

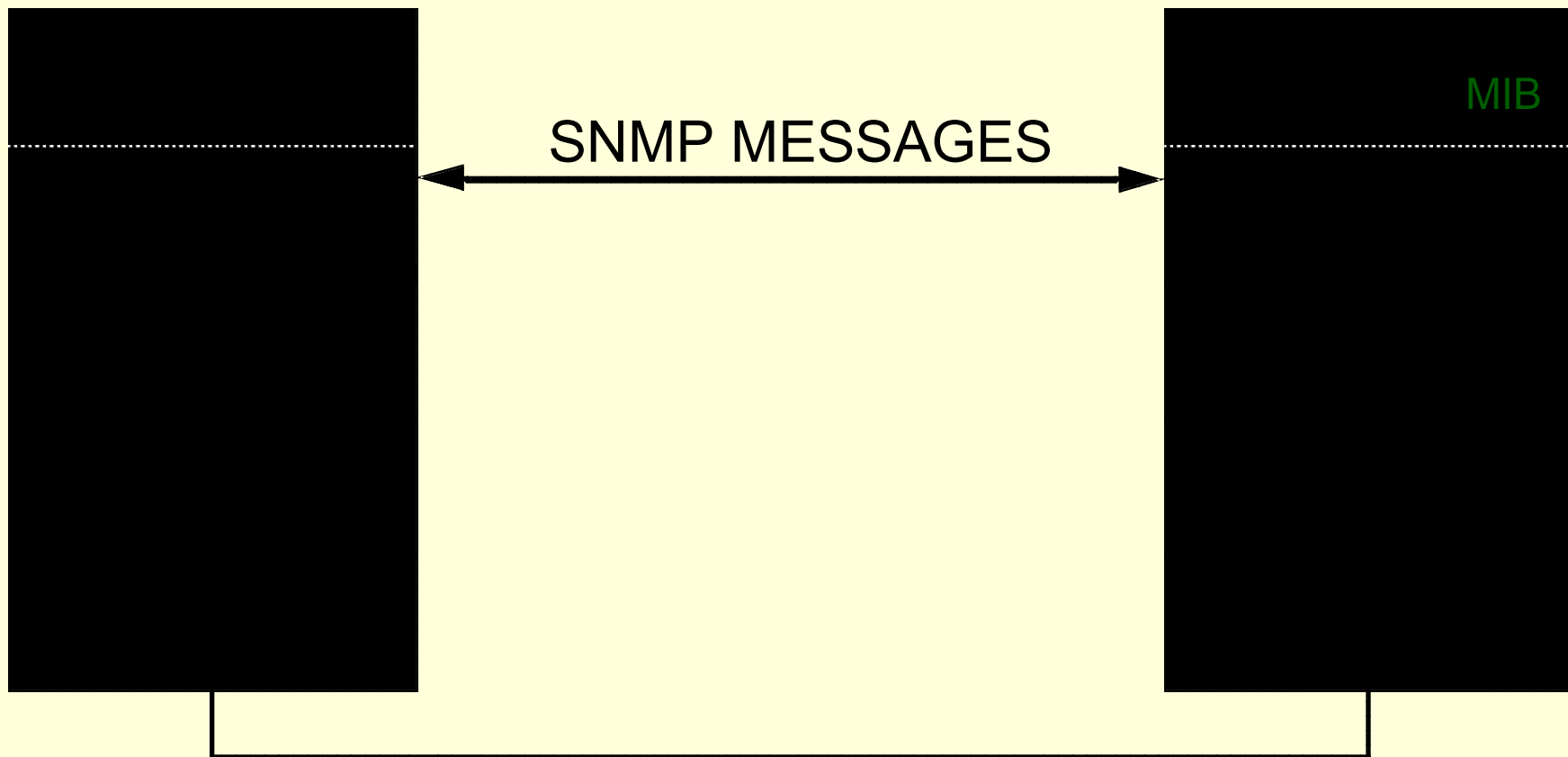
Moderní technologie Internetu

(2)

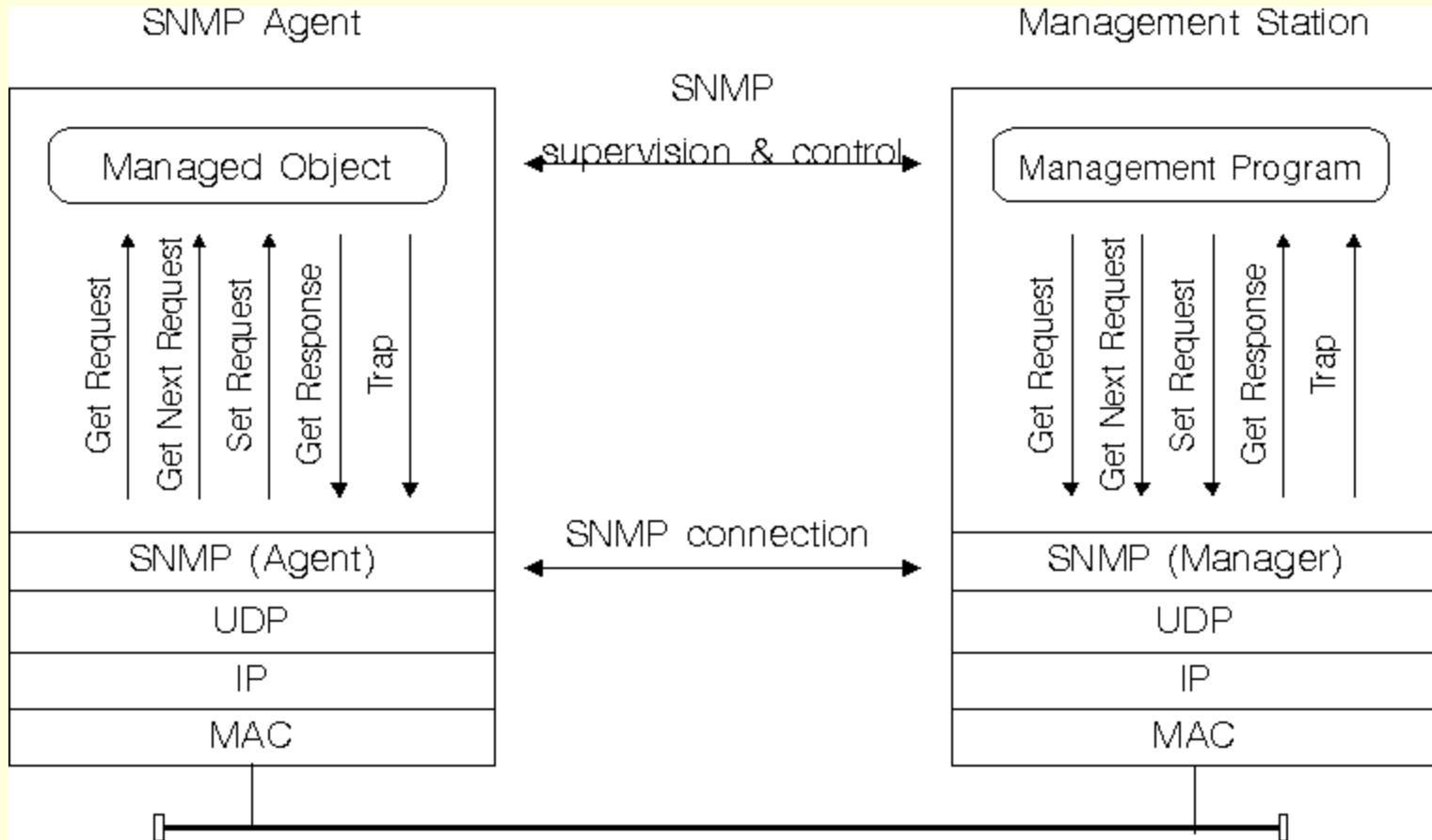
Jan Janeček

janecek@cs.felk.cvut.cz

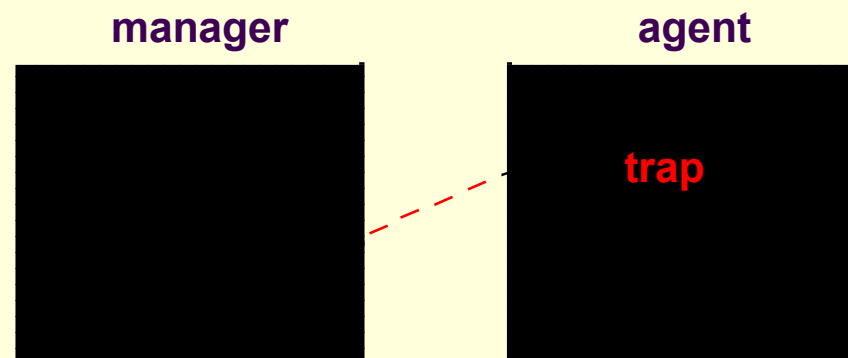
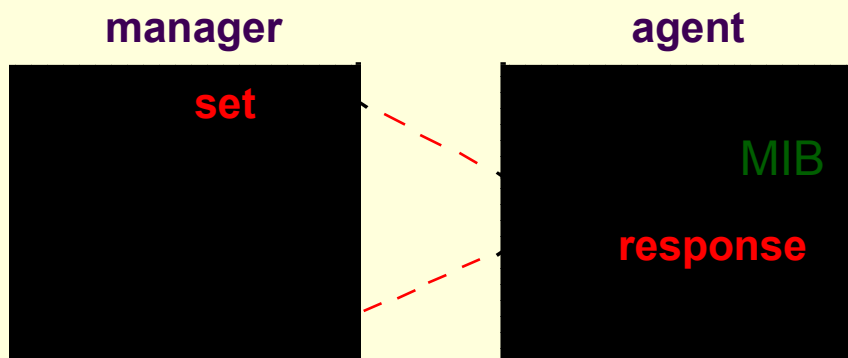
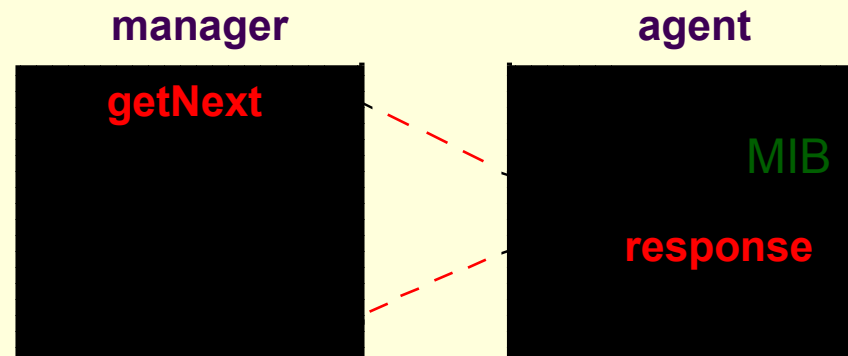
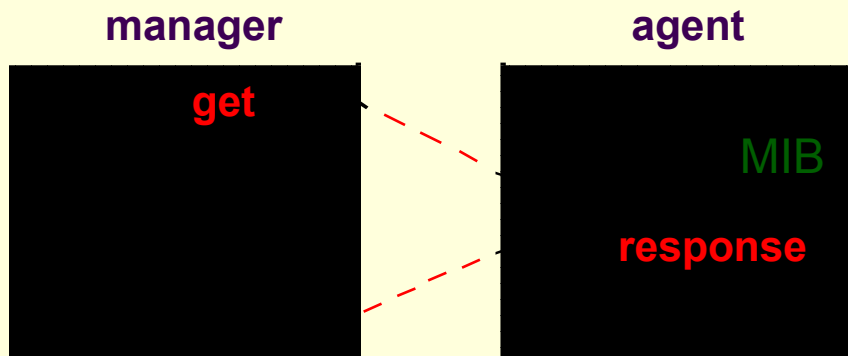
SNMP protokol



SNMP komunikace



SNMP operace



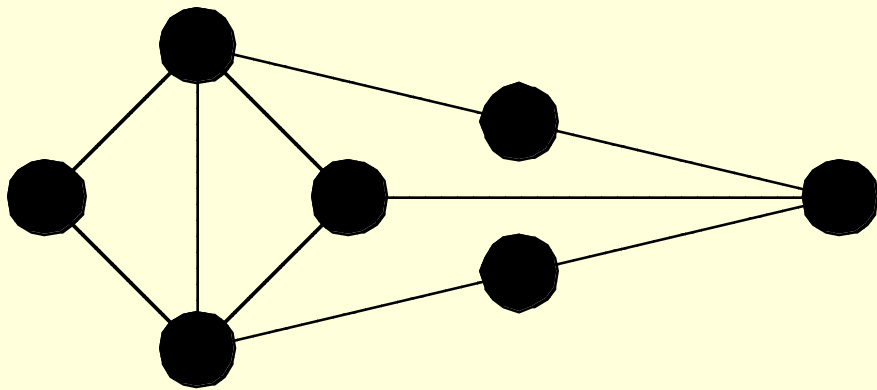
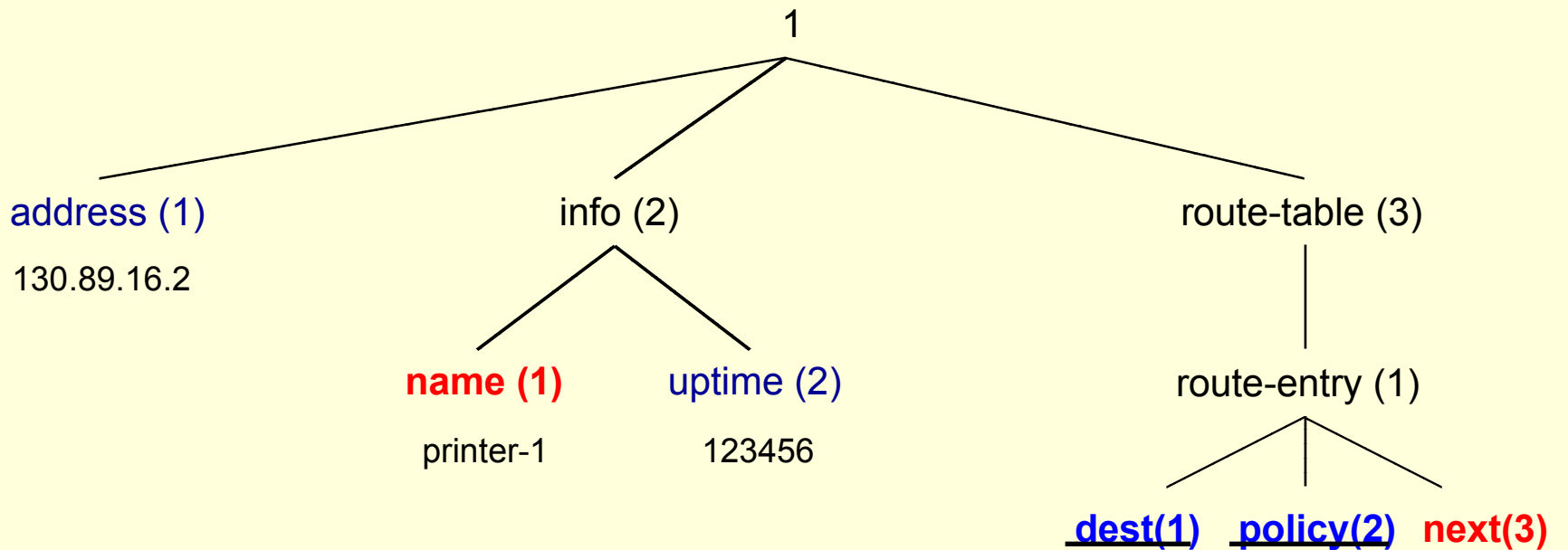
SNMP zprávy

variable bindings:

SNMP PDU:

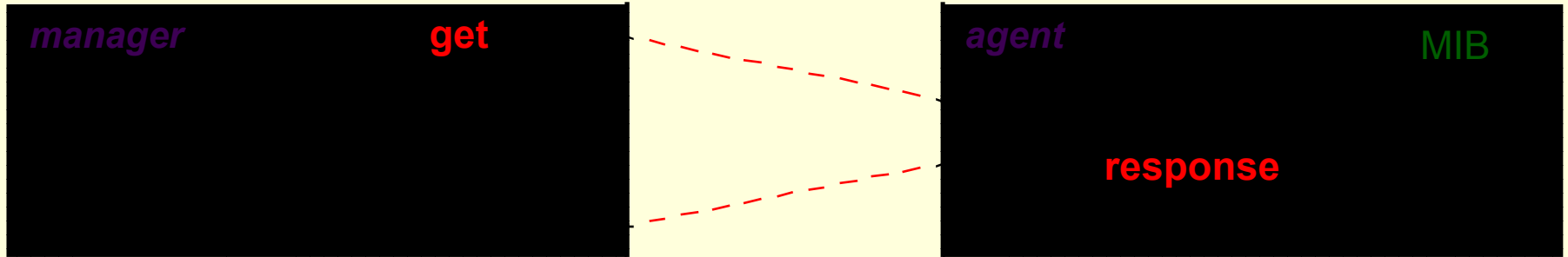
SNMP message:

Příklad



	2
	3
	2
	3
	2
	3
	2

Operace get



get(1.1.0)
response(1.1.0 => 130.89.16.2)

get(1.2.0)
response(error-status = noSuchName)

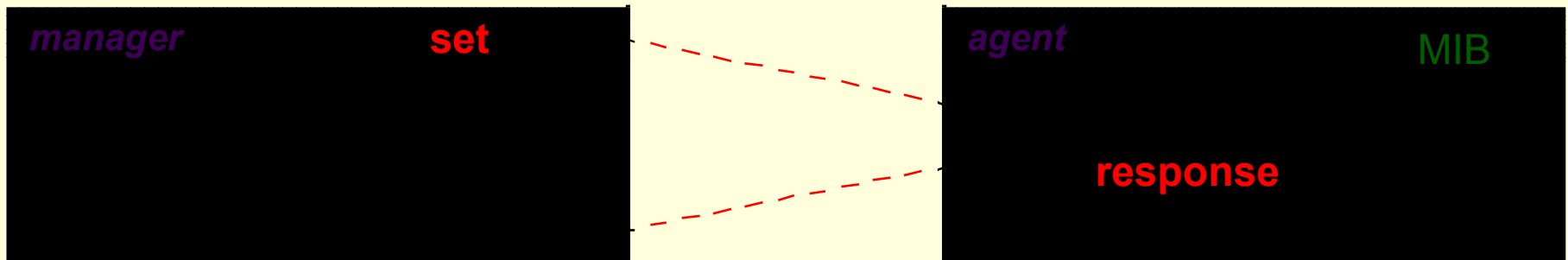
get(1.1.0; 1.2.2.0)
response(1.1.0 => 130.89.16.2; 1.2.2.0 => 123456)

get(1.3.1.3.5.1)
response(1.3.1.3.5.1 => 2)

get(1.3.1.1.5.1)
response(1.3.1.1.5.1 => 5)

get(1.3.1.1.5.1, 1.3.1.2.5.1, 1.3.1.3.5.1)
response(1.3.1.1.5.1 => 5, 1.3.1.2.5.1 => 1, 1.3.1.3.5.1 => 2)

Operace set



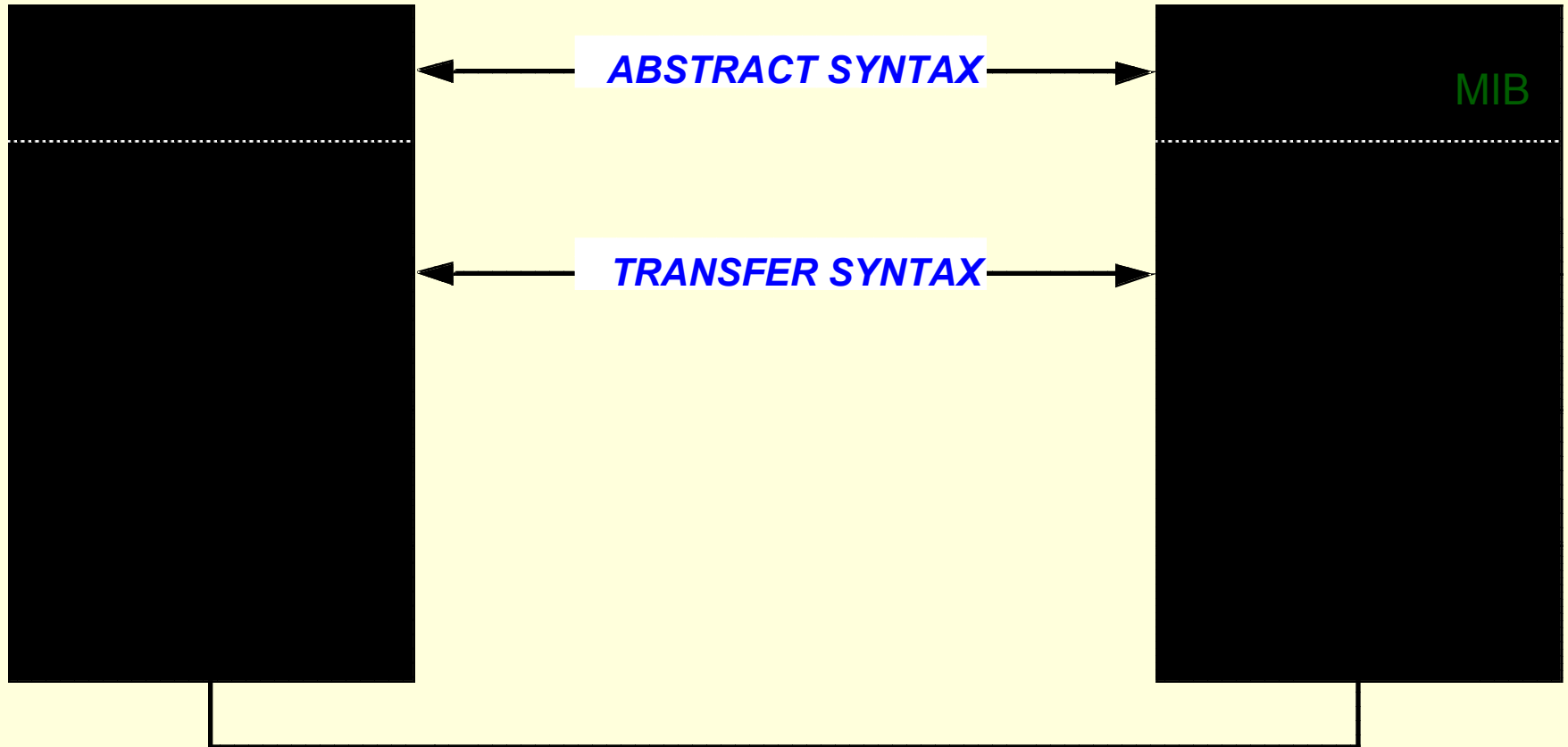
set(1.2.1.0 => *my-printer*)
response(noError; 1.2.1.0 => *my-printer*)

set(1.2.1.0 => *my-printer*, 1.2.2.0 => 0)
response(error-status = **noSuchName**; error-index = 2)

Lexikografické uspořádání

INSTANCE ID	INSTANCE VALUE
1.1.0	130.89.16.2
1.2.1.0	printer-1
1.2.2.0	123456
1.3.1.1.2.1	2
1.3.1.1.3.1	3
1.3.1.1.5.1	5
...	...
1.3.1.1.9.1	9
1.3.1.2.2.1	1
1.3.1.2.3.1	1
...	...
1.3.1.2.9.1	1
1.3.1.3.2.1	2
...	...

Kódování SNMP

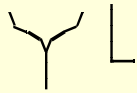


BER - Basic Encoding Rules

kódování ASN.1



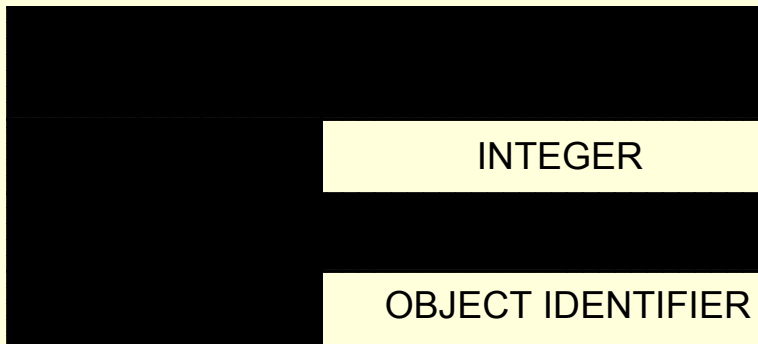
ASN.1 - definice typu



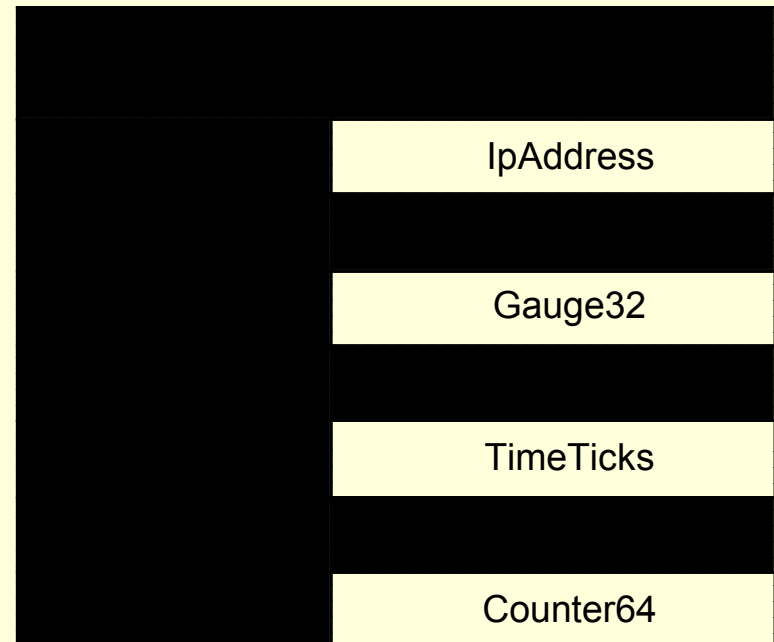
primitive (=simple) / constructed (=structured)

- 0 0 = universal tag
- 0 1 = application-wide tag
- 1 0 = (context specific tag)
- 1 1 = (private tag)

Universal tags



Application-wide tags

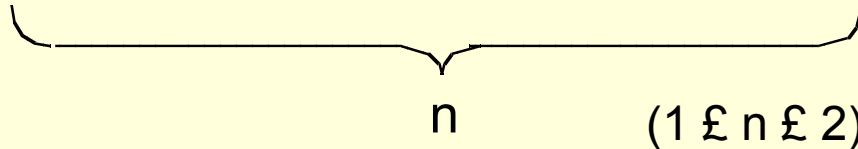


ASN.1 - definice délky

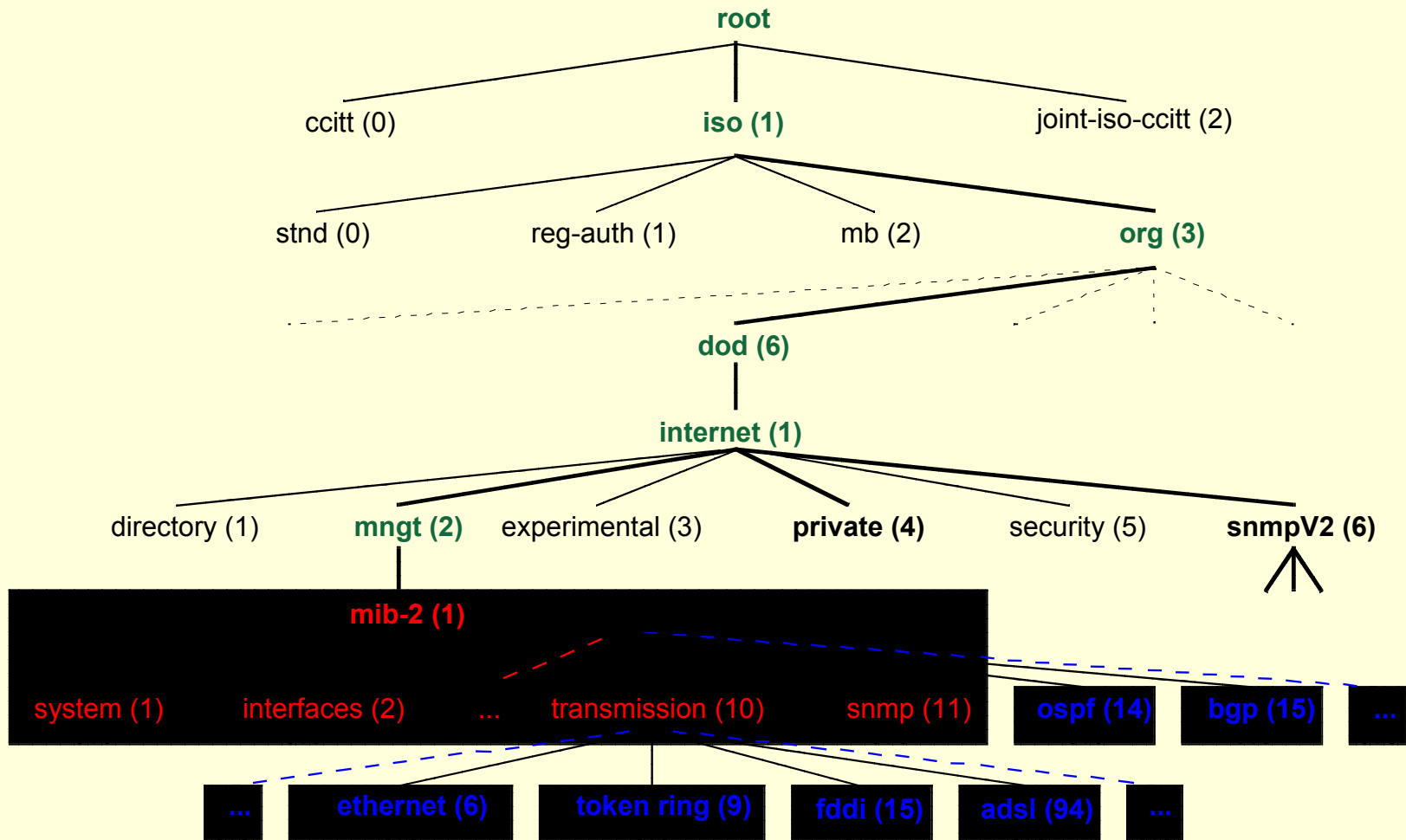
SHORT FORM:



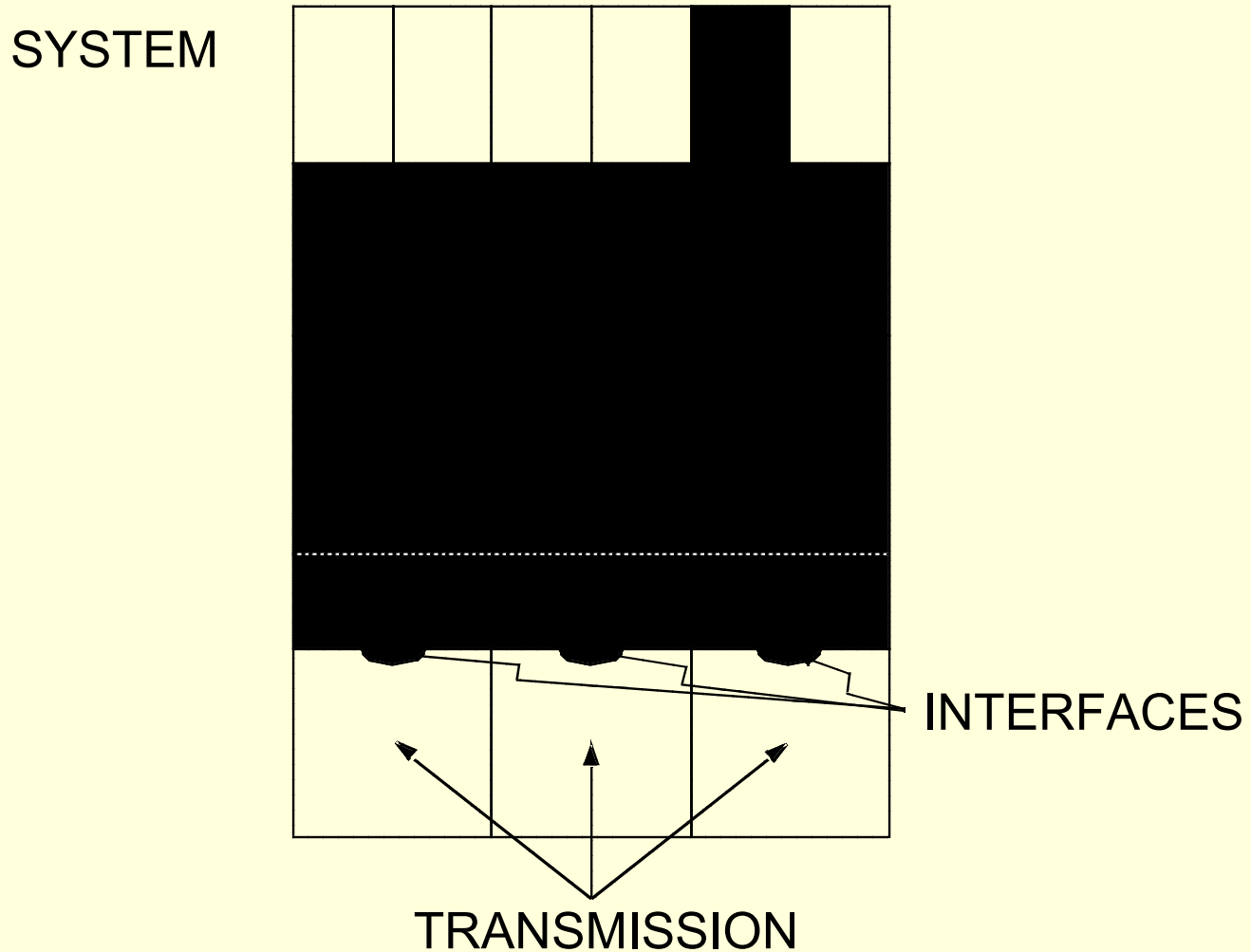
LONG FORM:



Hierarchie MIB



MIB-II - Protokoly



MIB-II - Protokoly

SYSTEM GROUP SNMPv2 MIB (RFC 1907)

INTERFACES (IF) GROUP IF-MIB (RFC 2863)

ADDR. TRANSLATION GROUP deprecated

IP & ICMP GROUPS IP-MIB (RFC 2011)

TCP GROUP TCP-MIB (RFC 2012)

UDP GROUP UDP-MIB (RFC 2013)

EGP GROUP outdated (BGP)

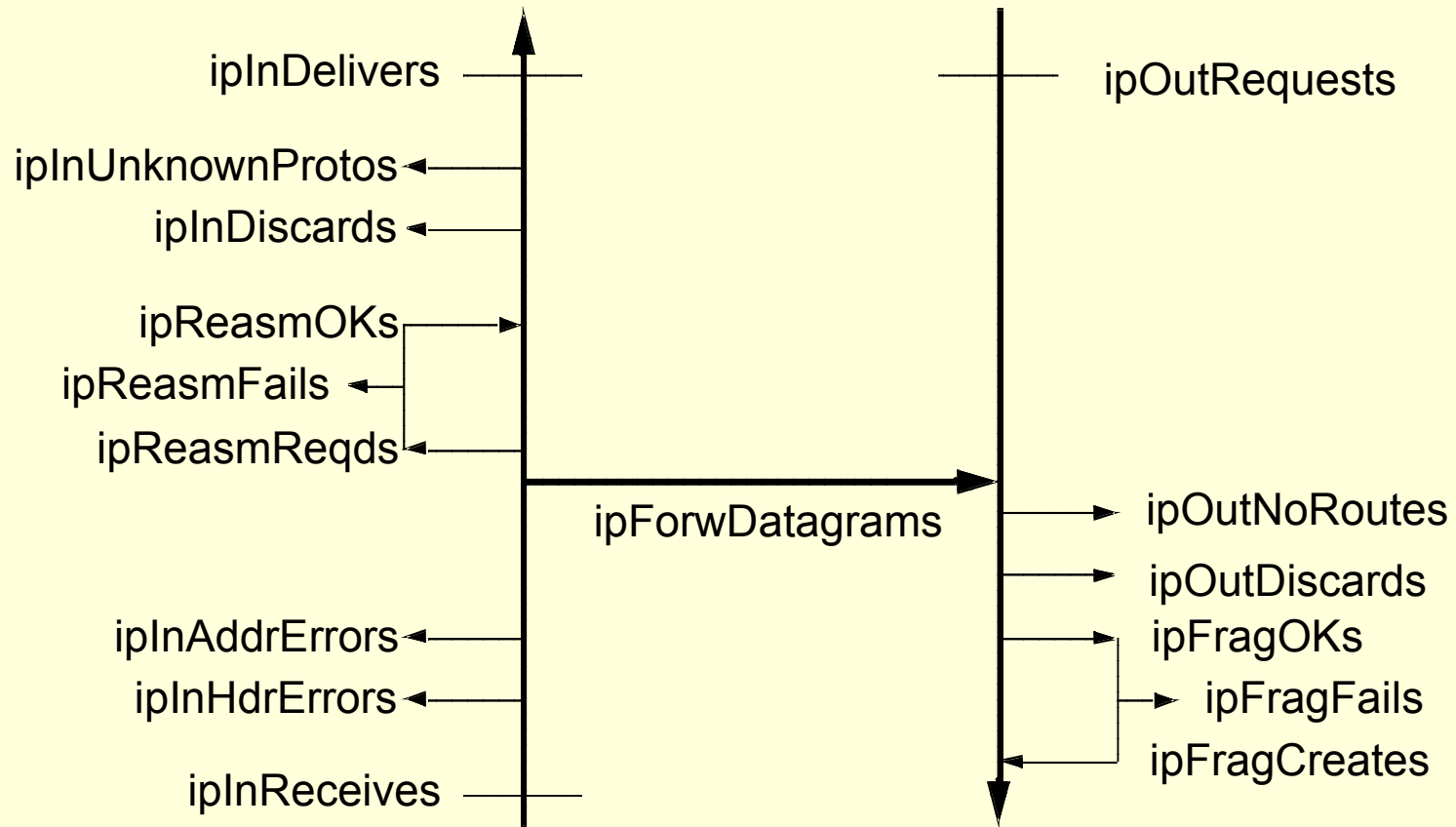
TRANSMISSION GROUP IS PLACEHOLDER

SNMP GROUP SNMPv2 MIB (RFC 1907)

IP MIB - Tabulka adres

	ipAdEntIfIndex	ipAdEntNetMask	ipAdEntBcastAddr	ipAdEntReasmMaxSize
	1	255.255.255.0	1	65535

IP MIB - Čítače paketů



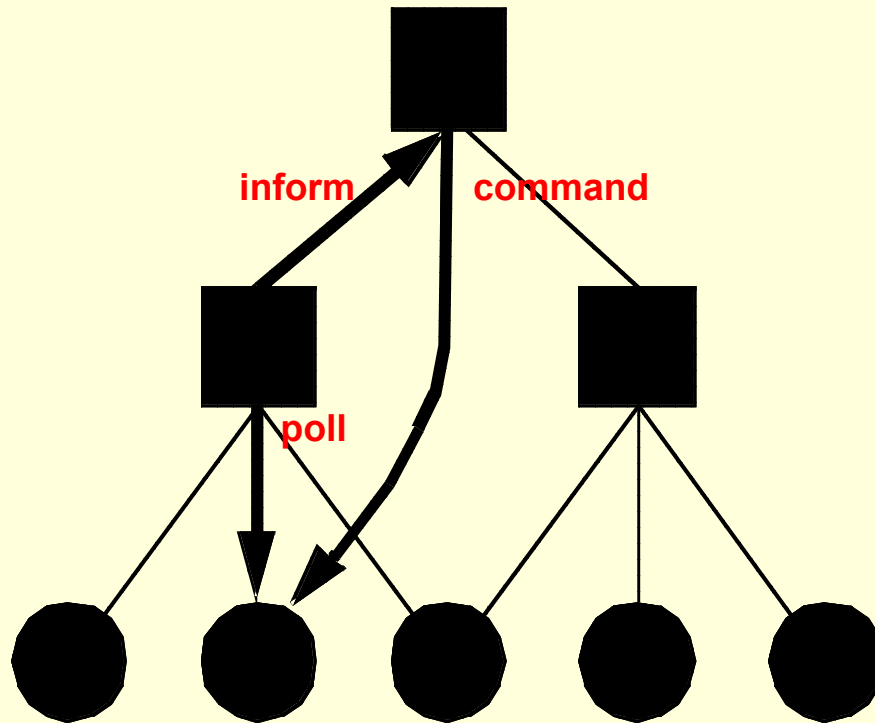
IP MIB - ARP tabulka

ipNetToMedia IfIndex	ipNetToMedia PhysAddress	ipNetToMedia NetAddress	ipNetToMedia Type
	08:00:20:00:25:66		3 (dynamic)

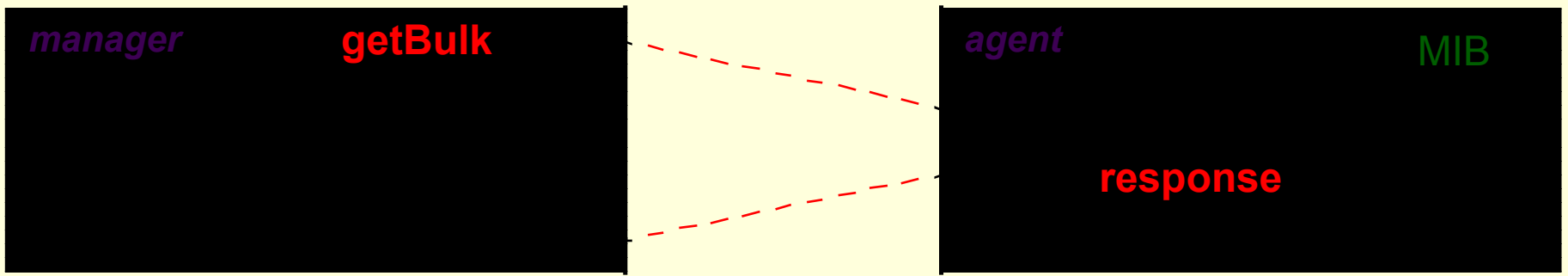
IP MIB - Směrovací tabulka

ipRouteDest	ipRouteNextHop	ipRouteIndex	ipRouteMask	ipRouteType	ipRouteMetric1	ipRouteMetric2	ipRouteMetric3	ipRouteMetric4	ipRouteMetric5	ipRouteAge	ipRouteProto	ipRouteInfo
		129.16.1.7	1	255.255.0.0	3							ospf
												● →
												● →

SNMPv2 - Basic idea



SNMPv2 - getBulk



SBNMPv2 - getBulk

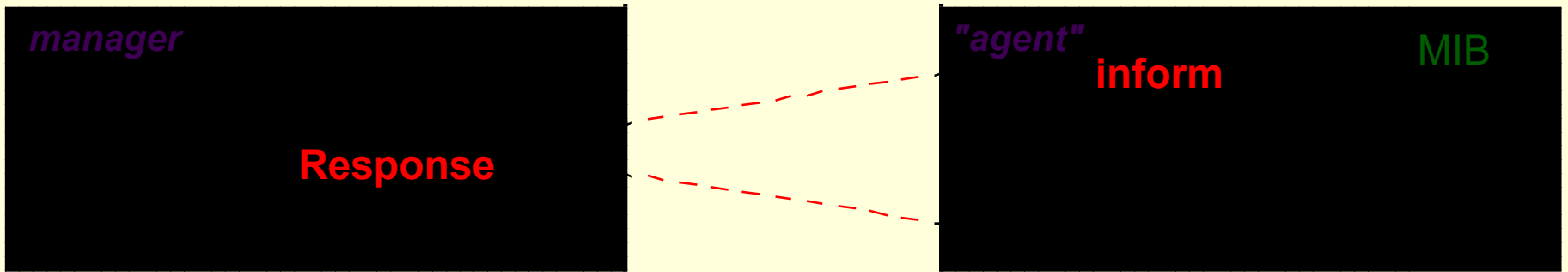
getBulk(max-repetitions = 4; 1.1)

**response(1.1.0 => 130.89.16.2
1.2.1.0 => printer-1
1.2.2.0 => 123456
1.3.1.1.2.1 => 2)**

getBulk(max-repetitions = 3; 1.3.1.1; 1.3.1.2; 1.3.1.3)

**response(1.3.1.1.2.1 => 2; 1.3.1.2.2.1 => 1; 1.3.1.3.2.1 => 2
1.3.1.1.3.1 => 3; 1.3.1.2.3.1 => 1; 1.3.1.3.3.1 => 3
1.3.1.1.5.1 => 5; 1.3.1.2.5.1 => 1; 1.3.1.3.5.1 => 2)**

SNMPv2 - Inform



SNMPv3 - Manager



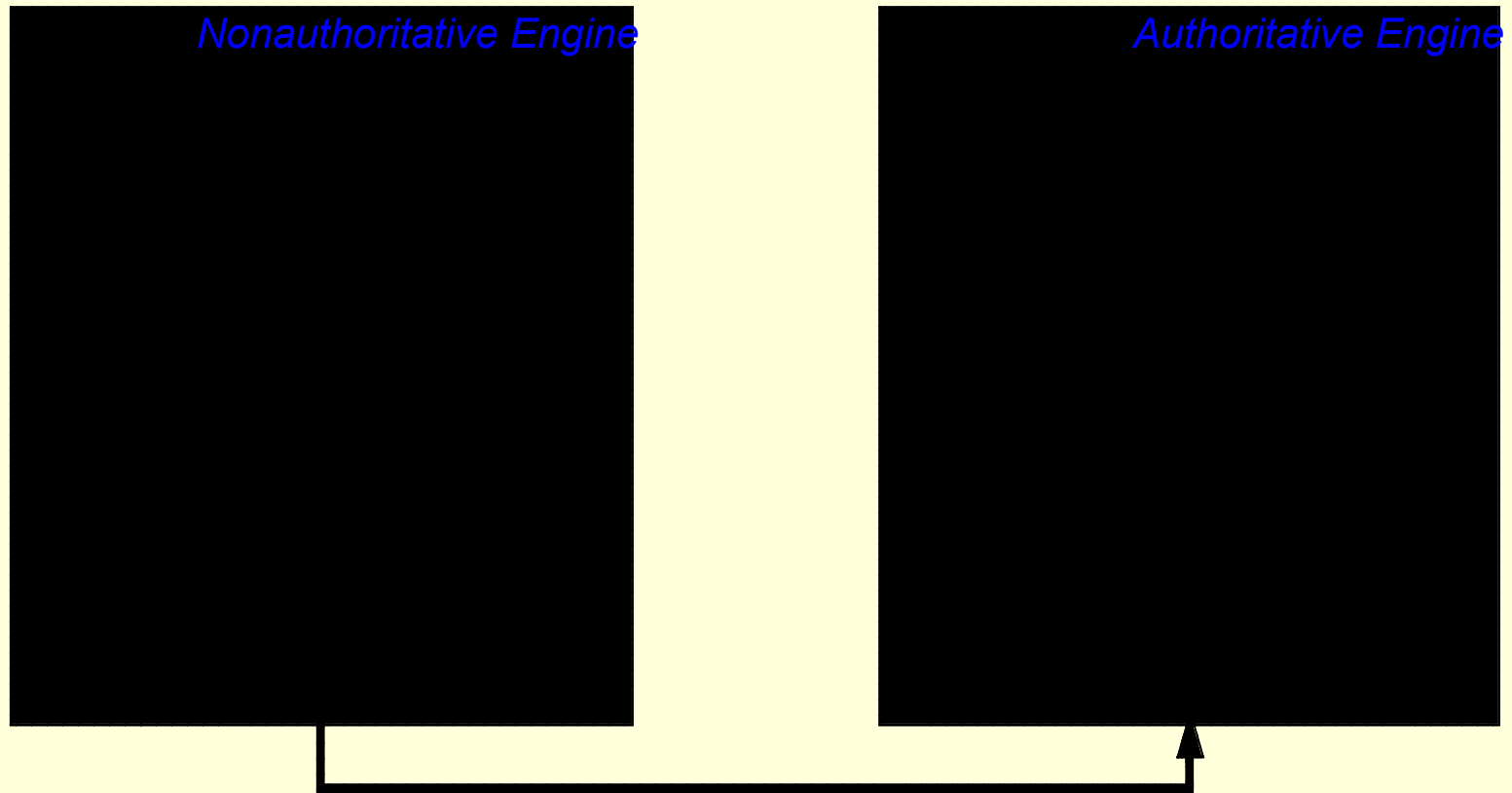
SNMPv3 - Agent



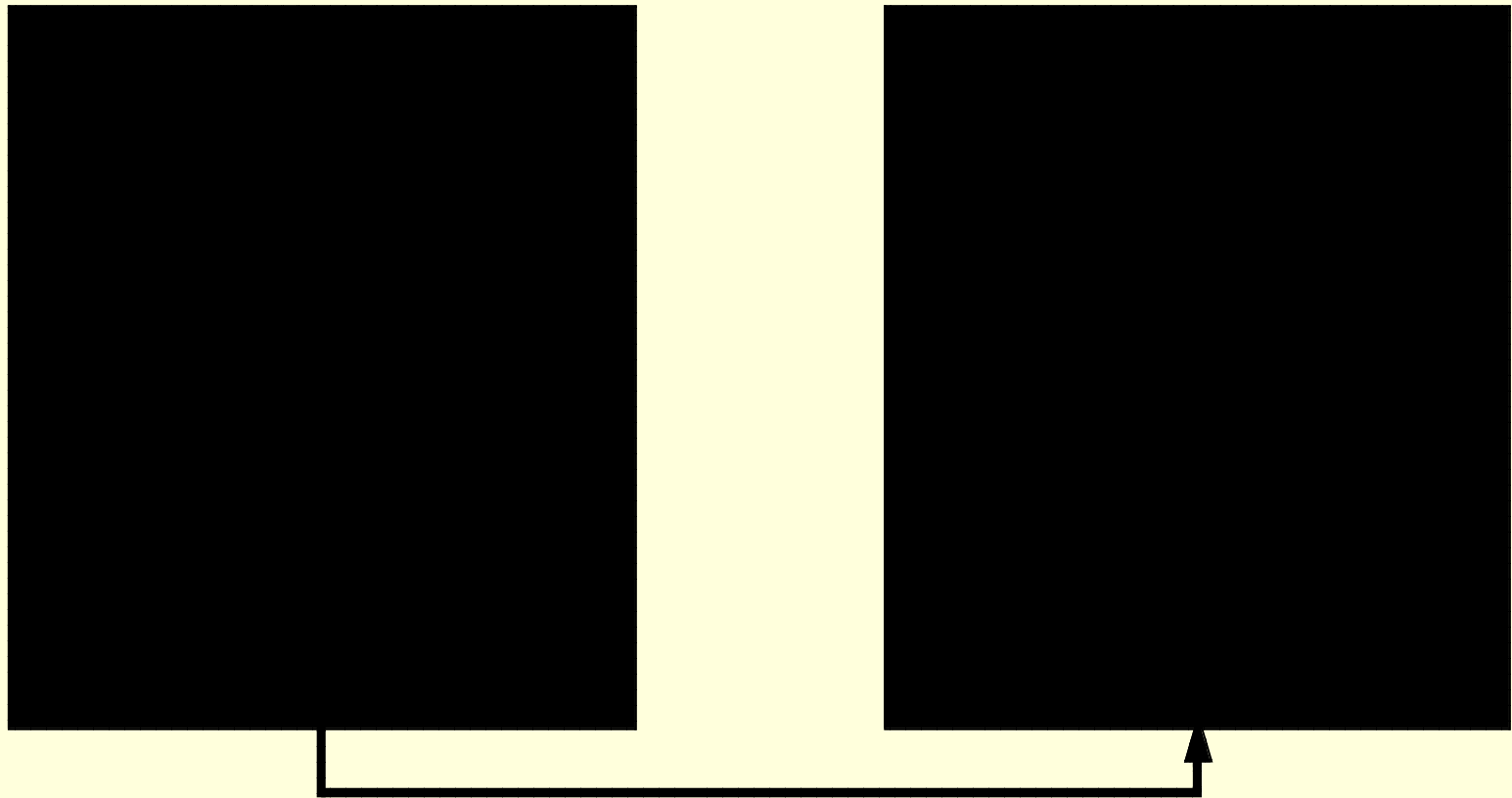
SNMPv3 - Bezpečnost

THREAT	ADDRESSED?	MECHANISM
REPLAY	YES	TIME STAMP
MASQUERADE	YES	MD5 / SHA-1
INTEGRITY	YES	(MD5 / SHA-1)
DISCLOSURE	YES	DES
DENIAL OF SERVICE	YES	
TRAFFIC ANALYSIS	YES	

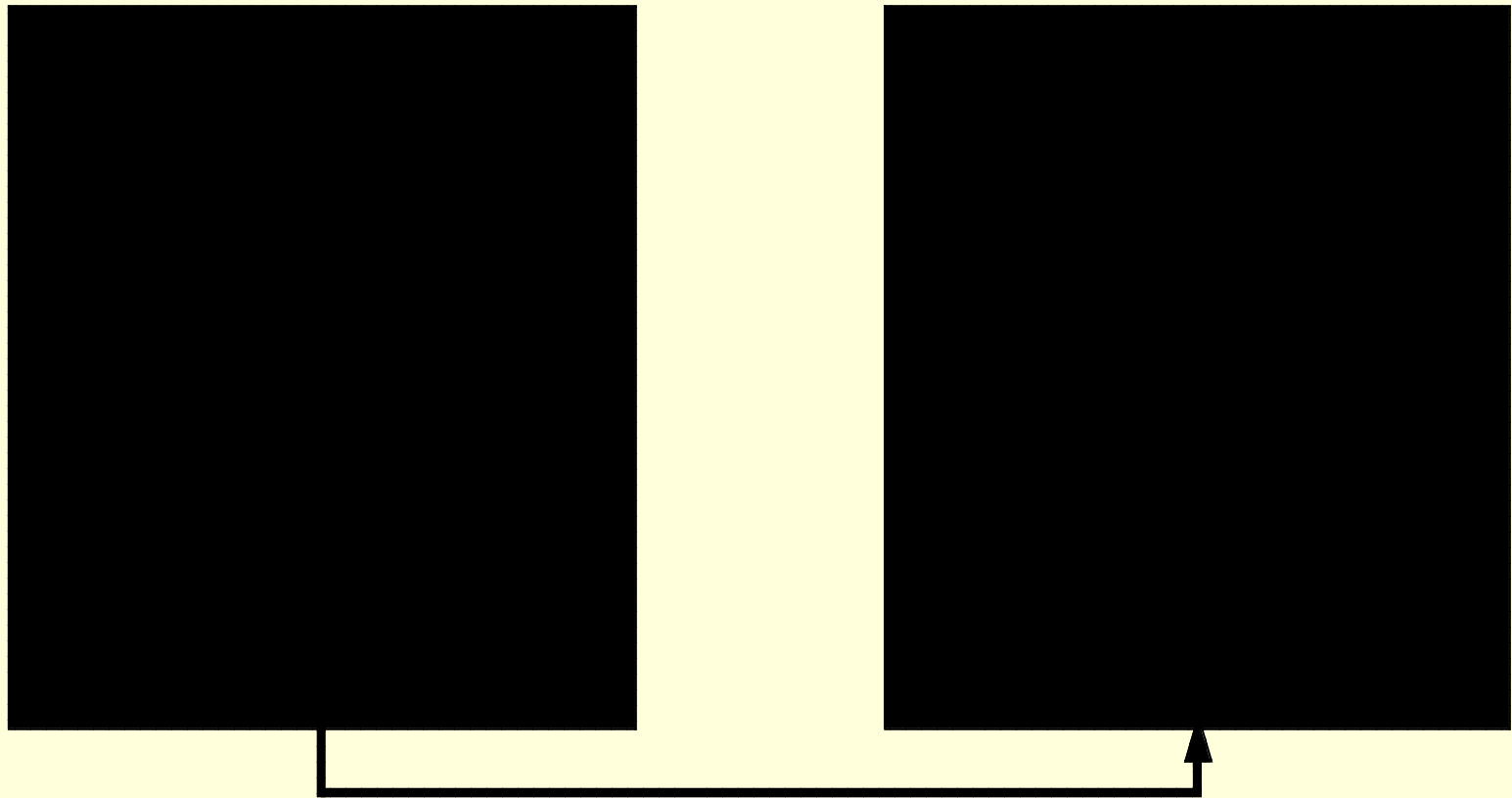
SNMPv3 - Reply protection



SNMPv3 - Authentication



SNMPv3 - Encryption

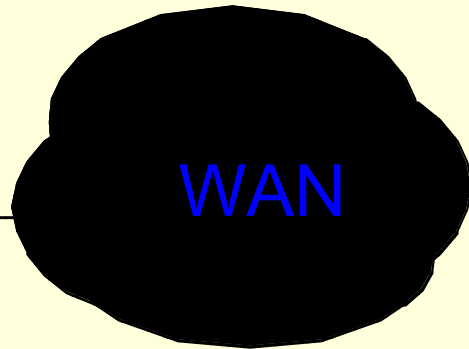
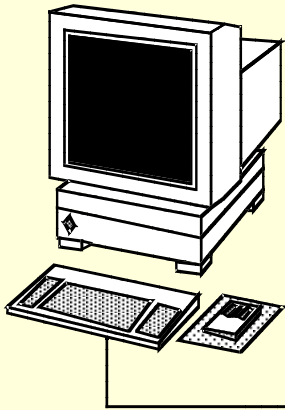


SNMPv3 - Access Control

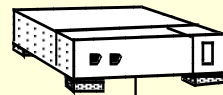
Interface Table	SET	John	Authentication Encryption
Systems Group	GET / GETNEXT	George	None
...
...

RMON - Groups

MANAGER



RMON



ETHERNET

statistics
history
host
host top N
traffic matrix
alarms
filters
packet capture
events

RMON - Statistics

Counts

Packets

Oktets

Broadcasts

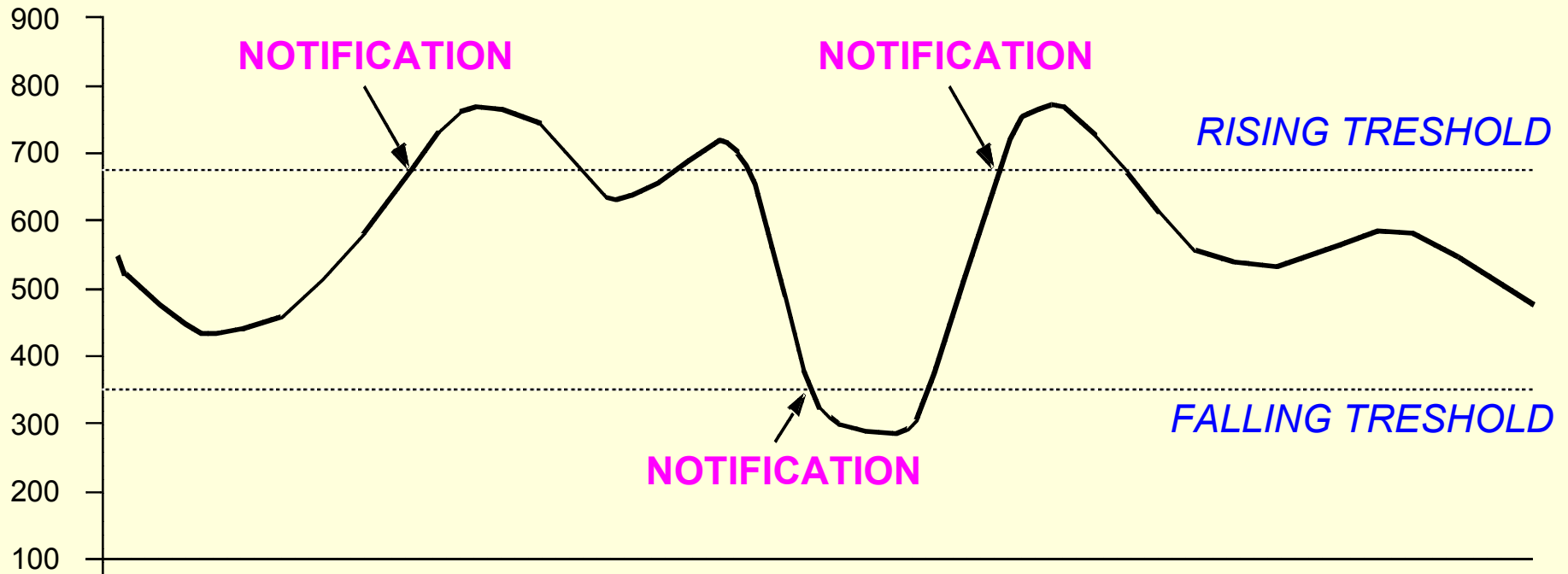
Multicasts

Collisions

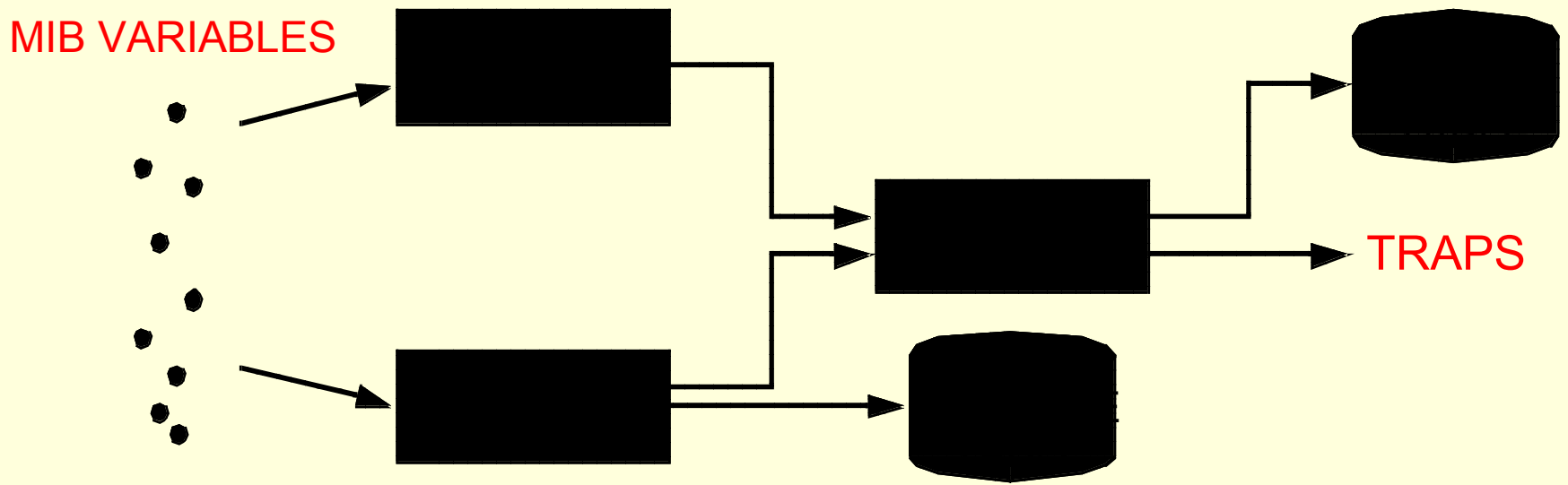
Errors

Size distribution

RMON - Alarms



RMON - Filters



Konec

