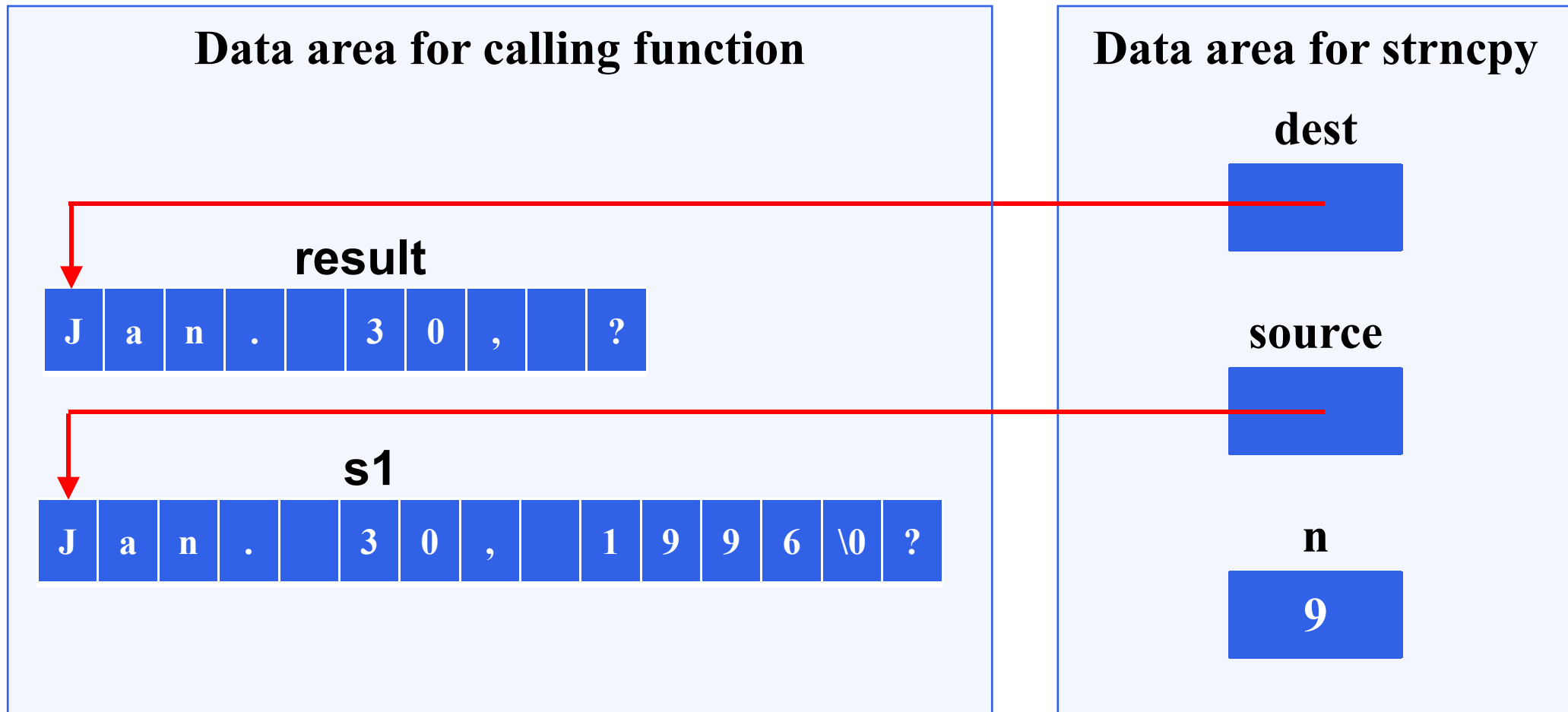# Programming with C I

Fangtian Zhong
CSCI 112

Gianforte School of Computing
Norm Asbjornson College of Engineering
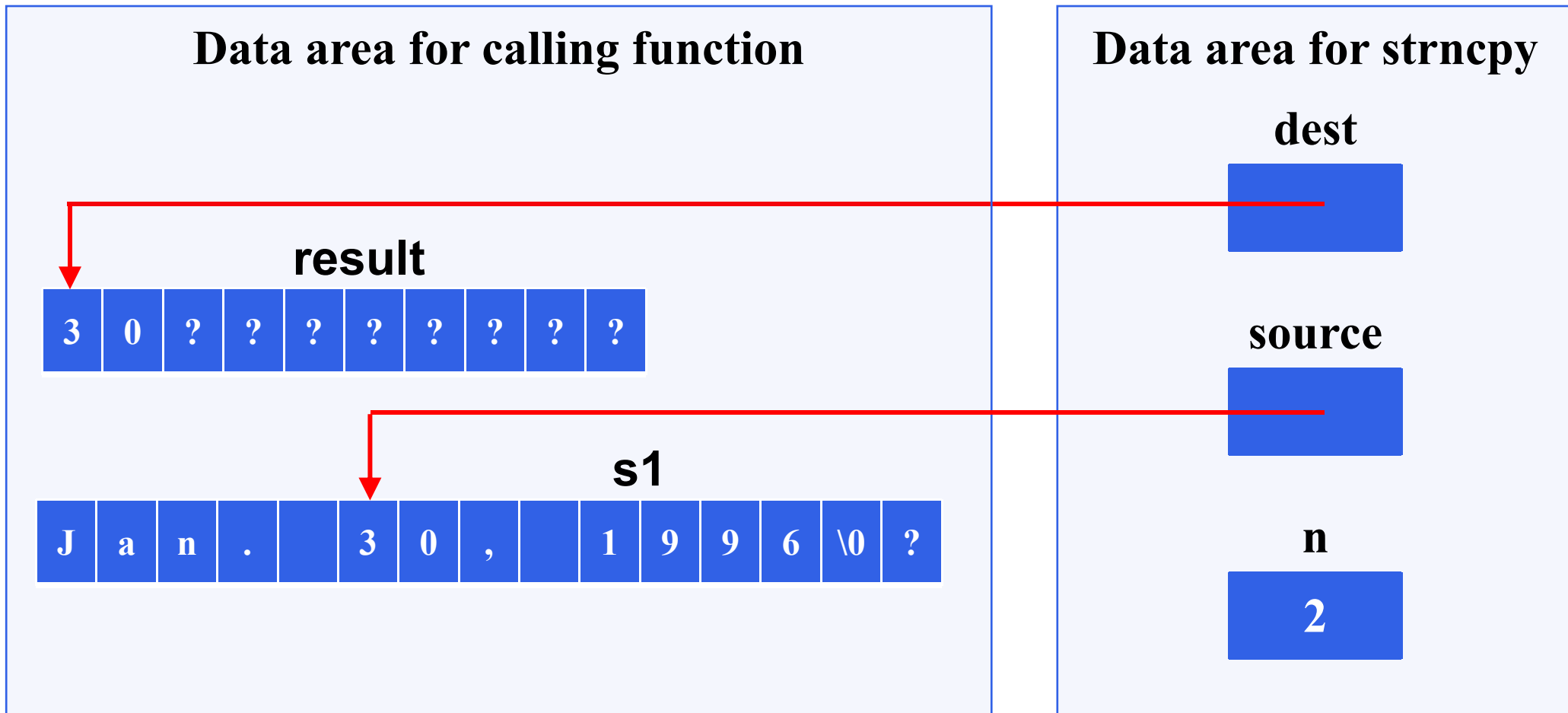E-mail: fangtian.zhong@montana.edu

2024.03.06

Substrings

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

Data area for calling function

Data area for strncpy

dest

result

| J | a | n | . | | 3 | 0 | , | | ? |

source

s1

| J | a | n | . | | 3 | 0 | , | | 1 | 9 | 9 | 6 | \0 | ? |

n

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";

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

Concatenation

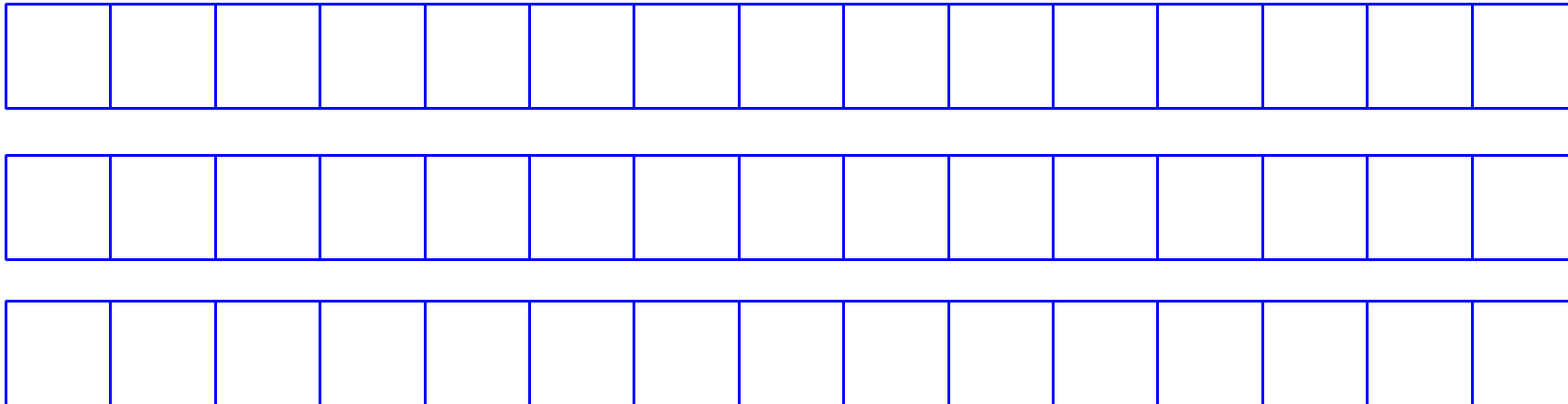### strcat

- 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

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

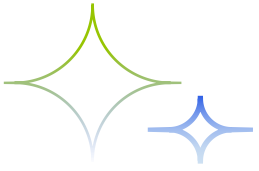| K	e	n	n	e	d	y	\0							

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 = "hello";
  ➢ strncat(s1, "and more", 5);

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

THE END

Fangtian Zhong
CSCI 112

Gianforte School of Computing
Norm Asbjornson College of Engineering
E-mail: fangtian.zhong@montana.edu

2024.03.06