International Civil Aviation Organization
CAR/SAM Regional Planning and Implementation Group (GREPECAS)
Eleventh Meeting of the GREPECAS Aeronautical Meteorology Subgroup (AERMETSG/11)
Lima, Peru, 28 to 30 November 2011

Agenda Item 2: Review the status of implementation of the World Area Forecast System (WAFS) in the CAR/SAM Regions

TIMES TO DOWNLOAD FILES FROM WIFS

(Presented by United States)

SUMMARY

This Working Paper conveys an overall perspective on the time to download files from each of the WAFS Internet File Service (WIFS) folders, based upon available bandwidth at the user's location.

1. Introduction

1.1 The intent of this paper is to provide member states with an idea of the time it takes to download files from each of the individual WIFS folders based upon a specific bandwidth used to access the WIFS service.

2. Discussion

2.1 The United States (U.S.) Federal Aviation Administration (FAA) set up a test-bed at its William J. Hughes Technical Center in New Jersey, U.S., to emulate a WIFS user system and it has the ability to restrict the available bandwidth used over the public Internet to access the WIFS service.

2.2 The FAA test bed utilizes the recommended Wget utility as the software tool to retrieve the files which produces a log file that captures the process of downloading the files and timestamps the interactions. The FAA processes this log file to determine the duration time to download the files from each folder.

2.3 The WIFS Users Guide states that the "minimum recommended Internet connection speed is 64 kbps, bursting to 512 kbps". The intent of this paper is to show the impact on download times based upon different fixed bandwidth across this minimum recommendation.

2.4 The tests are executed restricting the bandwidth to 64 kbps, 128 kbps, 256 kbps, and 512 kbps.

2.5 The tests are designed to retrieve all of the files out of each of the WIFS folders that contain files.

2.6 The tests were run multiple times during June 2011 and the results have been provided in the tables below.

3. Test Information and Results

3.1 Table 1 provides an overview of the minimum number of files that are currently found in each of the WIFS folders, the average file sizes within each folder, and the number of files generated for each set of files; i.e., for the GRIB folder, there are six (6) files generated every six (6) hours, and the folder maintains the last four (4) sets (24 hours).

Table 1 WIF Folders and File Characteristics

WIFS Folder	Minimum No. Files	Average File Size	Description
ADMIN_MSGS	0	550 B	Varies - Active admin message over last 36 hrs
BUFR	132	1.5 KB	6 x 6hr sets of 11 files of KWBC and EGRR
GRIB	24	3.3 MB	4 x 6hr sets of 6 files
GRIB2/cat	44	370 KB	4 x 6hr sets of 11 files
GRIB2/cb	44	31 KB	4 x 6hr sets of 11 files
GRIB2/ice	44	116 KB	4 x 6hr sets of 11 files
GRIB2/incldturb	44	375 KB	4 x 6hr sets of 11 files
GRIB2/KWBC	44	2.2MB	4 x 6hr sets of 11 files
OPMET-HOURLY	36	975 KB	36 x 1hr files
OPMET-MINUTE	2160	16.4 KB	36 hrs of 1 min files
OPMET-ROLLING	4	690 KB	Rolling Min 5, 30, 60 and Rolling Hourly
PNG	48	71 KB	6 x 6hr sets of 8 files

3.2 The tests downloaded all files that resided in each folder. The number of files downloaded from specific folders can differ due to the time of the day the test was actually run. This is due to the way that a new set of products are added to the WIFS servers, before the oldest set of products are deleted. i.e., every 6 hours 11 new files are added to each of the GRIB and GRIB2 folders. If a test was executed during the period between the new set of 11 products being added and the oldest set of products being deleted, the test would download anywhere up to 55 files, instead of 44.

3.3 It should be noted that the only time a user would ever need to download all files across all folders might be during an initial start-up of a WIFS system whose local database of files is out-of-date or needs to be completely refreshed. Even under restart, it is expected that a full download of all files would not be required, and more realistically, maybe only the last one or two sets of products would be required.

3.4 It should also be noted that users may not be accessing all products available on WIFS. Some States may only be using Gridded Binary (GRIB) 1 files, while some may have migrated to using GRIB2, but may not have a requirement for the trial forecasts. There are multiple ways to access the OPMET files, therefore only one of the OPMET folders will be used. The BUFR folder currently contains both sets of products for KWBC and EGRR, and therefore the volume of data and time to download can be halved if only one set of products is required.

3.5 In Tables 2 through Table 5, the figures are the median values calculated over multiple executions of the tests.

Table 2 Time to Download All Files at 64kbps

WIFS Folder	No. Files	Bytes Downloaded	Time to Download (hh:mm:ss)	Download Rate
ADMIN_MSGS	8	4.5KB	0:00:02	18.1kbps
BUFR	132	206.1KB	0:00:55	30.0kbps
GRIB	24	79.5MB	3:07:22	57.9kbps
GRIB2/cat	44	16.7MB	0:39:43	57.5kbps
GRIB2/cb	44	1.3MB	0:03:09	54.6kbps
GRIB2/ice	44	4.9MB	0:11:46	57.1kbps
GRIB2/incldturb	44	16.0MB	0:37:56	57.5kbps
GRIB2/KWBC	50	95.7MB	3:45:42	57.9kbps
OPMET-HOURLY	37	36.7MB	1:26:33	57.8kbps
OPMET-MINUTE	2178	34.7MB	1:30:36	52.3kbps
OPMET-ROLLING	4	2.2MB	0:05:28	56.0kbps
PNG	48	3.4MB	0:08:18	56.4kbps

Table 3 Time to Download All Files at 128kbps

WIFS Folder	No. Files	Bytes Downloaded	Time to Download (hh:mm:ss)	Download Rate
ADMIN_MSGS	8	4.8KB	0:00:02	25.5kbps
BUFR	132	206.1KB	0:00:35	47.1kbps
GRIB	24	79.5MB	1:33:55	115.5kbps
GRIB2/cat	44	16.9MB	0:20:06	114.5kbps
GRIB2/cb	44	1.3MB	0:01:43	103.7kbps
GRIB2/ice	44	5.0MB	0:06:04	111.8kbps
GRIB2/incldturb	44	16.0MB	0:18:53	115.3kbps
GRIB2/KWBC	44	94.7MB	1:51:45	115.8kbps
OPMET-HOURLY	37	37.2MB	0:43:51	115.8kbps
OPMET-MINUTE	2188	36.8MB	0:50:14	99.9kbps
OPMET-ROLLING	4	2.0MB	0:02:18	115.8kbps
PNG	48	3.4MB	0:04:09	111.5kbps

Table 4 Time to Download All Files at 256kbps

WIFS Folder	No. Files	Bytes Downloaded	Time to Download (hh:mm:ss)	Download Rate
ADMIN_MSGS	6	3.8KB	0:00:01	30.4kbps
BUFR	132	235.5KB	0:00:34	57.1kbps
GRIB	24	79.6MB	0:46:40	218.9kbps
GRIB2/cat	55	16.3MB	0:12:05	222.0kbps
GRIB2/cb	44	1.3MB	0:00:50	195.7kbps
GRIB2/ice	44	5.0MB	0:03:06	220.8kbps
GRIB2/incldturb	44	16.3MB	0:09:29	217.8kbps
GRIB2/KWBC	44	101.0MB	0:55:46	213.0kbps
OPMET-HOURLY	38	36.5MB	0:21:30	202.0kbps
OPMET-MINUTE	2167	36.8MB	0:28:57	143.4kbps
OPMET-ROLLING	4	2.5MB	0:01:10	173.0kbps
PNG	48	3.4MB	0:02:13	180.9kbps

Table 5 Time to Download All Files at 512kbps

WIFS Folder	No. Files	Bytes Downloaded	Time to Download (hh:mm:ss)	Download Rate
ADMIN_MSGS	7	4.6KB	0:00:02	37.1kbps
BUFR	132	222.3KB	0:00:14	101.6kbps
GRIB	24	79.6MB	0:25:24	391.0kbps
GRIB2/cat	44	16.1MB	0:05:00	381.8kbps
GRIB2/cb	44	1.3MB	0:00:34	297.7kbps
GRIB2/ice	44	4.9MB	0:01:49	341.9kbps
GRIB2/incldturb	44	16.0MB	0:04:55	351.4kbps
GRIB2/KWBC	44	94.4MB	0:29:16	364.8kbps
OPMET-HOURLY	37	35.7MB	0:10:48	366.7kbps
OPMET-MINUTE	2169	35.5MB	0:16:18	240.3kbps
OPMET-ROLLING	4	2.6MB	0:00:51	389.1kbps
PNG	48	3.3MB	0:01:13	363.5kbps

3.6 In Tables 2 through Table 5, the download rate for files in the ADMIN_MSG always reflects a much lower rate than the available bandwidth. This would seem to be due to the inaccuracy of the download information provided in the wget logs.

3.7 Table 6 reflects more of an operational perspective and provides the times (hh:mm:ss) associated with downloading only the current set of information from each folder, based on a fixed bandwidth. The frequency called out in this table is based on when new products sets are made available

to WIFS users, as well as an estimate on the frequency to retrieve Admin Messages and the options to retrieve OPMET data. As stated before, not all users require products from all folders.

Table 6 Time to Download Latest Set of Products

WIFS Folder	No. Files	Frequency	64Kbps	128 Kbps	256KBps	512Kbps
ADMIN_MSGS	8	Hourly	0:00:02	0:00:01	0:00:01	0:00:02
BUFR	11	Every 6 hrs	0:00:05	0:00:04	0:00:03	0:00:01
GRIB	6	Every 6 hrs	0:47:16	0:23:29	0:11:40	0:06:21
GRIB2/cat	11	Every 6 hrs	0:09:50	0:04:49	0:02:25	0:01:15
GRIB2/cb	11	Every 6 hrs	0:00:50	0:00:25	0:00:13	0:00:08
GRIB2/ice	11	Every 6 hrs	0:03:03	0:01:30	0:00:47	0:00:27
GRIB2/incldturb	11	Every 6 hrs	0:09:46	0:04:48	0:02:22	0:01:14
GRIB2/KWBC	11	Every 6 hrs	0:56:12	0:27:42	0:13:56	0:07:19
OPMET-HOURLY	1	Hourly	0:25:00	0:12:31	0:06:13	0:03:13
OPMET-MINUTE	1	Minute	0:00:29	0:00:15	0:00:09	0:00:05
OPMET-ROLLING	1	Minute	0:05:26	0:03:18	0:01:10	0:00:51
PNG	6	Every 6 hrs	0:01:02	0:00:31	0:00:17	0:00:09

4. Conclusion

4.1 Given the above information, the following conclusion is proposed:

DRAFT
CONCLUSION 11/XX ACQUIRE SUFFICIENT BANDWIDTH TO ACCESS WIFS TO MEET OPERATIONAL NEEDS

That States be urged to evaluate and acquire the necessary dedicated bandwidth to access WIFS, based on the type of data to be downloaded.

5. Action required

5.1 The subgroup is invited to:

a) consider the information presented in this working paper;

b) discuss any relevant matters as appropriate; and

c) endorse the above draft conclusion.

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