# Computer Networks 2021 Exercises - Unit 1

## FAN: lewi0231

*NOTE:* Each student's work unit is unique. You *must* use the work that has been generated for your FAN. If you do not, then you will fail this work unit.

*NOTE:* You must record your answers in the answer file EXACTLY as required, and commit and make sure your changes have been pushed to the github server, as they will otherwise not be counted.

*NOTE:* The topic coordinator will periodically run the automatic marking script, which will cause a file called unit1-results.pdf to be updated in your repository. You should check this file to make sure that your answers have been correctly counted. That file will contain the time and date that the marking script was last run, so that you can work out if it has been run since you last changed your answers. You are free to update your answers as often as you wish, until the deadline for the particular work unit.

# 1 Specify the OSI Layer to which best matches each statement

*For each question, you must record your answer in the unit1-answers.txt file in your git repository. For example, if you believed that the following question best matched the Network Layer, which is layer 3, you would put the digit 3 at the end of the* `rj=` *line in the file* `unit1-answers.txt`*.*

| Question# | Description |
|---|---|
| `rj` | *Responsible for inter-networking* |

*The entry in* `unit1-answers.txt` *would thus look like:*

```
# Question 'rj': Which layer best fits this statement: Responsible for inter-networking
rj=3
```

Templates for each answer are provided in `unit1-answers.txt` for your convenience.

## Which network layer best matches the following descriptions?

| Question# | Description |
|---|---|
| `ab` | Responsible for routing packets among networks |

| Question# | Description |
|---|---|
| `ac` | Is used to abstract the network for user-oriented programmes |

| Question# | Description |
|---|---|
| `ad` | The layer where virtual circuits can be established |

| Question# | Description |
|---|---|
| `ae` | Responsible for electromagnetic spectrum allocation |

| Question# | Description |
|---|---|
| `af` | Serialises data structures so that they can be sent, received and correctly interpreted at the other end of a network |

| Question# | Description |
|---|---|
| `ag` | Allows for the recovery of a lost connection |

| Question# | Description |
|---|---|
| `ah` | Responsible for logical link control |

| Question# | Description |
|---|---|
| `ai` | Responsible for closing a connection, especially where it involves multiple resources |

| Question# | Description |
|---|---|
| `aj` | Responsible for the correct conversion of character encodings in a session |

| Question# | Description |
|---|---|
| ak | Corrects the order of received packets, if they are received out of order |

| Question# | Description |
|---|---|
| al | Detects and reacts to congestion on network path between distant nodes |

| Question# | Description |
|---|---|
| am | Responsible for selecting the best path between nodes |

| Question# | Description |
|---|---|
| an | Facilitates connectionless communications between nodes on large networks |

| Question# | Description |
|---|---|
| ao | Provides globally addressable identifiers for nodes on large networks |

| Question# | Description |
|---|---|
| ap | Responsible for data encryption |

| Question# | Description |
|---|---|
| aq | Provides the interface for programmes to access network services |

# 2 Specify the OSI Layer in which correspond to the following network protocols

For each question, you will need to research the protocol, and judge to which OSI network layer it corresponds. *For each question, you must record your answer in the unit1-answers.txt file in your git repository. For example, if you believed that the following question best matched the Physical Layer, which is layer 1, you would put the digit 1 at the end of the* `fq=` *line in the file* `unit1-answers.txt`.

| Question# | Protocol |
|---|---|
| fq | *RFC1149* |

*The entry in* `unit1-answers.txt` *would thus look like:*

```
# Question 'fq': To which layer does this protocol correspond? : RFC1149
fq=1
```

Templates for each answer are provided in `unit1-answers.txt` for your convenience.

### To which OSI network layer do the following protocols correspond?

| Question# | Protocol |
|---|---|
| ar | Fibre Channel Protocol (FCP) |

| Question# | Protocol |
|---|---|
| as | Apple Filing Protocol (AFP) |

| Question# | Protocol |
|---|---|
| at | Short Message Peer-to-Peer (SMPP) |

| Question# | Protocol |
|---|---|
| au | Simple Service Discovery Protocol |

| Question# | Protocol |
|---|---|
| av | L2TP |

| Question# | Protocol |
|---|---|
| aw | Econet |

| Question# | Protocol |
|---|---|
| ax | Cisco Discovery Protocol (CDP) |

| Question# | Protocol |
|---|---|
| ay | iSCSI |

| Question# | Protocol |
|---|---|
| az | NetBIOS |

| Question# | Protocol |
|---|---|
| ba | Server message block (SMB) |

| Question# | Protocol |
|---|---|
| bb | Transmission Control Protocol |

| Question# | Protocol |
|---|---|
| bc | Internet Protocol |

| Question# | Protocol |
|---|---|
| bd | Link Aggregation Control Protocol (LACP) |

| Question# | Protocol |
|---|---|
| be | HTTP |

| Question# | Protocol |
|---|---|
| bf | High-Level Data Link Control (HDLC) |

| Question# | Protocol |
|---|---|
| bg | FTP |

# 3

For each question, you are presented with a fictional network topology and layered network protocol stack(s). You mush answer questions about these networks. *For each question, you must record your answer in the unit1-answers.txt file in your git repository. For example, if you believed that the answer to the following question was 42, you would write 42 at the end of the* xl= *line in the file* unit1-answers.txt.

| Question# | How large would the indicated Protocol Data Unit be? (in bytes) |
|---|---|
| xl | *C.3* |

*The entry in* unit1-answers.txt *would thus look like:*

```
# Question 'xl': How large would the indicated Protocol Data Unit be? (in bytes)
xl=42
```

Templates for each answer are provided in unit1-answers.txt for your convenience.

## Answer the following questions about the fictional network topologies shown

## Fictional Network Topology 1

**Network Stack 1: 'antrautete'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | gerennheit | 61 |
| 6 | ausgesetzung | 6 |
| 5 | aufgeklettest | 11 |
| 4 | angeklettkeit | 90 |
| 3 | anspracht | 63 |
| 2 | getrautete | 38 |

**Network Stack 2: 'eingehst'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | einraucher | 93 |
| 6 | gekaest | 17 |
| 5 | zertraut | 4 |
| 4 | antritten | 30 |
| 3 | ausgehunds | 58 |
| 2 | zerpflumung | 12 |

**Network Stack 3: 'aufgepflumte'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | ausfahrheit | 29 |
| 6 | vergehheit | 62 |
| 5 | aufgewitzse | 80 |
| 4 | geschmecken | 44 |
| 3 | eintraukeit | 6 |
| 2 | anrennen | 23 |

**Network Stack 4: 'aufrauchen'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | ensitzheit | 100 |
| 6 | gelauft | 88 |
| 5 | zerhundt | 83 |
| 4 | bekrauen | 46 |
| 3 | aussetzen | 1 |
| 2 | angesetzer | 48 |

**Physical Layer Properties**

| Physical Layer | PDU Header Size (bytes) | Data Rate (kilo-bits per second) | Propagation delay (milliseconds) |
|---|---|---|---|
| angekrause | 3 | 5552 | 427 |
| angewarfkeit | 5 | 2590 | 949 |
| ausgekatzeer | 22 | 1387 | 795 |
| gelaufheit | 79 | 354 | 37 |

**Network Diagram**
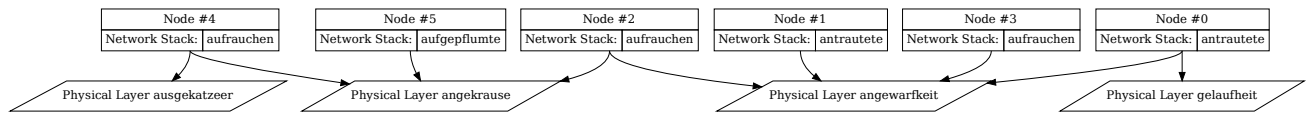


| Question# | Question |
|---|---|
| bh | Could applications on nodes 0 and 4 communicate with one another? i.e., are they using compatible network stacks, and is there a compatible path through the network between them? *Answer Y or N. Any other answer will be marked incorrect.* |
| bi | If an application on node 2 sends 223 bytes of data, how large would the PDU be at layer 6? *Provide the exact number of bytes as your answer.* |
| bj | What is the data rate that is possible between nodes 2 and 4? *Provide the exact number of kilo-bits per second as your answer.* |
| bk | How many milli-seconds would it take node 2 to send 5187 bytes of data to node 4? *Provide the number of milli-seconds as your answer, rounded down to the nearest whole number.* |

## Fictional Network Topology 2

### Network Stack 1: 'ausgesetzer'

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | einsetzer | 46 |
| 6 | versinns | 53 |
| 5 | zerfahrtete | 57 |
| 4 | behundtete | 26 |
| 3 | ausgegehst | 59 |
| 2 | verwitzse | 35 |

### Network Stack 2: 'ausgepflumse'

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | verwitzkeit | 62 |
| 6 | verkraute | 4 |
| 5 | ankaesst | 84 |
| 4 | aufgesetzkeit | 12 |
| 3 | geklettt | 40 |
| 2 | zerfahrtest | 47 |

### Network Stack 3: 'gesinntete'

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | einrabarbkeit | 97 |
| 6 | zerhalttete | 45 |
| 5 | aufgewarfs | 75 |
| 4 | aussprachheit | 40 |
| 3 | aufgelauft | 17 |
| 2 | zerrabarbt | 43 |

**Network Stack 4: 'betritttest'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | anfahren | 61 |
| 6 | angepflumheit | 20 |
| 5 | ausgewarfs | 58 |
| 4 | aussinnheit | 14 |
| 3 | verklettte | 95 |
| 2 | angeschmecktest | 68 |

**Physical Layer Properties**

| Physical Layer | PDU Header Size (bytes) | Data Rate (kilo-bits per second) | Propagation delay (milli-seconds) |
|---|---|---|---|
| aussinnt | 27 | 4651 | 280 |
| aufpflums | 73 | 3293 | 991 |
| zerkletttete | 26 | 7833 | 954 |
| aufgekraust | 31 | 1877 | 636 |

**Network Diagram**
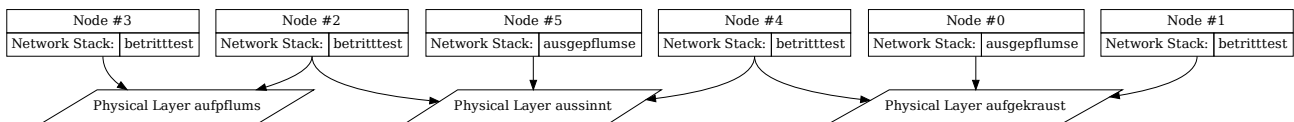


| Question# | Question |
|---|---|
| bl | Could applications on nodes 3 and 0 communicate with one another? i.e., are they using compatible network stacks, and is there a compatible path through the network between them? *Answer Y or N. Any other answer will be marked incorrect.* |
| bm | If an application on node 5 sends 591 bytes of data, how large would the PDU be at layer 5? *Provide the exact number of bytes as your answer.* |
| bn | What is the data rate that is possible between nodes 5 and 0? *Provide the exact number of kilo-bits per second as your answer.* |
| bo | How many milli-seconds would it take node 5 to send 1124 bytes of data to node 0? *Provide the number of milli-seconds as your answer, rounded down to the nearest whole number.* |

# Fictional Network Topology 3

**Network Stack 1: 'berabarbte'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | berauchse | 60 |
| 6 | aufsitzt | 13 |
| 5 | gepflumer | 87 |
| 4 | gehundt | 17 |
| 3 | angewarfheit | 73 |
| 2 | angetrittst | 48 |

**Network Stack 2: 'getrauer'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | angekraukeit | 36 |
| 6 | verrauchtete | 4 |
| 5 | ausgehundkeit | 33 |
| 4 | verschmeckung | 98 |
| 3 | besitzte | 54 |
| 2 | ankletten | 1 |

**Network Stack 3: 'aufrabarbheit'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | einstehheit | 7 |
| 6 | angefahrkeit | 62 |
| 5 | angelaufte | 55 |
| 4 | zerrauchs | 50 |
| 3 | einwitztest | 99 |
| 2 | enschmeckung | 8 |

**Network Stack 4: 'zertraus'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | aufrenner | 64 |
| 6 | besprachheit | 98 |
| 5 | zerpflums | 29 |
| 4 | verwitzt | 85 |
| 3 | verhunds | 26 |
| 2 | bekraus | 4 |

**Physical Layer Properties**

| Physical Layer | PDU Header Size (bytes) | Data Rate (kilo-bits per second) | Propagation delay (milli-seconds) |
|---|---|---|---|
| aufgehundung | 49 | 3634 | 15 |
| verwitzung | 78 | 116 | 186 |
| ensitzst | 52 | 6561 | 898 |
| aushaltkeit | 35 | 382 | 101 |

**Network Diagram**

| Node #4 | Node #5 | Node #1 | Node #0 | Node #2 | Node #3 |
|---|---|---|---|---|---|
| Network Stack: aufrabarbheit | Network Stack: berabarbte | Network Stack: zertraus | Network Stack: aufrabarbheit | Network Stack: berabarbte | Network Stack: berabarbte |

Physical Layer aufgehundung  Physical Layer verwitzung  Physical Layer aushaltkeit
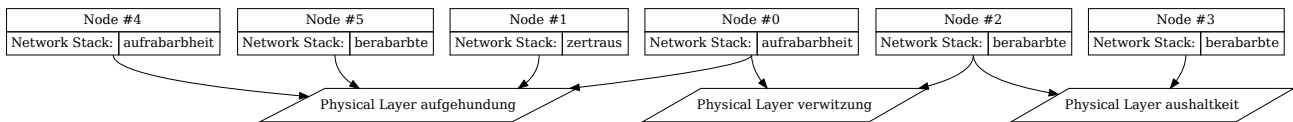
| Question# | Question |
|---|---|
| bp | Could applications on nodes 4 and 0 communicate with one another? i.e., are they using compatible network stacks, and is there a compatible path through the network between them? *Answer Y or N. Any other answer will be marked incorrect.* |
| bq | If an application on node 1 sends 509 bytes of data, how large would the PDU be at layer 5? *Provide the exact number of bytes as your answer.* |
| br | What is the data rate that is possible between nodes 1 and 0? *Provide the exact number of kilo-bits per second as your answer.* |
| bs | How many milli-seconds would it take node 1 to send 7135 bytes of data to node 0? *Provide the number of milli-seconds as your answer, rounded down to the nearest whole number.* |

# Fictional Network Topology 4

**Network Stack 1: 'gehalttest'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | entraus | 94 |
| 6 | behaltte | 42 |
| 5 | versprachse | 21 |
| 4 | einhundtete | 80 |
| 3 | versinner | 89 |
| 2 | aufsinns | 61 |

**Network Stack 2: 'aufgegehse'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | angesetzte | 71 |
| 6 | ensprachtest | 43 |
| 5 | angefahrs | 63 |
| 4 | aufgekaesse | 9 |
| 3 | aufsprachst | 36 |
| 2 | aushundheit | 29 |

**Network Stack 3: 'zerhundse'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | berauchte | 88 |
| 6 | gelaufse | 16 |
| 5 | verlaufen | 1 |
| 4 | gegehst | 12 |
| 3 | eintrittst | 67 |
| 2 | angehundheit | 64 |

**Network Stack 4: 'zerklettte'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | beschmeckkeit | 40 |
| 6 | berauchheit | 34 |
| 5 | angekatzese | 94 |
| 4 | gepflumkeit | 51 |
| 3 | gekaestete | 91 |
| 2 | auswarfte | 33 |

**Physical Layer Properties**

| Physical Layer | PDU Header Size (bytes) | Data Rate (kilo-bits per second) | Propagation delay (milli-seconds) |
|---|---|---|---|
| aufgerabarbheit | 82 | 2881 | 855 |
| ausgeschmecker | 25 | 7495 | 383 |
| auftrauheit | 97 | 2294 | 445 |
| ausrauchheit | 35 | 5214 | 476 |

**Network Diagram**
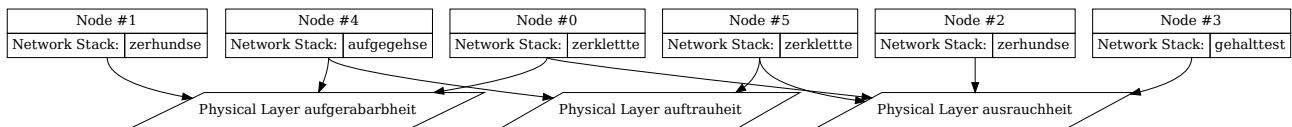


| Question# | Question |
|---|---|
| bt | Could applications on nodes 3 and 5 communicate with one another? i.e., are they using compatible network stacks, and is there a compatible path through the network between them? *Answer Y or N. Any other answer will be marked incorrect.* |
| bu | If an application on node 2 sends 142 bytes of data, how large would the PDU be at layer 7? *Provide the exact number of bytes as your answer.* |
| bv | What is the data rate that is possible between nodes 2 and 5? *Provide the exact number of kilo-bits per second as your answer.* |
| bw | How many milli-seconds would it take node 2 to send 5950 bytes of data to node 5? *Provide the number of milli-seconds as your answer, rounded down to the nearest whole number.* |

# Fictional Network Topology 5

**Network Stack 1: 'einrauchst'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | angestehse | 71 |
| 6 | antrittheit | 70 |
| 5 | einhalts | 29 |
| 4 | aufhalttest | 79 |
| 3 | enkaesung | 28 |
| 2 | gewitzheit | 6 |

**Network Stack 2: 'angehtest'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | enrabarbtete | 84 |
| 6 | angetrauer | 61 |
| 5 | einwarfung | 22 |
| 4 | angewarfst | 64 |
| 3 | zergehtete | 21 |
| 2 | angestehung | 99 |

**Network Stack 3: 'einfahrkeit'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | aussinnung | 36 |
| 6 | ausgesitztest | 12 |
| 5 | angehaltte | 93 |
| 4 | ausfahrst | 83 |
| 3 | angestehst | 24 |
| 2 | austrautest | 68 |

**Network Stack 4: 'zerkaesen'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | angerennte | 99 |
| 6 | ausrennheit | 96 |
| 5 | geschmecktest | 69 |
| 4 | aufwitztete | 63 |
| 3 | ausgepflumen | 9 |
| 2 | einlaufs | 64 |

**Physical Layer Properties**

| Physical Layer | PDU Header Size (bytes) | Data Rate (kilo-bits per second) | Propagation delay (milli-seconds) |
|---|---|---|---|
| anrabarbse | 98 | 7661 | 174 |
| aufgesitzte | 28 | 4969 | 504 |
| anlaufkeit | 17 | 2377 | 888 |
| enrennst | 54 | 1010 | 255 |

**Network Diagram**

| Node #1 | Node #3 | Node #0 | Node #2 | Node #4 | Node #5 |
|---|---|---|---|---|---|
| Network Stack: einrauchst | Network Stack: einrauchst | Network Stack: zerkaesen | Network Stack: einrauchst | Network Stack: einrauchst | Network Stack: zerkaesen |

Physical Layer anrabarbse  Physical Layer enrennst  Physical Layer anlaufkeit
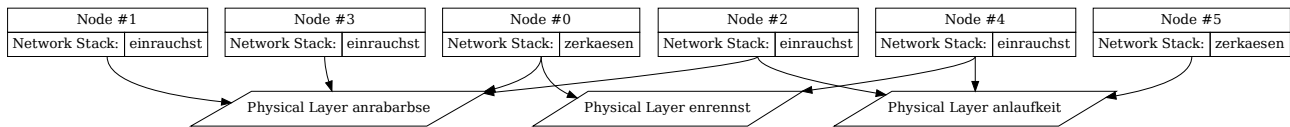
| Question# | Question |
|---|---|
| bx | Could applications on nodes 5 and 0 communicate with one another? i.e., are they using compatible network stacks, and is there a compatible path through the network between them? *Answer Y or N. Any other answer will be marked incorrect.* |
| by | If an application on node 5 sends 646 bytes of data, how large would the PDU be at layer 2? *Provide the exact number of bytes as your answer.* |
| bz | What is the data rate that is possible between nodes 5 and 0? *Provide the exact number of kilo-bits per second as your answer.* |
| ca | How many milli-seconds would it take node 5 to send 1091 bytes of data to node 0? *Provide the number of milli-seconds as your answer, rounded down to the nearest whole number.* |

# Fictional Network Topology 6

**Network Stack 1: 'verkatzetest'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | verstehkeit | 91 |
| 6 | besinnst | 68 |
| 5 | versprachte | 90 |
| 4 | angepflumkeit | 66 |
| 3 | vergehse | 2 |
| 2 | eingehheit | 11 |

**Network Stack 2: 'ensprachtete'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | auskrauheit | 63 |
| 6 | ausgepflumtete | 1 |
| 5 | einlaufheit | 6 |
| 4 | austrittt | 100 |
| 3 | vergehs | 39 |
| 2 | ausgekletter | 33 |

**Network Stack 3: 'ausgekatzet'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | auskaesheit | 70 |
| 6 | aufgesprachung | 8 |
| 5 | verhalttete | 18 |
| 4 | ausgetrittheit | 62 |
| 3 | bekaeser | 49 |
| 2 | zerwarfte | 33 |

**Network Stack 4: 'aufhaltt'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | gesinnung | 71 |
| 6 | aufgefahrse | 19 |
| 5 | aufsetzen | 40 |
| 4 | angeschmecks | 29 |
| 3 | aufgestehen | 39 |
| 2 | einwitzse | 70 |

**Physical Layer Properties**

| Physical Layer | PDU Header Size (bytes) | Data Rate (kilo-bits per second) | Propagation delay (milli-seconds) |
|---|---|---|---|
| ausgehundheit | 6 | 8586 | 755 |
| verfahrheit | 27 | 393 | 534 |
| angespracht | 58 | 1281 | 708 |
| angekraut | 98 | 8543 | 744 |

**Network Diagram**
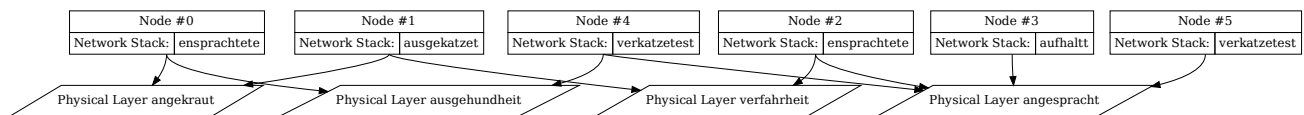


| Question# | Question |
|---|---|
| cb | Could applications on nodes 0 and 2 communicate with one another? i.e., are they using compatible network stacks, and is there a compatible path through the network between them? *Answer Y or N. Any other answer will be marked incorrect.* |
| cc | If an application on node 3 sends 522 bytes of data, how large would the PDU be at layer 5? *Provide the exact number of bytes as your answer.* |
| cd | What is the data rate that is possible between nodes 3 and 2? *Provide the exact number of kilo-bits per second as your answer.* |
| ce | How many milli-seconds would it take node 3 to send 6957 bytes of data to node 2? *Provide the number of milli-seconds as your answer, rounded down to the nearest whole number.* |

# Fictional Network Topology 7

**Network Stack 1: 'besinnte'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | anrauchheit | 65 |
| 6 | aufrennte | 59 |
| 5 | enstehen | 43 |
| 4 | befahren | 93 |
| 3 | gesteht | 11 |
| 2 | verkletten | 37 |

**Network Stack 2: 'ausgekaesung'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | enkletten | 61 |
| 6 | ansitzse | 11 |
| 5 | aufsitztete | 70 |
| 4 | aufgerabarbs | 12 |
| 3 | gehundte | 22 |
| 2 | aufrabarbung | 42 |

**Network Stack 3: 'angetrittte'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | vertrittheit | 82 |
| 6 | ausgetritts | 90 |
| 5 | angerabarben | 17 |
| 4 | eintrautete | 48 |
| 3 | angekraute | 56 |
| 2 | angetrittkeit | 3 |

**Network Stack 4: 'ausgewarfst'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | aufwarfs | 12 |
| 6 | angeklettse | 2 |
| 5 | enhunden | 76 |
| 4 | ausgetrittse | 7 |
| 3 | aufgelauftest | 18 |
| 2 | angewarfst | 59 |

**Physical Layer Properties**

| Physical Layer | PDU Header Size (bytes) | Data Rate (kilo-bits per second) | Propagation delay (milli-seconds) |
|---|---|---|---|
| antrittung | 51 | 4675 | 567 |
| angetritten | 24 | 8979 | 977 |
| ansprachs | 91 | 5266 | 670 |
| verwarft | 40 | 7378 | 162 |

**Network Diagram**

| Node #3 | Node #2 | Node #5 | Node #4 | Node #0 | Node #1 |
|---|---|---|---|---|---|
| Network Stack: ausgekaesung | Network Stack: angetrittte | Network Stack: ausgewarfst | Network Stack: angetrittte | Network Stack: angetrittte | Network Stack: ausgekaesung |

Physical Layer antrittung    Physical Layer verwarft    Physical Layer angetritten    Physical Layer ansprachs
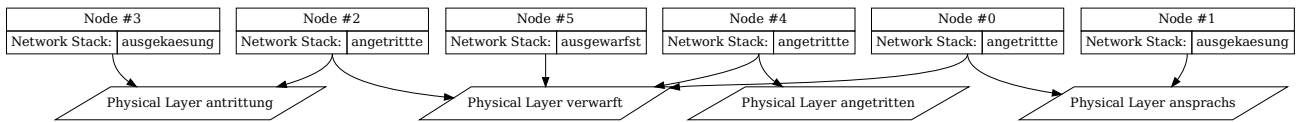
| Question# | Question |
|---|---|
| cf | Could applications on nodes 3 and 1 communicate with one another? i.e., are they using compatible network stacks, and is there a compatible path through the network between them? *Answer Y or N. Any other answer will be marked incorrect.* |
| cg | If an application on node 5 sends 330 bytes of data, how large would the PDU be at layer 5? *Provide the exact number of bytes as your answer.* |
| ch | What is the data rate that is possible between nodes 5 and 1? *Provide the exact number of kilo-bits per second as your answer.* |
| ci | How many milli-seconds would it take node 5 to send 2298 bytes of data to node 1? *Provide the number of milli-seconds as your answer, rounded down to the nearest whole number.* |

# Fictional Network Topology 8

**Network Stack 1: 'aufpflumst'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | aufgekraus | 77 |
| 6 | angehunder | 14 |
| 5 | belaufte | 90 |
| 4 | einschmeckse | 29 |
| 3 | enfahrst | 100 |
| 2 | ausgeschmeckst | 50 |

**Network Stack 2: 'auswarfkeit'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | zerpflumse | 37 |
| 6 | anwarft | 60 |
| 5 | zerlaufkeit | 95 |
| 4 | aufgeklettung | 85 |
| 3 | auskrauung | 91 |
| 2 | auspflumung | 67 |

**Network Stack 3: 'bepflumtest'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | enspracher | 85 |
| 6 | angewitzs | 1 |
| 5 | einstehte | 39 |
| 4 | ausgestehte | 10 |
| 3 | gewarfer | 72 |
| 2 | anfahrst | 85 |

**Network Stack 4: 'angesetzst'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | anrennse | 27 |
| 6 | angekletttest | 82 |
| 5 | ausgesinnen | 51 |
| 4 | angestehtete | 76 |
| 3 | angeschmeckte | 36 |
| 2 | getritten | 91 |

**Physical Layer Properties**

| Physical Layer | PDU Header Size (bytes) | Data Rate (kilo-bits per second) | Propagation delay (milli-seconds) |
|---|---|---|---|
| angefahrkeit | 29 | 5251 | 265 |
| bekatzetete | 64 | 2363 | 580 |
| behundkeit | 77 | 3429 | 759 |
| aufhalts | 40 | 9879 | 854 |

**Network Diagram**
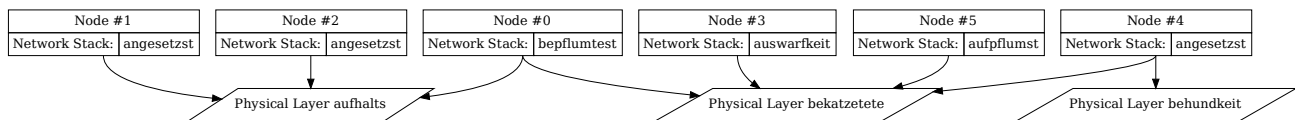


| Question# | Question |
|---|---|
| cj | Could applications on nodes 1 and 2 communicate with one another? i.e., are they using compatible network stacks, and is there a compatible path through the network between them? *Answer Y or N. Any other answer will be marked incorrect.* |
| ck | If an application on node 3 sends 722 bytes of data, how large would the PDU be at layer 5? *Provide the exact number of bytes as your answer.* |
| cl | What is the data rate that is possible between nodes 3 and 2? *Provide the exact number of kilo-bits per second as your answer.* |
| cm | How many milli-seconds would it take node 3 to send 3008 bytes of data to node 2? *Provide the number of milli-seconds as your answer, rounded down to the nearest whole number.* |

# Fictional Network Topology 9

**Network Stack 1: 'aufsprachs'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | aufgeschmeckheit | 24 |
| 6 | bekaest | 39 |
| 5 | begehse | 65 |
| 4 | angetrauung | 11 |
| 3 | besprachs | 25 |
| 2 | angewitzung | 52 |

**Network Stack 2: 'betraute'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | ausfahrte | 95 |
| 6 | einwarfte | 26 |
| 5 | angegehst | 46 |
| 4 | ausgesinnse | 2 |
| 3 | zerhundtete | 27 |
| 2 | ausrabarbtest | 35 |

**Network Stack 3: 'enrennt'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | ausgekaesst | 27 |
| 6 | einkaesen | 96 |
| 5 | besetzkeit | 48 |
| 4 | verkletter | 57 |
| 3 | gelauftest | 90 |
| 2 | einrauchtest | 7 |

**Network Stack 4: 'auftrauer'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | angesitztete | 74 |
| 6 | auftrauung | 56 |
| 5 | aufwarfer | 83 |
| 4 | einsetzkeit | 41 |
| 3 | ausfahren | 61 |
| 2 | aufgehundtete | 4 |

**Physical Layer Properties**

| Physical Layer | PDU Header Size (bytes) | Data Rate (kilo-bits per second) | Propagation delay (milli-seconds) |
|---|---|---|---|
| zerrennheit | 58 | 1649 | 947 |
| antrauung | 94 | 5696 | 367 |
| bekraukeit | 67 | 5291 | 68 |
| angerabarbung | 85 | 2506 | 864 |

**Network Diagram**

| Node #1 | Node #2 | Node #3 | Node #0 | Node #5 | Node #4 |
|---|---|---|---|---|---|
| Network Stack: enrennt | Network Stack: aufsprachs | Network Stack: auftrauer | Network Stack: auftrauer | Network Stack: aufsprachs | Network Stack: enrennt |

Physical Layer zerrennheit  Physical Layer antrauung  Physical Layer bekraukeit
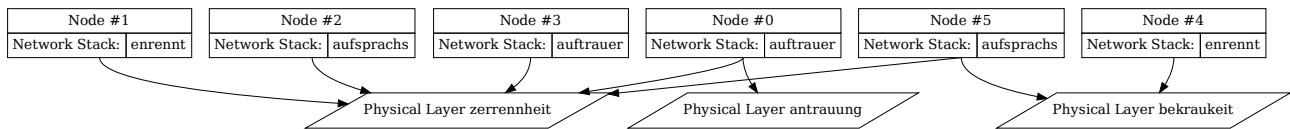
| Question# | Question |
|---|---|
| cn | Could applications on nodes 1 and 4 communicate with one another? i.e., are they using compatible network stacks, and is there a compatible path through the network between them? *Answer Y or N. Any other answer will be marked incorrect.* |
| co | If an application on node 2 sends 260 bytes of data, how large would the PDU be at layer 6? *Provide the exact number of bytes as your answer.* |
| cp | What is the data rate that is possible between nodes 2 and 4? *Provide the exact number of kilo-bits per second as your answer.* |
| cq | How many milli-seconds would it take node 2 to send 4126 bytes of data to node 4? *Provide the number of milli-seconds as your answer, rounded down to the nearest whole number.* |

# Fictional Network Topology 10

### Network Stack 1: 'aufsprachkeit'

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | angehundheit | 30 |
| 6 | einsinnst | 79 |
| 5 | einfahrte | 1 |
| 4 | angeschmeckst | 59 |
| 3 | angeklettt | 8 |
| 2 | angesinntest | 48 |

### Network Stack 2: 'anhaltst'

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | ausgerauchte | 76 |
| 6 | versinntete | 73 |
| 5 | ankaeste | 8 |
| 4 | angehaltse | 80 |
| 3 | verhunder | 54 |
| 2 | aufgehalter | 59 |

### Network Stack 3: 'ausgerauchung'

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | aufgeschmecken | 3 |
| 6 | aufsetzkeit | 27 |
| 5 | aufstehst | 41 |
| 4 | ansprachheit | 9 |
| 3 | ansteher | 5 |
| 2 | beschmecken | 3 |

**Network Stack 4: 'versitzheit'**

| OSI Layer # | Name | PDU Header Size (bytes) |
|---|---|---|
| 7 | anwarftete | 52 |
| 6 | enkatzetete | 5 |
| 5 | beschmeckte | 24 |
| 4 | angerabarbt | 47 |
| 3 | aufgehen | 7 |
| 2 | aufgesinns | 86 |

**Physical Layer Properties**

| Physical Layer | PDU Header Size (bytes) | Data Rate (kilo-bits per second) | Propagation delay (milli-seconds) |
|---|---|---|---|
| gelaufte | 22 | 638 | 449 |
| ausgefahrheit | 8 | 9502 | 393 |
| auspflumtest | 11 | 4834 | 70 |
| angegehtete | 87 | 1411 | 1 |

**Network Diagram**
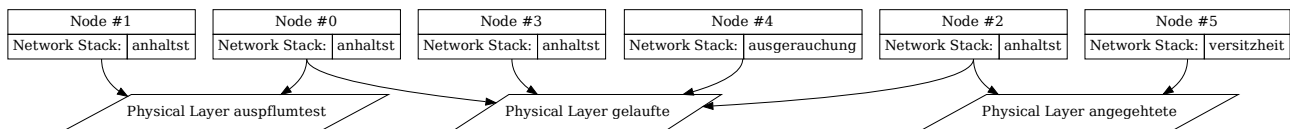


| Question# | Question |
|---|---|
| cr | Could applications on nodes 4 and 1 communicate with one another? i.e., are they using compatible network stacks, and is there a compatible path through the network between them? *Answer Y or N. Any other answer will be marked incorrect.* |
| cs | If an application on node 3 sends 654 bytes of data, how large would the PDU be at layer 1? *Provide the exact number of bytes as your answer.* |
| ct | What is the data rate that is possible between nodes 3 and 1? *Provide the exact number of kilo-bits per second as your answer.* |
| cu | How many milli-seconds would it take node 3 to send 1247 bytes of data to node 1? *Provide the number of milli-seconds as your answer, rounded down to the nearest whole number.* |

# 4 Name and describe five reliability challenges for computer networks, referring to the network layers at which these challenges either arise, or are solved.

*For each of the five challenges, you must record your answer in the unit1-answers.txt file in your git repository.*

| Question# | Description |
|---|---|
| cv | Reliability Challenge #1 |
| cw | Reliability Challenge #2 |
| cx | Reliability Challenge #3 |
| cy | Reliability Challenge #4 |
| cz | Reliability Challenge #5 |

The following question forms part of the DN/HD vs lower grade diagnosis for this work unit. Your answer will be used to assess if you are demonstrating the depth of understanding commensurate with a DN or HD grade. The pedagogical diagnosis is made based on the guidance from: `https://www.flinders.edu.au/content/dam/documents/staff/policies/academic-students/grading-scheme.pdf`.

Specifically, in this item, the DN gate will be:

- *iii. produced work which shows a developing capacity for original, critical and creative thinking over and above the essential requirements of the learning outcomes*

  and the HD gate will be:

- *iii. consistently demonstrated knowledge skills and application at the highest level expected of a student at a given topic level*

*You must write your answer in the* `unit1-answers.txt` *text file in your github repository between the lines* `BEGIN:da` *and* `END:da`.

| Question# | Description |
|-----------|-------------|
| `da` | Reliable delivery of a streaming video (such as watching a YouTube video) and a video conferencing session have different reliability requirements. What are the commonalities and differences in their requirements? What implications do these have for the way these services are provided and consumed on a network? Describe these implications with reference to the layered networking model, and/or to particular protocols and layers within the model. |

# Open Answer Question

The following question forms part of the DN/HD vs lower grade diagnosis for this work unit. Your answer will be used to assess if you are demonstrating the depth of understanding commensurate with a DN or HD grade. The pedagogical diagnosis is made based on the guidance from: `https://www.flinders.edu.au/content/dam/documents/staff/policies/academic-students/grading-scheme.pdf`.

Specifically, in this item, the DN gate will be:

- *iii. produced work which shows a developing capacity for original, critical and creative thinking over and above the essential requirements of the learning outcomes*

  and the HD gate will be:

- *v. demonstrated an ability to combine knowledge of the subject matter of the topic with original, critical and creative thinking relevant to the discipline,*

*You must write your answer in the* `unit1-answers.txt` *text file in your github repository between the lines* `BEGIN:db` *and* `END:db`.

| Question# | Description |
|-----------|-------------|
| `db` | In which layer is security normally implemented in the OSI layered network model? Choose two other layers, and suggest how security might be implemented in each of those layers instead. |