

ETCN Ethernet Train Communication Network

ERRAC Evaluation Group – Checklist for the Risk Benefit Analysis of EU Projects

The ERRAC Evaluation Working Group has established a check list where they can assess the state of health of existing EU Funded Research Projects. The intention is to use the same list for evaluating on-going projects as well as for pre-evaluating the feasibility of projects during the preparation phase before they are submitted to the Commission.

The first set of check points are related to the ease of implementation.

(The success of the project itself is taken for granted so the aim of the check points is to identify specific threats to the successful implementation of its results)

1. Why is the project being initiated?

At the present time train network architectures are mainly compliant to IEC 61375 Train Communication Network standard.

This standard defines the train network architectures from two different networks, a train network WTB (wired Train bus) and a vehicle network MVB (Multifunction Vehicle Bus) which have a throughput of 1,5 Mbits/s.

This throughput is for the future trains to be designed too low. There is a need for new multimedia functions and improved maintenance functions to have a throughput of 100 Mbit/s. So all the major train integrators are developing a new architecture based on Ethernet and IP Internet protocol based solutions that are used in all the fields of IT (Information technology). These solutions are used all over the world and the installed base is very vast. The cost of connection is very low.

It is of major interest for the railway sector that all these developments ends by a new common standard at least at Europe level for the new train architecture and its networks.

The only possibility to achieve practically this goal is that a Collaborative Project be set up whose objective will be to elaborate common specifications for the train network architecture and its associated buses based on Ethernet. These specifications shall be proposed as IEC standards for the world railway community.

Without such a project the major integrators will continue their developments and although there is discussions between them to agree on common choices there is a high risk that there will be no common standard at the end for the future train network architecture. This will lead that the bus interfaces of all the train devices will be specific to the architectures of each integrator. No interchangeability will be possible. To achieve interoperability between two different trains will be more complex than today.

There is a need to insure the communications between cars and consists in an easiest way than today using new emerging technology such as radio or optical link to suppress the use of wires. UIC 556 is a leaflet that specify the exchanges at application level between two consists. There is a need for open coupling that means the possibility to couple two consists that have different functions. How to operate one consist from another consist that is different from this consist? The deliverables of the project will be a proposed revision of IEC 61375 standard. IEC TC9 WG43 is already set up and has the task to re-work the existing IEC61375 in order to have a new structure that can include new vehicle busses and a new train bus. It is agreed that the new edition of IEC61375 will be submitted to CENELEC parallel voting. The contribution of such a project

will accelerate the standardization project and will result in a standardization document that is based on proven specification.

2. By whom is the project being initiated?

The project is initiated by the UNIFE TCMS Mirror Group that includes the main train integrators (ALSTOM, BOMBARDIER, SIEMENS, ANSALDOBREDA, CAF), two main train operators (SNCF and DB) and train suppliers (FAR Systems, Duagon, Selectron, KNORR-BREMSE)

3. What are the objectives and forecast benefits?

The objectives are:

- . to elaborate ETCN standard that will provide high throughput and low cost communication architecture from reusing existing standards and adding specific features of the railway sector such as inauguration when two trains are coupling
- . to find a new way for communicating between two cars and between two trains to reduce the wires
- . to elaborate a specification for a standardized communication between train and ground
- . to find a flexible way to achieve the coupling of two or more consists to form a train.

Forecast benefits are:

- . new standardized train network architectures at a lower cost than the current ones
- . standard network interfaces for train devices
- . reuse of the enormous work done by the different IT communities but there is a need to select the proper functions for the railway sector in the various standards
- . no use of contact for inter car communication and inter train communication
- . open coupling between two consists

4. How can that benefit be measured?

That benefits can be measured:

- . lower cost of development for the new architecture
- . lower recurring cost for the point of connection. Costs have to be seen also in relation to available bandwidth
- . lower cost of development for the suppliers to connect their subsystems to the consist network
- . higher throughput of the train and consist networks
- . more efficient maintenance
- . multimedia available for the passengers, the crew and the operator/maintainer companies

5. Who is taking the benefit?

The operators because the trains offer more services to the passengers and the trains are better monitored and controlled. The maintenance will be more efficient and less costly. Bigger bandwidth will allow further condition based maintenance support

The integrators because they can design new functions and the final cost will decrease

The suppliers because they can interface their devices to the network with a standard interface

The passengers because they have more services in the train

6. Who is taking the cost?

Every actor of the railway sectors is taking the cost

7. How equitably are the costs and benefits being distributed? (i.e. a proper LCC analysis should be elaborated and agreed upon in the bid preparation or initial work phases)

The costs for elaborating a common standard has a great return on investment for the four stakeholders (operators, integrators, suppliers and universities). There will be cost & benefits at all levels of the LCC, starting at the train design end ending with the train maintenance and operation

8. Is any party going to lose anything if specific results are implemented?
Integrators are losing differentiation of their products at the level of the train network architectures but such differentiation leads to a higher cost of the purchased subsystems and make not possible the interchangeability between devices.
9. Are all the real stakeholders for implementation of the results represented in the project or do they support the project in some other way?
All the stakeholders are involved in the projects, operators, integrators and suppliers. The stakeholders have good relationship with UIC, IEC, CENELEC and CER in order to facilitate the standardization process.
10. What are the consequences if part, or all, the implementation fails?
If the implementation fails the result will be that no standard will exist for the future Ethernet train network architecture
11. Who is affected by these consequences of failure?
Every actor of the railway sector will be affected by the consequences of the failure. The operators because they will be obliged to train their staff to the use of different train network architectures, they will pay a higher cost for their trains. The integrators will have higher cost of development. The supplier will have higher cost of development. Maintenance costs will be higher and interoperability will be lower. No interchangeability will be possible.
12. Is there any up front investment necessary before the benefit can be taken? Surely yes, but refer to question 7 with a demonstrable and increased LCC. Only then should we start the full project.
No up front investment seems necessary.
13. Is there anybody who has specific reasons to block implementation? (special interest groups or some potential industry partners excluded from the project?)
Nobody has a specific reason to block implementation. All the actors of the projects that represent all the actors of the railway field are keen on achieving the project.
14. What are the reasons for their opposition? (Market protection, job protection, call on investment funding, etc...)
There is no opposition.
15. Is there a need to change laws or Technical Specifications for Interoperability in order to be able to implement the results?
No need to change something to be able to implement the results.
16. How can the necessary changes best be implemented? (Through changes to Directives, national regulations or through the TSIs or mandatory or voluntary standards? What happens if there is no enabling legislation such as a Directive, as applied to most of the urban sector?)
The necessary changes will be implemented through voluntary standards. If a coupleability shall be reached then voluntary standards are not enough. To reach interoperability for a certain area (freight, high speed, ...) TSI have to be adapted
17. What are the probabilities to succeed with the necessary changes to the law or TSIs? See 16
No change to the law or TSI is required.
18. Are there any unknown parameters affecting implementation? (Fees, hidden costs or permissions required, etc...)
There are no unknown parameters affecting implementation.
19. Is there a need to redesign products to gain any benefits from the project? See 12.
The products will be redesign at the level of their network connection to meet ETCN standard. The paradigms of the existing IEC61375 will be kept so the ETCN will result in an extension of the existing specification providing the benefit if a facilitated migration path.

20. Is there a need to make changes to already installed base of vehicles or infrastructure?
There is no need to make changes to already installed base of consists. Development of ETCN-TCN gateway shall be of interest to make possible the implementation of both architecture.
21. If there is no need to change the existing installed base, can the existing base be disadvantaged in any way?
The existing base will have a less powerful network architecture and will provide less functions than the new one. Coupling of two trains having for one the existing installed base and for the other the new architecture will require a specific gateway. Existing installed base is not compatible with the new one. Providing that the IEC61375 paradigms are kept, the existing base can be easily interfaced to the ETCN network.
22. Who pays for the above changes and how will investment be funded? LCC must demonstrate.
Integrators and device suppliers will pay for the new ETCN onboard trains but there will be a high return on investment
23. Is the project underwritten by all stakeholders, at an operational level, with an appropriate level of authority?
All the technical directions of all the stakeholders are in favor of the project.
24. Are there any negative impacts of implementation foreseen which could threaten implementation in the longer term?
No negative impacts of implementation are foreseen.
25. Are there any existing projects whose results could be in conflict with this one?
At the level of Europe there are no existing projects whose results could be in conflict with this one. Furthermore IEC TC9 WG43 has established a liaison with the CER ET5 that has prepared a document on the specification requirements for interoperable communication between vehicles. At the level of the world in Japan and in the USA there are no existing projects that could be in conflict with this one. Furthermore IEC TC9 WG43 has established a liaison with the IEEE WG1 that is in charge of extending to Ethernet technology the existing document IEEE1473 that specifies the onboard communication. IEEE is willing to refer to the new edition of IEC61375.
26. Are there any other projects supporting or depending on this one?
MODTRAIN and InteGRail are supporting this project. No known project is depending of this project.
27. Are the results of the project immediately capable of implementation or is some additional research work likely to be required?
The results of the project are immediately capable of implementation
28. Can an 'Early Adopter' be identified and brought into the project from day one?
All the integrators involved in the project will be "early adopter".
29. Are there any 'parallel' activities at the level of CEN/CENELEC/ETSI/IEC/ IEEE in this area?
As reference herein above, there is parallel activity in the IEC WG 43 group.

The second set of check points deals with the project & threats to its future success.

(Economic and project auditing issues are excluded. Almost all of these items are required in the Bid documents and the agreed description of work negotiated with the Commission.)

30. Project participants (Composition of Consortium)
Operators:
SNCF, DB (to be confirmed)

ALSTOM, BOMBARDIER, SIEMENS, CAF
Selectron, Duagon , FAR Systems (to be confirmed)
Universities

31. Project mandate (Description of Work)
The project includes ten work packages
WP0 Project management
WP1 Requirements
WP2 Network architecture
WP3 Layers 1 to 4
WP4 Application layer
WP5 Coupling of two or more consists
WP6 Train to ground link
WP7 Demonstrator
WP8 testbench for compliance
WP9 Dissemination
32. Project organization (Management Structure)
Project organization will be the same of those of MODTRAIN Integrated project.
There will be a Steering Board, a Control Board and Technical Management Team
33. Representatives with an appropriate level of authority and expertise (Identified Experts)
The experts who will take part of the projects will be (list to be completed by each organization)
Jean-Pierre Gilbert ALSTOM
Gernot Hans Bombardier
Armin Heindel Siemens
Javier Goikoetxea CAF
Laurent Lasnier SNCF
Ralf Müller DB
Gianosvaldo Fadin FAR Systems
34. Intellectual leadership of the project, system architecture, etc. (Technical Management)
Intellectual leadership of the project is taken by heads of network department of the involved entities
35. Mechanisms available to ensure that the project is not deviating from its original mandate and objectives within the defined review frameworks (Management Structure)
Steering Committees ensure that the project is not deviating from its original mandate
36. Measures taken to follow up deliverables are made on time and to the right quality (Project Quality Plan)
Project control will be given to ALMA Consulting group. They will follow up the due time of all the deliverables of the project.
37. Mechanisms to quickly and smoothly resolve conflicts within the project (Management Structure)
Technical Management Team of the project will resolve conflicts within the project.
38. Known sources of potential conflicts (Risk Assessment prior to contract signature)
Sources of potential conflicts are the already existing developments of the integrators they will support as candidate for the common standard.
39. Any participant who may have an interest in failure of the project, should be identified at the Risk Assessment stage and mitigation measures considered
No participant may have an interest in failure of the project.

40. Communication with the main stakeholders (Communication and Dissemination Plan)
An Internet site will be created for the dissemination of the information.

The third set of questions could be industry or company specific

(These are not normally made available for public use)

41. Who will pay for the proposed changes and how will investment be funded? If there is a market and demonstrable LCC, the companies will pay for changes, if not they won't and the project shouldn't start.
The companies involved in the project will pay.
42. Is the project underwritten by all internal stakeholders, at an operational level, with an appropriate level of authority?
The project is not yet started, so this should be expressed as intention. The project will be underwritten by the technical directions of the involved parties.
43. Are there any negative internal impacts of implementation foreseen which could threaten implementation in the longer term?
No negative internal impact
44. Are there any existing internal projects which could be in conflict with this one?
No existing internal project in conflict with this one in the parties involved in the project.
45. Are there any other internal projects supporting or depending on this one?
There are internal projects that are supporting and depending of this one

The fourth set of questions relates to completed projects researching into the same topic and deals with the degree of implementation achieved:

46. Have the results already been implemented somewhere?
No
47. Have the results not been implemented in areas where similar conditions exist?
No
48. What are the reasons for this non-implementation? (Lack of funding, NIH, research overtaken by innovation, etc...)
Multimedia technology is new and the associated needs were not existing before

Revised 31-10-2006
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