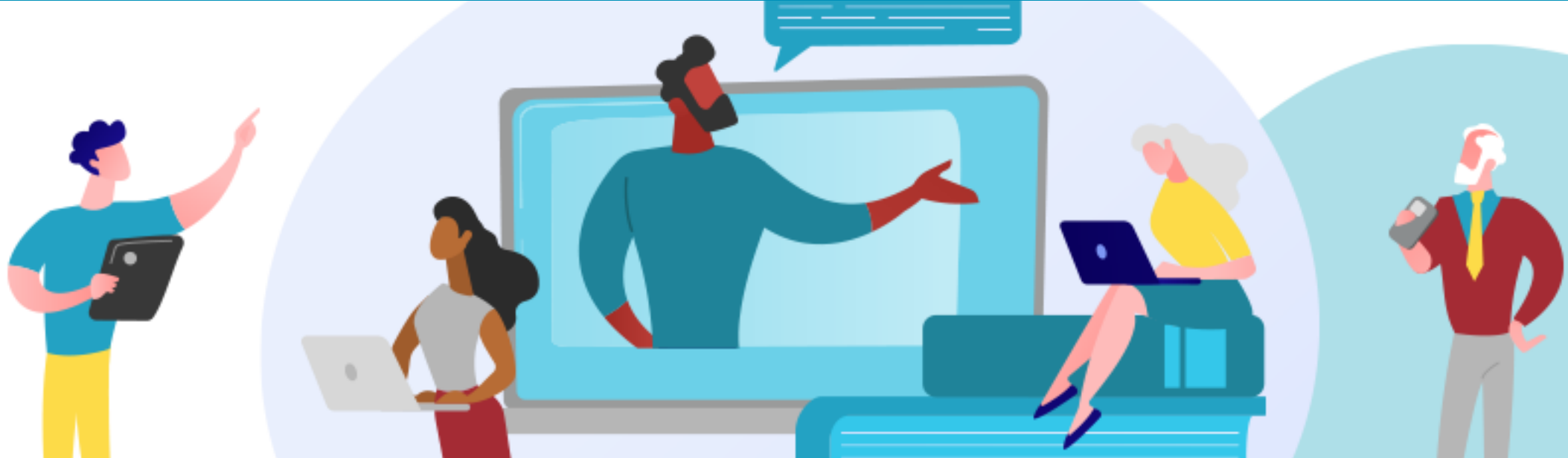


Accelerate Quality: Building FHIR that Meets Federal Mandates

Richard Ettema, AEGIS.net



HL7 FHIR DevDays 2021, Virtual Edition, June 7–10, 2021 | @HL7 | @FirelyTeam | #fhirdevdays | www.devdays.com

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Who am I?

- **Name:** Richard Ettema
- **Position:**
 - Lead Architect, Touchstone, AEGIS.net, Inc.
 - HL7® FHIR® Proficient
- **Background:**
 - 37+ years IT industry experience
 - 17+ years leading HIT development/implementation efforts
 - 7+ years contributing to the HL7® FHIR® specification (focus on testing)
 - Sr. Architect / Lead Developer for the Touchstone Project
 - Author of the AEGIS WildFHIR public test server and client



Learning Objectives

- FHIR® Testing Framework
 - Overview
- Importance of FHIR® Validation Testing
 - Interoperability Challenges
 - The 5 “Ws” of testing
- Testing with Touchstone
 - Program Testing - Drummond Certification
 - Touchstone Demo

FHIR Testing Framework

<http://hl7.org/fhir/testing.html>

To ensure interoperability between applications claiming conformance to the FHIR® specification, a testing framework has been established.

- This framework defines a TestScript resource as a natural language, computable format of a test case
<http://hl7.org/fhir/testscript.html>
- This framework also defines the test execution workflow that a FHIR® Test Engine must follow
<http://hl7.org/fhir/testing.html#execution>

Test Execution Workflow

- Pre-Processing
 - Determine whether the TestScript interactions match the capabilities of the system under test.
- Setup Execution
 - Optional operations that prepare the system under test for subsequent test execution.
- ★ Test Execution
 - Execute and record each test's operations and assertions.
- Teardown Execution
 - Optional operations that revert the system under test to its pre-test state.
- Post-Processing
 - Cleanup of test execution data and collection of test results.

Test Execution

Test execution consists of two action types:

- **operation**: The FHIR® RESTful API interaction to be executed.
 - All FHIR® operations including the extended operations framework are supported
 - Always executed regardless of whether an assert follows
- **assert**: A rule that is evaluated against the results of an operation.
 - Acts on the current, most recently executed operation context
 - Is a condition, rule or expression (XPath, JSONPath, FHIRPath) evaluated against the executed operation context
 - If true, the assert passes

FHIR® TestScript Resource

<http://hl7.org/fhir/testscript.html>

- The TestScript resource represents an executable test definition for examining the results of FHIR RESTful API interactions.
- A TestScript example would be a set of tests that exercise a certain function, such as Patient Search, and validating the responses. For example, we would require:
 - Patient resource(s) required to complete this test
 - A setup procedure to create those Patient resource(s)
 - The tests which execute the functions being exercised & evaluate the results
 - A setup or tear-down procedure to initialize or clean up the test data

Importance of FHIR® Validation Testing

Interoperability Challenges

- Implementation of a specification is often through the lens of interpretation
- We are often limited in our testing partners
- A common misconception - 2 systems interacting equals 'interoperability'
 - What happens with system 3, 4, etc.?
- Successful testing is multi-faceted and encompasses 'real-world' conditions

The 5 “Ws” - Why we test

- CMS issued the new Interoperability and Patient Access final rule (CMS-9115-F)
- ONC recently issued final rule guidance for the 21st Century Cures Act
 - Requires implementation and maintenance of a secure, standards-based Patient Access Application Programming Interface (API) ([using Health Level 7® \(HL7\) Fast Healthcare Interoperability Resources® \(FHIR\) Release 4.0.1](#))
 - Real World Testing -§170.405, CONDITIONS OF CERTIFICATION: “A health IT developer with Health IT Module(s) certified to §170.315(b), (c)(1) through (3), (e)(1), (f), (g)(7) through (10), and (h) must successfully test the real-world use of the technology for interoperability in the type of setting in which such technology would be marketed.”
- Continuous Interoperability
 - We test to ensure our eco-system remains interoperable against ever evolving standards

The 5 “Ws” - Who Should Test

- Any software vendor/implementer that wants to have ONC Health IT Certification Program certified Health IT Module(s)
- Any software vendor/implementer that wants to maintain conditions of certification to continue working with CMS
- Any software vendor/implementer who wants to verify that their systems are truly ‘interoperable’ by validating that they conform to the FHIR specification resources and profiles
- Implementation Guide authors who want to ensure their profiles are FHIR-compliant

The 5 “Ws” - What Should We Test

- Ultimately - interoperability
 - System conformance to the specification
 - Validate individual resources, profiles, Implementation Guides
 - Validate use of standard and extended RESTful API operations
 - Implementation Guides
 - Verify the Profiles follow FHIR standards
 - Verify examples provided in the IG
 - Certification
 - Rules and requirements based on certification programs

The 5 “Ws” - When Should We Test

- Test Early....Test Often
- During Development, Integration, Pre/Post-Production
- As part of initial and annual re-certification(s)
- Before, During and After Connectathon Events
- As IGs and Profiles are being built or updated

The 5 “Ws” - Where Can We Test

- Several options
 - AEGIS: Touchstone <http://touchstone.com>
 - MITRE:
 - Crucible <https://projectcrucible.org>
 - Inferno <https://inferno.healthit.gov/inferno>
 - Publicly available Test Servers
 - <https://confluence.hl7.org/display/FHIR/Public+Test+Servers>

The 5 “Ws” - Where Can We Test

- MITRE: Crucible <https://projectcrucible.org>
 - FHIR® testing for FHIR® DSTU2, STU3, R4
 - Supports FHIR Server Testing for:
 - Conformance to the FHIR standard
 - FHIR® Patient record quality and completeness
- MITRE: Inferno <https://inferno.healthit.gov/inferno>
 - Streamlined FHIR testing platform for FHIR Servers focused on:
 - SMART-on-FHIR, Bulk Data
 - US Core
 - International Patient Summary

The 5 “Ws” - Where Can We Test

- AEGIS: Touchstone <http://touchstone.com>
 - Implements the FHIR® Testing Framework and TestScript resource
 - Provides
 - Cloud based TAAS (Testing As A Service)
 - FHIR® base and workflow tests for IGs that meet regulatory requirements
 - Detailed and immediate feedback on FHIR® implementations
 - Lower cost of development by identifying issues before formal testing
 - Continuous integration support through Touchstone test execution API

The 5 “Ws” - Where Can We Test

- AEGIS: Touchstone <http://touchstone.com>
 - FHIR® testing for DSTU2, STU3, R4
 - Multiple FHIR® Validation Engines available as internal services
 - Touchstone supports FHIR Client Testing, FHIR Server Testing, Peer-to-Peer, CDS-Hooks, SMART-on-FHIR, Bulk Data, OAuth2, etc.
 - Touchstone works with FHIR® Accelerators like the Da Vinci project, housing publicly accessible FHIR® TestScripts for their IGs

The 5 “Ws” - Where Can We Test

- AEGIS: Touchstone <http://touchstone.com>
 - **Support for multiple regulatory programs:**
- ★ Drummond’s HL7® FHIR® Payer and Patient Access Certification
 - <https://www.drummondgroup.com/compliance/payer-and-patient-access-certification>
- Drummond’s ONC (g)(10) EHR Certification
 - <https://www.drummondgroup.com/compliance/onc-health-it-certification>
- MedMij Program - Netherlands Patients Federation
 - <https://www.medmij.nl/en>

Testing with Touchstone - Program Support

Drummond Payer and Patient Access FHIR® Certification Program

Powered By Touchstone



Drummond Payer and Patient Access FHIR® Certification Program

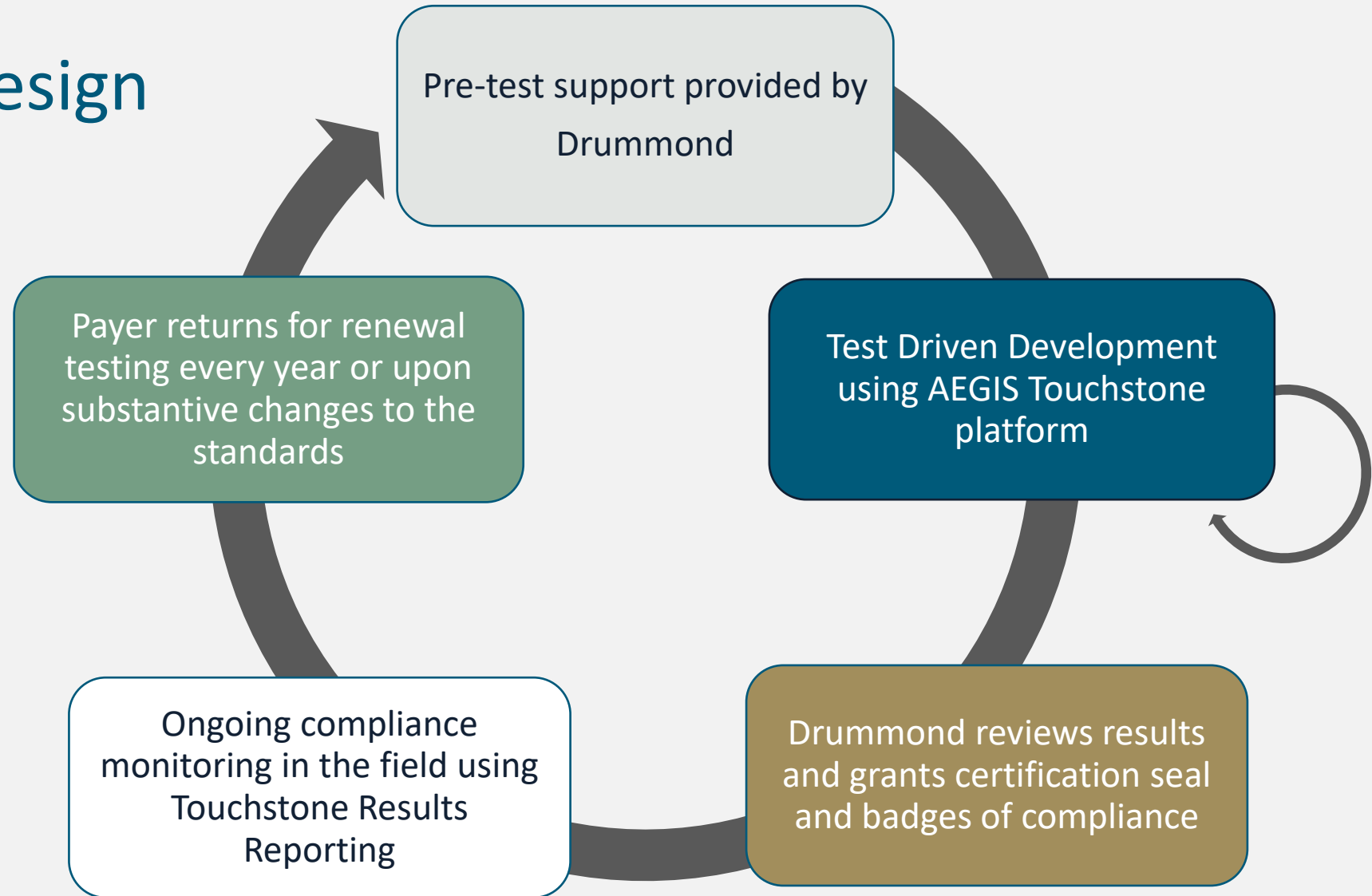
Drummond Group has created an Independent Validation and Verification certification program backed by its ONC Accredited Test Lab and Certification Body along with the industry-leading Touchstone FHIR® testing and validation platform.

- Roadmap to Compliance
 - Pre-certification access to policy and technical subject matter experts
 - Test Driven Development tools to build and validate solutions against an industry vetted testing platform

Drummond Payer and Patient Access FHIR® Certification Program

- Independent Certification Seal of Compliance
 - Unmatched industry credibility and experience as an independent assessor
 - Listed on the Drummond Certified Product Registry
 - Beyond Initial Certification
- Streamlined and consistent support from ISO 17025/17065 Certified organization
 - Always up-to-date validation support as the specifications and requirements evolve
 - Compliance monitoring for long term success and risk mitigation

Program Design



CMS Interoperability and Patient Access Final Rules Timelines

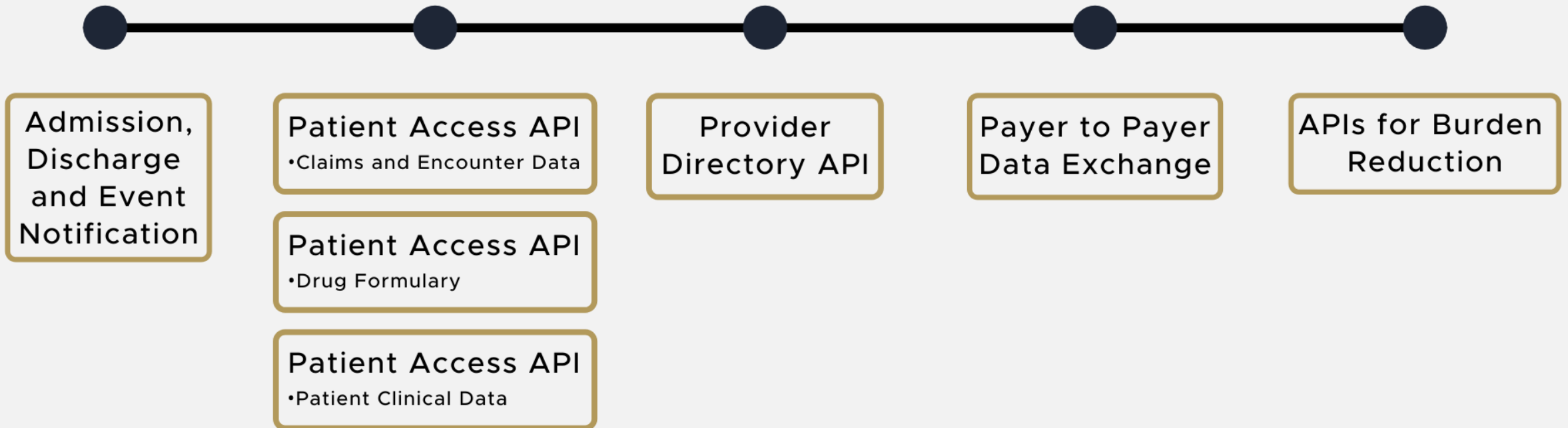
May 3, 2021

July 1, 2021

July 1, 2021

Jan 1, 2022

Jan 1, 2023



Drummond Certified™ seal and badges for each CMS requirement and their referenced FHIR Implementation Guides

Testing with Touchstone - Touchstone Demo



Learning Objectives Review

- The FHIR® specification defines a Testing Framework
 - Standardized approach to test definition and execution
- When performing FHIR® Validation Testing we must understand
 - Interoperability Challenges
 - The 5 “Ws” of testing
- The Touchstone Testing Platform supports Program Testing
 - Drummond Certification Programs
 - HL7® FHIR® Payer and Patient Access Certification
 - ONC (g)(10) EHR Certification
 - MedMij Program - Netherlands Patients Federation

Future of Testing

“We are not testing simply for ‘Today’, meaning the IG or version of the Standard we are working with today; that is too limiting a view; rather we are preparing our Testing Approaches and Testing Infrastructure for the future of Testing when our FHIR Community is significantly more complex.”

- AEGIS Interopguy (Mario Hyland)

Q&A

To learn more about the Drummond HL7® FHIR® Certification Programs

- Payer and Patient Access Certification:

<https://www.drummondgroup.com/compliance/payer-and-patient-access-certification>

- ONC (g)(10) EHR Certification:

<https://www.drummondgroup.com/compliance/onc-health-it-certification>



To learn more about



- Product information: <http://www.aegis.net/touchstone>
- Training: <https://touchstone.aegis.net/touchstone/features#Training>
- Support: email Touchstone_Support@aegis.net

Contact

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