SHOP USER FORUM

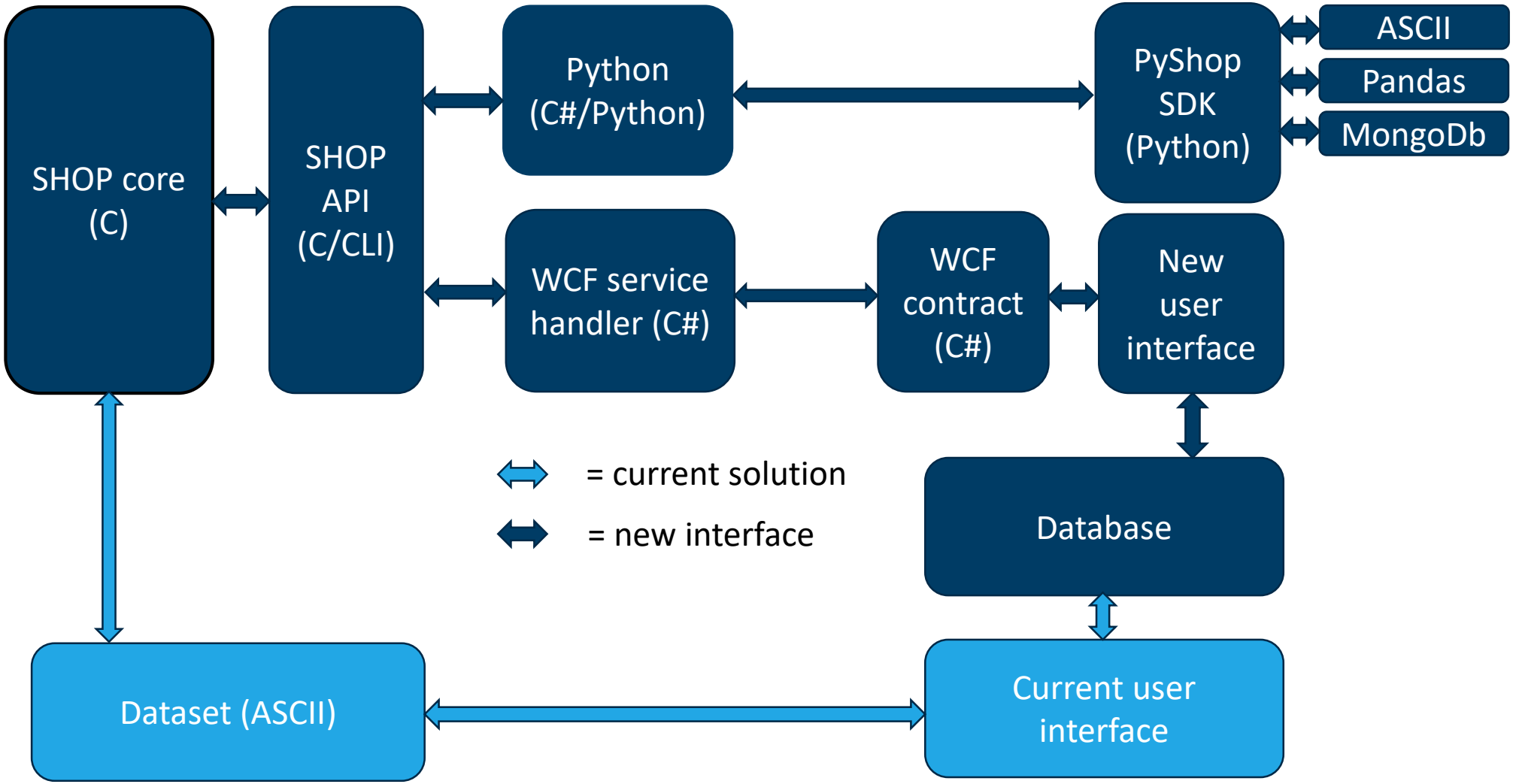
Per Aaslid

SINTEF Energy Research

API (Application Programming Interface)

- Demo
- Architecture
- PyShop

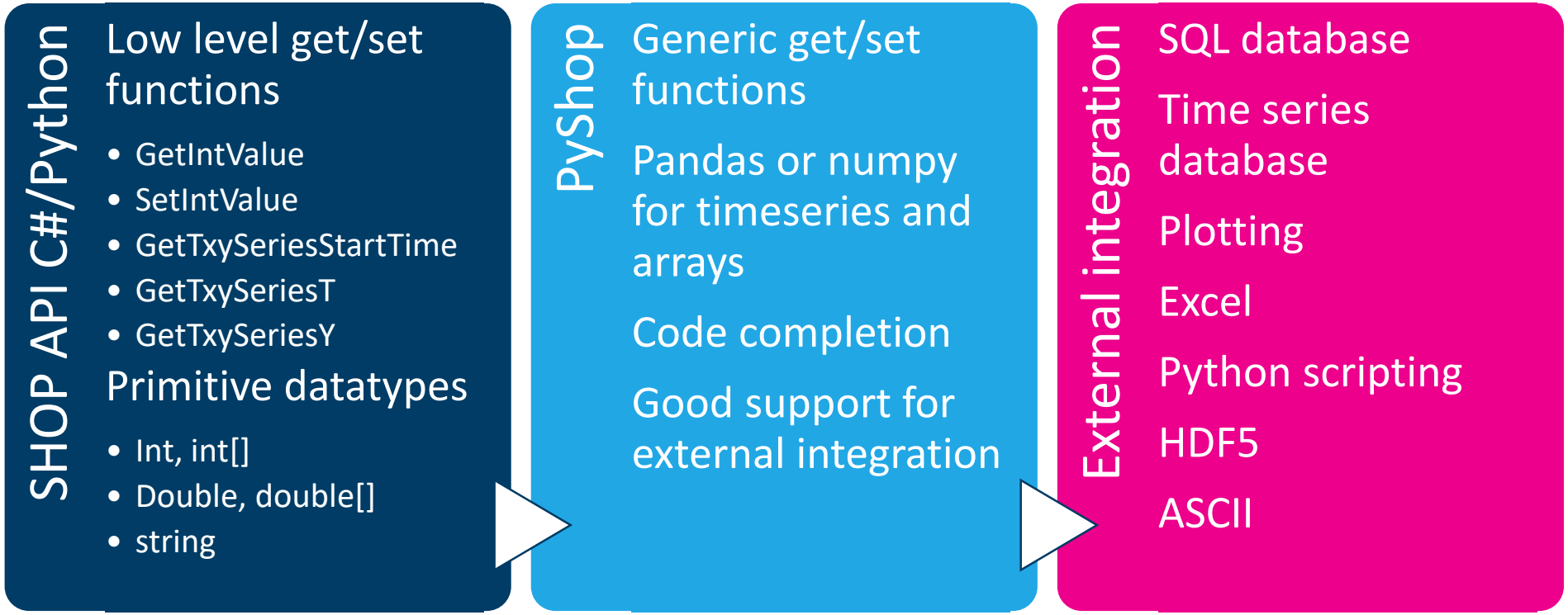
API architecture



Why Python?

- Easy to learn
- Easy to integrate with other programming languages, databases, file formats
- Widely used for data science both in academia and industry
- Large community

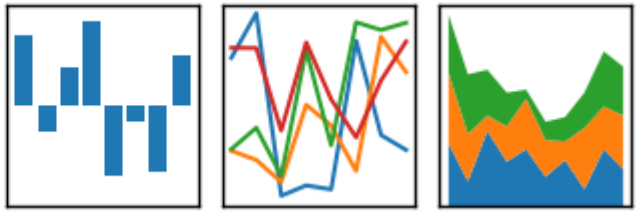
SHOP integration with PyShop



Pandas in PyShop

pandas

$$y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$$

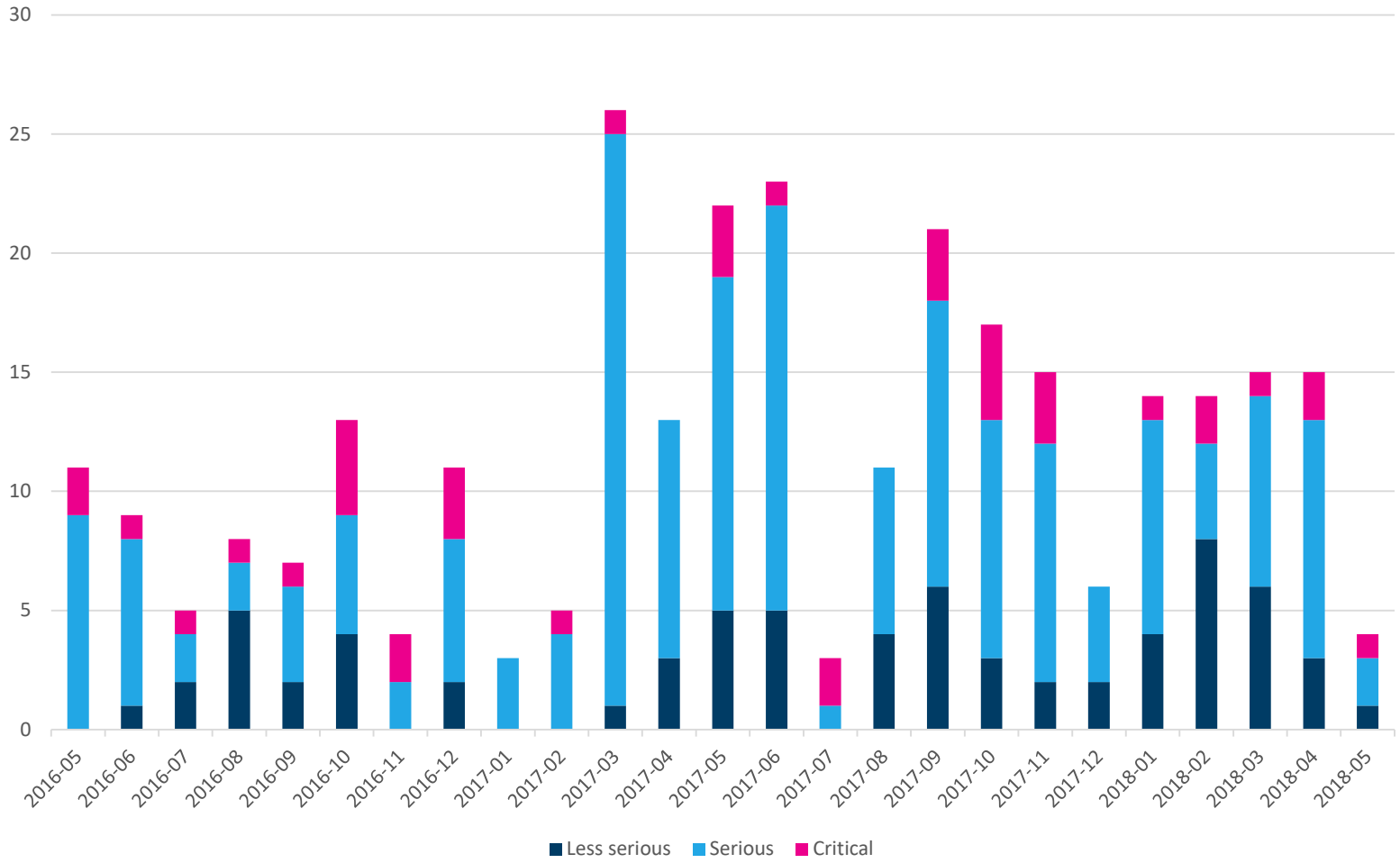


- High-performance python library for data structures and analysis
- Open source project
- Supported by data science libraries (scikit-learn, TensorFlow, Keras)
- Used for time series and xy data in PyShop
- Built-in integration against excel, csv, hdf5, SQL, JSON
- 3rd party libraries for integration against time series databases, MongoDb and more

Further API development

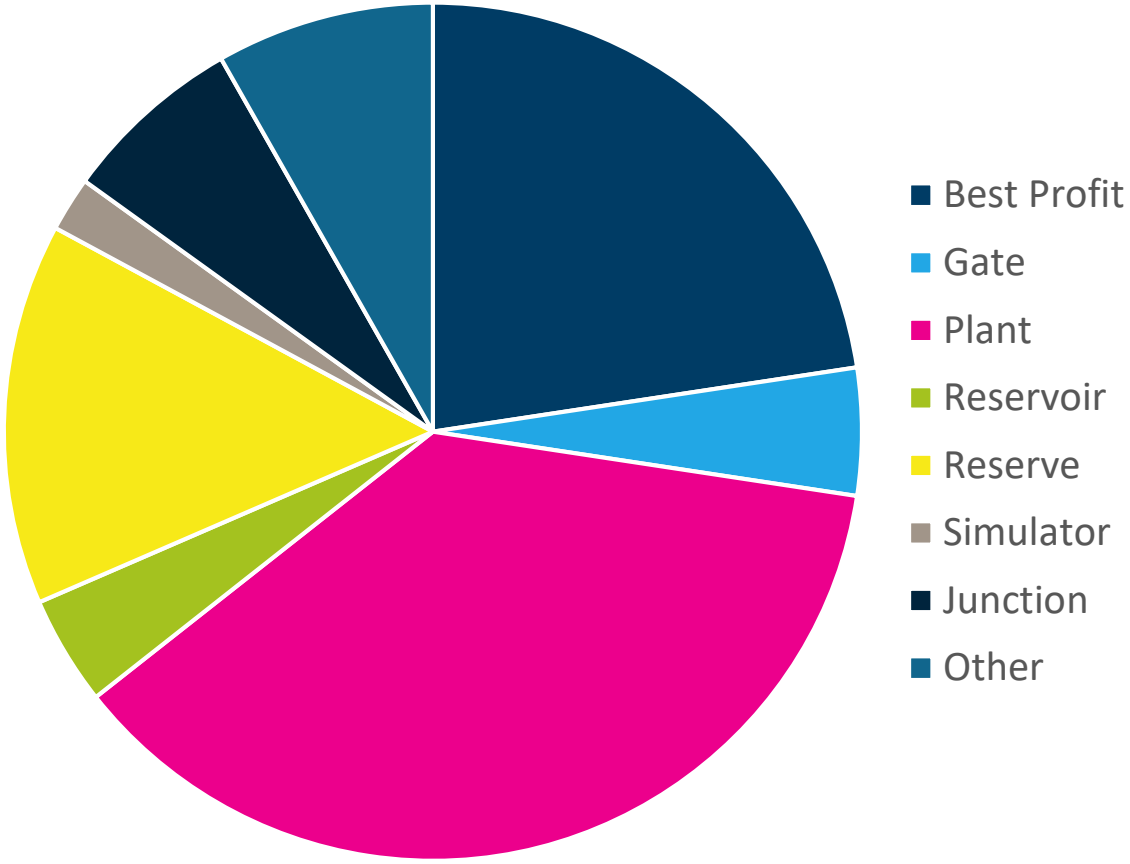
- Integrate documentation in API
- Replace C# interface in PyShop with C++ for better performance
- Improve handling of errors and error messages
- Improve logging in PyShop
- Improvements based on user feedback

Bugs reported in SHOP



SINTEF

Bug reports per category



SINTEF

SHOP SharePoint (SINTEF Uno)

- Latest SHOP documentation
- Newest SHOP versions
- PyShop – SHOP Software Development Kit

Release notes

- Release notes published at SharePoint

New in SHOP - maintenance

- New plant model (SHOP 12)
- Restructured junction model
- Objective function as time series
- Objective per object (licensed)
- Improved weir description
- Restructure PQ-curves (ongoing)

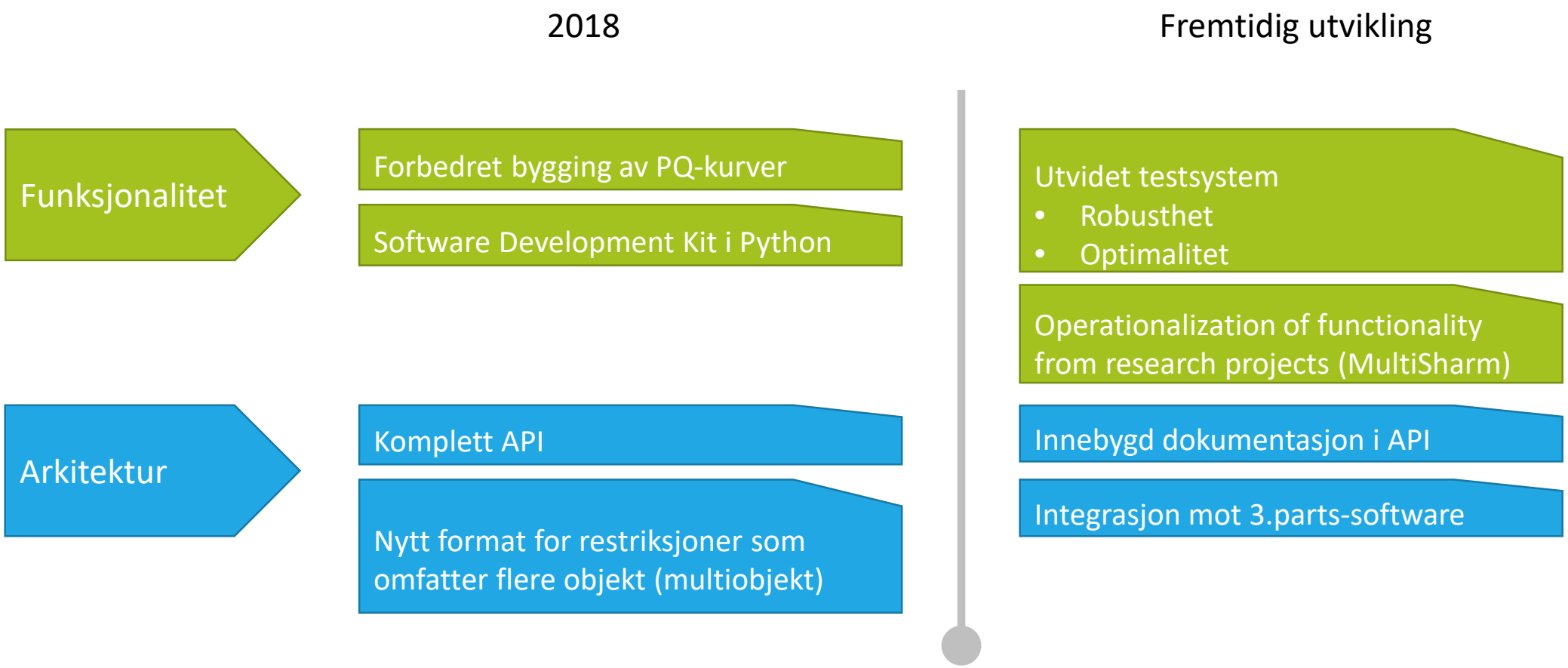
New in SHOP – maintenance

- Show restrictions causing infeasible LP-problem in log
- Performance improvements for first release of SHOP 12
- Updates in Gurobi and OSI solver interface
- More functionality available in API
- Heuristics for unit committment without MIP

New in SHOP (R&D)

- Pressure links
- Best profits
- Simulator inflow calculation
- Junction gate optimization (ongoing)
- Objective from simulation (not started)

Roadmap for SHOP



SINTEF

Maintenance plan

Plant

- ~~Build model on unit level~~
- Restructure PQ-curve (ongoing)

Junction

- ~~Pressure links~~
- ~~Integrate creek intake into junction model~~
- Junction gate optimization (ongoing)

Reservoir

- End value conversion
- Improved modelling of reservoir limits and overflow
- Rewrite model to use absolute variables

Gate

- Improved weir descriptions (ongoing)
- Rewrite model to use absolute variables

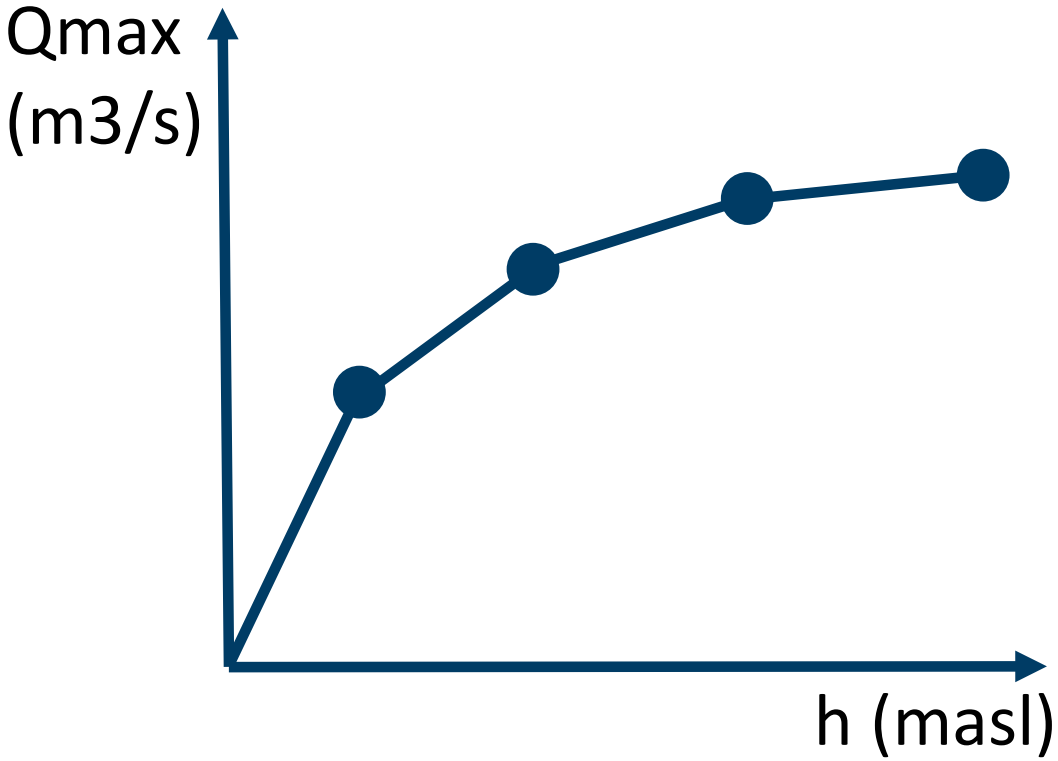
Multi object restructuring

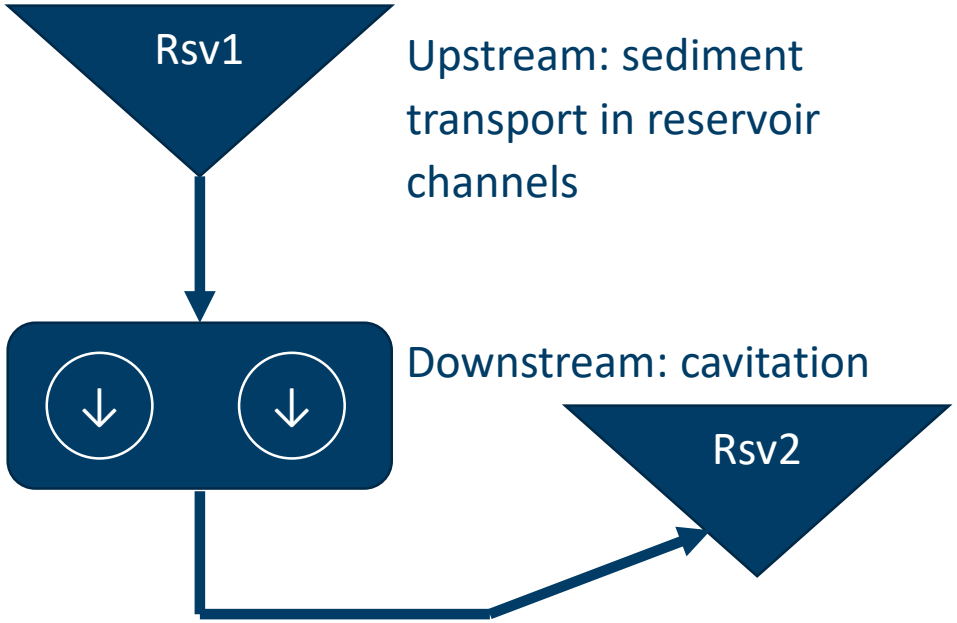
MULTI_OBJECT_DATA keyword sense name	OBJECT_GROUP <Group name> <sense>
OBJECT_LIST	
object_type1 name1	CONNECT PLANT/OBJECT_GROUP <Plant name> <Group name>
objevt_type2 name2	CONNECT PLANT/OBJECT_GROUP <Plant name> <Group name>
/OBJECT_LIST	
TIME_INTERVAL	OBJECT_GROUP <Group name> DATA_VALUE <TXY> T=time, Y=value
start_time end_time	OBJECT_GROUP <Group name> INTERVAL_LENGTH <TXY> T=start_time, Y=timespan
/TIME_INTERVAL	
PENALTY_COST unit	
UP value unit	OBJECT_GROUP <Group name> PENALTY_UP <TXY> T=time, Y=value
DOWN value unit	OBJECT_GROUP <Group name> PENALTY_DOWN <TXY> T=time, Y=value
/PENALTY_COST	
DATA_VALUE	
data value unit	
/DATA_VALUE	

New project: Tuning of open-source CBC solver

- CBC (Coin Branch- and Cut) is and open source alternative to CPLEX
- Out-of-the-box performance significant slower than CPLEX
- Methods for reducing solver time:
  - Heuristics for start basis first iteration
  - Using warm start from previous iteration
  - Tuning of parameters for CBC and CLP pre-solver
  - Strategy settings for branch-and-bound in CBC
  - 3rd party libraries for parallellization of branch-and-bound

New project: Discharge limits





SINTEF

Any other business

SINTEF

Teknologi for et bedre samfunn