

## **COLLATION OF COMMENTS RECEIVED REGARDING WGS84 / GDA94 ISSUE IMPACTING CAP-AU PROFILE**

This document collates comments received by Greg Trott through email from individuals or the EM-TC mail list between Mon 11/21/2011 4:49 PM (AEDT) / Mon 11/21/2011 12:49 AM (US EST) and Tue 11/22/2011 4:30 PM (AEDT) / Tue 11/22/2011 12:30 AM (US EST)

### **CAP v2.0 CONSIDERATIONS:**

- From Carl Reed:
  - This would be a good time to make this change as we do need to work CAP to use the new OASIS GML simple profile that allows more interesting geometries to be specified as part of the CAP message.
  - A couple of years ago, the EM TC agreed that at some point CAP 2.0 would be developed.
  - The 2.0 version of CAP would be enhanced to support the new OASIS GML Simple Features profile that is now used in EDXL.
  - An interesting aspect of such a migration is that GML provides for a simple mechanism for expressing one or more coordinate references systems.
- From Darrell O'Donnell:
  - On the future side (CAP v2+) when we allow for CRS data to be shared will we require everyone to also share out a WGS84 common coordinate as well?
    - To me, any part of CAP that isn't common becomes very dangerous.
    - I can picture an alert that uses a new local state-plane coordinate system being totally useless to a receiving system that only understands WGS84.

### **REX BROOKS (Network Centric Operations Industry Consortium)**

- From a practical, pragmatic viewpoint, I think [Greg Trott's] option 2 is probably better, but I think that it should be noted that a revision is likely when CAP v2.0 is approved.
- The primary issue is to be easily usable in the SE Asia – Australia – Micronesia / Polynesia context.
- I think this is a very good subject for the Pacific Endeavor exercises and I will suggest it.

### **DON McGARRY (Mitre Corporation)**

- We need to distinguish what goes out over the wire versus what is displayed to the user. As Carl points out there are two approaches:
  1. Allow multiple Coordinate systems / units of measure to be sent out over the wire
  2. Only allow one CRS / UOM on the wire
- If you opt for #1, every system that needs to process the geo-data in a message to do machine to machine (m2m) messaging needs to know about all possible formats and do a conversion to the format it will process the message in (to do geo routing, display, etc.).
  - IMO, this places a huge burden on the developer to handle a bunch of different cases.

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- In turn this can “break” interoperability because if a CRS / UOM is transmitted to a system that it doesn’t know how to handle it will drop the message on the floor.
- We run into this issue all the time with “flexible” message formats that allow for things like height to be in MSL, HAE, etc.
- To be frank, flexibility for the actual message over the wire is a lot of extra work for developers which leads to lack of adoption of a standard for m2m messaging.
- Carl Reed highlights: The default is still WGS84 – just like KML or GeoRSS.
  - I would suspect the majority of folks would continue to use WGS84 and the default UoM.
  - However, if a CRS element is provided, then another CRS is being specified.
  - The CRS should most likely be an EPSG code. There is an EPSG online registry. Simple and easy to use.
- If you opt for #2 (which is currently what we do)... Everyone knows what to expect on the wire.
  - In a m2m messaging system, what goes out over the wire \*should\* NOT matter to the end system consumers as the message processors can convert CRS / UOM to meet local needs.
  - To me this is much preferred.
  - The reason is that if I just want to use one CRS I either use the default, or do one conversion. If there are “n” number of possibilities and we are using approach #1...then I have to handle (n-1)! (that’s factorial) cases for conversion which is a lot of work
  - Carl Reed highlights: there are an array of commercial and open source solutions for coordinate transformations. No need to write one from scratch! Check out Blue Marble (commercial) or GeoAPI (open source).

### **PETE O’DELL (Individual member):**

- From a usability standpoint, the planet is shrinking (digitally) and many people/organizations in many countries want to be able to consume alerts that are relevant to their global organizations outside of physical country boundaries.
- Any resolution to this issue that is transparent to the alert recipient without an incredible amount of additional code and business rule processing to resolve differences between the various coordinate systems being used would be appreciated and help this objective long term.

### **LEW LEINENWEBER (SE Solutions, Inc):**

- A new, soon to be released, OASIS Committee Specification Draft (CSD) called EDXL GML Simple Features profile (EDXL-GSF), based on OGC and ISO international standard location-based GML schema, allows one to specify and use any known coordinate reference system (CRS) for a given location.
- Thus, while the default CRS may be WGS84, a CAP message, for example, using EDXL-GSF profile for location geometry (point, polygon, envelope, etc), could contain locations using GDA94 with clarity and without ambiguity.

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- The purpose of the EDXL-GSF profile is to provide a standards-based way to provide location information in a message.
- To incorporate use of EDXL-GSF profile would, of course, require each EDXL message standard Subcommittee to review and consider the path to achieve integration of this supporting standard (when it is eventually published).
- For additional details and description see the documentation excerpts from the EDXL-GSF profile schema (and by reference, also GML 3.2.1 standard schema) provide the description of its use in practice.

### NORM PAULSEN (Environment Canada):

- Australia's option 2 is close to the mark - by adding a note in the OASIS document explaining the AU rule set.
- Realistically, this means the (optional) GIS elements like <polygon> would not normally be filled out in CAP-AU because you would fill out your own <parameter> for this information
- when able to focus on global interoperability, a gateway function residing with the office that is designated as the official AU CAP source for the world could be employed.
- its easy to create a <parameter> value as Darrell O'Donnell exampled below for all the GIS constructs you want to use and you will avoid the big problem later when it comes time to go global.
- By putting it in a <parameter>, you avoid creating constraints and legacy issues going forward while still getting what you want.
  - The downside is if that's all you do, then the global community is negatively impacted long term and would have to do extra work to process your alerts.
  - this is where global agencies may step up and build some GIS transforms (gateway functions) for everyone as they will want Global Alerts on Google Earth and Google maps etc.

### CARL REED (Open Geospatial Consortium):

- numerous countries (Australia, China, India, and others) have national laws stating the official CRS for that country.
- I agree that we do not want one-off profiles for each case in which national law or other best practice requires the use of a CRS other than WGS-84.
  - We in the OGC community have encountered this issue in India, China, South Africa, and a few other countries.
  - We have actually had to allow the Chinese to modify our standards to use China's mandated national CRS in schema examples in order for them to become Chinese national standards.
  - In the OGC we run into community of practice or domain requirements all the time. The way to ensure interoperability within the domain or CiP is to have agreements on implementation best practice, just as is happening with CAP.
  - Also, interoperability between domains can actually be enhanced by allowing explicit expression of CRS and UoM metadata.

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- Rather than adding additional “normative” CRS references, my recommendation would be to allow any CRS to be specified with WGS 84 as the default.
  - Allowing alternative CRS definitions in the CAP specification does not add complexity, increases flexibility, allows for national profiles that adhere to national mandates as to which geoid to use, protects for the future
  - the IETF community has recognized the need to allow alternative CRSs than just WGS84. This is why, for example, the location extension to DHCP provides for alternative CRSs to be used.
- we need to solve the broader global issue of CAP and the use of a CRS other than WGS-84.
- Providing the ability to specify additional coordinate reference systems would not change any of the existing implementations. Any code necessary to check for additional CRSs would be trivial.
  - And any actual coordinate conversions should happen on the server side where the alerts are generated and not on the client side (although many clients now also support easy access to coordinate transformations.)
  - Gary Ham (Individual member) highlights: Not [trivial] if the messages are signed. The data could then not be changed without invalidating the signature. Changed messages are new messages. The basic message cannot be changed, although what the user sees can be changed as needed.
  - Darrell O’Donnell agrees: it would have to happen at the originator level.
    - I am betting Carl was considering the issuer and server to be one and the same, which I would agree with for the purposes of this discussion.
    - Certainly the issuer and server don't need to be the same, but Carl's point is that it is quite easy to share out both WGS84 and coordinates in another CRS.
    - most systems that use non-WGS84 coordinate systems nowadays can handle WGS84 as it has become a leveller. So, adding "hey this is my local CRS" parameter value still makes sense here.
    - At the CAP v1.2 level I can see adding a GML-compliant valueName/value that allows extension to the play.
- would systems that create or ingest a CAP message “understand” any other CRS than WGS84?
  - most geotechnologies can deal with CRS transforms – other than perhaps some of the very limited geo capabilities in social media location APIs – such as from Twitter.
- The normative aspect would be introduced when Australia defines the Aussie profile and specifies GDA94 as normative for the CAP-AU profile.
- Isn’t this what the CAP profile work is all about?
  - If a community decides not to use WGS-84 and favor some other CRS, then there is agreement in that community and all the implementing software abides by that agreement for that community. Interoperability is maintained.

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**DARREL O'DONNELL (Continuum Loop Inc):**

- cautionary note about changing anything without making it an explicit "different from CAP" addition.
- there is value in supporting a different coordinate system
- most groups have agreed that CAP is strong because it uses a single, unambiguous, and widely used coordinate system.
- For alerting purposes we need to focus on using a widely known position format and the minor inaccuracies [between WGS84 and GDA94] are not worth breaking this concept.
- Many groups have argued for better positioning and different datums, but the CAP community has consistently looked at its mission and realized that WGS84 meets the needs of the broad community.
- In the case of GDA94, this would be consistent with guidance issued in Australia, specifically by the Intergovernmental Committee on Surveying and Mapping (ICSM).
  - Here's a link (<http://www.icsm.gov.au/gda/wgs84fact.pdf>) to an ICSM guidance site that uses the phrase "**for most practical purposes GDA94 and WGS84 coordinates can be considered the same and no transformation is required.**"
    - There is a caveat to that statement in the document that basically states that if you need to be hyper-accurate, GDA94 needs to be explicitly considered (see document for full detail).
    - for the purposes of alerting, this kind of accuracy is meaningless. Alerting doesn't operate at that level of accuracy.
  - Here's another link quoting "What is the difference between GDA and WGS84 coordinates ? <http://www.icsm.gov.au/gda/gdabrocl.pdf>"
    - For all practical purposes, GDA and WGS84 are the same.
    - The difference is of the order of 10cm.
    - The GDA uses a more accurate model which is endorsed by the International Association of Geodesy (IAG) and to which WGS84 is being aligned."
- From the ICSM I see a strong argument in "living with" WGS84.
- Adding a new coordinate system to CAP will cause widespread angst and complexity in the CAP alerting world
  - I'd hate to see Australia have to ask each vendor to tailor their system to support GDA94, as the costs are not worth the extra accuracy.
- Though the issue looks so small at the XML level we need to be very careful about going in this direction – it is a slippery slope.
- For the GDA94 purists - Keeping pure on the CAP side and allowing for the CAP-AU profile to augment would potentially be good.
  - A <parameter> or <geocode> valueName/value pair could be used to support the use of GDA94 IN ADDITION to the normative WGS84 values.
  - That will allow the geo/survey savvy folk to use the GDA94 values without breaking the systems that need WGS84.
  - Here is an example of the CAP Canadian Profile ([www.cap-cp.ca](http://www.cap-cp.ca)) approach that uses a point.

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```
<parameter>  
<valueName>layer:CAPAN:eventLocation:point</valueName>  
<value>60.52459336850855,-117.66350189992689</value>  
</parameter>
```

- o The CAP-AU could make a similar reference as follows:

```
<parameter>  
<valueName>layer:CAP-AU:GDA94polygon</valueName>  
<value>65.05568945905345,-122.5853768999256  
63.76525349370743,-115.99358002492735 60.61097108402268,-  
113.62053314992798 57.542073550110594,-114.58733002492772  
58.335165816909,-121.3549081499259 65.05568945905345,-  
122.5853768999256</value>  
</parameter>
```

**ORIGINAL QUESTION POSED BY GREG TROTT (CAP-AU Project Manager):**

The Normative Reference list in the OASIS CAPv1.2 standard includes the WGS84 as the datum source for geographic coordinates to be populated in CAP messages. The use of WGS84 is no longer appropriate for the Australian environment because the Geocentric Datum of Australia 1994 (GDA94) is now the approved geographical coordinate system used in Australia. The GDA is a part of the global coordinate reference frame and is directly compatible with the Global Navigation Satellite Systems (GNSS), which is the generic term used to describe the US Global Positioning System (GPS). Detailed information about GDA94 can be obtained from Geoscience Australia at: <http://www.ga.gov.au/earth-monitoring/geodesy/geodetic-datums/GDA.html>

The question we need your response to is: **How should the different geocentric datums be managed within the Australian CAP Profile document?**

Two options that might be appropriate methods to manage these different datums in the Australian CAP Profile are:

**Option 1** – insert GDA94 into the Normative Reference list in the CAP-AU Profile document to replace the existing WGS84 reference.

- If any situation arose where a non-Australian CAP message was received that provided geo location coordinates from a geo standard that is different to the GDA94 (eg using the WGS84 or some other standard) then the organisation in Australia who received the CAP message would not likely detect a problem with the coordinates caused by use of different datums, until they had to act on the coordinates and accurately find where the hazard was located (perhaps to focus a satellite on the problem area or direct a rescue / recovery team to the hazard location).

- A Note should be added to the AREA element to highlight there is a different datum system used in Australia and explain the potential for location errors not to be detected by recipients in Australia.

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**Option 2** - Retain WGS84 as a normative reference in the CAP-AU Profile, and add the GDA94 as an additional Normative Reference plus add a note into the AREA element to highlight there is a difference in Australia and explain what is actually used in Australia.