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Práctica 1

Desarrollo.

1. Explique brevemente cada una de las etapas del sistema de procesamiento.

   a. Preprocesador.
      Invocado antes de que el compilador haga su función. El procesador tiene la tarea de eliminar los comentarios, copiar las librerías y variables definidas al código fuente, así como sustituir los macros, entre otras tareas.
   b. Compilador.
      El compilador se encarga de convertir el archivo fuente procedente del preprocesador a un archivo con código objeto, analiza la léxica, sintáctica y semántica del código a la vez que genera código intermedio y código objeto optimizado.
   c. Ensamblador.
      Convierte el código objeto generado por el compilador en código máquina, este depende de la arquitectura de la computadora que se esté utilizando. El código máquina que sale de aquí no tiene asignada memoria absoluta.
   d. Enlazador/Cargador
      Resuelve las referencias externas y las pasa a la memoria principal, de aquí surge el código máquina destino.

2. Programa breve en lenguaje ANSI C.

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

// Programa que invierte una cadena
int  main(int argc, char const *argv[])
{
        char cadena[100] = "Me llamo Jose Angel";
        char cadena2[100];
        printf("Cadena original : %s\n",cadena );
        int len = strlen(cadena);
        for(int i= 0 ;i<len;i++){
                cadena2[i] = cadena[len -i -1];
        }
        printf("Cadena volteada %s\n",cadena2 );
        return 0;
}
```

3. Salida gcc –E programa.c > programa.pp

```
    # 1 "programa.c"
# 1 "<command-line>"
# 1 "programa.c"
# 1 "/usr/include/stdio.h" 1 3 4
# 28 "/usr/include/stdio.h" 3 4
# 1 "/usr/include/features.h" 1 3 4
# 323 "/usr/include/features.h" 3 4
# 1 "/usr/include/x86_64-linux-gnu/bits/predefs.h" 1 3 4
# 324 "/usr/include/features.h" 2 3 4
# 356 "/usr/include/features.h" 3 4
# 1 "/usr/include/x86_64-linux-gnu/sys/cdefs.h" 1 3 4
# 359 "/usr/include/x86_64-linux-gnu/sys/cdefs.h" 3 4
# 1 "/usr/include/x86_64-linux-gnu/bits/wordsize.h" 1 3 4
# 360 "/usr/include/x86_64-linux-gnu/sys/cdefs.h" 2 3 4
# 357 "/usr/include/features.h" 2 3 4
# 388 "/usr/include/features.h" 3 4
# 1 "/usr/include/x86_64-linux-gnu/gnu/stubs.h" 1 3 4



# 1 "/usr/include/x86_64-linux-gnu/bits/wordsize.h" 1 3 4
# 5 "/usr/include/x86_64-linux-gnu/gnu/stubs.h" 2 3 4



# 1 "/usr/include/x86_64-linux-gnu/gnu/stubs-64.h" 1 3 4
# 10 "/usr/include/x86_64-linux-gnu/gnu/stubs.h" 2 3 4
# 389 "/usr/include/features.h" 2 3 4
# 29 "/usr/include/stdio.h" 2 3 4




# 1 "/usr/lib/gcc/x86_64-linux-gnu/4.7/include/stddef.h" 1 3 4
# 213 "/usr/lib/gcc/x86_64-linux-gnu/4.7/include/stddef.h" 3 4
typedef long unsigned int size_t;
# 35 "/usr/include/stdio.h" 2 3 4

# 1 "/usr/include/x86_64-linux-gnu/bits/types.h" 1 3 4
# 28 "/usr/include/x86_64-linux-gnu/bits/types.h" 3 4
# 1 "/usr/include/x86_64-linux-gnu/bits/wordsize.h" 1 3 4
```

```
# 29 "/usr/include/x86_64-linux-gnu/bits/types.h" 2 3 4


typedef unsigned char __u_char;
typedef unsigned short int __u_short;
typedef unsigned int __u_int;
typedef unsigned long int __u_long;


typedef signed char __int8_t;
typedef unsigned char __uint8_t;
typedef signed short int __int16_t;
typedef unsigned short int __uint16_t;
typedef signed int __int32_t;
typedef unsigned int __uint32_t;

typedef signed long int __int64_t;
typedef unsigned long int __uint64_t;




typedef long int __quad_t;
typedef unsigned long int __u_quad_t;
# 131 "/usr/include/x86_64-linux-gnu/bits/types.h" 3 4
# 1 "/usr/include/x86_64-linux-gnu/bits/typesizes.h" 1 3 4
# 132 "/usr/include/x86_64-linux-gnu/bits/types.h" 2 3 4


typedef unsigned long int __dev_t;
typedef unsigned int __uid_t;
typedef unsigned int __gid_t;
typedef unsigned long int __ino_t;
typedef unsigned long int __ino64_t;
typedef unsigned int __mode_t;
typedef unsigned long int __nlink_t;
typedef long int __off_t;
typedef long int __off64_t;
typedef int __pid_t;
typedef struct { int __val[2]; } __fsid_t;
typedef long int __clock_t;
typedef unsigned long int __rlim_t;
```

```
typedef unsigned long int __rlim64_t;
typedef unsigned int __id_t;
typedef long int __time_t;
typedef unsigned int __useconds_t;
typedef long int __suseconds_t;

typedef int __daddr_t;
typedef long int __swblk_t;
typedef int __key_t;


typedef int __clockid_t;


typedef void * __timer_t;


typedef long int __blksize_t;




typedef long int __blkcnt_t;
typedef long int __blkcnt64_t;


typedef unsigned long int __fsblkcnt_t;
typedef unsigned long int __fsblkcnt64_t;


typedef unsigned long int __fsfilcnt_t;
typedef unsigned long int __fsfilcnt64_t;

typedef long int __ssize_t;




typedef __off64_t __loff_t;
typedef __quad_t *__qaddr_t;
typedef char *__caddr_t;


typedef long int __intptr_t;
```

```
typedef unsigned int __socklen_t;
# 37 "/usr/include/stdio.h" 2 3 4
# 45 "/usr/include/stdio.h" 3 4
struct _IO_FILE;



typedef struct _IO_FILE FILE;




# 65 "/usr/include/stdio.h" 3 4
typedef struct _IO_FILE __FILE;
# 75 "/usr/include/stdio.h" 3 4
# 1 "/usr/include/libio.h" 1 3 4
# 32 "/usr/include/libio.h" 3 4
# 1 "/usr/include/_G_config.h" 1 3 4
# 15 "/usr/include/_G_config.h" 3 4
# 1 "/usr/lib/gcc/x86_64-linux-gnu/4.7/include/stddef.h" 1 3 4
# 16 "/usr/include/_G_config.h" 2 3 4




# 1 "/usr/include/wchar.h" 1 3 4
# 83 "/usr/include/wchar.h" 3 4
typedef struct
{
  int __count;
  union
  {

        unsigned int __wch;



        char __wchb[4];
  } __value;
} __mbstate_t;
# 21 "/usr/include/_G_config.h" 2 3 4

typedef struct
{
```

```
  __off_t __pos;
  __mbstate_t __state;
} _G_fpos_t;
typedef struct
{
  __off64_t __pos;
  __mbstate_t __state;
} _G_fpos64_t;
# 53 "/usr/include/_G_config.h" 3 4
typedef int _G_int16_t __attribute__ ((__mode__ (__HI__)));
typedef int _G_int32_t __attribute__ ((__mode__ (__SI__)));
typedef unsigned int _G_uint16_t __attribute__ ((__mode__ (__HI__)));
typedef unsigned int _G_uint32_t __attribute__ ((__mode__ (__SI__)));
# 33 "/usr/include/libio.h" 2 3 4
# 53 "/usr/include/libio.h" 3 4
# 1 "/usr/lib/gcc/x86_64-linux-gnu/4.7/include/stdarg.h" 1 3 4
# 40 "/usr/lib/gcc/x86_64-linux-gnu/4.7/include/stdarg.h" 3 4
typedef __builtin_va_list __gnuc_va_list;
# 54 "/usr/include/libio.h" 2 3 4
# 170 "/usr/include/libio.h" 3 4
struct _IO_jump_t; struct _IO_FILE;
# 180 "/usr/include/libio.h" 3 4
typedef void _IO_lock_t;




struct _IO_marker {
  struct _IO_marker *_next;
  struct _IO_FILE *_sbuf;



  int _pos;
# 203 "/usr/include/libio.h" 3 4
};


enum __codecvt_result
{
  __codecvt_ok,
  __codecvt_partial,
  __codecvt_error,
  __codecvt_noconv
```

```
};
# 271 "/usr/include/libio.h" 3 4
struct _IO_FILE {
 int _flags;




 char* _IO_read_ptr;
 char* _IO_read_end;
 char* _IO_read_base;
 char* _IO_write_base;
 char* _IO_write_ptr;
 char* _IO_write_end;
 char* _IO_buf_base;
 char* _IO_buf_end;

 char *_IO_save_base;
 char *_IO_backup_base;
 char *_IO_save_end;

 struct _IO_marker *_markers;

 struct _IO_FILE *_chain;

 int _fileno;



 int _flags2;

 __off_t _old_offset;



 unsigned short _cur_column;
 signed char _vtable_offset;
 char _shortbuf[1];



 _IO_lock_t *_lock;
# 319 "/usr/include/libio.h" 3 4
 __off64_t _offset;
# 328 "/usr/include/libio.h" 3 4
```

```
  void *__pad1;
  void *__pad2;
  void *__pad3;
  void *__pad4;
  size_t __pad5;

  int _mode;

  char _unused2[15 * sizeof (int) - 4 * sizeof (void *) - sizeof (size_t)];

};


typedef struct _IO_FILE _IO_FILE;


struct _IO_FILE_plus;

extern struct _IO_FILE_plus _IO_2_1_stdin_;
extern struct _IO_FILE_plus _IO_2_1_stdout_;
extern struct _IO_FILE_plus _IO_2_1_stderr_;
# 364 "/usr/include/libio.h" 3 4
typedef __ssize_t __io_read_fn (void *__cookie, char *__buf, size_t __nbytes);




typedef __ssize_t __io_write_fn (void *__cookie, __const char *__buf,
      size_t __n);




typedef int __io_seek_fn (void *__cookie, __off64_t *__pos, int __w);


typedef int __io_close_fn (void *__cookie);
# 416 "/usr/include/libio.h" 3 4
extern int __underflow (_IO_FILE *);
```

```
extern int __uflow (_IO_FILE *);
extern int __overflow (_IO_FILE *, int);
# 460 "/usr/include/libio.h" 3 4
extern int _IO_getc (_IO_FILE *__fp);
extern int _IO_putc (int __c, _IO_FILE *__fp);
extern int _IO_feof (_IO_FILE *__fp) __attribute__ ((__nothrow__));
extern int _IO_ferror (_IO_FILE *__fp) __attribute__ ((__nothrow__));

extern int _IO_peekc_locked (_IO_FILE *__fp);




extern void _IO_flockfile (_IO_FILE *) __attribute__ ((__nothrow__));
extern void _IO_funlockfile (_IO_FILE *) __attribute__ ((__nothrow__));
extern int _IO_ftrylockfile (_IO_FILE *) __attribute__ ((__nothrow__));
# 490 "/usr/include/libio.h" 3 4
extern int _IO_vfscanf (_IO_FILE * __restrict, const char * __restrict,
    __gnuc_va_list, int *__restrict);
extern int _IO_vfprintf (_IO_FILE *__restrict, const char *__restrict,
        __gnuc_va_list);
extern __ssize_t _IO_padn (_IO_FILE *, int, __ssize_t);
extern size_t _IO_sgetn (_IO_FILE *, void *, size_t);

extern __off64_t _IO_seekoff (_IO_FILE *, __off64_t, int, int);
extern __off64_t _IO_seekpos (_IO_FILE *, __off64_t, int);

extern void _IO_free_backup_area (_IO_FILE *) __attribute__ ((__nothrow__));
# 76 "/usr/include/stdio.h" 2 3 4




typedef __gnuc_va_list va_list;
# 91 "/usr/include/stdio.h" 3 4
typedef __off_t off_t;
# 103 "/usr/include/stdio.h" 3 4
typedef __ssize_t ssize_t;
```

typedef _G_fpos_t fpos_t;

161 "/usr/include/stdio.h" 3 4
1 "/usr/include/x86_64-linux-gnu/bits/stdio_lim.h" 1 3 4
162 "/usr/include/stdio.h" 2 3 4

extern struct _IO_FILE *stdin;
extern struct _IO_FILE *stdout;
extern struct _IO_FILE *stderr;

extern int remove (__const char *__filename) __attribute__ ((__nothrow__));

extern int rename (__const char *__old, __const char *__new) __attribute__ ((__nothrow__));

extern int renameat (int __oldfd, __const char *__old, int __newfd,
        __const char *__new) __attribute__ ((__nothrow__));

extern FILE *tmpfile (void) ;
206 "/usr/include/stdio.h" 3 4
extern char *tmpnam (char *__s) __attribute__ ((__nothrow__)) ;

extern char *tmpnam_r (char *__s) __attribute__ ((__nothrow__)) ;
224 "/usr/include/stdio.h" 3 4
extern char *tempnam (__const char *__dir, __const char *__pfx)
        __attribute__ ((__nothrow__)) __attribute__ ((__malloc__)) ;

extern int fclose (FILE *__stream);

extern int fflush (FILE *__stream);

249 "/usr/include/stdio.h" 3 4
extern int fflush_unlocked (FILE *__stream);
263 "/usr/include/stdio.h" 3 4

extern FILE *fopen (__const char *__restrict __filename,
        __const char *__restrict __modes) ;

extern FILE *freopen (__const char *__restrict __filename,
        __const char *__restrict __modes,
        FILE *__restrict __stream) ;
292 "/usr/include/stdio.h" 3 4

303 "/usr/include/stdio.h" 3 4
extern FILE *fdopen (int __fd, __const char *__modes) __attribute__ ((__nothrow__)) ;
316 "/usr/include/stdio.h" 3 4
extern FILE *fmemopen (void *__s, size_t __len, __const char *__modes)

```
 __attribute__ ((__nothrow__)) ;




extern FILE *open_memstream (char **__bufloc, size_t *__sizeloc) __attribute__
((__nothrow__)) ;




extern void setbuf (FILE *__restrict __stream, char *__restrict __buf) __attribute__
((__nothrow__));




extern int setvbuf (FILE *__restrict __stream, char *__restrict __buf,
       int __modes, size_t __n) __attribute__ ((__nothrow__));




extern void setbuffer (FILE *__restrict __stream, char *__restrict __buf,
       size_t __size) __attribute__ ((__nothrow__));


extern void setlinebuf (FILE *__stream) __attribute__ ((__nothrow__));




extern int fprintf (FILE *__restrict __stream,
       __const char *__restrict __format, ...);




extern int printf (__const char *__restrict __format, ...);
```

```
extern int sprintf (char *__restrict __s,
       __const char *__restrict __format, ...) __attribute__ ((__nothrow__));




extern int vfprintf (FILE *__restrict __s, __const char *__restrict __format,
       __gnuc_va_list __arg);




extern int vprintf (__const char *__restrict __format, __gnuc_va_list __arg);

extern int vsprintf (char *__restrict __s, __const char *__restrict __format,
       __gnuc_va_list __arg) __attribute__ ((__nothrow__));




extern int snprintf (char *__restrict __s, size_t __maxlen,
       __const char *__restrict __format, ...)
       __attribute__ ((__nothrow__)) __attribute__ ((__format__ (__printf__, 3, 4)));

extern int vsnprintf (char *__restrict __s, size_t __maxlen,
       __const char *__restrict __format, __gnuc_va_list __arg)
       __attribute__ ((__nothrow__)) __attribute__ ((__format__ (__printf__, 3, 0)));

# 414 "/usr/include/stdio.h" 3 4
extern int vdprintf (int __fd, __const char *__restrict __fmt,
       __gnuc_va_list __arg)
       __attribute__ ((__format__ (__printf__, 2, 0)));
extern int dprintf (int __fd, __const char *__restrict __fmt, ...)
       __attribute__ ((__format__ (__printf__, 2, 3)));
```

```
extern int fscanf (FILE *__restrict __stream,
      __const char *__restrict __format, ...) ;




extern int scanf (__const char *__restrict __format, ...) ;

extern int sscanf (__const char *__restrict __s,
      __const char *__restrict __format, ...) __attribute__ ((__nothrow__));
# 445 "/usr/include/stdio.h" 3 4
extern int fscanf (FILE *__restrict __stream, __const char *__restrict __format, ...) __asm__ (""
"__isoc99_fscanf")


                      ;
extern int scanf (__const char *__restrict __format, ...) __asm__ ("" "__isoc99_scanf")
                      ;
extern int sscanf (__const char *__restrict __s, __const char *__restrict __format, ...) __asm__
("" "__isoc99_sscanf") __attribute__ ((__nothrow__))


          ;
# 465 "/usr/include/stdio.h" 3 4




extern int vfscanf (FILE *__restrict __s, __const char *__restrict __format,
      __gnuc_va_list __arg)
      __attribute__ ((__format__ (__scanf__, 2, 0))) ;




extern int vscanf (__const char *__restrict __format, __gnuc_va_list __arg)
      __attribute__ ((__format__ (__scanf__, 1, 0))) ;


extern int vsscanf (__const char *__restrict __s,
      __const char *__restrict __format, __gnuc_va_list __arg)
      __attribute__ ((__nothrow__)) __attribute__ ((__format__ (__scanf__, 2, 0)));
```

496 "/usr/include/stdio.h" 3 4
extern int vfscanf (FILE *__restrict __s, __const char *__restrict __format, __gnuc_va_list __arg)
__asm__ ("" "__isoc99_vfscanf")

        __attribute__ ((__format__ (__scanf__, 2, 0))) ;
extern int vscanf (__const char *__restrict __format, __gnuc_va_list __arg) __asm__ (""
"__isoc99_vscanf")

        __attribute__ ((__format__ (__scanf__, 1, 0))) ;
extern int vsscanf (__const char *__restrict __s, __const char *__restrict __format,
__gnuc_va_list __arg) __asm__ ("" "__isoc99_vsscanf") __attribute__ ((__nothrow__))

        __attribute__ ((__format__ (__scanf__, 2, 0)));
524 "/usr/include/stdio.h" 3 4

extern int fgetc (FILE *__stream);
extern int getc (FILE *__stream);

extern int getchar (void);

552 "/usr/include/stdio.h" 3 4
extern int getc_unlocked (FILE *__stream);
extern int getchar_unlocked (void);
563 "/usr/include/stdio.h" 3 4
extern int fgetc_unlocked (FILE *__stream);

```
extern int fputc (int __c, FILE *__stream);
extern int putc (int __c, FILE *__stream);
```

```
extern int putchar (int __c);
```

```
# 596 "/usr/include/stdio.h" 3 4
extern int fputc_unlocked (int __c, FILE *__stream);
```

```
extern int putc_unlocked (int __c, FILE *__stream);
extern int putchar_unlocked (int __c);
```

```
extern int getw (FILE *__stream);
```

```
extern int putw (int __w, FILE *__stream);
```

extern char *fgets (char *__restrict __s, int __n, FILE *__restrict __stream)
    ;

extern char *gets (char *__s) ;

658 "/usr/include/stdio.h" 3 4
extern __ssize_t __getdelim (char **__restrict __lineptr,
      size_t *__restrict __n, int __delimiter,
      FILE *__restrict __stream) ;
extern __ssize_t getdelim (char **__restrict __lineptr,
      size_t *__restrict __n, int __delimiter,
      FILE *__restrict __stream) ;

extern __ssize_t getline (char **__restrict __lineptr,
      size_t *__restrict __n,
      FILE *__restrict __stream) ;

extern int fputs (__const char *__restrict __s, FILE *__restrict __stream);

extern int puts (__const char *__s);

extern int ungetc (int __c, FILE *__stream);

extern size_t fread (void *__restrict __ptr, size_t __size,
    size_t __n, FILE *__restrict __stream) ;

extern size_t fwrite (__const void *__restrict __ptr, size_t __size,
    size_t __n, FILE *__restrict __s);

730 "/usr/include/stdio.h" 3 4
extern size_t fread_unlocked (void *__restrict __ptr, size_t __size,
    size_t __n, FILE *__restrict __stream) ;
extern size_t fwrite_unlocked (__const void *__restrict __ptr, size_t __size,
    size_t __n, FILE *__restrict __stream);

extern int fseek (FILE *__stream, long int __off, int __whence);

extern long int ftell (FILE *__stream) ;

extern void rewind (FILE *__stream);

766 "/usr/include/stdio.h" 3 4

extern int fseeko (FILE *__stream, __off_t __off, int __whence);

extern __off_t ftello (FILE *__stream) ;
785 "/usr/include/stdio.h" 3 4

extern int fgetpos (FILE *__restrict __stream, fpos_t *__restrict __pos);

extern int fsetpos (FILE *__stream, __const fpos_t *__pos);
808 "/usr/include/stdio.h" 3 4

817 "/usr/include/stdio.h" 3 4

extern void clearerr (FILE *__stream) __attribute__ ((__nothrow__));

extern int feof (FILE *__stream) __attribute__ ((__nothrow__)) ;

extern int ferror (FILE *__stream) __attribute__ ((__nothrow__)) ;

extern void clearerr_unlocked (FILE *__stream) __attribute__ ((__nothrow__));
extern int feof_unlocked (FILE *__stream) __attribute__ ((__nothrow__)) ;
extern int ferror_unlocked (FILE *__stream) __attribute__ ((__nothrow__)) ;

extern void perror (__const char *__s);

```
# 1 "/usr/include/x86_64-linux-gnu/bits/sys_errlist.h" 1 3 4
# 27 "/usr/include/x86_64-linux-gnu/bits/sys_errlist.h" 3 4
extern int sys_nerr;
extern __const char *__const sys_errlist[];
# 847 "/usr/include/stdio.h" 2 3 4




extern int fileno (FILE *__stream) __attribute__ ((__nothrow__)) ;




extern int fileno_unlocked (FILE *__stream) __attribute__ ((__nothrow__)) ;
# 866 "/usr/include/stdio.h" 3 4
extern FILE *popen (__const char *__command, __const char *__modes) ;




extern int pclose (FILE *__stream);




extern char *ctermid (char *__s) __attribute__ ((__nothrow__));
# 906 "/usr/include/stdio.h" 3 4
extern void flockfile (FILE *__stream) __attribute__ ((__nothrow__));




extern int ftrylockfile (FILE *__stream) __attribute__ ((__nothrow__)) ;


extern void funlockfile (FILE *__stream) __attribute__ ((__nothrow__));
# 936 "/usr/include/stdio.h" 3 4
```

```
# 2 "programa.c" 2
# 1 "/usr/include/string.h" 1 3 4
# 29 "/usr/include/string.h" 3 4
```

```
# 1 "/usr/lib/gcc/x86_64-linux-gnu/4.7/include/stddef.h" 1 3 4
# 35 "/usr/include/string.h" 2 3 4
```

```
extern void *memcpy (void *__restrict __dest,
        __const void *__restrict __src, size_t __n)
        __attribute__ ((__nothrow__)) __attribute__ ((__nonnull__ (1, 2)));
```

```
extern void *memmove (void *__dest, __const void *__src, size_t __n)
        __attribute__ ((__nothrow__)) __attribute__ ((__nonnull__ (1, 2)));
```

```
extern void *memccpy (void *__restrict __dest, __const void *__restrict __src,
        int __c, size_t __n)
        __attribute__ ((__nothrow__)) __attribute__ ((__nonnull__ (1, 2)));
```

```
extern void *memset (void *__s, int __c, size_t __n) __attribute__ ((__nothrow__)) __attribute__
((__nonnull__ (1)));
```

```
extern int memcmp (__const void *__s1, __const void *__s2, size_t __n)
      __attribute__ ((__nothrow__)) __attribute__ ((__pure__)) __attribute__ ((__nonnull__ (1,
2)));
# 95 "/usr/include/string.h" 3 4
extern void *memchr (__const void *__s, int __c, size_t __n)
      __attribute__ ((__nothrow__)) __attribute__ ((__pure__)) __attribute__ ((__nonnull__
(1)));


# 126 "/usr/include/string.h" 3 4


extern char *strcpy (char *__restrict __dest, __const char *__restrict __src)
      __attribute__ ((__nothrow__)) __attribute__ ((__nonnull__ (1, 2)));

extern char *strncpy (char *__restrict __dest,
      __const char *__restrict __src, size_t __n)
      __attribute__ ((__nothrow__)) __attribute__ ((__nonnull__ (1, 2)));


extern char *strcat (char *__restrict __dest, __const char *__restrict __src)
      __attribute__ ((__nothrow__)) __attribute__ ((__nonnull__ (1, 2)));

extern char *strncat (char *__restrict __dest, __const char *__restrict __src,
      size_t __n) __attribute__ ((__nothrow__)) __attribute__ ((__nonnull__ (1, 2)));


extern int strcmp (__const char *__s1, __const char *__s2)
      __attribute__ ((__nothrow__)) __attribute__ ((__pure__)) __attribute__ ((__nonnull__ (1,
2)));

extern int strncmp (__const char *__s1, __const char *__s2, size_t __n)
      __attribute__ ((__nothrow__)) __attribute__ ((__pure__)) __attribute__ ((__nonnull__ (1,
2)));


extern int strcoll (__const char *__s1, __const char *__s2)
      __attribute__ ((__nothrow__)) __attribute__ ((__pure__)) __attribute__ ((__nonnull__ (1,
2)));

extern size_t strxfrm (char *__restrict __dest,
      __const char *__restrict __src, size_t __n)
      __attribute__ ((__nothrow__)) __attribute__ ((__nonnull__ (2)));
```

```
# 1 "/usr/include/xlocale.h" 1 3 4
# 28 "/usr/include/xlocale.h" 3 4
typedef struct __locale_struct
{

  struct __locale_data *__locales[13];


  const unsigned short int *__ctype_b;
  const int *__ctype_tolower;
  const int *__ctype_toupper;


  const char *__names[13];
} *__locale_t;


typedef __locale_t locale_t;
# 163 "/usr/include/string.h" 2 3 4


extern int strcoll_l (__const char *__s1, __const char *__s2, __locale_t __l)
     __attribute__ ((__nothrow__)) __attribute__ ((__pure__)) __attribute__ ((__nonnull__ (1,
2, 3)));

extern size_t strxfrm_l (char *__dest, __const char *__src, size_t __n,
     __locale_t __l) __attribute__ ((__nothrow__)) __attribute__ ((__nonnull__ (2, 4)));




extern char *strdup (__const char *__s)
     __attribute__ ((__nothrow__)) __attribute__ ((__malloc__)) __attribute__ ((__nonnull__
(1)));
```

```
extern char *strndup (__const char *__string, size_t __n)
       __attribute__ ((__nothrow__)) __attribute__ ((__malloc__)) __attribute__ ((__nonnull__
(1)));
# 210 "/usr/include/string.h" 3 4

# 235 "/usr/include/string.h" 3 4
extern char *strchr (__const char *__s, int __c)
       __attribute__ ((__nothrow__)) __attribute__ ((__pure__)) __attribute__ ((__nonnull__
(1)));
# 262 "/usr/include/string.h" 3 4
extern char *strrchr (__const char *__s, int __c)
       __attribute__ ((__nothrow__)) __attribute__ ((__pure__)) __attribute__ ((__nonnull__
(1)));


# 281 "/usr/include/string.h" 3 4



extern size_t strcspn (__const char *__s, __const char *__reject)
      __attribute__ ((__nothrow__)) __attribute__ ((__pure__)) __attribute__ ((__nonnull__ (1,
2)));


extern size_t strspn (__const char *__s, __const char *__accept)
      __attribute__ ((__nothrow__)) __attribute__ ((__pure__)) __attribute__ ((__nonnull__ (1,
2)));
# 314 "/usr/include/string.h" 3 4
extern char *strpbrk (__const char *__s, __const char *__accept)
      __attribute__ ((__nothrow__)) __attribute__ ((__pure__)) __attribute__ ((__nonnull__ (1,
2)));
# 342 "/usr/include/string.h" 3 4
extern char *strstr (__const char *__haystack, __const char *__needle)
      __attribute__ ((__nothrow__)) __attribute__ ((__pure__)) __attribute__ ((__nonnull__ (1,
2)));



extern char *strtok (char *__restrict __s, __const char *__restrict __delim)
       __attribute__ ((__nothrow__)) __attribute__ ((__nonnull__ (2)));
```

```
extern char *__strtok_r (char *__restrict __s,
      __const char *__restrict __delim,
      char **__restrict __save_ptr)
      __attribute__ ((__nothrow__)) __attribute__ ((__nonnull__ (2, 3)));

extern char *strtok_r (char *__restrict __s, __const char *__restrict __delim,
      char **__restrict __save_ptr)
      __attribute__ ((__nothrow__)) __attribute__ ((__nonnull__ (2, 3)));
# 397 "/usr/include/string.h" 3 4


extern size_t strlen (__const char *__s)
      __attribute__ ((__nothrow__)) __attribute__ ((__pure__)) __attribute__ ((__nonnull__
(1)));




extern size_t strnlen (__const char *__string, size_t __maxlen)
      __attribute__ ((__nothrow__)) __attribute__ ((__pure__)) __attribute__ ((__nonnull__
(1)));




extern char *strerror (int __errnum) __attribute__ ((__nothrow__));

# 427 "/usr/include/string.h" 3 4
extern int strerror_r (int __errnum, char *__buf, size_t __buflen) __asm__ ("" "__xpg_strerror_r")
__attribute__ ((__nothrow__))

            __attribute__ ((__nonnull__ (2)));
# 445 "/usr/include/string.h" 3 4
extern char *strerror_l (int __errnum, __locale_t __l) __attribute__ ((__nothrow__));




extern void __bzero (void *__s, size_t __n) __attribute__ ((__nothrow__)) __attribute__
((__nonnull__ (1)));
```

```
extern void bcopy (__const void *__src, void *__dest, size_t __n)
      __attribute__ ((__nothrow__)) __attribute__ ((__nonnull__ (1, 2)));


extern void bzero (void *__s, size_t __n) __attribute__ ((__nothrow__)) __attribute__
((__nonnull__ (1)));


extern int bcmp (__const void *__s1, __const void *__s2, size_t __n)
      __attribute__ ((__nothrow__)) __attribute__ ((__pure__)) __attribute__ ((__nonnull__ (1,
2)));
# 489 "/usr/include/string.h" 3 4
extern char *index (__const char *__s, int __c)
      __attribute__ ((__nothrow__)) __attribute__ ((__pure__)) __attribute__ ((__nonnull__
(1)));
# 517 "/usr/include/string.h" 3 4
extern char *rindex (__const char *__s, int __c)
      __attribute__ ((__nothrow__)) __attribute__ ((__pure__)) __attribute__ ((__nonnull__
(1)));


extern int ffs (int __i) __attribute__ ((__nothrow__)) __attribute__ ((__const__));
# 536 "/usr/include/string.h" 3 4
extern int strcasecmp (__const char *__s1, __const char *__s2)
      __attribute__ ((__nothrow__)) __attribute__ ((__pure__)) __attribute__ ((__nonnull__ (1,
2)));


extern int strncasecmp (__const char *__s1, __const char *__s2, size_t __n)
      __attribute__ ((__nothrow__)) __attribute__ ((__pure__)) __attribute__ ((__nonnull__ (1,
2)));
# 559 "/usr/include/string.h" 3 4
extern char *strsep (char **__restrict __stringp,
      __const char *__restrict __delim)
      __attribute__ ((__nothrow__)) __attribute__ ((__nonnull__ (1, 2)));


extern char *strsignal (int __sig) __attribute__ ((__nothrow__));
```

```
extern char *__stpcpy (char *__restrict __dest, __const char *__restrict __src)
      __attribute__ ((__nothrow__)) __attribute__ ((__nonnull__ (1, 2)));
extern char *stpcpy (char *__restrict __dest, __const char *__restrict __src)
      __attribute__ ((__nothrow__)) __attribute__ ((__nonnull__ (1, 2)));



extern char *__stpncpy (char *__restrict __dest,
   __const char *__restrict __src, size_t __n)
      __attribute__ ((__nothrow__)) __attribute__ ((__nonnull__ (1, 2)));
extern char *stpncpy (char *__restrict __dest,
      __const char *__restrict __src, size_t __n)
      __attribute__ ((__nothrow__)) __attribute__ ((__nonnull__ (1, 2)));
# 646 "/usr/include/string.h" 3 4

# 3 "programa.c" 2


int main(int argc, char const *argv[])
{
 char cadena[100] = "Me llamo Jose Angel";
 char cadena2[100];
 printf("Cadena original : %s\n",cadena );
 int len = strlen(cadena);
 for(int i= 0 ;i<len;i++){
  cadena2[i] = cadena[len -i -1];
 }
 printf("Cadena volteada %s\n",cadena2 );
 return 0;
}
```

Básicamente es el programa ya con todas las librerías y variables añadidas

4. ¿Qué pasa cuando aplicamos cpp programa.c>programa.pp?

Pasa lo mismo que el comando anterior pues cpp es C preprocessor

5. El archivo programa.s es la salida de aplicar el comando gcc -S programa.c. ¿Qué contiene ese archivo?

```
            .file   "programa.c"
   .section    .rodata
.LC0:
   .string    "Cadena original : %s\n"
.LC1:
   .string    "Cadena volteada %s\n"
```

```
    .text
    .globl    main
    .type     main, @function
main:
.LFB0:
    .cfi_startproc
    pushq    %rbp
    .cfi_def_cfa_offset 16
    .cfi_offset 6, -16
    movq     %rsp, %rbp
    .cfi_def_cfa_register 6
    subq     $240, %rsp
    movl     %edi, -228(%rbp)
    movq     %rsi, -240(%rbp)
    movl     $1814062413, -112(%rbp)
    movl     $1869439340, -108(%rbp)
    movl     $1936673312, -104(%rbp)
    movl     $1849761893, -100(%rbp)
    movq     $7103847, -96(%rbp)
    leaq     -88(%rbp), %rdx
    movl     $0, %eax
    movl     $9, %ecx
    movq     %rdx, %rdi
    rep stosq
    movq     %rdi, %rdx
    movl     %eax, (%rdx)
    addq     $4, %rdx
    leaq     -112(%rbp), %rax
    movq     %rax, %rsi
    movl     $.LC0, %edi
    movl     $0, %eax
    call     printf
    leaq     -112(%rbp), %rax
    movq     %rax, %rdi
    call     strlen
    movl     %eax, -8(%rbp)
    movl     $0, -4(%rbp)
    movl     $0, -4(%rbp)
    jmp      .L2
.L3:
    movl     -4(%rbp), %eax
    movl     -8(%rbp), %edx
    movl     %edx, %ecx
    subl     %eax, %ecx
    movl     %ecx, %eax
```

```
    subl    $1, %eax
    cltq
    movzbl   -112(%rbp,%rax), %edx
    movl    -4(%rbp), %eax
    cltq
    movb    %dl, -224(%rbp,%rax)
    addl    $1, -4(%rbp)
.L2:
    movl    -4(%rbp), %eax
    cmpl    -8(%rbp), %eax
    jl    .L3
    leaq    -224(%rbp), %rax
    movq    %rax, %rsi
    movl    $.LC1, %edi
    movl    $0, %eax
    call    printf
    movl    $0, %eax
    leave
    .cfi_def_cfa 7, 8
    ret
    .cfi_endproc
.LFE0:
    .size    main, .-main
    .ident    "GCC: (Debian 4.7.2-5) 4.7.2"
    .section    .note.GNU-stack,"",@progbits
```
Contiene el código máquina de nuestro programa.

6. El comando as programa.s -o programa.o ¿Qué da como resultado?

Un archivo tipo o, que significa que es un archivo que contiene código objeto enlazable.

7. ld programa.o -o programa ¿Qué nos arroja en la salida?

Una advertencia, pero se supone enlaza en código objeto relocalizable

8. Relacione cada uno de los comandos con las etapas del sistema de procesamiento.

- cpp programa.c > programa.pp: es la primera fase del procesamiento de nuestro código, aquí sale el mismo código fuente, pero con vario código extra
- gcc -S programa.c: esta es la salida del paso de compilación, tiene código ensamblador que va de acuerdo a nuestra arquitectura.
- as programa.s -o programa.o: ensambla el código ensamblador que viene de compilación y genera el código objeto localizable.
- ld programa.o -o programa: Lleva el código máquina a su destino en memoria, le asocia direcciones de memoria absoluta

9. ¿Cómo se compila en un solo paso utilizando gcc?

con el siguiente comando : gcc <archivo>.c -o <nombredelejecutabledeseado>

10. Escriba sus conclusiones.

La práctica me ha ayudado a entender los diferentes procesos que se llevan a cabo en la compilación de un programa, así como las salidas y entradas de estos procesos, es muy interesante observar cómo cambia el código máquina dependiendo de la arquitectura, en este caso se presentan diferencias entre intel y amd.

GCC no es un programa que hace todo como tal, son programas en conjunto los que compilan el código, y eso me quedó claro al utilizar los comandos ld, as y cpp.