

Developing a Comprehensive Address Data Standard for the United States

U.S. Address Standard Working Group:

Carl Anderson, Fulton County, Georgia

Hilary Perkins, GISP, Data Transfer Solutions, Inc.

Ed Wells, GISP, Washington (DC) Metro Area Transit Authority

Martha McCart Wells, GISP, Spatial Focus Inc.

Sara Yurman, Spatial Focus, Inc.

Eleventh Annual Washington GIS Conference

February, 2008

Need for a Standard

- Addresses are primarily created and maintained locally.
- Address data is often poorly understood, badly recorded, and not well documented.
- The Standards Development process focused on developing a comprehensive view of addresses that responds to needs for organization, quality, documentation, and exchange of information.
 - Broad participation provided information about differing address practices throughout the U.S.
 - Testing of the standard in real situations insured its usefulness and viability.

Authority

- In April 2005, the Federal Geographic Data Committee (FGDC) approved URISA's proposal to create a street address data standard
- The standard is being prepared under the auspices of the FGDC Subcommittee on Cultural and Demographic Data, chaired by the Census Bureau
- If the standard is adopted, the Census Bureau will be the maintenance authority

Sponsoring Organizations

- **URISA** – Submitting organization
- **NENA** – Supporting organization
- **U.S. Census Bureau** – Sponsoring organization, on-going maintenance



Other Organizations Represented

- Local, regional, and state government
- 911/Emergency management associations
- US Postal Service
- Federal agencies
- GIS software vendors and consultants
- Universities
- Other standards organizations

Organizing Principles

- Definition of an address:
 - "An address specifies a location by reference to a thoroughfare, or a landmark; or it specifies a point of postal delivery."
- Syntactical approach to address classification.
 - The standard classifies addresses according to their address elements and the order in which the elements are arranged.
- Address assignment and daily usage are local in nature.
 - Addresses are based on local schemes for naming and numbering.
 - There is information about the address that is vital to its many uses.
- The quality of address data must be measured and recorded.
- Address data must be able to be seamlessly exchanged between different users.
- All of these must be incorporated into a comprehensive address data standard.

Goals

- Create a street address content and classification standard that provides the foundation for data exchange and data quality standards
 - Provide a statement of best practices for street address data content and classification
 - Define tests of street address data quality
 - Facilitate exchange of address information
 - Offer a migration path from legacy formats to standards-compliant ones
 - Provide for different levels of standardization
 - Build on previous FGDC address standard efforts

Taxonomy of U.S. Address Classes

Thoroughfare Address Classes

- Numbered Thoroughfare Address: 123 Main Street
- Intersection Address: Fifth Avenue and Main Street
- Two-Number Address Range: 405-411 West Green Street
- Four-Number Address Range: 900-962, 901-963 Milton Street
- Unnumbered Thoroughfare Address: Forest Service Road 698

Landmark Address Classes

- Landmark Address: Statue of Liberty
- Community Address: 123 Urbanizacion Los Olmos

Postal Delivery Address Classes

- USPS Postal Delivery Box: PO Box 16953
- USPS Postal Delivery Route: RR 1, Box 100
- USPS General Delivery Office: General Delivery

Address Elements

- **Address numbers**
- **Street names**
- **Occupancies**
- **Landmark names**
- **Larger areas** (place names, states, postal codes, and country names)
- **USPS postal address elements**
- **USPS address lines**
- **Address Scheme Elements** (grid, axis, numbering rules)

Street Name Elements

- Pre-modifier: **Old** North B Street
- Pre-directional: **North** Main Street
- Pre-type: **Avenue** A
- Name: **Main** Street
- Post-type: Main **Street**
- Post-directional: Main Street **North**
- Post-modifier: B Street **Extended**

- *Complete Street Name:* **North Main Street**

Larger Area Elements: Place Name

Place Name Elements:

- Place Name: **Ajo, AZ**
Pima County, AZ
- *Complete Place Name:* ***Ajo, Pima County, AZ***

Place Name Attributes:

- Place Name Type: **Community, Municipal, Post Office, County, Region**
- GNIS Feature ID
- Element Sequence Number

Address Attributes

Purpose: documentation, mapping and quality control

Key attributes include:

- **Address identifier**
- **The address authority, dataset, and start and end dates**
- **Geographic coordinates and linear referencing**
- **Lifecycle and official status**
- **Class**
- **Feature type**
- **Attributes for quality control** (parity, sequence, relationships, etc.)

Data Quality

- Address schemes
 - The local geographic framework and business rules for address assignment.
 - Basis for testing the validity of an address
- Data quality
 - A complete suite of data quality tests.
 - Tests of data relative to business rules
 - Tests of address location relative to geographic scheme and known features

Quality Measures by Report

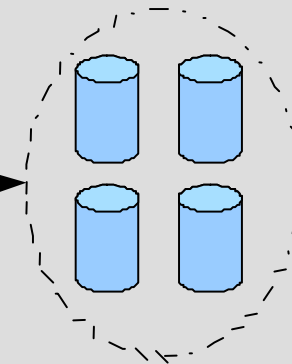
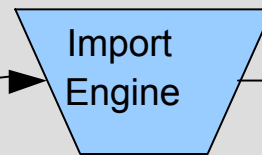
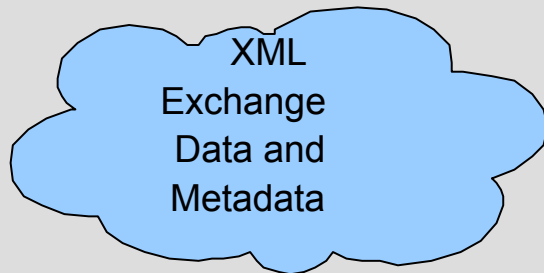
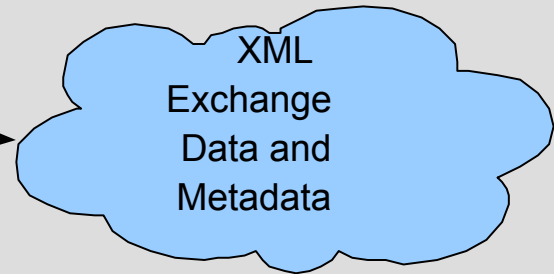
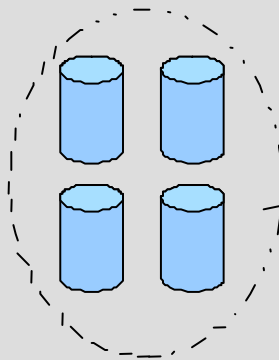
Measure	Attribute (Thematic) Accuracy	Completeness	Lineage	Logical Consistency	Positional Accuracy	Temporal Accuracy
Address Axes Address Number Range Measure				•		
Address Completeness Measure		•				
Address Lifecycle Status Date Consistency Measure				•		•
Address Number Parity Measure				•		
Address Number Range Completeness Measure				•		
Address Number Range Parity Consistency Measure				•		
Address Number Range Sequence Measure				•		
Address Origin Address Number Range Measure				•		
Address Scheme Axes Intersection Measure				•		
Check Attached Pairs Measure				•		
Check Side Measure	•					
Complete Street Name Tabular Domain Measure	•					
Complex Element Sequence Number Measure	•					
Data Type Measure				•		
Delivery Address Type Occupancy Measure				•		
Future Date Measure						•
Intersection Validity Measure				•		
Left Right Odd Even Parity Measure				•		
Location Description Field Check Measure			•		•	
Low High Address Sequence Measure				•		
Occupancy Component Order Measure	•					
Occupancy Element Z Level Measure	•					
Official Status Address Authority Consistency Measure				•		
Overlapping Ranges Measure				•		
Pattern Sequence Measure				•		
Range Domain Measure	•					
Related Not Null Measure				•		
Repeated Element Uniqueness Measure	•					
Situs Address Location Along Address Number Range Measure				•		
Spatial Domain Measure					•	
Start End Date Order Measure						•
Tabular Domain Measure	•					
Uniqueness Measure	•					
USNG Coordinate Spatial Measure					•	
XY Coordinate Completeness Measure				•		
XY Coordinate Spatial Measure					•	

Data Exchange

- Requires open, standardized format:
 - XML Schema Document (XSD) and XML.
 - Protects data producers and consumers
 - Allows localizations, but provides standard form for exchange.
- A data model, but not a database model.
 - Organizational database requirements and relationships vary considerably.

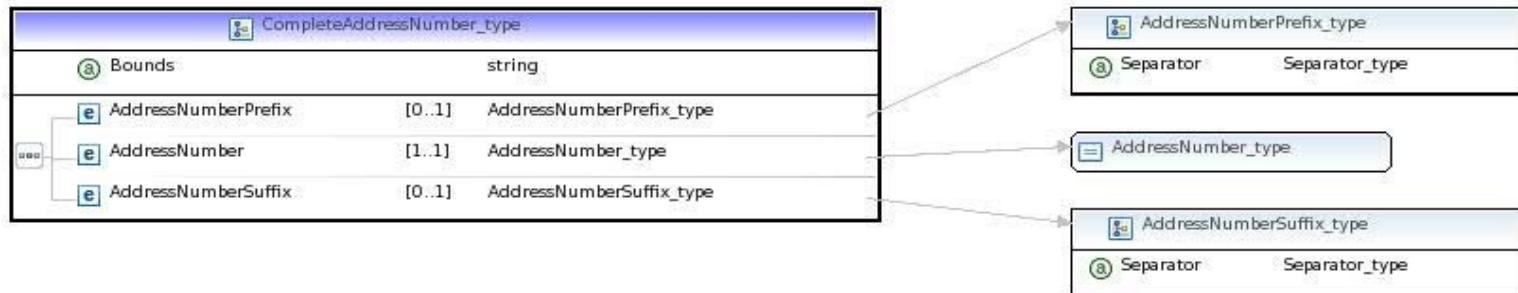
Exchange Process

Local Dataset

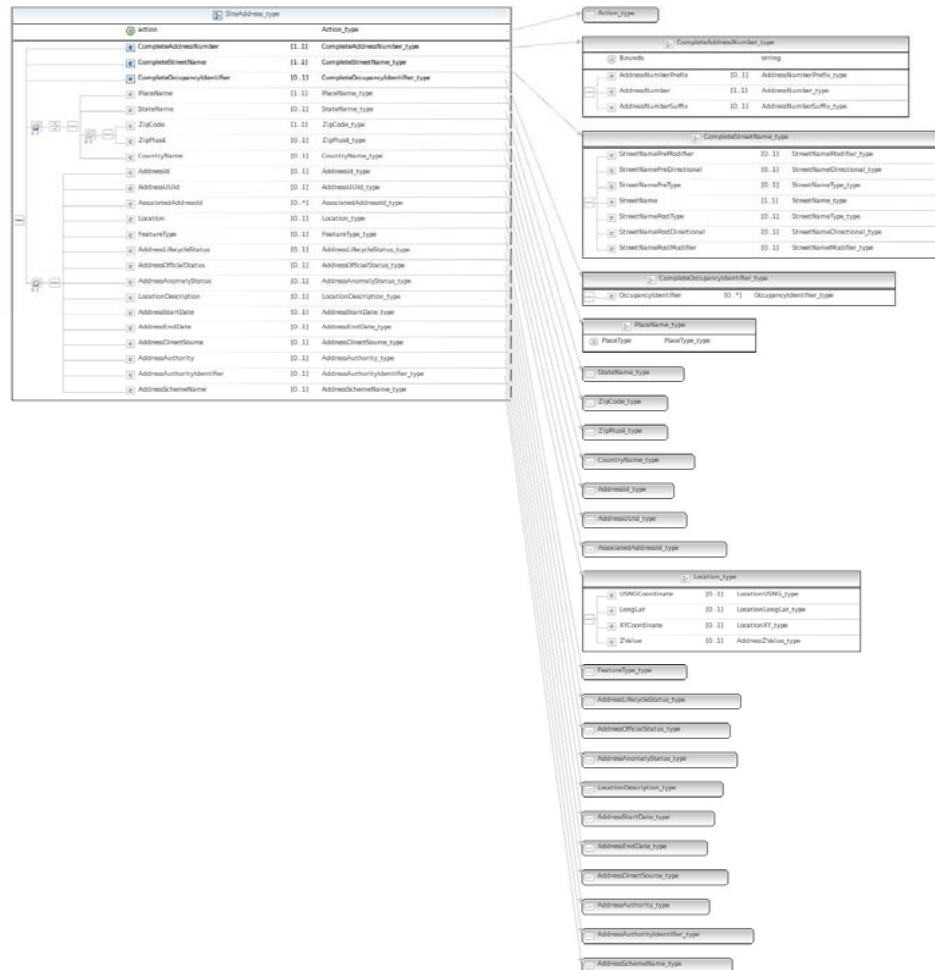


Destination Dataset

XSD Detail – Complete Address Number



Site Address XML Schema



XML Model

```
<xsd:complexType name="CommunityAddress_type">
  <xsd:sequence>
    <xsd:element name="CompleteAddressNumber" type="addr:CompleteAddressNumber_type" minOccurs="1"
      maxOccurs="1" />
    <xsd:element name="CommunityPlaceName" type="addr:CommunityPlaceName_type" minOccurs="1"
      maxOccurs="1" />
    <xsd:element name="CompleteOccupancyIdentifier" type="addr:CompleteOccupancyIdentifier_type"
      minOccurs="0" maxOccurs="1" />
    <xsd:element name="PlaceName" type="addr:PlaceName_type" minOccurs="1" maxOccurs="1" />
    <xsd:element name="StateName" type="addr:StateName_type" minOccurs="1" maxOccurs="1" />
    <xsd:element name="ZipCode" type="addr:ZipCode_type" minOccurs="0" maxOccurs="1" />
    <xsd:element name="ZipPlus4" type="addr:ZipPlus4_type" minOccurs="0" maxOccurs="1" />
    <xsd:element name="CountryName" type="addr:CountryName_type" minOccurs="0" maxOccurs="1" />
    <xsd:group ref="addr:AddressAttributes_type" minOccurs="0" maxOccurs="1" />
  </xsd:sequence>
  <xsd:attribute name="action" type="addr:Action_type" use="optional" />
</xsd:complexType>
```

XML Example

```
<addr:AddressCollection version="0.3"
xmlns:addr="http://wfs.co.fulton.ga.us/urisa/addr_std/0.3"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://wfs.co.fulton.ga.us
  <CommunityAddress>
    <CompleteAddressNumber>
      <AddressNumber>23</AddressNumber>
      <AddressNumberSuffix Separator="">B</AddressNumberSuffix>
    </CompleteAddressNumber>
    <CommunityPlaceName>Edgewater Park</CommunityPlaceName>
    <PlaceName PlaceType="USPSCommunity">Bronx</PlaceName>
    <StateName>NY</StateName>
    <ZipCode>10465</ZipCode>
  </CommunityAddress>
</addr:AddressCollection>
```

Standard Development Process

- Sought broad awareness and participation
 - Wiki collaborative website
 - Teleconferences
- Posted drafts for public comment via web form
- Focused on practical needs and usefulness
 - Local emphasis: Where addresses are created and used the most
 - Quality is integral to address use, must be built in to process
- Included both tabular and geospatial data

Findings

- Addresses are primarily created and maintained locally.
- Address data is often poorly understood, badly recorded, and not well documented.
- The Standards Development process focused on developing a comprehensive view of addresses that responds to needs for organization, quality, documentation, and exchange of information.
 - Broad participation provided information about differing address practices throughout the U.S.
 - Testing of the standard in real situations insured its usefulness and viability.

Conclusions

- The standard is intended to support the full range of address data needs, at all levels of government and in the private sector.
- The principles and syntactical approach used here may also be applied in other countries.
- If applied, we expect to find that:
 - Address elements vary little from country to country.
 - Syntaxes vary more.
- Development of an international address standard, using a syntactical approach, and universal elements, appears to be possible.

Next Steps

1. Complete final draft
2. Review by FGDC Standards Working Group
3. (If approved) Full public review
4. Comment adjudication
5. Review by FGDC Standards Working Group
6. (If approved) Review by FGDC Coordinating Committee
7. (If approved) Review by FGDC Steering Committee
8. (If approved) Final adoption