URBAN TRAFFIC CONTROL (UTC)

WORKFLOW PTV BALANCE & PTV EPICS

Short description

The example demonstrates the workflow for setting up PTV Balance (Balance) and/or PTV Epics (Epics) from Visum (Visum) and simulating in PTV Vissim (Vissim). The example is split up in two parts requiring either Visum or Vissim.

Requirements

Visum Modules required for the first part, (see Modelling steps and In Visum):

- Junction editor and control
- Vissig
- Vissim Export

Vissim Modules required for the second part, (see Modelling steps and In Vissim):

- Balance
- Epics
- Vissig

Objective

Signals play a significant role for the traffic flow quality in urban networks. This example shows how Visum provides data to Balance, Epics and Vissim in order to simulate the adaptive signal control methods Balance and Epics in Vissim. The example consists of the following steps:

- Exporting data in Visum for Vissim and Balance.
- Importing data in Vissim and setting up Balance and Epics.

Note: For more details on Balance and Epics, please refer to their respective manual, located in the example folder.

Modelling steps

Note: During this example, many files are created and potentially edited. Therefore, we recommend copying the example folder to another location and using that instance as the working copy.

The example folder contains the following subfolders to assist and to do only parts of the example:

- 01 START IN PTV VISUM

  Use this as a clean restart.

  Start with step 1. Until step 15 only Visum is required.
- 02 START IN PTV VISSIM

  Use this if you do not have Visum or if you want to skip the first part.

  Start with step 16. Until the end, only Vissim is required.
- 03 AFTER IN PTV VISSIM

  Use this if you only want to simulate (this folder does not contain a simulation yet).

  Start with step 40. Until the end, only Vissim is required.
- 04 AFTER RESULTS

  Use this if you want to access detailed results and comparisons of several different scenarios and signal control types (see Results).

In Visum

1. Set all project directories to the example folder.
2. Open the version-file PTV BALANCE PTV EPICS VISION SUITE WORKFLOW.VER.
3. Execute operation 1 in **procedure sequence**.

This creates and activates the visibility of specific attributes for Balance and Epics in Visum.

4. Look at node 4 with a completed junction modelling including the signal controller **Epics/Balance local**:
   - Geometry as in reality (lane turns, lane pockets, detectors, etc.)
   - Stage based signal programs modelled with **Epics/Balance local** (compatible with Vissig)

     Take note, that every signalized intersection has two stage based signal programs. These are identically except for **BALANCE fixed-time control** (**Signal programs** > **Signal program No. X** > **EPICS parameters**).

     For all signal programs with No. 1 this is inactive (**Epics/Balance local** takes into account results from Balance and adds local optimization of Epics) and for all signal programs with No 2 active (**Epics/Balance local** does exactly what Balance wants). This allows easy switching in Vissim between different modes (Balance only, Epics only, Balance and Epics together).
5. Execute operations 21-24 in **procedure sequence**.

   This calculates a Dynamic User Equilibrium (DUE) assignment for the standard demand scenario covering the morning peak hour (06:30-09:30). The ver-file includes an additional demand scenario with additional traffic when a trade fair is happening. Operations 25-28 calculate the corresponding assignment. Feel free to redo the example and choose this assignment.

   Operations 2-20 use an **Assignment with ICA**, **Signal cycle and split optimization** and **Signal offset optimization** to optimize the base signal programs and to derive suitable turn capacities for the DUE assignment. This example description does not

cover these operations that require the a 32 bit version of Visum and the modules **Signal offset optimization** and **Intersection Capacity Analysis**.

6. Select menu **File** > **Export** > **VISSIM (ANM) ...**.
7. Click the button **Open parameters** button.
8. Select the file VISUM ANM EXPORT PARAMETERS.ANMP.
9. Click the **Open** button.

Note: When handling different demand scenarios, we recommend to export the **ANM file** > **Network data** only once and export different **ANMRoutes file** > **Routes** with different fitting names on consecutive exports.

10. Click on tab **Further settings**.
11. Look at
    - **Simulation time interval**
      This corresponds to the DUE assignment but can also cover another time interval - though outside of the DUE time intervals there would be no demand in Vissim.
    - Section **Settings for other objects**
      - **Attribute defining the saturation flow rate of links**
      - **Attribute defining the saturation flow rate of turns**

      These are set to **BalanceSatFlowRate** the user defined attributes created by operation 1.
12. Confirm with **OK**.
13. Select **No further messages during ANM export.** in the warning dialogue and
14. Confirm with **OK.**

    Visum is going to warn that it could not copy the external control files. This is because the project folder for “External control” is the same as the anm export folder. As a result, Visum and Vissim will share the sig-files and changes in one software will potentially affect the other. This can be configured differently.
15. Open Vissim.

In Vissim

16. Select menu **File** > **Import** > **ANM...**.
17. In Section **Static Network Data** click the  button.
18. In the example folder select the file
    PTV BALANCE PTV EPICS VISION SUITE WORKFLOW.ANM.
19. Click the **Open** button.
20. In section **Dynamic Traffic Data** click the  button.
21. In the example folder select the file
    PTV BALANCE PTV EPICS VISION SUITE WORKFLOW.ANMROUTES.
22. Click the **Open** button.
23. In section **Save as** at **Vissim Input File** click the  button.
24. Enter PTV BALANCE PTV EPICS VISION SUITE WORKFLOW.INPX as the **file name**.
25. Click the **Save** button.
26. Click the **Import** button.
27. Activate **Don’t show this message anymore** in the warning dialogue and confirm with **OK**.

28. Confirm the information dialogue with **OK**.

    Vissim is going to warn mostly about geometrical difficulties when creating a Vissim network from an anm-file. For this example, we are fine ignoring these. For any other use cases, click the **Open** button in the information dialogue and examine the messages window.

Adjusting the Vissim network.

In order to produce feasible results an anm-import especially with complex intersections requires manual fine-tuning in Vissim. The following list handles the most important points and provides feasible results for this example:

- Open the list **Conflict Area**. Mark all rows containing “Crosswalk” in either column **Link1** or **Link2** and choose in column **Status** the option **passive**.

  For the sake of simplicity, the network does not contain pedestrians. Intersections with crosswalk require a lot more adjustments. Nevertheless, with default parameters the active conflict areas influence the driving behaviour in terms of using up look ahead related parameters.
- Set **Lane Change** > **Lane change:** to 50.0 m on connectors 10014 and 10017.

  This is required in order to make the drivers use the temporarily available additional lane.
- Edit in Menu **Base Data** > **Driving Behavior** the driving behaviour **Urban (motorized)**. In tab **Lane Change** set the value for **Waiting time before diffusion:** to 180.00 s.

  With cycle times of 90 seconds, the default value of 60 seconds is too low.

29. Select menu **Signal Control** > **Signal Controllers**.
30. At the top of the Signal Controllers list click the **New** symbol.
31. Select the **Balance-Central** option for **Type:**.
32. On the **Balance-Central** tab click at **Data file 1** the button.
33. Select in the example folder the file
    PTV BALANCE PTV EPICS VISION SUITE WORKFLOW.ANM.
34. Click the **Open** button.
35. On the **Balance-Central** tab click at **Data file 2** the button.
36. Select in the example folder the file
    PTV BALANCE PTV EPICS VISION SUITE WORKFLOW.ANMROUTES.
37. Click the **Open** button.
38. Confirm with **OK**.
39. Select menu **File** > **Save**.
40. Start the simulation.

    The Balance-Web-GUI will open in a browser. It shows internal values and results of Balance. Use **Debug mode:** of the signal controller to (de-)activate it.
41. Wait until the simulation is finished.

Results

The results can be analysed in different ways within Vissim. For a comprehensive example see PTV BALANCE PTV EPICS EXAMPLE.INPX in the subfolder 04 AFTER RESULTS. This inpx-file contains a total of eight simulations and visualisation in form of charts. The simulations are fixed time control, Epics, Balance and Balance & Epics for the standard demand scenario and the trade fair demand scenario. The charts show that specifically for the trade fair demand scenario Balance and Epics handle the

situation a lot better than the fixed time control. The charts also show that Epics explicitly helps public transport. Balance used the genetic algorithm as the optimization method. Exact reproduction of the results depends on many parameters including the version of Vissim.

Add further evaluations to your example:

- Select menu **Evaluation** > **Configuration**. Select on tab **Result Attributes** option **Vehicle network performances** and set **Vehicle Classes** and **From time**, **to time**, **Interval** as desired.
- Select menu **View** > **Create Chart...** to display evolution of result values over time or aggregated to simulation runs.
- Select menu **Signal Control** > **Signal Controllers**. Select tab **Signal Times Table Config.** Deactivate option **Automatic signal times table configuration**. Mark in the list **Typ (Category)** option **Balance-FSP** and add it to the table **Layout of Columns**. With this change the frame signal plans of Balance in the Signal Times Table during the simulation (menu **Evaluation** > **Window** > **Signal Times Table**).

  This works only for signal controllers of the type “Epics/Balance-Local”.

Calculate further simulations:

- Edit Balance parameters in menu **Signal Control** > **Signal Controller** > tab **Balance-Central** > **Parameters**. E.g. **Use genetic algorithm** as the optimization method.

  This works only for signal controllers of the type **Balance-Central**.
- Simulate with only Balance or only Epics. In the walkthrough above, Balance and Epics are working together. Epics handles local optimization and public transport prioritization while Balance handles network wide optimization and coordination.
  - Edit the option **ProgNo** in the Signal Controllers list for signal controllers of the type **Epics/Balance-Local**. **ProgNo**=1 means the signal controller considers Epics and Balance. **ProgNo**=2 means the signal controller considers only Balance.

    See above, this is not a parameter this works only due to the sig-files that are provided with the example.
  - Edit the option **Active** of signal controller **Balance-Central** to (de-)activate Balance.
- Export another demand scenario from Visum as an anmroutes-file, import in the existing Vissim inpx-file and simulate different demand scenarios.