Programming with C I

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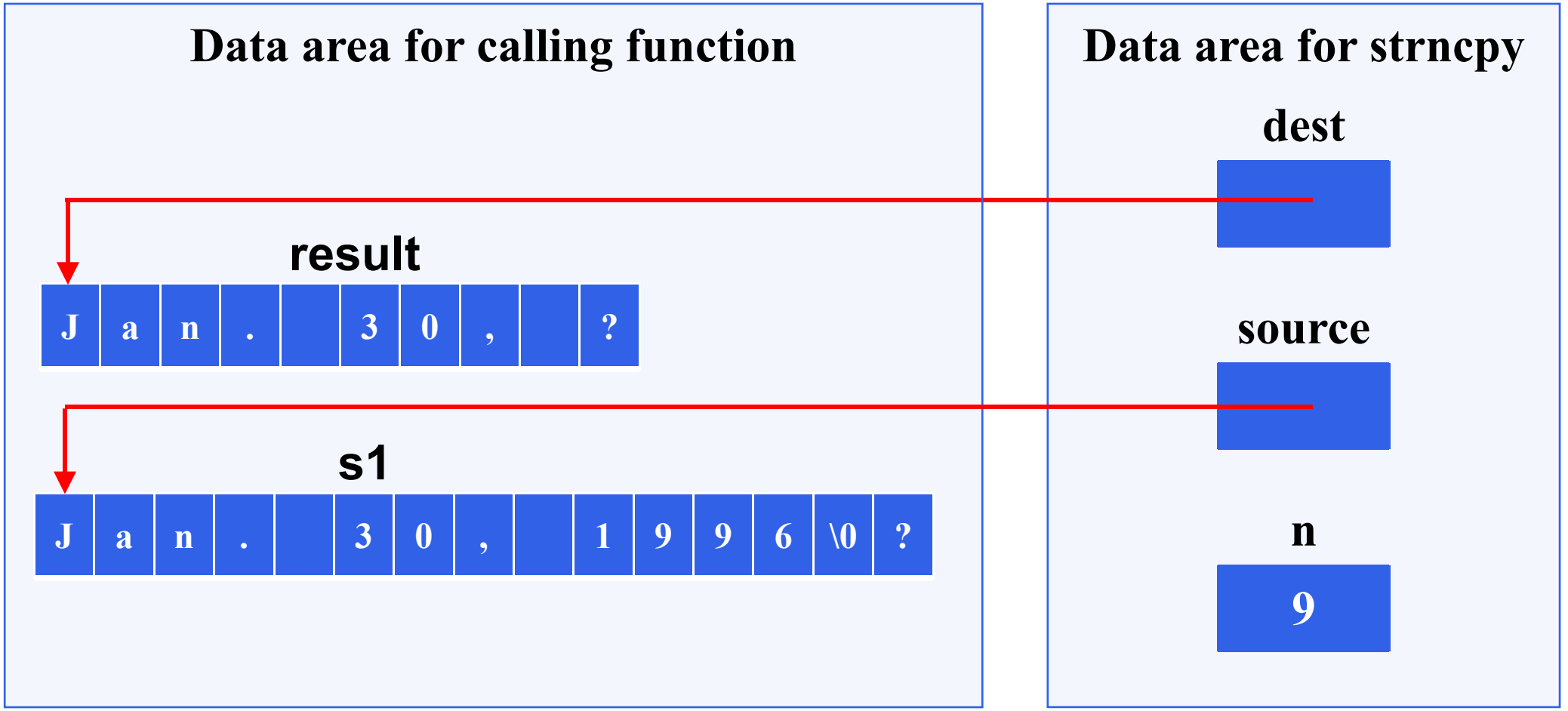
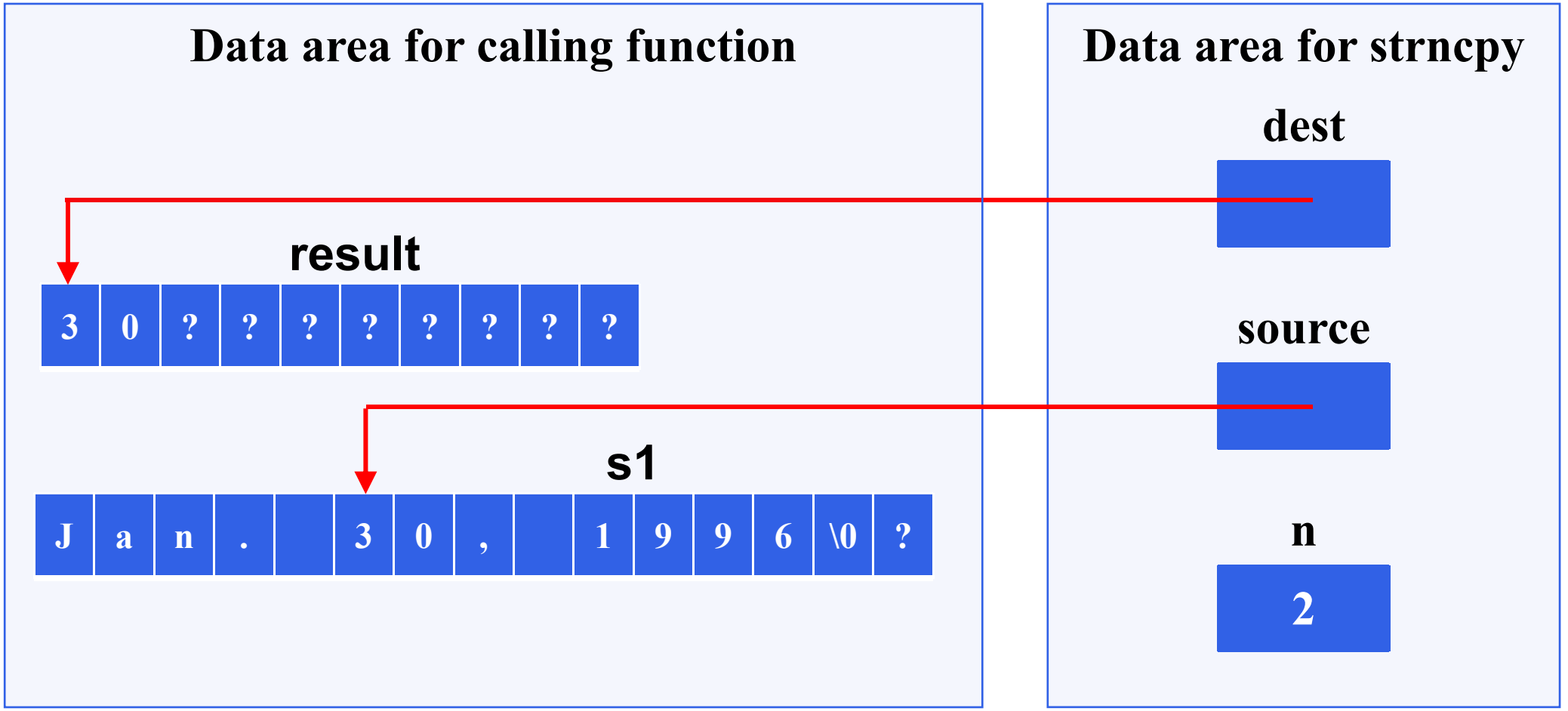
Substrings

Figure Execution of strncpy(result, s1, 9);



Substrings

Figure Execution of strncpy(result, &s1[5], 2);



Substrings

```
char last  [20], first  [20], middle  [20];
char pres[20] = “Adams, John Quincy”;
```

```
strncpy (last, pres, 5);
last[5] = ’\0’;
```

```
strncpy (first, &pres[7], 4);
first[4] = ’\0’;
```

```
strcpy (middle, &pres[12]);
```

J	o	h	n	\0	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?

Buffer Overflow

- more data is stored in an array than its declared size allows
- a very dangerous condition
- unlikely to be flagged as an error by either the compiler or the run-time system

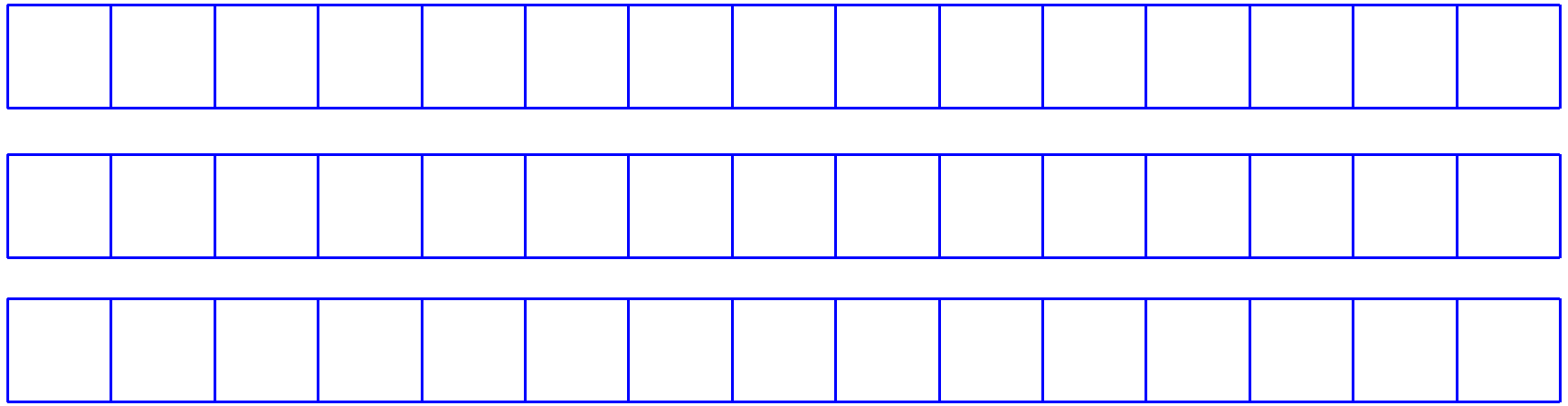
char string[8] = “hello world”;

Concatenation

- **strcat**
  - appends source to the end of dest
  - assumes that sufficient space is allocated for the first argument to allow addition of the extra characters
    - s1[100] = “hello”;
    - strcat(s1, “and more”);

Concatenation

```
char k1[15] = “John “,
        k2[15] = “Jacqueline “,
        last[15] = “Kennedy”;
strcat(k1,last);
strcat(k2,last);
```



Concatenation

```
char k1[15] = “John “,
        k2[15] = “Jacqueline “,
        last[15] = “Kennedy”;
strcat(k1,last);
strcat(k2,last);
```

J	**o**	**h**	**n**		**\0**									

J	**a**	**c**	**q**	**u**	**e**	**l**	**i**	**n**	**e**		**\0**			

K	**e**	**n**	**n**	**e**	**d**	**y**	**\0**							

Concatenation

```
char k1[15] = “John “,
        k2[15] = “Jacqueline “,
        last[15] = “Kennedy”;
strcat(k1,last);
strcat(k2,last);
```

J	**o**	**h**	**n**		**K**	**e**	**n**	**n**	**e**	**d**	**y**	**\0**		

J	**a**	**c**	**q**	**u**	**e**	**l**	**i**	**n**	**e**		**\0**			

K	**e**	**n**	**n**	**e**	**d**	**y**	**\0**							

Concatenation

```
char k1[15] = “John “,
        k2[15] = “Jacqueline “,
        last[15] = “Kennedy”;
strcat(k1,last);
strcat(k2,last);
```

overflow!

J	o	h	n		K	e	n	n	e	d	y	\0		

J	a	c	q	u	e	l	i	n	e		K	e	n	n

K	e	n	n	e	d	y	\0							

Concatenation

- **strncat**
  - appends up to n characters of source to the end of dest, adding the null character if necessary
  - assumes that sufficient space is allocated for the first argument to allow addition of the extra characters
    - S1[100] = “hello”;
    - strncat(s1, “and more”, 5);

THE END

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