

Monmouth STEM Presentation

Christopher Davis



UNIVERSITY OF
BIRMINGHAM

Outline

1 Introduction

2 Railway Engineering

3 Activity

4 Discussion

5 Questions

About me

- Christopher Davis
- STEM Ambassador
- Railway Systems Engineer
- PhD Student at the University of Birmingham
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- Member:
- Institution of Engineering and Technology (IET)
- Institution of Railway Signal Engineers (IRSE)
- Institute for Systems Engineering (IfSE)



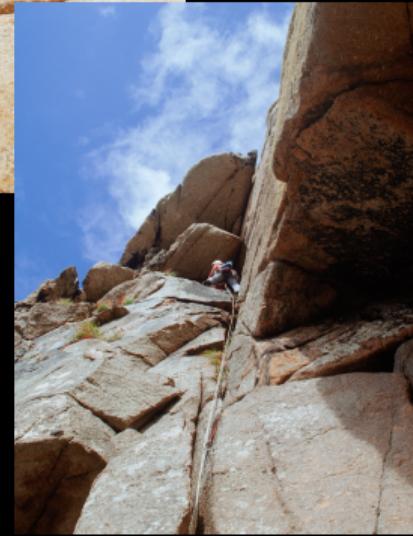
History

- Bishop's Stortford: School
- Bristol: Electrical and Electronic Engineering MEng
- Bristol: Internal Software Developer
- London: Arup, Railway Systems Engineer
- Birmingham: PhD Student



¹Image Source: OpenStreetMap.org

Outside of Work



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What is Engineering?

Engineering Definitions

Engineering Council

“Chartered Engineers (CEng) develop solutions to engineering problems using new or existing technologies, through innovation, creativity and change”

Wikipedia

“Engineering is the practice of using natural science, mathematics, and the engineering design process to solve problems within technology, increase efficiency and productivity, and improve systems.”

NASA

“Engineers solve problems.”

What is Railway Engineering?

Railway Engineering Disciplines

- Rolling Stock (Trains) (Mechanical / Electrical)
- Permanent Way (Track) (Mechanical / Civil)
- Bridges (Structural Engineers)
- Tunnels (Civil / Geotechnical Engineers)
- Stations (Structural Engineers)
- Signalling (Electrical)
- Timetabling / Transport Planning (Geography)



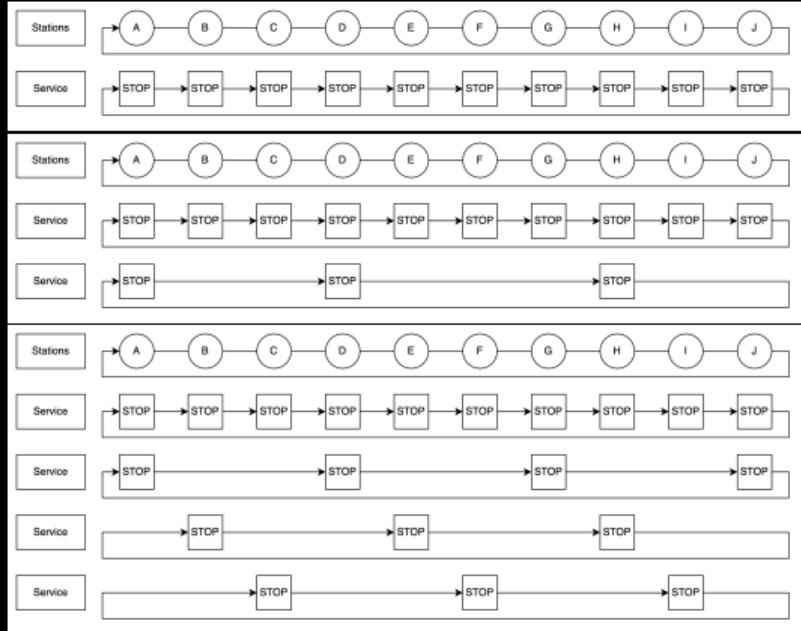
¹Image Source: TheFrog001, Wikimedia Commons

Different Views of a System

- Tube map
- Carto Metro
- undergrounddistances

My Research

- Research into modelling and simulation of novel transport operating concepts
- Design a language to describe system architectures that is understandable by both humans and computers



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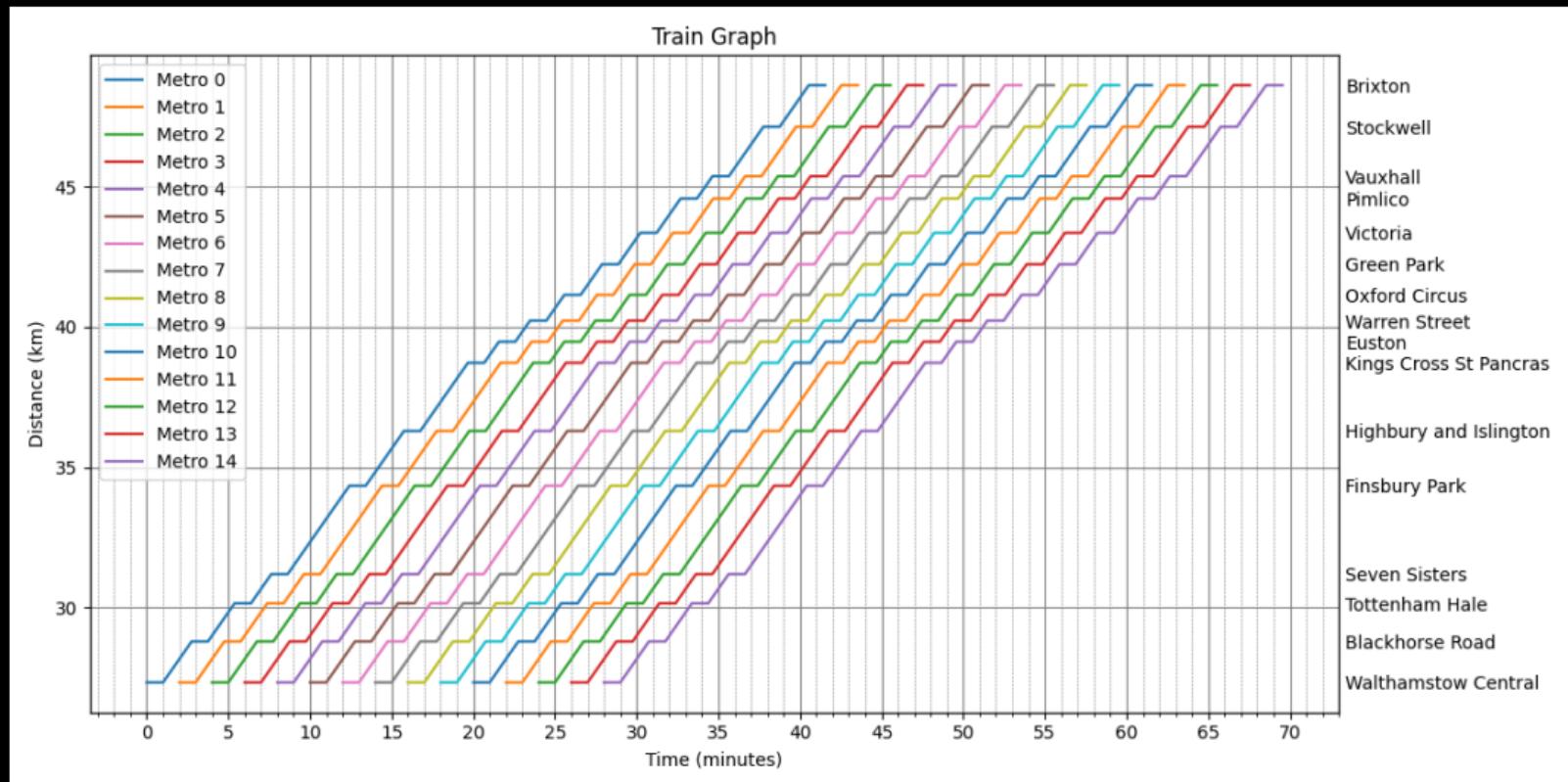
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Activity: Introduction

- Railway networks rely on precise scheduling to ensure trains run safely, efficiently and on time
- A train graph is a type of time-distance diagram used to visualise how train move through a network
- It helps planners
 - Check for conflicts between services
 - Spot delays or inefficiencies
 - Ensure trains maintain safe spacing and arrive on time
- In this activity you'll take the role of a timetable planner
- Your goal is to design a conflict free schedule using a train graph

Activity: Example Train Graph



Activity: Your Task



- All service must depart within 60 min
- The schedule must be designed so that it can be repeated every hour without conflicts.
- A minimum Headway of 5 min must be maintained between any two trains at any point along the line.
- Dwell time must be applied at each scheduled stop.

Train Type	TPH	Max Velocity (km h^{-1})	Stops	Dwell (min)
Express	2	120	D	2.5
Local	2	80	All	7
Freight	1	60	None	

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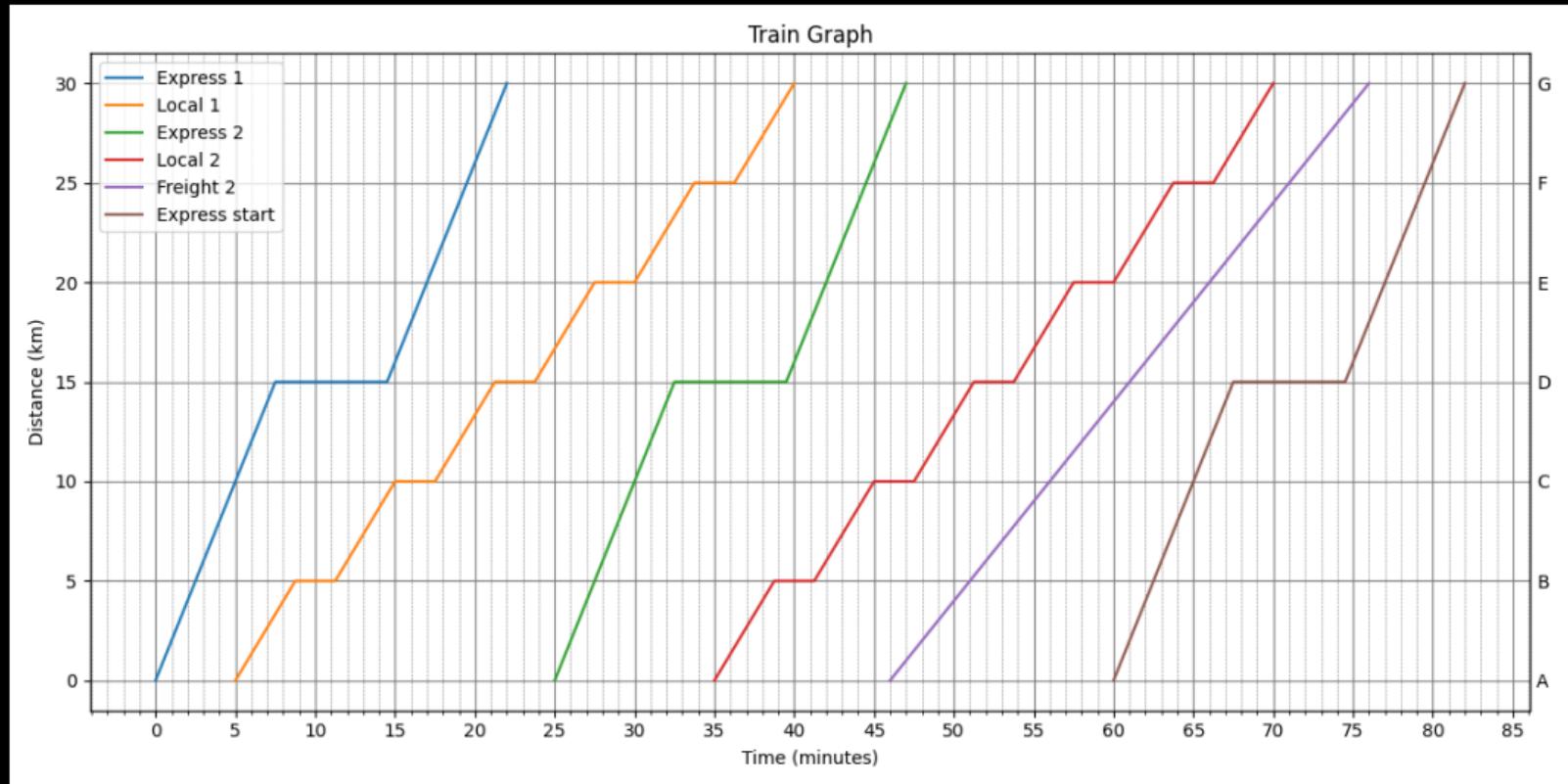
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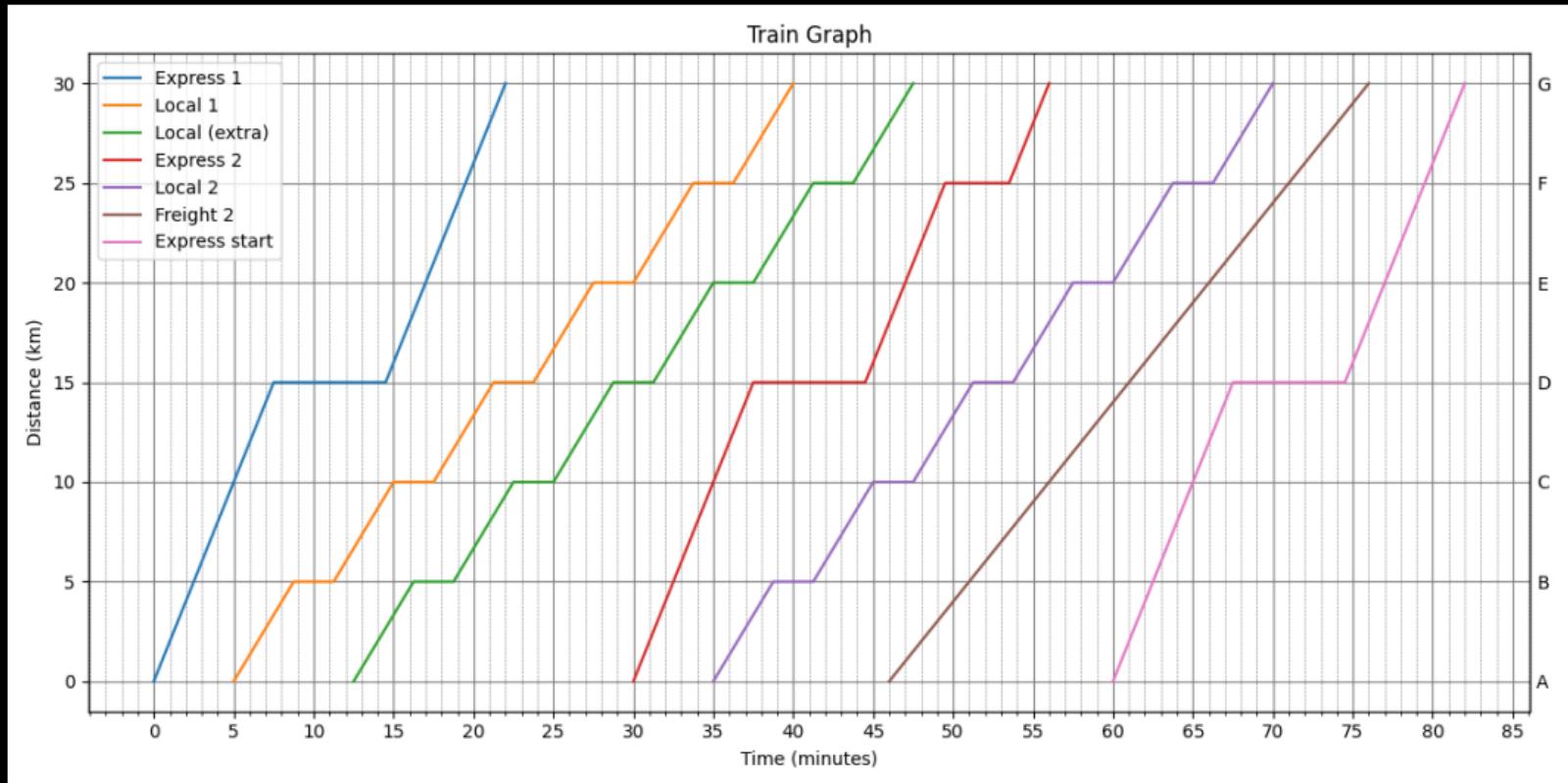
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Activity: Discussion

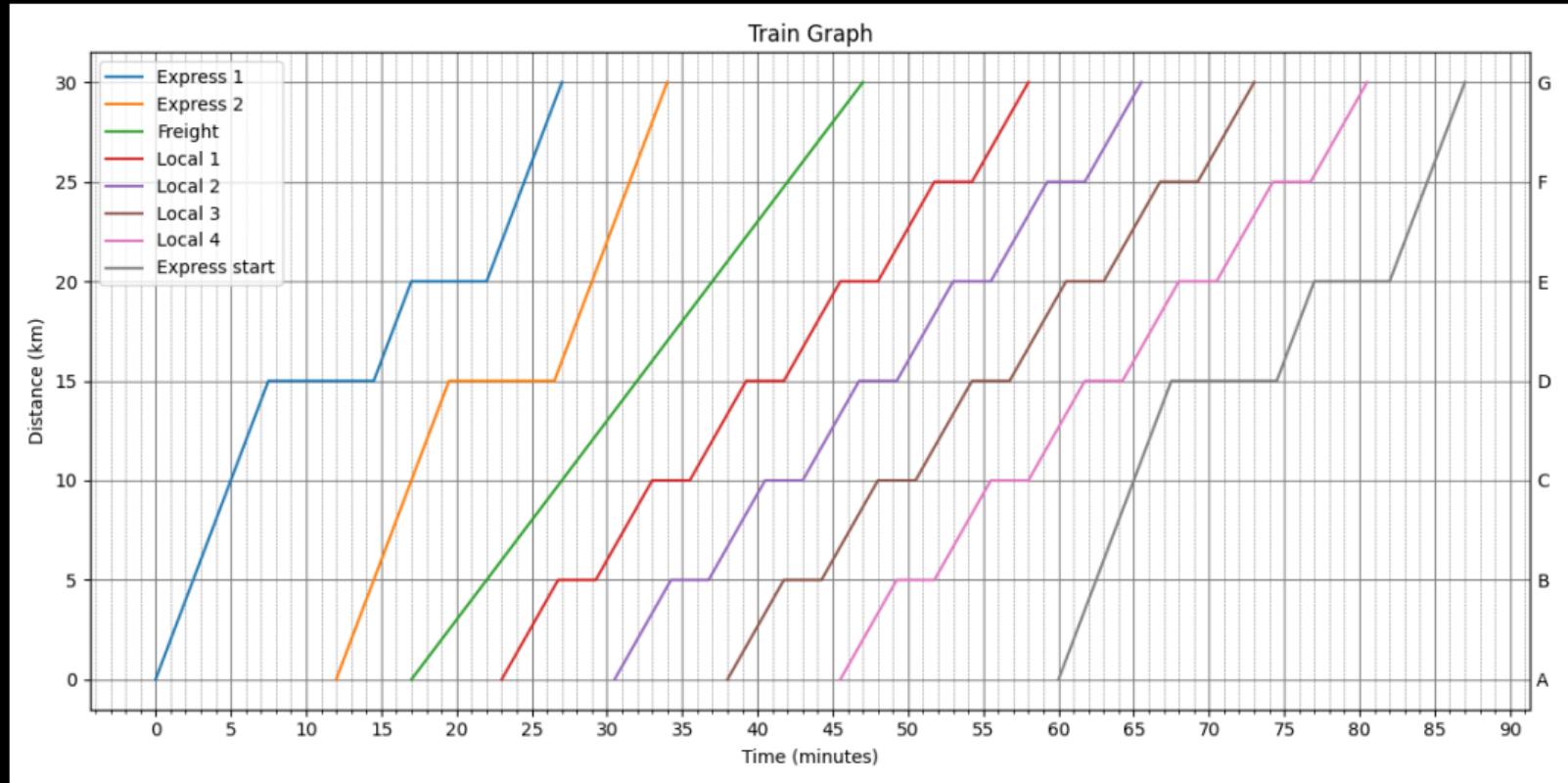
Activity: My Train Graph - Standard



Activity: My Train Graph - Extra Local



Activity: My Train Graph - Grouped



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