ACI EUROPE
GROUND COORDINATOR
CONCEPT PAPER

20 January 2016

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1 EXECUTIVE SUMMARY

The Ground Coordinator concept is an **industry-designed response to the challenges, on the ground and in the air, of satisfying the increasing demand for fast and frictionless air transport.** The evidence demonstrates that these challenges are closely linked with the shortage of physical infrastructure. Indeed ACI EUROPE has consistently argued together with aviation partners that Europe needs to urgently expand its airport capacity. But the challenges of growth are also intimately linked with how existing and future infrastructure is utilised.

In its long-term vision for European transport published in 2011[1], the European Commission underlined that no major change in transport will be possible without an adequate network and more intelligence in using it. Until the adequate infrastructure becomes a reality, and in order to bolster the argument for it, the aviation industry now needs to focus its efforts on operating as efficiently as possible in the existing operating environment. The Ground Coordinator concept presented in this paper delineates the airport industry's vision on how to use airport infrastructure *intelligently* through **an all-encompassing, collaborative paradigm of operations.**

The concept describes a central role that brings together all operational partners[2] at the airport: airport operator, airlines, ANSPs, and ground handlers, to monitor operations and provide solutions to problems together. To deliver this capability, the Ground Coordinator can be supported by advanced technology although at its core, the concept is not so much about hardware, or software, as about people. Airport Collaborative Decision Making (A-CDM) is one of the first steps in local collaboration with the aim of increasing predictability and efficiency of the departure process. Building on these existing elements, the Ground Coordinator concept aims to provide a means of unlocking potential or latent pockets of capacity and efficiency across the operation. It aims to do so through better communication and collaboration between stakeholders at the airport. **The functions introduced in this paper concern organisational and process-related changes.** These changes have the potential of generating **extensive**

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[1] Roadmap to a Single European Transport Area – Towards a Competitive and Resource-Efficient Transport System (COM/2011/144)

[2] Throughout the paper, the term "operational partners" signifies all stakeholders at an airport directly or indirectly contributing to the passenger's journey or the shipment of freight.

improvements in customer experience and shared value for operational stakeholders.

In an effort to address similar yet more specific challenges, a series of operational concepts have surfaced in recent years: some initially developed in the SESAR programme, while others elsewhere.[3] The purpose of the Ground Coordinator is **not to replace these concepts, but to collect them under a common vision**, shared objectives, and a collaborative operational process. Taking into account its full implications, this concept paper includes and exceeds the ambitions of existing operational solutions[4] and therefore can serve as an umbrella concept: an airport can either build on other already implemented concepts, such as an Airport Operations Centre (APOC), when implementing a Ground Coordinator, or use other concepts to gradually achieve the full function described by the Ground Coordinator.

This is made possible by the fact that **the Ground Coordinator concept is flexible and modular.** It can be adapted according to the specific needs, operational circumstances or complexity of a particular airport. The concept builds on only six core functions whereas a larger number of optional functions may be added to customise the depth of collaboration according to local requirements.

The substantial benefits of implementing the Ground Coordinator for all operational partners promise to outweigh the likely costs. The cost of implementation will differ at each airport as starting points and required functional scopes differ considerably. For smaller airports there may be limited associated costs or none at all, as existing Ground Coordination through personal contacts may only need to be formalised and equipped with a standard office tool for data management. In essence **the Ground Coordinator is a role: how exactly it is set up and fulfilled may be decided locally**, provided that the core functions are put in place.

The next logical step is to introduce the Ground Coordinator capabilities at airports. The collaborative environments of larger airports may comprise numerous operational partners, but they often feature collaborative decision-making in certain isolated operational areas. Implementing a Ground Coordinator process would effectively integrate these segregated areas of collaboration. In contrast, smaller airports often already apply Ground Coordination informally, as

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[3] Section 88 provides details on commonalities and differences of the Ground Coordinator Concept to other concepts.

[4] See Figure 7 on p. 25.

the smaller number of operational stakeholders tends to be more easily manageable and supported by closer personal contacts. In smaller as well as larger airports, the Ground Coordinator could be a single point of contact for the Network Manager, **offering a superior ATM network operation and a significant overall contribution to the Single European Sky**.

The decision to implement a Ground Coordinator role should be left to local collaborative environments for good reasons. Mandating collaboration would carry negative consequences and lead to mistrust among operational partners and a culture of blame. This would be to the detriment of all and would not resolve existing capacity and efficiency issues. These should be addressed for the benefit of all operational partners. **In order to succeed, the initiative would require industry-wide support and expertise.** Future collaboration with stakeholders, and especially aircraft operators and ANSPs, will be essential in developing the concept and the specific governance features of the Ground Coordinator further.

2 CONTEXT

In the context of the European Union's Single European Sky (SES) initiative, in 2011 ACI EUROPE came forward with the notion of "*airports as Ground Coordinators*". Already then, the concept was meant to be one of the contributions of Europe's airport industry to the development of the Single European Sky. Soon after this initial proposal, the expression "Ground Coordinator" became increasingly used and referred to in aviation policy. In an early example, the European Commission used the expression in the proposed Airport Package that was published in December 2011. However the context in which the term was used was not entirely in line with the ideas of ACI EUROPE.

In order to outline the Ground Coordinator Concept in more detail, ACI EUROPE subsequently published a first position paper in June 2012. This document was followed by an ACI EUROPE position paper on airport capacity, published in October 2015. This paper proposes the Ground Coordinator concept as a mitigating option to address capacity and efficiency at airports, necessary due to the looming airport capacity crunch that was documented by Eurocontrol in its 2013 *Challenges of Growth* report.

While these documents were important milestones in the evolution of the concept, it was widely felt that the initial idea needed to be further elaborated. For this reason, a dedicated ACI EUROPE Working Group was set up with members of the Technical and Operational Safety Committee (TOSC), the Facilitation and Customer Service Committee and other ACI EUROPE groups and fora. This document is the outcome of the work of the ACI EUROPE Ground Coordinator Working Group.

Building on the experiences of implementing the Airport Collaborative Decision Making (A-CDM) concept (see Figure 1) the Ground Coordinator allows for a continuous improvement of the coordination and predictability of airside and landside operations and integrates landside access modes. This aspect would allow all operational partners to improve the performance of their operations throughout the entire collaborative network, so that shared value is generated and customers'[5] door-to-door experiences improve.

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[5] In the context of this paper, all passengers as well as those shipping freight to or from a particular airport are meant by the term "customers". They are the end users of all aviation services.
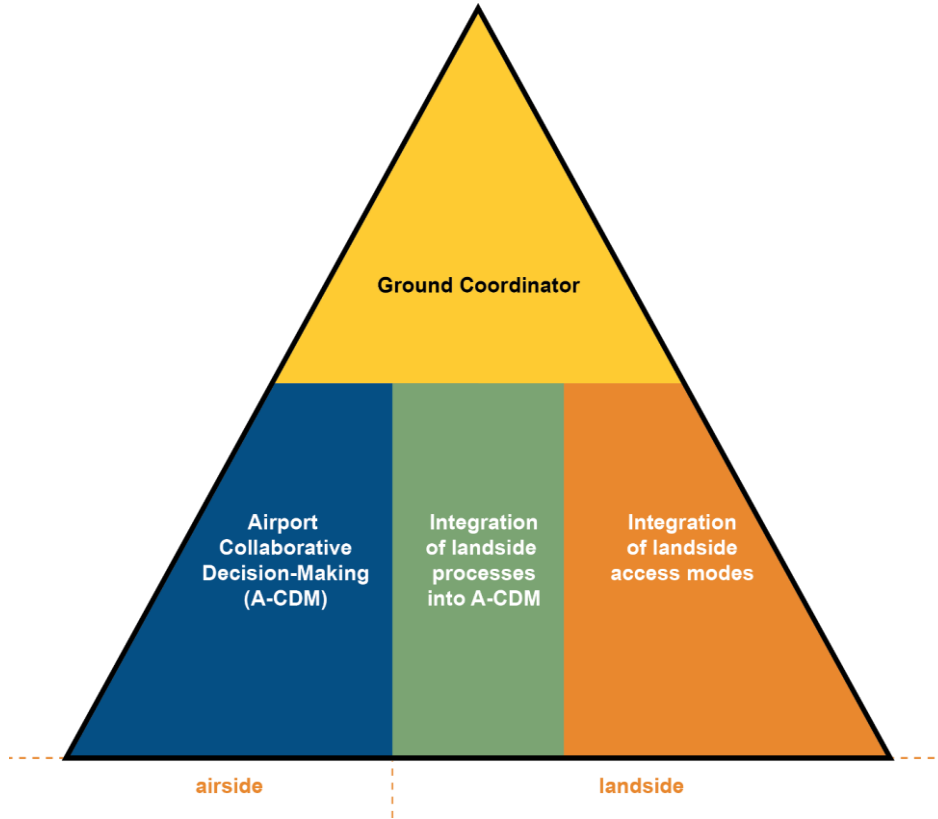
Figure 1: Evolution of the Ground Coordinator

3 THE GROUND COORDINATOR: KEY BENEFITS

3.1 Better Use of Capacity and Resources

Efforts to tighten coordination among airport partners are currently being made in light of the enduring challenge of airport capacity. With passenger growth rates at record highs since the onset of the economic crisis, the problem of capacity is again becoming important. However, airports are faced with complex and arduous decision-making when it comes to providing and financing the infrastructure needed to handle the increased passenger and movement numbers. Industry partners should jointly be looking at how to utilise existing capacity more efficiently by optimizing the throughput of their respective processes. The implementation of the Ground Coordinator concept would provide common situational awareness for all stakeholders and increased predictability throughout the airport system allowing for best use of existing resources. With the right governance in place, Ground Coordination could serve to "unlock" hidden pockets of airport capacity for the benefit of passengers, enabling new routes and reducing flight delays.

3.2 Improved Overall Performance and Customer Experience

Airport capacity is only one part of the story. Currently, operational partners are rarely coordinated throughout an entire airport system and therefore reaching maximum efficiency in operations will be impossible as long as airport operators, ANSPs and all other operational stakeholders run competitive businesses in the context of a fragmented operation. The main elements of the Ground Coordinator – common situational awareness, a holistic view of airport system performance, and the resulting predictability – can be deployed to improve the system's performance in any field: efficiency, safety, quality, and customer experience. The overall idea of the Ground Coordinator is to enable the individual functions to operate as a whole for the benefit of the operational partners and ultimately the customer.

3.3 Improved Network-Wide Situational Awareness

The Ground Coordinator would form a new, integral part of the European ATM network landscape that fits easily within the existing framework. At each airport, the Ground Coordinator would be the single point of contact for the Network Management function, which provides the Network Operations Plan (NOP). Meanwhile, the Airport Operations Plan (AOP) would be provided and managed by the Ground Coordination function. Both plans would be merged for operations.

Communication and coordination between the Network Manager and the different Ground Coordinators is needed to set up this combined plan in a consistent manner.

Commission Regulation (EC) No 255/2010 on the common rules of air traffic management, Article 8, emphasizes the need for a direct link between the airport operations and the Network Manager Operations Centre (NMOC), specifically stating that airport operators shall inform NMOC of any events that impact capacity or demand, either directly or through local ATC (at the same time informing the Flow Management Positons).

4 OBJECTIVES OF A GROUND COORDINATOR

Each airport is different and serves as a location for a variety of operations. A large number of them could be reaping some of the key benefits described in this paper if airport system wide collaborative processes were put in place. These processes may require various technical enablers, such as the Airports Operations Plan (AOP) or a common situational awareness dashboard. The cooperation needed for the Ground Coordinator to be established revolves around achieving three key objectives for all operational partners involved:

1. Common Situational Awareness;

2. Holistic View of Airport Performance[6]; and

3. Predictable Airport System.
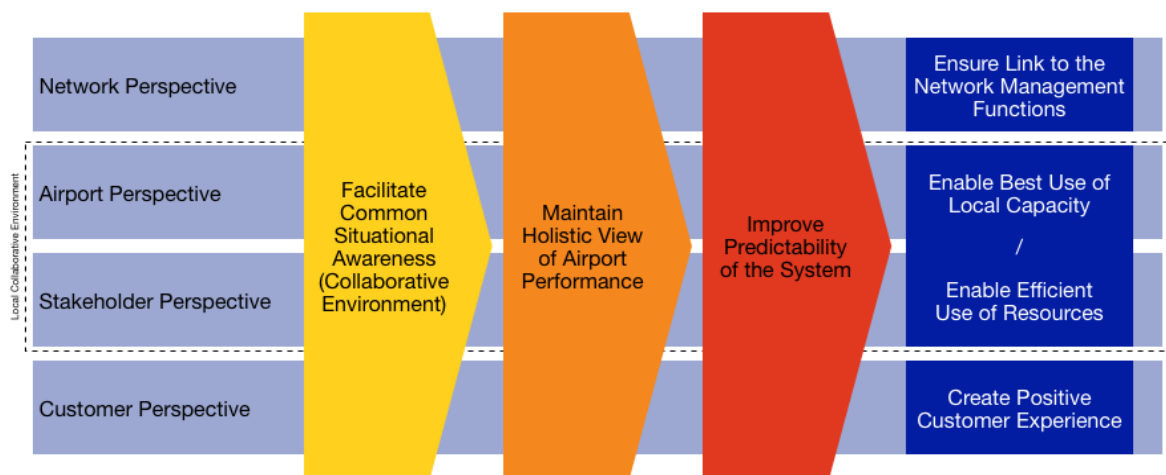
Figure 2: Perspectives, Objectives and Benefits of the Ground Coordinator

1. <u>Common Situational Awareness</u> is the first milestone to be achieved in reversing the fragmentation of airport operations. It occurs when all partners at an airport share information and hence develop a joint view and understanding of the normal operation as well as any disruption or irregularity. As a result, Individual airport partner actions can be more aligned towards an optimum overall solution. Currently, whenever a disruption occurs, each organisation only has a partial picture of the situation and tries to solve the problem from its specific angle or understanding. When new information comes to one operational partner, it acts on it while often leaving others out of the loop. In such an un-

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[6] In this context, as throughout this Paper, performance refers primarily to the operational aspects of the airport system as a whole.

coordinated response to a disruption, the knock on effects can quickly accumulate to undermine the entire operation. The result of this is cost and negative impacts for customers.

2. The second milestone of the Ground Coordinator is the achievement of a Holistic View of Airport Performance across all operational partners involved. This is ensured first and foremost through the sharing of data. With the provision of a consolidated set of data made available in one place, managing airport system performance by collaboratively setting and monitoring key performance indicators (KPIs) also becomes possible. Given that each organisation at the airport only deals with segregated parts of the airport system but that the services provided by each organisation are inseparably linked, the individual compliance with KPIs is difficult to verify or ensure. In a local collaborative environment, the Ground Coordinator can ensure higher quality of service and better aligned service level agreements, including the provision of automatic alerts that inform partners of deviations from set standards. This step builds on common situational awareness. Through common awareness, an irregularity in one area of system performance (e.g. security staffing) can be flagged and addressed by all involved stakeholders working together to manage any disruption or irregularity, before it snowballs and jeopardises the whole operation.

3. By facilitating common situational awareness and maintaining a holistic view of airport performance, the Ground Coordinator would be crucial to improving the predictability of the air transport system. Predictability is therefore the third transversal objective of the Ground Coordinator. From a customer standpoint, the predictability of travel time is an important parameter of route choice. With airport partners and the Network Management Function connected through the Ground Coordinator, unexpected events can be minimised. Even when disruptions or irregularities occur, the customer can expect swift information as soon as the situation arises and can ideally be provided with new arrival or travel times. Improved predictability is a key objective of the next generation Ground Coordinator operations and neatly summarises a central aspiration of the concept.

5 THE GROUND COORDINATOR IN OPERATION

The Ground Coordinator is a central role integrating the monitoring of all operational partners across the entire airport system, facilitating solutions in any given operational circumstances. The Ground Coordinator provides an exchange platform that is transversal based on the principles of communication and collaboration.

In order to be able to achieve its high level objectives, a Ground Coordinator needs to be active in three functional groups:

- Communication (internal and external)

- Capacity

- Performance

5.1 Internal and External Communication

The most fundamental and overarching function of the Ground Coordinator is communication. It lies at the heart of the concept and enables common situational awareness, commonly accepted decisions and, ultimately, more efficient use of capacity and improved performance.

In this concept, The Ground Coordinator is responsible for the communication among the local operational partners. Not every issue to arise requires the involvement of all operational partners. The Ground Coordinator assesses which operational partners are concerned and brings them together to solve or mitigate the problem, making sure that decisions taken are based on common situational awareness. In any case, the Ground Coordinator should communicate the results of planning and decision-making to external operational partners who are not involved in the collaborative decision-making process, or who do not have access to AOP data in order to achieve situational awareness. The Ground Coordinator should seek input on impact assessment from those external operational partners that could be affected by a decision being made even if they are not directly involved in the decision making process.

If the wider ATM network is likely to be impacted by a particular event, the Ground Coordinator should discuss possible implications and decisions to be made with the Network Management Function. Likewise, Flow Management Positions (FMP) partners should be involved if the event is thought to have a more regional/national impact.

In order to reap its full benefits, each Ground Coordinator should establish links to other Ground Coordinators so that issues not impacting the entire network can be resolved faster. A further idea would be to establish Ground Coordinator clusters, like the concept implemented to coordinate the winter ski operations at the airports of Chambéry, Geneva, Grenoble, and Lyon throughout the winter season with the objective of creating a common situational awareness across the cluster of airports in order to accommodate the increased traffic demand during the weekend peaks.

In addition to this, the Ground Coordinator can take over or provide support in external communication, for example when it comes to informing operational stakeholders or providing links with their respective communications/PR office(s) in order to convey a specific message. Building on its available pool of data the Ground Coordinator may also provide information directly to customers, for example when disruptions occur, via various means such as traditional or social media.

5.2 Capacity

Managing scarce capacity under strategic and daily operational constraints is a core element of airport operations. Numerous capacity drivers that are under the responsibility of different operational partners determine each airport's capacity.[7] The lowest capacity within the system is the bottleneck that determines overall airport capacity. In an operation that is not sufficently co-ordinated, an unexpected development such as bad weather or a staffing shortage in one airport partner can compromise operational plans and lead to severe flight delays and cancellations. Therefore, it is necessary that the Ground Coordinator maintains effective capacity monitoring across all operational areas and coordinates responses to existing or arising capacity shortfalls. The ability of the Ground Coordinator to manage capacity and maintain smooth operations would rely on effective communication (5.1) between aviation partners, whether that takes place using automated means, staff contact, or both.

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[7] See also ACI EUROPE's Position Paper on Airport Capacity, October 2015 which provides more detailed explanations on what airport capacity actually encompasses.

5.3 Performance[8]

While capacity is primarily determined by size or quantity, wider operational performance is mainly related to time, either in terms of the actual utilisation of the available capacity per unit of time or to timeliness which translates into punctuality, delay and predictability. In this respect, performance and capacity are intimately related and the distinction between the two is mostly a reflection of different perspectives. With regard to airport operators, managing performance is a customer-facing task and a responsibility an airport operator has to fulfil in order to improve overall customer experience by ensuring high performance and timely service. As a result, the importance of effective monitoring and coordination of performance by a Ground Coordinator is crucial for high-performing operations throughout the entire airport system. Like in the case of capacity, the ability of the Ground Coordinator to maintain high levels of airport system performance would rely on effective communication (5.1) between aviation partners, whether that takes place using automated means, staff contact, or both.
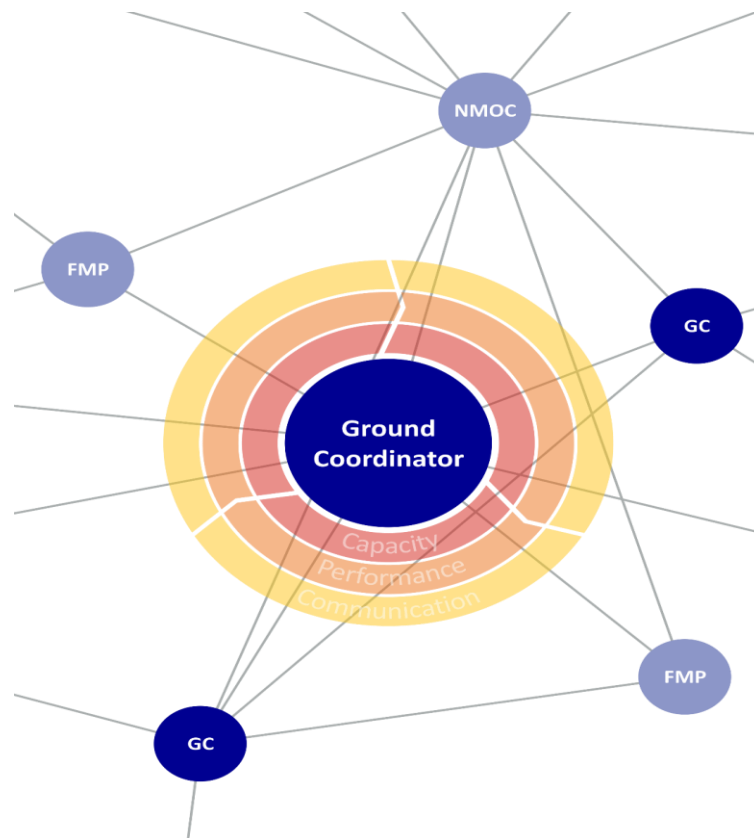

Figure 3: The Ground Coordinator as an Integral Part of the European ATM Network

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[8] In this context, as throughout this Paper, performance refers to the operational and service quality aspects of the airport system as a whole.

6 FUNCTIONS OF A GROUND COORDINATOR

In order for the Ground Coordinator to be operational at an airport, a number of functions have to be implemented. These functions can be broken down into tactical/pre-tactical (short timeframe) and strategic (long timeframe).

6.1 Management Cycles and Phases

The Ground Coordinator acts as the facilitator for the collaborative management of airport operations and executes functions during the strategic, pre-tactical as well as the tactical phase in accordance with the Network Manager's definition of the ATFCM phases:

- the **strategic** phase comprises the period until one week before the day of operations (D-7),

- the **pre-tactical** phase comprises the period of 6 days before the day of operations until one day before the day of operations (D-6 to D-1) and

- the **tactical** phase comprises the day of operations (D0).

In addition, the Ground Coordinator may also conduct certain functions after the day of operations (**post-operations**).

The collaborative management cycle of airport operations consists of:

1. Integrated process data **monitoring** and sharing,

2. Collaborative **planning** (decision making) and

3. Coordinated **execution**.

These three steps should be seen as a continuous management cycle, as shown in Figure 4 below, and which can be applied on a short-term or longer-term basis. The Ground Coordinator serves as the facilitator for the execution of functions related to the cycles and guides the operational partners through the overall management process. The execution remains with the operational partners. The Ground Coordinator facilitates but does not execute.

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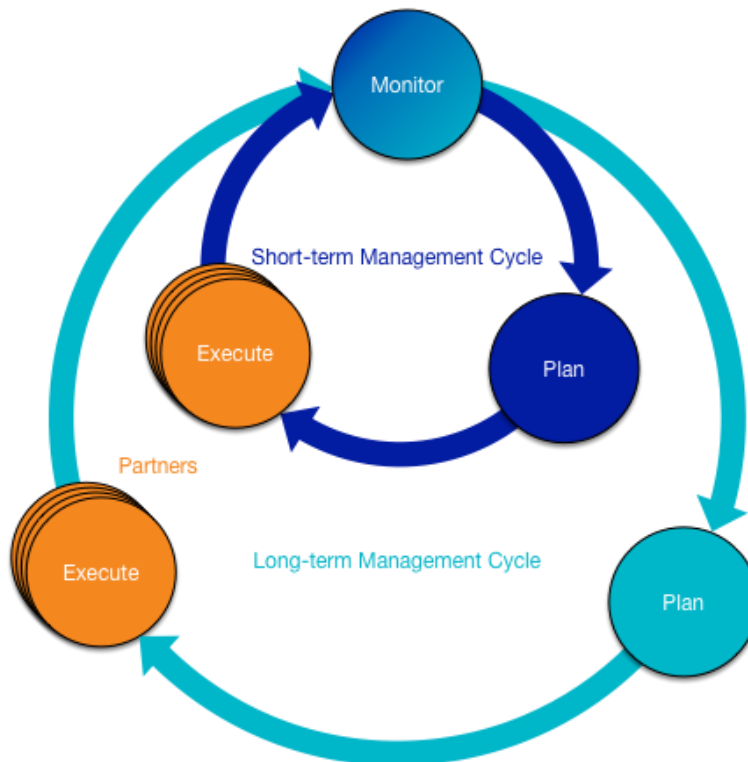
Figure 4: Management Cycles in the Local Collaborative Environment

In the short-term cycle any observations made in monitoring, planning and execution can be fed back into the loop to improve planning or execution, either instantly or as part of a daily post-operational analysis.

The long-term cycle is intended to adapt operations based on an analysis that will allow conclusions only from a statistically significant amount of data collected. This process is more appropriate for:

- the implementation of action plans that need to prove their effect over a pre-defined period of time or

- a big data approach that reveals potential for improvement.

At the departure process, A-CDM is already producing data that can be analysed for valuable insights. But for many other parts of the operation, the Ground Coordinator can produce innovative data-sharing and analysing partnerships and in this respect act as the airport's "think tank".

6.2 Tactical/Pre-Tactical Phase

In the **tactical/pre-tactical phase**, depending on the severity of a non-nominal situation characterized by

- a performance alert/violation of Minimum Service Level/KPI or

- an event that might potentially lead to a performance degradation

the Ground Coordinator would

- determine which operational partners are affected,

- make sure that all affected operational partners are aware of the situation,

- initiate a collaborative impact assessment together with the affected operational partners,

- moderate the decision making process for mitigation measures and

- communicate with the operational partners on implementation progress of decisions taken.

6.3 Strategic Phase

In the **strategic phase** the Ground Coordinator

- initiates long-term collaborative performance assessment,

- moderates the decision making process for long-term action plans and

- communicates with the operational partners on implementation of the long-term action plans.

6.4 Post-Operations Phase

Post-operations can be performed on a short-term cycle as well as on the long-term cycle. In the short term cycle, post-operations can reveal improvement potential on a daily basis whereas the long term cycle can address more systematic issues.

The Ground Coordinator:

- analyses specific events and irregularities

- draws conclusions from observations and proposes mitigation actions

- draws conclusions from data analysis

- identifies systematic bottlenecks

- identifies gaps in operational procedures

6.5   Functions Overview

SHORT-TERM CYCLES
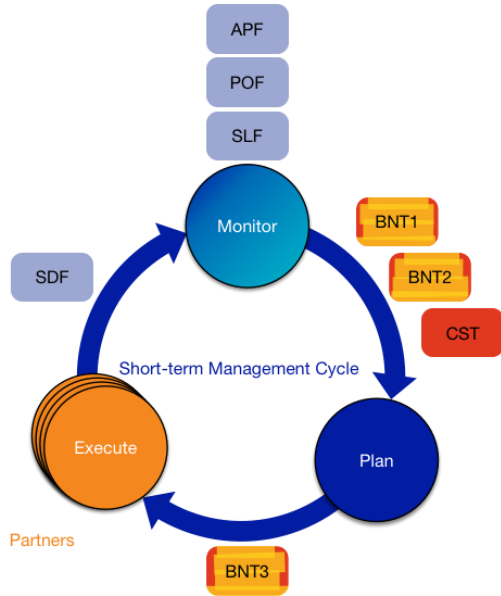
Capacity Domain   **Performance Domain**
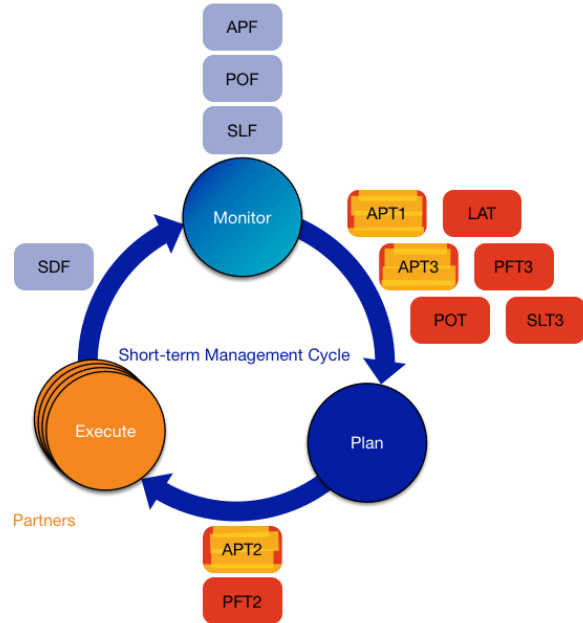
LONG-TERM CYCLES
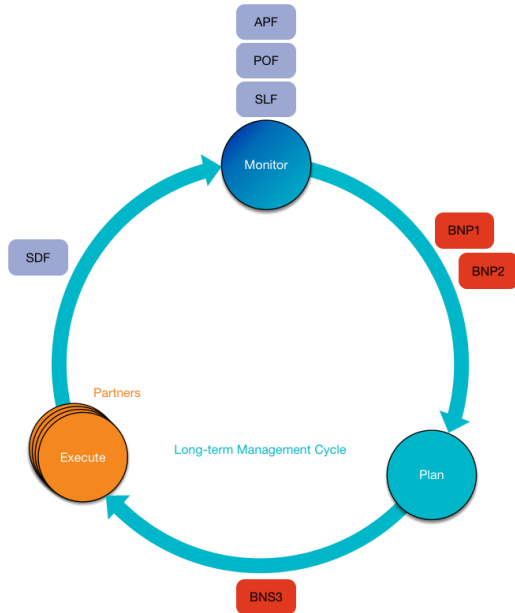
Capacity Domain   **Performance Domain**
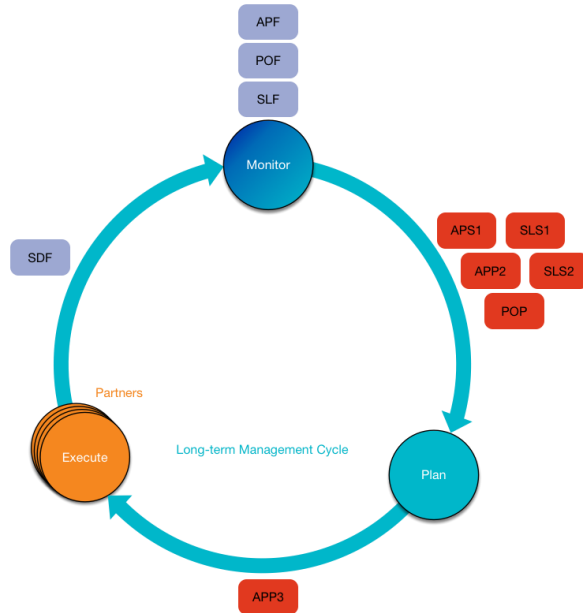
KEY: Red: Functions; Light Blue: Support Functions; Highlighted Yellow: Core Functions

Figure 5: Overview of Ground Coordinator Management Cycles and Functions

The following section provides an overview of all functions of the Ground Coordinator shown above. It should be understood that the Ground Coordinator does not have to fulfil each function but rather may delegate individual functions or tasks to other suitable entities.

Figure 6 below shows all functions of the Ground Coordinator clustered by functional groups and phases.
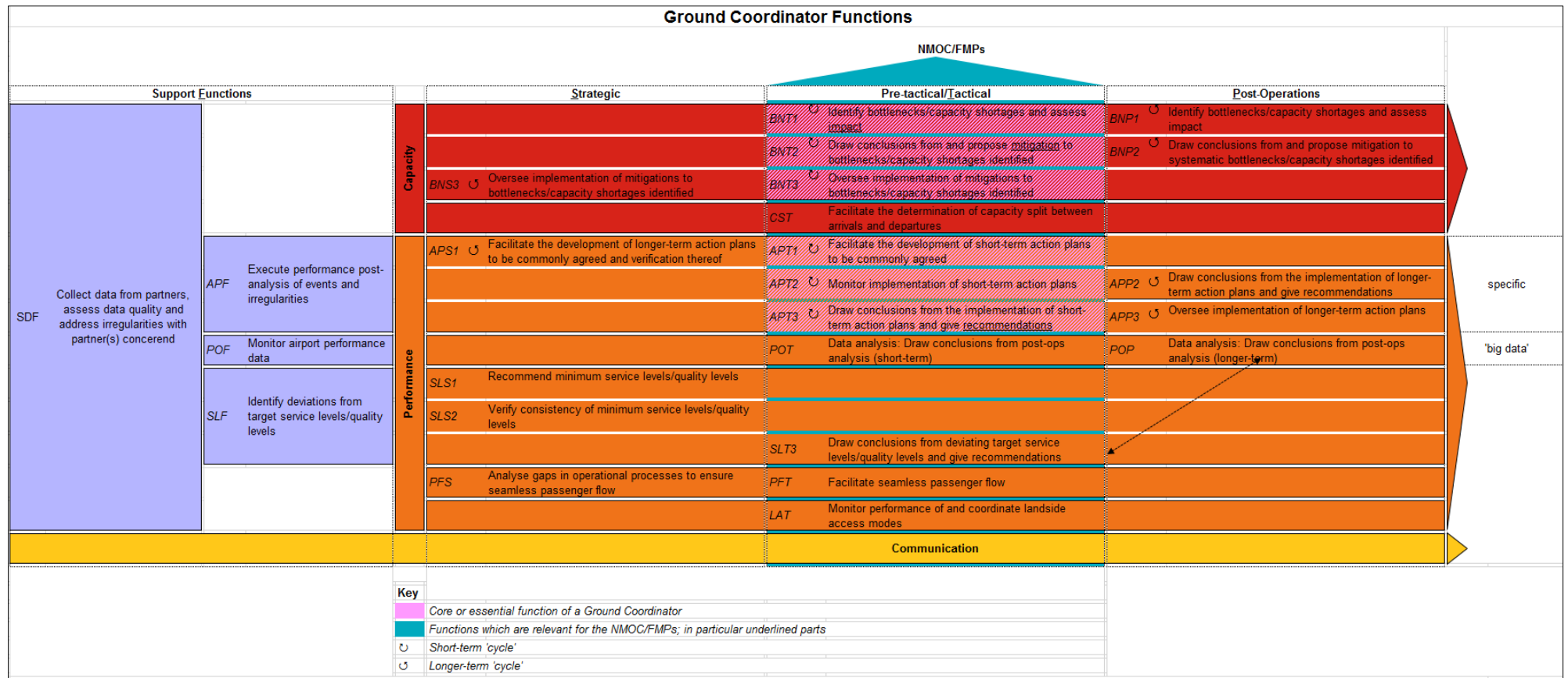
Figure 6: Ground Coordinator Functional Groups and Phases

6.5.1 Short Term Cycle: Capacity Cluster

BNT1: Identify Bottlenecks/Capacity Shortages and Assess Impact

- The Ground Coordinator will monitor data to identify and assess the impact of current and potentially upcoming capacity shortages and bottlenecks based on actual capacity
- The Ground Coordinator will consider process capacity shortages on airside and landside (e.g., relating to runway, taxiway, stands, security, border police, check-in)
- The Ground Coordinator will consider bottlenecks in airport system feeds which are not expressed in capacity (e.g., late trains, road access)

BNT2: Draw Conclusions from and Propose Mitigation to Bottlenecks/Capacity Shortages Identified

- The Ground Coordinator will draw conclusions from the capacity shortage impact assessment
- The Ground Coordinator will, where pertinent, propose mitigation to critical capacity shortages to the responsible operational partners as a basis for discussion and decision making

BNT3: Oversee Implementation of Mitigations to Bottlenecks/Capacity Shortages Identified

- The Ground Coordinator will be allowed to follow up on the progress of the implementation of mitigation actions with the responsible operational partners

CST: Facilitate the Determination of Capacity Split between Arrivals and Departures

- The Ground Coordinator should have operational partners decide on the best split of total capacity into arrival and departure capacity for the coming hours
- The Ground Coordinator should make relevant operational partners consider that deviation from pure arrival prioritization can be beneficial and

connect the availability of stands and terminal building resources with the runway capacity

6.5.2 Short Term Cycle: Performance Cluster

APT1: Facilitate the Development of Short-term Action Plans to be Commonly Agreed
• The Ground Coordinator will—upon performance alerts by the monitoring systems or upon impact assessment of a specific event—facilitate collaborative decision making resulting in action plans in order to 1. restore minimum service level, 2. avert impact of upcoming event and/or 3. improve performance

APT2: Monitor Implementation of Short-term Action Plans
• The Ground Coordinator will be allowed to follow up on the progress of the implementation of the agreed action plans with the responsible operational partners

APT3: Draw Conclusions from the Implementation of Short-term Action Plans and Give Recommendations

• The Ground Coordinator will verify the expected effect of action plans under aspects of
  • capacity and
  • performance
in order to correct/adapt future action plans.
• The Ground Coordinator shall present the results of the verification to the concerned operational partners

POT: Data Analysis: Draw Conclusions from Post-ops Analysis (short-term)

- The Ground Coordinator should identify potential risks, issues and opportunities from big data analysis results and present them to the affected operational partners for discussion

SLT3: Draw Conclusions from Deviating Target Service Levels/Quality Levels and Give Recommendations

- Upon alert from the automated monitoring of service/quality levels the Ground Coordinator should draw conclusions and give recommendations on mitigations (as input to APT1)

PFT: Facilitate Seamless Passenger Flow[9]

- PFT1(sub-function of SLT3): Draw Conclusions from Passenger Flow Data and Give Recommendations
- PFT2 (sub-function of APT1): Facilitate the development of short-term passenger flow action plans to be commonly agreed (e.g, with border police, security, check-in etc.)

LAT: Monitor Performance of and Coordinate Landside Access Modes

- Sub-function of APT1, APT2 and APT3

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[9] Similar functions exist for other flows (e.g. baggage) or sub flows (e.g., passenger retail) depending on the airport's Ground Coordinator scope.

6.5.3 Long Term Cycle: Capacity Cluster

BNP1: Identify Systematic Bottlenecks/Capacity Shortages and Assess Impact

- The Ground Coordinator should highlight systematic bottlenecks/capacity shortages through post-ops analysis and assess their impact
- The Ground Coordinator will not be in charge of removing them

BNP2: Draw Conclusions from and Propose Mitigation to Systematic Bottlenecks/Capacity Shortages Identified

- The Ground Coordinator should draw conclusions from the systematic capacity shortage impact assessment
- The Ground Coordinator shall, where pertinent, propose mitigation to systematic capacity shortages to the responsible operational partners as basis for discussion

BNS3: Oversee Implementation of Mitigations to Systematic Bottlenecks/Capacity Shortages Identified

- The Ground Coordinator should be allowed to follow up with the responsible operational partners on the progress of the implementation of mitigation actions to systematic bottlenecks/capacity shortages

6.5.4 Long Term Cycle: Performance Cluster

APS1: Facilitate the Development of Longer-term Action Plans to be Commonly Agreed

- The Ground Coordinator should upon identification of systematic performance issues facilitate collaborative decision making resulting in action plans in order to improve performance

APP2: Draw Conclusions from the Implementation of Longer-term Action Plans and Give Recommendations

- The Ground Coordinator should verify the expected effect of longer-term action plans under aspects of
  - performance and
  - capacity
  in order to correct/adapt future action plans.
- The Ground Coordinator should present the results of the verification to the affected operational partners

APP3: Oversee Implementation of Longer-term Action Plans

- The Ground Coordinator should be allowed to follow up with the responsible operational partners on the progress of the implementation of longer-term action plans

POP: Data Analysis: Draw conclusions from post-ops analysis (longer-term)

- The Ground Coordinator should highlight systematic performance issues through big data analysis
- The Ground Coordinator should draw conclusions and give recommendations on mitigations as input to APS1

PFS: Analyse Gaps in Operational Processes to Ensure Seamless Passenger Flow[10]

- The Ground Coordinator should highlight gaps in operational procedures through post-ops analysis with focus seamless passenger flow
- The Ground Coordinator should give recommendations for improvements as input to APS1

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[10] Similar functions exist for other flows (e.g. baggage) depending on the individual airport's Ground Coordinator Scope.

SLS1: Recommend Minimum Service Levels/Quality Levels

- The Ground Coordinator should recommend minimum service/quality levels for discussion among operational partners

SLS2: Verify Consistency of Minimum Service Levels/Quality Levels

- The Ground Coordinator should where possible verify the consistency among agreed service level targets

6.6   Core Functions

The modularity and flexibility of the Ground Coordinator makes implementation possible in every airport, through a tailored coordination of operational partners throughout the system. Each airport and its operational partners have different requirements and needs stemming from the context in which they operate. Financial and resource capabilities of operational partners also vary and need to be taken into account. As detailed in the examples provided in the Annex, Ground Coordinators at hub airports fulfil many more functions and would be organised in a very different way from those at smaller airports.

In order to ensure that the objectives of the Ground Coordinator can still be met and that the link to the Network Management Function would still be beneficial, certain functions of the Ground Coordinator are essential and can be seen as core functions. This means that these functions would have to be implemented at all airports with a Ground Coordinator. The core functions are primarily made up of the two following sets of pre-tactical/tactical functions

- BNT1: Identify bottlenecks/capacity shortages and assess impact,

- BNT2: Draw conclusions and propose mitigation to bottlenecks/capacity shortages identified,

- BNT3: Oversee implementation of mitigations to bottlenecks/capacity shortages identified

and

- APT1: Facilitate the development of short-term action plans to be commonly agreed,

- APT2: Oversee implementation of short-term action plans,

- APT3: Draw conclusions from the implementation of short-term action plans and give recommendations

Both groups represent the short-term cycles of the two clusters capacity and performance, as well as those functions relating to communication.

6.7 Support Functions

In order to fulfil the functions described above and to achieve its objectives, the Ground Coordinator employs a number of essential support functions. As all other functions, these functions could be carried out by the Ground Coordinator, by one of the operational partners, or could be outsourced to third parties.

The following support function is considered to be a primary function related to all three clusters:

SDF: Collect Data from Partners, Assess Data Quality and Address Irregularities with Partner(s) Concerned

- Data that is needed for analysis must be provided by operational partners
- Data quality must be ensured

The three following support functions relate to the performance cluster and mainly to the monitoring step in the management cycle:

APF: Execute Performance Post-analysis of Events and Irregularities

- A performance post-analysis of all relevant events or irregularities should be executed; either automatically or on the specific request of (an) operational partner(s)

POF: Monitor Airport Performance Data

- Airport (system) performance data shall be monitored, whenever possible this should be done in an automated way

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- Alert and warning thresholds should be set by the responsible operational partner or-for parameters not part of the function SLF-be agreed among operational partners
- When thresholds are surpassed or fallen short of an alarm shall be raised

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SLF: Identify Deviations from Target Service Levels/Quality Levels

- Alerts or warnings will be automatically generated if actual service/quality levels deviate from previously agreed service/quality level thresholds (previously agreed disclosure)

6.8 Functional Flexibility

As the Ground Coordinator concept is intended to be implementable at all airports, further functions — depending on an airport operator's or on operational partners' needs—could be added to it.[11] Again, these functions could be fulfilled by the Ground Coordinator or by other suitable entities.

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[11] See also section 7 below.

7 IMPLEMENTATION OF THE GROUND COORDINATOR

7.1 Governance

The Ground Coordinator is governed by one or more operational partners under the following principles:

- Relevant data that helps to improve the coordination, quality and performance of all operations (landside/airside/landside access) is shared by the operational partners,

- Execution of the management cycles is based on Collaborative Decision Making processes through an impartial, independent and customer-oriented approach that takes into consideration the equal treatment of participating partners.

Figure 7 overleaf shows the scope of a Collaborative Decision-Making process within the Ground Coordinator. Depending on the impact of an event on the airport's performance and the regularity with which a given type of event occurs, different mechanisms of collaborative decision making will apply.

Events that occur more regularly but have a low to medium operational impact would not require too much attention from the Ground Coordinator, as similar events would have already been handled in slightly varying operational circumstances, with previously established coordination procedures or measures to deal with the specific event. The affected stakeholders know what to do and how to work together for successful collaborative decision making. Little data analysis would be needed to find a proper solution. The Ground Coordinator's role in such a case would be to detect systematic shortcomings and identify improvements in operational processes.

Events that occur on a regular basis and are known to have a high impact on operations, such as management of reduced departure capacity, are mostly subject to a streamlined coordination mechanism which might be partially or fully automated, such as Airport Collaborative Decision Making (A-CDM). This semi-automated process is based on a large amount of data with high update rates and serves as a support system for the Ground Coordinator. In this case, its role would primarily be to facilitate collaborative decision making by setting up such coordination mechanisms, including in the form of identified improvements that reduce the workload of operational partners, using the systematic analysis of recurring medium to low impact events.

Events that occur rarely and have a low to medium operational impact would be handled by the Ground Coordinator directly, by bringing together the affected operational partners in an ad-hoc manner according to the given operational circumstances. Solving the situation may require a thorough data analysis and is where the core (tactical) functions of the Ground Coordinator are deployed.
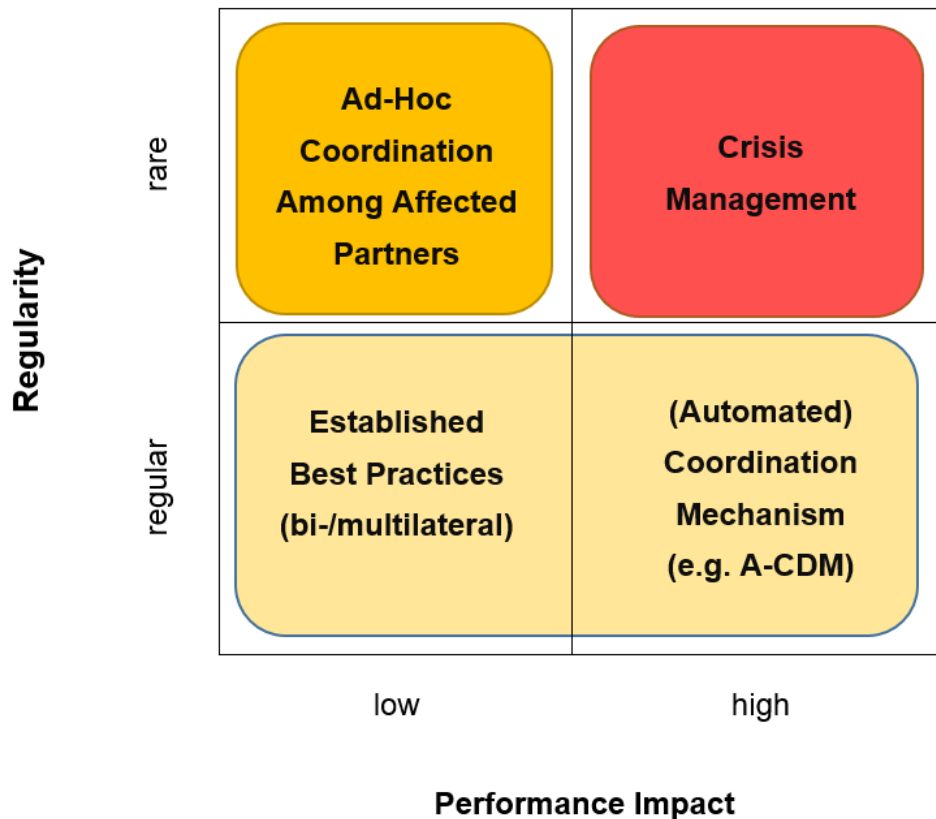
Figure 7: Ground Coordinator and Collaborative Decision Making

Events with a high to very high operational impact that occur only once or very rarely would reflect a crisis situation in which the Ground Coordinator could take a leading role in coordinating the individual operational partners' crisis cells and/or liaising with other authorities. Collaborative decision making is vital to maintaining operations and dealing with each crisis situation. Having the relevant data readily available would help resolve the crisis quickly, with the least possible loss of efficiency and operational impact.

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7.2   A Modular/Flexible Concept

Airports operate according to different business models that can vary considerably and can include point-to-point scheduled passenger traffic, general aviation, pilot schools and crew training, hubs for one (or more) network carrier(s) carrying passengers and/or freight, regional or international flights, fixed wing or helicopter traffic. Each business model in turn is addressed to a different variety of customer (frequent travellers, recreational travellers, cargo customers, etc.) with different needs who evaluate the suitability and performance of the air transport service from very different perspectives. In addition to these differences in customer segments, some airports serve as intermodal nodes connecting high-speed trains with regional trains, local or long-distance buses, metros and private transportation, while other airports are primarily reached by private transport.

Despite these differences, all airports will find benefits to reap from the implementation of the coordination process presented in this Paper. Clearly, the systems and processes needed to establish it in an airport featuring large (25 million or more) passenger volumes will not necessarily be the same as those needed at a small regional airport, with less than 5 million passengers per annum. Differences in requirements may also arise due to the complexity of the operation, capacity restrictions, location across the network, peak period operations or even national or local culture.

- In **small airports** the functions of a Ground Coordinator are quite naturally and probably already implemented, as there may be fewer operational partners at the airport with closer personal contacts. The common interest of all parties is more evident and common situational awareness is easily achieved. However, the link to the Network Management function would still need to be addressed.

- In **medium-sized airports** effective systems for data sharing and procedures would typically be required to support the Ground Coordinator role. However, the common goal and interest usually remains evident at a human level and possibly understandable to most operational partners.

- In **large airports,** logistics, procedures, systems, organisation and even liability agreements may be required to achieve the same level of efficiency. The common global interest is not easily decipherable by each individual operational partner. This is illustrated by the experience of implementing A-CDM in such airports, where the change of culture has commonly been cited as the major and most delicate issue of the project.

A Ground Coordinator role would deliver value to airports of any size, type or region due to its modular structure and flexibility. As described in Section 6, some functions are core functions that would need to be in place at any Ground Coordinated airport. These functions address issues related to capacity and performance in a pre-tactical and tactical timeframe. Any airport, irrespective of size, type and region, would benefit from addressing shortages or bottlenecks in capacity in a (pre-)tactical timeframe. In larger airports with complex operations and wider partner communities, it may also be especially beneficial to address the issues on a longer-term, strategic level. The relatively simpler operation and community of a small airport would in many cases obviate such a need.

Functions relating to seamless passenger flows do not provide much value for an airport that only operates cargo traffic. Likewise, functions on identifying gaps in operational processes that span several companies will not necessarily yield value in the case where the airport operator acts as the sole handling agent. In the same vein, the setting of target service levels does not provide significant value to an airport that only has a few operations over the course of a day. In such a context, an extensive post-operations analysis function would be unlikely to yield much value to the airport operator, the airlines or the Network Management Function.

For these reasons most of the functions that make up the Ground Coordinator are provided as modules that the Ground Coordinator can bring into play if the network or airport community would benefit from them. The Ground Coordinator could therefore look different in each airport, although the presence of the core process of the concept would nevertheless ensure consistency from a network and customer point of view.

8 SIMILARITIES AND DIFFERENCES WITH OTHER CONCEPTS

The Ground Coordinator shares a common aspiration with a number of different concepts presented below: the drive to facilitate better situational awareness among operational partners in a collaborative environment. The differences between the concepts are mostly a matter of the functional scope of collaboration and of the domains where collaboration is applied.

The domains of application range from the "core" airside domain with a limited number of operational partners, to regional ATC and the (ATM) Network on the one side, to the turnaround, landside and landside access modes on the other, that typically include a multitude of operational partners with direct and indirect impacts on airport capacity and efficiency.

Figure 8 compares the Ground Coordinator concept to other concepts such as A-CDM, APOC (incl. the role of APOC Supervisor), AOP and NOP, while TAM is not shown as there is currently no common understanding as to the precise meaning of the concept. This, however, might change if it will become a project dealt with under SESAR 2020.
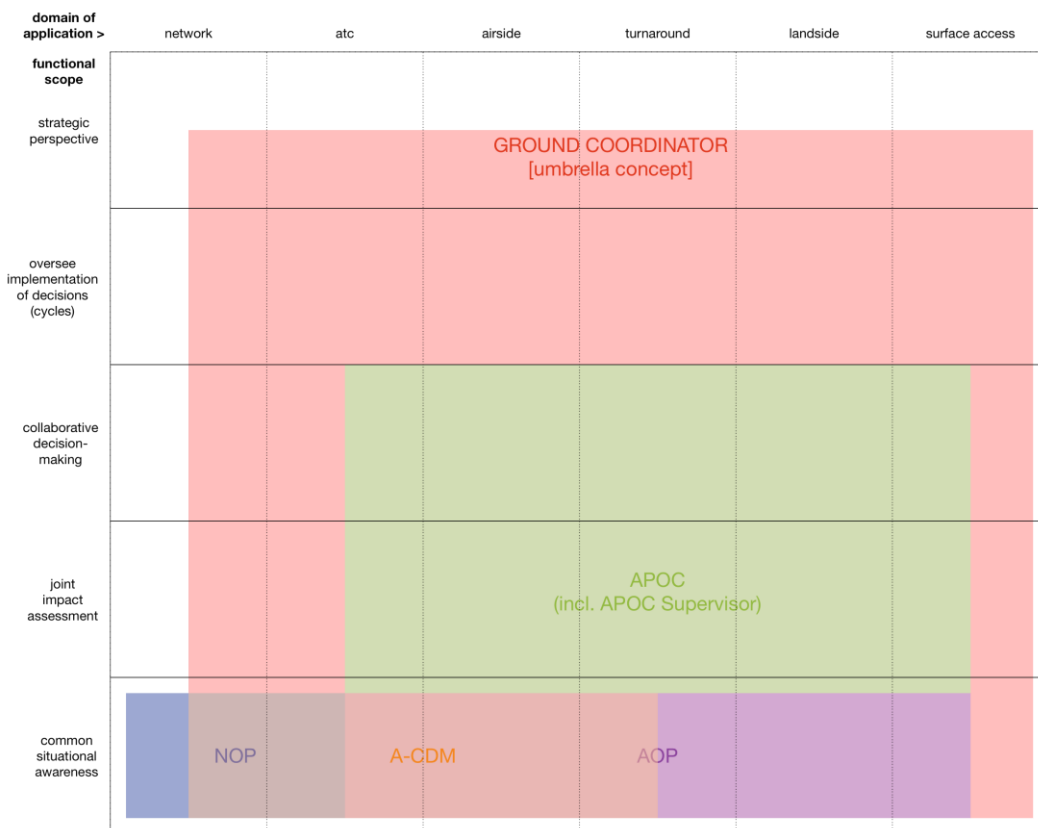

Figure 8: Ground Coordinator Compared to Other Concepts

As can be seen from Figure 8, all concepts shown are fully compatible, allowing airports to individually plan their evolution or transition from one concept to another step-by-step, or module-by-module, depending on their needs, their local situation, complexity and involvement of operational partners.

8.1 A-CDM

A-CDM can be seen as a collaborative process with a strong data focus. Within the A-CDM process, data is collected and shared among operational partners. The planning step is automated, governed by collaboratively formed and agreed rules. Within the A-CDM process, no collaborative decision making by humans is needed on a day-to-day basis and execution follows a single clear procedure. There is no coordinator for the nominal A-CDM process and none is required.

8.2 CDM

Collaborative Decision-Making at airports in a broader sense describes any process steps that are undertaken to achieve a commonly agreed decision through either automated coordination mechanisms or human involvement, taking into consideration the needs and input of all involved partners.

8.3 AOP/NOP

AOP and NOP are databases that reflect the current picture of the actual operational situation of all operational partners as well as their upcoming planning translated into data. Exchange between the AOP and NOP is merely an exchange of data to complete the picture on the respective other end. The underlying plans on both ends must be consistent for the data to be consistent. AOP/NOP covers only the data layer of collaboration. The decision making layer is not part of AOP/NOP. The Ground Coordinator acts mainly on the decision-making layer. However it is also the role of the Ground Coordinator to ensure that relevant data for exchange among local operational partners as well as for exchange with the NOP is provided through the AOP.

8.4 APOC

The APOC concept developed in SESAR has the highest similarity to the Ground Coordinator concept. More specifically, the role of the APOC supervisor is very similar to that of the Ground Coordinator. However, the concept was primarily defined for larger airports whereas the Ground Coordinator concept is intended to be more flexible.

The APOC supervisor takes on the mediator role in the collaborative management process, involving operational partners and making sure the APOC collaborative impact assessments and decision-making processes are followed. At airports where an APOC exists, the tasks of the Ground Coordinator will most likely coincide with those of the APOC supervisor, at least in the tactical timeframe.

However, strategic initiatives are not covered by the APOC (apart from the seasonal/monthly performance target setting) whereas they are covered within the Ground Coordinator concept. According to the APOC concept, the APOC Supervisor has no active role in monitoring the implementation progress of the decisions taken at the level of the individual operational partners. Progress is reflected in data, which is again being monitored continuously. The concept presented in this paper, on the other hand, foresees that the Ground Coordinator can closely follow the progress of implementation with the responsible operational partner on process level in addition to the data level.

The Ground Coordinator concept is applicable to any airport, regardless of whether there is an APOC or not. Therefore also at airports without APOC, the Ground Coordinator can fulfil the task of facilitating the communication and the decision-making among affected operational partners, although probably in a less formalised process than APOC. The APOC processes are independent of the scope of the management areas considered, so they can be extended to the landside, or to the extent that a given Ground Coordinator covers.

8.5 TAM

There is no clearly agreed definition of Total Airport Management and concepts for implementation vary across airports and projects. In general, TAM concepts address data to be exchanged, requirements for performance and process monitoring, as well as support tools. The landside is usually included but to different extents in different concepts.

The Ground Coordination concept is not meant to define detailed process monitoring steps or set up data or system requirements. Generally speaking, current TAM concepts seem to be mainly about *what* needs to be done in (total) airport operations management and to some extent about *how* it should be done (for e.g., governed by APOC processes).

The Ground Coordinator concept in contrast only describes which tasks would need to be performed by the Ground Coordinator, i.e. by the one actor in

collaborative airport operations management that acts as a facilitator for what should be done and how it should be done.

The rationale of setting up TAM is to handle flight operations as effectively as possible. The Ground Coordinator concept shares that goal. Yet the Ground Coordinator maintains a broader view and is also aware of the customer, external operational partners and various network perspectives.

9 AIRPORT OPERATORS AS GROUND COORDINATORS

At some smaller airports, the Ground Coordinator concept might already be unknowingly 'implemented'—due to the small number of operational partners, their proximity as well as the larger responsibilities borne by individual organisations. In these cases, the airport operator should have a good understanding of how a node in the air transport system works (both airside and landside). Although dogmatism should be avoided when answering the question of who could fulfil this role, the facts on the ground demonstrate that there is one operational partner that is the best-placed to accomplish all the functions of the Ground Coordinator on behalf of all other partners. That is the airport operator, among others for the following reasons:

- Airport operators provide ground infrastructure, from essential facilities like runways, terminals, and roads to more refined ones like communications infrastructure and in certain cases even ATC infrastructure;

- Airport operators are responsible for establishing the overall policy for the proper functioning of the transportation node;

- Airport operators are the only entity that interacts with all operational partners and users of the node.

In any case, the governance of a Ground Coordinator led by an airport operator would have to involve the different operational partners in a collaborative spirit, to carefully manage the potential conflicting interests, and to avoid negative impacts on competition between different partners. They would fulfill this role by finding balanced solutions.

10 THE BENEFITS OF IMPLEMENTATION

The Ground Coordinator is a central point of information exchange between all operational partners. This information can in turn be shared with all local operational partners leading to increased situational awareness of airport operational processes and their status. In this way, the Ground Coordinator enables individual partners to optimize operational decisions based on a holistic and "best achievable" view of the current circumstances. The increased situational awareness reached through the exchange of information and data leads to better predictability and as a consequence to more efficient utilization of resources.

Airlines would obtain a better view of capacity, and potential risk of a shortfall, way beyond the current scope of A-CDM. For example this expanded view would also include arrivals, allowing for more predictable operations and adaptive planning.

An efficient use of resources is crucial to **ground handlers**. Increased predictability with a time horizon extending past A-CDM would lead to more reliable planning.

For **ANSPs**, the increased predictability could entail more flexibility in staff planning. Similar staff planning flexibility would also apply for security and border control.

Landside access could benefit through better processes for minimising disruptions based on the increased predictability. Involving road authorities can contribute to a more seamless passenger flow in case of disruptions, for example through optimizing bus traffic or traffic lights.

Together with the **Network Manager**, the Ground Coordinators form the future ATM network backbone. The Network Manager would benefit from the information that the Ground Coordinator can provide in terms of a consolidated view of the operational status of the airport, especially in case of events that have a current or foreseen capacity impact. The impact can be anticipated by the Network Manager and preparation of mitigation actions can be facilitated.

This effect increases its added value to the network with each additional airport that implements a Ground Coordinator, as each serves as a single point of contact for the Network Manager. Each one relieving the Network Manager of less efficient peer-to-peer communication with individual local partners, which additionally bears the risk of collecting contradictory information. The Ground Coordinator could serve as the local 'clearing house' for information.

In turn, the more airports communicate with the Network Manager by means of the Ground Coordinator, the more valuable is the information returned to the airports, e.g., on the status of main destination airport, or surrounding airports. This information can be essential in disruptive situations such as those caused for example by snowfall.

Thanks to the increase in predictability, capacity and resource buffers used at different stages of the process to face unexpected variations could be reduced or even eliminated, allowing for capacity increases that would benefit all operational partners. Moreover, improvements in predictability increase trust between operational partners. Customer facing operational processes would appear more aligned from passengers' perspectives and can thereby contribute to a more positive passenger experience.

11 CONCLUSION

11.1 The Ground Coordinator: A necessity for each airport and a must for those airports conscious of their capacity and performance

Airport services are ultimately provided for airport customers, be they passengers or freight customers, irrespective of the type of the airport's business model or operation. In order to improve customer experience, coordination and collaboration between the operational partners is increasingly necessary, in particular to overcome the fragmentation of services and capacity crunches at airports and throughout the network. A transverse collaborative approach to managing the operations would lead to increasingly efficient airport and aircraft operations, to continuous improvement enabled by the different management cycles and functions of the Ground Coordinator, and would bring benefits even in such domains as safety and security.

11.2 The Ground Coordinator: A flexible and modular concept

The Ground Coordinator concept is a flexible and modular concept with just six core functions and a larger number of optional functions. At each airport the approach taken towards implementation can and should reflect the specific needs, the complexity of the operating environment, as well as the airport's size and traffic nature.

A Ground Coordinator covering all functions would be active in all time horizons starting with the longer term view (strategic), then shortly before and on the day of operation (pre-tactical/tactical), where the core functions are rooted, and finally after the day of operation (post-operations) for follow-up and feedback. At all times communication between Ground Coordinator and operational partners is paramount. The Ground Coordinator can be seen as the facilitator of communication ensuring transparency by allowing common situational awareness.

11.3 The Ground Coordinator: Coordination relying on a collaborative spirit to the benefit of all

The Ground Coordinator concept relies on the involvement of the operational partners, which can only be achieved through a collaborative approach and communication. Such a voluntary collaborative approach guarantees that the concept would be implemented to the benefit of all. The collaborative approach also means that the operational partners would remain responsible and liable for

their individual actions—no liability would be taken over by the Ground Coordinator.

In order to reach the best possible outcome, all operational partners at an airport should finally be involved when implementing the Ground Coordinator concept. While this does not mean that all operational partners need to be physically represented in a Ground Coordinating body, involving all operational partners would ensure that the various issues having an impact on airport and network capacity and performance are dealt with more efficiently and would increase overall performance and customer experience.