Data quality from a producer's perspective

Dolors Barrot & Maria Pla

Dolors.barrot@icgc.cat

Maria.pla@icgc.cat

ICGC
Institut
Cartogràfic i Geològic
de Catalunya

Generalitat
de Catalunya

Contents

- Context
- Quality information
  - Collected data
  - Examples
  - Management

Context

The organization

Institut Cartogràfic i Geològic de Catalunya (ICGC)

- ***Catalan Geoinformation Agency*** *and reference public service for the application of geo-scientific knowledge (Government of Catalonia).*
- ***Aim:*** *Deliver to users valued geographic and geological information and services . [free]*
- Creation: 2014
- Merger of 2 Orgs.: ICC (1982) + IGC (2005)
- Employees: 274 (April 2017)
- Location: Barcelona, Tremp

Institutional and commercial activities

Multidisciplinary knowledge fields

- Geodesy, Geomatics, Cartography, SDI, Geology, Geophysics

Context

Key products (I)

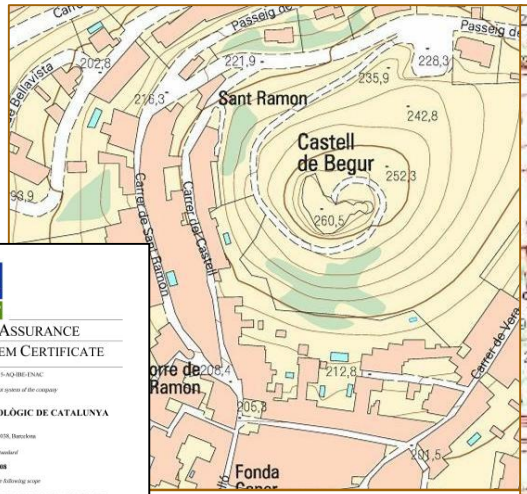
- **Vector data**
  - Topographic databases

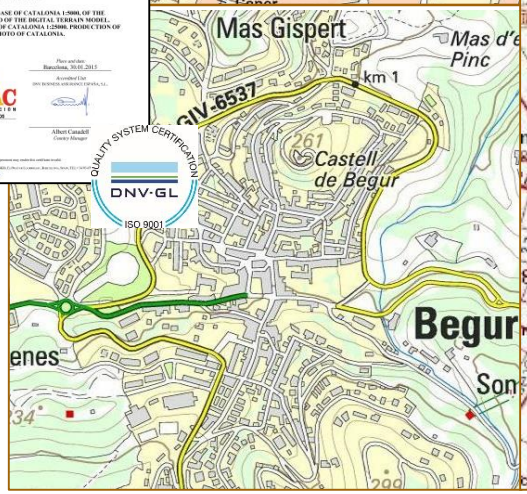
    1: 25000 (ISO 2009)

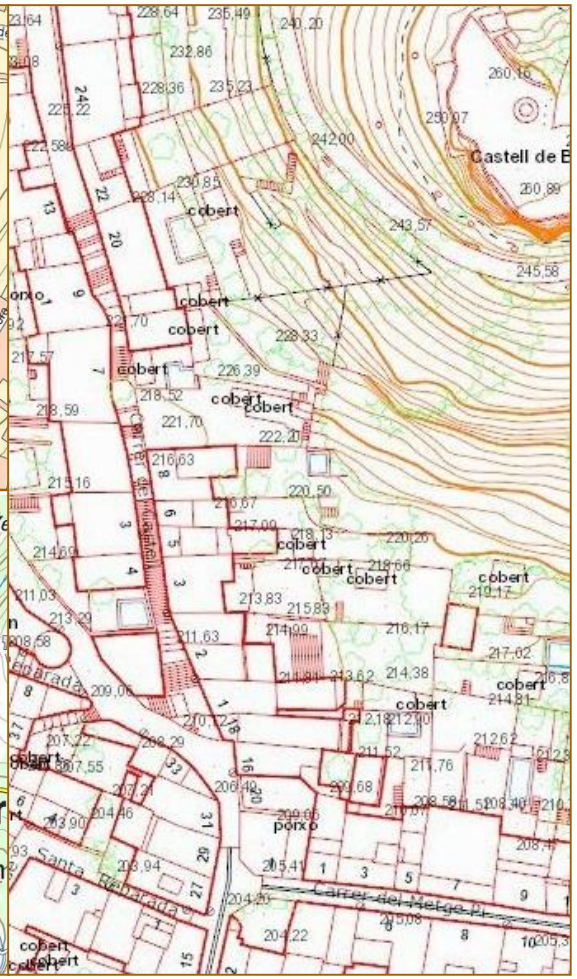
    1: 5000 (ISO 2006)

    1: 1000


DNV
DNV BUSINESS ASSURANCE
MANAGEMENT SYSTEM CERTIFICATE
INSTITUT CARTOGRÀFIC I GEOLÒGIC DE CATALUNYA
ISO 9001:2008
ENAC
DNV·GL
ISO 9001







Context

Key products (II)

- **Vector data**
  - Thematic databases

    Street & Address database
- **Raster data**
  - Orthoimagery (2012)


DNV

DNV BUSINESS ASSURANCE

MANAGEMENT SYSTEM CERTIFICATE

INSTITUT CARTOGRÀFIC I GEOLÒGIC DE CATALUNYA

ISO 9001:2008

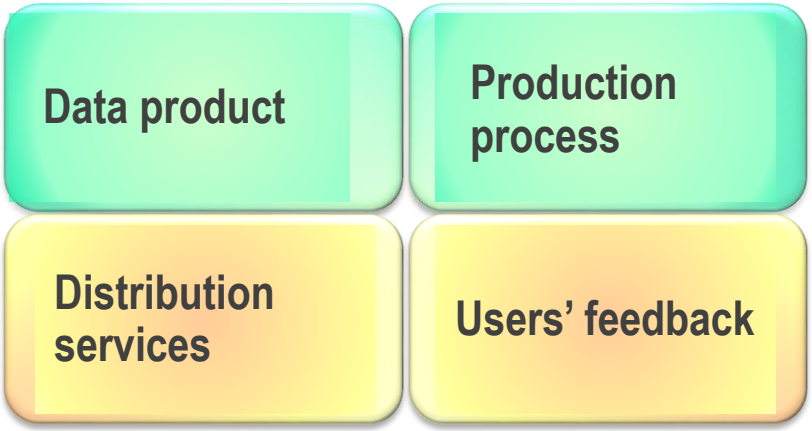
PRODUCTION OF THE TOPOGRAPHIC DATABASE OF CATALONIA 1:5000, OF THE TOPOGRAPHIC MAP OF CATALONIA 1:5000 AND OF THE DIGITAL TERRAIN MODEL. PRODUCTION OF THE TOPOGRAPHIC DATABASE OF CATALONIA 1:25000. PRODUCTION OF THE CONVENTIONAL ORTHOPHOTO OF CATALONIA.

ENAC CERTIFICACIÓN

QUALITY SYSTEM CERTIFICATION DNV·GL ISO 9001

Quality information

- Information collected to have a better knowledge of

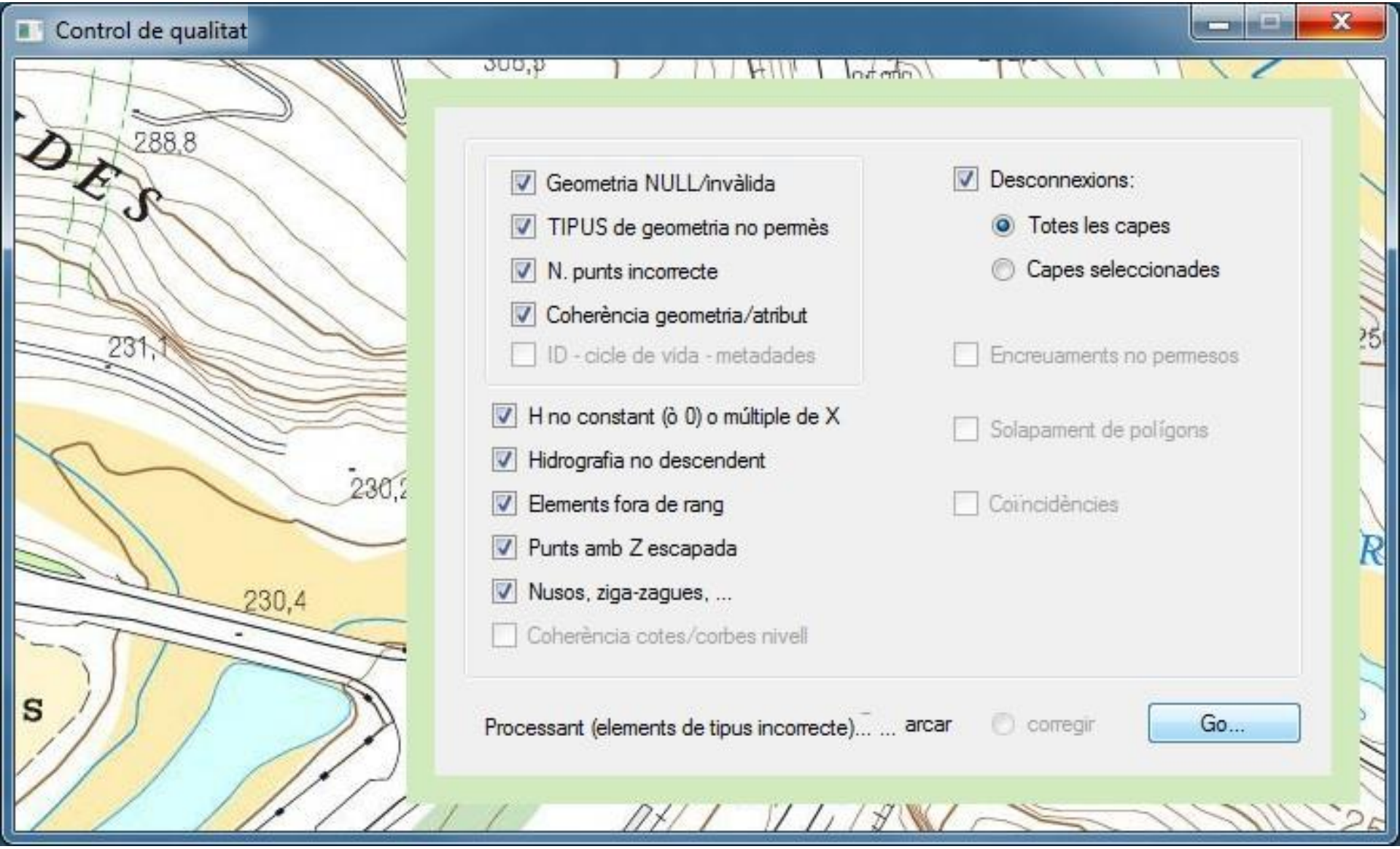


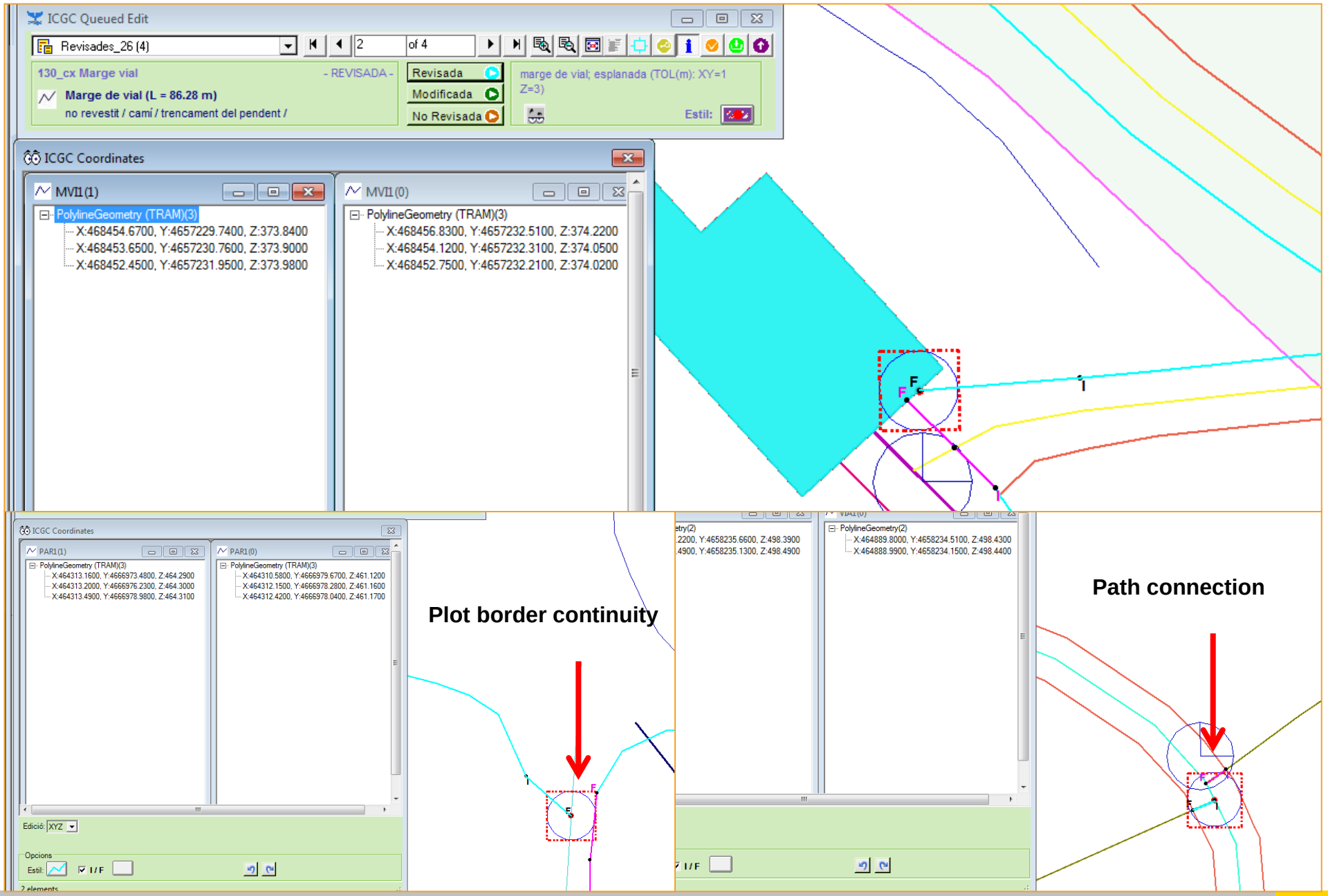
- Management

Data product

Conformity to specifications

- Topographic database (I)
  - Control by design : 0 errors
    - Domain consistency
      - Full control on feature catalogue: feature classes, authorized attribute combination, attributes domain, geometries, …
    - Conceptual consistency
      - Data capture with tools designed to ensure the minimum sizes and minimum distances between elements
  - Semi-automatic controls to warranty the logical consistency rules
    - Topological and conceptual consistency: false positives and, occasionally some error
      - Full control of topological rules and altimetry consistency between elements
      - A registry is created for each false positives and error


Control de qualitat
288,8
231,1
230,4
Geometria NULL/invàlida
TIPUS de geometria no permès
N. punts incorrecte
Coherència geometria/atribut
ID - cicle de vida - metadades
H no constant (ò 0) o múltiple de X
Hidrografia no descendent
Elements fora de rang
Punts amb Z escapada
Nusos, ziga-zagues, ...
Coherència cotes/corbes nivell
Desconnexions:
Totes les capes
Capes seleccionades
Encreuaments no permesos
Solapament de polígons
Coïncidències
Processant (elements de tipus incorrecte)... ... arcar
corregir
Go...

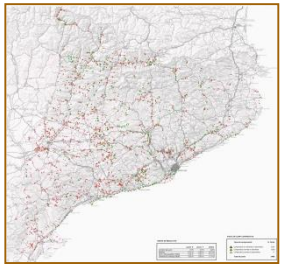

ICGC Queued Edit
Revisades_26 (4)
2
of 4
130_cx Marge vial
- REVISADA -
Marge de vial (L = 86.28 m)
no revestit / camí / trencament del pendent /
Revisada
Modificada
No Revisada
marge de vial; esplanada (TOL(m): XY=1 Z=3)
Estil:
ICGC Coordinates
MVI1(1)
PolylineGeometry (TRAM)(3)
X:468454.6700, Y:4657229.7400, Z:373.8400
X:468453.6500, Y:4657230.7600, Z:373.9000
X:468452.4500, Y:4657231.9500, Z:373.9800
MVI1(0)
PolylineGeometry (TRAM)(3)
X:468456.8300, Y:4657232.5100, Z:374.2200
X:468454.1200, Y:4657232.3100, Z:374.0500
X:468452.7500, Y:4657232.2100, Z:374.0200
F
I
ICGC Coordinates
PAR1(1)
PolylineGeometry (TRAM)(3)
X:464313.1600, Y:4666973.4800, Z:464.2900
X:464313.2000, Y:4666976.2300, Z:464.3000
X:464313.4900, Y:4666978.9800, Z:464.3100
PAR1(0)
PolylineGeometry (TRAM)(3)
X:464310.5800, Y:4666979.6700, Z:461.1200
X:464312.1500, Y:4666978.2800, Z:461.1600
X:464312.4200, Y:4666978.0400, Z:461.1700
Edició:
XYZ
Opcions
Estil:
I / F
2 elements
Plot border continuity
PolylineGeometry(2)
X:464889.8000, Y:4658234.5100, Z:498.4300
X:464888.9900, Y:4658234.1500, Z:498.4400
Path connection

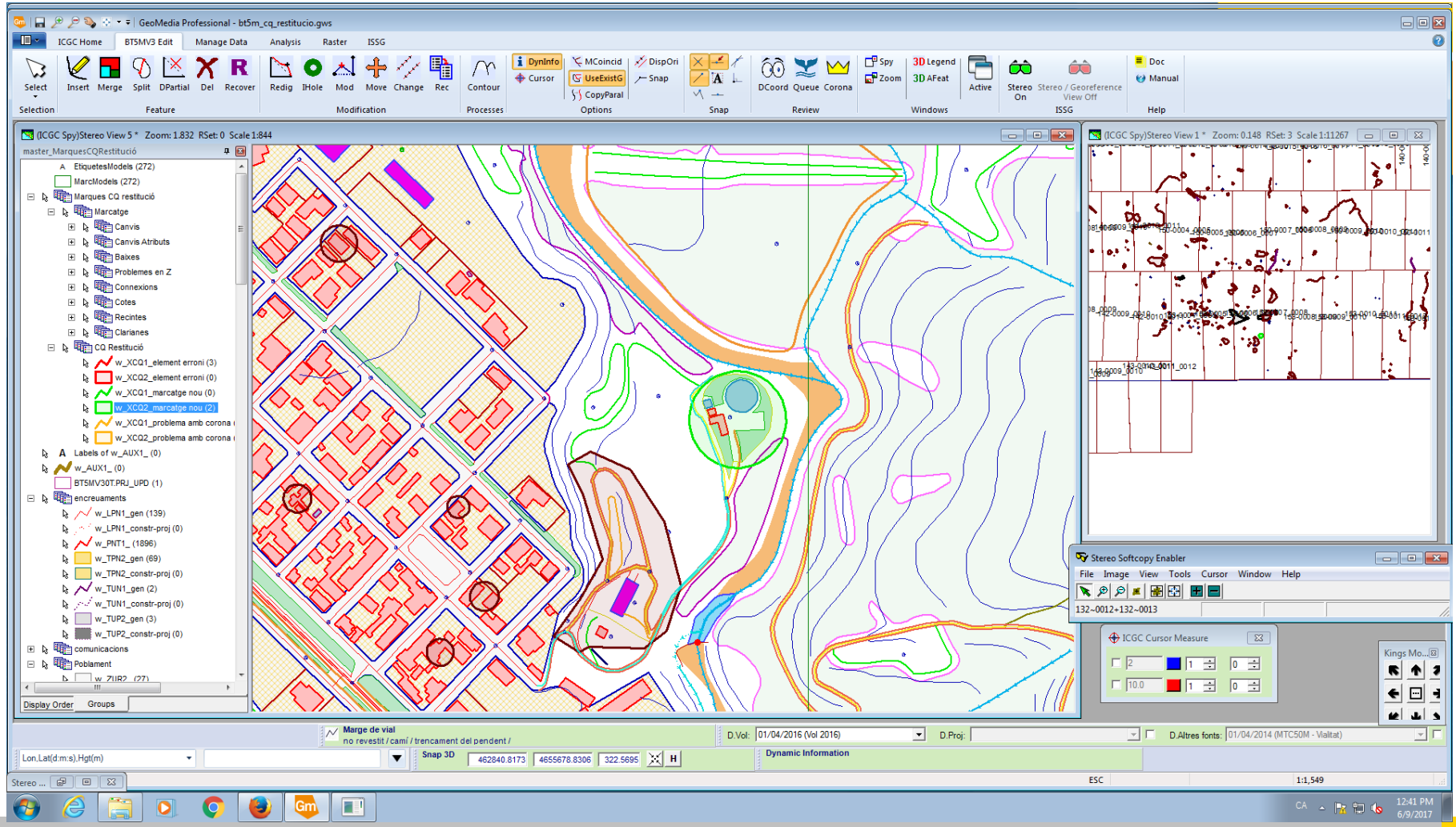
Data product

Conformity to specifications

- Topographic database (II)
  - Manual control: Visual inspection by sampling
    - Completeness and thematic accuracy
      - Around the 40% of the data is inspected in order to mark omissions, commissions and misinterpretations. The correction of errors is decided taking into account the error importance, the degree of complexity of the area, and the available resources.
      - The sample varies depending on the zone characteristics and the experience of the operator.
  - Manual control: positional check
    - Horizontal and vertical accuracy:
      - Annually, a set of points coming from the field points database is measured in the updated topographic data and a new global RMS is calculated.

Examples




GeoMedia Professional - bt5m_cq_restitucio.gws
(ICGC Spy)Stereo View 5 * Zoom: 1.832 RSet: 0 Scale 1:844
(ICGC Spy)Stereo View 1 * Zoom: 0.148 RSet: 3 Scale 1:11267
Stereo Softcopy Enabler
ICGC Cursor Measure
Marge de vial
no revestit / camí / trencament del pendent /
Dynamic Information

Data product

Conformity to specifications

- Topographic data

Quality	Sampling	By design	Semi-automatic controls	Manual controls	Non conformities
Completeness	40%			X	Yes
Logical consistency	100%	X	X		No
Positional accuracy				X	Yes
Thematic accuracy	40%			X	Yes
Temporal quality		X			No

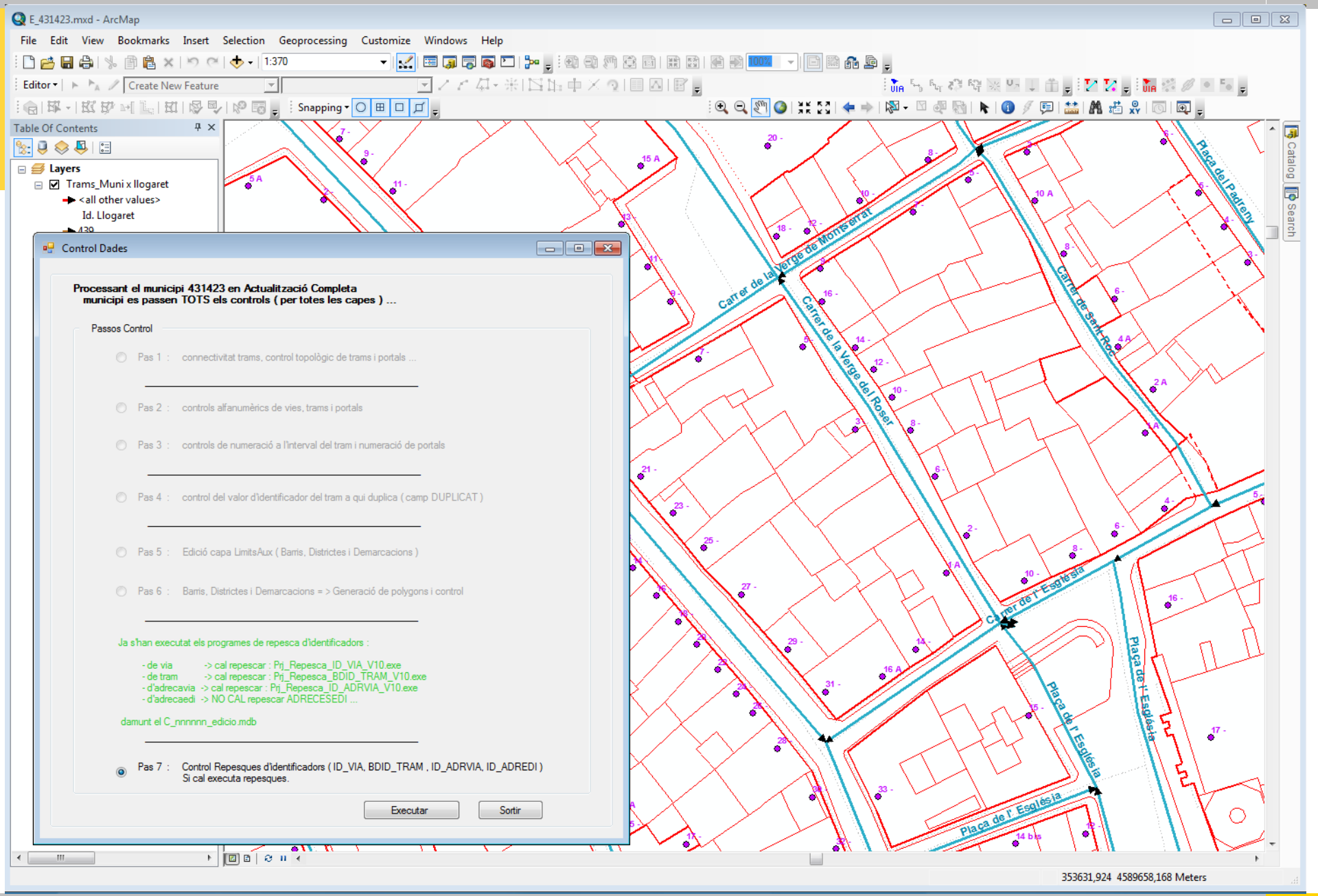
Management

- Internally
  - Refinement of production specifications
    - More accurate descriptions reducing ambiguities,
    - Harmonization criteria
  - Procedures refinement
    - Development of tools increasing the robustness of procedures
  - Operators' training
- Externally
  - Quality chapter in the data product specifications with measures and conformance level.
  - Tests results reported in metadata

Data product

Conformity to specifications

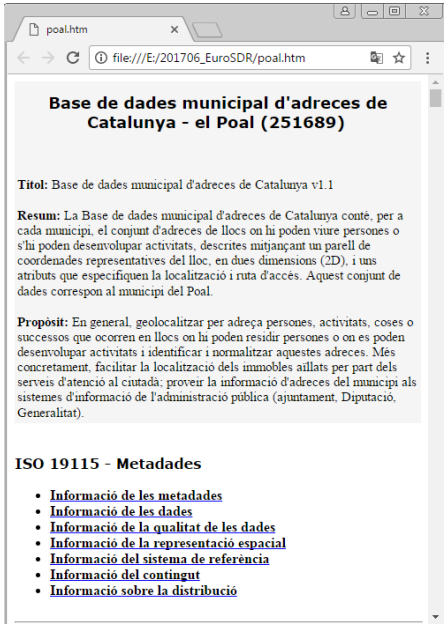
- Thematic database (Street & Address database)
  - Control by design : 0 errors
    - Domain consistency
      - Full control on feature catalogue: feature classes, authorized attribute combination, attributes domain, geometries, …
  - Semi-automatic controls to warranty the logical consistency rules
    - Topological and conceptual consistency: false positives and some errors
      - Full control of topological and conceptual rules: connectivity, consistency of street names.
      - A registry is created for each false positives and errors.
    - Completeness by comparison with other sources
      - Full control against the Street catalogue of National Institute of Statistics
      - Some municipalities against the Municipal Census Population…)


E_431423.mxd - ArcMap
File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
Table Of Contents
Layers
Trams_Muni x llogaret
<all other values>
Id. Llogaret
Control Dades
Processant el municipi 431423 en Actualització Completa
municipi es passen TOTS els controls (per totes les capes) ...
Passos Control
Pas 1 : connectivitat trams, control topològic de trams i portals ...
Pas 2 : controls alfanumèrics de vies, trams i portals
Pas 3 : controls de numeració a l'interval del tram i numeració de portals
Pas 4 : control del valor d'identificador del tram a qui duplica (camp DUPLICAT)
Pas 5 : Edició capa LimitsAux (Barris, Districtes i Demarcacions)
Pas 6 : Barris, Districtes i Demarcacions = > Generació de polygons i control
Ja s'han executat els programes de repesca d'identificadors :
- de via -> cal repescar : Prj_Repesca_ID_VIA_V10.exe
- de tram -> cal repescar : Prj_Repesca_BDID_TRAM_V10.exe
- d'adrecavia -> cal repescar : Prj_Repesca_ID_ADRVIA_V10.exe
- d'adrecaedi -> NO CAL repescar ADRECESEDI ...
damunt el C_nnnnnn_edicio.mdb
Pas 7 : Control Repesques d'identificadors (ID_VIA, BDID_TRAM , ID_ADRVIA, ID_ADREDI)
Si cal executa repesques.
Executar
Sortir
Carrer de la Verge de Montserrat
Carrer de la Verge del Roser
Carrer de Sant Roc
Carrer de l' Església
Plaça de l' Església
Plaça del Padreny
353631,924 4589658,168 Meters

Management

Quality chapter of the specifications

Metadata file



Data product

Conformity to specifications

- Orthoimages (I)
  - Semi-automatic controls to warranty the logical consistency rules
    - Radiometric rules: radiometric continuity, spectral quality (dynamic range, saturation)
    - Geometric rules: geometric continuity, pixel size, coverage
  - Semi-automatic and manual controls to check positional accuracy
    - By correlation of orthoimages with images of points coming from the field points database
      - Statistics are calculated per project (year of photogrammetric flight).
    - Comparison with a more accurate dataset
  - Manual control: Visual inspection
    - Completeness and thematic accuracy
      - Full inspection in order to mark artefacts (omissions, commissio
      - The marked errors are corrected according to their size and distr resources.

Examples

Continuity

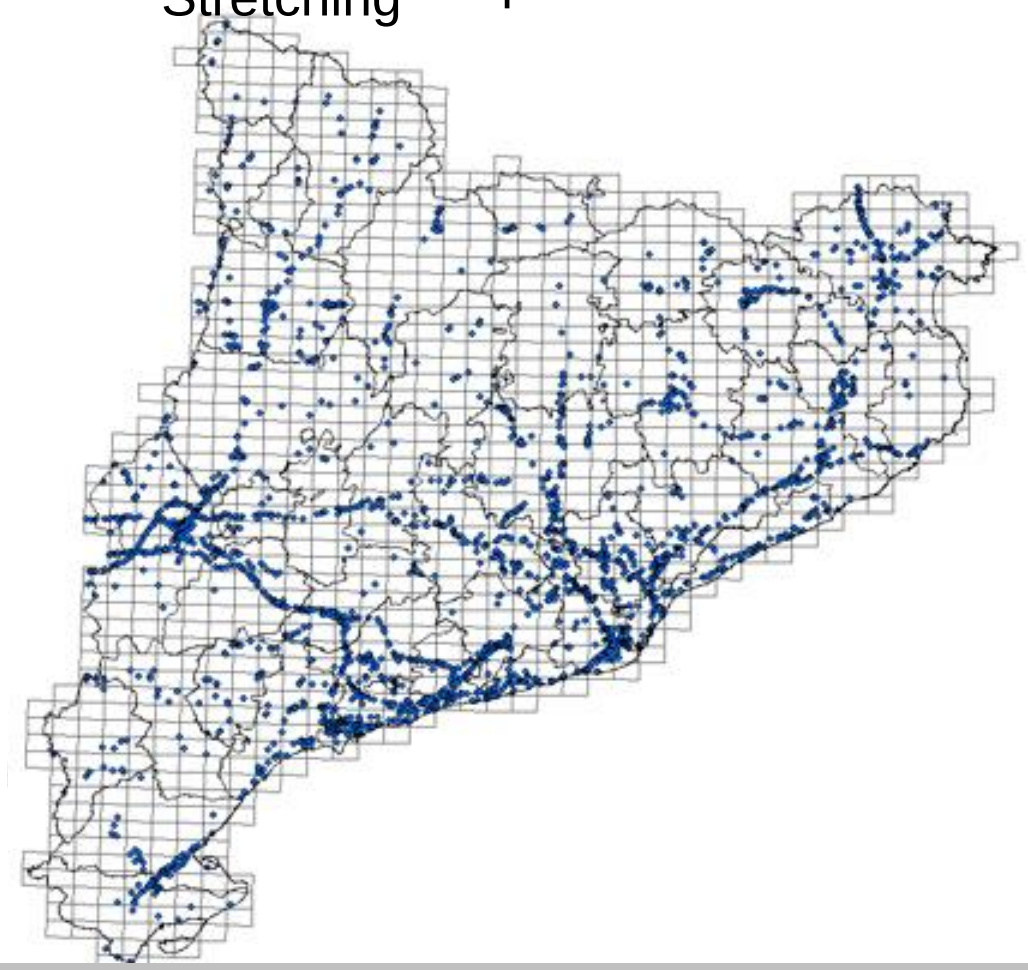
Spectral quality

Artefacts

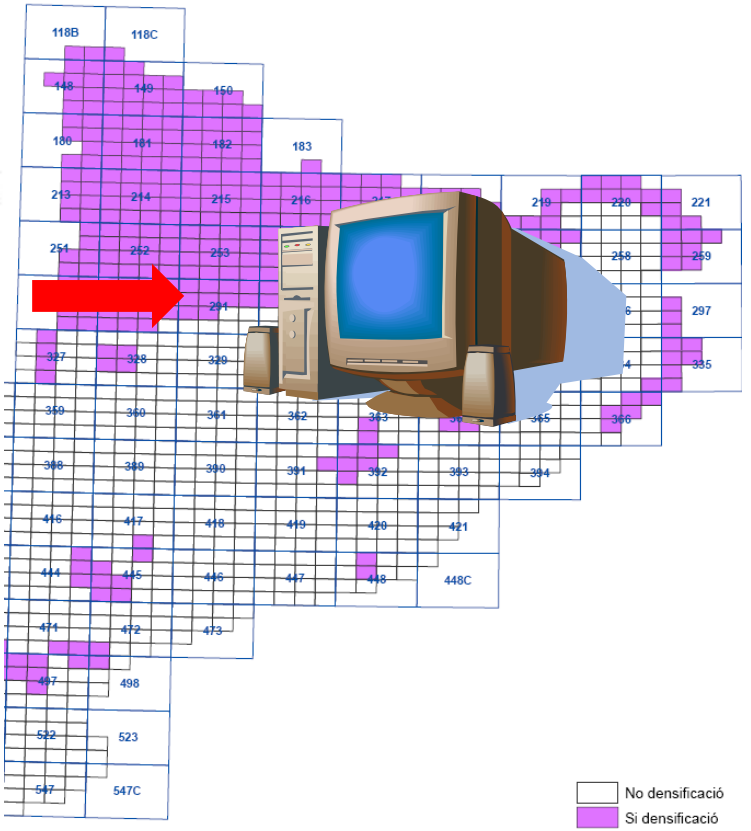
Color Patch		**CP**
Fly Patch		**FP**
Saturation		**SA**
Blooming	Water	**B_W**
	Land	**B_L**
No Data	Boundary	**ND_B**
	Inside	**ND_I**
Streching	Vegetation	**ST_V**
	Stone	**ST_S**
	Land	**ST_L**
Duplication		**DU**
Serrated		**SR**
Deformation		**DE**
Seamline	Water	**SL_W**
	Vegetation	**SL_V**
	Land	**SL_L**
	Building	**SL_B**
	Asphalt	**SL_A**
	Shadow	**SL_S**
Other		**O**

Management

Serrated & Duplications Stretching



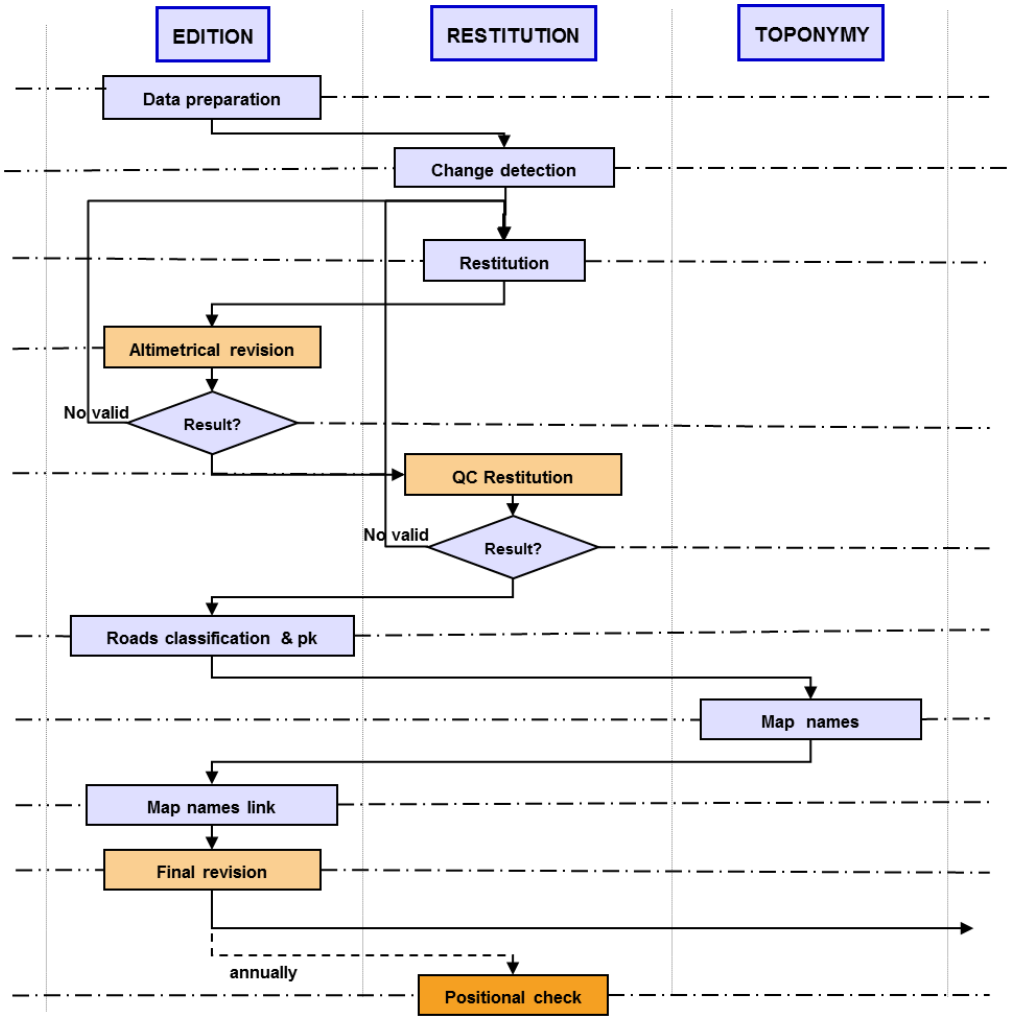
Flight densification



Data production

- Product conformity
- Monitor the production process
  - Ha/week at each process step
    - Zones of grade of difficulty
    - Operators capability
- Detect opportunities of improvement
  - Updating strategy

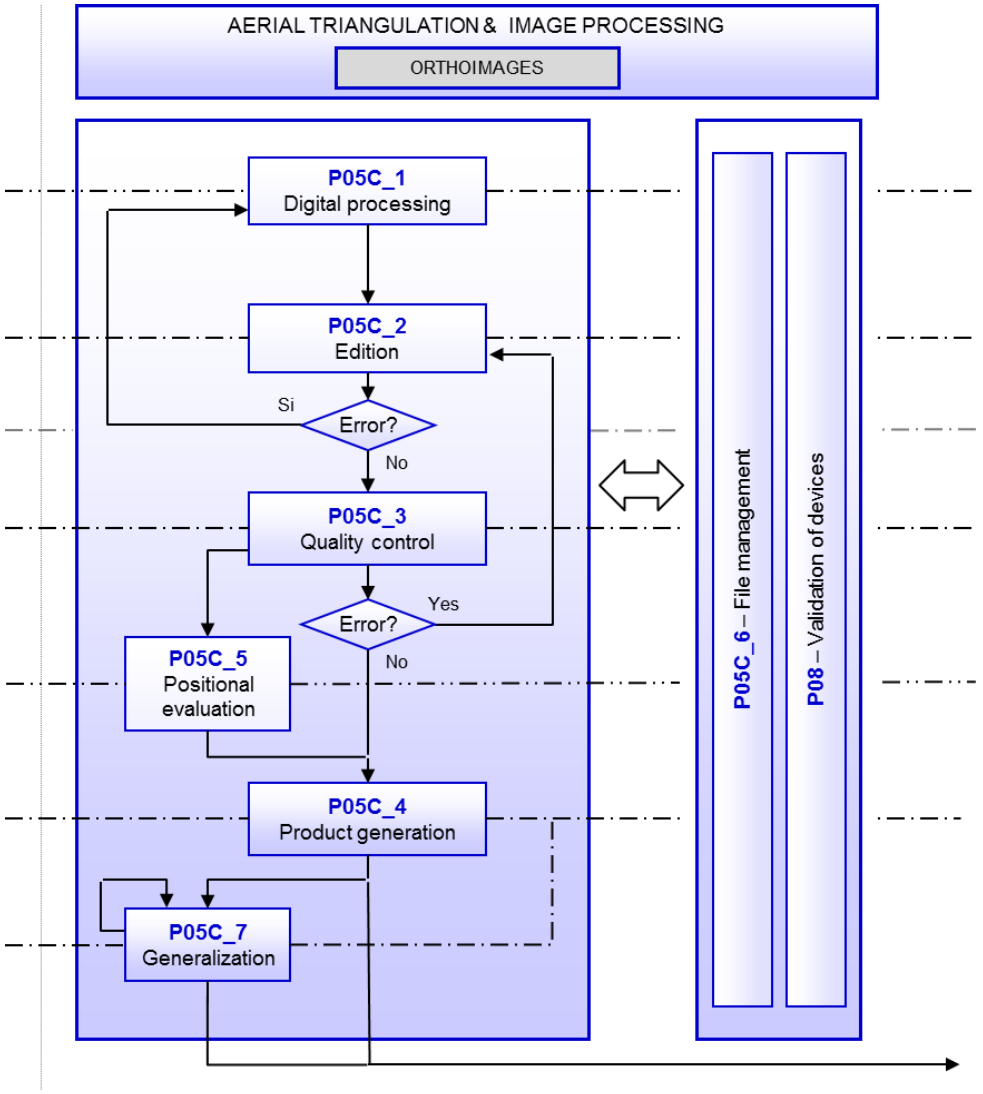
Efficiency of production flow



Data production

- Product conformity
- Monitor the production process
  - #item/time at each process step
    - Software capabilities
- Detect opportunities of improvement
  - Bottlenecks

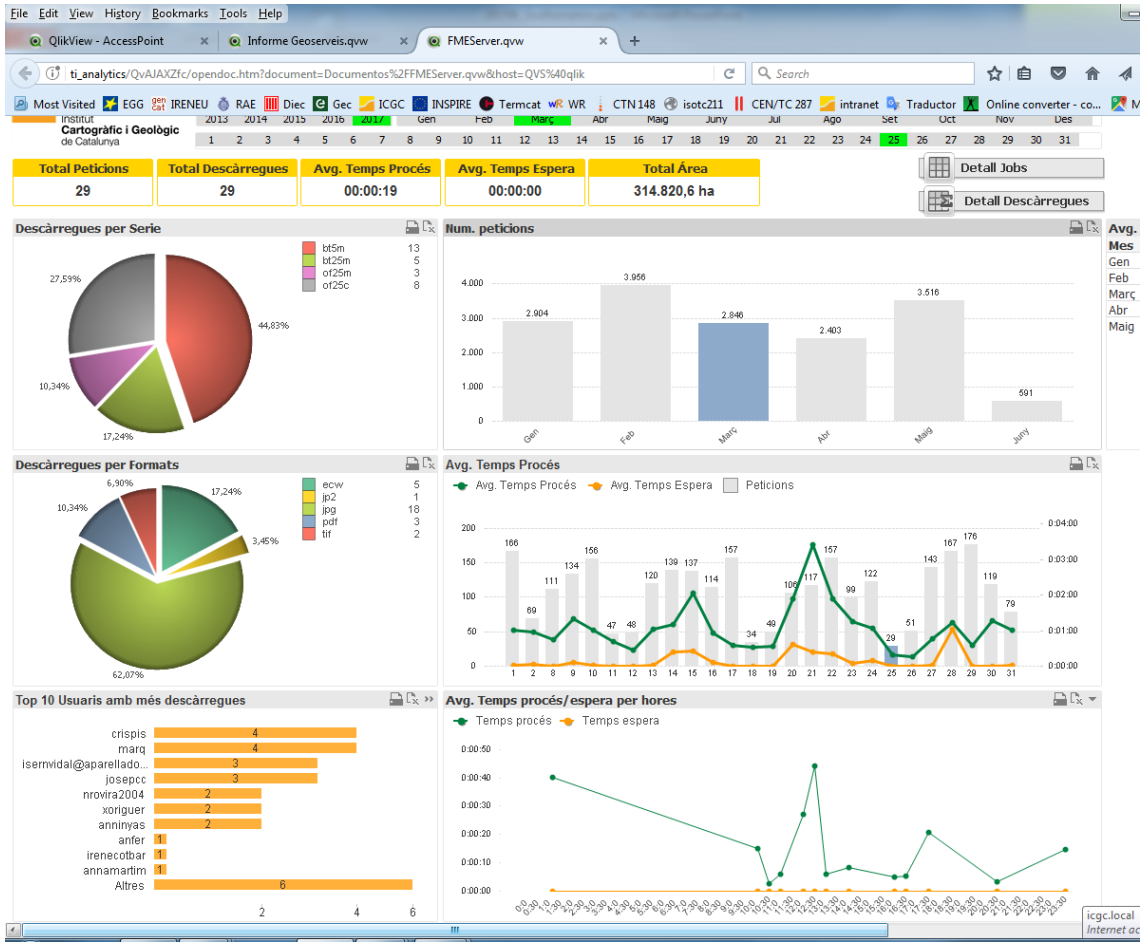
Efficiency of production flow



Data distribution

Set the SLA & its compliance

- Monitor distribution and delivery
  - File shared services, web services, geoservices
    - Availability (user perspective)
      - Services and data servers
  - Web services, geoservices
    - Capacity test (1000 users/mn)
      - Before publishing or technological changes
    - Performance
      - Elapsed time

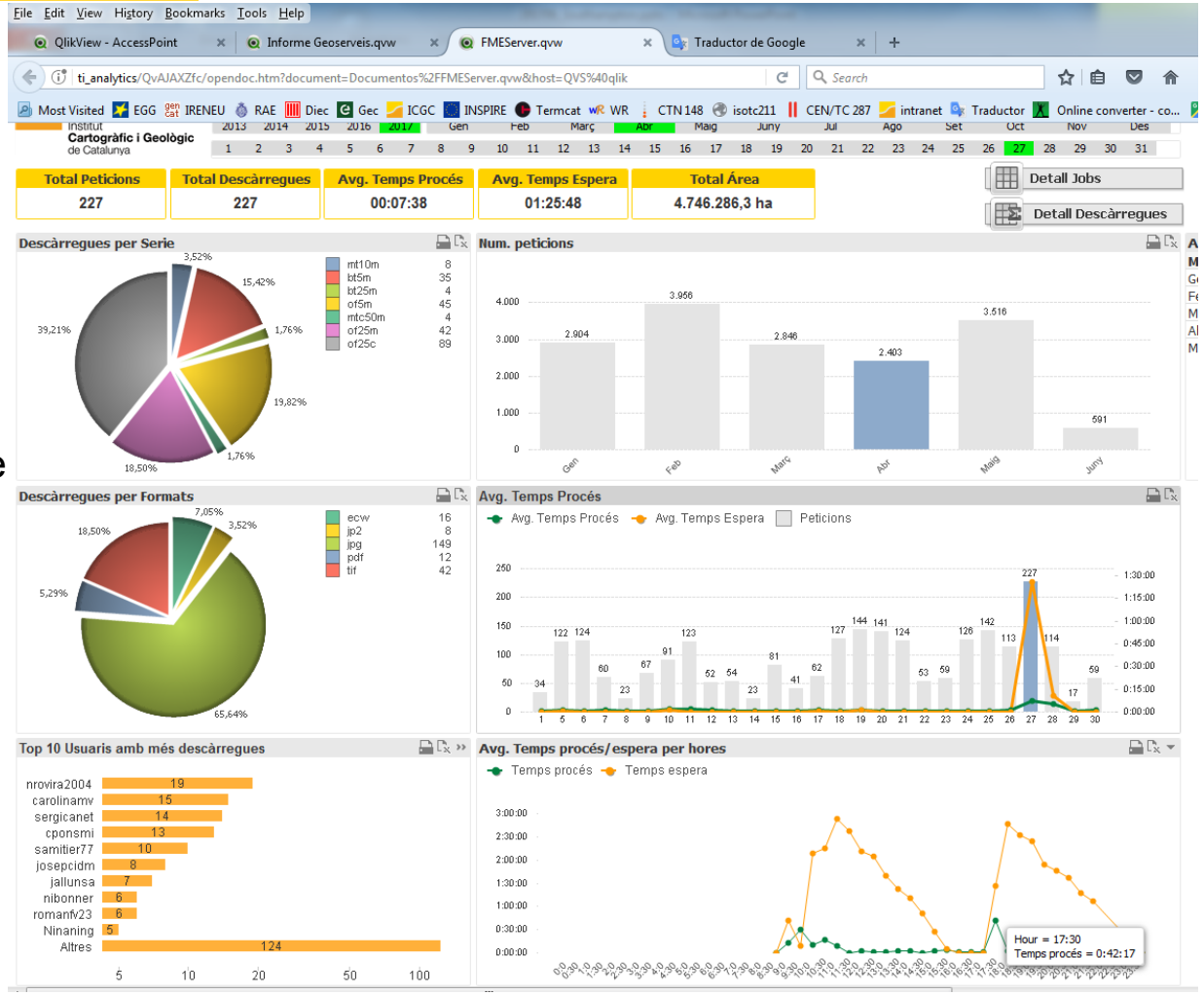


Data distribution

Set the SLA & its compliance

- Web applications
  - Performance
    - Elapsed and CPU time

- Detect proactive measures
  - Reduce users' waiting time
    - Filters, use limitations
  - Increase service capacity
    - Bottlenecks



Users' feedback

Perceived quality

- Specific users
  - Agreements with Institutional users
    - Street & Address database
      - Autonomous police consults 85,000 addresses per month and the average of failures is around 40 which means a 0.05%
- Webmaster
  - Complaints' analysis
    - Non conformities
    - New requirements
    - No errors

Users' feedback

Perceived quality

First term 2017

Quality / Subject	Data product	Production process	Distribution services	New requirement	Other	
Map names	50			5		Name, placement
Street names	10					
DTM			2			
Topographic data	10		1			Completeness, classification
Orthoimages			3			Availability
Web services	1		8	1	4	Availability, speed
File shared serv.	2					Format
Geoservices	1		2			Speed

Management

- Complaints analysis
  - Number of complaints is not enough to evaluate the usability
- Proactive measures
  - 2015-2016 Call for technicians of the Departments of the Catalan Government
    - 30 meetings with 8-10 users or potential users of the data provided by the ICGC to listened to the problems using ICGC data, know their needs and present them ICGC products and services.
  - 2017 Call for technicians of GIS enterprises working for the Catalan administration

Thank you

Institut Cartogràfic i Geològic de Catalunya

Parc de Montjuïc,
E-08038 Barcelona

41º22’12” N, 2º09’20” E (ETRS89)

www.icgc.cat
icgc@icgc.cat
twitter.com/ICGCat
facebook.com/ICGCat

Tel. (+34) 93 567 15 00
Fax (+34) 93 567 15 67