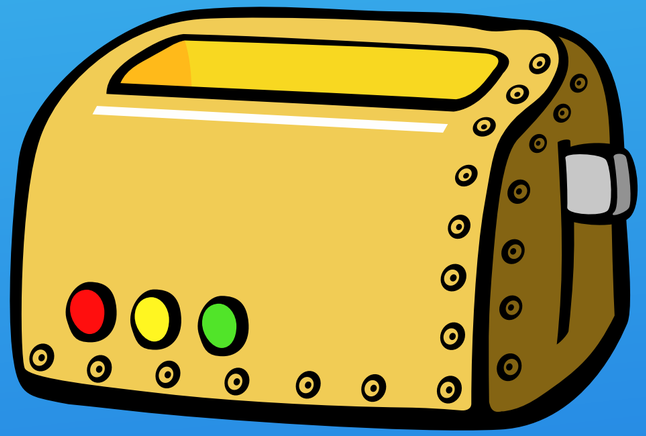
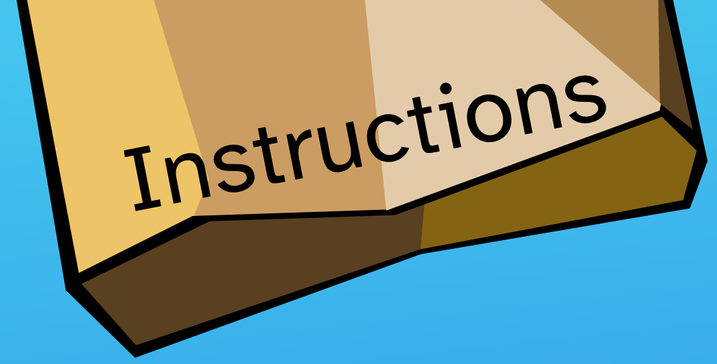
Attacker-defined Abstractions

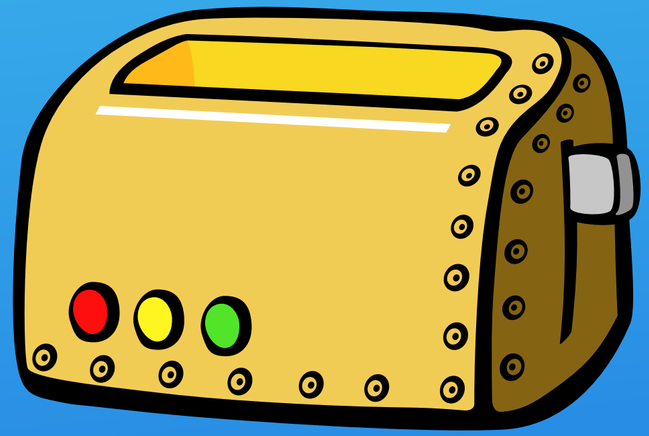
Programming Benign System Functionality For Subversive Purposes

Erik Bosman

VUSec




Instructions




Instructions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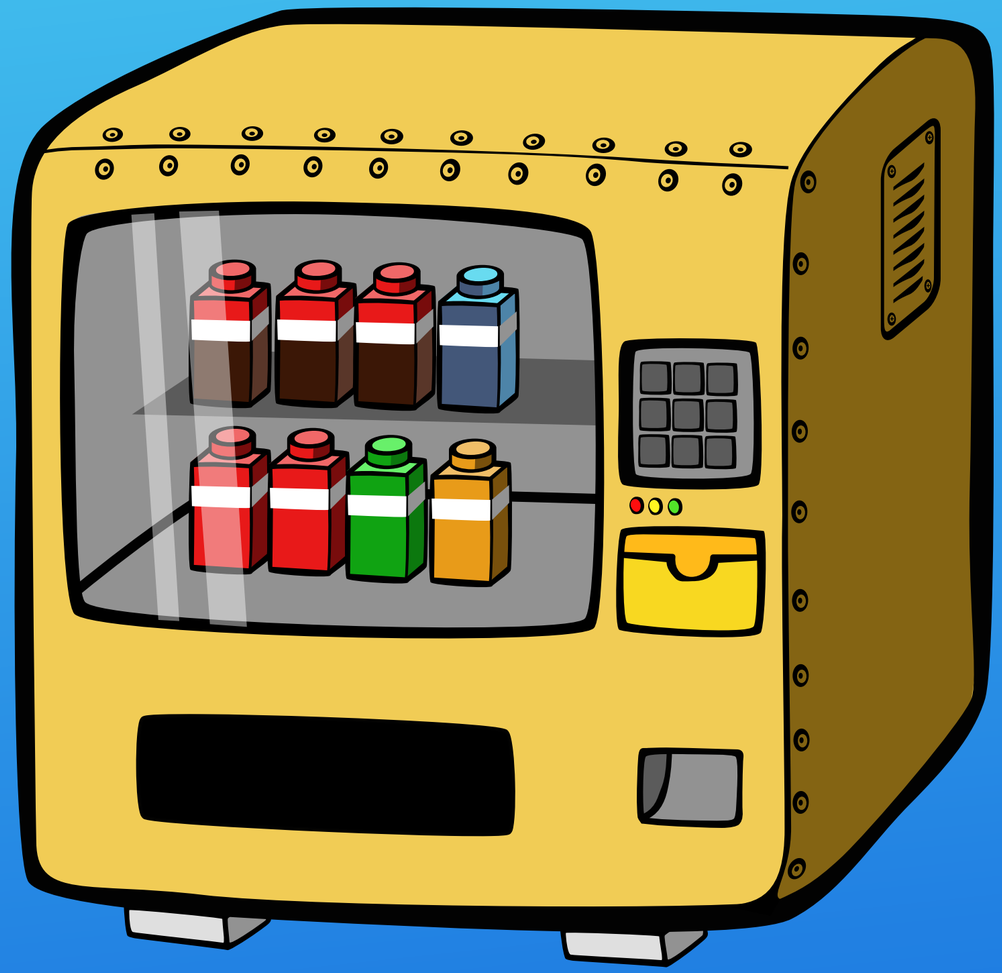
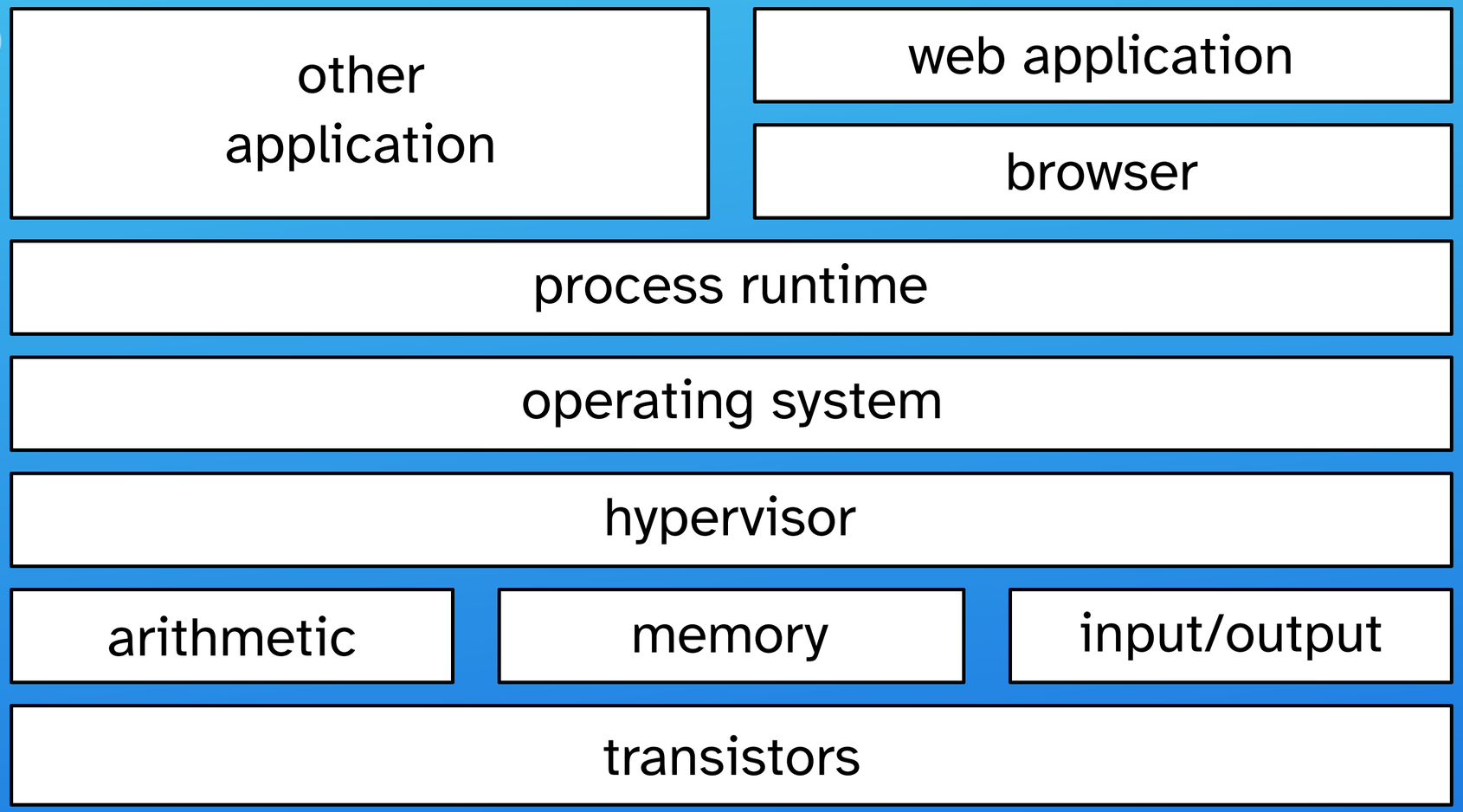



Input


Input
Output


Instructions
Output


other application
web application
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process runtime
operating system
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input/output
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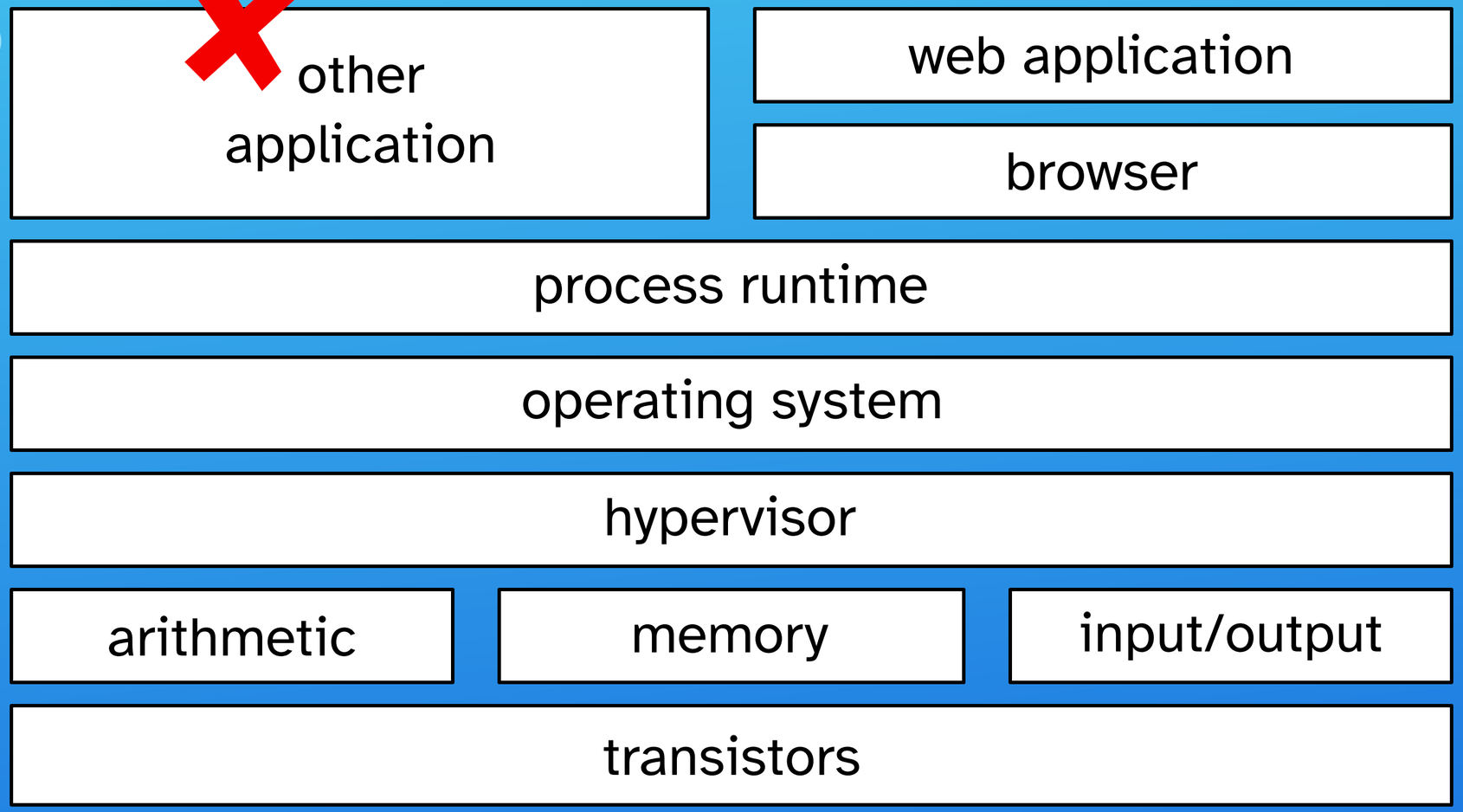
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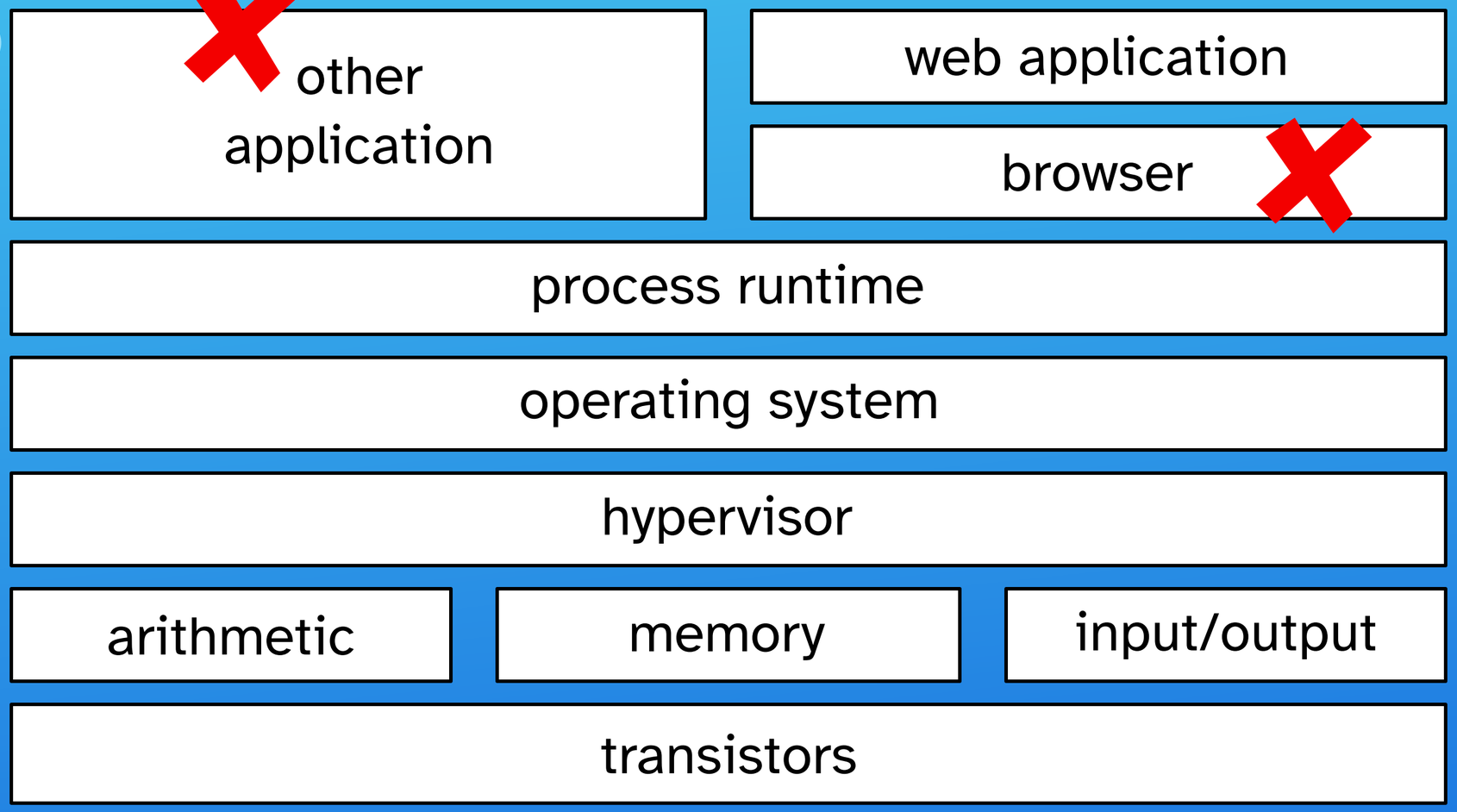
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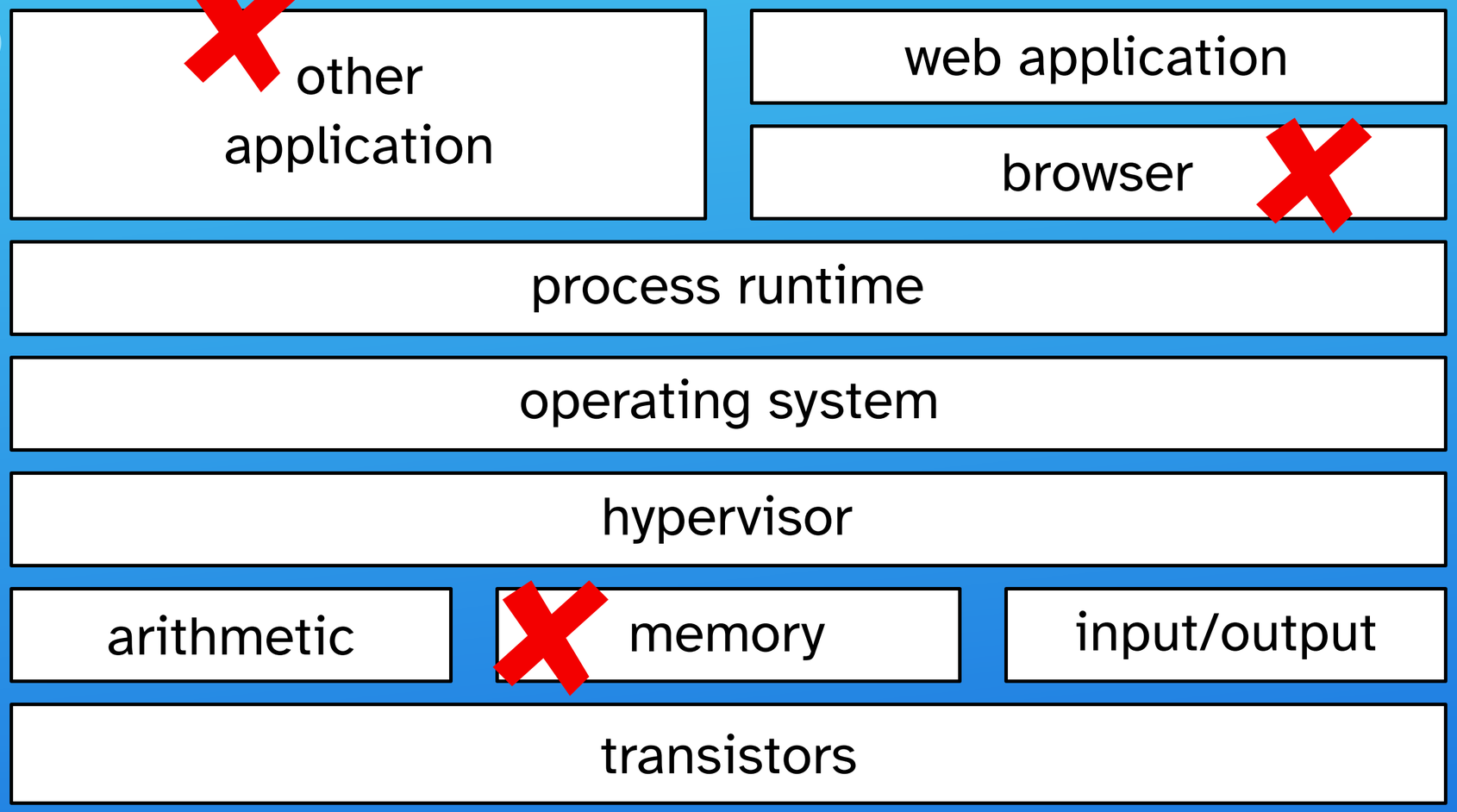
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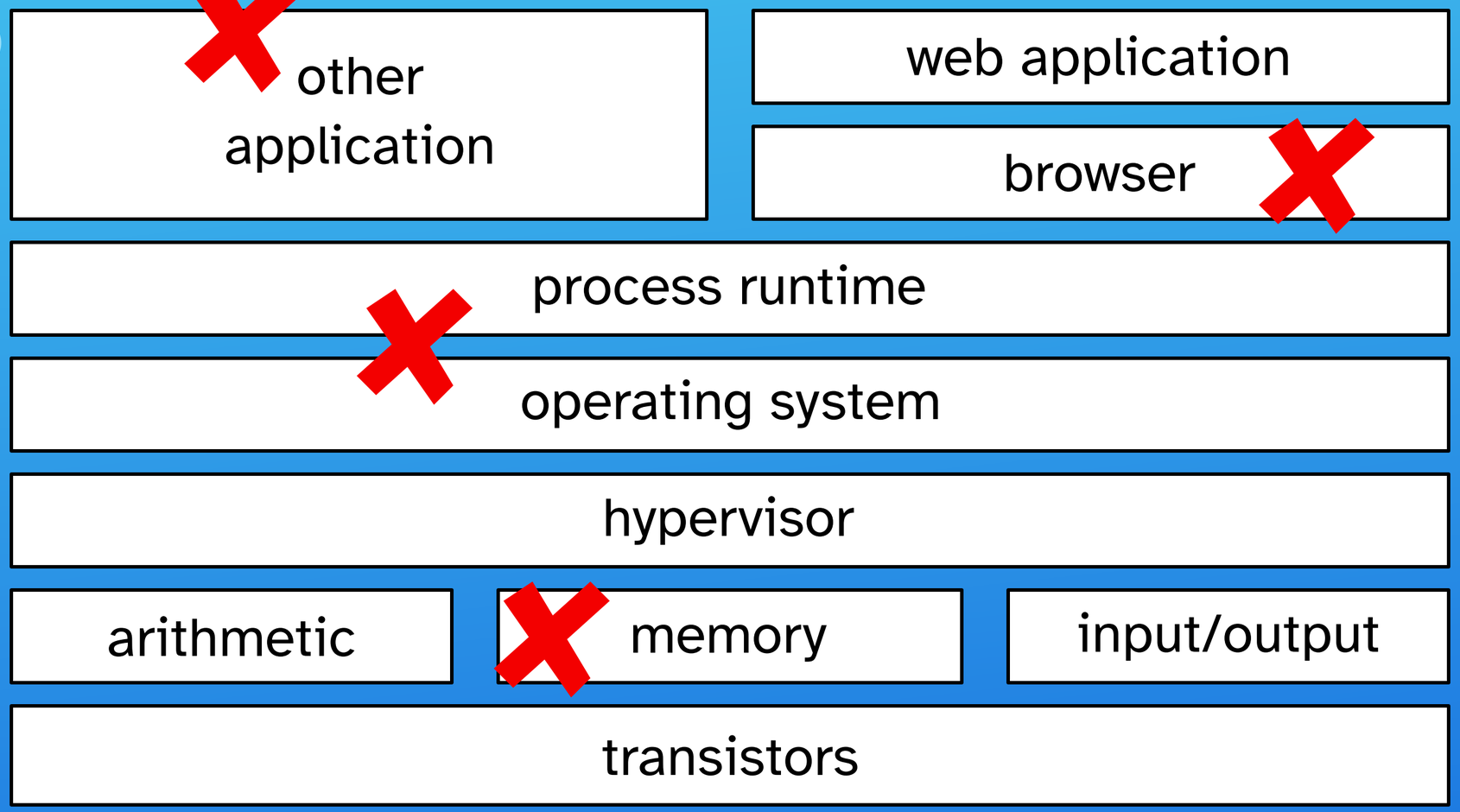
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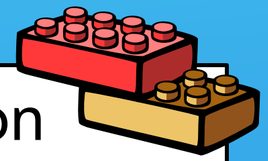

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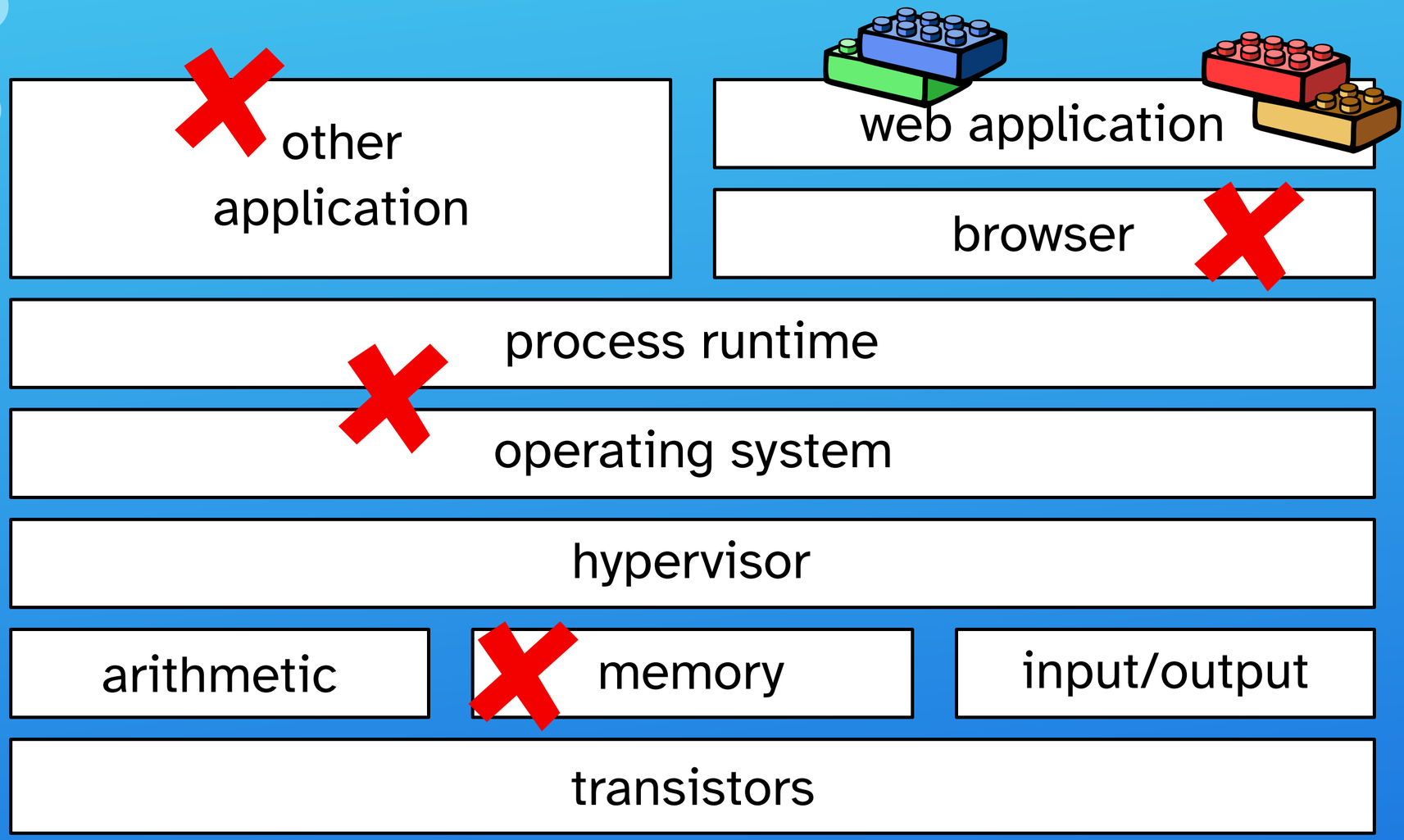
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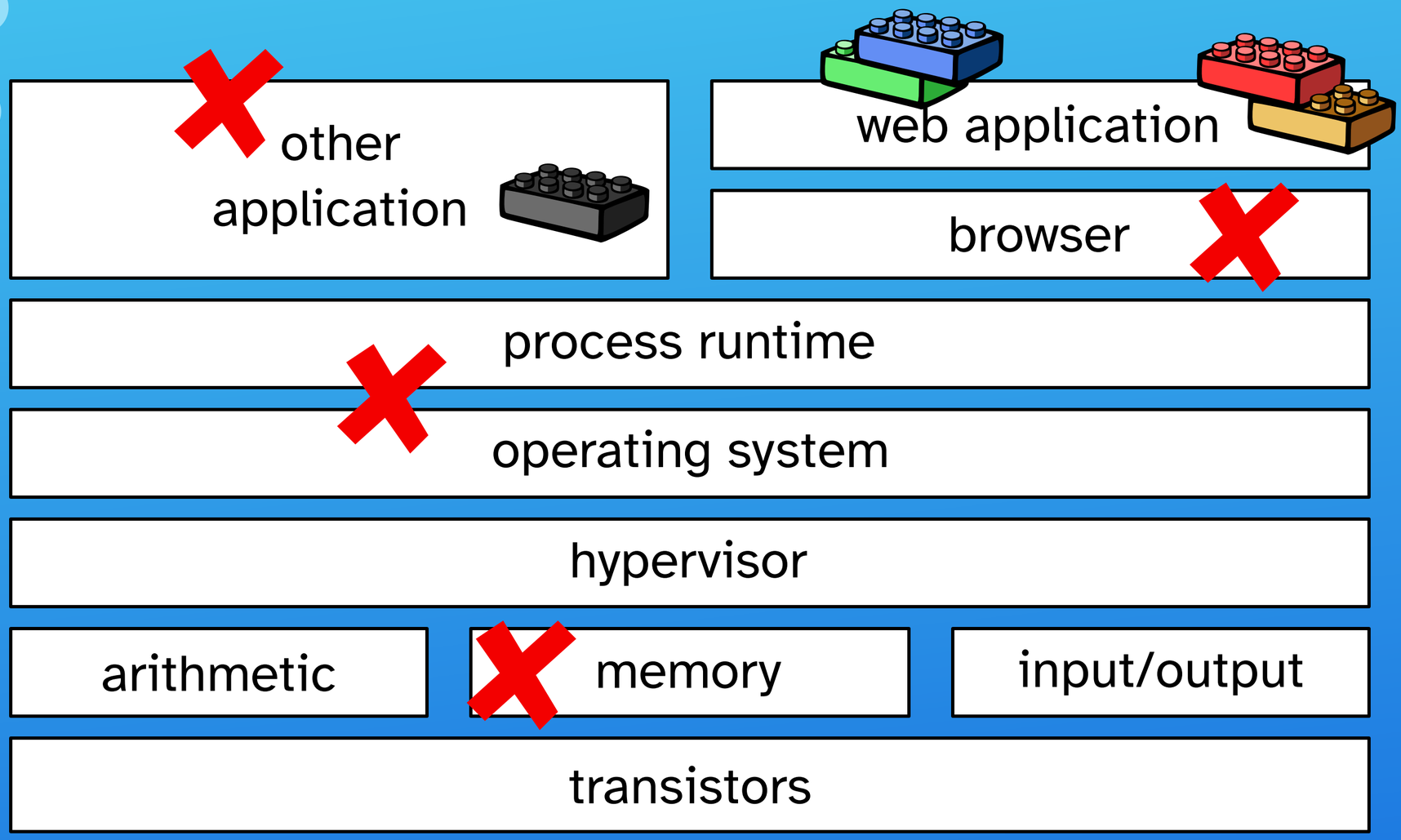
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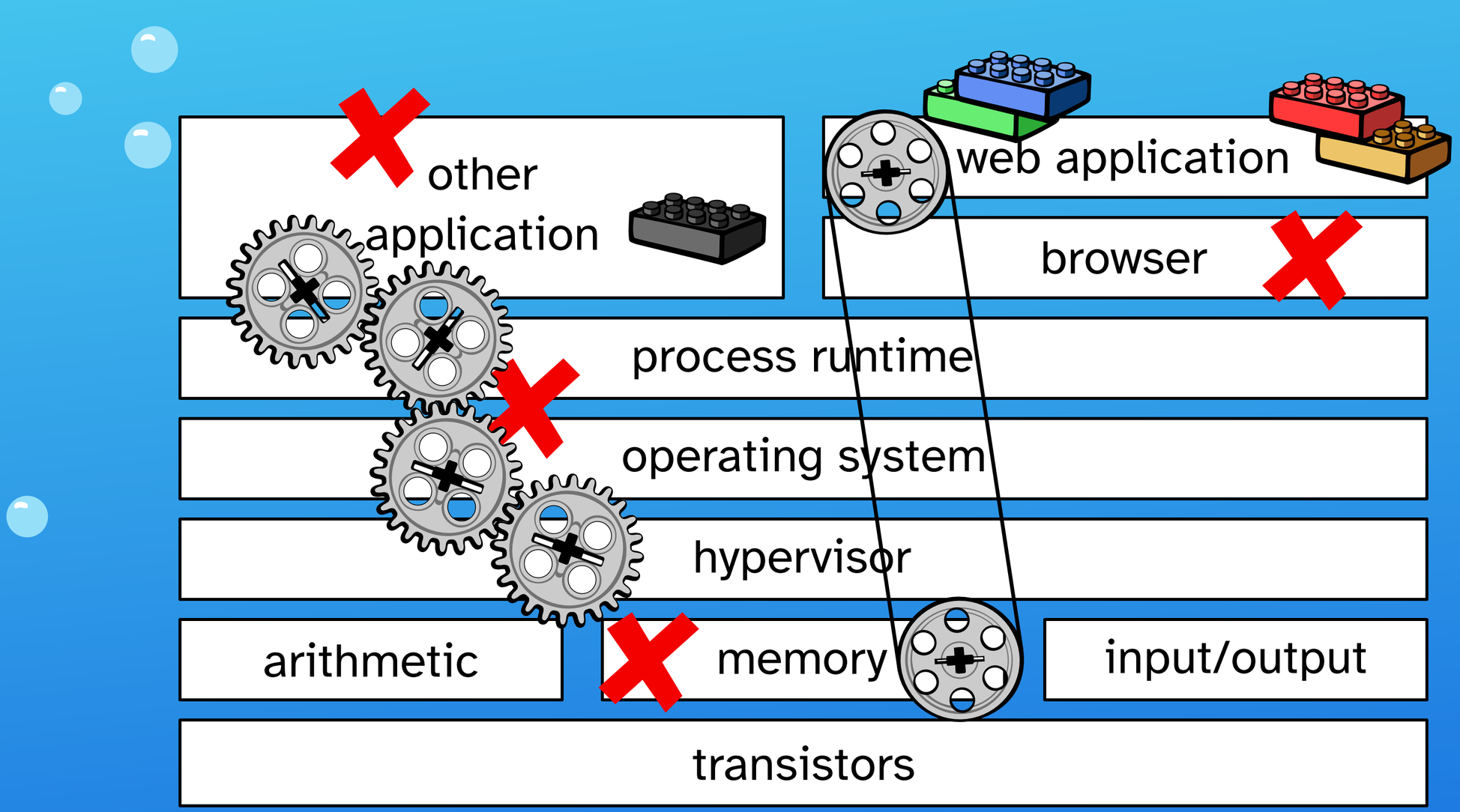
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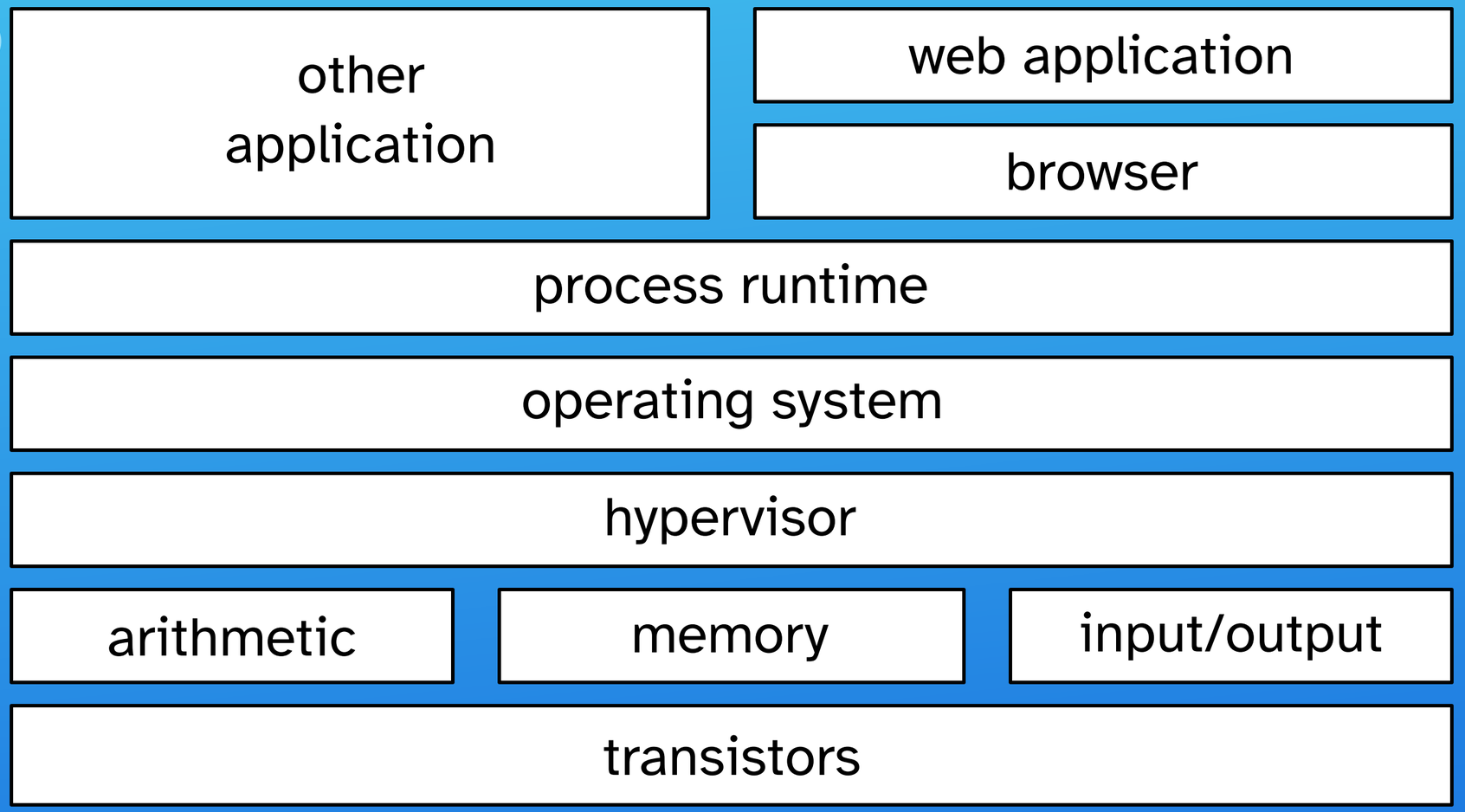
SigReturn Oriented Programming



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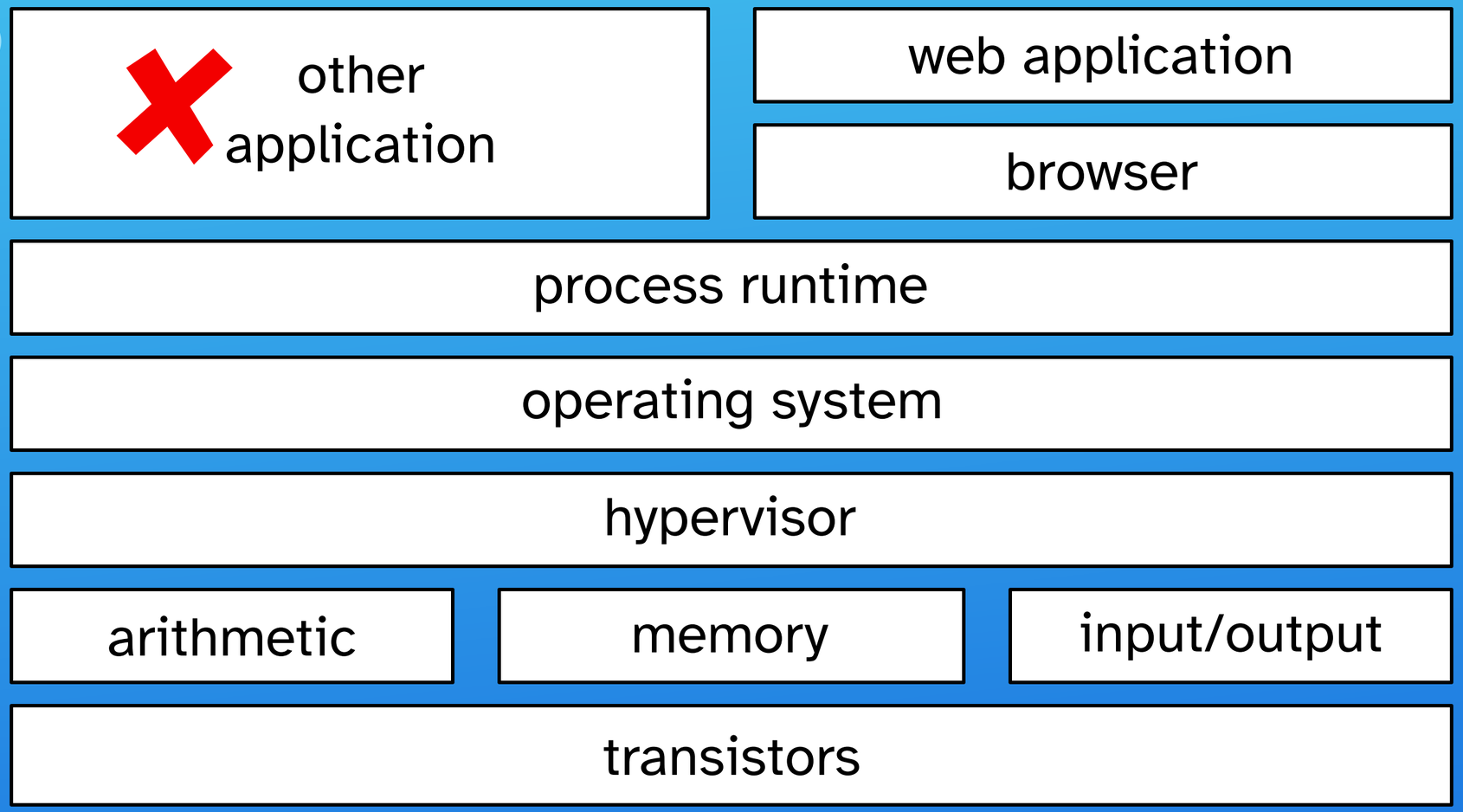

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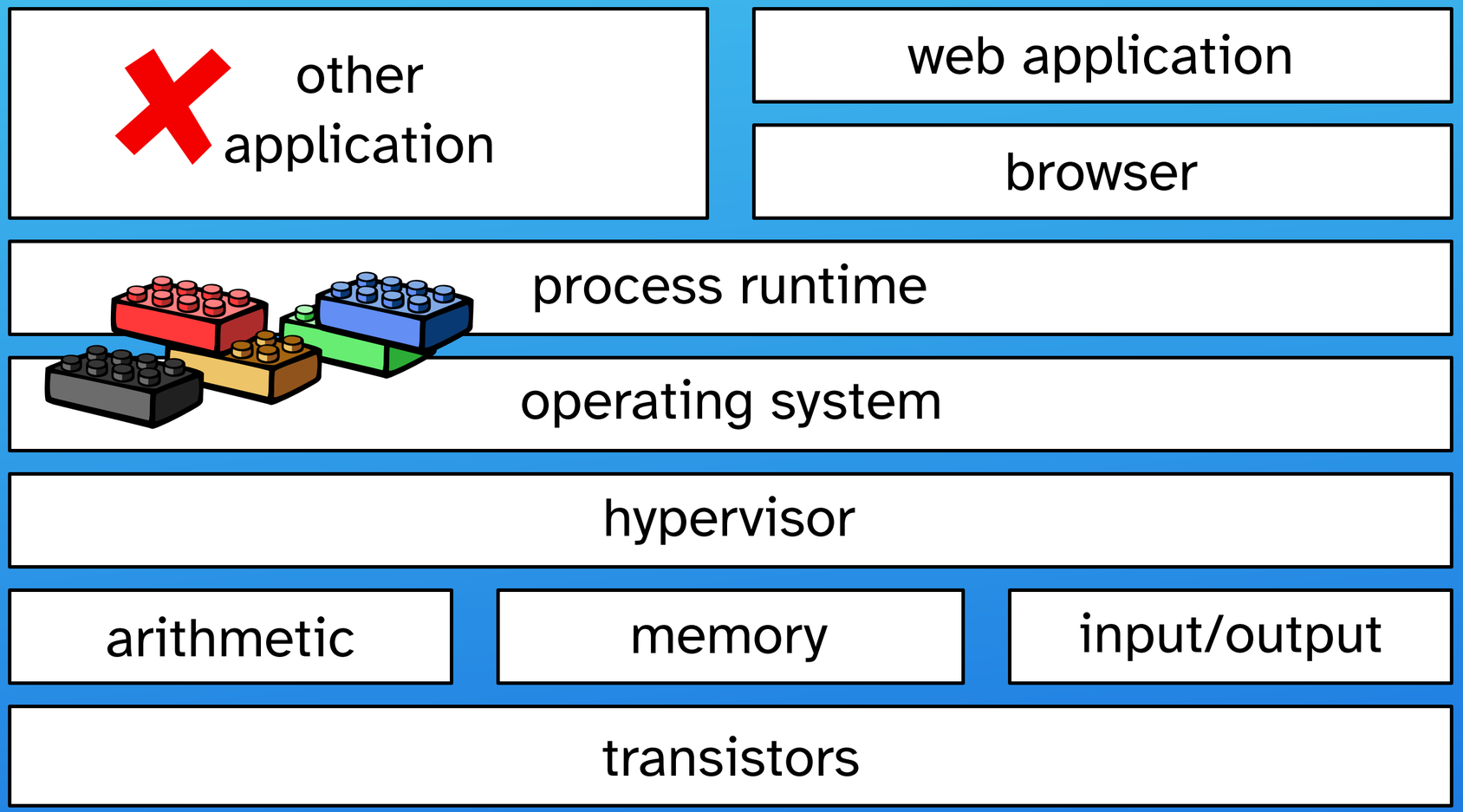


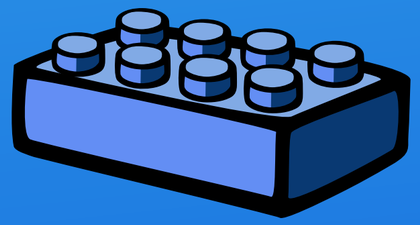
SigReturn Oriented Programming

SigReturn Oriented Programming

normal Return-Oriented Programming:

SigReturn Oriented Programming

normal
Return-Oriented
Programming:



ROP gadgets

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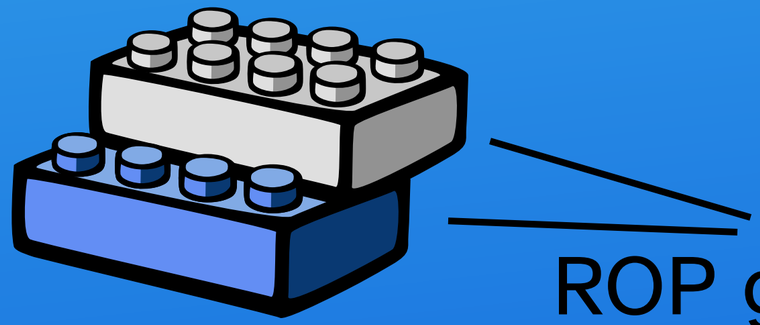

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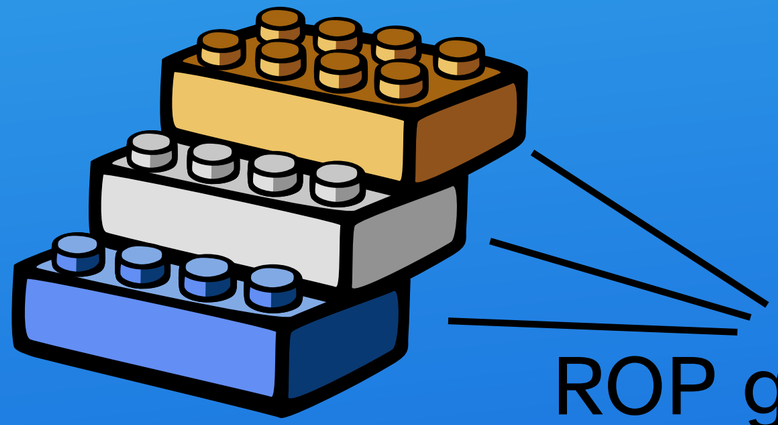

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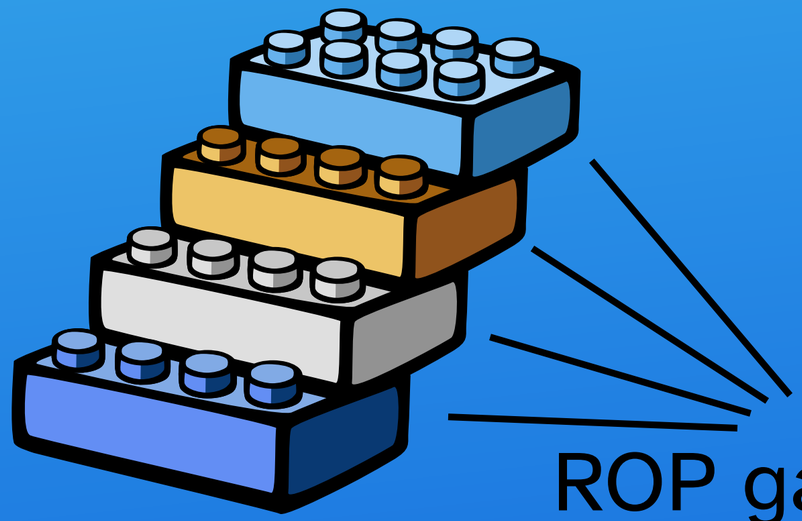

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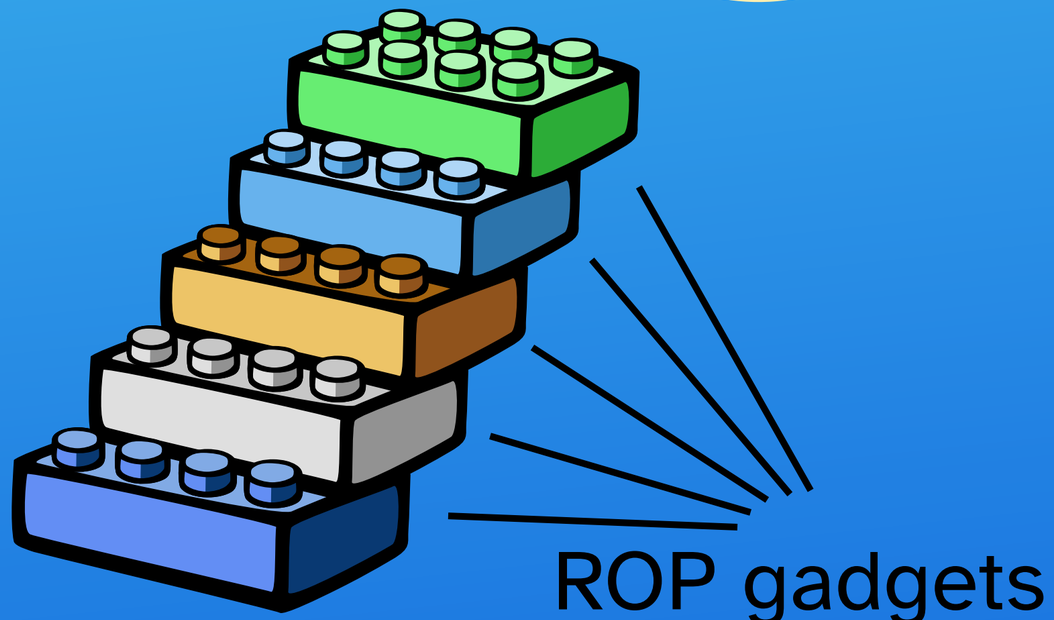

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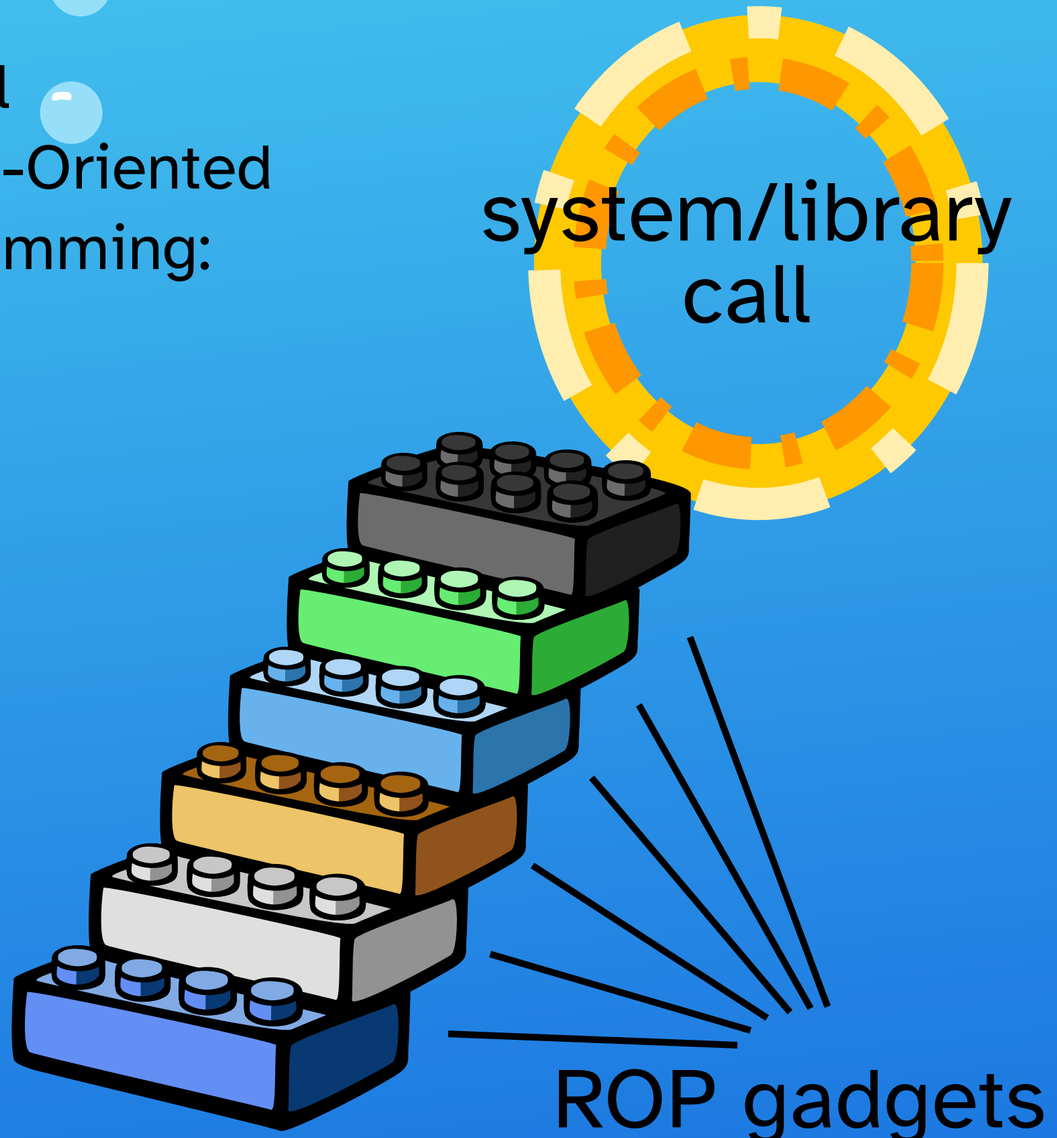

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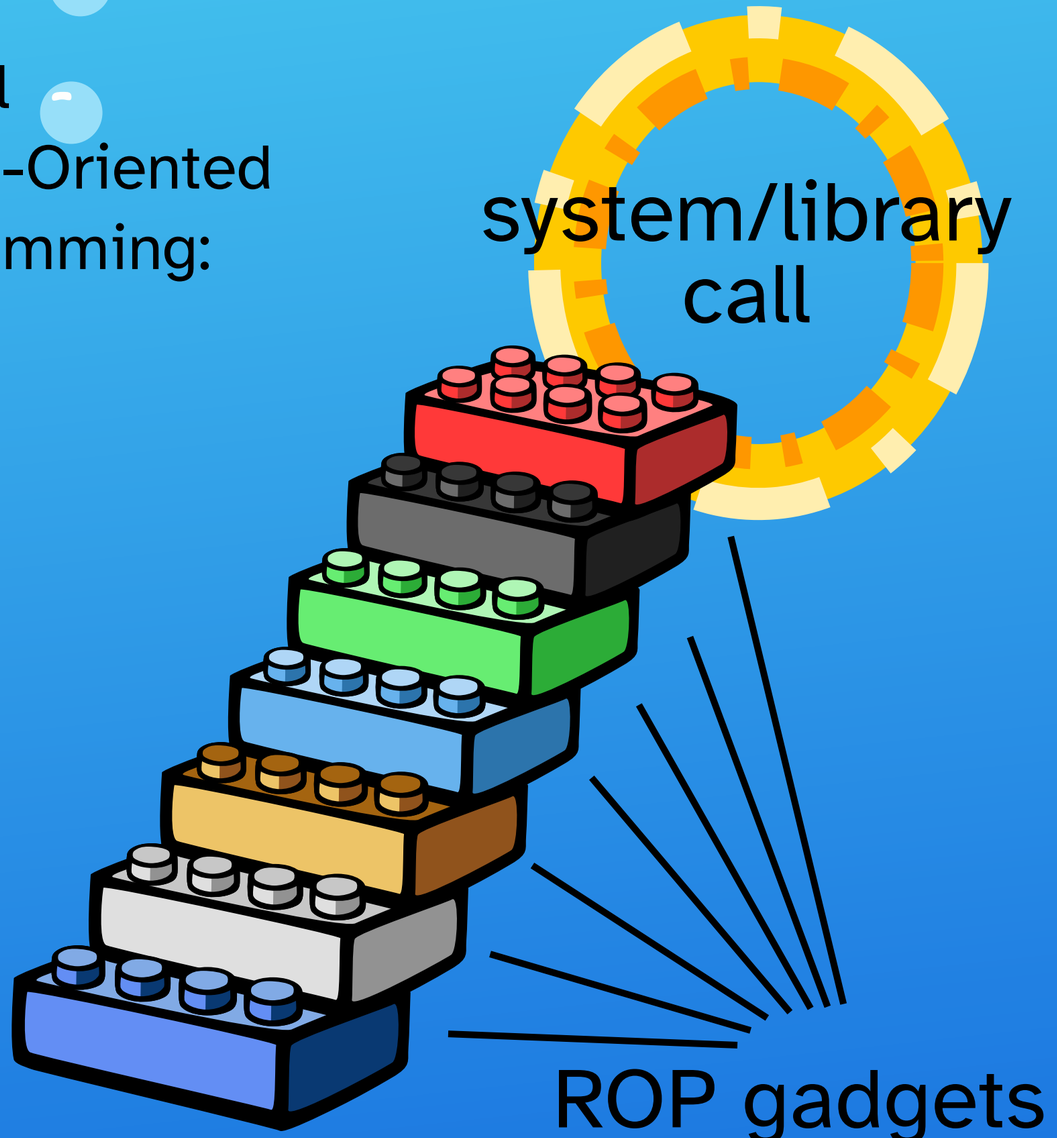

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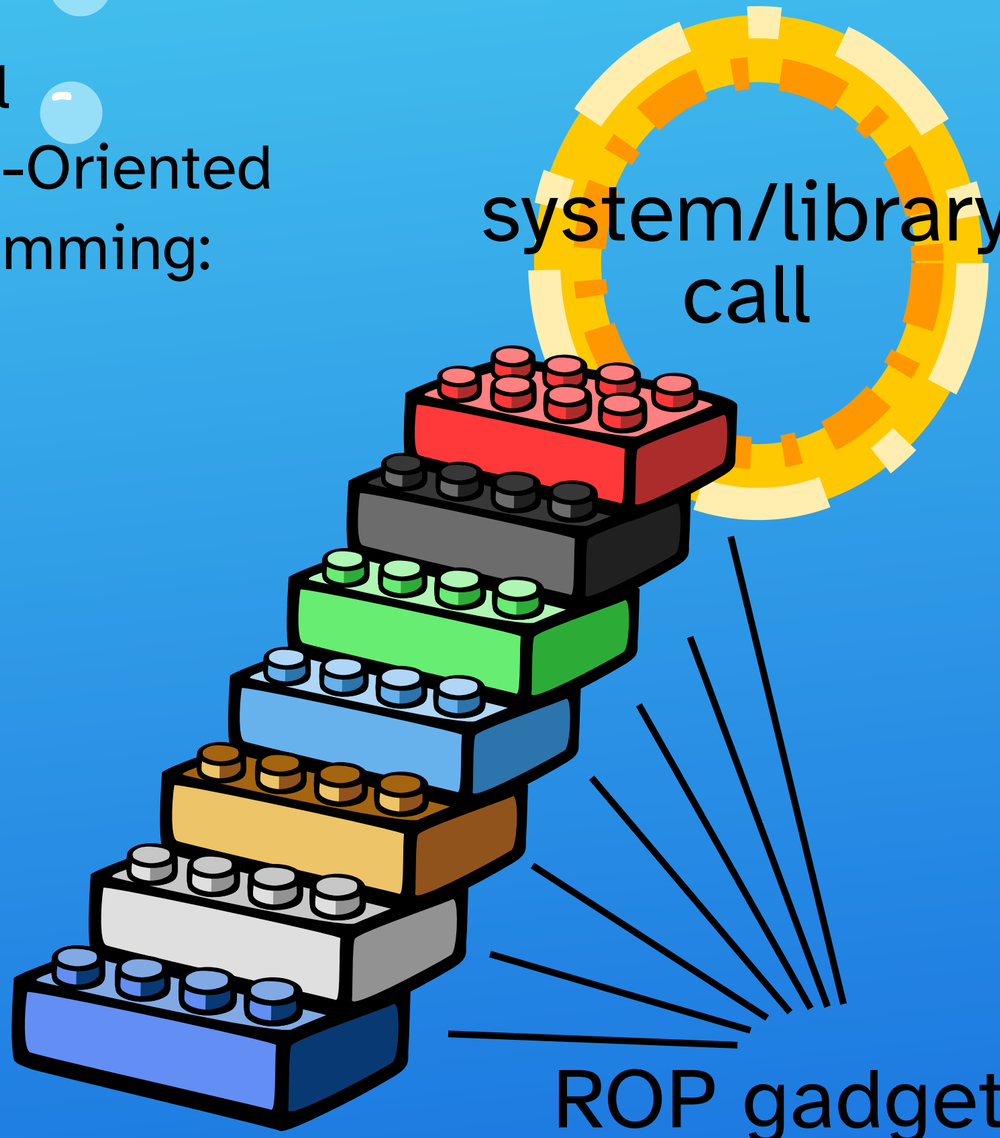

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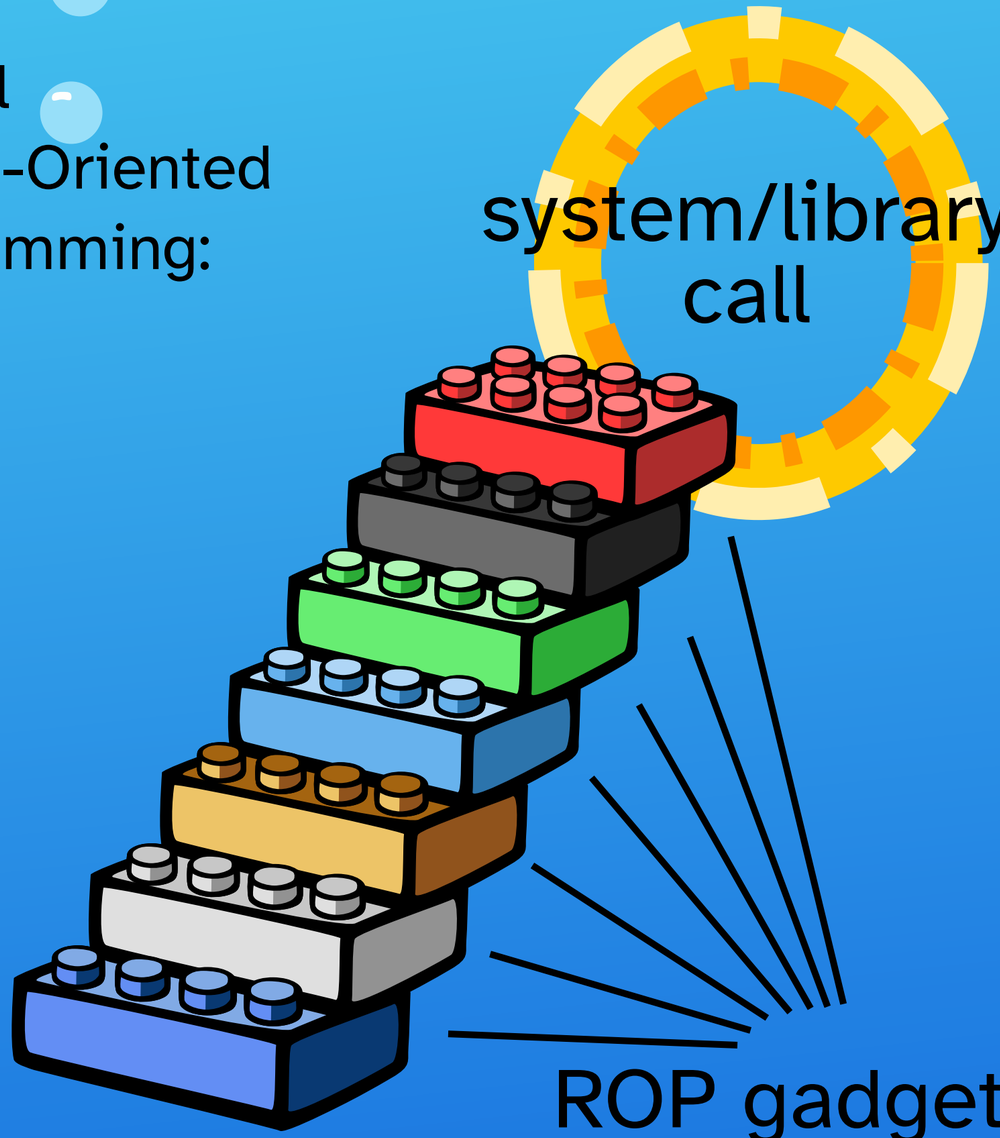

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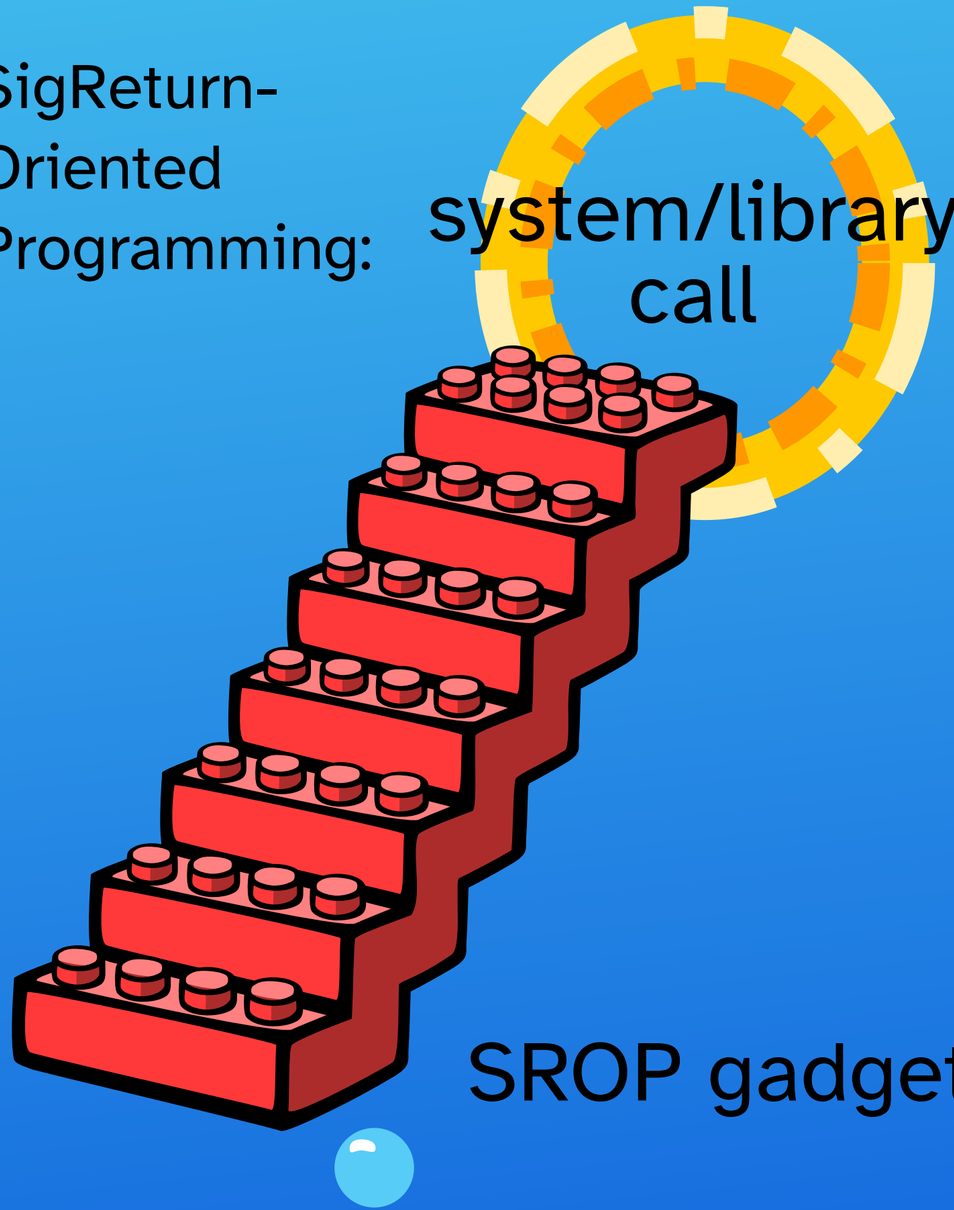
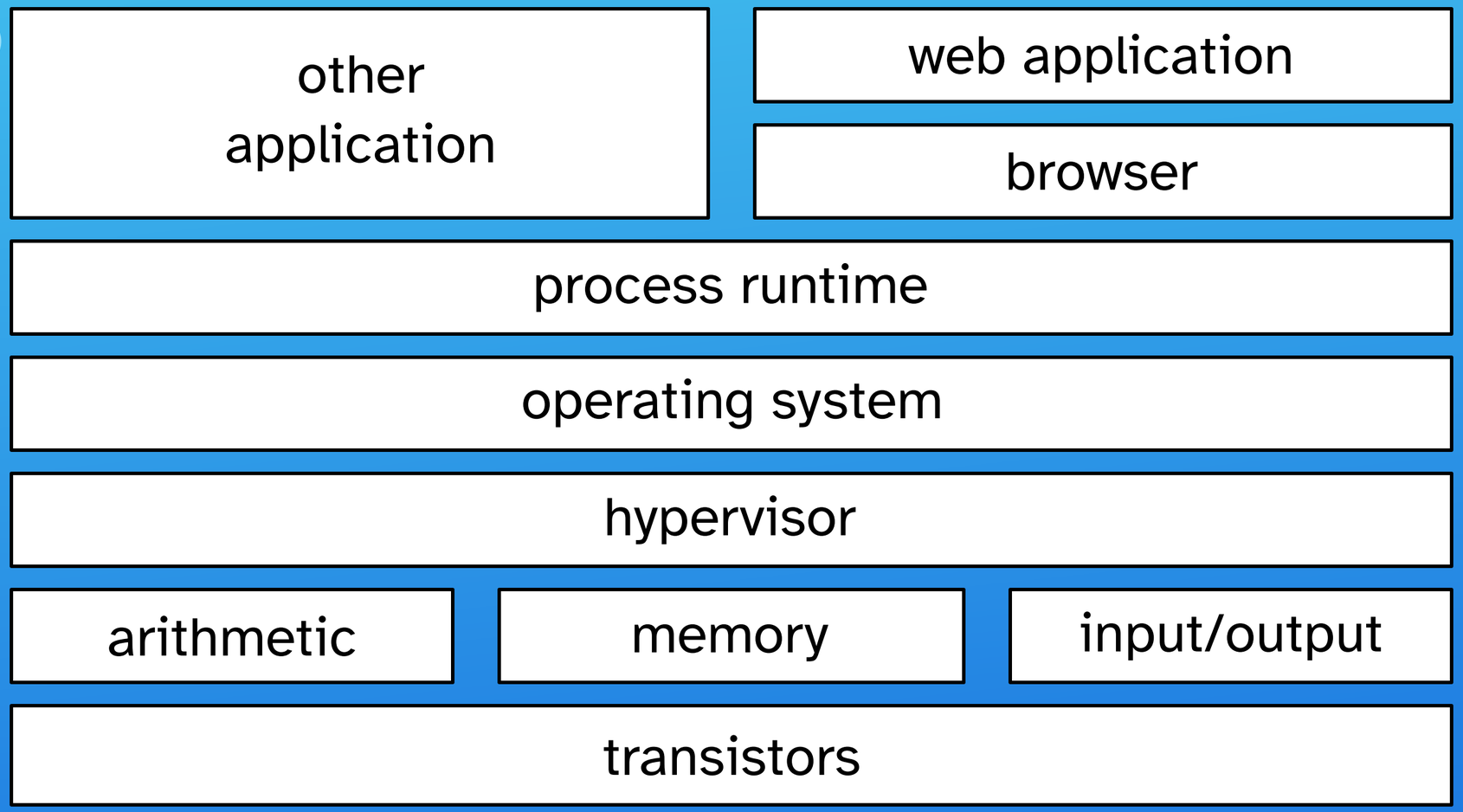


Dedup est Machina



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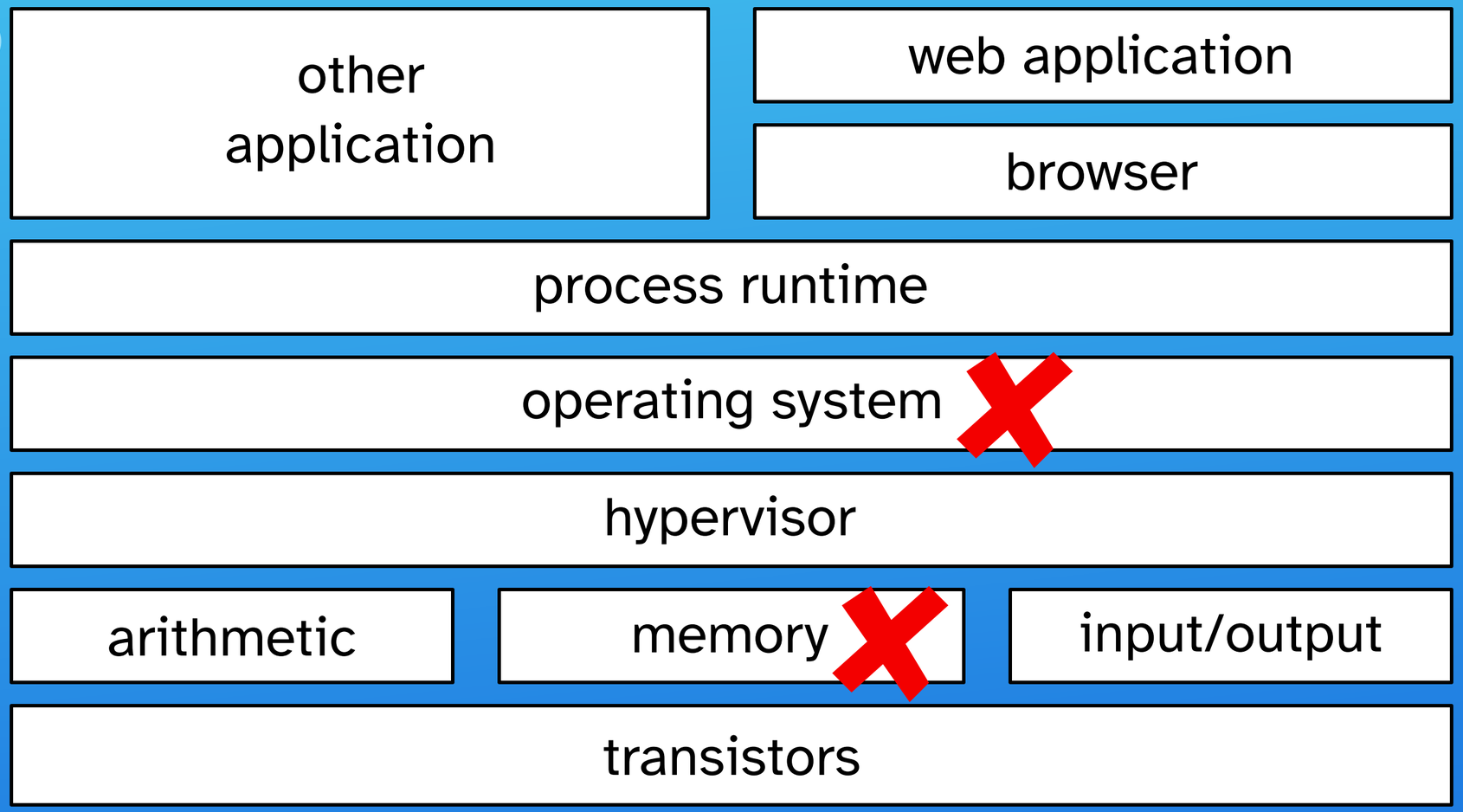

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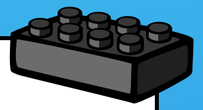

other application

web application

browser

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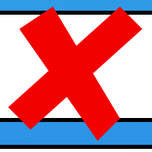

hypervisor

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Memory Deduplication

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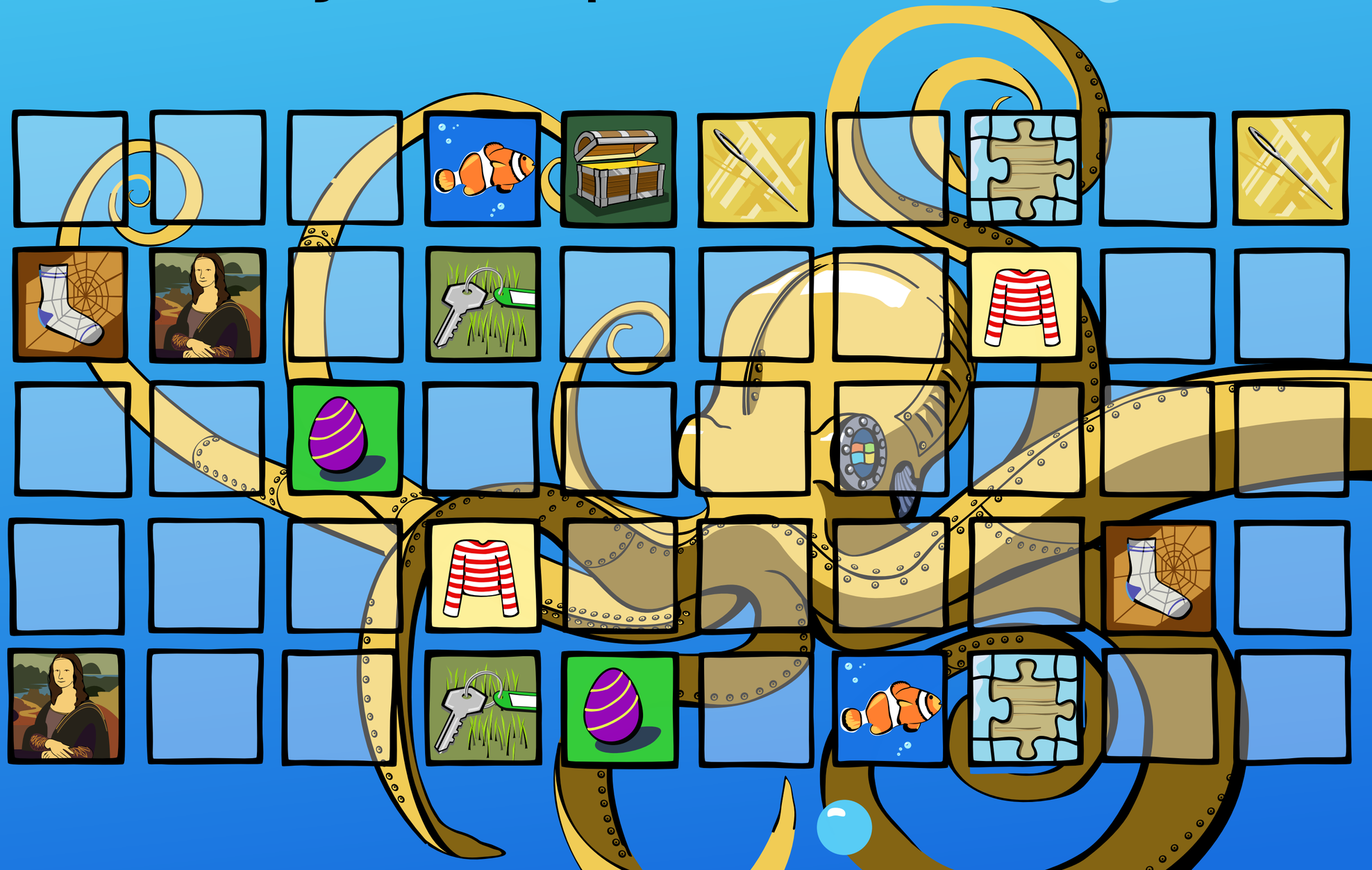

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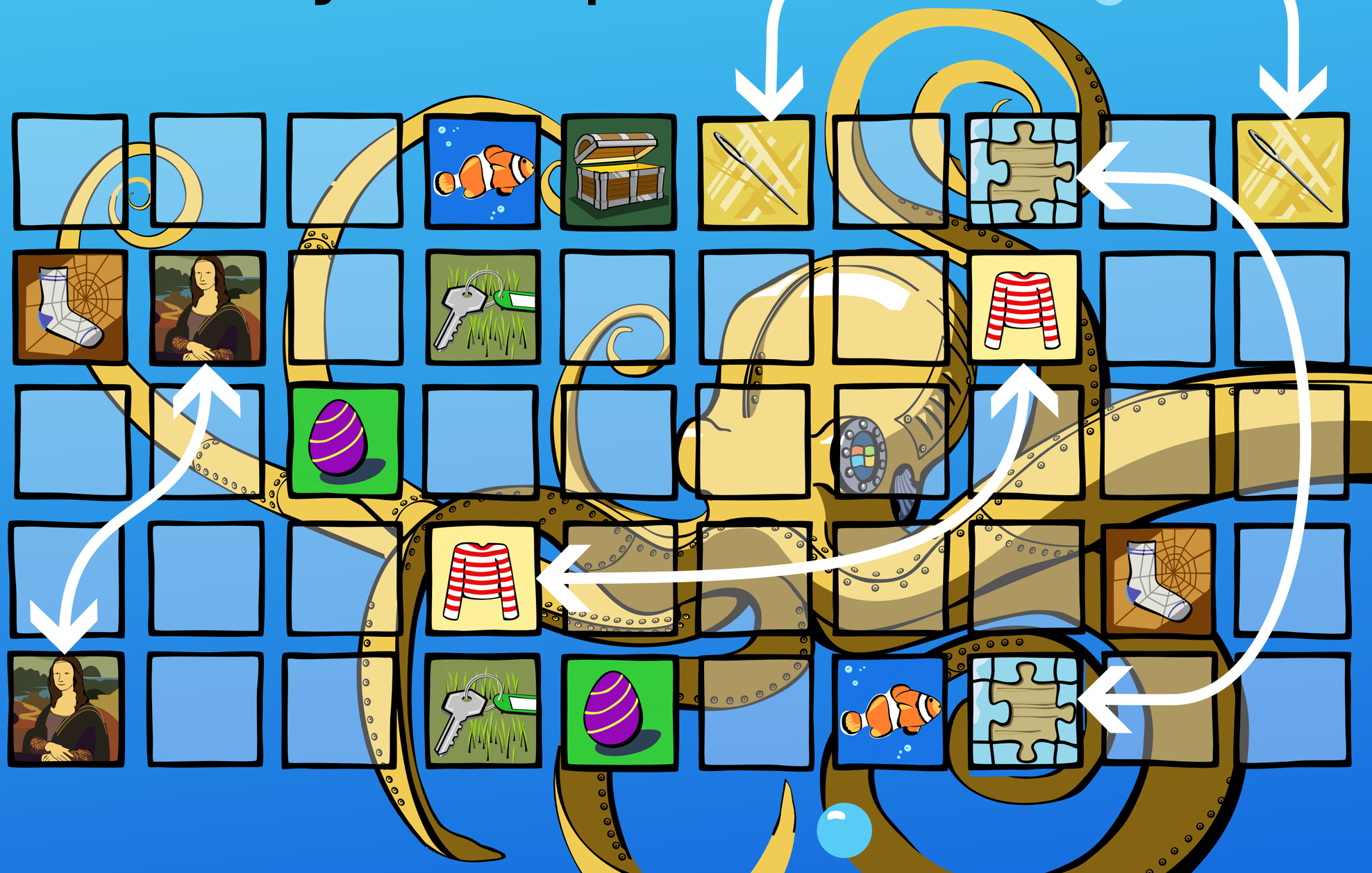
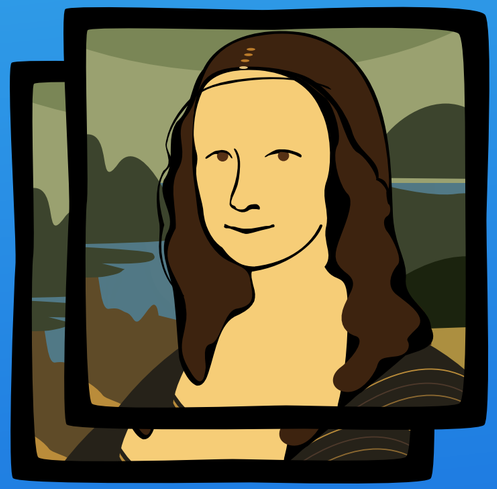


Memory Deduplication

My memory has the only copy:

There is another copy in the system:



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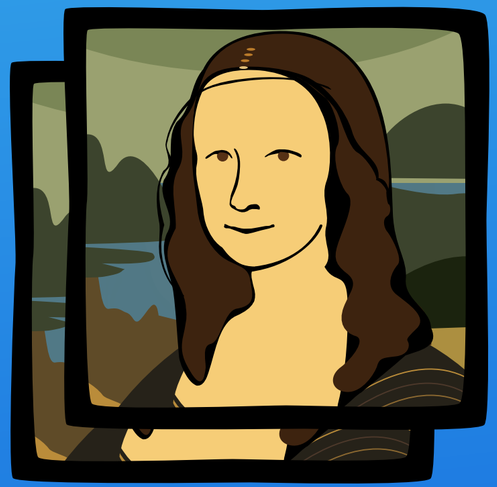

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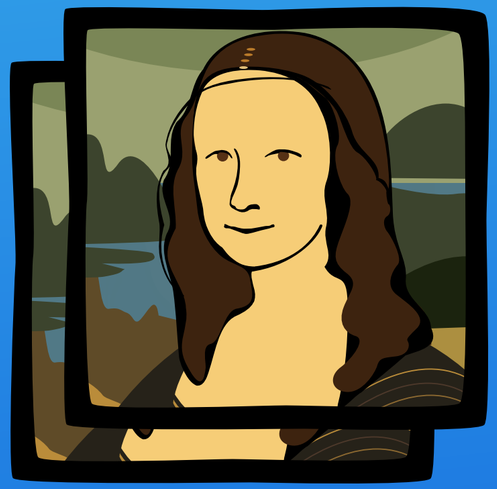

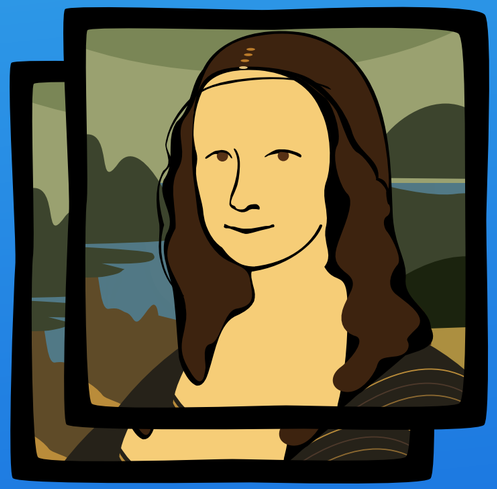

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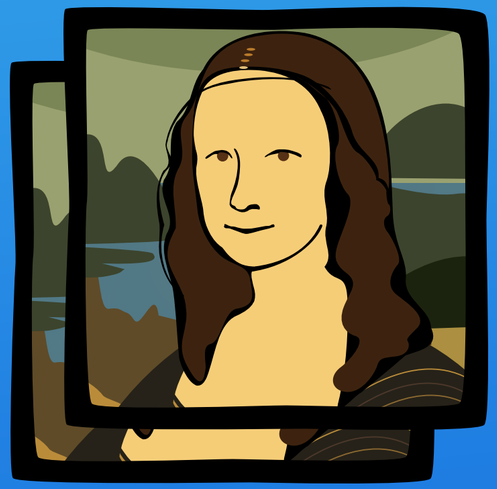
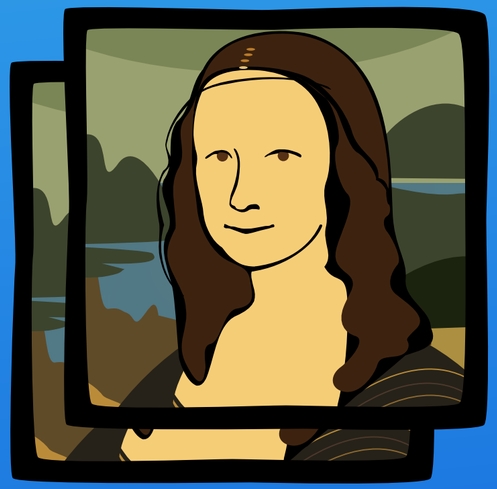
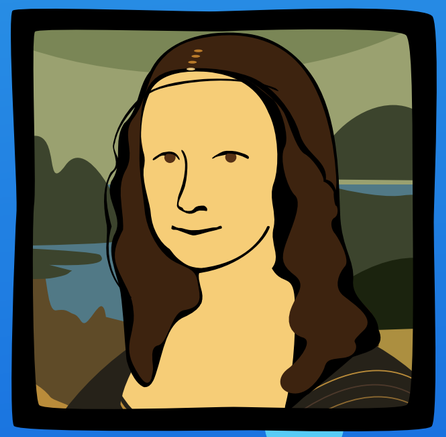
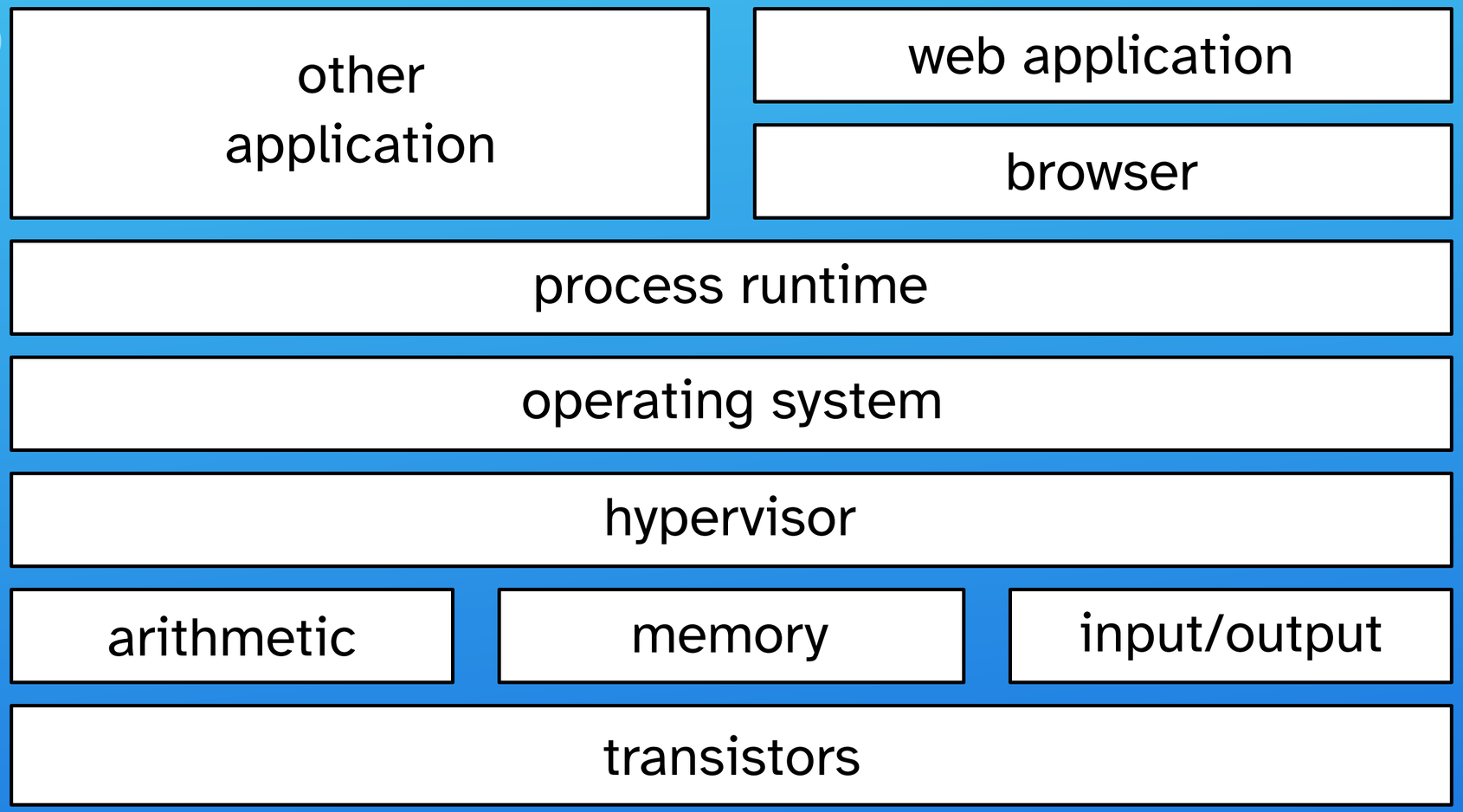






Flip Feng Shui



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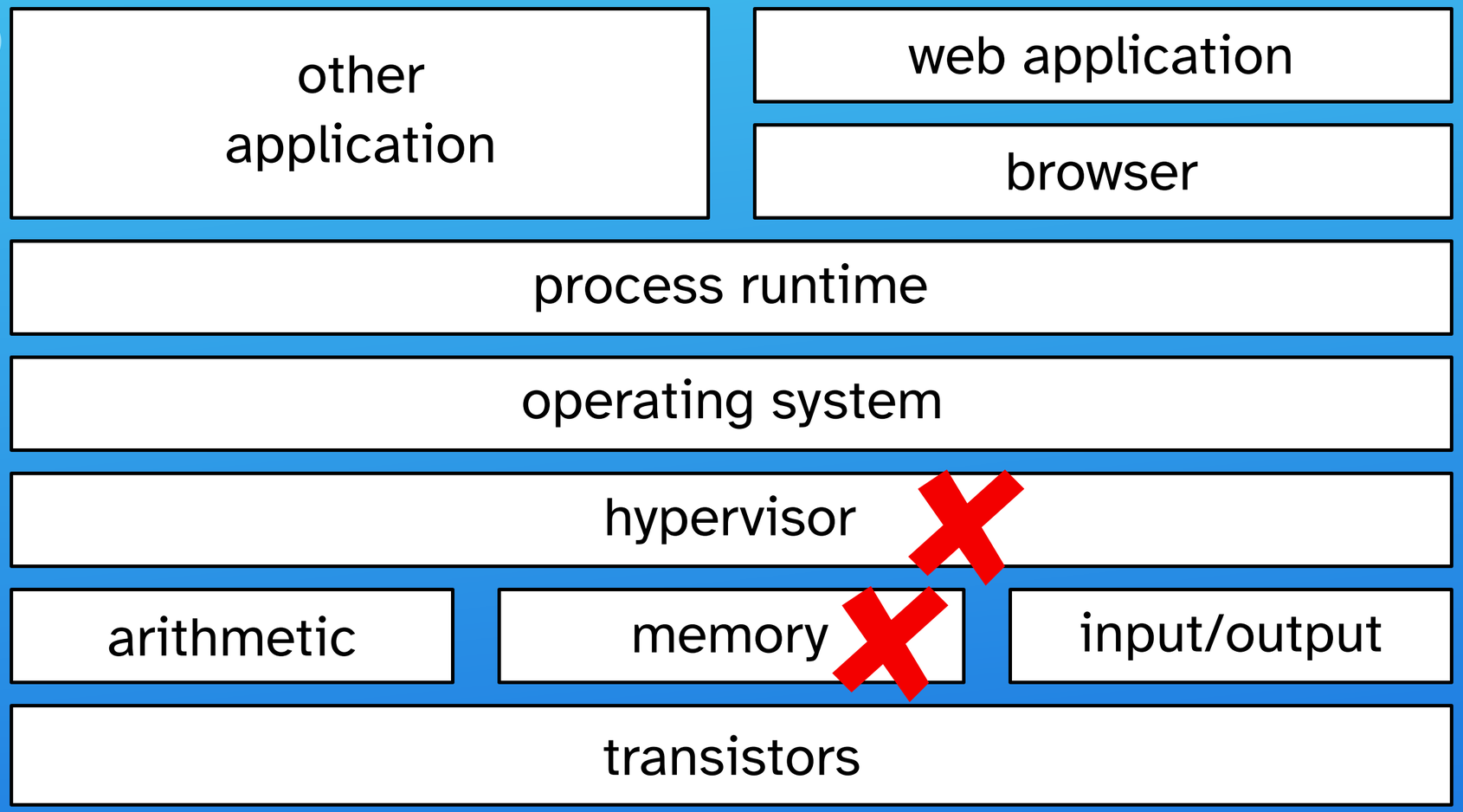

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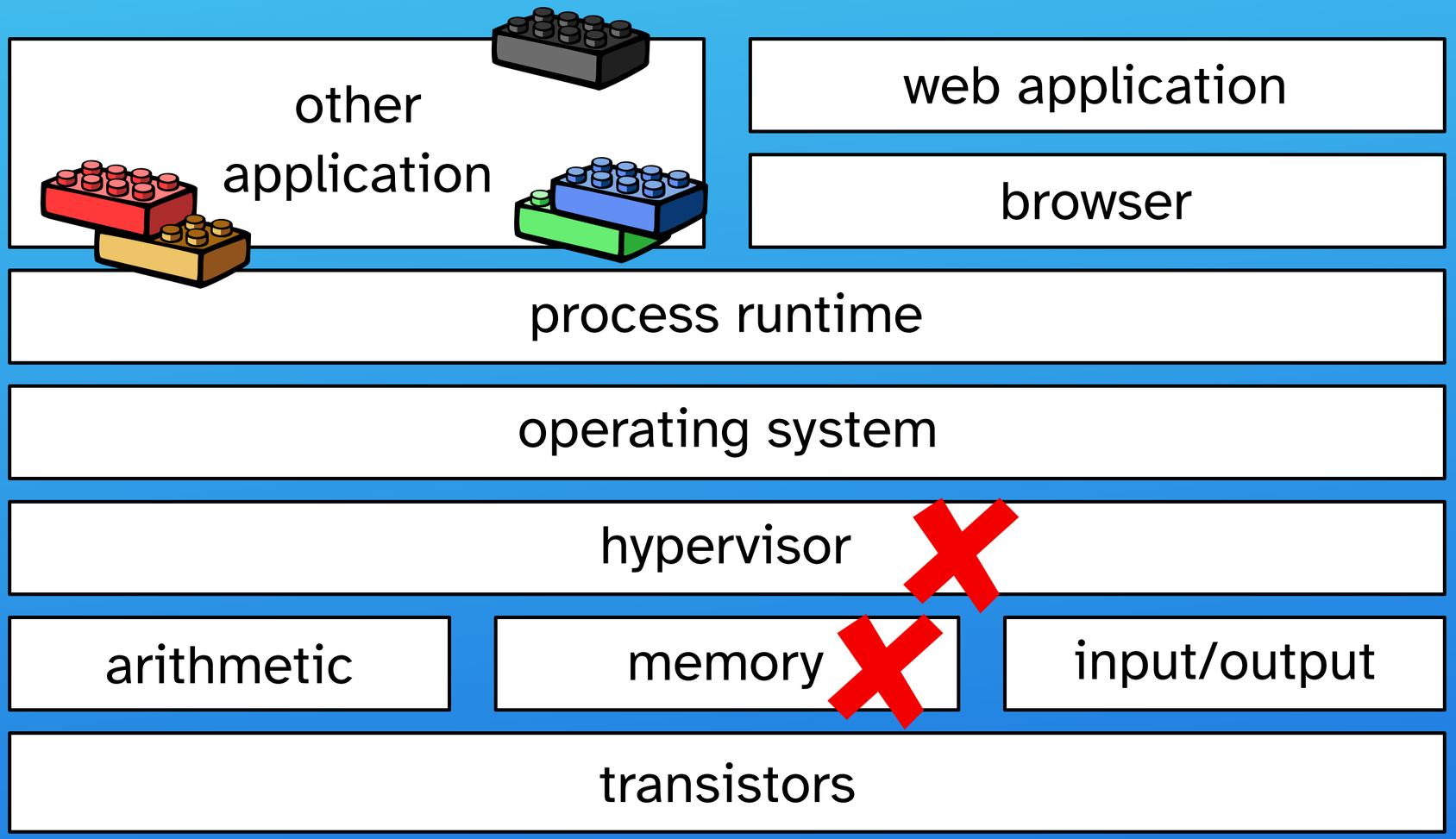

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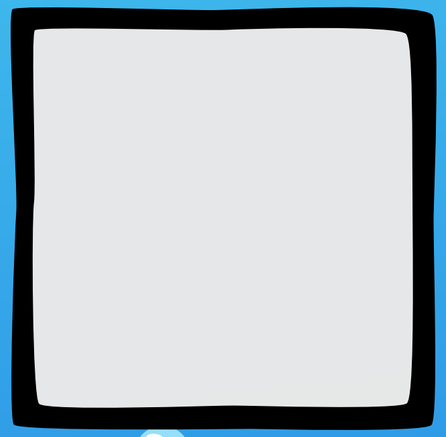
Target data (allowed login keys):

Flip Feng Shui

My memory:



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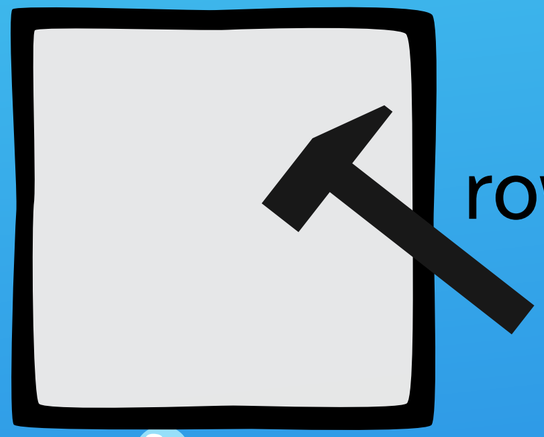

rowhammer

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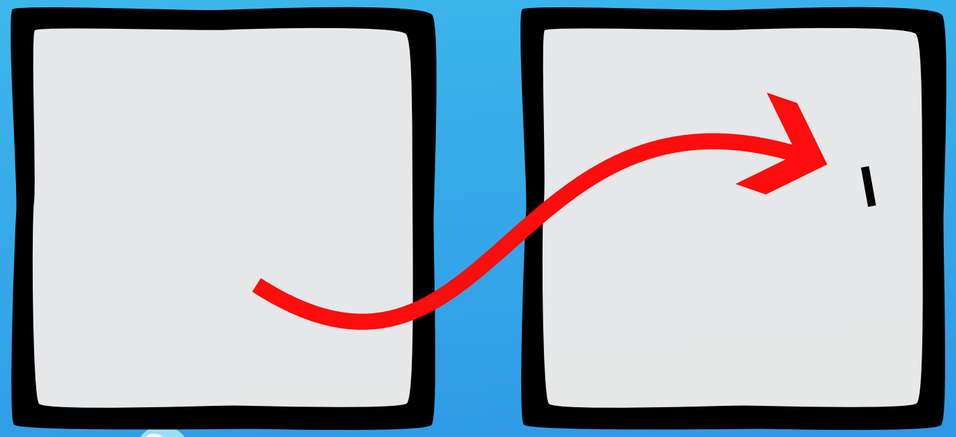

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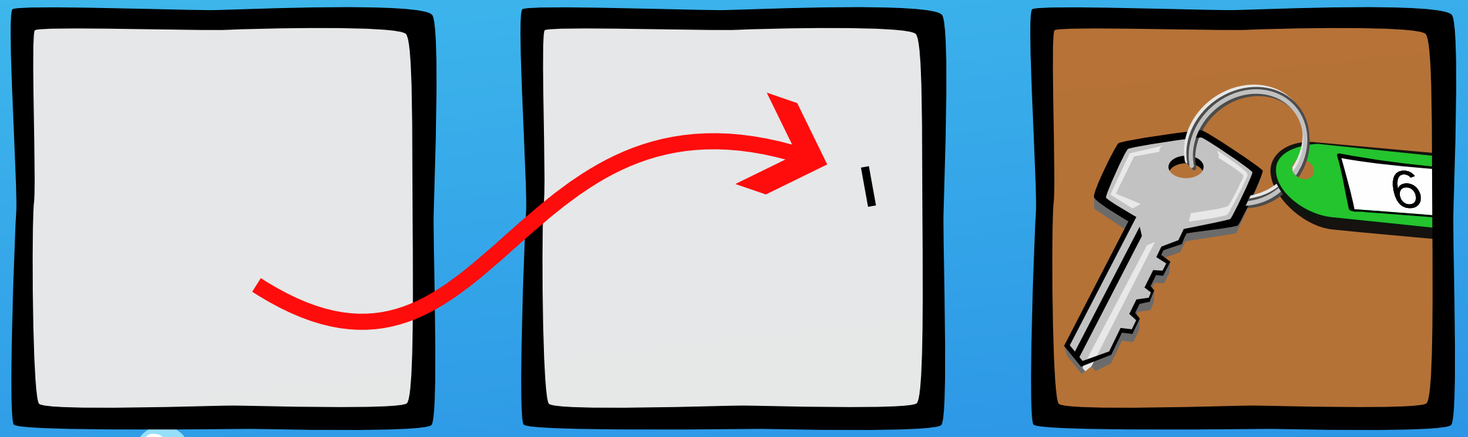

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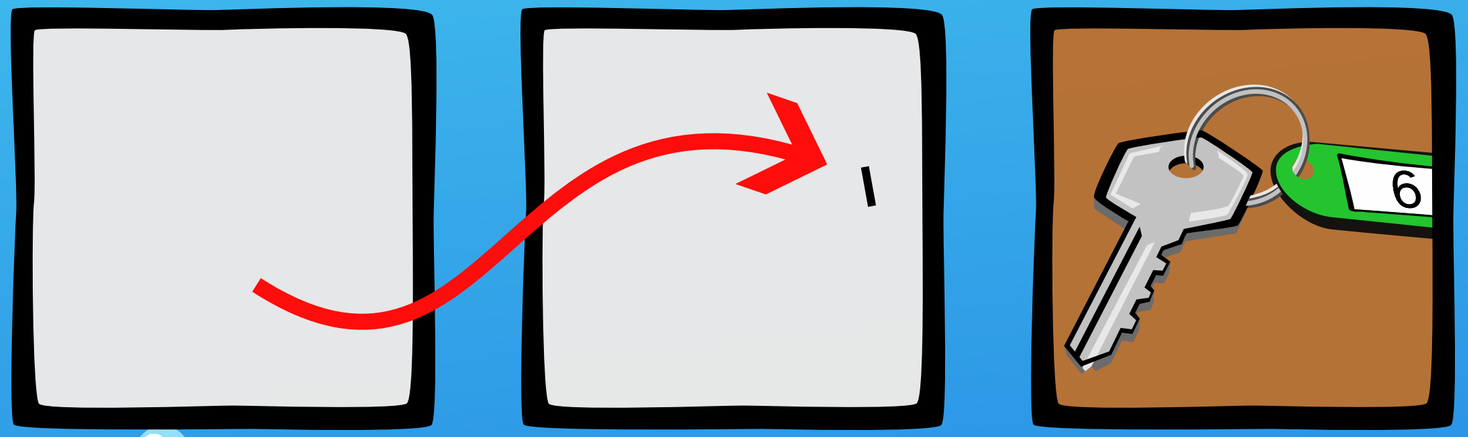

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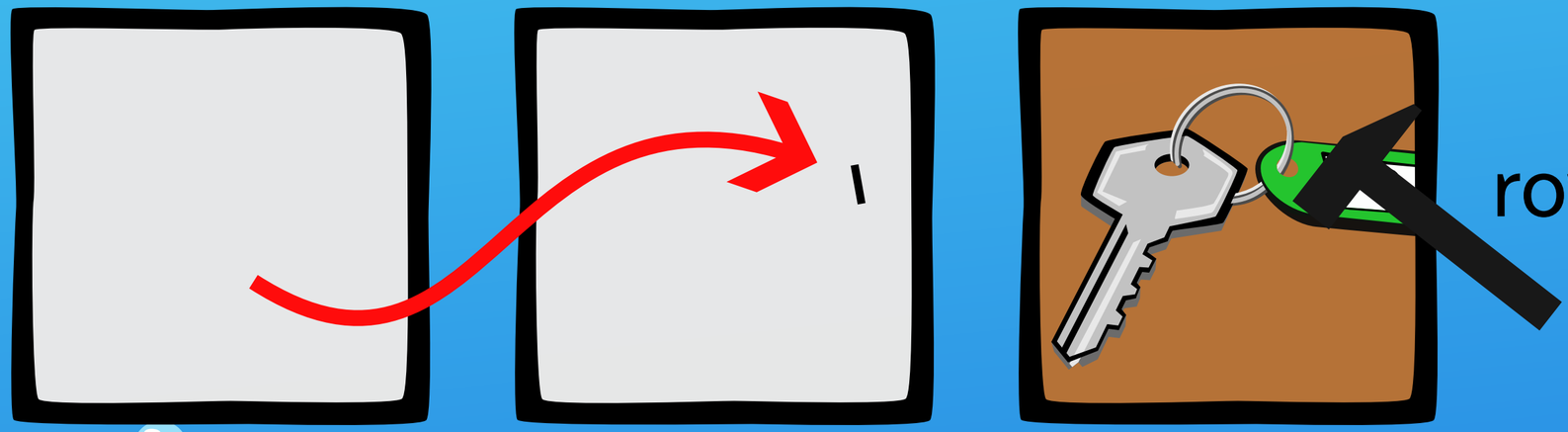
Flip Feng Shui

My memory:

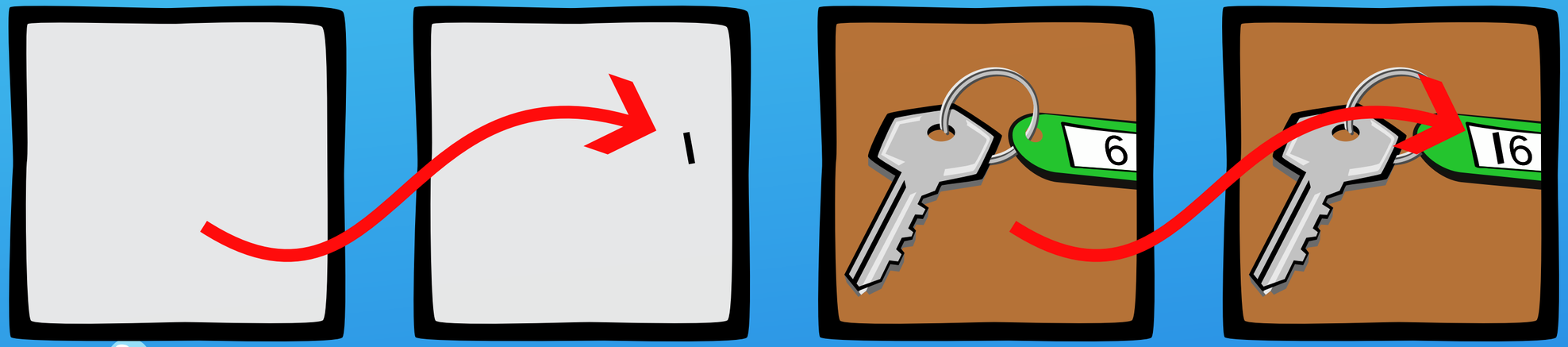


rowhammer

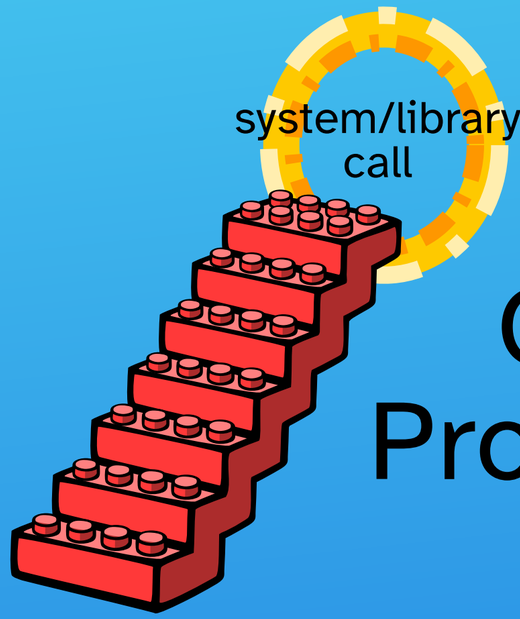
Target data (allowed login keys):

Flip Feng Shui

My memory:



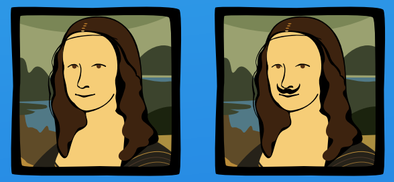
Target data (allowed login keys):



SigReturn Oriented Programming

Dedup est Machina

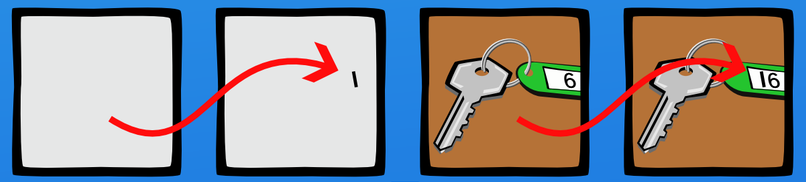
My memory has the only copy:



There is another copy in the system:

Flip Feng Shui

My memory:



Target data (allowed login keys):