EMA-30, EMB-30, and ECU-30 Quick User Guide

cmirisLib2 V2.1.1

Sep 2014
CMITECH Co., Ltd.

Changes in V2.1.1 (Sep 2014)

EMX Family:

- The depth of field is now adjustable with cmi_setDepthOfField().
- The center of depth of field is 330mm from the front surface of EMX.
- The minimum and default of each depth of field is 15mm, so total depth of field is 30mm. This is the depth of field for enrollment.
- The maximum is 35mm for inside and 25mm for outside, total maximum depth of field is 60mm, which is for recognition for physical access control application.

Changes in V2.1.0 (1/2, July 2014)

Note: These change notes apply to the pre-release versions of the EMA-30 and ECU-30 libraries that were delivered with pre-production (beta) units. Please disregard if your units were shipped after July 16, 2014.

- Most bugs were fixed including lockup problem during operation. The new cmirisLib2 library will survive with the frequent USB removal and arrival actions. But in artificial testing, this may cause the USB driver to crash in ECU-30 which cannot be recovered without system reboot. In order to recover the system automatically, "emaUsbMonitor" for EMA-30 and "ecuUsbMonitor" for ECU-30 will be also provided, which will monitor USB status. If something goes wrong in USB driver, it will reboot the EMA-30 or ECU-30. The "emaUsbMonitor"should be found in the folder /usr/local/bin and "/usr/local/bin/emaUsbMonitor >> usbMonitorLog start" should be added at the last line of /etc/rc.local to make it run as a daemon. It should be noted that "emaUsbMonitor" is also necessary for EMA-30, even though there is no chance for USB cable disconnections.
- Face tracking performance on EMA-30 and EMB-30 has been improved.
- Capture process has been optimized for faster performance.
- libcmirisLib_arm_1.x.xx.so without MIRLIN Algorithm will not be released any more, since libcmirisLib2_arm_2.x.xx.so is libcmirisLib_arm_1.x.xx.so plus the MIRLIN Algorithm.
- "Either eye" capture mode and "Vocal cues" have been added. Please refer to CMIRIS_SDK_Windows_User_Manual_V1.2.0_July 2014 for detailed information.
- Move up/down and press/release events are added in Device Manager Event.
- Auto adjustment of target intensity was added to avoid sclera saturation in small percentage of subjects, thereby improving FTC rate.

Changes in V2.1.0 (2/2, July 2014)

- The current indicator color is now available in the field of leftPosition or rightPosition in "CMI_IMAGE_INFO" structure for additional feedback to user.
- Rare case of software failure when motor is opened was fixed.
- Rare case of software failure (lockup) for "cmi_closeDevice()" problem was fixed.
- Other minor bugs were fixed.
- Positioning color indication (blue, green, red) was significantly improved to be more responsive and eliminate occasional error in indicator when subject was too close.
- Iris image margins were set as specified in ISO/IEC 19794-6:2011(E), so that the capture area (X and Y dimensions, not Z) was increased.
- Two voice cues were implemented: "Please come closer" and "Please move back". To support voice cues, the new event "CMI_EVENT_INDICATOR" was added, which notifies the indicator color change (blue or red) and the moment when the voice cue should be played. Voice cue sound files are .wav files that can be customized by customer for language or other preferences.
- Either Eye mode was added. In this mode, device tries to capture both eyes first and if the number of frames elapsed after one eye is captured exceeds "maxFrameDiffinEitherEyeMode", then device just returns image from only one eye. "maxFrameDiffinEitherEyeMode" can have the values from 3 to 9, referring to the number of frames.Rare case of failure in motor open was fixed.
- The new option whether to return to the initial motor position after successful capture was added. It can be enabled or disabled using cmi_setMotorReturnToInitEnabled() before cmi_startCapture() is called.
- CMIMIRDemo will now allow either eye enrollment and recognition.

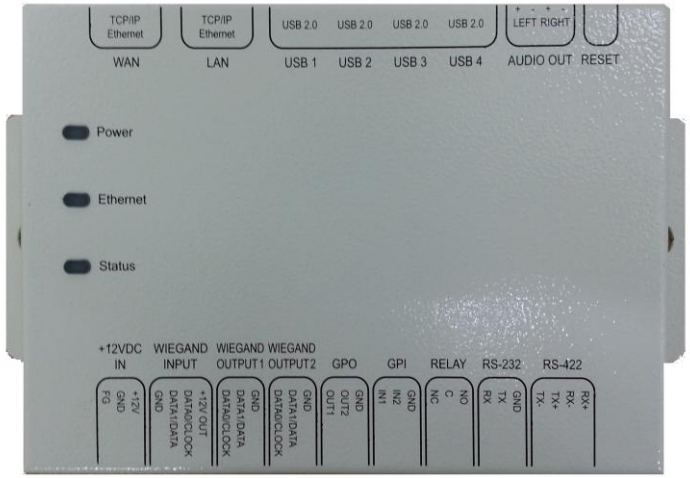
Changes in V2.0.3 (Jan. 2014—Old Note)

Note: old software version v2.0.3 applies to EMA-30 beta units only. Please disregard if your units have been shipped after May 1, 2014.

- There was a bug in ARM Linux cmirisLib2 library that made EMA / EMB units freeze during capture process. This bug has been temporarily fixed and it will require a firmware upgrade for fundamental improvement. All new production units shipped since May 1, 2014 have the current version of firmware for the EMA and EMB, which is 1.1.16.
- In the released SDK, all folders have been moved under /usr/local/. Please copy all the folders into /usr/local/ and set file's attribute appropriately. cmirisLib_arm_1.1.3.so without MIRLIN algorithm is also released which is used by EMXDemo.
- Known bug: In EMXDemo, USB removal is handled correctly but it is not in CMIMIRDemo. This bug is under investigation.
- Note: "dmesg" will show the kernel message "usb 1-2.1.2: usbfs: usb_submit_urb returned -121" after the capture process. This message is not error but USB debug message and will be off in the release version of Linux.
- Note: "libcmirisLib2_arm_2.0.3.so" was linked with /lib/libusb-1.0.so.2 (libusb-1.0.so.2.0.0) which must reside in the folder /lib. There is another libusb-1.0.so in the folder /lib/arm-linux-gnueabihf/libusb-1.0.so.0 (libusb-1.0.so.0.1.0) which is the older version.

Overview

EMA-30 / EMB-30



ECU-30

- EMA-30: Embedded processor is inside.
- EMB-30: connected to ECU via USB.

EMA-30 to PC Connections

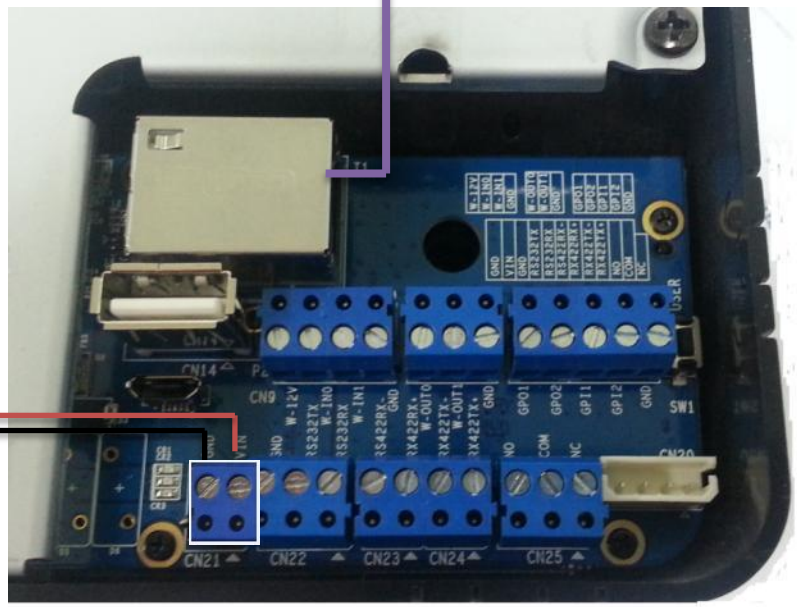
Direct Ethernet cable connection

EMA-30's static IP address was set to 192.168.5.100 in factory.

EMA-30 Power (system supplied with Quick Connector)

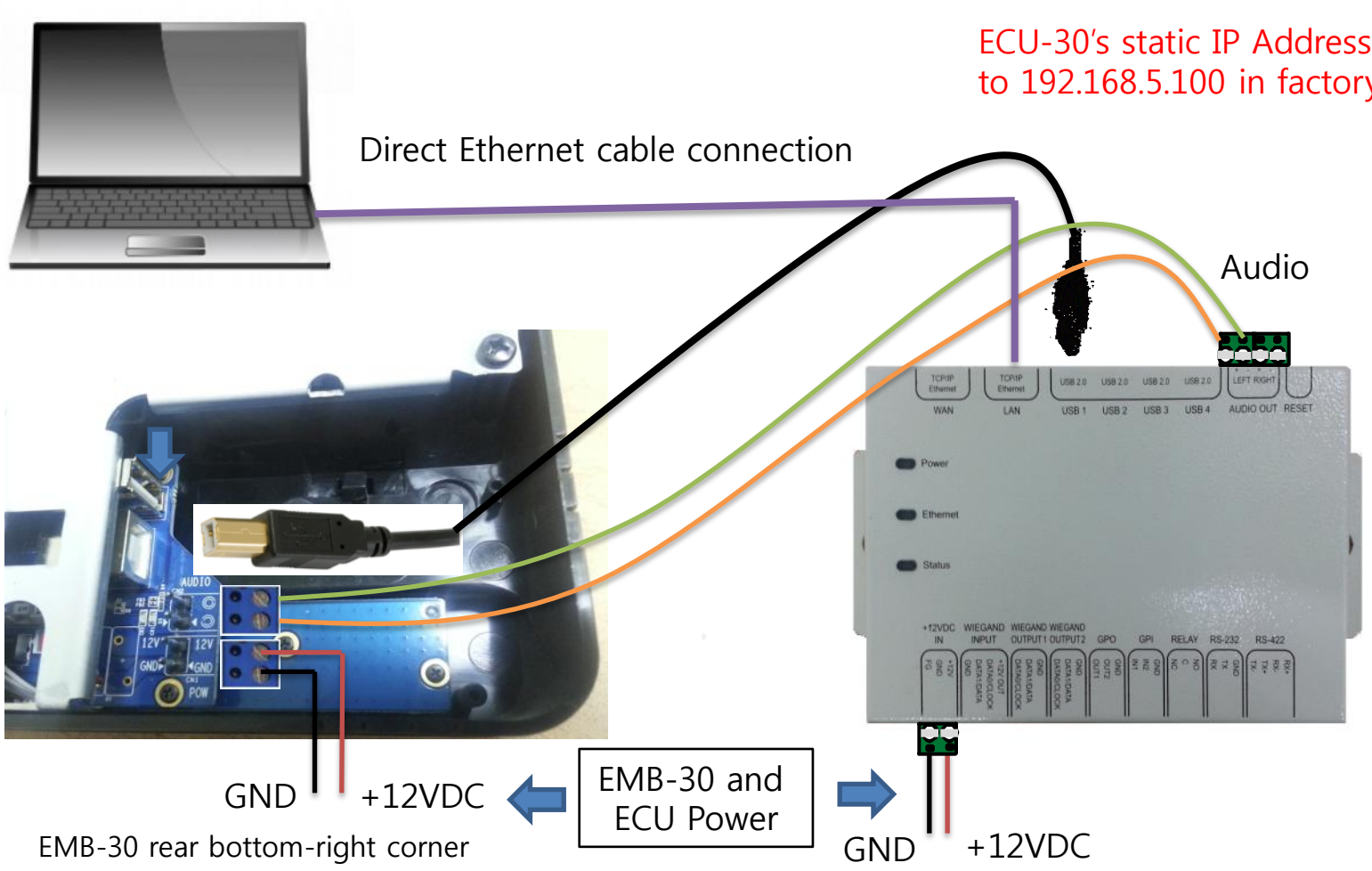
+12VDC

GND



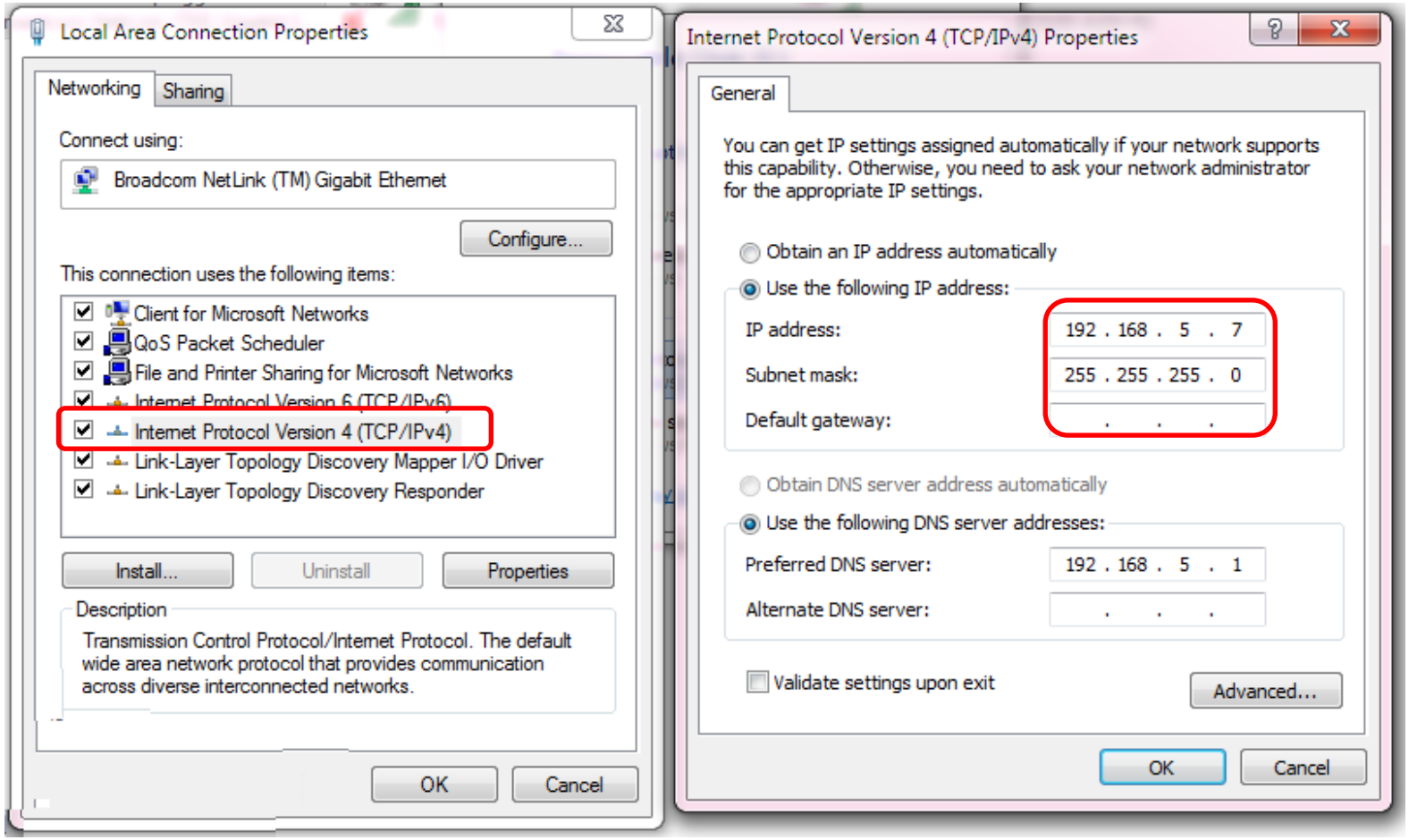
EMA-30 rear bottom-right corner

EMB-30+ECU-30 to PC Connections



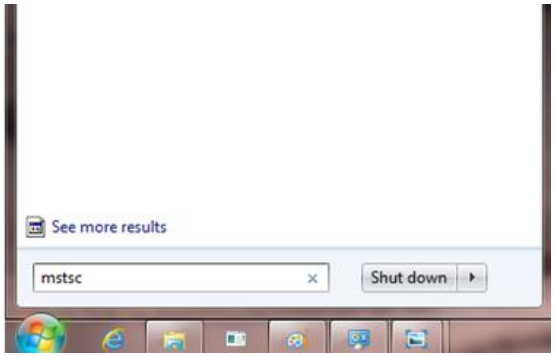
Remote Login to EMA-30/ECU-30 from PC

- Set the PC's IP address as follows. The PC's address can be 192.168.5.xxx.



Remote Desktop Login

Windows 7 "Search program and files"

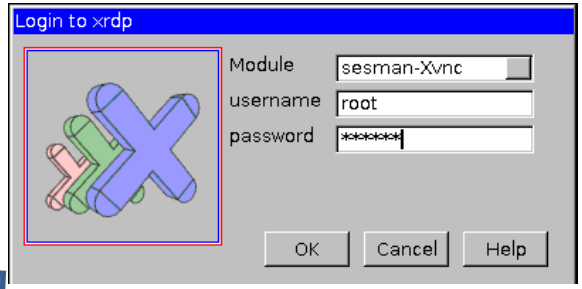


Type "mstsc" Command

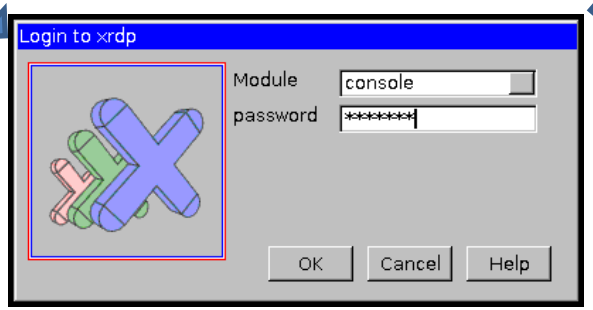
Enter the IP address of EMA/ECU

Type "192.168.5.100" and select connect

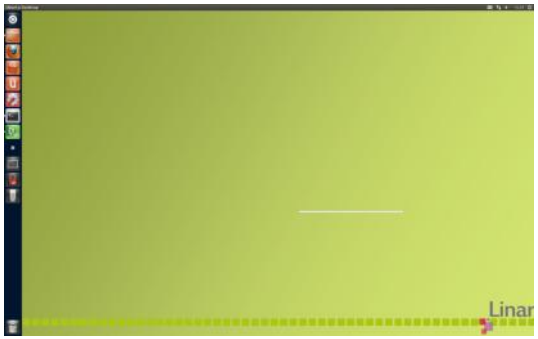
Select Module as "sesman-Xvnc" for user mode and Type username as "root" and password as "linaro" and press OK.



Option: select Module as "console" for console mode and there was no password set currently. In the future the console password will be set as "cmi1003".



Linaro Desktop



Now, a user has logged in to Linaro Desktop. If CMIMIRDemo was run as a startup application, you should log in as "console" to see CMIMIRDemo on the screen.

CMITECH IMAGING EXPERTS

Files in EMA-30 and ECU-30 (1/2)

- Please use the latest version of libraries (currently V2.1.0) provided separately in the SDK. Please do not include any files that are only necessary for your development (most of files in /usr/local/bin/, /usr/local/include/ /usr/local/src/CMITECH and /usr/local/share/CMITECH) in the device when the EMA-30/ECU-30 is provided to your end-customers.

- The demo application's name is "CMIMIRDemo" which is in /usr/local/bin/, and the source code of "CMIMIRDemo" can be found in /usr/local/src/CMITECH/.

- This demo application requires library files "libcmirisLib2_arm_2.1.0.so" and "libemaLib_arm_1.0.1.so" in the folder of /usr/local/lib/. The library "libcmirisLib2_arm_2.1.0.so" has the capability to generate and match iris templates using MIRLIN Algorithm by Smart Sensors Ltd. **In order to use these MIRLIN functions, MIRLIN License should be purchased separately with EMA-30, EMB-30, and EMX-30, so that MIRLIN License level in the device should be set to 1 in the factory. Please refer to page 15 for MIRLIN Licensing.** If the MIRLIN License level is 0, then the template generation and comparing functions will return error CMI_MIR_ERROR_INVALIDE_LICENSE. Please refer to /usr/local/doc/CMIRIS2_SDK_Linux_User_Manual_V2.1.0.pdf for iris template generation and matching functions.

- "libcmicolorLib_arm_0.9.0.so" is not used at this moment but will be used for color conversion of the face image when the SDK for color face capture in Linux is completed. Currently the color face is only supported in Windows.

- The additional files required by "CMIMIRDemo" is in the folder /usr/local/share/CMITECH/. The database file is "Enroll.db" and to reset the enrolled data base, just delete "Enroll.db". Then the new database will be created when CMIMIRDemo is executed next time.

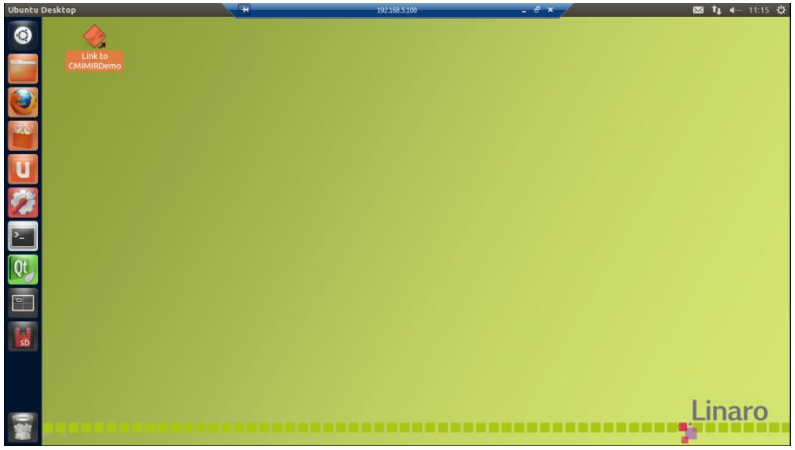
Files in EMA-30 and ECU-30 (2/2)

- EMA-30 and ECU-30 provide the interfaces necessary for physical access control applications such as Wiegand in/out, relay, RS-485 and GPIO. These interfaces can be programmed with the library "libemaLib_arm_1.0.1.so". There is a test application, "emaTest", that is provided in /usr/local/bin/ directory; the source code of "emaTest" is in /usr/local/src/CMITECH/. **It is very important to note that at least 5 seconds of delay should be put before ema_open() is called, if the application is executed as a startup daemon. Otherwise, the emaLib does not work as expected.**

- In the folder /usr/local/bin, "emaUsbMonitor" for EMA-30 and "ecuUsbMonitor" for ECU-30 are also provided, which will monitor USB status. If something goes wrong in USB driver, it will make the EMA-30 or ECU-30 to reboot. In order to make it run as a daemon "/usr/local/bin/emaUsbMonitor >> usbMonitorLog start" should be added at the last line of /etc/rc.local. It should be noted that "emaUsbMonitor" is also necessary for EMA-30, even though there is no chance for USB cable disconnections.

- As for WiFi USB dongle support in EMA and ECU, the driver of Realtek 8188eus chip set has only been ported to Linaro at this point. Currently WiFi is configured as DHCP in Linaro and you can set the wireless password after login as root. The performance of this WiFi USB dongle will depend on the environment of installation site, so please test the performance before the actual installation.

Running CMIMIRDemo on the desktop



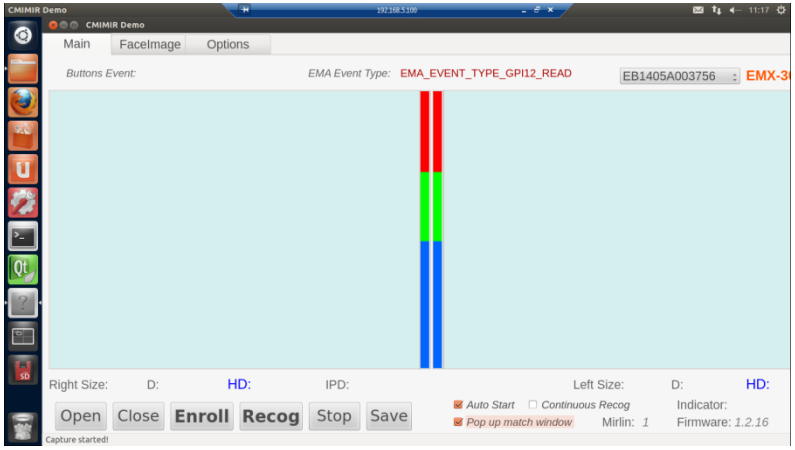
The above picture shows the desktop of Linaro operating system on EMA-30 with shortcut to CMIMIRDemo.

Double click the CMIMIRDemo icon to run the application.

If the icon does not exist, move to /usr/local/bin to find CMIMIRdemo. Then right click and select "Make Link" function, and then drag link to desktop.

If the new libraries are installed or updated, then "sudo ldconfig" should be executed in the terminal to reload the libraries in the LD_LIBRARY_PATH.

Need to enable "Allow executing file as program" in Properties > Permissions to make excutable.



The above figure shows CMIMIRDemo application interface. The application starts recognition automatically if "Auto Start" and "Continuous Recog" check boxes are checked.

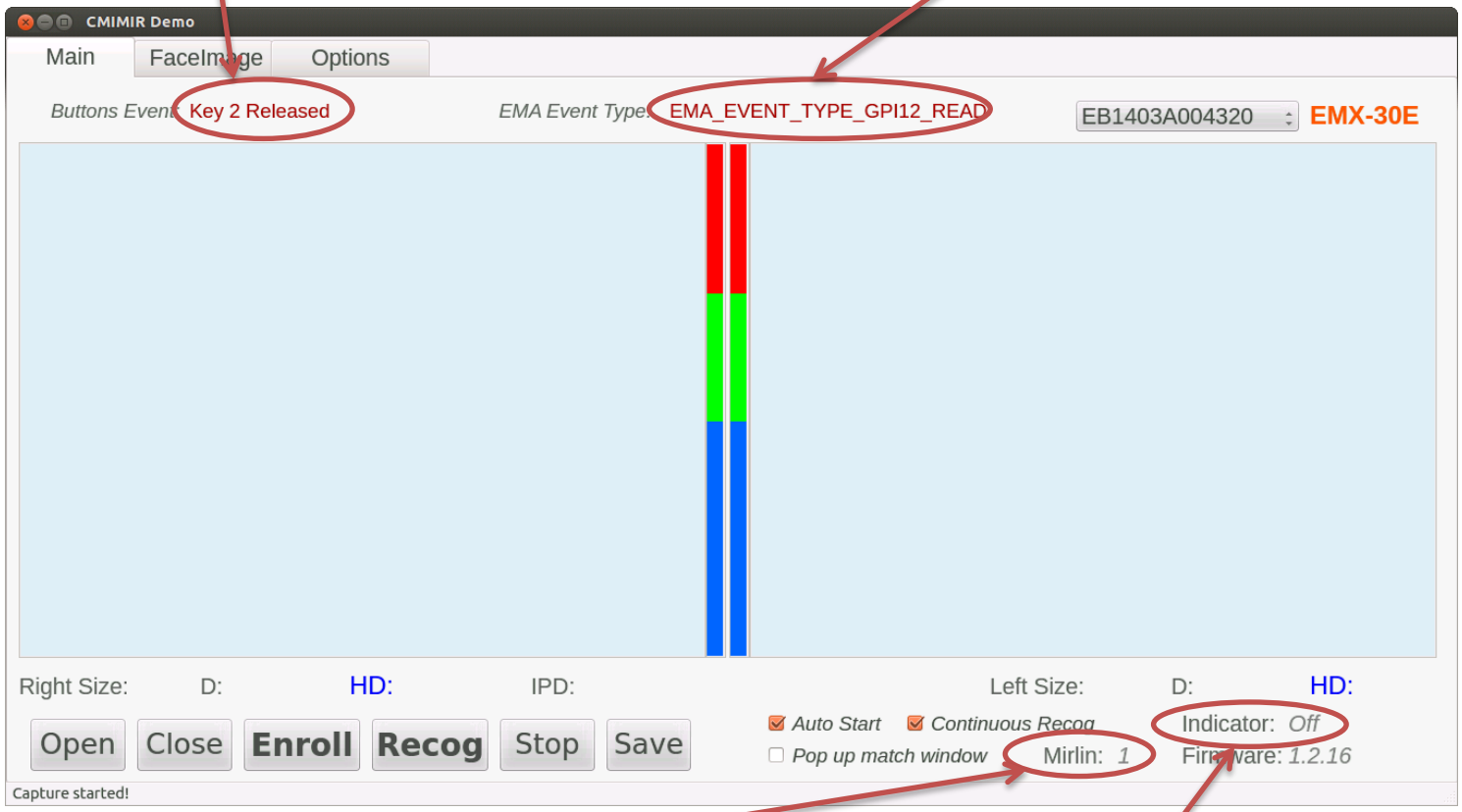
- "Enroll" will capture either or both irises and save the iris templates and face into the database "Enroll.db". The face image and iris image(s) will be saved in the folder /usr/local/share/CMITECH/EnrolledImages/. To reset the database, just delete "Enroll. db" and the image files in EnrolledImages/. Then the new database will be created when CMIMIRDemo is executed next time.
- If system left in Continuous Recog mode, then it will continue to operate after Remote Desktop is disconnected.
- Default is "Either Eye" mode.

CMIMIRDemo (1/2)

- CMIMIRDemo is a simple demo application which shows the EMA-30 and EMB-30/ECU-30 features, including the Smart Sensors Ltd. MIRLIN Algorithm.
- Please refer to /usr/local/src/CMITECH/CMIMIRDemo_src/ for the source code of this application.

Key buttons, move up/down and tamper switch events. These events come through DM (Device Manager).

Wiegand, GPIO, and Relay events

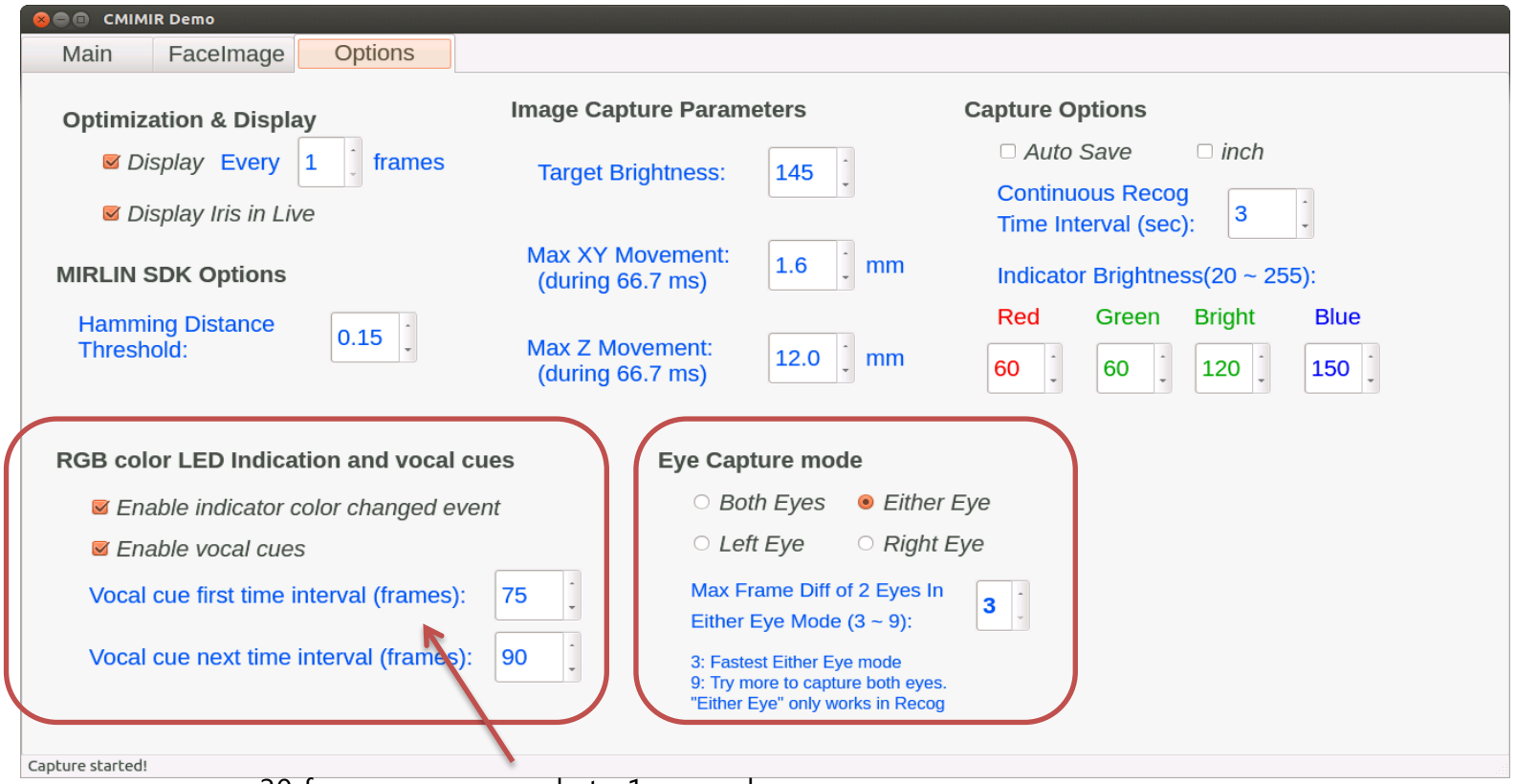


MIRLIN License enabled: 1

Current color RGB Indicator

CMIMIRDemo (2/2)

- There are 3 new features introduced in V2.1.0:
  1. Either Eye mode;
  2. RGB color indicator change events; and
  3. Vocal cues.
- CMIMIRDemo provides the "Options" tab where these new features can be tested.



30 frames corresponds to 1 second.

Smart Sensors MIRLIN Licensing

- The Smart Sensors MIRLIN run-time code is embedded in "libcmirisLib2_arm_2.1.0.so" in order to allow convenient access to the MIRLIN encoding and matching algorithm functionality.

- This functionality must be enabled in the factory, which is set within the EMA-30 or EMB-30 firmware prior to shipment, according to the terms of the specific unit's Purchase Order.

- If the EMA-30 or EMB-30 firmware does not have MIRLIN enabled, then on-board encoding and matching does not work.

- This method of enabling the run-time license for on-board MIRLIN means that the system integrator or end-customer do not have to be concerned about any other license installation or activation steps.

MIRLIN functions in cmirisLib2

- There are 5 functions related to the embedded Smart Sensors MIRLIN encoding and matching algorithm. Please refer to /usr/local/doc/CMIRIS2_SDK_Linux_User_Manual_V2.1.0.pdf, /usr/local/include/cmirislib2.h for detailed description and the sample code in /usr/local/src/CMITECH/CMIMIRDemo_src/.

① int cmi_mir_getVersion(CMI_HANDLE handle, DWORD *major, DWORD *minor, DWORD *revision);

② int cmi_mir_getLicenseLevel(CMI_HANDLE handle, int *level);

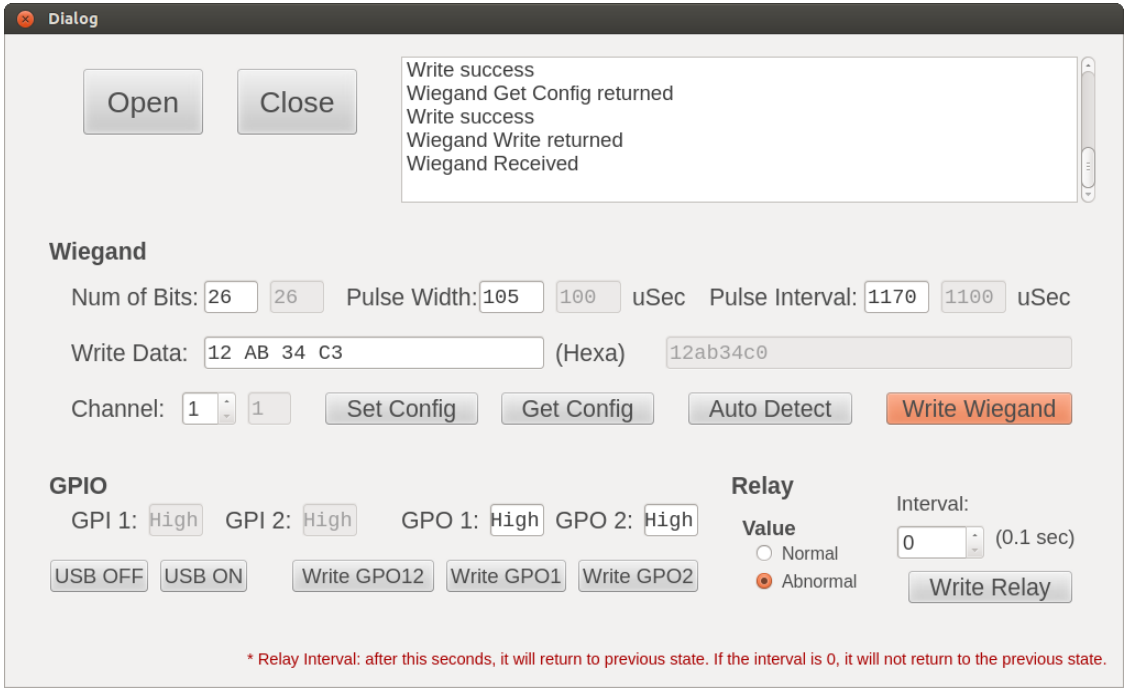
③ int cmi_mir_getEnrolTemplates(CMI_HANDLE handle, unsigned char *leftEnrolTemplate, unsigned char *rightEnrolTemplate, int templateSize, CMI_IMAGE_INFO *imageInfo, int showSegmentation);

④ int cmi_mir_getMatchTemplates(CMI_HANDLE handle, unsigned char *leftMatchTemplate, unsigned char *rightMatchTemplate, int templateSize, CMI_IMAGE_INFO *imageInfo, int showSegmentation);

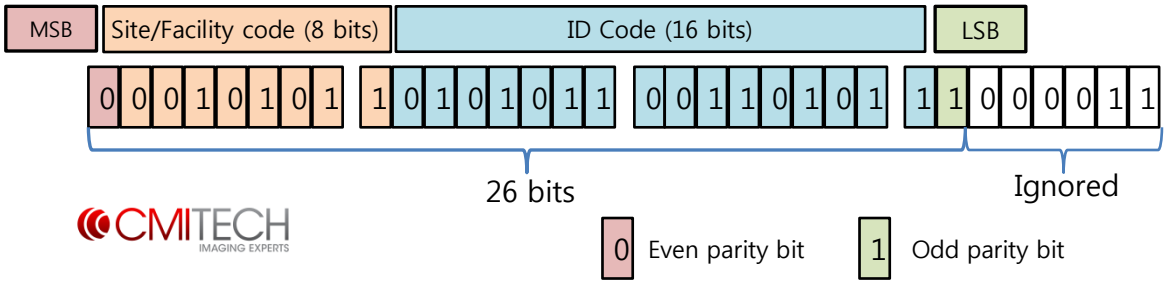
⑤ int cmi_mir_compareTemplate(CMI_HANDLE handle, unsigned char *enrolTemplate, unsigned char *matchTemplate, int matchTemplateSize, float *hammingDistance);

emaTest

- **emaTest** is a test application for "libemaLib_arm_1.0.1.so", which is provided in a separate package with its source code. It allows the user to test all the interfaces within the EMA or ECU.



Wiegand Data Format (26 bits example as shown above - 15 AB 36 C3):



- Wiegand:
  - ECU has 2 Wiegand Out channels, but EMA has one.
  - Before writing Wiegand Out, need to set number of bits, pulse width, and pulse interval with "Set Config". This configuration setup will affect on both channels in ECU.
  - "Auto Detect" will detect the Wiegand In format.
- GPIO: GPI will be read when emaLib is open and when the value is changed. The default value of GPIO is high.
- Relay: Normal is the default state of "Normally Open (NO) and Abnormal is alternative state of "Normally Closed" (NC).
- USB Port Reset: USB OFF cuts off USB power when port is not working properly. Application needs to send USB ON to complete reset. **This feature is obsolete since ema(ecu)UsbMonitor will monitor the USB status.**
- Please refer to emaglobal.h and emalib.h for detailed functions.

Known bugs / Future works

Known bugs

Future works

- The color face image will be implemented in Linux.
- Please feel free to suggest or comment for the future work.