JSR 310 Date and Time API
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What is the scope of this JSR?

- Comprehensive model for date and time
- Support for commonly used global calendars
- Immutable types work well with functional programming
- Type-safe
  - avoid primitives where sensible
  - self documenting
  - IDE friendly
- Interoperate with existing classes
- Designed to extend the JDK
Why do this JSR?
- The current APIs are hard to use
- Reduce programming errors and lower maintenance costs
- Add a contemporary style API

What's the need?
- Buggy and difficult current APIs
- Performance

How does it fit in to the Java ecosystem?
- The new API will complement the JDK and be the preferred Date and Time API

Is the idea ready for standardization?
- Well past due
History

• List the significant dates in the history of the JSR.
  – Feb 12, 2007 – Approved for Development
  – Mar 28, 2010 – Early Draft Review
  – Sept 2011 – Oracle joined as Co-spec lead
  – Dec 4, 2013 – Public Review
  – Jan 14, 2014 – Proposed Final Draft
Technical scope and features

- **java.time** – ISO Core Calendar
  - LocalTime, LocalDate, LocalDateTime, ZonedDateTime, ...
  - Clock, Instant, Duration, Period, ZoneId, Month, DayOfWeek, ...

- **java.time.format** – Parsing and Formatting
  - DateTimeFormat, DateTimeFormatBuilder, standard formats, patterns, styles, ...

- **java.time.chrono** – Regional Calendars
  - Chronology, Era, ChronoLocalDate, ChronoLocalDateTime, ChronoZonedDateTime, ...
  - Japanese, ThaiBuddhist, Minguo, Hijrah calendars

- **java.time.temporal** – Framework
  - Units, Fields, Adjusters, Temporal, TemporalAccessor, TemporalAmount, TemporalQuery, ...

- **java.time.zone** – TimeZone
  - ZoneRules, transitions, etc.
ISO Calendar Types

- LocalDate: 2010-12-03
- LocalTime: 11:05:30
- LocalDateTime: 2010-12-03T11:05:30
- OffsetTime: 11:05:30+01:00
- OffsetDateTime: 2010-12-03T11:05:30+01:00
- ZonedDateTime: 2010-12-03T11:05:30+01:00 Europe/Paris
- Year: 2010
- YearMonth: 2010-12
- MonthDay: -12-03
- Instant: 2576458258.266 seconds after 1970-01-01
# API Design Comparison

<table>
<thead>
<tr>
<th>New java.time</th>
<th>vs.</th>
<th>java.util.Calendar and Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluent API</td>
<td></td>
<td>Not Fluent</td>
</tr>
<tr>
<td>Immutable instances</td>
<td></td>
<td>Mutable instances – clone needed</td>
</tr>
<tr>
<td>Thread safe</td>
<td></td>
<td>Not Thread safe</td>
</tr>
<tr>
<td>Strong types</td>
<td></td>
<td>Weakly typed calendars</td>
</tr>
<tr>
<td>Fit for purpose types</td>
<td></td>
<td>One size fits all API</td>
</tr>
</tbody>
</table>
The Expert Group – JCP Members

• **Corporate:**
  – Oracle: Roger Riggs, Sherman Shen, Masayoshi Okutsu, Douglas Surber, Dan Chiba, Naoto Sato
  – Google Inc.: Kevin Bourrillion,
  – IBM: Toby Corbin
  – RedHat: David Lloyd

• **Individuals**
  – Steve Colebourne, Michael Nascimento Santos
  – Adam Bien, Michael Buckley, Tom Crosman, Mikael Grev, Fabio Correia Kung, Clark D. Richey Jr.
Open Source Project Members

• JUGs, individuals, open-source groups, academia, etc.
  – London Java Group
    • Richard Warburton
    • James Gough
• Other
  – barend, Jesper Steen Møller, renjith4, fabfas, Benjamin Graf, Viktor Hedefalk, Mark Thorton
Open Source Project Tools

• **Java.net** – [https://java.net/projects/jsr-310](https://java.net/projects/jsr-310)
  – Email archive Jan 2010 .. Dec 2010 – (2390 messages)
  – Svn repo – (1339 revisions)

• **SourceForge** – [Threeten home page](http://sourceforge.net)
  – Email threeten-develop (email archive Dec 2010 to present)
    • Svn - 2010-12-24 to 2011-06-10 – (1497 revisions)
    • Git - 2011-06-24 to 2011-06-24

• **Github** – [Threeten](https://github.com/threeten)
  – Github (documents repo history)
    • Source - 2011-06-24 to 2012-12-04
    • [Github Issue Tracker](https://github.com/threeten)

• **OpenJDK Sponsored** – [Threeten Project](http://openjdk.java.net)
  – Email threeten-dev@openjdk.java.net – Nov 2012 .. Present (1457)
  – [Mercurial JDK forest](http://hg.openjdk.java.net/jdk8/tl/jdk)
Other deliverables

• Other than Spec, RI, and TCK delivered:
  – Guide to the Specification
  – The Threeten Project
    • Backport to JDK 1.7 – org.threeten.bp…
Publicity

- JavaOne 2013
  - Introducing the Java Time API in JDK 8 - CON6064
  - Converting to the New Date and Time API in JDK 8 - CON6091

- JAX.de Mainz 2013

- Devoxx UK 2013

- UTC Colloquium Charlottesville 2013


- Paris JUG 2011

- JavaZone Oslo 2010

- Javapolis 2007
Collaboration with other community groups

• London Java Community
  http://www.meetup.com/Londonjavacommunity

• LJC Adopt-a-JSR
  – James Gough and Richard Warburton lead
    • https://java.net/projects/ljc-london-jug/pages/JSR-310
  – Contributed reviews, designs, tests, TCK tests, and participated actively in design discussions

• July 10, 2012; LJC hosted
  – Java 8 Date & Time Hackday
  – 25 Developers attended
Implementations

• The SE 8 RI implementation is the only conformant implementation

• A backport version was created in a separate package for use with JDK 7 and without JDK 8 features
Schedule

• Dec 4, 2013 – Public Review
• Dec 10-23, 2013 – Public Review Ballot
• Jan 13, 2014 – Proposed Final Draft
• [February 2014 – Final Approval Ballot]
• [March 2014 – Final Release]
• Provide pointers to the licenses for the Spec, RI, and TCK.
  – JSR 310 spec licensed using JCP standard license
  – JSR RI and TCK licensed using the same license as SE 8
• How are you handling contributions from non JCP members?
  – Initial source contributions accepted under JSR 310 Contributor Agreement (essentially the same as Sun Contributor Agreement)
  – JDK terms of use for ThreeTen OpenJDK Project
• What Terms of Use apply to your collaboration tools?
  – Standard terms for java.net, github, OpenJDK
• Any legal issues or concerns?
  – Some Open Source participants could not get their companies to sign the OpenJDK agreement; participation dropped off
RI and TCK development

• How are you developing the RI and TCK?
  – Tests developed in sync with spec and RI
  – Tests are divided into TCK and unit tests
  – Both maintained in same repository as the RI
  – Oracle JCK team integrated TCK tests into JDK 8 JCK
  – Missing: skills and discipline of veteran TCK engineers

• If collaboratively (through an open-source project)
  – How many committers and who?
    • 5 – Richard Warburton, James Gough, Stephen Colebourne, Roger Riggs, Sherman Shen
    – How many apart from the Spec Lead (organization)?
      • 2 – Richard, and James (LJC members)
• Is the RI available for public download?
  – Some interim binaries
  – Integrated into JDK 8 Early Access Downloads
• Is the TCK available for public download?
  – No, but all tests are in the repository
  – Reviewable and runnable
• Do you have a source-code repository?
  – See slide 10; currently in OpenJDK 8 and 9
Participation and transparency

• Provide a pointer to the JSR page on JCP.org

• Provide a pointer to the “JSR project website“
  – OpenJDK Project ThreeTen
  – The Threeten Github Project
• Total number of issues? 346
• How many in each state: Open: 0, Closed: 346, deferred: 0
• Average number of issues logged per month?
  – 8 per month; June 2010.. Jan 2014
• Average number of issues resolved per month?
  – 8 per month; June 2010.. Jan 2014
• How many different people logged them?
  – 28 People;
• How does this break down between Spec Lead, EG members, and non-EG members?
  • As expected, most by spec lead(s); then active participants and a long tail.
OpenJDK Issue tracker (2/2)

- Total number of issues?
  - 92

- How many in each state:
  - open: 0, resolved: 79, deferred: 5 issues, 8 enhancements.

- Average number of issues logged per month?
  - 6 per month

- Average number of issues resolved per month?
  - 5

- How many different people logged them?
  - 8

- How does this break down between Spec Lead, EG members, and non-EG members?
  - 92 Spec lead, 1 other
• Provide a pointer to your document archive.
  – N/A except for the source repository
• Are meeting minutes and materials published?
  – Via email in the archive
  – Most business conducted by email; no separate minutes
• What other materials are available for download?
  – N/A
• Total number of files available for download?
  – N/A except for the repository
• Average number of new files available for download each month?
  – Repository src java/time: 2580 Kb
  – Repository tests java/time: 3264 Kb
Thank you!
http://jcp.org