3GPP TS 03.32 V7.2.0 (2002-12)

Technical Specification

3rd Generation Partnership Project; Technical Specification Group Services and Systems Aspects; Network architecture (Release 98)

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Keywords
GSM, network, architecture

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Foreword

This Technical Specification (TS) 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:

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 or greater indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present document defines an intermediate universal Geographical Area Description which subscriber applications or GSM services can use and the network can convert into an equivalent radio coverage map.

For GSM services which involve the use of an "area", it can be assumed that in the majority of cases the Service Requester will be forbidden access to data on the radio coverage map of a particular PLMN and that the Service Requester will not have direct access to network entities (e.g. BSC/BTS).

The interpretation by the PLMN operator of the geographical area in terms of cells actually used, cells that are partly within the given area and all other technical and quality of service aspects are out of the scope of the present document.

This specification also provides a description of velocity that may be associated with a universal Geographical Area Description when both are applied to a common entity at a common time.

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.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.
- For this Release 1998 document, references to GSM documents are for Release 1998 versions (version 7.x.y).

[1] GSM 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".

[2] GSM 04.07: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface signalling layer 3 General aspects".

[3] Military Standard WGS84 Metric MIL-STD-2401 (11 January 1994): "Military Standard Department of Defence World Geodetic System (WGS)".

3 Definitions and abbreviations

3.1 Definitions

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

Service Requester: Entity, which uses the Geographical Area Description in any protocol to inform the network about a defined area

Target: an entity whose precise geographic position is to be described

3.2 Abbreviations

In addition to those mentioned below, abbreviations used in the present document are listed in GSM 01.04.

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

GAD	Geographical Area Description
GPS	Global Positioning System
WGS	World Geodetic System

4 Reference system

The reference system chosen for the coding of locations is the World Geodetic System 1984, (WGS 84), which is also used by the Global Positioning System, (GPS). The origin of the WGS 84 co-ordinate system is the geometric centre of the WGS 84 ellipsoid. The ellipsoid is constructed by the rotation of an ellipse around the minor axis which is oriented in the North-South direction. The rotation axis is the polar axis of the ellipsoid, and the plane orthogonal to it and including the centre of symmetry is the equatorial plane.

The relevant dimensions are as follows:

Major Axis (a) = 6378137 m

Minor Axis (b) = 6356752,314 m

First eccentricity of the ellipsoid

Co-ordinates are then expressed in terms of longitude and latitude relevant to this ellipsoid. The range of longitude is -180° to +180°, and the range of latitude is -90° to +90°. 0° longitude corresponds to the Greenwich Meridian, and positive angles are to the East, while negative angles are to the West. 0° latitude corresponds to the equator, and positive angles are to the North, while negative angles are to the South. Altitudes are defined as the distance between the ellipsoid and the point, along a line orthogonal to the ellipsoid.

5 Shapes

The intention is to incorporate a number of different shapes, that can be chosen according to need.

- Ellipsoid Point;
- Ellipsoid point with uncertainty circle;
- Ellipsoid point with uncertainty ellipse;
- Polygon;
- Ellipsoid point with altitude;
- Ellipsoid point with altitude and uncertainty ellipsoid;
- Ellipsoid Arc.

Each shape is discussed individually.

5.1 Ellipsoid Point

The description of an ellipsoid point is that of a point on the surface of the ellipsoid, and consists of a latitude and a longitude. In practice, such a description can be used to refer to a point on Earth's surface, or close to Earth's surface, with the same longitude and latitude. No provision is made in this version of the standard to give the height of a point.

Figure 1 illustrates a point on the surface of the ellipsoid and its co-ordinates.

The latitude is the angle between the equatorial plane and the perpendicular to the plane tangent to the ellipsoid surface at the point. Positive latitudes correspond to the North hemisphere. The longitude is the angle between the half-plane determined by the Greenwich meridian and the half-plane defined by the point and the polar axis, measured Eastward.

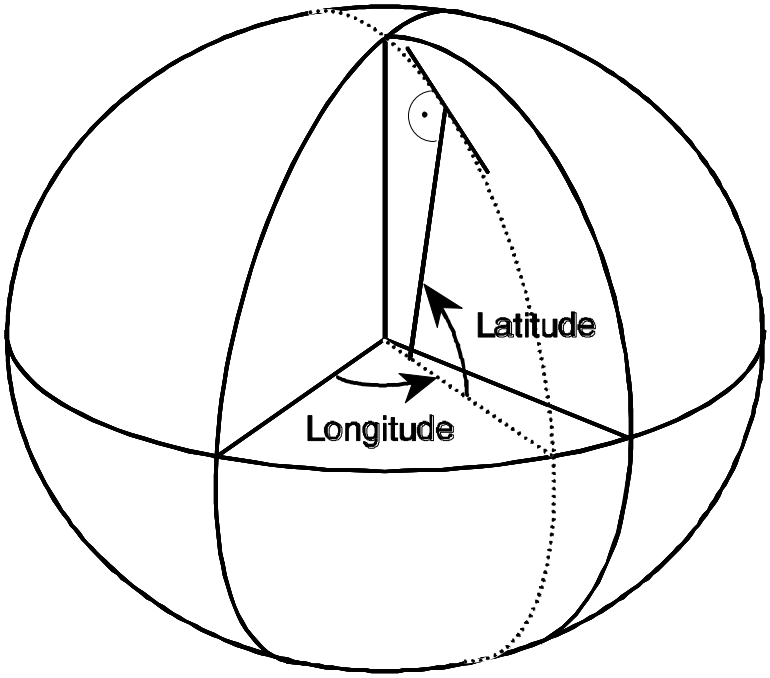


Figure 1: Description of a Point as two co-ordinates

5.2 Ellipsoid point with uncertainty circle

The "ellipsoid point with uncertainty circle" is characterised by the co-ordinates of an ellipsoid point (the origin) and a distance *r*. It describes formally the set of points on the ellipsoid which are at a distance from the origin less than or equal to *r*, the distance being the geodesic distance over the ellipsoid, i.e., the minimum length of a path staying on the ellipsoid and joining the two points, as shown in figure 2.

As for the ellipsoid point, this can be used to indicate points on the Earth surface, or near the Earth surface, of same latitude and longitude.

The typical use of this shape is to indicate a point when its position is known only with a limited accuracy.

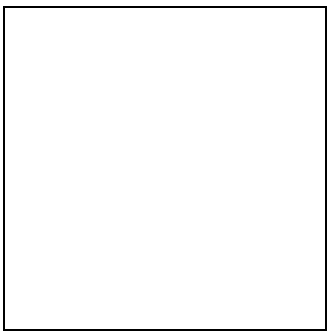


Figure 2: Description of an uncertainty Circle

5.3 Ellipsoid point with uncertainty ellipse

The "ellipsoid point with uncertainty ellipse" is characterised by the co-ordinates of an ellipsoid point (the origin), distances *r1* and *r2* and an angle of orientation *A*. It describes formally the set of points on the ellipsoid which fall within or on the boundary of an ellipse with semi-major axis of length *r1* oriented at angle *A* (0 to 180°) measure clockwise from north and semi-minor axis of length *r2*, the distances being the geodesic distance over the ellipsoid, i.e., the minimum length of a path staying on the ellipsoid and joining the two points, as shown in figure 2a.

As for the ellipsoid point, this can be used to indicate points on the Earth's surface, or near the Earth's surface, of same latitude and longitude. The confidence level with which the position of a target entity is included within this set of points is also included with this shape.

The typical use of this shape is to indicate a point when its position is known only with a limited accuracy, but the geometrical contributions to uncertainty can be quantified.

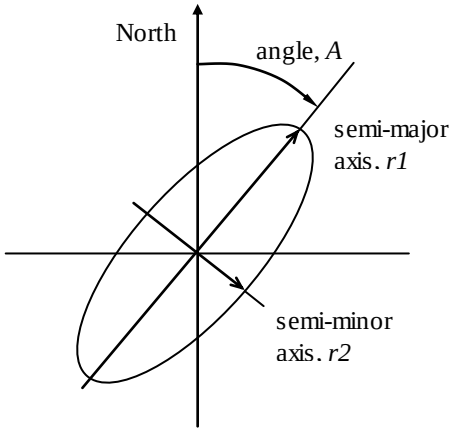


Figure 2a: Description of an uncertainty Ellipse

5.4 Polygon

A polygon is an arbitrary shape described by an ordered series of points (in the example pictured in the drawing, A to E). The minimum number of points allowed is 3, and the maximum number of points allowed is 15. The points shall be connected in the order that they are given. A connecting line is defined as the line over the ellipsoid joining the two points and of minimum distance (geodesic). The last point is connected to the first. The list of points must respect a number of conditions:

- a connecting line shall not cross another connecting line;
- two successive points must not be diametrically opposed on the ellipsoid.

The described area is situated to the right of the lines with the downward direction being toward the Earth's centre and the forward direction being from a point to the next.

NOTE: This definition does not permit connecting lines greater than roughly 20 000 km. If such a need arises, the polygon can be described by adding an intermediate point.

Computation of geodesic lines is not simple. Approximations leading to a maximum distance between the computed line and the geodesic line of less than 3 metres are acceptable.

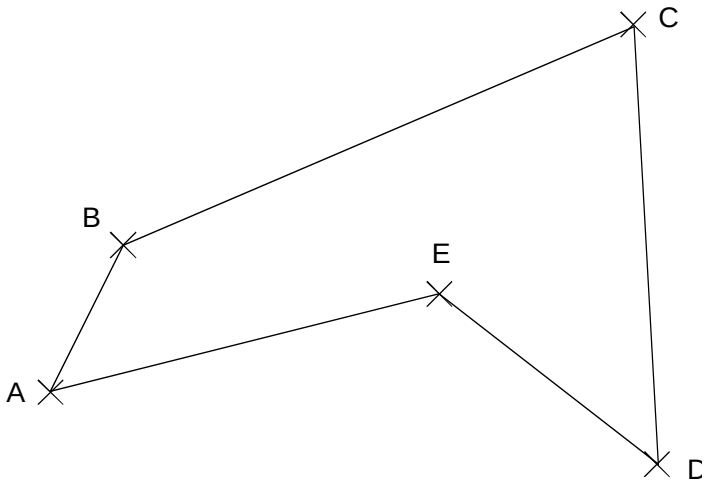


Figure 3: Description of a Polygon

5.5 Ellipsoid Point with Altitude

The description of an ellipsoid point with altitude is that of a point at a specified distance above or below a point on the earth's surface. This is defined by an ellipsoid point with the given longitude and latitude and the altitude above or below the ellipsoid point. Figure 3a illustrates the altitude aspect of this description.

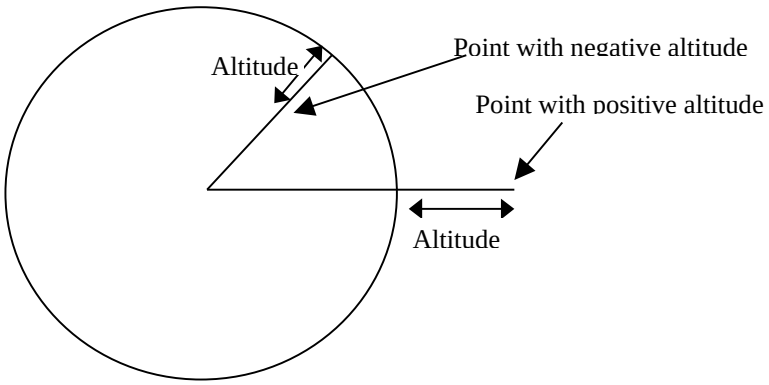


Figure 3a: Description of an Ellipsoid Point with Altitude

5.6 Ellipsoid point with altitude and uncertainty ellipsoid

The "ellipsoid point with altitude and uncertainty ellipsoid" is characterised by the co-ordinates of an ellipsoid point with altitude, distances r1 (the "semi-major uncertainty"), r2 (the "semi-minor uncertainty") and r3 (the "vertical uncertainty") and an angle of orientation *A* (the "angle of the major axis"). It describes formally the set of points which fall within or on the surface of a general (three dimensional) ellipsoid centered on an ellipsoid point with altitude whose real semi-major, semi-mean and semi-minor axis are some permutation of r1, r2, r3 with $r1 \geq r2$. The r3 axis is aligned vertically, while the r1 axis, which is the semi-major axis of the ellipse in a horizontal plane that bisects the ellipsoid, is oriented at an angle *A* (0 to 180 degrees) measured clockwise from north, as illustrated in Figure 3b.

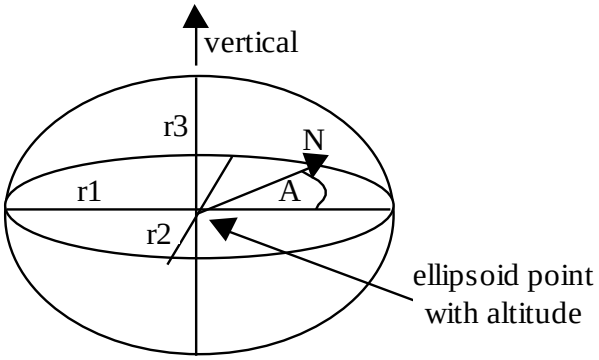


Figure 3b: Description of an Ellipsoid Point with Altitude and Uncertainty Ellipsoid

The typical use of this shape is to indicate a point when its horizontal position and altitude are known only with a limited accuracy, but the geometrical contributions to uncertainty can be quantified. The confidence level with which the position of a target entity is included within the shape is also included.

5.7 Ellipsoid Arc

An ellipsoid arc is a shape characterised by the co-ordinates of an ellipsoid point *o* (the origin), innerouter radius *r1*, uncertaintyinner radius *r2*, both radii being geodesic distances over the surface of the ellipsoid, the offset angle (θ) between the first defining radius of the ellipsoid arc and North, and the included angle (β) being the angle between the first and second defining radii.start angle *a1* and stop angle *a2*. Start and stop angle, (*a1* and *a2*) are defined as the angle clockwise from north. The offset start angle is within the range of 0° to 359,999…° while the included stop angle is within the range from 0,000…1° to 360°. This is to be able to describe a full circle, 0° to 360°.

This shape-definition can also be used to describe a sector (inner radius equal to zero),; a circle (included angle equal to 360°) and other circular shaped areas. The confidence level with which the position of a target entity is included within the shape is also included.

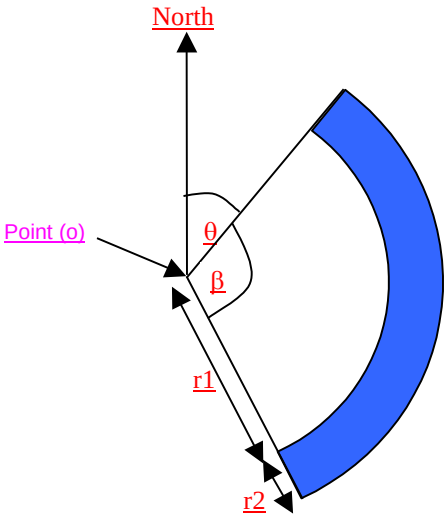


Figure 3c: Description of an Ellipsoid Arc

6 Coding

6.1 Point

The co-ordinates of an ellipsoid point are coded with an uncertainty of less than 3 metres

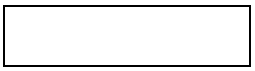
The latitude is coded with 24 bits: 1 bit of sign and a number between 0 and 2^{23}-1 coded in binary on 23 bits. The relation between the coded number N and the range of (absolute) latitudes X it encodes is the following (X in degrees):

except for N=2^{23}-1, for which the range is extended to include N+1.

The longitude, expressed in the range -180°, +180°, is coded as a number between -2^{23} and 2^{23}-1, coded in 2's complement binary on 24 bits. The relation between the coded number N and the range of longitude X it encodes is the following (X in degrees):

6.2 Uncertainty

A method of describing the uncertainty for latitude and longitude has been sought which is both flexible (can cover wide differences in range) and efficient. The proposed solution makes use of a variation on the Binomial expansion. The uncertainty *r*, expressed in metres, is mapped to a number K, with the following formula:



with C = 10 and x = 0,1. With $0 \leq K \leq 127$, a suitably useful range between 0 and 1800 kilometres is achieved for the uncertainty, while still being able to code down to values as small as 1 metre. The uncertainty can then be coded on 7 bits, as the binary encoding of K.

Table 1: Example values for the uncertainty Function

Value of K	Value of uncertainty
0	0 m
1	1 m
2	2,.1 m
-	-
20	57,.3 m
-	-
40	443 m
-	-
60	3 km
-	-
80	20 km
-	-
100	138 km
-	-
120	927 km
-	-
127	1800 km

6.3 Altitude

Altidude is encoded in increments of 1 meter using a 15 bit binary coded number N. The relation between the number N and the range of altitudes *a* (in metres) it encodes is described by the following equation;

$$N \le a < N+1$$

except for N=2^{15}-1 for which the range is extended to include all greater values of *a*.

The direction of altitude is encoded by a single bit with bit value 0 representing height above the WGS84 ellipsoid surface and bit value 1 representing depth below the WGS84 ellipsoid surface.

6.4 Uncertainty Altitude

The uncertainty in altitude, h, expressed in metres is mapped from the binary number K, with the following formula:

$$h = C\left((1+x)^K - 1\right)$$

with $C = 45$ and $x = 0{,}025$. With $0 \le K \le 127$, a suitably useful range between 0 and 990 meters is achieved for the uncertainty altitude,. The uncertainty can then be coded on 7 bits, as the binary encoding of K.

Table 2: Example values for the uncertainty altitude Function

Value of K	Value of uncertainty altitude
0	0 m
1	1,.13 m
2	2,.28 m
-	-
20	28,.7 m
-	-
40	75,.8 m
-	-
60	153,.0 m
-	-
80	279,.4 m
-	-
100	486,.6 m
-	-
120	826,.1 m
-	-
127	990,.5 m

6.5 Confidence

The confidence by which the position of a target entity is known to be within the shape description, (expressed as a percentage) is directly mapped from the 7 bit binary number K, except for K=0 which is used to indicate 'no information', and $100 < K \le 128$ which should not be used but may be interpreted as "no information" if received.

6.6 Radius

Inner Rradius is encoded in increments of 5 meters using a 16 bit binary coded number N. The relation between the number N and the range of radius *r* (in metres) it encodes is described by the following equation;

$$5N \le r < 5(N+1)$$

Except for N=2^{16}-1 for which the range is extended to include all greater values of *r*. This provides a true maximum radius of 327,.675 meters.

The uncertainty radius is encoded as for the uncertainty latitude and longitude.

6.7 Angle

Offset and Included Aangle areis encoded in increments of 21° using an 98 bit binary coded number N in the range 0 to 179. The relation between the number N and the range of offset (ao) and included (ai) angles *a* (in degrees) it encodes is described by the following equations;

Offset angle (ao)

2 N <= ao < 2 (N+1) Accepted values for ao are within the range from 0 to 359,9...9 degrees.

Included angle (ai)

2 N < ai <= 2 (N+1) Accepted values for ai are within the range from 0,0...1 to 360 degrees.

7 General message format and information elements coding

This clause describes a coding method for geographical area descriptions. A geographical area description is coded as a finite bit string. In the figures, the bit string is described by octets from top downward, and in the octet from left to right. Number encoding strings start with the most significant bit.

7.1 Overview

A bit string encoding a geographical description shall consist of the following parts:

- Type of Shape;
- Shape Description.

Such a bit string is usually part of an information element. The structure of the information element (e.g., element identifier, length) depends on the protocol in which the message containing the description is defined, and is specified in the protocol specification.

This organisation is illustrated in the example shown in figure 4.

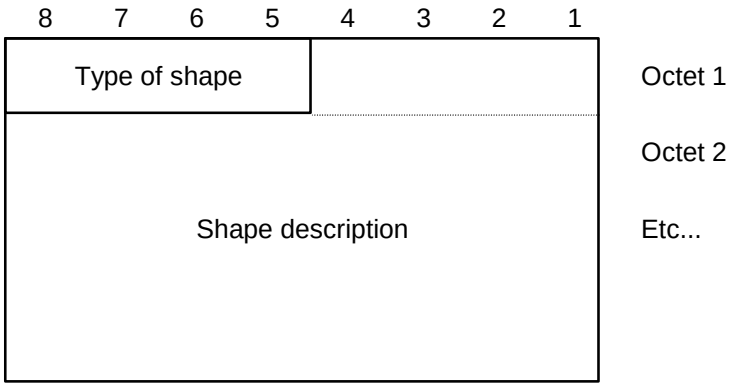


Figure 4: Example

7.2 Type of Shape

The Type of Shape information field identifies the type which is being coded in the Shape Description. The Type of Shape is coded as shown in table 2.

Table 2: Coding of Type of Shape

Bits	
4 3 2 1	
0 0 0 0	Ellipsoid Point
0 0 0 1	Ellipsoid point with uncertainty Circle
0 0 1 1	Ellipsoid point with uncertainty Ellipse
0 1 0 1	Polygon
1 0 0 0	Ellipsoid point with altitude
1 0 0 1	Ellipsoid point with altitude and uncertainty Ellipsoid
1 0 1 0	Ellipsoid Arc
other values	reserved for future use

7.3 Shape description

The shape description consist of different elements.

7.3.1 Ellipsoid Point

The coding of a point is described in figure 5.

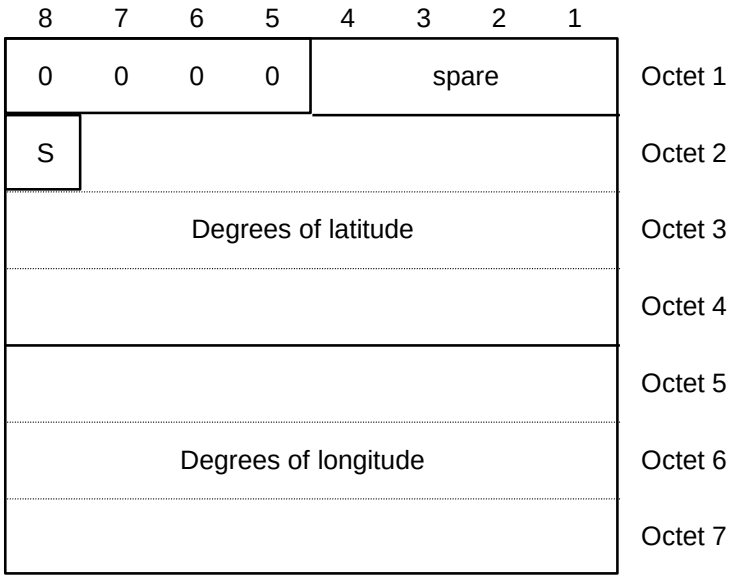


Figure 5: Shape description of a point

S: Sign of latitude

Bit value 0 North

Bit value 1 South

Degrees of latitude

Bit 1 of octet 4 is the low order bit

Degrees of longitude

Bit 1 of octet 7 is the low order bit

7.3.2 Ellipsoid Point with uncertainty Circle

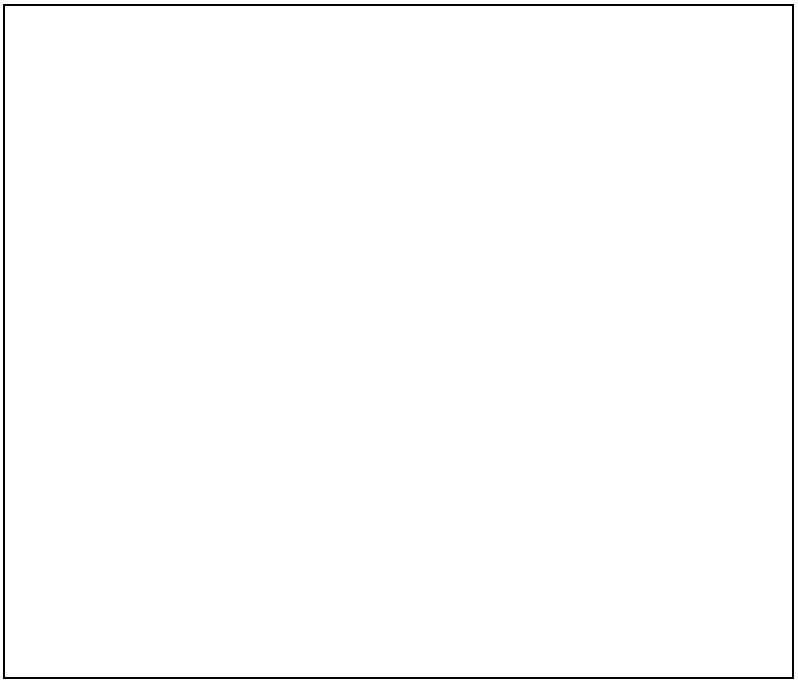


Figure 6: Shape description of an ellipsoid point with uncertainty circle

7.3.3 Ellipsoid Point with uncertainty Ellipse

8	7	6	5	4	3	2	1	
0	0	0	1	spare				Octet 1
S								Octet 2
Degrees of latitude								Octet 3
								Octet 4
								Octet 5
Degrees of longitude								Octet 6
								Octet 7
0 spare	Uncertainty semi-major							Octet 8
0 spare	Uncertainty semi-minor							Octet 9
Orientation of major axis								Octet 10
0 spare	Confidence							Octet 11

Figure 6a: Shape description of an ellipsoid point with uncertainty ellipse

Orientationof major axis

angle in degrees between the major axis and north

(0 = north, 90 = east, values of 180 and above are not used)

7.3.4 Polygon

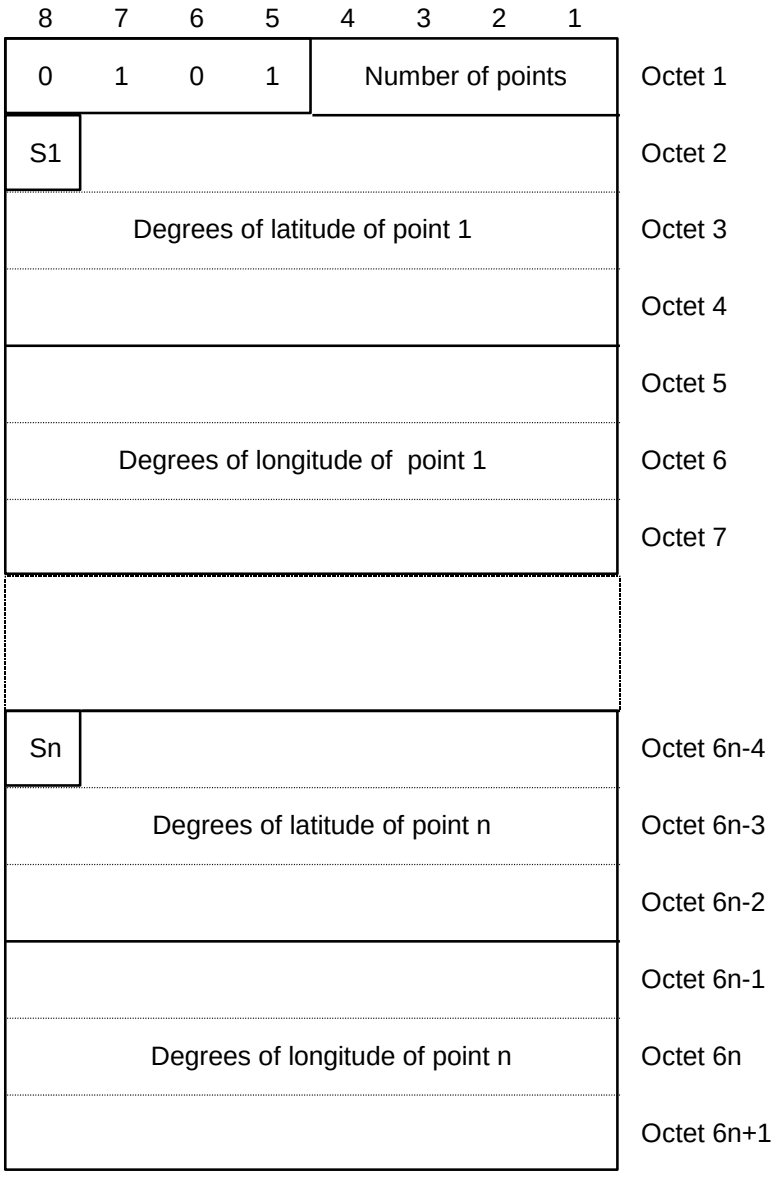


Figure 7: Shape description of a polygon

The number of points field encodes in binary on 4 bits the number n of points in the description, and ranges from 3 to 15.

7.3.5 Ellipsoid Point with Altitude

The coding of an ellipsoid point with altitude is described in figure 8.

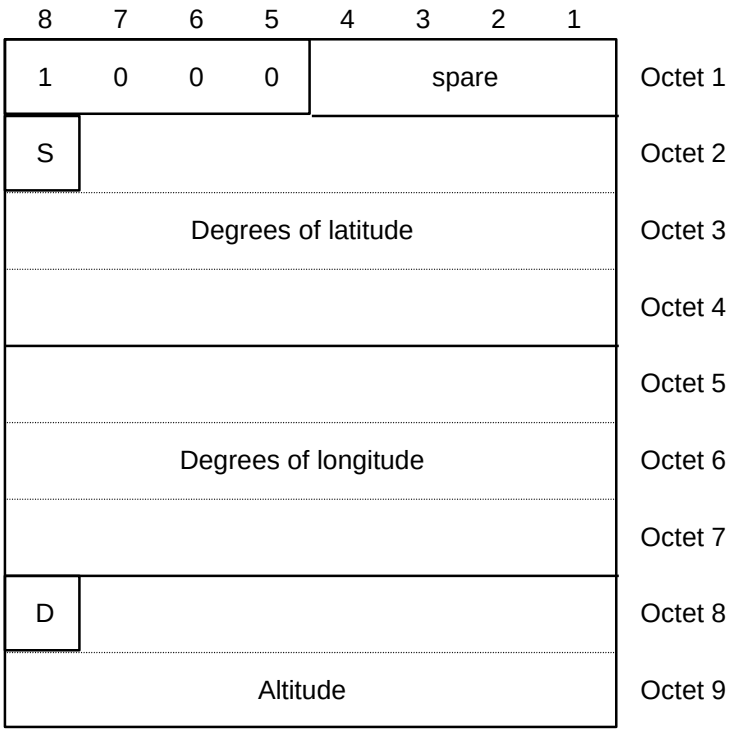


Figure 8: Shape description of an ellipsoid point with altitude

D: Direction of Altitude

Bit value 0 Altitude expresses height

Bit value 1 Altitude expresses depth

Altitude

Bit 1 of octet 9 is the low order bit

7.3.6 Ellipsoid Point with altitude and uncertainty ellipsoid

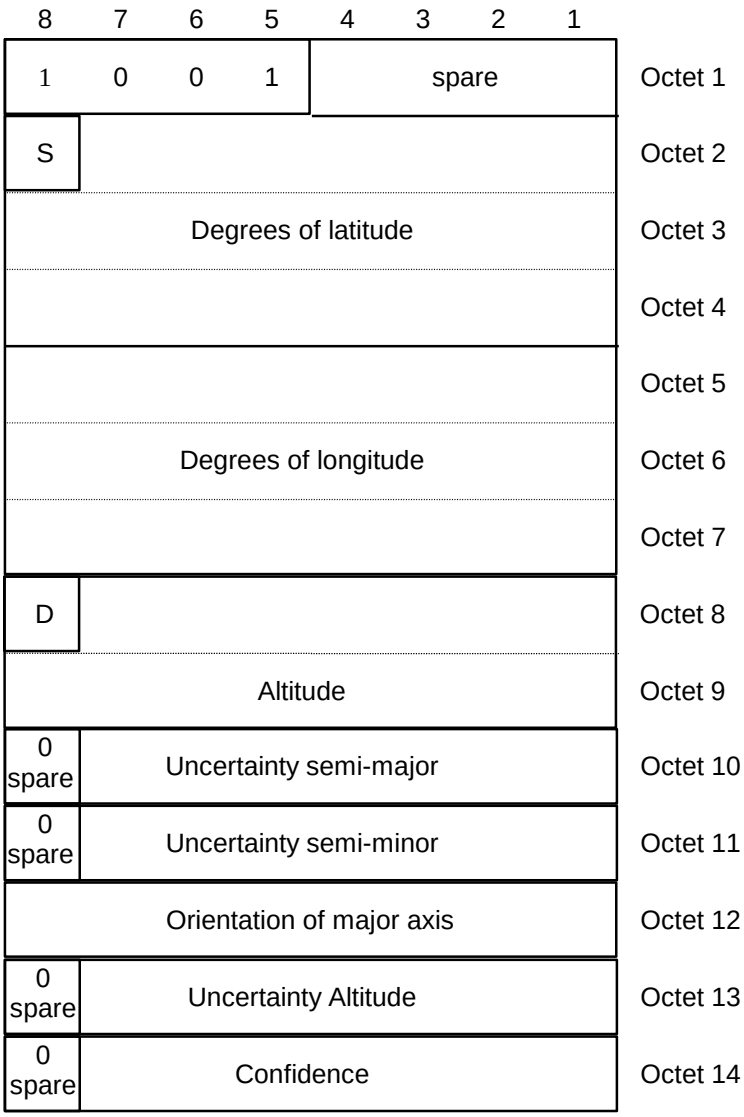


Figure 9: Shape description of an ellipsoid point with altitude and uncertainty ellipsoid

7.3.7 Ellipsoid Arc

Editorial Note: T1P1.5 intends to align the Arc shape with ITU-T Q.762, Q.763

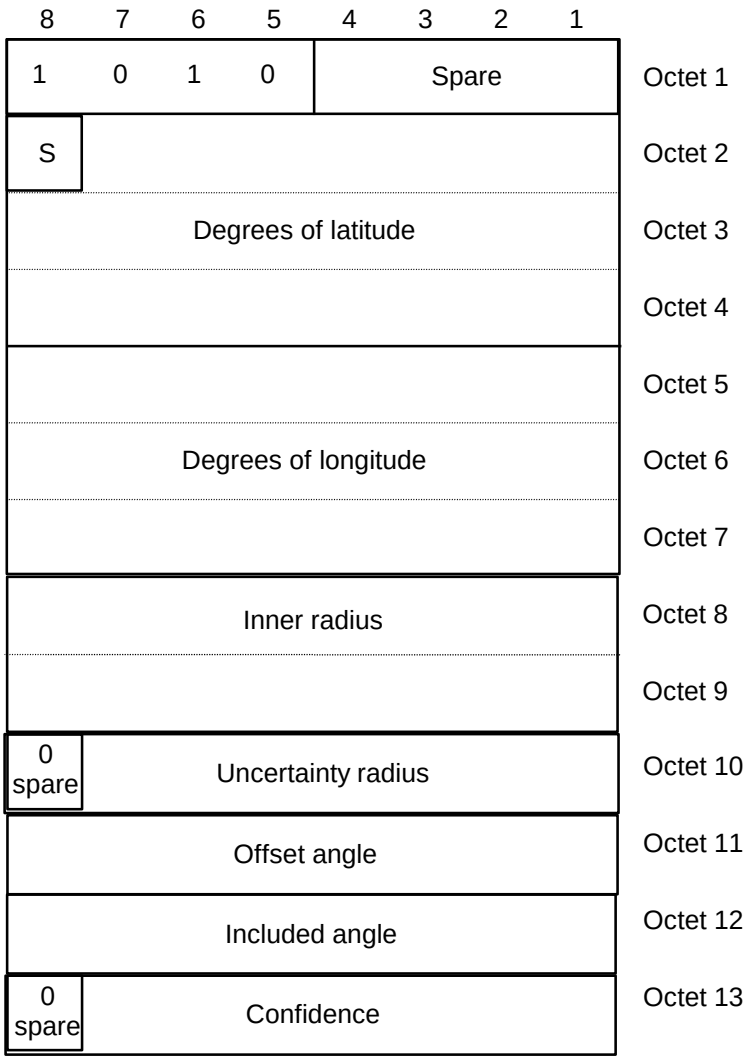


Figure 10: Shape description of an Ellipsoid arc

Start angle

Bit 8 of octet 9 is the low order bit

Stop angle

Bit 1 of octet 9 is the high order bit

Inner radius

Bit 8 of octet 8 is the high order bit

Bit 1 of octet 912 is the low order bit

8. Description of Velocity

A description of velocity is applicable to any target entity on or close to the surface of the WGS84 ellipsoid.

8.1 Horizontal Velocity

Horizontal velocity is characterized by the horizontal speed and bearing. The horizontal speed gives the magnitude of the horizontal component of the velocity of a target entity. The bearing provides the direction of the horizontal component of velocity taken clockwise from North.

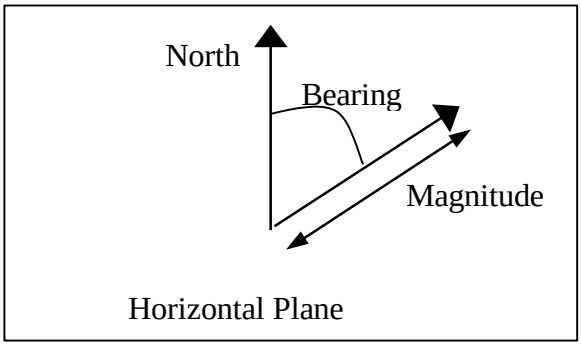


Figure 110 – Description of Horizontal Velocity with Uncertainty

8.2 Horizontal and Vertical Velocity

Horizontal and vertical velocity is characterized by horizontal speed, bearing, vertical speed and direction. The horizontal speed and bearing characterize the horizontal component of velocity. The vertical speed and direction provides the component of velocity of a target entity in a vertical direction.

8.3 Horizontal Velocity with Uncertainty

Horizontal velocity with uncertainty is characterized by a horizontal speed and bearing, giving a horizontal velocity vector $\underline{V}$, and an uncertainty speed s. It describes the set of velocity vectors $\underline{v}$ related to the given velocity $\underline{V}$ as follows:

$|\underline{v} - \underline{V}| \leq s$

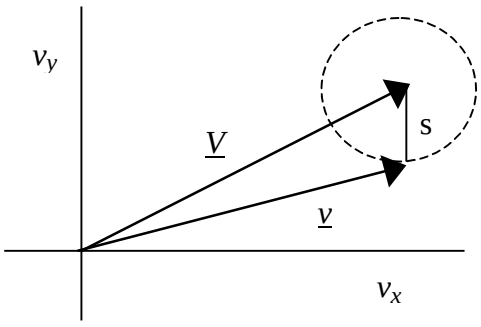


Figure 121 – Description of Horizontal Velocity with Uncertainty

8.4 Horizontal and Vertical Velocity with Uncertainty

Horizontal and vertical velocity with uncertainty is characterized by a horizontal speed and bearing, giving a horizontal velocity vector $\underline{V}_{x,y}$, a vertical speed and direction giving a vertical velocity component V_z, and uncertainty speeds s1 and s2. It describes the set of velocity vectors $\underline{v}$ with horizontal and vertical compents $\underline{v}_{x,y}$, and v_z that are related to the given velocity components $\underline{V}_{x,y}$, and V_z as follows:

$|\underline{v}_{x,y}, - \underline{V}_{x,y}, | \leq s1$

$|v_z - V_z| \leq s2$

8.5 Coding Principles

Velocity is encoded as shown in Figure 12. The velocity type in bits 8-5 of octet 1 defines the type of velocity information in succeeding bits.

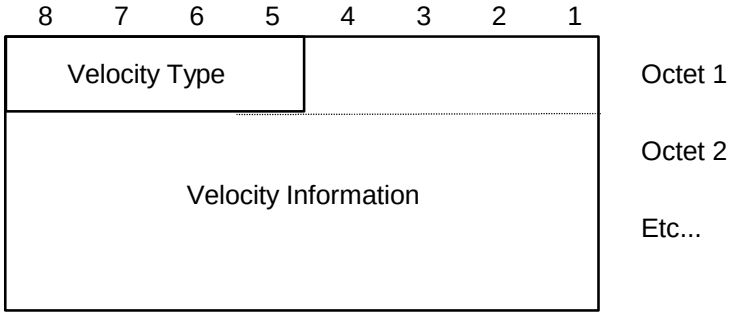


Figure 132 – General Coding of Velocity

8.6 Coding of Velocity Type

Table 3 shows the coding of the velocity type.

Table 3: Coding of Velocity Type

Bits	
4 3 2 1	
0 0 0 0	Horizontal Velocity
0 0 0 1	Horizontal with Vertical Velocity
0 0 1 0	Horizontal Velocity with Uncertainty
0 0 1 1	Horizontal with Vertical Velocity and Uncertainty
other values	reserved for future use

8.7 Coding of Horizontal Speed

Horizontal speed is encoded in increments of 1 kilometer per hour using a 16 bit binary coded number N. The relation between the number N and the horizontal speed *h* (in kilometers per hour) it encodes is described by the following equations:

$N \leq h < N + 0.5 \qquad (N = 0)$

$N - 0.5 \leq h < N + 0.5 \qquad (0 < N < 2^{16}-1)$

$N - 0.5 \leq h \qquad (N = 2^{16}-1)$

8.8 Coding of Bearing

Bearing is encoded in increments of 1 degree measured clockwise from North using a 9 bit binary coded number N. The relation between the number N and the bearing b (in degrees) it encodes is described by the following equation;

$N \leq b < N+1$

except for $360 \leq N < 511$ which are not used

8.9 Coding of Vertical Speed

Vertical speed is encoded in increments of 1 kilometer per hour using 8 bits giving a number N between 0 and 2^8-1. The relation between the number N and the vertical speed *v* (in kilometers per hour) it encodes is described by the following equations;

$N \leq v < N + 0.5$ (N = 0)

$N - 0.5 \leq v < N + 0.5$ ($0 < N < 2^8$-1)

$N - 0.5 \leq v$ ($N = 2^8$-1)

8.10 Coding of Vertical Speed Direction

Vertical speed direction is encoded using 1 bit: a bit value of 0 indicates upward speed; a bit value of 1 indicates downward speed.

8.11 Coding of Uncertainty Speed

Uncertainty speed is encoded in increments of 1 kilometer per hour using an 8 bit binary coded number N. The value of N gives the uncertainty speed except for N=255 which indicates that the uncertainty is not specified.

8.11 Coding of Horizontal Velocity

The coding of horizontal velocity is described in figure 13.

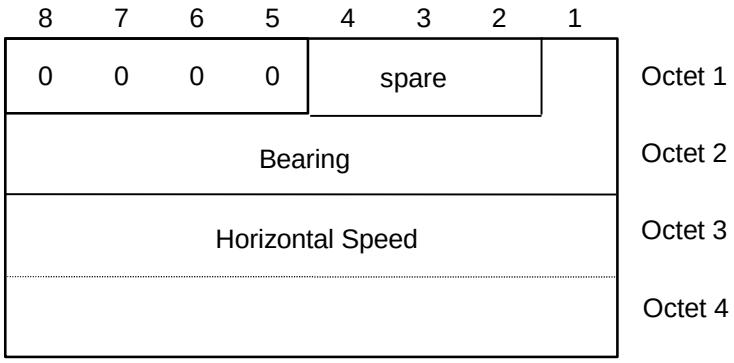


Figure 143: Coding of Horizontal Velocity

Bearing

Bit 1 of octet 1 is the high order bit; bit 1 of octet 2 is the low order bit

Horizontal Speed

Bit 1 of octet 4 is the low order bit

8.12 Coding of Horizontal with Vertical Velocity

The coding of horizontal with vertical velocity is described in figure 14.

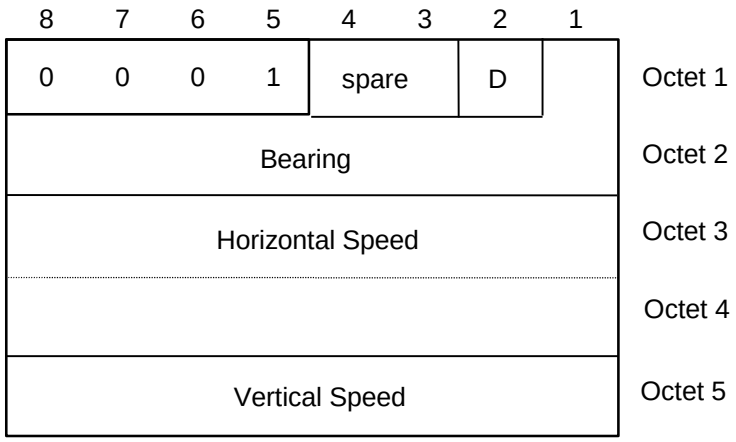


Figure 154: Coding of Horizontal with Vertical Velocity

D: Direction of Vertical Speed

Bit value 0 Upward

Bit value 1 Downward

8.13 Coding of Horizontal Velocity with Uncertainty

The coding of horizontal velocity with uncertainty is described in figure 15.

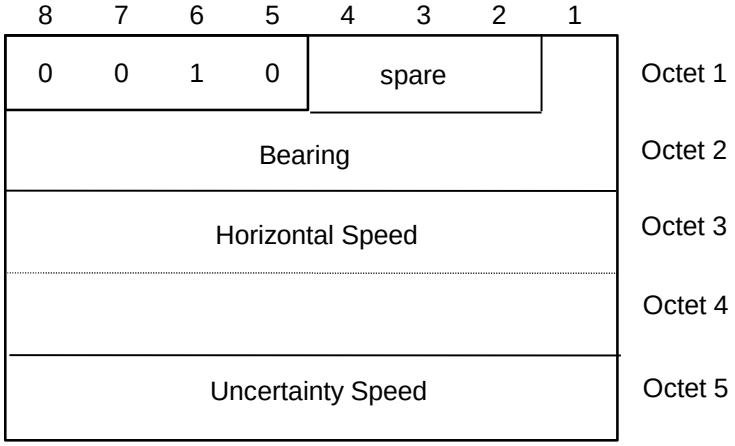


Figure 165: Coding of Horizontal Velocity with Uncertainty

8.14 Coding of Horizontal with Vertical Velocity and Uncertainty

The coding of horizontal with vertical velocity and uncertainty is described in figure 16.

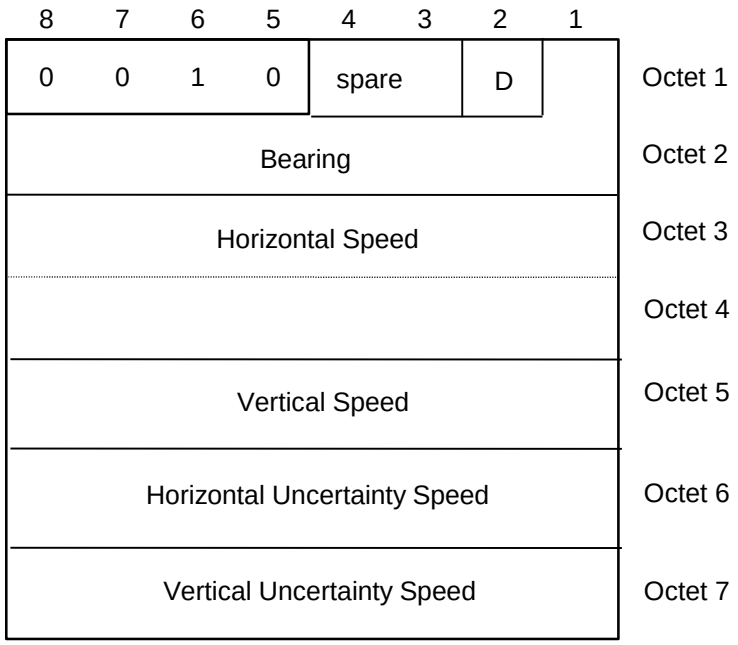


Figure 176: Coding of Horizontal with Vertical Velocity

Annex A (informative): Element description in compact notation

The notation is the one described in GSM 04.07.

```
<Geographical Area Description> ::=
    <Point> |
    <Point with uncertainty circle> |
    <Point with uncertainty ellipse> |
    <Polygon> |
    <Point with Altitude> |
    <Point with altititude and uncertainty ellipsoid> |
    <Arc>;

<Point> : :=
    0000 <spare>(4)
    <Point horizontal co-ordinates> ;

<point horizontal co-ordinates> ::=
    <Latitude sign : bit> <Unsigned latitude : bit string(23)>
    <Longitude : bit string(24)> ;

<Point with uncertainty circle> ::=
    0001 <spare>(4)
    <Point horizontal co-ordinates>
    <spare bit> <Uncertainty: bit string(7)> ;

<Point with uncertainty ellipse> ::=
    0011 <spare>(4)
    <Point co-ordinates>
    <spare bit> <Uncertainty semi-major: bit string(7)>
    <spare bit> <Uncertainty semi-minor: bit string(7)>
    <Orientation of major axis: bit string(8)>
    <spare bit> <Confidence: bit string(7)>;

<Polygon> ::=
    0101 <Number of points>
    <Point co-ordinates>(val(Number of points)) ;

<Number of points> ::=
    0011 | 0100 | 0101 | 0110 | 0111 | 1000 | 1001 | 1010 |
    1011 | 1100 | 1101 | 1110 | 1111 ;

<Point with Altitude> ::=
    1000 <spare>(4)
    <Point horizontal co-ordinates>
    <Point vertical co-ordinate>;

<point vertical co-ordinate> ::=
    <sign : bit> <Unsigned altitude : bit string(15)>

<Point with altitude and uncertainty ellipsoid> ::=
    1001 <spare>(4)
    <Point horizontal co-ordinates>
    <point vertical co-ordinate>
    <spare bit> <Uncertainty semi-major: bit string(7)>
    <spare bit> <Uncertainty semi-minor: bit string(7)>
    <Orientation of major axis: bit string(8)>
```

<Uncertainty altitude: bit string(7)>
<spare bit> <Confidence: bit string(7)>;

<Ellipsoid Arc> ::=
<1010> spare(4)
<Point horizontal co-ordinates>
<Inner radius: bit string(16)>
<Spare bit> <Uncertainty radius: bit string(7)>;
<Offset angle: bit string(8)>
<Included angle: bit string(8)>
<spare bit> <Confidence: bit string(7)>;

<Velocity Description> ::=
<Horizontal Velocity> |
<Horizontal and Vertical Velocity> |
<Horizontal Velocity with Uncertainty>|
<Horizontal and Vertical Velocity with Uncertainty>;

<Horizontal Velocity> : :=
0000 <spare>(3)
<Bearing: bit string(9)>
<Horizontal speed: bit string(16)>;

<Horizontal and Vertical Velocity> : :=
0001 <spare>(2)
<Vertical direction : bit>
<Bearing: bit string(9)>
<Horizontal speed: bit string(16)>
<Vertical speed: bit string(8)>;

<Horizontal Velocity with Uncertainty> : :=
0010 <spare>(3)
<Bearing: bit string(9)>
<Horizontal speed: bit string(16)>
<Uncertainty Speed: bit string(8)>;

<Horizontal and Vertical Velocity with Uncertainty> : :=
0011 <spare>(2)
<Vertical direction : bit>
<Bearing: bit string(9)>
<Horizontal speed: bit string(16)>
<Vertical speed: bit string(8)>
<Horizontal Uncertainty Speed: bit string(8)>
<Vertical Uncertainty Speed: bit string(8)>;

Annex B (informative): Change history

Date	Version	Information about changes
		No Phase 1 version
October 1997	5.0.0	Specification approved by SMG#23
June 1998	5.1.0	CR 03.32-A001r1 (R96-F) on Clarification in section 7.3.1 (WI: CAMEL Phase 1) approved by SMG#26
October 1998	5.2.0	CR 03.32-A002r1 (R96-F) on Error correction in GSM 03.32 for value of uncertainty (WI: CAMEL Phase 1) approved by SMG#27
January 1999	6.0.0	Release 1997 version
June 1999	7.0.0	CR 03.32-A004 Addition of Uncertainty Ellipse
July 2000	7.1.0	CR A006: Addition of new geographic shape descriptions for LCS
December 2002	7.2.0	CR # : 007rev2, Coding of Maximum Offset and Included angle Approved by SA Plenary #18