Wi-Fi Technical Advisor Manual

Overview

Job Description

Wi-Fi Technical Advisor (WTA) is a volunteer who helps the Event Director plan for large *FIRST* Tech Challenge (FTC) events. The WTA is also responsible for monitoring the wireless spectrum and troubleshooting wireless issues at large and/or critical *FIRST* Tech Challenge events. This position requires a high level of technical knowledge and interpersonal skills and can affect the quality of the event. This role can be performed seated or standing.

Not every *FIRST* Tech Challenge event will require a WTA. Most smaller events (less than 40 robots) do not require the skills of a WTA. However, events with many robots (greater than 40 robots), or events that have difficult wireless conditions or where malicious wireless activity might occur would benefit from having a designated WTA available. The *FIRST* Technical Advisor (FTA) can plan and execute most of these duties for smaller events.

Requirements	
Technical	High
Physical	Medium
Administrative	Medium
Communication	High
Pre-event Training	High

Time Commitment

Wi-Fi Technical Advisor should expect to spend 10-12 hours at a full day event. Approximately 6 hours of pre-event training and planning is required.

Attire

- Comfortable closed-toe, closed-heel shoes, much of the day will involve standing and walking.
- Safety glasses or safety rated glasses with side shields (ANSI-approved, UL Listed, CE EN166 rated, AS/NZS certified, or CSA rated are required in the pit and arena.

- Comfortable professional wear is encouraged.

Training and Certification

Volunteers must create an account on www.firstinspires.org and apply to the role. If you apply to an event role requiring training and certification, the 'Roles Missing Certification' section will appear on your Volunteer Dashboard. Click on 'Review Outstanding Tasks, then click the 'Resolve' button. This will take you directly to the training site. Alternately, you may also click on the 'Trainings/Certification' button on the top right of the screen. If you have applied for a role but have not received access to the training, please email FTCTrainingSupport@firstinspires.org. A separate confirmation of the role assignment will come later.

The WTA should speak to the FTA and Event Director to find out what additional requirements, such as meetings before the event or run-throughs of the space before the event are required.

All volunteers are expected to read and comply with the Volunteer Handbook.

Roles and Responsibilities

> **FIRST is fun for all.** The most important role of a volunteer is to provide a safe, fun and welcoming environment for all *FIRST* participants. When executing the duties of your role, always make decisions with the team experience in mind. Ask for help from event leadership if you feel your required duties conflict with the best team experience.

Wi-Fi Technical Advisor

The Wi-Fi Technical Advisor role is the technical volunteer who helps ensure that the wireless environment at a *FIRST* Tech Challenge event is clean and not too noisy to ensure that teams can compete effectively.

Before an event, the WTA might be asked to conduct a wireless network survey to determine if there are potential sources of wireless interference in the venue. The WTA might also be asked to work with the venue's IT staff to make any appropriate changes to the wireless equipment in the venue to ensure a clean environment for the scheduled event.

During an event, the WTA will be responsible for monitoring wireless activity near the arena to identify and resolve any wireless issues. The WTA might also need to "police" the wireless environment and look for clues for

potential malicious activity during an event. The WTA might also be asked to help the FTA and/or Control System Advisor (CSA) answer questions about the wireless environment.

The WTA requires advanced and very specialized skills:

- Experience/familiarity with computers running Windows® 7/8/10/11.
    - Mac OS and Linux operating system knowledge is not required but helpful.
- Recent and in-depth knowledge of the FTC control system and diagnostic tools.
- Experience with Wi-Fi and Wi-Fi Direct networking.
    - Experience using tools such as Wireshark, Fluke (NETSCOUT) AirCheck Meter, Aircrack-ng, AirTight Networks SpectraGuard and MetaGeek inSSIDer/Chanalyzer are not required but definitely helpful.
- Able to use deductive reasoning to solve technical problems.

Prerequisites for Wi-Fi Technical Advisor

It is important that prior to the event, the Wi-Fi Technical Advisor (WTA) reviews this manual, and reads the supporting documents listed in the checklist below. These training materials will help WTAs learn how to provide effective Wi-Fi monitoring and technical assistance for the event. Learning ahead of time will go a long way towards keeping the event running smoothly and on time.

The document names that are underlined are hyperlinks to public documents on the *FIRST* Tech Challenge website. The remaining documents are stored in the Learning Management System (LMS).

Outlined below are the responsibilities that a Wi-Fi Technical Advisor has before the event day. Make sure to check with the Event Director to see if they need help setting up before the event.

Requirement	Resource
Required	The Wi-fi Technical Advisor Manual (this document)
Required	Read the *FIRST* Tech Challenge Wi-Fi Event Guide
Required	Read and complete the *FIRST* Tech Challenge Wi-Fi Event Checklist.
Required	Read the Control System Troubleshooting Guide, which explains how to troubleshoot common problems with the *FIRST* Tech Challenge control system.
Encouraged	Competition Manual: • Section 12 – ROBOT Construction Rules

Encouraged	Attend the monthly FTA/CSA conference calls
Encouraged	Read the WTA discussion forum. This is a discussion forum where volunteers can ask questions or share tips and best practices with one another. *FIRST* staff will respond to posts, share tips, and important technical information in this forum.
Optional	watch the game animation video for a general understanding of the game
Optional	FTC Q&A System - This is a resource for teams, however you may also find these useful for rule clarifications

Reporting Structure

The Wi-Fi Technical Advisor (WTA) reports to the *FIRST* Technical Advisor(FTA).

Before the Event

Verify with the Event Director that a table, chair, and power drop are available in the arena for you to set up your Wi-Fi monitoring equipment.

The robot control system does not require any centralized control infrastructure. Teams will bring their own driver stations and robot controllers to the event. However, the WTA should do a wireless survey and conduct some wireless tests a week or more before event day. This helps to avoid troubleshooting wireless issues immediately before an event.

Prior to event day, the WTA needs to conduct a wireless survey of the venue to make sure the wireless environment is clear and that there are no Wi-Fi suppressors operating in the venue.

- The FTA will perform this task if a WTA or CSA is not available.
- Coordinate this activity and share the results with the Event Director and the FTA.
- The WTA can use one or more pairs of Android devices to measure the ping time in different areas of the venue and on different Wi-Fi channels of the spectrum. If available, use a tool (such as the Fluke or NETSCOUT AirCheck meter) to measure Wi-Fi and non- Wi-Fi activity in different areas of the venue. If no hardware tool is available, using a free software tool such as "Wi-Fi Analyzer" or the free version of the "Netspot App" is sufficient for a cursory survey.
- If necessary, the WTA should coordinate with local IT staff at the venue to turn off Wi-Fi signals which could be detrimental to the event, particularly for events involving 40 or more robots.
- Obtain the venue's IT on-call phone number in case there is a need to contact them on event day.

- Select preliminary Wi-Fi channels for the Wi-Fi robot communications, local FTC Live scoring system, and any other Wi-Fi access points needed to run the event based on the Wi-Fi site survey of the venue. Share the channel recommendations with the Event Director and the FTA.
- If there are any Wi-Fi or wireless devices operating in the venue that cannot be turned off by the local IT staff, select channels that will not overlap or interfere with these existing devices.
- If your event takes place alongside a *FIRST* Robotics Competition (FRC), you must coordinate with the FRC event organizer to select Wi-Fi channels that will not overlap or interfere with the FRC wireless activity.
- Wi-Fi channels can be assigned to teams within the FTC Live scoring system. Please note: Th assignments can be organized in the scoring system to support the inspection/configuration process.

> **Important Note:** A Wi-Fi Suppressor or Blocker is a device that disrupts the operation of unauthorized Wi-Fi networks in a venue. They are typically used to prevent people from creating Wi-Fi hotspots through cellular tethering. Schools often use the device to force students onto the school's network where it can monitor traffic and institute firewalls to block sites deemed unsuitable.

If a Wi-Fi Suppressor or Blocker is present at an event, then teams will be unable to control their robots properly. The most common symptom that a Wi-Fi suppression device is in use in a venue is that the driver station and robot controller will not be able to pair or will pair but then shortly thereafter will disconnect.

The FTA should check for the presence of such a device **before** the event, then work with the IT staff to disable the device for the day of the scheduled event.

Event Day

Report Time

The Event Director or Volunteer Coordinator will confirm the time you should arrive typically via email the week before the event. In most cases, arrive as soon as the event opens. When you arrive onsite check-in with the Volunteer Coordinator and report to the FTA.

Set-up

Tournament set-up generally occurs on the day before the competition. Setting up the arena and testing the wireless environment normally takes two to three hours for a single field event and three to four hours for a two-field (or more) event, although those times will decrease with experience. The WTA will survey the wireless environment in the arena and practice area. It is helpful to have a pair of Android devices running the *FIRST* Tech Challenge apps (FTC Driver Station and FTC Robot Controller) to test the wireless environment on the playing

field(s).

- Select the Wi-Fi channels for the competition and share the recommendation with the Event Director and FTA. Verify that the selected channels will not overlap or interfere with other wireless devices in the venue.
- Be sure to have all passwords of the computers or devices being used, if applicable.

Event Day for the WTA

- Verify that the reserved wireless channels for the competition are clear and that low ping times are observed for a test robot controller-driver station (RC-DS) pair operating on these channels.
- The remainder of the day will be spent monitoring the wireless environment at the arena. The WTA should monitor the spectrum to make sure the Wi-Fi channels that are designated for robot control are clear and not overloaded. The WTA should also monitor the spectrum to look for clues of potential malicious activity. Report issues of concern to the FTA.
- The WTA should remember that their primary focus is to ensure that teams are able to control their robots over the Wi-Fi spectrum without interference. When dealing with potential interference (such as a spectator running a portable hotspot) it is better to communicate that goal instead of acting like an enforcer. In this manner, it turns the spectators into assistants in keeping the spectrum clean instead of creating an adversarial situation.
- The WTA may also monitor which channels teams are on and help guide teams to the designated channels.
- The WTA might also be required to help the FTA and/or CSA troubleshoot wireless issues.

Suggested Event Day Equipment & Document List

- A pair of *FIRST*-approved Android devices:
    - Current FTC Driver Station App installed on one Android device (Driver Hub or approved smartphone).
    - Current FTC Robot Controller App installed on one Android device (Control Hub or approved smartphone).
    - Wi-Fi Analyzer app (available from the Google Play Store) installed on the driver station Android device.
- Laptop that supports wireless monitor mode with Wireshark installed. Note: that Windows laptops will not support monitor mode. Apple Mac's out of the box will support monitor mode. Alternatively, most Linux distributions will support monitor mode and can be burned to a USB drive and live booted.
- If available, specialized Wi-Fi analyzing tools (such as Fluke/NETSCOUT AirCheck Meter, MetaGeek inSSIDer with Wi-Spy hardware, etc.)
- Wi-Fi analyzing software tools such as "Wi-Fi Analyzer" or the free edition of the "Netspot App"
- Hard copy or electronic copy of the WTA Manual (this document).
- Hard copy or electronic copy of the Control System Troubleshooting Guide.
- Hard copy or electronic copy of the Wi-Fi Event Checklist.

Team Interaction and Support

When interacting with teams, please always consider the team's perspective. The teams have put significant time and effort into preparing for this event and may be feeling very stressed about everything working out as they have planned. Today is a very big deal for the team and we are here to help!

While it is our job to help guide the teams to a successful event, it is their responsibility to follow the rules and be on time for judging and matches.

If you feel there is an issue with an individual or individuals from a team that warrants specific intervention beyond just a kind reminder, please ensure the correct stakeholders for the team are aware. Here is a generally acceptable process when working with a student or team who you need to change their behavior:

The ABCs of Managing Team Behaviors	
Ask for an Adult	Do not directly reprimand a student one-on-one without an adult from their team present. Ask the student to bring an adult who is responsible for the team to meet you, before moving forward with any discussion about the concerns at hand.
Be aware of the Environment	Is the environment conducive for the feedback you are about to give? Is it loud in the area where you are? Are there other teams around that may hear the reprimand? Moving the conversation to a quieter, more private space as needed can be helpful.
(Offer a) Clear Explanation	Explain the concern to the team and offer clear examples of the behavior that is concerning.
Discuss any Questions	Offer the opportunity for students and adults to ask clarifying questions.
Explain Next Steps	Outline with the students and adults what the next steps are if the issue is not corrected. Certain behaviors may include the risk of yellow cards.

Note: the only person at an event who can give an official warning or issue a yellow/red card is the head referee. Please refer these more severe issues to the head referee and notify the Program Delivery Partner.

Be cautious about passing on any negative feedback about any teams directly to the judges or judge advisor (JA), because it is not possible to know all the contributing factors around such a complaint or observation.

End of the Day

If you have time to help with the load out at the end of the day it is always nice to clean up before leaving. Make sure to return all equipment prior to leaving.

Important Tools

Public Schedule

The Program Delivery Partner or the Event Director should publish the public schedule of events before the event. This schedule will have a high-level overview of all the activities for the event. It is important that everyone at the event does their best to stay true to the public schedule so that teams and volunteers who have planned their day around these times have a good experience.

Figure 1: Sample Public Schedule for a Typical FIRST Tech Challenge Event

Time	Agenda
7:15am	Doors Open for Volunteers
8:00am	Doors Open for Teams
8:30am	Judging & Inspection Commences
10:35am	Inspection Deadline
10:40am	Opening Ceremony & Driver's Meeting
11:00am	Qualification Matches Commence
12:00am	Lunch Time
12:30pm	Qualification Matches Resume
3:15pm	Alliance Selection
3:45pm	Elimination Matches
5:30pm	Closing Ceremony, Awards and Advancement Announcement

On occasion things that happen out of the event's control may impact the schedule. In these cases, work closely with the Event Director to understand the updated agenda.

Event Layout/Map

The Program Delivery Partner and Event Director should publish a map of the venue before the event. In some cases, details on the map might not be available until the day of the event.

The Event Layout / Map should detail the following:

- Load-In Path

- Parking for Personal Vehicles and Busses
- Team Check-in
- Volunteer Check-in
- Competition Area
- Pit Area (May include the Pit Map)
- Judging Room Locations (if applicable)
- Safety Details as available (Emergency Exits, AED, Shelter in Place Locations)

Match Schedule

The match list will be generated the day of the event after the teams have been confirmed. This schedule will list which teams will play in which Alliance (Red or Blue) and it will also list a match start time see Figure 2. Some events will have more than one competition field and/or more than one division and each division will have its own schedule.

Figure 2: Example Match Schedule

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Pit Map

Pit maps are typically provided by either the Event Director or by the Scorekeeper. Having a map of where each team is in the pit is key, as teams, parents or queuers might need to find specific teams. Below are two sample pit maps in Figure 3 and Figure 4:
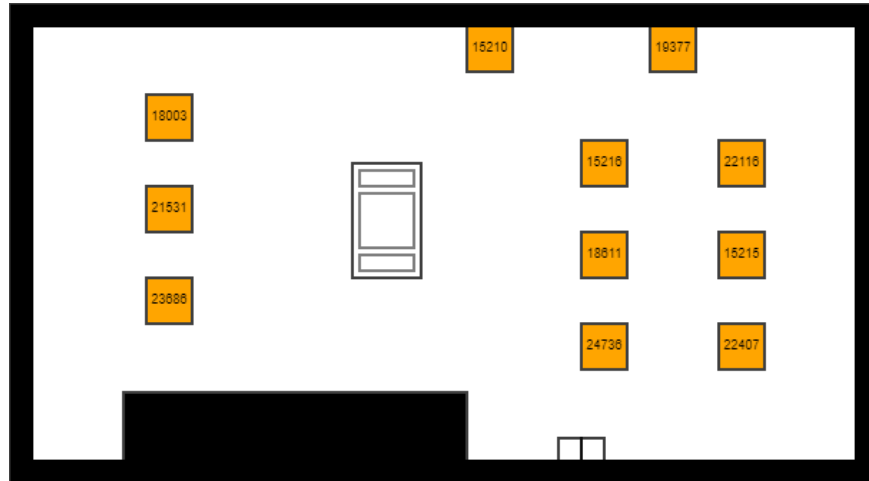

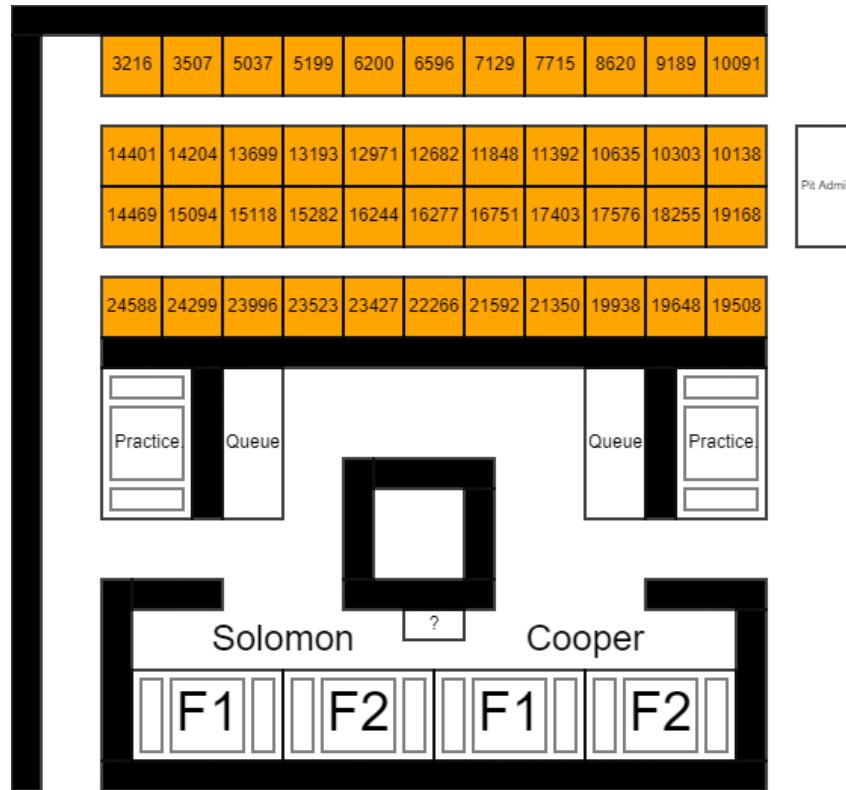*Figure 3:Example Pit Map for a small12-team Qualifier Event*

Figure 4: Example Pit Map for a Typical Regional Championship Event

Useful Links and Information

On-Call Support Numbers

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On-Call Support

These numbers are for *volunteer support only*. Teams should not use these numbers to call about rulings or technical assistance.

Administrative, judge, referee and Non-Technical Issues: (603)206-2412

Scoring System (FTC Live) or other Technical Issues: (603)206-2450

Call or use the built-in chat feature on FTC Live

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Pre-Event Support

Mon – Fri	8:30am – 5:00pm Eastern Time (UTC-4 or UTC-5)
Phone:	(603)666-3906
Email:	firsttechchallengeteams@firstinspires.org

Program Resources

FIRST Tech Challenge Website

Event Search

Game and Season Resources

FIRST Tech Challenge Blog

Volunteer Resources

Team Email Blasts

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. Thank you!