INSTITUTO POLITÉCNICO NACIONAL
ESCUELA SUPERIOR DE CÓMPUTO

Redes de Computadoras

“Analizador de tramas”

Versión 1.- LLC

Por:

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INDICACIONES DE LA PRACTICA

En su analizador de tramas la función deberá analizar la trama de acuerdo a las siguientes especificaciones,

- Tam/tipo <= 1500 LLC [mostrar todo el análisis]
- Tam/tipo = 2048 IP [Sólo imprimir IP]
- Tam/tipo = 2056 ARP [Solo imprimir ARP]
- Otro [imprimir el numero en hexadécimal y poner “otro”]

Su función debe

- Recibir como parámetros la trama
- Imprime el análisis correspondiente y no devuelve nada.

```
void analizatrama(unsigned char t[])
```

En el `main` se debe mandar a llamar a su función en un ciclo for de la siguiente manera:

```
unsigned char i;
for (i=0; i<36; i++){
      analizatrama(trama[i]);
}
```

[Realizar las pruebas con las 36 tramas del archivo tramasLLC.txt]

Compruebe que sus resultados son iguales a las hojas realizadas a mano.

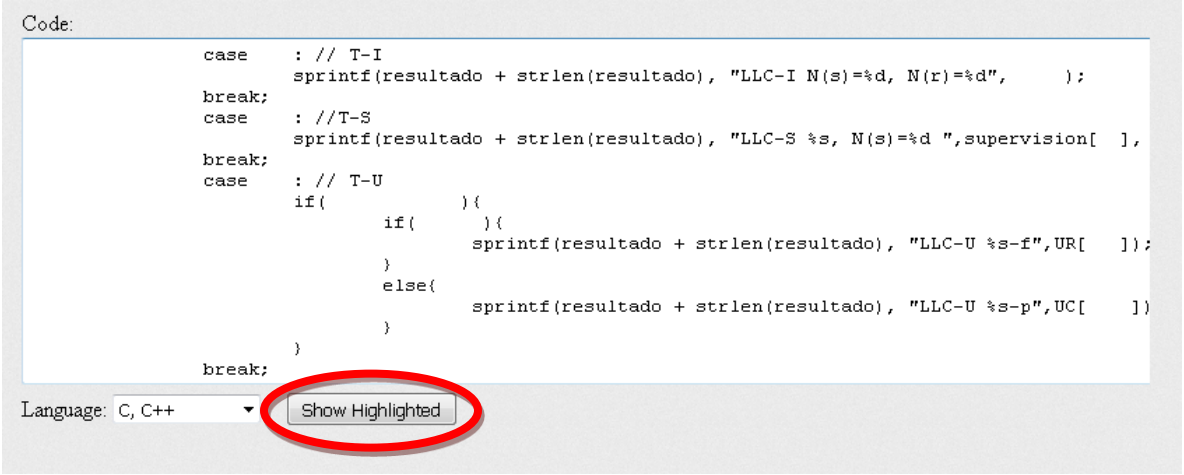
En su cuaderno haga el mapa de memoria correspondiente **sin** considerar

Arreglo de tramas

Arreglos: UC, UR y S.

Para esta entrega por parejas deberan elaborar un reporte que incluya solamente lo siguiente:

- Portada
- Introducción al protocolo LLC (definición, cabecera y estructura de los campos de control de T-I, T-S y T-U y explicar el bit P/F y campo SAPo) [máximo 1 cuartilla]
- Explicación breve de los procesos de enmascaramiento para determinar el tipo de trama, así como lo que se requirió para obtener el valor de los bits S y los bits M. (con sus palabras describir lo que hicimos en clase para obtener dichos bits, te sugiero incluir imágenes del campo de control)
- Incluir una captura de pantalla de la salida de su programa (imprime tu nombre completo al inicio de la ejecución)
- Conclusiones individuales. ¿habias trabajado a nivel de bits? ¿generalmente consideras el gasto de memoria ? ¿qué ventajas ofrecen los operadores binarios?¿la práctica te resulto fàcil o dificil?
- Incluye tu código, para ello debes entrar a la página http://www.planetb.ca/syntax-highlight-word , copiar tu código para que le de formato y pegarlo en el archivo de word]



- Guardar el archivo como Lastname1_Lastname2_Analizador_LLC.PDF

INTRODUCCIÓN

CONCEPTO: Logical Link Control, o LLC, es una de las dos subcapas en la que la capa de enlace de datos del modelo de referencia de Interconexión de sistemas abiertos (OSI) se subdivide para los protocolos de enlace de datos utilizados en las redes de área local (LAN).

CÓMO FUNCIONA: Para los protocolos de enlace de datos LAN como Ethernet, la capa de enlace de datos se divide en una capa superior llamada capa de control de enlace lógico (LLC) y una capa inferior llamada capa de control de acceso a medios (MAC). La capa MAC coordina el acceso a la capa física de acuerdo con un método de control de acceso a medios, que para Ethernet es el esquema de Acceso múltiple con detección de portadora con detección de colisión (CSMA / CD).

Por lo tanto, la capa MAC proporciona servicios a la capa LLC para que las unidades de datos de protocolo puedan transferirse al medio sin preocuparse por los esquemas de difusión, enmarcado, direccionamiento o detección de errores utilizados. La LLC utiliza los servicios MAC para proporcionar dos tipos de operaciones de enlace de datos a la capa de red que se encuentra sobre ella: LLC1 para sin conexión y LLC2 para servicios de comunicación de enlace de datos orientados a la conexión (conocidos como Tipo 1 y Tipo 2, respectivamente). Estos servicios de LLC se agrupan en dos clases:

- Servicios de clase 1: servicios sin conexión utilizados por aplicaciones que no requieren detección de errores o control de flujo.
- Servicios de clase 2: servicios de transferencia de datos sin conexión (tipo 1) o orientados a la conexión en modo equilibrado (tipo 2). La LLC proporciona los servicios de detección y recuperación de errores, control de flujo y secuenciación necesarios para la transferencia de datos orientada a la conexión.

PROTOCOLOS ORIENTADOS A BIT:

En una transmisión orientada a bit, los datos son transmitidos como constantes ráfagas de bits. Antes de que la transmisión de datos empiece, caracteres especiales de sincronía son transmitidos por el transmisor, así el receptor puede sincronizarse a sí mismo con la ráfaga de bits. Este patrón de bits es comúnmente representado en una cadena de 8 bits.

EXPLICACION DEL PROGRAMA CONSIDERANDO ESTRUCTURA DE LOS CAMPOS DE CONTROL

T-I:

0	**N(s)**			**p/f**	**N(r)**				
0	**N(s)**							**p/f**	**N(r)**

Para las tramas T – I debemos inicialmente realizamos una operación AND entre el byte 16 de la trama y el número 3, ya que los bits en la posición 1 y 0 de este byte determina el tipo de trama

T-S:

1	**0**	**S**	**S**	**p/f**	**N(r)**				
1	**0**	**S**	**S**	**0**	**0**	**0**	**0**	**p/f**	**N(r)**

Para determinar el bit S consideramos que estos se encuentran en el bit 16 en las posiciones 2 y 3 por eso realizamos un corrimiento de 2 en ese byte y se aplica un AND con 3. Sabemos que tenemos cuatro comandos posibles, y todos están en un arreglo, por lo que, al realizar la operación anterior, el valor obtenido puede ser 0,1,2,3 correspondiente a la posición del comando en el arreglo, y otro La opción puede ser Es usar 12 para realizar la suma y luego realizar el cambio.

T-U:

0	**0**	**M**	**M**	**M**	**p/f**	**M**	**M**	**0**	**0**

Para este tipo de trama debemos si este es comando o respuesta, donde:
BIT P/F: Este campo puede tener dos valores

Comando p

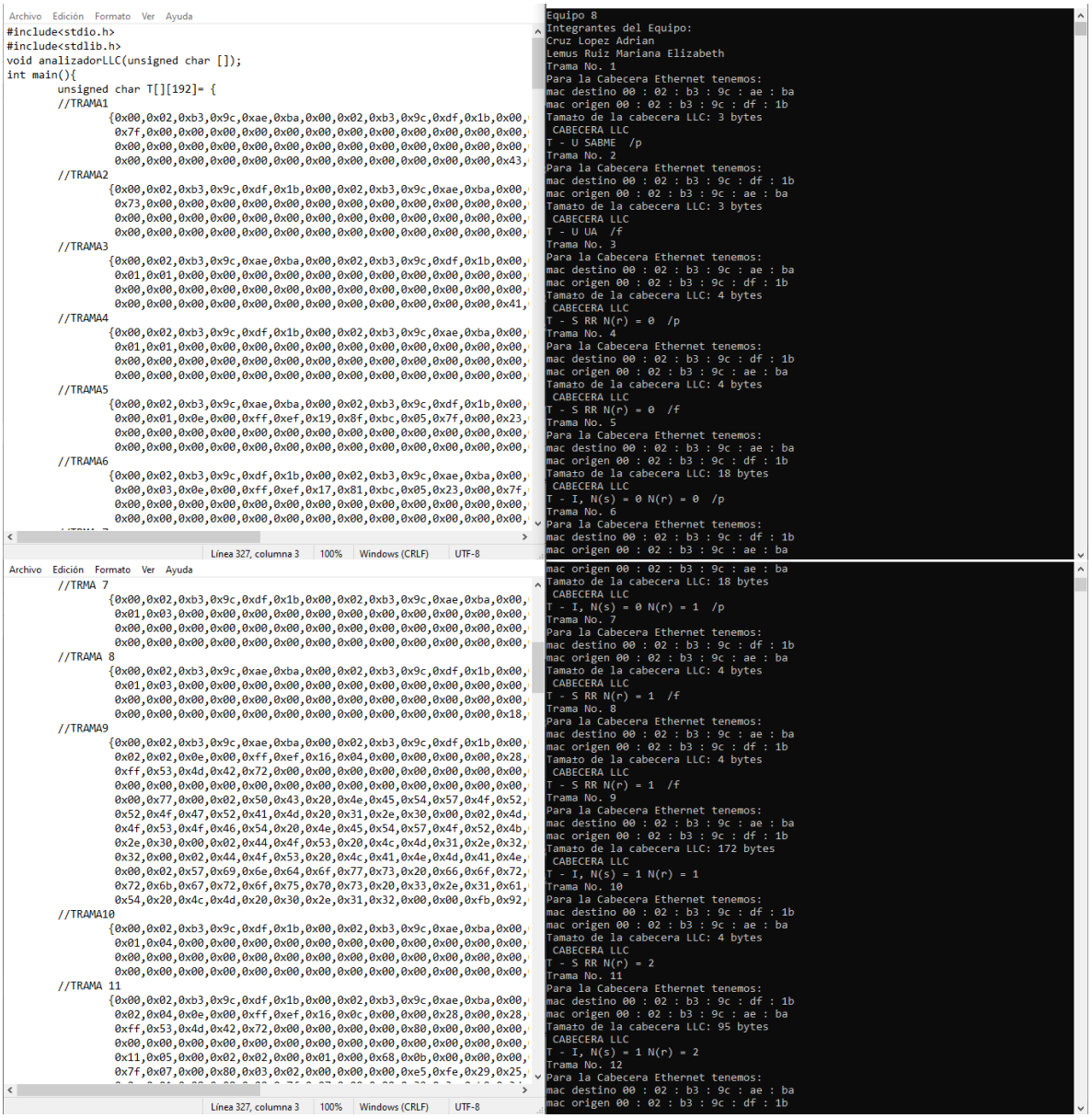
Respuesta f

Y en este caso sabemos que se encuentra en el byte 15 por eso realiza un and con 1 si este está encendido será una respuesta y si nos da un 0 es un comando.

En el caso de los bits M vamos a realizar un corrimiento de dos para eliminar los últimos bits y después se realizará un AND con 3 para obtener las dos M a la derecha de P/F. Y en el caso de los otros M, se realizará inicialmente un corrimiento de tres bits y después un AND con el 28.

Finalmente se unen ambos resultados con un OR.

CAPTURAS DEL PROGRAMA



```
Archivo  Edición  Formato  Ver  Ayuda
#include<stdio.h>
#include<stdlib.h>
void analizadorLLC(unsigned char []);
int main(){
        unsigned char T[][192]= {
        //TRAMA1
                {0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,
                 0x7f,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
                 0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
                 0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x43,
        //TRAMA2
                {0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,
                 0x73,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
                 0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
                 0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
        //TRAMA3
                {0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,
                 0x01,0x01,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
                 0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
                 0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x41,
        //TRAMA4
                {0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,
                 0x01,0x01,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
                 0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
                 0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
        //TRAMA5
                {0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,
                 0x00,0x01,0x0e,0x00,0xff,0xef,0x19,0x8f,0xbc,0x05,0x7f,0x00,0x23,
                 0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
                 0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
        //TRAMA6
                {0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,
                 0x00,0x03,0x0e,0x00,0xff,0xef,0x17,0x81,0xbc,0x05,0x23,0x00,0x7f,
                 0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
                 0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
```

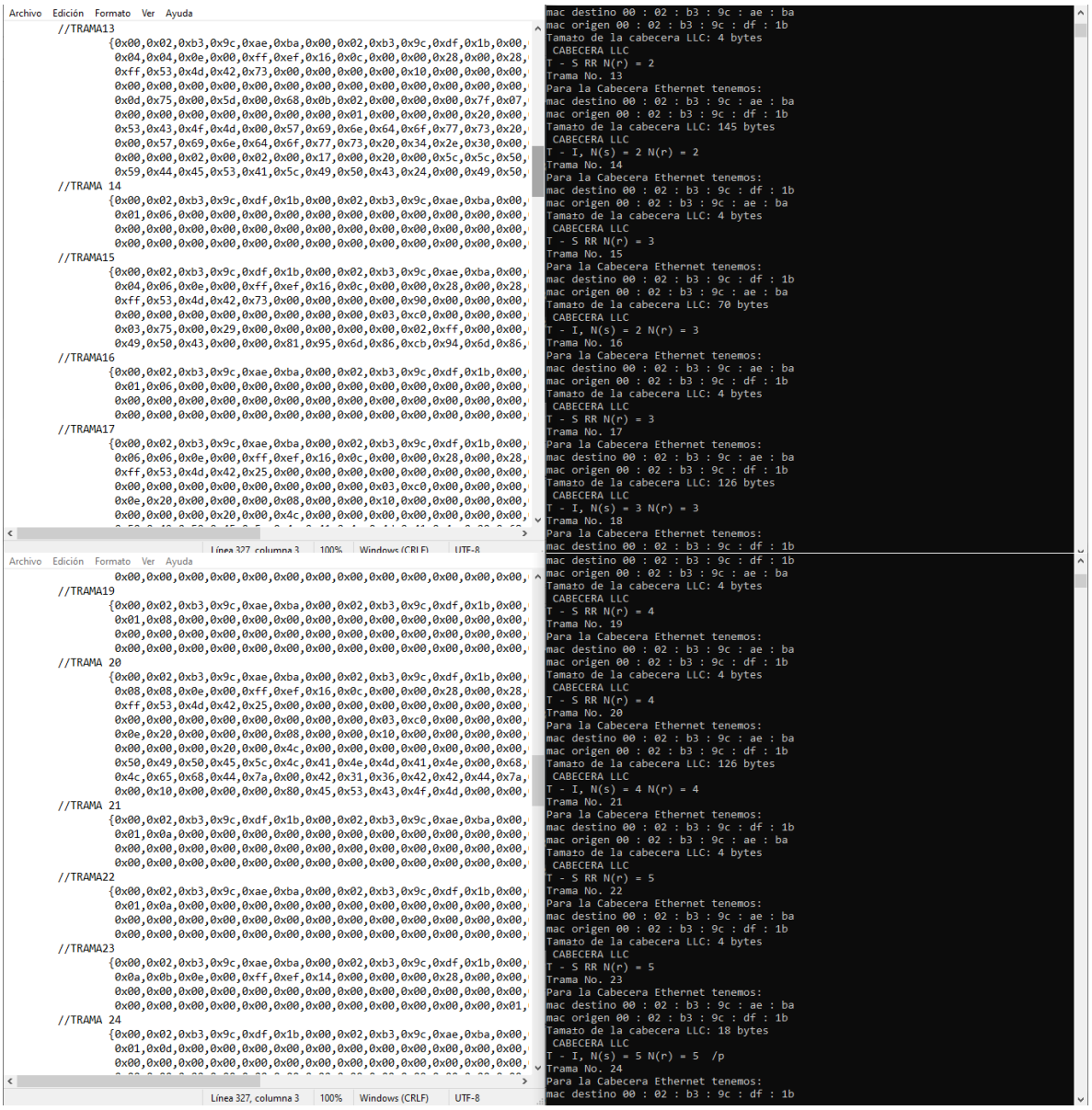
```
Línea 327, columna 3   100%   Windows (CRLF)   UTF-8
```

```
Archivo  Edición  Formato  Ver  Ayuda
        //TRMA 7
                {0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,
                 0x01,0x03,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
                 0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
                 0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
        //TRAMA 8
                {0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,
                 0x01,0x03,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
                 0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
                 0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x18,
        //TRAMA9
                {0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,
                 0x02,0x02,0x0e,0x00,0xff,0xef,0x16,0x04,0x00,0x00,0x00,0x00,0x28,
                 0xff,0x53,0x4d,0x42,0x72,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
                 0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
                 0x00,0x77,0x00,0x02,0x50,0x43,0x20,0x4e,0x45,0x54,0x57,0x4f,0x52,
                 0x52,0x4f,0x47,0x52,0x41,0x4d,0x20,0x31,0x2e,0x30,0x00,0x02,0x4d,
                 0x4f,0x53,0x4f,0x46,0x54,0x20,0x4e,0x45,0x54,0x57,0x4f,0x52,0x4b,
                 0x2e,0x30,0x00,0x02,0x44,0x4f,0x53,0x20,0x4c,0x4d,0x31,0x2e,0x32,
                 0x32,0x00,0x02,0x44,0x4f,0x53,0x20,0x4c,0x41,0x4e,0x4d,0x41,0x4e,
                 0x00,0x02,0x57,0x69,0x6e,0x64,0x6f,0x77,0x73,0x20,0x66,0x6f,0x72,
                 0x72,0x6b,0x67,0x72,0x6f,0x75,0x70,0x73,0x20,0x33,0x2e,0x31,0x61,
                 0x54,0x20,0x4c,0x4d,0x20,0x30,0x2e,0x31,0x32,0x00,0x00,0xfb,0x92,
        //TRAMA10
                {0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,
                 0x01,0x04,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
                 0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
                 0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
        //TRAMA 11
                {0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,
                 0x02,0x04,0x0e,0x00,0xff,0xef,0x16,0x0c,0x00,0x00,0x28,0x00,0x28,
                 0xff,0x53,0x4d,0x42,0x72,0x00,0x00,0x00,0x00,0x80,0x00,0x00,0x00,
                 0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
                 0x11,0x05,0x00,0x02,0x02,0x00,0x01,0x00,0x68,0x0b,0x00,0x00,0x00,
                 0x7f,0x07,0x00,0x80,0x03,0x02,0x00,0x00,0x00,0xe5,0xfe,0x29,0x25,
```

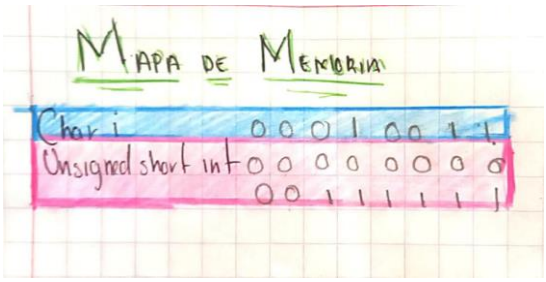
```
Línea 327, columna 3   100%   Windows (CRLF)   UTF-8
```

```
Equipo 8
Integrantes del Equipo:
Cruz Lopez Adrian
Lemus Ruiz Mariana Elizabeth
Trama No. 1
Para la Cabecera Ethernet tenemos:
mac destino 00 : 02 : b3 : 9c : ae : ba
mac origen 00 : 02 : b3 : 9c : df : 1b
Tamaño de la cabecera LLC: 3 bytes
 CABECERA LLC
T - U SABME  /p
Trama No. 2
Para la Cabecera Ethernet tenemos:
mac destino 00 : 02 : b3 : 9c : df : 1b
mac origen 00 : 02 : b3 : 9c : ae : ba
Tamaño de la cabecera LLC: 3 bytes
 CABECERA LLC
T - U UA  /f
Trama No. 3
Para la Cabecera Ethernet tenemos:
mac destino 00 : 02 : b3 : 9c : ae : ba
mac origen 00 : 02 : b3 : 9c : df : 1b
Tamaño de la cabecera LLC: 4 bytes
 CABECERA LLC
T - S RR N(r) = 0  /p
Trama No. 4
Para la Cabecera Ethernet tenemos:
mac destino 00 : 02 : b3 : 9c : df : 1b
mac origen 00 : 02 : b3 : 9c : ae : ba
Tamaño de la cabecera LLC: 4 bytes
 CABECERA LLC
T - S RR N(r) = 0  /f
Trama No. 5
Para la Cabecera Ethernet tenemos:
mac destino 00 : 02 : b3 : 9c : ae : ba
mac origen 00 : 02 : b3 : 9c : df : 1b
Tamaño de la cabecera LLC: 18 bytes
 CABECERA LLC
T - I, N(s) = 0 N(r) = 0  /p
Trama No. 6
Para la Cabecera Ethernet tenemos:
mac destino 00 : 02 : b3 : 9c : df : 1b
mac origen 00 : 02 : b3 : 9c : ae : ba
```

```
mac origen 00 : 02 : b3 : 9c : ae : ba
Tamaño de la cabecera LLC: 18 bytes
 CABECERA LLC
T - I, N(s) = 0 N(r) = 1  /p
Trama No. 7
Para la Cabecera Ethernet tenemos:
mac destino 00 : 02 : b3 : 9c : df : 1b
mac origen 00 : 02 : b3 : 9c : ae : ba
Tamaño de la cabecera LLC: 4 bytes
 CABECERA LLC
T - S RR N(r) = 1  /f
Trama No. 8
Para la Cabecera Ethernet tenemos:
mac destino 00 : 02 : b3 : 9c : ae : ba
mac origen 00 : 02 : b3 : 9c : df : 1b
Tamaño de la cabecera LLC: 4 bytes
 CABECERA LLC
T - S RR N(r) = 1  /f
Trama No. 9
Para la Cabecera Ethernet tenemos:
mac destino 00 : 02 : b3 : 9c : ae : ba
mac origen 00 : 02 : b3 : 9c : df : 1b
Tamaño de la cabecera LLC: 172 bytes
 CABECERA LLC
T - I, N(s) = 1 N(r) = 1
Trama No. 10
Para la Cabecera Ethernet tenemos:
mac destino 00 : 02 : b3 : 9c : df : 1b
mac origen 00 : 02 : b3 : 9c : ae : ba
Tamaño de la cabecera LLC: 4 bytes
 CABECERA LLC
T - S RR N(r) = 2
Trama No. 11
Para la Cabecera Ethernet tenemos:
mac destino 00 : 02 : b3 : 9c : df : 1b
mac origen 00 : 02 : b3 : 9c : ae : ba
Tamaño de la cabecera LLC: 95 bytes
 CABECERA LLC
T - I, N(s) = 1 N(r) = 2
Trama No. 12
Para la Cabecera Ethernet tenemos:
mac destino 00 : 02 : b3 : 9c : ae : ba
mac origen 00 : 02 : b3 : 9c : df : 1b
```


Archivo Edición Formato Ver Ayuda
//TRAMA13
{0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,
0x04,0x04,0x0e,0x00,0xff,0xef,0x16,0x0c,0x00,0x00,0x28,0x00,0x28,
0xff,0x53,0x4d,0x42,0x73,0x00,0x00,0x00,0x00,0x10,0x00,0x00,0x00,
0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
0x0d,0x75,0x00,0x5d,0x00,0x68,0x0b,0x02,0x00,0x00,0x00,0x7f,0x07,
0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x01,0x00,0x00,0x00,0x20,0x00,
0x53,0x43,0x4f,0x4d,0x00,0x57,0x69,0x6e,0x64,0x6f,0x77,0x73,0x20,
0x00,0x57,0x69,0x6e,0x64,0x6f,0x77,0x73,0x20,0x34,0x2e,0x30,0x00,
0x00,0x00,0x02,0x00,0x02,0x00,0x17,0x00,0x20,0x00,0x5c,0x5c,0x50,
0x59,0x44,0x45,0x53,0x41,0x5c,0x49,0x50,0x43,0x24,0x00,0x49,0x50,
//TRAMA 14
{0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,
0x01,0x06,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
//TRAMA15
{0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,
0x04,0x06,0x0e,0x00,0xff,0xef,0x16,0x0c,0x00,0x00,0x28,0x00,0x28,
0xff,0x53,0x4d,0x42,0x73,0x00,0x00,0x00,0x00,0x90,0x00,0x00,0x00,
0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x03,0xc0,0x00,0x00,0x00,
0x03,0x75,0x00,0x29,0x00,0x00,0x00,0x00,0x00,0x02,0xff,0x00,0x00,
0x49,0x50,0x43,0x00,0x00,0x81,0x95,0x6d,0x86,0xcb,0x94,0x6d,0x86,
//TRAMA16
{0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,
0x01,0x06,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
//TRAMA17
{0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,
0x06,0x06,0x0e,0x00,0xff,0xef,0x16,0x0c,0x00,0x00,0x28,0x00,0x28,
0xff,0x53,0x4d,0x42,0x25,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x03,0xc0,0x00,0x00,0x00,
0x0e,0x20,0x00,0x00,0x00,0x08,0x00,0x00,0x10,0x00,0x00,0x00,0x00,
0x00,0x00,0x00,0x20,0x00,0x4c,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
Línea 327, columna 3 100% Windows (CRLF) UTF-8
mac destino 00 : 02 : b3 : 9c : ae : ba
mac origen 00 : 02 : b3 : 9c : df : 1b
Tamaño de la cabecera LLC: 4 bytes
CABECERA LLC
T - S RR N(r) = 2
Trama No. 13
Para la Cabecera Ethernet tenemos:
mac destino 00 : 02 : b3 : 9c : ae : ba
mac origen 00 : 02 : b3 : 9c : df : 1b
Tamaño de la cabecera LLC: 145 bytes
CABECERA LLC
T - I, N(s) = 2 N(r) = 2
Trama No. 14
Para la Cabecera Ethernet tenemos:
mac destino 00 : 02 : b3 : 9c : df : 1b
mac origen 00 : 02 : b3 : 9c : ae : ba
Tamaño de la cabecera LLC: 4 bytes
CABECERA LLC
T - S RR N(r) = 3
Trama No. 15
Para la Cabecera Ethernet tenemos:
mac destino 00 : 02 : b3 : 9c : df : 1b
mac origen 00 : 02 : b3 : 9c : ae : ba
Tamaño de la cabecera LLC: 70 bytes
CABECERA LLC
T - I, N(s) = 2 N(r) = 3
Trama No. 16
Para la Cabecera Ethernet tenemos:
mac destino 00 : 02 : b3 : 9c : ae : ba
mac origen 00 : 02 : b3 : 9c : df : 1b
Tamaño de la cabecera LLC: 4 bytes
CABECERA LLC
T - S RR N(r) = 3
Trama No. 17
Para la Cabecera Ethernet tenemos:
mac destino 00 : 02 : b3 : 9c : ae : ba
mac origen 00 : 02 : b3 : 9c : df : 1b
Tamaño de la cabecera LLC: 126 bytes
CABECERA LLC
T - I, N(s) = 3 N(r) = 3
Trama No. 18
Para la Cabecera Ethernet tenemos:
mac destino 00 : 02 : b3 : 9c : df : 1b
Archivo Edición Formato Ver Ayuda
0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
//TRAMA19
{0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,
0x01,0x08,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
//TRAMA 20
{0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,
0x08,0x08,0x0e,0x00,0xff,0xef,0x16,0x0c,0x00,0x00,0x28,0x00,0x28,
0xff,0x53,0x4d,0x42,0x25,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x03,0xc0,0x00,0x00,0x00,
0x0e,0x20,0x00,0x00,0x00,0x08,0x00,0x00,0x10,0x00,0x00,0x00,0x00,
0x00,0x00,0x00,0x20,0x00,0x4c,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
0x50,0x49,0x50,0x45,0x5c,0x4c,0x41,0x4e,0x4d,0x41,0x4e,0x00,0x68,
0x4c,0x65,0x68,0x44,0x7a,0x00,0x42,0x31,0x36,0x42,0x42,0x44,0x7a,
0x00,0x10,0x00,0x00,0x00,0x80,0x45,0x53,0x43,0x4f,0x4d,0x00,0x00,
//TRAMA 21
{0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,
0x01,0x0a,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
//TRAMA22
{0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,
0x01,0x0a,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
//TRAMA23
{0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,
0x0a,0x0b,0x0e,0x00,0xff,0xef,0x14,0x00,0x00,0x00,0x28,0x00,0x00,
0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x01,
//TRAMA 24
{0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,
0x01,0x0d,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
Línea 327, columna 3 100% Windows (CRLF) UTF-8
mac destino 00 : 02 : b3 : 9c : df : 1b
mac origen 00 : 02 : b3 : 9c : ae : ba
Tamaño de la cabecera LLC: 4 bytes
CABECERA LLC
T - S RR N(r) = 4
Trama No. 19
Para la Cabecera Ethernet tenemos:
mac destino 00 : 02 : b3 : 9c : ae : ba
mac origen 00 : 02 : b3 : 9c : df : 1b
Tamaño de la cabecera LLC: 4 bytes
CABECERA LLC
T - S RR N(r) = 4
Trama No. 20
Para la Cabecera Ethernet tenemos:
mac destino 00 : 02 : b3 : 9c : ae : ba
mac origen 00 : 02 : b3 : 9c : df : 1b
Tamaño de la cabecera LLC: 126 bytes
CABECERA LLC
T - I, N(s) = 4 N(r) = 4
Trama No. 21
Para la Cabecera Ethernet tenemos:
mac destino 00 : 02 : b3 : 9c : df : 1b
mac origen 00 : 02 : b3 : 9c : ae : ba
Tamaño de la cabecera LLC: 4 bytes
CABECERA LLC
T - S RR N(r) = 5
Trama No. 22
Para la Cabecera Ethernet tenemos:
mac destino 00 : 02 : b3 : 9c : ae : ba
mac origen 00 : 02 : b3 : 9c : df : 1b
Tamaño de la cabecera LLC: 4 bytes
CABECERA LLC
T - S RR N(r) = 5
Trama No. 23
Para la Cabecera Ethernet tenemos:
mac destino 00 : 02 : b3 : 9c : ae : ba
mac origen 00 : 02 : b3 : 9c : df : 1b
Tamaño de la cabecera LLC: 18 bytes
CABECERA LLC
T - I, N(s) = 5 N(r) = 5 /p
Trama No. 24
Para la Cabecera Ethernet tenemos:
mac destino 00 : 02 : b3 : 9c : df : 1b

MAPA DE MEMORIA



CONCLUSIONES INDIVIDUALES

Cruz López Adrián

Antes de cursar esta materia nunca había trabajado a nivel de bits, ni siquiera sabía que se pueden utilizar operadores a nivel de bits. Así que solamente en las prácticas que hemos estado realizando es cuando he trabajado de esta manera.
Fue hasta este semestre que empecé a considerar el costo de memoria de los programas que realizo, tanto por esta materia como por Análisis de Algoritmos, ya que antes solo me preocupaba que el programa funcionara, sin embargo, ahora sé que debo considerar el costo de memoria que podrían presentar mis programas, pues si se requiere resolver un problema de gran tamaño, el costo de este es algo que considerar.
La principal ventaja que encuentro de los operadores binarios es el poco costo de memoria, pues si en lugar de utilizarlos se optara por trabajar con operaciones aritméticas, estas requieren de más memoria que los operadores binarios.
Y esta práctica si fue algo complicada, encontrar la lógica correcta a implementar para obtener algunos parámetros específicos, como los son los bits M y los N(r) y N(s).

Lemus Ruiz Mariana Elizabeth

En el caso de trabajos a nivel de bit, únicamente los he usado constantemente en las prácticas de esta materia y pocas veces en algunas otras tareas de asignaturas distintas y a pesar de eso, con anterioridad en otros semestres no había considerado el gasto de memoria, hasta que vi la importancia de esta en análisis de algoritmos, donde se vio la importancia de la memoria pues a la larga si presenta una diferencia en los tiempos de ejecución bastante amplia. En este caso, hablando de las ventajas de los operadores binarios, tenemos que se tiene la posibilidad de transferir sin la necesidad de traducción, lo que supone una velocidad de ejecución superior a cualquier otro método, además de un costo menor en la memoria.
Finalmente, hablando con la práctica, en esta se presentaron dificultades en el caso de la ubicación del SAPo, además de otros parámetros como son los bits M y los N(r) y N(s), pero al final la trama que presento más dificultades de realizar es la trama tipo U, pues esta fue la que más requirió una lógica en el uso de los operadores binarios, por lo mismo, esta fue la que más errores presentaba en la implementación de esta.

CÓDIGO

```
#include<stdio.h>
#include<stdlib.h>

void analizadorLLC(unsigned char []);

int main(){

    unsigned char T[][192]=
    {
    //TRAMA1
        {0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x03,0xf0,0xf0,
        0x7f,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
        0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
        0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x43,0x05,0x90,0x6d},
    //TRAMA2
        {0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x03,0xf0,0xf1,
        0x73,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
        0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
        0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x54,0x90,0x6d},
    //TRAMA3
        {0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x04,0xf0,0xf0,
        0x01,0x01,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
        0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
        0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x41,0xa3,0x90,0x6d},
    //TRAMA4
        {0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x04,0xf0,0xf1,
        0x01,0x01,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
        0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
        0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0xf2,0x90,0x6d},
    //TRAMA5
        {0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x12,0xf0,0xf0,
        0x00,0x01,0x0e,0x00,0xff,0xef,0x19,0x8f,0xbc,0x05,0x7f,0x00,0x23,0x00,0x7f,0x23,
        0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
        0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x41,0x91,0x6d},
    //TRAMA6
        {0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x12,0xf0,0xf0,
```

```
        0x00,0x03,0x0e,0x00,0xff,0xef,0x17,0x81,0xbc,0x05,0x23,0x00,0x7f,0x00,0x23,0x7f,
        0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
        0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x90,0x91,0x6d},
    //TRMA 7
        {0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x04,0xf0,0xf1,
        0x01,0x03,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
        0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
        0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0xdf,0x91,0x6d},
    //TRAMA 8
        {0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x04,0xf0,0xf1,
        0x01,0x03,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
        0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
        0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x18,0xac,0x92,0x6d},
    //TRAMA9
        {0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0xac,0xf0,0xf0,
        0x02,0x02,0x0e,0x00,0xff,0xef,0x16,0x04,0x00,0x00,0x00,0x00,0x28,0x00,0x7f,0x23,
        0xff,0x53,0x4d,0x42,0x72,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
        0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x82,0x09,
        0x00,0x77,0x00,0x02,0x50,0x43,0x20,0x4e,0x45,0x54,0x57,0x4f,0x52,0x4b,0x20,0x50,
        0x52,0x4f,0x47,0x52,0x41,0x4d,0x20,0x31,0x2e,0x30,0x00,0x02,0x4d,0x49,0x43,0x52,
        0x4f,0x53,0x4f,0x46,0x54,0x20,0x4e,0x45,0x54,0x57,0x4f,0x52,0x4b,0x53,0x20,0x33,
        0x2e,0x30,0x00,0x02,0x44,0x4f,0x53,0x20,0x4c,0x4d,0x31,0x2e,0x32,0x58,0x30,0x30,
        0x32,0x00,0x02,0x44,0x4f,0x53,0x20,0x4c,0x41,0x4e,0x4d,0x41,0x4e,0x32,0x2e,0x31,
        0x00,0x02,0x57,0x69,0x6e,0x64,0x6f,0x77,0x73,0x20,0x66,0x6f,0x72,0x20,0x57,0x6f,
        0x72,0x6b,0x67,0x72,0x6f,0x75,0x70,0x73,0x20,0x33,0x2e,0x31,0x61,0x00,0x02,0x4e,
        0x54,0x20,0x4c,0x4d,0x20,0x30,0x2e,0x31,0x32,0x00,0x00,0xfb,0x92,0x6d,0x86,0xdf},
    //TRAMA10
        {0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x04,0xf0,0xf1,
        0x01,0x04,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
        0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
        0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x7b,0x93,0x6d},
    //TRAMA 11
        {0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x5f,0xf0,0xf0,
```

```
        0x02,0x04,0x0e,0x00,0xff,0xef,0x16,0x0c,0x00,0x00,0x28,0x00,0x28,0x00,0x23,0x7f,
        0xff,0x53,0x4d,0x42,0x72,0x00,0x00,0x00,0x00,0x80,0x00,0x00,0x00,0x00,0x00,0x00,
        0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x82,0x09,
        0x11,0x05,0x00,0x02,0x02,0x00,0x01,0x00,0x68,0x0b,0x00,0x00,0x00,0x00,0x01,0x00,
        0x7f,0x07,0x00,0x80,0x03,0x02,0x00,0x00,0x00,0xe5,0xfe,0x29,0x25,0x7c,0xc2,0x01,
        0x2c,0x01,0x08,0x08,0x00,0x7f,0x07,0x00,0x80,0x32,0x3e,0xb9,0x3d,0x00,0xca,0x93},
    //TRAMA 12
        {0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x04,0xf0,0xf1,
        0x01,0x04,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
        0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
        0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x7c,0x94,0x6d},
    //TRAMA13
        {0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x91,0xf0,0xf0,
        0x04,0x04,0x0e,0x00,0xff,0xef,0x16,0x0c,0x00,0x00,0x28,0x00,0x28,0x00,0x7f,0x23,
        0xff,0x53,0x4d,0x42,0x73,0x00,0x00,0x00,0x00,0x10,0x00,0x00,0x00,0x00,0x00,0x00,
        0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
        0x0d,0x75,0x00,0x5d,0x00,0x68,0x0b,0x02,0x00,0x00,0x00,0x00,0x7f,0x07,0x00,0x80,0x00,
        0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x01,0x00,0x00,0x00,0x00,0x20,0x00,0x00,0x00,0x45,
        0x53,0x43,0x4f,0x4d,0x00,0x57,0x69,0x6e,0x64,0x6f,0x77,0x73,0x20,0x34,0x2e,0x30,
        0x00,0x57,0x69,0x6e,0x64,0x6f,0x77,0x73,0x20,0x34,0x2e,0x30,0x00,0x04,0xff,0x00,
        0x00,0x00,0x02,0x00,0x02,0x00,0x17,0x00,0x20,0x00,0x5c,0x5c,0x50,0x52,0x4f,0x47,
        0x59,0x44,0x45,0x53,0x41,0x5c,0x49,0x50,0x43,0x24,0x00,0x49,0x50,0x43,0x00,0x00},
    //TRAMA 14
        {0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x04,0xf0,0xf1,
        0x01,0x06,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
        0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,
        0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x32,0x95,0x6d},
    //TRAMA15
        {0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x46,0xf0,0xf0,
        0x04,0x06,0x0e,0x00,0xff,0xef,0x16,0x0c,0x00,0x00,0x28,0x00,0x28,0x00,0x23,0x7f,
            0xff,0x53,0x4d,0x42,0x73,0x00,0x00,0x00,0x00,0x90,0x00,0x00,0x00,0x00,0x00,0x00,
            0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x03,0xc0,0x00,0x00,0x00,0x00,0x82,0x09,
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                0x03,0x75,0x00,0x29,0x00,0x00,0x00,0x00,0x00,0x02,0xff,0x00
    ,0x00,0x00,0x04,0x00,
                0x49,0x50,0x43,0x00,0x00,0x81,0x95,0x6d,0x86,0xcb,0x94,0x6d
    ,0x86,0x0d,0x09,0x0e},
        //TRAMA16
        {0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0
    x04,0xf0,0xf1,
                0x01,0x06,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x00,0x00,0x00,
                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x00,0x00,0x00,
                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x20,0x96,0x6d},
            //TRAMA17
                {0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1
    b,0x00,0x7e,0xf0,0xf0,
                0x06,0x06,0x0e,0x00,0xff,0xef,0x16,0x0c,0x00,0x00,0x28,0x00
    ,0x28,0x00,0x7f,0x23,
                0xff,0x53,0x4d,0x42,0x25,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x00,0x00,0x00,
                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x03,0xc0,0x00,0x00
    ,0x00,0x00,0x82,0x0a,
                0x0e,0x20,0x00,0x00,0x00,0x08,0x00,0x00,0x10,0x00,0x00,0x00
    ,0x00,0x88,0x13,0x00,
                0x00,0x00,0x00,0x20,0x00,0x4c,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x2d,0x00,0x5c,
                0x50,0x49,0x50,0x45,0x5c,0x4c,0x41,0x4e,0x4d,0x41,0x4e,0x00
    ,0x68,0x00,0x57,0x72,
                0x4c,0x65,0x68,0x44,0x7a,0x00,0x42,0x31,0x36,0x42,0x42,0x44
    ,0x7a,0x00,0x01,0x00,
                0x00,0x10,0xff,0xff,0xff,0xff,0x45,0x53,0x43,0x4f,0x4d,0x00
    ,0x00,0x6f,0x96,0x6d},
            //TRAMA 18
                {0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x02,0xb3,0x9c,0xae,0xb
    a,0x00,0x04,0xf0,0xf1,
                0x01,0x08,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x00,0x00,0x00,
                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x00,0x00,0x00,
                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0xbe,0x96,0x6d}, //trama18
            //TRAMA19
                {0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1
    b,0x00,0x04,0xf0,0xf1,
                0x01,0x08,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x00,0x00,0x00,
                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x00,0x00,0x00,
                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x5d,0x97,0x6d}, //trama19
            //TRAMA 20
                {0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1
    b,0x00,0x7e,0xf0,0xf0,
                0x08,0x08,0x0e,0x00,0xff,0xef,0x16,0x0c,0x00,0x00,0x28,0x00
    ,0x28,0x00,0x7f,0x23,
                0xff,0x53,0x4d,0x42,0x25,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x00,0x00,0x00,
                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x03,0xc0,0x00,0x00
    ,0x00,0x00,0x02,0x0b,
                0x0e,0x20,0x00,0x00,0x00,0x08,0x00,0x00,0x10,0x00,0x00,0x00
    ,0x00,0x88,0x13,0x00,
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135.                0x00,0x00,0x00,0x20,0x00,0x4c,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x2d,0x00,0x5c,
136.                0x50,0x49,0x50,0x45,0x5c,0x4c,0x41,0x4e,0x4d,0x41,0x4e,0x00
    ,0x68,0x00,0x57,0x72,
137.                0x4c,0x65,0x68,0x44,0x7a,0x00,0x42,0x31,0x36,0x42,0x42,0x44
    ,0x7a,0x00,0x01,0x00,
138.                0x00,0x10,0x00,0x00,0x00,0x80,0x45,0x53,0x43,0x4f,0x4d,0x00
    ,0x00,0xac,0x97,0x6d},
139.            //TRAMA 21
140.                {0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x02,0xb3,0x9c,0xae,0xb
    a,0x00,0x04,0xf0,0xf1,
141.                0x01,0x0a,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x00,0x00,0x00,
142.                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x00,0x00,0x00,
143.                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0xfb,0x97,0x6d},
144.            //TRAMA22
145.                {0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1
    b,0x00,0x04,0xf0,0xf1,
146.                0x01,0x0a,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x00,0x00,0x00,
147.                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x00,0x00,0x00,
148.                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x4a,0x98,0x6d},
149.            //TRAMA23
150.                {0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1
    b,0x00,0x12,0xf0,0xf0,
151.                0x0a,0x0b,0x0e,0x00,0xff,0xef,0x14,0x00,0x00,0x00,0x28,0x00
    ,0x00,0x00,0x7f,0x23,
152.                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x00,0x00,0x00,
153.                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x01,0x99,0x98,0x6d},
154.            //TRAMA 24
155.                {0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x02,0xb3,0x9c,0xae,0xb
    a,0x00,0x04,0xf0,0xf1,
156.                0x01,0x0d,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x00,0x00,0x00,
157.                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x00,0x00,0x00,
158.                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x45,0x99,0x6d},
159.            //TRAMA25
160.                {0x03,0x00,0x00,0x00,0x00,0x01,0x00,0x04,0xac,0x44,0x4d,0x0
    2,0x00,0x8b,0xf0,0xf0,
161.                0x03,0x2c,0x00,0xff,0xef,0x08,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x42,0x34,0x20,
162.                0x20,0x20,0x20,0x20,0x20,0x20,0x20,0x20,0x20,0x20,0x20,0x20
    ,0x1b,0x49,0x42,0x4d,
163.                0x53,0x45,0x52,0x56,0x45,0x52,0x20,0x20,0x20,0x20,0x20,0x20
    ,0x00,0xff,0x53,0x4d,
164.                0x42,0x25,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x00,0x00,0x00,
165.                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x11,0x00,0x00,
166.                0x06,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0xe8,0x03
    ,0x00,0x00,0x00,0x00,
167.                0x00,0x00,0x00,0x00,0x06,0x00,0x56,0x00,0x03,0x00,0x01,0x00
    ,0x01,0x00,0x02,0x00,
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                0x17,0x00,0x5c,0x4d,0x41,0x49,0x4c,0x53,0x4c,0x4f,0x54,0x5c
    ,0x42,0x52,0x4f,0x57,
                0x53,0x45,0x00,0x09,0x04,0x33,0x17,0x00,0x00,0x00,0x9b,0x99
    ,0x6d,0x86,0x99,0x98},
            //TRAMA26
                {0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1
    b,0x00,0x35,0xf0,0xf0,
                0x0c,0x0a,0x0e,0x00,0xff,0xef,0x16,0x04,0x00,0x00,0x00,0x00
    ,0x28,0x00,0x7f,0x23,
                0xff,0x53,0x4d,0x42,0x71,0x00,0x00,0x00,0x00,0x00,0x01,0x00
    ,0x00,0x00,0x00,0x00,
                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x03,0xc0,0x00,0x00
    ,0x00,0x00,0x01,0x50,
                0x00,0x00,0x00,0x45,0xf1,0x99,0x6d,0x86,0x45,0x99,0x6d,0x86
    ,0x1f,0x09,0x52,0x5b},
            //TRAMA27
                {0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x02,0xb3,0x9c,0xae,0xb
    a,0x00,0x35,0xf0,0xf0,
                0x0a,0x0e,0x0e,0x00,0xff,0xef,0x16,0x0c,0x00,0x00,0x28,0x00
    ,0x28,0x00,0x23,0x7f,
                0xff,0x53,0x4d,0x42,0x71,0x00,0x00,0x00,0x00,0x80,0x01,0x00
    ,0x00,0x00,0x00,0x00,
                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x03,0xc0,0x00,0x00
    ,0x00,0x00,0x01,0x50,
                0x00,0x00,0x00,0x40,0x9a,0x6d,0x86,0x9b,0x99,0x6d,0x86
    ,0x20,0x09,0x75,0x5b},
            //TRAMA28
                {0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1
    b,0x00,0x12,0xf0,0xf0,
                0x0e,0x0d,0x0e,0x00,0xff,0xef,0x14,0x00,0x00,0x00,0x28,0x00
    ,0x00,0x00,0x7f,0x23,
                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x00,0x00,0x00,
                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x8f,0x9a,0x6d},
            //TRAMA29
                {0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x02,0xb3,0x9c,0xae,0xb
    a,0x00,0x04,0xf0,0xf1,
                0x01,0x11,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x00,0x00,0x00,
                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x00,0x00,0x00,
                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0xde,0x9a,0x6d},
            //TRAAMA30
                {0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1
    b,0x00,0x12,0xf0,0xf0,
                0x10,0x0d,0x0e,0x00,0xff,0xef,0x18,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x00,0x7f,0x23,
                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x00,0x00,0x00,
                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x2d,0x9b,0x6d},
            //TRAMA31
                {0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x02,0xb3,0x9c,0xae,0xb
    a,0x00,0x04,0xf0,0xf1,
                0x01,0x13,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x00,0x00,0x00,
                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x00,0x00,0x00,
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                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x7c,0x9b,0x6d},
            //TRAMA32
                {0x00,0x02,0xb3,0x9c,0xae,0xba,0x00,0x02,0xb3,0x9c,0xdf,0x1
    b,0x00,0x03,0xf0,0xf0,
                0x53,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x00,0x00,0x00,
                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x00,0x00,0x00,
                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0xcb,0x9b,0x6d},
            //TRAMA A
                {0x00,0x02,0xb3,0x9c,0xdf,0x1b,0x00,0x02,0xb3,0x9c,0xae,0xb
    a,0x00,0x03,0xf0,0xf1,
                0x73,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x00,0x00,0x00,
                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x00,0x00,0x00,
                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
    ,0x00,0x77,0x9c,0x6d},
            //TRAMA B
                {0xff,0xff,0xff,0xff,0xff,0xff,0x00,0x23,0x8b,0x46,0xe9,0xa
    d,0x08,0x06,0x00,0x04,
                0x08,0x00,0x06,0x04,0x00,0x01,0x00,0x23,0x8b,0x46,0xe9,0xad
    ,0x94,0xcc,0x39,0xcb,
                0x00,0x00,0x00,0x00,0x00,0x00,0x94,0xcc,0x39,0xfe },
                        /*Trama a */
            //TRAMA C
                {0x00,0x23,0x8b,0x46,0xe9,0xad,0x00,0x1f,0x45,0x9d,0x1e,0xa
    2,0x08,0x06,0x00,0x01,  /*TRAMA b */
                0x08,0x00,0x06,0x04,0x00,0x02,0x00,0x1f,0x45,0x9d,0x1e,0xa2
    ,0x94,0xcc,0x39,0xfe,
                0x00,0x23,0x8b,0x46,0xe9,0xad,0x94,0xcc,0x39,0xcb,0x00,0x00
    ,0x00,0x00,0x00,0x00,
                0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
     },

                {0x00,0x1f,0x45,0x9d,0x1e,0xa2,0x00,0x23,0x8b,0x46,0xe9,0xa
    d,0x08,0x00,0x46,0x00, /* TRAMA c */
                0x80,0x42,0x04,0x55,0x34,0x11,0x80,0x11,0x6b,0xf0,0x94,0xcc
    ,0x39,0xcb,0x94,0xcc,
                0x67,0x02,0xaa,0xbb,0xcc,0xdd,0x04,0x0c,0x00,0x35,0x00,0x2e
    ,0x85,0x7c,0xe2,0x1a,
                0x01,0x00,0x00,0x01,0x00,0x00,0x00,0x00,0x00,0x00,0x03,0x77
    ,0x77,0x77,0x03,0x69,
                0x73,0x63,0x05,0x65,0x73,0x63,0x6f,0x6d,0x03,0x69,0x70,0x6e
    ,0x02,0x6d,0x78,0x00,
                0x00,0x1c,0x00,0x01}
            };
            char i;
            printf("Equipo 8 \n");
            printf("Integrantes del Equipo: \n");
            printf("Cruz Lopez Adrian \n");
            printf("Lemus Ruiz Mariana Elizabeth\n\n");
            for(i=0;i<36;i++){

                unsigned short int tot = T[i][12] << 8 | T[i][13];
                printf(" \nTrama No. %d \n",i+1);
                printf("Para la Cabecera Ethernet tenemos: \n");
                printf("mac destino %.2x : %.2x : %.2x : %.2x : %.2x : %.2x
     \n", T[i][0], T[i][1], T[i][2], T[i][3], T[i][4], T[i][5]);
```

```
240.                printf("mac origen %.2x : %.2x : %.2x : %.2x : %.2x : %.2x
    \n", T[i][6], T[i][7], T[i][8], T[i][9], T[i][10], T[i][11]);
241.
242.                if(tot < 1500){
243.                    printf("Tamaño de la cabecera LLC: %d bytes \n", tot);

244.                    analizadorLLC(T[i]);
245.                }
246.
247.            // Parte Tam/tipo = 2048 IP Sólo imprime IP
248.                else if(tot == 2048){
249.                    printf("Tipo IP \n");
250.                }
251.
252.            //Parte Tam/tipo = 2056 ARP Solo imprime ARP
253.                else if(tot == 2054){
254.                    printf("Tipo ARP \n");
255.                }
256.
257.            //Otro - imprime el numero en hexadécimal y pone “otro”
258.                else{
259.                    printf("Tipo OTRO \n");
260.                    printf("Tamaño: %.2x %.2x o %d bytes  \n", T[i][12], T[
    i][13], tot);
261.                }
262.            }
263.
264.        return 0;
265.        }
266.
267.        void analizadorLLC(unsigned char T[]){
268.            char ss[4][5]={"RR","RNR","REJ","SREJ"};
269.            char uc[][6]={"UI",  "SIM","-","SARM","UP","-","-
    ","SABM","DISC","-","-","SARME","-","-","-","SABME","SNRM","-","-
    ","RSET","-","-","-","XID","-","-","-","SNRME"};
270.            char ur[][6]={"UI",  "RIM","-","DM","-","-","-","-","RD","-","-
    ","-","UA","-","-","-","-","FRMR","-","-","-","-","-","XID","-","-","-","-
    "};
271.
272.             printf(" CABECERA LLC \n");
273.
274.            switch(T[16]&3){
275.
276.            case 0:
277.                printf("T - I, N(s) = %d N(r) = %d", T[16] >> 1, T[17] >> 1
    );
278.                if(T[17] & 1)
279.                    if(T[15] & 1)  //final
280.                        printf("  /f ");
281.                    else
282.                        printf("  /p ");
283.            break;
284.            case 1:
285.                printf("T - S %s N(r) = %d", ss[(T[16]>>2)&3],T[17] >> 1);

286.
287.                if(T[17] & 1)
288.                    if(T[15] & 1)  //final
289.                        printf("  /f ");
290.                    else
291.                        printf("  /p ");
```

```
            break;

            case 2:
                printf("T - I, N(s) = %d N(r) = %d", T[16] >> 1, T[17] >> 1
    );
                if(T[17] & 1)
                    if(T[15] & 1)  //final
                        printf("  /f");
                    else
                        printf("  /p");
            break;

            case 3:
                if(T[16] & 16)
                    if(T[15] & 1){
                        printf("T - U %s",ur[(T[16]>>2&3)|(T[16]>>3&28)]);

                        if(T[16] & 1)
                            if(T[15] & 1)
                                printf("  /f");
                            else
                                printf("  /p");
                     }
                    else{
                        printf("T - U %s",uc[(T[16]>>2&3)|(T[16]>>3&28)]);

                        if(T[16] & 1)
                            if(T[15] & 1)
                                printf("  /f");
                            else
                                printf("  /p");
                     }
                else
                    if(T[15] & 1)
                        printf("T - U %s",ur[(T[16]>>2&3)|(T[16]>>3&28)]);

                    else
                        printf("T - U %s",uc[(T[16]>>2&3)|(T[16]>>3&28)]);


            break;
            }
        }
```