BAA Service Provider Current Information Technology Network

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1.0   Introduction

CI^2 Aviation Bermuda Ltd., is a dynamic, full-range aviation facility management, information technology, engineering, airport operations, administrative consulting and staffing services organization committed to excellence. CI² Aviation Bermuda is the contractor for Airport Operations and Maintenance Services for the Government of Bermuda, as part of an aviation services contract with the BAA.

Air traffic controllers control and direct air traffic arriving and departing L.F. Wade International Airport, in a safe orderly and timely manner. Controllers provide information and give instructions through radio transmissions, to aircraft in the Bermuda Class D Airspace and keep pilots informed of weather conditions. Air traffic Controllers also control the movement of aircraft and vehicles on the ground. Departure and Arrival control is provided by New York Air Route Traffic Control Center using a radar, radio transmitters and receivers installed in Bermuda. Bermuda Class D Airspace extends up to and including 2,500 ft above ground level, within a 5 statute mile radius of the L.F. Wade International Airport Bermuda, extending to eight statute miles WNW and ESE respectively from the BDA VHF Omni-directional Range/Distance Measuring Equipment (VOR/DME).

The BWS is officially recognized as the island's National Meteorological and Hydrological Service, providing public, marine, tropical and aviation weather forecasts, warnings and climatological services. The BWS supplies weather information to the media, including two local weather-dedicated TV channels and a variety of marine users, including the many visiting yachts. Bermuda Maritime Operations Centre staff relay our forecasts on Marine VHF radio, weather channel 2. The BWS works in close liaison with Bermuda's Emergency Measures Organisation and the US National Hurricane Center. The BWS also operates a comprehensive web site www.weather.bm which is extremely popular with both local residents and visitors. To promote awareness about weather phenomena, BWS hosts tours and endeavours to educate the community by means of public presentations.

Operational staff at the BWS gather information from a variety of sources. International weather observations, bulletins and World Area Forecast System products are obtained via the UK Met. Office, and U.S. National Weather Service. Due to the sparseness of marine observations from the surrounding ocean, forecasters in Bermuda have to place much reliance on the various numerical weather prediction models, imagery and other products from geostationary and orbiting weather satellites. Computer model data and observations are processed and displayed on Visual Weather workstations, supported by both the UK Met. Office and IBL Software Engineering. Observers take surface observations at least every hour, provide synoptic summary observations every few hours and release a weather balloon for radiosonde observations at least once a day.

The GES department employs highly trained technicians who, collectively, maintain all Air Traffic Service Navigational Aids, Communications, Meteorological, and Surveillance equipment currently in use at the L.F. Wade International Airport. The CI² Aviation Bermuda GES department has operated since 1995 in the capacity of private contractors for the Bermuda Department of Airport Operations and the American Federal Aviation Administration (FAA). GES employs certified technicians who have received training from the FAA and equipment manufacturers. GES

technicians currently manage approximately two hundred pieces of operational equipment. Major systems which GES maintain include: RADAR (Aviation and Weather), Air to Ground Transmitters and Receivers (BDA ATC and FAA), Instrument Landing Systems, VHF Omni Ranging and Distance Measuring Equipment, and the AWOS.

Maintenance to the runway and taxiways include surface repair and line marking; maintenance of airfield lighting systems; grounds maintenance; maintenance of emergency power generation; wildlife control; and maintenance of building infrastructure, all help to ensure aircraft operating in and out of Bermuda continue to do so in a safe and efficient manner.

From our vehicle maintenance workshop CI² maintains its own fleet of specialist vehicles and trucks including back-hoe, fork-lift, runway sweeper, and hi-lift. Through an additional contract with the Bermuda Fire and Rescue Service specialist fire vehicles are maintained in accordance with manufacturers' requirements.

As a service company CI² considers its greatest asset to be our employees, and prides itself in developing well-trained individuals capable of completing often complex and safety-critical tasks.

2.0   Current Information Technology Network

The current IT network consists of physical and virtual servers, storage devices, operational and user workstations, network switches, routers, security firewall devices, and software. Virtual servers negate the need for multiple physical computer servers realizing an extensive cost saving as physical servers are virtualized within a software environment. This configuration requires a more robust and less amount of hardware devices. A majority of these items and devices are past their operational lifespan, are discontinued, and no longer supported by their manufacturers.

Four eight year old Dell 2950 servers make up the virtual server network. Prior to the purchase of a Dell NX3230 Network Attached Storage (NAS) device, the Dell 2950 internal hard drives were used for storage. For redundancy, two of the Dell 2950 servers are located in separate buildings; two at ATC and two at GES. Drobo storage devices are also attached for additional supplemental storage and redundancy. The Drobo devices are aging as well and over the years, multiple hard drives have been replaced and continue to be replaced. Frequent failures of this device prior to the start of the CI² contract prompted another stop gap solution by purchasing the required NAS.

There is no replication ability. If a failure occurs, systems are restored from backups.

The aging hardware also contains outdated and discontinued software. A majority of the users are utilizing the discontinued Windows XP for their daily operations. Critical operational and users workstations have been upgraded to Windows 7. The server software is outdated and discontinued as well. Some server systems are forced to run on Windows 2000 Server due to hardware incompatibility and a majority of the other servers are the Windows 2003 version.

In February of 2017, the main file server, an eleven year old Dell PowerEdge 1800 failed causing a major disruption to operations throughout all CI² departments. All files were recovered via

backup and restoral processes. A NAS device was purchased at the start of the CI² contract by DAO and is currently being used as the file server replacement and for all network tasks and is currently **a single point of failure**. The main file server contained a magnetic tape drive for off-site storage of backed up critical data. With its loss, there is currently no off site storage process. One week following the main file server failure, one of the four virtual servers suffered a failure that affected the BWS website by taking down a BWS server. The system was recovered the next day through extensive labor efforts by BWS and GES. On 21JUL17, one of the two core network switches failed impacting operations for all departments and forcing BWS to use backup procedures to disseminate weather information to the aviation and general public. A temporary replacement network switch was purchased and installed on 10AUG17.

The outdated and unsupported MSSQL 2000 Enterprise Database server utilized by the Bermuda Weather Service touches many, if not all, operational and non-operational tasks performed on a day-to-day basis. This includes aviation, marine and public products; many of which are distributed via www.weather.bm. Over the years the quantity of data and demand for low latency data has steadily increased the impact on this server and reduced the responsiveness of the tools used by the Duty Staff. The preferred solution would be to keep this server virtual, but we are at a point where if this option will take too long then the upgrade should be the purchase of physical enterprise quality hardware and software.

All service provider building network cables and switches are CAT6 Gigabit capable and the core servers, network routing, and security devices are housed within equipment racks in the climate controlled equipment rooms.

3.0 Network Diagrams and Devices

This section provides a listing of the CI² Aviation Bermuda current and requested virtual servers and diagrams of the main and various networks. The main server and network device information are provided for reference. The FortiGate 200A devices have been replaced with FortiGate 200B units.

Current and Requested Virtual Servers

#	Server Name	OS and Function	Current
1	HALO_VitalBWS	Linux - Under development. Intended to provide message switching functionality for BWS	New
2	SRVAD02	Windows - Backup Active Directory & Domain Controller	
3	srv-cms-bws	Linux - Training material for BWS staff	
4	TDCF-Encoder	Linux - Message encoding software for BWS	
5	SRVWEB01	Windows - Web and FTP server	
6	Virtual-Center	Windows 2003 - VMWare Virtual Center	
7	VisualWeatherServer2013	Linux - Forecast Workstation Server (One of BWS's high priority servers)	
8	HeliportPC	Windows - Weather Data Display	
9	TAPIT Nova Server	Windows - PBX Call Accounting	
10	METEOWEB	Windows XP - Doppler Weather Data Webserver	
11	serbas01	Windows - Print Server	
12	Thor	Windows - Database Server & Web Server	
13	File Server * New	Windows - Main File Server	
14	AD Server * New	Windows - Main Active Directory and Domain Controller Server	
15	File Backup Server * New	Windows - Main File Backup Server	
16	SQL Server * New	Windows - Main Database Server	
17	Weather Radar	Windows - Doppler Weather Data Transmission	