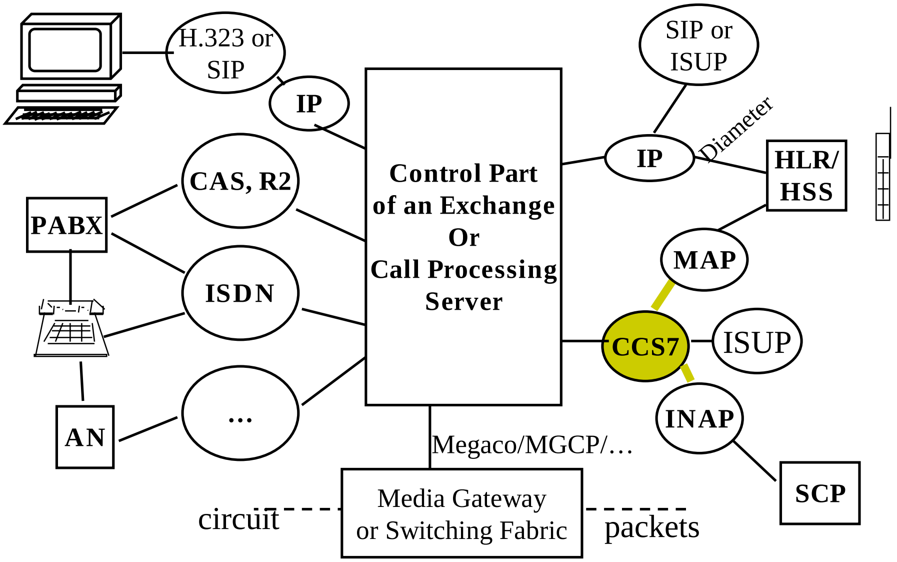
TCAP - Transaction Capabilities Application Part is used by

- ✓ **Mobile services (roaming and mobility management)**
- ✓ **Intelligent Network services**
- ✓ **Services that are independent of voice circuits (look-ahead …)**
- ✓ **O&M applications**
- ✓ **etc**

TCAP provides generic services supporting the execution of distributed transactions.
Parties in the transactions can be exchanges, service nodes, data bases etc.

TCAP offers a way to implement services that are independent of network resources.

Summary of course scope



H.323 or SIP

IP

CAS, R2

PABX

ISDN

AN

…

Control Part of an Exchange Or Call Processing Server

SIP or ISUP

IP

Diameter

HLR/ HSS

MAP

CCS7

ISUP

INAP

SCP

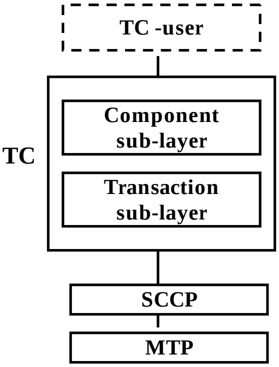
Megaco/MGCP/…

Media Gateway or Switching Fabric

circuit

packets

TCAP has two sub-layers

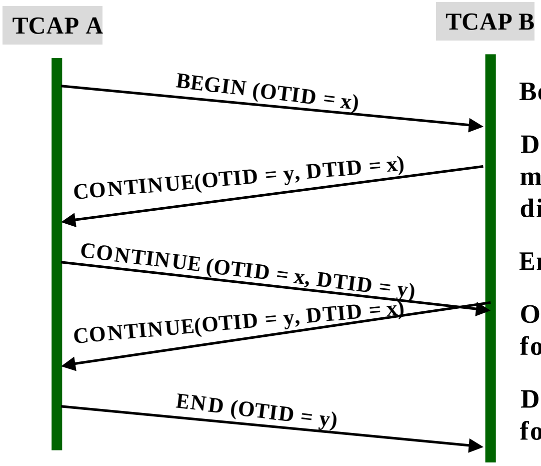


Component sub-layer: data units of the application protocol, requests and responses, dialogues: application context

Transaction sub-layer: message exchange between parties, optionally dialogues between parties.

TCAP has a lot of similarity with ROSE (Remote Operation Service Element) and ACSE (Association Control Service Element). ROSE ja ACSE are OSI layer 7 services.

A TCAP use case


TCAP A
TCAP B
BEGIN (OTID = x)
CONTINUE(OTID = y, DTID = x)
CONTINUE (OTID = x, DTID = y)
CONTINUE(OTID = y, DTID = x)
END (OTID = y)

Begin begins a dialogue

During the dialogue Continue -messages are sent in both directions.

End-message closes the dialogue.

OTID -identifies the dialogue/ for the sender of the transaction.

DTID -identifies dialogue/ for the object of the transaction.

TCAP supports four operation types

- ✓ **Class 1 - Both success and failure are reported**
- ✓ **Class 2 - Only failures are reported.**
- ✓ **Class 3 - Only success is reported.**
- ✓ **Class 4 - Nothing is reported**

An operation is identified by the Invoke-Id - identifier.

Indication (ind) is associated with the request (req) based on the Invoke-id.

A user may have many ongoing active operations simultaneously.

TCAP is a purely end-to-end function. There may be many intermediate nodes in the CCS7 network that do not touch TCAP.

Operations are identified and chained using the Invoke-Id

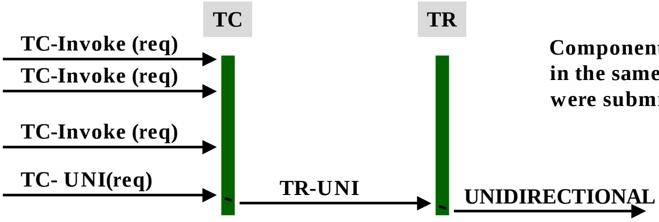
- ✓ **Operation is identified by the Invoke-Id.**
- ✓ **Indication (ind) is associated with the request (req) based on the Invoke-id.**
- ✓ **The Response can be a new operation request that is chained to the previous operation request using a link-identifier.**
- ✓ **A user may have many simultaneous operations.**

The result of an operation sent to a remote system can be

- ✓ Result: Operation succeeded.
  - › The result can also be segmented (chained)
- ✓ Error: Operation failed.
- ✓ Reject: Execution of the operation is not possible.
- ✓ Before sending the result, the remote system can send an arbitrary number of linked operations.

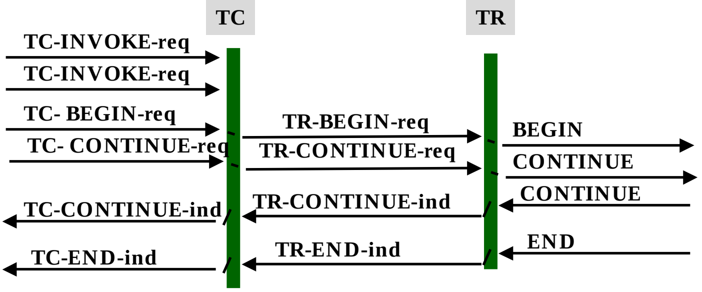
Non-structured dialogue transfers one or more components

- ✓ TC-user can send many components in Class 4 operations by a UNIDIRECTIONAL message.
- ✓ Components with the same dialogue -id can be sent in one message.
- ✓ Control over sequencing of operations is left to the application.



Components are delivered in the same order they were submitted!

A Structured dialogue has a beginning, information transfer, ending or abort



TC

TR

TC-INVOKE-req

TC-INVOKE-req

TC- BEGIN-req

TC- CONTINUE-req

TR-BEGIN-req

TR-CONTINUE-req

BEGIN

CONTINUE

CONTINUE

TC-CONTINUE-ind

TR-CONTINUE-ind

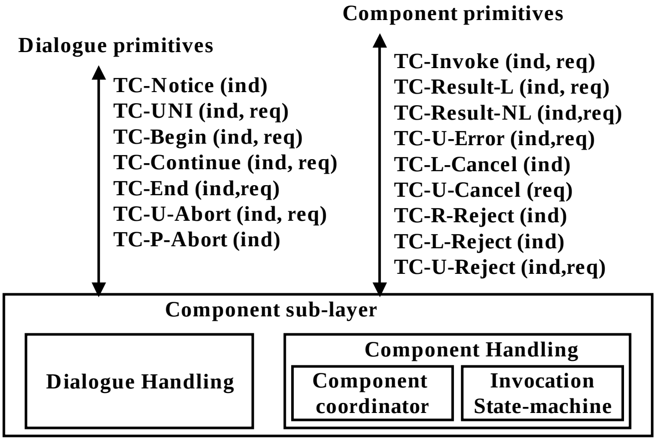
TC-END-ind

TR-END-ind

END

- Begin causes a ***transaction identifier*** to be reserved.
- The remote system can either continue the transaction or close it.
- Continue - messages are exchanged in a full-duplex mode.
- Closing options:
  - based on pre-arrangement independently
  - normally by the End-message or “abnormally” by an Abort message

The Component sub-layer is split into dialogue handling and component handling



Component primitives

Dialogue primitives

TC-Notice (ind)
TC-UNI (ind, req)
TC-Begin (ind, req)
TC-Continue (ind, req)
TC-End (ind,req)
TC-U-Abort (ind, req)
TC-P-Abort (ind)

TC-Invoke (ind, req)
TC-Result-L (ind, req)
TC-Result-NL (ind,req)
TC-U-Error (ind,req)
TC-L-Cancel (ind)
TC-U-Cancel (req)
TC-R-Reject (ind)
TC-L-Reject (ind)
TC-U-Reject (ind,req)

Component sub-layer

Dialogue Handling

Component Handling

Component coordinator

Invocation State-machine

Component handling primitives are

TC_INVOKE - Invocation of an operation which may be linked to another operation

TC_RESULT_L - Only result or last part of segmented result of a successful operation

TC_RESULT_NL - non-last part of segmented result

TC_U_ERROR - reply to a previously invoked op that failed

TC_L_CANCEL - informs user of local timeout

TC_U_CANCEL - Causes local termination of op on TC_user request

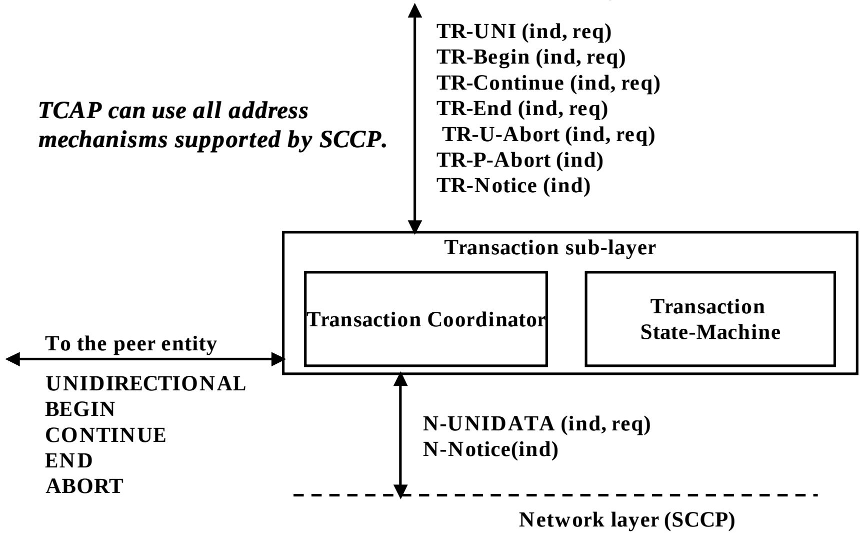
TC_L_REJECT - local reject by Component sub-layer to TC_user

TC_R_REJECT - remote reject by remote component sub-layer

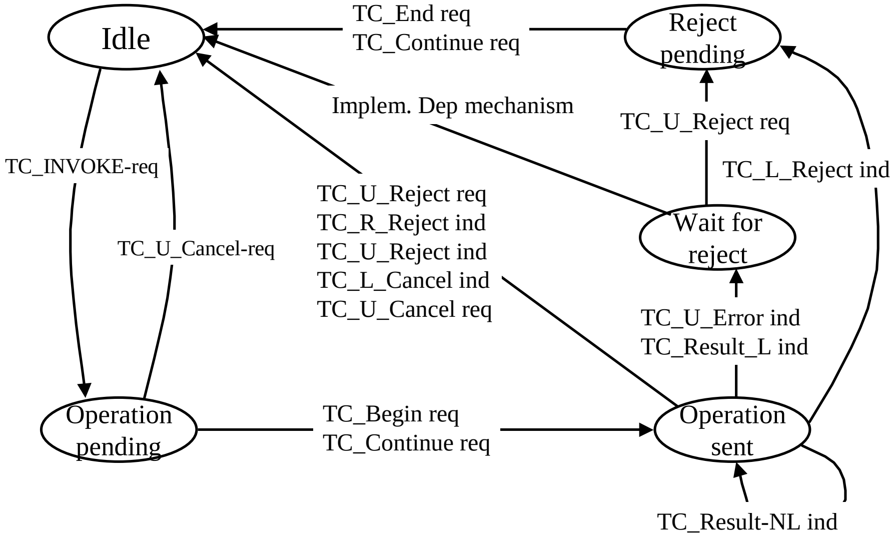
TC_U_REJECT - Rejection by TC_user indicating malformation

Transaction sub-layer handles the interfacing to the network layer

TCAP can use all address mechanisms supported by SCCP.



State transition Diagram for Class 1 Operations


Idle

TC_End req
TC_Continue req

Reject pending

Implem. Dep mechanism

TC_U_Reject req

TC_INVOKE-req

TC_L_Reject ind

TC_U_Reject req
TC_R_Reject ind
TC_U_Reject ind
TC_L_Cancel ind
TC_U_Cancel req

Wait for reject

TC_U_Cancel-req

TC_U_Error ind
TC_Result_L ind

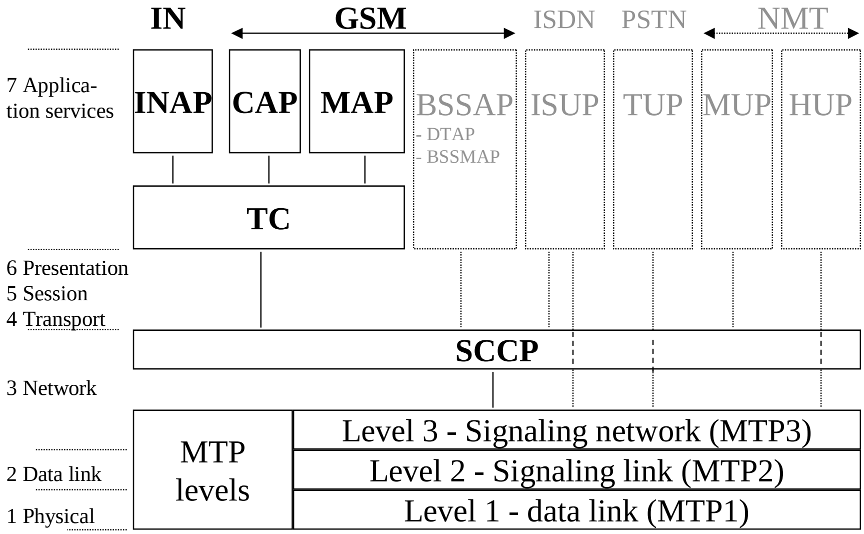
Operation pending

TC_Begin req
TC_Continue req

Operation sent

TC_Result-NL ind

Most important users of TCAP are..


IN

GSM

ISDN

PSTN

NMT

7 Applica-
tion services

INAP

CAP

MAP

BSSAP
- DTAP
- BSSMAP

ISUP

TUP

MUP

HUP

TC

6 Presentation
5 Session
4 Transport

SCCP

3 Network

MTP levels

Level 3 - Signaling network (MTP3)

Level 2 - Signaling link (MTP2)

Level 1 - data link (MTP1)

2 Data link

1 Physical

TCAP added value is

- ✓ Decoupling the actions and states of an application from communication states for managing the flow of information with the remote end
- ✓ Takes care of managing the communication with the peer – let's the application concentrate on essential matters
  - › four classes of service
  - › report on success tells the application that the remote end has done its job for sure
  - › report on failures speeds up recovery (but an application can not really rely on getting the report on every failure!)
  - › or alternatively can let the application take care of all acknowledgements