RFID Access Control System
MOD Addendum to the System Overview Document

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https://github.com/TeamPracticalProjects/MN_ACL/blob/master/Terms_of_Use_License_and_Disclaimer.pdf

TABLE OF CONTENTS.

FORWARD.

This document is an addendum to the RFID_ACS_Overview_Document that can be found in this repository, see:

https://github.com/makernexus/RFID_System/blob/main/Documents/RFID_ACS_Overview_Document.pdf

This document amends the RFID_ACS_Overview_Document to include Manager-On-Duty (MOD) functionality that has been added to the Maker Nexus RFID Access Control System, effective July 2022. This new capability is an addition to the standard RFID Access Control System functionality by which members check-in and check-out of Maker Nexus using their RFID badges.

MOD BACKGROUND.

Maker Nexus policy is that there must be a Manager On Duty (MOD) designated and present in the facility at all times that the facility is open to members. The MOD is responsible for safety and security of the facility, as well as being the go-to person for any issues that members might have with Maker Nexus equipment or with the facility in general.

Only certain trained staff members are eligible to be MODs. The Executive Director is responsible for training and certifying MOD eligibility among Maker Nexus staff and for ensuring that there is an assigned MOD at all times that the facility is open to members.

It is important for members to be able to determine the current MOD at any time that they may need MOD assistance. Prior to deployment of this new capability within the RFID Access Control System, the name of the currently active MOD would be manually affixed to a board near the facility's front desk. This system worked, but it was a bit cumbersome to use and it was difficult to keep current. Furthermore, some members might not know what the MOD looks like when they need to engage the MOD, and no permanent record of MOD duty times was available for retrospective analysis.

This enhancement to the RFID Access Control System now allows an MOD-eligible person to check in as the current MOD, automatically replacing the previous MOD and displaying the MOD's photo on the facility display. The enhanced system ensures that there is only one designated MOD at any given time (unless the facility is closed), that only MOD eligible people can become MOD, that it is easy for the newly on-duty MOD to take the place of the previous MOD, and that it is easy for members to know who the current MOD is and what s/he looks like.

REQUIREMENTS.

The basic requirements for the MOD enhancement to the RFID Access Control System are as follows.

1. An MOD eligible person who comes on-duty as the MOD shall be able to transfer the MOD assignment to themselves via (any one of) the RFID Check-in station(s).

2. Only the person becoming the on-duty MOD shall be able to transfer the MOD assignment to themselves, using their Maker Nexus RFID badge.

3. Only an MOD eligible person shall have the capability of gaining the MOD assignment on the RFID Access Control System. If a non-MOD eligible member tries to check-in as the current MOD, the system shall check them in or out as an ordinary member.

4. The list of MOD eligible persons shall be kept in the facility database, based upon eligibility information supplied by the Executive Director.

5. An MOD eligible person shall be able to check-in to Maker Nexus as an ordinary member, e.g. if they are using the facility outside of their assigned MOD shift.

6. An MOD eligible person who is checked-in to Maker Nexus as an ordinary member shall be able to upgrade themselves to current MOD status at the (any) check-in station by checking in as MOD. This action shall promote the person to MOD as opposed to checking them out of the facility.

7. The MOD shall check out of the Maker Nexus facility when leaving using the ordinary checkout procedure for any member.

8. If the current MOD checks out of the facility, the fact that there is no current MOD and that the facility is (by policy) closed shall be prominently displayed on the facility display.

9. The MOD capability of RFID Access Control System shall be designed to prevent someone from accidently checking in with the wrong designation. This requirement means that an MOD eligible person who wished to become the new MOD must take some affirmative action on the check-in station in order to become the new MOD. The check-in station must preclude being left in a default state that checks the next person in as MOD.

10. The MOD capability shall use the existing RFID Stations without hardware modifications. Note that the ADMIT (green) indicator is also a momentary pushbutton switch and the REJECT (red) indicator is also a mechanical push-on/push-off switch. These switches are otherwise unused and may be used to implement the MOD functionality required herein.

OPERATION.

The green ADMIT indicator/pushbutton has been chosen to implement the added MOD functionality to an RFID Check-in station. Per prior procedure, this pushbutton was normally not used. Ordinary member check-in/check-out operations are unchanged from the previous design when this pushbutton is not activated, even if a member checking in is MOD-eligible. This is in accordance with requirements #5, #7 and #10.

In order to go On Duty as the current MOD, the MOD eligible person presses and holds the ADMIT pushbutton until their RFID card is accepted (indicated by a single short beep). This is in accordance with requirement #9. The green ADMIT light is illuminated while the button is depressed. The button may be released after the user's RFID card is read. If the user is MOD eligible, the user is checked-in to the facility and designated as the On Duty MOD in the facility database. This is accordance with requirement #3. The Check-in station responds with an MOD welcome message on the LCD as well as a double set of "happy" beeps on the station's buzzer. Going On Duty as MOD will happen regardless of whether the user is already checked in to the facility as a member or is just arriving to check in. This is in accordance with requirements #1, #2 and #6.

If a non-MOD eligible user tries to check-in as MOD using the above procedure, they will checked-in/out as an ordinary member, in accordance with requirement #3.

Checking out of the Maker Nexus facility always uses the current procedure, regardless of who is checking out. Any checked-in person who taps their RFID badge on a Check-in station will be checked out of the facility. When the On Duty MOD checks out of the facility, the facility display shows that there is no MOD and that (by policy) the facility is closed – see figure 1.

Figure 1. The Facility is Closed (no MOD).

Assume that MOD-eligible person “Stanley” now opens the facility and goes On Duty as MOD. The facility display changes to figure 2.

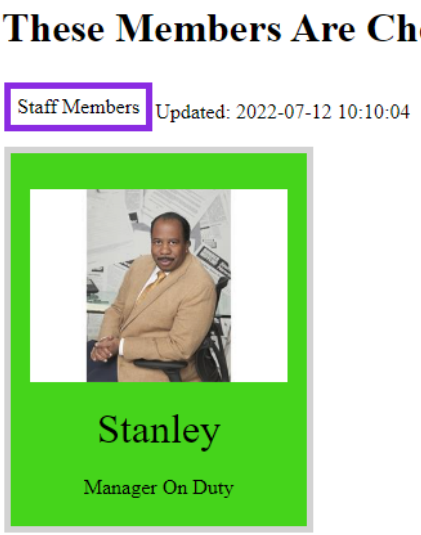

Figure 2. Stanley is MOD – Facility is Open.

Next, let’s assume that Maker Nexus member Pam checks into the facility. The facility display now shows figure 3.

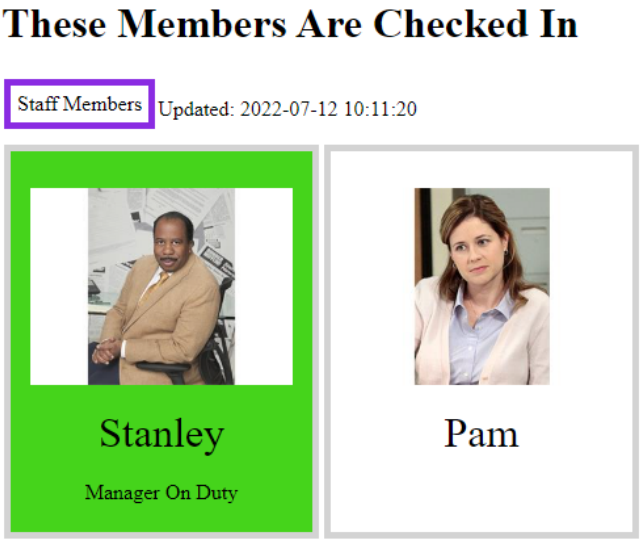

Figure 3. Ordinary Member Checks in.

Next, let’s assume that MOD-eligible staff member “Dwight” checks into the facility as an ordinary member. It is not yet time for Dwight's assigned MOD shift. The facility display shows figure 4.

Figure 4. MOD-eligible Checks in as Ordinary Member.

Note in figure 4 that Dwight's picture has a magenta border, indicating that Dwight is a staff member but that Stanley is still the MOD.

It is now time for Dwight to take over as MOD. Dwight returns to a Check-in station and follows the procedure to check in as MOD. The Station assigns Dwight as the on-duty MOD and the facility display is now depicted in figure 5.

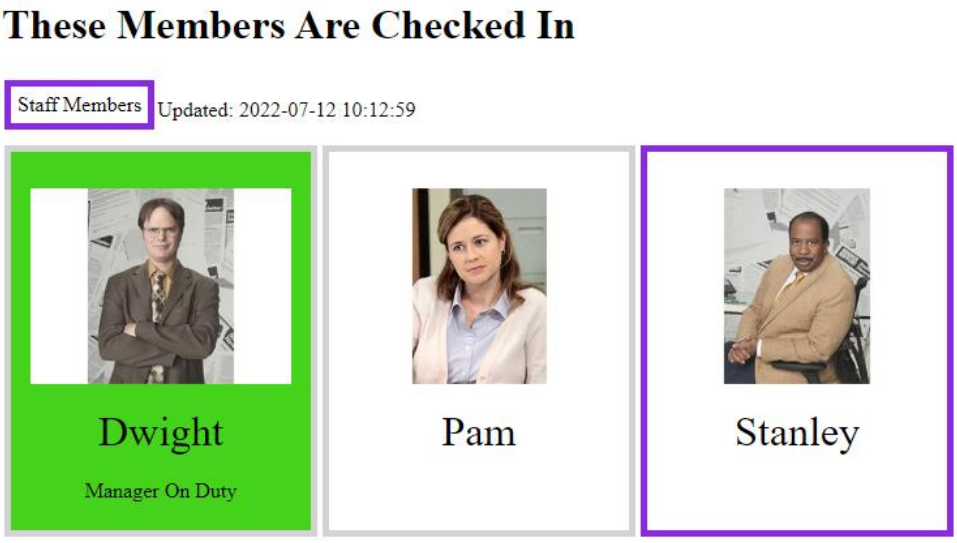

Figure 5. Dwight Takes Over as MOD.

Note that Stanley, the former MOD, is still shown as being checked into the facility, but is now an ordinary staff member and no longer the MOD.

Next, assume that Pam checks out of Maker Nexus by tapping her RFID card at a Check-in station. The facility display is shown in figure 6.

Figure 6. Pam Checks Out.

Next, assume that Stanley is done for the day and checks out of Maker Nexus by tapping his RFID card on a Check-in station. The facility display changes to figure 7.

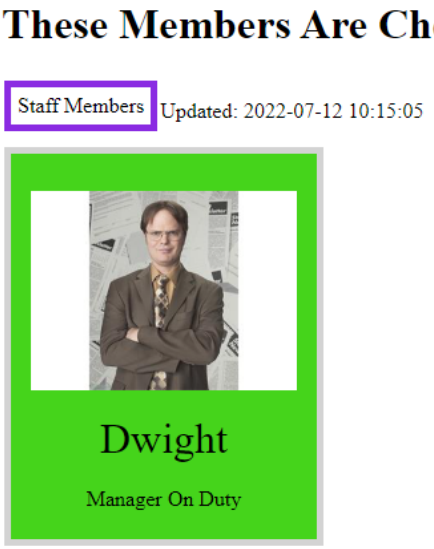

Figure 7. Stanley Checks Out.

It is now the end of the day and all members have checked out, except for Dwight. Dwight is the current MOD and is responsible to ensure that the facility is empty and ready to be closed. Dwight then taps his RFID card on a Check-in station and closes up the facility. The facility display shows the facility is closed – see figure 1. This is in accordance with requirement #8.

DESIGN CHANGES FOR MOD.

This is a top level description of the changes to the Maker Nexus Access Control System that have been made to implement the MOD functionality.

Station Hardware.

There are no changes at all to the Station hardware. This is in accordance with requirement #10. Note that the ADMIT indicator must be a momentary pushbutton switch and that this pushbutton must be wired to the PCB signal and ground pins. This is as specified in the released hardware design, but now the pushbutton functionality is used by the station firmware.

Station Firmware.

The released version of the RFID station firmware is version 2.7 or higher. There are no changes to the firmware implementation of the Admin station functionality nor to the Location/Equipment station functionality. The only changes are to the Check-in station functionality.

The ADMIT (green) pushbutton is wired to Argon pin D8 which is now setup as INPUT_PULLUP. The main check-in loop tests for activation of this button and lights the button backlight when the button is pressed, prior to an RFID card tap. When the user taps their RFID card, the button is again read (debounced) and, if activated, the check-in message published to the facility database (via a webhook) has an MOD parameter added to its JSON data. As before, the user's RFID card is checked for validity and the user is checked for current membership in good standing (based upon data from EZ Facility).

The station firmware does not implement the decision-making logic to determine if the person can become MOD. This "business logic" is part of the cloud functionality associated with the facility database. The webhook JSON response to the check-in/check-out message indicates the check-in status – one field for MOD action and one for checkin/out. Note that for a member who is not MOD eligible the MOD action response is "no change". The station firmware responds with the appropriate LCD display message and station beep sequence.

Facility Database and PHP Scripts.

The schema of the facility database has been enhanced by adding a field (MOD_Eligible) to the clientInfo table. That field is set to 1 for each member who is MOD eligible (per requirement #4). This release of MOD functionality does not have a user interface for the Executive Director to manage MOD eligibility. This is due to current security issues. Rather, the Executive Director must have an RFID database administrator make any necessary changes to this list.

The facility database also flags the current MOD, if any, as a record in the rawData table.

The ”business logic” associated with checking in an MOD is implemented in the PHP check-in script that is the target of the check-in/check-out webhook. This script uses the new facility database information to make the decision about MOD or regular check-in, if MOD check-in has been indicated by the check-in message from the check-in webhook. This script also changes the current MOD indicator in the facility database accordingly and responds to the webhook with the MOD decision.

The PHP script that produces the HTML for the facility display has likewise been enhanced to show:

- The current MOD, with a highly visible background.
- Any staff members checked in as not MOD, with a suitable highlight.
- Other members, as depicted previously.