SMART Wayfinding Specification

Leveraging Innovative Technology to Develop the SMART Wayfinding Specification to Facilitate Independent Use of Public Transit by People with Cognitive Disabilities

www.its.dot.gov/index.htm

Final Report – February 28, 2019

Publication Number FHWA-JPO-19-772

U.S. Department of Transportation

Produced by AbleLink Smart Living Technologies, LLC
U.S. Department of Transportation
Office of the Assistant Secretary for Research and Technology
Intelligent Transportation Systems
Joint Program Office

Notice

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
FHWA-JPO-19-772		(Delete and insert information here or leave blank)

4. Title and Subtitle	5. Report Date
SMART Wayfinding Specification Leveraging Innovative Technology to Develop the SMART Wayfinding Specification to Facilitate Independent Use of Public Transit by Individuals with Cognitive Disabilities	February 28, 2019 **6. Performing Organization Code**
7. Author(s) Daniel K. Davies Steven E. Stock	**8. Performing Organization Report No.**
9. Performing Organization Name and Address AbleLink Smart Living Technologies, LLC 6745 Rangewood Dr. Suite 210 Colorado Springs, CO 80918 719-592-0347	**10. Work Unit No. (TRAIS)** **11. Contract or Grant No.** DTFH611C00008
12. Sponsoring Agency Name and Address Federal Highway Administration PO Box 268865 Oklahoma City, OK 73126-8865	**13. Type of Report and Period Covered** **14. Sponsoring Agency Code**

15. Supplementary Notes

16. Abstract

The SMART Wayfinding Specification is provided as an open source application programming interface (API) and defacto standard for transportation related app developers to interface with new or existing travel related applications, with the goal of promoting increased independence in transportation for travelers with disabilities and others with special travel needs. This standard is being developed through support from the U.S. Department of Transportation's Accessible Transportation Technologies Research Initiative (ATTRI), a program of the Intelligent Transportation Systems (ITS) Joint Program Office. The foundation of the SMART Wayfinding Specification is built upon a transportation application initially developed by AbleLink Smart Living Technologies, LLC. that has been successfully used since 2010 to enable more independent travel for individuals with cognitive disabilities.

17. Keywords	18. Distribution Statement
technology, disability, transportation, independence, SMART, specification	

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
		54	

Form DOT F 1700.7 (8-72) **Reproduction of completed page authorized**

DOCUMENT CONTROL PANEL		
File Name:	SMART Wayfinding Specification	
File Location:		
Version Number:	1.0	
	Name	**Date**
Created By:	Daniel K. Davies	Initial version delivered: 4/27/2018
	AbleLink Smart Living Technologies, LLC	
Reviewed By:	NOBLIS	
Modified By:	Daniel K. Davies	Revision 1: 5/17/2018
	Daniel K. Davies	Revision 2: 2/28/2019
	Daniel K. Davies	Revision 3: 10/10/2019

Approved By:		

Acknowledgements

AbleLink would like to acknowledge the many individuals, agencies, universities and others who provided information, feedback, evaluation, and other support in pursuit of this project. We would specifically like to thank our field evaluation partners at ARCA, Black Hills Works, Ability Beyond, Horizons Unlimited, and Merakey, as well as the various members of the Project Steering Committee. Finally, AbleLink is appreciative of the support and guidance provided by Noblis in development of this report.

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Executive Summary

The SMART Wayfinding Specification is provided as an open source application programming interface (API) and defacto standard for transportation related app developers to interface with new or existing travel related applications, with the goal of promoting increased independence in transportation for travelers with disabilities and others with special travel needs. This standard is being developed through support from the U.S. Department of Transportation's Accessible Transportation Technologies Research Initiative (ATTRI), a program of the Intelligent Transportation Systems (ITS) Joint Program Office. The foundation of the SMART Wayfinding Specification is built upon a transportation application initially developed by AbleLink Smart Living Technologies, LLC. that has been successfully used since 2010 to enable more independent travel for individuals with cognitive disabilities. In collaboration with ATTRI, AbleLink has enhanced their previously proprietary language for presentation of route information and is making this route instruction language available as an open source route presentation protocol via the SMART Wayfinding Specification. SMART refers to Specialized Media for Assisting Route Travel, a new standardized approach for communicating travel instructions to individuals who can benefit from person-centered instructions designed to meet their specific information access needs. In the present context, a route is defined as a series of geolocation-based travel instructions which may include walking segments and segments where the traveler is using one or more modes of transportation to complete a full trip from a designated point of origin (e.g. the individual's front door) to a specific planned destination (e.g., the individual's employment location). A SMART Route consists of a set of electronic information and associated media files used to present geolocation-based prompts and instructions to travelers with disabilities that are using a SMART Ready wayfinding app to help them navigate from their starting location to a desired destination. The relationship of the media files and instructions contained in a SMART Route are described by a smart.json document which serves as the "control center" of the route instruction set.

Background

Specially designed methodologies are required to overcome cognitive limitations experienced by individuals with cognitive disabilities and others with limited ability to use mainstream travel tools to enable these individuals to independently travel by bus or other transportation vehicle to their destination without special assistance from others. Unique applications and tools have been created by AbleLink Technologies to use cloud-connected mobile technology, such as tablets or smartphones, to deliver accessible travel support instructions. These instructions can enable individuals to travel independently despite existing cognitive limitations or existing difficulty using mainstream travel systems.

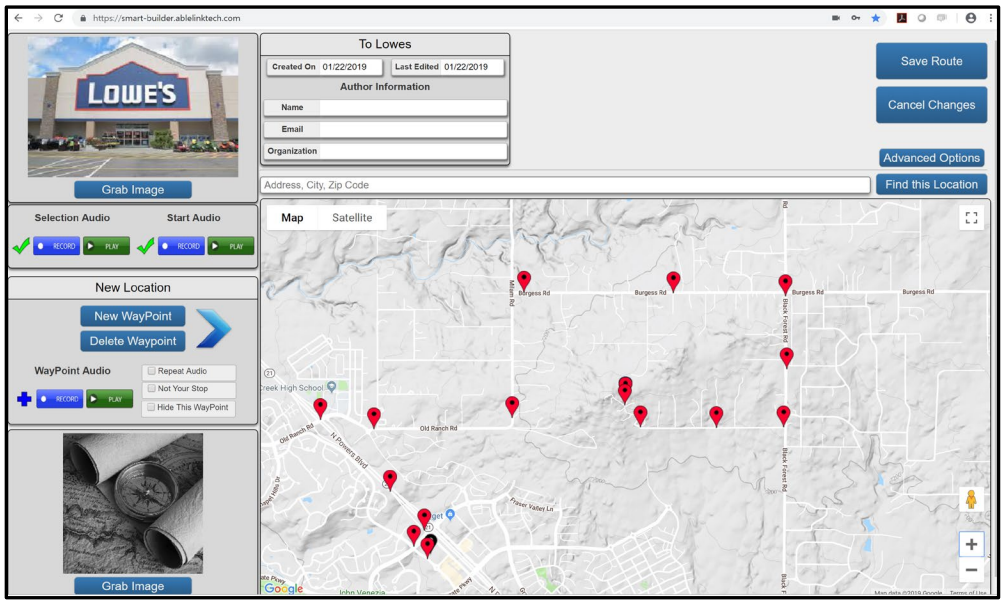
Based upon research, development, and commercial use of the WayFinder 3 App, AbleLink pioneered a technical approach which serves as the foundation for a standardized travel route protocol, called now the SMART Wayfinding Specification. The SMART Wayfinding Specification uses JAVA Script Object Notation (JSON), a cross-platform file structure, along with common format multimedia files to provide travel instructions in an accessible manner to travelers with special needs. This structure can facilitate creation, distribution, playback and sharing of travel instructions across organizations and across technology platforms. By using a simple and open language for storing instructional prompts and

structuring that data, the SMART protocol will be used by applications to deploy step-by-step travel instructions for individuals with cognitive and other disabilities to use public transportation. In addition, detailed walking or hiking instructions for health-focused individuals can be provided, as well as guided tour instructions in an accessible manner for visitors of outdoor attractions, such as National Parks, zoos or open-air museums. The destinations for which SMART travel routes can be used are only limited by the imagination of the route developer. The SMART Wayfinding Specification will provide a common language for travel applications and technologies so that the content can be created once and then utilized on multiple systems and platforms and easily shared with other individuals or organizations.

The SMART Ecosystem: Advanced Technologies for Building, Distributing and Utilizing SMART Routes

Several tools are being developed by AbleLink as part of ongoing ATTRI funded research and development projects to promote the adoption and use of the SMART Wayfinding Specification to facilitate travel independence for individuals with disabilities. This section provides a summary of these tools and how they fit within the SMART ecosystem.

SMART Route Builder--SMART Route Builder is a web-based application that can be used to create SMART compliant routes. These routes can then be contributed to a SMART Route Library and subsequently downloaded directly from the library to a SMART Ready wayfinding app. A SMART Ready wayfinding app is defined as a technology-based application that has been developed to interface with the SMART Wayfinding Specification for the purpose of facilitating transportation for an end user with or without special needs. Figure 1 depicts the "**new route**" screen in the SMART Route Builder application which is used to create a route, complete with instructions, pictures and audio which are used to provide accessible travel instructions at each key location along the route.



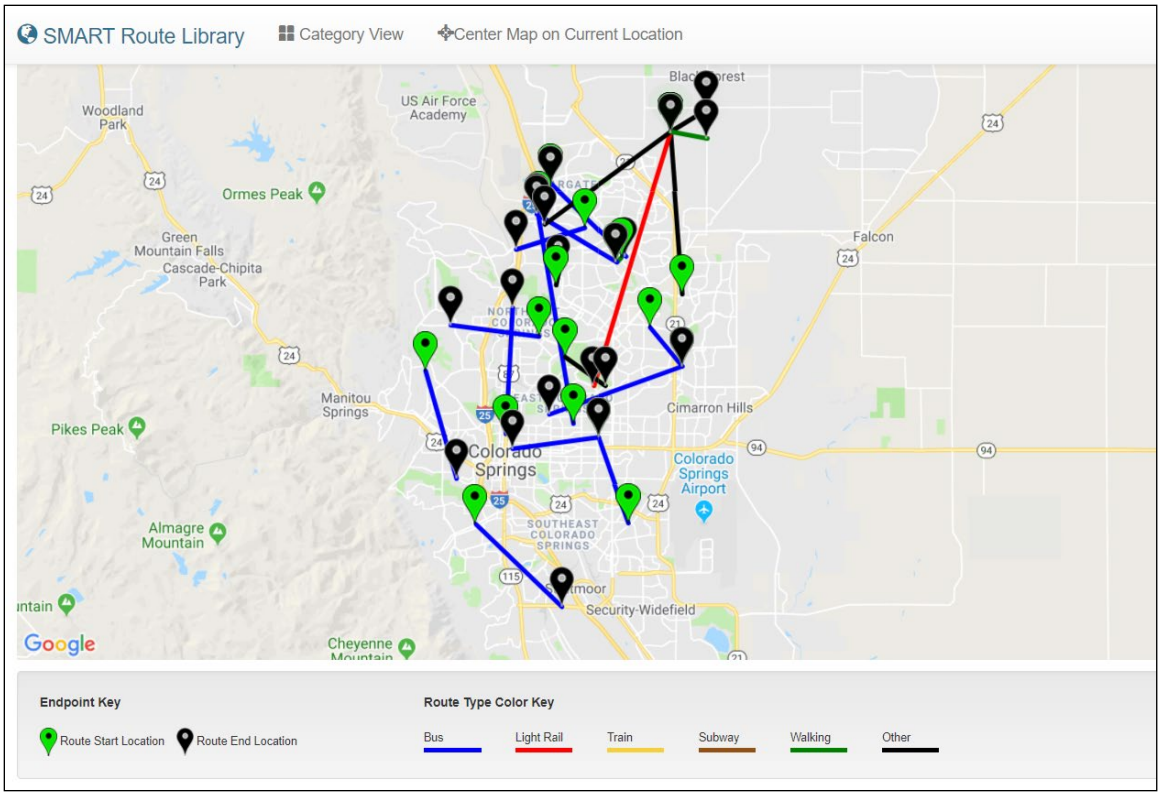
Source: AbleLink Smart Living Technologies, LLC, February 1, 2019

Figure 1: SMART Route Builder web-based program for creating SMART Routes

The web-based route building application will enable travel trainers or caregivers to create routes for planned destinations for specific individuals with disabilities that they are supporting regarding the individual's unique transportation needs. Routes are created by adding waypoint locations, assigning GPS coordinates to each key location on a designated route, adding pictures and recording custom audio cues, such as "Do not get off here, you need to wait until the next bus stop" or "This is the doctor's office, you can get off the bus when it stops." These cues can then be presented to individuals with special needs via a simplified interface on a SMART Ready wayfinding application that processes the information contained in the SMART Route. As the user arrives at each location along the route, the app can automatically present travel instructions using audible and visual information and prompts (along with physical vibration alerts) associated with each specific geolocation. This will allow caregivers to, not only program cues for target destinations, as well as provide the opportunity to anticipate points along the route where a mistake might be made and provide a pre-emptive cue (e.g., "Remember John, this is a different Starbuck's, so do not get off the bus here. Wait for your phone to tell when to get off the bus."). Digital pictures (which can be captured directly from a mobile device while editing a route or simply by selecting images available online when using SMART Route Builder to create routes) will be displayed along with the audio prompts to help identify landmarks at locations throughout the trip:

SMART Route Library--The SMART Route Library is a cloud-based service that will house SMART Routes for a specific geographic area covered by a transit agency. The routes are created with the SMART Route Builder system, or any route creation tool that is developed in accordance with the SMART Wayfinding Specification described in this document. Routes can then be contributed to a particular SMART Route Librar*y* to be shared with other individuals in the same geographic region. Figure 2 depicts an example of a SMART Route Library for Colorado Springs, Colorado, which shows a map containing various types of routes (bus, walking, light rail) which are color coded based on the type of route.

After a route has been created with a route creation application, such as SMART Route Builder, a user with administrative privileges can upload the route to a selected SMART Route Library. Once the route is uploaded, the SMART Route Library server application will open the route folder, condition all of the media contained in the route, and reassemble it. The reason for this step is to ensure media playback compliance across multiple platforms due to the difference of supported file formats from one mobile operating system to the next. Once the route is reassembled it will be categorized based on location and made available for download. Another user can then browse the SMART Route Library from his or her SMART Ready wayfinding app and select available routes in the user's specific geographic area. When the user finds a route for a destination he or she is wanting to travel to, the route can be downloaded to his or her smartphone or tablet using a SMART Ready application and used immediately to travel to the desired destination. Alternatively, the route instructions can be customized to meet the specific needs of a particular user, such as by adding in instructions for getting from the user's front door to a particular bus stop.



Source: AbleLink Smart Living Technologies, LLC, February 5, 2019

Figure 2: Cloud-based SMART Route Library for Colorado Springs

SMART Ready Mobile Wayfinding App--A SMART Ready mobile wayfinding app is an application that has been developed or enhanced to operate with SMART Routes and to use the information and instructions in the route to provide travel related support to users with special needs. The open API provided by the SMART Wayfinding Specification enables a wide array of applications to benefit from the SMART ecosystem and create and utilize routes. In addition, a SMART Ready wayfinding app can interface with a SMART Route Library to download routes which can then be used by users of a SMART Ready wayfinding app as needed to support specialized travel needs. The first SMART Ready app is AbleLink's WayFinder app (shown in Figure 3), has been modified to work with the SMART Wayfinding Specification as part of ATTRI research and development efforts.

WayFinder is an application that has been developed to support the specific travel needs of individuals with cognitive disabilities, a population that historically has underutilized fixed route transit, despite having a significant need with regards to more independent transportation. WayFinder operates on off-the-shelf Android and iOS smartphone and tablet devices and uses GPS and specialized visual, audio, and vibration prompts to allow individuals with cognitive disabilities to be able to use fixed route transportation independently. The enhanced WayFinder application uses the SMART Wayfinding Specification to present travel instructions to users with special needs. WayFinder can operate with new routes that are created with other SMART Wayfinding Specification compliant route building applications as they become available, as will any other SMART Ready wayfinding apps that emerge.

Source: AbleLink Smart Living Technologies, LLC, February 15, 2019

Figure 3: WayFinder, a SMART Ready App using the SMART Wayfinding Specification to Facilitate Independent Transportation

Chapter 1. SMART Wayfinding Specification – Data Dictionary

SMART JSON documents, for the sake of compatibility across multiple platforms, should be created as ASCII text. The naming convention for the documents is smart.json (lowercase smart, and lowercase json). On a SMART Ready wayfinding app, the smart.json file must reside in the same subdirectory as all of the route content. The route content may consist of images, audio files, and video files and the format of these files will be specific to the wayfinding app. Adherence to broad multimedia file standards such as JPG, PNG, WAV, MP3, MP4, or MOV is required.

The smart.json documents are divided into three main sections. These sections are referred to as **ROUTE**, **LOCATIONS**, and **CORRIDOR**. The **ROUTE** section includes all elements at the root level of the smart.json file. The ROUTE section is required, although not all elements of the ROUTE section are required. Each route will also contain a number of **LOCATIONS**. The **LOCATIONS** section is required and can include any number of locations based on the distance of the route and the specific instructions needed by the traveler to successfully complete the route. The **CORRIDOR** section is optional and is used when it is important to be able to detect when the traveler has exited the travel "corridor" and is thus "off route." A particular SMART Ready wayfinding app may then include functionality to provide assistance to the traveler to either help him or her return to the route, to notify an external party, such as a family member or other caregiver, or both. The basic organization of a smart.json document is as follows:

ROUTE SECTION

Route element

Route element

Route element

Route element

LOCATIONS SECTION

FIRST LOCATION

Location element

Location element

Location element

SECOND LOCATION

Location element

Location element

Location element

THIRD LOCATION

Location element

Location element

Location element

CORRIDOR SECTION (OPTIONAL)

Corridor element

Corridor element

The remainder of this document provides the data dictionary including a complete breakdown of each section of the SMART Wayfinding Specification, the fields, or *tags*, within each section, and a definition of the data type, specific values and examples of the required syntax for each tag.

SMART Routes – the smart.json document

Each smart.json document describes a single SMART Route. The top-level tags in the smart.json file comprise the ROUTE section. The ROUTE section tags are presented at the root level of the smart.json file (e.g. they are not a sub-section of another section). See Appendix A for a sample smart.json route file. Tags at the route level can be presented in any order. Therefore, the order of tags presented in this section is recommended, but not required. Only one collection of route tags (i.e., one ROUTE section per document) may exist in a valid smart.json document. Tags which are **required** are indicated in the data dictionary. Tags which are **not required** can either be included with an empty string for the value, or they can be omitted altogether. It is recommended that any non-required tags be included in the smart.json file for consistency, although this is not required. Each section of the data dictionary for a tag is described, below followed by a detailed description of each of the tags available for each of the three sections (**ROUTE**, **LOCATIONS**, **CORRIDOR**) of a smart.json document.

DESCRIPTION -- The description identifies the purpose of the respective SMART json tag in the specification.

TYPE -- The type value (string, integer, real number, etc.) identifies the data types used to identify valid values for the respective SMART json tag.

SPECIFIC VALUES -- This section describes the complete set of specific values that are expected for a tag, if specific values are expected.

DATASET UNIQUE -- True/ false value which identifies tags that must contain a value representing a *single distinct entity* within the relevant section of the smart.json file (ROUTE,

LOCATIONS, CORRIDOR). For example, if a route is assigned the ID **s86r902ki3851mk**, then no other route may use that route ID. Similarly, if a route includes the location ID of **location_120,** no other location ID within that same route.json file may contain the same location ID.

REQUIRED -- True/ false value indicating whether the tag is a required tag or not for the smart.json document. Many items in the SMART standard are provided as optional tags to allow for expansion of the system with additional functionality. The minimum fields that are required for every route are indicated by a “Yes” value. A “No” value indicates that a value is not required for the field for the route to be a valid SMART Route.

EXAMPLE -- Contains a specific example of the syntax used for each tag when the tag is used in the smart.json file. Tags that do not contain a value should include an empty string for the value. Ex. "routenotes": ""

Chapter 2. SMART Wayfinding Specification - Version 1.0

Route Section

smartVersion

Description: Field identifying the highest version of the smart.json standard that the current route is compatible with.

Type: String

Specific Values: n/a

Required: Yes

Example: `"smartVersion": "1.0"`

routeId

Description: Unique identifier for the route.

Type: String

Specific Values: n/a

Dataset Unique: Yes

Required: Yes

Example: `"routeId": "acda1fc0130b4f99f1e577bf822"`

routeTitle

Description: Descriptive title of the route.

Type: String

Specific Values: n/a

Dataset Unique: No

Required: Yes

Example: `"routeTitle": "Bus 25 - Center Mall to North Transfer Station"`

routeDescription

Description: Freeform text used to provide a more detailed description of the route than is provided in the title.

Type: String

Specific Values: n/a

Dataset Unique: No

Required: No

Example: `"routeDescription": "This is a short walking route in Black Forest Colorado."`

routeKeywords

Description: List of key words that may be used for route searches or categorization.

Type: Comma-delimited string

Specific Values: n/a

Dataset Unique: No

Required: No

Example: "routeKeywords" "exercise, park, recreation"

routeImage

Description: File name of the image that is used to represent the route.

Type: String

Specific Values: Valid file name

Dataset Unique: Yes

Required: No

Example: `"routeImage": "routeimage12345.png"`

routeAudio

Description: File name of the audio file used to describe the route. This audio is used to provide feedback to the user when selecting the route from within a SMART Ready wayfinding app.

Type: String

Specific Values: Valid file name

Dataset Unique: No

Required: No

Example: `"routeAudio": "route123.wav"`

instAudio

Description: File name of the audio file used to provide an initial instructional audio message after the route is selected.

Type: String

Specific Values: Valid file name

Dataset Unique: No

Required: No

Example: `"instAudio": "pressstarttobegin.wav"`

routeLat

Description: Numeric value representing the latitude of the starting position for the route.

Type: Real number

Specific Values: Valid latitude in signed degrees format (DDD.ddd). Specific values can range from -90 to 90.

Dataset Unique: No

Required: Yes

Example: `"routeLat": 38.963546`

routeLong

Description: Numeric value representing the longitude of the starting position for the route.

Type: Real number

Specific Values: Valid longitude in signed degrees format (DDD.ddd). Specific values can range from -180 to 180.

Dataset Unique: No

Required: Yes

Example: `"routeLong": -104.79514966667`

dateCreated

Description: Creation date for the route.

Type: Integer

Specific Values: Valid epoch date value, which represents the number of seconds that have elapsed since January 1, 1970.

Dataset Unique: No

Required: Yes

Example: `"dateCreated": 1522562400`

dateLastEdited

Description: Last edit date for the route.

Type: Integer

Specific Values: Valid epoch date value, which represents the number of seconds that have elapsed since January 1, 1970.

Dataset Unique: No

Required: No

Example: `"dateLastEdited": 1525154399`

routeNotes

Description: Freeform text containing any additional information the route author may want to include with the route.

Type: String

Specific Values: n/a

Dataset Unique: No

Example: `"routeNotes": "Route expected to be revised when north west corridor of I-485 is expanded in coming years."`

routeType

Description: Text description of the type(s) of travel included in the route, used in the SMART Route Library to identify the route type.

Type: Comma-delimited string

Specific Values: autonomous vehicle, bus, bike, cable car, ferry, funicular, gondola, light rail, metro, rail, ride share, streetcar, subway, tram, walking, other

Dataset Unique: No

Required: No

Example: `"routeType": "walking, bus"`

destinationType

Description: Text description of the type of destination for the route, used for reporting/ data tracking.

Type: String

Specific Values: n/a

Dataset Unique: No

Required: No

Example: `"destinationType": "work"`

travelTime

Description: Numeric value representing the expected travel time for the route in minutes. This value may also be used for reporting/ data tracking.

Type: Integer

Specific Values: n/a

Dataset Unique: No

Required: No

Example: `"travelTime": "28"`

travelDistance

Description: Numeric value representing the expected travel distance for the route. This value may also be used for reporting/ data tracking. Distance values may be in miles or kilometers, based on the system used in the local area.

Type: Integer

Specific Values: n/a

Dataset Unique: No

Required: No

Example: `"travelDistance": "7"`

nextAction

Description: Text value which can be used to define a subsequent action to be initiated by an external process at the completion of the route.

Type: String

Specific Values: n/a

Dataset Unique: No

Required: No

Example: `"nextAction": "visualimpact"`

nextActionParameter

Description: Text value which can be used to initiate a subsequent action by an external process at the completion of the route. Typically used to provide one or more parameters to the action identified in **nextAction**.

Type: Comma-delimited string

Specific Values: n/a

Dataset Unique: No

Required: No

Example: `"nextActionParameter": "tlwmp3k78kn29xu34l981,Peak Vision Office"`

nextRoute

Description: Text value containing the ID of a SMART Route which can be used to continue a trip to the next leg of the journey.

Type: String

Specific Values: n/a

Dataset Unique: No

Required: No

Example: `"nextRoute": "830b4cf72f0baf1c35e58c8e84372ae7"`

authorName

Description: Text containing the author's name that created the route.

Type: String

Specific Values: n/a

Dataset Unique: No

Required: No

Example: `"authorName": "Mary Jones"`

authorOrg

Description: Text containing the organization or company of the route author.

Type: String

Specific Values: n/a

Dataset Unique: No

Required: No

Example: `"authorOrg": "AbleLink Smart Living Technologies, LLC"`

authorEmail

Description: Text containing the author's email address.

Type: String

Specific Values: n/a

Dataset Unique: No

Required: No

Example: `"authorEmail": "routecreator@ablelinktech.com"`

authorUrl

Description: Text containing the author's web address.

Type: String

Specific Values: n/a

Dataset Unique: No

Required: No

Example: `"authorUrl": "www.ablelinktech.com"`

routeLibraryName

Description: Text containing the name of the SMART Route Library for the route.

Type: String

Specific Values: n/a

Dataset Unique: No

Required: No

Example: `"routeLibraryName": "SMART Route Library – Mountain Metro Transit"`

routeLibraryUrl

Description: Text containing the URL of the SMART Route Library for the route.

Type: String

Specific Values: n/a

Dataset Unique: No

Required: No

Example: `"routeLibraryUrl": "http://coloradosprings-smart.ablelinktech.com"`

gtfsAgencyId

Description: Text containing the General Transit Feed Specification (gtfs) agency id for a relevant transit agency for routes that correspond with a specific geographic area. This value is provided as a cross-reference and corresponds with the **agency_id** tag which is identified in the GTFS **agency.txt** file specification.

Type: String

Specific Values: n/a

Dataset Unique: No

Required: No

Example: `"gtfsAgencyId": "627-colospgs"`

gtfsAgencyName

Description: Text containing the General Transit Feed Specification (gtfs) agency name for a relevant transit agency for routes that correspond with a specific geographic area. This value is provided as a cross-reference and corresponds with the **agencyName** tag which is identified in the GTFS **agency.txt** file specification.

Type: String

Specific Values: n/a

Dataset Unique: No

Required: No

Example: `"gtfsAgencyName": "Mountain Metro Transit"`

virtualVideo

Description: This value represents the video soure file used to present a trip virtualization scenario to provide pre-trip orientation to a traveler. The **virtualTargetPoint** tag described in the next section defines the elapsed-time values for corresponding locations in relation to the playback of the identified virtual video.

Type: Integer

Specific Values: n/a

Dataset Unique: No

Required: No

Example: `"virtualVideo": "Bus 25 – route video.mp4".`

Locations Section

A SMART Route will typically contain multiple locations, each of which can be used to present instructions to the traveler through the user interface of the SMART Ready wayfinding app. The LOCATIONS section is placed subordinate to the ROUTE section of the document. Locations must be presented in sequential

order within the LOCATIONS section, with the first location that will be arrived at listed first and each subsequent location listed in sequential order up to the final location (destination). Please refer to the sample SMART Route file included in Appendix A, which illustrates how each of the locations are differentiated from one another in the smart.json file. There is no hard limit to the number of locations within a LOCATIONS section of the smart.json document. However, each smart.json document must contain only one collection of locations embodied in a single LOCATIONS section within the file. Each of the tags that comprise a single unique location within the LOCATIONS section are described below. Together these tags represent a single location.

locationId

Description: Unique identifier for the specific location within the route.

Type: String

Specific Values: n/a

Dataset Unique: Yes

Required: Yes

Example: `"locationId": "1507827232"`

locationName

Description: Descriptive name of the specific location.

Type: String

Specific Values: n/a

Dataset Unique: No

Required: Yes

Example: `"locationName": "Downtown bus stop near work"`

locationDescription

Description: Detailed description of the specific location which can be optionally displayed along with the locationName to provide additional textual information for users needed textual presentations of travel instructions.

Type: String

Specific Values: n/a

Dataset Unique: No

Required: No

Example: `"locationDescription": "You are at Old Farm Road now and about half way to your bus stop. Remember to begin putting away anything you have taken out of your backpack in a few minutes."`

locationImage

Description: File name of the image that is used to represent the specific location.

Type: String

Specific Values: Valid file name

Dataset Unique: No

Required: No

Example: `"locationImage": "locationimage12345.png"`

locationAudio

Description: File name of the audio file used to present audible information and/or directions at the specific location.

Type: String

Specific Values: Valid file name

Dataset Unique: No

Required: No

Example: `"locationAudio": "loc_7893.wav"`

geolocationSource

Description: Describes the source data type for the geolocation information for the current specific location.

Type: String

Specific Values: n/a

Dataset Unique: No

Required: No

Example: `"geolocationSource": "gps"`

geolocationTriggerPoint

Description: Field designed to provide identification of a trigger point for prompts based on non-GPS location data, such as an internal building location marked with a RFID tag.

Type: Comma-delimited string

Specific Values: n/a

Dataset Unique: No

Required: No

Example: `"geolocationTriggerPoint": "2812,second floor office"`

locationLat

Description: Numeric value representing the latitude of the current specific location.

Type: Real number

Specific Values: Valid latitude in signed degrees format (DDD.ddd). Specific values can range from -90 to 90.

Dataset Unique: No

Required: No

Example: `"locationLat": 36.067526`

locationLong

Description: Numeric value representing the longitude of the current specific location.

Type: Real number

Specific Values: Valid longitude in signed degrees format (DDD.ddd). Specific values can range from -180 to 180.

Dataset Unique: No

Required: No

Example: `"locationLong": -104.845149625467`

locationAccuracy

Description: Numeric value representing the relative GPS signal strength when geolocation coordinates were captured for the specific location, if applicable. A value of 9 indicates the maximum signal strength and 0 represents the minimum signal strength.

Type: Integer

Specific Values: 0 - 9

Dataset Unique: No

Required: No

Example: `"locationAccuracy": "9"`

locationType

Description: Text description of the type of location.

Type: String

Specific Values: n/a

Dataset Unique: No

Required: No

Example: `"locationType": "bus terminal"`

locationAction

Description: Text value which can be used to initiate an action by launching an external process when the current location is detected.

Type: String

Specific Values: n/a

Dataset Unique: No

Required: No

Example: `"locationAction": "SurveyApp"`

locationActionParameter

Description: Text value which can be used to initiate an action by launching an external process when the current location is detected. Typically used to provide one or more parameters to the action identified in **locationAction**.

Description:

Type: Comma-delimited string

Specific Values: n/a

Dataset Unique: No

Required: No

Example: `"locationActionParameter": "34298435,Trip Satisfaction Survey"`

virtualTargetPoint

Description: Value specifically used within a trip virtualization scenario to trigger the prompts associated with a specific location, without actually needing to be physically present at the geolocation. This feature enables the playback of a route using a SMART Ready trip virtualization system.

Type: Comma-delimited string

Specific Values: n/a

Dataset Unique: No

Required: No

Example: `"virtualTargetPoint": "23"`

noStop

Description: True/false value indicating a location that, while not the desired destination for the route, warrants specific communication of this fact to the traveler.

Type: Boolean

Specific Values: true, false

Dataset Unique: No

Required: No

Example: `"noStop": "true"`

gtfsRouteId

Description: Value provided as a cross-reference to the **route_id** value defined in the **route.txt** file of the General Transit Feed Specification (gtfs).

Type: String

Specific Values: Relevant **route_id** value from relevant transit agency gtfs dataset.

Dataset Unique: No

Required: No

Example: `"gtfsRouteId": "83"`

gtfsStopId

Description: Value provided as a cross-reference to the **stop_id** value defined in the **route.txt** file of the General Transit Feed Specification (gtfs).

Type: String

Specific Values: Relevant **stop_id** value from transit agency gtfs dataset.

Dataset Unique: No

Required: No

Example: `"gtfsStopId": "WASJONW"`

gtfsStopCode

Description: Value provided as a cross-reference to the **stop_code** value defined in the **route.txt** file of the General Transit Feed Specification (gtfs).

Type: String

Specific Values: Relevant **stop_code** value from transit agency gtfs dataset.

Dataset Unique: No

Required: No

Example: `"gtfsStopCode": "2383"`

Corridor Section

While the LOCATIONS section is required in a smart.json file, the CORRIDOR section is optional and is placed subordinate to the ROUTE section of the document. When used, the CORRIDOR section provides a set of geolocation coordinates that define the corridor or path of travel for the route. Therefore, using these values, a SMART Ready wayfinding app can detect when the traveler is off-route and invoke notifications to the user or to a remote caregiver that the user has departed from the route corridor or has returned to the route corridor that the user previously departed from. The frequency by which CORRIDOR section elements are recorded will be based on the functionality of the particular SMART Ready wayfinding app (if that functionality has been provided in the application), but are usually recorded at a prescribed interval (e.g., every 30 seconds). A minimum of one pair of geolocation coordinates is required in the Corridor Section. Pairs of geolocation coordinates are included in the Corridor section, captured at the prescribed interval from beginning to end of the route. Therefore, the geolocation coordinates that define a corridor are presented with the syntax shown in the example below

```
"corridor": [
    {
      "pathLong": -104.700913926,
      "pathLat": 38.998032934
    },
```

```
    {
      "pathLong": -104.701089434,
      "pathLat": 38.998169362
    },
}
```

The two tags that are included in each paring of geolocation coordinates are defined below.

pathLat

Description: Numeric value representing the latitude of the current specific location.

Type: Real number

Specific Values: Valid latitude in signed degrees format (DDD.ddd). Specific values can range from -90 to 90.

Dataset Unique: No

Required: Yes

Example: `"pathLat": 36.067526`

pathLong

Description: Numeric value representing the longitude of the current specific location.

Type: Real number

Specific Values: Valid longitude in signed degrees format (DDD.ddd). Specific values can range from -180 to 180.

Dataset Unique: No

Required: Yes

Example: `"pathLong": -104.845149625467`

Chapter 3. Conclusion

The SMART Wayfinding Specification makes the best effort to maintain the broadest sense of flexibility for wayfinding apps that can be used to enable greater independence in transportation for individuals with disabilities. The SMART Wayfinding Specification is flexible in that it allows for application developers to provide additional capabilities in their applications beyond those supported by the tags in a smart.json document, while still maintaining compliance with the SMART Wayfinding Specification. It is acknowledged that no specification can hope to address all of the needs of consumers and developers alike. Therefore, it is expected that this specification will continue to mature over time, while keeping forward- and backward-compatibility issues, performance issues, and platform issues in mind. In summary, the SMART ecosystem will significantly advance the field of wayfinding technologies for individuals with disabilities and serve to promote widespread availability of travel support technologies for previously underserved populations.

DOCUMENT REVISION HISTORY			
Version Number	**Approved Date**	**Description of Change(s)**	**Created/ Modified By**
Revision 1		Changes made to specification based on comments received from NOBLIS and ATTRI team.	Daniel K. Davies
Revision 2		Changes made to the SMART Wayfinding Specifications data dictionary to correspond with the final determined needs for the various components of SMART ecosystem.	Daniel K. Davies
Revision 3		Changes made to specification based on final comments received from NOBLIS and ATTRI team.	Daniel K. Davies

Appendix A. SAMPLE SMART.JSON DOCUMENT


```
{

  "smartVersion": "1.0",

  "routeId": "680b4cf72f0baf5c35e58c8e84372aa7",

  "title": "Bus 25 – Center Mall to North Transfer Station",

  "routeDescription": "This route begins in central Colorado   Springs at the mall and travels north of Academy Blvd to the North Transfer Station",

  "keywords": "exercise, city, recreation, shopping",

  "routeImage": "route.jpg",

  "routeAudio": "route.wav",

  "instAudio": "routeInst.wav",

  "routeLong": -104.7155545818,

  "routeLat": 38.985245983229,

  "dateCreated": 1507827142,

  "dateLastEdited": 1520962346,

  "routeNotes": "",

  "routeType": "bus",

  "destinationType": "shopping",

  "travelTime": "23",

  "travelDistance": "9"
```

```
"nextAction": "VisualImpact",
"nextActionParameter": "t1wmp3k78kn291981, Peak Vision Office",
"nextRoute": "",
"authorName": "Mary Jones",
"authorOrg": "AbleLink Smart Living Technologies, LLC",
"authorEmail": "routecreator@coloradocity.org",
"authorUrl": "www.coloradocity.org",
"routeLibraryName": "Colorado – Mountain Metro Transit",
"routeLibraryUrl": "colorado-smart.sharedroutelibrary.gov",
"gtfsAgencyId": "4354345",
"gtfsAgencyName": "Mountain Metro Transit",
"virtualVideo": "Bus 25 – route video.mp4",



 "locations": [
  {
    "locationId": "1507827181",
    "locationName": "Catch the Bus Here",
    "locationImage": "",
    "locationAudio": "1507827181.wav",
    "geolocationSource": "gps",
    "geolocationTriggerPoint": "2812, second floor office",
    "locationLat": 38.911616534546,
    "locationLong": -104.71533102996,
```

```
    "locationAccuracy": 9,
    "locationType": "bus stop",
    "locationAction": "SurveyApp",
    "locationActionParameter": "34298435, Trip Survey",
    "virtualTargetPoint": "42",
    "nopStop": false,
    "gtfsRouteId": "39",
    "gtfsStopId": "919242-b"
  },
  {
    "locationId": "2507827183",
    "locationName": "Langly Road",
    "locationImage": "",
    "locationAudio": "1507827181.wav",
    "geolocationSource": "gps",
    "geolocationTriggerPoint": "",
    "locationLat": 38.911616534546,
    "locationLong": -104.71533102996,
    "locationAccuracy": 9,
    "locationType": "",
    "locationAction": "",
    "locationActionParameter": "",
    "virtualTargetPoint": "70",
    "nopStop": false,
```

```
    "gtfsRouteId": "39",
    "gtfsStopId": ""
  },
  {
    "locationId": "6347827181",
    "locationName": "Jones Road",
    "locationImage": "",
    "locationAudio": "7506827181.wav",
    "geolocationSource": "gps",
    "geolocationTriggerPoint": "",
    "locationLat": 38.911616534546,
    "locationLong": -104.71533102996,
    "locationAccuracy": 9,
    "locationType": "",
    "locationAction": "",
    "locationActionParameter": "",
    "virtualTargetPoint": "96",
    "noStop": false,
    "gtfsRouteId": "39",
    "gtfsStopId": ""
  },
  {
    "locationId": "835627183",
    "locationName": "Observation Tower",
```

```
    "locationImage": "",
    "locationAudio": "9506827181.wav",
    "geolocationSource": "gps",
    "geolocationTriggerPoint": "",
    "locationLat": 38.911616534546,
    "locationLong": -104.71533102996,
    "locationAccuracy": 9,
    "locationType": "",
    "locationAction": "",
    "locationActionParameter": "",
    "virtualTargetPoint": "123",
    "nopStop": false,
    "gtfsRouteId": "39",
    "gtfsStopId": ""
  },
  {
    "locationId": "25838183",
    "locationName": "Halfway point",
    "locationImage": "",
    "locationAudio": "7506827181.wav",
    "geolocationSource": "gps",
    "geolocationTriggerPoint": "",
    "locatioonLat": 38.911616534546,
    "locationLong": -104.71533102996,
```

```
    "locationAccuracy": 9,
    "locationType": "",
    "locationAction": "",
    "locationActionParameter": "",
    "virtualTargetPoint": "168",
    "nopStop": false,
    "gtfsRouteId": "39",
    "gtfsStopId": ""
  },
  {
    "locationId": "92678827187",
    "locationName": "Baker Park",
    "locationImage": "",
    "locationAudio": "7506827181.wav",
    "geolocationSource": "gps",
    "geolocationTriggerPoint": "",
    "locationLat": 38.911616534546,
    "locationLong": -104.71533102996,
    "locationAccuracy": 9,
    "locationType": "",
    "locationAction": "",
    "locationActionParameter": "",
    "virtualTargetPoint": "96",
    "nopStop": false,
```

```
    "gtfsRouteId": "39",
    "gtfsStopId": ""
  },
  {
    "locationId": "67927827183",
    "locationName": "Get ready to get off the bus",
    "locationImage": "",
    "locationAudio": "5806827181.wav",
    "geolocationSource": "gps",
    "geolocationTriggerPoint": "",
    "locationLat": 38.911616534546,
    "locationLong": -104.71533102996,
    "locationAccuracy": 9,
    "locationType": "",
    "locationAction": "",
    "locationActionParameter": "",
    "virtualTargetPoint": "231",
    "nopStop": false,
    "gtfsRouteId": "39",
    "gtfsStopId": ""

  },
  {
    "locationId": "2507827183",
```

```
    "locationName": "Pull cord to notify driver to stop",
    "locationImage": "",
    "locationAudio": "6506827181.wav",
    "geolocationSource": "gps",
    "geolocationTriggerPoint": "",
    "locationLat": 38.911616534546,
    "locationLong": -104.71533102996,
    "locationAccuracy": 9,
    "locationType": "",
    "locationAction": "",
    "locationActionParameter": "",
    "virtualTargetPoint": "254",
    "nopStop": false,
    "gtfsRouteId": "39",
    "gtfsStopId": ""
  },
  {
    "locationId": "6910827441",
    "locationName": "Exit the Bus Here",
    "locationImage": "",
    "locationAudio": "7506827181.wav",
    "geolocationSource": "gps",
    "geolocationTriggerPoint": "",
    "locationLat": 38.911616534546,
```

```
      "locationLong": -104.71533102996,
      "locationAccuracy": 9,
      "locationType": "",
      "locationAction": "",
      "locationActionParameter": "",
      "virtualTargetPoint": "274",
      "nopStop": false,
      "gtfsRouteId": "39",
      "gtfsStopId": ""

    },
  ],
```



```
  "corridor": [
```

```
{
  "pathLong": -104.700913926,
  "pathLat": 38.998032934
},
{
  "pathLong": -104.701089434,
  "pathLat": 38.998169362
},
{
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  "pathLat": 38.99834334
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},
```

```
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  "pathLat": 38.989464358
},
{
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```

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    {
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      "pathLat": 38.989595272
    },
    {
      "pathLong": -104.722004928,
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    },
    {
      "pathLong": -104.722247656,
      "pathLat": 38.989597052
    },
    {
      "pathLong": -104.722515002,
      "pathLat": 38.989605334
    },
    {
      "pathLong": -104.722765776,
      "pathLat": 38.989612914
    }
  ],
```

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