Varian’s Integration & Developer Technologies

- DICOM Service + DICOM Worklist
- Aria Web Services
- Documents Service
- Aria Access Services
- Aria Connect + HL7 (formerly called IEM)
- Mobius Web APIs
- Velocity APIs (Research Mode only)
- Eclipse Scripting API
What is Varian DICOM Service?

- DICOM Service provides a network endpoint that allows for fully scripted data extraction and injection.
- Implements DICOM Standard networking protocol.
- Allows for connection and integration with any third-party software that implements DICOM standard networking.
- Can extract and inject DICOM 3D Images (CT, MR, CBCT), 2D Images, RT Plan, RT Dose, RT Structure Set, RT Treatment Record and more.
- Runs as a Windows Service on any client computer that has connectivity to Aria DB in your RadOnc network.
- DICOM Service aka DICOM Daemon in earlier releases
  - Available since v8.x (approximately)

What is Varian Eclipse Scripting API (aka ESAPI)?

- Application Programming Interface to Eclipse Treatment Planning System.
- Cleared for clinical use since v11.
- Implements writeable features that are cleared for clinical use since v15.1.
- C# programming language is used for clinical scripts.
- Python also allowed for research scripts with pyESAPI.

Eclipse Scripts

Two approaches

* Plugin Script
  - Eclipse calls you!
  - Operates on current patient

* Standalone EXE
  - You call Eclipse!
  - Operates on any number of patients
Eclipse Scripts
Two approaches

Plugin Script
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This Demo
Start with CT + Structure Set Files

Inject Files with DICOM Script to Eclipse DB

This Demo
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Input Files with DICOM Script to Eclipse DB
This Demo

Start with CT + Structure Set Files

Inject Files with DICOM Service to Eclipse DB

Automate Planning with Eclipse Script

Make Tradeoffs in Eclipse

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Make Tradeoffs in Eclipse
Your Script Here

Eclipse Scripting API

- RT Data Model
- DICOM Services
- Dose Calculation Engine
- DVH Engine
- ARIA DB

Multiple Varian Scripting APIs

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eclipse Scripting API (ESAPI)</td>
<td>C# scripting access to Plans, DVH engine, Dose, Structure Sets, Image data, voxels</td>
</tr>
<tr>
<td>SmartAdapt™ API</td>
<td>Rigid Reg, Deformable Reg, 2D, 3D images, DVF</td>
</tr>
<tr>
<td>Portal Dosimetry API</td>
<td>Access to Portal Dose, PD evaluation tests, analysis</td>
</tr>
</tbody>
</table>
Eclipse Scripts

Two approaches

**Plugin Script**
- Eclipse calls you!
- Operates on current patient

**Standalone EXE**
- You call Eclipse
- Operates on any number of patients

Varian Scripting with C# .NET

Scripts are created with C# .NET

- Great modern language
- Best in class tooling provided by Microsoft
- Huge community (MSDN, Stack Overflow)
- Lots of help & open source examples

Eclipse Scripting API Features by Version

<table>
<thead>
<tr>
<th>Feature</th>
<th>v.11</th>
<th>v.13.6</th>
<th>v.13.7</th>
<th>v.15.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access to Eclipse EXB Photon Data</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Access to Eclipse Brachytherapy Data</td>
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<tr>
<td>Access to Eclipse Proton Data</td>
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<td>✓</td>
<td>✓</td>
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<tr>
<td>Eclipse Automation for EXB Photon Planning</td>
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<td></td>
<td>✓</td>
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<tr>
<td>Script Approval</td>
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<td>✓</td>
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<tr>
<td>Visual Scripting</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

*Clear for Clinical Use*
Eclipse Automation

- Writeable Scripting
- Script Approval & Dev process support
- Targeted use cases:
  - Super-templated planning
  - Automated QA and QC
  - Optimization Structure creation

Eclipse Automation - Approval

- Clinical development process support
- Write-enabled scripts must be approved
- Optional system setting to force read-only scripts to be approved

Research system

In development
Approved for evaluation
Approved
Retired

What can I access through Mobius3D APIs?
Everything you see in the UI!

<table>
<thead>
<tr>
<th>Overall results</th>
<th>Dose statistics</th>
<th>ROI statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>- List of all patients:</td>
<td>- Mean dose and percent coverage to each target:</td>
<td></td>
</tr>
<tr>
<td>- Linear attenuation</td>
<td>- DVH objectives:</td>
<td></td>
</tr>
<tr>
<td>- What type of QA checks have been performed:</td>
<td>- Plan target for TVH and TVD:</td>
<td></td>
</tr>
<tr>
<td>- Plan check:</td>
<td>- Actual values (DVH spread):</td>
<td></td>
</tr>
<tr>
<td>- Predelivery QA:</td>
<td>- Full DVH data:</td>
<td></td>
</tr>
<tr>
<td>- Treatment QA:</td>
<td>3D gamma passing rate:</td>
<td></td>
</tr>
<tr>
<td>- QA/QC analysis:</td>
<td>TVH and TVD 3D ECOM dose:</td>
<td></td>
</tr>
<tr>
<td>- Staff approvals:</td>
<td>Delivery time:</td>
<td></td>
</tr>
</tbody>
</table>

Varian’s Integration Technologies

- DICOM DB Daemon
- Web Services
- Documents Service
- Aria Access Services
- FHIR Services
- VAIS
- Mobius APIs
- Qumulate APIs
- Velocity APIs
- Direct read from Aria DB
Varian DICOM Service

- Runs as Windows Service
- Aria DB Client
- Allows for programmable DICOM data flow in and out of Aria / Eclipse.
  - 3D images (MR, CT, CBCT), 2D Images, Structures, Plans, Dose, Treatment/Records, Registrations
- Scriptable / programmable with tools like DCMTK, DVTK, pyDICOM, PixelMed, EvilDICOM, FODICOM.
- Included with Aria systems since v8.x

DB Daemon Supported Scenarios (1)

- DB Daemon to DB Daemon (E.g. Main Center to Collaborating Institution & Vice versa)
- Programmatically send Image, Planning, or Treatment Data from one center to another through DB Daemons.
DB Daemon Supported Scenarios (2)

• DB Daemon to File System & Vice-versa
  • Programmatically extract DICOM files from one Aria system to file share, or load files into an Aria system.

DB Daemon Supported Scenarios (3)

• DB Daemon to DICOM PACS & Vice-versa
  • Programmatically send Images, Plans, and other DICOM objects to / from a PACS system.

DB Daemon Supported Scenarios (4)

• Eclipse to DB Daemon (Export from Eclipse, Import to Eclipse).
  • Users can directly import a plan from one center to another using Eclipse Import.
  • User can directly export a plan or other DICOM data from one center to another.