Bentley®
Sustaining Infrastructure

ADVANCING REALITY MODELING WITH CONTEXT**CAPTURE**

Knowing the existing conditions of a project is a key asset in any decision process. Governments need to better know their territories, through mapping operations, infrastructure owners want to survey and inspect their assets, project delivery companies have to plan and monitor their actions and report to their customers.
Being able to quickly reconstruct a 3D model accurately representing the existing conditions proves every day to be increasingly critical.

Much cheaper and more versatile than laser scanners or depth field cameras, ContextCapture automatically turns simple photos into accurate 3D models. Suited and optimized for surveying, mapping and inspection tasks at any scale, from objects to cities, and at any levels of detail, ContextCapture is the best-in-class solution for the reconstruction of existing conditions of infrastructure and assets.

SOLUTION POSITIONING

WHAT

Developed for 15 years at two major European research institutes, ContextCapture (formerly called Smart3DCapture) is a software solution for automatic high resolution 3D reconstruction from photographs, based on the highest-performance photogrammetry, computer vision and computational geometry algorithms.
ContextCapture takes as input a series of digital photographs of a static scene acquired from distinct viewpoints, and automatically turns this dataset into a high resolution and textured manifold triangular mesh that can be exported in various 3D formats.

FOR

MAPPING
- 3D Cities
- 3D Territories
- 3D Cadastre
- True orthophotos
- 2.5D DSM

SURVEYING
- Automatic modelling of existing conditions
- Volume measurement for excavation work

INSPECTION
- 3D Inspection of assets conditions
- Change detection on asset

VALUE PROPOSITION

PHOTO BASED
COST SAVINGS
No need for any expensive acquisition devices operated by trained users, any cameras suffice.
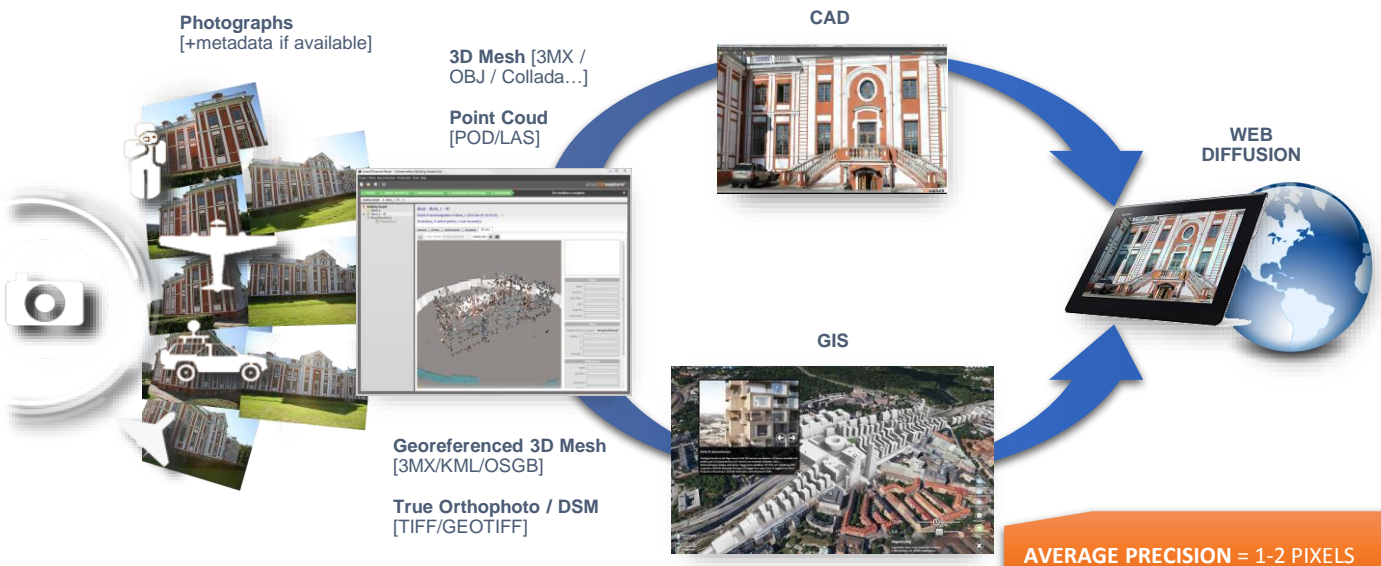
UNLIMITED SCALABILITY
SUPERIOR PRECISION
From simple objects to entire cities with the same solution. Renders the finest details thanks to a unique technology.

FULLY AUTOMATED
TIME SAVINGS
No human intervention is required.

HOW DOES IT WORK?

Photographs
[+metadata if available]

3D Mesh [3MX /
OBJ / Collada…]

Point Coud
[POD/LAS]

CAD

**WEB
DIFFUSION**

GIS

Georeferenced 3D Mesh
[3MX/KML/OSGB]

True Orthophoto / DSM
[TIFF/GEOTIFF]

AVERAGE PRECISION = 1-2 PIXELS
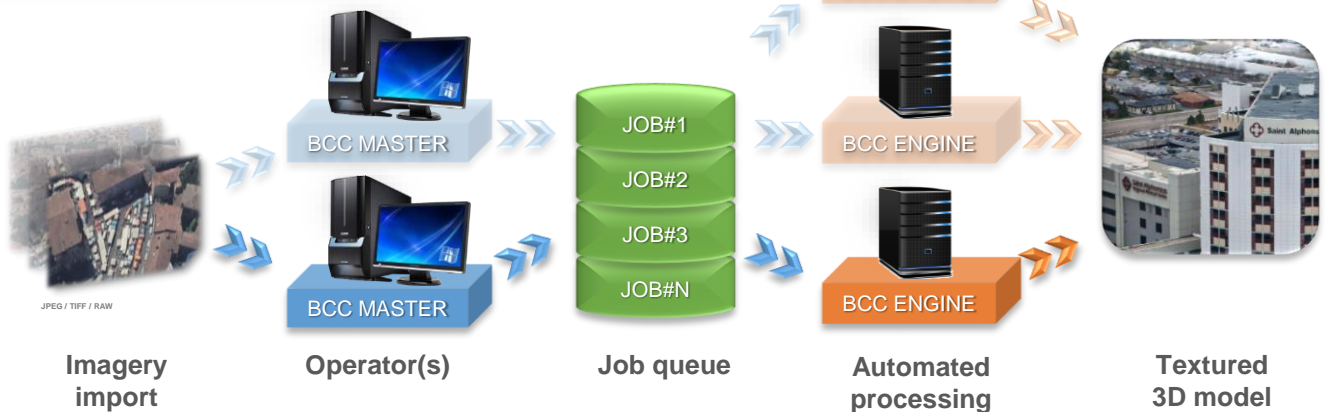
RECOMMENDED HARDWARE CONFIGURATION:
I7 CPU / 16-64GB or RAM / GPU NVIDIA GeFORCE GTX 980
Titan or equivalent / Windows OS

MODULAR SOFTWARE ARCHITECTURE

CONTEXTCAPTURE is limited to a single
PC and can process up to 30 Gpix /
project when **CONTEXTCAPTURE
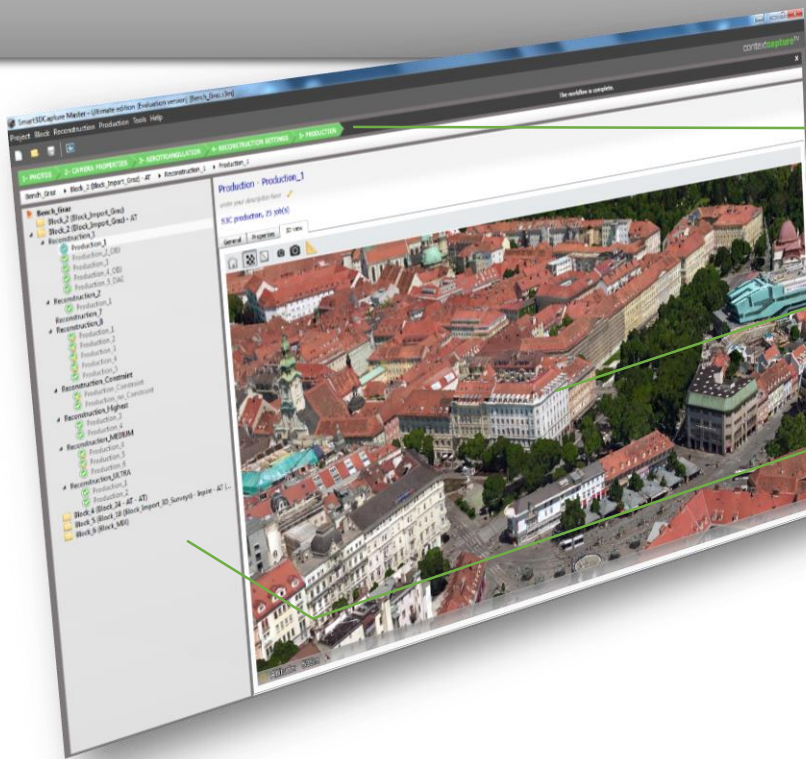CENTER** is not limited and supports
multiple Engines on a cluster.

**MINIMUM CONTEXTCAPTURE CENTER
CONFIGURATION** = 1 Master + 1 Engine

FLEXIBLE   COST EFFECTIVE   MICROSTATION READY

BCC ENGINE

BCC ENGINE

BCC ENGINE

BCC MASTER

BCC MASTER

JOB#1
JOB#2
JOB#3
JOB#N

JPEG / TIFF / RAW

**Imagery
import**

Operator(s)

Job queue

**Automated
processing**

**Textured
3D model**

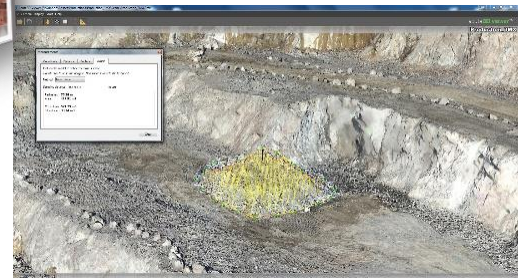**AVERAGE PROCESSING SPEED:**
15 **G**pix / day / Engine

USER INTERFACE

Project steps completion indicator.

3D Mesh visualization.

Project tree.

Volume Measurement interface

PACKAGING

	CONTEXT**CAPTURE**	CONTEXT**CAPTURE** **CENTER**
Windows version	✓	✓
Imagery (JPEG / RAW / TIFF) dataset import limitation / project (in Gpix)	30	No limit
Mesh export formats (3MX / OBJ / FBX / KML / Collada / STL / OSGB)	✓	✓
Colored point cloud export (POD / LAS)	✓	✓
True Orthophoto + 2.5D DSM (TIFF/GEOTIFF)	✓	✓
Georeferencing	✓	✓
Parallel (cluster) processing for unlimited scalability		✓
SDK		✓
Modularity (Master + Engine architecture)		✓

USE CASES

CITY MAPPING

STOCKHOLM – by BLOM
Area: 500 sq-km (~100,000 photos)
Resolution: 7-8 cm per pixel
Solution: ContextCapture Center with 4 Engines (3 months)
Deliverable: Georeferenced Textured 3D mesh + True orthophotos

SURVEYING

GAS PLANT – by GERPHO
#Photos: 180 (36MPix)
Area: 1 ha
Resolution: 2-3 cm per pixel
Solution: 1 Engine (2 hours)
Deliverable: Georeferenced Textured 3D mesh

STREET MAPPING

CHINA STREET (400m) – by IFA Tech
Photos: 1500 (21MPix)
Resolution: 1-2 cm per pixel
Solution: ContextCapture Center with 3 Engines (3 days)
Deliverable: Georeferenced Textured 3D mesh
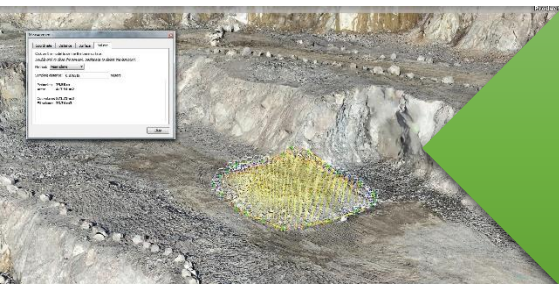
INSPECTION

BRIDGE – by Diades
#Photos: 1500 (36MPix)
Resolution: 0.2-0.5 cm per pixel
Solution: 2 Engines (3 days)
Deliverable: Georeferenced Textured 3D mesh

MONITORING

STOCKPILE VOLUME
Photos: 80 (21MPix)
Area: 2,000 sq-m
Resolution: 5 cm per pixel
Solution: ContextCapture (1 Engine)
Deliverable: 3D mesh + Volume

MODULES DESCRIPTION

CONTEXTCAPTURE MASTER

The ContextCapture Master is the master module of ContextCapture. Through a graphical user interface, it allows you to: import the data sets, define the processing settings, submit and monitor tasks, visualize results, etc. The Master does not perform the processing tasks. Instead, it decomposes tasks into elementary jobs which it submits to a job queue. ContextCapture Master's main interface manages the different steps of the ContextCapture workflow through a project.
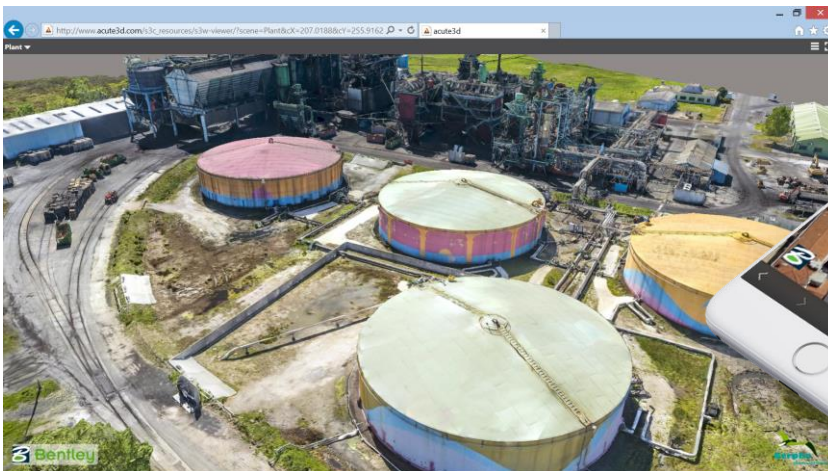
ACUTE3D VIEWER

Acute3D Viewer is a free lightweight visualization module. It is optimized for Acute3D 's native format, which handles level-of-detail, paging and streaming, thus allowing visualization of terabytes of 3D data, locally or online, with a smooth frame rate. Acute3D Viewer can also read models in OBJ, PLY and OSGB format, record fly-through to generate animations and select tiles. It can also be used in conjunction with ContextCapture Master to control production quality all along the workflow.

CONTEXTCAPTURE ENGINE

ContextCapture Engine is the worker module of ContextCapture. It runs on a computer in the background, without user interaction. When it is not busy, the Engine takes a pending job in the queue, depending on its priority and date of submission, and executes it. A job usually consists of an aerotriangulation or 3D reconstruction process, using various computationally intensive algorithms (keypoint extraction, automatic tie point matching, bundle adjustment, dense image matching, robust 3D reconstruction, seamless texture mapping, texture atlas packing, level-of-detail generation, etc). ContextCapture Engine makes an extensive use of general-purpose computation on graphics processing units (GPGPU). Each Engine can exploit a single GPU.

ACUTE3D WEB VIEWER

ContextCapture solutions can now produce in 3MX format, a proprietary format based on a WebGL compliant structure, that can be easily published on the web and visualized with a mere browser on any platform: PC, Mac, smartphones & tablets.

REFERENCES

"The ContextCapture Technology automatically produces extremely precise 3D models that render the finest details of any existing conditions, saving a lot of infographics work. The end result, photorealistic in essence, is simply stunning!"

Julien Roger, CEO of on situ

FOR MORE INFORMATION ON CONTEXTCAPTURE: Please visit WWW.ACUTE3D.COM or contact your nearest Bentley Systems Office or local Partner.

www.bentley.com