Automatic Production and Updating of Topographic Maps

A Case Study Using the German AAA Data Model

ICC 2013 Dresden

Ajay Mathur
CEO, Axes Systems Switzerland
Who are we?

• Axes Systems, an independent Swiss company
• Founded in 1990
• Core product - axpand, released in 2001
• Repeated acknowledgement

2013   IT Innovation Prize, axpand automation solutions in Europe
2013   IT Innovation Prize, axpand “on Demand” solutions in Europe
2011   IT Innovation Prize, Top 3 “on Demand” solutions in Europe
2010   Appeared on WVVH-TV East Coast USA
2009 & 2010 Featured on CNN Headline News in the U.S.A
"Leading Developments in Geographic Information"
2009   Red Herring Global 100 Tech Companies winner
2009   Top 20 on Demand solutions in German speaking Europe
2009   potential top 500 company in Switzerland
       by Computerworld magazine
2008 & 2009 Innovation prizes in German speaking Europe
2007   Red Herring Europe 200 finalist
axpand in production
public sector, civil and military mapping
**axpand in production**

German ATKIS® civil and military mapping
axpand in production
private companies (I)
axpand in production
private companies (II)
Why axpand?

To have

Up-to-date map and data products

at all times
Some Customer Successes

- 2006 Saxony-Anhalt, statewide topographic maps and data 1:10K out of ATKIS - first in Germany
- 2007 Thuringia, statewide topographic maps 1:50K - first in Germany
- 2010 Thuringia, statewide handover of ATKIS topographic maps 1:100K to German Bundeswehr - first in Germany
- 2010 Saarland, statewide topographic maps 1:25K out of the new AAA data model - first in Germany
- 2010 swisstopo publishes 75% - 80% correct generalization results for 1:25K
- 2013 swisstopo publishes 76% - 84% correct generalization results for 1:25K - “We think these are good results and we see potential for further improvements.”
When it comes to automation, no one comes closer to 100% - ©2013 Axes Systems - www.axes-systems.com
Architecture

- **axpand ng**
  - Data-base driven
  - Client-server / service-based
  - 32 / 64 bit architecture
  - Windows / Linux / Mac (Client)
  - Optimized for speed - multiple processors, cores and threads
**axpand AAA DTK Process**

- GeoInfoDoc 6.0.1 Specs (AdV)
  - Data Model
  - Signatures & Styles
- Workflows available for
  - Topographic Map 1:10K (DTK10)
  - Topographic Map 1:25K (DTK25)
  - Topographic Map 1:50K (DTK50)
  - Topographic Map 1:100K (DTK100)
# AAA Map Production Process with *axpand*

<table>
<thead>
<tr>
<th>Input (NAS/NBA)</th>
<th>Automation Process</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Check for Relevance</strong></td>
<td><strong>Incremental Updating</strong></td>
<td><strong>Check for Relevance</strong></td>
</tr>
<tr>
<td>Base Data</td>
<td>Update Increments</td>
<td>Re-generalization</td>
</tr>
<tr>
<td></td>
<td>Apply style and symbols</td>
<td>Generalize using Constraints</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Label using style rules</td>
</tr>
<tr>
<td><strong>Input Increments</strong></td>
<td><strong>Edit and finish Map</strong></td>
<td><strong>Create PDF and Raster</strong></td>
</tr>
<tr>
<td><strong>Generalize using Constraints</strong></td>
<td><strong>Label using style rules</strong></td>
<td></td>
</tr>
</tbody>
</table>
Integration in AAA Production Process
Integration in AAA Production System

External GIS

DHK
Update Instantly

1:25K Maps
1:50K Maps
1:10K Maps
1:100K Maps

Master Data

Master Data Updates

When it comes to automation, no one comes closer to 100% - ©2013 Axes Systems - www.axes-systems.com
**axpand ng automation**

- automated incremental updating using methods of generalization
  - holistic, non-destructive approach
  - constraints driven (generalization criteria)
  - comprehensive set of generalization operators
  - workflow and generalization zones configuration
  - relevance checks at import and export
  - feature relationship history (MRDB) over time
  - stable UUIDs over time and geometry type changes
  - one-click automation.
Generalization process in axpand ng

- complete generalization process executed in sequences for different generalization zone type
- generalization zones – can have their own set of constraints and workflows
- workflows are set up - embedded, in succession, or in parallel
- workflows in axpand ng consist of tasks
- tasks contain combinations of “operators”
- topology is defined according to generalization tasks and maintained within the operators
- operators - logical combinations of algorithms that perform specific generalization steps based on constraints
- constraints - defined in Data Dictionary, read by operators during workflow process
Constraints Driven

Data Dictionary

Task

Workflow

When it comes to automation, no one comes closer to 100% - ©2013 Axes Systems - www.axes-systems.com
Incremental Updating

Data flow - first time generalization

Master Data → Import increment or axpand builds increment (all new features) → Derived map → Export derived data increment (optional)

Data flow - automated incremental updating

Updated master data → Import increment or axpand builds the increment → Updated map → Export derived data increment (optional)
Before Example AAA-DTK25 1:25K
Example AAA-DTK25 1:25K

When it comes to automation, no one comes closer to 100%  - ©2013 Axes Systems - www.axes-systems.com
Before Example AAA-DTK25 1:25K
After Example AAA-DTK25 1:25K

When it comes to automation, no one comes closer to 100% - ©2013 Axes Systems - www.axes-systems.com
Before Example AAA-DTK25 1:25K
Example AAA-DTK25 1:25K
Example AAA-DTK25 1:25K
After Example AAA-DTK25 1:25K
Example AAA-DTK25 1:25K
Example AAA-DTK25 1:25K

When it comes to automation, no one comes closer to 100%  - ©2013 Axes Systems - www.axes-systems.com
Example AAA-DTK25 1:25K
Example AAA-DTK25 1:25K
Examples AAA-DTK50 1:50K
Master DLM
Examples AAA-DTK50 1:50K

DLM50
Examples AAA-DTK50 1:50K

DCM50
Example AAA-DTK50 1:50K

Master DLM
Example AAA-DTK50 1:50K
Example AAA-DTK50 1:50K

DCM50
Generalize while Editing

Making interactive editing a breeze
Generalize while Editing

Watch the video http://www.youtube.com/watch?v=lP_b6gPnZUM
Generalize while Editing

- same set of constraints used
- Topology maintained
- feature relationship history
- stable UUID
axpand

Up-to-date AAA map and data products at all times

Thank you - Questions?

Website – axes-systems.com
a.mathur@axes-systems.com
YouTube – axpandrocks
Twitter - @axpand
LinkedIn Group - Automated map updating