Addendum

NorDig Unified Test Plan

for

Integrated Receiver Decoders

for use in cable, satellite, terrestrial and IP-based networks

Addendum NorDig Test Plan Task 11 – SSU testing

This Addendum replaces the complete Task 11, The System Software Update within the NorDig Test Plan ver. 2.6.0

Document History:

Version	Date	Comments
Addendum Task 11 - SSU for Ver 2.6	2018-10-04	This addendum is an update and replaces the Task 11 (The System Software Update - SSU) within the NorDig Test Plan v2.6 and is planned to be incorporated into next version of NorDig Test Plan.

2.11 Task 11: The System Software Update

2.11.1 SSU testing General

The NorDig IRD **shall** provide a software download mechanism that enables download of sytem software to replace existing software.

Delivery alternatives (optional or mandatory depending on the connectable status of the IRD) are:
- OTA (#D1 and #D2): “Over-the-Air”, refers here to over the broadcast channel (via terrestrial, cable, satellite or managed IPTV interface) .
- OTA Notification (#D3): refers here to search/get notification over the broadcast channel and download from Internet and/or USB.
- OTN (#D4): “Over-the-Network”, refers here to over the Internet channel (via IRD’s two-way interface).
- USB (#D5): “Local”, refers to download from the local interface.

During the SSU testing both upgrade and downgrade are are performed with a special mode/SW used for the downgrade process (normally not available with production software/public SSU).
Alternatively the manufacturer must deliver several physical samples that can each be upgraded once.

2.11.2 Test equipment summary

To configure the minimum test setup described in these test procedures, the test setup seen inFigure 1 can be used.

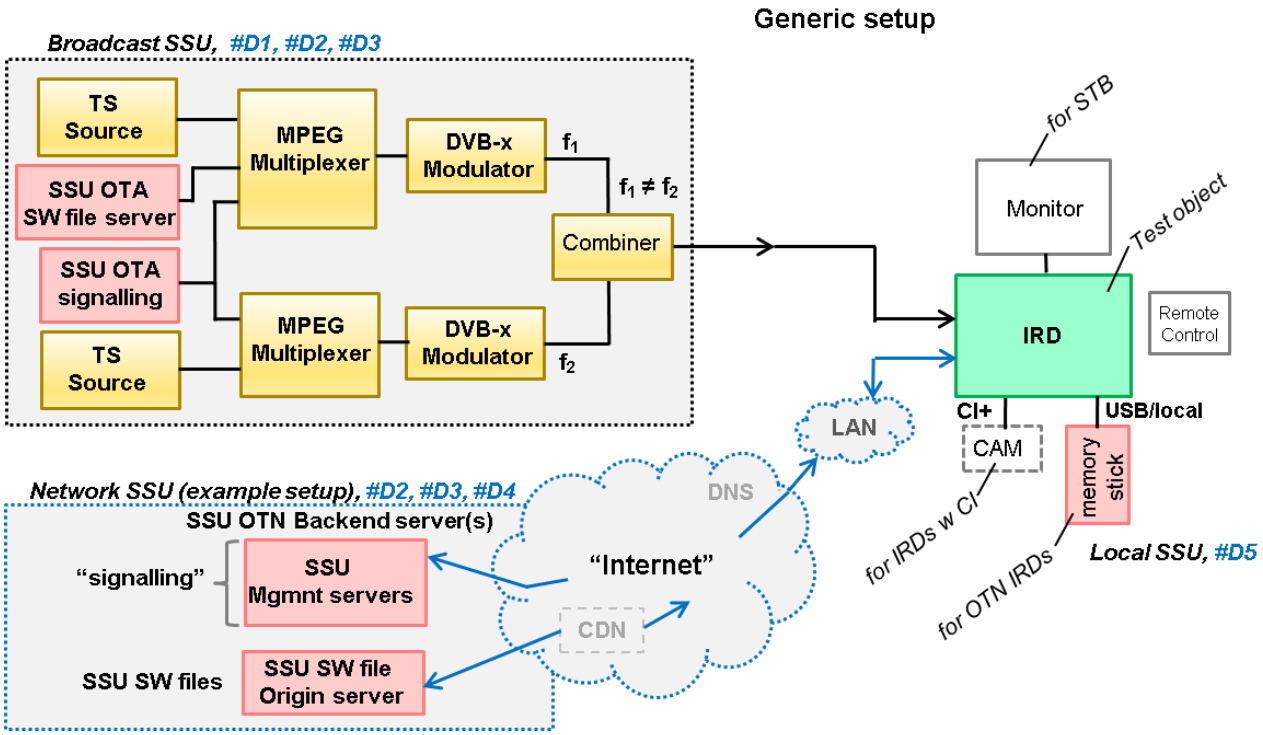

Figure 1. Generic test setup for SSU / CI+ CAM test procedures

Note! The equipment needed may vary depending on the system used and can be purchased from many vendors even in a compact all-in-one unit. However, most of the tests can done using one general test setup.

2.11.2.1 Broadcast SSU (OTA)

The OTA-SSU / CI+ CAM update service is carried within a transport stream. The TS must contain the correct type of signaling information in order for the IRD to detect the correct OTA-SSU / CI+ CAM update service. The following sections describe minimum signaling information.

The NIT must contain:

- Linkage_descriptor 0x4A to DVB SSU service using linkage_type 0x09.

  Example for linkage_descriptor for IRD system download located at TSID/ONID 0x0456/0x22F1.

Descriptor_tag	0x4A
Transport_stream id	0x0456
Original_network_id	0x22F1
Service_id	0x1194
Linkage_type	0x09
OUI *)	
selector_bytes	
private_data_byte **)	

*) DVB OUI or manufacturer specific OUI
) The private_data_byte **shall be used as specified in the DVB Data Download Specification; Part 1: Simple Profile. (ETSI TS 102 006 v1.3.1)

The PMT must contain:
(The descriptor **shall** be placed in the component loop of the PSI PMT table.)

- Data_broadcast_id_descriptor

descriptor_tag	0x66
data_broadcast_id	0x000A
id_sector_bytes *)	
OUI **)	
update_type ***)	
update_versioning_flag	
update_version	
selector_bytes	
private_data_bytes	

*) The id_sector_bytes **shall** be used as specified in the DVB Data Download Specification (ETSI TS 102 006).
) The OUI value in the PMT **shall match the OUI value in the NIT linkage to SSU descriptor.
***) Update_type, use value below specified for simple or enhanced profiles;

proprietary update solution (not allowed).	0x0
standard update carousel (i.e. without notification table) via broadcast.	0x1
system software update carousel with notification table (UNT) both available via broadcast.	0x2
system software update signaled via broadcast UNT, update available from the return channel.	0x03
system software update signaled via broadcast UNT, update available from the Internet.	0x04
Reserved for future use.	0x5 – 0xFF

The UNT must contain:
Signaling of UNT is relevant in case of the data_broadcast_id_descriptor parameter update_type is set to 0x02 in PMT.

The parameters for different descriptors in UNT are specified below:

descriptor_tag	0x4B
table_id	0x01
OUI [1)]	
processing_order [2)]	
common_descriptor_loop [3)]	
target_descriptor_loop [4)]	
operational_descriptor_loop [5)]	

1) The OUI value in the PMT **shall** match the OUI value in the NIT linkage to SSU descriptor.
2) Depending on the SSU OTA mechanism.
3) common_descriptor_loop carries information which is intended for descriptors which apply to all platform/target devices listed in target_descriptor_loop and operational_descriptor_loop.
4) target_descriptor_loop can contain descriptor:
- target_serial_number_descriptor

5) operational_descriptor_loop can contain descriptors:
- scheduling_descriptor

  Examples for scheduling_descriptor

descriptor_tag	0x01
start_date_time	
end_date_time	
final_availability	0
periodicity_flag	
period_unit	
duration_unit	
estimated_cycle_time_unit	
period	
duration	
estimated_cycle_time	

- update_descriptor
- ssu_location_descriptor
- message_descriptor
- ssu_subgroup_association_descriptor
- private_data_specifier_descriptor

See more details regarding settings in DVB Data Download Specification (ETSI TS 102 006).

NorDig T2-IRD SSU OTA in DVB-T2 system
- The SSU stream is broadcast with parameter settings of PLP_ID = 1, T2_System_Id = 1 and Cell_Id = 1 in a single PLP mode.

2.11.2.2 Network SSU

The IRD manufacturer must ensure that the published OTN software contains the correct type of signaling information in order for the IRD to detect the correct SSU.
The IRD manufacturer **shall** ensure a software upgrade is available over the public Internet, the test is not valid if the SSU is just locally published in a lab enviroment.
For the OTN testing the IRD must connect to the Internet by LAN cable or via Wi-Fi through a local router or access point.

The Internet connection during testing should reflect the country settings of the IRD under test, e.g. using a VPN tunnel to simulate ip connection from the same country as the country setting of the IRD.

2.11.3 Test cases

Test Case	***Task 11:1 IRD System software update using DVB SSU simple profile***
Section	NorDig Unified 10.1, 10.2,10.5, 12.2.6 and 16.4
Requirement	The NorDig IRD **shall** provide a software download mechanism that enables download of system software, to add a new system software or replace an existing system software. The upgrade of NorDig IRD software **shall** be initiated by the user (by update user preference setting and/or by user interaction). The user **shall** be able to choose the update approach for the IRD (see 10.2.1 in IRD spec) and the user **shall** be able to disable any automatic update. The factory default **shall** be a value that disables Fully Automatic mode. In cases where the user is prompted to confirm an update, the user **shall** be able to confirm or to abort/postpone the update (for example with a Yes and No option). If the user selects to abort/postpone an available update or by other ways cancel an available update, the NorDig IRD **shall** remind the user as stated in section 10.1.6 in IRD spec. The NorDig IRD **shall** be provided with a mechanism ensuring that only newer software versions than the existing System Software are accepted. If the NorDig IRD System software is corrupt (due to normal operation of the IRD or due to updating the system software), the IRD manufacturer **shall** provide a backup mechanism, either on local storage or via download, which can make the IRD operational again. The NorDig IRD supporting SSU via broadcast channel **shall** support the DVB SSU simple profile using the signalling in NIT, BAT and PMT, in accordance with the DVB-SSU specification . The Linkage descriptor in the NIT table, for linking to the SSU service is defined in NorDig Unified IRD specification section 12.2.6.
IRD Profile(s)	All IRDs that are using OTA SSU simple profile
Test procedure	**Purpose of test:** To verify the IRD system software update process in broadcast channel using DVB SSU simple profile. The SSU end user functionality is not tested in this case. It is tested in Task 11:6 SSU end user functionality. This test is convenient to do parallel with Task 11:6 SSU end user functionality. **Equipment:** Test setup described in 2.11.2 Test equipment summary

For the testing three IRD SSU software is needed, “SW v1“,“SW v2“ and “SW v3“, (“SW v1“ as starting point, “SW v2“ for testing upgrading and “SW v3“ for testing ”non-downgrading”).

IRD manufacturer **shall** ensure that software upgrade (“SW v1”) , (“SW v2”) and (“SW v3”) is available for the test lab.

Two approaches for the SSU testing, either via using:
- one single IRD with possibility to upgrade and downgrade the SW by other means plus SSU sw images of “SW v1“ , “SW v2“ and “SW v3“.
- alternative via using multiple IRDs. Two IRDs with software “SW v1“ and one IRD with software “SW v3“.

Selection of two different ONID for different networks corresponding country1 and country2 in the test procedure.

Test procedure:

1. Configure three outgoing download streams from the system software source. The system software PID, PMT PID and SID may not conflict with each other.
2. Configure the multiplexer to transmit three outgoing system software download streams within TS on the frequency f1. The system software PID, PMT PID and SID may not conflict with each other. (Simulates three system software streams.)
3. Configure linkage_descriptor for the two system software download streams not to be suitable for the IRD under test. The linkage_descriptor parameters for the third download stream **shall** be suitable for the IRD under test. The third system software download stream **shall** be the last in order.
4. Fill in the test results which parameters are unmatching with the IRD under test.
5. For the frequency f2 configure linkage_descriptor to refer to the frequency f1 with suitable parameters for the over-the-air download. (Simulates frequency change).
6. Make sure the IRD has “SW v1” installed.
7. Perform factory reset to the IRD, complete the “first time” installation and check that all the services are possible to receive.
8. Tune the IRD to a service on the frequency f1.
9. Fill in the test results if the IRD has a setting for automatic search and it is set to “auto search”.

10. Initiate the download.
11. Verify that the software in the IRD is updated to “SW v2”.
12. Fill in the test protocol.

13. Downgrade IRD software to “SW v1”.
14. Tune the IRD to a service on the frequency f2.
15. Initiate the download again.
16. Verify that the software in the IRD is updated to “SW v2”.
17. Fill in the test protocol.

18. Upgrade IRD software to “SW v3”.
19. Perform factory reset to IRD and check that all the services are possible to receive.
20. Initiate the download again. Verify that no software update occurs.

21. Downgrade IRD software to “SW v1”.
22. Initiate the download again.

23. During the update process (step 10), remove the power cable to corrupt the installation of the system software to corrupt the downloading of the system software.
24. Wait 10 seconds and then re-insert the power cable.
25. Verify that the IRD is still usable.
26. Fill in the test protocol. Fill in extended information in the comments section if the IRD ends up in an error state. Error messages etc.

27. Initiate the download again.
28. Plug out the antenna cable. (Simulates RF disturbances).
29. Plug in the antenna cable.
    Fill in the test protocol. Fill in extended information in the comments section if the IRD ends up in an error state. Error messages etc.

30. Verify which ONID values correspond country1 and country2 settings in IRD.
31. Make sure that the IRDs country setting is equal to country2.
32. Configure the TS from f1 carrying the SSU service so that the ONID is equal to country1.
33. Configure the TS from f2 so that the ONID is equal to country2.
34. Fill in the test protocol which ONID values are broadcasted in TS in f1 (country1) and f2 (country2).
35. Fill in the test protocol which country settings are selected in the IRD.
36. Control that the IRD will not download and install the SSU.
37. Fill in the test protocol.

Expected result:
IRD performs a software update from DVB SSU simple profile OTA broadcast available stream.

Test result(s)

Unmatched SSU stream number	**Unmatched parameter name**
#1	
#2	

	ONID value
ONID value in TS in f1 (country1)	
ONID value in TS in f2 (country2)	

Test points		**OK** or **NOK**
9	Does IRD have a setting for automatic SSU search set by default to “auto search” ?	
10- 12	The correct system software on the frequency f1 is upgraded.	
13 – 17	The correct system software, when initiated on frequency f2, is upgraded.	
18 - 20	Ensure that only newer versions are downloaded	
21 – 26	IRD starts after electric break using old (working) software.	
27 – 29	The IRD clarifies the RF signal reception disturbancies under OTA download. It has current software.	
30 – 37	The IRD does not download or install the SSU from other ONIDs than the ONID that matches the country setting in the IRD.	

Conformity	☐**OK** **Fault** ☐ Major ☐ Minor, define fail reason in comments		
Comments	If possible describe if fault can be fixed with software update: ☐**YES** ☐**NO** Describe more specific faults and/or other information		
Date		***Sign***	

Test Case	***Task 11:2 IRD System software update using DVB SSU enhanced profile - scheduling***
Section	NorDig Unified 10.1, 10.2 and 10.5
Requirement	The NorDig IRD supporting SSU via broadcast channel **shall** provide a software download mechanism in accordance with the DVB SSU specification , the IRD **shall** support the SSU Simple Profile and the parts of SSU Enhanced Profile that are specified below. The test requirements are the same as for DVB SSU simple profile in Task 11:1 with the addition of scheduled tasks. The NorDig IRD supporting SSU download via broadcast channel **shall** support the DVB SSU UNT Enhanced profile using the signalling in NIT, BAT, PMT, and UNT, in accordance with the DVB-SSU specification. The Linkage descriptor in the NIT table, for linking to the SSU service is defined in section 12.2.6. The descriptors of the UNT Enhanced profile are specified in Section 12.7.
IRD Profile(s)	All IRDs that are using OTA SSU enhanced profile
Test procedure	**Purpose of test:** To verify the IRD system software update process in broadcast channel using DVB SSU enhanced profile. The SSU end user functionality is not tested in this case. It is tested in Task 11:6 SSU end user functionality. This test is convenient to do parallel with Task 11:6 SSU end user functionality. **Equipment:** Test setup described in 2.11.2 Test equipment summary For the testing three IRD SSU software is needed, “SW v1“,“SW v2“ and “SW v3“, (“SW v1“ as starting point, “SW v2“ for testing upgrading and “SW v3“ for testing ”non-downgrading”). IRD manufacturer **shall** ensure that software upgrade (“SW v1”) , (“SW v2”) and (“SW v3”) is available for the test lab. Two approaches for the SSU testing, either via using: - one single IRD with possibility to upgrade and downgrade the SW by other means plus SSU sw images of “SW v1“ , “SW v2“ and “SW v3“. - alternative via using multiple IRDs. Two IRDs with software “SW v1“ and one IRD with software “SW v3“. Selection of two different ONID for different networks corresponding country1 and country2 in the test procedure.

Test procedure:

Refer to Task 11:1 but use DVB SSU enhanced download stream instead.

1. Configure three outgoing download streams from the system software source. The system software PID, PMT PID and SID may not conflict with each other.
2. Configure the multiplexer to transmit three outgoing system software download streams within TS on the frequency f1. (Simulates three system software streams.)
3. Configure linkage_descriptor for the two system software download streams not to be suitable for the IRD under test. The linkage_descriptor parameters for the third download stream **shall** be suitable for the IRD under test. The third system software download stream **shall** be the last in order.
4. Fill in the test results which parameters are unmatching with the IRD under test.
5. Configure UNT inclusive scheduling_descriptor by creating schedule with three scheduling descriptors, one in the past and two in the future for the system download streams.
6. For the frequency f2 configure linkage_descriptor to refer to the frequency f1 with suitable parameters for the over-the-air download. (Simulates frequency change).

7. Make sure the IRD has “SW v1” installed.
8. Perform factory reset to the IRD, complete the “first time” and check that all the services are possible to receive.
9. Fill in the test protocol if the IRD support automatic search and it is set to “automatic search” by default.

10. Tune the IRD to a Tv service on f1, turn off the IRD and wait until IRD is standby.
11. Turn on the IRD from standby.
12. A message **shall** be displayed telling that a new software is available at the time specified in the scheduling_descriptor. The IRD **shall** find the nearest available scheduled time.
13. Verify that the “EXIT or abort” option works by verifying that no download occur at the scheduled time.
14. Turn off the IRD and wait until IRD is standby.
15. Turn on the IRD from standby.
16. Verify that the “Yes or OK” option works by verifying that download occur at the scheduled time.
17. Verify that the software in the IRD is updated to “SW v2”.

18. Downgrade IRD software to “SW v1” .
19. Perform 11,12,13,14,15,16,17,18 but Tune the IRD to a Tv service on f2, turn off the IRD and wait until IRD is standby.

20. Upgrade IRD software to “SW v3” or use “IRD”.
21. Perform factory reset to the “IRD” and check that all the services are possible to receive.
22. Initiate the download again. Verify that no software update occurs.

23. Enhanced profile with software for the IRD under test, scheduled active now, with more than one schedule_descriptor in UNT.
24. Initiate a manual download from the menu.
25. A message **shall** be displayed telling that a new software is available right now.
26. Verify that both OK and EXIT works.

27. Reset the IRD
28. Perform 23,24,25,26 but initiate the download via a background/standby search.

29. Downgrade IRD software to “SW v1” .
30. Verify which ONID values correspond country1 and country2 settings in IRD.
31. Make sure that the IRDs country setting is equal to country2.
32. Configure the TS from f1 carrying the SSU service so that the ONID is equal to country1.
33. Configure the TS from f2 so that the ONID is equal to country2.
34. Fill in the test protocol which ONID values are broadcasted in TS in f1 (country1) and f2 (country2).
35. Fill in the test protocol which country settings are selected in the IRD.
36. Initiate a download.
37. Control that the IRD will not download and install the SSU.

38. Downgrade IRD software to “SW v1” .
39. Initiate the download again.
40. During the update process remove the power cable to corrupt the installation of the system software to corrupt the downloading of the system software.
41. Wait 10 seconds and then re-insert the power cable.
42. Verify that the IRD is still usable.
43. Fill in the test protocol. Fill in extended information in the comments section if the IRD ends up in an error state. Error messages etc.

44. Initiate the download again.
45. Plug out the antenna cable. (Simulates RF disturbances).
46. Plug in the antenna cable.
47. Fill in the test protocol. Fill in extended information in the comments section if the IRD ends up in an error state. Error messages etc.

48. Fill in the test protocol.

Expected result:

IRD performs a system software update from DVB SSU enhanced profile OTA broadcast for future available stream.

Test result(s)

Unmatched SSU stream number	**Unmatched parameter name**
#1	
#2	

	ONID value
ONID value in TS in f1 (country1)	
ONID value in TS in f2 (country2)	

Test points		**OK** or **NOK**
9	Does the IRD have a setting for automatic SSU search and it is set to “automatic search” by default?	
11-17	Does the IRD display a pop-up message telling the closest time and date for the available OTA ?	

	11-17	Does the pop-up message have selection “OK to download” and “EXIT to abort” ?	
	11-17	Selecting EXIT doesn’t upgrade the IRD at specified time and date.	
	11-17	Does the IRD upgrade the future available software at available time and date when turned off and turned on ?	
	18-19	Does the IRD display a pop-up message telling the closest time and date for the available OTA ?	
	18-19	Does the pop-up message have selection “OK to download” and “EXIT to abort” ?	
	18-19	Selecting EXIT doesn’t upgrade the IRD at specified time and date.	
	18-19	Does the IRD upgrade the future available software at available time and date when turned off and turned on ?	
	20-22	IRD has a mechansim that ensures only newer software version than the existing System Software is accepted	
	23-26	Does the IRD upgrade when the new sw is available right now when searching, From menu .	
	27-28	Does the IRD upgrade when the new sw is available right now when searching, standby.	
	29-37	The IRD does not download or install the SSU from other ONIDs than the ONID that matches the country setting in the IRD.	
	38-43	IRD starts after electric break using old (working) software.	
	44-47	The IRD clarifies the RF signal reception disturbancies under OTA download.	
Conformity	☐**OK** **Fault** ☐ Major ☐ Minor, define fail reason in comments		
Comments	If possible describe if fault can be fixed with software update: ☐**YES** ☐**NO** Describe more specific faults and/or other information:		
Date		***Sign***	

Test Case	***Task 11:3 IRD System software update using DVB SSU Notification***
Section	NorDig Unified 10.1, 10.2, 10.3, 10.5 and 12.7
Requirement	For this approach the NorDig IRD **shall** automatically perform a regular search for a notification signal (using DVB SSU’s Update_type 0x4) indicating the availability of new system software and, whenever new software is available, prompt the user with the IRD manufacturer's message associated with that The NorDig IRD **shall** support the SSU notifications update type 0x4 using UNT in accordance with the DVB-SSU specification. Linkage descriptor in the NIT table, for linking to the SSU service is defined in section 12.2.6 . The descriptors of the SSU UNT **shall** be as specified in Section 12.7 .
IRD Profile(s)	All IRDs that are using DVB SSU Notfication profile
Test procedure	**Purpose of test:**

	To verify the IRD system software update process in broadcast channel using DVB SSU Notifications. A typical use case for SSU Notification is to reach all non-connected connectable IRDs via broadcast channel with information that new SSU software is available but the new SSU software size is too large to be distributed via broadcast channel and/or requires a higher bandwidth over broadcast channel than is available. Manufacturers are recommended to: - Pre-store SSU messages in their IRDs and messages should be in all available languages that the IRD supports, - Mainly using the message_index (in the enhanced_message_descriptor, see 12.7.10) to reference which pre-stored message to be displayed for the user, - Minimize the broadcast text (in the enhanced_message_descriptor and/or message descriptor, see 12.7.10). **Equipment:** Test setup described in 2.11.2 Test equipment summary Software/configuration information to enable the SSU Notification process in the IRD. **Test procedure:** 1. Configure three outgoing download streams from the system software source. The system software PID, PMT PID and SID may not conflict with each other. 2. Configure the multiplexer to transmit three outgoing system software download streams within TS on the frequency f1. The system software PID, PMT PID and SID may not conflict with each other. (Simulates three system software streams.) 3. Configure linkage_descriptor for the two system software download streams not to be suitable for the IRD under test. The linkage_descriptor parameters for the third download stream **shall** be suitable for the IRD under test. The third system software download stream **shall** be the last in order. 4. For the frequency f2 configure linkage_descriptor to refer to the frequency f1 with suitable parameters for the over-the-air download. (Simulates frequency change). 5. Tune the IRD to a service on the frequency f1. 6. Perform a manual software update search. 7. Verify that a notification is presented 8. Reset the IRD to its factory default settings. 9. Repeat step 1-5. 10. Perform an automatic search from standby. 11. Turn on the IRD from standby. 12. Verify that a notification is presented 13. Reset the IRD to its factory default settings. 14. Tune the IRD to a service on the frequency f2. 15. Perform a manual software update search. 16. Verify that a notification is presented 17. Reset the IRD to its factory default settings. 18. Repeat step 1-5. 19. Perform an automatic search from standby. 20. Turn on the IRD from standby. 21. Verify that a notification is presented 22. Fill in the test results. **Expected result:** The IRD performs an SSU Notification update. .
Test result(s)	

Unmatched SSU stream number	Unmatched parameter name
#1	
#2	

	ONID value
ONID value in TS in f1 (country1)	
ONID value in TS in f2 (country2)	

	OK or **NOK** Test points 6-7	**OK** or **NOK** Test points 10-12	**OK** or **NOK** Test points 15-16	**OK** or **NOK** Test points 19-21
Verify that any Notification to the user (pop-up message) related to SSU **shall** be displayed in the same language as the language setting of the IRD.				
Verify the Notification informs the user about where the new software is available(Internet address) and how to proceed with the update process				
Verify the user have a choice to postpone/abort/reject the system software update Notification.				
If the user didn't choose to abort/ reject the notification verify that the user is reminded with the notification after restart of the IRD				

Conformity	☐**OK** **Fault** ☐ Major ☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update: ☐**YES** ☐**NO** Describe more specific faults and/or other information
Date	***Sign***

Test Case	***Task 11:4 IRD System software update using over-the-network download***
Section	NorDig Unified 10.1, 10.2 and 10.3
Requirement	The NorDig IRD **shall** provide a software download mechanism that enables download of system software, to add a new system software or replace an existing system software. The upgrade of NorDig IRD software **shall** be initiated by the user (by update user preference setting and/or by user interaction). The user **shall** be able to choose the update approach for the IRD (see 10.2.1) and the user **shall** be able to disable any automatic update. The factory default **shall** be a value that disables Fully Automatic mode.

	In cases where the user is prompted to confirm an update, the user **shall** be able to confirm or to abort/postpone the update (for example with a Yes and No option). If the user selects to abort/postpone an available update or by other ways cancel an available update, the NorDig IRD **shall** remind the user as stated in section 10.1.6 in IRD spec. The NorDig IRD **shall** be provided with a mechanism ensuring that only newer software versions than the existing System Software are accepted. A connected IRD receiving updates in this way **shall** still arbitrate between software versions available via the broadcast network and the IP-based broadband network to ensure that only newer versions are downloaded and installed (according with section 10.1.4.2 of IRD spec). If the NorDig IRD System software is corrupt (due to normal operation of the IRD or due to updating the system software), the IRD manufacturer **shall** provide a backup mechanism, either on local storage or via download, which can make the IRD operational again. The NorDig IRD **shall** be implemented with a protection mechanism for the existing system software. It **shall** ensure that the existing software will not be corrupted in case the System Software Update (SSU) is interrupted before the new system software is fully downloaded.
IRD Profile(s)	All IRDs that are using OTN SSU profile
Test procedure	**Purpose of test:** To verify the IRD system software update process using over-the-network (OTN) download profile. The SSU end user functionality is not tested in this case. It is tested in Task 11:6 SSU end user functionality. **Equipment:** Test setup described in 2.11.2 Test equipment summary For the testing three IRD SSU software is needed, “SW v1“,“SW v2“ and “SW v3“, (“SW v1“ as starting point, “SW v2“ for testing upgrading and “SW v3“ for testing ”non-downgrading”). IRD manufacturer **shall** ensure a software upgrade (“SW v2”) is available at the internet. Internet connection which can be enabled / disabled during the test (e.g. LAN connection through a local switch or Wi-Fi through a local access point) Two approaches for the SSU testing, either via using: - one single IRD with possibility to upgrade and downgrade the SW by other means plus SSU sw images of “SW v1“ and “SW v3“, - alternative via using multiple IRDs. Two IRDs with software “SW v1“ and one IRD with software “SW v3“. **Test procedure:** 1. Connect the IRD to live TV network. 2. Connect the IRD to internet. 3. Make sure the IRD has “SW v1” installed.

4. Perform factory reset to the IRD and complete the "first time" installation. During installation, enable/ensure IRD still connected to Internet.
5. Tune the IRD to a TV service (from the live TV network).
6. Fill in the test results if the IRD has a setting for automatic search and it is set to "auto search".

7. Access the navigator. Look for a menu option for SSU over the Internet.
8. Enable SSU download over the Internet.
9. Verify that the software in the IRD is updated to "SW v2".
10. Fill in the test protocol.

11. Perform factory reset to the IRD and new installation. During installation, enable network connection on the IRD.
12. Enable SSU download over the Internet.
13. Verify that no software update occurs.
14. Fill in the test protocol

15. Install/change the IRD software to "SW v3" *(OTN server still has SW v2)*.
16. Perform factory reset to the IRD and new installation. During installation, enable network connection on the IRD.
17. Enable SSU download over the Internet.
18. Verify that no software update occurs.
19. Fill in the test protocol

20. Install/change IRD software to "SW v1" *(OTN server still has SW v2).*
21. Initiate the download again using steps 7-8.
22. During the download (step 8), remove the power cable to corrupt the downloading of the system software.
23. Wait 10 seconds and then re-insert the power cable.
24. Verify that the IRD is still usable.
25. Fill in the test protocol. Fill in extended information in the comments section if the IRD ends up in an error state. Error messages etc.

26. Initiate the download again.
27. Cut the network connection temporarily by e.g. disabling the network access point uplink.
28. Re-enable the network connection.
29. Fill in the test protocol. Fill in extended information in the comments section if the IRD ends up in an error state. Error messages etc.

Expected result:
IRD performs a software update over-the-network.

Test result(s)

Test points		**OK** or **NOK**
6	Does IRD have a setting for automatic SSU search set by default to "auto search" ?	
7-10	IRD is able to upgrade the System Software over-the-network.	
11-14	IRD has a mechansim that ensures only newer software version than the existing System Software is accepted (testing with same version number)	
15-19	IRD has a mechansim that ensures only newer software version than the existing System Software is accepted (testing with lower version number)	
20-25	IRD starts after electric break using old (working) software.	

	26-29	The IRD clarifies the network disturbancies under OTN download. Download is either aborted or resumed after a short network break.	
Conformity	☐**OK** **Fault** ☐ Major ☐ Minor, define fail reason in comments		
Comments	If possible describe if fault can be fixed with software update: ☐**YES** ☐**NO** Describe more specific faults and/or other information		
Date		***Sign***	

Test Case	***Task 11:5 IRD System software update using USB update***
Section	NorDig Unified 10.1, 10.2 and 10.3
Requirement	The NorDig IRD which is relying on OTN updates **shall** also provide a USB mechanism that enables the download of software to an IRD. As many devices will need to be upgraded during their certification time, that upgrade process should be used as the basis for this test rather than having a dedicated test step where special softwares are required. The actual upgrade of NorDig IRD software **shall** be initiated by the user, in this case after inserting a USB device into one of the IRDs USB slot. Any notification to the user (pop-up message) related to SSU **shall** be displayed in the same language as the language setting of the IRD. The IRD manufacturer **shall** ensure that download of non-certified system-software is prevented. The NorDig IRD **shall** be implemented with a protection mechanism for the existing system software. It **shall** ensure that the existing software will not be corrupted in case the System Software Update (SSU) is interrupted before the new system software is fully installed. The NorDig IRD **shall** be provided with a mechanism ensuring that only newer software versions than the existing System Software are accepted.
IRD Profile(s)	All IRDs that are using OTN and/or USB SSU profile
Test procedure	**Purpose of test:** To verify the IRD system software update process using the USB interface. The SSU end user functionality is not tested in this case. It is tested in Task 11:6 SSU end user functionality. This test is convenient to do parallel with Task 11:6 SSU end user functionality. **Equipment:** Test setup described in 2.11.1 Test equipment summary For testing three IRD software versions are needed:

Software “SW v1”, version on USB memory stick, to test IRD does not downgrade.
Software “SW v2”, version on USB memory stick, to test upgrade
Software “SW v3” , version on USB memory stick (special version, only for testlab usage) to allow downgrade SW version during SSU testing.

NOTE: to perform the USB test it is not necessary for the IRD to be connected to either the Broadcast Network or the Internet.

Test procedure:

1. Connect the IRD to the live TV network
2. Make sure the IRD has “SW v1” installed
3. Perform factory reset to the IRD and complete the “first time” installation.
4. Tune the IRD to a TV service (from the live TV network).
5. Fill in the test results if the IRD has a setting for automatic search and it is set to “auto search”

6. Insert the USB device containing the software “SW v2” update (in the format recommended by the manufacturer)
7. The IRD may recognize the USB device and if the IRD offers to perform the SSU at that time accept the offer.
8. Else navigate through the system menu to the Software update screen and select ‘Manual Update’ (or nearest equivalent)
9. Verify that the software is updated to “SWv2”
10. Fill in the test protocol.

11. Perform factory reset to the IRD and complete the “first time” installation.
12. Insert the USB device containing the software “SW v2” update (in the format recommended by the manufacturer)
13. The IRD may recognize the USB device and if the IRD offers to perform the SSU at that time accept the offer.
14. Else navigate through the system menu to the Software update screen and select ‘Manual Update’ (or nearest equivalent)
15. Verify that no software update occurs.
16. Fill in the test protocol.

17. Install software “SW v3” version of the IRD software to downgrade the IRD software version using steps 6-8.
18. Verify that the software is updated to a lower version.
    Note this is a special process to be used only during testing and is not considered a ‘real world’ test.

19. Now using the software “SW v1” again initiate the installation again using steps 6-8.
20. During the update process (step 7 or 8), remove the power cable to corrupt the installation of the system software.
21. Wait 10 seconds and then re-insert the power cable.
22. Verify that the IRD is still usable.
23. Fill in the test protocol. Fill in extended information in the comments section if the IRD ends up in an error state. Error messages etc.

24. Using the software “SW v1”, initiate the installation again using steps 6-8.
25. During the update process (step 7 or 8), remove the USB stick to corrupt the installation of the system software.
26. Verify that the IRD is still usable.

	27. Fill in the test protocol. Fill in extended information in the comments section if the IRD ends up in an error state. Error messages etc. **Expected result:** IRD performs a software update from the USB source
Test result(s)	<table><tr><td>Test points</td><td></td><td>**OK** or **NOK**</td></tr><tr><td></td><td>IRD correctly upgrades its software</td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td>IRD starts after power break using old (working) software.</td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td>The IRD does not download or install the SSU from other sources/manufacturers</td><td></td></tr></table>
Conformity	☐**OK** **Fault** ☐ Major ☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update: ☐**YES** ☐**NO** Describe more specific faults and/or other information
Date	***Sign***

Test Case	***Task 11:6 SSU end user functionality***
Section	NorDig Unified 10.1, 10.2, 10.5, 16.4
Requirement	Any (pop-up) messaging to the user related to SSU **shall** be displayed in the same language as the language setting of the IRD. If the system software update does not allow the normal utilization of the NorDig IRD, the user **shall** be warned by some means. For example, by displaying information if the display is not available according to NorDig unified IRD spec section 10.1.3. If the user selects to abort/postpone an available update or by other ways cancel an available update, the NorDig IRD **shall** remind the user. The user **shall** be able to choose the update approach for the IRD and the user **shall** be able to disable any automatic update. If the IRD supports Fully Automatic mode the user must be able to disable Fully Automatic mode Depending on if the Nordig IRD is connectable or Non connectable the delivery alternatives and the update approaches can vary according to Nordig Unified IRD spec Table 10.1.
IRD Profile(s)	Basic, IRD, FE
Test procedure	**Purpose of test:** To verify that the IRD has settings required for SSU end user functionality.

This test of common requirements (independent of delivery alternative) is convenient to do parallel with Task 11:1 (OTA Simple), 11:2 (OTA enhanced), 11:3 (OTA Notification), 11:4 (OTN) and 11:5 (USB) IRD System software update.

Equipment:
Test setup described in 2.11.2 Test equipment summary.

Software to upgrade

2 pcs IRDs with older software than the version to upgrade or older software to downgrade the IRD under testing.

Test procedure:

1. Verify that the IRD supports one of the described upgrade delivery altenatives and approach alternatives specified in [1].
2. Fill in the test results.
3. Verify that any notification to the user (pop-up message) related to SSU **shall** be displayed in the same language as the language setting of the IRD.
4. Verify that the user is informed about the upgrade process if the SSU does not allow the normal utilization of the NorDig IRD.
5. Verify the user can cancel the upgrade process
6. Verify that if the user selects to abort/postpone an available update or by other ways cancel an available update, the NorDig IRD **shall** remind the user.
7. Fill in the test results.

Expected result:

All the test result are OK, and the available upgrade processes works as expected.

Test result(s)

Delivery alternatives	**Non connectable IRD**	**OK or NOK or N/A**	**Internet connectable IRD**	**OK or NOK or N/A**
#D1	Mandatory		Mandatory to implement at least one of the alternatives #D1, #D2, #D3 or #D4.	
#D2	n/a			
#D3	Optional			
#D4	n/a			
#D5	Optional		Optional unless #D1/#D2/#D3 are not implemented, then mandatory.	

Approach alternatives	**Non connectable IRD**	**OK or NOK or N/A**	**Internet connectable IRD**	**OK or NOK or N/A**
#A1	Mandatory to implement at least one of the alternatives #A1, #A2 or #A3.		Mandatory to implement at least one of the alternatives #A1, #A2, #A3 or #A4.	
#A2				
#A3				
#A4	Optional			
#A5	Optional		Optional	

	<table><tr><th></th><th>**OK** or **NOK**</th></tr><tr><td>IRD displays pop-up message with language selected in the settings</td><td></td></tr><tr><td>IRD informs user about upgrade process when applicable</td><td></td></tr><tr><td>User can cancel the ongoing upgrade process</td><td></td></tr><tr><td>User can abort/postpone available update</td><td></td></tr><tr><td>User is reminded about available update</td><td></td></tr><tr><td>User can disable Fully automatic mode.</td><td></td></tr></table>
Conformity	☐**OK** **Fault** ☐ Major ☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update: ☐**YES** ☐**NO** Describe more specific faults and/or other information
Date	***Sign***

Test Case	***Task 11:7 Common interface plus (CI+) CAM module system software update***
Section	NorDig Unified 10.6 and Content Security Extensions to the Common Interface. Version 1.4 (CI Plus specifikation)
Requirement	In the case of IRDs with CIP- CAM, the IRD **shall** also support to update the System Software on the CIP-CAM when such software is broadcast. The IRD **shall** inform the user whether there is an IRD update or CIP-CAM update.
IRD Profile(s)	Basic, IDTV, FE
Test procedure	**Purpose of test:** To verify the CI+ CAM module can be updated. **Equipment:** Test setup described in 2:11:2 Test equipment summary Software to upgrade **Test procedure:** 1 Setup equipment for broadcast CI+ CAM update 2 Tune the IRD to the multiplex which is carrying the CI+ CAM update 3 Verify that CI+ CAM can be updated with CI+ IRD **Expected result:** All test results are OK.
Test result(s)	
Conformity	☐**OK** **Fault** ☐ Major ☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update: ☐**YES** ☐**NO** Describe more specific faults and/or other information
Date	***Sign***