ANN

A Scalable, High Performance Active Network Node

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The people

- PI: Guru M. Parulkar (ARL)
- Co-PI: Bernhard Plattner (TIK)
- Co-PI: Jonathan S. Turner (ARL)

- Staff: John DeHart (ARL)
- Grad: Dan Decasper (ARL/TIK)

  two Grads vacant

- Start: July 1st 1998

Project Goal

Design and
Implement a Prototype of a
Scalable, Active Networking Platform
supporting Traffic at
Gigabit Rates

The challenge

- Active networking should allow applications to control networking nodes and how their packets are processed and forwarded
- Requirement should not considerable degrade the performance of each network node

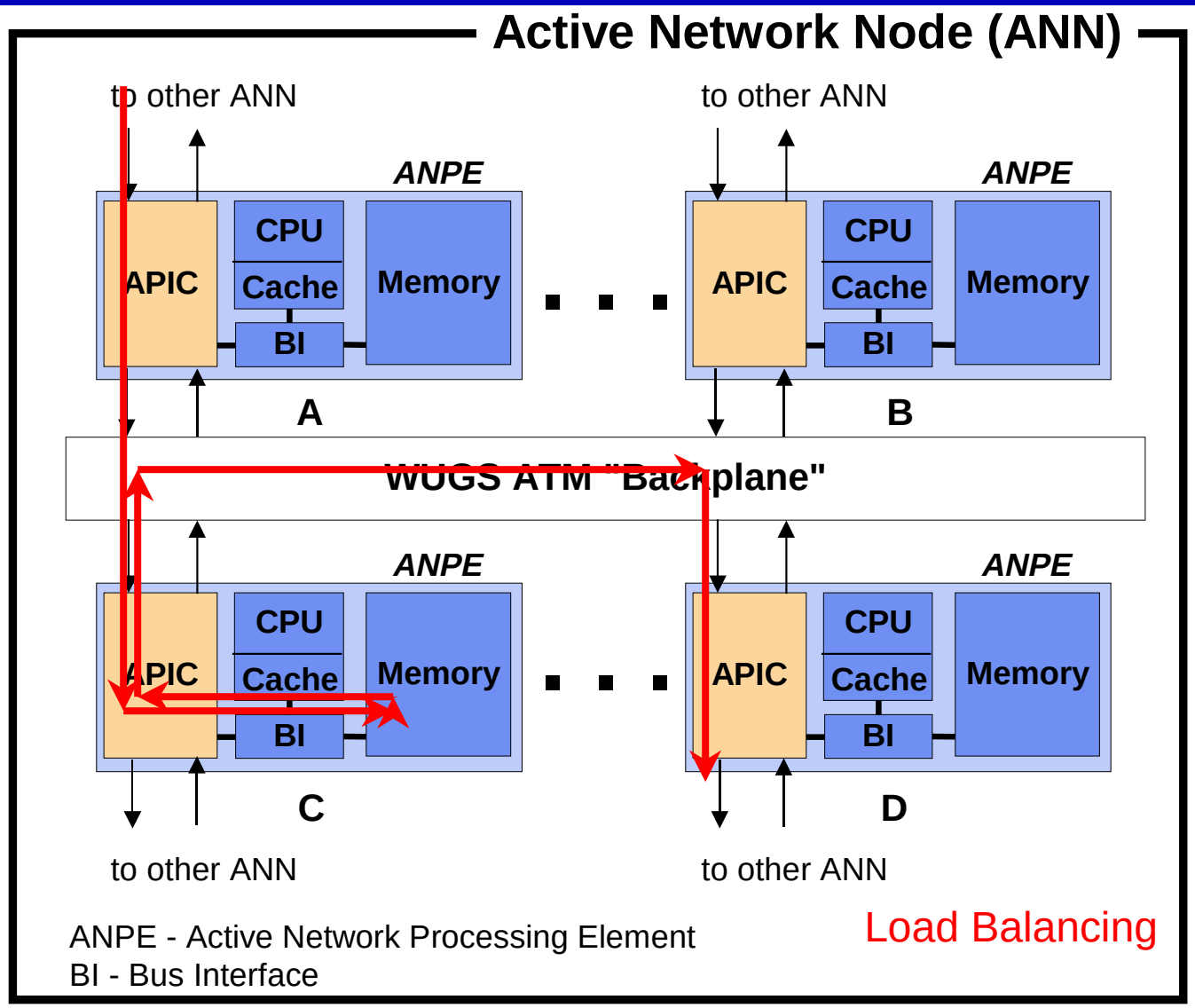
The challenge (Cont.)

- Fundamental challenge:
  - Allow relocating part of the processing from the end-systems into the network
  - minimize the amount of processing on a single node
  - make the processing as efficient as possible
  - keep the necessary flexibility and customizability typical to AN

Facing the Challenge

- Building a High Performance Active Network Platform consisting of
  - Scalable Hardware Platform
  - Distributed Code Caching
  - Streamlined Software Platform
- Applications
- Conclusions and Status

ANN Hardware



ANPE

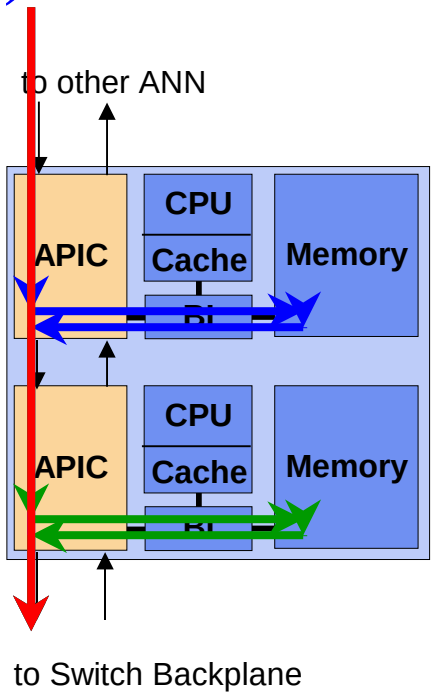
Active Network Processing Element (ANPE)

Default: Processed by first CPU

Load balancing: Processed by second CPU

Non active: cut-through

APIC performance: 1.2 Gbit/s

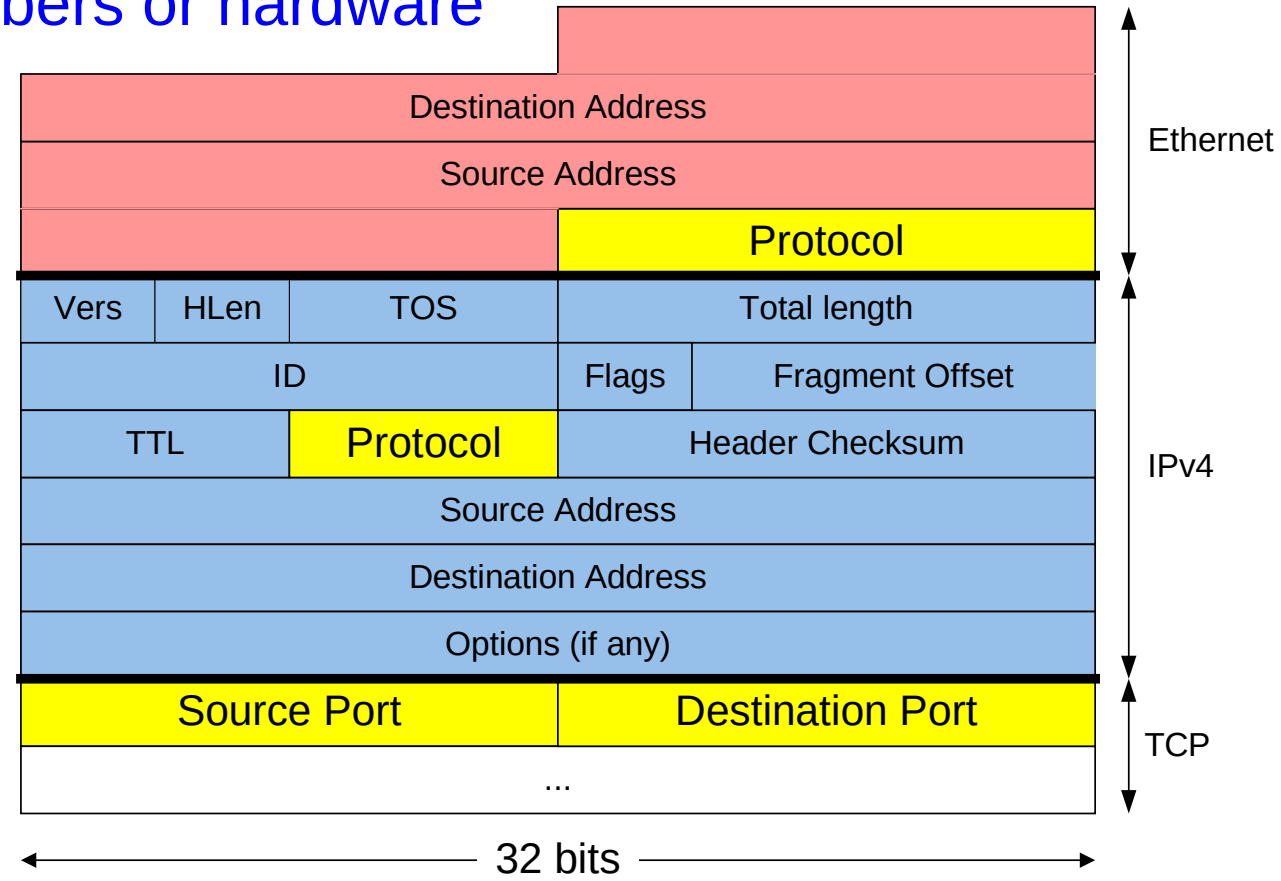


Software platform

- Important observations guiding our design:
  - Potential active networking functionality is more application specific than user specific
  - Number of active networking functions grows with the number of new applications and communication standards
  - Automatic installation and upgrading of such functions is very desirable

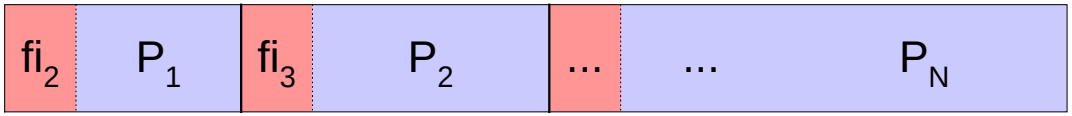
DAN: Function identifiers

- Ethernet/IPv4/TCP packet
  - Functions identified by Protocol numbers/Port numbers or hardware



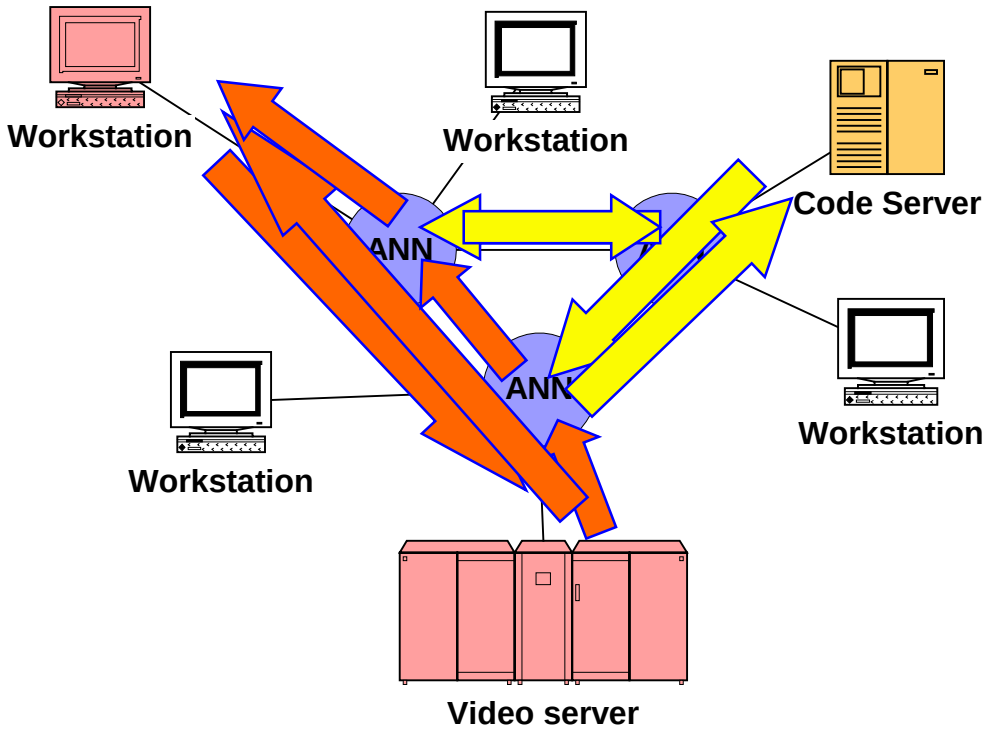
Distributed Code Caching

- Abstract view:



- Today:
  - Function identifiers commonly identify known functions or packet is dropped by the router.
- New:
  - Let router look for the implementation of the identified function on a Code Server!

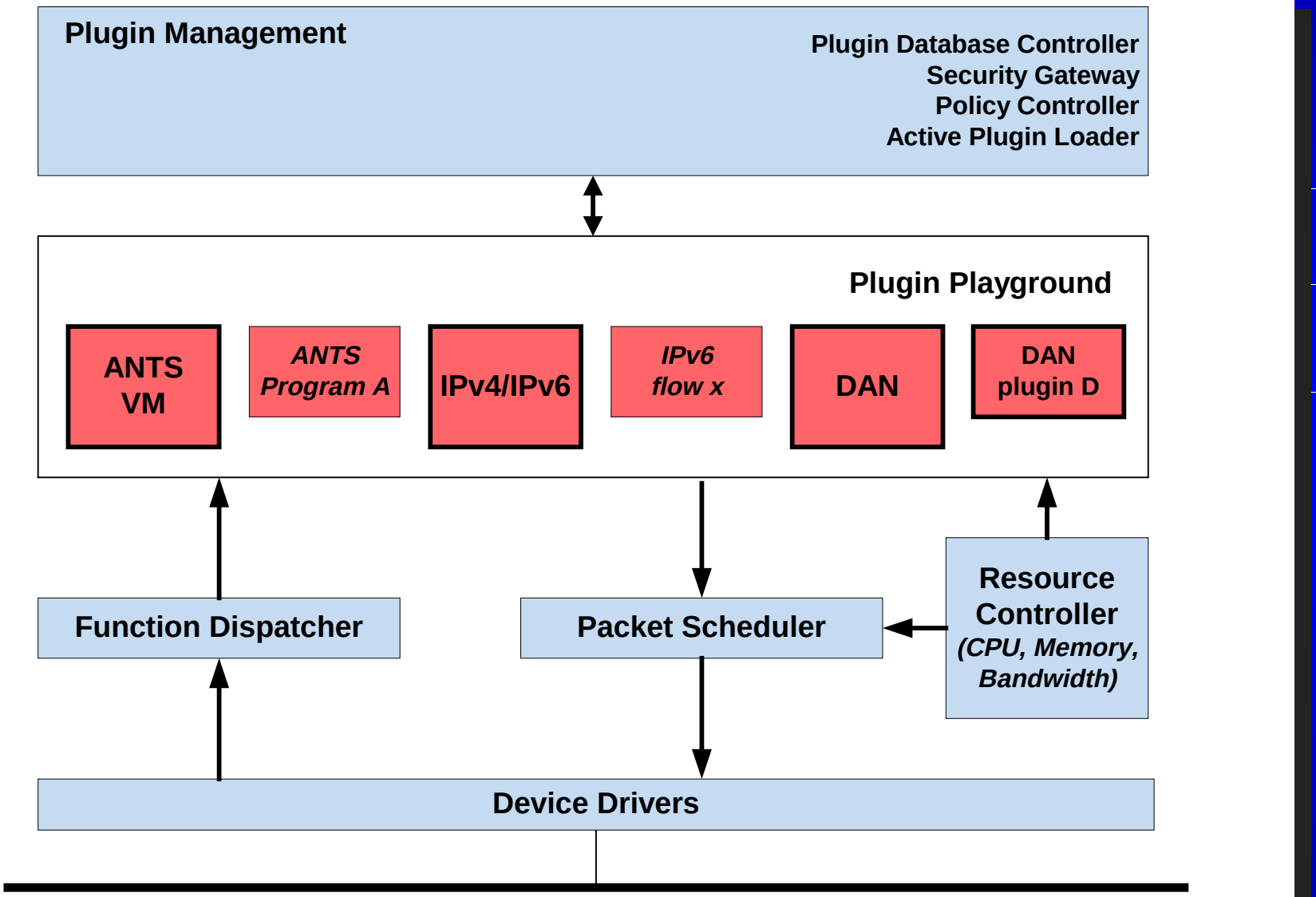
Distributed Code Caching (Cont.)



ANPE Software Architecture

- Implemented on top of NetBSD/Router Plugins
- Two types of Active Plugins:
  - Class Plugins (contain code)
  - Instance Plugins (run time configuration)
- All types of Plugins can be directly addressed by the upstream node using a Plugin Identifier (PID)

ANPE Software Architecture (Cont.)



Applications

- Automatic Network Protocol Deployment / Revision
  - especially well suited for IPv6 options
- Large-Scale reliable multicast
  - Faster recovery through topology knowledge
  - Application-specific multicast
- Congestion control for real-time video and audio
- High-performance media gateways for real-time multicast audio/video sessions

Conclusion and Status

- Most of the ideas presented exist only on paper so far
- Solid background in building high performance, modular router platforms
- Able to leverage results from previous project to jump start this project
- Web site: http://www.arl.wustl.edu/arl/projects/ann/ann.html