

# Exploring Geopolitical Realities through Taxonomies: The Case of Taiwan

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<https://github.com/EulerProject/NASKO19>

NASKO 2019, Philadelphia, Pennsylvania



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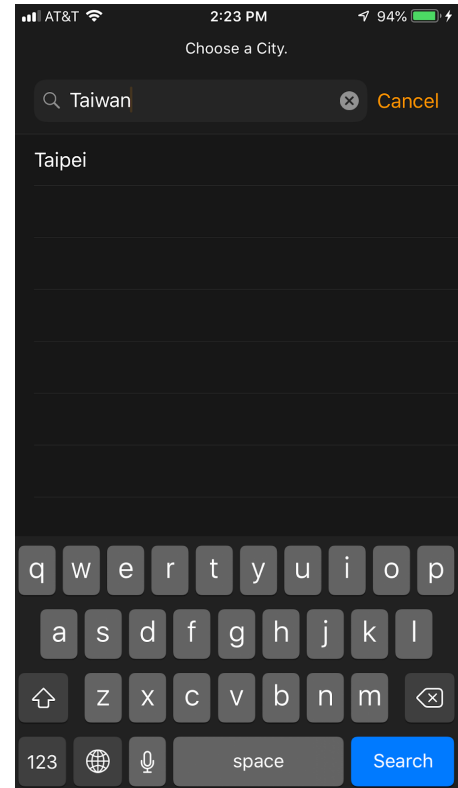
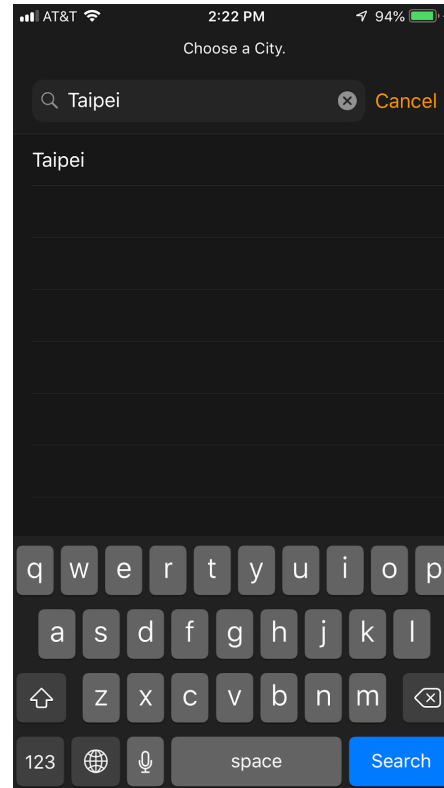
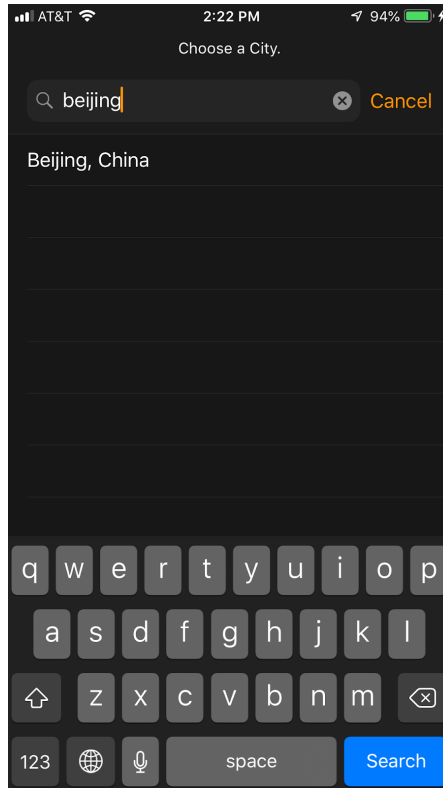
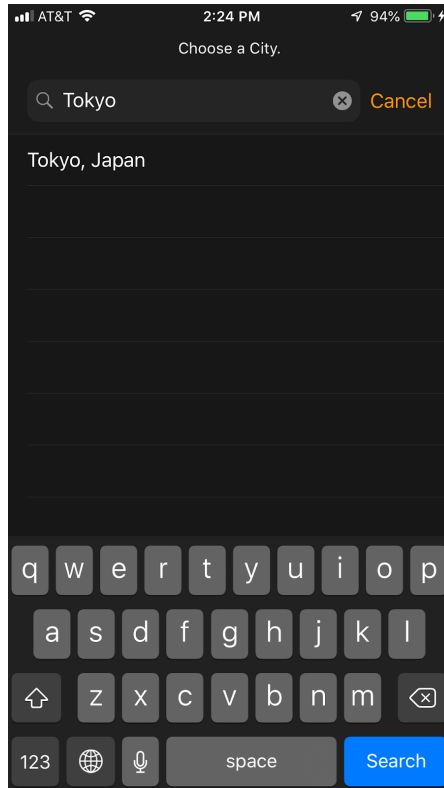
# Can you find your airport(s)?



Book	Book	Book	Book
<b>Flight</b> Vacation packages	<b>Flight</b> Vacation packages	<b>Flight</b> Vacation packages	<b>Flight</b> <u>Vacation packages</u>
<input checked="" type="radio"/> Round trip <input type="radio"/> One way	<input checked="" type="radio"/> Round trip <input type="radio"/> One way	<input checked="" type="radio"/> Round trip <input type="radio"/> One way	<input checked="" type="radio"/> Round trip <input type="radio"/> One way
From	From	From	From
<input type="text" value="Tokyo"/>	<input type="text" value="Beijing"/>	<input type="text" value="Taipei"/>	<input type="text" value="Taiwan"/>
<div>TYO - Tokyo, Japan</div> <div>HND - Tokyo Haneda, Japan</div> <div>NRT - Tokyo Narita, Japan</div>	<div>BJS - Beijing, China</div> <div>PEK - Beijing Capital Intl, China</div>	<div>TPE - Taipei International</div> <div>TSA - Taipei Songshan</div>	<div>KHH - Kaohsiung International</div> <div>TPE - Taipei International</div>
<input type="text" value="06/07/2019"/>	<input type="text" value="06/07/2019"/>	<input type="text" value="06/07/2019"/>	<input type="text" value="06/07/2019"/>
Bag and optional fees »	Bag and optional fees »	Bag and optional fees »	Bag and optional fees »
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Carry-on allowance changes for Ba	Carry-on allowance changes for Ba	Carry-on allowance changes for Ba	Carry-on allowance changes for Ba

(Source: American Airline website (U.S. version))

# Can you find your time zones?



(Source: Apple iPhone World Clock)

June 2019

Cheng

# Embedded Structures and KO



- **Misrepresentation of subjects**
  - marginalization and systematic biases in library classification systems, specifically in the cases of female representations (works by Olson)
  - racial representations in DDC (Higgins 2016)
  - indigenous peoples knowledge in major classifications (Green 2015, Hajibayova et al. 2016, Littletree and Metoyer 2015, Webster and Doyle 2008)
- **Social, cultural, and political influences**
  - apartheid South Africa in the 1950s and its classification of people into racial groups (Bowker & Star 2000)
- **What to do?**
  - advocate to uncover the invisible infrastructures (Bowker & Star 2000)
  - designer of classification should anticipate future changes and 'design for change' (Tennis 2012)

# Geopolitical Realities



- What do maps mean?
  - Not simply a rendering of the world
  - Can be used as “technologies of power” that can shape a certain discourse about a nation (Callahan 2009)
  - omissions, or silences on maps only amplify the fact that elite groups exist and they are using maps as a means to ‘promote an uneven dialogue’ to the weak (Crampton 2001, Harley 1988, 1992)
- Empirical studies on geopolitical realities, examples:
  - Soeller et al (2016)’s Map Watch
  - Stewart et al (2015)’s WSTAMP project

# Goal of this research



- Inspired by a series of current events in the China-Taiwan conflict on the sovereignty of Taiwan...
- We propose the use of a logic-based taxonomy alignment approach to
  - to elucidate multiple, often conflicting perspectives and hidden assumptions
  - to first align and then reconcile distinct but overlapping taxonomies

# Three taxonomies




*“...in the face of incompatible information or data structures among users or among those specifying the system, attempts to create unitary knowledge categories are futile. Rather, parallel or multiple representational forms are required”* [Bowker & Star, 2000, p.159]

Source	Created by/ Maintained by	# of regions	# of entities
ISO 3166	14 different organizations. Usually reflecting UN member states.	5	250
Department of Homeland Security	United States	8	232
CIA	United States	11	267
World Factbook			

# Three taxonomies



- Each has its own assumptions..



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2 results for

[Search results](#) [HK](#) [TW](#)

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[Graphical symbols](#)  
[Terms & Definitions](#)  
**[Country codes](#)**

2

For definition of the different code types, please click [here](#)

☐ Follow

English short name	French short name	Alpha-2 code	Alpha-3 code	Numeric
China	Chine (la)	CN	CHN	156
Macao	Macao	MO	MAC	446



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2 results for

[Search results](#) [HK](#) [TW](#)

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For definition of the different code types, please click [here](#)

☐ Follow

English short name	French short name	Alpha-2 code	Alpha-3 code	Numeric
China	Chine (la)	CN	CHN	156
Taiwan (Province of China)	Taiwan (Province de Chine)	TW	TWN	158





Search

Search results

HK

TW

1 result for

Japan



Results per page: 25

Country codes Officially assigned codes

Sort by:

English short name

French short name

Alpha-2 code

Alpha-3 code

Numeric code

Standards  
Collections  
Publications  
Graphical symbols  
Terms & Definitions  
Country codes

1

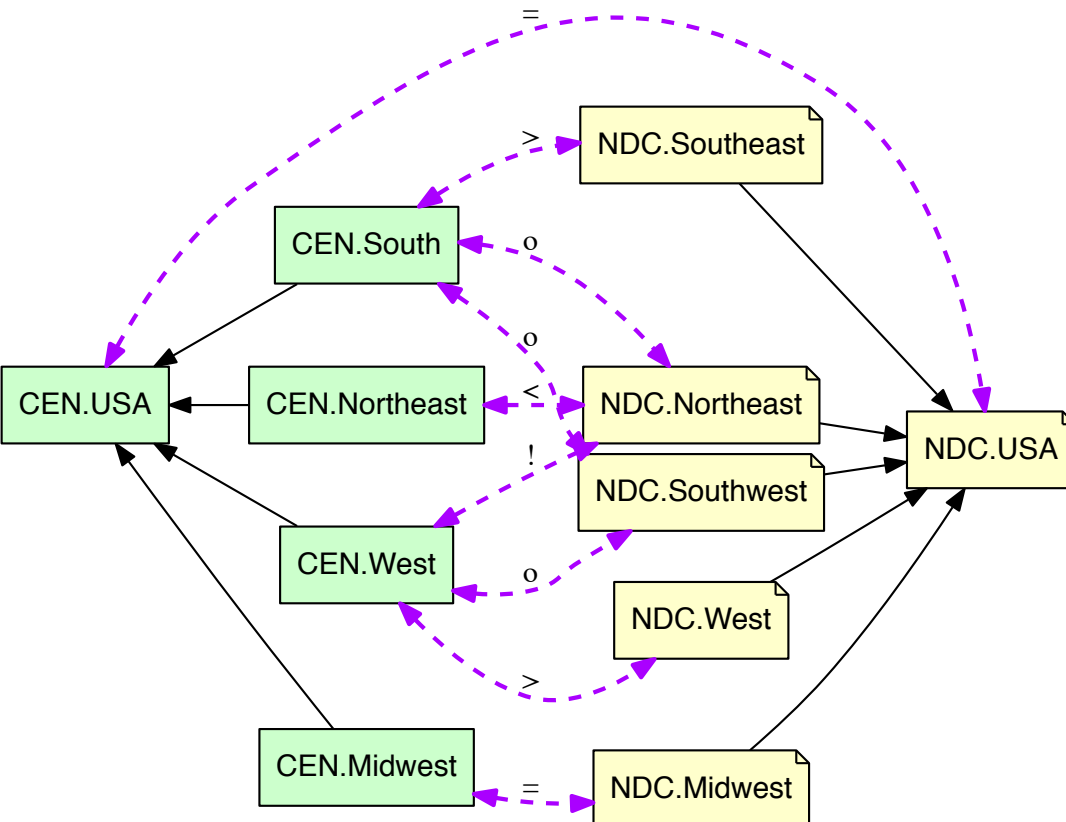
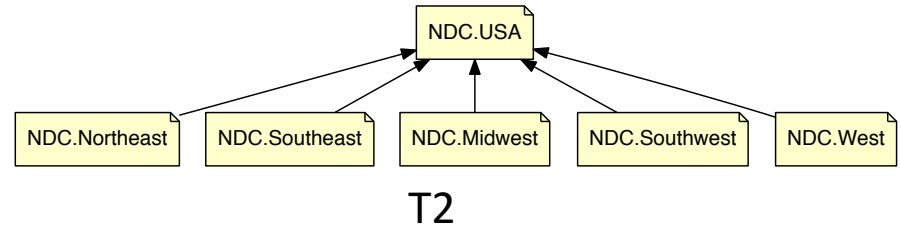
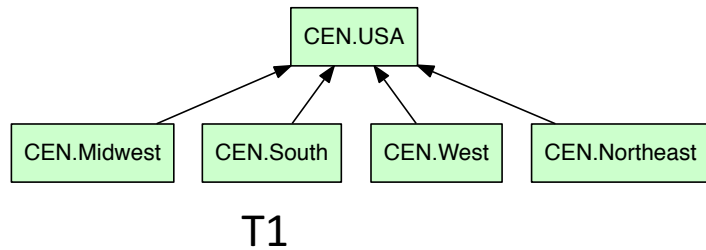
For definition of the different code types, please click [here](#)

Follow

English short name	French short name	Alpha-2 code	Alpha-3 code	Numeric
Japan	Japon (le)	JP	JPN	392

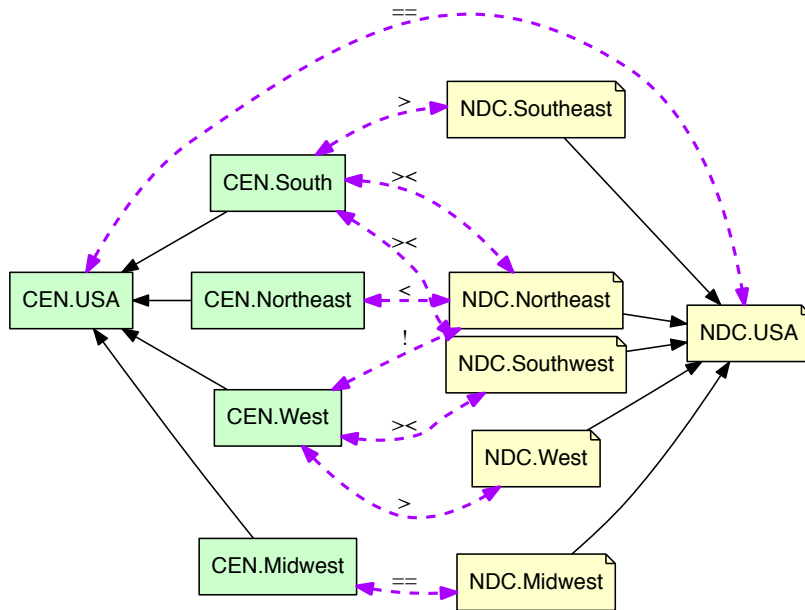
# Sorting things out ...

## Taxonomy Alignment Problems (TAP)

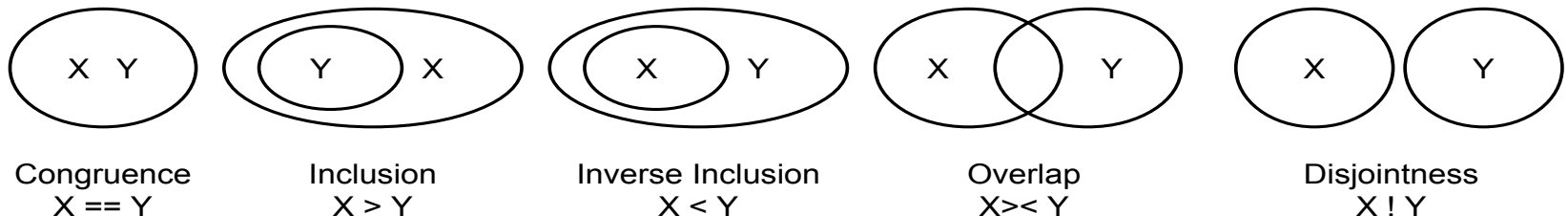


- **Given:**
  - taxonomies T1, T2
  - and relations T1 ~ T2 (*articulations, alignment*)
- **Find:**
  - merged taxonomy T3
- **Such that:**
  - T1, T2 are **preserved**
  - all pairwise relations are **explicit**

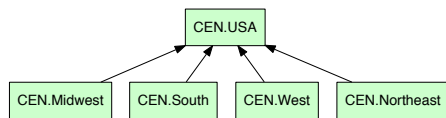
# 5 ways to relate concepts (regions) **I**



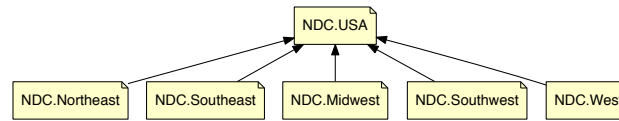
- **Idea:** relate concepts X and Y with *articulations*
- Articulation Language: **Region Connection Calculus (RCC5)**: congruence, inclusion, inverse inclusion, overlap, disjointness



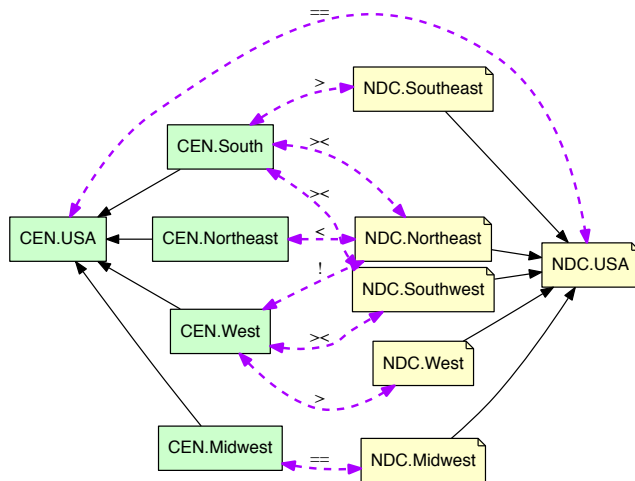
# Merged taxonomy T3



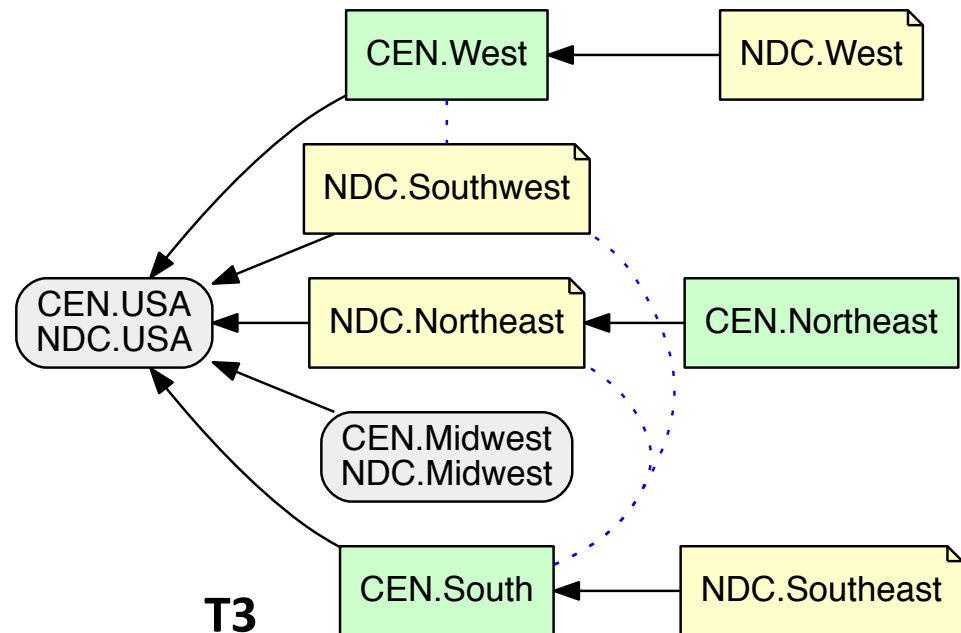
T1



T2



T1 ~ T2

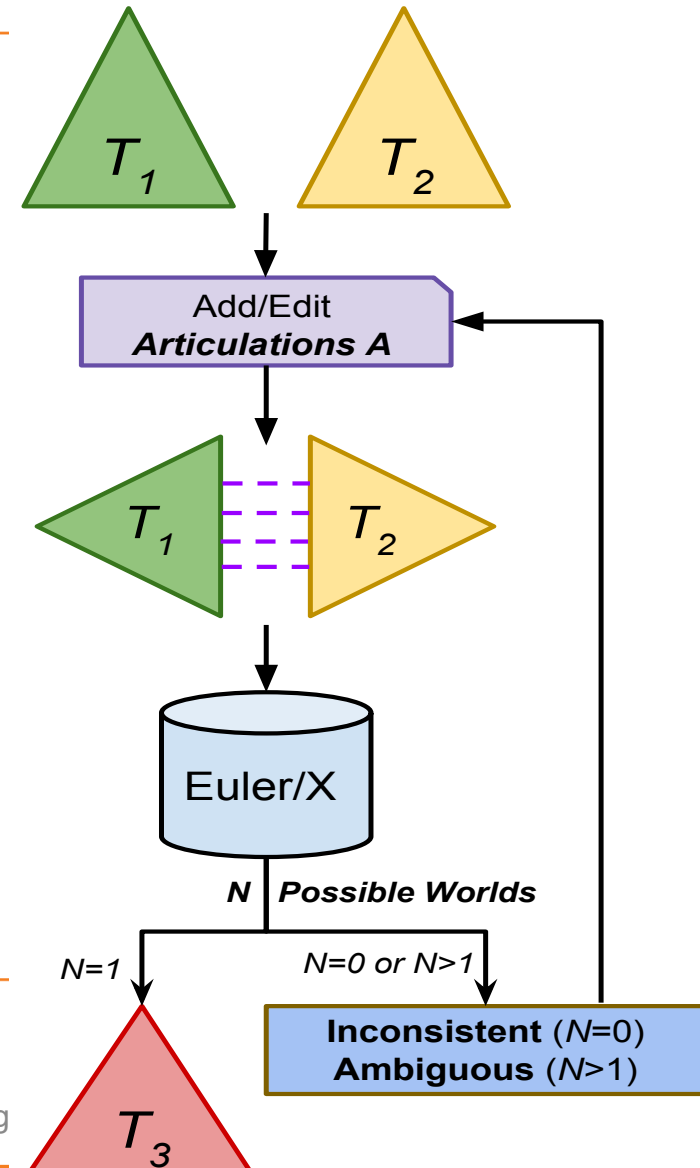


T3

# How we align two taxonomies $T_1$ and $T_2$



- **Step 1.** Supply input taxonomies  $T_1$  and  $T_2$
  - **Step 2.** Describe the relationships between  $T_1$  and  $T_2$
  - **Step 3.** Iteratively edit articulations in Euler/X
- 
- ... but where do the *articulations* come from??
    - **expert opinion (user-defined)** (Franz et al)
    - **automatically derived from data**



# Interpretations



- Recognizing that existing taxonomies or TAP may not have a *ground truth* to verify against, conscious human modeling decisions are often made in a TAP
- Two layers of interpretations:
  - (1) *The taxonomies* – we model each data source into a tree-like structure to the best of our knowledge or as reflected in the literature
  - (2) *the articulations*: given that the topic of our uses case is intuitive, the articulations given between each concept in each pair of taxonomies are specified by us

# The TAP in this research



- In this research, we employed *pairwise alignments* with the three taxonomies:
  - Use case 1: ISO vs. DHS
  - Use case 2: ISO vs. CIA
  - Use case 3: CIA vs. DHS

# Use Case 1: ISO-DHS



**taxonomy ISO ISO3166**

(Asia China VietNam AsiaOther)

(China HongKong Macao Taiwan ChinaOther)

**taxonomy DHS HomelandSecurity**

(Asia China ChinaOther HongKong Macau Taiwan Vietnam AsiaOther)

**articulation ISO-DHS ISO-Homeland**

[ISO.Asia equals DHS.Asia]

[ISO.HongKong equals DHS.HongKong]

[ISO.Macao equals DHS.Macau]

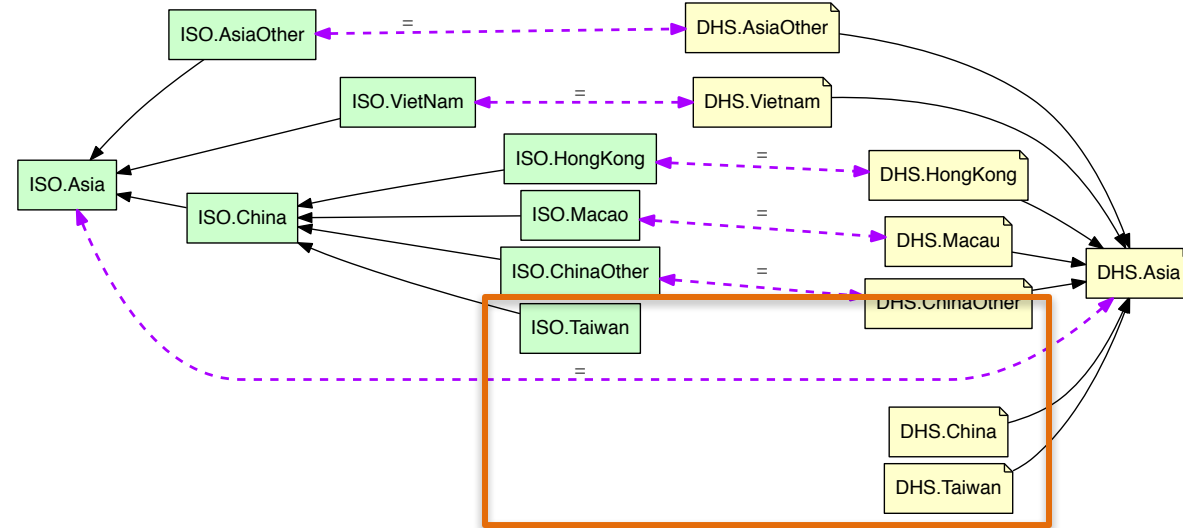
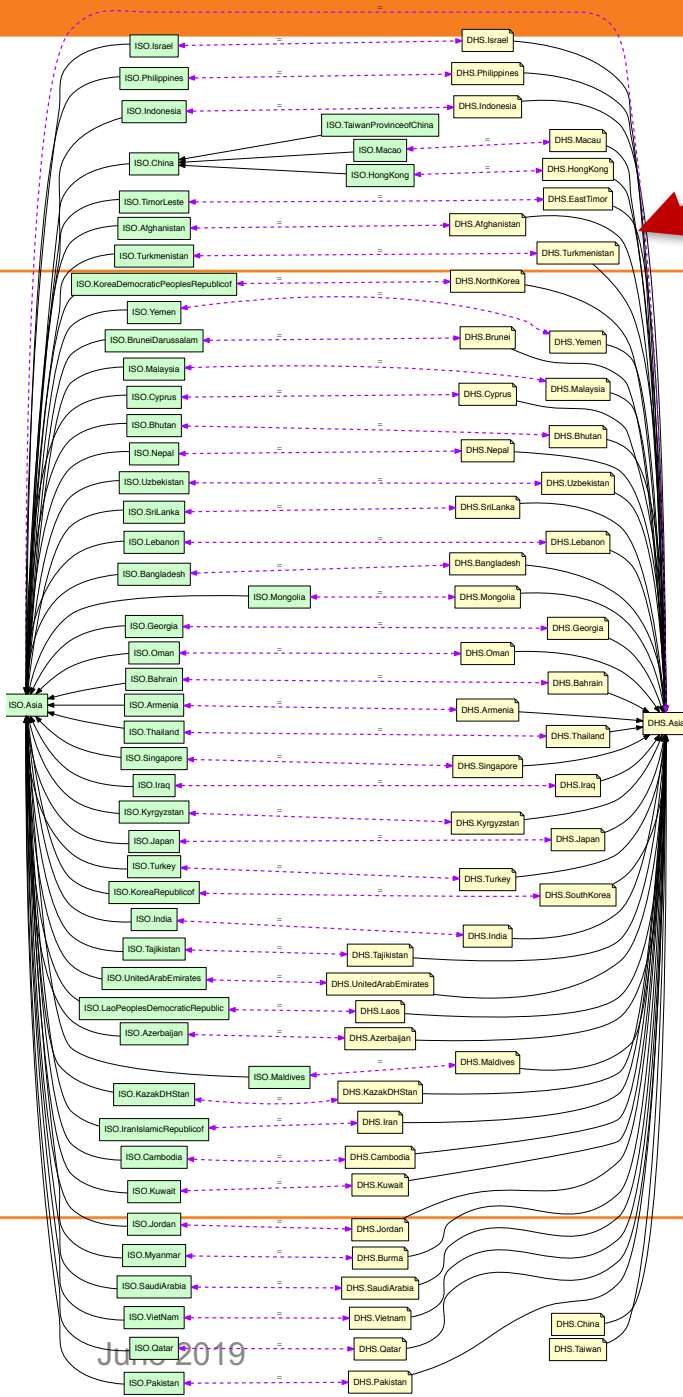
[ISO.VietNam equals DHS.Vietnam]

[ISO.ChinaOther equals DHS.ChinaOther]

[ISO.AsiaOther equals DHS.AsiaOther]



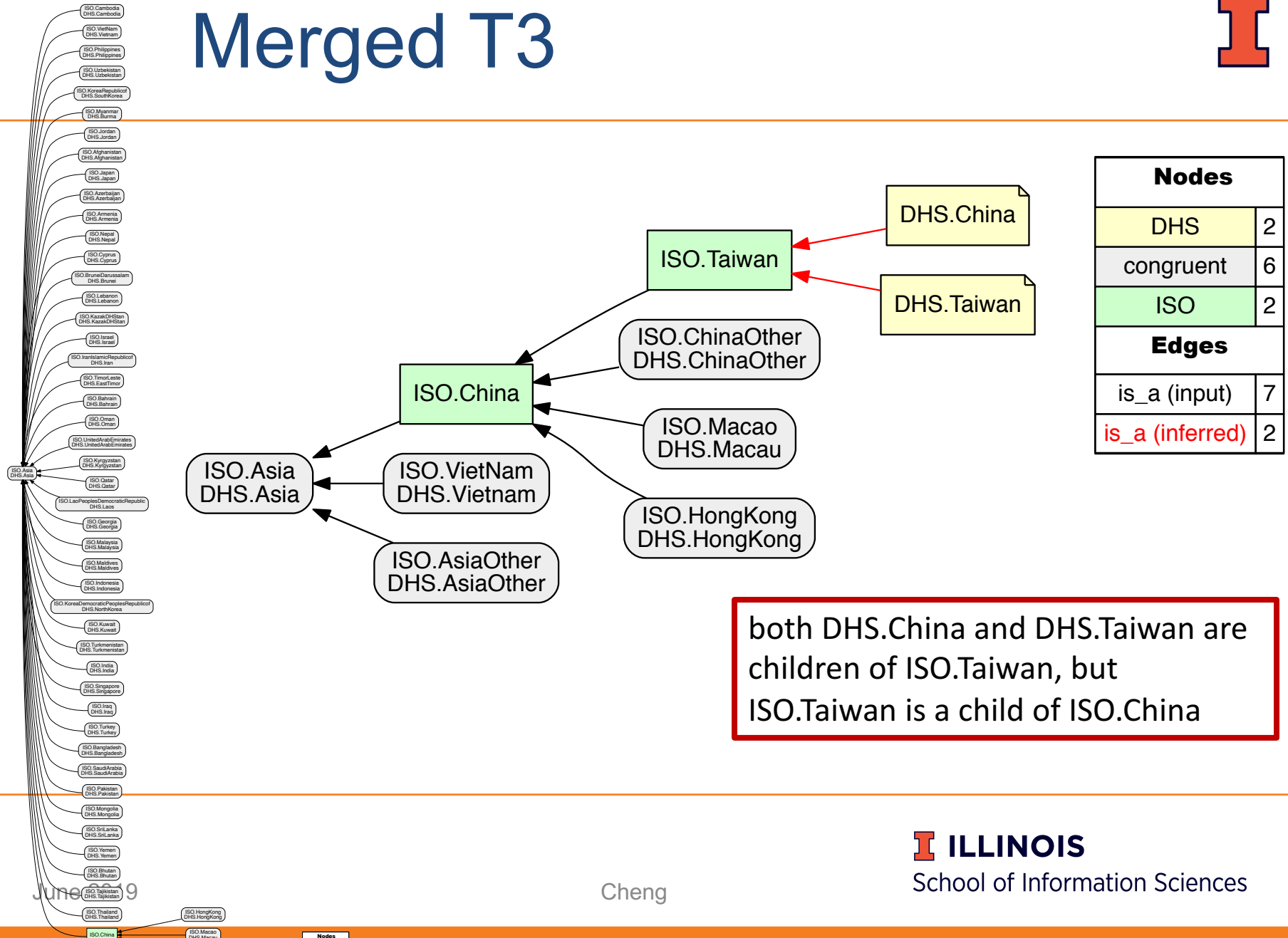
The full input of all entities in Asia: Too large and hard to see!



A brief view of Asia:  
 - truncated to a smaller set of entities; most are marked with '='  
 - articulations between Taiwan and China were left blank



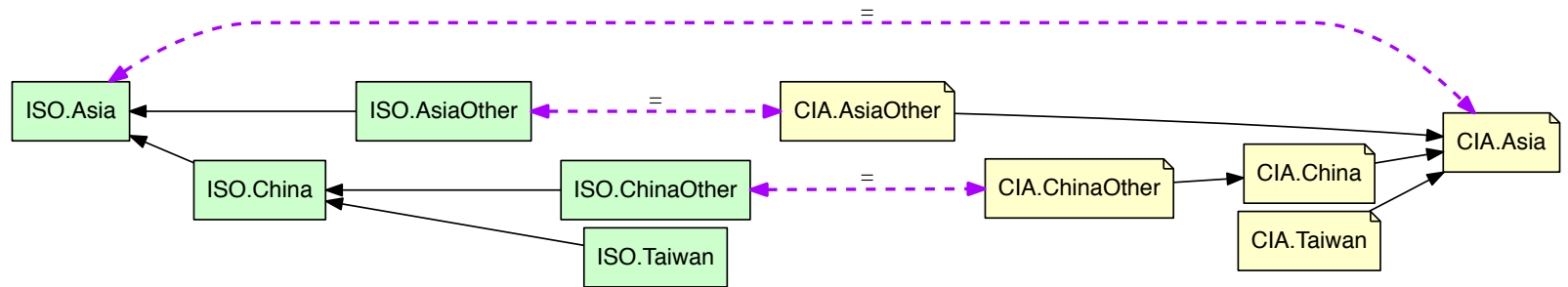
# Merged T3



# Use Case 2: ISO-CIA

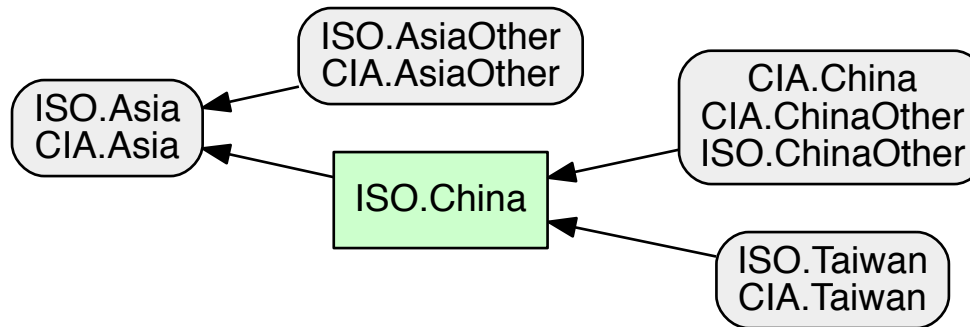


Nodes	
CIA	5
ISO	5
Edges	
is_a (CIA)	4
is_a (ISO)	4
articulations	3



Again, articulations between Taiwan and China were left blank

# Merged T3



Nodes	
congruent	4
ISO	1
Edges	
is_a (input)	4

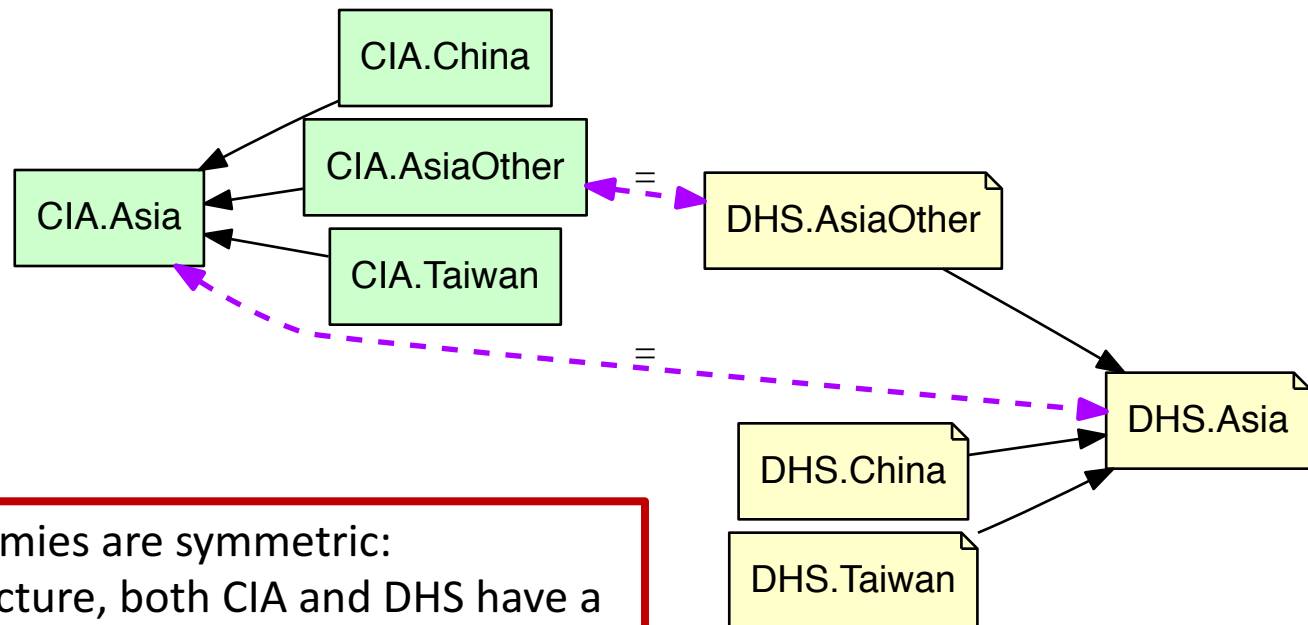
Subtle differences from Use case 1:

- *CIA.China*, *CIA.ChinaOther* and *ISO.ChinaOther* are considered the same
- *ISO.Taiwan* is equivalent to *CIA.Taiwan*
- *ISO.China* is the super-entity of both *CIA.China* and *CIA.Taiwan* (or *ISO.Taiwan*)
- The two children are at equal level rather than one being superior than the other

# Use Case 3: CIA-DHS

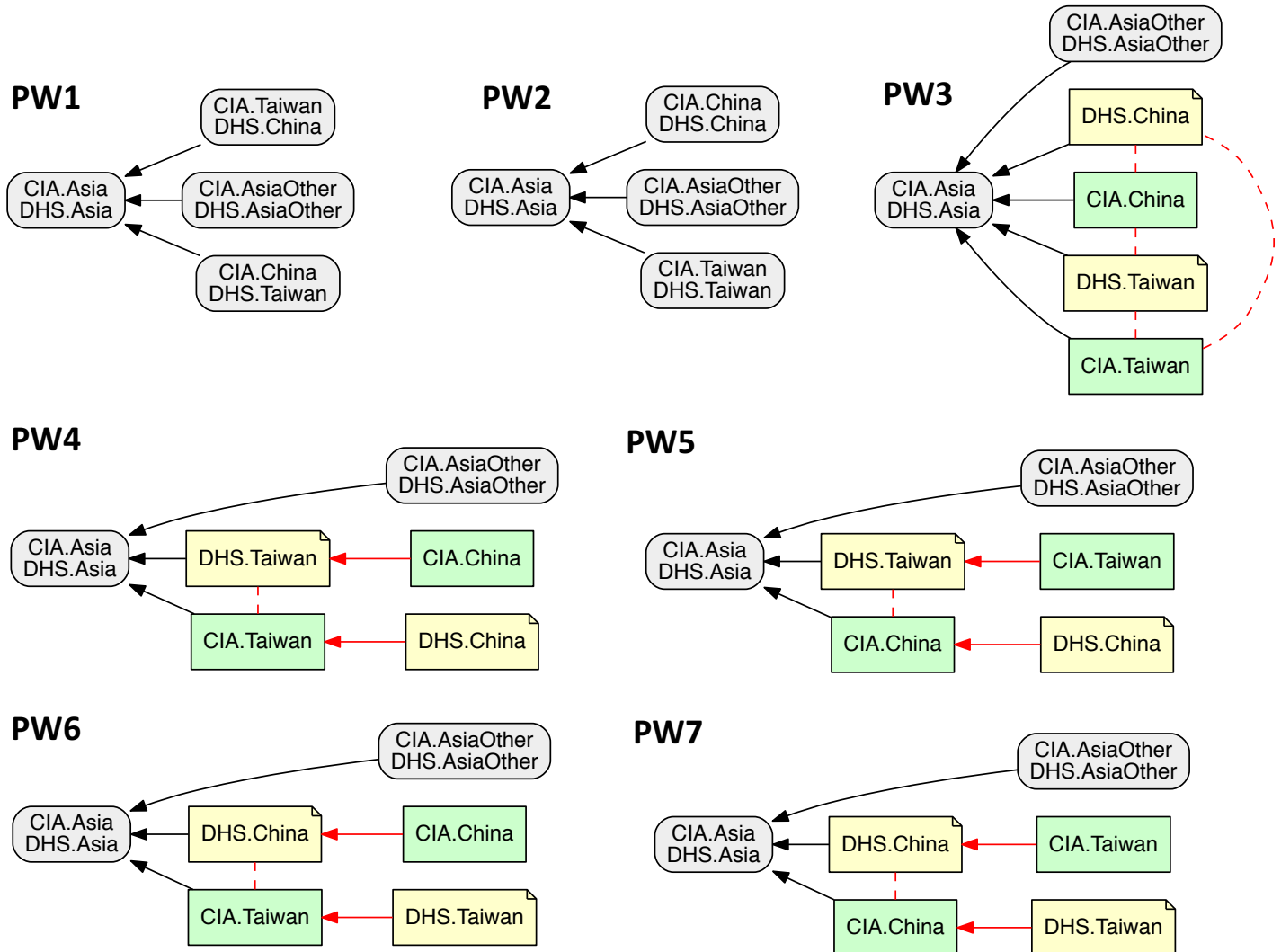


Nodes	
CIA	4
DHS	4
Edges	
is_a (CIA)	3
is_a (DHS)	3
articulations	2



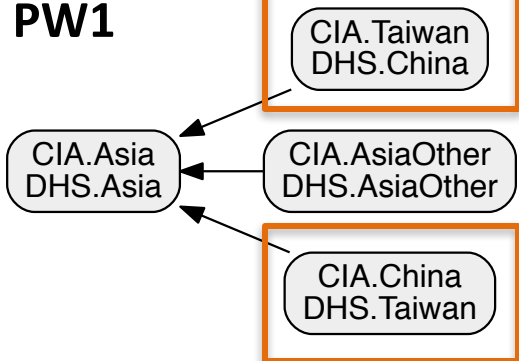
The two taxonomies are symmetric:  
In terms of structure, both CIA and DHS have a two-level structure with a root entity *Asia* and three children *Taiwan*, *China*, *AsiaOther*

# We have 7 Possible Worlds!



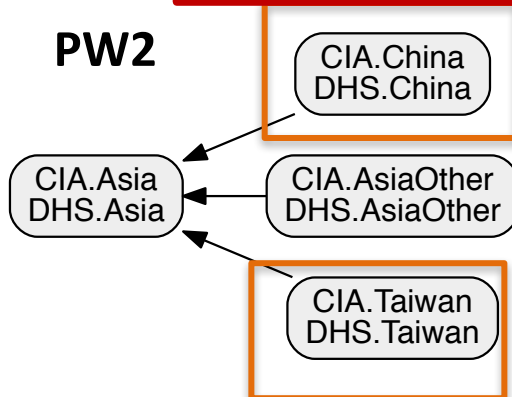
The rest of the world's view

PW1



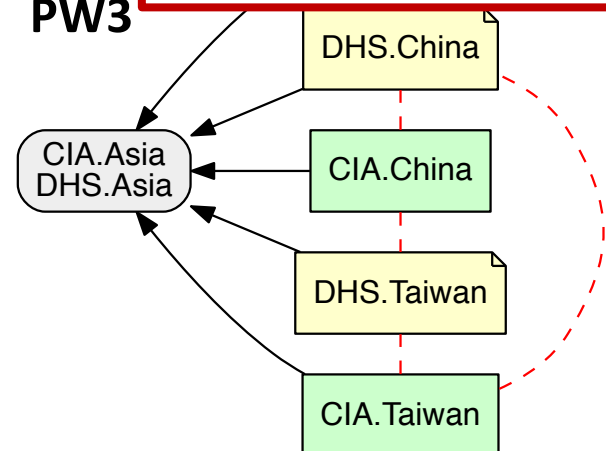
Democratic Progressive Party (DPP)'s view

PW2



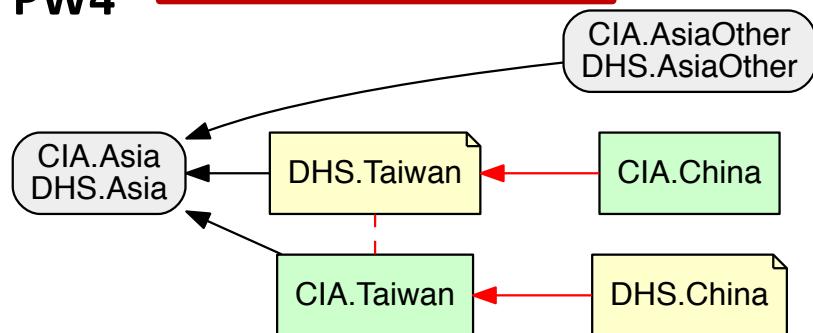
Neighboring countries' view

PW3



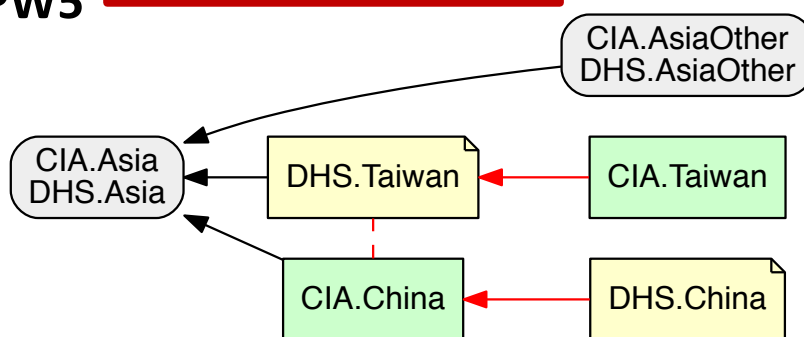
Political extremist's view

PW4



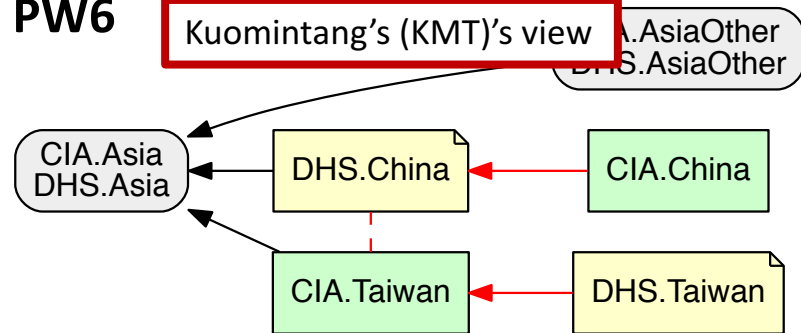
Kuomintang's (KMT)'s view

PW5



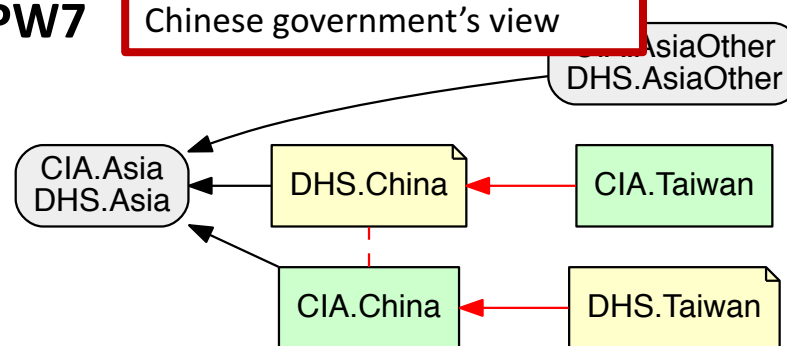
Kuomintang's (KMT)'s view

PW6

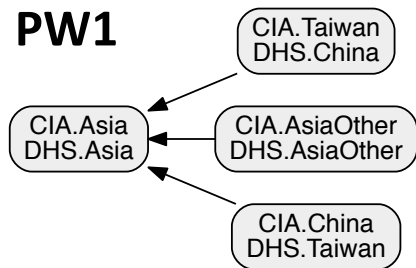


Chinese government's view

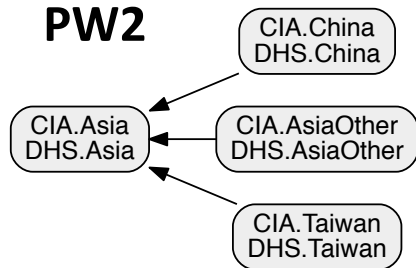
PW7



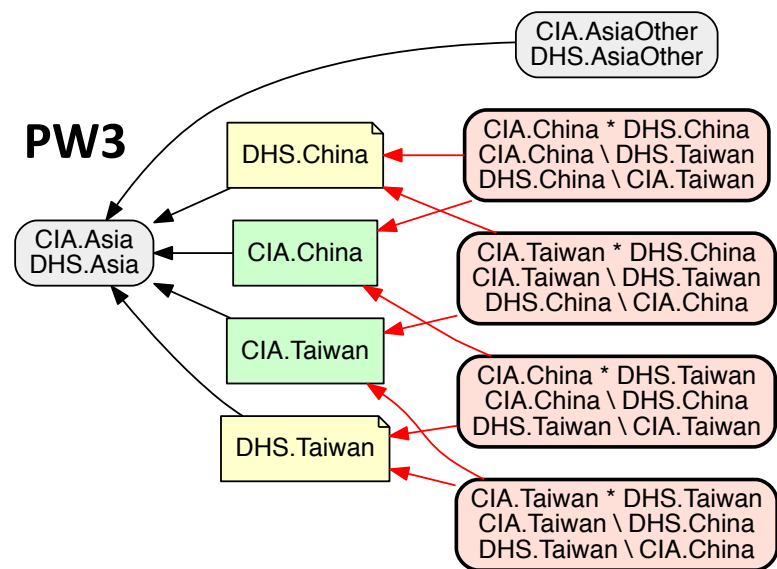
**PW1**



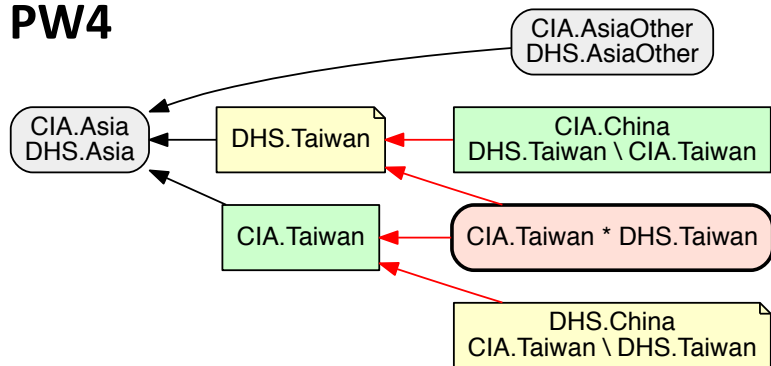
**PW2**



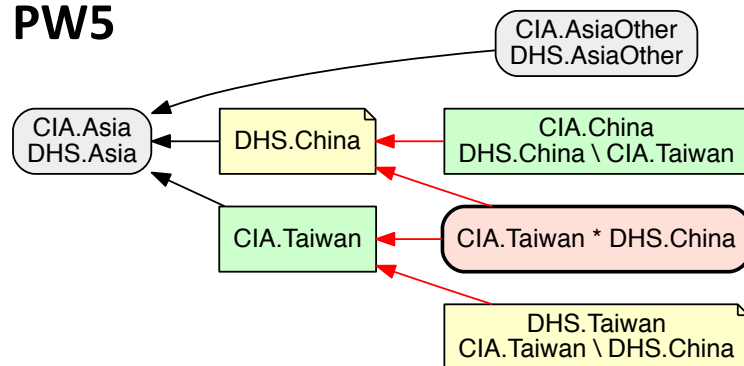
**PW3**



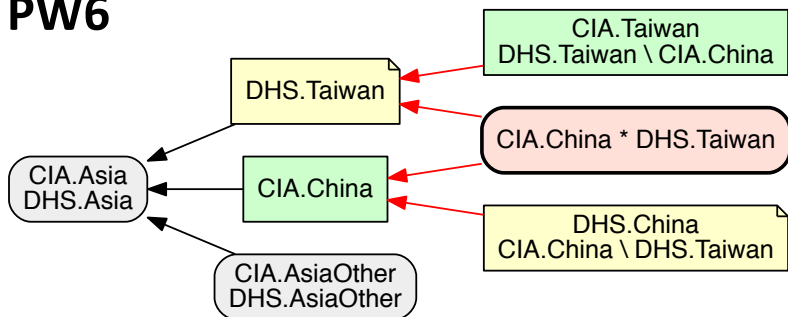
**PW4**



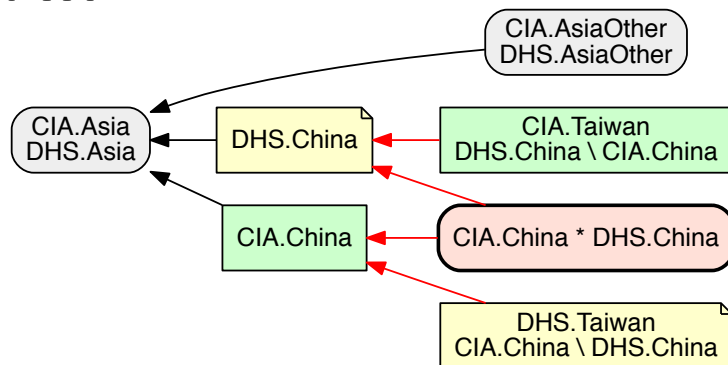
**PW5**



**PW6**



**PW7**





# Conclusion & Discussion



- Our first attempt at looking into the disputed geographic regions and sovereignties in the world, focusing on the case of Taiwan
- The three taxonomies
  - ISO standard (ISO) conforms with the United Nation's viewpoints of the world with a more reserved stance on its member stances
  - the U.S. Homeland Security (DHS) taxonomy provides a more liberal, flat worldview
  - the CIA World Fact Book (CIA) strikes a balance of the former two taxonomies

# Conclusion & Discussion



- Logic-based approach
  - provides different modeling situations for the two entities (Taiwan and China)
  - taxonomy alignment results (specifically the use case on *DHS vs. CIA*) interestingly coincides with different perspectives in different social worlds
- Latent assumptions within information systems, e.g.
  - the Library of Congress (LOC) adopts ISO standards
    - MARC 21: *China* and *China (Republic: 1949– )*
    - LOC classification: lists Taiwan as a sub-entity of China

# Conclusion & Discussion



- Geo-political realities exist in taxonomies (and KO)!
  - to *raise awareness* that there are hidden structures within a KOS is only the first step
  - to *present a more holistic view* on the possible worlds of these geopolitical realities simultaneously will be inevitable
- Limitation: Researcher's bias
  - we tried to make any interpretations or modeling situations of the use cases unequivocal in order to keep a open stance and embrace different opinions on this issue.

# Future work



- incorporate more data sources
- align other entities in the world
- discuss perceived boundaries between minority groups and the authorities (e.g. indigenous people versus the government)

# Acknowledgement



- The Conceptual Foundations Group (<https://publish.illinois.edu/ischool-cfg/>) at iSchool Illinois, members include Dr. Allen Renear, Dr. Karen Wickett, Dr. Jodi Schneider, Dr. Bertram Ludäscher, Dr. Dave Dubin, and many others!
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# Thank you!

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NASKO 2019, Philadelphia, Pennsylvania



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