THE SNMPv2 PROJECT

AT

TWENTE UNIVERSITY

Aiko Pras

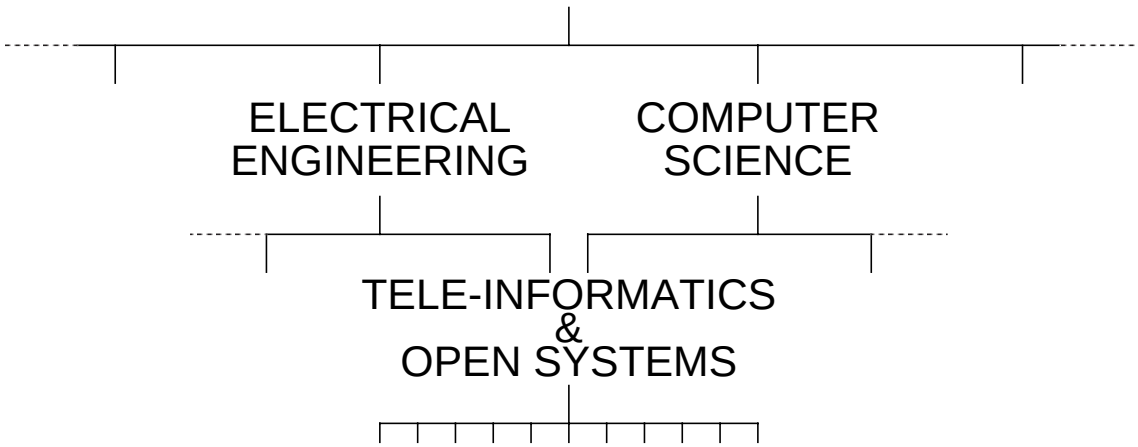
pras@cs.utwente.nl
http://snmp.cs.utwente/

PRESENTATION AT BELLCORE
28 April 1995

OVERVIEW

- THE UNIVERSITY OF TWENTE
- GOALS OF THE UT-SNMPv2 PROJECT
- IMPLEMENTATION ENVIRONMENT & APPROACH
- FEATURES OF UT-SNMPv2
- OVERALL STRUCTURE
- THE SNMPv2 PROTOCOL MACHINE (SPM)
- DETERMINING PARTIES & CONTEXTS
- STATUS
- DOCUMENTATION
- EXPERIENCES THUS FAR
- FUTURE DIRECTION

THE UNIVERSITY OF TWENTE



DISCIPLINE GROUPS

ARCHITECTURE
(VISSERS)

FORMAL METHODS
(BRINKSMA)

QUANTITATIVE METHODS
(NICOLA)

TOOLS
(ALBLAS)

APPLICATION PROTOCOLS
(MICHIELS)

COMMUNICATION PROTOCOLS
(NIEMEGEERS)

TRANSMISSION SYSTEMS
(van ETTEN)

MANAGEMENT
(BAKKER, PRAS, van HENGSTUM & MANY STUDENTS)

GOALS

- GET IMPLEMENTATION EXPERIENCE

- IMPROVE UNDERSTANDING OF INTERNET MANAGEMENT

- IMPROVE CONTACTS
  FREE SOFTWARE
  SIMPLE-WEB WWW SERVER

NON-GOALS

- COMMERCIAL PRODUCT

- REPLACE CMU

IMPLEMENTATION ENVIRONMENT

- UNIX

- SUN-SPARC

- SUNOS-4.1 & 5.3 (SOLARIS)

- GNU SOFTWARE

- ANSI-C LANGUAGE

APPROACH

CYCLIC DEVELOPMENT

NOV. 1993

RELEASE 1
- BER
- MD-5
- RFC 1503 LIKE API

APR. 1994

RELEASE 2
- DES
- NEW API
- OPTIONAL: TCP

JUN. 1994

RELEASE 2.1
- SNACC TYPES

AUG. 1994

RELEASE 3
- BETTER SUPPORT ADM. MODEL
- BI-LINGUAL OPERATION
- OPTIONAL: PER

DEC. 1994

RELEASE 4
- M2M MIB
- DYNAMIC MIB ADDITION / REMOVAL
- BETTER VIEW HANDLING

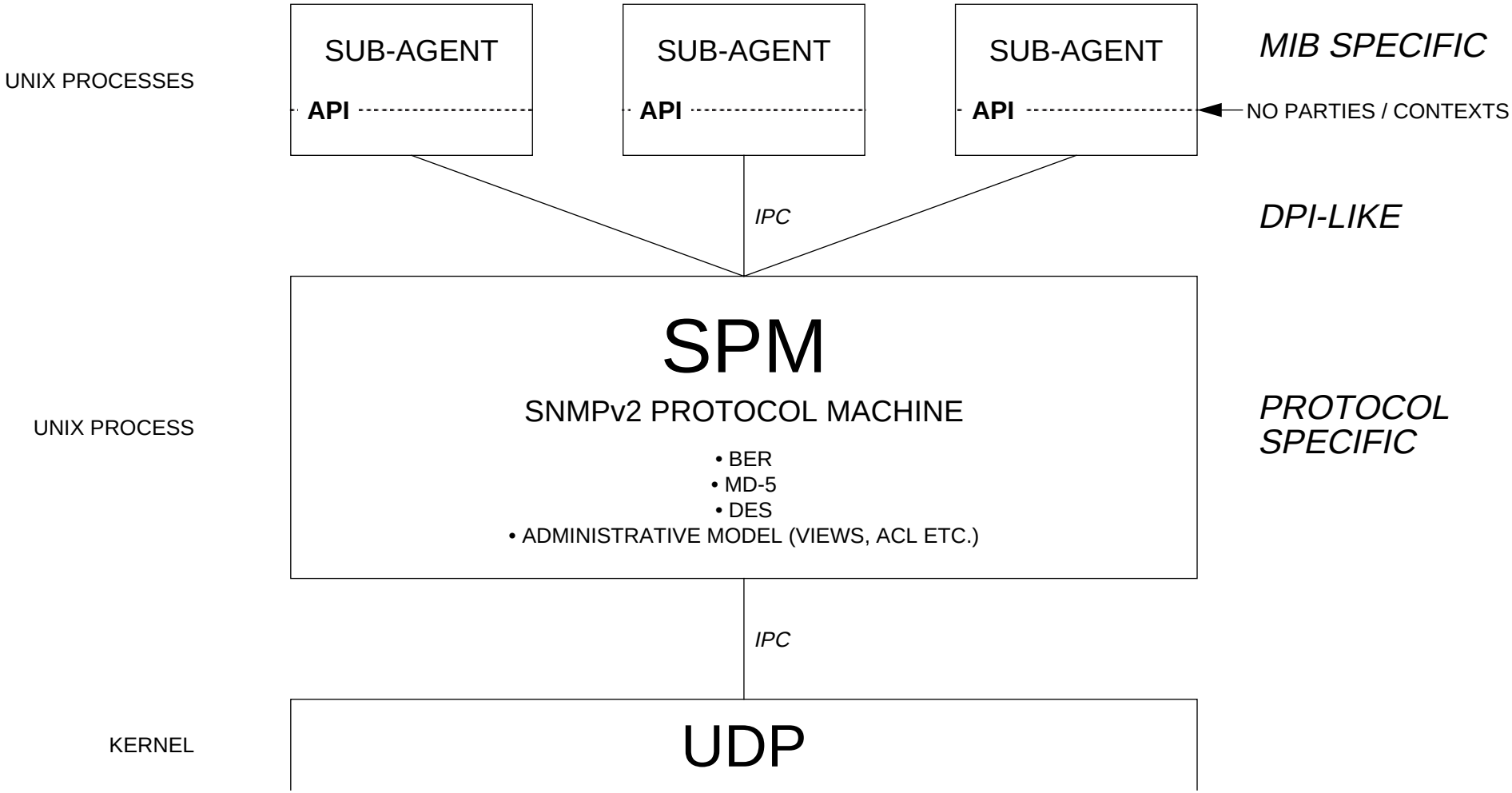
MAIN FEATURES

WELL STRUCTURED
=
EASY TO UNDERSTAND

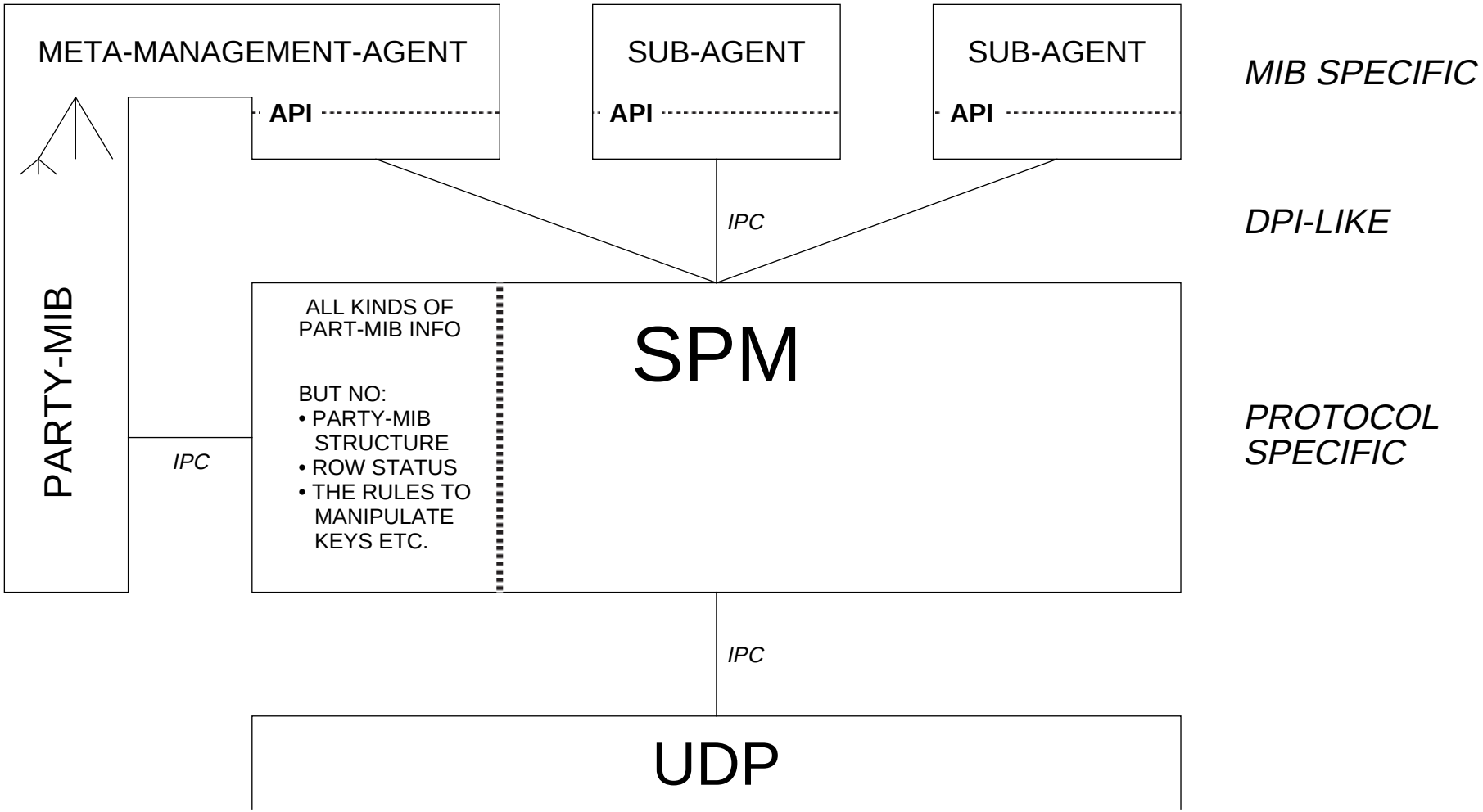
EXTENSIBLE AGENT TECHNOLOGY

NO NEED FOR ‘USERS’
TO UNDERSTAND
ADMINISTRATIVE MODEL
•NO KNOWLEDGE OF PARTIES & CONTEXTS

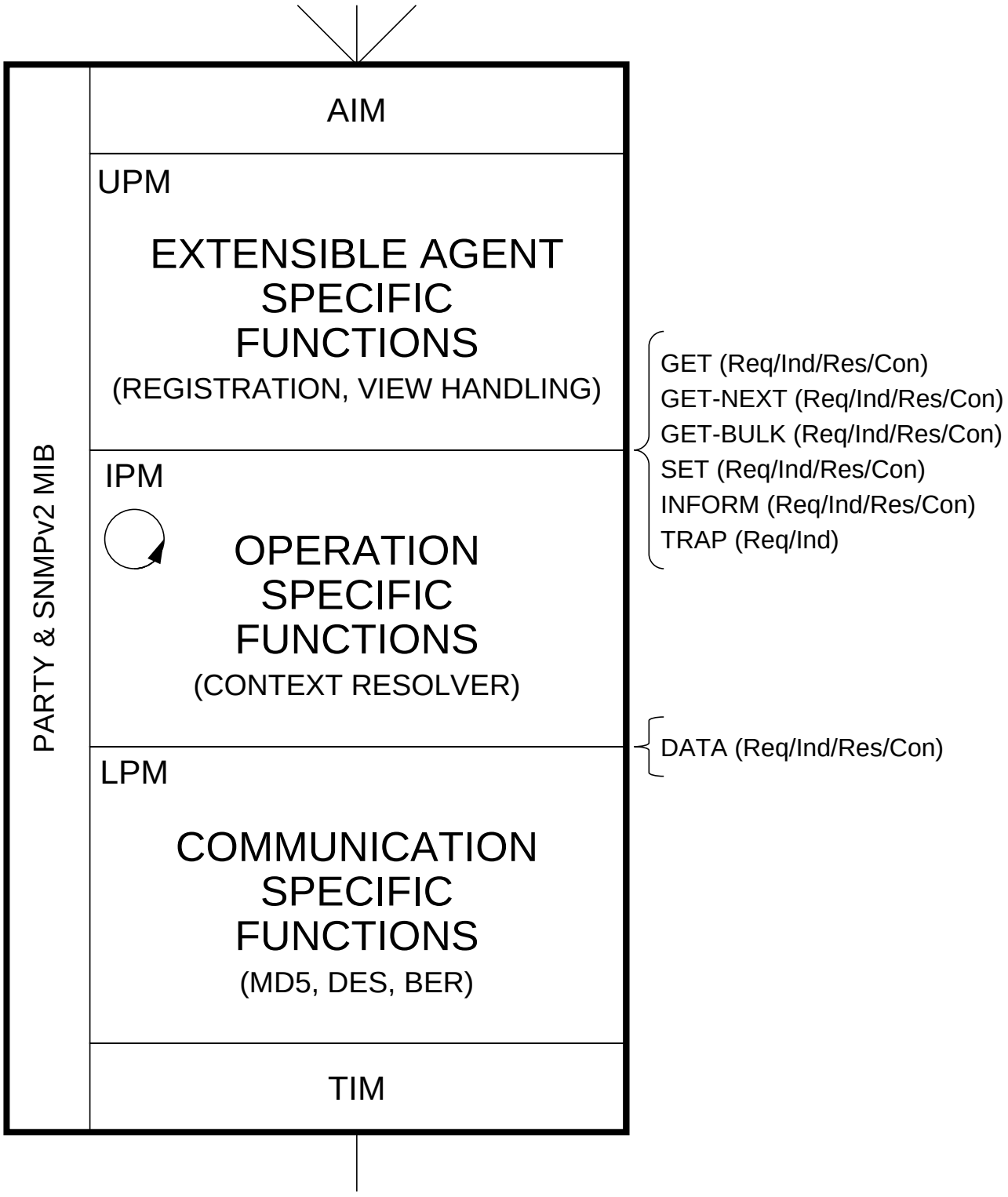
OVERALL STRUCTURE



META-MANAGEMENT



SPM STRUCTURE



SPM CODE SIZE

REQUIRED PHYSICAL MEMORY:
1.1 Mbyte

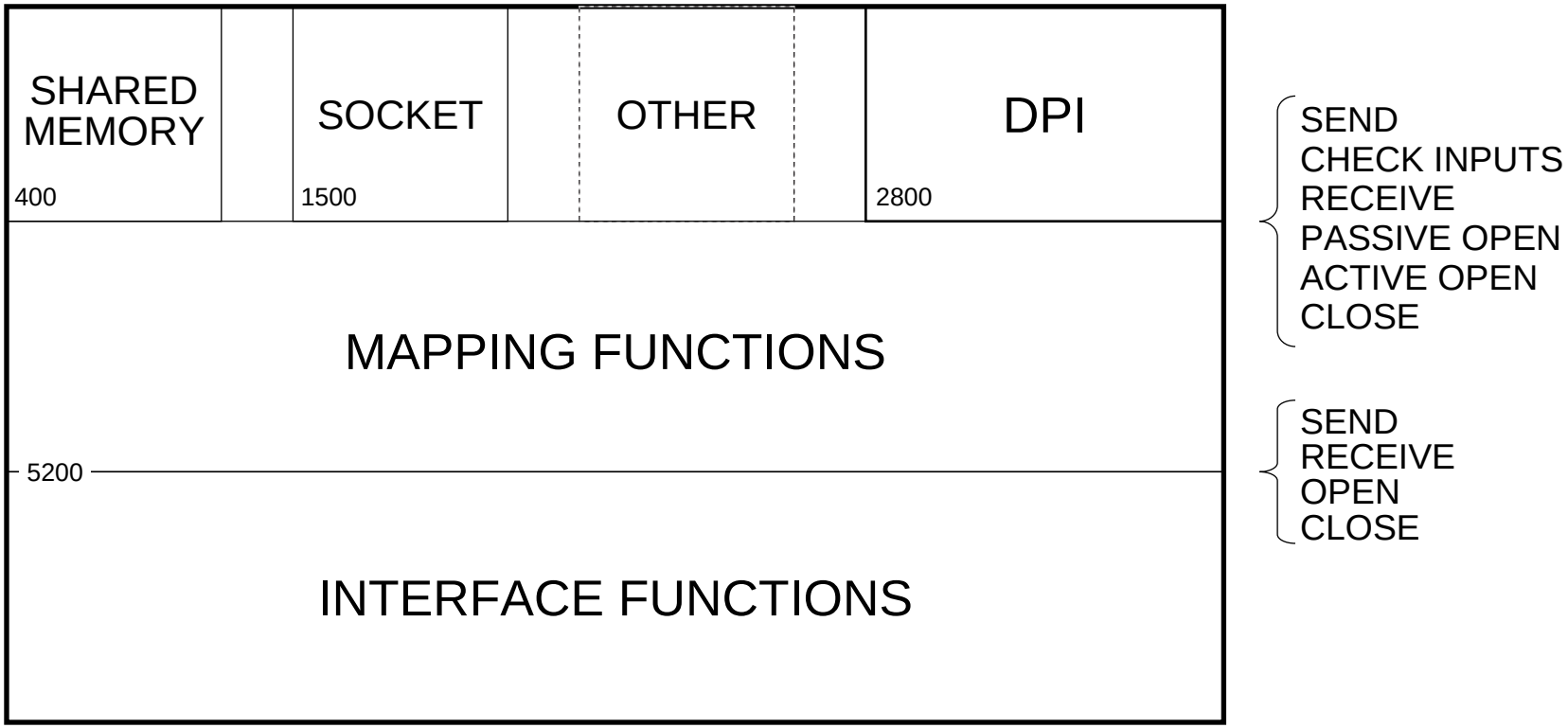
(CMU: 750 - 800 Kbytes)

LINES OF SPM C-CODE: 31.500
(CMU: 8500)

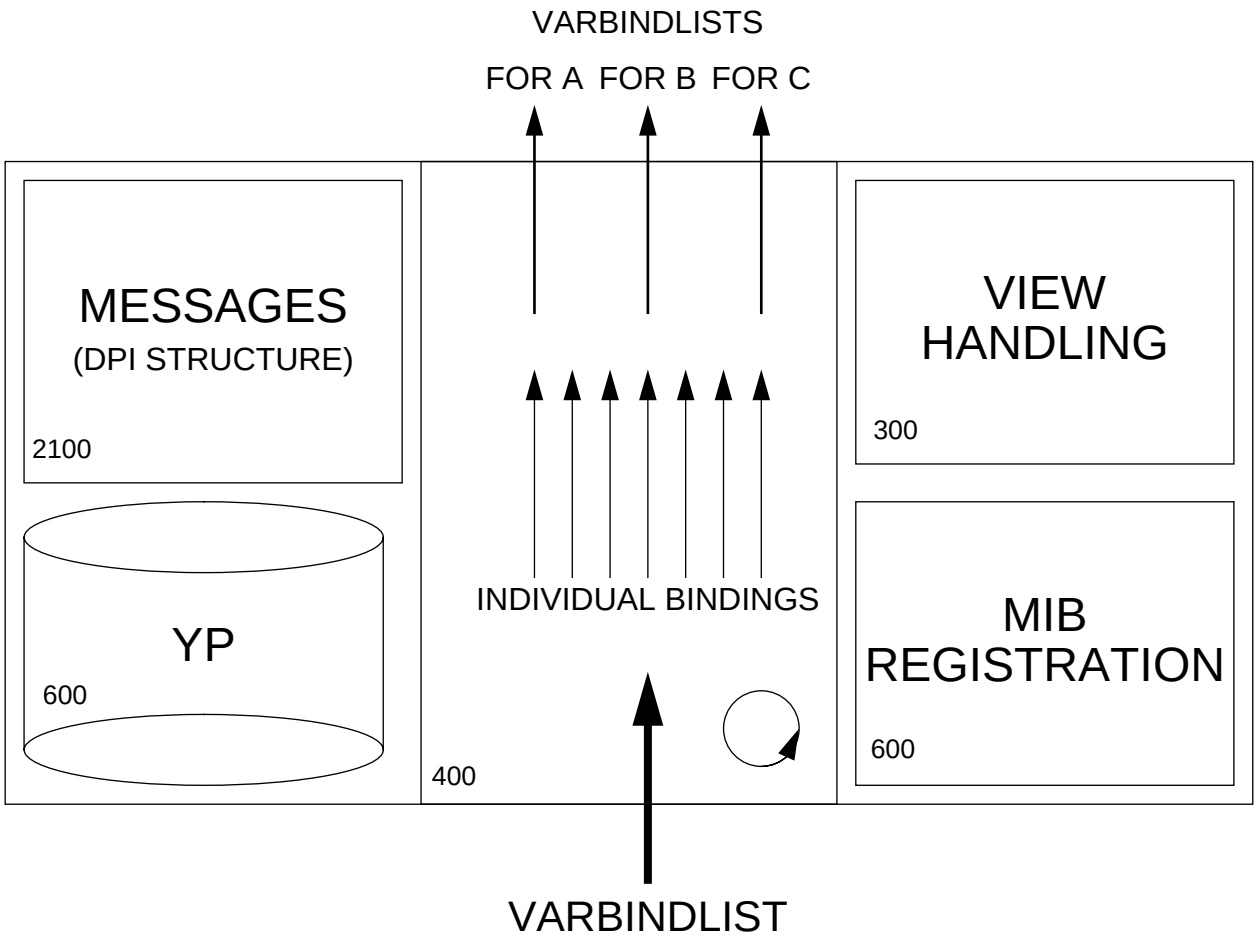
- AIM: 5.000
- UPM: 4.000
- IPM: 1.400
- LPM: 9.400
- TIM: 1.600
- PARTY & SNMPv2 MIB: 9.300 & 800

LINES OF API C-CODE: 9.700

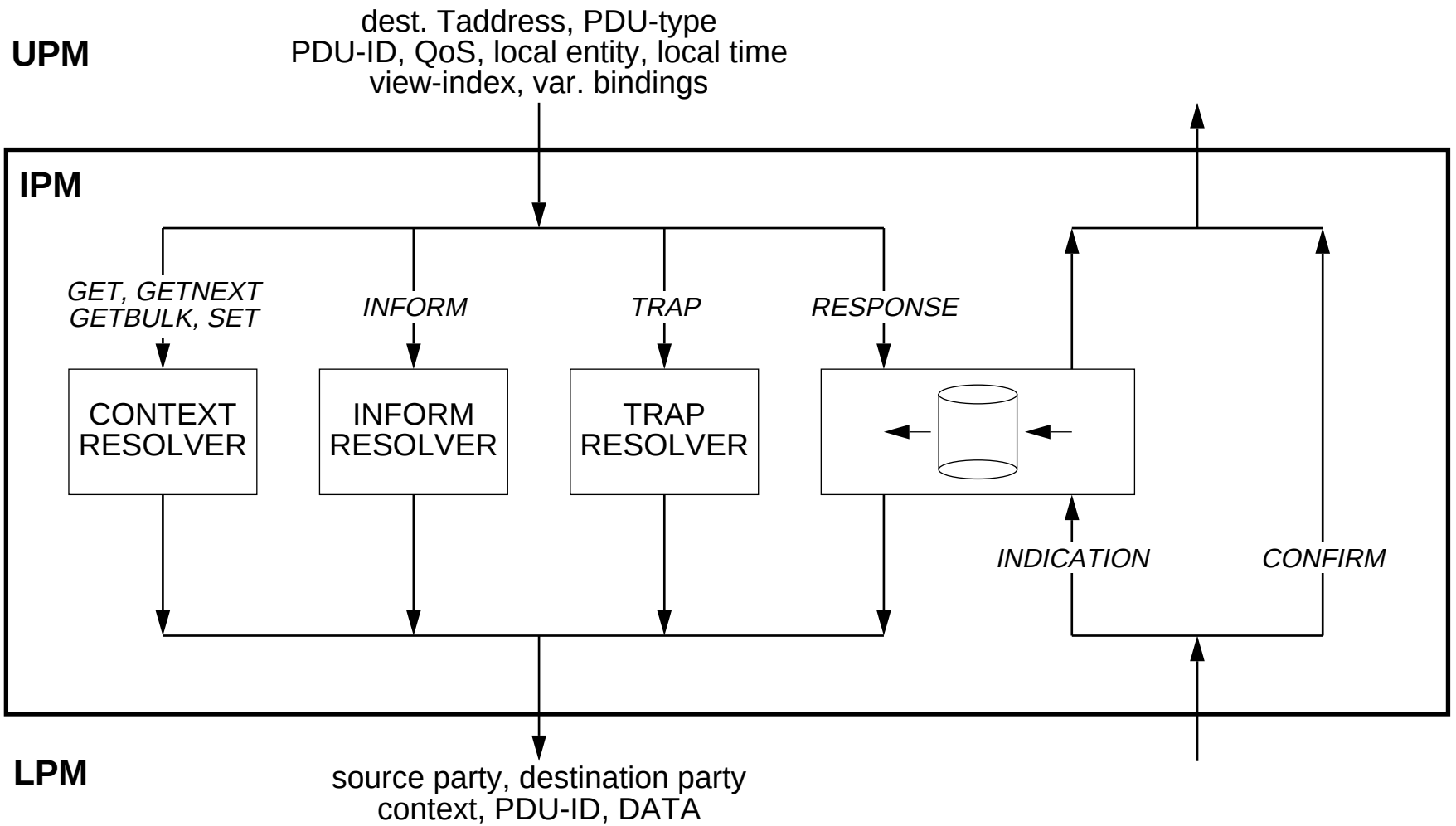
AIM STRUCTURE



UPM STRUCTURE



IPM STRUCTURE



CONTEXT RESOLVER

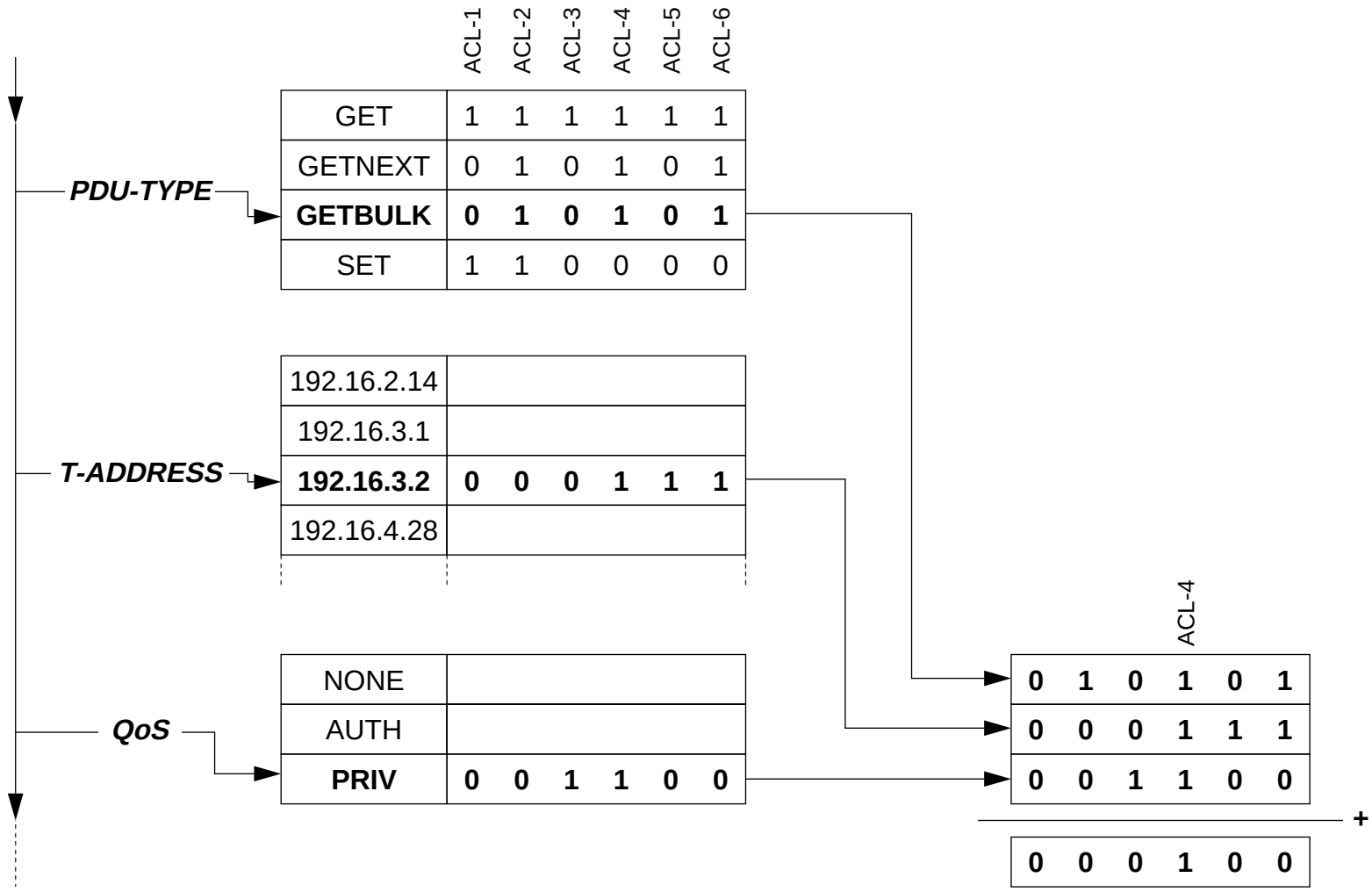
HAS TO FIND A VALID TRIPLE OF
•SOURCE PARTY
•DESTINATION PARTY
• CONTEXT

GIVEN A:
• DEST. T-ADDRESS
•PDU-TYPE
• QoS
• CONTEXT LOCAL ENTITY
• CONTEXT LOCAL TIME
• VIEW INDEX

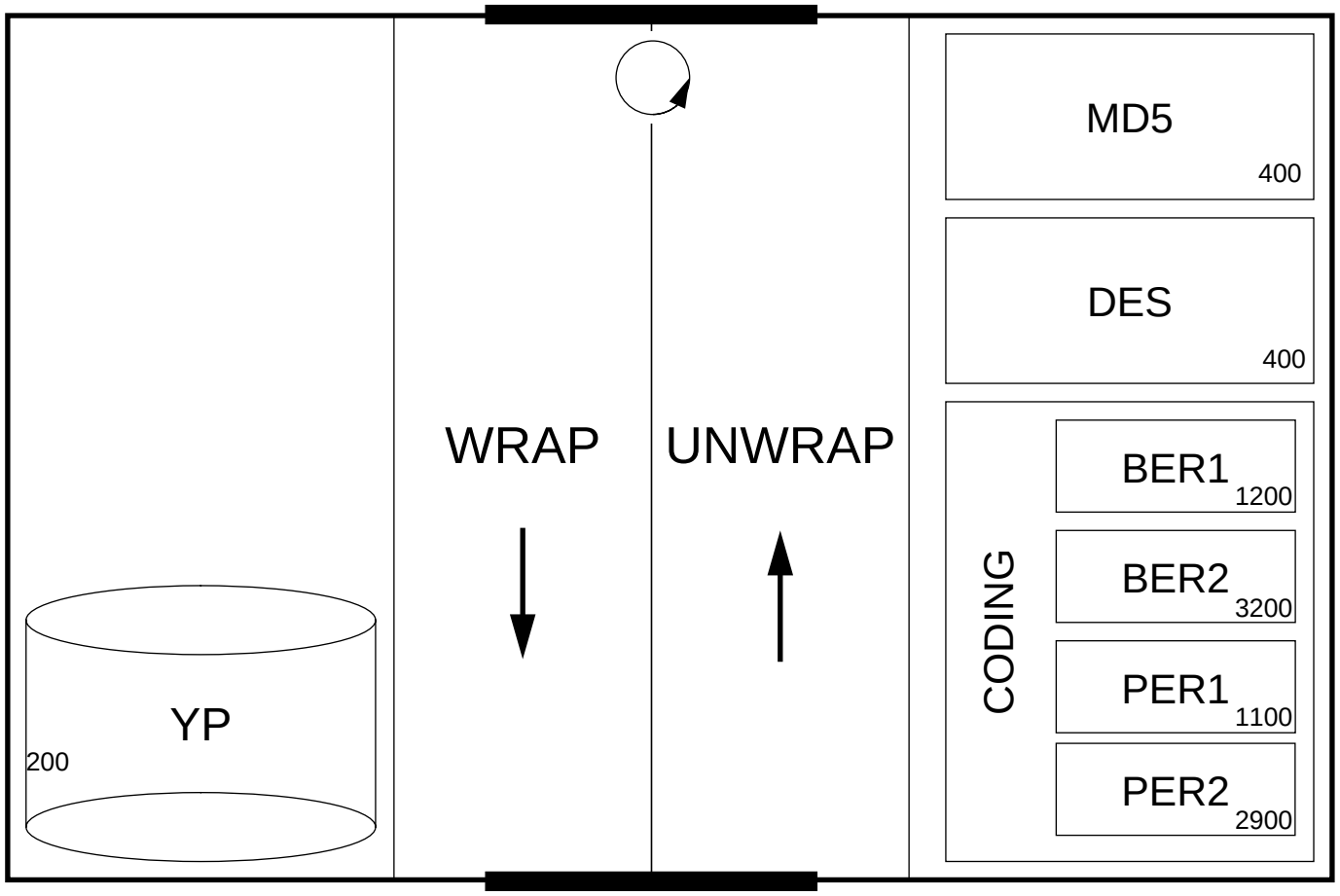
OBSERVATION:
ACL TABLE CONTAINS
ALL VALID TRIPLES

IDEA:
MAKE A VECTOR OF ACL ENTRIES

CONTEXT RESOLVER - BASIC OPERATION



LPM STRUCTURE



STATUS

95% OF THE
RFCs 1441-1452
HAVE BEEN IMPLEMENTED

STILL TO DO:

- IMPLEMENT RECENT CHANGES MADE BY THE IETF
- ADD POSSIBILITY TO MODIFY PARTY-MIB VALUES VIA SNMPv2
- COMPLETE SNMPV2 MIB
- SOLVE EXTENSIBLE AGENT PROBLEMS
- INCLUDE SNMPv1 SUPPORT

STATUS

UT-SNMPv2
Release 4 of the SPM
December 1994

UT-M2M
An (untested) implementation of the M2M MIB
April 1995

UT-TRIPPER
A MIB browser
November 1994

UT-INIT
Software to create CMU-format configuration files
(X-Windows version available)
April 1994

UT-PERKINS
Software for Perkins-format configuration files
October 1994

UT-ROSE
A port of MTR's Tcl/Tk package to UT-SNMPv2
March 1995

UT-FOID
Friendly-Name to / from OID mapper
March 1995

DOCUMENTATION

SNMPv2 at Twente University
A. Pras & J. Togtema
Simple Times: February 1994

SIMPLE-WEB
http://snmp.cs.utwente.nl/

Student Reports

- SNMPv2: Simple or Sophisticated?
  V. G. M. Berkhout
  TWAIO Report: October 1993 - October 1994

- An analysis of the Simple Network Management Protocol version 2
  E. J. Schekkerman
  M.Sc. Thesis: October 1992 - June 1993

- Specification and implementation of a Network Management Service based on SNMPv2
  J. W. Togtema
  M.Sc. Thesis: January 1993 - November 1993

- Implementation of a Network Management Service
  M. Scholtes & H. C. Toet
  B.Sc. Thesis: March 1993 - January 1994

- Implementation options for concurrency and IPC in UT-SNMP
  J.H van der Knaap
  M.Sc. Thesis: March 1993 - February 1994

- SNMPv2 lower protocol functions
  R. B. J. Oude Vrielink
  M.Sc. Thesis: November 1993 - June 1994

- Party-MIB & SNMPv2MIB in the SNMPv2 protocol
  K. W. G. Flapper
  M.Sc. Thesis: November 1993 - July 1994

- SNMPv2 Meta Management
  M. W. H. van Ooijen & E. D. Veluwenkamp
  M.Sc. Thesis: December 1993 - July 1994

- Interfacing the UT-SNMP package
  P. G. H. Peters
  B.Sc. Thesis: March 1994 - August 1994

- Design of a high-level management API
  A. Holleman
  M.Sc. Thesis: January 1994 - August 1994

- Security aspects in the UT-SNMP package
  J. Lezwijn & P.G.H. Peters
  Report: December 1994 - March 1995

- Manager to Manager Management Information Base
  Rob Post
  M.Sc. Thesis: May 1993 - January 1994

- Evaluation and new specification of the extensible agent protocol
  Harmen van de Linde
  M.Sc. Thesis: September 1994 - March 1995

EXPERIENCES UNTIL NOW

THE RFCs
PROVIDE A SUFFICIENT BASE
TO IMPLEMENT SNMPv2

BETTER STRUCTURE OF SNMPv2
WOULD HAVE BEEN HELPFUL

LONG TRAINING PERIOD REQUIRED

ADMINISTRATIVE MODEL IS COMPLEX
BASIC CONCEPTS HAVE NOT BEEN EXPLAINED

COMPLEXITY OF
EXTENSIBLE AGENT TECHNOLOGY
IS HIGHER THAN ANTICIPATED

STILL MUCH WORK ON
MANAGEMENT HIERARCHIES

UNDERSTANDING PARTIES

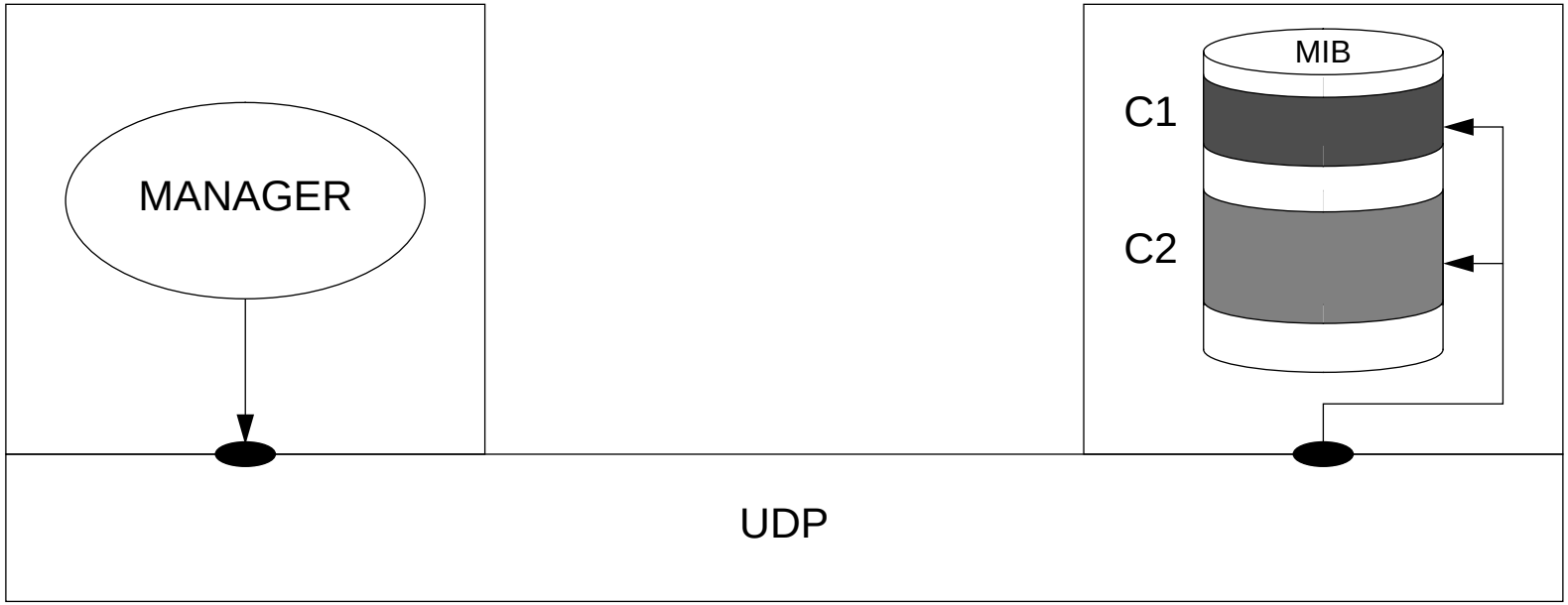
INITIAL QUESTIONS:

- HOW MANY PARTIES ARE NEEDED?
- CAN PARTIES BE SHARED
- NAMING OF ‘MANAGER’ PARTIES

THE DESCRIPTION OF ADMINISTRATIVE INFORMATION IN TERMS OF A MIB STRUCTURE CAUSED CONFUSION

IT WOULD HAVE BEEN BETTER TO DISTINGUISH BETWEEN ‘NORMAL OPERATION’ AND ‘MANAGEMENT OF SNMPv2’ (META-MANAGEMENT)

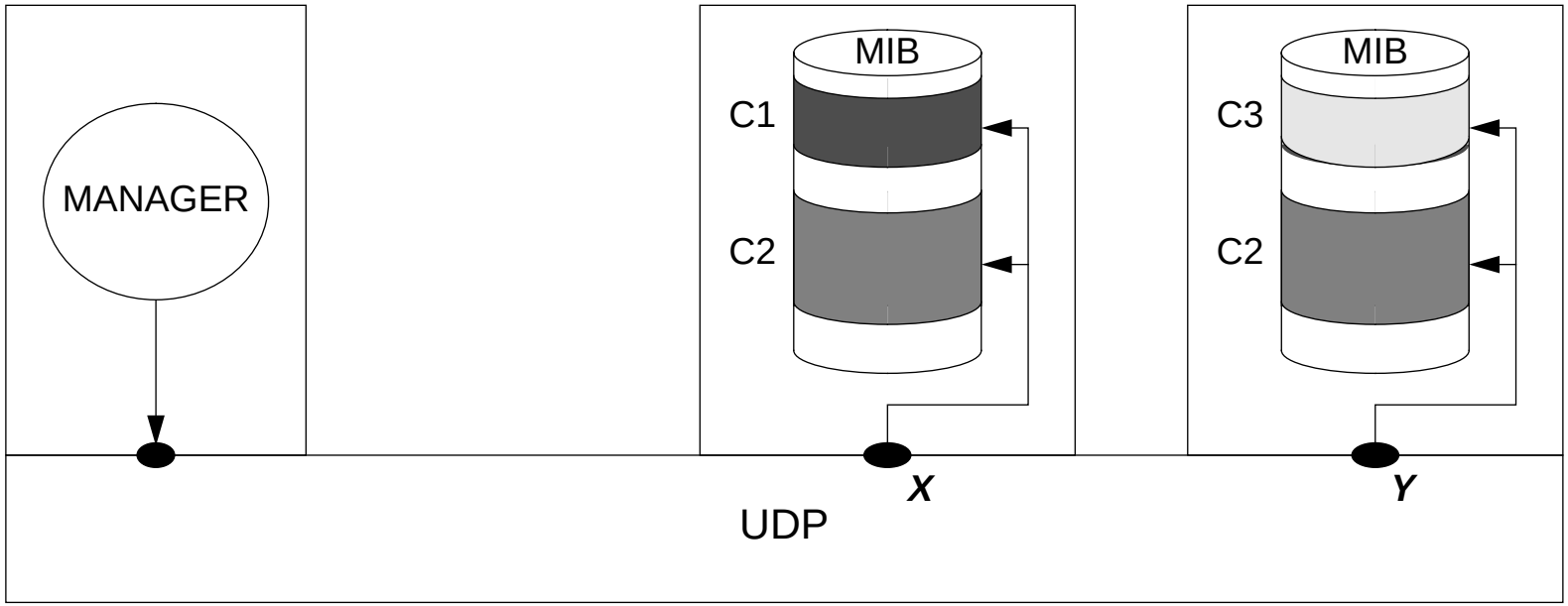
WHAT IS A CONTEXT - 1



OUR ORIGINAL ASSUMPTION:

EACH CONTEXT REFERS TO INFORMATION WITHIN A SINGLE SYSTEM

WHAT IS A CONTEXT - 2

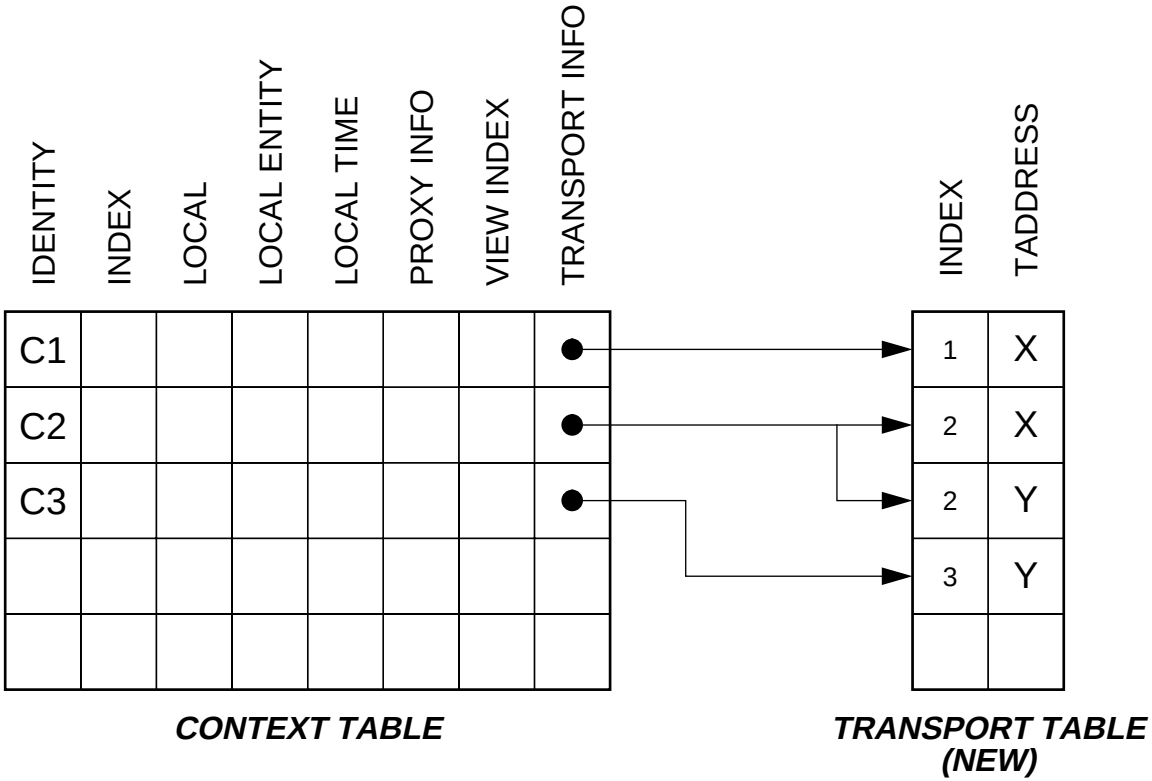


CURRENT ASSUMPTION:

A CONTEXT MAY REFER TO INFORMATION WITHIN MULTIPLE SYSTEMS

CONSEQUENCES FOR IDENTIFICATION?

WOULDN'T IT BE BETTER TO MOVE
THE TRANSPORT INFORMATION
FROM THE PARTY-TABLE TO THE CONTEXT TABLE?



EXTENSIBLE AGENT TECHNOLOGY

SET PROCESSING REQUIRES THREE PHASES:

- CHECK
- COMMIT / ROLL-BACK
- CLEAN-UP

SEVERAL DIFFICULTIES WITH OID REGISTRATION:

- ROW REGISTRATION
- OVERLAPPING TREES
- HOLES WITHIN TREES

VIEW HANDLING IN CASE OF GET-NEXT / GETBULK EVEN MORE COMPLEX

FUTURE ACTIVITIES OF UT

META-MANAGEMENT
- TOOLS

MOVE TOWARDS MANAGEMENT APPLICATIONS
- MIB GENERATOR
- ATM (SURFNET-4)

TRY TO INCREASE EUROPEAN INVOLVEMENT IN INTERNET MANAGEMENT