



Training and  
Support

# 2018-2019 *FIRST*® Tech Challenge Wi-Fi Event Guide

## ROVER RUCKUS



Presented By **Qualcomm**

[www.firstinspires.org](http://www.firstinspires.org)

200 BEDFORD STREET ■ MANCHESTER, NH 03101



FOR INSPIRATION & RECOGNITION OF SCIENCE & TECHNOLOGY

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# Volunteer Thank You

Thank you for taking the time to volunteer for a *FIRST®* Tech Challenge event. *FIRST®* and *FIRST®* Tech Challenge rely heavily on volunteers to ensure events run smoothly and are a fun experience for teams and their families, which could not happen without people like you. With over 5,500 teams competing yearly, your dedication and commitment are essential to the success of each event and the *FIRST* Tech Challenge program. Thank you for your time and effort in supporting the mission of *FIRST*!

Revision History		
Revision	Date	Description
1	8/1/2018	Initial Release

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*Gracious Professionalism®* - "Doing your best work while treating others with respect and kindness - It's what makes *FIRST*, first."

## Introduction

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### **What is FIRST® Tech Challenge?**

FIRST® Tech Challenge is a student-centered program that focuses on giving students a unique and stimulating experience. Each year, teams engage in a new game where they design, build, test, and program autonomous and driver operated robots that must perform a series of tasks. To learn more about FIRST® Tech Challenge and other FIRST® Programs, visit [www.firstinspires.org](http://www.firstinspires.org).

### **FIRST Core Values**

We express the FIRST® philosophies of *Gracious Professionalism*® and *Coopertition*® through our Core Values:

- **Discovery:** *We explore new skills and ideas.*
- **Innovation:** *We use creativity and persistence to solve problems.*
- **Impact:** *We apply what we learn to improve our world.*
- **Inclusion:** *We respect each other and embrace our differences.*
- **Teamwork:** *We are stronger when we work together.*
- **Fun:** *We enjoy and celebrate what we do!*

## **Gracious Professionalism®**

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FIRST® uses this term to describe our programs' intent and *Gracious Professionalism*® is not clearly defined for a reason. It has different meanings to everyone. Some possible meanings of *Gracious Professionalism* include:

- Gracious attitudes and behaviors are win-win.
- Gracious folks respect others and let that respect show in their actions.
- Gracious Professionals make valued contributions in a way that is pleasing to others and to themselves.

In the end, *Gracious Professionalism*® is part of everyday life. When professionals use their knowledge graciously and individuals act with integrity and sensitivity, everyone wins, and society benefits.

Watch Dr. Woodie Flowers explain *Gracious Professionalism* in this [short video](#).

### **Gracious Professionalism for Volunteers**

It is a good idea to spend time going over this concept with volunteers. Provide volunteers with real-life examples of *Gracious Professionalism* in practice before, during, and after the event and recognize great *Gracious Professionalism* when you see it in action!

## **FIRST Volunteer Rights and Responsibilities**

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### **NOTICE OF NON-DISCRIMINATION**

For Inspiration and Recognition of Science and Technology (FIRST®) does not discriminate based on race, color, national origin, sex, disability, age, status as a veteran who served in the military, religion, gender, gender identity, or gender expression in its programs and activities.

Keep updated at: <http://www.firstinspires.org/about/legal-notices>

## Volunteer Rights and Responsibilities

Volunteers are the most valuable asset to FIRST®. Your selfless contribution of time and resources are instrumental in accomplishing our mission of inspiring the next generation of science, technology, engineering, and mathematics leaders and innovators. The foundation of the relationship between FIRST and our volunteers is respect.

### It is your right to:

- Be treated with *Gracious Professionalism*®. *Gracious Professionalism* is a way of doing things that encourages high-quality work, emphasizes the value of others, and respects individuals and the community.
- Feel valued. FIRST recognizes the significant efforts that volunteers contribute. The time that you donate not only helps FIRST succeed but also builds the FIRST community.
- Understand your role. FIRST will inform you about what's expected of you, your schedule, any meals you will be provided, any changes to program or policy, and who to contact should you need assistance.
- Expect a safe environment. FIRST strives to create and maintain a safe environment for all volunteers and participants and will always factor safety into program planning.
- Receive fair treatment and inclusion. All volunteers will be treated with respect and dignity in inclusive environments. FIRST does not discriminate on the basis of race, color, national origin, sex, disability, age, status as a veteran who served in the military, religion, sexuality, gender, gender identity, or gender expression in its programs and activities.
- Reevaluate your time commitment. FIRST appreciates all of our volunteers and understands that volunteers experience life situations that may affect their commitment.
- Communicate with your Volunteer Coordinator or your local FIRST leadership about:
  - Concerns or limitations that are affecting your volunteer role.
  - Any mistreatment towards you or others. You may be required to fill out a [non-medical incident form](#).
  - Contact FIRST Headquarters directly if you feel that you are being treated improperly and attempts to resolve issues and conflicts at the local level are not successful. Volunteers can call (800) 871-8326 or email [volunteer@firstinspires.org](mailto:volunteer@firstinspires.org).

### It is your responsibility to:

- Treat others with *Gracious Professionalism*®.
- Follow the schedule and the role description provided for your position. Contact your local FIRST leadership if there are any issues.
- Respect others, treat them fairly and kindly. Be inclusive and follow the non-discrimination policy of FIRST.
- Follow safety rules and ensure safety of others. Adhere to all [FIRST Youth Protection Program \(YPP\) policies](#). Report any injuries or safety concerns within 48 hours.
- Adhere to the [FIRST Code of Conduct](#).
- Have FUN!

## Tournament Organization Structure

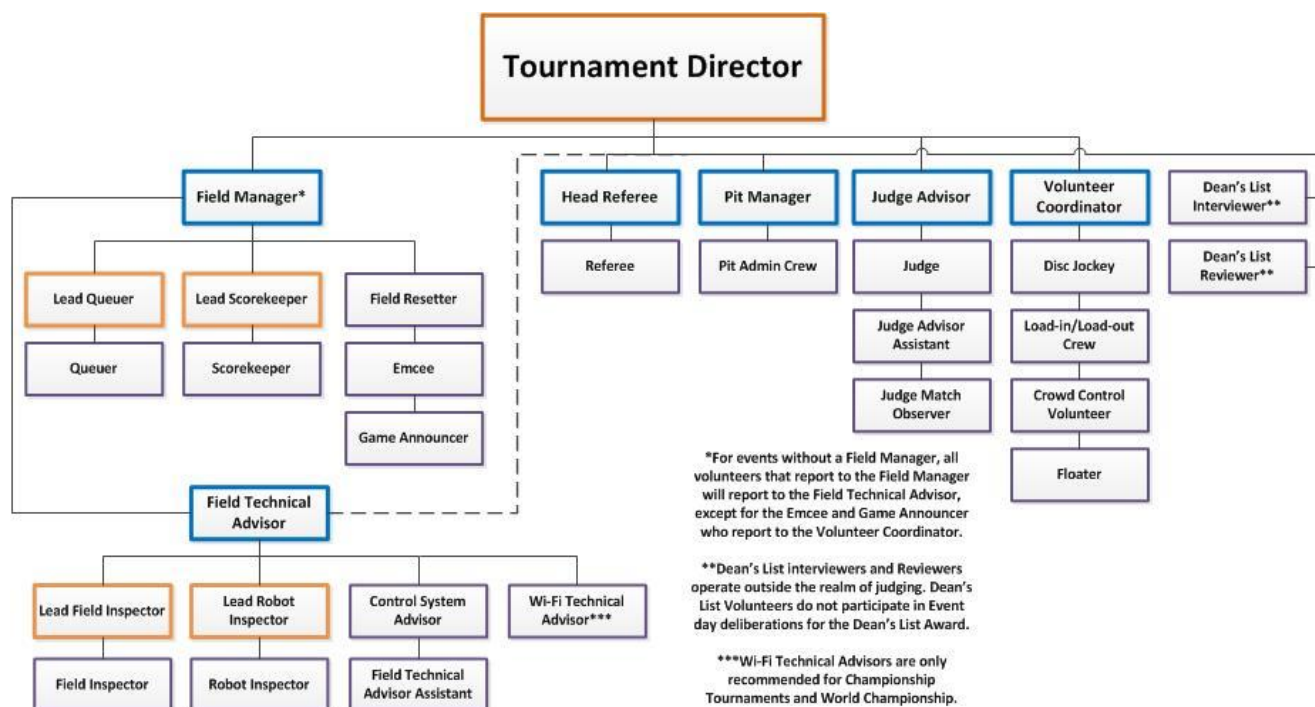


Figure 1 - League Championship, Qualifying Tournament, Championship Tournament Organization

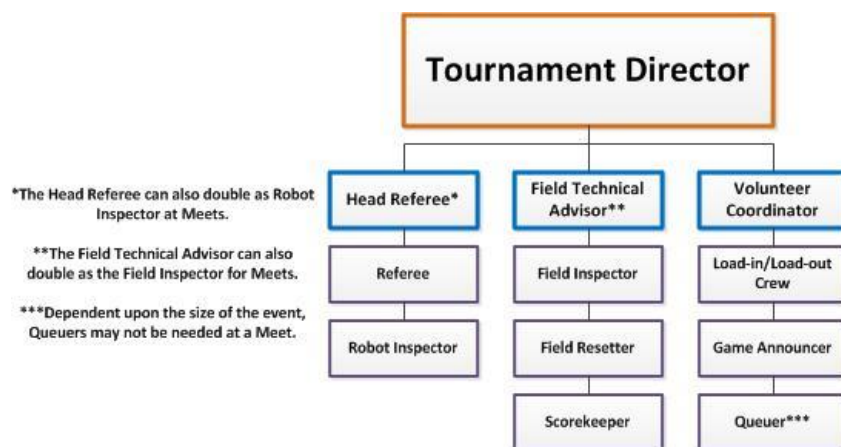


Figure 2 - League Meet Organization

Learn more about the roles of volunteers on our [Volunteer Resources page](#), "Volunteer Role Description".

## Introduction

The *FIRST* Tech uses an Android smartphone as the primary robot controller. This system enables point-to-point wireless technology to control the robots. This document offers some basic suggestions on how to prepare for and support the wireless control system at any *FIRST* Tech Challenge competition.



Figure 1 – *FIRST* Tech Challenge's Android-based platform

## Point-to-Point Wireless Connectivity

The *FIRST* Tech Challenge control system is a point-to-point solution. This means that teams will use two Android devices to control their robot. The first device will be mounted on the robot and act as the *robot controller*. The second device will reside with the team drivers and will be connected to a pair of gamepad controllers. This second device is known as the *driver station*. The driver station will communicate wirelessly with the robot controller.

Teams use their driver station to control their robot. The driver station has a user interface that the teams use to see status information about their robot, and to select special programs (called *op modes*) to run on the robot controller. During the driver-controlled portion of a match, teams can use their gamepad to direct functions on the robot controller. The gamepad may also be used by teams to configure the functionality of their autonomous programs, but during the running of the actual autonomous program, the teams are not permitted to touch their gamepad controllers or *driver station*.



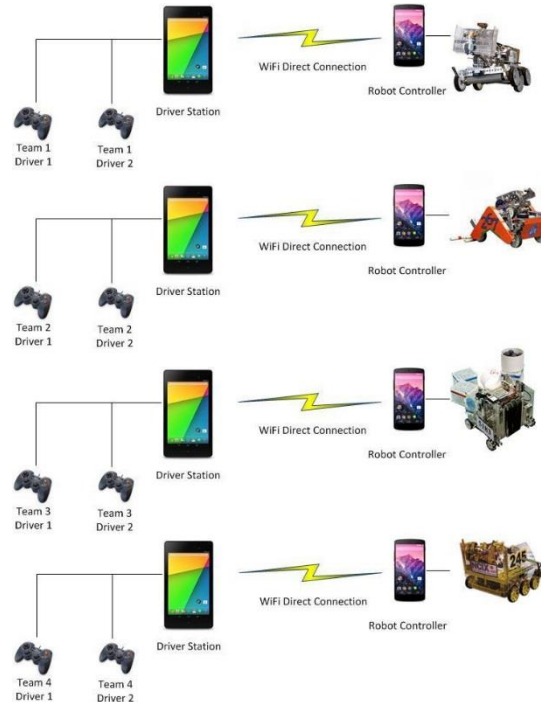
Figure 2 - The *FIRST* Tech Challenge platform is a point-to-point solution

It is important to note that with a point-to-point control system, each driver station-robot controller pair establishes its own independent wireless network. For example, if you have four robots operating in a venue, then you will have four independent wireless networks, one for each Driver Station-Robot Controller pair.

<sup>1</sup> Note that the user interfaces that are pictured on the Android devices are simulated and do not reflect the current user interfaces that are available with the platform.



If you have 16 robots operating in a venue, then you will have 16 independent wireless networks in that venue, one for each driver station-robot controller pair.



**Figure 3 – Each driver station-robot controller pair establishes its own unique wireless network.**

During a competition, each team will bring their own gamepads, driver station and robot controller. The teams are responsible for understanding how to establish and maintain the Wi-Fi Direct connection between their driver station and robot controller. However, it is the responsibility of the Tournament Director to take some precautions before and during a *FIRST* Tech Challenge event to ensure that the wireless environment is “clean enough” so that the teams will have reliable, uninterrupted connections to their robots.

## Volunteer Roles to Help Support the Control System

### Field Technical Advisor (FTA)

The [Field Technical Advisor](#) (FTA) role is an important technical volunteer position. The FTA is responsible for identifying and troubleshooting minor technical issues on the competition field to help keep things running smoothly and on time.

The FTA should have a basic familiarity of the following subjects:

1. How the Android devices and robot hardware modules are connected and operate.
2. How the teams write and execute *op modes* for their robots.
3. How the wireless control system works.
4. How to identify and troubleshoot common minor problems with the robots and control system

The FTA does not have to be an expert in any of these subjects. The FTA should have a rudimentary understanding so that he/she can quickly resolve minor issues or pull teams aside if they have a more serious problem that cannot be addressed immediately.



It is not the responsibility of the FTA to do an in-depth examination of a team's robot. If a technical problem on the field arises and the FTA is unable to quickly identify and resolve the issue, then the FTA should pull the team aside and direct them to a Control System Advisor (if one is available). Then the FTA should help the remaining teams get the matches running back on time.

The FTA should have good communication skills and be able to work with the drivers and coaches to troubleshoot minor problems, yet keep the matches running smoothly and on time.

There should be at least one FTA per competition field at any *FIRST* Tech Challenge event.

### **Control System Advisor (CSA)**

The [Control System Advisor](#) (CSA) role is another important technical volunteer position. The CSA is responsible for identifying and troubleshooting technical issues in greater depth than an FTA. Although the skills of a CSA and FTA overlap, it is important to have a CSA present at most *FIRST* Tech Challenge events. At a typical event, the FTA will not have time to provide in depth technical support while keeping the matches running on time. It is the CSA who is responsible for troubleshooting more in-depth problems with the robots, wireless control system and other technical issues at an event.

The CSA should have an in depth understanding of the following subjects:

1. How the Android devices and robot hardware modules are connected.
2. How the teams write and execute op modes for their robots.
3. How to use development tools like the Android Debug Bridge.
4. How Wi-Fi and the *FIRST* Tech Challenge wireless control system work.
5. How to do basic monitoring of the wireless spectrum at an event.
6. How to troubleshoot wireless connectivity and performance issues at an event.
7. How to identify and troubleshoot common minor and more serious problems with the robots and their control system.

The CSA should have a solid understanding of these subjects and be able to act as a technical expert to the FTA, teams and mentors at an event. In addition to being able to solve robot-related issues, the CSA should also have enough knowledge of how Wi-Fi technology works so that he/she can troubleshoot wireless issues at an event and help an event manager plan, in advance, for a *FIRST* Tech Challenge event.

The CSA might be required to work with the event venue's IT staff to ensure that the wireless environment will be clear and accessible at a planned *FIRST* Tech Challenge event.

The CSA should have good problem-solving skills and be a good communicator. The CSA should be persistent and be gracious under pressure.

### **Wi-Fi Technical Advisor (WTA)**

At larger events, such as a regional or World Championship, it is beneficial to have at least one [Wi-Fi Technical Advisor \(WTA\)](#) on hand to help plan the event (in advance) and to monitor the wireless spectrum at the event to make sure the Wi-Fi channels stay relatively clear of noise and interference. The WTA is responsible for balancing the wireless load across available channels. The WTA is also responsible for identifying and resolving wireless related issues (including Wi-Fi and non-Wi-fi interference, and malicious attacks in the wireless environment).

The WTA should have the following skills:

1. Expert knowledge of networking concepts.

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2. Expert knowledge of Wi-Fi (802.11) and related technology.
3. Expert knowledge of wireless measurement tools including:
  - a. Wi-Fi Analyzer (Android app)
  - b. Fluke AirCheck or NETSCOUT AirCheck™ G2 meter
  - c. MetaGeek inSSIDer
  - d. aircrack-ng
  - e. Wireshark
4. Working knowledge of Mac OS and Linux operating systems.
5. Working knowledge of writing Linux shell scripts.
6. Working knowledge of Android operating system and related tools (including the Android Debug Bridge).

The WTA should be able to act as a technical expert to the FTAs, CSAs, and the Tournament Director. The WTA might be required to work with the event manager and the event venue's IT staff to ensure that the wireless environment will be clear and accessible at a planned *FIRST* Tech Challenge event.

The WTA should be able to monitor and police the wireless spectrum to look for wireless interference, crowded channels, and malicious activity.

The WTA should have good problem skills and be a good communicator. The WTA should be persistent and be gracious under pressure.

Not every event requires a WTA. At smaller events with a lower number of teams (scrimmages, small qualifying events, etc.) the functions of the WTA might not be required. A qualified CSA should be able to handle most of the technical issues encountered.

At larger events (regional championships and World Championship) a WTA should be available to monitor the wireless environment and to help identify and troubleshoot more in depth technical issues.

## Wireless Event Checklist

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There is a set of recommend steps that an Tournament Director can take before and during an event to ensure a smooth wireless environment for a competition. The steps are listed in an excel worksheet called the [Wi-Fi Event Checklist](#). The Tournament Director can work with a technical volunteer such as the Field Technical Advisor (FTA), the Control Systems Advisor (CSA) or the Wi-Fi Technical Advisor (WTA) to follow the steps in the checklist prior to and during an event. Even for small events, it is important to try and follow these steps to ensure that there aren't any sources of interference (such as audio/video public announcement systems or Wi-Fi suppressors) operating in the venue. The [Wi-Fi Event Checklist](#) has some tasks that should be performed at least 6 weeks in advance of an event. It is important to review the checklist well in advanced of an official *FIRST* Tech Challenge competition.

## Getting Additional Help

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If you have technical questions about the *FIRST* Tech Challenge control system and how it relates to your event, you can visit the [FIRST Tech Challenge Technology](#) forum and search for related posts or post your own questions.

## Appendix A – Resources

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### **Game Forum Q&A**

<http://ftcforum.usfirst.org/forum.php>

Anyone may view questions and answers within the *FIRST*® Tech Challenge Game Q&A forum without a password. To submit a new question, you must have a unique Q&A System User Name and Password for your team.

Volunteers that apply for a specific volunteer role will receive an email from [FTCTrainingSupport@firstinspires.org](mailto:FTCTrainingSupport@firstinspires.org) with their username and password to the forum. You will receive access to the forum thread specific to your role.

## **FIRST Tech Challenge Game Manuals**

Part 1 and 2 - <https://www.firstinspires.org/resource-library/ftc/game-and-season-info>

## **FIRST Headquarters Pre-Event Support**

Phone: 603-666-3906

Mon – Fri

8:30am – 5:00pm

Email: [Firsttechchallenge@firstinspires.org](mailto:Firsttechchallenge@firstinspires.org)

## **FIRST Tech Challenge Event On-Call Support**

*These numbers are available for event personnel only. Please **do not** call these numbers if you are a team looking for a ruling, a decision, or assistance. We trust that you will not misuse this resource.*

Day of Event Robot Control System Support: 603-206-2450

All other Day of Event support: 603-206-2412

## **FIRST Websites**

FIRST homepage – [www.firstinspires.org](http://www.firstinspires.org)

[FIRST Tech Challenge Page](#) – For everything FIRST Tech Challenge.

[FIRST Tech Challenge Volunteer Resources](#) – To access public Volunteer Manuals.

[FIRST Tech Challenge Event Schedule](#) – Find FIRST Tech Challenge events in your area.

## **FIRST Tech Challenge Social Media**

[FIRST Tech Challenge Twitter Feed](#) - If you are on Twitter, follow the FIRST Tech Challenge Twitter feed for news updates.

[FIRST Tech Challenge Facebook page](#) - If you are on Facebook, follow the FIRST Tech Challenge page for news updates.

[FIRST Tech Challenge YouTube Channel](#) – Contains training videos, Game animations, news clips, and more.

[FIRST Tech Challenge Blog](#) – Weekly articles for the FIRST Tech Challenge community, including Outstanding Volunteer Recognition!

[FIRST Tech Challenge Team Email Blasts](#) – contain the most recent FIRST Tech Challenge news for teams.

## **Feedback**

We strive to create support materials that are the best they can be. If you have feedback about this manual, please email [firsttechchallenge@firstinspires.org](mailto:firsttechchallenge@firstinspires.org). Thank you!