Memo

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RE: More information on "BIG DATA"

This memo is in response to an email received from Patrick Curry May 29, 2014, inviting additional information and/or case studies.

My original email response to the RFI was brief and contained a "big picture" perspective. This email duplicates some of that information but offers additional detail that may be helpful. The following is an overview. As appropriate, more detail is readily available for each item.

I. The impact of the digital revolution has been enormous. A change in perspective is warranted.
   A. Philosophical "Award Winning" paper on 3-D http://www.globalcogo.com/setepaper.pdf
   B. International Trade Magazine article http://www.globalcogo.com/Digital%20RevR.pdf
   C. Specific challenge with links to details - http://www.globalcogo.com/challenge.pdf

II. Proliferation of traditional reference systems is burdensome for the user community.
   A. Map projections are strictly 2-dimensional and inappropriate for 3-D computations.
      1. UTM
      2. State Plane
      3. Low Distortion Projections
   B. Local GPS users rely on "localization" to get the job done.
      1. Widely used and beneficial but "non-standard."
      2. Aggregating disparate projects (in a GIS) remains a challenge.
      3. Concepts of "relative" and "absolute" are fuzzy and contribute to confusion.

III. A review of existing and available spatial data models needs to bring practice forward.
   A. National Spatial Reference System (NSRS) is an integral part.
   B. Height Modernization is "good" but needs re-evaluation in light of "big picture."
      http://www.globalcogo.com/vertical.pdf
   C. Old datums (NAD27) are still used for:
      1. Maps of off-shore oil/gas exploration and production.
      2. Drilling/mining throughout the USA.
         www.globalcogo.com/ascemining.pdf
      3. Geographic reference systems such as the SE Wisconsin Regional Planning Commission.
         http://www.sewrpc.org/SEWRPCFiles/Publications/ppr/definition_three-dimensional_spatial_data_model_for_wi.pdf
      4. 2-D datums and elevation (1-D) need to be integrated into a consistent 3-D system.
         http://www.sewrpc.org/SEWRPCFiles/Publications/TechRep/tr-045_review_of_control_survey_program.pdf

D. Error propagation procedures are more efficient in an integrated 3-D system.
http://www.globalcogo.com/fsdagsdm.pdf

E. GPS PPP will replace relative baseline observations. A new model needs to accommodate.
http://www.profsurv.com/magazine/article.aspx?i=71132

IV. Dynamic applications rely on the efficiency (reliability) offered by using an integrated 3-D model.
   A. FAA – air traffic control
   B. Intelligent transportation – cars, trains, ships, and drones
   C. Remote sensing, photogrammetry, and LiDAR
   D. Reliable rapid determination of 3-D spatial data accuracy is critical and relies upon:
      1. Ability to determine current location within a "standard" 3-D environment.
      2. Comparison of observed position with location of features in the stored data base.

V. As stated in the March 28, 2014 response to the RFI, the global spatial data model (GSDM) accommodates 3-D digital spatial data, modern measurement systems, and demanding applications. Current research is focused on computation of network and local accuracies. The latest revelation is that spatial data accuracy (stochastic model processes) needs "standardization" in much the same way the RINEX format made it possible to compute reliable (functional model) positions using various brands of GPS processing software. A technical paper documenting this development is being prepared and will be published in the near future.

VI. The National Geodetic Survey (NGS) component of NOAA has many dedicated talented professionals capable of implementing the GSDM. From my perspective, the obstacle to doing that is related to funding, their proud tradition of past practice, and their reluctance to adopt the assumption of a single origin (earth's center of mass) for 3-D data. Eventually, that will happen.
http://www.globalcogo.com/gsdm-eos.pdf