

Testing Agile Information Management Systems with Video Test Client Case Study: DIMES



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Outline



- **Agile Information Management Systems (AIMS)**
- **Distributed Information Management Enterprise Service (DIMES)**
- **Quality of Service**
- **Video Test Client**



Information Management Systems and Agility



- **Information management systems support forces by providing information sharing and collaboration services.**
- **In “Power to the Edge,” David S. Alberts and Richard E. Hayes stated that there are six dimensions to force agility: Robustness, Resilience, Responsiveness, Flexibility, Innovation and Adaptation.**
- **An information management system that supports the six dimensions are agile.**



Robustness



- **“Robustness is the ability to retain a level of effectiveness across a range of missions that span the spectrum of conflict, operating environments, and/or circumstances.” (Alberts and Hayes)**
- **Future Ready**
 - **Open standards ensures effectiveness through different operating environments**
 - **User extensible ensures effectiveness in different conflicts**



Resilience



- **“Resilience is the ability to recover from or adjust to misfortune, damage, or a destabilizing perturbation in the environment.” (Alberts and Hayes)**
- **Misfortune, damage and destabilizing perturbations can all be classified as “faults”**
- **Replicated systems can provide the capability to recover from faults**
- **Fault tolerant systems provide the capability to dynamically adjust to faults**



Responsiveness



- “[Responsiveness] refers to the ability of an operating concept, C2 system, or force to act (or react) effectively in a timely manner.” (Alberts and Hayes)
- Timeliness is not only dependent on the system but also the infrastructure.
- Networks are less predictable and controllable than systems
 - AIMS needs to be as responsive as possible



Flexibility



- **“Flexibility refers to the capability to achieve success in different ways.” (Alberts and Hayes)**
- **It is characterized by the ability to first understand changes in the battlespace and then perceive different possible futures and select the appropriate course of action.**
- **The only battlespace or space that the system knows and can control is its own system state. Therefore, it should characterize the inputs that affect the state and take effective measures to ensure a stable system state in the future.**
 - **Load balancing**



Innovation



- **“[Innovation] involves the ability to learn over time about missions and operational environments and to take advantage of the lessons learned to create and maintain competitive advantages.” (Alberts and Hayes)**
- **Learning is largely a cognitive process**
- **Learn from information about missions and environments to help better serve the users**
- **Information transformation**
- **Semi-innovation is innovation without self-learning**



Adaptation



- **“Adaptation is the ability to alter force organization and work processes when necessary as the situation and/or environment changes.” (Alberts and Hayes)**
- **Scalability allows users to configure a more or less capable system to match the needs**
 - **Capacity**
 - **Throughput**
- **Reconfigurable systems enable users to select the best configuration and algorithms for the tasks**
 - **Modularity**



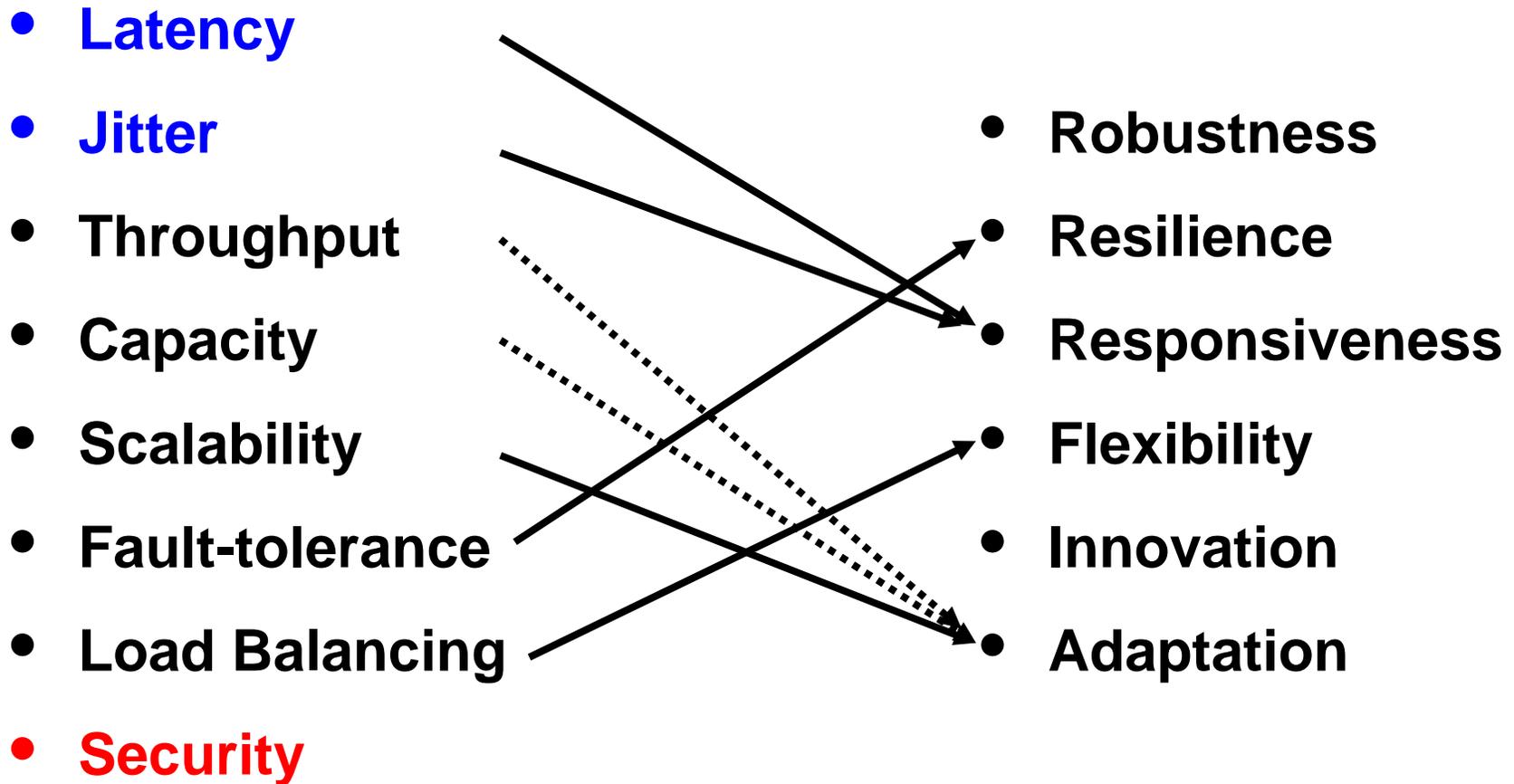
Quality of Service



- In “Testing Quality-of-Service Aspects in Multimedia Applications,” Jens Grabowski and Thomas Walker define QoS as “a set of parameters that characterize a connection between communication entities across a network.”
- The “connection” consists of
 - Clients/Users
 - Communications channel
 - Servers and services, such as the Information Management service



QoS Mappings

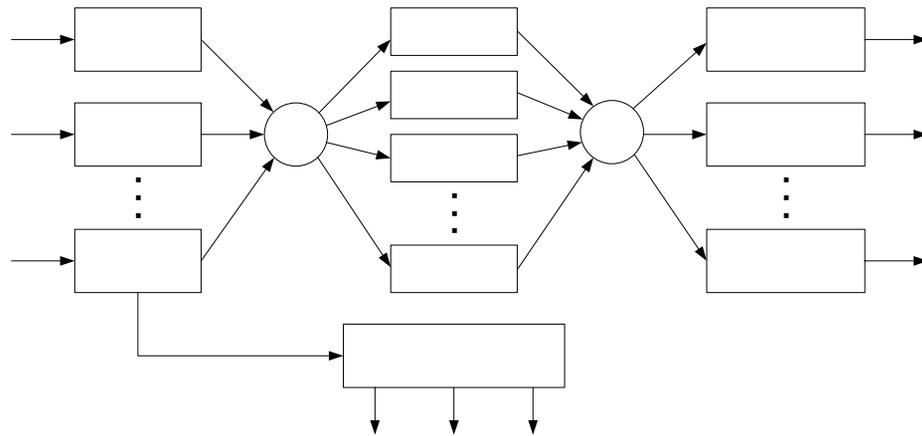




DIMES



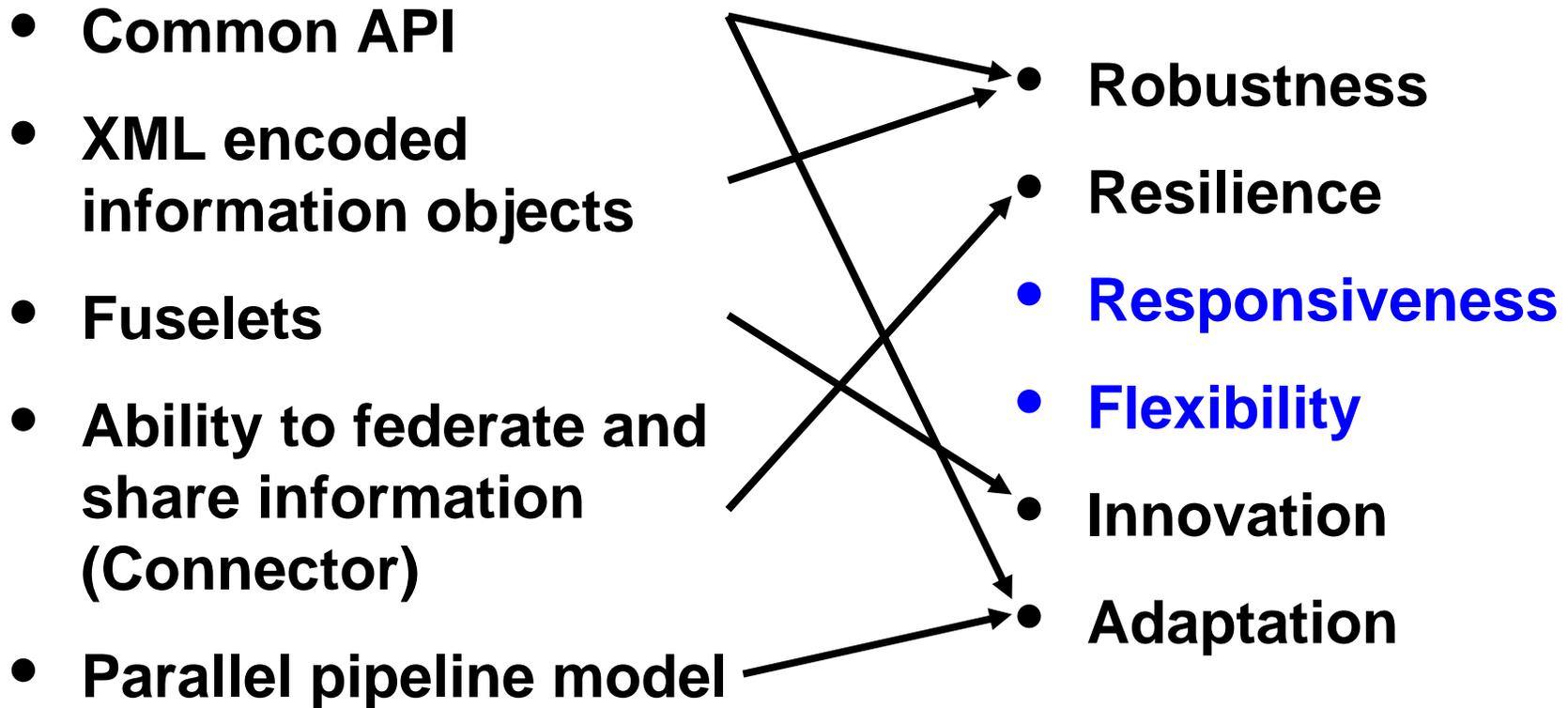
- **Developed at AFRL/IFTC**
- **Extends the Information Management Enterprise System**
- **Parallel and Distributed**
- **Scalable**
- **Low latency**
- **High throughput**
- **High capacity**
- **Secure**
- **Fault Tolerance**
- **Load balancing**



Parallel Pipeline Model



DIMES Mapping to AIMS





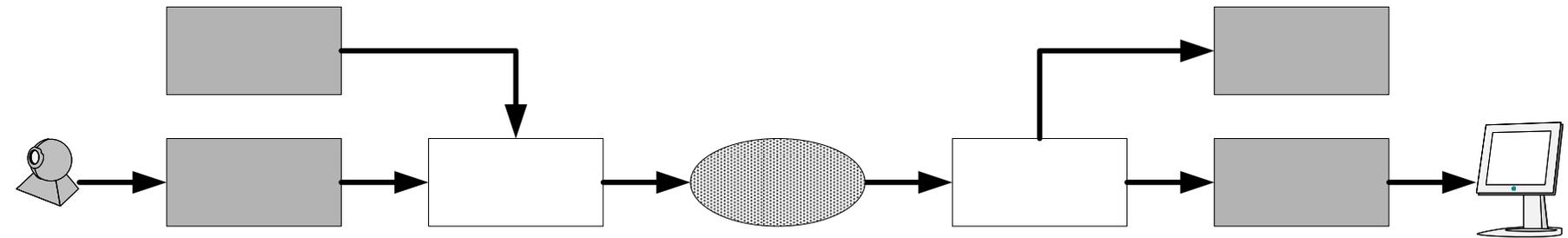
Video Test Client



- **Provides the foundation for building an audio/video collaboration tool**
- **Uses audio and video as the unit of information**
- **Provides qualitative and quantitative results**
- **Utilizes Microsoft DirectShow to allow users to control the rate and site of information production**
 - **Select and configure encoding algorithms**
 - **Select capture rates**



Video Test Client Figure



AVI File Reader

Video Test Client Overview

Capturer

Transmitter



Example Setup/Configuration



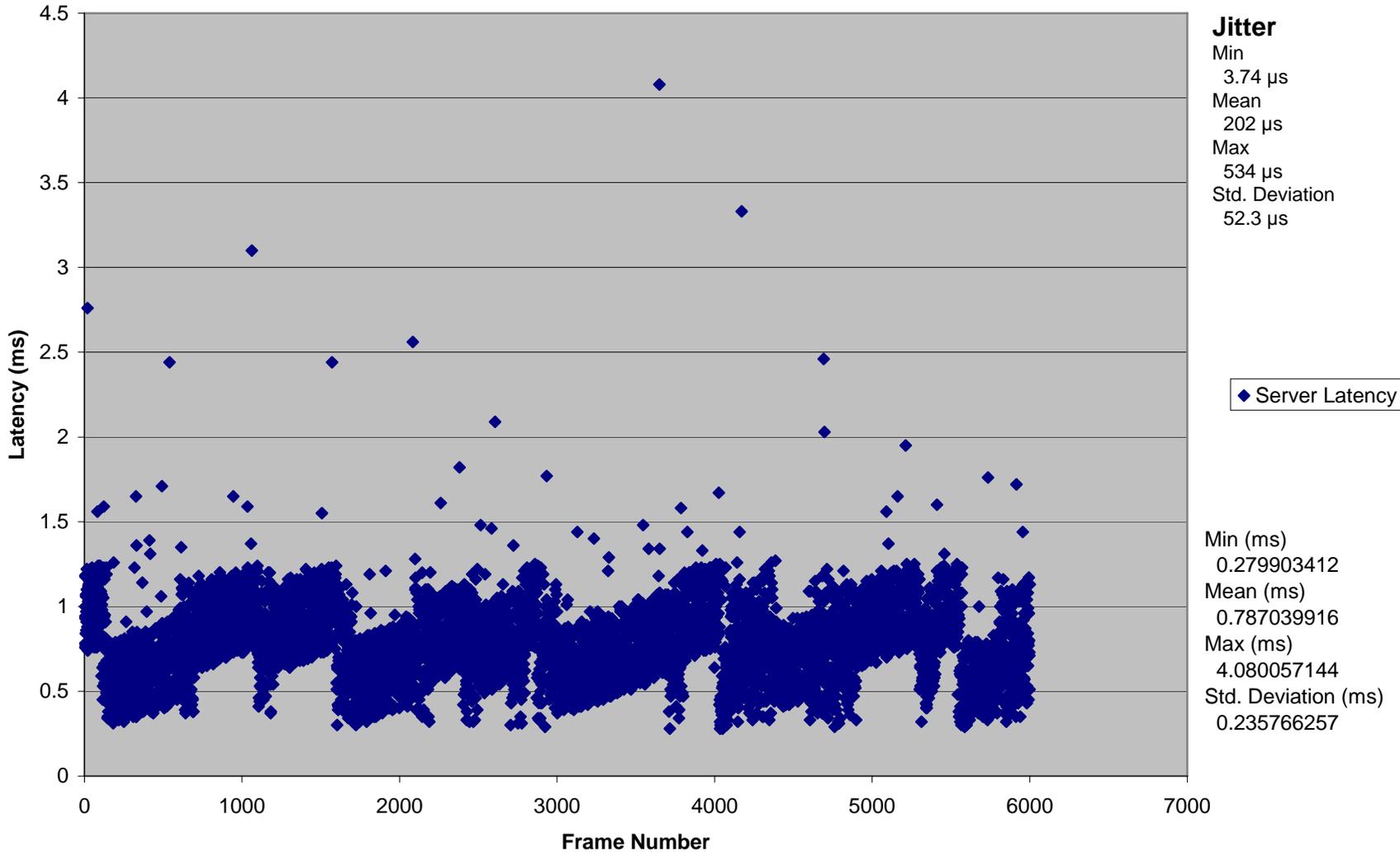
- **1.2GHz laptop acting as both the publisher and subscriber of audio and video information**
- **Dual 3.2GHz Xeon with 8GB RAM server hosting a DIMES configured with a single Publisher Catcher, a single Broker and a single Disseminator**
- **100Mbps campus area network**
- **320x240 video at 30fps**
 - **DIVX 6.0 at 200kbps and 300 keyframe interval**
- **22kHz, 16bit mono audio at 20fps**
 - **MP3 at 32kbps**



Example Result DIMES Server Latency



Server Latency





Summary



- **An agile information management system is a system that provides information sharing and collaboration services while exhibiting, robustness, resilience, responsiveness, flexibility, innovation and adaptation.**
- **The Distributed Information Management Enterprise System is an AIMS under development at AFRL/IFTC.**
- **Quality of Service metrics such as latency, jitter, throughput, capacity, scalability, fault-tolerance, load balancing and security can be used to compare AIMS.**
- **Video Test Client is a tool designed to assess the fitness of an AIMS in providing audio and video collaboration services and to measure QoS metrics.**
 - It can measure latency and jitter out of the box.
 - It can be instrumented to measure throughput and capacity



Questions



- **Now**
- **Later**
 - **Email: Lok.Kwong.Yan@rl.af.mil**