Explicit register renaming:
R10000 Freelist Management

P0	P2	P4	F6	F8	P10	P12	P14	P16	P18	P20	P22	P24	p26	P28	P30

Current Map Table

Done?

Newest

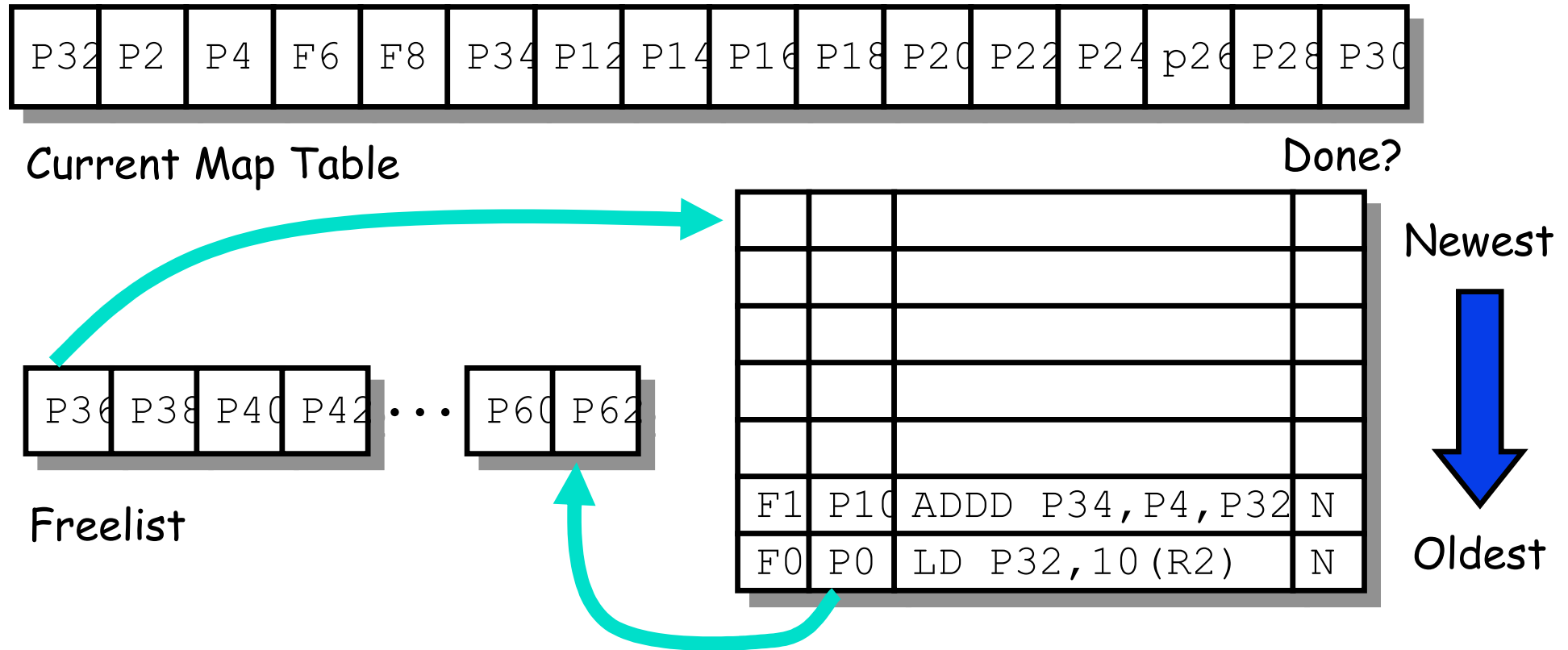| P32	P34	P36	P38	...	P60	P62

Freelist

Oldest

- ❑ Physical register file larger than ISA register file
- ❑ On issue, each instruction that modifies a register is allocated new physical register from freelist
- ❑ Used on: R10000, Alpha 21264, HP PA8000

Explicit register renaming:
R10000 Freelist Management

P32	P2	P4	F6	F8	P10	P12	P14	P16	P18	P20	P22	P24	p26	P28	P30

Current Map Table

Done?

F0	P0	LD P32,10(R2)		N

Newest

Oldest

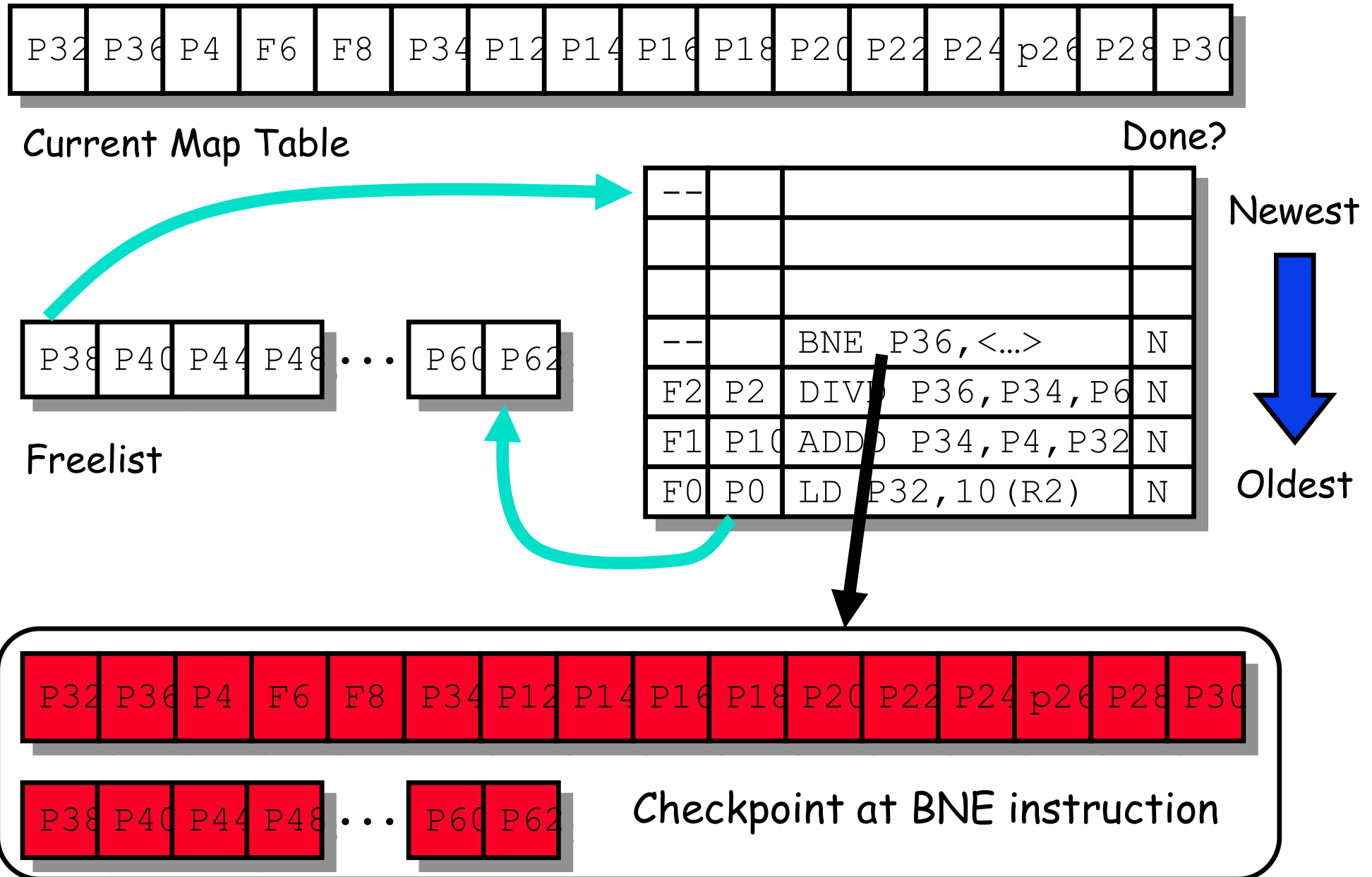| P34	P36	P38	P40	...	P60	P62
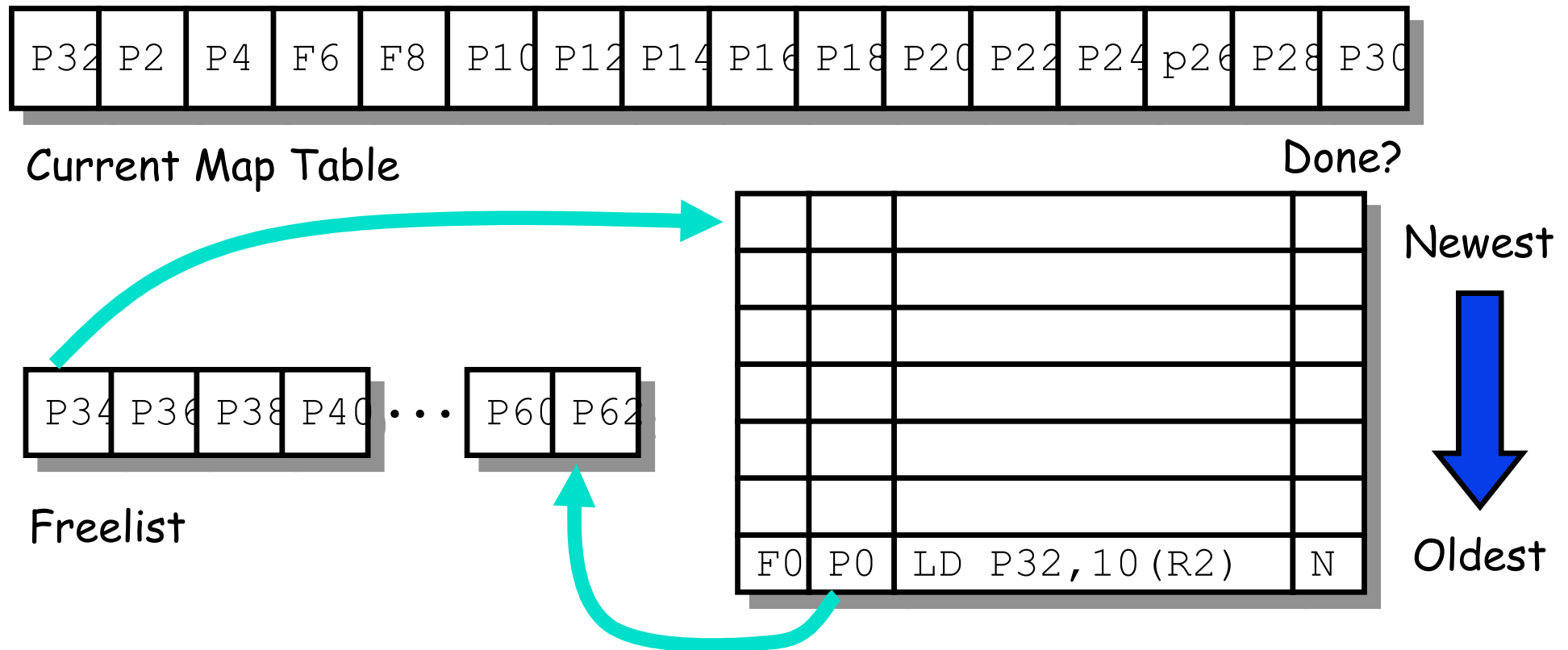
Freelist

- ❑ Note that physical register P0 is "dead" (or not "live") past the point of this load.
  - ● When we go to commit the load, we free up

Explicit register renaming:
R10000 Freelist Management

P32	P2	P4	F6	F8	P34	P12	P14	P16	P18	P20	P22	P24	p26	P28	P30

Current Map Table

Done?

Newest

F1	P10	ADDD P34,P4,P32	N
F0	P0	LD P32,10(R2)	N

Oldest

P36	P38	P40	P42	···	P60	P62

Freelist

Explicit register renaming:
R10000 Freelist Management

P32	P36	P4	F6	F8	P34	P12	P14	P16	P18	P20	P22	P24	p26	P28	P30

Current Map Table

Done?

Newest

--			
--		BNE P36,<...>	N
F2	P2	DIVD P36,P34,P6	N
F1	P10	ADDD P34,P4,P32	N
F0	P0	LD P32,10(R2)	N

Oldest

P38	P40	P44	P48	...	P60	P62

Freelist

P32	P36	P4	F6	F8	P34	P12	P14	P16	P18	P20	P22	P24	p26	P28	P30

P38	P40	P44	P48	...	P60	P62

Checkpoint at BNE instruction

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Explicit register renaming:
R10000 Freelist Management

P40	P36	P38	F6	F8	P34	P12	P14	P16	P18	P20	P22	P24	p26	P28	P30

Current Map Table

Done?

--		ST 0(R3),P40	Y
F0	P32	ADDD P40,P38,P6	Y
F4	P4	LD P38,0(R3)	Y
--		BNE P36,<...>	N
F2	P2	DIVD P36,P34,P6	N
F1	P10	ADDD P34,P4,P32	y
F0	P0	LD P32,10(R2)	y

Newest
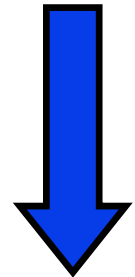
Oldest

P42	P44	P48	P50	...	P0	P10

Freelist

P32	P36	P4	F6	F8	P34	P12	P14	P16	P18	P20	P22	P24	p26	P28	P30

P38	P40	P44	P48	...	P60	P62

Checkpoint at BNE instruction

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Explicit register renaming:
R10000 Freelist Management

P32	P36	P4	F6	F8	P34	P12	P14	P16	P18	P20	P22	P24	p26	P28	P30

Current Map Table

Done?

Newest

P38	P40	P4		P0	P10

Freelist

F2	P2	DIVD P36,P34,P6	N
F1	P10	ADDD P34,P4,P32	y
F0	P0	LD P32,10(R2)	y

Oldest
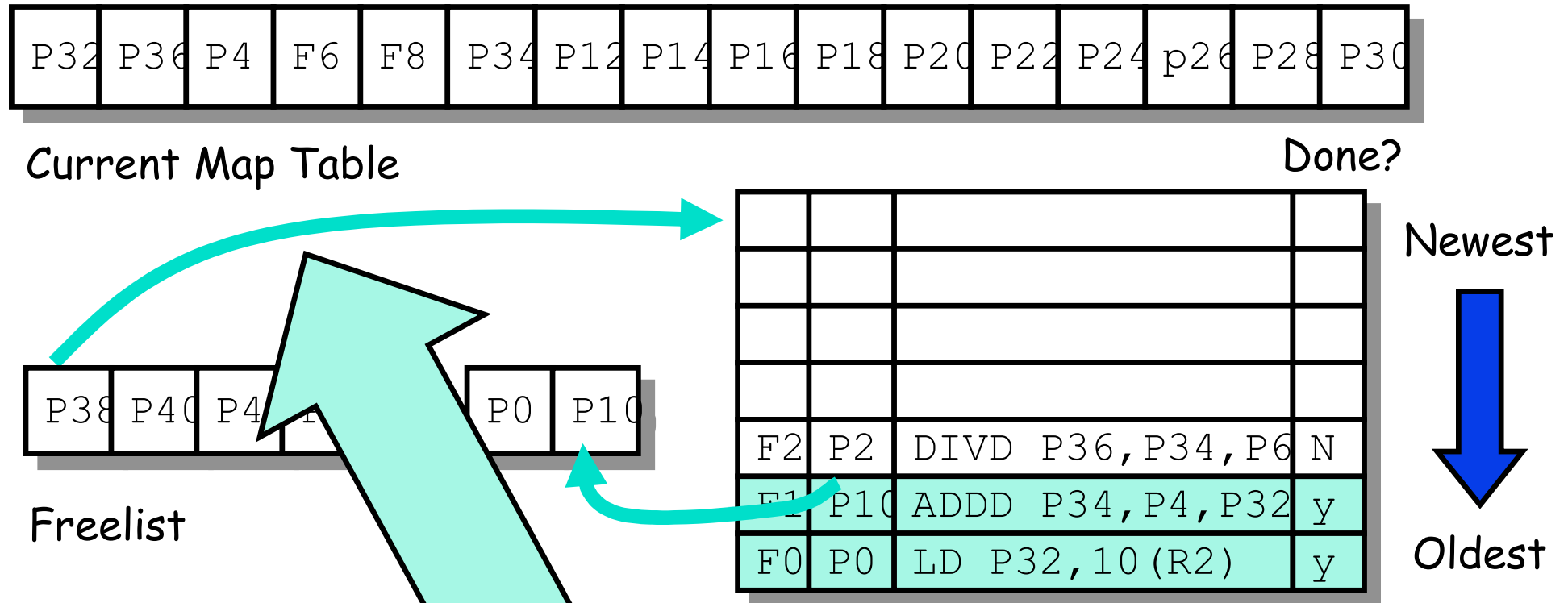
Error fixed by restoring map table and *merging* freelist

P32	P36	P4	F6	F8	P34	P12	P14	P16	P18	P20	P22	P24	p26	P28	P30

P38	P40	P44	P48	…	P60	P62

Checkpoint at BNE instruction

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