EE 200 Lecture 2:
Reading code + types

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Tufts
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Quiz review

- Everyone did pretty well

- Please don't delete anything in the file (e.g., "(string), (int)")

Office hours

- Monday 10:30-12:30pm

- Tuesday 3-5pm

- Thursday 3-4pm (walking OH)

Piazza

https://piazza.com/tufts/fall2019/ee200

```c
int isPositive(int x)
{
    return(x >= 0);
}

int makePositive(int x)
{
    int val = x;
    if(!isPositive(val))
        val = -val;
    }
    return(val);
}

int main()
{
    int x = -5;
    printf("The value is: %d\n", makePositive(x));
}
```

main
| x |

makePositive
| x |
| val |

isPositive
| x |

```
int main(int argc, char* argv[])
{
  int i = 0;
  while(i < 5){
    printf("%d\n", i++);
  }
  printf("\n\n");

  i = 0;
  while(i < 5){
    printf("%d\n", ++i);
  }
}
```

What gets printed?

```c
const int PLAY = 0;
const int REWIND = 1;
const int FAST_FORWARD = 2;
const int STOP = 3;

void main(void)
{
    int mode = REWIND;
    int playing;

    switch(mode){
        case default:
        case REWIND:
        case FAST_FORWARD:
        case STOP:
          playing = 0;
        case PLAY:
          playing = 1;
    }
```

```c
    if(playing){
        printf("start the music!\n");
    }
    else{
        printf("stop the music!\n");
    }
}
```

What gets printed?

enum

Creates a new type with a restricted set of named values

```c
const int PLAY = 0;
const int REWIND = 1;
const int FAST_FORWARD = 2;
const int STOP = 3;

void main(void)
{
    int mode = REWIND;
    int playing;

    switch(mode){
        case default:
        case REWIND:
        case FAST_FORWARD:
        case STOP:
          playing = 0;
```

```c
enum mode_t {
    PLAY,
    REWIND,
    FAST_FORWARD,
    STOP
};

void main(void)
{
    mode_t mode = REWIND;
    int playing;

    switch(mode){
        case default:
        case REWIND:
        case FAST_FORWARD:
```

```c
const int THRESHOLD = 1000;

int doStuffToBigOnes(int values[], int len)
{
    for(int i = 0; i < len; i++){
        if(values[i] < THRESHOLD){
            continue;
        }

        // Do lots of stuff with the value, now that we know it's big

    }
}
```

```
int checkIt(int thingToCheck)
{
    int test1 = 0;
    int test2 = 0;

    if(thingToCheck == 5)
        test1 = 0;
        test2 = 1;
    if(thingToCheck == 7)
        test1 = 1;


    return(test1 || test2);
}
```

What does this return for various values of **thingToCheck()** ?

# Bad code in the wild

```
static OSStatus
SSLVerifySignedServerKeyExchange(SSLContext *ctx, bool isRsa, SSLBuffer signedParams,
                                  uint8_t *signature, UInt16 signatureLen)
{
    OSStatus        err;
    ...

    if ((err = SSLHashSHA1.update(&hashCtx, &serverRandom)) != 0)
        goto fail;
    if ((err = SSLHashSHA1.update(&hashCtx, &signedParams)) != 0)
        goto fail;
        goto fail;
    if ((err = SSLHashSHA1.final(&hashCtx, &hashOut)) != 0)
        goto fail;
    ...

fail:
    SSLFreeBuffer(&signedHashes);
    SSLFreeBuffer(&hashCtx);
    return err;
}
```
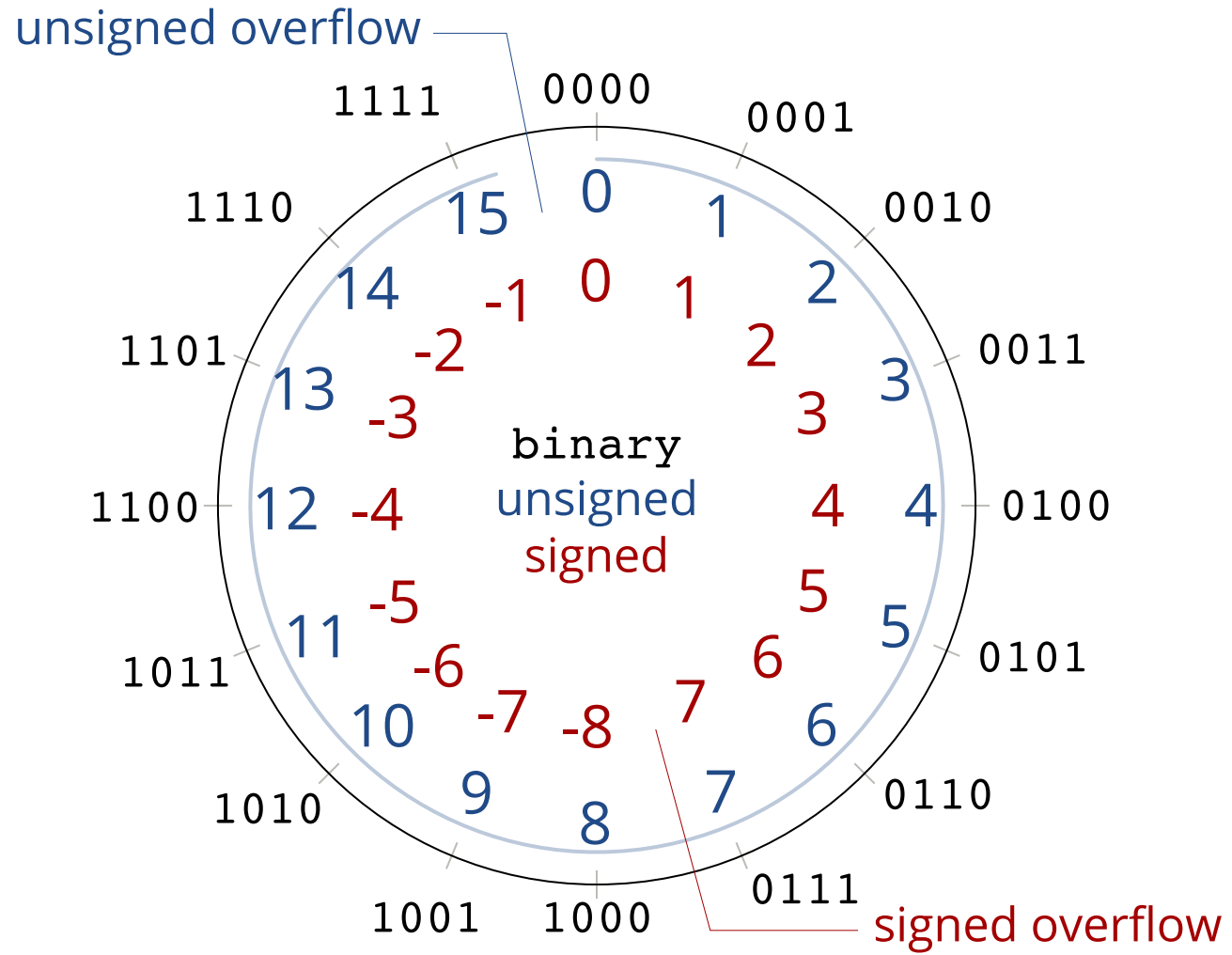
From Safari SSL key verification
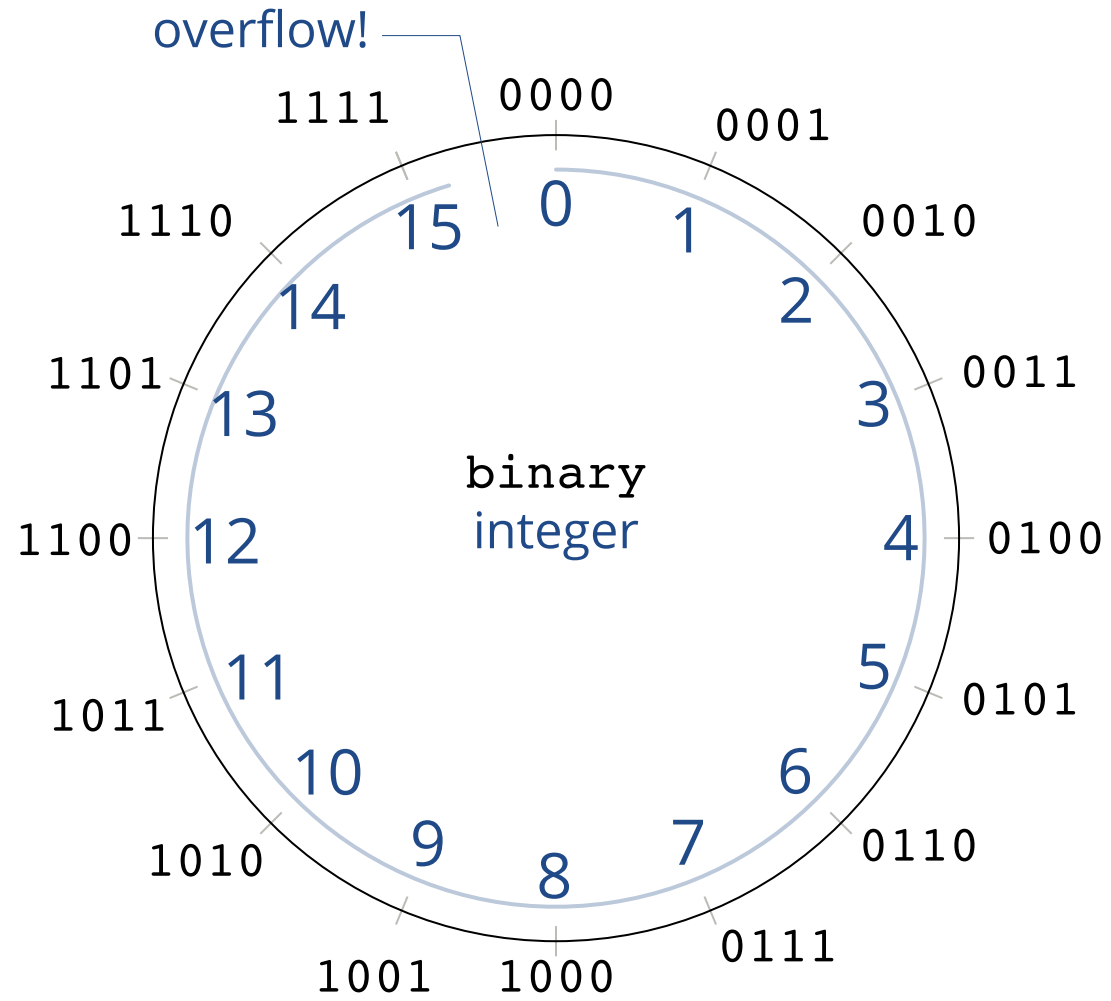
To write a negative number in 2's complement:
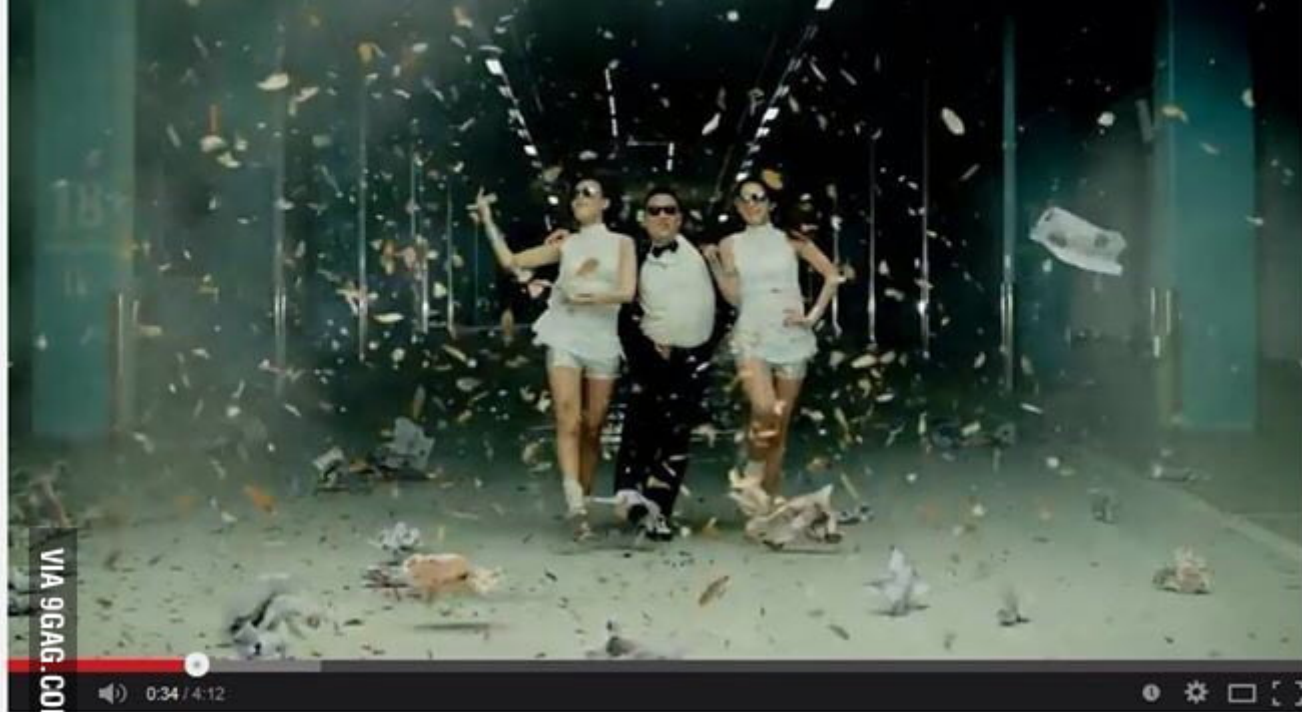
Write the positive number in binary

Flip all the bits (1→0, 0→1)

Add 1 (with all the appropriate carries)

To convert negative 2's complement to decimal,

Flip all the bits (1→0, 0→1)

Add 1 (with all the appropriate carries)

Write the number in decimal

PSY - GANGNAM STYLE (강남스타일) M/V

officialpsy

Subscribe 7,603,314

-2142153076

+ Add to   < Share   ••• More   👍 8,773,116   👎 1,141,536

Mike Brzozowski via Google+ 3 hours ago
Gangnam Style has been watched more than MAX_INT32 times (that's well over 2 billion views). Google nerds have been eagerly anticipating this day...

YouTube originally shared this
We never thought a video would be watched in numbers greater than a 32-bit integer (=2,147,483,647 views), but that was before we met PSY. "Gangnam Style" has been viewed so many times we had to upgrade to a 64-bit integer (9,223,372,036,854,775,808)!

Hover over the counter in PSY's video to see a little math magic and stay tuned for bigger and bigger numbers on YouTube.

Ariane-5

(wikipedia)

Bad code makes things blow up

Ariane-5

Reused but untested

~~Bad~~ code makes things blow up

(wikipedia)

Comparing floating-point numbers

```c
float x = 9;
float y = (x / 3.0) + 2.5;
float z = (3.0 * y) - 7.5;

if(z == x) {
  printf("it's equal!\n");
}
else {
    printf("surprise! The value is %.20f, but the result was %.20f (%f)\n",
          x, z, (x-z));
}
```

Doing math with integers

What is printed as a result of running the code below?

```c
int total = 350;
int dailyAveragePercent = total / 365 * 100;
printf("average (percentage): %d\n", dailyAveragePercent);
```

typedef

Creates an alternative name for a type

```
typedef int Time;


Time now = getTheTime();
Time future = now + 100;
```

```
typedef unsigned char u8;
typedef char s8;
typedef short unsigned int u16;
typedef short int s16;


u16 myVariable = 1000;
```

struct

Creates a type which is a bundle of related variables

```
struct Vec3d {
    float x;
    float y;
    float z;
}
```

```
Vec3d addVectors(Vec3d a, Vec3d b)
{
    Vec3d sum;
    sum.x = a.x + b.x;
    sum.y = a.y + b.y;
    sum.z = a.z + b.z;

    return(sum);
}
```

ProTip

- Use up arrow to repeat a command in the shell

- Move quickly in vim:

  #g to move to a specific line

  gg to move to the top

  G to move to the bottom

Homework 2 is posted on the website

submit it with provide:

```
provide ee200 hw2 <FILE>
```