The 7th Land Administration Domain Model Workshop

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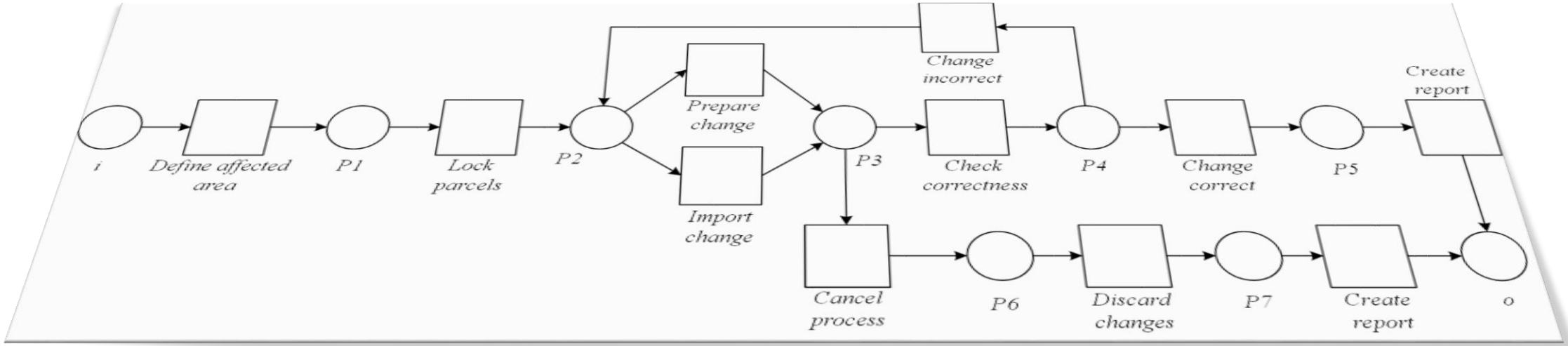

Application of workflow management system to the modelling of processes in land administration systems

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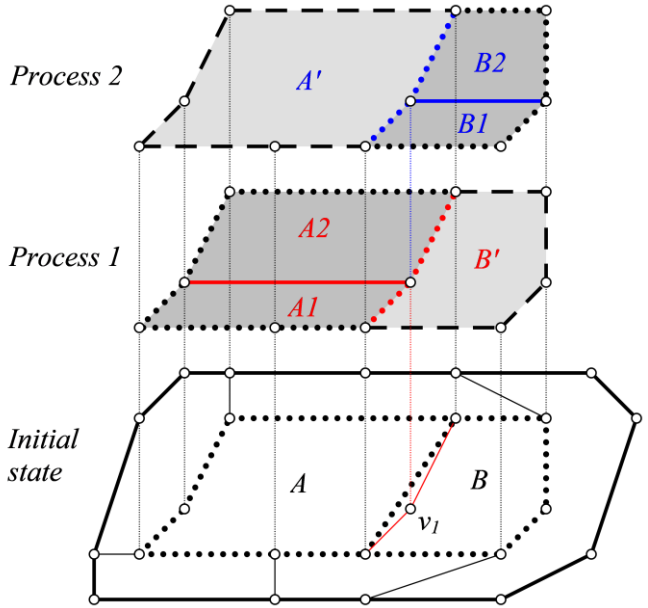
DEVELOPMENT OF MULTIPURPOSE LAND ADMINISTRATION SYSTEM

Background

- Efficiency – important in every administrative domain
  - Land administration as well
- WFMS -> efficient process management
- Transactional WFMS
  - Integration of transactional concepts
  - Ensuring consistency of data

Research idea

- Increase efficiency of land administration
  - Application of WFMS
  - Netherlands (van Osch and Lemmen, 2004)
  - Indonesia (Sari, 2010)
- Processes over spatial data are complex
- If spatial data are supported than non-spatial should be also
- Problem
  - Only a few papers for transactions/processes over spatial data



Research approach

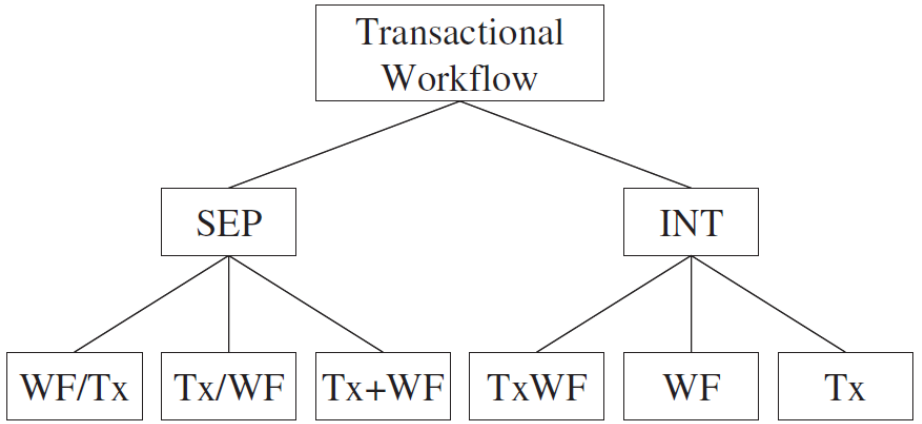
- Questions:
  - Can transactional WFMS be used to model processes over spatial component of LA data
  - How could LADM be extended to support processes using transactional WFMS
- Test case on polygon based cadastral parcels
- Conceptual data model of transactional WFMS

Workflow management system

- Result of need for more efficient and flexible process management
- Support for collaboration of users
- Support for heterogenous IT environments
  - Web services
  - Invoking applications
  - Executing SQL queries and DB procedures
  - Blockchain technology
- Disadvantages
  - Weak support for consistency and
  - Recovery in case of failure

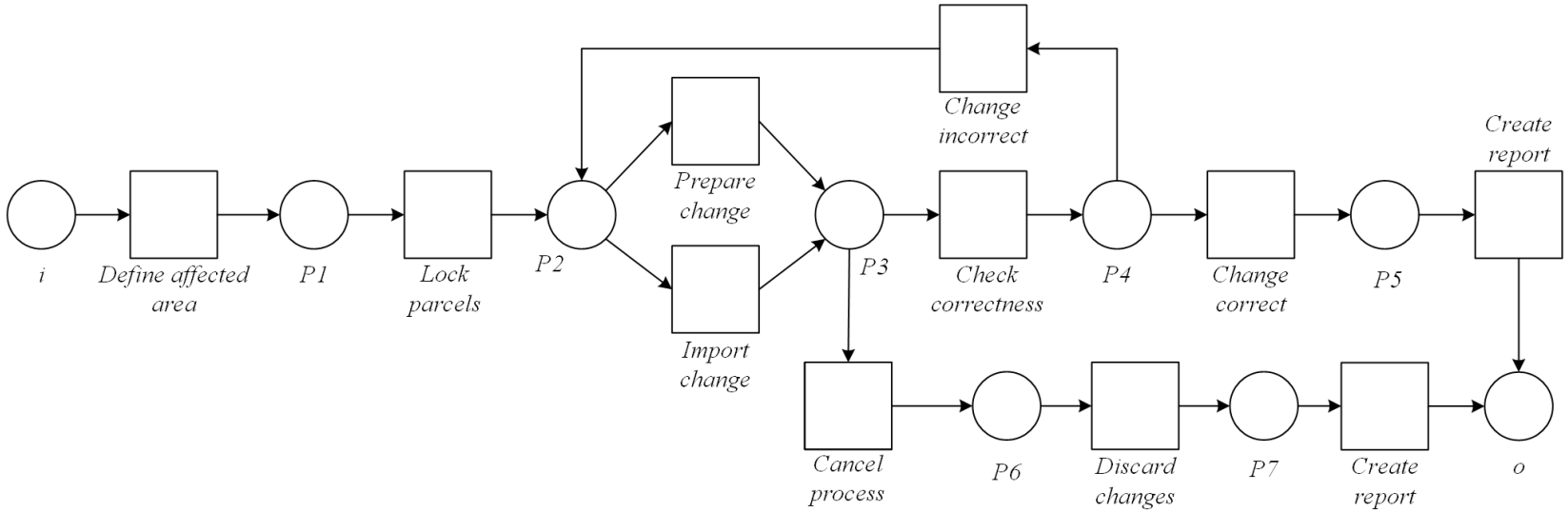
Transactional WFMS

- Overcome disadvantages of WFMS
- Integration of transactions and WFMS (Grefen & Vonk, 2006)
- Spatial WFMS
  - Weak or no support for transactional concepts
  - Complex collaborative operations on spatial data



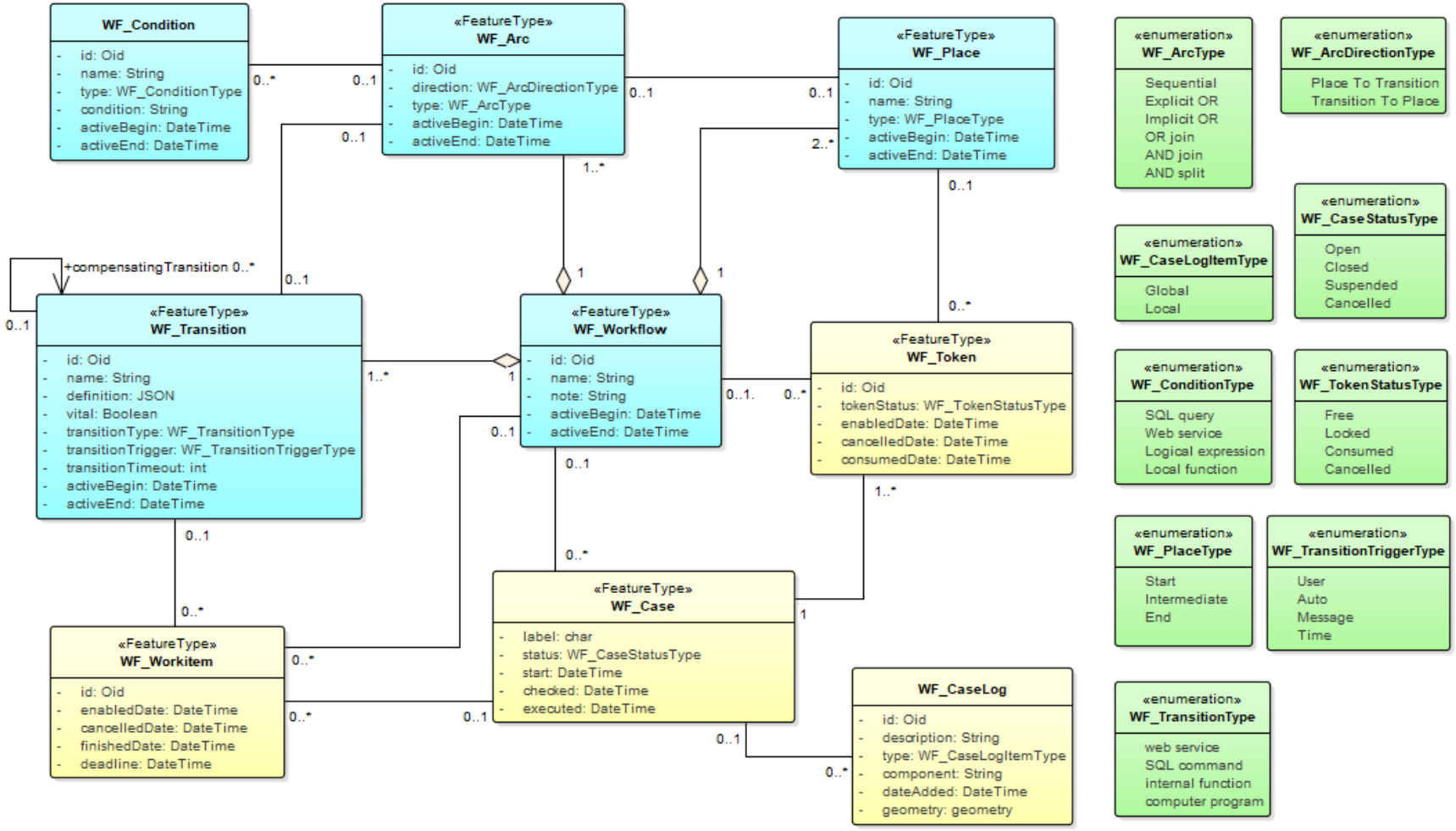
Modelling of processes

- Various notations
  - BPMN
  - UML AD
  - WF(Petri) nets



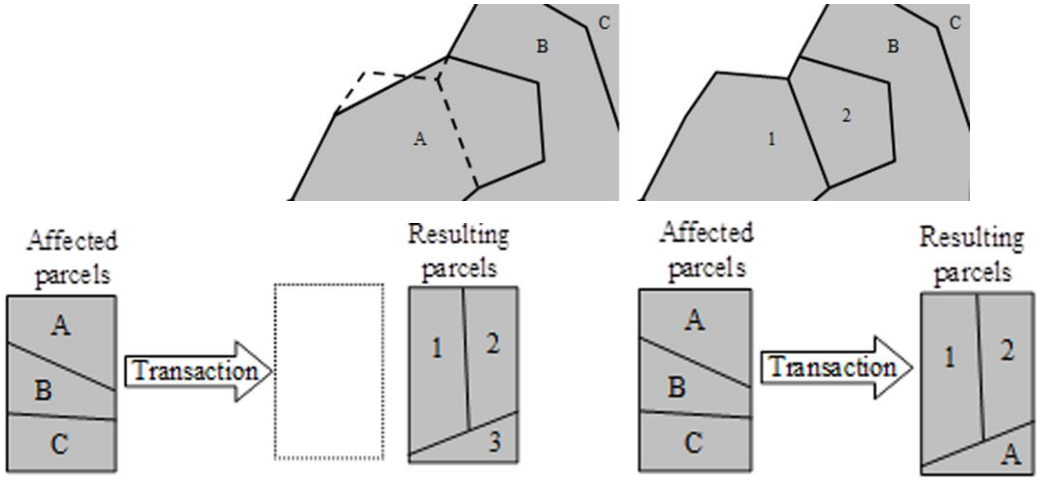
- Petri nets
  - Solid mathematical background
  - Simple notation

Generic conceptual model



Test case

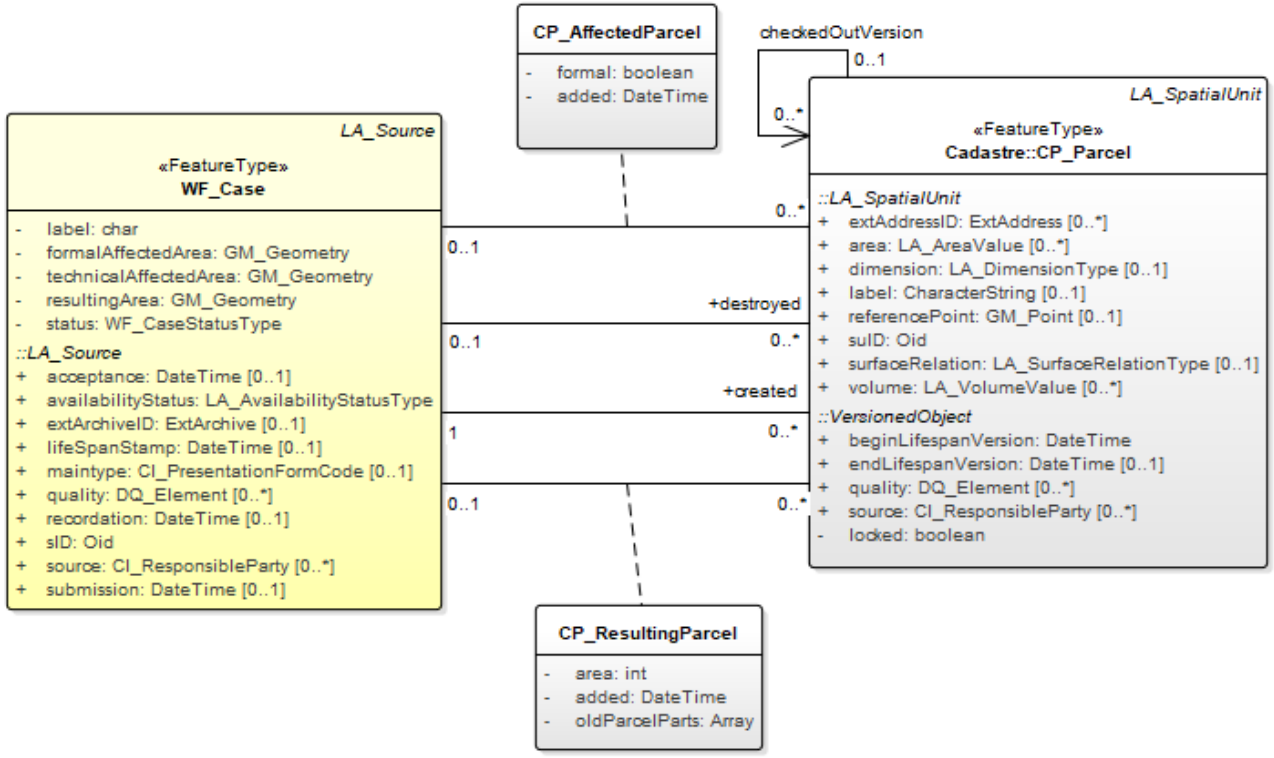
- Integrity constraints defined in
  Vranić, S., Matijević, H., & Roić, M. (2015). Modelling outsourceable transactions on polygon-based cadastral parcels. International Journal of Geographical Information Science, 29(3):454–474.
  - Transaction type
  - Planar partition
  - Parcel version overlapping



Combination	Affected	Resulting	Affected	Affected area constant resulting	Affected area variant resulting	Transaction
2 (3)	0	1..m		n/a	1	Geometry registration
4 (7)	1..n	0	A	n/a		Geometry deregistration
5	1	1	A	n/a	A	Geometry correction
5a	n	n	A B	A B	A B	Multi geometry correction
6a	1	m	A	1 2 3	1 2 3	Splitting
6b	1	m	A	A 2 3	A 2 3	Deduction
8a	n	1	A B	1	1	Joining
8b	n	1	A B	A	A	Annexation
9	n	m	A B	1 2 3	1 2 3	Reallocation

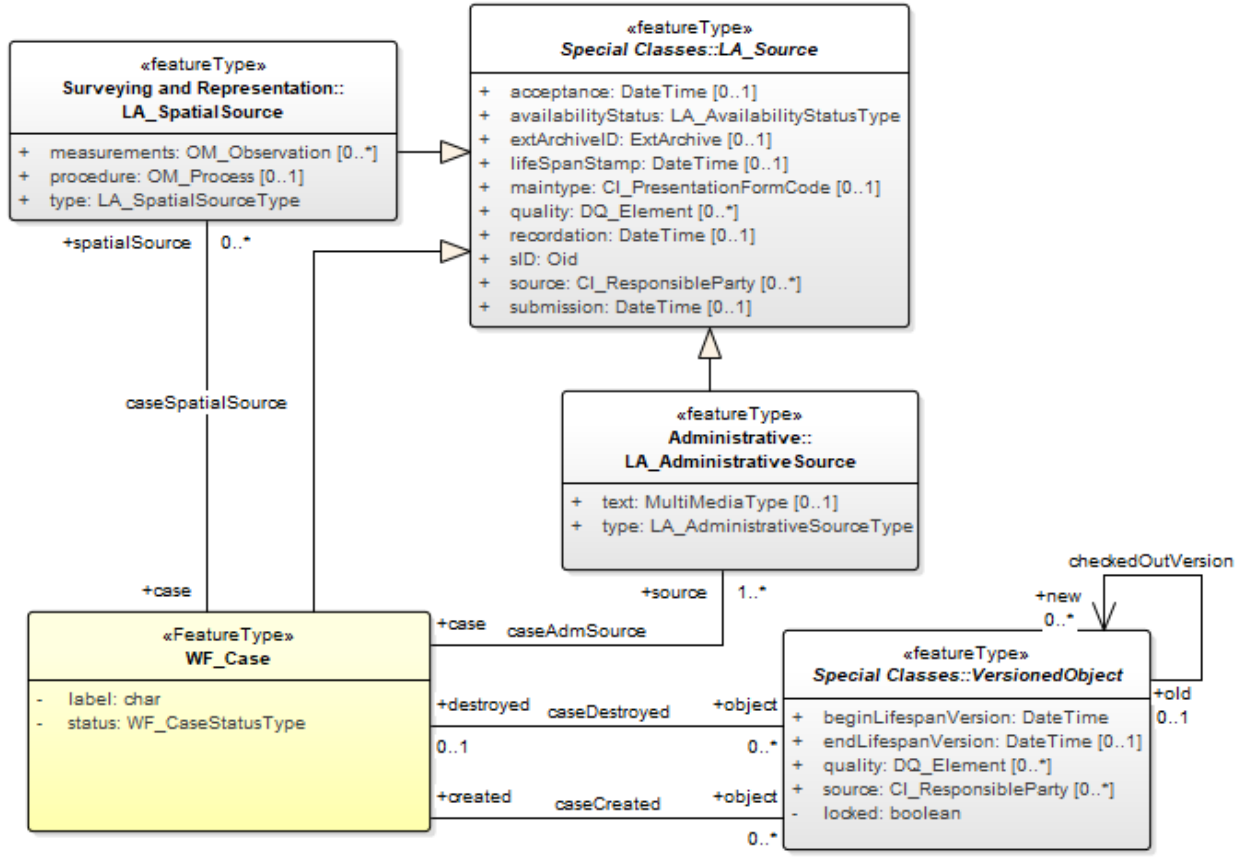
Support for spatial component of parcels

- Spatial definition of affected area
- Ensuring geometric and topological correctness
  - Integrity constraints from (Vranić et al., 2015)
- Ensuring serializability
  - Pessimistic manner
  - Locking parcels in the affected area



Integration of WFMS to LADM

- Case is descendant of a source
- Relationships to other descendants
  - LA_AdministrativeSource
  - LA_SpatialSource
- Reflexive relationship
  - checkedOutVersion
- Double relationship
  - caseCreated
  - caseDestroyed
  - With single update, status of all affected objects is changed



Conclusion

- Processes on polygon-based cadastral parcels can be modelled
- Transactional WFMS can ensure consistency
  - Application of ACID properties on a process level
  - Application of integrity constraints for spatial component
- Transactional WFMS can be integrated into LADM
  - General associations WF_Case <-> VersionedObject
  - Associations WF_Case <-> CP_Parcel
- Other approaches were tested
  - Optimistic
  - Altruistic

Further research

- Support for other spatial data structures such as topological
- Application of other (than ACID) correctness criteria
  - Such as relaxation of atomicity

Thank you. Questions?