



D1.1 – Technical Principles Description

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Document History

Revision	Status	Date	Author	Description
1	Draft	14/05/2018	THP	Initial version
2	Issue	24/06/2018	THP	Issued version including comments from the partners

Notes:

A status is associated to each step of the document lifecycle:

- Draft: this version is under development by one or several partner(s);
- Under review: this version has been sent for review;
- Issued: this version of the document has been submitted to EC.

A dissemination Level

- PU: Public
- CO: Confidential, restricted under conditions set out in Model Grant Agreement X
- CI: Classified, information as referred to in Commission Decision 2001/844/EC

EXECUTIVE SUMMARY

This document defines the Technical principles (Engineering Process methodology) adapted to the COHESIVE project. It includes the project life cycle definition, its activities, the methods as well as references to the engineering processes used in the different work packages of the project.

In the project, the different WPs will share a common set of technical rules to guarantee consistency throughout the project.

Likewise, the different IP4 CFM projects (and TDs) should, as much as possible, follow the same or similar principles, to guarantee homogeneity and consistency on the processes (and indirectly on the results).

The specificities of some CFMs or TDs may require adjustments to the rules, however, the core principles should be followed.

The following sections will address the different aspects of the Technical/Engineering principles:

- Engineering Methodology & Guidelines: definition of consistent and interoperable specifications;
- Technical Quality Plan: principles to apply guarantee adequate development and results
- Technical Master Schedule: to ensure timely and controlled development

The document targets the following stakeholders:

- Cohesive WP leaders;
- IP4 CFM projects' coordinators
- Shift2Rail Joint Undertaking;
- European Commission;
- Reference for IP4 OC.

The following criteria shall be used to update this document:

- Major changes made to the project organization;
- Changes made to the initial project organization structure;
- Changes made to project engineering methods and tools;
- Project amendments that have significant repercussions on the Project or Engineering system process changes.

Evolutions or updates of the document will give origin to a new version which must be verified and approved in accordance with the Configuration Management Plan of the project [R5] .

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1. INTRODUCTION

The COHESIVE project aims to guarantee technical consistency and homogeneity throughout the different IP4 CFM projects to support the successful and meaningful integration of the modules coming from those projects, thus supporting the seamless multimodal (air, rail, coach and urban) traveler experience across Europe.

Shift2Rail IP4 aims to deliver a complete multimodal travel solution door-to-door connecting the first and last mile to long distance journeys combining air, rail, coach and other services.

This initiative includes a semantic interoperability framework, business analytics platforms, a one-stop shop where customers can search, plan, shop, book and ticket multimodal travel itineraries, an European scale trip tracker, multiple inventory, booking and ticketing systems having interoperability with related 'orchestrator' modules attached to the one-stop-shop (covering air, rail, coach and urban) and invoked by a customer centric application to be used on customer devices. These intentions will be demonstrated in different occasions through the Cohesive project lifetime via a set of functionally incremental technical releases.

1.1 List of Acronyms

Acronym	Description
EC	European Commission
GA	Grant Agreement
MoM	Minutes of Meeting
PCT	Project Coordination Team
SC	Steering Committee
TMT	Technical Management Team
WP	Work Package

Table 1 - List of acronyms

1.2 Reference Documents

Reference	Name	Code
[R1]	COHESIVE Grant Agreement - N° 777599	-
[R2]	COHESIVE Consortium Agreement	-
[R3]	COHESIVE Project Management and Quality Plan	S2R-COH-WP7-D-THP-001-02
[R4]	COHESIVE Risk Management Plan	S2R-COH-WP7-D-THP-002-02
[R5]	COHESIVE Configuration Management Plan	S2R-COH-WP7-D-THP-006-01

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2. TECHNICAL PRINCIPALS

2.1 Principles

Technical management principles aim to coordinate and synchronize all the technical activities within a project to assure the technical objectives set, are reached.

The principles and associated guidelines described within this document shall be applied throughout the duration of the project to:

- Set shared engineering rules and guidelines
- Synchronize activities
- Organize the technical coordination activities
- Define the relevant reference documents and their content (e.g. specification, glossary, interfaces) that will be used as reference for all IP4 CFM projects
- Coordinate and develop the integrated demonstrations resulting from the different technical releases planned for IP4.

The technical coordination activity is mainly done through regular WP1 technical coordination meetings and involves the different WP leaders (WP1 to WP6).

The WP1 technical coordination meeting is organized at least every two months, by conference call or face-to-face meetings. The frequency may be changed to one per month on specific project phases (e.g., the starting phase, where all the basics have to be put in place or close to critical or relevant Milestones).

The WP1 Technical coordination meeting is the place to:

- Share the technical progress status of the WPs
- Define and follow action plans
- Act as the reference in terms of documents agreement between WP leaders and on a version basis, according to the Technical master schedule
- Update the Technical Master Schedule
- Manage technical project risks
- Manage or prepare the interface with IP4 CFM and or OC projects
- Prepare the TMC technical report

The project risks are managed according to the Risk management plan [R4]

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2.2 Relationships to Others Plans

Figure 1 depicts the relationship between IP4 TDs while Figure 2 shows the project organization.

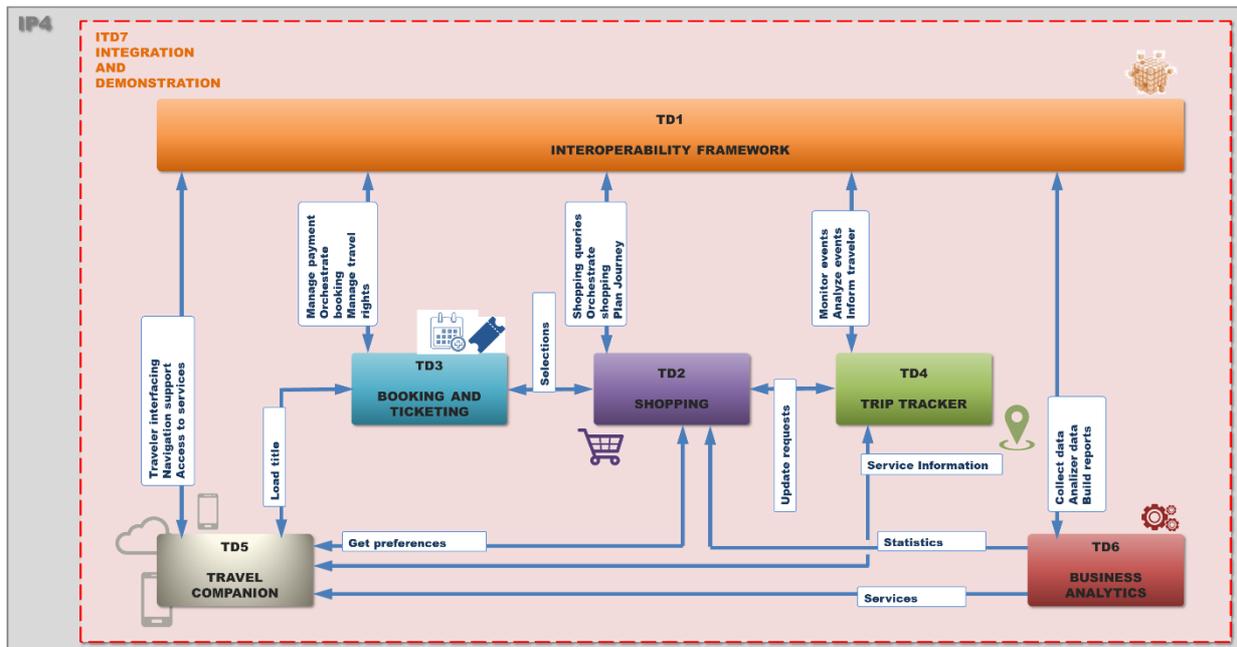


Figure 1 – Relationship between TDs

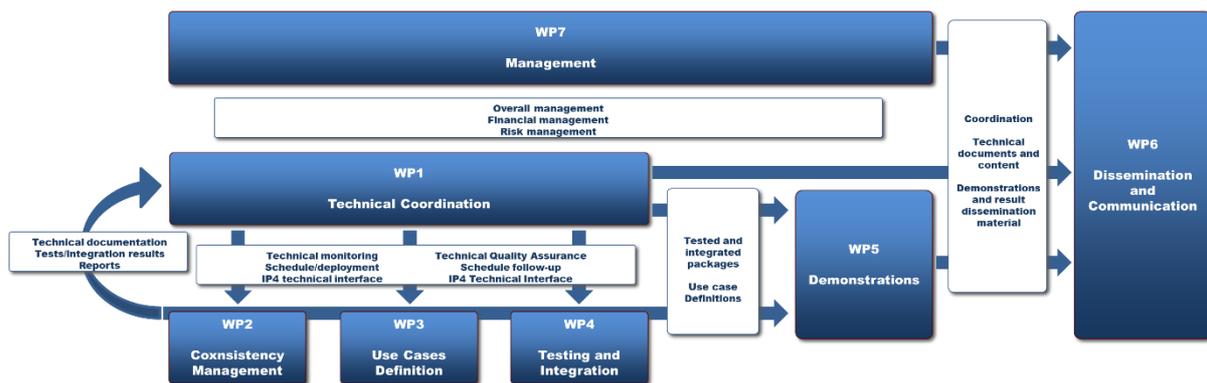


Figure 2 – COHESIVE Project Organizational structure

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2.3 Technical Reporting

The technical reporting process is depicted in Figure 3.

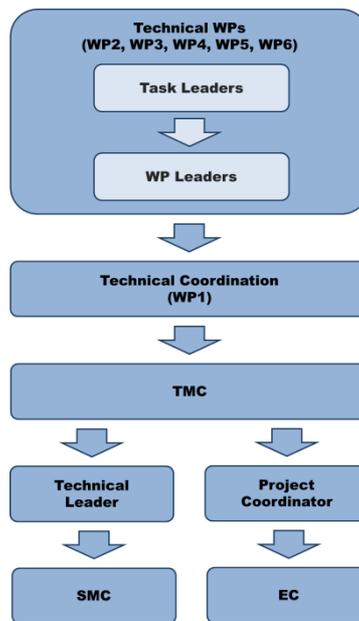


Figure 3 – Technical reporting flow

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3. ENGINEERING METHODOLOGY & GUIDELINES

3.1 Objectives

This section describes the strategy to put in place to control and share references and to control the project implementation process.

A robust system engineering methodology will be set to ensure that the project technical management is met according to the best available industrial practices.

3.2 General Methodology

The engineering methodology of COHESIVE is based on an iterative methodology, adapted to the project activities and to its technical coordination scope.

The iterative software integration methodology is based on iterative and incremental developments assumed by the other IP4 CFM projects, where requirements and solutions evolve through collaboration between self-organized, cross-functional teams. It promotes adaptive planning, evolutionary development and delivery, a time-boxed iterative approach, and encourages rapid and flexible response to change.

The iterative methodology is based on 4 main principles:

- Individual and collective interactions over processes and tools
- Working software over comprehensive documentation
- Contributors collaboration over contract negotiation
- Responding to changes by following a plan

The application of these principles is crucial and will have a big impact on the project development. The priority is given to regularly delivering a working product/system with high value functionalities instead of having long discussions about what the final product should look like.

The integration activities begin at CFM WPs level, before it is integrated and tested at each release by Cohesive.

3.3 Standard Inputs Focus

This chapter describes the methodology specificities according to the project activities and goals to help consolidating grounds for a future interoperable and multi-modal travel.

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3.3.1 Documents Lifecycle

According to the general method, the lifecycle follows an iterative process to assure that the outputs from the WPs of different CFM projects are consistent and synchronized along the duration of the program, coinciding with the duration of COHESIVE

For each lifecycle iteration of a document, the following key steps are identified (Sec 3.3.2)

- IP4 concepts and specifications are designed by the relevant CFM project through their technical work packages (WPs)
- Review and consistency check is done by WP2 of COHESIVE
- Synchronization of functionalities, specifications and dependencies from the technical work packages is done in WP2 of COHESIVE
- Updates and comments are issued
- Agreement of a new document version is reached

Concerning the concept and specification design step, each CFM project and associated TDs has to create its concept and specification (including the interfaces), according to the project scope and phase (see Section 5- TECHNICAL MASTER SCHEDULE). This design activity progresses depending upon each project's organization and management and may need some interactions with other projects. The interactions between projects are handled directly by the projects, while the consolidation of the information and consistency check is done at the COHESIVE level when the relevant documents are delivered. The output of this process is a final consolidated version of a document.

To synchronize the concepts and specifications from the different projects in accordance with the last document version, COHESIVE (WP2) shall review the content to assure its consistency. During the review/consolidation process COHESIVE-WP2 will be supported by the technical leaders of the relevant CFM projects.

The output of this step may be a formal delivery or just an internal document, depending on how it was defined by each project.

The final version of a new document, takes into account the review comments in order to create the final version of the document by COHESIVE WP7. After acceptance from the Technical Committee the official new version will be issued/published.

New versions of documents should be applied throughout the project (and/or associated CFM projects when relevant) since the date of its approval and publication.

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3.3.2 Reference Documents

For IP4 the following content/documents are identified as reference for support to the technical ecosystem:

- Glossary: resulting from the compilation of terms generated by the different projects, and contains the definition of the common language to be applied in the different IP4 projects throughout their work packages;
- Specifications: technical details coming from the different IP4 WPs deriving concept and design documents;
- Interfaces: which come from the IP4 CFM projects covering external and internal (to the same project) interface definition (usually included in the specifications documents);
- Ontologies: covering the formal naming and definition of the types, properties, and interrelationships of functionalities and/or components covered.

3.4 Releases / Demonstrations Process

Since the project encompasses the integration of a number of technical releases delivered by different projects, having each release a demonstration associated to it, with the objective of guarantee the significance and consistency of the integrated technical packages which will compose the demonstrations, the definition of this process is critical.

This chapter describes the methodology specificities according to the IP4/COHESIVE activities to define a demonstration/pilot, which will demonstrate the feasibility of the key concepts involved.

The demonstrations will be incremental in functionalities and will cover only the functionalities and components identified for each release of the relevant projects

3.4.1 Lifecycle management

Pilots and technical releases follow an iterative process to assure that outputs from the different WPs/TDs are consistent and synchronized all along the lifecycle of COHESIVE.

Each lifecycle iteration includes the following process:

- The software implementation by the relevant projects
- The acceptance of the software packages delivered by relevant projects (after quality check internal to the relevant projects)
- The integration and respective testing of the software packages
- The final validation

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Each release will follow the same basic process/lifecycle being considered the following releases:

- Alfa release with deliveries from ATTRACKTIVE and Co-active, leading to an integrated demonstration
- Intermediate release (internal to the project) in 2019
- Beta release with deliveries from CONECTIVE and CFM2018, leading to an integrated demonstration
- Intermediate release (internal to the project) in 2021
- Final release with deliveries with deliveries from CONECTIVE and CFM2020

Some releases and/or demonstration may also be applied or adapted to relevant events, such as Innotrans or TRA using the content from the closest stable release.

The overall content of each release is defined in the COHESIVE Technical Master Schedule (see chapter 5).

Software implementation is under the responsibility of the CFM projects according to the TDs involved and following each project's management structure, objectives, functionalities and specifications.

Acceptance of the software packages, carried out by COHESIVE WPx, with the support of the originating and relevant work packages, will verify that the software package is consistent with the [4. TECHNICAL QUALITY PLAN](#) and that all the conditions are met in order to proceed with its integration. The output is an acceptance report which results in the next key step execution and/or an action plan.

Concerning the integration of the software packages, WP4 of COHESIVE integrates the software by testing the interface links between different WPs, to prepare its validation with the support of the relevant projects and work packages. The output of this step is an integration status which results in a final validation and/or an action plan.

Concerning the validation, WP4 of COHESIVE validates according to the identified test cases, the integrated system with the support of the relevant projects and work packages. The output is a test report which results in the next iteration start and may be identifying missing features. These potential missing features are integrated for mitigation into one or several action plans.

3.4.2 Scenarios and Corridors

The software releases and the respective pilots will follow iterative scenarios. The scenarios will be shared by the different projects and associated TDs addressing coherent setups.

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Associated to each release, overall scenarios will be defined. These will be defined by COHESIVE WP3 in coordination with the active CFM projects and the basis of the demonstrations to be carried out.

The definition of scenarios and use cases will be based on the IP4 objectives.

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4. TECHNICAL QUALITY PLAN

4.1 Objectives

This section describes the strategy put in place to control and share the technical quality measures through all the technical activities to ensure the project technical management according to the best industrial practice.

4.2 Quality Assurance Management

4.2.1 Quality Assurance Organization and Responsibilities

The overall Project Management and Quality Plan [3] for COHESIVE covers the main principles to be applied to guarantee the successful and controlled implementation of the project and its objectives.

Each contributor to the production of technical deliverables is responsible for ensuring the Quality Assurance rules are applied and that his/her technical contribution meets the quality standards defined in the present document.

4.2.2 Quality Assurance Activities

In the scope of the technical activities performed in the CFM technical WPs, the technical quality assurance activities performed are the following:

- Plan and organize the relevant quality assurance activities, mainly document reviews and software component acceptances
- Document the Quality Assurance activities to be performed, which is the aim of the present document
- Enforce the application of the management principles defined in Chapter .2

4.3 Configuration Management

The configuration management process associated to the integrations to be done in COHESIVE is described in a specific document [R5].

4.4 Review and Approval Process

4.4.1 Technical Documents

The relevant technical documents to be developed and/or delivered to the JU shall be reviewed and approved by the WP7 [1], according to the TECHNICAL QUALITY PLAN. This review and approval process shall be defined on a case-by-case basis between COHESIVE WP7 and WPs of CFM projects coordinators depending on the deliverable itself.

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4.4.2 Software Deliverables

Scope

The process shall apply to any software packages to be integrated or simply received (repository) by COHESIVE and produced by the CFM projects. The relevant WP leaders from the different IP4 CFM projects are encouraged to cascade and enforce the same process within the scope of their work packages to guarantee consistency of methodology and facilitate their own integration and delivery tasks if any.

Software Deliverable Acceptance Criteria

1) Functional coverage

This measure refers to the total planned (in 5. TECHNICAL MASTER SCHEDULE) versus delivered quantity of functions implemented or supported by the software products.

- 2) It is required that for every planned official release to reach at least minimum 95% of the functions planned to be delivered. Planned functions are understood as those identified and defined by the relevant project in the respective specification document.
- 3) For intermediate (non-official releases) the target will be at least 80% of the functions planned to be delivered

These threshold values may be adjusted during the lifetime of the project in a further version of the present document.

De-scoping artefacts shall be discussed and agreed with COHESIVE WP7 before the delivery.

2) Test coverage

This value is referring to the total quantity of tests performed versus the total quantity of tests planned.

The values required for a software deliverable are:

- It is required that for every planned official release to reach at least a minimum 80% of coverage required
- For intermediate (non-official releases) the target will be at least 70% minimal coverage required

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These threshold values are the percentage of the executed tests compared to the defined scope (as defined in the specification documents of the relevant project). These threshold values may be adjusted during the lifetime of the project in a further version of the present document.

The test plan shall cover the installation and deployment of the software deliverable through dedicated test cases.

3) Test quality

This value is referring to the total quantity of tests performed successfully versus the total quantity of tests performed.

The values required for a software deliverable are:

- It is required that for every planned official release to reach at least a minimum 80% of planned tests successful
- For intermediate (non-official releases) the target will be at least 70% minimal planned tests successful

These threshold values are the percentage of the successful executed tests compared to the defined scope. These threshold values may be adjusted during the lifetime of the project in a further version of the present document.

4) Performance

Some technical constraints may enforce some specific performance requirements which shall be managed case by case.

At the moment, no performance requirements were identified for any of the IP4 CFM projects. In case they are identified during the lifetime of the projects, they shall be documented in a further version of the present document.

5) Delivery format and content

The package shall be properly delivered as described previously. It shall be in line with the Master Schedule integrated and maintained at COHESIVE WP7 level, both at a schedule and scope perspective.

1. In case of source code or runnable code delivery it shall include at least:

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- a. A delivery note describing:
 - scope of the delivery
 - set of required third parties
 - installation / deployment instructions (or reference to the relevant test case(s))
 - list of external interfaces / services provided and their references
 - list of external interfaces / services used and their references
 - full detailed test report, including detailed test cases, test steps and results, description of any workaround applied or any information that could help to test, investigate or use the functionalities covered by the test
 - list of all known issues that could affect further test, investigation or use of the functionalities delivered
 - description of the licenses to used third party components
 - b. A software package integrating:
 - software executables (component integrated and running)
 - required licenses if any
 - required 3rd parties if any
 - the associated documentation (including the delivery note)
2. For software delivered as a service it shall include at least:
- a. A delivery note describing:
 - scope of the delivery
 - set of required third parties
 - list of external interfaces / services provided and their references
 - list of external interfaces / services used and their references
 - full detailed test report, including detailed test cases, test steps and results, description of any workaround applied or any information that could help to test, investigate or use the functionalities covered by the test
 - list of all known issues that could affect further test, investigation or use of the functionalities delivered
 - b. A service package integrating:
 - IDD – Interface Description Document
 - SLA – Service Level Agreement (including responsible and contacts)
 - VDD – Version Description Document
 - associated documentation (including the delivery note)
3. If the software delivered as a service includes option to request source code access to the original company, it shall include all the items identified for a service on point 2, and the original company that produced the software should provide a point of contact available till the end of IP4 projects (2022). This point of contact should be available to:
- a. receive a request to have access to their source code (this request should have a clear explanation of the need to access the source code);
 - b. evaluate if the request is valid;
 - c. provide the source code corresponding to the deployed service.

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5. TECHNICAL MASTER SCHEDULE

5.1 Deliverable review

The Technical Master Schedule is the reference schedule for the COHESIVE project covering also the links of all IP4 CFM projects that will feed it with the different software packages that will be integrated. It includes the integrated main events and technical milestones to reach successful integrations and demonstrations.

The Technical Master Schedule also defines the overall contents of the internal technical releases.

It is to be updated by the COHESIVE WP7 in close interaction with WP1 and with the technical and overall management coordinators of the IP4 CFM projects.

Major updates to the different projects may lead to updates to the Master Schedule.

Major updates of the Master Schedule need to be agreed with the different CFM projects.

The reference Technical Master Schedule will be available on the Cooperation Tool under a specific folder available to the CFM coordinators

Figure 4-depicts a simplified version of the Overall Master Schedule

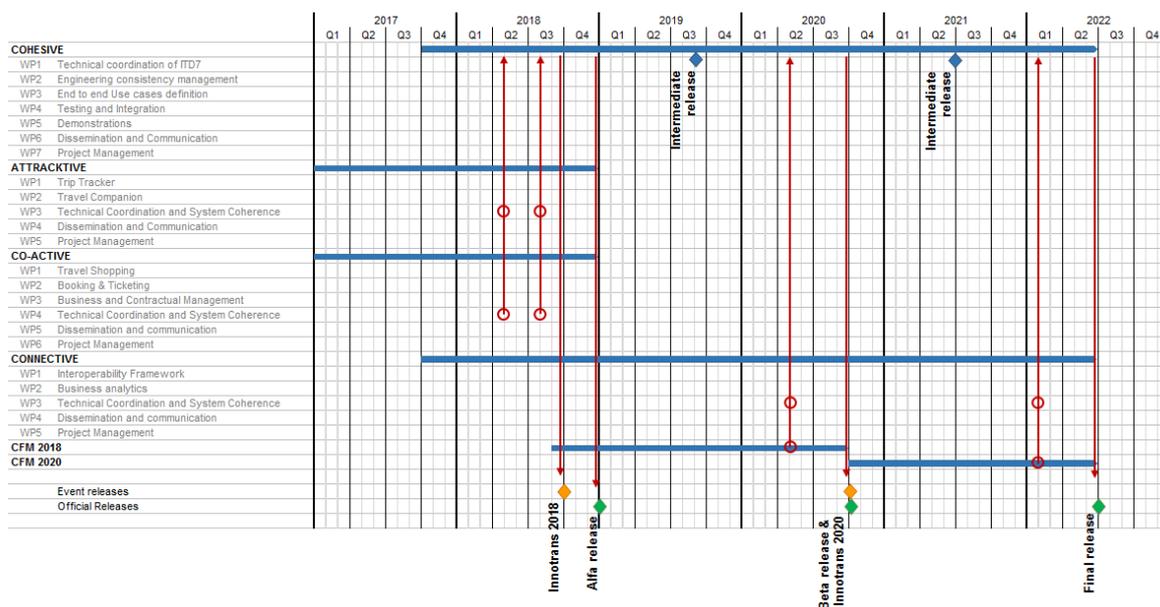


Figure 4 – Simplified Overall Master Schedule

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