

Traffic Management Plans – modelling evaluation KPIs

Author Ian Cornwell (Mott MacDonald)
Review by Alastair Dunsmore (Mott MacDonald)
Date 5/4/18
Ref 387405/TN/01v2

Purpose and Scope

This note describes a DATEX II model for the publication of quantitative evaluation of traffic management plans.

The model expresses the results from an evaluation service, for example a predictive evaluation service with short-term traffic prediction and what-if scenario modelling.

The model is constructed as a compliant DATEX II v3 extension. Because it defines new kinds of publication it is a “Level C extension”.

Although at time of writing this DATEX II extension model has not been implemented and tested in software this precise form, it is based on a very similar (non-DATEX) model implemented and shown (in research) to support integration of systems and display to operational traffic managers to support their traffic management decisions.

Potential use cases

This model could be used within several related use cases.

1. Within the facilities of one organisation, a traffic management system has requested the evaluation of a set of potential traffic management measures. An evaluation service has performed an evaluation of the predicted effects of these measures. [The results are returned using the EvaluationResultsPublication described in this note.](#)
2. For a response that affects roads under the authority of different organisations, one traffic management authority, having performed an evaluation to check that the predicted effects are beneficial, asks another for agreement to activate traffic management measures. [The EvaluatedActionsPublication is used to tell the recipient authority about the requested measures and the requesting authority's evaluation.](#)
3. A traffic management authority is activating or recommending some traffic management measures, having performed an evaluation to check that the predicted effects are beneficial, and now wishes to inform in-vehicle services providers who can in turn inform motorists. [The EvaluatedActionsPublication is used to tell the service providers about the suggested](#)

This document is issued for the DATEX user community for the stated purpose only. It should not be relied upon by any other party or used for any other purpose.

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties

measures and the authority's evaluation.

The response evaluation results used in these use cases are expected to typically come from short-term traffic prediction.

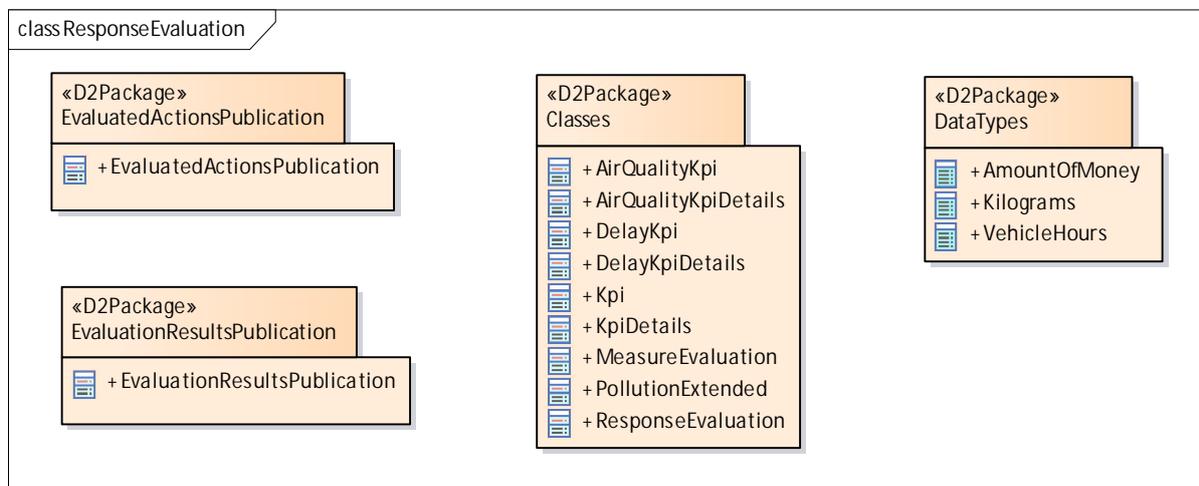
Terminology

We use the term "measure" as it is defined in the EasyWay Deployment Guideline on Traffic Management Plans¹: a "possible reaction to respond to the impact of the initial situation". We also use the synonymous term "response measure" to avoid potential confusion with values of metrics.

It is expected that each measure has been represented as a DATEX II "OperatorAction", hence use of "Action" in "EvaluatedActionsPublication".

Traffic management response evaluation model

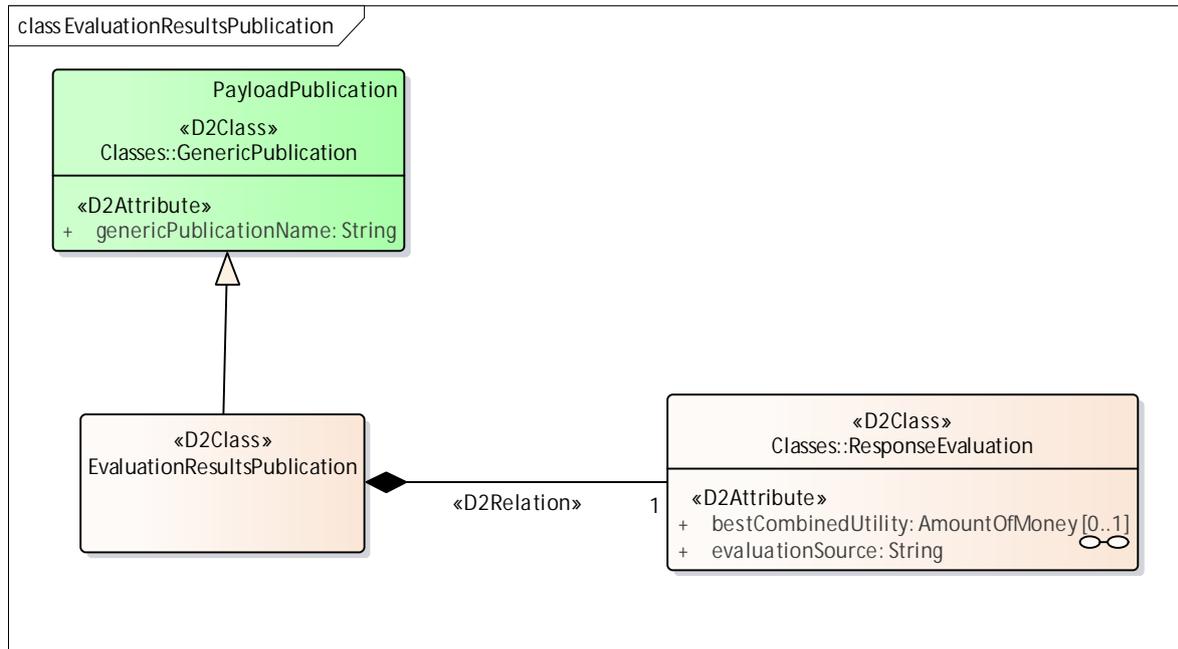
The contents of the extension are summarised in the UML package diagram below.



The contents are then described in further sections, with UML class diagrams in which colour distinguishes new extension elements from existing DATEX II constructs.

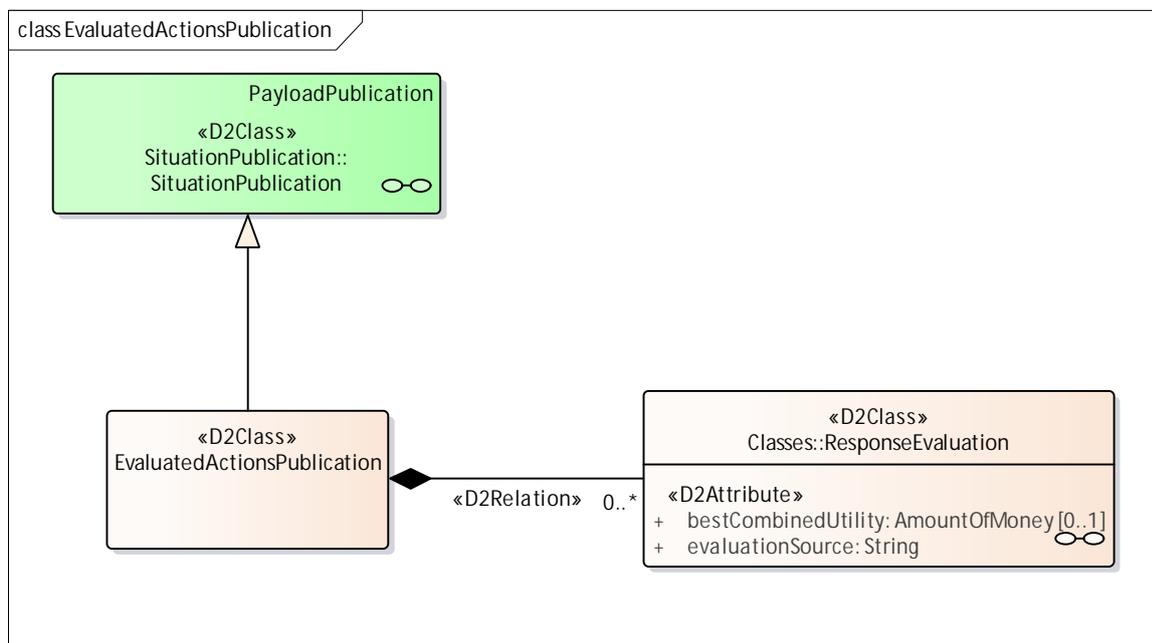
¹ EasyWay Deployment Guideline TMS-DG07 "Traffic Management Plan Service for Corridors and Networks", <https://dq.easyway-its.eu/DGs2012>

EvaluationResultsPublication



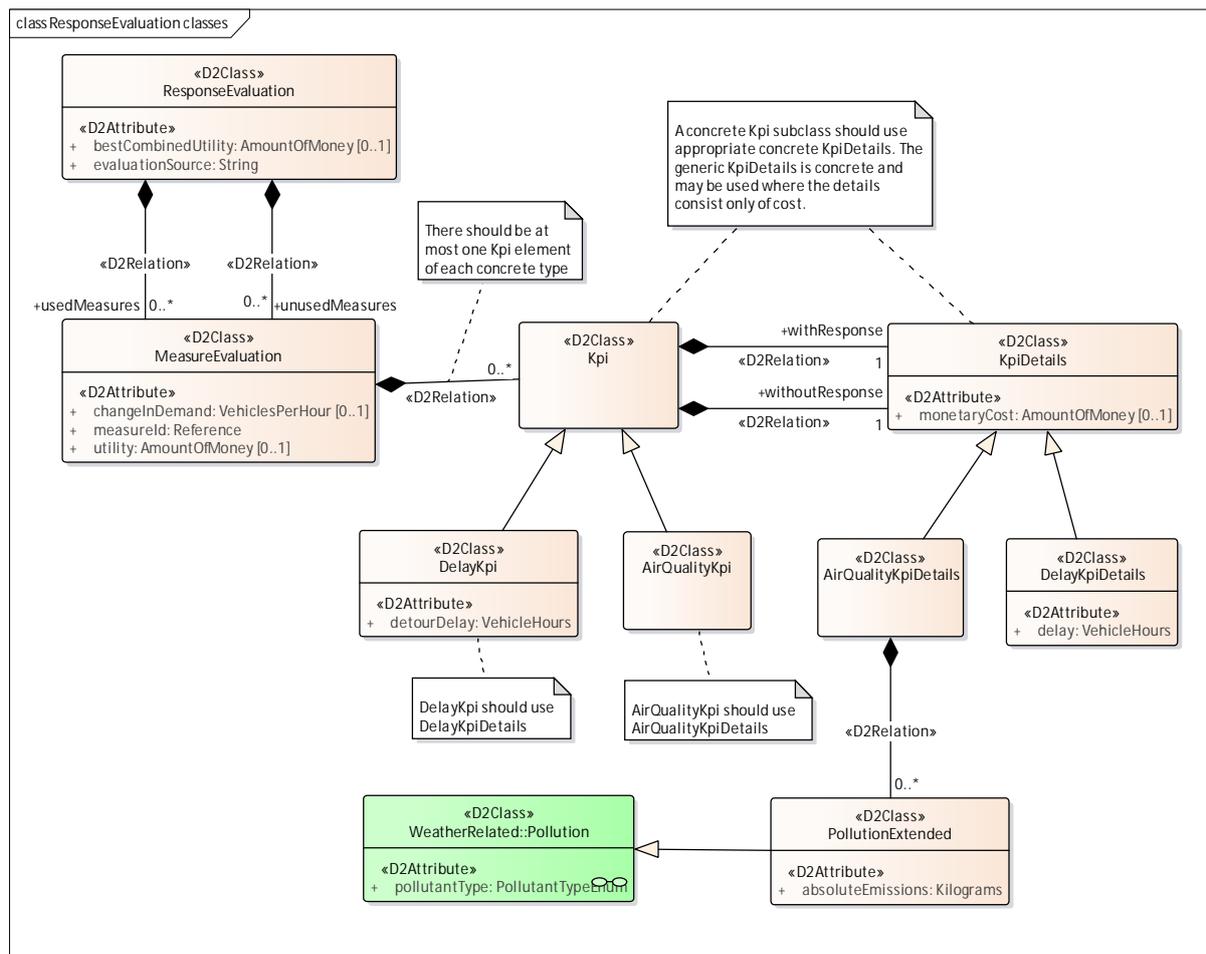
This publication can be used to publish a set evaluation results from one source. This publication does not include definition of the responses themselves.

EvaluatedActionsPublication



This publication can be used to publish proposed or running traffic management plans in the form of OperatorActions (contained in the Situations of the SituationPublication), and corresponding evaluation results - one set for each different evaluation source used.

ResponseEvaluation classes



The classes in the UML diagram are further described in the following tables; in most cases the definitions are identical to the "definition" fields in the model, but in a few cases due to limitations of the Enterprise Architect UML tool the "definitions" fields are abbreviated.

Element	Definition
ResponseEvaluation	The results of an evaluation of potential traffic management plans
bestCombinedUtility	The best result (most savings, or least costs) from evaluated permutations of responses. This is expressed as a money value in units of Euros. A positive value means a benefit, a negative value means a cost.
evaluationSource	Identifies the service that produced these evaluation results.
usedMeasures	The evaluation results for response measures that are included in the set that produced the best combined utility. If all combinations of measures have been evaluated to be worse than making no response, this will be empty.
unusedMeasures	The evaluation results for response measures that are not included in the set that produced the best combined utility – i.e. the responses which, if added to the best set, would make things worse.

Element	Definition
MeasureEvaluation	The evaluation results for one response measure.
utility	The contribution to utility made by the measure, expressed as a money value

	in units of Euros. A positive value means a benefit, a negative value means a cost. If the measure has been evaluated as being part of the optimum permutation, then this value is in some way indicative of the contribution of this measure to the utility of the optimum set, although since measures affect one another that is not a precise concept. If the measure is not part of the optimum permutation, then this value will be non-positive and represents the amount by which this measure lessens the evaluated utility of the optimum set if it is added to that set.
changeInDemand	The expected change in traffic demand caused by this measure while it is active, in units of vehicles per hour. For example, if the measure is a diversion then this number of vehicles per hour will divert from the original route to the alternative route while the diversion is active.
measureId	Identifies the measure for which these results apply. The measure should be described as a DATEX II OperatorAction, which may be in the current publication or in another publication.
kpi	Set of evaluation results for this measure, one for each individual metric.

Element	Definition
Kpi	The evaluation results for one response measure for one kind of metric.
withResponse	Evaluation results for the scenario that the response measure is in effect
withoutResponse	Evaluation results for the scenario that the response measure is not in effect

Element	Definition
DelayKpi	The evaluation results for one response measure, for the metric of delay. The kpi details (withResponse and withoutResponse) for a DelayKpi should be of type DelayKpiDetails.
detourDelay	Ignoring any congestion effects, the total extra time taken by vehicles due to the response measure. It makes most sense for a diversion measure where it is the total extra time taken by diverting vehicles due to the diversion route being slower than the original route in freely flowing conditions. Expressed in units of vehicle hours. If the diversion route is faster than the original route in freely flowing conditions then this number will be negative.

Element	Definition
AirQualityKpi	The evaluation results for one response measure, for the metric of air quality. The kpi details (withResponse and withoutResponse) for an AirQualityKpi should be of type AirQualityKpiDetails.

Element	Definition
KpiDetails	Evaluation results relating to one response measure, for a single scenario: either the scenario that the measure is in effect or the scenario that it is not in effect.
monetaryCost	The total of monetized costs assigned for this particular metric for a given response and scenario.

Element	Definition
---------	------------

DelayKpiDetails	Evaluation results relating to one response measure, for the metric of delay, representing either the scenario that the measure is in effect or the scenario that it is not in effect.
delay	The total extra time (due to congestion, compared with freely flowing conditions) taken by vehicles in this scenario. Expressed in units of vehicle hours.

Element	Definition
AirQualityKpiDetails	Evaluation results relating to one response measure, for the metric of air quality, representing either the scenario that the measure is in effect or the scenario that it is not in effect.

Element	Definition
PollutionExtended	Details of emissions of pollutants and atmospheric pollution levels
absoluteEmissions	The total quantity of emissions of the specified pollutant

Data Types

Element	Definition
AmountOfMoney	Identical to type in Parking – ideally would become Common.
Kilograms	A value of weight expressed in units of kilograms. Specialisation of Common:: <datatypes>::Generic::Float.</datatypes>
VehicleHours	An absolute value (not a rate) of traffic delay in vehicle hours. Specialisation of Common:: <datatypes>::Generic::Float.</datatypes>