

Searchlight

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Goal

- Enterprise control of application QoS at scale

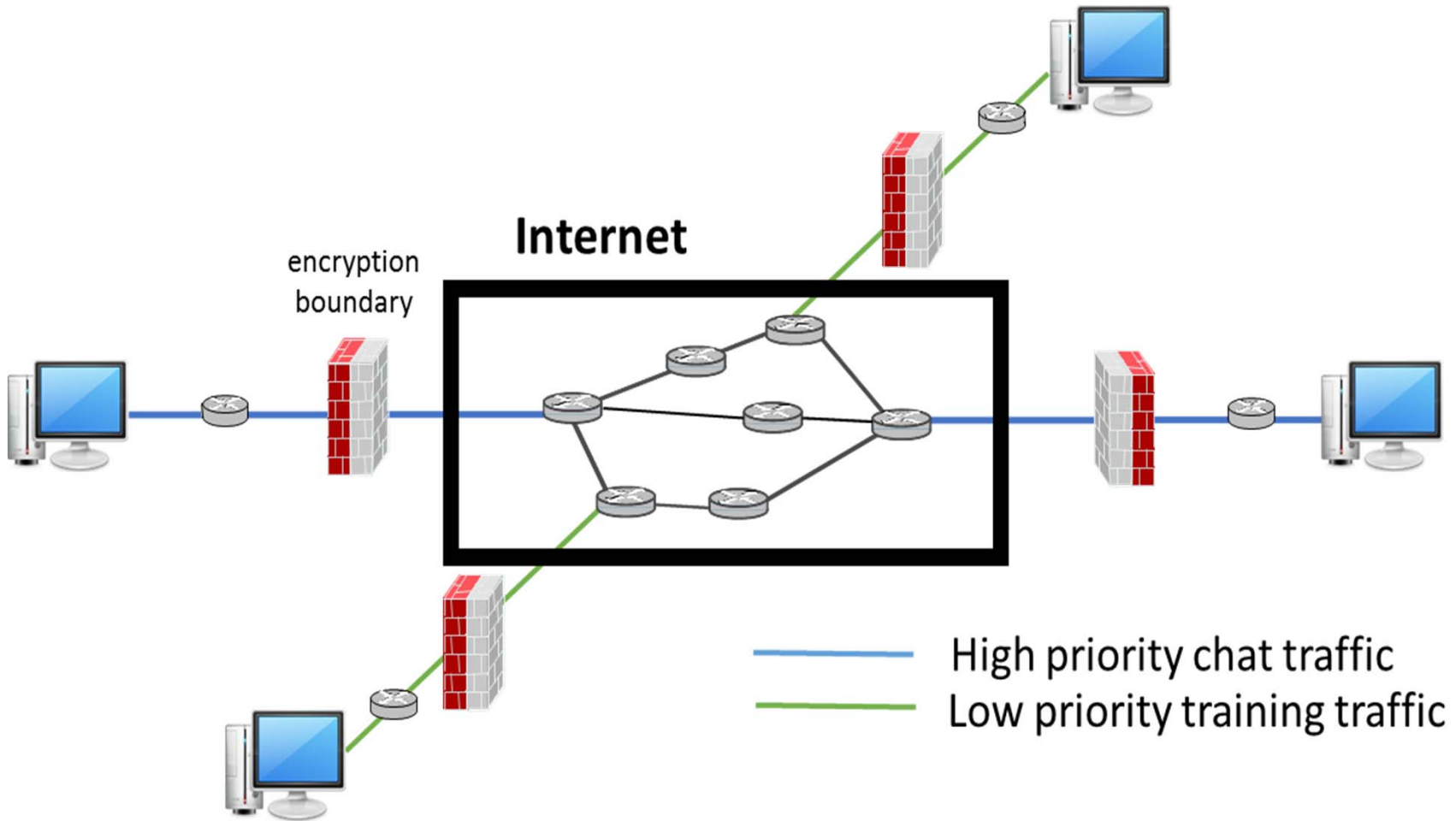


Applications Matter!

- Distributed applications in enterprises
 - Document sharing, Calendars, Social media/messaging
- Specialized QoS/priority requirements?
 - MPLS and VLANs internal to enterprise
 - No global solution for federated Internet
 - No network support for RSVP, etc., thus not used
- How can an enterprise prioritize application use?



Searchlight Concept of Operation





Example problem

- 12 collaborators (e.g., corporate leaders) share a document
 - One sharer on a particularly bad path (overloaded SATCOM)
 - Load from, e.g., follow-the-sun data migration, entertainment/news video
 - Consistency protocols spread the delay, frustrate interaction
- Need an approach to:
 - Analyze the network to identify applications instances
 - Actively manage application traffic to reflect enterprise priorities



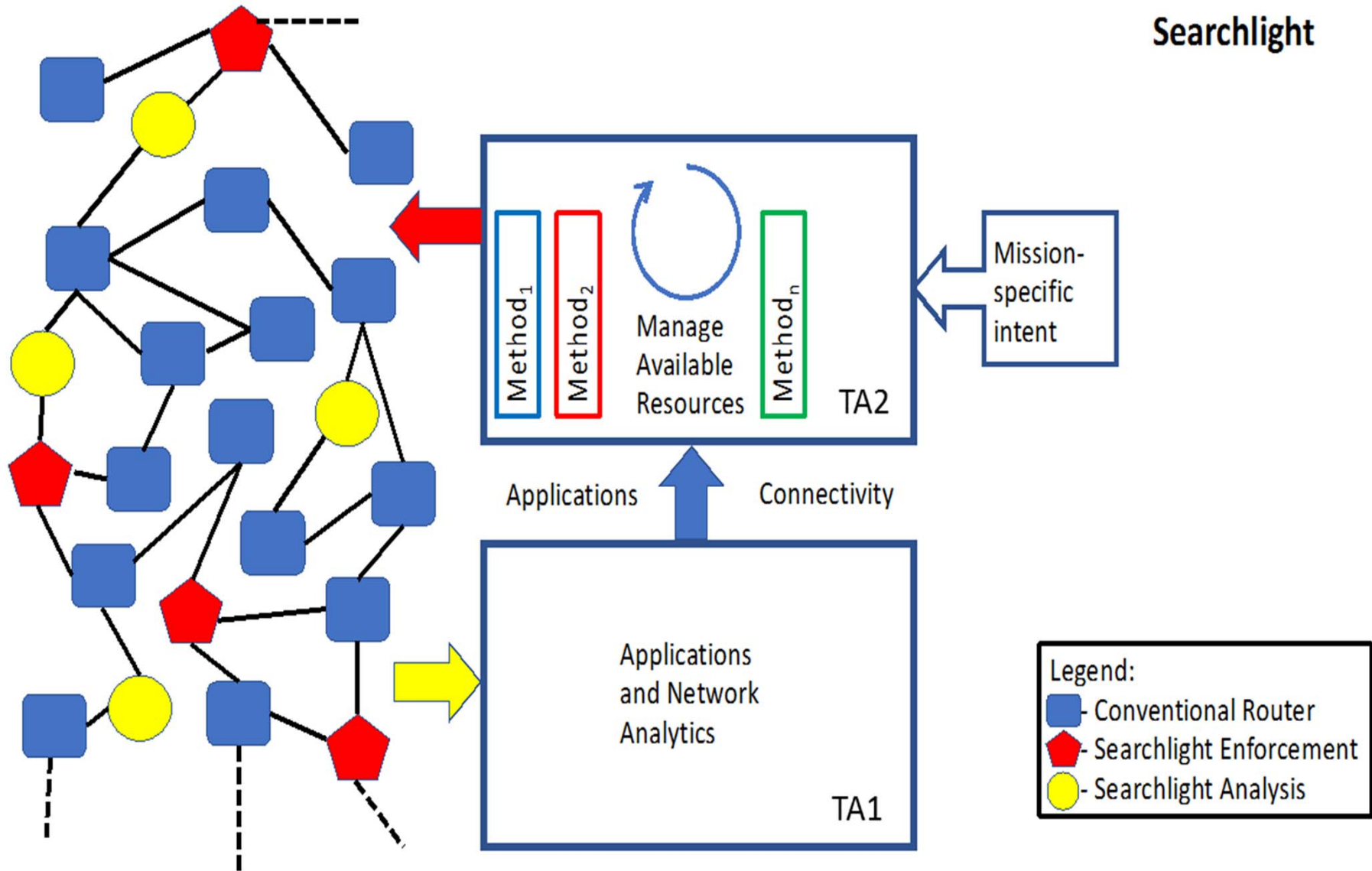
Why is this "DARPA hard"???

- Constantly evolving applications and user populations
- Increasing use of encryption
 - Reduces utility of Deep Packet Inspection (DPI)
- Must:
 - Be efficient
 - Be cost-effective
 - Do no harm



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TA1 – Applications and Network Analytics

- Breakthrough approaches in analytic techniques required
- Principled blend of traffic analysis / network tomography
 - No interest in content, only what application it is
 - Need to know where affecting other apps, thus tomography
 - Need to identify separate instances
- Innovations needed in *theory* for limited observables
 - E.g., limitations on flow observables and sensor placement
- Innovations needed in *practice* to accomplish efficiently
 - E.g., combining data from possibly many sensors



TA2 – Resource Management

- Breakthrough approaches in focused prioritization
- Novel method(s)
 - Application, topology, network-type or load-specific?
 - Interface with novel TA1 analytic approaches
 - Can only *infer* edge-observed Quality of [Service, Experience]
 - Feedback-based approaches
 - Cannot affect enterprise-external applications
- Searchlight TA2 systems:
 - Need multiple methods for future-proofing
 - Need automated strategy for selection of methods



Metrics and Phases

| | Metric | Phase 1 18 mos. 100 nodes | Phase 2 18 mos. 1,000 nodes | Phase 3 12 mos. 10,000 nodes |
|---------|---|---------------------------------|-----------------------------------|------------------------------------|
| TA1 | Identify applications and associated network paths with precision and recall rates of | 50% | 75% | 80% |
| | Node coverage: | 20% | 10% | 5% |
| TA2 | Develop and execute network management plans yielding the specified QoS performance gains for 3 chosen high-priority apps | 25% | 50% | 100% |
| | Upper bound on low-priority app performance delay for 3 chosen apps for network management plans: | 5 sec | 3 sec | 2.2 sec |
| Program | TA1/TA2: Execute network management plans yielding specified QoS performance gains | 10% | 25% | 50% |
| | Number of chosen high-priority applications | 2 | 3 | 4 |



Strategy: Phasing and Metrics

- Couple performance metrics to technology evolution during program
- Concurrent demands on metrics and difficulty of achieving them
- Analytic development can use live Internet (passive)
- Resource Management active, so at-scale tests on testbed



Technology Transition and Program Security

- Program deliverables will include:
 - Technical documentation
 - Open source software (BSD license) to permit rapid continuous transition
- Searchlight is UNCLASSIFIED
 - All work performed under either TA1 or TA2 will be UNCLASSIFIED
- Principal Investigators and Essential Personnel for TA2 Proposals
 - Must possess minimum current SECRET clearance
- Principal Investigators for TA1 proposals do not require a clearance



Program Scale and Awards

- Program budget is approximately \$18M
- DARPA anticipates multiple TA1 awards and a single TA2 award
- Proposers may propose to TA1, TA2, or both



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