

# Hausübung 02 Cnuvs

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## Aufgabe 2.1: Routing (2 Punkte)

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2.1a)

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**Routing:** process of calculating the whole route that a package takes from origin to destination (possibly multiple hops)

**Forwarding:** process of passing packet to another router (single hop)

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2.1b)

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Two common metrics used in routing decisions are average packet delay and Total Throughput:

**Average Packet Delay:** The average time it takes for a packet to travel from the source to the destination inside a network.

**Total Throughput:** The total amount of data successfully delivered across the network per unit of time, for example bits per second. Higher throughput means more data is transmitted effectively.

The minimum number of hops do not always lead to optimal routing because there are cases in which a shorter path might go through slower or congested links, leading to higher latency, lower throughput, or increased packet loss. In contrast, a slightly longer path (in terms of hops) might use high-speed, low-latency connections and result in better performance overall.

**Aufgabe 2.2: Distance vector routing (23 Punkte)**

**2.2a) (3 Punkte)**

**Initialization**

$D^A$	Via		
Des.	B	C	E
B	2	$\infty$	$\infty$
C	$\infty$	2	$\infty$
D	$\infty$	$\infty$	$\infty$
E	$\infty$	$\infty$	3

$D^B$	Via		
Des.	A	C	E
A	2	$\infty$	$\infty$
C	$\infty$	1	$\infty$
D	$\infty$	$\infty$	$\infty$
E	$\infty$	$\infty$	4

$D^C$	Via		
Des.	A	B	D
A	2	$\infty$	$\infty$
B	$\infty$	1	$\infty$
D	$\infty$	$\infty$	2
E	$\infty$	$\infty$	$\infty$

$D^D$	Via
Des.	C
A	$\infty$
B	$\infty$
C	2
E	$\infty$

$D^E$	Via	
Des.	A	B
A	3	$\infty$
B	$\infty$	4
C	$\infty$	$\infty$
D	$\infty$	$\infty$

**2.2b) (7 Punkte)**

**2. Iteration**

$D^A$	Via		
Des.	B	C	E
B	<u>2</u>	<u>3</u>	<u>7</u>
C	<u>3</u>	<u>2</u>	$\infty$
D	$\infty$	<u>4</u>	$\infty$
E	<u>6</u>	$\infty$	<u>3</u>

$D^B$	Via		
Des.	A	C	E
A	<u>2</u>	<u>3</u>	<u>7</u>
C	<u>4</u>	<u>1</u>	$\infty$
D	$\infty$	<u>3</u>	$\infty$
E	<u>5</u>	$\infty$	<u>4</u>

$D^C$	Via		
Des.	A	B	D
A	<u>2</u>	<u>3</u>	$\infty$
B	<u>4</u>	<u>1</u>	$\infty$
D	$\infty$	$\infty$	<u>2</u>
E	<u>5</u>	<u>5</u>	$\infty$

$D^D$	Via
Des.	C
A	<u>4</u>
B	<u>3</u>
C	<u>2</u>
E	<u><math>\infty</math></u>

$D^E$	Via	
Des.	A	B
A	<u>3</u>	<u>6</u>
B	<u>5</u>	<u>4</u>
C	<u>5</u>	<u>5</u>
D	$\infty$	<u><math>\infty</math></u>

**3. Iteration**

$D^A$	Via		
Des.	B	C	E
B	<u>2</u>	3	7
C	3	<u>2</u>	<u>8</u>
D	<u>5</u>	<u>4</u>	$\infty$
E	6	<u>7</u>	<u>3</u>

$D^B$	Via		
Des.	A	C	E
A	<u>2</u>	3	7
C	4	<u>1</u>	<u>9</u>
D	<u>6</u>	<u>3</u>	$\infty$
E	5	<u>6</u>	<u>4</u>

$D^C$	Via		
Des.	A	B	D
A	<u>2</u>	3	<u>6</u>
B	4	<u>1</u>	<u>5</u>
D	<u>6</u>	<u>4</u>	<u>2</u>
E	5	<u>2</u>	$\infty$

$D^D$	Via
Des.	C
A	<u>4</u>
B	<u>3</u>
C	<u>2</u>
E	<u>7</u>

$D^E$	Via	
Des.	A	B
A	<u>3</u>	6
B	5	<u>4</u>
C	5	<u>5</u>
D	<u>7</u>	<u>7</u>

**4. Iteration**

$D^A$	Via		
Des.	B	C	E
B	<u>2</u>	3	7
C	3	<u>2</u>	8
D	5	<u>4</u>	<u>10</u>
E	6	7	<u>3</u>

$D^B$	Via		
Des.	A	C	E
A	<u>2</u>	3	7
C	4	<u>1</u>	9
D	6	<u>3</u>	<u>11</u>
E	5	6	<u>4</u>

$D^C$	Via		
Des.	A	B	D
A	<u>2</u>	3	6
B	4	<u>1</u>	5
D	6	4	<u>2</u>
E	5	<u>5</u>	<u>9</u>

$D^D$	Via
Des.	C
A	<u>4</u>
B	<u>3</u>
C	<u>2</u>
E	<u>7</u>

$D^E$	Via	
Des.	A	B
A	<u>3</u>	6
B	5	<u>4</u>
C	5	<u>5</u>
D	7	<u>7</u>

2.2c) (6.5 Punkte)

Initialization

$D^A$	Via		
Des.	B	C	E
B	5*	$\infty$	$\infty$
C	$\infty$	2	$\infty$
D	$\infty$	$\infty$	$\infty$
E	$\infty$	$\infty$	3

$D^B$	Via		
Des.	A	C	E
A	5*	$\infty$	$\infty$
C	$\infty$	1	$\infty$
D	$\infty$	$\infty$	$\infty$
E	$\infty$	$\infty$	4

$D^C$	Via		
Des.	A	B	D
A	2	$\infty$	$\infty$
B	$\infty$	1	$\infty$
D	$\infty$	$\infty$	2
E	$\infty$	$\infty$	$\infty$

$D^D$	Via
Des.	C
A	$\infty$
B	$\infty$
C	2
E	$\infty$

$D^E$	Via	
Des.	A	B
A	3	$\infty$
B	$\infty$	4
C	$\infty$	$\infty$
D	$\infty$	$\infty$

2. Iteration

$D^A$	Via		
Des.	B	C	E
B	5	(3)	(7)
C	(6)	2	$\infty$
D	$\infty$	(4)	$\infty$
E	(9)	$\infty$	3

$D^B$	Via		
Des.	A	C	E
A	5	(3)	(7)
C	(7)	1	$\infty$
D	$\infty$	(3)	$\infty$
E	(8)	$\infty$	4

$D^C$	Via		
Des.	A	B	D
A	2	(6)	$\infty$
B	(7)	1	$\infty$
D	$\infty$	$\infty$	2
E	(5)	(5)	$\infty$

$D^D$	Via
Des.	C
A	(4)
B	(3)
C	2
E	$\infty$

$D^E$	Via	
Des.	A	B
A	3	(9)
B	(8)	4
C	(5)	(5)
D	$\infty$	$\infty$

3. Iteration

$D^A$	Via		
Des.	B	C	E
B	5	3	7
C	6	2	(8)
D	(8)	4	$\infty$
E	9	(7)	3

$D^B$	Via		
Des.	A	C	E
A	5	3	7
C	7	1	(9)
D	9	3	$\infty$
E	8	(6)	4

$D^C$	Via		
Des.	A	B	D
A	2	6	(6)
B	7	1	(5)
D	6	4	2
E	5	5	$\infty$

$D^D$	Via
Des.	C
A	4
B	3
C	2
E	(7)

$D^E$	Via	
Des.	A	B
A	3	9
B	8	4
C	5	5
D	(7)	(7)

4. Iteration

$D^A$	Via		
Des.	B	C	E
B	5	3	7
C	6	2	8
D	8	4	(10)
E	9	7	3

$D^B$	Via		
Des.	A	C	E
A	5	3	7
C	7	1	9
D	9	3	(11)
E	8	6	4

$D^C$	Via		
Des.	A	B	D
A	2	6	6
B	7	1	5
D	6	4	2
E	5	5	(9)

$D^D$	Via
Des.	C
A	4
B	3
C	2
E	7

$D^E$	Via	
Des.	A	B
A	3	9
B	8	4
C	5	5
D	7	7

The highlighted values are different from 3b).

## 2.2d) (6.5 Punkte)

## Endergebnis von b)

$D^A$	Via		
Des.	B	C	E
B	<u>2</u>	3	7
C	3	<u>2</u>	8
D	5	<u>4</u>	10
E	6	7	<u>3</u>

$D^B$	Via		
Des.	A	C	E
A	<u>2</u>	3	7
C	4	<u>1</u>	9
D	6	<u>3</u>	11
E	5	6	<u>4</u>

$D^C$	Via		
Des.	A	B	D
A	<u>2</u>	3	6
B	4	<u>1</u>	5
D	6	4	<u>2</u>
E	<u>5</u>	5	9

$D^D$	Via
Des.	C
A	<u>4</u>
B	<u>3</u>
C	<u>2</u>
E	<u>7</u>

$D^E$	Via	
Des.	A	B
A	<u>3</u>	6
B	5	<u>4</u>
C	<u>5</u>	5
D	<u>7</u>	7

## 1. Iteration

$D^A$	Via		
Des.	B	C	E
B	<u>2</u>	3	7
C	3	<u>2</u>	8
D	5	<u>4</u>	10
E	6	7	<u>3</u>

$D^B$	Via		
Des.	A	C	E
A	<u>2</u>	$\infty$	7
C	<u>4</u>	$\infty$	9
D	<u>6</u>	$\infty$	11
E	5	$\infty$	<u>4</u>

$D^C$	Via		
Des.	A	B	D
A	<u>2</u>	$\infty$	6
B	<u>4</u>	$\infty$	5
D	6	$\infty$	<u>2</u>
E	<u>5</u>	$\infty$	9

$D^D$	Via
Des.	C
A	<u>4</u>
B	<u>3</u>
C	<u>2</u>
E	<u>7</u>

$D^E$	Via	
Des.	A	B
A	<u>3</u>	6
B	5	<u>4</u>
C	<u>5</u>	5
D	<u>7</u>	7

## 2. Iteration

$D^A$	Via		
Des.	B	C	E
B	<u>2</u>	6	7
C	$\infty$	<u>2</u>	8
D	$\infty$	<u>4</u>	10
E	6	7	<u>3</u>

$D^B$	Via		
Des.	A	C	E
A	<u>2</u>	$\infty$	7
C	<u>4</u>	$\infty$	9
D	<u>6</u>	$\infty$	11
E	5	$\infty$	<u>4</u>

$D^C$	Via		
Des.	A	B	D
A	<u>2</u>	$\infty$	6
B	<u>4</u>	$\infty$	5
D	6	$\infty$	<u>2</u>
E	<u>5</u>	$\infty$	9

$D^D$	Via
Des.	C
A	<u>4</u>
B	$\infty$
C	<u>2</u>
E	<u>7</u>

$D^E$	Via	
Des.	A	B
A	<u>3</u>	6
B	5	<u>4</u>
C	<u>5</u>	$\infty$
D	<u>7</u>	$\infty$

## 3. Iteration

$D^A$	Via		
Des.	B	C	E
B	<u>2</u>	6	7
C	6	<u>2</u>	8
D	8	<u>4</u>	10
E	6	7	<u>3</u>

$D^B$	Via		
Des.	A	C	E
A	<u>2</u>	$\infty$	7
C	<u>4</u>	$\infty$	9
D	<u>6</u>	$\infty$	11
E	5	$\infty$	<u>4</u>

$D^C$	Via		
Des.	A	B	D
A	<u>2</u>	$\infty$	6
B	<u>4</u>	$\infty$	$\infty$
D	6	$\infty$	<u>2</u>
E	<u>5</u>	$\infty$	9

$D^D$	Via
Des.	C
A	<u>4</u>
B	<u>6</u>
C	<u>2</u>
E	<u>7</u>

$D^E$	Via	
Des.	A	B
A	<u>3</u>	6
B	5	<u>4</u>
C	<u>5</u>	8
D	<u>7</u>	10