Automatic Quality Control in the New production environment using ArcGIS

Gonzalo Moreno Vergara

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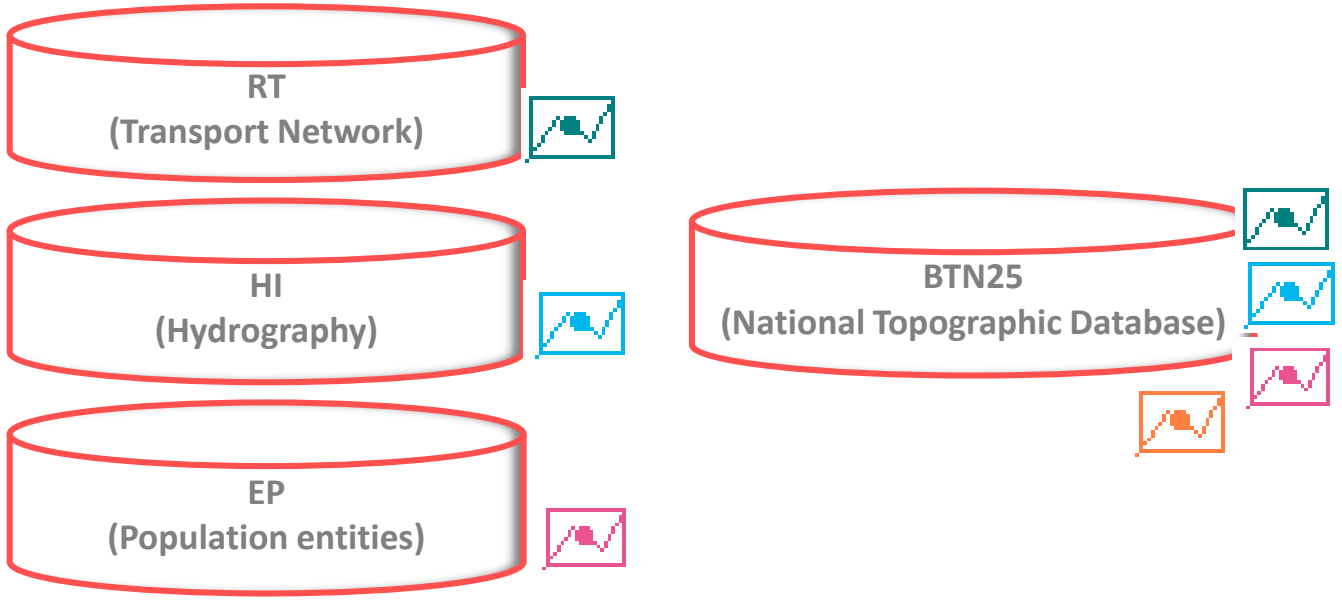
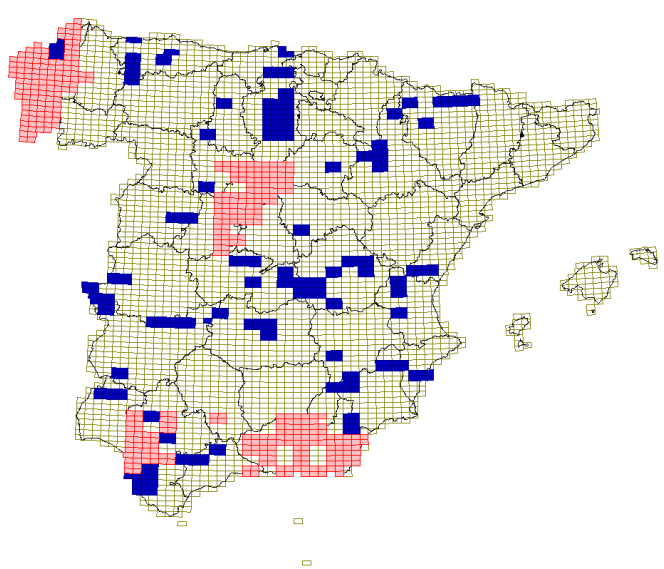
- BDIG program
  - Changes detection
  - Work orders management
  - BDIG environment (with ArcGIS)
  - BDIG environment. Databases
- Main workflow
- Consistency rules. Possibilities to automate
- Consistency rules. Solution applied
- Error management

Changing the update process

Current production

- Different environments
- Geometries duplicated
- Updates by themes
- Updates by blocks





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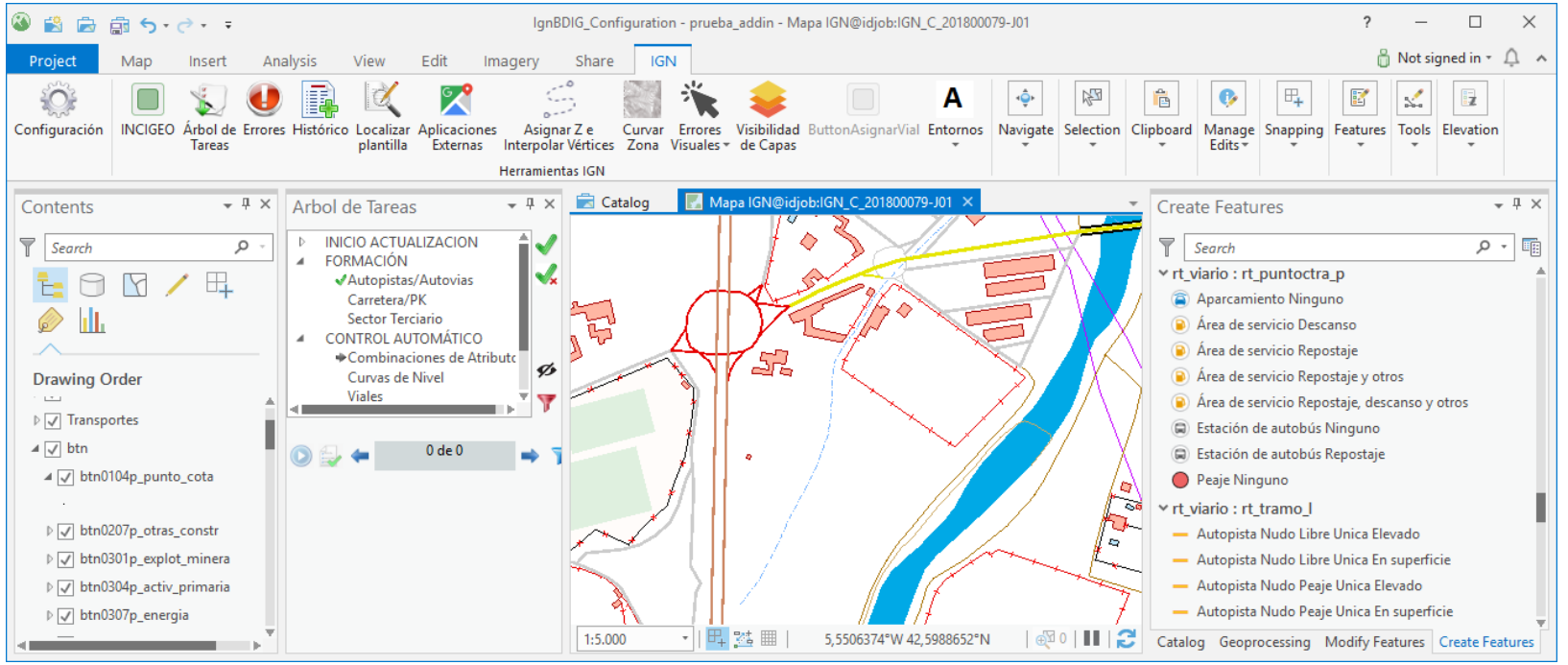
Future Production

- **One production environment**



Changing the update process

Current production

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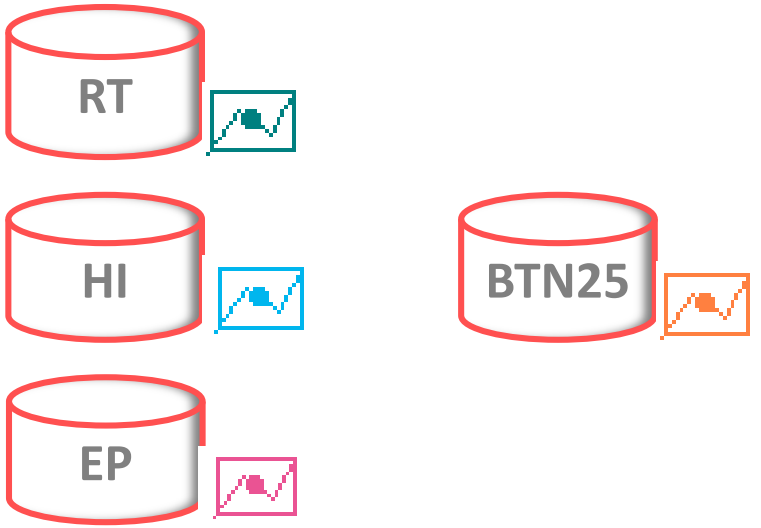
- Updates by blocks

Future Production

- One production environment
- **One geometry**



Changing the update process

Current production

- Different environments
- Geometries duplicated
- Updates by themes
- Updates by blocks

Future Production

- One production environment
- One geometry
- **Update by changes**

Changing the update process

Current production

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- Geometries duplicated
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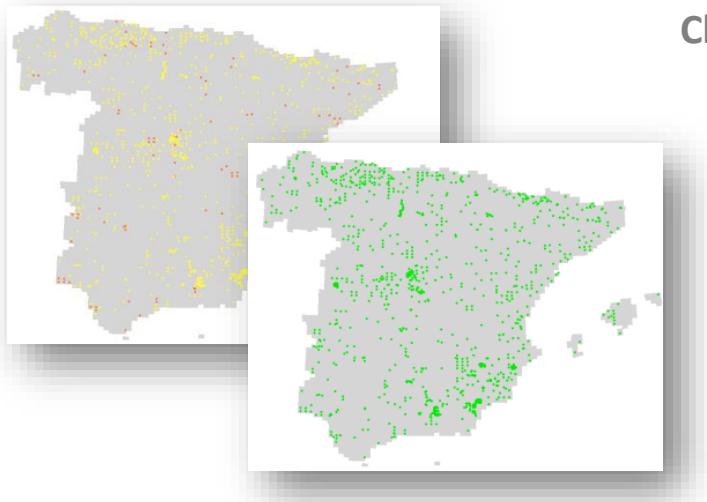
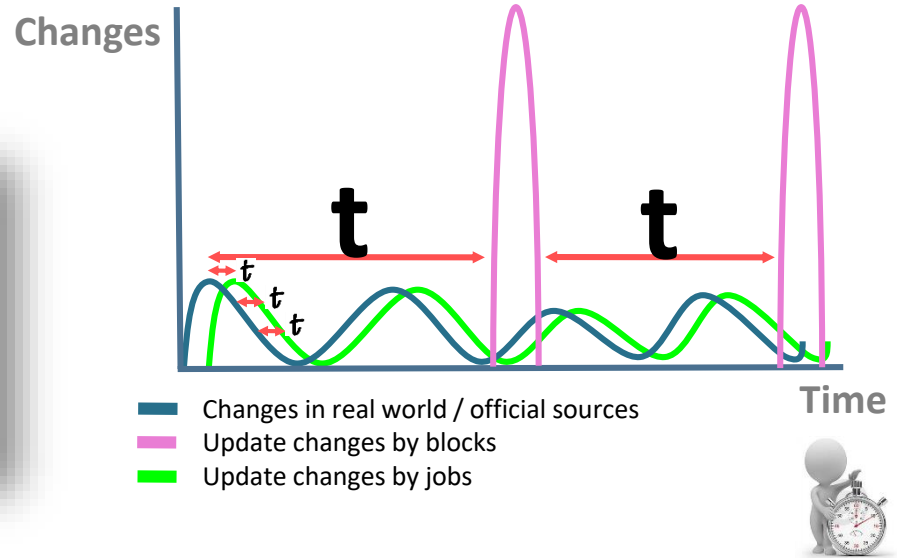
- Updates by blocks

Future Production

- One production environment
- One geometry
- Update by changes
- **Update by jobs**





Changes detection

Work orders management

BDIG program

Aim: continuous updating of Geospatial Information Databases (BDIG)

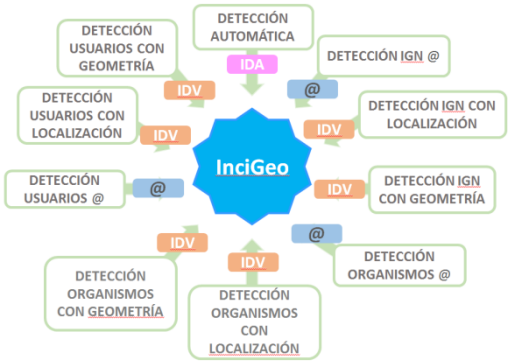
4 principles

- Jointly
- Without geometry duplication
- By changes
- By jobs

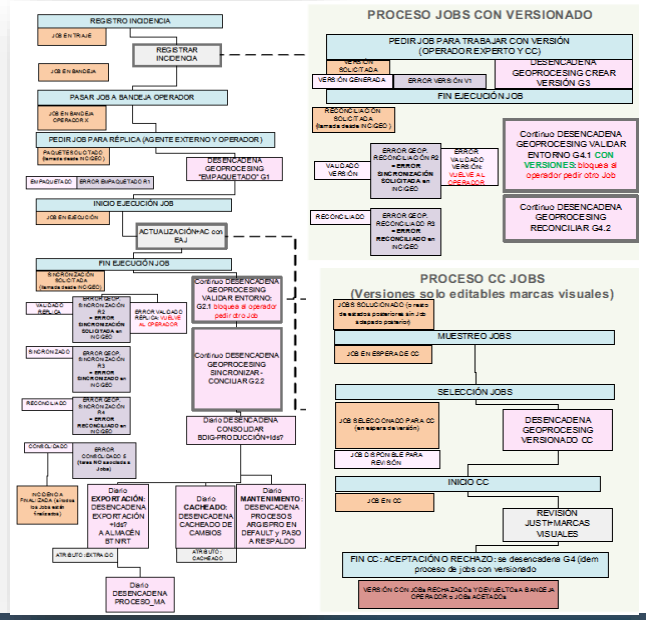
Projects

- Changes detection
- InciGeo
- BDIG environment

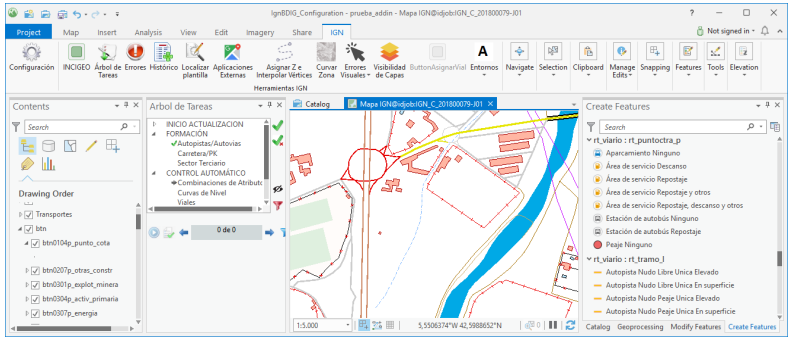
Changes detection



InciGeo



BDIG environment



CNIG demand

Publish

Changes detection

AUTOMATIC DETECTION

VISUAL DETECTION

OFFICIAL SOURCES DIRECT UPDATE

OTHER SOURCES

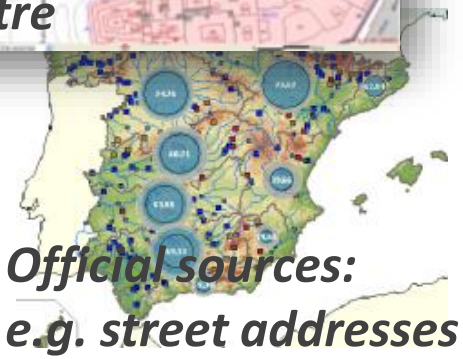
CHANGES / ERRORS WITH GEOMETRY

CHANGES / ERRORS WITHOUT LOCATION

WITH GEOMETRY

WITHOUT GEOMETRY

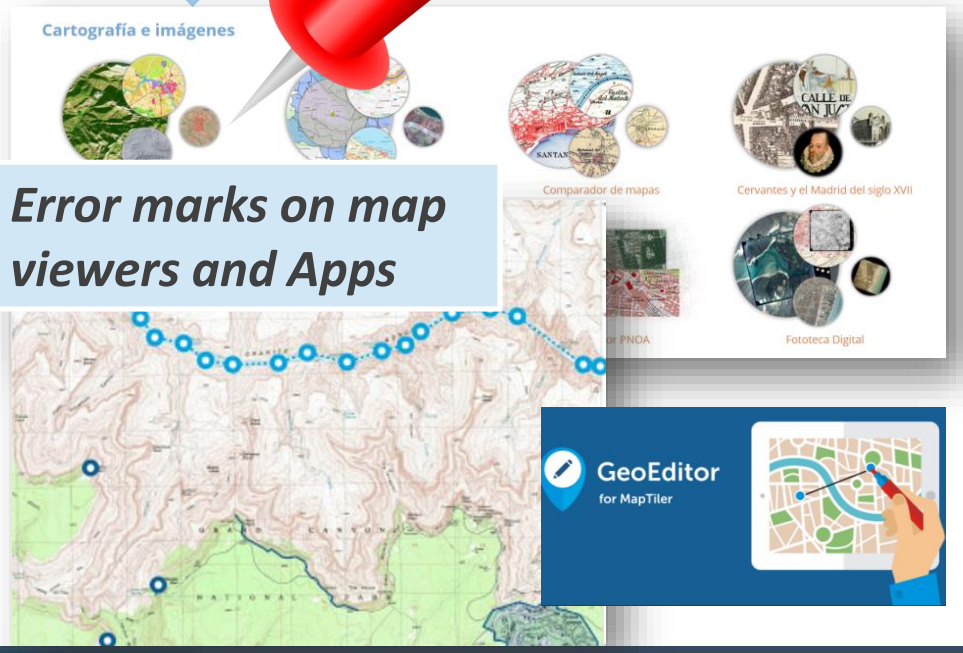
Cadastre



Official sources: e.g. street addresses

Neural networks

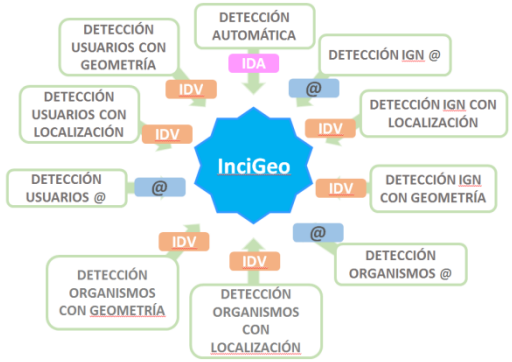
Bots



Error marks on map viewers and Apps

Aim: efficient management of potential changes

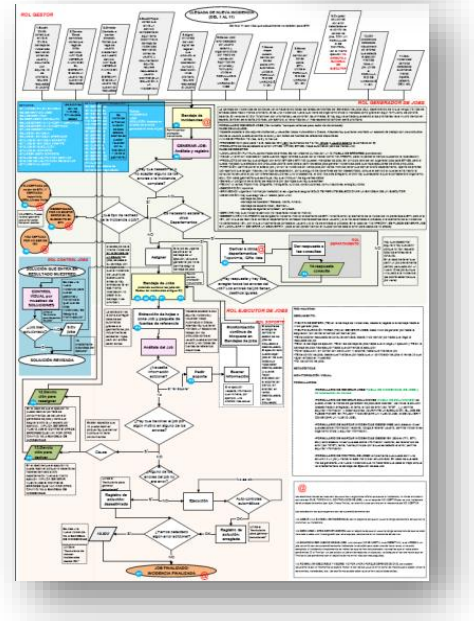
- Diversity of entries



- **Triage**

DERIVE / REJECT

GENERATE JOB

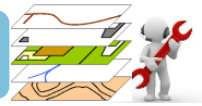


- Automatic flow between different **roles**

JOBS GENERATOR → OPERATOR ← QUALITY EVALUATION

EXTERNAL DEPARTMENT

SUPPORT



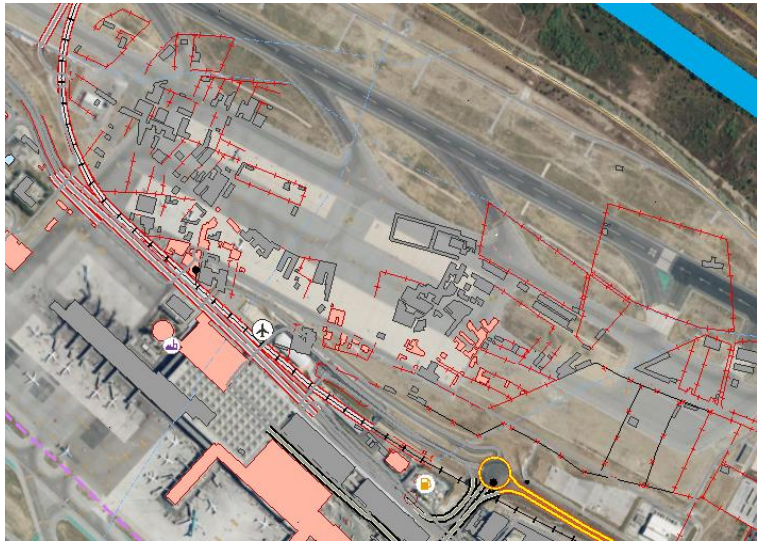
MANAGER

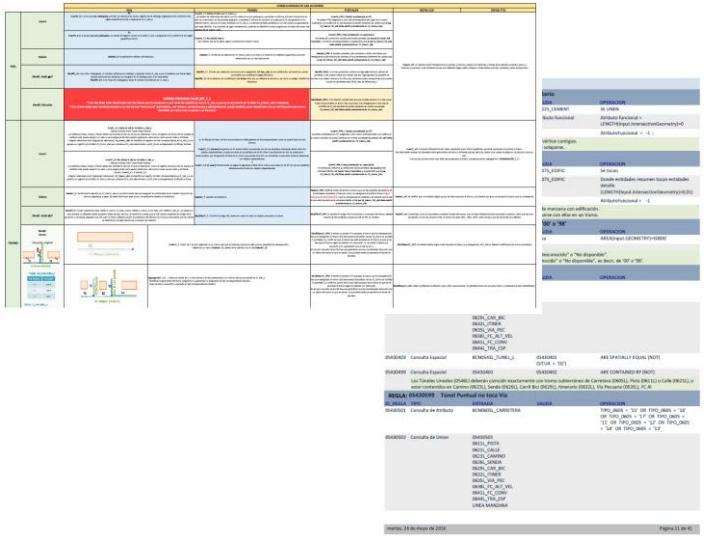
- **Monitored**

STATES | TASK TIMES | WARNINGS | INCIDENCE USER TRACKING (@)

BDIG environment

- Update GI
  - By Jobs
  - Jointly
  - Ensure specifications

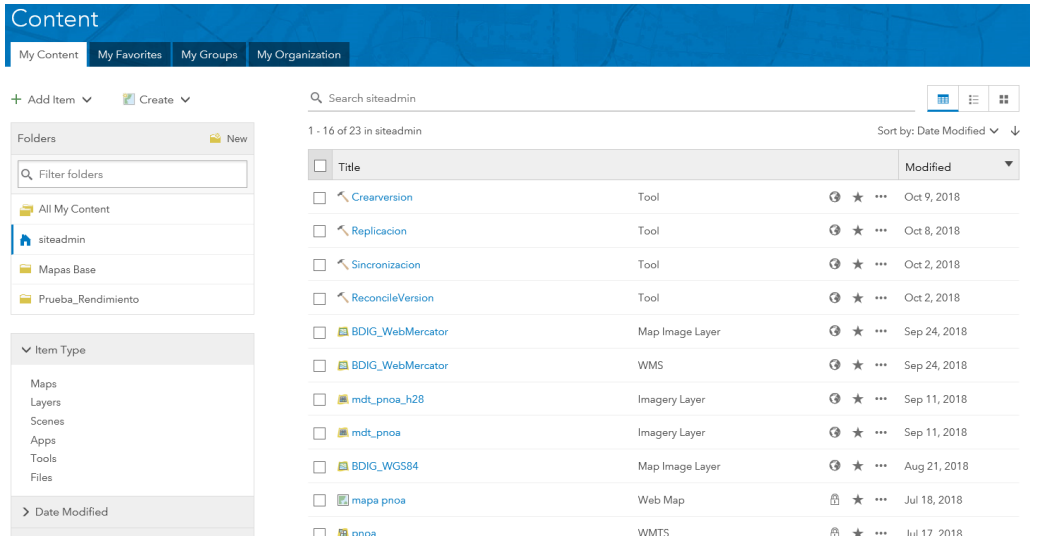




- On ArcGIS Pro
  - Customized (Add-In)
  - Services
    - Reference data
    - Geoprocessing
  - Ensure consistency

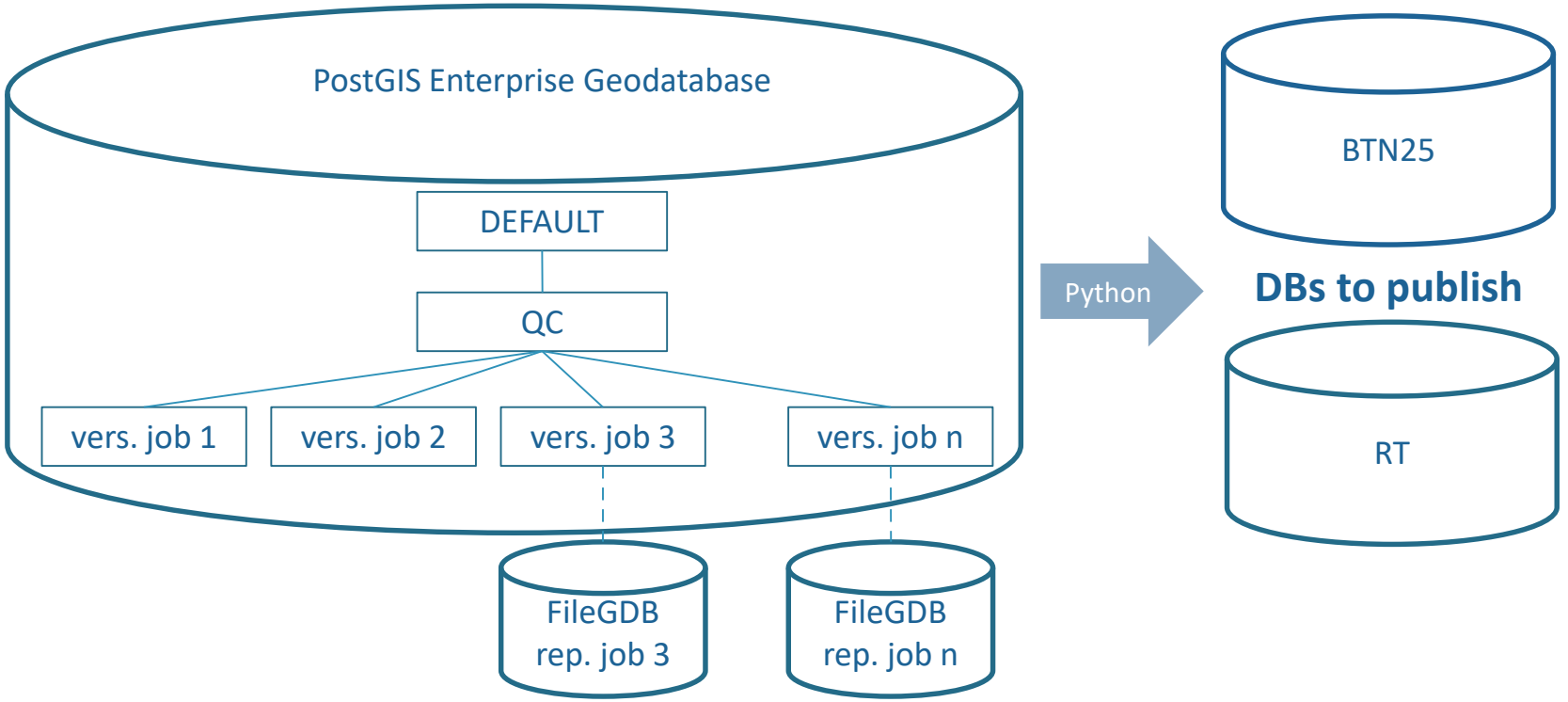
Pro SDK

ArcPy

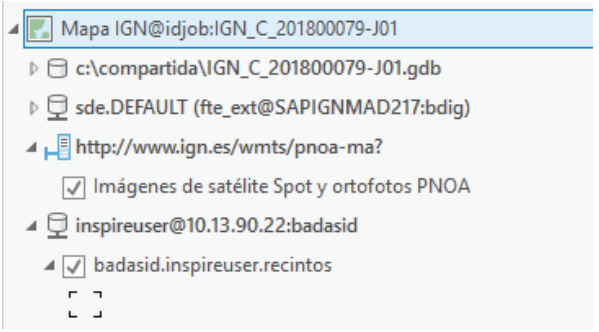


BDIG environment. Databases

- Edition geodatabase
  - Schemas
    - BTN25 (partially)
    - RT
  - Versions and replicas



- Reference data
  - Services
    - Existing
    - Created on purpose



Main workflow

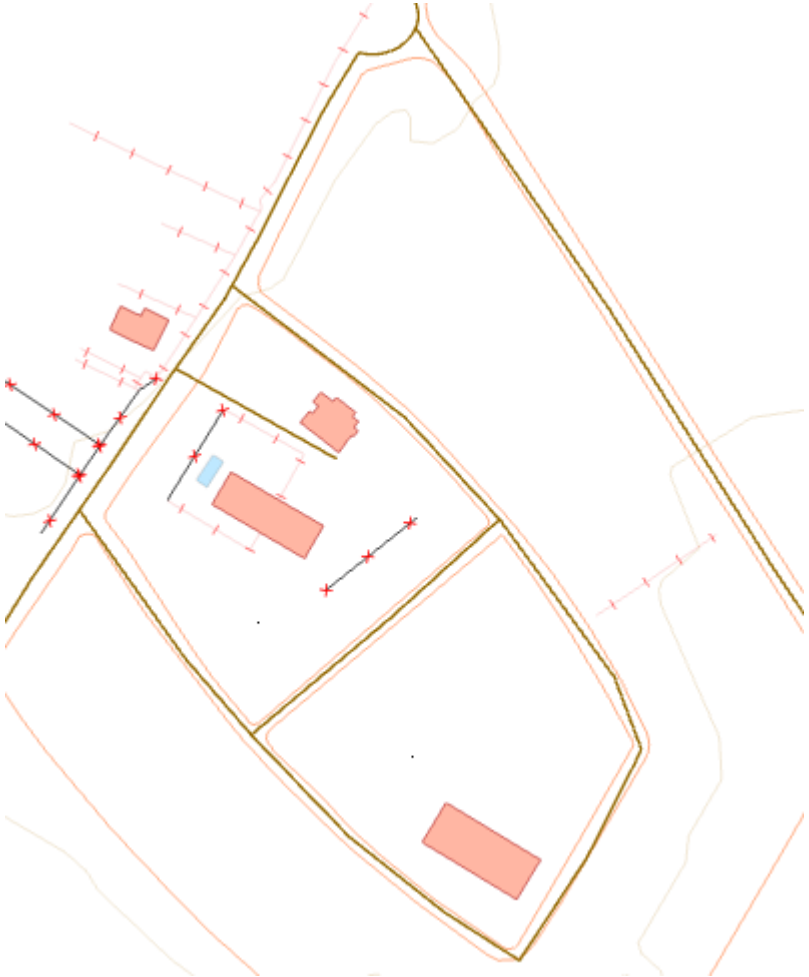
- Change in real world

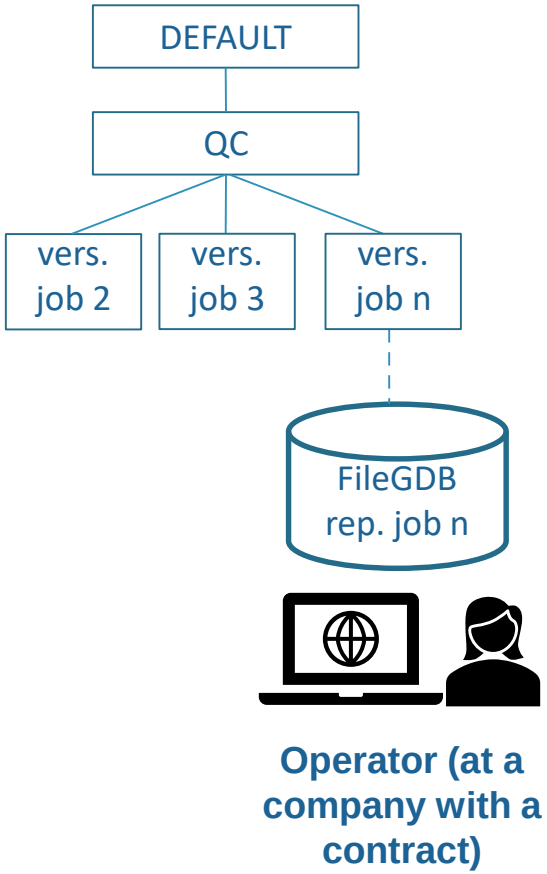
Main workflow

- Change in real world
- Create area for a job

Main workflow

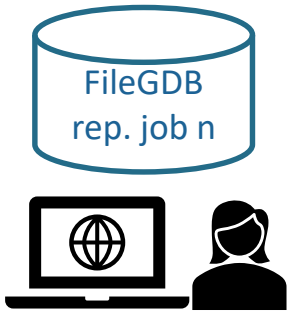
- Change in real world
- Create area for a job
- Assign job to operator
- Generate a replica





Main workflow

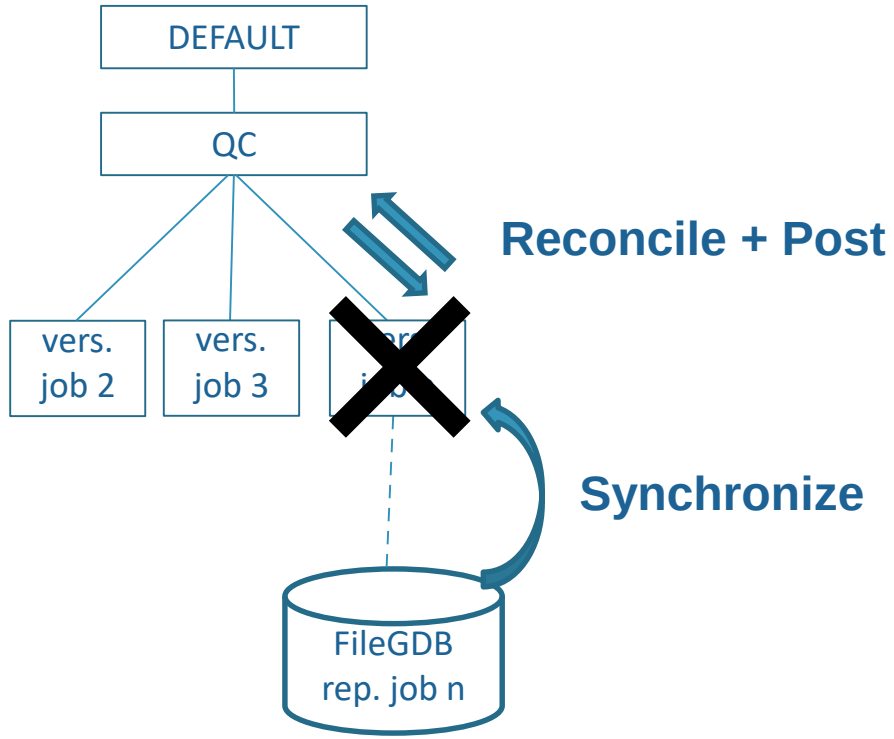
- Change in real world
- Create area for a job
- Assign job to operator
- Generate a replica
- Operator
  - Update
  - Run consistency rules
  - Fix errors



Operator (at a company with a contract)

Main workflow

- Change in real world
- Create area for a job
- Assign job to operator
- Generate a replica
- Operator
  - Update
  - Run consistency rules
  - Fix errors
- Finishing the job
  - Verify no errors remain
  - Synchronize
  - Reconcile + Post
  - Delete version



Main workflow

- Change in real world
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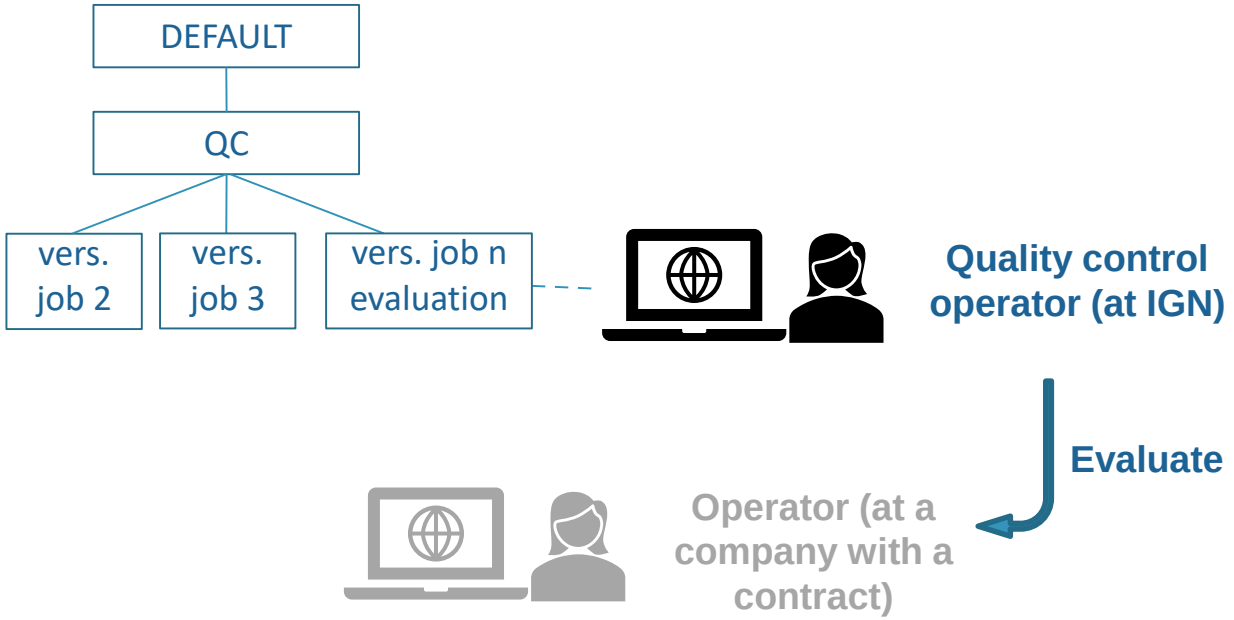


- For some finished Jobs
  - Pick up for quality evaluation
  - Generate a version and assign to a quality control operator
  - Aim: evaluate the operator

Consistency rules. Possibilities to automate

Define functions and procedure on PostGIS DB

- ☺ Independence from ArcGIS
- ☹ Data must be on PostGIS DB

Using ArcGIS Data Reviewer

- ☺ Basic functions and error management provided
- ☺ Work on Enterprise and File Geodatabase
- ☹ Hard to define for big dataset (graphic interface to define the application of rules one by one)
- ☹ ArcGIS dependency and extra licence

Define functions and procedure with ArcPy and configuration tables

- ☺ Flexibility
- ☺ Work on Enterprise and File Geodatabase
- ☹ Extra work to define
- ☹ ArcGIS dependency

Consistency rules. Solution applied

ArcPy + configuration tables

- Define basic rules (or as basic as possible)
  - For now, 36 rules (developing)

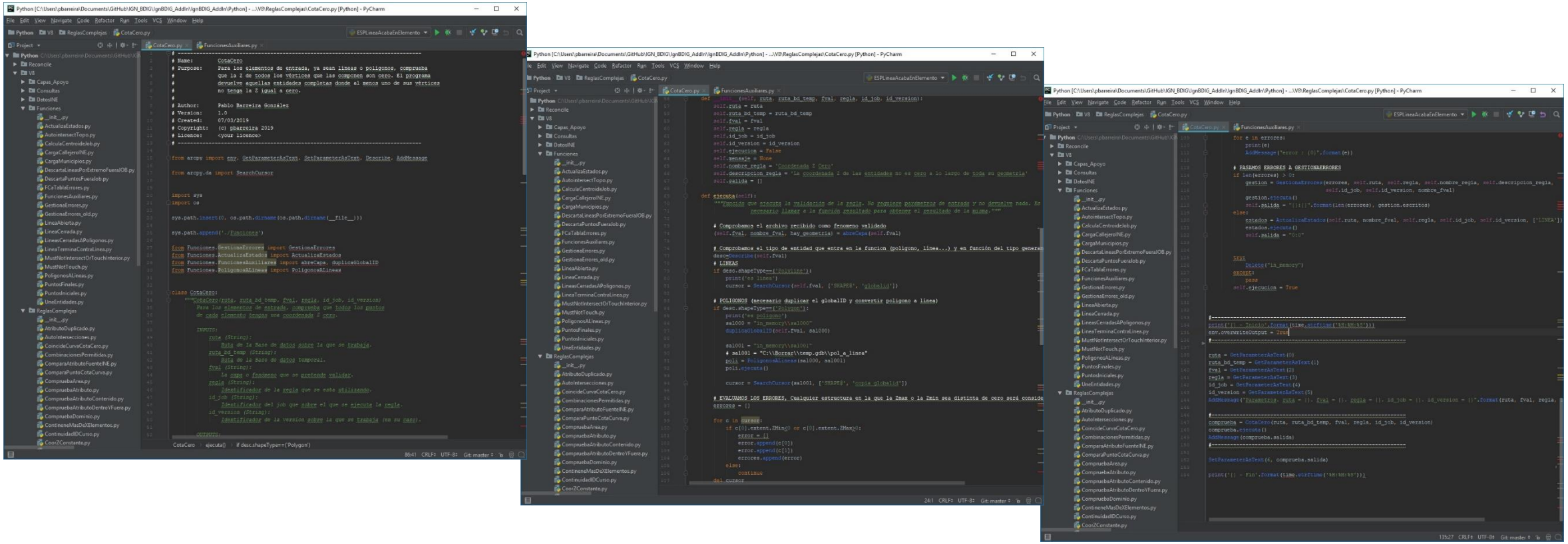
Name	Definition	Feature validated	Feature to compare (if any)	Other parametres

OBJE	nombre	definicion	fenomeno_validado	fenomeno_comparado	atrib
2	LineaFueraPoligono	Las entidades lineales no deben cruzar las entid...	True	True	False
3	AutoIntersecciones	Las entidades no pueden cortarse a si mismas.	True	False	False
4	CoordZConstante	Las entidades han de tener una coordenada Z c...	True	False	True
5	LineaTocaLineaMismaFC	Las entidades lineales no pueden tocar otras en...	True	True	False
6	CompruebaAtributo	Los atributos de las entidades deben cumplir la...	True	False	False
7	PuntoDentroPolilineaCer...	Dentro de una polilínea cerrada ha de haber un...	True	True	False
8	ComparaPuntoCotaCurva	La cota de los puntos acotados debe estar relac...	True	True	False
10	PuntoTocaLinea	Los elementos puntuales no pueden tocar los e...	True	True	False
11	MultiLineaCortaMultiPoli...	Los elementos lineales no pueden cortar comp...	True	True	True
12	CombinacionesPermitidas	Las combinaciones de atributos tienen que cor...	True	False	False
13	AtributoDuplicado	El atributo tiene que tener un valor único para t...	True	False	True

Consistency rules. Solution applied

ArcPy + configuration tables

- Define basic rules (or as basic as possible)
  - For now, 36 rules (developing)
- Each rule → .py



Consistency rules. Solution applied

ArcPy + configuration tables

- Define basic rules (or as basic as possible)
  - For now, 36 rules (developing)
- Each rule → .py
- Configuration tables
  - Rules
  - Rules X Features
  - Errors
    - 4 tables (1 per geometry type and 1 without geometry)
    - Status field

Feature validated | **Rule** | **Feature to compare (if any)** | **Other parametres**

OBJE	fenomeno_validado	regla	fenomeno_comparado	atributo01	valc
67	rt_tramoffcc_l	CombinacionesPermitidas	<Null>	<Null>	<Nu
68	btn0401l_curso_natural	CompruebaAtributoDentroYFuera	CONSULTA_AGUAS_SUPERFICIALES_BDIG	<Null>	"trar
69	btn0401l_curso_natural	MultiLineaCortaMultiPoligono	CONSULTA_AGUAS_SUPERFICIALES_BDIG	codigo	<Nu
70	btn0401s_curso_natural	MultiPoligonoNoContieneLinea	FILTRO_CURSOS_NAT_CONEXION	nombre;codigo;jerar...	<Nu
71	FILTRO_RIOS_NO_CUBIERTOS	LineaCruzaLineaSinElevacion	rt_tramo_l	<Null>	situa
72	FILTRO_RIOS_NO_CUBIERTOS	LineaCruzaLineaSinElevacion	rt_tramoffcc_l	<Null>	situa
73	CONSULTA_RIOS_LINEAL_BDIG	SuperficieAguaSinLineaInterior	CONSULTA_AGUAS_SUPERFICIALES_BDIG	<Null>	<Nu
74	btn0401l_curso_natural	ExcesoRamificaciones	<Null>	codigo	Non

Consistency rules. Solution applied

ArcPy + configuration tables

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- Each rule → .py
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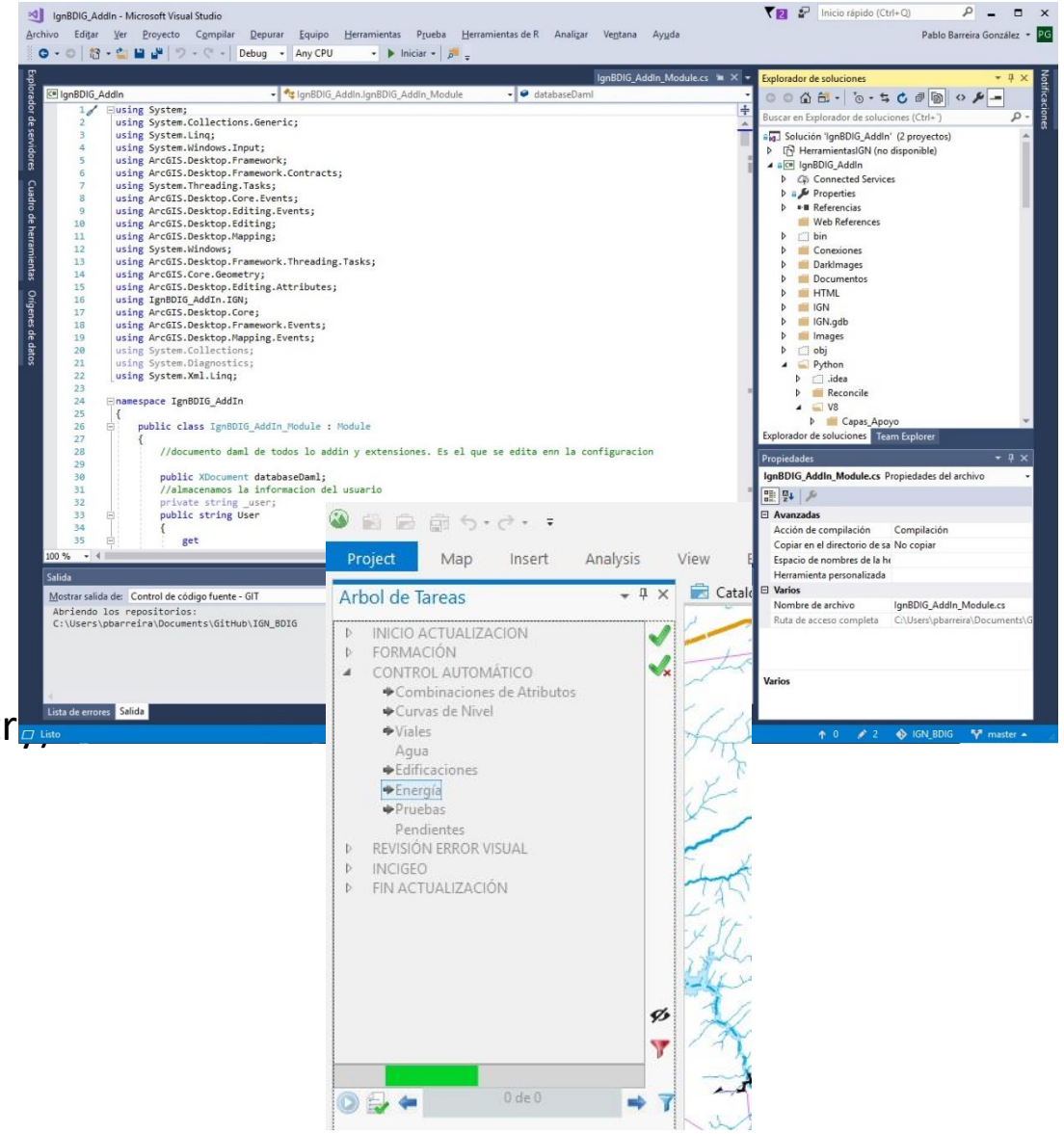
- Execution Flow
  - Launched from Addin



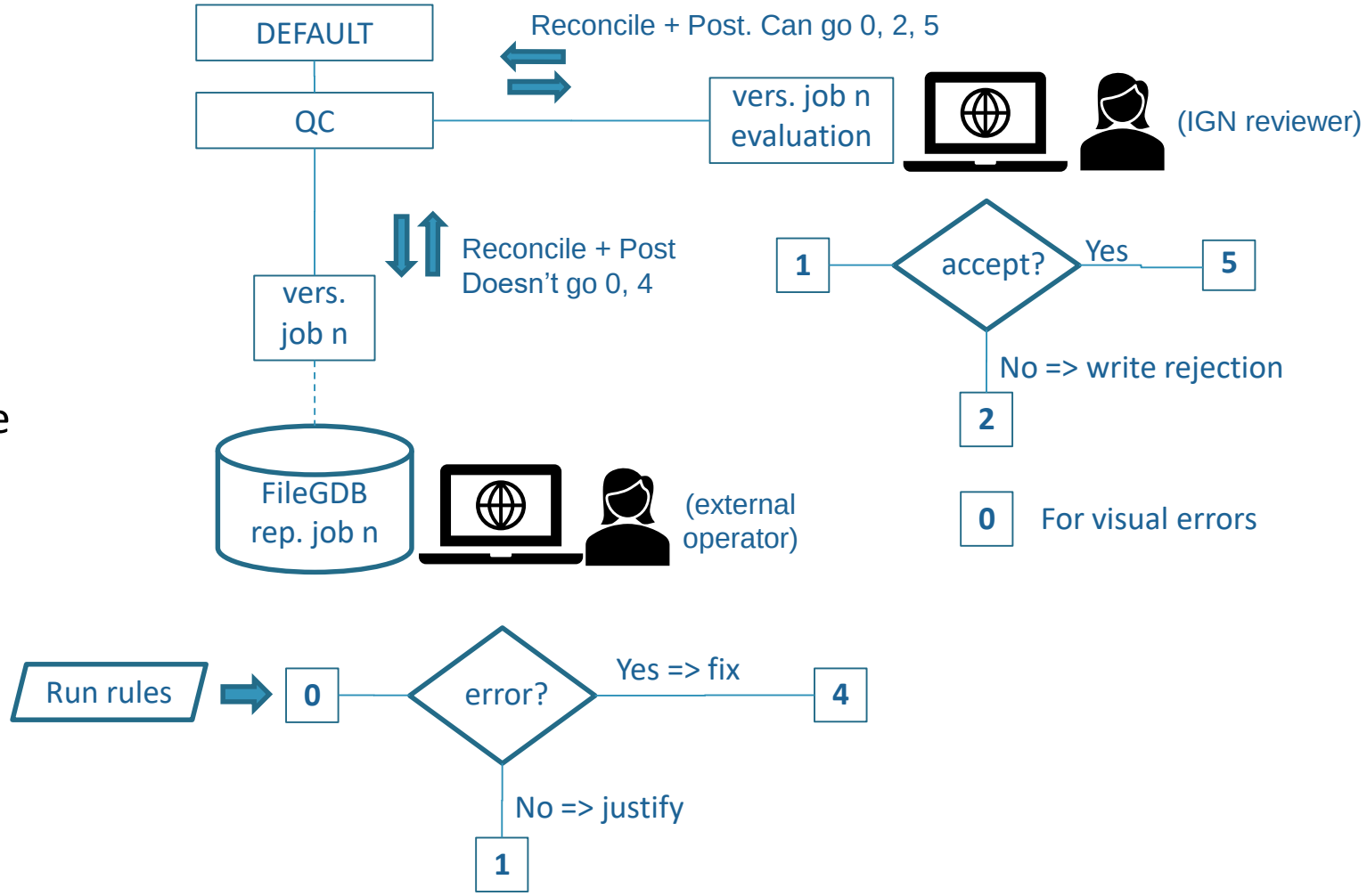
Consistency rules. Solution applied

ArcPy + configuration tables

- Define basic rules (or as basic as possible)
  - For now, 36 rules (developing)
- Each rule → .py
- Configuration tables
  - Rules
  - Rules X Features
  - Errors
    - 4 tables (1 per geometry type and 1 without geometry)
    - Status field
- Execution Flow
  - Launched from Addin
- Other .py functions (manage errors, etc.)

Error management

- Status field in error tables. Six possible values
  - 0: error detected
  - 1: error justified (by external operator)
  - 2: justification rejected (by IGN reviewer)
  - 3: IGN reviewer must validate
  - 4: error fixed
  - 5: false error



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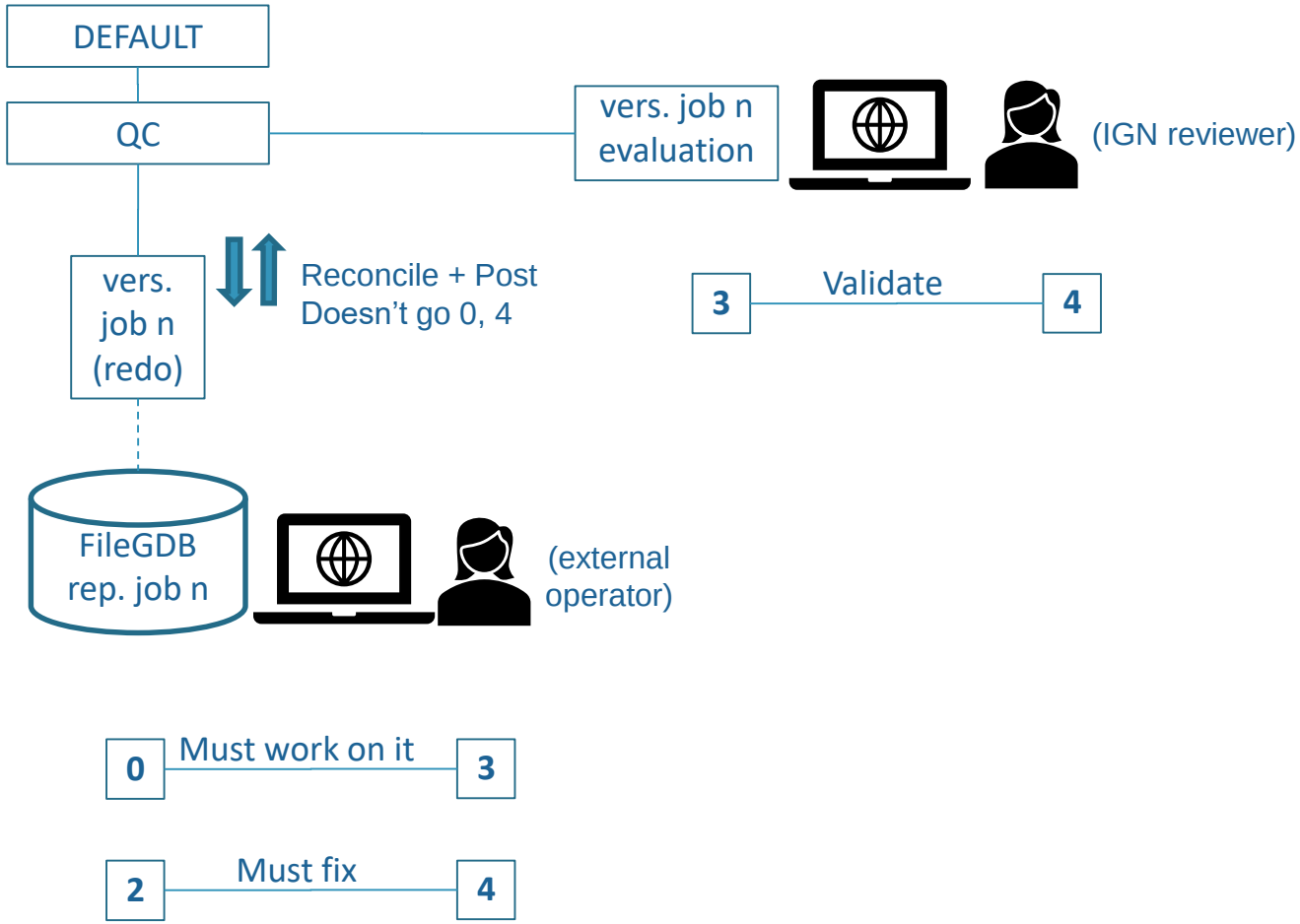

THANKS

QUESTIONS?

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