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Vehicle Occupancy Data in SIRI v2.1

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List of contents

1	Introduction	3
1.1	Background and Purpose	3
1.2	Status of this document	3
2	Occupancy in SIRI 2.0	4
2.1	Occupancy field	4
2.2	Boarding Activity	4
3	Occupancy in SIRI 2.1	5
3.1	Occupancy Concepts in SIRI 2.1	5
3.2	ProgressInfo	5
3.3	EstimatedCall and EstimatedVehicleJourney	6
3.4	Occupancies	7
3.5	Capacities	8

1 Introduction

1.1 Background and Purpose

- 1.1.1 The measurement of vehicle occupancy for buses in real time is not something that was carried out regularly or, was in widespread use in the UK until the onset of the COVID-19 pandemic.
- 1.1.2 Over the course of 2020, significant work was carried out and progress made, by suppliers and bus operators to introduce passenger counting solutions and present the information to passengers.
- 1.1.3 Advice was provided in RTIGT039 Providing Vehicle Occupancy Data:- Data Interfaces in May 2020.
- 1.1.4 At the same time, work was underway to produce the next iteration of the SIRI standard to address existing development requirements from the industry - two of which were capacity and occupancy data at a more detailed level than was possible in SIRI v2.0q. The new requirements that emerged from the pandemic were added.
- 1.1.5 The technical development of SIRI v2.1 was completed in March 2021 and the schema is available through <http://github.com/SIRI-CEN/SIRI> as the 'Integration' branch. This will in due course be published as the master. The supporting documentation will take some time to progress through the formal CEN release processes but at the time of writing, it is expected to be released during late 2021.
- 1.1.6 In advance of this, and because of the urgency of the requirements to support passenger use of public transport, this report has been produced detailing the changes to occupancy data in SIRI v2.1
- 1.1.7 Note: The document has been developed and written during the COVID-19 pandemic. As such, some comments and discussion are specifically relevant in that context.

1.2 Status of this document

- 1.2.1 This document is Published.
- 1.2.2 If there are any comments or feedback arising from the review or use of the document, please contact us at secretariat@rtig.org.uk.

2 Occupancy in SIRI 2.0

2.1 Occupancy field

- 2.1.1 The SIRI structure for occupancy in v 2.0 and in previous versions has remained consistent since its inception. It is in widespread use in Europe and beyond and will continue to be supported.
- 2.1.2 The Occupancy field in SIRI is one of the optional properties of ProgressInfo of a MonitoredVehicleJourney. This element can be used in both SIRI-SM and SIRI-VM services.
- 2.1.3 There is, in addition, an Occupancy field in the EstimatedCall structure of the SIRI-ET service. If this is populated, it represents a predicted passenger load. If the corresponding field is filled in a MonitoredVehicleJourney, this should be used in preference - as it reflects the actual current passenger occupancy value.
- 2.1.4 The allowed values for Occupancy are limited to:

VALUE	DESCRIPTION
<i>full</i>	Service is full.
<i>standingAvailable</i>	Standing space is available.
<i>seatsAvailable</i>	Seats are available.

- 2.1.5 If this element is omitted occupancy is not known.

2.2 Boarding Activity

- 2.2.1 If a vehicle is determined to be full - measured against either the designed or safe capacity, then it may be appropriate to not allow further passengers to board the vehicle until some existing passengers have alighted.
- 2.2.2 This can be achieved using DepartureBoardingActivity in the MonitoredCall element of SIRI-ET AND SIRI-SM; or MonitoredVehicleJourney in SIRI-SM and SIRI-VM.
- 2.2.3 In this case, DepartureBoardingActivity should be set to 'noBoarding'.
- 2.2.4 One consideration if using this approach, is the overall latency of data from the decision to set DepartureBoardingActivity to 'noBoarding' - to when a customer will be informed through any channel; and the likelihood of sufficient passengers having alighted to enable additional passengers to board during this time.

3 Occupancy in SIRI 2.1

3.1 Occupancy Concepts in SIRI 2.1

3.1.1 With the introduction of SIRI 2.1, there are three ways to represent vehicle occupancy:

- Occupancy as part of ProgressInfo of a MonitoredVehicleJourney. This element can be used in both SIRI-SM and SIRI-VM services and provides a way to provide a high-level overview of current occupancy.
- Occupancy in the EstimatedCall and EstimatedVehicleJourney structures of the SIRI-ET service. If this is populated, it represents a predicted passenger load. If the corresponding field is filled in a MonitoredVehicleJourney, this should be used in preference - as it reflects the actual current passenger occupancy value.
- Occupancies can also be specified in more detail for the departure on CALL level down to carriage level for compound vehicles such as Trams or Trains. This is supported as part of SIRI ET and SIRI SM

3.1.2 In addition to Occupancies, capacities can also be specified in more detail for the departure on CALL level down to carriage level for compound vehicles such as Trams or Trains. This is supported as part of SIRI ET and SIRI SM.

3.2 ProgressInfo

3.2.1 Starting with SIRI v2.1, the number of allowed enumerated values for Occupancy has been increased from the original three values to ten, which for compatibility reasons, includes the original three which appear first in the list of enumerations:

VALUE	DESCRIPTION
<i>full</i>	Service is full.
<i>standingAvailable</i>	Standing space is available.
<i>seatsAvailable</i>	Seats are available.
<i>unknown</i>	Occupancy is unknown.

<i>empty</i>	The vehicle is considered empty by most measures, and has few or no passengers onboard, but is still accepting passengers.
<i>manySeatsAvailable</i>	The vehicle has a large percentage of seats available. What percentage of free seats out of the total seats available is to be considered large enough to fall into this category is determined at the discretion of the producer.
<i>fewSeatsAvailable</i>	The vehicle has a small percentage of seats available. What percentage of free seats out of the total seats available is to be considered small enough to fall into this category is determined at the discretion of the producer.
<i>standingRoomOnly</i>	The vehicle can currently accommodate only standing passengers.
<i>crushedStanding-RoomOnly</i>	The vehicle can currently accommodate only standing passengers and has limited space for them.
<i>notAccepting-Passengers</i>	The vehicle cannot accept passengers.

3.2.2 The additional enumerations provide compatibility with the GTFS-RT OccupancyStatus field.

3.3 EstimatedCall and EstimatedVehicleJourney

3.3.1 If either the Occupancy field in the EstimatedCall or EstimatedVehicleJourney structures are filled, this represents a predicted passenger load. If the corresponding field is filled in a MonitoredVehicleJourney, this overwrites the last current passenger occupancy value.

3.3.2 The enumerated values are the same as described in ProgressInfo.

3.4 Occupancies

- 3.4.1 A new enhanced structure of occupancy and capacity data has been introduced in SIRI v2.1; and is part of the RecordedCall and MonitoredStopDepartureStatusGroup structures.
- 3.4.2 This is a complex structure and can be used as part of the new compound vehicle structures to allow for data to be collected at a carriage level. In addition, in the case where alighting/boarding data from an automatic passenger counting system is available, the respective vehicle entrances may be referenced.
- 3.4.3 The new structure allows for the recording of a wide range of different occupancy data: including by FareClass, age and special seating.
- 3.4.4 In the event that booking of seats is required for some or all seating, this is supported through the concept of reservations including group reservations.

Recorded-Departure-Occupancy	0:*	+Structure	Real-time occupancies of a VEHICLE and reservations after departing from a given stop. +SIRI v2.1 Could be feedback from an automatic passenger counting system (APC) or estimated values from statistics.
...	0:1	TrainFormation-ReferenceGroup	See SIRI Part 2 TrainFormationReferenceGroup .
FareClass	0:1	FareClass-Enumeration	Fare class in VEHICLE for which occupancy or capacities are specified.
Passenger-Category	0:1	NLString	Adult, child, wheelchair etc.
Occupancy-Level	0:1	Occupancy-Enumeration	An approximate figure of how occupied the journey is across all of its stops, e.g., 'manySeatsAvailable' or 'standingRoomOnly'. If omitted: Passenger load is unknown. <i>full seatsAvailable standingAvailable unknown empty manySeatsAvailable fewSeatsAvailable standingRoomOnly crushedStandingRoomOnly notAcceptingPassengers</i> More accurate data can be provided by the individual occupancies or capacities below.
Occupancy-Percentage	0:1	PercentageType	Utilised percentage of maximum payload after departing the SCHEDULED STOP POINT.
AlightingCount	0:1	NumberOf-Passengers	Total number of alighting passengers for this vehicle journey at this SCHEDULED STOP POINT.
Boarding-Count	0:1	NumberOf-Passengers	Total number of boarding passengers for this vehicle journey at this SCHEDULED STOP POINT.
OnboardCount	0:1	NumberOf-Passengers	Total number of passengers on-board after departing the SCHEDULED STOP POINT.

	SpecialPlaces-Occupied	0:1	<i>NumberOf-Passengers</i>	Total number of special places, e.g., seats for the disabled or lounge seats, that are occupied after departing the SCHEDULED STOP POINT.
	Pushchairs-OnboardCount	0:1	<i>NumberOf-Passengers</i>	Total number of pushchairs on-board after departing the SCHEDULED STOP POINT.
	Wheelchairs-OnboardCount	0:1	<i>NumberOf-Passengers</i>	Total number of wheelchairs on-board after departing the SCHEDULED STOP POINT.
	Prams-OnboardCount	0:1	<i>xsd:non-NegativeInteger</i>	Total number of prams on-board after departing the SCHEDULED STOP POINT.
	Bicycle-OnboardCount	0:1	<i>xsd:non-NegativeInteger</i>	Total number of bicycles on-board, i.e., number of bicycle racks that are occupied after departing the SCHEDULED STOP POINT.
	TotalNumber-OfReserved-Seats	0:1	<i>NumberOf-Passengers</i>	Total number of booked seats from individual and group reservations.
	Group-Reservation	0:*	<i>+Structure</i>	Used to specify that a travel group has booked a section of the vehicle for a part of the journey, and if so under what name. +SIRI v2.1
	NameOf-Group	1:1	<i>NLString</i>	Name for which the travel group has made the reservation.
	NumberOf-Reserved-Seats	1:1	<i>NumberOf-Passengers</i>	Number of seats that the group has booked.

3.5 Capacities

- 3.5.1 A new structure of Capacities has been introduced in SIRI v2.1; and is part of the RecordedCall and MonitoredStopDepartureStatusGroup structures.
- 3.5.2 This is a complex structure and as with Occupancies (see 3.4.2), can be used as part of the new compound vehicle structures to allow for data to be collected at a carriage level.
- 3.5.3 The new structure allows for the recording of a wide range of different capacity data, for example by FareClass and Wheelchair.
- 3.5.4 NeTEx format includes PassengerCapacity as part of the VehicleType and has a structure that allows for detail - including seated and standing capacities, to be handled.
- 3.5.5 RecordedDepartureCapacities is an important enhancement to SIRI as, in the context of shifting social distancing rules which change vehicles' prescribed capacities during the pandemic, it will be necessary to determine capacity in a more dynamic manner than that supported by NeTEx.

Recorded-Departure-Capacities	0:*	+Structure	Recorded capacities of a VEHICLE after departing from a given stop. Alternative way to communicate occupancy measurements. +SIRI v2.1
...	0:1	<i>TrainFormation-ReferenceGroup</i>	See SIRI Part 2 TrainFormationReferenceGroup .
FareClass	0:1	<i>FareClass-Enumeration</i>	Fare class in VEHICLE for which occupancy or capacities are specified.
Passenger-Category	0:1	<i>NLString</i>	Adult, child, wheelchair etc.
TotalCapacity	0:1	<i>NumberOf-Passengers</i>	The total capacity of the vehicle in number of passengers.
Seating-Capacity	0:1	<i>NumberOf-Passengers</i>	The seating capacity of the vehicle in number of passengers.
Standing-Capacity	0:1	<i>NumberOf-Passengers</i>	The standing capacity of the vehicle in number of passengers.
SpecialPlace-Capacity	0:1	<i>NumberOf-Passengers</i>	The number of special places on the vehicle, e.g. seats for the disabled or lounge seats.
Pushchair-Capacity	0:1	<i>NumberOf-Passengers</i>	The number of push chair places on the vehicle.
Wheelchair-PlaceCapacity	0:1	<i>NumberOf-Passengers</i>	The number of wheelchair places on the vehicle.
PramPlace-Capacity	0:1	<i>xsd:nonnegative-Integer</i>	The number of places on the vehicle that are suitable for prams.
BicycleRack-Capacity	0:1	<i>xsd:nonnegative-Integer</i>	The number of bicycle racks on the vehicle.