

## Executive Summary of NA-MIC Interactions with NAC(P41) and BIRN

### NA-MIC

- National Level Science, National Level Outreach
  - Less than 15% of direct funding stays at BWH
  - Large majority of investigators working at sites other than BWH
- Compatible with commonly available equipment and resources
- Core infrastructure that is broadly deployable
- Focus on tool and algorithm development (evolving Cores 1 and 2)
- Platform for national effort to develop image computing software engineering framework

### BIRN

- National Level Science, National Level Outreach
  - Multi-site collaborative clinical research
  - Focus on image calibration, high-speed networking, grid computing, shared databases and large-scale image repositories
- Adapts and applies algorithms and application software from other efforts
- Platform for NA-MIC

### NAC

- Local Level Science, National Level Outreach
  - Close interactions of Local BWH expertise
  - Leverage Unique BWH environment and infrastructure
  - Custom software
- Develop "pioneering solutions"
- Focus on science questions driven by diverse independent collaboration
- Precursor for some NA-MIC development projects

The NA-MIC, NAC, and BIRN efforts form a mutually beneficial constellation of research initiatives, each with a distinct area of focus and set of priorities, but sharing a common development vision. There are natural interfaces between these projects where interoperability is necessary, but in reality each project has unique deliverables that rely and build upon components provided by the other efforts. In particular, the Neuroimage Analysis Center, as a P41 BTR resource center, brings together a set of collaborators who work together closely, primarily at a local institutional setting (BWH) in order to develop pioneering solutions and to disseminate the results nationally, as well as to make the equipment and related facilities available to the wider community. In contrast, the BIRN and NA-MIC efforts are national consortia aimed at creating solutions that will be workable across a range of institutional settings and different situations.

Thus the differences in scope between NAC and BIRN, and NA-MIC, allow NAC to push the envelope in areas where it can draw on local expertise and the unique environment at BWH. For example, the diffusion tensor based white matter neuroimaging efforts within NAC make use of custom and rapidly evolving MRI pulse sequences not yet widely available outside of the BWH environment. Accordingly, the analysis of these images relies on custom software optimized for the computer infrastructure available at BWH. NAC is, however, dedicated to making these unique resources available through its outreach activities, though this is not the exclusive focus of the research efforts. In contrast, a focus on outreach activities at the national level must work within the constraints of commonly available equipment and resources in their efforts to develop an infrastructure that is deployable to all sites. The fruitful interplay of pioneering local efforts, with widely reproducible and robust national efforts, informed by the best practices at multiple sites, thus provides a significant strength to the research agenda.

In addition to the differences in scope that differentiate NA-MIC and BIRN from the NAC, the NA-MIC and BIRN national efforts themselves have very different scientific targets. The BIRN efforts are fundamentally infrastructure development projects to enable multi-site collaborative clinical research. In particular, the BIRN testbed efforts are heavily focused on multi-site image calibration, nationwide high speed networking, grid computing, and shared databases and large-scale image repositories. Key technology components from several collaborating P41 sites have been adopted, and extended where needed, by the BIRN testbeds in order to prove the efficacy of the infrastructure. Importantly however, the BIRN efforts do not directly fund the development of new algorithms or the corresponding application software methodology -- they only support the adaptation and utilization of algorithms and software within the BIRN testbeds. In contrast, NA-MIC was specifically conceived to address the need for fundamentally new computer science approaches. In one sense, NA-MIC can be seen as an effort to develop the next generation of image computing algorithms that exist in a complementary relationship to, and build upon, the BIRN infrastructure. This new category of algorithms and software engineering practice relies on the well-curated data repositories and abundant grid computing resources provided by BIRN to address the large-scale population studies needed to extract statistically significant findings in measurements of the subtle effects of disease and treatment response. Thus in the burgeoning field of biomedical computing, it is vital to pursue several distinct research agendas -- such as those followed by NAC, BIRN, and NA-MIC in accordance with the mandates of the NIH programs they serve -- while coordinating the efforts so that the scientific results work well together and avoid redundancy.