OCTO Coding Challenge 2024 - Week 4

Welcome back to week 4, the final week of Bentley's OCTO Coding Challenge for 2024!

As always, you'll have until Thursday 26th December (boxing day!), 11PM EST, to complete 2 coding puzzles.

You can also solve the puzzles with any tools/languages you like, including and especially AI!
In fact we'll be giving special recognition to colleagues who submit transcripts of their interactions with CoPilot Chat.

Hi, Tunc. When you submit this form, the owner will see your name and email address.

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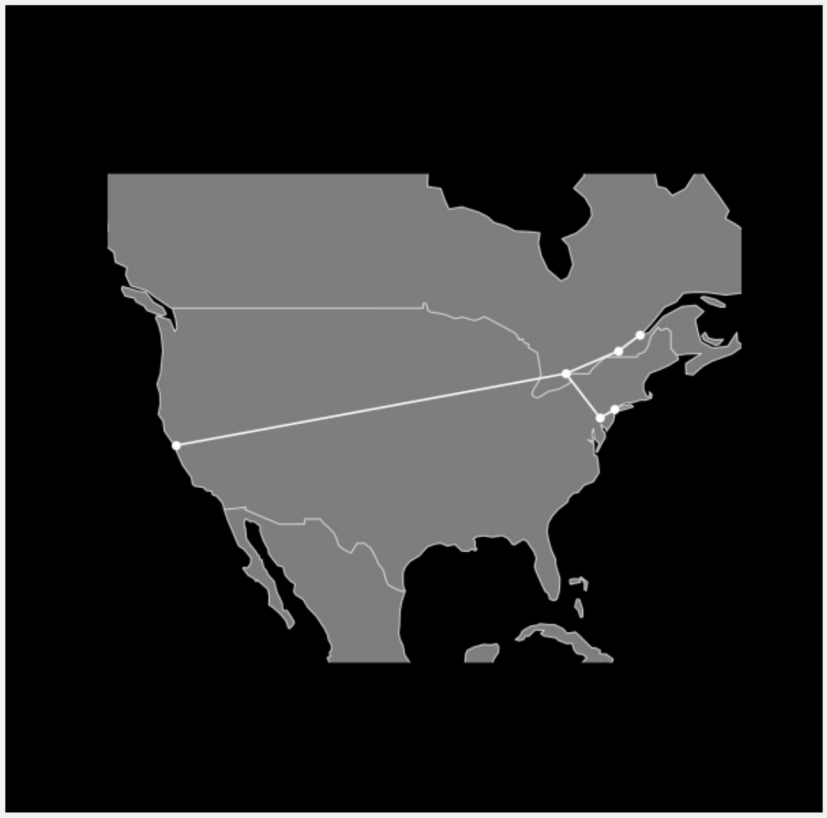
Part 1: Connected Cities (20 Points)

Introduction

At Bentley we connect teams with software for infrastructure. Can AI help us design and optimize these solutions?

Problem Statement

Given a distance matrix representing distances between all pairs of cities, what is the minimum total distance of a network connecting all of them? An edge in your network must be between 2 cities,



and a pair of cities is considered connected if there is a connected path through your network between them.

The distance matrix is given as a csv file: https://tinyurl.com/4znspvnn

Example

Let's take a look at how we would connect the following cities:

- Exton, Pennsylvania
- Montreal, Quebec
- Quebec City, Quebec
- Toronto, Ontario
- New York City, New York
- San Francisco, California

The distances between them are given in the following csv file: https://tinyurl.com/s798umjf
The minimum sized network connecting all of these cities would be Exton-Toronto (509795km), Exton-New York City (157066km) Montreal-Quebec City (233039km) Montreal-Toronto (504182km) Toronto-San Francisco (3643511km), for a total of distance of **5047593**km.

The value must be a number

2

Part 1 (Bonus) (2 Points)

Feel free to share your solution source code for Part 1.

Remember, recognition will be given to correct submissions for the following categories:

1. Code golf: Who's got the shortest source?
2. Most elegant solution
3. Best use of AI in writing a solution.

Enter your answer

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Part 2: Traffic (30 Points)

Introduction

Let's try something a step up in difficulty. Instead of connecting cities with a minimal network, let's look at the maximum traffic flow between cities, a problem very relevant to many Bentley teams.

Problem Statement

Given a weighted directed graph representing a road network with road capacities, what is the maximum traffic flow between city 'A' and the city 'Z'?

The graph is given as an adjacency list JSON file: https://tinyurl.com/mpax5zjb
Round your answer to 2 decimal places.

Example

The following example JSON, https://tinyurl.com/2sax8u8f, represents the following cities:

- City A has a road leading to city B, with a capacity of 10
- City A has a road leading to city C, with a capacity of 10
- City B has a road leading to city D, with a capacity of 3
- City C has a road leading to city D, with a capacity of 2
- City D has a road leading to city Z, with a capacity of 6

The traffic flow is limited by the roads between B and D, and C and D, which gives a maximum traffic flow of **5.00**.

The value must be a number

4

Part 2 (Bonus) (2 Points)

Feel free to share your solution source code for Part 2.

Remember, recognition will be given to correct submissions for the following categories:

1. Code golf: Who's got the shortest source?
2. Most elegant solution
3. Best use of AI in writing a solution.

Enter your answer

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AI Bonus (10 Points)

Feel free to share transcripts of any use of CoPilot Chat in solving these puzzles.

Remember, there's a recognition category for best use of AI!

Enter your answer

☐ Send me an email receipt of my responses