

FCB

Flexible Content Barcode



Barcodes in ticketing

Barcodes represent ticket data in machine-readable form. Because they can easily be printed on paper or displayed on a screen (smartphone), no special technology or hardware is required to host the data. This makes distribution of rail or other ticket data very simple – the customer who purchases the service does not need chip cards, e-tokens or secured CIT paper.

Barcodes exist either as one-dimensional versions, e.g. for tin cans in shops, or as 2D versions (QR code, Aztec, Datamatrix, etc.). 2D barcodes can hold much more data than 1D versions.

Barcodes are static once they are printed. They may also be dynamic when displayed on a screen (e.g. smartphone) as they can be regenerated using variable information. This significantly increases protection against copyfraud.

Barcodes are also very useful for occasional tickets: no extra hardware is needed and interoperability between operators can be organised easily as barcodes are standardised (e.g. Aztec open standard).

The most modern UIC standard in rail barcode ticketing is the Flexible Content Barcode (FCB) defined in UIC IRS 90918-9 and in Technical Document B12 of the EU TAP TSI.

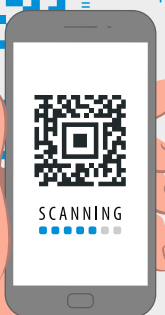
FCB – Flexible Content Barcode

The FCB standard is an Aztec barcode. It offers excellent error correction (the barcode can be scratched or folded), can hold a large volume of binary data and is available in many IT development tools both for creating and reading barcodes. Most of these IT tools are free of charge.

The FCB barcode holds all transport contracts in an open, unencrypted format. The data itself is signed using asymmetric signature algorithms, which guarantees a very high level of security and prevents counterfeiting.

These security algorithms are also a market standard and are included in many libraries of existing development software (Digital Signature Algorithm (DSA) and Elliptic Curve Digital Signature Algorithm (ECDSA)).

Various contracts (O/D tickets, pass tickets, city tickets, reservations, group tickets, ancillary services, customer cards, etc.) are defined in the FCB dataset. Different contracts may be combined, which means that multiple rail legs and passenger types (adults, children, dogs, etc.) can be stored in a single UIC FCB barcode.





The FCB standard defines both static and dynamic barcodes. Static barcodes can be issued on paper or on screen, while dynamic barcodes – which change every few seconds – can be displayed on screen only. A dynamic barcode is an excellent extra safeguard against copy fraud.

FCB is currently being deployed by railways in Europe as they make enhancements to their ticketing systems.

How is ticket security organised?

FCB can be used for Security in Data (SiD), Security in System (SiS) or a combination of both, as well as for check-in and check-out ticketing.

- SiD: all contract information is stored in the barcode. An online connection is not required. Protection against modification is obtained by creating a *secured hashcode* (a “signature”) from the data itself. Changes to the data will be detected as the signature will no longer correspond.
- SiS: the customer has a barcode containing only a reference (link) to the contract information on a server. All ticket checks, status changes etc. are performed using the data on the server. An online connection is needed to check tickets.
- SiD/SiS combined: the barcode holds the last known status of the contract in a secured manner. All changes are sent back from the control device to the server. This system does not need a permanent online connection to check tickets. The passenger may be required to create the SiD part when boarding, for example.

Signing is done by means of an asymmetric signature algorithm based on a key pair consisting of a public and a private key. The private key is used only by the issuing server for creating the signature, and the corresponding public key to check the signature can be found on the PKMW website hosted by UIC. This model ensures that all issuers can issue barcodes in a secure manner, with no requirement for a trust-based model between the issuer and the controller for signing or reading.

Dynamic barcodes can be used only for tickets presented on a (mobile) screen by the customer. They can be made by adding data to the barcode which changes over time by nature (e.g. timestamps, GPS coordinates, random numbers, challenge codes, etc.). The barcode must be generated when the ticket is checked.

The barcode has a defined structured header (DOSIPAS) enabling the standard signature algorithms – DSA and ECDSA - as well as other future algorithms.



What is needed to implement FCB?

The information on the passenger contract of transport (ticket data) itself is stored in a *data structure* defined in Abstract Syntax Notation One (ASN.1), a worldwide standardised interface description language. Many development tools can compile ASN.1 data structures.

Aztec, ASN.1 and DSA/ECDSA are all brand- and platform-independent and are open-source copyrighted. The tools and software are often integrated in existing development packages.

UIC provides the files and libraries needed to create the barcodes on GitHub, ready to be integrated in development projects.

FCB is defined in the standards of UIC (IRS 90918-9) and ERA (European Railway Agency), where it is part of the TAP/TSI regulation (B12). FCB is part of French standardised national ticketing, called “intercode” (ref. XP P99-405-6).

The FCB can be read with a smartphone or a tablet with a built-in camera. Specific extra hardware is not required.



The collaboration model – the FCB User Group (FCB UG)

A user group has been created at UIC. The members of the group are companies using the FCB as ticket issuers or Ticket Controlling Organisations (TCO). Companies developing FCB solutions are also welcome to join the group.

The members of the FCB user group share experiences of developing and using FCB. They can also exchange test barcodes to check whether content is being interpreted correctly.

The UIC FCB user group:

- has developed a neutral barcode reading tool for test and debugging purposes;

- has defined procedures for change requests, problem solving and test requests (exchange of test barcodes);
- maintains the GitHub libraries available to all companies using FCB;
- organises meetings to facilitate rapid response times; for organisational reasons, meetings are often held online. Subgroups are created for certain topics to enable prompt solutions for specific issues.

For more information on FCB, please contact Kurt De Vriendt at:

FCB@kurtdevriendt.com or email TSG@uic.org

