National Geospatial Digital Archive

Greg Janée

University of California at Santa Barbara

A misadventure in preservation

- 1976
  - Viking probes go to Mars
  - soil data is analyzed for evidence of life
- 1999
  - USC neurobiologist Joseph Miller asks for data
  - NASA has data on tape!
- But…
  - tapes coded “in a format so old that the programmers who knew it had died”

Paradox of preservation

- Is the data valuable?
  - yes: had to travel to another planet to get it

- Is the data being used?
  - no
  - perhaps never again

- How much am I willing to pay for its preservation?
  - as close to zero as possible

Is it worth preserving?

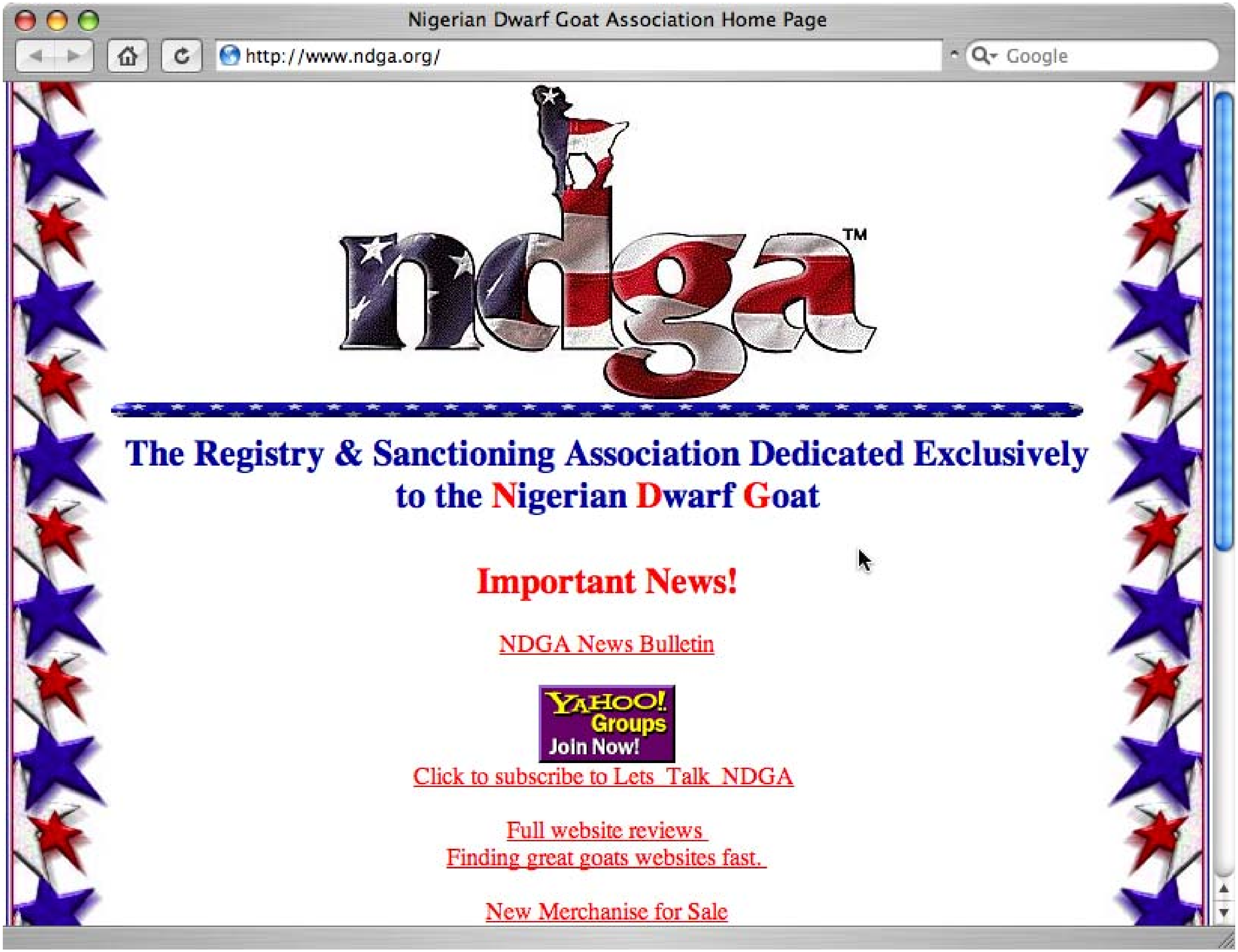
- Keith's equation[*]:
  - (current value) = (intrinsic value) - (cost to use)

- Greg's equation:
  - item is worth preserving for time duration T if:
    - (intrinsic value) * Prob_T(usage) > Σ_T(preservation costs) + (cost to use)

[*] apologies to Keith Johnson, Stanford libraries

Project genesis

- NDIIPP
  - Library of Congress, 2000
  - $100M
  - http://www.digitalpreservation.gov/
- NGDA
  - UCSB (MIL) & Stanford (Branner Library)
  - $2.6M, 3 years
  - geospatial data
  - http://www.ngda.org/



The Registry & Sanctioning Association Dedicated Exclusively to the Nigerian Dwarf Goat

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New Merchanise for Sale

Project goal

- *"How can we preserve geospatial data on a national scale and make it available to future generations?"*

- No focus on a particular collection

- Geospatial data
  - discrete chunks
  - relatively highly-structured, well-defined
  - but 90% of our work is generic

Idea #1

- Archival has to be cheap & easy
  - must be distributed
  - little incentive, no funding
  - not sexy

NGDA approach

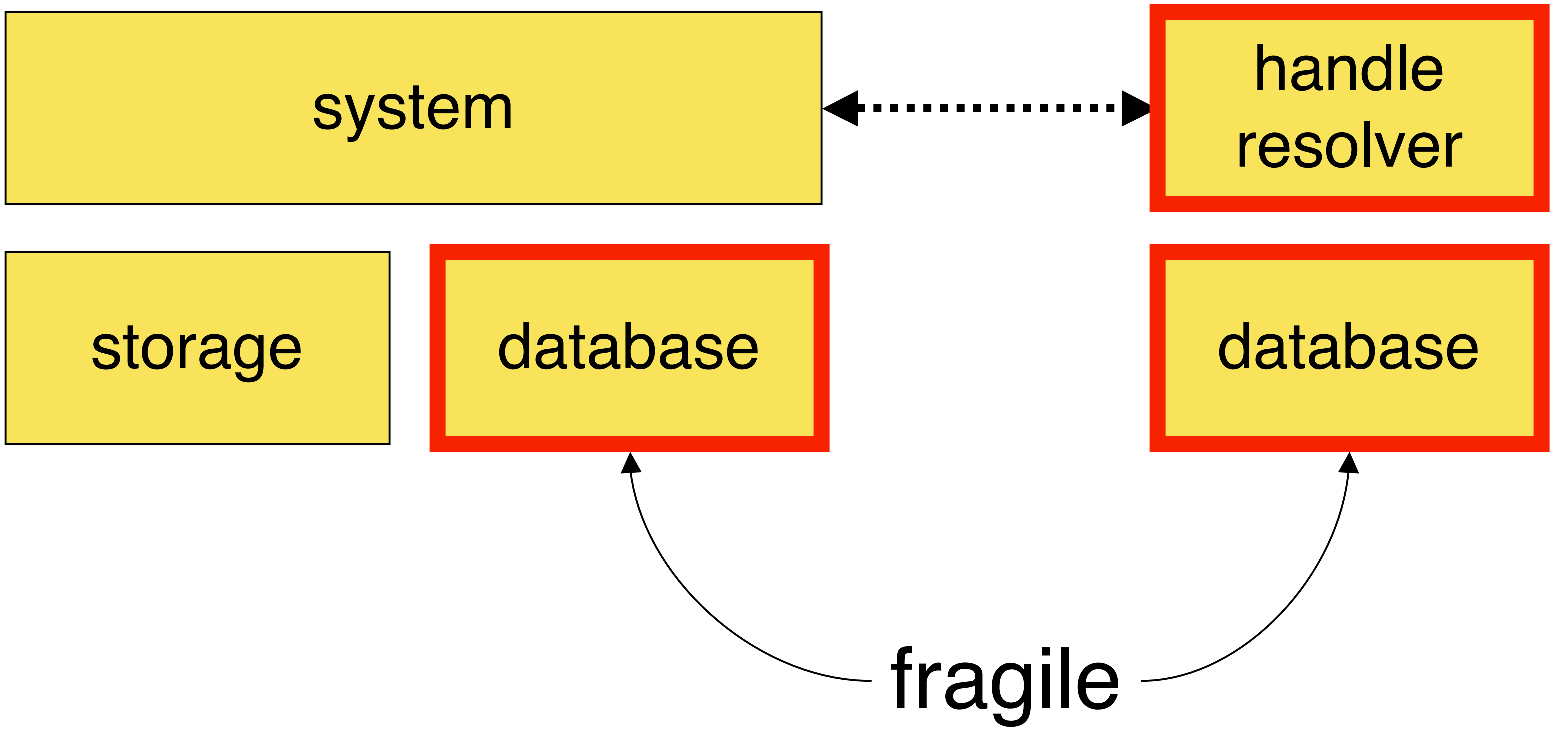
- Compromise: define cheap archive
  - fundamental approach: preservation by co-archival of object semantics
  - ingest: one step up from crawling
  - web access
  - notable for what's missing: discovery, usability

- Foundation for additional functionality
  - e.g., migration
  - prototype archives will offer ADL, OAI access

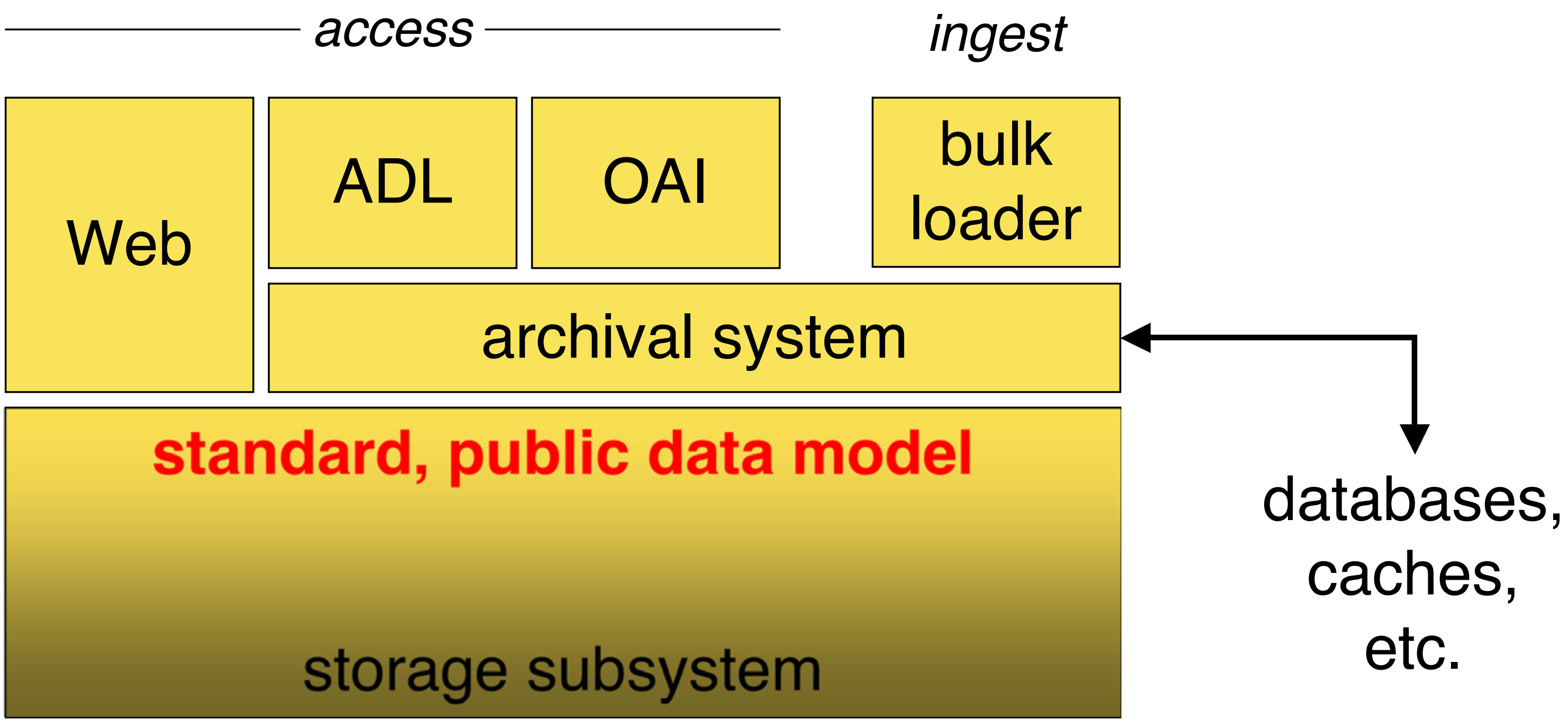
Idea #2

- Archival systems must be designed with their own demise in mind
  - archival *objects* will long outlive any *system* that manages them
  - system-level migrations will occur
  - at inopportune times

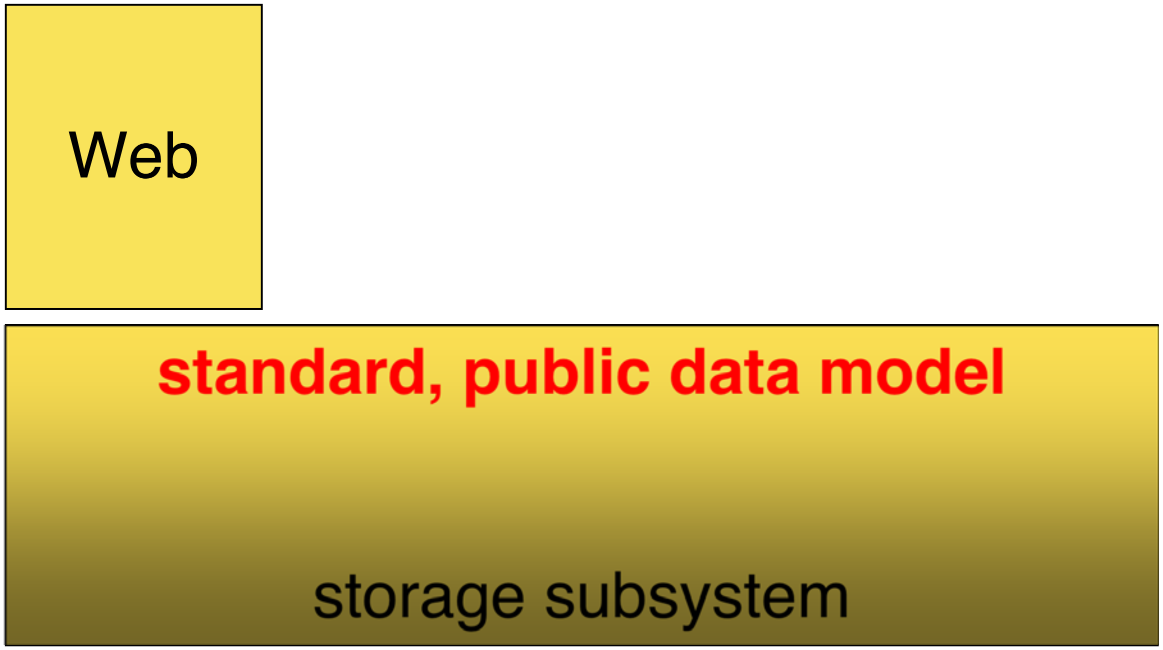
Typical repository architecture



NGDA architecture



Post-NGDA architecture

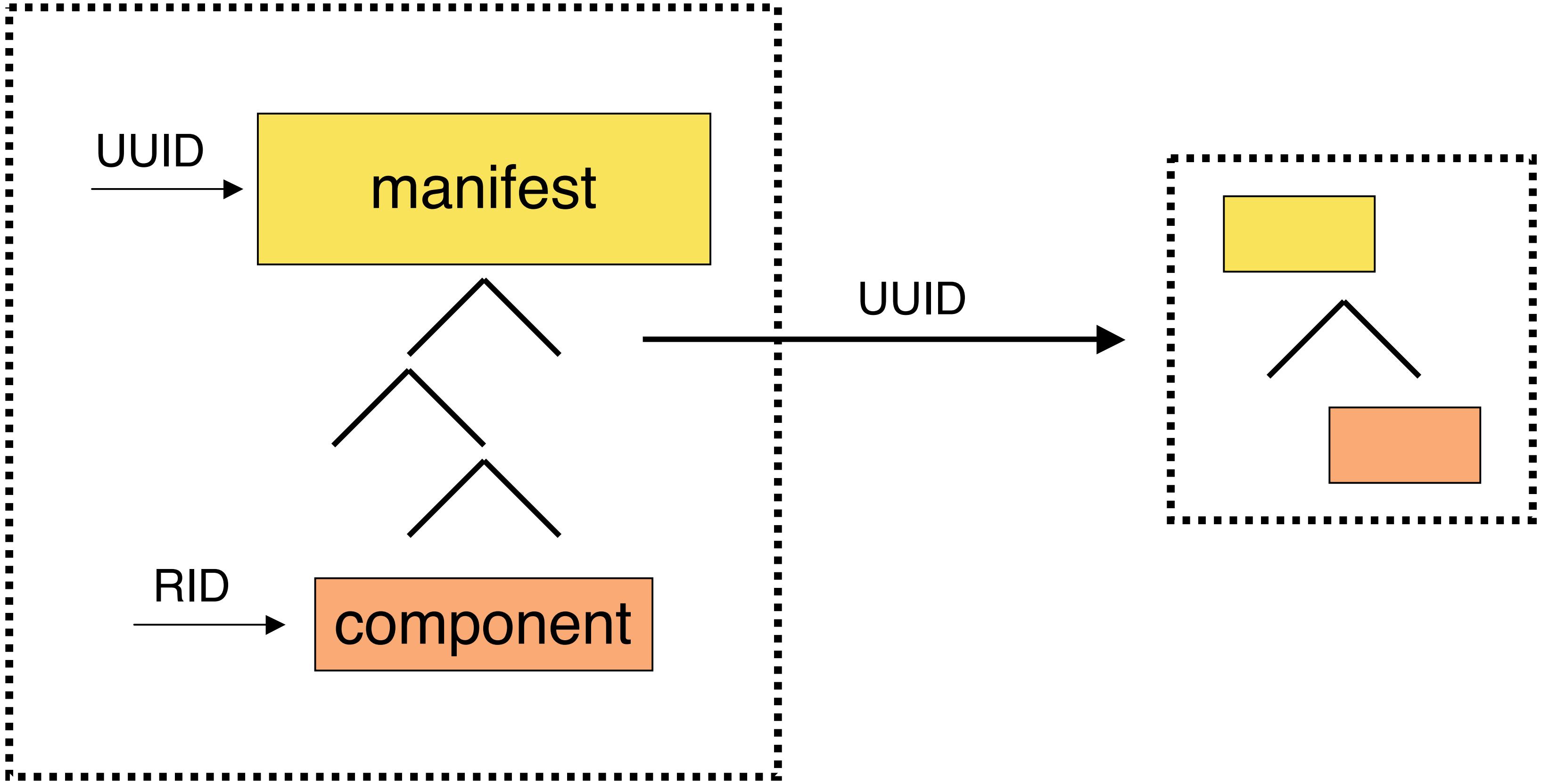


Storage system requirements

- Req's:
  - associate UUIDs/RIDs with bitstreams
  - retrieve global/local bitstream by UUID/RID
  - determine (parent) UUID of any bitstream
  - list all UUIDs

- Satisfied by:
  - any filesystem
  - any kind of UUIDs
    - tag:library.ucsb.edu,2005:*identifier*

Archival objects



Archival object representation

- Components are files
- Manifest is an XML document

- Other approaches
  - OAIS: archival information packages (AIPs)
  - XMLtape

Ingest

- Ingest template defines
  - common structure of objects to be ingested
  - necessary validations
  - associations to other objects
    - assumes pre-loading of semantic definitions
  - policies, rights, etc.

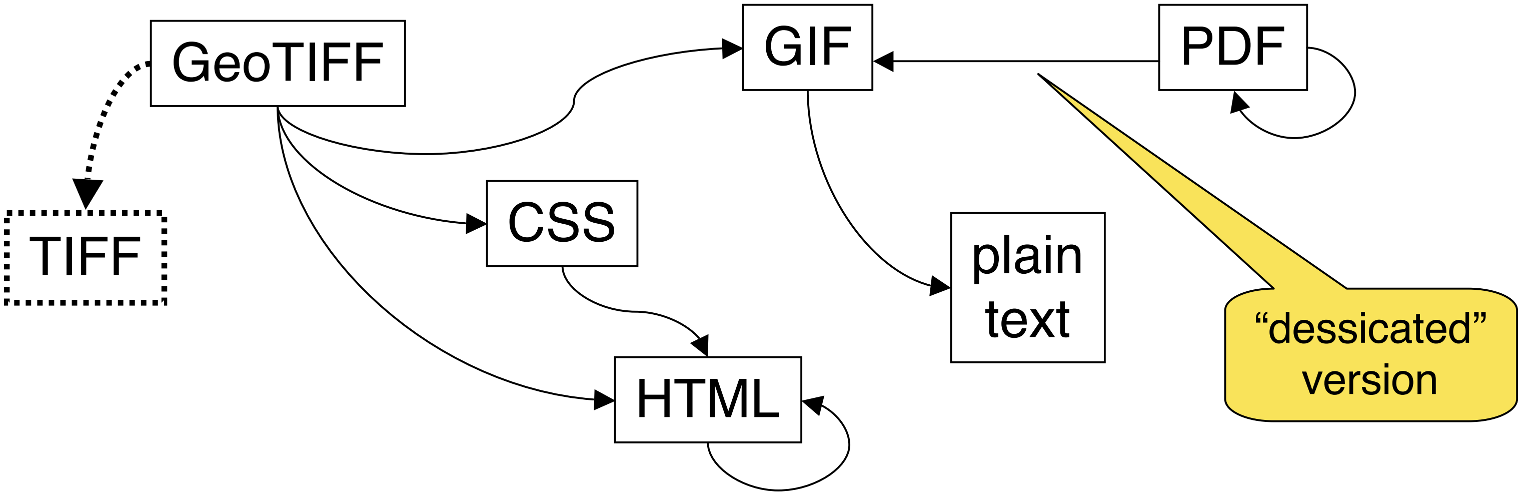
- Represents choke point
  - requires human evaluation

Format registry

- We’re developing one
  - who isn’t?
- Serves as archive of format specifications
- How broadly to interpret “format”?
  - traditional file format
  - product
  - series, collection, arbitrary set

Format dependencies

- Consider dependency graph induced by format specifications
- Def: a format is recoverable if the format of its specification is recoverable
- Axioms: plain text, HTML are recoverable



Challenges

- Making ingest easy, easier, easier-er, ...
- GIS formats
  - very complex: topology, layer, coverage, project
  - proprietary
- MODIS
  - multiple petabytes
  - format (HDF) is not well-defined
  - moving to on-demand computation of products
  - lineage important
  - copious additional semantics

Misadventure, redux

- What if there had been an NGDA-like solution?
  - format specification would have been archived
- Limitations
  - data not necessarily immediately usable
  - format specification itself not necessarily viewable
- But limitations can be addressed according to usage, available resources

Questions for you

- Archival systems
  - definition? functionality?
- Storage systems
  - definition? functionality?
- Archival object representation
  - discrete files vs. AIPs?
- GIS formats
  - “dessicated” form?