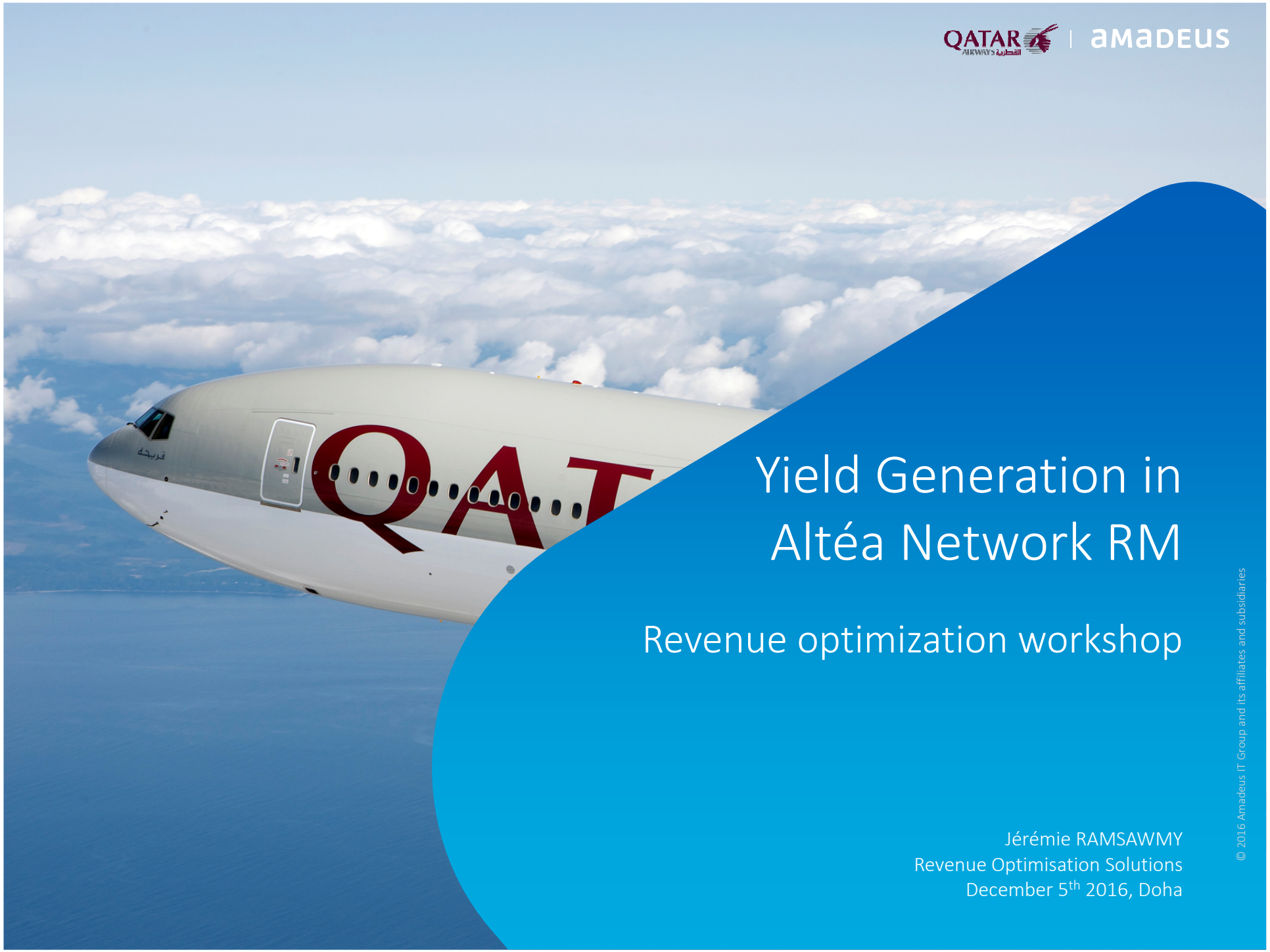


Yield Generation in Altéa Network RM

Revenue optimization workshop

Jérémie RAMSAWMY
Revenue Optimisation Solutions
December 5th 2016, Doha

Agenda

1. Generation of yields and application to any downstream RM process

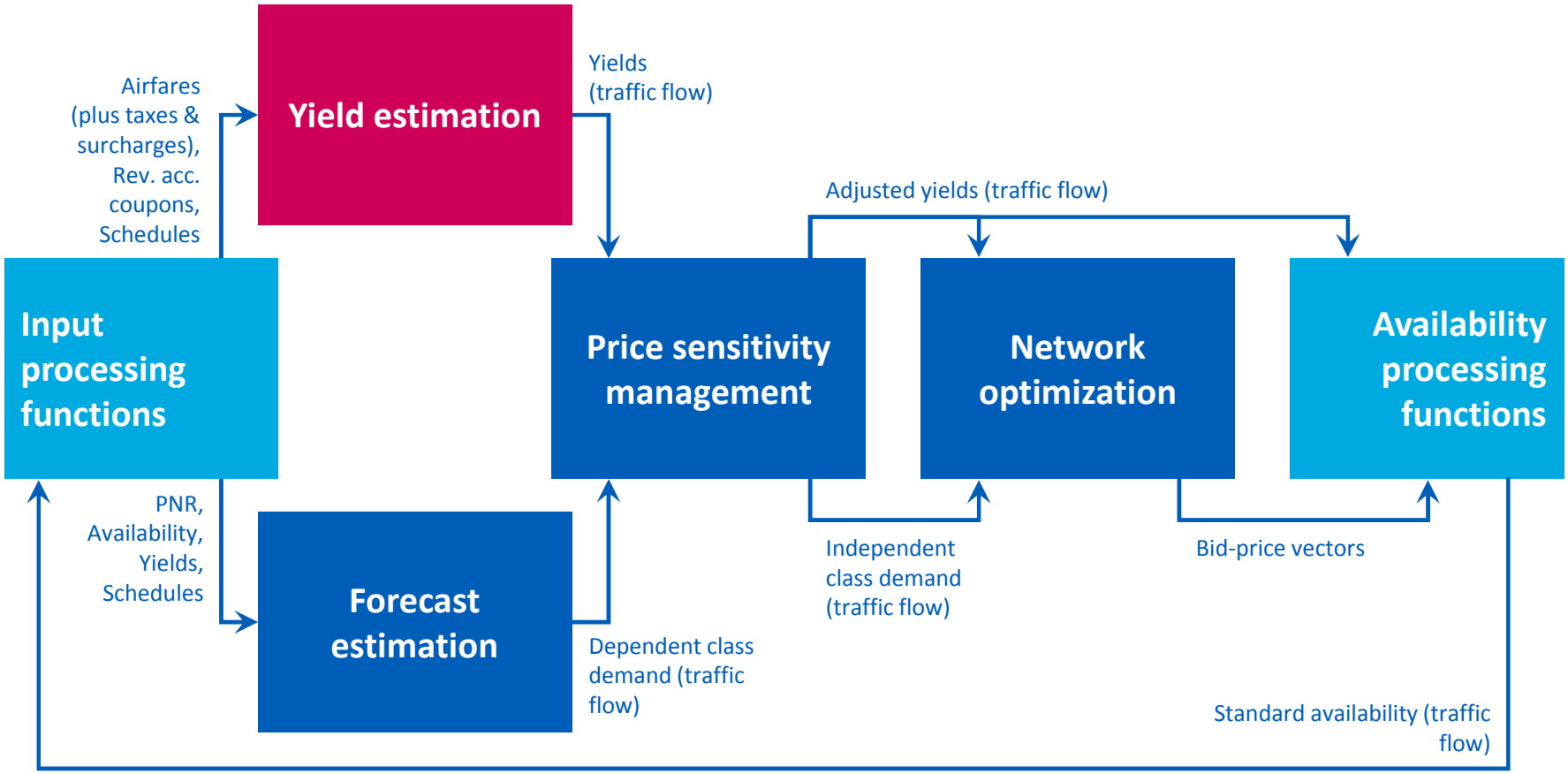
2. System overview
   a) Data sources
   b) Network projection
   c) Yield Generation

1

Generation of yields and application to any downstream RM process

Revenue Management workflow

Set the optimal pricing & availability strategy



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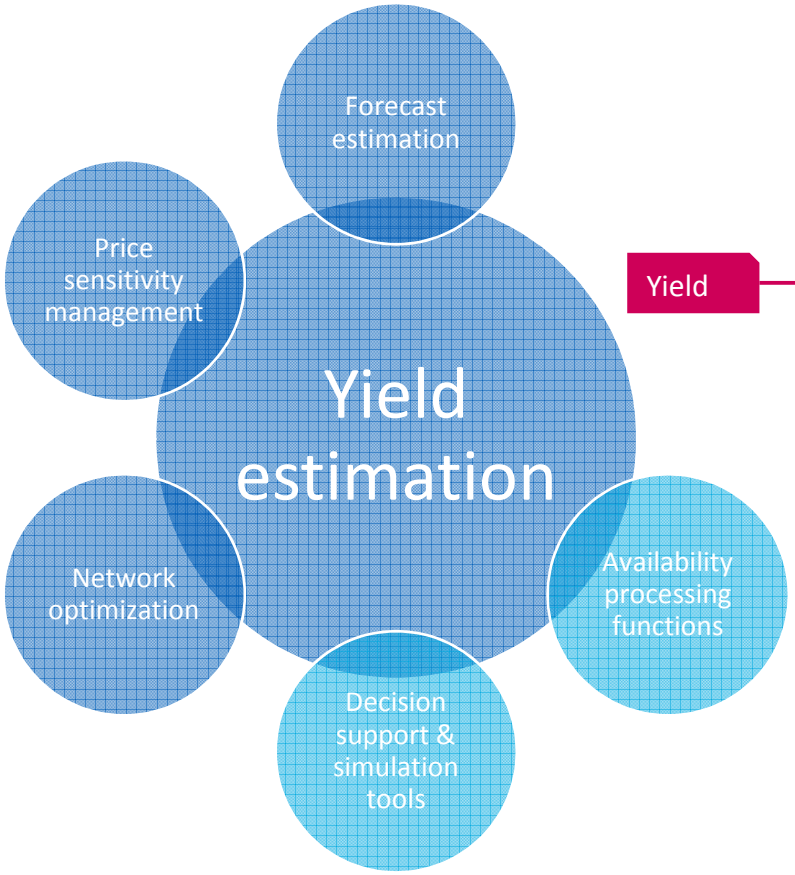
Altéa Network RM produces and uses yields as close as possible to the airline pricing

Yield

O&D LHR-NRT, PoS UK, class K



Yield 824

Airline pricing

1,560	One way
1,250	Round trip (adult)
950	Round trip (child), 14-day min stay
715	Stopover (CPH, FRA)
699	21-day advance purchase
538	Frequent flyer
460	Corporate
417	Student

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The average customer contribution to the network is measured **everyday**

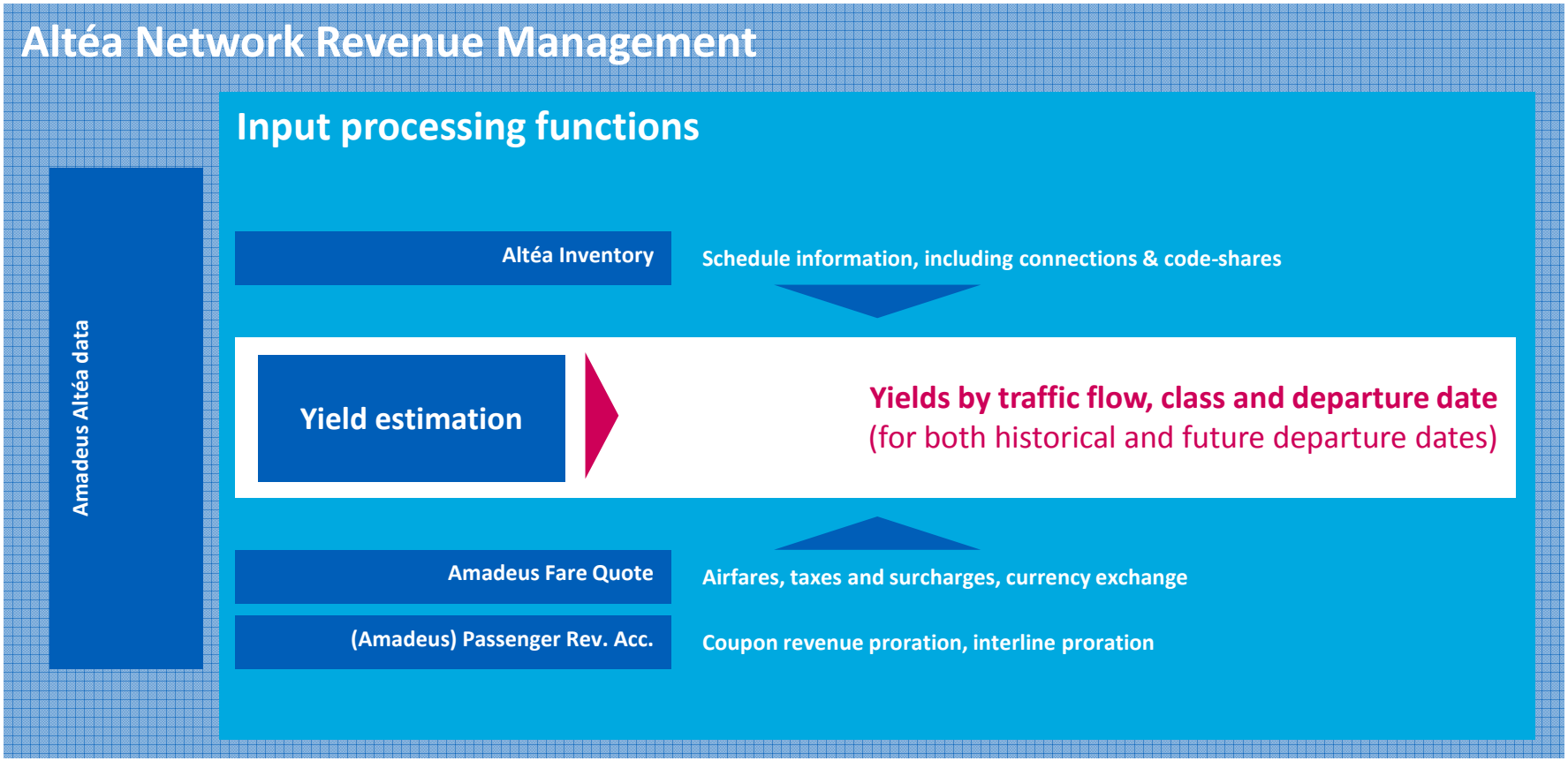
_ Over the **entire journey** the customer flies
- Includes connections & code-shares

_ Based on **fares currently on sale** (and not only past coupons from revenue accounting)

_ Include airfares, as well **all surcharges & taxes**

_ Rely on a **Amadeus Pricing Engine** massive computation
- Regardless of the fare filing system used
- Retrieves airfares, surcharges & taxes whenever filed

Scheduling, revenue accounting & fare filing information is combined with no manual input



Glossary: Price, Fare, Tax, Surcharge & Fee

_ **Price**: what is paid by the passenger

_ **Fare**: base brick in pricing to build the price
- Generally distributed to GDS via ATPCO
- Applicable with specific conditions such as stay duration, advance purchase, point of sale restrictions …

_ **Tax**: what the customer pays on top of the base fare
- Per default imposed and defined by governments

_ **Surcharge**: special taxes contributing to airline revenue
- Such as the fuel and insurance surcharge (YQ/YR code)

_ **Fee**: additional commissions linked to a booking
- Travel Agency Ticketing fee (e.g. agent commission), Airline Ticketing Fee (e.g. credit card), GDS fee…

The **Price** of an itinerary

=

Fares

+

Surcharges

+

Taxes

+

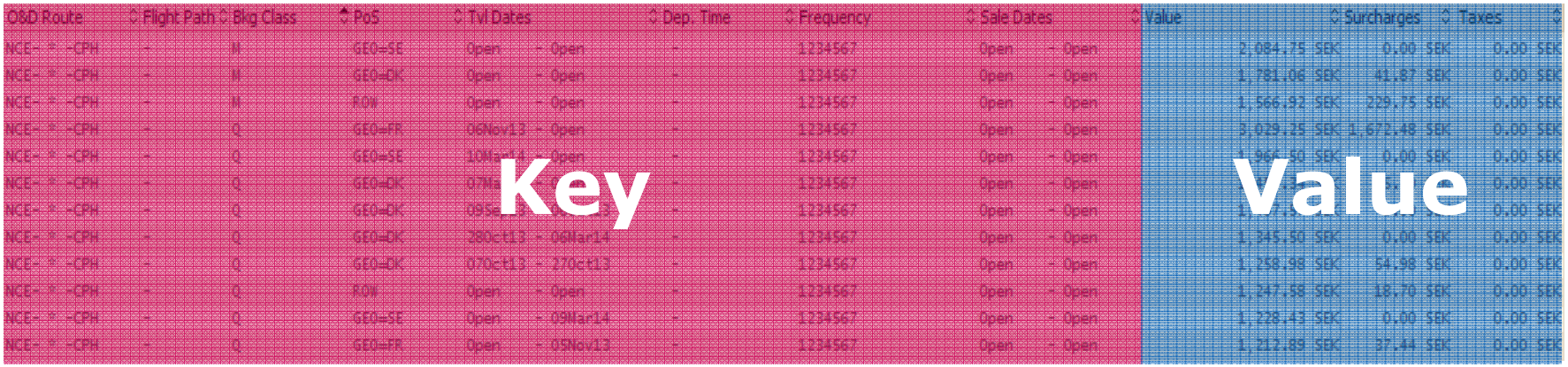
Fees

One yield aggregates several real prices paid by several customers

- Historical Yield (for flight departed in the **previous year**) are real historical average of:
  - Revenue (averaged fares + surcharges)
  - Net revenue (averaged fares)
  - Customer price (averaged fares + surcharges + taxes & fees)

- Future Yield (for flight departing in the **coming year**) are estimated average of:
  - Expected revenue
  - Expected net revenue
  - Expected customer price

In practice: yield key & yield value



O&D Route	Flight Path	Bkg Class	PoS	Tvl Dates	Dep. Time	Frequency	Sale Dates	Value	Surcharges	Taxes
NCE-*-CPH	-	M	GEO=SE	Open - Open	-	1234567	Open - Open	2,084.75 SEK	0.00 SEK	0.00 SEK
NCE-*-CPH	-	M	GEO=DK	Open - Open	-	1234567	Open - Open	1,781.06 SEK	41.87 SEK	0.00 SEK
NCE-*-CPH	-	M	ROW	Open - Open	-	1234567	Open - Open	1,566.92 SEK	229.75 SEK	0.00 SEK
NCE-*-CPH	-	Q	GEO=FR	06Nov13 - Open	-	1234567	Open - Open	3,029.25 SEK	1,672.48 SEK	0.00 SEK
NCE-*-CPH	-	Q	GEO=SE	10Mar14 - Open	-	1234567	Open - Open	1,966.50 SEK	0.00 SEK	0.00 SEK
NCE-*-CPH	-	Q	GEO=DK	07Ma	-	1234567	Open - Open	1,[illegible]	[illegible]	0.00 SEK
NCE-*-CPH	-	Q	GEO=DK	09Se	-	1234567	Open - Open	1,[illegible]	[illegible]	0.00 SEK
NCE-*-CPH	-	Q	GEO=DK	28Oct13 - 06Mar14	-	1234567	Open - Open	1,345.50 SEK	0.00 SEK	0.00 SEK
NCE-*-CPH	-	Q	GEO=DK	07Oct13 - 27Oct13	-	1234567	Open - Open	1,258.98 SEK	54.98 SEK	0.00 SEK
NCE-*-CPH	-	Q	ROW	Open - Open	-	1234567	Open - Open	1,247.58 SEK	18.70 SEK	0.00 SEK
NCE-*-CPH	-	Q	GEO=SE	Open - 09Mar14	-	1234567	Open - Open	1,228.43 SEK	0.00 SEK	0.00 SEK
NCE-*-CPH	-	Q	GEO=FR	Open - 05Nov13	-	1234567	Open - Open	1,212.89 SEK	57.44 SEK	0.00 SEK

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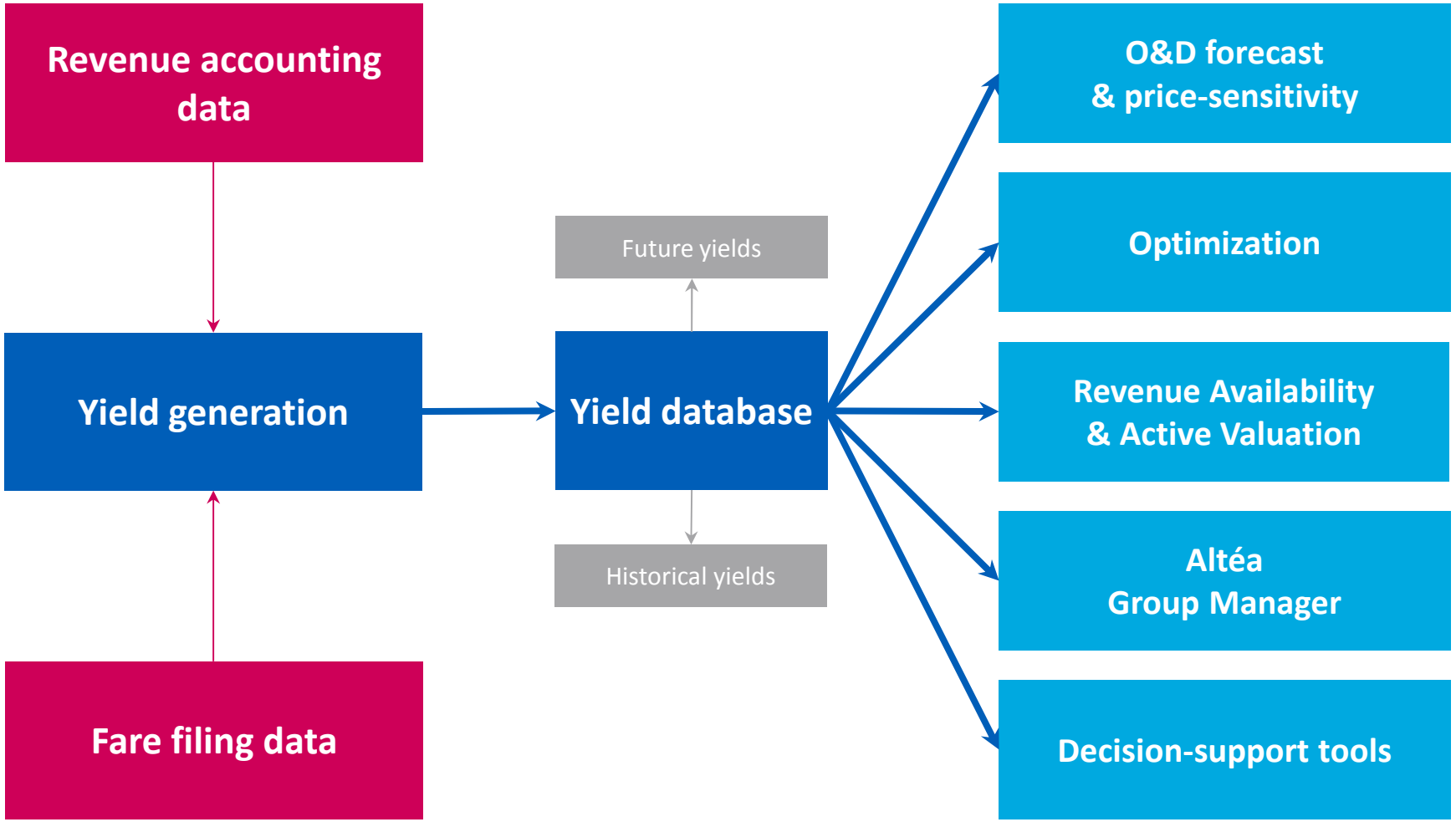
Altéa Network RM produces yields consistently used in any downstream RM process



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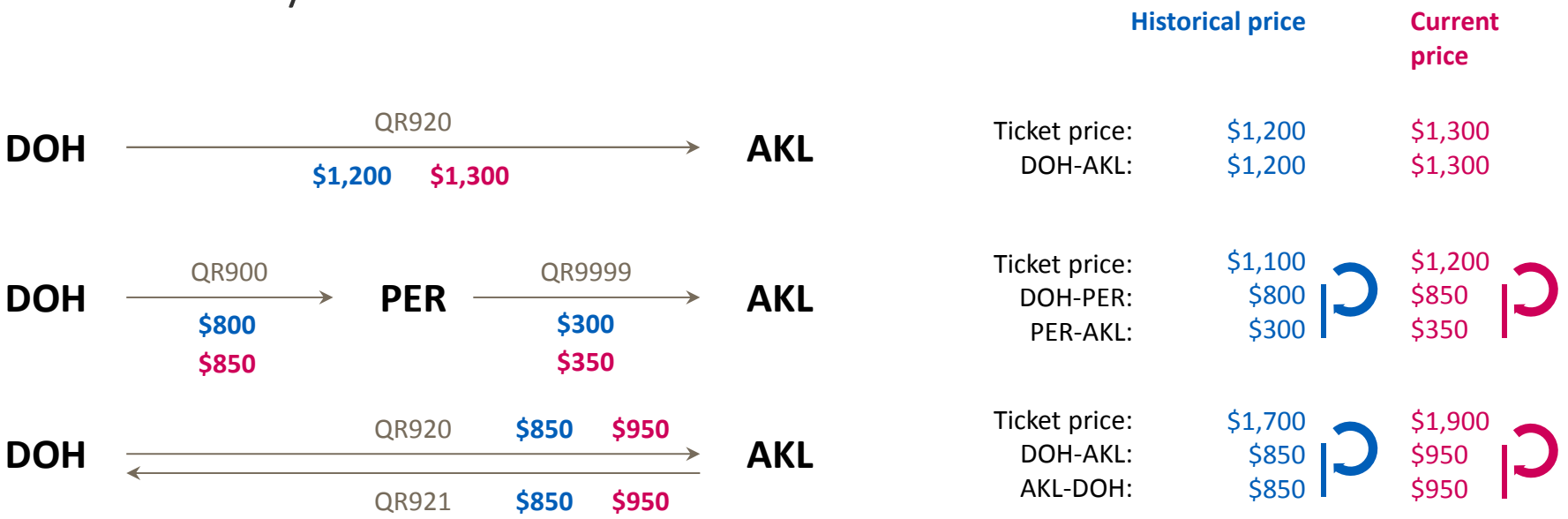
Yield generation overview, usage of data sources

How is revenue accounting & fare filing data combined to make a yield?



Geo O&D	Historical yield	Future yield
DOH-AKL	(1,200+1,100+850)/3 = **$1,050**	(1,300+1,200+950)/3 = **$1,150**
AKL-DOH	850/1 = **$850**	950/1= **$950**

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Yield estimation automates business operations

_ Solve automatically **missing & inverted yield cases**

_ Whenever **a new fare is filed**

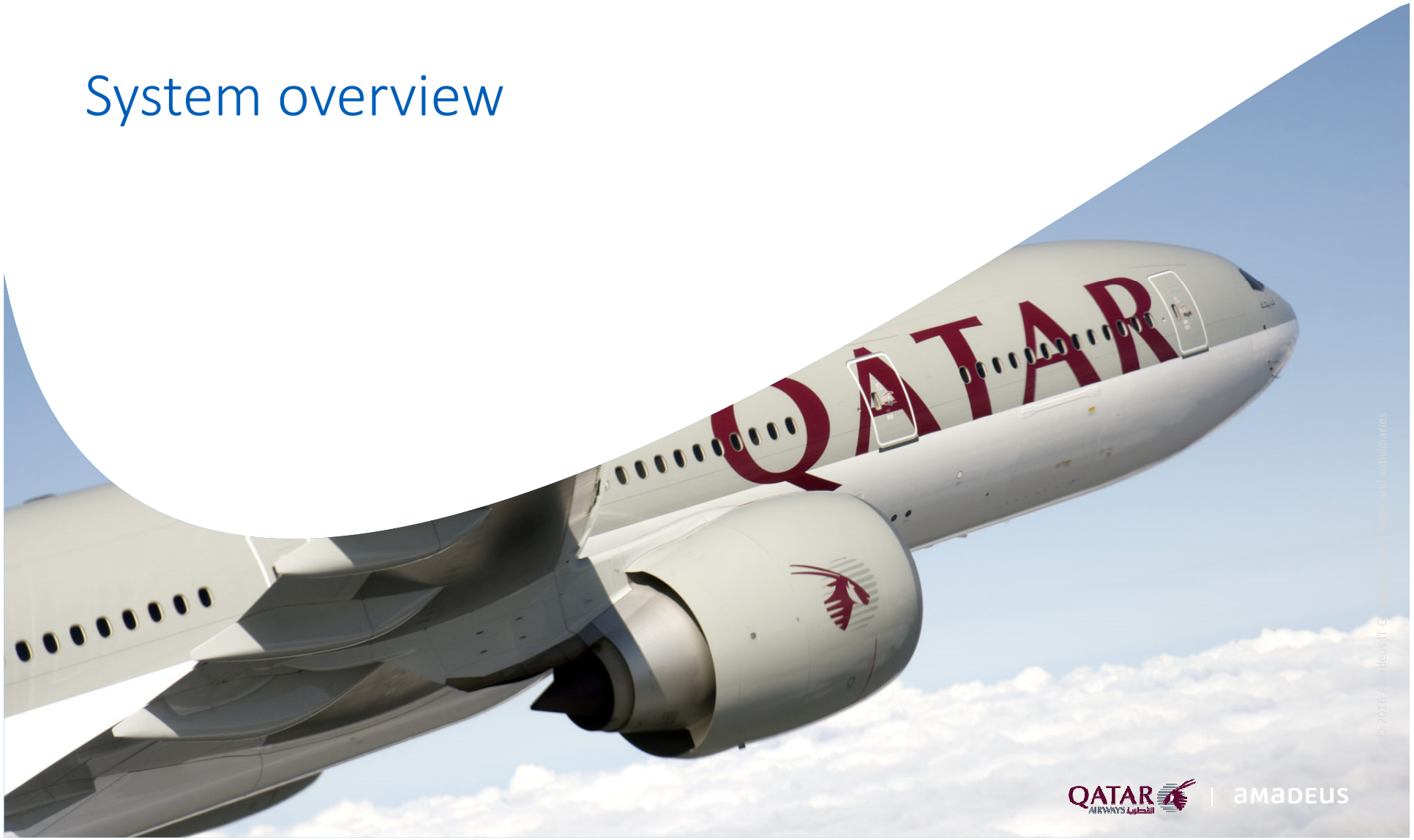
- Massive price computation platform retrieves it
- Reflect it in the yield value

_ Whenever **a new service is launched**

- New traffic flows are identified based on scheduling information
- Applicable fares on sale are retrieved
- Past coupons from an already existing traffic flow sponsor the new traffic flow

2

System overview



Objectives of the Yield Generation

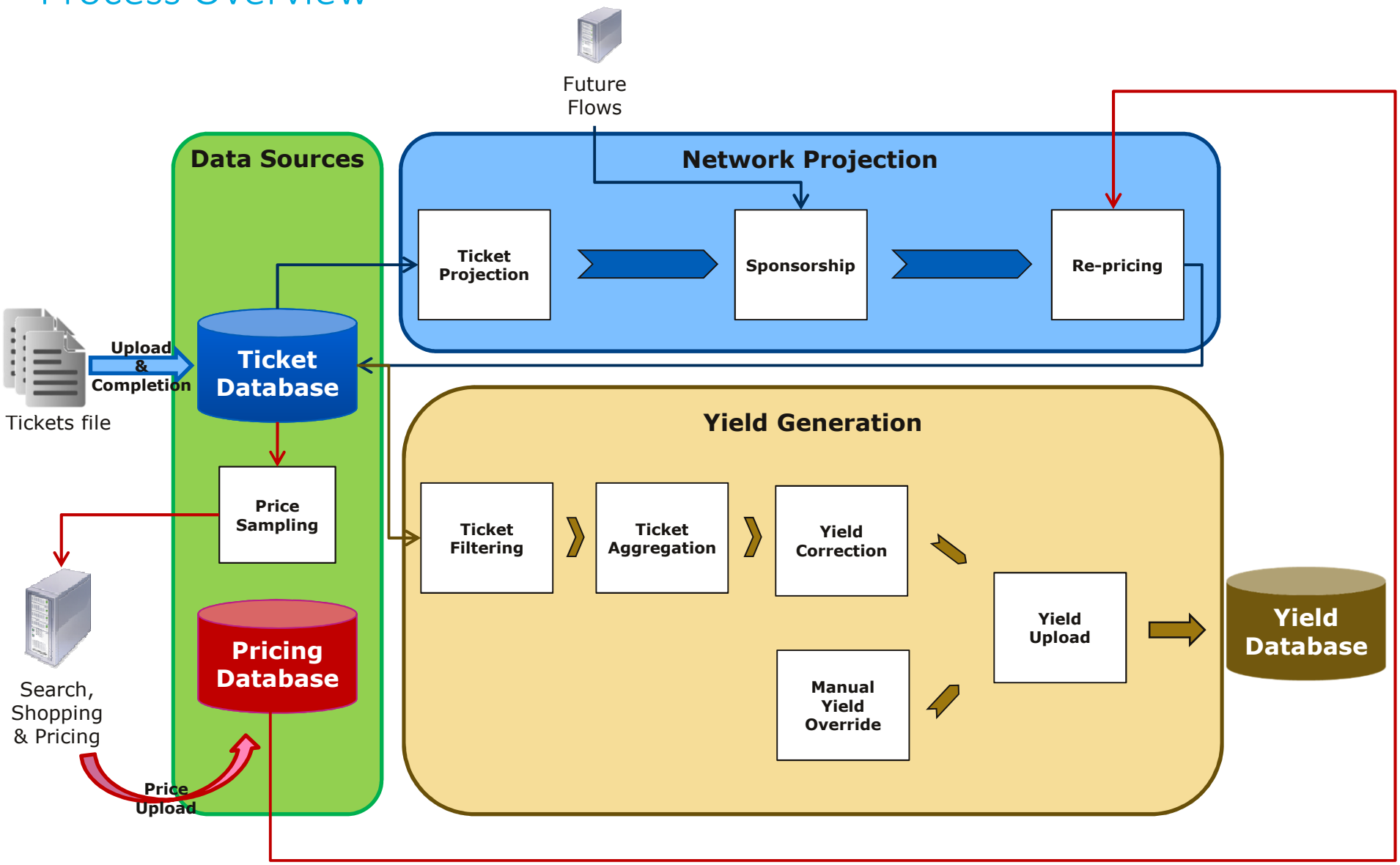
- Producing yield values as close as possible to customer price, revenue and net revenue brought by individual standard bookings

- Providing a full coverage of the O&D network and booking classes

- Ensuring yield values per booking class follow the nesting and the fare families orders

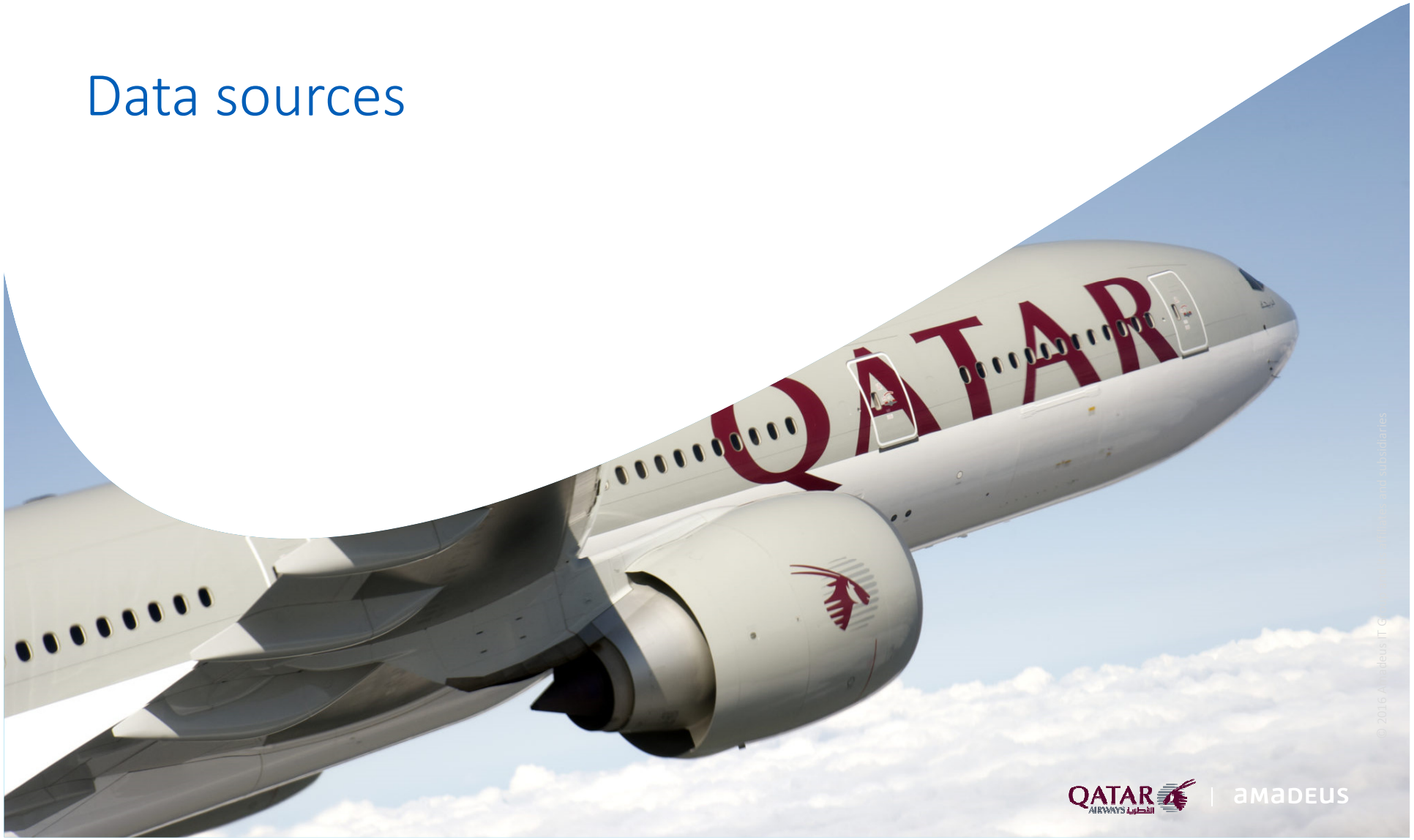
Yield Generation in Altéa Network RM

Process Overview



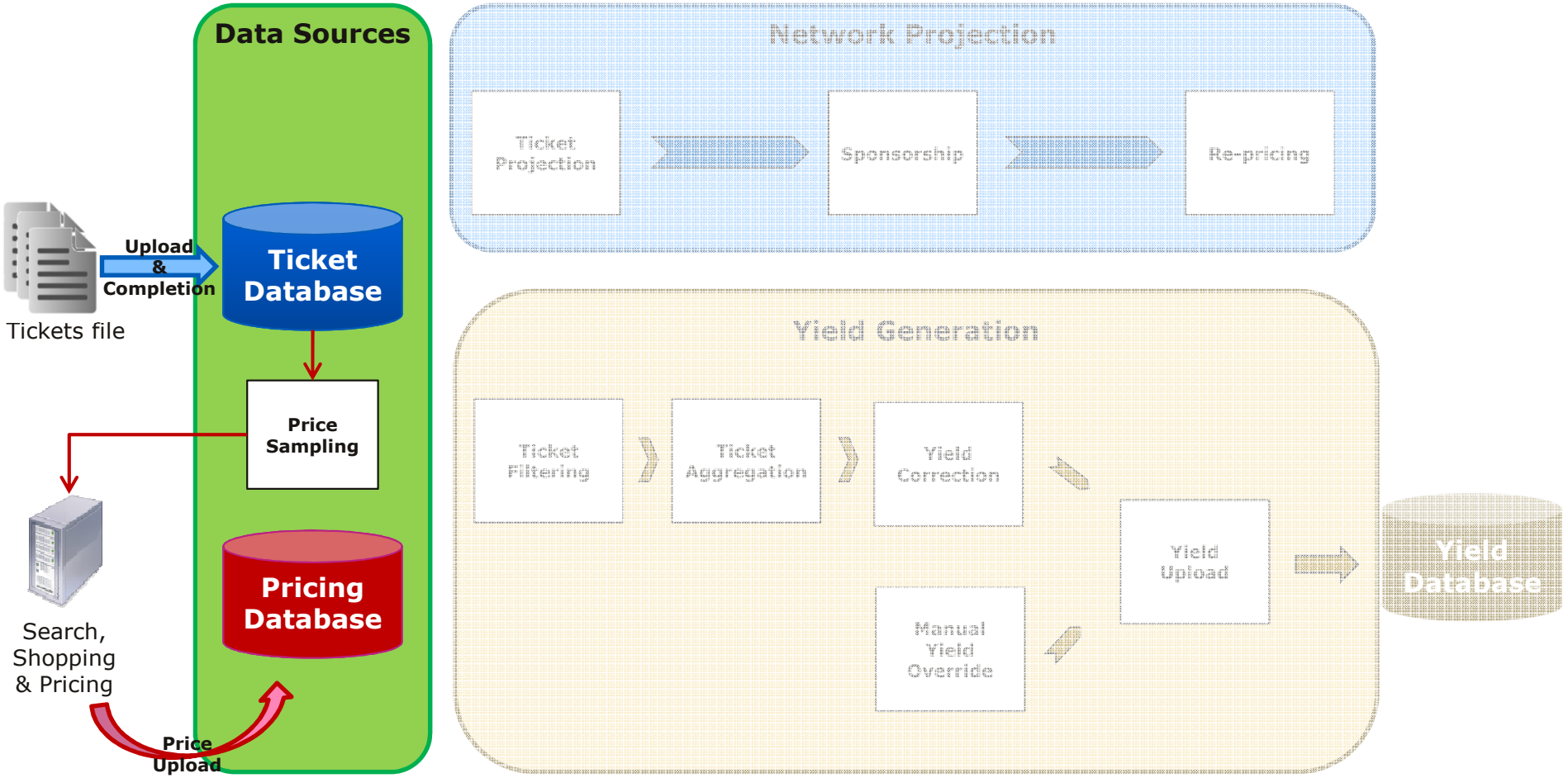
2a

Data sources



Data Sources

Process Overview



Ticketing and pricing data as the two data sources

Ticketing Data

- Historical tickets information with historical prices
- **Objectives:**
  - Compute **Historical Yields** from historical prices
  - Produce passenger traffic for coming year for **Future Yields**

Pricing Data

- Interaction with SSP to obtain current applicable prices
- **Objectives:**
  - Estimate what future customer will pay
  - Compute **Future Yields** from new prices

Ticketing Data

Tickets sources

- External feed from airline's revenue accounting system (CSV format)
- Or internal feed from Amadeus revenue accounting system (XML format)
- Net price and taxes are prorated at coupon level (i.e. proration taking into account commercial agreements (SPA) between airlines)

Ticketing Data

Ticket, Coupon

_ A ticket for a given passenger contains:

- **Ticket level** information
- **Coupon level** information (segment level)

Lead ticket ID: 7940000012345
Ticket ID: 7940000012345

→ Identifiers

Passenger Type: Adult
Point of Sale: NCE8X0950 (Nice, FR)
Validating Carrier: 2X
Sale Date: 01MAR16

→ Ticket level

Flight	Brd-Off	DptDate	BkgClas	FareBasis	NetPrice	Taxes
2X0010	NCE-CDG	09JUN16	Class B	YRT	100€	YQ:10€+YR:5€+XT:12€
2X0050	CDG-JFK	09JUN16	Class Y	YRT	400€	YQ:50€+YR:3€
2X0060	JFK-FRA	16JUL16	Class Y	YRT	500€	YQ:30€
6X0040	FRA-NCE	16JUL16	Class V	YRT	150€	YQ:40€

→ Coupon level

Ticketing Data

O&D Determination

_ Identify the original routing of the traveller

_ Build O&Ds within tickets (Geographical, Base or segment)

Ticket:

```
6X10 JFK-CPH 08Jun16 08:00-20:00, Class Y, YRT, 1000€
2X20 CPH-OSL 08Jun16 20:30-23:30, Class Y, YRT, 100€
2X30 OSL-JFK 15Jun16 08:30-20:30, Class Y, YRT, 1000€
```

O&Ds determined

Geographical O&D outbound (JFK-OSL):

```
6X10 JFK-CPH 08Jun16 08:00-20:00, Class Y, YRT, 1000€
2X20 CPH-OSL 08Jun16 20:30-23:30, Class Y, YRT, 100€
```

Geographical O&D inbound (OSL-JFK):

```
2X30 OSL-JFK 15Jun16 08:30-20:30, Class Y, YRT, 1000€
```

Pricing Data

Process

- Pricing Data are retrieved from SSP using Priced Fare Matrix (PFM) which supports massive prices computations

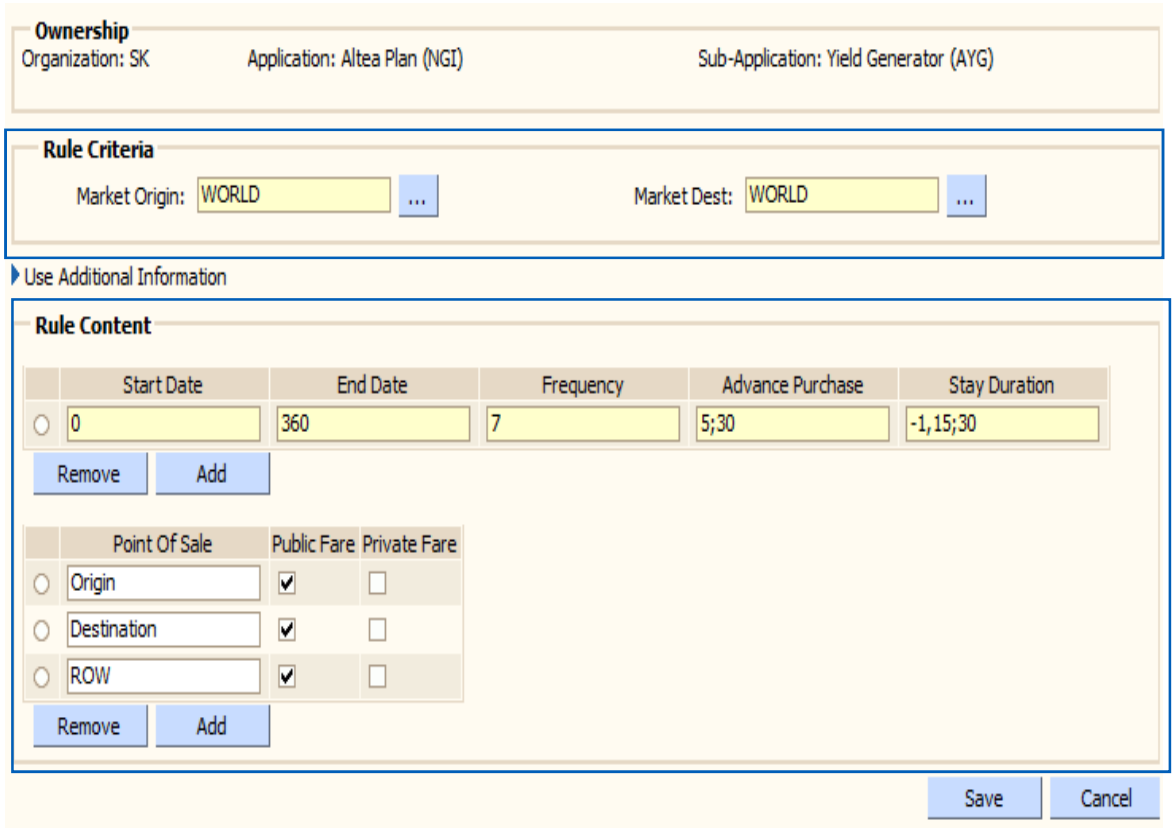
- The price retrieval process follows 3 main steps:
  1. Building of PFM queries (i.e. Price Sampling)
  2. Computation of new prices by PFM from queries
  3. Upload of PFM prices result in our own Pricing Database

- Pricing Data are actually priced travel solutions

Pricing Data

Price Sampling

_ PFM Query defined through the Price Sampling Rule



Market driven sampling

Sampling by:

- Travel Date
- Advance Purchase
- Stay Duration
- Point of Sale
- Public/Private fares

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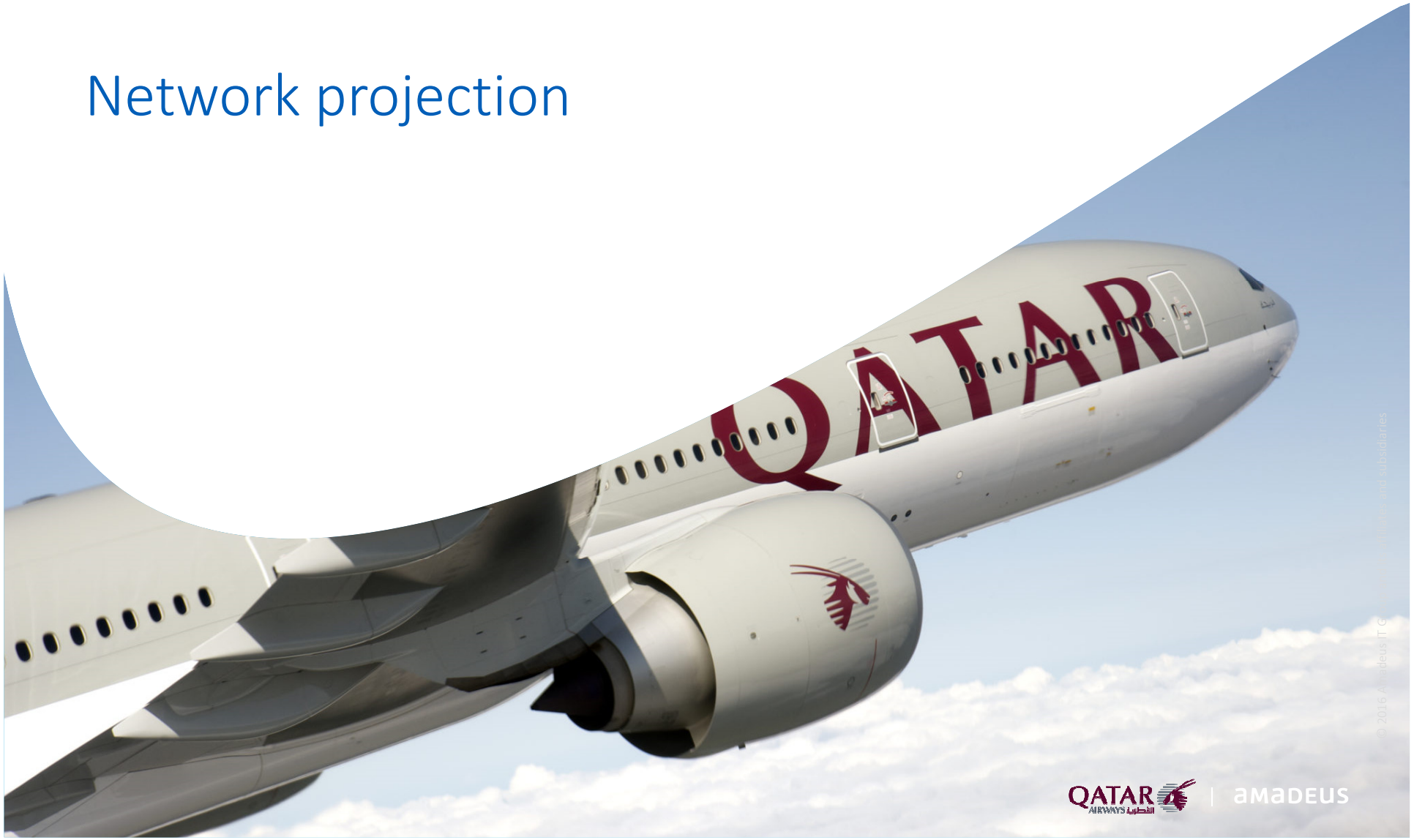
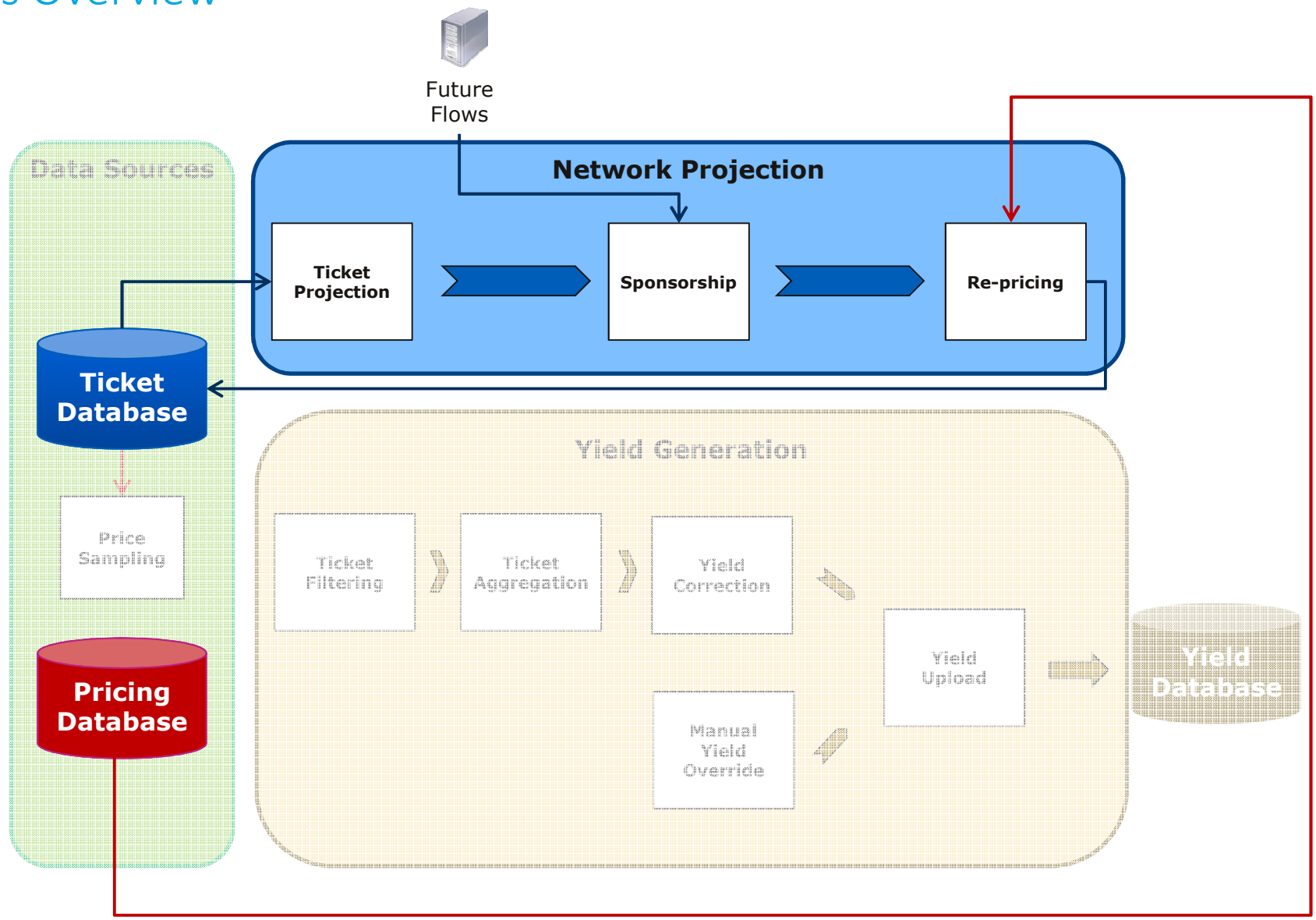
2b

Network projection



Network Projection

Process Overview



Purpose of the Network Projection

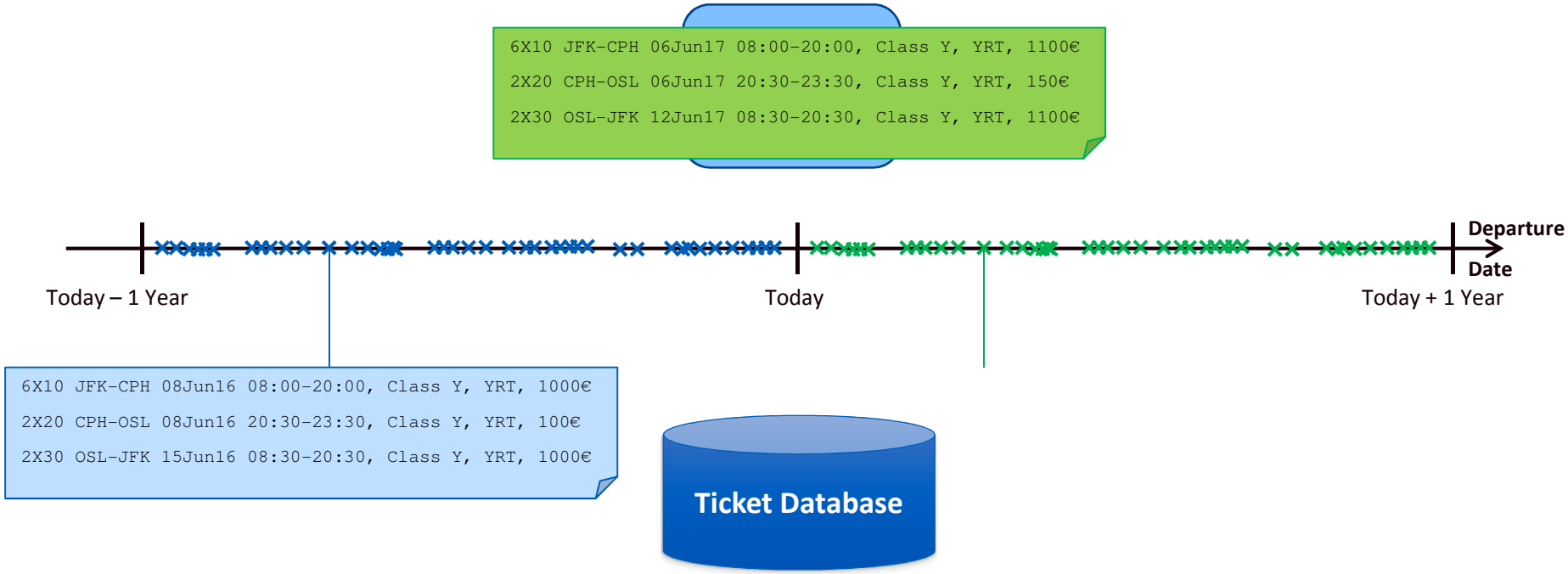
_ Why we need to project the tickets in the future?

- The Forecaster is meant to use future departure dates
- Prices may vary significantly from one year to another
- The Forecast module will use something more similar to what the customer really pays → better estimation of the Willingness to Pay

Network Projection

Ticket Selection

- Tickets processed individually by the Network Projection Module
  - Only the last year of historical tickets are processed



Network Projection

Ticket Projection → **Sponsorship** → **Re-pricing**

- Project travel date by 52 weeks
  - Same day of week projection to keep Day of Week traffic

Monday

```
6X10 JFK-CPH 08Jun16 08:00-20:00, Class Y, YRT, 1000€
2X20 CPH-OSL 08Jun16 20:30-23:30, Class Y, YRT, 100€
```

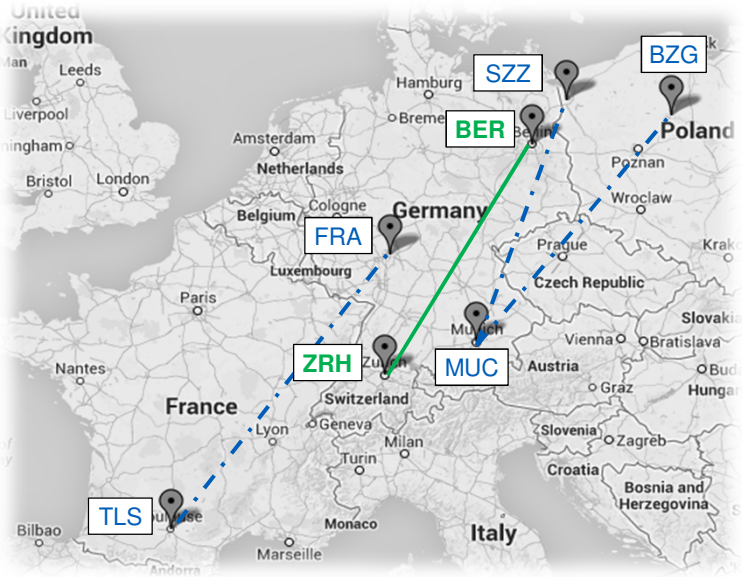
Monday

```
6X10 JFK-CPH 06Jun17 08:00-20:00, Class Y, YRT, 1000€
2X20 CPH-OSL 06Jun17 20:30-23:30, Class Y, YRT, 100€
```

Network Projection

Ticket Projection → **Sponsorship** → **Re-pricing**

- The Ticket Sponsorship aims to create Yields on new flights and/or new O&Ds opened by the airline
- Sponsorship data received from Future Flows (Forecaster module)
  - For each new flight created in the schedule (i.e. without historical data), Future Flows creates a sponsorship to the nearest existing route



Distance = Distance (Board Points)
+ Distance (Off Points)

MUC-SZZ ➔ ZRH-BER

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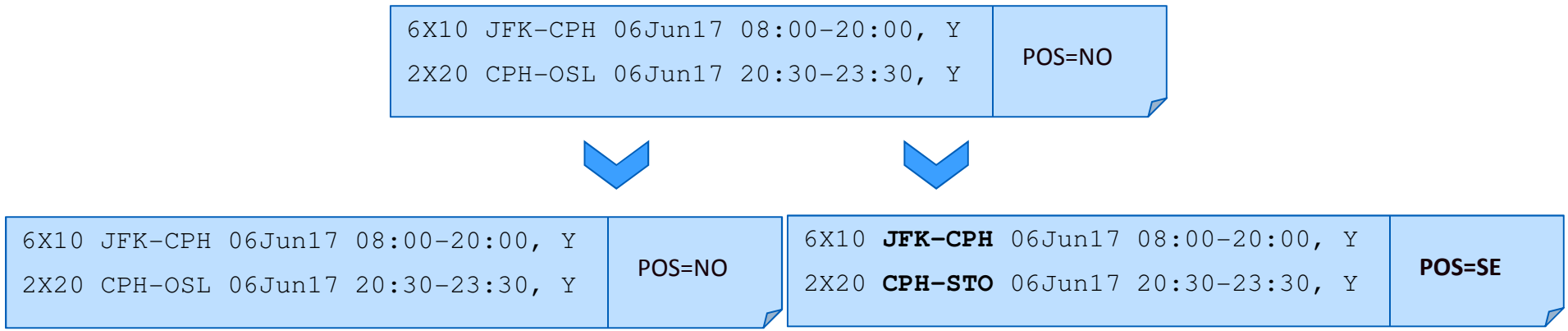
Network Projection

Ticket Projection → **Sponsorship** → **Re-pricing**

- The process creates ‘fake tickets’ on new O&Ds to create Yields on those new O&Ds

Sponsor data	
Sponsoring	Sponsored
CPH-OSL, NO	CPH-STO, SE

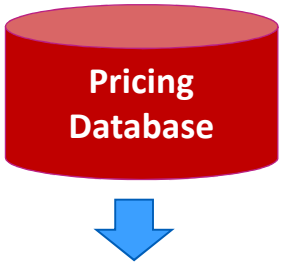


Network Projection

Ticket Projection → **Sponsorship** → **Re-pricing**

_ Retrieve most applicable price is done in several steps:

- Exact match on O&D (routing and marketing airlines)
- Dominant class
- Closest travel date
- Point of sale
- Best advance purchase
- Best stay duration




```
Issuance POS: DK
Sale Date: 15Apr16

Inbound:
6X10 JFK-CPH 06Jun17 07:30-19:00, Class Y, YRT, 1000€
2X20 CPH-OSL 06Jun17 19:45-23:30, Class Y, YRT, 100€

Outbound:
2X30 OSL-JFK 12Jun17 10:00-22:00, Class Y, YRT, 1000€
```

Stay Duration: 7
Advance Purchase: 53

POS	Travel Date	Travel Solution	Flight Path	RBD	Stay Duration	Advance Purchase	Price
DK	06JUN17	**JFK-CPH-OSL**	**6X10-2X20**	**Y**	15	30	1400€

Network Projection

Ticket Projection → **Sponsorship** → **Re-pricing**

- Prorate new prices at coupon level
  - Proportional to historical proration

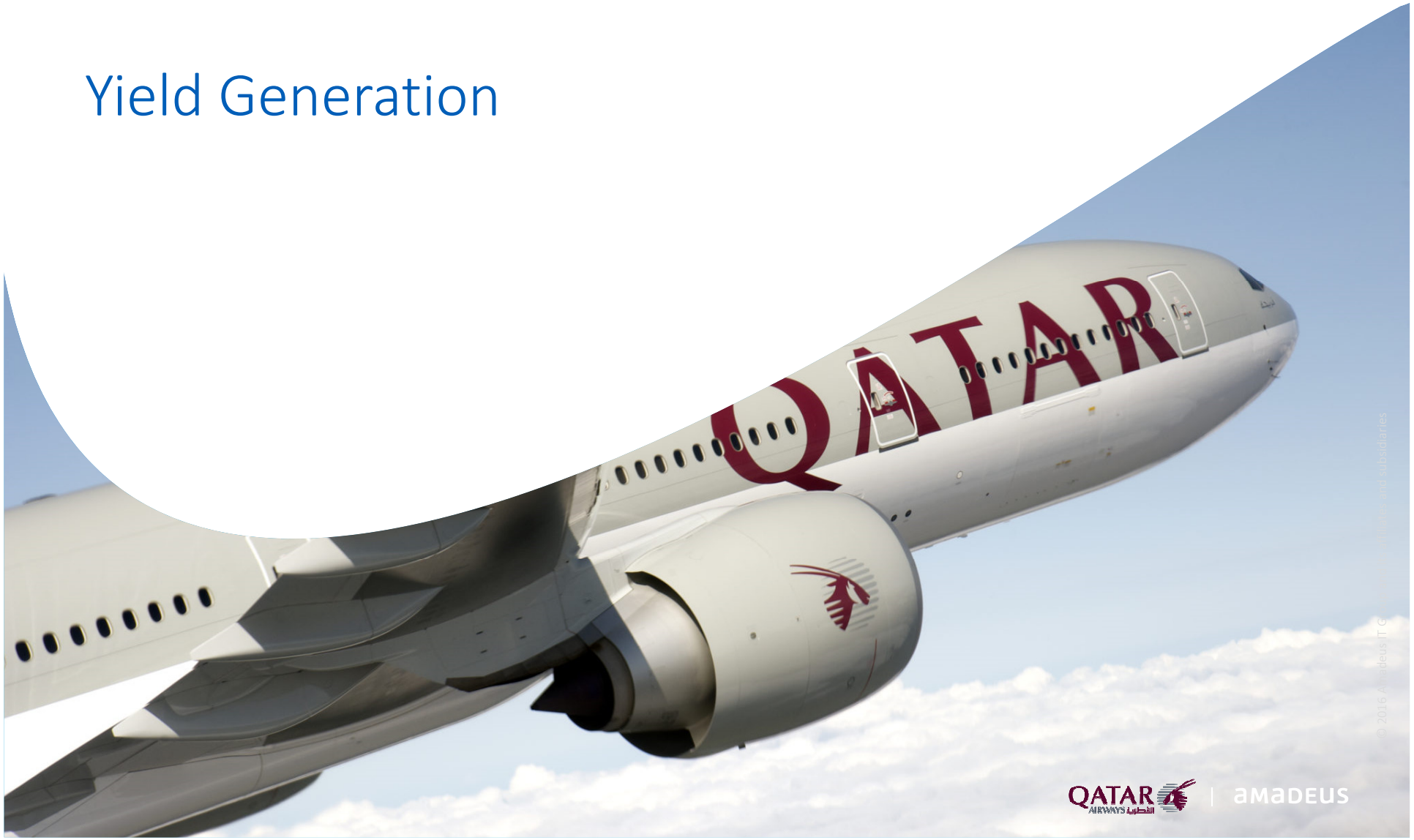
```
6X10 JFK-CPH 06Jun17 07:30-19:00, Class Y, YRT, 1000€
2X20 CPH-OSL 06Jun17 19:45-23:30, Class Y, YRT, 100€
```


```
6X10 JFK-CPH 06Jun17 07:30-19:00, Class Y, YRT, 1273€
2X20 CPH-OSL 06Jun17 19:45-23:30, Class Y, YRT, 127€
```

- New image of the ticket stored in Ticket Database

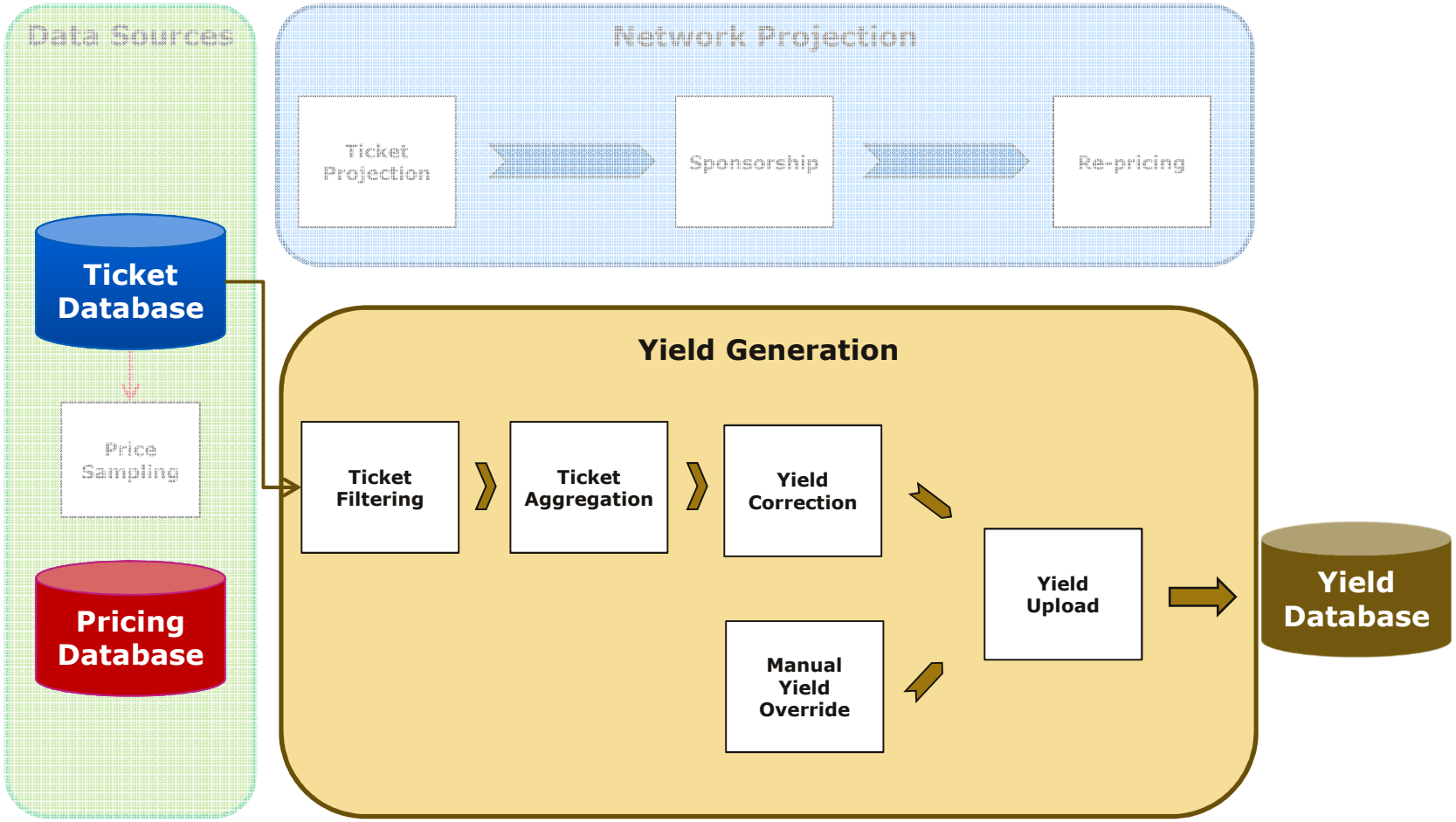
2c

Yield Generation



Yield Generation

Process Overview



Ticket Filtering

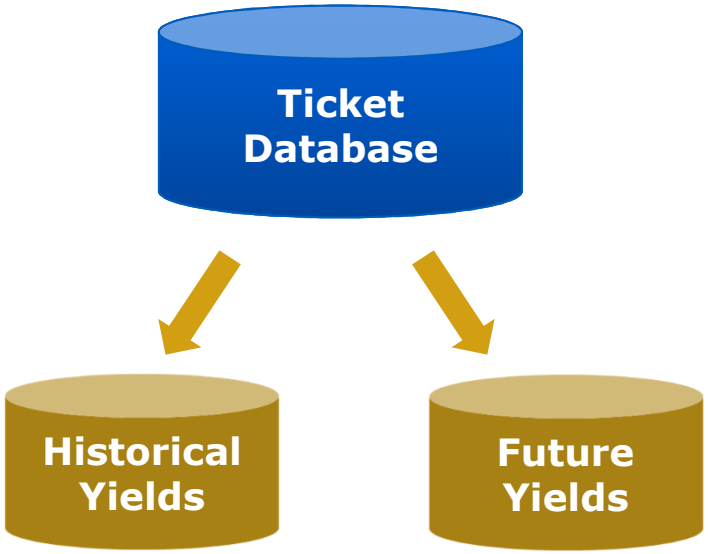
Ticket Selection

Historical Yield Generation

1. **Ticket Aggregation Yields**: Select 1 year of original tickets
2. Yield Adjustment Override

Future Yield Generation

1. Ticket Aggregation Yields: Select 1 year of projected tickets
2. Yield Adjustment Override
3. Manual Yields



Ticket Filtering

Ticket Filtering Rule

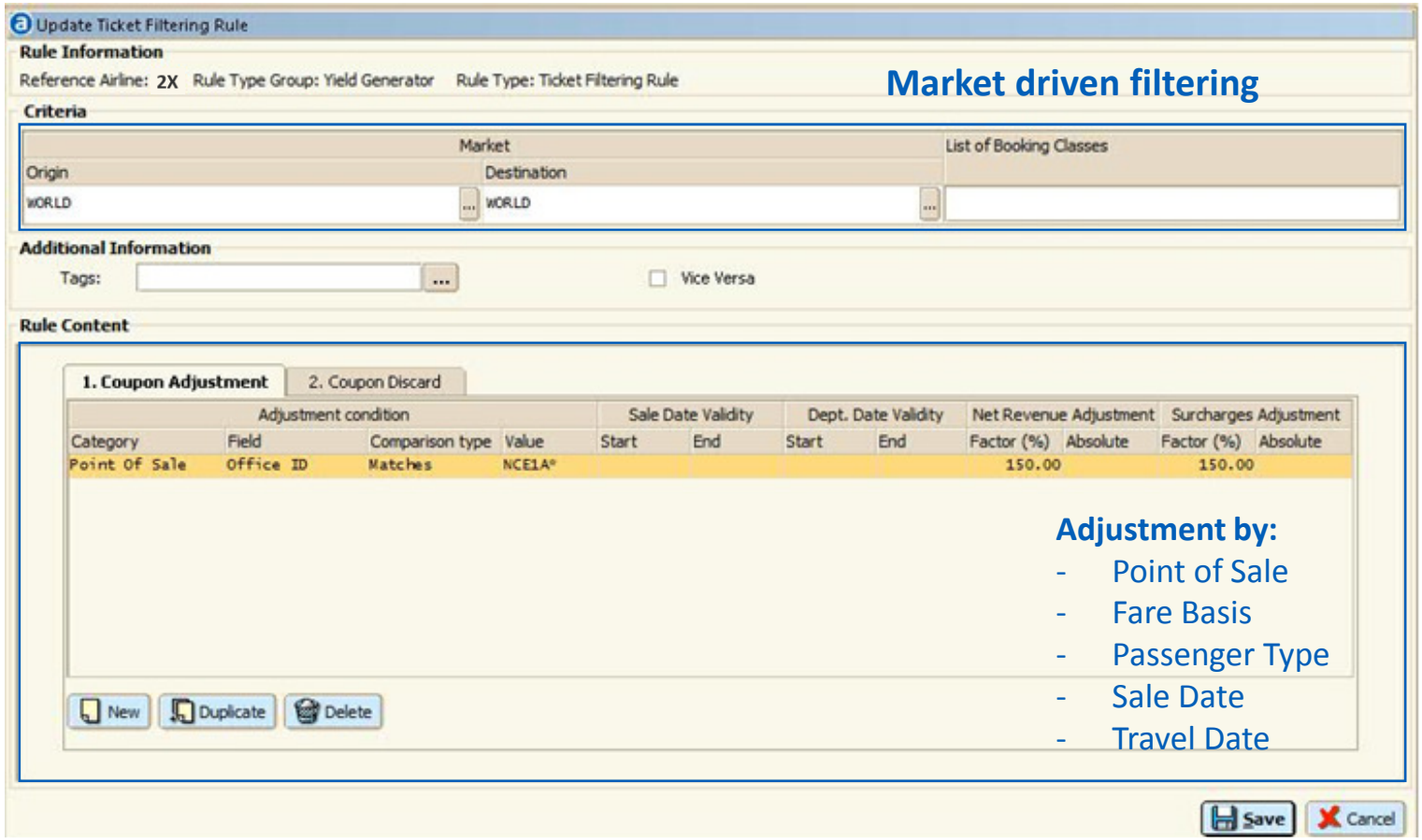
_ Ticket Filtering is applied to:

- Remove non-revenue tickets that should not be considered in Yield computation such as promotions or redemption tickets
- Discard outliers
- Adjust prices for specific conditions (e.g. for corporate fares)

_ Filtering applied at Geographical O&D level

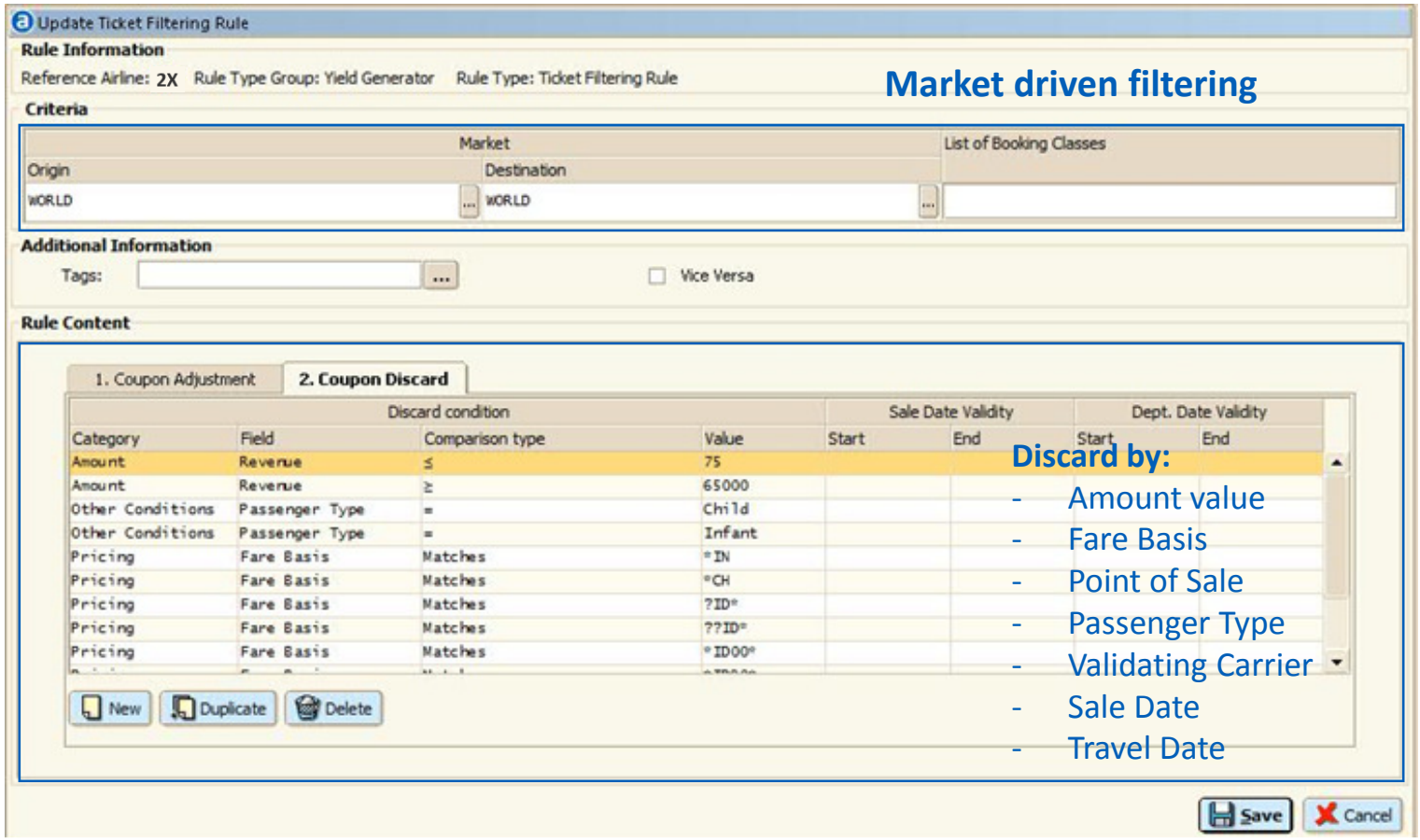
Ticket Filtering

Ticket Filtering Rule



Ticket Filtering

Ticket Filtering Rule



Market driven filtering

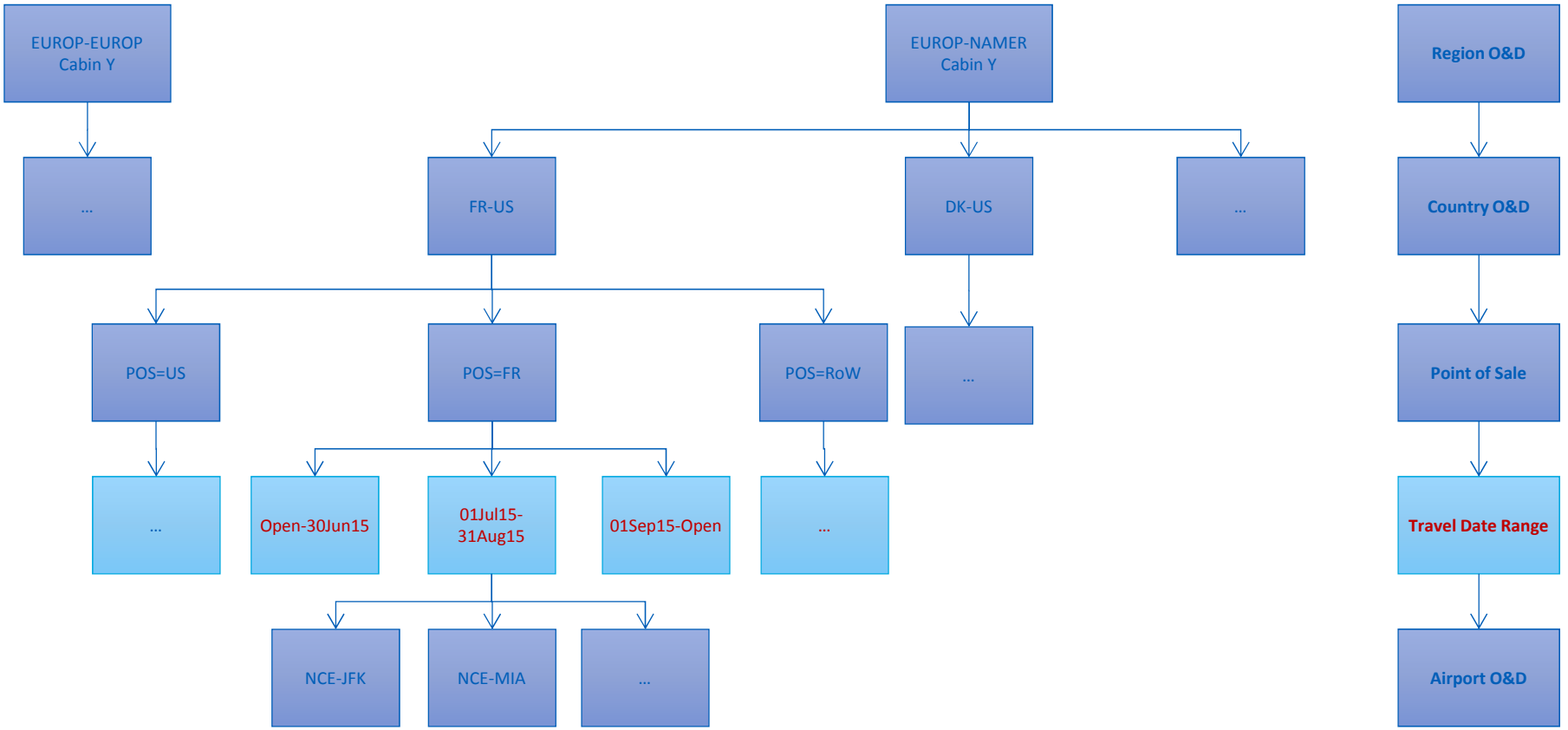
Discard by:

- Amount value
- Fare Basis
- Point of Sale
- Passenger Type
- Validating Carrier
- Sale Date
- Travel Date

Ticket Aggregation

Aggregation Tree

- **Aggregate** all O&D tickets with **same region O&D/cabin** and **split successively** by available criteria
  - Each cluster contains **Yields for all classes**
  - Region and country level for **network coverage**



Ticket Aggregation

Aggregation Tree

_ A cluster is created only if a threshold of tickets is reached

- **Condition:** At least 'X' classes with more than 'Y' tickets for cabin Z
- A yield computed with **too few tickets is not relevant**. In such case, the previous level of aggregation is more reliable.

_ Possible aggregation criteria:

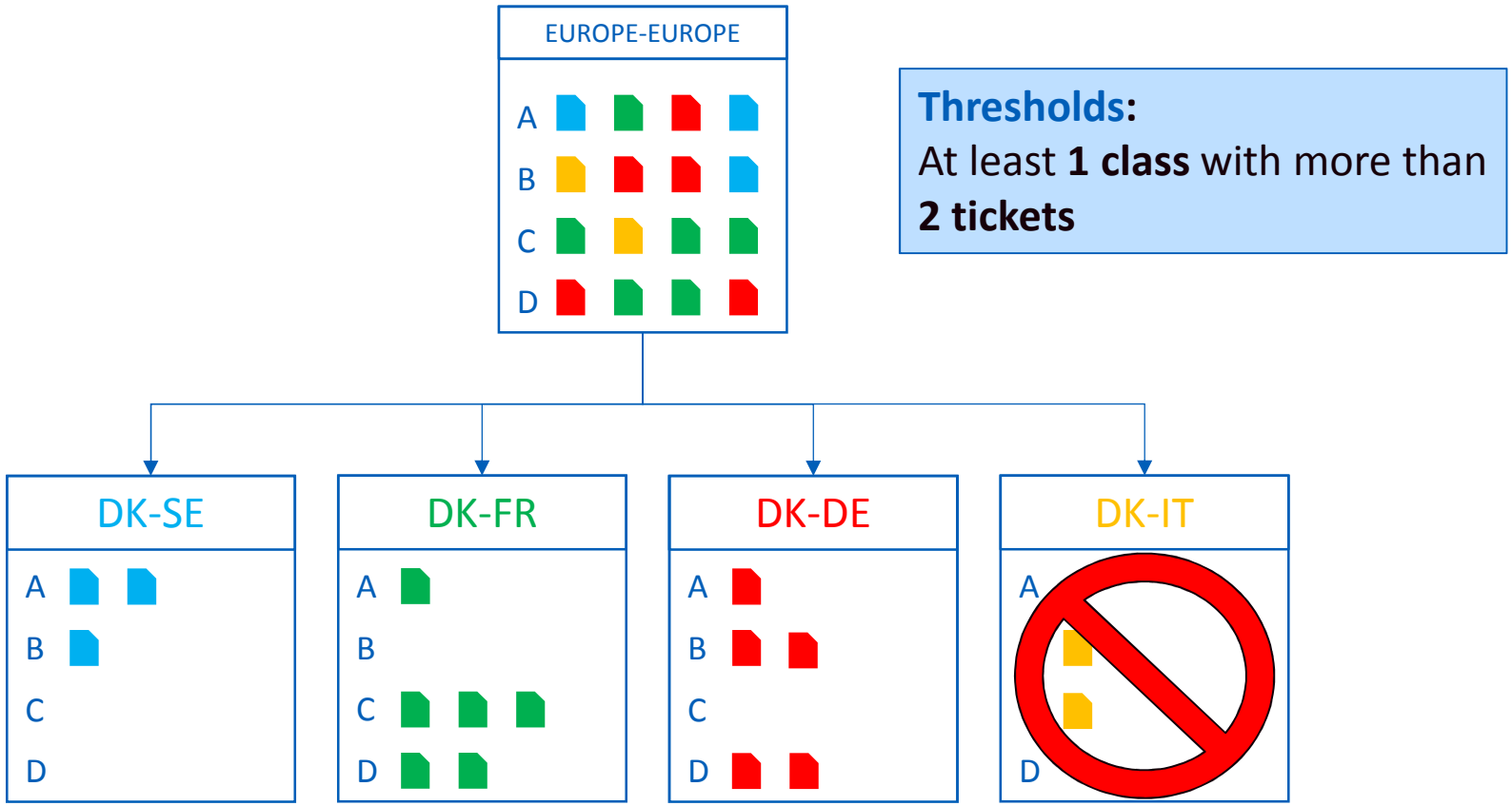
	Discrete criteria	Continuous criteria
Automatic	Region O&D Country O&D Airport O&D Point of Sale	Travel Date Sale Date Day to Departure
Manual	Flight Path/Number	Travel Date

_ Order of aggregation defined in airline parameter

- E.g. Region O&D > Country O&D > Airport O&D > POS > Travel Date > Flight Path

Ticket Aggregation

Aggregation Tree - Discrete Criteria (e.g. Country O&D)



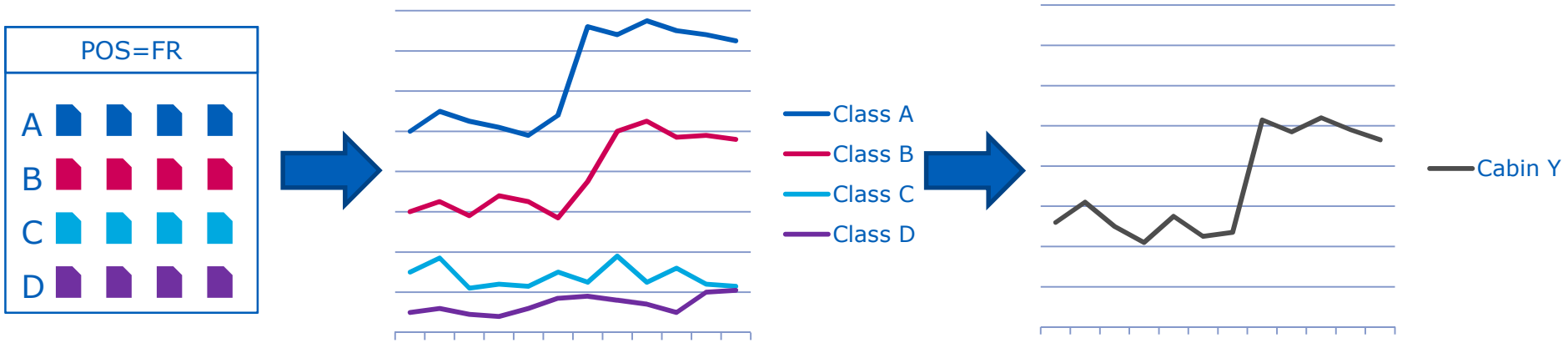
Thresholds:
At least **1 class** with more than **2 tickets**

Remark: A yield query CPH-ROM will use the EUROPE-EUROPE yield.

Ticket Aggregation

Aggregation Tree - Continuous Criteria (e.g. Travel Date)

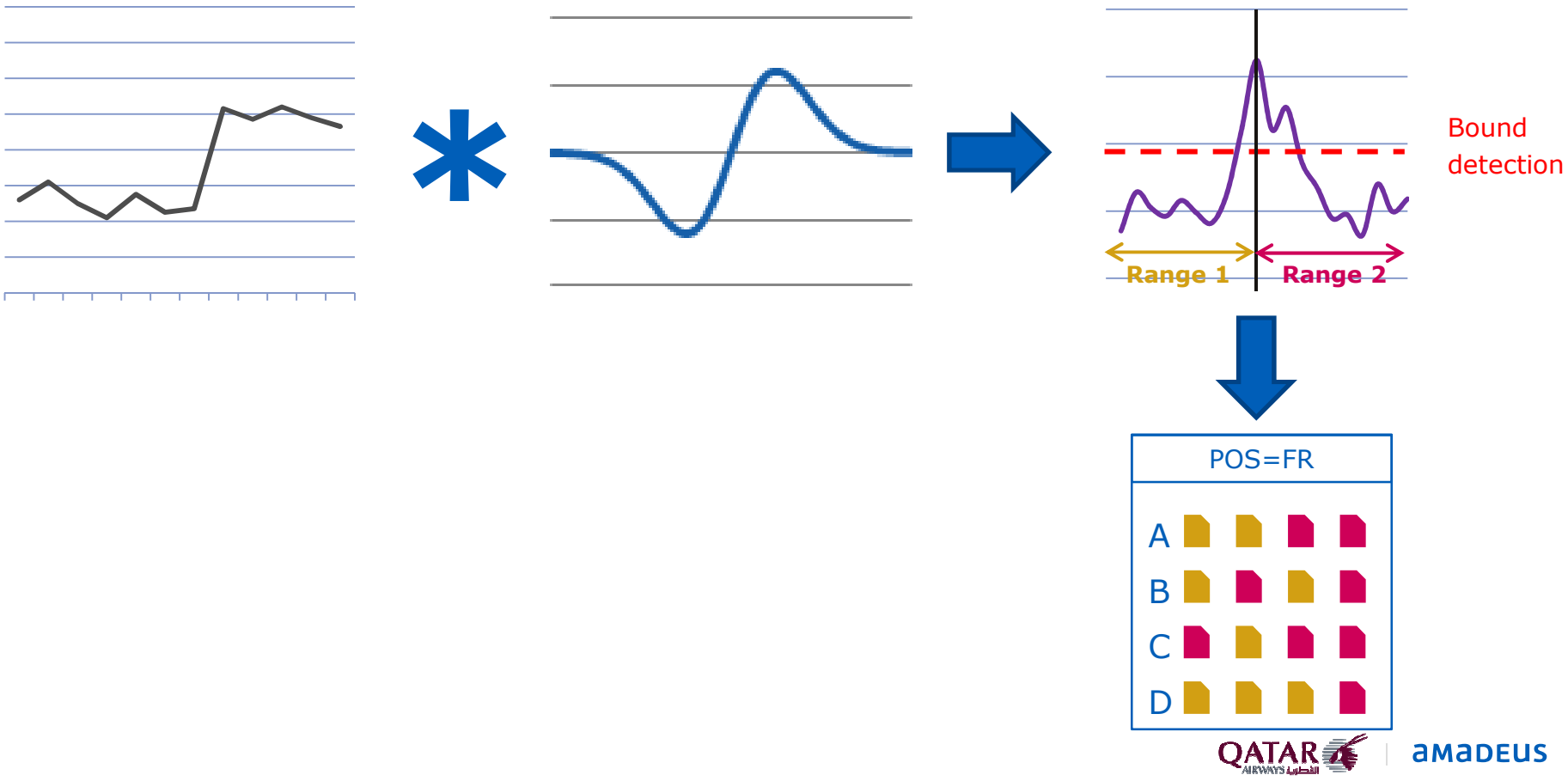
- Detect **average price jumps** to create sub-clusters of similar data
- Aggregation always done at **cabin level**



Ticket Aggregation

Aggregation Tree - Continuous Criteria (e.g. Travel Date)

_ Average price jumps of the cabin detected from a Canny edge detector



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Yield Correction

Process

- 2 “Yield issues” can appear:
  - Yield Missing: **No ticket or threshold not reached** for a given class
  - Yield Inversion: Yield value per class does not follow the **nesting order**

- Process
  - Compute uncorrected Yield value for each booking class
  - Retrieve the nesting order and fare families order
  - Remove inverted Yields by identifying inverted classes with the least tickets
  - Complete missing Yields by interpolation with above aggregation level

- Special classes can be considered out of nest (Group class, redemption class, staff class, …)

Yield Correction

Example

Thresholds:
At least **3 classes** with more than **20 tickets**

Class	Yield	Nb Tkt
A	1000	100
B	800	150
C	600	200
D	500	250
E	850	100

EUROP-NAMER

Fare Structure:

Fare Family	Booking Classes
Plus	A>B>C>D
Single Class	E

Yield Correction

Example

Thresholds:
At least **3 classes** with more than **20 tickets**

Fare Structure:

Fare Family	Booking Classes
Plus	A>B>C>D
Single Class	E

Class	Yield	Nb Tkt
A	1000	100
B	800	150
C	600	200
D	500	250
E	850	100

EUROP-NAMER

FR-US

Class	Yield	Nb Tkt
A	1200	50
B	-	**0**
C	750	165
D	600	50
E	800	40

Yield Missing

DK-US

Class	Yield	Nb Tkt
A	800	50
B	600	75
C	**700**	25
D	400	150
E	750	45

Yield Inversion

[illegible]-US

Class	Yield	Nb Tkt
A	-	**0**
B	1000	75
C	500	**10**
D	700	50
E	900	**15**

Thresholds not reached

Yield Correction

Example

Thresholds:
At least **3 classes** with more than **20 tickets**

Fare Structure:

Fare Family	Booking Classes
Plus	A>B>C>D
Single Class	E

Class	Yield	Nb Tkt
A	1000	100
B	800	150
C	600	200
D	500	250
E	850	100

EUROP-NAMER

Class	Yield	Nb Tkt
A	1200	50
B	-	0
C	750	165
D	600	50
E	800	40

FR-US

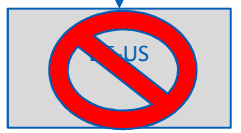
Yield Missing

$$B = 1200 - (1200 - 750) * \frac{1000 - 800}{1000 - 600} = 975$$

Class	Yield	Nb Tkt
A	800	50
B	600	75
C	700	25
D	400	150
E	750	45

DK-US

Yield Inversion



Yield Correction

Example

Thresholds:
At least **3 classes** with more than **20 tickets**

Fare Structure:

Fare Family	Booking Classes
Plus	A>B>C>D
Single Class	E

Class	Yield	Nb Tkt
A	1000	100
B	800	150
C	600	200
D	500	250
E	850	100

EUROP-NAMER

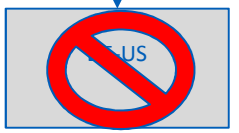
Class	Yield	Nb Tkt
A	1200	50
B	**975**	**0**
C	750	165
D	600	50
E	800	40

FR-US

Class	Yield	Nb Tkt
A	800	50
B	600	75
C	**700**	25
D	400	150
E	750	45

DK-US

Yield Inversion



$$C = 600 - (600 - 400) * \frac{800 - 600}{800 - 500} = 466$$

Yield Correction

Example

Thresholds:
At least **3 classes** with more than **20 tickets**

Fare Structure:

Fare Family	Booking Classes
Plus	A>B>C>D
Single Class	E

Class	Yield	Nb Tkt
A	1000	100
B	800	150
C	600	200
D	500	250
E	850	100

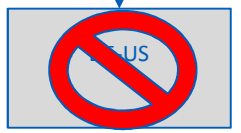
EUROP-NAMER

Class	Yield	Nb Tkt
A	1200	50
B	**975**	**0**
C	750	165
D	600	50
E	800	40

FR-US

Class	Yield	Nb Tkt
A	800	50
B	600	75
C	**466**	-
D	400	150
E	750	45

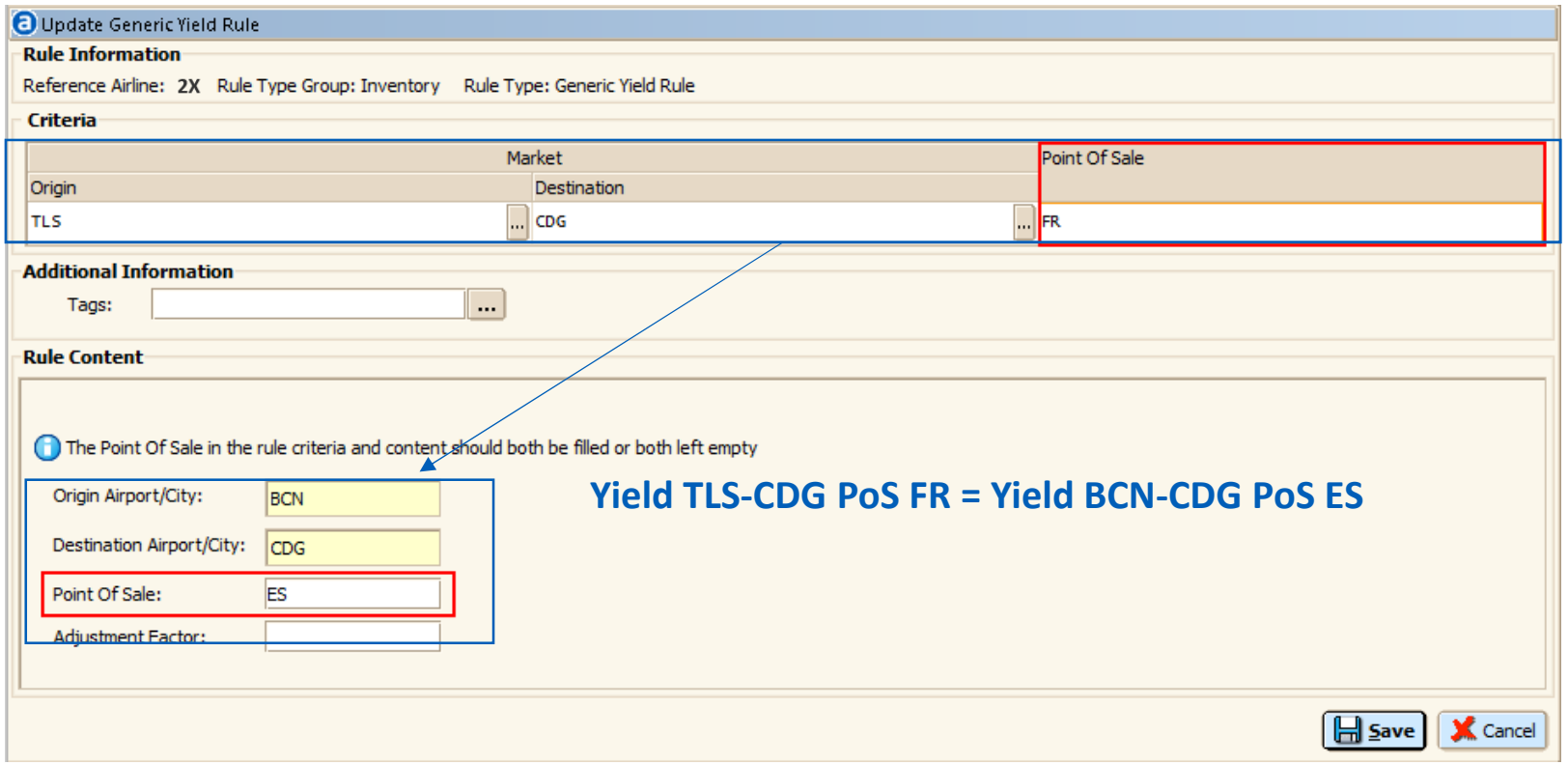
DK-US



Manual Yield Override

O&D Yield Sponsorship

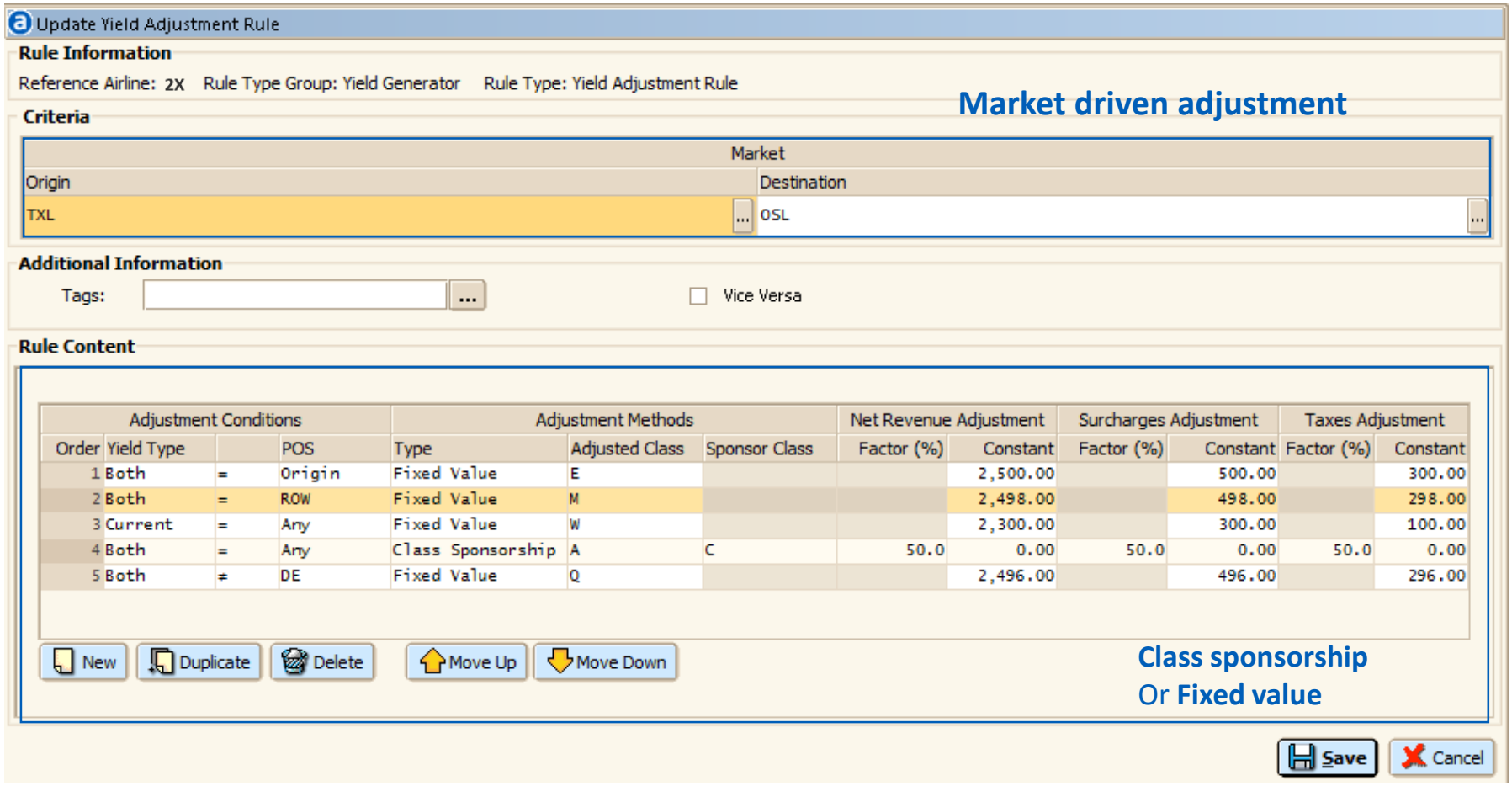
- Define **manual sponsorship of routes** in case a new route is introduced
- Yields of **all booking classes** are sponsored



Manual Yield Override

Yield Adjustment

- Define **manual override/adjustment** in case the automatic process does not provide suitable Yields



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