International Civil Aviation Organization

The Third Meeting of the Asia/Pacific Air Traffic Management Automation System Task Force (APAC ATMAS TF/3)

Video Tele-Conference, 08 - 10 June 2022

Agenda Item 4: ATM Automation System Implementation by States

4.1 ATMAS Implementation Status and Experience

GPS WEEK ROLLOVER ON TIME DISTRIBUTION SYSTEM OF PHILIPPINE AIR TRAFFIC MANAGEMENT CENTER AUTOMATION SYSTEM

(Presented by Philippines)

SUMMARY

This paper presents the impact of GPS Week Rollover to the ATM Automation System at Philippine Air Traffic Management Center.

1. INTRODUCTION

1.1 The Network Time Protocol (NTP) Time Distribution System (TDS) provides a precise and accurate time signal to the Philippine Air Traffic Management Center.

1.2 The time architecture of the Philippine ATM system is a 3-tier solution involving the main NTP server called a Master clock (stratum 1) and a minimum of three (3) nominated servers (stratum 2) which gets its time reference to stratum 1, and the last tier synchronize themselves to stratum 2.

2. DISCUSSION

2.1 In a global advisory, GPS week rollover will occur due to limitations of the maximum number of GPS weeks, which is up to 1024 weeks, week number encoded in 10 bits only. Although the GPS time and position are still correct, the date will be wrong.

2.2 August 21, 1999, was the first GPS system week rollover and the recent advisory was last April 6, 2019. The NTP servers then, were not affected by April 6, 2019 advisory. After April 6, 2019 advisory, a vendor advisory was received due to own internal rollover date for the year 2022.

2.3 The Philippine Air Traffic Management ATM System has maximum tolerance for time inaccuracy, set to 800ms, before it discards the system tracks. However, it was set only to 500ms at the platform level. It has built-in protection against sudden jump of time when there's a complete loss of the master clock stratum 1, the nominated stratum 2 servers will maintain time with a best effort, leveraging their historical time drift data which can take a minimum of two (2) to three (3) days depending on many factors such as ambient temperature.

2.4 To avoid the impact of GPS WEEK ROLLOVER, the current time server has to be replaced before the internal rollover date.

2.5 Based on this experience in using NTP servers, it is important to keep track of the hardware and/or software limitations as these may vary in the solution provided by the vendor.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper; and

b) discuss any relevant matter as appropriate.

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