From 3D Laser Scanning to Revit
Processes, Products and Questions

Altogether More Innovative
Topics

- Scanning Overview
- Recommended Processes
- Best Practices
- Up-front questions to ask
- Tools and Technologies, including the new “Scan to BIM” application
Beau Turner
Director, Business Development
IMAGINiT Technologies (merged with Avatech Solutions)

Emerging Technology, Strategic Partnerships and Software Development

Veteran of 60 Small/Medium Revit API projects and 6 large API projects over 6 years.

Commercial Software Development:
- Avatech Utilities for Revit
- BIMreview – now Autodesk Revit Model Review
- Scan to BIM for Revit

Social:
Blog: http://rndr4food.blogspot.com    Twitter: beauturner
Scan to BIM: What is it?

Use of 3D Laser Scanners to capture as-built conditions in the form of “point clouds”, then use the point clouds to create a Building Information Model.
Scan to BIM: Story

- **School**
  - 40,000 SF Single Story Project
  - 2 people, 4+ weeks measuring and paper sketches, and pictures, 2 weeks to draw and 2+ weeks for discrepancy.
  - 8 Weeks of work for 2d snapshot, tolerance of 4” – 2’-0”

- **Private**
  - 70+ acres, 100+ buildings starting from the late 1800’s to around 1970
  - In addition to the building(s), there were also steam tunnels connecting each building, underground storage as well as onsite vegetation, helo pads and more
  - Accuracy tolerance measured in fractions of an inch
Scan to BIM: Why?

- Driven by increasing renovation, retrofit, adaptive re-use projects that want to use BIM.
- The alternative?
  - Tape Measures
  - Lots of onsite time
  - Reconciliation
  - Marginal Accuracy

More than 60% of Projects in the next 20 years will make use of existing structures
Scanning: How Does It Work?
Scanning: How Does it Work?

Use of 3D Laser Scanners to capture as-built conditions in the form of “point clouds”
Scanning: How Does it Work?

Scanners need to have visible targets in order to be able to assemble different scans into one unified point cloud.

Targets appear in more than one scan, so that the scans can be stitched together.
Scanning: How Does it Work?

With data captured you can use the point clouds to create a Building Information Model.
Customer Feedback

Scanning Provider

One year ago, 10% of our incoming scanning service requests specified a BIM(Revit) deliverable. Today, 90% of the requests specify it.

- Council Member Quote

AEC Firm

Our biggest obstacle in creating a Revit model is working back and forth (in multiple software packages) with the point cloud data. If I could have one item only, it would to be able to visualize this in Revit.

- Council Member Quote
Scan to BIM is a software add-in for the Autodesk Revit 2011 product line created by IMAGINiT Technologies/Avatech Solutions (from the same people who created BIMreview now Autodesk Revit Model Review and the Avatech Utilities for Revit).

With this you can *Import*, *Visualize* and *Interact* with point clouds inside of the Revit environment. Interaction allows you to query points within the model, verify measurements, generate construction linework and use geometry recognition for object creation (ex. Walls, Ducts, Piping, etc…)

Supports the Autodesk 2011 Revit Product Line: Architecture, Structure and MEP
The Problem: Current State of the Art Process

Scanner Data → Leica Tru-View

Leica Cyclone → Leica CloudWorx

PTS/PTX Files → Geometry Extraction Software

Geometry Extraction Software → DWG

DWG → Autodesk AutoCAD

AutoCAD → Autodesk Revit

Autodesk Navisworks
Our Solution: Scan to BIM with 3 Step Framework

- Import
- Visualize
- Interact via Discipline Specific Tools
Using this approach your Revit model does not increase in size using point clouds. Revit will retrieve the data it needs and display appropriately.
What’s the nature of the building?

- Square Footage
- General Shape/Features (box? Gehry-esque?)
- Open floor plan? Closed Rooms?
- Conditions (empty, occupied, access/permission to spaces, roof, etc)?
- Old? New?
- Materials? Brick, Metal Wall Panel, Shiny Black Surfaces, other?
What are you trying to get out of the scanning project?

- Quick scan of property and surrounding building placement
- Site only
- Exterior Shell and Openings
- Interiors
- Ornamental Details
- MEP Systems
- Industrial Piping
- Other
What kind of modeling is planned?
- Basic walls/doors/windows/openings?
- Stairs/Railings?
- Ornamental Details (crown molding, custom casework, etc)
- Piping/Ductwork/Structural Elements

What kind of modeling accuracy am I attempting to get?
- What defines modeling accuracy for you?
- For out-of-plumb walls:
  - I will do profile (90 deg) walls, and test that deviation is “not too bad”
  - I will create mass walls to model exactly
- Content: creation of instance-based doors, etc?
- Documentation of discrepancies
Scanning: Up-Front Requirements

Planning to capture MEP data?
- Mechanical Rooms?
- Above the ceiling? (you’ve just doubled your square footage)
- Ease of access / removing tiles / etc?

Hardware / Logistics
- How are point clouds being stored, delivered, archived?
Scanning: Up-Front Requirements

Manage the Point Count
- Modern scanners are able to collect an overwhelming number of points
- What amount is useful/necessary for the modeling process?
- Balance distance with detail

Origin/Orientation
- Meaningful location on building/property?
- GIS-based / State Plane coordinates?
How can you get started

Source a project

Scanner

Scan to BIM
Discussion
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Have an idea?

Interested in Revit Development?

The IMAGINiT/Avatech software development team focuses on design technology automation. We have a seasoned group of professional programmers and project managers who customize, automate, and integrate technologies, streamline processes, and enable new capabilities for clients large and small.

If you have an idea that you would like to have developed but not the expertise yourself, or even if you just need a jump start contact us to discuss:

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The process of creating 3D building information models from point cloud data used to be tedious, requiring us to use multiple software products and workflows. The Scan to BIM product solves this by enabling us to visualize and create geometry directly inside Revit. As a result, we are realizing greater efficiencies in production time and accuracy.

- Clair VanderZwaag, HDS Manager, Nederveld Inc.
Working with 3D laser scanning data is a critical part of our workflow. Using the Scan to BIM software allows us to work more efficiently by leveraging that data in Revit to generate elements directly. This proved invaluable on a recent project – we knew that the as-built information was developed directly from the point cloud data, and it provided us with the confidence to move forward.

- Kelly Cone, Innovations Director, The Beck Group