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## Purpose Built for BIM

By Staci Matlock, ConnectPress Staff Writer

ToolBox

Perhaps no address is more a part of the modern American psyche than One World Trade Center.

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The Freedom Tower structure that will stand in the place of the twin towers requires an extensive level of collaboration between professionals from the city of New York, JB & B Consulting Engineers, WSP Cantor Seinuk Structural Engineers and dBox. They chose Autodesk software to help smooth the Building Information Modeling (BIM) process.

Early, accurate collaboration between architects, engineers, construction professionals and building owners is essential to successful BIM for projects ranging from the One World Trade Center down to a small school. Regardless of size, those projects require coordination all the way through the process to create a building that meets design expectations on schedule and on budget.

Autodesk has a slate of software tools designed to help facilitate coordinated, accurate data sharing between all members of a building team. Revit Architecture, Revit Structure, Revit MEP, AutoCAD Civil 3D, and Autodesk NavisWorks make up Autodesk's tools that create an integrated workflow for a building project with coordinated, reliable information from design through construction and into operations.

### Revit Architecture

The centerpiece of Autodesk BIM tools is Revit Architecture. The software was tailor-made for BIM. "It is based on parametric building modeling technology, which uses a relational database together with a behavioral model to capture and present building information dynamically," according to the company.

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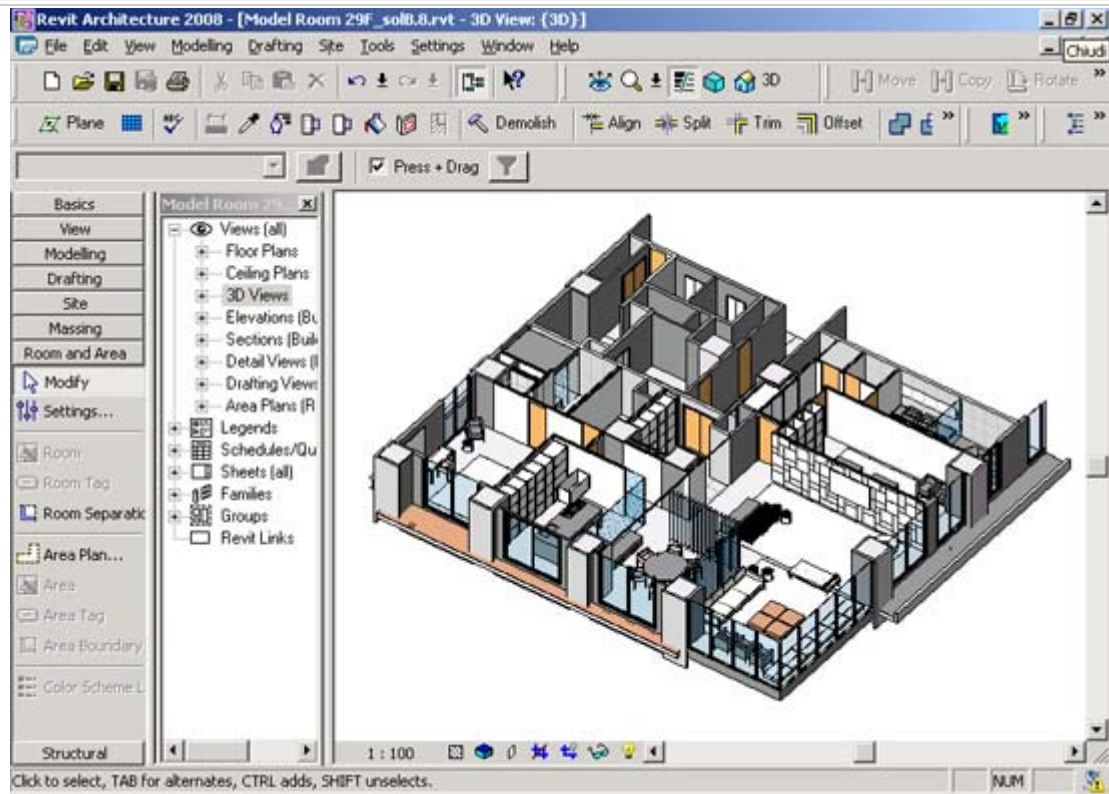
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*Lissoni Associati Milano used Revit Architecture for BIM for the Brillia Tower Nagoya Grand-Suite, Nagoya, Japan. Tis 29-story residential development with 132 apartments, which is planned for occupation in 2009. Source: Lissoni Associati Milano*

Autodesk calls parametric modeling a “tool for thinking about building.” It acts like an Excel spreadsheet for modeling buildings, where a change in one part of the model will translate accurately throughout the building’s design parameters. So the impact of a change to the height of one wall in one elevation will reflect throughout the architectural design layers. Revit Architecture is based on parametric modeling technology. Using a relational database, the way Revit models a building is described by the company as “an integrated database of coordinated information. Beyond graphically depicting the design, much of the data needed for supporting sustainable design is captured naturally as design on the project proceeds.”

Revit Architecture also integrates with energy analysis tools and other tools used in the design of energy efficient, “green” buildings. New “green” building standards are increasingly mandated by states and towns for projects.

Revit Architecture helps architects study multiple designs simultaneously and weigh the impacts of changing various elements. This capability is crucial in BIM and helps in determining the best combination of design elements for measuring green standards. “Design options can be toggled on and off in the model for visualization, quantification, and analysis as needed, and can be maintained for as long as required (which sometimes can be quite late in the design process) and then incorporated, discarded or archived as key design decisions are made,” according to Autodesk.

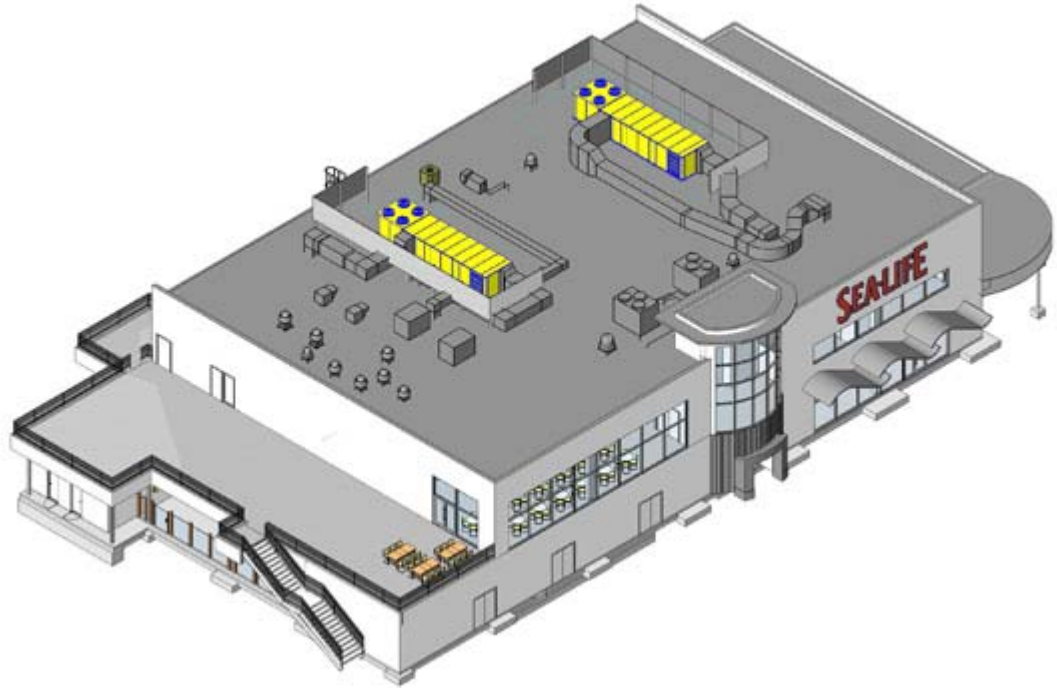
Revit Architecture efficiently produces the architectural renderings needed as part of the LEED certification process for green buildings. “A LEED requirement documented in the Revit building information model is far less likely to fall out of synch or be overlooked (and inadvertently violated) during project design than a requirement documented in a conventional CAD or object-CAD-based application,” according to the company.

**AutoCAD Revit MEP Suites**

The MEP suite is Autodesk’s answer to resolving design and documentation needs for mechanical, electrical and plumbing engineers. The dual software slate improves data coordination and accuracy between engineering teams on a building project and integrates their work with architectural design and structural engineering.

Revit MEP added a plethora of new features in the 2009 version such as commercial condensing units up to 130 tons, packaged air handlers up to 25 tons, high-efficiency water source heat pumps and occupancy/daylighting sensors.

To help with green building design, the MEP suites allow export to gbXML (green building extensible markup language) and API (application programming interface) for linkage to analysis tools such as Integrated Environmental Solutions' (IES ) optimizing building designs for energy analysis, lifecycle cost, CFD, daylight, solar gain studies, and more.



*SEA LIFE at LEGOLAND and Rooftop Mechanical Equipment. The Design West team used Revit MEP for BIM to model the building's MEP systems, and then used the model to communicate the location and requirements for the HVAC ducts.*

### **AutoCAD Civil 3D**

This tool for civil engineers enhances coordination and simplifies workflow across a range of projects.

### **Revit Structure**

Another program for helping engineers with building design, Revit Structure software combines a physical model with an analytical model to create a single building model for different types of analyses and for all construction documents.

### **Autodesk Buzzsaw**

Autodesk Buzzsaw, helps organizations simplify and centralize all project-related documents and information.

### **Autodesk NavisWorks**

This set of tools brings the data of designers and building professionals into one synchronized building information model for a project. With NavisWorks team members can "share, combine, review, and perfect detailed 3D design models of any size or format," making the software essential to BIM. NavisWorks incorporates Autodesk 3ds Max for optimal design visualization, real-time updates on projects via Autodesk Collaborative Project Management and Autodesk Design Review, a tool for reviewing and revising 2D or 3D designs.

A variety of other BIM tools integrate well with Autodesk. Among these are:

### **BIMContentManager**

This software, offered by BIMWorld, helps teams manage and share AutoCAD drawings and Revit files. BIMContentManager Desktop manages the Revit files and allows them to be shared via BIMContentManager Web. The software allows for simultaneous grid and thumbnail dualview; assigning and editing properties; sorting properties by various criteria; linking supplier products to file “families” and dragging and dropping families into Revit.

### **IES VE**

IES, based in Glasgow, Scotland, specializes in tools that analyze the energy, carbon, solar and daylighting performance of buildings.

The company gears its VE (Virtual Environment) software packages to different levels of need and to address a variety of sustainable building challenges.

VE-Ware, for example, is a free energy and carbon analysis tool which can be used by professionals or lay people who are curious about building performance. A new version of the software has a Revit plug-in and can be used to analyze buildings worldwide.

VE-Toolkits are a little more sophisticated, allowing architects or do-it-yourselfers to analyze a variety of energy, carbon, solar and daylight performance outcomes for different design combinations in the early stages.

V.2 of the Sustainability Toolkit now available includes an Energy, Carbon and Architecture 2030 Challenge Assessment, ASHRAE/CIBSE Loads Calculations, Daylight Assessments and Solar Shading Animations. V.2 of the LEED Toolkit also is available to help rate buildings based on the U.S. Green Building Council's nationwide certification system.

Other toolkits due out at the end of the year include BREEAM and Greenstar.

Finally there's the full, integrated suite of software tools that provide professionals with detailed structure performance analysis. “We see performance analysis as having a big role to play in the design of green, high-performance buildings, and in the bridging of the 'information' gulf between architects and engineers,” according to the company's Web site.

In August, IES released a major upgrade to its software with v5.9, providing a tool that helps building designers look at how changing climate factors coupled with design elements will impact long-term sustainable performance. “IES's worldwide users benefit from both local and global enhanced technical capabilities – including major graphical input and output developments, and more visual, interactive and flexible reporting,” according to information about the upgraded software.

With the new IES central 3D data model builder, users can now record camera path animations, change sketch styles and add textured rendering. The software also allows users to visually model bulk airflow through openings and use room color coding to track the result and input data thresholds. IES's CD airflow analysis also helps designers to model Underfloor Air Displacement in greater detail.

### **InterSpec**

Specializing in e-SPECS for automated specification technology, this company's software links CAD drawings to master guide specifications. InterSpec is a leader in providing Internet-based management of construction specification services for AECO professionals. E-SPECS 4.0 integrates with Autodesk Revit, allowing building firms to increase coordination and reduce change orders. The software development grew in part out of customer requests.

### **Tekla Structures**

Open integration is a key to Tekla Structures, a software that helps bring together data-rich structural models from architectural design into construction. Tekla Structures is a BIM tool with special solutions for structural engineers, steel and precast fabricators and detailers, and construction companies.

Tekla Structure is an open platform tool that streamlines the building process through standardization and interoperability. The software integrates with architectural programs and provides the level of 3D model detail needed for contractors. "Tekla models naturally develop in parallel, representing the 'as-built' condition of a building. Tekla Structures effectively integrates into any best-of-breed software driven workflow, while maintaining the highest levels of data integrity and accuracy," according to the company.

Tekla models are used from conceptual design to fabrication, erection and construction management.

Tekla Structures interfaces well with other existing applications, or can be used as sole platforms. Tekla Structures links with various systems through Tekla Open API™ application programming interface that is implemented using Microsoft .NET technology. Some of the standard formats supported by Tekla Structures are IFC, CIS/2, SDNF and DSTV. Examples of proprietary formats that integrate with Tekla Structures are DWG, DXF and DGN. This interoperability allows Tekla to work with both 3D geometry and model data from powerhouse tools like the Autodesk BIM suite.

Tekla Structures is available in different configurations, meeting the specialized needs of different segments in the construction industry. Among those are:

- Full detailing
- Steel detailing
- Precast concrete detailing
- Reinforced concrete detailing
- Engineering

### **Trelligence Affinity**

Trelligence Affinity helps architects and building teams conduct early analysis and estimates for a project, before introducing more complex programs such as Revit and analysis tools. The program works with both CAD and BIM tools. "Affinity delivers a comprehensive design analysis tool, built on top of domain-specific knowledge templates," that clients can configure for specific projects with unique needs such as healthcare centers, schools or science buildings.

Trelligence got its start in Houston, Tex. in 2002 as a software company targeting the architecture, engineering, contractor and owner (AECO) industry. Their tools focus on helping a planning team work together in the planning and pre-design of building projects.

Trelligence rolled out its Affinity version for Revit in July and was named an Autodesk Preferred Industry Partner. The two integrate to provide more power to BIM, connecting "the requirements of a building program with the elements of the spatial design," according to the Web site.

### **Vela Systems**

Vela Systems is a leader in developing mobile field software for the AECO industry. It helps professionals replace their notebooks with software useable in the field via Tablet PCs, giving them the ability to save time, standardize documents and boost collaboration among various professionals on a construction job.

In April, Tekla and Vela Systems joined to create a field and BIM software for construction supply chain management. Tekla brings its expertise in developing BIM software together with Vela's field administration tools. "When enabled with field software and radio frequency identification, stakeholders in a construction project can manage critical-path building components and visualize the supply chain through a real-time, 4D simulation in which the fourth dimension is time," according to an April press release from the company.

The jointly created software will benefit a building team in controlling the quality and source of building materials while better coordinating the construction scheduling.

### **Solibri**

Solibri, based in Finland, is akin to a BIM watchdog.

Solibri Model Checker compares the models produced by BIM software tools "for integrity, quality and physical safety."

“The system offers easy-to-use visualization with an intuitive walk-in functionality,” according to the company’s Web site. “With a single mouse click, the system X-rays the building model and reveals potential flaws and weaknesses in the design, highlights the clashing components and checks that the model complies with the building codes and organization’s best practices.”

The Model Checker is useful across a project’s life from concept to building occupation. Architects and engineers can use the program to create cost-efficient 3D building models. Construction companies can use the software to calculate reliable, current cost estimates. The program can help facilities managers check the life-cycle and maintenance of materials.

Solibri Model Viewer is a free software built for viewing Open Standard IFC files and Solibri Model Checker files. Solibri Model Viewer brings BIM files from all IFC compatible software products into a single environment that works on PC and Macintosh platforms.

**Vico Software Virtual Construction**

Vico offers a 5D software program that integrates design, construction and management. The company promotes interoperability in its software to help construction companies work with 3D construction models, scheduling and cost estimates. The Vico Virtual Construction suite of software supports both IFC models, produced in Autodesk, or architect and engineer delivered models. According to the company, the fourth dimension enables schedulers to create location-based line of balance schedules with the 3D model in the Vico environment. Next, the estimators and cost planners can drill down on costing information by material, by trade/resource, by zone for the 5th dimension. The result is a 5D model that spans pursuit, preconstruction, construction, and final hand-off to the owner.

**Newforma**

Newforma Project Center Fifth Edition is the key behind this five-year-old New Hampshire company's success in the AEC world. Newforma offers Project Information Management software to help teams manage data across all levels of an AEC project. It helps that the company was founded by seven professionals with decades of experience in software development and the needs of the AECO industry.

Newforma Project Center, connects team members together, organizes project information and streamlines project processes. According to the company, Newforma Project Center "is specifically designed to remove time- and money-draining inefficiencies from project execution in the AEC industry. (The software) is used by architects and engineers to organize and manage internal project information, share and track published project information with external team members and streamline project execution processes. Newforma Project Center software is a fully integrated solution which solves major AEC project execution challenges including email management, comprehensive search, external communication, BIM/CAD design review, project monitoring and contract administration."

Newforma utilizes existing IT infrastructure, is easy to implement and works with multiple tools. Newforma software operates on a Microsoft Windows platform. Newforma Project Center client software runs on Vista or the XP operating software and is compatible with MS Office 2003 and 2007. E-mail management tools are designed for Outlook 2003 or 2007.

**Onuma**

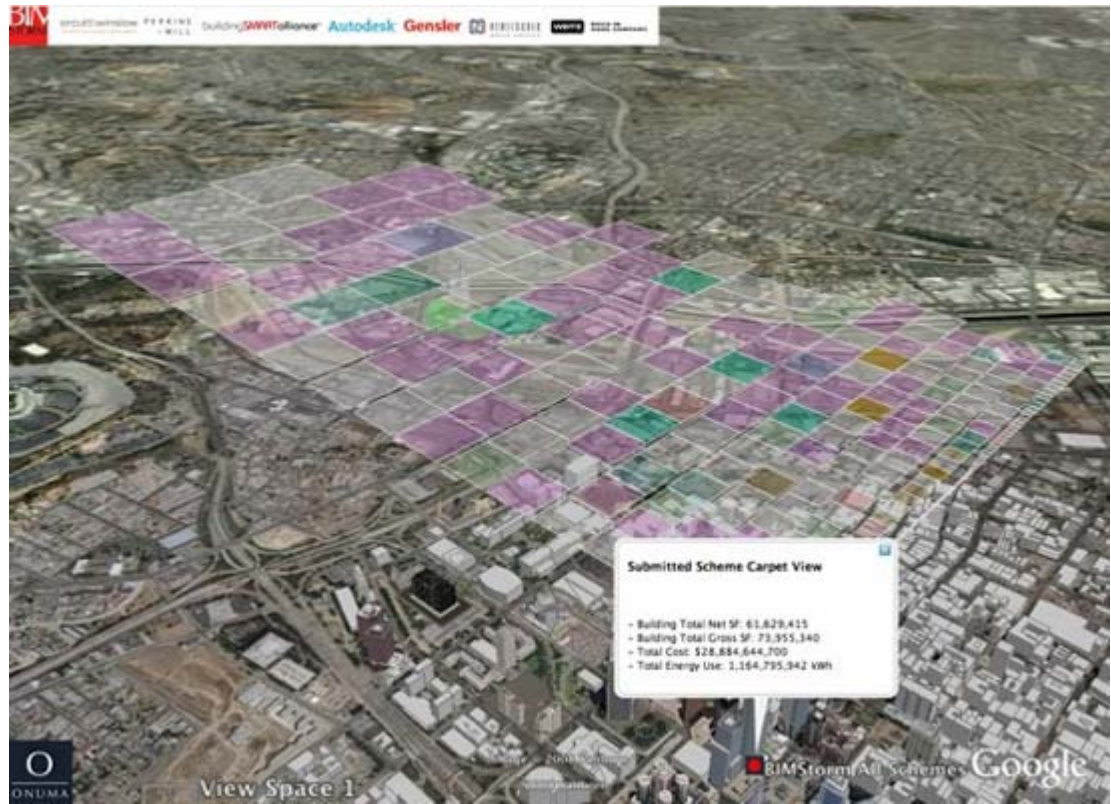
Onuma, the brainchild of founder Kimon Onuma, created the BIMStorm as a hands-on way for people from all kinds of professions to try Building Information Modeling in a risk-free environment. The company provides the kind of web-based, interoperable software needed to move BIM forward. Moreover, the company's tools work with Autodesk Revit and more. Among the companies offerings are:

Onuma Planning Systems - The software simplifies complex operations and create simplified interfaces. According to Onuma, anyone "from principals with all the design knowledge, to the recently hired intern, anyone with Excel skills can be a BIMmer!"

OPS Accounts – create and share projects internally, then import and export via tools such as Revit and ArchiCAD. Can export to Google Earth and import/export to Excel.

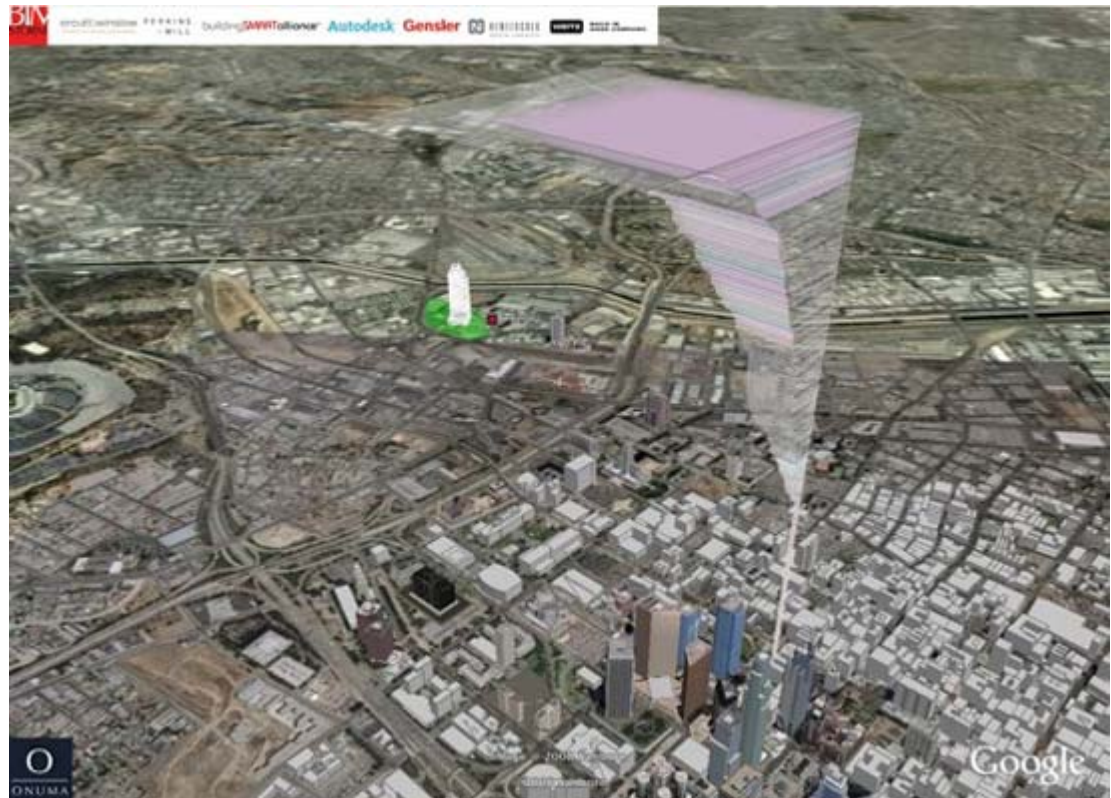
BIMXML Converter – import BIM files to OPS via this Java-based tool that runs on Mac or PC.

Other Onuma tools to check out include GSA-OPS, BIMBlobs, BIM Data, and BIM Bombs.



Source: Onuma

*BIMStorm™ LAX: A view of all the schemes submitted on Feb. 1, 2008 totalling over 50 Million Square Feet. This is a view of of all square footage spread out on one floor as a carpet and hovering 1000 feet of the ground. Each block represents one building*



Source: Onuma

*This view is of every scheme stacked on top of each other to represent the total area of all projects.*



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