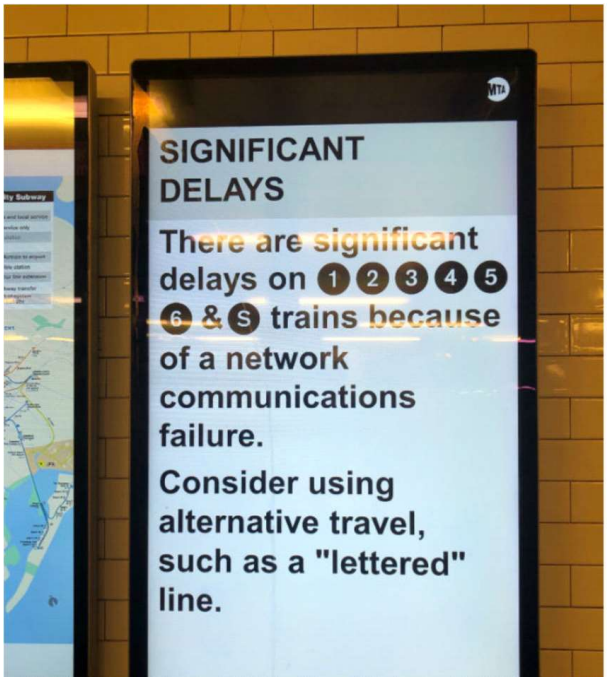
New York City's subway system, though vital to millions of commuters each day, continues to face major challenges from frequent train delays caused by its outdated signaling technology. The old fixed-block system restricts how many trains can safely operate on the same track, leading to congestion, longer wait times, and reduced service reliability. To address this issue, the MTA introduced Communication Based Trains Controls (CBTC), a modern signaling system that uses wireless communication between trains and control centers to track train positions more precisely and manage traffic flow in real time. Unlike traditional systems, CBTC allows trains closer together safely, increasing efficiency and reducing delays. Some CBTC systems also integrate Global Navigation Satellite System (GNSS) technology, which enhances train positioning accuracy, especially on open-air tracks. By combining CBTC and GNSS, New York can modernize its subway for a faster, smarter, and more dependable transit network.

The main problem is that train routes are not properly coordinated. When one train is delayed, it causes a chain reaction that disrupts the spacing between all other trains on the line. This leads to what is known as a phantom delay, where service becomes inconsistent across stations. Past efforts to improve the subway system, such as the Enhanced Station Program that was announced in 2016, focuses more on station appearance rather than fixing how trains actually run. The program aimed to renovate stations but did not address the major functional issues, and costs increased due to infrastructure problems, eventually stopping the project early.



The solution to this problem is Communications-Based Train Control (CBTC), a system designed to improve how trains are monitored and controlled. CBTC works by

constantly sending information between trains and trackside computers, allowing the system to always know each train's exact position and speed. This data is used to create a moving block around each train instead of fixed sections of the track. The system then automatically controls train speed and braking to maintain safe and even spacing between trains. This continuous communication allows trains to run closer together while reducing the risks of collision and improving the overall efficiency.

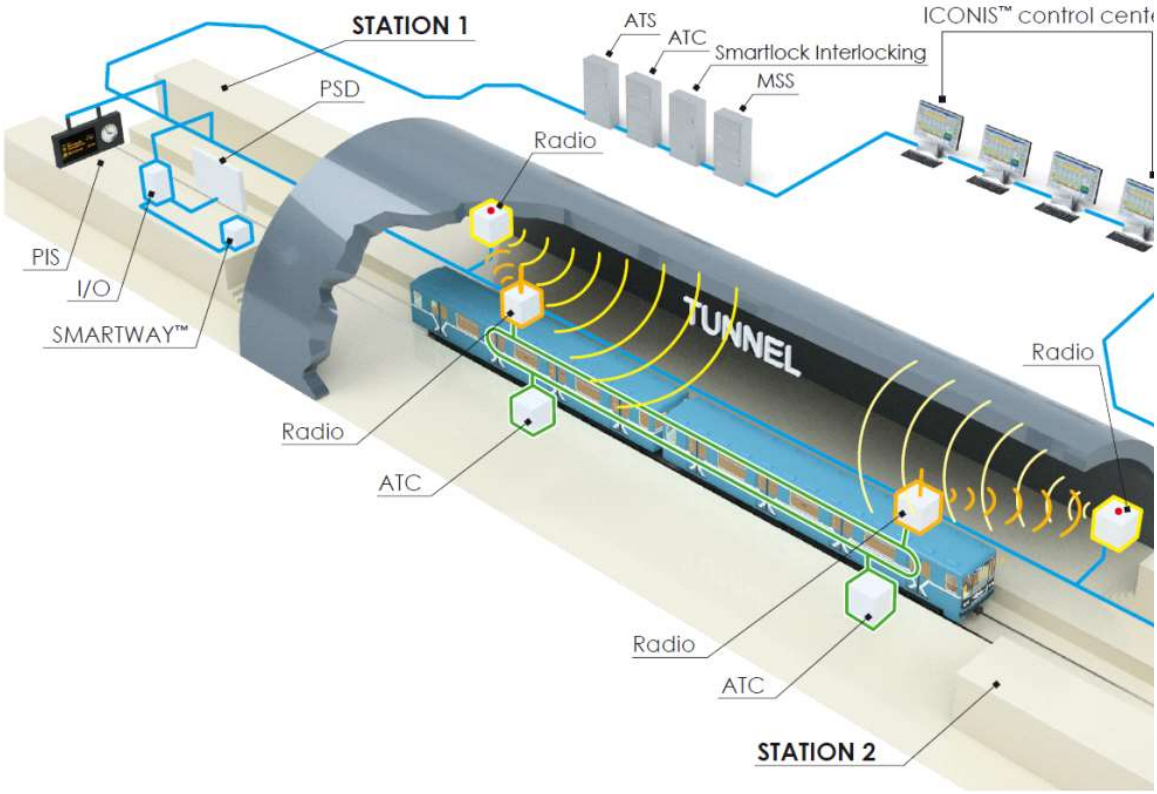
Traffic congestion and delays have posed the NYC Subway system a lot of trouble for as long as you can imagine. From trains coming too late, to trains coming right after another, the traffic of the Subway system has always been unreliable. As a group we've decided to come up with a project that will surely fix these issues while also providing riders with a safe method of travel. In the past many companies have tried to fix this issue, the MTA has been at work and there's yet a solution to be found. However, in recent times we have found other people interested in fixing this issue and we have found one idea that could potentially work.

CBTC(Communications-Based Train Control) is a train signaling system that will allow us to track trains better and make sure to prevent the early and late arrival of trains, making it more consistent.

How CBTC works:

CBTC works by constantly sending information between each train and trackside computer so the system always knows every train's exact position and speed. Using this

data, it creates a safe “moving block” around each train instead of fixed sections of track, then automatically controls train speed and braking to keep them separated, preventing control collisions, and allowing more trains to run closely and smoothly on the line.


STATION 1
ATS
ATC
Smartlock Interlocking
MSS
ICONIS™ control cent
PSD
Radio
PIS
I/O
SMARTWAY™
TUNNEL
Radio
Radio
ATC
Radio
ATC
STATION 2

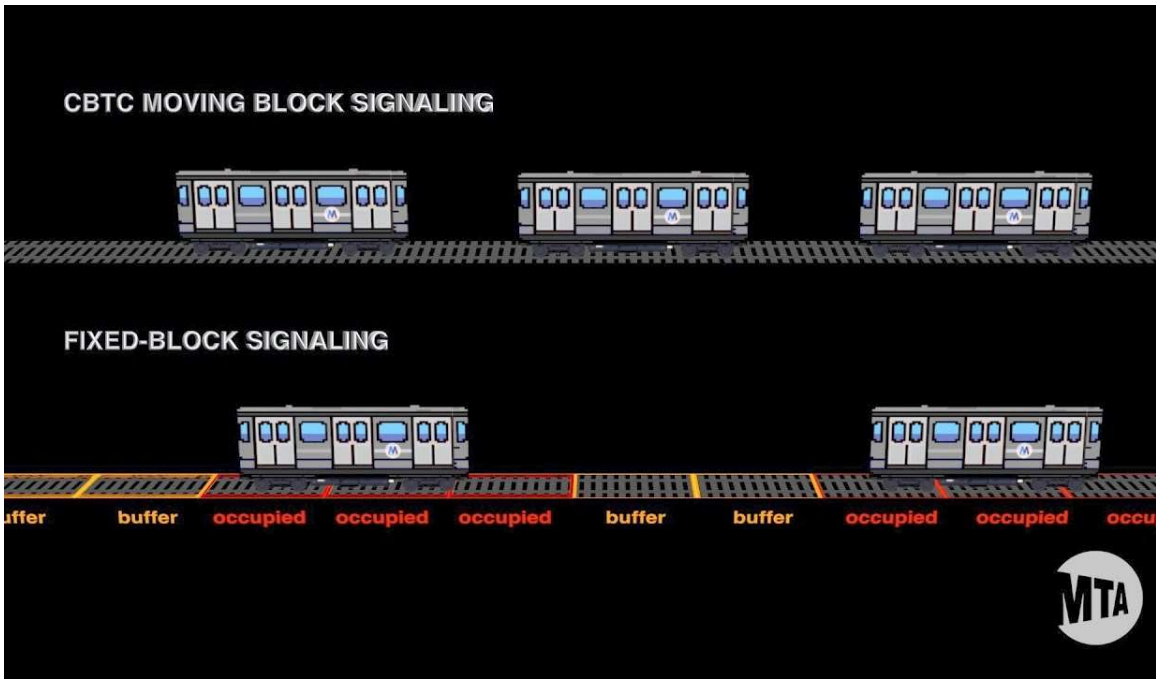
Benefits and Justifications for CBTC

Improved Reliability and Capacity: CBTC allows trains to run closer together, reducing headways and improving overall reliability and capacity.

Enhanced Station Program:

For years, New York City has known about its Subway Crises and the impending renovations that would be needed to keep the over-a-century system functioning. Governor Cuomo announced the Enhanced Station Program in 2016, and declared a State of Emergency for the subways. While being a step in the right direction, the Program did not address fundamental problems with the functionality of the subway, and was seen as more of a cosmetic improvement. The initial project was intended to renovate 32 stations, each to cost 28 million USD. However, the project was put to a halt initially due to violations against the ADA. While the Program included many facets of improvement for the stations, it did not include an improvement of the stations' accessibility. Furthermore, when the project was put into action, engineers discovered "infrastructure rot" in the stations, causing the projected cost for each station to skyrocket. The project ended up out of money after a mere 13 stations. The project, despite costing much, did not improve the much-needed schedule of the trains, and instead underestimated the scope of the project, the budget, and what was needed for NYC subways.

To proceed, we can elect a specific board of engineers to determine which aspects of subway improvement are vital for its functioning, and the estimated budget.



Why it isn't in every train line:

Communications-based train control isn't on every line mainly because it is very expensive to install and requires major upgrades to the existing lines. The cost of this system is around 25-25 million dollars per mile. Also during the installation of this

system, train services may also need to be reduced or shut down temporarily, which can cause many delays. So because of this, transit agencies usually install CBTC slowly or only on certain lines instead of across the entire network.

When talking about designing a project on this scale, we have to consider the importance of the materials and cost needed to proceed with this project. Firstly, we have to take into account the legal and safety aspects of this project. If we tried to do this as an independent company we would face many legal problems. Some of these major ones range from permission to actually build on this track to the effects it would have on the environment itself. These many hurdles of legal stuff we would have to overcome would hold us back years of progress we could've had done. This is why the best route we can take in achieving this in a reasonable amount of time would be to partner up with the MTA as a vendor. Being a vendor would allow us to sell our idea to the MTA and skip over the many legal challenges we would have to figure out before carrying on with this project.