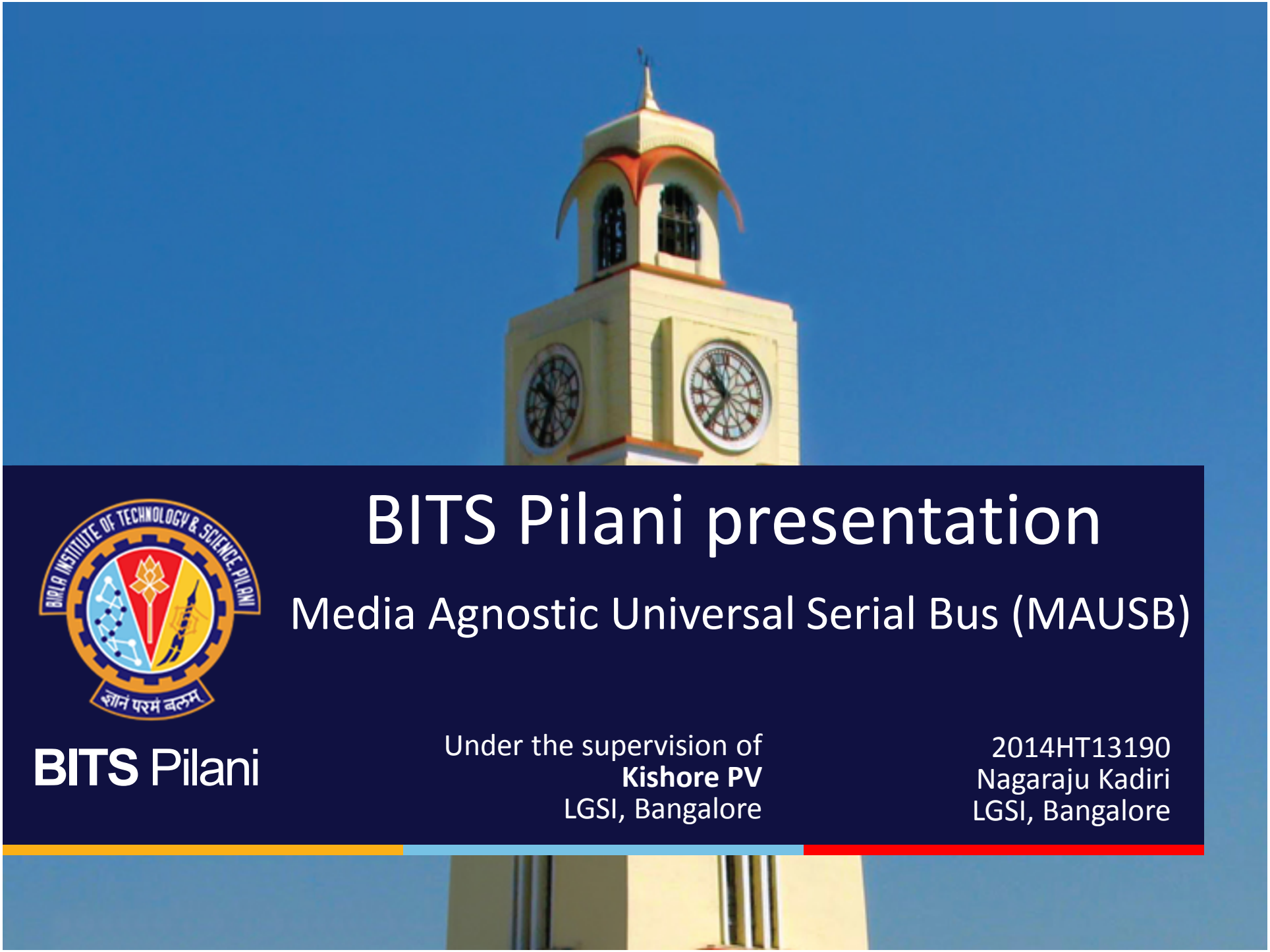


BITS Pilani presentation

Media Agnostic Universal Serial Bus (MAUSB)

BITS Pilani

Under the supervision of
Kishore PV
LGSI, Bangalore

2014HT13190
Nagaraju Kadiri
LGSI, Bangalore

innovate achieve lead

BITS Pilani

ZG 628T - Dissertation

Media Agnostic Universal Serial Bus

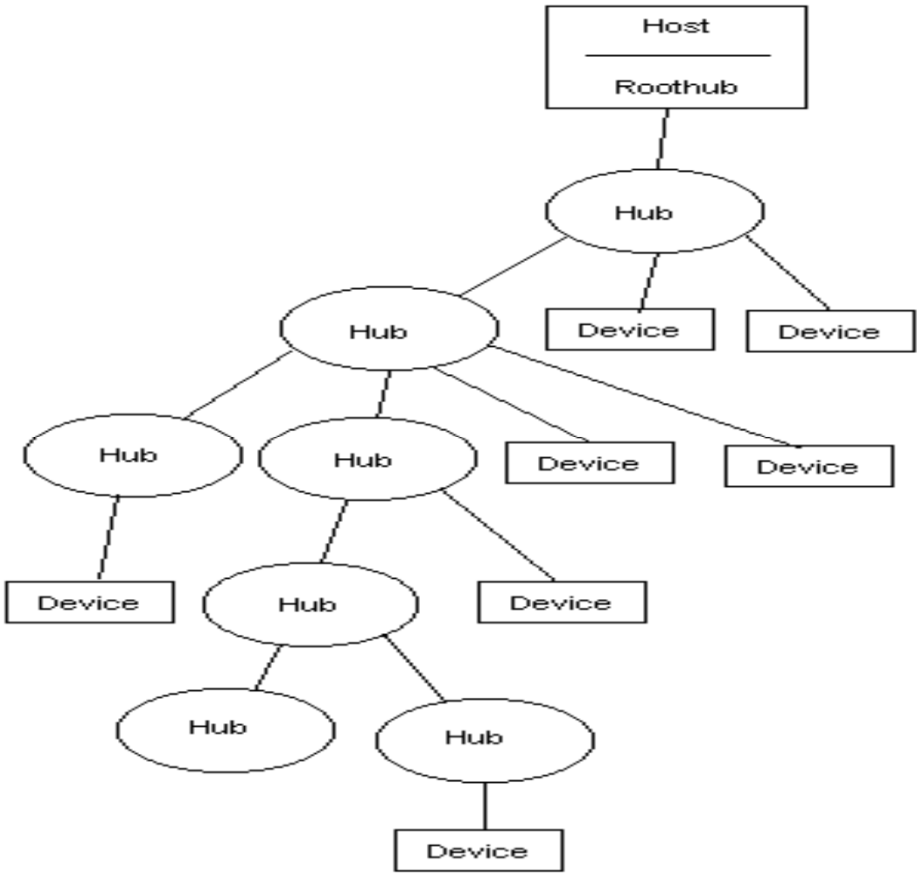
AGENDA

- MAUSB Introduction
- USB Architecture
- MAUSB Architecture
- MAUSB Details of work done
- MAUSB Future of work

MAUSB Introduction

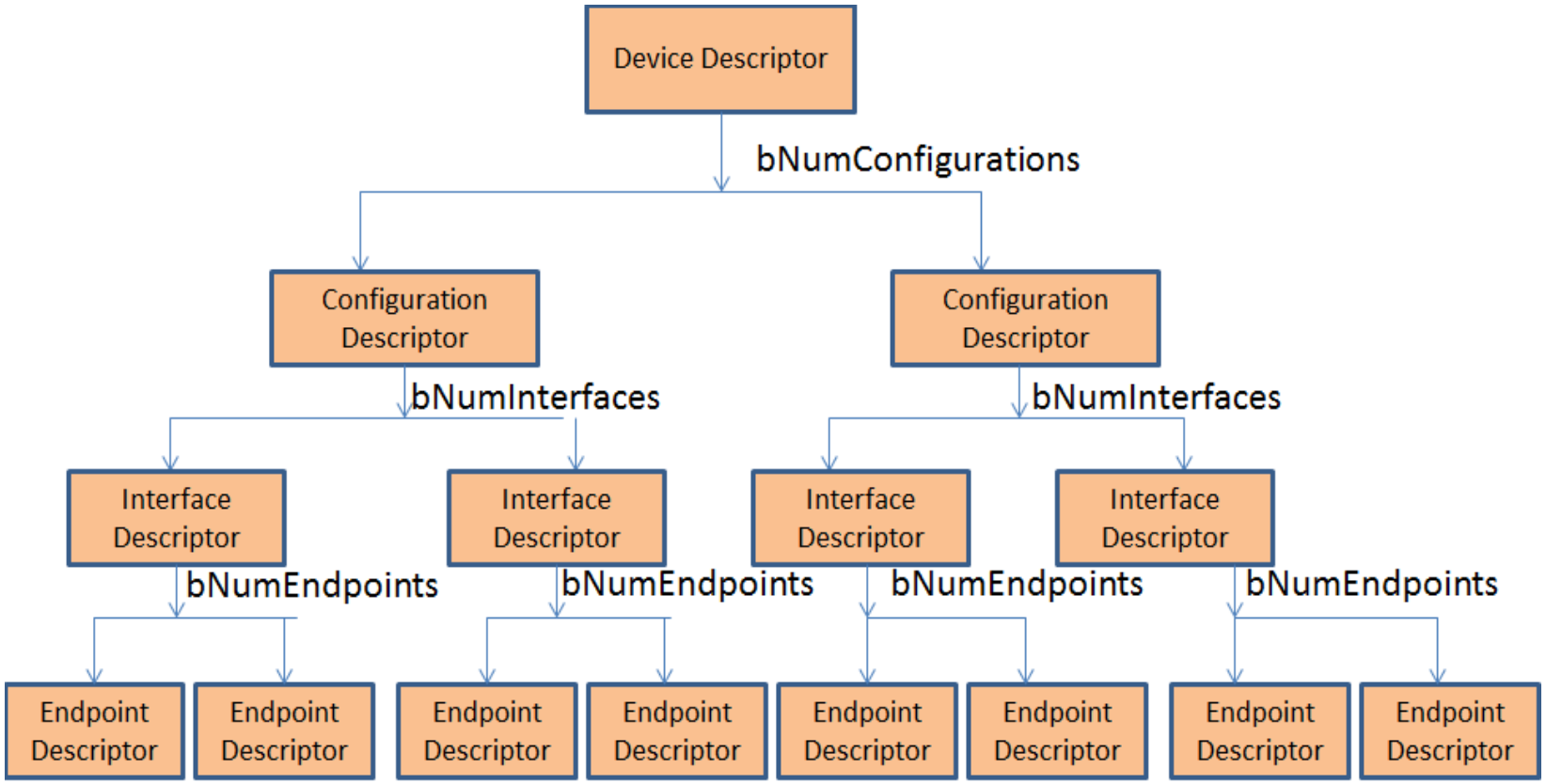
- MAUSB provides Connectivity over medium other than USB,
- Medium can be either WiFi or ZigBee or Bluetooth.
- Using MAUSB protocol we will get same functionality as USB port is available.
- MAUSB specifications are developed by USB forum.
- No more USB data cables are required

USB Architecture



USB Topology

USB Architecture



USB Descriptors

USB Packet

USB is made up of several layers of protocols. Each USB transaction consists of a

- Token Packet ,
- Optional Data Packet,
- Handshake Packet
- Start of frame Packet

USB Transfers

The Universal Serial Bus specification defines four transfers.

- Control Transfers
- Interrupt Transfers
- Isochronous Transfers
- Bulk Transfers

USB Control Transfer

- Control transfers are typically used for command and status operations.
- USB device with all enumeration being performed using control transfers.
- The packet length of control transfers in low speed devices must be 8 bytes, high speed devices allow a packet size of 8, 16, 32 or 64 bytes and full speed devices must have a packet size of 64 bytes.

USB Control Transfer

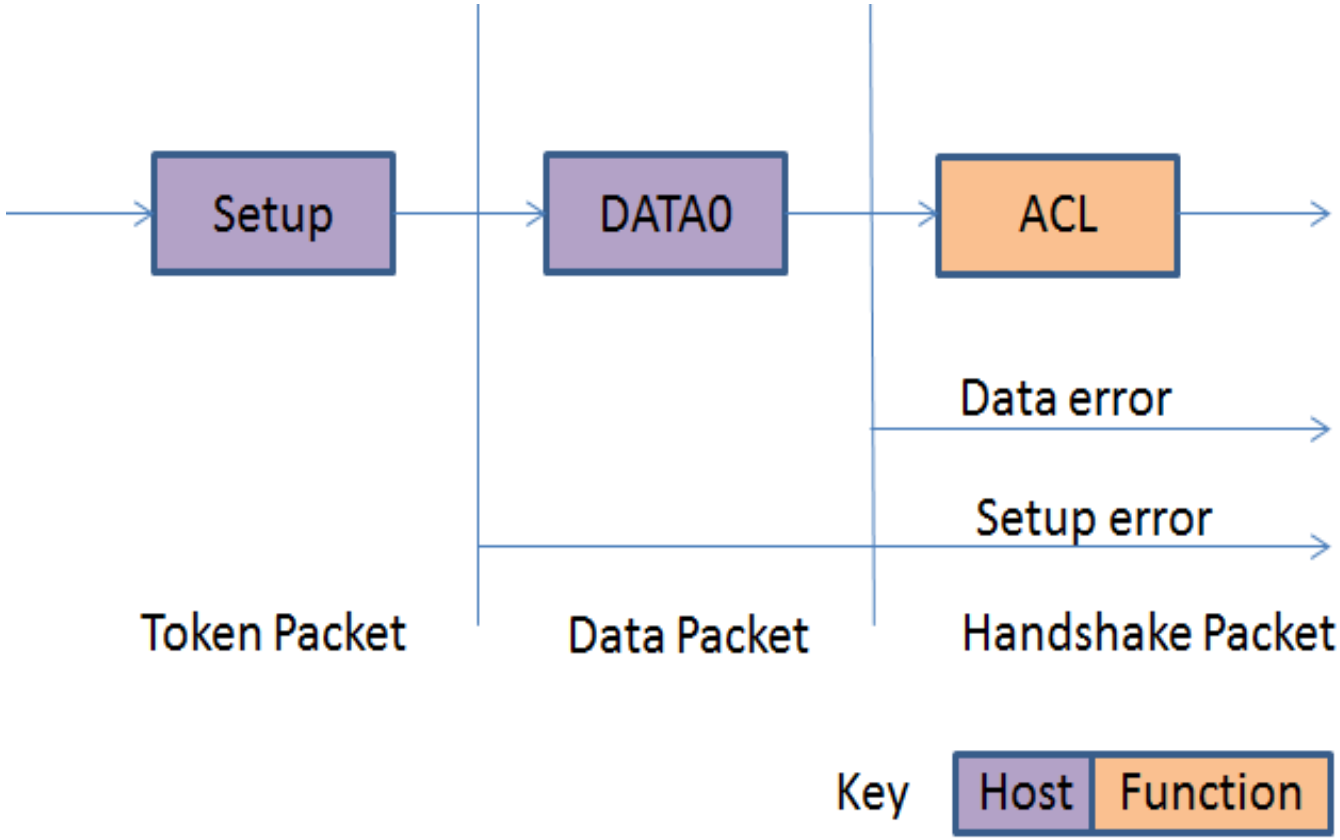
A control transfer can have up to three stages.

- Setup
- Data
- Status/Handshake

USB Interrupt Transfer

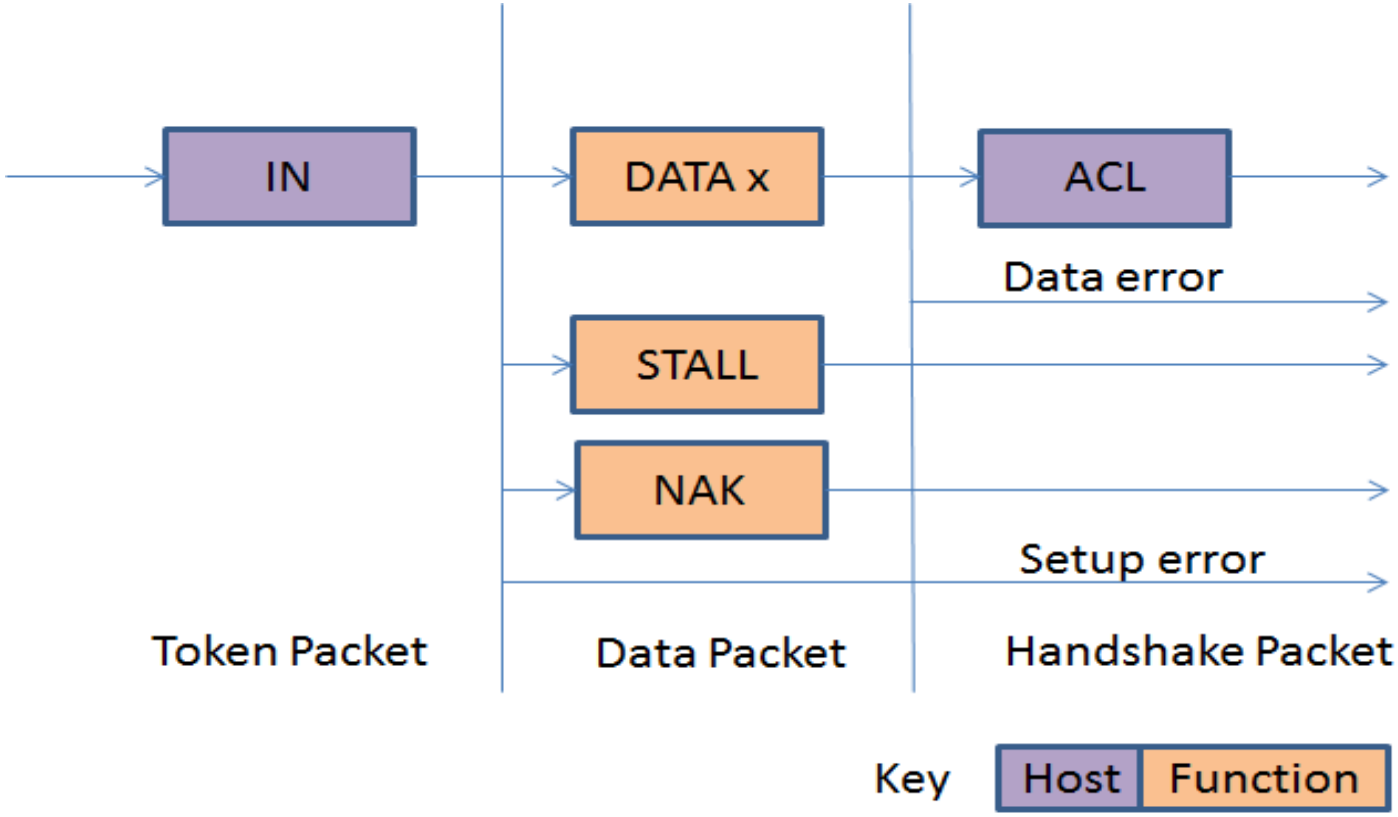
- Control transfers are typically used for command and status operations.
- USB device with all enumeration being performed using control transfers.
- The packet length of control transfers in low speed devices must be 8 bytes, high speed devices allow a packet size of 8, 16, 32 or 64 bytes and full speed devices must have a packet size of 64 bytes.

USB Control Transfer (Setup)



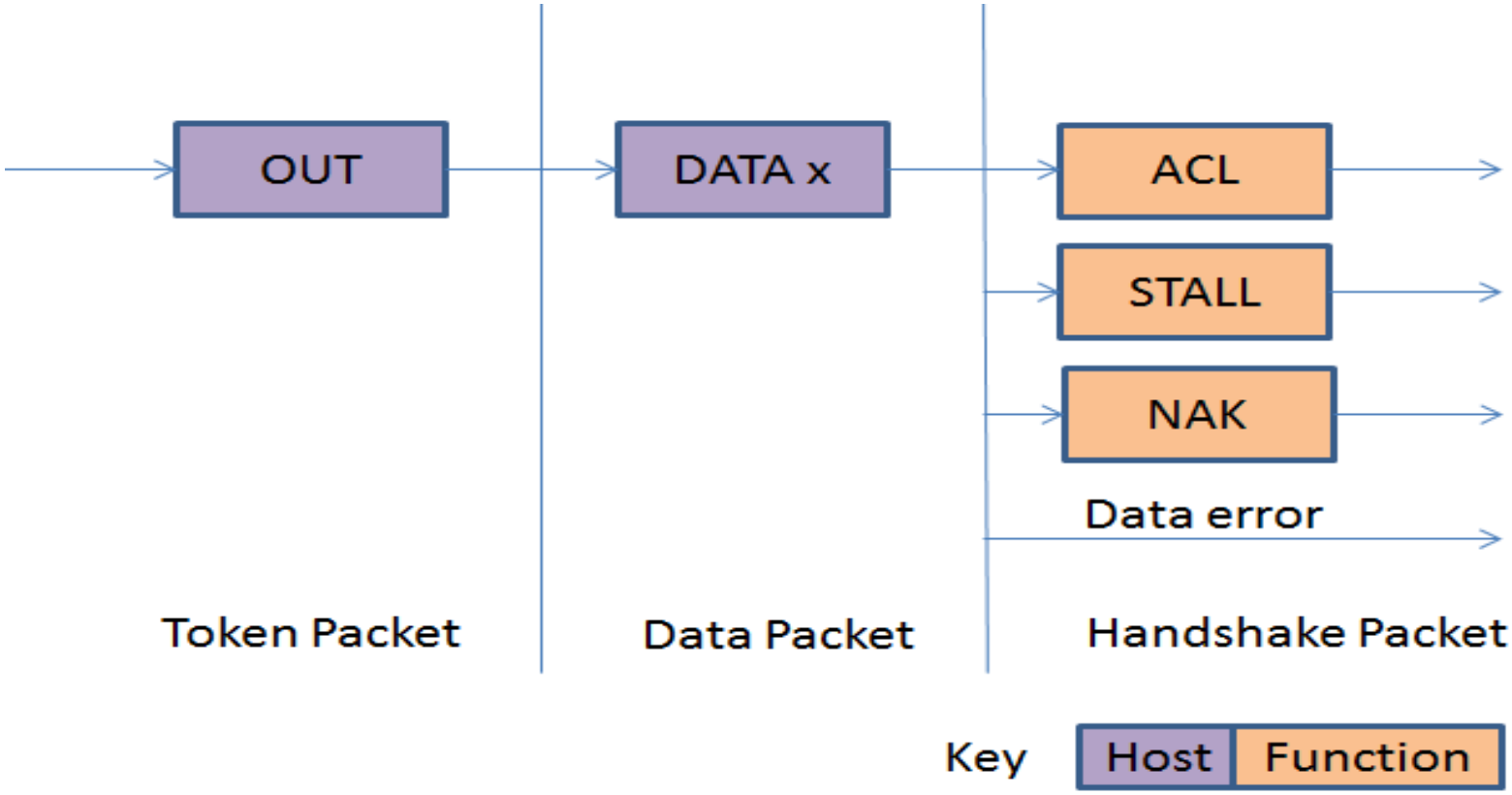
USB Control Transfer Setup Packet

USB Control Transfer (Data Stage)



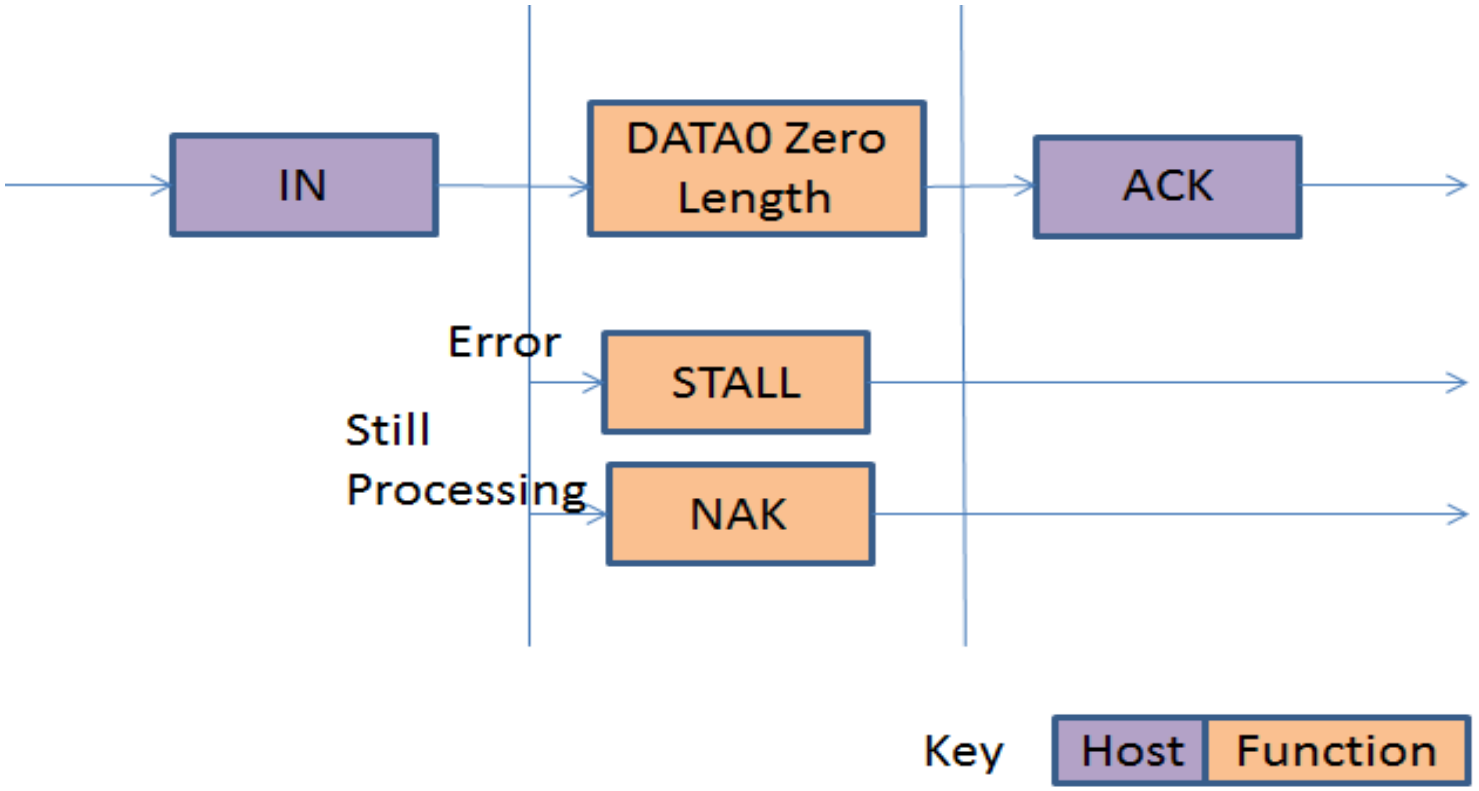
USB Control Transfer Data IN Packet

USB Control Transfer (Data Stage)



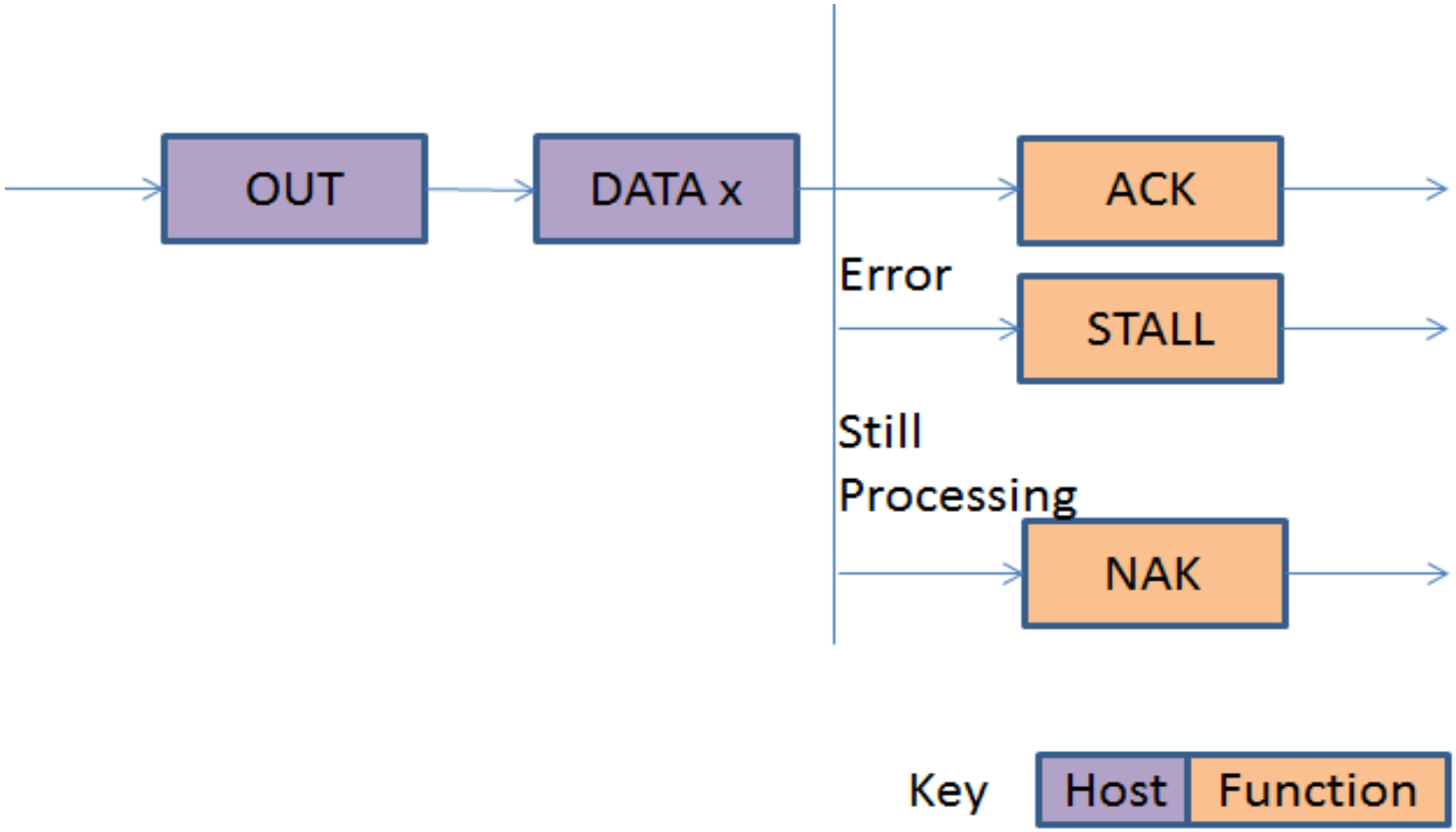
USB Control Transfer Data OUT Packet

USB Control Transfer (Status Stage)



USB Control Transfer Status IN Packet

USB Control Transfer (Status Stage)



USB Control Transfer Status OUT Packet

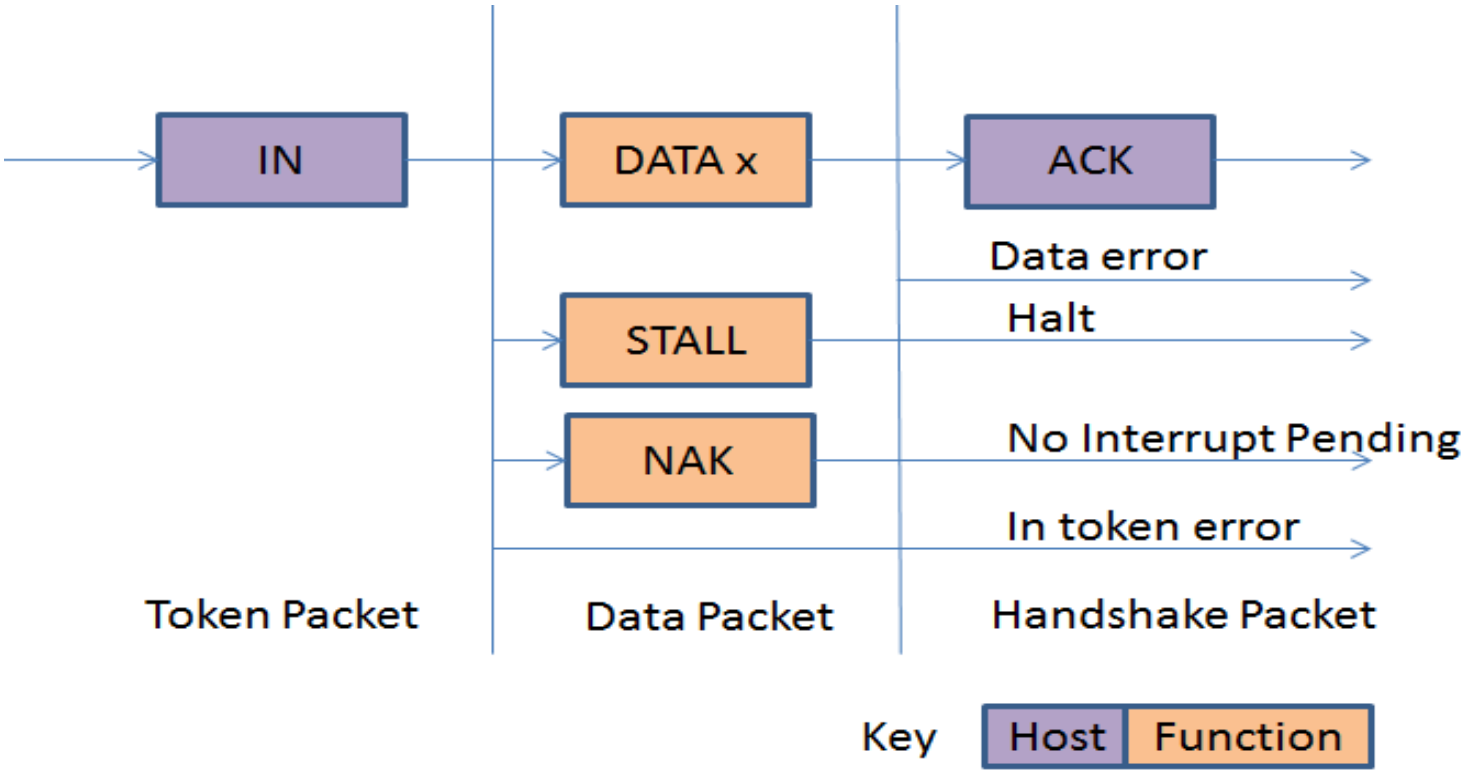
USB Interrupt Transfer

Interrupt transfers have nothing to do with interrupts. The name is chosen because they are used for the sort of purpose where an interrupt would have been used in earlier connection types.

- Guaranteed Latency
- Stream Pipe - Unidirectional
- Error detection and next period retry.

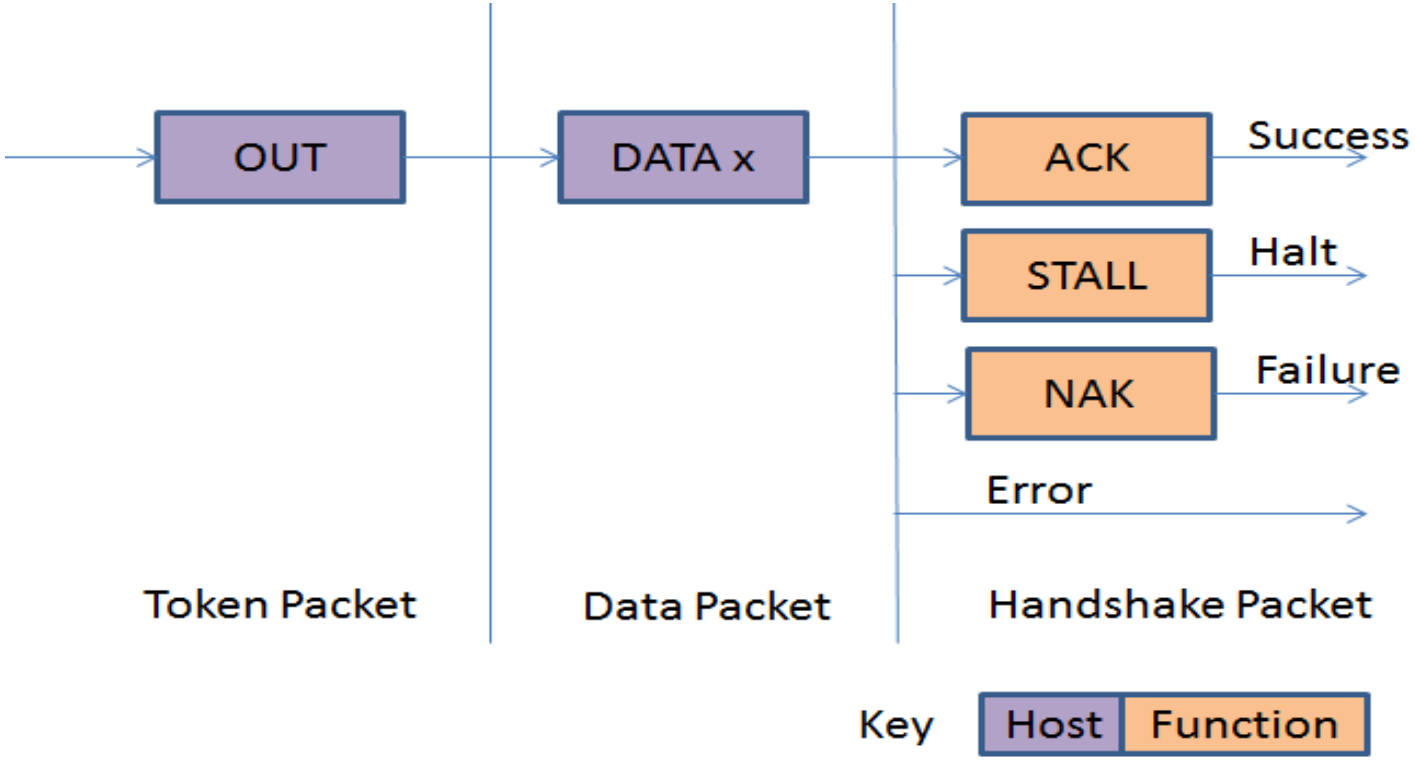
USB Control Transfer Status IN Packet

USB Interrupt Transfer



USB Interrupt Transfer IN Packet

USB Interrupt Transfer

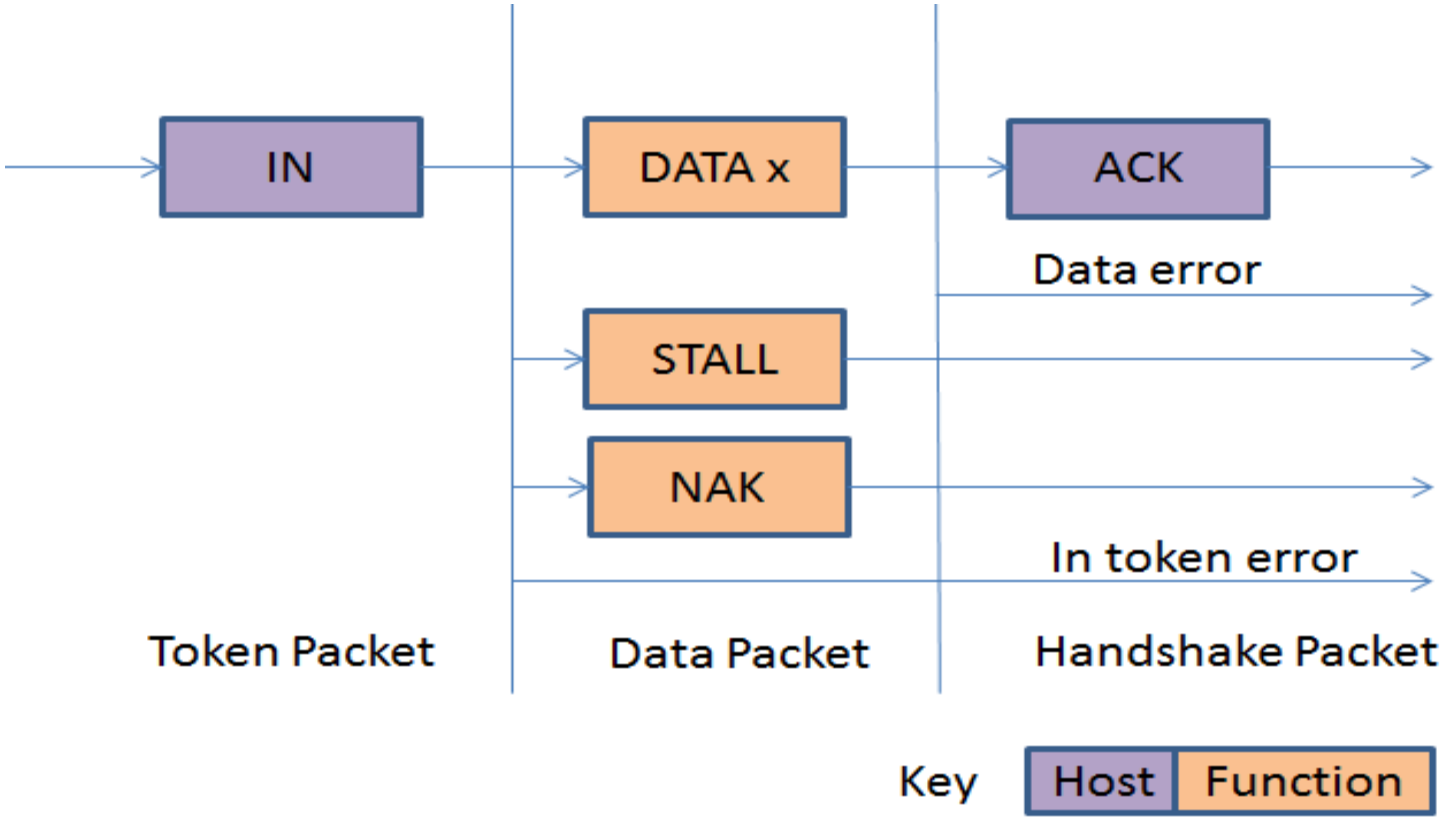


USB Interrupt Transfer OUT Packet

USB Bulk Transfer

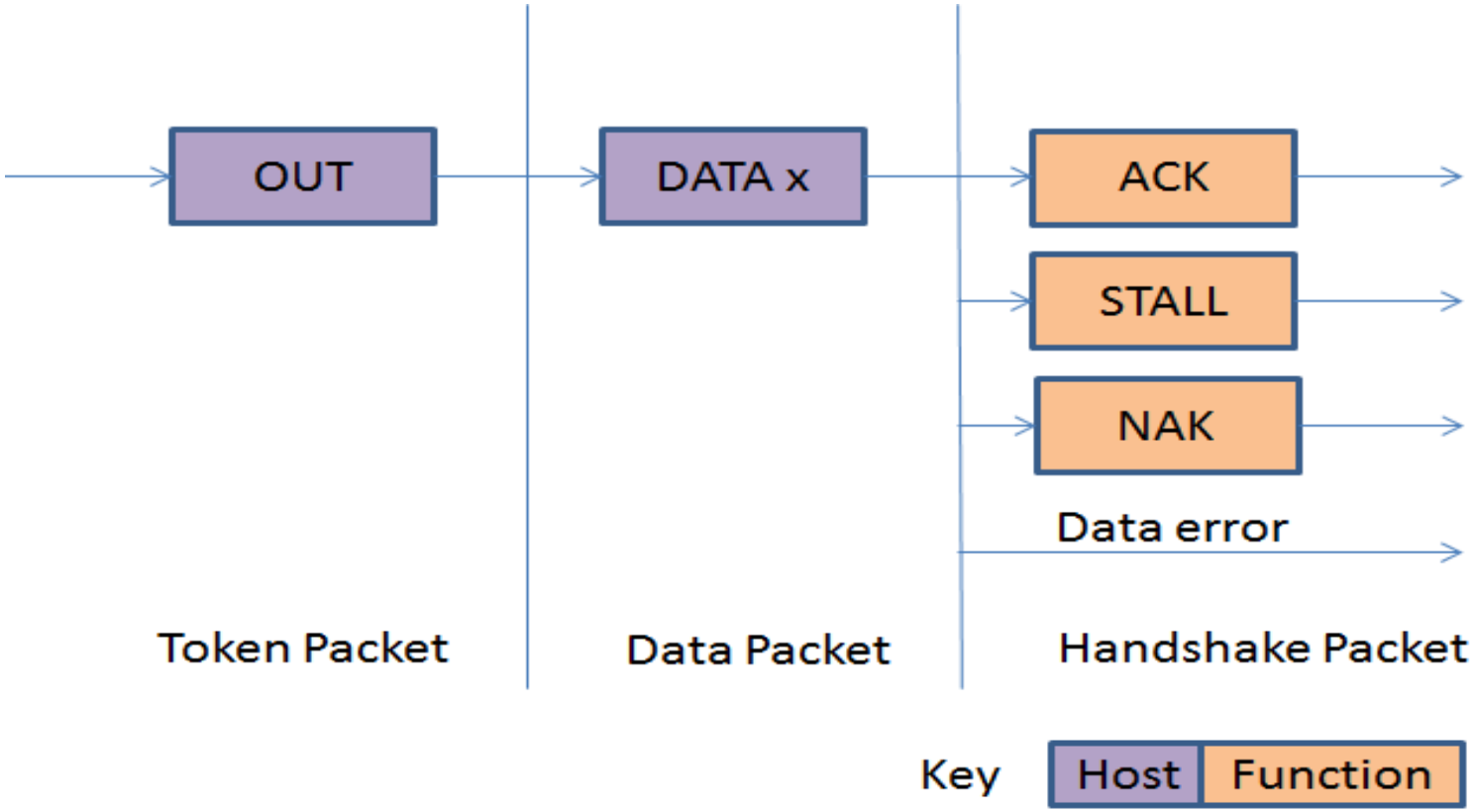
- Used to transfer large bursty data.
- Error detection via CRC, with guarantee of delivery.
- No guarantee of bandwidth or minimum latency.
- Stream Pipe – Unidirectional
- Full & high speed modes only.

USB Bulk Transfer



USB Bulk Transfer IN Packet

USB Bulk Transfer

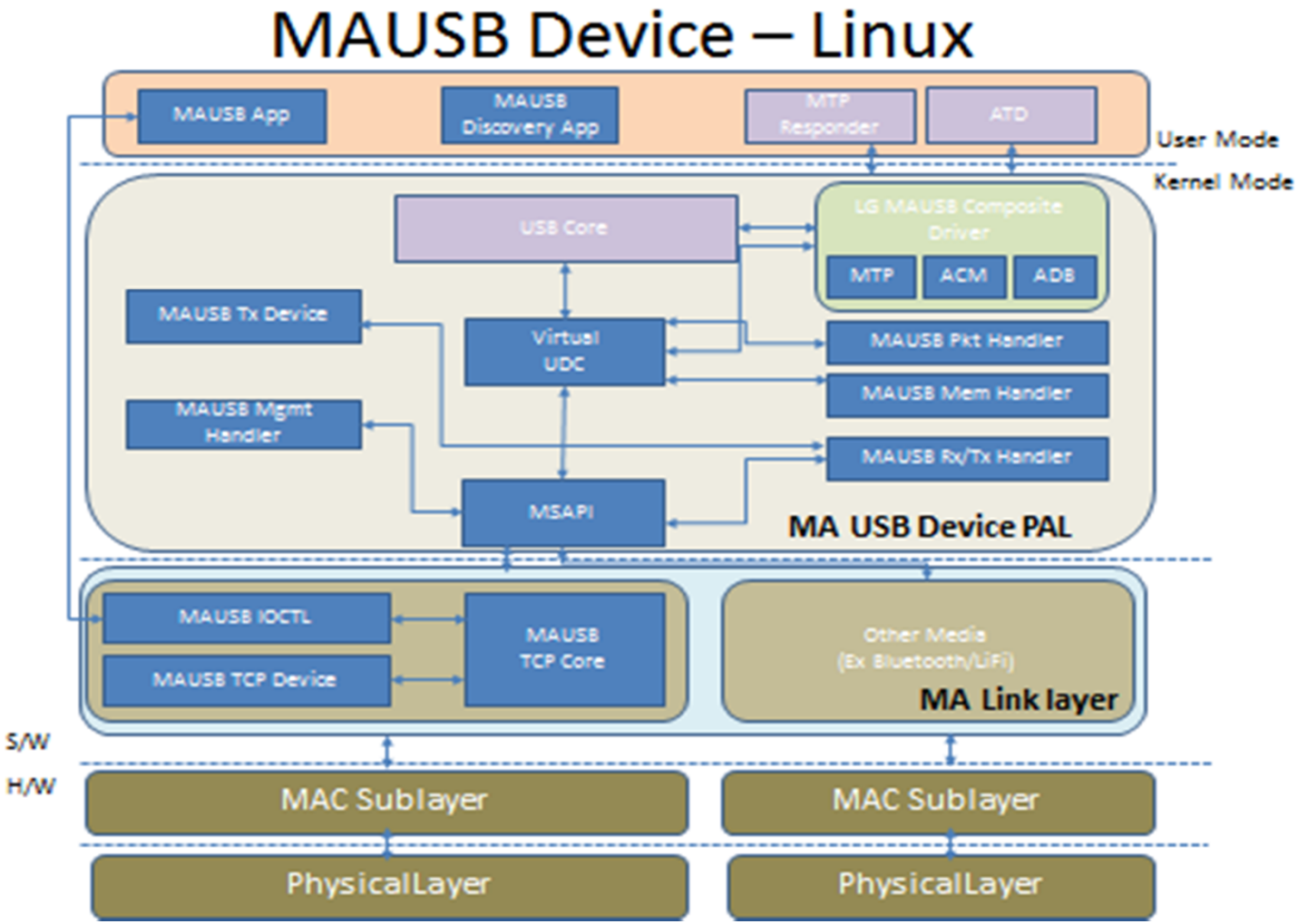


USB Bulk Transfer OUT Packet

USB Isochronous Transfer

- Guaranteed access to USB bandwidth.
- Bounded latency.
- Stream Pipe - Unidirectional
- Error detection via CRC, but no retry or guarantee of delivery.
- Full & high speed modes only.
- No data toggling.

MAUSB Architecture



MAUSB Modules

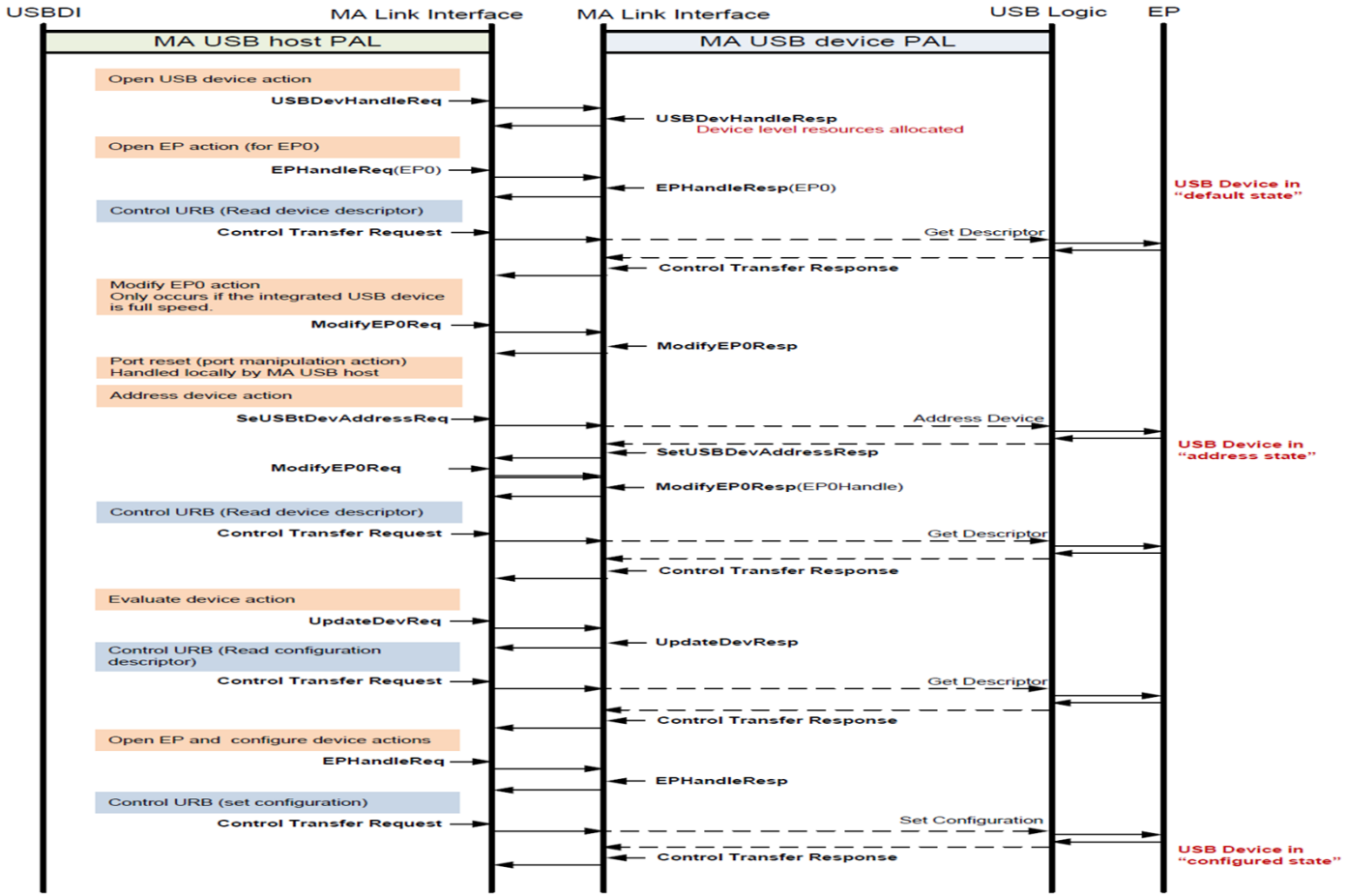
The MAUSB Driver contains the following modules in it

- MAUDC – Virtual USB Device Controller.
- MGMT – All Management packets are handled in this module.
- TRANSPORT – MAUSB RX thread is used to receive mausb packets from media.
- TRANSPORT – MAUSB TX thread is used to send mausb packets to media.

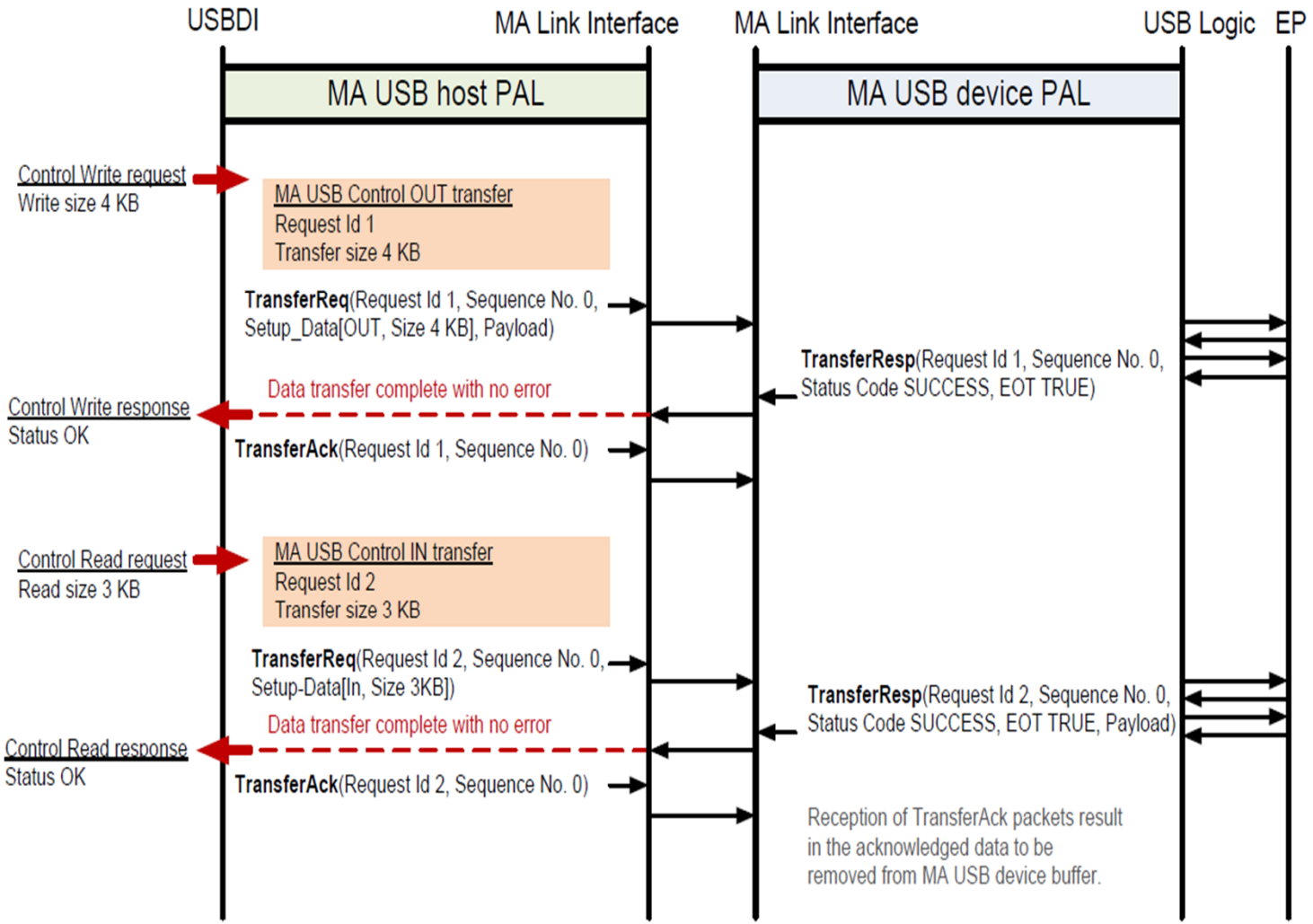
MAUSB Modules

- MS Packet Handler
- MAUSB Packet handling
  - Management Packet handling
  - Control Packet Handling
  - Data Packet Handling

MAUSB Device Enumaration

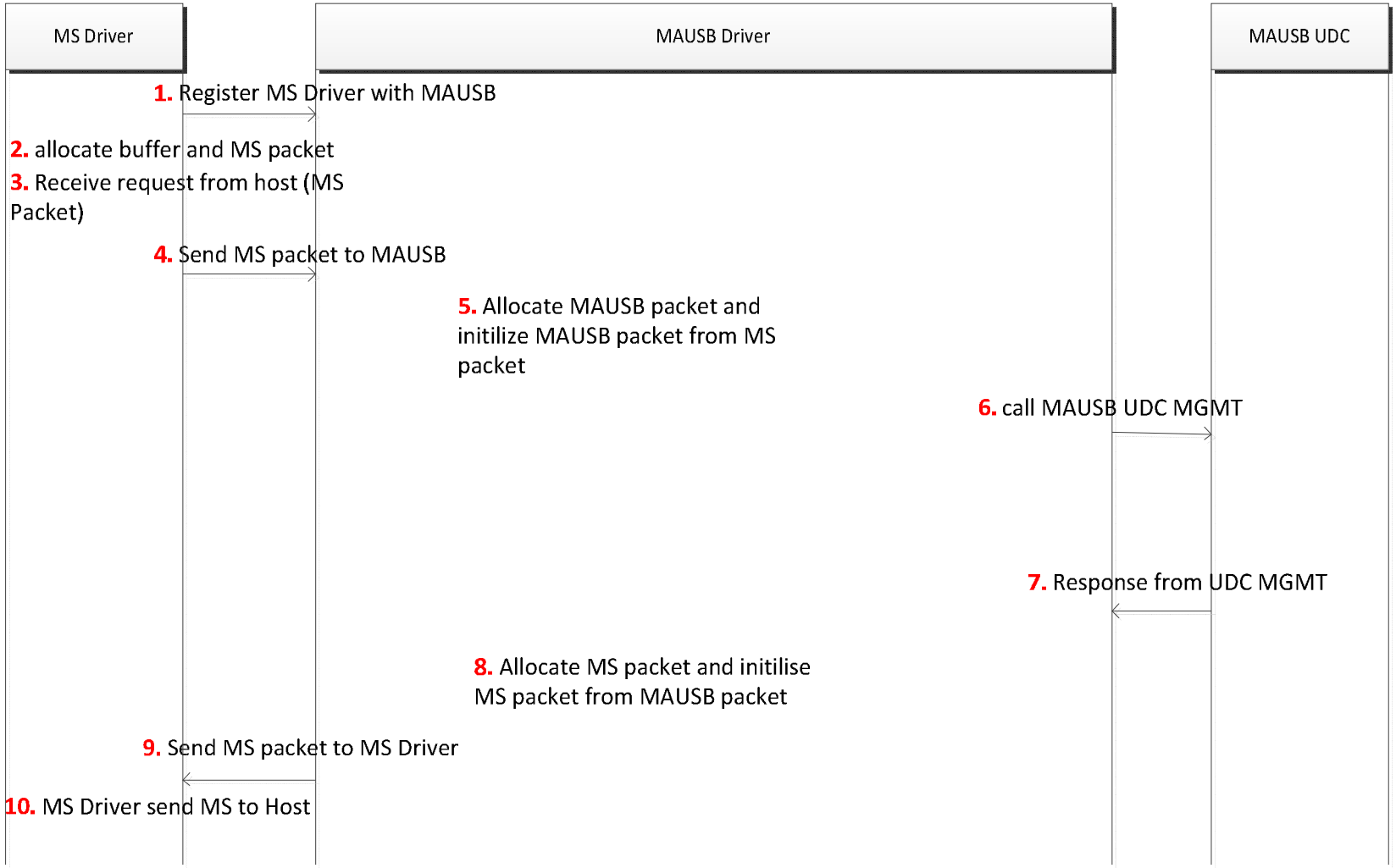


MAUSB Control Transfer

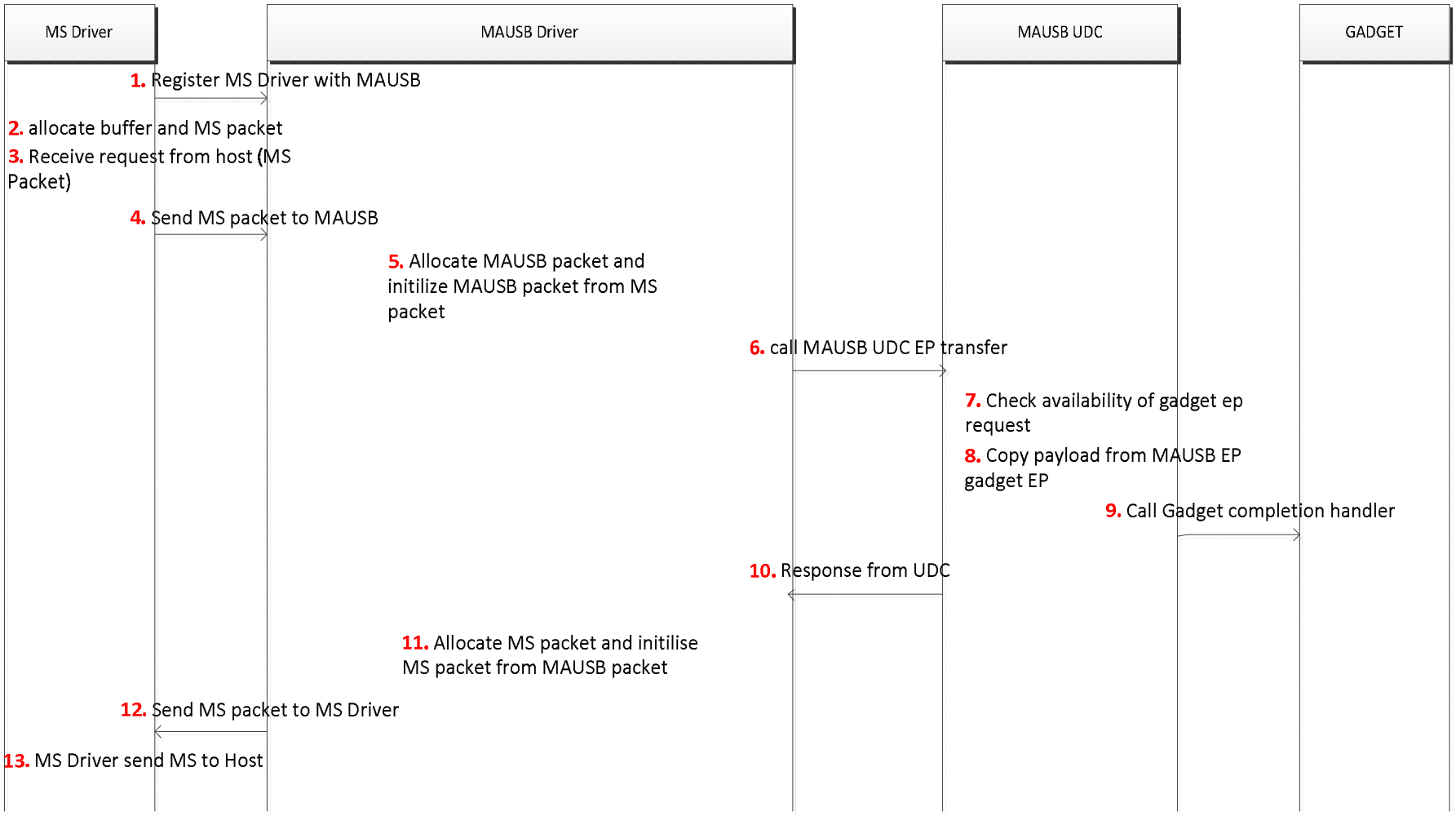


MAUSB Control Transfer Flow Diagram

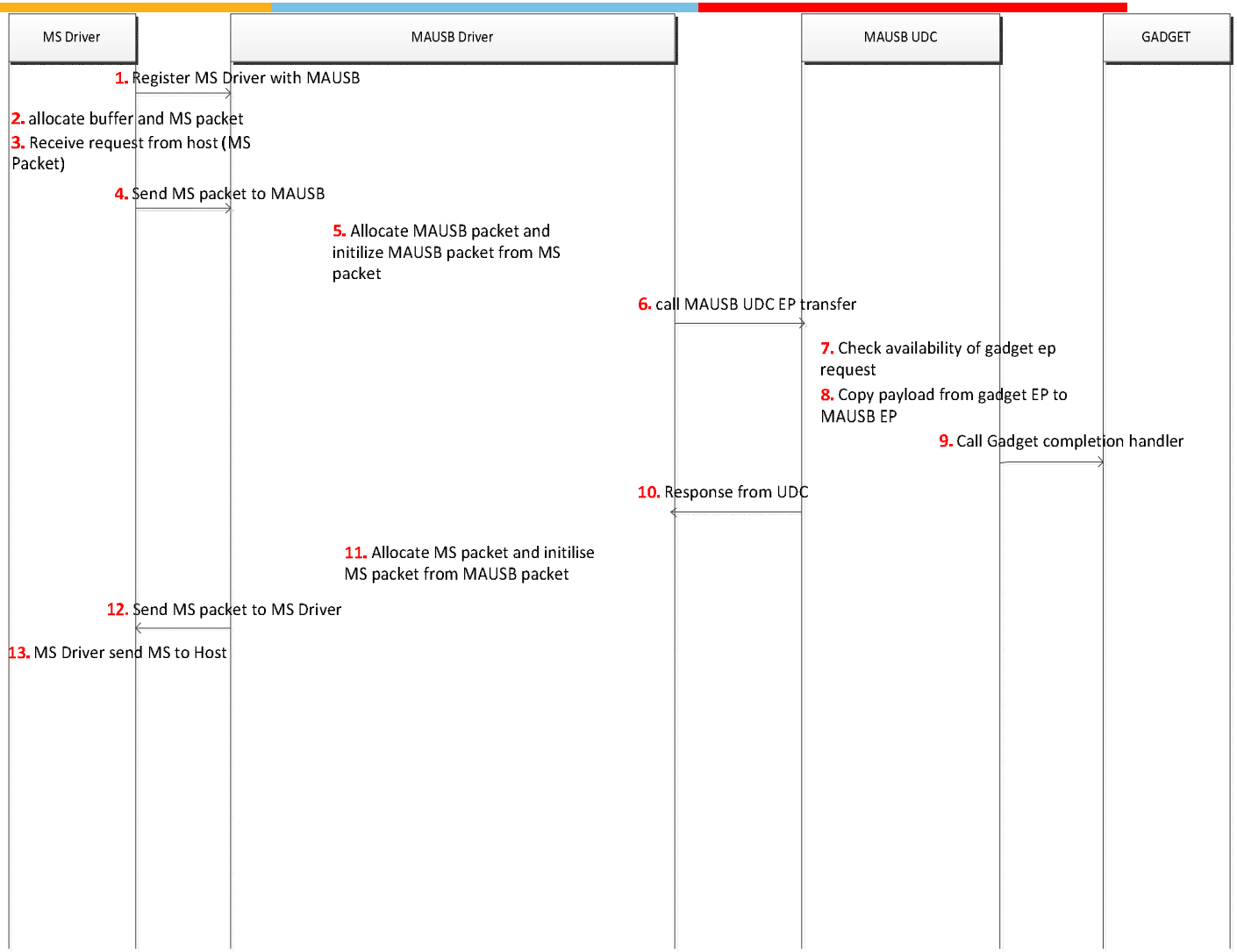
MAUSB Management Packet Flow Diagram



MAUSB OUT Transfer Flow Diagram



MAUSB IN Transfer Flow Diagram



MAUSB Details of work done

- Virtual USB Device Controller: Virtual UDC is core component in MAUSB architecture. Virtual UDC receives URB packets from USB core and submits URB packets to core.
- MAUSB Management Packet Handler: All management commands are handled in this module.
- MAUSB Transport: MAUSB Tx/Rx threads are created to receive and send data from media.
- MAUSB control packet handling: In this routine we will handle USB control packets.
- Data IN/OUT Packet handling

MAUSB Future of work

- We need to add other media like SNAP, Bluetooth and ZigBee,
- We need to integrate other gadget drivers like MTP and mass storage.
- We need to port MUSB on handset and televisions.
- We need to support MAUSB isochronous transfers.

Thank You.