

Open source systems software at the University of Crete and FORTH

Polyvios Pratikakis

University of Crete - Visual Programming

Implementation of a general-purpose visual programming tool for syntax-directed editing

- Grammar as input, based on the idea of combining interactive syntax learning together with the art of programming as such
- Interactive grammar rules enabling to trace the entire production chain of any source code fragment
- Provision of a custom grammar definition language
- May configure facilities, styling, and also an interactively configurable toolbox of visual program elements
- <https://agapakis.github.io/MSV-Visual-Code-Chips>
- <https://github.com/agapakis/MSV-Visual-Code-Chips>

University of Crete - Open Source Radio

University of Crete Radio Station - All on Open Source Software

1. <https://gitlab.com/rastapank/public/-/wikis/home>
2. <https://github.com/UoC-Radio/JMPXRDS> - FM MPX signal generator
3. <https://github.com/UoC-Radio/mantato> - metadata server based on crossbar.io
4. <https://github.com/UoC-Radio/libguard> - plugin for picard to get rid against low quality audio

University of Crete - Open Source Radio

5. <https://github.com/UoC-Radio/audio-scheduler> - Audio Scheduler, automatic DJ
6. <https://github.com/UoC-Radio/flow-dashboard> - UI for Audio Scheduler
7. <https://github.com/UoC-Radio/icestreamer> - Encoding and streaming of the final audio stream
8. <https://github.com/UoC-Radio/audio-coffin> - Recording and Archiving of Radio Shows
9. <https://github.com/UoC-Radio/audio-link> - Replace audio cables with network traffic

FORTH - Systems Software

The screenshot shows the GitHub profile page for the 'Computer Architecture and VLSI Systems (CARV) Laboratory'. The header includes a search bar, navigation links for Pull requests, Issues, Codespaces, Marketplace, and Explore, and a user profile icon. The organization's name is 'Computer Architecture and VLSI Systems (CARV) Laboratory', with 4 followers, located in Heraklion, Greece, and a website link. A 'Follow' button is present. Below the header is a navigation bar with 'Overview' (selected), 'Repositories' (38), 'Projects', 'Packages', 'Teams' (5), 'People' (14), and 'Settings'. A tooltip above 'Overview' says 'Change your organization's avatar'. The main content area is titled 'Popular repositories' and lists six repositories: 'frisbee' (Go, 39 stars, 3 forks), 'knot' (Python, 30 stars, 1 fork), 'kreon' (C, 24 stars, 5 forks), 'FastMap' (C, 23 stars, 5 forks), 'parallax' (C, 20 stars, 3 forks), and 'H3' (C, 12 stars, 1 fork). The right sidebar shows 'View as: Public', a note about public visibility, a 'Get started with tasks' link, 'Discussions' section with a 'Turn on discussions' link, 'People' section with a grid of avatars and an 'Invite someone' button, and 'Top languages' section with a legend for C, Go, C++, Shell, and Python.



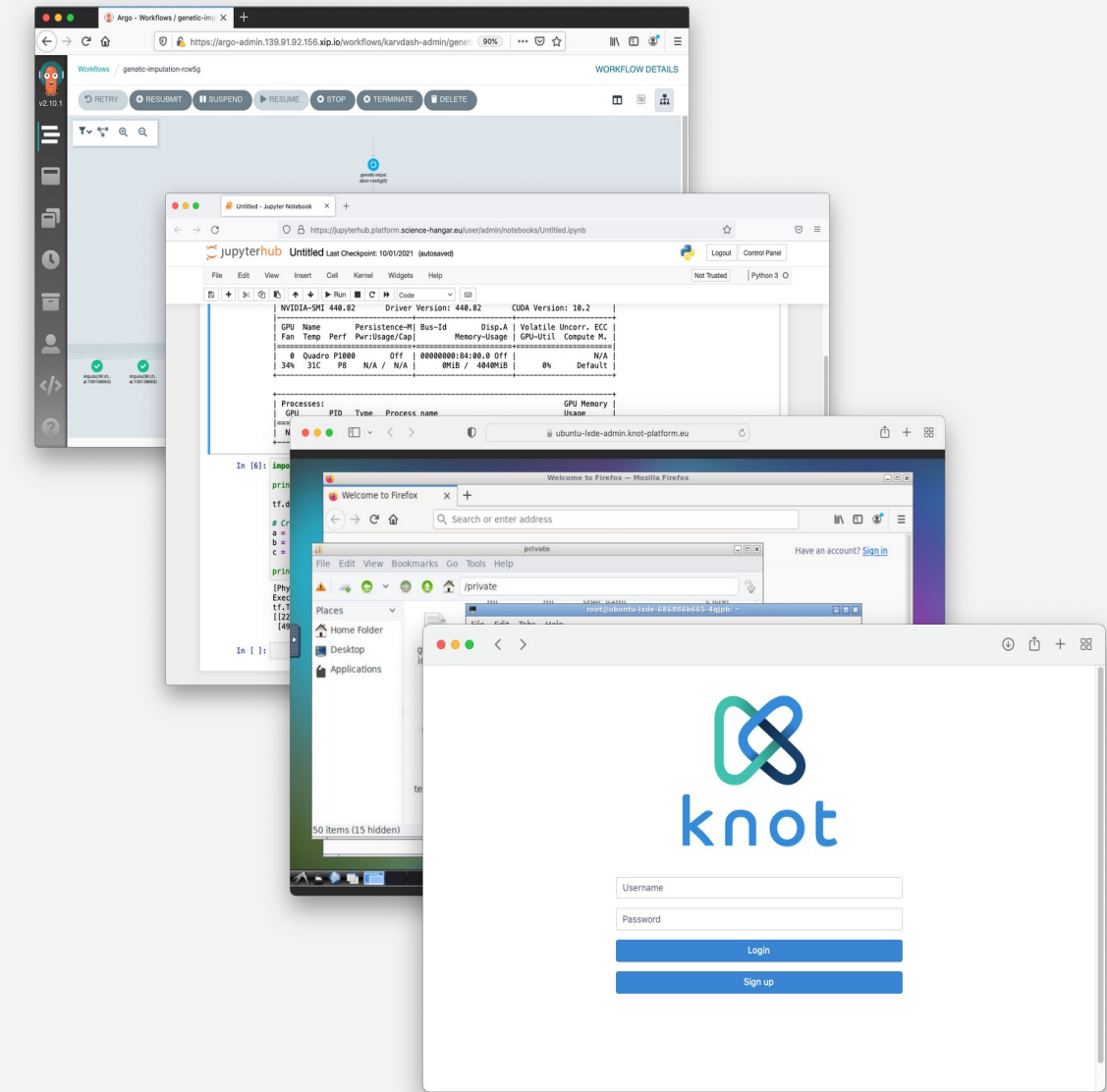
Open "https://github.com/organizations/CARV-ICS-FORTH/settings/profile" in a new tab

FORTH - Systems Software

Cloud-native platform for scientific workflows

<https://github.com/CARV-ICS-FORTH/knot>

- Based on Knot, an in-house, open-source software stack running on Kubernetes
- Includes web-based environment for workflow synthesis and execution
- Notebook frontend
- Focus on reproducibility → Containers and high-level tools
- Easy to use → Familiar web interfaces, transparent file management
- Scale → Local or in the Cloud, exploit accelerators, offload to HPC



FORTH - Systems Software

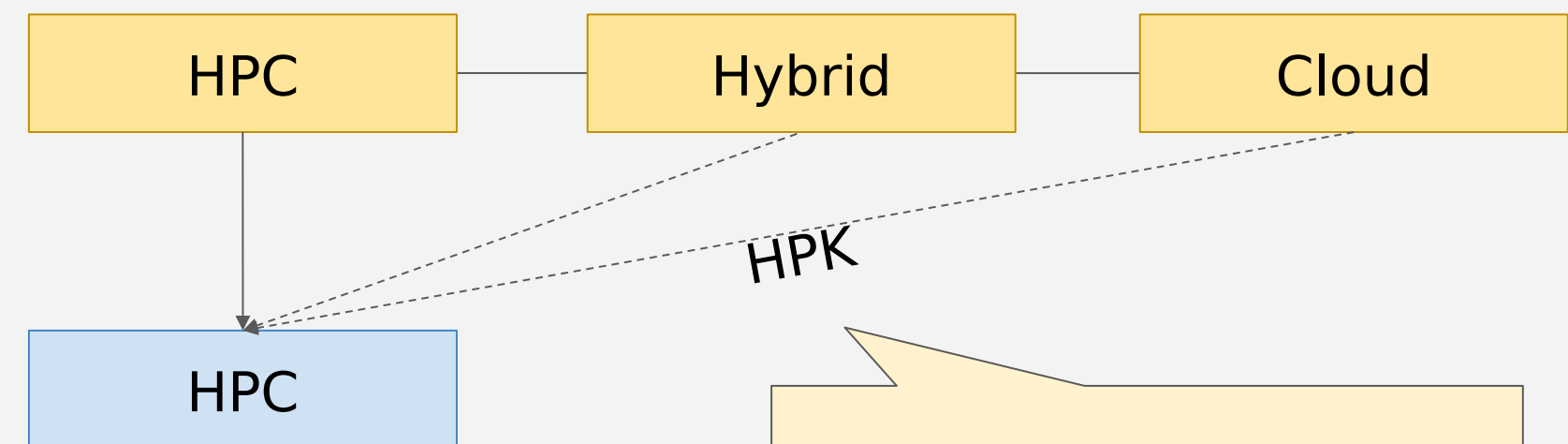
Cloud/HPC convergence

<https://github.com/CARV-ICS-FORTH/HPK>

- High Performance Kubernetes is the only practical way to run Cloud software in HPC as a user → HPK translates Kubernetes deployments to Slurm scripts
- All Kubernetes abstractions supported
- Resource management delegated to Slurm
- Uses Singularity/Apptainer for running containers
- Also supports running MPI steps as part of Cloud workflows
- Minimal system requirements



Embed Cloud in HPC



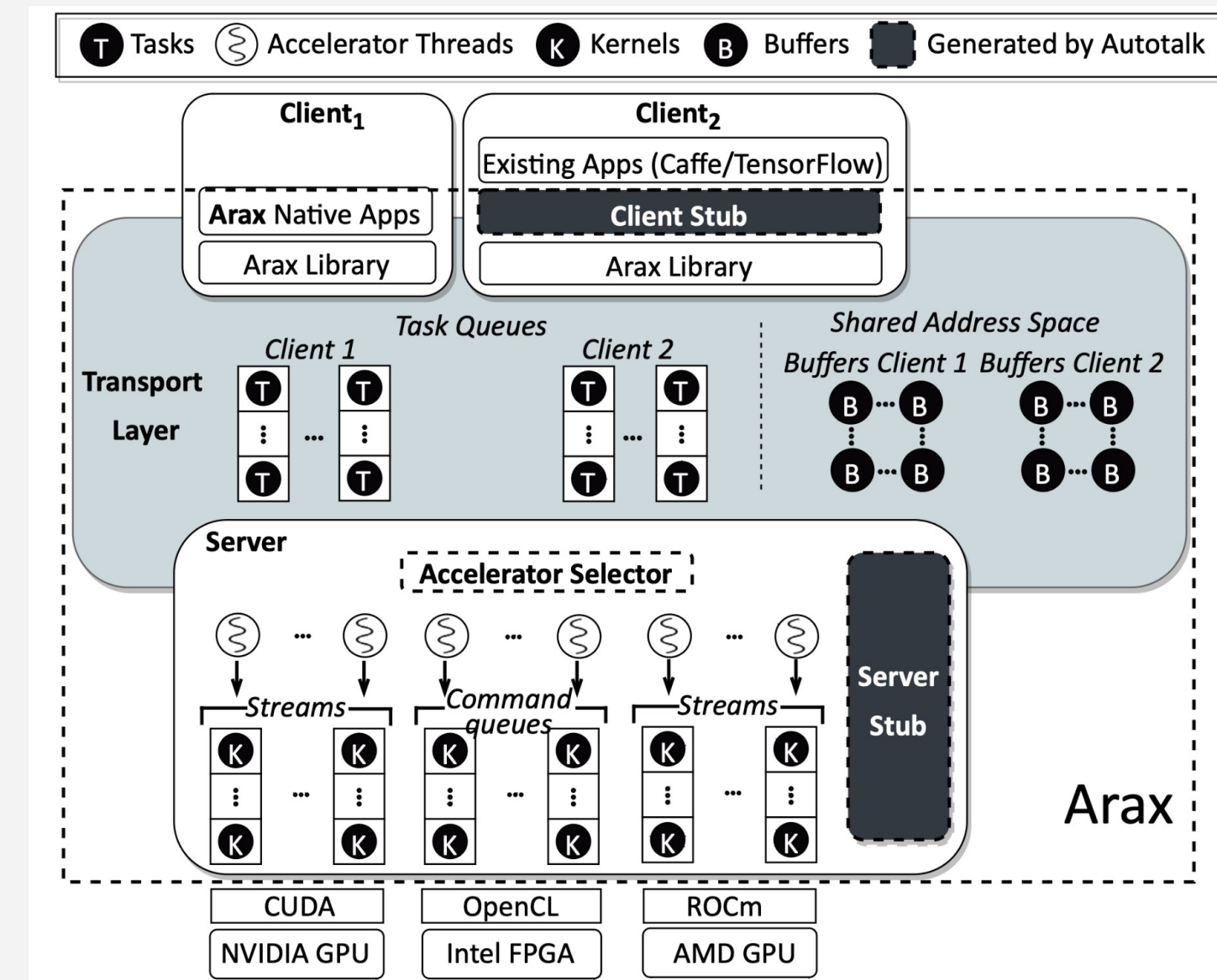
Run Cloud and hybrid workflows on HPC.

FORTH - Systems Software

Accelerator management

<https://github.com/CARV-ICS-FORTH/arax>

- Arax can integrate multiple, heterogeneous accelerators
- Manages available hardware → execution streams, memory
- Handles sharing of resources
- Reduces the programming effort
- Arax also works with CUDA
- GPUs are getting larger, inference workloads smaller
fine-grain resource sharing is important

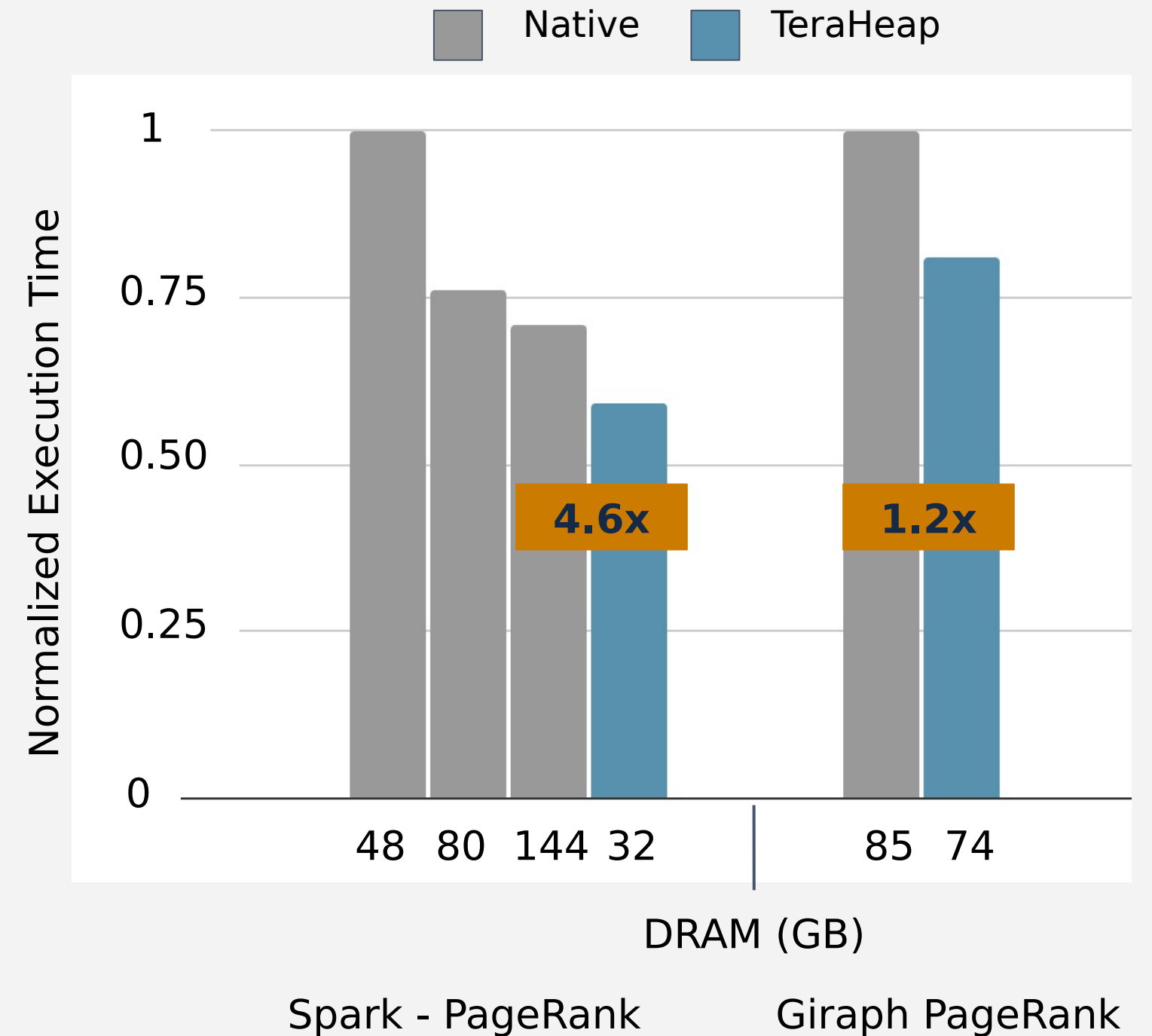


FORTH - Systems Software

Terabyte Heaps on the JVM

<https://github.com/CARV-ICS-FORTH/teraheap>

- Data Analytics requires very large heaps
- Garbage Collection Cost is Prohibitive
- Offloading to storage requires serialization/deserialization
- TeraHeap: OpenJDK extension to extend JVM Heap on NVMe devices
- Custom Garbage Collector
- Outperforms native Spark using 4.6x less DRAM
- Outperforms native Giraph using 1.2x less DRAM



University of Crete and FORTH

1. Thriving Ecosystem
2. Synergies
3. Open Source development and expertise
4. Lots more...