Best practices with development of enterprise-scale SharePoint solutions

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About Me

- Project Manager, Consultant, Trainer
- More than 40 Microsoft certification exams passed, including MC(S)M
- Focused on SharePoint since 2002
- Author of 10 books about XML, SOAP, .NET, LINQ, and SharePoint
- Speaker at main IT conferences worldwide

- http://www.piasys.com/

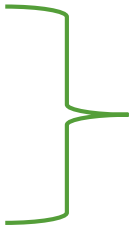
Agenda

- What's an enterprise-scale solution?
- Best Practices for …
  - Server-side code
  - Workflows
  - Public Facing Web Sites

What's an enterprise-scale solution?

What makes a solution enterprise-scale?

- Some technical numbers that matter
  - Number of concurrent users
  - Number of transactions x day
- Some technical facts that matter, as well
  - Business continuity requirements
  - Scalability requirements
  - Etc.
- Some other facts that still matter
  - Overall size of the customer
    - Network and infrastructure topology
  - Overall complexity of the solution
    - Number of use cases to support
  - Team Project size
  - Etc.



Determine Overall Throughput

How to calculate Throughput

- Throughput = number of operations per second (RPS)
- Input Variables
  - Total Number of Users
  - Concurrency Rate (%)
  - Request Rate
- Easy Output
  - Total Number of Users * Concurrency Rate / Request Rate
- More Realistic and Complex Output
  - Based on usage clusters
  - And on concurrency peak

Cluster	Req/Hour	Distribution
Light	20	10%
Typical	36	70%
Heavy	60	15%
Extreme	120	5%

Let's make an example!

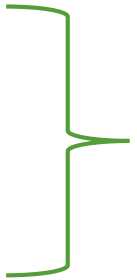
- Input Variables
  - Total Number of Users: 10.000
  - Concurrency Rate (%): 10%
  - Request Rate: 36/hour = 1 every 100 seconds
- Easy Output
  - 10.000 * 10% / 100 = 10 RPS
- Complex Output
  - Usage Peak: 33%
  - 42.200 / 3600 = 11,72 RPS
  - Realistic Throughput = 3,87 RPS

Cluster	Req/Hour	Distribution	# Users	# Req/Hour
Light	20	10%	1.000	2.000
Typical	36	70%	7.500	25.200
Heavy	60	15%	1.500	9.000
Extreme	120	5%	500	6.000
				42.200

THE BIGGEST IS THE THROUGHPUT, THE MORE YOU HAVE TO TAKE CARE OF QUALITY OF CODE … BUT YOU SHOULD ALWAYS TAKE CARE OF IT!

Our scope in this session

- Here we focus on top best practices for enterprise-scale solutions
- What kind of best practices?
  - Better Performances
  - Better Scalability
  - High Availability and Business Continuity
  - Stability of Code
  - Security of Code
- What kind of solutions are we thinking about?
  - Custom Development Solutions
  - Custom Workflow Solutions
  - Public Facing Web Sites



"Server-side" solutions

Let's see the top 15 rules!

Rule #1: Properly Dispose unmanaged data

- Remember to properly release unmanaged resources that you have created
  - Leverage the *using* keyword in that case
- Avoid releasing unmanaged resources that you did not created

- If you don't adhere to this rule
  - Your code will be unstable
  - Sooner or later you will crash the hosting app pool
  - Because of memory leaks … performances could degrade, as well

- Use SPDisposeCheck and/or SPCAF
- Rule applies to: *SPSite*, *SPWeb*, *SPLimitedWebPartManager*, etc.

PROPERLY DISPONING UNMANAGED RESOURCES

Rule #2: Create *SPWeb/SPSite* only if needed

- Don't create *SPWeb/SPSite* objects too much freely
- Create them only in case of real need
- Otherwise leverage *SPContext/SPControl*
  - This will keep memory lighter and will be less error prone (mind Dispose)

- If you don't adhere to this rule
  - Memory allocation will increase uselessly
  - Performances will degrade
  - Code will not scale properly

Rule #3: Request only the data that you need

- Don’t ever iterate over full *SPListItemCollection* of a list/library
- Always query items using a specific view or a CAML query
- Remember to page data, instead of quering the full resultset

- If you don’t adhere to this rule
  - Performances will be bad and sad
    - Mainly in production, with huge numbers of users/items/documents/requests
  - Code will not scale properly
    - When the size of data grows … the performances decrease

QUERYING DATA WITH CAML THE RIGHT WAY

Rule #4: Don’t abuse of LINQ to SharePoint

- Instead of LINQ to SharePoint queries
  - Which let you pay for the LINQ QueryProvider work, under the cover
- Prefer well-defined CAML queries with paging
- Avoid two-stage queries in LINQ to SharePoint
  - Involve superset queries through CAML + LINQ to Objects in memory
- For read-only LINQ to SharePoint queries
  - Use view projections and turn off ObjectTracking
- Eventually simply use LINQ to SharePoint to discover CAML queries

- If you don’t adhere to this rule
  - Your code will be slower than expected
  - Code will not scale properly
  - Solution ALM will be painful from a maintenance perspective

Rule #5: Handle exceptions properly

- Catch and handle only those exceptions that you anticipate and can manage
- Avoid simply catching all exceptions using a *catch all* block or an empty *catch* block
- Always log exceptions and issues in the ULS log, for centralized management

- If you don't adhere to this rule
  - Your code will be unstable
  - The behavior of your solutions will be unpredictable

PROPERLY HANDLING EXCEPTIONS

Rule #6: SharePoint isn't a DBMS!

- Avoid using SharePoint as a DBMS replacement!
- SharePoint isn't a transactional resource manager
- SharePoint cannot participate in distributed transactions
  - Or at least cannot do that with consciousness ☺ …
- Consider using a polyglot system (SharePoint + DBMS + noSQL)
  - Handle with care data persistence and data integrity
  - Make your choice based on what you need to persist

- If you don't adhere to this rule
  - Sooner or later your solution will fail to keep data integrity
  - Your code will be potentially unstable
  - The behavior of your solutions will be unpredictable

MANAGING A POLYGLOT SYSTEMS, WHICH INCLUDES SHAREPOINT

Rule #7: Mind throttling rules

- Keep in mind the list view threshold settings
  - 5.000 items for regular users
  - 10.000 items for site administrators
  - Daily time window for overriding
  - Unlimited for Local Administrators in local/remote server session
- Overridable through Object Model
  - But it is not a good idea to exceed limits!
  - Restrict the scope of any overriding to the minimum
- Consider List View Lookup Threshold, as well
- Partition data results through custom views
- Use indexed columns to avoid full table scan
- Impacts on large workflow solutions (history list and task list)

MANAGING THROTTLING OVERRIDES

Rule #8: Avoid too many item-level permissions

- Assign permissions at the highest possible level
- Break permission inheritance as infrequently as possible
- Don’t create tons of items with item-level permissions
- Prefer folders to group items and their security rules via groups membership
  - In SharePoint 2013 continuous crawl mitigates security trimming issues
- For lists of items (!documents) use ReadSecurity and WriteSecurity permission levels

Rule #9: Avoid "elevated" code via *SPSecurity*

- *SPSecurity.RunWithElevatedPrivileges* is generally speaking a "bad idea"
  - Consider changing the implementation
  - Or at least impersonate "minimal" principals using
    - *SPSite(*, SPUserToken)* constructor

- If you don't adhere to this rule
  - You could have potential security issues
  - Your code could be unsafe for the target farm

Rule #10: Properly use *AllowUnsafeUpdates*

- Avoid using *AllowUnsafeUpdates* as much as you can
- And use it properly in case you really need it
  - Remember to use a *try* … *finally* block of code to reset it
  - Especially when you share *SPWeb* with others
- Remember to put *FormDigest* in your custom pages
  - And manage update/delete/insert actions via POST
  - Avoid update/delete/insert actions via GET, as much as you can

WRITING SAFE AND SECURE CODE IN SHAREPOINT

Rule #11: Mind workflow numbers

- Keep in mind List View Threshold and Trottling for history and tasks lists
- Be careful with item level permissions, as already stated
- Dependant tasks and task-level permissions are not supported out of the box by the Workflow Manager tools
  - You have to manually create custom actions for that

Rule #12: Caching, caching, caching!

- Avoid useless network roundtrips
- Keep in cache frequently accessed and rarely changing data
  - SharePoint Objects
  - Lookup data
  - Images, blob files, etc.
- Out of the box there are
  - Object Cache
  - Output Cache
  - BLOB Cache
- Use them to improve performances and response time
  - In particular in Public Facing Web Sites, but not only

Rule #13: Try to always use CQWP/CSWP

- In Public Facing Web Sites always try to use
  - Content by Query Web Part
  - Content by Search Web Part
- These web parts do a good caching of results
  - Thus, improving the overall perceived time
- You only have to focus on XSLT or HTML Templates
- Fallback to *DataFormWebPart* or *XsltWebPart*
- Lastly, if you can't avoid it, fallback to custom a WebPart

Rule #14: Don’t use Session or in-memory data

- Avoid storing sessions or in-memory data on a single server
  - It wouldn’t scale across multiple servers
- Only cached data that can stay in-memory of a single server

- If you don’t adhere to this rule
  - The solutions will not scale horizontally
  - You will have to configure NLB affinity (very bad idea!)
  - The overall availability of the solutions will be reduced

Rule #15: Avoid single points of failure

- Create code ready to be executed on multiple servers
  - Avoid relying on web.config or app.config directly
  - Avoid looking for specific files on the file system
  - Use only shared resources accessed through a provider
    - To abstract from the physical location of data/content
- Mind data concurrency across multiple servers
  - Provide concurrency checks and optimistic concurrency

- If you don’t adhere to this rule
  - Your solution will not scale
  - You will have to activate affinity, which will impact availability, as well

questions?

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thank you.

SHAREPOINT AND PROJECT CONFERENCE ADRIATICS
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