Enabling unified passenger information thanks to a single, open software solution

White paper summary

1. PaxLife Innovations

PaxLife Innovations GmbH is a young company which, thanks to its experience in the air transport industry, has specialized in offering innovations in the interface with the passenger.

All solutions have as a standard feature that the passenger interface can always be configured at a central point of a transport company - while getting executed autonomously on a large number of clients (or local nodes) without further modification and adaptation.

These passenger-oriented functionalities are completely represented in software and can holistically be used and operated across any fleet on trains, buses, trams, underground trains as well as on fixed information displays and information pillars at stations or stops, irrespective of actual target hardware.

Overview paxCMS

paxCMS is an open software platform for transport operators to manage flexibly and in an autonomous way across the entire fleet passenger information regardless of the vehicle and equipment specifics. paxCMS enables real-time travel information to be easily combined with infotainment, including dynamic data such as news, weather, commercials…and content and information to be designed and delivered in a consistent way, whatever the output equipment, whether on board vehicles, in stations or on the passenger's smartphone.

With paxCMS, thanks to the equipment abstraction layer that the solution provides, transport operators of rail and public transit can take advantage of software innovations to make them available on their fleet of vehicles no matter which mode of transport and equipment. They can easily offer a high-performance, regularly updated information service that meets passenger expectations and needs.

paxCMS solution is currently being deployed in the Berlin transport system and in South Tyrol, with further projects in the process of finalization.

2. Context

Efficient passenger information provides the right information at the right time and in the right place, in a consistent format, whether on board vehicles, in stations or on passengers' smartphones. It's a service that plays a crucial role in ensuring a smooth and enjoyable travel experience, passenger satisfaction and, consequently, growth in the operator's business and image.

But until now, providing a performing passenger information is extremely challenging for transport operators. Managing fleets of screens or information channels across various vehicles and multiple equipment suppliers has been a source of technical complexity, increased effort, and cost; each vendor is supporting its own solutions; systems are organized in silos and the systems implemented are strongly tied to hardware specifications and vendors.
These locked relationships and combinations of software and hardware islands considerably hamper the consistency, accuracy and speed of information provided to passengers.

3. The paxCMS solution approach

To meet this challenge and enable transport operators to benefit from market innovations in software for their vehicle fleets - hardware generally remains unchanged for many years - PaxLife Innovations has designed a flexible, open and entirely equipment-independent software solution for passenger information.
paxCMS is a single software platform that allows transport operators to easily design and flexibly manage the passenger information in an open fashion, across ANY equipment or vehicles´ fleet.

Decoupling software from hardware specifications

On board vehicles or other locally installed systems "at the edge", paxCMS includes an hosting environment (a runtime - the raiSTACK) that provides an abstraction layer to any hardware, through a simple, open interface (API). This means that the Passenger Information System, Passenger Audio System, or just the output element of a PIS or a PAS (optical and audio display) can be adjusted remotely in the Cloud, but is "hosted" onboard of the vehicles. Thus the passenger information solution paxCMS does not make any difference anymore between the display hardware installed onboard, or even whether the passenger information is running onboard a train, a bus, a tram or at a station.

This layer of abstraction provided by paxCMS offers transport operators the possibility, via a single software package, of unifying very easily and autonomously the management of all passenger information distribution channels, whatever the specific characteristics of the equipment and the suppliers, existing or future.

## Edge-hosting architecture for more applications, services and benefits

In addition, the hosting environment enables transport operators to freely deploy, manage and host onboard any additional software (applications) that can run on existing vehicles or other locally installed systems "at the edge". All passenger-related functions are then orchestrated as a single software service. This shortens innovation cycles, deployment to market is faster, while it significantly reduces the equipment lifecycle cost. Regular updates of software solutions and operating systems guarantee a constant flow of innovations, continuous improvement and thus overall better results. Finally, the paxCMS edge hosting architecture brings reliability to environments where peripheral equipment is irregularly connected to the Internet.
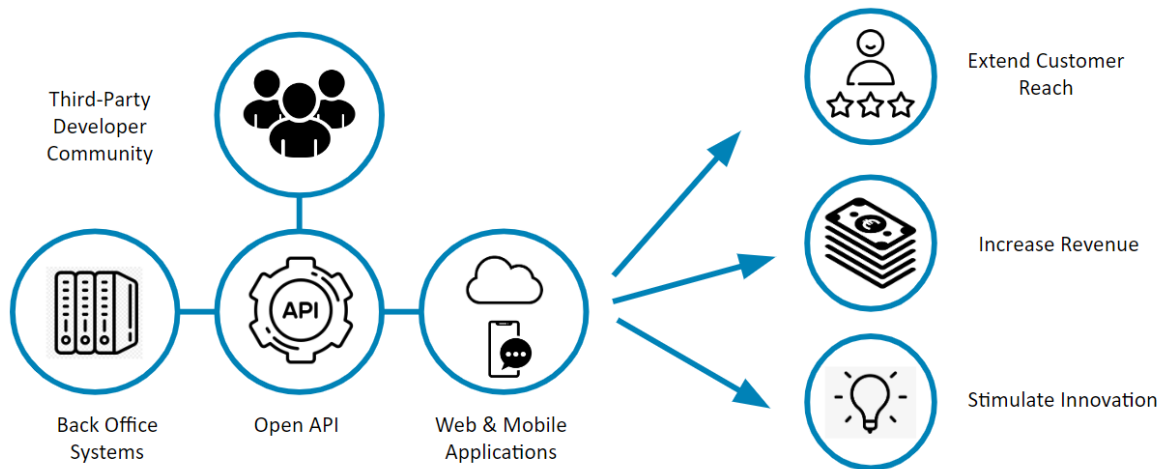
A centralized software editor for unified design of playlists and page layouts

Also, paxCMS includes a powerful editor tool for transport operators to further simplify the building of the passenger information system, in a centralized fashion and without programming knowledge required.

PaxLife enables operators to easily design, maintain and flexibly update the paxCMS user-friendly interface while integrating software or dynamic links to other systems (news, weather, advertising content platforms, etc.) into the developed playlists; paxCMS can also manage media content subject to specific rules (such as a geographical reference, limited time validity, etc.).

Operators can thus offer a high-performance and regularly updated service that meets passenger expectations.
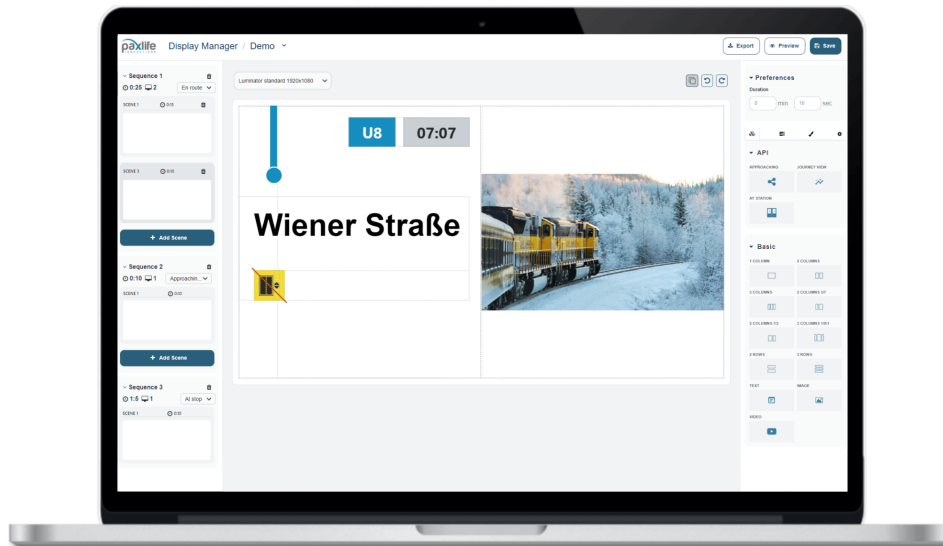

Thanks to the system's multi-client capability, it is even possible to allocate different levels of responsibility for the management of certain parts of the content and/or certain sub-areas of operation, depending on the customer, for example, adapted to local operating licenses or specific to the different skills within the organization.

Data flow

In general paxCMS interfaces to landside data hubs, such as DatNet from ETC Solutions GmbH for example, to receive the schedule information, updated schedules, disruption messages, and connecting traffic information. The necessary data is then regularly collected and preserved for the rest of the journey by the paxCMS system that is hosted onboard vehicles. Depending on the vehicle or fleet, it is possible to configure which sources are used for which data.

Finally, as indicated previously, the paxCMS solution supports optical (visual) as well as audio delivery. On the vehicles paxCMS usually interfaces to existing passenger information systems, and delivers to display screens or audio subsystems / speakers. In the extended version of the solution, paxCMS can also be operated as a 100% software-based Passenger Information System.

4. Summary of paxCMS main functions
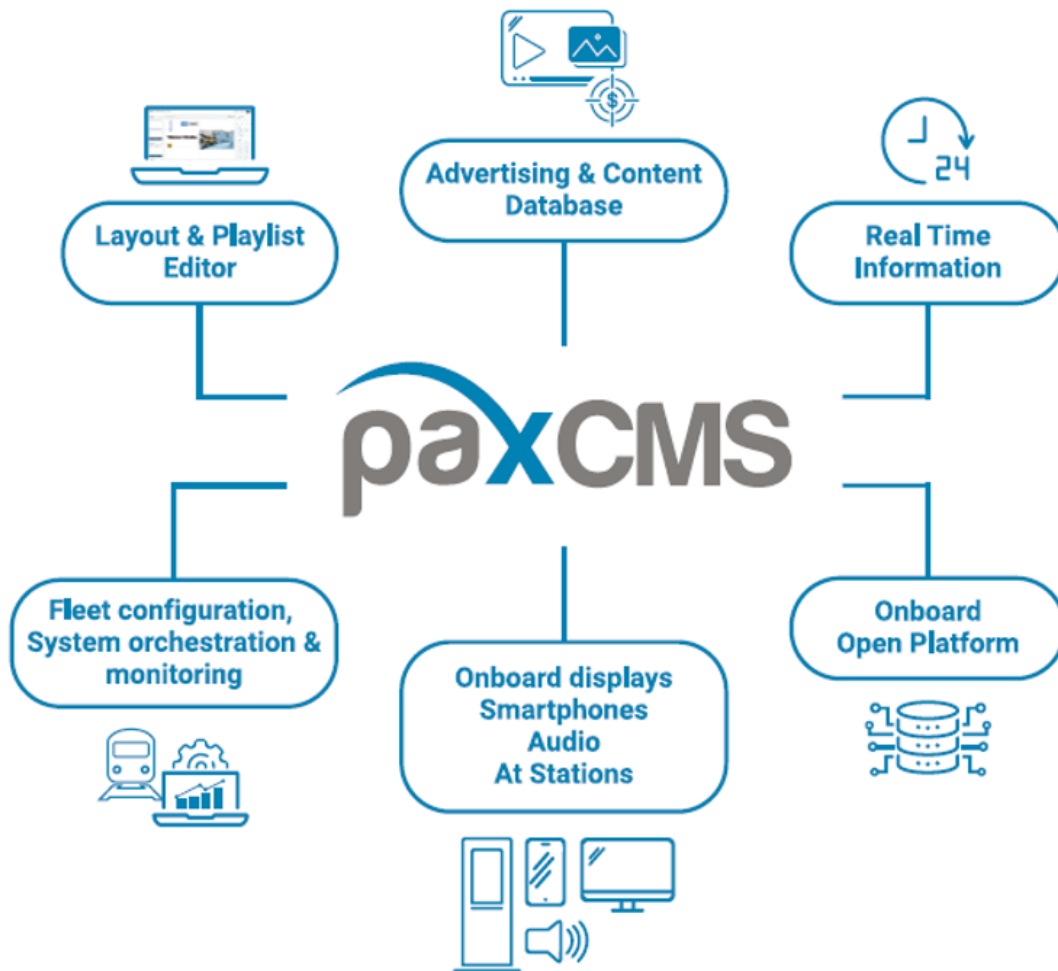
Scalability and protection of investments

The core idea behind paxCMS is to offer transport companies the possibility of producing using a single, easy-to-use software package to provide comprehensive passenger information at all points of contact with passengers.

The paxCMS architecture is therefore extremely flexible in terms of configuration and extension. The functionalities expected by a transport operator can be implemented on a global basis, providing full protection for the investments made in all projects, because:

- Future random changes to functional requirements can be implemented easily and, in many cases in-house,
- Depending on the potential evolution of passenger information towards even more dynamic information, it will be very easy to integrate fully dynamic data (e.g. integration of the availability of other mobility offers at stops, etc).
- Thanks to the integrated abstraction of the hardware, the solution can be used without new development, even if the hardware is divergent.