OASIS Visualization Data Model Primer

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1.1 Yard hierarchy

Overview

At the highest level of the yard hierarchy, functional divisions include any number of **Parking** and **Track** locations. The OAS_LOCATION_DATA is used to keep all hierarchy configurations. Each location or its child location is assigned an index stored in the *LOT_AREA_INDEX* column under the OAS_LOCATION_DATA table. The *CLASS* column defines what type of location it is, with 80 ('P') representing Parking and 84 ('T') for Track.

Traditional wheeled parking

Traditional parking **lots** can be broken down into **areas** which, in turn, can be further divided into individual **slots**. The lot and area names are stored in the *LOT_NAME* and *AREA_NAME* columns respectively. Only areas can be slotted. If slotted, the slot information is stored in *SLOT_START*, *SLOT_INCREMENT* and *SLOT_COUNT* columns. For example, for 10 even numbered slots starting from 700, i.e. {700, 702, …. , 718}, values will be *SLOT_START* = 700, *SLOT_INCREMENT* = 2, *SLOT_COUNT* = 10.

Currently OASIS does not support XY coordinates for traditional wheeled parking locations.

Wide span crane stacks and truck spots

Wide span crane stacks and truck spots are implemented as parking locations with additional attributes, including stack number (*STACK*), XY coordinates (*X_FROM, X_TO, Y_FROM, Y_TO*) and row width (*Y_SLOT_WIDTH*). In OASIS, the entire pad the wide span cranes operate on is defined as a lot with stack number > 0.

Within the lot, a **stack** is defined as a slotted area (i.e. *SLOTTED* =1) which can span multiple rows. The number of rows is determined by how many can fit in the area with the user-defined row width value. A **truck spot** is a fixed location to transfer units between the trucker and the crane. It is defined as an un-slotted area with no rows.

For BNSF, the XY coordinates are expressed in tenths of feet.

Tracks

Tracks can either be defined as one single linear location, or sub-divided into areas with assigned lengths. The *LOT_NAME* column holds what is commonly called the track ID. Generally a track does not have XY coordinates, except in the wide span crane lot, where the track is defined with Y coordinates (*Y_FROM, Y_TO*) as well as a stack number (*STACK*).

Railcars

Railcar information for each track can be found in the OAS_RAILCAR_DATA table, such as its track location (*TRACK_AREA_INDX, TRACK_ID*), sequence (*SEQUENCE*), orientation (*RVS_ORIENTAION*), valid platforms (*PLATFORM_ONE_ID, PLATFORM_TWO_ID, PLATFORM_THREE_ID, PLATFORM_FOUR_ID, PLATFORM_FIVE_ID*) and hitches (*VALID_HITCHES*). The *FMLY_NBR* column can be mapped to the flat file *railcar_descr.dat* for railcar and hitch dimensions lookup.

The X coordinate of center of platform is stored in the *PLATFORM_A_X, PLATFORM_B_X, PLATFORM_C_X, PLATFORM_D_X, PLATFORM_E_X* columns. Since the exact locations are not available to OASIS when the inbound train arrives, the estimated values are first stored as negative numbers. As the wide span cranes start spotting units on platforms, these columns will get updated with the actual X coordinate stored as a positive number.

1.2 Unit characteristics

Overview

OASIS stores all unit information under the OAS_UNIT_DATA database table. Columns relevant to yard visualization includes, but not limited to, unit type (*TYPE_IND*), dimensions (*WDTH_NBR, LGTH_NBR, HGT_NBR*), inventory status (*INV_STATUS*), TOFC/COFC (*TOFC_IND*), inbound/outbound related data (*OTBD_IND, ORIG_NAME, DEST_NAME*) and train block and symbol (*TRAIN_BLOCK, TRN_SYMB_TYPE*).

Unit type uses pre-defined values 'C' for containers, 'T' for trailers and 'S' for chassis.

Unit inventory statuses include waybilled ('W'), current ('C'), pending gate arrival ('P'), pending gate departure ('D'), rejected gate arrival ('R') and rejected gate departure ('J').

Unit location

The unit location is stored in a combination of columns under the OASIS_UNIT_DATA table. At a minimum, the *LOT_AREA_INDX* is used to specify the current lot, area or track, mapping to OAS_LOCATION_DATA.*LOT_AREA_INDEX*. If the wheeled parking area is slotted, the *SLOT_NBR* column gets the slot number. If the unit is on the track, the railcar id and the hitch (*RAIL_CAR_INIT, RAIL_CAR_NBR, HTCH_CODE*) is used to store the railcar and hitch, whether it is loaded (*LOAD_IND = 1*) or sitting trackside.

For wide span crane yard locations, OASIS also stores the stack number (*STACK_NUM*) and coordinates (*X, Y, Z*) of the unit. In the stacks, the *SLOT_NBR* column is used as a secondary aid to define level/row as a 2-digit number, e.g. 23 means the unit is 2 up on row 3. It is assumed one stack level is about 9 feet high, which roughly translates to *Z* column having values close to multiples of 90.

Container and chassis mating

To specify a container is mounted to a chassis, OASIS inserts a row in the OAS_ADJ_DATA table with {*UNIT_1_INIT, UNIT_1_NBR*} = container id, *DIRECTION* = 20 (on top of), {*UNIT_2_INIT, UNIT_2_NBR*} = chassis id. Additionally, the OASIS_UNIT_DATA.*MONT_STAK_IND* column for both units is set to 'M'.

Historical Activities

Past unit activities are stored under the OAS_MASTER_TRAN table. Each transaction is tagged with the work type (*TRANS_TYPE*) and the yard resource involved (*EQUIPMENT_ID*). Some transaction types of interest are 'G' (ground/unload), 'L' (load), 'c' (clear), 'p' (place), 'r' (chassis retrieval), 't' (chassis store) and 'm' (move). By linking the *SEQUENCE_NBR* column to the OAS_COMPLETE_TRAN table, the activity can be drilled down to obtain work order locations (*RAIL_CAR_INIT, RAIL_CAR_NBR, HTCH_CODE, FROM_LOT, FROM_AREA, FROM_SLOT_NBR, TO_LOT, TO_AREA, TO_SLOT_NBR*).

1.3 Terminal workforce

Overview

The terminal workforce is comprised of hostlers, packers, cranes (overhead or wide span), yard checkers and IBC grunts. Hostlers are responsible for moving units around on the ground. Packers and cranes execute the lifting of the units. Yard checkers corrects discrepancies in the yard inventory. IBC grunts ensure the inter-box connectors are properly installed between stacked containers on the railcar.

Every resource is pre-configured with a fixed resource number. By using the flat file *vmu_equipment_map.dat*, OASIS will map this number to an alpha-numeric equipment id as well as the resource type. The different resource types are listed below.

Hostler : 0x1 (1)

Side packer : 0x10 (16)

Overhead crane : 0x20 (32)

Wide span crane : 0x40 (64)

Yard check (aka Inquiry) : 0x200 (512)

Traditional resources

OASIS currently keeps the list of all active yard resources in memory only. However, the OAS_RESOURCE_TRAN database table records every single logon (*LOG_TYPE* = 1) and logoff (*LOG_TYPE* = 0).

OASIS does not keep track of current workforce locations due to the lack of DGPS feeds. The last known location is available by looking up from the historical transactions tables.

Wide span cranes / IBC grunts

Wide span cranes require additional setup information stored in OAS_CRANE_DATA. The physical boundary of the crane working zone is defined with the *columns STACK_NUM, BEGIN_X, END_X, BEGIN_X and BEGIN_Y*. When a wide span crane is logged in, the *ACTIVE_FLAG* is set to 'Y'.

Both wide span cranes and IBC grunts are equipped with DGPS devices. OASIS receives constant feeds of their current locations, but does not keep record anywhere.

1.4 Work orders

Overview

Work orders are unit disposition change requests. A work order can be decomposed into multiple tasks or legs. For example, when an inbound unit needs to be unloaded from the railcar to a parking location, the work order is divided into three tasks. First, a hostler will need to retrieve a chassis to trackside. Then after a packer or crane flips the unit from the railcar onto the chassis, the hostler will eventually clears it from the track and parks it.

In general, work orders are composed of the following tasks.

Inbound work orders : chassis retrieval (hostler), unload (crane), clear (hostler)

Outbound work orders : place (hostler), load (crane), chassis store (hostler)

Hostler tasks are usually not needed when truckers are dropping off or picking up a unit.

If a work order has been created for a unit, the *WO_STAT_CODE* column is set to 97 under the OAS_UNIT_DATA table. The work order destination is stored in the work order related columns, namely *WO_LOT_AREA_INDX, WO_CLAS_NBR, WO_SLOT_NBR, WO_RAIL_CAR_INIT, WO_RAIL_CAR_NBR, WO_HTCH_CODE, WO_LOAD_IND*.

OASIS keeps the task list in memory only.

Available but rarely used in production today, a work order can be directly assigned to one particular yard resource. If that happens, the *WO_EQUIPMENT_ID* column will be populated with the resource equipment id under the OAS_UNIT_DATA table.

Planning

OASIS keeps track of loading plans which have yet been submitted for work order generation. Under the OAS_PLAN_HITCH_DATA table, each row represents a unit being planned to a particular railcar and hitch.

On plan submission, a Submit transaction (*TRANS_TYPE* ='s') is written to the OAS_MASTER_TRAN table, with details stored in the OAS_SUBMIT_TRAN child table.

IBC work

When a unit has a pending IBC work order, the *IBC_WORK_STATUS* column will become non-blank under the OAS_UNIT_DATA table. The possible values are 'l' (lock), 'u' (unlock), 'i' (install), 'r' (remove) and 'v' (verification). High priority work orders are upper-cased. A wait status('w') means although the unit has no pending IBC work of its own, it depends on some other unit's IBC to be completed.