

Evolveum

**Project midScale
Final Coaching Session**

October 2021

Agenda



- Introduction and Objectives
- Project Progress
- Outcomes and achievements
- Future

MidScale Introduction

Automated identity management is a necessary condition for implementing **identity governance and data protection policies in most large organizations**. MidPoint is a leading open source identity management and governance platform. However, midPoint was originally designed for medium-size organizations. Limited scalability capabilities of midPoint posed an obstacle for large-scale midPoint deployments. MidScale project aimed at overcoming this obstacle. Re-implementing midPoint data store layers, significantly improving clustering capabilities, visibility and manageability, focusing on stability and quality assurance – all of that significantly improved scalability possibilities of midPoint. An open source identity governance platform can now be **deployed at scales well beyond millions of managed identities**.

Project Objectives

- Increase midPoint scalability by an order of magnitude

Routinely manage: ~1 million identities

Possible deployments: ~10 million identities

- Identify scalability and performance obstacles

Performance testing environment

- Overcome scaling obstacles

Data store: data model, indexing, partitioning, etc.

Distributed task management: Clustering / multi-threading

Visibility & manageability: UX, GUI performance, diagnostics

Project Progress Overview

Milestone	Goal	Planned date	Status
START	Project start	15 Oct 2020	DONE
M1	Performance environment	26 Nov 2020	DONE (report)
M2	Performance evaluation and repository analysis/design	15 Jan 2021	DONE (report)
M3	Multithreading, Schrodinger and Query language	26 Feb 2021	DONE (report)
M4 (midPoint 4.3)	Performance Repo prototype, UI basic tests, Multinode Tasks	12 Apr 2021	DONE (report)
M5	PostgreSQL, Performance environment (2), UX Analysis & Design	31 May 2021	DONE (report)
M6	Repository optimization, performance evaluation	9 Jul 2021	DONE (report)
M7	Migration Procedure, GUI Improvements, Auto-scaling	31 Aug 2021	DONE (report)
M8 (midPoint 4.4)	Project finish	14 Oct 2021	Near finish (preliminary report)

Overall Progress of the Project

- Near finish
- On track, progress according to plan
- Small deviations from original plan
 - Some tasks were done ahead of time
 - Scope of some tasks was adjusted to account for work done ahead of time
- Extra unfunded resources: Kamil Jireš, Radovan Semančík, Jan Mederly
 - Internal funding from Evolveum, not funded by NGI

Major Achievements

- Native PostgreSQL repository implementation (“sqale”)
- Axiom query language
- Distributed task management: clustering and autoscaling
- Multi-threading, multi-node tasks, auto-scaling
- Diagnostics, visibility and robustness improvements
- Improved manageability: improved GUI and UX
- Quality assurance: Performance testing environment and Schrodinger
- MidPoint 4.3 released, MidPoint 4.4 release planned very soon

Other Achievements (selection)

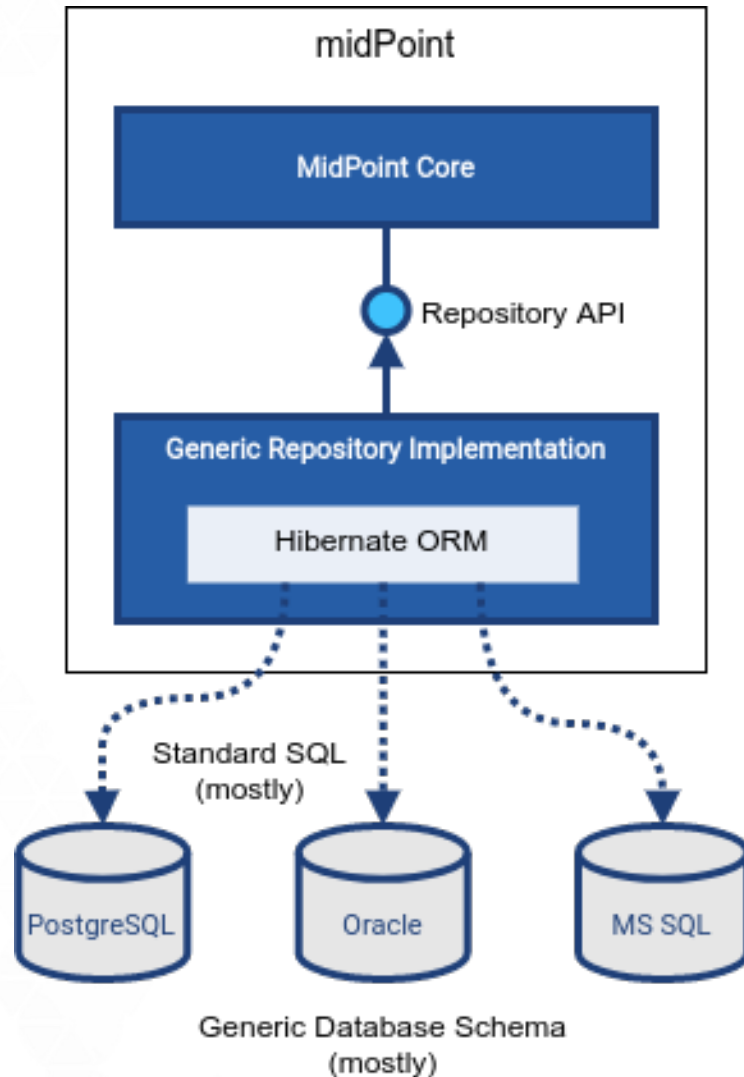
- Performance evaluation, identification of issues
- Database storage format: XML → JSON
- Partitioning of audit database
- Code optimizations (Prism, Projector, Clockwork)
- Resolving thread safety issues
- Optimized GUI code (less queries)
- Schrodinger testing framework & tests
- Testing environment: Kubernetes, Gitops
- Survey, blog posts, community workshops

Work done on top of original plan

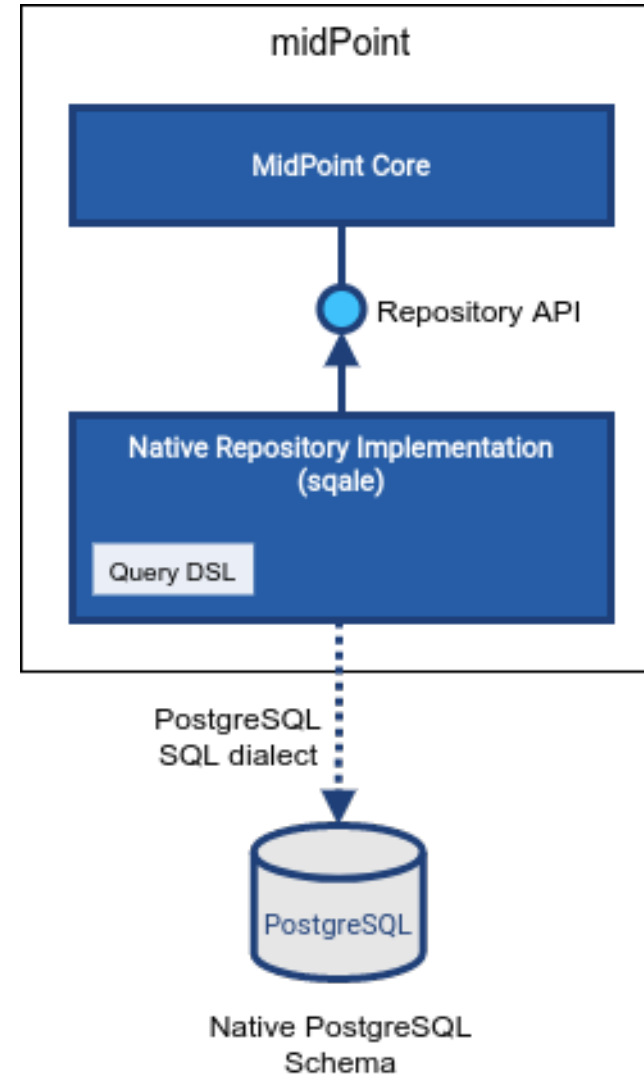
- Deeper GUI improvements
 - Further user experience and usability
 - Flexibility
- Prism data representation library separated
 - Continuation of Axiom-related work from midPrivacy initiative
- Reports and dashboards
- Cluster-wide thresholds
- Connector auto-loading

Native PostgreSQL Repository Implementation

Before
midPoint 4.2



After
midPoint 4.4



Axiom Query Language

- Human-friendly query language
- Goal: administration of system with millions of identities
- Based on concepts of Axiom data modeling

Axiom is outcome of midPrivacy: Data Provenance

- Community workshop/webinar (May 2021)

<https://www.youtube.com/watch?v=UACuiXQ8w-Y>

```
name = 'smith' or familyName = 'Smith'
```

```
<filter>  
  <or>  
    <equal>  
      <path>name</path>  
      <value>smith</value>  
    </equal>  
  </or>  
</filter>
```

Schrodinger Testing Framework

- Automated testing of MidPoint user interface
- Simulating user working in web browser
- Fluent, easy-to-write test code
- Maintainable, even if user interface design changes
- Separate project – motivating re-use
- Goals

Primary: user interface stability

Secondary: evaluating user interface scalability

```
usersPage
    .table()
    .search()
    .byName()
    .inputValue("mike")
    .updateSearch()
    .and()
... ..
    .clickSave()
    .feedback()
    .isSuccess();
```

Distributed Task Management

- Reworked substantial part of old task management code
- Concept of “activities” – tasks are much more flexible
- Improved code that distributes the tasks (“clustering”)
- Autoscaling – adapting to cluster re-sizing

Visibility and Diagnostics

Import HR entitlement-org
 100000 (closed)
 Last object processed: PAT.TTO.10.B.BA.2.IVA.0
 10/6/21, 9:30:20 AM - 10/6/21, 9:42:41 AM (00:12:21.331)

Operations

Task operations

- Basic
- Activity
- Schedule
- Operation statistics
- Subtasks
- Errors
- Performance
- Operation context
- Result

Objects processed: 100,000 (might contain duplicates in case task was suspended/resumed)

Wall clock average: 7.4 ms, throughput: 8,093.6 per minute

Success (99,571)
 Failure (429)
 Skip (0)

LAST SUCCESS ON WEDNESDAY, 6. OCT 2021 09:42:41
PAT.TTO.10.B.BA.2.IVA.0
 128 milliseconds

LAST FAILURE ON WEDNESDAY, 6. OCT 2021 09:38:13
MAT.TKM.06.B.TT.4
 72 milliseconds
 Object with conflicting normalized name '21112684' already exists

Synchronization situation transitions

Original state	Synchronization start	Synchronization end	Exclusion reason	Succeeded	Failed	Skipped	Total
Linked	Linked	Linked		99565	0	0	99565
Unmatched	Unmatched	Unmatched		0	429	0	429
Unmatched	Unmatched	Linked		6	0	0	6

presence	Own/presence	Repo #	Repo	Repo:R #	Repo:R	Repo:W #	Repo:W	RCache #	RCache	Map #	Map	Not #	Not	NTrans #	NTrans	Audit #	Audit	ICF #	ICF	ICFR #	ICFR	ICIR
2,484.19	1.18	87.40	353.12	87.40	353.12	0.00	0.00	798.00	404.10	1,527.13	911.74	4.00	3.07	0.00	0.00	2.00	39.47	21.80	402.44	21.80	402.44	
2,483.01	79.58	87.40	353.12	87.40	353.12	0.00	0.00	798.00	404.10	1,527.13	911.74	4.00	3.07	0.00	0.00	2.00	39.47	21.80	402.44	21.80	402.44	
2,403.43	0.10	87.40	353.12	87.40	353.12	0.00	0.00	798.00	404.10	1,527.13	911.74	4.00	3.07	0.00	0.00	2.00	39.47	21.80	402.44	21.80	402.44	
2,403.33	0.15	87.40	353.12	87.40	353.12	0.00	0.00	798.00	404.10	1,527.13	911.74	4.00	3.07	0.00	0.00	2.00	39.47	21.80	402.44	21.80	402.44	
2,403.18	4.05	87.40	353.12	87.40	353.12	0.00	0.00	798.00	404.10	1,527.13	911.74	4.00	3.07	0.00	0.00	2.00	39.47	21.80	402.44	21.80	402.44	
0.13	0.02	0.07	0.11	0.07	0.11	0.00	0.00	0.97	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
1,594.67	4.15	84.00	276.54	84.00	276.54	0.00	0.00	519.10	310.02	904.73	526.45	1.00	0.00	0.00	0.00	1.00	9.10	21.80	402.44	21.80	402.44	
11.09	0.67	1.00	10.38	1.00	10.38	0.00	0.00	1.00	10.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.21	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.07	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
9.10	9.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	9.10	0.00	0.00	0.00	0.00	
1,569.96	0.15	83.00	266.16	83.00	266.16	0.00	0.00	517.33	299.59	904.73	526.45	0.00	0.00	0.00	0.00	0.00	0.00	21.80	402.44	21.80	402.44	
542.55	0.66	30.63	69.16	30.63	69.16	0.00	0.00	178.10	77.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21.80	402.44	21.80	402.44	
857.99	0.21	31.50	149.07	31.50	149.07	0.00	0.00	296.50	169.89	643.47	475.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
89.17	19.83	8.23	17.86	8.23	17.86	0.00	0.00	34.37	20.29	108.93	55.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.22	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
321.46	10.52	14.07	100.74	14.07	100.74	0.00	0.00	42.00	106.40	19.00	210.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
444.73	0.01	9.20	30.47	9.20	30.47	0.00	0.00	219.13	43.15	515.53	210.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
444.72	4.95	9.20	30.47	9.20	30.47	0.00	0.00	219.13	43.15	515.53	210.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
286.08	1.49	3.03	14.83	3.03	14.83	0.00	0.00	180.47	24.85	450.67	88.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
112.96	18.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	43.60	92.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
92.38	1.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	43.60	92.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2.28	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
40.71	0.24	6.17	15.64	6.17	15.64	0.00	0.00	38.67	18.30	21.27	29.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
1.63	1.58	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.41	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
3.78	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.80	0.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
6.79	0.01	2.00	5.12	2.00	5.12	0.00	0.00	4.00	5.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
7.11	0.01	2.53	5.29	2.53	5.29	0.00	0.00	5.07	5.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
22.84	0.01	1.87	4.46	1.87	4.46	0.00	0.00	3.73	4.93	39.20	7.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
23.96	0.01	1.87	4.84	1.87	4.84	0.00	0.00	3.73	5.34	38.27	6.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
26.08	0.01	2.00	5.11	2.00	5.11	0.00	0.00	4.00	5.56	52.00	10.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
20.37	0.01	2.00	4.54	2.00	4.54	0.00	0.00	4.00	4.98	34.00	8.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5.94	0.01	1.93	4.31	1.93	4.31	0.00	0.00	3.87	4.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5.65	0.01	1.87	3.70	1.87	3.70	0.00	0.00	3.73	4.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
18.94	0.01	0.93	2.11	0.93	2.11	0.00	0.00	1.87	2.34	36.40	7.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
18.04	0.01	1.87	3.98	1.87	3.98	0.00	0.00	3.73	4.38	33.60	5.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14.25	0.01	2.00	4.48	2.00	4.48	0.00	0.00	4.00	4.89	24.00	4.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
1.67	1.62	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.77	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2.37	2.35	0.10	0.10	2.35	2.37	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4.11	2.17	0.00	0.00	2.17	4.11	0.00	0.00	21.80	0.													

User Interface and User Experience

The screenshot displays the 'Edit user' page in the midPoint system. The header includes the 'midPoint' logo, a navigation menu, and the user's current role as 'administrator'. The main content area is divided into several sections:

- User Profile:** Shows the user's name 'John Smith (X001212)', title 'Human Resources Specialist', and department 'Human Resources'. It also includes status toggles for 'Enabled', 'Manager', and 'Employee'.
- Operations:** A row of action buttons including 'Back', 'Save', 'Preview changes', 'Change archetype', 'Delete object', and 'Edit raw'.
- Options & Tracing:** A dropdown menu for 'Options'.
- Properties Table:** A table listing various user attributes and their values.

Property	Value	Actions
Name	X001212	🗑️ ⚙️
Organizational Path	0300	⚙️
Is Manager	True	⚙️
Employee Status	Active Employee	⚙️
Cost Center	0300	⚙️
Email	john.smith@example.com	⚙️
Full name	John Smith	🗑️ ⚙️
Given name	John	🗑️ ⚙️
Family name	Smith	🗑️ ⚙️
Title	Human Resources Specialist	🗑️ ⚙️
Employee Number	001212	⚙️
Organizational Unit	Human Resources	🗑️ ⚙️

Below the table, there are '+', '-' icons and a 'Show empty fields' link.

The left sidebar contains navigation options under 'SELF SERVICE' and 'ADMINISTRATION'. The 'Users' section is expanded, showing 'All users', 'Employees', 'Externals', 'Active Employees', 'Inactive Employees', 'Former Employees', 'New user', and 'Edit user'.

Survey

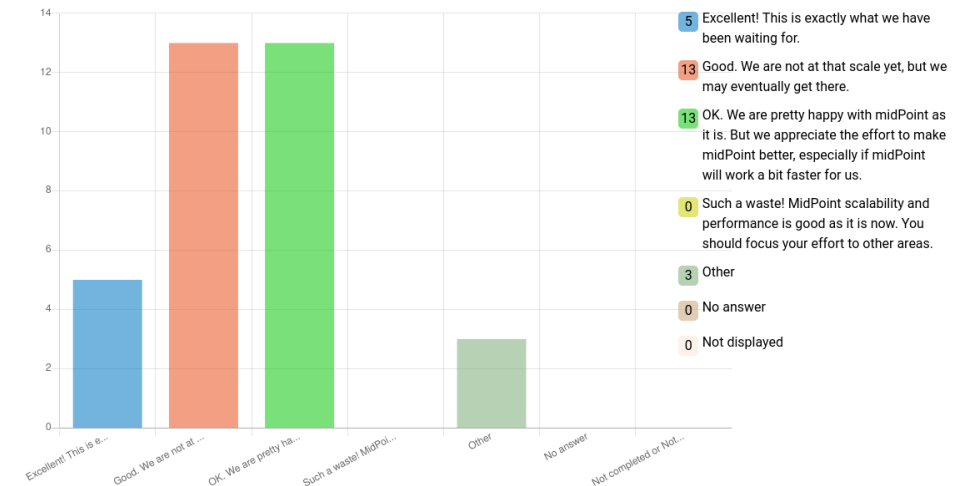
- MidPoint community survey, February-March 2021

<https://docs.evolveum.com/midpoint/projects/midscale/survey/>

- Relatively low number of responses (34)
- Validating midScale purpose and goals
- Positive results

Results of midScale will be a benefit to midPoint community and Evolveum customers

The goal of midScale project is to increase the total number of identities that midPoint instance can handle. We hope to be able to routinely support deployments with tens of millions of identities. How do you feel about this plan?



MidPoint 4.3 “Faraday”

- Released during M4 of midScale project (9th April 2021)
<https://docs.evolveum.com/midpoint/release/4.3/>
- All midScale functionality integrated, available to the community

Some functionality marked as *experimental*, gathering community feedback

PostgreSQL repository prototype code is present, but not enabled by default

MidPoint 4.4 “Tesla”

- Coming soon

Final testing and bugfixing phase

To be released in October 2021 (most likely)

<https://docs.evolveum.com/midpoint/release/4.4/>

- All midScale functionality integrated, available for use

Most functionality is production-ready

Native PostgreSQL repository implementation is strongly recommended

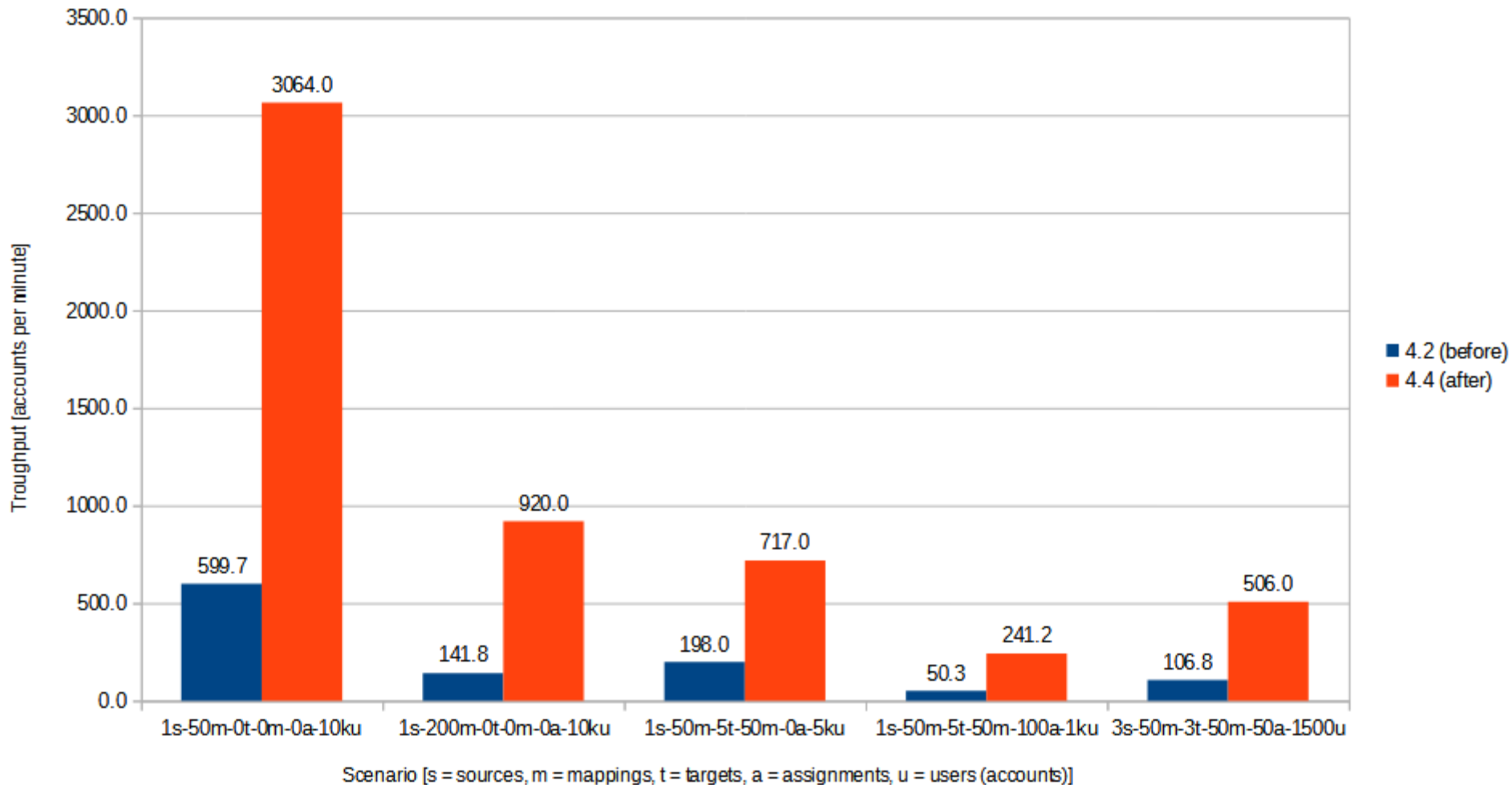
Generic repository implementation still present (compatibility)

Testing Environment

- Dynamic environment
- Kubernetes/Docker
- Jenkins
- Grafana
- Gitops – Gitlab, Flux

Performance Gains (still preliminary results)

Comparison of account import performance

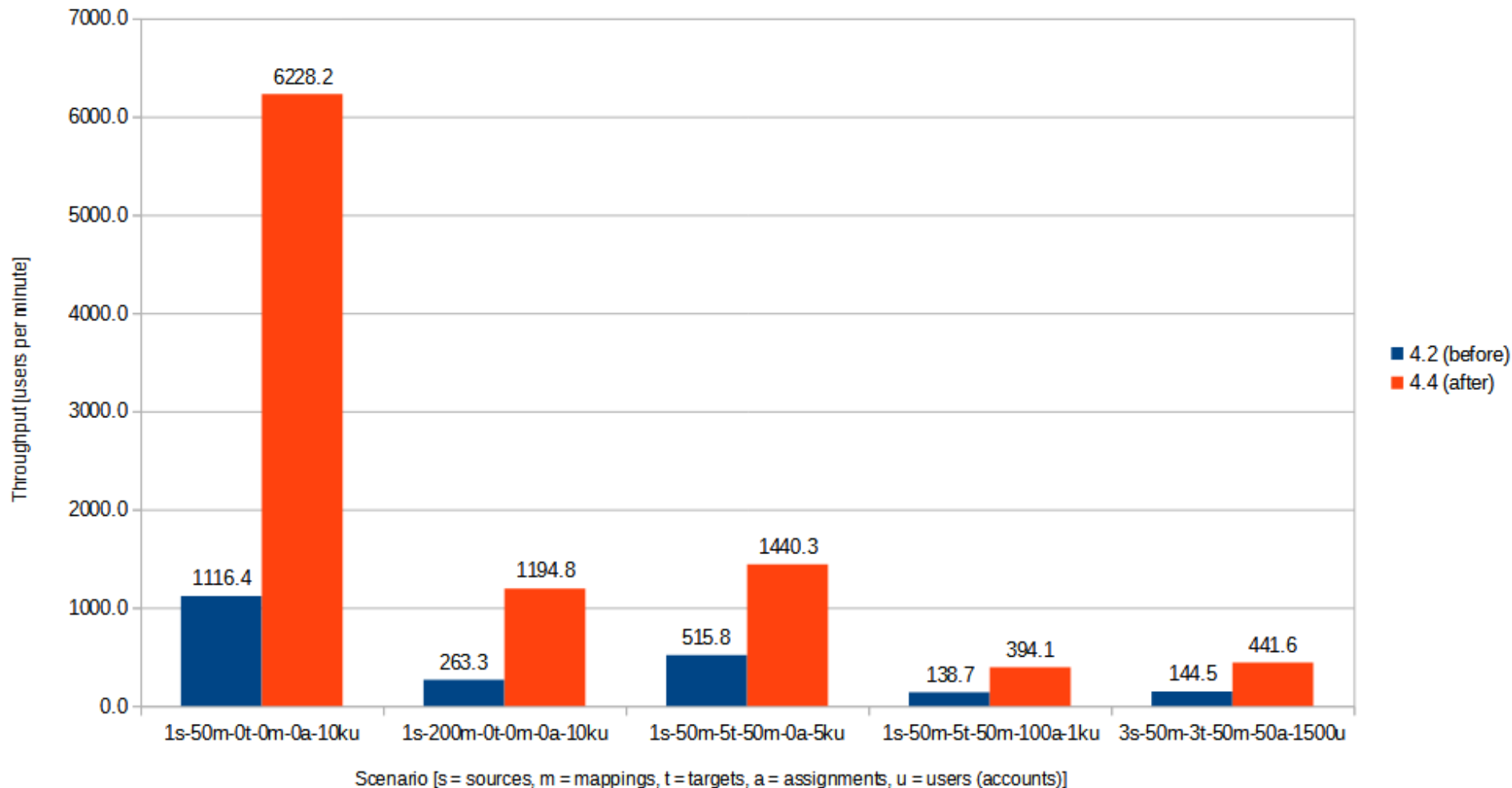


Increase of throughput:

262% - 549%

Performance Gains (still preliminary results)

Comparison of user recomputation performance

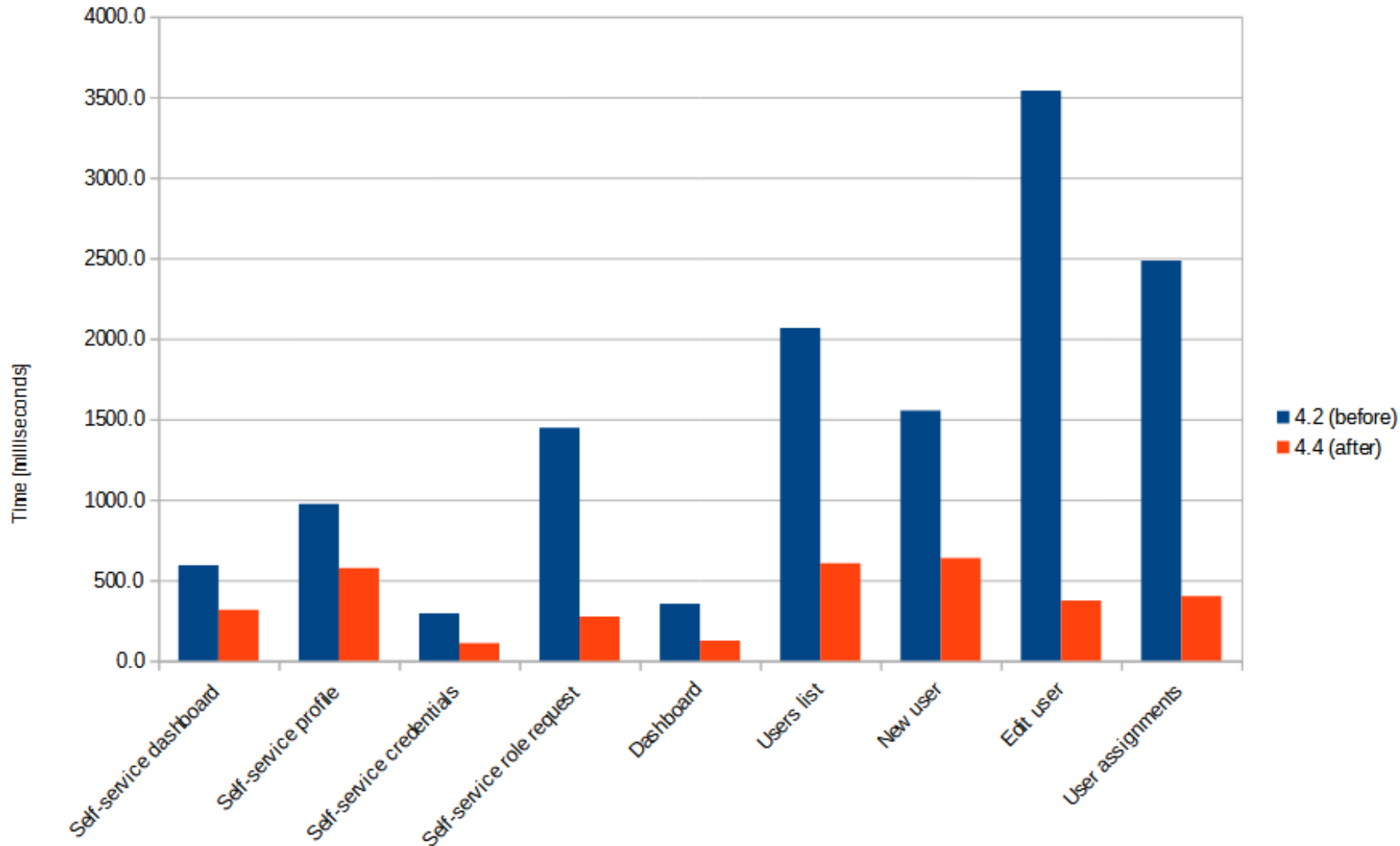


Increase of throughput:

205% - 458%

Performance Gains UI (still preliminary results)

Performance of page rendering in GUI



Improvement:

80% - 840%

Scalability Improvement (still preliminary results)



Deliverables

- D1 - Architecture and design documentation
- D2 - Axiom query language documentation
- D3 - MidPoint 4.3 “Faraday” release
- D4 - Results of midScale survey
- D5 - Technology workshops, slides and recordings
- D6 - Overview of performance testing environment
- D7 - MidPoint 4.4 "Tesla" release (candidate?)

Available at project home page: <https://docs.evolveum.com/midpoint/projects/midscale/>

Key Results

- **Improved scalability of midPoint** at least by one order of magnitude, enabling deployment beyond millions of managed identities.
- Improved visibility, diagnostics and reliability of midPoint, making **long-term maintenance of large-scale deployments** feasible.
- Improved performance and user experience of midPoint user interface, making **management of massive user bases** efficient.

Project and Outcomes Propagation

- Evolveum blog posts
- Evolveum mailing lists
- Public on-line workshops/webinars
<https://docs.evolveum.com/talks/>
- Evolveum YouTube channel
https://www.youtube.com/channel/UCSDs8qBlv7MgRKRLu1rU_FQ
- Internet2/InCommon communication channels (selective)
- NGI_TRUST 9th Results Webinar

Budget (preliminary)

Organization	Total Budget (EUR)	Used Budget (EUR)	Used Budget (%)
Evolveum (till Sept)	249 200,-	254 304,25	102
Evolveum (exp Mid-Oct)	249 200,-	264 126,10*	105*

* Projection, to be updated on 14th of October 2021

Future

- Marketing: webinars, conferences, blogs, videos, etc.
- Deployment for existing customers – increase deployment scale
- Attract more lucrative customers
- Explore cloud service possibilities / partnerships
- Further improvements: midPoint 4.5 and beyond
- Continue executing tests, collect and evaluate data

Project Resources

- Project home page

<https://docs.evolveum.com/midpoint/projects/midscale/>

- MidPoint source code

<https://github.com/Evolveum/midpoint>

- Evolveum Blog

<https://evolveum.com/blog/>

- MidPoint Releases

<https://docs.evolveum.com/midpoint/release/>

Discussion

Questions & Answers

Thank you for your time

See other talks at <https://docs.evolveum.com/talks>

Also **follow us** on our social media for further information!



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