

application protocol data unit (APDU)

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In the context of smart cards, an *application protocol data unit* (APDU) is the communication unit between a smart card reader and a smart card.

There are two categories of APDUs:

- command APDUs
- response APDUs

Command APDU

A command APDU is sent by the reader to the card — it contains a mandatory 4-byte header (CLA, INS, P1, P2) and from 0 to 65535 bytes of data.

| Field name | Length | Description |
|--------------|--------------|--|
| CLA | 1 | Instruction class - indicates type of command |
| INS | 1 | Instruction code - indicates specific command |
| P1-P2 | 2 | Instruction parameters for the command |
| Lc | 0, 1 or 3 | Encode number (Nc) of bytes of command data |
| Command data | Nc | Nc bytes of data |
| Le | 0, 1, 2 or 3 | Maximum number (Ne) expected response bytes |

See APUDs at Wikipedia¹ for Lc and Le encodings.

Response APDU

A response APDU is sent by the card to the reader — it contains from 0 to 65536 bytes of data, and 2 mandatory status bytes (SW1, SW2).

| Field name | Length | Description |
|---------------|--------------------------------|---------------|
| Response data | Nr (at most Ne) | Response data |

¹https://en.wikipedia.org/wiki/Smart_card_application_protocol_data_unit

| Field name | Length | Description |
|----------------------------|--------|---------------------------|
| Response trailer (SW1-SW2) | 2 | Command processing status |

Some status bytes

| SW1-SW2 | Message |
|---------|--------------------------------|
| 9000 | Command executed without error |

See SW1 SW2 status bytes² for more status bytes.

²<https://web.archive.org/web/20090623030155/http://cheef.ru/docs/HowTo/SW1SW2.info>