

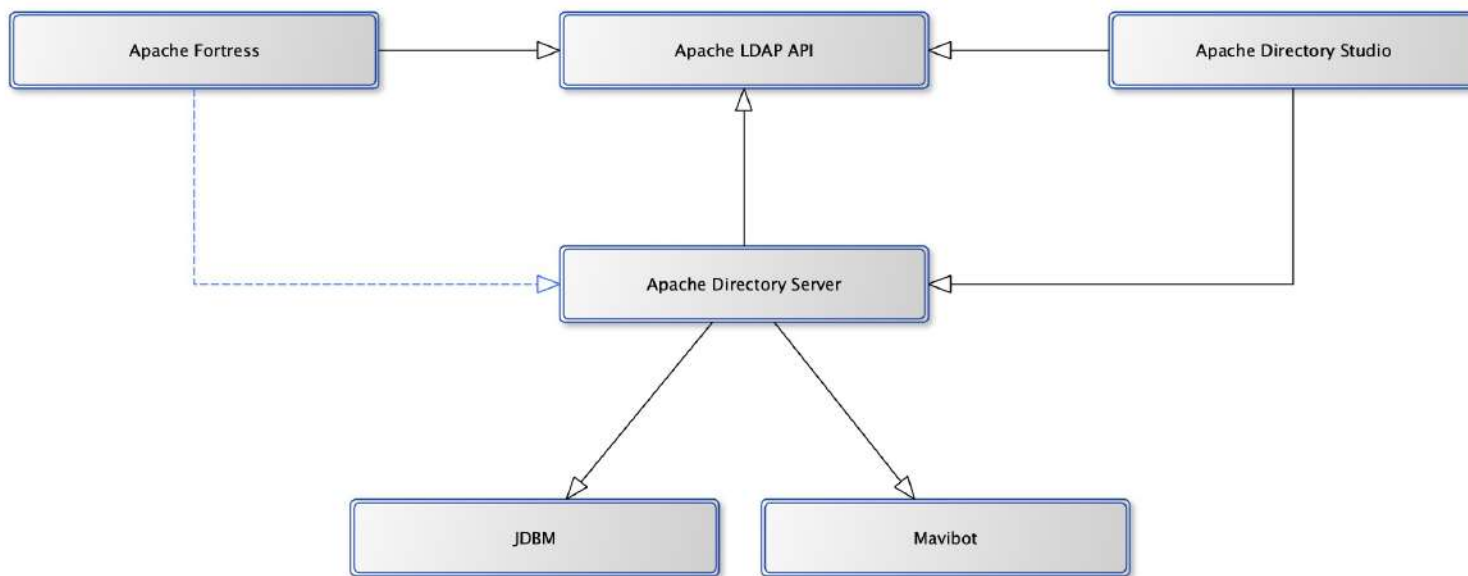


Apache Directory

The State of the Union

Apache Directory Project

Apache Directory





Apache LDAP API

LDAP API

- Replacing JNDI
- Bringing a Schema aware API
- Easy to use
 - One line operations
 - Convenient searches
 - Easy to use LDIF constructions
- Extensible
 - New controls
 - New extended operations
 - New schema elements

```
try { EntryCursor cursor = connection.search(
    "ou=groups,o=isp",
    "(&(objectClass=top)(cn=testLDAPGroup))", SearchScope.ONELEVEL, "*" );
    {
        Entry result = cursor.get();
        assertTrue( result.contains( "cn", "testLDAPGroup" ) );
    }
} catch ( Exception e ) {
    e.printStackTrace();
}
```

```
connection.add(
    new DefaultEntry(
        "cn=testadd,ou=system",
        "ObjectClass : top",
        "ObjectClass : person",
        "cn: testadd_sn",
        "sn: testadd_sn"
    ) );
```

LDAP API history

- First thought about writing LDAP API in 2006
- Effort started in 2007
- Collaboration with OpenDS team
- Very first release in March 2010
- First 1.0.0 release In June 2017 (after 33 milestones and 3 RCs!)
- 2.0.0 was out in November 2019
- 2.1.0 was out in June 2021
- 2.1.9 was out in September 2026
- 57 releases globally in 16 years, roughly 4/year

LDAP API metrics

Quite a bit of effort...

But may be it's Java ;-)

```
Total Physical Source Lines of Code (SLOC) = 207,235
Development Effort Estimate, Person-Years (Person-Months) = 54.11 (649.38)
  (Basic COCOMO model, Person-Months = 2.4 * (KSLOC**1.05))
Schedule Estimate, Years (Months) = 2.44 (29.29)
  (Basic COCOMO model, Months = 2.5 * (person-months**0.38))
Estimated Average Number of Developers (Effort/Schedule) = 22.17
Total Estimated Cost to Develop = $ 7,310,177
  (average salary = $56,286/year, overhead = 2.40).
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```

github.com/AlDanial/cloc v 2.10 T=4.29 s (711.8 files/s, 119042.1 lines/s)

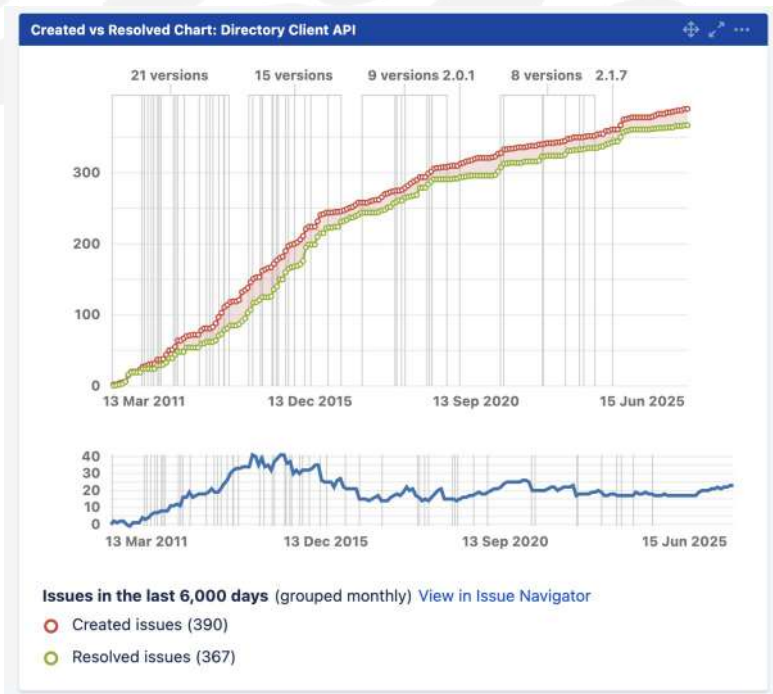
Language	files	blank	comment	code
Java	1538	63759	122511	207168
XML	996	1172	8209	59838
JSON	33	0	0	36041
Maven	35	430	621	3449
Properties	19	178	429	2814
Text	402	89	0	1890
INI	13	0	0	476
Markdown	4	69	50	302
HTML	3	25	48	141
YAML	5	27	106	129
Perl	1	12	21	109
Groovy	1	11	34	76
XSLT	1	8	18	22
SUM:	3051	65780	132047	312455



LDAP API 2025/26

- Last year:
 - Fixing a lot of security issues found by Glasswind (around 60)...
 - CVE-2026-35563 (Verify the server certificate)
 - Removing AntLR parsers so that we can use Java 25
 - Fixing some bad handling of ASN.1 PDU
 - And many other fixes and improvements (150+ commits)

LDAP API : issues



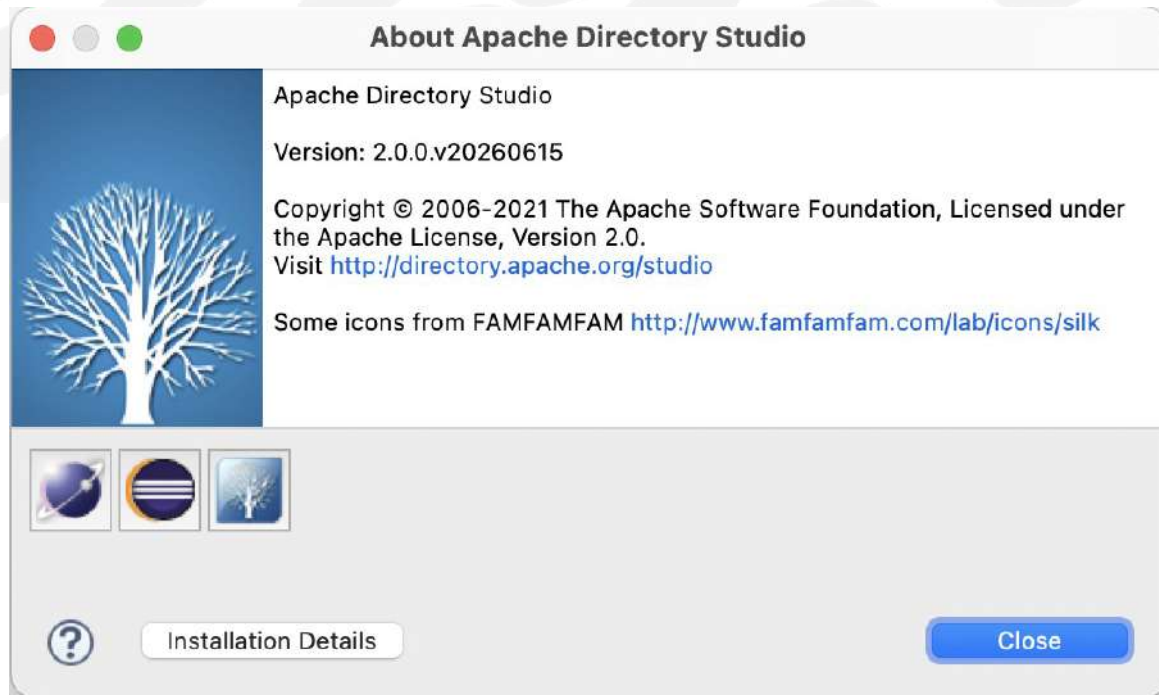
LDAP API : Next ?

- New version of MINA
- Blocking IO
- More controls/extended operation
- More schemas
 - Supann
 - EduPerson
 - AD ?



Apache Directory Studio

Directory Studio



Directory Studio

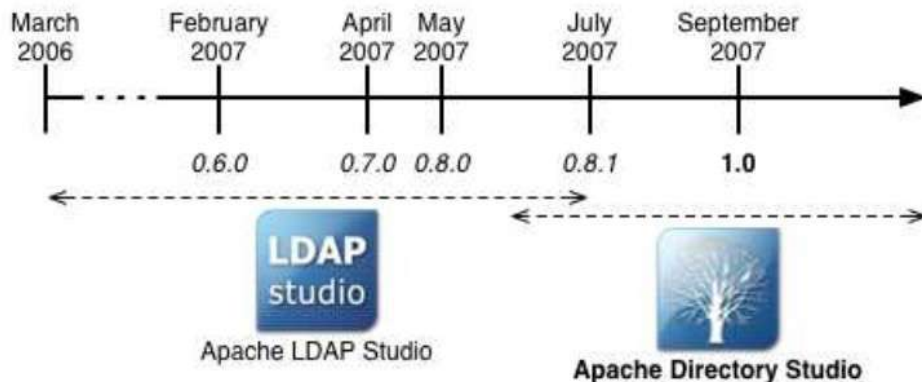
- Existing tools were lagging or not free
 - Ldap Explorer Tool, last version in 2006
 - Jxplorer, which lagged since 2003 in 3.0 version
 - LDAP Browser (now Softerra) which is not free
- None supported Schema handling
- We also needed an GUI for Apache Directory Server

Studio features

- Generic LDAP browser
- LDIF editor
- Schema Editor (on-line and off-line)
- Embedded Apache DS
- Apache DS configuration editor
- ACI Editor
- A not yet released OpenLDAP configuration editor (off-line and on-line)
- A not yet released WP/YP GUI

Studio history

- Started in 2006 as a students project by Pierre-Arnaud Marcelot and Pierre Chatel
- Stefan Seelmann had started Elbe (Eclipse LDAP Browser and Editor) back in 2004
- Both joined their effort at Apache Directory at the end of 2006
- The first official release was Apache LDAP Studio 0.6 in February 2007
- It became Apache Directory Studio in September 2007 with the first 1.0.0 release



Studio state

- The last release is 2.0.0-M17 (July 2021)
- 33 releases in 19 years (1,7/year)
- Support Windows, Mac OSX and Linux (RPM and DEB)
- Requires Java 11 as of M17
- The next release is going to require Java 25

Studio status

- It's a bit lagging...
- The source base is big: 223 287 slocs
- Still we intend to move forward but... See later ;-)

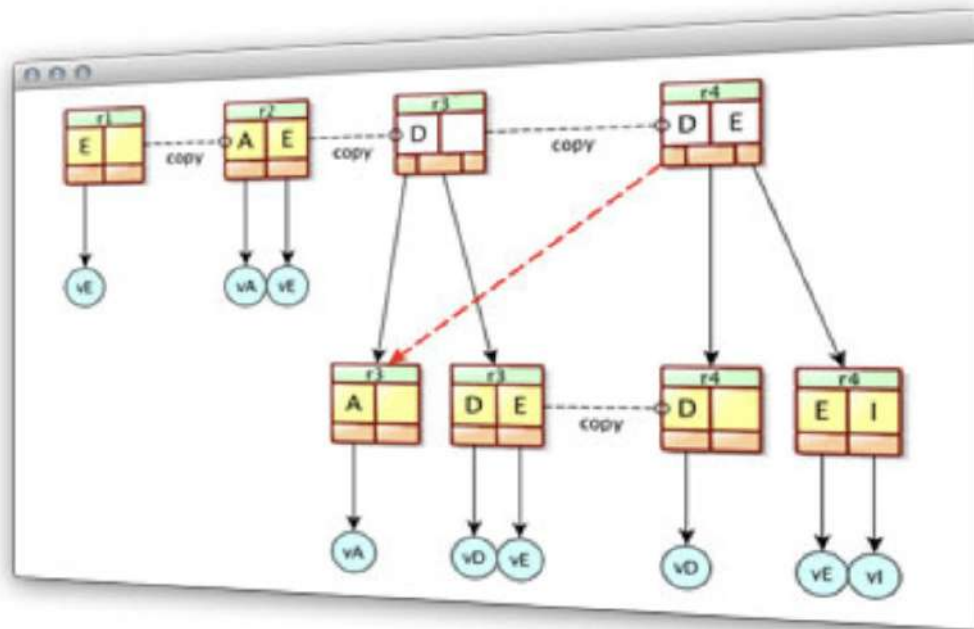
Total Physical Source Lines of Code (SLOC) = 223,287
 Development Effort Estimate, Person-Years (Person-Months) = 58.52 (702.29)
 (Basic COCOMO model, Person-Months = $2.4 * (KSLOC * 1.05)$)
 Schedule Estimate, Years (Months) = 2.51 (30.17)
 (Basic COCOMO model, Months = $2.5 * (person-months * 0.38)$)
 Estimated Average Number of Developers (Effort/Schedule) = 23.28
 Total Estimated Cost to Develop = \$ 7,905,844
 (average salary = \$56,286/year, overhead = 2.40).
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Apache Mavibot

Apache Mavibot



Apache Mavibot

- A MVCC B-Tree database written in Java
- Should replace JDBM
- Much faster, and more important reliable!
- Started in 2012 in Apache LABS
- Originated in a discussion in 2009, when Apache CouchDB was presented in Oakland
- Still to be completed (cleanup is missing)



Apache Directory Server

Apache DS



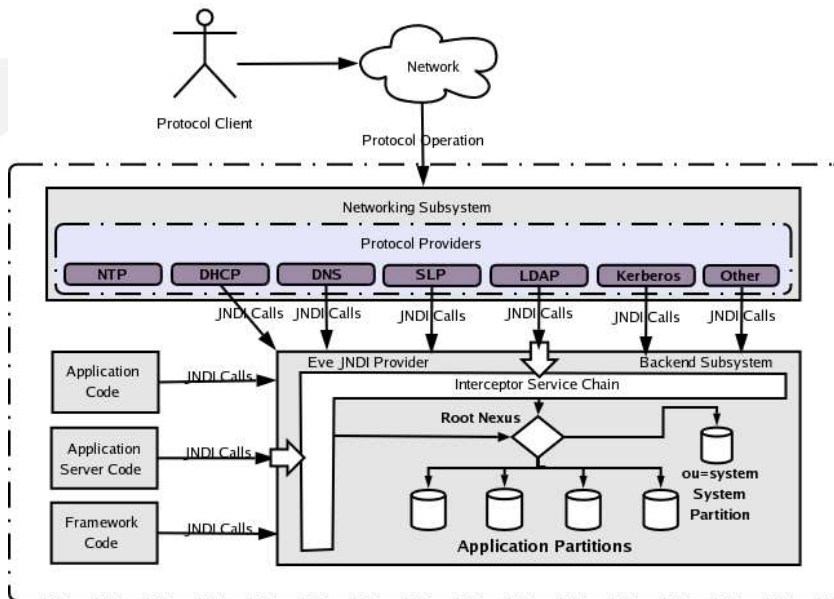
ApacheDS History

- Started in 2002 (LDAPd project) by Alex Karasulu
- Incubated at The ASF in October 2003
- Became a TLP in October 2004
- The very first release was ApacheDS 0.8 in January 2005!
- 1.0 was announced during the 2006 Apache Conference in Austin (October 2006)
- 46 versions since then, around 2 per year.

ADS features

- LDAP V3 compliant
- LDIF based configuration since 1.5
- Embeddable
- Password Policy
- X500 authorization
- Transaction support
- Test annotations in Java

Architecture



As of 2026

- Very useful as a test platform
 - Either in Ldap Directory Studio
 - Or as a standalone server
 - Last, not least, in Java unit tests
- Still having some data loss issue in some corner cases
- Replication is clearly a work in progress
- Authorization is overly complex
- The administrative model is not fully implemented

Test platform

- Starting an ApacheDS Ldap Server in studio is a breeze
- It can also be used as a standalone server that runs on any OS
- The best use is for unit tests
 - A full java annotation system to start a server, and stop it at the end
 - Whether the test is completed or failed
 - Without messing with each test data
 - A unique rollback mechanisms that come back where a test started

See <https://directory.apache.org/conference-materials.data/testing-LDAP.pdf>

!production ready

- When concurrent write operation occur, we may have a database corruption
- Numerous attempts have been done to fix it (added a transaction mode, fixing the underlying database, etc...)
- Mavibot does not have this problem...
- ... but can't (yet) cleanup removed entries (à la CVS)
- Replication work (sort of), but the implementation is brittle

Authorization

- ApacheDS chose to use the X.500 ACI model
- It's overly complex, and verbose
- There is no tool to help the user
- Performances are poor due to its complexity
- We must do better!

Admin model

- ApacheDS chose to implement the X.500 administrative model
- It's a very powerful one
- But complex
- Used to manage ACI, Collective Attributes, Triggers, Schema and Replication
- It has the potential to 'containerize' the data

See <https://directory.apache.org/conference-materials.data/ac-us-06-FR20-ErsinEr->

ApacheDS_Access_Control_Administration_The_X.500_Way.pdf

Performances

- A LOT of improvements since the very first version :-)
- Parsing DN was the most costly operation, it's now down to 15% of the CPU usage
- Mavibot + cross-B-tree transactions will bring better performances
- Still far away from openLDAP!

What's next ?

- A production ready server ;-)
- Mavibot with cleanup
- A better replication, RFC 4533 based, and delta-syncrepl support
- Simpler authorization (ACI based, but with a decent GUI, and some tooling)
- Java new features like virtual thread (may be)
- AI all over, because it's hype (just kidding...)



Apache Kerby

Apache Kerby



Kerby History

- Initially Apache Directory Server supported Kerberos
- Kerby is a standalone Kerberos Server
- First version in 2015
- 13 releases since then, the latest being 2.1.2, issued on June 2026
- Not based on ApacheDS but can use it.
- Can use Mavibot as a backend



Apache SCIMple

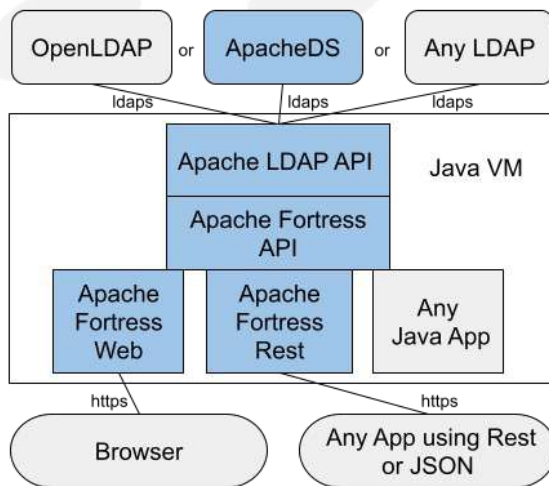
Apache Scimple

- A SCIM 2.0 specification implementation
- Started in 2013 at Penn State university
- First official release (1.0.0-M1) done in January 2024
- A new release is being prepared!



Apache Fortress

Apache Fortress



Apache Fortress

- Started in 2009 by the McKinney Family (Kevin, Kelly and Shawn) !!!
- Moved under the OpenLDAP banner in 2011
- Migrated to Apache Directory in 2014
- 17 versions since then, the latest (3.0.1) in July 2025
- Is RBAC dead?

Apache Fortress

- Started in 2009 by the McKinney Family (Kevin, Kelly and Shawn) !!!
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- Is RBAC dead?

Apache Directory & IA ?

LD(IA)P?

- Spoiler: we don't use it.
- Really we don't
- We don't want to anyway
- We don't think we need it.

BUT

- we benefit from Glasswind which reported many security issues we are now fixing, like anyone writing a piece and using a grammar & spell checker.
 - 60 issues found in Apache LDAP API
 - 56 issues found in Apache DS
 - 33 issues found in Apache Mavibot
 - 37 issues found in Apache Directory Studio



Apache Directory Future



Near term

- Fix the security issues
- Releases (LDAP API done on Sep. 28th, Studio to come, ApacheDS later)
- Add proper deletion in Mavibot
- Fix ApacheDS Database breakages and cut a 2.0 GA
- Release Apache Directory Studio with the latest LDAP API and ApacheDS

Middle/long term

- Improve the Administrative Model
 - Completion and hardening of ApacheDS replication
 - Improve authorization
 - Allow multiple schema
- Evaluate Virtual Threads In the server
- Release the OpenLDAP configuration/administration plugin in Directory Studio
- Improve Password Policy
- Better and completed documentation

Apache Directory Needs

What we need

- The committers base is narrow
- And aging ;-)
- This is a 20+ years old project
- Not backed by a commercial entity (not sure there is a market for that though)
- It's a complex and voluminous code base (Around 700K slocs)
- Heavy coupling: Studio → ApacheDS → Mavibot, Ldap API → Apache MINA
- Java is moving fast :-/
- IA is killing us (but Glasswind is helping, too!)
- The number of CVE has exploded...



**Thank you for
your attention !**

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