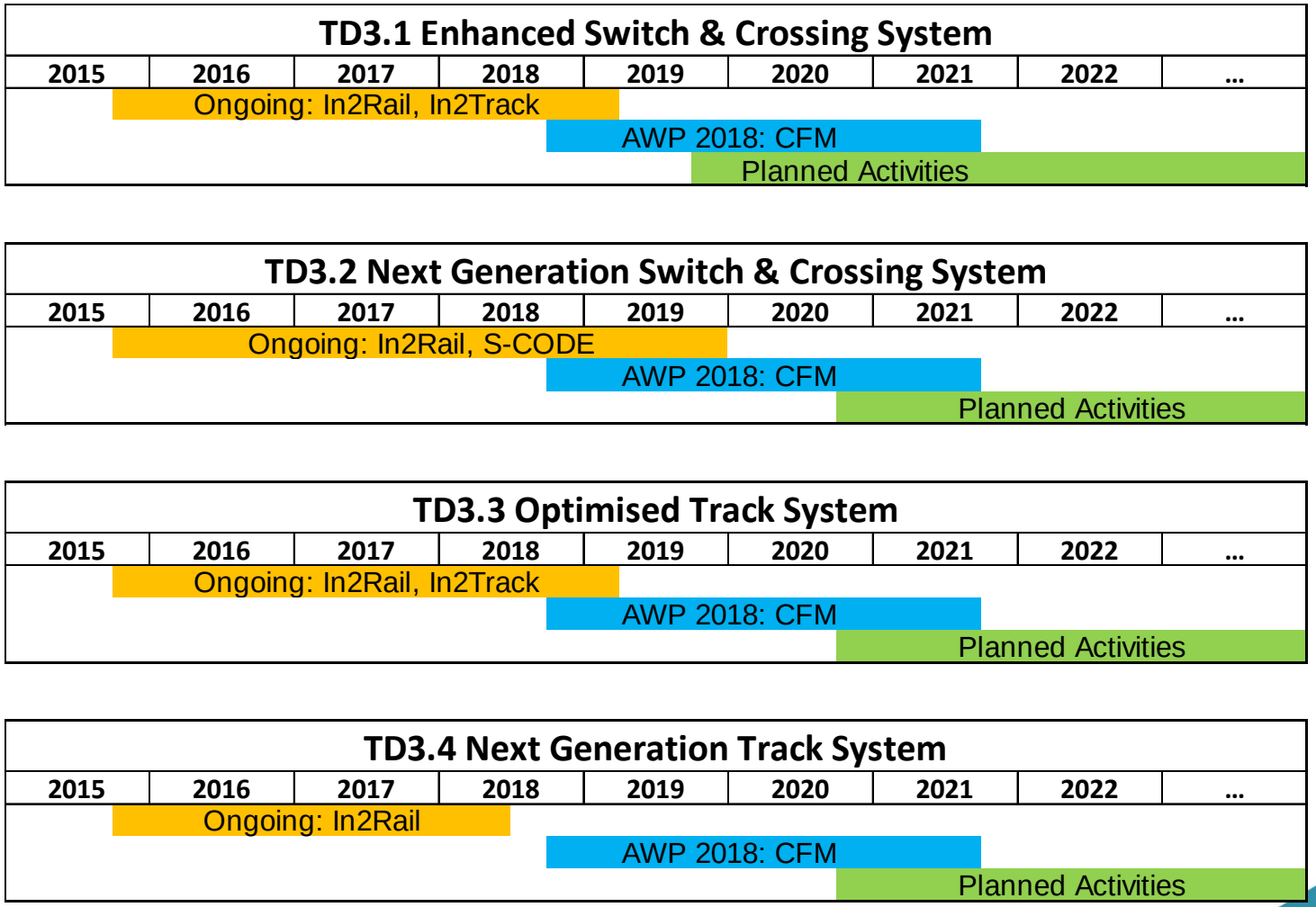
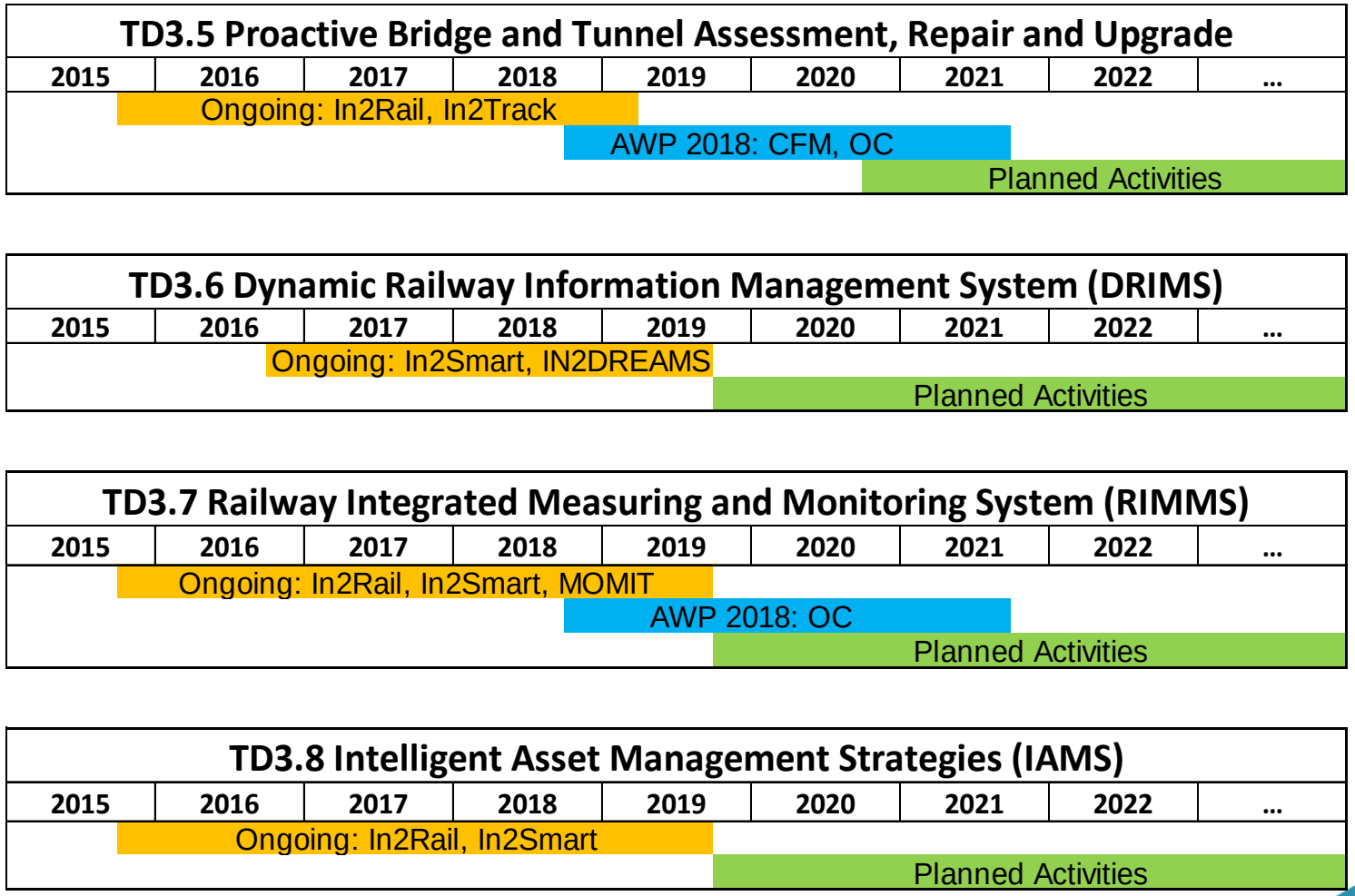
IP3: Planning of activities per TD



IP3: Planning of activities per TD



IP3: Planning of activities per TD

TD3.9 Smart Power Supply								
2015	2016	2017	2018	2019	2020	2021	2022	…
	Ongoing: In2Rail, In2Stempo							
					Planned Activities			

TD3.10 Smart Metering for Railway Distributed Energy Resource Management System								
2015	2016	2017	2018	2019	2020	2021	2022	…
	Ongoing: In2Rail, In2Stempo, In2Dreams							

TD3.11 Future Stations								
2015	2016	2017	2018	2019	2020	2021	2022	…
			Ongoing: In2Stempo, FAIR Stations					

IP3: Open Calls 2018

Topic number - IP	Topic name	Expected TRL	Type of action	Maximum S2R Co-funding EUR	Complementarity
S2R-OC-IP3-01-2018	**Measuring and monitoring devices for railway assets**	TRL 5-6	IA	4,700,000	S2R-CFM-**IP3**-01-2016 (In2Track) S2R-CFM-**IP3**-02-2016 (In2Smart) S2R-CFM-**IP3**-01-2018

The main challenge is to identify specific **monitoring** and **upgrading** solutions addressed to bridges and tunnels (**TD 3.5**) and to develop monitoring solutions for trains and **track geometry** monitoring as well as **data collection** from fail-safe systems (**TD3.7**)

IP3: Open Calls 2018

The work expected in **work stream 1** concerning research on monitoring of bridges and tunnels including upgrading solutions should include:

- Railway tunnel examination technologies for subsurface defect detection
- Non-traffic disturbing methods for cleaning long tunnel drainage pipes. This is specifically to remove precipitate calcium products;
- Development of contactless measurement technology to detect and monitor noise emissions from train passage over bridges as well as the development of noise dampers for significant noise reduction;
- Bridge and tunnel information modelling systems able to import digital data in various formats (such as numerical data, 3-d models and photos) as well as capable of interpreting and filtering data and reporting current asset status compared to previous condition history;
- Algorithms for bridge information model module

IP3: Open Calls 2018

The work expected in **work stream 2** concerning train dynamics simulation should include (details provided in the call text):

- Train monitoring solutions
- Development of a system/sensor to measure the transversal position of the wheel in relation to the rail
- Collection of data from fail-safe systems: Study and development of new diagnostic data collection solutions (HD and SW) designed to achieve seamless safety approval prior to implementation in the field

IP4: IT Solutions for Attractive Railway Services

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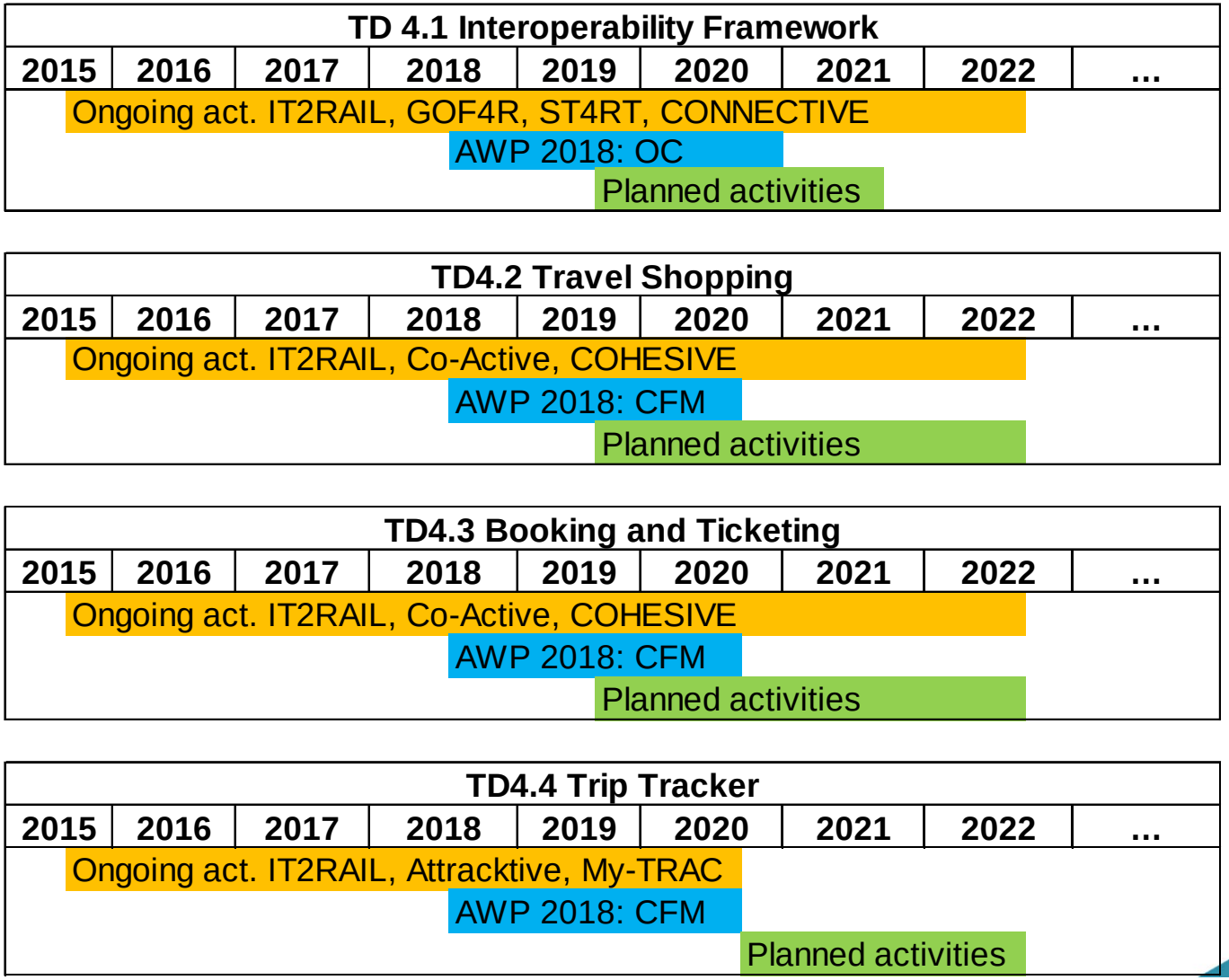
IP4: Planning of activities per TD



IP4: Planning of activities per TD

TD4.5 Travel Companion								
2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**…**
Ongoing act. IT2RAIL, Attracktive, My-TRAC								
			AWP 2018: CFM					
					Planned activities			

TD4.6 Business Analytics								
2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**…**
Ongoing act. IT2RAIL, GOF4R, ST4RT, CONNECTIVE								
					Planned activities			

ITD4.7 Integrated Technical Demonstrator								
2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**…**
Ongoing act. IT2RAIL, COHESIVE								
			AWP 2018: OC					

IP4: Open Calls 2018

Topic number - IP	Topic name	Expected TRL	Type of action	Maximum S2R Co-funding EUR	Complementarity
S2R-OC-IP4-01-2018	**Semantic framework for multimodal transport services**	4	RIA	2,000,000	S2R-CFM-**IP4**-01-2017 (CONNECTIVE)
S2R-OC-IP4-02-2018	**Supporting the implementation of the IP4 multi-modal transport ecosystem**	4	RIA	1,000,000	S2R-CFM-**IP4**-02-2017 (COHESIVE)

IP4 Open Call: S2R-OC-IP4-01-2018

The proposals should address all the following work streams:

1) **Performance**:

- Optimize performance and scalability of the interoperability framework, exploiting new techniques developed over the last few years in semantic architectures and standards.
- The project will explore different options, such as: alternative architecture, new software paradigms (such as application containers, dynamic resizing, in-memory processing), parallel computing mechanisms, etc.

2) **Automation for an easy integration of new services or sub-systems**:

- Propose mechanisms to automate the generation of ontologies (esp. lightweight ontologies), the annotation, the mapping and translation between different systems, etc.

For all these activities, the project should cover the following aspects: state of the art and best practices, realistic target performances and definition of KPIs, but also implementation of proof of concepts (including tests and validation), and finally recommendations.

IP4 Open Call: S2R-OC-IP4-02-2018

The proposals should address all the following work streams:

- Propose relevant scenarios, and support COHESIVE project to transform them in valid use-cases, compatible with the developments made in the others IP4 projects.

- Support the demonstration of these use-cases by the COHESIVE project, with non-technical contributions, for instance but not restricting to:
  - ✓ Access to data to execute the use-cases
  - ✓ Alert on implementation constraints and business logics
  - ✓ Give access to the interfaces of the legacy systems, with associated support, allowing their mapping in the IP4 ecosystem.
  - ✓ For real life pilot testing, provide a realistic and adequate environment to integrate and run the demonstration done by COHESIVE project

IP5: Technologies for Sustainable & Attractive European Rail Freight

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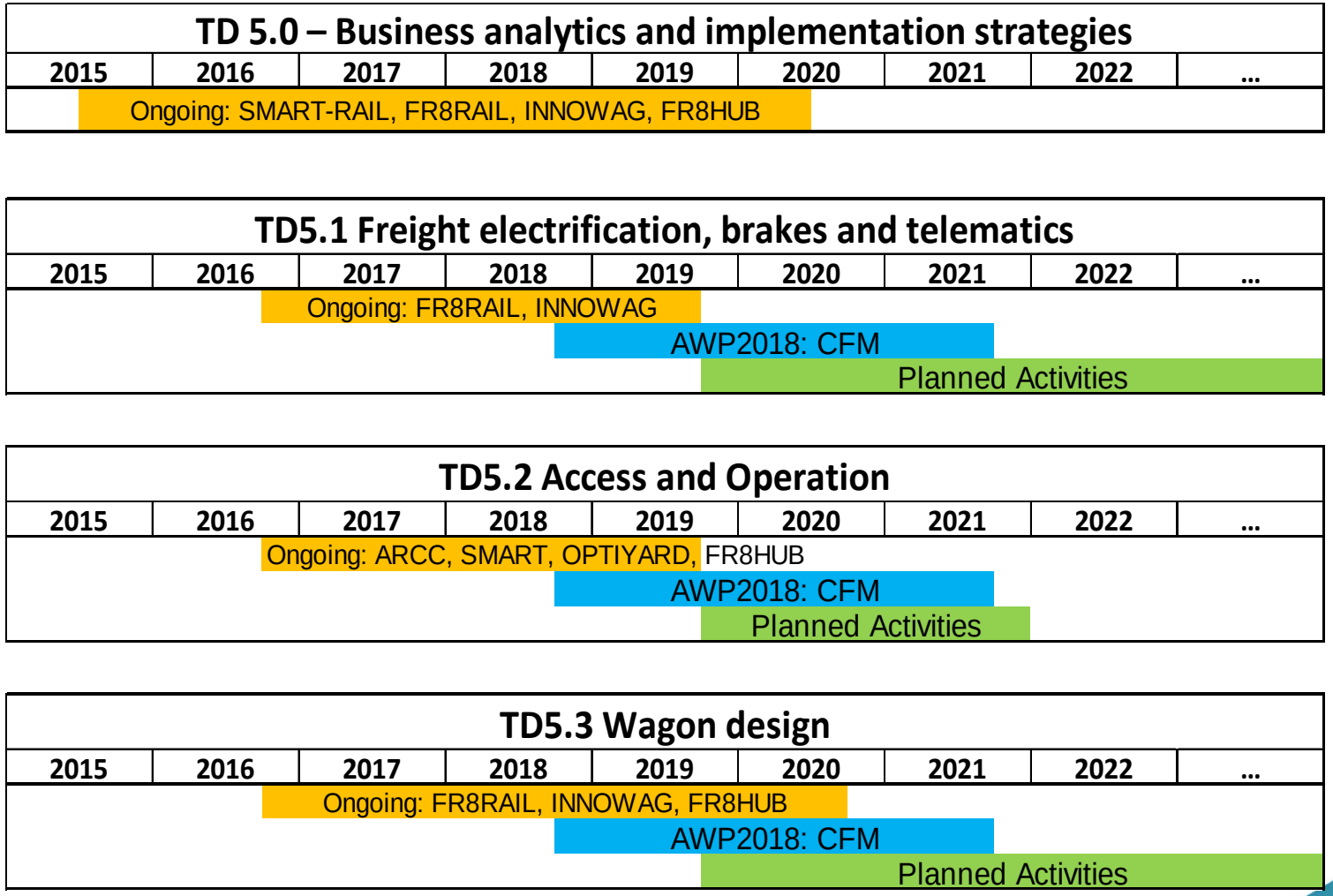
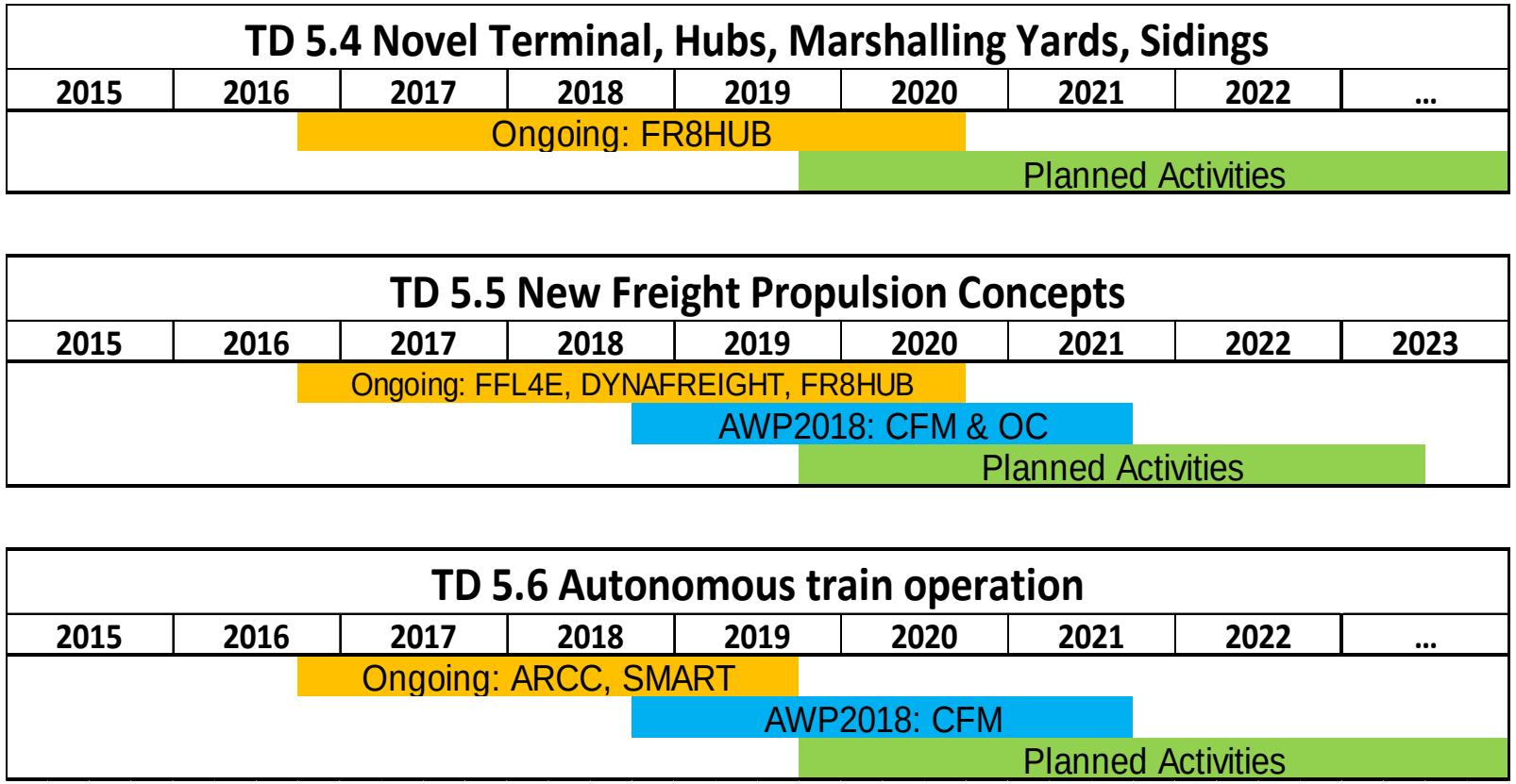
IP5: Planning of activities per TD



IP5: Planning of activities per TD



IP5: Open Calls 2018

Topic number - IP	Topic name	Expected TRL	Type of action	Maximum S2R Co-funding EUR	Complementarity
S2R-OC-IP5-01-2018	**Radio communication and simulation of train dynamics for Distributed Power within long trains**	5	RIA	600,000	S2R-CFM-**IP5**-03-2015 (FFL4E) S2R-CFM-**IP5**-01-2018

IP5 Open Call: S2R-OC-IP5-01-2018

Long trains up to 1,500 m with distributed traction units enable operators and infrastructure managers to **increase competitiveness and capacity** of railway system rapidly.

Distributed Power Systems (DPS) steering multiple traction units within 1,500 m trains need:

1. Efficient and reliable technologies to **transmit** traction and braking **commands between locos**, and

2. Simulation-driven traction and braking regimes which **optimise upcoming in-train-forces** and follow an integrated **safety management**.

IP5 Open Call: S2R-OC-IP5-01-2018

Within the challenges highlighted in the IP5 part of the S2R Master Plan, the following specific challenges should be addressed by the proposal in answer to this topic:

1. The challenge in **Radio communication for long trains** is to develop and implement a GSM-R based radio communication system for Distributed Power systems (DPS) in freight trains and to demonstrate it in trial runs up to 1,500 m train-length.

2. The challenge in **train dynamics simulation** is to identify upcoming and tolerable in-trainforces in different operational scenarios and to integrate this into a safety assessment of the operation of long trains.

The consortium should bring experience in the field of both **hardware and software** for both work streams.

Cross Cutting Activities (CCA) and IPX

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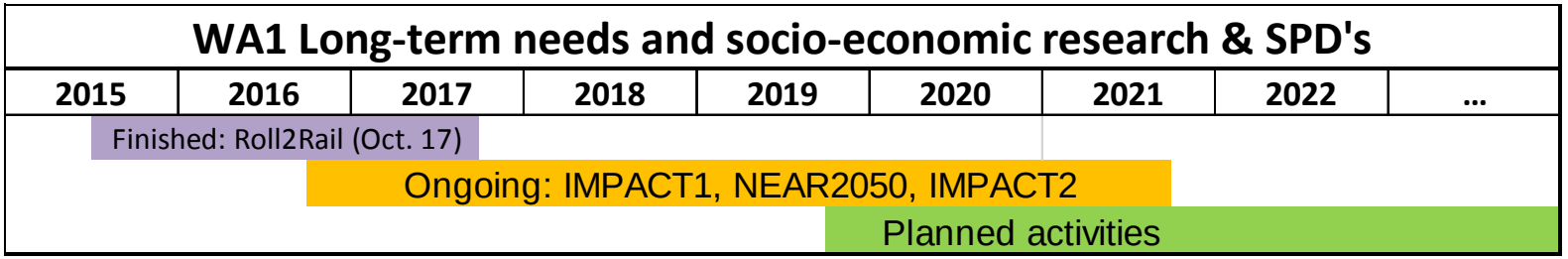
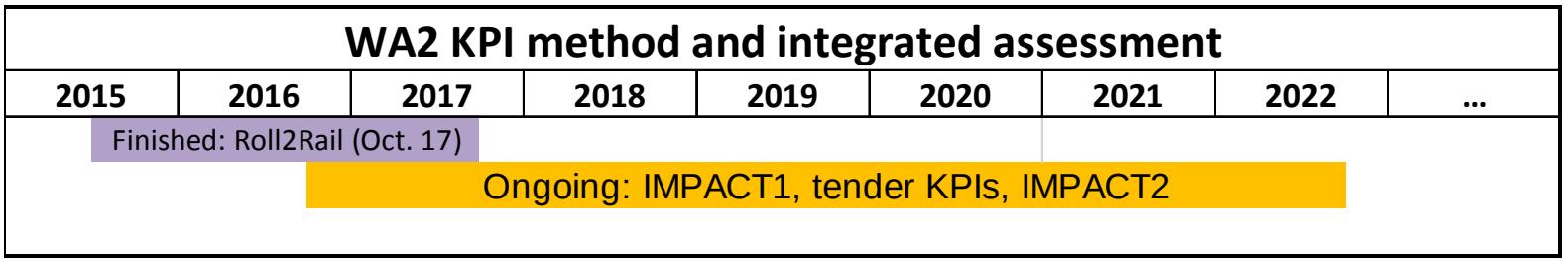
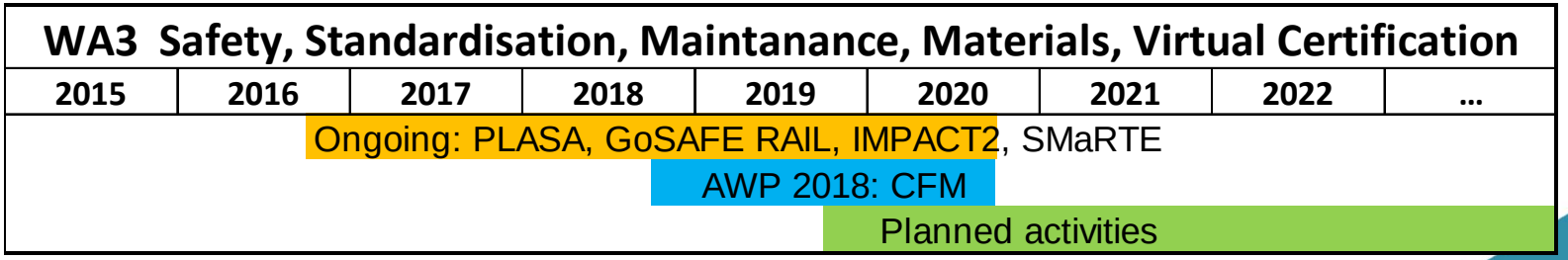
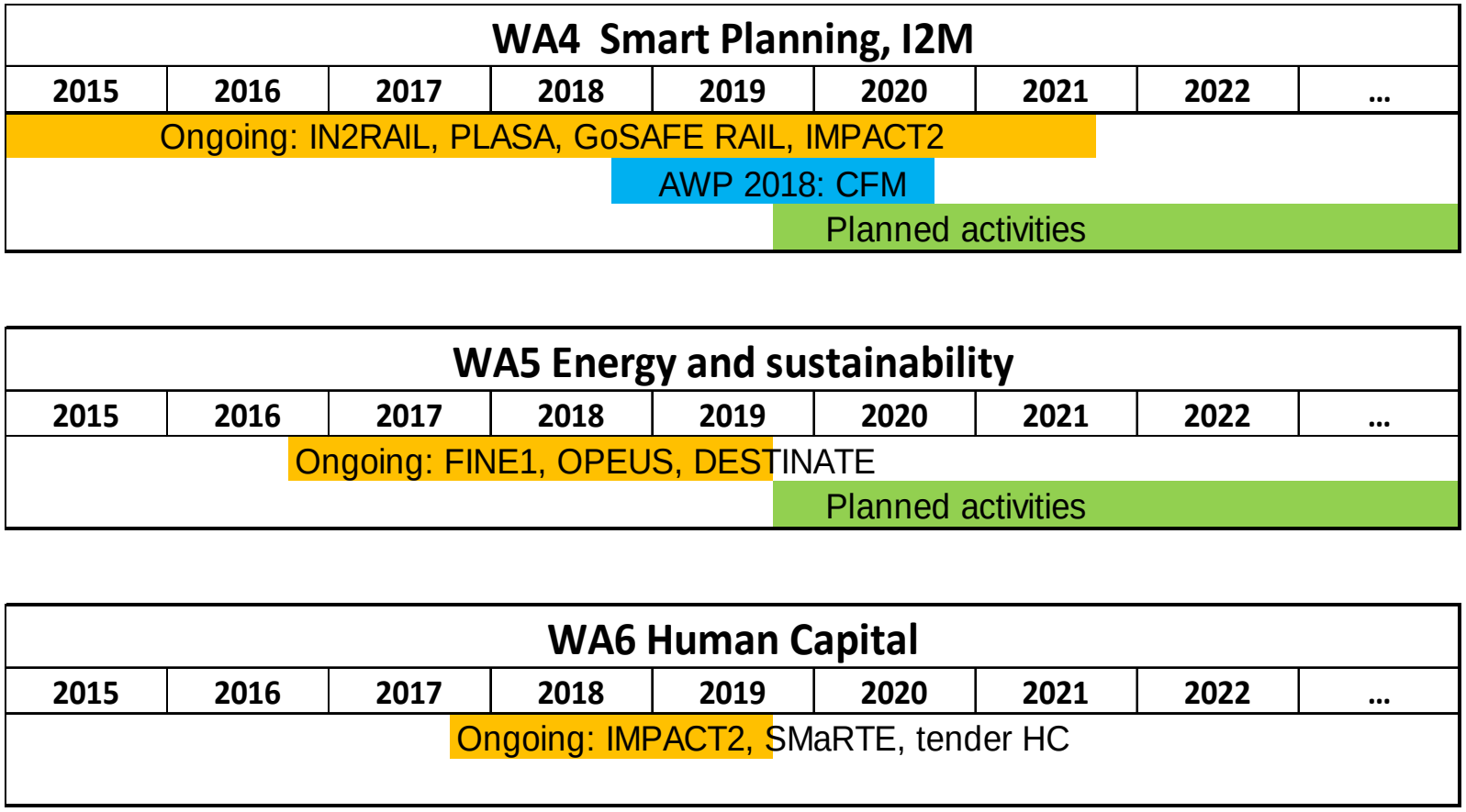
CCA: Planning of activities per TD







CCA: Planning of activities per TD



CCA: Open Calls 2018

Topic number - IP	Topic name	Expected TRL	Type of action	Maximum S2R co-funding EUR	Complementarity
S2R-OC-IPX-01-2018	**Paradigm shifts for railway**	Up to TRL 2	RIA	2,200,000	S2R-CFM-**IP1**-02-2018 S2R-CFM-**IP2**-01-2018 S2R-CFM-**IP3**-01-2018
S2R-OC-IPX-02-2018	**Transversal exploratory research activities and knowledge transfer**	NA	CSA	500,000	
S2R-OC-IPX-03-2018	**Innovative/breakthrough mobility concepts (with rail as backbone)**	NA	CSA	500,000	

CCA Open Call: S2R-OC-IPX-01-2018

- Arising and promising disruptive technologies such as artificial intelligence, robotics will also contribute to shaping the way how future rail automation and maintenance will be organised and the subsequent strategic industrial developments on rolling stock and infrastructure.
- The study (up to TRL 2) should formulate **technological concepts tackling all of the following work-streams** and their interconnection:
    a) Concepts for the future autonomous railway vehicles “train-centric”
    b) Promising disruptive technologies impacting automation systems and maintenance concepts
    c) Railway 4.0
- The aspects above and any more operational principle/industrial concept (up to TRL2) should also be investigated in collaboration with the other relevant projects stemming from the CFM topics calls (in all IPs).
- The S2R JU expect proposals of requesting up to 1.1M and plan to finance **at least up to two projects.**

CCA Open Call: S2R-OC-IPX-02-2018

- This topic aim to strengthening the effectiveness of consensual exploratory research building in Europe, through continuous cooperation among the rail community, including decision-makers, to provide an orientation on the future needs and possible collaborative research on future and emerging innovative ideas.
- The proposals should address the following work-stream and coordination actions:
  - **Delivery of a Rail Sector observatory and roadmap**. The roadmap should contain information on the S2R Capabilities and its Building Blocks (described in the S2R Multi Annual Action Plan) in the long-term period for S2R concepts evolution.
  - Delivery of compiled and analysed data and **statistics on the rail advantages/benefits** in Europe (e.g. GPD influence growth, employments, passenger/freight demographics
  - **Benchmarking activities** and support to the creation and organization of innovative rail initiatives in close cooperation with the S2R JU
- Incorporate and elaborate on the results of the complementary topic S2R-OC-IPX-03-2018: Innovative/breakthrough mobility concepts (with rail as backbone)

CCA Open Call: S2R-OC-IPX-03-2018

- This topic aim to challenge the traditional rail approach with innovative and breakthrough concepts from a non-linear approach to existing technological evolution.

- PhD research for indicatively a period between 12 to 24 months on the following thematic: **Innovative/breakthrough mobility concepts that keep rail as backbone of a sustainable European Transport system**.

- Research results are expected to contribute to future S2R exploratory research and in general to open new possibilities and ideas for the S2R stakeholders and rail research community.

CCA Open Call: S2R-OC-IPX-03-2018

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Thank you for your attention

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