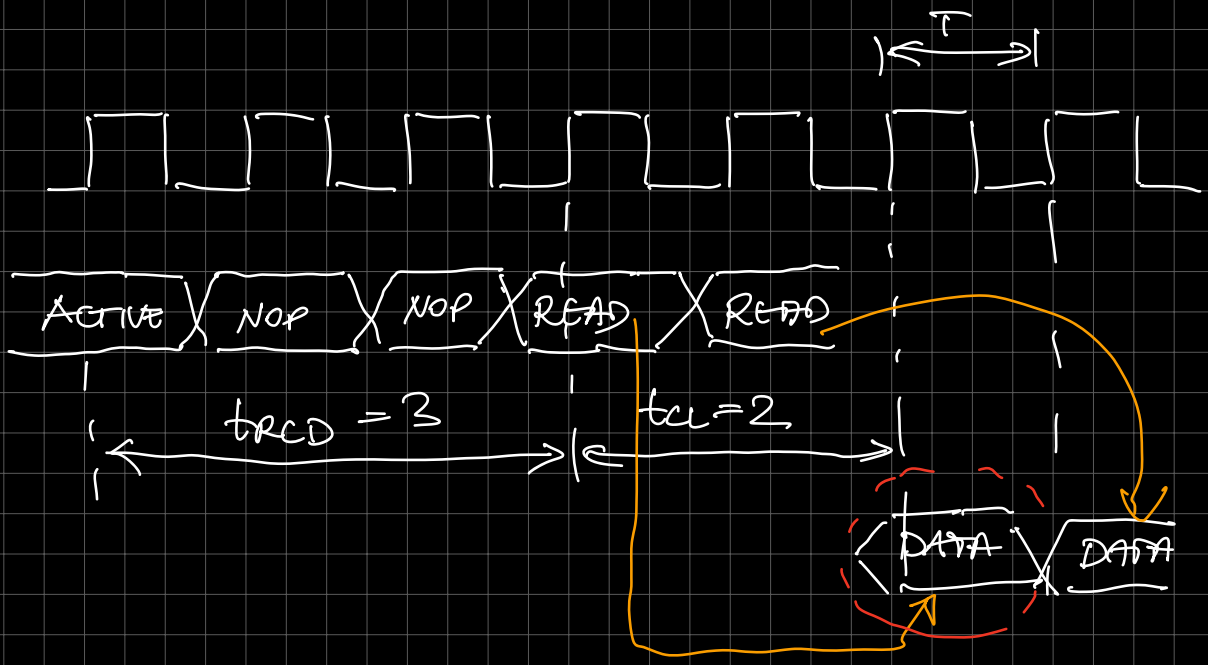
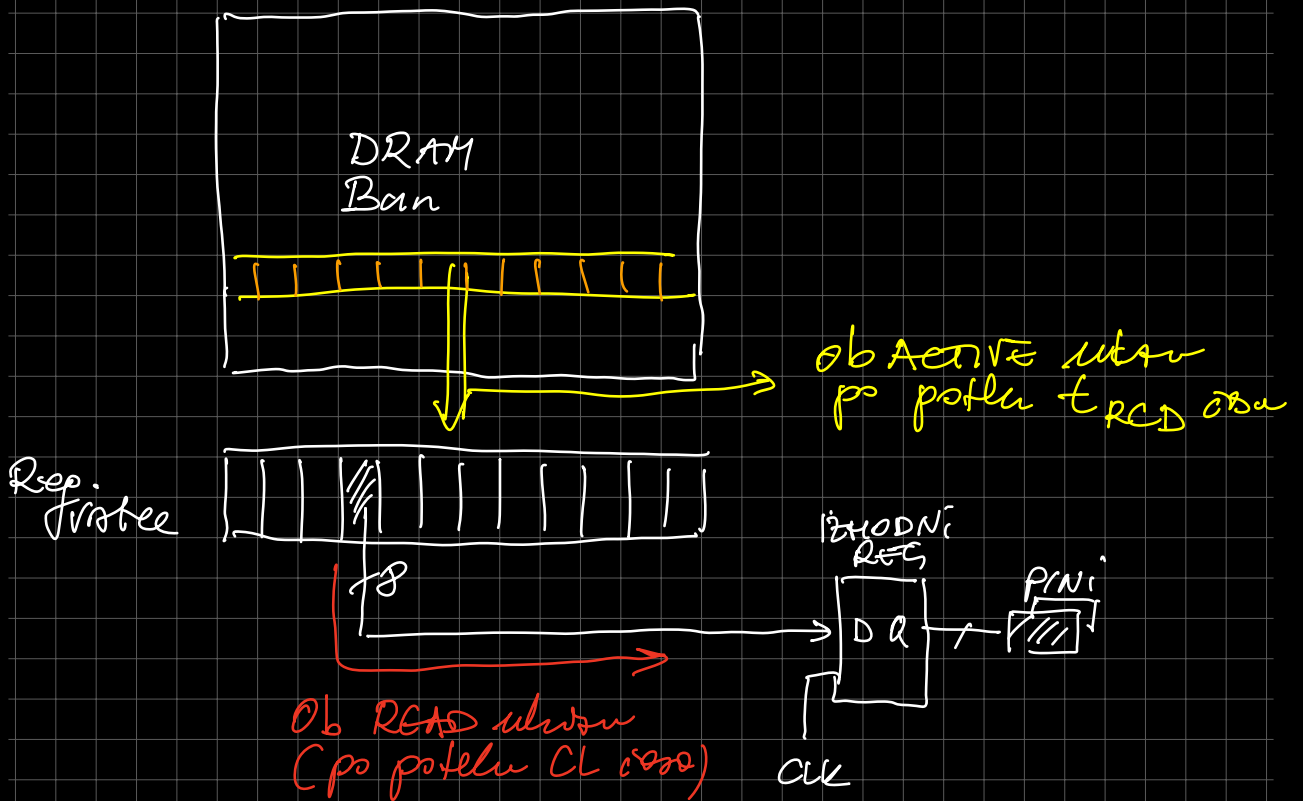
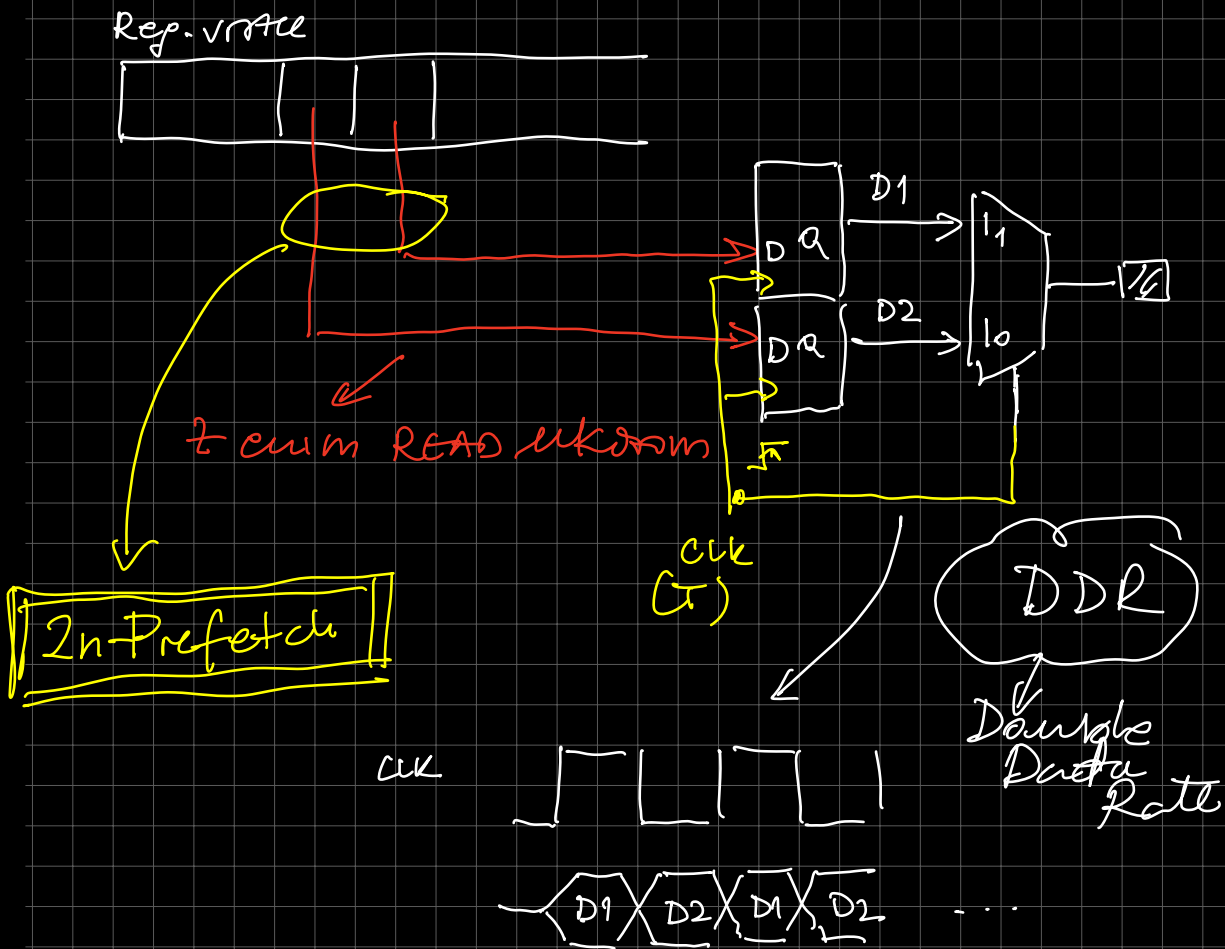


Ponovrtka



DDR SDRAM

Ideja: 2 enim READ ukrom 12 rep. vratae
preberemo dve sotedujici besedi.



Se hitreje?

→ 4n-prefetcher ⇒ namesta 2 stolpcer
 2 enim READ ukrom,
 preberemo vsaj 4

+ ← ZARADI TBA

2x f_{clk} ⇒ **DDR2 SDRAM**

Je hitrije:

↳ 8n - prefetch ⇒ z enim READ
 lokom prebravo
 sosednjih stolpcer

+
 2x fclk ⇒ **DDR3 SDRAM**

Je hitreje (2015 →)? NE

↳ zmanjšal napajalno napetost
 in povečal kapaciteto

⇓
DDR4 SDRAM

2021: Je hitreje?

16n prefetch ⇒ **DDR5 SDRAM**
 2x fclk

CL-tred-terp

	Interna frekvenca	frekvenca vodila	Število prenosov/s	Komercialna oznaka čipu	Dodatna oznaka
SDRAM	133 MHz	133 MHz	133 MT/s	SDRAM-133	3-3-3
	200 MHz	200 MHz	200 MT/s	SDRAM-200	15ns 15ns 15ns
DDR	133 MHz	133 MHz	266 MT/s	DDR-266	
	166 MHz	166 MHz	333 MT/s	DDR-333	3-3-3
	200 MHz	200 MHz	400 MT/s	DDR-400	
DDR2	133 MHz	266 MHz	533 MT/s	DDR2-533	4-4-4 15ns
	166 MHz	333 MHz	666 MT/s	DDR2-666	5-5-5 15ns

1 2.5V
 2 2V

1.8V	44	DC	200 MHz	400 MHz	800 MT/s	DDR2-800	6-6-6	15ns
1.5V	84	DDR3	133 MHz	533 MHz	1066 MT/s	DDR3-1066		
1.2V	84	DDR3	166 MHz	666 MHz	1333 MT/s	DDR3-1333		
1.2V	84	DDR3	200 MHz	800 MHz	1600 MT/s	DDR3-1600		
1.2V	84	DDR4	300 MHz	1200 MHz	2400 MT/s	DDR4-2400	18-18-18	
1.2V	84	DDR4	333 MHz	1333 MHz	2667 MT/s	DDR4-2667	20-20-20	
1.2V	84	DDR4	400 MHz	1600 MHz	3200 MT/s	DDR4-3200	22-22-22	

↳ u.p. = 0.625 ns

13.75 ns

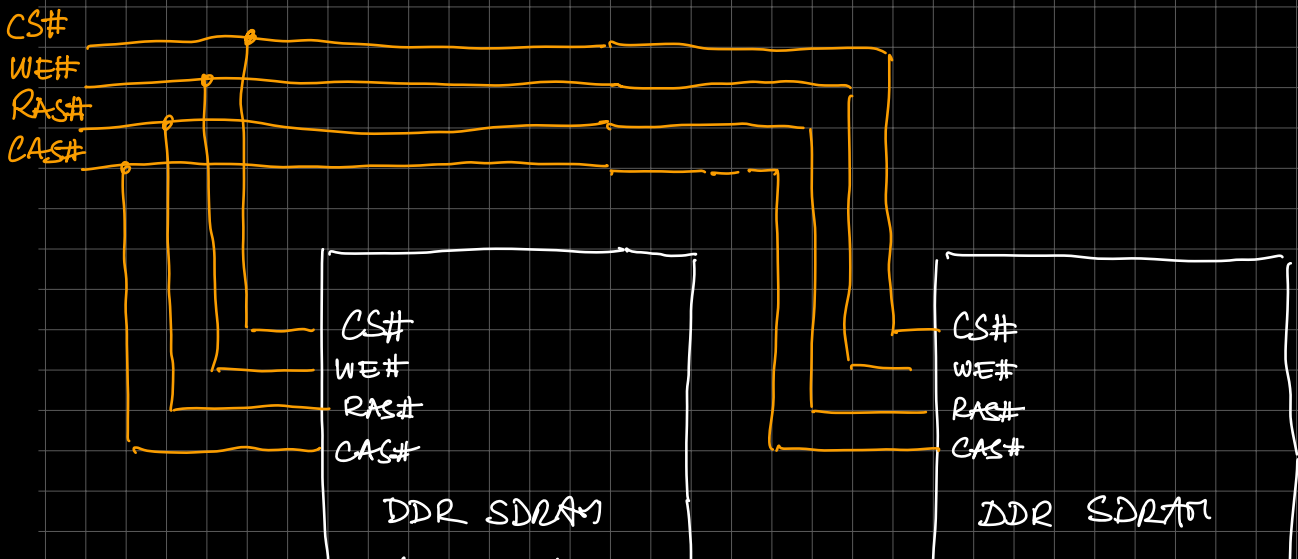
13.75 ns

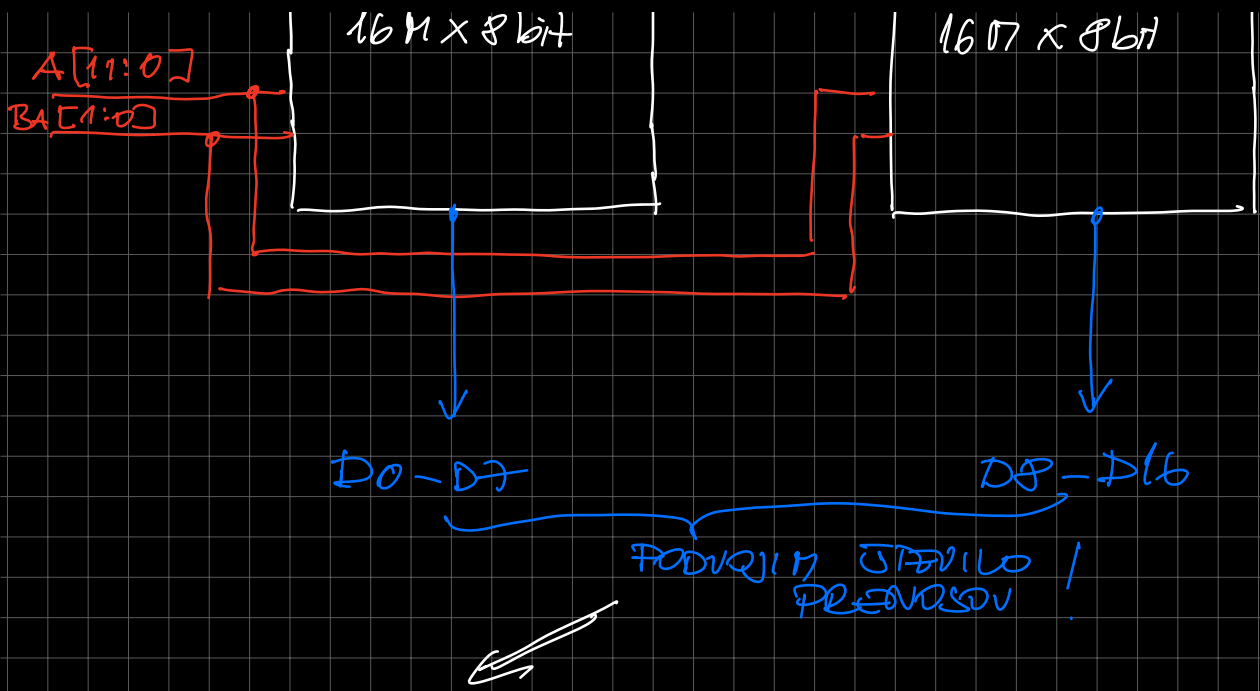
13.75 ns

Porecunje kapacitete pomululu

→ max kapaciteta DDR4 SDRAM čipa ~ 32 Gbit (4GB)

↳ čipovi : 256MB, 512MB





Pri sadržaju računala tako pričemo Φ
 DDR4 JDRAN čipov
 (pri DDR4 pa 4 čipe)