
ResearchChannel and
HD over IP
QuestNet July 2005
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AARNet


Delivering Australian
Research and Education
to the nation and the
world

What we do …

Develop and deploy advanced media delivery systems capable of utilising the high capacity networks connecting Australian Universities, research and other related organisations

Create advanced services such as Voice and Video over IP, Access Grids, Content Streaming, Storage and Indexing and HD video over IP based on standard and bespoke software and hardware.

Outline

1. What is ResearchChannel ?
2. Streaming National Science and Education
3. Partners
4. Building the Service
   - Technology
   - DigitalWell
5. Demonstrating the reality
6. The Challenges

What is ResearchChannel ?

- A broadcast, streaming and on-demand archive of education and research content
- Consortium of US Universities who pay an annual fee to participate
- Lead by University of Washington (Seattle)
- Reaches 25-30 million screens across continental US via the Dish network and globally using the Internet
- AARNet is the national representative on the ResearchChannel steering committee

Towards ResearchChannel Australia

- Discussions initiated with ResearchChannel at Fall 2003 Internet2 members meeting to utilise ResearchChannel technology and content base to implement ResearchChannel as an AARNet3 service
- AARNet became a formal member of ResearchChannel in 2004
- Membership provides technology and content exchange with University of Washington and access to insert content US and Global ResearchChannel feeds

ResearchChannel Australia

- On-demand and multiple streamed video channels delivered using the AARNet3 network
  - National Science Festival
  - Parliamentary TV
  - ABC Multichannel service (ABC 2)
  - AARNet Training material
  - Recordings of presentations and conferences
  - Contributed material
  - Sponsored material
  - Student and special interest radio and television stations
- National media storage and streaming service for AARNet members and related organisations

Why an Australian ResearchChannel ?

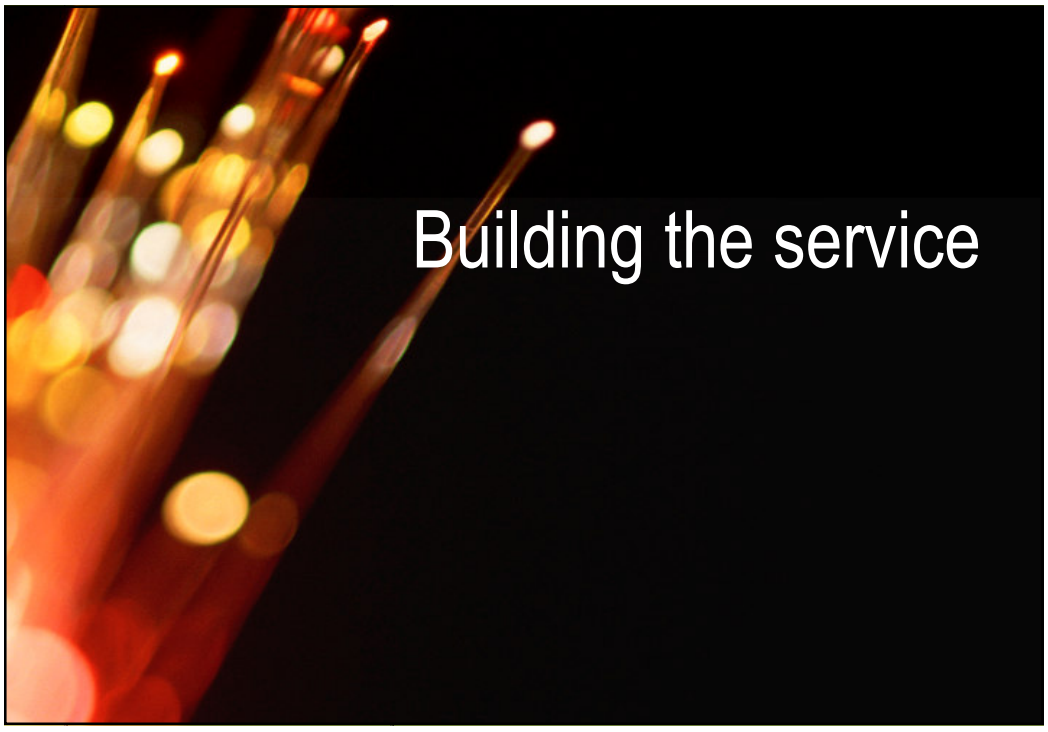
- Past experiences point the way
- Astronomical events broadcast in collaboration with CSIRO to a global audience in 2002 and 2003 using Telstra streaming infrastructure
  - Solar Eclipse from Ceduna 20,000 viewers
  - Transit of Venus 40,000 viewers
    - Size of the Internet doubled between events
    - Telstra streaming infrastructure collapsed under load
- Requests from AARNet members to provide a storage and streaming solution

A National vehicle for science education

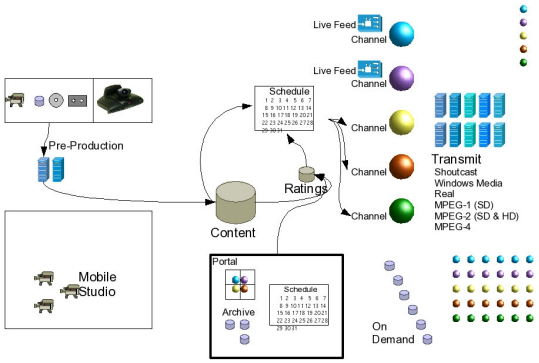
- Showcase the best of Australian Science Education and Research to the nation and the world
- A cost effective national service with a single point of reference linking existing repositories
- Develop Digital Right Management services to control access to content

Partners

- University of Washington
- Australian Film Television and Radio School
- QuT Creative Media precinct
- Centie



The big picture



Storage - Retain

- AARNet Storage Repository Project - **Retain** will provide the foundation of the ResearchChannel Service
- **Retain** refreshes and extends the AARNet Mirror service with the addition of storage capacity and hardware upgrade

Streaming

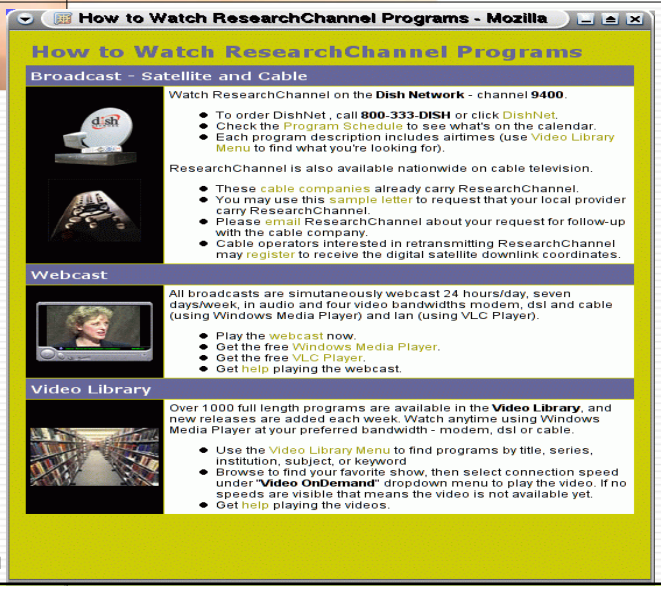
- Primary streaming format will be Multicast MPEG2 delivered using a cluster of VideoLan servers
- Additional streaming formats Real, QuickTime and Windows Media can also be supported upon request
- Multiplatform, Open source client available
- Streaming demonstration to TransACT cable TV subscribers successful

Content

- Initial service will be stocked with US content which will be supplemented and replaced with Australian content as it becomes available
- AARNet member contributions
- Video Content and Streaming BoF will be established at QuestNet 2005 to promote discussion and contribution of AARNet member content
- AARNet will capture and post produce QuestNet 2005 Keynote presentations

Portal

How to watch Research Channel Programs



Digital Well

- Media asset management framework developed by University of Washington
- Supports ingest, indexing and access to video, audio and images with a variety of metadata schemas
- Overlays SRB storage service
- Development path
  - Digital Rights Management
  - Multilingual caption and audio tracks
  - Middleware AAI
  - Automated format and frame rate conversion (PAL/NTSC)
  - High Definition video content management

Knowledge

- AARNet staff attended the National Association of Broadcasters conference in May 2005 with ResearchChannel staff to acquire product, production and technology background information
- Additional technology transfer from University of Washington of High Definition streaming prototype code has occurred
- AARNet has successfully participated in a number of international events demonstrating Standard and High Definition video streaming
- AARNet is an active participant in Internet2 and APAN video initiatives

High Definition Video Streaming

Super Computing 2004 Conference

Equivalent to one DVD being transmitted under the Pacific in both directions every seven seconds

- At the exhibition floor of the Pittsburgh SC 2004 conference, AARNet and ResearchChannel demonstrated high definition real-time video interaction between Canberra Australia, Seattle and Pittsburgh
- ~2million pixels per frame; 60 frames per second interleaved; using 1.4Gbps for each stream; video quality amazing
- During the 30 hours of demonstration, 20 Terabytes of data were transmitted in each direction
- No custom equipment involved, all off-the-shelf components

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High Definition Video over IP

Uncompressed HD1080/60i

1920x1080 image

60 frames per sec

1.5Gbs

- Pair of Dual Xeon PCI Express systems used to packetise and depacketise data stream
- Input
  - Sony HD video camera provides SDI (1.5Gbs) signal (SMPTE 292M)
  - AJA video card captures the SDI data
  - Due to NIC availability each frame split into two IP packets for transmission over two GbE NIC interfaces
- Output
  - Packets reassembled and injected into AJA video card which generated a SDI (SMPTE 292M) signal displayed on a HD monitor

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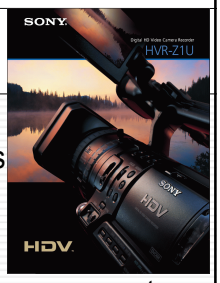
HDV



Consumer High Definition

Long GOP MPEG2 (15 frames)

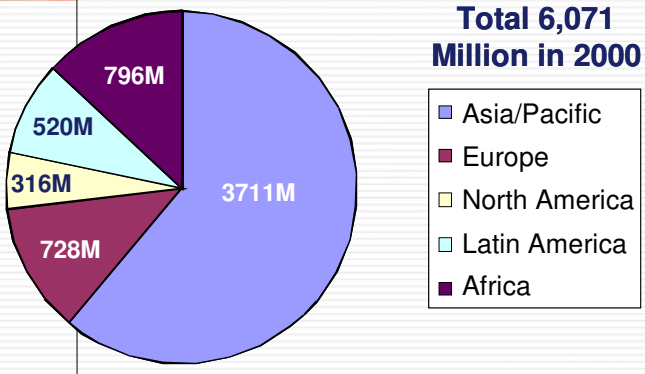
25Mbs MPEG2 data stream stored on DV tapes

- Consumer/prosumer HD cameras
  - Sony 1080i
  - JVC 720p
- Both vendors support generating a component (Y/Pr/Pb) video signal which can be converted to SDI for HD streaming or editing using an AJA or Evertz device
  - Sony supports component from the front end of the compression stage
- Long Group of Frames (GOP) 12-15 MPEG2 used to achieve compression of 25Mbs for tape storage

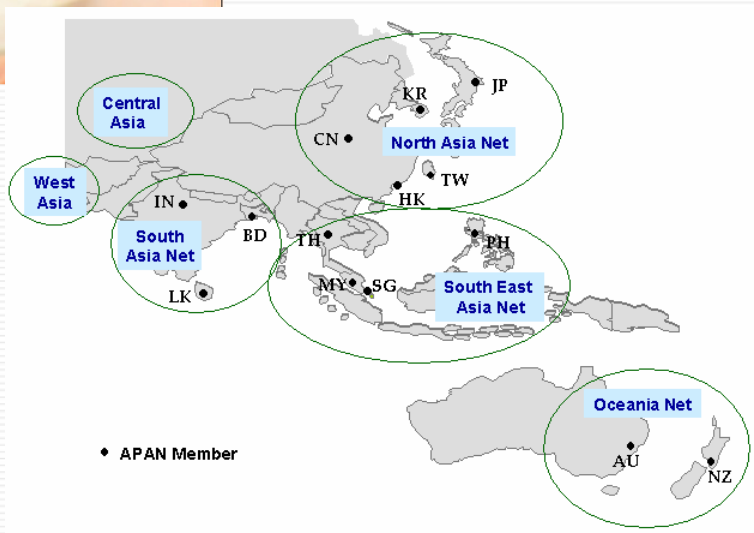
Super Computing 2004 Conference HD Video Canberra Seattle Pittsburgh

Super Computing 2004 Conference

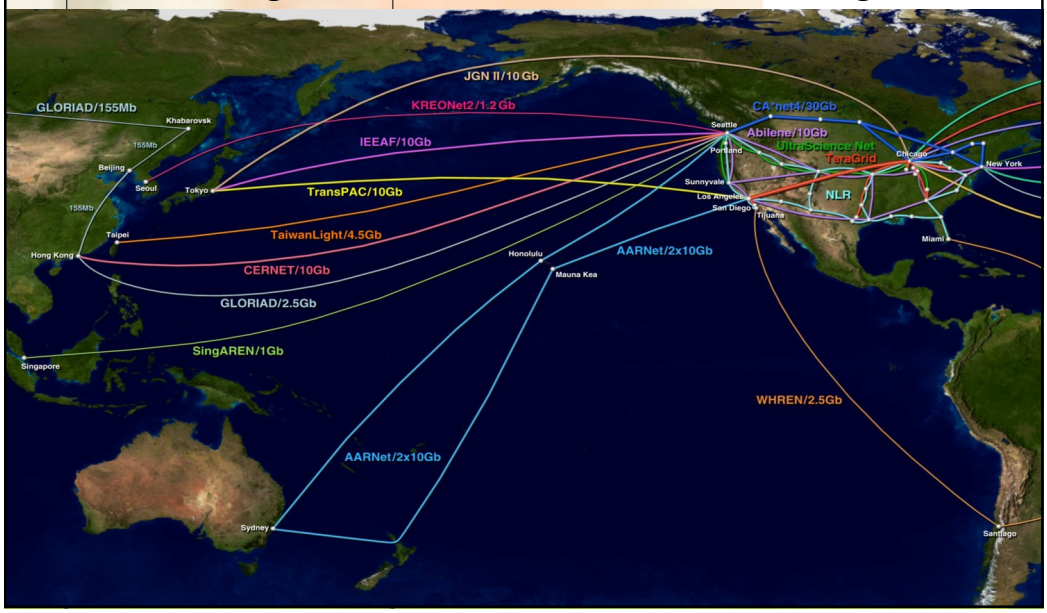
World Population



APAN Regional Groups



Delivering Australian content to the region



Content Challenge

- Contact each of the AARNet members to determine available content, production capabilities and ongoing requirements for ingest and streaming services
- Capture and post produce AARNet conference events
- Access and digitize existing repositories of non-digital content (AFTRS 35mm film collection)

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Middleware Challenge

- How do we build applications/services that slot down into the middleware layer?
- How do we glue them together (there could be many different perspectives)?
- Who will coordinate, build and implement standard AAA features?
- How do we make best use of evolving work already done in standards and toolkits ?

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Technology Challenge

- Maintain AARNet's technology leadership by
  - participating in global research and education next generation demonstrations
  - participating in international standards groups
- Build and deploy systems using "off the shelf" components
- Develop software and services to support the requirements of AARNet members
- Disseminate the information gained to AARNet members

One bright idea after another

Thank You