RACOM
RADIO DATA NETWORKS

Semi Dynamical Routing (SDR)

version 7.35
6/21/2010

1. Introduction

Semi Dynamický Routing (SDR) allows send the packet to the alternative route in case of main route break. The principle used is a different then this one used in IP networks. The reconstruction of routing tables does not take place here. The topology is permanently written in the routing tables for individual routes. The MORSE mechanism accomplishes the exchanging of routing tables in case of main route break. The spare tables are user defined. They contains the nearest points of MORSE network which are able to provide next routing to the destination. The rules for spare tables creating are the same like rules for static routing, see the Routing introduction and next chapters in the MORSE Guide.

It is good to remember the basic principle of MORSE routing - each node seeks for the next hop according to the destination address, which is always contained in the packet. The node which receives the packet processes the packet in similar fashion.This process continues until the packet arrives at the destination.

The description of new version 10.x.x.x is in the manual MORSE Guide 2[1].

2. Cofiguration parameters

From the Main menu choose D:

```
Sort of Dynamic Routing:
(N)ode extensions
(G)lobals
(q)uit
(e)dit
rmt de(f)ault  rmt (r)ead  rmt (w)rite
(q)uit
```

The parameter configuration for all nodes is done in the Globals menu:

```
Dynamic routing: Globals
(t)imeout:120sec
m(o)de:NEXT HOP  DB(G):OFF
de(f)ault (r)ead (w)rite
(I)nit (S)ync
```

---

[1] https://www.racom.eu/eng/support/morse-m2/index.html

```
(q)uit
>>
```

- `(t)imeout:120sec` - time of validity for records in the address table having the given status

- `DB(G):OFF/ON` - switch on/off the displaying of NEXT HOP table

- m(o)de - choice of the dynamical routing mode

  - `(0) OFF`

  - `(4) NEXT HOP`

The (N)ode extensions menu contains the setting of spare routing tables for the net output for individual nodes in CU. The column Mode is filled in automatically.

```
Node Extensions:
     retab
Nid |l w n g| Mode
(0) |0 0 0 0| 0
(1) |2 1 0 0| 5
(2) |3 1 0 0| 1
(3) |0 0 0 0| 0
(4) |1 4 0 0| 1

de(f)ault (r)ead (w)rite
(I)nit (S)ync
(q)uit
```

Node Extensions for nod 1:

```
Node Extensions:
(l)o:2 (w)i:1 (n)e:0 (g)l:0
(K)eep lines:ON
(I)nit (W)rite
(q)uit
```

- `(K)eep lines: - On/Off` – switching on/off the keep packets, this packets are sent when the timeout in Global menu expired.

The keep packets are transmitted to the addresses, which are in the next hop address table. This table is created and updated by the modem in the Dynamic routig mode. The recomended value is ON. In case OFF can difficults occur in switching back to the main route, because the spontaneous call to the nearest CU does not need be done. Critical is the network topology and the type of traffic.

Keep in the mind, that after switching in the spare route the CU starts work with all spare tables belonging to the respective node. This is why the all tables (l,w,n,g) must be fullfiled.

3. Actual SDR mechanism and debug routing in the Setr

The radiomodem creates in the Dynamic routing mode the table containing it's neighbour nodes (NEXT HOP). This table is critical for the decision if the main or spare route will be used. The next explanation will be done on the listing at DB(G):ON in the menu Globals.

```
10:50:43.850 Tt: 6 120

Tt:nid:4 toa:690F2000 120.000000 m:2.000000
Tt:nid:4 toa:690F4804 100.000000 m:0.000000
Tt:nid:4 toa:690F4800 119.000000 m:0.000000
Tt:nid:2 toa:690F4701 115.000000 m:0.000000
Tt:nid:3 toa:690F4901 116.000000 m:0.000000
Tt:nid:2 toa:690F4700 112.000000 m:-1.000000
```

- first line:

  ```
  10:50:43.850 Tt: 6 120
  ```

  - `10:50:43.850` – the time, when the record was creating

  - `Tt: 6` - 6 items of the record

  - `120` - the preset time of the record validity (timeout)

- next line:

  ```
  Tt:nid:4 toa:690F2000 120.000000 m:2.000000
  ```

  - `nid:4` – the record belongs to the node 4

  - `toa:690F2000` - MORSE address of the next step

  - `120.000000` - the remaining validity time, after successful packet delivering to the given address the time is updated to the timeout value (120sec - according the set parameter)

  - `m:2.000000` – link status

    - `2` - link OK

    - `1` – one packet was not delivered

    - `0` – inaccessible link, the spare route is active

    - `-1` – unknown MORSE address

According to the status the packet is sent to the main route or to the spare one. If the status is 2 or 1, then the packet will be sent to the main route. In the state 0 the radiomodem uses the spare route. In the case, that the spare route is also inaccessible, the modem try send alternately packet to the main and spare route.

If it is choosen (K)eep lines:ON in the menu (N)ode extensions, then the modem after timeout expire send the keep packets in the relevant directions and surveys the line state. The record bellow shows the routing table after successful delivering the Keep packet from address 690FAA14 to 690FAA30.

If the Keep packet or the user data packet was not delivered successfully, then the link status changes to m:1. If in next attempt the status does not change, the the line is declared as inaccessible and the spare route is used for next routing.

```
11:28:47.000 Sdr Keep: 690FAA14->690FAA30
11:28:47.041 Tt: 2 30
```

```
Tt:nid:1 toa:690FAA30 30.000000 m:2.000000
Tt:nid:1 toa:690FAA14 27.000000 m:2.000000
```

Routing of the next hop dynamic address table in the Setr (degug). The service output from node in the local CU is set to the SCC0. The `ise` menu in the remote CU is routed using `id(1)` to the local CU, where the Setr is connected. In case of local CU the `ise` menu can stay in it's default state. The next example is used for the message delivering via the network. Keep in mind, that the table is transmitted every second and the network can be overloaded.
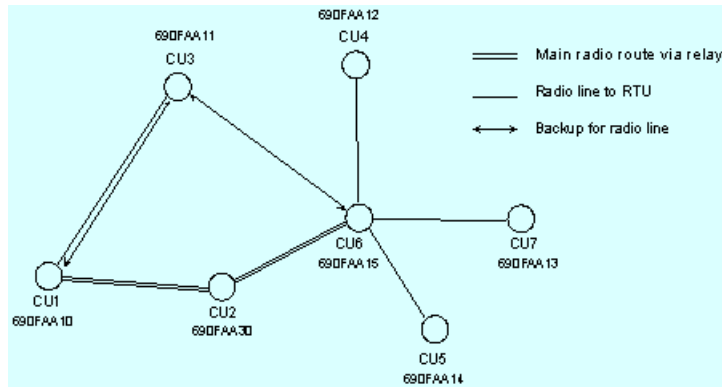
```
System channels:
(Service 'iMo' works for s0 and s1 only)


id|--Node--addr------timeout---size---s(e)c--
(0)   0     00000000     888      400      ON
(1)   4     690FD0FF     888      400      ON
(2)   0     00000000     888      400      ON
(3)   0     00000000     888      400      ON
(4)   0     00000000     888      400      ON
(5)   0     00000000     888      400      ON


de(f)ault (r)ead (w)rite
(I)nit (S)ync
(q)uit
```

4. Settings examples

4.1. Backup of radio line by radio line

pic. No. 1 - Network topology - backup by radio line

Node 690FAA10:

```
 Nodes:
                              retab
Nid|address |M | u    s | L    N |l w n g|sTO Err   Cent vTO hTO
(0) 005A6A7F      -   S00| -   R00|0 0 0 0| 15 SERV  OFF  304  30
(1) 690FAA10    S02 S00| -   R01|1 0 0 0| 15 SERV  OFF  304  30
(2) 00000000    S01 S00| -   R02|0 0 0 0| 15 SERV  OFF  304  30
(3) 00000000    S02 S00| -   R03|0 0 0 0| 15 SERV  OFF  304  30
(4) 00000000    S03 S00| -   R04|0 0 0 0| 15 SERV  OFF  304  30
```

```
de(f)ault (r)ead (w)rite
(I)nit (S)ync
(q)uit
>>
```

A local routing table No.1 for main radio line:

```
>>Tl1
>>
Local retab. No 1
12 to:30  13 to:30  14 to:30  15 to:30
>>
```

- default direction to end points of network is repeater with MORSE address 690FAA30, except end point 690FAA11

MORSE dynamic routing setting

Global parameters setting:

```
Dynamic routing: Globals
(t)imeout:120sec
m(o)de:NEXT HOP  DB(G):ON
de(f)ault (r)ead (w)rite
(I)nit (S)ync
(q)uit
```

- `(t)imeout:120sec`

- `m(o)de:NEXT HOP` - mode NEXT HOP active

- `DB(G):ON` - ON/OFF - NEXT HOP table print out

Backup route line setting for Node No. 1:

```
Node Extensions:
     retab
Nid |l w n g| Mode
(0) |0 0 0 0| 0
(1) |2 0 0 0| 1
(2) |0 0 0 0| 0
(3) |0 0 0 0| 0
(4) |0 0 0 0| 0

de(f)ault (r)ead (w)rite
(I)nit (S)ync
(q)uit
>>1

Node Extensions:
(l)o:2 (w)i:0 (n)e:0 (g)l:0
(K)eep lines:ON
```

```
(I)nit (W)rite
(q)uit
```

- for alternate routing will be use a local routing table No.2

Print out of a local routing table No.2

```
>>Tl2
Local retab. No 1
12 to:11 13 to:11 14 to:11 15 to:11
>>
```

Print out of a NEXT HOP table:

```
15:14:15.000 Sdr Keep: 690FAA10->690FAA30
15:14:15.041 Tt: 2 120
Tt:nid:1 toa:690FAA30 120.000000 m:2.000000
Tt:nid:1 toa:690FAA11 3.000000 m:2.000000
```

- both direction are available status m:2, radio modem with MORSE address 690FAA10 send Keep packet to MORSE address 690FAA30

```
15:15:39.700 Tt: 2 120
Tt:nid:1 toa:690FAA30 117.000000 m:0.000000
Tt:nid:1 toa:690FAA11 39.000000 m:2.000000
```

– a NEXT HOP with MORSE address 690FAA30 isn't available, packets are alternate to backup line

Node 690FAA15:

```
 Nodes:
                                retab
Nid|address |M | u    s | L    N |l w n g|sTO Err   Cent vTO hTO
(0) 005A6A7F     -  S00| -  R00|0 0 0 0| 15 SERV  OFF 304  30
(1) 690FAA15    S02 S00| -  R01|1 0 0 0| 15 SERV  OFF 304  30
(2) 00000000    S01 S00| -  R02|0 0 0 0| 15 SERV  OFF 304  30
(3) 00000000    S02 S00| -  R03|0 0 0 0| 15 SERV  OFF 304  30
(4) 00000000    S03 S00| -  R04|0 0 0 0| 15 SERV  OFF 304  30
de(f)ault (r)ead (w)rite
(I)nit (S)ync
(q)uit
```

A local routing table No.1 for main radio line:

```
>>Tl1

Local retab. No 1
10 to:30
>>
```

- default direction for packet routing to centre (690FAA10) is repeater with MORSE address 690FAA30

MORSE dynamic routing setting

Global parameters setting:

```
Dynamic routing: Globals
(t)imeout:120sec
m(o)de:NEXT HOP  DB(G):ON
de(f)ault (r)ead (w)rite
(I)nit (S)ync
(q)uit
>>
```

- `(t)imeout:120sec`

- `m(o)de:NEXT HOP` - mode NEXT HOP active

- `DB(G):ON` - ON/OFF - NEXT HOP table print out

Backup route line setting for Node No. 1:

```
Node Extensions:
     retab
Nid |l w n g| Mode
(0) |0 0 0 0| 0
(1) |2 0 0 0| 1
(2) |0 0 0 0| 0
(3) |0 0 0 0| 0
(4) |0 0 0 0| 0

de(f)ault (r)ead (w)rite
(I)nit (S)ync
(q)uit
>>1

Node Extensions:
(l)o:2 (w)i:0 (n)e:0 (g)l:0
(K)eep lines:ON
(I)nit (W)rite
(q)uit
```

- for alternate routing will be use a local routing table No.2

Print out of a local routing table No.2

```
>>Tl2

>>
Local retab. No 2
10 to:11
>>
```

- alternate direction to centre via CU 3

Print out of a NEXT HOP table:

```
15:14:30.041 Tt: 2 120
Tt:nid:1 toa:690FAA30 116.000000 m:2.000000
Tt:nid:1 toa:690FAA11 10.000000 m:2.000000
```

- both direction are available, status m:2

```
15:15:39.700 Tt: 2 120
Tt:nid:1 toa:690FAA30 117.000000 m:0.000000
Tt:nid:1 toa:690FAA11 39.000000 m:2.000000
```

- a NEXT HOP with MORSE address 690FAA30 isn't available, packets are alternate to backup line

4.2. Backup of radio line by serial line
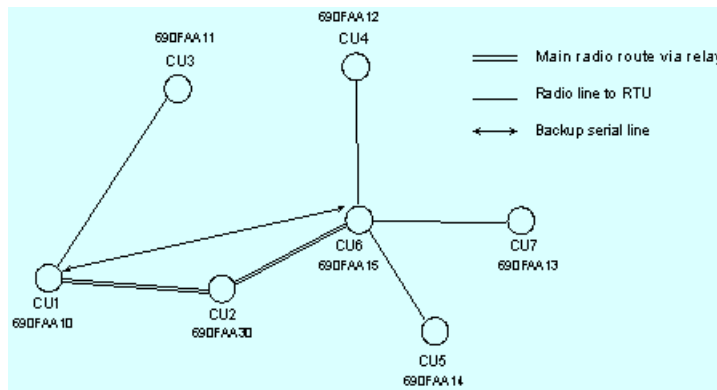
pic. No. 2 - Network topology - backup by serial line(to Link output, PSTN modem etc.)

Node 690FAA10:

```
 Nodes:
                             retab
Nid|address |M | u    s | L   N |l w n g|sTO Err  Cent vTO hTO
(0) 005A6A7F    -  S00| -   R00|0 0 0 0| 15 SERV  OFF 304  30
(1) 690FAA10    S02 S00|S02 R01|1 0 0 0| 15 SERV  OFF 304  30
(2) 00000000    S01 S00| -   R02|0 0 0 0| 15 SERV  OFF 304  30
(3) 00000000    S02 S00| -   R03|0 0 0 0| 15 SERV  OFF 304  30
(4) 00000000    S03 S00| -   R04|0 0 0 0| 15 SERV  OFF 304  30


de(f)ault (r)ead (w)rite
(I)nit (S)ync
(q)uit
>>
```

A local routing table No.1 for main radio line:

```
>>Tl1

Local retab. No 1
12 to:30 13 to:30 14 to:30 15 to:30
>>
```

-default direction to end points via repeater with MORSE address 690FAA30, excpet end point 690FAA11

MORSE dynamic routing setting

Global parameters setting:

```
Dynamic routing: Globals
(t)imeout:120sec
m(o)de:NEXT HOP  DB(G):ON
de(f)ault (r)ead (w)rite
(I)nit (S)ync
(q)uit
>>
```

- `(t)imeout:120sec`

- `m(o)de:NEXT HOP` - mode NEXT HOP active

- `DB(G):ON` - ON/OFF - NEXT HOP table print out

Backup route line setting for Node No. 1:

```
Node Extensions:
     retab
Nid |l w n g| Mode
(0) |0 0 0 0| 0
(1) |2 0 0 0| 1
(2) |0 0 0 0| 0
(3) |0 0 0 0| 0
(4) |0 0 0 0| 0

de(f)ault (r)ead (w)rite
(I)nit (S)ync
(q)uit
>>1

Node Extensions:
(l)o:2 (w)i:0 (n)e:0 (g)l:0
(K)eep lines:ON
(I)nit (W)rite
(q)uit
>>
```

- for alternate routing will be use a local routing table No.2

Print out of a local routing table No.2

```
>>Tl2

>>
Local retab. No 2
12 to:10 13 to:10 14 to:10 15 to:10
>>
```

- alternate route to reley station via itself (to Link output)

Print out of a NEXT HOP table:

```
15:18:20.041 Tt: 2 120
Tt:nid:1 toa:690FAA30 26.000000 m:2.000000
Tt:nid:1 toa:690FAA11 70.000000 m:2.000000
```

- both direction are available m:2

```
15:15:39.700 Tt: 2 120
Tt:nid:1 toa:690FAA30 117.000000 m:0.000000
Tt:nid:1 toa:690FAA11 39.000000 m:2.000000
Tt:nid:1 toa:690FAA10 33.000000 m:2.000000
```

- a NEXT HOP with MORSE address 690FAA30(relay isn't available, packets are alternate to backup line - to Link network output (serial line, MARS-A, PSTN modem ..etc.)

Node 690FAA15:

```
  Nodes:
                                retab
Nid|address |M | u    s | L    N |l w n g|sTO Err   Cent vTO hTO
(0) 005A6A7F    -  S00| -   R00|0 0 0 0| 15 SERV  OFF 304  30
(1) 690FAA15   S02 S00|S02 R01|1 0 0 0| 15 SERV  OFF 304  30
(2) 00000000   S01 S00| -   R02|0 0 0 0| 15 SERV  OFF 304  30
(3) 00000000   S02 S00| -   R03|0 0 0 0| 15 SERV  OFF 304  30
(4) 00000000   S03 S00| -   R04|0 0 0 0| 15 SERV  OFF 304  30


de(f)ault (r)ead (w)rite
(I)nit (S)ync
(q)uit
>>
```

A local routing table No.1 for main radio line:

```
>>Tl1

>>
Local retab. No 1
10 to:30
```

MORSE dynamic routing setting

Global parameters setting:

```
Dynamic routing: Globals
(t)imeout:120sec
m(o)de:NEXT HOP  DB(G):ON
de(f)ault (r)ead (w)rite
(I)nit (S)ync
(q)uit
>>
```

• (t)imeout:120sec

- `m(o)de:NEXT HOP-` mode NEXT HOP active

- `DB(G):ON-` ON/OFF - NEXT HOP table print out

Backup route line setting for Node No. 1:

```
Node Extensions:
     retab
Nid |l w n g| Mode
(0) |0 0 0 0| 0
(1) |2 0 0 0| 1
(2) |0 0 0 0| 0
(3) |0 0 0 0| 0
(4) |0 0 0 0| 0
de(f)ault (r)ead (w)rite
(I)nit (S)ync
(q)uit
>>1

Node Extensions:
(l)o:2 (w)i:0 (n)e:0 (g)l:0
(K)eep lines:ON
(I)nit (W)rite
(q)uit
>>
```

- for alternate routing will be use a local translation table No.2

Print out of a local routing table No.2

```
>>Tl2

>>
Local retab. No 2
10 to:15
>>
```

Print out of a NEXT HOP table:

```
15:18:20.041 Tt: 2 120
Tt:nid:1 toa:690FAA30 44.000000 m:2.000000
Tt:nid:1 toa:690FAA11 68.000000 m:2.000000
```

- both direction are available m:2

```
15:15:39.700 Tt: 2 120
Tt:nid:1 toa:690FAA30 96.000000 m:0.000000
Tt:nid:1 toa:690FAA11 41.000000 m:2.000000
Tt:nid:1 toa:690FAA12 45.000000 m:2.000000
Tt:nid:1 toa:690FAA13 47.000000 m:2.000000
Tt:nid:1 toa:690FAA14 77.000000 m:2.000000
Tt:nid:1 toa:690FAA15 91.000000 m:2.000000
```

4.3. Local packet cycling loop delimitation – recommended setting

On the picture No. 3 is a general network topology with backbone line (ethernet or serial line). To the MORSE backbone are radially connected a end user stations (RTU) via radio lines.
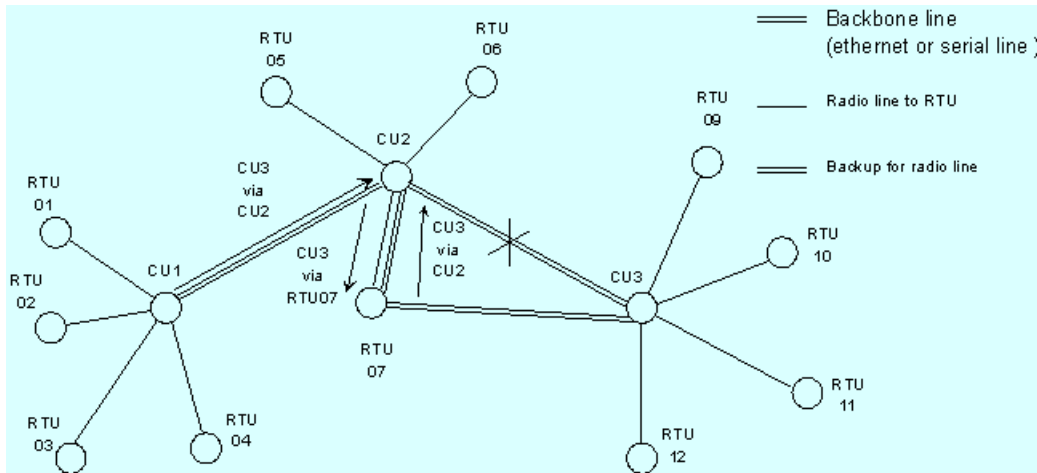
pic. No. 3 - Network topology

For example, a backbone line is interrupted between CU2 and CU3. A CU2 made dynamic routing re-direction according to a backup routes to NEXT HOP via RTU07. The RTU07 was proposed as end point and we want use it as backup radio point, for routing to CU3 from CU2, but RTU07 had a default way for communication to network a point CU2 and dynamic router at this point don't have information that's a ethernet line between CU2 and CU3 was interrupt. When were delivered a redirected packets from CU2 for CU3 to RTU07, a RTU07 will send redirected packet back to CU2 and now was been created a local cycle loop between CU2 and RTU07. This's very dangerous for radio network and RA-COM recommended avoid this setting. This problem could be solved by creating a new NODE address inside of end point - RTU07. New routing address provide direct routing to CU03 by radio transmission. Backup route line from CU2 to CU3 will by create via auxiliary Node at RTU07, which allows delivering of redirecting packet.
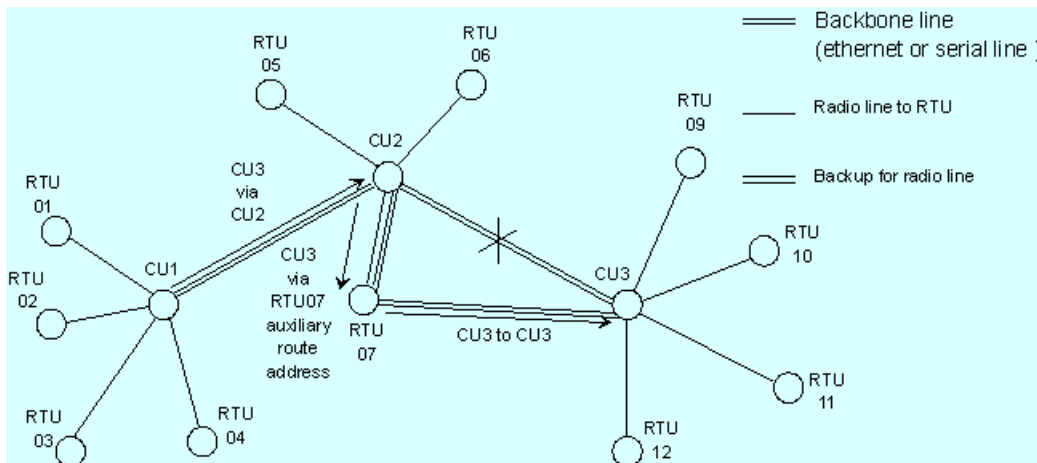
5. History

A guide validate - since firmware release 7.34 to 7.45.

The description of new version 10.x.x.x is in the manual MORSE Guide 2[2].

---

[2] https://www.racom.eu/eng/support/morse-m2/index.html