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SUMMARY

Eight indicators from the framework described in the ATMAP Report were selected for regular monitoring of airport ANS operational performance. This technical note provides a tutorial description of those indicators

Keywords

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1 Introduction

1.1 Background

The Performance Review Commission (PRC) has been analysing the performance of the European Air Traffic Management System since 1998. Initially, the focus was on en-route ATM performance.

In December 2007, the PRC saw a need to extend the scope to cover airport airside and nearby airspace performance (maximum range 40 NM radius from the airport). The "ATM Airport Performance" (ATMAP) project was launched to develop initial proposals for validated indicators. Some 20 major airports, their corresponding ANSPs, airport coordinators, major airlines, the Agency and IATA were involved on a voluntary basis. Together with the Performance Review Unit (PRU) and PRC representatives, they comprised the ATMAP Working Group. The results of ATMAP Phase I were approved by the PRC and documented in December 2009 in a report called "ATM Airport Performance (ATMAP) Framework" [Ref 1].

The main objectives of this project were as follows:

- To develop a high-level framework for consistent and continuous review of airport airside and nearby airspace air transport performance with a focus on ATM;
- To identify a set of easily understandable high-level performance indicators which enables interested parties:
    - to understand airport airside and nearby airspace aspects of air transport performance network;
    - to measure performance across airports and over time;
    - to position ATM performance within airport airside and nearby airspace air transport performance;
- to validate high-level indicators and the performance measurement framework in consultation with airport stakeholders (airlines, airport operators, Air Navigation Service Providers);
- to specify the underlying data required to populate the performance framework.

In 2010, during ATMAP Phase II, eight indicators from this framework were selected for regular monitoring of operational airport ANS operational performance by the PRC. Some have been included as airport indicators in the European SES II Performance Scheme, for monitoring purposes during the 1st Reference Period (RP1 - 2012-2014).

The eight selected ATMAP indicators represent the first version of the performance framework that the PRC will use to monitor ANS operational performance at main European airports. Individual airport communities can use those indicators, as well as specific indicators for local performance monitoring.

Annex IV of the SES II Performance Scheme [Ref 2] lays out the list of data to be provided by airports and other stakeholders. This data will be used to support the calculation of the ATMAP indicators.

Starting 2012, the PRC plans to publish a periodic ATMAP report, which will report on ANS performance at some 80 airports in Europe, using the indicators described in this document.

1.2 Purpose and Audience

The purpose of this document is twofold:

- to help the readers of the PRR and ATMAP reports of the PRC understand the meaning and context of the indicators used in these reports;
- to give the data providers (airports, ANSPs, airlines) a better appreciation of what their data is used for.

In line with these objectives, this document is conceived as an introductory tutorial-style document, aimed at providing a conceptual understanding of the ATMAP performance framework to external readers. It should be suitable for readers new to the subject.

1.3 Scope and Applicability

This document focuses on the **conceptual description** of the ATMAP performance framework.

This being said, the document is **NOT**:

- A performance review report: the material does not include analysis results which are dependent on collected performance data;
- A handbook describing how the indicators should be interpreted in a combined manner to conduct a holistic assessment of ANS airport performance;
- A detailed technical description of the data collection and processing needed to produce indicator values.
- A data validation report, describing the results of the data validation conducted as part of the development of the indicators.

1.4 Roles and Responsibilities

The following roles and responsibilities are foreseen in the airport performance monitoring process:

- **Maintenance of the performance framework**:
  - o The airport community will be consulted when major changes are proposed by the PRC or required by the Performance Scheme.
  - o This document will be maintained by the PRU on behalf of the PRB/PRC. After the first complete edition, annual revisions are foreseen to ensure that this description remains aligned with the evolution of the performance framework.
- **Data provision to PRB/PRC**:
  - o Annex IV of EU 691/2010 (Performance Regulation) specifies which National authorities, ANSPs, airport operators and air carriers are required to participate in data provision; which data they have to provide; with which periodicity and by which deadlines.
  - o PRR 2009 states (page x, PC recommendations): "The Provisional Council is invited to […] encourage airport stakeholders […] to constructively engage in […] the building of a comprehensive and reliable data base that can adequately support [the ATMAP performance framework]".
- **Data processing and calculation of ATMAP indicators:**
  - o Data processing (i.e. data validation and storage) and calculation of ATMAP indicators will be ensured by EUROCONTROL on behalf of the PRB/PRC. Stakeholders will not be required to calculate indicator values themselves.

- **Target setting**:
  - o During Reporting Period 1 (2012-2014), there will not be any EU-wide target for ATMAP indicators.
- **Performance analysis and publication of results**:
  - o Performance analysis and publication of results (periodic ATMAP reports) will be the responsibility of the PRB/PRC, supported by the PRU.

2 Terminology and Principles

2.1 Terminology Precedence

When choosing terminology for use in the ATMAP performance framework, the following order of precedence is used if the same notion is defined by different sources (perhaps with a different term and/or definition):

1. ICAO terminology
2. Terms and definitions contained in EU legislation
3. Eurocontrol and IATA terminology
4. Other sources

2.2 Indicators and Related Terminology

This document is mainly about the description of (key) performance indicators. To put the notion of indicator into proper perspective, it is useful to recall some related terminology. This is also an opportunity to highlight some of today's differences in the use of terminology. A glossary with more performance related terminology can be found in ICAO Doc 9883 [Ref 5].

"**Performance Area**" is a generalised term referring to:

- Key Performance Area (**KPA**), term used for the general categorisation of policy related expectations and ambitions
  - ICAO Doc 9883: has defined 11 standard KPAs
  - SESAR: uses the 11 ICAO KPAs plus an additional one: Human Performance
  - EC Regulation 691/2010: uses 4 of the 11 ICAO KPAs
  - PRC/PRU: PRR reports use a somewhat different set of KPAs
- Focus Area (**FA**), a subdivision of a KPA or another FA (ICAO Doc 9883)
  - SESAR has defined 149 Focus Areas within the 12 KPAs it uses
  - In addition, the CIV/MIL performance framework has defined 24 Focus Areas
  - The notion of Focus Area has up to now not been used in the PRB/PRC framework or in EC Regulation 691/2010

"**Objective**" represents a policy decision; is a generalised term referring to a:

- Goal (ICAO Doc 9161 [Ref 6])
- Performance Objective (ICAO Doc 9883)
  - Generic Performance Objective (what)
  - Instantiated Performance Objective (what + where/when/who)

Related **objectives** are grouped by **performance area** (see definition above)

Objectives may be **qualitative** only (loosely described using text), or **measurable**, meaning that they make a statement about the required or desired evolution of one or more **indicators** (see definition below). Objectives are said to be **quantified** if these indicators have **targets** associated with them (see definition below).

"**Indicator**" is a general term referring to:

- Performance Indicator (**PI**)
  - ICAO Doc 9883: an indicator with or without targets
  - Reg 691/2010: an indicator for monitoring only (without targets)

- Key Performance Indicator (KPI)
  - Reg 691/2010: KPI = a PI with binding targets

- Wikipedia: "KPIs are commonly used by an organization to evaluate its success or the success of a particular activity in which it is engaged. […] Accordingly, choosing the right KPIs is reliant upon having a good understanding of what is important to the organization".
- Difference between KPI and PI: While there can be many PIs, there should only be a limited number of "Key" PIs (KPIs).

"**Target**" is a general term referring to:

- Performance target
  - ICAO Doc 9883: performance targets are closely associated with performance indicators: they represent the values of performance indicators that need to be reached or exceeded to consider a performance objective as being fully achieved. Targets can also be set to provide guidance, and should not just be seen as an instrument for enforcement.
- Binding target
  - EC Regulation 691/2010: 'Binding target' means a performance target adopted by Member States as part of a national or functional airspace block performance plan and subject to an incentive scheme providing for rewards, disincentives and/or corrective action plans.

"**Metric**" is a general term referring to:

- Numeric facts (also called measures) which are categorized by dimensions
- A variable used in the calculation of one or more indicators
- Supporting Metric (ICAO Doc 9883). "Supporting" because it supports the calculation of indicators.

"**Dimension**" in simple terms: dimensions are used to describe the where/when/who scope of performance data and/or targets (ICAO Doc 9883). Often, the entries in dimension lists are organised in hierarchical structures (taxonomies or aggregation hierarchies).

2.3 Conceptual and Technical Indicators

It is useful to make a distinction between:

- **Conceptual indicators** which are defined to represent exactly what we want to measure, but for which the required data feeds may not currently be available, and
- **Technical indicators** which are designed to approximate a certain conceptual indicator as much as possible, but their calculation methodology (formula and/or algorithm) takes into account current limitations in data availability and quality.

This approach has the advantage that the requirement side and implementation side of the performance based approach are decoupled:

- The **requirement** side is described in terms of a conceptual framework with conceptual indicators which remain fairly stable over time,
- The **implementation** side consists of technical indicators associated with certain data feeds; each time that a significant improvement in the data feed is put in place, a technical indicator may be modified or replaced by another one which better approximates the conceptual indicator.

2.4 Criteria for Assessing the Quality of Indicators

Each (technical) indicator should be checked against a pre-defined set of quality criteria. The ones used to describe ANS related indicators are listed hereunder.

Regulation EC 691/2010 prescribes that:

"Key performance indicators should be selected for being specific and measurable and allowing the allocation of responsibility for achieving the performance targets. The associated targets should be achievable, realistic and timely and aim at effectively steering the sustainable performance of air navigation services."

These requirements (or criteria) for selecting indicators can be expanded as follows:

1) **Specific**. Specific indicators are clear and well-defined. The indicator should be narrow and focus on the performance to be delivered for providing a clear added value to air transport operations. The change in performance should be easily recognisable as negative or positive in order to make a trade off with other indicators.

2) **Measurable.** Indicators should be clearly quantifiable (definitions, taxonomy, etc.) and it must be possible (availability, confidentiality issues, etc.) and affordable (established vs. new data collections) to acquire the data necessary for the calculation of the indicators.

Additionally, the indicators used for target setting should be transparent, easy to understand and allow disaggregation into different levels in order to:

- ensure coherence and consistency within the SES performance scheme;
- ensure a common understanding on high level performance between policy makers, regulators and providers;
- enable meaningful links between Community, State and local targets.

3) **Drive the desired behaviour**. Performance Indicators should be set for a few relevant parameters that drive the right ANSP behaviour consistent with customer objectives and avoid unintended consequences.

4) **Accountable/manageable**. The indicator should reflect the performance outcome from the ANSP and not be unduly affected by factors on which ANSPs have no influence at all.

The concept of accountability/manageability is a seamless range from full accountability to non-accountability. An entity could be fully accountable if it controls all factors which generate a given performance. This is rarely the case in aviation. The indicators shall not be restricted to areas which are under full ANSP control but they shall also incentivise ANSPs to take pro-active action and seek adequate solutions in collaboration with other stakeholders concerned. However the indicator shall not be unduly affected by factors on which ANSPs have no influence at all.

5) **Compatible with ICAO guidelines**. With regard to ANS performance the reference is ICAO Doc 9883, "Manual on Global Performance of the Air Navigation System".

2.5 Lifecycle Based Approach for Developing and Using Indicators

Each indicator goes through a number of Lifecycle phases as shown in Figure 1.

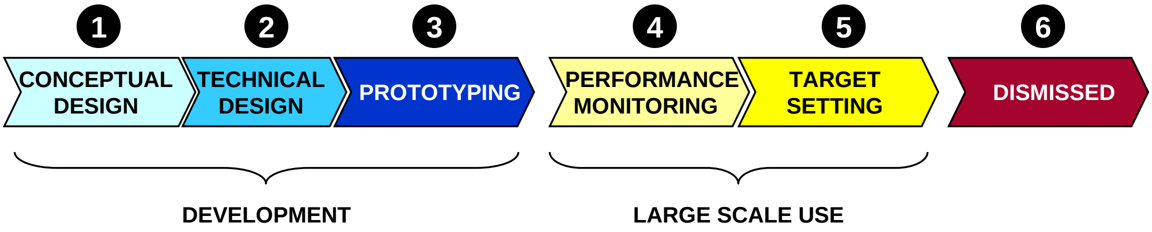

Figure 1 Indicator Lifecycle

1) **Conceptual Design**: the indicator is generically described (as a conceptual indicator) as well as its relationship with the performance area to which the indicator belongs. The description addresses the question what the indicator intend to measure, why the indicator will contribute in enhancing its performance area and in which way the indicator could be used to operate trade offs with other performance areas.

2) **Technical Design**: after the conceptual design phase, data availability and quality considerations come into play and are taken into account to select candidate metrics as well as identify candidate computation formulae. This results in one or more technical indicator definition proposals.

3) **Prototyping**: after the technical design phase, the candidate technical indicators (metrics and formulae) are tested on a restricted data sample. The first assessment against the "indicator quality criteria" (see above) is done on the retained indicator(s). This phase may require iterations (going back to phase 2). Just one technical indicator remains as the output of the prototyping phase.

4) **Performance Monitoring** (i.e. large scale validation): the retained indicator is used to monitor performance at European level. However, improvements and refinements are still possible. There is a continuous activity of validation and comparison with local and national indicators which has a double purpose: to identify possible refinements and improvements to the European indicator and to make national and/or local stakeholders aware of the correlations between the European and local/national indicators. The assessment against the "indicator quality criteria" is kept updated. This phase could last for years until the indicator is dismissed or until it is used for target setting.

5) **Target setting** (optional): the indicator has matured during the performance monitoring phase. There is a wide consensus that the indicator is robust enough to be used in target setting and that it drives the desired behaviours. The indicator is incorporated in EC legislation and a target is attached to it.

6) **Dismissed**: The indicator is not used anymore for various reasons: the performance area has been dismissed, the indicator has been replaced by another one which is of higher quality, etc.

3 Measuring Operational ANS Performance at Airports

3.1 Overview

3.1.1 Scope

The framework refers to airport airside operations and airspace in a range of 40 Nm around the airport. This airspace is called the Arrival Sequencing and Metering Area (ASMA). The framework encompasses scheduling and operational data.

As shown in Figure 2, the framework comprises 8 indicators which address:

- Capacity
- Predictability
- (Flight) Efficiency, including punctuality

The present version of the framework does not address airport related:

- Environmental performance (CO2 and noise emissions)
- Safety
- Cost effectiveness

Note that three of the ATMAP flight efficiency indicators have been adopted as airport capacity indicators for Reference Period 1 (2012-2014) in the SES II performance scheme [Ref 2]. See the marked indicators in Figure 2. KPI 7 supports article 11 of the ATFM regulation [Ref 8].

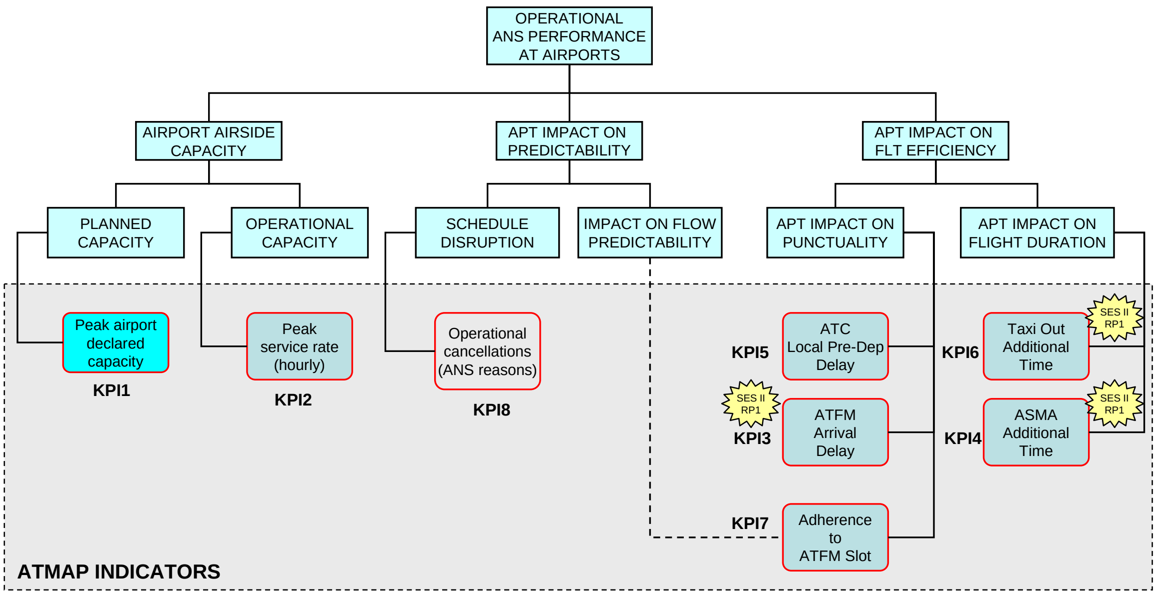

Figure 2 Overview of Focus Areas and Indicators for Measuring Operational ANS Performance at Airports

All indicators take an airport-centric view, meaning that they refer to:

- Aggregated performance of inbound traffic at a given airport, regardless of departure airport
- Aggregated performance of outbound traffic at a given airport, regardless of destination airport
- Or the combined effect of inbound and outbound traffic at a given airport

See Table 1 for a mapping of the indicators to the airport traffic flow direction.

Table 1 List of Indicators

Indicator		Perf.		Flow			KPAs		
ID	Indicator Name	Scheduled	Operational	Inbound	Outbound	In+outbound	Capacity	Predictability	Flt Efficiency
KPI 1	Peak airport declared capacity	X				X	X		
KPI 2	Peak Service Rate		X			X	X		
KPI 3	ATFM Arrival delay		X	X					X
KPI 4	ASMA additional time		X	X					X
KPI 5	ATC local pre-departure delay		X		X				X
KPI 6	Taxi-out additional time		X		X				X
KPI 7	Adherence to ATFM slot		X		X			X	X
KPI 8	Operational Cancellations (ANS reasons)		X			X		X	

The detailed descriptions further in this document mention additional indicators and metrics, for the purpose of explaining the operational context and the calculation method of the eight main indicators.

The subject of 'Operational ANS Performance at Airports' is subdivided into a number of Focus Areas, each of which defines a performance measurement/management scope which is more specific than a KPA. See Table 2.

Table 2 List of Focus Areas

Focus Area	Definition
APT-CAP1 Planned capacity	This focus area covers all performance objectives and indicators related to the planning of airside airport capacity and nearby airspace, from seasonal planning to the refinement and adjustment of capacity plans one day ahead of the day of operations.
APT-CAP2 Operational capacity	This focus area covers all performance objectives and indicators related to managing airside airport and nearby airspace operational capacity, i.e. managing the maximum runway throughputs that are achievable on the day of operations in function of the traffic and operational conditions.
APT-PRD1 Schedule disruption	This focus area covers all performance objectives and indicators related to observing and managing the number of departure and arrival cancellations of scheduled flights on the day of operation (i.e. operational cancellations).
APT-PRD2 Impact on flow predictability	This focus area covers all performance objectives and indicators related to keeping actual take-off times aligned with ATFM slots (slot adherence), to contribute to the predictability of flow rates en-route and at the destination airports.
APT-EFF1 Airport impact on punctuality	This focus area covers all performance objectives and indicators related to managing OOOI (out-off-on-in) delays caused by airport capacity/demand mismatches.
APT-EFF2 Airport impact on flight duration	This focus area covers all performance objectives and indicators related to managing the duration of airport and TMA related flight phases (taxi-out, departure, arrival and taxi-in).

3.1.2 Conceptual Overview of ANS role at airports

At airports, with respect to the Capacity, Efficiency and Predictability KPAs, Air Navigation Services have the role:

- to manage traffic in normal, marginal and disruptive operating conditions;
- to sustain the airport declared capacity in normal weather conditions;
- to keep the queuing and delays within agreed service levels while maximising runway utilisation;
- to reduce traffic variability related to variable level of delays and queuing.

This can be summarised as the task of managing inbound and outbound traffic from the planning stage (initial flight scheduling) until post-flight, while dealing with continuous demand changes (added and removed or cancelled demand) in a context of static as well as dynamically changing airport capacity constraints. This is conceptually shown in Figure 3, from an airport pair traffic flow perspective.

Not shown in this figure are the effects of en-route capacity constraints, reactionary delays and longer than expected turn-around durations, which impact overall air transport performance but are considered as factors external to local airport airside operations. Hence these are 'external inputs' (e.g. received requests to deviate from the scheduled departure time) to which airport ANS needs to respond but which are not part of the local airport ANS performance itself. Therefore, these effects are not intended to be measured in the ANS airport performance framework, but they could be measured in the wider air transport operational performance framework.

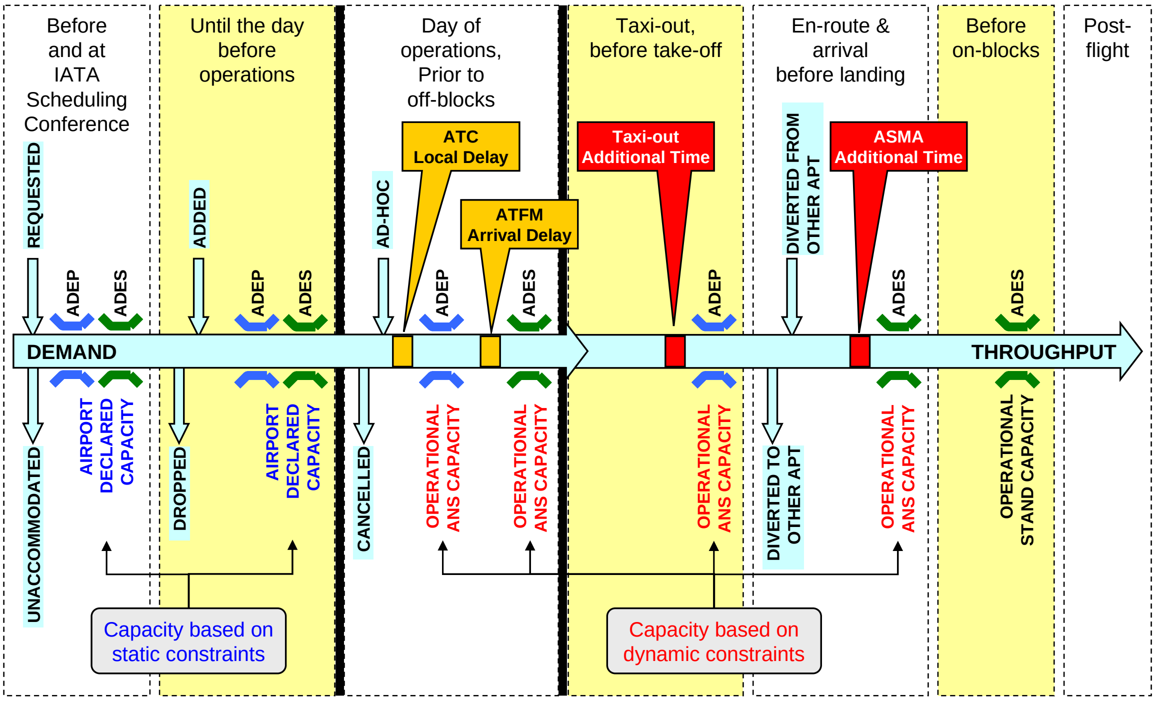

Figure 3 Conceptual View of Balancing Demand and Capacity at Airports

Airport and ANS demand and capacity management:

Demand and capacity management is conducted in three successive planning stages: scheduling, flow management and tactical ATC.

- **At scheduling time** (until the day before operations), airport capacity is simply the 'airport declared capacity' in terms of a number of available airport slots (at coordinated and facilitated airports). These scheduling limits should always be lower than or equal to the operational capacity provided by ANS for the airport in normal operating conditions.
- **On the day of operations**, the ANS operational capacity is influenced by dynamically changing factors (weather conditions, etc.). The dynamic changes are taken into account in two steps:
  - **Before off-blocks**, the anticipated capacity is expressed in terms of number of ATFM slots or flights per hour
  - **After off-blocks** capacity used by ATC is mainly determined by the process of managing runway utilisation (sequencing, metering, etc.).

Airport demand/capacity balancing: traffic demand will be 'pushed' through the capacity bottlenecks (constraints) at the various planning stages and flight phases (see Figure 3). In case of demand/capacity mismatch, the following approach is typically used:

- **Until the day before operations**: flight scheduling activity continues until defining the final schedule list (may fly list). Although in practice scheduling continues on the day of operations, the snapshot taken at the end of the previous day is the reference coordinated demand for the ATMAP performance framework.
- **On the day of operations before off-blocks**:
  - If there is a **disruptive capacity reduction for a long duration** (hours, days)
    - If this capacity reduction occurs at the **departure** airport: flights may be cancelled or rescheduled
    - If this capacity reduction occurs at the **destination** airport: flights may be cancelled, rescheduled or diverted
  - If the demand/capacity mismatch is **not disruptive or just temporary**, flights might be held at the gate/stand (pre-departure delay) according to the procedure agreed by the aviation community at the airport
    - If this mismatch is at the **departure** airport: the term 'local pre-departure delay' is used
    - If this mismatch is at the **destination** airport: the pre-departure delay is called 'ATFM arrival delay'
    - Note that in certain cases some of this pre-departure delay could be traded off against additional taxi out time
- **On the day of operations after off-blocks:**
  - If there is congestion at the **departure** runway: traffic will be queued at the runway, leading to additional taxi-out time
    - High runway utilisation targets require some queuing to allow optimisation of the departure sequence and optimum take-off spacing
    - Beyond this queuing in support of departure sequencing, additional queuing and taxi-out time may result from sub-optimal taxi-out management or due to operational needs
  - If there is congestion at the **arrival** runway: traffic will be queued in the Arrival Sequencing and Metering Area, leading to ASMA additional time
    - High runway utilisation targets require some arrival queuing to allow optimisation of the arrival sequence and optimum approach spacing
    - Additional queuing may occur in case of sub-optimal arrival management (early arrival in the TMA leads to arrival overdelivery, hence queuing which is longer than strictly necessary)
  - If taxi-out management frequently fails to deliver aircraft to the departure runway as required by ATFM, a large number of flights may take off outside

their assigned ATFM slot. Poor ATFM slot adherence reduces flow predictability and may lead to en-route and destination airport overdeliveries.

The following sections introduce the selected key performance indicators and explain their measurement context.

3.2 Airport Capacity and Schedule Disruption

This section covers the following Focus Areas and Indicators.

Focus Area		Indicator	
APT-CAP1	Planned capacity	KPI 1	Peak airport declared capacity
APT-CAP2	Operational capacity	KPI 2	Peak Service Rate
APT-PRD1	Schedule disruption	KPI 8	Operational Cancellations (ANS reasons)

3.2.1 Context for the Indicators

The specific process used for managing airport demand and capacity depends on whether the airport is congested or not. Three cases are to be distinguished [Ref 9]:

- **IATA Level 1 (Non Coordinated Airport):** A non-coordinated airport is one where the capacities of all the systems at the airport are adequate to meet the demands of users.
- **IATA Level 2 (Schedules Facilitated Airport):** A schedules facilitated airport is one where there is potential for congestion at some periods of the day, week or scheduling period, which is amenable to resolution by voluntary cooperation between airlines and where a schedules facilitator has been appointed to facilitate the operations of airlines conducting services or intending to conduct services at that airport.
- **IATA Level 3 (Coordinated Airport):** A coordinated airport is one where the expansion of capacity, in the short term, is highly improbable and congestion is at such a high level that:
    - o the demand for airport infrastructure exceeds the coordination parameters during the relevant period;
    - o attempts to resolve problems through voluntary schedule changes have failed;
    - o airlines must have been allocated slots before they can operate at that airport.

The general process for managing demand and capacity is outlined in Figure 4, which positions a number of relevant metrics in their overall context. This is an influence diagram in which each box represents an indicator or metric populated with a data set. The diagram can represent the data of a single airport, as well as the data for all airports. The main indicators (see Table 1) are highlighted with a red border. In the description which follows below, all the words shown in bold refer to metrics shown in the diagram.

The figure is an influence diagram for the most complex case (coordinated airports), but is equally suitable for explaining what happens at IATA level 2 and 1 airports. In those cases certain boxes will not contain data or will be characterised by different numerical values.

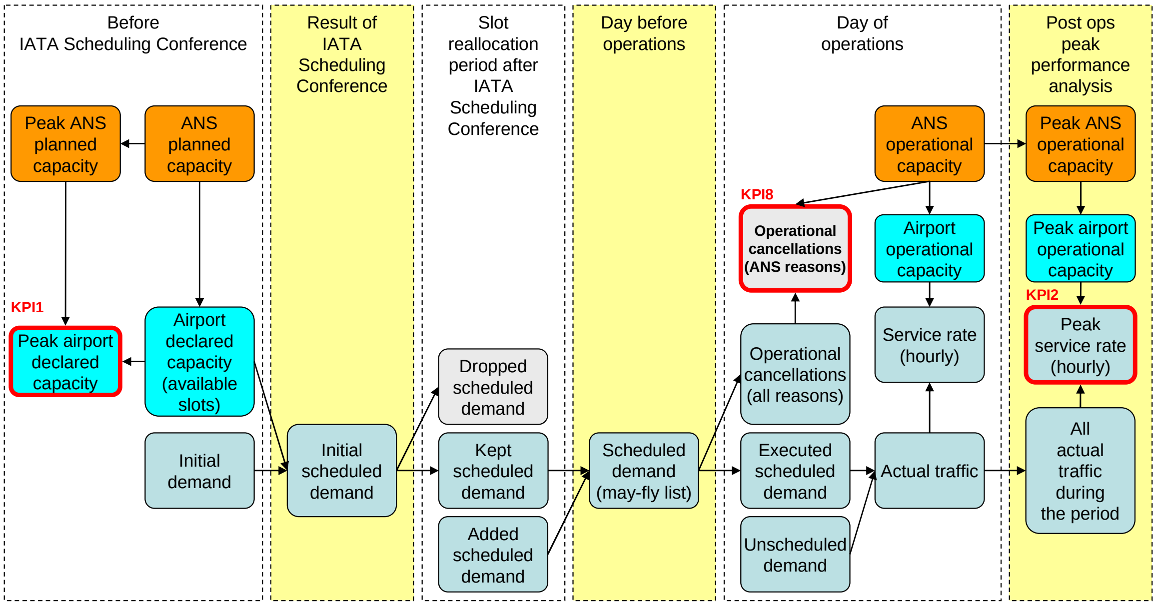

Figure 4 Airport Demand and Capacity Management

Twice a year (for the summer season and the winter season), an IATA Scheduling Conference is organised. In preparation of this event:

- Coordinated airports establish their **Airport declared capacity** (also named "coordination parameters" or "scheduling limits") which define the number of departure slots and arrival slots available for scheduling. These parameters can have different values depending on time of day, the mix between departures and arrivals, etc. Within this performance envelope the highest hourly value is the **Peak airport declared capacity (KPI 1)**. One of the factors influencing the Airport declared capacity is the **ANS planned capacity**.
- Airlines define their **Initial demand** which will serve as input to the IATA Schedules Coordination Conference. This is a list of proposed flights. Each proposed flight originating and/or terminating at a coordinated airport represents a requirement for a departure and/or arrival airport slot.

As a result of the scheduling conference, an initial snapshot of the **Scheduled demand** is available. This is a flight schedule with an associated list of allocated departure and arrival slots.

The conference is followed by a period, during which the airline schedules are adapted: some of the original demand is dropped (slots are returned), and new flights are added to the schedule in available slots.

This schedule refinement continues until the day of operations. For performance measurement purposes, another snapshot picture is taken at the end of the day before operations: this is called the **Scheduled demand**, also called the may-fly list.

The **Actual traffic** on the day of operations may be different from this scheduled demand for two reasons:

Part of the scheduled demand may not take place at the departure and destination airports, due to diversion, aborted flights or flight cancellations. This is called the **Operational Cancellations (all reasons)**. The remainder is the **Executed scheduled demand**.

A subset of the Operational Cancellations (all reasons) is the **Operational Cancellations (ANS reasons) (KPI 8)**. This subset can be determined if the cancellation reasons are known. Only those cancellations are included which are due to a lack of **ANS Operational Capacity**. Note that the operational cancellations (all reasons) indicator will also be used for assessing the effectiveness and efficiency of the flow management strategy when the capacity drop at airport is not attributable to ANS.

On the day of operation a certain amount of unplanned traffic may take place. This is the **Unscheduled demand**.

The **Actual traffic** corresponds to a flight-by-flight airport throughput which varies through time. At hourly level (movements per hour, measured at the runways) it is called the airport **Service rate**.

The Service rate is the result of the interaction between the level of the demand and the **Airport operational capacity** which both vary through time and are dependent on land-side and air-side factors. One of the factors which has the potential to limit the Airport operational capacity is the **ANS operational capacity**. Both the Airport and ANS operational capacity are set in accordance to the specific situation of the day or hours of operations (traffic mix, weather, status of systems and infrastructures, availability of staff).

After a certain time period (e.g. a month, a season), a post-operations analysis will reveal the highest sustainable throughput values that the airport has been able to accommodate. This can be determined by analysing **All actual traffic during the period**, and looking at the traffic levels during typical busy-hour periods (the approach excludes any exceptional performance achieved during the busiest hours of the period). This typical busy-hour indicator is called the **Peak service rate**.

The **Peak airport operational capacity** is the highest sustainable throughput the airport can achieve under optimum conditions, assuming there is sufficient demand, i.e. during periods of congestion. Note that at airports which are never or rarely congested, the **Peak service rate** might be significantly lower than the **Peak airport operational capacity**.

3.2.2 What we Ideally Would Like to Measure (Conceptual Indicators)

To achieve a certain airport throughput, the supporting processes and resources of all involved Stakeholders (i.e. the capacity of terminal buildings, turn-around operations, aircraft stands, taxiways, runways, nearby airspace, ANS services etc.) need to provide sufficient capacity. The process/resource with the lowest capacity is the constraining factor, i.e. the element which determines overall airport capacity.

In this context, we would like to measure the **ANS operational capacity** and the **ANS planned capacity**.

The **ANS operational capacity** impacts the runway utilisation and it is made of the following elements which could be constrained by the current airport movement area lay-out and by noise management constraints:

- ANS capacity in the taxiways of the manoeuvring area
- Runway capacity
- TMA and/or CTR airspace capacity

Within the context of overall airport capacity planning, **ANS planned capacity** is one of the influencing factors[1] driving the number of available airport slots. Therefore:

- **ANS planned capacity** supports the airport capacity declaration process.
- The **Peak ANS planned capacity** (see Figure 4**)** is the highest ANS planned capacity value that is used for scheduling purposes during a season. It should be equal or higher than the **Peak airport declared capacity (KPI 1)**.
- **ANS operational capacity** supports the day-to-day and hour-by-hour airport operational capacity. It is delivered through appropriate staffing, system availability, appropriate use of airport operating modes etc.
- The **Peak ANS operational capacity** is the highest sustainable ANS operational capacity available during a measurement period.

When designing a measure for peak ANS operational capacity, the goal is to be able to filter out the following variable non-ANS performance affecting factors:

- any theoretical ANS operational capacity values which have not been demonstrated in real operations;
- demand variations (volume and traffic mix);
- impact of pilot performance on runway capacity;
- weather.

3.2.3 What we Can Measure (Technical Indicators)

While we are interested in the above ANS capacity, it has to be noted that it cannot be directly measured. Therefore the following indicators have been selected in stead:

Selected Indicator	Substitute for
KPI 1 Peak airport declared capacity	Peak ANS planned capacity
KPI 2 Peak service rate	Peak ANS operational capacity
KPI 3 Operational Cancellations (ANS reasons)	The effect of ANS operational capacity shortfalls

See Figure 4 for the positioning of these indicators. They are briefly described in the sections below.

3.2.3.1 KPI 1 Peak airport declared capacity

Airport declared capacity supports the scheduling process conducted in accordance with the IATA Worldwide Scheduling Guidelines (WSG) [Ref 9] and EC Regulation 95/93 [Ref 7]. It is the number of available arrival and departure slots per time interval, for the airport as a whole (land- and airside). It is used to set a limit on the number of movements per hour or fraction thereof. Some airports provide a variation of declared hourly capacity values during the day. The airport declared capacity could be quite complex and may contain various rolling parameters to control the concentration of demand.

Peak airport declared capacity is the highest hourly airport declared capacity of the day.

Peak airport declared capacity is used as a proxy to measure the agreed peak ANS planned capacity.

For those airports where ANS planned capacity is the most constraining factor in the airport capacity declaration process, KPI 1 values provide a good indication of Peak ANS planned capacity.

[1] The reader should make a clear distinction between the runway system limitations and the use of the runway system. The latter being ANS responsibility.

3.2.3.2 KPI 2 Peak Service Rate

Peak service rate measures the highest sustainable hourly runway throughput (arrivals plus departures on all runways) that has been achieved during a selected time interval, for which the indicator is published. This is typically a month or a season. It is not the highest throughput of that time interval, as it is defined as the 1% percentile of the number of movements per 10-min rolling hours during the time interval.

> The objective of the **peak service rate** indicator is to measure the peak ANS operational capacity that has been achieved at congested airports.

During a time interval of one month or longer, one can assume that the airport has encountered a wide spectrum of operational conditions. The indicator looks at the 1% of cases with the best performance, which normally take place under optimal conditions:

- traffic mix (the 1% percentile includes the ideal traffic mix)
- pilot performance on runway capacity (the 1% percentile includes the best pilot performance)
- weather (the 1% percentile includes hours not affected by weather either directly or indirectly)

The indicator is demand based; therefore it is not measuring the real capacity of those airports where demand is constantly below the ANS operational capacity. This limitation is mitigated by considering additional measures outside the KPI itself such as ATFM regulated capacity or the level of Efficiency KPIs (taxi-out and ASMA).

3.2.3.3 KPI 8 Operational Cancellations (ANS reasons)

Operational Cancellations (ANS reasons) is a number of cancelled flights in a given time period. It is composed of scheduled arrival or departure flights which were contained in the daily list of flight schedules produced before the day of operations, but for which actual landing or take-off never occurred due to ANS reasons. Figure 5 illustrates how the set of cancelled scheduled flights (for ANS reasons) relates to the other groups of flights.

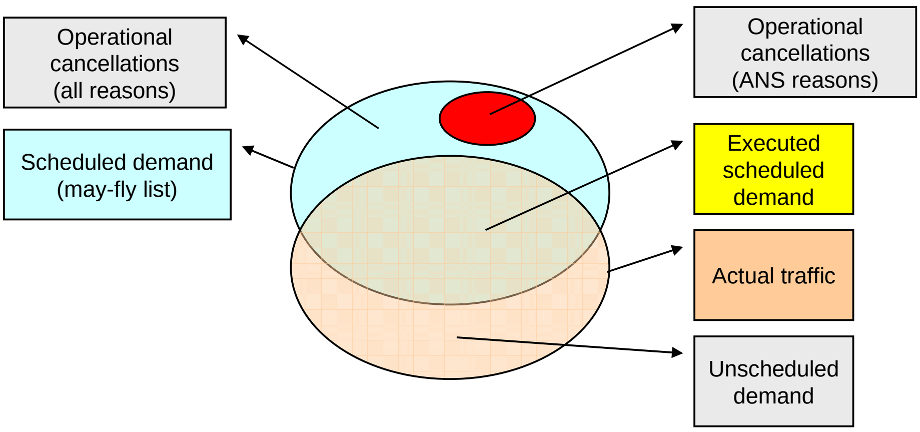

Figure 5 Scheduled Demand vs Actual Traffic

> The main objective of measuring **Operational Cancellations (ANS reasons)** is to assess the robustness of airport operations during degraded and disrupted conditions, either caused by weather or other special events (e.g. the closure of a runway).

It is particularly relevant to be able to identify causes associated to cancellations and to compare cancellations caused by degraded and disrupted operating conditions with the number of cancellations in days of normal operations. The indicator is based on cancellation reason codes reported by airlines participating in the data feed, but it is validated against cancellations recorded by airport operators.

The technical indicator will filter out the following non-ANS performance affecting factors thanks to its design, to the data collection foreseen by EC 691/2010 and to the weather algorithm:

- Commercial cancellations earlier than 1 day before operations
- Cancellations due to other than ANS reasons
- Cancellations due to reactionary reasons

However, also cancellations for all reasons will be used for assessing the effectiveness/efficiency of flow management strategies.

3.3 Impact of Airport ANS Performance on Punctuality and Flow Predictability

This section covers the following Focus Areas and Indicators.

Focus Area		Indicator	
APT-EFF1	Airport ANS impact on punctuality	KPI 3	ATFM Arrival delay
		KPI 5	ATC local pre-departure delay
		KPI 7	Adherence to ATFM slot
APT-PRD2	Impact on flow predictability		

This part of the performance framework focuses on the impact that operational capacity constraints and ANS traffic managing capabilities have on the punctuality of flights in terms of off-block time (actual vs. scheduled) and take-off time (actual vs ATFM departure slot). The latter also has an impact on flow predictability.

3.3.1 Context for the Indicators

Scheduled flights are an air transport service which delivers to the customer a **departure time** (STD = Scheduled Time of Departure = SOBT = Scheduled Off-Block Time = IOBT = Initial Off-Block Time) and an **arrival time** (STA = Scheduled Time of Arrival = SIBT = Scheduled In-Block Time).

The STA is connected to the STD of other flights to allow sufficient time for ground handling of the same aircraft (**Scheduled Turn-Around Time**), and adequate flight connection times for crew, passengers and cargo (e.g. for hub operations).

The time difference between STA and STD for a given flight is called the **Scheduled block-to-block flight time**. It includes the **Minimum block-to-block flight time** for the performance of the planned aircraft type, plus a **schedule delta** as illustrated in Figure 6.

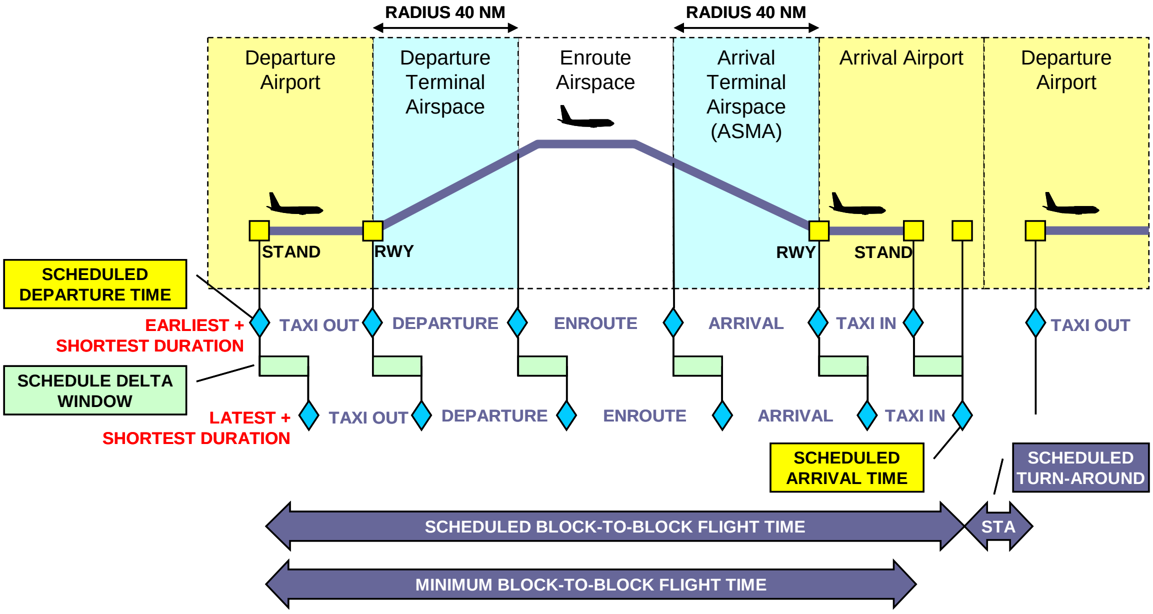

Figure 6 Scheduling of Flight time and Turn-Around Time

The "schedule delta window" represents a total amount of time variability that can be distributed across all flight phases to deal with the effect of foreseeable and unforeseeable events.

In the ideal case, the length of the schedule "delta" is based on the <u>predictable</u> (repeatable) flight duration extensions plus a reasonable extra margin to protect the schedule against the total amount of <u>uncertainty</u> (unpredictable variability) in the system. It is chosen such that it is most of the time sufficient to absorb the above effects. When designing their schedules, airlines apply trade-off considerations to balance the impact of residual late arrivals (network effect leading to reactionary delays) against the cost of the schedule buffer.

In reality, the buffer may be different, simply because the carrier didn't receive the requested (optimum) slot times at the destination.

As shown in green on Figure 6, the length of the schedule delta represents a time tolerance window for each flight phase event which is available to manage time constraints (e.g. ATFM slot, required time of arrival) and flight phase duration variations. In principle, any timing within the green time windows does not impact schedule punctuality, but it may affect airline costs.

The departure timing of a flight from SOBT to ATOT is shown in Figure 7. Only periods P3, P4, P7 and P8 are directly under the responsibility of airport ANS, hence within the scope of this document.

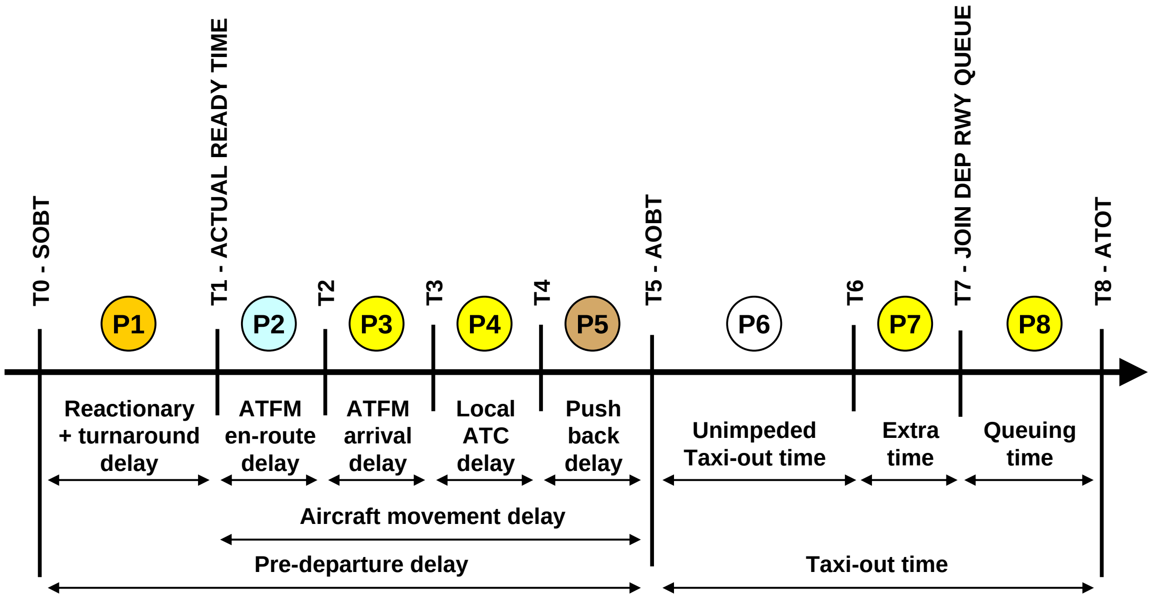

Figure 7 Departure Timing of a Flight

The figure depicts the following concepts for a single flight:

- T0 – SOBT (Scheduled Off-Block Time)
- P1 – All reactionary plus turnaround delay
- T1 – Actual Ready Time: the moment the aircraft could leave the stand if no other delays than P1 were present
- P2 – ATFM en-route delay: delay due to en-route ATFM restrictions
- T2 – the moment the aircraft could leave the stand if no other delays than P1+P2 were present
- P3 – ATFM arrival delay: additional delay due to ATFM restrictions at the destination airport. For a single flight, P2 and P3 are mutually exclusive as all ATFM delay is associated with the most constraining regulation location
- T3 – the moment the aircraft could leave the stand if no other delays than P1+P2+P3 were present
- P4 – Local ATC delay: additional time that the aircraft is held at the stand to avoid queuing at the departure runway. Part of this is ATFM departure delay.
- T4 – aircraft is cleared for push-back (or to leave the stand) by ATC
- P5 – push-back delay: additional time lost after ATC clearance
- T5 – AOBT (Actual Off-Block Time): the time the aircraft actually starts moving and leaves the stand
- P6 – unimpeded taxi-out time: the time needed to reach the (end of the queue at the) departure runway, using the shortest taxi route and without any speed restrictions or need for intermediate stops
- T6 – time of reaching the (end of the queue at the) departure runway, using the shortest taxi route and without any speed restrictions or need for intermediate stops
- P7 – extra taxi time due to inefficient taxi route, speed restrictions and/or need for intermediate stops
- T7 – time of joining the end of the queue at the departure runway, or the holding line if there is no queue
- P8 – Queuing time at the departure runway plus time for take-off roll
- T8 – ATOT (Actual Take-Off Time)

3.3.2 What we ideally would Like to Measure (Conceptual indicators)

To measure the effect of airport capacity/demand mismatches on departure punctuality, the following conceptual indicators have been selected:

- For outbound capacity/demand mismatches at an airport: the accumulation of local ATC delay (period P4 on Figure 7) for all outbound flights
- For inbound capacity/demand mismatches at an airport: the accumulation of ATFM arrival delay (period P3 on Figure 7) for all inbound flights

To measure the airport contribution to the predictability of traffic flows from ATOT onwards, an ATFM slot adherence indicator is selected (percentage of take-offs respecting their ATFM slot). This indicator is needed in support of Article 11 of the ATFM regulation (EC 225/2010) [Ref 8].

3.3.3 What we Can Measure (Technical Indicators)

3.3.3.1 KPI 5 ATC local pre-departure delay

This indicator is calculated for the outbound flow at a departure airport. For all flights departing the airport, it takes that portion of the pre-departure delay which is caused by take-off restrictions at the departure airport. The indicator is the average generated pre-departure delay per outbound flight. The indicator is based on IATA delay code 89 (defined as "restrictions at airport of departure with or without ATFM restrictions, including air traffic services, start-up and pushback, airport and/or runway closed due to obstruction or weather, industrial action, staff shortage, political unrest, noise abatement, night curfew, special flights"). This IATA delay code aims at capturing off-block delays due to local ATC and push-back when the aircraft is ready to leave the stand (periods P4 + P5 on Figure 7).

The purpose of this indicator is to measure the effect that outbound demand/capacity imbalances (known prior to off-blocks) could have on departure punctuality.

This indicator has been able to filter out the following influencing factors:

- Reactionary and turn-around pre-departure delays (P1)
- Arrival ATFM delays (P3)

The indicator has not been able to filter out push-back delays (P5) when these are generated by an apron management unit which is not managed by the ANS provider.

The planned mitigations for this limitation are as follows:

- IATA plans to enrich the delay code 89 with sub-codes which will allow to filter out push-back delays (P5)
- Supervision of activities and data validation jointly conducted by airlines and airport operators

3.3.3.2 KPI 3 ATFM Arrival delay

This indicator is calculated for the inbound flow at a destination airport. For all flights arriving at the airport, it takes that portion of the pre-departure delay which is caused by landing restrictions at the destination airport (i.e. P3). The indicator is the average generated ATFM delay per inbound flight.

The purpose of this indicator is to measure the effect that inbound demand/capacity imbalances (known prior to off-blocks) could have on departure punctuality.

This indicator is “specific” on what should be measured (i.e. P3) and there is no need to filter out any value.

3.3.3.3 KPI 7 Adherence to ATFM slot

In EU 255/2010 ‘air traffic flow management (ATFM) departure slot’ means a calculated take-off time attributed by the central unit for ATFM with a time tolerance managed by the local ATS unit. The same regulation states in Article 11 (Monitoring of compliance to ATFM measures) that "1. Member States shall ensure that where adherence to ATFM departure slots at an airport of departure is 80 % or less during a year, the ATS unit at that airport shall...".

This indicator is based on the difference between calculated (CTOT) and actual take-off times (ATOT). To calculate this indicator, a standard Slot Tolerance Window (STW) [-5 and +10 minutes] is used for all airports and throughout the whole year. When the difference is outside the window, there is a lack of adherence to ATFM slots. The indicator is defined as the ratio of the number of flights taking of inside the window over the total number of flights with an ATFM slot.

The purpose of this indicator is to assess the contribution of the departure airport to the predictability of en-route and arrival flow rates.

This indicator is “specific” on what should be measured and there is no need to filter out any value.

3.4 Impact of Airport ANS Performance on Flight Duration

This section covers the following Focus Areas and Indicators.

Focus Area		Indicator	
APT-EFF2	Airport impact on flight duration	KPI 4	ASMA additional time
		KPI 6	Taxi-out additional time

This part of the performance framework focuses on the effect that sequencing and metering (runway utilisation management for arrivals and departures) has on block-to-block flight duration.

3.4.1 Context for the Indicators

When aircraft cannot fly unimpeded 4D trajectories, there are generally three places at which queuing takes place, as illustrated in Figure 8:

- At the departure stand (pre-departure queuing to optimise network performance)
- At the departure runway (take-off queuing, e.g. runway holding)
- In the arrival terminal airspace (arrival queuing in the Arrival Sequencing and Metering Area or ASMA, using speed control, stacks, holding, extension of approach path etc.)

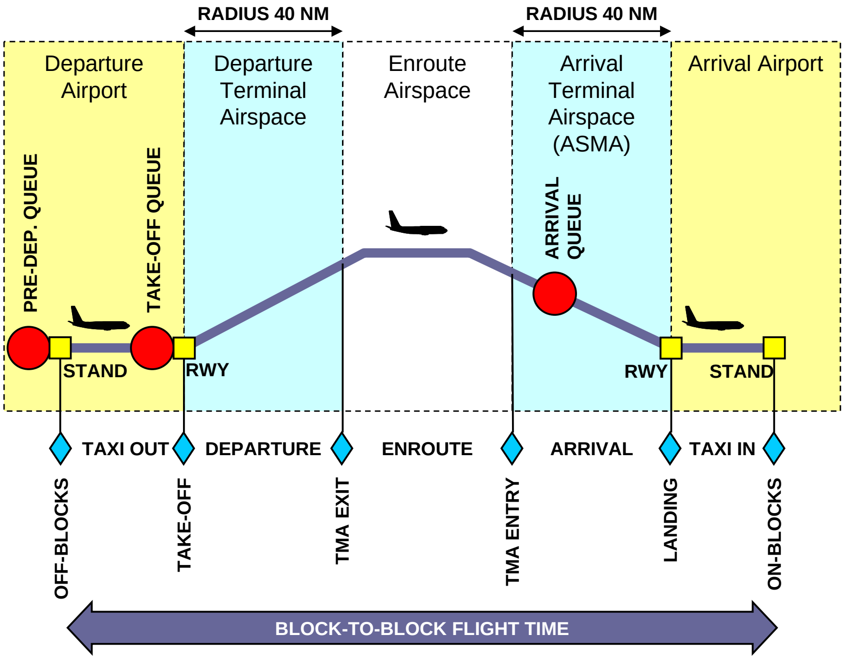

Figure 8 Outbound and Inbound Traffic Queues from a Flight Phase Perspective

A certain extent of departure runway queuing and arrival queuing in airspace is necessary to allow departure/arrival management (sequencing and metering) to optimise runway utilisation when demand is at or near the operational capacity,

Optimisation of the runway utilisation may require:

- Re-sequencing the take-off/ landing order at the runway (first come is not first served), and
- buffering a sufficient number of aircraft in the queue to be able to fine tune the metering (to optimise the separation of aircraft released from the queue to the runway).

In both cases some aircraft will suffer a certain penalty in terms of queuing time.

Higher runway utilisation targets may require higher levels of departure (take-off) queuing in the manoeuvring area and arrival queuing in airspace. This effect can be reduced if aircraft are already delivered to the queue in the right sequence and at the required time intervals.

To reduce cost and environmental impact, the departure and arrival queuing time should be kept to the minimum needed to achieve the selected runway utilisation objectives. If possible, any departure and arrival delay that is needed for other reasons than sequencing and metering should therefore be absorbed at the departure stand through ATFM delays and local ATC delay. If this is done properly, then measuring outbound and inbound queuing time allows assessing the "operational cost" associated with sequencing and metering in function of the selected runway utilisation objectives.

3.4.2 What we Ideally Would Like to Measure (Conceptual indicators)

To measure the operational penalty associated with techniques used to maximise runway utilisation, the following conceptual indicators have been selected:

- For outbound traffic flows at an airport: the accumulation of time spent in the departure runway queue (period P8 on Figure 7, the orange box in Figure 9)

- For inbound traffic flows at an airport: the accumulation of additional approach time resulting from speed control, path stretching and circling in the vicinity of the airport (use of holding patterns/stacks)

These techniques are not the optimum solutions. The maximum flight efficiency and environmental performance would be reached if the same runway utilisation results could be achieved by transferring all outbound queuing time to the departure stand (local ATC delay, see KPI 5), and transferring inbound queuing time to the maximum extent to the en-route phase (speed control), while absorbing the remaining time at the departure gate in the form of ATFM arrival delay (KPI 3). However, nowadays this is not achievable considering that many factors determining the capacity are known only in the last half hour before using the runway for landing or take-off.

3.4.3 What we Can Measure (Technical indicators)

3.4.3.1 KPI 6 Taxi-out additional time

This purpose of the **Taxi-out additional time** indicator is to provide an approximate measure of the **average departure runway queuing time** (P8 in Figure 7) on the outbound traffic flow, during times that the airport is congested.

The approach for calculating this indicator on the basis of data availability for actual off block time (AOBT) (T5) and actual take-off time (ATOT) (T8) is illustrated in Figure 9.

The indicator is first calculated at disaggregated level, i.e. per group of similar flights (comparable combinations of departure stand, departure runway and aircraft class). Taking the weighted average of the values for all groups produces the taxi-out additional time for the airport.

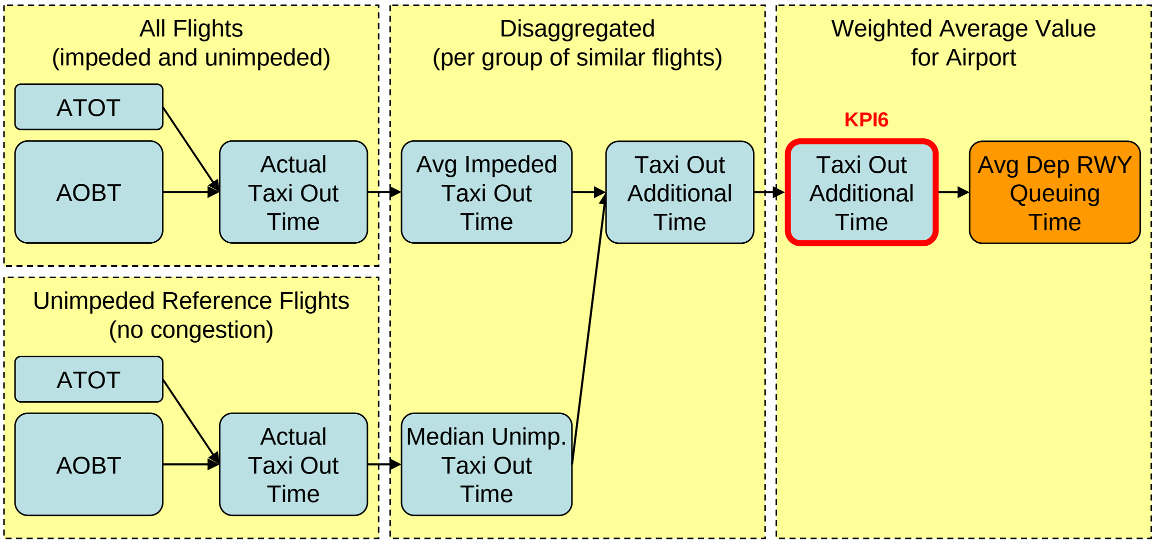

Figure 9 KPI 6 Taxi Out Additional Time

This indicator excludes influences from the following factors:

- Additional times in push back operations (P5): the validation exercises [Ref 10] have demonstrated that this duration has a negligible effect on the indicator

- Additional times prior to joining the runway queuing (P7): the validation exercises [Ref 10] have demonstrated that this duration has a negligible effect on the indicator

- Freezing conditions and contamination of the movement area: the weather algorithm and the data collection allow the exclusion of periods when taxi-out performance (P6) is reduced for reasons other than ANS.

3.4.3.2 KPI 4 ASMA additional time

This purpose of the **ASMA additional time** indicator is to provide an approximate measure of the **Average inbound queuing time** on the inbound traffic flow, during times that the airport is congested.

The approach for calculating this indicator on the basis of data availability for actual ASMA entry time (flight entering the area with 40 NM radius around the airport[1]) and actual landing time (ALDT) is illustrated in Figure 10.

The indicator is first calculated at disaggregated level, i.e. per group of similar flights (comparable combinations of ASMA entry point octagon, landing runway and aircraft class). Taking the weighted average of the values for all groups produces the ASMA additional time for the airport.

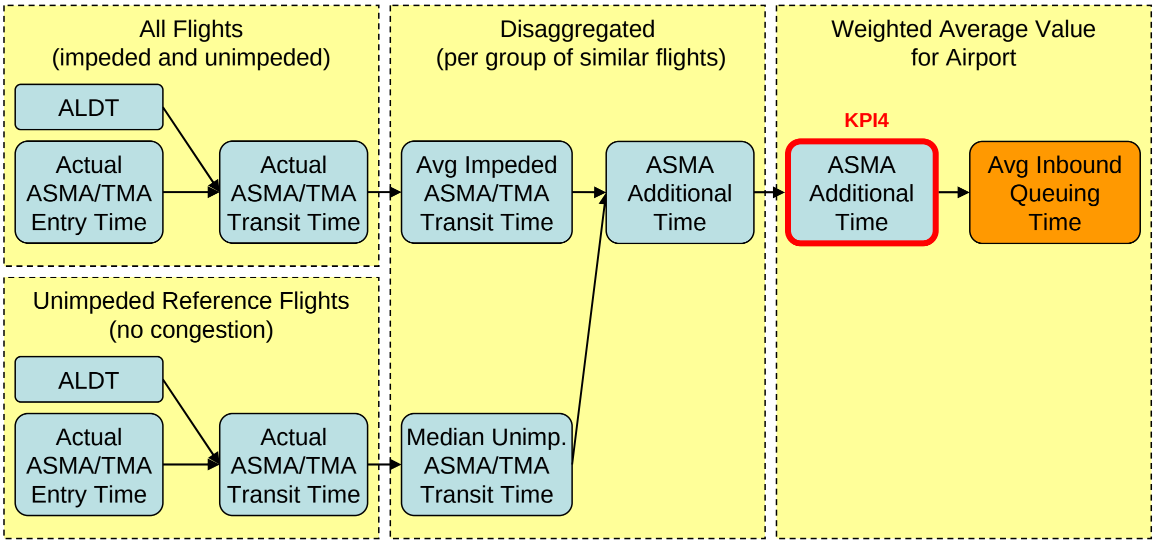

Figure 10 KPI 4 ASMA Additional Time

This indicator excludes influences from the following factors:

- Impact of noise management and terrain clearance aspects: the same effects are included in both the impeded and unimpeded transit times; therefore this does not show up in the additional time which is the difference between impeded and unimpeded.

- Effect of runway friction deteriorations: periods with such conditions can be excluded through the use of the weather algorithm.

Special attention has been paid to ensure that the set of unimpeded reference flights does not include periods of congestion.

[1] A variant of this indicator using a radius of 100 NM is also available. This is useful because for some airports sequencing begins before 40 NM.

4 Abbreviations

4D	Four-dimensional
ACE	ATM Cost Effectiveness
ALDT	Actual Landing Time
ANS	Air Navigation Service
ANSP	Air Navigation Service provider
AOBT	Actual Off-block Time
ASMA	Arrival Sequencing and Metering Area
ATC	Air Traffic Control
ATFM	Air Traffic Flow Management
ATM	Air Traffic management
ATMAP	ATM Airport Performance
ATOT	Actual Take-off Time
ATS	Air Traffic Service
CAP	Capacity
CATM	Commercial Air Transport Movement
CFMU	Central Flow Management Unit
CIV	Civil
CODA	Central Office for Delay Analysis
CTOT	Calculated Take-off Time
CTR	Control Zone
EC	European Commission
EFF	Efficiency
ETOT	Estimated Take-Off Time
EU	European Union
EUACA	European Union Airport Coordinators Association
FA	Focus Area
IATA	International Air Transport Association
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
IOBT	Initial Off-Block Time
KPA	Key Performance Area
KPI	Key Performance Indicator
MIL	Military
NM	Nautical Mile
OOOI	Out-Off-On-In
PC	Provisional Council
PI	Performance Indicator
PRB	Performance Review Body
PRC	Performance Review Commission
PRD	Predictability
PRISME	Pan-European Repository of Information Supporting the Management of EATM
PRR	Performance Review Report
PRU	Performance Review Unit
SES	Single European Sky
SESAR	Single European Sky ATM Research Programme
SIBT	Scheduled In-Block Time
SOBT	Scheduled Off-Block Time
STA	Scheduled Time of Arrival
STD	Scheduled Time of Departure
STW	Slot Tolerance Window

TAAM	Total Airspace and Airport Modeller
TMA	Terminal Manoeuvring Area
TSAT	Target Start-up Approval Time
VFR	Visual Flight Rules
WSG	IATA Worldwide Scheduling Guidelines

5 References

[Ref 1] "ATM Airport Performance (ATMAP) Framework Measuring Airport Airside and Nearby Airspace Performance" (PRU, December 2009). http://www.eurocontrol.int/prc/gallery/content/public/Docs/ATMAP_Report_December_2009.pdf.

[Ref 2] COMMISSION REGULATION (EU) No 691/2010 of 29 July 2010 laying down a performance scheme for air navigation services and network functions and amending Regulation (EC) No 2096/2005 laying down common requirements for the provision of air navigation services. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:201:0001:0022:EN:PDF

[Ref 3] PRC Performance Review Reports. http://www.eurocontrol.int/prc/public/standard_page/doc_prr.html

[Ref 4] ATM Cost Effectiveness (ACE) Reports. http://www.eurocontrol.int/prc/public/standard_page/doc_ace_reports.html

[Ref 5] Manual on Global Performance of the Air Navigation System (ICAO Doc 9883, 1st edition, 2009). http://store1.icao.int

[Ref 6] Manual on Air Navigation Services Economics (ICAO Doc 9161, 4th edition, 2007). http://www.icao.int/icaonet/dcs/9161/index.html

[Ref 7] Council Regulation (EEC) No 95/93 of 18 January 1993 on common rules for the allocation of slots at Community airports. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31993R0095:EN:HTML

[Ref 8] COMMISSION REGULATION (EU) No 255/2010 of 25 March 2010 laying down common rules on air traffic flow management. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:080:0010:0016:EN:PDF

[Ref 9] IATA Worldwide Scheduling Guidelines (WSG). http://www.iata.org/whatwedo/passenger/scheduling/Documents/wsg_20_edition.pdf

[Ref 10] Validation Reports for ATMAP KPI 6 Taxi Out Additional Time (ATMAP project documentation):
- A comparative study of taxi-out time (ATMAP working group, 28/05/2009)
- Taxi-out phase efficiency (Agenda Item 4, ATMAP Task Force meeting December 10th 2009)
- Taxi-out additional time vs EDDM waiting time (ATMAP Task Force meeting March 3rd 2011)
- Taxi-out additional time at LIRF comparison (ATMAP Task Force meeting March 3rd 2011)

6 Annexes

6.1 Annex I: Templates

6.1.1 Indicator/Metric Template

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<tr><td>Version date</td><td>Date of version</td></tr>
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<tr><td>2. Tech. dev.</td><td></td><td></td></tr>
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<tr><td>4. Monitoring</td><td></td><td></td></tr>
<tr><td>5. Target setting</td><td></td><td></td></tr>
<tr><td>6. Phase out</td><td></td><td></td></tr>
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Originator (related programme and/or policy documents)
General description of applicability (where, when…)</td></tr>
<tr><td>Conceptual Description</td><td>Short textual description/definition/summary.</td></tr>
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<tr><td>Data flow</td><td>Illustration of the data flow from the reporting source until the resulting indicator or metric data sets. Static view as well as dynamic (process) view with timings, periodicity etc.</td></tr>
<tr><td>Methodology</td><td>Methodology and tools used to compute values, approach to deal with missing data (coverage gaps) and to manage data quality</td></tr>
<tr><td>Uncertainties</td><td>Methodology uncertainty, data sets uncertainty (strengths and weaknesses at data level), rationale uncertainty</td></tr>
<tr><td>How indicator is commonly used.</td><td>More detailed description, focusing on the type of performance analysis and evidence development that is possible with this indicator or metric.
Use for target setting: yes/no, when, at which level, binding or not etc.
Intended stakeholder behaviour when used in conjunction with target setting.
Potential side effects of target setting.</td></tr>
<tr><td>Used in</td><td>Reference to data product(s) and indicator(s) in which this metric or indicator is used</td></tr>
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6.2 Annex II: Detailed Description of Indicators

6.2.1 KPI 1 Peak airport declared capacity

Indicator/Metric template	
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Version date	04/02/2011
Version status	Monitoring
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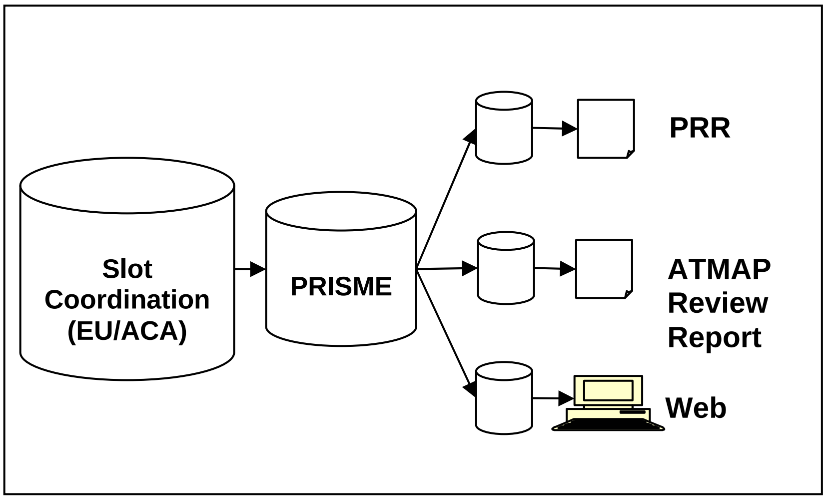
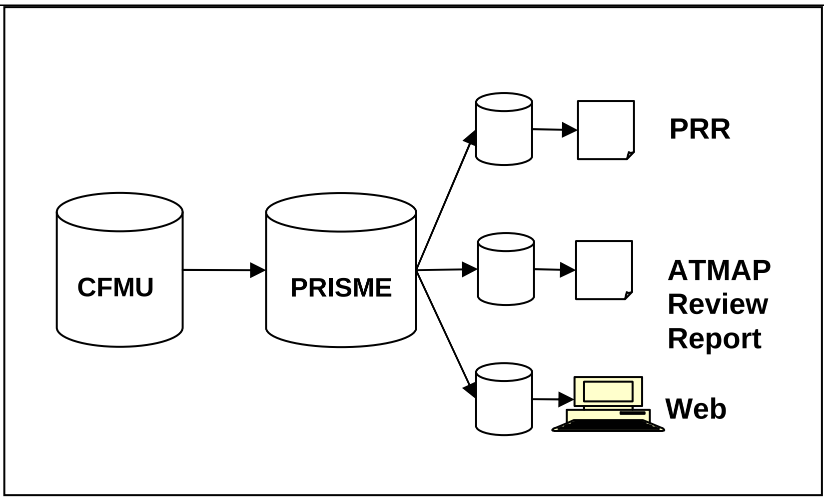
Key question	When reviewing the performance of the past season, to what extent was the peak ANS planned capacity aligned with the peak service rate (KPI 2)?
Context	KPA : Capacity Focus Area: APT-CAP1 Planned capacity Trade Offs: Efficiency and Operational cancellation. Originator: ATMAP project
Description	Peak airport declared capacity is the highest hourly airport declared capacity of the day. This indicator is used as a proxy to measure the agreed peak ANS planned capacity contribution which has to be provided as a minimum to meet airport scheduled capacity objectives.
Formula and metrics	Maximum daily value of declared capacity (arrival, departure or global) for a given season.
Units	Number of movements per hour
Input Metrics required	<table><tr><th>ID</th><th>Title</th><th>Units</th></tr><tr><td></td><td>Airport declared capacity (available slots)</td><td>movements by time interval</td></tr><tr><td></td><td></td><td></td></tr></table>
Scope	<table><tr><th>DIM_ID</th><th>Dimension Title</th><th>Granularity</th><th>Range / Scope</th></tr><tr><td></td><td>Time</td><td>season</td><td>W08/09 to now</td></tr><tr><td></td><td>Airport</td><td>airport</td><td>IATA level 3 and 2 airports in Europe</td></tr><tr><td></td><td>Type of movement</td><td>arrival, departure, both</td><td>arrival, departure</td></tr></table>
Framework	See Figure 4.
Data flow	Slot coordination, updated 2 times per year

	
Methodology	Maximum value of declared capacity (departures, arrivals or global)
Uncertainties	a) related to methodology - None in particular. b) related to data - None in particular.
Use	The purpose of this indicator is to measure the maximum number of available arrival, departure and global airport slots per time interval at coordinated and facilitated airports (IATA level 3 and 2).
Used in	PRR, ATMAP review report, Web
Meta data	Contact: pru@eurocontrol.int

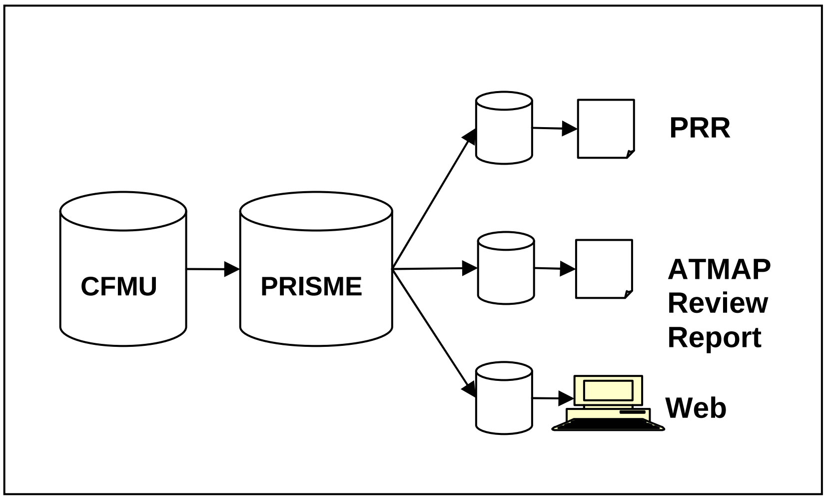
6.2.2 KPI 2 Peak Service rate

Indicator/Metric template	
Type	Indicator
Title	Peak Service rate
ID	KPI 2
Version ID	V1.0
Version date	03/02/2011
Version status	Monitoring.
Evolution	<table><tr><th>Phase</th><th>Time period</th><th>Remarks</th></tr><tr><td>1. Conc. dev.</td><td>2008</td><td>Closed</td></tr><tr><td>2. Tech. Dev.</td><td>2008</td><td>Closed</td></tr><tr><td>3. Prototyping</td><td>2008</td><td>Closed</td></tr><tr><td>4. Monitoring</td><td>2009 to now</td><td>Active</td></tr><tr><td>5. Target setting</td><td></td><td>Not Applicable</td></tr><tr><td>6. Phase out</td><td></td><td>Not applicable</td></tr></table>
Key question	What is the highest sustainable number of aircraft movements that a congested airport can achieve under optimal conditions?
Context	KPA : Capacity Focus Area: APT-CAP2 Operational capacity Trade Offs: Efficiency and operational cancellations. Originator: ATMAP project
Description	This indicator measures the highest sustainable hourly runway throughput (arrivals plus departures on all runways) that has been achieved during a selected time interval, for which the indicator is published. This is typically a month or a season..
Formula and metrics	Percentile 1st of number of movements per 10-min rolling hours during a selected time interval.
Units	Arrivals, departures or global movements by time interval
Input Metrics required	<table><tr><th>ID</th><th>Title</th><th>Units</th></tr><tr><td></td><td>number of arrivals and/or departures</td><td>movements per time interval</td></tr></table>
Scope	<table><tr><th>DIM_ID</th><th>Dimension Title</th><th>Granularity</th><th>Range / Scope</th></tr><tr><td></td><td>Airport</td><td>airport</td><td>> 150 k CATM > 50 k CATM</td></tr><tr><td></td><td>Time</td><td>Month, season</td><td>W06/07 to now</td></tr><tr><td></td><td>Aircraft category</td><td></td><td>(H,M,L)</td></tr><tr><td></td><td>Flight rule</td><td></td><td>IFR only</td></tr><tr><td></td><td>Type of movement</td><td>arrival, departure</td><td>arrival, departure</td></tr></table>
Framework	See Figure 4.
Data flow	PRISME data, daily refreshment rate: after 3 days of the day of ops.

	
Methodology	1% percentile of the number of movements per 10-min rolling hours during the time interval (a month, season or year)
Uncertainties	a) related to methodology - The indicator measures operational throughput. This equals capacity only when demand exceeds capacity. In case of low demand, the indicator measures the demonstrated capacity. b) related to data - CFMU flights database contains only IFR. Therefore the indicator is not suitable for measuring capacity at airports with mixed VFR/IFR traffic. Mitigation strategy: - Use the peak service rate in combination with Efficiency KPIs to understand the drivers of the indicator (low demand, constrained capacity, etc.) - Use the airport operator data instead of CFMU data
Use	The purpose of this indicator is to evaluate the highest sustainable hourly runway throughput achieved during the time interval (a month, season or year)
Used in	PRR, ATMAP review report, Web
Meta data	Contact: pru@eurocontrol.int

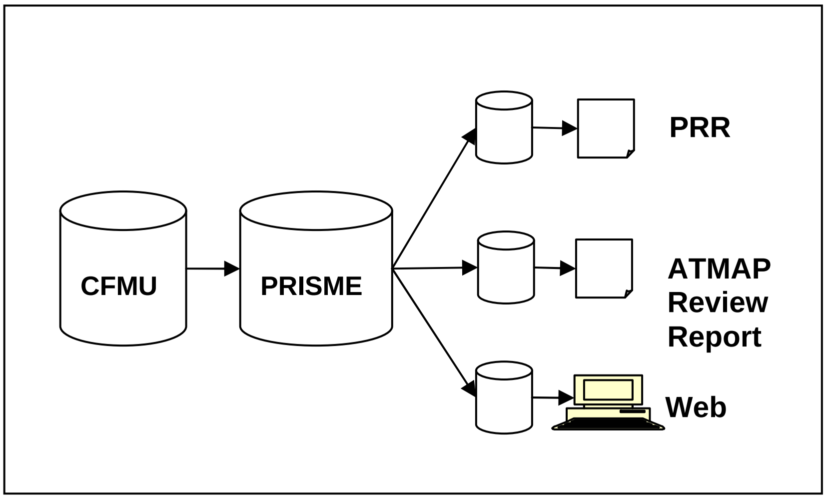
6.2.3 KPI 3 ATFM Arrival delay

Indicator/Metric template	
Type	Indicator
Title	ATFM Arrival delay
ID	KPI 3
Version ID	V1.0
Version date	29/11/2010
Version status	Monitoring.
Evolution	<table><tr><th>Phase</th><th>Time period</th><th>Remarks</th></tr><tr><td>1. Conc. dev.</td><td>2002</td><td>Closed</td></tr><tr><td>2. Tech. Dev.</td><td>2002</td><td>Closed</td></tr><tr><td>3. Prototyping</td><td>2002</td><td>Closed</td></tr><tr><td>4. Monitoring</td><td>2003 to now</td><td>Active</td></tr><tr><td>5. Target setting</td><td></td><td>Not Applicable</td></tr><tr><td>6. Phase out</td><td></td><td>Not applicable</td></tr></table>
Key question	What is the effect of the ANS demand and capacity balancing on off-block delays at departure stand when the arrival airport capacity is constrained?
Context	KPA : Efficiency Focus Area: APT-EFF1 Airport impact on punctuality Trade Offs: throughput and ASMA additional times. Originator: indicator existed prior to the ATMAP project Supports the SES II Performance Scheme (IR 691/2010 Annex I - Section 1 - 3.1 and Section 2 - 3.1)
Description	This indicator is calculated for the inbound flow at a destination airport. For all flights arriving at the airport, it takes that portion of the pre-departure delay which is caused by landing restrictions at the destination airport. The indicator is the average generated ATFM delay per inbound flight..
Formula and metrics	Sum of all arrival ATFM delays divided by the sum of all inbound flights.
Units	Minutes per arrival
Input Metrics required	<table><tr><th>ID</th><th>Title</th><th>Units</th></tr><tr><td></td><td>ATFM delay</td><td>minute</td></tr><tr><td></td><td>number of arrivals IFR</td><td>arrival</td></tr></table>
Scope	<table><tr><th>DIM_ID</th><th>Dimension Title</th><th>Granularity</th><th>Range / Scope</th></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td>Time</td><td>day, season, year</td><td>2003 to now</td></tr><tr><td></td><td>ATFM Codes</td><td>codes, group</td><td></td></tr><tr><td></td><td>Flight rules</td><td></td><td>IFR only</td></tr><tr><td></td><td>Airport</td><td>airport, group</td><td>> 150 k CATM > 50 k CATM</td></tr></table>
Framework	See Figure 7.
Data flow	PRISME data, daily refreshment rate: after 3 days of the day of ops.

	
Methodology	Sum of all ATFM delays divided by the sum of all inbound flights, for a given airport for a given delay category for a given period. The ATFM delay is measured by the difference between the CTOT (Calculated Take-Off Time) and the ETOT (Estimated Take-Off Time).
Uncertainties	a) related to methodology - None in particular. b) related to data - None in particular.
Use	The purpose of this indicator is to measure the effect that inbound demand/capacity imbalances (known prior to off-blocks) have on punctuality. Trade-off can be observed between ATFM delay and ASMA additional time. A conservative ATFM capacity rate for inbound traffic could lead to increased ATFM arrival delay while reducing ASMA additional time, but also reducing runway utilisation below what it is achievable).
Used in	PRR, ATMAP review report, Web
Meta data	Contact: pru@eurocontrol.int

6.2.4 KPI 4 ASMA additional time

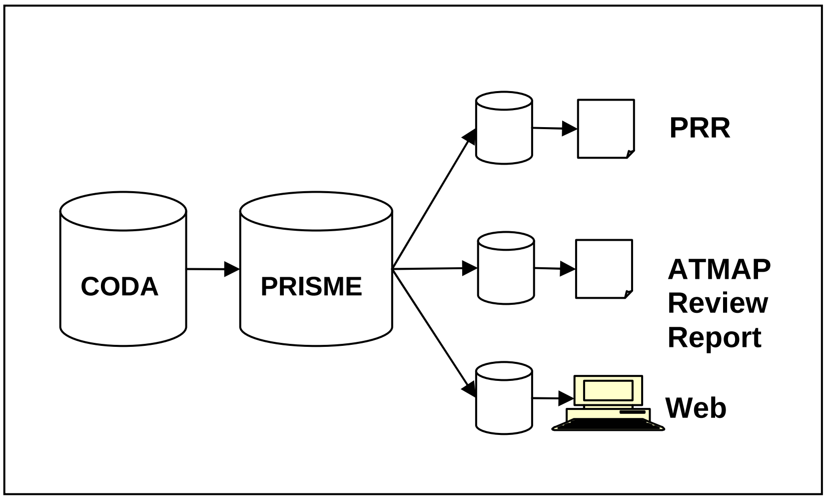
<table>
<tr><th colspan="2">Indicator/Metric template</th></tr>
<tr><td>Type</td><td>Indicator</td></tr>
<tr><td>Title</td><td>ASMA additional time</td></tr>
<tr><td>ID</td><td>KPI 4</td></tr>
<tr><td>Version ID</td><td>V1.0</td></tr>
<tr><td>Version date</td><td>04/02/2011</td></tr>
<tr><td>Version status</td><td>Monitoring.</td></tr>
<tr><td>Evolution</td><td>
<table>
<tr><th>Phase</th><th>Time period</th><th>Remarks</th></tr>
<tr><td>1. Conc. dev.</td><td>2008</td><td>Closed</td></tr>
<tr><td>2. Tech. Dev.</td><td>2008</td><td>Closed</td></tr>
<tr><td>3. Prototyping</td><td>2008</td><td>Closed</td></tr>
<tr><td>4. Monitoring</td><td>2009 to now</td><td>Active</td></tr>
<tr><td>5. Target setting</td><td></td><td>Not Applicable</td></tr>
<tr><td>6. Phase out</td><td></td><td>Not applicable</td></tr>
</table>
</td></tr>
<tr><td>Key question</td><td>What is the effect of the arrival queuing techniques applied at the airport?
What is the effect of limiting ATFM arrival delays on inbound flow?</td></tr>
<tr><td>Context</td><td>KPA : Efficiency
Focus Area: APT-EFF2 Airport impact on flight duration
Trade Offs: throughput and ATFM arrival delays.
Originator: ATMAP project
Supports the SES II Performance Scheme (IR 691/2010 Annex I - Section 1 - 3.1 and Section 2 - 3.1)
Trade-off can be observed between ASMA additional time, ATFM delay and runway throughput.</td></tr>
<tr><td>Description</td><td>This indicator provides an approximate measure of the average inbound queuing time on the inbound traffic flow, during times that the airport is congested.</td></tr>
<tr><td>Formula and metrics</td><td>This indicator is calculated on the basis of data availability for actual ASMA entry time (flight entering the area with 40 NM radius around the airport) and actual landing time (ALDT). The ASMA additional time per group of similar flights is the difference between the average impeded ASMA transit time and the median unimpeded ASMA transit time. Taking the weighted average of the values for all groups produces the ASMA additional time for the airport.</td></tr>
<tr><td>Units</td><td>Minutes per arrival</td></tr>
<tr><td>Input Metrics required</td><td>
<table>
<tr><th>ID</th><th>Title</th><th>Units</th></tr>
<tr><td></td><td>ASMA 40 NM entry-point</td><td>date-time</td></tr>
<tr><td></td><td>Actual landing time</td><td>date-time</td></tr>
<tr><td></td><td>Number of arrivals IFR</td><td>arrival</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>Scope</td><td>
<table>
<tr><th>DIM_ID</th><th>Dimension Title</th><th>Granularity</th><th>Range / Scope</th></tr>
<tr><td></td><td>Airport</td><td>airport, group</td><td>> 150 k CATM
> 50 k CATM</td></tr>
<tr><td></td><td>Time</td><td>day, season, year</td><td>2003 to now</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td></td><td><table>
<tr><td></td><td>Aircraft class</td><td></td><td>Jet (large, small, ..), commuters</td></tr>
<tr><td></td><td>Type of movement</td><td>arrival, departure</td><td>arrival</td></tr>
<tr><td></td><td>Runway of landing</td><td></td><td></td></tr>
<tr><td></td><td>Entry-point octagon</td><td></td><td>1 to 8</td></tr>
</table></td></tr>
<tr><td>Framework</td><td>See Figure 10.</td></tr>
<tr><td>Data flow</td><td>PRISME data, daily refreshment rate: after 3 days of the day of ops.

</td></tr>
<tr><td>Methodology</td><td>1° Computation of transit time between the Entry-point at 40 NM and the landing time by flight for a given period.
2° Computation of unimpeded time by group.
3° Average value of transit time – unimpeded time of each group.
4° Weighted average of all additional time for a given period.

A group may be :
- Month, aircraft class;
- Entry point octagon, landing runway and aircraft class.</td></tr>
<tr><td>Uncertainties</td><td>a) related to methodology
- None in particular.
b) related to data
- Landing-time definition and measurement accuracy might differ from one airport to another and from one data source to another.
Mitigation strategy
- Use always the best data source between the available ones (airport, airline, CFMU)</td></tr>
<tr><td>Use</td><td>The purpose of this indicator is to measure the queuing time before landing in terms of additional flight time.</td></tr>
<tr><td>Used in</td><td>PRR, ATMAP review report, Web</td></tr>
<tr><td>Meta data</td><td>Contact: pru@eurocontrol.int</td></tr>
</table>

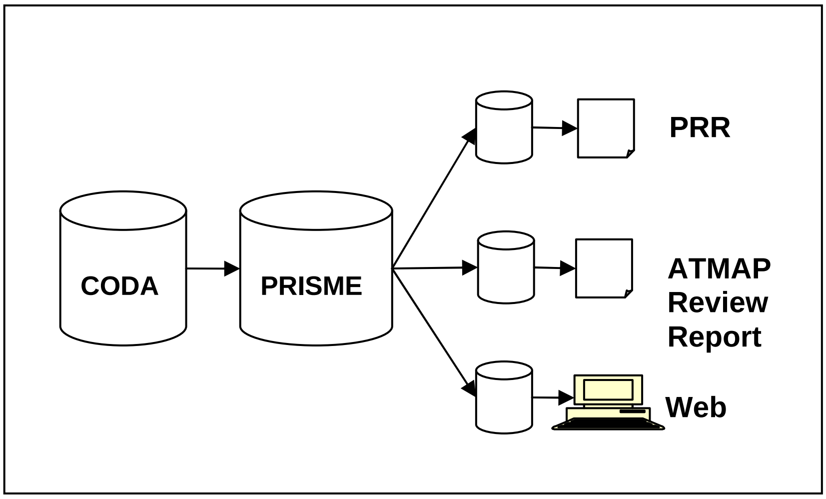
6.2.5 KPI 5 ATC local pre-departure delay

<table>
<tr><th colspan="2">Indicator/Metric template</th></tr>
<tr><td>Type</td><td>Indicator</td></tr>
<tr><td>Title</td><td>ATC local pre-departure delay</td></tr>
<tr><td>ID</td><td>KPI 5</td></tr>
<tr><td>Version ID</td><td>V1.0</td></tr>
<tr><td>Version date</td><td>04/02/2011</td></tr>
<tr><td>Version status</td><td>Monitoring.</td></tr>
<tr><td>Evolution</td><td><table>
<tr><th>Phase</th><th>Time period</th><th>Remarks</th></tr>
<tr><td>1. Conc. dev.</td><td>2010</td><td>Closed</td></tr>
<tr><td>2. Tech. Dev.</td><td>2010</td><td>Closed</td></tr>
<tr><td>3. Prototyping</td><td>2010</td><td>Closed</td></tr>
<tr><td>4. Monitoring</td><td>2010 to now</td><td>used for performance monitoring by CODA since 2001</td></tr>
<tr><td>5. Target setting</td><td></td><td>Not Applicable</td></tr>
<tr><td>6. Phase out</td><td></td><td>Not applicable</td></tr>
</table></td></tr>
<tr><td>Key question</td><td>What is the effect of departure queuing techniques on the delay experienced at the departure stand?</td></tr>
<tr><td>Context</td><td>KPA : Efficiency
Focus Area: APT-EFF1 Airport impact on punctuality
Trade Offs: taxi-out additional times and runway throughput (departure peak service rate).
Originator: CODA</td></tr>
<tr><td>Description</td><td>This indicator measures off-block delays at the departure airport due to expected or actual ATC constraints before taxi-out.</td></tr>
<tr><td>Formula and metrics</td><td>Sum of all delays IATA code 89 divided by the sum of all outbound flights.</td></tr>
<tr><td>Units</td><td>Minutes per arrival</td></tr>
<tr><td>Input Metrics required</td><td><table>
<tr><th>ID</th><th>Title</th><th>Units</th></tr>
<tr><td></td><td>number of delay minutes</td><td>minute</td></tr>
<tr><td></td><td>number of departures</td><td>departure</td></tr>
</table></td></tr>
<tr><td>Scope</td><td><table>
<tr><th>DIM_ID</th><th>Dimension Title</th><th>Granularity</th><th>Range / Scope</th></tr>
<tr><td></td><td>Airport</td><td>airport, group</td><td>> 150 k CATM
> 50 k CATM</td></tr>
<tr><td></td><td>Time</td><td>day, season, year</td><td>2010 to now</td></tr>
<tr><td></td><td>IATA delay code</td><td></td><td>code 89 only</td></tr>
<tr><td></td><td>Type of movement</td><td>arrival, departure</td><td>departure</td></tr>
</table></td></tr>
<tr><td>Framework</td><td>See Figure 7.</td></tr>
<tr><td>Data flow</td><td>CODA data, refreshment rate: after 30 days of the last day of operations of previous month.</td></tr>
</table>

	
Methodology	Sum of all IATA code 89 delays divided by the sum of all outbound flights, for a given airport for a given period.
Uncertainties	a) related to methodology - IATA delay code 89 captures both ATC and push back delay. A proposal for changing the IATA delay reporting system is likely to solve this issue in the medium-short term. b) related to data - IATA delay code 89 suffers from some inaccuracies related to how the delay data is recorded by red caps or pilots and how the IATA delays are cross checked between airlines and airport operators. There are evidences which demonstrate that accuracy could be improved in the medium term. .
Use	The purpose of this indicator is to measure the effect that ATC local constraints and/or trade-off with taxi-out additional times could haves have off-block punctuality.
Used in	PRR, ATMAP review report, Web
Meta data	Contact: pru@eurocontrol.int

6.2.6 KPI 6 Taxi-out additional time

<table>
<tr><th colspan="2">Indicator/Metric template</th></tr>
<tr><td>Type</td><td>Indicator</td></tr>
<tr><td>Title</td><td>Taxi-out additional time</td></tr>
<tr><td>ID</td><td>KPI 6</td></tr>
<tr><td>Version ID</td><td>V1.0</td></tr>
<tr><td>Version date</td><td>10/02/2011</td></tr>
<tr><td>Version status</td><td>Monitoring.</td></tr>
<tr><td>Evolution</td><td><table>
<tr><th>Phase</th><th>Time period</th><th>Remarks</th></tr>
<tr><td>1. Conc. dev.</td><td>2008</td><td>Closed</td></tr>
<tr><td>2. Tech. Dev.</td><td>2008</td><td>Closed</td></tr>
<tr><td>3. Prototyping</td><td>2008-2011</td><td>Active</td></tr>
<tr><td>4. Monitoring</td><td>2003 to now</td><td>Active</td></tr>
<tr><td>5. Target setting</td><td></td><td>Not Applicable</td></tr>
<tr><td>6. Phase out</td><td></td><td>Not applicable</td></tr>
</table></td></tr>
<tr><td>Key question</td><td>What is the effect of the departure queuing techniques applied at the airport?
What is the effect of limiting ATC pre-departure delays on queuing departing aircraft?</td></tr>
<tr><td>Context</td><td>KPA : Efficiency
Focus Area: APT-EFF2 Airport impact on flight duration
Trade Offs: throughput and ATC local delay.
Originator: ATMAP project
Supports the SES II Performance Scheme (IR 691/2010 Annex I - Section 1 - 3.1 and Section 2 - 3.1)</td></tr>
<tr><td>Description</td><td>This indicator provides an approximate measure of the average departure runway queuing time on the outbound traffic flow, during times that the airport is congested.</td></tr>
<tr><td>Formula and metrics</td><td>This indicator is calculated on the basis of data availability for actual off block time (AOBT) and actual take-off time (ATOT). The taxi-out additional time per group of similar flights is the difference between the average impeded taxi-out time and the median unimpeded taxi-out time. Taking the weighted average of the values for all groups produces the taxi-out additional time for the airport</td></tr>
<tr><td>Units</td><td>Minutes per departure</td></tr>
<tr><td>Input Metrics required</td><td><table>
<tr><th>ID</th><th>Title</th><th>Units</th></tr>
<tr><td></td><td>Taxi-out additional time</td><td>minute</td></tr>
<tr><td></td><td>number of departures</td><td>departure</td></tr>
</table></td></tr>
<tr><td>Scope</td><td><table>
<tr><th>DIM_ID</th><th>Dimension Title</th><th>Granularity</th><th>Range / Scope</th></tr>
<tr><td></td><td>Airport</td><td>airport, group</td><td>> 150 k CATM
> 50 k CATM</td></tr>
<tr><td></td><td>Time</td><td>day, season, year</td><td>2008 to now</td></tr>
<tr><td></td><td>Flight rules</td><td>VFR, IFR</td><td>IFR only</td></tr>
<tr><td></td><td>Aircraft class</td><td></td><td>Jet (large, small, ..), commuters</td></tr>
<tr><td></td><td>Type of movement</td><td>arrival, departure</td><td>arrival</td></tr>
<tr><td></td><td>Take-off Runway</td><td></td><td>runway id</td></tr>
<tr><td></td><td>Stand</td><td></td><td>stand id</td></tr>
</table></td></tr>
<tr><td>Framework</td><td>See Figure 9.</td></tr>
</table>

Data flow	CODA data, refreshment rate: after 30 days of the last day of operations of previous month. PRISME data, daily refreshment rate: after 3 days of the day of ops. 
Methodology	1° Computation of taxi time between the AOBT and the take-off time by flight for a given period. 2° Computation of unimpeded time by group. 3° Average value of taxi-out time – unimpeded time of each group. 4° Weighted average of all additional time for a given period. A group may be : - month, aircraft class; - runway, stand and aircraft class.
Uncertainties	a) related to methodology: none in particular - Additional time does not depend on push-back delays. - additional time does not depend on extra delays before joining the runway queue - ATMAP taxi-out shows a high correlation with local taxi-out measures (LHR and MUC) and with TAAM simulations (Madrid, Palma). - De-icing times can be taken out at least with three different methods. b) related to data - Data accuracy varies depending on the availability of stand/runway configuration and on the accuracy of the recording of the AOBT. The mitigation strategy is to use always the best data source at a given airport among two (airport operators and/or airlines).
Use	The purpose of this indicator is to measure the queuing time before take-off. Trade-off can be observed between taxi-out additional time, ATC pre-departure delay and runway throughput.
Used in	PRR, ATMAP review report, Web
Meta data	Contact: pru@eurocontrol.int

6.2.7 KPI 7 Adherence to ATFM slot

<table>
<tr><th colspan="2">Indicator/Metric template</th></tr>
<tr><td>Type</td><td>Indicator</td></tr>
<tr><td>Title</td><td>Adherence to ATFM slot</td></tr>
<tr><td>ID</td><td>KPI 7</td></tr>
<tr><td>Version ID</td><td>V1.0</td></tr>
<tr><td>Version date</td><td>11/02/2011</td></tr>
<tr><td>Version status</td><td>Monitoring.</td></tr>
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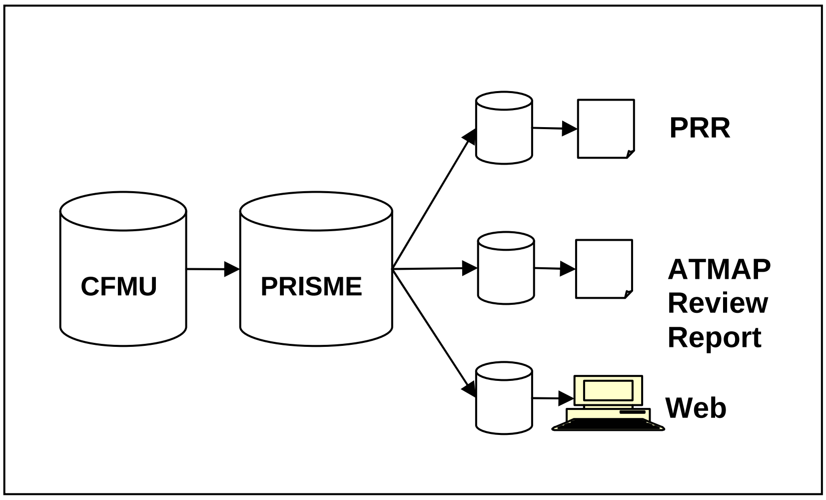
<tr><td>1. Conc. dev.</td><td>Unknown</td><td>Closed</td></tr>
<tr><td>2. Tech. Dev.</td><td>Unknown</td><td>Closed</td></tr>
<tr><td>3. Prototyping</td><td>Unknown</td><td>Closed</td></tr>
<tr><td>4. Monitoring</td><td>2009 to now</td><td>Active (at PRU)</td></tr>
<tr><td>5. Target setting</td><td></td><td>Not Applicable</td></tr>
<tr><td>6. Phase out</td><td></td><td>Not applicable</td></tr>
</table>
</td></tr>
<tr><td>Key question</td><td>Does local traffic management ensure that a sufficient number of flights take off within their assigned ATFM slot?</td></tr>
<tr><td>Context</td><td>KPA : Efficiency
Focus Area: APT-EFF1 Airport impact on punctuality
Focus Area: APT-PRD2 Impact on flow predictability
Trade Offs: throughput and taxi-out additional times.
Originator: CFMU.
Supports the ATFM Regulation (EC 255/2010) Article 11</td></tr>
<tr><td>Description</td><td>This indicator is the percentage of flights adhering to their assigned ATFM slot.</td></tr>
<tr><td>Formula and metrics</td><td>Sum of all flights with a difference between (CTOT) and (ATOT) inside the slot tolerance window [-5 and +10 minutes] divided by the total number of flights with an ATFM slot.</td></tr>
<tr><td>Units</td><td>%</td></tr>
<tr><td>Input Metrics required</td><td>
<table>
<tr><th>ID</th><th>Title</th><th>Units</th></tr>
<tr><td></td><td>difference between (CTOT) and (ATOT)</td><td>minute</td></tr>
<tr><td></td><td>number of departures IFR</td><td>departures</td></tr>
</table>
</td></tr>
<tr><td>Scope</td><td>
<table>
<tr><th>DIM_ID</th><th>Dimension Title</th><th>Granularity</th><th>Range / Scope</th></tr>
<tr><td></td><td>Airport</td><td>airport, group</td><td>> 150 k CATM
> 50 k CATM</td></tr>
<tr><td></td><td>Time</td><td>day, season, year</td><td>2011 to now</td></tr>
<tr><td></td><td>Flight rules</td><td></td><td>IFR only</td></tr>
<tr><td></td><td>Type of flight</td><td>arrival, departure</td><td>departure</td></tr>
</table>
</td></tr>
<tr><td>Framework</td><td>N/A</td></tr>
<tr><td>Data flow</td><td>PRISME data, daily refreshment rate: after 3 days of the day of ops.</td></tr>
</table>

	
Methodology	The difference between calculated (CTOT) and actual take-off times (ATOT). When the difference is outside the window [-5 and +10 minutes], there is a lack of adherence to ATFM slots. The indicator counts the number of flights regulated by CFMU inside the window.
Uncertainties	a) related to methodology - None in particular. b) related to data - None in particular.
Use	The purpose of this indicator is to assess the contribution of the departure airport to the predictability of en-route and arrival flow rates.
Used in	PRR, ATMAP review report, Web
Meta data	Contact: pru@eurocontrol.int

6.2.8 KPI 8 Operational Cancellations (ANS reasons)

<table>
<tr><th colspan="2">Indicator/Metric template</th></tr>
<tr><td>Type</td><td>Indicator</td></tr>
<tr><td>Title</td><td>Operational Cancellations (ANS reasons)</td></tr>
<tr><td>ID</td><td>KPI 8</td></tr>
<tr><td>Version ID</td><td>V1.0</td></tr>
<tr><td>Version date</td><td>10/02/2011</td></tr>
<tr><td>Version status</td><td>Prototyping.</td></tr>
<tr><td>Evolution</td><td>
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<tr><th>Phase</th><th>Time period</th><th>Remarks</th></tr>
<tr><td>1. Conc. dev.</td><td>2009;</td><td>Closed</td></tr>
<tr><td>2. Tech. Dev.</td><td>2009</td><td>Closed</td></tr>
<tr><td>3. Prototyping</td><td>2010</td><td>In progress</td></tr>
<tr><td>4. Monitoring</td><td></td><td>Not active</td></tr>
<tr><td>5. Target setting</td><td></td><td>Not Applicable</td></tr>
<tr><td>6. Phase out</td><td></td><td>Not applicable</td></tr>
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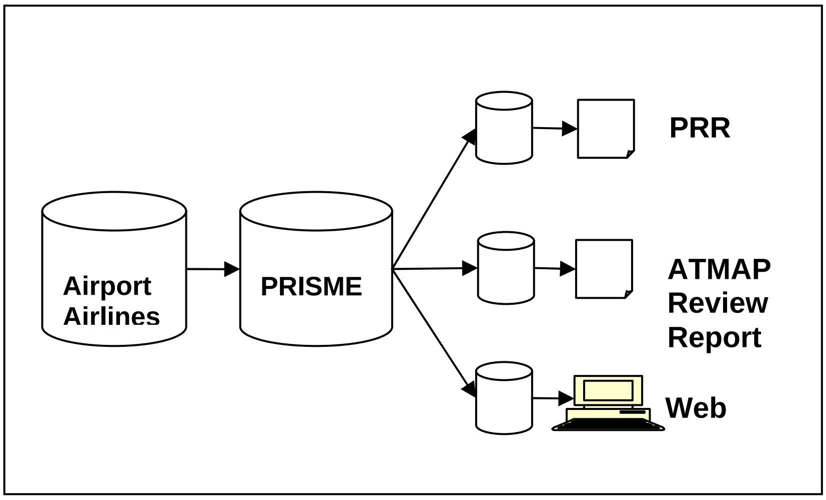
</td></tr>
<tr><td>Key question</td><td>What is the effect of ANS operational disruption and/or ineffective flow management techniques on scheduled flight cancellations?</td></tr>
<tr><td>Context</td><td>KPA : Predictability
Focus Area: APT-PRD1 Schedule disruption
Trade Offs: None in particular
Originator: ATMAP project</td></tr>
<tr><td>Description</td><td>This indicator measures the number of cancelled flights in a given time period. It is composed of scheduled arrival or departure flights which were contained in the daily list of flight schedules produced before the day of operations, but for which actual landing or take-off never occurred due to ANS reasons.</td></tr>
<tr><td>Formula and metrics</td><td>Sum of all cancelled arrival and departure flights for which the cancellation code is categorised as “ANS reason”.</td></tr>
<tr><td>Units</td><td>cancelled movement</td></tr>
<tr><td>Input Metrics required</td><td>
<table>
<tr><th>ID</th><th>Title</th><th>Units</th></tr>
<tr><td></td><td>number of cancelled movements</td><td>movements</td></tr>
</table>
</td></tr>
<tr><td>Scope</td><td>
<table>
<tr><th>DIM_ID</th><th>Dimension Title</th><th>Granularity</th><th>Range / Scope</th></tr>
<tr><td></td><td>Airport</td><td>airport, group</td><td>> 150 k CATM
> 50 k CATM</td></tr>
<tr><td></td><td>Time</td><td>day, season, year</td><td>2011 to now</td></tr>
<tr><td></td><td>Flight rules</td><td>VFR, IFR</td><td>IFR only</td></tr>
<tr><td></td><td>Flight type</td><td>Scheduled, unscheduled</td><td>Scheduled only</td></tr>
<tr><td></td><td>Cancellation reason</td><td>Variable</td><td>ANS reasons only</td></tr>
<tr><td></td><td>Type of movement</td><td>arrival, departure</td><td>arrival, departure</td></tr>
</table>
</td></tr>
<tr><td>Framework</td><td>See Figure 4.</td></tr>
<tr><td>Data flow</td><td>Airport +Airline data, refreshment rate: after 30 days of the last day of operations of previous month.</td></tr>
</table>

	
Methodology	Participating airlines provide cancellation data to CODA. This includes a cancellation reason code (different airlines use different codes). CODA translates these codes to a common code system, which is then used to select those cancellations due to ANS reasons.
Uncertainties	a) related to methodology - the measurement of the total number of cancellations has been agreed in ATMAP and already successfully tested with some airport operators. - the measurement of ANS-related cancellations should be tested as soon as data becomes available from airlines. A major point to check is cancellations related to ATC strikes or predictable disruptive phenomena (e.g. volcanic ash). b) related to data - PRU issued guidelines to airport operators on how to provide operational cancellation data. The contacted airports mentioned they were able to implement the guidelines. The airline cancellation data flow is still under development. - The airport data feed (without cancellation reasons) will be used as a reference against which to validate the airline data feed
Use	The purpose of this indicator is to measure the effect of ANS capacity disruption on traffic and to measure the impact of the flow management strategy during significant airport capacity drops.
Used in	PRR, ATMAP review report, Web
Meta data	Contact: pru@eurocontrol.int