Strings

Advanced C

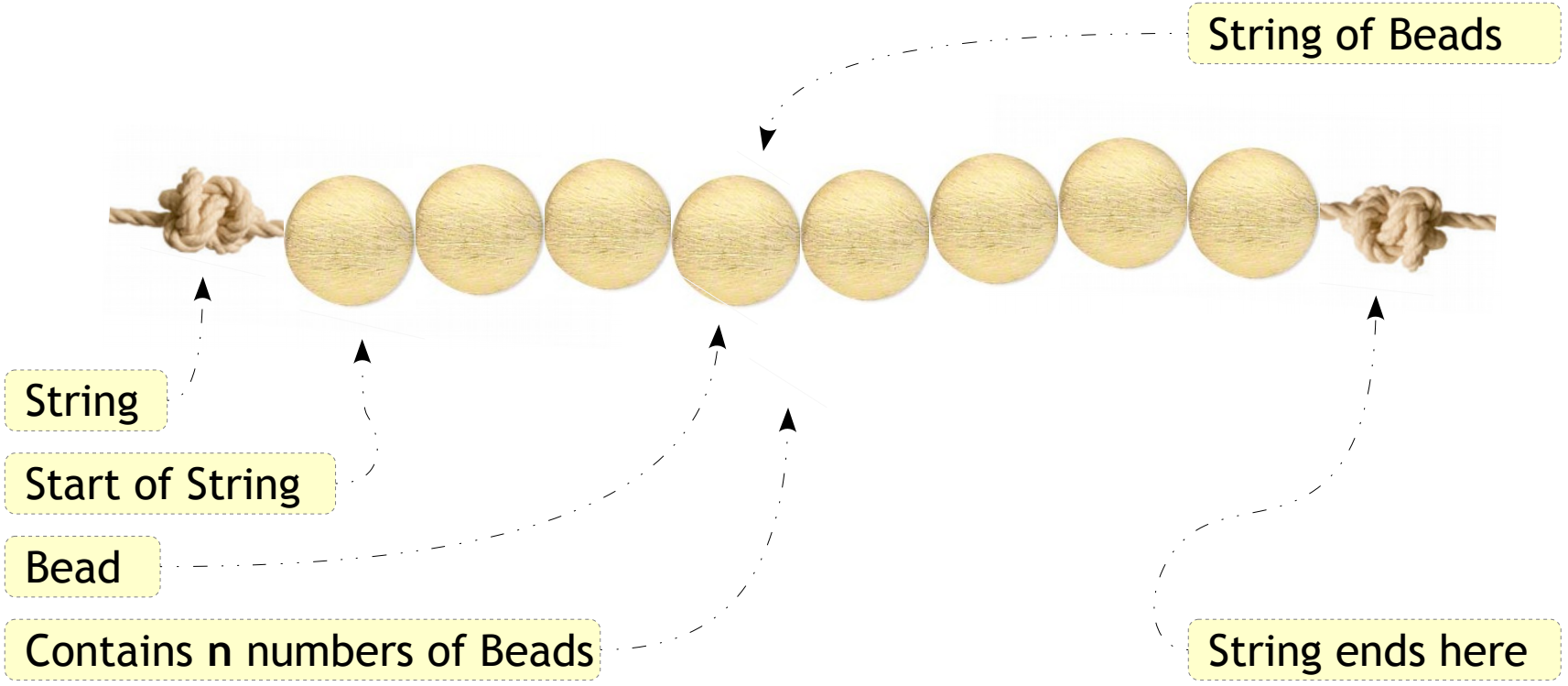
S_____s - Fill in the blanks please ;)

Advanced C

Strings

A set of things tied or threaded together on a thin cord

Source: Google



EMERTXE

Advanced C

Strings

- Contiguous sequence of characters
- Stores printable ASCII characters and its extensions
- End of the string is marked with a special character, the null character '\0'
- '\0' is implicit in strings enclosed with “”
- Example

“You know, now this is what a string is!”

Advanced C

Strings

- Constant string
  - Also known as string literal
  - Such strings are read only
  - Usually, stored in read only (code or text segment) area
  - String literals are shared
- Modifiable String
  - Strings that can be modified at run time
  - Usually, such strings are stored in modifiable memory area (data segment, stack or heap)
  - Such strings are not shared

Advanced C

Strings - Initialization

001_example.c

```c
char char_array[5] = {'H', 'E', 'L', 'L', 'O'};
```
Character Array

```c
char str1[6] = {'H', 'E', 'L', 'L', 'O', '\0'};
```
String

```c
char str2[] = {'H', 'E', 'L', 'L', 'O', '\0'};
```
Valid

```c
char str3[6] = {"H", "E", "L", "L", "O"};
```
Invalid

```c
char str4[6] = {"H" "E" "L" "L" "O"};
```
Valid

```c
char str5[6] = {"HELLO"};
```
Valid

```c
char str6[6] = "HELLO";
```
Valid

```c
char str7[] = "HELLO";
```
Valid

```c
char *str8 = "HELLO";
```
Valid

Advanced C

Strings - Memory Allocation

Example

```
char str1[] = {'H', 'E', 'L', 'L', 'O', '\0'};
char *str2 = "Hello";
```

EMERTXE

Advanced C

Strings - Size

002_example.c

```c
#include <stdio.h>

int main()
{
    char char_array_1[5] = {'H', 'E', 'L', 'L', 'O'};
    char char_array_2[] = "Hello";

    sizeof(char_array_1);
    sizeof(char_array_2);

    return 0;
}
```

The size of the array is calculated so,

5, 6

003_example.c

```c
int main()
{
    char *str = "Hello";

    sizeof(str);

    return 0;
}
```

The size of pointer is always constant so,
4 (32 Bit Sys)

Advanced C

Strings - Size

004_example.c

```c
#include <stdio.h>

int main()
{
    if (sizeof("Hello" "World") == sizeof("Hello") + sizeof("World"))
    {
        printf("WoW\n");
    }
    else
    {
        printf("HuH\n");
    }

    return 0;
}
```

Advanced C

Strings - Manipulations

005_example.c

```c
#include <stdio.h>

int main()
{
    char str1[6] = "Hello";
    char str2[6];

    str2 = "World";

    char *str3 = "Hello";
    char *str4;

    str4 = "World";

    str1[0] = 'h';

    str3[0] = 'w';

    printf("%s\n", str1);
    printf("%s\n", str2);

    return 0;
}
```

Not possible to assign a string to a array since its a constant pointer

Possible to assign a string to a pointer since its variable

Valid. str1 contains "hello"

Invalid. str3 might be stored in read only section.
Undefined behaviour

Advanced C

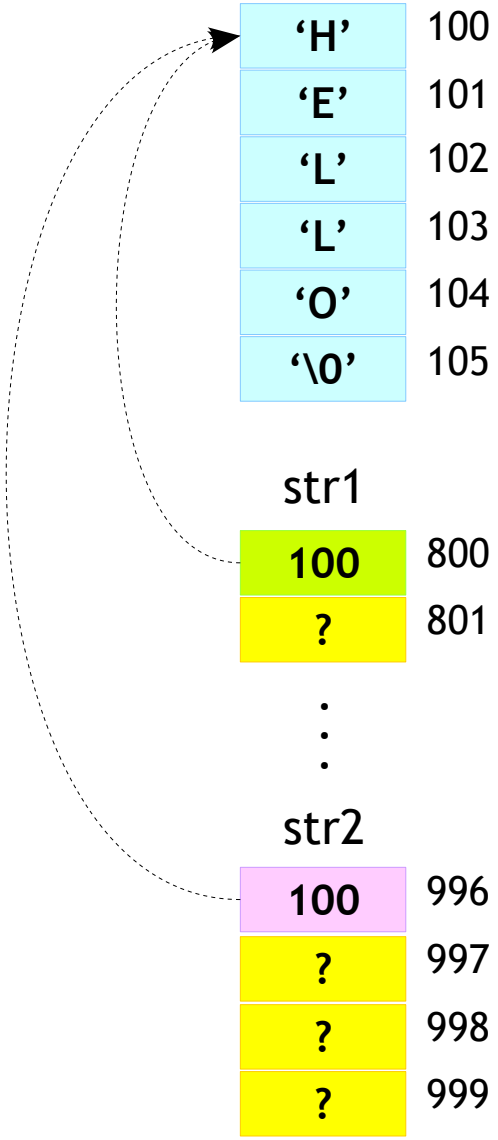
Strings - Sharing

006_example.c

```c
#include <stdio.h>

int main()
{
    char *str1 = "Hello";
    char *str2 = "Hello";

    if (str1 == str2)
    {
        printf("Hoo. They share same space\n");
    }
    else
    {
        printf("No. They are in different space\n");
    }

    return 0;
}
```

Advanced C

Strings - Sharing



Advanced C

Strings - Empty String

007_example.c

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

int main()
{
    char *str = "";
    int ret;

    ret = strlen(str);
    printf("%d\n", ret);

    return 0;
}
```

Advanced C

Strings - Passing to Function

008_example.c

```c
#include <stdio.h>

void print(const char *str)
{
    while (*str)
    {
        putchar(*str++);
    }
}

int main()
{
    char *str = "Hello World";

    print(str);

    return 0;
}
```

Advanced C

Strings - Reading

009_example.c

```c
#include <stdio.h>

int main()
{
    char str[6];

    gets(str);
    printf("The string is: %s\n", str);

    return 0;
}
```

- The above method is not recommend by the gcc. Will issue warning while compilation
- Might lead to stack smashing if the input length is greater than array size!!

EMERTXE

Advanced C

Strings - Reading

010_example.c

```c
#include <stdio.h>

int main()
{
    char str[6];

    fgets(str, 6, stdin);
    printf("The string is: %s\n", str);

    scanf("%5[^\n]", str);
    printf("The string is: %s\n", str);

    return 0;
}
```

- fgets() function or selective scan with width are recommended to read string from the user

Advanced C

Strings - DIY

- WAP to calculate length of the string
- WAP to copy a string
- WAP to compare two strings
- WAP to compare two strings ignoring case
- WAP to check a given string is palindrome or not

Advanced C

Strings – Library Functions

Purpose	Prototype	Return Values
Length	**size_t strlen(const char *str)**	String Length
Compare	**int strcmp(const char *str1, const char *str2)**	str1 < str2 → < 0 str1 > str2 → > 0 str1 = str2 → = 0
Copy	**char *strcpy(char *dest, const char *src)**	Pointer to dest
Check String	**char *strstr(const char *haystack, const char *needle)**	Pointer to the beginning of substring
Check Character	**char *strchr(const char *s, int c)**	Pointer to the matched char else NULL
Merge	**char *strcat(char *dest, const char *src)**	Pointer to dest

Advanced C

Strings - Quiz

- Can we copy 2 strings like, str1 = str2?
- Why don't we pass the size of the string to string functions?
- What will happen if you overwrite the '\0' (null character) of string? Will you still call it a string?
- What is the difference between char *s and char s[]?

Advanced C

Strings – Quiz – Pointer vs Array

Pointer	Array
A single variable designed to store address	A bunch of variables; Each variable is accessed through index number
Size of pointer depends on size of address (Ex - 32 bit or 64 bit)	Size of Array depends on number of elements and their type
Pointer is a lvalue - • Pointers **can be modified** (can be incremented/decremented or new addresses can be stored)	Array name is not lvalue - • Array name represents either whole array (when operand to sizeof operator) or base address (address of first element in the array) • **Can't be modified** (Array can't be incremented/decremented or base address can't be changed)

Advanced C

Strings – DIY

- WAP to reverse a string
- WAP to compare string2 with string1 up to n characters
- WAP to concatenate two strings

Advanced C

Strings - DIY

- Use the standard string functions like
  - strlen
  - strcpy
  - strcmp
  - strcat
  - strstr
  - strtok

Advanced C

Strings – DIY

- WAP to print user information –
  - Read : Name, Age, ID, Mobile number
  - Print the information on monitor
  - Print error “Invalid Mobile Number” if length of mobile number is not 10
- WAP to read user name and password and compare with stored fields. Present a puzzle to fill in the banks
- Use strtok to separate words from string “www.emertxe.com/bangalore”