Problem

- Old CRS WKT1 standard (ISO 19125-1:2004) inconsistent
- The text representation WKT1 is also inconsistent
- Different vendors implement it in different ways
- This leads to incompatibilities in data exchange

Solution

- New CRS2 standard (based upon ISO 19111:2007 and ISO 19111:2009)
- Text representation is called WKT2
- Official name is "Geographic information - Well-known text representation of coordinate reference systems" (OGC 12-063r5 and ISO 19162:2015)
- Updated version of original standard
- Defines both structure and content
  - Names are from the EPSG Geodetic Parameter Registry
- Does NOT specify any implementation
- New standard goes into effect January 1, 2018

Backward Compatibility

- WKT2 implementation must be able to read WKT1 strings

- WKT1 implementations are NOT required to be able to write out WKT1 strings

- Does NOT require old parsers of WKT1 strings to be able to read WKT2 strings

Differences between CRS1 and CRS2

- Additional CRS types are defined
  - Geodetic (geocentric Cartesian) CRS
  - Geodetic (geographic 2D) CRS
  - Geodetic (geographic 3D) CRS
  - Engineering CRS
  - Temporal CRS
  - Parametric CRS
  - Image CRS
  - Compound CRS
- Internal structures changed

Differences between CRS1 and CRS2 (continued)

- Additional metadata attributes added
  - Area
  - Bounding box
  - Scope
  - Remarks
- Units added to some attributes
  - Ellipsoid
  - Parameter
- PARAMETERFILE attribute added

Differences between WKT1 and WKT2

- Many keywords changed
  - All top-level keywords changed to differentiate between WKT1 and WKT2 strings:
    - GEOGCS   →   GEODCRS   or   GEODETICCRS
    - PROJCS   →   PROJCRS   or   PROJECTEDCRS
    - VERTCS   →   VERTCRS   or   VERTICALCRS
  - UNIT keyword deprecated in favor of specific unit types:
    - ANGLEUNIT
    - LENGTHUNIT
    - SCALEUNIT
  - Prime Meridian optional if 0 (Greenwich)

Differences between WKT1 and WKT2 (continued)

- Parameters now contained within a CONVERSION block in PROJCRS

- Coordinate system (CS) attribute added

- AUTHORITY changed to ID and multiple IDs may be specified

- COORDINATEOPERATION object added
  - Supersedes Esri objects GEOGTRAN and VERTTRAN

- PROJECTION keyword deprecated in favor of METHOD

Sample WKT1 projected CRS

```
PROJCS["WGS 84 / Pseudo-Mercator",
 GEOGCS["WGS 84",
  DATUM["World Geodetic System 1984",
   SPHEROID["WGS 84", 6378137.0, 298.257223563]],
  PRIMEM["Greenwich", 0.0],
  UNIT["Degree", 0.0174532925199433]],
 PROJECTION["Popular Visualization Pseudo Mercator"],
 PARAMETER["False easting", 0.0],
 PARAMETER["False northing", 0.0],
 PARAMETER["Longitude of natural origin", 0.0],
 PARAMETER["Latitude of natural origin", 0.0],
 UNIT["meter", 1.0]]
```

Sample WKT2 projected CRS

```
PROJCRS["WGS 84 / Pseudo-Mercator",
  BASEGEODCRS["WGS 84",
    DATUM["World Geodetic System 1984",
      ELLIPSOID["WGS 84", 6378137.0, 298.257223563, LENGTHUNIT["meter", 1.0]]],
    ANGLEUNIT["Degree", 0.0174532925199433]],
  CONVERSION["Popular Visualization Pseudo-Mercator",
    METHOD["Popular Visualization Pseudo Mercator"],
    PARAMETER["Latitude of natural origin", 0.0, ANGLEUNIT["degree", 0.01745329252]],
    PARAMETER["Longitude of natural origin", 0.0, ANGLEUNIT["degree", 0.01745329252]],
    PARAMETER["False easting", 0.0, LENGTHUNIT["meter", 1.0]],
    PARAMETER["False northing", 0.0, LENGTHUNIT["meter", 1.0]]],
  CS[cartesian, 2],
    AXIS["easting (X)", east, ORDER[1]],
    AXIS["northing (Y)", north, ORDER[2]],
    LENGTHUNIT["meter", 1.0],
  ID["EPSG", 3857]]
```

Sample WKT1 coordinate operation

```
GEOGTRAN["NAD_1927_To_WGS_1984_85",
  GEOGCS["GCS_North_American_1927",
    DATUM["D_North_American_1927",
      SPHEROID["Clarke_1866",6378206.4,294.9786982]],
    PRIMEM["Greenwich",0.0],
    UNIT["Degree",0.0174532925199433]],
GEOGCS["GCS_WGS_1984",
    DATUM["D_WGS_1984",
      SPHEROID["WGS_1984",6378137.0,298.257223563]],
    PRIMEM["Greenwich",0.0],
    UNIT["Degree",0.0174532925199433]],
METHOD["NADCON"],
PARAMETER["Dataset_alaska",0.0]]
```

Sample WKT2 coordinate operation

```
COORDINATEOPERATION["NAD27 to WGS 84 (85)",
   SOURCECRS[ GEODCRS["NAD27",
     DATUM["North American Datum 1927",
       ELLIPSOID["Clarke 1866",6378206.4,294.9786982,LENGTHUNIT["metre",1.0]]],
   CS[ellipsoidal,2],
     AXIS["latitude",north,ORDER[1]],
     AXIS["longitude",east,ORDER[2]], ANGLEUNIT["degree",0.01745329252],
     ID["EPSG",4267]]],
   TARGETCRS[ GEODCRS["WGS 84",
     DATUM["World Geodetic System 1984",
       ELLIPSOID["WGS 84",6378137,298.257223563,LENGTHUNIT["metre",1.0]]],
   CS[ellipsoidal,2],
     AXIS["latitude",north,ORDER[1]],
     AXIS["longitude",east,ORDER[2]], ANGLEUNIT["degree",0.01745329252],
   ID["EPSG",4326]]],
  METHOD["NADCON",ID["EPSG",9613]],
  PARAMETERFILE["Latitude difference file","alaska.las"],
  PARAMETERFILE["Longitude difference file","alaska.los"],
  ID["EPSG",15864]]
```

Esri implementation of WKT2

- WKT2 support added in ArcGIS Desktop 10.5.1 and ArcGIS Pro 2.0
  - GeoPackages only

- Require ANGLEUNIT attribute in BASEGEODCRS
  - The official WKT2 spec omits this

- Only one ID attribute supported

- AXIS attributes not yet supported

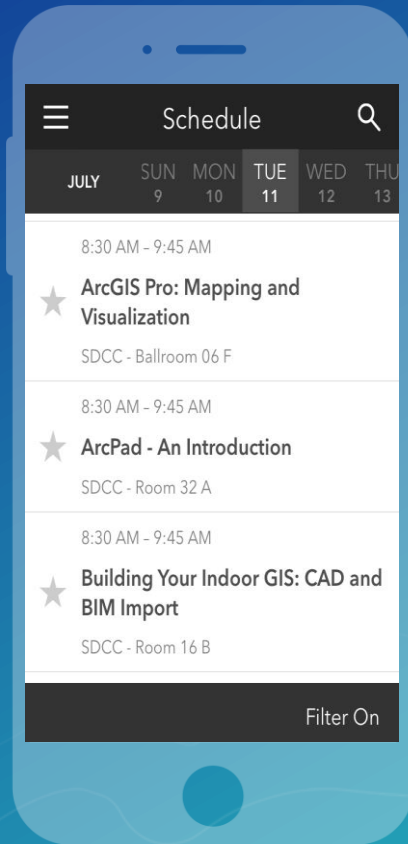- CONVERSION and METHOD attributes in PROJCRS identical

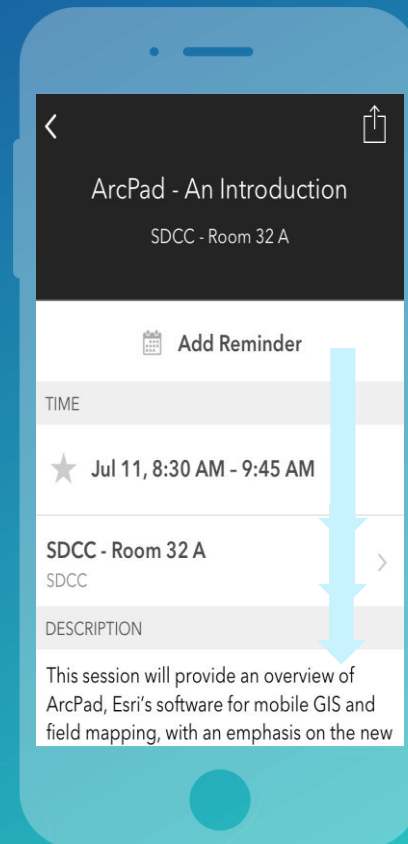# Please Take Our Survey on the **Esri Events App!**
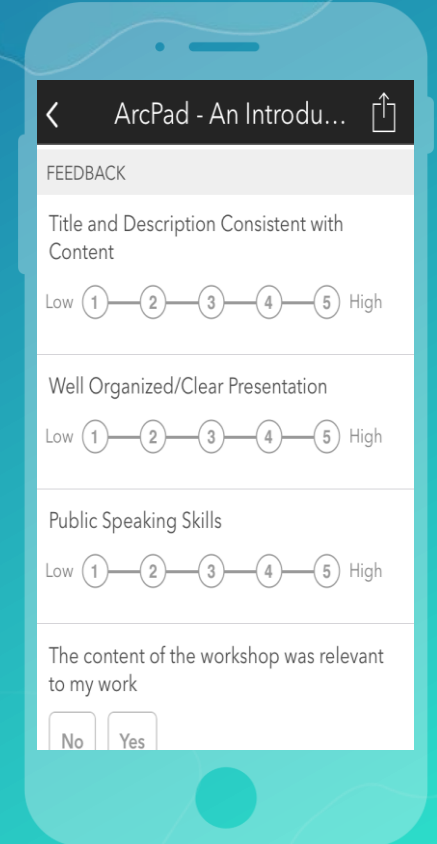
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Scroll down to find the survey

Complete Answers and Select "Submit"

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