Department for Transport

traveline

Fares and NeTEx Workshop

Manchester

November 2018

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Requirements for Complex Fares

Objectives of this session

- Discuss further features that are more complex to implement
  - Discount Rights
  - Coaches
  - Dynamic Prices

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Modelling complex products

- Multiple products in one package
- Products supported by multiple operators
- Large scale tariffs

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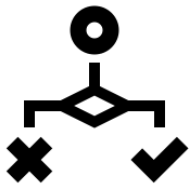
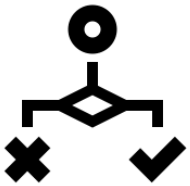
Some types of Complexity found of fares





- **More complex Products & Tariff structures**
  - E.g. Capped Pay as You Go
- **Compound products / offers:**
  - Multiple products in one package
    - E.g. Oyster , Plusbus
  - Products that are available both as separate offers and as single purchase
    - E.g. Plusbus
- **Products supported by multiple operators**
  - Tariff structures covering large networks
    - E.g. *Plusbus*
  - Local variation in rules ?
- **Complex rules for a fare product, notably**
  - Day types / Timebands / Fare demand typs
    - E.g. *Metro & rail peak/offpeak into London*
    - Plusbus exceptions Night buses after 11.30
  - Exclusions / inclusions of services
    - E.g. all Metrobus in Crawley region except and line 4
  - Eligibility conditions
- **Combining rules specified at different levels**
  - E.g. Temporal Validity conditions on tariff, product, sales offer

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Additional Tariff Structures & Product Types

Capped Sales Rights

Sales Discounts

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Complex UK Bus Fare Products
Discount cards, etc

	FARE PRODUCT	Peak / Off Peak	(Can) or Must be Account Based	Notes
SALES DISCOUNT	SALES DISCOUNT RIGHT	☑	☑	E.g. like a Railcard
	CAPPED SALES DISCOUNT RIGHT	☑	☑	PAYG e.g. Oyster
USAGE DISCOUNT	USAGE DISCOUNT RIGHT	☑	☑	Rebate for use, e.g. mileage
STORED VALUE	AMOUNT OF PRICE UNIT	-	☑	Stored value
ENTITLING PRODUCT	THIRD PARTY PRODUCT	-	-	E.g. Military Pass

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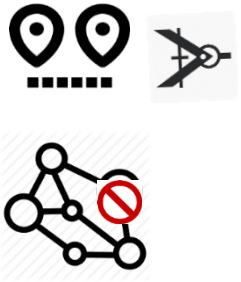
Some Exclusions Not needed?



- Fare Structures
  - Mileage based distance fares? ☒
  - Routing Constraints ☒

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Complex Sales Offers

Multiple Product Bundles

Capped Pay as You go

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Describing a complex product – TfL Oyster

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Fares example - Tfl Oyster

TYPEs OF TRAVEL DOCUMENTs

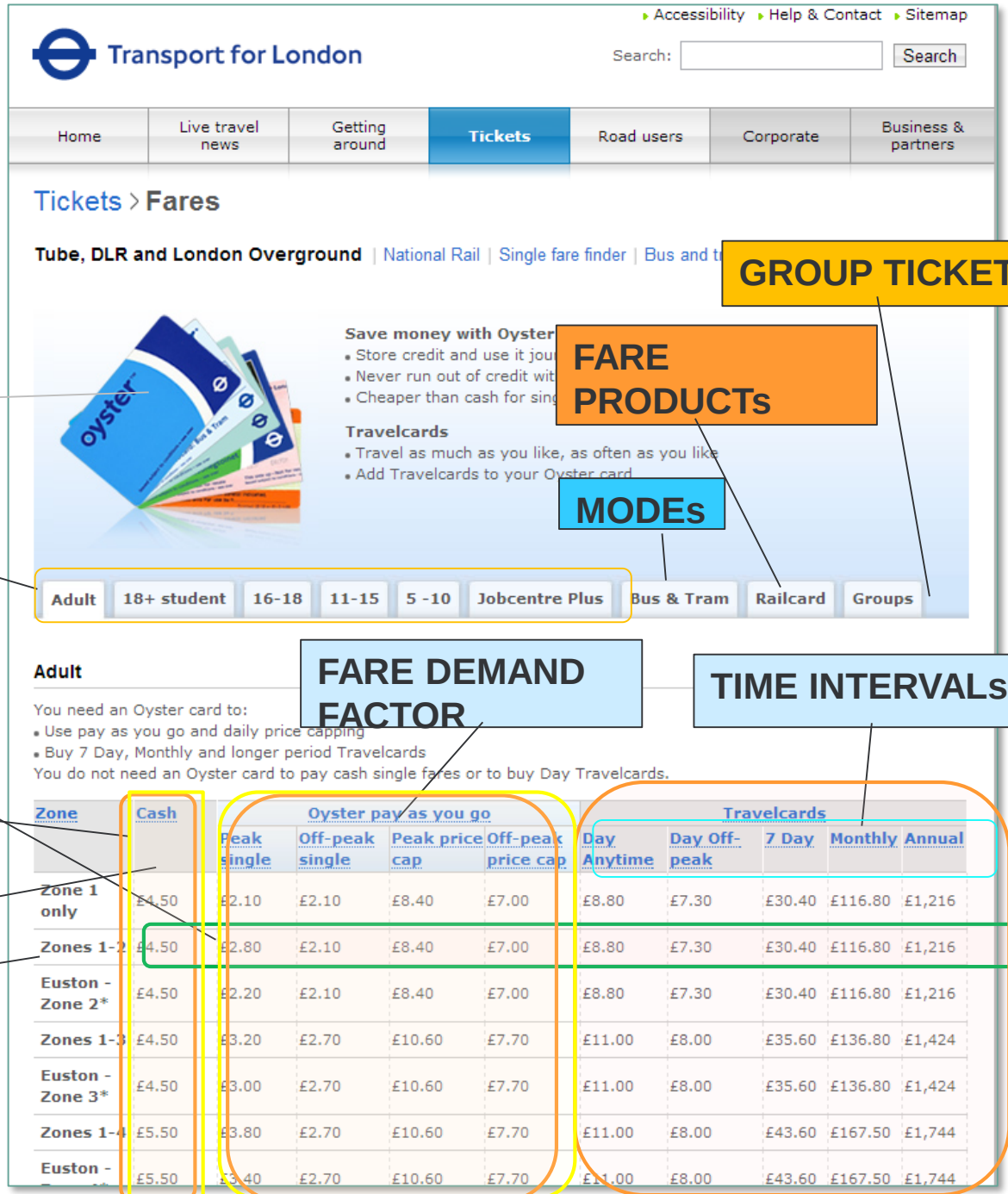
USER PROFILEs

FARE PRICEs

FARE PRODUCTs

SALES PACKAGEs

FARE ZONEs



Zone	Cash	Oyster pay as you go				Travelcards				
		Peak single	Off-peak single	Peak price cap	Off-peak price cap	Day Anytime	Day Off-peak	7 Day	Monthly	Annual
Zone 1 only	£4.50	£2.10	£2.10	£8.40	£7.00	£8.80	£7.30	£30.40	£116.80	£1,216
Zones 1-2	£4.50	£2.80	£2.10	£8.40	£7.00	£8.80	£7.30	£30.40	£116.80	£1,216
Euston - Zone 2*	£4.50	£2.20	£2.10	£8.40	£7.00	£8.80	£7.30	£30.40	£116.80	£1,216
Zones 1-3	£4.50	£3.20	£2.70	£10.60	£7.70	£11.00	£8.00	£35.60	£136.80	£1,424
Euston - Zone 3*	£4.50	£3.00	£2.70	£10.60	£7.70	£11.00	£8.00	£35.60	£136.80	£1,424
Zones 1-4	£5.50	£3.80	£2.70	£10.60	£7.70	£11.00	£8.00	£43.60	£167.50	£1,744
Euston -	£5.50	£3.40	£2.70	£10.60	£7.70	£11.00	£8.00	£43.60	£167.50	£1,744

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Fares example - Tfl Oyster

TYPEs OF TRAVEL DOCUMENTs

USER PROFILEs

FARE PRODUCTs

SALES PACKAGEs

FARE PRICEs

FARE ZONEs

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Tube, DLR and London Overground | National Rail | Single fare finder | Bus and t

GROUP TICKETs

Save money with Oyster pay as
- Store credit and use it journey by
- Never run out of credit with Auto t
- Cheaper than cash for single fare

DISCOUNT RIGHTs

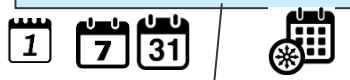
Travelcards
- Travel as much as you like, as often as you like
- Add Travelcards to your O

MODEs

Adult | 18+ student | 16-18 | 11-15 | 5 -10 | Jobcentre Plus | Bus & Tram | Railcard | Groups

FARE DEMAND FACTOR

TIME INTERVALs



Adult

You need an Oyster card to:
- Use pay as you go and daily price capping
- Buy 7 Day, Monthly and longer period Travelcards

You do not need an Oyster card to pay cash single fares or to buy Day Travelcards.

Zone	Cash	Oyster pay as you go				Travelcards				
		Peak single	Off-peak single	Peak price cap	Off-peak price cap	Day Anytime	Day Off-peak	7 Day	Monthly	Annual
Zone 1 only	£4.50	£2.10	£2.10	£8.40	£7.00	£8.80	£7.30	£30.40	£116.80	£1,216
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Zones 1-4	£5.50	£3.80	£2.70	£10.60	£7.70	£11.00	£8.00	£43.60	£167.50	£1,744
Euston -	£5.50	£3.40	£2.70	£10.60	£7.70	£11.00	£8.00	£43.60	£167.50	£1,744

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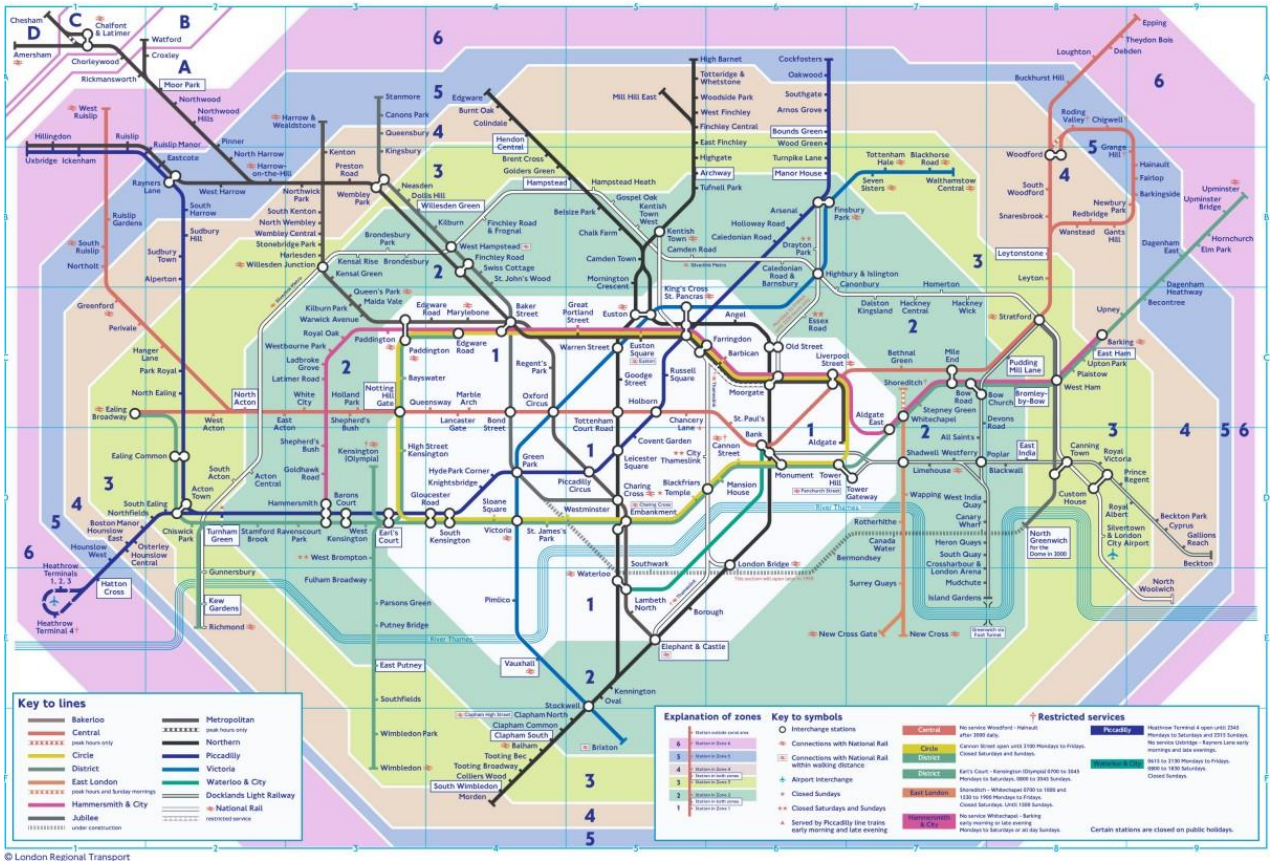
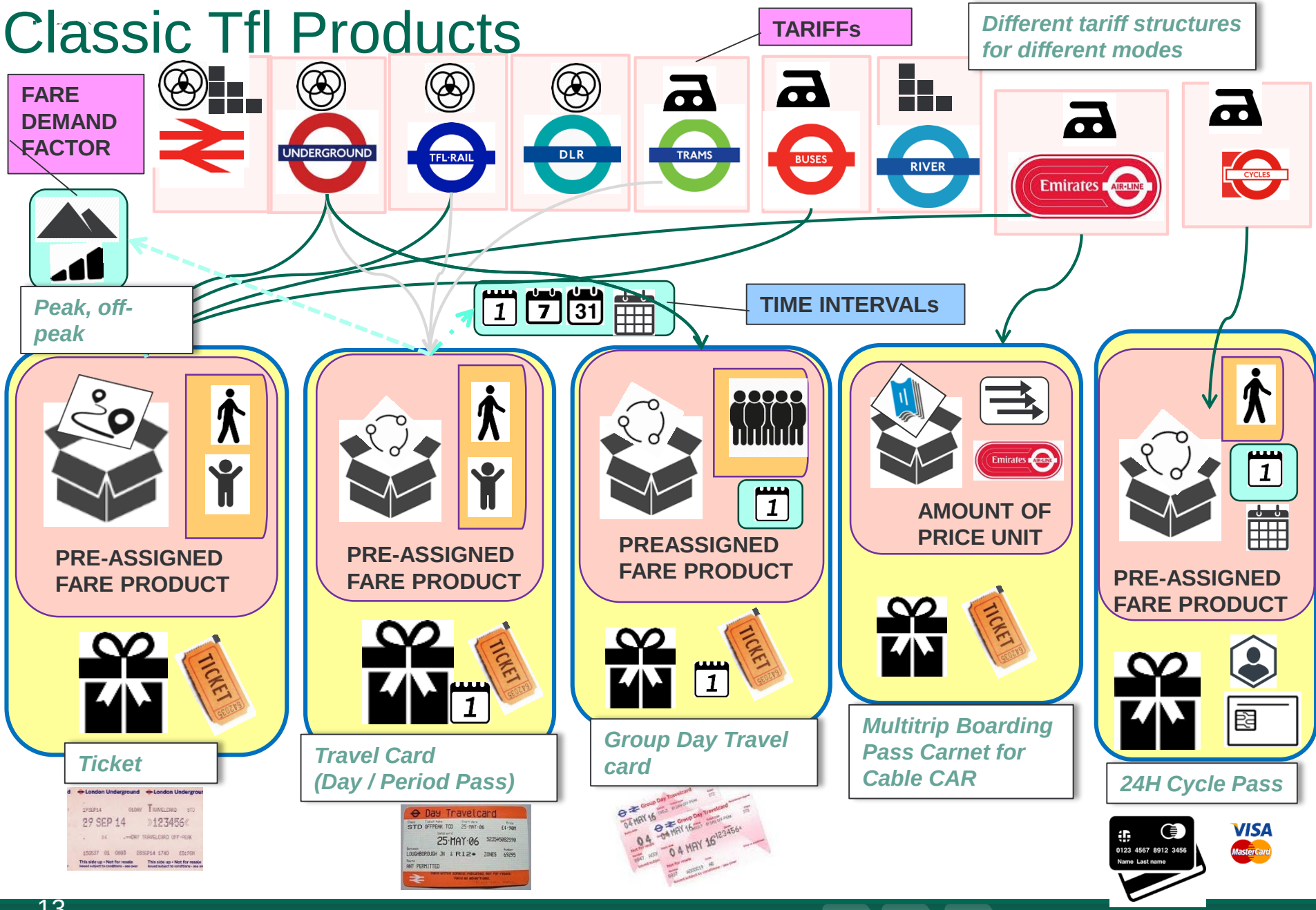
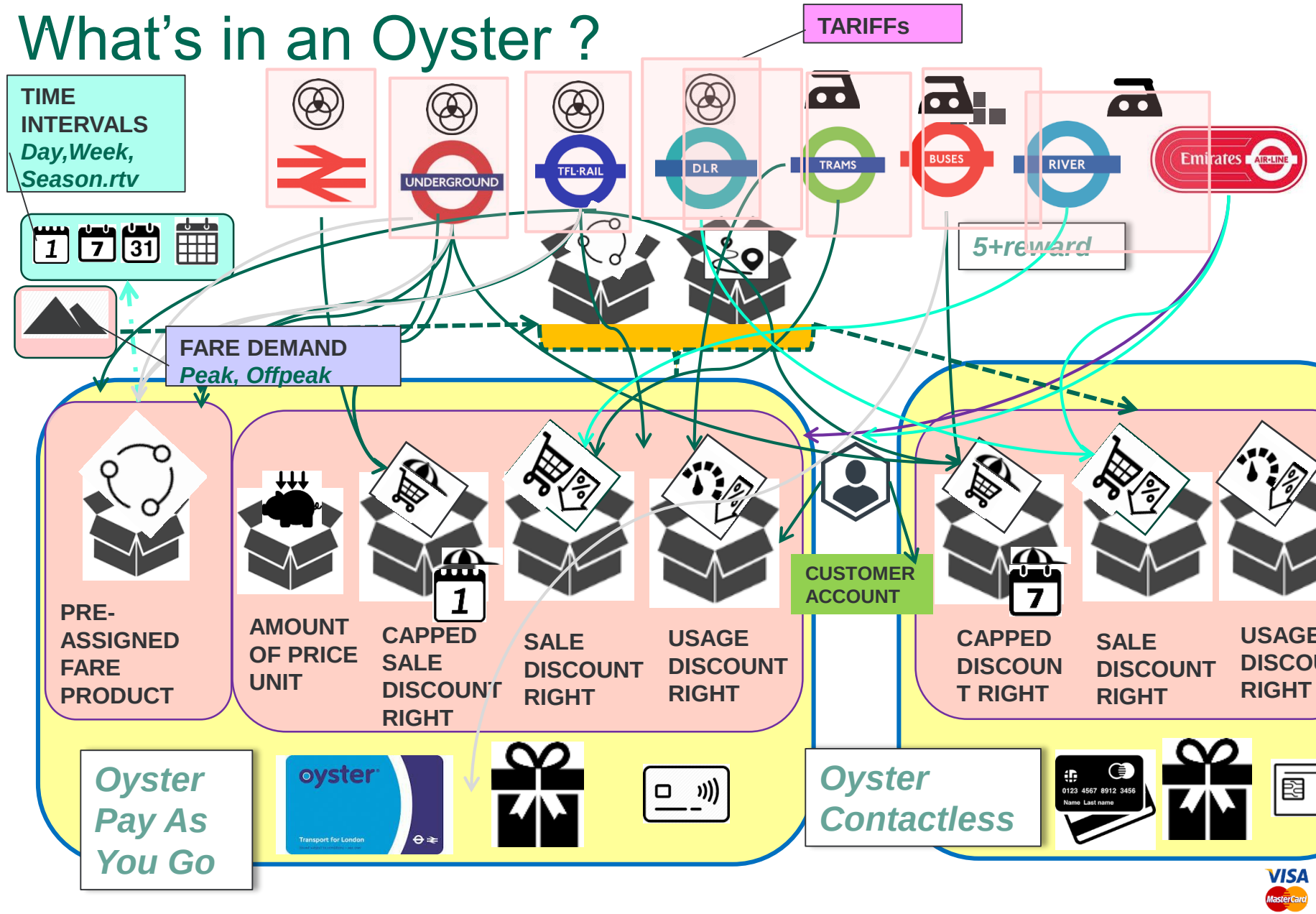
Zone Doughnut - TfL Zones



Classic Tfl Products



What's in an Oyster ?



Sales Offer Packages & Accounts

THIRD PARTY ENTITLEMENT

CUSTOMER ACCOUNT

Photo card

Account- linked card

Anonymous Card

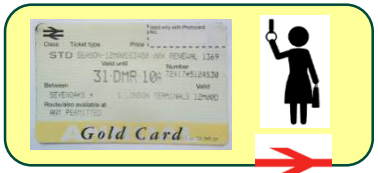
Child -Zip

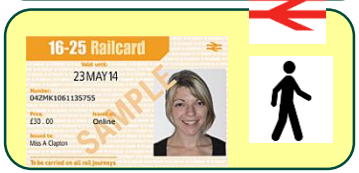
Youth -Zip

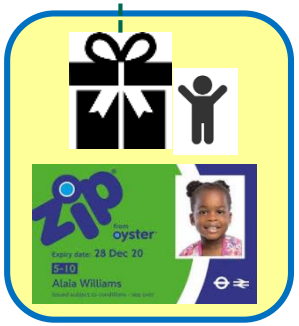
Student

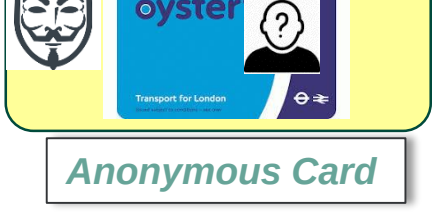
Senior

Veteran

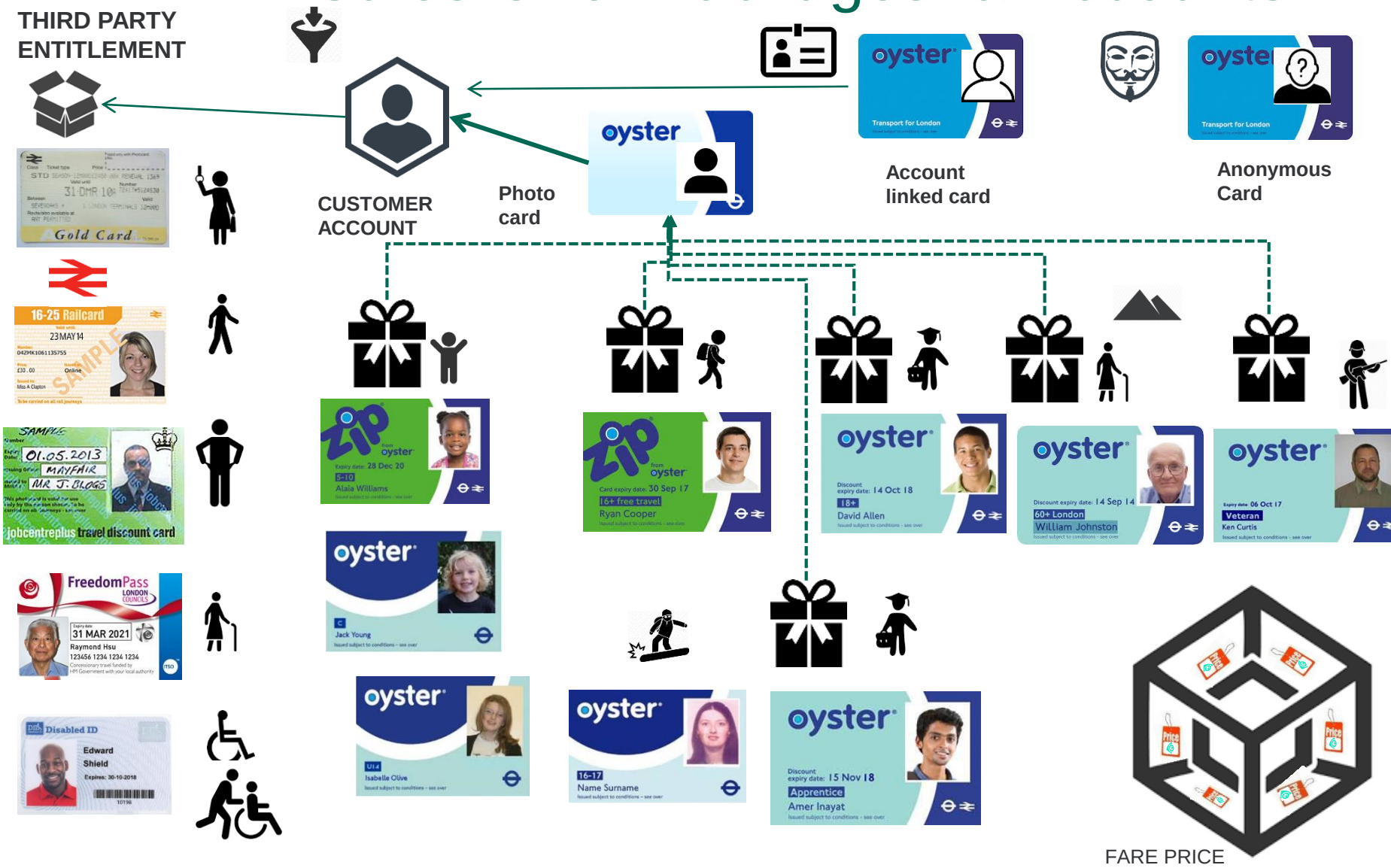








Sales Offer Packages & Accounts



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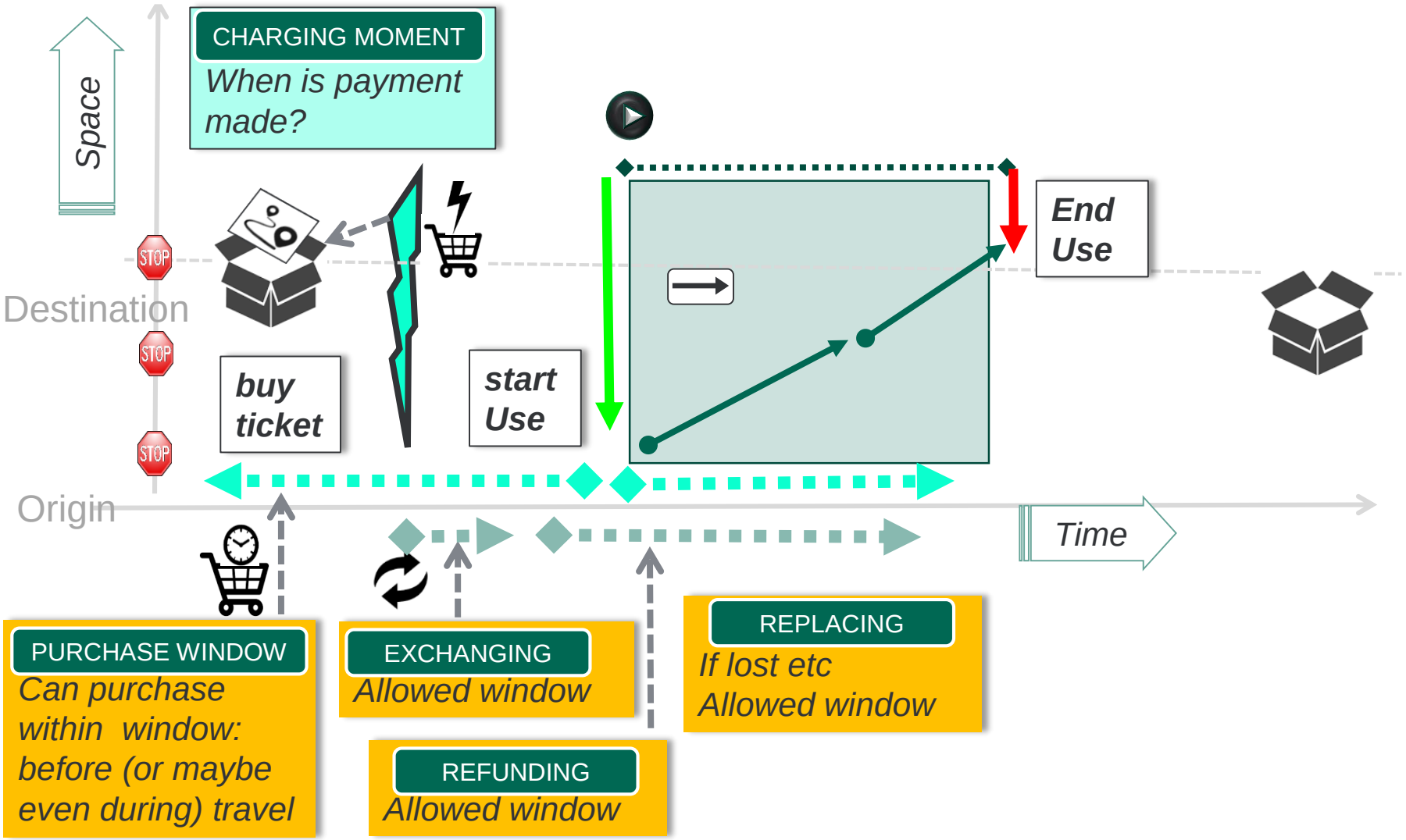
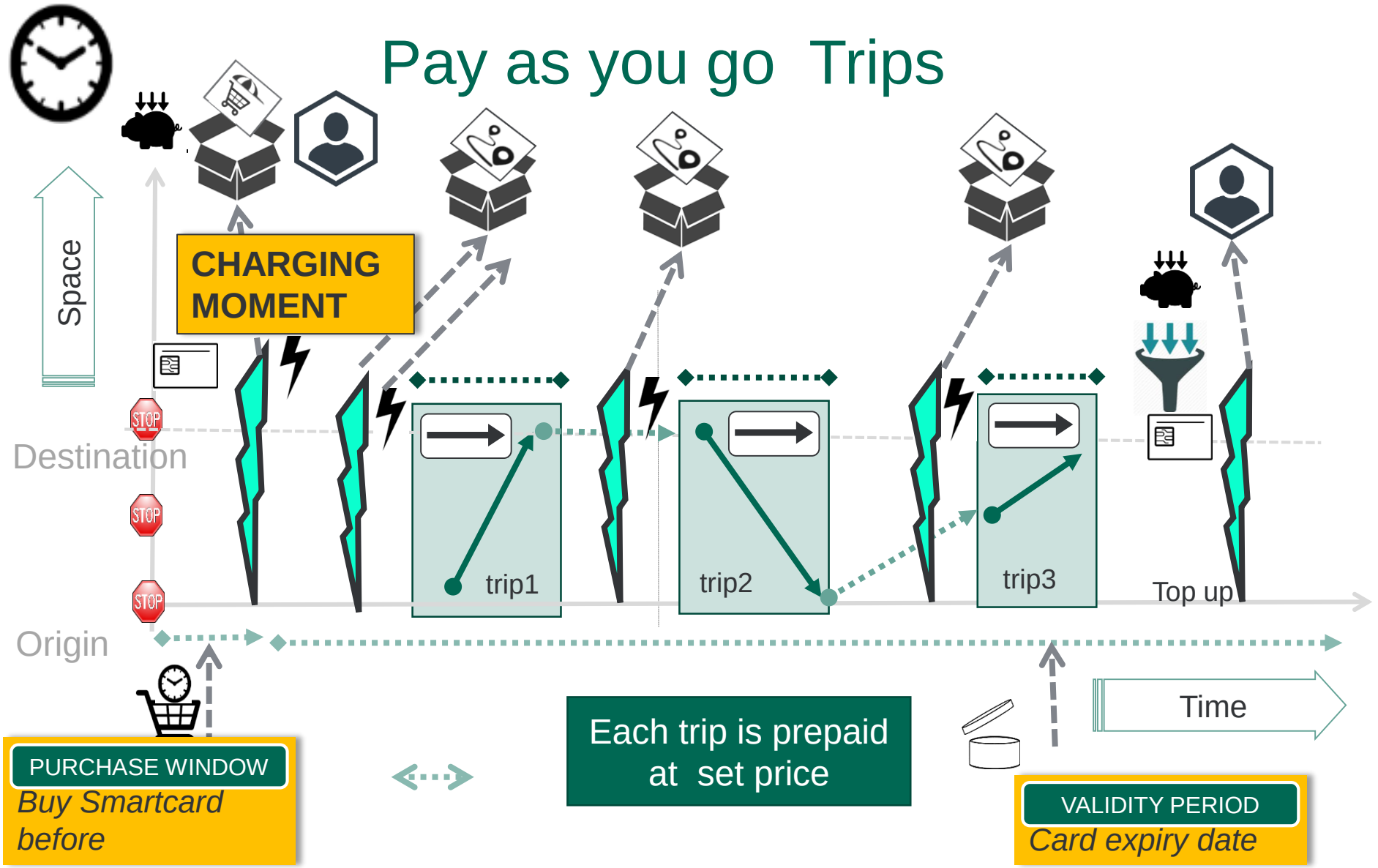
Pay as yoy go products

1. Simple pre-payment for each trip from stored value on card

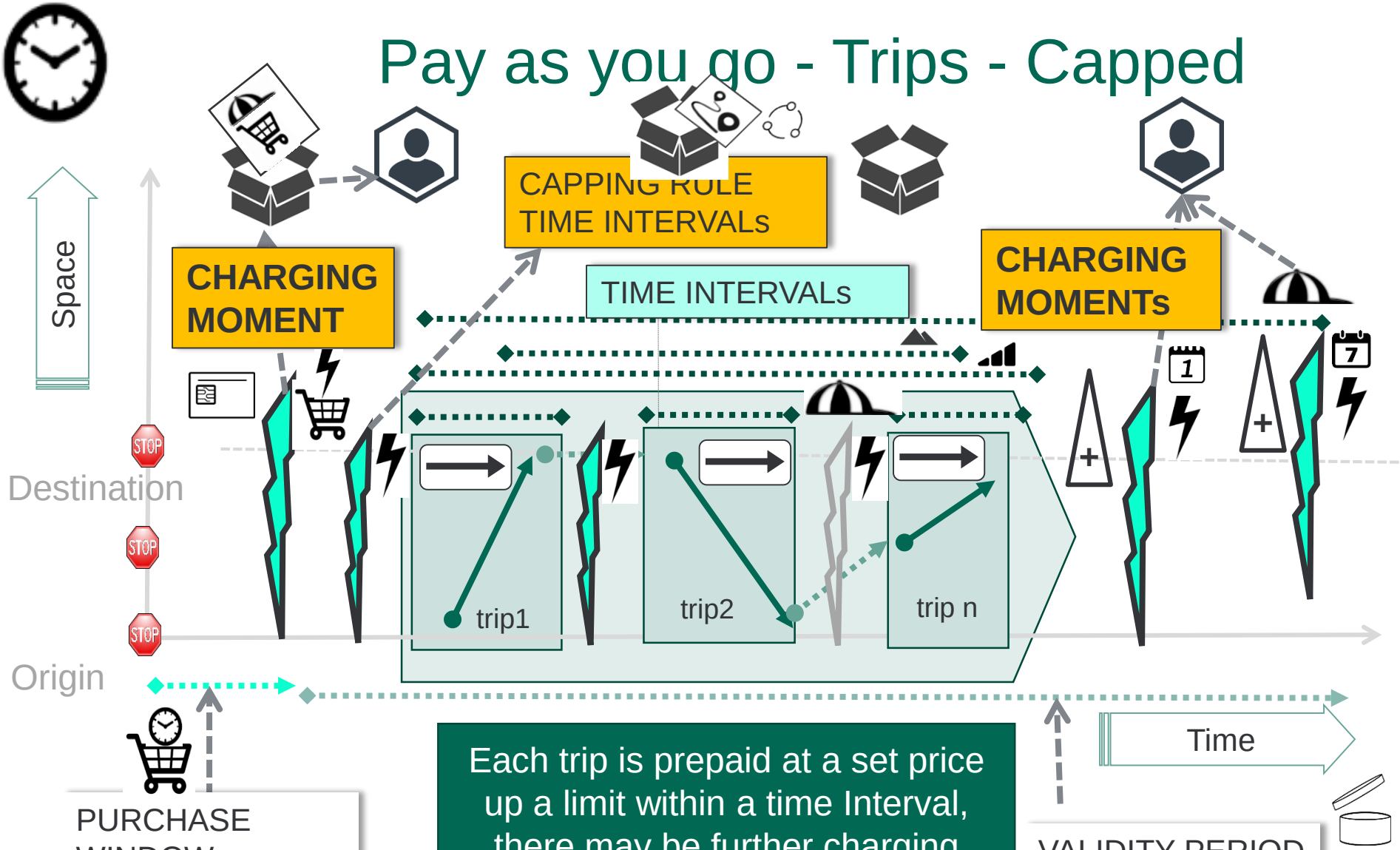
Products – Prepaid CHARGING MOMENT



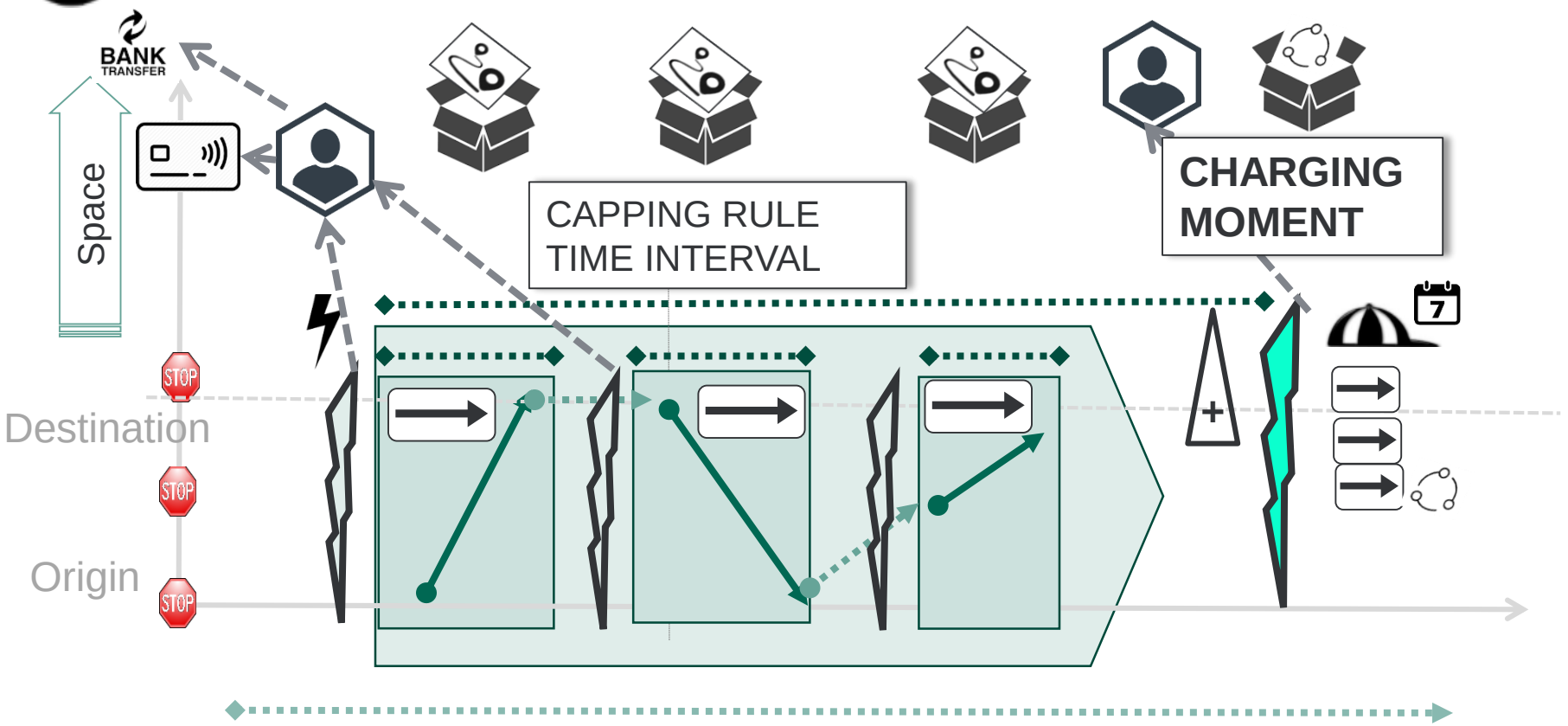
Pay as you go Trips



Pay as you go - Trips - Capped



Pay as you go Trip – Contactless Capped



All trips are post paid at end of interval, capped if set price is reached

Time

VALIDITY PERIOD
Of card

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Notes on Complex Sales Offers

- Quite straightforward to use existing NeTEx data elements to describe.
  - SALES OFFER PACKAGE + SALES OFFER PACKAGE ELEMENT + FARE PRODUCT
  - ENTITLEMENT REQUIRED / ENTITLEMENT GIVEN can be used to stated prerequisites
- Potential sematic complexity as to use
  - how to interpret combining conditions at different levels
- Important to modularise products in to manageable groupings – use Version Frames
  - Eg Separate FARE FRAMEs for different types fo Product

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Modelling Multioperator Fares

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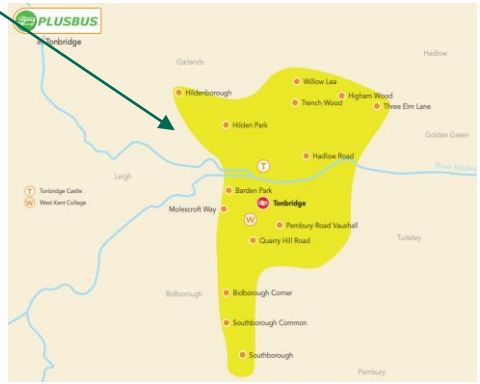
Interoperating fares – eg Plus Bus : Zonal add on for rail tickets

FARE ZONEs

TOPOGRAPHIC PLACEs

PlusBus



Zones around country

- Multiple participating Bus operators
- Sold via rail sales channels

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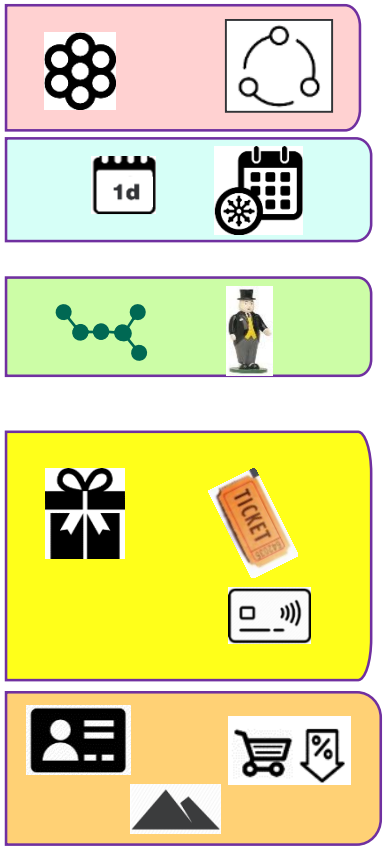
PlusBus

PLUS BUS – National bus fare trip supplements



- Available as
  - Zonal day pass origin and destination stations
  - Zonal Season pass origin and destination stations
- Coverage
  - City wide Tariff zones around stations,
  - Named operators & Lines
  - Local exceptions
- Sales Packages / Distribution / Media
  - Add-on purchased with rail ticket /season pass
  - Bought separately to rail ticket or season pass
  - As paper ticket, on smartcard some areas
- Further discounts
  - Rail cards
    - Peak/off peak restrictions on railcard discounts
- Product Owner: JSP: Branding?

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Plus Bus tariff - Crawley

SALES PACKAGEs

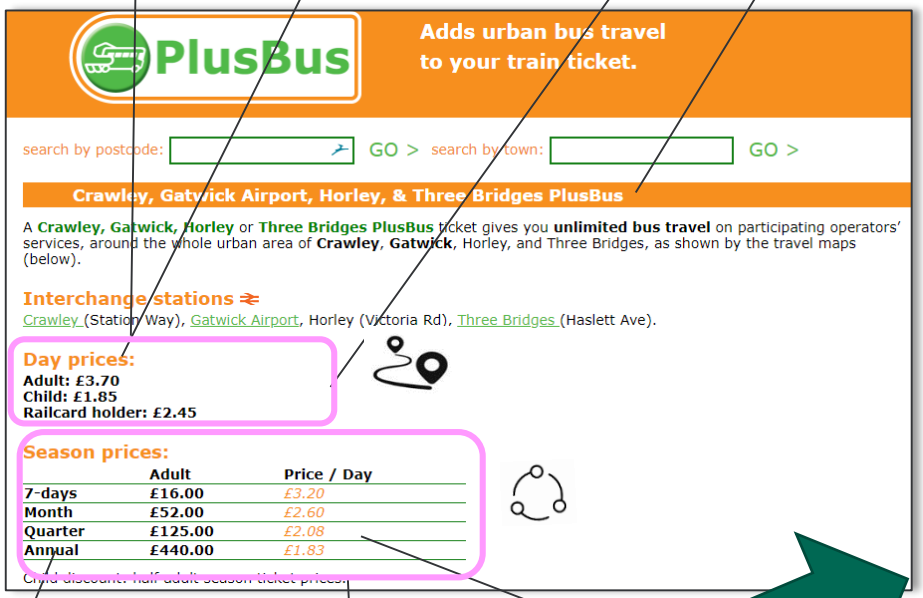
USER PROFILEs

FARE PRODUCTs

TARIFFs

FARE ZONE

DISCOUNT RIGHT



TIME INTERVALs

USER PROFILEs

FARE PRICEs

Railcard discount restrictions for PLUSBUS

Railcard holders get 1/3 off the adult price of *PLUSBUS* day
Some Railcards have retail restrictions, ee individua
Sorry, Railcards do **NOT** give a discount off any P eason ticket pr

NETWORK Railcard (Annual Gold Card) ho 3 off the adult *PLUSBUS* day tickets for towns and cities locate South East of England, upon presentation of their valid Network Railcard (Annual Gold Card), as follows:-
Mondays to Fridays **after 10:00hours**;
Saturday, Sunday, Bank Holidays any time.
The £13 minimum fare restriction does not apply to *PLUSBUS* day ticket purchases.

Two Together Railcard holders get 1/3 off the adult price of *PLUSBUS* day tickets, upon presentation of their valid Two Together Railcard, as follows:-
Mondays to Fridays **after 09:30hours**;
Saturday, Sunday, Bank Holidays any time.
You must buy 2 tickets at the same time.

16-25 Railcard, 26-30 Railcard & HM Forces Railcard holders get holders get 1/3 off the adult price of *PLUSBUS* day tickets, upon presentation of their valid 16-25 or 26-30 Railcard or HM Forces Railcard, **at all times**.
The £12 minimum fare restriction does not apply to *PLUSBUS* day ticket purchases.

Senior Railcard holders get 1/3 off the adult price of *PLUSBUS* day tickets, upon presentation of their valid Senior Railcard, as follows:-
outside of the South East of England at all times;
in the South East after the Monday to Friday morning peak period* (excluding Bank Holidays) for a journey wholly within the South East region.
* times of off-peak services vary by route, but generally related to the availability of Off-Peak tickets.

Disabled Persons Railcard holders get 1/3 off the adult price of *PLUSBUS* day tickets, upon presentation of their valid Disabled Persons Railcard at all times, when purchased with the following rail ticket types:-
Off-Peak Day Singles, Off-Peak Day Returns;
Anytime Singles, Anytime Returns;
Advance fares.
Disabled Persons discounts are valid during the morning peak hours.

Family&Friends Railcard
Adult travellers get one third off the adult *PLUSBUS* day ticket price upon presentation of their valid Family&Friends Railcard:
outside of the South East of England at all times;
in the South East after the Monday to Friday morning peak period* (excluding Bank Holidays) for a journey wholly within the South East region.
* times of off-peak services vary by route, but generally related to the availability of Off-Peak tickets.

Children MUST be charged the normal child *PLUSBUS* day ticket price (which is half the adult fare).

Railcard discount restrictions for PLUSBUS. Updated: 06/12/2017

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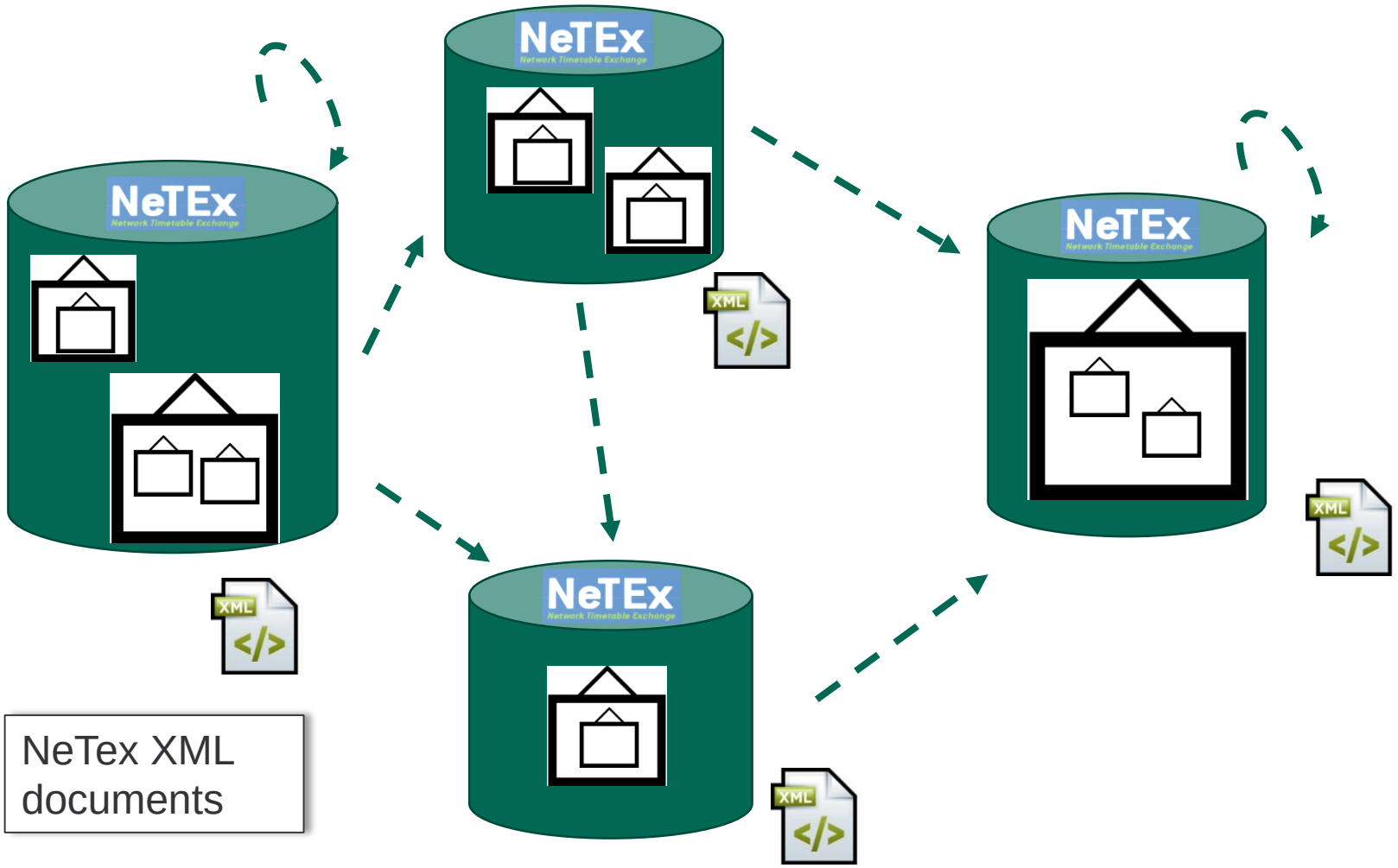
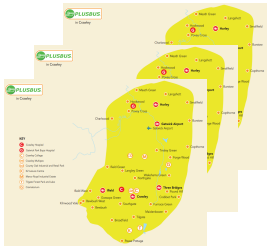
Modularise ; references may be internal or external

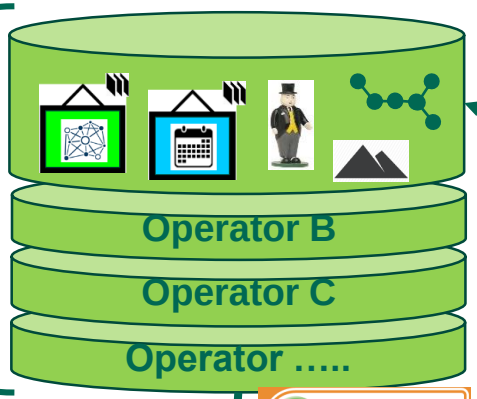


How to partition a Multi-operator product

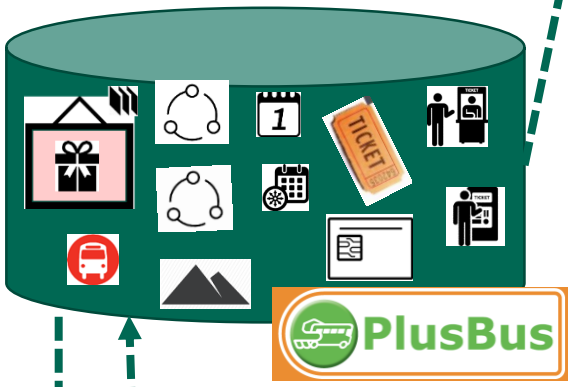


Plusbus Prices

Operator specific Lines & exceptions

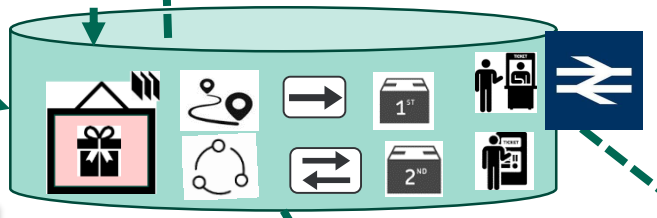


Plusbus Product definitions

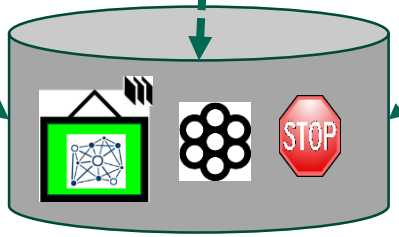


Common Plus Bus definitions

National Rail Travel Products

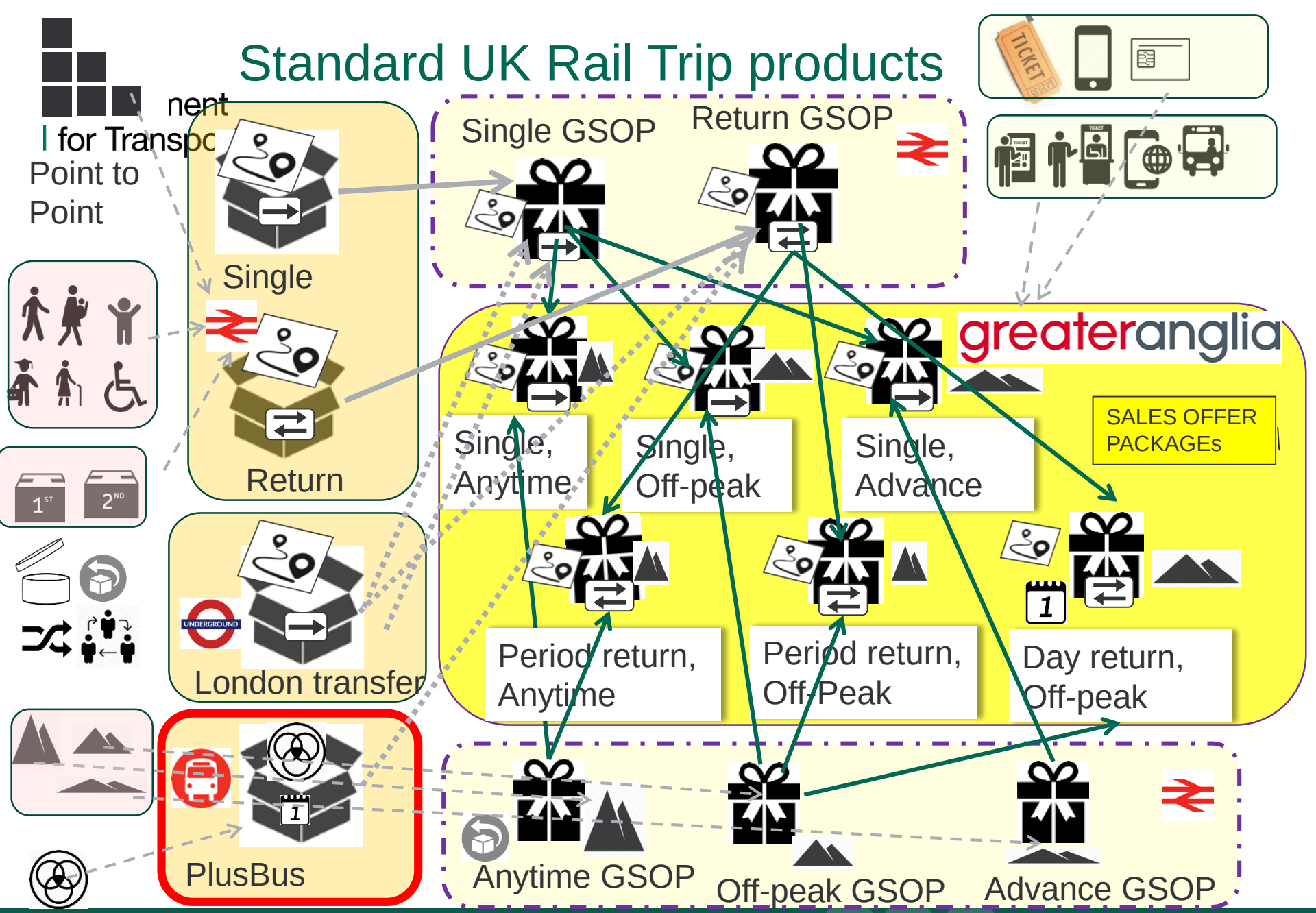


National Rail Railcard Products



National Stop & Plusbus Zone definitions (NPTG & NAPTAN)

Standard UK Rail Trip products



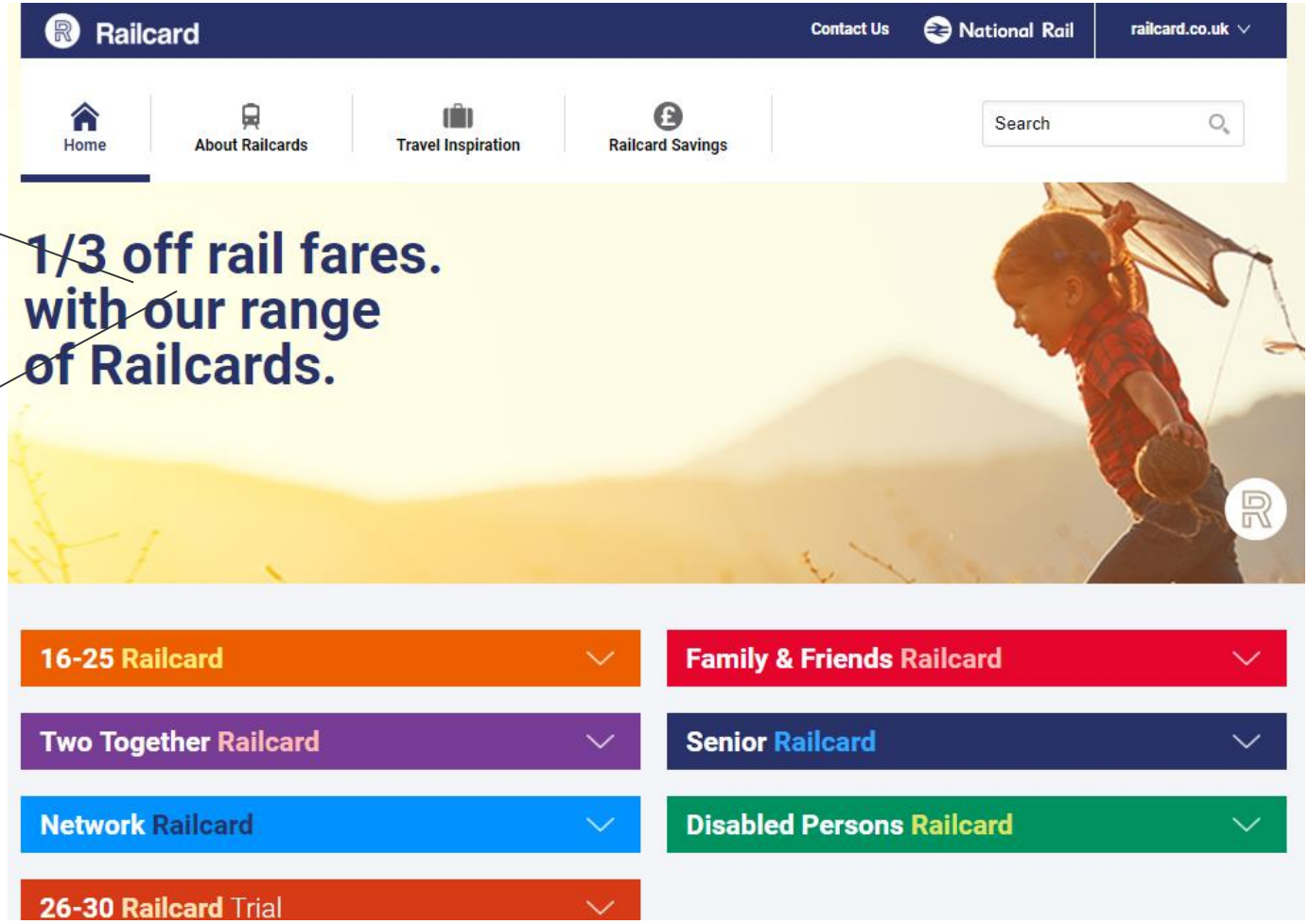
Rail Cards

SALE DISCOUNT RIGHT (FARE PRODUCT)

DISCOUNTING RULE

SALES OFFER PACKAGEs

USER PROFILEs



https://www.railcard.co.uk/about-railcards/

UK Rail card products

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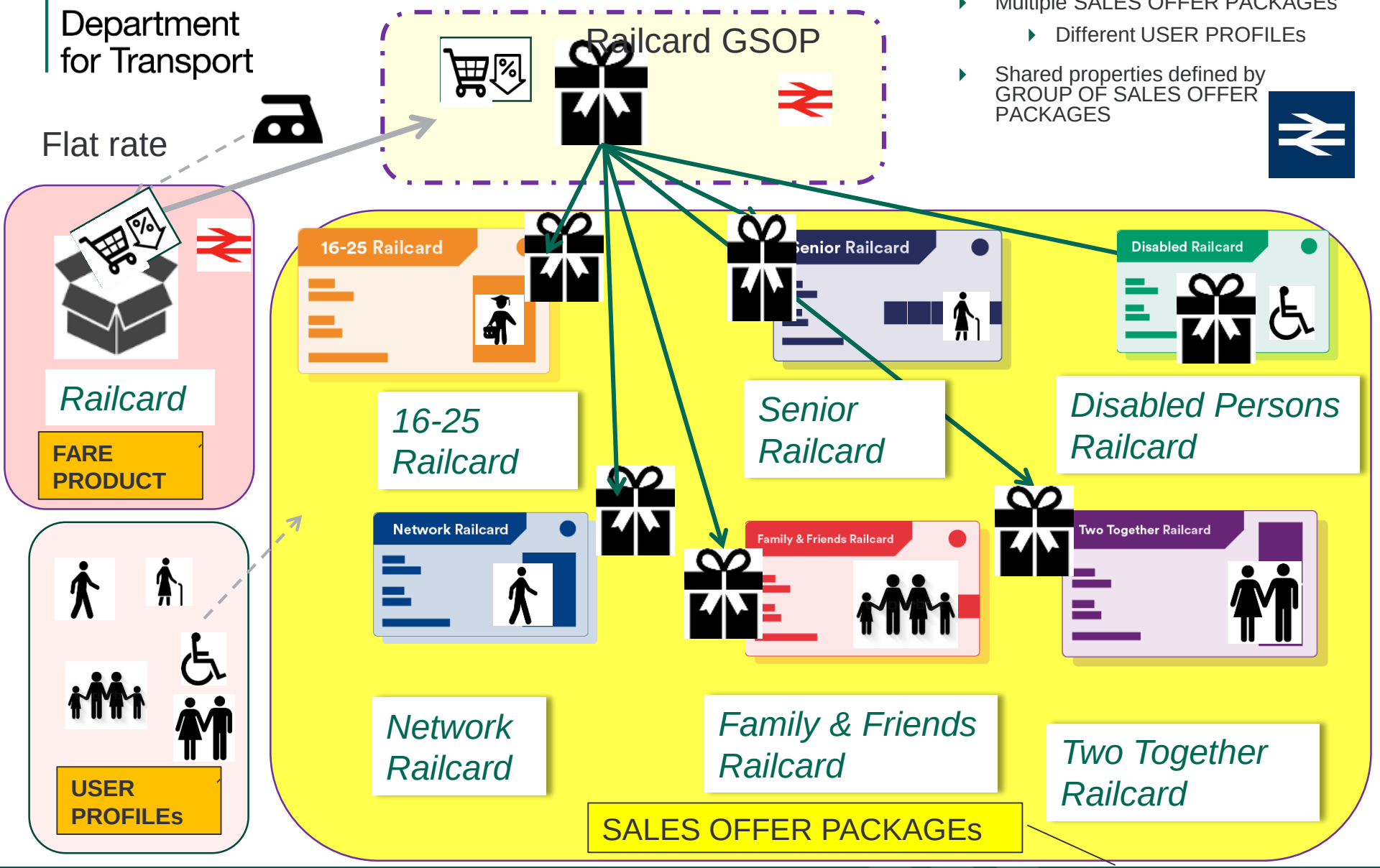
- Single FARE PRODUCT
- Multiple SALES OFFER PACKAGEs
  - Different USER PROFILEs
- Shared properties defined by GROUP OF SALES OFFER PACKAGES



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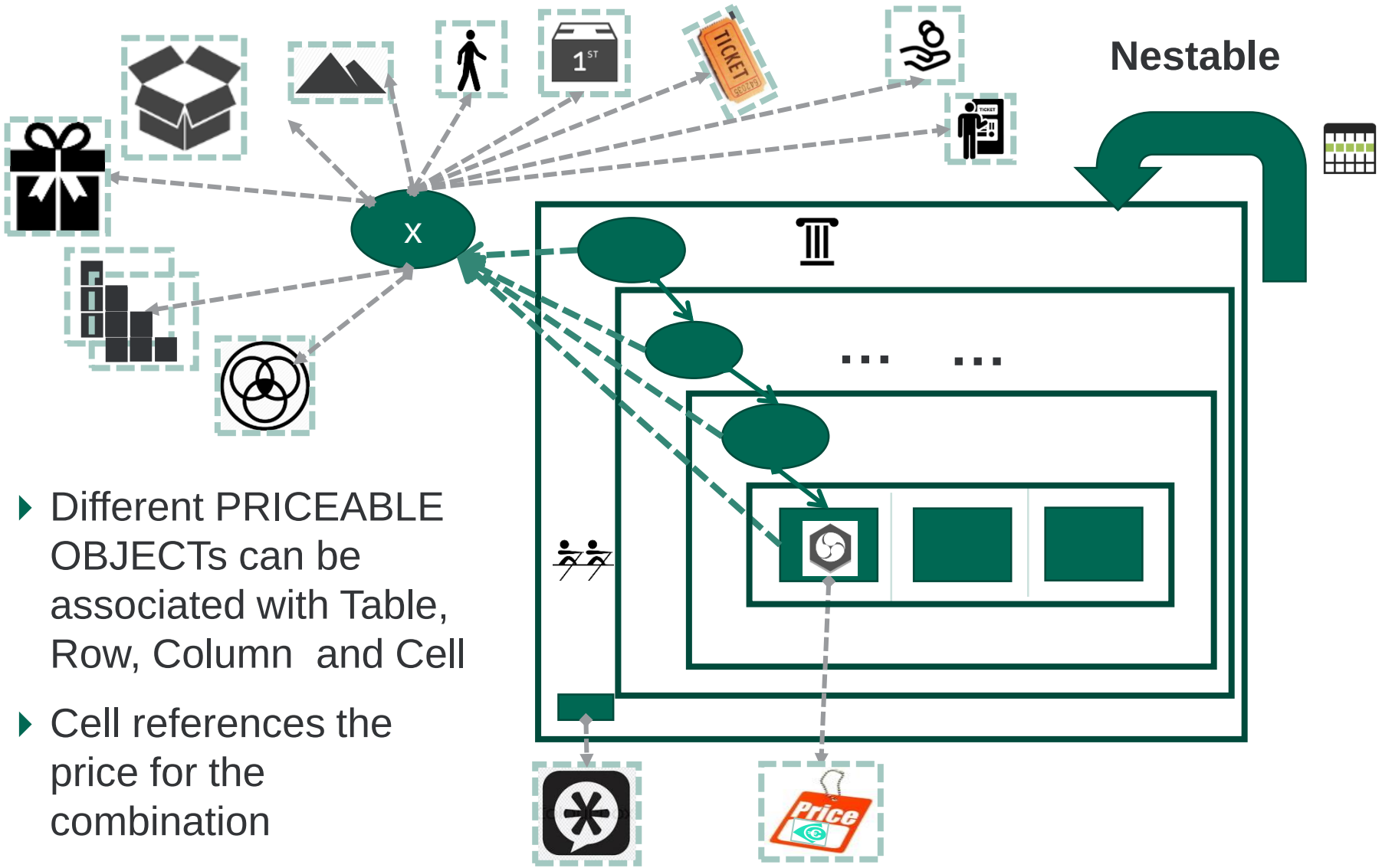
Further Aspects of Modelling Fares

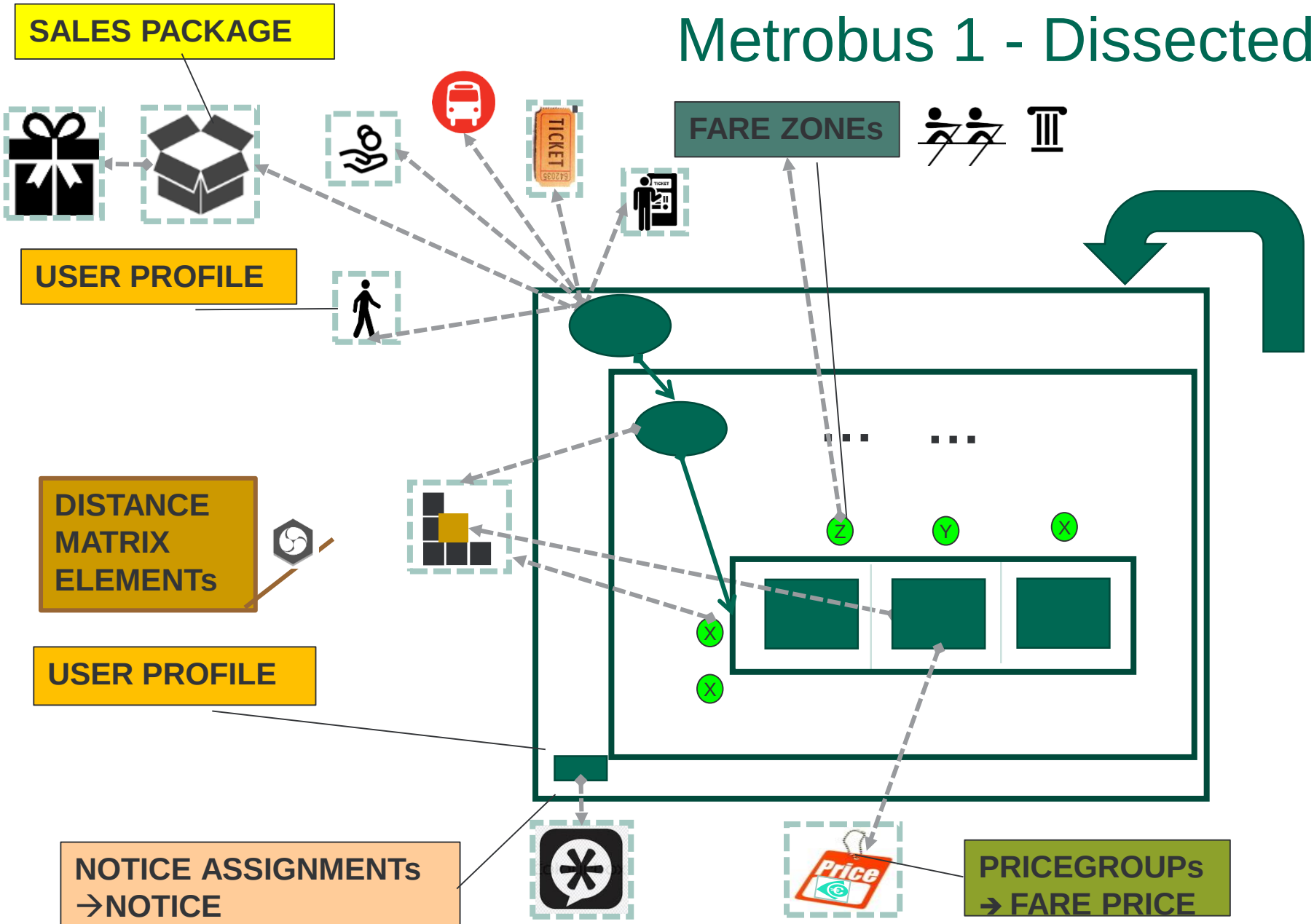
Prices

Fare Tables – Organising Price Combinations

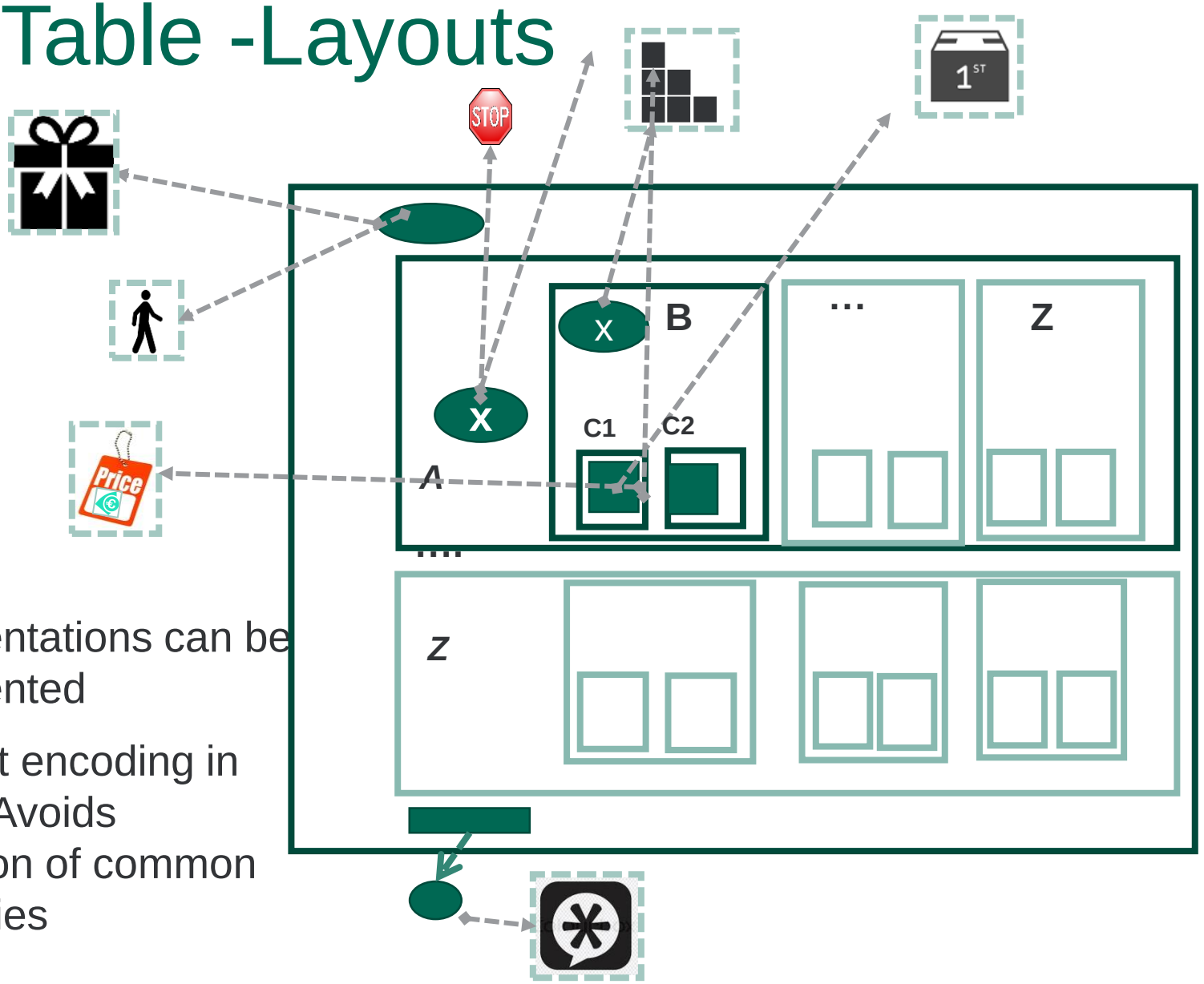


- Different PRICEABLE OBJECTs can be associated with Table, Row, Column and Cell
- Cell references the price for the combination

Metrobus 1 - Dissected



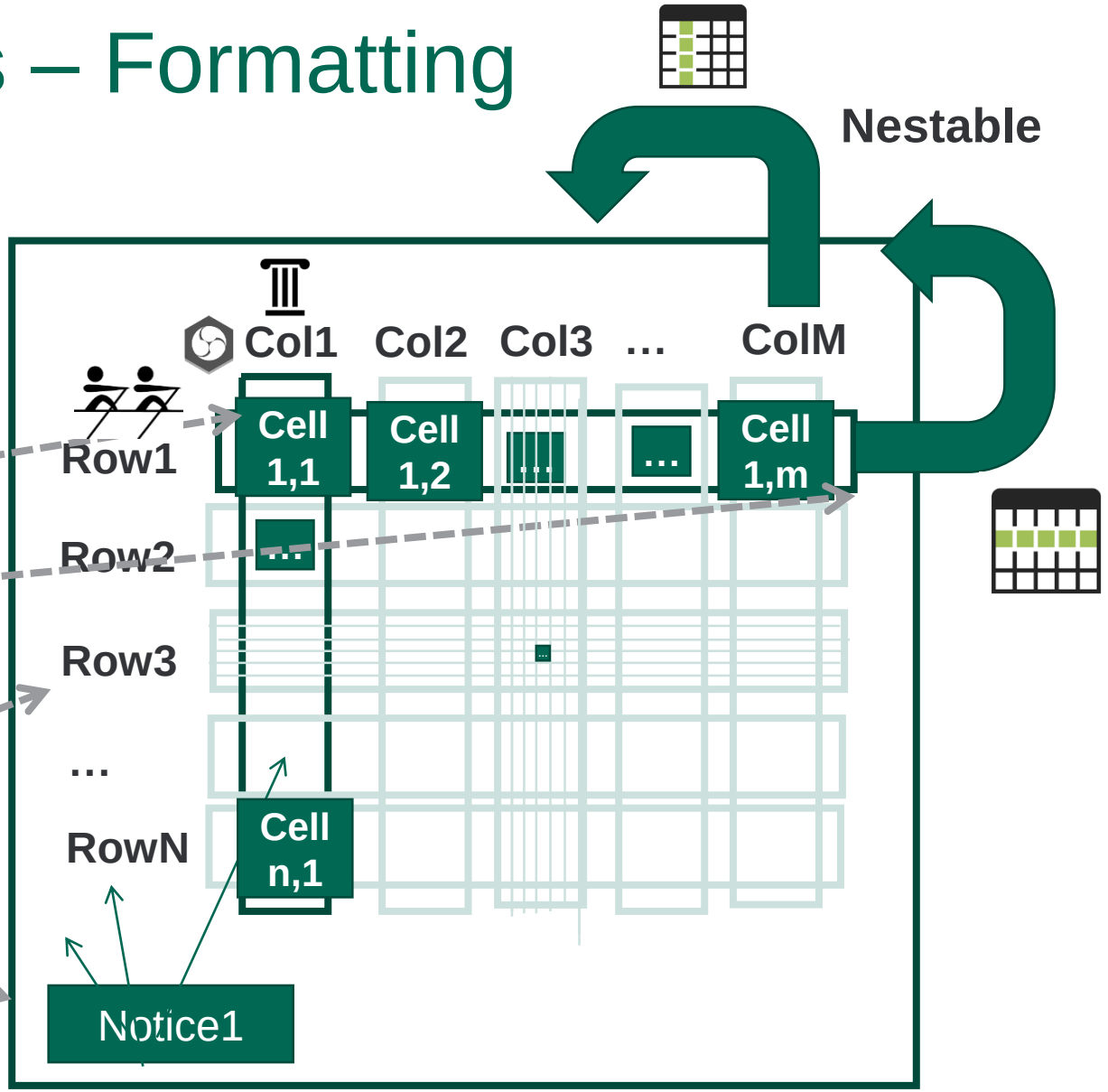
Fare Table -Layouts



- Tabular representations can be represented
- Efficient encoding in XML – Avoids repetition of common properties

Fare Tables – Formatting

- **Presentation of fares in tabular form**
  - Table of price **cells**
  - Row or column can be another nested table
  - Can have row and column **headers**
  - **Notices** may relate to any element



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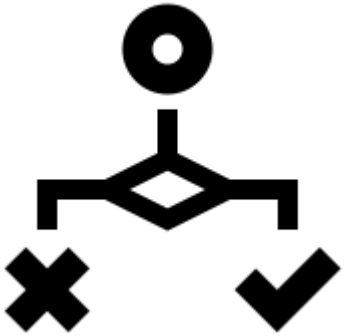
Specifying Complex Conditions

Parameter Assignments

Access Rights

Using Parameters #1



- Generic Assignment:
  - List of parameters. Can be Ored or ANDed
    - *Eg 1st Class | Second Class*
    - *E.g. 1st Class & Private Compartment | 2nd Class & Couchette Berth*
    - **Can be used to build complex conditions:**
    - *Eg Travel times for zones.*
    - *Eceptions toPlus bus services*
    - *Timebands into Lndon etc*

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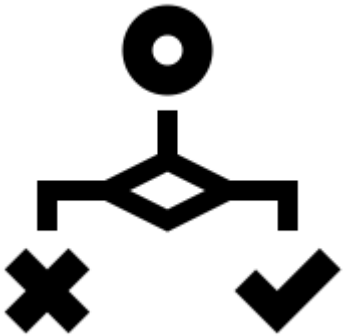
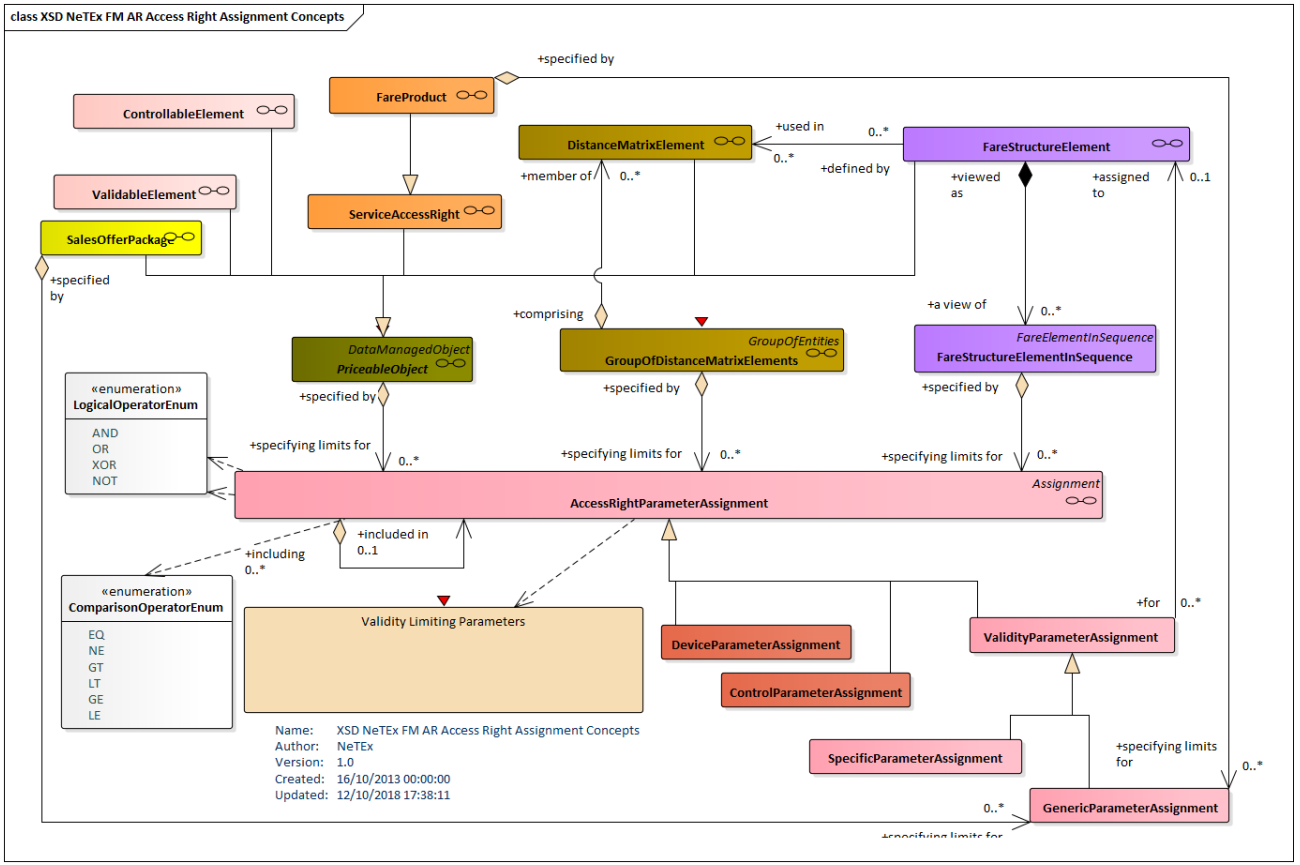
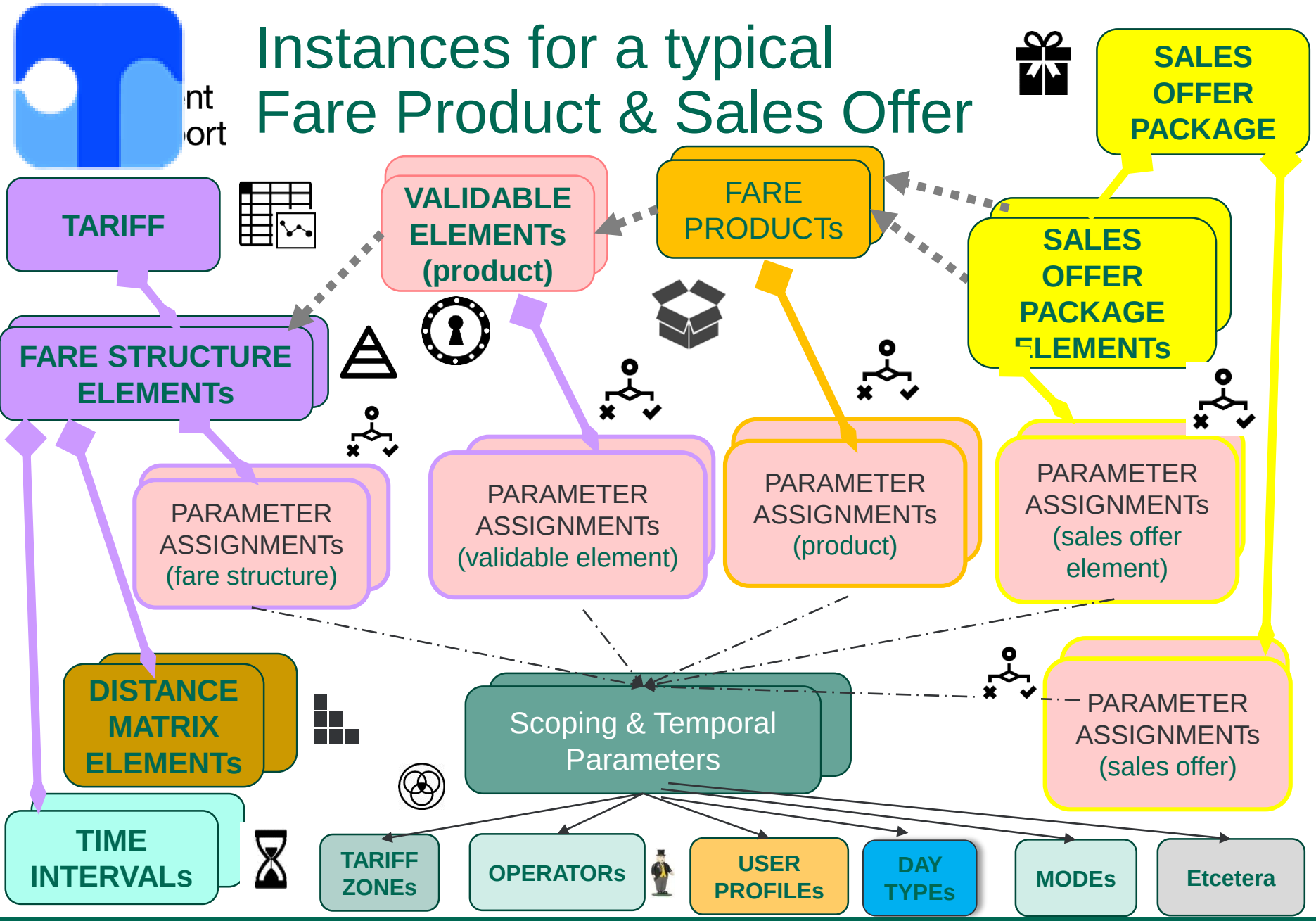
Assignments can be ANDed and ORed together and nested to build complex conditions





Instances for a typical Fare Product & Sales Offer



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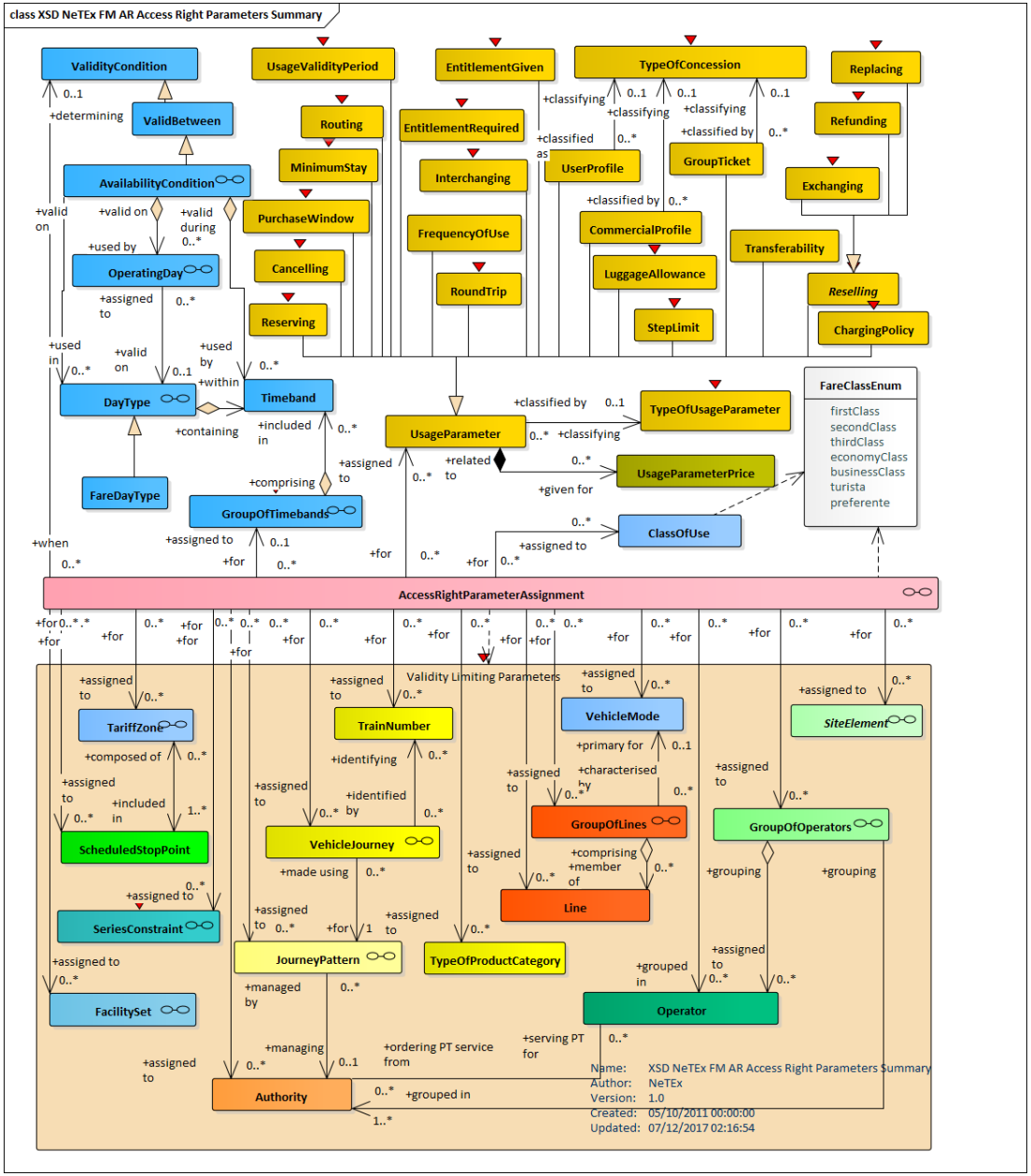
Validity Parameters

Most Network elements, Temporal eleemnts and product components can be used as validity parameters

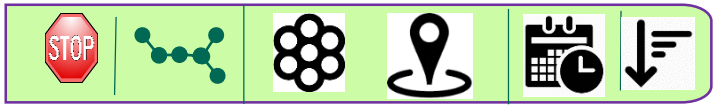


Common Framework

Describing Fares with NeTEx

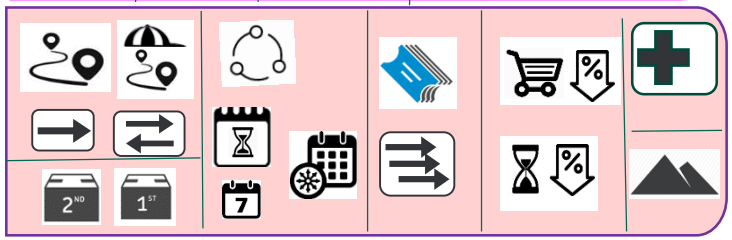
Pricing

Network Basis

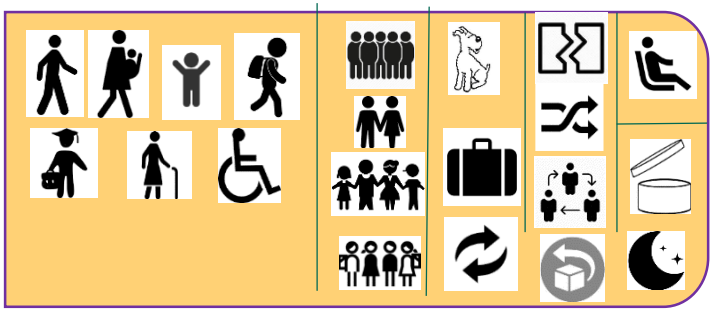


Tariff Structure

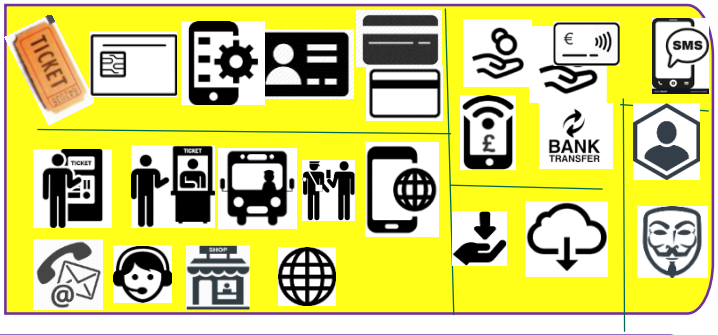
Access Rights



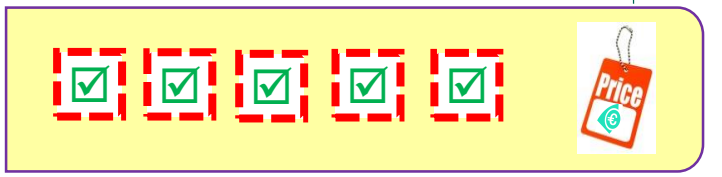
Fare Products



Sales Offer Packages



Travel Specifications & Sales



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Additional Tariffs

Mileage Distance

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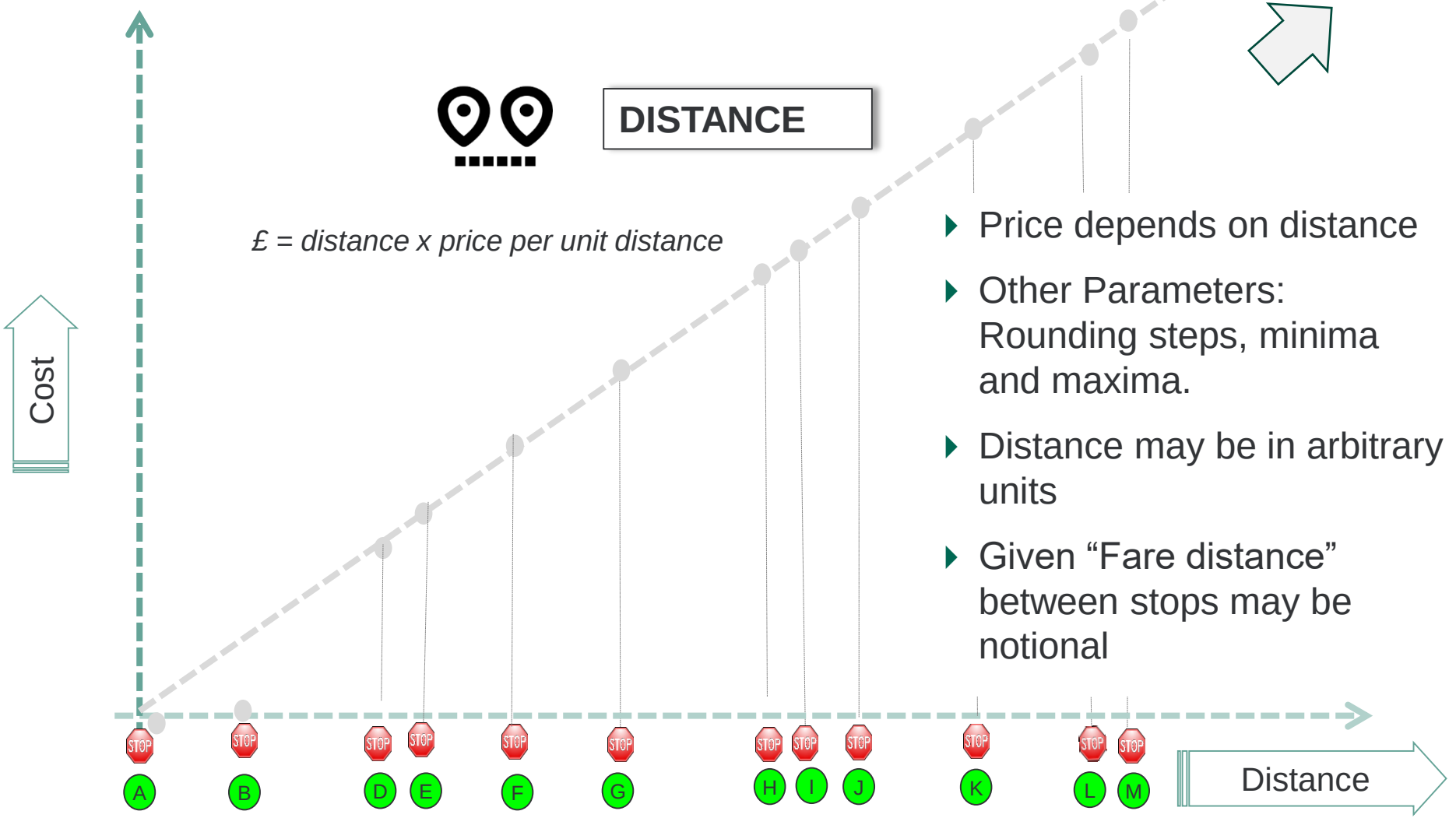
Distance

DISTANCE

£ = distance x price per unit distance

- Price depends on distance
- Other Parameters: Rounding steps, minima and maxima.
- Distance may be in arbitrary units
- Given “Fare distance” between stops may be notional



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Distance based Fares

CLASS OF USE

TARIFF

GEOGRAPHICAL INTERVAL PRICEs

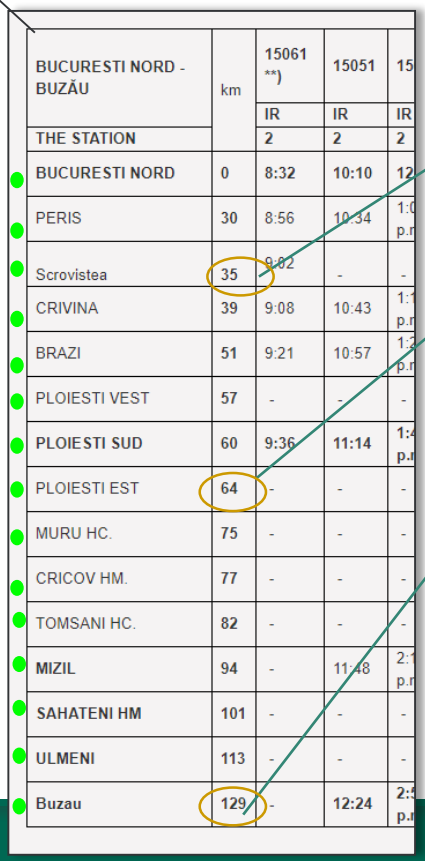
TIMETABLE

GEOGRAPHICAL INTERVALs

SCHEDULED STOP POINTs

- Distance steps specified as GEOGRAPHICAL INTERVALs
- Each interval has a price or prices

DISTANCE MATRIX ELEMENTs ***distance***



BUCURESTI NORD - BUZĂU	km	15061 **)	15051	15
		IR	IR	IR
THE STATION		2	2	2
BUCURESTI NORD	0	8:32	10:10	12
PERIS	30	8:56	10:34	1:0 p.r
Scrovistea	35	9:02	-	-
CRIVINA	39	9:08	10:43	1:1 p.r
BRAZI	51	9:21	10:57	1:3 p.r
PLOIESTI VEST	57	-	-	-
PLOIESTI SUD	60	9:36	11:14	1:4 p.r
PLOIESTI EST	64	-	-	-
MURU HC.	75	-	-	-
CRICOV HM.	77	-	-	-
TOMSANI HC.	82	-	-	-
MIZIL	94	-	11:48	2:1 p.r
SAHATENI HM	101	-	-	-
ULMENI	113	-	-	-
Buzau	129	-	12:24	2:5 p.r

TARIF DE TAXARE ÎN TREN

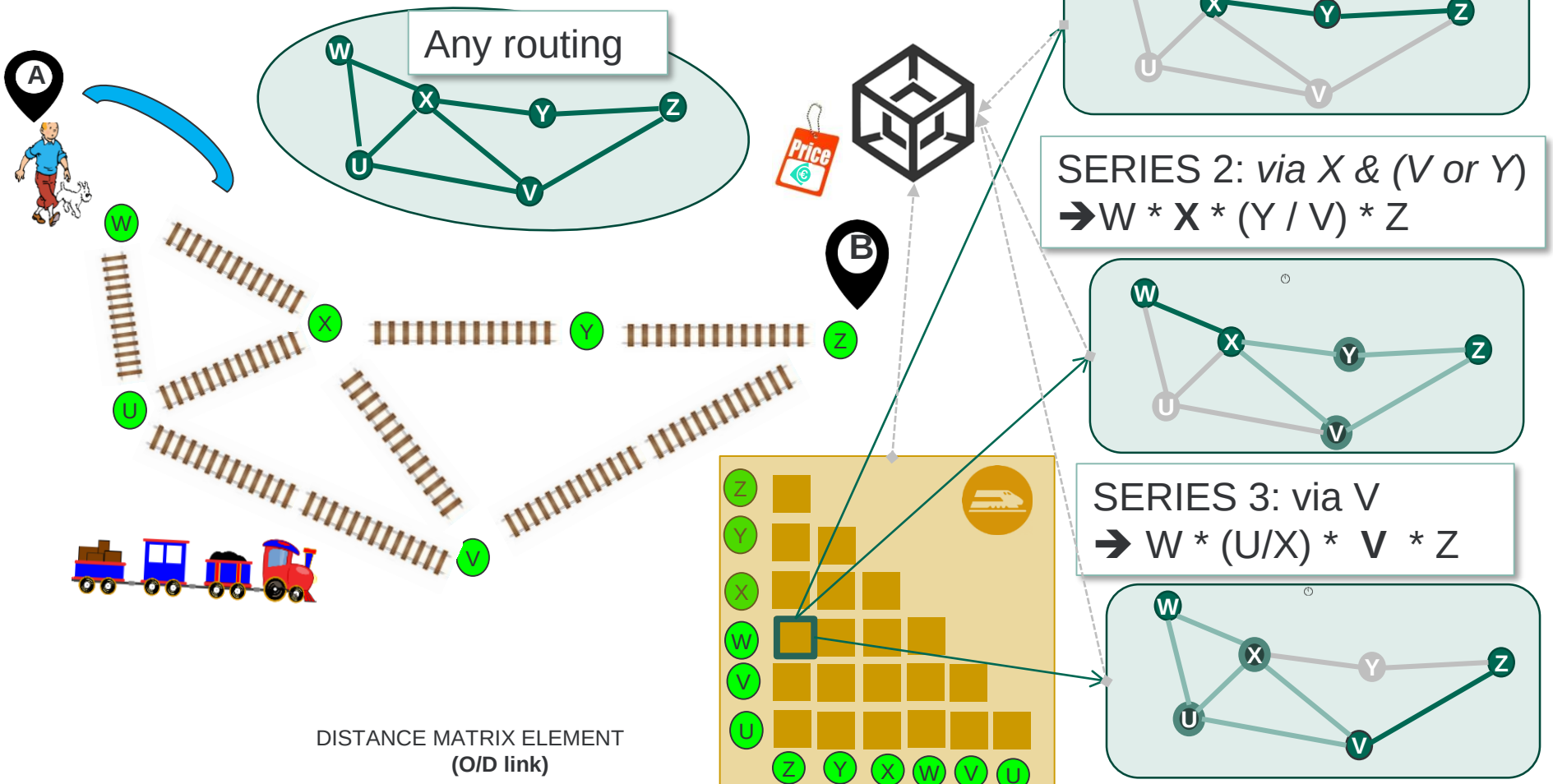
Regio-R și Interregio-IR

Zona km	clasa 1		clasa 2	
	LEI	*din care tva 19%*	LEI	*din care tva19%*
1-10	6,00	0,96	5,50	0,88
11-20	7,50	1,20	6,00	0,96
21-30	10,00	1,60	6,50	1,04
31-40	11,50	1,84	7,50	1,20
41-50	14,50	2,32	9,00	1,44
51-60	15,00	2,39	9,50	1,52
61-70	17,50	2,79	11,50	1,84
71-80	19,50	3,11	13,00	2,08
81-90	21,50	3,43	14,50	2,32
91-100	24,00	3,83	15,50	2,47
101-120	28,00	4,47	18,00	2,87
121-140	32,50	5,19	21,00	3,35
141-160	36,00	5,75	23,50	3,75
161-180	41,00	6,55	27,00	4,31
181-200	45,00	7,18	28,50	4,55
201-250	51,50	8,22	32,50	5,19
251-300	59,50	9,50	38,00	6,07
301-350	67,50	10,78	44,00	7,03

Network Basis

Routing constraints specify an allowed envelope for travel over a network.

- The same O/D pair may have multiple alternate routings, each with a different price.



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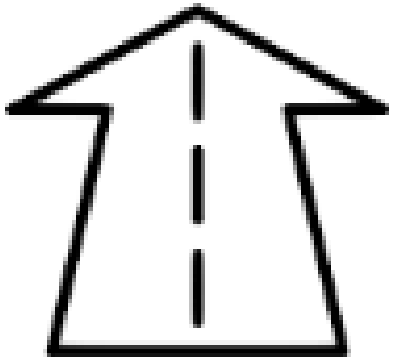
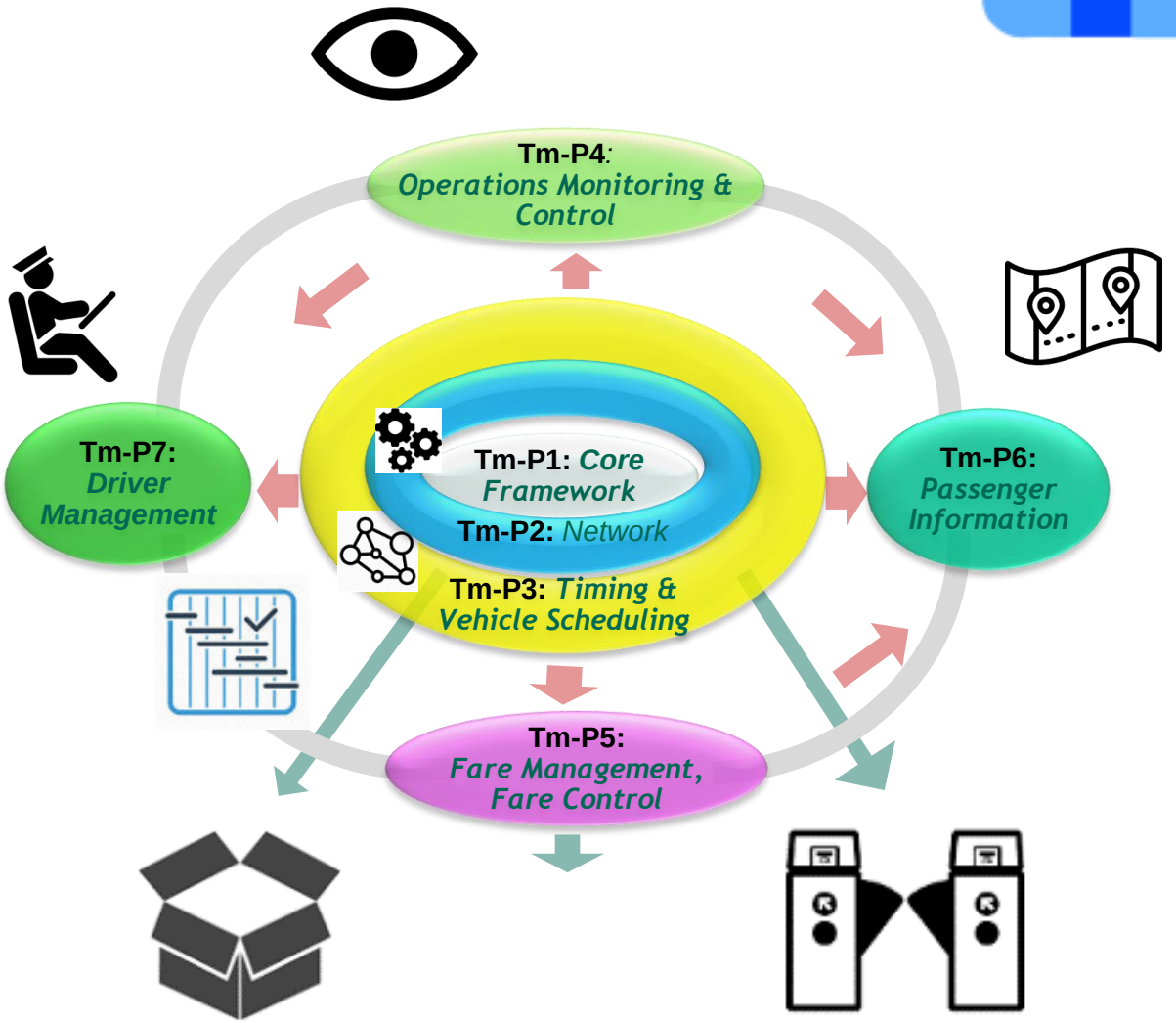
Further Aspects of Modelling Fares

VALidation & COntrol

Transmodel 6.0
Also includes Validation & Control



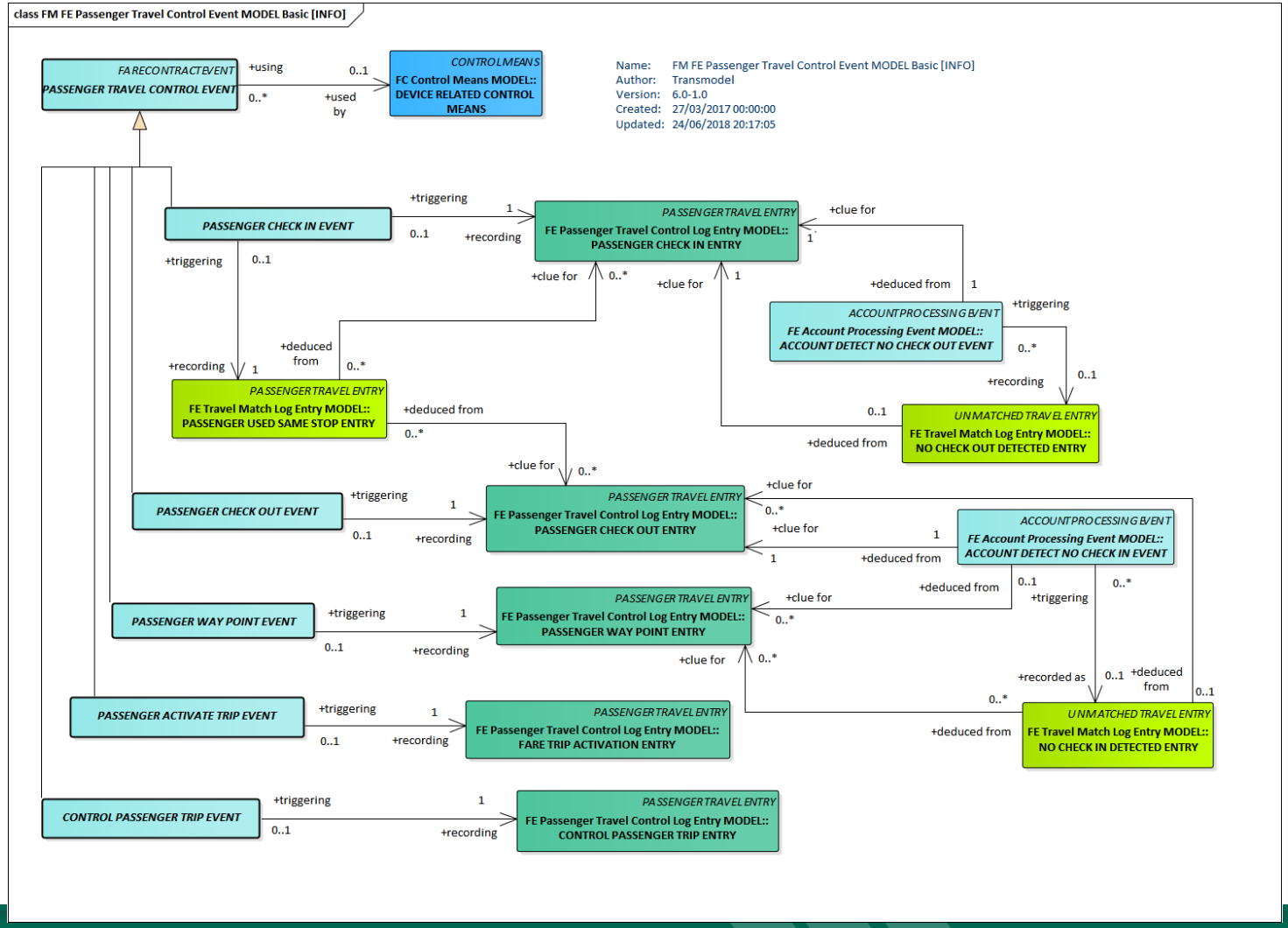


Tm-P8: ***Management Information & Statistics***

Transmodel Fare concepts not encoded in NeTEx (1) Validation & Control Events

- User Interaction with system can be described as events & as log entries
  - **Sales**
    - **Registration**: Account creation, update, delete, etc
    - **Purchase**, **fulfilment**, Selection, payment, collection , app installation, subscription,etc
    - **After Sales:** Exchange, Refund, Reinstallation, Replacement, etc
  - **Control & Validation**
    - **Travel**: Activation, Check-in, Control, Checkout…, etc
    - **Control**: No Check in, No Check out, Repeated chkec in, etc
    - **Revenue protection:** Access rights, No Proof of Travel, Suspicious behaviour, etc
    - **Security Action:** Suspend, Activate, Place on Scurity List, Delist, etc
- Useful for aligning fare with various standard, proprietary and informal descriptions of Fare Processes that generate data for control, clearing and settlement systems
  - eg IFM, FSM, UIC Account Based Ticketing report etc

Harmonising Fare Validation



PURCHASE & FULFILMENT EVENTS

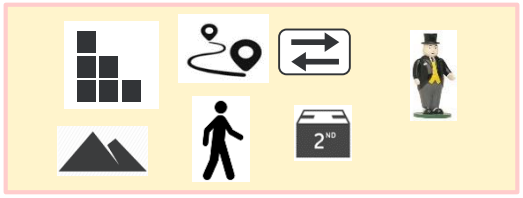
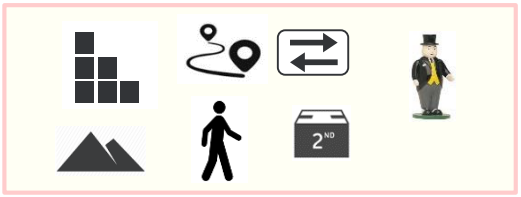
From SALES OFFER PACKAGE + TRAVEL SPECIFICATION

TRAVEL DOCUMENT + CUSTOMER PURCHASE PACKAGE + CUSTOMER PURCHASE PACKAGE PARAMETERS

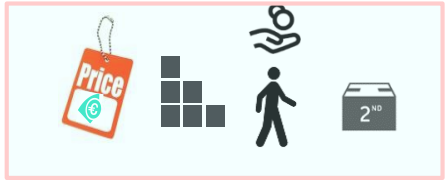
VALIDITY PARAMETERS (generic)

Purchase & Fulfilment

VALIDITY PARAMETERS (CP specific)

VALIDITY PARAMETERS (specific)



SALES TRANSACTION

Back Office

VALIDATION & CONTROL of

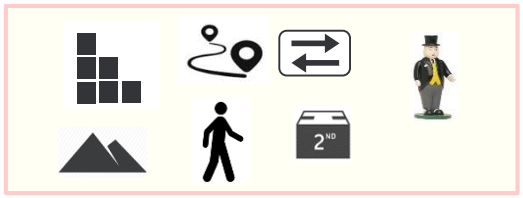
From TRAVEL DOCUMENT / USTOMER PURCHASE PACKAGE (Media centric) or ACCOUNT (ABT)

CONTROL MEANS:
From CONTROL DEVICE or TCO

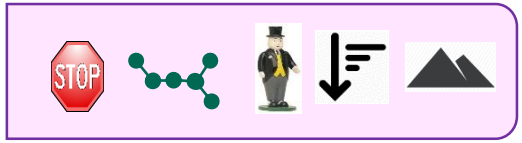
VALIDITY PARAMETERS

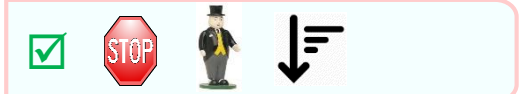
Compare

CONTROL PARAMETERS



VALIDATION PARAMETERS





VALIDATION ENTRY

Back Office

ACCOUNT MANAGEMENT

From CUSTOMER

To CUSTOMER ACCOUNT

VALIDITY PARAMETERS (generic)

Register / Update, etc

VALIDITY PARAMETERS

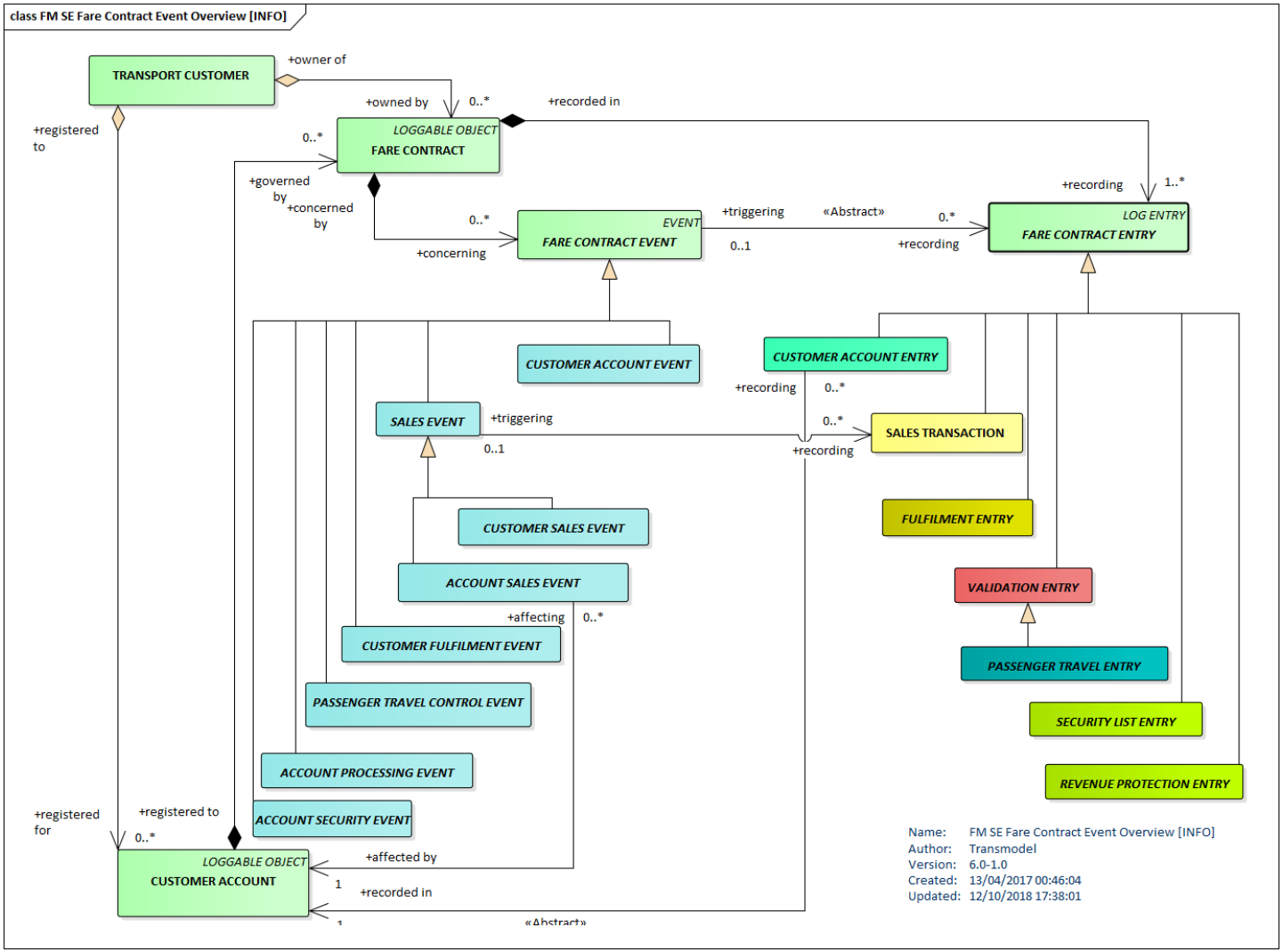
ACCOUNT PARAMETERS

CUSTOMER ACCOUNT TRANSACTION

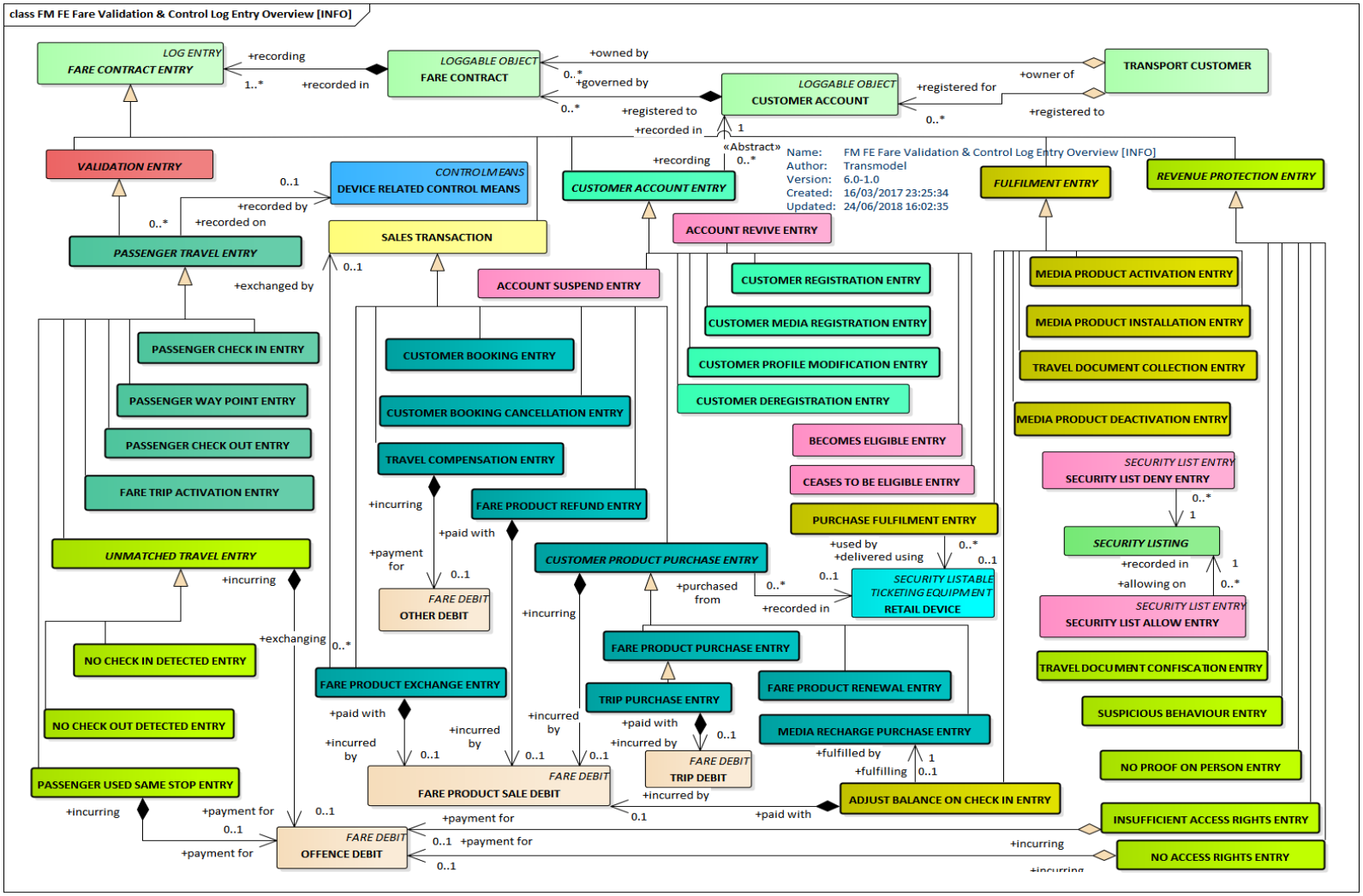
Back Office

Fare Contract events

- **Events are recorded as log entries**
  - **Each type of event creates a type of log entry**



Recording Events – Log Entries



Sales and Fare Transactions

- Events to record purchase and fulfilment

	Action Name	Classical	Media Centric	ABT	Note
Customer Purchase & After Sales	FARE PRODUCT PURCHASE ENTRY	Applicable	Applicable	Applicable	
	TRIP PURCHASE ENTRY	Applicable	Applicable	Applicable	
	FARE PRODUCT RENEWAL ENTRY	Applicable	Applicable	Applicable	
	MEDIA RECHARGE PURCHASE ENTRY	n/a	Applicable	Applicable	
	FARE PRODUCT REFUND EVENT	Applicable	Applicable	Applicable	
	FARE PRODUCT EXCHANGE ENTRY	Applicable	Applicable	Applicable	
	TRAVEL COMPENSATION ENTRY	Applicable	Applicable	Applicable	
	CUSTOMER BOOKING ENTRY	Applicable	Applicable	Applicable	
	CUSTOMER BOOKING CANCELLATION ENTRY	Applicable	Applicable	Applicable	
Account Auto Sales	ACCOUNT AUTO RENEWAL ENTRY	n/a	Applicable	Applicable	
	ACCOUNT AUTO TOP UP ENTRY	n/a	Applicable	Applicable	
	ACCOUNT AWARD REFUND ENTRY	n/a	n/a	Applicable	
Fulfilment	TRAVEL DOCUMENT COLLECTION ENTRY	Applicable	Applicable	Applicable	
	PURCHASE FULFILMENT ENTRY	n/a	Applicable	Applicable	
	MEDIA PRODUCT INSTALLATION ENTRY	n/a	Applicable	Applicable	Account may have media
	MEDIA PRODUCT ACTIVATION ENTRY	n/a	Applicable	Applicable	ditto
	MEDIA PRODUCT DEACTIVATION ENTRY	n/a	Applicable	Applicable	to
	MEDIA RESTORE ENTRY	n/a	Applicable	Applicable	to
	MEDIA APPLICATION RESTORE ENTRY	n/a	Applicable	Applicable	to
	TRAVEL DOCUMENT ANNULMENT ENTRY	Applicable	Applicable	Applicable	

Account Events

- Events to create or change a customer account

	Action Name	Classical	Media Centric	ABT	Note
Customer Account	CUSTOMER REGISTRATION ENTRY	Applicable	Applicable	Applicable	Classical may register for season pass
	CUSTOMER DEREGISTRATION ENTRY	Applicable	Applicable	Applicable	
	CUSTOMER PROFILE MODIFICATION ENTRY	Applicable	Applicable	Applicable	
	CUSTOMER MEDIA REGISTRATION ENTRY	n/a	Applicable	Applicable	
	RESTORE CUSTOMER ACCOUNT ENTRY	n/a	Applicable	Applicable	
	BECOMES ELIGIBLE ENTRY	n/a	n/a	Applicable	

Travel Control & Validation Events

	Action Name	Classical	Media Centric	ABT	Note
Travel	PASSENGER CHECK IN ENTRY	n/a	Applicable	Applicable	
	PASSENGER CHECK OUT ENTRY	n/a	Applicable	Applicable	Post payment only
	PASSENGER WAY POINT ENTRY	n/a	Applicable	Applicable	Post payment only
	FARE TRIP ACTIVATION ENTRY	Applicable	Applicable	Applicable	
	CONTROL PASSENGER TRIP ENTRY	Applicable	Applicable	Applicable	
Travel Match	NO CHECK OUT DETECTED ENTRY	n/a	Applicable	Applicable	Post payment only
	NO CHECK IN DETECTED ENTRY	n/a	Applicable	Applicable	
	PASSENGER USED SAME STOP ENTRY	n/a	Applicable	Applicable	
Revenue Protect-ion	NO ACCESS RIGHTS ENTRY	Applicable	Applicable	Applicable	
	INSUFFICIENT ACCESS RIGHTS ENTRY	Applicable	Applicable	Applicable	Depends on Policy
	SUSPICIOUS BEHAVIOUR ENTRY	Applicable	Applicable	Applicable	
	NO PROOF ON PERSON ENTRY	Applicable	Applicable	Applicable	
	TRAVEL DOCUMENT CONFISCATION ENTRY	Applicable	Applicable	Applicable	
Account Security	ACCOUNT SUSPEND ENTRY	n/a	n/a	Applicable	
	ACCOUNT REVIVE ENTRY	n/a	n/a	Applicable	
	SECURITY LIST ALLOW ENTRY	n/a	Applicable	Applicable	
	SECURITY LIST DENY ENTRY	n/a	Applicable	Applicable	
	CEASES TO BE ELIGIBLE ENTRY	n/a	n/a	Applicable	
	BECOMES ELIGIBLE ENTRY	n/a	n/a	Applicable	

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Thank You !