

RMAP Protocol

SpaceWire Working Group
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RMAP Protocol



- Work done at last SpaceWire Working Group meeting
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Aim

- Provide a means of
 - Writing to
 - Reading from
 - Registers or memory on a SpaceWire node
 - Over a SpaceWire network
- Be simple and effective

Commands in RMAP Protocol

- Unit providing RMAP services
- Shall support:
 - Direct Write
 - Direct Read
- May support:
 - Indirect Write
 - Indirect Read

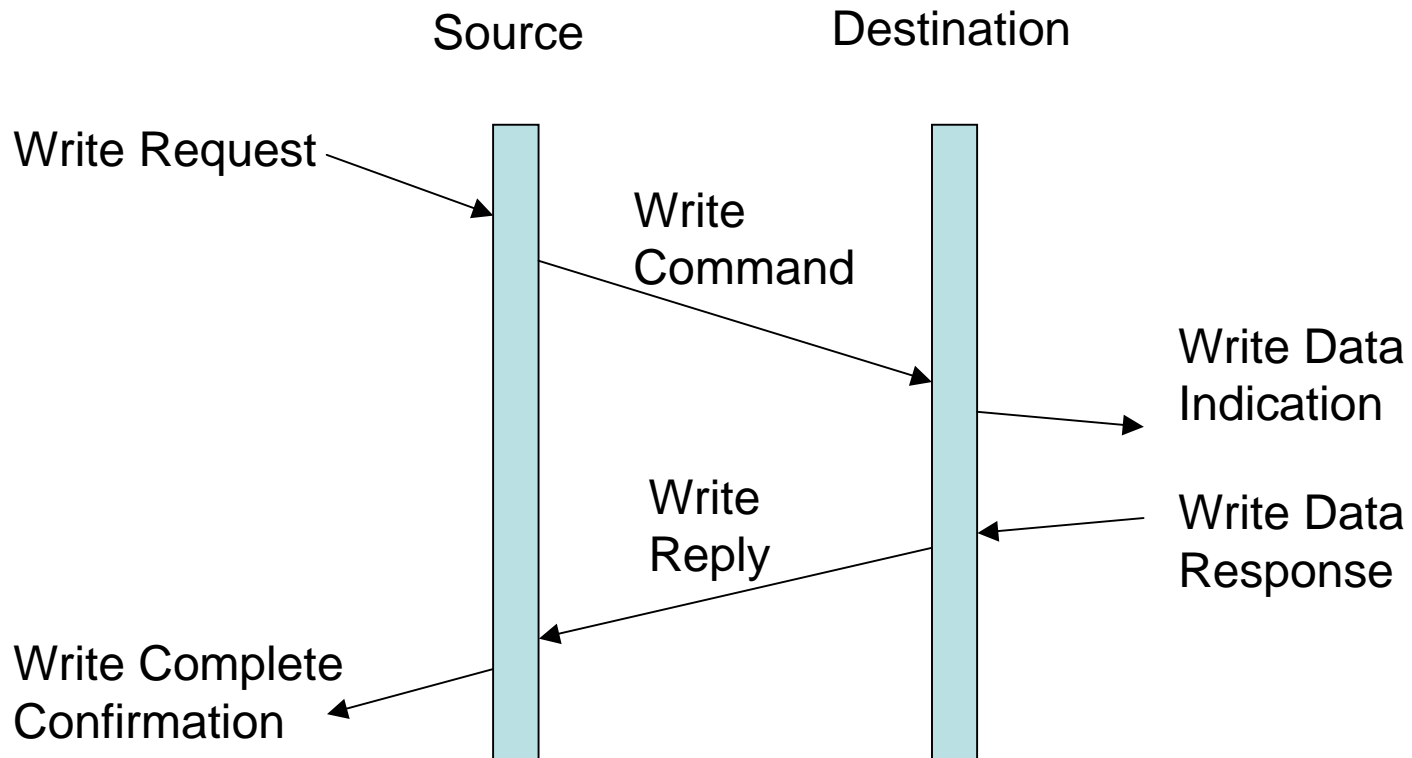
Commands in RMAP Protocol

- **Direct Write**
 - Source writes to destination memory
- **Direct Read**
 - Source reads from destination memory
- **Indirect Write**
 - Source tells intermediate node to
 - Read from intermediate node memory and
 - Write the data into destination node memory
- **Indirect Read**
 - Source tells intermediate node to
 - Read from destination node memory and
 - Write the data into intermediate node memory

Trade-off Criteria

- Shortest possible commands vs easier/faster to decode
- Aligned fields across commands vs not aligned
- 32-bit alignment vs byte alignment only
- Simplest baseline set with more complex extensions/options

Write Command/Reply



Short Direct Write Command

First byte transmitted

	Destination Address	Destination Address	Destination Address
Logical Address	Protocol Identifier	Type, CMD, AddrLen	Options
Extra Return Address	Extra Return Address	Extra Return Address	Extra Return Address
Return Address	Transaction Identifier	Transaction Identifier	Transaction Identifier
Write Address	Write Address	Write Address	Write Address
Data	Data	Data	Data
Hdr/Data Checksum	EOP		

Last byte transmitted

Checks data received ok before writing

Command Bits

Bits in Packet Type / Command / Return Address Extra Length Byte

Command/ Response	Read/ Write	Direct/ Indirect	Short/Long Operation or Increment/No inc. source*
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Increment/ No inc. target	Ack/ No ack	Extra Return Addr Words	Extra Return Addr Words
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* Depends on Direct/Indirect

Long Direct Write Command

First byte transmitted

	Destination Address	Destination Address	Destination Address
Logical Address	Protocol Identifier	Type, CMD, AddrLen	Options
Extra Return Address	Extra Return Address	Extra Return Address	Extra Return Address
Return Address	Transaction Identifier	Transaction Identifier	Transaction Identifier
Write Address	Write Address	Write Address	Write Address
Data Length	Data Length	Data Length	Header Checksum
Data	Data	Data	Data
Data	Data	Data	Data
Data	Data Checksum	EOP	

Last byte transmitted

Direct Write Reply

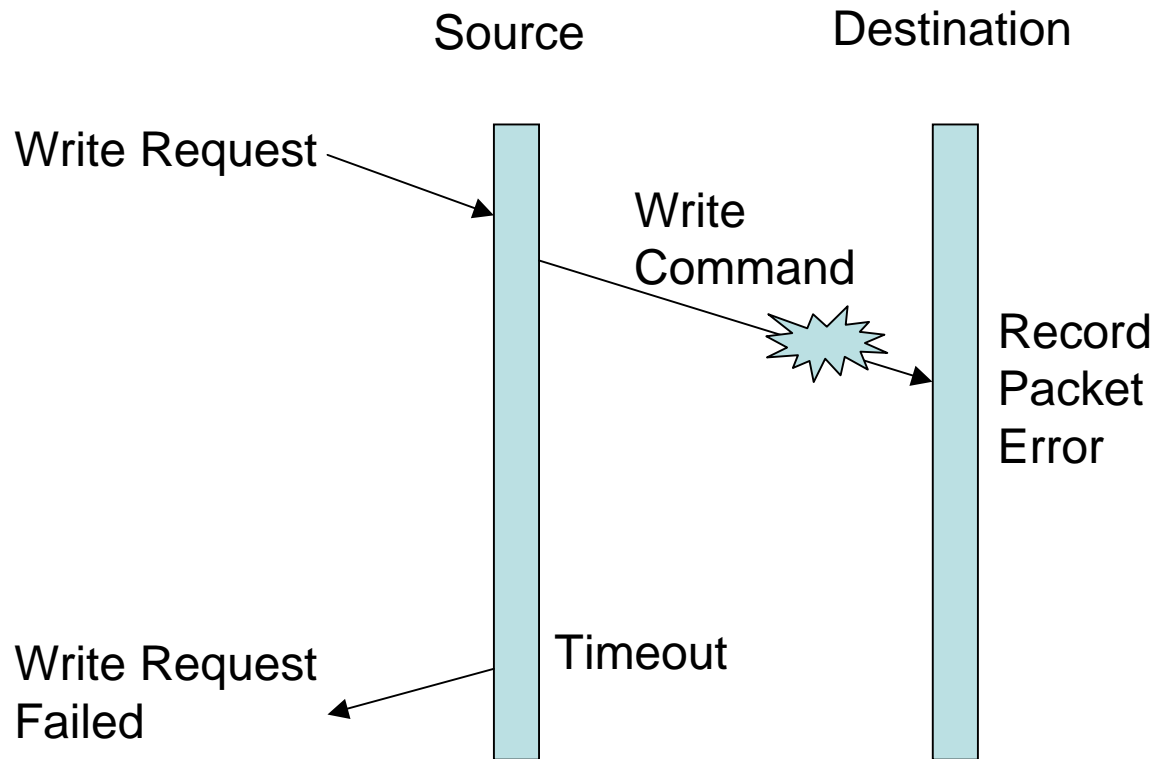
First byte transmitted

	Return Address	Return Address	Return Address
Logical Return Addr	Protocol Identifier	Packet Type	Status
Transaction Identifier	Transaction Identifier	Transaction Identifier	Reply Checksum

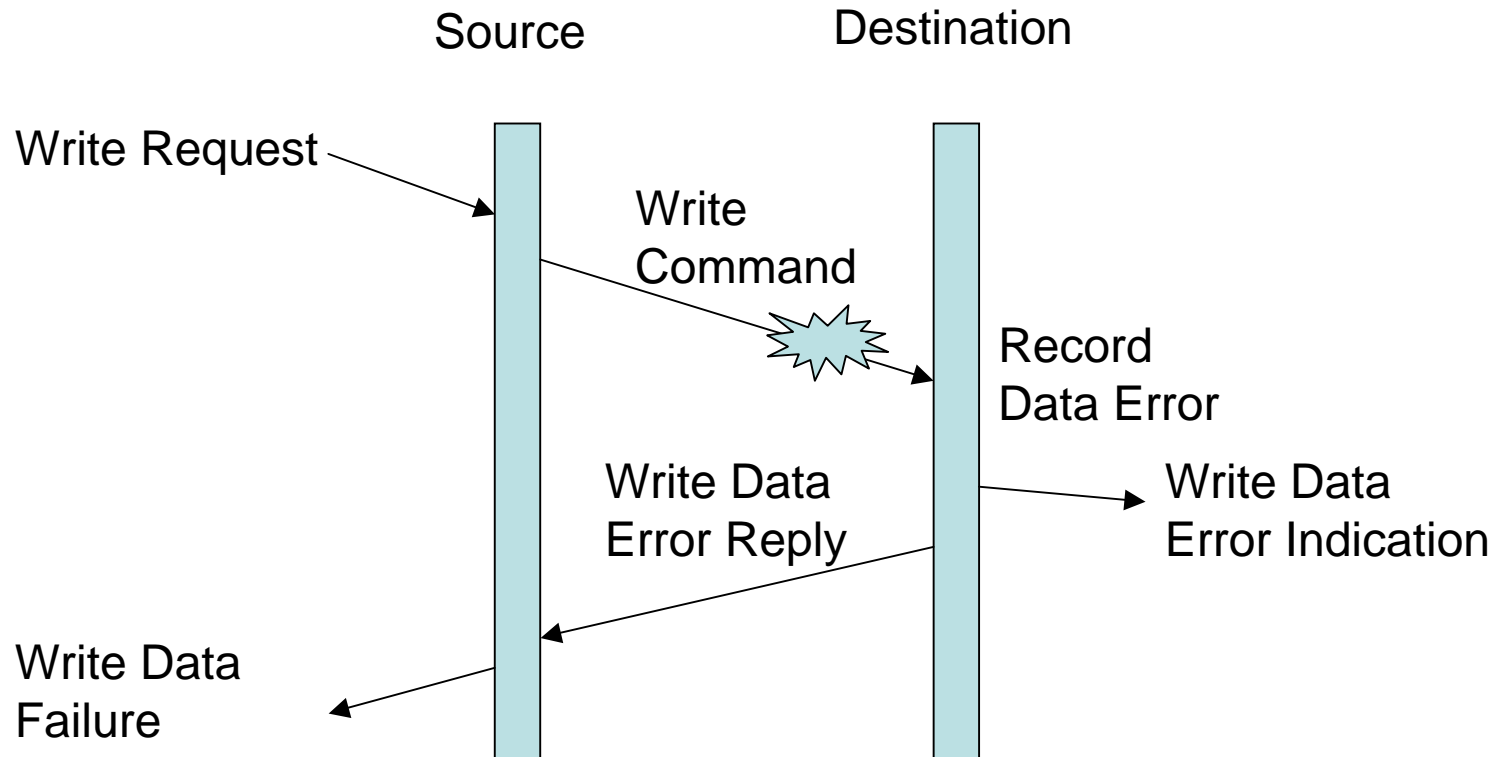
EOP

Last byte transmitted

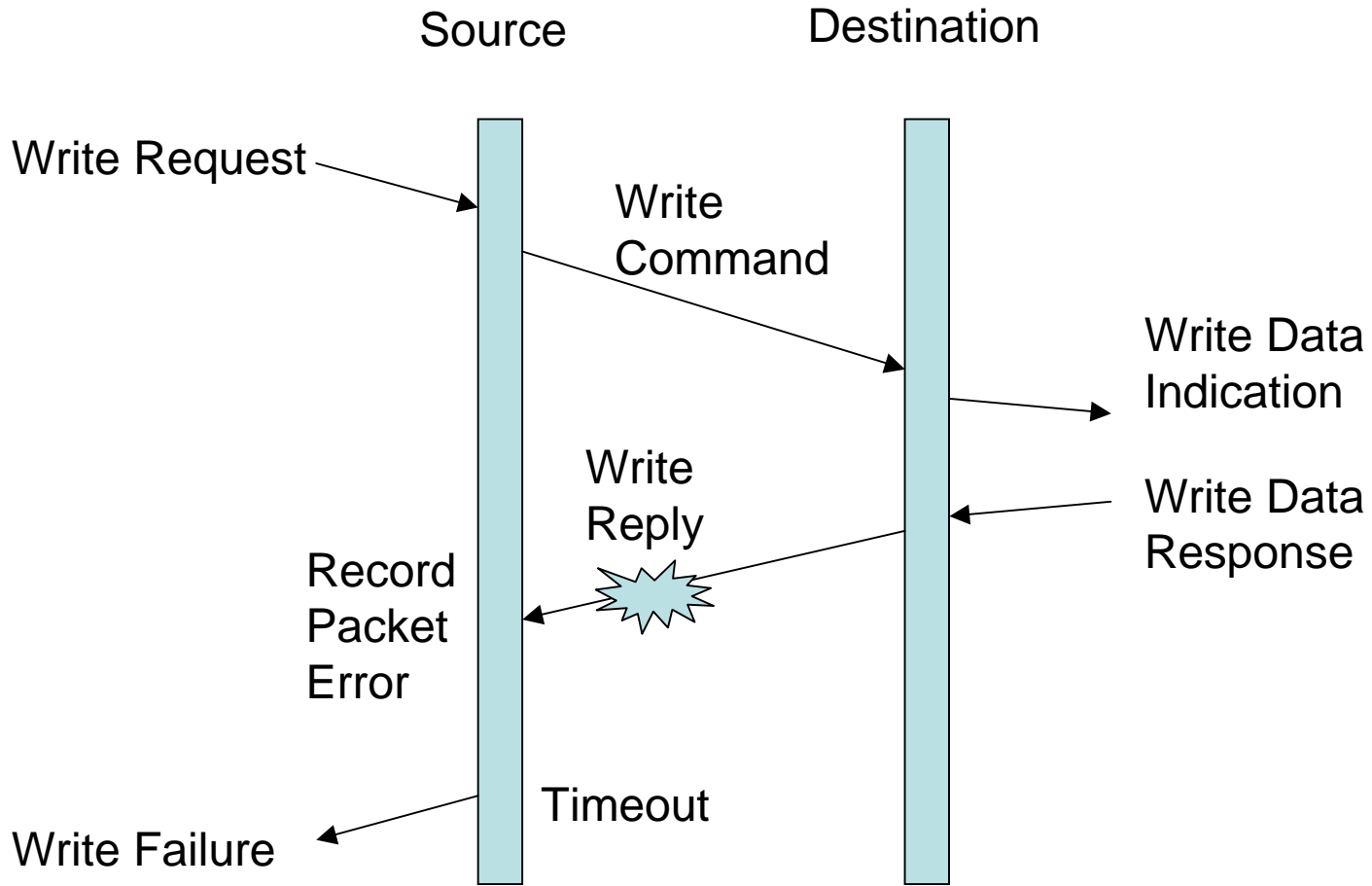
Write Command Header Error



Write Command Data Error



Write Reply Error



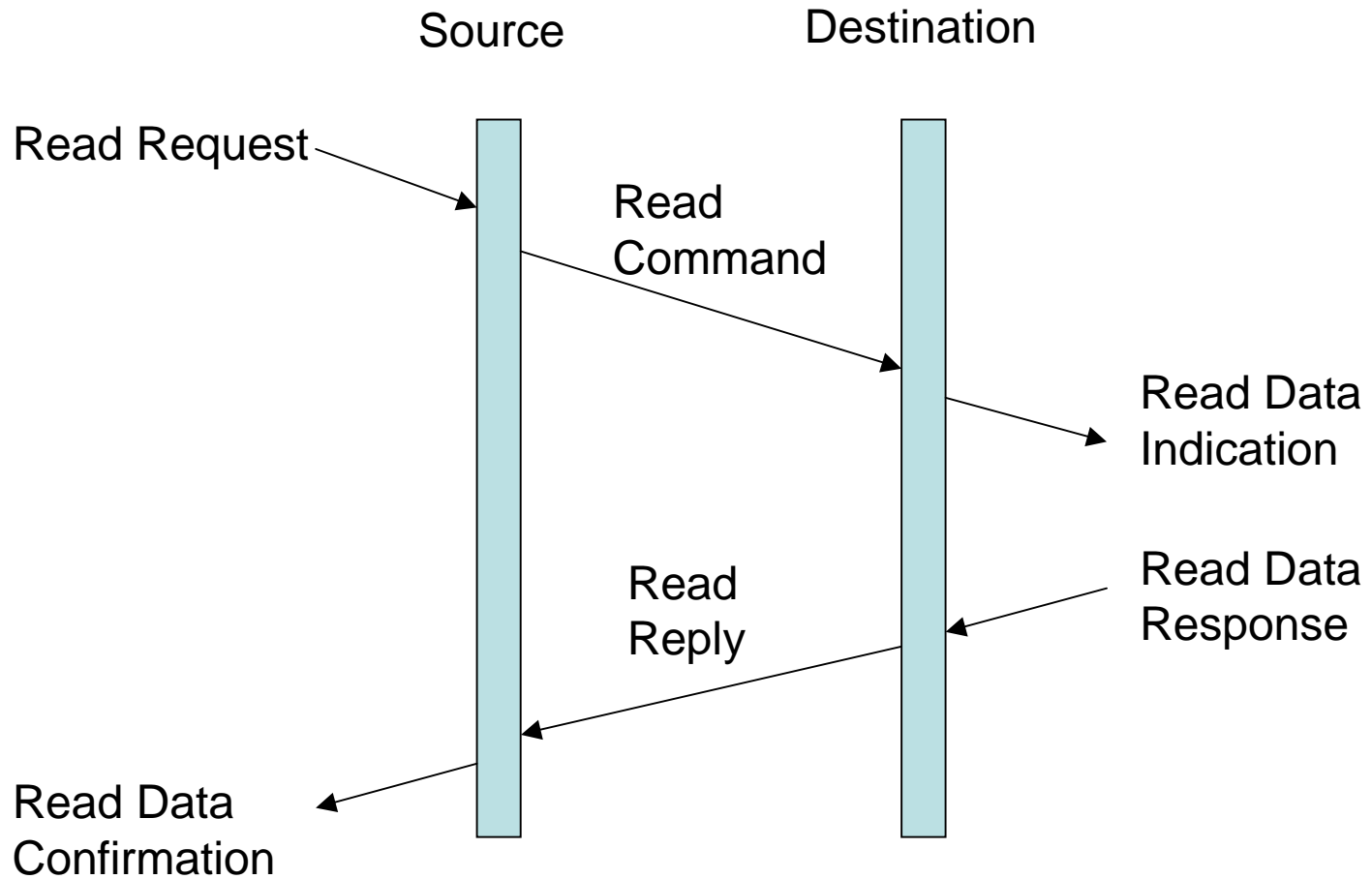
Write Request Parameters

- Write Request has following parameters:
 - Destination address
 - Return address
 - Write command options
 - Write address
 - Data length
 - Data
 - Timeout interval

Key points thus far

- Short command
 - Short / long
 - Control / data
 - Checked data / not checked data (i.e. checked before execution)
 - To be consolidated
 - Do we restrict the length of a checked data packet???
- Error if memory not “registered”
 - Error conditions to be considered further
- Command to be split into
 - Command - mandatory
 - Options – not mandatory
- Third party
 - i.e. the new name for the indirect command
- Atomic Operations
 - Read-Modify Write / Test-and-set /Exchange

Read Command/Reply



Direct Read Command

First byte transmitted

	Destination Address	Destination Address	Destination Address
Logical Address	Protocol Identifier	Type, CMD, AddrLen	Options
Extra Return Address	Extra Return Address	Extra Return Address	Extra Return Address
Return Logical Addr	Transaction Identifier	Transaction Identifier	Transaction Identifier
Read Address	Read Address	Read Address	Read Address
Data Length	Data Length	Data Length	Header Checksum

EOP

Last byte transmitted

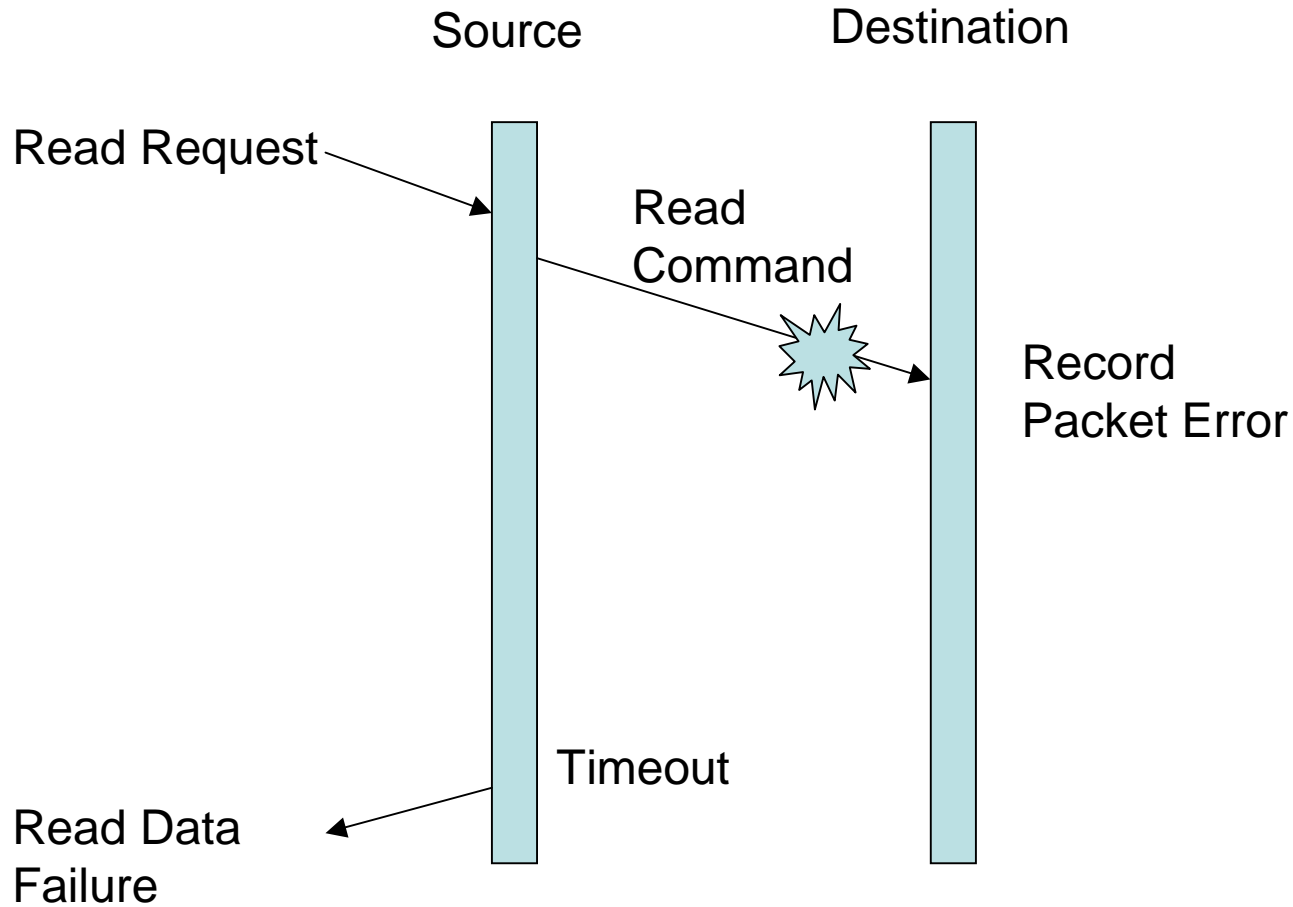
Direct Read Reply

First byte transmitted

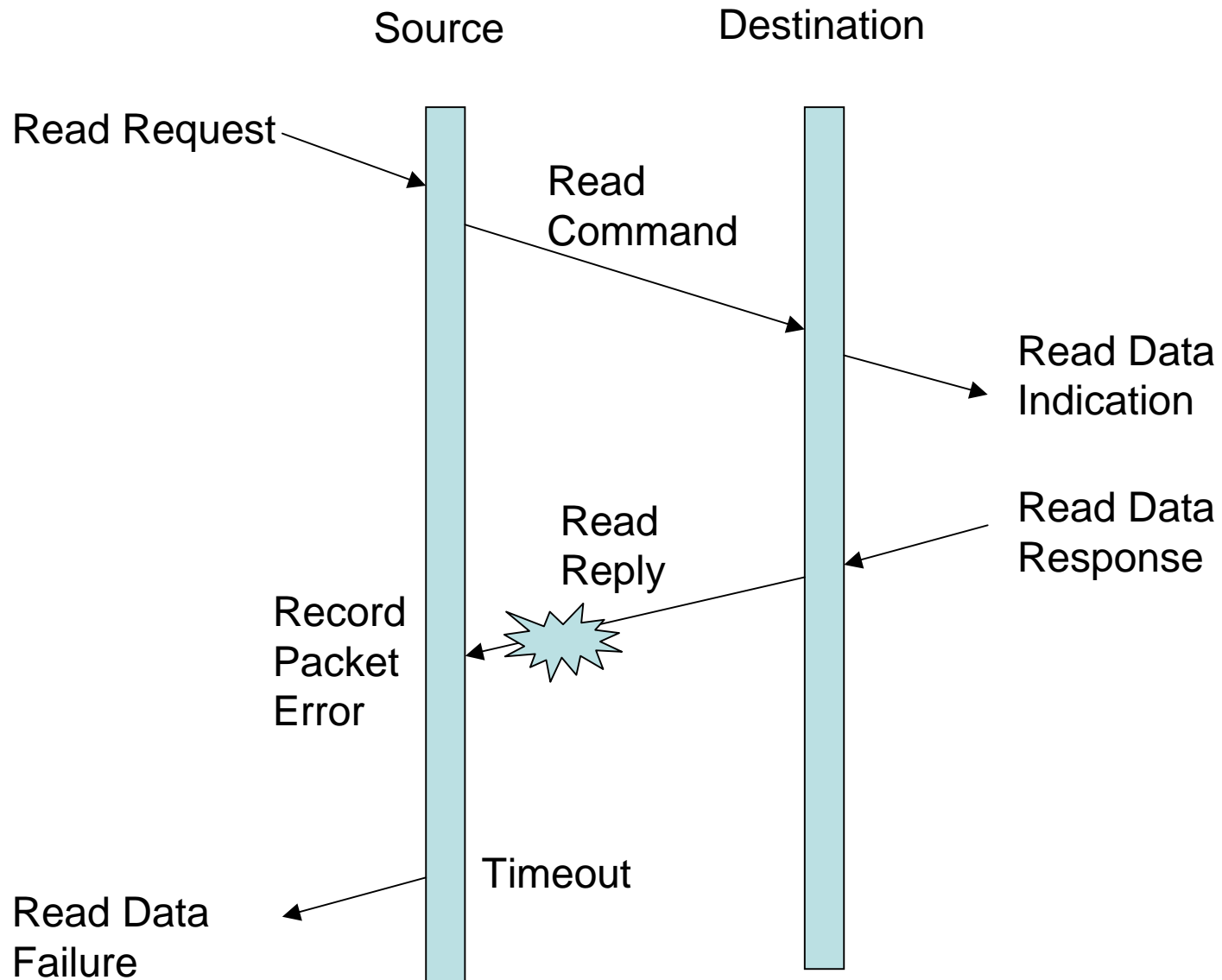
	Return Address	Return Address	Return Address
Logical Return Addr	Protocol Identifier	Packet Type	Status
Transaction Identifier	Transaction Identifier	Transaction Identifier	Pad
Data Length	Data Length	Data Length	Header Checksum
Data	Data	Data	Data
Data	Data	Data	Data
Data	Data Checksum	EOP	

Last byte transmitted

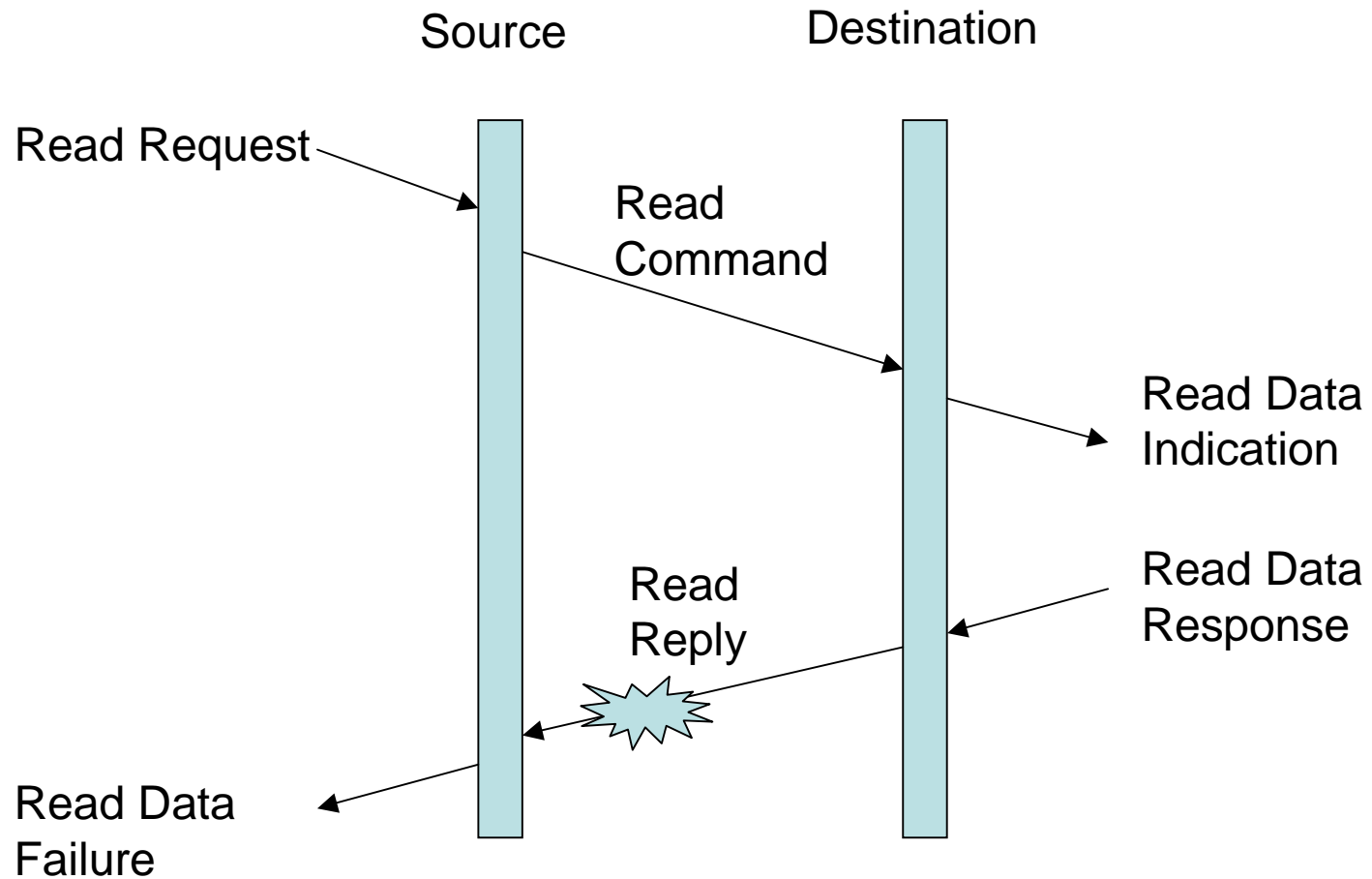
Read Command Header Error



Read Reply Header Error



Read Reply Data Error

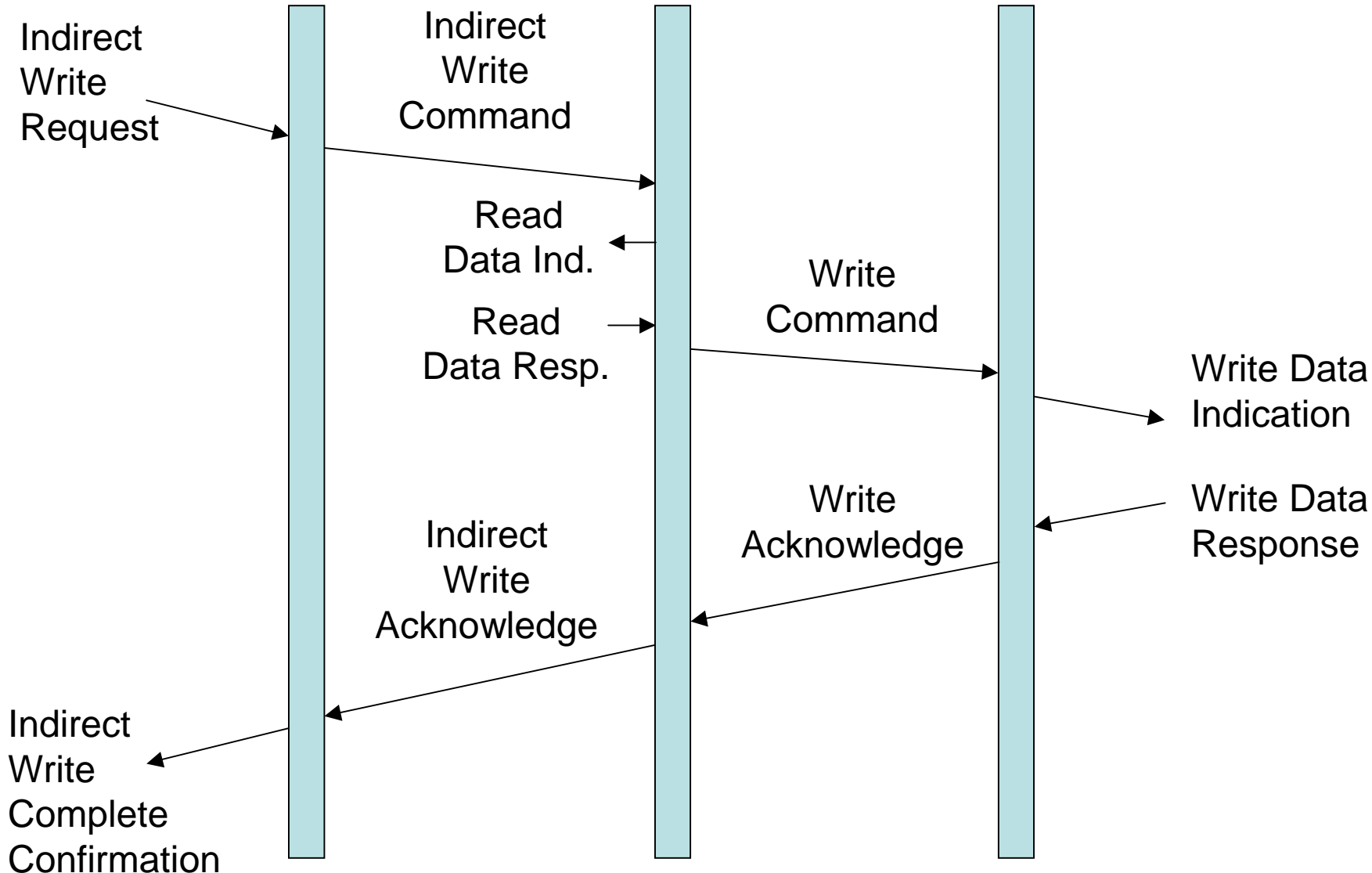


Read Request Parameters

- The Read Request provides following parameters:
 - Destination address
 - Return address
 - Read command options
 - Read address
 - Data length
 - Buffer in which to put the received data

Indirect Write Command

Source Intermediary Destination



Indirect Write Command/Reply

First byte transmitted

	Intermediate Address	Intermediate Address	Intermediate Address
Intermediate Logical Address	Protocol Identifier	Type, CMD, AddrLen	Options
Transaction ID	Transaction ID	Transaction ID/Pad?	Pad?
Read Address	Read Address	Read Address	Read Address
Extra Target Address	Extra Target Address	Extra Target Address	Extra Target Address
Target Logical Addr	Protocol Identifier	Type, CMD, AddrLen	Options
Extra Return Address	Extra Return Address	Extra Return Address	Extra Return Address
Return Logical Addr	Space for Trans ID	Space for Trans ID	Space for Trans ID
Write Address	Write Address	Write Address	Write Address
Data Length	Data Length	Data Length	Header Checksum

EOP

Last byte transmitted

Indirect Write Reply

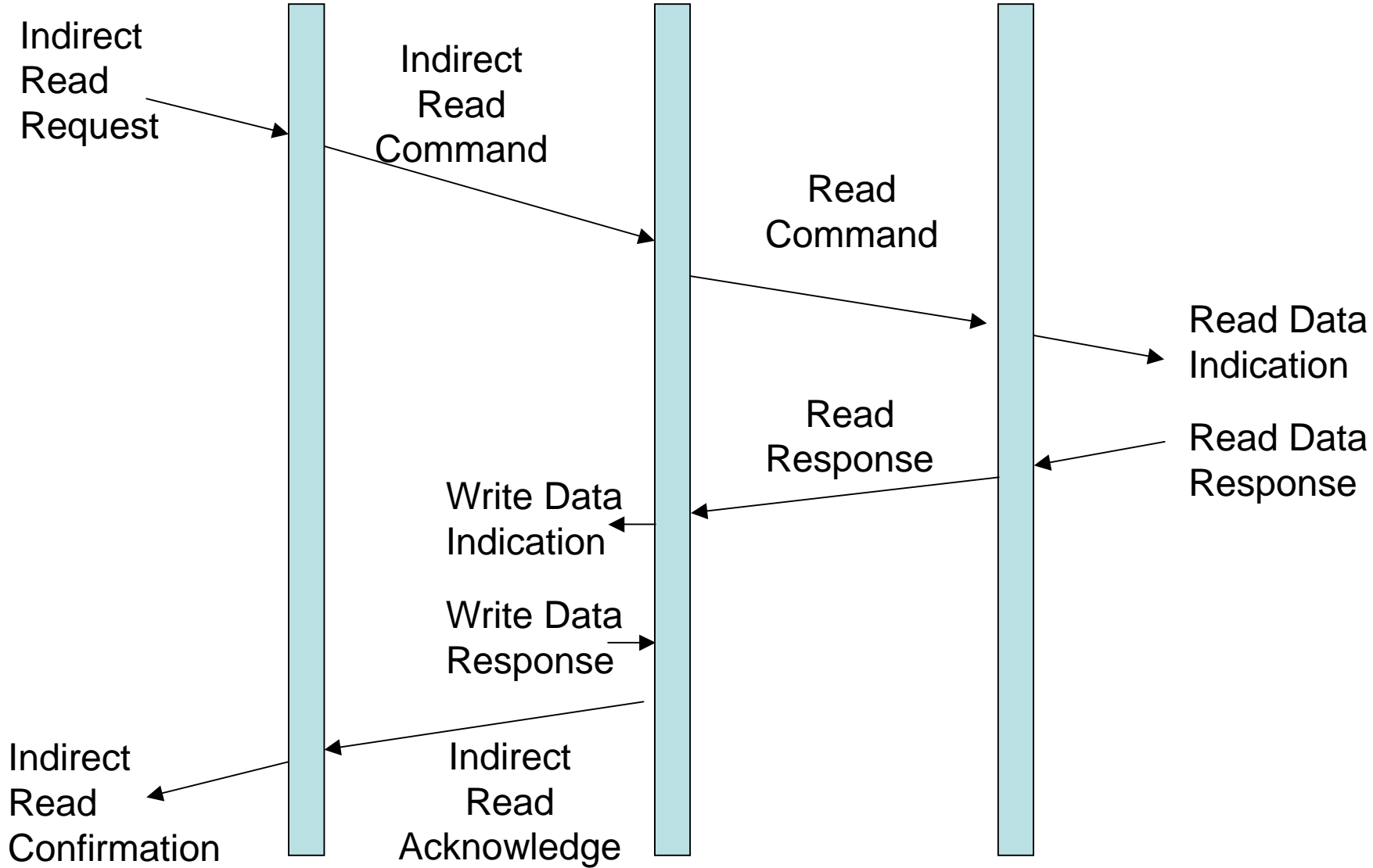
First byte transmitted

	Return Address	Return Address	Return Address
Logical Return Addr	Protocol Identifier	Packet Type	Status
Transaction Identifier	Transaction Identifier	Transaction Identifier	Pad
Header Checksum	EOP		

Last byte transmitted

Indirect Read Command/Reply

Source Intermediary Destination



Indirect Read Request

Indirect Read Command

Read Command

Read Data Indication

Read Response

Read Data Response

Write Data Indication

Write Data Response

Indirect Read Confirmation

Indirect Read Acknowledge

Indirect Read Command

First byte transmitted

	Destination Address	Destination Address	Destination Address
Logical Address	Protocol Identifier	Type, CMD, AddrLen	Options
Transaction ID	Transaction ID	Transaction ID/Pad?	Pad?
Write Address	Write Address	Write Address	Write Address
Extra Target Address	Extra Target Address	Extra Target Address	Extra Target Address
Target Address	Protocol Identifier	Type, CMD, AddrLen	Options
Extra Return Address	Extra Return Address	Extra Return Address	Extra Return Address
Return Address	Space for Trans ID	Space for Trans ID	Space for Trans ID
Read Address	Read Address	Read Address	Read Address
Data Length	Data Length	Data Length	Header Checksum

EOP

Last byte transmitted

Indirect Read Reply

First byte transmitted

	Return Address	Return Address	Return Address
Logical Return Addr	Protocol Identifier	Packet Type	Status
Transaction Identifier	Transaction Identifier	Transaction Identifier	Pad
Header Checksum	EOP		

Last byte transmitted