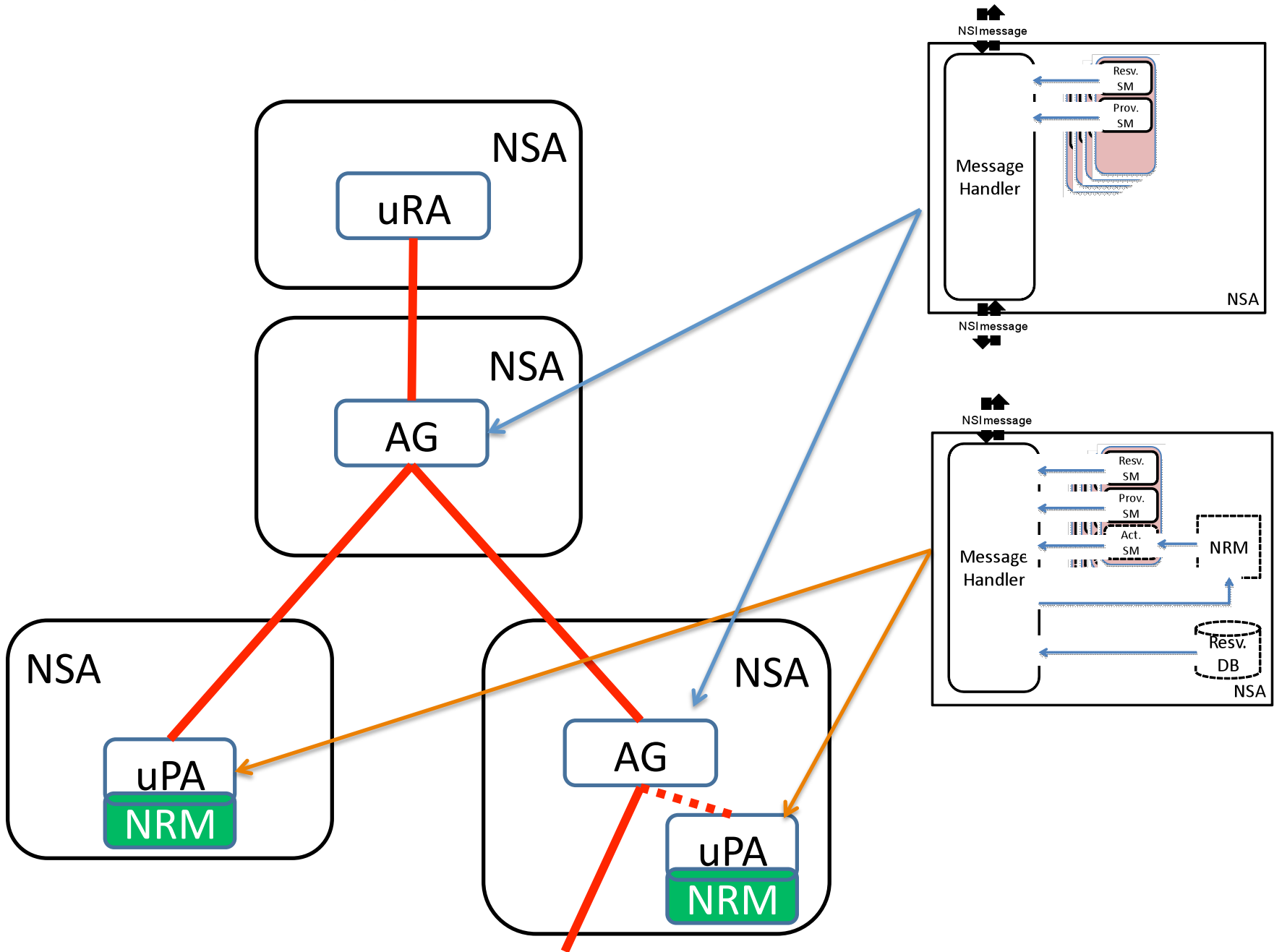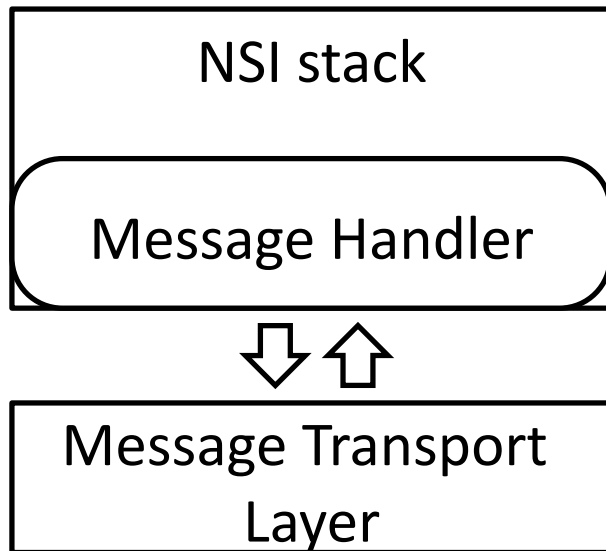# NSI Message handling and delivery

NSA: uRA, Aggregator and uPA

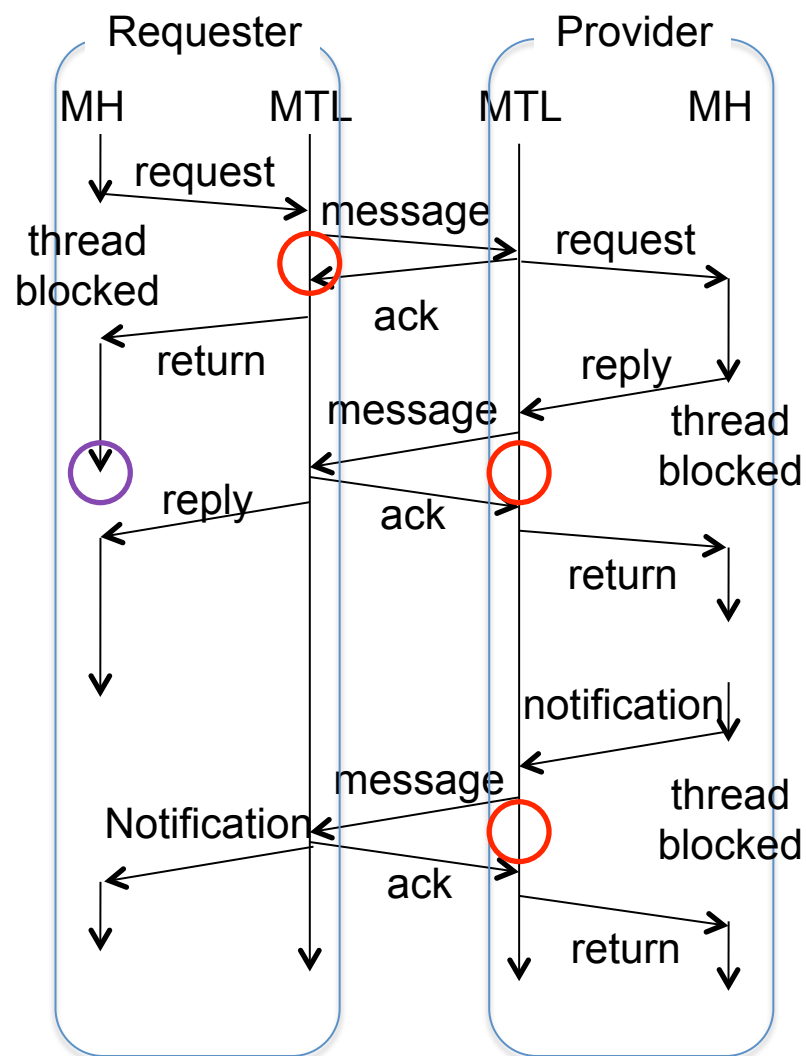# Message Handler (MH) and
Message Transport Layer (MTL)

```
┌─────────────────────────────┐
│         NSI stack           │
│  ┌───────────────────────┐  │
│  │   Message Handler     │  │
│  └───────────────────────┘  │
└─────────────────────────────┘
          ⇩ ⇧
┌─────────────────────────────┐
│    Message Transport        │
│         Layer               │
└─────────────────────────────┘
```

- MH is a part of NSI stack, and uses MTL to send/receive messages
- MH is primarily responsible for keeping track of messaging state, e.g.
  - Who was the message sent to
  - Was the message received (i.e. ack'ed or MTL timeout)
  - Who has not replied to the message (e.g. *.cf, *.fl, etc)

- MTL is primarily responsible for sending and receiving messages, and notifying MH if the message was received, or if a (MTL) timeout occurs
- MTL interface (to MH) has 2 simple operations:
  - Send: blocks until ack is returned by destination MTL, or timeout happens. Timeout value is implementation dependent. NB: The MTL may be implemented to retry sending messages, but this is opaque to the MH
  - Receive: a thread in MH is invoked when a message is received

Message ack, reply and timeouts

○ : MTL timeout may happen

○ : MH timeout may happen

- Ack is sent by MTL for each message
  - If ack is not returned in a certain period of time, MTL timeout occurs
- Reply is sent by MH (via MTL) and is either confirm, fail or not_applicable
  - MH can timeout if expected reply is not received from a child

Timeouts

- Message transport layer (MTL) timeout
  - Underlying MTL (http/tcp) initiates a MTL timeout
  - Happens when an ack is not returned for a message.
- Message Handler (MH) timeout
  - MH can timeout if a reply message is not returned in a certain period of time
- MH notifies both MTL and MH timeouts to the parent RA
- When a MTL/MH timeout is notified, uRA can either retry or terminate the connection.
  - Retry is requested by NSI_messageRetry.rq, which has the original request message's id (correlation id) as a parameter
  - MH keeps not-yet-replied requests in a table, so that it can re-send the request.

Tables an aggregator MH maintains for each reservation (connection)

FAIL_FLAG(cor)

CON	A	Z	Parameters

COR		FAIL_FLAG

CL(con)

RCV_LIST(cor)

NSA1	C_CON1	A1	Z1	Parameters1	RSM1	PSM1	ASM1	LSM1
NSA2	C_CON2	A2	Z2	Parameters2	RSM2	PSM2	ASM2	LSM2
NSAn	C_CONn	An	Zn	Parametersn	RSMn	PSMn	ASMn	LSMn

C_COR1	STATUS1
C_COR2	STATUS2
C_CORn	STATUSn

Expected states of children
including version info.
(for non-recursive queries)

Flags to indicate:
- A reply has been received
- A MTL timeout has occurred
- A MH timeout has occurred

Generated for each reservation (connection)

Generated for each request