Lab 4 : HDCL et réseau multipoint

CEG 3585 [A] – Introduction à la communication de données et au réseautage

Hiver 2023

École de science informatique et de génie électrique

Université d'Ottawa

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But et théorie du problème :

Ce laboratoire présente une relève de conception et d'implémentation d'un réseau multipoint et HDLC. On a la tâche de compléter les méthodes dans la classe SecondaryHDLCDataLink.java. En faisant ceci, nous allons accomplir les quatre objectifs du laboratoires. Premièrement, nous souhaitons se familiariser avec les réseau multipoint contenant des stations primaires, ainsi que des stations secondaires. Nous voulons aussi mieux comprendre l'importance et le rôle des protocoles en étudiant le protocole de la couche de liaison de données HDLC.

Explication de l'algorithme de notre solution :

Nous avons utilisé Java pour notre solution de l'application de réseau multipoint.

Comment utiliser le code :

1. Assurer d'avoir télécharger tous les fichiers java, et les mettre dans le même répertoire.
2. Entrez les trois commandes suivantes :
   - javac PhysicalLayerServer.java
   - javac SecondaryStation.java
   - javac PrimaryStation.java
3. Entrez les quatre commandes suivantes chacun dans leur propre terminal:
   - java PhysicalLayerServer
   - java SecondaryStation 1
   - java SecondaryStation 2
   - java PrimaryStation

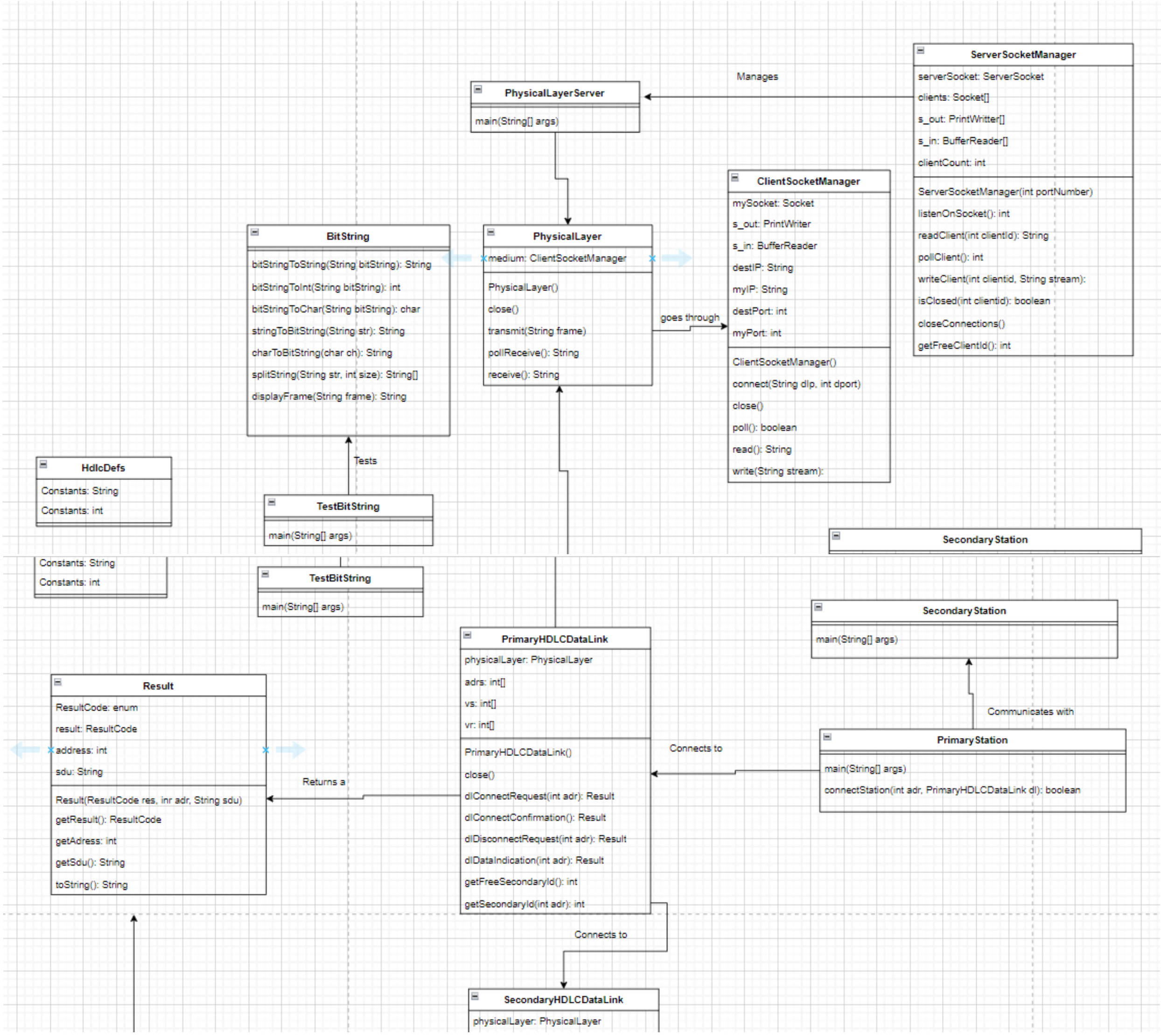
Il y a trois fonctions que nous avons dû modifier / créer pour que l'application de réseau multipoint fonctionne correctement. Dans les prochains paragraphes, il y aura une explication pour chacune des implémentations.

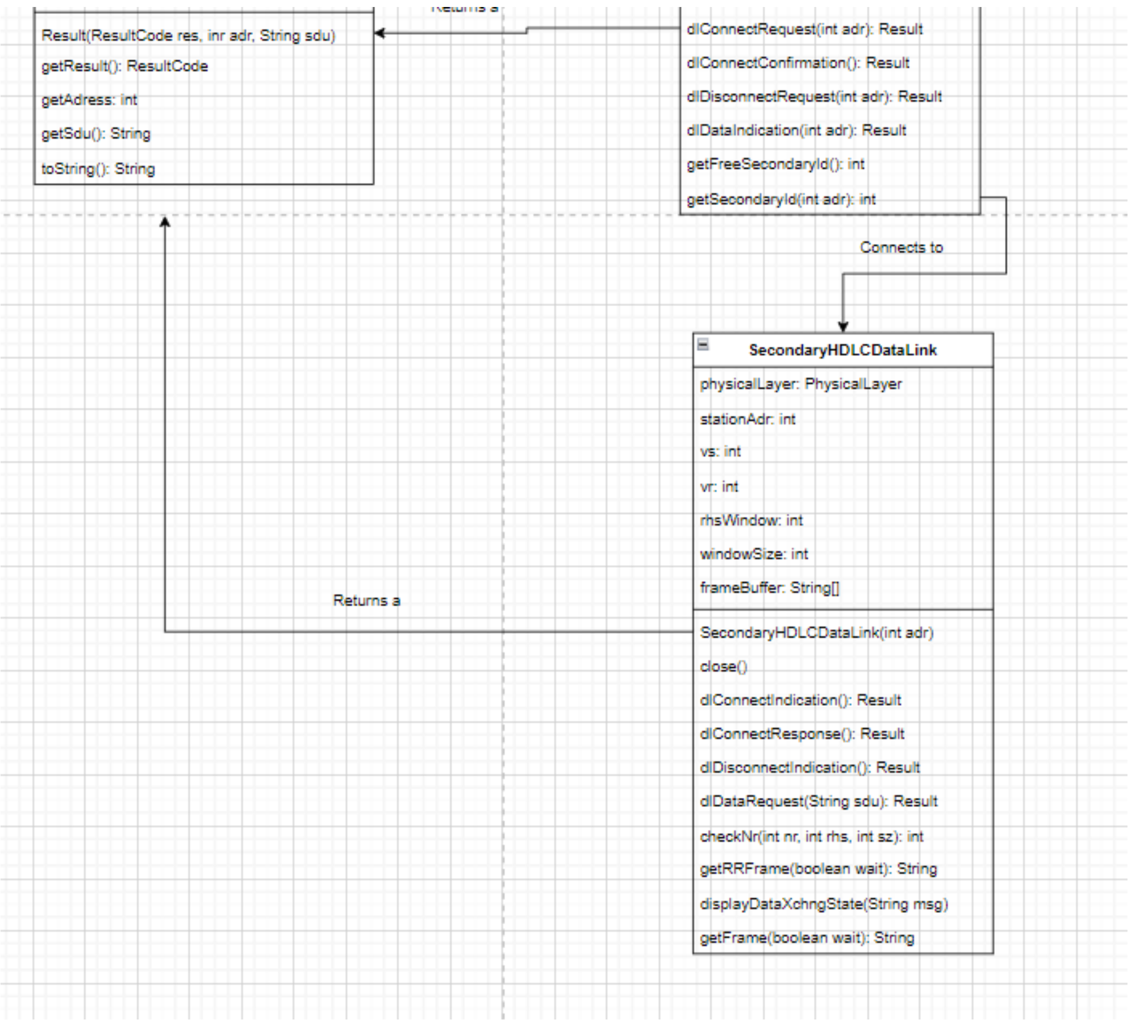
La première fonction à modifier est : dlDataRequest(String sdu). Nous avons ajouté un while loop pour vérifier si le HdlcDefs.PF_IX = 0. Si oui, le on initialise le frame. De suite, nous avons complété la boucle avec les conditions suivantes : frameBuffer.size()>0 || i<dataArr.length. Le premier if a les conditions suivantes : i<dataArr.length && vs!=rhsWindow && frame!=null. À l'intérieur de la boucle et du if statement, on transmet les valeurs au physicalLayer et le data est afficher sure l'écran. De suite, dans le deuxième if statement, les conditions sont frame!=null && frame.charAt(HdlcDefs.PF_IX) == 0. Cette fonction est maintenant complète.

De suite, nous avons implémenter : checkNr(int nr, int rhs, int sz). Le code de checkNr a été fourni par le professeur dans la section annonce sur Brightspace, alors nous avons utilisé ce code dans notre implémentation.

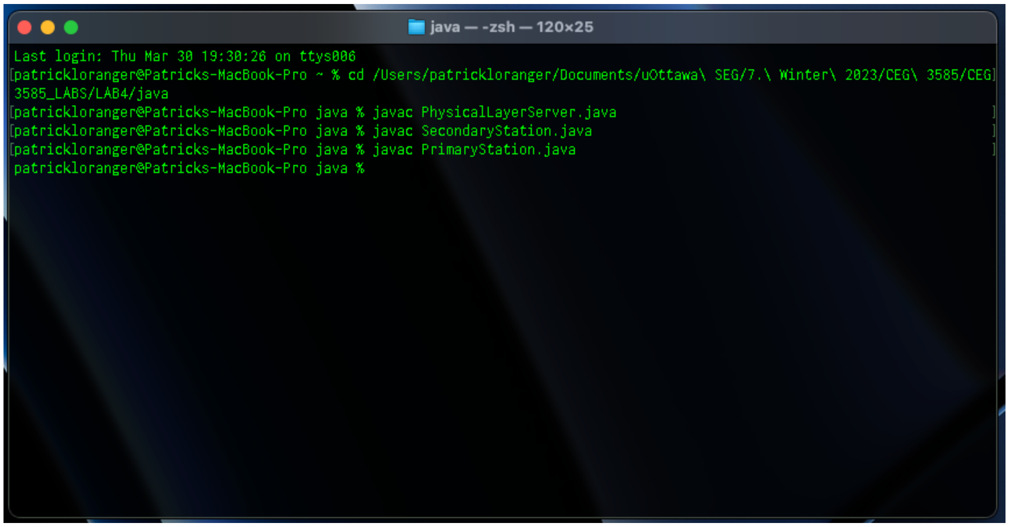
Finalement, c'était la fonction : getRRFrame(boolean wait). Lorsque le frame == null, nous allons alors prendre nos deux conditions pour le if statement, et on ajoute aussi lorsque le frame != null. Si ce la négation de ces conditions sont vrai, alors le frame est null, sinon, on retourne le frame comme telle. Avec ceci, les trois fonctions sont complètes et le code fonctionne correctement.

Document de conception et diagrammes UML :



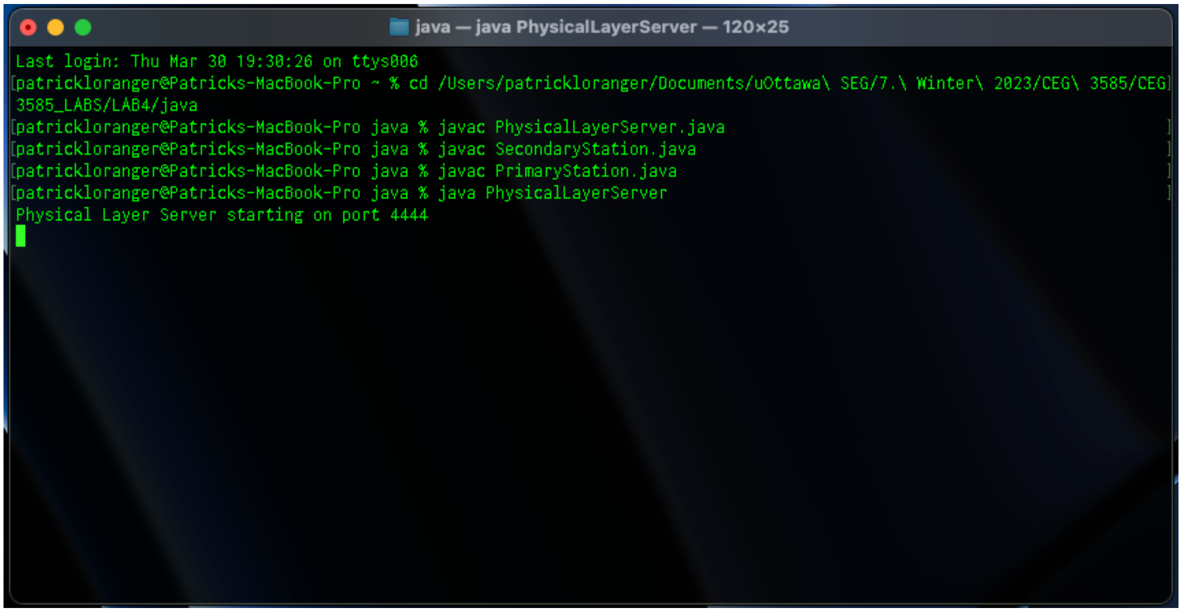

Returns a
Result(ResultCode res, inr adr, String sdu)
getResult(): ResultCode
getAdress: int
getSdu(): String
toString(): String
dlConnectRequest(int adr): Result
dlConnectConfirmation(): Result
dlDisconnectRequest(int adr): Result
dlDataIndication(int adr): Result
getFreeSecondaryId(): int
getSecondaryId(int adr): int
Connects to
SecondaryHDLCDataLink
physicalLayer: PhysicalLayer
stationAdr: int
vs: int
vr: int
rhsWindow: int
windowSize: int
frameBuffer: String[]
SecondaryHDLCDataLink(int adr)
close()
dlConnectIndication(): Result
dlConnectResponse(): Result
dlDisconnectIndication(): Result
dlDataRequest(String sdu): Result
checkNr(int nr, int rhs, int sz): int
getRRFrame(boolean wait): String
displayDataXchngState(String msg)
getFrame(boolean wait): String
Returns a

Captures d’écrans de la démonstration de l’application :



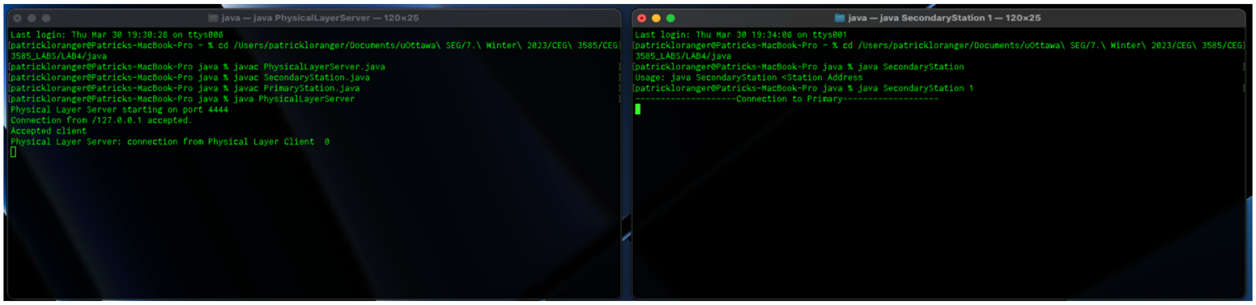
```
Last login: Thu Mar 30 19:30:26 on ttys006
[patrickloranger@Patricks-MacBook-Pro ~ % cd /Users/patrickloranger/Documents/uOttawa\ SEG/7.\ Winter\ 2023/CEG\ 3585/CEG]
3585_LABS/LAB4/java
[patrickloranger@Patricks-MacBook-Pro java % javac PhysicalLayerServer.java                                            ]
[patrickloranger@Patricks-MacBook-Pro java % javac SecondaryStation.java                                               ]
[patrickloranger@Patricks-MacBook-Pro java % javac PrimaryStation.java                                                 ]
patrickloranger@Patricks-MacBook-Pro java %
```

Entrer les commandes javac pour les trois fichiers suivants.



```
Last login: Thu Mar 30 19:30:26 on ttys006
[patrickloranger@Patricks-MacBook-Pro ~ % cd /Users/patrickloranger/Documents/uOttawa\ SEG/7.\ Winter\ 2023/CEG\ 3585/CEG]
3585_LABS/LAB4/java
[patrickloranger@Patricks-MacBook-Pro java % javac PhysicalLayerServer.java
[patrickloranger@Patricks-MacBook-Pro java % javac SecondaryStation.java
[patrickloranger@Patricks-MacBook-Pro java % javac PrimaryStation.java
[patrickloranger@Patricks-MacBook-Pro java % java PhysicalLayerServer
Physical Layer Server starting on port 4444
```

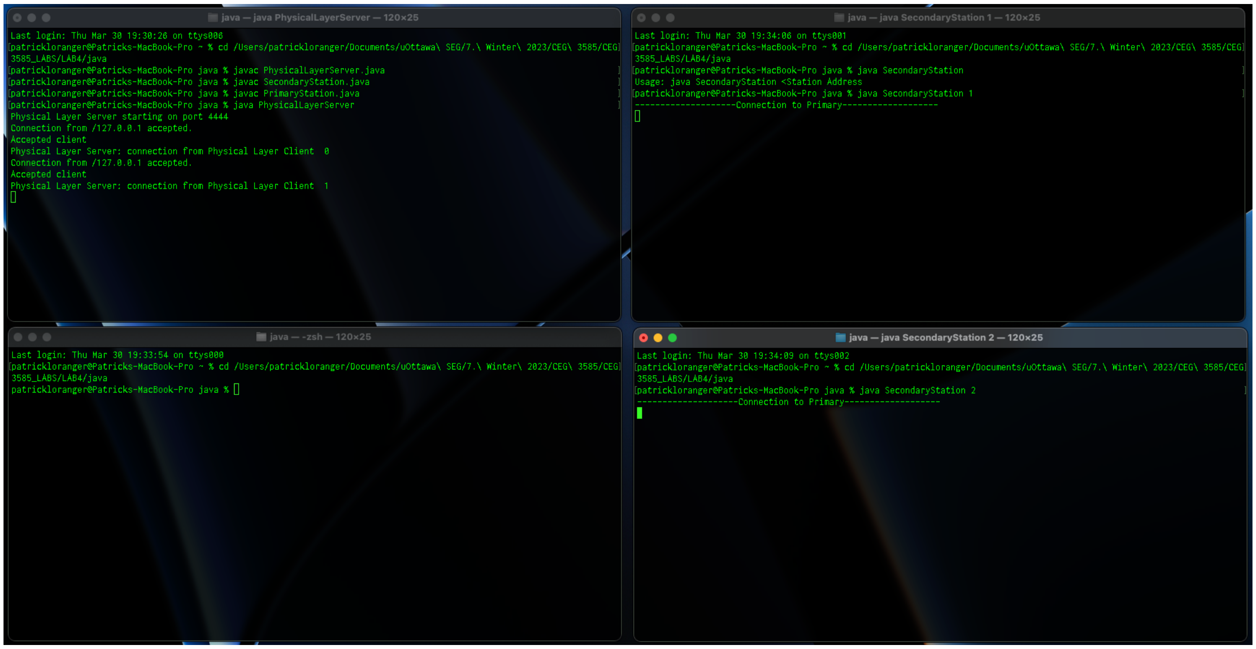
Entrer la commande pour partir le serveur sur le port 4444.


java — java PhysicalLayerServer — 120×25
java — java SecondaryStation 1 — 120×25

```
Last login: Thu Mar 30 19:30:26 on ttys006
[patrickloranger@Patricks-MacBook-Pro ~ % cd /Users/patrickloranger/Documents/uOttawa\ SEG/7.\ Winter\ 2023/CEG\ 3585/CEG]
3585_LABS/LAB4/java
[patrickloranger@Patricks-MacBook-Pro java % javac PhysicalLayerServer.java
[patrickloranger@Patricks-MacBook-Pro java % javac SecondaryStation.java
[patrickloranger@Patricks-MacBook-Pro java % javac PrimaryStation.java
[patrickloranger@Patricks-MacBook-Pro java % java PhysicalLayerServer
Physical Layer Server starting on port 4444
Connection from /127.0.0.1 accepted.
Accepted client
Physical Layer Server: connection from Physical Layer Client  0
```

```
Last login: Thu Mar 30 19:34:06 on ttys001
[patrickloranger@Patricks-MacBook-Pro ~ % cd /Users/patrickloranger/Documents/uOttawa\ SEG/7.\ Winter\ 2023/CEG\ 3585/CEG]
3585_LABS/LAB4/java
[patrickloranger@Patricks-MacBook-Pro java % java SecondaryStation
Usage: java SecondaryStation <Station Address
[patrickloranger@Patricks-MacBook-Pro java % java SecondaryStation 1
--------------------Connection to Primary-------------------
```

Entrer la commande pour partir la station secondaire 1.


java — java PhysicalLayerServer — 120×25
java — java SecondaryStation 1 — 120×25
java — -zsh — 120×25
java — java SecondaryStation 2 — 120×25

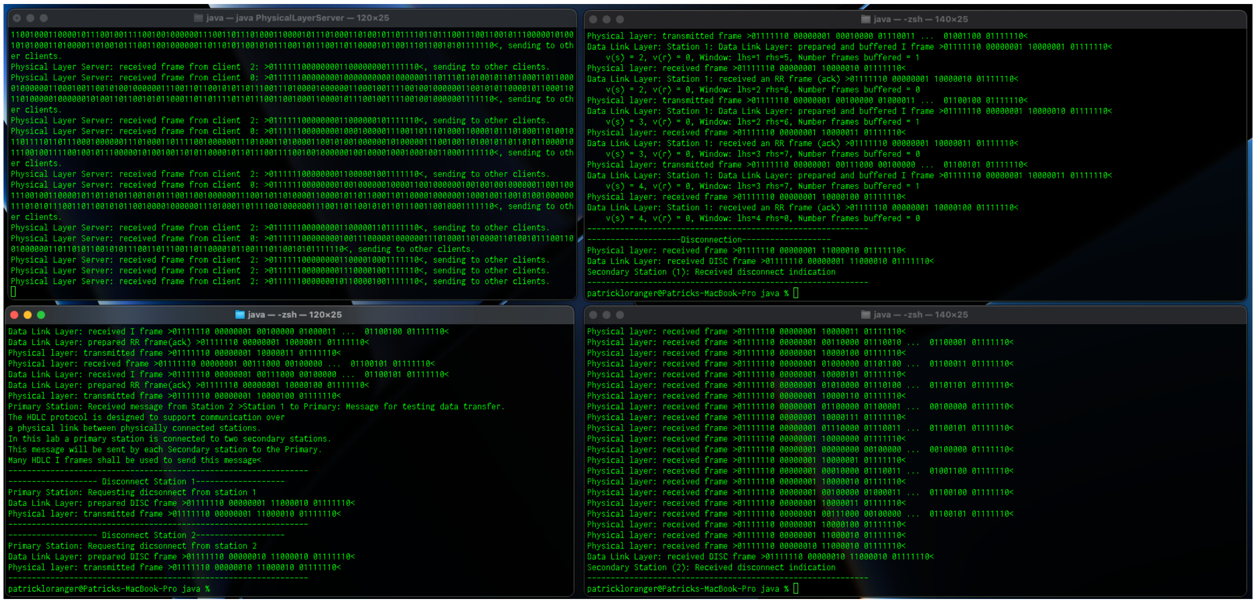
```
Last login: Thu Mar 30 19:30:26 on ttys006
[patrickloranger@Patricks-MacBook-Pro ~ % cd /Users/patrickloranger/Documents/uOttawa\ SEG/7.\ Winter\ 2023/CEG\ 3585/CEG]
3585_LABS/LAB4/java
[patrickloranger@Patricks-MacBook-Pro java % javac PhysicalLayerServer.java
[patrickloranger@Patricks-MacBook-Pro java % javac SecondaryStation.java
[patrickloranger@Patricks-MacBook-Pro java % javac PrimaryStation.java
[patrickloranger@Patricks-MacBook-Pro java % java PhysicalLayerServer
Physical Layer Server starting on port 4444
Connection from /127.0.0.1 accepted.
Accepted client
Physical Layer Server: connection from Physical Layer Client  0
Connection from /127.0.0.1 accepted.
Accepted client
Physical Layer Server: connection from Physical Layer Client  1
```

```
Last login: Thu Mar 30 19:34:06 on ttys001
[patrickloranger@Patricks-MacBook-Pro ~ % cd /Users/patrickloranger/Documents/uOttawa\ SEG/7.\ Winter\ 2023/CEG\ 3585/CEG]
3585_LABS/LAB4/java
[patrickloranger@Patricks-MacBook-Pro java % java SecondaryStation
Usage: java SecondaryStation <Station Address
[patrickloranger@Patricks-MacBook-Pro java % java SecondaryStation 1
--------------------Connection to Primary-------------------
```

```
Last login: Thu Mar 30 19:33:54 on ttys000
[patrickloranger@Patricks-MacBook-Pro ~ % cd /Users/patrickloranger/Documents/uOttawa\ SEG/7.\ Winter\ 2023/CEG\ 3585/CEG]
3585_LABS/LAB4/java
patrickloranger@Patricks-MacBook-Pro java %
```

```
Last login: Thu Mar 30 19:34:09 on ttys002
[patrickloranger@Patricks-MacBook-Pro ~ % cd /Users/patrickloranger/Documents/uOttawa\ SEG/7.\ Winter\ 2023/CEG\ 3585/CEG]
3585_LABS/LAB4/java
[patrickloranger@Patricks-MacBook-Pro java % java SecondaryStation 2
--------------------Connection to Primary-------------------
```

Entrez la commande pour partir la station secondaire 2.



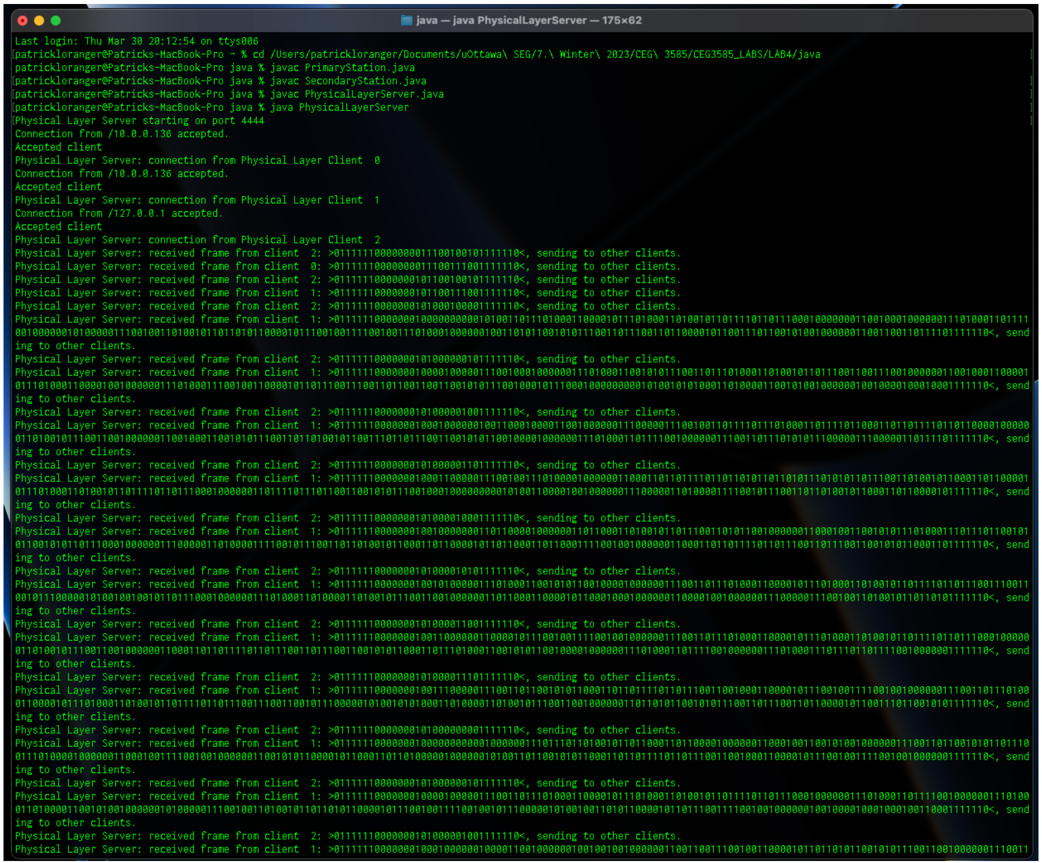
```
110010001100001011100100111100100100000011100110111010001100001011101000110100101101110110111001110011001011100000010100
10101000110100001101001011100110010000001101101011001010111001101110011011000010110011101100101011111110<, sending to oth
er clients.
Physical Layer Server: received frame from client  2: >01111110000000011000000001111110<, sending to other clients.
Physical Layer Server: received frame from client  0: >011111100000000100000000001000000111011101101001011011000110110000
010000001100010011001010010000001110011011001010110111001110100001000000110001001110010010000001100101011000010110001101
1101000001000000101001101100101011000110110111101101110011001000110000101110010011100100100000011111110<, sending to oth
er clients.
Physical Layer Server: received frame from client  2: >01111110000000011000000101111110<, sending to other clients.
Physical Layer Server: received frame from client  0: >011111100000000100010000011100110111010001100001011101000110100100
110111101101110001000000111010001101111001000000111010001101000011001010010000001010000011100100110100101101101011000010
111001001111001001011100000010100100110101100001011011100111100100100000010010000100010001001100011111110<, sending to oth
er clients.
Physical Layer Server: received frame from client  2: >01111110000000011000001001111110<, sending to other clients.
Physical Layer Server: received frame from client  0: >011111100000000100100000010000110010000000100100100000011001100
111001001100001011011010110010101110011001000000111001101101000011000010110110001101100001000000110001001100101001000000
111010101110011011001010110010000100000011101000110111100100000011100110110010101101110011001000111110<, sending to oth
er clients.
Physical Layer Server: received frame from client  2: >01111110000000011000001101111110<, sending to other clients.
Physical Layer Server: received frame from client  0: >011111100000000100111000001000000111010001101000011010010111001100110
0100000011011010110010101110011011100110110000101100111011001010111110<, sending to other clients.
Physical Layer Server: received frame from client  2: >01111110000000011000010001111110<, sending to other clients.
Physical Layer Server: received frame from client  2: >01111110000000011100001001111110<, sending to other clients.
Physical Layer Server: received frame from client  2: >01111110000000101100001001111110<, sending to other clients.
```

```
Physical layer: transmitted frame >01111110 00000001 00010000 01110011 ...  01001100 01111110<
Data Link Layer: Station 1: Data Link Layer: prepared and buffered I frame >01111110 00000001 10000001 01111110<
    v(s) = 2, v(r) = 0, Window: lhs=1 rhs=5, Number frames buffered = 1
Physical layer: received frame >01111110 00000001 10000010 01111110<
Data Link Layer: Station 1: received an RR frame (ack) >01111110 00000001 10000010 01111110<
    v(s) = 2, v(r) = 0, Window: lhs=2 rhs=6, Number frames buffered = 0
Physical layer: transmitted frame >01111110 00000001 00100000 01000011 ...  01100100 01111110<
Data Link Layer: Station 1: Data Link Layer: prepared and buffered I frame >01111110 00000001 10000010 01111110<
    v(s) = 3, v(r) = 0, Window: lhs=2 rhs=6, Number frames buffered = 1
Physical layer: received frame >01111110 00000001 10000011 01111110<
Data Link Layer: Station 1: received an RR frame (ack) >01111110 00000001 10000011 01111110<
    v(s) = 3, v(r) = 0, Window: lhs=3 rhs=7, Number frames buffered = 0
Physical layer: transmitted frame >01111110 00000001 00111000 00100000 ...  01100101 01111110<
Data Link Layer: Station 1: Data Link Layer: prepared and buffered I frame >01111110 00000001 10000011 01111110<
    v(s) = 4, v(r) = 0, Window: lhs=3 rhs=7, Number frames buffered = 1
Physical layer: received frame >01111110 00000001 10000100 01111110<
Data Link Layer: Station 1: received an RR frame (ack) >01111110 00000001 10000100 01111110<
    v(s) = 4, v(r) = 0, Window: lhs=4 rhs=0, Number frames buffered = 0
------------------------------------------------------------
--------------------Disconnection------------------
Physical layer: received frame >01111110 00000001 11000010 01111110<
Data Link Layer: received DISC frame >01111110 00000001 11000010 01111110<
Secondary Station (1): Received disconnect indication
------------------------------------------------------------
patrickloranger@Patricks-MacBook-Pro java % 
```

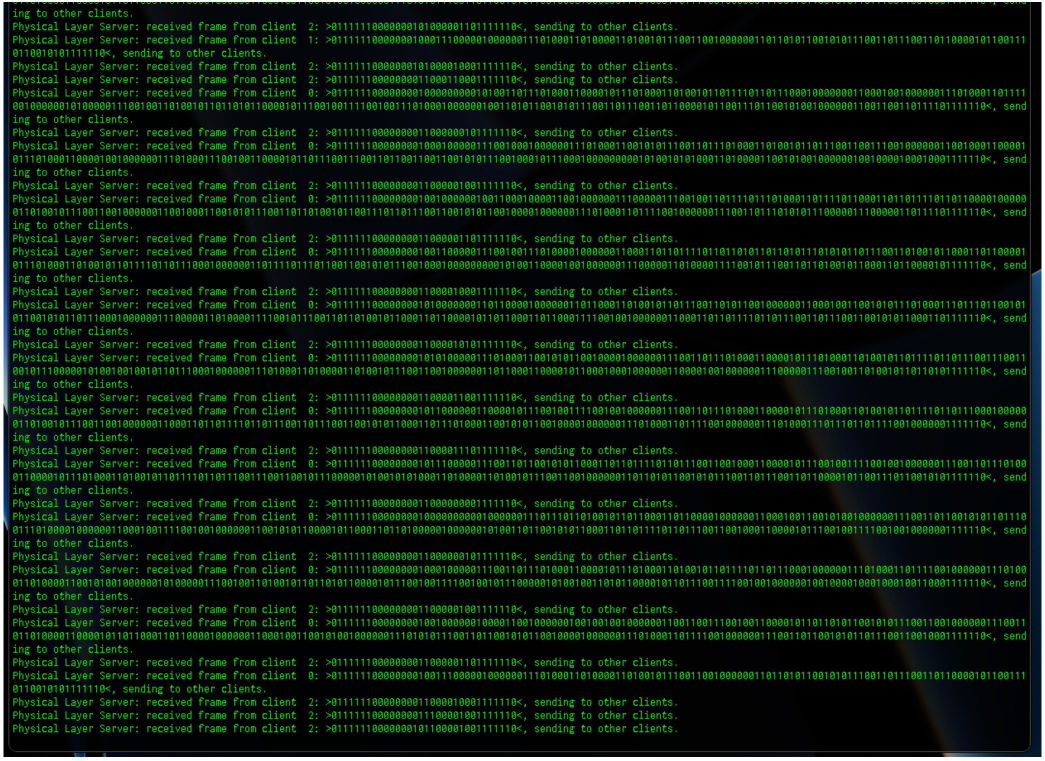
```
Data Link Layer: received I frame >01111110 00000001 00100000 01000011 ...  01100100 01111110<
Data Link Layer: prepared RR frame(ack) >01111110 00000001 10000011 01111110<
Physical layer: transmitted frame >01111110 00000001 10000011 01111110<
Physical layer: received frame >01111110 00000001 00111000 00100000 ...  01100101 01111110<
Data Link Layer: received I frame >01111110 00000001 00111000 00100000 ...  01100101 01111110<
Data Link Layer: prepared RR frame(ack) >01111110 00000001 10000100 01111110<
Physical layer: transmitted frame >01111110 00000001 10000100 01111110<
Primary Station: Received message from Station 2 >Station 1 to Primary: Message for testing data transfer.
The HDLC protocol is designed to support communication over
a physical link between physically connected stations.
In this lab a primary station is connected to two secondary stations.
This message will be sent by each Secondary station to the Primary.
Many HDLC I frames shall be used to send this message<
----------------------------------------------------------------
------------------- Disconnect Station 1-------------------
Primary Station: Requesting dicsonnect from station 1
Data Link Layer: prepared DISC frame >01111110 00000001 11000010 01111110<
Physical layer: transmitted frame >01111110 00000001 11000010 01111110<
----------------------------------------------------------------
------------------- Disconnect Station 2-------------------
Primary Station: Requesting dicsonnect from station 2
Data Link Layer: prepared DISC frame >01111110 00000010 11000010 01111110<
Physical layer: transmitted frame >01111110 00000010 11000010 01111110<
----------------------------------------------------------------
patrickloranger@Patricks-MacBook-Pro java %
```

```
Physical layer: received frame >01111110 00000001 10000011 01111110<
Physical layer: received frame >01111110 00000001 00110000 01110010 ...  01100001 01111110<
Physical layer: received frame >01111110 00000001 10000100 01111110<
Physical layer: received frame >01111110 00000001 01000000 01101100 ...  01100011 01111110<
Physical layer: received frame >01111110 00000001 10000101 01111110<
Physical layer: received frame >01111110 00000001 01010000 01110100 ...  01101101 01111110<
Physical layer: received frame >01111110 00000001 10000110 01111110<
Physical layer: received frame >01111110 00000001 01100000 01100001 ...  00100000 01111110<
Physical layer: received frame >01111110 00000001 10000111 01111110<
Physical layer: received frame >01111110 00000001 01110000 01110011 ...  01100101 01111110<
Physical layer: received frame >01111110 00000001 10000000 01111110<
Physical layer: received frame >01111110 00000001 00000000 00100000 ...  00100000 01111110<
Physical layer: received frame >01111110 00000001 10000001 01111110<
Physical layer: received frame >01111110 00000001 00010000 01110011 ...  01001100 01111110<
Physical layer: received frame >01111110 00000001 10000010 01111110<
Physical layer: received frame >01111110 00000001 00100000 01000011 ...  01100100 01111110<
Physical layer: received frame >01111110 00000001 10000011 01111110<
Physical layer: received frame >01111110 00000001 00111000 00100000 ...  01100101 01111110<
Physical layer: received frame >01111110 00000001 10000100 01111110<
Physical layer: received frame >01111110 00000001 11000010 01111110<
Physical layer: received frame >01111110 00000010 11000010 01111110<
Data Link Layer: received DISC frame >01111110 00000010 11000010 01111110<
Secondary Station (2): Received disconnect indication
------------------------------------------------------------
patrickloranger@Patricks-MacBook-Pro java % 
```

Entrez la commande pour partir la station primaire et voir l’exécution du programme.

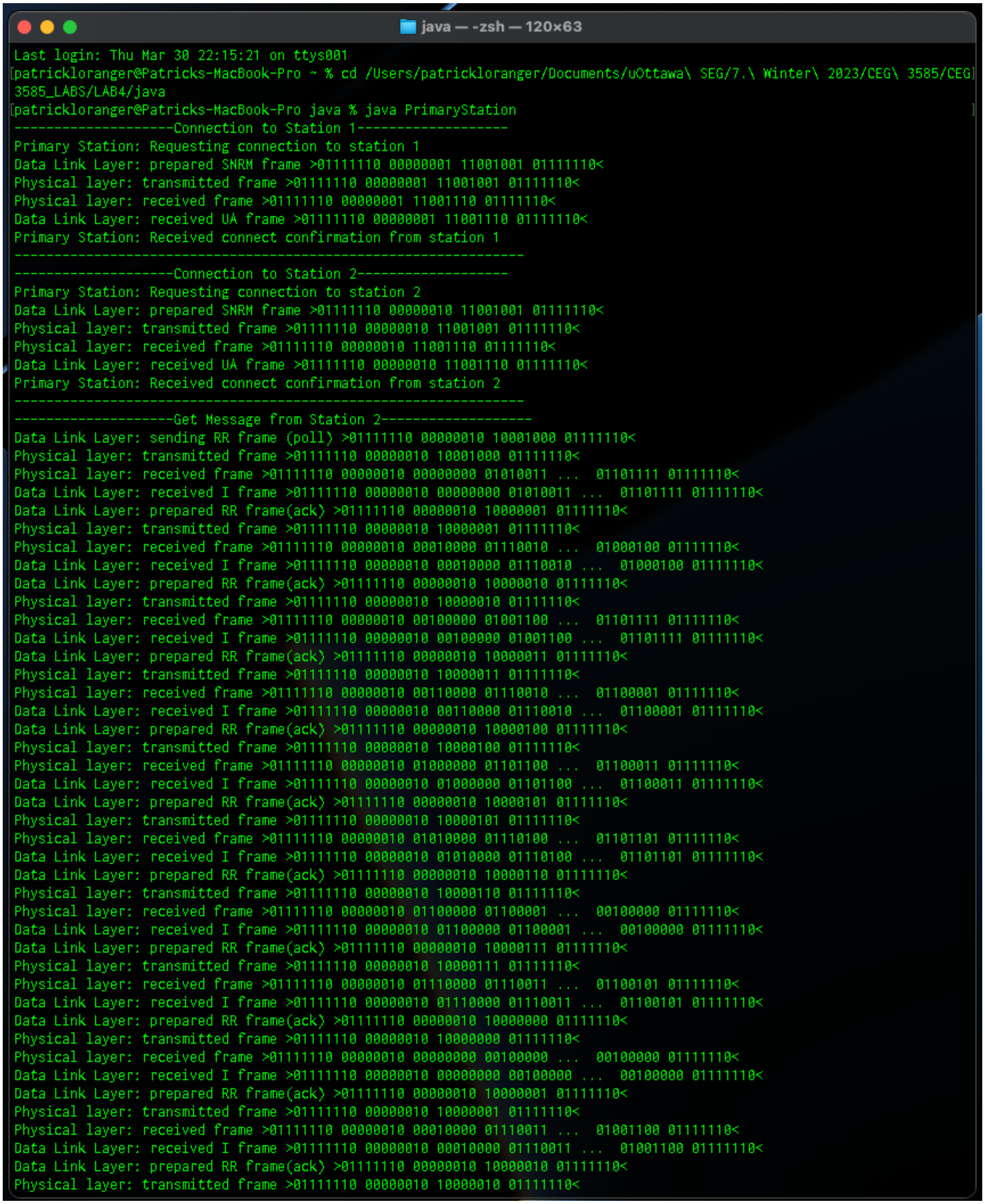


```
java — java PhysicalLayerServer — 175×62
Last login: Thu Mar 30 20:12:54 on ttys006
patrickloranger@Patricks-MacBook-Pro ~ % cd /Users/patrickloranger/Documents/uOttawa\ SEG/7.\ Winter\ 2023/CEG\ 3585/CEG3585_LABS/LAB4/java
patrickloranger@Patricks-MacBook-Pro java % javac PrimaryStation.java
patrickloranger@Patricks-MacBook-Pro java % javac SecondaryStation.java
patrickloranger@Patricks-MacBook-Pro java % javac PhysicalLayerServer.java
patrickloranger@Patricks-MacBook-Pro java % java PhysicalLayerServer
Physical Layer Server starting on port 4444
Connection from /10.0.0.136 accepted.
Accepted client
Physical Layer Server: connection from Physical Layer Client  0
Connection from /10.0.0.136 accepted.
Accepted client
Physical Layer Server: connection from Physical Layer Client  1
Connection from /127.0.0.1 accepted.
Accepted client
Physical Layer Server: connection from Physical Layer Client  2
Physical Layer Server: received frame from client  2: >01111110000000011100100101111110<, sending to other clients.
Physical Layer Server: received frame from client  0: >01111110000000011100111001111110<, sending to other clients.
Physical Layer Server: received frame from client  2: >01111110000000101100100101111110<, sending to other clients.
Physical Layer Server: received frame from client  1: >01111110000000101100111001111110<, sending to other clients.
Physical Layer Server: received frame from client  2: >01111110000000101000100001111110<, sending to other clients.
Physical Layer Server: received frame from client  1: >01111110000000010000000000101001101110100011000010111010001101001011011110110111000100000001100100010000000111010001101111
001000000010100000111001001101001011011010110000101110010011110010011101000100000010011010110010101110011011100110110000101100111011001010010000000110011001101111011111110<, send
ing to other clients.
Physical Layer Server: received frame from client  2: >01111110000000010100000101111110<, sending to other clients.
Physical Layer Server: received frame from client  1: >011111100000000100010000001110010001000000111010001100101011100110111010001101001011011100110011100100000001100100011000001
0111010001100001001000000011101000111001001100001011011100111001101100110011001010111001000101110001000000000101001010100011010000011001010010000000100100001000100011111110<, send
ing to other clients.
Physical Layer Server: received frame from client  2: >01111110000000010100001001111110<, sending to other clients.
Physical Layer Server: received frame from client  1: >011111100000000100100000001001100010000110010000000111000000111001001101111011101000110111101100011011011110110110000100000
01101001011100110010000000110010001100101011100110110100101100111011011100110010101100100001000000011101000110111100100000001110011011101010111000000111000000110111101111110<, send
ing to other clients.
Physical Layer Server: received frame from client  2: >01111110000000010100001101111110<, sending to other clients.
Physical Layer Server: received frame from client  1: >01111110000000010001100000011100100111010000100000011000110110111101101101011011010111010101101110011010010110001101100001
011101000110100101101111011011100010000000110111101110110011001010111001000100000000001010011000010010000000111000000110100000111100101110011011010010110001101100001011111110<, send
ing to other clients.
Physical Layer Server: received frame from client  2: >01111110000000010100010001111110<, sending to other clients.
Physical Layer Server: received frame from client  1: >01111110000000010010000000110110000100000011011000110100101101110011010110010000000110001001100101011101000111011101100101
011001010110111000100000001110000001101000001111001011100110110100101100011011000010110110001101100011110010010000000110001101101111011011100110111001100101011000110111111 0<, send
ing to other clients.
Physical Layer Server: received frame from client  2: >01111110000000010100010101111110<, sending to other clients.
Physical Layer Server: received frame from client  1: >01111110000000010010100000111010001100101011001000010000000111001101110100011000010111010001101001011011110110111001110011
00101110000001010010010010110111000100000001110100011010000110100101110011001000000011011000110000101100010001000000011000010010000000111000000111001001101001011011010101111110<, send
ing to other clients.
Physical Layer Server: received frame from client  2: >01111110000000010100011001111110<, sending to other clients.
Physical Layer Server: received frame from client  1: >0111111000000001001100000011000010111001001111001001000000111001101110100011000010111010001101001011011110110111000100000
0110100101110011001000000011000110110111101101110011011100110010101100011011101000110010101100100001000000011101000110111100100000001110100011101110110111100100000001111110<, send
ing to other clients.
Physical Layer Server: received frame from client  2: >01111110000000010100011101111110<, sending to other clients.
Physical Layer Server: received frame from client  1: >01111110000000010011100000011100110110010101100011011011110110111001100100011000010111001001111001001000000111001101110100
011000010111010001101001011011110110111001110011001011100000010100101010001101000011010010111001100100000001101101011001010111001101110011011000010110011101100101011111110<, send
ing to other clients.
Physical Layer Server: received frame from client  2: >01111110000000010100000001111110<, sending to other clients.
Physical Layer Server: received frame from client  1: >01111110000000010000000000100000011101110110100101101100011011000010000000110001001100101001000000011100110110010101101110
011101000010000000110001001111001001000000110010101100001011000110110100001000000010100110110010101100011011011110110111001100100001000001011100100111100100100000001111110<, send
ing to other clients.
Physical Layer Server: received frame from client  2: >01111110000000010100000101111110<, sending to other clients.
Physical Layer Server: received frame from client  1: >011111100000000100010000001110011011101000110000101110100011010010110111101101110001000000011101000110111100100000001110100
0110100000110010100100000001010000011100100110100101101101011000010111001001111001001011100000010100100110101100001011011100111100100100000001001000010001000100110001111110<, send
ing to other clients.
Physical Layer Server: received frame from client  2: >01111110000000010100001001111110<, sending to other clients.
Physical Layer Server: received frame from client  1: >01111110000000010001000000010000110010000000100100100100000001100110011100100110000101101011011001010111001100100000001110011
```



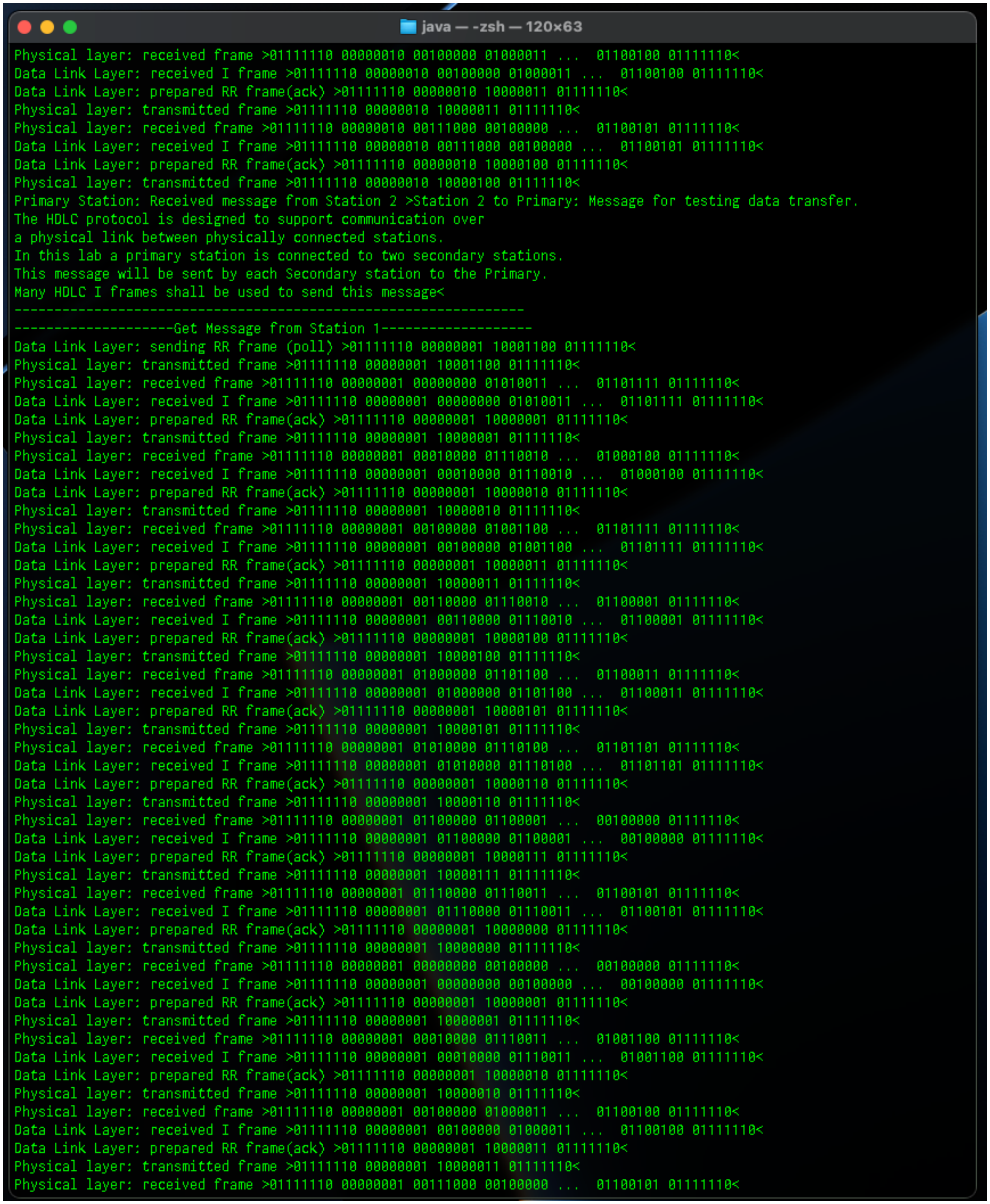
```
ing to other clients.
Physical Layer Server: received frame from client  2: >01111110000000010100001101111110<, sending to other clients.
Physical Layer Server: received frame from client  1: >011111100000000100011100000010000001110100011010000110100101110011001000000011011010110010101110011011100110110000101100111
0110010101111110<, sending to other clients.
Physical Layer Server: received frame from client  2: >01111110000000010100010001111110<, sending to other clients.
Physical Layer Server: received frame from client  2: >01111110000000001100011001111110<, sending to other clients.
Physical Layer Server: received frame from client  0: >01111110000000001000000000101001101110100011000010111010001101001011011110110111000100000001100100010000000111010001101111
001000000010100000111001001101001011011010110000101110010011110010011101000100000010011010110010101110011011100110110000101100111011001010010000000110011001101111011111110<, send
ing to other clients.
Physical Layer Server: received frame from client  2: >01111110000000001100000101111110<, sending to other clients.
Physical Layer Server: received frame from client  0: >011111100000000010001000000111001000100000011101000110010101110011011101000110100101101110011001110010000000110010001100001
0111010001100001001000000011101000111001001100001011011100111001101100110011001010111001000101110001000000000101001010100011010000011001010010000000100100001000100011111110<, send
ing to other clients.
Physical Layer Server: received frame from client  2: >01111110000000001100001001111110<, sending to other clients.
Physical Layer Server: received frame from client  0: >011111100000000010010000000100110001000011001000000011100000011100100110111101110100011011110110001101101111011011000010000
01101001011100110010000000110010001100101011100110110100101100111011011100110010101100100001000000011101000110111100100000001110011011101010111000000111000000110111101111110<, send
ing to other clients.
Physical Layer Server: received frame from client  2: >01111110000000001100001101111110<, sending to other clients.
Physical Layer Server: received frame from client  0: >01111110000000001001100000011100100111010000100000011000110110111101101101011011010111010101101110011010010110001101100001
011101000110100101101111011011100010000000110111101110110011001010111001000100000000001010011000010010000000111000000110100000111100101110011011010010110001101100001011111110<, send
ing to other clients.
Physical Layer Server: received frame from client  2: >01111110000000001100010001111110<, sending to other clients.
Physical Layer Server: received frame from client  0: >01111110000000001010000000110110000100000011011000110100101101110011010110010000000110001001100101011101000111011101100101
011001010110111000100000001110000001101000001111001011100110110100101100011011000010110110001101100011110010010000000110001101101111011011100110111001100101011000110111111 0<, send
ing to other clients.
Physical Layer Server: received frame from client  2: >01111110000000001100010101111110<, sending to other clients.
Physical Layer Server: received frame from client  0: >01111110000000001010100000111010001100101011001000010000000111001101110100011000010111010001101001011011110110111001110011
00101110000001010010010010110111000100000001110100011010000110100101110011001000000011011000110000101100010001000000011000010010000000111000000111001001101001011011010101111110<, send
ing to other clients.
Physical Layer Server: received frame from client  2: >01111110000000001100011001111110<, sending to other clients.
Physical Layer Server: received frame from client  0: >0111111000000000101100000011000010111001001111001001000000111001101110100011000010111010001101001011011110110111000100000
0110100101110011001000000011000110110111101101110011011100110010101100011011101000110010101100100001000000011101000110111100100000001110100011101110110111100100000001111110<, send
ing to other clients.
Physical Layer Server: received frame from client  2: >01111110000000001100011101111110<, sending to other clients.
Physical Layer Server: received frame from client  0: >01111110000000001011100000011100110110010101100011011011110110111001100100011000010111001001111001001000000111001101110100
011000010111010001101001011011110110111001110011001011100000010100101010001101000011010010111001100100000001101101011001010111001101110011011000010110011101100101011111110<, send
ing to other clients.
Physical Layer Server: received frame from client  2: >01111110000000001100000001111110<, sending to other clients.
Physical Layer Server: received frame from client  0: >01111110000000001000000000100000011101110110100101101100011011000010000000110001001100101001000000011100110110010101101110
011101000010000000110001001111001001000000110010101100001011000110110100001000000010100110110010101100011011011110110111001100100001000001011100100111100100100000001111110<, send
ing to other clients.
Physical Layer Server: received frame from client  2: >01111110000000001100000101111110<, sending to other clients.
Physical Layer Server: received frame from client  0: >011111100000000010001000000111001101110100011000010111010001101001011011110110111000100000001110100011011110010000000111010
0110100000110010100100000001010000011100100110100101101101011000010111001001111001001011100000010100100110101100001011011100111100100100000001001000010001000100110001111110<, send
ing to other clients.
Physical Layer Server: received frame from client  2: >01111110000000001100001001111110<, sending to other clients.
Physical Layer Server: received frame from client  0: >01111110000000001001000000100001100100000001001001001000000011001100111001001100001011010110110010101110011001000000001110011
0110100001100001011011000110110000100000001100010011001010010000000111010101110011011101100101011001000010000000111010001101111001000000011100110111011001000111111 0<, send
ing to other clients.
Physical Layer Server: received frame from client  2: >01111110000000001100001101111110<, sending to other clients.
Physical Layer Server: received frame from client  0: >011111100000000010011100000010000001110100011010000110100101110011001000000011011010110010101110011011100110110000101100111
0110010101111110<, sending to other clients.
Physical Layer Server: received frame from client  2: >01111110000000001100010001111110<, sending to other clients.
Physical Layer Server: received frame from client  2: >01111110000000001110001001111110<, sending to other clients.
Physical Layer Server: received frame from client  2: >01111110000000101100001001111110<, sending to other clients.
```

Tous la section du PhysicalLayerServer.



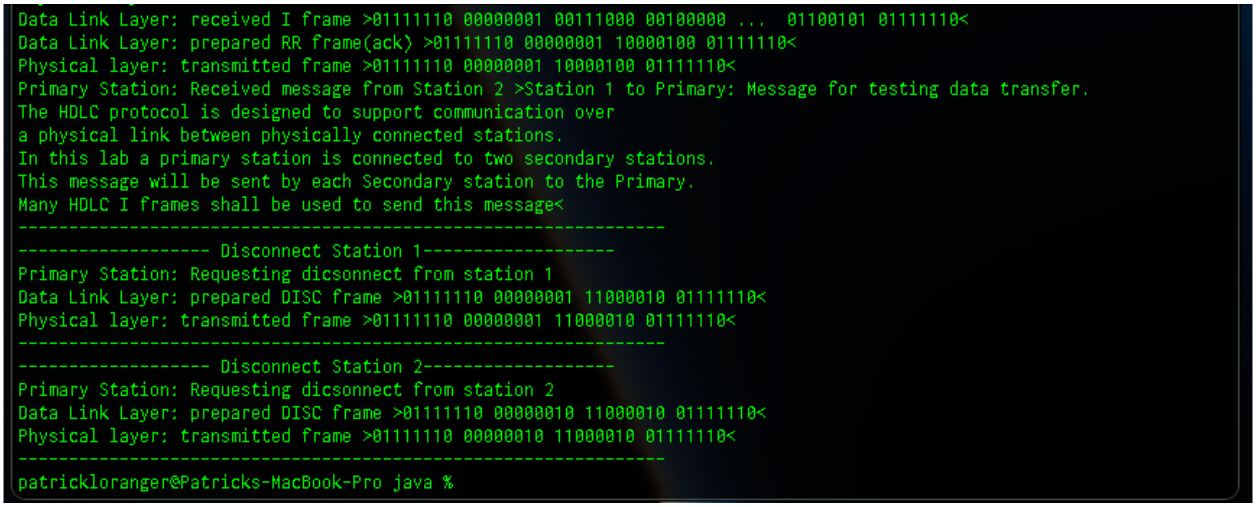
```
Last login: Thu Mar 30 22:15:21 on ttys001
[patrickloranger@Patricks-MacBook-Pro ~ % cd /Users/patrickloranger/Documents/uOttawa\ SEG/7.\ Winter\ 2023/CEG\ 3585/CEG]
 3585_LABS/LAB4/java
[patrickloranger@Patricks-MacBook-Pro java % java PrimaryStation                                                        ]
--------------------Connection to Station 1-------------------
Primary Station: Requesting connection to station 1
Data Link Layer: prepared SNRM frame >01111110 00000001 11001001 01111110<
Physical layer: transmitted frame >01111110 00000001 11001001 01111110<
Physical layer: received frame >01111110 00000001 11001110 01111110<
Data Link Layer: received UA frame >01111110 00000001 11001110 01111110<
Primary Station: Received connect confirmation from station 1
----------------------------------------------------------------
--------------------Connection to Station 2-------------------
Primary Station: Requesting connection to station 2
Data Link Layer: prepared SNRM frame >01111110 00000010 11001001 01111110<
Physical layer: transmitted frame >01111110 00000010 11001001 01111110<
Physical layer: received frame >01111110 00000010 11001110 01111110<
Data Link Layer: received UA frame >01111110 00000010 11001110 01111110<
Primary Station: Received connect confirmation from station 2
----------------------------------------------------------------
--------------------Get Message from Station 2-------------------
Data Link Layer: sending RR frame (poll) >01111110 00000010 10001000 01111110<
Physical layer: transmitted frame >01111110 00000010 10001000 01111110<
Physical layer: received frame >01111110 00000010 00000000 01010011 ...  01101111 01111110<
Data Link Layer: received I frame >01111110 00000010 00000000 01010011 ...  01101111 01111110<
Data Link Layer: prepared RR frame(ack) >01111110 00000010 10000001 01111110<
Physical layer: transmitted frame >01111110 00000010 10000001 01111110<
Physical layer: received frame >01111110 00000010 00010000 01110010 ...  01000100 01111110<
Data Link Layer: received I frame >01111110 00000010 00010000 01110010 ...  01000100 01111110<
Data Link Layer: prepared RR frame(ack) >01111110 00000010 10000010 01111110<
Physical layer: transmitted frame >01111110 00000010 10000010 01111110<
Physical layer: received frame >01111110 00000010 00100000 01001100 ...  01101111 01111110<
Data Link Layer: received I frame >01111110 00000010 00100000 01001100 ...  01101111 01111110<
Data Link Layer: prepared RR frame(ack) >01111110 00000010 10000011 01111110<
Physical layer: transmitted frame >01111110 00000010 10000011 01111110<
Physical layer: received frame >01111110 00000010 00110000 01110010 ...  01100001 01111110<
Data Link Layer: received I frame >01111110 00000010 00110000 01110010 ...  01100001 01111110<
Data Link Layer: prepared RR frame(ack) >01111110 00000010 10000100 01111110<
Physical layer: transmitted frame >01111110 00000010 10000100 01111110<
Physical layer: received frame >01111110 00000010 01000000 01101100 ...  01100011 01111110<
Data Link Layer: received I frame >01111110 00000010 01000000 01101100 ...  01100011 01111110<
Data Link Layer: prepared RR frame(ack) >01111110 00000010 10000101 01111110<
Physical layer: transmitted frame >01111110 00000010 10000101 01111110<
Physical layer: received frame >01111110 00000010 01010000 01110100 ...  01101101 01111110<
Data Link Layer: received I frame >01111110 00000010 01010000 01110100 ...  01101101 01111110<
Data Link Layer: prepared RR frame(ack) >01111110 00000010 10000110 01111110<
Physical layer: transmitted frame >01111110 00000010 10000110 01111110<
Physical layer: received frame >01111110 00000010 01100000 01100001 ...  00100000 01111110<
Data Link Layer: received I frame >01111110 00000010 01100000 01100001 ...  00100000 01111110<
Data Link Layer: prepared RR frame(ack) >01111110 00000010 10000111 01111110<
Physical layer: transmitted frame >01111110 00000010 10000111 01111110<
Physical layer: received frame >01111110 00000010 01110000 01110011 ...  01100101 01111110<
Data Link Layer: received I frame >01111110 00000010 01110000 01110011 ...  01100101 01111110<
Data Link Layer: prepared RR frame(ack) >01111110 00000010 10000000 01111110<
Physical layer: transmitted frame >01111110 00000010 10000000 01111110<
Physical layer: received frame >01111110 00000010 00000000 00100000 ...  00100000 01111110<
Data Link Layer: received I frame >01111110 00000010 00000000 00100000 ...  00100000 01111110<
Data Link Layer: prepared RR frame(ack) >01111110 00000010 10000001 01111110<
Physical layer: transmitted frame >01111110 00000010 10000001 01111110<
Physical layer: received frame >01111110 00000010 00010000 01110011 ...  01001100 01111110<
Data Link Layer: received I frame >01111110 00000010 00010000 01110011 ...  01001100 01111110<
Data Link Layer: prepared RR frame(ack) >01111110 00000010 10000010 01111110<
Physical layer: transmitted frame >01111110 00000010 10000010 01111110<
```

Tous la section du PrimaryStation (partie 1).



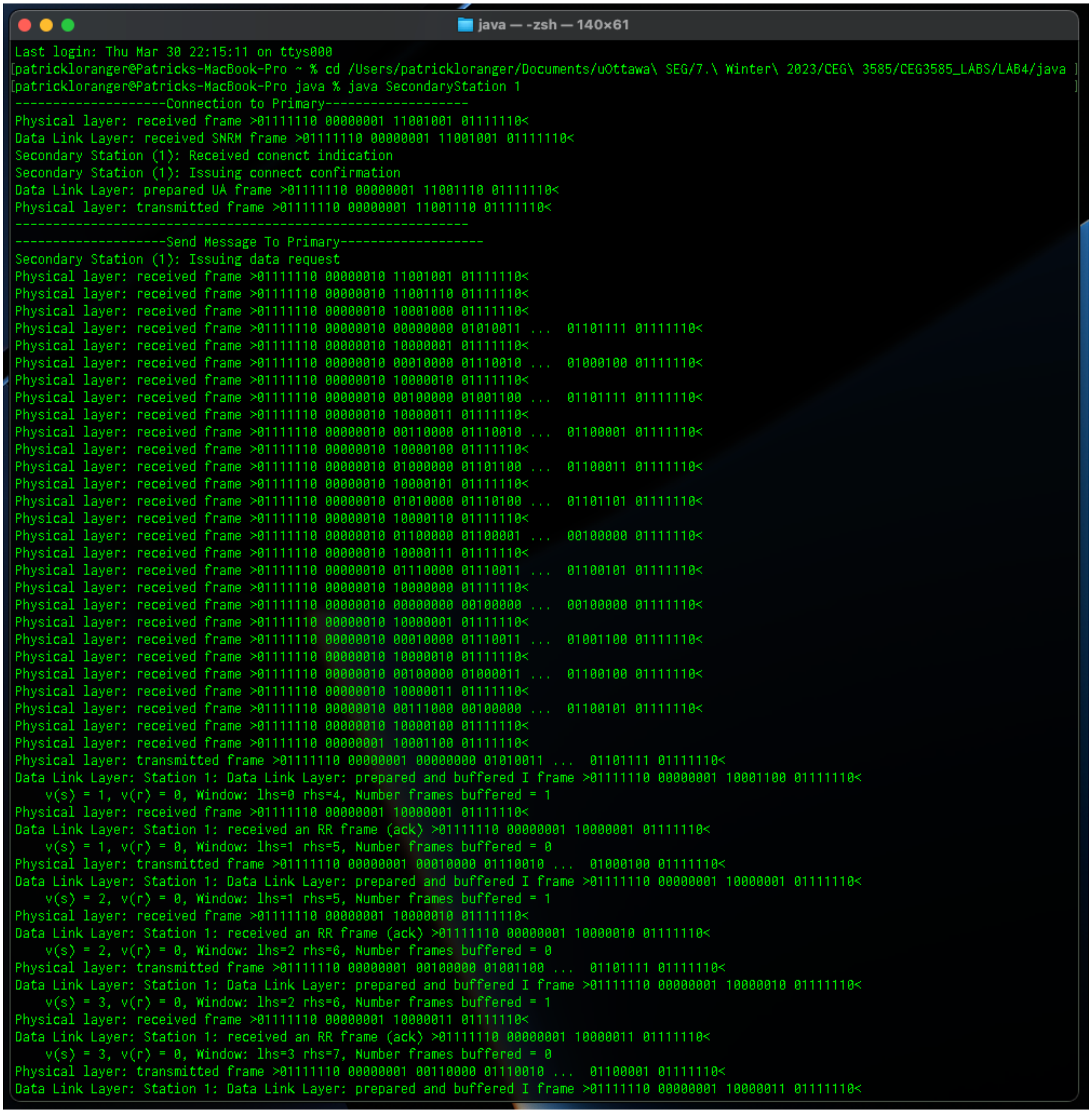
```
Physical layer: received frame >01111110 00000010 00100000 01000011 ...  01100100 01111110<
Data Link Layer: received I frame >01111110 00000010 00100000 01000011 ...  01100100 01111110<
Data Link Layer: prepared RR frame(ack) >01111110 00000010 10000011 01111110<
Physical layer: transmitted frame >01111110 00000010 10000011 01111110<
Physical layer: received frame >01111110 00000010 00111000 00100000 ...  01100101 01111110<
Data Link Layer: received I frame >01111110 00000010 00111000 00100000 ...  01100101 01111110<
Data Link Layer: prepared RR frame(ack) >01111110 00000010 10000100 01111110<
Physical layer: transmitted frame >01111110 00000010 10000100 01111110<
Primary Station: Received message from Station 2 >Station 2 to Primary: Message for testing data transfer.
The HDLC protocol is designed to support communication over
a physical link between physically connected stations.
In this lab a primary station is connected to two secondary stations.
This message will be sent by each Secondary station to the Primary.
Many HDLC I frames shall be used to send this message<
----------------------------------------------------------------
--------------------Get Message from Station 1-------------------
Data Link Layer: sending RR frame (poll) >01111110 00000001 10001100 01111110<
Physical layer: transmitted frame >01111110 00000001 10001100 01111110<
Physical layer: received frame >01111110 00000001 00000000 01010011 ...  01101111 01111110<
Data Link Layer: received I frame >01111110 00000001 00000000 01010011 ...  01101111 01111110<
Data Link Layer: prepared RR frame(ack) >01111110 00000001 10000001 01111110<
Physical layer: transmitted frame >01111110 00000001 10000001 01111110<
Physical layer: received frame >01111110 00000001 00010000 01110010 ...  01000100 01111110<
Data Link Layer: received I frame >01111110 00000001 00010000 01110010 ...  01000100 01111110<
Data Link Layer: prepared RR frame(ack) >01111110 00000001 10000010 01111110<
Physical layer: transmitted frame >01111110 00000001 10000010 01111110<
Physical layer: received frame >01111110 00000001 00100000 01001100 ...  01101111 01111110<
Data Link Layer: received I frame >01111110 00000001 00100000 01001100 ...  01101111 01111110<
Data Link Layer: prepared RR frame(ack) >01111110 00000001 10000011 01111110<
Physical layer: transmitted frame >01111110 00000001 10000011 01111110<
Physical layer: received frame >01111110 00000001 00110000 01110010 ...  01100001 01111110<
Data Link Layer: received I frame >01111110 00000001 00110000 01110010 ...  01100001 01111110<
Data Link Layer: prepared RR frame(ack) >01111110 00000001 10000100 01111110<
Physical layer: transmitted frame >01111110 00000001 10000100 01111110<
Physical layer: received frame >01111110 00000001 01000000 01101100 ...  01100011 01111110<
Data Link Layer: received I frame >01111110 00000001 01000000 01101100 ...  01100011 01111110<
Data Link Layer: prepared RR frame(ack) >01111110 00000001 10000101 01111110<
Physical layer: transmitted frame >01111110 00000001 10000101 01111110<
Physical layer: received frame >01111110 00000001 01010000 01110100 ...  01101101 01111110<
Data Link Layer: received I frame >01111110 00000001 01010000 01110100 ...  01101101 01111110<
Data Link Layer: prepared RR frame(ack) >01111110 00000001 10000110 01111110<
Physical layer: transmitted frame >01111110 00000001 10000110 01111110<
Physical layer: received frame >01111110 00000001 01100000 01100001 ...  00100000 01111110<
Data Link Layer: received I frame >01111110 00000001 01100000 01100001 ...  00100000 01111110<
Data Link Layer: prepared RR frame(ack) >01111110 00000001 10000111 01111110<
Physical layer: transmitted frame >01111110 00000001 10000111 01111110<
Physical layer: received frame >01111110 00000001 01110000 01110011 ...  01100101 01111110<
Data Link Layer: received I frame >01111110 00000001 01110000 01110011 ...  01100101 01111110<
Data Link Layer: prepared RR frame(ack) >01111110 00000001 10000000 01111110<
Physical layer: transmitted frame >01111110 00000001 10000000 01111110<
Physical layer: received frame >01111110 00000001 00000000 00100000 ...  00100000 01111110<
Data Link Layer: received I frame >01111110 00000001 00000000 00100000 ...  00100000 01111110<
Data Link Layer: prepared RR frame(ack) >01111110 00000001 10000001 01111110<
Physical layer: transmitted frame >01111110 00000001 10000001 01111110<
Physical layer: received frame >01111110 00000001 00010000 01110011 ...  01001100 01111110<
Data Link Layer: received I frame >01111110 00000001 00010000 01110011 ...  01001100 01111110<
Data Link Layer: prepared RR frame(ack) >01111110 00000001 10000010 01111110<
Physical layer: transmitted frame >01111110 00000001 10000010 01111110<
Physical layer: received frame >01111110 00000001 00100000 01000011 ...  01100100 01111110<
Data Link Layer: received I frame >01111110 00000001 00100000 01000011 ...  01100100 01111110<
Data Link Layer: prepared RR frame(ack) >01111110 00000001 10000011 01111110<
Physical layer: transmitted frame >01111110 00000001 10000011 01111110<
Physical layer: received frame >01111110 00000001 00111000 00100000 ...  01100101 01111110<
```

Tous la section du PrimaryStation (partie 2).



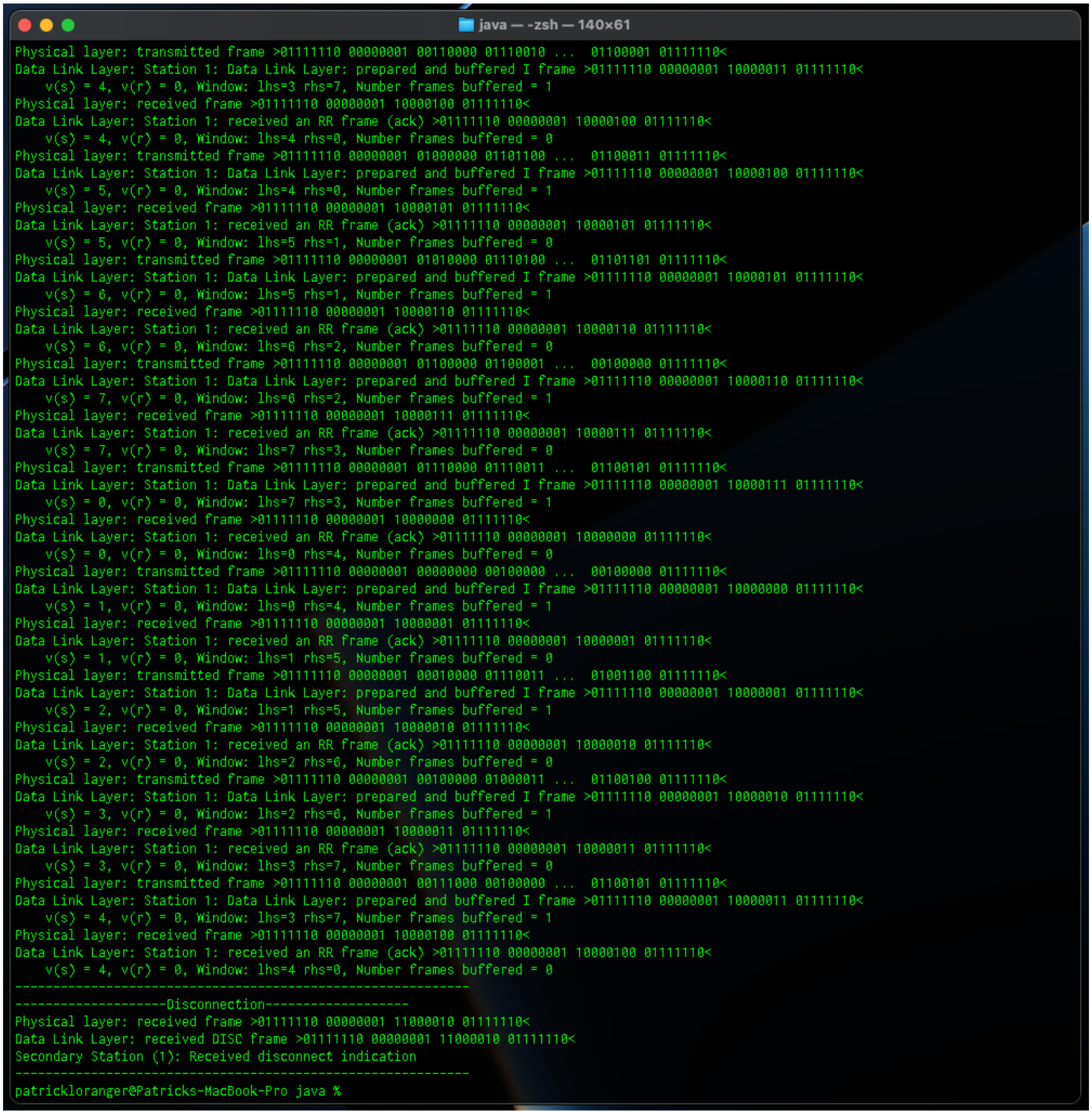
```
Data Link Layer: received I frame >01111110 00000001 00111000 00100000 ...  01100101 01111110<
Data Link Layer: prepared RR frame(ack) >01111110 00000001 10000100 01111110<
Physical layer: transmitted frame >01111110 00000001 10000100 01111110<
Primary Station: Received message from Station 2 >Station 1 to Primary: Message for testing data transfer.
The HDLC protocol is designed to support communication over
a physical link between physically connected stations.
In this lab a primary station is connected to two secondary stations.
This message will be sent by each Secondary station to the Primary.
Many HDLC I frames shall be used to send this message<
-----------------------------------------------------------------
------------------- Disconnect Station 1-------------------
Primary Station: Requesting dicsonnect from station 1
Data Link Layer: prepared DISC frame >01111110 00000001 11000010 01111110<
Physical layer: transmitted frame >01111110 00000001 11000010 01111110<
-----------------------------------------------------------------
------------------- Disconnect Station 2-------------------
Primary Station: Requesting dicsonnect from station 2
Data Link Layer: prepared DISC frame >01111110 00000010 11000010 01111110<
Physical layer: transmitted frame >01111110 00000010 11000010 01111110<
-----------------------------------------------------------------
patrickloranger@Patricks-MacBook-Pro java %
```

Tous la section du PrimaryStation (partie 3).



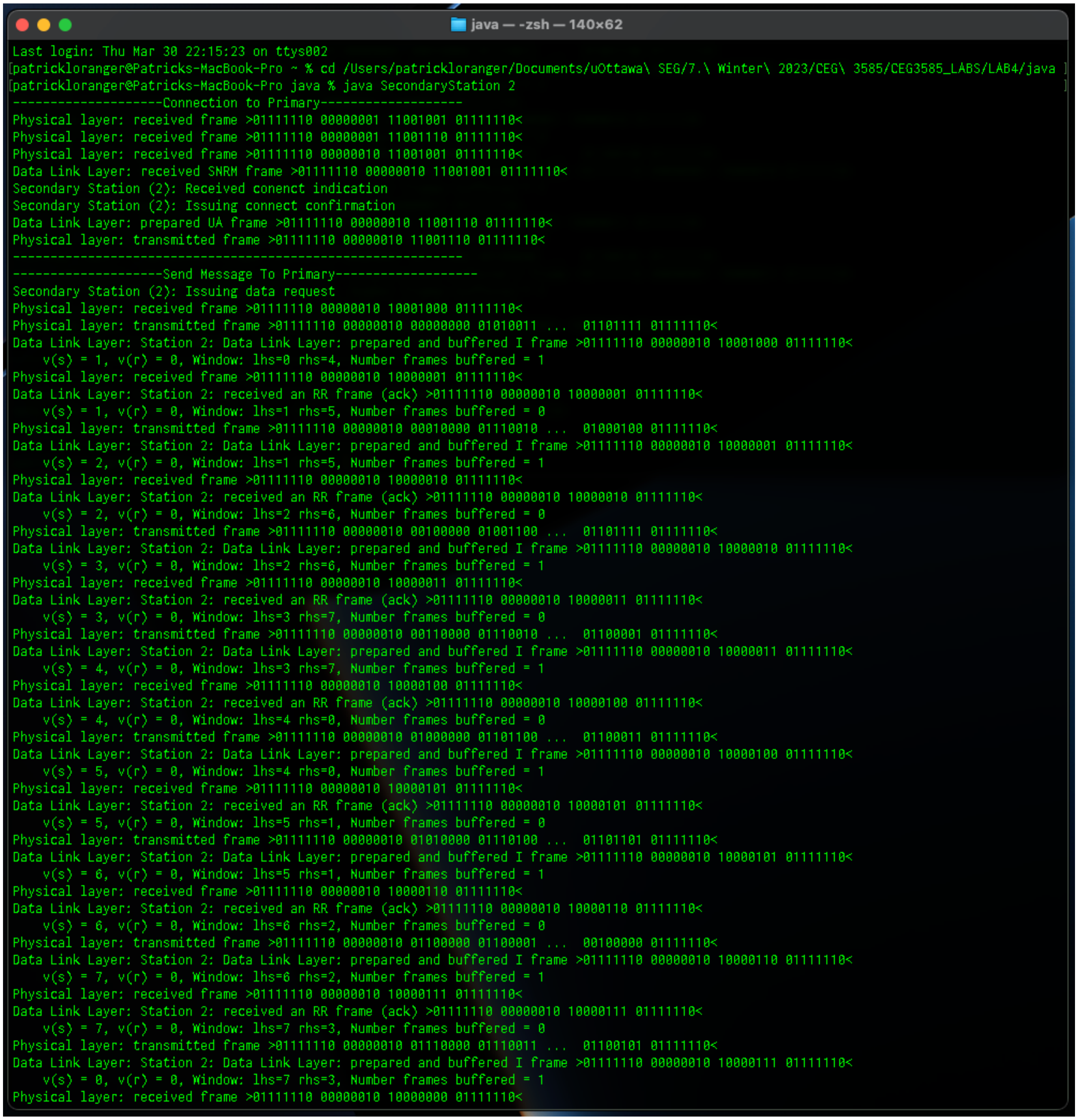
```
Last login: Thu Mar 30 22:15:11 on ttys000
[patrickloranger@Patricks-MacBook-Pro ~ % cd /Users/patrickloranger/Documents/uOttawa\ SEG/7.\ Winter\ 2023/CEG\ 3585/CEG3585_LABS/LAB4/java ]
[patrickloranger@Patricks-MacBook-Pro java % java SecondaryStation 1                                                                        ]
--------------------Connection to Primary-------------------
Physical layer: received frame >01111110 00000001 11001001 01111110<
Data Link Layer: received SNRM frame >01111110 00000001 11001001 01111110<
Secondary Station (1): Received conenct indication
Secondary Station (1): Issuing connect confirmation
Data Link Layer: prepared UA frame >01111110 00000001 11001110 01111110<
Physical layer: transmitted frame >01111110 00000001 11001110 01111110<
------------------------------------------------------------
--------------------Send Message To Primary-------------------
Secondary Station (1): Issuing data request
Physical layer: received frame >01111110 00000010 11001001 01111110<
Physical layer: received frame >01111110 00000010 11001110 01111110<
Physical layer: received frame >01111110 00000010 10001000 01111110<
Physical layer: received frame >01111110 00000010 00000000 01010011 ...  01101111 01111110<
Physical layer: received frame >01111110 00000010 10000001 01111110<
Physical layer: received frame >01111110 00000010 00010000 01110010 ...  01000100 01111110<
Physical layer: received frame >01111110 00000010 10000010 01111110<
Physical layer: received frame >01111110 00000010 00100000 01001100 ...  01101111 01111110<
Physical layer: received frame >01111110 00000010 10000011 01111110<
Physical layer: received frame >01111110 00000010 00110000 01110010 ...  01100001 01111110<
Physical layer: received frame >01111110 00000010 10000100 01111110<
Physical layer: received frame >01111110 00000010 01000000 01101100 ...  01100011 01111110<
Physical layer: received frame >01111110 00000010 10000101 01111110<
Physical layer: received frame >01111110 00000010 01010000 01110100 ...  01101101 01111110<
Physical layer: received frame >01111110 00000010 10000110 01111110<
Physical layer: received frame >01111110 00000010 01100000 01100001 ...  00100000 01111110<
Physical layer: received frame >01111110 00000010 10000111 01111110<
Physical layer: received frame >01111110 00000010 01110000 01110011 ...  01100101 01111110<
Physical layer: received frame >01111110 00000010 10000000 01111110<
Physical layer: received frame >01111110 00000010 00000000 00100000 ...  00100000 01111110<
Physical layer: received frame >01111110 00000010 10000001 01111110<
Physical layer: received frame >01111110 00000010 00010000 01110011 ...  01001100 01111110<
Physical layer: received frame >01111110 00000010 10000010 01111110<
Physical layer: received frame >01111110 00000010 00100000 01000011 ...  01100100 01111110<
Physical layer: received frame >01111110 00000010 10000011 01111110<
Physical layer: received frame >01111110 00000010 00111000 00100000 ...  01100101 01111110<
Physical layer: received frame >01111110 00000010 10000100 01111110<
Physical layer: received frame >01111110 00000001 10001100 01111110<
Physical layer: transmitted frame >01111110 00000001 00000000 01010011 ...  01101111 01111110<
Data Link Layer: Station 1: Data Link Layer: prepared and buffered I frame >01111110 00000001 10001100 01111110<
    v(s) = 1, v(r) = 0, Window: lhs=0 rhs=4, Number frames buffered = 1
Physical layer: received frame >01111110 00000001 10000001 01111110<
Data Link Layer: Station 1: received an RR frame (ack) >01111110 00000001 10000001 01111110<
    v(s) = 1, v(r) = 0, Window: lhs=1 rhs=5, Number frames buffered = 0
Physical layer: transmitted frame >01111110 00000001 00010000 01110010 ...  01000100 01111110<
Data Link Layer: Station 1: Data Link Layer: prepared and buffered I frame >01111110 00000001 10000001 01111110<
    v(s) = 2, v(r) = 0, Window: lhs=1 rhs=5, Number frames buffered = 1
Physical layer: received frame >01111110 00000001 10000010 01111110<
Data Link Layer: Station 1: received an RR frame (ack) >01111110 00000001 10000010 01111110<
    v(s) = 2, v(r) = 0, Window: lhs=2 rhs=6, Number frames buffered = 0
Physical layer: transmitted frame >01111110 00000001 00100000 01001100 ...  01101111 01111110<
Data Link Layer: Station 1: Data Link Layer: prepared and buffered I frame >01111110 00000001 10000010 01111110<
    v(s) = 3, v(r) = 0, Window: lhs=2 rhs=6, Number frames buffered = 1
Physical layer: received frame >01111110 00000001 10000011 01111110<
Data Link Layer: Station 1: received an RR frame (ack) >01111110 00000001 10000011 01111110<
    v(s) = 3, v(r) = 0, Window: lhs=3 rhs=7, Number frames buffered = 0
Physical layer: transmitted frame >01111110 00000001 00110000 01110010 ...  01100001 01111110<
Data Link Layer: Station 1: Data Link Layer: prepared and buffered I frame >01111110 00000001 10000011 01111110<
```

Tous la section du SecondaryStation 1 (partie 1).



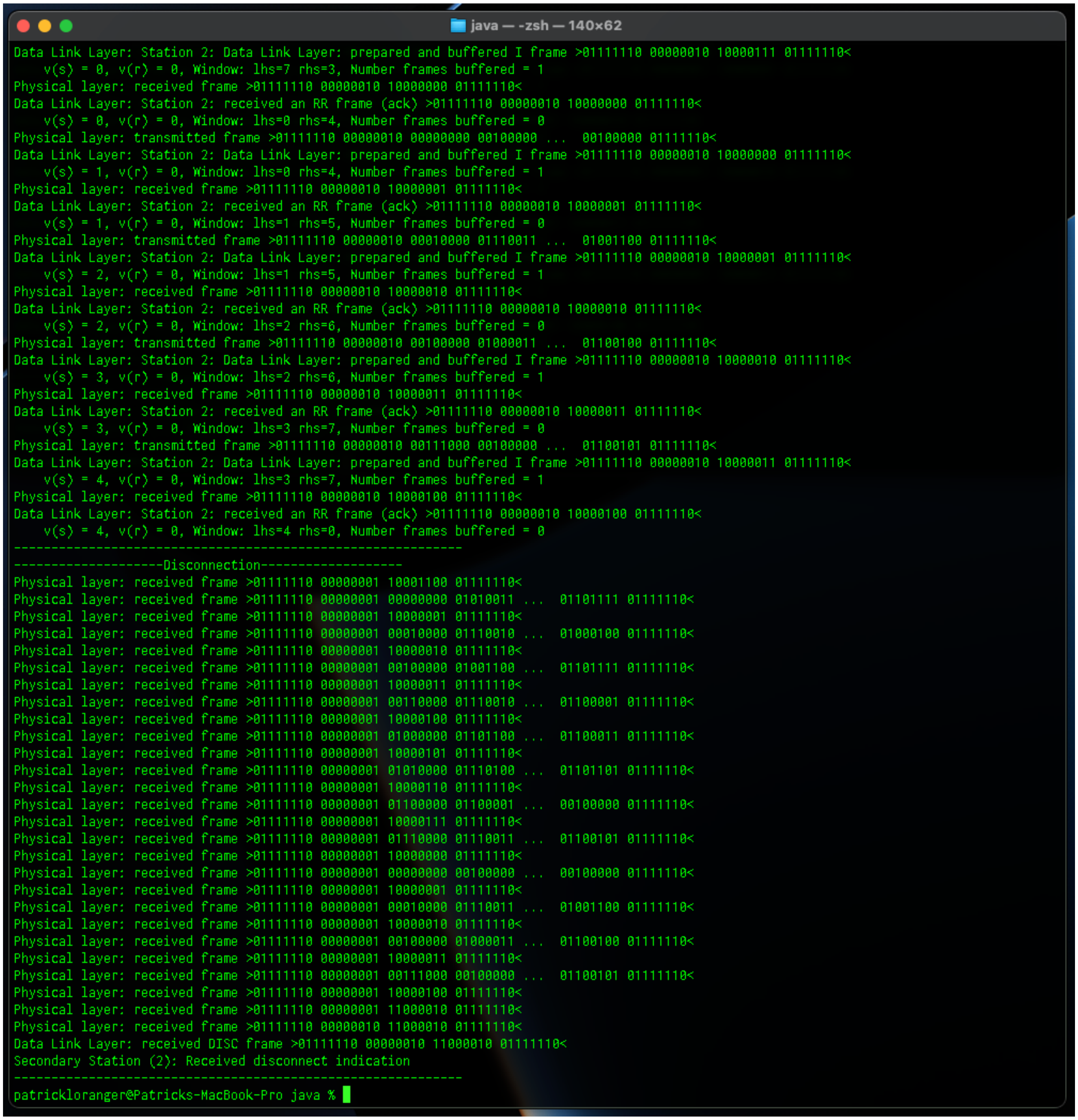
```
Physical layer: transmitted frame >01111110 00000001 00110000 01110010 ...  01100001 01111110<
Data Link Layer: Station 1: Data Link Layer: prepared and buffered I frame >01111110 00000001 10000011 01111110<
    v(s) = 4, v(r) = 0, Window: lhs=3 rhs=7, Number frames buffered = 1
Physical layer: received frame >01111110 00000001 10000100 01111110<
Data Link Layer: Station 1: received an RR frame (ack) >01111110 00000001 10000100 01111110<
    v(s) = 4, v(r) = 0, Window: lhs=4 rhs=0, Number frames buffered = 0
Physical layer: transmitted frame >01111110 00000001 01000000 01101100 ...  01100011 01111110<
Data Link Layer: Station 1: Data Link Layer: prepared and buffered I frame >01111110 00000001 10000100 01111110<
    v(s) = 5, v(r) = 0, Window: lhs=4 rhs=0, Number frames buffered = 1
Physical layer: received frame >01111110 00000001 10000101 01111110<
Data Link Layer: Station 1: received an RR frame (ack) >01111110 00000001 10000101 01111110<
    v(s) = 5, v(r) = 0, Window: lhs=5 rhs=1, Number frames buffered = 0
Physical layer: transmitted frame >01111110 00000001 01010000 01110100 ...  01101101 01111110<
Data Link Layer: Station 1: Data Link Layer: prepared and buffered I frame >01111110 00000001 10000101 01111110<
    v(s) = 6, v(r) = 0, Window: lhs=5 rhs=1, Number frames buffered = 1
Physical layer: received frame >01111110 00000001 10000110 01111110<
Data Link Layer: Station 1: received an RR frame (ack) >01111110 00000001 10000110 01111110<
    v(s) = 6, v(r) = 0, Window: lhs=6 rhs=2, Number frames buffered = 0
Physical layer: transmitted frame >01111110 00000001 01100000 01100001 ...  00100000 01111110<
Data Link Layer: Station 1: Data Link Layer: prepared and buffered I frame >01111110 00000001 10000110 01111110<
    v(s) = 7, v(r) = 0, Window: lhs=6 rhs=2, Number frames buffered = 1
Physical layer: received frame >01111110 00000001 10000111 01111110<
Data Link Layer: Station 1: received an RR frame (ack) >01111110 00000001 10000111 01111110<
    v(s) = 7, v(r) = 0, Window: lhs=7 rhs=3, Number frames buffered = 0
Physical layer: transmitted frame >01111110 00000001 01110000 01110011 ...  01100101 01111110<
Data Link Layer: Station 1: Data Link Layer: prepared and buffered I frame >01111110 00000001 10000111 01111110<
    v(s) = 0, v(r) = 0, Window: lhs=7 rhs=3, Number frames buffered = 1
Physical layer: received frame >01111110 00000001 10000000 01111110<
Data Link Layer: Station 1: received an RR frame (ack) >01111110 00000001 10000000 01111110<
    v(s) = 0, v(r) = 0, Window: lhs=0 rhs=4, Number frames buffered = 0
Physical layer: transmitted frame >01111110 00000001 00000000 00100000 ...  00100000 01111110<
Data Link Layer: Station 1: Data Link Layer: prepared and buffered I frame >01111110 00000001 10000000 01111110<
    v(s) = 1, v(r) = 0, Window: lhs=0 rhs=4, Number frames buffered = 1
Physical layer: received frame >01111110 00000001 10000001 01111110<
Data Link Layer: Station 1: received an RR frame (ack) >01111110 00000001 10000001 01111110<
    v(s) = 1, v(r) = 0, Window: lhs=1 rhs=5, Number frames buffered = 0
Physical layer: transmitted frame >01111110 00000001 00010000 01110011 ...  01001100 01111110<
Data Link Layer: Station 1: Data Link Layer: prepared and buffered I frame >01111110 00000001 10000001 01111110<
    v(s) = 2, v(r) = 0, Window: lhs=1 rhs=5, Number frames buffered = 1
Physical layer: received frame >01111110 00000001 10000010 01111110<
Data Link Layer: Station 1: received an RR frame (ack) >01111110 00000001 10000010 01111110<
    v(s) = 2, v(r) = 0, Window: lhs=2 rhs=6, Number frames buffered = 0
Physical layer: transmitted frame >01111110 00000001 00100000 01000011 ...  01100100 01111110<
Data Link Layer: Station 1: Data Link Layer: prepared and buffered I frame >01111110 00000001 10000010 01111110<
    v(s) = 3, v(r) = 0, Window: lhs=2 rhs=6, Number frames buffered = 1
Physical layer: received frame >01111110 00000001 10000011 01111110<
Data Link Layer: Station 1: received an RR frame (ack) >01111110 00000001 10000011 01111110<
    v(s) = 3, v(r) = 0, Window: lhs=3 rhs=7, Number frames buffered = 0
Physical layer: transmitted frame >01111110 00000001 00111000 00100000 ...  01100101 01111110<
Data Link Layer: Station 1: Data Link Layer: prepared and buffered I frame >01111110 00000001 10000011 01111110<
    v(s) = 4, v(r) = 0, Window: lhs=3 rhs=7, Number frames buffered = 1
Physical layer: received frame >01111110 00000001 10000100 01111110<
Data Link Layer: Station 1: received an RR frame (ack) >01111110 00000001 10000100 01111110<
    v(s) = 4, v(r) = 0, Window: lhs=4 rhs=0, Number frames buffered = 0
------------------------------------------------------------
--------------------Disconnection-------------------
Physical layer: received frame >01111110 00000001 11000010 01111110<
Data Link Layer: received DISC frame >01111110 00000001 11000010 01111110<
Secondary Station (1): Received disconnect indication
------------------------------------------------------------
patrickloranger@Patricks-MacBook-Pro java %
```

Tous la section du SecondaryStation 1 (partie 2).



```
Last login: Thu Mar 30 22:15:23 on ttys002
[patrickloranger@Patricks-MacBook-Pro ~ % cd /Users/patrickloranger/Documents/uOttawa\ SEG/7.\ Winter\ 2023/CEG\ 3585/CEG3585_LABS/LAB4/java ]
[patrickloranger@Patricks-MacBook-Pro java % java SecondaryStation 2                                                                              ]
--------------------Connection to Primary------------------
Physical layer: received frame >01111110 00000001 11001001 01111110<
Physical layer: received frame >01111110 00000001 11001110 01111110<
Physical layer: received frame >01111110 00000010 11001001 01111110<
Data Link Layer: received SNRM frame >01111110 00000010 11001001 01111110<
Secondary Station (2): Received conenct indication
Secondary Station (2): Issuing connect confirmation
Data Link Layer: prepared UA frame >01111110 00000010 11001110 01111110<
Physical layer: transmitted frame >01111110 00000010 11001110 01111110<
------------------------------------------------------------
--------------------Send Message To Primary------------------
Secondary Station (2): Issuing data request
Physical layer: received frame >01111110 00000010 10001000 01111110<
Physical layer: transmitted frame >01111110 00000010 00000000 01010011 ...  01101111 01111110<
Data Link Layer: Station 2: Data Link Layer: prepared and buffered I frame >01111110 00000010 10001000 01111110<
    v(s) = 1, v(r) = 0, Window: lhs=0 rhs=4, Number frames buffered = 1
Physical layer: received frame >01111110 00000010 10000001 01111110<
Data Link Layer: Station 2: received an RR frame (ack) >01111110 00000010 10000001 01111110<
    v(s) = 1, v(r) = 0, Window: lhs=1 rhs=5, Number frames buffered = 0
Physical layer: transmitted frame >01111110 00000010 00010000 01110010 ...  01000100 01111110<
Data Link Layer: Station 2: Data Link Layer: prepared and buffered I frame >01111110 00000010 10000001 01111110<
    v(s) = 2, v(r) = 0, Window: lhs=1 rhs=5, Number frames buffered = 1
Physical layer: received frame >01111110 00000010 10000010 01111110<
Data Link Layer: Station 2: received an RR frame (ack) >01111110 00000010 10000010 01111110<
    v(s) = 2, v(r) = 0, Window: lhs=2 rhs=6, Number frames buffered = 0
Physical layer: transmitted frame >01111110 00000010 00100000 01001100 ...  01101111 01111110<
Data Link Layer: Station 2: Data Link Layer: prepared and buffered I frame >01111110 00000010 10000010 01111110<
    v(s) = 3, v(r) = 0, Window: lhs=2 rhs=6, Number frames buffered = 1
Physical layer: received frame >01111110 00000010 10000011 01111110<
Data Link Layer: Station 2: received an RR frame (ack) >01111110 00000010 10000011 01111110<
    v(s) = 3, v(r) = 0, Window: lhs=3 rhs=7, Number frames buffered = 0
Physical layer: transmitted frame >01111110 00000010 00110000 01110010 ...  01100001 01111110<
Data Link Layer: Station 2: Data Link Layer: prepared and buffered I frame >01111110 00000010 10000011 01111110<
    v(s) = 4, v(r) = 0, Window: lhs=3 rhs=7, Number frames buffered = 1
Physical layer: received frame >01111110 00000010 10000100 01111110<
Data Link Layer: Station 2: received an RR frame (ack) >01111110 00000010 10000100 01111110<
    v(s) = 4, v(r) = 0, Window: lhs=4 rhs=0, Number frames buffered = 0
Physical layer: transmitted frame >01111110 00000010 01000000 01101100 ...  01100011 01111110<
Data Link Layer: Station 2: Data Link Layer: prepared and buffered I frame >01111110 00000010 10000100 01111110<
    v(s) = 5, v(r) = 0, Window: lhs=4 rhs=0, Number frames buffered = 1
Physical layer: received frame >01111110 00000010 10000101 01111110<
Data Link Layer: Station 2: received an RR frame (ack) >01111110 00000010 10000101 01111110<
    v(s) = 5, v(r) = 0, Window: lhs=5 rhs=1, Number frames buffered = 0
Physical layer: transmitted frame >01111110 00000010 01010000 01110100 ...  01101101 01111110<
Data Link Layer: Station 2: Data Link Layer: prepared and buffered I frame >01111110 00000010 10000101 01111110<
    v(s) = 6, v(r) = 0, Window: lhs=5 rhs=1, Number frames buffered = 1
Physical layer: received frame >01111110 00000010 10000110 01111110<
Data Link Layer: Station 2: received an RR frame (ack) >01111110 00000010 10000110 01111110<
    v(s) = 6, v(r) = 0, Window: lhs=6 rhs=2, Number frames buffered = 0
Physical layer: transmitted frame >01111110 00000010 01100000 01100001 ...  00100000 01111110<
Data Link Layer: Station 2: Data Link Layer: prepared and buffered I frame >01111110 00000010 10000110 01111110<
    v(s) = 7, v(r) = 0, Window: lhs=6 rhs=2, Number frames buffered = 1
Physical layer: received frame >01111110 00000010 10000111 01111110<
Data Link Layer: Station 2: received an RR frame (ack) >01111110 00000010 10000111 01111110<
    v(s) = 7, v(r) = 0, Window: lhs=7 rhs=3, Number frames buffered = 0
Physical layer: transmitted frame >01111110 00000010 01110000 01110011 ...  01100101 01111110<
Data Link Layer: Station 2: Data Link Layer: prepared and buffered I frame >01111110 00000010 10000111 01111110<
    v(s) = 0, v(r) = 0, Window: lhs=7 rhs=3, Number frames buffered = 1
Physical layer: received frame >01111110 00000010 10000000 01111110<
```

Tous la section du SecondaryStation 2 (partie 1).



```
Data Link Layer: Station 2: Data Link Layer: prepared and buffered I frame >01111110 00000010 10000111 01111110<
    v(s) = 0, v(r) = 0, Window: lhs=7 rhs=3, Number frames buffered = 1
Physical layer: received frame >01111110 00000010 10000000 01111110<
Data Link Layer: Station 2: received an RR frame (ack) >01111110 00000010 10000000 01111110<
    v(s) = 0, v(r) = 0, Window: lhs=0 rhs=4, Number frames buffered = 0
Physical layer: transmitted frame >01111110 00000010 00000000 00100000 ...  00100000 01111110<
Data Link Layer: Station 2: Data Link Layer: prepared and buffered I frame >01111110 00000010 10000000 01111110<
    v(s) = 1, v(r) = 0, Window: lhs=0 rhs=4, Number frames buffered = 1
Physical layer: received frame >01111110 00000010 10000001 01111110<
Data Link Layer: Station 2: received an RR frame (ack) >01111110 00000010 10000001 01111110<
    v(s) = 1, v(r) = 0, Window: lhs=1 rhs=5, Number frames buffered = 0
Physical layer: transmitted frame >01111110 00000010 00010000 01110011 ...  01001100 01111110<
Data Link Layer: Station 2: Data Link Layer: prepared and buffered I frame >01111110 00000010 10000001 01111110<
    v(s) = 2, v(r) = 0, Window: lhs=1 rhs=5, Number frames buffered = 1
Physical layer: received frame >01111110 00000010 10000010 01111110<
Data Link Layer: Station 2: received an RR frame (ack) >01111110 00000010 10000010 01111110<
    v(s) = 2, v(r) = 0, Window: lhs=2 rhs=6, Number frames buffered = 0
Physical layer: transmitted frame >01111110 00000010 00100000 01000011 ...  01100100 01111110<
Data Link Layer: Station 2: Data Link Layer: prepared and buffered I frame >01111110 00000010 10000010 01111110<
    v(s) = 3, v(r) = 0, Window: lhs=2 rhs=6, Number frames buffered = 1
Physical layer: received frame >01111110 00000010 10000011 01111110<
Data Link Layer: Station 2: received an RR frame (ack) >01111110 00000010 10000011 01111110<
    v(s) = 3, v(r) = 0, Window: lhs=3 rhs=7, Number frames buffered = 0
Physical layer: transmitted frame >01111110 00000010 00111000 00100000 ...  01100101 01111110<
Data Link Layer: Station 2: Data Link Layer: prepared and buffered I frame >01111110 00000010 10000011 01111110<
    v(s) = 4, v(r) = 0, Window: lhs=3 rhs=7, Number frames buffered = 1
Physical layer: received frame >01111110 00000010 10000100 01111110<
Data Link Layer: Station 2: received an RR frame (ack) >01111110 00000010 10000100 01111110<
    v(s) = 4, v(r) = 0, Window: lhs=4 rhs=0, Number frames buffered = 0
------------------------------------------------------------
--------------------Disconnection-------------------
Physical layer: received frame >01111110 00000001 10001100 01111110<
Physical layer: received frame >01111110 00000001 00000000 01010011 ...  01101111 01111110<
Physical layer: received frame >01111110 00000001 10000001 01111110<
Physical layer: received frame >01111110 00000001 00010000 01110010 ...  01000100 01111110<
Physical layer: received frame >01111110 00000001 10000010 01111110<
Physical layer: received frame >01111110 00000001 00100000 01001100 ...  01101111 01111110<
Physical layer: received frame >01111110 00000001 10000011 01111110<
Physical layer: received frame >01111110 00000001 00110000 01110010 ...  01100001 01111110<
Physical layer: received frame >01111110 00000001 10000100 01111110<
Physical layer: received frame >01111110 00000001 01000000 01101100 ...  01100011 01111110<
Physical layer: received frame >01111110 00000001 10000101 01111110<
Physical layer: received frame >01111110 00000001 01010000 01110100 ...  01101101 01111110<
Physical layer: received frame >01111110 00000001 10000110 01111110<
Physical layer: received frame >01111110 00000001 01100000 01100001 ...  00100000 01111110<
Physical layer: received frame >01111110 00000001 10000111 01111110<
Physical layer: received frame >01111110 00000001 01110000 01110011 ...  01100101 01111110<
Physical layer: received frame >01111110 00000001 10000000 01111110<
Physical layer: received frame >01111110 00000001 00000000 00100000 ...  00100000 01111110<
Physical layer: received frame >01111110 00000001 10000001 01111110<
Physical layer: received frame >01111110 00000001 00010000 01110011 ...  01001100 01111110<
Physical layer: received frame >01111110 00000001 10000010 01111110<
Physical layer: received frame >01111110 00000001 00100000 01000011 ...  01100100 01111110<
Physical layer: received frame >01111110 00000001 10000011 01111110<
Physical layer: received frame >01111110 00000001 00111000 00100000 ...  01100101 01111110<
Physical layer: received frame >01111110 00000001 10000100 01111110<
Physical layer: received frame >01111110 00000001 11000010 01111110<
Physical layer: received frame >01111110 00000010 11000010 01111110<
Data Link Layer: received DISC frame >01111110 00000010 11000010 01111110<
Secondary Station (2): Received disconnect indication
------------------------------------------------------------
patrickloranger@Patricks-MacBook-Pro java % 
```

Tous la section du SecondaryStation 1 (partie 2).

Discussion :

En participant à ce laboratoire on a eu l'opportunité d'apprendre à propos de la technologie du HDLC été le réseau multipoint. Le HDLC (High-Level Data Link Control) est utiliser pour faire du data framing. Le réseau multipoint permet d'avoir plusieurs stations sur une ligne de communication. Le focus pour ce laboratoire était d'implémenter des fonctions dans la classe SecondaryHDLCDataLink. Certaines de ces méthodes avait pour but d'aider les méthodes principales du code comme getRRFrame(). On devait aussi faire référence à certaines classes déjà implémenter dans d'autres fichier dans le code de départ. Donc on devait prendre le temps de comprendre comment ces classes sont implémenter et comment on peut les utiliser dans l'implémentation de SecondaryHDLCDataLink. Les détails du fonctionnement de ce système sont discutés dans une section précédente du laboratoire. Le langage de programmation choisi pour implémenter cette classe était Java. On a choisi Java partiellement à cause que c'était la langue fournie dans le code de départ mais aussi à cause que cette langue offre plusieurs librairies qui sont utiles pour l'implémentation. Par exemple, la librairie IOException permet d'attraper les erreurs. Aussi, l'approche de programmation orienté objet était la meilleure approche pour ce laboratoire. Cette approche à faciliter la communication entre les différentes classes de ce laboratoire.

Conclusion :

En conclusion on a réussi à accomplir les tâches nécessaires pour implémenter le HDLC et le réseau multipoint. Le langage de programmation choisie était java, car l'approche de programmation orienté objet était la meilleure approche pour résoudre ce problème. Aussi on voulait pouvoir réutiliser le code de départ fourni. Les buts du laboratoire étaient de se familiariser avec le réseau multipoint qui contient une station primaire et plusieurs stations secondaires; mieux comprendre l'importance et rôle des protocoles; maitriser le mécanisme de la fenêtre d'anticipation; et étudier un protocole concret de la couche liaison de données, le HDLC ont été accomplie.