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Presentation of Technical Report to TSG

Presentation to:	**TSG SA Meeting #24**
Document for presentation:	**TR 32.804, Version 1.0.0**
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Abstract of document:

This TR defines the Requirements for the network wide control of Remote Electrical Tilting (RET) antennas via the Itf-N interface.

The TR has been produced following the approval of the Work Task "The Remote Control of Electrical Tilting Antennas OAM&P Impacts" (S5-048176).
This Work Task is a child of the TSG RAN work item RANimp-TiltAnt contained in RP-030193.

Changes since last presentation to TSG-SA:
New.

Outstanding Issues:

1 Issue regarding failures – should each return code given in TR 25.802 be converted into a probable cause, or an exception.
2 What is the impact of radio access network sharing.
3 What is the impact of failures, back up management systems?
4 Do we need any time dependency for making RET configuration data (e.g. all antennas in a Node B) apply within a defined period of time.
5 Health and safety requirements.
6 Consideration to delegating control to Node B software
- aiding network resilience.
- reducing Itf-N signalling.

7 Security concerns need to be addressed.
8 Multiple IRPManagers, there is a need to have one designated master.

Contentious Issues:
None.

3GPP TR 32.804 V1.0.0 (2004-06)

Technical Report

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Contents

Foreword

This Technical Report has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

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  - 1 presented to TSG for information;
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- z the third digit is incremented when editorial only changes have been incorporated in the document.

Introduction

There has been an initiative to standardize an interface to control Remote Electrical Tilting (RET) antennas. This is an enabler to remotely manage multi-vendor control of RET antennas from a centralised Operations Support System (OSS) via the Itf-N.

1 Scope

The present document defines the requirements for the network wide control of RET antennas via the Itf-N. Two example types of RET antennas are those that are tilted using a mechanical tilting mechanism and those that use a phased array.

The control of RET antennas has been studied in RAN3 with an approved work item for “Remote Control of Electrical Tilting Antennas” provided in RP-030193 at RAN#19 in March 2003, producing TR 25.802 [1].

The ability to control Antenna tilt permits cell size to be adjusted, thereby permitting control of up and downlink throughput.

The ability to control Antenna tilts remotely from a network management system permits a network wide perspective to be obtained and for settings to be adjusted in response to predicted population movements, or in response to performance monitoring data to help make the best use of the available radio access network.

Figure 1 shows the main network elements and depicts the two system contexts A and B where the IRPagent may be located either in the Element Manager, or within the Network Element.

The RET antenna control capability may be achieved either by using an RS485 cable, or by using a Layer One Converter (LOC) which permits RET controls to be sent to the tower top equipment via the coaxial feeder.

The options mentioned above are subject to final agreement in RAN-3

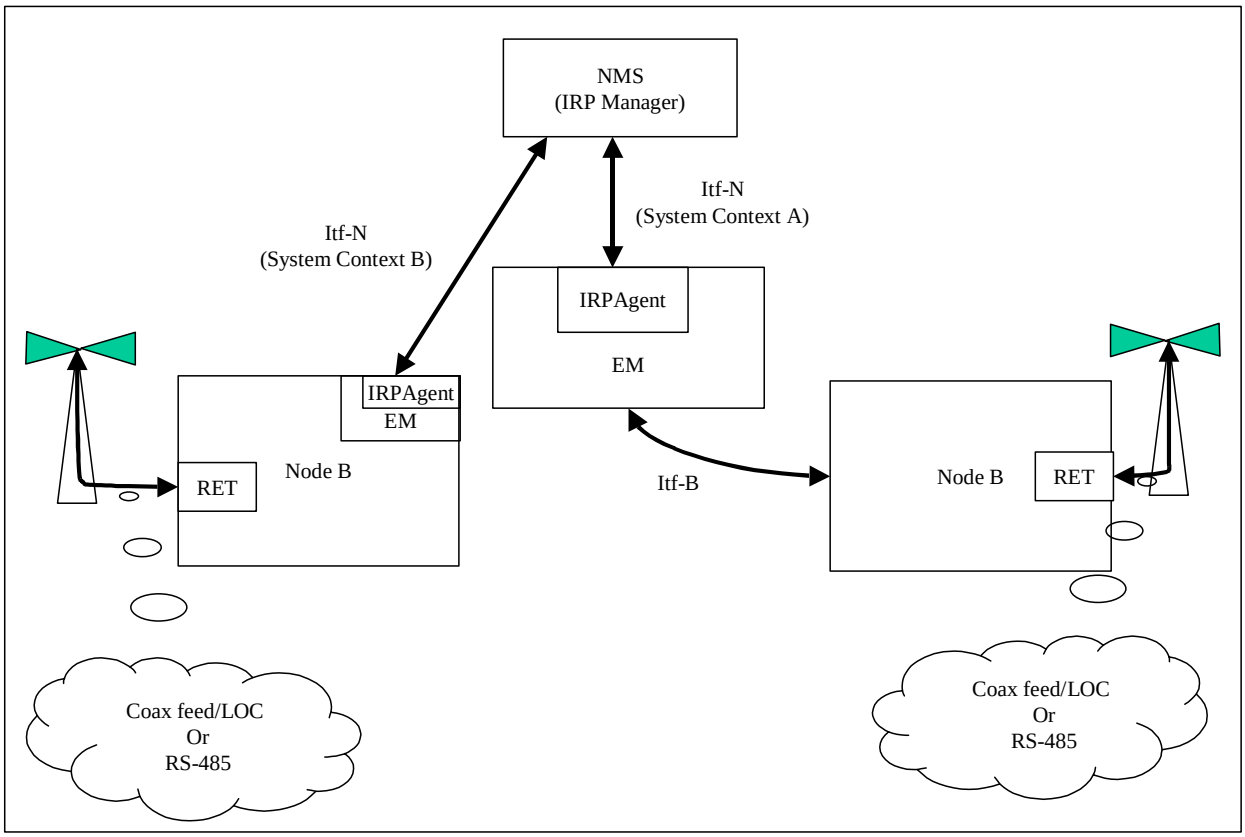

Figure 1

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document.*

[1] 3GPP TR 25.802: "Remote control of electrically tilting antennas".

[2] 3GPP TS32.401: "Telecommunication management; Performance Management (PM); Concept and requirements".

[3] 3GPP TS 32.403: " Telecommunication management; Performance Management (PM); Performance measurements".

[4] 3GPP TS32.411: " Telecommunication management; Performance Management (PM) Integration Reference Point (IRP): Requirements".

[5] 3GPP TS32.412: "Telecommunication management; Performance Management (PM) Integration Reference Point (IRP): Information Service (IS)".

[6] 3GPP TS 32.413: "Telecommunication management; Performance Management (PM) Integration Reference Point (IRP): Common Object Request Broker Architecture (CORBA) Solution Set (SS)".

[7] 3GPP TS 32.102: "Telecommunication management; Architecture".

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

IRPAgent: See [7].

IRPManager: See [7].

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AISG	Antenna Interface Standards Group (http://www.aisg.org.uk/)
Itf-N	Interface N between a network or service management OSF and NE OSFs (TS 32.102 [7])
LNA	Low Noise Amplifier
OSF	Operations System Functions
OSS	Operations Support System
RET	Remote Electrical Tilting
RNS	Radio Network Sub-system
TMA	Tower Mounted Amplifier
TT	Tower Top

4 Requirements for RET control over Itf-N

4.1 Fault Management

Any fault detected by the RET equipment will be passed up to the IRPManager.

4.2 Configuration

1) Parameters range checking shall be performed to avoid sending invalid parameters to a RET antenna

   Whether this applies to manager or agent is for further study.

2) It shall be possible to define a tilt angle for a single antenna.

3) It shall be possible to define the tilt angles for a large number of antennas

4) There is no support for controlled session management i.e. the last configuration command received by the RET equipment will be effective (i.e. last command wins).

5) There shall be a capability to 'turn off' Itf-N command responses to support local maintenance work which may require additional exceptions / notifications.

   This requirement needs to be clarified.

6) The results of configuration changes shall be provided to IRPManager(s).

7) The IRPManager may determine if a command is in progress for example device status==locked where a local field engineer has overridden the network manager's configuration capability to the local antenna.

8) The failure to configure a parameter, and a reason for not configuring a parameter shall be returned to the IRPManager making the configuration change.

9) Where an operator finds it necessary the Itf-N will permit the definition of a sets of related values which are applied as near as possible at the same time (this may be of the order of a minute), e.g. a set of Antenna Tilt values for different cells which due to interactions need to be applied closely together. This is necessary so as to coordinate RET settings across the network with other related cell settings such as uplink and downlink parameters, gain settings, and coding allocations.

4.3 Inventory

1) A unique identifier (this may be an RDN combining cell, antenna and other identifiers) is used by the IRPManager to retrieve and configure parameters for a particular antenna. This unique identifier shall be used over the Itf-N interface.

   It shall be possible for the IRPManager to learn of each unique antenna at a remote site via the Itf-N interface.

2) The IRPManager shall be able to determine whether an antenna can be remotely tilted or is instead fixed..

3) The IRPManager shall be able to determine the compass direction an antenna is facing.

4) The IRPManager shall be able to determine the angle of tilt for all antennas at a Node B, with a corresponding UTC time stamp of when the value was obtained.

5) The IRPManager shall be able to obtain the valid range of parameters each RET enabled antenna is able to support.4.3.6 It shall be possible to determine both the Node B identifier and the HDLC bus address, the signalling technique (LOC or RS485) for each RET enabled antenna.

   This requirement is for further study.

6) It shall be possible for the IRPManager to define and retrieve a descriptive label to be associated with any antenna.

7) For antennas which are not RET enabled, the IRPManager shall be able to obtain manually entered configuration data.

8) The IRPManager shall be able to retrieve diversity information. i.e. which antennas are involved in transmitting the same signal and which antennas are involved in receiving the same signal at the same site.

4.4 Maintenance

The IRPManager shall be able to cause the tilting mechanism to be exercised such that the complete range of tilt is exercised. At the end of the exercise the tilt will be set to a defined value.

It will be permitted that settings may be provided by localised maintenance staff using a local craft terminal. Indications of local work shall be provided to remote operation support systems.

All locally applied settings will be sent to an IRPManager. There will not be any concurrency /resource protection or complex resource locks being used, in terms of any conflicts between local settings and IRPManager settings, the last valid configuration parameter received will persist.

It shall be possible at the time of a RET installation for the maintenance staff to configure a compass direction which indicates the direction the antenna faces. An IRPManager shall be able to obtain this compass direction setting.

4.5 IRPManager feedback

The 3GPP interface for configuring RET will not include performance monitoring data.
Where data is required to determine the performance of the network, existing PM techniques and parameters are to be used please refer to 3GPP TS 32.401 [2], 32.403 [3], 32.411 [4], 32.412 [5], 32.413 [6].

If any form of bulk configuration is used, the IRP manger shall be notified if one or more parameters cannot be applied. The IRPManager may initiate the undoing of all successfully applied settings of a set using the bulk configuration. i.e the set of system parameters and values are returned to the set of values that existed before the bulk configuration command was started

5 Issues

1) Issue regarding failures – should each return code given in TR 25.802 be converted into a probable cause, or an exception.

2) What is the impact of radio access network sharing

3) What is the impact of failures, back up management systems?

4) Do we need any time dependency for making RET configuration data (e.g. all antennas in a Node B) apply within a defined period of time.

5) Health and safety requirements.

6) Consideration to delegating control to Node B software
   – aiding network resilience.
   – Reducing Itf-N signalling.

7) Security concerns

8) Multiple IRPManagers, there is a need to have one designated master.

Annex A:
TR 25.802 defined return (error) codes

TR25.802 [1] sub clause 6.1.6 defines a number of return (error) codes.
The table is copied below for convenience. The table in TR 25.802 provides the normative reference.

The following require possible mapping to probable causes in the notification IRP

Table A.1:

Code	Meaning	
0x00	OK	Normal response
0x01	Actuator Detection Fail	Signals from the actuator are detected but are abnormal, for example due to failed calibration.
0x02	Actuator Jam Permanent	Actuator cannot be moved
0x03	Actuator Jam Temporary	Actuator jam has been detected. No movement was detected in response to the normal stimulus.
0x04	Block Number Sequence Error	Used in combination with software download; block number sequence is wrong.
0x05	Busy	The device is busy and cannot respond until an activity is complete.
0x06	Checksum Error	Used in combination with software download; checksum incorrect.
0x07	Command Sequence Error	Used in combination with software download; command sequence is not permitted, eg a SetTilt command is received during software update sequence.
0x08	Data Error	RET AP data fault, e.g. length of data is inconsistent with length fields.
0x09	Device Disabled	Device is in logical Disabled state and cannot execute Set commands.
0x0A	EEPROM Error	EEPROM error detected
0x0B	Fail	Abnormal response. Indicates that a command has not been executed.
0x0C	Flash Erase Error	Used in combination with software download. indicates error when erasing flash memory.
0x0D	Flash Error	Used in combination with software download. indicates error when writing to flash memory.
0X0E	Not Calibrated	The device has not completed a calibration operation, or calibration has been lost.
0x0F	Not Scaled	No setup table has been stored in the device.
0x11	Other Hardware Error	Any hardware error which cannot be classified.
0x12	Other Software Error	Any software error which cannot be classified.
0x13	Out of Range	Value specified by a Set Tilt command is not supported by the device.
0x14	Position Lost	RET controller is unable to return a correct position value, for example there was a power failure while a SetTilt command was being executed.
0x15	RAM Error	An error was detected in reading data to/from RAM
0x16	Segment Number Sequence Error	Used in combination with software download; block sequence number is wrong.
0x17	UART Error	Hardware specific. This error may be sent after recovery from a temporary error which has prevented the sending or receiving of data.
0x19	Unknown Command	Received command is not defined in the version of AISG1 transmitted in the frame header, or the device has received a vendor-specific command with a vendor ID different from its own.

Annex B:
Future requirements

This annex is a place holder for requirements which are not within the scope of RET for release 6.

These are provided since considerations for them may ease the future evolution of RET control.

a) It shall be possible to adjust the gain of Low noise Tower top amplifiers

b) It shall be possible to relate the both Tilt angle and amplifier gain settings in a way which allows them to be applied as collections of values, which are configured at (as near as possible) the same time.

c) It shall be possible to determine the current gain and gain settings of Tower Top (TT) Low Noise Amplifiers (LNAs).

d) It shall be possible to define a number of pre-defined antenna profiles which may be activated at particular times of day (using UTC).

This requirement is for further study. Whether this applies to manager or agent is for further study.

e) The interface will permit several configuration profiles per day to be supported; e.g. it is considered that 4 profiles would be sufficient but absolute number is likely to vary on a case by case basis.

This requirement is for further study.

Annex C:
Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
Jun 2004	S_24	SP-040264	--	--	Submitted to TSG SA#24 for Information	1.0.0	