BSIA FTTP
security equipment
– test plan

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0. Introduction

The rollout of BT Retails consumer Voice over FTTP (VoFTTP) service is delivered based on a fibre access product from Openreach (Fibre Voice Access). Moving to a fibre based voice service will present different technical characteristics than a PSTN based service, and as such it would be prudent to validate any equipment connected to the service. However, the large majority of CPE (customer premises equipment) is expected to perform with the same functionality and with voice quality broadly equivalent to the present PSTN. The work of the Customer Environment team is to test as wide a range of CPE as is possible within time and resource constraints, in order to be aware of CPE that may exhibit any differences in operation.

The characteristics of VoFTTP that have the potential to affect the operation of CPE are:-

- Maximum off-hook loop current reducing from 40mA to 25mA (no change to published minimum of 25mA as set out in BT SIN 351 and 352).
- Ringing implementation moving from predominately unbalanced to predominately balanced (balanced ringing applies ringing voltage to both legs in the pair rather than one).
- Echo Cancellation: always used unless high-speed fax or modems are detected.
- Data Discontinuities: may occur due to either dynamic jitter buffer adaptation or from packet loss under exceptional network conditions.
- End-to-End Delay: round trip processing delay increasing for all voice calls.

This test plan is specific to the security alarm industry and excludes social/telecare alarms and fire alarms. Separate test plans cover PSTN Small Apparatus (such as phones, answer-phones, and fax machines), Telemetry, Telecare and Card Terminals.

The approach taken to test security equipment is to invite relevant organizations to carry out tests at the CPE test facility in Milton Keynes or via the remote dial-up delay code [Appendix C]. This test plan outlines the testing that is required to provide a reasonable level of confidence that an item of CPE successfully operates on BTs VoFTTP.

The increase in end-to-end delay encountered on VoFTTP is the primary confirmed impact for certain items of security equipment, due to the timings used in some signalling protocol implementations such as DTMF (dual tone multi-frequency) and SIA (Security Industry Association) formats.

There may also be the potential, in principle, for the signalling protocols used in some CPE to be affected by audio path discontinuities caused by jitter buffer adaptations. However given the low levels of jitter expected on VoFTTP, and the jitter buffer configuration due to be adopted, the expected frequency of such adaptations is expected to be zero on VoFTTP calls, and low on multi-hop NGN calls. It is therefore currently believed that audio path discontinuities caused by jitter buffer adaptations are unlikely to be a major problem.

1. Document scope

This test plan is specific to the security alarm industry and excludes social/telecare alarms and fire alarms.

Testing of CPE in this plan is specific to BT Retail (FTTP) & BT Openreach (FVA) fibre network. It excludes other Next Generation Networks and Communication providers, for which specifications are unavailable at the time of writing this plan.

2. General information

2.1 Objective

The aim of VoFTTP Compatibility testing is to test the features of the premises CPE that interface to the network. The aim is not to confirm that VoFTTP is operating correctly (other teams are carrying out this work) nor is it to fully test all CPE functionality and specifications. However if any indication of a potential network issue is found then this will be immediately investigated.

The VoFTTP CPE Compatibility testing uses a risk based approach. In the case of the premises CPE, given the results so far, the approach is to test as large a percentage of the installed premises CPE base as is reasonably possible.

2.2 Test facilities

Testing will take place at the Test Facility at Phoenix House in Milton Keynes on a "live" pilot deployment of FVA. The dialup delay code (see Appendix C) can be used anywhere in the UK. Details of these test facilities, and the various test platforms available can be found in the VoFTTP briefing pack available from BSIA or BTR on request. More detailed investigation of any problems encountered can be undertaken at Adastral Park.

There will be four telephone lines at the facility for testing. Two will be VoFTTP and the others PSTN. These will be labeled accordingly. The fibre phone lines are set up for "Adaptive jitter", which is reflective of how IP connectivity between NGNs works in the UK.

2.3 Test scenarios

The full set of tests are:

- Benchmark test - Alarm CPE on PSTN; alarm receiver on PSTN (Test 1).
- FTTP compatibility test - CPE on VoFTTP; alarm receiver on PSTN (Test 2).
- Power fail test - CPE on VoFTTP; alarm receiver on PSTN (Test 3).
- End-to-end Delay test – A stand-alone test (no network) to test under increased end-to-end delay using the Genie / Adtech delay emulator (Test 4).
- Jitter emulation test – A stand-alone test (no network) to test the impact in the presence of emulated de-jitter buffer adaptations using the Genie emulator and an automated test profile (Test 5).
- Remote alarm management software (Test 6)

These test scenarios are described in more detail in Section 3. These scenarios do not cover the Alarm receiving centre (ARC) receiver being connected to a VoFTTP line as it is not expected that the central modem bank would be using VoFTTP. If the ARC is a single dialler device that could be connected to a residential VoFTTP line this device should also be tested as a premises CPE including a test VoFTTP to VoFTTP.

Notes:

1. The Line disconnection test recommended by BT has been considered and deemed as not required as alarm CPE characteristics for line monitoring is considered known and the impact on CPE predicted.

2. The PSTN lines used will have Non-geographic numbers (08xx) applied to reflect "real world" ARC call routing.

2.4 Line loss

Line loss is not an impact for FTTP lines, however, as part of the test facility use of the PSTN lines (for connection of the alarm receiving equipment used at the test facility) these are subject to loss. BT will advise of this figure and it should be recorded as part of the test results.

It may be possible to artificially increase the line loss to -15db by introducing a fixed line loss emulator, however, it must be stressed that the test plan is not evaluating the PSTN functionality (as this is not changing to FTTP as part of the FVA deployment) and therefore does not form part of the test plan.

2.5 Criteria for Triggering Detailed Fault Diagnostics & Root Cause Analysis

Where a failure is observed, but root cause is not clearly understood, the BT CPE test team will assist in conducting further detailed diagnostics to establish root cause.

The following test results will NOT normally trigger any further investigation:

- Any failure on any FTTP scenario when the equivalent legacy-to-legacy scenario also fails.
- Any failure on any FTTP scenario when the equivalent legacy-to-legacy scenario has not been tested.
- Any legacy-only failure.

3. Tests

3.1 General

3.1.1 Message type

Each of the tests in 3.2.2 and 3.2.4 is to be conducted twice using the following data message strings to confirm a send/receipt within a single call.

a. Test a single message call (i.e. PA or intruder).
b. Test a follow on message call (i.e. intruder/confirmed).

3.1.2 Alarm formats

It is recommended that, where the CPE and/or alarm receiver permits, all three of the following alarm signal formats are tested:

a. Fast format - Carry out tests as listed above for both message types WITH the addition of extended format test (16 Channel).
b. SIA format - Test for both message types.
c. Contact ID format – Test for both message types.

3.1.3 Remote alarm management software tests

The test in 3.2.6 is designed to confirm the operation of both the alarm CPE and receiving modem whilst simulating "jitter" adaptations using a TDM based delay emulator (Genie).

The test is to be used only where the modem protocol does not identify itself to the network as a high-speed modem (2100Hz acknowledge tone).

3.2 Tests sequence

3.2.1 Benchmark PSTN test (Test 1)

1. Connect the CPE and the alarm receiver to 20C PSTN lines (08 platform to be used for the receiver line only).
2. Test the transmission of alarm calls from CPE to receiver to ensure correct receipt.

3.2.2 FTTP compatibility test (Test 2)

1. Connect the CPE to a VoFTTP line and the alarm receiver to a 20C PSTN line (08 platform to be used for the receiver line only).
2. Test the transmission of alarm calls from CPE to receiver to ensure correct receipt.

3.2.3 FTTP power fail test (Test 3)

1. Connect the CPE to a VoFTTP line and the alarm receiver to a 20C PSTN line (08 platform to be used for the receiver line only).
2. Initiate the transmission of alarm calls from CPE to receiver. Whilst a call is in progress, disconnect the primary power to the Optical Network Interface (ONT), leaving the secondary ONT supply present.
3. Check for message corruption.

3.2.4 End-to-end delay test (Test 4)

1. Connect the CPE and receiver to the Genie / Adtech delay emulator.
2. Test the transmission of alarm calls from CPE to receiver, increasing the emulated delay until the point of failure of the alarm transmission is reached.
3. Measure the end-to-end round trip delay using the software provided to record the failure point.

3.2.5 Jitter emulation test (Test 5)

1. Connect the CPE and receiver to the Genie delay emulator.
2. Enable the jitter emulation test profile on the Genie emulator.
3. Test the transmission of alarm calls from CPE to receiver for correct operation.

Note 1: The jitter test profile will start automatically once the call is in progress.
Note 2: A brief description of the jitter profile test is given in Appendix B.
Note 3: This test is emulating phase delay. It is not a live IP configuration and therefore does not test the effect of packet loss or insertion.

3.2.6 Remote alarm management software - Jitter emulation test (Test 6)

1. Connect the CPE to the remote computer (RC) and modem via the Genie emulator.
2. Enable the jitter emulation test profile on the Genie emulator.
3. Establish communications between the CPE and the RC and start an up/download programme that is expected to last at least 3 minutes in duration.
4. Although the auto profile will have run its initial sequence as the call was initiated, run the profile again without interrupting the up/download routine.
5. Record the cumulative result of the two jitter emulation tests.

Note 1: The jitter test profile will start automatically once the call is in progress but will need to be started manually for the second test sequence.
Note 2: A brief description of the jitter profile test is given in Appendix B.
Note 3: This test is emulating phase delay. It is not a live IP configuration and therefore does not test the effect of packet loss or insertion.

3.3 Test results

Results for each item of CPE are to be recorded on the BSIA FTTP Test Sheet (see References 4.7) – see Appendix A.
Note: Each result sheet represents testing a single alarm CPE against an individual Receiver / modem.

4. References

4.1 BT Retail Voice Over FTTP CPE Compatibility Issue 1.0 June 2011
'Security equipment test plan'
4.2 BT SIN 350 Issue 1.3 July 2005
'BT Public Switched Telephone network (PSTN): Network tones and announcements'
4.3 BT SIN 351 Issue 4.5 May 2006
'BT Public Switched Telephone Network (PSTN): Technical Characteristics Of The single Analogue Line Interface'
4.4 NICC ND1701 V1.5.2 April 2009
'Recommended standard for the UK National Transmission plan for public networks'
4.5 NICC ND1704 V1.2.2 May 2009
'End-to End network performance rules & objectives for the interconnection of NGNs'
4.6 NICC ND1431 V1.1.1 March 2011
'Guidance on CPE compatibility on NGNs and NGAs'
4.7 BSIA FTTP Test Sheet (see Appendix A)
The following document is available from the BSIA web site:
*'BSIA Form 255 Issue 3 June 2007 'A guide to Fast format protocol for the intruder alarm industry'
'BSIA Form 255 Issue 4 May 2010 'A guide to Fast format protocol for the intruder alarm industry'

The following published protocol standards are available from: www.siaonline.org

- Digital Communication Standard – Ademco ® Contact ID protocol – for alarm system communication – SIA DC 05 1999.09
- Security Communications – Digital Communications Standard - "SIA Format" Protocol - for Alarm System Communications – SIA DC 03 1990.01

* archived issue available on request to BSIA

Appendix A

BSIA FTTP TEST RESULT (Appendix A)

MANUFACTURER:			TEST DATE:	
MODEL NUMBER:			SERIAL NUMBER:	
RECEIVER USED IN TESTS: Bold RX2000		TEST PERSONNEL:		PSTN Line loss = -5.7db
TEST 1 - Benchmark test (20C to 20C) - Correct transmission / receipt of messages: Yes ☐ No ☐				
TEST 2 - FTTP compatibility test (CPE FTTP – Rx PSTN) Average RTD = ms (network delay only)				
		PASS	FAIL	COMMENTS
SINGLE MESSAGE	FAST FORMAT			
	FAST FORMAT EXT			
	SIA 3			
	CONTACT ID			
FOLLOW ON MESSAGE	FAST FORMAT			
	FAST FORMAT EXT			
	SIA 3			
	CONTACT ID			
TEST 3 - FTTP Power fail test (CPE FTTP – Rx PSTN)				
		PASS	FAIL	COMMENTS
SINGLE or FOLLOW ON MESSAGE	FAST FORMAT			
	FAST FORMAT EXT			
	SIA 3			
	CONTACT ID			
TEST 4 – End to End delay test (Stand alone)				
		TOTAL ROUND TRIP DELAY REQUIRED TO INDUCE FAILURE (ms)		
SINGLE MESSAGE	FAST FORMAT			
	FAST FORMAT EXT			
	SIA 3			
	CONTACT ID			
FOLLOW ON MESSAGE	FAST FORMAT			
	FAST FORMAT EXT			
	SIA 3			
	CONTACT ID			
TEST 5 – Jitter emulation test (Stand alone)				
		PASS	FAIL	COMMENTS
SINGLE or FOLLOW ON MESSAGE	FAST FORMAT			
	FAST FORMAT EXT			
	SIA 3			
	CONTACT ID			
TEST 6 – Remote alarm management software test (Stand alone)				
MANUFACTURER:			TEST DATE:	
MODEL NUMBER:			SERIAL NUMBER:	
MODEM USED IN TESTS:			TEST PERSONNEL:	
		PASS	FAIL	COMMENTS
JITTER PROFILE TEST 1&2				

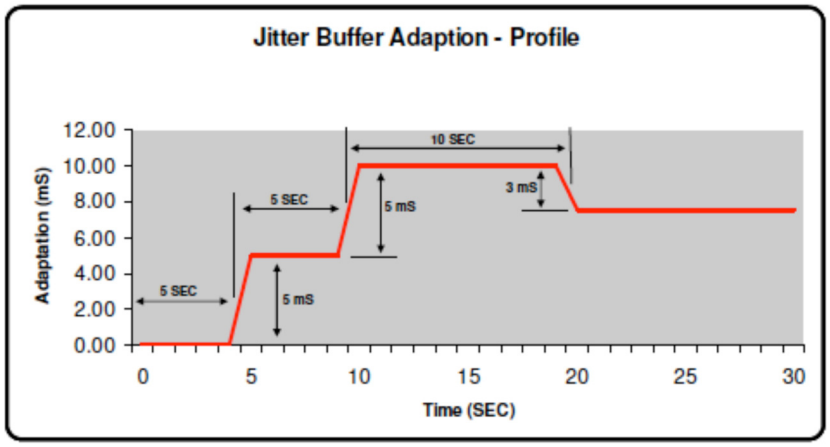
Appendix B

Test for emulated jitter buffer adaptations

There is the potential, in principle, for the signalling protocols used in some CPE to be affected by audio path discontinuities caused by jitter buffer adaptations. These can be characterized as:

1) Discontinuities within the VoFFTP network. These will not occur when a voice band modem is detected as the jitter buffers are locked to a fixed level.
2) Discontinuities across multi-hop Next Generation Networks (NGN). These depend on the number of networks the call is routed over and the design of each network. In multi-hop NGN calls during periods of high or maximum loading of all networks, upward adaptations may occur at the start of a call, and/or an individual upward or downward adaptation may occur in the middle of a call.

The jitter buffer adaptation test profile is: 5ms upwards adaptation at t=5 seconds, a second 5ms upwards adaptation at t=10 seconds, and a 3ms downwards adaptation at t=20 seconds, as shown in the following graph:



IP Jitter buffer adaptation testing on selected devices will take place at Adastral Park if/when the facility is available.

Note: This test is emulating phase delay. It is not a live IP configuration and therefore does not test the effect of packet loss or insertion.

Appendix C

Test for dial-up delay

The premises CPE can be connected to any BT PSTN line and temporarily re-programmed with a code prefix 170xx for a dial-through-delay facility. The central station receiver can be connected to any BT PSTN line. Operation can then be checked in each direction of communication, at a single fixed round trip delay of 300ms minimum. If this 300ms round trip delay test fails, then further investigation can be done to determine the point of failure using other test equipment specified in this test plan.

Note:

1) In order to minimise inappropriate use of this test tool, which has limited capacity, this 170xx delay code can be provided by BT to testing organisations on request.
2) If Carrier Pre-select (CPS) is active on either of the BT PSTN lines, then the CPS override code 1280 can be used in front of the 170xx prefix to ensure the call is routed over the BT network via the delay facility.

Use of the dial code prefix (170xx) should not be precluded from testing CPE's susceptibility to added delay. This test is seen as a "rough" determination of sensitivity to maximum delay and can be carried out at any location at any time and is un-calibrated. It does not form part of the sequence of tests in this plan.