A Crash Course in Handling Large BIM Projects

Harlan Brumm
Service Design Manager

About Me

- 7 years with Autodesk
- Revit expert
  - Support Specialist
  - Technical Lead
  - Product Manager
- 8 years experience with AEC Firms prior
  - Residential, Healthcare, Education, Commercial, Land Development

- Education
  - BS-ARCH: University of Wisconsin-Milwaukee

Harlan Brumm

Service Design Manager

Autodesk Customer Service and Support

Crucial Questions

What is a large BIM project?

- Number of team members
- Size of file
- Square footage
- Complexity

What do they all have in common?

- Perception
- Unpredictability
- Need for collaboration

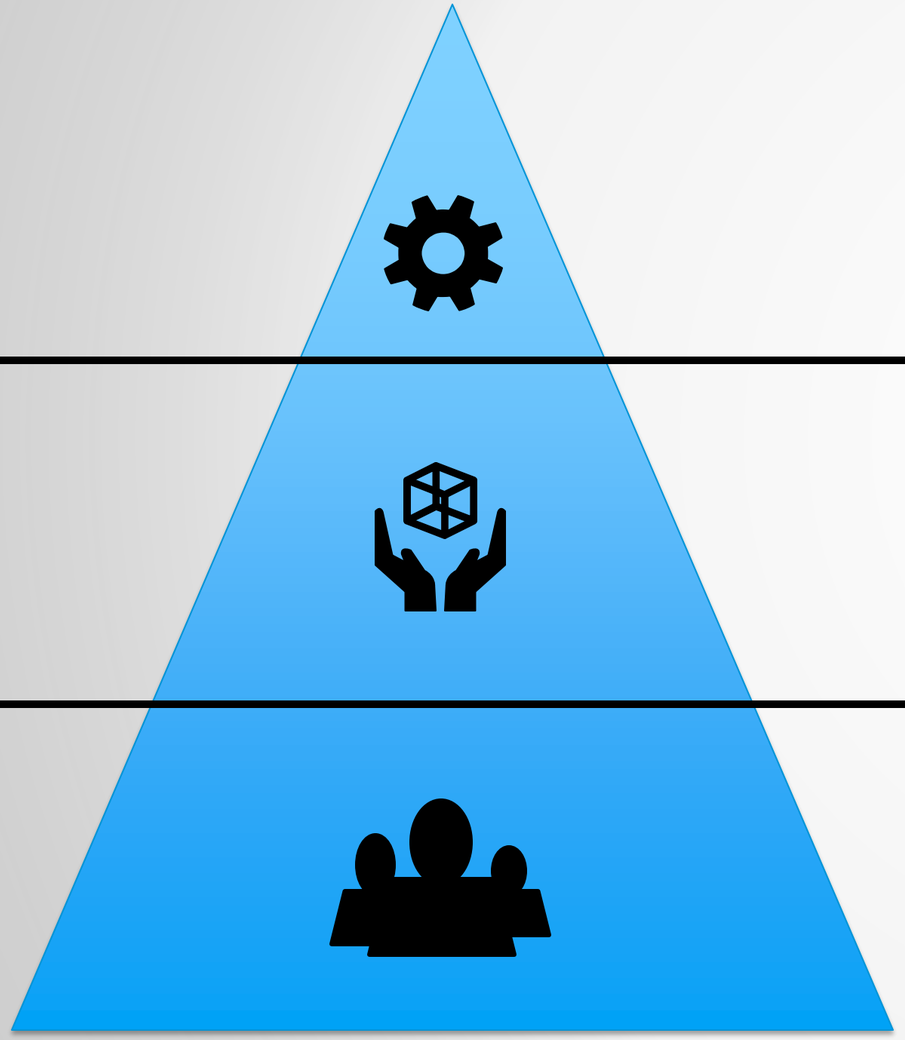
Why do they warrant concern?

- Drain resources of time and money
- Lessened likelihood of success
- Force stressful tipping points

What do teams control?

- Capability of teams
- Understanding of methods to achieve
- Familiarity with solutions

BIM Large Project Framework

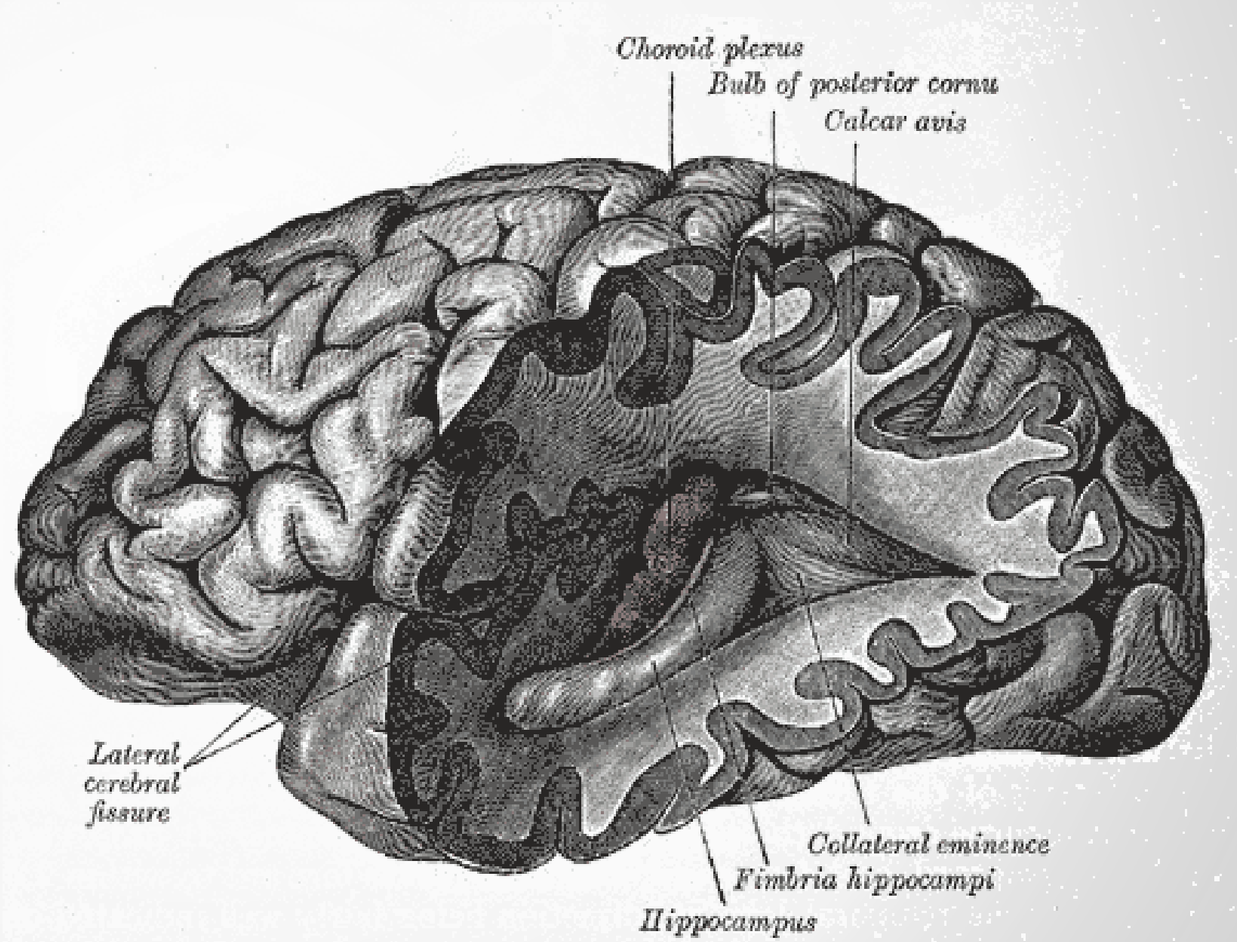


Tools	Applications, data files, parameters, templates, folders, workstations, servers (real and virtual), networks connections
Processes	Standards, protocols, workflows, project reviews, file audits, content creation, content modification, content approval
People	Modelers, designers, project managers, BIM champions, BIM managers, content creators, data managers

People

People are more important to a large BIM project than any tool or process

- Culture
- Organization
- Training
  - Assessments
    - Skills Matrix
  - Skill Focus
    - Applications
    - Standards
    - Workflows
    - Maintenance



People | Who’s on our team?

When a team is performing at its best, we'll find that each member has clear responsibilities and every role needed to achieve the team's goals is being performed well.

- Recruiting
- Team effectiveness
- Coaching
- Motivation
- Delegation

People | Roles

Organization is a crucial part of any well-oiled machine. Without it, how are responsibilities known?

Typical BIM Roles

- Design Manager
- Model Manager or Revit Champion
- Content Creation Specialist
- Discipline BIM Coordinators
- Data Coordinators
- Project Specific Role

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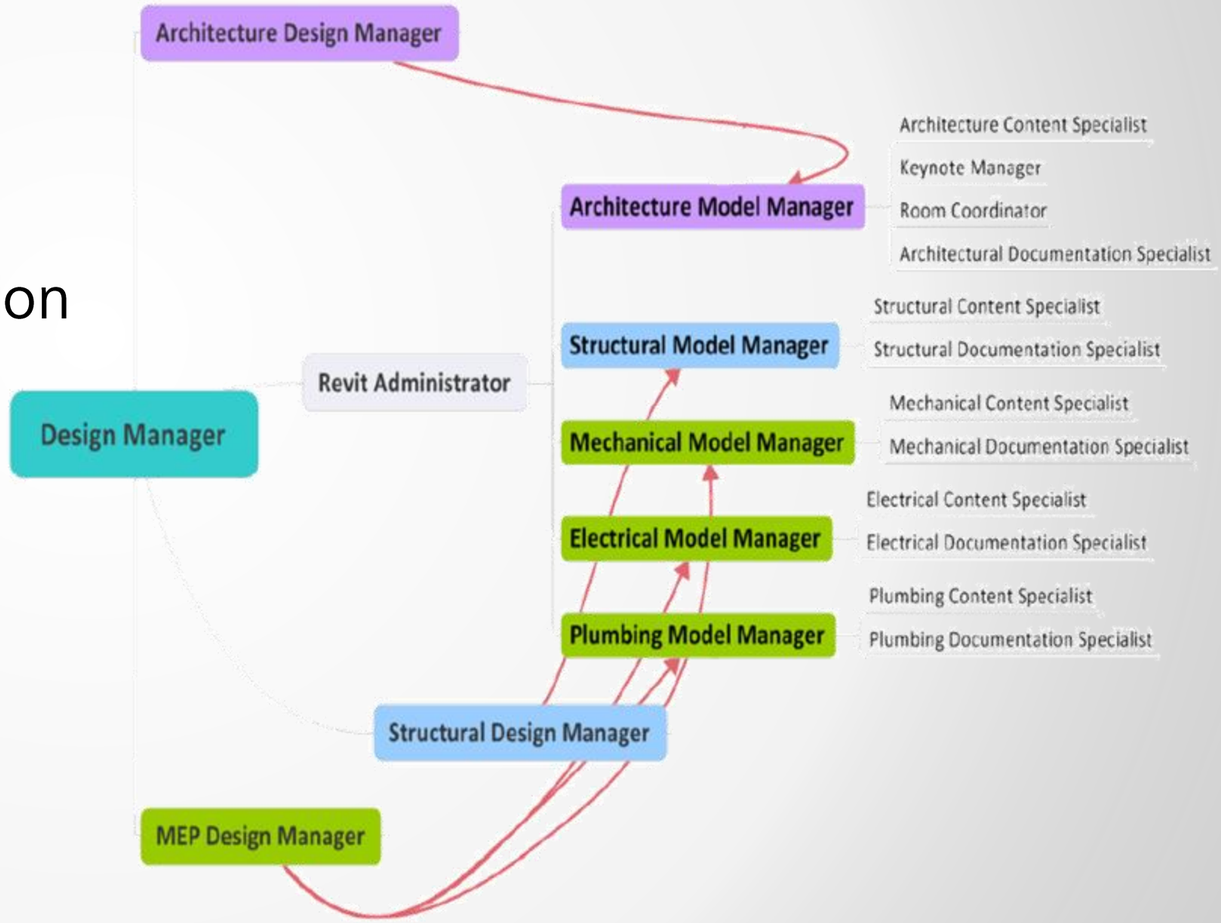


People | Skills

How do you identify the training that people really need to perform at their best? And, how do you make best use of a small training budget, and negotiate for more training resources where you need this?

Assessments (Skills Matrix)

- What training is needed?
- Who needs it?
- Why is the training important?
- How will the training be delivered?

Skill Focus

- Applications
- Standards
- Workflows
- Maintenance

Processes

We have good tools, but are we using them right? Process is the means by which we deploy tools and invariably is more important to the success to large projects than any application.

- BIM Project Execution Planning – How is BIM to be deployed on this project?
- Collaboration Workflows– How and When do we share data effectively?
- Standardization – How does everyone know the proper format of the deliverables?

Processes | Project Execution Plans

The BIM Project Execution Plan defines uses for BIM on the project (e.g. design authoring, cost estimating, and design coordination), along with a detailed design of the process for executing BIM throughout the project lifecycle.

- Project Information
- BIM Uses
- Process Design
- Information Exchanges
- Data Requirements
- Collaboration Procedures
- Model Structure

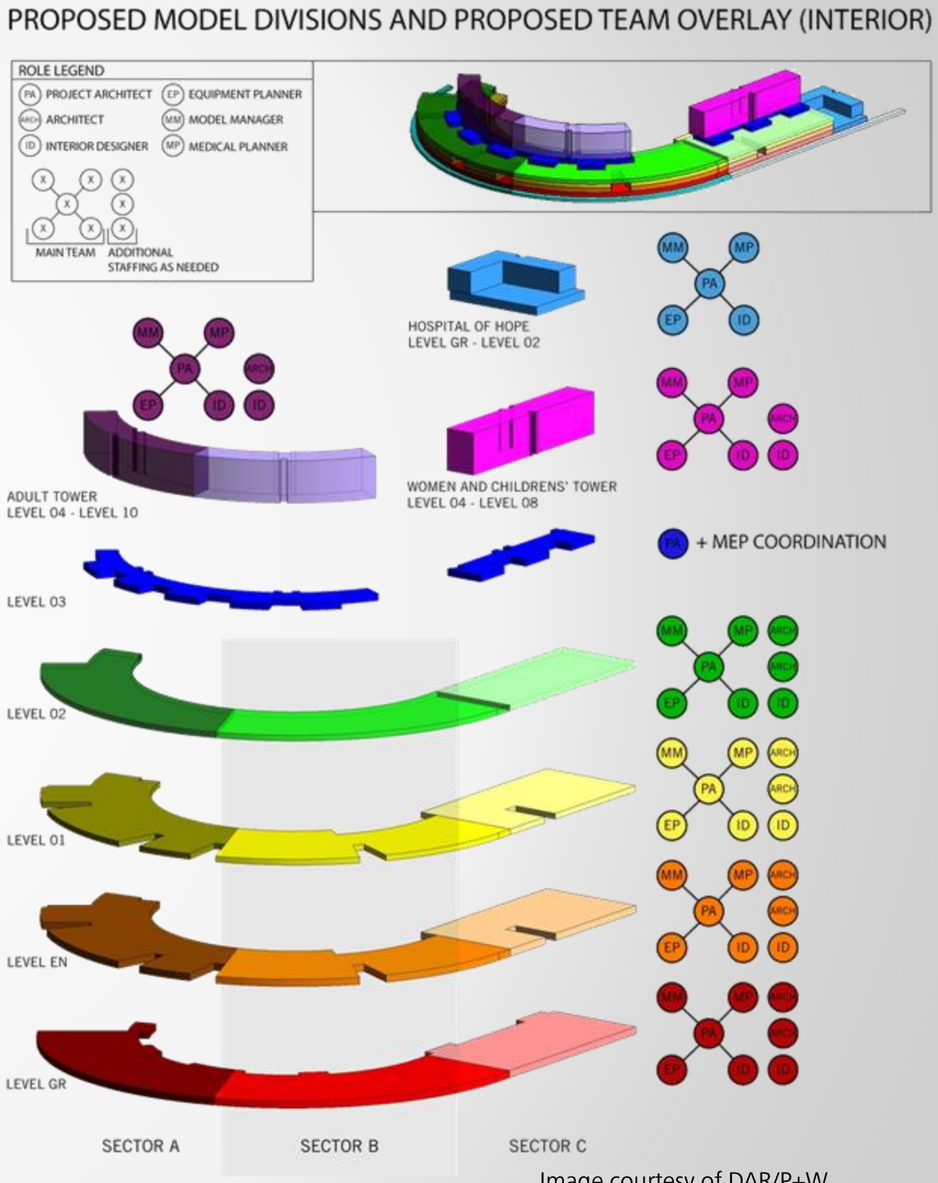


Image courtesy of DAR/P+W

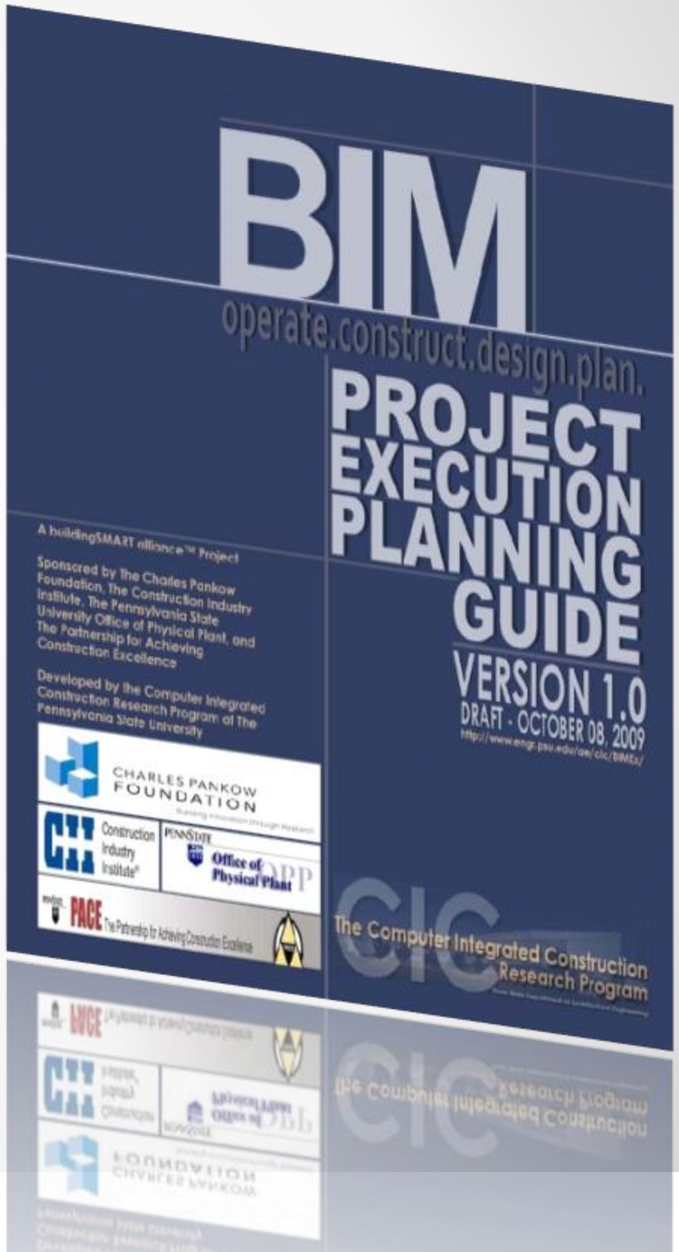
Processes | PxP cont.

Autodesk BIM Deployment Plan (Enterprise and Project)

- Establish organizational and project team business practice standards
- Bind all parties early in project and define roles and responsibilities
- Define model types and requirements
- Set parameters for visualization, simulation and analysis
- Standardize communication and collaboration practices
- Level of Development is key

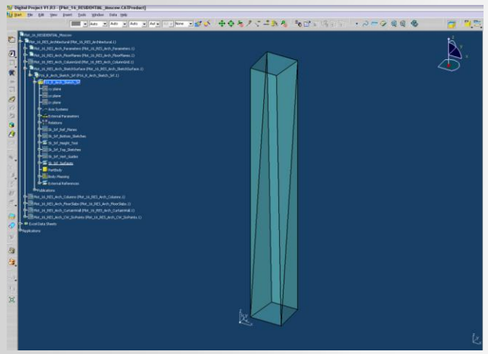
Processes | PxP, cont.

- AGC – Consensus Docs / BIM Addendum / Execution Plan
- AIA – IPD Guide / E202
- CIC – BIM Project Execution Planning Guide
- NIST – General Buildings Handover Guide
- FIATECH – Fully integrated and automated project processes
- CURT – Collaboration, Integrated Information and the Project Lifecycle
- GSA – BIM Standard
- NIBS – National BIM Standard
- 3xPT Strategy Group – CURT, AGC and AIA collaboration
- AIST – CIMsteel Integration Standard



Processes | Collaborative Workflows

Model Creation Design Workflows

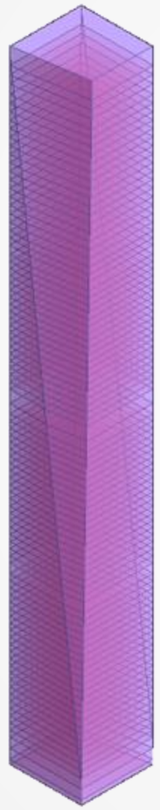


DIGITAL PROJECT

AutoCAD

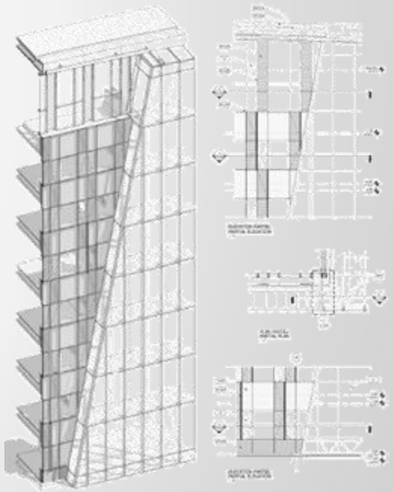
Revit

Pre-Design



Schematic Design

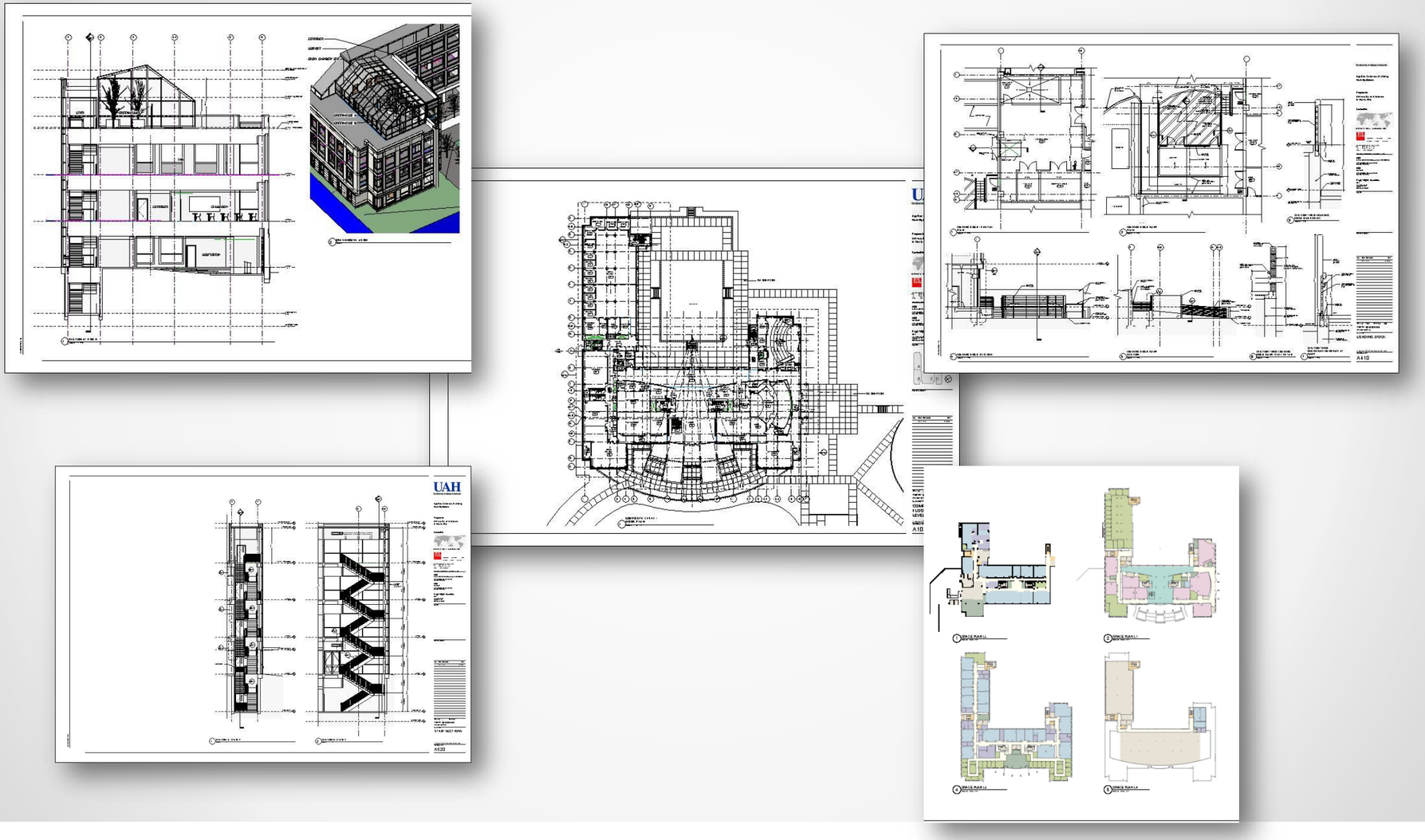
Design Development



Construction Documents

Processes | Collaborative Workflows

Documentation via the federated model



Processes | Standards

Project Standards make everything easier…if they are followed

exp. Autodesk Consulting

D1. Air Terminals *(Mechanical)*

A Summary of Air Terminals

.1 Air Terminals are identified as follows:
- .1.1 Definition: Source for Air Distribution in a space.
- .1.2 Family Category: Air Terminal
- .1.3 Has the following Functional Types:
  - .a *Air Terminal*
  - .b *Louver*
- .1.4 Has no Sub-Categories
- .1.5 Example Name Imperial: **exp_Use_Shape-Connection** (e.g. exp_Supply_Round-Round_Neck)
- .1.6 Example Name Metric: **exp_M_Use_Shape-Connection** (e.g. exp_M_Supply_Round-Round_Neck)

B Starting Out

.1 To start the family, utilize ***exp_Air_Terminal.rfa*** or ***exp_M_....rfa***

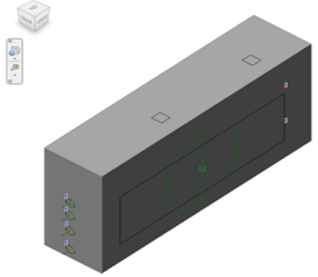
.2 Set category parameters.

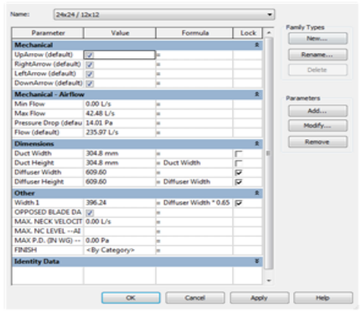
C General Requirements

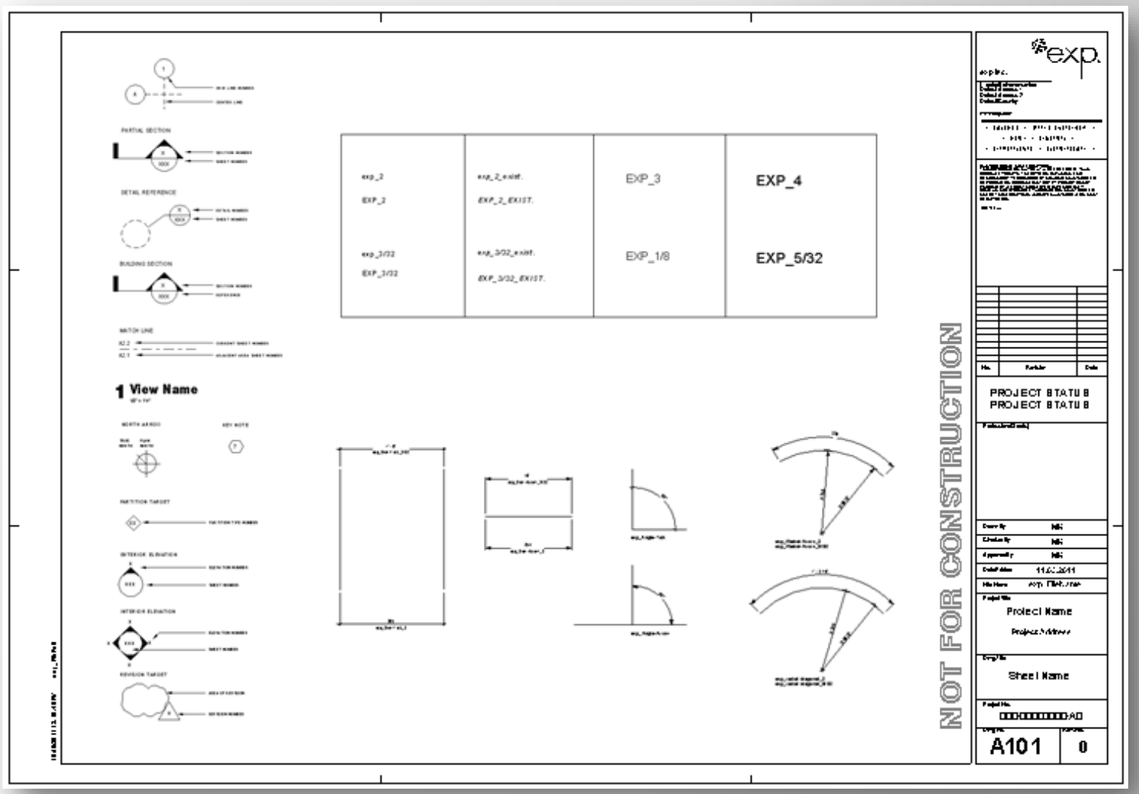
.1 Use appropriate Parameters for all connections.
- .1.1 System Classification
- .1.2 Flow Configuration
- .1.3 Flow direction
- .1.4 Loss Definition
- .1.5 Description

.2 If creating Types Use size as the method for the Types created (i.e. 12" x 12"). Materials could also be considered as possible Types

.3 Flat Graphical Requirements
- .3.1 A representation of the object shall be developed with two levels of visibility: *coarse* and *medium/fine*
- .3.2 A representation of the object shall exist in 3D.
- .3.3 Unless otherwise indicated, features with any two dimensions smaller than 1/2" need not be modeled with three-dimensional geometry. Basic symbology shall be used to represent Returns and Supplies in plan.
- .3.4 Shall obscure ceilings and ceiling patterns.
- .3.5 An example of a Return:







Tools | Lets Talk Tech

Hardware

- Workstations
  - What hardware do we need to efficiently execute this project?
  - Does everyone need the same hardware or the same performance?
  - How do make the business case for procurement?
- Networking
  - Where are my teams located and how do connect them?
  - How do we maximize bandwidth, but minimize costs?
  - Where does virtualization fit in?

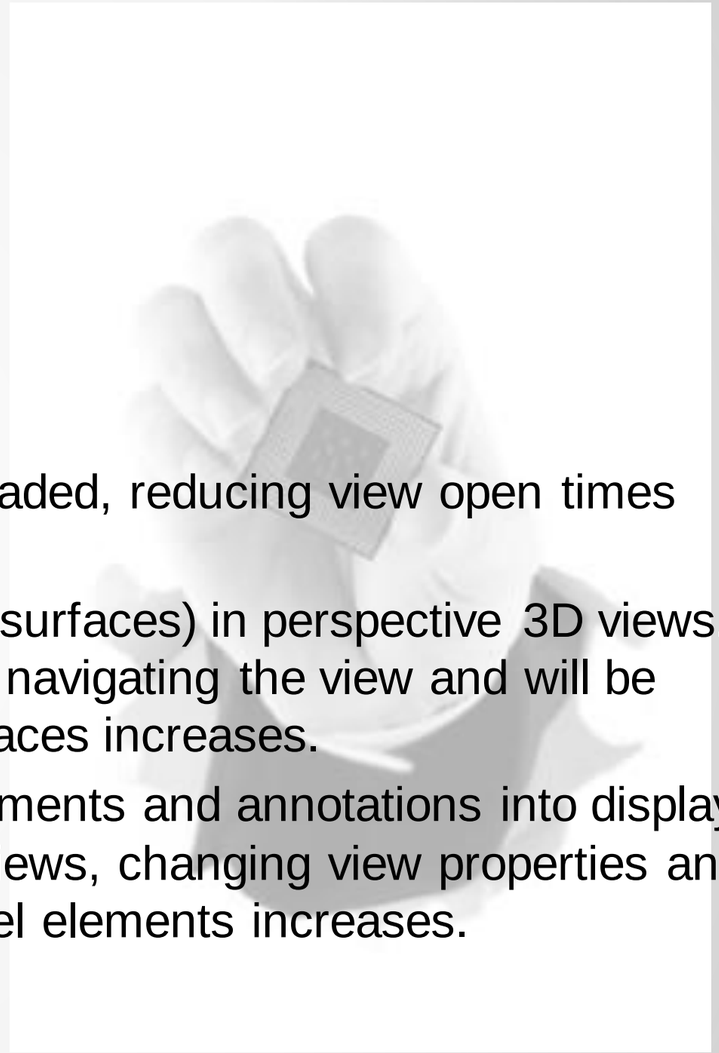
Tools | Hardware Requirements

People cost more than workstations

http://usa.autodesk.com/revit/system-requirements/

Tools | Processor

- **Speed**
- Cores – Revit is **multi-threaded**
  - Vector printing
  - 2D Vector Export such as DWG and DWF
  - Rendering (4 Core Limitation lifted in Revit 2011)
  - Wall Joins representation in plans and sections
  - Element Loading. Loading elements into memory is multi-threaded, reducing view open times when elements are displayed for the first time in the session.
  - Parallel computation of silhouette edges (outlines of a curved surfaces) in perspective 3D views. Engaged when opening views, changing view properties, and navigating the view and will be more noticeable as the number and complexity of curved surfaces increases.
  - Translation of high level graphical representation of model elements and annotations into display lists optimized for given video card. Engaged when opening views, changing view properties and will be more noticeable as the number and complexity of model elements increases.
  - File Loading
  - Point Cloud Data Overlay



Tools | Hard drive

SSD = **Speed**

Impacts not just Revit…

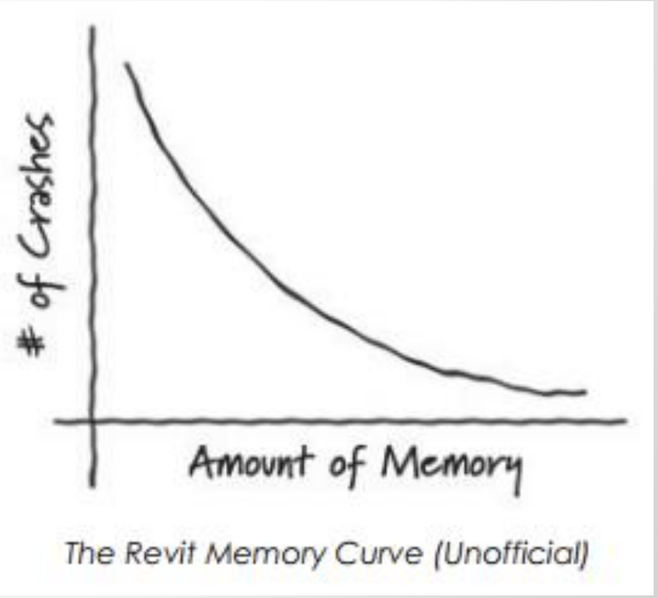
Tools | Memory

~20X file size when expanded in Memory

32 GB RAM recommended for management of large models.

Do More…

not really faster (that's the processor)



The Revit Memory Curve (Unofficial)

Tools | Graphics Card

Go Here

DirectX 10 capable GPU with Shader Model 3.

Tools | What's the worst that can happen?

Stress, Stress, Stress, and worse – project death

- Poor performance, slow response times
- Inability to do common tasks
  - Printing
  - Exporting
  - Navigation of the Revit Model
- Worst Case Scenario – Complete halt to the Revit Project, abandonment

Tools | Servers

- **File** servers
  - Windows based
  - HD speed
  - Avoid DFS but it can work…
- **License** Servers
  - Bandwidth
  - Whatever is supported
  - Don’t do Redundant configurations

Tools | Network Infrastructure

Networking can be the weak link to the best organizations.

- Performance, performance, performance
  - How do you speed it up?
    - Increase bandwidth – Manage usage (People)
    - Re-organize configuration
    - Reduce data through-put
  - Virtualization…
    - Force – multiplier
    - Changes through-put

Tools | Network bandwidth

- The better the **bandwidth**, the **better** for Revit.
- Network latency should not exceed **100ms**

Tools | Revit – End Users

- New Local File Daily
- Communicate and coordinate Syncs with Peers
  - Worksharing Monitor / Bluestreak
- Follow Workset creation guidelines and usage
- Use “Specify Open”
- Working views
  - Views are “Cheap”
- Take care of UserName and ensure consistent file pathing

Tools | Revit – End Users

- Close other open applications when performing a memory intensive task
  - i.e. printing, exporting, and rendering
- Before performing memory intensive tasks, restart it
- Restart Revit at least once a day.
- Close Hidden Windows

Tools | BIM Managers

- With Large Projects, the BIM Manager plays a important role in the Health of the project
- Their decisions will often make or break the project work
- Good BIM Managers are engaged with People, Process, and Technology.

Tools | Basic Revit Troubleshooting: Questions to always ask

Did this issue recently occur?

Are all users seeing the same behavior?

Is Revit on latest build?

Same results with Hardware Acceleration on \ off?

Display driver updated/certified list?

Tools | Basic Revit Troubleshooting: Resolve View problems

- Create a new view
- Cut and Paste geometry to same place
- Cut and Paste geometry to new project
- Apply a view template (new workflow for 2013)
- Check for large coordinates outside 20 mile “box”
- Save a project copy with worksets disabled
- Check View Properties:
  - View Range
  - Discipline
  - Detail Level
  - Scale
  - Visibility / Graphic Overrides

Tools | Deployment Prep

- Do you need to create deployments for different groups of **users** based on discipline, software features, and settings?
- What Revit out of the box **content** do you need?
- How can / do you want to manage content?
- How will you manage **add-ins**?
- Where will user projects and files reside?
- Which user settings do you want to specify?
- Revit Server?
- Do you need to create 32 bit and/or 64 bit deployments?
- For network licensing, what is your **license server type**?
- How do you want to distribute/access your licenses across your enterprise?

Tools | Deployment Best Practices

Read the Autodesk Network Admin Guide.
Read the Revit Install Supplement

- Use **short** paths
- Plan Revit Server
- Do **not** use Modify Deployment tool
- Turn Off Any Security Software
- Close All Programs
- Turn Off **UAC** (User Account Control)

Tools | Revit.ini workflow

- Install **first** standalone on test machine
- Launch Revit
- Configure
- Locate and **Save** Revit.ini
- Use option to include Revit.ini in deployment

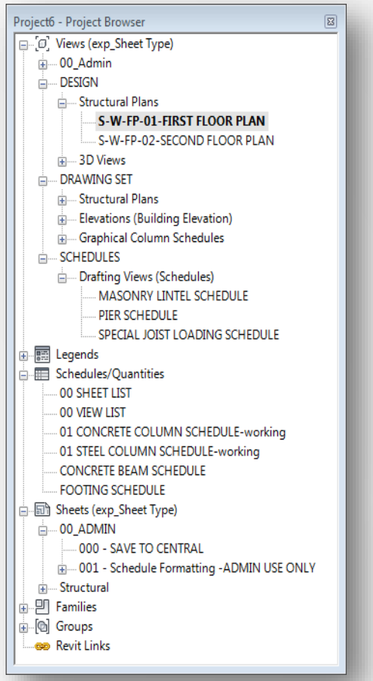
Tools | Setup Log vs. Install Log

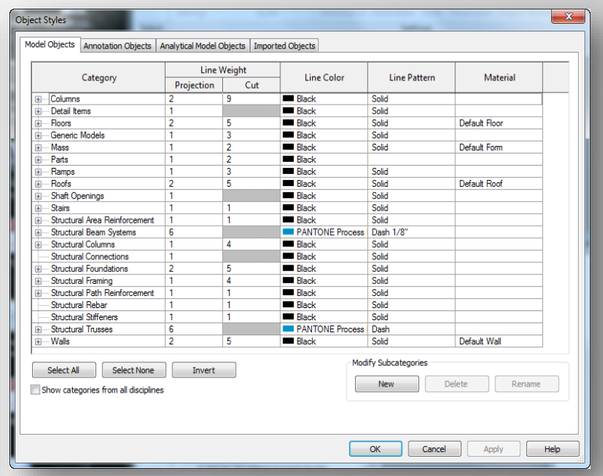
- Setup log is **summary**
- Install log is **detailed** (Verbose)
- Microsoft Windows install Log Analyzer (Wilogutl.exe)
- Verbose log for silent GPO/SCCM installation

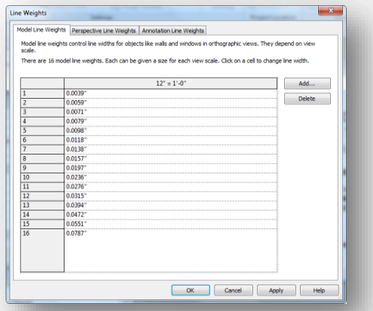
Tools | Revit - Template

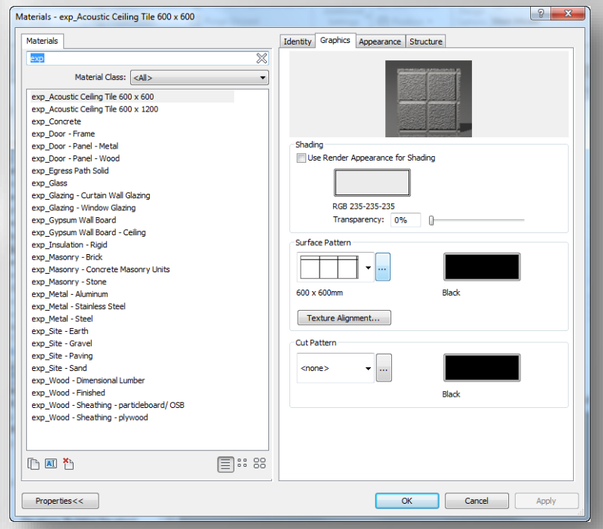
Pre-configuration requirements

- Project Browser
- Object Styles, Line Styles, Line Weights
- Shared Parameters
- Families
- Materials
- Annotative Objects









Tools | Revit - Worksharing

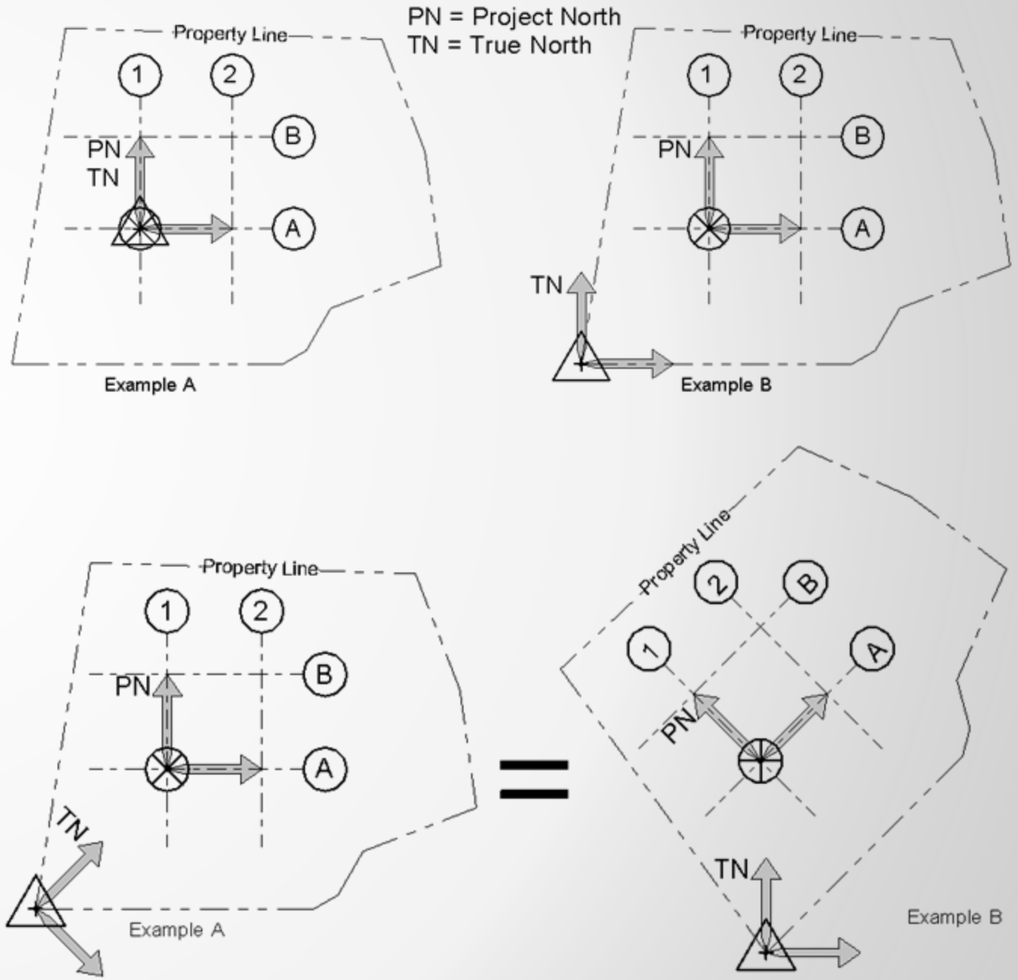
Worksharing Best Practices

1. New Local File daily
2. Consistent network locations \ mapped drives
3. Consistent workset naming
4. Each user has unique username
5. Set synchronization intervals for project teams – must manage the people!

Tools | Revit – Shared Coordinates

The coordinate system causes many more issues than it should on large projects.

- Pre-defined organization and methodology clearly documented and communicated
- Project Internal vs. Shared Coordinate systems
- Consistent set-up and management
- **Set it in beginning <u>AND</u> don't change it without planning!**



Tools | Revit - Maintaining the Project

Schedule Regular Maintenance

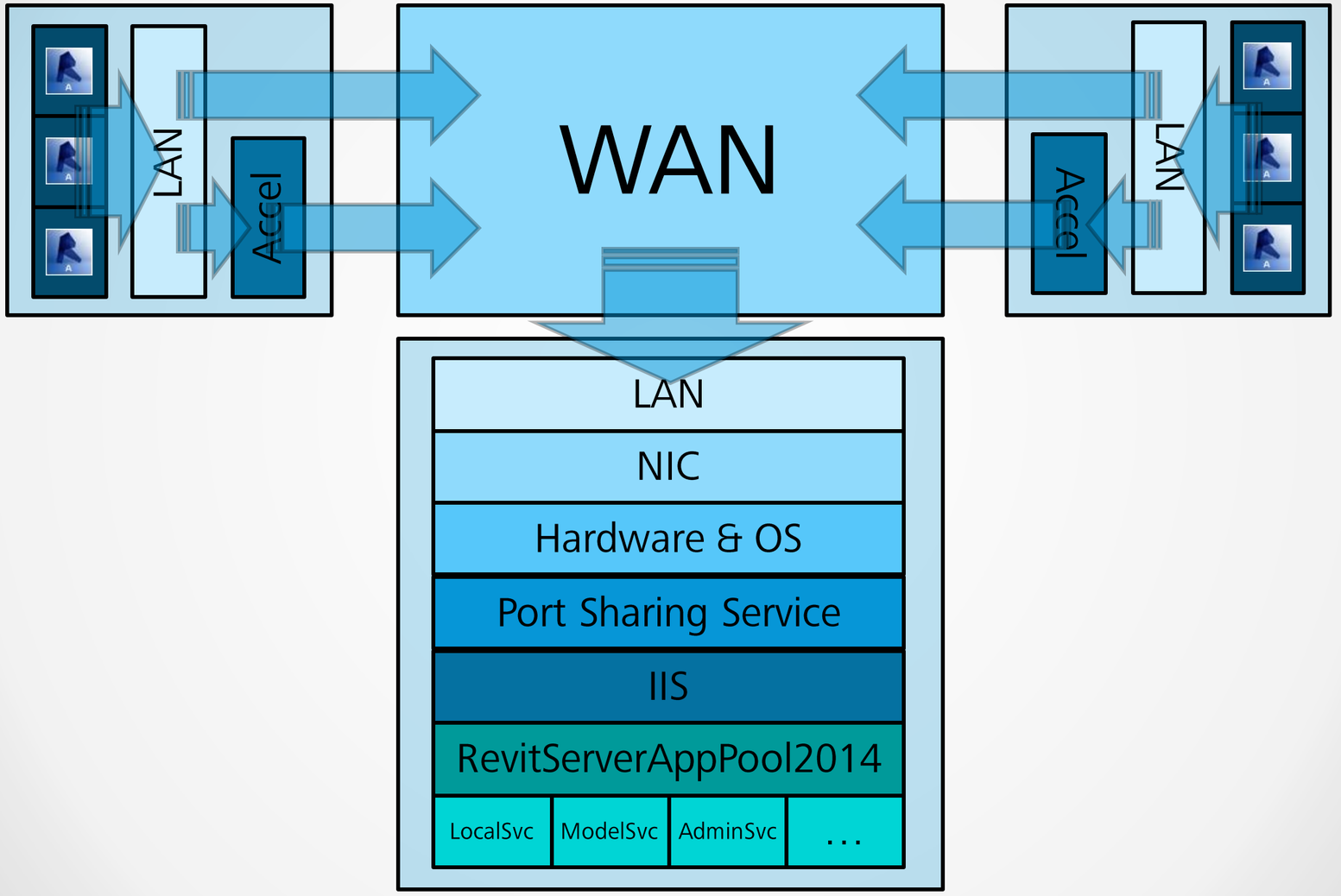
- Purge Unused
- Audit
- Save As (with new name) – New Locals for All – wipe the old away.
- Monitor Project Size and Family Sizes
  - Reduce Family Complexity
  - Clean up imported content
  - “Health Checks” at key intervals – consider project phases as key milestones for checking the model.

Tools | Revit Server

When should Revit Server be a part of helping manage a larger BIM project?

- Clear division of work for multiple teams accessing same data
  - Firewall restrictions excluded
  - Different locations working on different data removes the need
- Distance is an issue
- BIM managers have time and expertise to help manage it

Tools | Revit Server: Overview of communication



Summary

- People
  - Culture and communication are key
- Processes
  - Document your plan of execution
- Technology
  - Think of your end users and your managers

Following up with questions and your experiences

Join me for a roundtable:

AB2115-R
Thursday, 1 PM

Good Luck!

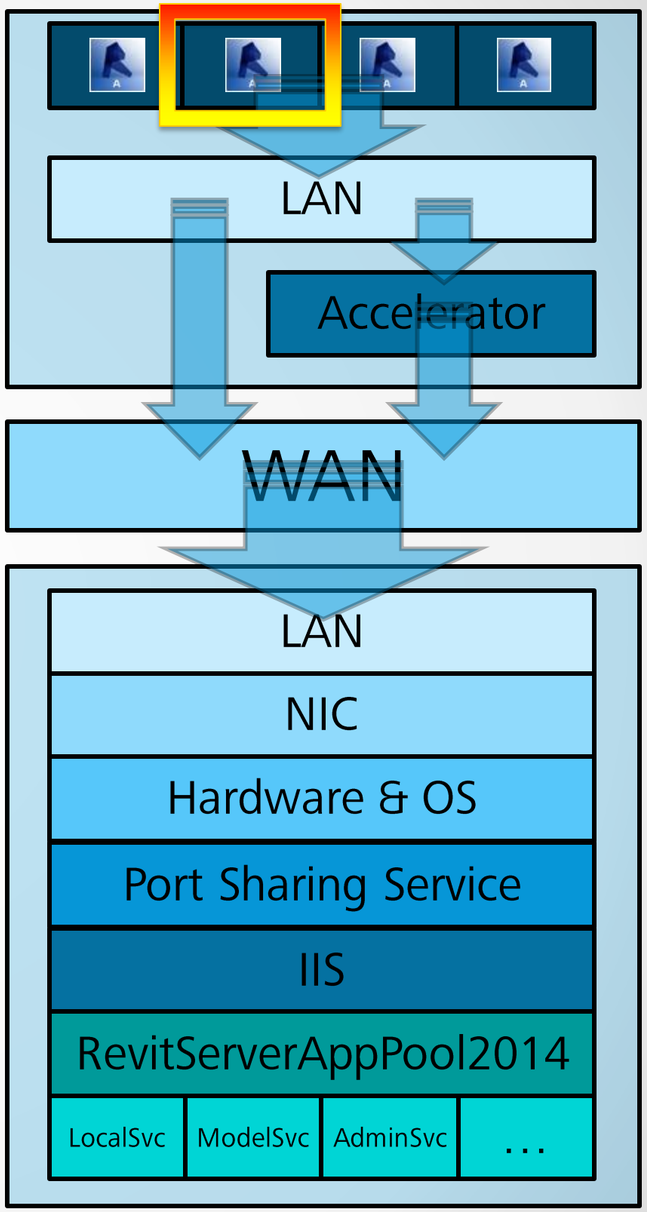
Connect with me on twitter @HarlanBrumm

Appendix: Where can things go wrong with Revit Server?...

…an instance of Revit

Possible symptoms

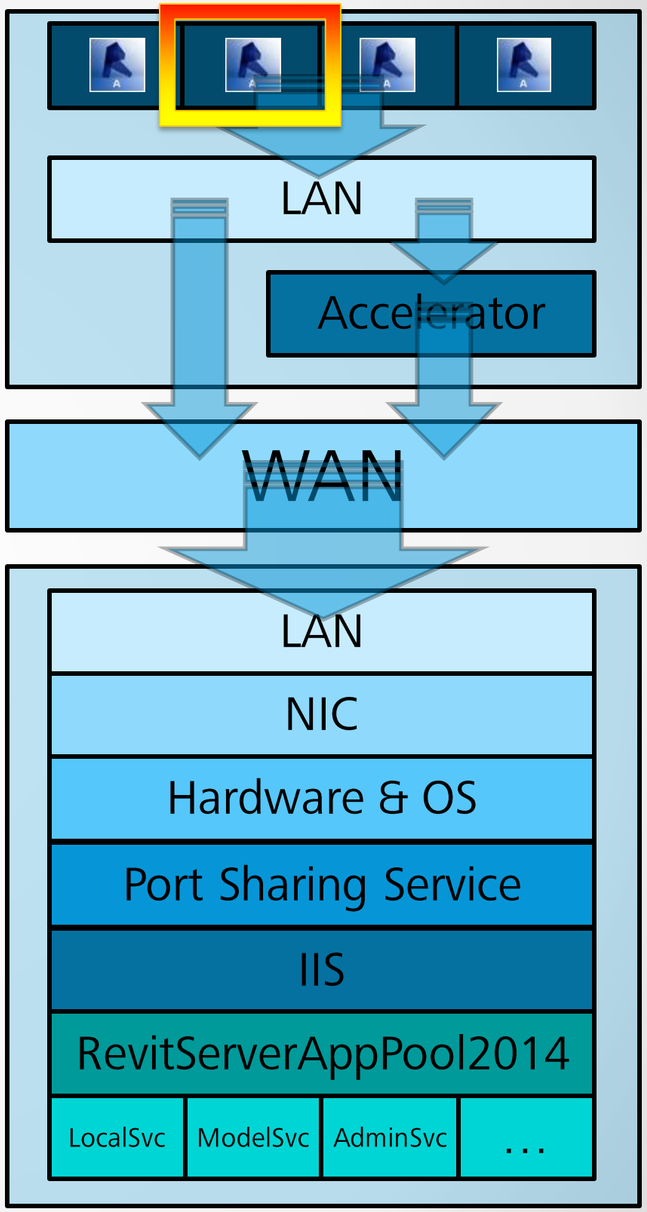
- Problem only occurs on one workstation
- Problem occurs regardless of Revit user ID and whether / which accelerator is used
- Problem may only manifest with certain models



…an instance of Revit, continued

Next steps

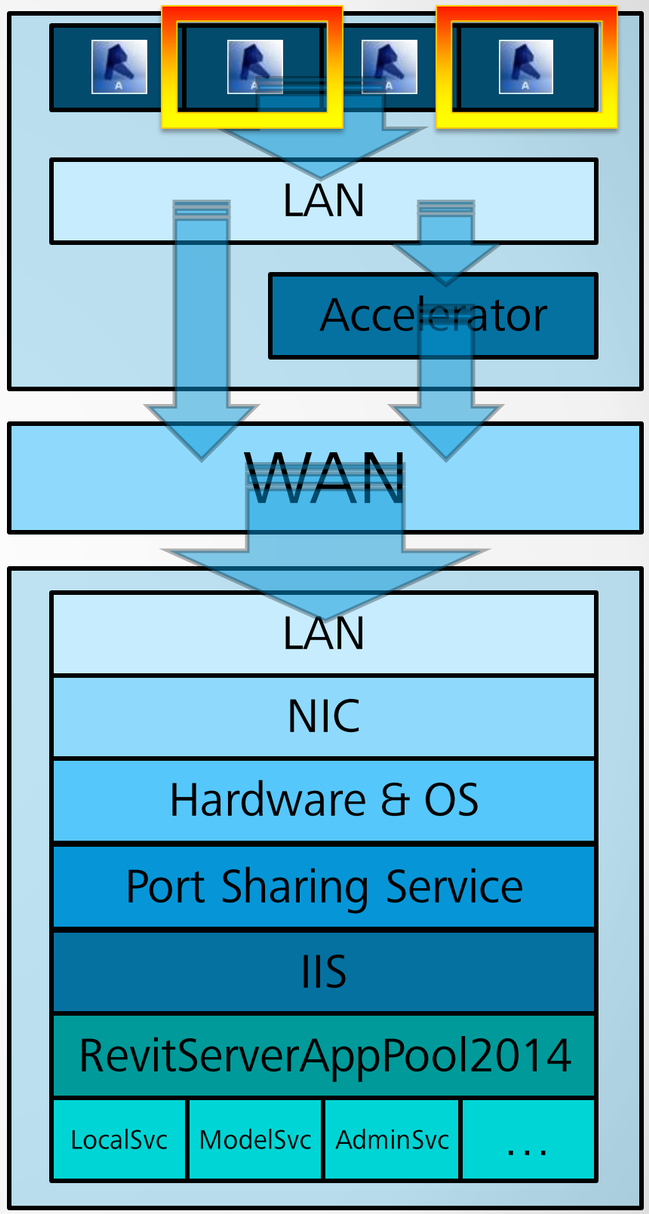
- Search journal for exceptions
- Check to see how this workstation is different from others: hardware config, Windows network config, Revit Server deployment config
- If problem occurs on only some models, identify commonality between them



...multiple instances of Revit

Possible symptoms

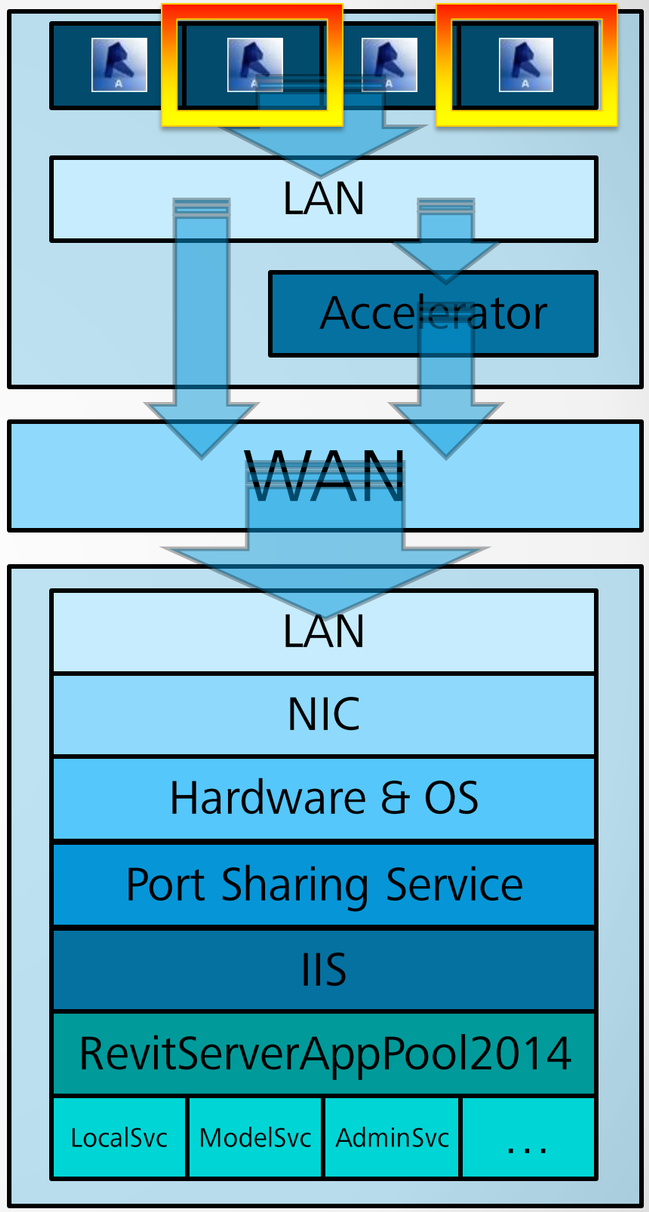
- Similar to single instance failure
- Problem occurs regardless of Revit user ID and whether / which accelerator is used
- Problem may only manifest with certain models



...multiple instances of Revit, continued

Next steps

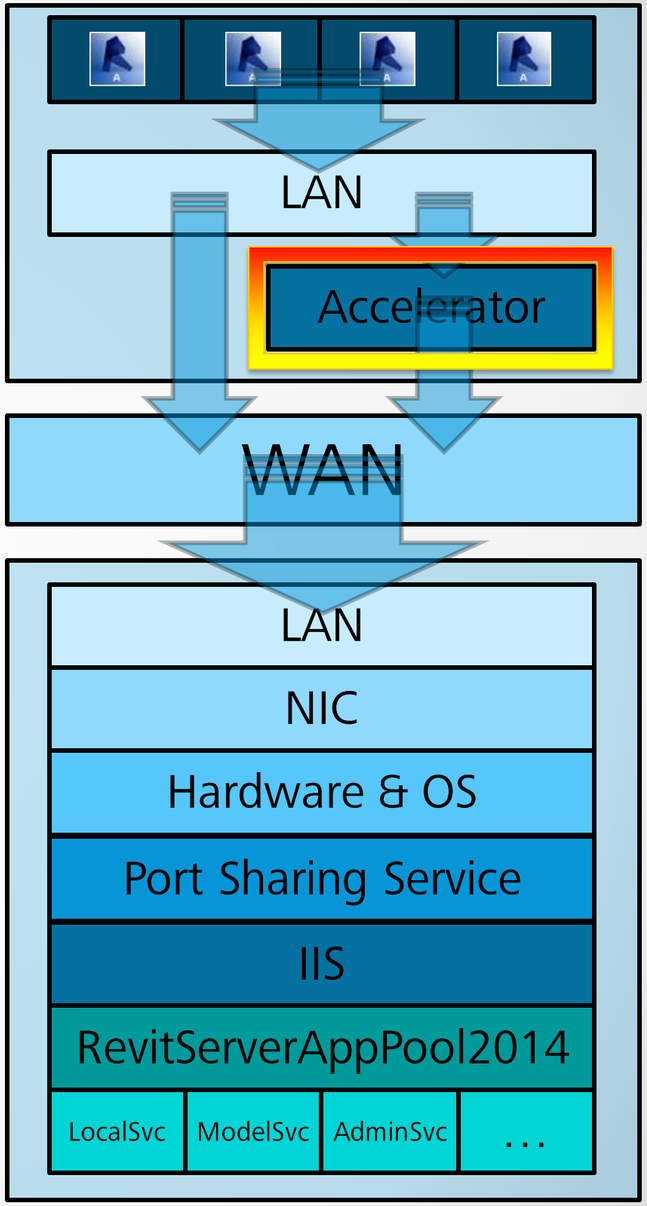
- Search journal for exceptions
- Try to identify commonality between systems that experience the issue
- If problem occurs on only some models, identify commonality between them



…the Accelerator

Possible symptoms

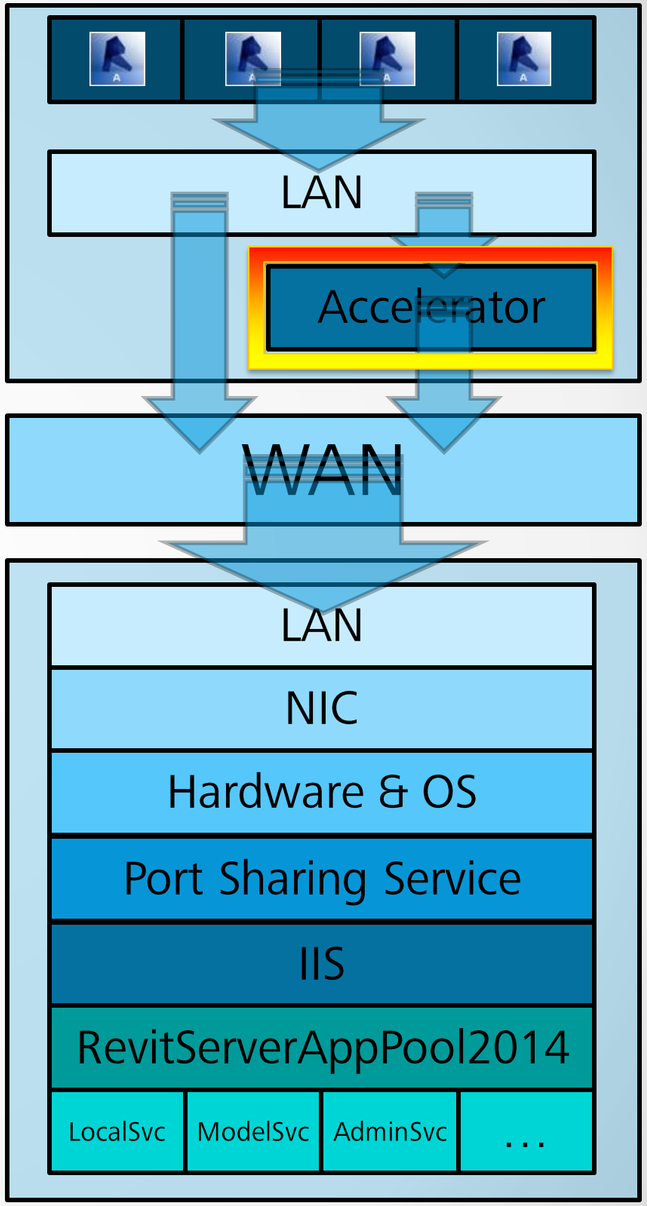
- Fault indicated in Manage Connection to a Revit Server Accelerator dialog
- Performance is poor
- For 2011/2012, all users at a particular site report issues. Or, a problem manifests that disappears when switching to a different accelerator



…the Accelerator continued

Next steps

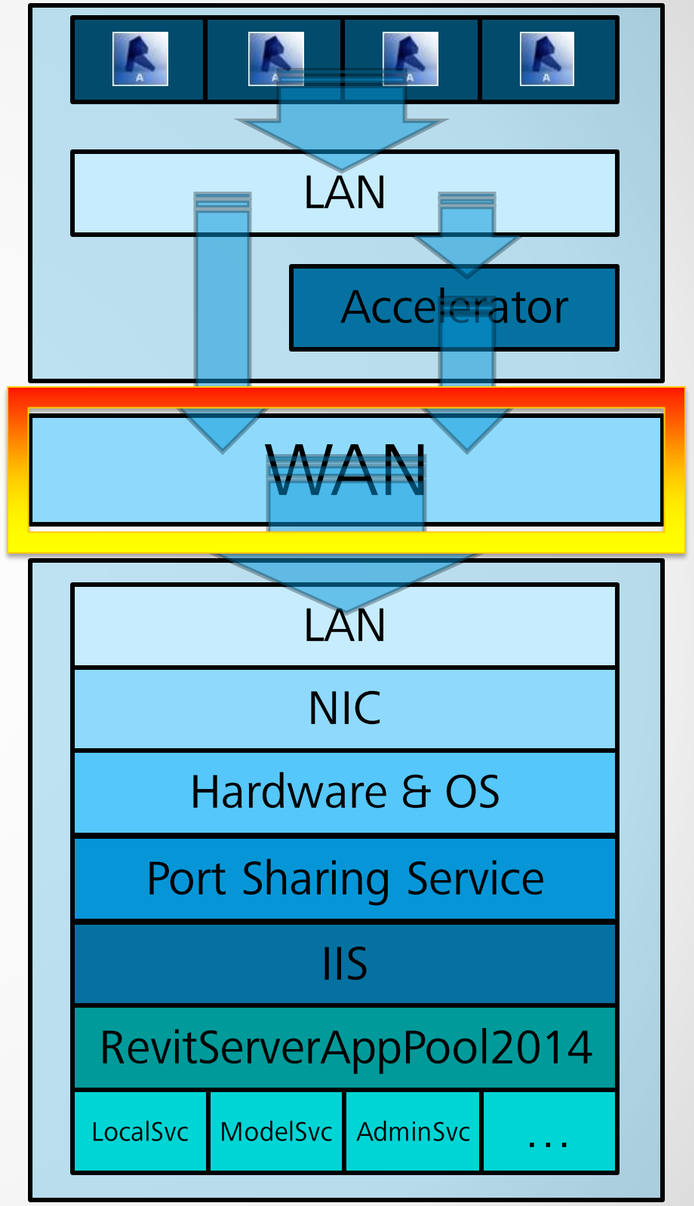
- Check autosync logs for errors
- Check local service logs for errors
- Go through troubleshooting steps for the OS, IIS, and Revit Server on the accelerator system



…the WAN

Possible symptoms

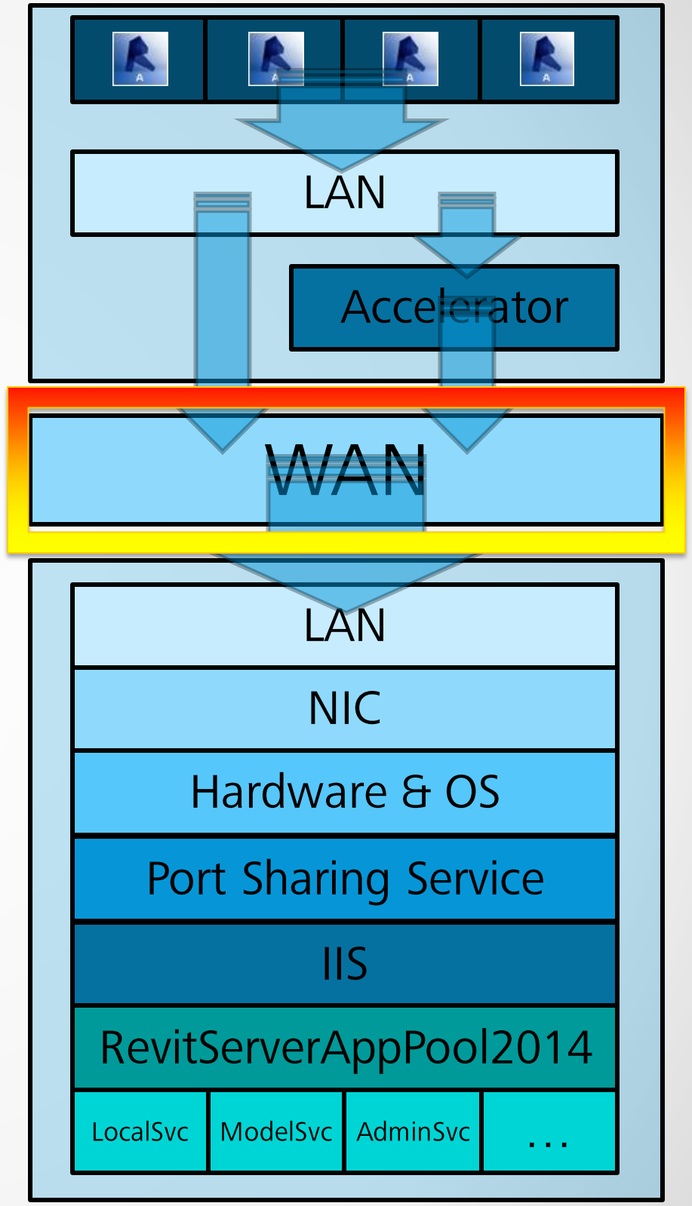
- Sporadic operation failures
- Poor performance
- Might affect all users at all sites, but not necessarily (e.g., if one site has poor network capacity to the internet)
- Might be most noticeable at certain times of day



…the WAN continued

Next steps

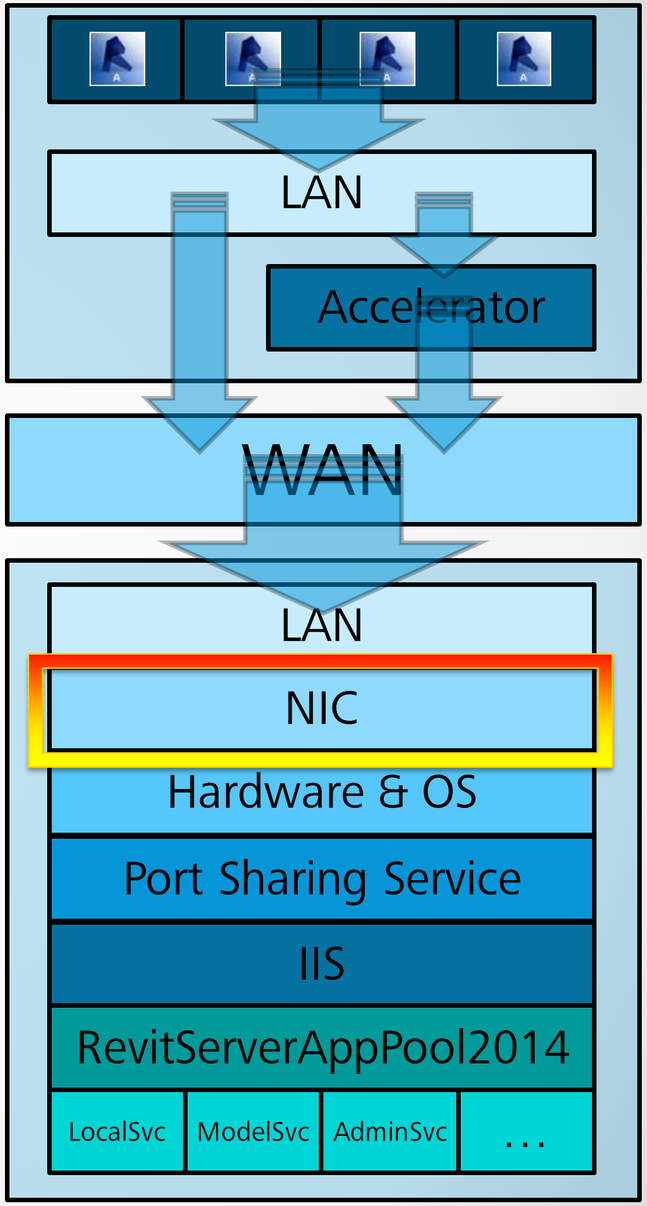
- Check real world network performance in both directions
- Monitor inbound/outbound traffic using resource monitor
- Analyze journals to understand where time is being spent
- Riverbed: check compression ratio. For 2013, install hotfix



…the host server NIC

Possible symptoms

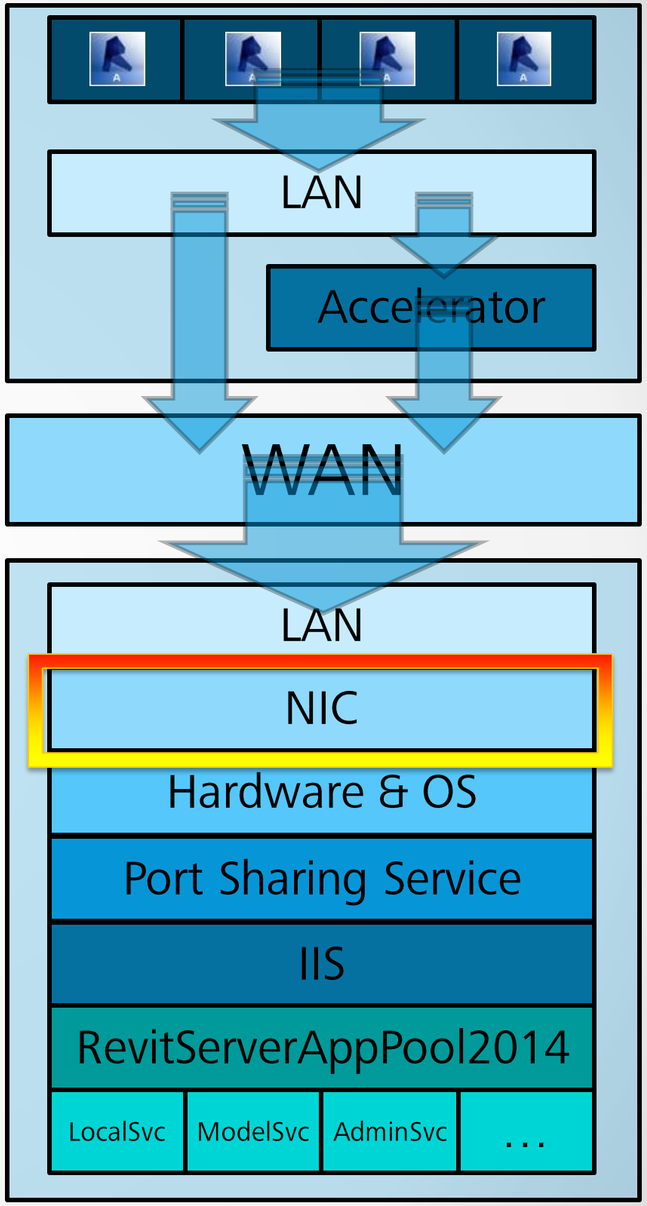
- Server is virtualized
- Symptoms very similar to problems in the WAN
- Journals indicate frequent incidence of CommunicationException



…the host server NIC continued

Next steps

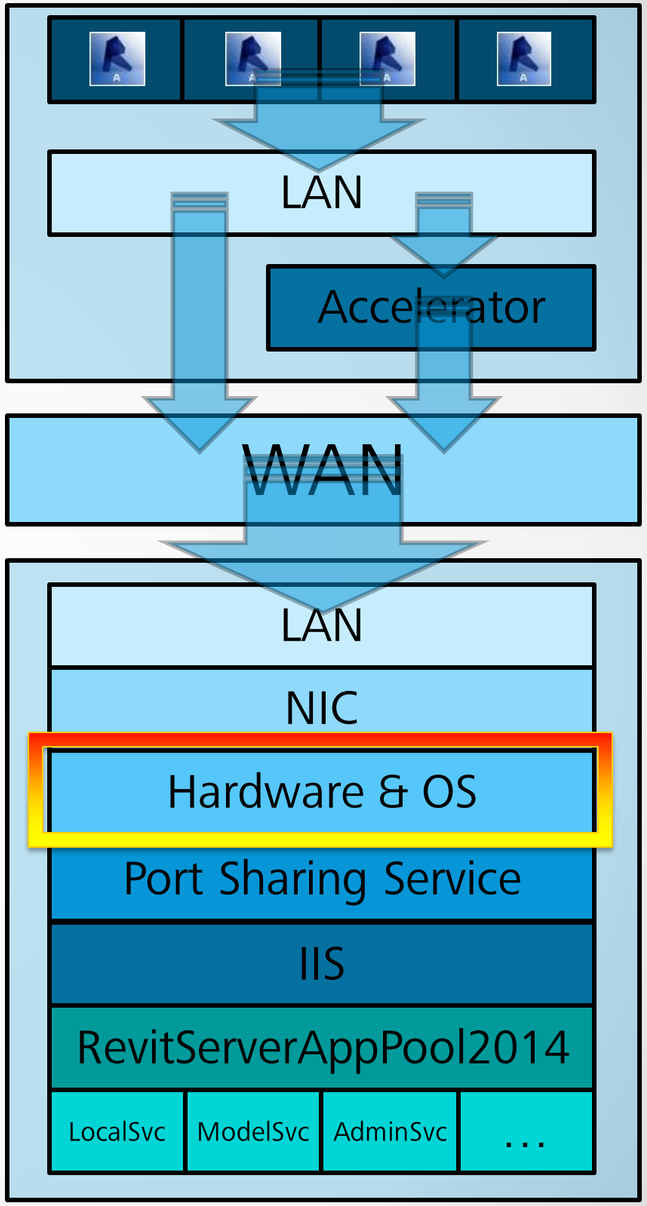
- Check virtual and host CPU utilization
- Check virtual network adapter device type (VMWare)
- Consult virtualization best practices



…Hardware & OS

Possible symptoms

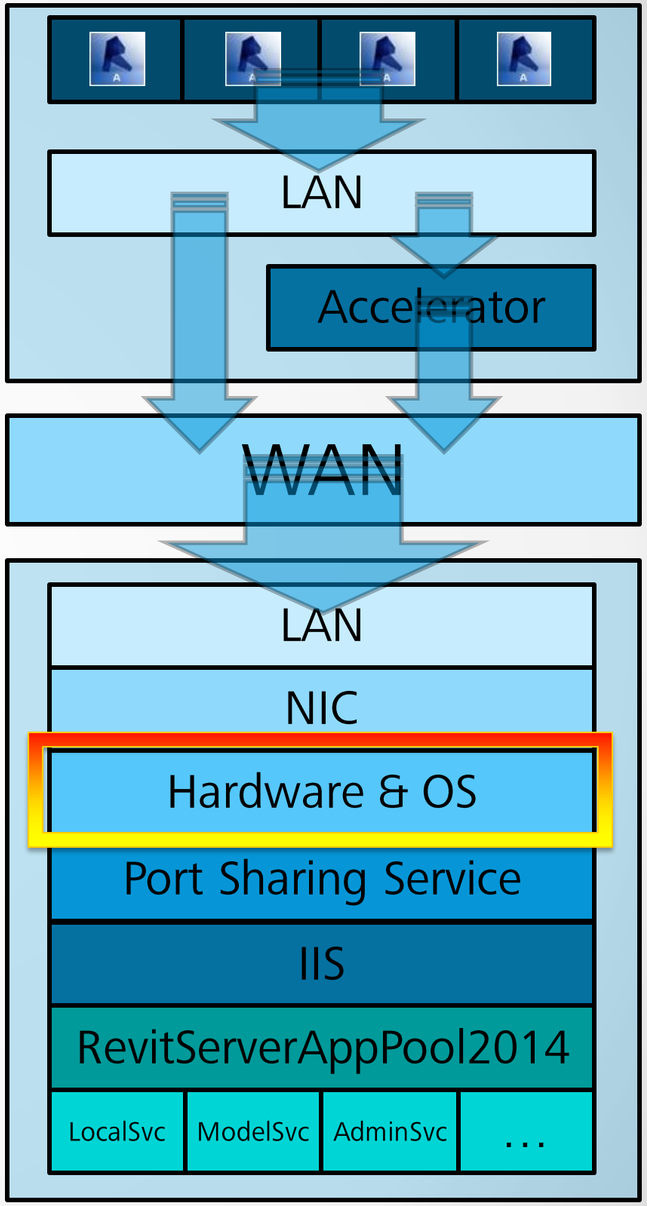
- Revit can communicate with Revit Server but Radmin cannot, or vice versa
- SVC files browse successfully in IIS Manager but nothing else seems to work
- Create new central fails and logs indicate problems with file/folder access
- Poor performance



…Hardware & OS continued

Next steps

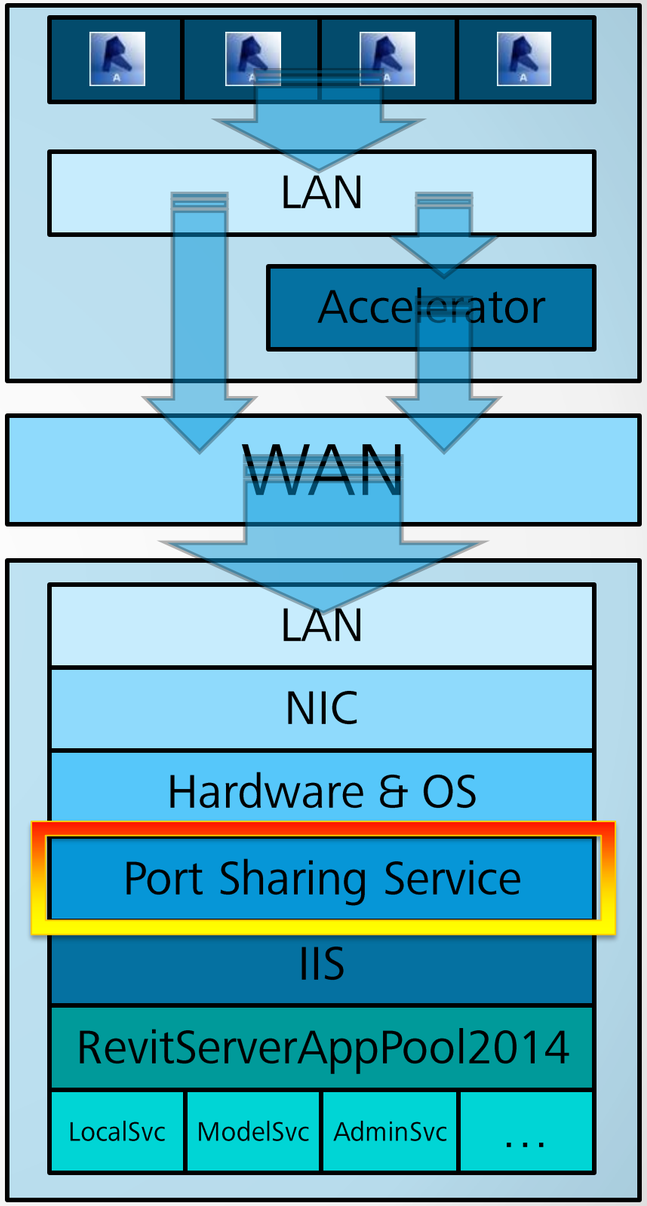
- Verify net.tcp services are running in server manager
- Try disabling firewall temporarily
- Check file system privs for RS working directories
- Check Prereqs
- Monitor server health using resource monitor



…the port sharing service

Symptoms

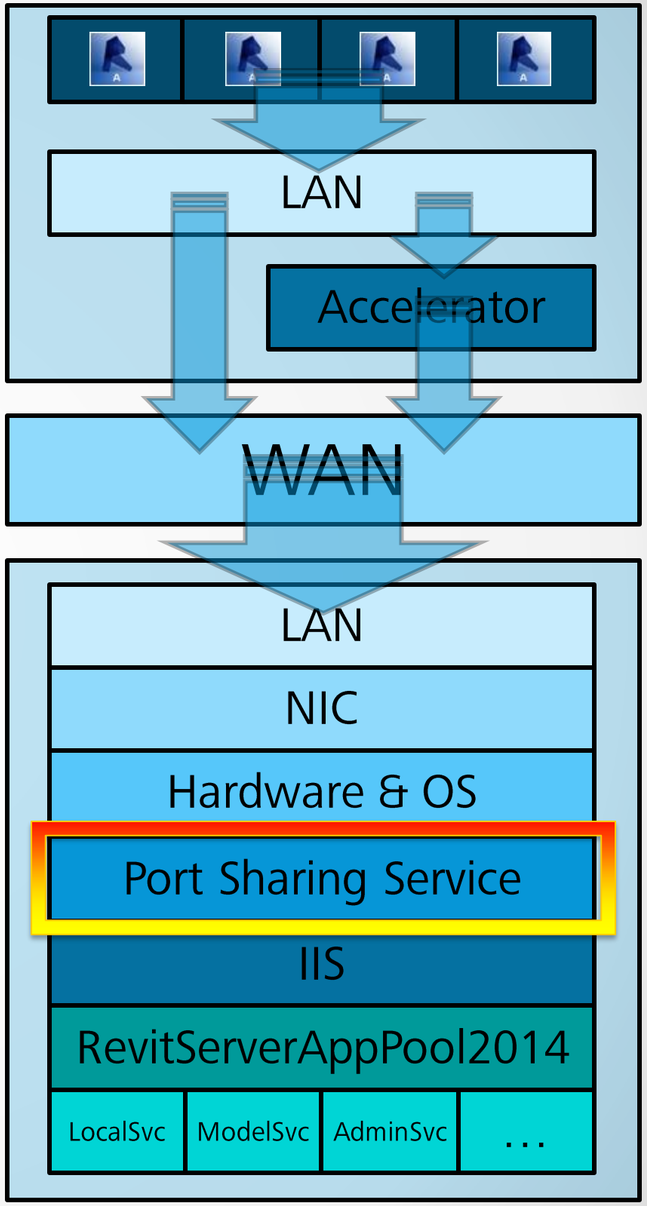
- System is under very heavy load
- Journal reports socket aborted or forcibly closed on the host
- Errors in the windows event log related to SMSvcHost
- Perfmon reports large gap between TCP connections accepted and dispatched



…the port sharing service continued

Next Steps

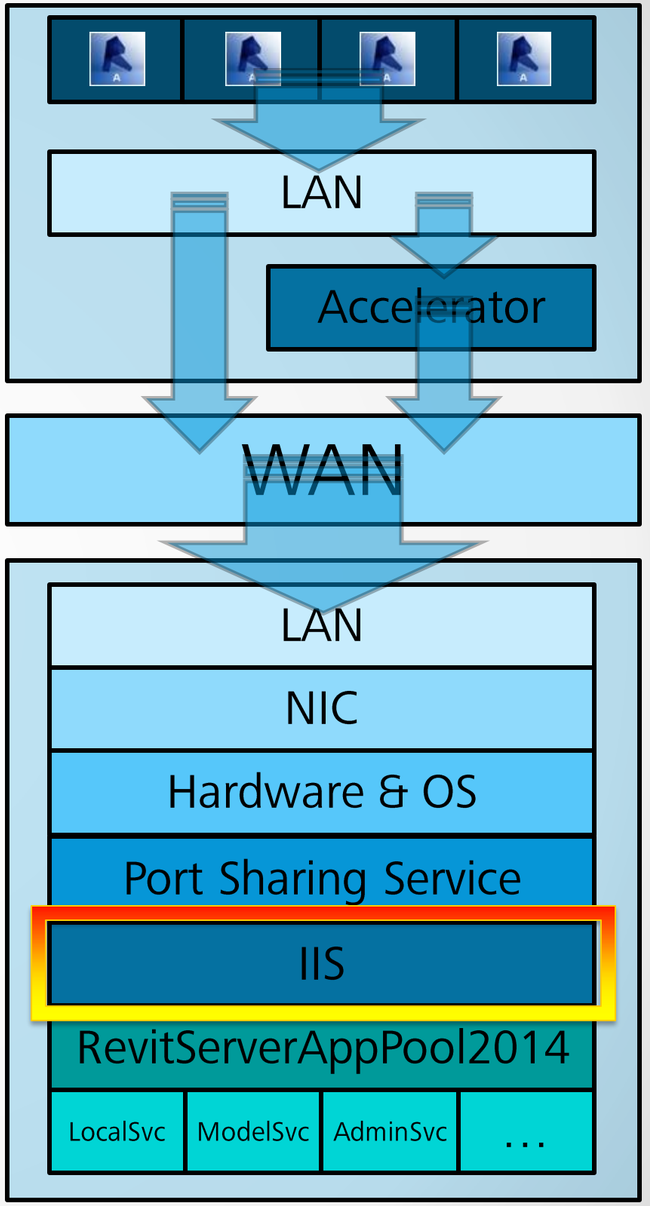
- Install MSFT hotfix KB2504602
- Increase compute power of the server, or consider using multiple host servers to distribute load
- Tune the port sharing service via SMSvcHost.exe.config



…IIS

Possible Symptoms

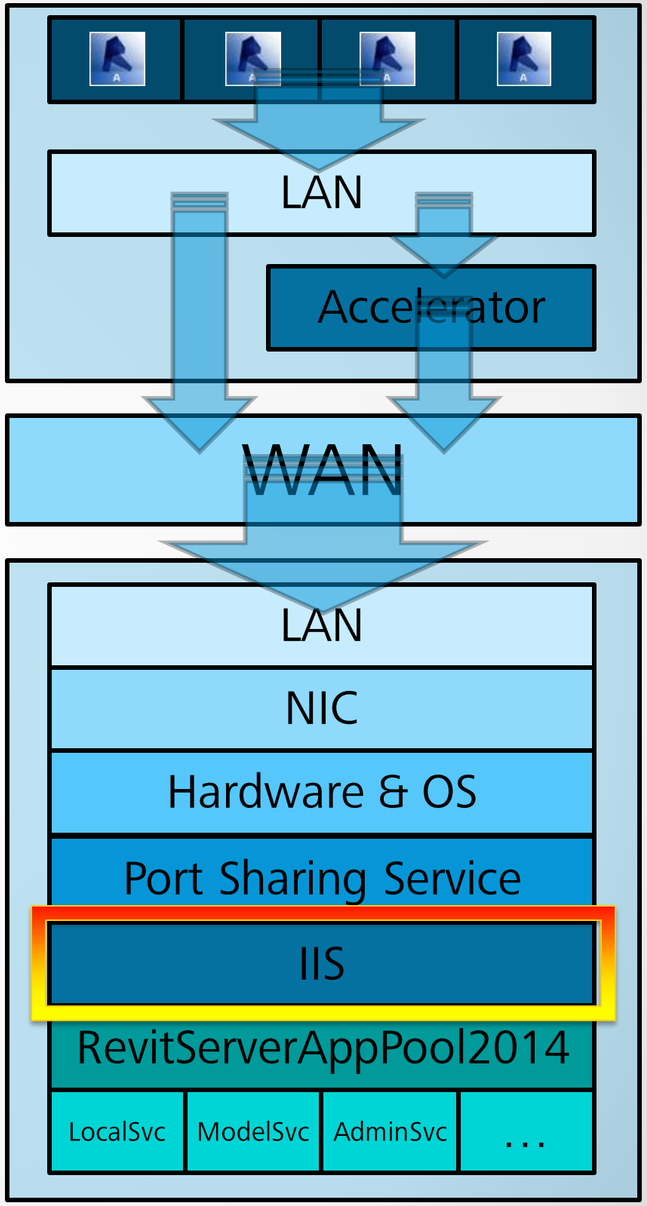
- Browsing SVC files in IIS returns error page
- No communication with Revit Server is possible
- Can’t browse the IIS default welcome html page



…IIS continued

Next Steps

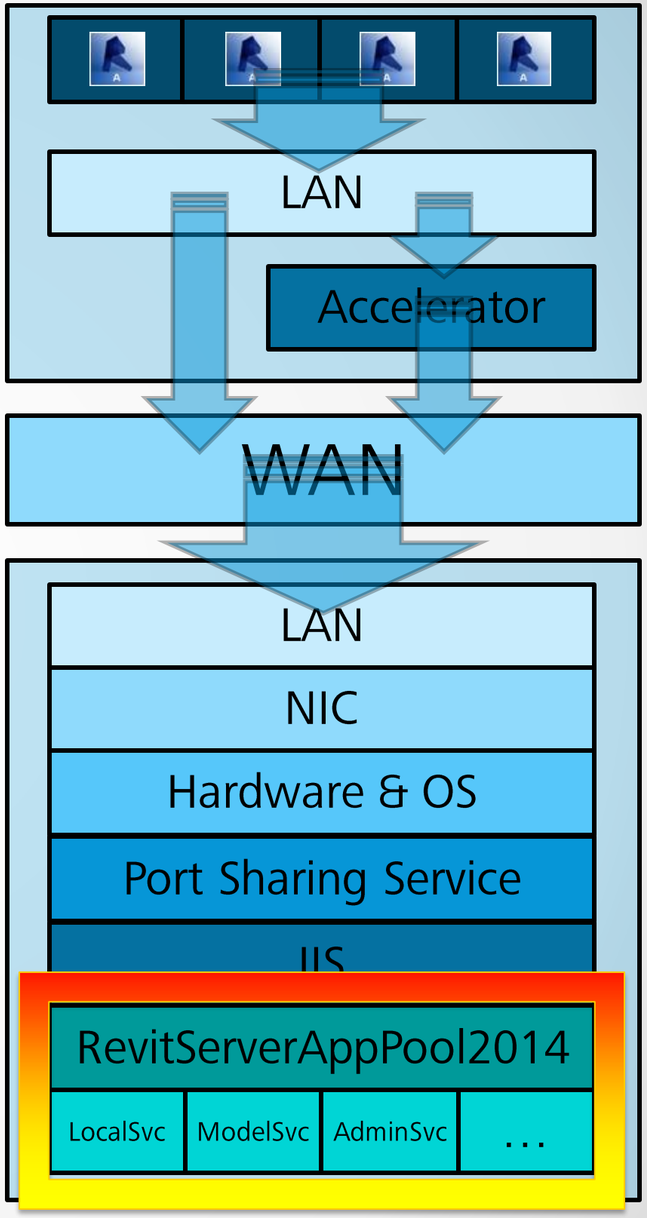
- Check Prereqs
- (Re-)start app pool in IIS Mgr
- Repair .net framework
- Check process identity
- Reboot the server
- Check if other apps are / were installed on IIS



…Revit Server

Possible Symptoms

- User cannot connect to the server even though all other layers of the stack seem fine.
- Problems in Radmin
- Matching Operation GUIDs in Revit journal and RS server log, with an exception logged for that operation.



…Revit Server continued

Next steps

- Check that roles are correctly defined in the RSROLE20xx env var
- Check that rsn.ini is correct for instances with the accelerator or admin role enabled
- Contact Support