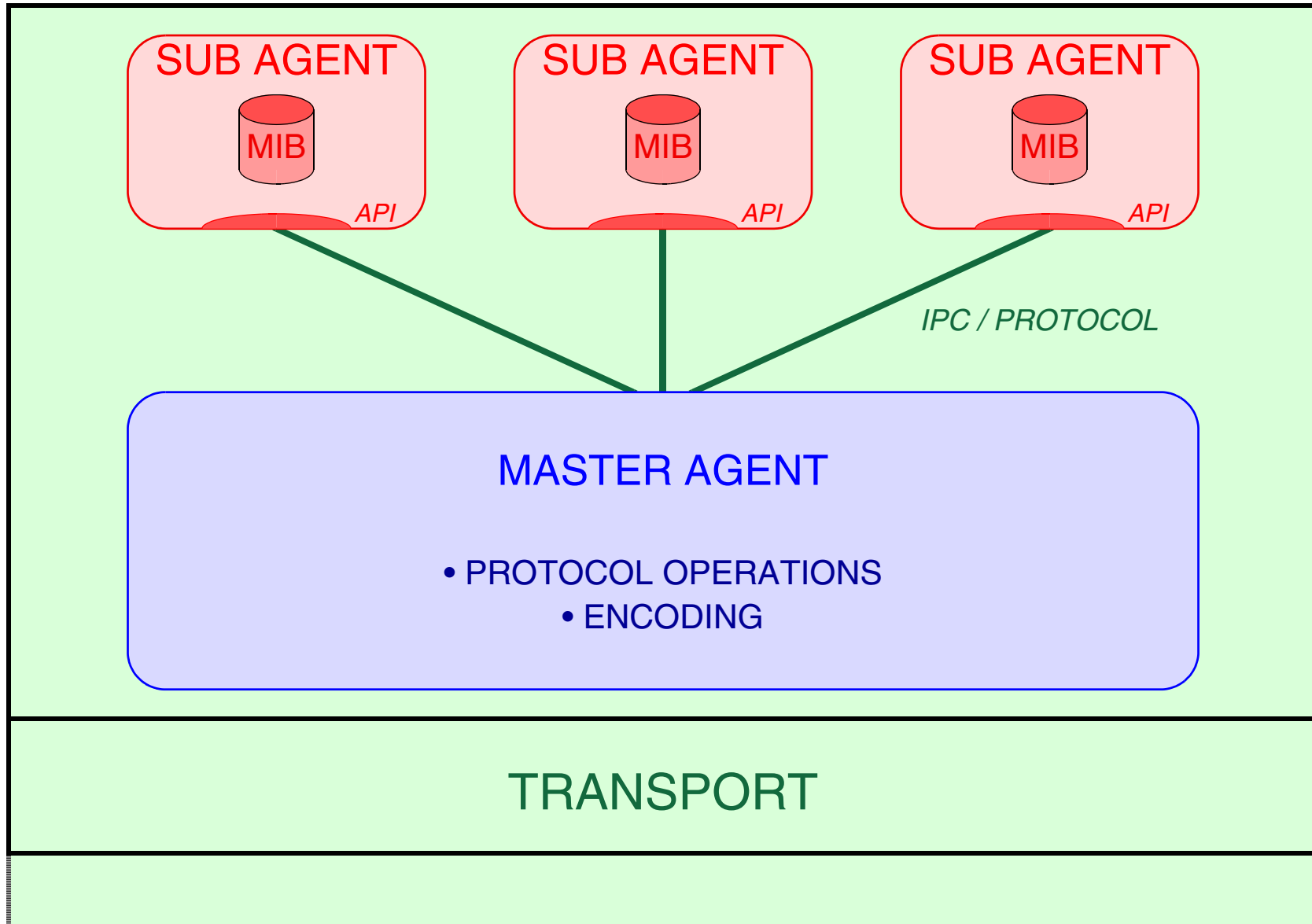


# EXTENSIBLE AGENTS

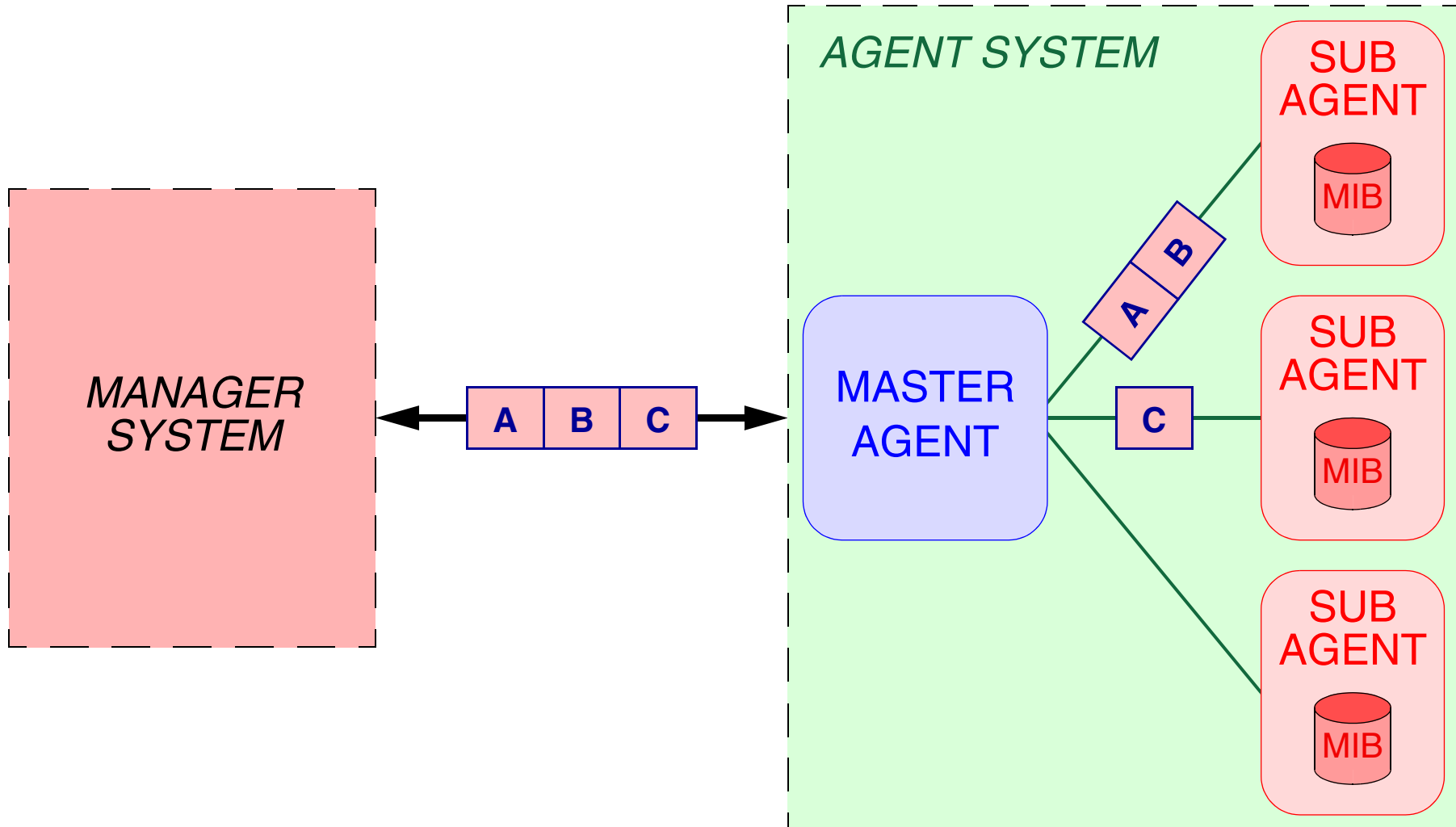
## FACILITATE THE EXTENSION OF SNMP AGENTS WITH NEW MIB MODULES

- SEPARATE SNMP PROTOCOL ENGINE  
FROM MIB INSTRUMENTATION
  - ALLOW DYNAMIC ADDITION  
OF NEW MIB MODULE IMPLEMENTATIONS
- EXTENSIBLE AGENTS SHOULD BE TRANSPARENT

# BASIC STRUCTURE



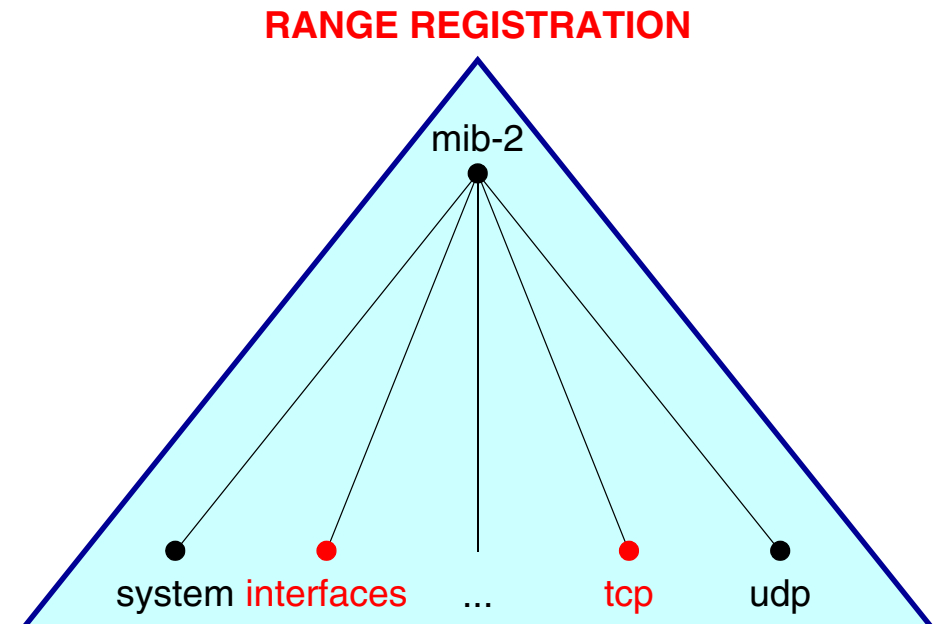
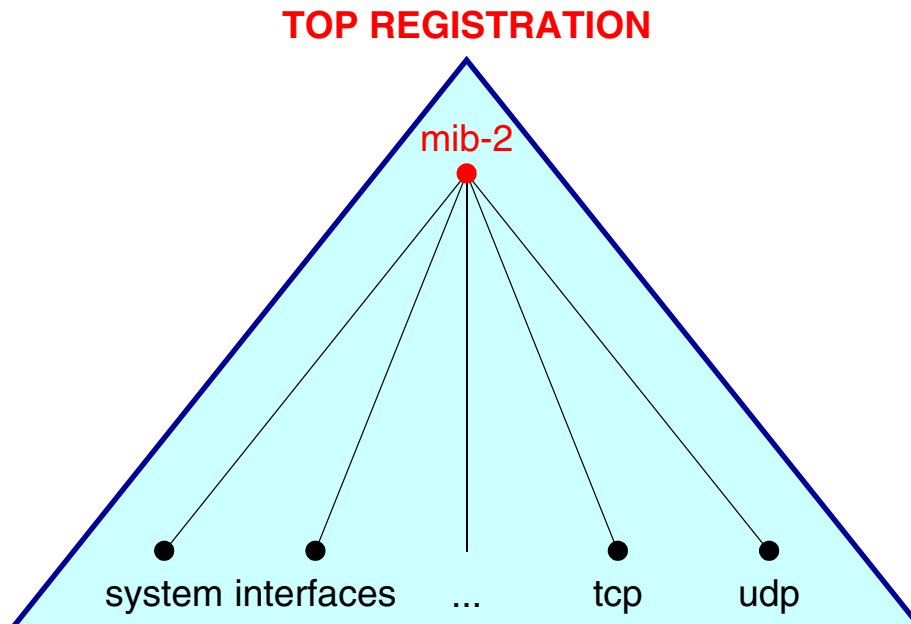
# SPLITTING OF VARBIND LIST



# CHARACTERISTICS

## REQUIRES OID REGISTRATION:

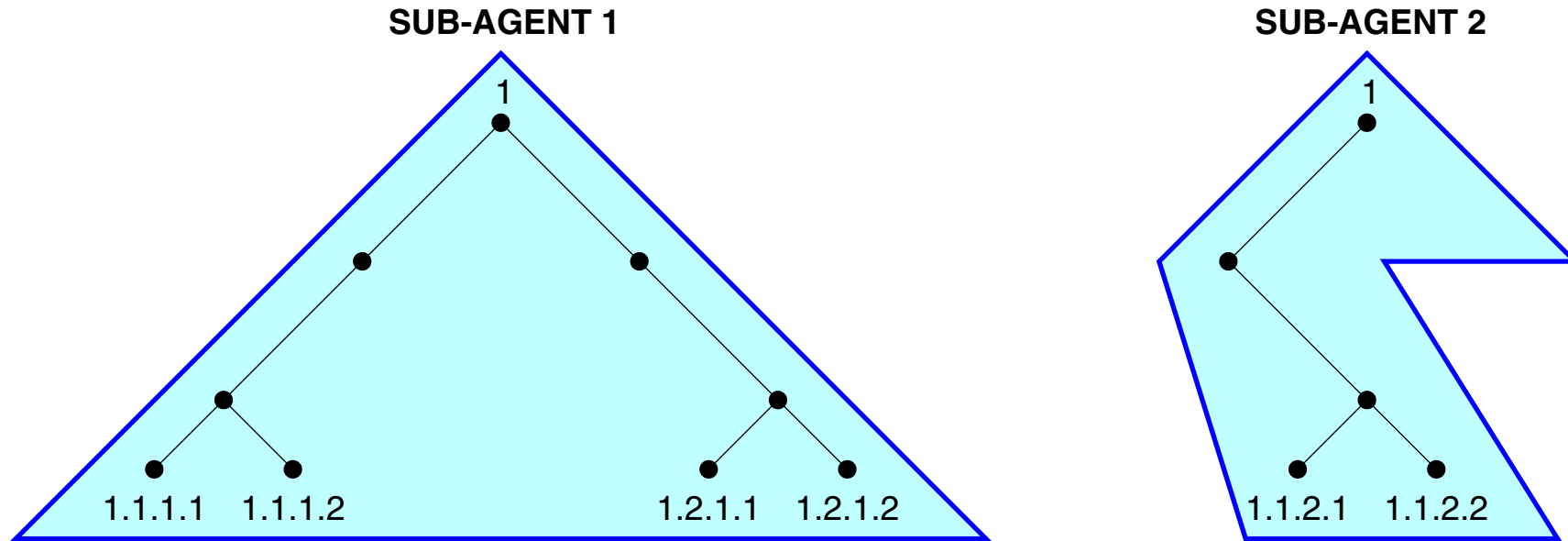
- TOP REGISTRATION  
EXAMPLE: REGISTER(mib-2)
- RANGE REGISTRATION  
EXAMPLE REGISTER(interfaces -> tcp)



## POTENTIAL PROBLEMS

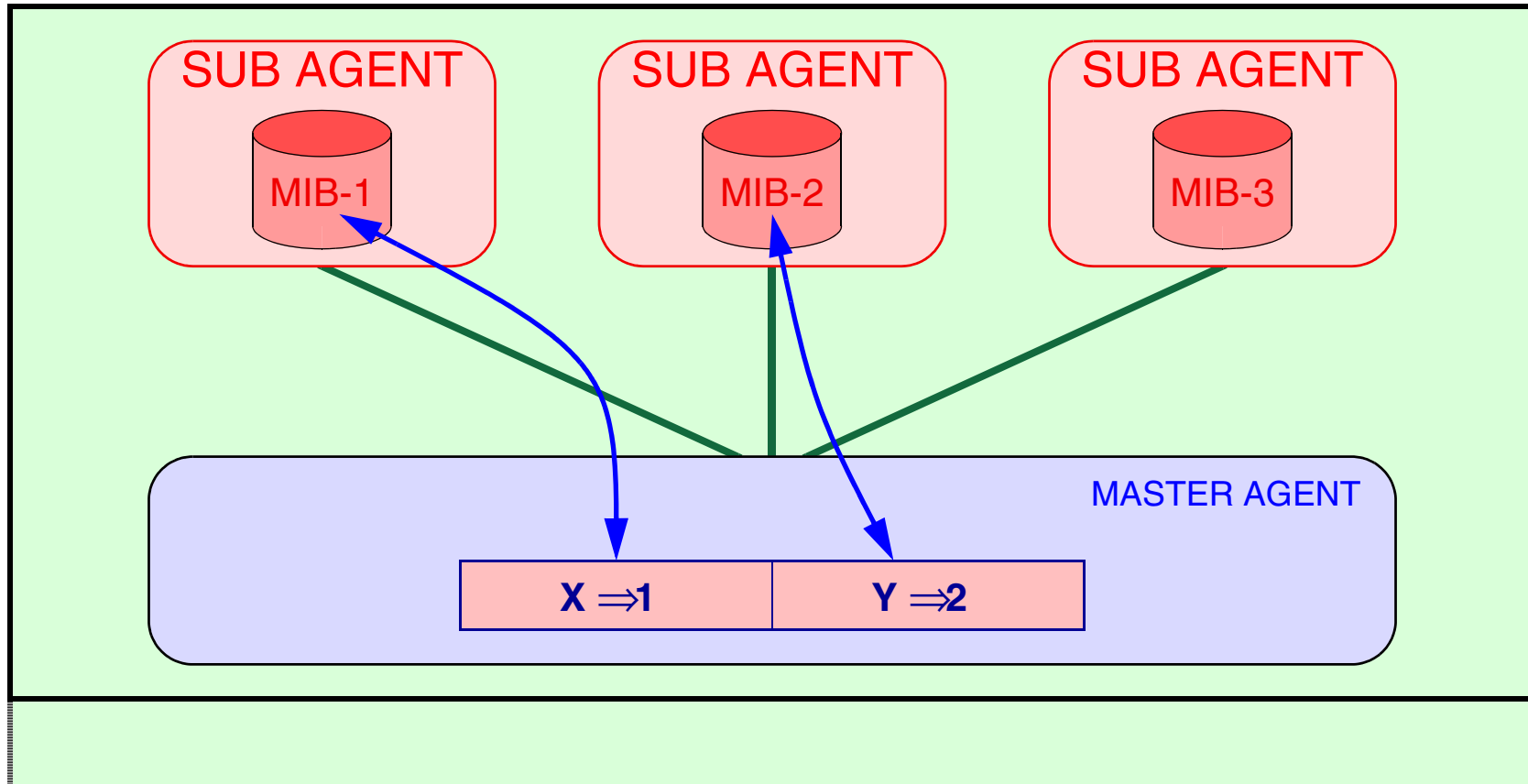
- TABLE ENTRIES MAY BE CREATED AND DELETED AT RUN-TIME
- ENTRIES OF A SINGLE TABLE MAY BE LOCATED IN DIFFERENT SUBAGENTS
  - DUPLICATED OIDs
    - GAPS
    - SETS
    - `sysUpTime`

## EXAMPLE: GAPS



IMAGINE WHAT HAPPENS WITH GET-NEXT OR GETBULK ...

# SETS AND ATOMICITY



## TRANSACTION-LIKE APPROACH

- TEST
- COMMIT
- UNDO / CLEAN

# HISTORY

SMUX (1991: RFC 1227)  
SNMP MULTIPLEXING PROTOCOL

DPI (1991-1994: RFC 1228 & RFC 1592)  
DISTRIBUTED PROTOCOL INTERFACE

RESEARCH PROTOTYPES  
FOR EXAMPLE: UNIVERSITY OF TWENTE - UT-SNMPv2

COMMERCIAL PRODUCTS  
FOR EXAMPLE: SNMP RESEARCH - EMANATE  
(ENHANCED MANAGEMENT AGENT THROUGH EXTENSIONS)

AGENTX (1998-2000: RFC2741 & RFC2742)



# AGENTX

## PROPOSED IETF STANDARD

- RFC 2741 & RFC 2742
- <http://www.scguild.com/agentx/>

HAS EFFICIENT MESSAGE FORMAT AND CODING

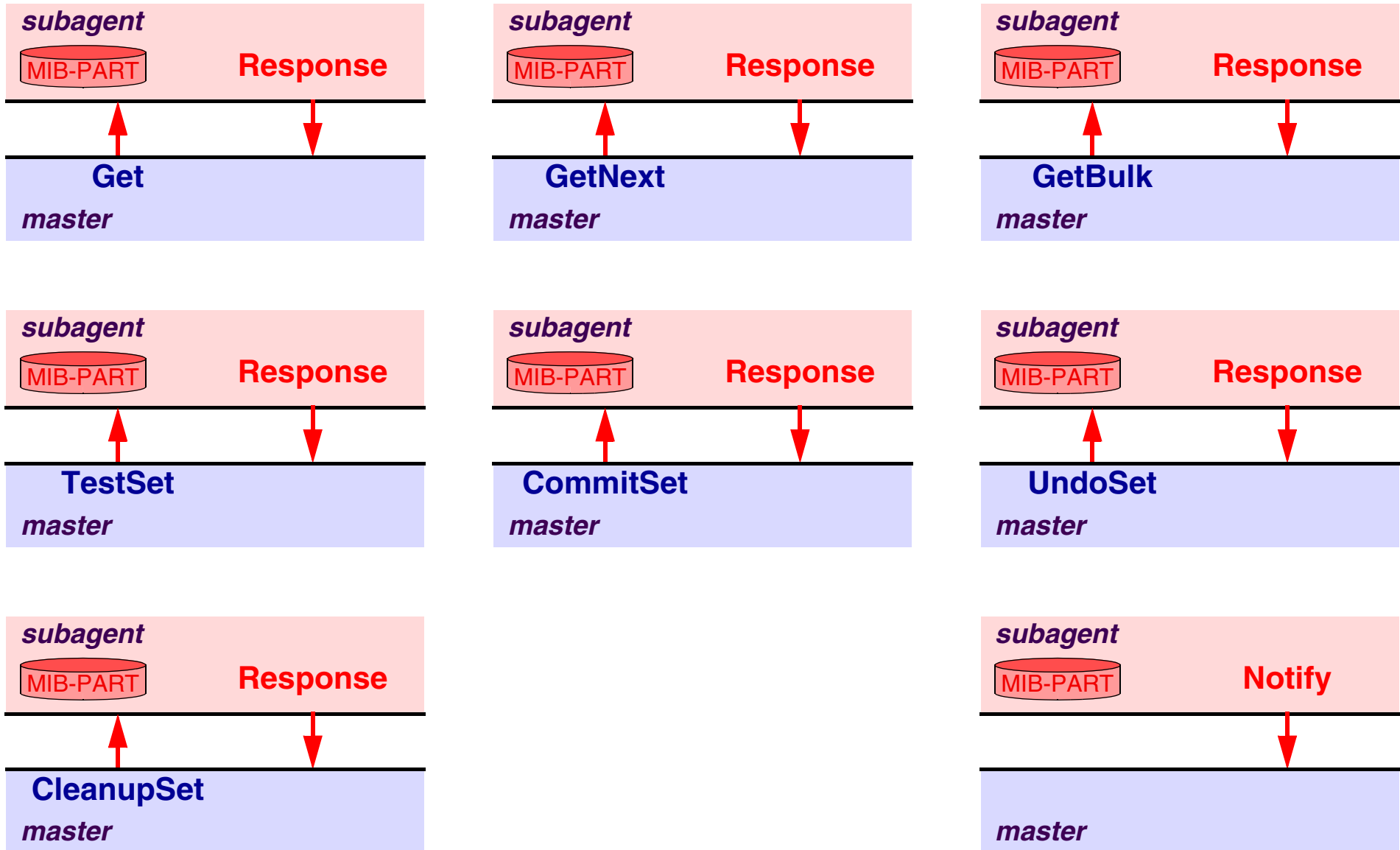
## SUPPORTS

- SUBAGENTS IMPLEMENTING SEPARATE MIB MODULES
- SUBAGENTS IMPLEMENTING ROWS IN "SIMPLE TABLES"
- SUBAGENTS SHARING TABLES ALONG NON-ROW BORDERS

## NON-GOALS

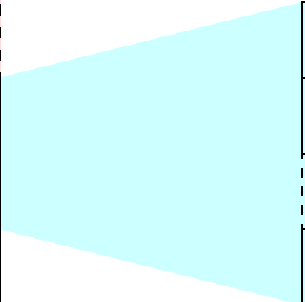
- SUBAGENTS SHARING "COMPLEX TABLES"
- SUBAGENT TO SUBAGENT COMMUNICATION

# AGENTX - NORMAL PDUS



## EXAMPLE: PDU FORMAT OF GetNext

VERSION	TYPE	FLAGS	RESERVED
SESSION ID			
TRANSACTION ID			
PACKET ID			
PAYLOAD LENGTH			
CONTEXT (OPTIONAL)			
OBJECT 1 START OF RANGE			
OBJECT 1 END OF RANGE			
OBJECT N START OF RANGE			
OBJECT N END OF RANGE			



LENGTH	PREFIX	INCLUDE	RESERVED
FIRST SUB IDENTIFIER			
LAST SUB IDENTIFIER			

# AGENTX - ADMINISTRATIVE PDUS

Open  
Close

AddAgentCaps  
RemoveAgentCaps

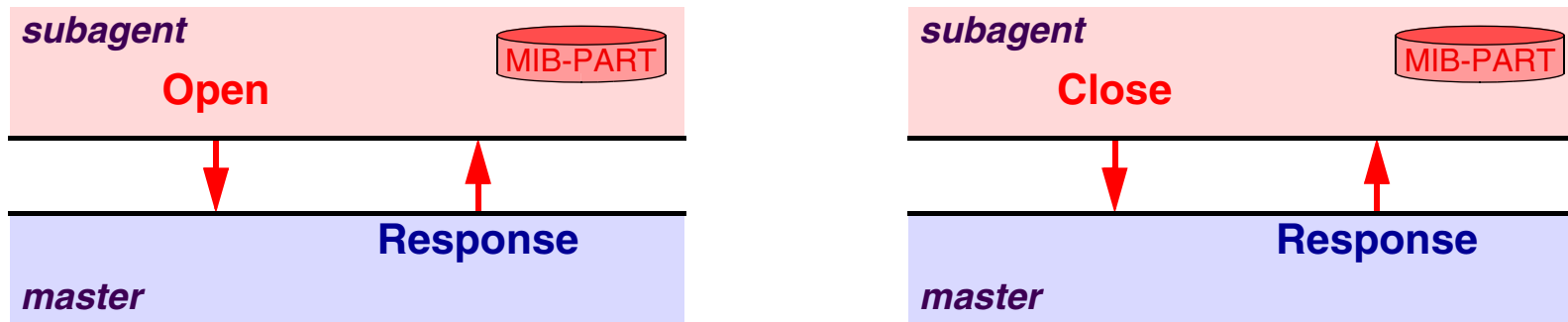
Register  
Unregister

IndexAllocate  
IndexDeallocate

Ping

Response

## OPEN & CLOSE



TO ESTABLISH A SESSION

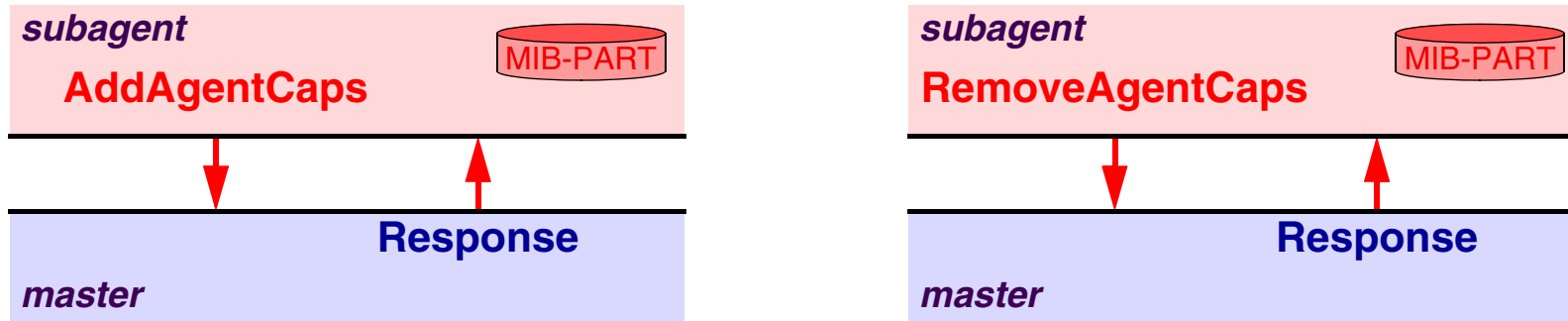
A UNIQUE `sessionID` IS ASSIGNED

SUBAGENT SPECIFIES DEFAULT TIME-OUT

RESPONSES FROM MASTER ALWAYS INCLUDE `sysUpTime`

SESSION CAN BE CLOSED BY MASTER OR SUBAGENT

## AGENT CAPABILITIES



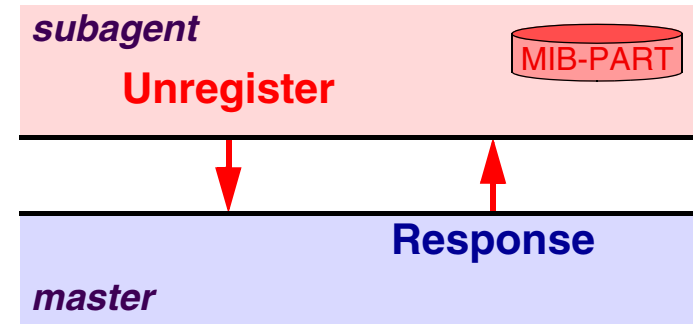
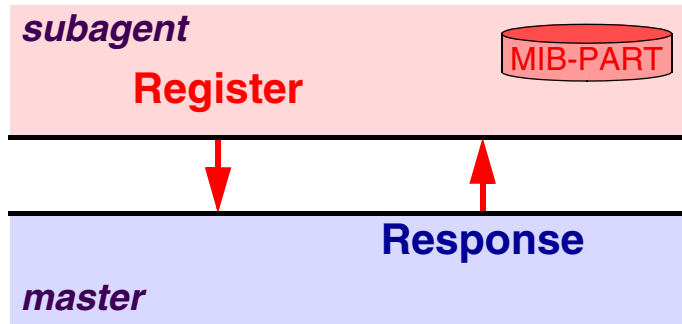
TO INFORM THE MASTER OF THE AGENT'S CAPABILITIES

CAPABILITIES ARE DEFINED AS:

- AN OBJECT ID
- A HUMAN READABLE STRING

THE CAPABILITIES ARE STORED IN THE `sysORTable`

## REGISTRATION



CHOICE BETWEEN:

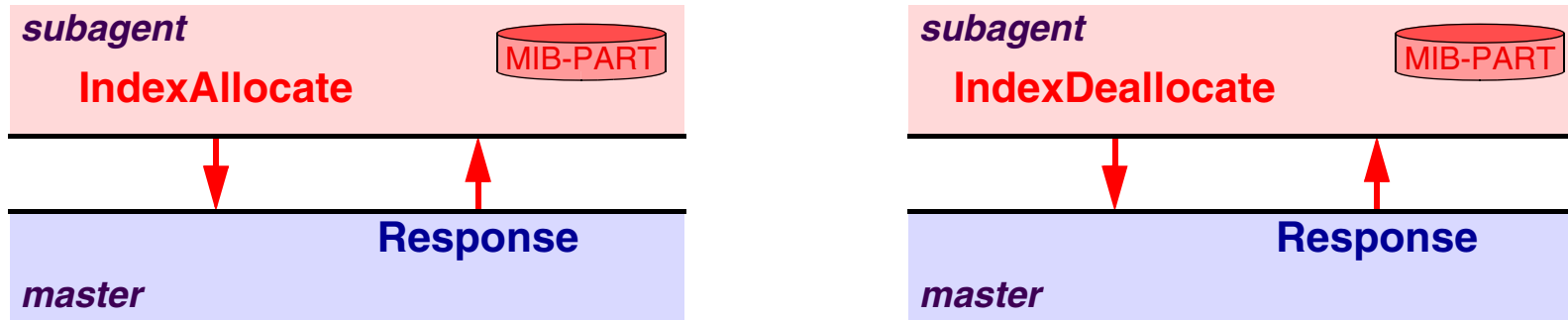
- TOP REGISTRATION
- RANGE REGISTRATION

PRIORITY CAN BE SPECIFIED

- TO DETERMINE THE AUTHORITATIVE SUBAGENT

TIME-OUT CAN BE SPECIFIED

## INDEXALLOCATION



TO ALLOCATE ONE OR MORE TABLE ROWS

SUBAGENT REQUESTS ALLOCATION OF:

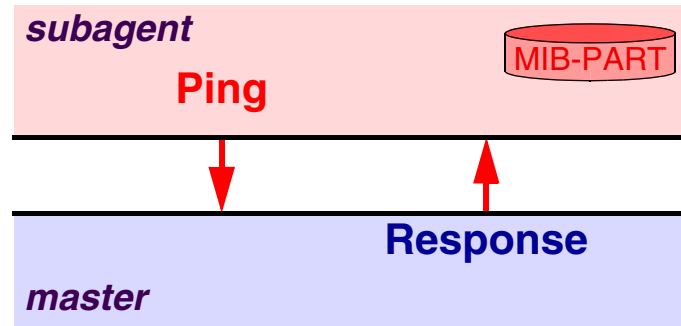
- A SPECIFIC INDEX VALUE
- AN INDEX VALUE THAT IS NOT CURRENTLY ALLOCATED
- AN INDEX VALUE THAT HAS NEVER BEEN ALLOCATED

MASTER AGENT MAINTAINS DATABASE

AFTER ALLOCATION REGISTRATION IS STILL NEEDED



# PING



TO MONITOR IF THE MASTER AGENT IS STILL ABLE  
TO RECEIVE AND SEND AGENTX PDUs

# AGENTX TRANSPORT MAPPINGS

## UNIX SOCKETS

- var/agentx/master

## TCP

- PORT 705

## ANY OTHER IPC MECHANISM

- FOR EXAMPLE: SHARED MEMORY