OpenACS and EuroTcl 2022

OpenACS 5.10 and Beyond

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Overview

- ## OpenACS 5.10
  - What's new (facts and figures)
  - New Packages

- ## Examples
  - Software quality management (automated testing, API browser)
  - Scalability (COVID experience)
  - COVID induced functionality

- ## Outlook OpenACS 5.10.1
  - New functionality
  - New packages

OpenACS 5.10 in Figures

- ## Changes in OpenACS 5.10
  - 3445 files changed, 215464 insertions(+), 193642 deletions(-)
  - 6 additional OpenACS packages
  - Direct Contributions from 13 developers

- ## Code summary of OpenACS 5.10 release
  - 349 packages, 93 package actively maintained
  - 131 contributors
  - Figures on my development site
    - 21386 unique files
    - 3.2 mio lines of code (+444K lines comment + empty lines), including documentation, 300K lines of Tcl, 200K lines of SQL
    - >55K tests in regression test

  - LEARN (roughly *2)
    - 39891 unqiue files
    - 9.5 mio lines of code (+1.3M lines comment + empty lines), including documentation, 520K lines of Tcl, 240K lines of SQL

Code Age analysis for acs-core packages
(based on git-blame statistics)

Available OpenACS Packages

Wiki pages for the packages available in the OpenACS code repository :

- Packages
  - Available OpenACS Packages
  - Core Packages
    - ACS Admin
    - ACS API Browser
    - ACS Authentication
    - ACS Automated Testing
    - ACS Bootstrap Installer
    - ACS Content Repository
    - ACS Core Docs
    - ACS Default Theme
    - ACS Developer Support
    - ACS Kernel
    - ACS Lang
    - ACS Mail Lite
    - ACS Messaging
    - ACS Reference Data
    - ACS Service Contract
    - ACS Subsite
    - ACS Tcl
    - ACS Templating
    - ACS Translations
    - Intermedia Driver
    - Notifications
    - Reference Data - Country
    - Reference Data - Language
    - Reference Data - Timezone
    - Search
    - Tsearch2 Driver
  - Non-Core Packages
    - ACS Date Time
    - ACS Events
    - ACS Interface
    - ACS Object Management
    - Address Book
    - Ad Server
    - Ajax Filestore UI
    - Ajax Helper
    - Ajax Photoalbum UI
    - Anonymous Evaluation
    - Assessment
    - Attachments
    - Attendance
    - Attribute Management System
    - Auth CAS

5.9.0
5.9.1
5.10.0
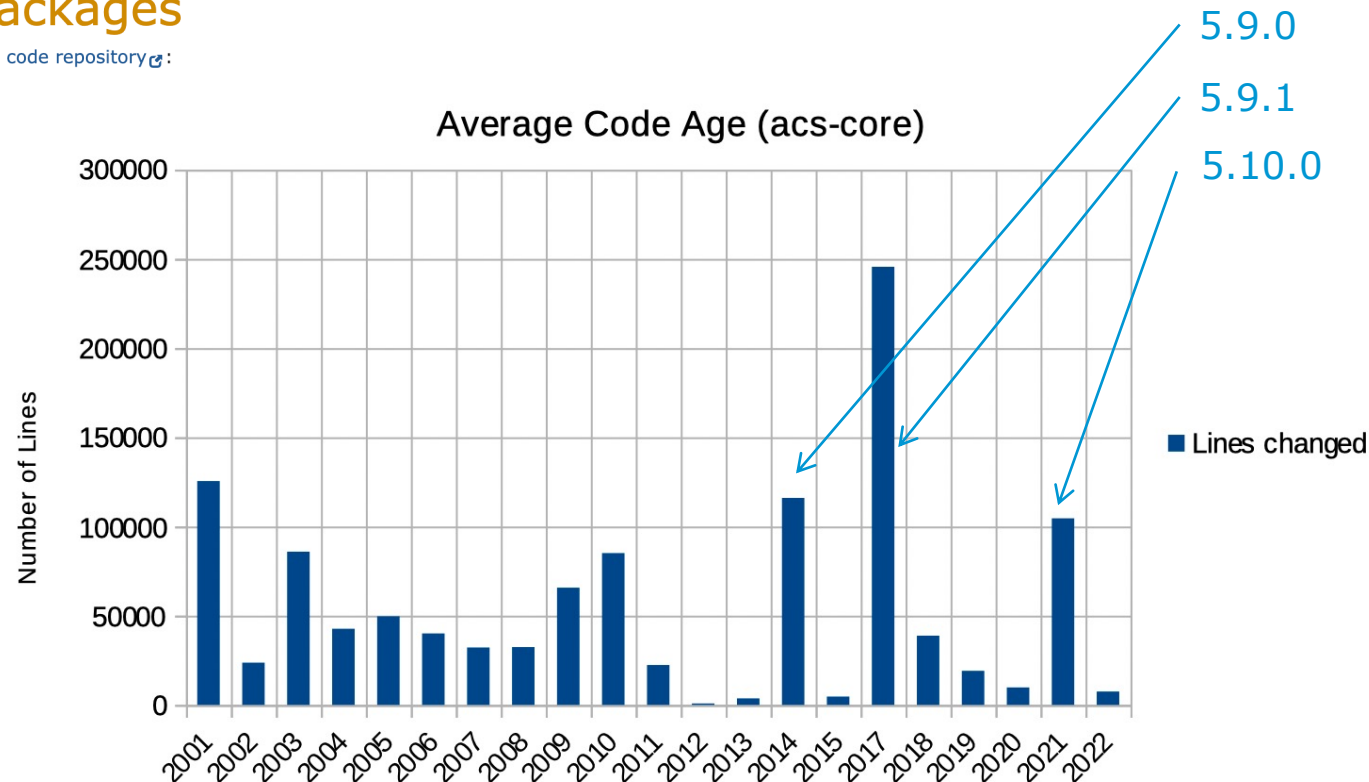
History: 20 years in repository
Average age per line: 10 years
Oldest lines: Copyright lines from MIT

OpenACS Development

- ## Newly developed packages in 5.10.0
  - cookie-consent: alerting users about the use of cookies on a website
  - boomerang: performance of your website from your end user's point of view (RUM)
  - xooauth: OAuth implementation, including LTI (Learning Tools Interoperability)

    LTI packages: Zoom, BigBlueButton, Jupyter Notebook
  - dotlrn-bootstrap3-theme: Bootstrap 3 theme for DotLRN
  - xowf-monaco-plugin: Integration of Monaco editor with for coding exercises
  - proctoring-support: watching students (camera, screen, sound) during exams

- ## Software Quality management
  - Test Coverage analysis
  - CI/CD pipeline based on GitLab
  - Extended Regression tests (>35K tests)

- ## Easier deployment
  - Docker images

Automated testing, coverage analysis

Single package coverage

Package summary

Clickable Call Graph with Tests integrated in API browser
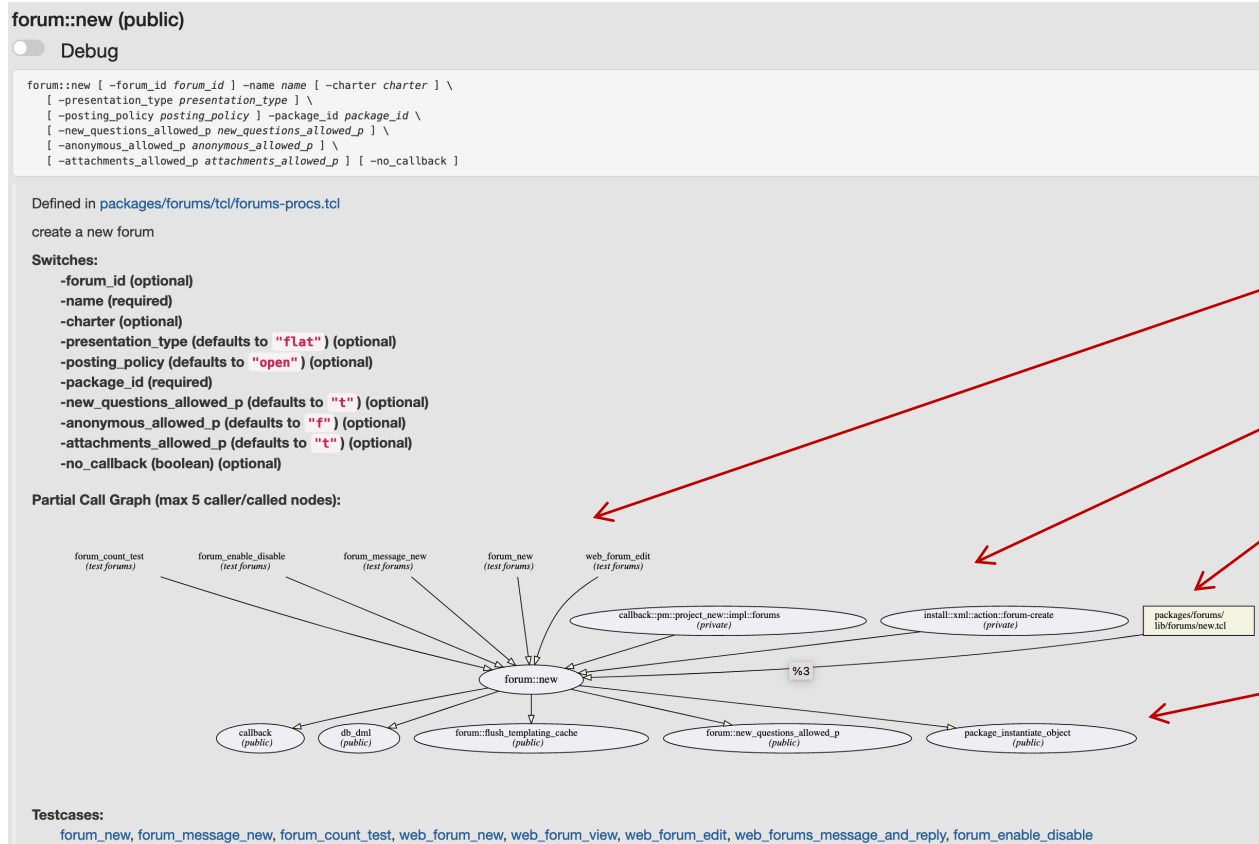
Test cases

Callers of forum::new

Web Pages

Callees

OpenACS API browser

LEARN @COVID

- LEARN = Inhouse System of WU, based on OpenACS and DotLRN

- OpenACS scaled very well (20K users active per day, 400 views/s)

	SS 2019	SS 2020	Factor
LEARN views	91.885.514	212.689.084	2,31
Learning Activities			
- Editing of Resources	10.786	47.471	4,40
- Number of Authors	411	789	1,92
Online-Proctoring	--	18.692.783	
Lecturecasts	7.520.999	54.208.457	7,21
Forums	449.268	2.259.461	5,03
Chats	57.803	584.496	10,11
Bandwidth April	11.709	186.831	15,96
Bandwidth May	12.671	226.985	17,91
Bandwidth June	16.845	271.506	16,12

270TB

- Avg response time < 0.1 sec:
  - OpenACS, NaviServer, PostgreSQL on a single server
  - Xeon Gold 6154 CPU @ 3.00GHz, 36 cores
  - Lecture Casting (per course 2 Streams via Paella-Player, live or recorded streams, adaptive bitrates, up to 1500 participants per Stream, …)
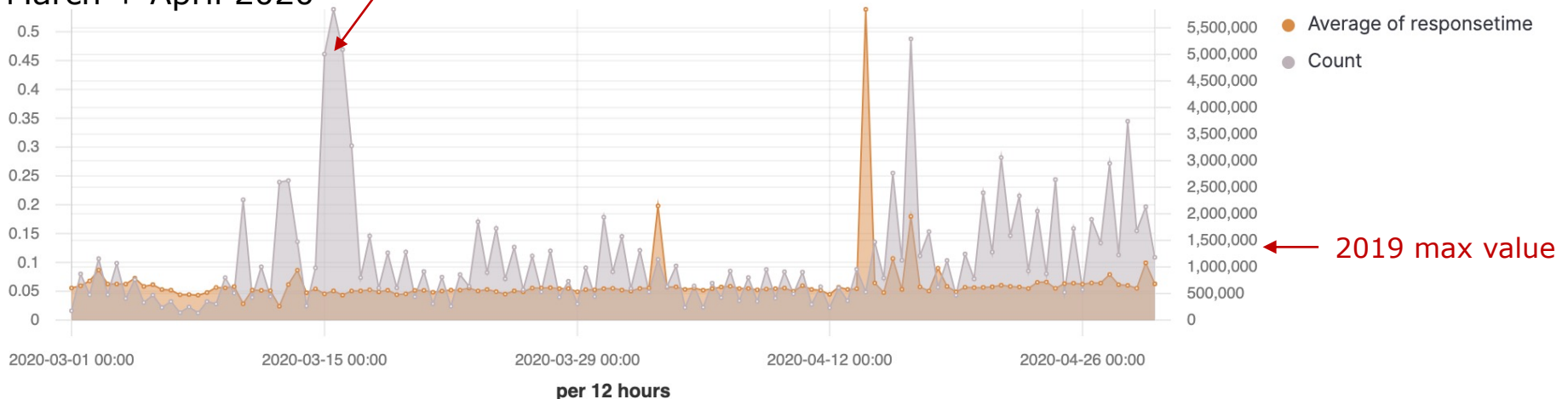
Performance and Usage

March + April 2019

March + April 2020

First COVID shutdown
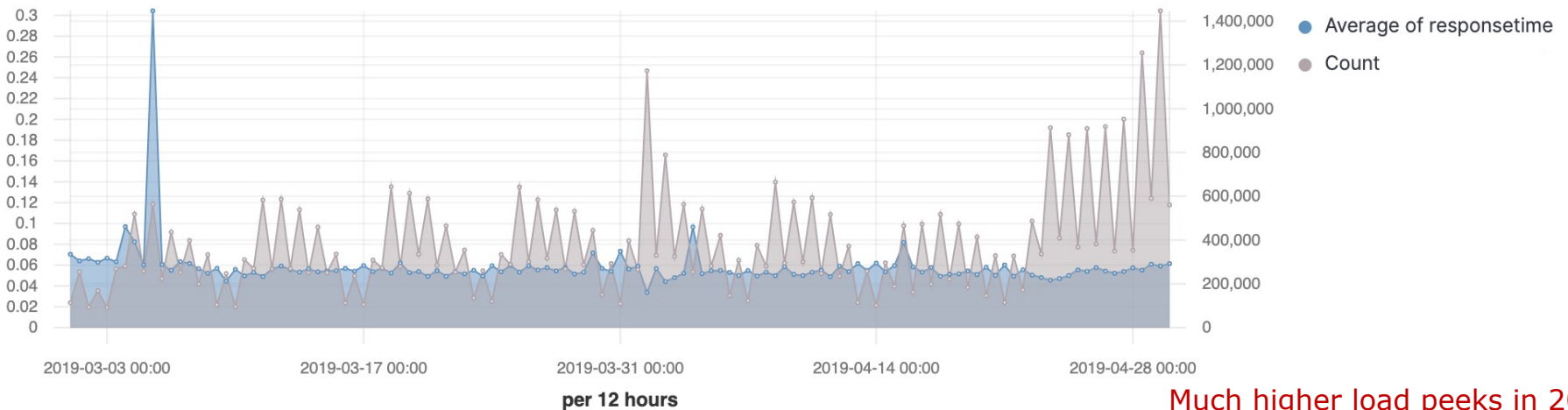
Much higher load peeks in 2020
Same avg response time <0.1s

2019 max value

Further OpenACS 5.10.0 improvements


- **General improvements**
  - URN-based registry for .js and .css libraries
  - Dynamic Blueprint reloading (effects all threads)
  - Improved support for streaming HTML
  - Various performance and security improvements
  - …

- **New E-Learning functionality in OpenACS**
  - Included in packages xowf, proctoring-support

  - Learning workflows for
    - Editing learning resources
    - Composing and publishing of complex resources
    - Multiple kind of answering workflows

  - Lecturer-paced quizzes, …

  - Exams with support for
    - Strong randomization
    - Manual grading and auto-grading
    - Various timing modes
    - Publishing workflow (develop, publish, closing exam, grading, making results available to student, …)
    - IP-filtering
    - proctoring
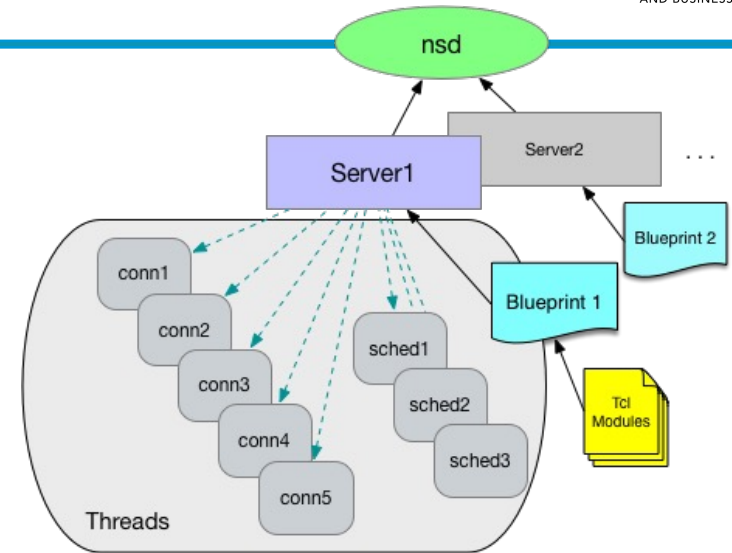
Pages, Questions, …
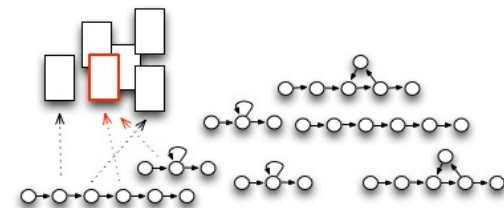
Workflow instances

Remote Assessment

- Newly developed proctoring component

  - From the "idea" to "large-scale real live" in just 5 weeks
  - Due to lock-down: development and large scale testing was a challenge
  - Hardware was not bought for this purpose
  - Recording of Screen + WebCam + Audio
  - Bandwidth requirement max 300kbit/s (suitable for 3G)

- Figures

  - Per exam up to 1500 participants per exam
  - More than 30k remote-exams in May and June

- Very positive feedback from students via social media

All Open-Source, no propretary software involved

Typical Remote Exams

>1300 participants per exam

Synchronous exams

Short peaks at exam starts

Single server for exam and
regular courses
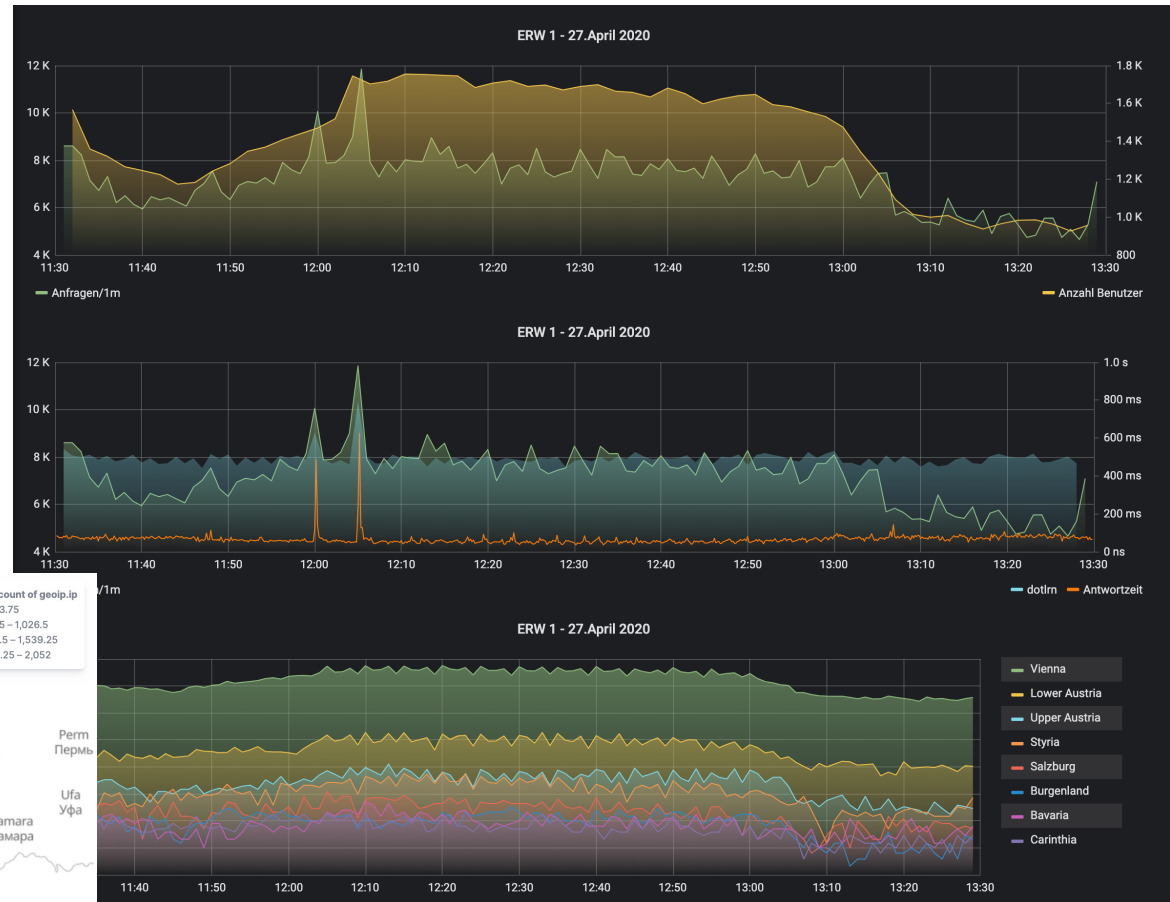
Side effect: Students were taking regular
exams from various locations

Improved scalability of caching

- Split caches and cache partitioning
  - Advantages:
    - Different caches use different locks, a lock on a specialized cache does not block operations on the `util_memoize` cache
    - Finer lock granularity
    - Less irrelevant data is processed, when wild-card operations are applied to caches

- Use different caches for different purposes
  e.g. separate `permission_cache` in OpenACS 5.10*

- Cache partitioning:
  use different caches based on key values (OpenACS 5.10 supports different partitioning strategies as config options)

xotcl_object_type_cache-1	30000	18125	60.42%	1738	10	0	18248
xotcl_object_type_cache-0	30000	11529	38.43%	980	11	0	3849

Cache Partitioning (1/2)

- Similar to "table partitioning" in PostgreSQL or "sharding" in NoSQL databases
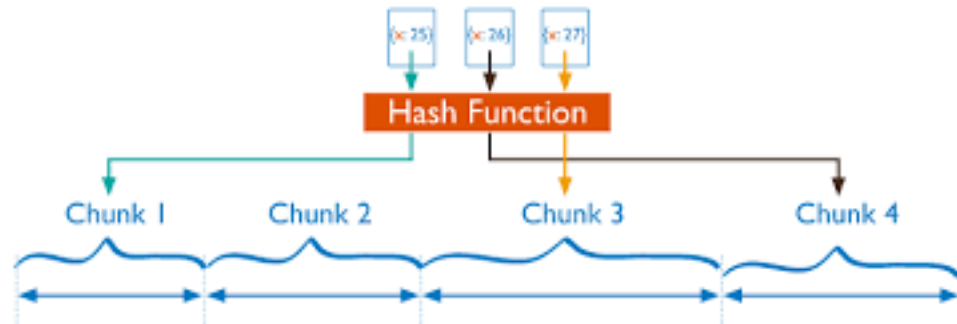
- Supported by OpenACS:

  - Evenly distribute cache entries keys between a configurable number of caches

  - Requirements:
    - Provide for every cache access a "cache key" for shard calculation
    - Currently cache key must be numeric (typically `object_id`)

Cache Partitioning (2/2)

- Example

```
::acs::KeyPartitionedCache create ::xo::xotcl_object_type_cache \
    -package_key xotcl-core \
    -parameter XOTclObjectTypeCache \
    -default_size 60000 \
    -partitions 2


# . . .
# Usage: CACHENAME eval . . .
#
set item_id [xo::xotcl_object_type_cache eval \
    -partition_key $parent_id \
    $parent_id-$name { . . . }


# Flush operation
xo::xotcl_object_type_cache flush \
    -partition_key $parent_id \
    $parent_id-$name
```

OpenACS 5.11 Preview

- ## New packages
  - Bootstrap 5 theme
  - Icon sets:
    - bootstrap-icons
    - fa-icons
  - Captcha
  - Caldav

- ## Added Functionality
  - Support of Oracle 19c (for acs-core packages)
  - Stronger password hashes
    "scram-sha-256" for password hashing in addition to classic "salted-sha
    (maybe also argon2*)
  - Cookie namespaces
    (for avoiding conflicts when multiple server instances
    run on the same host)

  - Usage of adp-tags

    ```
    <adp:icon name="NAME" title="..." style="..." class="...">
    ```

Server-side Tags to ease Theming
(NaviServer feature)

Same markup for different renderings based on themes.

```
<master>

<p>Version 5.10 <adp:icon name="download">
</p>
```

```
<adp:icon name="NAME" title="..." style="..." class="...">
```

yourdomain Network
GN's Main Site

Welcome, Gustaf Neumann | 1 Member Online | Your Account | Logout

Members | Administration

Version 5.10 ⬇

Plain-theme no icon-set

```
<p>Version 5.10 <img src='/shared/images/download16.png' height='16' width='16' style='border:0; '></p>
```

GN's Main Site Home

Members   Administration ▾

Search   Go!

GN's Main Site

Version 5.10 ⬇

Bootstrap3 glyphicons

```
<p>Version 5.10 <span class='glyphicon glyphicon-download-alt' aria-hidden='true' ></span>
</p>
```

GN's Main Site Home

Members Administration ▾

Search   Go!

GN's Main Site

Version 5.10 ⬇

Bootstrap5 bootstrap icons

```
<p>Version 5.10 <i class='bi bi-download' aria-hidden='true' ></i>
</p>
```

Summary

- OpenACS 5.10.0

  - OpenACS releases with most changes

  - New functionality

  - Security and scalability improvements

  - Makes use of new NaviServer functionality, when available (based on "Can I use" pattern)

  - High backward compatibility

- Large Scale Usage in real world systems
- Covid19-proof
- Many new features ante portas 5.10.1

- Questions?

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