FEDERATION INTERNATIONALE DE L'AUTOMOBILE

FIA SMART Rally Tracking System Software Specification Guidance

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Date	Update
30/04/2021	Creation
25/01/2022	Clarify safety alert reliable transmission (§ 5.2.5)

TABLE OF CONTENTS

1. Introduction

1.1. Overview

National Sporting Authorities (ASNs) use various tracking systems within their National and Local Rally Series. Among these systems, there are more and more SMART Rally Tracking Systems available for use.
The objective of the FIA is to support the ASNs in choosing tracking system solutions which are compliant with the needs of the Rally discipline and the specificities of region of use, and improve safety.
In this context, the FIA intends to establish an evaluation list of SMART Rally Tracking Systems, and to share it with the ASNs. Selection of a tracking system solution for a National or Local Rally Series will however remain with the relevant ASNs.
The aim of this document is to allow interested providers to better understand the specification based on which the FIA intends to evaluate the SMART Rally Tracking Systems.
The SMART Rally Tracking System is a low-cost rally tracking system designed to run on competitors smartphones, to enable rapid growth in the amount of rallies being tracked worldwide. Targeting a low-cost solution, even though it may not work on all special stages at all rallies, means that the most useful safety features provided by a rally tracking system can be utilised by all levels of rallying, from the club level of the sport upwards.
The system concept describes two applications: the Event Officials application, and the Competitors application.
The Event Officials application allows the organiser to create and set up their event, and when the rally is live, it allows for live monitoring of the competitors locations and for safety features.
The Competitors application allows them to view/accept event invites, sends tracking data to the Event Officials application, and provides a simple UI for when they are competing.
Only one device & application should be used per vehicle for tracking purposes.

1.2. Legal notice

Interested providers are made aware that this document – as well as subsequent evaluation of the SMART Rally Tracking Systems by the FIA – reflects the views of the FIA only, and that the ASNs remain free to select their providers based on any criteria they deem appropriate. As a consequence, the FIA makes no representations that the ASNs will make their decisions based on the specification listed in this document or on the evaluation of the FIA.
This document is thus for informational purposes only and is not intended to offer advice on which reliance should be placed. To the extent permissible under applicable law, the FIA therefore disclaims all liability and responsibility arising from any reliance placed on this document.
By participating in the project, interested providers: (i) accept to do so at their own risk and cost, (ii) accept that their SMART Rally Tracking System will be evaluated by the FIA acting at its sole discretion, (iii) accept not to contest such evaluation by the FIA, and (iv) acknowledge that they won't be entitled to seek any kind of indemnification or compensation from the FIA in connection with both this document and the evaluation of the SMART Rally Tracking Systems by the FIA.
Interested providers further acknowledge that nothing in this document or any communication made by the FIA or its employees, affiliates, subcontractors and/or any other third party it may engage in relation to this document shall: (i) constitute an offer or a contract between the FIA and any interested provider, or (ii) be construed as placing an obligation on the FIA to grant rights to any interested provider, or (iii) constitute any appointment of an interested provider by the FIA, or (iv)

not act as a representation that any interested provider will be granted any right(s) or appointed by the FIA in any capacity.

2. Glossary

POI – Points of Interest, often used to designate areas of interest on rally maps (TC's, refuel zones etc).
Cellular – Refers to cellular networks i.e. (GSM/GPRS/4G/LTE/5G).
Polyline – A line segment of individual points joined by a line. Often used to describe a section of road on rally tracking maps.

3. Scope

This section describes at a high level those items of the system which are aimed to be completed by the project, and those which fall outside its aims. A low-cost rally tracking system cannot hope to be perfect under every condition, so it is important to document the known risks and any features not being targeted.

3.1. In Scope

This section lists those features which the applications will support. They are listed in more detail in the Specification section.

- Allow administrator to create/update/delete event organiser accounts
- Allow event organisers access to all roles in the system
- Allow event organisers to create an event
- Allow event organisers to upload competitors entry list
- Allow event organisers to invite competitors
- Allow event organisers to upload polylines for special stages
- Allow event organisers to upload points of interest (POI's)
- Allow event officials to view a map displaying the following
    - Live tracking location of all competitors
    - Safety status of each competitor (OK/SOS)
    - Any uploaded special stage polylines
    - Any uploaded POI's
- Allow event Clerk of the Course to activate a Red Flag
    - Allow competitors to receive the Red Flag
- Provide comprehensive documentation/tutorials on how to use the system for event organisers
- Provide comprehensive documentation/tutorials on how to use the system for competitors
- Allow competitors to sign up to the service
- Allow competitors to view and accept their event invites
- Allow competitors to view a racing user interface
    - OK/SOS activation

3.2. Out of Scope

This section lists all those feasible features for rally tracking systems which have been excluded from the scope.
Each feature has been omitted in order to lessen the overall system cost to a degree where it is financially feasible for use in club level events.

- Tracking outside of cellular network areas
- Tracking delivered on any network other than cellular
- Dedicated tracking device units
- Tracking device rental
- Comprehensive user interface for competitors
- Rally computer functionality i.e. trip meters
- Robust mounting solutions
- Speed monitoring features; i.e. quiet zones, speed restriction zones
- Logging of tracking data for Stewards/Coronial inquests
- Vehicle-to-Vehicle safety features

4. Assumptions, Risks, Issues & Dependencies

- It is assumed that every rally competitor will own or have available a smartphone with a cellular connection & GPS sensor, running either iOS or Android, and that they will be able to download and install the tracking application
- It is assumed that event organisers will be able to create and edit their event online, without significant training other than the documentation/tutorials provided
- It is assumed that event organisers will have internet access in race control and can open a web application (website) in a modern web browser
- It is assumed that event organisers will have a way to contact each competitor; either through a phone number or email address, in order to send them a digital invite for the application
- It is assumed that competitors will nominate only one device per vehicle, and that only one device will be used for tracking purposes in each vehicle
- Compared to a traditional rally tracking system (powered and charged from the vehicles power system) it is a risk to allow competitors control over the power status of the system. They may not have power leads available in the car to keep their device charged throughout the rally, or may forget to charge it overnight
- Similarly to the above point, it is a risk to allow competitors control over the tracking system at all. They may forget their device, forget to activate the application, suffer issues installing and running the application, or a myriad of other issues
- It is a risk to install any loose object in the cockpit of a rally car which could come loose in an impact
- Lack of adequate cellular reception (covering all the special stage & liaison sections) on a lot of rallies will be an issue

5. Specification

The Specification section has been split into two parts; one for organisers and one for competitors. Some features have overlap between the two sections.

5.1. Event Officials Application

5.1.1. Allow event organisers access to three roles in the system

The system should contain, at a minimum, three user-facing roles which can be combined additively to control access to the system:

- Event Organiser (secretary; etc.)
- Clerk of the Course
- Event Official (Safety Officer; etc.)

The Event Organiser role covers general rally set-up, inviting users etc.
The COC role covers any safety-critical features such as sending a red flag.
The Event Official role is used for access to the tracking map.
A user may have one or more roles in the system. It is left to vendor implementation to decide how best to assign/activate these accounts; one per role could be created for every event, or event organisers could have a UI and control to manage the users for their events.

5.1.2. Allow event organisers to sign up to the system

Event organisers should be able to sign up to the system using a standard application sign up form. Industry best practices for identity and access management should be followed to prevent unauthorised access and keep organiser's account credentials safe.

5.1.3. Allow event organisers to sign in/out

Event organisers should be able to sign in and out of the system using a standard login form/logout button. After logging in, the main dashboard of the system should be shown.

5.1.4. Show the main dashboard

Event organisers should be shown a dashboard showing their username, a link to their account settings, a logout button, a list of events (past/present/upcoming) they have created, and a button to create a new event.
The username/account settings/logout button may be concatenated into a menu.
The list of events should show for each event:

- Name
- Start/Finish dates
- Number of competitors
- Link to view the map display
- Link to view/edit entry list
- Link to view/edit polylines
- Link to view/edit POI's

5.1.5. Allow event organisers to create/update/delete an event

Event organisers should be able to create an event. They should be shown a form with some basic fields:

- Event Name

- Location
- Country
- Start Date (inclusive)
- Finish Date (inclusive)

Event organisers should also be able to update an existing event to make updates/correct mistakes, and they should be able to delete existing events.

5.1.6. Allow event organisers to view/create/delete/upload entry list

Event organisers should be able to view an entry list of competitors. The list should show:

- Car number
- Driver name
- Driver country (optional)
- Driver phone number
- Driver email
- Device identifier (phone number)
- Codriver name (optional)
- Codriver country (optional)
- Codriver phone number (optional)
- Codriver email (optional)
- Invite status (not sent/sent with no response/accepted/rejected)

Event organisers should be able to upload a spreadsheet in common formats (CSV, Excel) of the same fields in order to quickly populate the list. They should be able to edit each entry individually to make updates/correct mistakes, and they should be able to delete individual entries.

5.1.7. Allow event organisers to invite competitors

At any time, the event organiser should be able to invite competitors with registered device identifiers. This should send a notification to the users device, so that they can accept or decline the invitation.

5.1.8. Allow event organisers to upload polylines for special stages

Event organisers should be able to upload polylines of the special stages/liaison sections in common formats (KML, CSV). The polyline may be automatically simplified/cleaned in order to reduce data transmission; as long as the simplification does not reduce detail to an unacceptable level.

5.1.9. Allow event organisers to upload points of interest (POI's)

Event organisers should be able to upload points of interest in common formats (KML, CSV). The points of interest should include a label and a latitude/longitude, in order to be displayed on the map.

5.1.10. Allow event organisers to view a map displaying the following

The main function of the event officials application is to provide a near real-time tracking map. The map should contain a vectorized or satellite view background of the rally course terrain, automatically centred on the stages & competitors.

5.1.11. Live tracking location of all competitors

Event organisers should be able to see the location of all competitors in near real-time.
Clicking on a vehicle should display any extra information sent from the device or recorded in the database about the vehicle; driver/codriver names, speed etc.

5.1.12. Safety status of each competitor (OK/SOS)

The map should contain icons with the vehicle car number. Ideally, the icons would be coloured by the vehicles' current safety status (none/OK/OK – Road Clear/OK - Road blocked/SOS/SOS Fire/SOS Medical), and contain an indicator to show if they are currently displaying a red flag to the crew.

5.1.13. Safety alarm for SOS activation

When a new SOS/SOS Fire/SOS Medical is received by the web application, an audible and visible alarm should be activated to alert the user to the incident. The alarm should be easily silenced and the user interface should contain an option to turn the alarm on/off.

5.1.14. Connection status of each competitor

The system should track the connection status of each competitor, and after a period of time with no connectivity, the map icon of that competitor should update to represent the fact that the device is no longer connected. Ideally, a neutral colour i.e. grey would be used to represent a disconnected device. The user interface should have a way to see how long it has been since the device last transmitted tracking information.

5.1.15. Any uploaded special stage polylines

The map should display the polylines the event organiser has uploaded. The user should be able to choose to hide any of these on their screen.

5.1.16. Any uploaded POI's

The map should display the POI's the event organiser has uploaded. They should display in an icon on the map at their location with the label the organiser has set.

5.1.17. Allow event organisers to activate a Red Flag

At any time, the event organiser should be able to activate a red flag through a simple user interface. As the system may or may not be aware of which cars are currently on which stage, the following two options are described:

Option 1 (Stage Aware)

In this option the system is aware of which special stage each car is currently on, and their distance into stage. This allows the event organiser to select the stage & distance into stage they would like to activate the flag for. The red flag signal is then sent to all cars on the stage whose distance into stage is less than the distance set.

Option 2 (Stage Unaware)

In this option the system does not know which special stage each car is currently on. The event organiser can activate a red flag for a single car by selecting the car and pressing a "Red Flag" button, and must repeat this process for each car they would like to send the flag to, or they can press an

applicable button and make a selection on the map (drag a box, or click repeatedly to define a shape) to send the red flag to all those cars inside the selection.

5.1.18. Provide comprehensive documentation/tutorials on how to use the system for event organisers

Documentation and tutorials must be supplied to event organisers in order to facilitate their swift adoption of the system. Ideally, the documentation would be provided in the same system, accessible through a menu or similar button. The documentation must cover every function listed in Section 5.1

5.2. Competitors Application

5.2.1. Allow competitors to register/login/logout to the service

Competitors should be able to sign up for an account with the service, using their phone number or some other unique identifier as a way to uniquely reference their device.
Competitors should be able to log in using a standard login form. If technically possible, OAuth can be used to make users logins easier (sign in with Google/Facebook etc).
After login, there is no need to ever log the user out automatically, although they should be given the option of logging out manually.
After login, the main event page should be shown.

5.2.2. Allow competitors to view and accept their event invites

Competitors should be able to see a list of their events (past/present/upcoming) and their invite status (not replied/accepted/rejected). Each event should show the name, dates and country flag. The competitor should be able to respond to pending event invites through a natural smartphone user experience (buttons/swiping etc). Competitors should be able to change their response from either accepted/rejected to rejected/accepted.

5.2.3. Allow competitors to activate tracking

If an event the competitor is registered for and has accepted is live, they should be shown an option to begin tracking. When they activate the tracking function, they should be shown a screen showing GPS speed, time and the safety status buttons (OK/SOS). The device should immediately start transmitting tracking data to the event organiser application, but only ever transmit tracking data while the tracking function is active.
No extra information that the system might hold about the rally, i.e. the stage polyline, should ever be displayed to the competitor in any user interface.

5.2.4. Allow competitors to receive the Red Flag

Competitors who are sent a red flag should immediately see their user interface change to show the red flag. The recommended UI is a red background with white text saying "RED FLAG". An audible warning should also be used to alert the user to the red flag. The user interface must still allow competitors who have received a red flag to send safety updates (OK/SOS) and must not interfere with the normal tracking operation of the system.

5.2.5. OK/SOS activation

The competitor should be able to activate the OK/SOS safety buttons at any time. The buttons should be prominent, coloured for status (green for OK, red for SOS) and be clearly labelled. They must be able to change their safety status from any state to any state at any time.

Each option (OK/SOS) has sub-states that can be selected after choosing that option. They are:

- OK
  - OK – Road Clear
  - OK – Road Blocked
- SOS
  - SOS – Fire
  - SOS – Medical

The sub-states give race control a lot more information about the appropriate safety response for each incident. If the competitor selects only the main state (OK/SOS) without activating a sub-state, this information should still be transmitted to race control.
The SOS button should require confirmation through a long-press (3 seconds to activate), while the UI should update to show the progress to the competitor, through use of a circular progress bar around the button or similar.

Upon activation of any safety state, the user interface should update to display prominently that a safety alert is being sent, and an audible warning should be used to alert the competitor (in case of a mis-press of a button). The UI should prominently display either that the alert has been sent successfully, or, if there is no network connection, that the alert is not being received by race control and an indicator of what the system is doing (e,g. retrying sending in 15s).

If there is no network connection the system must try to re-transmit the message; the maximum time between connection attempts should be 30s, and the system should try and re-transmit until either 30 minutes has passed or the safety alert has been de-activated by the crew.

5.2.6. Provide a basic tutorial for competitors to understand how the application operates and how to activate the safety features

The competitor should be able to view a basic tutorial/read basic documentation on the system, inside the mobile application. The documentation/tutorial should be thorough enough that they can quickly learn the basics, without overwhelming them with details.

6. Non-Functional Specification

6.1. Simple / Intuitive

As the applications are designed for wide audiences of varying technical levels, simplicity and intuition must be at the heart of the design. User interface elements should be used where appropriate to guide users in the right direction or offer small bits of help where necessary.

6.2. Internationalisation

Both applications should be designed for internationalisation, with the default language being based on the users' operating system choices, and options to manually switch language. However, no

standard rallying terminology should be translated i.e. Parc Fermé should not be translated. Text based information should be kept to a minimum in favour of standard user interface and rally symbols where appropriate.

6.3. Performance

Both applications must be performant on lower-level current devices and mid-level older devices.

6.4. Regulation Compliance

Both applications must be compliant with any and all applicable personal data protection laws and regulations. It is however specified that the FIA will not evaluate such compliance.

7. Future Work

7.1. Automatic stage recognition

A logical future extension to the system would be for it to be able to automatically detect when it is on a live special stage. The event itinerary, polylines and sensor data can all be combined to give a high degree of accuracy when detecting on stage/on liaison status.

However, it is recognised that this functionality requires very accurate GPS points, which are not always available in a timely manner from rally organisers, and that last minute or mid-rally course changes can cause inconsistencies with system operation. Great care must be taken when choosing this option to prevent tracking/safety options not being available to the crew when they racing.

7.2. Allow event marshals / spectators access to tracking

It is possible in the future that tracking access could be opened up to event marshals/spectators by use of a public facing application. Care would have to be taken to ensure no sensitive data is leaked, like safety statuses or speed while not on stage.

7.3. Safety POI's/Polylines visible to crew

A future extension to the system envisages the competition UI extended to show the crew the locations of nearby stage polylines/POI's, after activating OK/SOS. This allows them to realise, for example, that an SOS point is only a few hundred metres around the next corner.