

GAP

Groups, Algorithms,
Programming

GAP

- Groups, Algorithms, Programming
- Free software platform for computation in abstract algebra and discrete mathematics
 - research mathematics
 - also teaching, physics, chemistry, CS,
 - 1986—, Aachen, St Andrews, Braunschweig, Fort Collins, Kaiserslautern, ...
 - Neubuser, Schonert
- Over 2000 citations

GAP Packages

- Much of the mathematical functionality of GAP is found in its 118 contributed packages.
- simple addons; major pieces of software; links to external software;....
- Totalling over 1M lines of GAP code, plus many C programs and libraries

HPC-GAP

- Adapted GAP kernel and run-time for parallel computation
 - **Problem:** GAP library architecture depends heavily on updating shared data to avoid repeating work, and a call to one part of the library may lead to calls to very many other parts
 - Exactly what you don't want with threads!
- novel architecture protects legacy code from inadvertent interference between threads
- Demonstrated performance gains and safety but only parts of the library and very little user code could be adapted within the project

GAP Architecture

- Kernel — C, 160K Lines
 - UI, memory management, OS interface, interpreter, some performance critical routines
 - all horribly mixed up with one another
- Library — GAP, 400K lines
 - almost all the real mathematics is here
 - kernel/library interface isn't as clean as we'd like
- Data Libraries —
 - each manages it's own data using it's own GAP programs, similar interfaces but no common architecture
 - some can access remote data
- Packages —
 - Maintained separately. Over 100 now, standard interface with GAP allows integration, loading on demand, integration of documentation, versioning