Automotive Industry

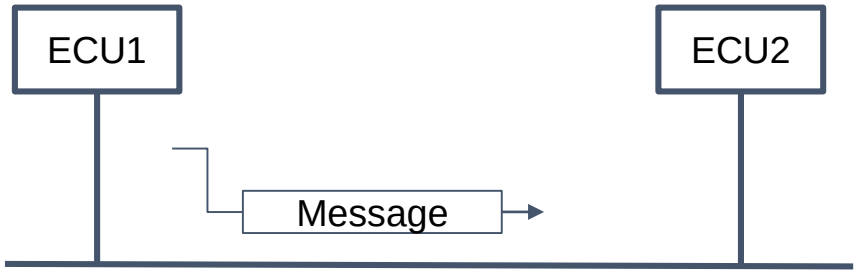
AUTOSAR Communication Stack

Agenda

- Overview of the Communication Stack
- AUTOSAR Com features
- Know the interface between Applications and COM modules
- Know the interface between COM and Lower layer modules

Overview of communication stack

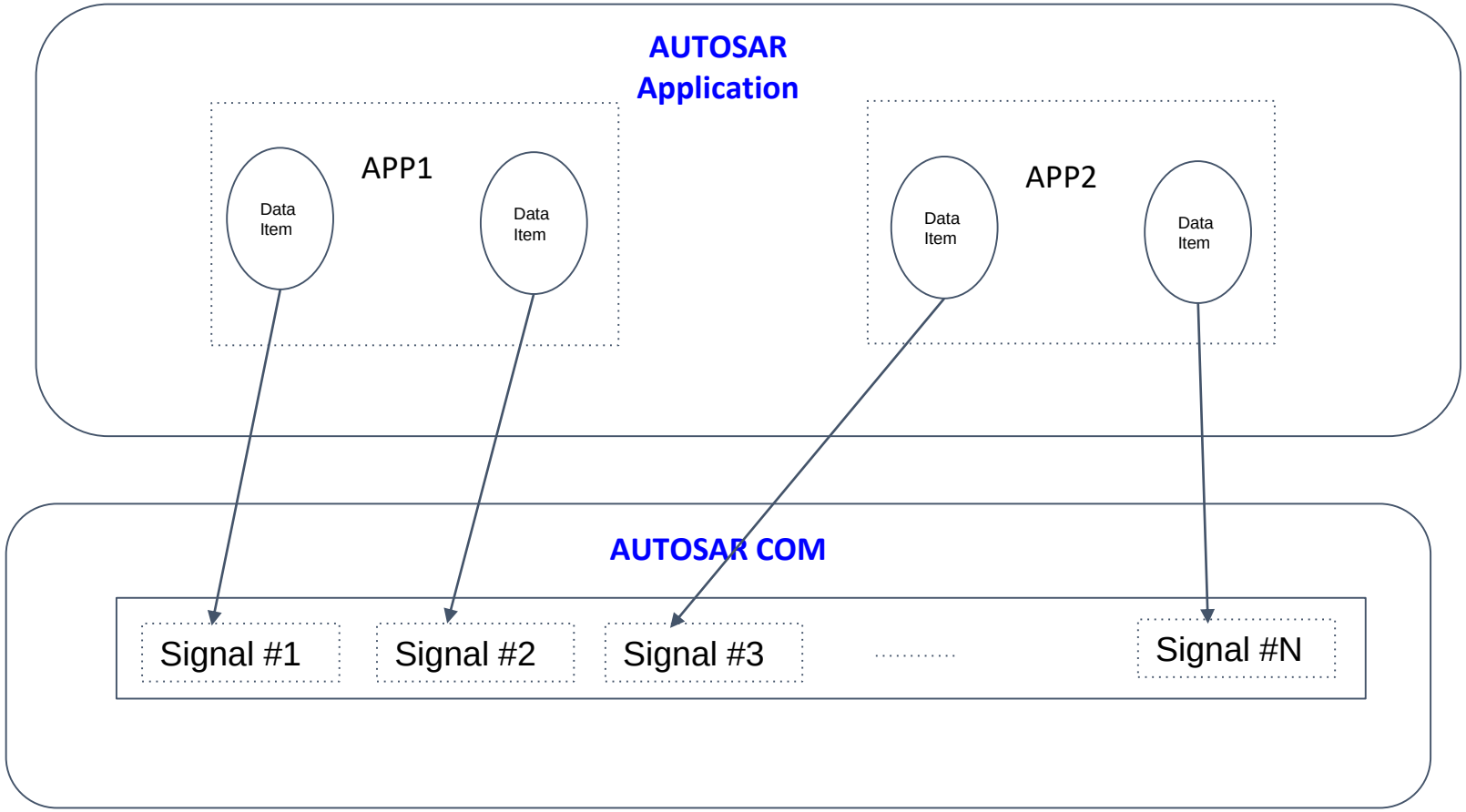
- ECU sends messages over different networks (Can , Lin , Flexray ..) these messages called PDUs (Protocol Data Unit)



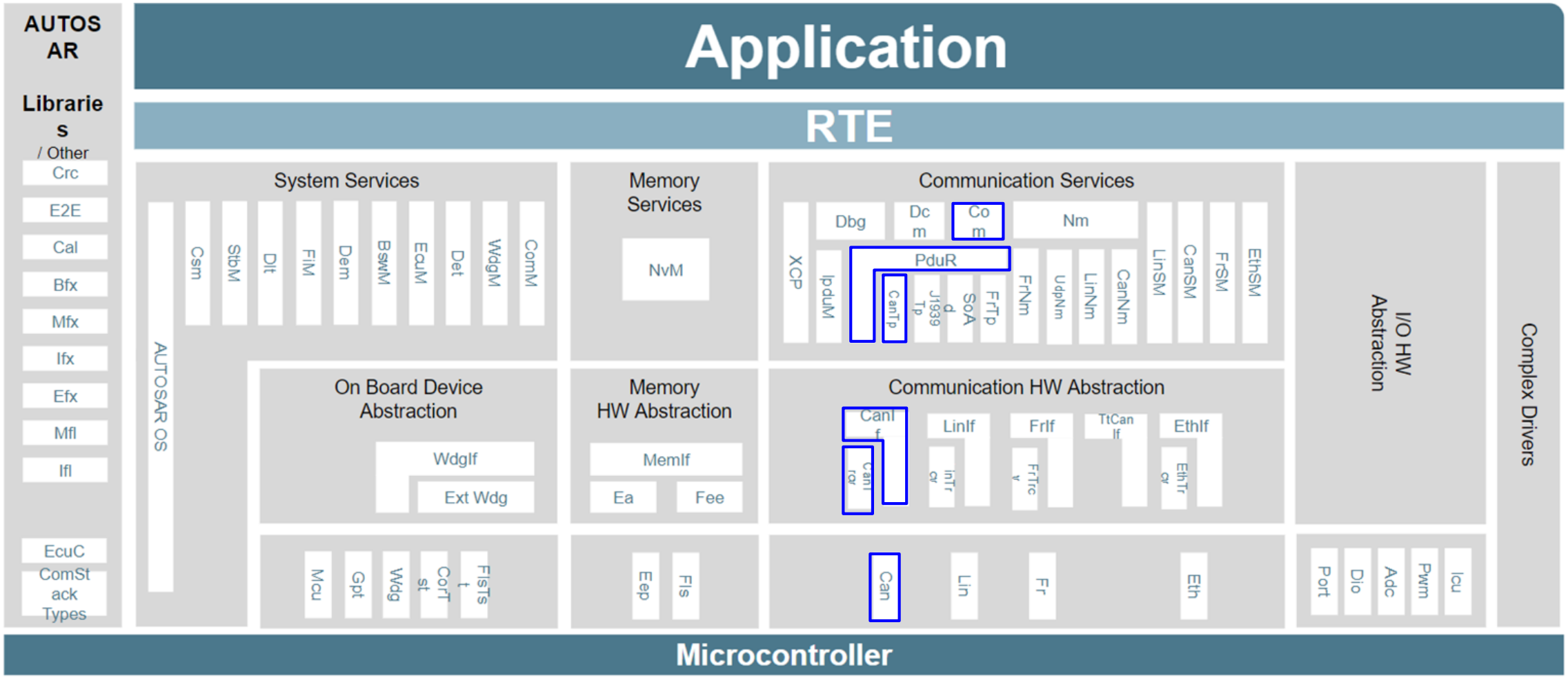
- Each message/PDU consists of different signals

Overview of communication stack

- Data items sent or received by applications are mapped to signals



Overview of communication stack



Overview of communication stack

- AUTOSAR Com Stack modules role :
  - Com module : Packs signals from application into PDUs
  - PduR module : Routes PDUs to different communication protocols
  - CanTp module : Performs segmentation of large PDUs
  - CanIf module : Maps PDUs to their corresponding specific Can IDs
  - Can module : Access microcontroller registers in order to send actual Can frame on physical bus

AUTOSAR COM features

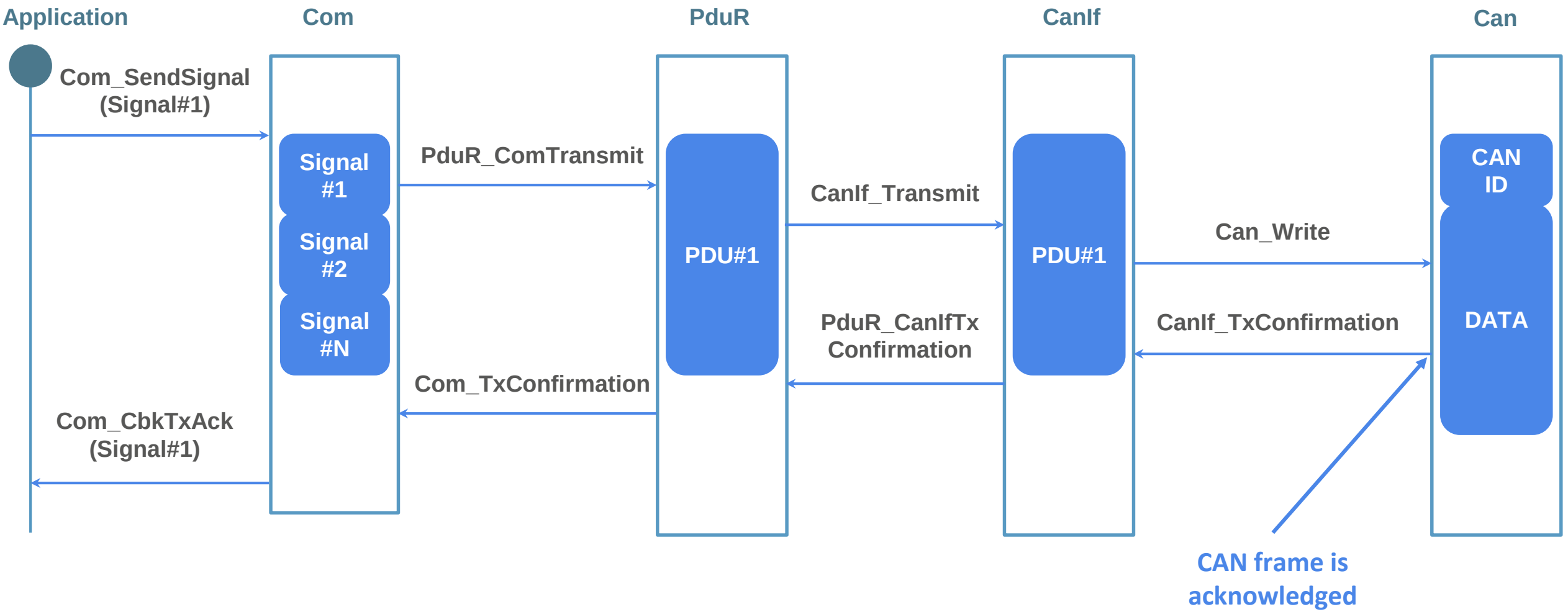
- Why do we need AUTOSAR COM module ?
  - Common software communication interfaces for AUTOSAR applications (SW-C)
  - Services to transfer data between applications , through different communication networks

AUTOSAR COM features

- Communication Modes
  - Transmission modes (Pdu level)
    - Direct
    - Periodic
    - Mixed
  - Transfer property (Signal level)
    - Triggered
    - Triggered (On change)
    - Pending

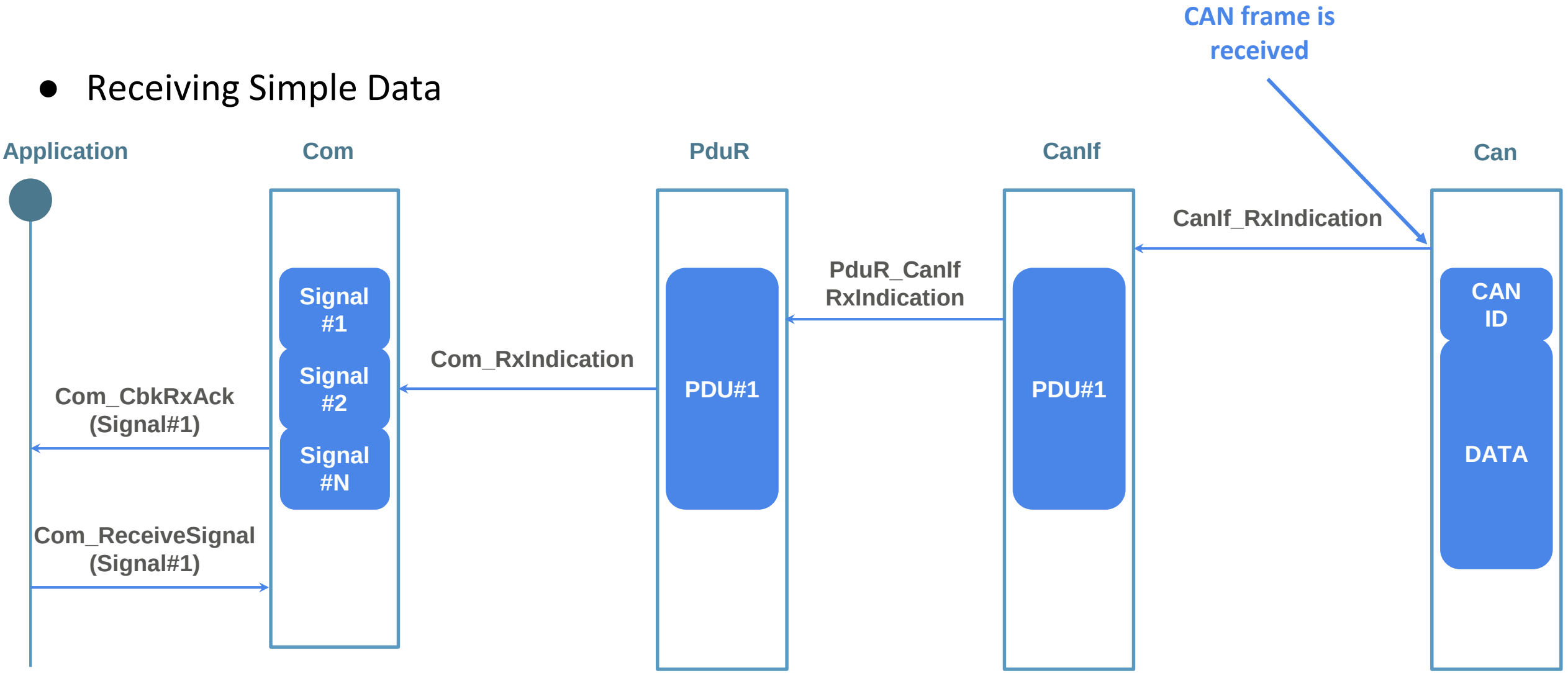
AUTOSAR COM features

- Sending Simple Data



AUTOSAR COM features

- Receiving Simple Data



AUTOSAR COM features

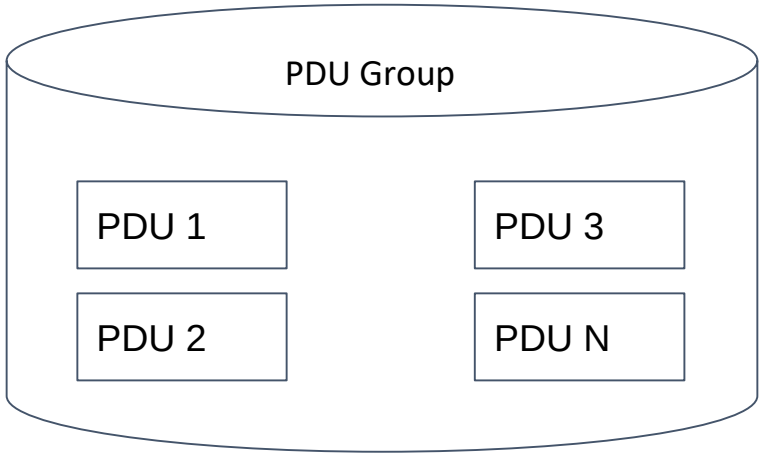
- Filtering
  - Filter control passage of signals from/to the application
  - A filtering algorithm either evaluates to true or false
  - On receiver side
    - Filter out the signal received by Com
  - On sender side
    - Not use to filter out the signal but depending on whether the signal satisfies a certain condition or not the transmission mode of the I-PDU is affected

AUTOSAR COM features

- Filtering
  - Different kinds of filtering algorithms are used by Com :
    - ALWAYS
    - NEVER
    - NEW_IS_WITHIN
    - NEW_IS_OUTSIDE
    - MASKED_NEW_EQUALS_X
    - MASKED_NEW_DIFFERS_X

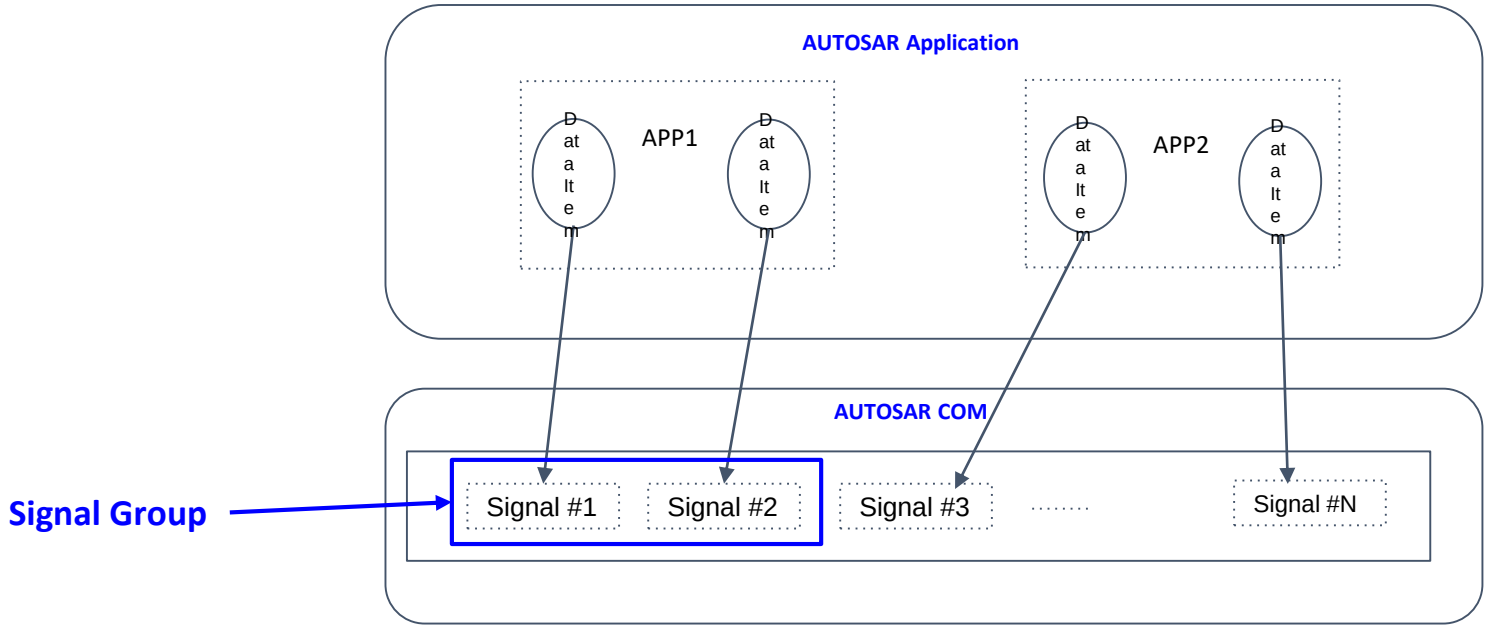
AUTOSAR COM features

- PDU Groups
  - PDU group : A number of PDUs that can be logically grouped
  - Those PDUs are treated by Com as a group that can be activated (started) or deactivated (stopped) together



AUTOSAR COM features

- Complex Data Type Handling
  - Data items which have complex data types (e.g. structures) should be updated atomically
  - Com wraps them in **Signal Groups**
  - When the values of the elements of a complex data item need to be updated , Com guarantees that all elements are updated atomically

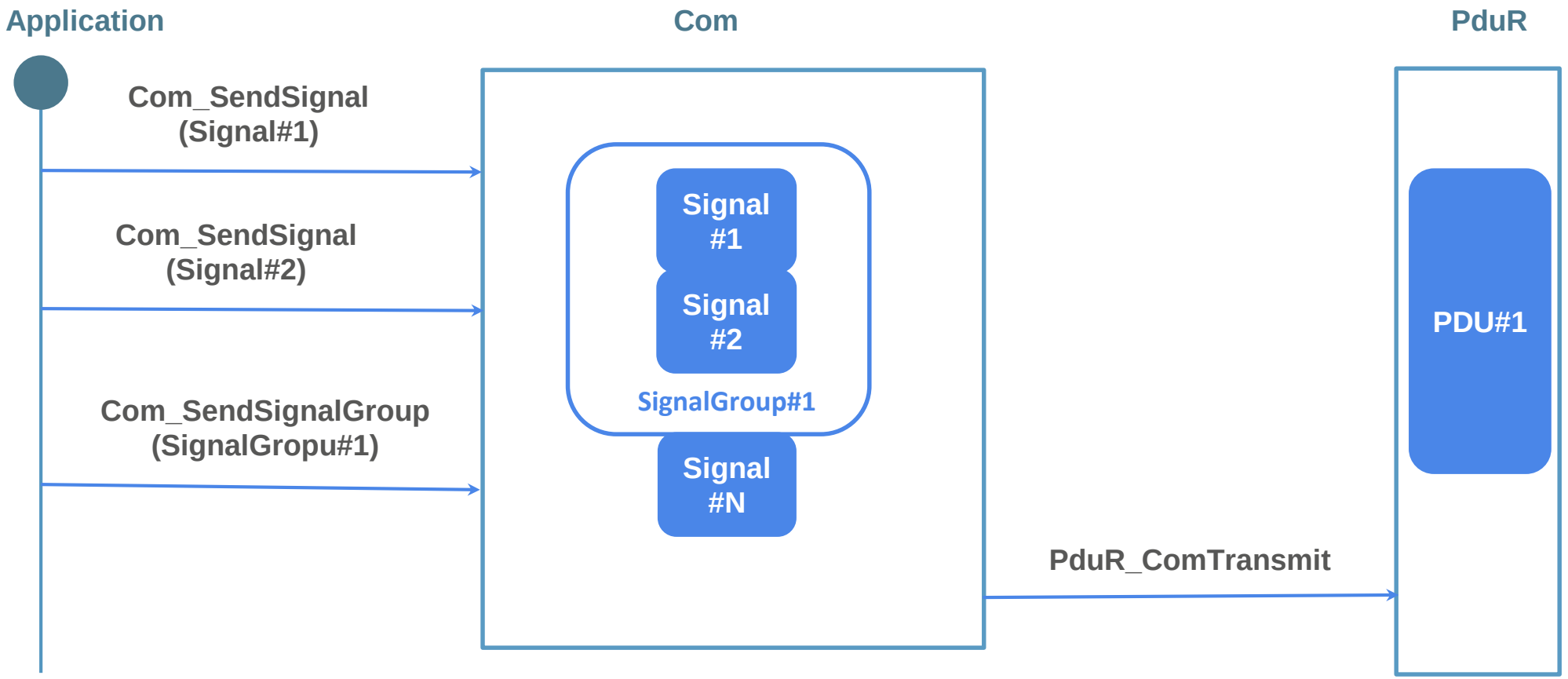


AUTOSAR COM features

- Complex Data Type Handling
  - Transmission of complex data in a signal group
    - Com_SendSignal(Signal #1 , Value)
    - Com_SendSignal(Signal #2 , Value)
    - Com_SendSignalGroup(Signal group)
  - Reception of complex data in a signal group
    - Com_ReceiveSignalGroup(Signal group)
    - Com_ReceiveSignal(Signal #1 , &data1)
    - Com_ReceiveSignal(Signal #2, &data2)

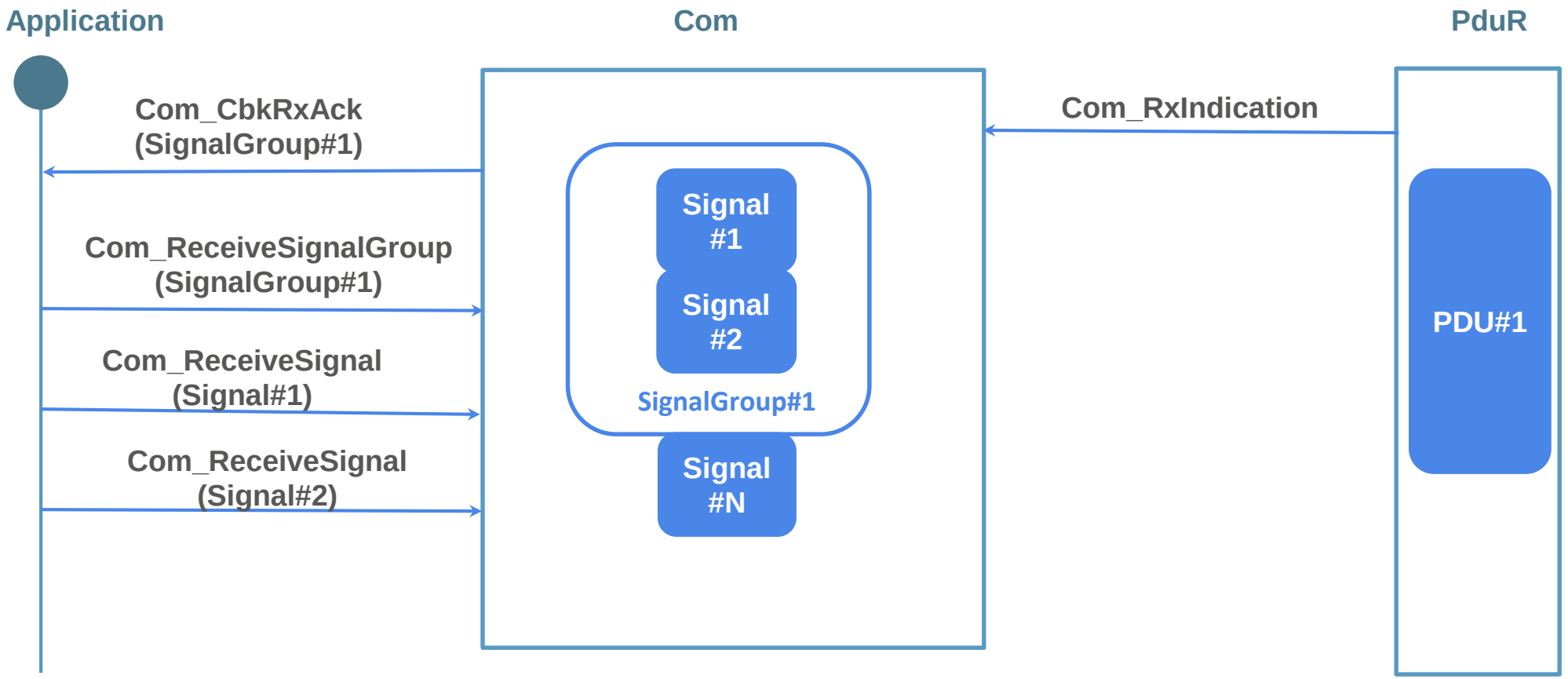
AUTOSAR COM features

- Sending Complex Data



AUTOSAR COM features

- Receiving Complex Data



AUTOSAR COM features

- Signal Invalidation
  - Indicates that the sender is not able to provide a valid value for a signal , for example in case a sensor is faulty (parameter : ComSignalDataInvalidValue)
  - Transmission
    - Com_InvalidateSignal(Signal ID)
    - Com_InvalidateSignalGroup(Signal Group ID)
  - Reception
    - Configuration parameter (ComDataInvalidAction)
      - Notify
      - Replace
      - None

AUTOSAR COM features

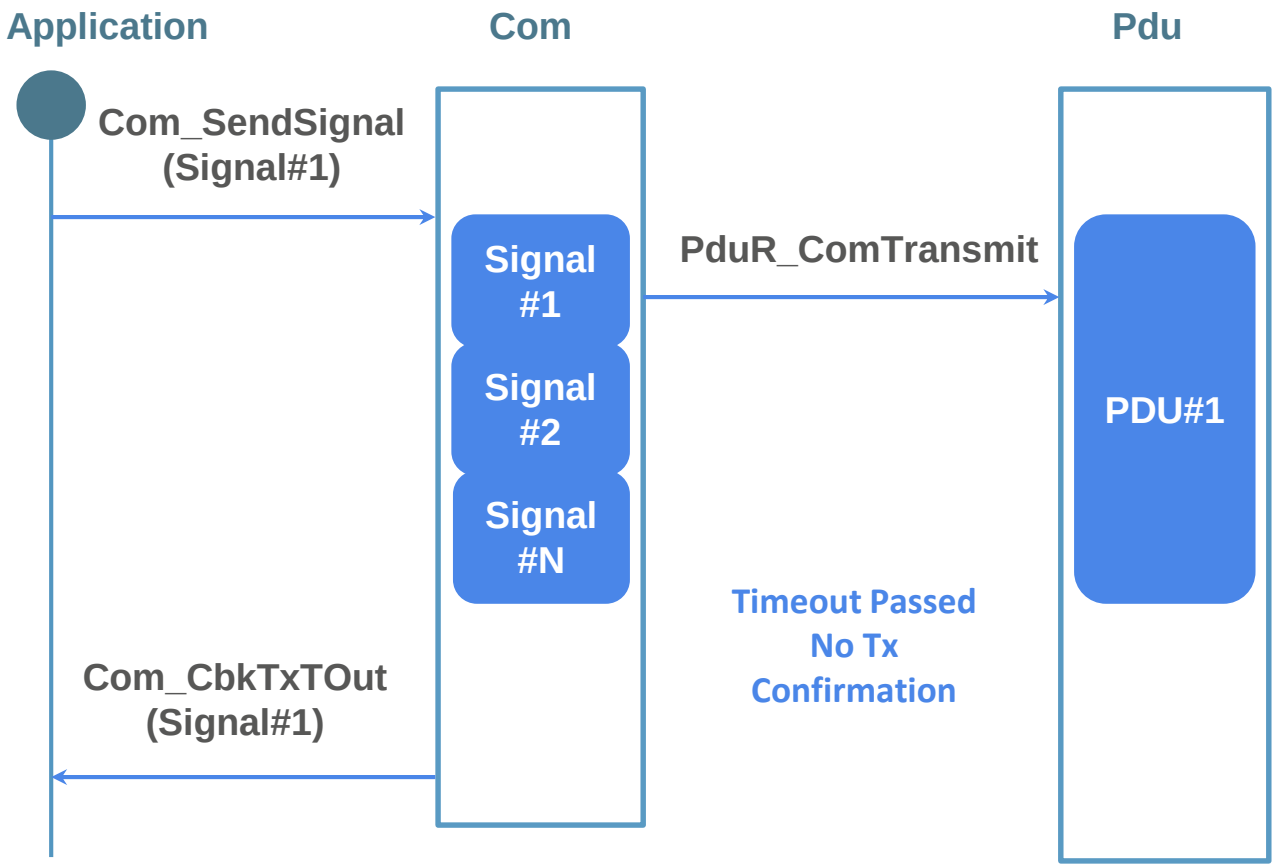
- Minimum Delay Timer
  - A minimum delay time “ComMinimumDelayTime” between transmissions can be configured per PDU
  - If a transmission is requested before MDT expires , the next transmission is postponed until the delay time expires
  - If “ComMinimumDelayTime” is configured with 0 , no minimum delay time monitoring shall be performed

AUTOSAR COM features

- Deadline Monitoring
  - Reception Deadline Monitoring
    - Used to verify that periodic PDUs are received within the allowed time frame
  - Transmission Deadline Monitoring
    - Used to verify that transmission requests are acknowledged by other ECUs on the network (TxConfirmation is received) within a given time frame
  - Configuration parameters
    - ComTimeout
    - ComFirstTimeout
    - ComRxDataTimeoutAction
    - ComTimeoutNotification

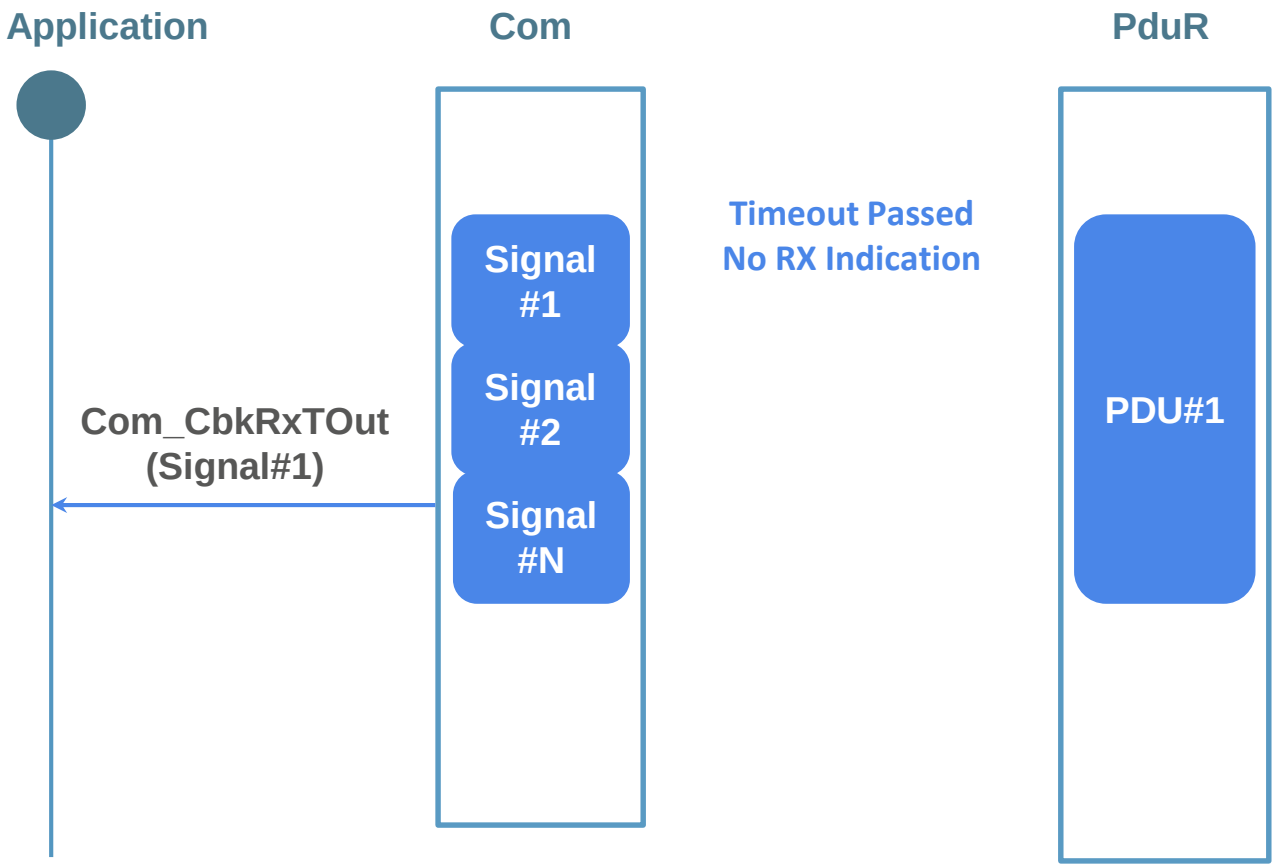
AUTOSAR COM features

- Monitoring TX Data



AUTOSAR COM features

- Monitoring RX Data



AUTOSAR COM features

- Update Bit
  - Allows the receiver to identify whether the sender has updated the data in the signal before sending the PDU or not
  - An update bit can be configured for each signal or signal group through “ComUpdateBitPostion”
  - On the sender side , AUTOSAR COM shall set the update bit if the application updates the value of the signal or the signal group
  - On the receiver side , AUTOSAR COM shall only process the signal or the signal group if the update is set otherwise it is discareded

AUTOSAR COM features

- Large Data Types
  - A large signal is a signal that is too large to fit into a single PDU of the underlying communication protocol (e.g. CAN protocol supports 8 bytes only as data in single CAN frame)
  - Large signals require configuring a large PDU that will be transmitted via the transport protocol of the underlying bus (e.g CanTp , LinTp , FrTp)

The End ...

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