Addendum to Discussion of Multidrop Access Methods

David D. Brandt

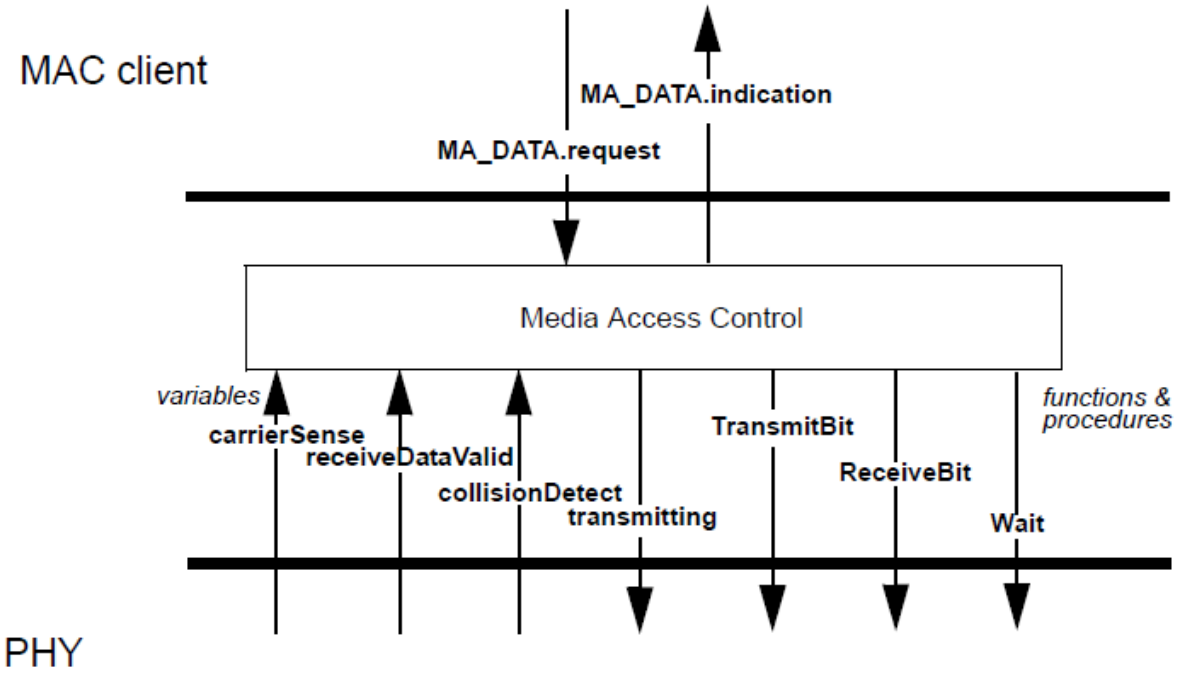
Rockwell Automation

Purpose

- The purpose of this presentation is to:
  - Provide an addendum to the following submission:
    - http://www.ieee802.org/3/cg/public/July2017/brandt_cg_01a_0717.pdf
  - Demonstrate that the MAC client can already determine the proper TS indications to use with CSMA/CD collisions

- Special thanks to Don Pannell for pointing out the oversight in the original presentation

MAC client interface



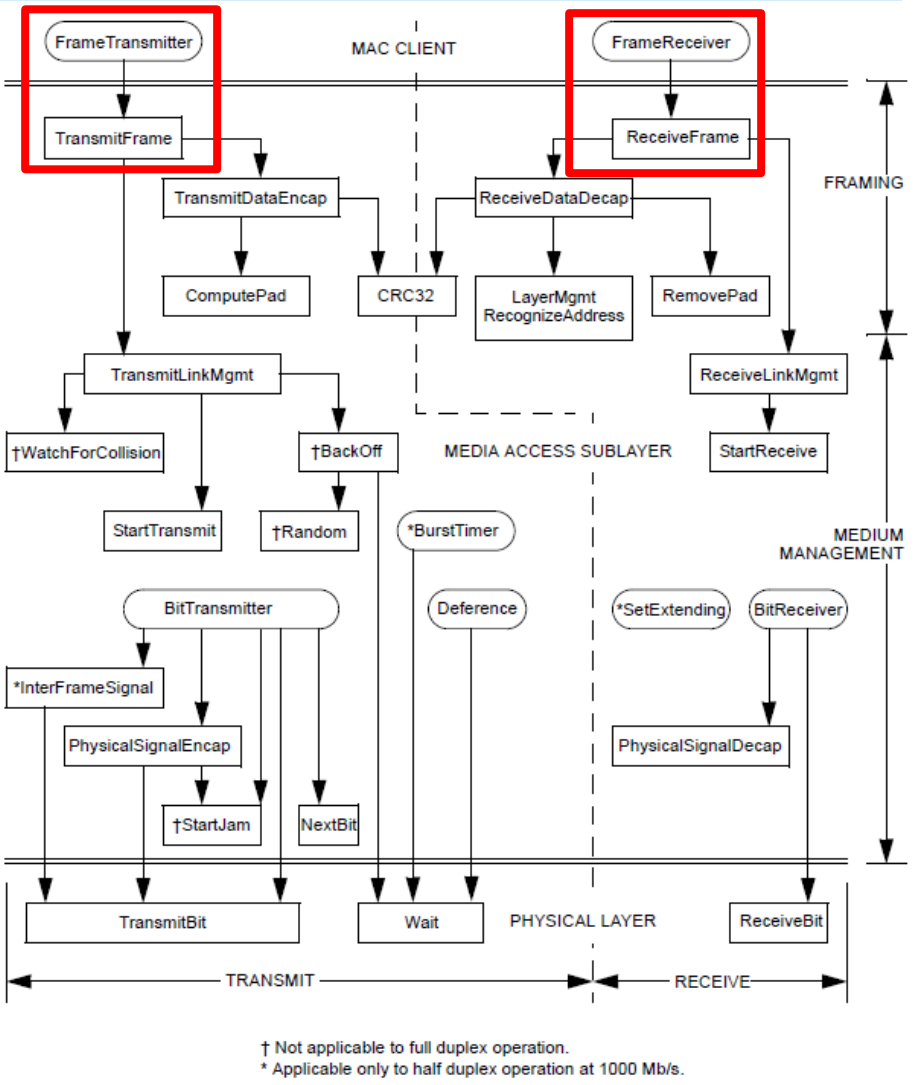
- 2.3.1 MA_DATA.request
  - Generated by MAC client entity whenever data is transferred to a peer entity or entities.
- 2.3.2 MA_DATA.indication
  - Passed from the MAC sublayer entity (through the optional MAC Control sublayer, if implemented) to the MAC client entity or entities to indicate the arrival of a frame to the local MAC sublayer entity that is destined for the MAC client.

Synchronous operation

- 4.3.1 Overview
  - The MAC sublayers are “synchronous”
    - “one frame at a time”

Procedure map

- MAC client uses:
  - TransmitFrame
  - ReceiveFrame



Pascal syntax usage

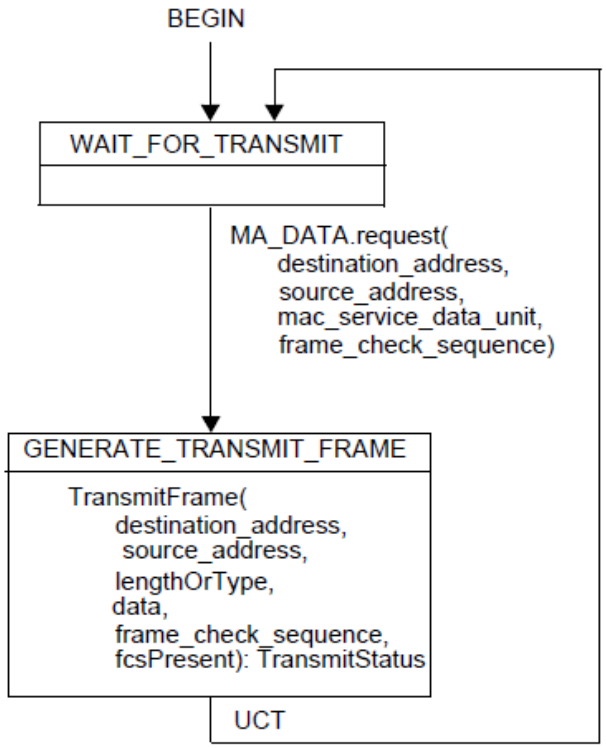
- https://en.wikibooks.org/wiki/Pascal_Programming/Syntax_and_functions
  - Function Func_Name(params...) : Return_Value;

```
function TransmitFrame (
    destinationParam: AddressValue;
    sourceParam: AddressValue;
    lengthOrTypeParam: LengthOrTypeValue;
    dataParam: DataValue;
    fcsParamValue: CRCValue;
    fcsParamPresent: Bit): TransmitStatus;
```

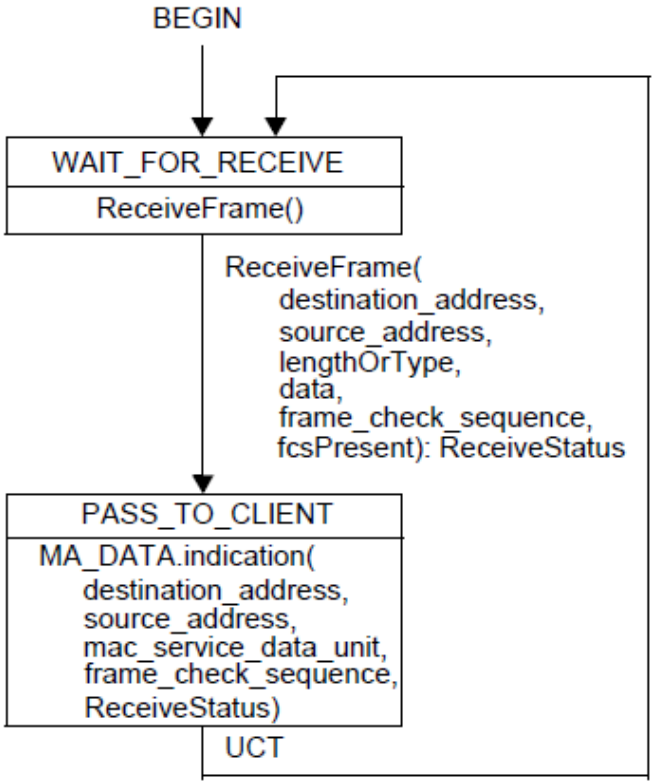
```
function ReceiveFrame (
    var destinationParam: AddressValue;
    var sourceParam: AddressValue;
    var lengthOrTypeParam: LengthOrTypeValue;
    var dataParam: DataValue;
    var fcsParamValue: CRCValue;
    var fcsParamPresent: Bit): ReceiveStatus;
```

MAC client state diagrams

- 4.3.2.1.4 MAC client transmit interface state diagram

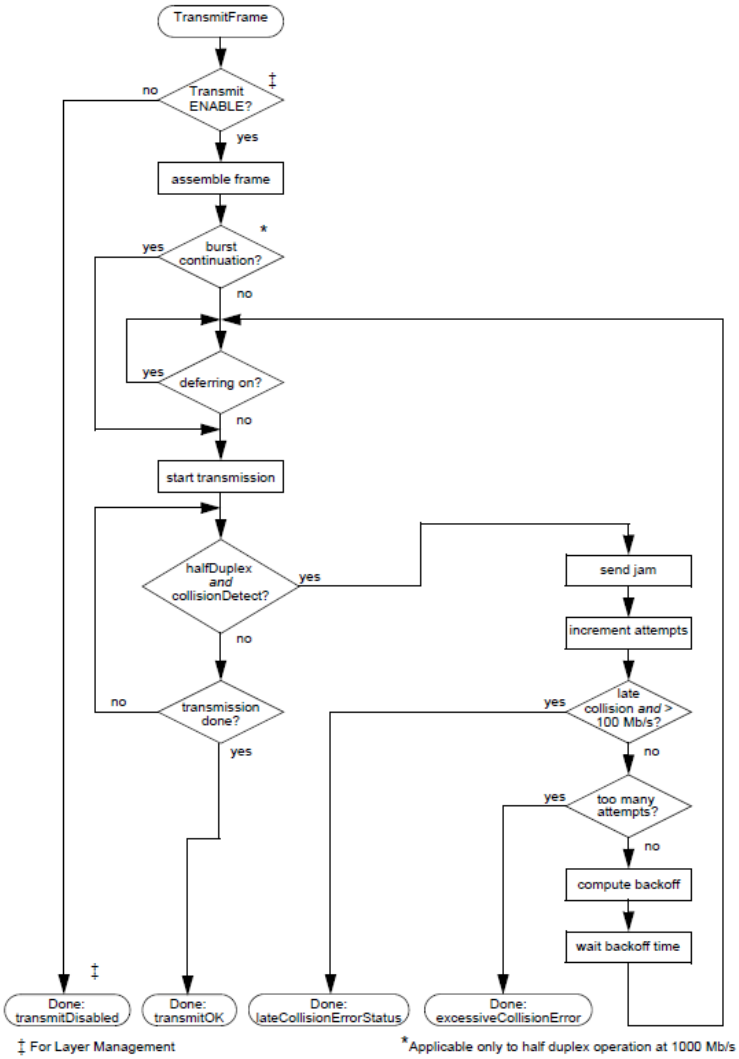


- 4.3.2.2.4 MAC client receive interface state diagram



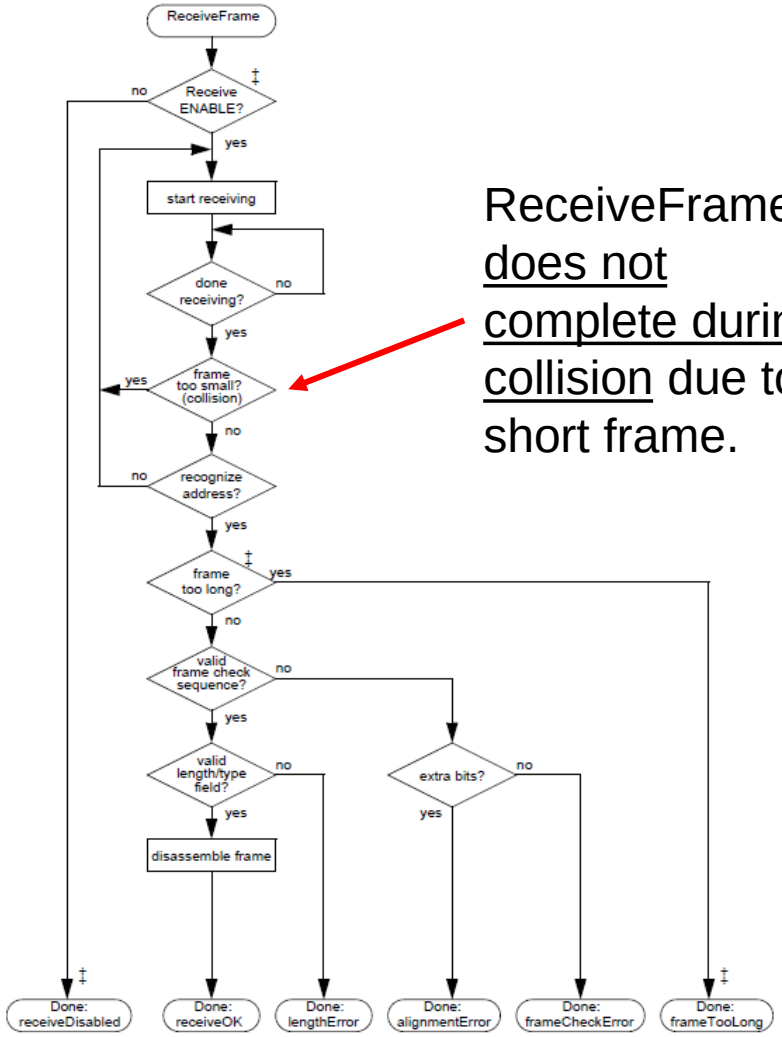
TransmitFrame

- 4.2.8 Frame transmission
  - The function TransmitFrame implements the frame transmission operation provided to the MAC client.
  - The TransmitFrame operation is synchronous. Its duration is the entire attempt to transmit the frame; when the operation completes, transmission has either succeeded or failed, as indicated by the TransmitStatus status code.
  - Successful transmission is indicated by the status code transmitOK.



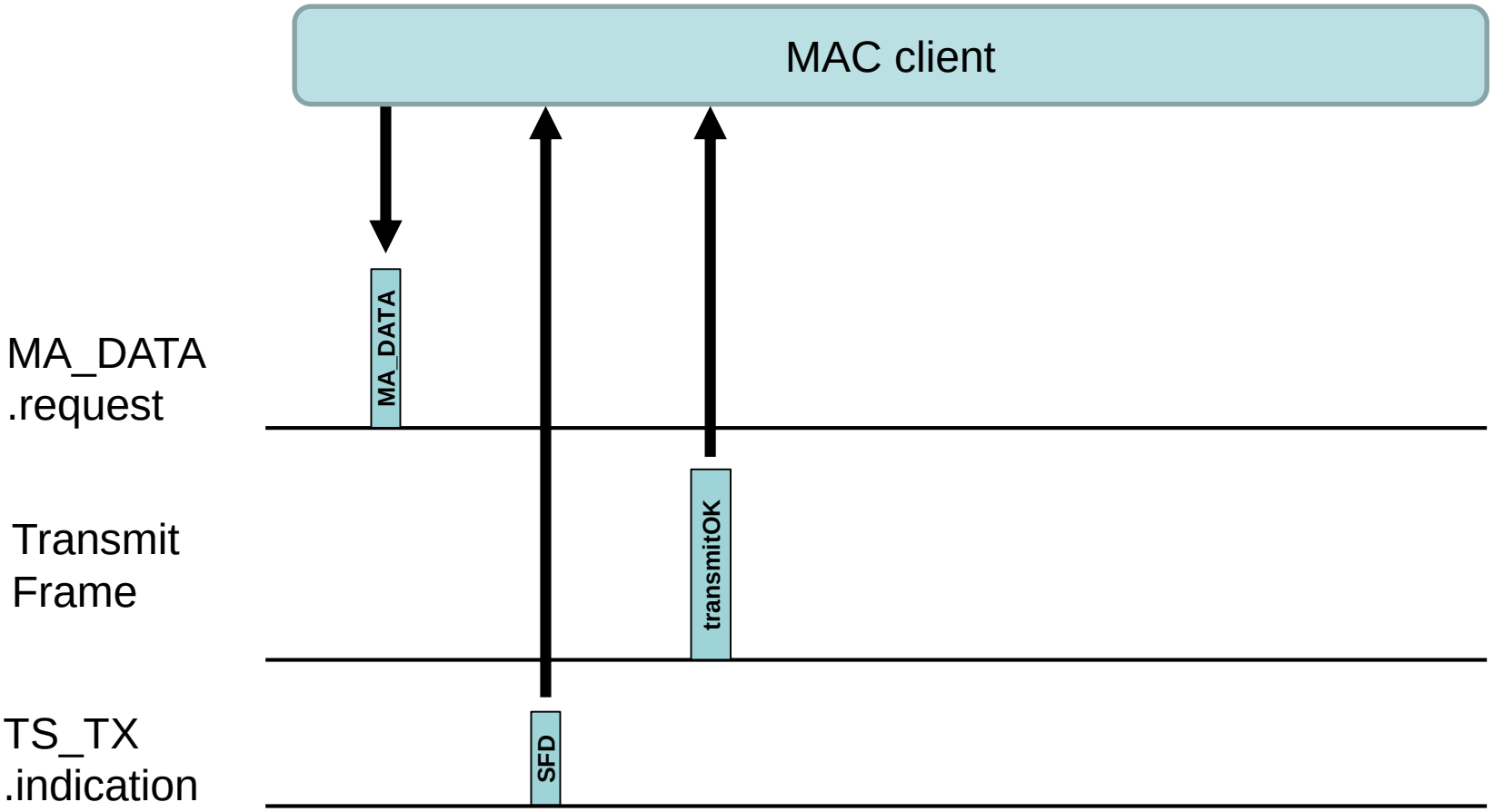
ReceiveFrame

- 4.2.9 Frame reception
  - The function ReceiveFrame implements the frame reception operation provided to the MAC client.
  - The ReceiveFrame operation is synchronous. The operation does not complete until a frame has been received.
  - The fields of the frame are delivered via the output parameters with a status code.
  - Successful reception is indicated by the status code receiveOK.

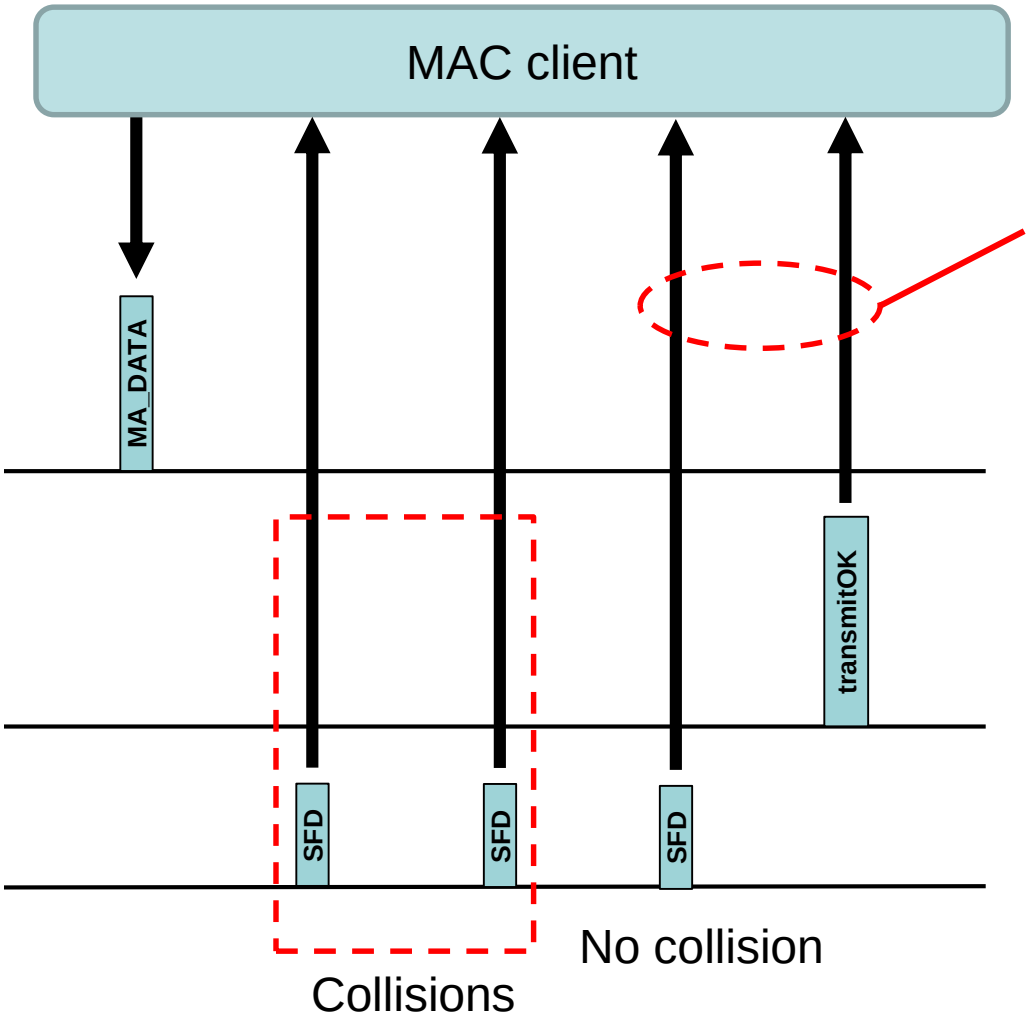


ReceiveFrame does not complete during collision due to short frame.

Successful immediate TX

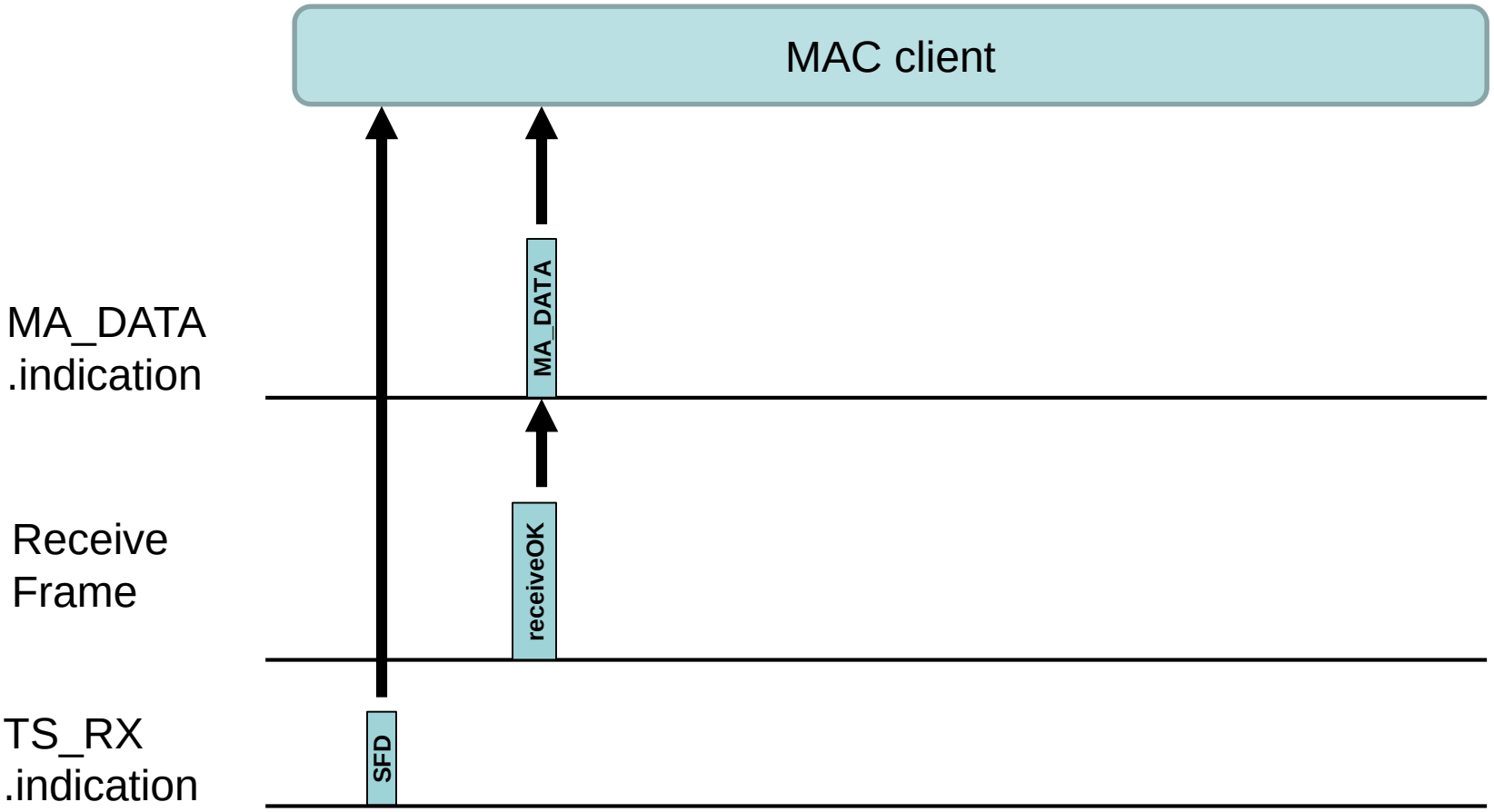


Successful TX after collisions

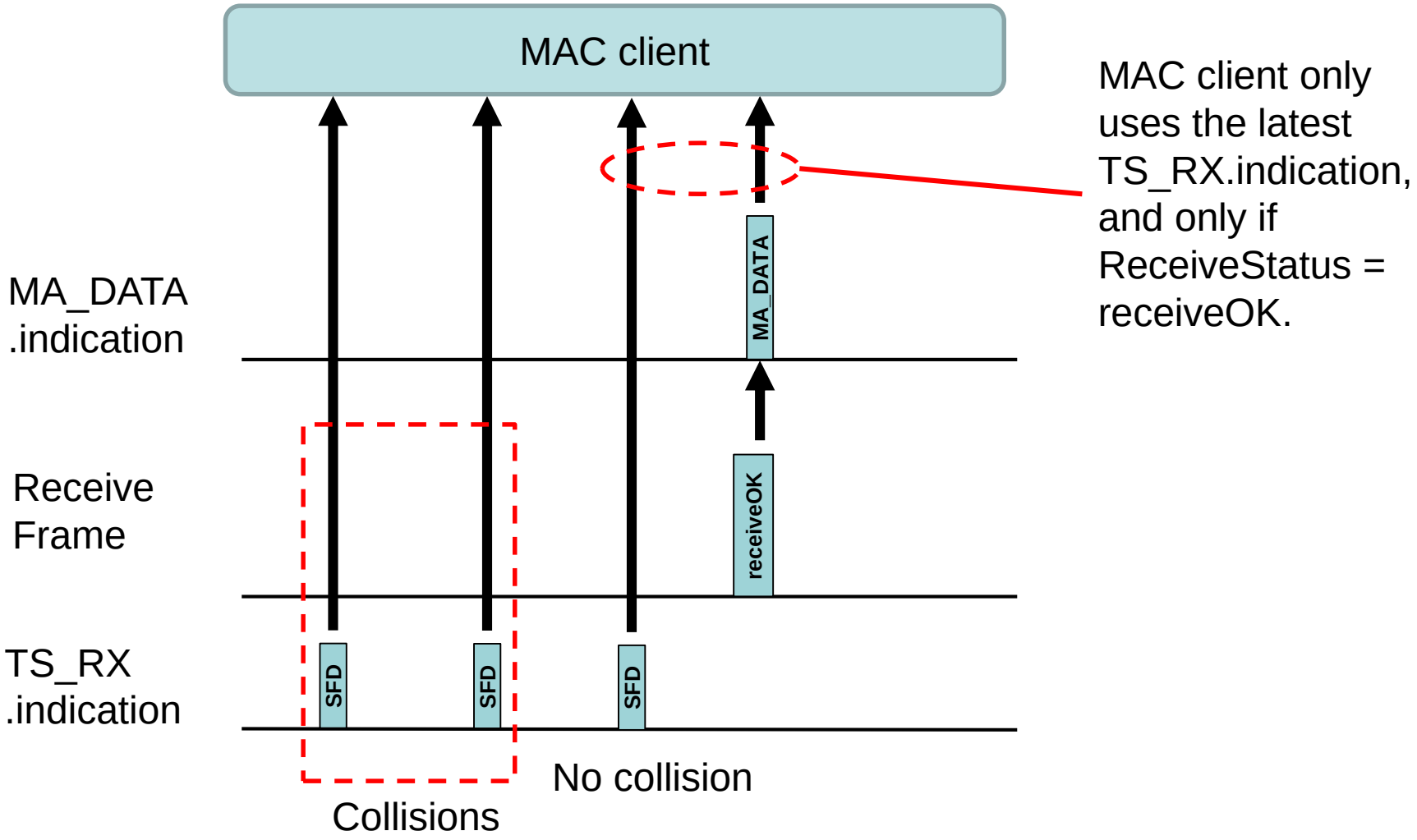


MAC client only uses the latest TS_TX.indication, and only if TransmitStatus = transmitOK.

Successful immediate RX



Successful RX after collisions



Conclusions

- The existing TSSI definition is adequate for a MAC client to determine which TS indications represent valid TX and RX timing
  - Even in the presence of collisions
- Clause 90.1, paragraph 2, should be amended as follows:
  - "The TSSI is defined for ~~the~~ full-duplex and half-duplex modes of operation ~~only~~."