



**Wrap-around Semantics**

- Cause of unbelievably expensive bugs, e.g. the Ariane 5 Flight 501.
- $2^{64} - 1$  is the largest value that can be represented by 64 bits. In selfie this value is denoted `UINT64_MAX`.

$$\text{UINT64\_MAX} + 1 = 0$$

$$\text{UINT64\_MAX} + 2 = 1$$

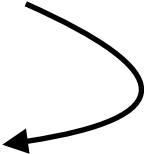
$$\text{UINT64\_MAX} + 3 = 2$$

...



1 1 1 1 1 1 1 1 1 ... 1 1 1 1 1 1 1 1 1

204-1





Adding 1 to  
`UINT64_MAX` leads  
to a wrap-around,  
where only the  
64 LSB  
are considered.



264

-

1

+

1

64

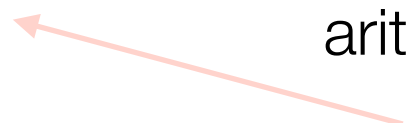
bit

# Arithmetic Instructions

|      |      |       |       |
|------|------|-------|-------|
| sltu | \$rd | \$rs1 | \$rs2 |
|------|------|-------|-------|

- Set `$rd` to 1 if `$rs1 < $rs2`.
- This is the only instruction needed to implement `<`, `>`, `<=`, `>=`, `==` and `!=`.
- How this is done:
  - `==` is implemented using `b - a < 1`.

In unsigned arithmetic only 0 satisfies this condition.



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