



**AIRSERVICES AUSTRALIA**

**OPERATIONAL CONCEPT  
FOR  
AUSOTS  
(AUSTRALIAN ORGANISED TRACK  
STRUCTURE)**

**17<sup>th</sup> March 2005**

**Version 1**

**ORIGINAL SIGNED**

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## 1. INTRODUCTION

Flex Tracks are defined as Stage 2 of strategy 1 User Preferred Trajectories (UPT) of The Australian Air Traffic Management Strategic Plan (AATMSP). Flex tracks provide cost saving opportunities for airlines and benefits to the environment through significant long term reduction in fuel burn and prior knowledge of traffic flows to ATC.

To achieve ATC safety requirements and efficiencies, Flex Tracks should be arranged in an Organised Track Structure (OTS) thus controlling the relationship or interaction between tracks. Flex Tracks are displayed on the air situation display ensuring situational awareness in the same manner as traffic presented on fixed routes.

AUSOTS is the name given to the Airservices Australia OTS that is based on fixed ATC requirements and agreed airline parameters appropriate to the Australian ATM environment.

## 2. GENERAL CONCEPT

Consistent with the AATMSP the Operational Concept for AUSOTS considers the wide spread promulgation of Flex Tracks for applicable international and long haul domestic operations. This could include flights between Australia's major commercial aerodromes and The Middle East, The Sub Continent, South East Asia and New Zealand. Consideration will also be given to Australian airspace overflights and possible Flex Track interactions with other regions e.g. eastern Asia. All areas will require an assessment of benefits prior to inclusion into AUSOTS. The AUSOTS will develop incrementally from an initial trial as both ANSPs and airlines are able to implement the AUSOTS in new areas. Liaison will occur with Industry to determine expansion possibilities for AUSOTS and any intentions to introduce new areas and subsequent implementation strategies will be promulgated by NOTAM.

Creation and promulgation of the daily AUSOTS will be accomplished by utilising a Track Management System (TMS). The TMS is composed of three main components; the Trackmaster, a Track Generation System (TGS) and Data.

To ensure airlines and ATC Flex Tracks design preferences are considered, an independent national ATC position; titled "the Trackmaster"<sup>1</sup> will utilise a Track Generation System to produce an OTS. The Trackmaster will consider ATC fixed procedures (requirements to enhance separation assurance and achieve operational efficiencies) and Airline agreed parameters to create an ATM responsive OTS. This OTS as a whole or more specifically the individual city pair Flex Tracks will exist for defined periods promulgated as the validity period within the Track Definition Message (TDM). The AUSOTS will be reissued at defined times of the day and will be available every day of the year.

The Flex Tracks will be presented in draft form to a selected group of airlines and the Brisbane and Melbourne ATC Centres as a Track Co-ordination Message (TCM). The centres and selected airlines will have the opportunity prior to TDM publication to comment on any operational reasons that require amendment to any of the Flex Tracks. The airlines may make comment on the unsuitability of the boundary fix due to unacceptable operating conditions outside the Australian FIRs. Comments based solely on possible fuel burn calculation differences will not be sent.

Flex Tracks will be created between agreed waypoints. For flights arriving/departing from Australian ports the agreed waypoint will be those fixes considered appropriate as connectors to the fixed route structures and traffic management plan of the aerodromes. AUSOTS routes are available at all levels within Australian Class A or C airspace.

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<sup>1</sup> Comprehensive list of the Trackmaster Roles and Responsibilities will be covered in The Trackmaster Operations Manual.

To operate on the AUSOTS, that portion of the flight on the Flex Tracks must be completed during the published validity period. When this is not possible airlines are required to flight plan via the fixed route structure.

The construction of the AUSOTS will consider operations and interactions with other international & domestic traffic on the fixed route structure.

### **3. DEFINITIONS**

#### **3.1 Flex Tracks (FT)**

MATS Chapter 10 describes Flex Tracks as: "A non-fixed ATS route calculated on a daily basis to provide the most efficient operational flight conditions between specific city pairs."

#### **3.2 Organised Track Structure (OTS)**

A Flex Track OTS is predicated on the daily generation of tracks arranged in a manner that enhances separation assurance for the controller while simultaneously allowing airlines to obtain benefits from forecast wind conditions that cannot be obtained using the fixed route structure.

#### **3.3 AUSOTS**

The Australian Organised Track Structure is an OTS based on Fixed ATC requirements and agreed airline parameters appropriate to the Australian ATM environment. AUSOTS will exist within the Australian FIRs and extend across into neighbouring FIRs as agreed by the respective ANSP.

Track Definition Messages, and operator and ATM operational rules relating to the applications and utilisation of the Flex Tracks are all components of AUSOTS.

#### **3.4 Track Management System (TMS)**

A TMS see Figure 1. is a mechanism that can produce and output a single Flex Track or an Organised Track Structure (OTS) to the Airways System. The TMS system comprises of:

- Track Generation System (TGS): The Track Generation System provides the processing mechanisms and includes:
  - Hardware and
  - Software\*
- Data: The data contained within TGS which enables the track or OTS to be created e.g. meteorological and aeronautical data
- Trackmaster: The Trackmaster is a qualified person who is authorised to use the TGS for the creation and publication of tracks

#### **3.5 Dynamic Oceanic Track System plus (DOTS+)**

The FAA DOTS+ system is a demonstrated OTS generation tool in daily use and operated by ATC personnel for tracks across the Pacific. Current capabilities of the DOTS+ system include:

- a) Optimised flexible track systems by
  - i. producing laterally separated tracks or tracks based on separation assurance principles
  - ii. generation of fuel efficient tracks for industry.

- b) Oceanic traffic situation display.
- c) Integrated track advisory function to identify and propose resolutions to solve capacity issues.
- d) Generation of Track Definition Messages (TDM) for industry advice and ATC system display.

DOTS+ is a self contained redundant system capable of maintaining operational capabilities in the event of system failures. Due to the DOTS + redundancy capability the planned architecture will be a single operational site located at a major centre supported by spares.

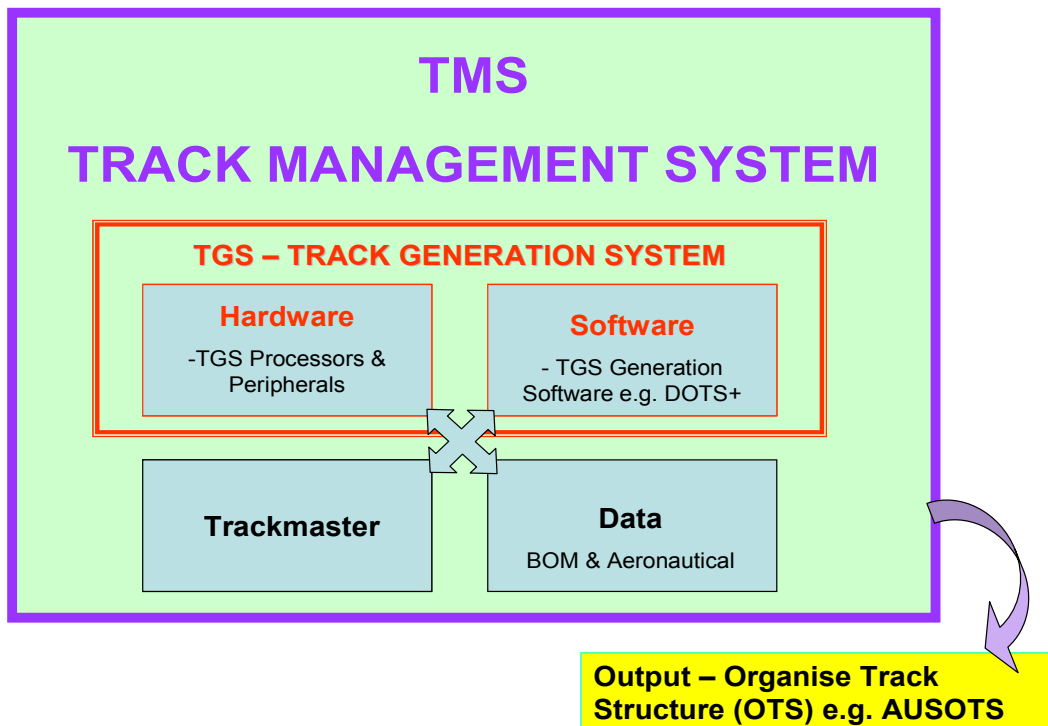


Figure 1 TMS - Track Management System

## 4. OPERATIONAL CONCEPT - ATM

### 4.1 Assumptions

- a) Flex Tracks will provide benefits to airlines, air traffic control and the environment.
- b) Although intended for use primarily for international long haul routes, it is intended to include longer range transcontinental domestic routes into AUSOTS.
- c) It is expected that unless precluded by Operational Reason all operators will utilise the Flex Tracks of AUSOTS when generated and applicable.
- d) On some occasions a Flex Track generated as part of AUSOTS may be slightly less efficient for a specific airline's particular aircraft type than a fixed route option. However to maintain the separation assurance integrity of AUSOTS all operators will continue to plan via the Flex Tracks with the knowledge that the longer term benefits outweigh minor negatives.
- e) As ATC experience increases it is expected that the number of daily flex tracks forming AUSOTS will increase and eventually be replaced by User Preferred Routes UPRs when ATC conflict recognition/resolution tools are designed, developed, deployed and ATC trained in their use.

## 4.2 Proposed Strategies

The proposed strategies applicable to the design and operation of AUSOTS are derived from ATC Fixed Requirements (AFR) and from the Airline Agreed Parameters (AAP).

- a) Tracks will be available for planning for all aircraft that are certified RNP10 or RNP 4.
- b) Any aircraft which loses its RNP capability enroute but is still able to navigate on AUSOTS will continue on the Flex Tracks.
- c) When conflicts occur between aircraft on the Flex Tracks and aircraft that elect not to use the AUSOTS tracks, ATC will apply separation favouring the aircraft on the Flex Track.
- d) Unless converging or diverging, tracks will be laterally spaced by the appropriate horizontal separation standard. e.g. 50nm Oceanic or 30nm domestic reducing as applicable with the introduction of ADS B or within radar coverage.
- e) Where Flex Tracks cross other Flex Tracks at less than 45° a common defined point **should be created** to assist in longitudinal separation.
- f) Where Flex Tracks cross other Flex Tracks at 45° or greater a common defined point **should be considered** to assist in lateral separation.
- g) Flex Tracks will be constructed from appropriate waypoints according to the following hierarchy.
  - i. Published High Route Waypoint
  - ii. Published Floating/Buried Waypoint
  - iii. Created waypoint whole degree Lat Long
- h) Review of ATC fixed requirements and Airline agreed parameters will be addressed as follows:
  - i. Stakeholder significant safety issues – immediately reviewed by Trackmaster/Operations Manager
  - ii. Changes to Airline agreed parameters – quarterly either via stakeholder meetings called by the Trackmaster or direct Email to the Trackmaster who will initiate discussion with all stakeholders.
  - iii. Broadening of capability – post PIR of initial trial.
- i) Flight Planning limitations will be determined in conjunction with all stakeholders and may include such requirements as to define vertical constraints on AUSOTS airspace and maximum altitude for the operation of non AUSOTS aircraft.
- j) Aircraft with operational limitations that at flight planning stage can not comply with the AUSOTS must notify the Trackmaster.
- k) Aircraft may flight plan to utilise the AUSOTS when not intending to land at the Flex Tracks designated destination, however they may not diverge from the Flex Tracks prior to the exit gate unless specified in the RMKs section of the TDM. Eg. Aircraft for YPAD to exit at WHA.
- l) Procedures will be established to defined tracking requirements for New Zealand over flights to transit between the Tasman air routes and the AUSOTS tracks.
- m) All aircraft intending to fly the city pair are expected to plan via the published AUSOTS. Additionally all flights operating out of aerodromes that would naturally make use of the TDM specified gates are also encouraged to plan via the published AUSOTS
- n) In the unlikely event of total DOTS+ system failure no TDMs will be promulgated and a NOTAM will be issued stating that no Flex Tracks are available and all aircraft are required to flight planned via the fixed route structure.

- o) Based on significant environmental events (eg. cyclones or volcanic activity) the airlines may provide advice to Airservices Australia recommending the suspension of specific city pair AUSOTS routes.

### 4.3 Methodology

The DOTS+ OTS will be achieved through the following process.

- a) Establishment of Fixed ATC requirements by:
  - i. TAAM Modelling results
  - ii. Feasibility Testing through simulation
  - iii. DOTS+ Demonstration outcomes
  - iv. Controller consultation
  - v. Rules and regulation (AIP & MATS)
- b) Airline agreed parameters determined by stakeholders. In several circumstances there will be a requirement for a consistent approach to particular issues without the need to set specific constraints. The resolution of these requirements must be achieved through airline forum to determine an agreed position. These airline agreed parameters will include at least the following:
  - i. Aircraft profiles to be used within DOTS+ for specific city pairs
  - ii. Agreed TDM issue times, validity periods and production process
  - iii. Priority structure on which to base OTS creation
  - iv. Priorities for interaction with fixed route structure.
- c) DOTS+ will be populated with airspace and fix data from the ADMS and will be updated through the DAHAP process.
- d) The initial Trackmasters will be trained by FAA contractors and Airservices Australia personnel experienced with operating DOTS+.
- e) Creation and amendment of the flex track gates will be in line with the published traffic management plan and the requirements of the AIP.
- f) A hierarchy of fixed ATC requirement will be reviewed to determine the Flex Tracks suitability to form part of the AUSOTS. These requirements will include but not be limited to the following:
  - i. Distance between tracks for lateral separation, both Flex to Flex and Flex to fixed.
  - ii. Position of track in regard to FIR and Sector boundaries.
  - iii. Crossing/converging or diverging tracks between Flex and fixed.
  - iv. Relationship between boundary crossings and ATC coordination requirements.
  - v. The use of known and common points such as Waypoints, Nav aids or Lat/Longs.
  - vi. Length of route segments.
- g) The AUSOTS will be created and published to stakeholder by agreed times defined by wind forecast updates and traffic flows.
- h) It is expected that the generation of the AUSOTS will occur immediately following the loading of updated GRIB wind data daily at 0600 and 1800 UTC approx.
- i) The AUSOTS is promulgated via a series of Track Definition Messages (TDM). One TDM per specific city pair track and will include the track validity times.
- j) The AUSOTS will also be published via either NOTAM, Track Message (eg NAT Tracks) or on the Airservices Australia Web Site.
- k) The validity periods for the AUSOTS will be subject to agreement by all stake holders to capture the majority of flights. See Fig. 2
- l) Flex Track validity will span the main traffic flows for a city pair and individual Flex Tracks may have different validity times within an AUSOTS.
- m) Aircraft will be planned to be clear of the AUSOTS Flex Tracks prior to the end of the validity period for each track.

- n) The Flex Tracks will be available for display on the Air Traffic Controllers Air Situation Display for the duration of the validity period.
- o) To maintain predictability of traffic flows to assist in the planning of separation the TDM should be displayed on the ASD.
- p) A diagram of the AUSOTS will be available:
  - a. In the centres for self briefing of controller, and
  - b. for pilots/airlines on the Airservices Australia Web Site.

Sample Start:- 16/01/2005 16:01:44, Sample End:- 13/02/2005 23:59:54, Granularity:- 10 minutes.

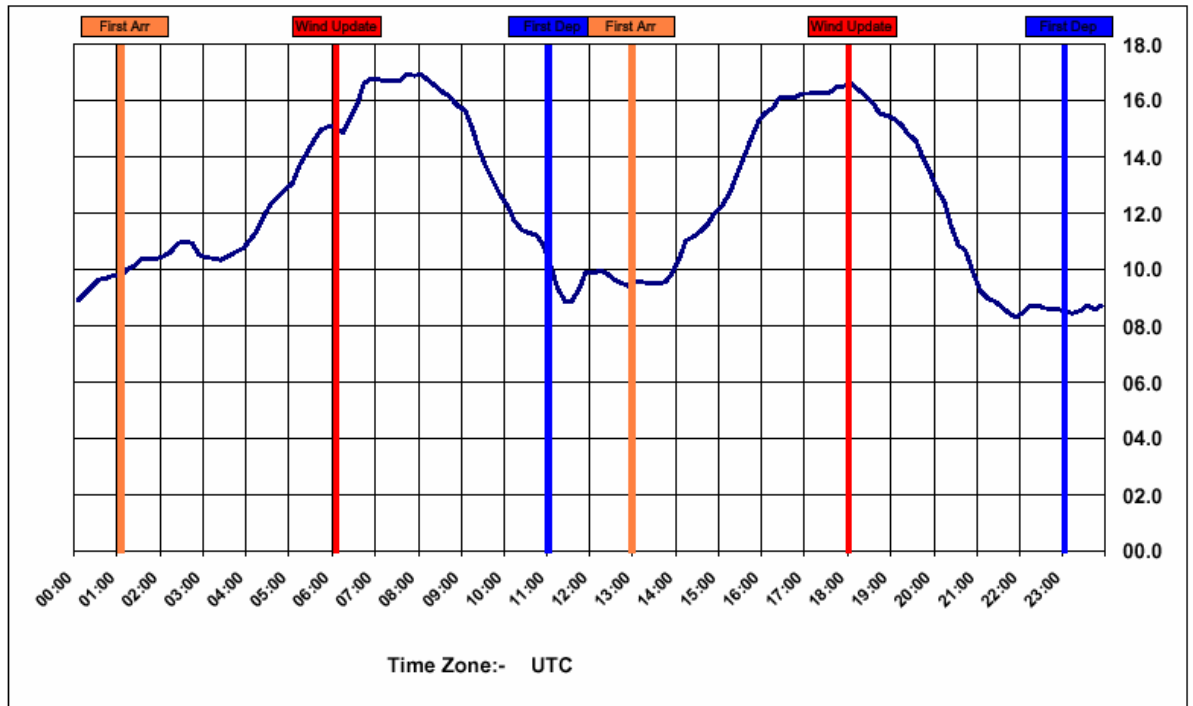


Fig. 2. Depiction of the average number of flights airborne in Australian airspace between the Singapore area and Brisbane, Sydney and Melbourne. Wind updates in red, possible validity period start times in yellow and blue.

## 5. OPERATIONAL CONCEPT - TECHNICAL

### 5.1 System Architecture

A fully redundant DOTS+ system will be installed at the selected Operational Centre. The DOTS+ system shall comprise of:

- Duplicated Servers/Workstations
- Duplicated Local Area Networks (LAN)
- Duplicated AFTN and Weather Interfaces

A system architecture drawing is shown in Figure 4.



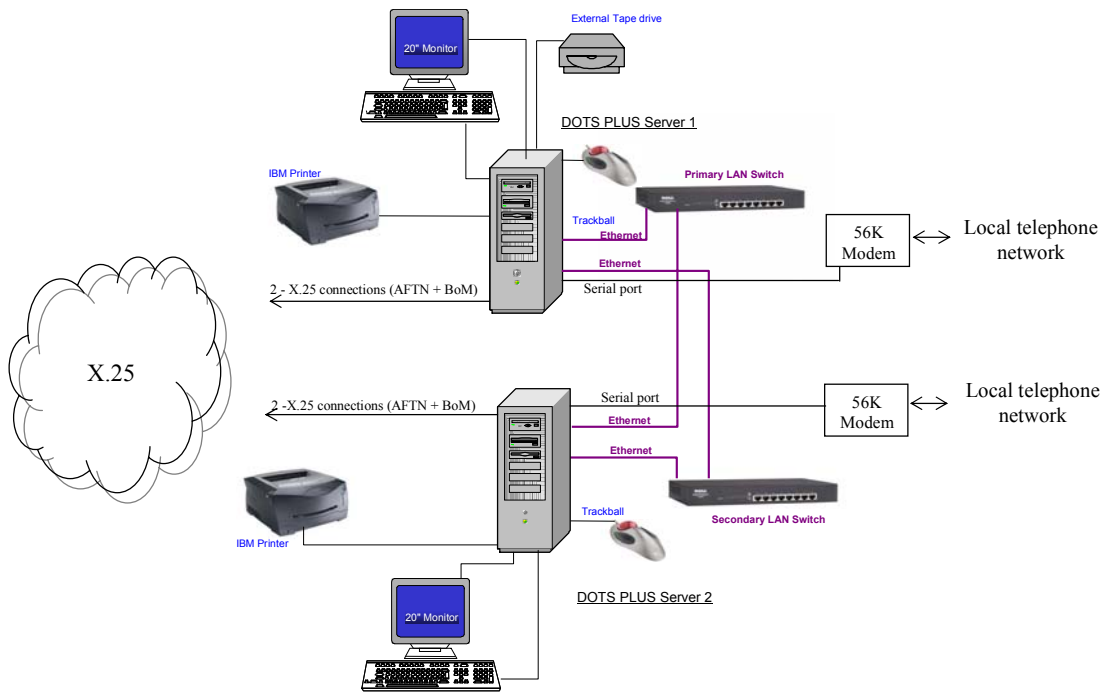


Figure 4 DOTS+ System Architecture

## 5.2 System Interfaces

### 5.2.1. AFTN

The DOTS+ system requires interfacing to AFTN to allow sending and receiving of TDM/PRM messages.

### 5.2.2. Bureau of Meteorology

DOTS+ requires interfacing with the Bureau of Meteorology (BoM) to allow automatic downloads of GRIB data to be received. Separate physical links will be established with the BoM for DOTS purposes, ensuring no performance impact to existing Airservices systems that are already using GRIB.

DOTS+ system requires wind and temperature data at pressure levels 150, 200, 250, 300, 400 hPa, uses forecasts up to 48 hours, and handles all of the eight GRIB sectors in the world. ie.

Sector I	30W – 60E; 0-90N
Sector J	60E-150E; 0-90N
Sector K	150E-120W; 0-90N
Sector L	120W-30W; 0-90N
Sector M	30W-60E; 90S-0
Sector N	60E-150E; 90S-0
Sector O	150E-120W; 90S-0
Sector P	120W-30W; 90S-0

For DOTS operations in Australia, GRIB data will be provided from BoM for Sectors I, J, K, M, N & O; with forecasts up to 48 hours, and at the five pressure levels as stated above. Note that this is a variation to the GRIB requirements for TAAATS.

## 5.3 System Maintenance & Support

### 5.3.1. Hardware Maintenance

The hardware for the DOTS+ system will be sourced in Australia according to detailed hardware specifications provided by the FAA. In addition to the acquisition of a redundant operating system backup support is provided by a:

- Hot spare (see para 5.3.4), and
- An on-going vendor hardware support on a 24/7, 4-hour response time basis.

ISS Technical Staff at the selected Operational Centre will be trained to provide 24/7, on-site hardware maintenance for the DOTS+ system and shall, when required, liaise with the vendor or the FAA on any maintenance issue. A technical monitoring capability is available in DOTS+.

An Engineering and Operating Authority for the DOTS+ system shall be appointed.

### 5.3.2. Software Maintenance

All DOTS+ system software and processes shall remain the sole property of the U.S. Government. The FAA or its contractor shall be responsible for all DOTS+ software changes. Airservices can request software changes for DOTS+ through the FAA contact and be programmed, when agreed, into their regular DOTS+ software maintenance activities. The DOTS+ software will be periodically upgraded, typically twice a year by the FAA. A new software release shall be dispatched by the FAA or its contractor to Airservices on electronic storage media.

ISS Technical Staff at the selected Operational Centre shall be trained to carry out the installation and activation of any given system software packages, and through the Engineering Authority, shall liaise with the FAA or its contractor on any software application issues as required.

Technical staff shall also be responsible for routine software/data housekeeping tasks such as system cleanup, archiving and backups. Procedures will be developed and specified in technical documentation that defines the methodology and process for this housekeeping.

All maintenance procedures required by the technical staff to perform the above mentioned tasks shall be provided prior to implementation.

### 5.3.3. Adaptation Data Maintenance

Airservices shall be responsible for the maintenance of DOTS+ data. eg. Airspace mapping, characteristic points etc.

The Trackmaster will as required amend fix data through the DOTS+ GUI interface.

TDMU will amend the sector shapes, Air Routes and the In and Out Traps data off-line through Unix. This process will support the commonality of data between DOTS+ and TAAATS.

ISS Technical Staff at the selected Operational Centre will be trained, initially by CSSI then OJTI, to carry out the installation and activation of any given adaptation data packages prepared by the TDMU or the Trackmaster. The maintenance procedures required by the technical staff to perform this task shall be provided prior to implementation.

### 5.3.4. Spare Server at NOSI

A set of spare equipment will be provided. When not required, these spares shall reside within National Operational Support & Improvements (NOSI) at the selected centre for operational and technical test and evaluation purposes. There will be no live interfaces provided to this standalone system.

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