ArchiveDicomizer – Bring Buried Radiotherapy Treatment Planning Data into New Life

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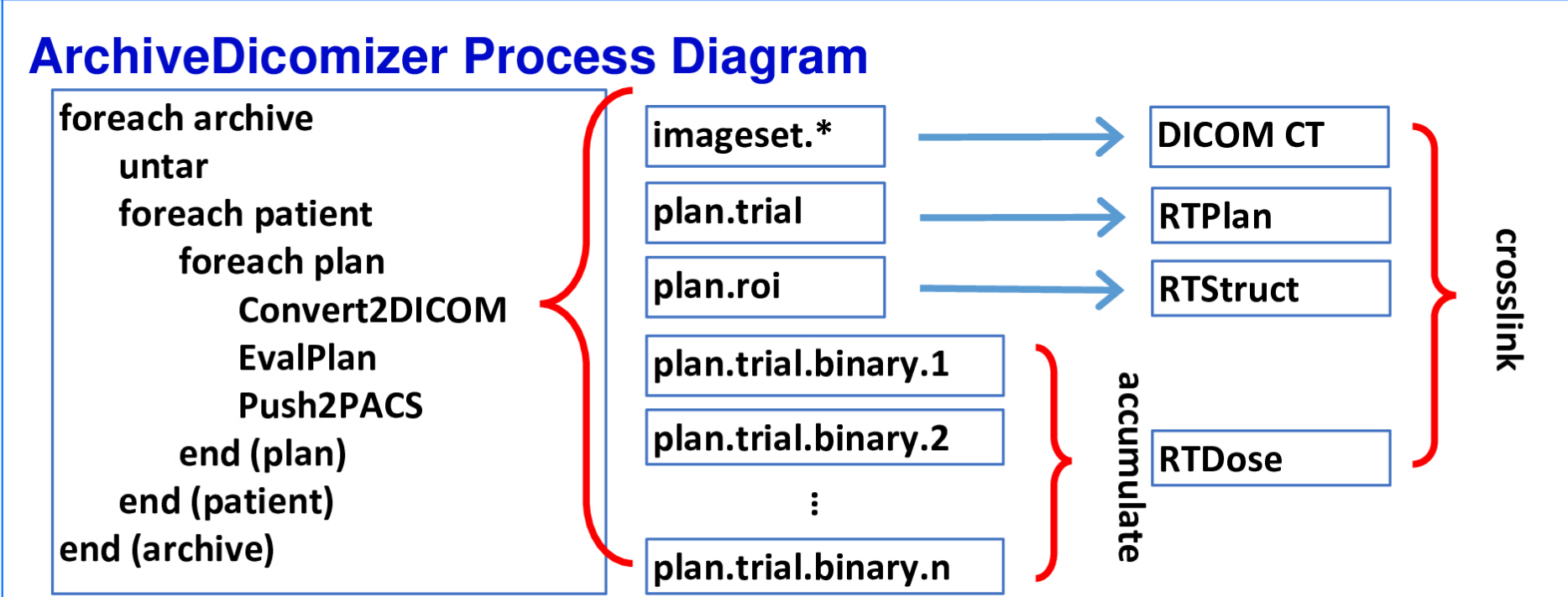Medical Center
Radiation Oncology

Introduction Legacy clinical data buried in the archives are virtually lost after the evolution of technology and software, such as upgrade or switch of the treatment planning system (TPS). We developed a general tool to automatically convert the legacy archives to standard DicomRT and export the results to the centralized RT-PACS system.

Method/Material Our first project was to convert the archives of Pinnacle TPS to DicomRT. The Pinnacle TPS uses the tape archive (tar) technique to compress patient and machine data for each patient into a single tarball (*.tar) file that is then saved in a tape. Each tar file is organized as a standard tree-structure file system with the "institution / patient / plan" hierarchy. The contour and planning information are stored in structured text files. CT and beam doses are stored as volume data in the raw binary format. All the text files use a simple hyper-text tree structure.

ArchiveDicomizer For each plan, the "plan.trial" file is parsed and the link to contour file (plan.roi) and beam dose files (plan.Trial.binary.#) are identified. The prescriptions, fractionation group and beam control points are parsed and converted to the corresponding RTPlan module. The linked plan.roi is parsed and the contour point coordinates are converted to the DICOM coordinate system and saved in the RTStruct module. All beam doses are parsed and accumulated into the plan dose according to the normalization scheme defined in the "plan.trial". The plan dose is stored in the RTDose format. The CT volume is converted into standard DICOM CT images. CT, RTPlan, RTDose and RTStruct are organized using the "study/series/image" hierarchy with the corresponding DICOM uids assigned and crosslinked. The generated DICOM files are automatically pushed into the in-house RT-PACS accessible by any TPS and DICOM compatible software. The whole procedure from "untar" to "DICOM pushing" is built into an automated streamlined process and running as a background server.

ArchiveDicomizer Process Diagram

```
foreach archive
    untar
        foreach patient
            foreach plan
                Convert2DICOM
                EvalPlan
                Push2PACS
            end (plan)
        end (patient)
end (archive)
```

imageset.* → DICOM CT
plan.trial → RTPlan
plan.roi → RTStruct

plan.trial.binary.1
plan.trial.binary.2
...
plan.trial.binary.n

accumulate → RTDose

crosslink

Results The software was verified step-by-step and validated through apple-to-apple comparison of the plan, including images, contours, dose, and beams, in the original Pinnacle TPS, Eclipse TPS, and Dicoman through conversion and import. A total of 353 archives (4.20TB) between 2009 and 2016 have been automatically extracted and converted, consisting of 4718 patients with 6474 plans. It would otherwise take years of human power if done manually with archive retrieval, import and export through the TPS.

Conclusion ArchiveDicomizer is an essential tool to bring years of "buried" radiotherapy treatment planning data back into clinical/research life by converting them to the standardized format and storing them in a centralized PACS system.

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Thank You
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