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| <pre> /**  * length - counts the number of characters <b>in</b> a string  * @param x0: pointer to the string to count  * @param x1: maximum number of characters to count  * @return x0: number of characters counted, including null terminator  *  * This <b>function</b> counts the number of characters <b>in</b> a string pointed to by x0, u  * p  * to a maximum of x1 characters. The count includes the null terminator. If the  * string is longer than x1 characters, the <b>function</b> stops counting at x1  * characters.  *  * Registers used: x0, x1, x2, x3, w3  * Registers saved: x19-x30, lr  */  .text .global length  // Entry point <b>for</b> the 'length' subroutine length:     // Point to the first byte of the string to count     mov x7, x0      // Initialize the counter to zero     mov x2, #0  // Top of the loop to count characters top:     // Load the <b>next</b> byte of the string and update the pointer     ldrb w1, [x7], #1      // Check <b>if</b> the byte is the null terminator     cmp w1, #0      // If the byte is the null terminator, jump to the bottom of the loop     b.eq bottom      // Increment the counter by one     add x2, x2, #1      // Jump back to the top of the loop     b top  // Bottom of the loop to <b>return</b> the length bottom:     // Return the length of the string, including the null terminator     mov x0, x2     ret lr  // Entry point <b>for</b> the 'substring' subroutine sstr:     // Save the necessary registers on the stack     stp x0, x1, [sp, #-16]!      // Compute the length of the substring     sub x0, x2, x1      // Save the length and the original string pointer on the stack     stp x2, x0, [sp, #-16]!      // Call 'malloc' to allocate memory <b>for</b> the substring </pre> |          |          |

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| <pre>     bl malloc      // Restore the length and the original string pointer from the stack     ldp x2, x5, [sp], #16      // Restore the <b>return</b> address and the start index of the substring from the     stack     ldp x4, x1, [sp], #16      // Save the pointer to the substring on the stack     str x0, [sp, #-16]!  // End of the loop to copy characters from the original string to the substring end:     // Check <b>if</b> we've copied the desired number of characters     cmp x5, #0      // If we've copied all the characters, <b>return</b> from the subroutine     b.eq <b>return</b>      // Load the <b>next</b> byte from the original string and store it <b>in</b> the substring     ldrb w6, [x4], #1     strb w6, [x0], #1      // Decrement the counter and jump back to the top of the loop     sub x5, x5, #1     b end  // Return from the 'substring' subroutine <b>return</b>:     // Restore the pointer to the substring from the stack     ldr x0, [sp], #16      // Return the pointer to the substring     ret lr </pre> |          |          |