HIGHLIGHTS OF THE OSS NAS API

Role of the "originator" of a NAS message

- the encoder and the decoder take account of the **originator** of the message (either **UE** or **network**) specified by the user application; the originator determines the set of permitted values of certain fields and the interpretation of the values of certain other fields and thus affects the outcome of an encode or decode operation

Highlights relative to the encoder

- the encoder checks all information elements (**IEs**) against their **minimum** and **maximum permitted lengths** specified by the NAS protocol
- for those fields for which the NAS protocol specifies a set of **forbidden values**, the encoder checks the value assigned by the user application against the forbidden values; in case of violation, the encoder generates an error message and terminates the operation
- for those fields for which the NAS protocol specifies a single **required value** (e.g., a "spare bits" field, which must be set to 0), the encoder automatically sets the field to the required value (therefore the user application can simply ignore the existence of these fields)
- each error message generated by the encoder includes the **complete path of the field** associated with the error (if applicable)

Highlights relative to the decoder

Generation of error messages during a decode operation

- the decoder maintains a **text buffer** that may contain one or more **error messages** (concatenated); this buffer is emptied at the beginning of a decode operation
- when the decoder encounters an information element (**IE**) prefixed by a **length** that is **outside the permitted range of lengths** for that IE, the decoder adds a **recoverable error message** to the error message buffer, skips the IE, and **continues** the operation
- when the decoder encounters an **unknown IE** encoded as **"comprehension required"**, the decoder adds a **recoverable error message** to the error message buffer, skips the IE, and **continues** the operation
- when the decoder encounters an **out-of-sequence IE** encoded as **"comprehension required"**, the decoder adds a **recoverable error message** to the error message buffer, skips the IE, and **continues** the operation
- when the decoder encounters a field for which the NAS protocol specifies a set of **forbidden values**, and which is contained in a **mandatory IE**, the decoder checks the value against the

forbidden values; in case of violation, the decoder adds a **recoverable error message** to the error message buffer and **continues** the operation

- when the decoder encounters a field for which the NAS protocol specifies a single **required value** (with the exception of spare-bit fields), and which is contained in a **mandatory IE**, the decoder checks the value against the required value; in case of violation, the decoder adds a **recoverable error message** to the error message buffer and **continues** the operation
- when the decoder encounters a **mandatory IE** that is **syntactically incorrect**, the decoder adds a **critical error message** to the error message buffer and **aborts** the operation
- at the end of a decode operation, if **one or more recoverable errors** have occurred during the operation, the decoder adds a **critical error message** to the error message buffer
- at the end of a decode operation, the error message buffer (containing all the error messages generated during the operation, if any) becomes available to the user application; if a decode operation returns a result code of zero (success), the error message buffer will be empty, otherwise it will contain one or more error messages
- each error message generated by the decoder includes the **complete path of the field** associated with the error (if applicable)

Generation of warning messages during a decode operation

- the decoder maintains a **text buffer** that may contain one or more **warning messages** (concatenated); this buffer is emptied at the beginning of a decode operation
- when the decoder encounters an **unknown IE** not encoded as "comprehension required", the decoder adds a **warning message** to the warning message buffer, skips the IE, and continues the operation
- when the decoder encounters an **out-of-sequence IE** not encoded as "comprehension required", the decoder adds a **warning message** to the warning message buffer, skips the IE, and continues the operation
- if an **IE** with format T, TV, TLV, or TLV-E **occurs more than once** in a message, when the decoder encounters the second or any subsequent occurrence of that IE, the decoder adds a **warning message** to the warning message buffer, skips the occurrence, and continues the operation
- when the decoder encounters a known **optional IE** that is **syntactically incorrect**, the decoder reports that IE as **absent**, adds a **warning message** to the warning message buffer, and continues the operation
- when the decoder encounters a field for which the NAS protocol specifies a set of **forbidden values**, and which is contained in an **optional IE**, the decoder checks the value against the forbidden values; in case of violation, the decoder adds a **warning message** to the warning message buffer and continues the operation
- when the decoder encounters a field for which the NAS protocol specifies a single **required value** (with the exception of spare-bit fields), and which is contained in an **optional IE**, the decoder checks the value against the required value; in case of violation, the decoder adds a **warning message** to the warning message buffer and continues the operation

- at the end of a decode operation, the warning message buffer (containing all the warning messages generated during the operation, if any) becomes available to the user application; this applies to both successful and failed operations
- **most applications can ignore the warning messages**; this information is made available in case an application is interested in knowing about any non-critical issues that were automatically solved by the decoder (e.g., an invalid optional IE that was discarded, in accordance with the 3GPP technical specifications)
- each warning message generated by the decoder includes the **complete path of the field** associated with the warning (if applicable)

Interpretation of the value of certain fields

- for certain fields, the NAS protocol specifies that some of their values must be interpreted as a certain other value; when the decoder encounters a field for which the NAS protocol specifies a set of values **to be interpreted** as a certain **replacement value**, the decoder checks the value of the field against those values; in case of match, the decoder **replaces** the value of the field with the specified **replacement value** and adds a **warning message** to the warning message buffer

Features supporting diagnostics and testing of NAS messages

Ability to convert a message to XML and compare two messages

- an API function is available that **converts** an **encoded** NAS message to **XML**
- an API function is available that **converts** an **unencoded** message to **XML**
- an API function is available that **compares** two **unencoded** NAS **messages** and tells whether they are different

Ability to create, edit, and display NAS messages

- a **GUI-based application** is available as a separate product (NAS-1Step)