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To: **T10 CAP Working Group**
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Subject: **UAS Clause 6 (Usage)**

1 Related documents

UASr1, USB Attached SCSI revision 1
USB-2, Universial Serial Bus Revision 2.0

2 Introduction

This proposal defines the Usage clause for UAS. The Usage clause describes the communication sequences between the initiator and the target.

3 Proposed additions to UAS

The following text adds to clause 3 and replaces clause 6.3 of UAS.

3.6 Communication Sequence Figure Notation

Some figures describe sequences of communication between an initiator and a target. Figure 1 is an example communication sequence figure. In this figure, arrows that start at the initiator and end at the target represent communication from the initiator to the target and arrows the start at the target and end at the initiator represent communication from the target to the initiator. Each arrow has up to 3 elements;

a) Pipe Name is the name of a USB pipe as described in clause 4xxxx;
b) IU is an optional parameter which indicates the Information Unit (See 6.2xxx) that is transferred on the pipe;
c) PARM is an optional parameter which provides information regarding a field in an IU.

The communication sequence figures start at the top and progress in time toward the bottom. Only the Command Pipe (see xxxx) and the Status Pipe (see xxxx) use the IU and PARM fields. The PARM field, when present, represents an INITIATOR PORT TRANSFER TAG unless otherwise specified. The Data-in (see xxxx) and Data-out (see xxxx) transfer data associated with commands.

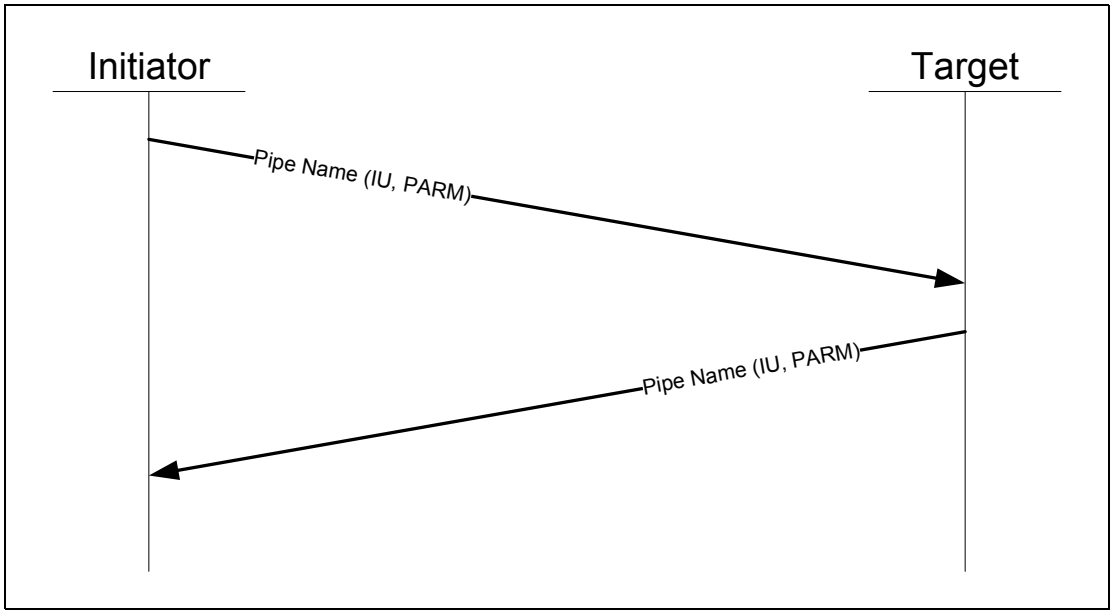

Figure 1 — Notation

6.3 Information Unit Sequences

6.3.1 Non-Data Command

Figure 2 describes the sequence of communication between the initiator and target for a command which does not require data transfer.

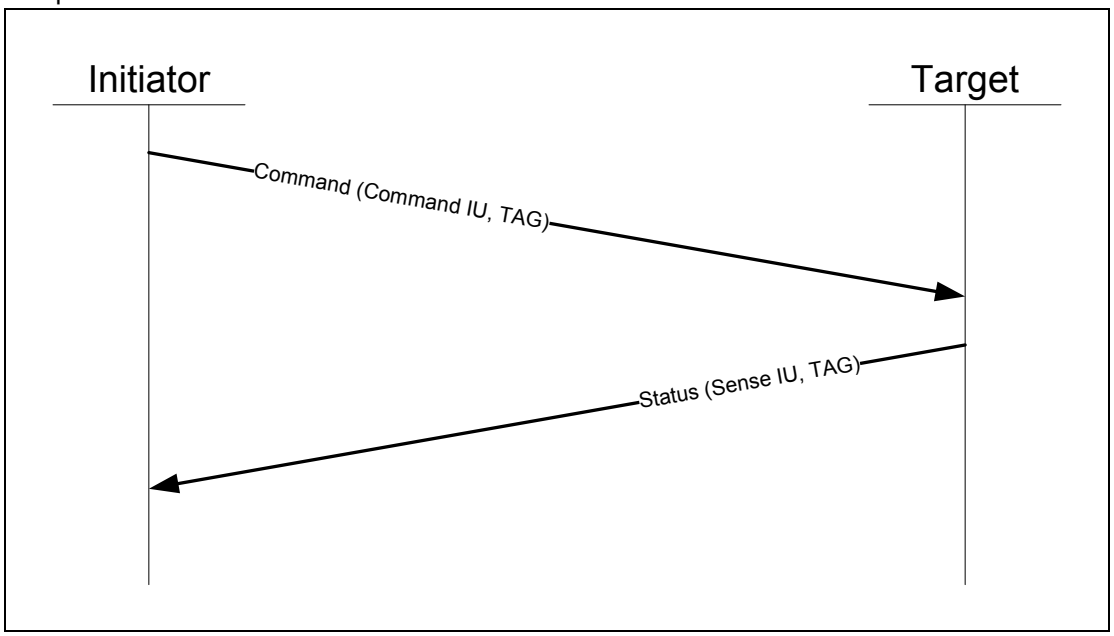

Figure 2 — Non-data Transfer

6.3.2 Data-out command sequence

Figure 3 describes the sequence of communication between the initiator and target for a command which requires data transfer from the initiator to the target.

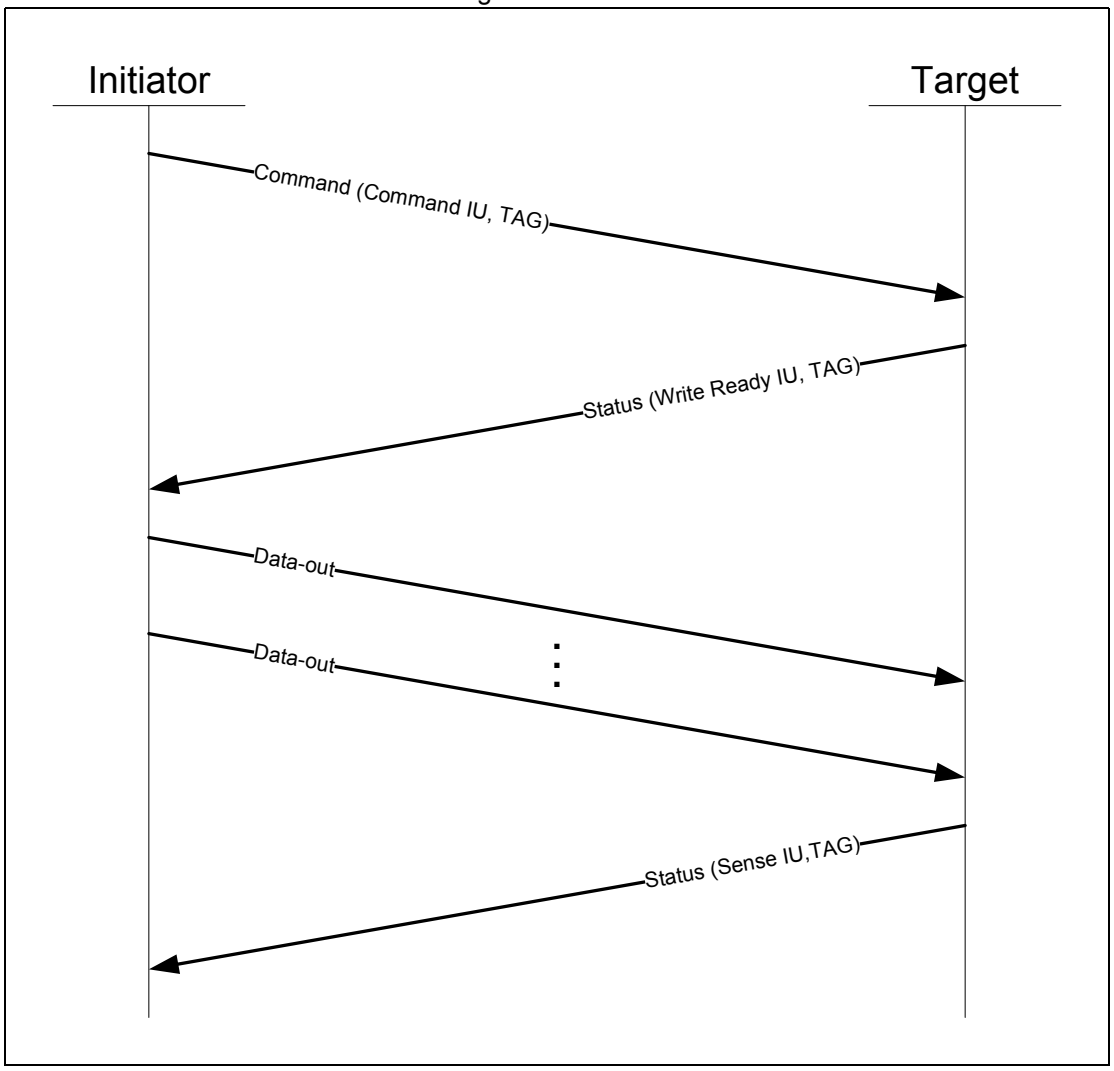

Figure 3 — Write Data Transfer

6.3.3 Data-in command sequence

Figure 4 describes the sequence of communication between the initiator and target for a command which requires data transfer from the target to the initiator. Although figure 4 shows that the Sense IU is transferred when the last Data-in transfer has completed, the initiator may process the Sense IU before the data transfer is complete

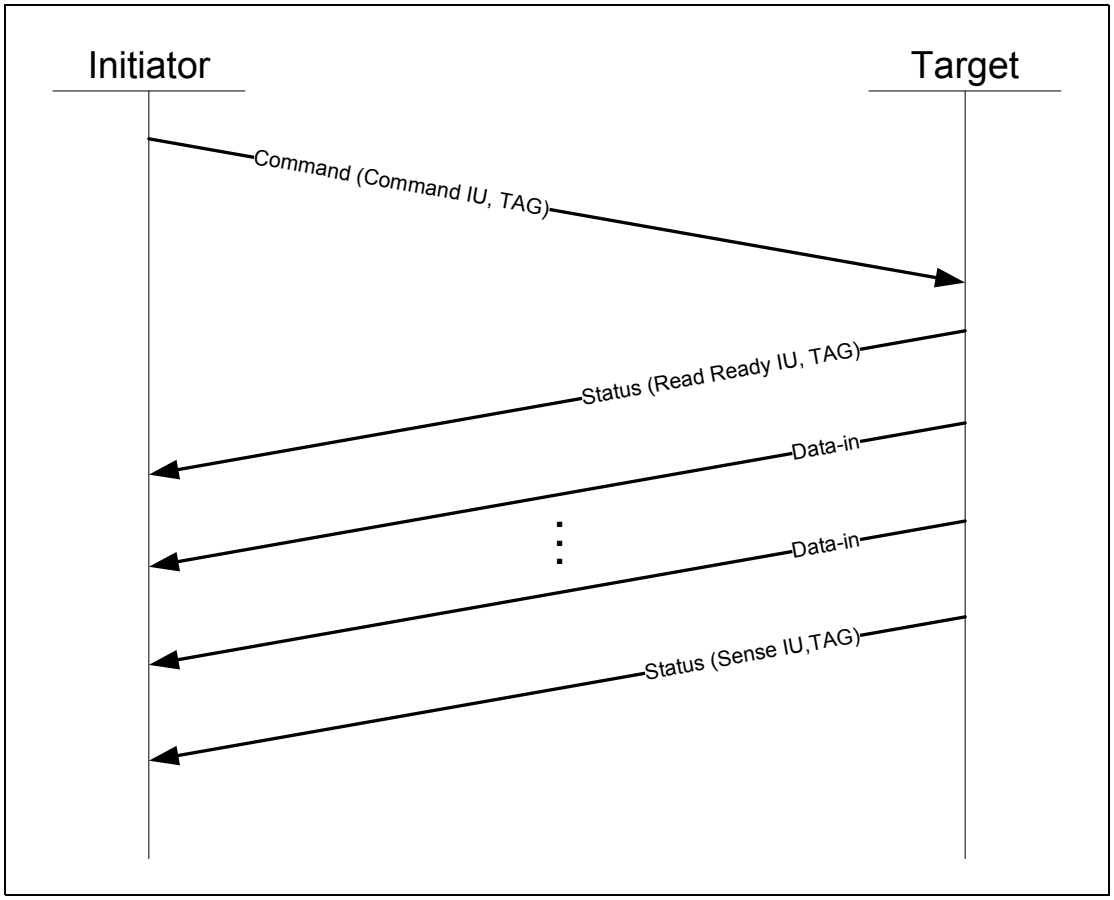

Figure 4 — Read Data Transfer

6.3.4 Bi-directional command sequence

Figure 5 describes the sequence of communication between the initiator and target for a command which requires data transfer both directions between the target and the initiator. Once the Read Ready IU and Write Ready IU are received by the initiator, both Data-in and Data-out transfer occur asynchronously. The target may send the Ready Ready IU and wait for the Data-in transfer to complete and then send the Write Ready IU and then wait for data-out transfer to compete; or vice versa. Although figure 5 shows that the sense IU is transferred when the last Data-in transfer has completed, the initiator may process the Sense IU before the Data-in transfer is complete.

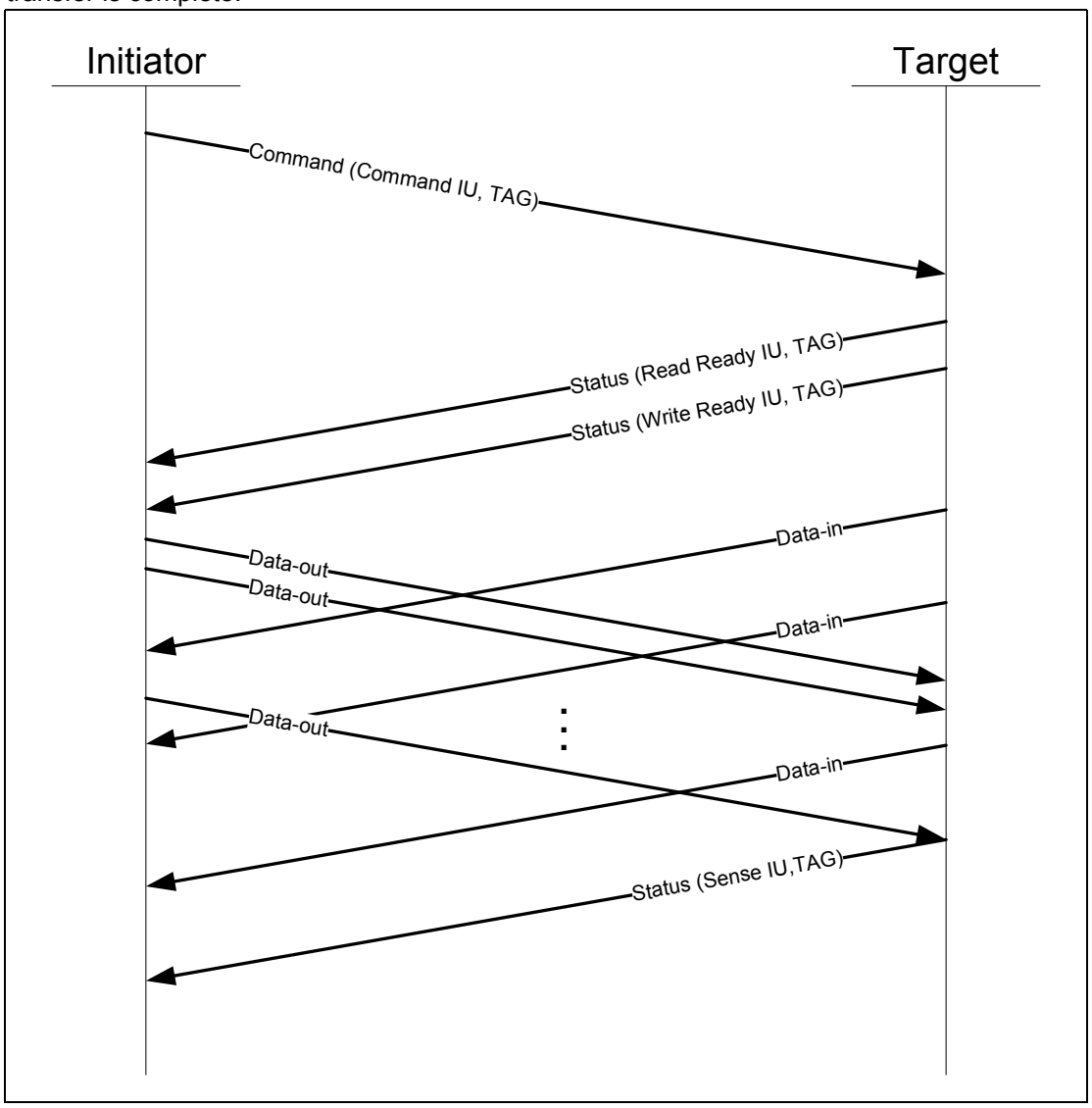

Figure 5 — Bi-directional Data Transfer

NOTE 1 - The order of the Data-in and Data-out phases of a bidirectional command may be influenced by both the definition of the bidirectional command and the capabilities of the USB target device.

6.3.5 Multiple command example

Figure 6 describes the sequence of communication between the initiator and target for several commands as follows:

1) the initiator transfers a read command with an INITIATOR PORT TRANSFER TAG of TAG-1;
2) the initiator transfers a read command with an INITIATOR PORT TRANSFER TAG of TAG-2;
3) the initiator transfers a write command with an INITIATOR PORT TRANSFER TAG of TAG-3
4) the initiator transfers a write command with an INITIATOR PORT TRANSFER TAG of TAG-4;
5) the target requests to transfer the read data for INITIATOR PORT TRANSFER TAG of TAG-2;
6) the target requests to transfer the write data for INITIATOR PORT TRANSFER TAG of TAG-4;
7) data transfer begins for both TAG-2 and TAG-4
8) the initiator transfers a request to abort the command with INITIATOR PORT TRANSFER TAG TAG-3;
9) the target reports that the command with INITIATOR PORT TRANSFER TAG TAG-3 was successfully aborted;
10) the initiator transfers a write command with an INITIATOR PORT TRANSFER TAG of TAG-5;
11) the target reports command completion for INITIATOR PORT TRANSFER TAG TAG-2;
12) the target requests to transfer the read data for INITIATOR PORT TRANSFER TAG of TAG-1;
13) the target begins transferring data for INITIATOR PORT TRANSFER TAG TAG-1;
14) the target reports command completion for INITIATOR PORT TRANSFER TAG TAG-4;
15) the initiator transfers a write command with an INITIATOR PORT TRANSFER TAG of TAG-6;
16) the target requests the write data for INITIATOR PORT TRANSFER TAG of TAG-6;
17) the initiator begins transferring data for INITIATOR PORT TRANSFER TAG TAG-6;
18) the initiator transfers a command which does not require data transfer with an INITIATOR PORT TRANSFER TAG of TAG-3;
19) the target reports command completion for INITIATOR PORT TRANSFER TAG TAG-3;
20) the target reports command completion for INITIATOR PORT TRANSFER TAG TAG-6;
21) the target reports command completion for INITIATOR PORT TRANSFER TAG TAG-1;
22) the target requests the write data for INITIATOR PORT TRANSFER TAG of TAG-5;
23) the initiator begins transferring data for INITIATOR PORT TRANSFER TAG TAG-5;
24) the target reports command completion for INITIATOR PORT TRANSFER TAG TAG-5; and
25) the target is idle.

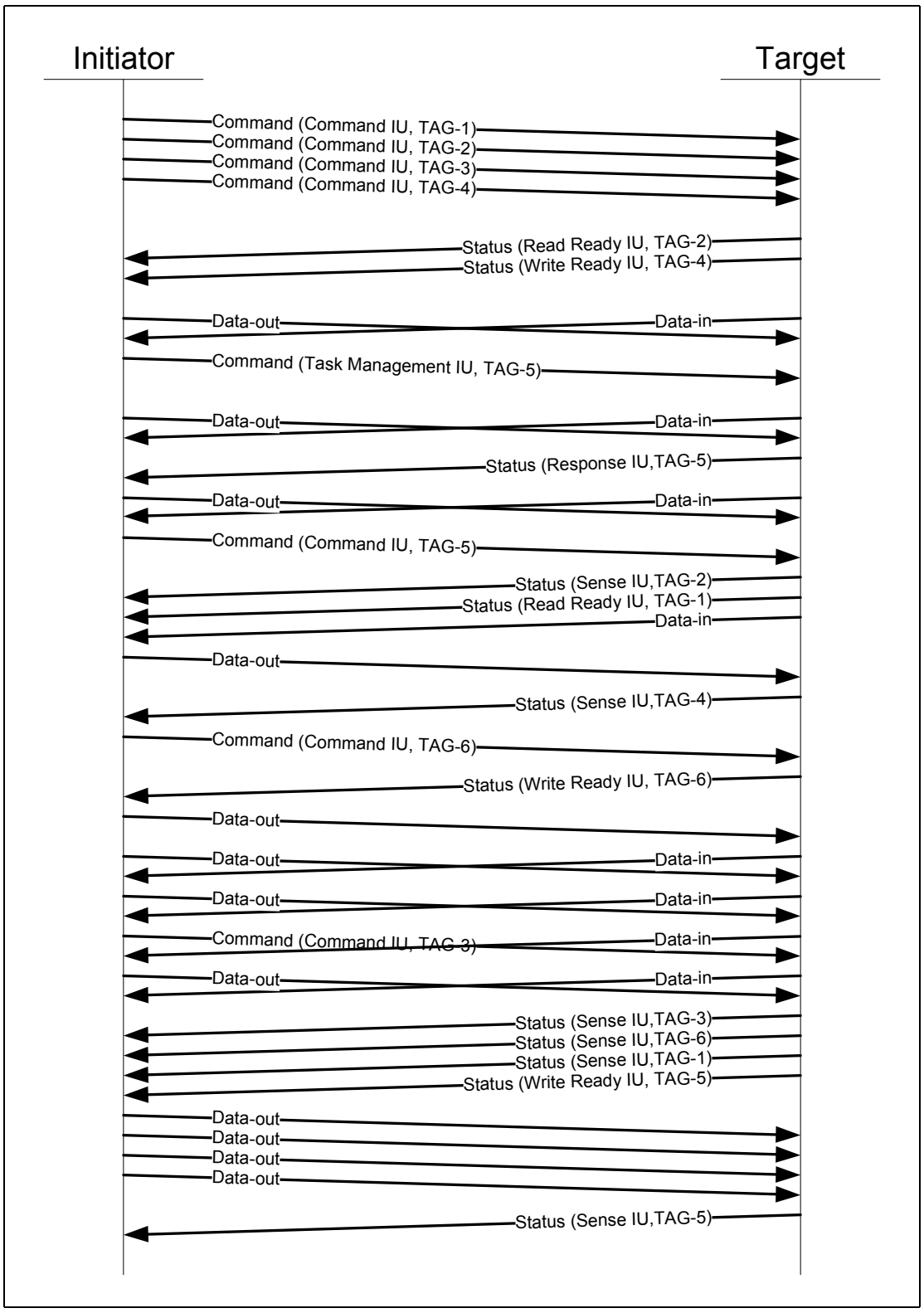

Figure 6 — Multiple Command Example