

How We Use the NSFCloud to Save the World

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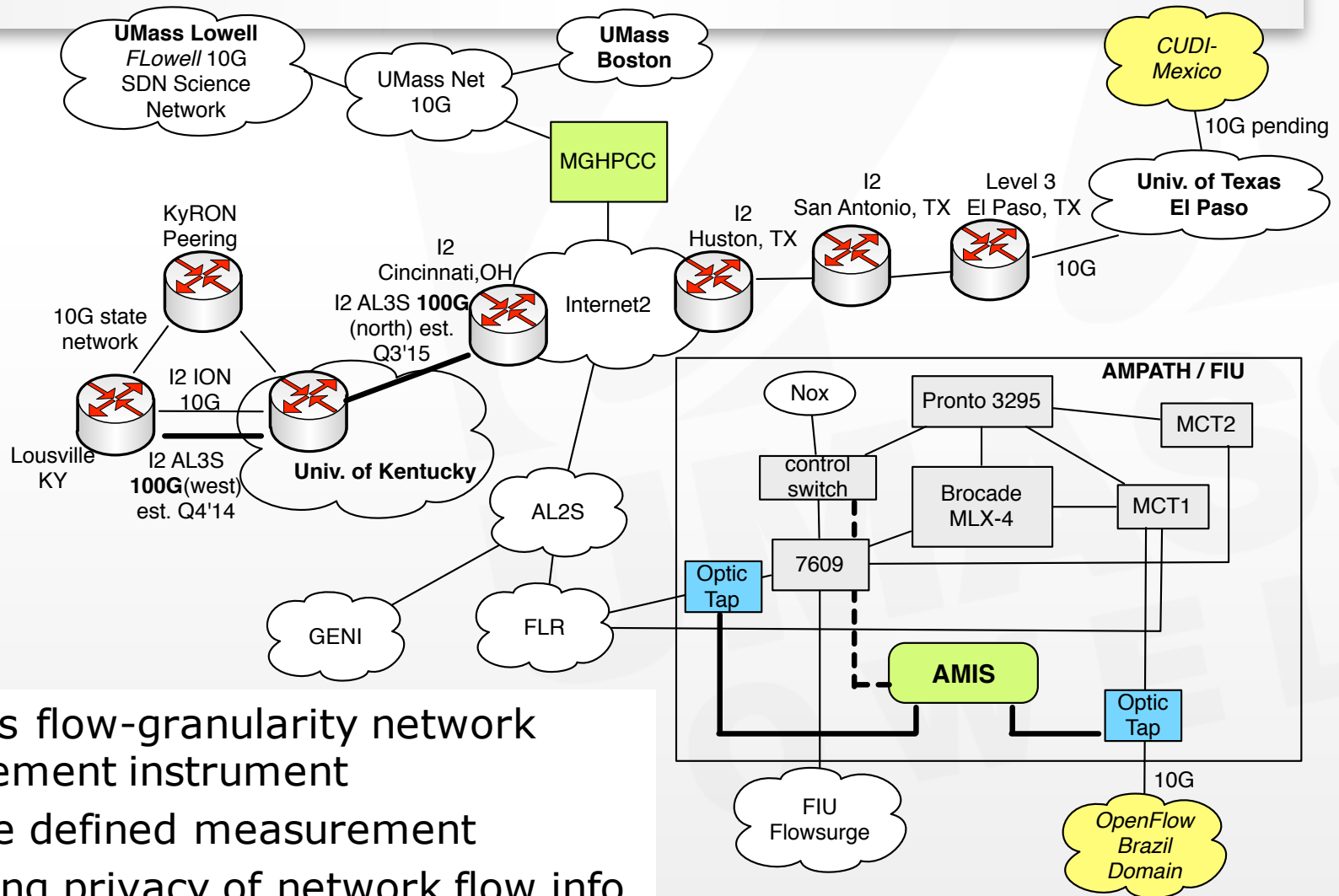
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Outline

- ▶ NSF IRNC AMIS Project
- ▶ NSF CICI STREAMS Project
- ▶ HeteroSpark Project
- ▶ Wish List for Future Research Cyberinfrastructure

IRNC AMIS at a Glance



- 40+Gbps flow-granularity network measurement instrument
- Software defined measurement
- Preserving privacy of network flow info
- In-depth flow analytics

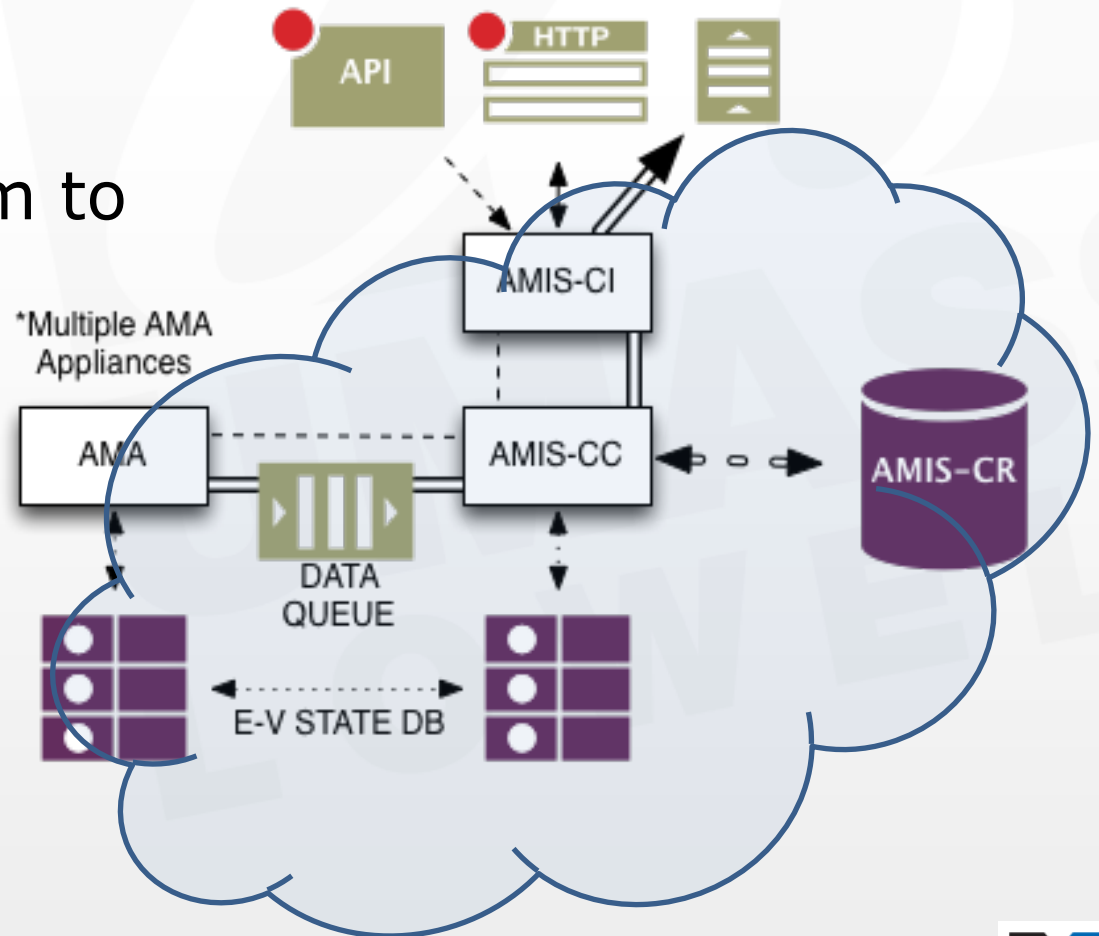
Challenges in Measurement Data Analytics

- ▶ Diversity of analytics algorithms
 - Privacy preserving algorithms: differential privacy, searchable encryption, etc.
 - reports of network activities: traffic matrix, flow-level, burst-level
 - Predictive: e.g. congestion event prediction
- ▶ Variations on Traffic Load
 - variations on compute loads
 - Variations of network I/O demands
 - Streaming requirements

Measurement Data Management and Processing in the Cloud

- A centralized Operational Data Management System to manage distributed AMAs

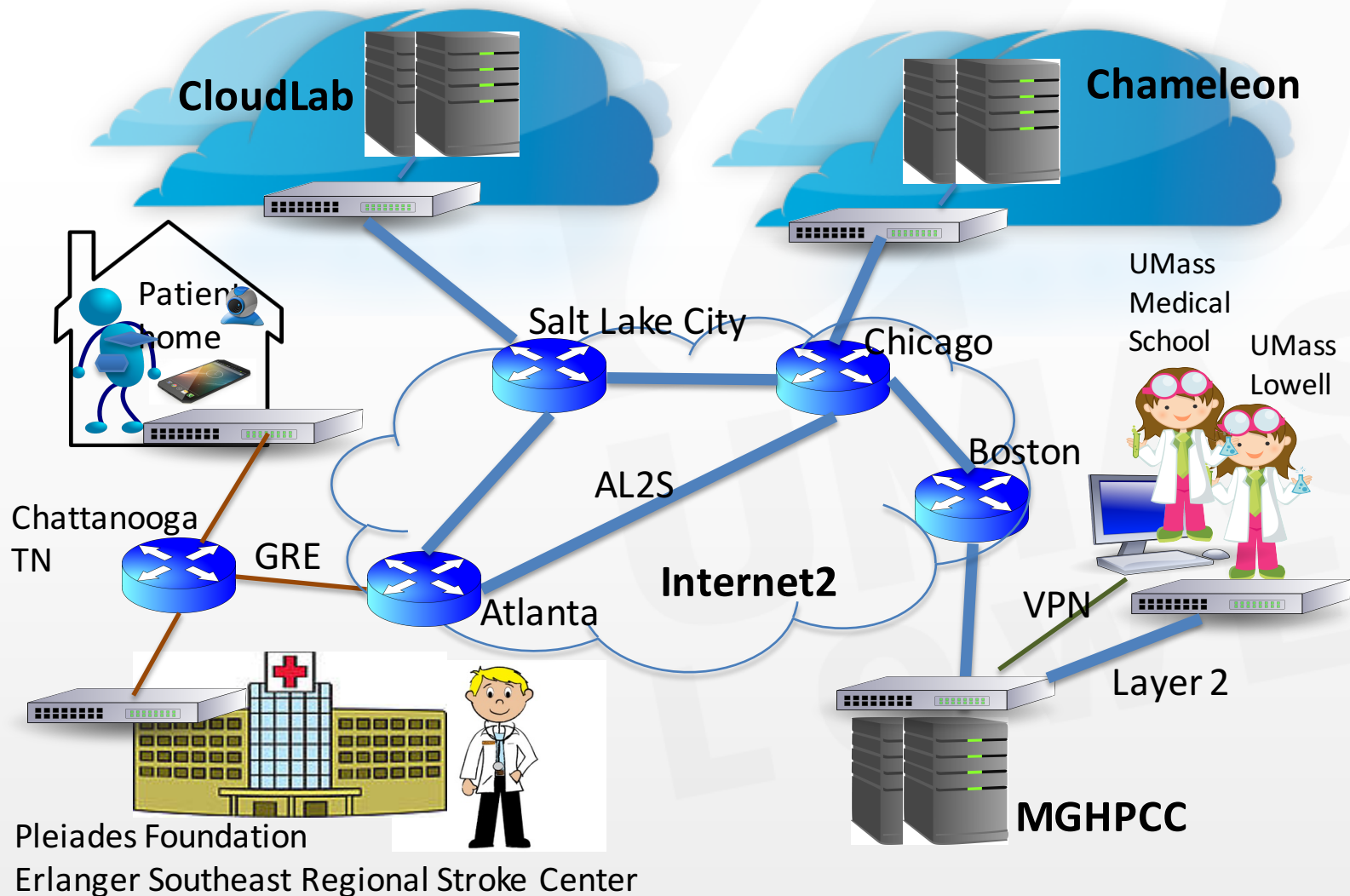
- configuration
- collection
- storage
- Processing
- Reporting



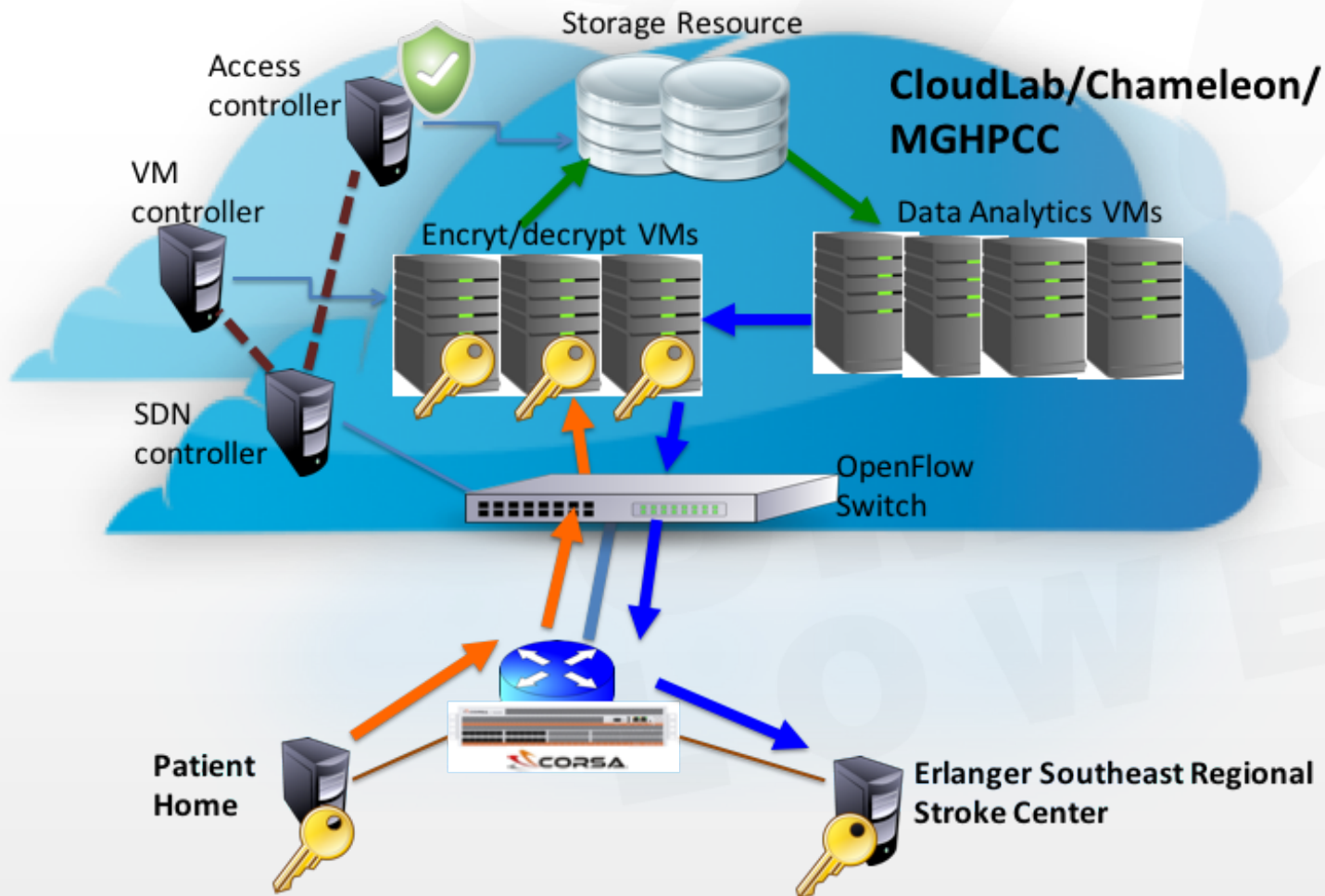
STREAMS : Secure Transport and REsearch Architecture for Monitoring Stroke Recovery

- ▶ Stroke and patient care
 - stroke is one of the leading cause of death
 - Stroke recovery is very time consuming and
 - post-stroke monitoring of physiological status, dietary intake, and rehabilitation progress for each individual patient provides optimal patient recovery outcomes.
- ▶ Stroke patient monitoring
 - Pervasive with multiple multi-modal sensors
 - Smart watch, shimmer motes, google class, MS kinect
 - Requires real-time data analytics for immediate feedback

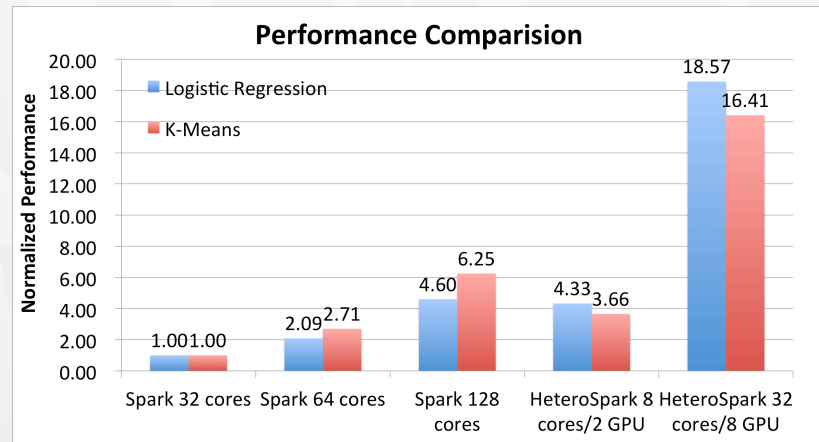
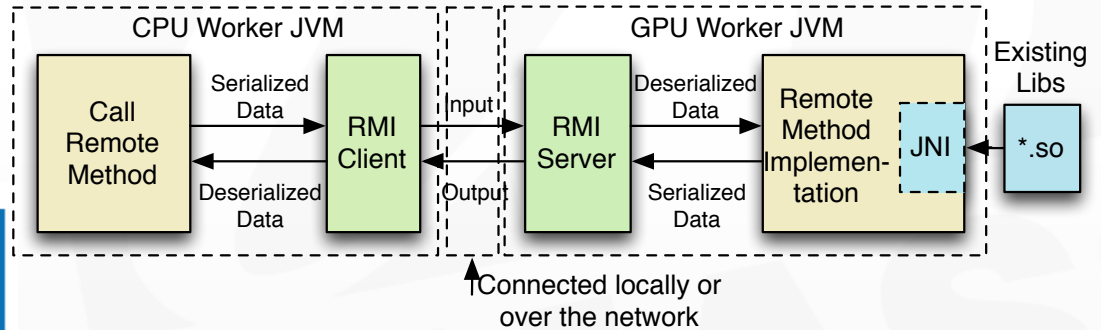
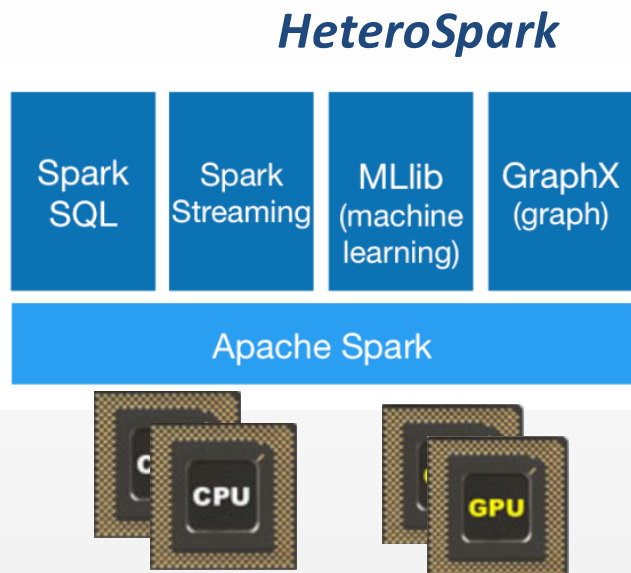
Network Architecture Overview of STREAMS



Security-ware VM Provisioning in the Cloud



HeteroSpark: Heterogeneous Architecture for Data-Compute-Intensive Applications



Diverse Research Calls for Software Defined Heterogeneous Cyberinfrastructure

- ▶ Heterogeneous Architecture
 - CPU/GPU/FPGA, x86/arm, Ethernet/infiniband
- ▶ Software Defined Networking
 - OpenFlow, ODL
- ▶ Different Levels of Resource Abstraction
 - VM, vCPU, vGPU
 - Exclusive access to or reconfig physical resources
- ▶ Sustainable Cost Model
 - Encourage resource contribution

Thank You !

Q&A