Instrumentation and Measurement in GENI

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Our team

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- Tristan Halverson – UW Madison
- Joel Sommers – Colgate University
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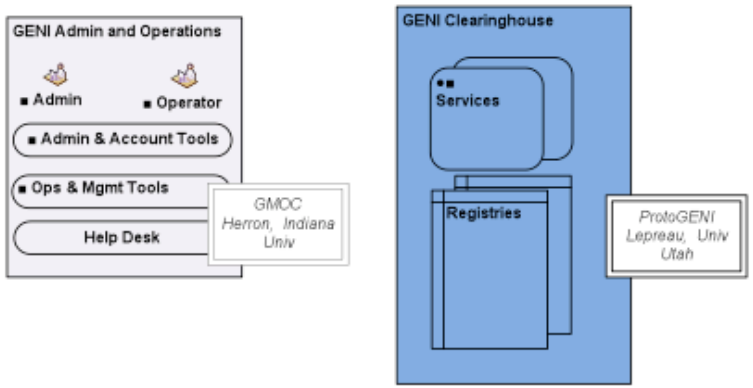
Motivation

- **The ability to *measure* is of intrinsic value to any experimental instrument**
- **The diversity and size of experiments envisioned in GENI calls for comprehensive measurement capability**
  - **Data gathering**
  - **Transformation**
  - **Analysis and visualization**
  - **Archival**

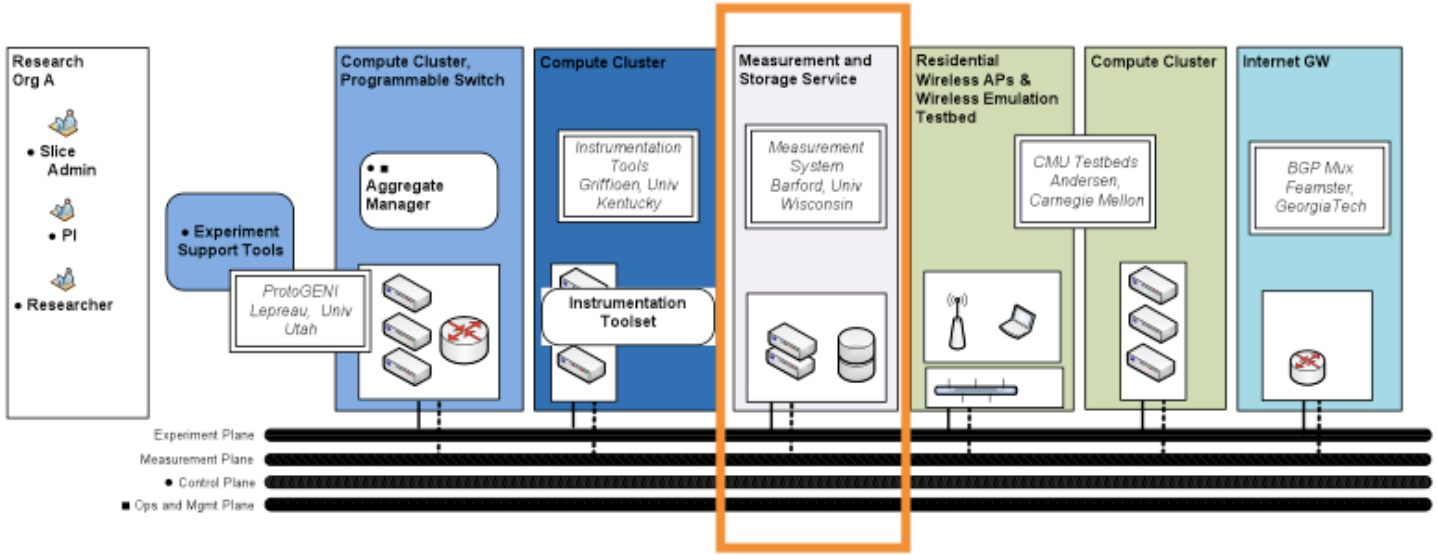
Objectives

- **Identify and document key requirements for measurement infrastructure**
  - **Focus on "what" and "how" to measure**
- **Develop measurement protocols and systems that support a broad set of experiment**
  - **Subset of possible measurements**
  - **Available to multiple control frameworks**
- **Develop a measurement system test and evaluation infrastructure**
- **Deploy an initial set of measurement systems on GENI substrate**

Spiral 1 context



ProtoGENI cluster



What to measure?

- "Application" behavior
  - *E.g.,* logs of activity from the software running in a slice on a node
- Node behavior
  - *E.g.,* MIB or syslog data available from nodes
- Link behavior
  - *E.g.,* packets or frames on a link
  - Our initial focus
- Path behavior
  - *E.g.,* flows between nodes across a series of links

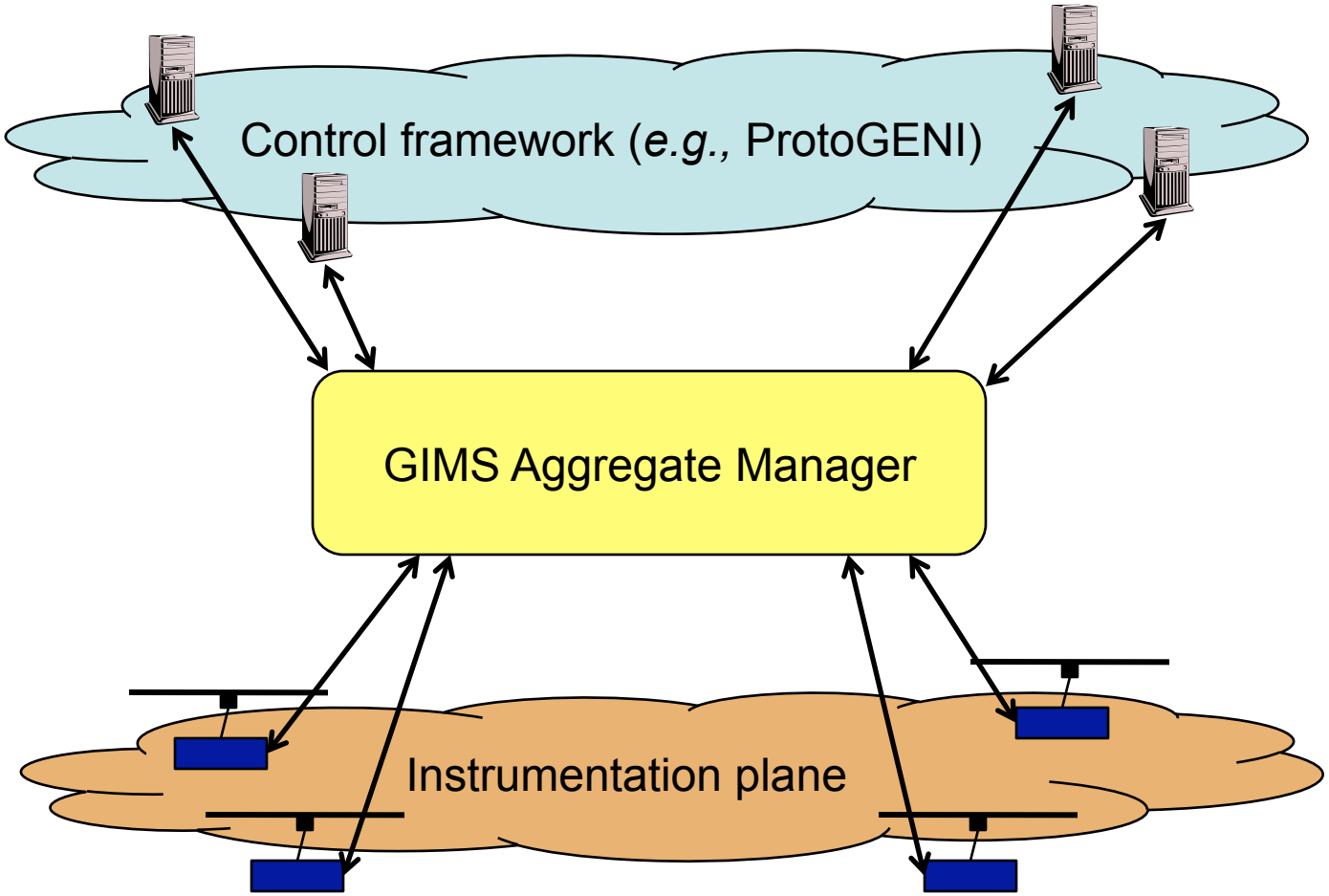
How to measure (1)?

- Subproblem: how to gather data (node, link, path)
- Specification
  - Users specify what, where and when to measure
- Instrumentation
  - Devices required to gather specified data
- Data flow
  - Protocols required to enable specification – data gathering - storage
- The primary focus of our team's initial efforts

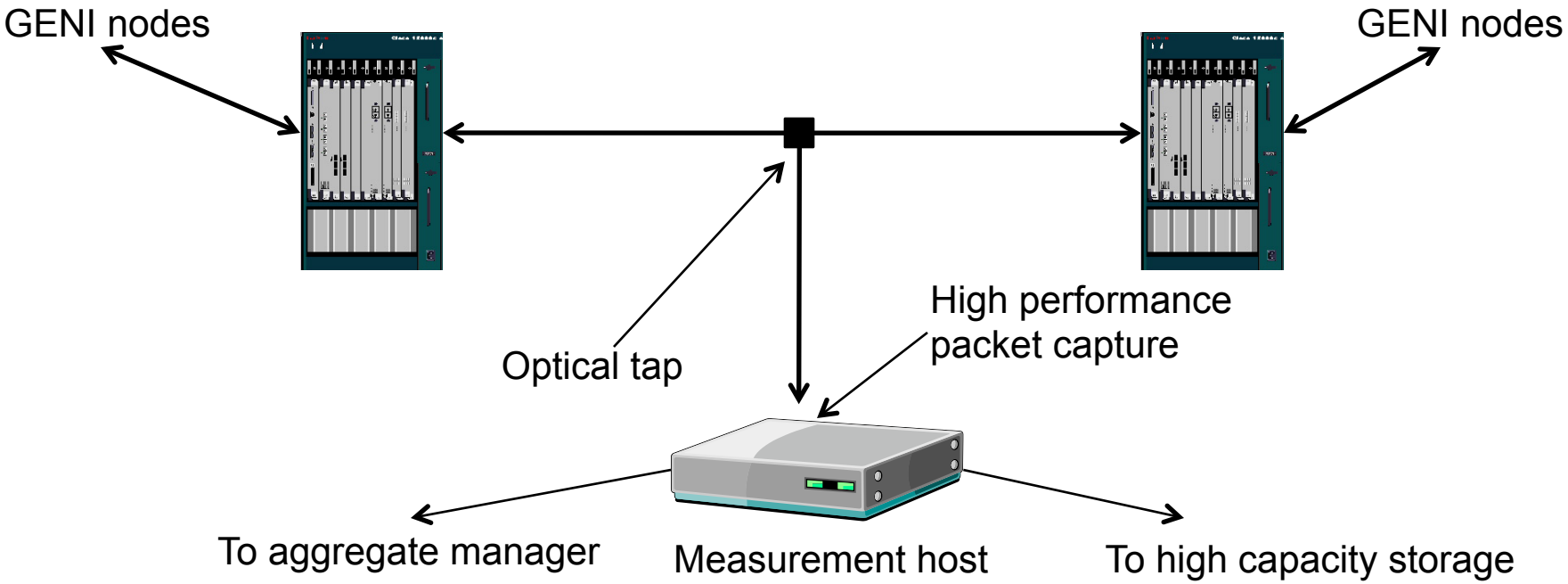
How to measure (2)?

- Subproblem: bridge the gap between data gathering and facilitating experiments
  - E.g., Paxson, IMC '04
- Policy enforcement
  - E.g., user groups have access to different data
- Documentation/data catalog
  - Meta data on experiments
- Analysis and visualization tools
  - Facilitate consistent, repeatable evaluation
- An important secondary focus for our team

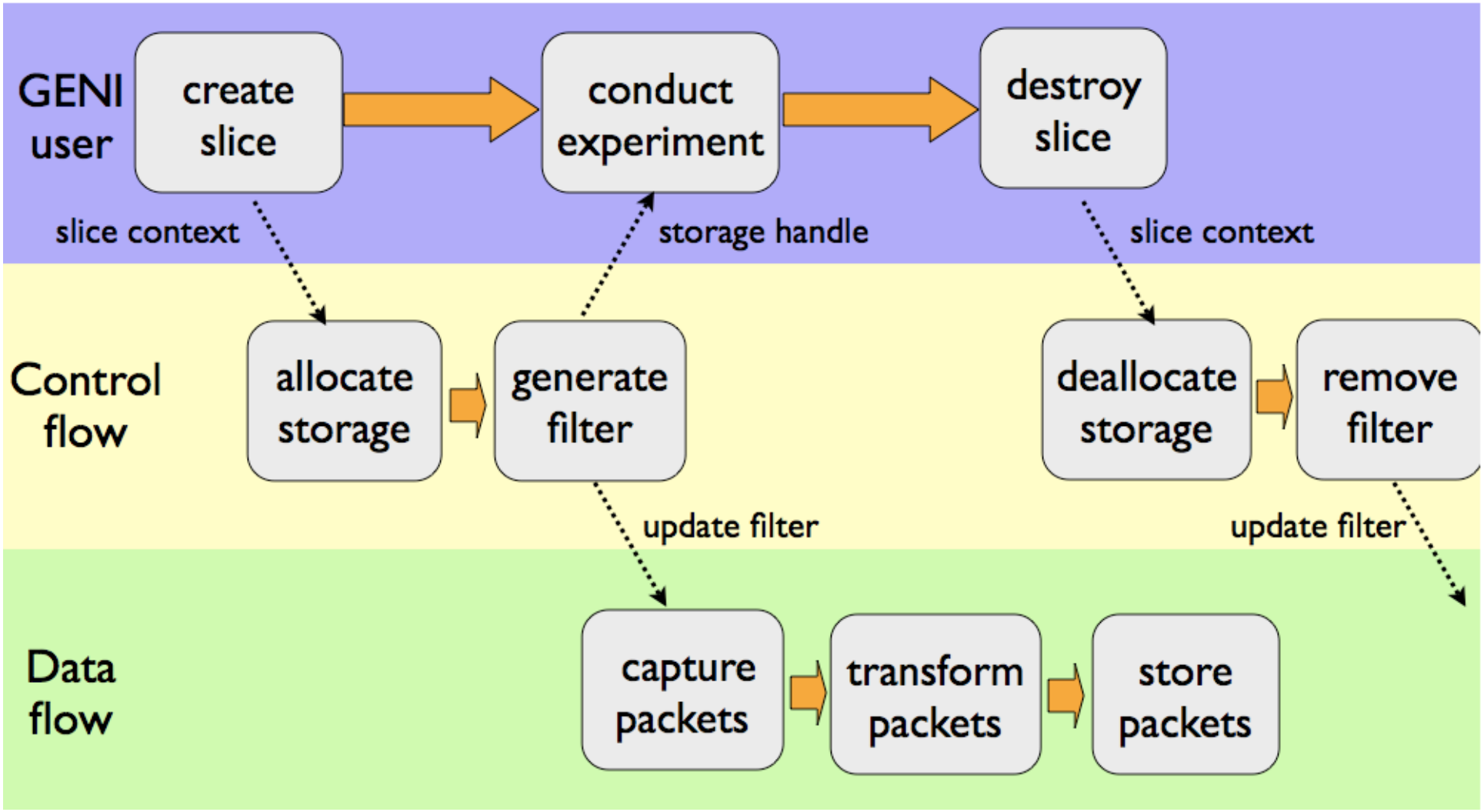
System design



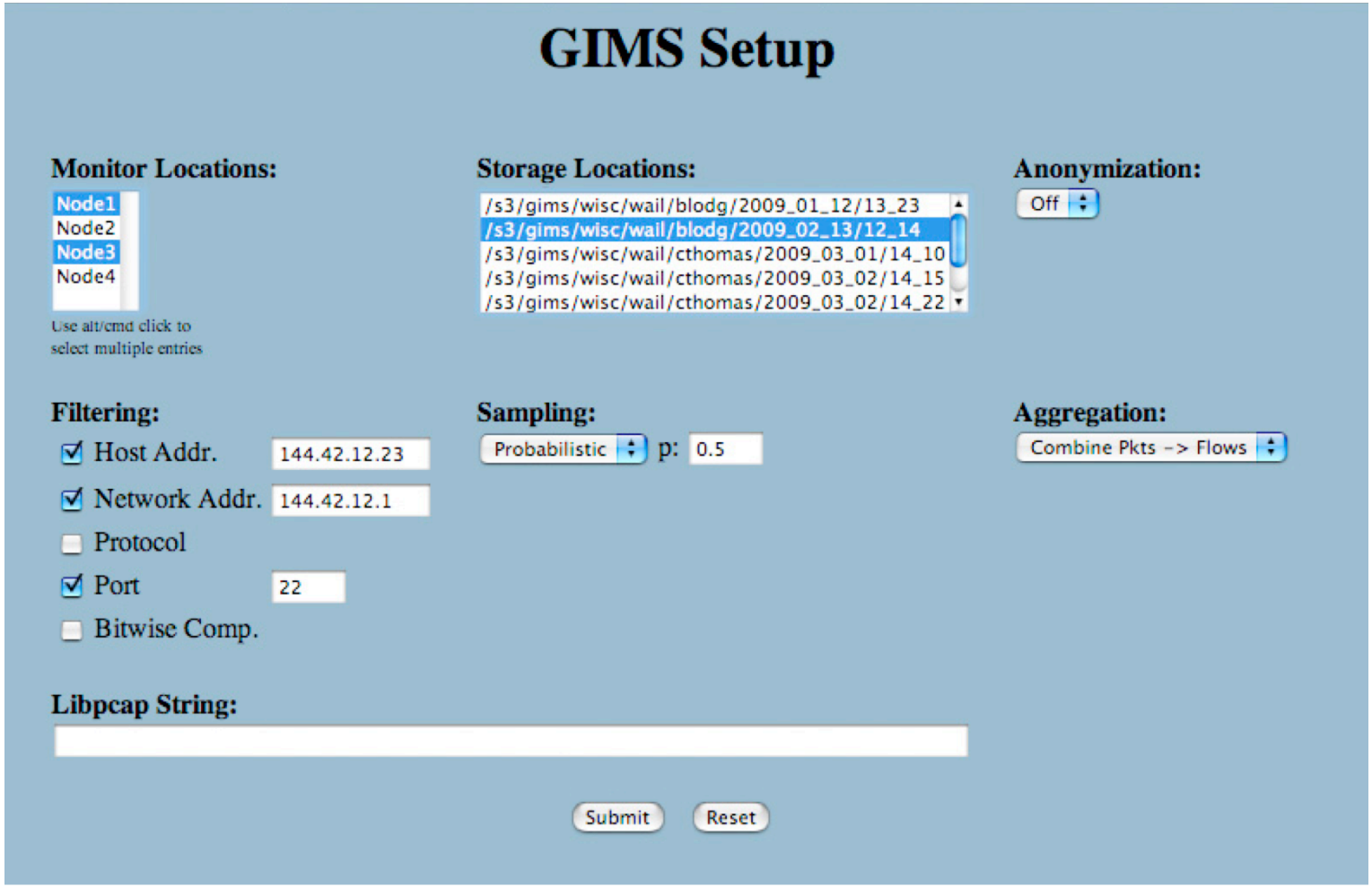
Instrumentation



Control and data flow



UI mockup


GIMS Setup
Monitor Locations:
Node1
Node2
Node3
Node4
Use alt/cmd click to
select multiple entries
Storage Locations:
/s3/gims/wisc/wail/blodg/2009_01_12/13_23
/s3/gims/wisc/wail/blodg/2009_02_13/12_14
/s3/gims/wisc/wail/cthomas/2009_03_01/14_10
/s3/gims/wisc/wail/cthomas/2009_03_02/14_15
/s3/gims/wisc/wail/cthomas/2009_03_02/14_22
Anonymization:
Off
Filtering:
Host Addr.
144.42.12.23
Network Addr.
144.42.12.1
Protocol
Port
22
Bitwise Comp.
Sampling:
Probabilistic
p:
0.5
Aggregation:
Combine Pkts -> Flows
Libpcap String:
Submit
Reset

Year 1 timeline

- **Generate requirement and functional specification for measurement systems**
  - **Draft is nearly complete**
- **Develop prototype that can be deployed and demonstrated in WAIL**
  - **Focus on data flow protocols and control framework integration to enable measurements to be specified and data to be gathered**
  - **Build is underway**
  - **Demo at GEC5**

Thank you!