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Title:

DUETCOM

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Abstract:

The purpose of duetcom is to govern the communication between one ore more process(es) and the terminals/printers utilizing the process(es).

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CONTENTS

CONTENTS (continued)

Introduction

DUETCOM is a slangcoded programe, which takes care of the communication between a number of terminals/printers and an applicationsystem.

Main features

DUETCOM controls that terminals, which attempt login, are legal.

DUETCOM reads in transactions from terminals and orders them in a queue for a predefined receiver.

DUETCOM returns the receiver's answer to a transaction, if any, to the terminal.

DUETCOM writes out textareas on a printer defined by the user.

DUETCOM generates transactions to the receiver containing the result of a printeroperation.

DUETCOM broadcasts on request.

Transactions may be keyed from terminals which are logged in to DUETCOM; be read by DUETCOM and stored in a queue which is linked to a receiverprocess defined by the login.

When the receiverprocess is ready, it fetches a transaction in its queue with DUETCOM and completes it. A transaction is not completed till the receiverprocess has delivered an answer to DUETCOM. This answer is in reality a command to DUETCOM to perform some action or other, for instance to send an ok to the

terminal, to write out a more closely defined errormessage, or to start a print out on a printer.

Not until DUETCOM has received its answer the next transaction is delivered to the receiverprocess.

1. THE STRUCTURE OF DUETCOM

The DUETCOMcode consists of two important parts, The base code - containing a rudimentary terminal-catalogue, a printercatalogue, and a process-catalogue - and options - where you within certain limits have a free hand with regard to describing terminals, printers, and processes.

Sect. 10 is a thorough description of the structure of the abovementioned catalogues.

2. PROCESS SIZE AND START UP OF DUETCOM

Process size

When translating the DUETCOMcode the translation is to be followed by some information about which process size DUETCOM must have in order to run plus which claims this process is to be equipped with (buf-area-base). It is important to observe these demands, as DUETCOM, if the contrary is the case will refuse to run - by too small a process - or by interrupting the processing with an alarmmessage.

Start up

The start up of DUETCOM differs considerably from the start up of other processes, because DUETCOM runs completely without FP and RS which means that DUETCOM in itself is a sort of primitive driver with the quality that you can communicate with it.

Start up is done in the following way:

```
att s

new DUETCOM size <procsize>
            area <areas>
            buf <bufs>
            base <proj. min> <proj. max>
            prog <assembled DUETCOM>
            run
```

All values in "< >" are values which are produced by the translation of the DUETCOM sourcematerial.

3. LOGIN

Login code

Login is done by keying att DUETCOM. DUETCOM will then demand that the terminal identifies itself by means of a Logincode, consisting of a username and number, which DUETCOM will try to find in its usercatalogue. If DUETCOM succeeds in finding the code the terminal will be regarded as logged in, otherwise it will be rejected with an errormessage.

When a terminal is logged in, it is reserved by DUETCOM and everything which is keyed on it will be picked up by DUETCOM and regarded as input lines.

Login-transaction

By login DUETCOM generates a logintransaction, which is placed in a queue for the receiver, so, that the receiver has a further possibility of checking up on the user - for instance check of pass word.

3.1 LOGIN EXAMPLE

ATT DUETCOM	The attentionkey is pressed, whereafter you key DUETCOM.
KEY USERNAME AND NUMBER	Is written out by DUETCOM.
RC 2	Keyed by the user.
<BELL>	From DUETCOM = ready for input.

DUETCOMGENERATED LOGIN TRANS

When a login is regarded as legal by DUETCOM, the following transaction is generated, which

3.1 LOGIN EXAMPLE

is then sent to the receiver:

<termno><1><1><32>

<termno> stands for the logical terminalnumber, the terminal is described with in DUETCOM's usercatalogue, always followed by <,> - comma.

3.2 ERROR-MESSAGES BY LOGIN

At any mistake made during login DUETCOM writes out an errormessage and leaves the terminal as it was before the login-attempt. DUETCOM has the following error-messages at its disposal:

TOO BIG A USERNUMBER

Usernumber by login >999999

USERNUMBER MISSING

Only the username has been keyed in, in the login line.

ERROR IN USERNAME

The username does NOT begin with a letter.

USER EXISTS ALREADY

A user with the same no. is logged in.

ERROR IN PROCESSNAME

Processname not found in processcatalogue.

3.2 ERROR-MESSAGES BY LOGIN

TERMINAL EXISTS ALREADY

Terminal with the same name and number is logged in.

WE DO NOT KNOW YOU, SORRY

Logincode not found in user-catalogue.

4. LOGOUT

By logout the text "Good bye" is keyed as a common inputline. This text is interpreted by DUETCOM as a logout command and is followed by a write out on the terminal of the text:

TERMINAL LOGOUT

The terminal will then be in a condition as before login.

Logout-transaction

As by login DUETCOM generates a logouttransaction which is sent on to the receiverprocess as a confirmation that this terminal is out of the system.

4.1 DUETCOM GENERATED LOGOUTTRANSACTION

The logouttransaction generated by DUETCOM has the following appearance:

<termno,><2><2><10>

<termno,> stands for the terminal's logical terminalnumber followed by <,> - comma.

After a logouttransaction DUETCOM does NOT accept output to this terminal.

There exists no error-messages of course, in connection with logout:

Either the line is logout

or a common inputline.

5. TREATMENT OF INPUTLINES

DUETCOM regards an inputline as terminated when it contains 150 signs or more, but also a <NL> character - and the latter is the most common - functions as a line termination.

When a line is terminated it is taken over by DUETCOM, given a logical terminalnumber and placed in a queue for the receiver.

It remains here and awaits its turn to be "delivered", which usually takes place before the user has finished his next inputline.

Queue

While a transaction is in the queue and while it is being processed, the buffer, in which it was delivered, is blocked, and is not released for use of a new inputline before the receiver has announced that it has completed the transaction.

To reduce the waiting time, if any, for the user, DUETCOM has two buffers pr. terminal at its disposal.

5.1 A TRANSACTION IN DUETCOM

Seen from DUETCOM's point of view a transaction consists of a line of iso signs terminated by <NL> - if the transaction is terminated because of too many signs, DUETCOM inserts, for the benefit of the receiver a <NL> character, as the last sign in the line.

5.1 A TRANSACTION IN DUETCOM

Logical terminal-number

Then the line is given a prefix, consisting of a logical terminalnumber followed by a comma. This logical terminalnumber plus the comma is taken from DUETCOM's usercatalogue by login and is "added" to every transaction from the terminal in question.

Queue

Next stop on the transaction's way is the queue. Every transaction is placed in the queue to await its turn to be read in and processed by the receiver. DUETCOM has not finished with a transaction till the receiver has delivered an answer to the reception of the transaction.

5.2 "COMPLETED" TRANSACTION

When DUETCOM has made a transaction ready for delivery it has the following appearance:

<termno,> <inputline ..... <NL>>

Logical terminal-number

<termno,> stands for a logical terminalnumber from DUETCOM's usercatalogue followed by a comma. If the inputline is not terminated with <NL> the receiver will not notice it, as DUETCOM always inserts a <NL> character as the last sign of the linebuffer.

6. OUTPUT

Output

DUETCOM distinguishes between two sorts of output:

Short answer

1. A socalled short answer where the contents of a buffer is written out on the resulting terminal, and

Long answer

2. A long answer where it is the contents of a discarea which is being written out - converted - on the terminal.

The short answers are the most common as the receiver usually returns an ok-answer or an error-message, both of which can be in a buffer.

Long answers appear in connection with displays of vouchers and db.records, where the amount of data to be returned from the receiver cannot be stored in a buffer.

A buffer is defined as having a length of 150 signs. A short answer may then be contained within 100 halfwords while a long answer exceeds these.

7. PRINTERS

DUETCOM operates with three types of printers:

1. Hardcopy printer

2. Separate printer

3. Selective printer.

Below each printertype is described separately plus how it differs from the other types.

Hardcopy printer:

A hardcopy printer reproduces all the output written on the terminal - usually a screen - in hardcopy.

A hardcopy printer differs from other printer-types by being physically connected to the same line as the terminal.

Separate printer:

When using a separate printer the user must explicitly ask to have his output printed. The printer is logically connected with one or more terminals.

A separate printer differs from the other types by having its own physical line, but is logically linked to one or more terminals.

Selective printer:

A selective printer may be used by all users, i.e. a user will have to know a selective printer's identification in order to use it.

A selective printer differs from the other types by having its own physical line and by not being connected to terminals.

8. DUETCOMGENERATED TRANSACTIONS

In some cases DUETCOM generates a transaction which is sent on to the receiver. These transactions observe the convention:

<ident><data>

where <ident> is a logical terminal - or printernumber followed by <,>-comma, and <data> is the actual transaction containing the information DUETCOM wishes to deliver. A DUETCOMgenerated dataline always consists of three iso-signs.

TERMINAL-LOGIN: <termno,> = ident
<1><1><32> = dataline

TERMINAL-LOGOUT: <termno,> = ident
<2><2><10> = dataline

All other transactions generated by DUETCOM concern printeroperations. For printers logically connected to terminals as well as for hardcopy printers, the generated transaction ident corresponds to the logical TERMINAL-number, whereas the ident for the transaction concerning the selective printers, corresponds to the logical PRINTER-number. The logical printernumber is always followed by <p>.

END CONVERT (normal): <termno,>/<printerno p>
= ident
<3><3><10> = dataline

*)

END CONVERT
(hard error) : <termno,>/<printerno p>
= ident
<4><4><10> = dataline

*) This transaction is not generated when the printer is a hardcopy printer.

PRINTER RESERVATION
(only separate): <termno,> = ident
<5><5><10> = dataline

ATTENTION INTERRUPTED
CONVERT (only hardcopy): <termno,> = ident
<6><6><10> = dataline

re. END CONVERT
(hard error): This transaction is only generated if, during the write out, a hard error is detected - parity error etc. - on the area DUETCOM reads the text from.

re. PRINTER RESERVATION: Can only occur in connection with a write out on a separate printer, which is logically connected to several terminals, if the printer already is being used by another process.

re. ATTENTION INTERRUPTED CONVERT: Only a hardcopy printer may be disconnected by activating the att. key on the terminal (same physical line).

9. BROADCAST

DUETCOM has a facility which is useful by for instance in case of an unscheduled shutdown. It can broadcast an announcement from a system-terminal to all terminals which are logged in.

System-terminal

A systemterminal is a terminal which has the logical terminalnumber 0 (zero) in DUETCOM's usercatalogue. From a terminal of this kind the following transaction may be keyedin:

message <sp> <text to be broadcasted>

DUETCOM interprets the text <message> as a command to "broadcast" the subsequent text on the same line to all the terminals which are logged in.

10. DUETCOM OPTIONS (duetoptions)

"Duetoptions" is a discfile containing initial values for duetcom's controlling variables. Furthermore "Duetoptions" contains some fp.-commands, which make it possible to let fp. read from the file, when a duetcom translation is needed e.g. to include a new terminal.

10.1 FP.-COMMANDS

The fp.-commands are placed at the beginning in the duetoptions-file and consist of a call of the slang compiler, a call of the fp.-utility-programs changeentry, and end.

The fp.-commands look like this:

```
(<objectfile> = slang type.yes list.{yes}1
                                    {no }1,

                xref. {yes}1 <sourcefile>
                      {no }1

 <objectfile> = changeentry <objectfile>,
                            <objectfile>,
                            <objectfile>,
                            <objectfile>,
                            <objectfile>,
                            3.0          ,
                            <objectfile>
end)
```

The parameters to the slangcompiler are type, list and xref. The type-parameter must always by type.yes. The user may decide whether a list or/and a crossreference is wanted or not, by using the list and xref parameters with .yes or .no.

10.2 CONTROLLING VARIABLES

After the fp.-commands Duetoptions contains three pieces of slangcode separated by n. These codepieces are read by the slangcompiler as modifications to the basic code in <sourcefile> - 10.1 fp.-commands -. The first piece of code contains values to be assigned to the controlling variables - the e-variables.

variable-name:	variable-explanation:	variable standard value:
e0:	number of receiving processes to be served by this version of duetcom.	1
e1:	number of active terminals, which must be described in the usercatalogue.	2
e3:	buffersize in halfwords (two per terminal, one per printer).	100
e4:	number of halfwords to be skipped at the beginning in blocks output to a terminal.	2
e5:	e5=1: duetcom produces testoutput in a discfile called duettest (the file must be present before start). e5=-1: no testoutput will be produced.	-1
e6:	ISO-value of fillcharacter.	1

10.3 THE USERCATALOGUE (TERMINALCATALOGUE)

The first piece of slangcode also contains a description of the terminals legal to the version of duetcom translated by means of these duet-options.

Each terminal is described in a record with a length of 26 halfwords.

Each record is split into fields with an i-name.

A terminal is described by assigning values to fields identified by their i-names.

The following is an exact definition of the meaning and use of the fields identified by their i-name, concluded with an example of a terminal-description.

10.3 THE USERCATALOGUE (TERMINALCATALOGUE)

field-name:	field-explanation:	field-type:
i0:	term. ref.: initially zero, later: addr. of terminal description	- word
i1:	fillcharacterref. (in case of hard-copyprinter)	- halfword
i2:		- halfword
i3:		- halfword
i4:		- halfword
i5:	printer; initially ident of printer, later: addr. of printer description	- word
i6:	termno, 3 chars used as prefix to all lines input	- word
i7:	*)username	- 4 words
i8:	userdefined terminalindex	- word
i9:	senderindex - (used to select receiving process)	- word
i11:	character instead of 10 (0 == 10)	- halfword
i12:	character after 13 (0 == none)	- halfword
i13:	outputmode; (0,0 == skip controle chars,	- halfword
i14:	4,0 == output all chars.)	- halfword

Example of terminal description in usercatalogue:

```
; i0,   i1,   i2,   i3,   i4,   i11,   i12,   i13,   i14,   i9,
   0,h.  0,    0,    0,    0,    0,     0,     0,     0 w.  0,

;      i5,      i6,     i7,     i8
  <:01p:>, <:01t:>, <:nc:>,0,0,0,1
```

h. indicates that the following variables are halfwords of 12 bits each.
w. - - - - - - words of 24 bits each.
; indicates that the rest of the line is a comment.

*) Username must not contain digits - only letters

NB: Please note that the order of the i-names in the shown examples are valid, the previous list of i-names is chronological

10.4 PRINTERCATALOGUE

In the second piece of slangcode follows the description of the printers which are known to this version of duetcom.

A printer is described in a record with a length of 24 halfwords split into fields with an i-name each; analogous with the terminalcatalogue.

Printers are also described by assigning values to i-name identified fields.

The meaning and use of fields followed by an example is shown on the next page.

re. THE USERCATALOGUE

i13 outputmode - if i13 = 0 all controle chars. are skipped; to avoid this i13 should be set to 4.

By controle chars. is understood the characters <VT>, <FF> and maybe other printercontrolling characters.

10.4 PRINTERCATALOGUE

field-name:	field-explanation:	field-type:
i1:	fillcharref. see section 10.6 page 1 for further explanation.	- halfword
i2:		- halfword
i3:		- halfword
i4:		- halfword
i5:	printertype (0 == separat printer, ≠ 0 == selective printer)	- word
i6:	ident of printer	- word
i7:	name of printer if RCNET-printer else 0,0,0,0	- 4 words
i9:	terminal sender index (equal i9 in user-catalogue)	- word
i10:	devicenumber (-1 if RCNET-printer)	- word
i11:	character instead of 10 (0 == 10)	- halfword
i12:	character after 13 (0 == none)	- halfword
i13:	outputmode (0,0 == skip controlchars.,	- halfword
i14:	4,0 == output all chars.)	- halfword

<u>Example of printerdescription in printercatalogue:</u>

```
              ; i10,  i1,  i2,  i3,  i4,  i11,  i12,  i13,  i14,  i9,
RCNET:          -1 h.  0,   0,   0,   0,    0,    0,    0,    0 w.  0,

                i5,      i6,          i7
                 0,  <:01p:>,  <:printer:>,0

NORMAL:          5 h.  0,   0,   0,   0,    0,    0,    0,    0 w.  0,
                 0,  <:02p:>,        0,0,0,0

SELECTIVE:      37 h.  0,   0,   0,   0,    0,    0,    0,    0 w.  0,
          <:03p:>,   <:03p:>,        0,0,0,0
```

h. indicates that the following variables are considered halfwords
w. - - - - - - - words

10.5 PROCESSCATALOGUE

The third and last piece of slangcode contains the processcatalogue.

The processcatalogue describes the processes which can receive input from Duetcom.

The processdescription consists of two elements,

the processindex and the processname.

The format of the processdescription looks like this:

```
process-     process-
index        name

  0,         <:proc1:>,0,0   ; the length of the
  2,         <:proc2:>,0,0   ; namefield must
  .                          ; occupy 4 words
  .
  .
  n,         <:procn:>,0,0
```

10.6 FILLCHARACTERCALCULATION

Calculation of fillcharacters to be printed at:

```
-NL:  a + b * n // 8
-VT:  c + d * ((pos_of_vt-1) mod lines_on_form) // 8
-FF:  c + d * (lines_on_form-1) // 8
```

n = number of characters on current line.
l = number of current line on this form.
a
b ref. to number of fillcharacters.
c initiated separately pr. printertype.
d
p = current position
f = number of lines on current form.

gives:

```
NL: a + b * n // 8                  n := 0; l := (l + 1) mod f;
VT: c + d * (( p - l) mod f) // 8   l := p;
FF: c + d * ( f - l) // 8           l := 0;
```

The following values of a, b, c and d are a result of experience:

type of printer:	values for:	a	b	c	d
centronic	300 bps	5	2	4	11
"	1200 -	30	5	10	40
logabax	1200 -	30	0	0	40

11. Communication with Duetcom

Processes, which want to communicate with Duetcom, must obey some restrictions defined by Duetcom. These restrictions are more closely described in the following.

A process must identify itself by means of a process-index. This is done by assigning the processindex to the mode field of the modekind variable, before calling the open procedure for the communication-zone. Let's say, the zone com_zone is to be connected to Duetcom:

```
mode_kind := process_index shift 12;
open (com_zone, mode_kind, <:duetcom:>,
      giveup_mask);
```

Now the process has connected its communication-zone to Duetcom and identified itself. This is done only once during the communication.

At this state the communicating process, henceforth called CP, may choose between an input action or a control action. The communication must not be started with an output action, - actions are explained in sect. 11.1.

The communication may now take place as follows - seen from CP's point of veiw:

1: perform input action - one or more
2: perform control action - one or more
3: perform output action - only one
4: perform control action - one or more
5: goto 1

11. Communication with Duetcom

Duetcom's most significant restriction is:

> an output action must not be followed by
> an output action.

11.1 Definition of actions

To ease the understanding of the rules for communication with Duetcom, the communication is split into a sequence of actions.

The actions are split into three groups, namely:

> input action
> control action
> output action

11.1.1 Input action

The input action is performed when CP wants Duetcom to deliver an inputline in a buffer specified by CP. The action is performed by send_message and wait_answer,

message:	answer:
input	logic status

11.1.2 Control action

A control action is one or more instructions to Duetcom to execute an operation and immediately return an answer. After each instruction (message) the answer must be waited for. The type of answer is dependent on the kind of operation which is executed.

11.1.2 Control Action

message:	answer:
sense	the number of transactions in the queue meant for the sender.
change device	result of change printer-deviceno.
print	result of start printing *)

A control action may be performed at any state during the communication.

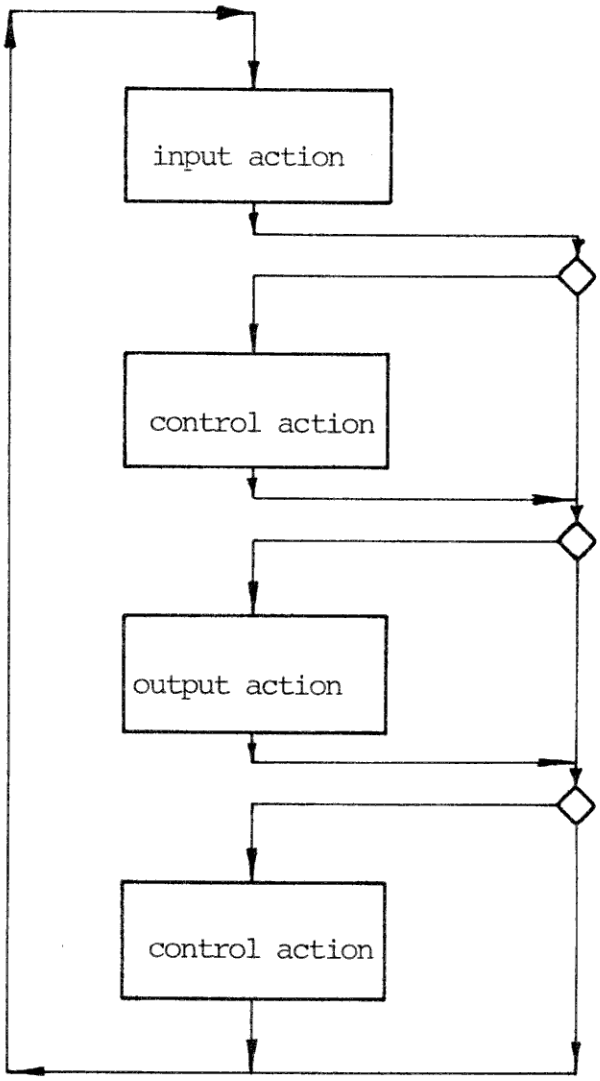
11.1.3 Output action

An output action is meant to produce some output to the terminal addressed. Between two output actions an input action must have been executed. The output action consists of send_message and wait_answer.

message:	answer:
output	logic status
convert	result of start convert *)

*) The result of the print/convert is delivered later as a normal inputline generated by Duetcom at end_print/end_convert (cfr. sect. 8 - transactions generated by Duetcom).

11.2 Communication scheme



send input message and wait answer.

send as many control messages as wanted and wait answer for each.

send one output/ convert message and wait answer.

send as many control messages as wanted and wait answer for each.

According to this scheme an output action cannot be followed by an output action while the order among other actions is arbitrary.

12. INDEX

12. INDEX (continued)

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DUETCOM

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