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# CTC User Stories

## Dispatcher

As a dispatcher, I want to upload the day’s schedule as an excel sheet and have the system dispatch all the trains at their correct time automatically, so that I can efficiently communicate my plans with the system.

## Wayside Controller

As the wayside controller, I want to receive suggested speed and authority such that trains don’t collide, so I have to stop less trains and the system runs smoothly.

# Wayside (Software & Hardware) - User Stories

## PLC Programmer

* 1. Ensure simple uploading of PLC file to smoothly enter and conduct automatic operation
     1. As the PLC programmer, I want to be able to easily upload the PLC file, so that the train system is able to operate smoothly (prevent block-occupancy conflicts, switch rails, change lights, etc.) during automatic operation. In manual operation, I must be able to change the attributes (lights, crossings, switches) of blocks which have them.
     2. CoS: System must ensure that the process of uploading the PLC file occurs smoothly and without any data loss. Automatic operation is vital and operates according to PLC file content, so this must be accurate and up-to-date with the most recent track configuration.

## CTC Office

* 1. Ensure initial speed and authority of each train is communicated and confirmed
     1. As the CTC office, I want to be able to send speed and authority data of trains to the wayside controller in order for this data to be communicated with other modules. I also must receive block occupancies from the wayside controller, as well as shut down blocks and operate switches upon putting the wayside controller under maintenance operation.
     2. CoS: System must ensure that block occupancies, as well as confirmed speed and authority, are accurately communicated with other modules.

## Track Model

* 1. Ensure that block occupancies are received by the wayside, and ensure that block states (lights, crossings, switches) are relayed to the track model.
     1. As the track model, I want to ensure that block occupancies are received by the wayside controller accurately, so important decisions about block states can be determined according to said occupancies. I also want to receive an accurate list of blocks that have experienced attribute changes in order to apply these changes to the track itself.
     2. CoS: System will accurately report all changes in block attributes to the track model as soon as these changes occur to provide the best real-time changes to the track as necessary.

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# Track Model User Stories

## Track Builder

### Ensuring Real-Time Accuracy for Uploading Track Layout and Block Data Updates

* + 1. As the track builder, I need to be able to upload the track layout and ensure that block data is updated successfully, so that the system accurately reflects the physical characteristics and status of the track for operational and safety purposes.
    2. CoS: System must allow and make sure the process of uploading track layout goes smoothly without error or data loss. The system also should provide real-time updates of the block data as changes occur, ensuring all modifications adhere to predefined safety procedures.

## Murphy

### Indicating and Responding to Failures

* + 1. As the user Murphy, I need to be able to initiate any of the three failure modes, broken rail, track circuit failure, and power failure,so that I can test and identify vulnerabilities and refine preventative measures.
    2. CoS: The system shall include switches so that Murphy can change and indicate failure states at any time. The system must also display failures in real-time and automatically transmit this information to the wayside controller to ensure immediate awareness and response to potential safety threats.

## Wayside Controller

### Monitoring Track State

* + 1. As the Wayside Controller, I want to be able to receive information about the track state so that I can promptly report any failures to the CTC (Centralized Traffic Control), thereby ensuring passenger safety.
    2. CoS: The system must be able to receive real-time updates on the track state including failure signals. Upon detection of any track state failures, the system must promptly transmit detailed information about the failures to the Centralized Traffic Control (CTC) without delay.

### Speed and Authority Communication

* + 1. As the Wayside Controller, I want to be able to send commanded speed, authority, and track status which includes lights and railway switches so that I can relay this data to other modules to eventually be applied to the physical train.
    2. CoS: The Wayside Controller system must be able to send real-time speed information and track status efficiently. The Wayside Controller system must also ensure timely and accurate relay of the data to the Track Model for seamless integration and application to train operations.

### Presence on the Block

* + 1. As the Wayside Controller, I want to be able to receive block occupancies from Track Model so that important decisions about block states can be determined according to said occupancies.
    2. CoS: Wayside Controller must be able to receive real-time updates of block occupancies from Track Model so that a train can’t crash. Therefore, the communication between the two modules must be reliable and efficient.

## Train Model

### Sending Commanded Speed, Authority, Grade, and Beacon

* + 1. As a Train Model, I want to be able to receive commanded speed, authority, information about the next station, and the grade of the track so that I can pass this information along to the Train Controller, enabling the train to operate properly and safely.
    2. CoS: Train Model must be able to receive real-time updates of commanded speed, authority, grade, and beacon from Track Model so that a train can’t crash. Therefore, the communication between the two modules must be reliable and efficient.

### Receiving Passengers Information (Passenger Disembarking)

* + 1. As a Train Model, I want to send passengers information so that the Track Model can use that information to display to its user.
    2. CoS: Train Model must be able to send real-time updates of the information about the passengers to the Track Model. Upon receiving this information, the Track Model must promptly update its UI to display relevant information.

# Train Model User Stories

## Murphy

### Indicating and Responding to Failures

# As the user Murphy, I need to be able to initiate any of the three failure modes: engine failure, signal pickup failure and brake failure, so that I can test and identify vulnerabilities and refine preventative measures.

* + 1. CoS: The system shall include toggles so that Murphy can change and indicate failure states at any time. The system must also display failures in real-time and automatically transmit this information to the train controller to ensure immediate awareness and response to potential safety threats.

## Track Model

### Communicating commanded speed, authority, beacon and grade

* + 1. As the Track Model, I want to be able to send commanded speed, authority, beacon and grade so that I can relay this data to other modules to eventually be applied to the physical train.
    2. CoS: The Track Model system must be able to send real-time speed information and track status efficiently.

## Passengers

### Enabling Emergency Stop

* + 1. As a passenger, I want to be able to pull the emergency stop button incase of an emergency.
    2. CoS: The Passenger should be able to pull the emergency stop to ensure safety if the train needs to be stopped suddenly

## Train Controller

### Ensuring the Train Model follows speed limits and safety by applying appropriate power

* 1. As Train Controller, I want to be able to control the train’s actual velocity by inputting the appropriate power function.
  2. CoS: The Train Model should follow the speed limit and drive under a safe speed as instructed by the Train Controller. The train controller forwards this instruction by inputting the appropriate power function.

### Ensuring the passenger’s safety by dealing with the emergency stop and Murphy failure signals

* 1. As Train Controller I want to be able to constantly communicate with the Train Model to get information regarding the failure signals and emergency stop status, so that they can be dealt with appropriately.
  2. CoS: All failure cases and emergency stop scenarios must be dealt with by the train controller until the train model can continue regular operation.

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# Train Controller User Stories

## Train Engineer

As a Train Engineer, I want to be able to adjust Ki and Kp to adjust the power ratio of the train.

## Train Driver

As the Train Driver, I want to be able to clearly adjust the conditions within the cabin to make sure the passengers have a smooth ride, enjoy their time on the train, and clearly understand where they are going

## Train Model

As a Train Model, I want to be able to clearly receive instruction for power, lights, doors, temperature, and braking and alert in order to properly function as a steel box

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