

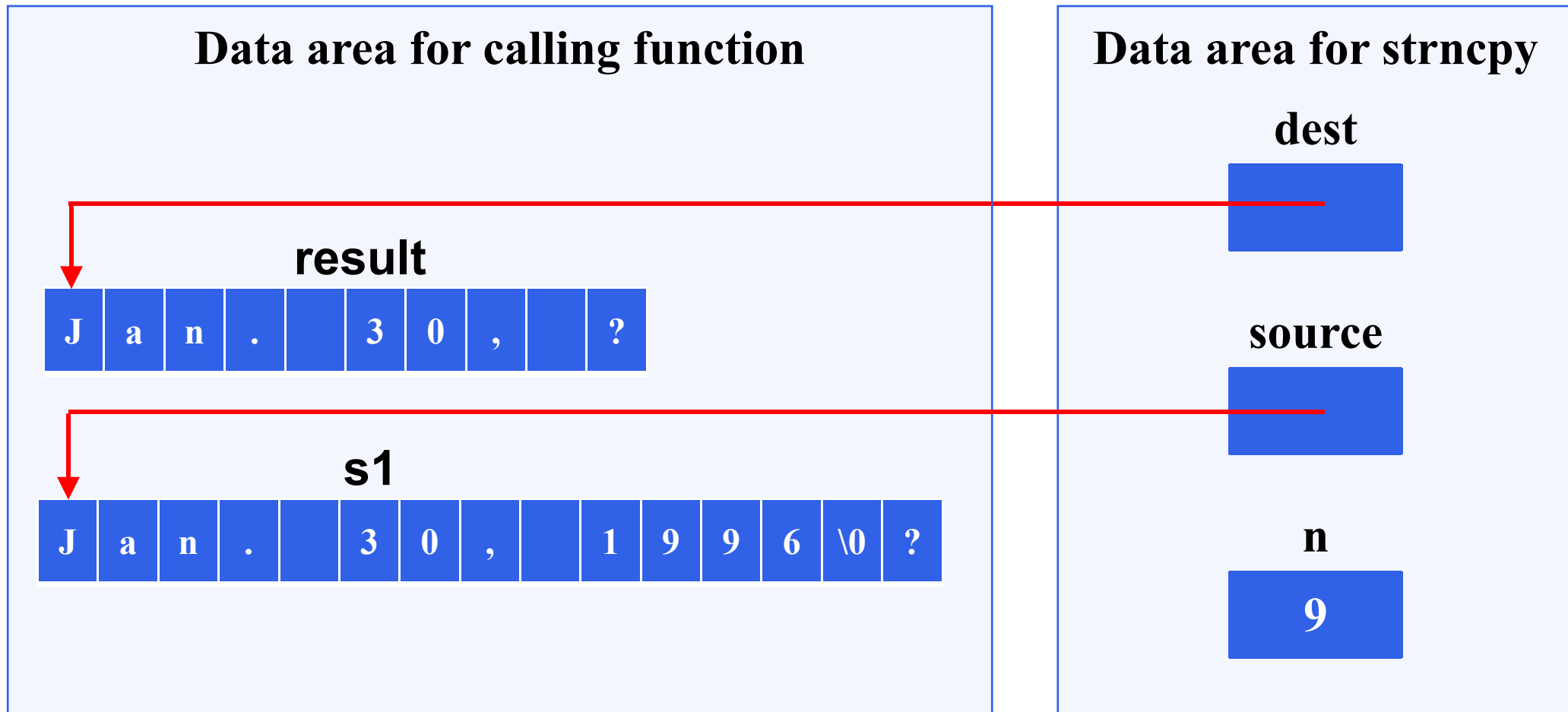
# Programming with C I

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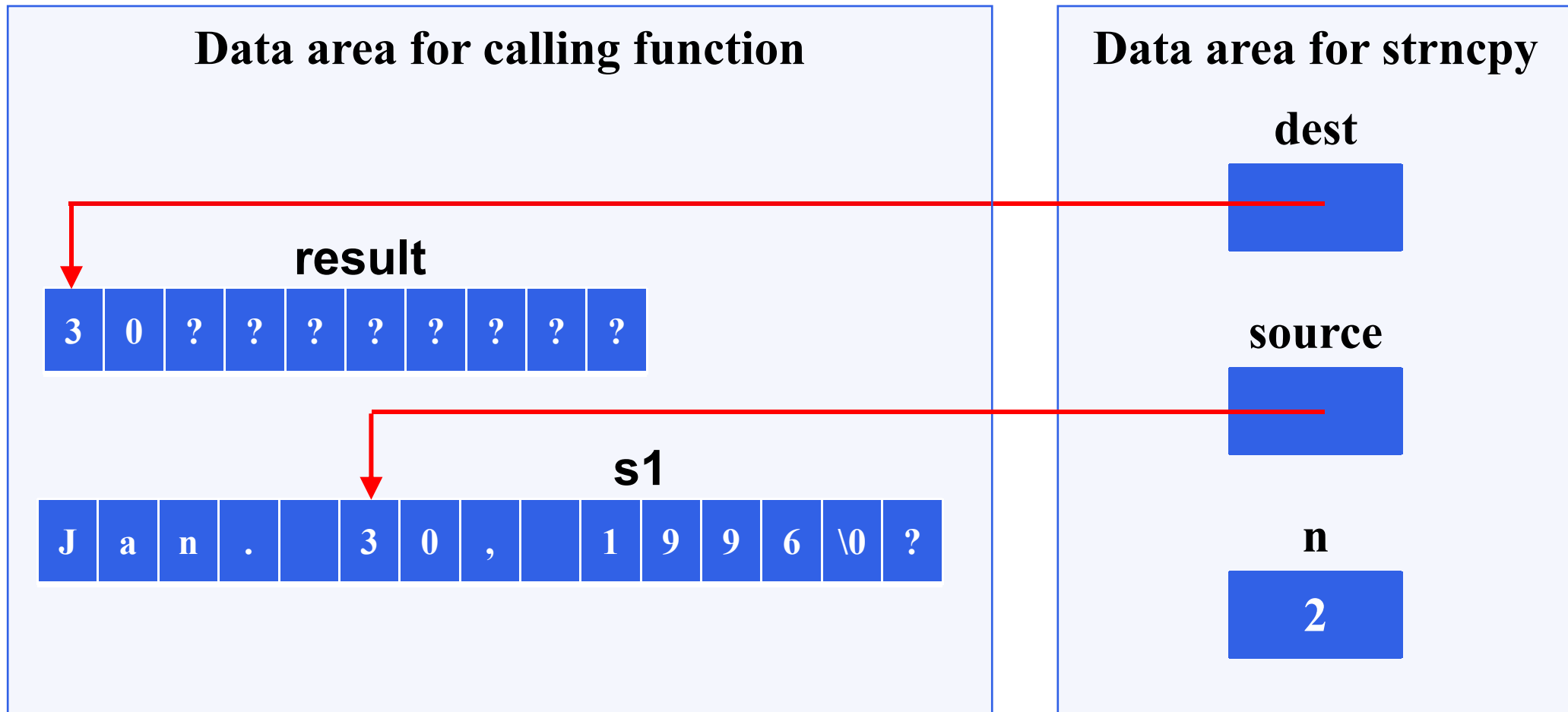
# Substrings

**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';

strcpy (middle, &pres[12]);

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

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";**

h	e	l	l	o		w	o	r	l	d	\0
---	---	---	---	---	--	---	---	---	---	---	----

# 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 = "hello";`  
➤ `strcat(s1, "and more");`

h	e	l	l	o	a	n	d		m	o	r	e	\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 = "hello";`

➤ `strncat(s1, "and more", 5);`

h	e	l	l	o	a	n	d		m	\0	?
---	---	---	---	---	---	---	---	--	---	----	---

# Concatenation

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




# Concatenation

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char k1[15] = "John ",  
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```

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

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

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

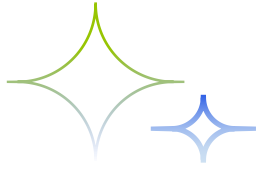
K	e	n	n	e	d	y	\0							
---	---	---	---	---	---	---	----	--	--	--	--	--	--	--

# Concatenation

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```

**overflow!**

e	d	y	\0		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							



# THE END

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