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Unique Building Identifier

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U.S. DEPARTMENT OF ENERGY BATTELLE

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Unique Building Identifier (UBID)

- Free, open-source software tool
- Generate and assign unique record numbers—referred to as UBIDs—to 2-D footprints on a map occupied by any object for which data is tracked
- Assigning UBIDs allows object-specific data to be cross-referenced and clearly matched across datasets and tracking systems

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Benefits for Cities and Local Governments

- Clear, consistent spatial identification
- Integrated with common platforms
- UBIDs are inter-compatible
- UBIDs help unlock powerful data insights
- UBID is free and decentralized

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Uses of UBIDs

- For cities and local governments, UBIDs can be:
  - Stored in databases
  - Published in open-access datasets
  - Included in publications such as covered buildings lists
  - Included in documentation such as invoices or energy benchmarking documents
  - Used as a “Standard ID” in ENERGY STAR® Portfolio Manager

https://www.pexels.com/photo/aerial-view-and-grayscale-photography-of-high-rise-buildings-1105766/

What can be assigned UBIDs?

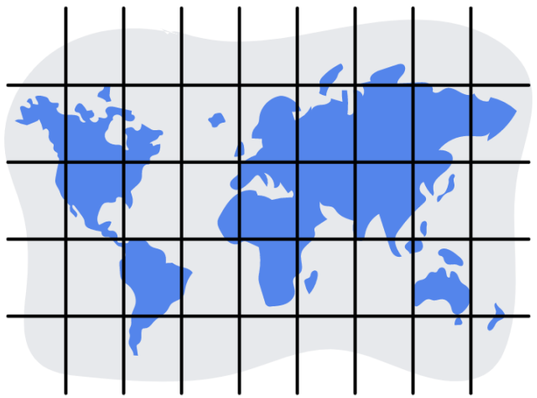
- For cities and local governments, UBIDs may be used to identify:
  - Buildings
  - Individual units in multi-tenant buildings
  - Land parcels
  - Tax lots
  - Municipal boundaries
  - Civic infrastructure
  - Parking spaces
  - Vehicles

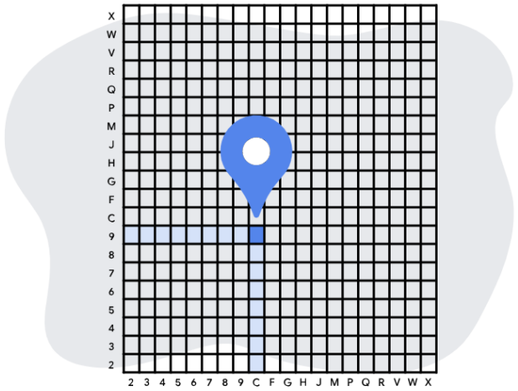
Source: https://buildingfootprintusa.com/usa-latest-release/

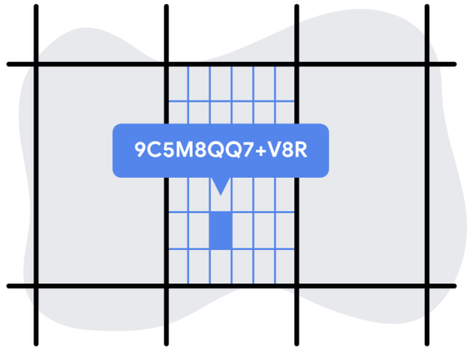
- Each of these examples has a 2-D footprint that can be specifically identified as belonging to that object

UBID Encoding Algorithm

- Input:
  - 2-D footprint
- Output:
  - UBID string



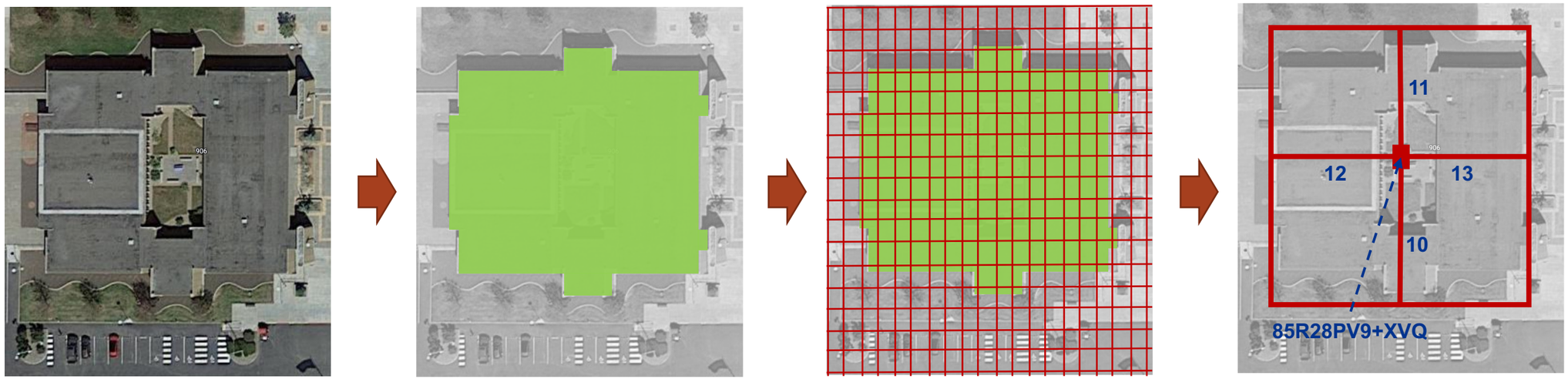




https://maps.google.com/pluscodes/

- Algorithm:
  1. Overlay 2-D footprint on Plus Code grid
  2. Find grid cell for center of mass of 2-D footprint
  3. Find grid cells for SW and NE corners of bounding box of 2-D footprint
  4. Count number of grid cells from center of mass to N/E/S/W edges of bounding box
  5. Write UBID string: “C-N-E-S-W”

UBID Encoding Algorithm (cont.)



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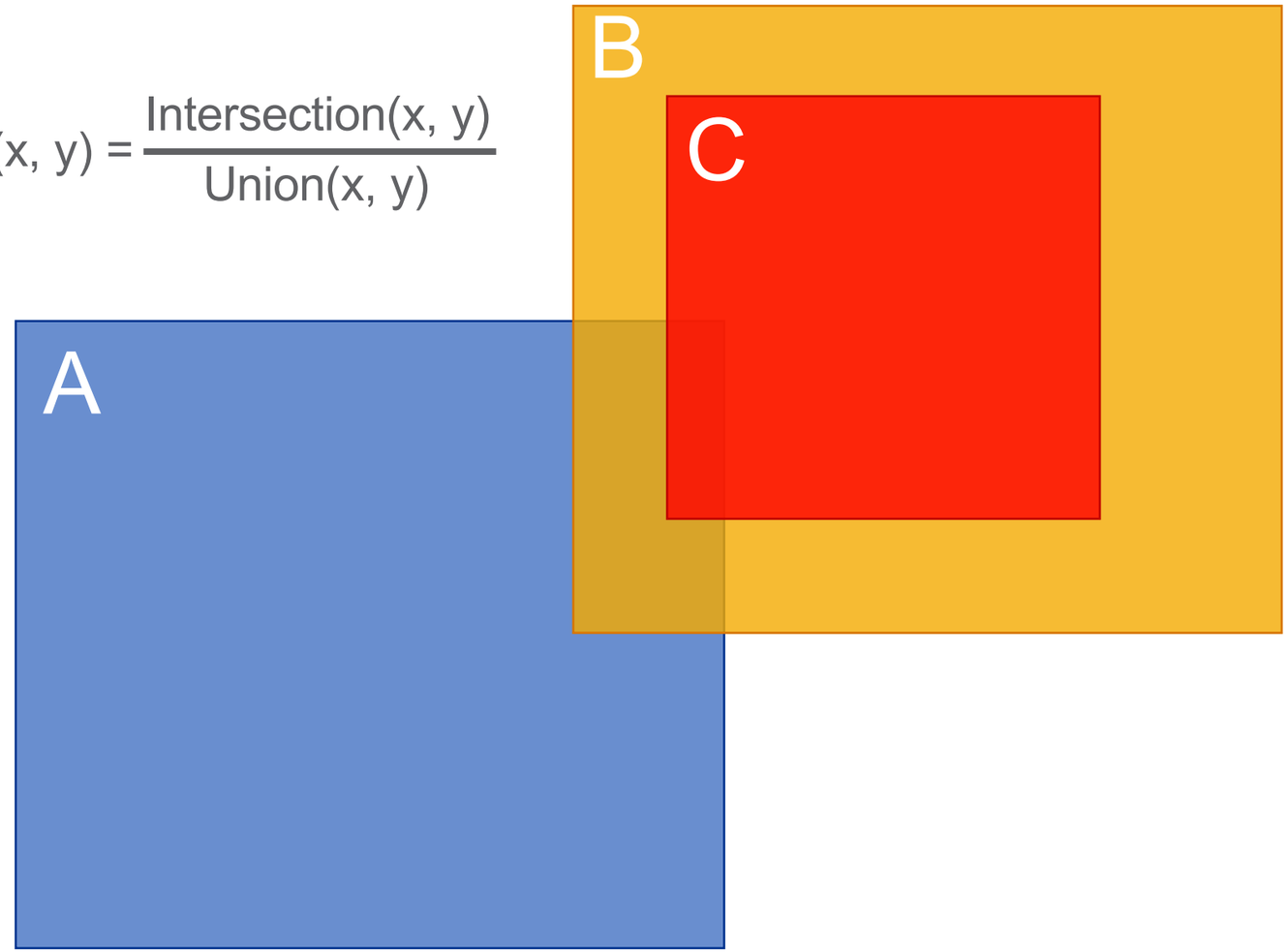
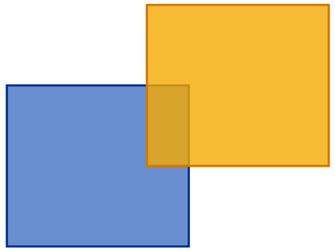
85R28PV9+XVQ-11-13-10-12

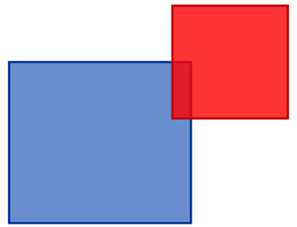
UBID Cross-reference (Jaccard Similarity)

$$\text{Score}(x, y) = \frac{\text{Intersection}(x, y)}{\text{Union}(x, y)}$$

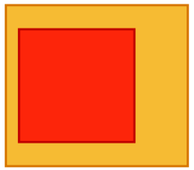




Score(A, B) = “Low”



Score(A, C) = “Low”



Score(B, C) = “High”

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UBID/NPN Collaboration

- Acknowledgements:
  - Dennis Klein
  - Chuck Benton

UBID/NPN Collaboration (cont.)

- Assigned UBIDs to buildings and land parcels in Manhattan
  - ~44,000 buildings
- Cross-referenced UBIDs for buildings and land parcels
  - 84% success rate using Jaccard similarity
- Related UBIDs to NPNs
  - Buildings with more than one owner have more than one NPN

UBID

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87G7PX3Q+8H3-2-2-2-2,87G7PX3Q+8H3:00001
87G7PX3Q+8H9-3-2-3-2,87G7PX3Q+8H9:00001
87G7PX3Q+95J-3-10-5-10,87G7PX3Q+94Q:00001
87G7PX3Q+9F3-3-4-5-4,87G7PX3Q+9F2:00001
87G7PX3Q+9G8-3-2-4-3,87G7PX3Q+9G4:00001
87G7PX3Q+9HF-3-2-3-3,87G7PX3Q+9HF:00001
87G7PX3Q+9J3-6-3-6-3,"87G7PX3Q+9J3:00001,87G7PX3Q+9J3:00002"
87G7PX3Q+9MG-6-6-7-5,"87G7PX3Q+9MH:00002,87G7PX3Q+9MH:00001,87G7PX3Q+9MH:00003"
87G7PX3Q+J6X-1-6-1-5,87G7PX3Q+J7R:00001
87G7PX3Q+JR6-5-4-5-3,87G7PX3Q+JR6:00001
87G7PX3Q+JRP-5-4-5-3,87G7PX3Q+JRP:00001
87G7PX3Q+M3X-5-3-6-3,87G7PX3Q+M4J:00001
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87G7PX3Q+P7C-8-6-8-6,87G7PX3Q+P7C:00001
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Getting Started with UBID

- For cities and local governments with software development capability in-house:
  - Access the open-source UBID software at https://github.com/pnnl/buildingid
- Agencies without a software development capability in-house:
  - Use web-based interface developed by PNNL
  - Contact BuildingID@pnnl.gov for any assistance needs
- Read more about UBID on the DOE Better Buildings website: https://bit.ly/3YasedO

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Thank you