Venue Networking Requirements

Wi-Fi and Network Infrastructure Requirements for Events

Revision History	
Revision	**Description**
25-26.1	Initial 2025-26 Season Release

Contents

Overview

This document provides an overview of the wired and wireless networking requirements for venues hosting *FIRST* Tech Challenge (FTC) events.

Event Wi-Fi Implementation

Robot Wireless Implementation

Each battery-powered robot on the playing field powers its own independent Access Point (AP) that hosts its own 802.11w wireless network (5GHz) used for robot control. Teams connect their driver station devices to the robot's wireless network in order to remotely control their robots. No internet access is provided to or by teams through this connection.

Scoring System Wireless Implementation

The *FIRST* Tech Challenge scoring system (FTC Live) networking is typically managed by a consumer-grade Wi-Fi router providing an AP, connecting the scoring system and the tablets used at the event for inspection and real-time scoring purposes as well as the display screens used to display real-time status of the event. This Wi-Fi router may also be physically connected to venue internet, or the scoring system laptop device may be connected to venue internet via Wi-Fi, to provide internet access for uploading event status and match data to FTC cloud servers.

An alternate configuration exists where, with close communication and configuration support with the venue IT staff in advance of the event, the scoring system computer, tablets, and display devices may use the venue wireless instead of a Wi-Fi router. This is not recommended because most school venue networks are configured to restrict/prevent inter-device communications with each other across the venue Wi-Fi. Direct communication between devices on the Wi-Fi is a hard requirement for the FTC-Live system. Some venue IT systems require MAC address white-listing of all devices in advance in order to facilitate this, and it is not realistically possible to provide such information prior to the event. If such a system is being considered, emergency contact info must be provided for on-call IT venue support.

Event and Venue Wi-Fi and Wired Requirements

Robot and Scoring System Wireless Requirements

Robots and Scoring System both use a considerable amount of bandwidth on whatever channels they are assigned to, but that bandwidth utilization is not constant. Venue Wi-Fi that employs active channel management (a network that actively scans channels and adjusts the channels it operates on based on congestion levels) can cause significant harm to an event if infrastructure Wi-Fi moves to the same channels that robots and field equipment are on. It is advisable to either have dedicated channels for robots and field equipment during the event, disable public Wi-Fi access, or completely disable the venue Wi-Fi during the event.

Events with 40 or fewer robots	Events with more than 40 robots

• 2 or more open 5GHz channels
  ○ 20MHz bandwidth
• One channel for robots
• One channel for the scoring system
	• 3 or more open 5GHz channels
	  ○ 20MHz bandwidth
	• Each channel with up to 40 robots
	• One additional for the scoring system

Robot Access Points are only able to operate on any of the following 5GHz 20MHz channels:

Robot Access Point Channel Compatibility List		
Channel Number (20 MHz)	Center Frequency (MHz)	Frequency Range (MHz)
36	5180	5170-5190
40	5200	5190-5210
44	5220	5210-5230
48	5240	5230-5250
149	5745	5735-5755
153	5765	5755-5775
157	5785	5775-5795
161	5805	5795-5815
165	5825	5815-5835

Venue Wi-Fi Infrastructure Requirements

1. Venue must disable *Rogue Access Point Detection*, or any wireless hotspot or unknown Access Point blocking protocols in the venue infrastructure. As it is not realistically possible to provide MAC addresses prior to the event, and there could be up to one hundred different MAC addresses in use (or more), it is not viable to perform white-listing of devices.
2. Venues providing internet access via Wi-Fi for FTC-Live updates should adhere to these requirements:
    a. IP Assignment – DHCP or static IPv4 address assignment
        i. The Address Space of the IP Assignment needs to be known in advance:
            1. DHCP – Class A only (10.x.x.x)
            2. DHCP – Class B only (172.16.x.x)
            3. DHCP – Class C only (192.168.x.x)
            4. DHCP – Class A, B, or C (i.e. venue configurable)
            5. Static
    b. Content Permissions – Remove content filters which may be in place restricting access to Discord, even if port 80 is open.
    c. Ports – TCP ports 80 and 443 must be open; http/https, general web browsing
    d. Required Web Sites / Site Masks:
        i. *.firstinspires.org
        ii. *.ftclive.org
        iii. ftc-cloud-pdx-prod-uploads.s3.us-west-2.amazonaws.com

Venue Wired Infrastructure Requirements

1. Field electronics will almost certainly be using a Wi-Fi router to manage the devices connected to the field Wi-Fi. Wired venue internet will most likely be plugged into the WAN port on the Wi-Fi router (preferred).
    a. If routers are allowed on the venue network, the MAC Address of the router can be provided to white-list it if necessary.
    b. If routers are not allowed to be connected to the venue network, venue internet can be connected directly to the scoring system laptop and the laptop may use Wi-Fi to connect to the Field Electronics Wi-Fi network.
2. Venues providing internet access via wired interface should adhere to these requirements:
    a. Physical Layer – RJ45 Ethernet, auto-negotiation
    b. IP Assignment – DHCP or static IPv4 address assignment
        i. The Address Space of the IP Assignment needs to be known in advance:

1. DHCP – Class A only (10.x.x.x)
2. DHCP – Class B only (172.16.x.x)
3. DHCP – Class C only (192.168.x.x)
4. DHCP – Class A, B, or C (i.e. venue configurable)
5. Static

c. Content Permissions – Remove content filters which may be in place restricting access to Discord, even if port 80 is open. (This is used for remote event support.)
d. Ports – TCP ports 80 and 443 must be open; http/https, general web browsing
e. Required Web Sites / Site Masks:
    i. *.firstinspires.org
    ii. *.ftclive.org
    iii. ftc-cloud-pdx-prod-uploads.s3.us-west-2.amazonaws.com