Demo of ISP
Eclipse GUI
Command-line Options
Set-up Audience with LiveDVD

About 30 minutes – by Ganesh

Understanding Out-of-order Execution

- For MPI programs, no dynamic tool can maintain in-order (in program order) issue of all instructions and yet cover the full extent of non-determinism!
- Luckily, the MPI semantics are such that out-of-order issue of ‘hijacked’ instructions is OK !
- Theory of ‘happens-before’ (after break) justifies
- Illustration on Crooked-barrier now
  - Real code illustration is through POE-Illustration

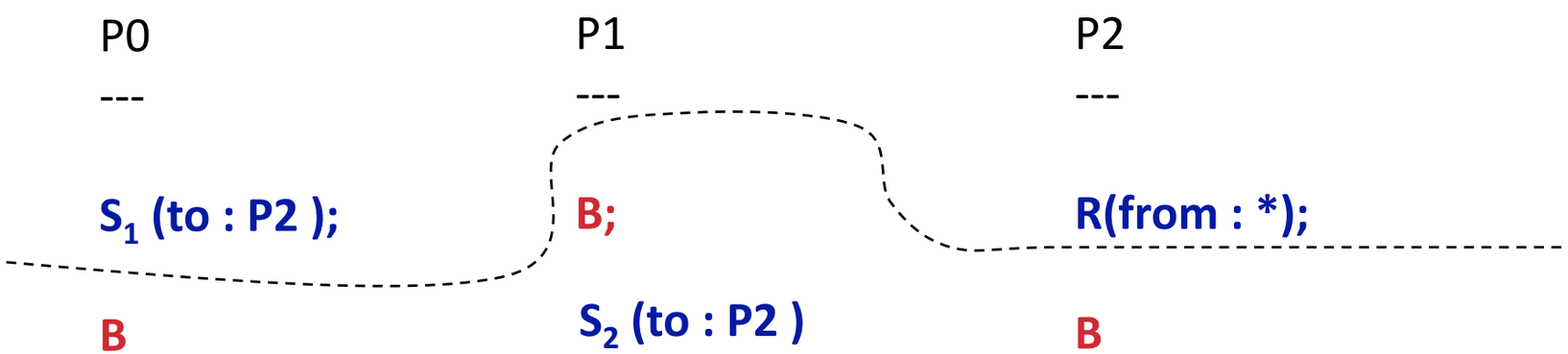
Demonstrate on Auto-send Examples

- Experiment with Autosend examples
  - MPI_Autosend1 and Autosend2
    - These execute without deadlocks
    - Stepping in internal issue order shows how ISP performs things
    - The IntraCompletesBefore (recently called IntraHappensBefore) justifies this out-of-order execution
  - MPI_Autosend3
    - This example deadlocks
    - Pattern is R(from:0,h1); W(h1); B; S(to:0,h2); W(h2)
  - Try variant MPI_Autosend4
    - Have pattern S(to:0,h2); W(h2); B; R(from:0,h1); W(h1)
    - Run with and without buffering
    - What do you observe?
      - The case with buffering does not deadlock!

‘Crooked Barrier’ in POE-Illustration.c

Process P0	Process P1	Process P2
Isend(1, req) ;	Irecv(*, req) ;	**Barrier ;**
Barrier ;	**Barrier ;**	Isend(1, req) ;
Wait(req) ;	Recv(2) ;	Wait(req) ;
	Wait(req) ;	

The “Crooked Barrier” example



Can S_2 **(to : P2)** match **R(from : *)** ?

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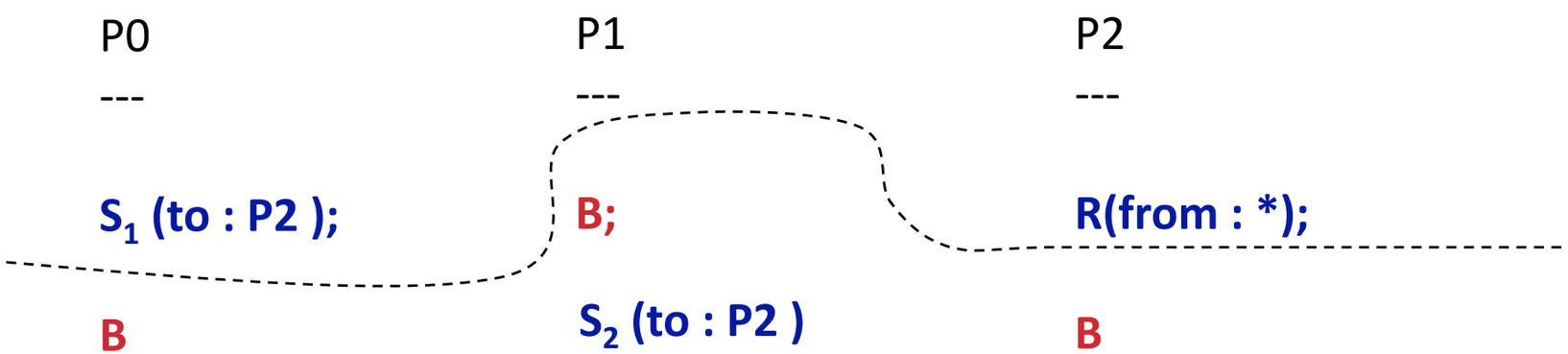

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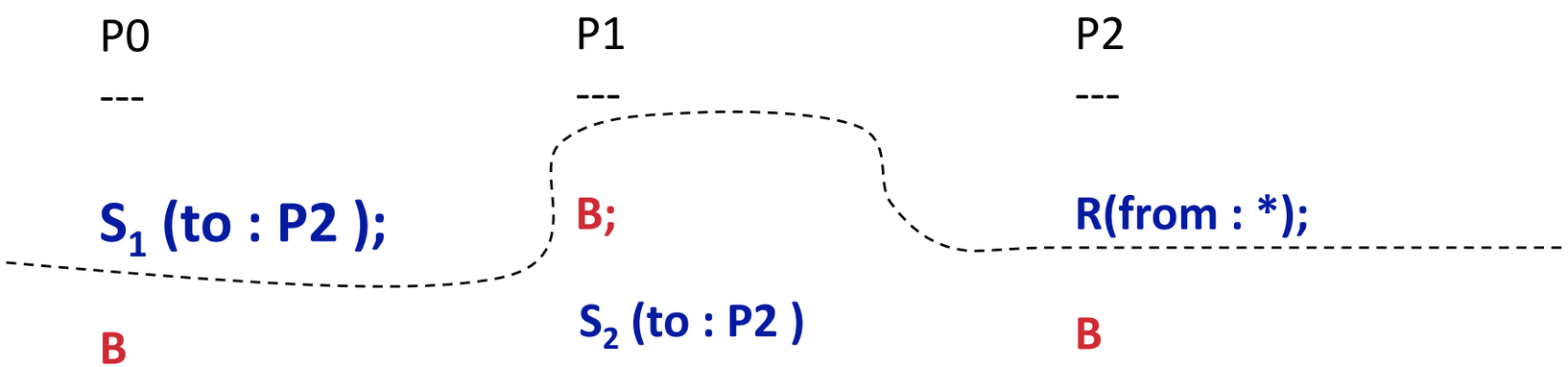

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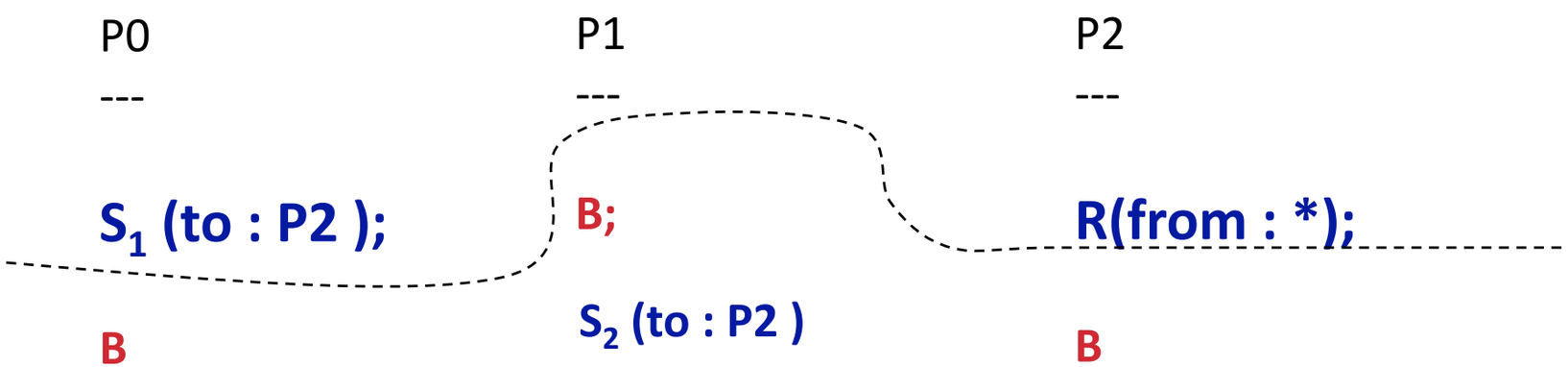

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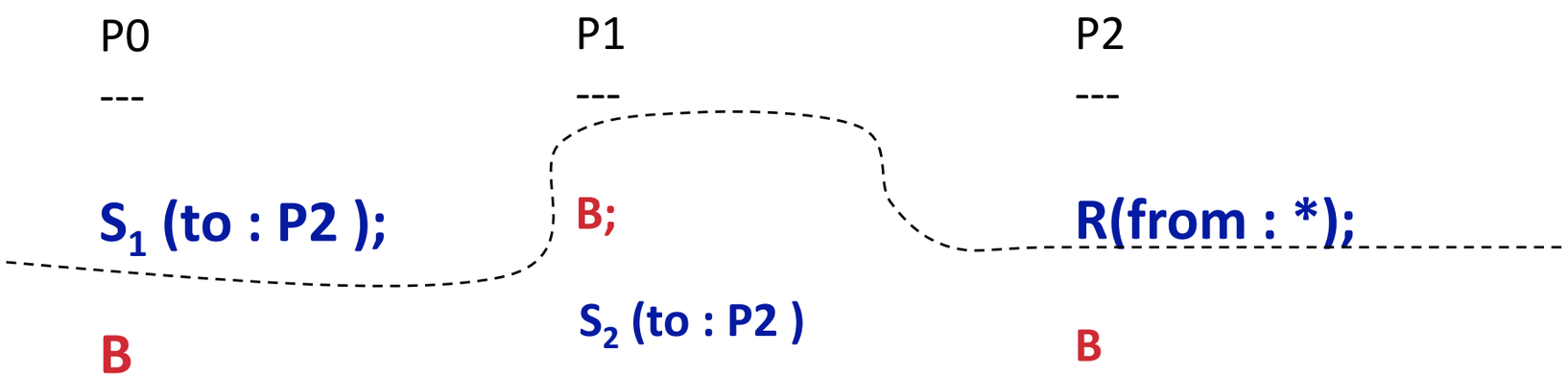

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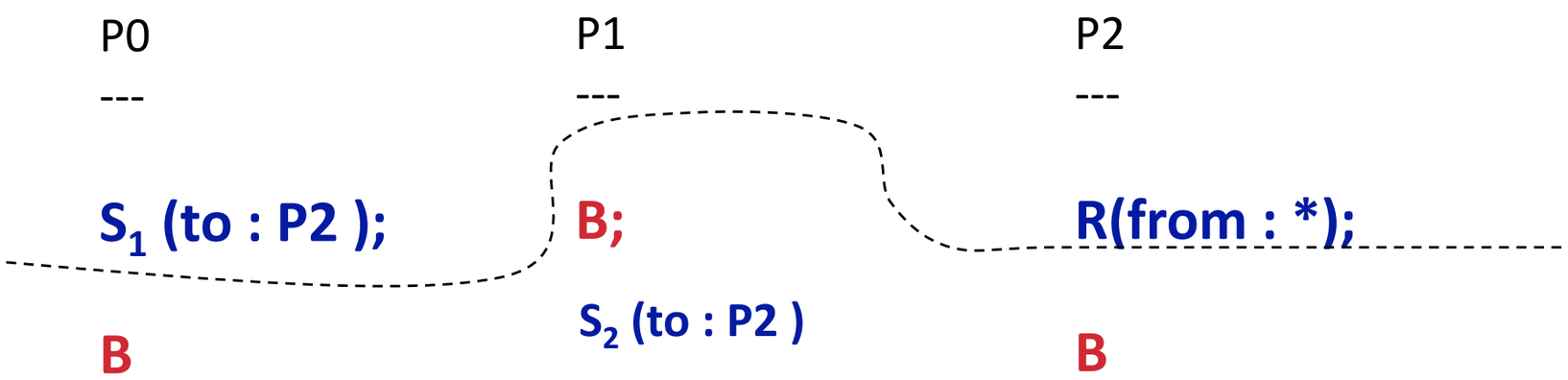

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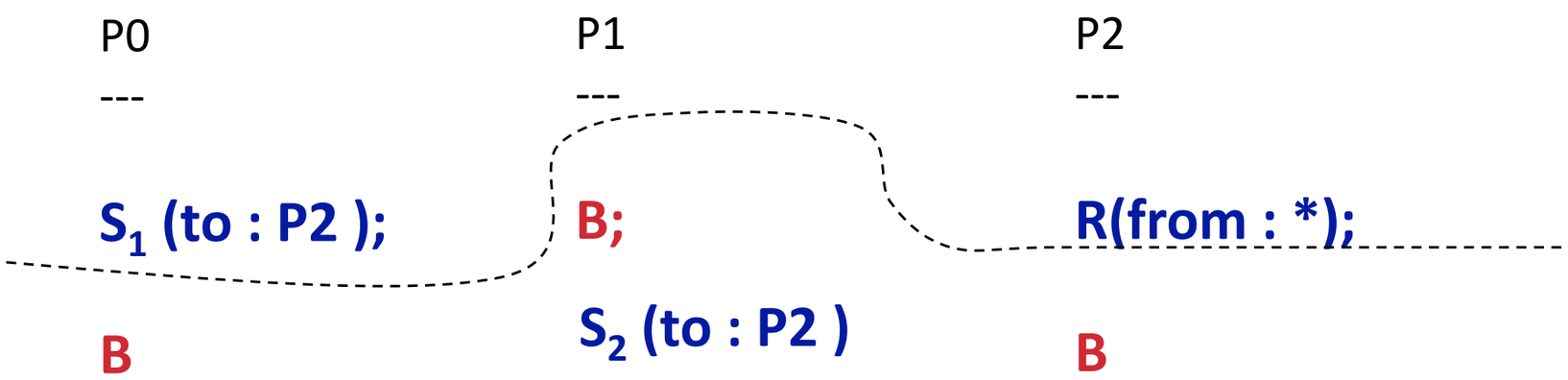

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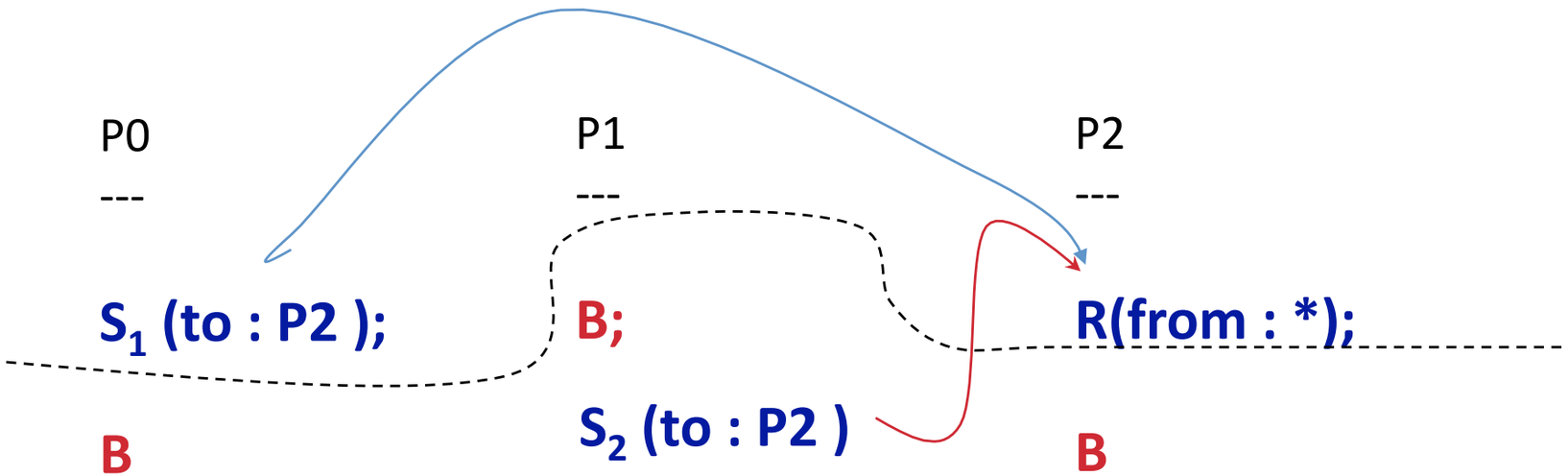

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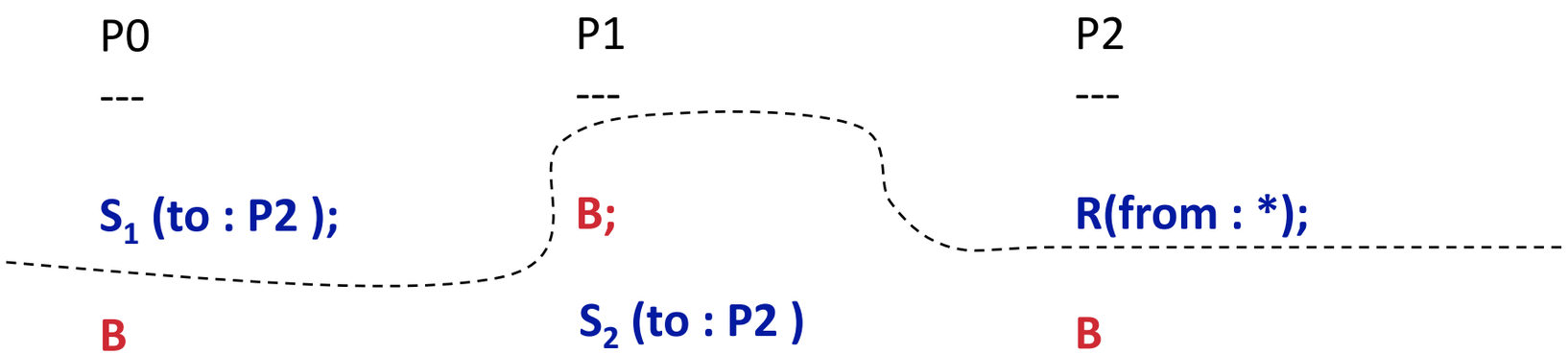

ISP handles this situation through

- Out-of-order execution
- Dynamic Instruction Rewriting

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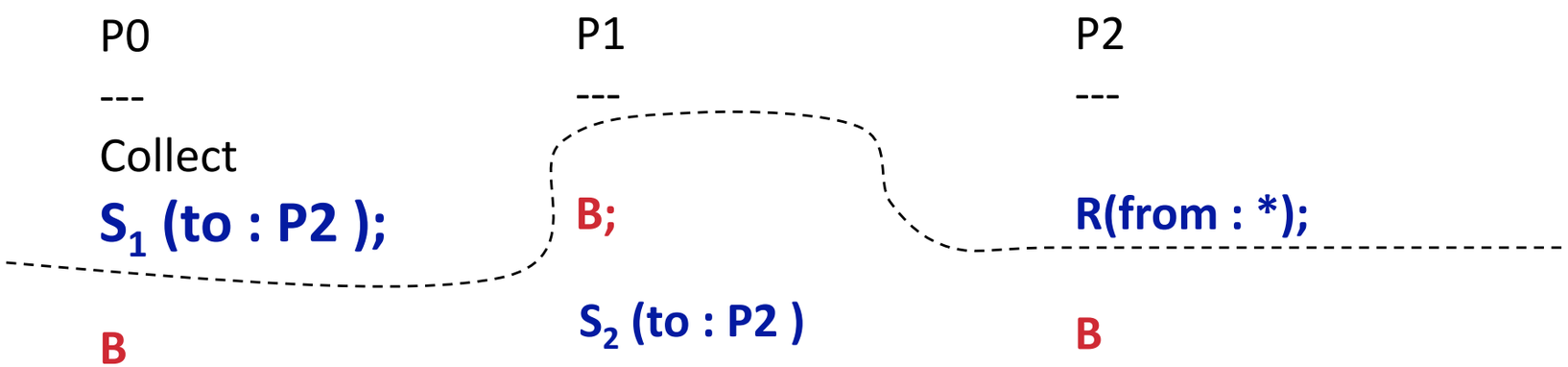

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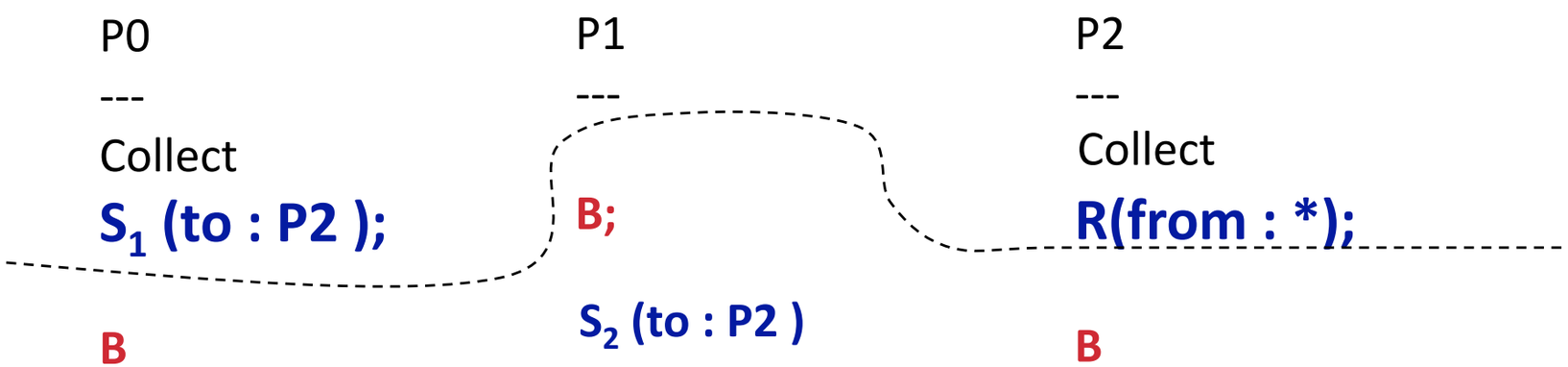

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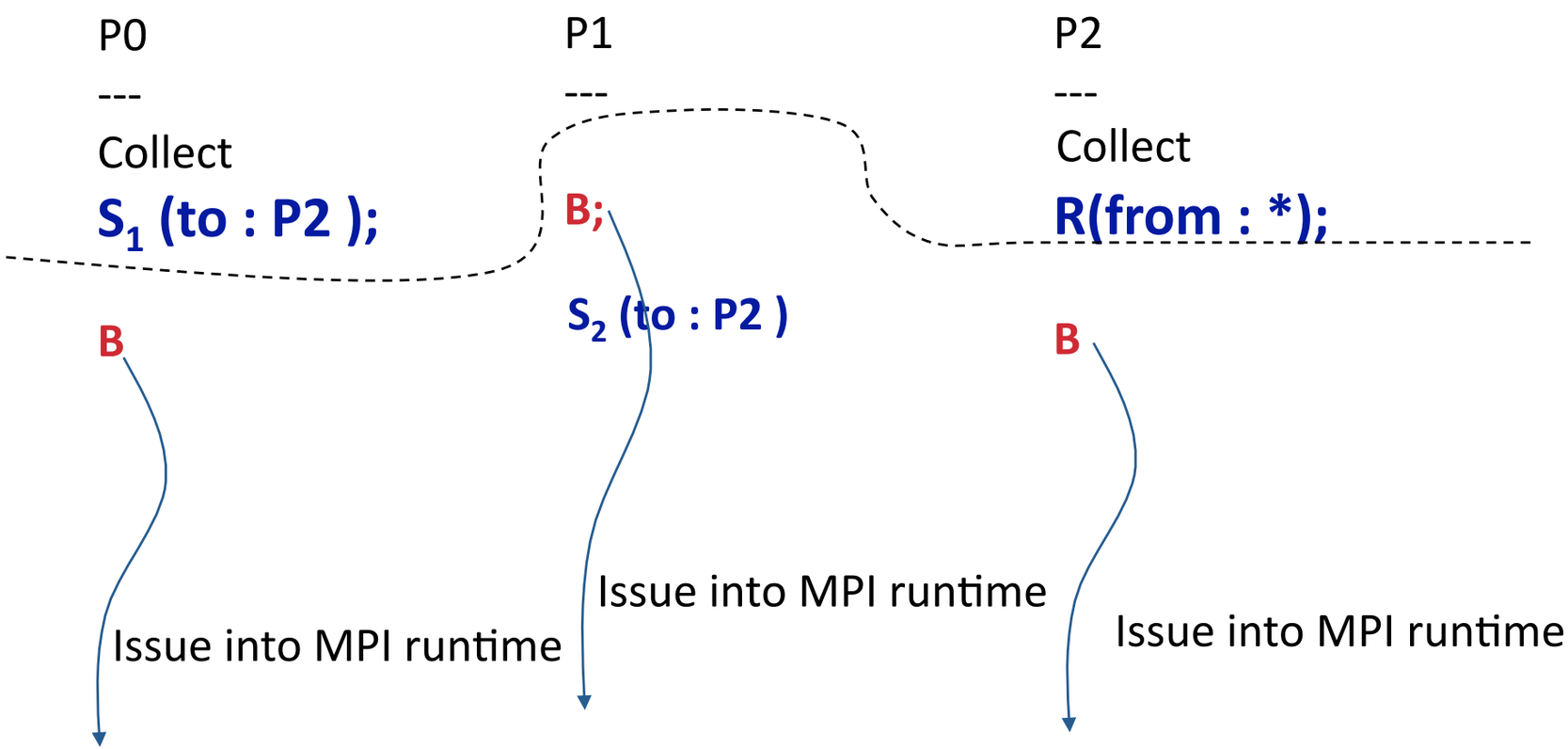

The “Crooked Barrier” example

P0	P1	P2
---	---	---
Collect		Collect
S_1 (to : P2);	B;	**R(from : *);**
	S_2 (to : P2)	
B		B

The “Crooked Barrier” example

P0	P1	P2
---	---	---
Collect		Collect
S_1 (to : P2);	B;	**R(from : *);**
	Collect	
B	**S_2 (to : P2)**	B

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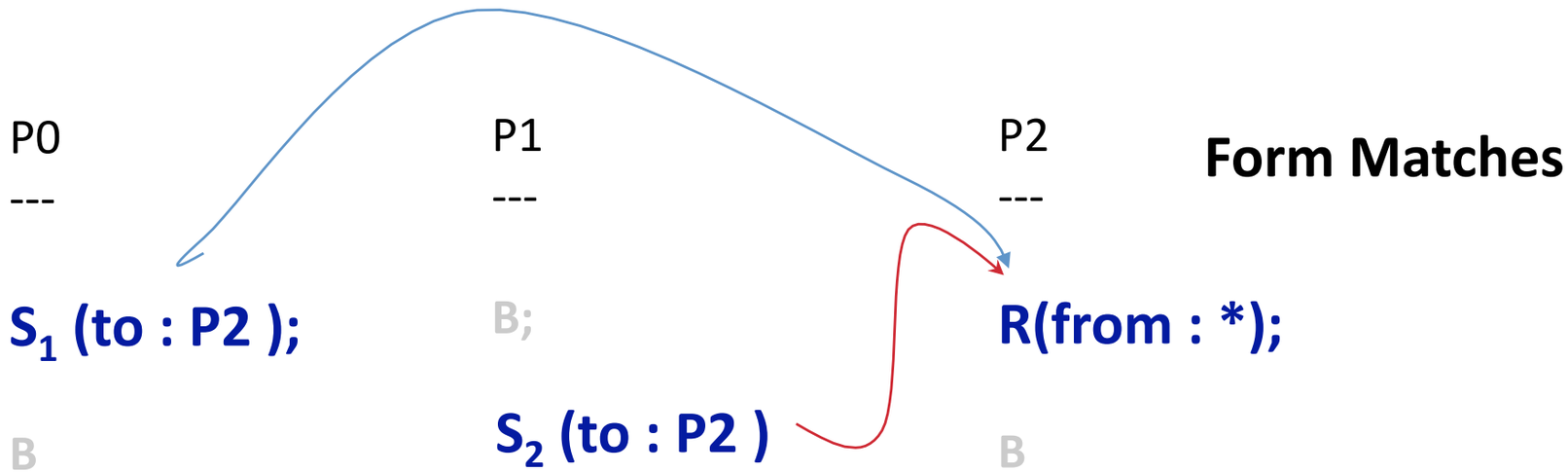

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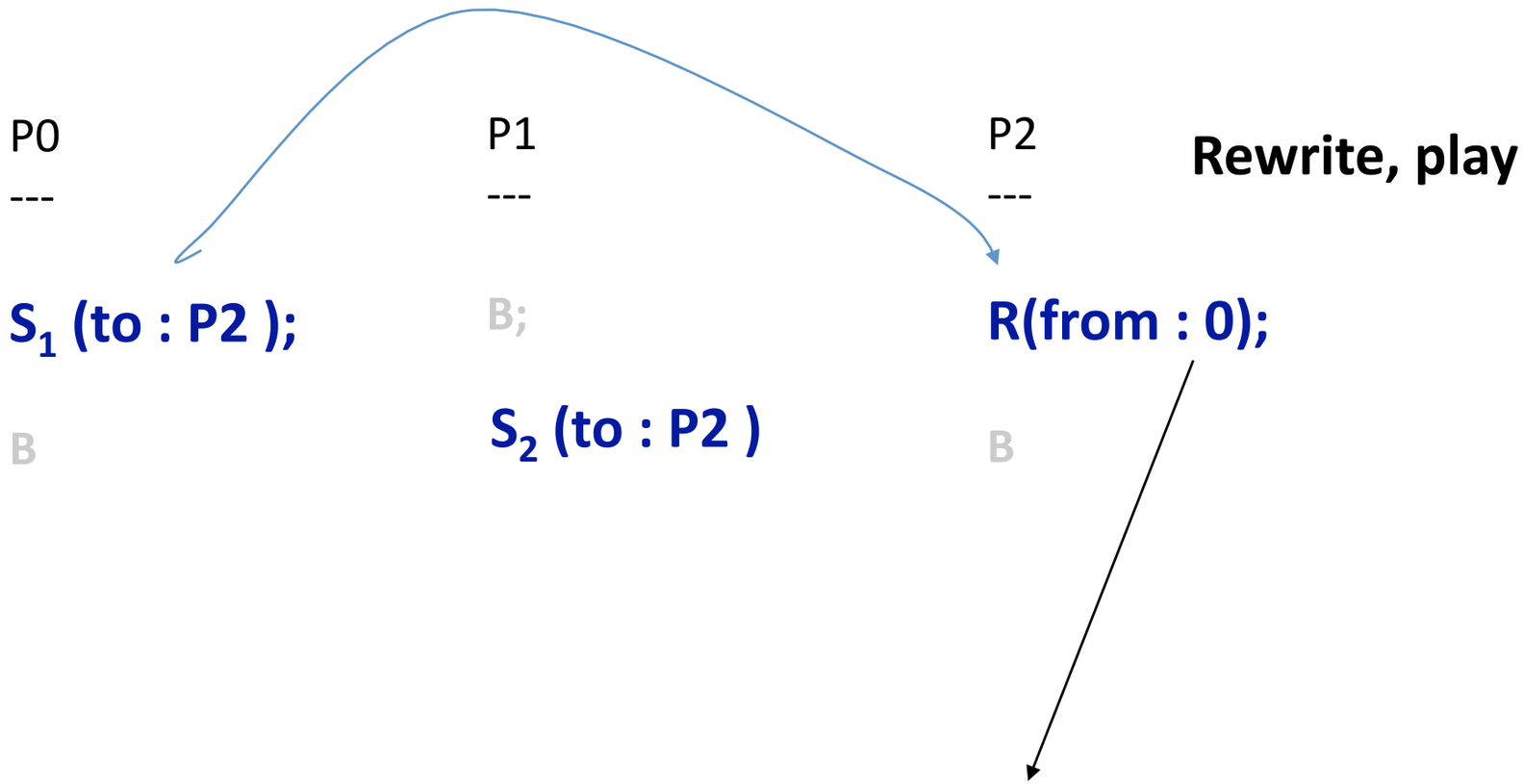

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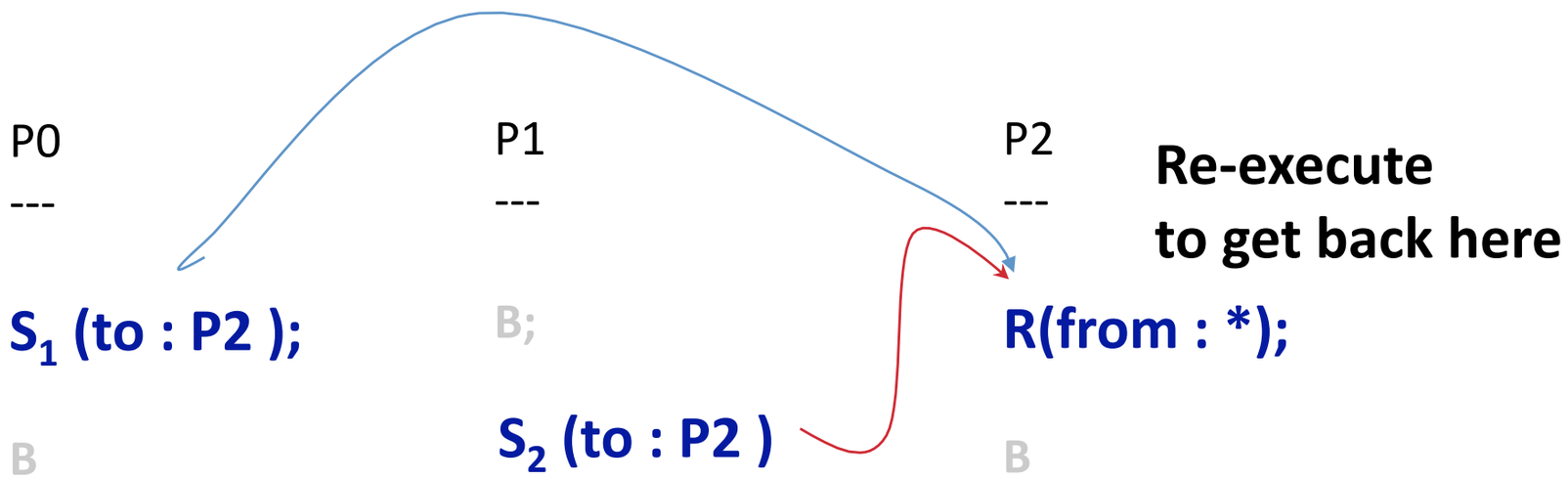

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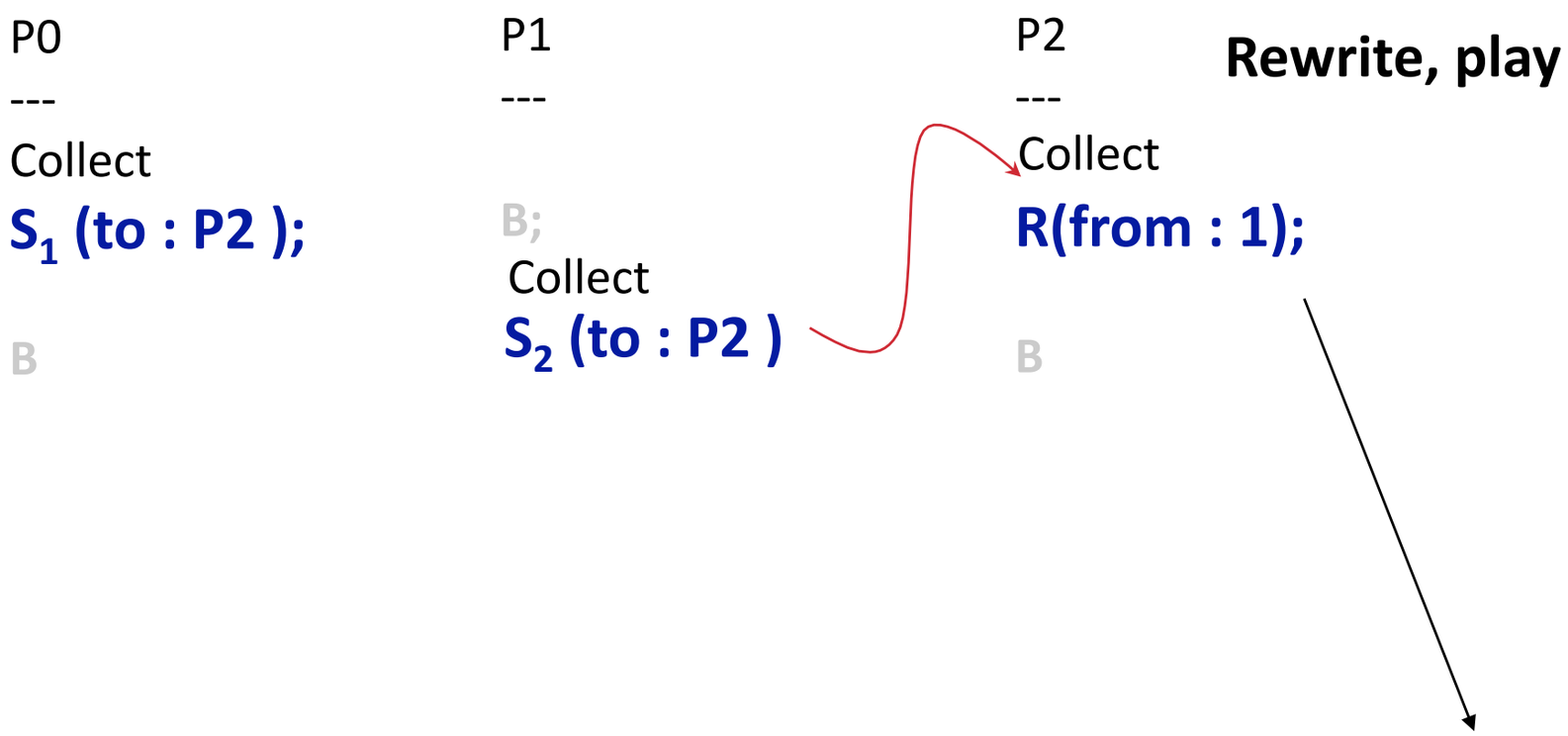
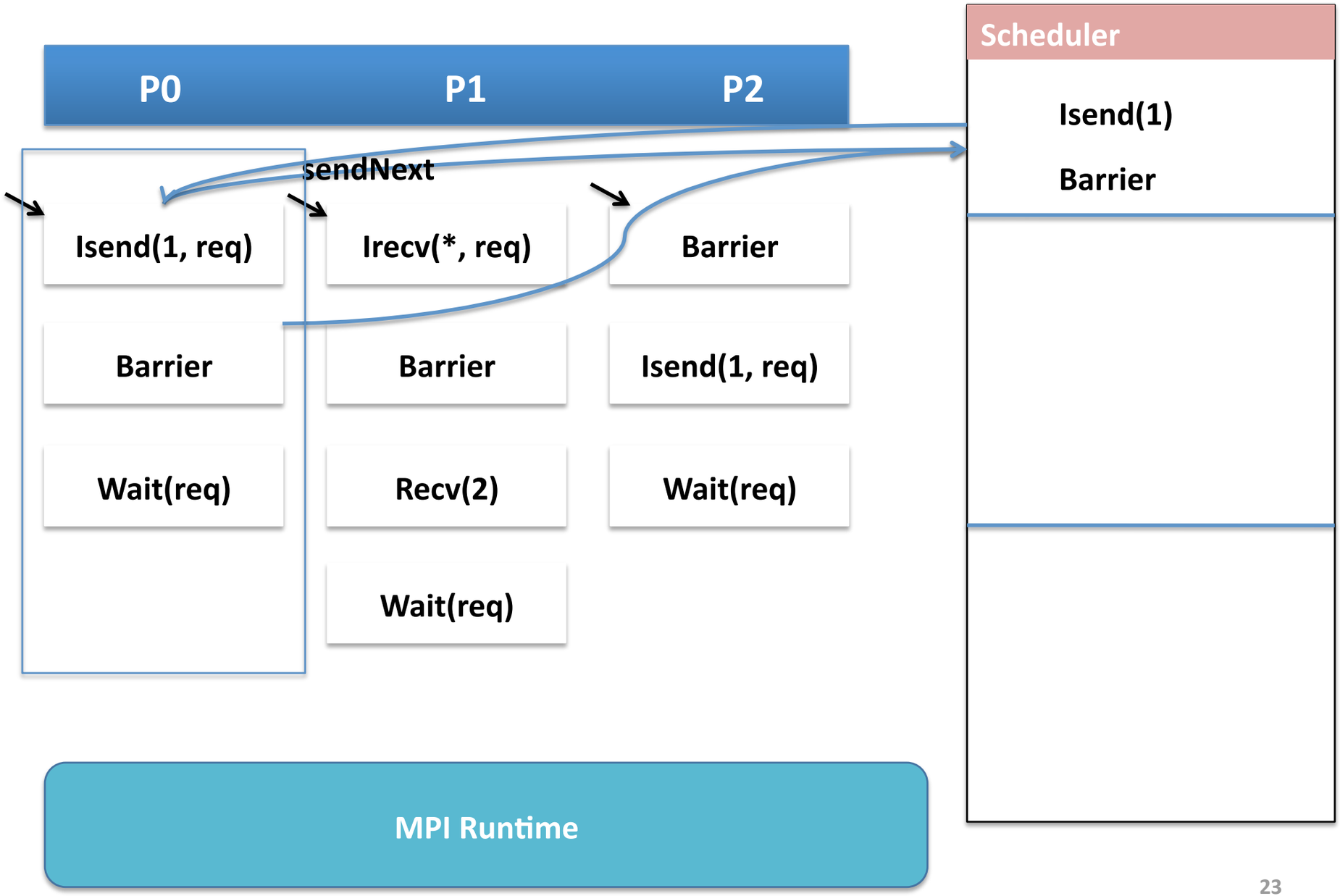


Hijack Calls, Generate Relevant Interleavings



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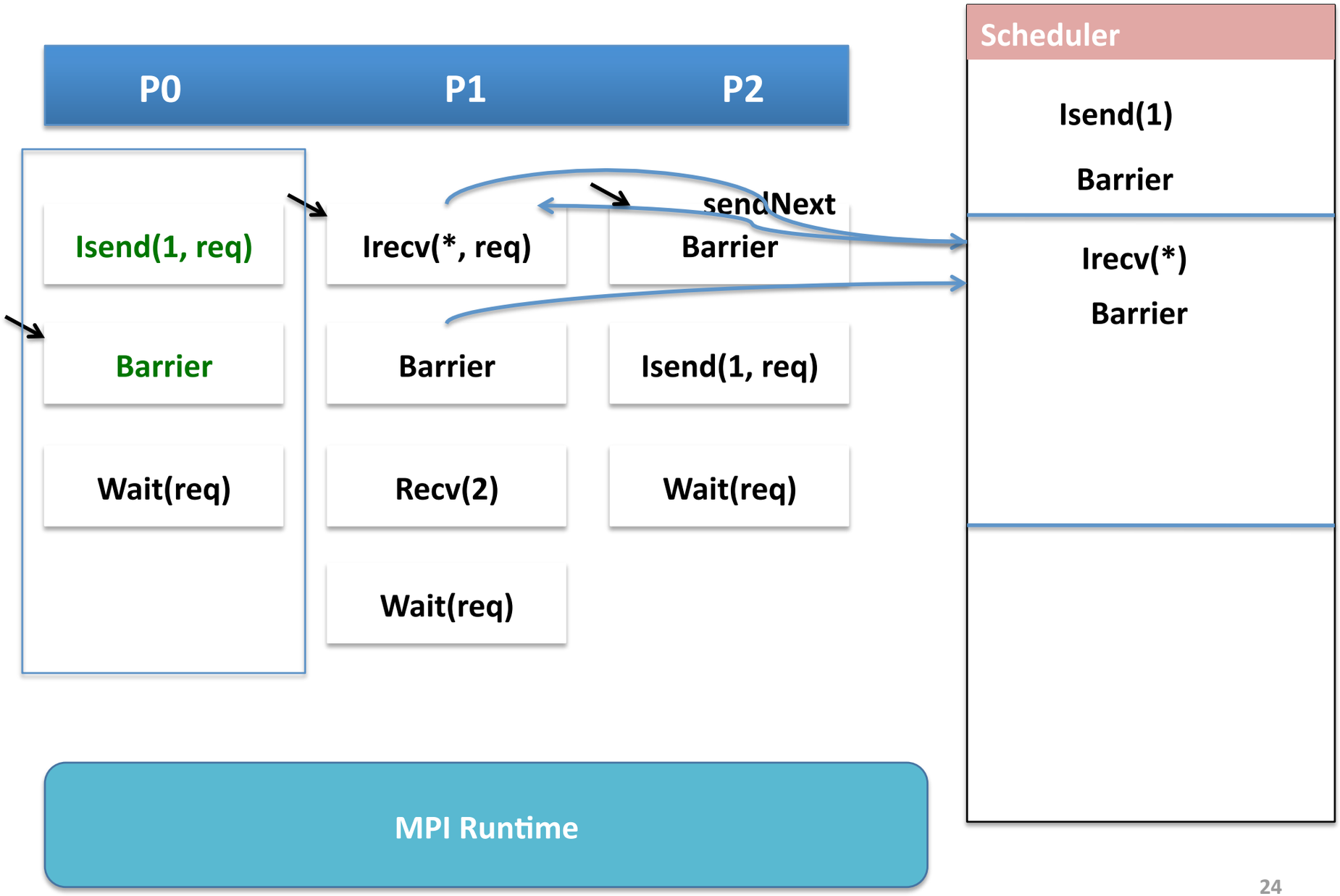

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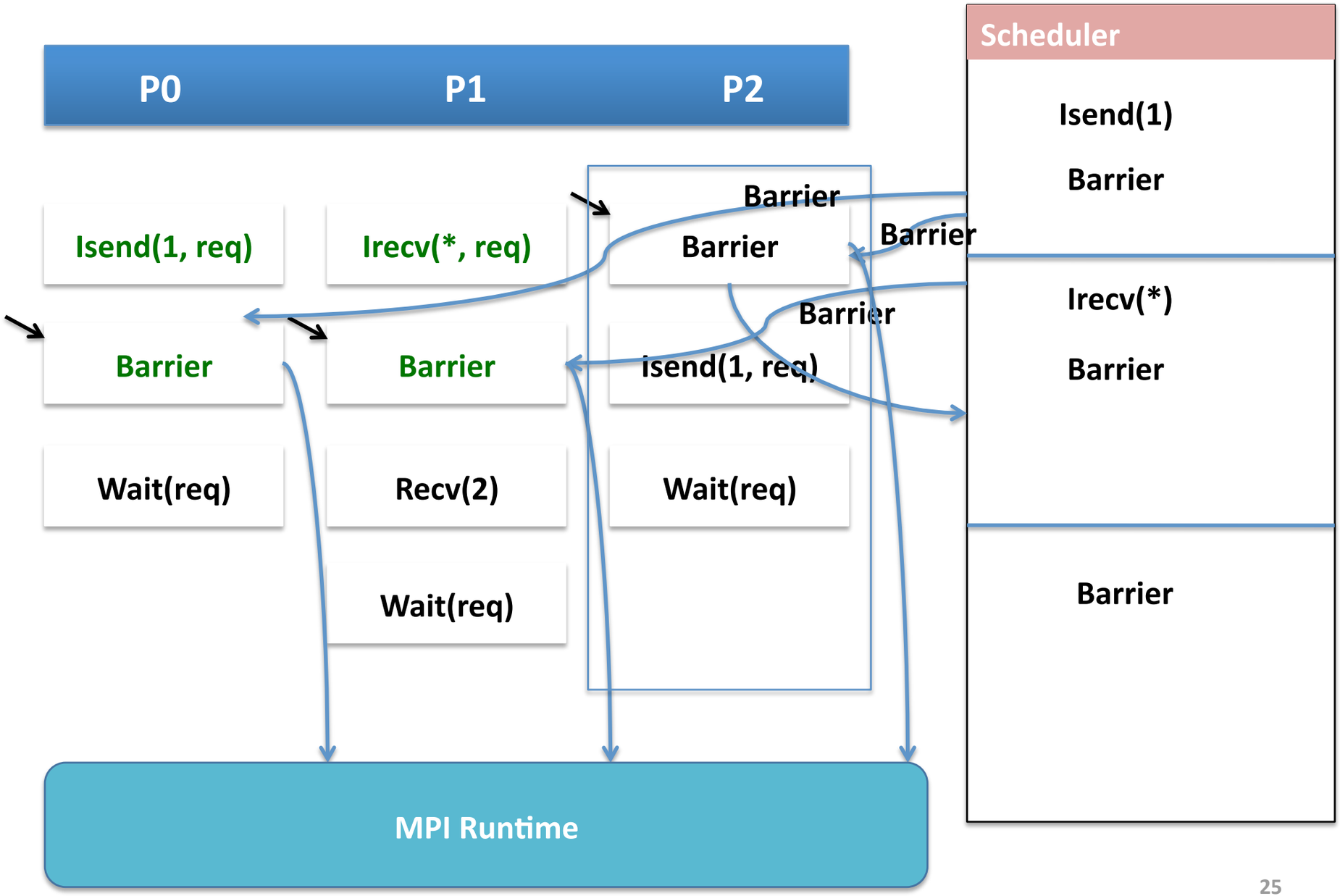

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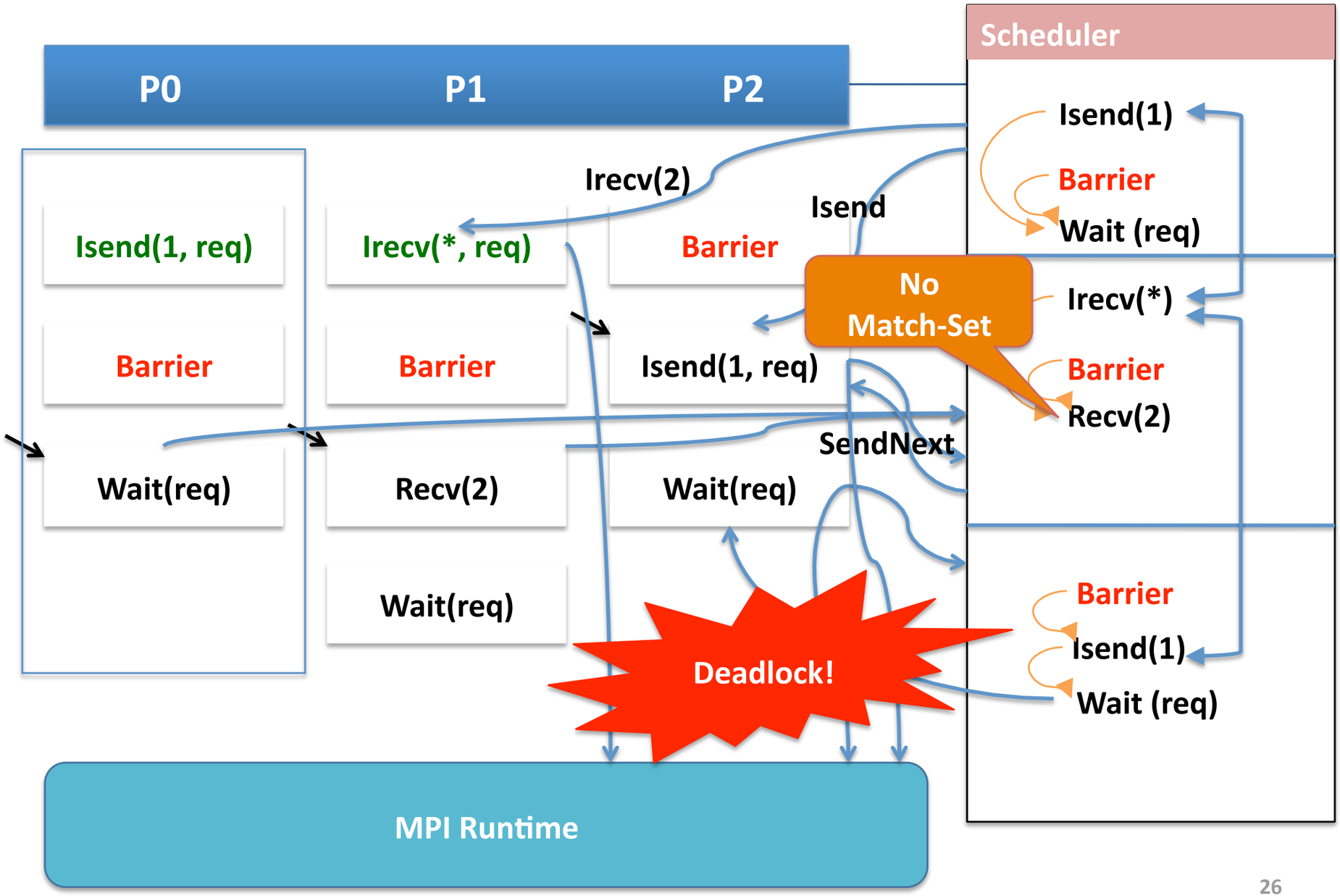

Example 1: Any-src-can-deadlock9.c (Umpire) lucky.c and unlucky.c are just variations

- Distribute LiveDVDs
  - Help audience boot into it
- Source code of any-src-can-deadlock.c
  - Demonstrate Verification Options
  - Observe completes-before
- Source code of POE-illustration.c
  - Observe completes-before
  - Observe internal issue order and program order

LiveDVD Instructions

- For Windows, boot using LiveDVD
  - Select ‘try Linux without installing
- For MAC, select boot device with LiveDVD present inside drive
  - Select to be DVD
  - Power down
  - Power-up with DVD in drive
- For MAC, you can restore boot device by pressing and holding down ALT / Option when booting again

Observations of examples lucky / unlucky

- ISP finds deadlock
- In Java GUI, do these
  - Watch the execution deadlock
  - Learn how to step
    - Step into different interleavings
    - Step through the traces of an interleaving
  - Do the above with and without rank locking
  - Do the above by locking ranks and watching
    - According to Program Order
    - According to Internal Issue Order
- Watch the IntraCB and InterCB

End of C