

# **A Preview to PowerPivot Server Best Practices**

SQL90CALT

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Denny Lee is a Data Warehousing and Business Intelligence specialist with the SQL Customer Advisory Team (SQLCAT) which works with some of the largest most complex enterprise SQL implementations. He had helped create the first OLAP Services reporting application in production at Microsoft and is a co-author of several books including “Professional Microsoft SQL Server Analysis Services 2008 with MDX” and the upcoming “Professional Business Intelligence with PowerPivot for Microsoft Office 2010”. In addition to contributing to the <http://SQLCAT.com>, you can also review the blogs <http://dennyglee.com> and <http://powerpivottwins.com>.

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Dave Wickert is a Program Manager with the Microsoft SQL Server, PowerPivot team. He is responsible for the server infrastructure components of PowerPivot. He has been with Microsoft for 13 years and, previous to that, with Computer Sciences Corporation and Digital Equipment Corporation specializing in database systems.

# Agenda

- PowerPivot Infrastructure
- Capacity Planning
- Topologies
- Installation
- Upload Configuration
- Troubleshooting

## Agenda

### PowerPivot Infrastructure

Capacity Planning

Topologies

Installation

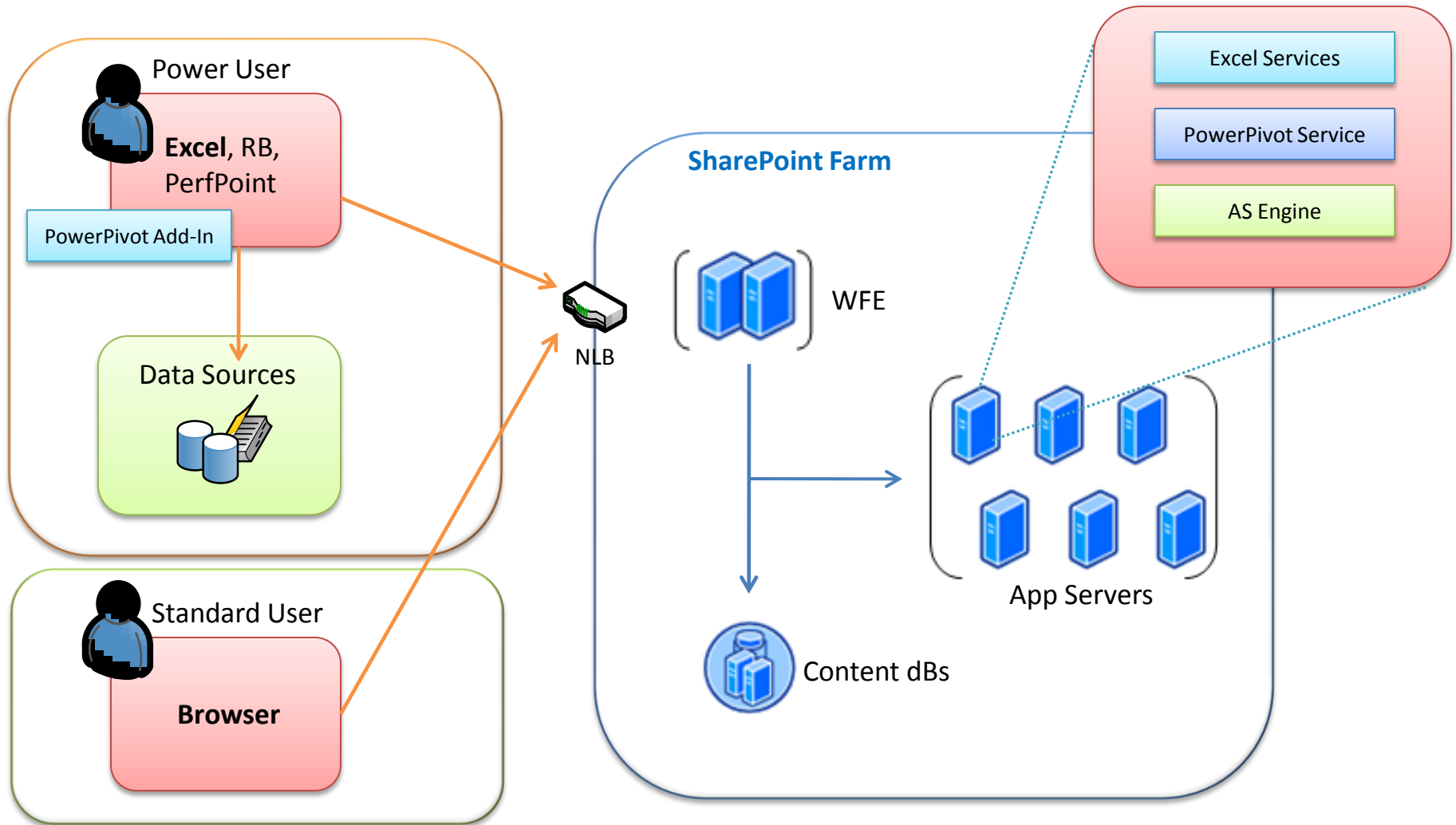
Upload Configuration

Troubleshooting

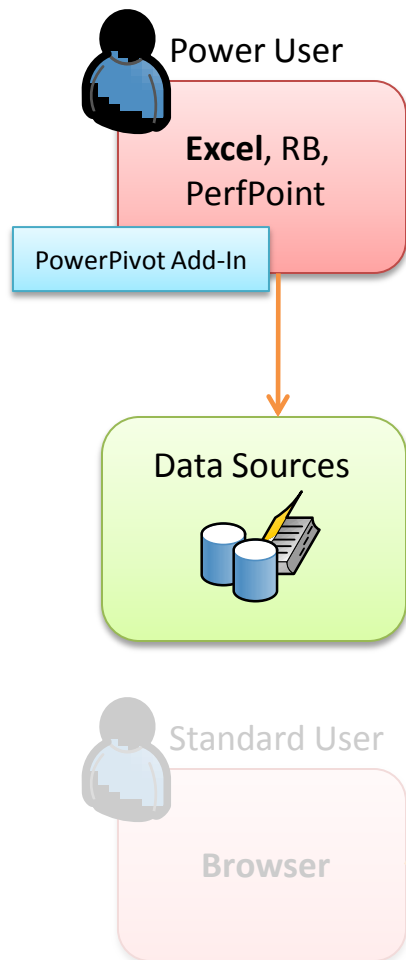
Client and Server Infrastructure

# PowerPivot Infrastructure

# PowerPivot Infrastructure Overview



# PowerPivot Infrastructure: Excel



- Use of AS Engine: in-memory, column-based store w/ VertiPaq compression
- Once data is imported, all calculations are performed on client
- Excel now has it's own local in-process SSAS engine
- Added Excel power functions for PowerPivot called DAX (Data Access eXpressions)
- Use of new compression algorithm to significantly compress the data ~ 10:1
- Added slicer functionality: not just for UI but for smoother SharePoint integration

# PowerPivot Infrastructure

## Client Observations

- For few instances VertiPaq may result in more storage than MOLAP
  - MOLAP can compress fact rows with same FK into a single row where VertiPaq maintains each row separately
- How do you see the VertiPaq internal storage...

**Let's show you the trick!**

# demo

SharePoint Integration

## PowerPivot Server

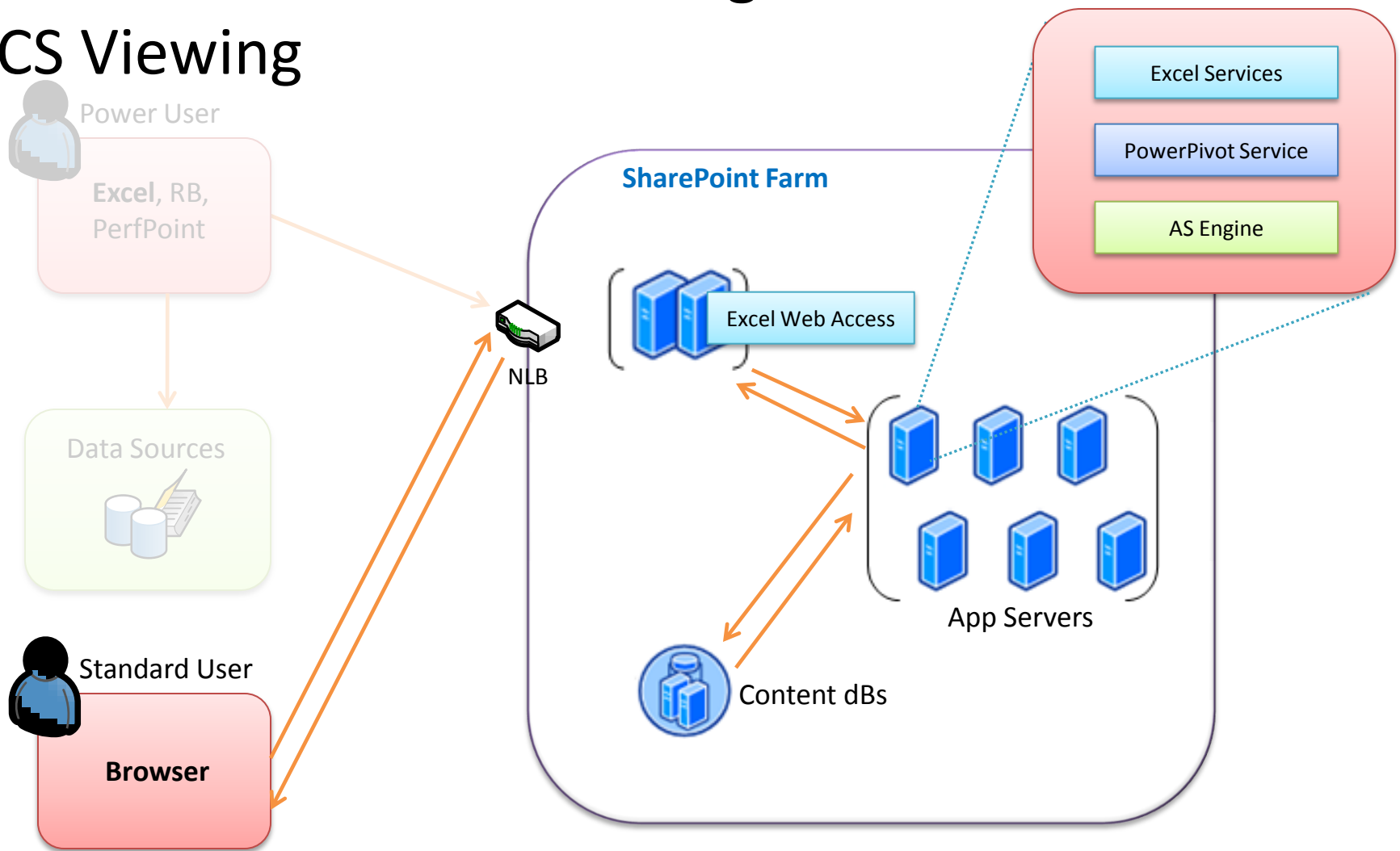
### Agenda

#### PowerPivot Infrastructure

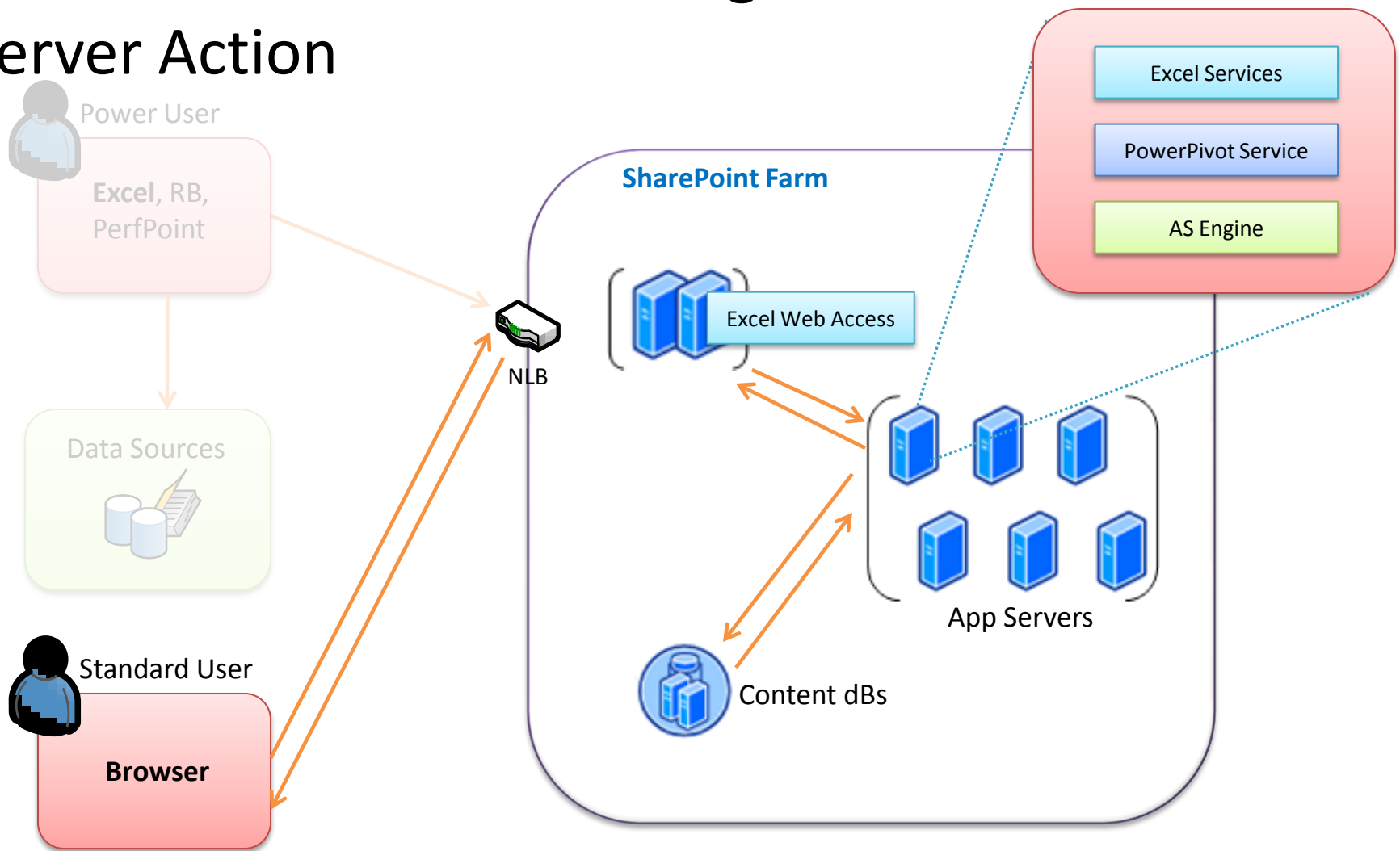
#### PowerPivot Server

- Capacity Planning
- Topologies
- Installation
- Upload Configuration
- Troubleshooting

# PowerPivot SharePoint Integration: ECS Viewing



# PowerPivot SharePoint Integration: Server Action



## Agenda

PowerPivot Infrastructure

**Capacity Planning**

Topologies

Installation

Upload Configuration

Troubleshooting

PowerPivot Best Practices

# Capacity Planning

# Capacity Planning: Basic observations

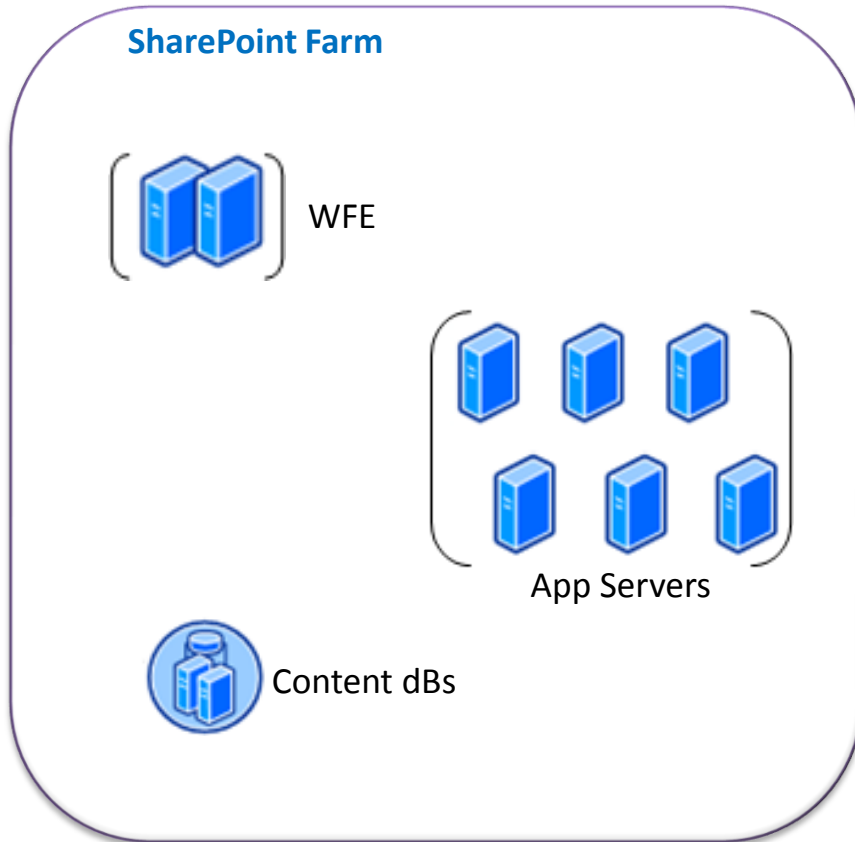
- VertiPaq mode is an in-memory system
  - Any currently 'in-use' database must be in memory (add'em up)
  - Need some buffer (~10-20%) for the auto-detection to work effectively
- To reduce impact on content database, PowerPivot keeps a 'cache' of detached databases in the SSAS Backup folder

# Capacity Planning: Provisioning

Metric	Determination
Total # of Users	<ul style="list-style-type: none"><li>• Ascertain maintenance costs for user-base</li><li>• Storage Requirements = Avg # of files x Avg Size of files x Total # of Users</li></ul>
Total # of Concurrent Users	Help determine number of SharePoint WFEs
Total # of PowerPivot Users	Help determine number of SharePoint Application Servers (hosting Excel Services, AS Engine, PowerPivot System Service)
# of Files; Avg/Max Size of Files	Necessary to determine storage requirements to host SharePoint data (PowerPivot and non-PowerPivot).
Data Refresh Options	<ul style="list-style-type: none"><li>• Security and driver issues – users will have access to data sources that PowerPivot may not have</li><li>• Frequency and # of files dictate how much resources used to process/open/store these files</li></ul>

# Capacity Planning

## Scale Out Content Database



- Excel workbooks (or any file) stored as blobs in content database
- Another option is to use Remote Blob Store to store in FILESTREAM or connected network storage (e.g. EMC Centera)
- Preliminary results note low overhead (2-3%) and able to better handle higher concurrency scenarios

## Agenda

PowerPivot Infrastructure  
Capacity Planning

### **Topologies**

Installation  
Upload Configuration  
Troubleshooting

PowerPivot Best Practices

# Topologies

# SharePoint Server 2010 Topologies

## Medium Server Farm Topology

### Medium topologies

The medium server farm illustrated is scaled for search to serve approximately 40 million items. Beyond this search scale, the recommendation is to deploy a dedicated search farm. Scale out all other servers based on the utilization of other services within the farm and the volume of content the farm will host.

#### Web servers



The number of users will affect the requirement for Web servers. Factor 10,000 users per Web server as a starting point. Adjust the number based on how heavily the servers are utilized. Heavy use of client services will increase the load on Web servers.

#### Application servers



Combined query and crawl server



All other application server roles and services

Start with all application server roles installed on one server (except search roles). Based on utilization, consider either adding additional servers with all the non-search roles installed, or add additional servers to dedicate resources to specific services. For example, if performance data indicates that Excel Services is using a disproportionate amount of resources, offload this service to a dedicated server.

#### Database servers



Search databases



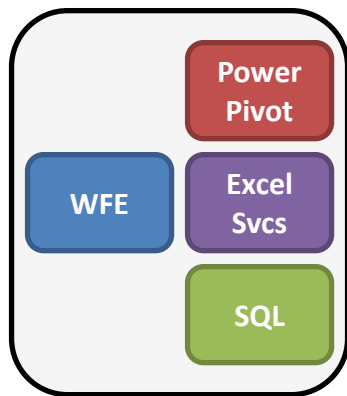
All other SharePoint databases

Add additional database servers based on the volume of content in your environment and sizing targets for your organization.

# SharePoint Server 2010 Topologies

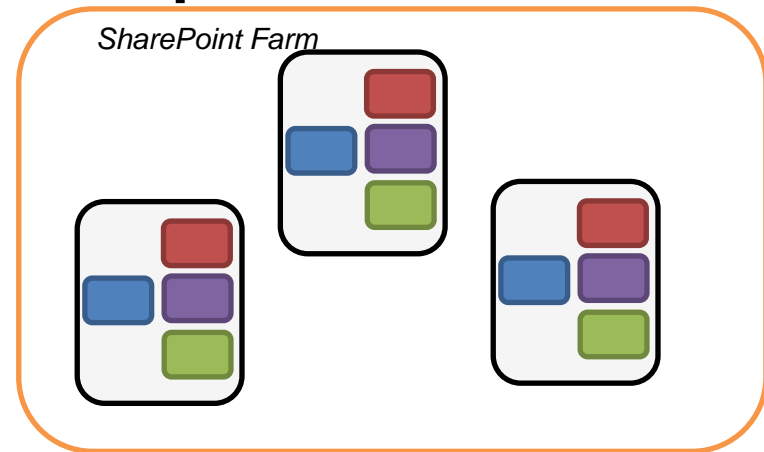
## PowerPivot Departmental Topology

### Single Server



- Good for small setups
- Not a good farm scenario
- Should work fine in Kerberos or Claims scenarios

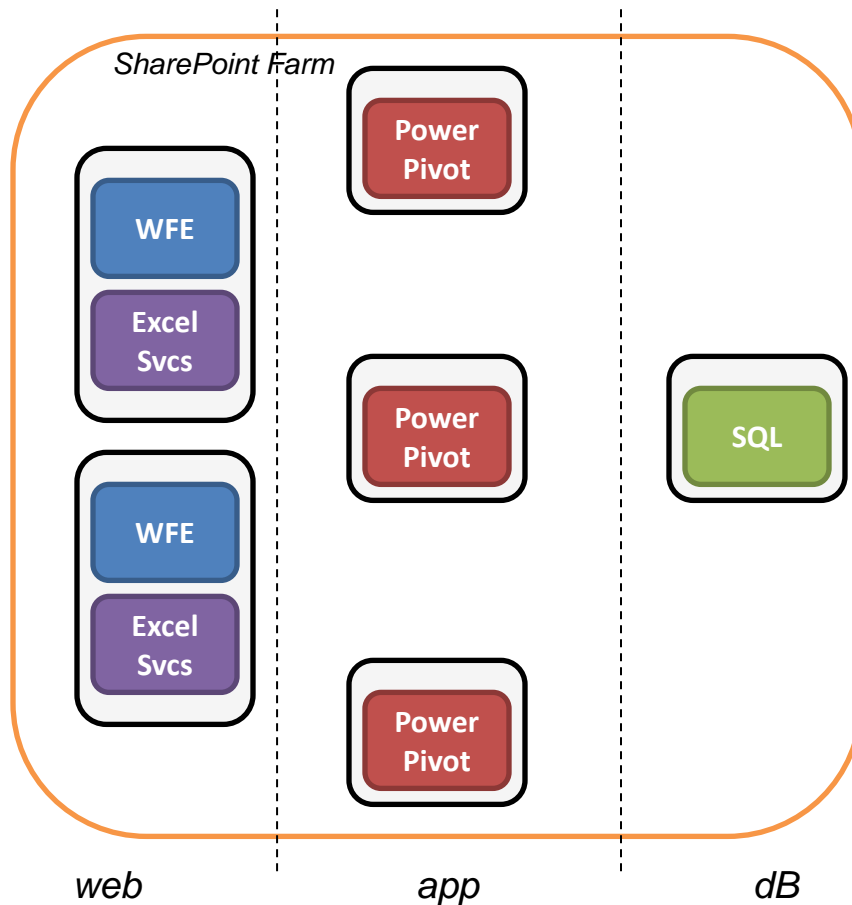
### Multiple Standalone Server



- Evenly distributes load across many servers\*
- Easy to rebuild but doesn't take into account heavier loads
- Should work in Claims and Kerberos

# SharePoint Server 2010 Topologies

## Enterprise Topology (1)

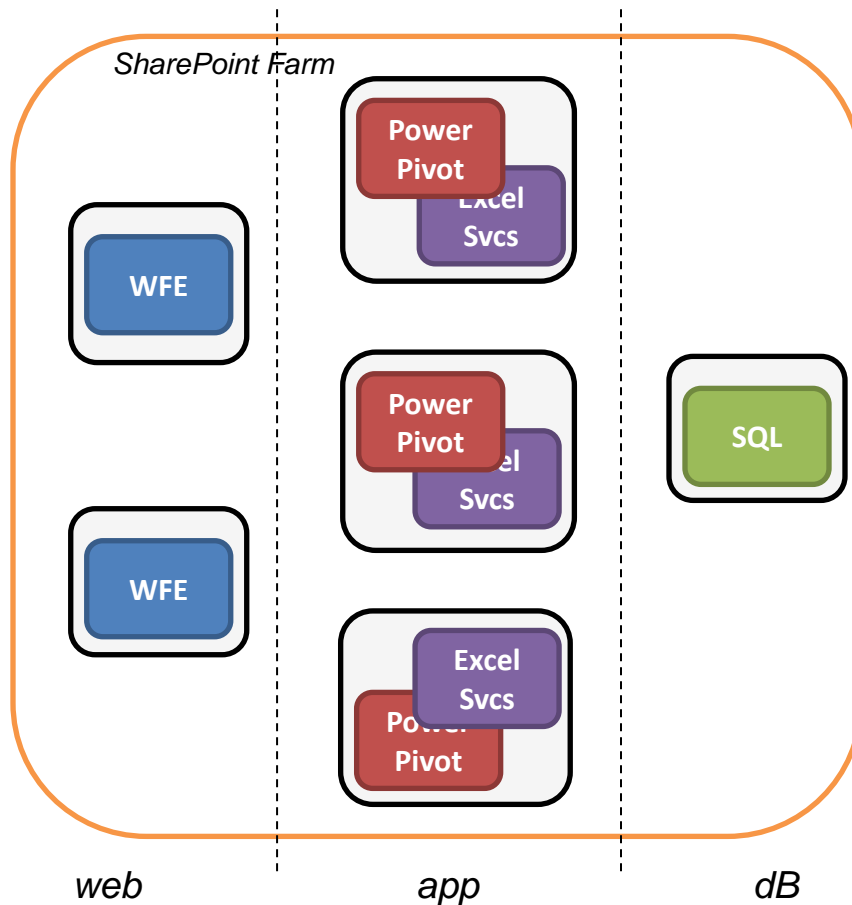


## Application Servers are PowerPivot Only

- Scenario is good if PowerPivot servers have the most amount of load
- Not as common because most calculations in PowerPivot are not overly complex
- May be helpful for Report Builder and Performance Point scenarios
- Should work in Claims and Kerberos scenarios

# SharePoint Server 2010 Topologies

## Enterprise Topology (2)

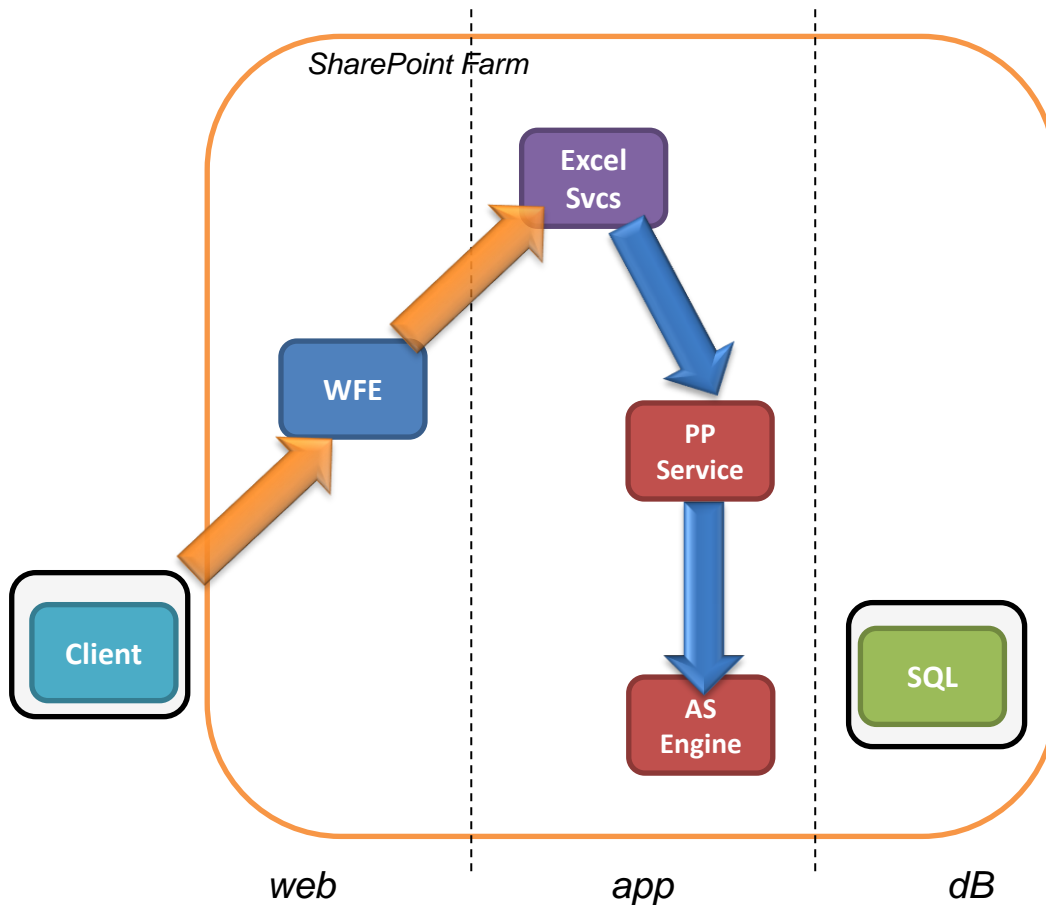


## Application Servers are PowerPivot and Excel Services

- Scenario is good if WFE servers have the most amount of load
- May be a good idea due to high amount of chatter between Excel Services and PowerPivot
- Should work in Claims and Kerberos scenarios

# SharePoint Server Topology

## Multi-hop scenario?



## Multi-Hop

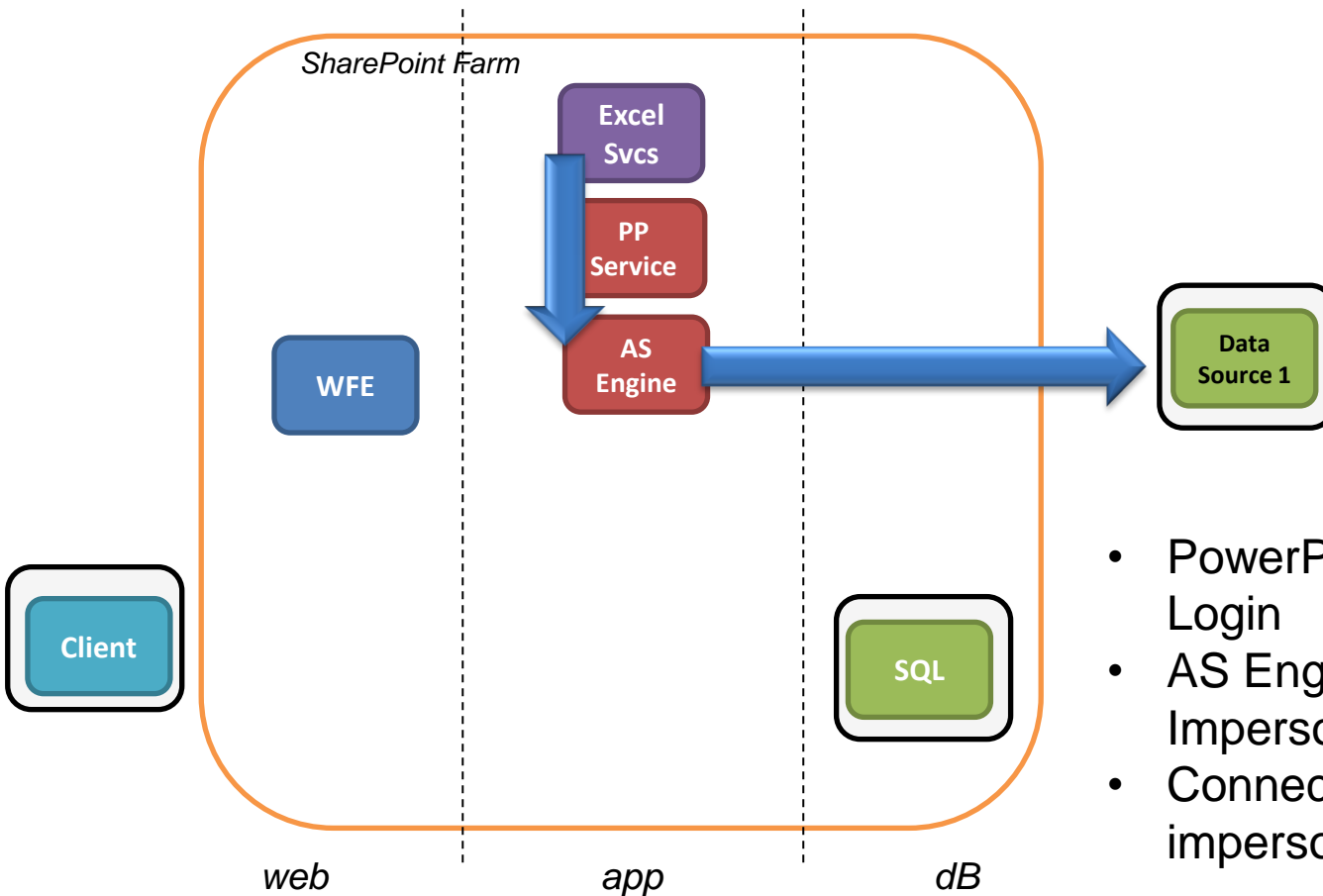
- By definition, going from the client to Excel Services to PowerPivot server is multi-hop
- But
- Excel Services and PowerPivot Services are service applications
  - PowerPivot System Service recreates the identity token

## Background

With SharePoint 2010, we have Claims token as part of Geneva framework

# SharePoint Server Topology

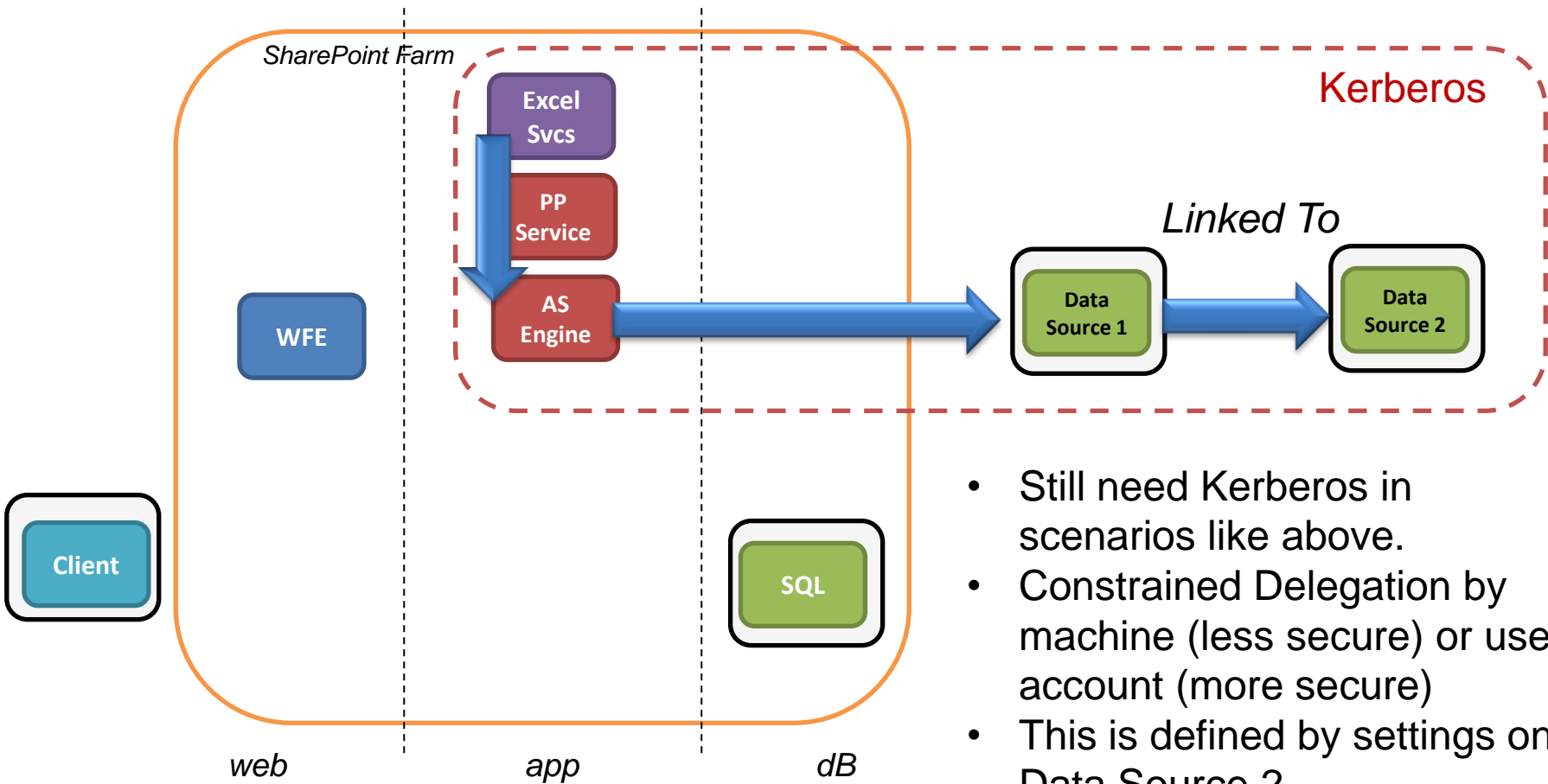
## Claims Data Source Scenario



- PowerPivot System Service Login
- AS Engine Service Impersonates SSS credentials
- Connects to Data Source 1 via impersonation

# SharePoint Server Topology

## Kerberos Data Source Scenario



- Still need Kerberos in scenarios like above.
- Constrained Delegation by machine (less secure) or user account (more secure)
- This is defined by settings on Data Source 2

## Agenda

PowerPivot Infrastructure  
Capacity Planning  
Topologies  
**Installation**  
Upload Configuration  
Troubleshooting

PowerPivot Best Practices

# Installation

# Installation Best Practices

- **Read the manuals!!!**

- <http://powerpivotgeek.com/server-installation/>

- There are a lot of steps and a lot components integrated together:

- (PowerPivot System Service, AS Engine, SharePoint, Excel Services, Reporting Services, Excel Client, Office Workspace, IIS, Windows, etc.)

- **Examples:**

- To change password for SharePoint Farm takes seven separate steps in the farm, services, and IIS.

- Multiple steps to handle larger file sizes

# Installation Best Practices Gotchas!

- “New Farm” vs. “Existing Farm”
- Require Domain Accounts
- Upgrade SharePoint 2007 to SharePoint 2010 is very complex
- Cannot upgrade from Gemini Server
  - CTP2 -> CTP3: Cannot do
  - CTP3 -> RTM: ??

## Agenda

PowerPivot Infrastructure  
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**Upload Configuration**  
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PowerPivot Best Practices

# Upload Configuration

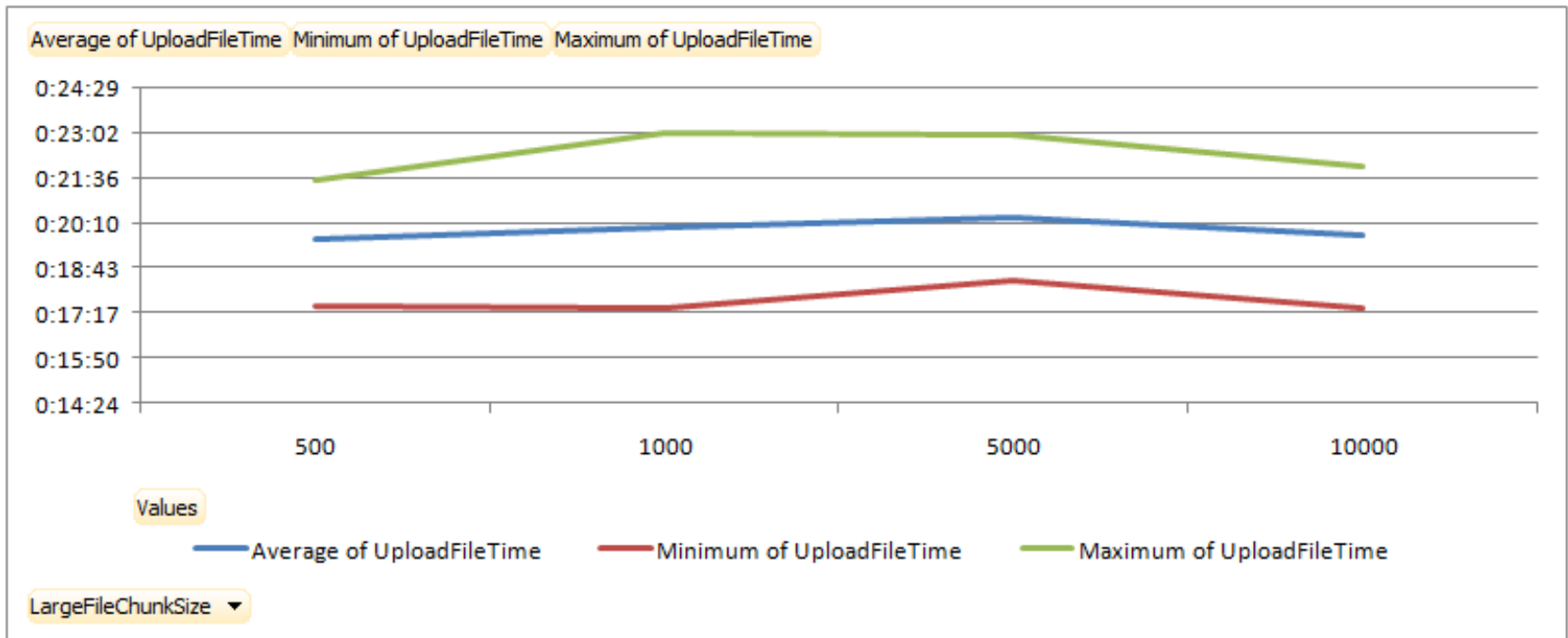
# Upload Configuration

## Overview

- SharePoint is optimized for download, hence our concerns for PowerPivot scenarios were for upload
- Important because IT (SharePoint) Administrators are now dealing with larger files
  - Default SharePoint Scenarios
    - Max Size: 50Mb; Average Size: 20Mb
  - PowerPivot SharePoint Scenarios
    - Max Size: 2000Mb (configure Excel Services and SharePoint); Average Size: ~50Mb
    - Install instructions provide how to configure this
- New: Office Sync Center which can asynchronously upload files from Excel to SharePoint

# Upload Configuration

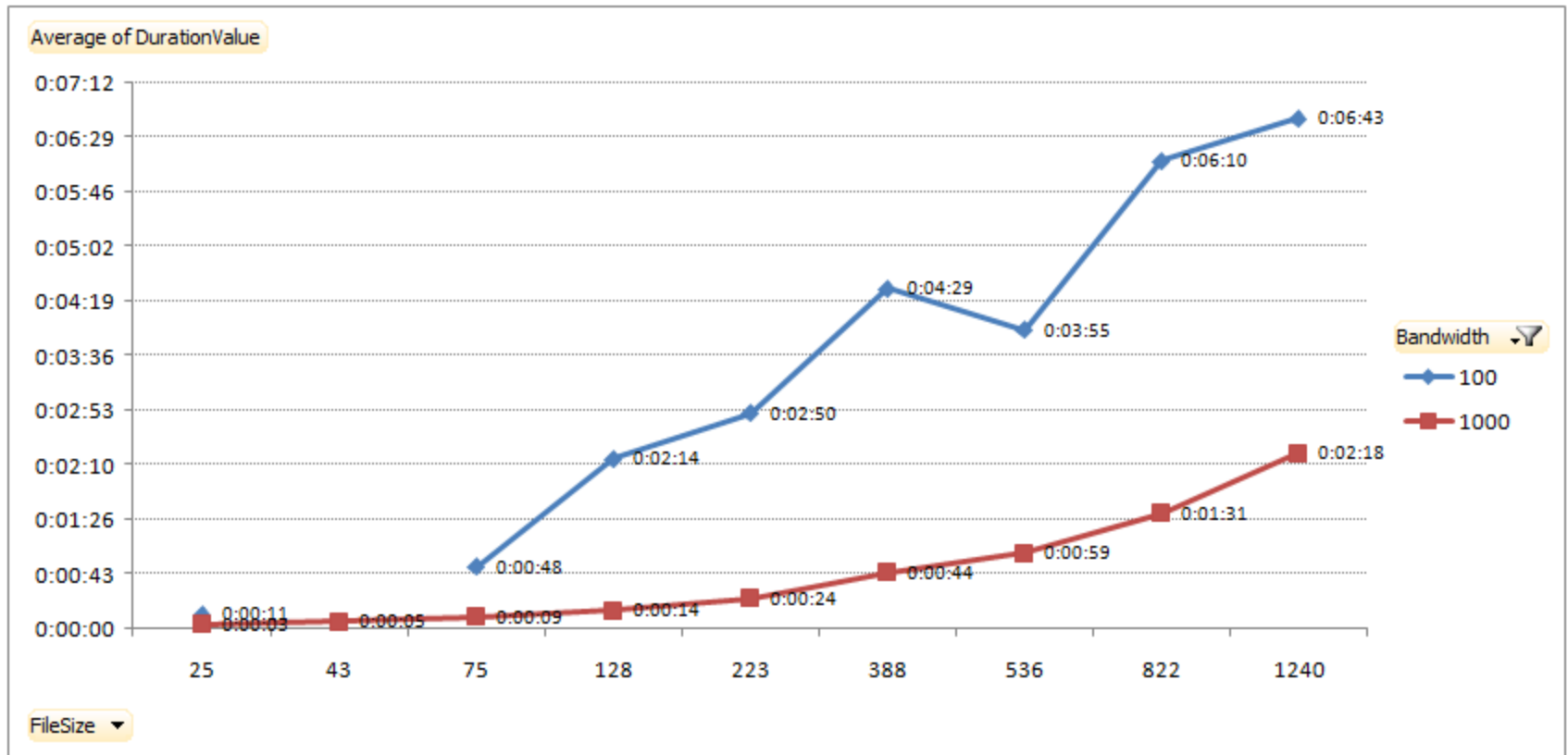
## SharePoint LargeChunkFileSize



LargeChunkFileSize parameter little to no effect on upload performance

# Upload Configuration

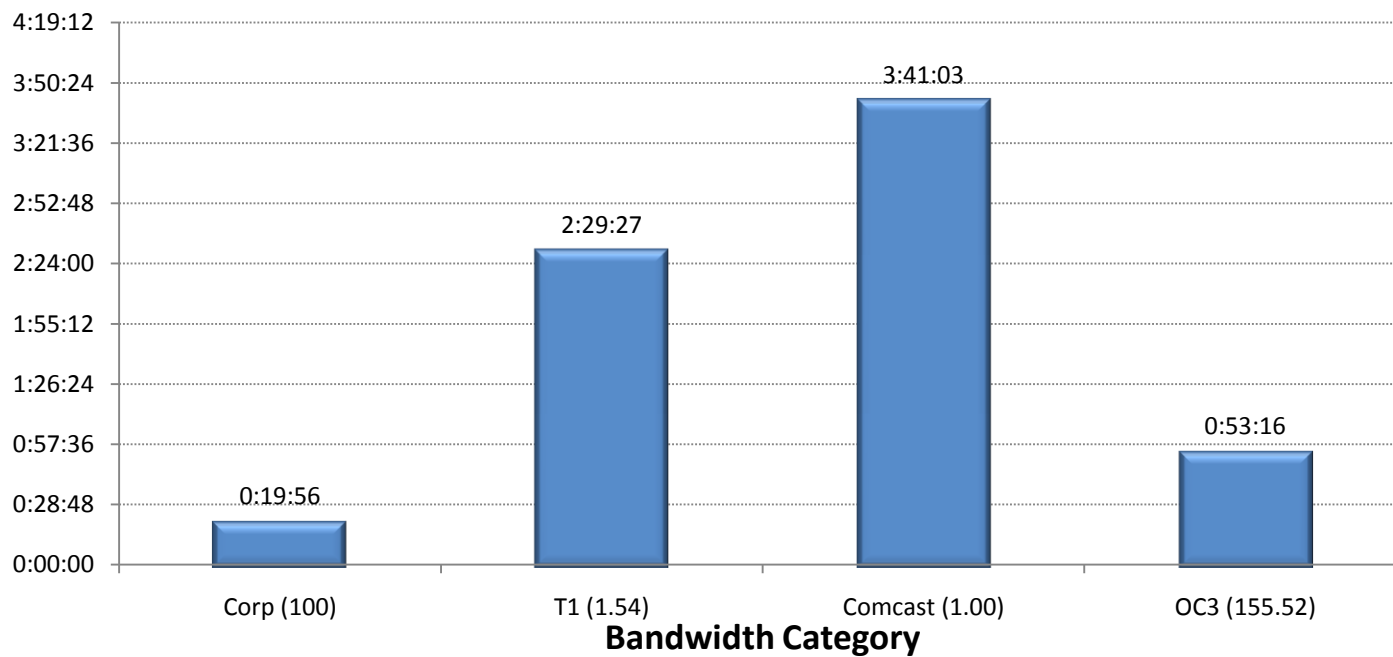
## Effect of Bandwidth (100Mbps vs. 1Gbps)



# Upload Configuration

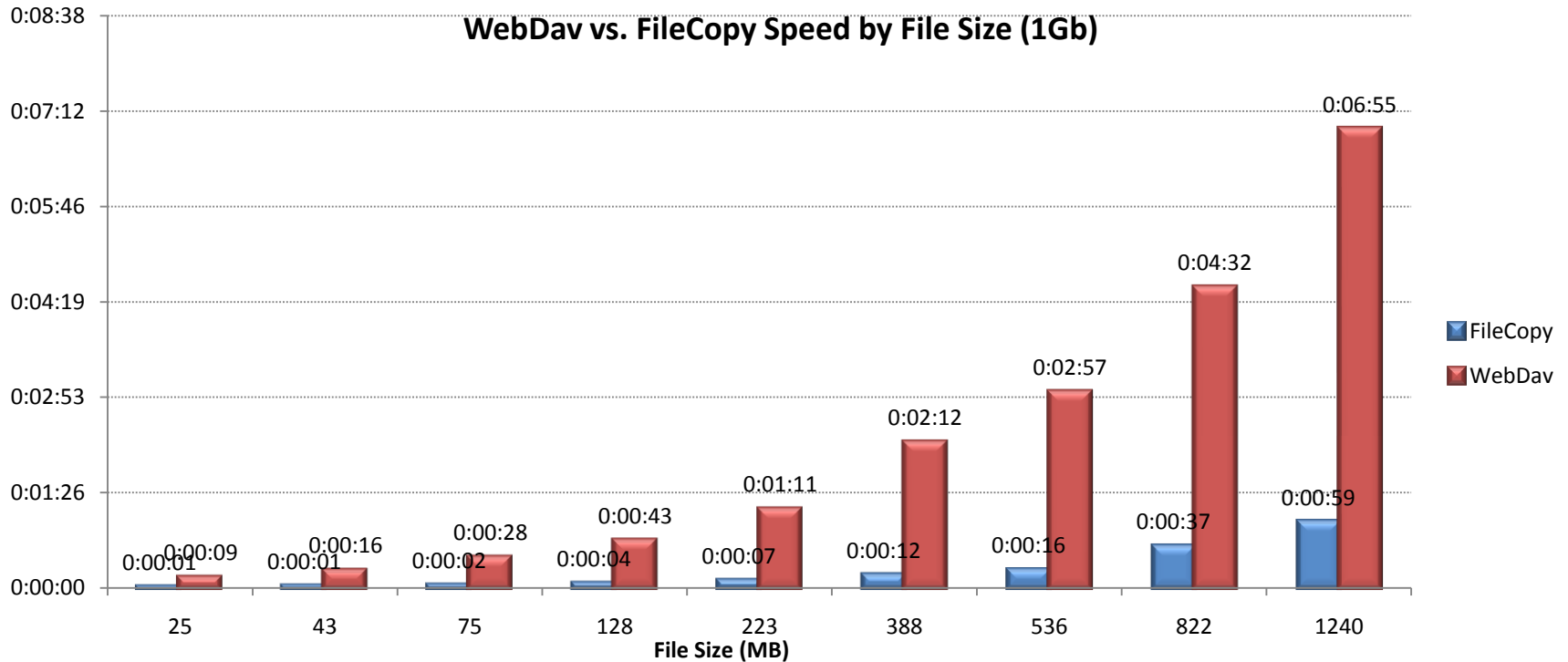
## Effect of Bandwidth (Various)

Average Upload Duration for 1.3GB to SharePoint



# Upload Configuration

## SharePoint Upload vs. File Copy



## Agenda

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Installation  
Upload Configuration  
**Troubleshooting**

PowerPivot Best Practices

# Troubleshooting

# Troubleshooting Reading ULS Logs

%commonprogramfiles%\Microsoft Shared\Web Server Extensions\14\LOGS

The screenshot shows an "Error" dialog box in the foreground with the text "The creator of this fault" and "Go back to site". Behind it is a table of ULS log entries. A context menu is open over the "Correlation ID" column, showing sorting options (Sort A to Z, Sort Z to A, Sort by Color) and a search filter. The table columns are: TimeStamp, Process, TID, Area, Category, EventID, Level, Message, and Correlation ID. The log entries show various events from 13:25.2 to 13:26.2, including monitoring and logging events.

	A	B	C	D	E	F	G	H	I	J	K	L
	TimeSt	Process	TID	Area	Catego	EventID	Level	Message	Correlat	n		
2	13:25.2	OWSTIME	0x09E0	Windows	Monitor				26f9-4521-a22a-bf1c83e22fec			
3	13:25.2	OWSTIME	0x09E0	Office Ser	Shared				26f9-4521-a22a-bf1c83e22fec			
4	13:25.2	OWSTIME	0x09E0	SharePoin	Single S				26f9-4521-a22a-bf1c83e22fec			
5	13:25.2	OWSTIME	0x09E0	Office Ser	Shared				26f9-4521-a22a-bf1c83e22fec			
6	13:25.2	OWSTIME	0x09E0	Windows	Monitor				26f9-4521-a22a-bf1c83e22fec			
7	13:25.2	OWSTIME	0x09E0	Windows	Monitor				26f9-4521-a22a-bf1c83e22fec			
8	13:25.2	OWSTIME	0x09E0	Windows	Monitor				26f9-4521-a22a-bf1c83e22fec			
9	13:25.2	OWSTIME	0x09E0	Windows	Monitor				26f9-4521-a22a-bf1c83e22fec			
10	13:25.2	OWSTIME	0x09E0	Windows	Monitor				26f9-4521-a22a-bf1c83e22fec			
11	13:25.5	w3wp.exe	0x28A0	Office Ser	Logging				87a3-2940-0000-000050f7b00c			
12	13:25.5	w3wp.exe	0x28A0	Office Ser	Logging				87a3-2940-0000-000050f7b00c			
13	13:25.5	w3wp.exe	0x28A0	Office Ser	Logging				87a3-2940-0000-000050f7b00c			
14	13:25.9	w3wp.exe	0x1B3C	Office Ser	Logging				87a3-2940-0000-000050f7b00c			
15	13:25.9	w3wp.exe	0x1B3C	Office Ser	Logging				87a3-2940-0000-000050f7b00c			
16	13:25.9	w3wp.exe	0x1B3C	Office Ser	Logging				87a3-2940-0000-000050f7b00c			
17	13:26.2	w3wp.exe	0x27D4	Office Ser	Logging				87a3-2940-0000-000050f7b00c			
18	13:26.2	w3wp.exe	0x27D4	Office Ser	Logging				87a3-2940-0000-000050f7b00c			
19	13:26.2	w3wp.exe	0x27D4	Office Ser	Logging				87a3-2940-0000-000050f7b00c			
20	13:26.2	w3wp.exe	0x22A8	Office Ser	Logging				87a3-2940-0000-000050f7b00c			
21	13:26.2	w3wp.exe	0x22A8	Office Ser	Logging	Ccxmrv	Medium	Name=Ta:000cc3b8-87a3-2940-0000-000050f7b00c				

# Troubleshooting SQL Profiler

The screenshot shows the SQL Server Profiler interface with a table of events. The table has columns for EventClass, EventSubclass, TextData, ConnectionID, NTUserName, ApplicationName, IntegerData, and StartTime. A red circle highlights the XML data for a 'Batch' event (ConnectionID 9037, NTUserName dwickert).

EventClass	EventSubclass	TextData	ConnectionID	NTUserName	ApplicationName	IntegerData	StartTime
Session Initialize		*	9140	dwickert			2009-10-30 18:41
Discover Begin	31 - DISCOVER_XML_METADATA	<RestrictionList xmlns="urn:schemas...	9140	dwickert			2009-10-30 18:41
Discover End	31 - DISCOVER_XML_METADATA	<RestrictionList xmlns="urn:schemas...	9140	dwickert			2009-10-30 18:41
Audit Logout			9140	dwickert			
Notification	11 - Flight Recorder Snapsh...		0				2009-10-30 18:42
Server State Discover Begin	8 - DISCOVER_LOCKS	<RestrictionList xmlns="urn:schemas...	0				2009-10-30 18:42
Server State Discover End	8 - DISCOVER_LOCKS	<RestrictionList xmlns="urn:schemas...	0				2009-10-30 18:42
Server State Discover Begin	7 - DISCOVER_JOBS	<RestrictionList xmlns="urn:schemas...	0				2009-10-30 18:42
Server State Discover End	7 - DISCOVER_JOBS	<RestrictionList xmlns="urn:schemas...	0				2009-10-30 18:42
Server State Discover Begin	2 - DISCOVER_SESSIONS	<RestrictionList xmlns="urn:schemas...	0				2009-10-30 18:42
Server State Discover End	2 - DISCOVER_SESSIONS	<RestrictionList xmlns="urn:schemas...	0				2009-10-30 18:42
Server State Discover Begin	1 - DISCOVER_CONNECTIONS	<RestrictionList xmlns="urn:schemas...	0				2009-10-30 18:42
Server State Discover End	1 - DISCOVER_CONNECTIONS	<RestrictionList xmlns="urn:schemas...	0				2009-10-30 18:42
Notification	12 - Flight Recorder Snapsh...		0				2009-10-30 18:42
Audit Login			9141	dwickert			2009-10-30 18:42
Session Initialize		*	9141	dwickert			2009-10-30 18:42
Discover Begin	31 - DISCOVER_XML_METADATA	<RestrictionList xmlns="urn:schemas...	9141	dwickert			2009-10-30 18:42
Discover End	31 - DISCOVER_XML_METADATA	<RestrictionList xmlns="urn:schemas...	9141	dwickert			2009-10-30 18:42
Audit Logout			9141	dwickert			
Audit Login			9142	dwickert			2009-10-30 18:42
Session Initialize		*	9142	dwickert			2009-10-30 18:42
Query Begin	1 - DMXQuery	select PERF_COUNTER_NAME, PERF_COUN...	9142	dwickert			2009-10-30 18:42
Query End	1 - DMXQuery	select PERF_COUNTER_NAME, PERF_COUN...	9142	dwickert			2009-10-30 18:42
Audit Logout			9142	dwickert			
Command Begin	12 - Batch	<Batch Transaction="false" xmlns="h...	9037	dwickert			2009-10-30 18:42
Session Initialize		*	9037	dwickert			2009-10-30 18:42
Progress Report Begin	42 - Attach	Attach started.	9037	dwickert			2009-10-30 18:42
Progress Report Begin	48 - Load	Load started.	9037				2009-10-30 18:42
Progress Report Begin	49 - Metadata Load	Metadata load started.	9037				2009-10-30 18:42

```
<Batch Transaction="false" xmlns="http://schemas.microsoft.com/analysisisservices/2003/engine" xmlns:ddl2="http://schemas.microsoft.com/analysisisservices/2003/engine/2" xmlns:ddl100...
  <Attach>
    <Folder>C:\Program Files\Microsoft SQL Server\MSAS10_50.GEMINI1\OLAP\Backup\Sandboxes\DefaultGeminiServiceApp\99a50222-2fe8-4bcc-b0d1-0de180e...
    <ddl100:ReadWriteMode value="ddl200_200">ReadOnlyExclusive</ddl100:ReadWriteMode>
  </Attach>
</Batch>
```

```
<PropertyList xmlns="urn:schemas-microsoft-com:xml-analysis">
  <LocaleIdentifier>1033</LocaleIdentifier>
</PropertyList>
```

# Resources

- Where do I get the bits?

- <http://powerpivot.com/download.aspx>

- Books-OnLine:

- [http://msdn.microsoft.com/en-us/library/ee210682\(SQL.105\).aspx](http://msdn.microsoft.com/en-us/library/ee210682(SQL.105).aspx)

- Unofficial resources:

- Cool blogs:

- <http://dennyglee.com>
- <http://powerpivot-info.com>
- <http://powerpivotgeek.com>
- <http://powerpivotpro.com>

# Do you have any final questions?

Use Q&A to submit your questions and comments.