## Overview

These are exciting times—around the globe, new services and technologies are intersecting to create value-added convenience to customers and business owners while better utilizing our available parking, mobility, and transport infrastructure. Whether related to car-sharing, ride-sharing, micro-mobility services, prepaid parking, dynamic pricing in parking structures, remote management of operations, and/or improved reporting, the sharing of data is key to enabling the adoption of these services. If the parking industry does not produce standards to facilitate this sharing, those standards will come from and be imposed by entities outside the parking industry.

It is for this reason that the British Parking Association (BPA), the European Parking Association (EPA), and the International Parking & Mobility Institute (IPMI) formed the Alliance for Parking Data Standards (APDS). Through the Alliance, the three organizations are managing the creation of consensus-built, international parking data specifications to establish a common language for data elements and definitions in the parking, transport, and mobility sectors; these specifications will facilitate seamless integration, compatibility, and communication between parking entities, the automotive industry, IT developers, ITS operators, services, and map and app providers, as well as other stakeholders.

We define "parking data specifications" as a common language composed of a set of data elements and definitions that public and private parking owners, operators, and service providers can follow to facilitate communication between themselves and with the outside world. This includes stakeholders in the automotive industry, IT developers, official national and international organizations, universities, map and app providers, highway and event operators, airport and railway operators, and end users themselves.

APDS seeks to reduce the effort required to connect technology solutions to each other and allow companies to refocus their resources on innovating new services and operations. APDS, with the support of the global parking industry, is defining workable data specifications to share parking data for international use. APDS will maintain the parking data specifications over time as living, open specifications that will evolve and expand as the marketplace evolves. Additionally, APDS is working with ISO (the International Organization for Standardization) and its European regional counterpart (CEN) to seek to get the APDS specifications adopted as formal ISO and CEN standards.

This new set of standards will be called the APDS specifications.

## Mission

APDS is a not-for-profit organization developing, promoting, and managing and maintaining uniform global specifications for parking data that will allow organizations to share parking data worldwide.

### How is APDS accomplishing this mission?

By forming cross-functional working groups from within and outside the global parking industry to define an open but specified structure for communicating parking related information and enabling certain actions between systems used in the parking.

The deliverables include standardized terms and definitions for the industry that allow participants to communicate in the same language and share data across platforms.

APDS provides a forum for both discussion and decision-making. APDS will release and support maintenance of the specifications as they develop and evolve.

## Background

For a couple of years, the BPA, EPA, and IPMI (formerly IPI) worked independently to develop approaches to share and process information related to parking. Each entity established working groups with input from property owners, parking operators, municipalities, universities, access control system providers, enforcement system providers, marketing firms, transaction processing organizations, map suppliers, and search engines. In early 2018, the three entities agreed to merge their efforts and work to establish a single, common set of international specifications. The initial phase of these specifications was released in June 2018 and the second phase was released in May 2019.

This document provides a summary of the current working documents for the second phase of the APDS specification development. Subsequent specifications will be released in 2020.

APDS specifications will evolve into a collection of data specifications that define how entities share various types of data within the parking industry and, more importantly, with other industries and users of parking. As smart-city and mobility efforts continue to expand, the ability for parking facilities and operations to participate and share data efficiently will be important to the continued success of the industry.

APDS is establishing a formal consultation and governance structure with representation from the appropriate parties to manage the data specifications and set objectives for the various working groups.

As the specifications are developed, APDS will convene working groups to define the relevant data elements and use cases for each phase of the specification. The working groups prepare working papers to document their discussions and initial concepts. The working papers are then presented to the APDS governance structure and industry and related stakeholders for comment. After the comment period, the working group incorporates feedback and develops the final specification. After revisions are made and the APDS governance structure approves, the data specification is released.

## Guiding Principles

The proposed principles to guide the APDS specification efforts, in no specific order, are:

1. *The focus is on defining a set of open global data specifications that constitute a common language for parking operations and sharing parking related data with other industries.* As the APDS specifications are developed, collaboration of participants around the globe will ensure the specifications are applicable internationally. This will include a data dictionary to translate the meaning of specific data elements to regional terminology.

2. *To ensure the highest probability of adoption, the efforts to create the APDS specifications will focus on the needs of the industry.* Industry participants will define the priorities to ensure that the specifications create immediate value to the industry.

3. *APDS will focus on the parking industry and will not duplicate efforts across other related industry segments* (i.e. public transport and transit, smart city, highway operations, etc.). Where applicable, the Alliance will reference and take account of existing standards when developing the APDS specifications.

4. *The individual APDS specifications will be versioned and subject to ongoing maintenance. The specifications will evolve as a living set of documents that responds to market needs, priorities, and technology.* In all cases, the industry, as defined by the entities that volunteer to participate in the development and maintenance of the specifications, are managing the evolution of the specifications.

5. *Use of the APDS specifications is voluntary and adoption will be driven by the marketplace.*

6. *The intent of the APDS specifications is to enable the sharing of data within the industry and reduce costs and efforts to support data sharing.* Each entity that uses the APDS specifications will decide the data elements it chooses to share; the specifications define how to share them. How an organization uses or manipulates the data is not in the scope of these specifications.

7. *The APDS specifications will provide guidance on Permissions/Use of Data/Privacy of Shared Data.* The intent of the specifications is to define common rules and permissions on how to use and share data.

8. *The APDS specifications will not create a competitive advantage for any one entity or group and APDS will not encourage the use of one entity's services over another.*

9. *The creation and ongoing maintenance of the APDS specifications will be transparent and open to solicited and structured industry feedback*. Industry participants will be essential to the development and maintenance of the specifications. The APDS specifications will be made available for public review and comment.

10. *APDS's role is to convene parking industry and data standards experts, as well as related stakeholder representatives, to develop and maintain the parking data specifications. APDS will not store parking data or act as an aggregator.*

## APDS Specification Development Priorities

Developing a complete set of specifications to cover every possible data element related to parking is a significant and time-consuming undertaking. APDS has established milestones and deliverables to break this initiative down into achievable and meaningful steps. By grouping data elements into specific data domains, we allow the community to work on specific data domains to create a specification. Figure 1: Parking Data Overview shows the phased delivery of data domains that comprise the APDS Specifications.



*Figure 1: Parking Data Overview*

Referring to one of the *Guiding Principles* related to developing specifications that the industry needs, APDS established a priority list of data domains. While there are many data elements that require standardization, the initial effort was prioritized to develop specifications for the following data domains, which were released as Phase I in June 2018:

- Parking Place Information.
- Parking Rate (Pricing).
- Occupancy/Utilization.

Phase 2, released in May 2019, adds the following data domains to the APDS specification:

- Rights.
- Sessions.
- Observations.

The APDS specifications define the data structure to share relevant parking location (on- or off-street), transactions, and other data to be shared between parties. The specifications define common terms and a consistent structure to share and receive data.

Figure 2: Phase 2 Data Domains shows the content included in the current phase of the APDS Specifications. Additional details can be found in the following documents.

- Use Case.

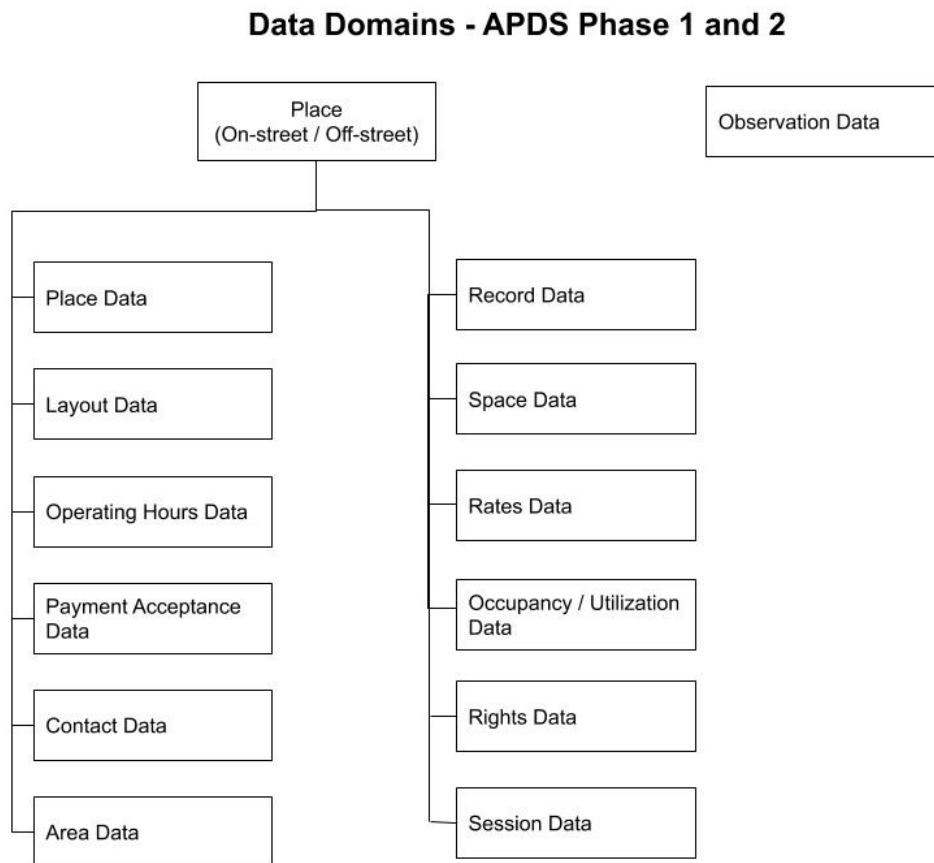- Information Model.

- Data Dictionary.



*Figure 2: Phase 2 Data Domains*

## APDS Technical Documentation

The APDS Technical Documentation describes a set of data elements and definitions public and private parking owners, operators, and service providers can adopt and use as a common language to facilitate the communication of data between themselves and with the outside world.

The specifications comprise a set of documents that define the various data elements related to parking operations and show the relation of these data elements to other data elements. The documentation includes the following documents and information:

- Information Model Document.

    o List of data elements.

    o Defined lists of acceptable entries for certain data elements.

    o Identified references to other standards, as appropriate.

    o Relationship diagram showing how the data is organized and expected to be sent and received.

- Use Case Document: Example use cases for applying the data specification.

- Data Dictionary Document: Terminology and definitions for the data elements.

## APDS Governance

The Alliance is a not-for-profit organization developing, promoting, and managing and maintaining uniform global specifications and standards for parking data that will allow organizations to share parking data worldwide. The Board of APDS is currently preparing a detailed governance structure and procedures. Its purpose is to ensure that the Alliance has sufficient resources to meet its objectives and to define specification development priorities, review specifications prior to release, and ensure that APDS specifications, including PIPS, support the needs of the industry and external stakeholders. Participation in the Alliance for Parking Data Standards is open to all.

## Data Specification Permission and Security

The data specifications created by APDS do not specifically define data security and permissions rules. It is incumbent on the party sharing its data to use common data security and data access practices with the parties it is engaged.

The following are guidelines an entity should consider:

1. Access and security to data is controlled by the Distributing Party of the data.

    It is the responsibility of the Distributing Party of the data to implement a security protocol that protects access to data on the Distributing Party's network. Typically, a Distributing Party will issue an authorization token to a specific Receiving Party to validate and control access to specific data sets.

    The Distributing Party should manage the specific amount of data that a Receiving Party can access. It is customary that different Receiving Parties will receive different sets of data.

2.  Receiving Party should confirm ownership of data when data for a parking place record previously received is newly received from a different Distributing Party.

    Due to the distributed nature of data ownership in the marketplace, it is expected that a Receiving Party will eventually receive data on a specific parking place record from different sources.

    The Receiving Party should have a data procedure to identify conflicting data records for the same parking place record and a process to validate the appropriate data owner.

**Examples of this scenario**

Example 1: Parking Operator A transfers management duties of Place 1234 to Parking Operator B. Thus, at one time, Parking Operator A was the Distributing Party for Place 1234. Parking Operator B became the new Distributing Party when it took over management duties.

A Receiving Party has Place 1234 in its database with a record update date/time of 15 June 2016 by johndoe@parkopA.com.

A Receiving Party receives a new data feed for Place 1234 in its database with a record update date/time of 31 March 2017 by janesmith@parkB.com.

Receiving Party should have a process to contact parties to confirm which record is accurate.

Example 2: Parking Operator A is managing Parking Place 6789 and is a Distributing Party for the place. Owner C owns Parking Place 6789 and is a Distributing Party for the parking place. In this example, there are two Distributing Parties.

Receiving Party will decide which data elements are different and which to use. Most likely, the difference will be in the logos provided and contact information. Receiving party can merge contact and logo information into a single location record or select one of the Distributing Parties as the default source as they determine is appropriate.

## Place Data Specification

This specification facilitates the sharing of basic place information between organizations and systems. These include map services, online marketing and aggregator services, event ticketing platforms, public transport and transit companies, and other firms, organizations or individuals that have a need to know the location of parking services and general information about their operation.

### Benefits of Place Data Specification

Parking a vehicle is a geographic-based activity. This means people and entities search for parking based on proximity to a destination. These searches require a person or application to know certain facts about the place, such as where the place is located, whether the place is available to use at a certain time, how to access the place, who to contact, and other relevant operating attributes.

Currently, there is not a common method to share place information. How should the name of the place be identified? Is it available for use by the public?

By providing a common specification for sharing this information, firms will more quickly and accurately be able to share and find place data to support value added services that can be offered to businesses and consumers.

In addition, higher level of data sharing such as pricing, occupancy, and online transactions all have an association to the place. It is very difficult to share higher level of data if the place data is not accurate.

## Use Cases Supported by the Specification

The following use cases are examples of data sharing the Place specification is intended to support. Additional use cases will also be supported and will be added to the specification to ensure the specification supports them effectively.

Use cases:

1. Finding, reserving and paying for parking.
2. Updating a data aggregator.
3. A platform for interfacing with a parking operator.
4. Exchanging data within an organization.

## Place Hierarchy

The specification defines a method to build a hierarchy of Place records. This enables a parking operation to break down a place into discrete parking enclosures to better communicate operating hours, space counts, operating restrictions, location, and eventually pricing and utilization information in a consistent manner.

The hierarchy allows a Distributing Party to decide the appropriate level of detail to send to a Receiving Party.

The hierarchy supports the ability of lower-level Place records to inherit data elements from higher-level Place records because when sharing a lower-level parking place record, all place data (that contains the lower-level data record) will flow down and be distributed as well. Figure 4: Place Hierarchy depicts the use of these data elements.

*Place* is a term introduced in the specification to define where a vehicle may park, stand, rest, or briefly transit to allow a person to change modes of transport (i.e. taxi drop-off/pickup, ride share drop-off/pickup, valet stand, etc.).

The Place is a collection of *Hierarchy Elements. Hierarchy Elements* allow an operating entity to subdivide the Place into homogenous operating areas. The Place is typically identified in the physical world as a specific parking structure, surface lot, or city zone of on-street parking.

A *Hierarchy Element* is a collection of *Identified Areas* and other *Hierarchy Elements*. In the APDS data specifications, the lowest data element to define a parking place is the *Identified Area*. This is a required data element.

A collection of *Identified Areas* ultimately defines the lowest-level *Hierarchy Element*.

A collection of *Hierarchy Elements* can create higher-level *Hierarchy Elements* or a *Place*.

At the highest level, a collection of *Places* can be defined by a *Campus*. A *Campus* is not a required data element in the model.
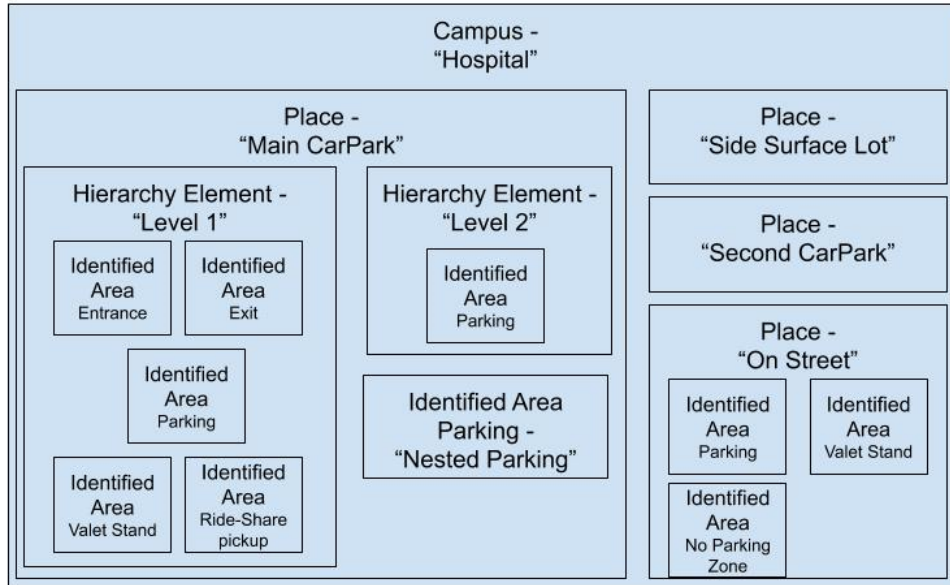
*Figure 4 : Place Hierarchy*

The **Identified Area** data element can be identified as one of several common types of purposes in parking operations. This is an area with homogeneous characteristics. Identified Area includes entry lane, exit lane, parking area, no-parking area, disable parking area, loading zone, ride-share pickup, etc. Each Identified Area type enables specific type of data to be captured relevant to the type.

The **Identified Area** also collects general operating information such as operating hours, operating restrictions, rate information, space information, and payment information. If the data is absent at the Identified Area, it is assumed the data is inherited from higher layers in the hierarchy, perhaps ultimately from the **Place** level. This allows for customization of operations at lower levels while relying on default data.

A **Place** is synonymous with where a vehicle parks. It can be a collection of five (5) parking spaces, an entire parking structure, a curb supporting on-street parking or a collection of streets supporting on-street parking. General operating information such as operating hours, operating restrictions, rate information, space information, payment information, etc., is associated to a Place and any parking places underneath it as appropriate.

The following example demonstrates the use of the hierarchy and data domains.

A parking operation includes a surface lot and a parking garage. Collectively the parking operation is known as "Main Street Parking." The parking garage, called "One Main Parking," contains four (4) levels and includes 500 spaces. The surface lot is 200 spaces, of which 100 are covered. The parking garage has a premium parking area on the first level for 25 cars. There is no access technology and customers purchase a prepaid parking pass and display it on the vehicle's dashboard or provide their license plate number. The parking garage has a nested area of 50 spaces that is controlled by automatic vehicle identification (AVI) tag on the third level, 24 hours a day, Monday through Friday.

The surface lot has 25 covered spaces which are reserved for tenants and not available to the public Monday – Friday 6 a.m. – 9 p.m. These spaces are otherwise open to the public.

Main Street Parking is open to the public and the hours of operation are defined below:

Parking Garage: 24 hours per day.

Premium Parking area: 24 hours per day.

Parking Garage: nested area for reserved parkers - 24 hours per day.

Surface lot (reserved parking area): Monday – Friday 6 a.m. – 9 p.m. not available to the public; available to the public other times.

Operating Hours by Parking Place and Time

| | | | Mon – Fri (0900 – 1800) | Mon – Fri; 6 p.m. – 9 a.m. (Mon starts at 0000 and Fri ends at 2359) | Sat – Sun (0000 - 2359) |
|---|---|---|---|---|---|
| Place → | Main Street Parking Operation | | | | |
| Hierarchy Element → | One Main Garage (total 500) | | | | |
| Identified Area → | | Normal space | 425 | 425 | 475 |
| Identified Area → | | Premium | 25 | 25 | 25 |
| Identified Area → | | Reserved | 50 | 50 | 0 |
| Hierarchy Element → | Surface (total 200) | | | | |
| Identified Area → | | Covered | 75 | 100 | 100 |
| Identified Area → | | Uncovered | 100 | 100 | 100 |
| Identified Area → | | Covered Reserved | 25 | 0 | 0 |

Applying the data specification, a Distributing Party builds the Place records with associated hierarchy data elements as shown above. The Data Specification suggests that a distributing Party provide data elements and parking place hierarchy to the level of detail appropriate. As an example, an entity may only send the detail about Main Street Parking Operation to the One Main Garage and Surface Lot level for one integration partner. For a different integration partner, it may send all Hierarchy levels. An entity controls the amount of detail they provide. However, when providing lower level details, the higher-level details must be included.

For a more in-depth review of the Place Specification, refer to the Information Model, Use Case, and Data Dictionary documents.

# Right Data Specification

The Right data domain includes the data elements that define how a facility/place owner or manager authorizes the use (e.g. park, delivery, pick up, etc) of a specific **Place** to various users or vehicles via a credential at a specific set of rate(s), if a rate applies.

The **RightSpecification** defines the operating parameters for parking or related transportation activities (Delivery, pick-up/drop-off, electric vehicles only, etc.). A RightSpecification is the combination of operating privileges, Rate(s), at Place(s), during a specific time period for a type of user or vehicle.

The **RightSpecification** is best described as the template of a right as defined by the place owner. A **RightSpecification** is granted to a specific **RightHolder** by an **AssignedRightIssuer**. The **AssignedRightIssue**r can be the place owner, a reservation service, or other entities authorized to sell or distribute the **RightSpecification** on behalf of the place owner.

When a **RightSpecification** is granted to a specific **RightHolder**, an **AssignedRight** is created**.** The AssignedRight includes the information from the RightSpecification as well as specific information related to the RightHolder (expiration of the AssignedRight, number of uses, etc). In some cases, an AssignedRight can include the ability to perform a specific action multiple times (example, prepay for five (5) parking events). When a specific, future use of the AssignedRight is initiated a **Planned Use** is generated.

**RightSpecification**

1) Has a unique identification within a Place.
2) Has a description of the Right being granted.
3) Has an expiration: the date/time when the right is no longer valid for any user as defined by the Place owner.
4) Has a Creator: the entity, typically the Place owner, that defines and authorizes the right.
5) Has authorized credential types.

Data Associations to a Right Specification:

1) **Place**: Defined earlier in the document. **Place** defines where a **RightSpecification** is valid. A RightSpecification can be associated to multiple Places. Each place owner needs to authorize the RightSpecification and reference the proper RightSpecification IDs when sharing data.

2) **Eligibility**: This is a group of data elements that define the type of vehicle or customer that is able to access the **RightSpecification**. Eligibility may be associated to being a member of a group (office employee, resident, etc), a vehicle type (electric car, truck, passenger car, etc), or use of a Rate in a previous session. **Eligibility** is associated to **RightSpecification** via **RateEligibility**.

**Rate Table**:  **RateTable** is a specific rate structure that defines how a service is priced. A **RightSpecification** can have multiple Rates associated to it as long as the Rates all apply to the same eligibility requirements and **RightSpecification** via **RateEligibility**. Actual pricing in Rates may vary based on time of day.

3) **RateEligibility:** Defines the combination of Eligibility requirements with **RateTables** and associates this combination to a **RightSpecification**. RateEligibility enables a RightSpecification to have association to multiple RateTable(s) for a specific Eligibility. RateEligibility also defines if RateTables are combinable. This is a Yes/No (Boolean) definition. Either all RateTables associated to a RightSpecification with a common Eligibility can be combined or they cannot.

   If **RateEligibility** has the **Combinable** flagged YES, then Rates can be combined in a SEGMENT.

4) **OperatingTimes Validity: D**efined earlier in the document. This defines when the **RightSpecification** is available for use. In association with **Right Pool**, this data elements defines the specific number of **RightSpecifications** that are available for use, in use, or intended for use in specific date/time periods. A **RightSpecification** for monthly parking for a business employee may have **OperatingTimes valid** Monday through Friday from 6 a.m. to 9 p.m. While a resident may have a **RightSpecification** with **OperatingTimes Validity** of Sunday through Saturday 24 hours a day.

5) **Right Pool**: Shares the number of **AssignedRights** that are available for use, are currently in use, or intended for use within a specific **RightSpecification** in specific date/time periods by a specific **AssignedRightIssuer.** A specific calendar (i.e. March 23, March 25, April 7) can be defined to represent the number of **AssignedRights** available for distribution via the **OperatingTimesValidity** or a recurring time period can be defined (Monday - Friday, Saturday - Sunday) via **RelativeValidity.**

6) **RightHolder**: This is a specific entity [e.g. individual, corporation, vehicle] that is issued a **RightSpecification** by a Place owner or **AssignedRightIssuer** via an **AssignedRight**. The RightSpecification along with additional data related to the RightHolder is contained in the AssignedRight data element. Associated to a RightHolder are the individuals and/or vehicles able to access the AssignedRight.

   a) A **RightHolder** may have multiple vehicles associated to one or more credentials.
      i.   Example: A person that has access to more than one vehicle and uses them interchangeably.

   b) A **RightHolder** may have multiple users associated to one or more credentials.
      i.   Example: A company that provides parking to its employees under one contract or that issues validations to customers to discount their parking.
      ii.  Example: A family share a defined number of credentials.

c) **AssignedRight**: when a place owner or authorized issuer grants a RightSpecification to a specific person or entity, an AssignedRight is created. The AssignedRight includes the key data from the RightSpecification as well as specific data related to the RightHolder's use of the RightSpecification which includes:

    i.    Approved credential.

    ii.    Expiration date and time of **AssignedRight.**

    iii.    Rate(s).

    iv.    Valid number of uses, minutes or some other value describing the quantity of use.

    v.    Data on the entity that issued the **RightSpecification** to the **RightHolder**. The issuer can be the Place owner, Place manager, or a third-party entity authorized by the Place owner.

    vi.    Data about when the **AssignedRight** was issued to the **RightHolder**

    vii.    **AssignedRight** has one to multiple **PlannedUse**(s)

7) **PlannedUse**: When an **AssignedRight** is "activated" for a future use, a **PlannedUse** data element is created. The **PlannedUse** defines the proposed time to use the AssignedRight in the future and identifies the credential of the AssignedRight.

For a more in-depth review of the Right Data Specification, refer to the Information Model, Use Case, and Data Dictionary documents.

## Session and Segment Data Specification

The Session data domain includes the data elements that document the actual act of parking or other use of an **AssignedRight** such as delivery, pickup, etc. A **Session** captures the ACTUAL use of an **AssignedRight** and includes start time, end time, credential, and other relevant data related to an operational activity. A **Session** is not used for future activities.

A **Session** is broken into one or multiple **Segments**.

**Segments** enable a single **Session** to capture and report changes in **Rate** and **AssignedRight** during a **Session.**

A **Segment** can only have one **AssignedRight** and **Rate** associated to it.

**Session**

1) Has a unique identification within a **Place.**
2) Has a start time and end time.
3) Has at least one **Segment.**
4) Is associated to a **Place.**

**Segment**

1) Is associated to a **Session.**
2) Is associated to an **AssignedRight.**
3) Is associated to a specific **Rate** via the **AssignedRight.**
4) Has a start and end time.
5) Has a credential via the **AssignedRight.**
6) Is associated with basic Financial data.

7) Has version control on the **AssignedRight** (i.e. a segment starts with one **AssignedRight** and then is updated to a new **AssignedRight** at the end of the segment, replacing the original).
8) Has a Place reference or **Space ID.**
9) Can be associated to one or multiple **Observations.**

Financial transaction data will be addressed in later releases of the APDS specification. To allow limited sharing of financial data immediately, minimum financial data is associated to the **Segment**. Each **Segment** has its own financial data defined. An entity shall be able to sum the financial data of each **Segment** to determine total **Session** financial data.

Minimum financial data to include in a **Segment** includes:
  i.    Total value of Segment based on expected value to be received by place owner or operator (i.e. amount of calculated rate table based on session times).
  ii.   Entity name of the service provider that is responsible for selling/collecting fees associated to the **Segment.**
  iii.  Tax included in value—Yes/No (Boolean).
  iv.   Country Currency.

Optional data to include in Segment:
  i.    Date Segment fees collected by service provider.
  ii.   Transaction ID (reservation number, credit card transaction number, etc) as agreed upon by the two entities sharing data.

For a more in-depth review of the Session Specification, refer to the Information Model, Use Case, and Data Dictionary documents.

## Rate and Occupancy Data Specification

This specification will facilitate the sharing of place, parking rate and occupancy information between organizations.

### Benefits of Rate and Occupancy Specification

Parking information is becoming a highly valuable information to support customer needs. The ability of an entity to share parking place data as well as rate and occupancy information helps consumers to make more informed decisions about options that best fit their transportation and parking needs.

By providing a common specification for sharing this information, firms will be more quickly and accurately able to share and find parking place, rate, and occupancy data to support value added services that can be offered to businesses and consumers.

Defining a specification for sharing parking data will allow the industry and consumers of parking data to more effectively incorporate the data into their services.

### Use Cases Supported by the Specification

The following use cases are examples of data sharing that the Parking Rate and Occupancy Specification is intended to support. Additional use cases will also be supported and will be added to the specification to ensure the specification supports them effectively.

Use cases:

1) Share parking rate and occupancy information with map providers to present parking rate and occupancy information on maps.

2) Share parking rate and occupancy information with an aggregator.

3) Share updates of parking information with map provider or aggregator.

4) Present parking rate and occupancy on a self-managed or third party hosted website or mobile application.

5) Configure parking rates in PARCs, meters and other revenue and access control systems.

## Parking Rate Data Elements

The data set is segmented into several domains. Each domain is a grouping of similar data elements. The domains do not necessarily represent table structures. The domains are:

- **Rate Table:** Provides descriptions on the rate table, period rate table is available for use, and expiration time of the rate table.

- **Rate Derivation: D**efines how to calculate a tariff for the specific time durations and fees for specific parking event(s).

- **Rate Surcharges:** Defines additional fees and taxes associated with the rate table.

- **Rate Ancillary:** Defines additional parameters associated to a rate table such as authorized users of a rate table and responsible party for collecting fees.

The document provides initial definitions for each data element, the suggested format to transfer data, and where appropriate, defined lists to ensure consistency on specific data elements.

## Parking Rate

The specification introduce defines a Rate Table and the critical data elements to include in a Rate Table. It also introduces a concept to define a collection of Rate Tables at a Place that can be updated on a collective basis.

A Rate Table in the data specification includes summary information to provide additional description about the collection of rate lines and conditions of their use and association to a specific Right.

- **Rate Name:** common name used at a Place

- **Rate ID:** identification to associate a specific rate table across various platforms and devices. This includes online services, PARCS, pay station, mobile payment provider, etc.

- **Rate Type:** describes that type of the rate table define the fees for daily, contract/monthly, event, validation, etc.

- **Rate Expiration:** when is the rate table replaced by a new rate table or permanently deactivated from use?

| | | |
|---|---|---|
| **Weekend**<br><br>Sun — Sat 0000 - 2400<br><br>Valid 2018010T0000<br>Expire 20180115T2359 | **Weekend Day**<br><br>Sun — Sat 0800 - 2100<br><br>Valid 2018010T0000<br>Expire 20180115T2359 | ← Rate Name<br><br>← Rate Active time<br><br>← Rate Expiration |

## Key Concepts

- A Place or Hierarchy Element may have multiple rate tables active simultaneously during a specific time of the day.

- Rate tables have effective periods—times of day when a parker should expect to pay the rates defined (i.e. active Monday to Friday 6 a.m. until 12 a.m., Friday @ 5 p.m. through to Monday @ 2 a.m., etc.).

- Rate tables have expiration dates and times—times when the rate table expires and is no longer valid for use or is replaced by a new rate table.

- Places can have their Rate Matrix replaced with a new Rate Matrix to allow simpler rate table revisions.

For a more in-depth review of the Rate Specification, refer to the Information Model, Use Case, and Data Dictionary documents.

## Parking Occupancy Elements

The data set is segmented into several domains that are associated to an *Identified Area*. Each domain is a grouping of similar data elements. The domains do not necessarily represent table structures. The domains include:

- **Supply:** Defines the parameters of the supply of parking. This is the total number of spaces usable for parking. It can be defined as demarcated or non-demarcated spaces.

- **Space: D**efines the specific space ID and associated information on a specific space, such as space characteristics, methods of occupancy detection, and valid time of space information.

- **Demand:** Defines the parameters of reporting actual usage of parking in a Hierarchy Element.

- **Demand Space: D**efines the occupancy status of a specific space and associated usage start and end times.

The document provides initial definitions for each data element, the suggested format to transfer data, and where appropriate, defined lists to ensure consistency on specific data elements.

## Occupancy

Occupancy has been deconstructed into two data segments: Supply and Demand.

Supply is the data that defines the number of vehicles or spaces that can be parked in the defined Place, Hierarchy Element, or Identified Area.

Demand is the data that defines the actual number of vehicles parked or spaces occupied.

By separating the Occupancy data into a Supply and Demand segment, the intent is to improve the efficiency of communicating demand data (real-time parking space usage). It is assumed that Demand Data will be communicated very frequently, potentially more frequently than every five (5) minutes. It is assumed that Supply data should not change frequently and could be communicated every day. This approach enables the Supply data segment to communicate a majority of the data on parking spaces while the demand data is limited to communicating critical data that changes frequently.

Supply data includes data elements that define the type of parking supported in the area, methods used to detect usage, space count, and space characteristics. When defining the supply for a parking area, an entity can communicate if the space count is based on actual demarcated spaces (i.e. there are five (5) parking spaces defined as five (5) demarked parking spaces) or if the supply count is based on derived data.

As an example of a derived supply count, consider a street curb that is not marked with specific spaces. The street curb is 100 metres long and the controlling entity assumes the average length of a vehicle parking is 5 metres. The derived available supply is 20 spaces. A different entity could use a different average length of 7 metres and report 14 spaces. It is the responsibility of the entity to determine the appropriate method to use when sharing derived space supply.

For a more in-depth review of the Occupancy Specification, refer to the Information Model, Use Case, and Data Dictionary documents.

## Observation Data Specification

The **Observation** data domain includes the data elements that document the observation of an entity in a Place performing an action. **Observations** can be visual or electronic (e.g. ALPR read, RFID read, etc.).

Observation:
1) Has a date/time when the observation is made.
2) Has a location where the observation is made.
3) Has an association to a credential observation.


Credential Observation:
1) Has a reference identification of the observation.
2) Has a method of observation (ALPR, visual, ticket, RFID, etc).
3) Has an observer name (who made the observation).
4) Has a credential type observed (license plate, tag, hang tag).
5) Has the credential Identification observed.


For a more in-depth review of the Observation Specification, refer to the Information Model, Use Case, and Data Dictionary documents.

# Contact

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