Deltares

Enabling Delta Life

DAM

Architecture Overall

Deltares

DAM

Architecture Overall

1210702-000

Deltares

Title
DAM

Client	Project	Reference	Pages
Deltares - Geo engineering DKS	1210702-000	1210702-000-GEO-0005	13

Classification
-

Keywords
Dike, safety assessment, design, software, macro stability, piping

Summary
This document contains a description of the overall architecture for DAM, an application that computes the strength of a complete dikering with respect to several failure mechnanisms, such as macro stability and piping.

Samenvatting
Dit document bevat een beschrijving van de totale architectuur van DAM, een User Interface applicatie die een gebruiker in staat stelt om voor een dijktraject berekeningen uit te voeren voor verschillende faalmechanismen, waaronder macrostabiliteit en piping.

References
Refer to chapter 5.

Version	Date	Author	Initials	Review	Initials	Approval	Initials
0.1	Jan 2017	Tom The		John Bokma		Maya Sule	

Status
draft
This is a draft report, intended for discussion purposes only. No part of this report may be relied upon by either principals or third parties.

Contents

List of Figures

List of Tables

1 Introduction

1.1 Purpose and scope of this document

This document contains the overall architecture of DAM, a software package for the automated calculation of the strength of dikes, and all of its components. DAM was developed by Deltares with and for STOWA for all water authorities.

1.2 Other system documents

The full documentation on the program comprises the following documents.

Title	Content
DAM - Architecture Overall (The, 2017a)	Description of overall architecture of DAM and its components.
DAM Engine - Technical Design (The, 2017b)	Description of the implementation of the architecture and technical design of DAM.
DAM Engine - Technical documentation (Doxygen, 2017a)	Description of the arguments and usage of different software components, generated from in-line comment with Doxygen.
DAM Engine - Test Plan (Trompille, 2017a)	Description of the different regression and acceptation tests, including target values.
DAM Engine - Test Report (Trompille, 2017b)	Description of the test results (benchmarks and test scripts).
DAM UI - Functional Design (Zwan, 2017)	Description of the requirements and functional design of the DAM User Interface.
DAM UI - Technical Design (The, 2017c)	Description of the implementation of the architecture and technical design of the DAM User Interface.
DAM UI - Technical documentation (Doxygen, 2017b)	Description of the arguments and usage of different software components of the DAM User Interface, generated from in-line comment with Doxygen.
DAM UI - Test Plan (Trompille, 2017c)	Description of the different regression and acceptation tests, including target values for the DAM User Interface.
DAM UI - Test Report (Trompille, 2017d)	Description of the test results (benchmarks and test scripts) of the DAM User Interface.
DAM UI - User Manual (Erik Vastenburg, 2013)	Description of the different functionalites available in the *User Interface* and background information.

Table 1.1: *DAM system documents.*

2 DAM and its components

DAM contains several components. Please see Figure 2.1 for an overview of the components.

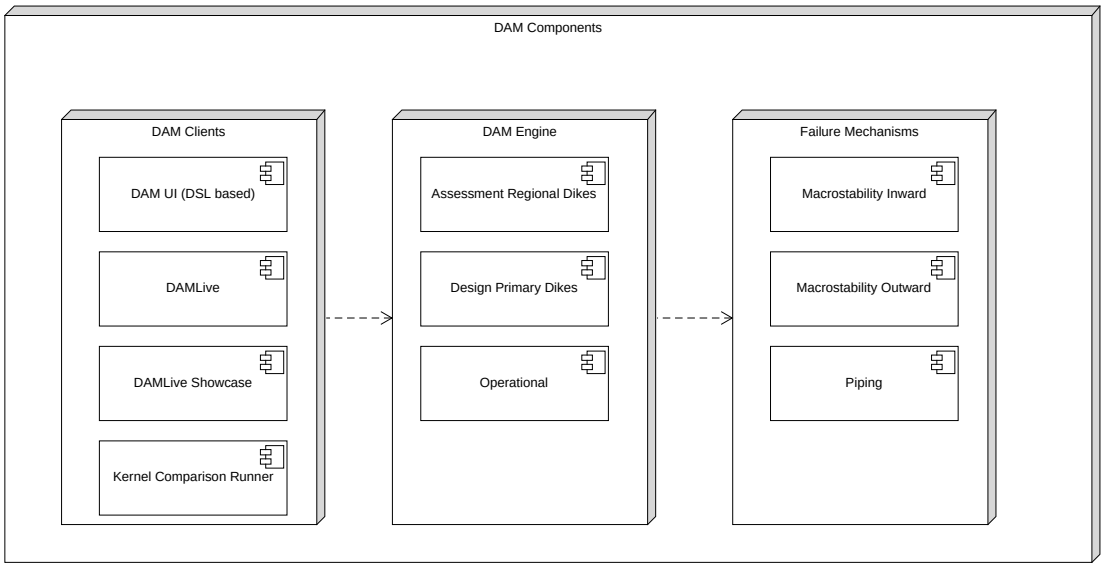

Figure 2.1: *DAM and its components.*

The arrows illustrate the dependencies of the components. In the following sections the components are described.

2.1 DAM clients

DAM clients are the modules that mostly interact with the user or sometimes with another system. These can be full graphical user interfaces (like DAM UI as shown in Figure 2.2 and DamLive Showcase as shown in Figure 2.3 and Figure 2.4), commandline parameter tools (like KernelComparisonRunner.exe) or a module that can be used by other systems (like DAMLive, that is to be used as a module in a FEWS system).

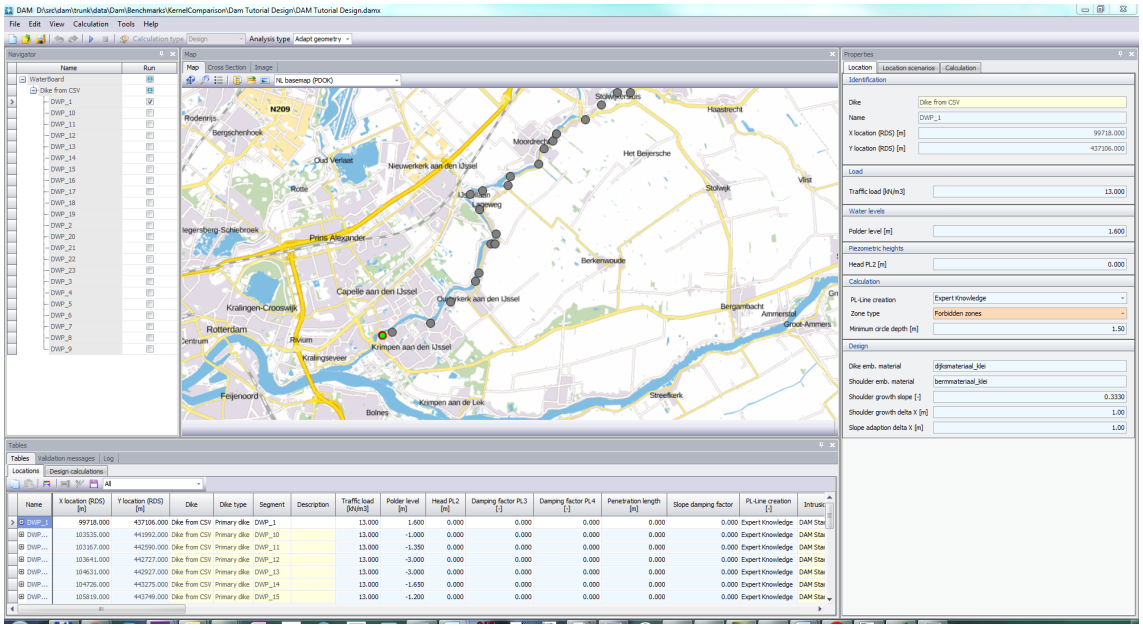

Figure 2.2: *DAM User Interface.*

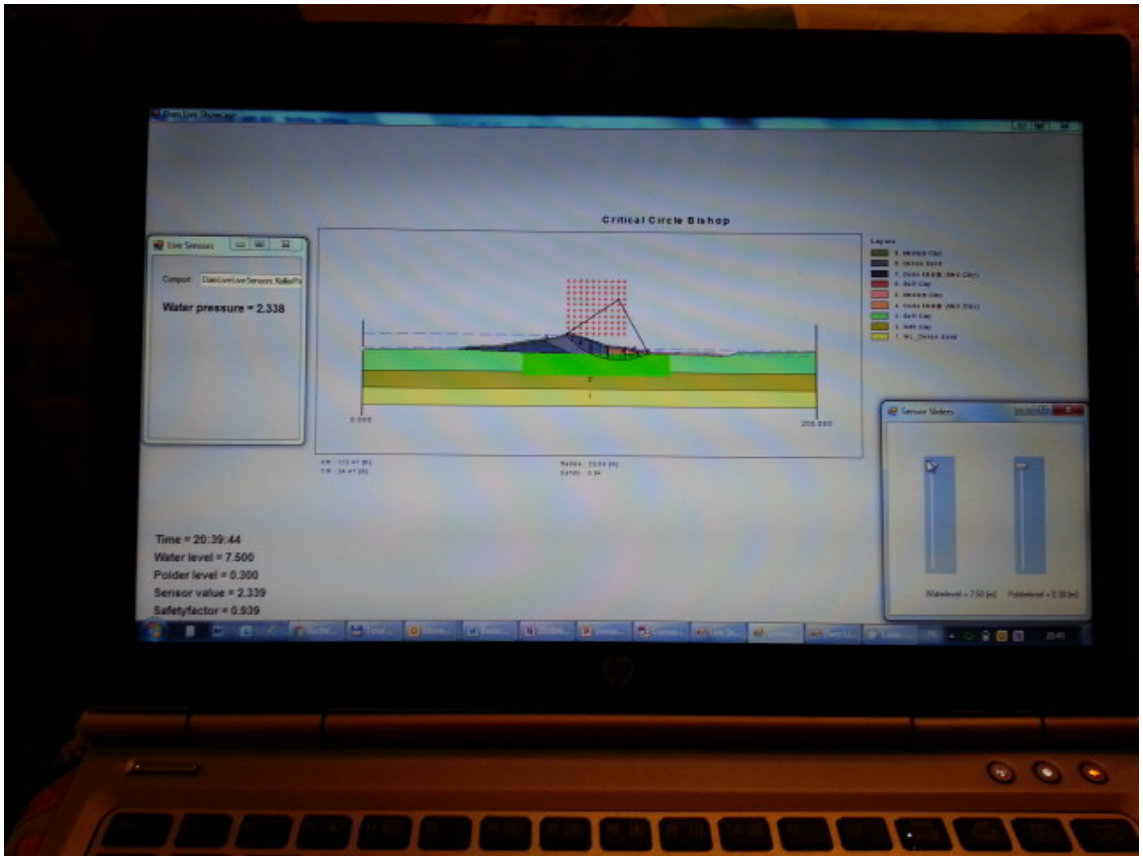

Figure 2.3: *DAMLive Showcase User Interface.*

Figure 2.4: *DAMLive sensor.*

These clients interact directly with the DAM Engine (see next section).

2.2 DAM Engine

The DAM Engine is the engine for the DAM computation. It contains several submodules, depending on which computation has to be made. As can be seen in Figure 2.1 the submodules are

- Assessment regional dikes
- Design primary dikes
- Operational module (for realtime calculations)

Depending on the client, 1 or more of these submodules can be addressed by the client. The DAM Engine has no knowledge of the clients that use the Engine and there will be no code dependencies from the Engine to the clients.

2.3 Failure mechanisms

The DAM Engine uses the failure mechanisms. These are completely independent and have no knowledge of the DAM Engine. So there will be no code dependencies from the failure mechanisms to the DAM Engine.

3 Architectural Choices

3.1 Module dependencies

As can be seen in Figure 2.1 the arrows pointing between the main parts of the system are only 1 way. This means that e.g. the DAM clients may address the DAM Engine, but the DAM Engine may not address the DAM clients.

3.2 External libraries and components

DAM uses third-party libraries and components. Only open sources and free components, that are free to redistribute, are allowed to be used.

Furthermore DAM uses the Delta Shell Light (DSL) library, that is developed by Deltares.

Due to choises that have been made in the past, the UI modules of DSL use DevExpress, which is a commercial library. Free redistribution of the DevExpress is allowed by the development license that is used by Deltares.

In the future the dependency on DevExpress should be removed, e.g. by using other, open source, UI libraries.

In the next sections the libraries that are used by the components are summarized.

3.3 DAM UI (DSL)

This client uses the full Delta Shell Light (DSL) library

- DSL-Core: standard library with general common functionality
- DSL-Probabilistic: probabilistic functionality
- DSL-Geographic: GIS functionality
- DSL-Geo: geotechnics functionality
- DSL-GeoIO: geotechnics import and database functionality
- DSL-FormsStandard: standard UI functionality
- DSL-FormsMaps: extends FormsStandard with GIS functionality
- DSL-FormsGeo: extends FormsStandard with geotechnical functionality

Other libraries that are used are

- Dot Spatial: GIS library
- Commandline Parser: library for parsing commandline options
- Lumenworks: CSV import library
- SQLite: SQLite database access library
- Firebird: Firebird database access library

3.4 DAM Engine

The DAM Engine only uses part (the non-UI modules) of the DSL library

- DSL-Core
- DSL-Probabilistic
- DSL-Geo

Other libraries that are used are

- Math.Net: mathematical library

4 Version control

For the version control system Subversion with the Tortoise client will be used. The layout of the SVN repository will reflect the components of DAM as shown in Figure 2.1.

The failure mechanisms are not part of DAM itself and thus not of the DAM repository. Instead, the failure mechanisms will be stored in their own repositories. DAM will refer to the failure mechanisms as external libraries.

4.1 DAM repository main layout

In Figure 4.1 the main layout is shown.

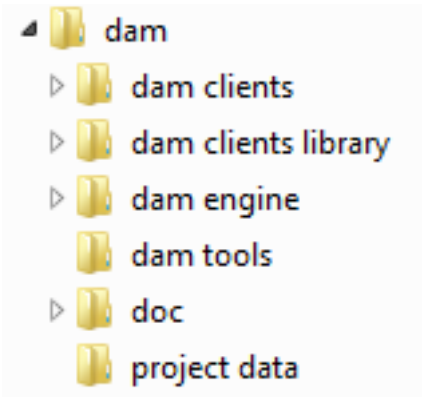

Figure 4.1: *DAM SVN main layout.*

The 4 main parts are

- dam clients - the client applications that use the DAM Engine.
- dam clients library - shared libraries by the DAM clients.
- dam engine - the computational engine of DAM.
- doc - general documentation for DAM (like this document).

With the excpetion of "'dam clients"' Each of these parts has its own trunk/branches/tags layout.

The map "'dam tools"' is for storing independent tools that are not part of DAM itself, but support the work processes of DAM (e.g. Dam Edit Design).

The map "'project data"' is for archiving DAM project data.

4.2 DAM repository clients layout

Each DAM client has its own entry in the clients map. In Figure 4.2 the layout of the DAM clients map is shown.

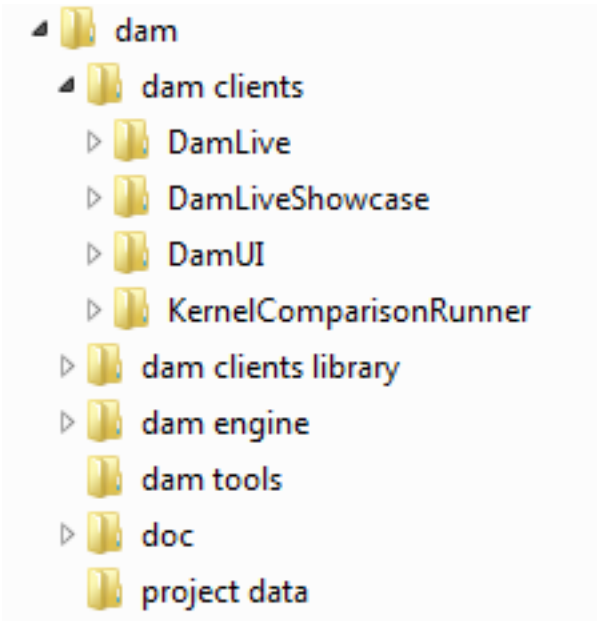

Figure 4.2: *DAM SVN clients layout.*

Each of the "'dam clients"' has its own trunk/branches/tags layout.

The currently known applications are

- Dam UI - the current DAM desktop application.
- DamLive - the current runner for the Fews operational system.
- DamLiveShowcase - a demo application to show DamLive with live sensors.
- KernelComparisonRunner - a commandline utility for comparing the results of different macrostability kernels.

4.3 DAM repository clients library layout

In Figure 4.3 the layout of the DAM clients library map is shown

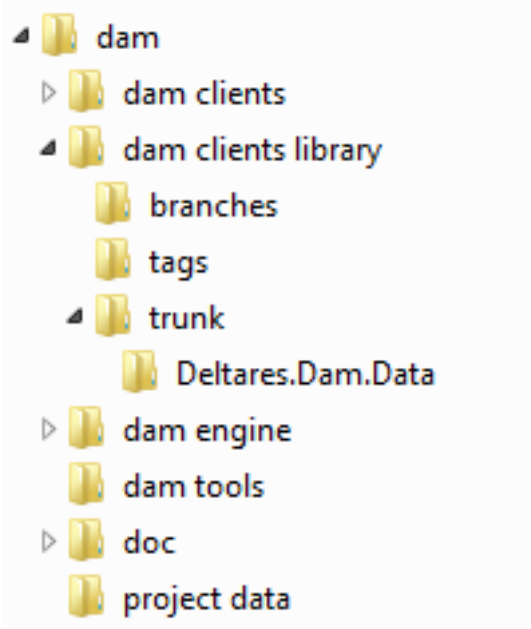

Figure 4.3: *DAM SVN clients library layout.*

At this moment only one project is foreseen to be put in the "'dam clients library"' map

- Deltares.Dam.Data

4.4 DAM repository full layout

The full layout of the DAM repository will be as shown in Figure 4.4.

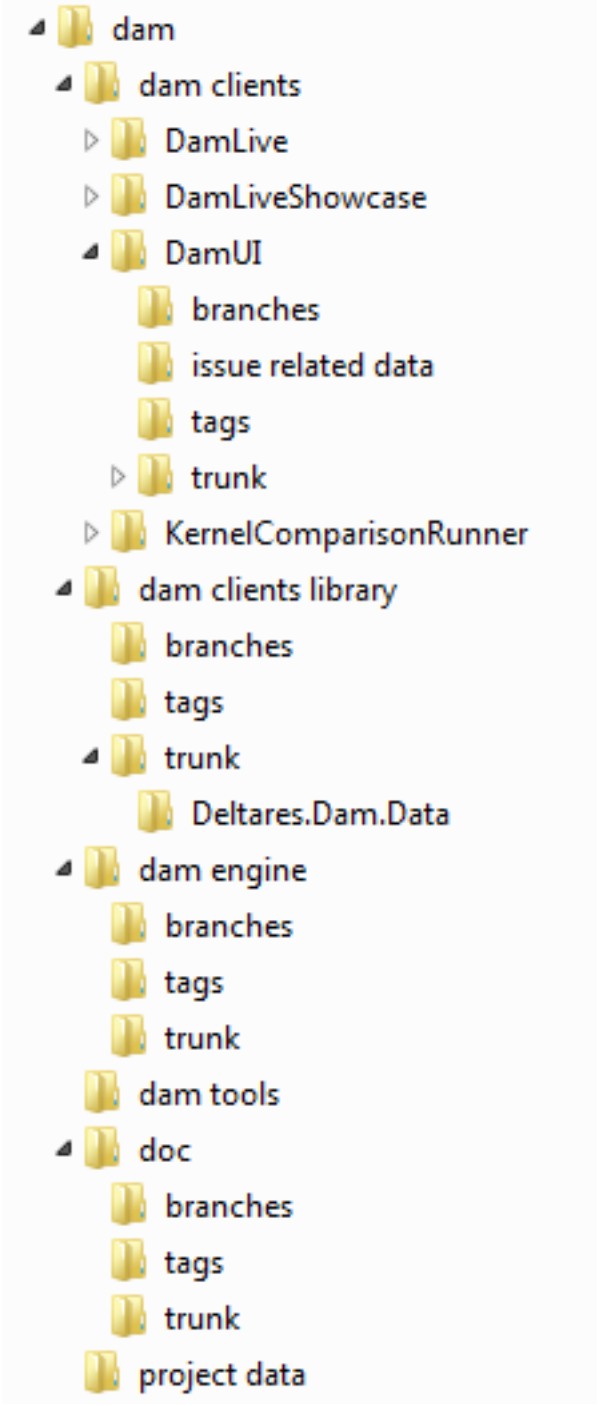

Figure 4.4: *DAM SVN full layout.*

5 Literature

Doxygen, 2017a. *DAM Engine - Technical documentation, Generated by Doxygen 1.8.10*. Tech. rep., Deltares.

Doxygen, 2017b. *DAM UI - Technical documentation, Generated by Doxygen 1.8.10*. Tech. rep., Deltares.

Erik Vastenburg, I. v. Z., 2013. *DAM UI - Users Manual*. Tech. Rep. 1207094-000-GEO-0002, Versie 2, 11 juni 2013, concept, Deltares.

The, T., 2017a. *DAM Architecture Overall*. Tech. Rep. 1210702-000-GEO-0005, version 0.1, jan. 2017, concept, Deltares.

The, T., 2017b. *DAM Engine - Technical Design*. Tech. Rep. 1210702-000-GEO-0004, version 0.2, mar. 2017, concept, Deltares.

The, T., 2017c. *DAM UI - Technical Design*. Tech. Rep. 1210702-000-GEO-0009, version 0.1, jan. 2017, concept, Deltares.

Trompille, V., 2017a. *DAM Engine - Test Plan*. Tech. Rep. 1210702-000-GEO-0006, version 0.1, jan. 2017, concept, Deltares.

Trompille, V., 2017b. *DAM Engine - Test Report*. Tech. Rep. 1210702-000-GEO-0007, version 0.1, jan. 2017, concept, Deltares.

Trompille, V., 2017c. *DAM UI - Test Plan*. Tech. Rep. 1210702-000-GEO-0010, version 0.1, jan. 2017, concept, Deltares.

Trompille, V., 2017d. *DAM UI - Test Report*. Tech. Rep. 1210702-000-GEO-0011, version 0.1, jan. 2017, concept, Deltares.

Zwan, I. v., 2017. *DAM - Functional design*. Tech. Rep. 1207094-000-GEO-0005, Versie 2, 11 juni 2013, concept, Deltares.