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FAS32XX/V32XX/SA320: Issue with NVMEM battery capacity and FCMTO error condition

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Symptoms

There are several ways this issue can manifest, including warning and critical system notifications, depending on the battery charge level.

- Warning low limit exceeded 80-hr run-time: BATT_CAP_LOW

Sun Nov 20 00:00:11 CET

[befiler04:nvmem.battery.capacity.low.warn:info]: The NVMEM battery capacity is below normal.

- Critical low limit exceeded 72-hr run-time: LOW_BATT

Mon Nov 21 20:00:00 CET [befiler04:

monitor.nvramLowBattery:CRITICAL]: NVRAM battery is dangerously low.

Mon Nov 21 20:00:00 CET [befiler04:

monitor.nvramLowBattery.notice:notice]: If the NVRAM battery is dangerously low, the system shuts down automatically every 24 hours to encourage you to replace it. If you reboot the system it will run for another 24 hours before shutting down. (The 24 hour timeout may be increased by altering the "raid.timeout" value using the "options" command.

Mon Nov 21 20:00:00 CET [befiler04:

monitor.shutdown.nvramLowBattery.pending:warning]: NVRAM battery is dangerously low. Halting system in 24 hours. Replace the battery immediately!

Mon Nov 21 20:00:00 CET [befiler04: asup.throttle.drop:info]:

Too many autosupport messages in too short a time, throttling autosupport: BATTERY_LOW

AutoSupport Verification of the Issue

AutoSupport (ASUP) messages from a system can be reviewed to determine the status of the NVMEM battery related to this issue:

- If the system has detected a 'warning low' or 'critical low battery' condition, the ENVIRONMENT section of the system ASUP will contain battery sensor details.
- A symptom for this issue can be either that the run-time is less than '80-hr Warning' or less than '72-hr Critical'. Systems above 80 hrs run-time will not produce a message.
- Another symptom is that the "Bat Curr" = 0mA. The charger should be on based on the low capacity level of the battery, and this sensor confirms that there is no current going into the

battery.

- The last symptom for this issue is that "Charger Volt" displays 0V. In a normal operation, it should always be reported as 8200 mV.

Charger Volt	normal	0	mV	--	--	8900 mV
9000 mV						
Charger Cycles	normal	0	cycles	--	--	250 cycles
251 cycles						
Charger Curr	normal	0	mA	--	--	2200 mA
2300 mA						
Bat Temp	normal	20	C	-40 C	1 C	70 C
75 C						
Bat Run Time	warnlow	80	hr	72 hr	80 hr	--
--						
Bat Capacity	normal	3072	mA*hr	--	--	--
--						
Bat Curr	normal	0	mA	--	--	2048 mA
2304 mA						
Bat 8.0V	normal	7400	mV	--	--	8900 mV
9000 mV						
Bat 1.8V	normal	1818	mV	1612 mV	1625 mV	1973 mV
1999 mV						

Sometimes, the only information provided in the ENVIRONMENT section of the ASUP is as below:

```
Battery: Sensor Bat_Run_Time warning low: current custom is 74 ,
critical low is 72 , normal low is 80
```

Systems not on AutoSupport can be interrogated using the SP command system sensors. The details can be found in the procedure provided.

Scope of Affected Systems: Deliveries for all FAS/V32X0 and SA320 systems prior to February 2012 contain battery firmware which is susceptible to the FCMTO issue.

Cause

This message is sent as long as the battery is below the minimum safe voltage required to protect the data in the event of a power failure or unexpected shutdown.

Solution

The battery firmware version must be determined to choose the proper update process. To determine the battery firmware version issue the command "system battery show" from the SP and review the rev_hardware value.

```
SP*>system battery show
chemistry : LION
device-name : bq20z80
expected-load-mw : 90
id : 27100027
manufacturer : EnergySales
manufacturer-date : 4/4/2010
rev_cell : 0x0000
```

```
rev_firmware : 0x0100
rev_hardware : 0x00d1
TI_fw_version : 0x0102
TI_hw_version : 0xa2
serial : 0x0001
status : ready
```

- If the battery firmware revision is 0x00d1, the primary option should be used and SP firmware version 1.3 or newer will automatically update the battery firmware to 0x00d3 and clear the FCMT0 condition.
- If the battery firmware revision is NOT 0x00d1, the secondary option must be used because updated SP firmware will NOT automatically update the battery firmware. It is still recommend that the SP firmware is updated to the current version.

Primary option(preferred):

If the current battery firmware version is d1, mitigation can be done non-disruptively by upgrading the service processor to the most current version. For detailed instructions to install service processor firmware please review [NetApp® Service Processor Firmware Download and Installation Instructions Using Data ONTAP™ Command Line Interface \(CLI\)](#)

Secondary option:

The system battery firmware revision should be identified to confirm if a firmware update is required. Follow steps 1-5 of the section **How to Flash the Battery Firmware** to confirm if an update to the battery firmware is required.

There are two parts to this procedure, **Flashing the Battery Firmware** and **Resetting the FCMT0 flag**. The FCMT0 flag issue can be confirmed by following steps 1-5 of the **Resetting the FCMT0 flag** procedure. For systems which have not encountered the FCMT0 flag issue, there is no need to perform the **Resetting the FCMT0 flag** procedure. There are two scenarios for the systems:

Note: Flashing the battery firmware does not clear the FCMT0 flag.

- Systems which have the FCMT0 flag set condition:
Actions: Flash the battery Firmware and Reset the FCMT0 flag
- Systems which do not have the FCMT0 flag issue:
Actions: Verify the FCMT0 flag issue is not present in the system and flash the battery firmwarexxxxxx`x`

Notes:

- The battery firmware update must be performed prior to resetting the FCMT0 flag.
- This is a disruptive procedure and will require system downtime.
- For HA systems, a takeover and giveback should be managed in conjunction with the system halt required for this procedure, and this might reduce the operational impact of this procedure for some users.

Follow the instructions on the NetApp Support Site to save the two Battery Firmware Files: 'battery-27100027-nexergy.i' and 'battery-27100027-energysales.i' to the <Battery_Firmware_File_Location>, identified on the user's Web server. These are in a zipped package located at this link: [BATTERY FIRMWARE 271-00027](#).

Important: A FAS32XX system with network connectivity through an SP port is required. A Web server is also required to apply the battery firmware update. Download the updated firmware from

the NOW Support site, extract the files from the archive, and place the files on a Web server in a subnet that is accessible by the Service Processor. We will refer to this location as `<Battery_Firmware_File_Location>`. This URL location must be less than 100 characters.

How to enable the SP port (if not currently set up)

Perform the following steps:

1. Connect a network cable to the FAS32XX system SP port.
2. Setup the SP with a static IP address:

```

LOADER-A> sp setup
The Service Processor (SP) provides remote management
capabilities including console redirection, logging and power
control.
It also extends autosupport by sending additional system event
alerts. Your autosupport settings are used for sending these
alerts via email over the SP LAN interface.
Would you like to configure the SP? yes
Would you like to enable DHCP on the SP LAN interface? no
Please enter the IP address for the SP [ ]: 192.168.30.243
Please enter the netmask for the SP [ ]:255.255.254.0
Please enter the IP address for the SP gateway []:192.168.30.1
Do you want to enable IPv6 on the SP ? no

```

How to flash the battery Firmware

Note: User 'naroot' is disabled in C-Mode for Data ONTAP 8.1 and later. User must create an SP admin user account to login. This as a pre-requisite, before shutting down Data ONTAP.

1. Use the following command to halt the system.

```

7-Mode: ontap> halt
C-Mode: cluster::> system node halt -node <local node name>

```

1a. Alternatively, a `cf takeover` can be executed from the partner node in a clustered configuration. From the partner controller, run the following command:

However, before running the command, ensure that `autogiveback` is not enabled (that is, **ON**).

```

7-Mode: ontap> options cf.giveback.auto.enable
C-Mode: cluster::> run -node <node2> -command options
cf.giveback.auto.enable

```

If enabled:

```

7-Mode: ontap> options cf.giveback.auto.enable off
C-Mode: cluster::> storage failover modify -node <node_name>
-auto-giveback false
7-Mode: partner_ontap> cf takeover
C-Mode: cluster::> storage failover takeover -ofnode
<node_name>

```

1b. If AUTOBOOT environment variable is set to **TRUE**, the local node boots to the Waiting for giveback...(Press Ctrl-C to abort wait) prompt.

Use **control+c** to abort waiting and halt the node. Enter 'y' when the system prompts:
Do you wish to halt this node rather than wait [y/n]?

2. Log in to the SP CLI by using **control-G**:

```
LOADER> CTRL-G
```

3. Log in as naroot. Input a password if necessary.

Switching console to Service Processor

Service Processor Login: naroot

4. Enable the diagnostic privileges and display the battery information:

```
SP>priv set diag
```

5. Confirm the battery vendor (EnergySales or Nexergy) and check the rev_hardware values. If the rev_hardware is 0x00d3 or higher, the battery firmware already has the FCMT0 related change. In this case, do not upgrade the battery firmware as these batteries are already updated.

```
SP*>system battery show
```

```
chemistry           : LION
device-name         : bq20z80
expected-load-mw    : 90
id                  : 27100027
manufacturer        : EnergySales
manufacturer-date   : 4/4/2010
rev_cell            : 0x0000
rev_firmware        : 0x0100
rev_hardware        : 0x00d1
TI_fw_version       : 0x0102
TI_hw_version       : 0xa2
serial              : 0x0001
status              : ready
```

Note: For systems running SP versions earlier to 1.2, the manufacturer might not be displayed in the output of the `system battery show` command. To resolve this issue, upgrade to SP version 1.2.2 or later.

6. Flash the battery firmware on to the battery. Use the correct battery firmware file: 'battery-27100027-nexergy.i' or 'battery-27100027-energysales.i' depending on the manufacturer identified in step 5.

When the operation is completed successfully, you will see the confirmation: Battery firmware update completed.

For Energy Sales Batteries:

```
SP*> system battery flash
```

```
http://<Battery_Firmware_File_Location>battery-27100027-energysales.i
```

-OR-

For Nexergy Batteries:

```
SP*> system battery flash
http://<Battery_Firmware_File_Location>battery-27100027-
nexergy.i

Downloading battery firmware image ... Successful
Accessing battery ...
Flashing 27100027-EnergySales battery FW revision from 'd1' to
'd3' ... done
Disabled battery auto update after manual firmware flash
Battery firmware update completed.
```

7. Perform a battery verify.

When the operation is completed successfully, you will see the confirmation: Verify test passed

For Energy Sales Batteries:

```
SP*> system battery verify
http://<Battery_Firmware_File_Location>battery-27100027-
energysales.i
```

-OR-

For Nexergy Batteries:

```
SP*> system battery verify
http://<Battery_Firmware_File_Location>battery-27100027-
nexergy.i
Downloading battery firmware image ... Successful
Verify test passed
```

8. Verify the rev_hardware has changed to 0x00d3.

```
SP*> system battery show
chemistry           : LION
device-name         : bq20z80
expected-load-mw    : 90
id                  : 27100027
manufacturer        : EnergySales
manufacturer-date   : 4/4/2010
rev_cell            : 0x0000
rev_firmware        : 0x0100
rev_hardware        : 0x00d3
TI_fw_version       : 0x0102
TI_hw_version       : 0xa2
serial              : 0x0001
status              : ready
```

- SP*>CTRL-D to exit SP shell

```
LOADER> boot ontap
```

- 10a. On a cluster system, when the node boots to the 'Waiting for giveback... (Press Ctrl-C to abort wait)' prompt, perform a giveback from the partner node:

```
C-Mode:cluster::> storage failover giveback -ofnode <node name>
```

1. Enter the SP shell:

```
ontap> CTRL-G
```

- 1a. Optional method to access the SP shell: Use SSH to the SP interface, to get to the SP CLI for issuing commands.

2. Run the following command from the system's console port:

SP* > system sensors

Sensor Name		Current	Unit	Status	LCR
LNC	UNC	UCR			

-----+-----+-----+-----+-----+-----
 -----+-----+-----+-----+-----+-----

Bat_1.8V	1.819	Volts	ok	1.613
1.625	1.974	2.000		

Bat_8.0V	8.100	Volts	ok	na
na	8.900	9.000		

Bat_Curr	0.000	Amps	ok	na
na	2.048	2.304		

Bat_Capacity	3.840	Amps * hour	ok	na
na	na	na		

Bat_Run_Time	80.00	hour	crit	72.000
80.000	na	na		

Bat_Temp	21.000	degrees C	ok	-40.000
1.000	70.000	75.000		

Charger_Curr	0.000	Amps	ok	na
na	2.200	2.300		

```
Charger_Cycles | 0.000 | cycles | ok | na |
na | 250.000 | 251.000
```

```
Charger_Volt | 0.000 | Volts | ok | na |
na | 8.900 | 9.000
```

3. Check if “Bat_Run_Time” is below 80-hr Warning or below 72-hr Critical.
4. Confirm that “Bat_Curr” = 0 mA and “Charger_Volt” = 0 mV.
 - For systems below 72-hr Critical Low threshold – LOW_BATT, take immediate action. The shutdown sequence has begun.
 - For systems below 80-hr but > 72-hr 'run time,' there is some time prior to initiating the shutdown sequence. Under normal conditions, a typical battery can take up to 14 days to decrease from 80 to 72-hr 'run time'.
5. Press **CTRL-D** to exit the SP shell (if SSH was used to access the SP, connect to the system console port).

*****Proceed with the following steps during a scheduled maintenance window*****

6. Run the following command to halt the system:

```
7-Mode: ontap> halt
```

```
C-Mode: cluster::> system node halt -node <node_name>
```

6a. Alternatively, a `cf takeover` can be executed from the partner node in an HA configuration.

From the partner controller, run the following command. However, before doing that, ensure `autogiveback` is not enabled (that is, **ON**).

```
7-Mode: partner_ontap> options cf.giveback.auto.enable
```

```
C-Mode: cluster::> node run -node <partner_ontap_node>
partner_ontap_node> options cf.giveback.auto.enable
```

If enabled:

```
7-Mode: partner_ontap> options cf.giveback.auto.enable off
```

```
C-Mode: cluster::> storage failover modify -
node <partner_ontap_node> -auto-giveback false
```

```
7-Mode: partner_ontap> cf takeover
```

```
C-Mode: cluster::> storage failover takeover -ofnode <node_name>
```

If the AUTOBOOT environment variable was set to TRUE, the local node boots to the Waiting for giveback... (Press Ctrl-C to abort wait) prompt. Press **CTRL+c** to abort waiting and halt the node. Enter **y** when the system prompts, Do you wish to halt this node rather than wait [y/n]?

7. Enter Maintenance Mode. While booting Data ONTAP, when the CTL-C message appears, press **<CTL-C>** to interrupt the boot process.

```
LOADER> boot_ontap
```

Select 5 as the Maintenance Mode boot method.

8. Clear the 'no charger' condition by running the following command:

```
*> halt
```

9. Recover the system by running the following command:

```
LOADER> boot_ontap
```

For systems with less than 72 hr “runtime,” the system will not boot Data ONTAP until the battery has charged to a minimum of 72 hr “runtime” is reached. This is usually achieved in a few minutes, the command **CTRL+G** could be used to bypass the wait period, depending on the user environment.

Note: If the wait period is bypassed, the warning messages will continue until the battery is sufficiently charged beyond the 72 hour threshold.

- 9a. If a takeover was performed per step 6a, the controller will boot to waiting for giveback.

From the partner controller, run the following command:

```
7-Mode: partner_ontap> cf giveback
C-Mode: partner_ontap(node2)> storage failover giveback -
ofnode <local node(node1)>
```

10. Enter the SP shell, as indicated in Step 2.
11. Confirm the battery status by running the system sensors command, as indicated in Step 2.
12. Verify that the 'Charger_Volt' is 8200 mV and there is 'Bat_Curr' >0 mA (if the battery needs to be charged). If the battery is fully charged, Bat_Curr will be 0mA and 'Charger_Volt' will be 8.200 V.

Recheck 'Bat_Run_Time': This value should be increasing. For systems that do not reach the 72 hr 'runtime' threshold, the battery should recover and the warning messages will then discontinue.

13. Press **CTRL-D** to exit the SP shell (if SSH was used to access the SP, connect to the system console port).

Restore the auto giveback option to the original state:

```
7-Mode: partner_ontap> options cf.giveback.auto.enable <on | off>
C-Mode: partner_ontap(node2)> storage failover modify -node
<local node(node2)> -auto-giveback <true | false>
```

Related Links:

- BUG [536445](#)
- BUG [570895](#)

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