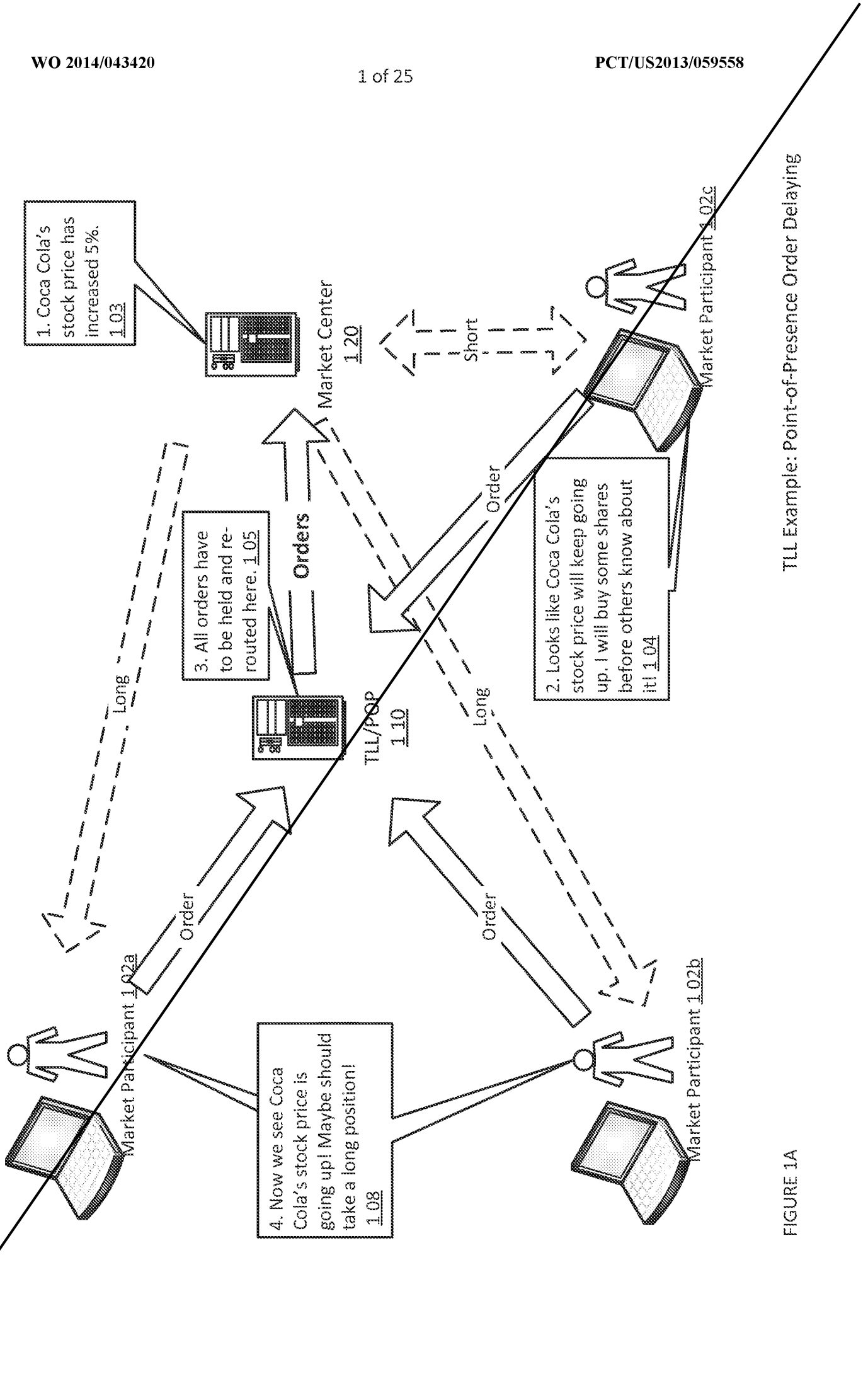


FIGURE 1A

TLL Example: Point-of-Presence Order Delaying

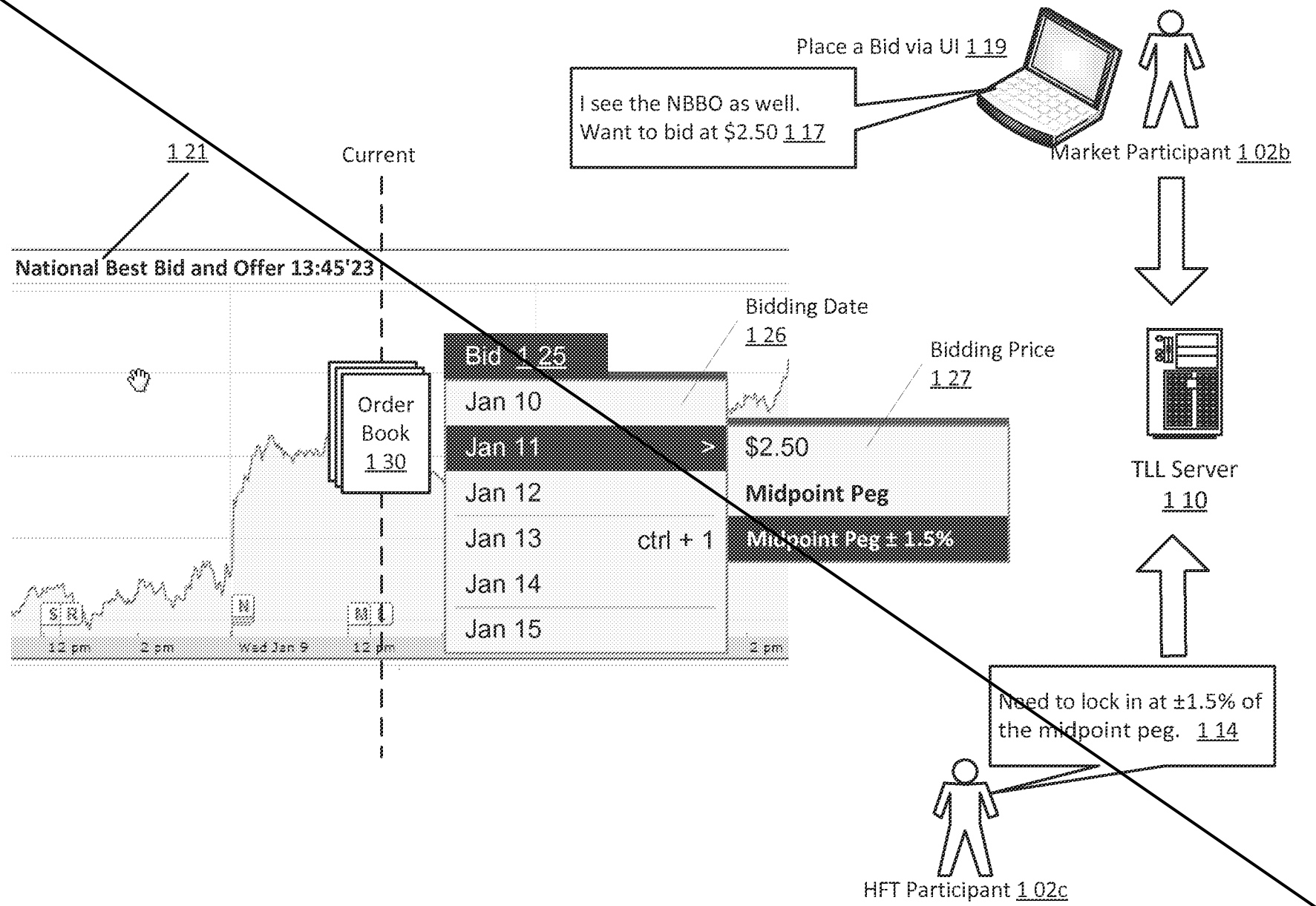
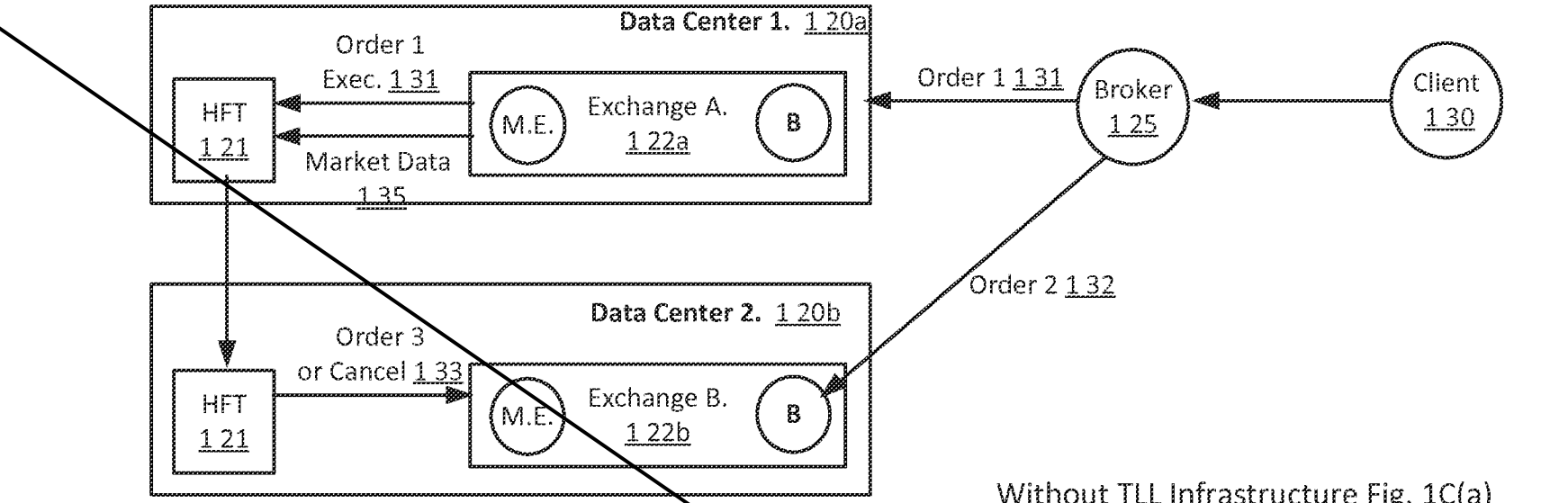
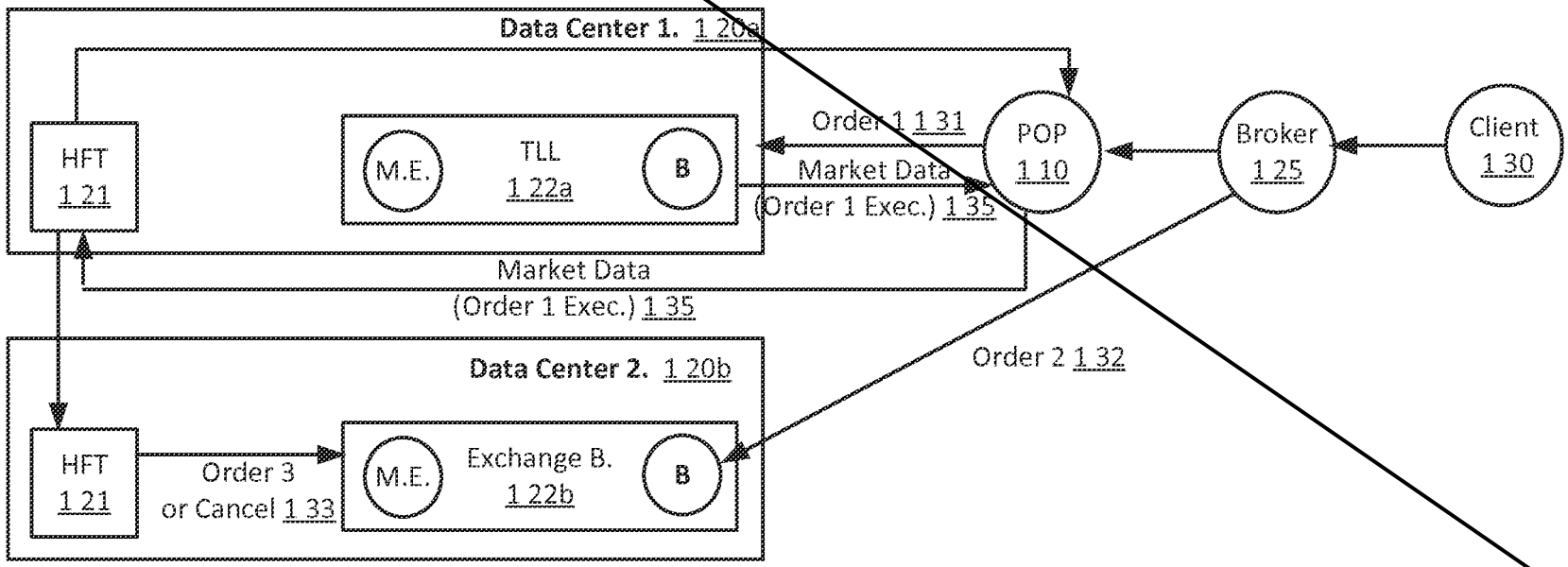


FIGURE 1B

TLL Example: Reducing Order Book Arbitrage



Without TLL Infrastructure Fig. 1C(a)



With TLL Infrastructure Fig. 1C(b)

FIGURE 1C

TLL Example: Reducing Latency Arbitrage

TLL Example: Reducing Arbitrage (Order Anticipation)

FIGURE 1D

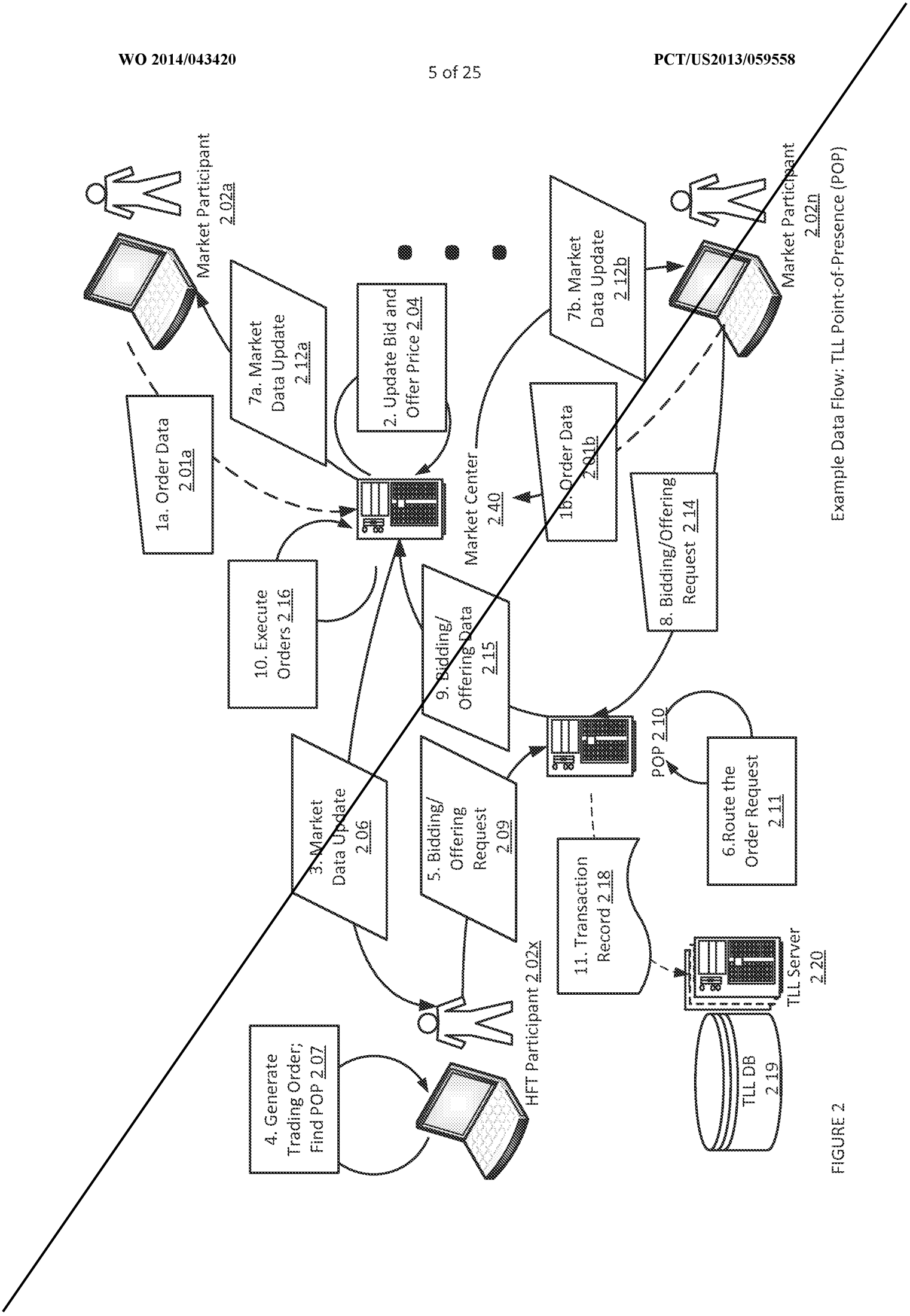


FIGURE 2

Example Data Flow: TLL Point-of-Presence (POP)

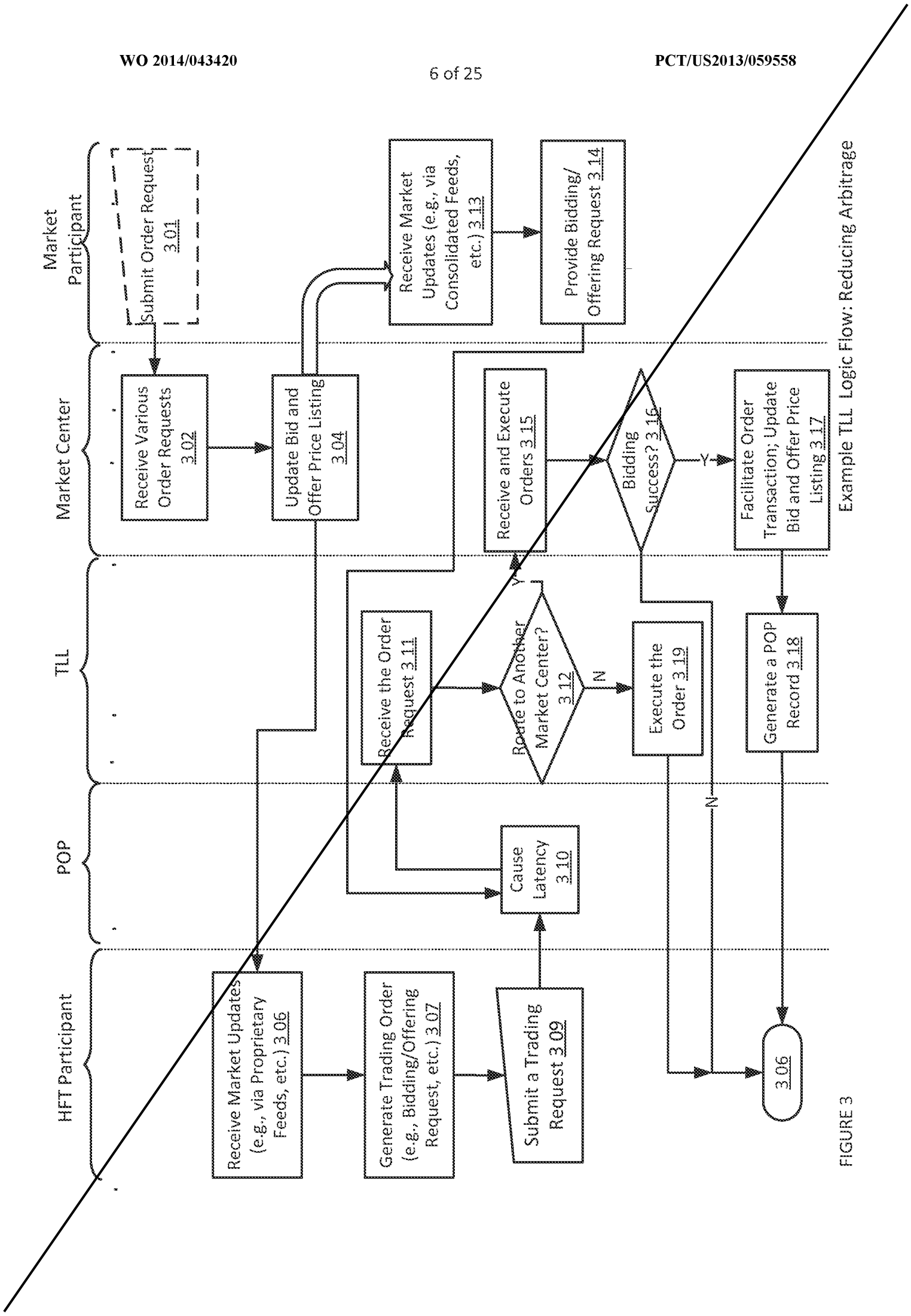


FIGURE 3 Example TLL Logic Flow: Reducing Arbitrage

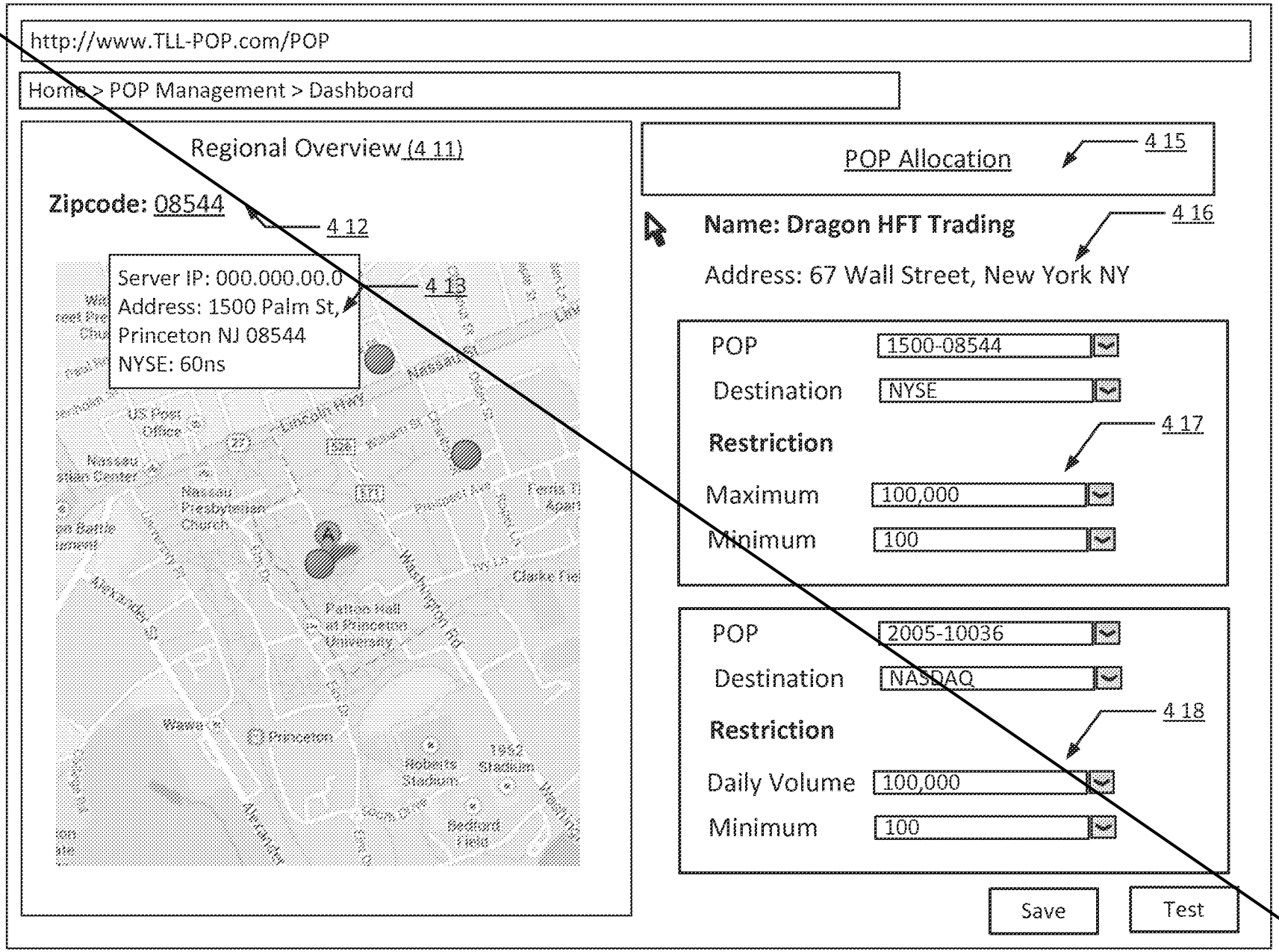


FIGURE 4A

Example TLL UI: POP Routing

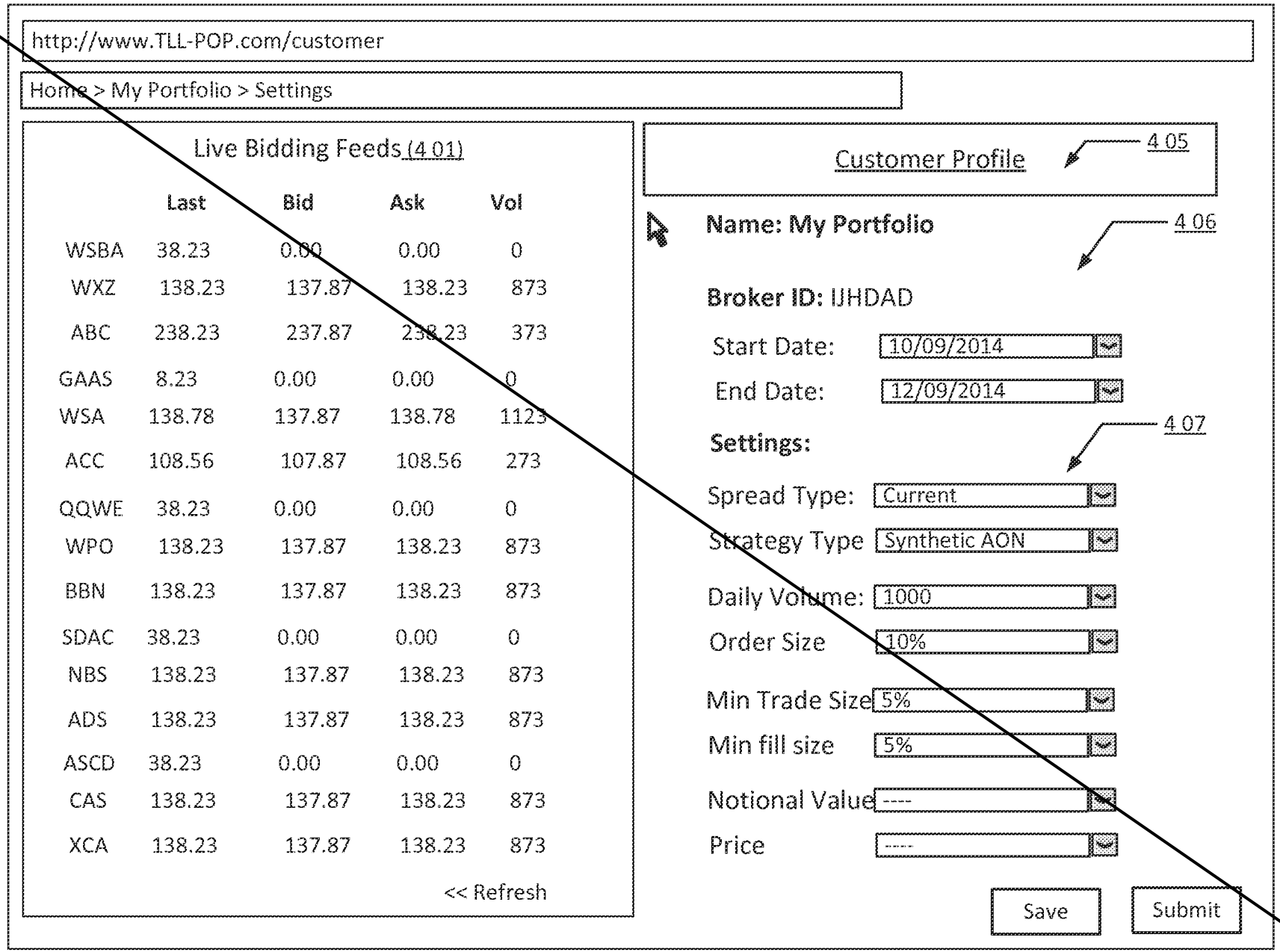


FIGURE 4B Example TLL UI: Customer Settings

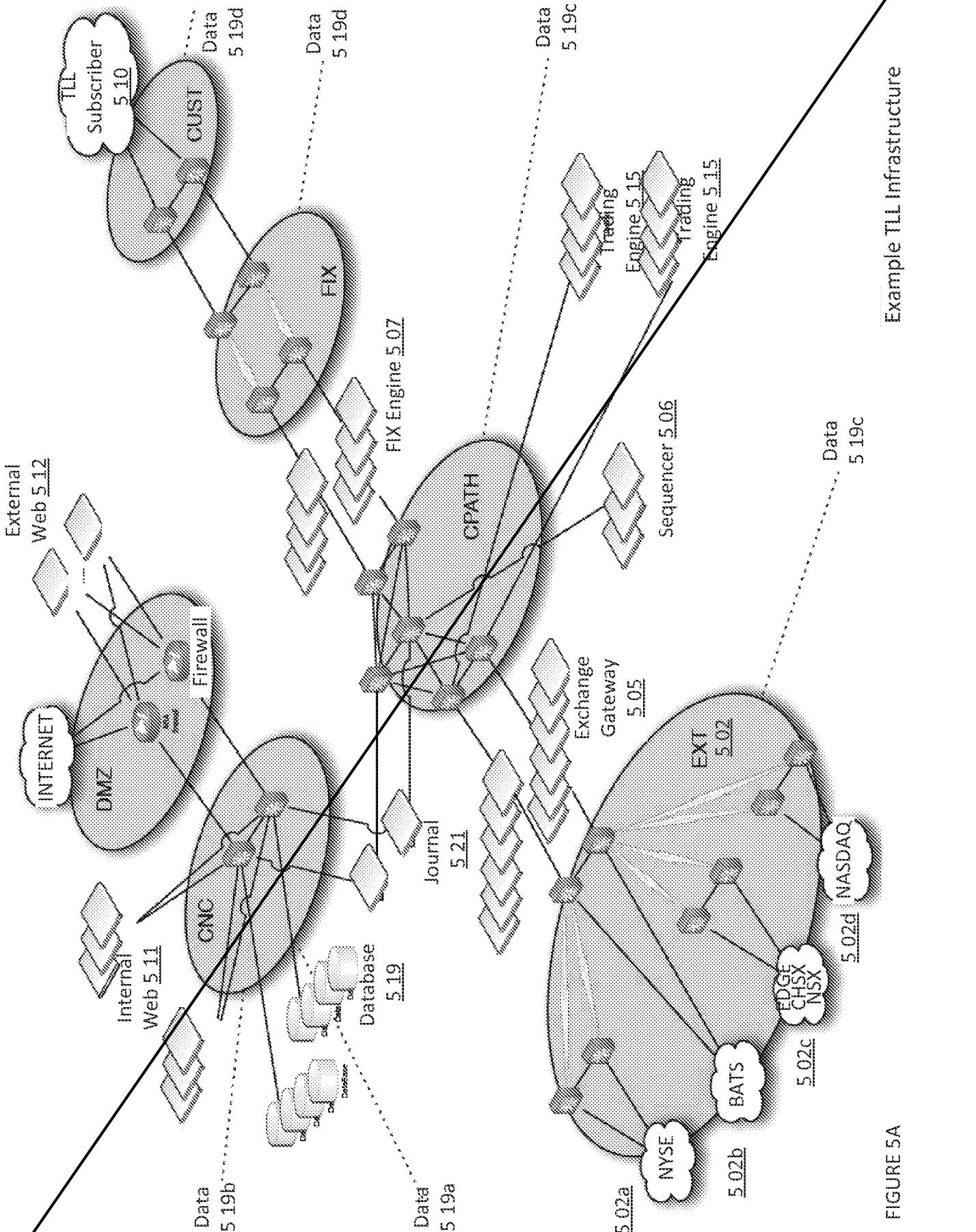


FIGURE 5A

Example TLL Infrastructure

Example TLL Data Packet

FIGURE 5B

FIX
TCP Data
TCP Header
IP Data
IP Header
Frame Data
Frame Header
Frame Footer
Data 5.19c
TLL BUS
SRMC
UDP Data
UDP Header
IP Data
IP Header
Frame Data
Frame Header
Frame Footer
Data 5.19d
Example TLL Data Packet

FIGURE 5C

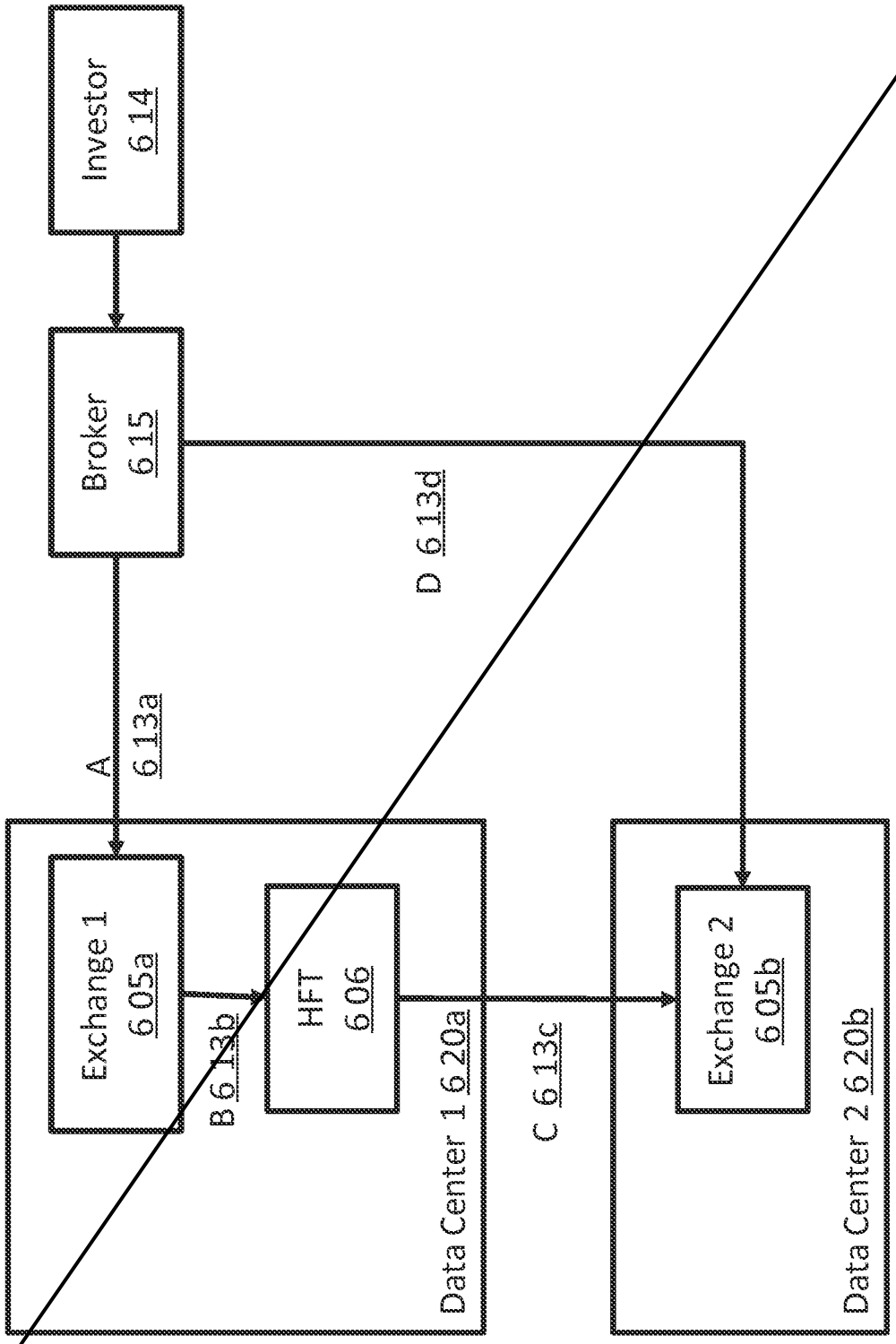
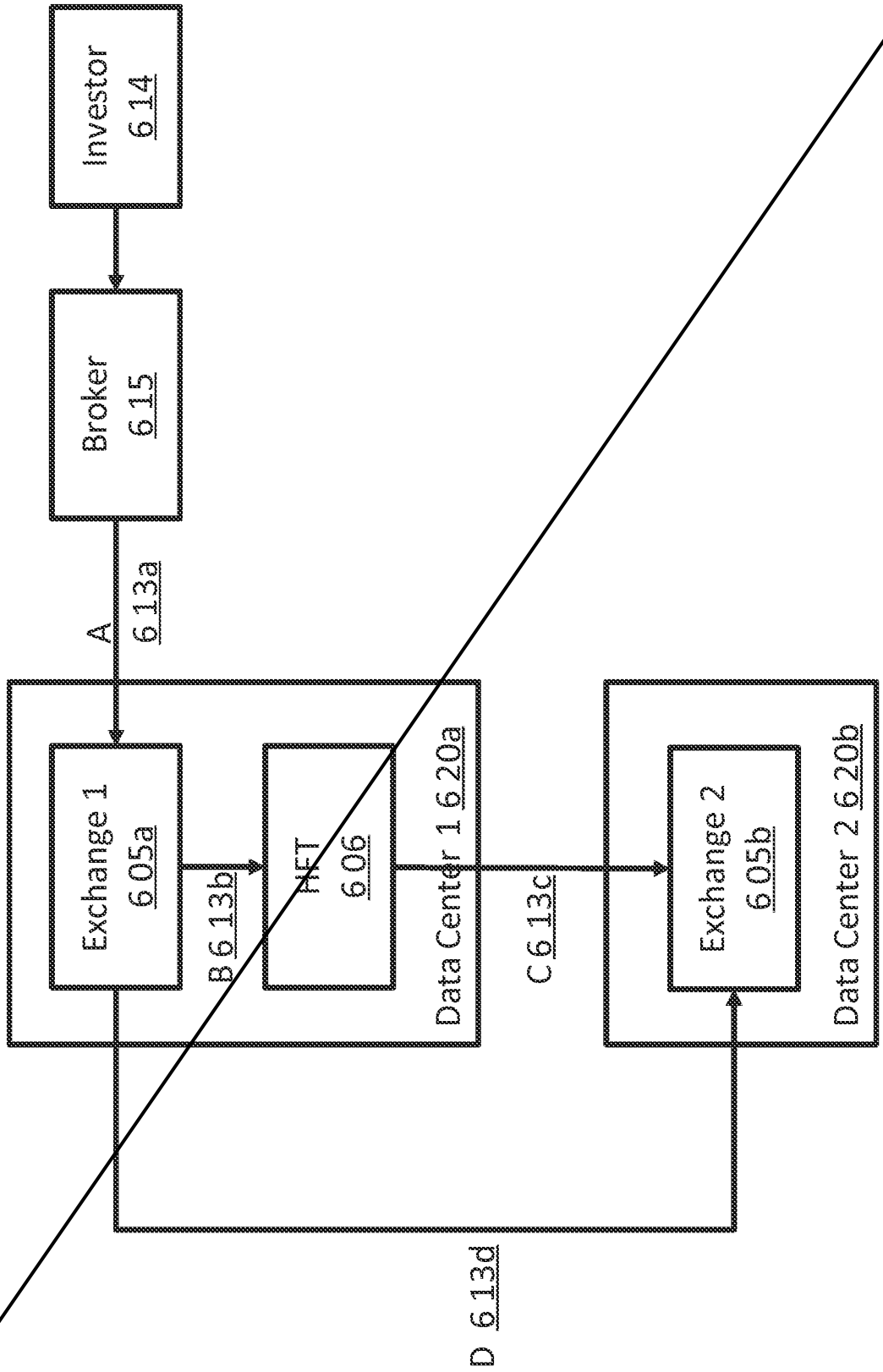


FIGURE 6A

Example TLL Diagram: Latency Arbitrage vs. Broker SOR

FIGURE 6B

TLL Example:Latency Arbitrage vs. Broker Smart Order Routers Inoculated with POP



TLL Example:Latency Arbitrage vs. Exchange SOR

FIGURE 6C

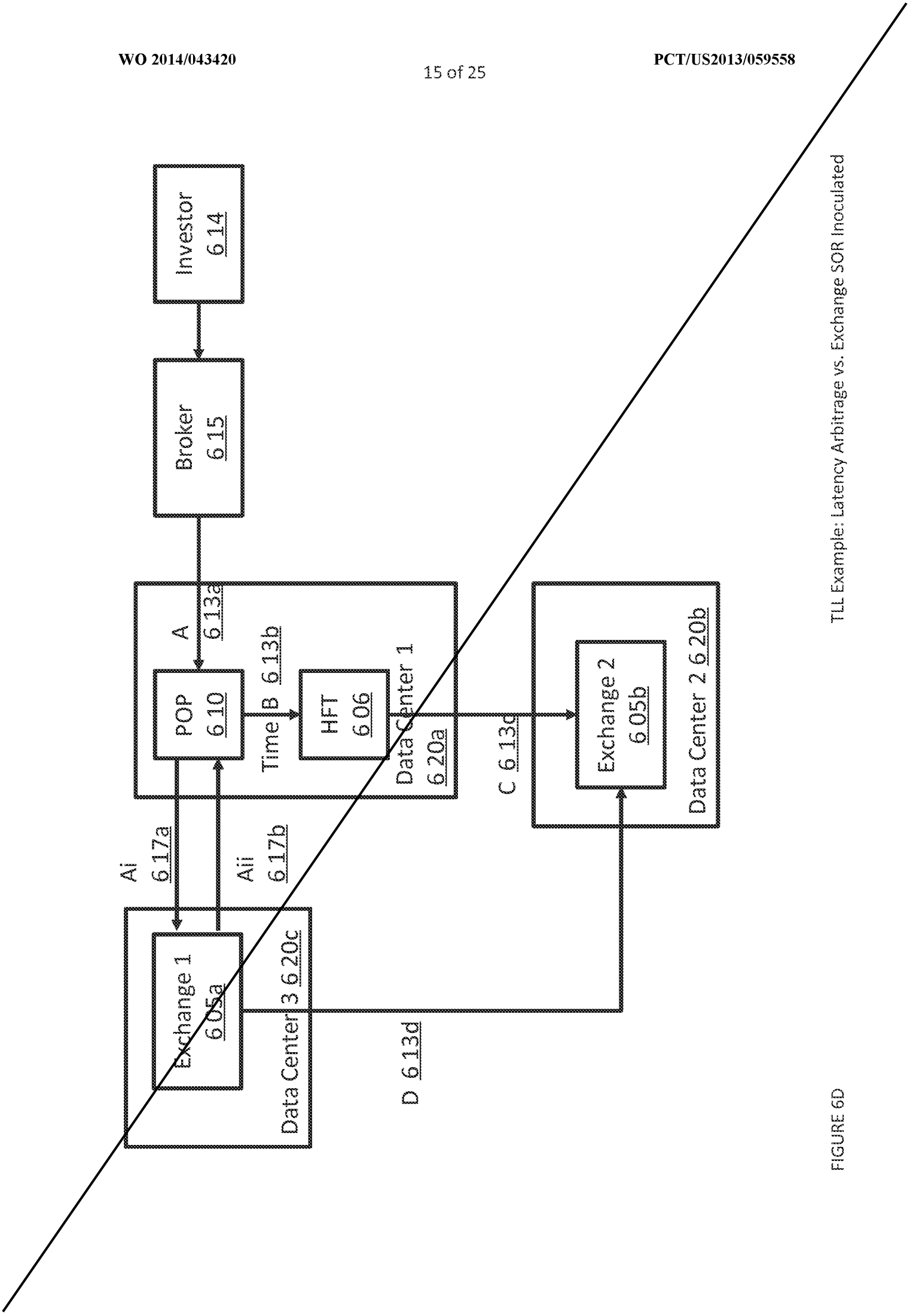


FIGURE 6D

TLL Example: Latency Arbitrage vs. Exchange SOR Inoculated

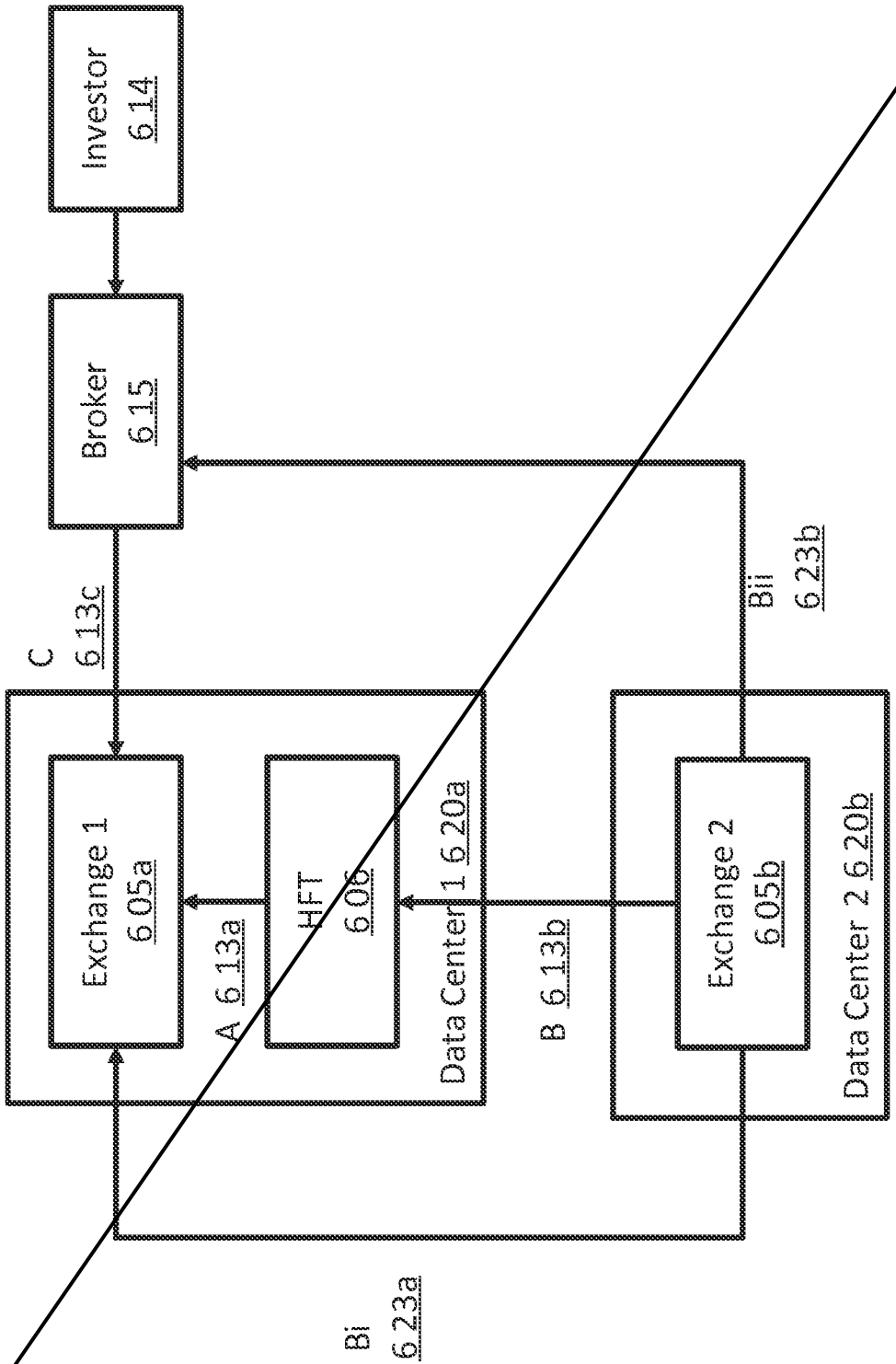


FIGURE 6E

TLL Example: Order Book Arbitrage (Passive)

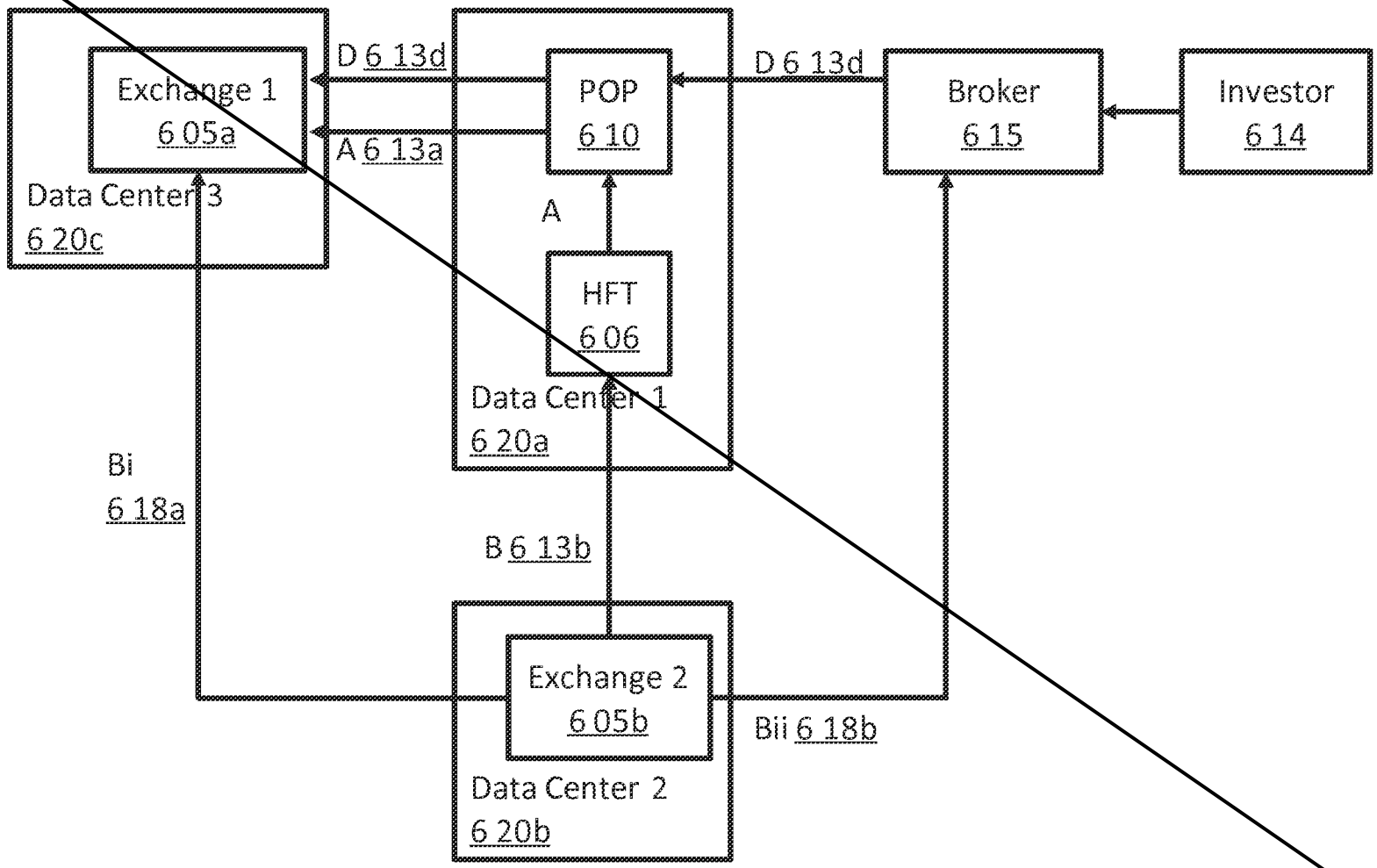


FIGURE 6F

TLL Example: Order Book Arbitrage (Passive Inoculated)

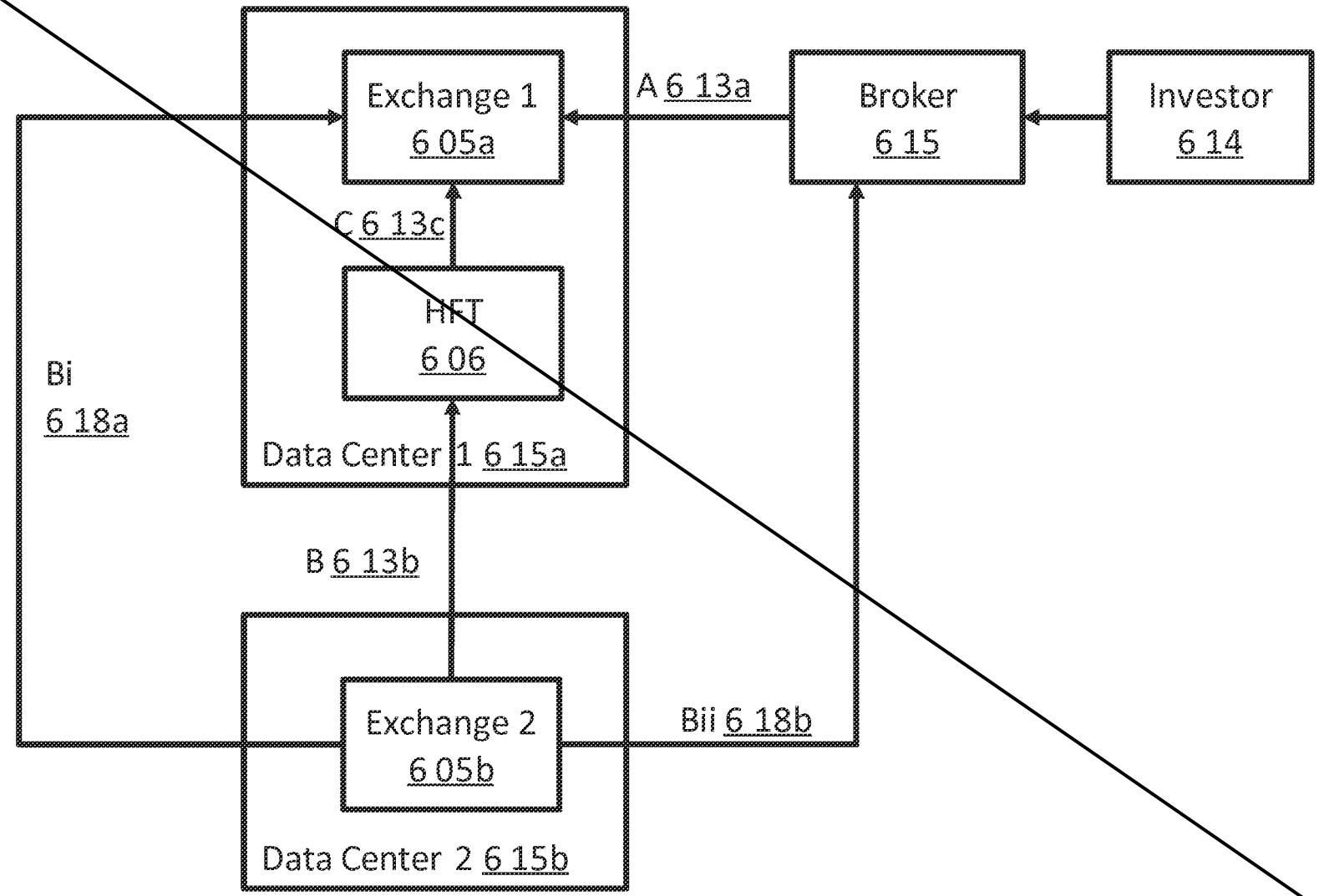


FIGURE 6G

TLL Example: Order Book Arbitrage (Aggressive)

FIGURE 6H

TLL Example: Order Book Arbitrage (Aggressive Inoculated)

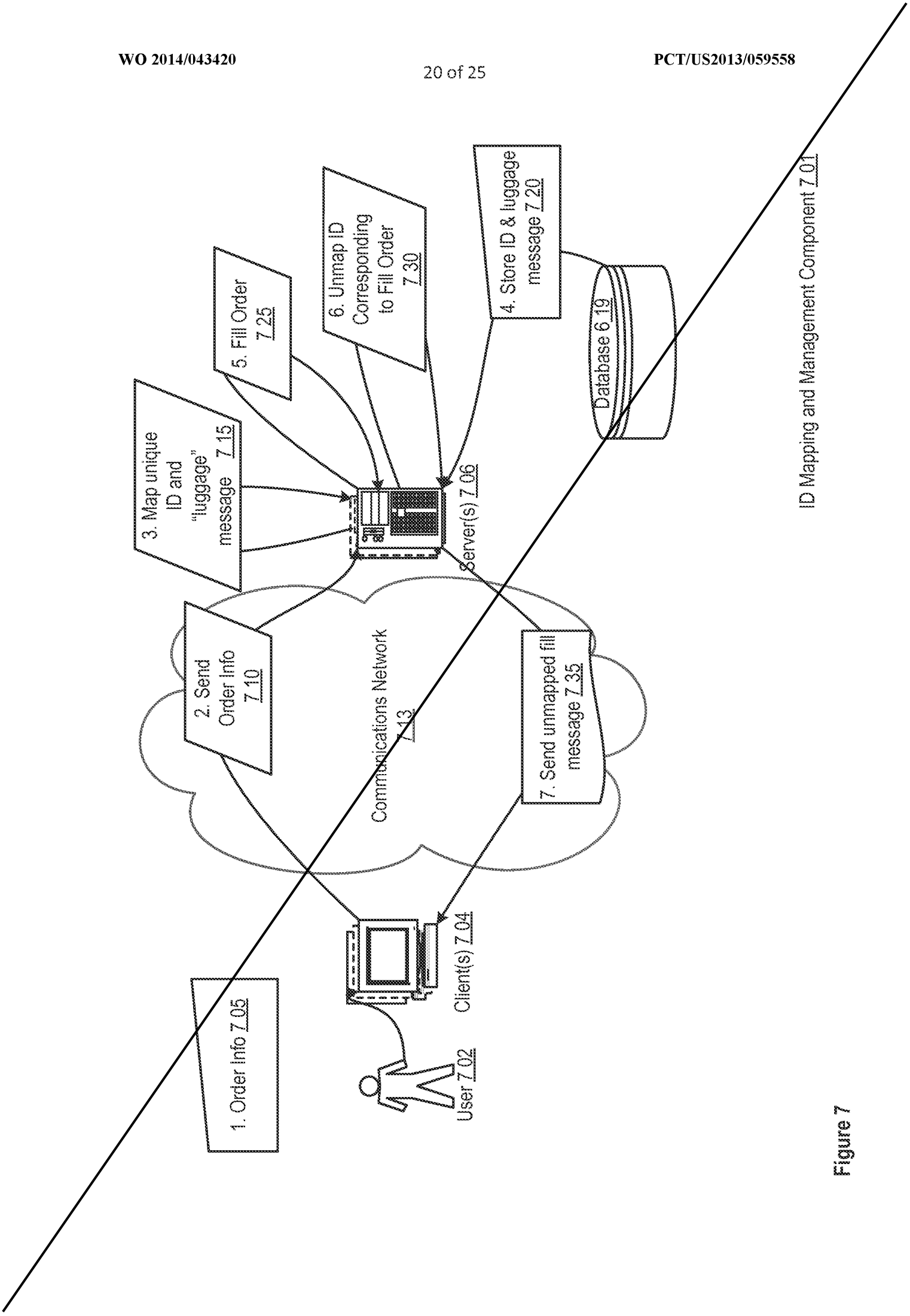

1. Order Info 7 05
User 7 02
Client(s) 7 04
2. Send Order Info 7 10
Communications Network 7 13
3. Map unique ID and "luggage" message 7 15
Server(s) 7 06
5. Fill Order 7 25
6. Unmap ID Corresponding to Fill Order 7 30
4. Store ID & luggage message 7 20
Database 6 19
7. Send unmapped fill message 7 35
ID Mapping and Management Component 7 01

Figure 7

TLL Example: Binary Search Tree
Right Child
Range
Key
Values
Left Child

FIGURE 8A

FIGURE 8B

TLL Example: Binary Search Tree

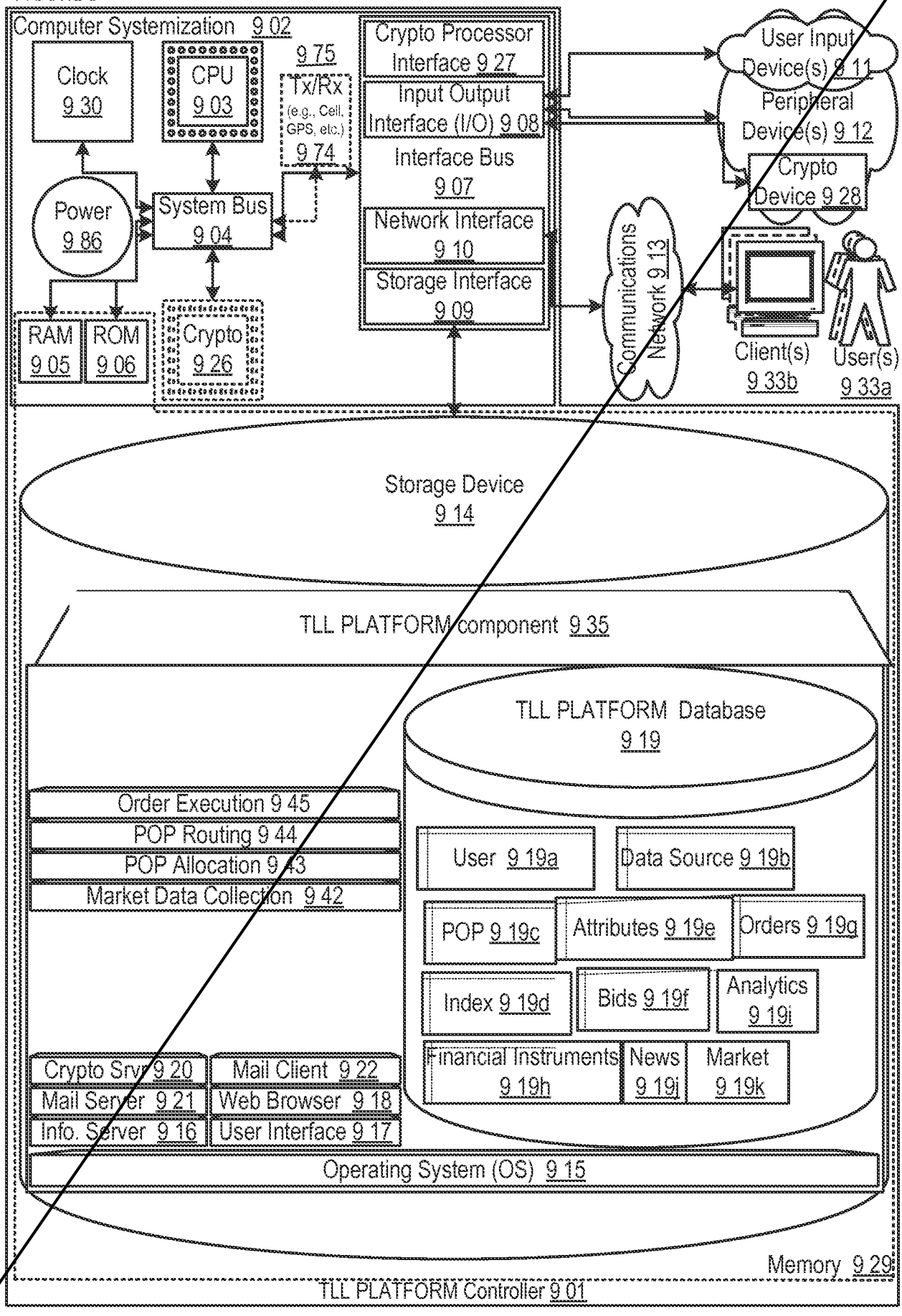
TLL Example: Binary Search Tree

FIGURE 8C

TLL Example: Binary Search Tree

FIGURE 8D

FIGURE 9


Computer Systemization 9 02
Clock 9 30
CPU 9 03
9 75
Tx/Rx (e.g., Cell, GPS, etc.) 9 74
Power 9 86
System Bus 9 04
RAM 9 05
ROM 9 06
Crypto 9 26
Crypto Processor Interface 9 27
Input Output Interface (I/O) 9 08
Interface Bus 9 07
Network Interface 9 10
Storage Interface 9 09
User Input Device(s) 9 11
Peripheral Device(s) 9 12
Crypto Device 9 28
Communications Network 9 13
Client(s) 9 33b
User(s) 9 33a
Storage Device 9 14
TLL PLATFORM component 9 35
TLL PLATFORM Database 9 19
Order Execution 9 45
POP Routing 9 44
POP Allocation 9 43
Market Data Collection 9 42
User 9 19a
Data Source 9 19b
POP 9 19c
Attributes 9 19e
Orders 9 19g
Index 9 19d
Bids 9 19f
Analytics 9 19i
Financial Instruments 9 19h
News 9 19j
Market 9 19k
Crypto Srvr 9 20
Mail Client 9 22
Mail Server 9 21
Web Browser 9 18
Info. Server 9 16
User Interface 9 17
Operating System (OS) 9 15
Memory 9 29
TLL PLATFORM Controller 9 01

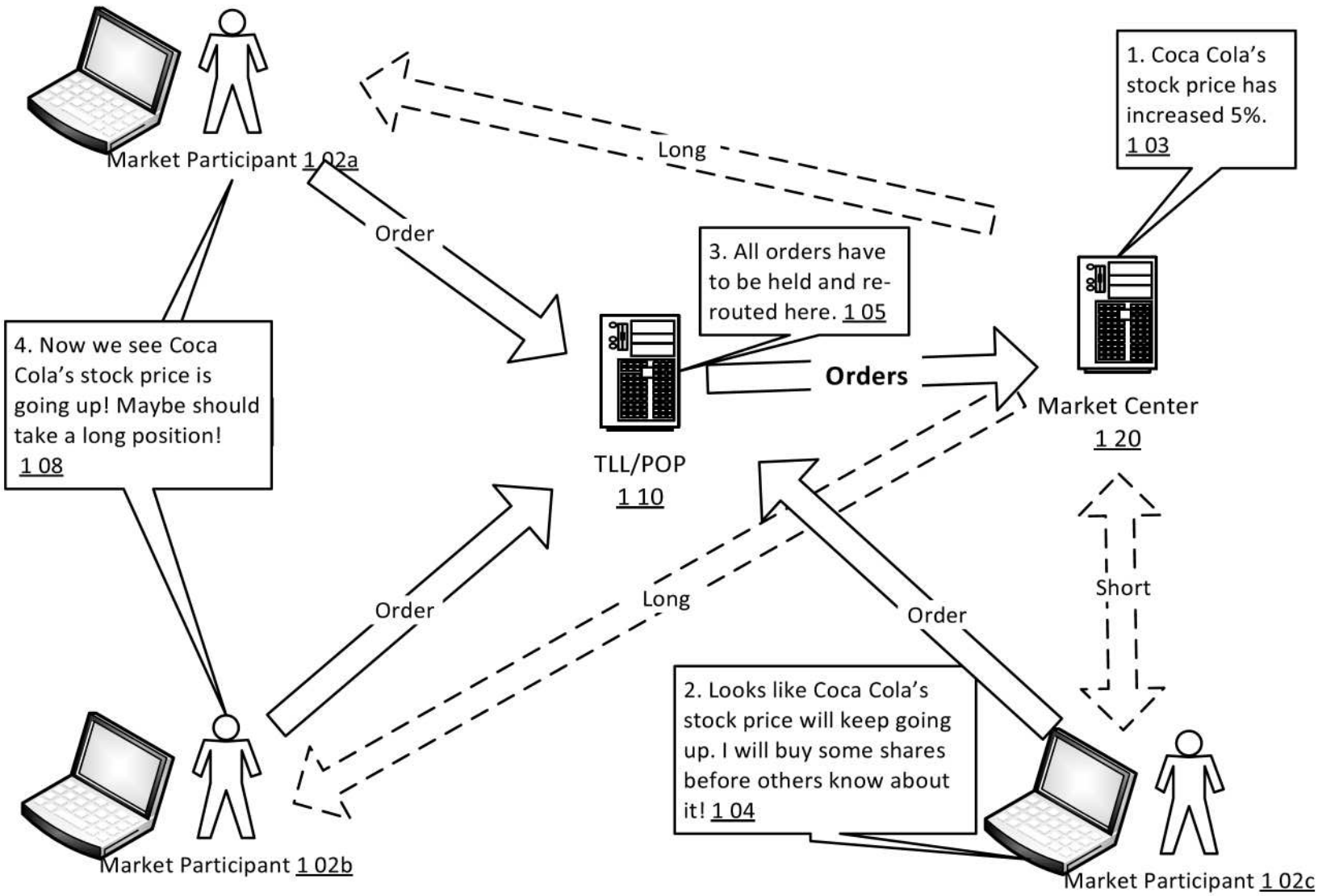


FIGURE 1A

TLL Example: Point-of-Presence Order Delaying

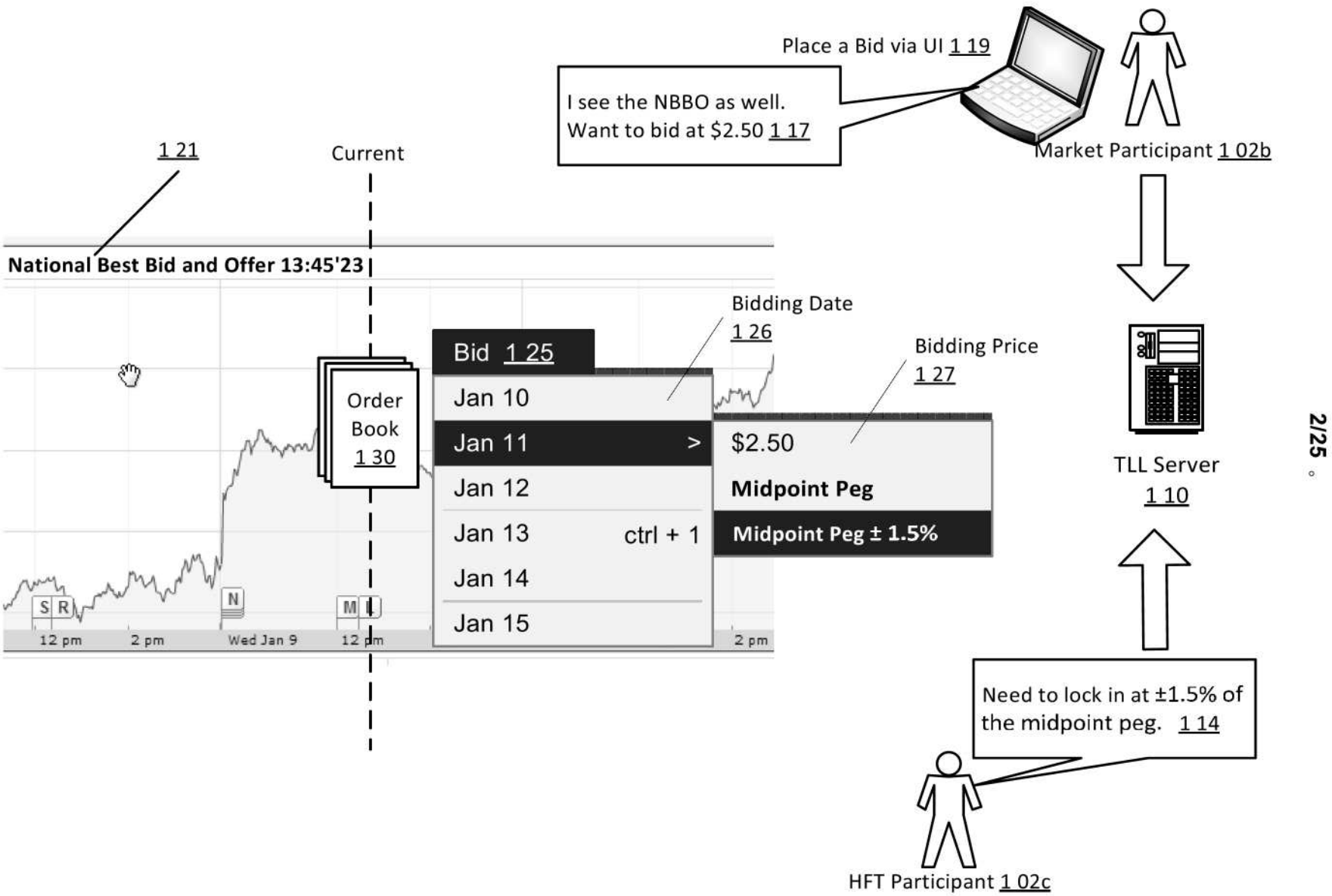
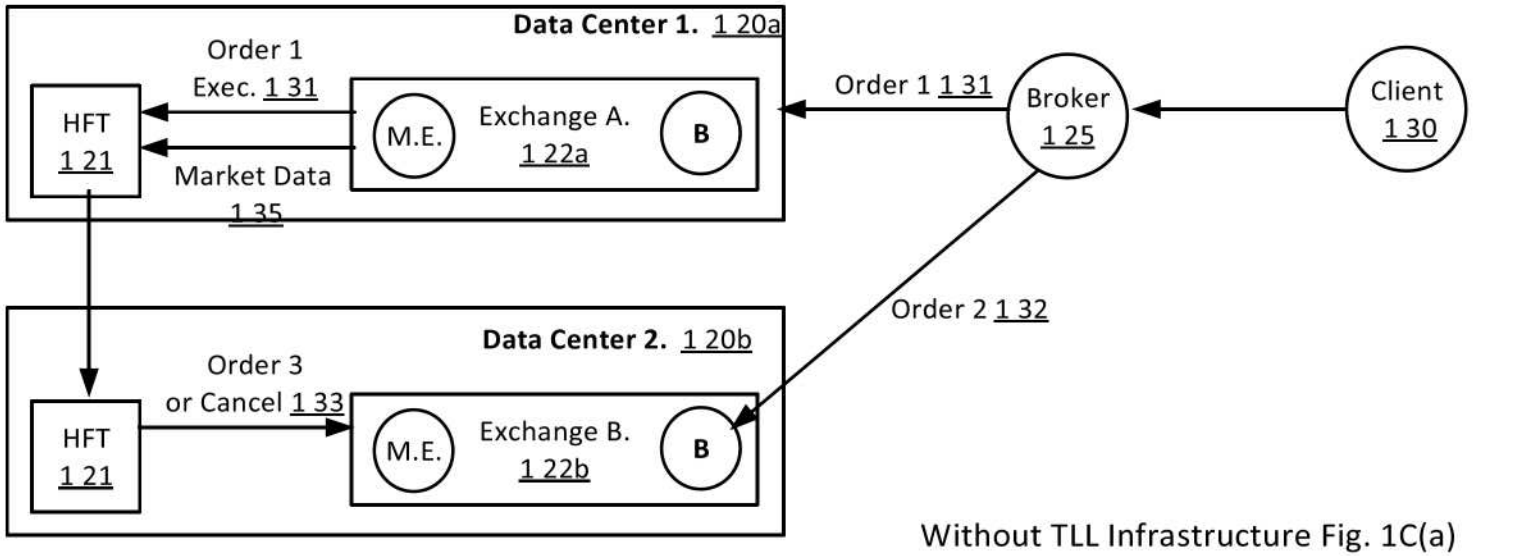
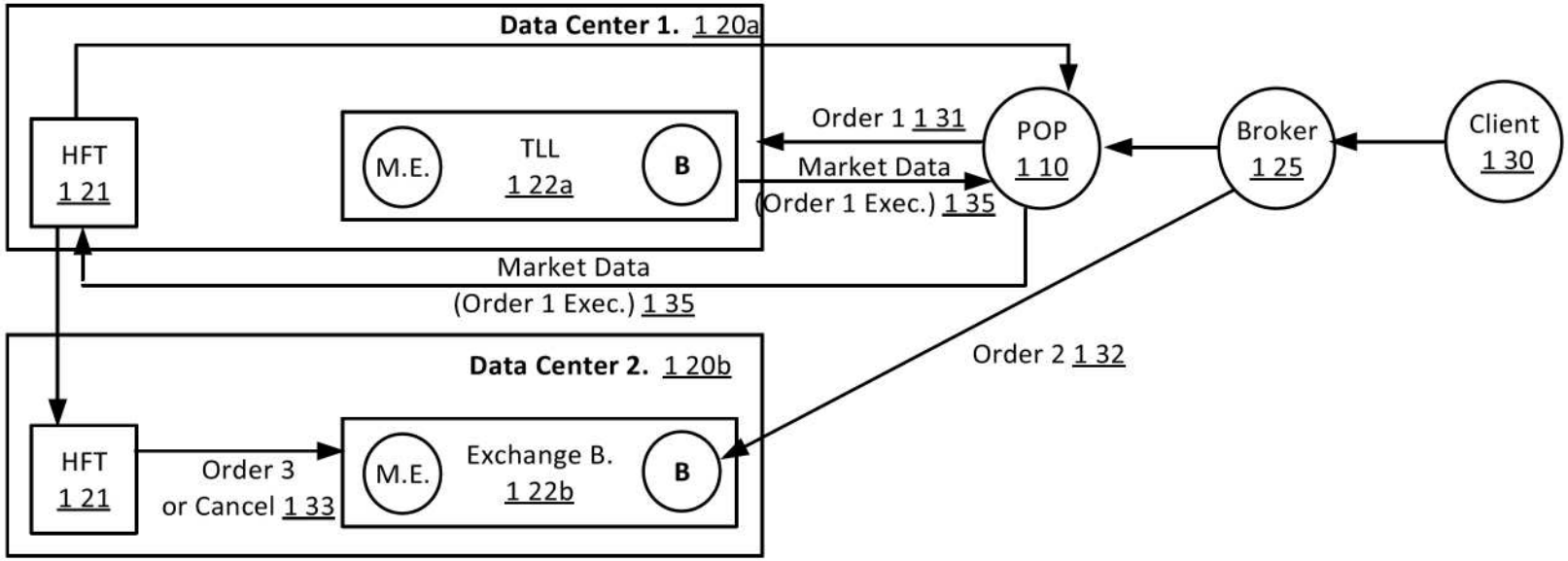


FIGURE 1B

TLL Example: Reducing Order Book Arbitrage



Without TLL Infrastructure Fig. 1C(a)



With TLL Infrastructure Fig. 1C(b)

FIGURE 1C

TLL Example: Reducing Latency Arbitrage

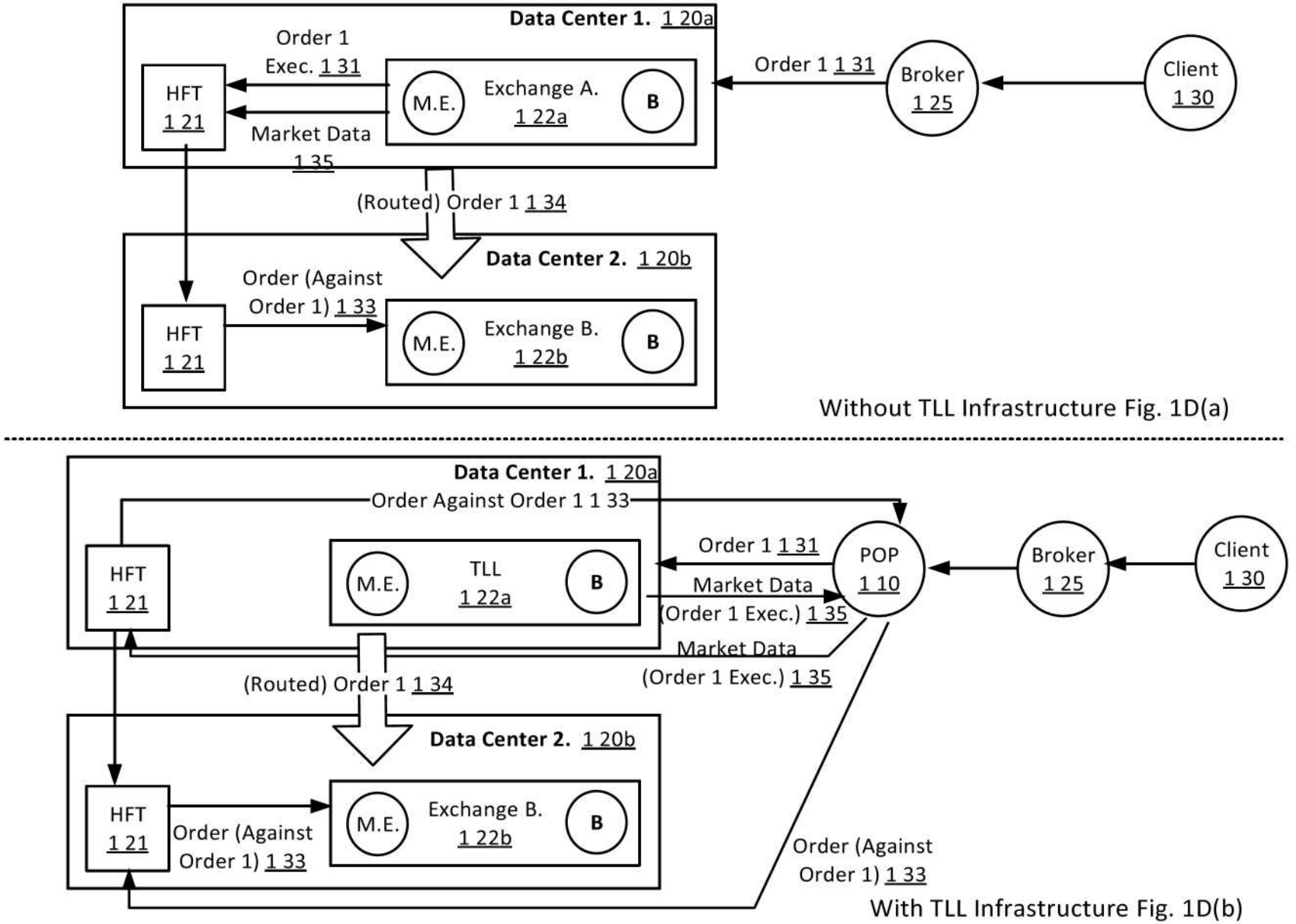


FIGURE 1D

TLL Example: Reducing Arbitrage (Order Anticipation)

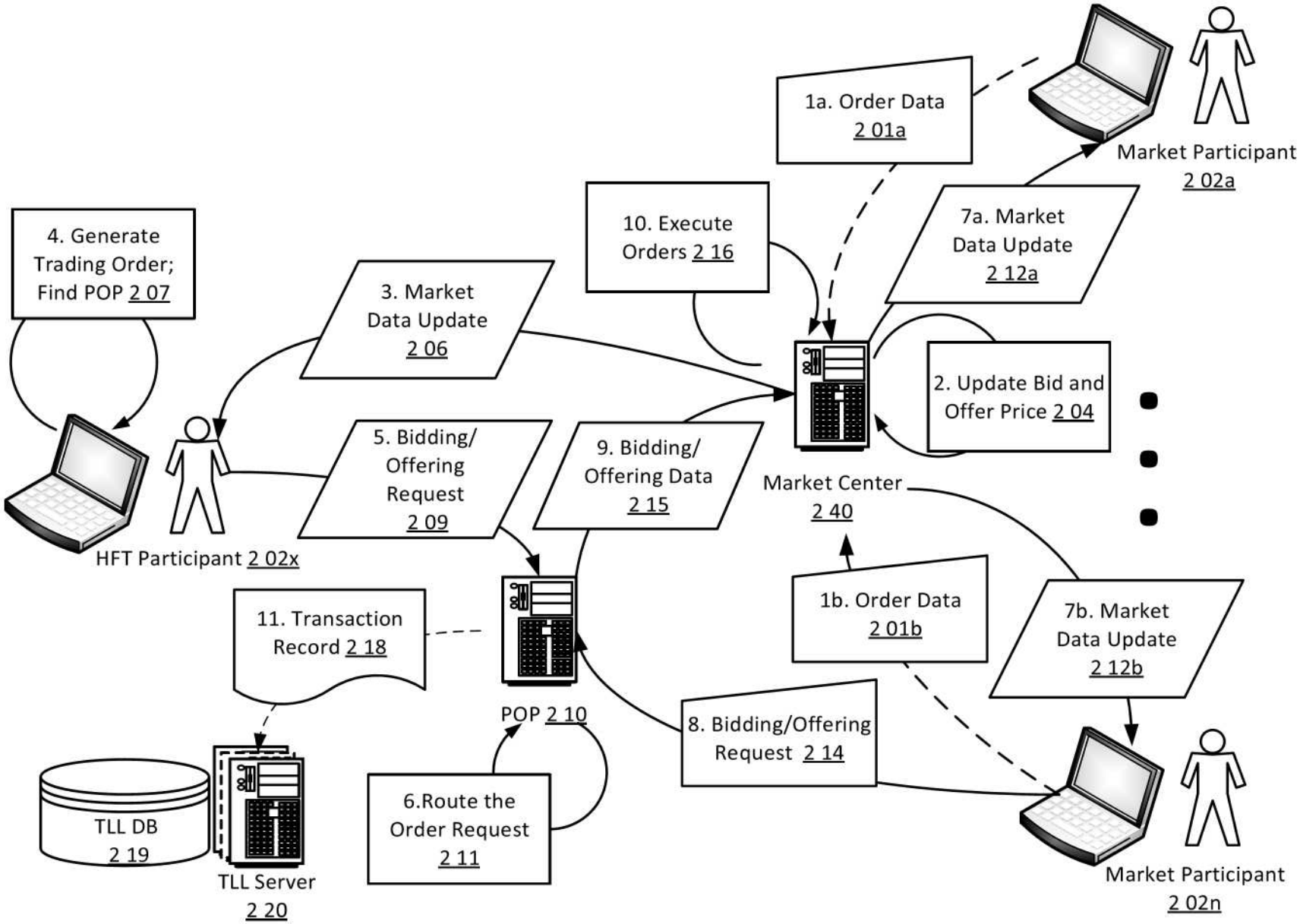


FIGURE 2

Example Data Flow: TLL Point-of-Presence (POP)

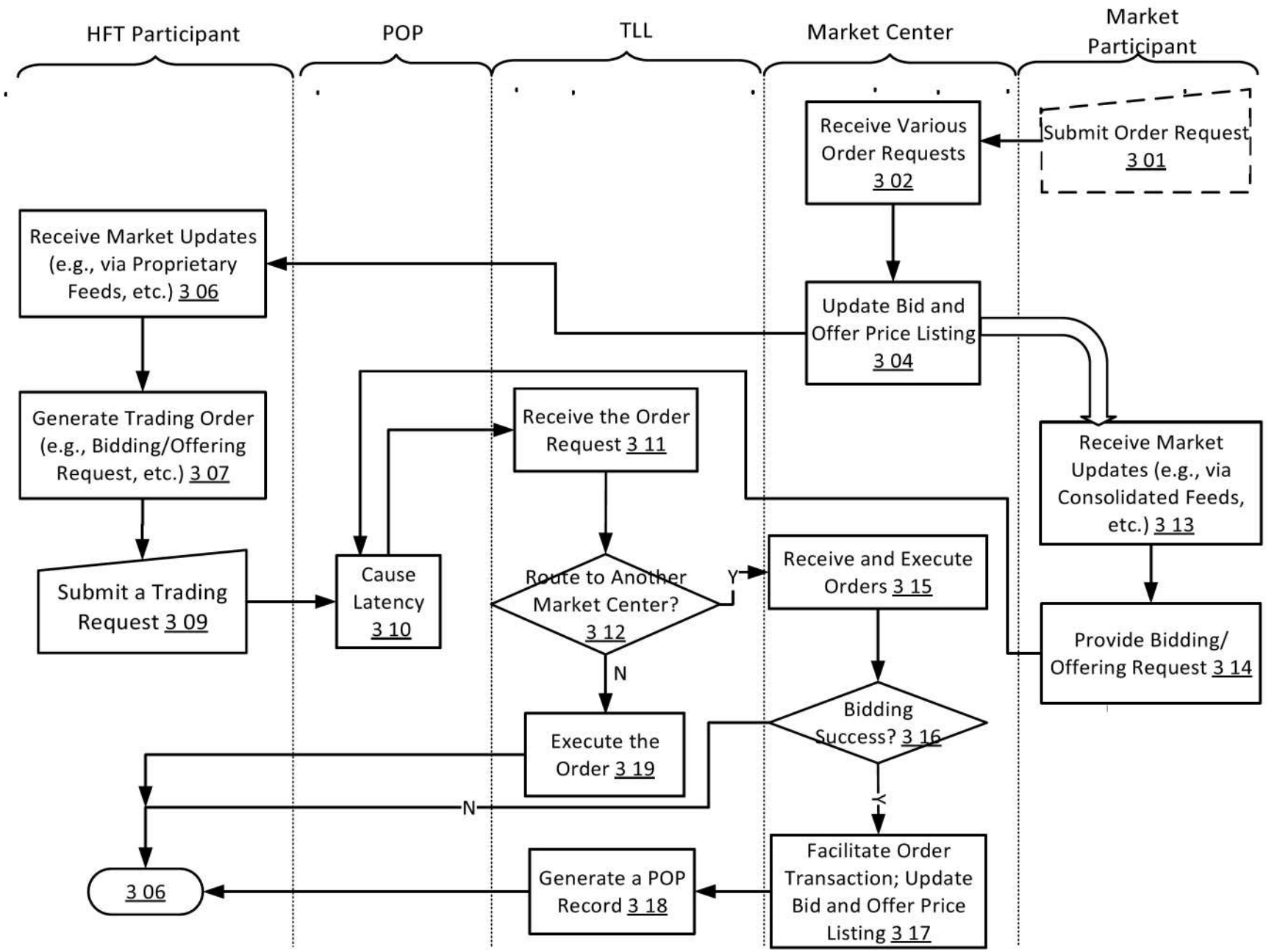


FIGURE 3

Example TLL Logic Flow: Reducing Arbitrage

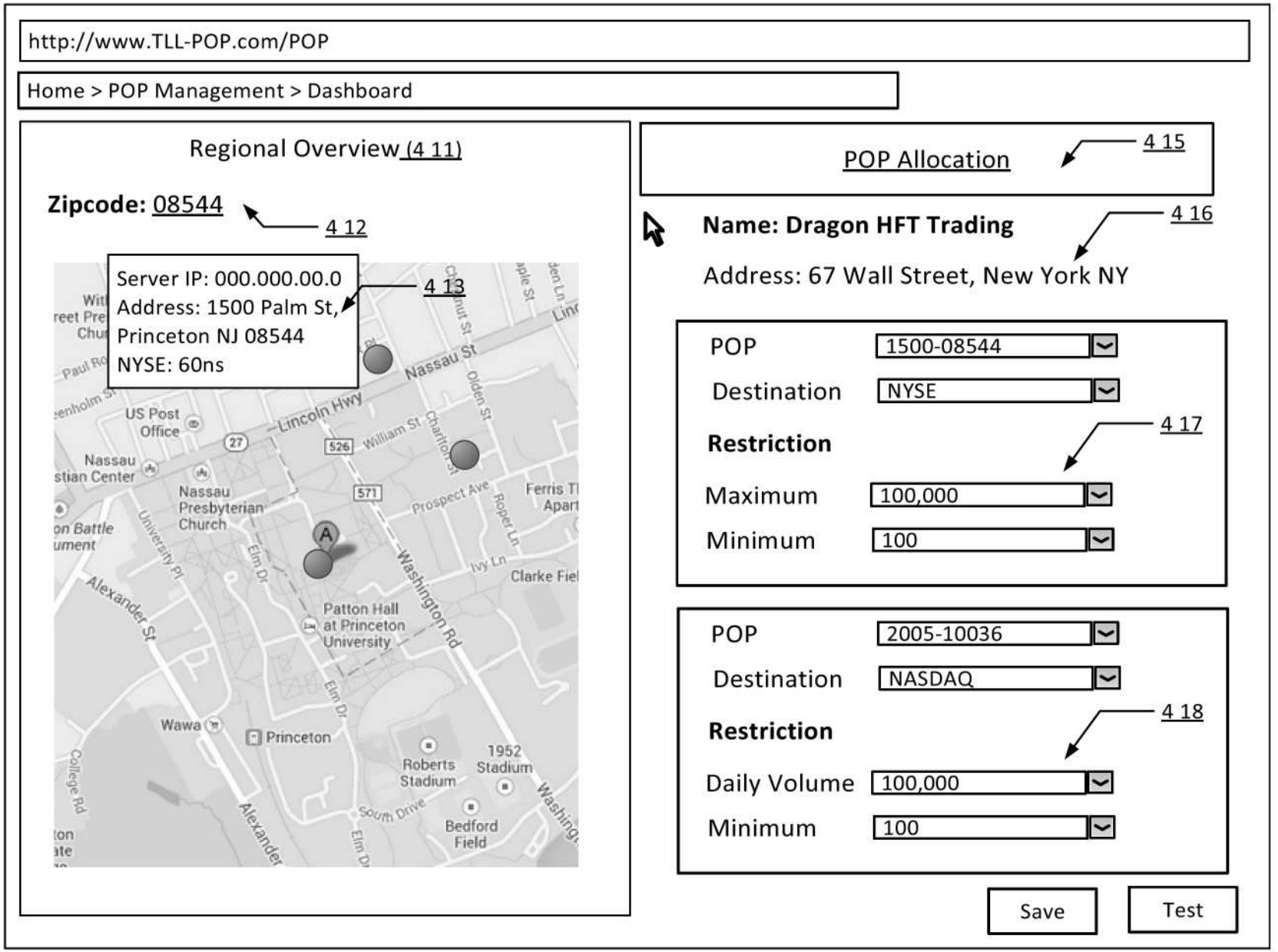


FIGURE 4A

Example TLL UI: POP Routing

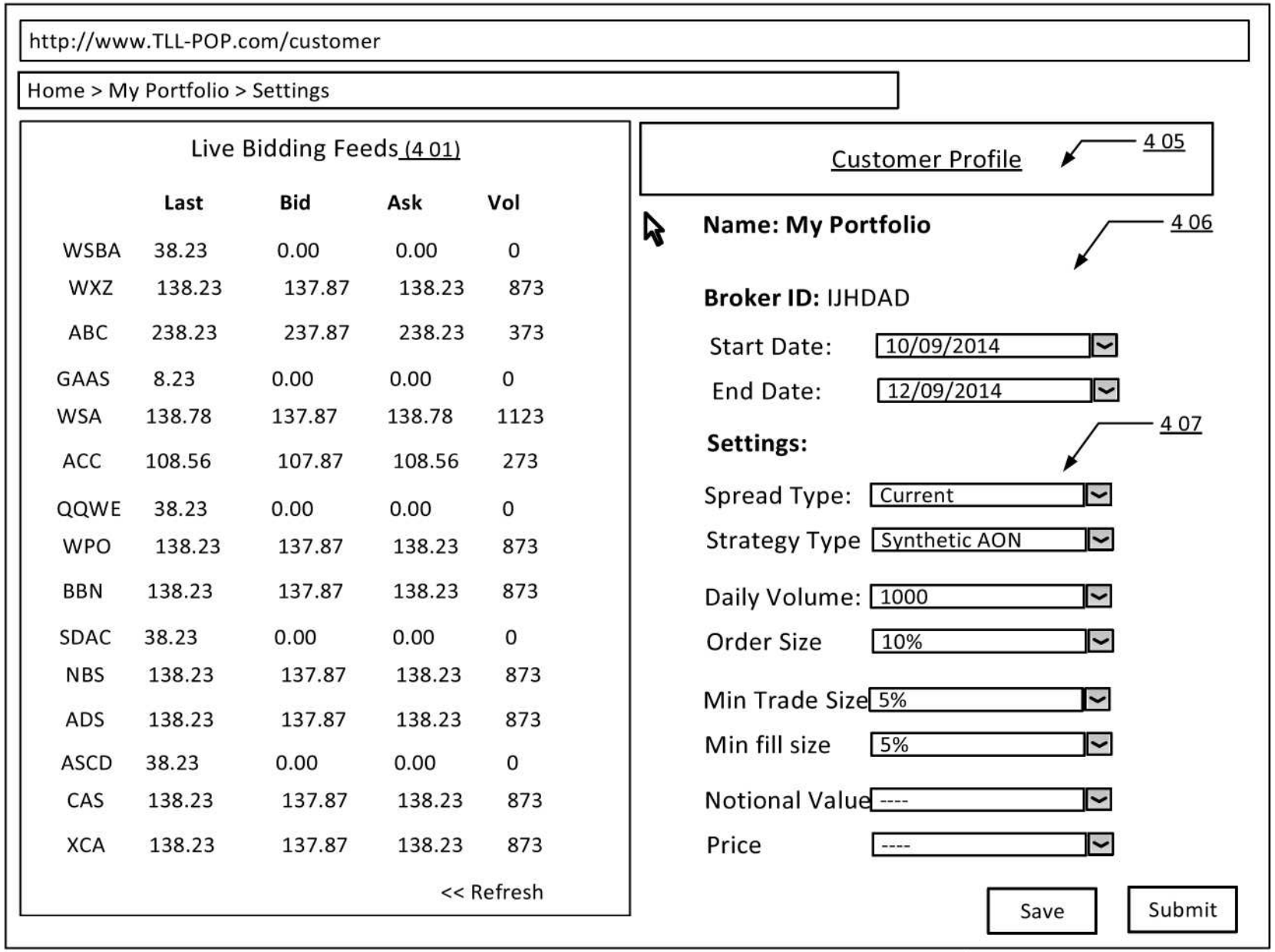


FIGURE 4B Example TLL UI: Customer Settings

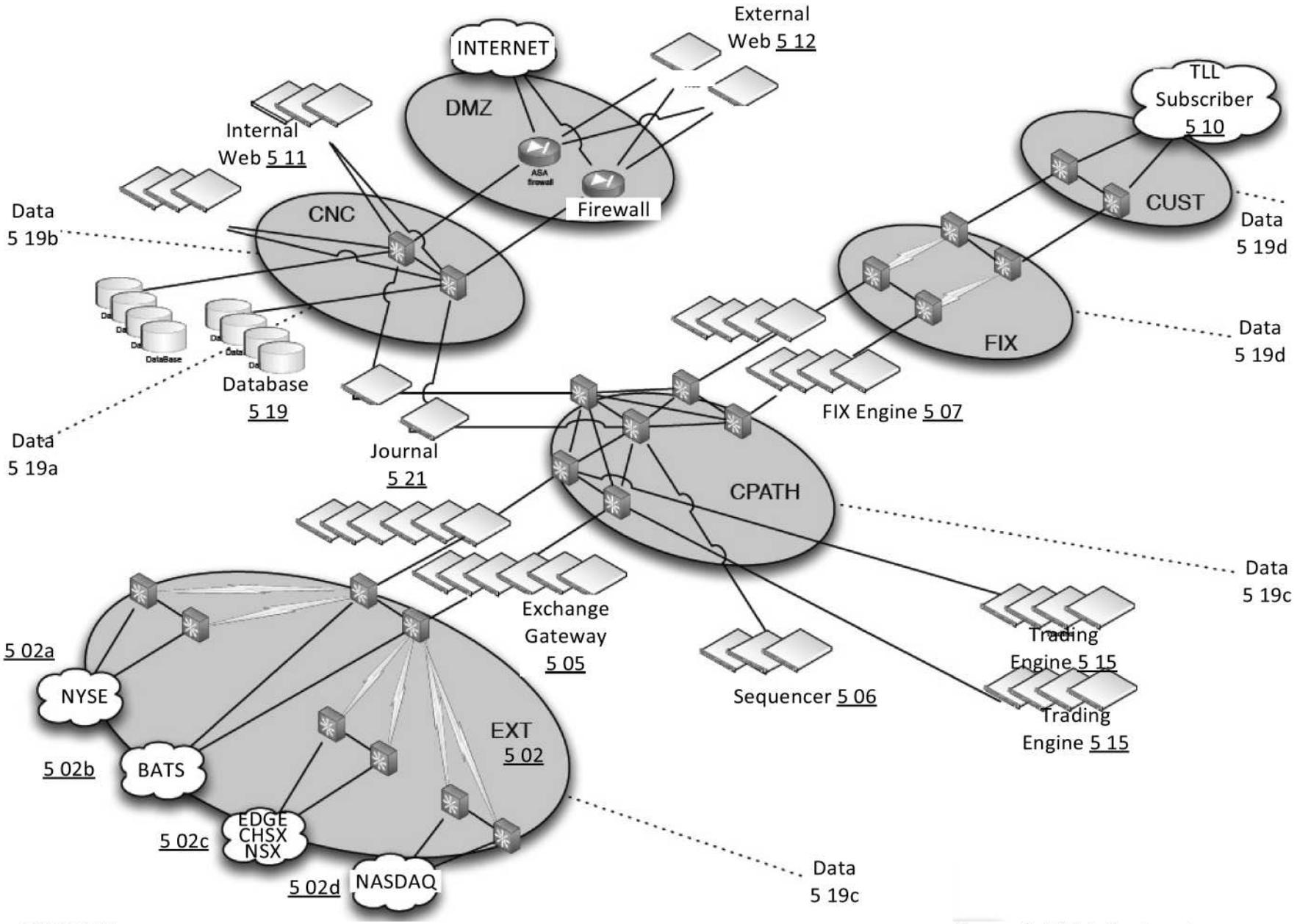
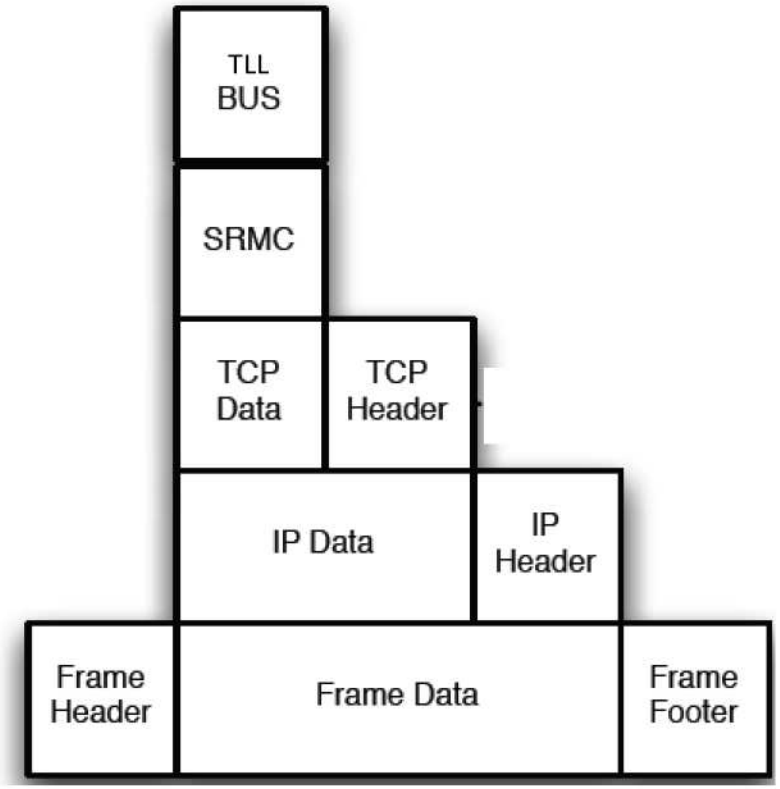


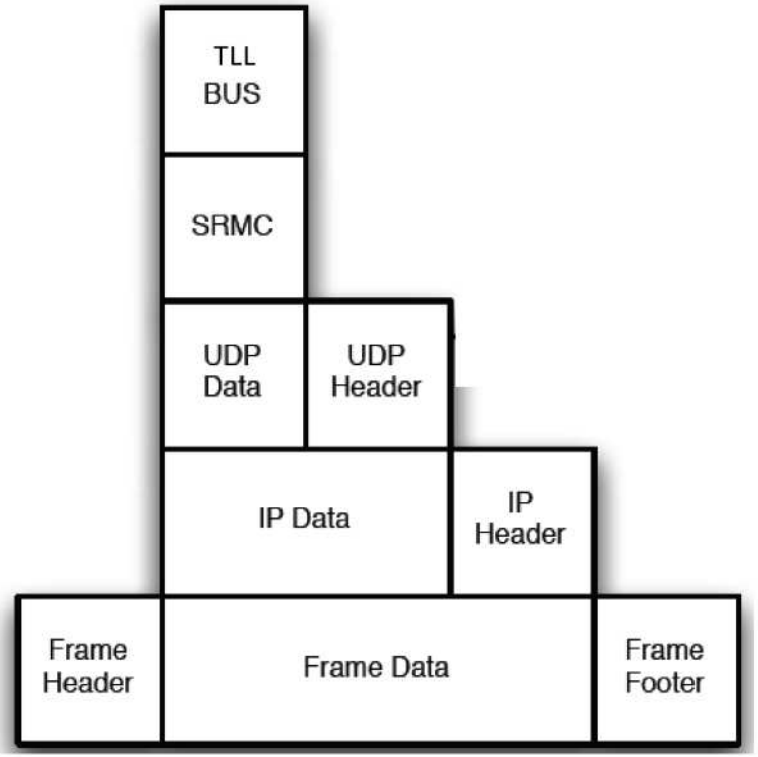
FIGURE 5A

Example TLL Infrastructure

9/25



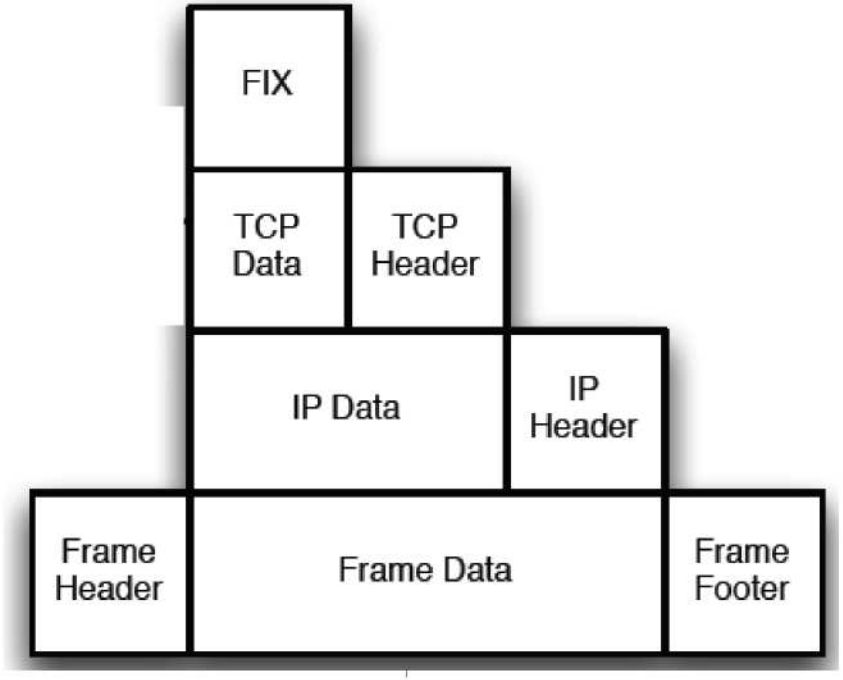
Data 5 19b



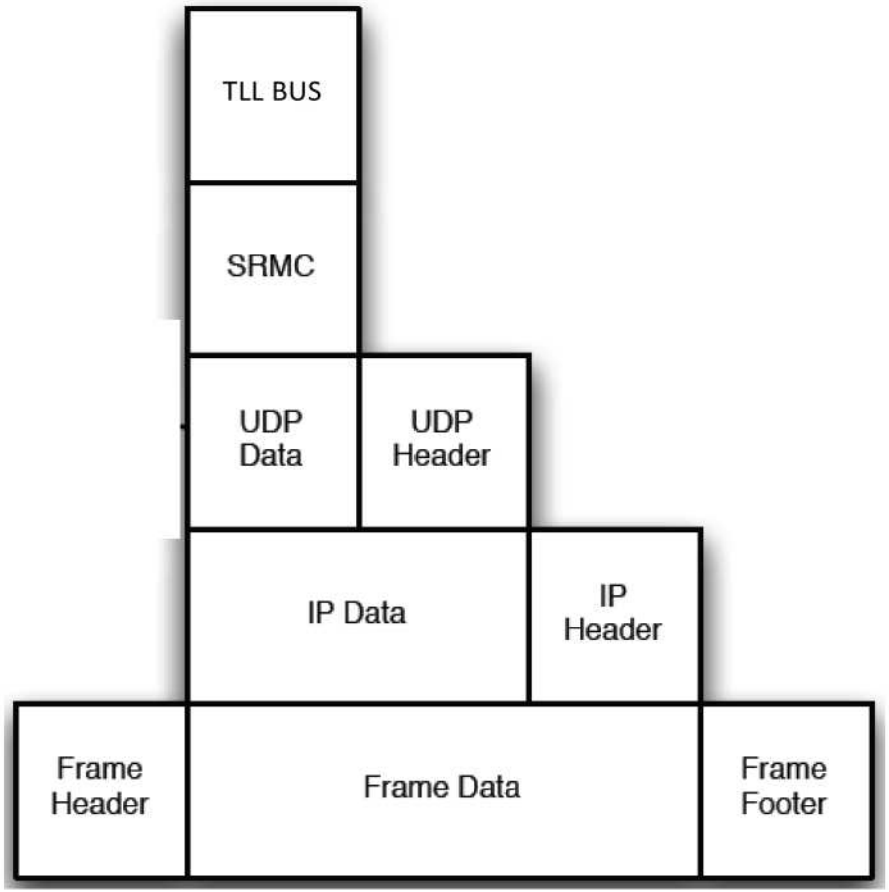
Data 5 19a

FIGURE 5B

Example TLL Data Packet



Data 5 19c



Data 5 19d

FIGURE 5C

Example TLL Data Packet

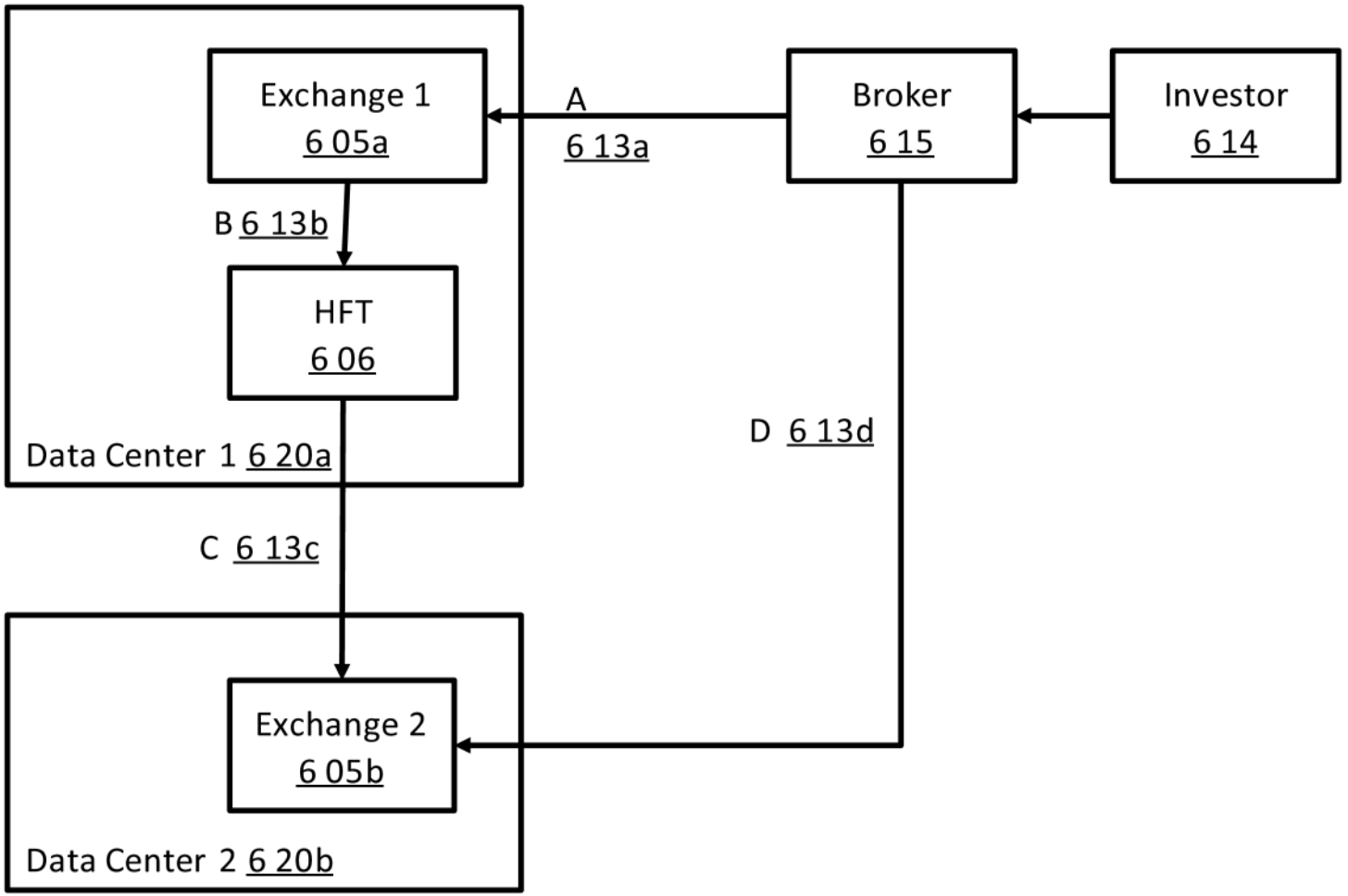


FIGURE 6A

Example TLL Diagram: Latency Arbitrage vs. Broker SOR

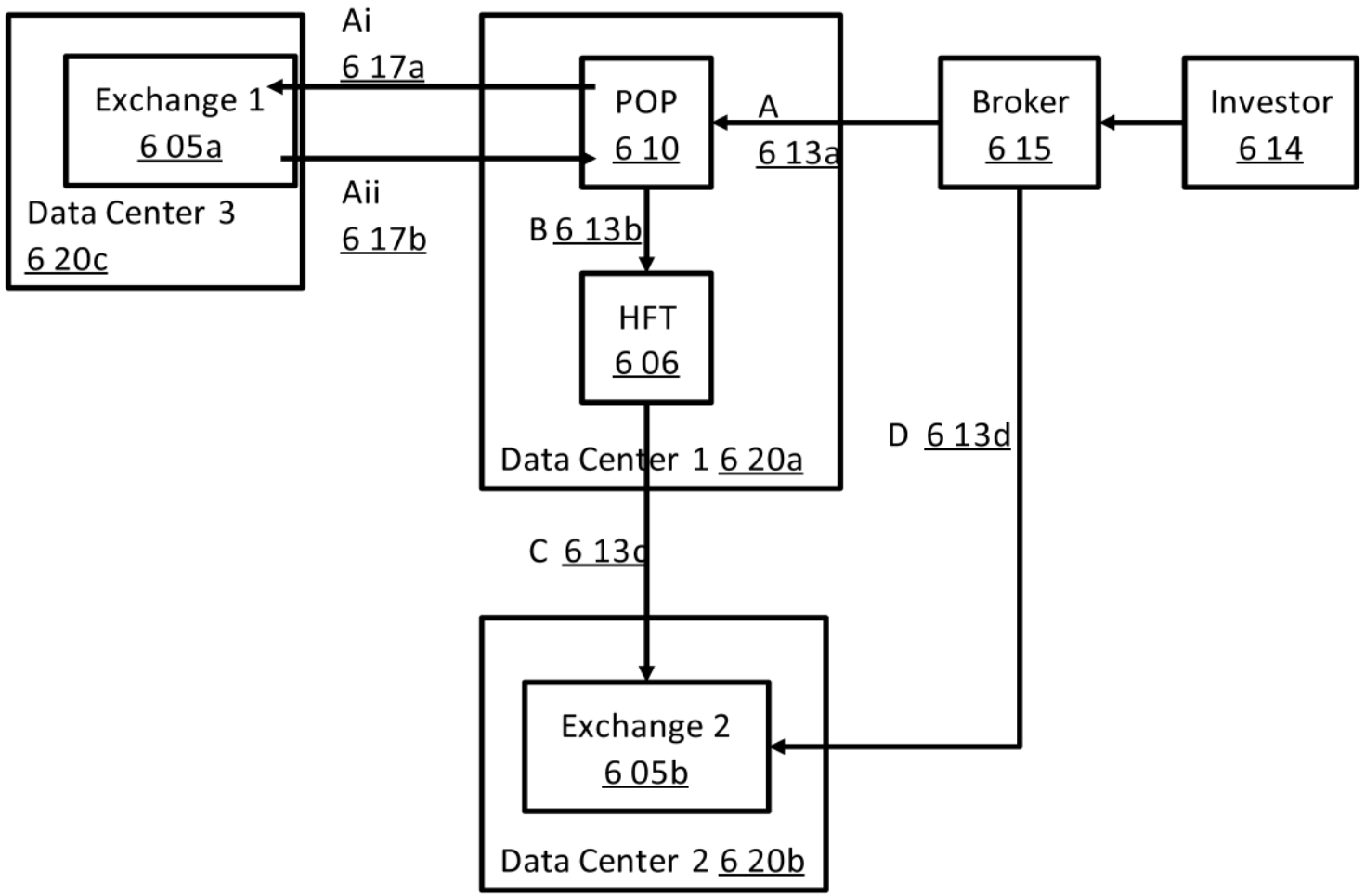


FIGURE 6B

TLL Example:Latency Arbitrage vs. Broker Smart Order Routers Inoculated with POP

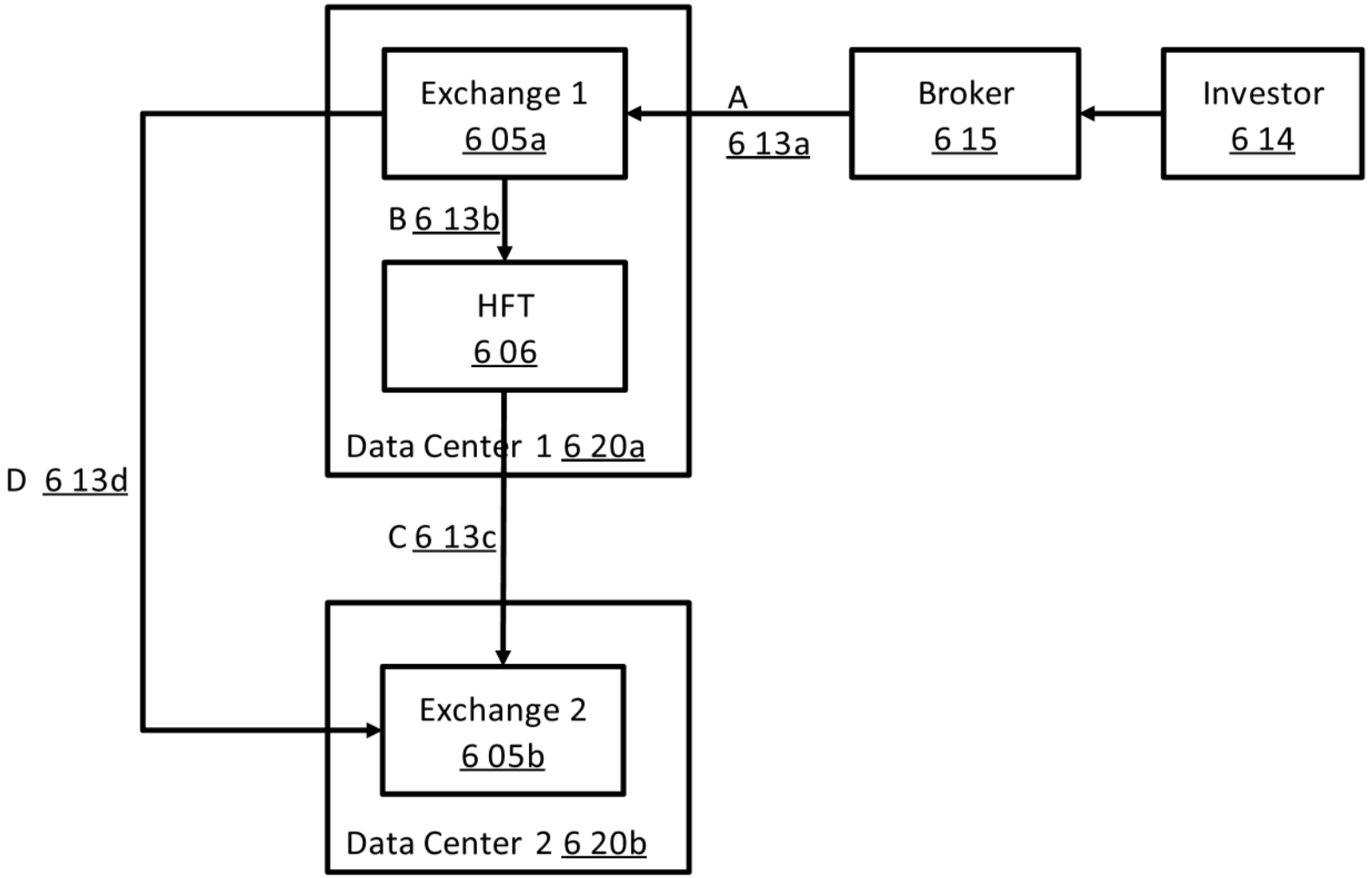


FIGURE 6C

TLL Example:Latency Arbitrage vs. Exchange SOR

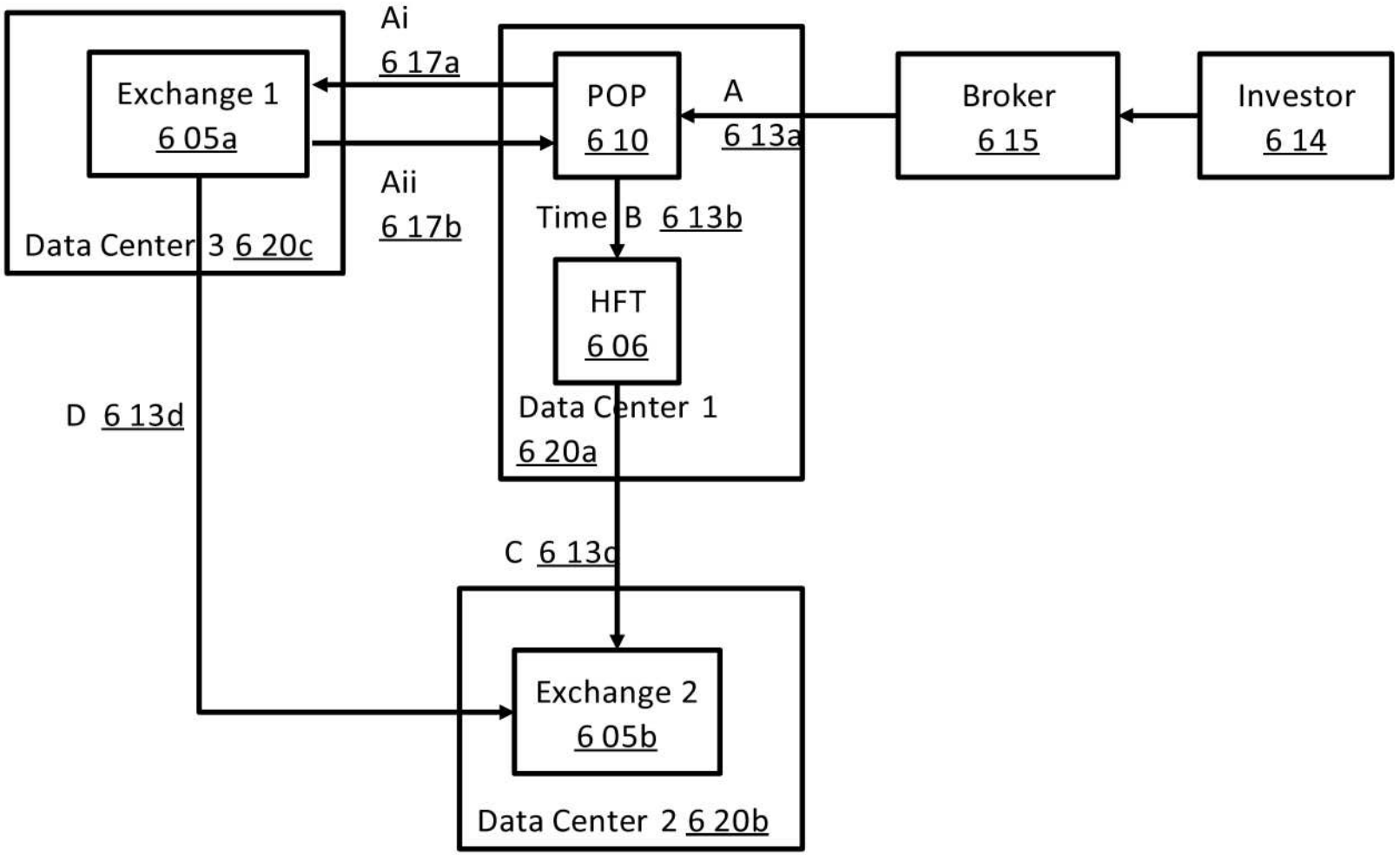


FIGURE 6D

TLL Example: Latency Arbitrage vs. Exchange SOR Inoculated

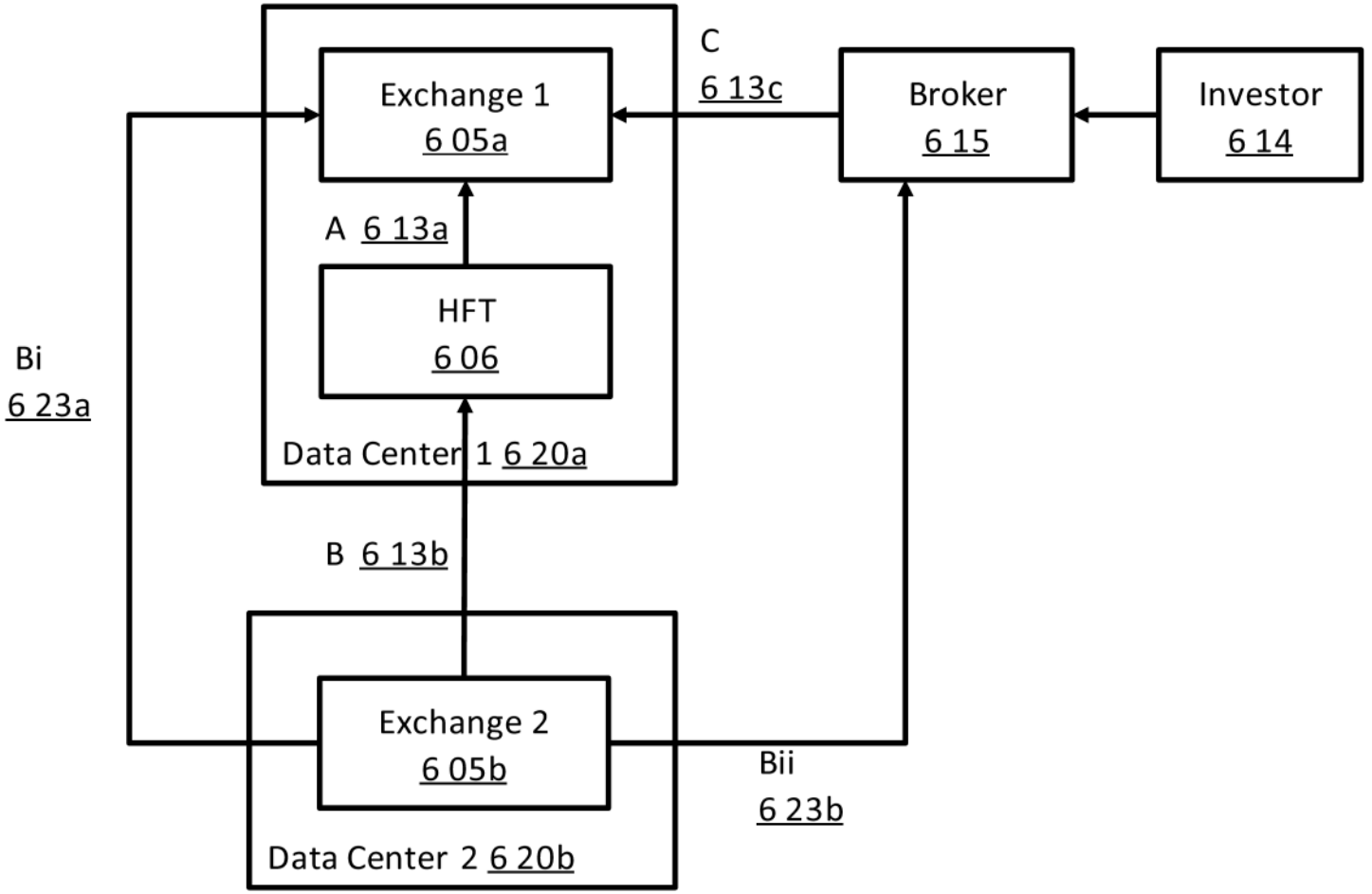


FIGURE 6E

TLL Example: Order Book Arbitrage (Passive)

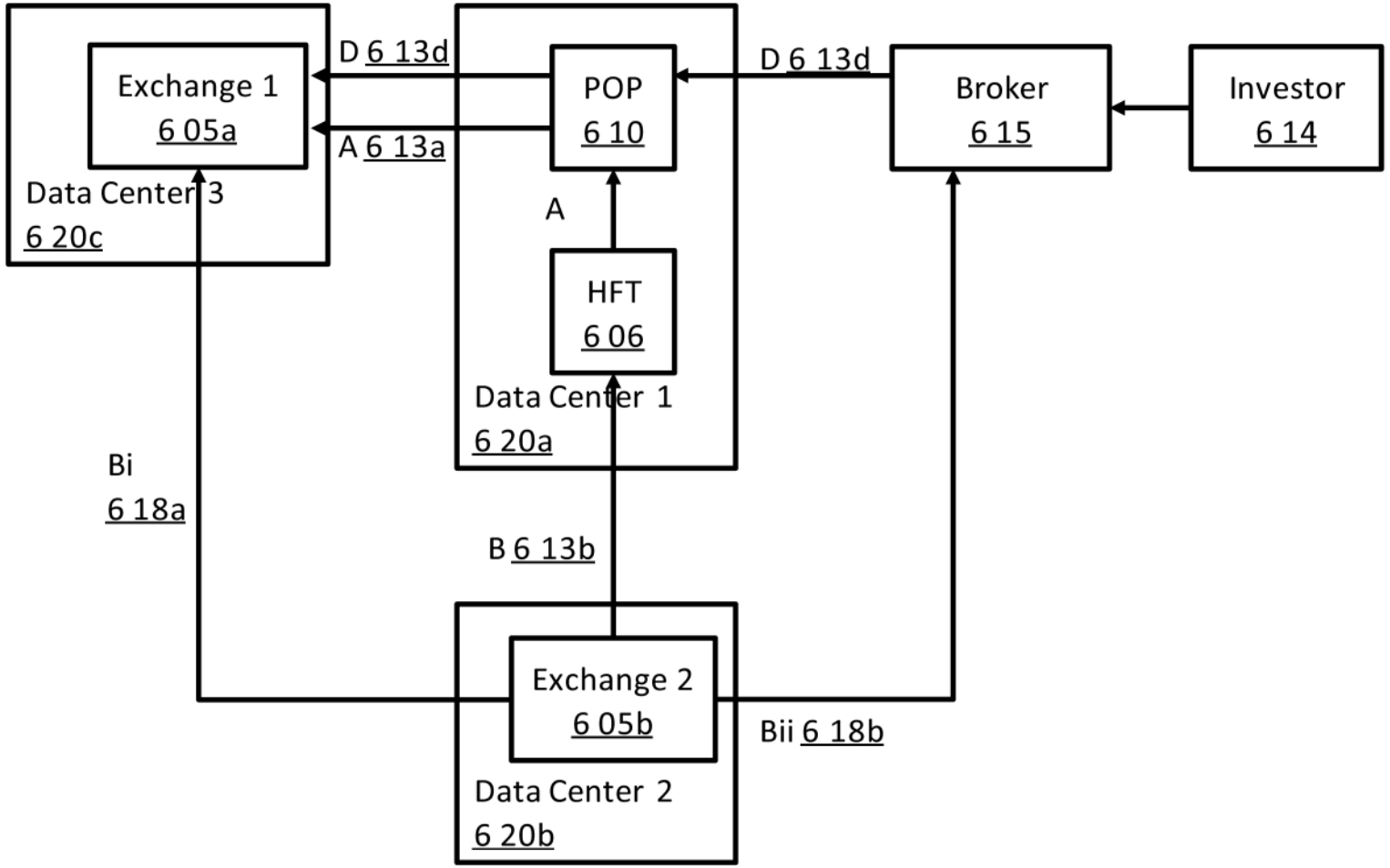


FIGURE 6F

TLL Example: Order Book Arbitrage (Passive Inoculated)

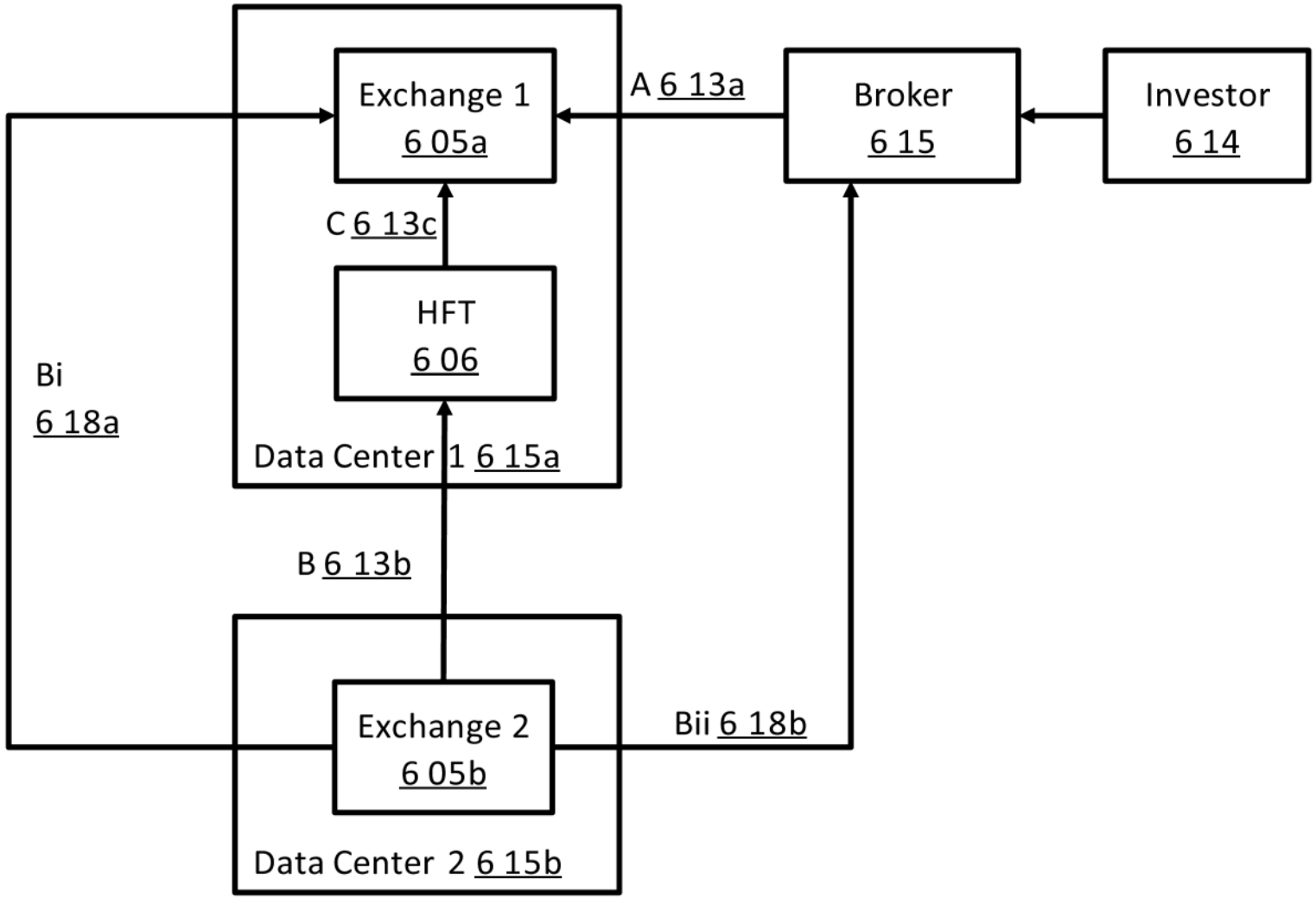


FIGURE 6G

TLL Example: Order Book Arbitrage (Aggressive)

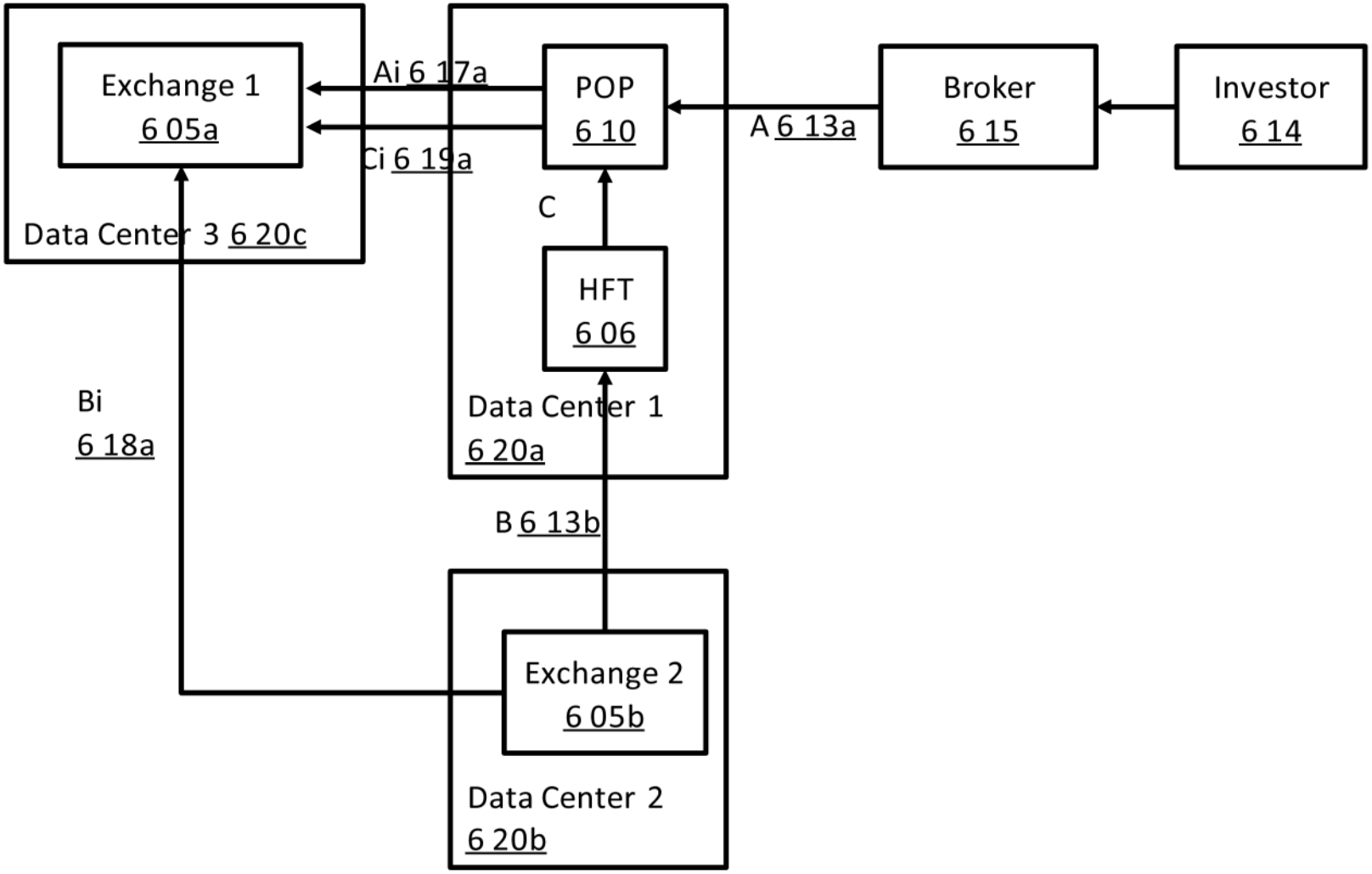


FIGURE 6H

TLL Example: Order Book Arbitrage (Aggressive Inoculated)

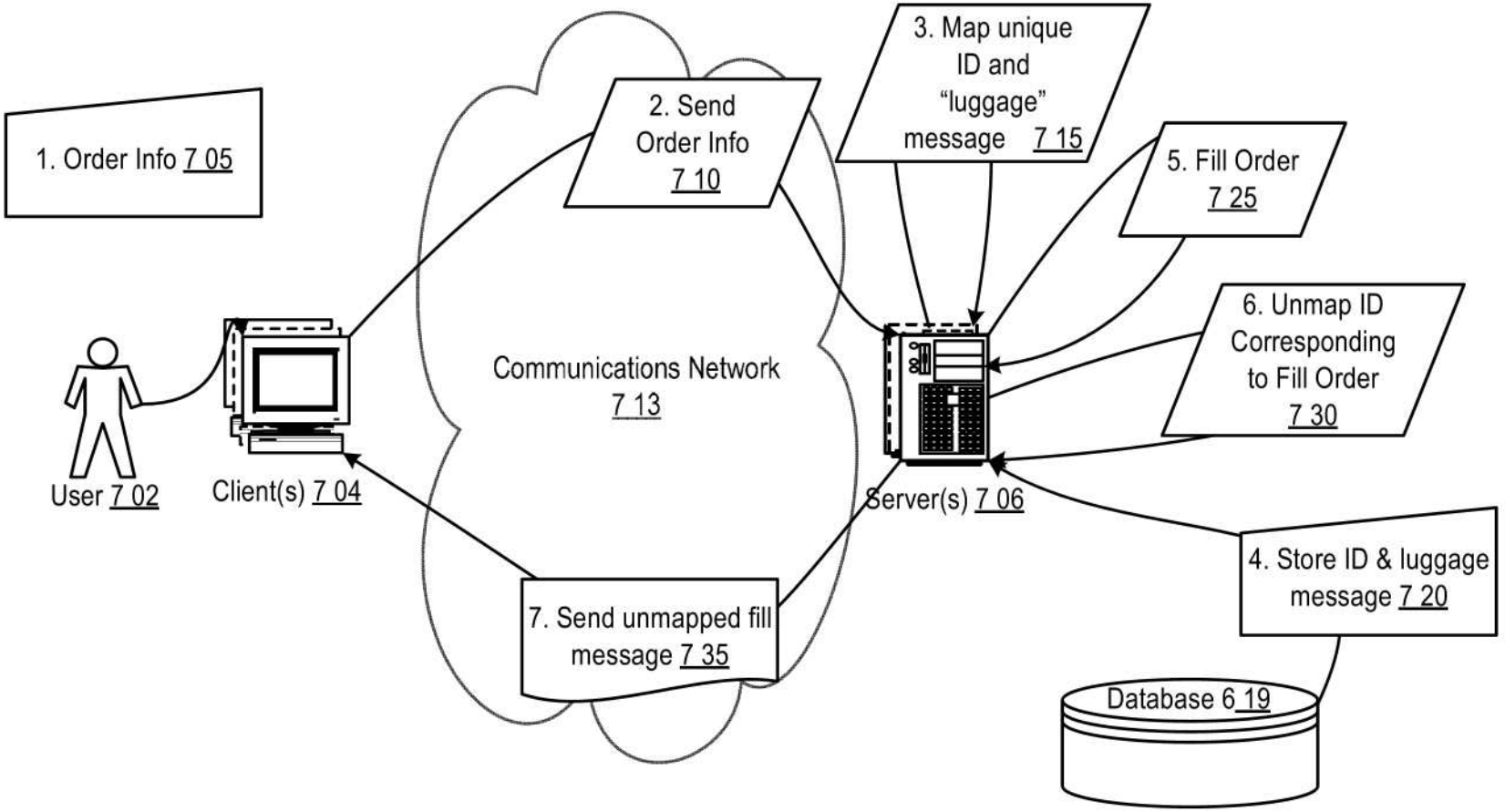

1. Order Info 7 05
2. Send Order Info 7 10
3. Map unique ID and "luggage" message 7 15
5. Fill Order 7 25
6. Unmap ID Corresponding to Fill Order 7 30
Communications Network 7 13
User 7 02
Client(s) 7 04
Server(s) 7 06
4. Store ID & luggage message 7 20
7. Send unmapped fill message 7 35
Database 6 19
ID Mapping and Management Component 7 01

Figure 7

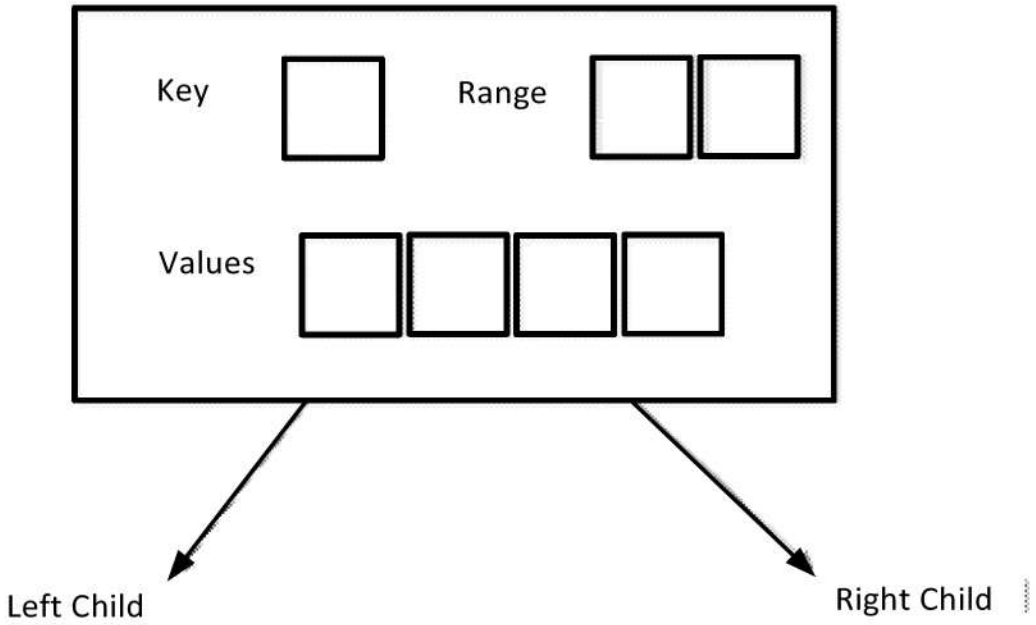


FIGURE 8A

TLL Example: Binary Search Tree

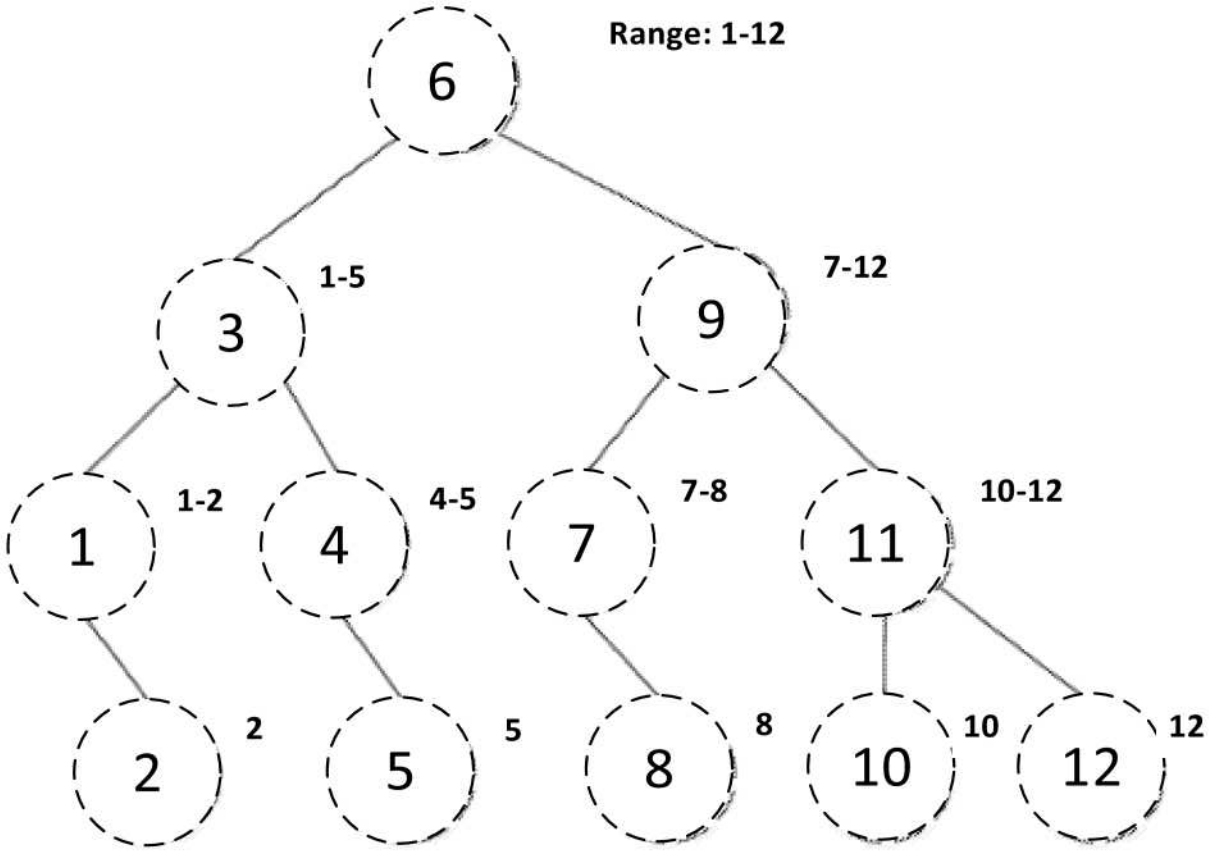


FIGURE 8B

TLL Example: Binary Search Tree

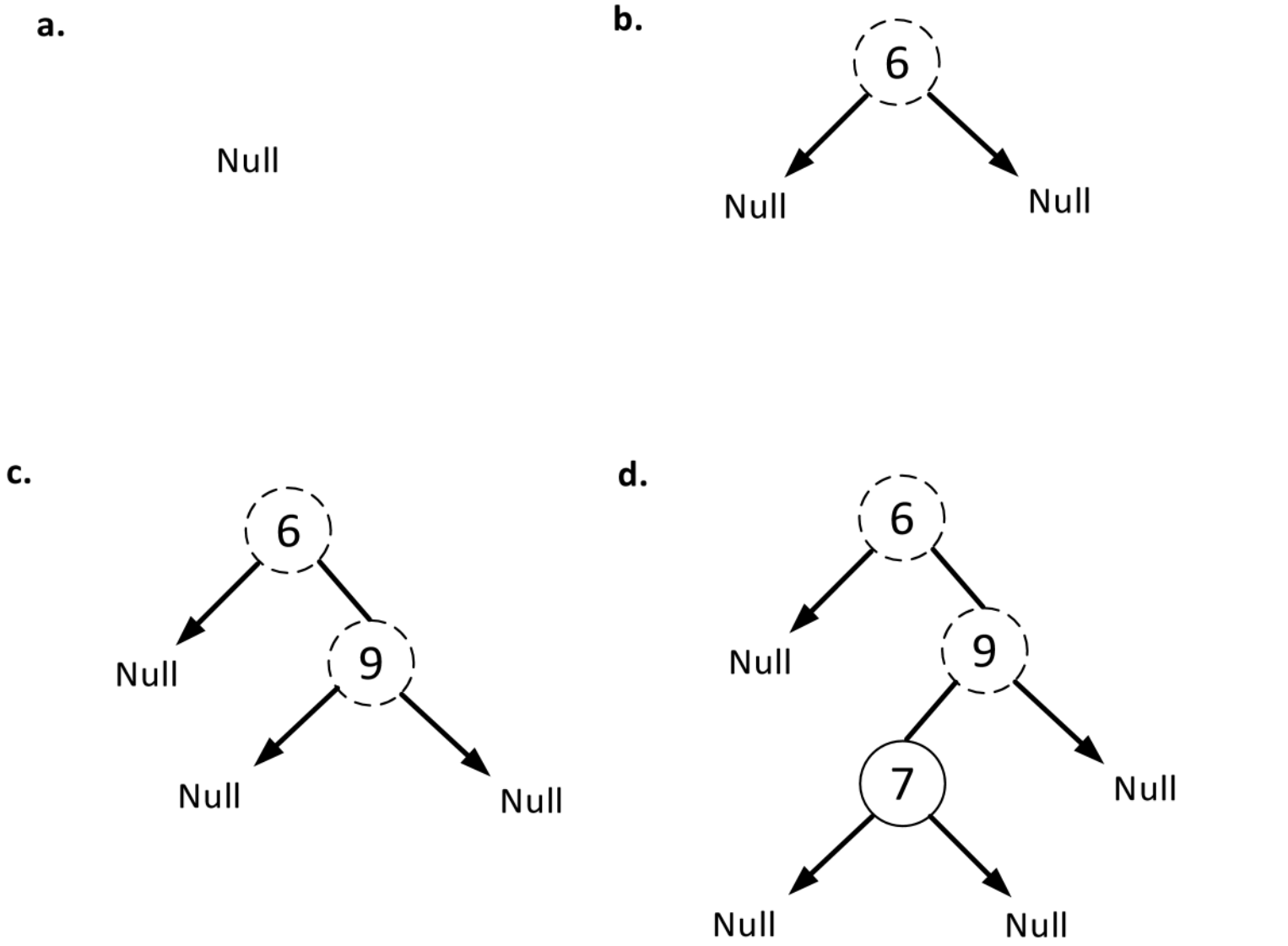
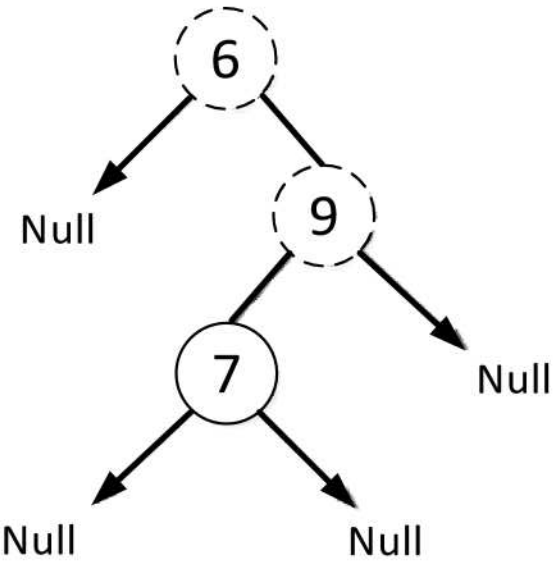


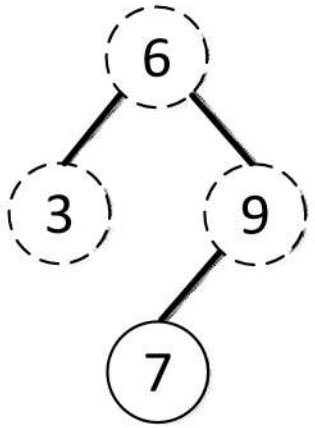
FIGURE 8C

TLL Example: Binary Search Tree

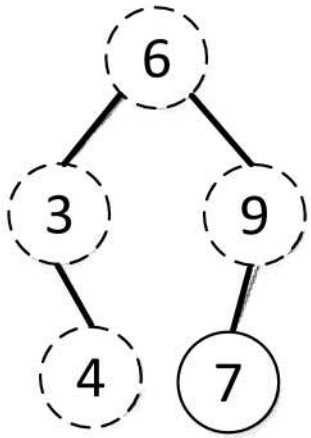
a.



b.



c.



d.

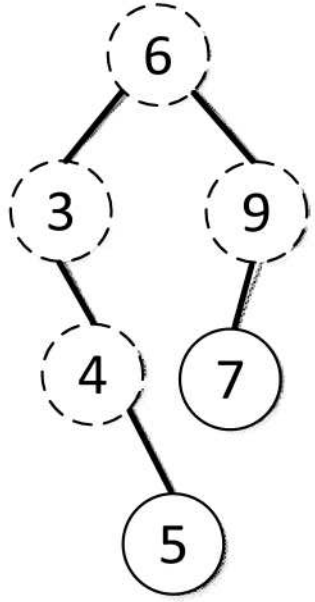
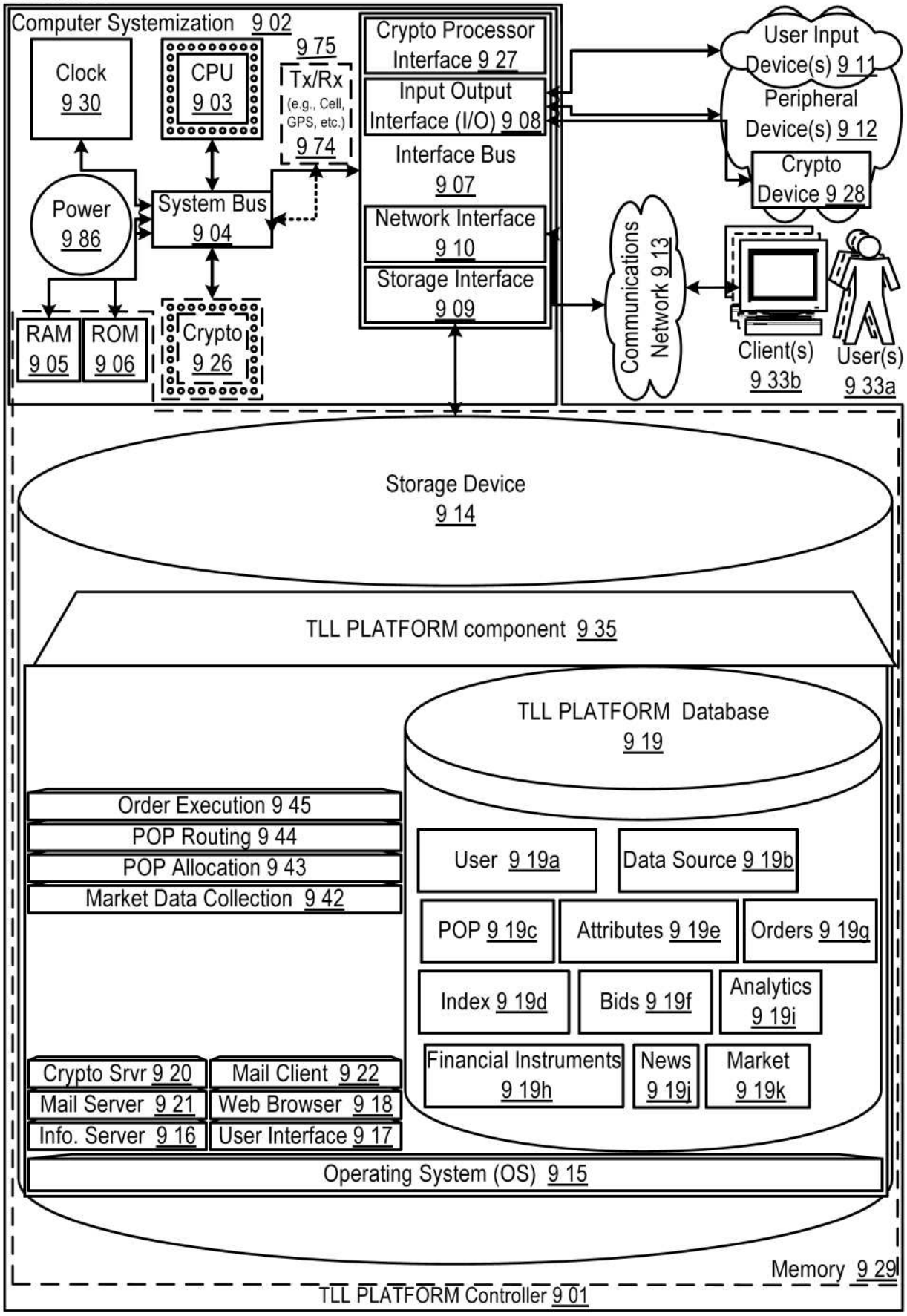


FIGURE 8D

TLL Example: Binary Search Tree

FIGURE 9


Computer Systemization 9 02
Clock 9 30
CPU 9 03
9 75
Tx/Rx (e.g., Cell, GPS, etc.) 9 74
Power 9 86
System Bus 9 04
RAM 9 05
ROM 9 06
Crypto 9 26
Crypto Processor Interface 9 27
Input Output Interface (I/O) 9 08
Interface Bus 9 07
Network Interface 9 10
Storage Interface 9 09
User Input Device(s) 9 11
Peripheral Device(s) 9 12
Crypto Device 9 28
Communications Network 9 13
Client(s) 9 33b
User(s) 9 33a
Storage Device 9 14
TLL PLATFORM component 9 35
TLL PLATFORM Database 9 19
Order Execution 9 45
POP Routing 9 44
POP Allocation 9 43
Market Data Collection 9 42
User 9 19a
Data Source 9 19b
POP 9 19c
Attributes 9 19e
Orders 9 19g
Index 9 19d
Bids 9 19f
Analytics 9 19i
Financial Instruments 9 19h
News 9 19j
Market 9 19k
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