New Mexico Geospatial Advisory Committee

715 Alta Vista Street Simms Building Santa Fe, NM 87505

NM DEPARTMENT OF INFORMATION TECHNOLOGY

AGENDA

9 November 2021

New Mexico Geospatial Advisory Committee

DATE: 9 November 2021	**DAY**: Tuesday **PLACE**: Virtual	**TIME:** 9:30 am to 12:00pm
INSTRUCTIONS: MS-Teams Meeting	**Phone**: 505.312.4308	**Conference ID**: 144 329 330#

Join the Meeting

NOTE: New link and phone number

Introductions/Announcements:

New Business:

- **None**

Current Business:

- **None**

Reports/News:

- GAC Sub-Committee Reports
  - Cadastral, Boundary, and Geodetic Control – *Larry Brotman*
  - Geospatial Data Planning and Acquisition – *Volunteers*
  - National Hydrography Dataset (NHD/NHD-Plus) – *Zack Stauber/Phil Polzer*
  - Geospatial Products and Related Services – *Lance Tyson*
  - GeoStrategic Planning –*Larry Brotman/Gar Clarke*
  - Transportation/Addressing – *Brian Keller/ John Di Ruggiero/Todd Howell*
  - Unmanned Aerial Vehicles/Sensors – *Linda DeLay/Su Zhang*
- NM Professional Groups
  - New Mexico Flood Plain Managers Association – *Shawn Penman/Shirley Baros*
  - New Mexico Geographic Information Council – *Sandeep Talasila*
  - New Mexico Professional Surveyors – *Mark Murrujo/Earl Burkholder*
  - New Mexico Intelligent Transportation Society - *John Di Ruggiero*
  - Industry News - *Group*
- National Professional Groups
  - National States Geographic Information Council (NSGIC) – *Leland Pierce*
    - *Address and Transportation Committee Report: Larry Brotman/Todd Howell*
    - *GeoPreparedness Committee Report: Shirley Baros/ Shawn Penman*
    - *NG911 Committee Report: Tyler Fossett*
    - *Tribal Activities: Gar Clarke*
  - National Geospatial Advisory Committee: *Gar Clarke*
- Local and Regional Agencies
- State Agencies and Education
- Federal and Tribal Agencies
- EDAC/RGIS Geospatial Data Clearinghouse Report – *Shawn Penman/Shirley Baros*
- Department of Information Technology (DoIT) –*Gar Clarke*

TECHNO HIGH (11:30 am-12:00 pm): ***Reviewing the Intersection of Abstraction, Technology, Policies, and Practices as Related to the Use of Spatial/Geospatial Data, Earl Burkholder, Global COGO Inc. –*** *Presented will be the simple truth that the world is flat given the behavior of the Plumb Bob. Discussed will be the differences between spatial and geospatial data; one being referenced to a curved earth. See the following link for an amazing amount of detail: www.globalcogo.com.*

NEXT MEETING:

DATE: 14 December 2021 DAY: Tuesday TIME: 9:30am to 12:00pm

PLACE: Virtual TECHNO HIGH: CompassCom Suite

ADDITIONAL INFORMATION: Gar Clarke,NM GAC Chair (george.clarke@state.nm.us)

GAC Website: http://www.gac.state.nm.us/

The New Mexico Geospatial Advisory Committee (GAC) guides the use and development of Geospatial Technologies within New Mexico by advising the State Department of Information Technology (DoIT) Cabinet Secretary and CIO. The committee meets monthly and includes representatives from state, federal, local, tribal, and professional interests. For a copy of our Charter and Strategic Plan, please access the following web page: http://www.gac.state.nm.us/

November 9, 2021, Meeting of
New Mexico Geospatial Advisory Committee
Mr. George (Gar) Clarke, Chairman
(Remote attendance by invitation)

Full Committee Meeting – 9:30 to 12 noon
TECHNO HIGH portion of Agenda -- 11:30 a.m. to 12 noon

TECHNO HIGH portion

Geospatial Data: Convergence of Abstraction/Technology/Policy/Practice

Presented by:
Earl F. Burkholder, PS, PE, F.ASCE – NMSU Emeritus Faculty
Global COGO, Inc. – Las Cruces, NM 88003
eburk@globalcogo.com
www.globalcogo.com

(Revised November 12, 2021)

New Mexico Geospatial Advisory Committee -- NMGAC
TECHNO HIGH Portion of Agenda – November 9, 2021
Earl F. Burkholder – Global COGO, Inc.

Presenter: Earl F. Burkholder, PS, PE, F.ASCE

- **Fellow and Life Member of ASCE.**
- **Retired from NMSU Surveying Engineering faculty - July '10.**
- **Wrote "The 3-D Global Spatial Data Model (GSDM)" - 2008.**
- **Second Edition – published in 2017.**

Aspiration:

That spatial data users share common experiences (can use the same model) when working with 3-D digital spatial data.

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Spatial/Geospatial Data:

- **Defines geometrical location of points, lines, surfaces, volumes.**
- **Two-dimensional: x/y, e/n – plane Euclidean geometry.**
- **Three-dimensional: x/y/z, e/n/u – solid geometry.**

Geospatial data are those referenced to the Earth:

- **Latitude/longitude/elevation – 3D mixed units, sexagesimal and length.**
- **State plane (or UTM) coordinates and elevation – 3D, but separate origins.**
- **Geocentric Earth-center Earth-fixed (ECEF) – single origin for 3D data.**

Geodesy equations are more complex than using plane geometry.

- **Map projections are used to "flatten the Earth."**
- **Spatial data users have long history of using separate origin for elevation.**

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Would it not be simpler if the world were flat? It is and here is proof!

1. **No matter where you go, a plumb bob always points "down."**
2. **Under equilibrium, a water surface is always perpendicular to plumb line.**
3. **Therefore, the world is "flat!"**

How can that assertion be disproved?

1. **I was taught that the world is round.**
   (Although true, not a valid rebuttal!)
2. **Need physical (believable) evidence.**
   a. **First see top of mast of distant ship.**
   b. **Shadow of Earth on moon.**
   c. **Pictures of Earth from space.**

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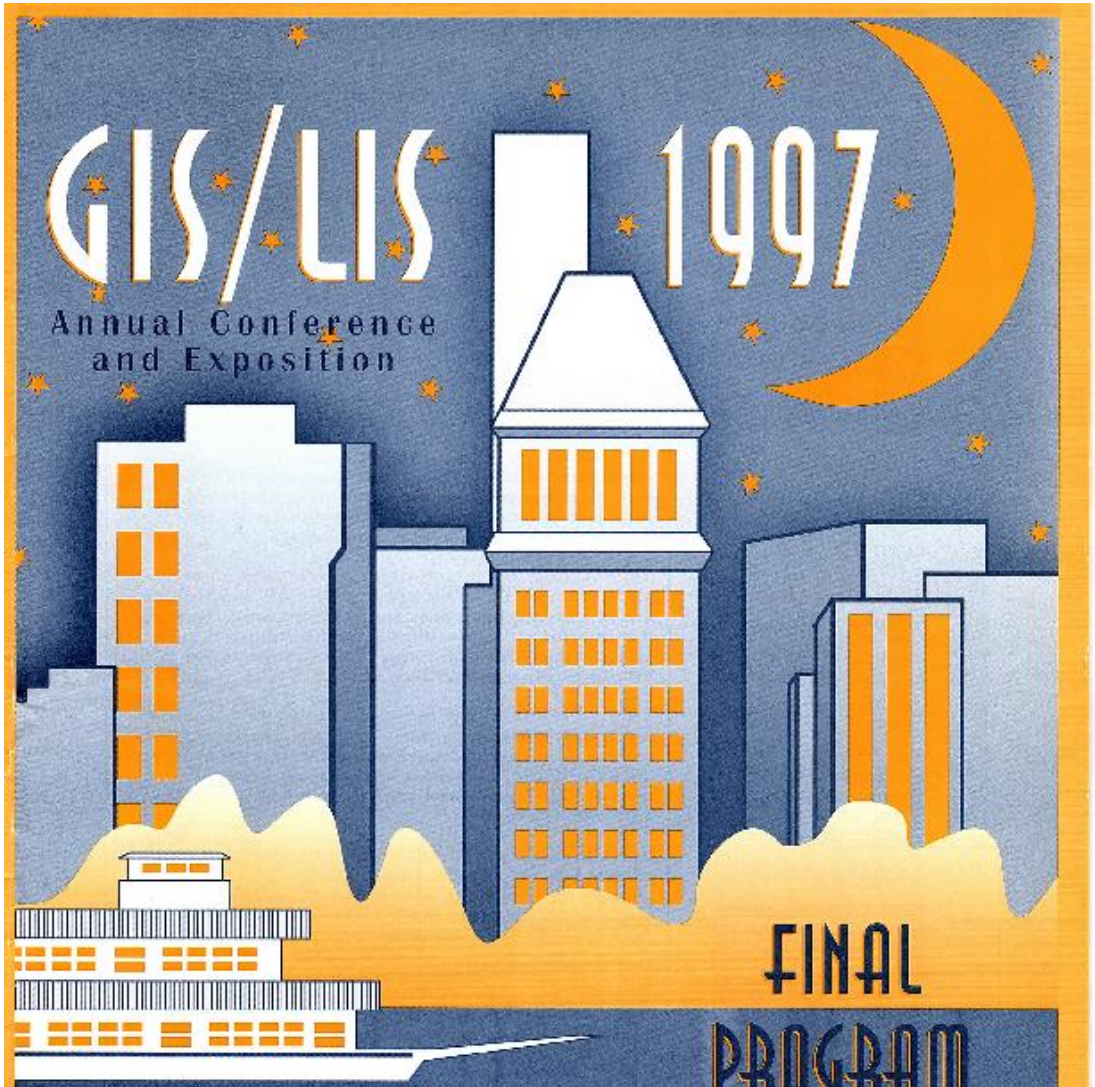
Issues and challenges:

- **Modernization of NSRS, see www.globalcogo.com/poster.pdf.**
  1. **Poster identifies current use of separate origins.**
  2. **Poster promotes use of a 3-D model for 3-D data.**
  3. **3-D challenge is not new – the AGU meeting was in 2016.**
  4. **GSDM accommodates spatial data accuracy (HUGE impact).**
  5. **Second Edition of 3-D book published in 2017:**
     - **Contains documentation of successful 3-D projects.**
     - **Appendix on spatial data accuracy is "forward looking."**

- **The 3-D Global Spatial Data Model (GSDM):**
  1. **Defined in 1997, see www.globalcogo.com/gsdmdefn.pdf.**
  2. **Discussed at 1997 GIS/LIS conference, considered by ESRI.**
  3. **Yet to be embraced by "the system."**


GIS/LIS 1997
Annual Conference
and Exposition
FINAL
PROGRAM
Cincinnati Convention Center
Cincinnati, Ohio
October 28-30, 1997
Pre-Conference Workshops:
October 26-27, 1997
Sponsored by:
URISA
AM/FM

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Description of a Simple, Three-Dimensional Global Spatial Data Model (GSDM)

Earl F. Burkholder, PS, PE
Global COGO, Inc.
Circleville, Ohio 43113
eburk@delphi.com (614) 477-6261

GIS/LIS 1997 Annual Conference & Exposition
Cincinnati Convention Center, Cincinnati, Ohio, October 28-30, 1997

Biographical Sketch

Earl F. Burkholder, formerly Professor of Surveying at Oregon's Institute of Technology, is principle owner of Global COGO, Inc, a firm which promotes use of a three-dimensional (3-D) model for handling spatial data. A graduate of the University of Michigan (BSCE '73) and Purdue University (MSCE '80), he has been registered as a Land Surveyor in 7 different states including Ohio. A member of ACSM, ASCE and other professional organizations, he has authored numerous papers on 3-D coordinate geometry and is a former Editor of the ASCE Journal of Surveying Engineering. He is currently an ACSM representative to the Related Accreditation Commission of the Accreditation Board of Engineering & Technology (RAC/ABET).

Abstract

Spatial data are three-dimensional (3-D). Modern measurement systems collect data in a 3-D spatial environment. Some data are used as one-dimensional (elevations and linear referencing), some are used as two-dimensional (maps, and construction drawings) and some are used as three-dimensional (digital terrain models and other data visualization applications). A 1-D data base will not support 2-D or 3-D applications. Neither will a 2-D data base support 3-D applications. A 3-D data base will support all three. This article describes a simple 3-dimensional spatial data model which is equally applicable world-wide (although with less convenience in the polar regions due to meridian convergence). Having both functional and stochastic components, it is also intended to be compatible with the 3-D Geodetic Model described by Leick (1995) and the coordinate systems discussed by Soler and Hothem (1988). This paper is an extension of the local coordinate system concept presented previously by the author (Burkholder, 1995) and very similar to another paper scheduled for September 1997 publication in England in the GIS/GPS Supplement of The Civil Engineering Surveyor.

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Modernization of National Spatial Reference System (NSRS):

- Ambitious project to replace NAD 83 and NAVD 88 datums.
- COVID-19 (& other factors) delay planned 2022 completion date.
- Science and technology coming together in impressive manner.
- NGS (and other) professionals deserve kudos for work being done!

Except current plans (Blueprints) promote two "obsolete" applications:

- If geodetic height is used for elevation, geoid modeling is not needed.
- Map projections are 2-D. Low-distortion projections serve "small" areas.
- Need for geoid modeling & low-distortion projections obviated by GSDM.

Should current NSRS modernization plans should be carried to fruition?

- Existing investments justify continued use of previous models.
- When/how will society benefit from using a 3-D model for 3-D data?

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Convergence of abstraction/technology/policy/practice:

- **Practice – spatial data users depend/rely on equipment and software.**
- **Policy – professional leaders debate policy and allocate resources.**
- **Technology – waits for no one and is implemented at the cutting edge.**
- **Abstraction – Looks at philosophical impact of choices made by society.**

Increasing levels of abstraction as applied to geospatial data:

- **Surveying/engineering/geodesy/cartography of long service to society.**
- **GIS/LIS "invaded" spatial data arena over 30 years ago.**
- **Management of data processing & workflow optimization now thrive.**
- **Artificial intelligence & machine learning (AI/ML) will drive true 3-D.**

Cut to the chase – the "need" for using a 3-D model for 3-D geospatial data increases dramatically as society places more reliance on automation.

www.globalcogo.com/SamePageGeometry.pdf

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Resources:

- High level discussions need to consider "role of a model."

  www.globalcogo.com/role.html

- Learn from Thomas Kuhn's 1996 book:

  The Structure of Scientific Revolutions – University of Chicago Press

- Reconciling Gravity and the Geometry of 3-D Digital Geospatial Data

  www.globalcogo.com/ImpactOfGravity.pdf

  (Removes geoid modeling from most end-user applications.)

- By Comparison – the GSDM is "Simple"

  www.globalcogo.com/simple.pdf

  (Shows benefits of using the GSDM rather than LDPs.)

- The Power of Where: A Geospatial Knowledge Infrastructure to Enhance the World Economy, Society, and Environment

- www.globalcogo.com/GKI-White-Paper.pdf

  UN publication calling geospatial data the 4th Industrial Revolution.