



Building Best-of-Breed File Collaboration Infrastructure for Concurrent Design

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Introduction

As architecture, engineering, construction and manufacturing organizations pursue competitive advantage via advanced methodologies such as concurrent design, the ability of project teams to share and edit computer-aided design (CAD) and other project related files is rapidly becoming imperative across their respective industries.

Whether these organizations are trying to improve productivity, profitability or speed to market, effective CAD file collaboration requires technology infrastructure that supports the increasingly distributed nature of project teams while maintaining fidelity of CAD models and associated project files.

Unfortunately, common IT infrastructure fails to support the unique collaboration requirements of CAD power users involved in detailed design processes. The most notable challenges occur when sharing large CAD models while collaborating with distributed project teams in branch offices

The Concurrent Design methodology focuses on identifying tasks that engineering teams can execute in parallel (concurrently) to accelerate the development of a product or delivery of a project.

and remote locations, including those of partners and contractors. These infrastructure issues fuel communication problems, project delays and friction between design teams and their engineering and production counterparts regardless of industry.

While speaking with architecture, engineering, construction and manufacturing organizations which tried to build their own collaboration environments, we heard recurring stories of challenges including:

- Inability to support the wide variety of applications and file types typically used on projects
- Out of control bandwidth and storage consumption
- Governance of file sharing activity
- Project file corruption
- File security

Because of these challenges, many organizations indicated that the process of sharing and interacting with CAD files hasn't changed much from the days of accessing hardcopy drawings from a central library.

Concurrent Design Challenges

Globally distributed teams and “follow the sun” development models gaining popularity in many engineering disciplines have driven the most change in how project teams work together.

Concurrent design plays a fundamental role in this trend by focusing on identifying tasks that project teams can deliver in parallel (concurrently) to accelerate product development or project delivery. Concurrent design has the potential to radically change the design process while reducing project costs and associated completion times.

As organizations race to adopt concurrent design as a practice, they quickly discover some key challenges including:

- Cultural opposition to opening up the design and review process (lose control)
- Dependency on efficient communication between design and production teams
- Software and systems compatibility to enable design models and project files to be exchanged efficiently

While effective collaboration among project team members can address these challenges, the best way to understand the overall impact of collaboration on concurrent design should first be analyzed within the context of the design lifecycle.

Collaboration – An Integral Part of the Design Lifecycle

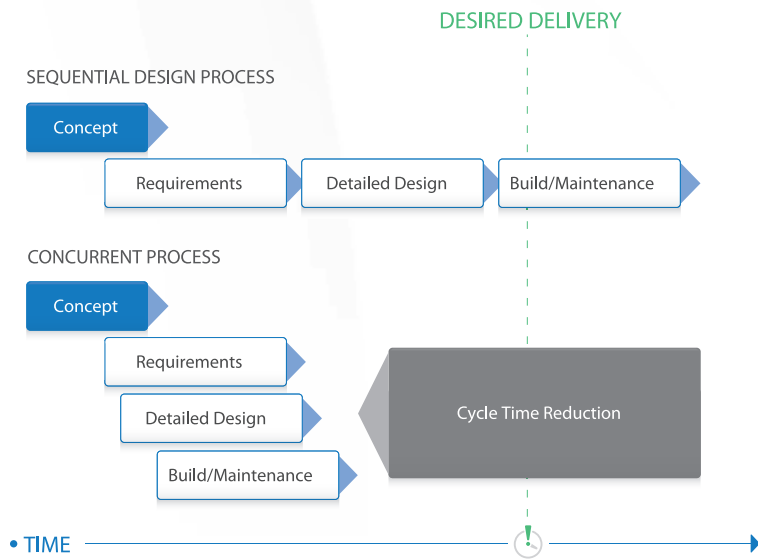
Our research identified a common design lifecycle and uncovered a variety of collaboration models in place throughout a project, each with unique requirements that need to be met to support project teams effectively.

Design Lifecycle Process

Let's break down a common design lifecycle in use across many engineering and architectural disciplines. Process phases can include the following:

- Concept
- Requirements and Architecture
- Detailed Design Development
- Implementation/Production/Build
- Maintenance

Depending on capabilities and project management practices, project teams can execute these activities in a sequential manner which is also referred to as a waterfall model, or teams can deliver activities concurrently. The following diagram provides a high level comparison between sequential and concurrent design methodologies.



Design Lifecycle Incorporates Both Enterprise Social and File Collaboration Requirements

We discovered that during each design lifecycle phase there are a mix of requirements for collaboration and a variety of tools available to facilitate enterprise social collaboration including:

- Unified communications platforms
- Email and instant messaging
- Enterprise social platforms
- Video conferencing
- Design walkthrough and feedback aggregation systems

File collaboration is the process of enabling and managing the lifecycle of business file sharing. Effective file collaboration requires file version management to ensure that project teams are working with up-to-date files.

Examples of tools utilized for project file sharing and collaboration included:

- Shared folders on a server and using FTP to transfer files
- Content Management Systems
- “Vault” systems
- Product Lifecycle Management Systems
- File sharing services
- Content caching and accelerators

CAD File Collaboration is Essential to Concurrent Design

During our research, we quickly determined that enterprise social collaboration tools were numerous and relatively mature. However, “file” collaboration tools varied wildly in capabilities, cost and complexity.

At a high level, file collaboration is defined as the process of enabling and managing the lifecycle of business file sharing. File collaboration requirements unique to teams of CAD users participating in concurrent design processes include:

- Compatibility with a variety of applications, complex models and file types
- Fast access to current project files and models
- Proper maintenance of project file versioning
- Minimal impacts on storage, bandwidth and WAN utilization
- Ability to support secure file collaboration with internal and external teams

Those benefiting the most from concurrent design were proactive in deploying high-performance CAD file collaboration infrastructure to support their most valuable resources including engineers, designers and project managers.

CAD File Collaboration Technical and Cultural Challenges

The size and growing complexity of CAD models along with conservative engineering culture create additional challenges that affect concurrent design productivity including:

- Reliance on familiar tools for transferring sizable CAD files that utilize File Transfer Protocol (FTP) and typically lack current Internet security and file version management capabilities.
- Organization-to-organization security policies that hinder convenient file interchange between different domains.
- Site-related circumstances such as poor Internet connectivity and lack of alternative communications infrastructure that supports high-speed data connectivity.
- Shared drives falling into disarray with redundant and out-of-date files resulting from a lack of ongoing maintenance and oversight.
- Banned USB thumb drives or portable hard drives due to acknowledged security threats. (Common across the federal government and commercial sectors).
- Security, reliability and performance concerns with cloud-based storage and file sharing providers like Amazon Web Services (AWS), Rackspace and Dropbox that offer low cost storage options for CAD files.

- Negative impacts on satellite and wired WAN connectivity due to a lack of performance optimization techniques such as byte-level replication of file changes.
- Ability to support a wide variety of applications and file types.
- High per site cost and limited functionality of product lifecycle management (PLM) solutions that support file collaboration.

Organizational Perspectives and Collaboration Models

Typically, CAD file collaboration happens internally (intra-organizational between departments or offices) or externally with a partner outside the corporate firewall.

Internal File Collaboration

With internal collaboration, multiple operating units inside an organization might be in the same facility or split between job sites and corporate branch offices around the world. Key challenges in both of these scenarios always involve maintaining file integrity, versioning and performance over a geographic distance that can be complicated even further by mediocre Internet connectivity.

External File Collaboration

External collaboration, sometimes called partner collaboration, enables multiple organizations to collaborate. A common example of external collaboration we found is leading engineering firms collaborating on CAD drawings and other engineering deliverables with project partner firms, regardless of their respective geographic locations.

CAD file collaboration can be looked at from an internal/intra-organizational perspective, as well as an external perspective where project files are being shared and edited by third party organizations outside the corporate firewall.



- How do I integrate with my existing IT environment?
- How can I maximize productivity for employees and partners?
- What about security and compliance?

The growing necessity of external collaboration means facing security requirements (keeping outsiders away from your internal network), deployment, and remote location (geographic distance) concerns. CAD drawings often serve as legal documents and represent hard-earned intellectual property making veteran CAD users and their organizations hesitant to expose their work to outsiders much less over the Internet.

Comparing CAD File Collaboration Tools

Most file collaboration tools have changed little technology wise since the launch of CAD software. Even though these tools are known to be inadequate for CAD file collaboration requirements, they are utilized because they are readily available and based on familiar technology.

With the growing adoption of concurrent design and engineering processes, CAD software vendors developed and launched a variety of Product Lifecycle Management systems (PLMs) that take a holistic approach to managing the entire lifecycle of a project from inception, through engineering design, manufacturing and maintenance. PLMs have internal and external collaboration capabilities, but due

Global file collaboration systems rely on a combination of distributed storage, real-time replication, and file locking technologies to facilitate effective file collaboration.

to cost and complexity are only utilized by large organizations. In many cases, PLMs have limited support for CAD applications from multiple vendors and their corresponding files.

Global file collaboration systems rely on a combination of distributed storage, real-time replication, and file locking technologies to facilitate effective file collaboration. Such collaboration solutions do not have the associated complexity, overhead and cost of a PLM while delivering many of the benefits including support for internal and external file collaboration models.

A comparison of typical file collaboration tools includes:

Method	Fast Open and Save	Version Management	Broad Application and File Support	Conserves Bandwidth	Optimized for Concurrent Design	External Collaboration	TCO
Content Management System		●				●	Med
Shared Network Folder			●				Low
Cloud File Sharing Service		●	●			●	Med
Cloud-based Enterprise Social Platform		●	●			●	Med
Product Lifecycle Management Systems	●	●		●	●	●	High
Global File Collaboration Systems	●	●	●	●	●	●	Med

Choosing a Solution Optimized for File Collaboration

PeerLink by Peer Software is a proven, enterprise-class global file collaboration solution focused on the needs of distributed project teams. Adaptable to a range of engineering design applications and methodologies, PeerLink provides the infrastructure to support work delegation through multiple collaboration models and delivers a competitive advantage to architectural, engineering construction and manufacturing organizations.

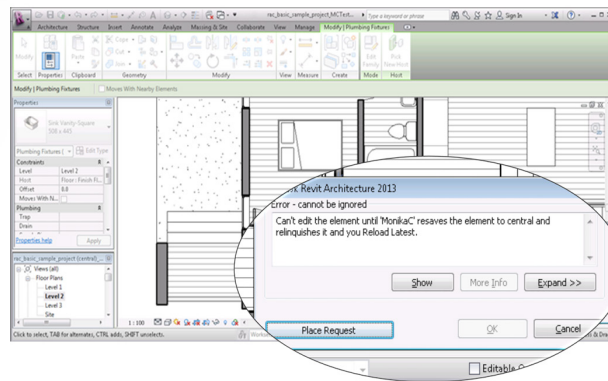
PeerLink includes the following capabilities to meet the requirements for effective CAD file collaboration:

- Distributed storage architecture for fast, local access to file replicas
- Distributed global file locking to maintain file versioning
- WAN optimized byte-level replication
- Enables secure internal and external collaboration
- Compatibility with existing servers and hardware
- Easy and fast setup, users can be up and running in hours
- Software only, no additional hardware required
- Cross Platform (Windows, NetApp and cloud-integrated)

With PeerLink, shared CAD files reside in a folder on participating Windows servers linked across a global enterprise. When a designer in one location makes a change to a CAD drawing, PeerLink will maintain file versioning and replicate file changes to folders on servers where other collaborators work.

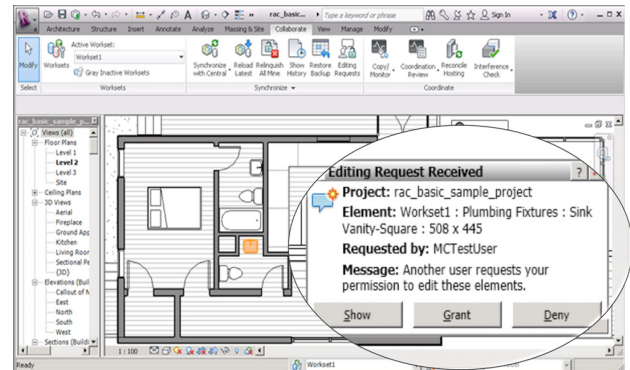
Example of Concurrent Design Internal Collaboration

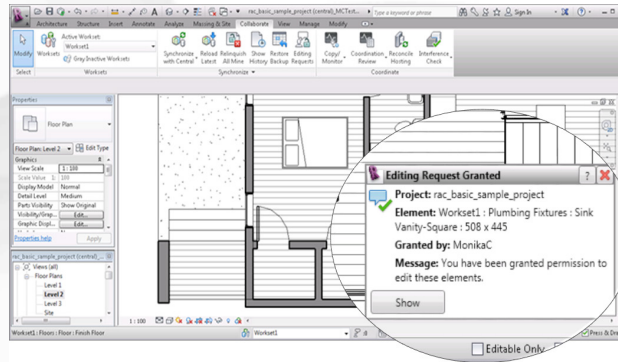
Here is an example of concurrent design enabled by PeerLink. The designers work in two different offices with shared CAD file replicas on their respective local servers. In this example they are utilizing Revit®, a popular design tool from Autodesk®.



A design team member in the San Francisco office opens a CAD project file from their local server and attempts to edit a plumbing fixture element that is owned by MonikaC in the New York office and cannot be edited. The user initiates a request to MonikaC for permission to edit the element and PeerLink synchronizes the changes associated with the request to all participating sites.

MonikaC is working on a copy of the same file residing in the New York office. She receives an editing request message from the user in San Francisco for the element owned by her. MonikaC then grants permission to the user in the San Francisco office and PeerLink replicates changes to all participating servers.





The designer in San Francisco receives notification that they can now edit the element. The designer now has ownership of the element and no other user is able to edit it.

Note that neither user had to leave their design environment to collaborate and share model elements.

Concurrent Design in an External Collaboration Model

The external file collaboration model brings the additional challenges of working across different network domains while navigating the security, bureaucracy, and related factors that aren't part of an internal collaboration model. Fortunately, in the case of PeerLink the move from internal to external (partner) collaboration does not have to depend on a single point of failure or even require a dramatic change in business processes. It only requires a secure TCP/IP connection and some minor setup performed on a Windows server inside each partner's network.

Conclusion

Deploying high-performance file collaboration infrastructure is a business requirement for maximizing the benefits of productivity enhancing methodologies such as concurrent design. As a featured solution, PeerLink supports the needs of CAD users and other project team members while providing the best combination of security, performance, cost and overall capabilities to enable internal and external file collaboration regardless of users' geographic locations.

Key PeerLink benefits include:

- Distributed storage architecture enables fast file access on local servers
- Distributed global file locking maintains file version discipline
- WAN optimized
- Enables secure internal and external collaboration
- Robust support for leading CAD, engineering and productivity applications
- Compatibility with existing servers and hardware
- Easy and fast setup
- Software only, no additional hardware required
- Cross Platform - Windows, NetApp and cloud-integrated



Resources from Peer Software

File collaboration solutions from Peer Software offer high-performance alternatives to expensive PLM platforms while supporting secure internal and external CAD file collaboration use cases.

PeerLink is an enterprise-class business file sharing and collaboration solution featuring real-time file replication and version conflict prevention across Windows, NetApp Data ONTAP and cloud-integrated environments. To learn more about Peer's file collaboration solutions and to download free, fully-functional evaluation software, please visit www.peersoftware.com/collaborate.

About Peer

Peer Software develops data management solutions addressing the unique challenges related to backup, replication and collaboration in a WAN environment. Since 1993, Peer solutions are in use globally by over 10,000 corporate, government and education customers including half of the US Fortune 100.