



February 12<sup>th</sup> 2010, CCIRN

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## **perfSONAR Efforts in the U.S.**

# Outline

- perfSONAR History
- Architecture Overview
- Adoption
- NSF sponsored perfSONAR Workshop

# Motivation for perfSONAR

- Most organizations perform monitoring and diagnostics of their own network
  - SNMP Monitoring via common tools (e.g. [MRTG](#), [Cacti](#))
  - Enterprise monitoring (e.g. [Nagios](#))
- Networking is increasingly a cross-domain effort
  - International collaborations in many spaces (e.g. science, the arts and humanities) are common
  - Interest in development and use of R&E networks at an all time high
- Monitoring and diagnostics must also become a cross-domain effort

# perfSONAR Inception

- *perfSONAR* originated from discussions between [Internet2's](#) End-to-End Performance Initiative ([E2Epi](#)), and the [Géant2](#) project in September 2004.
- Members of the [OGF's](#) (then GGF) NM-WG provided guidance on the encoding of network measurement data.
- Additional network partners, including [ESnet](#) and [RNP](#) provided development resources as well as served as early adopters.
- The first release of *perfSONAR* branded software was available in July 2006.
- All *perfSONAR* branded is open source
- All products looking to be labeled as *perfSONAR compliant* must establish protocol compliance based on the public standards of the OGF



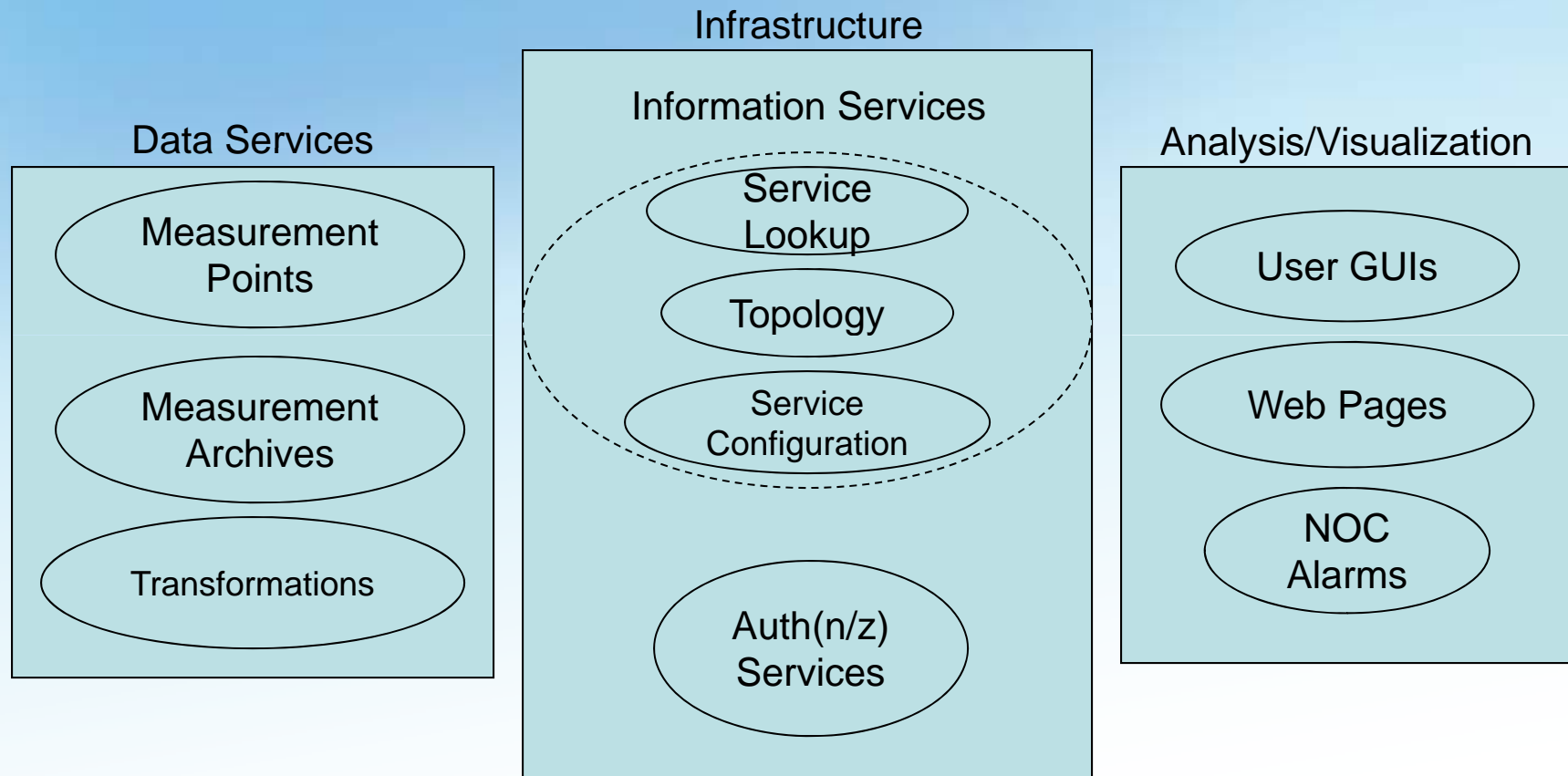
# What is perfSONAR?

- A collaboration
  - Production network operators focused on designing and building tools that they will deploy and use on their networks to provide monitoring and diagnostic capabilities to themselves and their user communities.
- An architecture & set of communication protocols
  - Web Services (WS) Architecture
  - Protocols established in the Open Grid Forum
    - Network Measurement Working Group ([NM-WG](#))
    - Network Measurement Control Working Group ([NMC-WG](#))
- Several interoperable software implementations
  - [perfSONAR-MDM](#)
  - [perfSONAR-PS](#)
- A Deployed Measurement infrastructure

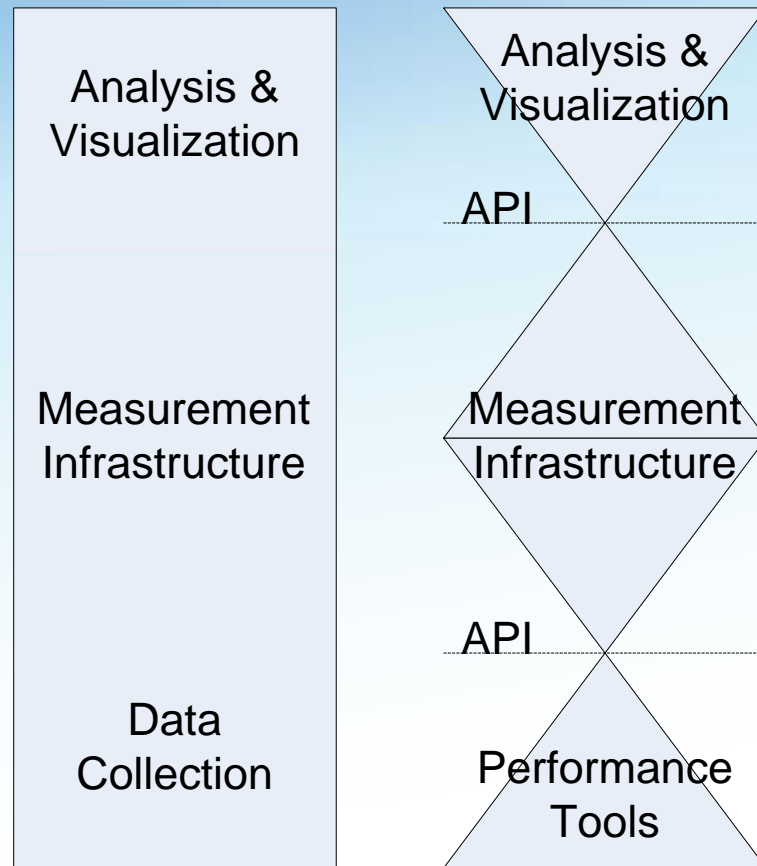
# perfSONAR Architecture

- Interoperable network measurement middleware (SOA):
  - Modular
  - Web services-based
  - Decentralized
  - Locally controlled
- Integrates:
  - Network measurement tools and archives
  - Data manipulation
  - Information Services
    - Discovery
    - Topology
    - Authentication and authorization
- Based on:
  - Open Grid Forum Network Measurement Working Group schema
  - Currently attempting to formalize specification of perfSONAR protocols in a new OGF WG (NMC)

# perfSONAR Components



# Decouple 3 phases of a Measurement Infrastructure





# perfSONAR Adoption

- Networks
  - APAN, CENIC, CSTNET, ESnet, Geant, Gloriad, GPN, Internet2, JGN2, LONI, MAX, NOX, NSERNET, RNP, Starlight, Transpac2, UEN
- Labs
  - ANL, BNL, FNAL \*\*, NERSC, PNNL, PSC, SLAC
- International Sites
  - Chinese University of Hong Kong, Chonnam National University (Korea), KISTI (Korea), Monash University (Melbourne, Victoria, Australia), MRREE (Lima, Peru), NCHC (Taiwan), NICT (Japan), Simon Frazier (Burnaby, BC, Canada), Thaisarn Nectec (Bangkok, Thailand), UNIFACS (Salvador, Bahia, Brazil)
- Other
  - Cobham, Northop Gruman, Ocala Electric, Philadelphia Orchestra, REDDnet
- Current
  - <http://www.perfsonar.net/activeServices/IS/>
- Evaluation
  - JET, USCMS, GENI
- Universities
  - Boston University \*
  - College of William and Mary
  - George Mason Univ
  - Georgia Tech University
  - Hope College
  - Indiana University \*
  - Leeward Community College
  - Louisiana State University
  - Michigan State University \*
  - Middle Tennessee State University
  - Northwestern \*\*
  - Oregon State
  - Penn State University
  - Southern Methodist University \*
  - Syracuse
  - Texas A&M University \*
  - Tufts \*
  - University of California Los Angeles
  - University of California San Diego \*\*
  - University of Chicago \*
  - University of Connecticut
  - University of Delaware
  - University of Hawaii
  - University of Michigan \*
  - University of Northern Iowa
  - University of Oklahoma \*
  - University of Texas \*
  - University of Utah
  - University of Wisconsin (Condor)
  - University of Wisconsin (Madison) \* \*\*
  - Vanderbilt \*\*
  - University of Florida \*\*

\* USATLAS

\*\* USCMS

# perfSONAR Evolution, Vision

- perfSONAR grew out of the efforts of independent and collective efforts several organizations (ESnet, GÉANT, and Internet2)
- Basic architecture laid out in in 2004; it has evolved and grown ever since
- We now have 2+ implementations of one common protocol
- Aggressive adoption of perfSONAR by US LHC ATLAS community
- Growing adoption across campuses and networks worldwide
  - Deployments approaching critical mass
- Looking for ways to shape evolution of infrastructure into the future
  - Incorporate (new) NSF-funded network research ideas, tools into operational networks
  - Support (new) network researcher consumption needs
  - Address deployment and operational concerns
  - Meet users needs
  - Shape development of analysis tools, user interfaces to solve real problems

# pS Workshop – Proposal to NSF

- Organization of an NSF-sponsored perfSONAR workshop
  - open to everyone
  - prospect for further funding (annual event)
  - bring together perfSONAR developers, operators, and network researchers
- Chart way forward
  - system of ubiquitous end-to-end performance monitoring
  - using perfSONAR infrastructure
  - across networks used/operated by the R&E community
- Workshop impact
  - creation of an ongoing community of interest,
  - Report community consensus on potential research focus areas, open issues, and operational requirements
  - basis for continued annual workshops to further these goals

# pS Workshop - Specific Goals

- Identify unimplemented techniques & network research focus areas with existing ideas to help solve problems of real world end-to-end performance problems
- Identify required perfSONAR infrastructure components for network operators, end-users, network researchers, & virtual organizations, plus any missing components
- Determine operational requirements & best practices for ongoing & on-demand measurements end-to-end, cross-domain, & trans-oceanic links
- Create a larger perfSONAR community seeded by the Workshop participants, including strategies for engaging new:
  - network researchers
  - domain science researchers
  - science communities
  - networks

# Audience

- Workshop will bring together:
  - researchers
  - applications developers
  - network developers
  - network managers
  - others with an interest in network performance measurement
- Although Workshop is open to all, invitations to:
  - key network researchers
  - broad spectrum of representatives from governmental, educational, and commercial network operators
  - those with expertise and authority to advance the development and deployment of perfSONAR.

# Anticipated Outcomes

- Community of perfSONAR developers, deployers, & network researchers who work together to continue the evolution of a global performance monitoring infrastructure
- List of open issues in the standards, development, deployment, & operations spaces to challenge researchers & network operators going forward
- Continuing community conversation through annual follow-on workshops
- Workshop report documenting findings and open issues

# Logistics

- High level tutorial preceding to get researchers (and others) up to speed
- A 2-day Workshop (run 9am-6pm and 9am-1pm) held in ~July 2010 at a hotel near the NSF office
  - venue for 80-100 participants, including 4 breakout rooms for 30 participants each
  - Executive Committee will guide discussion, take input from the larger group, and pull those recommendations together into a Workshop report that reflects the disparate community inputs
  - open participation but Executive Committee will invite ½ Workshop's capacity
- Registrants required to submit a paragraph on
  - interest in the Workshop
  - how they can contribute
  - if they wish to present a poster, they may describe that
  - if number of registrants or the number of posters exceeds the capacity, the Executive Committee will select
- Internet2 will
  - provide a registration page
  - publicize the meeting in appropriate venues
- Travel awards will be made by the PI and a subset of non-eligible Executive Committee members to members of the Executive Committee and/or international participants who lack alternate funds to attend and merit such awards.

# Current confirmed “Executive Committee”

- Eric Boyd, PI
- Matt Zekauskas, co-PI
- Grover Browning /NLR, IU
- Ann Harding / DANTE
- Roberto Sabatino / DANTE
- Augusto (Suruagy) Montiero / RNP
- Joe Metzger / ESnet
- Brian Tierney / ESnet
- Carla Hunt / MCNC
- Kitamura Yasuichi / APAN-JP
- Mark Crovella / BU
- Martin Swany / UD
- Malathi Veeraraghavan (UVA)
- Victor Frost / NSF
- Taieb Znati / NSF
- Jennifer Schopf / NSF
- Grant Miller / NCO
- Paul Love / NCO, JET
- Rich Carlson / DOE





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For more information, visit [psps.perfsonar.net](http://psps.perfsonar.net)