—————————————— MODULE *Modbus* ——————————————

The set of all *Modbus* messages for a given network

EXTENDS
    Integers,
    Hex,
    Sequences,
    LRC

CONSTANT N number of hosts on the line

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Start: ":"
Address: two hex chars
Function: two hex chars
Data: 0 up to 504 hex chars
LRC: two hex char *Longitudinal* Redundancy Check (*LRC*)
End: "CRLF"

Start ——————————————————————————————
$IsStart(str) \triangleq str = \text{":"}$

Address fields ——————————————————————————
$GetAddr(str) \triangleq SubSeq(str, 2, 3)$

$IsAddr(str) \triangleq$
    $\wedge Len(str) = 2$
    $\wedge Head(str) \in HexChar$
    $\wedge Head(Tail(str)) \in HexChar$

Function fields ——————————————————————————
$GetFunct(str) \triangleq SubSeq(str, 4, 5)$

$IsFunctionCode(str) \triangleq$
    $\wedge Len(str) = 2$
    $\wedge Head(str) \in HexChar$
    $\wedge Head(Tail(str)) \in HexChar$

Data ——————————————————————————————
$GetData(str) \triangleq SubSeq(str, 6, Len(str) - 3)$

$IsData(str) \triangleq$
    $\wedge Len(str) \in 0 \mathinner{\ldotp\ldotp} 504$
    $\wedge str = [x \in \text{DOMAIN } str \mapsto x \in HexChar]$

End ———————————————————————————————
$GetEnd(str) \triangleq SubSeq(str, Len(str), Len(str))$

$IsEnd(str) \triangleq str = \text{"CRLF"}$

―― *LRC* ――――――――――――――――――――――――――――

$GetLRC(str) \stackrel{\Delta}{=} SubSeq(str, Len(str) - 2, Len(str) - 1)$

$IsLRC(str) \stackrel{\Delta}{=} CheckLRC(str)$

$LRCInvariant \stackrel{\Delta}{=} CheckLRC(start \circ addr1 \circ addr2 \circ fc1 \circ fc2 \circ data \circ end)$

Helper Functions ――――――――――――――――――――――

$IsModbus(message) \stackrel{\Delta}{=}$
  $\wedge Len(message) \in 9 \mathinner{\ldotp\ldotp} 513$
  $\wedge IsStart(Head(message))$
  $\wedge IsAddr(GetAddr(message))$
  $\wedge IsFunctionCode(GetFunct(message))$
  $\wedge IsData(GetData(message))$
  $\wedge IsLRC(GetLRC(message))$
  $\wedge IsEnd(GetEnd(message))$

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\ * Modification History
\ * Last modified *Wed* May 02 20:50:20 *EDT* 2018 by *SabraouM*
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