

Yutraffic **PDMx** & **SL4sX**

Local traffic-actuated control, efficiently parameterized with SL4sX or flexibly programmed with PDMx

Yunex TA Methods for the sX Controller

An integral part of the planning functionality of *Yutraffic Office* are the traffic-actuated (TA) control methods. As part of the planning functionality, these can be seamlessly parameterized, programmed, simulated and supplied into the traffic light controller. A variety of different control methods are available for each controller type and country. The two field-tested and established control methods *PDMx* and *SL4sX* are available for the *Yutraffic sX* controller family.

Stage-oriented Approach

PDMx and *SL4sX* are based on a stage-oriented approach. Stages and stage transitions are supplied in *Yutraffic Office*. Stage sequences for up to four partial intersections can be controlled separately. When using *Traffic Language*, special commands for individual signal group manipulation provide additional flexibility.

Configuration and Simulation

The configuration data for both methods is created as usual with *Yutraffic Office*. This means that the TA configuration data is also part of the seamless and transparent system integration of the supply processes. For testing the TA control, an interface to the common microsimulation tools *AIMSUN.Next* and *PTV Vissim* is provided.

Programmed vs. Parameterized

PDMx offers flexible adaptation to the requirements of the respective intersection. This is made possible by free programming in the Yunex proprietary *Traffic Language* (TL). Alternatively, the SL4sX control method offers an approach based purely on parameterization and thus enables efficient implementation of traffic-actuated control. If needed, however, a purely parameterized SL control can also be extended by a programmed part in *Traffic Language*. The resulting gain in flexibility and speed combines the best of both worlds.

Further Development

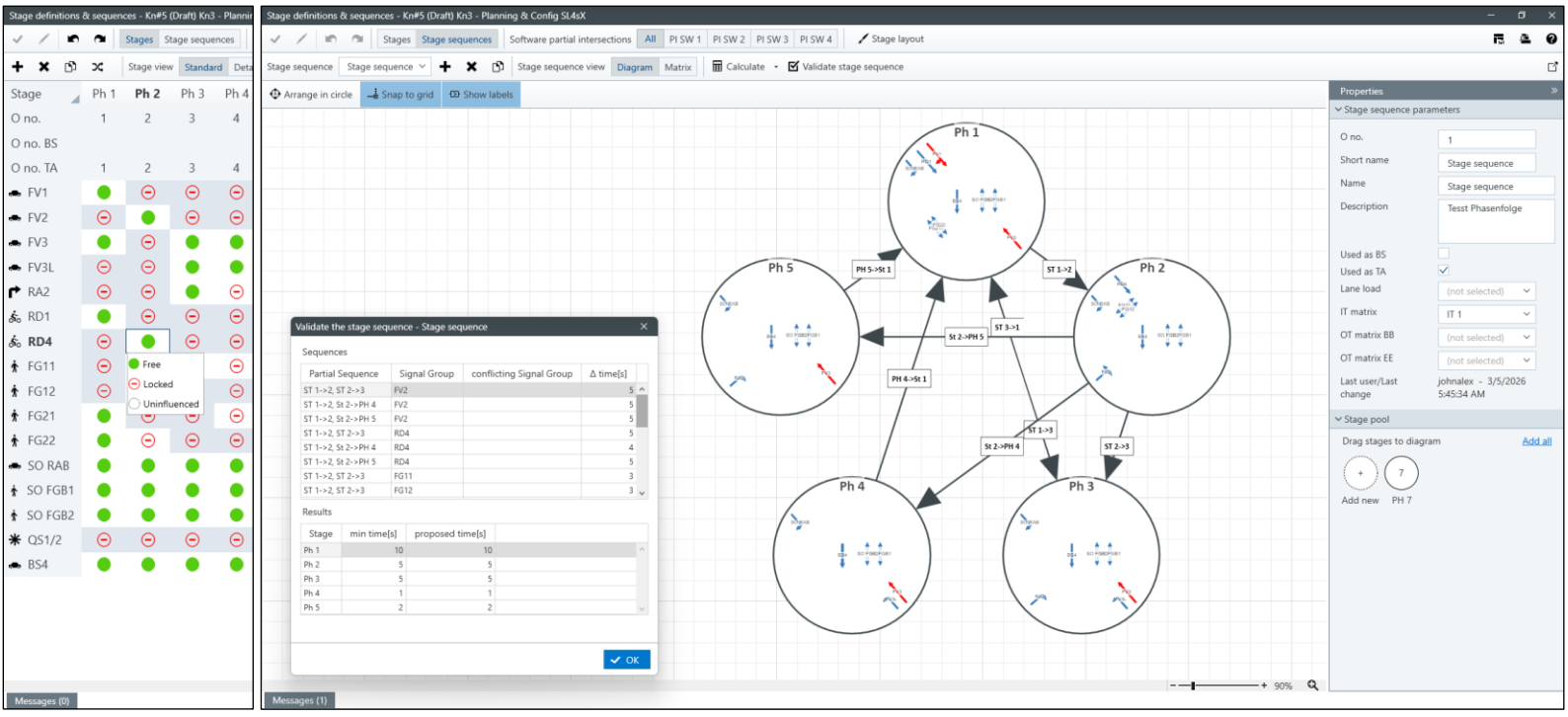
Both methods are continuously developed further based on feedback from our customers and our own traffic engineering. Special attention is paid to backward compatibility. In the case of a controller replacement, e.g. from C900 to sX, a low-cost migration of the TA configuration is usually possible. This reduces the effort in direct comparison to a complete redesign. In addition, when using *Traffic Language*, access to new technologies, such as SREM/SSEM, is possible.

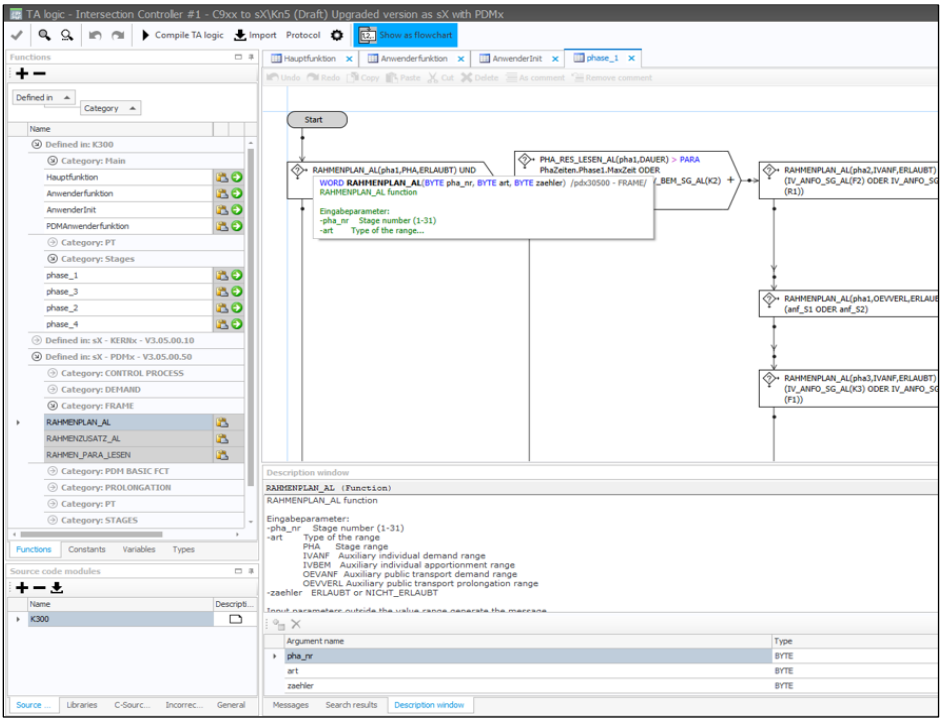
License for Yutraffic sX

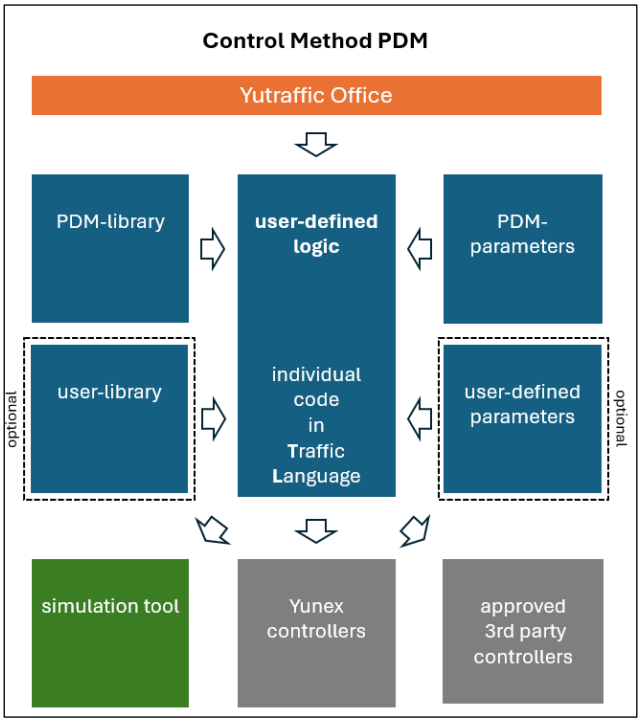
There are no different licenses for the sX controller for *PDMx* and *SL4sX*. The use of both control methods requires the use of an ATE (**A**dvanced **T**raffic **E**ngineering) license. This makes it easier to select the control method purely based on traffic engineering requirements and enables a later change, without additional costs for the controller license.

Licensing for 3rd Party Controllers

The PDMx and SL4sX control methods are also available for third-party controllers and are available for licensing by other manufacturers.







Control Method PDMx

The traffic-dependent control procedure PDM (**p**hase control with **d**ecentralized **m**odification) has been tried and tested many times in practice. It offers a high degree of flexibility through the free programming of user logic in *Traffic Language* to overcome the intersection-specific challenges of traffic light control.

Efficient Creation

The creation of user logic is supported by special editors in *Yutraffic Office*. The integrated development environment facilitates the efficient programming of user logic through auto-completion, plausibility checks and copy & paste. The PDM library provides the necessary instruction set. This set is optimized for traffic engineering tasks and is continuously improved and further developed based on user feedback.

Reusability

For recurring questions, the user can independently define libraries in *Traffic Language*. To secure the know-how, these user libraries can optionally be provided with password protection. Thus, the solution library grows with each completed intersection. The reuse of the finished and tested solutions then saves time for subsequent projects.

C-ITS

For the processing of C-ITS data, tried and tested instruction sets for *Traffic Language* are available. They allow the processing of SREM (**S**ignal **R**equest **E**xtended **M**essage) and allow the sending of SSEM (**S**ignal **S**tatus **E**xtended **M**essage). The SREM is processed in the sX control unit on the basis of MAPEM data (**MAP E**xtended **M**essage) supplied with *Yutraffic Office* to take the intersection topology into account.

Peripherals

Access functions to internal AP values (user program values) are available for the connection of external hardware. For example, detection data from *Yutraffic AwareAI* can be made usable for local control. In addition to the classic detection information, extended data on queue lengths or turning rates is available. The more comprehensive detection of the traffic situation creates the basis for more efficient control.

Advanced Control

The user programming also enables the connection to a central control system. Special commands are available for evaluating BLOB data (**B**inary **L**arge **O**bjects) or project-specific modifications according to OCIT/Canto. This means that local traffic actuated control by PDM can be integrated into a network-wide control concept. This is true even when migrating a PDM intersection to *Yutraffic Fusion*. The function of the user logic is taken over by the local component of Fusion. The controller supply (e.g. SiMon, HW/basic supply) and large parts of the TA supply can be reused.

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Control Method SL4sX

The traffic actuated control method SL (**S**tandard **L**ogic**)** is an established alternative to methods with freely programmed user logic. The user logic is standardized here and only needs to be parameterized. The user can use the parameterization to adjust to the specific requirements of the respective intersection. In addition to the effort required for creation, the effort required to test the control system is thus also significantly reduced. Compared to more complex approaches with free user programming, the training time is also significantly shortened. This makes the SL method particularly suitable for entering the challenging field of traffic actuated control.

Integration in Yutraffic Office

Due to the omission of user logic, the creation of TA planning and parameters in *Yutraffic Office* is of particular importance. The basis of stage-oriented control with SL are stages, stage transitions and the stage sequence plan. These can be generated manually or automatically, e.g. based on offset or intergreen-time matrices. With automatic generation, subsequent manual editing is of course possible at any time. SL's standardized control logic is simple and transparent. For each permitted stage change in the stage sequence plan, a demand- and an extension condition are parameterized. Both conditions together form the logical condition for the stage change.

Stage Change Logic

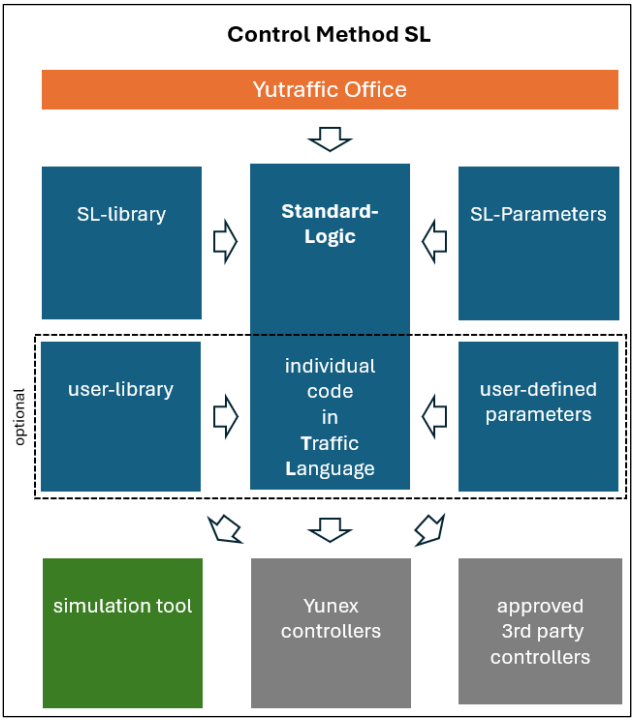
The logical conditions for the stage change are defined in the SL Stage Data Editor. With its fully graphical interface, this editor offers an intuitively accessible framework for entering the logical conditions. All available stage changes are already stored here in order of priority. For each of these conditions, the stage demand- and extension conditions are selected and parameterized.

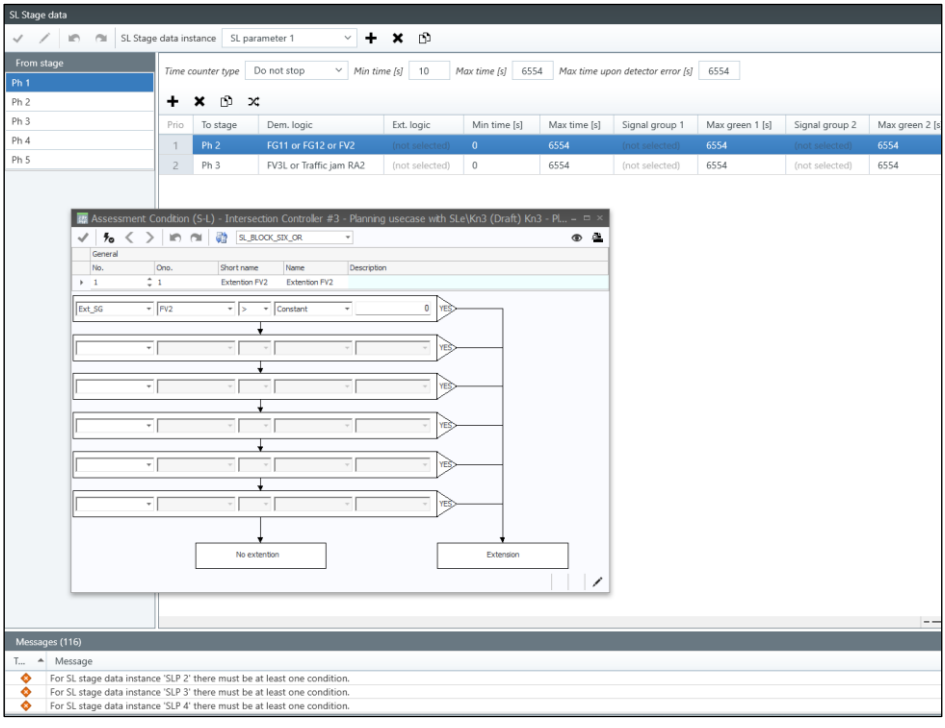
Demand and Extension

The logical conditions for stage demand and extension are defined for each stage change in separate editors. Here, the known markers for individual signal groups and detectors can be queried and combined with each other in predefined templates. This automatically guarantees the consistency of the control logic with the controller basic supply, as only objects that actually exist can be referenced.

Additional Logic

For special requirements where greater control flexibility is needed, SL also offers the option of additional programming in *Traffic Language*. The available instruction set of the SL library is reduced to essentials in order to minimize the amount of additional complexity. In addition, however, the functions known from PDMx, such as user libraries or user parameters, are available to enable easy reuse of logic components.





Specifications in Detail

Control Method PDMx

Supporter controller types	• sX • configuration data migration from C800 and C900
Signal Groups	• up to 64 signal groups • up to 96 signal groups with project-specific approval
Detectors, Inputs/Outputs	• up to 250 inputs and 250 outputs
Partial Intersections	• up to 4 software partial intersections • up to 4 hardware partial intersections
Stages	• up to 60 stages
Stage Transitions	• up to 224 stage transitions • up to 15 simultaneous target stages • up to 7 simultaneous partial transitions
PT Directions	• up to 64 PT-directions with 4 parameter sets each • 5 reporting points, 5 subsequent trains and 1 emergency registration
Frame Plans	• up to 16 frame plans for each stage permit, one frame for IT request, IT extension, PT request, PT extension • up to 10 freely usable additional frames per frame plan
Parameter Sets	• up to 4 demand- and extension parameter sets with 50 Det/SG markers each • up to 16 user parameter sets, editable via sX Web UI • one global parameter set
User Logic	• mandatory
SREM/SSEM	• with ETA provided by KERNx • via R09 telegram conversion
Yutraffic awareAI	• IP connection via internal AP values by KERNx for additional TL programming • Connection via digital inputs through KERNx for additional TL programming
Central connection via OCIT and Canto	• Project-specific modifications and BLOB communication • up to 512 user-defined AP values for additional TL programming • Standard AP values of SL4sX and KERNx
Required License	• ATE – Advanced Traffic Engineering for sX

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Control Method SL4sX

Supporter controller types	• sX • configuration data migration from C800 and C900
Signal Groups	• up to 64 signal groups • up to 96 signal groups with project-specific approval
Detectors, Inputs/Outputs	• up to 250 inputs and 250 outputs
Partial Intersections	• up to 4 software partial intersections • up to 4 hardware partial intersections
Stages	• up to 16 stages
Stage Transitions	• up to 96 stage transitions • up to 15 simultaneous target stages • up to 7 simultaneous stage transitions
PT Directions	• up to 10 PT-directions with 2 parameter sets each • 2 reporting points, 5 subsequent trains and 1 emergency registration
Frame Plans	• up to 16 frame plans for each stage permit, one frame for IT request, IT extension, PT request, PT extension
Parameter Sets	• up to 4 demand- and extension parameter sets with 50 Det/SG markers each • up to 16 user parameter sets • one global parameter set
User Logic	• optional • up to 8 parameter sets for SL stage data • up to 100 parameterized SL logic blocks each for stage demand and extension
SREM/SSEM	• via R09 telegram conversion, especially without TL additional programming
Yutraffic awareAI	• IP connection via internal AP values by KERNx for additional TL programming • Connection via digital inputs through KERNx for additional TL programming
Central connection via OCIT and Canto	• Project specific modifications and BLOB communication • up to 512 user-defined AP values for additional TL programming • Standard AP values of SL4sX and KERNx
Required License	• ATE – Advanced Traffic Engineering for sX

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In General

Supporter controller types Yutraffic Office	• sX Controller family • C900 Controller family • C800 Controller family • M-Controller family (partially) • Generic OCIT Controller • Generic CANTO Controller
Supported TA methods (selection) **Yutraffic Office**	• PDM – also licensed to 3rd party controllers • SL – also licensed to 3rd party controllers • VSp • FESA • STRIDE • NORRA • OML – C900 controllers only • OMTC, TRELAN/TRENDS – external TA method for sX, i.e. without parameters in Office, only declaration in basic supply
System clock	• 1s – planning, controller- and TA configuration PDM/SL • 200ms – TA configuration NORRA, STRIDE • 100ms – partially planning, controller- and TA configuration for NORRA, STRIDE
Micro-Simulationtools	• AIMSUN.Next • PTV VISSIM
Adaptive network control methods	• Yutraffic FUSION • Yutraffic MOTION
Information Security Standard	• Development process in accordance with ISO/IEC 27001
Download for full version and free demo version	• Yunex Traffic Tools - Home • Digitally signed setups to verify authenticity
Product Training	• upon request at the Yunex Academy • on-site or at the Yunex Academy in Munich • E-mail: academy@yunextraffic.com • WWW: https://academy.yunextraffic.com/
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