**Best Practices**

**Before An Event**

* Download and backup all pipelines to your programming laptop.
* Download a copy of the latest Limelight image to your programming laptop.
* **Record a list of your pipelines and their indicies.**
  + 1 - Dual Target Low
  + 2 - Dual Target High Cargo
* Add strain reliefs to all power and ethernet cables going to your LL.
* Consider hot-gluing all connections.

**During Event Calibration**

* **Roll your robot to each target on the field.**
  + Make sure your thresholding is working properly. Switch to the “threshold” view during this process (located under the image stream).
  + Roll your robot close to the target, and far away from the target. Ensure crosshairs are calibrated properly.
  + While far away from the target, rotate your robot left and right ~ 30 degrees to ensure that other targets will not be erroneously tracked.
  + See the tuning section below for more tuning tips.
  + Ensure no other field / arena elements are being accidentally tracked. Check your area and aspect ratio filters if you are picking up arena lights.
  + Take snapshots of all targets and erroneous targeting. You can use these to tune your pipelines in the pits.

**Pipeline Tuning**

* Use the lowest exposure possible, and increase black level offset until field lights and LED reflections are removed from the image.
* Test your thresholding while far away and angled away from your target.
* Use 2019.7’s “Smart Speckle Rejection” to filter unwanted LED reflections

**Before Connecting to the Field**

* **Give your laptop a static IP configuration.**
  + IP: 10.TE.AM.5
  + Subnet Mask: **255.0.0.0**
  + Gateway: 10.TE.AM.1
* **Give your RIO a static IP configuration.**
  + IP: “10.TE.AM.2”
  + Subnet Mask: **255.255.255.0** **<- NOTE THE DIFFERENCE HERE**
  + Gateway: 10.TE.AM.1
* Give your Limelights unique hostnames (if using multiple).
* **Give your Limelights unique static IP configurations.**
  + Always start with “.11” addresses and go upward. (10.9.87.11, etc.)
  + **The use of other addresses may cause your units to malfunction when connected to the FMS.**
  + IP: “10.TE.AM.11”
  + Subnet mask: **255.255.255.0**
  + Gateway: “10.TE.AM.1”

Additional information: <https://wpilib.screenstepslive.com/s/currentCS/m/troubleshooting/l/319135-ip-networking-at-the-event>

**Before Every Match**

* Check all power and Ethernet cables going to your Limelights.
* Check all electrical connections for looseness and frayed wires.
* Check all mounting screws / zipties / tape.
* Observe ESD precautions at all times.

**Bandwidth**

* Some teams run two Limelights with two USB cameras while staying well under under the bandwidth limit. Follow the steps below to reduce bandwidth.
* Rather than using driver mode, create a “driver” pipeline. Turn down the exposure to reduce stream bandwidth.
* Using a USB camera? Use the “stream” NT key to enable picture-in-picture mode. This will dramatically reduce stream bandwidth.
* Turn the stream rate to “low” in the settings page if streaming isn’t critical for driving.
* Use the 160x120 stream option introduced in 2019.7.

**Troubleshooting**

* Try to access the stream at <IP>:5800 with a web browser. This should help you determine the root of your issues.
* Restart your dashboard
* Reboot your computer
* Reboot your robot if the field has been reset
* Broken Ethernet cables can be the cause of intermittent networking issues.
* Always use static IP configurations on the field.