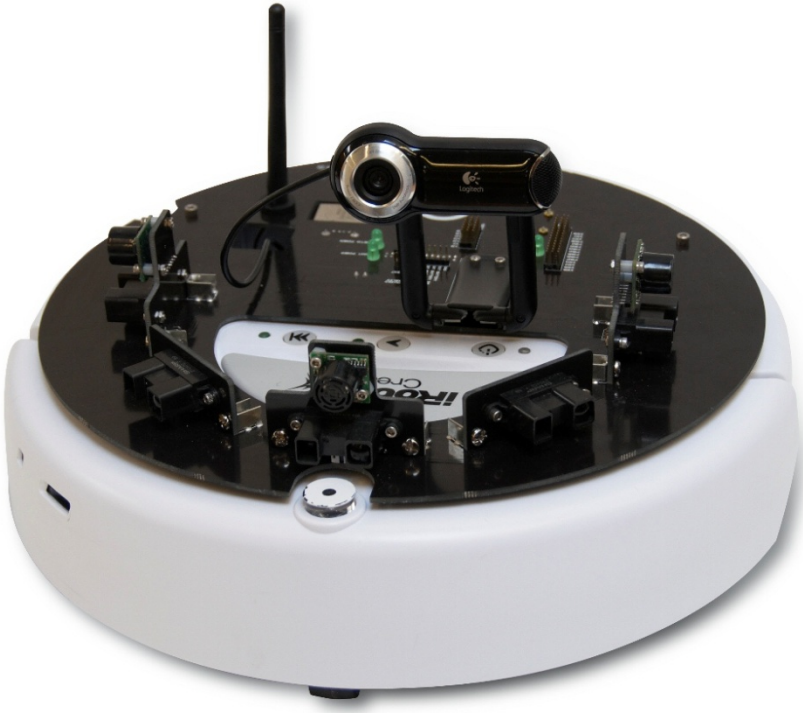
Quanser Qbot

Set up and Tutorial Guide

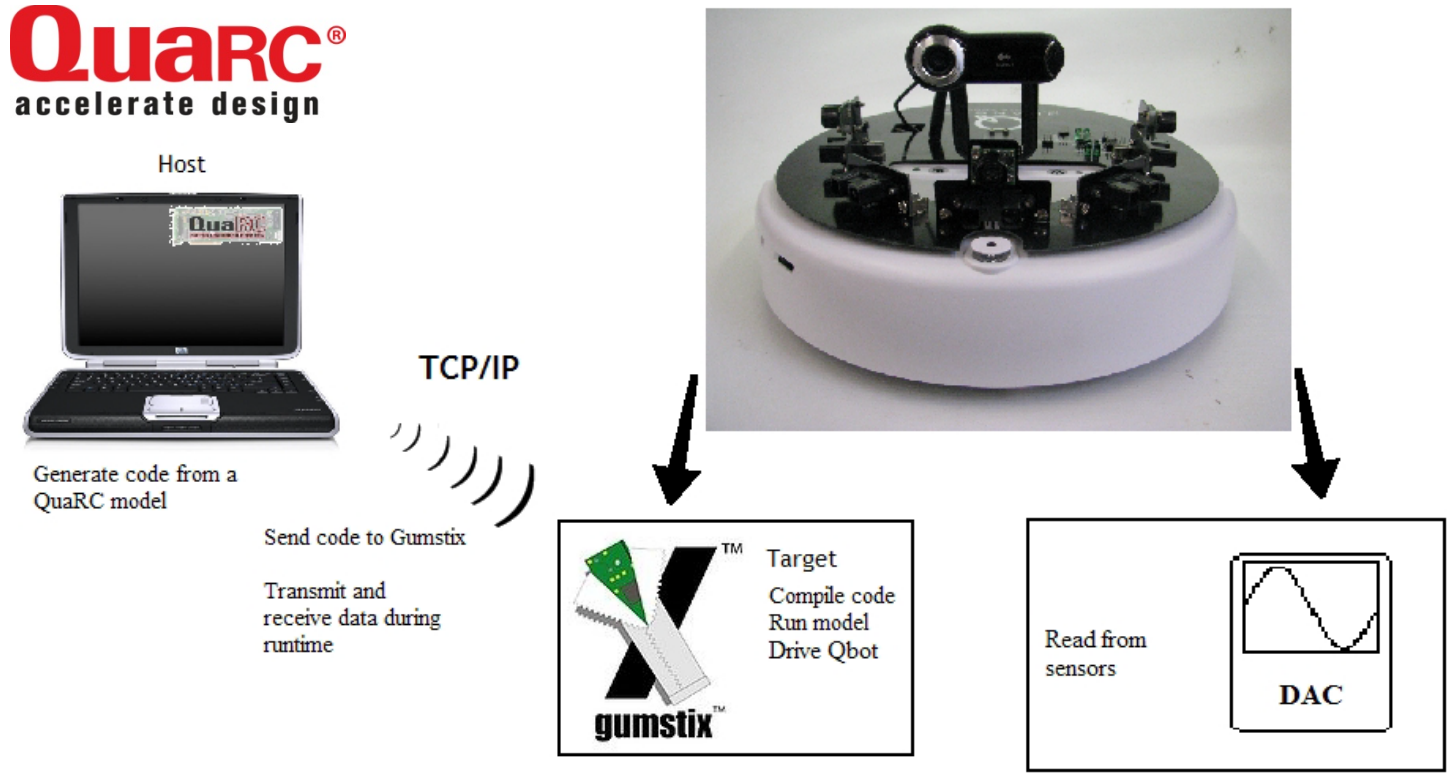
Qbot Hardware

- iRobot Create robotic platform
- Sensors
  - infrared, sonar, webcam
- Quanser Controller Module (QCM)
  - Gumstix computer



Operation Overview

- Host PC running QUARC sends commands via TCP/IP connection to Qbot w/ Gumstix



Installation Overview

1. Install/test QUARC on HOST PC
2. Set up wireless connection between PC and Qbot
3. Run the “qbot_drive” demo

QUARC Software Requirements

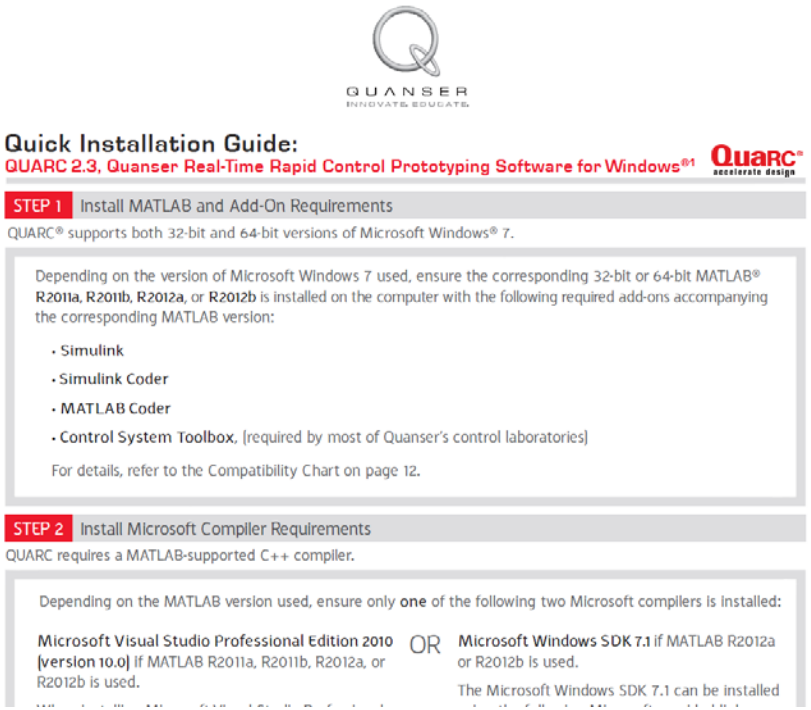
- You NEED to install the following software BEFORE installing QUARC
  - MATLAB
  - Simulink
  - Simulink Coder
  - MATLAB Coder
  - Control System Toolbox

QuaRC®
accelerate design

- See the ***QUARC Quick Installation Guide*** for details on **the EXACT versions you need!**

Installing QUARC

- To install QUARC, follow the instructions in *QUARC Quick Installation Guide* carefully
- IMPORTANT: On the *Features Installation* screen, make sure select ***Gumstix Support*** and ***Simulink Beta Components*** featur



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Quick Installation Guide:
QUARC 2.3, Quanser Real-Time Rapid Control Prototyping Software for Windows®1

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STEP 1 Install MATLAB and Add-On Requirements

QUARC® supports both 32-bit and 64-bit versions of Microsoft Windows® 7.

Depending on the version of Microsoft Windows 7 used, ensure the corresponding 32-bit or 64-bit MATLAB® R2011a, R2011b, R2012a, or R2012b is installed on the computer with the following required add-ons accompanying the corresponding MATLAB version:

- Simulink
- Simulink Coder
- MATLAB Coder
- Control System Toolbox, [required by most of Quanser's control laboratories]

For details, refer to the Compatibility Chart on page 12.

STEP 2 Install Microsoft Compiler Requirements

QUARC requires a MATLAB-supported C++ compiler.

Depending on the MATLAB version used, ensure only one of the following two Microsoft compilers is installed:

Microsoft Visual Studio Professional Edition 2010 (version 10.0) if MATLAB R2011a, R2011b, R2012a, or R2012b is used.

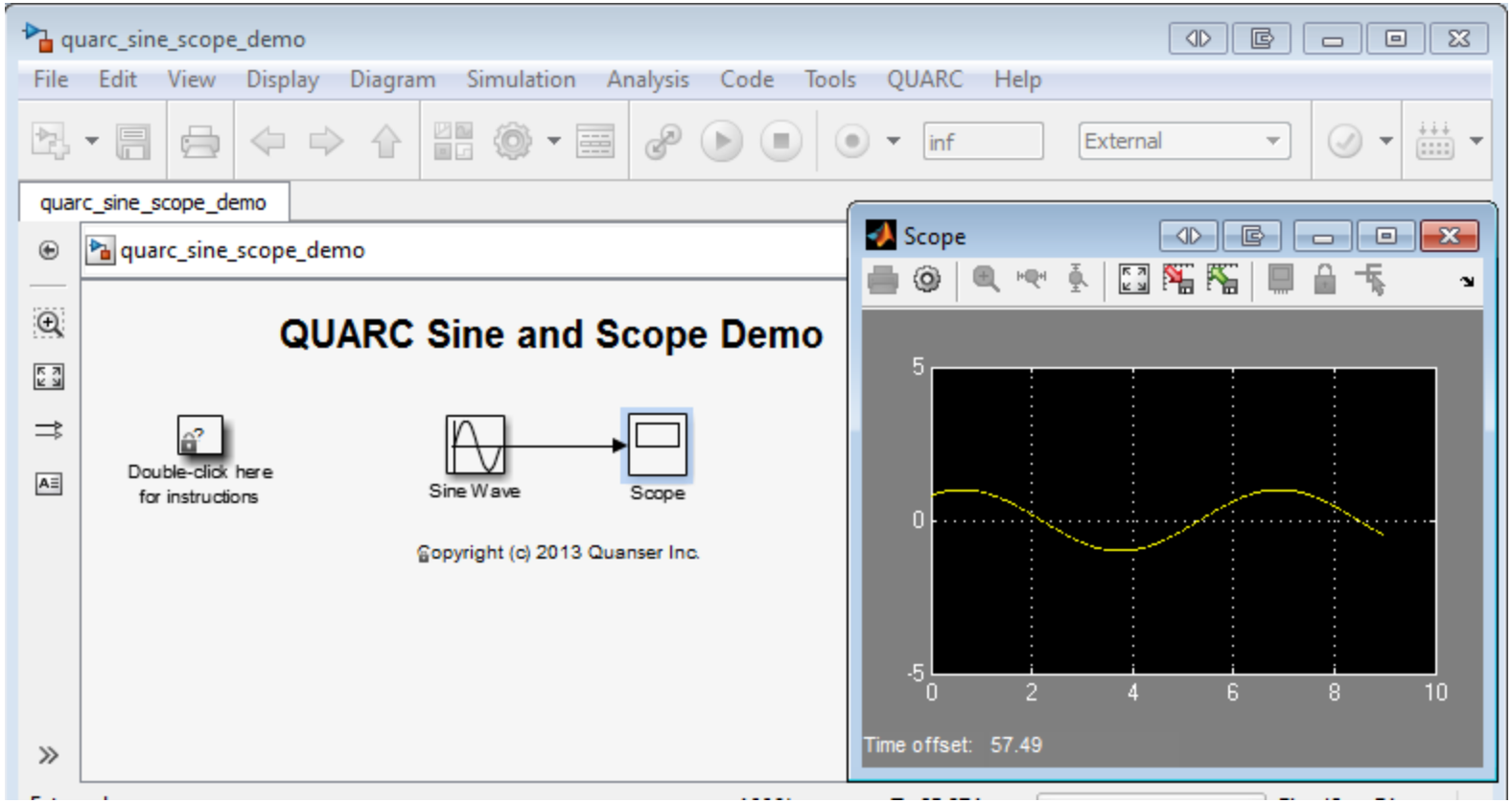
OR

Microsoft Windows SDK 7.1 if MATLAB R2012a or R2012b is used.

The Microsoft Windows SDK 7.1 can be installed

Testing QUARC

- After installing QUARC on the HOST PC, make sure **you can run the *quarc_sine_scope_demo***



Qbot Software

- Qbot is already shipped with QUARC installed on the Gumstix embedded computer
- If you need to update QUARC on the Qbot:
  - See http://www.quanser.com/tutorials_quarc_gumstix

Step 2) Wireless Connection

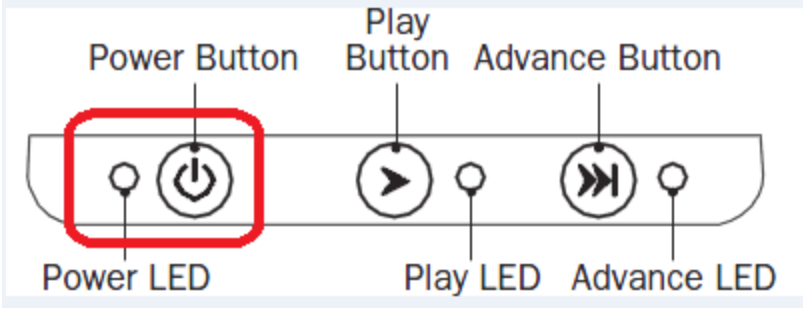
- Establish wireless connection between the **host PC** and the **Gumstix embedded computer** on the Qbot

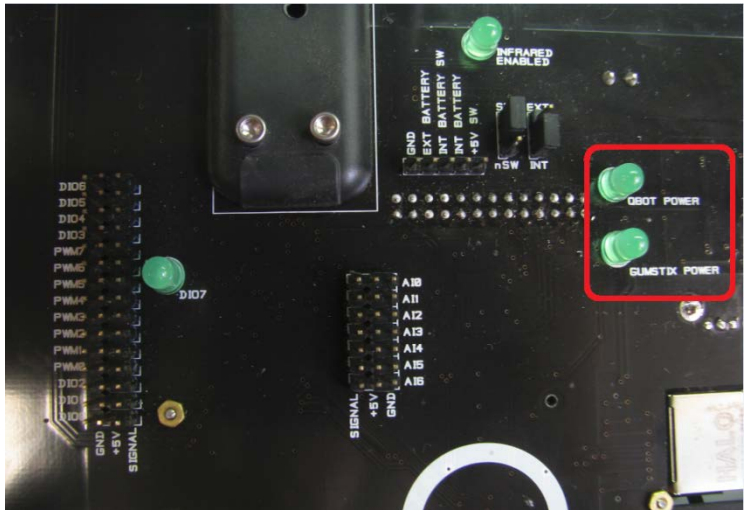
Wireless USB Adapter (Optional)

- Wireless USB adapter is supplied
- Install supplied wireless USB adapter in host PC
  - Note: Not required if you already have an available wireless adapter on your PC/laptop

Power up Qbot

- Press the Power button on the Qbot
- Power LED on front panel
  - Green: battery is fresh
  - Red: battery is discharged
- Also make sure the *QBOT POWER* and *GUMSTIX POWER* LEDs are ON



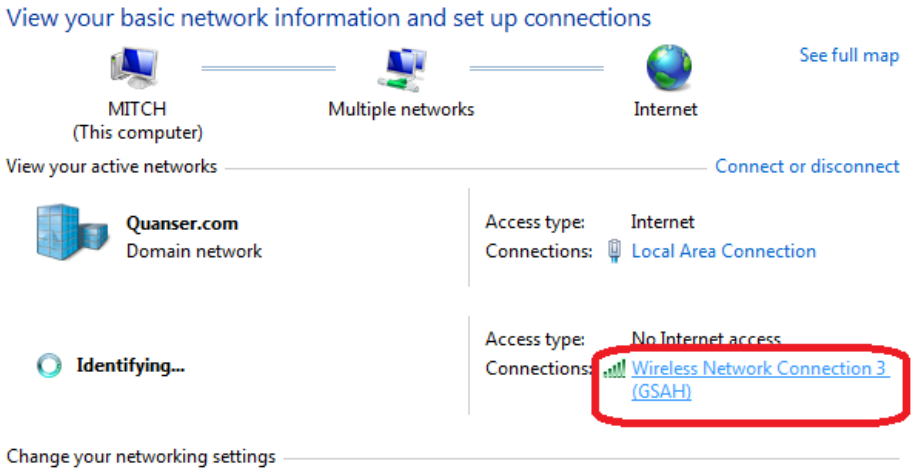


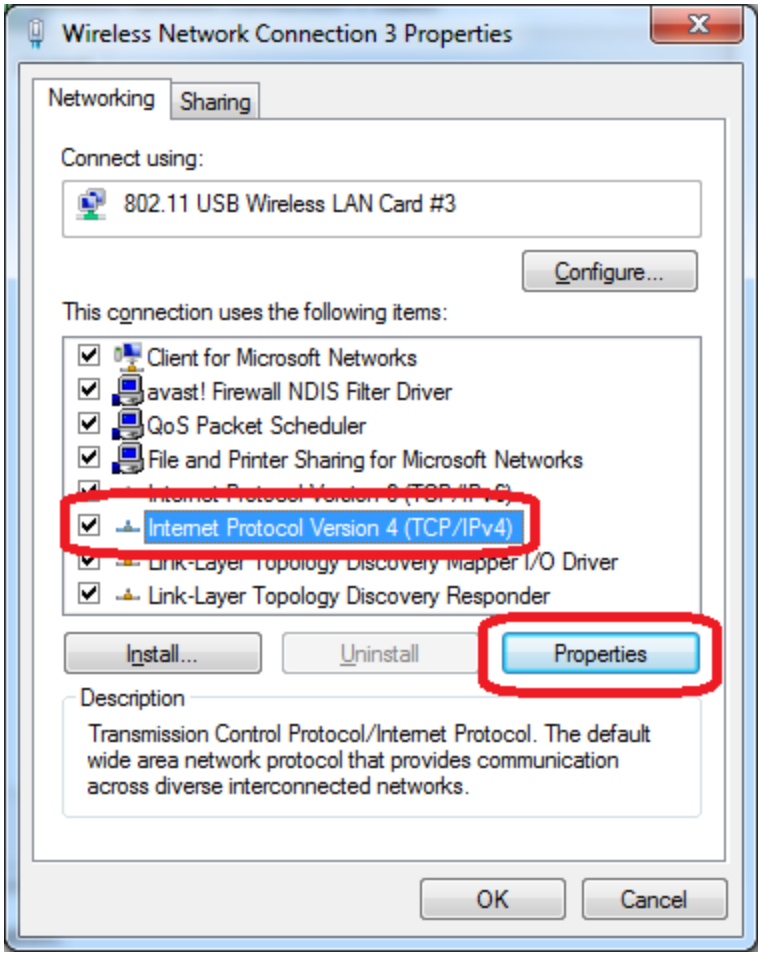
GSAH Network

- "GSAH" network should appear under your wireless networks
- Connect to the GSAH network

TCP/IP Settings

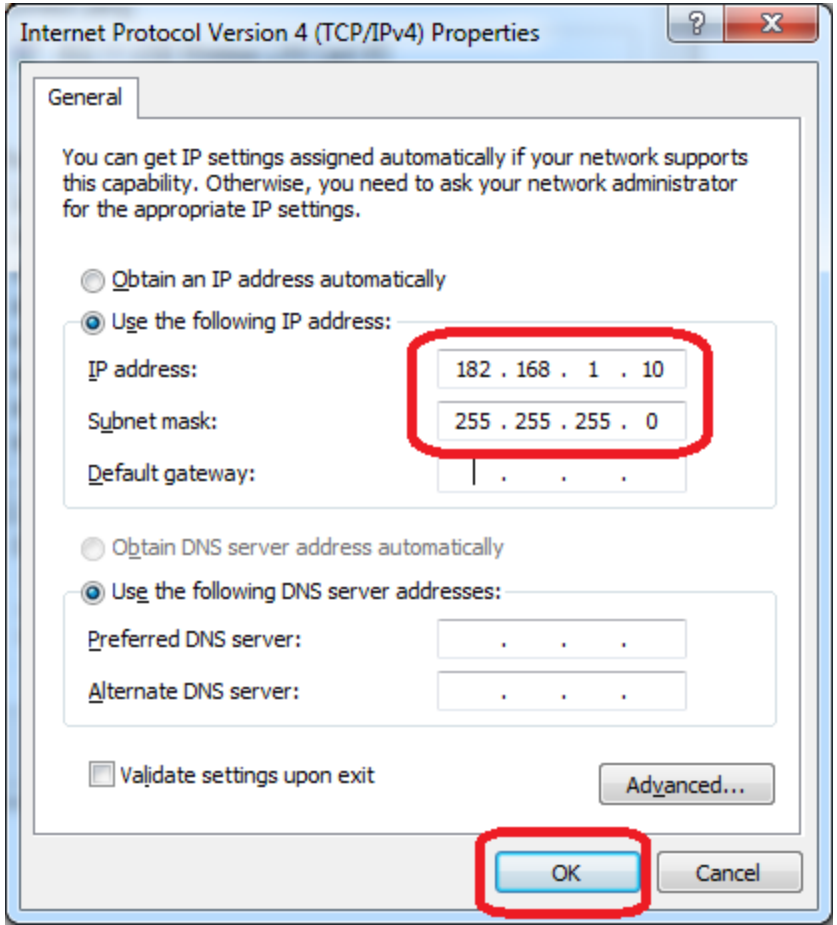
- Go to the wireless network settings
- Select TCP/IPv4 and go to “Properties”





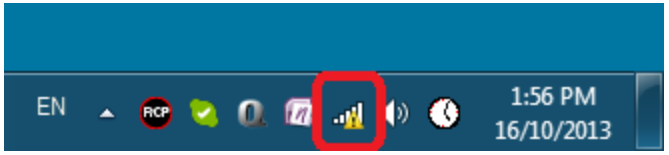
Set IP Address

- Set host PC wireless adapter to an IP between 182.168.1.10 and 182.168.1.19
- Subnet = 255.255.255.0
- No Gateway needed



Check network status

- Once HOST PC IP is set, the GSAH network should **NO longer say "Identifying…"**
- Wireless icon will have an "!" mark

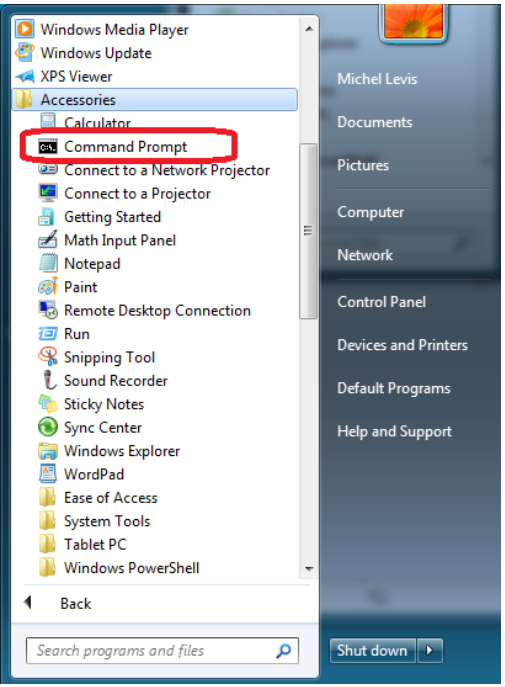


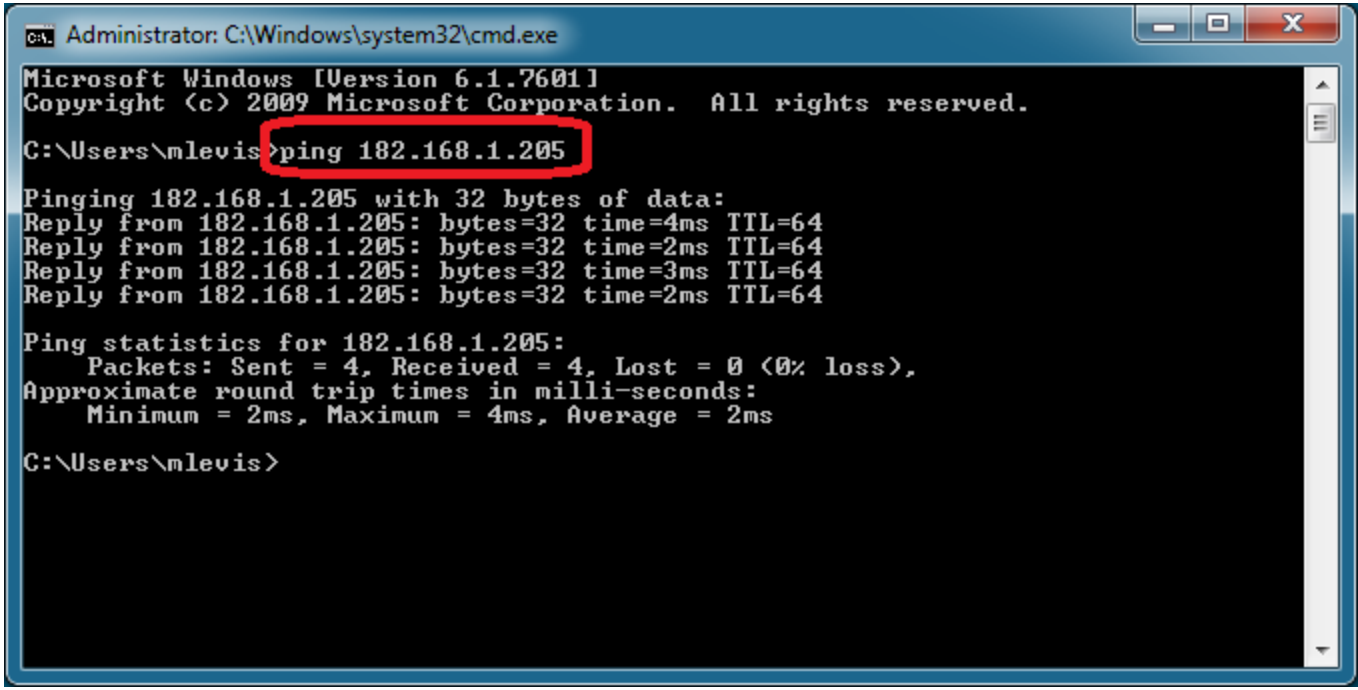
Qbot IP

- Each Qbot/Gumstix has a unique IP address
- IP address is labelled on the back bumper
  - between 182.168.1.20 and 182.168.1.254

Ping Test

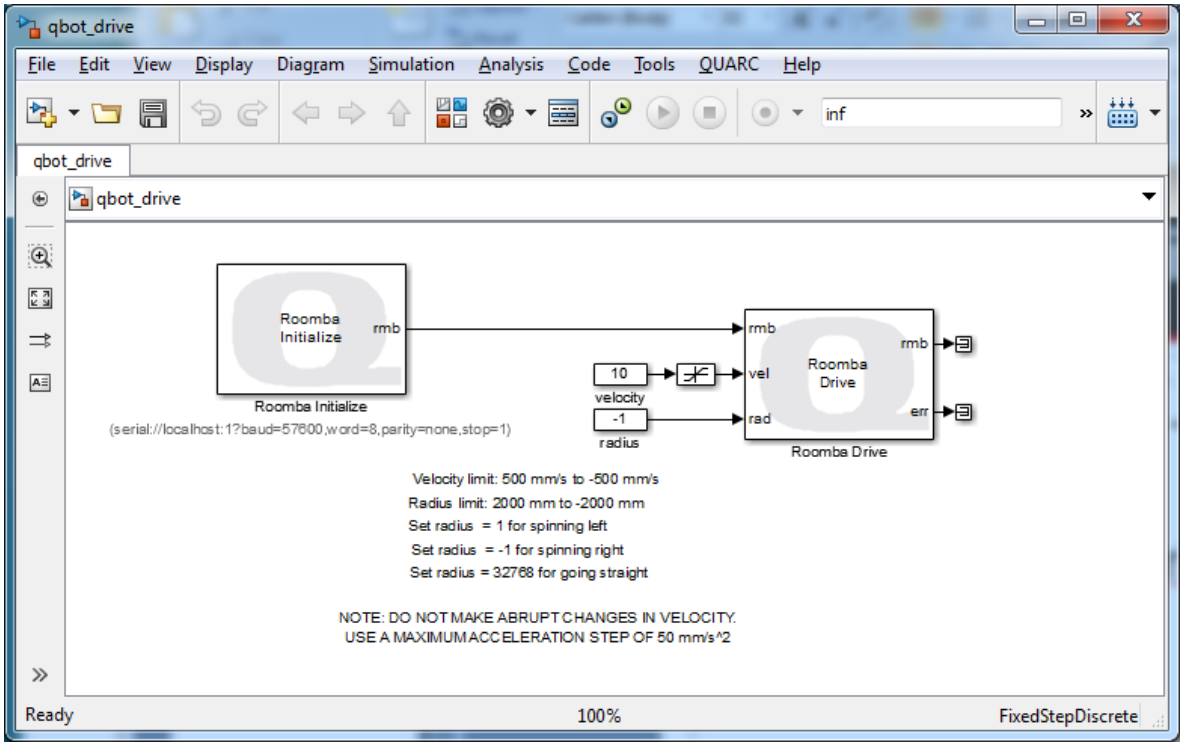
1. Load “Command Prompt” (under *Start* | *Accessories*)
2. Enter “ping 182.168.1.xxx” command
3. Should get “Reply” message from Gumstix/Qbot





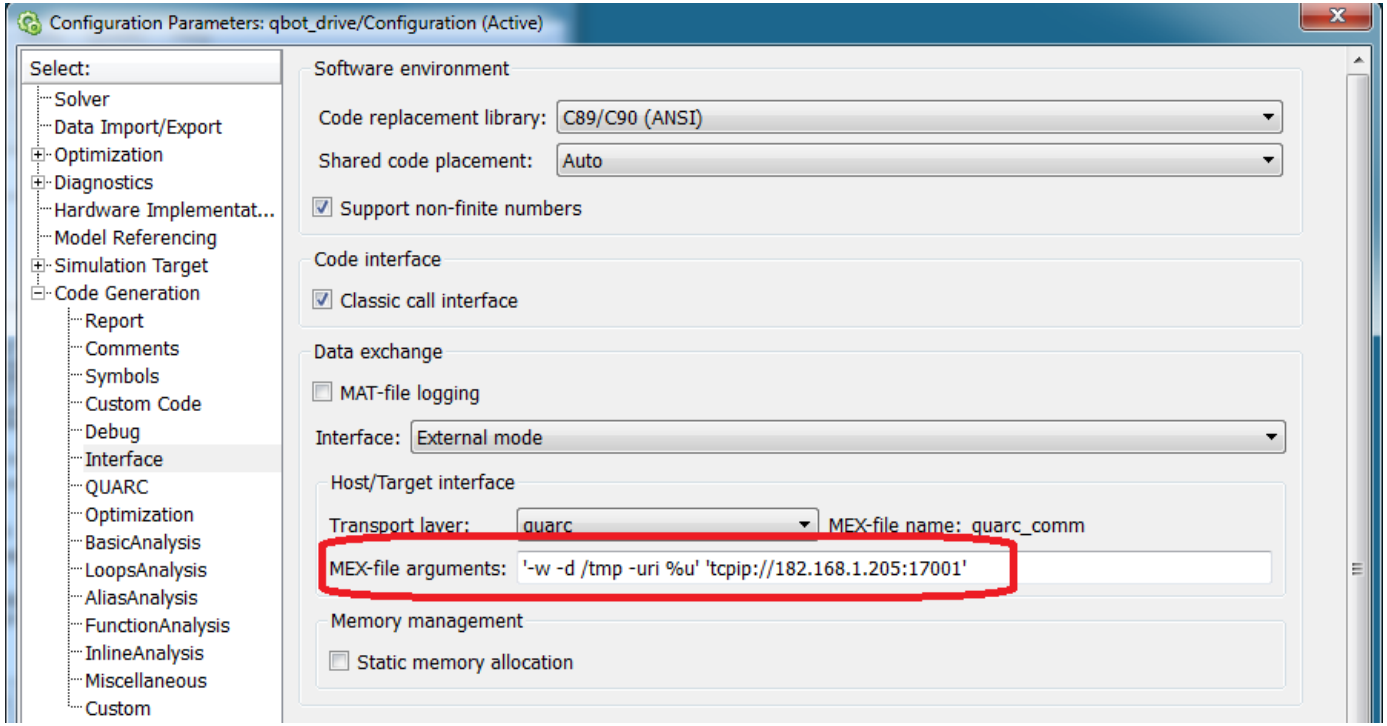
Open “Qbot Drive” Demo

- Go to the “\QBOT_CD\Demos” folder in MATLAB
- Open “qbot_drive” Simulink model



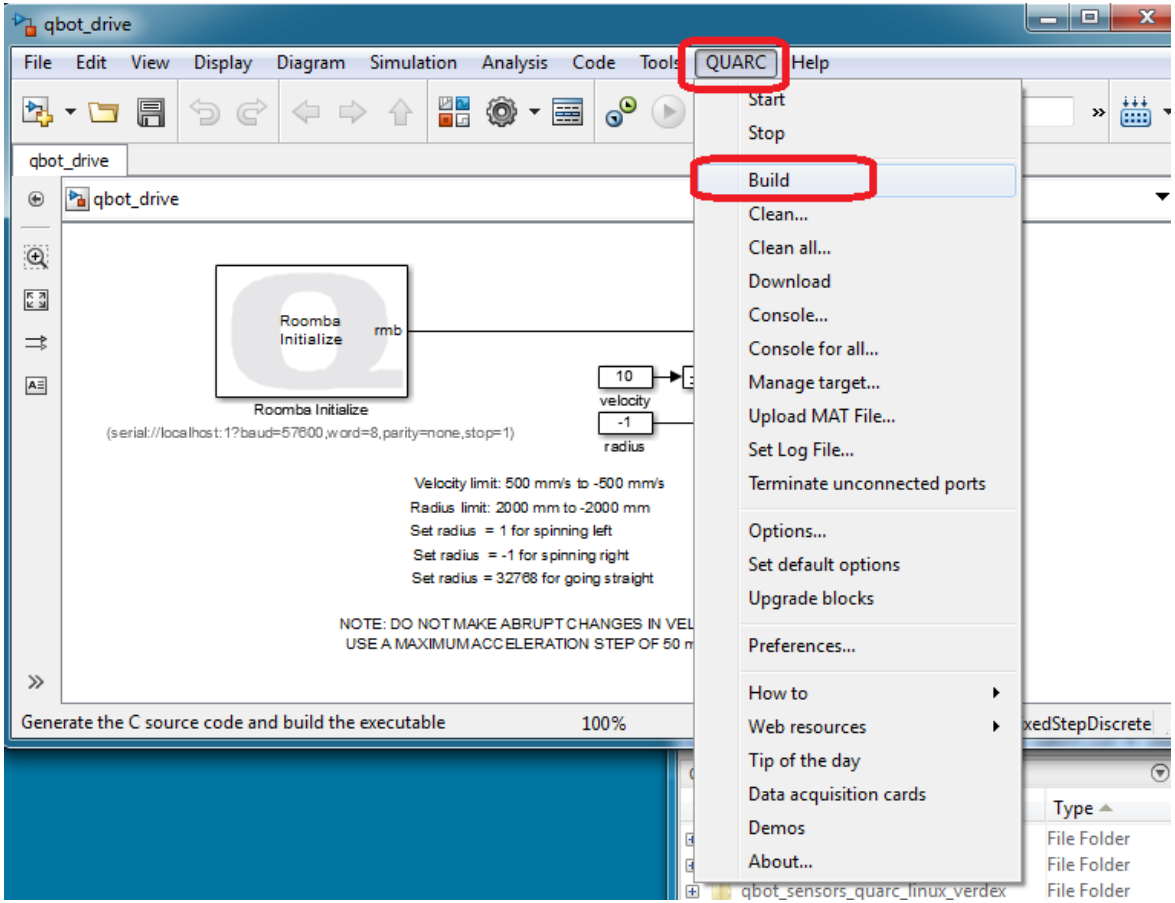
Configure Model

- In *qbot_drive*, go to QUARC | Options and select the *Interface* panel
- Add the following to the *MEX-file arguments* field:
  `tcpip://{IP of Gumstix}:17001`



Build Controller

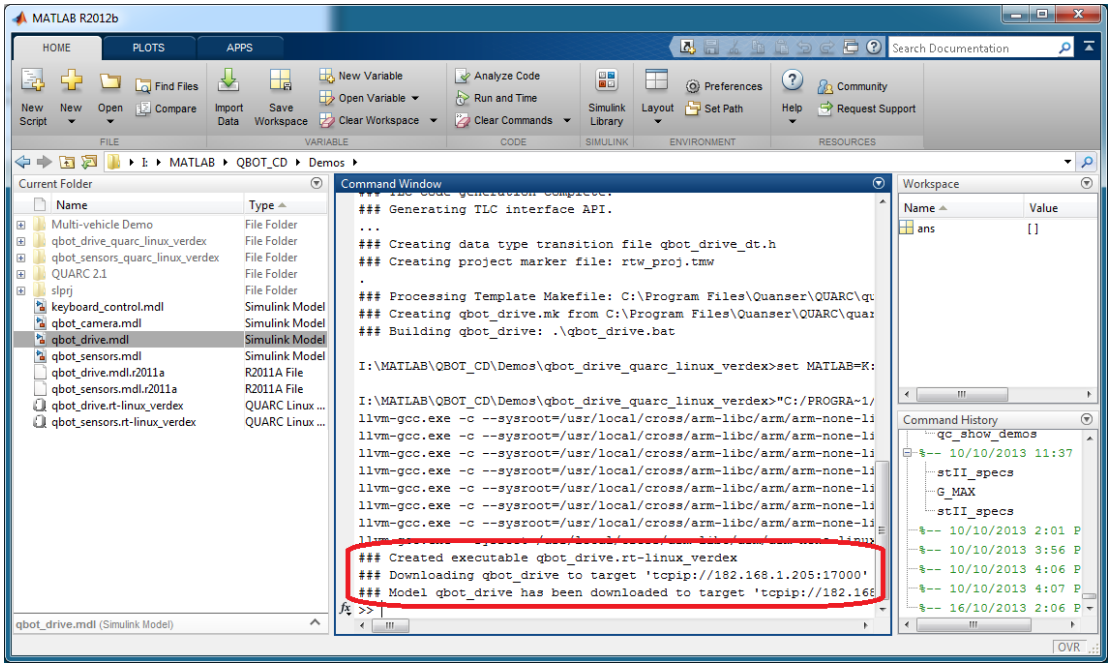
- Go to *QUARC* | *Build*



MATLAB Prompt

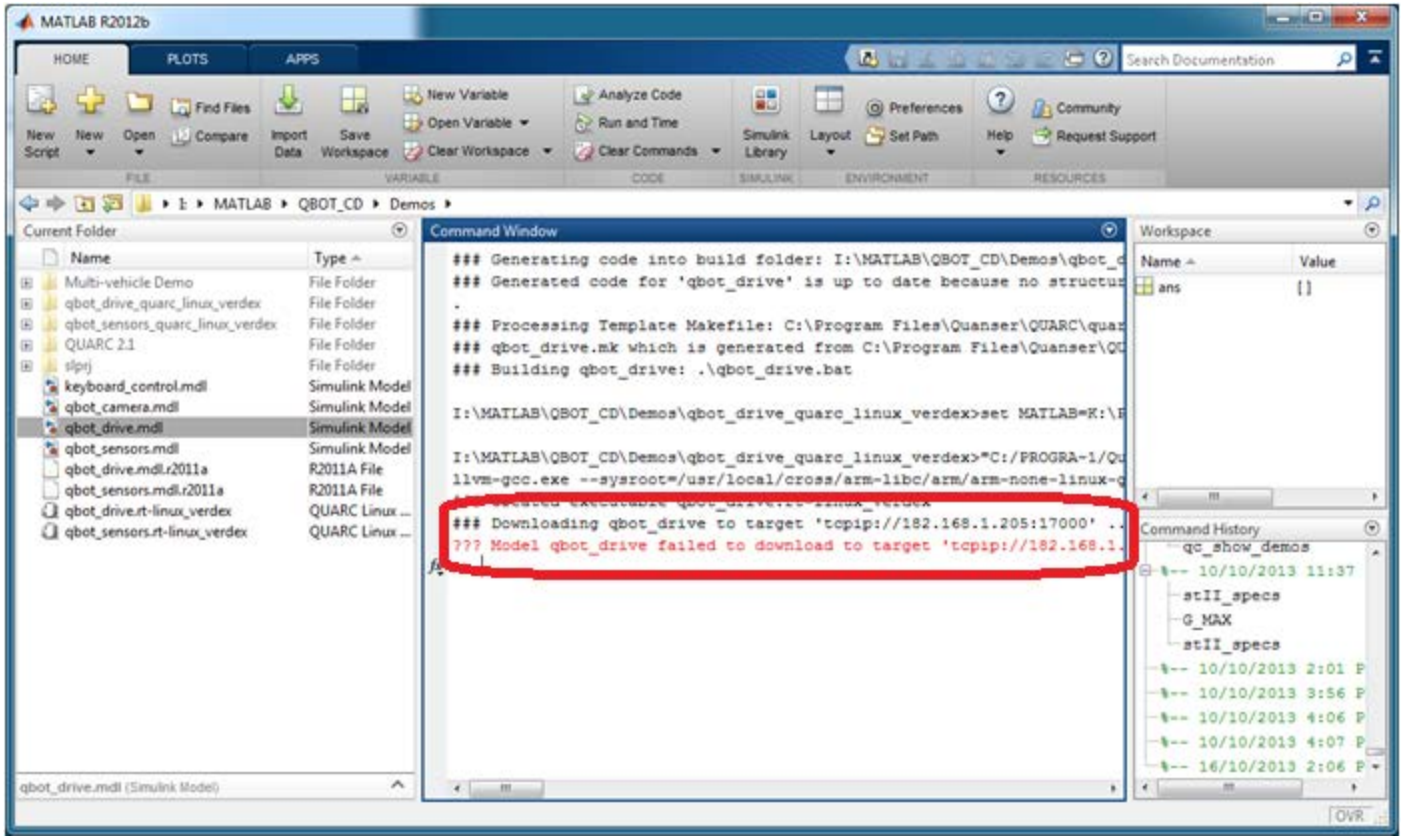
- The following message should be shown in the MATLAB Command Window:

```
### Created executable qbot_drive.rt-linux_verdex
### Downloading qbot_drive to target 'tcpip://182.168.1.205:17000' ...
### Model qbot_drive has been downloaded to target
   'tcpip://182.168.1.205:17000' (93132 bytes)
```



Did it download?

- If the “target downloaded to…” message was NOT seen in the MATLAB prompt then go here.



Run Qbot Drive

- If the controller downloaded successfully then go to QUARC | Start
- Qbot will begin to rotate slowly

Done!

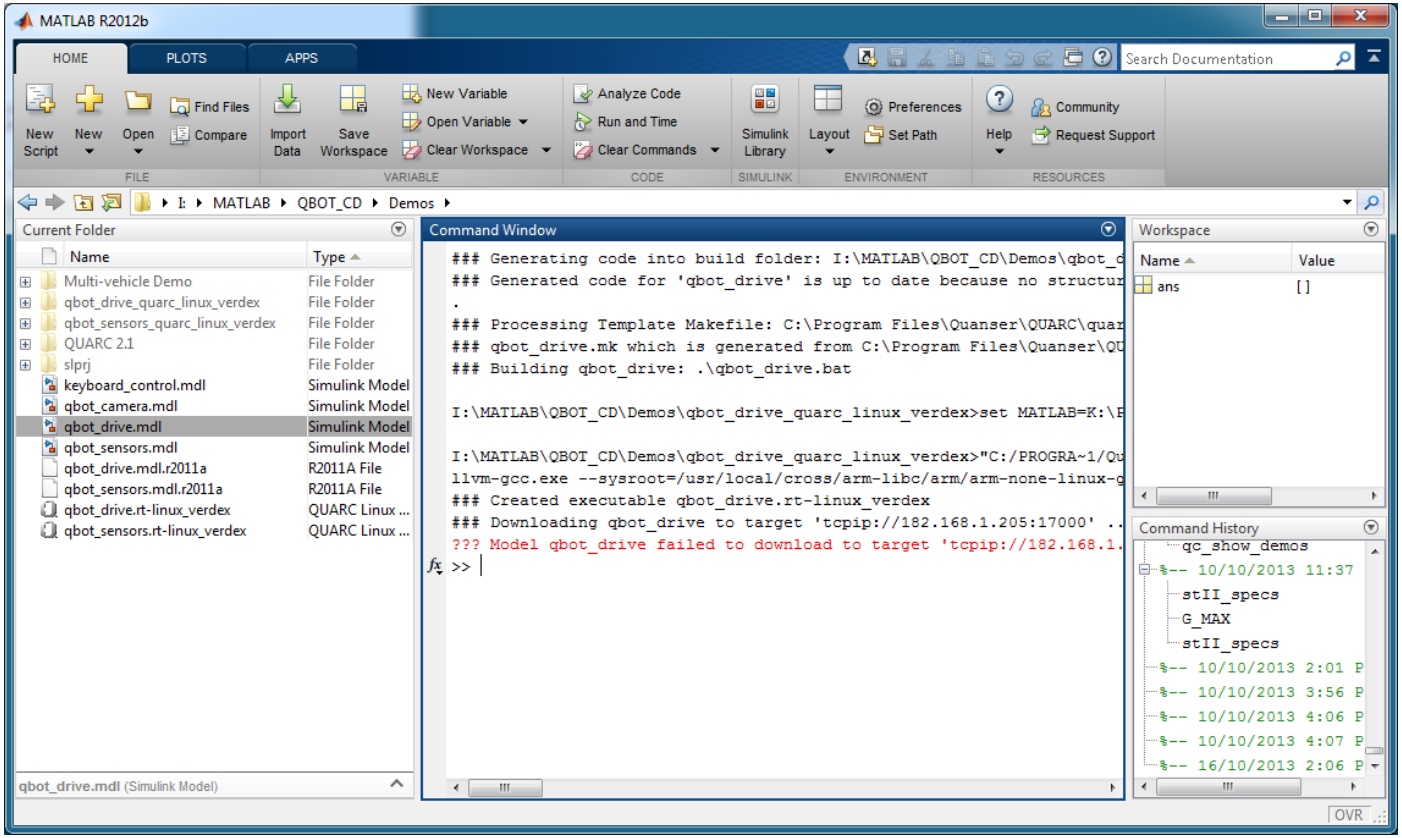
- Your Qbot is now working. What's next?
- Feel free to try *qbot_sensors* demo
- Try any of the controllers in the *Curriculum* folder.

Common Download Issues

- Are you still connected to the GSAH network?
- Go back to the "**ping test**" to confirm that you can "talk to" the Gumstix/Qbot
- Make sure you set the **correct IP and port** in *qbot_drive* (e.g. 'tcpip://182.168.1.140:17001')
- Gumstix may be TOO full

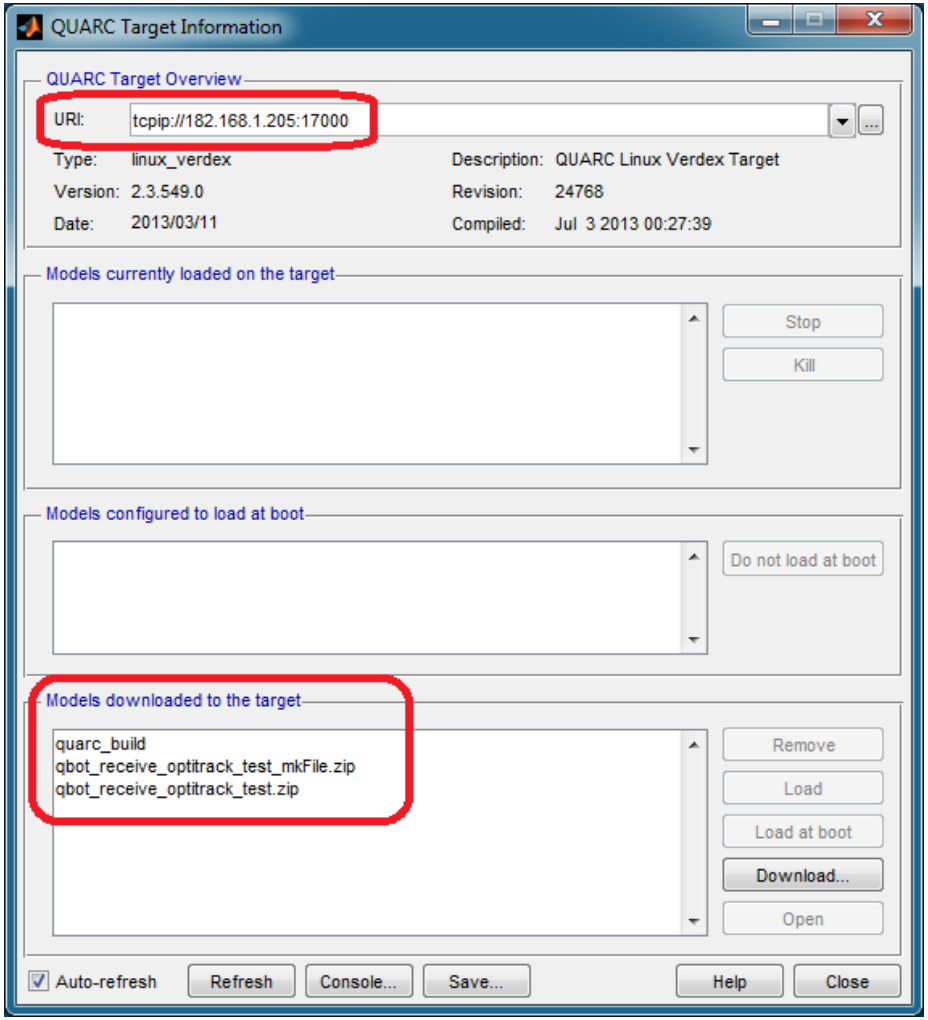
Gumstix Full

- If it cannot download due to “Not enough system resources…” – Gumstix may be full



Clear Out Gumstix

1. Go to QUARC | *Manage target…*
2. Set IP in *URI*
3. View models downloaded to target
4. Select and remove ALL models
5. Try building “qbot_drive”again



Still having issues?

- Still not downloading… go to the FAQ page at: http://www.quanser.com/FAQ
- See Section 6 in Qbot User Manual

6. Troubleshooting Guide

For any issue, the first and easiest troubleshooting solution on any electronic device is to reboot the device. Turn off the Qbot, then turn it back on again. For troubleshooting any problem with the Qbot, it is always a good idea to open the QUARC console in case additional information is printed to the console by going to the QUARC menu and clicking on "Console for all…". The console must be opened after the Qbot has booted and established a wifi connection. If the console is opened successfully it establishes a connection to the target and the console window has the title "QUARC Console for * at tcpip://182.168.1.xxx:17000", where xxx corresponds to the IP address of the Qbot.

If you are still unable to resolve the issue after reading through this section, contact tech@quanser.com for further assistance.

6.1. Qbot Drive or Direct Drive commands aren't responding or are causing the robot to move incorrectly, or the Qbot bump sensor inputs are not functioning.

1. Check that the Qbot wheels are retracted fully into the wheel bays. If any wheel is out of its bay, then the Qbot will stop driving for safety reasons. Makes sure to operate the Qbot on a hard, flat surface

Contact Technical Support

- If you are still having issues, contact technical support at: http://www.quanser.com/ContactUs