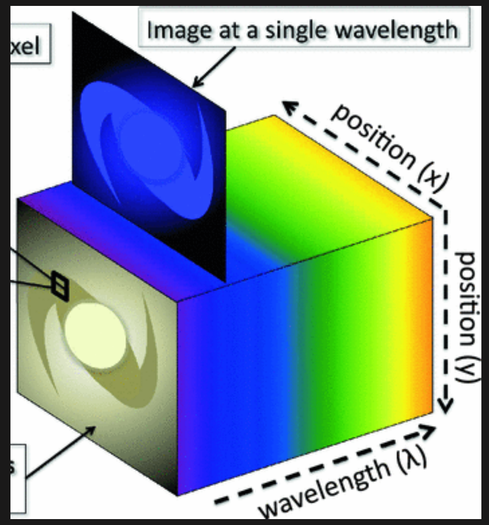
Web Visualisation of Spectral Data Cubes with JPEG2000

Anthony Carbone
Supervisor: Dr Slava Kitaeff

2020/21 ICRAR Summer Studentship Final Presentations
4th February 2021

SKA and SIDC's

Artist impression of SKA-Mid dishes (left) and SKA-Low antennas (right)
(Credit: SKAO)



Spectral Imaging Data Cube (SIDC)
(Credit: Harrison C.M.)

ASKAP Telescope used for
Deep Investigation of Neutral Gas Origins (DINGO)
(Credit: CSIRO)

Problem

SIDC's = tens of TBs

ASKAP Telescope used for
Deep Investigation of Neutral Gas Origins (DINGO)
(Credit: CSIRO)

SIDC's = hundreds of TBs

Artist impression of SKA-Mid dishes (left) and SKA-Low antennas (right)
(Credit: SKAO)

Source: AusSRC

Solution

Current

CASA Image Tables

FITS The Astronomical Image and Table Format
Flexible Image Transport System

LOFAR

- Inefficient in
  - Portability
  - Scalability
  - Random-access

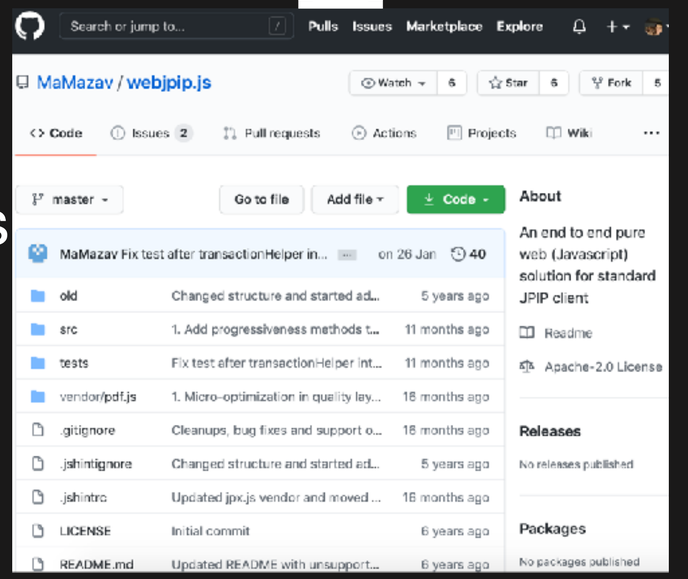
Astronomical imagery: Considerations for a contemporary approach with JPEG2000

V.V. Kitaeff[a,*], A. Cannon[a], A. Wicenec[a], D. Taubman[b]

Proposed

JPEG 2000

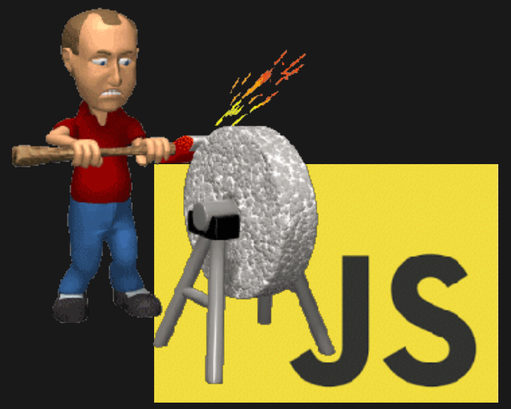
+ Enhanced portability
+ Enhanced random-access
+ Region Of Interest (ROI)
+ JPIP Protocol = Efficient
+ Used in other fields



MaMazav's webjpip.js GitHub Repository

Source: Kitaeff et al., 2014; Pence et al., 2010; Anderson et al., 2011

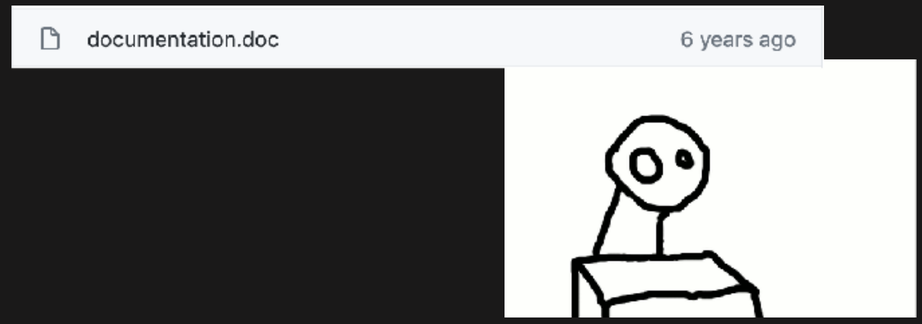
Roadmap



~~Build up JS & Web Development skills~~

~~Grasp JPEG2000 & JPIP~~

~~Get webjpip.js working with JPIP server~~



Modify webjpip.js for use

Add scientific features

Implement FITS metadata support

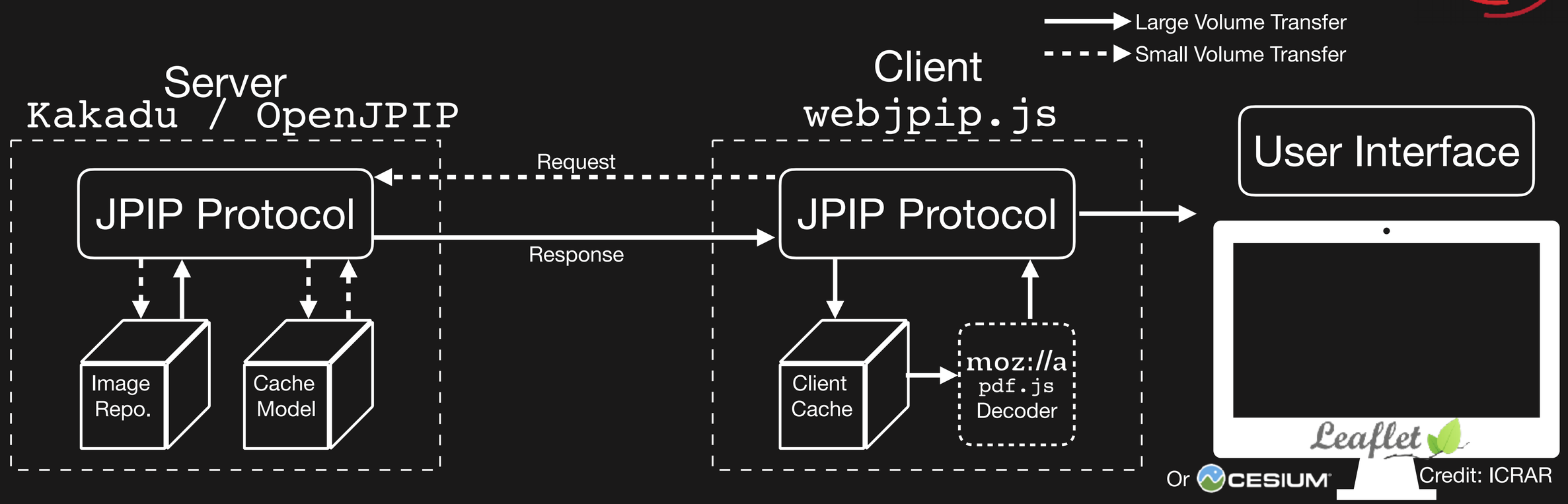
AusSRC Recommendations

Finalise documentation

Side Quests

- OpenJPIP as Kakadu Alternate
- Single-slice Demo

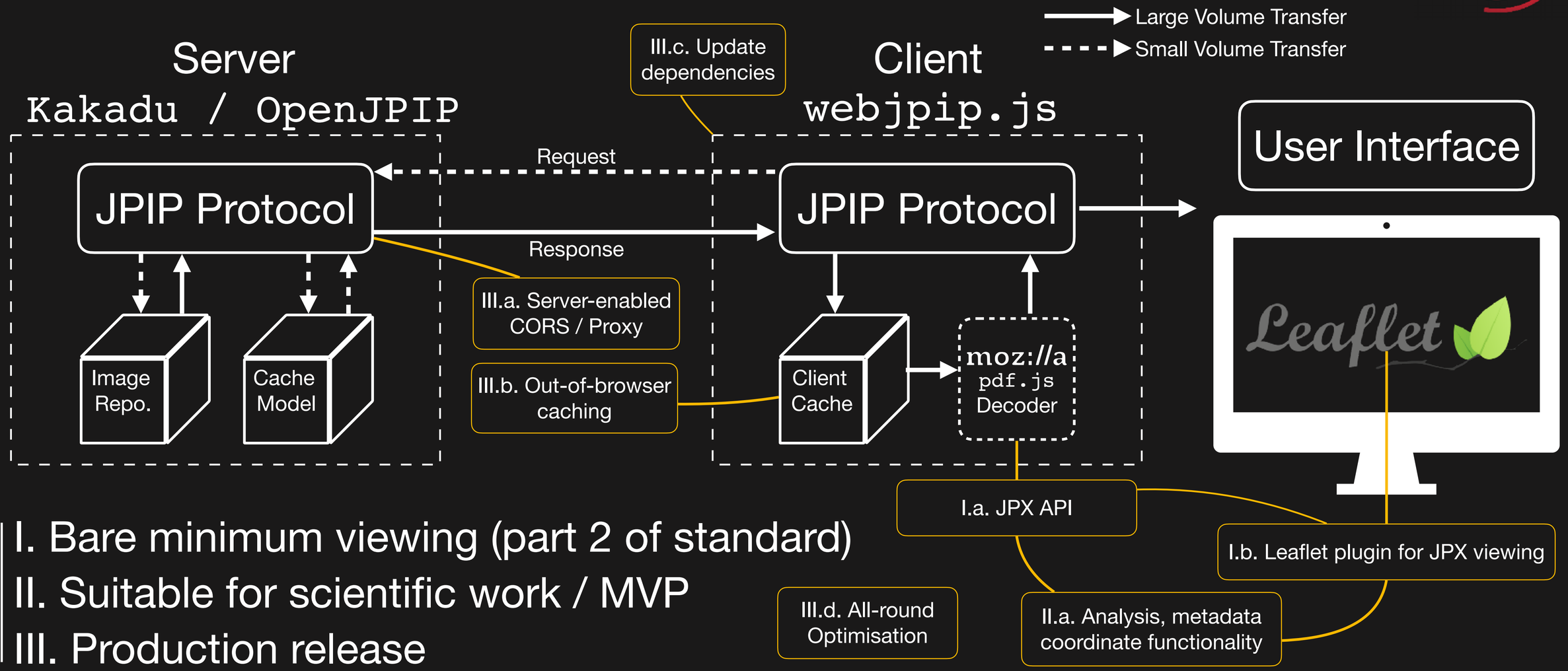
Architecture



Source: Kitaeff, 2016

Now for a demo…

TODO



PHASE

I. Bare minimum viewing (part 2 of standard)

II. Suitable for scientific work / MVP

III. Production release

Source: Kitaeff, 2016

Recommendations

- JPEG2000 + JPX Extensions + JPIP Protocol = Flexible Solution
- In-browser solution? -> webjpip.js library… with modifications:
  - Update webjpip build dependencies

  I. Bare minimum viewing of spectral image cubes

  ‣ JPX Extension functionality - Mozilla's `pdf.js` and Leaflet plugin/interface

  II. Minimum Viable Product for scientists

  ‣ Analysis, metadata, coordinate functionality

  III. Product Release

  ‣ Server, caching, and all-round optimisation - dependencies update

Open Source development promises untold benefits to the community
Credit: Líkið Geimfari

Many Thanks To...

- Dr Slava Kiteaff
- Ryan Bunney and Nicholas Pritchard
- James Strauss
- Brent Groves, Jess Broderick, Cass Rowles, and Lisa Randell
- All ICRAR/UWA students
- William Anderson, Gemma Edwards, Mia Williams, and all summer students

Source: