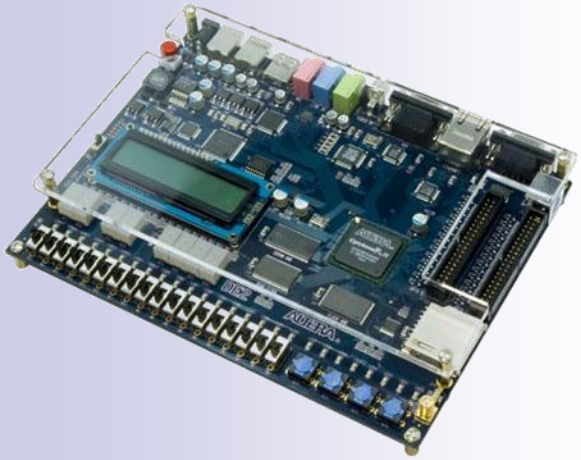
Selection from

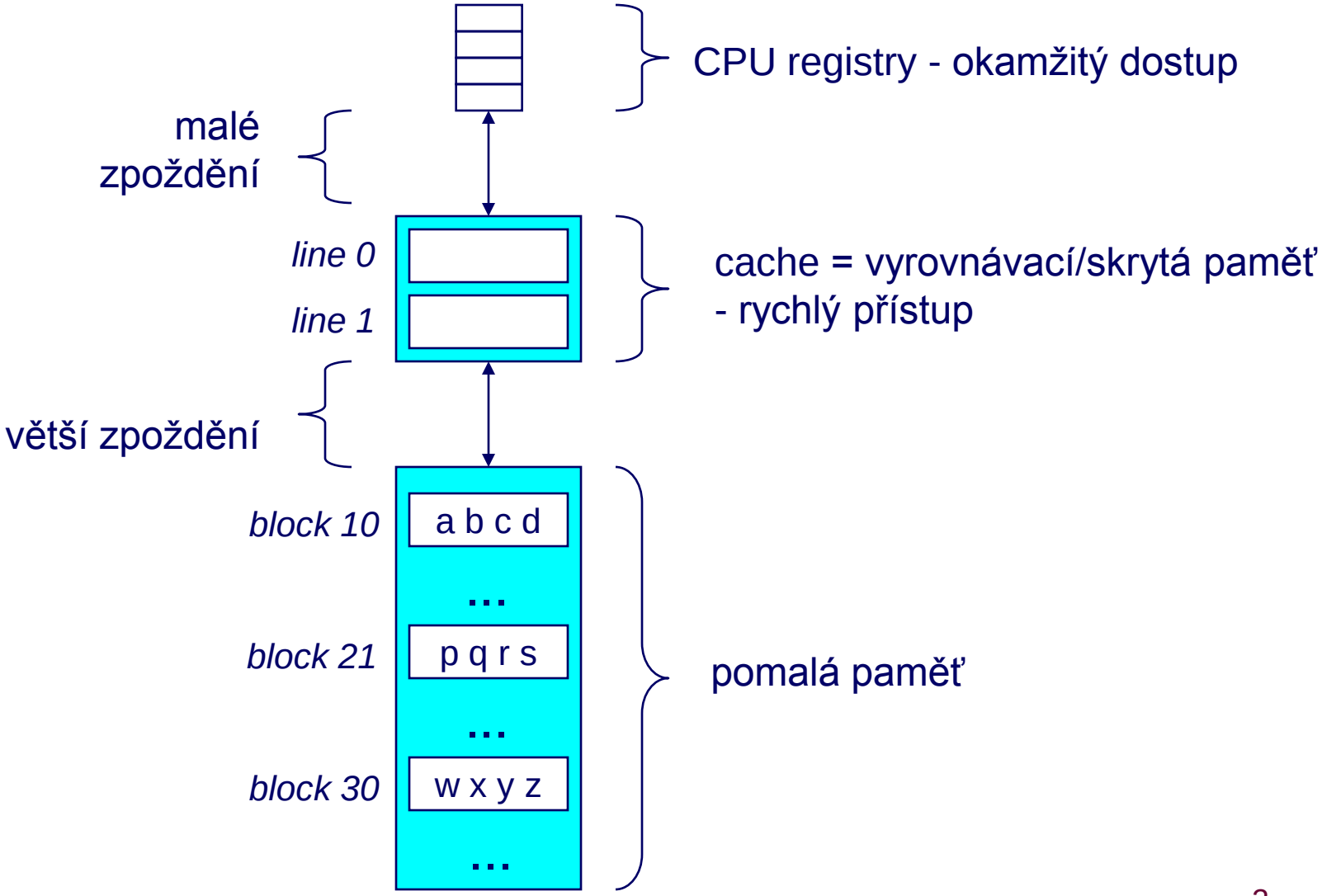
MIT:Computer Architecture and Organization
FEL:Architektury počítačů

Version: 1.0



ČVUT-FEL in Prague,

Skrytá paměť - cache



Cache - etymology

ONLINE ETYMOLOGY DICTIONARY

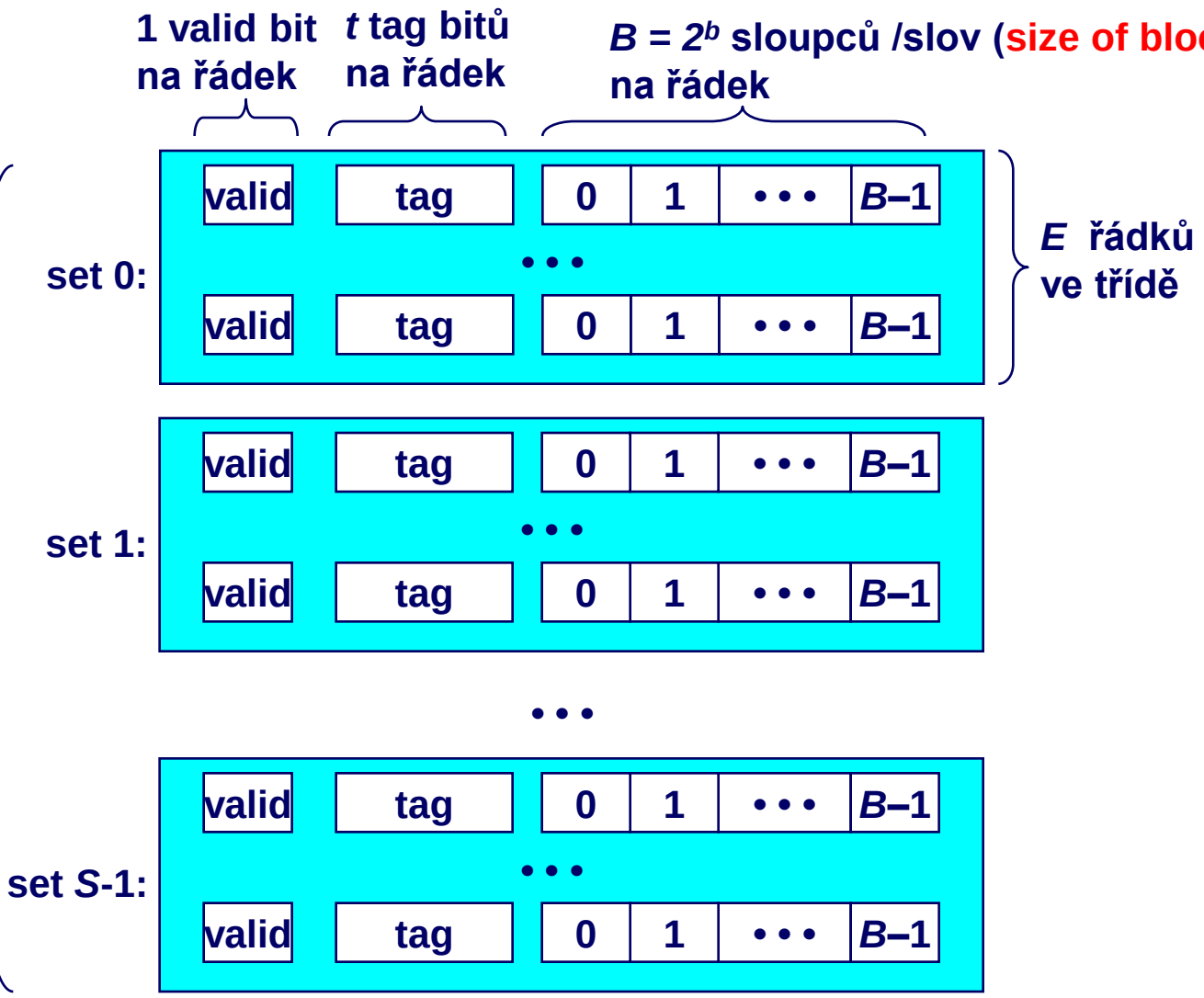
cache (noun) **"hiding place"**

- from French Canadian trappers' slang, "hiding place for stores"
- from French *cacher* "to hide, conceal"
- from Vulgar Latin **coacticare* "store up, collect, compress"
- related to Latin *cogere* "to collect"
- sense extended by 1830s to "anything stored in a hiding place."

Obecná organizace cache

Cache je pole
S tříd (sets)

Třída obsahuje
E řádků (blocks)
Každý řádek
má B slov/sloupců

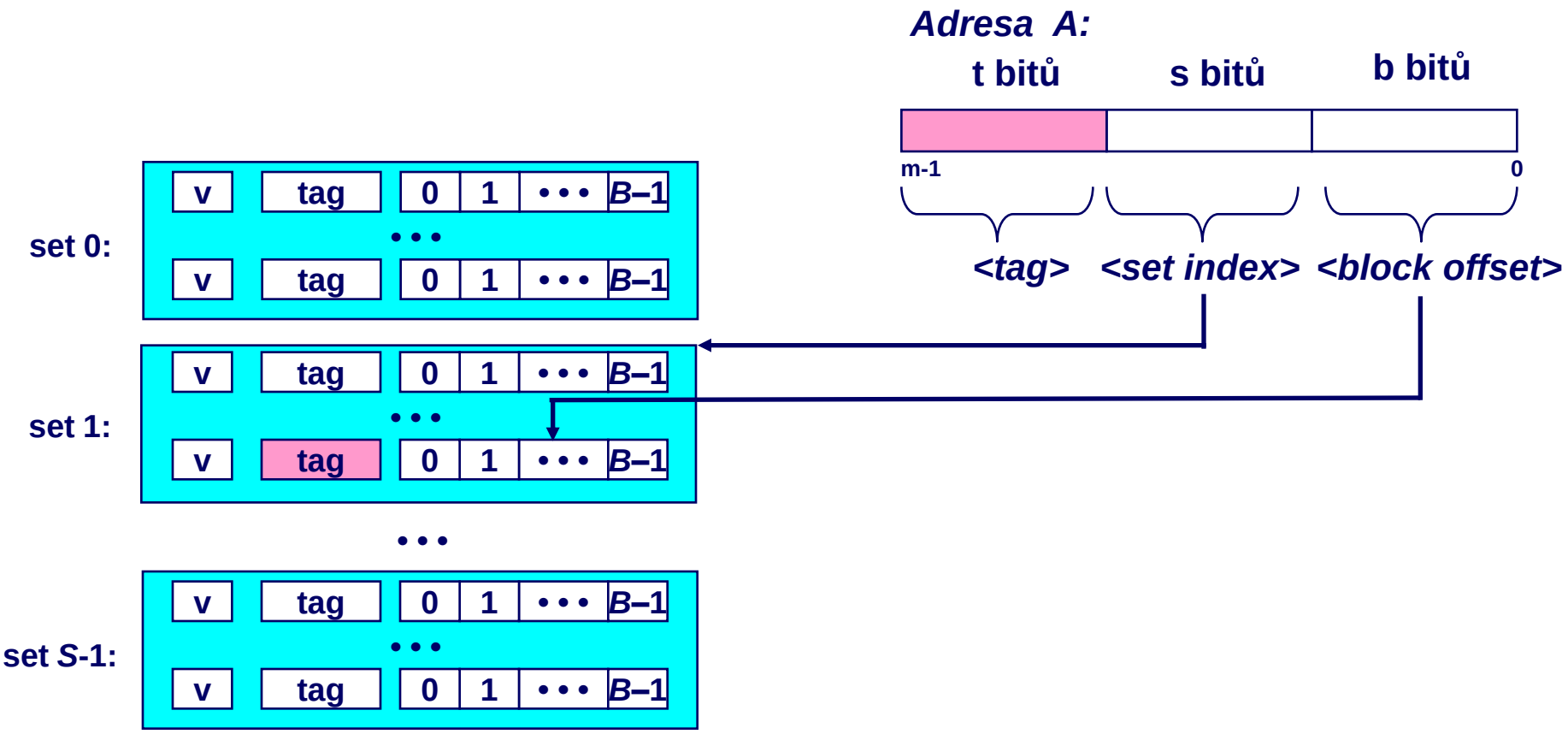


Set # ≡ hash kód

Tag ≡ hash klíč

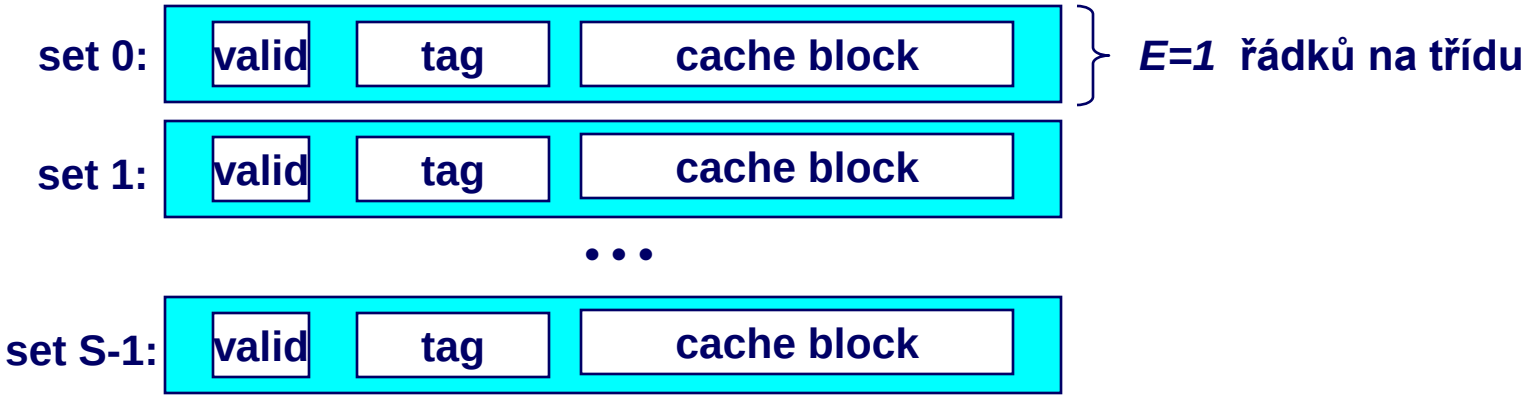
Velikost: $C = B \times E \times S$ slov

Adresování cache



Direct-Mapped Cache

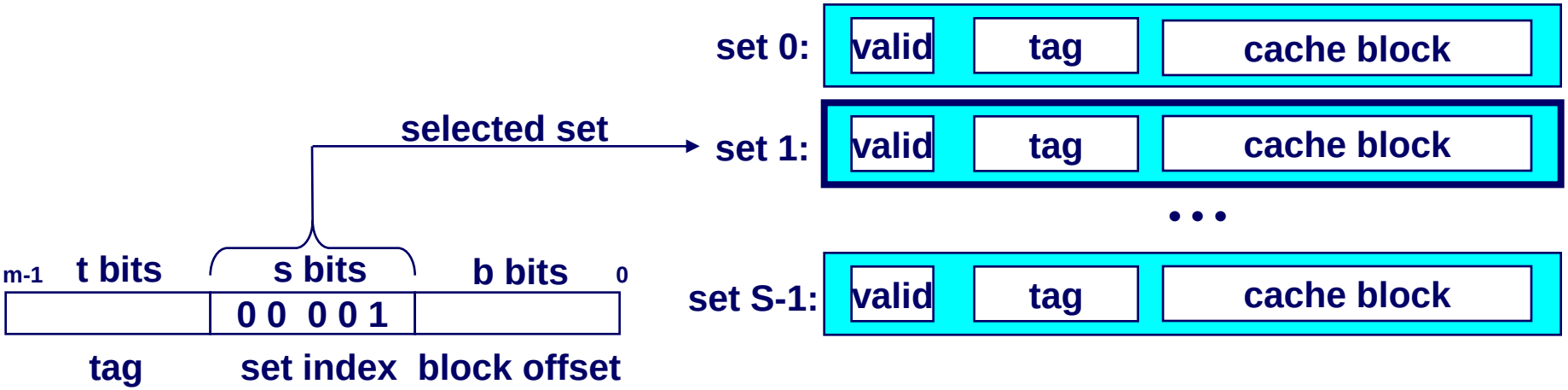
1 řádek (block) na třídu (set)



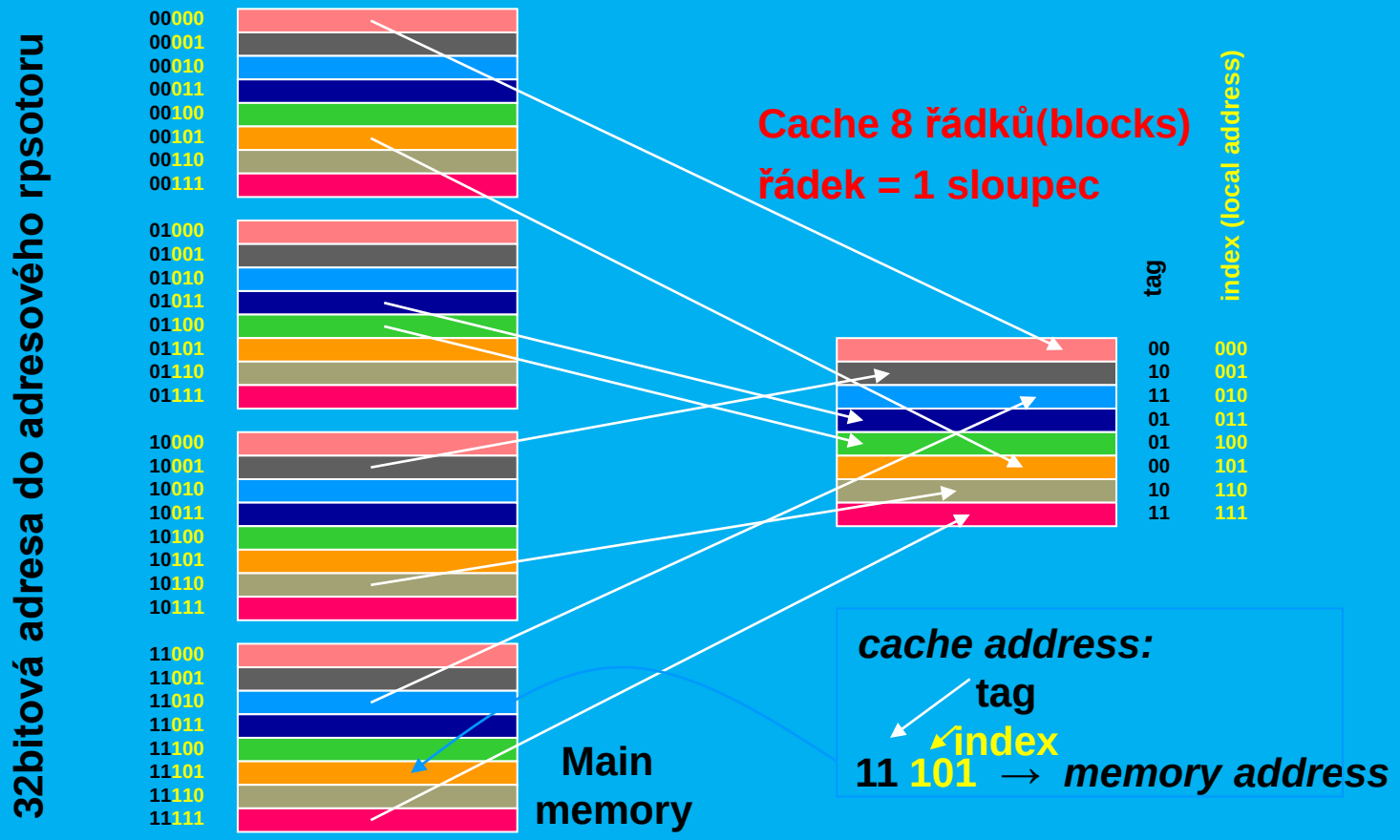
Čtení přímo mapované Cache

Set selection

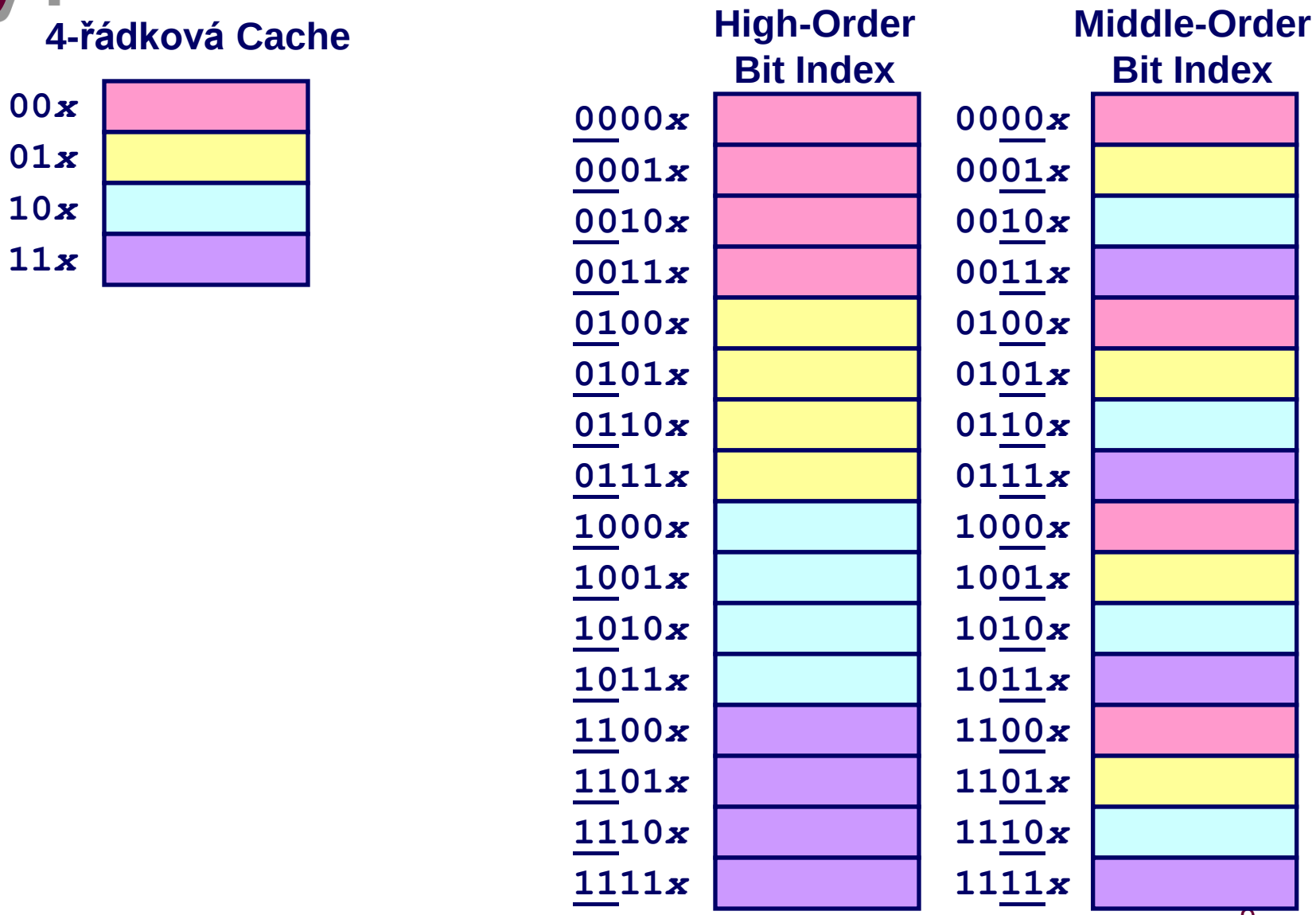
- index třídy (set) určuje cíl



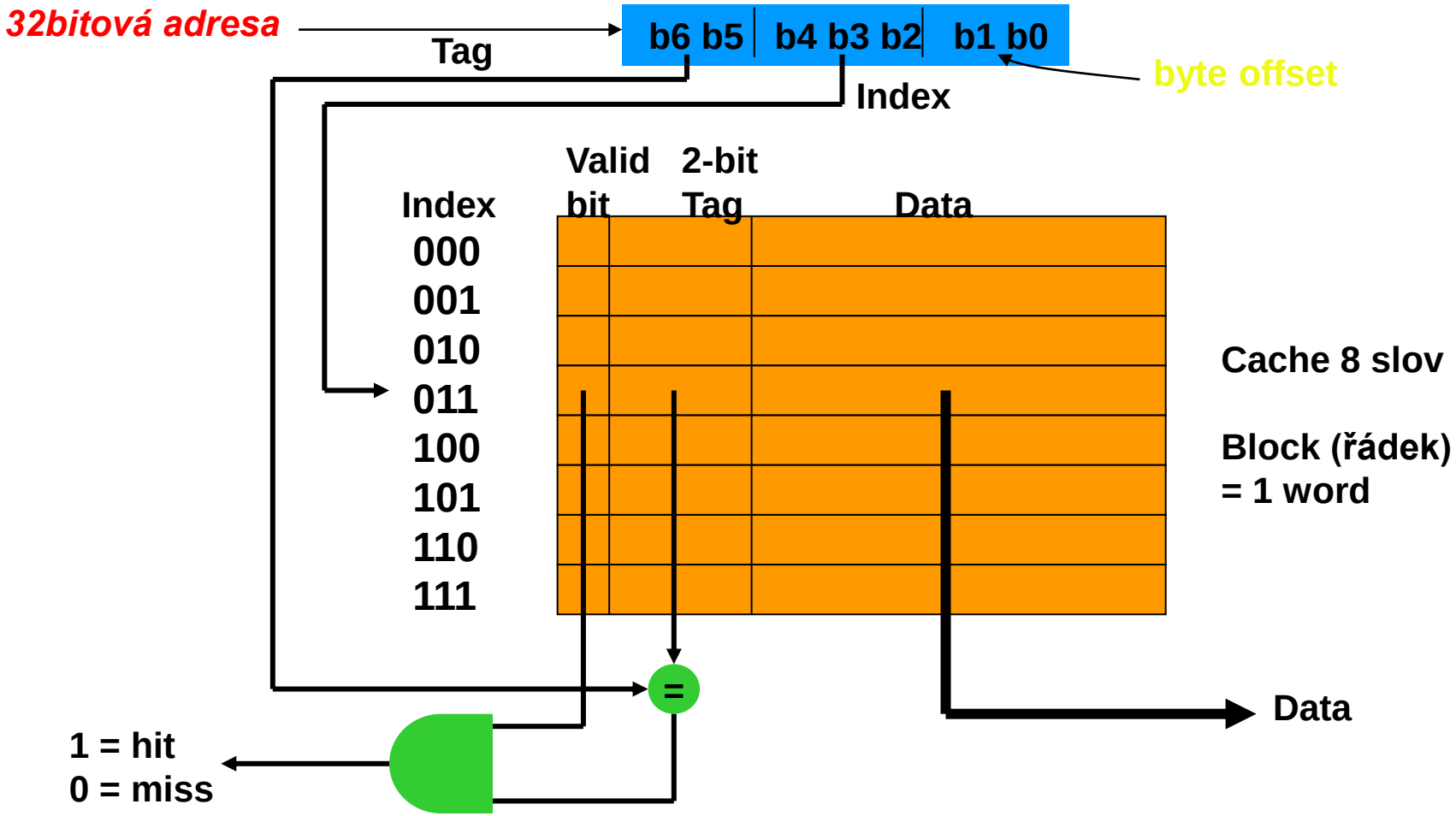
Direct-Mapped Cache



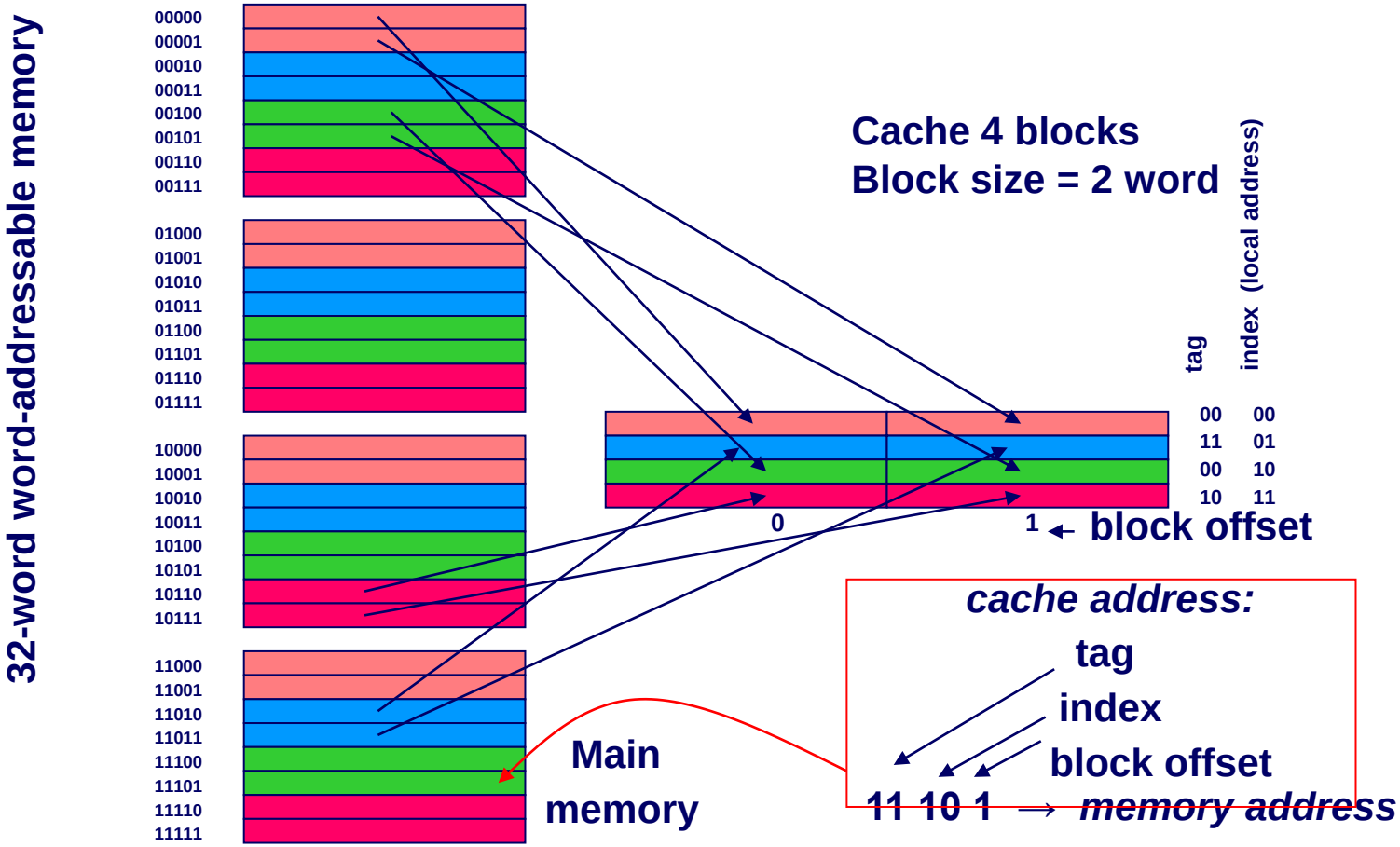
Proč se používají prostřední bity?



Výběr slova


32bitová adresa
b6 b5
b4 b3 b2
b1 b0
Tag
Index
byte offset
Index
Valid bit
2-bit Tag
Data
000
001
010
011
100
101
110
111
Cache 8 slov
Block (řádek) = 1 word
=
Data
1 = hit
0 = miss

Direct-Mapped Cache



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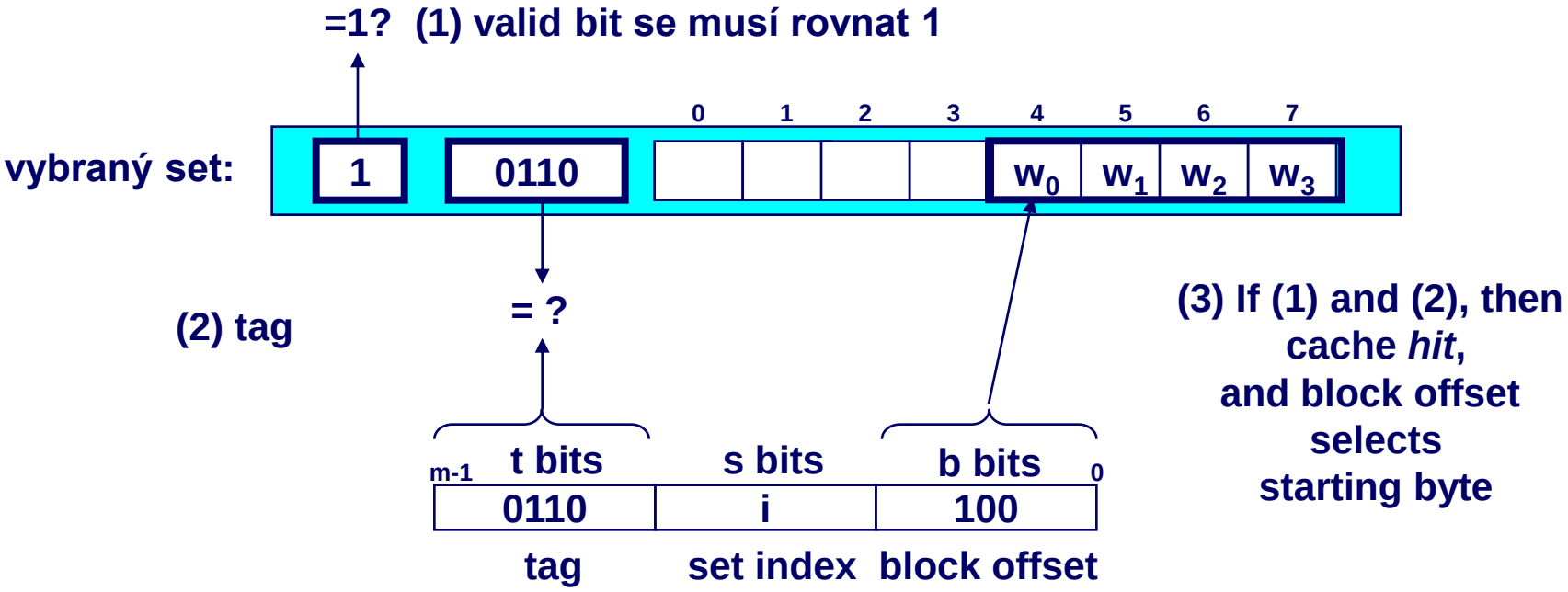
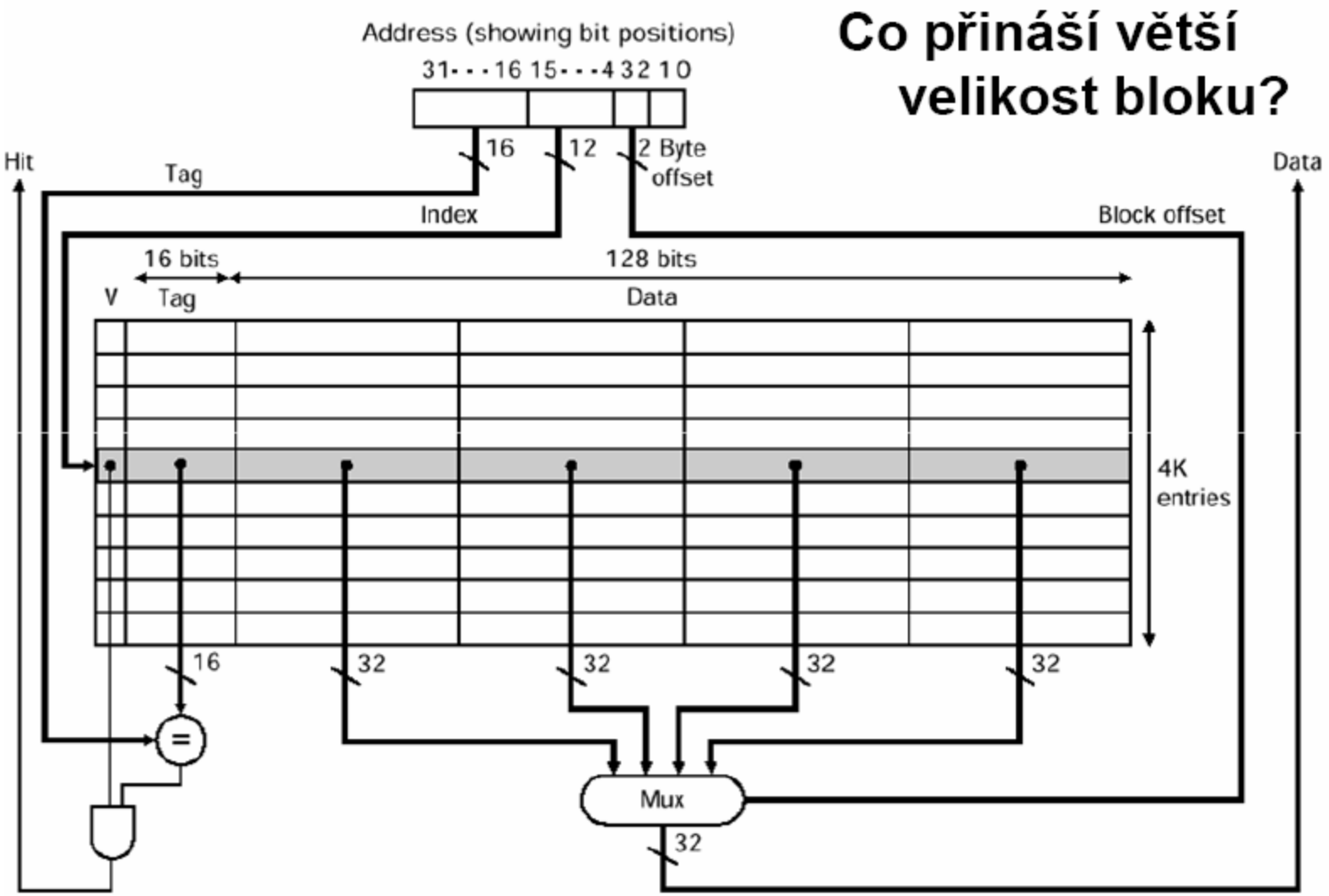
Accessing Direct-Mapped Caches

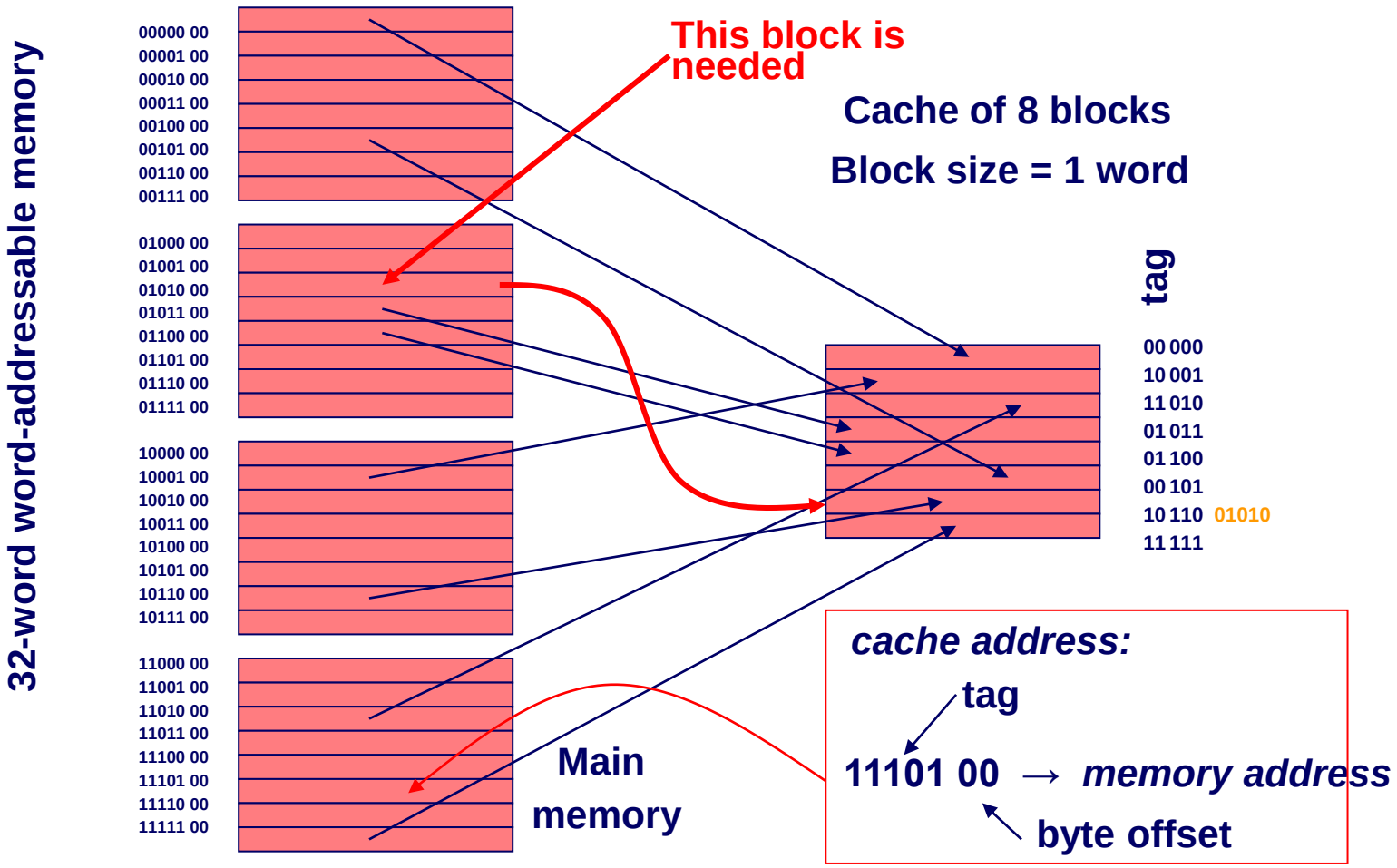


Přímo mapovaná skrytá paměť – velikost bloku 4 slova

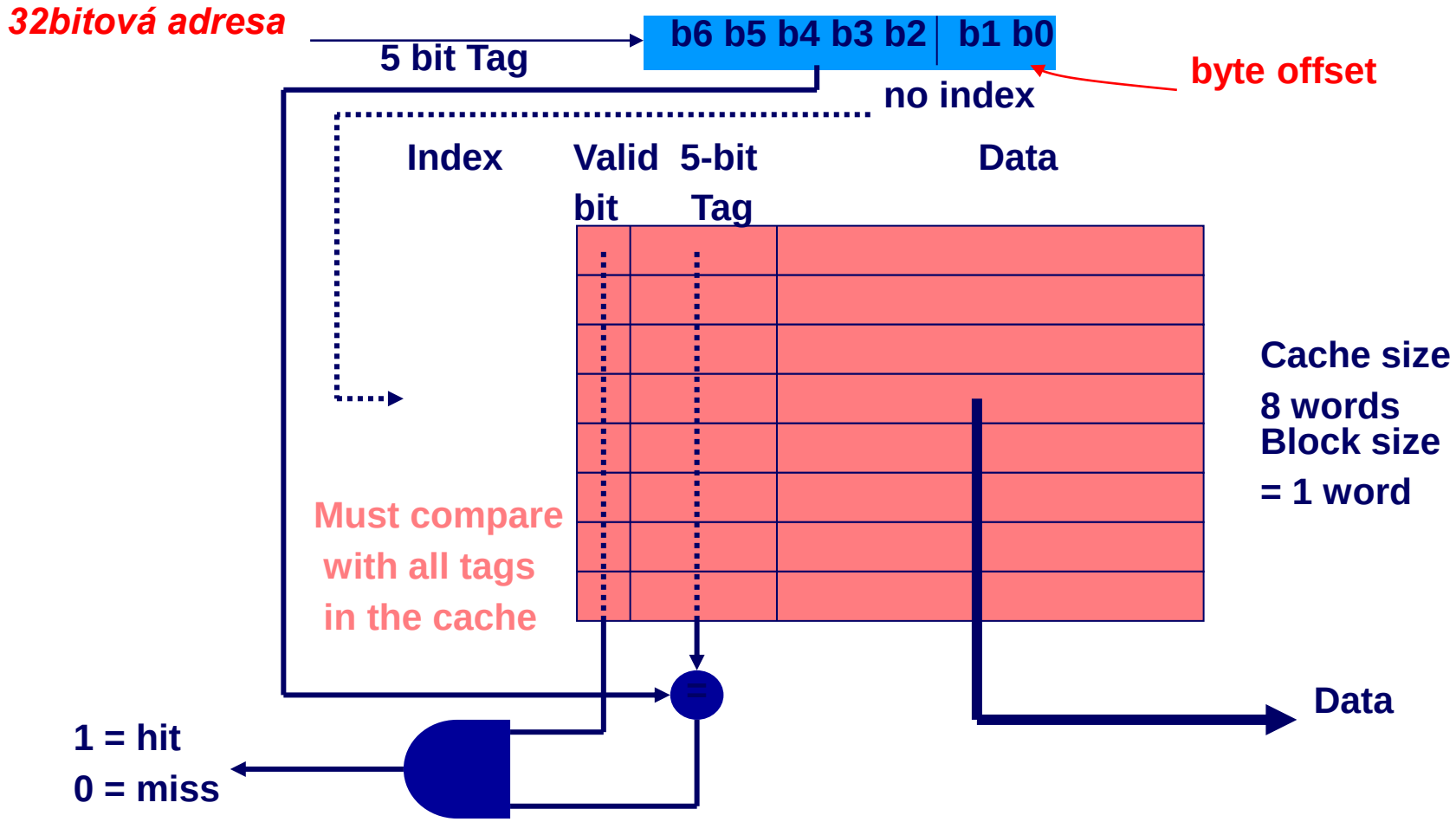


Co přináší větší velikost bloku?

Fully-Associative Cache (8-Way Set Associative)

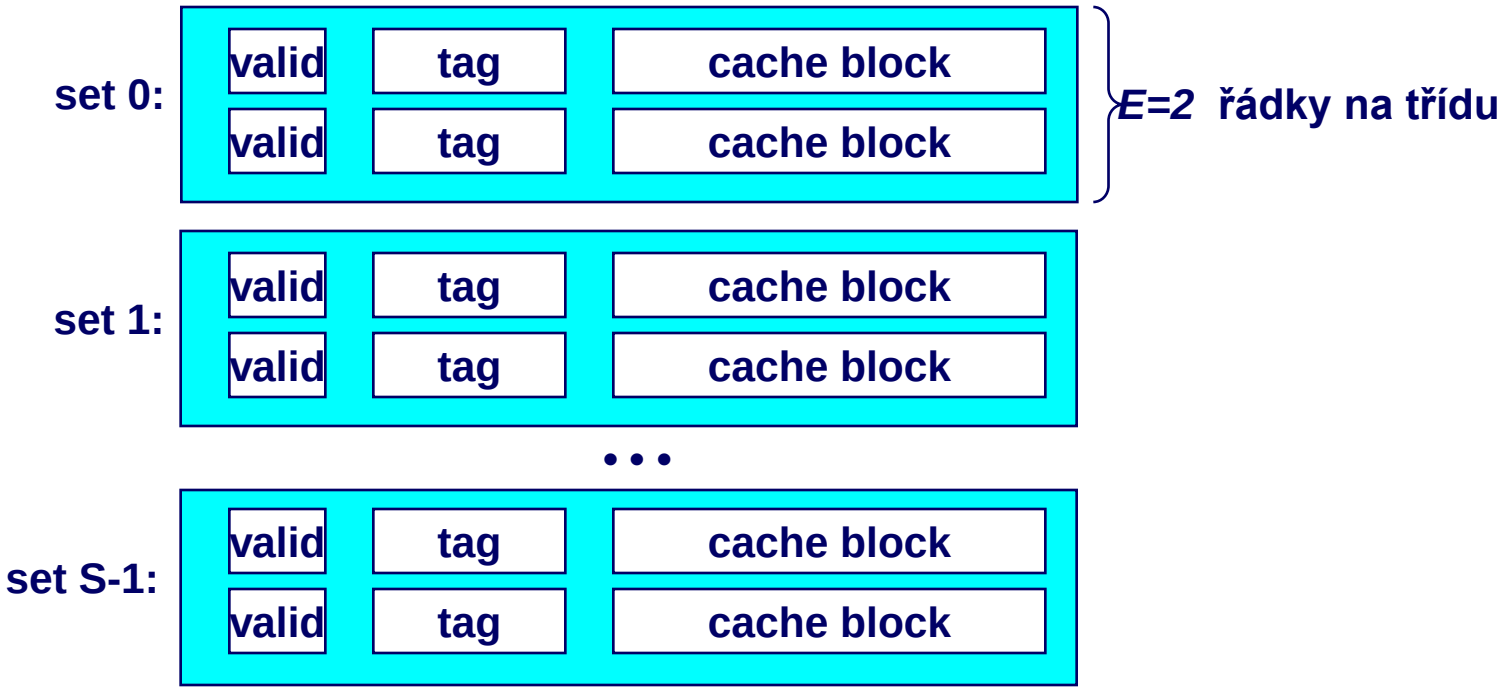


Finding a Word in Associative Cache

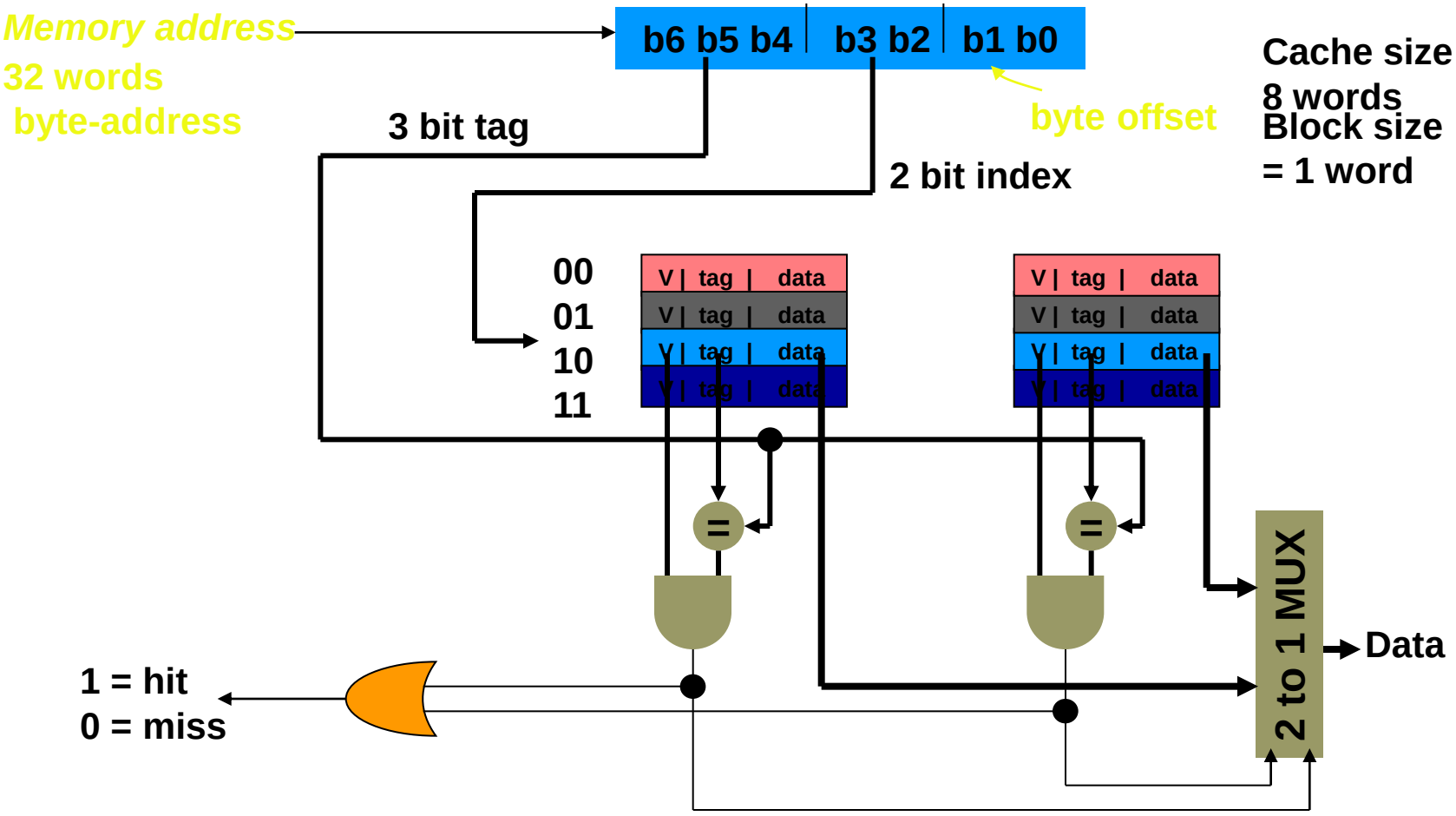


Set-Associative Cache
s omezeným stupněm asociativity

Více řádků (blocks) v třídě (set)



Two-Way Set-Associative Cache



SP s omezeným stupněm asociativity N=2

Co přináší zvětšení stupně asociativity?

Capacity – C

Number of sets – S

Block size – b

Number of blocks – B

Degree of associativity – N

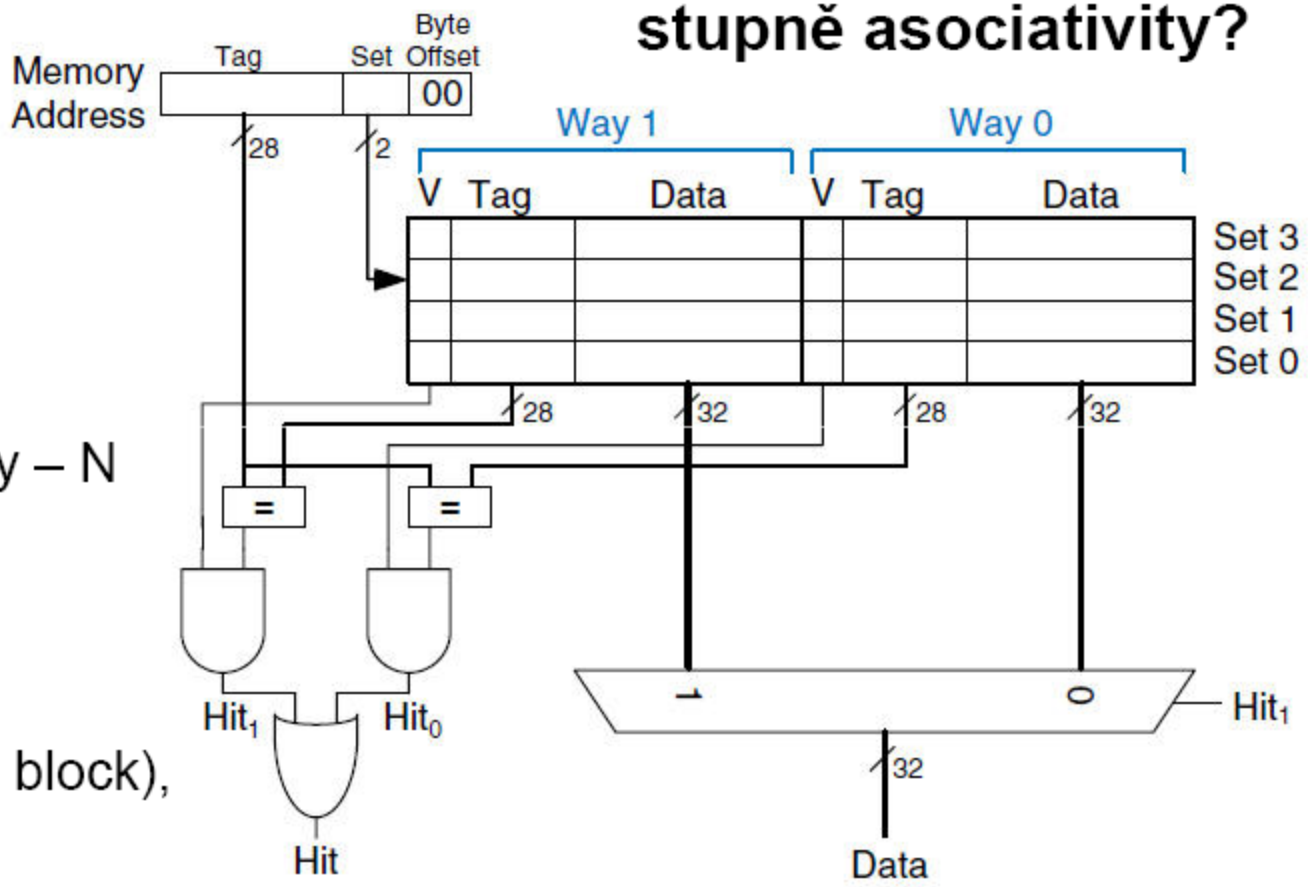
C = 8 (8 words),

S = 4,

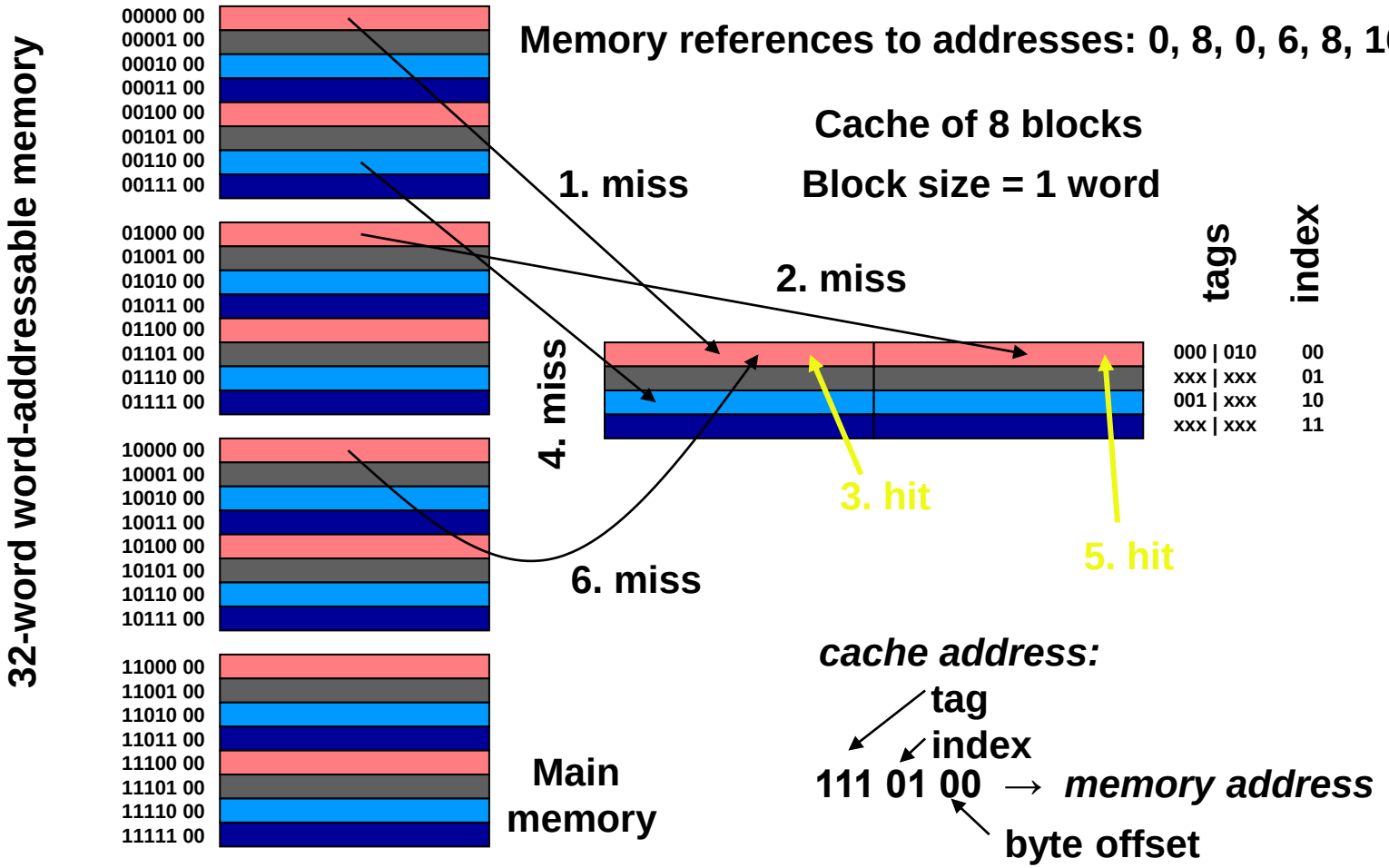
b = 1 (one word in the block),

B = 8

N = 2



Miss Rate: Two-Way Set-Associative Cache



Eight-Way Set-Associative Cache