DDFS GENERATOR

AUTOMATING THE CREATION OF DESIGN DAY FLIGHT SCHEDULES

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Technical Documentation for DDFS Generator

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- External image credits (as depicted at the respective images)
  - United Nations, 2025
  - Our World in Data, 2025
  - Eurocontrol, 2023

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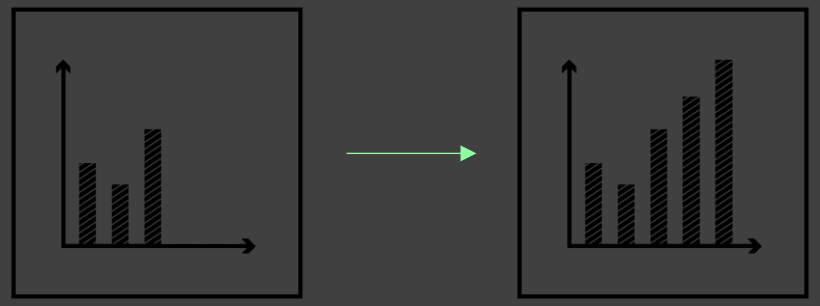
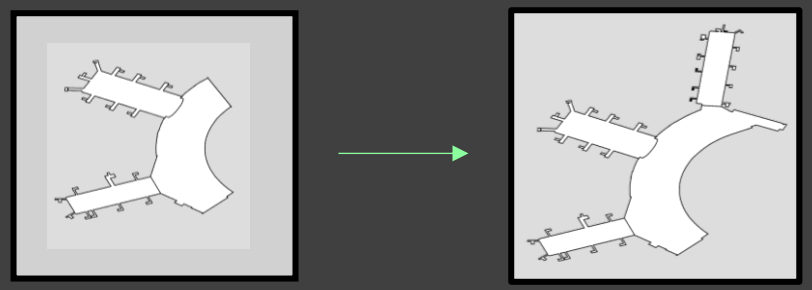
Part 1:
Forecasting Context & Background

The Forecasting Process

- Accurate passenger demand forecasts form THE basis for future airport infrastructure requirements and inherent investments.

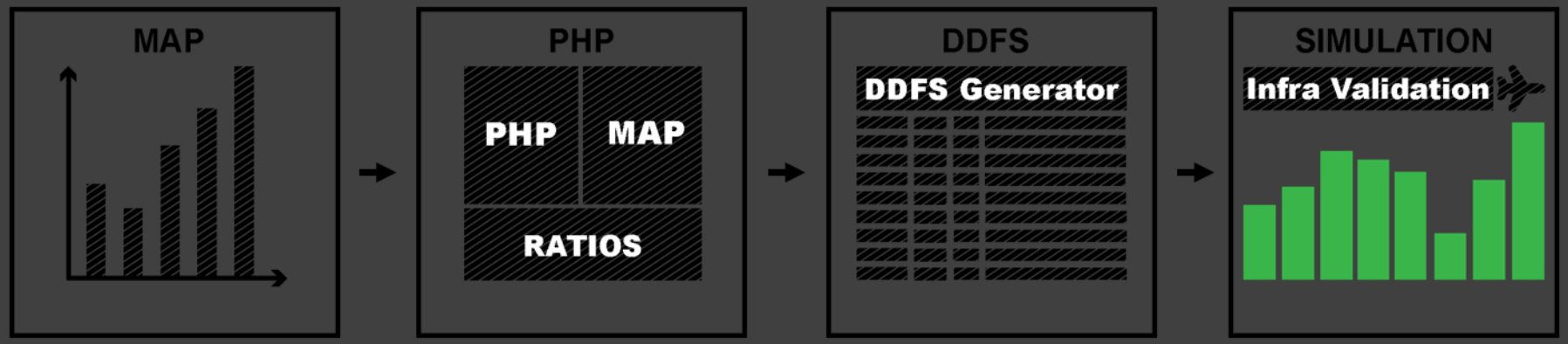


- In order to validate and optimise the respective future infrastructure in simulation studies → Traffic forecasts need to be converted into a future flight schedule - the DDFS.



The Forecasting Process

- Before a DDFS is created, various traffic forecasting steps have to be performed first:
  1. Annual Forecast – The annual numbers (MAP)
  2. Peak Hour Forecast – The peak hour passenger numbers (PHP)
  3. DDFS Development – Specify future flights in a flight schedule
  4. Apply the DDFS in simulation studies for infra optimisation and validation



The Forecasting Process

- 1st Step is forecasting annual passengers - MAP (million annual passengers)
- This can be done for various 'timeframes'
  - Short term – up to 1 year – aimed at operations and short term capacity management
  - Medium term – 1 to 5 years – aimed at minor infra developments/adaptations and identification of traffic trends
  - Long term – 5 to 20+ years – aimed at strategic airport planning, masterplanning, investment decisions
- As per ICAO DOC 8991, a forecast should be updated every 2-3 years

The Forecasting Process

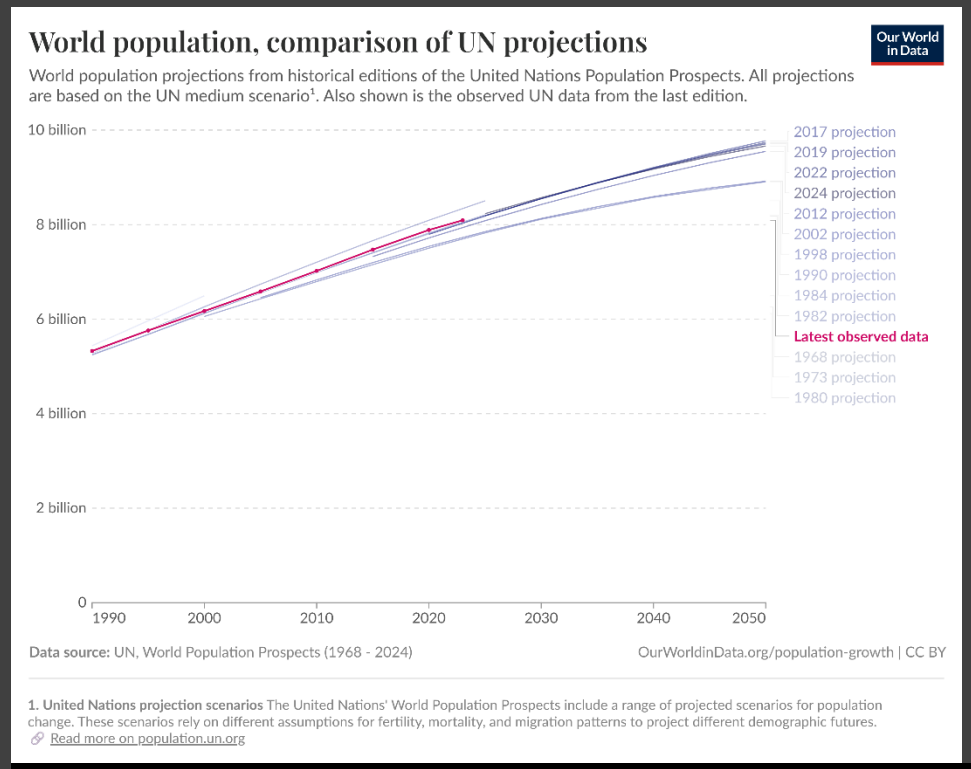
- Forecasting methods:
  - Quantitative (e.g. time series analysis, regression analysis)
  - Qualitative (e.g. expert surveys – 'delphi method')
  - 'Top-down' or 'bottom-up', depending on forecasting timeframe you can use long-term traffic correlations or short-term airline ambitions (see input below)
  - A mix of approaches is also possible

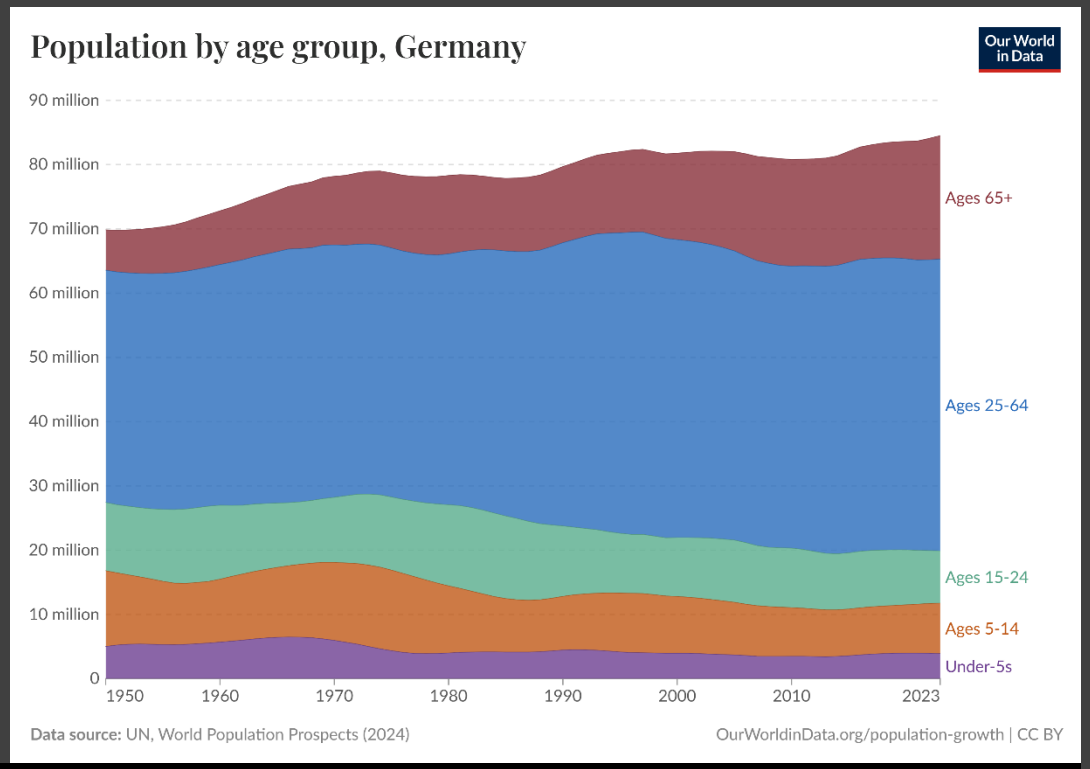
- Which input data is generally used?
  - Analysis of historical airport AODB/towerlog data → characteristics of the airport
  - Future demographics (population aged 15-70)
  - Economic forecasts (GDP, inflation, unemployment, etc)
  - Development of airfares / market liberalization
  - Development of air traffic and passenger taxes
  - Development of fuel costs and carbon emission trading schemes
  - Airline ambitions (expansion plans, fleet orders, etc.)
  - Airport catchment area and mobility behaviour (for O&D traffic; for transfer traffic, also the geographic position between major markets)
  - Infrastructure development at competing airports
  - Availability of slots at local airport and (potential) destinations
  - Bilateral agreements/freedoms of the air/openskies treaties

- How is the input data applied
  - Regression between input variables and passenger numbers
  - Demand elasticity between airfares and pax demand

The Forecasting Process

- Examples of demographic developments and data sources

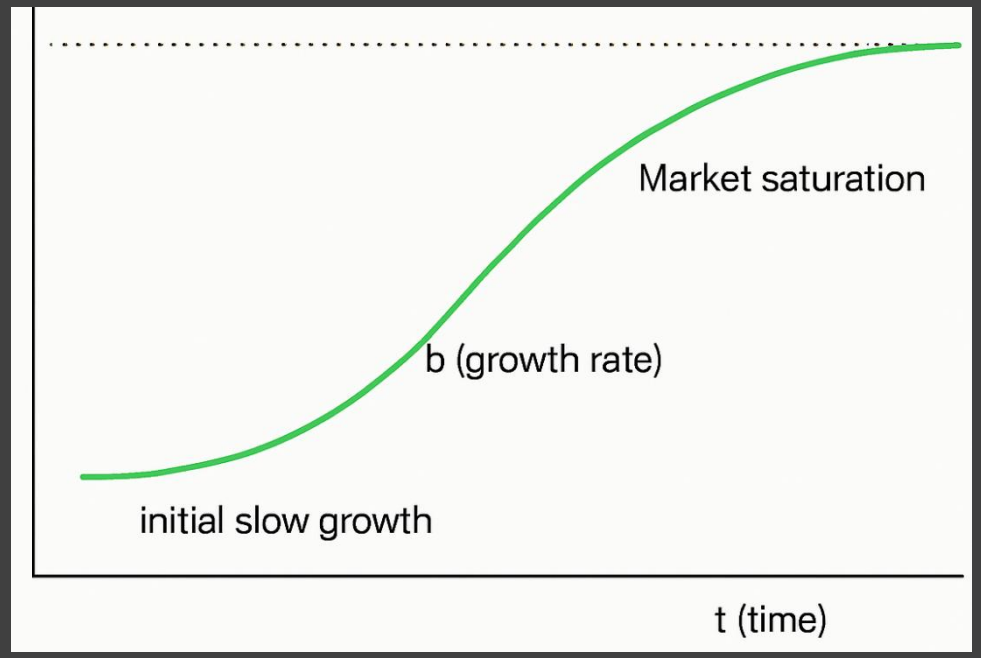




Graphs courtesy of United Nations and Our World in Data, 2025

The Forecasting Process

- Annual forecast output:
  - Passenger demand (main output), derived ATM demand (derivate, reaction to pax demand)
  - Demand development pattern normally along the 'S-curve'
  - At the end either demand saturation has taken place, or a capacity limit is reached
  - Depending on whether a capacity limit applies, you can develop an 'unconstrained' and/or 'constrained' forecast
  - Various level of detail possible as output; total annual pax, or pax per region, pax according to int/dom, etc, etc



The Forecasting Process

- Annual forecast output:
  - High - base - low traffic development scenario to account for future uncertainty
  - Also depends on airport profile (eg heavily LCC driven vs more diverse traffic mix)

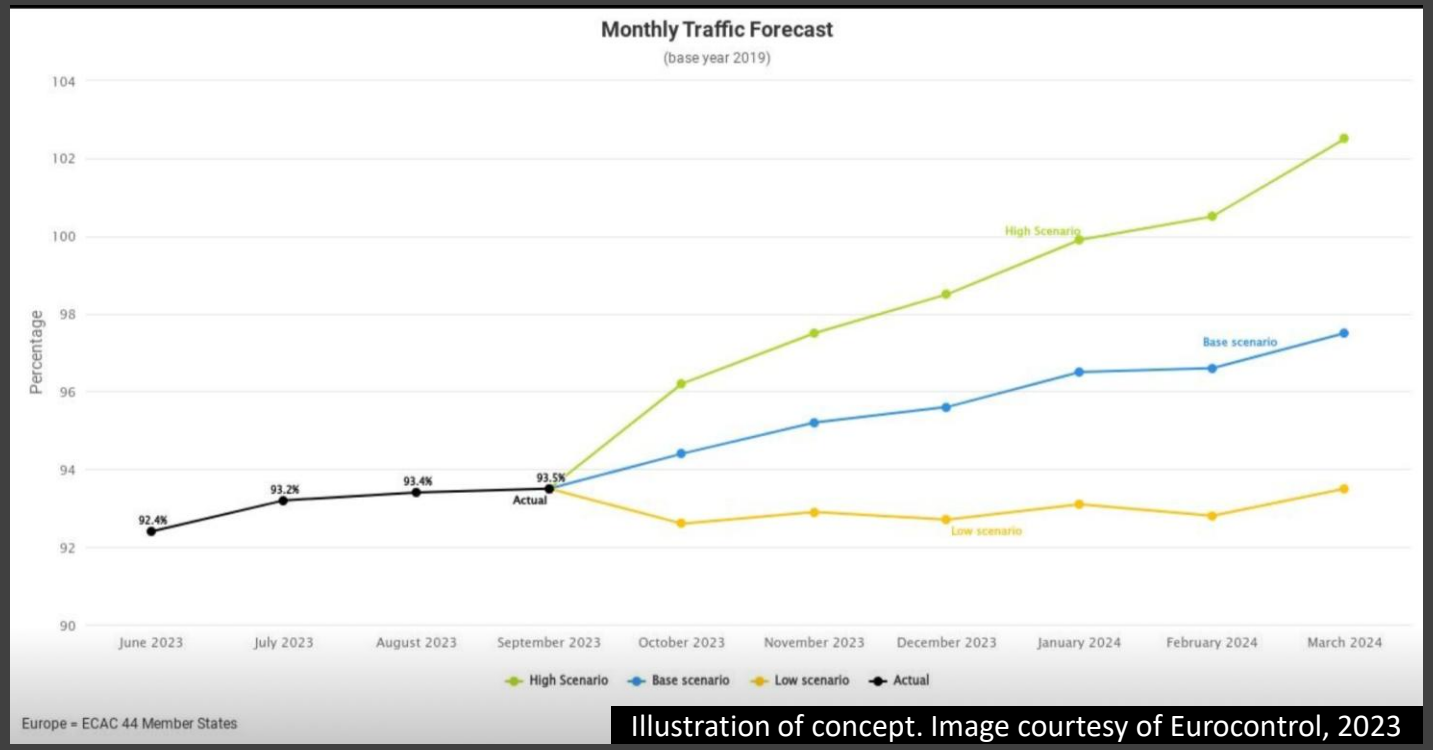


Illustration of concept. Image courtesy of Eurocontrol, 2023

The Forecasting Process

- The 2nd step is deriving peak hour passengers (PHP)
- This is first done by defining a current ‘representative day’
- A ‘representative‘ day can be defined in various ways:

Methodology	Advocate	Definition
30th busiest hour (Standard Busy Rate)	Former BAA, now worldwide application	The day featuring the thirtieth busiest hour of the year
Peak hour of the average day of the peak month	FAA	The peak hour of the average day of the peak month of the year
IATA busy day	IATA	The peak hour of the second busiest day during the average week in a peak month
Five Percent Busy Hour (Busy Hour Rate)	LHR	Day with the 95th percentile of peak hour passenger values. Generally for very mature airports only.

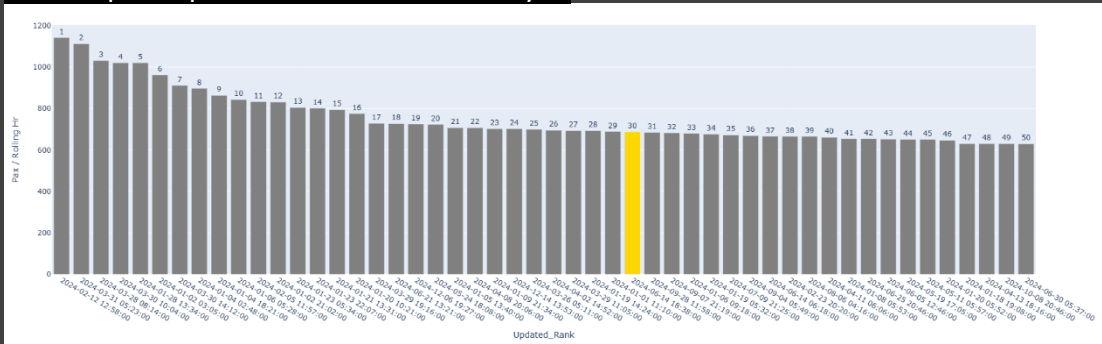
The Forecasting Process

- Generally speaking, the approach of the 30th busiest hour is recommended
  - This allows to clearly say something about levels of service (LoS) instead of having to define an ‘average’ day – since ‘average’ can feature many different properties to consider
  - With the 30th peak hour (of your peak type), you can statistically say that on 29 hours of the year, it is busier, while the rest of the year it is more manageable
- The 30th peak is below extremities driven by ‘one-off’ events like the UEFA Champions League final, hence no over-investments.
- It allows for efficient planning without over-dimensioning or over-investing, while keeping passenger queues, waiting times, and delays within acceptable limits – a sensible trade-off between operational reality and economic efficiency.

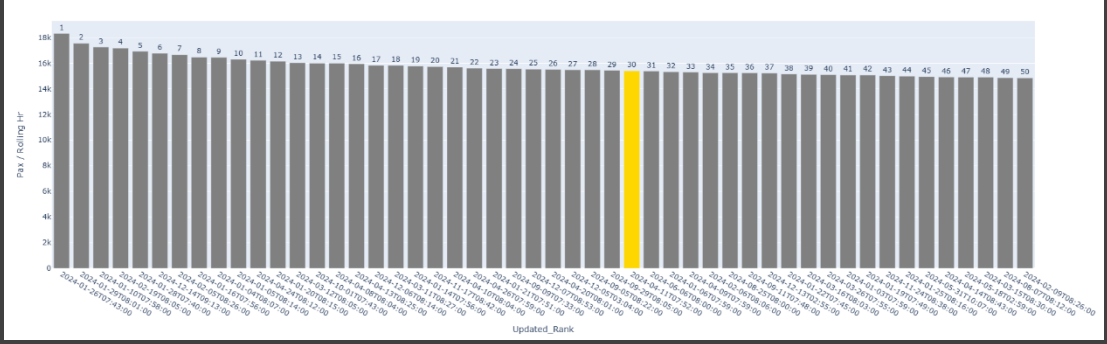
The Forecasting Process

- Note that the 30th peak hour rank shall concern the *cleaned* 30th peak (eg if 2 peak ranks are within one hour of each other, only the highest one shall be ranked, the other one does not count)
- Apart from that, it can be required to deviate from the standardised 30th peak rank and eg take the 25th or the 32nd, etc. in case that fits better in terms of weekday or month.
- Furthmore, depending on the aim of the DDFS (passenger related or airside related), a different peak can also be required (airside is generally based on the upper peak ranks)
- Deviation from the standardised 30th peak rank can also take place for airports with strong seasonality.

Example airport with more seasonality



Example 'matured' airport



The Forecasting Process

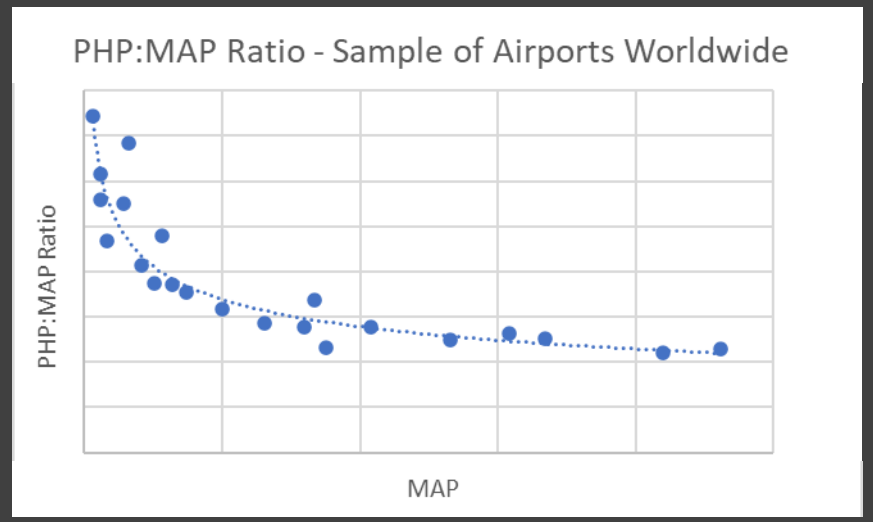
- For each peaktype, a ‘representative’ day can be defined in the aforementioned way
- Note that all peak types in their ‘representative’ shape occur on different days. This is one more reason why using the 30th peak hour method is more suitable than working with one single ‘average’ day
- Example analysis:

#PHP - 30th cleaned peak	Arr	Dep	2Way
Int	2949	2892	4661
Dom	5265	5036	8841
Int+Dom	5879	5926	10691

Date/Time	Arr	Dep	2Way
Int	12/07/2024 10:20	14/05/2024 11:09	21/09/2024 10:55
Dom	22/08/2024 17:48	16/08/2024 18:02	16/08/2024 21:34
Int+Dom	28/07/2024 20:54	06/10/2024 15:35	19/08/2024 10:25

The Forecasting Process

- For each peaktype, we can check how the #passengers in the selected peak hour compare to the #yearly passengers
- This is the so-called 'PHP:MAP ratio'
  - Actual figures provided in DDFS Generator analysis dashboards
- The PHP:MAP ratio changes with the maturity of an airport (due to 'peak flattening' concept, see graph), and depending on the *forecasted* MAP figure, we can derive the *pertaining future* PHP
- This serves as an input for the DDFS, which shall feature this future #peak hour passengers.

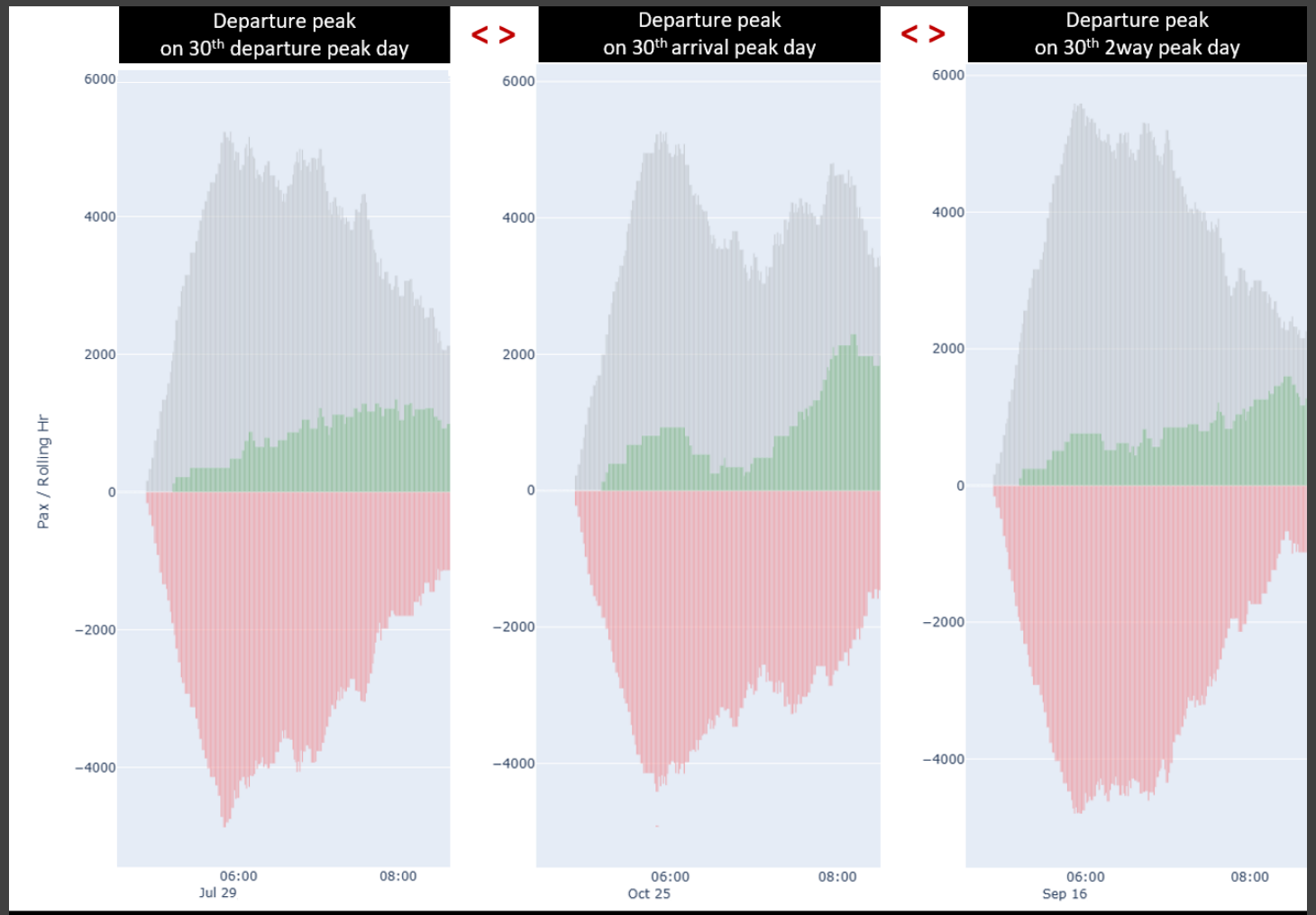


The Forecasting Process

- The next step entails the creation of the design day flight schedules (DDFS)
  - In an automated way using DDFS Generator, or;
  - The traditional, manual way
- As per ACRP guidance, developing DDFS is generally required for medium and large airports
  - For medium and long term time horizons
  - For application into fast-time simulation studies
- From the previous step, we have the ‘representative day’ per peaktype serving as a basis (‘base day’) for our DDFS
- Furthermore, we have obtained the future #peak hour passengers
- By adding future flights to the respective base day until matching the *future* peak and offpeak passengers figures, a DDFS is created

The Forecasting Process

- For accurate DDFS, one schedule per selected/relevant peaktype is required
- Reason: it is impossible to squeeze all separate peaks into one single combined DDFS
  - Example of a departure peak differing significantly on various days, hence a single day with representative peaks for eg arrivals, departures, 2way (etc) all in the same day is basically impossible



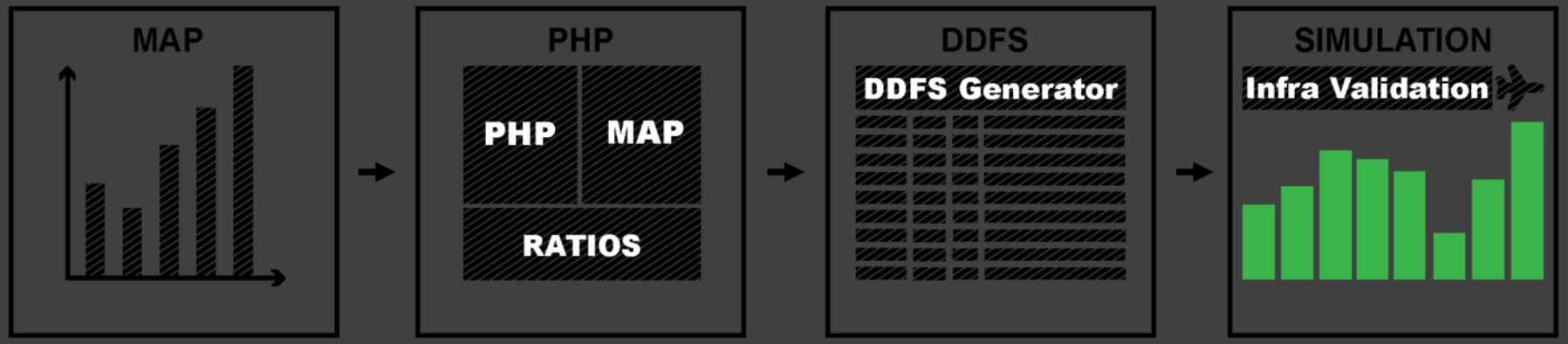
Impossible to fit Dep, Arr and 2Way **representative** peaks in a single day. **Each peak requires dedicated DDFS for max accuracy.**

The Forecasting Process

- In essence, converting the base day to a DDFS entails:
  - Updating current flights (“organic growth”):
    - ✅ Updating previous generation aircraft types depending on forecast year
    - ✅ Upgauging aircraft
    - ✅ Load factor increases
  - Future additional flights
    - ✅ Frequency increases (considering summer vs winter season)
    - ✅ (New) airlines + new destinations
  - ✅ On- and offpeak increases and ratios ('peak flattening’)
  - ✅ Potential consideration of capacity limits/slots
  - **DDFS Generator considers these dynamics and more when creating automated flight schedules**

The Forecasting Process

- For the final step why DDFS are required, let us remind the purpose:
  - DDFS are the #1 essential input for simulation studies
  - Simulation studies enable **validation and optimisation** of the respective future infrastructure
  - In this way, airports can optimally and efficiently plan their future infra requirements and investments



Literature Reg. Forecasting

- ICAO
  - DOC 8991 – Manual on Air Traffic Forecasting (2006).
  - Developing a Long Term Air Traffic Demand Forecast Model. Methodology followed by the Multi-Disciplinary Working Group on Long-Term Traffic Forecasts (MDWG-LTF) under the Aviation Data and Analysis Panel (ADAP) (2016).
- FAA / GRA, Incorporated
  - FORECASTING AVIATION ACTIVITY BY AIRPORT (2001).
- ACI
  - ACI Guide to World Airport Traffic Forecasts (2016).
- ACRP
  - Airport Aviation Activity Forecasting (2007)
  - Guidelines for Preparing Peak Period and Operational Profiles (2012)
- Ashford, et al.
  - Airport Engineering (2011)