

Appendix P Demonstration Exercise EXE-VLD-09-003 (Multiple XMAN operation in ACC / UAC) Report

P.1 Summary of the Demonstration Exercise EXE-VLD-09-003 Plan

Demonstration Exercise EXE-VLD-09-003 was built on results of SESAR 1 WP 05.06.04 EXE 696 (multiple XMAN Simulation in upper airspace).

The objectives of the exercise are:

- Elaborate and apply XMAN strategies via CDM process.
 - Assess impact of XMAN Mode of operations, e.g. concrete application of XMAN constraint, on XMAN Strategy.
 - Identify criteria to maintain and/or degrade XMAN Service provision.
 - Identify measures for workload reduction related to XMAN Service provision.
- Test XMAN Portal as CDM Tool.

The general approach of the exercise was to validate the multiple arrival constraints scenario for several Upper Area Control Centres in a real time shadow mode environment: Specific demonstration activity involving Maastricht (MUAC), Karlsruhe (KUAC) and Reims UAC (RUAC) with several airports providing their arrival information (Paris-CDG, Frankfurt, Amsterdam, London-LHR, and London-LGW).

An XMAN Strategy Management was developed in order to be able to balance demand on XMAN Services with ATCO workload in order to make best use of the available ACC/UAC capacity.

Participants in the exercise were:

- DFS / Karlsruhe
- DFS / Langen
- DSNA / Paris
- DSNA / Reims
- Maastricht
- DLR

Naviar / Copenhagen could not be included in the exercise, as it was not possible to feed AMAN Copenhagen requests into the XMAN Portal in the available period of time.

P.1.1 Exercise description and scope

In order to achieve the exercise objectives a shadow mode trial seemed to be appropriate. The exercise runs and scenarios were based on real time data and the exercise was conducted mainly at the operational sites of the involved partners. The XMAN strategies that were tested were based on real XMAN data feeds into the XMAN Portal. But the resulting measures from applying the XMAN strategies were not implemented and did not affect real traffic.

FMP, Supervisor or equivalent personnel (OPS office) had been involved in the shadow mode trial.

XMAN Portal

Purpose of the XMAN Portal:

- Situational Awareness on current arrival situation at XMAN airports (provide current information on the arrival situation at selected airports).
- Collaboration platform (provide a multi-lateral communication mechanism for information sharing and decision making according to strategy management use cases).
- Technical gateway (for transitions etc.) and provision of the capability to store and display pre-defined (strategy management) scenarios.

XMAN Portal Development:

- MUAC is developing and hosting the XMAN Portal as part of their ATM Portal.
- Common requirements for XMAN Portal have been worked out.

The XMAN Portal satisfies requirements related to Strategy Management on XMAN Operation Forecast, Communication and Collaboration and XMAN Service Requests. The XMAN Portal served as the collaboration tool to apply and test XMAN Strategy Management.

The current development status of the XMAN Portal at MUAC is shown in the figure below with the main data flows depicted. The central reception and processing of data takes place in the MUAC ATFCM environment, where through OLDI and PENS the inputs for the XMAN Partners are received. Value-added XMAN information is then provided through the ATMP Message Broker and the AMTP Front End to the users of the XMAN Portal.

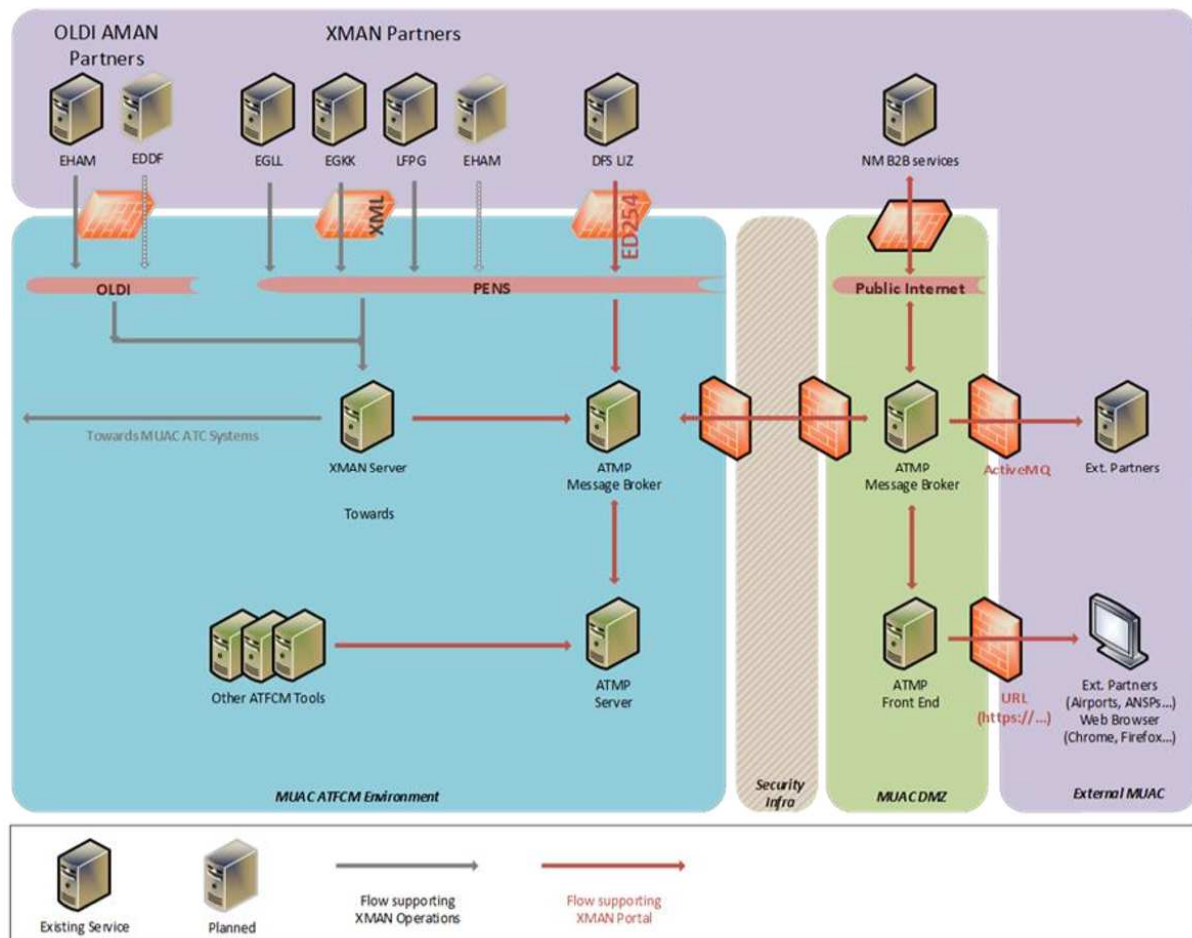


Figure 1: Data exchange and overall architecture of exercise 9#3 setup

Data input to the XMAN Portal is either via PENS Network or via OLDI/FMTP Messages.

Access to the XMAN Portal information is via Internet Web-Interface with usual Web-Browsers.

Strategy management

In the next years, a number of additional XMAN (E-AMAN) sites will go operational. ACC/UAC in the core area will need to handle up to 10 different arrival streams with potentially increasing number of XMAN requests. This “XMAN workload” will contribute to the overall workload of ATCOs in the upper airspace. In simulations, it was found that up to seven XMAN requests per 20 minutes would still allow for a sustainable sector operation. However, potential XMAN hotspots have been identified and the need to alleviate these has been expressed.

A solution to this problem is the development and application of XMAN Strategies, which need to be prepared, coordinated and put into operation in a collaborative process in order to best balance the needs and the potentials of the involved control centres.

Strategy management is described as:

- Having reference and alternative strategies per flow regarding sector airspace design,

- Coordinated through a CDM process between the different ATSUs involved,
- Activating the strategies per flow and per period of time.

The main actors and interactions for XMAN Strategy Management are shown in the figure below:

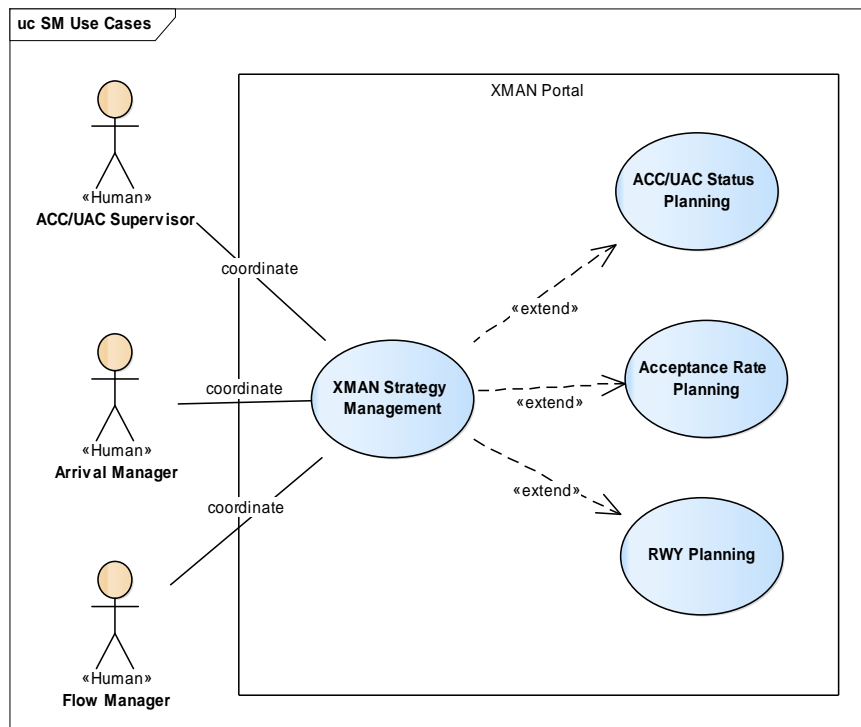


Figure 2: Roles of the XMAN Portal and Human Operators

The human actors involved in XMAN Strategy Management are:

- Supervisors and/or Flow Managers in ACC/UAC units which are dealing with XMAN requests,
- Arrival Managers and/or Supervisor in XMAN units, i.e. in ATC units which are running Arrival Management Systems and serving a specific XMAN airport.

XMAN Strategies are managed and coordinated by these actors with the help of the XMAN Portal.

In a first iteration, two main classes of use cases for XMAN Strategy Management have been identified:

- ACC/UAC Status Planning, e.g. Capacity constraints/limits,
- Airport Status Planning, e.g. Capacity/Acceptance constraints.

The first class of use cases is related to workload considerations in an ACC/UAC in situations where capacity limits are approached or other constraints need to be handled. In these use cases, the Supervisor or Flow Manager of the ACC/UAC is triggering the coordination and application of XMAN strategies.

The second class of use cases is related to capacity or acceptance constraints for arriving traffic at an XMAN airport. In these use cases, the role responsible for Arrival Management or the Supervisor at the relevant ATC unit is triggering the coordination and application of XMAN strategies.

In the following, these classes of use cases are further described and worked out.

Use Case 1: D0: Capacity limit in En-route ATC units

Scenario#1: Sudden local ATC limitations (“now time”)

- Unplanned deterioration of local conditions having an impact on ATC workload / capacity, e.g. short-term MIL activity, en-route weather, staff not showing-up or technical issues.
- The CDM process foresees dissemination of the information that XMAN service is stopped to the partners so that mitigation actions can be taken locally.

Scenario#2: Local ATC limitations (between H-1 and H-3)

- Flow Manager at UAC realizes that capacity limit will be reached in 2-4 h for several sectors
 - Flow Manager/Supervisor assesses planned XMAN workload for these sectors (e.g. by consulting the XMAN Portal)
 - If the sector occupancy/complexity (related to traffic and expected XMAN requests) is then deemed too high, then
 - The Supervisor could decide for a different internal sector configuration, or could decide to take standard flow measures, i.e. put a regulation into place, if the situation is assessed to be too severe, and/or
 - The Supervisor could apply (prepared) XMAN Strategies, e.g.
 - The prioritisation of some XMAN Flows for a certain time period, e.g. the period of high traffic demand
 - Switching off XMAN Actions for a certain time period
- and inform all XMAN Partners via the XMAN Portal on these decisions, or
- The Supervisor could start a CDM Process with XMAN partners via the XMAN Portal
 - Assessing the need for XMAN Actions with partners
 - Agree on best balanced action/strategy
 - Apply the coordinated strategy and inform all XMAN Partners

This use case is typically triggered by a relevant situation in an ACC/UAC handling high traffic and a considerable amount of XMAN flows. Nevertheless, it could also be applicable for any ACC/UAC in capacity constraining situations.

Use Case 2: D0: Capacity limit at XMAN Airport

- Arrival Manager/Supervisor realizes that a planned or anticipated or unexpected runway change or short runway closure will occur in short term (< 1 h) for its XMAN Airport
- This will lead to a “backlog” of arriving flights for ~ ½ h and induces high delay values for the concerned flights

- The Arrival Manager/Supervisor announces this situation to the concerned UAC/ACC via the XMAN Portal and requests
 - The UAC/ACC to prioritise the XMAN Flow to that XMAN airport, i.e. to work XMAN requests for that airport with highest priority
 - The UAC/ACC to apply maximum delay value/speed reduction to the concerned flights during the announced period
- The Arrival Manager/Supervisor announces the end of the capacity limit situation to the concerned UAC/ACC via the XMAN Portal
 - The UAC/ACC will go back to normal XMAN activity and will possibly announce this to other concerned units in case the prioritisation of the XMAN flows has led to restrictions for other XMAN flows

Any ATS unit serving as an XMAN airport can trigger this use case. The application of this use case will usually affect a considerable number of ATS units handling the XMAN flows to this airport.

Use Case 3: D-1: No XMAN service from one upstream UAC/ACC

- The local D-1 planning process receives the message that the XMAN service will not be available from one of the upstream UAC/ACCs, for a certain period of time, the next day,
- The Flow Manager/Supervisor have the following strategy options with respect to receiving XMAN services from upstream UACs
 - a. Cancel all XMAN services from upstream UAC/ACCs, to maintain a uniform planning horizon or
 - b. Retain XMAN services for local ACC sectors that are not affected by the unavailability of one UAC/ACC XMAN service or
 - c. Cancel the XMAN services from other upstream UAC/ACCs that feed traffic into the affected local ACC sector.
- Flow Manager/Supervisor will assess the effect of the unavailability of the XMAN service for the capacity of the local ACC sectors, in relation to the forecast traffic demand. The Flow Manager/Supervisor have the following strategy options to deal with the lower capacity of the affected local ACC sector:
 - i. Delay absorption may be redistributed to other local ACC sectors that are not affected by the unavailability of XMAN services, in coordination with APP (local AMAN delay configuration to be adapted)
 - ii. Pre-tactical measures may be set and discussed/communicated with NM

Exercise schedule:

The following exercise runs were conducted:

- 05.09. 2019 **Dry Run#1**
 - Test of technical implementation of XMAN Portal and local Clients,

- Test of selected Use Cases

Personal: Technical, Ops Office, OPS Personal

- 06.09.2019 **Dry Run#2**

- Familiarisation with XMAN Portal and Clients
- Test of selected Use Cases

Personal: Ops Office, OPS Personal

- 13.09.2019 **Check-Point for readiness** for Formal Exercise

- XMAN Portal
- Use Cases

Personal: Technical, Ops Office

- 16.09.2019 **Formal Exercise#1**

- Handling of all Use cases

Personal: Ops Office, OPS Personal

P.1.2 Summary of Demonstration Exercise EXE-VLD-09-003

Demonstration Objectives and success criteria

The objectives and success criteria for EXE-VLD-09-003 are provided in the xStream DEMOR main document in chapter 3.4 "Summary of the xStream Demonstration Plan".

P.1.3 Summary of Demonstration Exercise EXE-VLD-09-003

Demonstration scenarios

In the following the demonstration scenarios and the set-up of the exercise are described.

Target Set-up for the data input to the XMAN Portal:

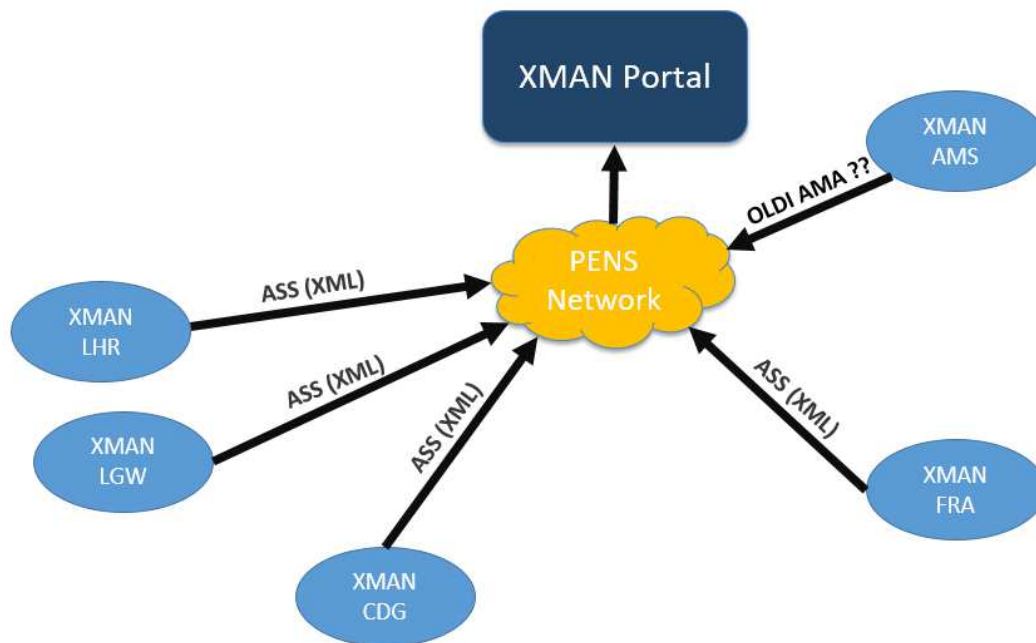


Figure 3: Feeds of the XMAN Portal

The users and clients of the XMAN Portal information were distributed over several operational sites as shown below:

XMAN Portal Clients Set-up

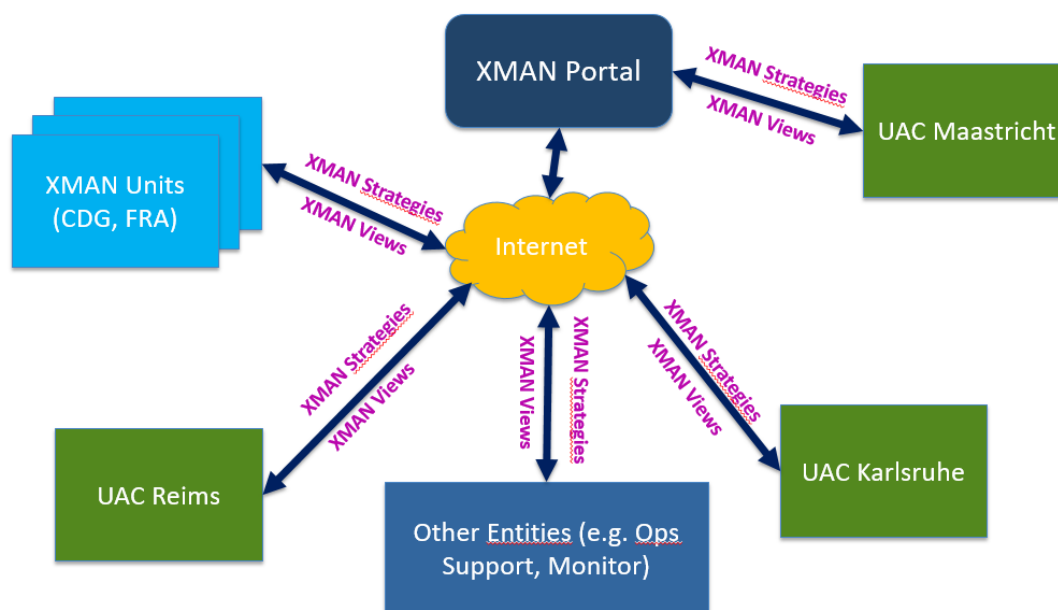


Figure 4: XMAN Portal Clients setup

Founding Members

Status of XMAN Portal Clients during Formal Exercise #1:

- UAC MUAC: available
- UAC Reims: available
- UAC Karlsruhe: available
- XMAN Unit:
 - XMAN CDG: available (Paris ACC)
 - XMAN FRA: available (DFS Langen)
- Observer: to monitor exercise
 - DLR : available

Use cases

Following use cases were performed:

Use Case	Scenario	Prerequisites
1: Capacity limit in en-route ATC unit	1: Sudden poor en-route weather in UAC Maastricht	MUAC offers their default XMAN service to all connected XMAN units
	2a: Capacity limit in UAC Karlsruhe	KUAC offers as a default XMAN service from 02h-20h
	2b: Unavailability of OPS staff in UAC Reims	RUAC offers as a default XMAN service from 02h-20h
2: Capacity limit at XMAN airport	1: Runway closure at CDG	MUAC, KUAC and RUAC have no scheduled XMAN service hours for LFPG in the time period 10-12h
	2: Weather issues at FRA	MUAC, KUAC and RUAC have no scheduled XMAN service hours for LFPG in the time period 06-10h

Table 1: Performed Use Cases and Scenarios

The Use Cases were conducted by making use of exercise scripts. Below is an example for such an exercise script:

Use cases for XMAN Strategy Management				
Use case 1: Capacity Limit in Enroute ATC Unit				
Scenario 2a: Capacity Limit in UAC Karlsruhe				
Prerequisites: KUAC offers as a default full XMAN Service from 02h - 20h				
Step #	Time (hh:mm)	Actor	Action	Action on XMAN Portal
Step 1	00:00	FMP/SV KAR	Flow Manager/Supervisor KAR checks through inspection of CHMI and/or other tools if demand is still within the capacity limits within the next 4 h. for all	None
Step 2	00:03	FMP/SV KAR	Flow Manager/Supervisor KAR realizes that capacity limit will be reached in 2 h. for several sectors groups	None
Step 3	00:05	FMP/SV KAR	Flow Manager/Supervisor KAR assesses planned XMAN workload for these sectors by consulting the XMAN Portal related to XMAN airports LHR, LGW, FRA, MUC, CDG	Open EGLL view and check XMAN demand: Scheduling information and current delay situation Open EGKK view and check XMAN demand: Scheduling information and current delay situation Open EDDF view and check XMAN demand: Scheduling information and current delay situation Open EDDM view and check XMAN demand: Scheduling information and current delay situation Open LFPG view and check XMAN demand: Scheduling information and current delay situation
Step 4	00:10	FMP/SV KAR	Flow Manager/Supervisor KAR concludes that sector occupancy and complexity due to XMAN actions will be too high.	None
Step 5	00:13	FMP/SV KAR	Flow Manager/Supervisor KAR changes the XMAN service hours	Cancel service hours for EGKK, EDDF, LFPG Keep service hours for EGLL and EDDM
Step 6a	00:11	FMP/SV KAR	Flow Manager/Supervisor KAR informs the XMAN Units EGKK, EDDF and LFPG about the service suspension	Open collaboration window in demand/availability view (Click on "read bar") for each recipients EGKK, EDDF and LFPG Write: "XMAN Service will be suspended in 2 h until further notice"
Step 6b	00:12	FMP/SV KAR	Flow Manager/Supervisor KAR informs (downstream unit) MUAC about the suspension of XMAN Service for EGKK and LFPG	Open free collaboration window (Click on "+"): Address recipient MUAC Write: "XMAN Service will be suspended in 2 h until further notice for EGKK and LFPG"
Step 7a	00:15	XMAN Unit EGKK	Acknowledge/accept reduction of service hours	Reduce service hour demand according to request from KAR
Step 7b	00:15	XMAN Unit EDDF	Acknowledge/accept reduction of service hours	Reduce service hour demand according to request from KAR
Step 7c	00:15	XMAN Unit LFPG	Acknowledge/accept reduction of service hours	Reduce service hour demand according to request from KAR
Step 8	00:20	FMP/SV KAR	After 4h Flow manager/Supervisor KAR decides to cancel the restrictions	None Re-establish service hours for EGKK, EDDF, LFPG Keep service hours for EGLL and EDDM
Step 9a	00:22	XMAN Unit EGKK	Acknowledge full of service hours	Re-establish service hour demand to default
Step 9b	00:22	XMAN Unit EDDF	Acknowledge full service	Re-establish service hour demand to default
Step 9c	00:22	XMAN Unit LFPG	Acknowledge full of service hours	Re-establish service hour demand to default
Step 10	00:22	FMP/SV KAR	Flow Manager/Supervisor KAR informs (downstream unit) MUAC about normal operation of XMAN Service for	Open free collaboration window (Click on "+"): Address recipient MUAC Write: "XMAN Service available again for EGKK and LFPG"
	xxxxx	All Units	Run normal XMAN operation	None

The XMAN Portal supported the application of the Use Cases and the related XMAN Strategies with the following features and views.

XMAN Portal Top Page:

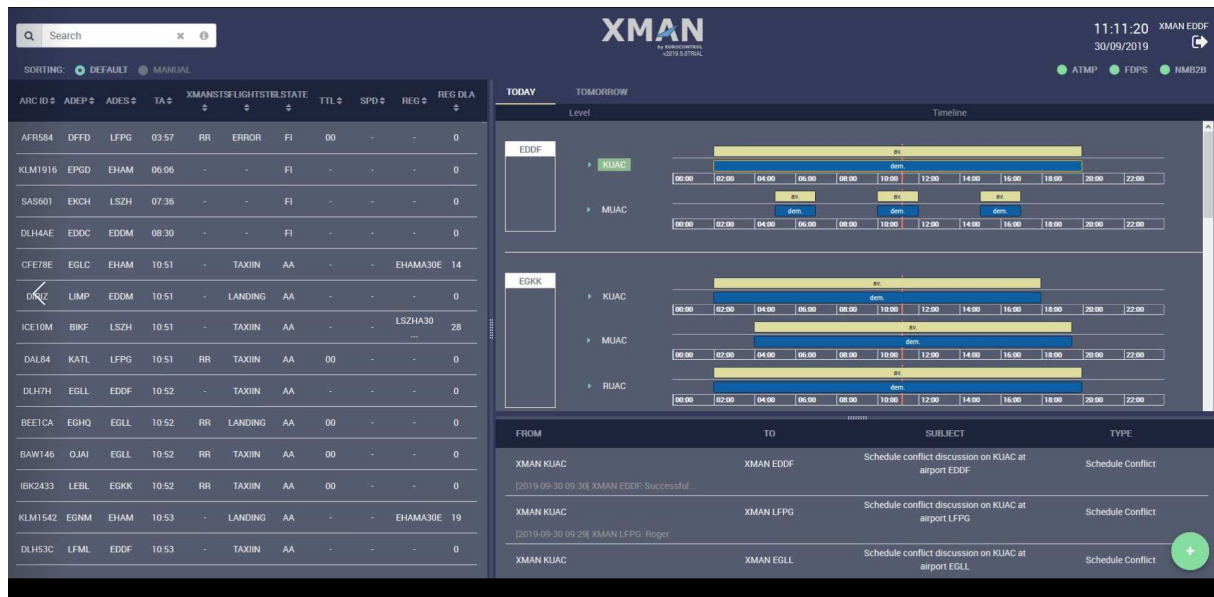


Figure 5: XMAN Portal Top Page

The XMAN Portal Top Page displays a flight list with flights applicable to XMAN (left), scheduling information for XMAN Service Provision (top right) and a collaboration and communication window (bottom right).

Scheduling (Example of XMAN Unit Frankfurt):

The following figure shows the demand and availability of XMAN services with regard to Karlsruhe UAC and Maastricht UAC.

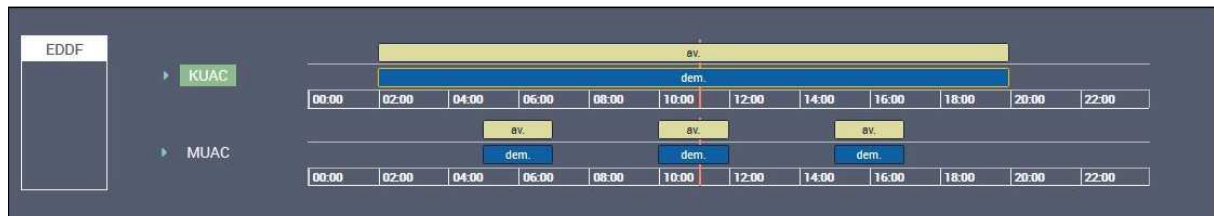


Figure 6: XMAN Portal EDDF Demand and Availability

Flow Exception List / collaboration window:

Flow Exception List

Applicable for: TODAY

Airport: LFPG

Level: MUAC

Organisation: MUAC

Type:

Current timeline

00:00

02:00

04:00

06:00

08:00

10:00

12:00

14:00

16:00

18:00

20:00

22:00

Match Av.

Default Dem.

START *

END *

+

Subject

Schedule conflict discussion on MUAC at airport LFPG

52 / 128

RUNWAY

XMAN LFPG

Runway closure at CDG please prioritise XMAN flows to CDG apply maximum speed reduction

09:05

XMAN MUAC

Will support

09:06

XMAN LFPG

Normal operations at CDG again. XMAN service back to schedule

Enter your message here!

0 / 250

SAVE

Figure 7: XMAN Portal Flow Exception List

Within this window XMAN service provision can be communicated and coordinated.

Free Collaboration window:

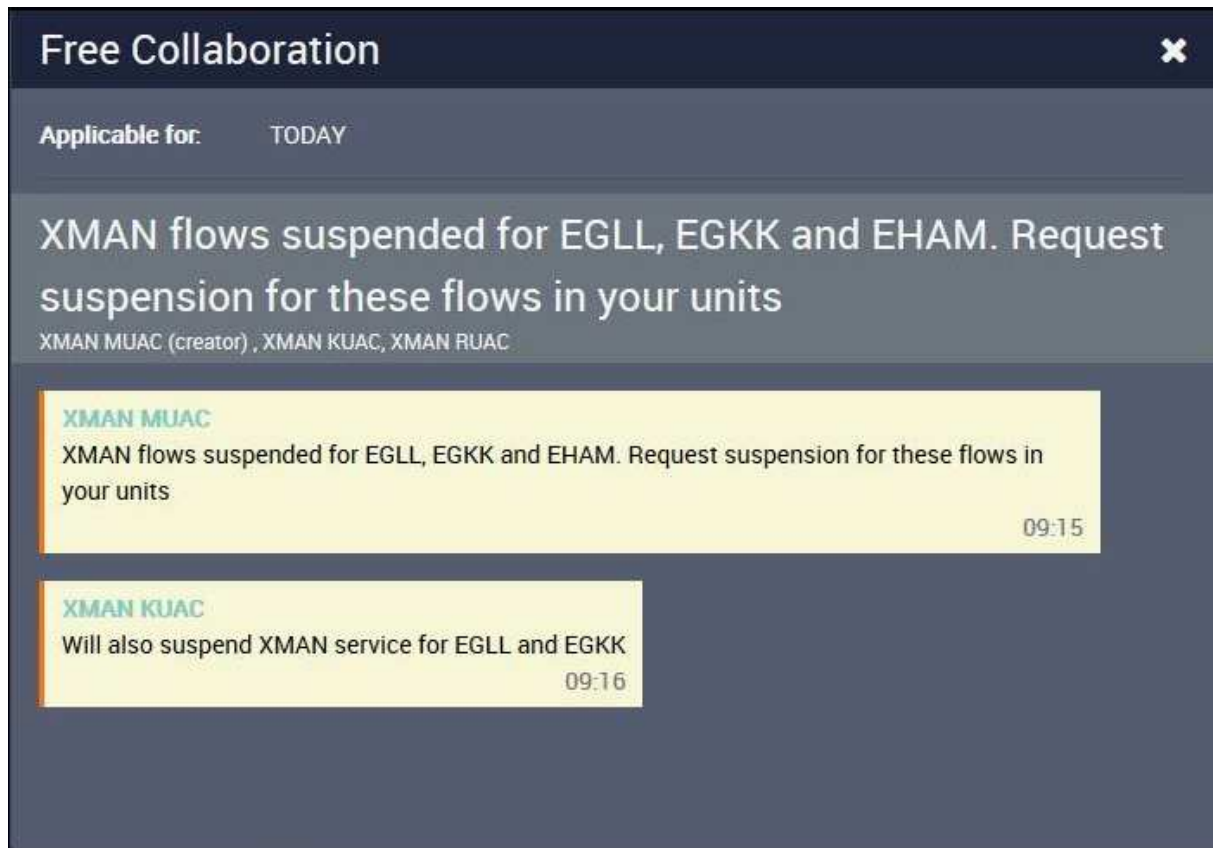


Figure 8: XMAN Portal Free Collaboration Window

Within this window any information can be freely exchanged. It adds to the situational awareness of all actors.

Airport Arrival Timeline (per RWY):



Figure 9: XMAN Portal Airport Arrival Timeline (RWY)

The Arrival Timeline Display (including delay information) provides an overview of the arrival situation at a specific airport.

Airport Arrival Timeline (per COP):

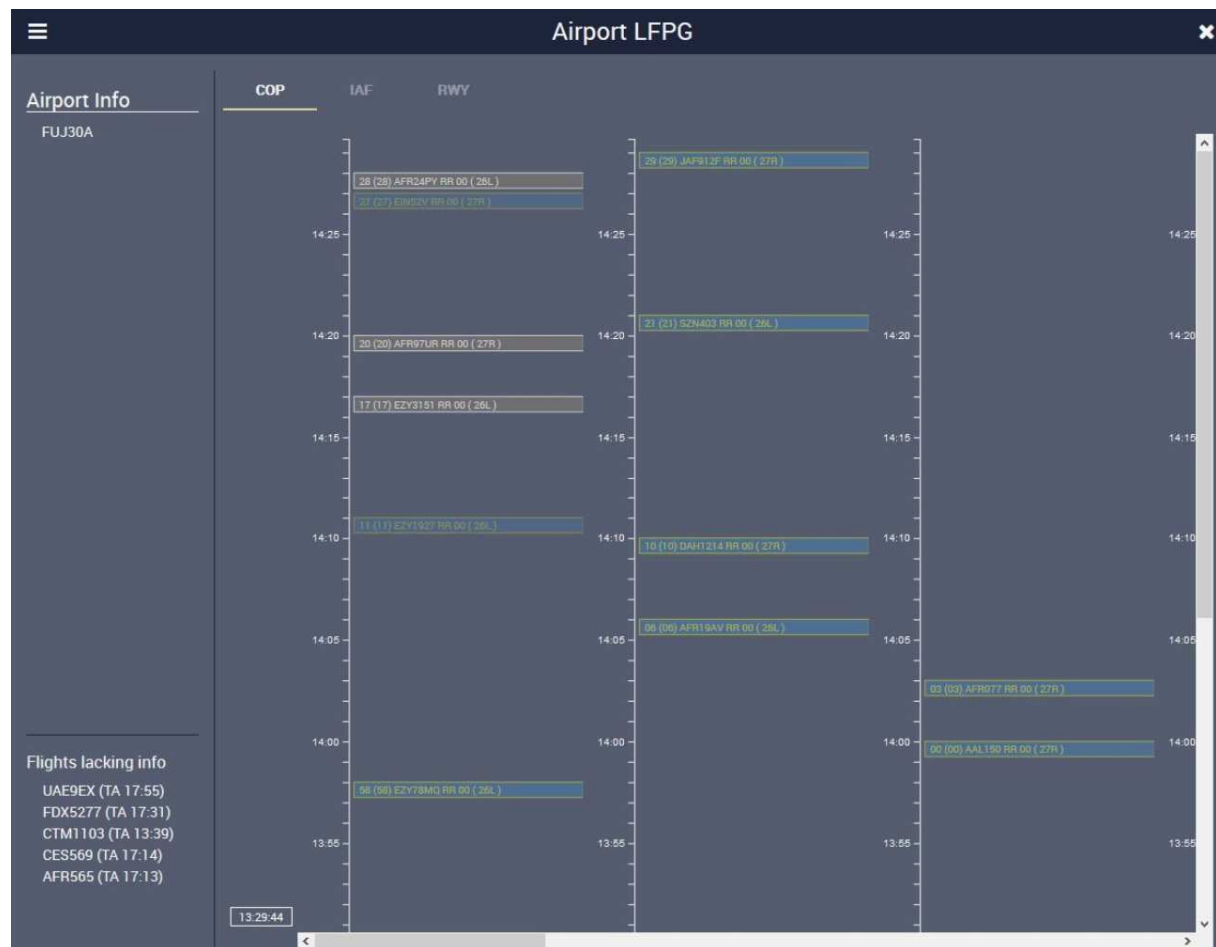


Figure 10: XMAN Portal Airport Arrival Timeline (COP)

The Arrival Timeline Display (including delay information) per COP provides an overview of the arrival situation at a specific airport related to a certain arrival flow.

Performance assessment (by DLR)

The performance parameters to be evaluated were assessed with an Evaluation Questionnaire developed by DLR, which was individually answered by each participant.

General Evaluation

In addition, a common debriefing was performed and additional observations and suggestions were collected.

P.1.4 Summary of Demonstration Exercise EXE-VLD-09-003

Demonstration Assumptions

The assumptions concerning EXE-VLD-09-003 are provided in the xStream DEMOR main document, in chapter 3.4 "Summary of the xStream Demonstration Plan".

P.2 Deviation from the planned activities

Initially eight XMAN Data Feeds to the XMAN Portal were expected (XMAN London-Heathrow, - Gatwick, XMAN Paris-Charles de Gaulle, XMAN Frankfurt, XMAN Amsterdam, XMAN Zurich, XMAN Munich and XMAN Copenhagen).

Due to the lack of technical enablers the following XMAN Data Feeds to the XMAN Portal were not in place in a timely manner:

- XMAN Zurich
- XMAN Munich
- XMAN Copenhagen

With the limited number of XMAN connections it was necessary to align the objectives of the exercise to a realistic scenario.

Therefore, the exercise was conducted in shadow mode, i.e. it was based on real data in a real operational environment, but the results of the application of the tested XMAN Strategies were not applied to real traffic. Otherwise this would have led to unnecessary measures for the traffic.

P.3 Demonstration Exercise EXE-VLD-09-003 Results

P.3.1 Summary of Demonstration Exercise EXE-VLD-09-003 Demonstration Results

See DEMOR main document chapter 4.

The assessment is mainly based on questionnaires, also including general questions not directly related to a specific objective, but nevertheless of interest.

In total $N=7$ participants (from UAC Maastricht, Reims & Karlsruhe and the XMAN units Paris and Frankfurt) answered the online questionnaire and took part in two debriefing sessions after the demonstrations trials.

Figure 11 ~~Figure 11~~, which shows the results of the general questions, indicates positive feedback regarding feasibility, effectivity and usefulness of the strategies defined in the applied use cases as well as of the used XMAN portal as strategy management tool.

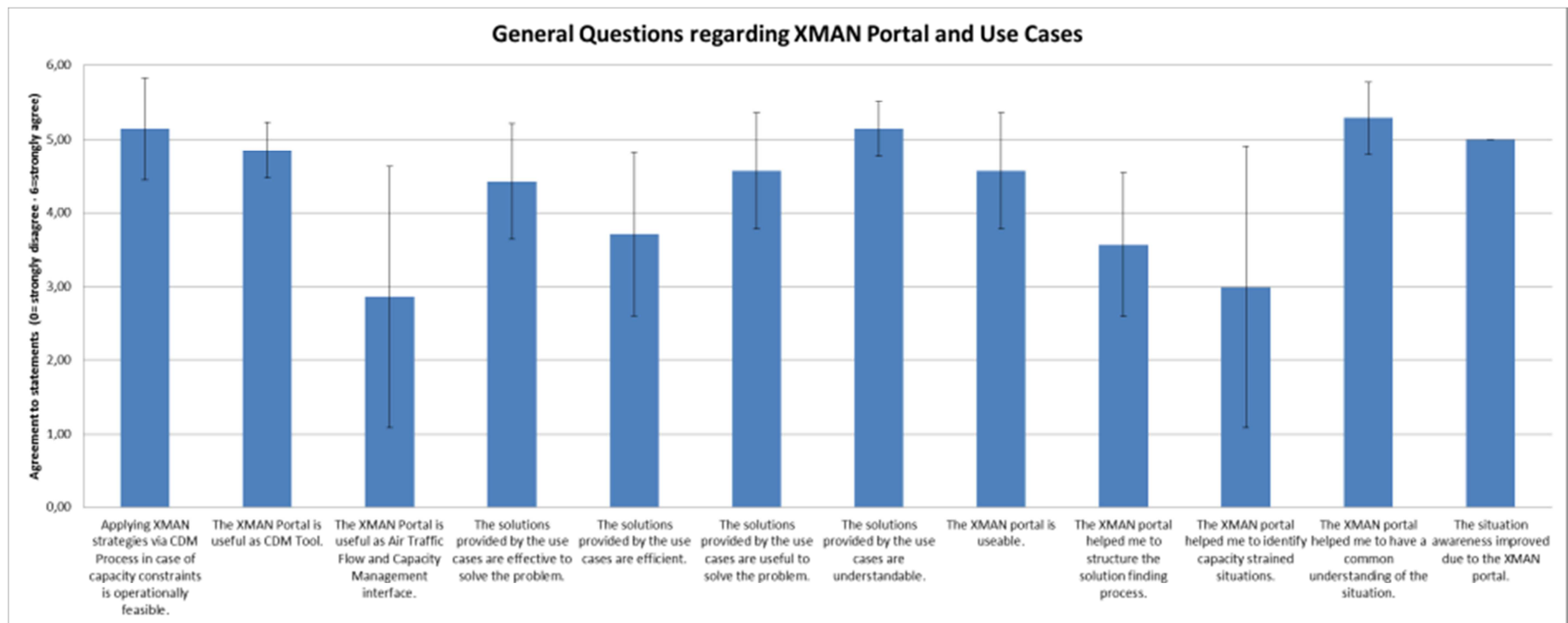


Figure 11: General Questions Results

1. Results per KPA

In the following, results per KPA are represented. The KPA results are answering the two exercise objectives related to safety and capacity. Safety is given when the safe management of traffic by ATC is not compromised and new procedures do not cause critical incidents. The capacity objective is fulfilled when traffic load, ATC workload and complexity in en-route airspace do not exceed available capacity.

a. KPA Safety

i. Quantitative Assessment

Not foreseen

ii. Qualitative Assessment

Questionnaire results related to Safety

A bespoke questionnaire was developed to cover EXE-VLD-09-003 OBJ-VLD-01-001 (“Safe management of traffic for ATCO”) and its criterion (“The safe management of traffic by ATC is not compromised”). The questionnaire comprised three questions and was presented to the participants after the XMAN trials via an online survey tool (LimeSurvey). After the participants answered the online questionnaire individually, a general debriefing with all participants was done. During this debriefing, the participants had the opportunity to express their opinion and discuss their impressions with the other participants. If they had the feeling that important things have not been asked during the individual debriefing with the online questionnaire, they had the opportunity to comment at that time. As method a semi-structured guided interview with mainly open-ended questions was chosen, giving both the investigator and the participants the opportunity to control the interview. The participants were provided the possibility to clarify their position and to talk freely about their experience as a user of the XMAN portal and in their role as an actor performing the defined strategy management use cases. The chosen approach was appropriate for an initial assessment, because the semi-structured guided interviews guaranteed that all important topics were discussed.

The results regarding KPA Safety stem mainly from OBJ-VLD-01-001 questionnaire results (see P.3.21). These results show that safety is not compromised, as participants answered positively for all questions. Participants agreed that xStream operational improvements are respecting the current level of safety in air traffic management. Questionnaire answers can be found in **Figure 12** and **Figure 13**.

Other subjective feedback related to Safety

According to participants’ feedback the XMAN portal is very useful for supporting situational awareness. Participants agreed that the XMAN portal, its processes and procedures as well as the defined use cases and related mitigation strategies are not compromising the safe management of

traffic. However one expert stated that he would not use the tool to determine safety, because there are other tools existing for that.

b. KPA Capacity

i. Quantitative Assessment

Not foreseen

ii. Qualitative Assessment

Questionnaire results related to Enroute capacity

Again, a bespoke questionnaire was developed to cover EXE-VLD-09-003 OBJ-VLD-05-002 (“En-route capacity not decreased”) and its criterion (“Traffic Load, ATC Workload and Complexity in Enroute Sectors does not exceed available capacity”). The questionnaire comprised four questions and was presented to the participants after the XMAN trials via an online survey tool (LimeSurvey). After the participants answered the online questionnaire individually, a general debriefing with all participants was done. During this debriefing, the participants had the opportunity to express their opinion and discuss their impressions with the other participants. If they had the feeling that important things have not been asked during the individual debriefing with the online questionnaire, they had the opportunity to comment at that time. As method a semi-structured guided interview with mainly open-ended questions was chosen, giving both the investigator and the participants the opportunity to control the interview. The participants were provided the possibility to clarify their position and to talk freely about their experience as a user of the XMAN portal. The chosen approach was appropriate for an initial assessment, because the semi-structured guided interviews guaranteed that all important topics were discussed.

For capacity, all questions were rated at a medium level. This indicates that the objective is not compromised. Furthermore high standard deviations are noticed. So participants made very different assessments and there is no consistent view on capacity related issues. This result is explainable by the fact that the XMAN Portal is not seen as a capacity management tool by the participants (which is also supported by the comments during the common debriefing), but instead as a strategy management tool raising awareness of expected XMAN workload. Questionnaire results can be found in **Figure 14**.

Other subjective feedback related to Enroute capacity

According to participants’ feedback on capacity, the XMAN Portal is not seen as a capacity management tool (which is also supported by the comments during the common debriefing), but is very useful for its intended purpose as a strategy management tool, raising awareness of expected XMAN workload. Additionally, one participant stated, that it would be necessary to improve the visualization of the portal in order to make it easier to read the XMAN workload per sector. That way it would be possible to compare it to the actual sector load. Another feedback was that it would be helpful to have an information display of the overall delay at an airport. This would be a good metric to assess airport disruption.

2. Results impacting regulation and standardisation initiatives

Provision of standardized E-AMAN information is key for having a common tool for the coordination of multiple E-AMAN operations. Therefore the application of ED-254 “Arrival Sequence Service Performance Standard” should be promoted.

In general, data sharing between operational partners should be enhanced and possibly data sharing agreements should be in place to safeguard the reliable operational use of the data.

P.3.2 Analysis of Exercises Results per Demonstration objective

1. EXE-VLD-09-003 OBJ-VLD-01-001 Results

This objective was to show that operational improvements of this xStream exercise are respecting the current level of safety in air traffic management.

The corresponding success criterion is fulfilled when the safe management of traffic by ATC is not compromised and new procedures do not cause critical incidents.

The figure below shows the results of the debriefing questionnaire with participants agreeing that the XMAN portal, its processes and procedures including the defined mitigation strategies applied in the use cases are not compromising the safe management of traffic.

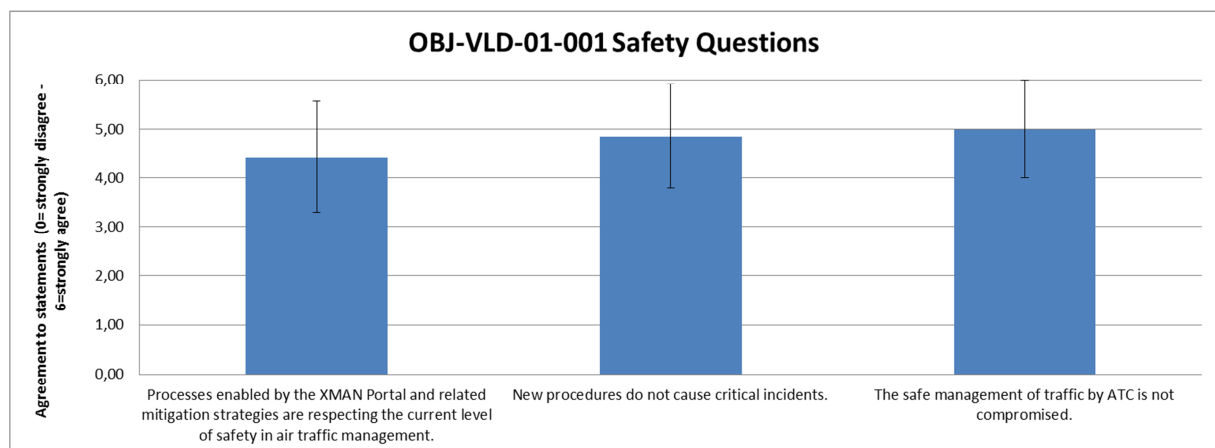


Figure 12: Safety Questions Results (1)

Further, the participants agreed that the impact on workload by applying the CDM processes according to the use cases have been acceptable. The majority of participants also agreed that the XMAN portal was helpful in finding good solutions and that by using the strategies defined in the prepared use cases they were able to mitigate critical situations caused by multiple XMAN constraints. The use cases also help to keep the workload on an acceptable level in situations with arrival constraints.

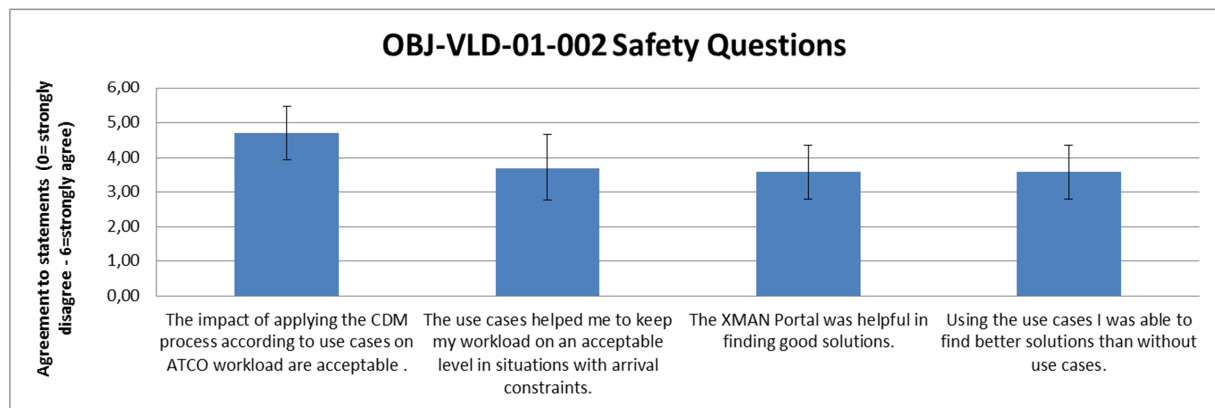


Figure 13: Safety Questions Results (2)

As the participants did not have any safety concerns, the success criterion is fulfilled and the objective is ok.

2. EXE-VLD-08-001 OBJ-VLD-05-002 Results

This objective was to show that available enroute sector capacity allows the application of xStream operational improvements.

The corresponding success criterion is fulfilled when Traffic load, ATC workload or complexity in en-route sectors do not exceed available capacity.

In the figure below the results of the questions regarding en-route capacity are displayed. Before going into a detailed analysis of the results, it has to be mentioned that the XMAN Portal is not an ATFCM Tool and is not supposed to ensure that capacity is not exceeded. Capacity and demand are as they are and other tools (CHMI or local ones) exist to help Supervisors/FPM Officers in monitoring and maintaining the balance. The XMAN Portal has been developed as an OPS support tool that helps sharing information and organise a strategy that allows graceful degradation of the XMAN service, if needed. Keeping that in mind, the mixed answers (as shown by the large standard deviation for each question) and the on average neutral response to the questions are explainable. As the XMAN portal is not seen as a capacity management tool by the participants (which is also supported by the comments during the common debriefing), but instead as a strategy management tool raising awareness of expected XMAN workload and supporting the existing ATFCM tools in order to help Supervisors/FPM Officers to see if workload (not capacity) may be impacted.

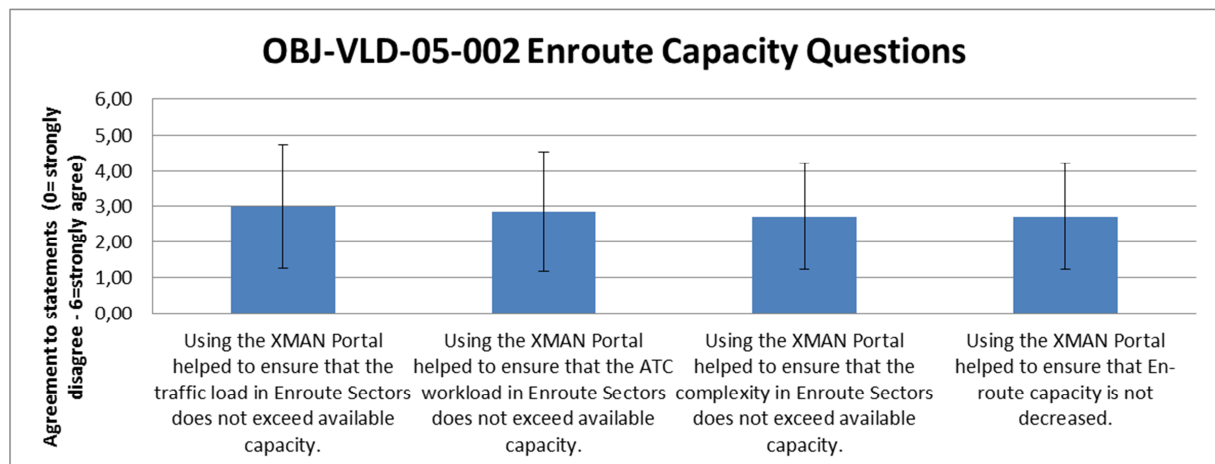


Figure 14: Questions results related to enroute capacity

As participants indicated that - by using the XMAN Portal and applying the defined strategies - the maintenance of capacity was safeguarded by controlling XMAN workload, the objective can be considered fulfilled.

P.3.3 Unexpected Behaviours/Results

None

P.3.4 Confidence in the Demonstration Results

1. Level of significance/limitations of Demonstration Exercise Results

The exercise provided interesting and valuable results that can help to improve the XMAN Portal and the related CDM process. For example, important insights into the usability of the tool were obtained. However, there is also one limitation concerning the significance of the results related to the sample size. Since only 7 people were interviewed, the results might not be representative for all users. So they should be interpreted with caution.

2. Quality of Demonstration Exercise Results

The quality of the results can be rated as meaningful and reliable, since the validation was carried out with subject matter experts in a shadow-mode trial. That is why a highly realistic evaluation of the XMAN Portal and the Strategy Management use cases can be assumed. However, one weakness of the validation process may be that only experts participated who are involved in the project from the beginning. Thus, the assessment may not be completely neutral. Therefore further validation exercises should also invite operators, who are not that familiar with the XMAN Portal. This would offer the opportunity to gather data regarding training needs. The benefit of having deeply involved experts as participants in the trial runs was, however, that we assured that the participants were highly familiar with the XMAN Portal, its purpose and how to use it with the Strategy Management use cases. This can be seen as enhancing the quality of the received feedback.

3. Significance of Demonstration Exercises Results

Due to the small sample size, no solid statements on the significance of the results can be made. Therefore the next step should be to validate the XMAN Portal and the CDM processes on a larger sample of operators.

P.4 Conclusions

The general approach of the exercise was to validate the multiple arrival constraints scenario for several Upper Area Control Centres in a real time shadow mode environment: The demonstration activity involved Maastricht (MUAC), Karlsruhe (KUAC) and Reims UAC (RUAC) with several airports providing their arrival information (Paris-CDG, Frankfurt, Amsterdam, London-LHR, and London-LGW).

An XMAN Strategy Management was developed in order to be able to balance airspace capacity with ATCO workload on one hand and airport demand for XMAN services with available ACC/UAC capacity.

In this exercise, different XMAN Strategy Management use cases were investigated, involving different constraining situations that might occur when various hub airports use XMAN now and in the near future. Appropriate mitigation strategies were developed and assessed. The coordination and implementation of these strategies was supported by the newly developed XMAN Portal, which was running in a real operational environment.

For the purpose of the tested situations, both the developed strategies as well as the XMAN portal have proved to be useful, feasible and realistic approaches. The XMAN portal itself was found to be a tool with great potential. Defined additional processes were assessed to be not affecting ATC capacity. Safety is not compromised. Overall the validation objectives have been achieved.

This exercise can therefore be seen as an essential step forward towards the full implementation of a multiple XMAN environment in European air traffic system. Next steps would be the further development of the XMAN portal to achieve a level of maturity allowing a repetition of the demonstration under fully operational conditions. Furthermore, additional use cases and operational situations apart from those tested in this exercise should be investigated.

P.5 Recommendations

P.5.1 Recommendations for industrialization and deployment

With the advent of multiple E-AMAN operation in the core area of Europe it will become necessary to coordinate these especially between ATS units (e.g. UAC Maastricht, UAC Reims, UAC Karlsruhe) and the E-AMAN units. A specific tool, the XMAN Portal, which can share situational awareness of the arrival situation at various airports and which is able to coordinate E-AMAN Strategies has shown its usefulness.

It is therefore recommended, that

- The XMAN Portal is further developed and rolled out in the core area of Europe
- E-AMAN Strategies are further developed to have a complete set of operational scenarios related to E-AMAN operation which can be applied as needed
- XMAN Portal information are combined with Flow Management information and Sector Load information to more precisely assess the impact of E-AMAN operations on sector capacity

and workload

- A capability to provide also the Network Manager with the value-added E-AMAN information contained in the XMAN Portal should be implemented.

The Strategy Management use cases should be further assessed under fully operational conditions with impact on real traffic and may be enhanced with additional features or situations which are not yet considered. As they are relying on the use of the XMAN Portal, their introduction into operations depends on the deployment of it. In any case, FMPs and/or Supervisors should receive an appropriate training beforehand.

The XMAN Portal itself was found to be a promising tool, but still should be improved in terms of usability and functionality. Therefore, the prototype development should be continued to further test this tool with a variety of Strategy Management use cases under full operational conditions.

P.5.2 Recommendations on regulation and standardisation initiatives

Provision of standardized E-AMAN information is key for having a common tool for the coordination of multiple E-AMAN operations. Therefore the application of ED-254 “Arrival Sequence Service Performance Standard” should be promoted.

In general, data sharing between operational partners should be enhanced and possibly data sharing agreements should be in place to safeguard the reliable operational use of the data.