

$\forall y \in X, \exists x \in X \text{ such that } f(x) = y$
 $\exists x \in X \text{ such that } \forall y \in X, f(x) = y$

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Ur%zu1_vŠ ~ r€19ezsv†r€1r€u1Yz~ r}r{Er€1Uzx†r}1]zs...r...{€1p1y††f{@†yu)?, ...x1:=1Ur%zu
Xv...~ r€, =lav....{€1c, }r€u1r€u1S}rz..1ez€ | v...19f€z%w...††{€1, w1gz...xz€zr:

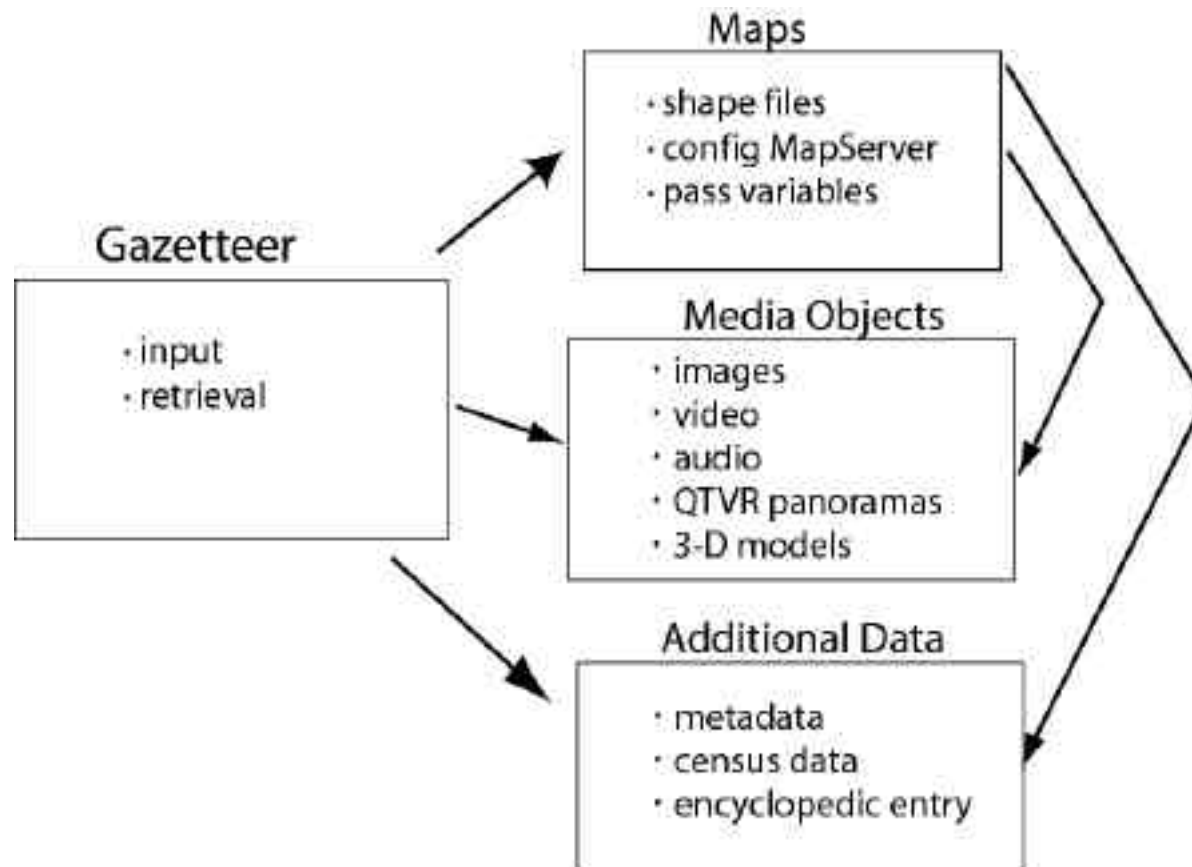
Goals in connecting with data

- ¿ $T \dots v r \dagger v_1 r_1 \sim v \dagger y, u_1 w, \dots \dagger \dots r t \mid z \in x_1 u r \dagger r_1 r s, \hat{\dagger} f \} r t v \dagger 1 r \in u_1 z \in 1 \dagger \hat{\dagger} \dots \in 1 \sim v u z r_1 f v \dots \dagger r z \in z \in x \dagger, \dagger y, \dagger v_1 f \} r t v \dagger$
- ¿ $R t t v \dagger \dagger 1 \sim v u z r_1 s \{ \mathbb{E} 1 \}, t r \dagger z, \in 1 r \dagger 1, f f, \dagger v u_1 \dagger, \dagger y v \sim v_1, \dots \dagger \sim v u z r_1 \dagger \{ f v_1, \dots \dagger r \in \mathbb{E} 1, \dagger y v \dots \dagger \{ \mathbb{E} \dagger \dagger v \sim$
- ¿ $\hat{\dagger} r \in r x v_1 u r \dagger r_1 r t, \hat{\dagger} z \dagger z \dagger z, \in = 1 z \in f \hat{\dagger} \dagger = 1 \dots v \dagger \dots z v \% d r \}$
 $r \in u_1 z \in \dagger v \dots w r t v$

Terminology

- ¿ $Xr' v\ddot{v}..k1p13r1xv, x...rfyztr\}z\in uv < 1, ..1uzt\ddot{z}, \in r..E3$
- ¿ $Wvr\ddot{\wedge} ...v\ddot{t}1p1 R\in E\ddot{t}yz\in x\ddot{t}yr\ddot{t}1tr\in 1sv1uv\ddot{t}t..zsvu\ddot{r}t$
 $, tt^{\wedge}f\{Ez\in x1 \ddot{t}f\ddot{r}tv=1 y, \check{S}v\%w...1 z\ddot{t}1 \sim r\{E1 r\}t, 1 sv$
 $zuv\in\ddot{t}zwzv\ddot{u}r\ddot{t}1r\in 1z\in\ddot{t}r\in xz\}v1ru \sim z\in z\ddot{t}\ddot{t}..r\ddot{t}z\%w1x..., \wedge fz\in x$
 $\ddot{t}^{\wedge}ty\ddot{r}\ddot{t}1r\ddot{t}t, \wedge \in\ddot{t}..E=1f..., \%z\in tv=1...vxz, \in=1v\ddot{t}t?$
- ¿ $Wvr\ddot{\wedge} ...v1\ddot{t}\{Efv\ddot{t}$
- ¿ $Ru \sim z\in z\ddot{t}\ddot{t}..r\ddot{t}z\%w1yzv...r...ty\{E$
- ¿ $e, f, \in E \sim$
- ¿ $Xld1p1eyv1^{\wedge} \in z, \in 1, w1x...rfyztr\}1ur\ddot{t}r1r\in u1r\in r\}\{E\ddot{t}ztr\}$
 $ur\ddot{t}r1\ddot{t}zv\ddot{u}1s\{E1\}, tr\ddot{t}z, \in k13xv, ..vwv...v\in tvu''$

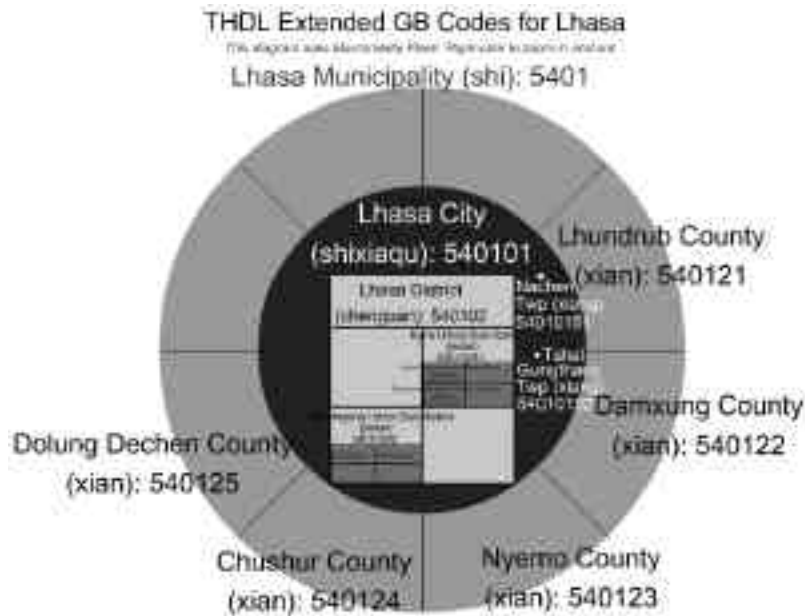
Data Input and Retrieval



Technology

- ¿ $i \wedge]1Xr' v\ddot{t}v\dot{v}\dots 1\dots v \in uv\dots vu1z \in 1Ye \wedge]1\check{S}z\dot{t}y1i d]e$
- ¿ $cv\dot{t}^{\wedge}\ddot{t}1f\}, \ddot{t}vu1, \in 1\check{S}vs1uvf\}, (\text{Evu1}^{\wedge}rfdv\dots\%v\dots z \in \dot{t}v\dots wrtv$
- ¿ $cv\dot{t}^{\wedge}\ddot{t}1f\}, \ddot{t}vu1, \in 1r1\sim, \dots v1z \in \dot{t}v\dots r\dot{t}\dot{t}\%v1\sim rf v \in \%d\dots, \in \sim v \in \dot{t}1\sim ruv1f, \dot{t}\dot{t}z\dot{s}\dot{v}1z \in 1W\dot{r}ty$
- ¿ $aYaltr\dot{\dot{t}}\dot{t}\dot{t}, 1,, \wedge v\dots (\text{E}\dot{t}y\dot{v}1^{\wedge}(\text{E}db]1ur\dot{t}rsr\dot{t}v\dot{t}1, \in 1\dot{t}yv wvr\dot{t}^{\wedge}\dots v1, \dots 1z\dot{t}\dot{t}1fr\dots v \in \dot{t}1wvr\dot{t}^{\wedge}\dots v\dot{t}$
- ¿ $f\dot{t}z\sim r\dot{t}v\}\text{E}\dot{t}\dot{t}, 1\dots v\dot{t}\dots zv\%v1r \in 1v \in t(\text{E}t\}, fvuzt1\dot{t}v < \dot{t}^{\wedge}r\} v \in \dot{t}\dots \text{E}1, \in 1\dot{t}yr\dot{t}1r\dot{t}1\check{S}v\dot{\dot{t}}\dot{t}1z \in | \dot{t}\dot{t}\dot{t}, 1\dot{t}yv1\%r\dots z, \wedge \dot{t}1\sim vuzr \dot{t}, 1\check{S}yzt\dot{y}1z\dot{t}1\dots v\dot{t}\dot{t}v\dot{t}=1z?v?1r^{\wedge}uz, =1\%d\dot{u}v, =1\dot{t}\dot{t}z\dot{\dot{t}}\dot{t}z\sim rxv\dot{t}= begc1fr \in, \dots r\sim r\dot{t}1r \in u1z \in \dot{t}v\dots r\dot{t}\dot{t}\dot{t}\%v1D > U1\sim, uv\dot{t}$

Determine national administrative hierarchy



- Sample hierarchical structure of Lhasa, with modified Chinese *guobiao* codes.

Some key elements in DTD

- ¿ $M \in r \sim v$ $01p1 \dagger yv1 \in r \sim v1, w1 \dagger yv1 wvr \dagger \hat{\dots} v$
- ¿ $Mt, \% \dagger frtv$ $01p1 \dagger yv1 \dagger frtv1, tt \hat{fzvuis} \in \dagger yv1 wvr \dagger \hat{\dots} v$
- ¿ $Mt, \% \dagger z \sim v$ $01p1 \dagger yv1 \dagger z \sim v1, w1 rff \} ztrs z \} z \dagger \in , w1 wvr \dagger \hat{\dots} v$
- ¿ $Mw \dots v \} 01p1 \dots v \} r \dagger vu1 wvr \dagger \hat{\dots} vt = t \hat{ty1r \dagger 1 \dagger yv ru \sim z \in z \dagger \dagger \dots r \dagger z \% v1 wvr \dagger \hat{\dots} v1, w1 \check{S} yzty1 z \dagger 1 z \dagger fr \dots \dagger$

Gazetteer home page



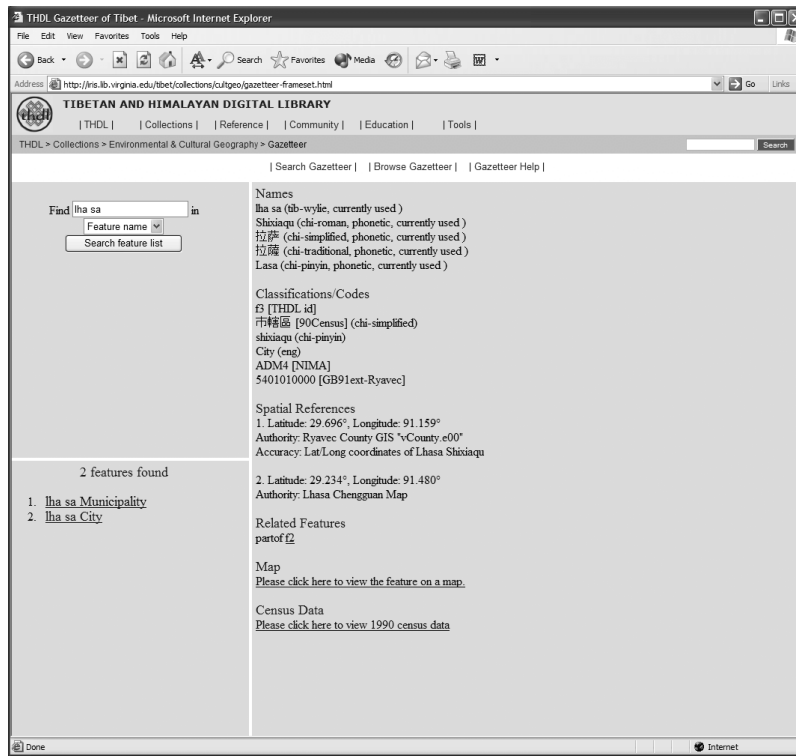
- Enter toponym on which to search

Feature search



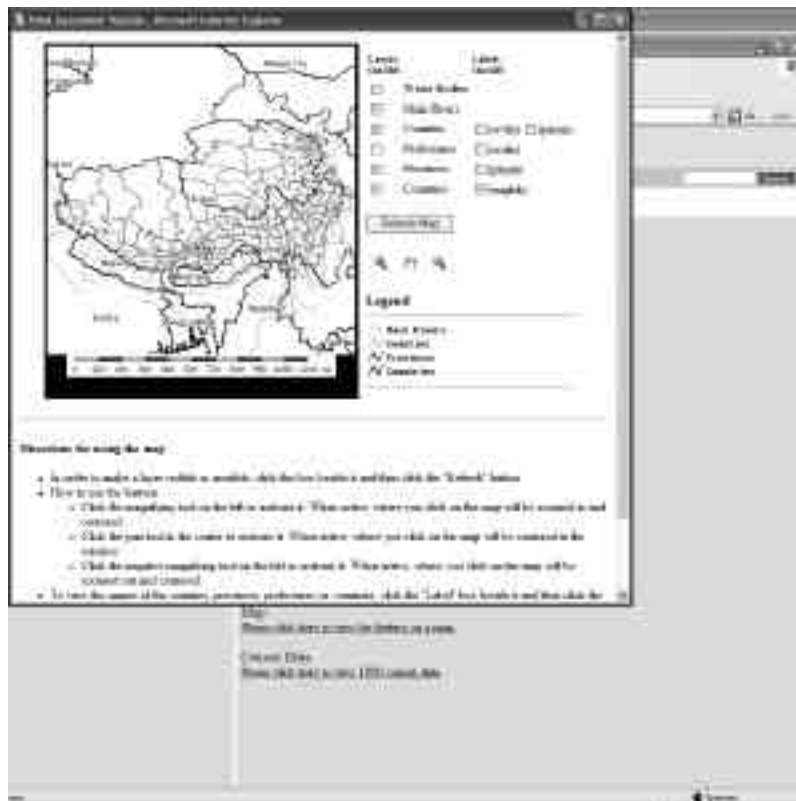
- "Search" button runs SGREP search of the XML via Perl script
- All features with matching names appear in lower left frame

Feature details



- Feature details appear in Right frame
- XML record results transformed via XSL to HTML
- Links to Mapserver map and Census data (if applicable) dynamically generated

Feature dynamically plotted



- Shape files previously processed in ESRI ArcMap
- Parameters passed to MapServer to select shape files and highlight feature

Feature (zoomed in)



- A number of options are available on the MapServer-generated HTML page

Sample census data



A Sample of 1990 Census Data for Lhasa collected urban units

Feature Name - Tibetan (Wylie): ལྷ་ས།
Feature Name - Chinese (Pinyin): Lhasa
Feature Name - Chinese (Traditional): 拉薩
Feature Type: collected urban units
THDL Reference Number: 0

Population Data
Total Population: 159022
Total Female Population: 76738
Total Male Population: 82284
Total Ethnic Tibetans: 90431
Total Ethnic Han: 40367

Literacy Data
University Educated - Male: 1815
University Educated - Female: 1004
Senior Middle School Educated - Male: 8140
Senior Middle School Educated - Female: 4047
Male Literacy - Age 15 and Over: 90202
Female Literacy - Age 15 and Over: 47040

Agricultural Data
Total Area Under Cultivation:
2287.000 hectares
Grain Sown Area (official):
1587.900 hectares
Grain Output: 3603 tons
Cotton Output: 0 tons
Oil Output: 0 tons

- A sample of 1990 census data available for county-level features

Interactive map (Flash)



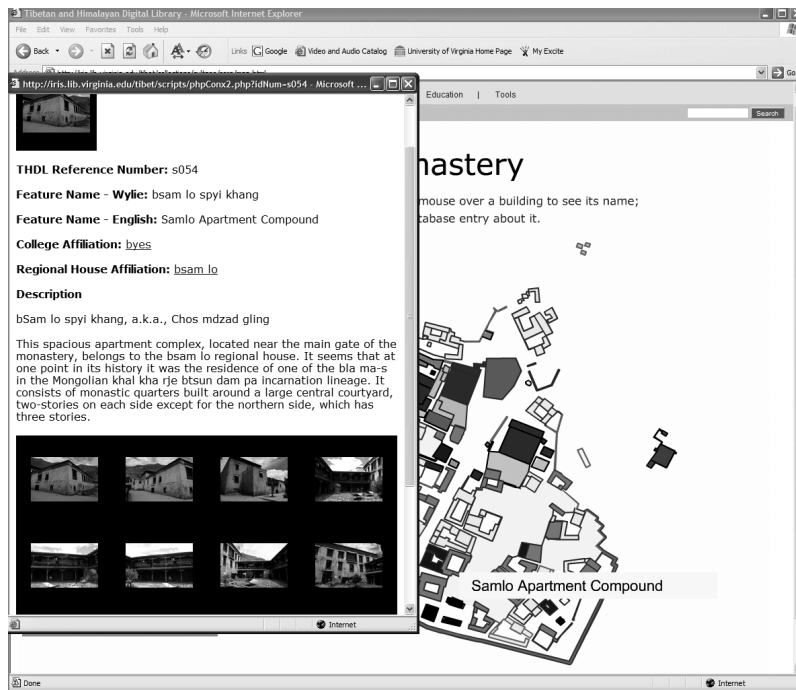
Controlling Flash objects with XML



Sample XML for an object

- ```
<building FID="f1201" mapID="s001"
nameWylie="gzhung pa khang tshan"
nameEngDiacrit="Zhungpa Regional
House Headquarters Headquarters"
nameEng="Zhungpa Regional House
Headquarters Headquarters"
collegeName="smad" parentID=""
khangtshanName="gzhung pa"
fClassWylie="khang tshan gtso bo"
fClass="regionalHouse"
fClassLong="regional house
headquarters" form="Compound"
condition="fair" GPSLatLong="S = N
29.69655, E 91.13258. W = N
29.69682, E 91.13213. E = N
29.69696, E 91.13291. (This latter
point is also a point for dwags pa
bla brang) Central courtyard = N
29.69686 E 91.13252. Main temple -
" constructionDate=""
constructionPatron="" ktAltName=""
/>
```

# Records associated with feature



- Flash interacts with MySQL databases of features and images
1. PHP call to query feature database, passing ID of clicked feature
  2. Images corresponding to feature dynamically printed to page via PHP
  3. PHP-generated link to feature's "parent"

# Image detail



- Clicking on a thumbnail results in larger image and database entry on image

# Parent Feature



- Feature contains PHP-generated link to its parent