Exercise 2

Business Informatics 2 (PWIN)

Information Systems III & Communication Systems

SS 2011

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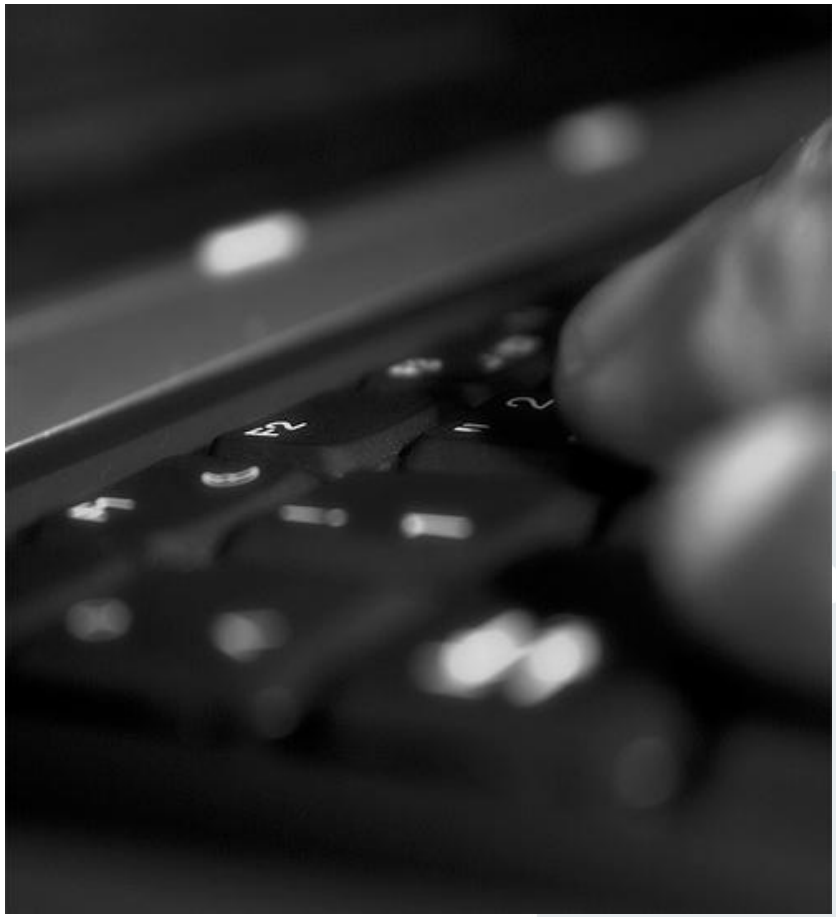

Jenser (Flickr.com)

Agenda

- Exercise 1: Mobile Device Characteristics
- Exercise 2: SIM Card
- Exercise 3: Functions of a Mobile Operating System
- Exercise 4: Mobile Apps vs. Mobile Web Apps
- Exercise 5: Mobile App Markets
- Exercise 6: Mobile Marketing
- Exercise 7: Layer-based Communication Models
- Exercise 8: Network Layer: Routing

Exercise 1: Mobile Device Characteristics

a) Name three characteristics specific to mobile devices.

Exercise 1a): Solution

- Terminal of users differ in technical specifications
  - Heterogeneous and fragmented system landscape
    - Display resolution
    - Different web browsers
    - Keyboard
    - Mobile Operating Systems
    - Application software that can be installed
    - Other features

Exercise 1: Mobile Device Characteristics

b) How can one summarise the situation for the InstantONS provider with regard to the development of a Mobile App?

Exercise 1b): Solution

- Fragmented mobile device landscape with regard to existing
  - Display sizes, Mobile OS, Mobile Device Capabilities (e.g. I/O)

- Consequences
  - Mobile device landscape of potential target group (e.g. 20 to 50-year-olds) is fragmented as well

  - InstantONS Provider needs to support the majority of mobile devices of its potential target group

    - or -

  - InstantONS Provider has to select the main mobile device platform within its potential target group (e.g. iPhone)
    - Disadvantage: InstantONS service reaches fewer potential users

Exercise 1: Mobile Device Characteristics

c) What technological means exist to alleviate the situation in b) for the InstantONS provider?

Exercise 1c): Solution

- Mobile Apps
  - Code Portability
  - Cross-platform Compilers
- Mobile Web Apps
  - Content Render Systems

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Exercise 2: SIM Card

a) Name one central function of the SIM card with regard to mobile communications.

Exercise 2a): Solution

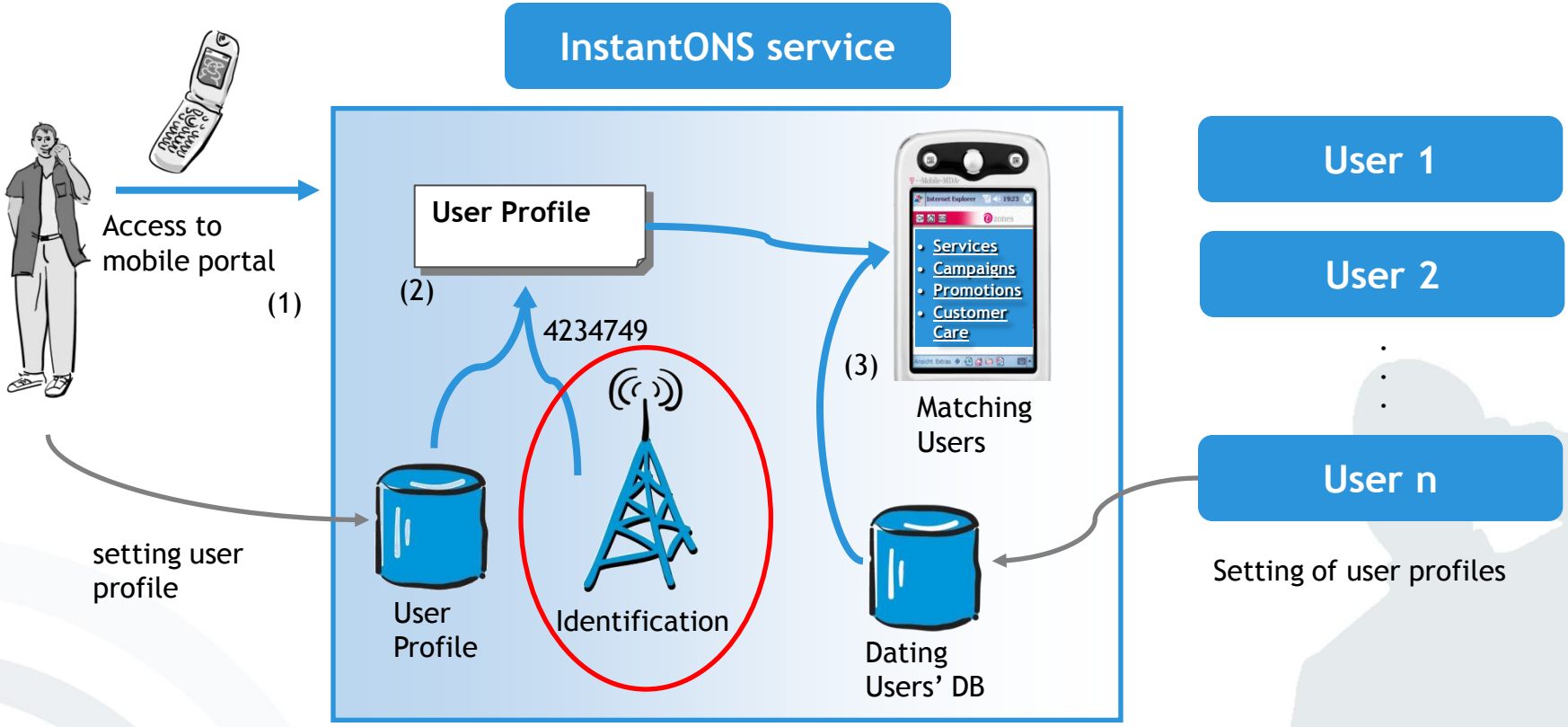
- **SIM**s are **Smartcards:**
  - **SIM cards** serve as security medium.
  - Tamper-resistance prevents counterfeiting.
  - robust design
  - Small computers with **memory**, **operating system**, **software**, **processor**, **I/O** and **access control**
- Contain **International Mobile Subscriber Identity** (**IMSI**) for subscriber identification and a key provided by the mobile operator used for encryption
- Reliably execute computational functions for the mobile device
- **Represents** contract **between subscriber & network operator**

- Authorises **a "mobile device"** to **use** the network by linking it to a **subscription**

Exercise 2: SIM Card

b) Which function of the SIM card enables the automatic identification of InstantONS users in order to process their corresponding user profile?

Exercise 2b): Solution



The mobile network allows to uniquely identify mobile users via their **International Mobile Subscriber Identity (IMSI).**

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Exercise 3: Functions of a Mobile Operating System

a) Security functions are only one category of the mobile operating system functionality. Name two more categories and explain their purpose.

Exercise 3a): Solution

- Controlling of the resources:
  - Computation time, real-time processing:
    “Who is computing how much? How long does it take?”
  - Memory (RAM, Disk):
    “Who gets which part of the memory?”

- Communication:
  - Allocation of I/O-Resources
  - Processing of the communication
  - User interface (UI)

Exercise 3: Functions of a Mobile Operating System

b) Why is specifically *security* important for the InstantONS service and its users?

Exercise 3b): Solution

- Security functions:
  - Protection of the data (memory, hard disk):
    "Who is allowed to access resources?"
  - Process protection (computation time, code, isolation):
    "Who is allowed to compute?"

- Dating services in general are very sensitive to most users
- Dating services process and store very personal user data
  - Self-presentation (pictures, personal interests, etc.)
  - Message Repository for exchanged messages between users
- The InstantONS service processes even more sensitive personal data (i.e. location data)
- But is Mobile OS security sufficient enough for InstantONS to provide data security?

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Exercise 4: Mobile Apps vs. Mobile Web Apps

a) Name two significant differences between Mobile Apps and Mobile Web Apps.

Exercise 4a): Solution

Mobile App ("Native App")	Mobile Web App
Supports offline use	Needs constant internet connectivity (network coverage)
Can be found easily in App Store(s)	Distribution via URL, e.g. QR-codes
Business Model: Sold in App Store(s)	Difficult to implement payment and authentication system
Can make use of all OS and device functions	Cannot access OS core functions (e.g. 3D graphic processing or access to local storage)
Needs to be platform-specific (native code)	Using web browser of the device, hence manufacturer-independent multi-platform support possible; also porting to other devices/platforms is less expensive
Based on Objective-C, C#.Net, Java	Based on HTML5, CSS, Javascript
Updates/Versioning through App Stores	Easy updates as they are done on the server, not on every client device

Exercise 4: Mobile Apps vs. Mobile Web Apps

b) What would be the benefits / drawbacks of offering the InstantONS service as a Mobile App?

Exercise 4b): Solution

	Mobile App ("Native App")
	Supports offline use
Benefits	Can be found easily in App Store(s)
	Business Model: Sold in App Store(s)
	Can make use of all OS and device functions
Drawback	Needs to be platform-specific (native code)
	Based on Objective-C, C#.Net, Java
	Updates/Versioning through App Stores

Exercise 4: Mobile Apps vs. Mobile Web Apps

c) Considering your answer in b), what kind of application type (Mobile Apps vs. Mobile Web Apps) would you recommend to the InstantONS service provider?

Exercise 4c): Solution

- Mobile Application should make use of local mobile operating resources (e.g. access to local database)
  → Mobile App

- Mobile Application should be platform-independent in order to provide better maintainability
  → Mobile Web App (logic and data in the cloud)

- Users have to pay for the Mobile Application
  → Mobile App (Mobile App Stores provide a payment system)

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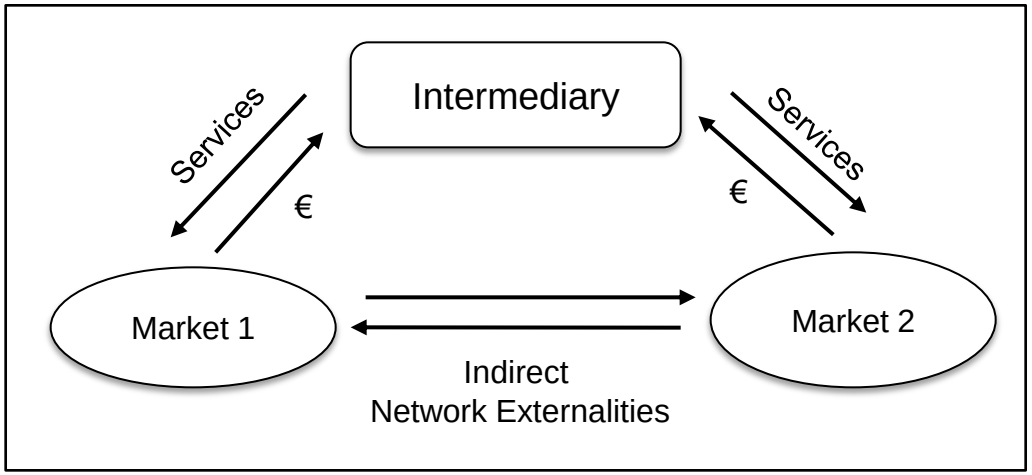
Exercise 5: Mobile App Markets

a) From which specific characteristics do two-sided markets benefit? What are their weaknesses?

Exercise 5a): Solution

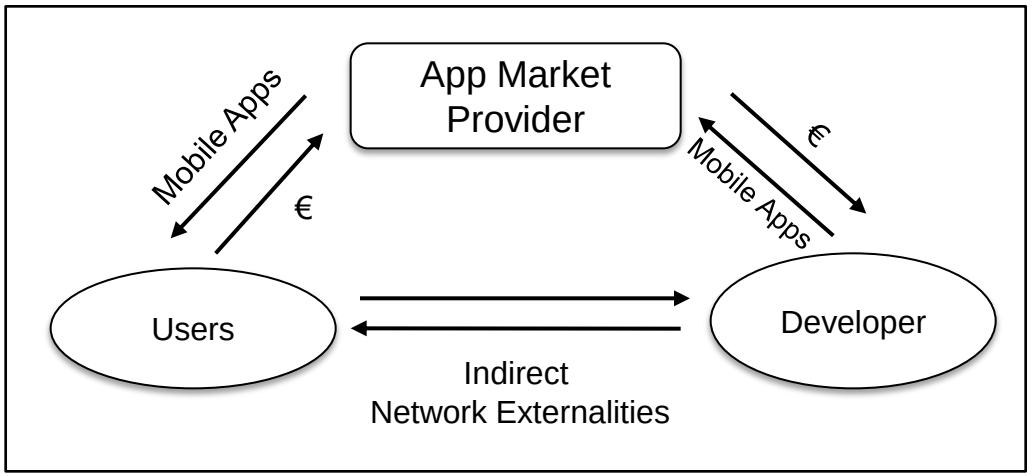


- Benefits
  - Indirect Network Externalities
- Weaknesses
  - Critical Mass of Users required (Chicken & Egg Problem)
  - Common Price Structure needs to be balanced

Exercise 5: Mobile App Markets

b) Describe the characteristics of two-sided markets with regard to mobile apps markets. What are the differences of the *Apple App Store* and the *Google Android Market* with regard to the business strategy of both companies?

Exercise 5b): Solution



- How did current Mobile App Market Providers solve the Chicken & Egg problem?

Exercise 5b): Solution

- Apple App Store
  - Closed platform
  - Solely controlled by Apple
  - Mobile Apps can only be installed via the App Store
  - Direct revenues for Apple from revenue share model (70% of app price for developer / 30% for Apple)
  - Business strategy of Apple: Generation of direct revenues from app sales
- Android App Market
  - Open platform for multiple market providers (e.g. Google, Amazon, etc.)
  - Each market is controlled by its corresponding market provider
  - Mobile Apps can be installed via any Android market
  - Each Android market can have an individual revenue model
  - Business strategy of Google: Generation of indirect revenues from the sale of advertisement by fostering the use of the mobile Internet

Exercise 5: Mobile App Markets

c) Assuming the current market for Mobile Apps will resolve into a market of Mobile Web Apps, what are the consequences for Google, Apple and the other players in the market? Do they need to align their business strategy in order to maintain their current revenues? If yes, how?

Exercise 5c): Solution

- Mobile Web Apps
  - are much harder to control than mobile apps closed app markets
  - are accessible via single URL
  - are in their majority currently free of charge
  - are mostly platform-independent

- Possible Strategy of Mobile App Market Providers
  - Provide Marketing platform for Mobile Web Apps
  - Provide added value functions for Developers
    - e.g. identity management, security functions, payment services
  - ...

- Is this enough for Mobile App Market Providers?

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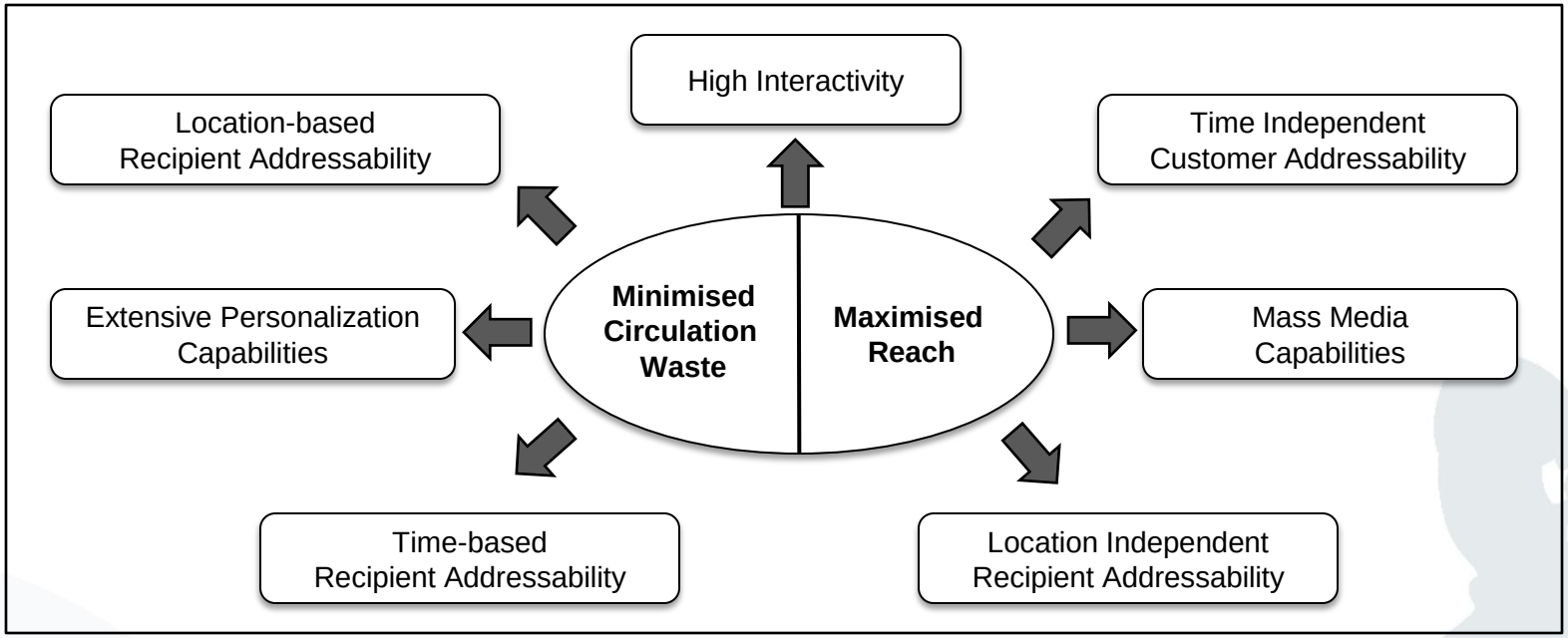
Exercise 6: Mobile Marketing

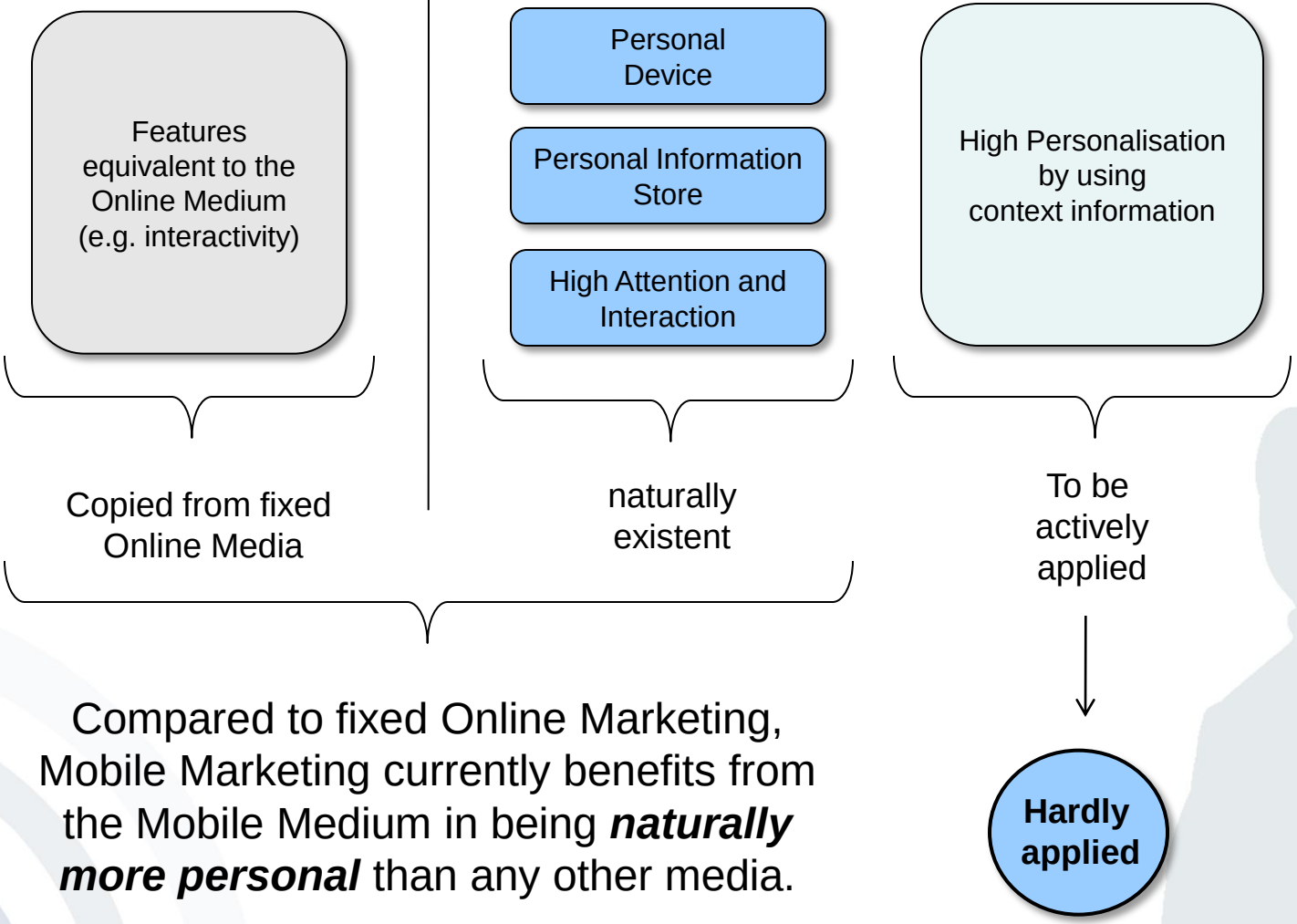
a) Name three benefits of Mobile Marketing which originate from the unique characteristics of mobile data communications.

Exercise 6a): Solution



Theoretical Potential of Mobile Marketing

Exercise 6a): Solution Unique Features of Mobile Marketing at Present



Compared to fixed Online Marketing, Mobile Marketing currently benefits from the Mobile Medium in being ***naturally more personal*** than any other media.

Based on Praxisleitfaden Mobile Marketing (2008)

Exercise 6: Mobile Marketing

b) What are the benefits of available context information about mobile users (i.e. current location, identity and time) for the InstantONS service?

Exercise 6b): Solution

Benefits of available context information about mobile users for the InstantONS service

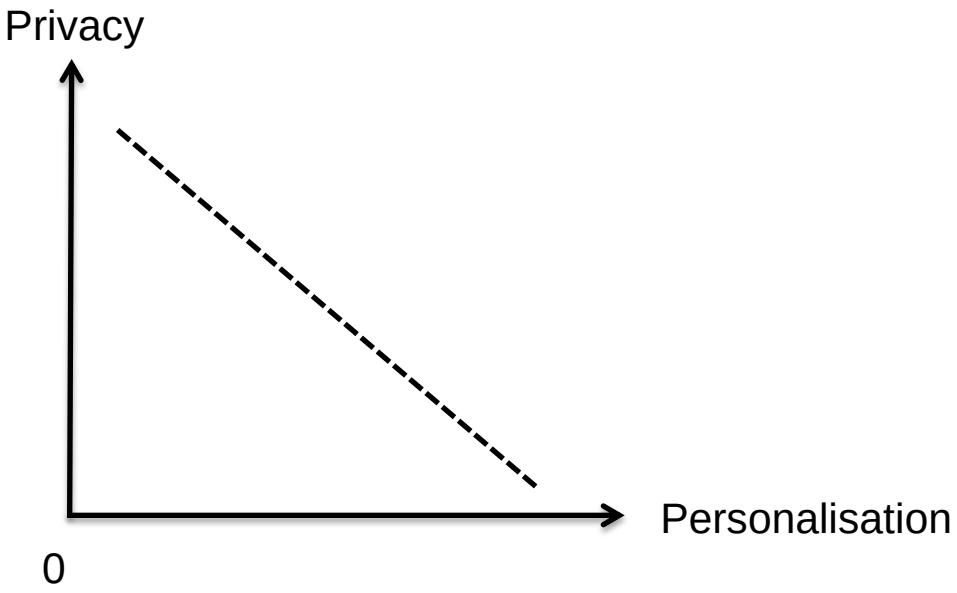
- Users can be matched based on context-based dynamic user profile
  - Personal interests and location (for matching)
  - Location and time for meeting point recommendation
  - Automatic user identification allows automatic login into InstantONS services (i.e. improved usability)
  - ...

Exercise 6: Mobile Marketing

c) Discuss the area of conflict between the benefit of the InstantONS service collecting context information about users and the demand of users to maintain their privacy.

Exercise 6c): Solution

- Trade-Off between Service Personalisation and User Privacy



- User should be in control of his data: Identity Management.

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Exercise 7: Layer-based Communication Models

a) What is the reason for the development of layer-based communications?

Exercise 7a): Solution

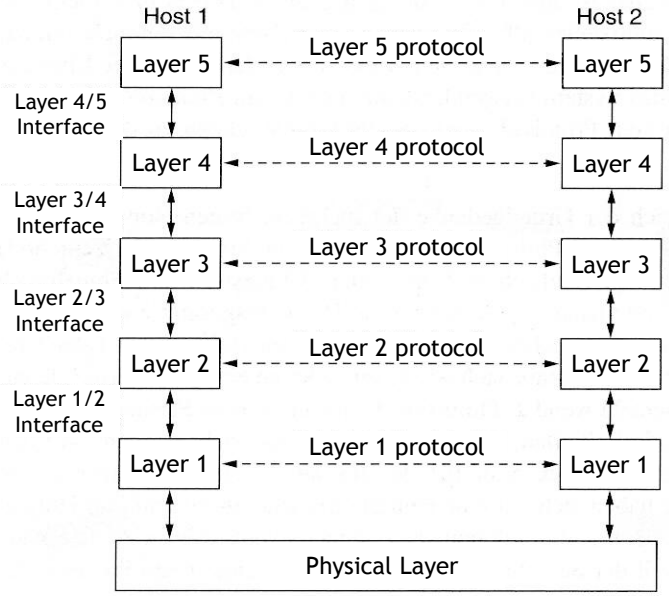
- In order to **reduce complexity** of communication systems, most networks are built using **multiple layers**, one upon the other.
- In all networks, layers provide specific **services** to the layer above while, in particular, shielding it from details such as **how** these services are provided or implemented.
- In informatics, this concept is known from the areas of abstract **data types, data encapsulation and object-oriented programming**.

Exercise 7: Layer-based Communication Models

b) How does layer-based communication work in principal? Give a brief example.

Exercise 7b): Solution

- Layers provide specific **services** to the layer above
- The figure shows 5 layers.
- Communication inside one layer uses the respective **protocol**.
- **No direct data communication** from layer n of one host to the same layer n of another host.
- Each layer sends data and control messages to the layer below until the lowermost layer was reached.
- Located below layer 1 is the physical transmission medium which is used for the communication.



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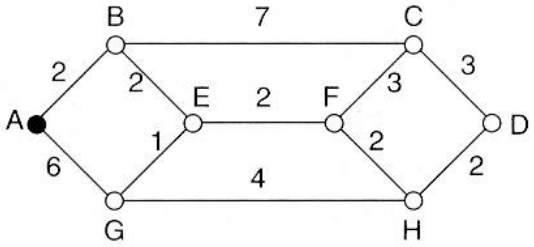
Exercise 8: Network Layer: Routing

a) The main task of the Network Layer constitutes *routing*. In this regard, describe the basic concept of the *Dijkstra algorithm* as one important approach in this context.

Exercise 8a): Solution

- The algorithm was developed 1959 by Edsger Wybe Dijkstra.
- It solves the problem of **finding the shortest path between** two vertices *(singular: vertex)* in a graph.
- For this concept, a graph is created in which every router is represented by a **vertex** and every transmission line by an **edge**.
- The algorithm computes the shortest path between a selected pair of (two) routers with the help of this graph.
- The labels of the **edges** can e.g. be distance, bandwidth, average traffic, transmission costs, average queue length, average transmission time measured or other factors.
- Every **weighted edge** has an impact on the shortest path.



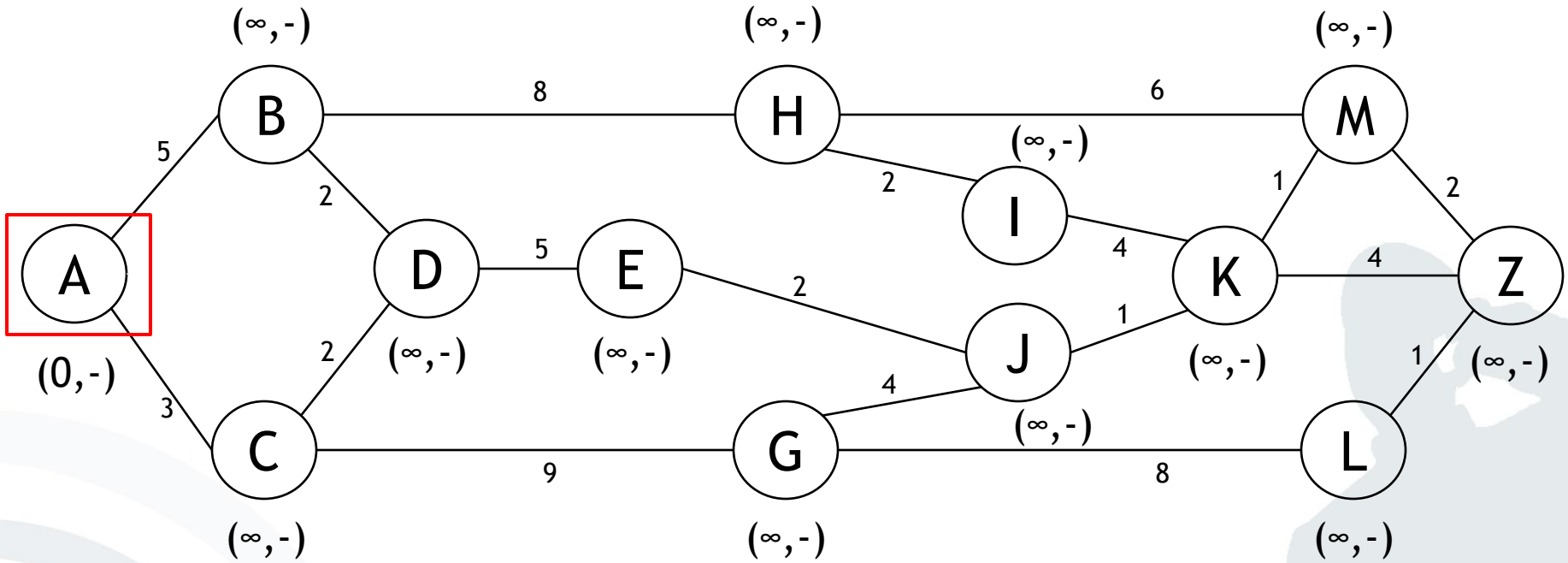
(a)

Exercise 8: Network Layer: Routing

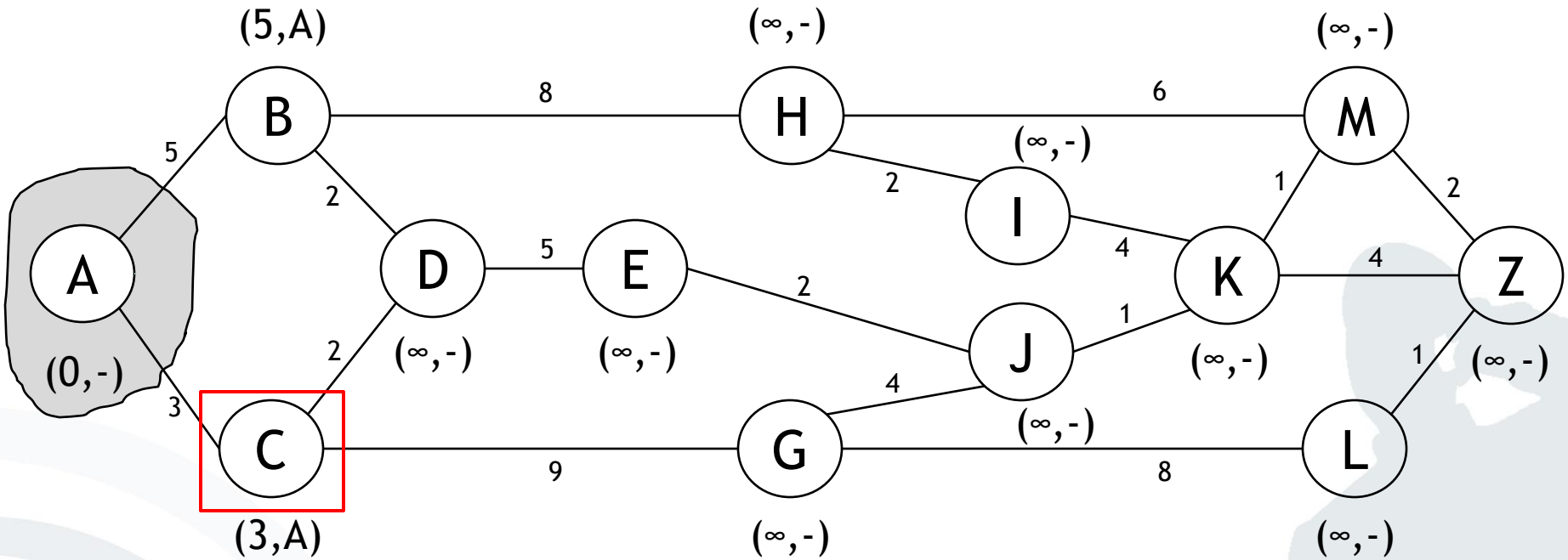
b) Assume when using the InstantONS service, a text message to your dating partner has to be passed through various systems before it is able to reach its destination. Since it is critical to reach your beloved in time, calculate the shortest path (from person “a” to person “z”) based on the *Dijkstra algorithm*.

Please note that lower case letters denote *system vertices* and numbers denote the *milliseconds* it takes for a message to travel between two system vertices.

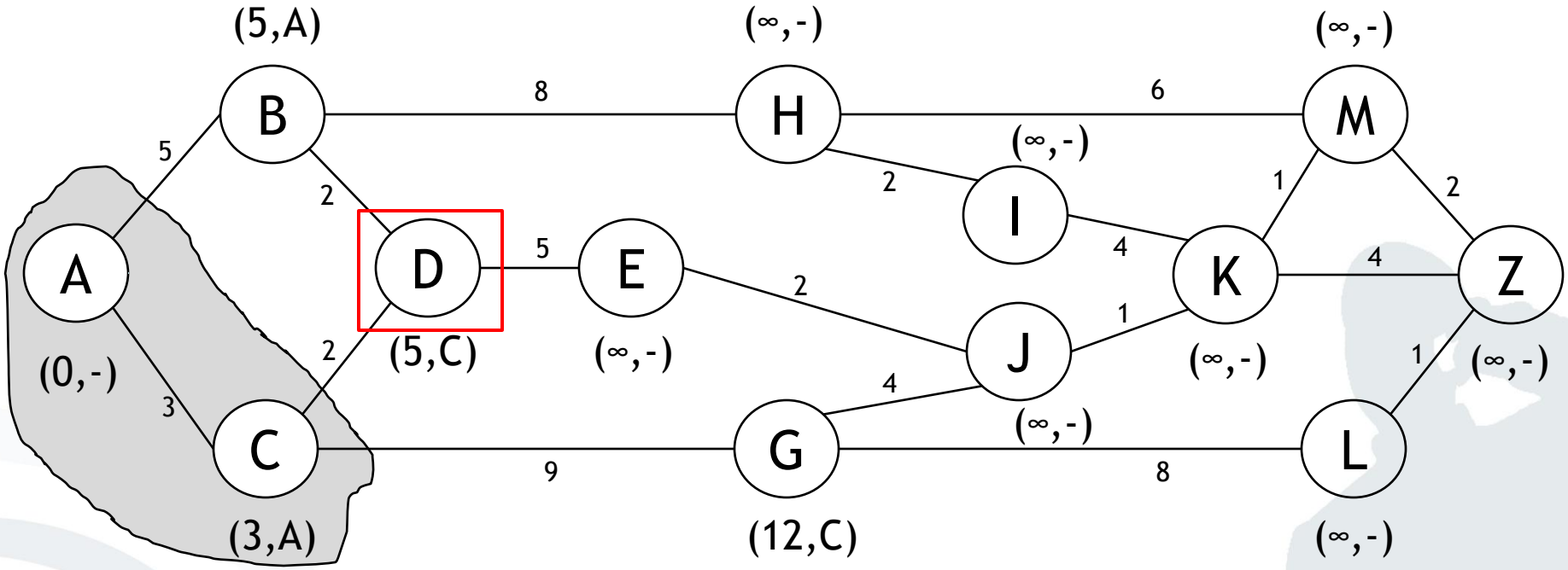
Exercise 8b): Solution Dijkstra Algorithm (1)



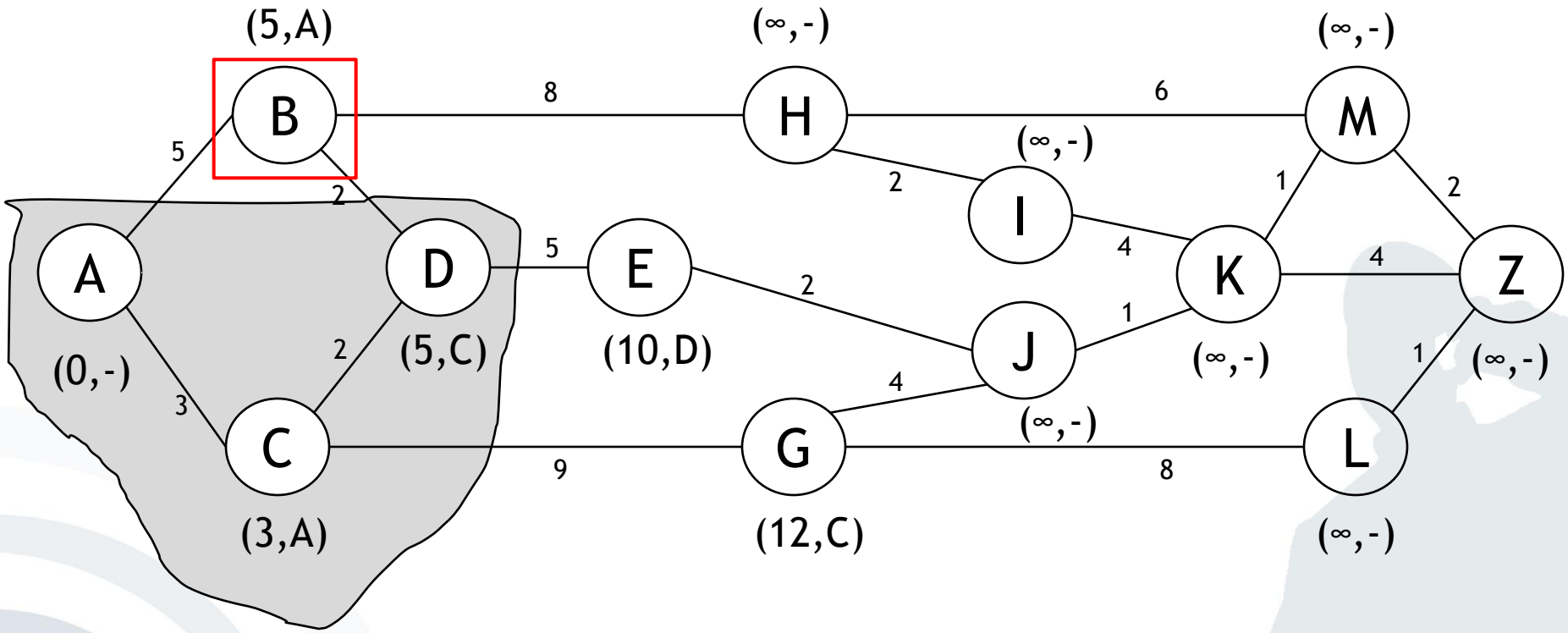
Exercise 8b): Solution Dijkstra Algorithm (2)



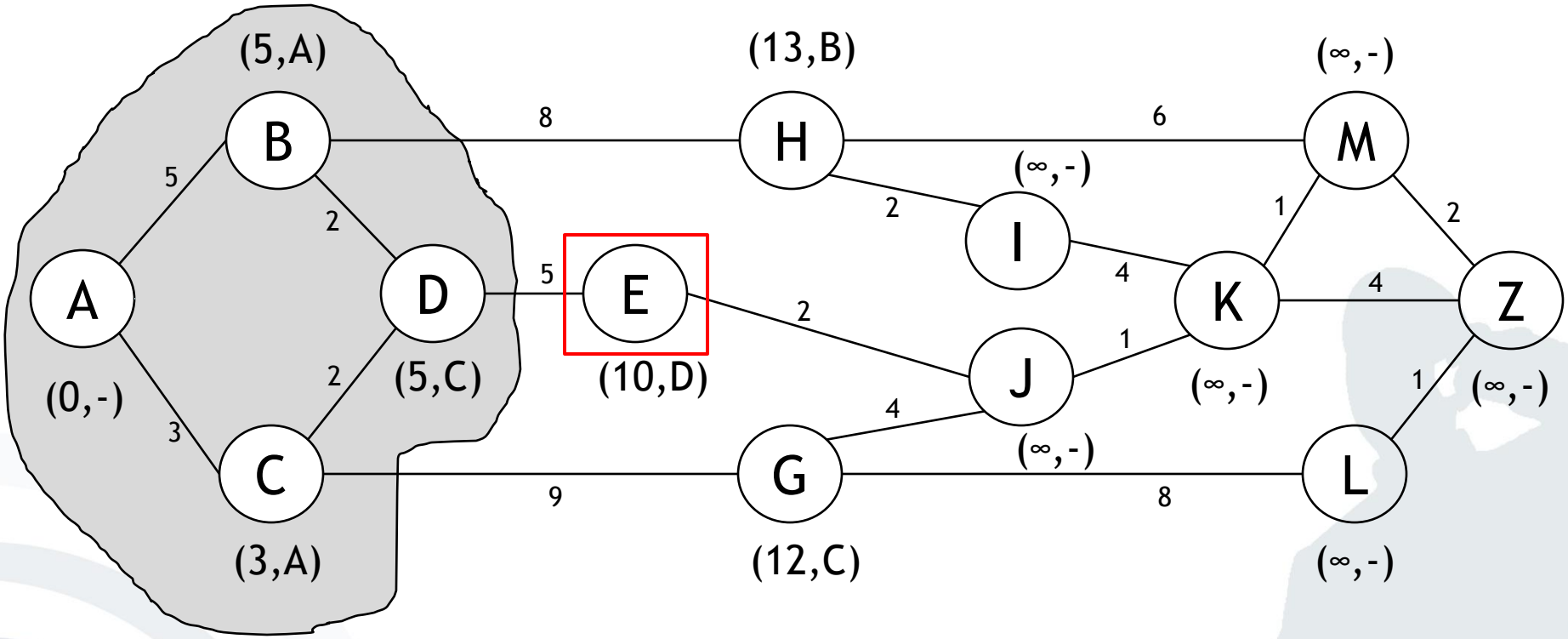
Exercise 8b): Solution Dijkstra Algorithm (3)



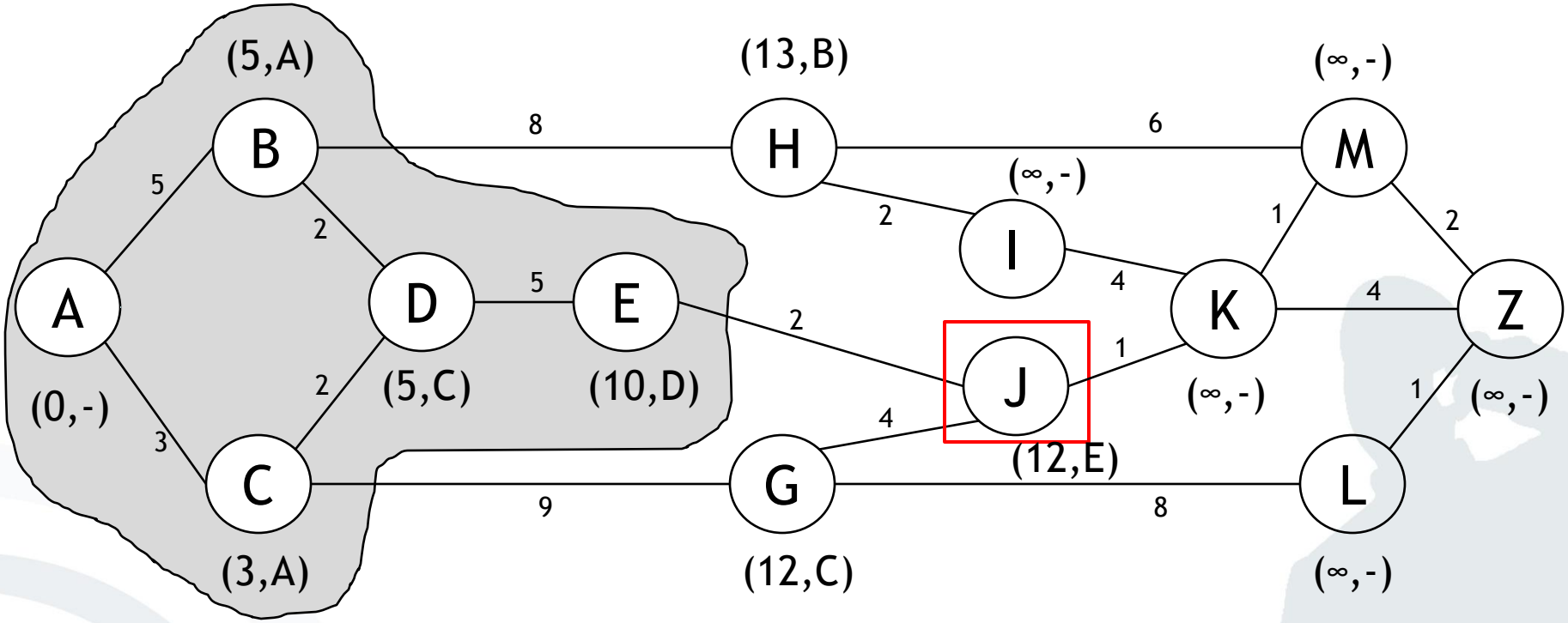
Exercise 8b): Solution Dijkstra Algorithm (4)



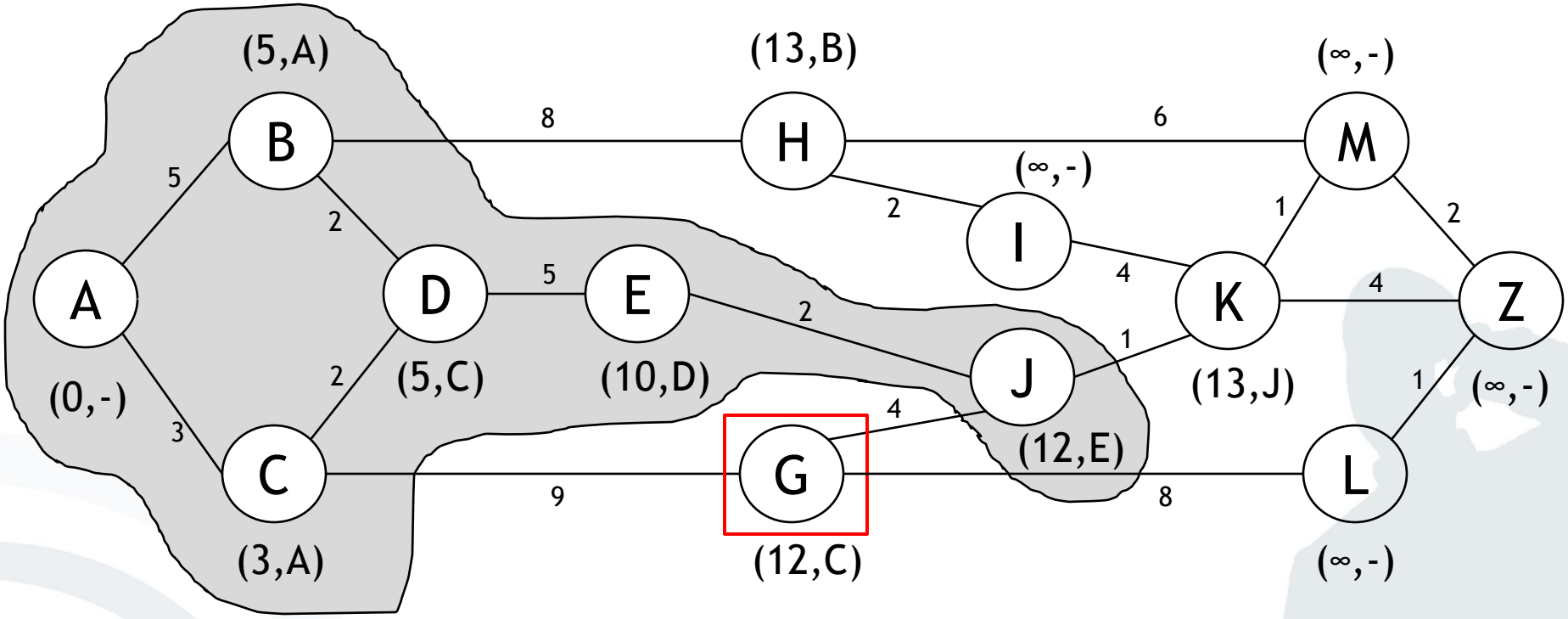
Exercise 8b): Solution Dijkstra Algorithm (5)



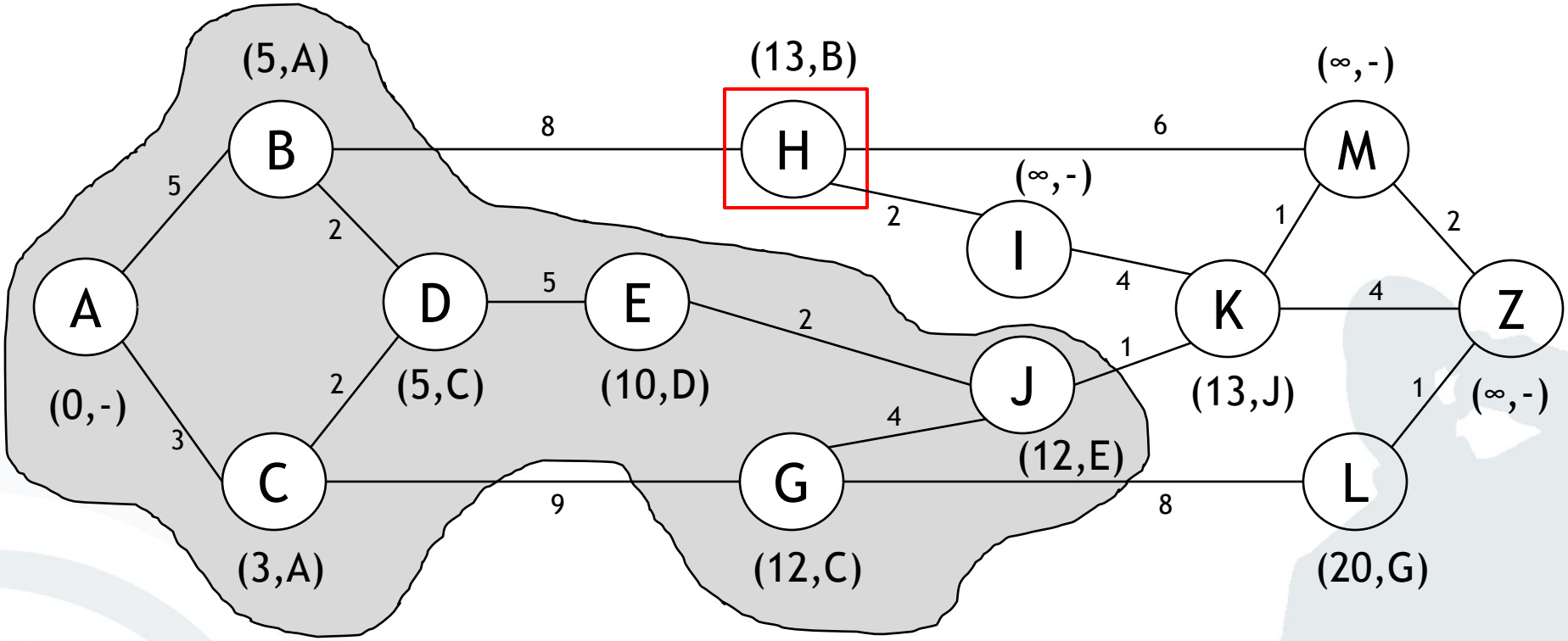
Exercise 8b): Solution Dijkstra Algorithm (6)



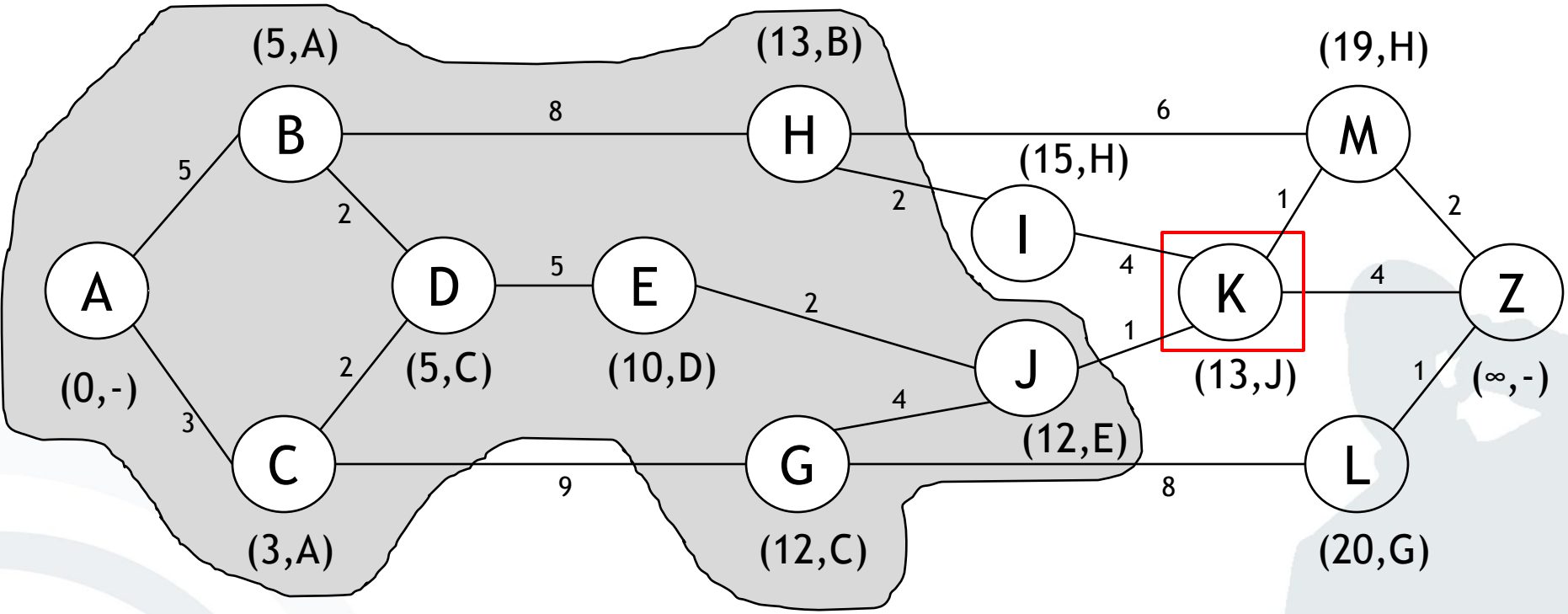
Exercise 8b): Solution Dijkstra Algorithm (7)



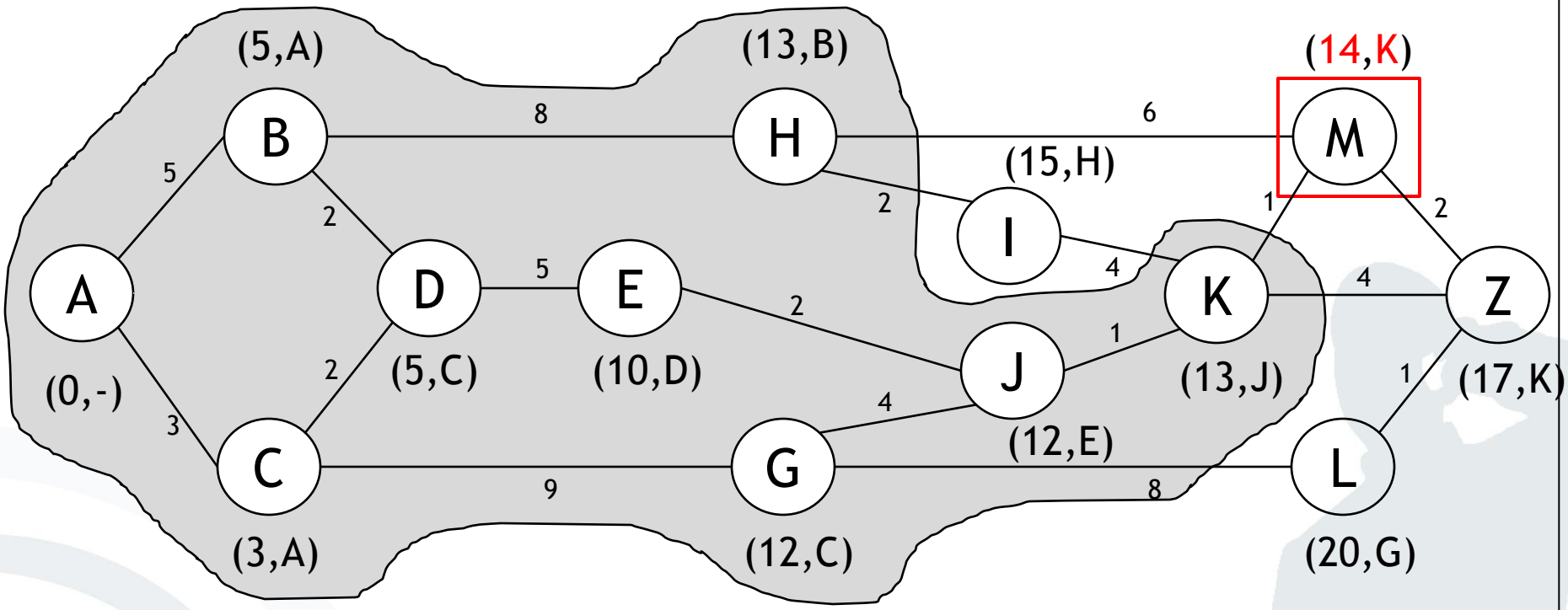
Exercise 8b): Solution Dijkstra Algorithm (8)



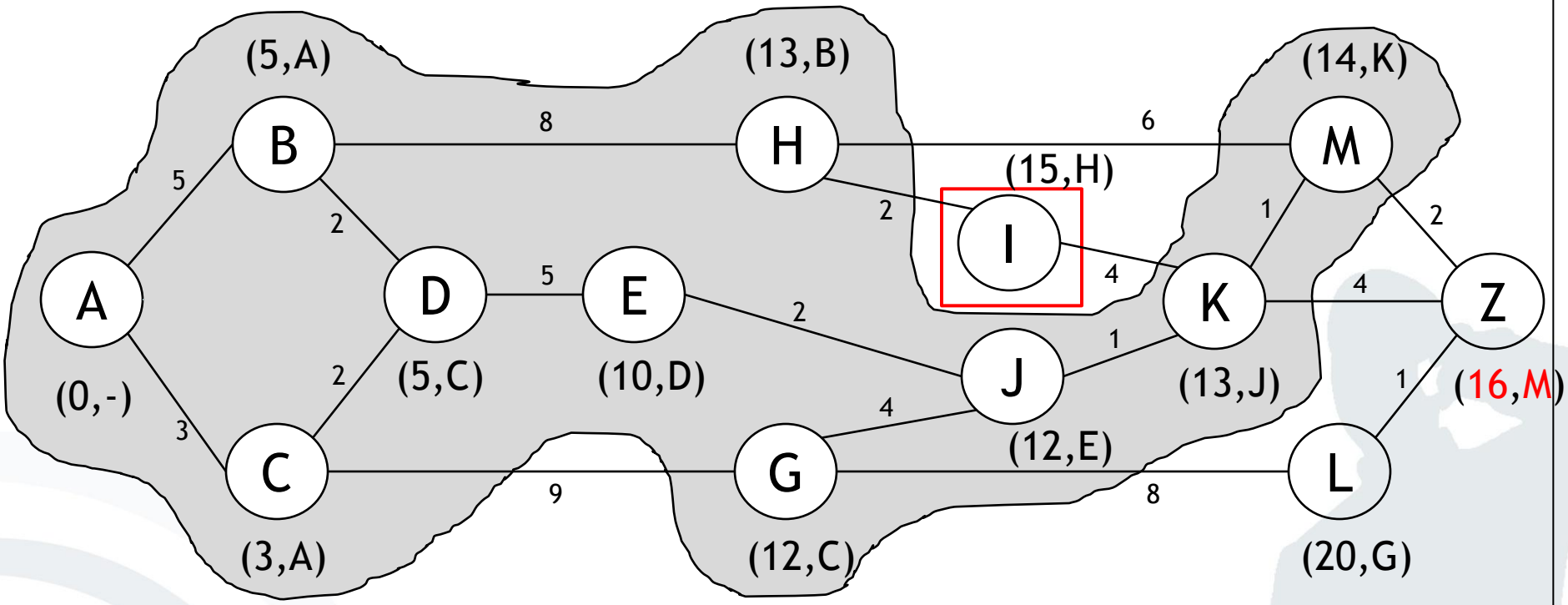
Exercise 8b): Solution Dijkstra Algorithm (9)



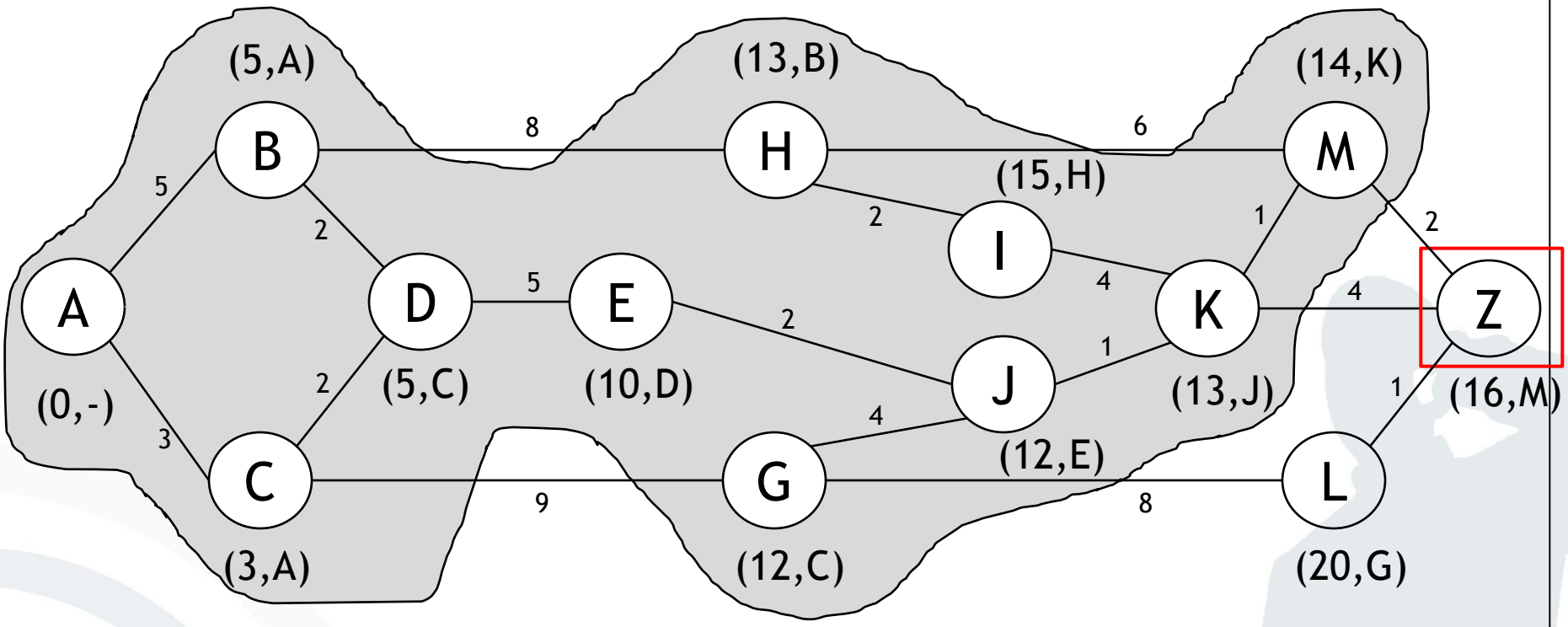
Exercise 8b): Solution Dijkstra Algorithm (10)



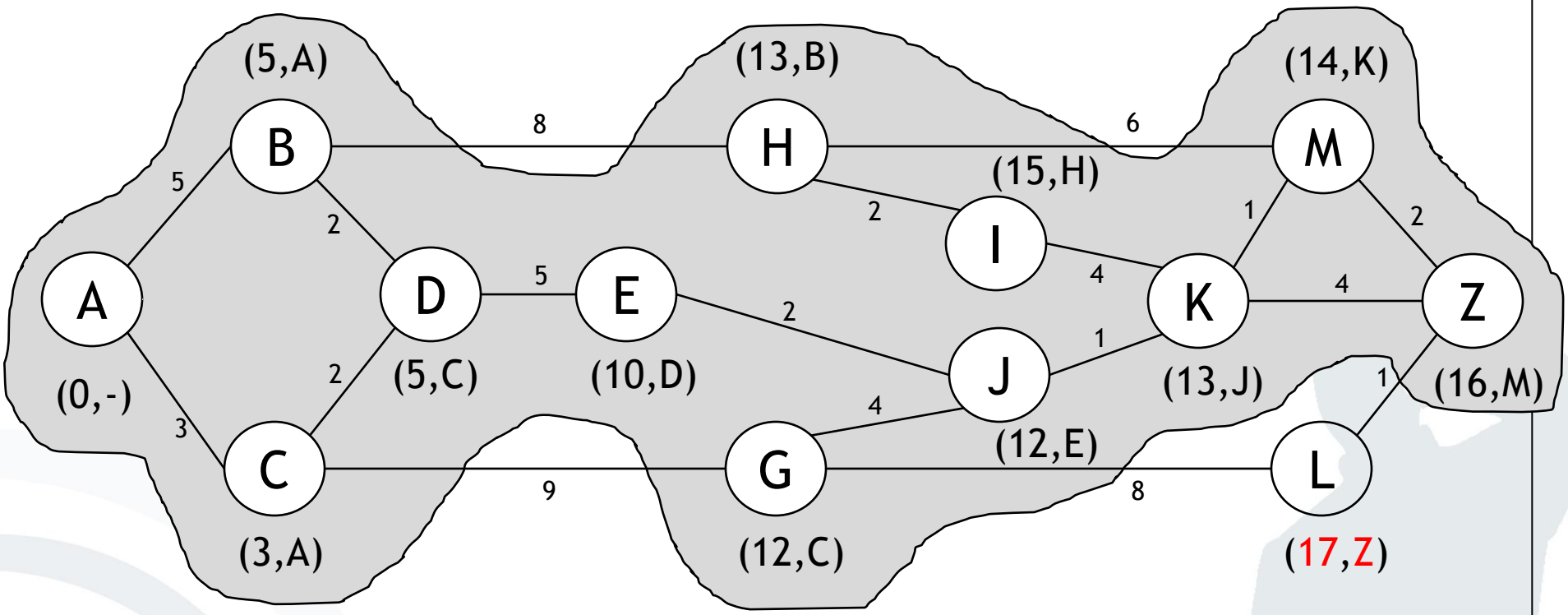
Exercise 8b): Solution Dijkstra Algorithm (11)



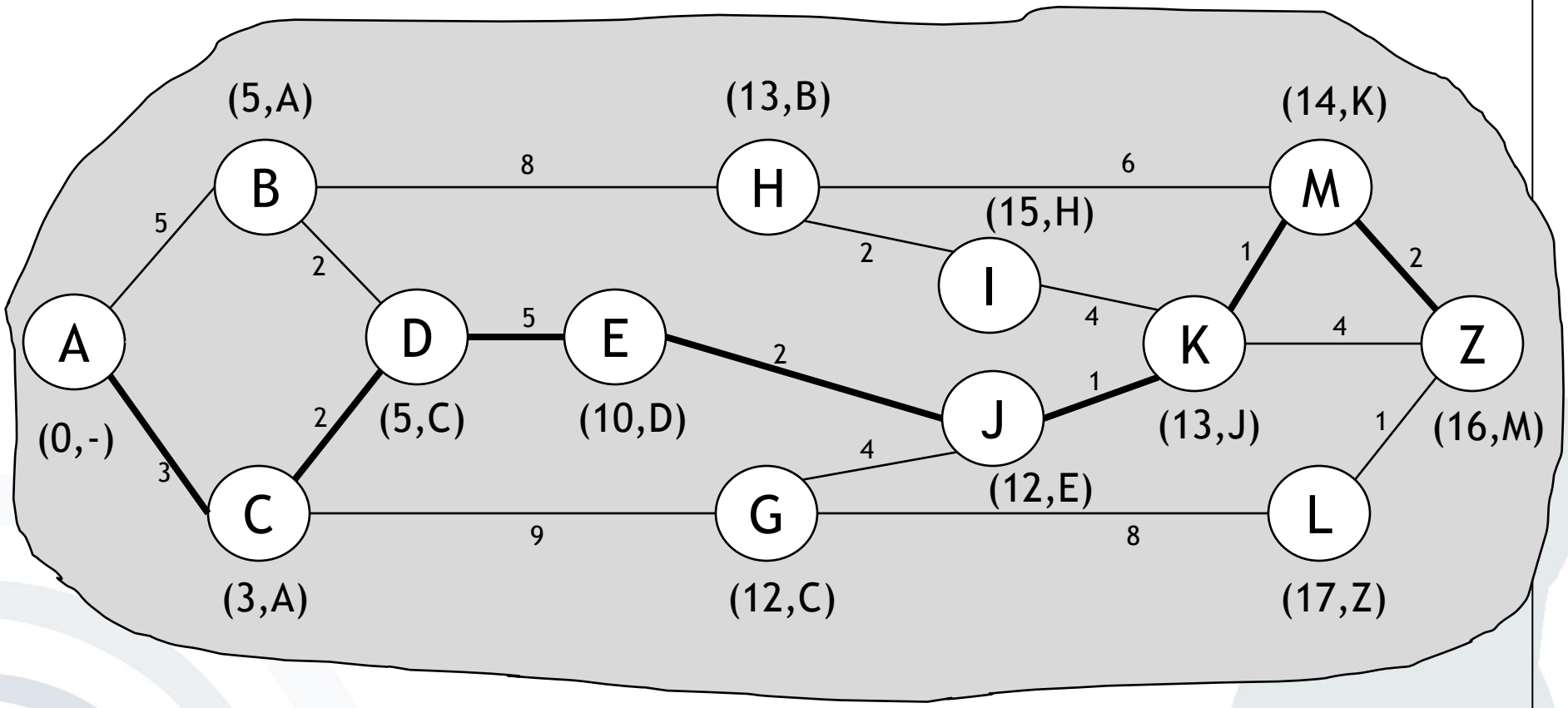
Exercise 8b): Solution Dijkstra Algorithm (12)



Exercise 8b): Solution Dijkstra Algorithm (13)



Exercise 8b): Solution Dijkstra Algorithm (14)



Shortest path: A → C → D → E → J → K → M → Z

Open Questions?