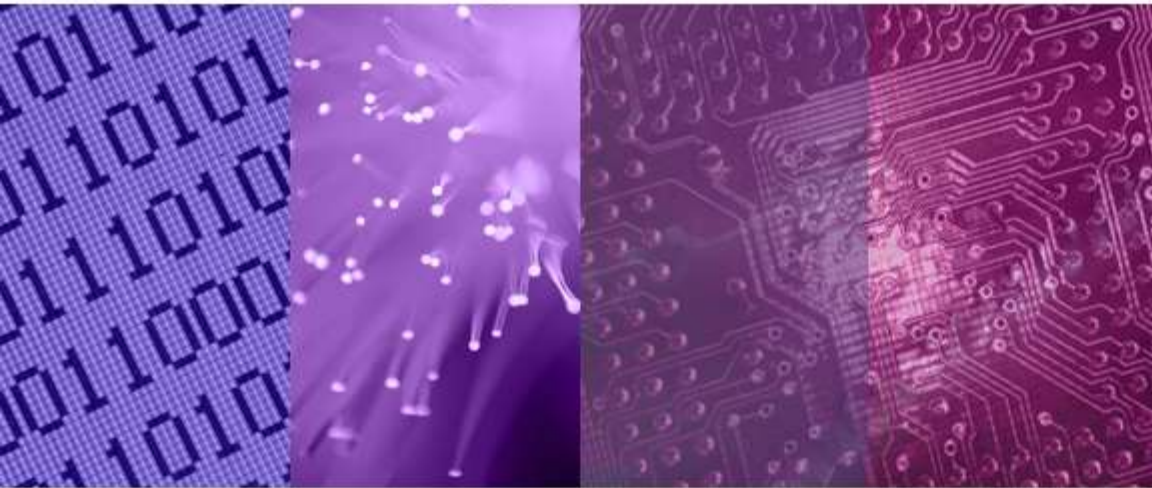


JXTA and Grid Update



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Ph.D*

Director

Asia Pacific Science and
Technology Center
and

Associate Professor
Nanyang Technological Univ.

JXTA™ Vision

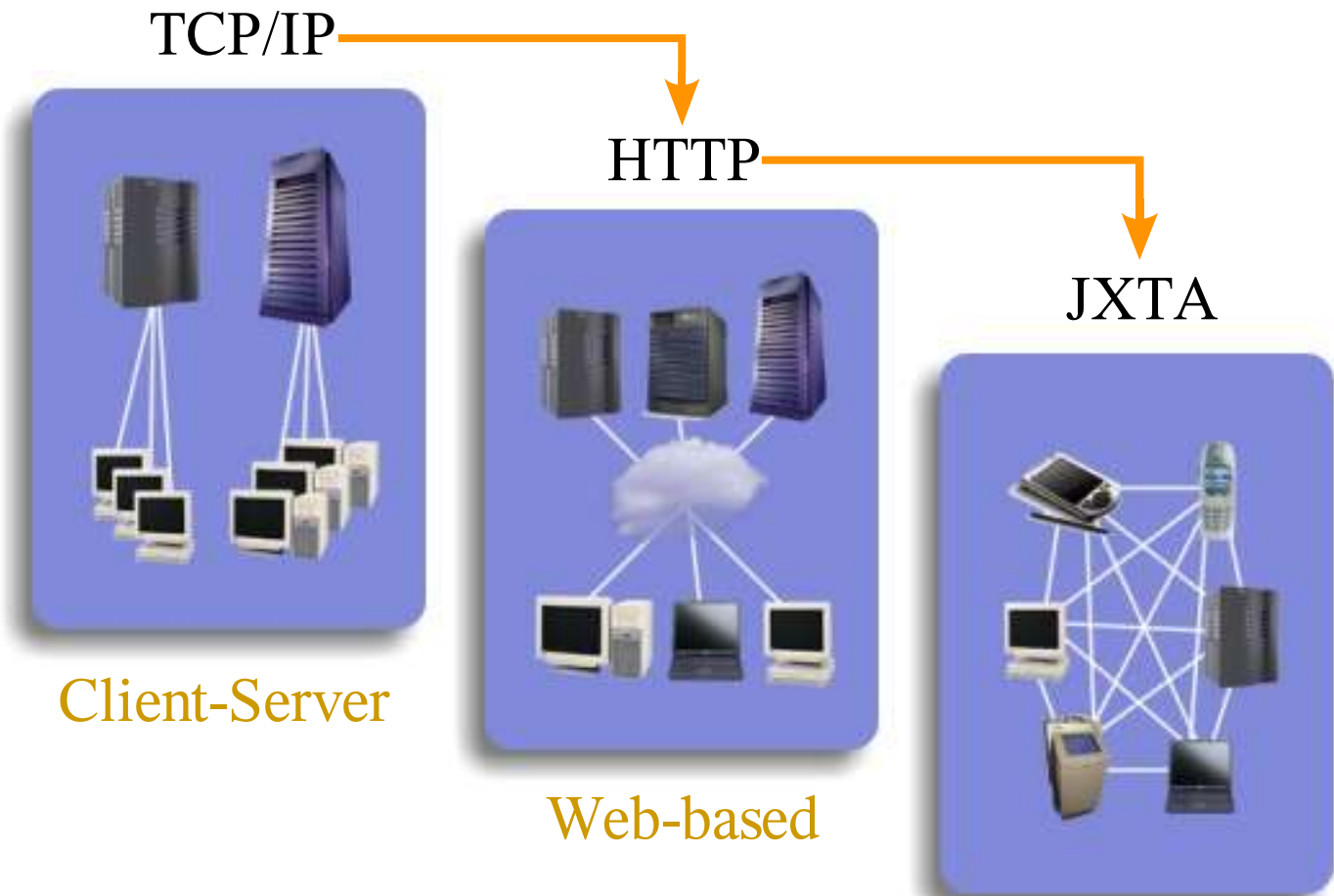
Everybody and
everything
connected to the
Network

- Network of People, Places, Things
- A complex network computing problem
- Enable edge computing



Evolution of Distributed Computing Driven by Protocols

<JXTA and Grid Update>



What is JXTA?

- An open network programming platform for peer-to-peer (P2P) computing
 - A set of protocols (XML-based)
 - Works with any language, OS, network, and service models
 - A virtual network overlay
 - A set of mechanisms, not policies
 - An Open Source project: www.jxta.org

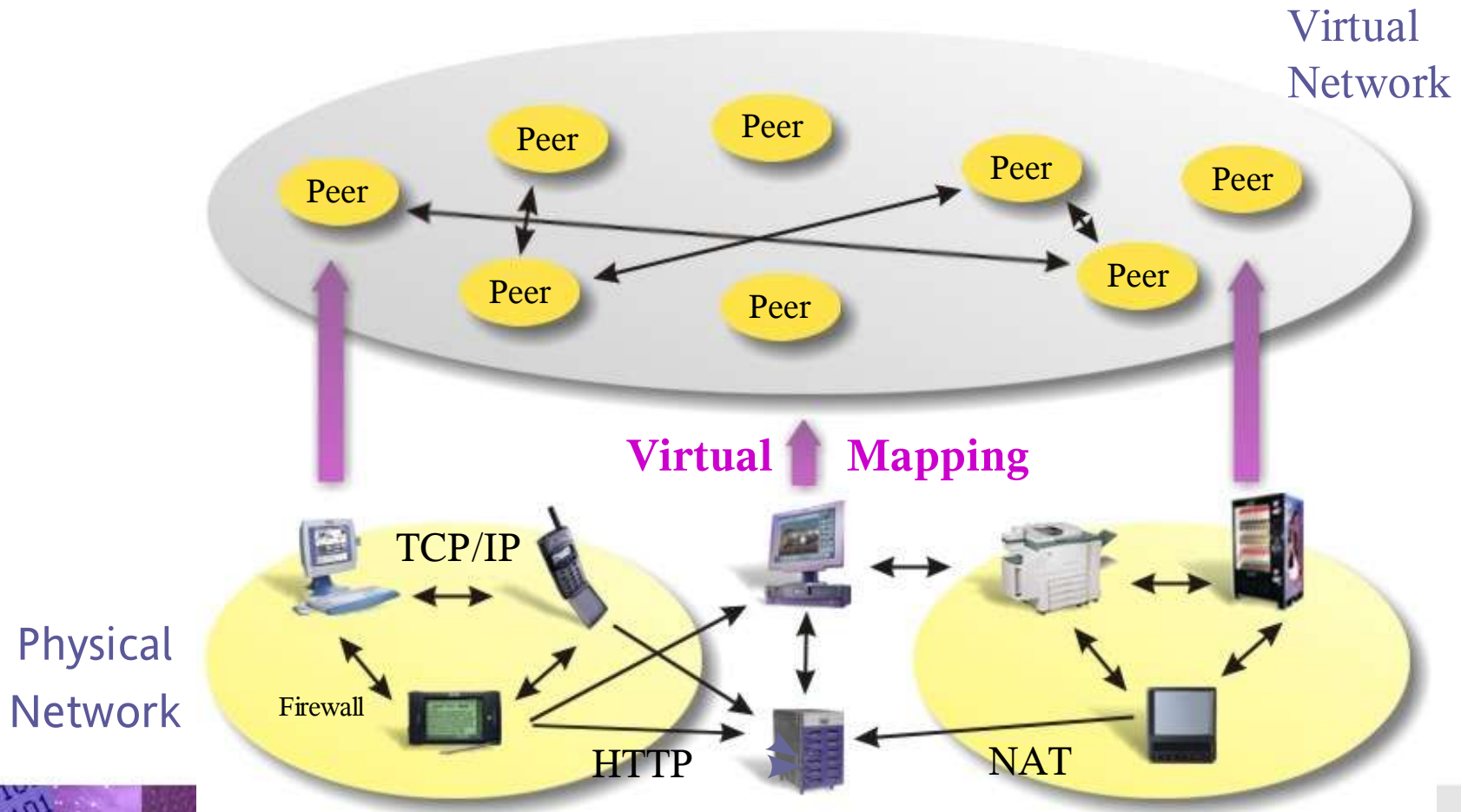


Open Source Model

- www.jxta.org
 - All source, projects, docs, examples on-line
- Apache style software license
 - No barriers to getting started
 - No royalties, no fees, no registration
- Meritocracy
 - The more you've done, the more you can do

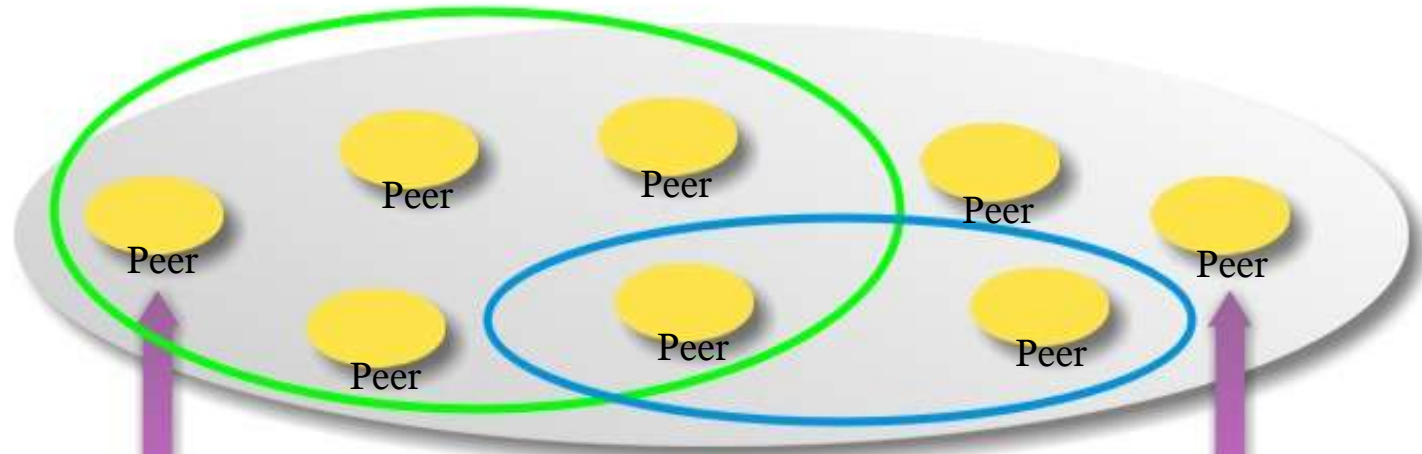


JXTA Virtual Network (Virtual Sockets)



Peer Groups (Application level's VPNs)

Virtual Network



Physical Network



Virtual Mapping

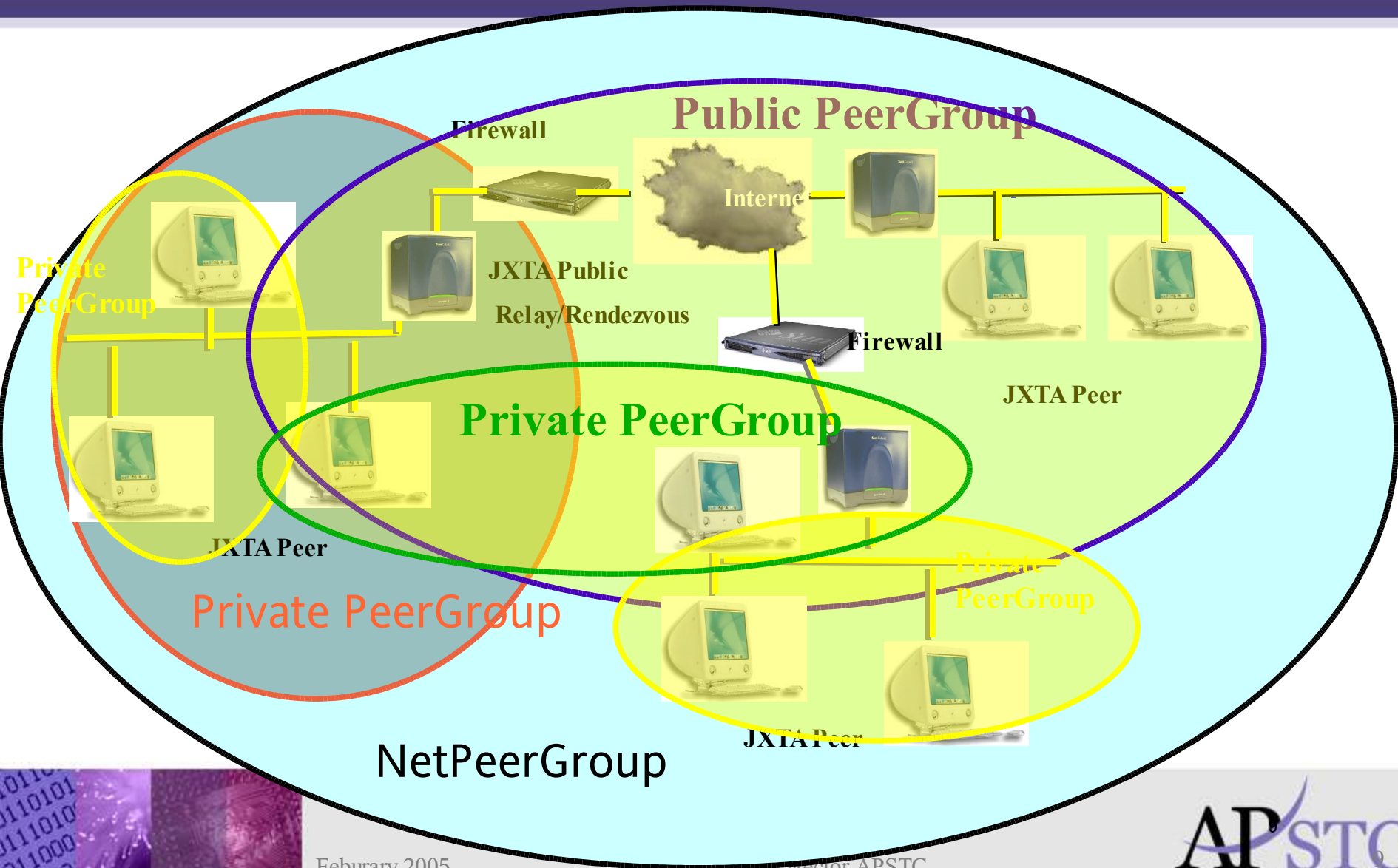


Why Use Peer Groups?

- Create secure and protected domains
- Scope peer operations
 - Discovery, search, communications
- Provide a “group” identity
 - Group peers sharing a common interest
- Enable monitoring and auditing



A Network of Virtual P2P Networks



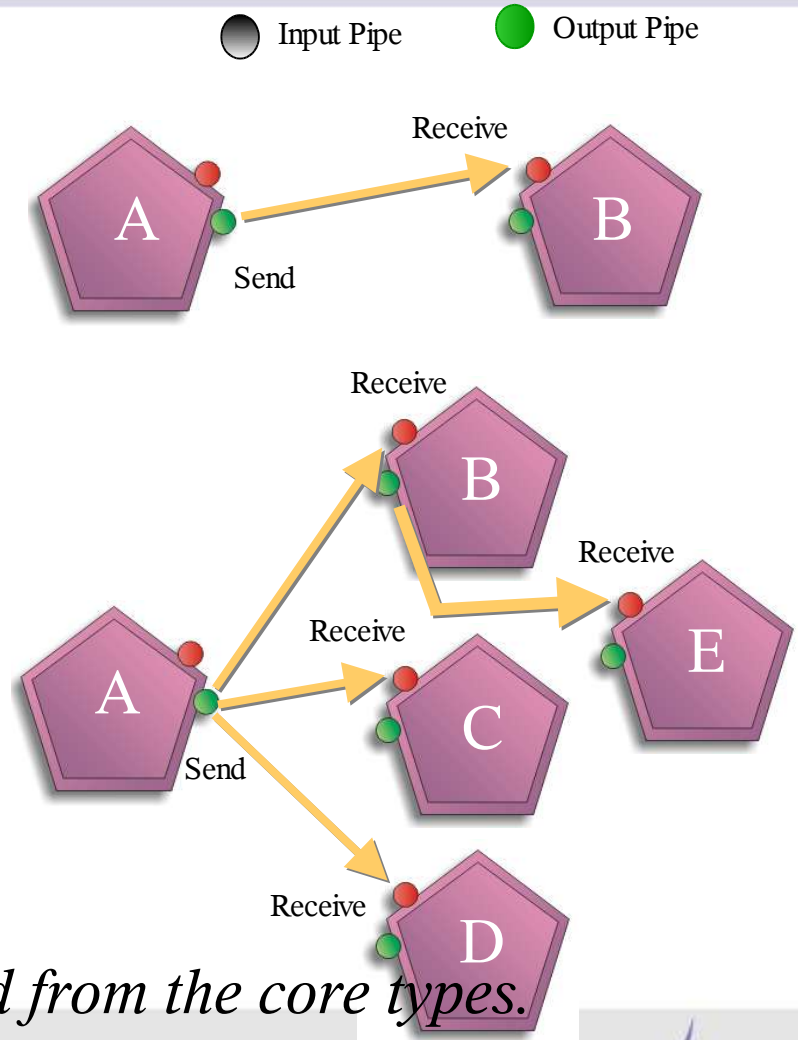
Virtual Socket

- Support the transfer of virtually any objects
 - Binary, code, data, metadata, etc.
- Virtual communication channels
 - Binding at runtime
 - May connect peers that do not have direct physical links
 - Can be bound to more than one peer endpoint
 - Migrate as peers roam within the JXTA network



Communication Primitives

- Point-to-Point
 - Connects exactly two peer endpoints together
- Propagate
 - Connects one output pipe to multiple input pipes
 - Within logical domain scope



Additional pipe types can be created from the core types.

Discovery

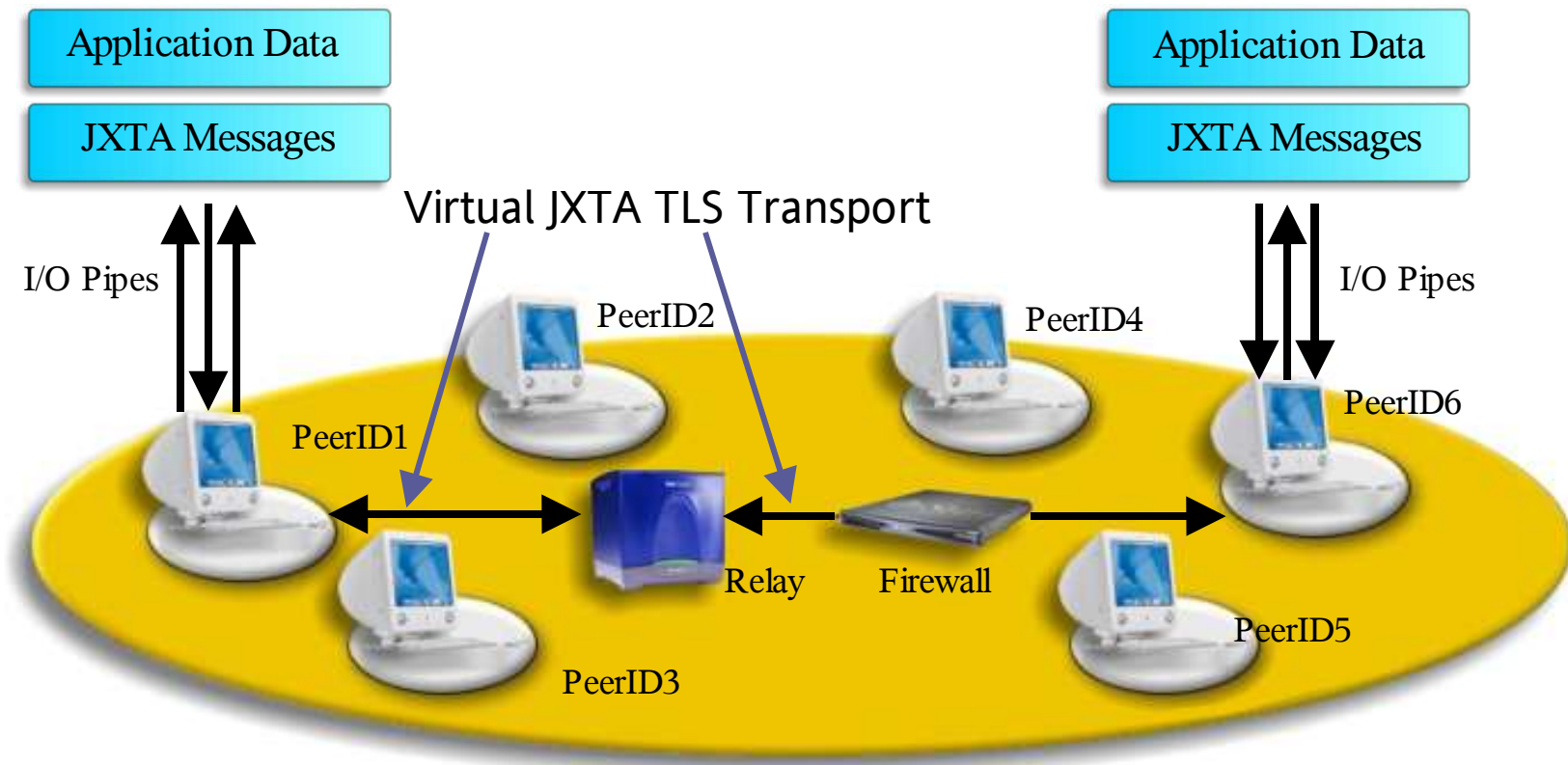
- Asynchronous mechanism for publishing and discovering resources (CPU, network, service, etc.)
- All resources in JXTA represented as **advertisements**
 - Language-neutral XML documents
 - Peers cache, publish, and exchange advertisements
 - Each advertisement published with a lifetime (time-to-live)
- P2P discovery network (across subnet, LAN, WAN, Firewall, Nat)

JXTA End-to-End Security

- Transport Layer Security (TLS)
- Peer certificates
- Multiple certificate authority policy (centralized, decentralized)
- Domain certificate chains
- Enable Web of Trust (reputation)



Transport Layer Security (TLS)



JXTA and Web Services

- Web Services define a platform-independent environment to create, access and deploy services on the network
- JXTA extends Web Services
 - Provide virtual network support: NAT and Firewall traversals, location independence (soap.jxta.org)
 - Application level's domain scoping
 - Internet scale service discovery
 - Services failover and availability (domain service signatures)



JXTA and Jini

- Jini is a service technology, JXTA is a network technology
- JXTA expands Jini
 - Deploy Jini services over the Internet
 - Dynamic discovery of lookup service
 - Domain scoping
 - Secure transports
 - Jeri provider: Jini running over JXTA



Sun Related JXTA Grid Projects

- JXTA in Sun Grid Engine
 - Dynamic discovery of resource to join a grid
- JXTABoot in VSP Products
 - Embed JXTA into boot firmware
 - Provision OS image to VSP server
 - Sun Control Station self-discovery



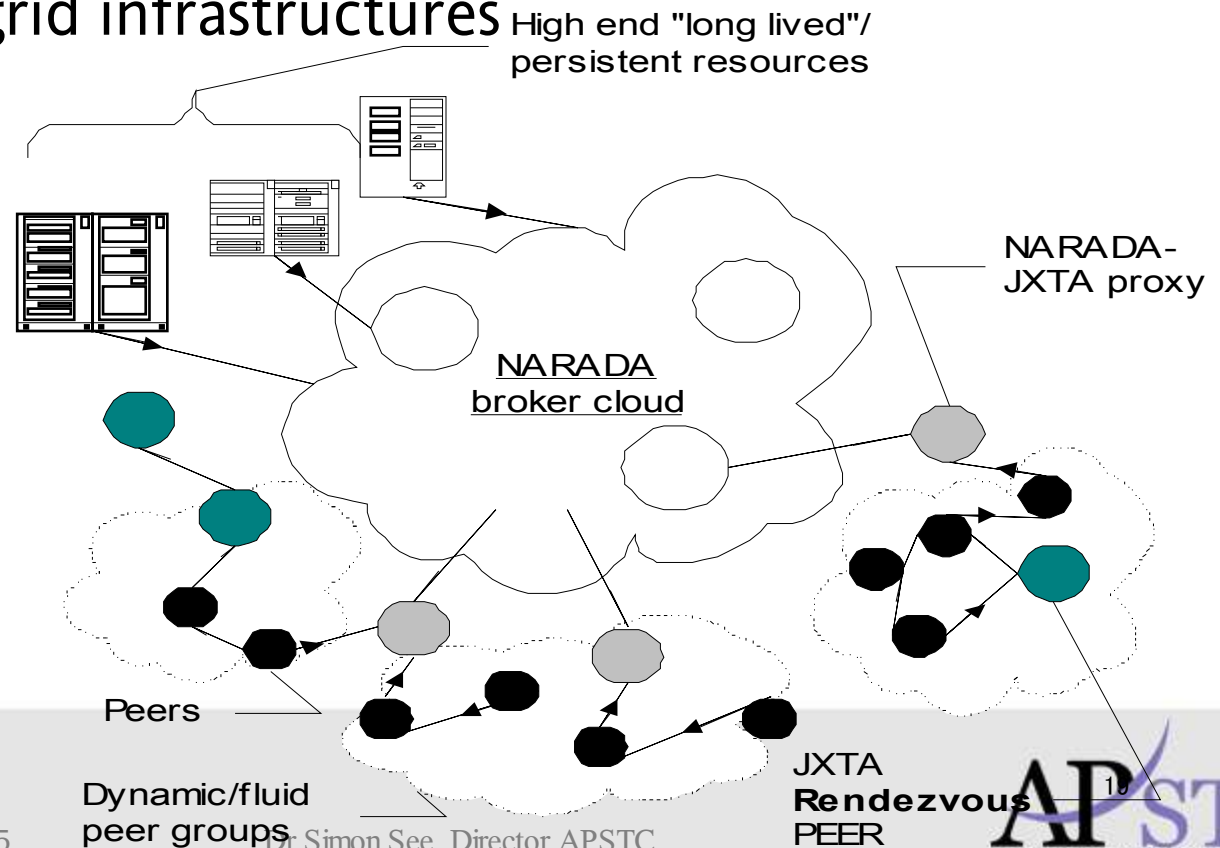
Sun Related JXTA Grid Projects

- Sun Grid Engine MDE Group
- JNGI (jngi.jxta.org) is a framework that users can use to submit jobs.
 - Jobs are split and distributed among several peers.
 - JXTA peer groups helps us to localize communication, which in turn improves scaling.
 - JXTA Peergroups provide redundancy within peer groups, we ensure that failures do not affect job completion.



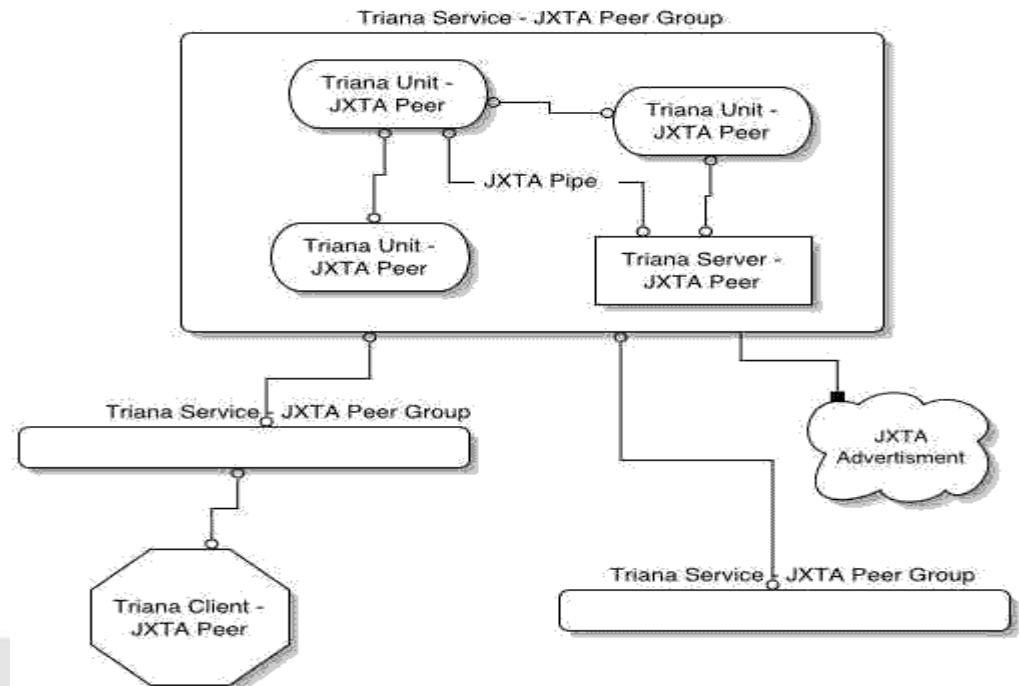
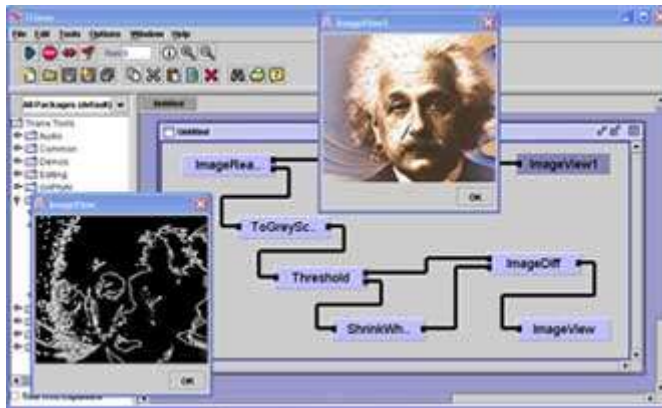
JXTA within GGF

- NaraBrokering (Pervasive Computing Labs – University of Indiana - G. Fox and al.)
 - provide a messaging/brokering infrastructure for linking multiple grid infrastructures



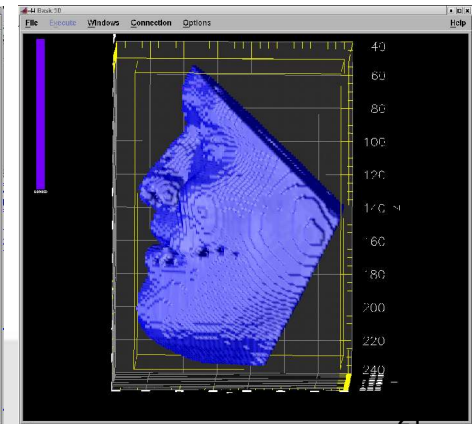
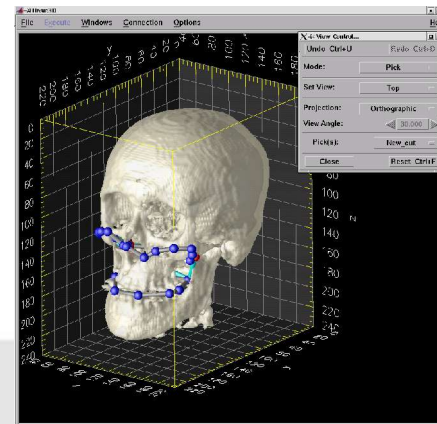
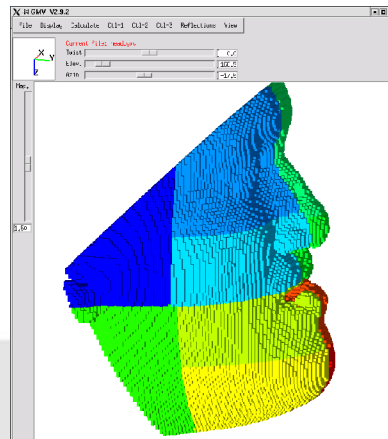
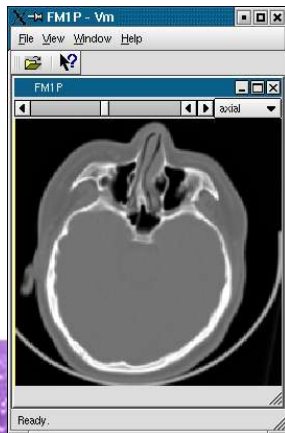
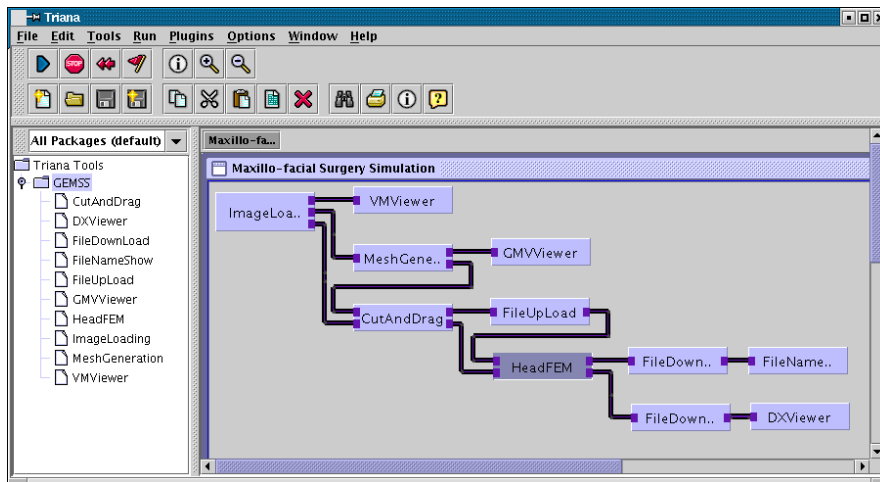
JXTA within GGF

- Triana (Cardiff University)
 - Distribute collections of computing units among a set of distributed computers



GEMSS: Maxillo-facial Surgery Simulation

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February 2005

Dr Simon See, Director APSTC

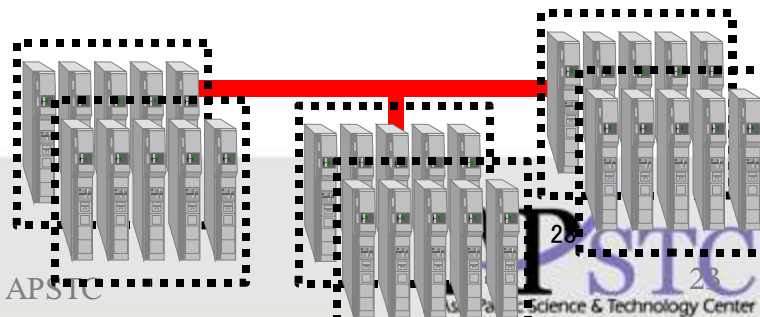
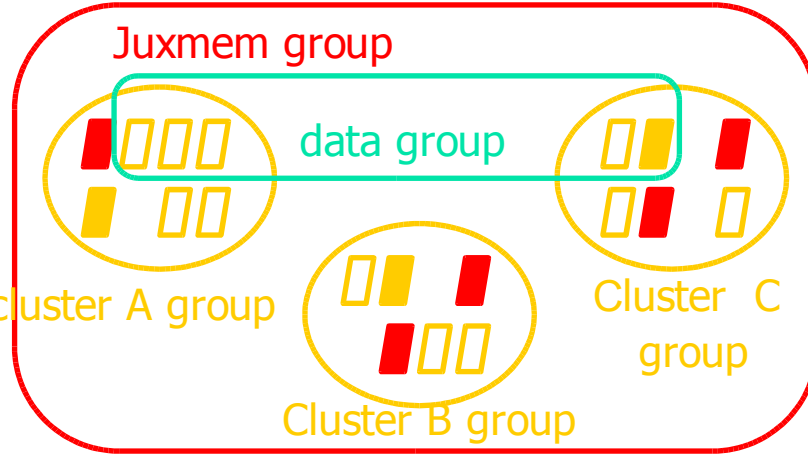
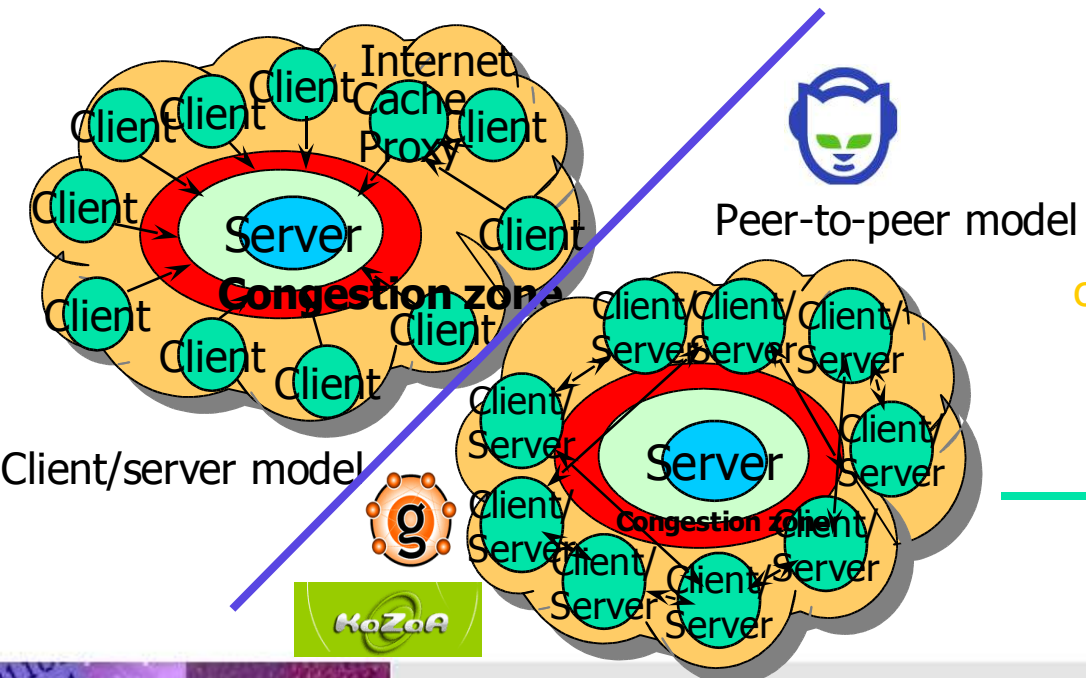
Applications

- **User Interface Integration (direct plugin)**
 - Used GriPhyN to represent work-flow
 - GEO 600 - interface with GEO++ monitoring system
- **GEMSS:**
 - Application Work-flow
 - choreographing web services
- **Galaxy Formation**
 - Galaxy formation group at Cardiff for visualization
- **GEO 600 Signal Processing**
 - Quick Look data analysis
 - GEO 600 - rigorous unit testing (over 200 signal processing units)
 - Data mining
 - Coalescing Binary Code - will compare against MPI code
 - Uses 50+ Triana units to simulate the search
 - Full search complete ...

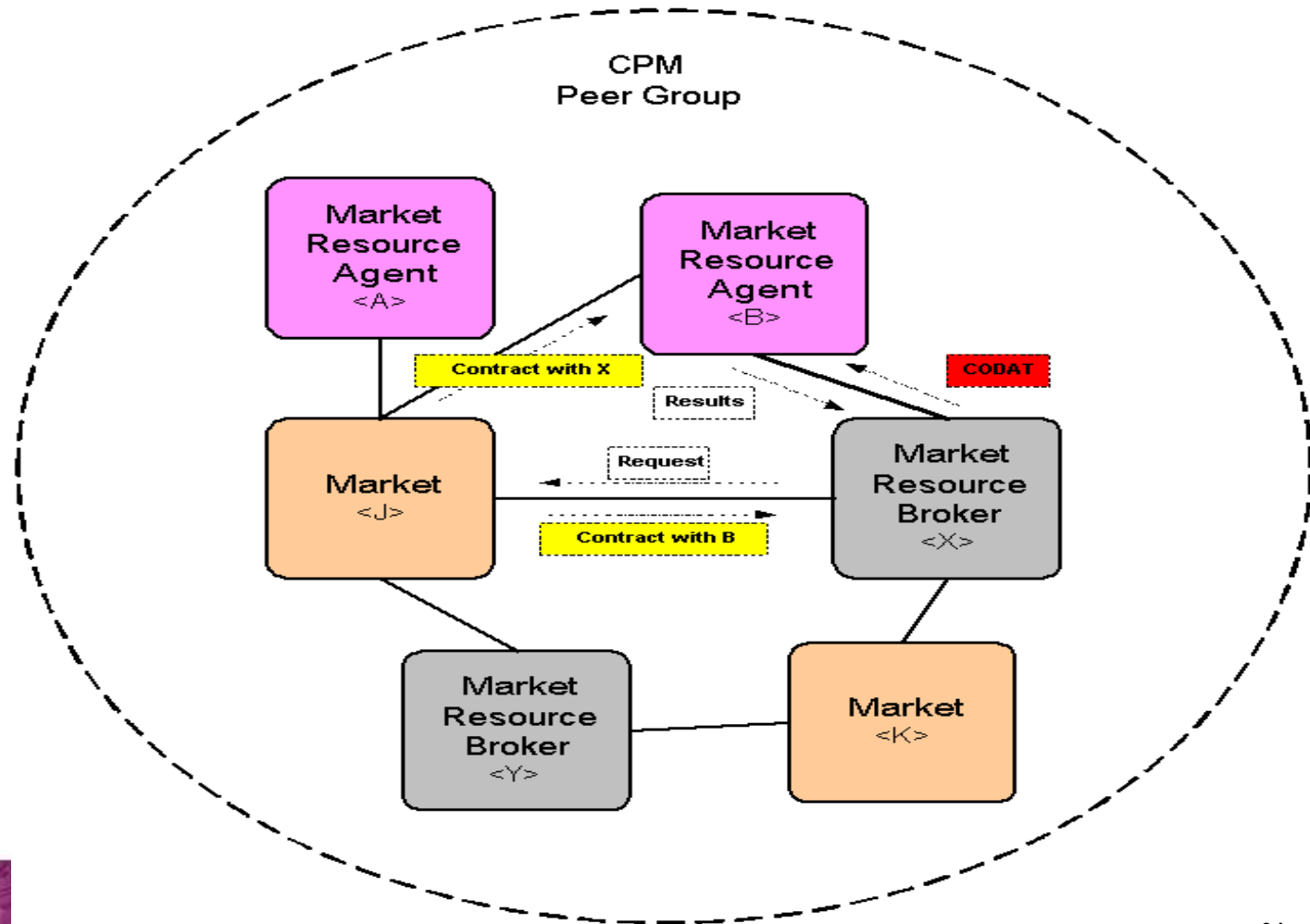


JXTA within GGF

- JuxMem (INRIA - IRISA)
 - Large scale persistent and coherent Data Grids



Compute Power Market



JXTA Sample Applications --

<JXTA and Grid Update>

Momentum 1.0 by InView Software

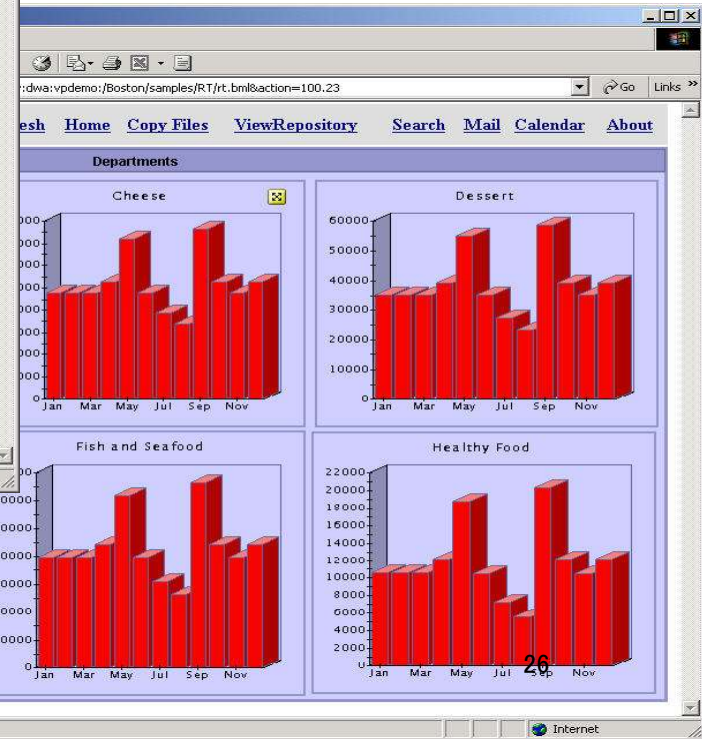
The screenshot displays the Momentum 1.0 software interface. The main window, titled "Momentum - artw", features a menu bar (File, Edit, View, Tools, Window, Help) and a toolbar. On the left, a "Shortcuts" pane lists various workspace elements like "Inbox", "Local Network Users", and "Personal Contacts". The central "Navigation" pane shows a tree view of workspaces, with "The Orion Product" selected. The right-hand "General" pane displays details for "The Orion Product", including the owner "Art Whitten" and creation date "10/16/02 1:33 PM".

Overlaid on the bottom right is a "Proposal Block Diagram" window. The diagram, titled "Controller Schematic", illustrates a system architecture. A central "JTAC/DEBUG" block is connected to a "RISC CPU 16-bit" block. The CPU is linked to a bus system with "MAB" (Master Address Bus) and "MDB" (Master Data Bus) lines. Various peripheral blocks are connected to this bus, including "FLASH 4/8 kB ISP", "RAM 256 kB", "Power-on reset with Brown-out Protection", "Port 1 with IRQ", "Port 3", "Watchdog 15-bit", "Timer A3 16-bit", "ADC10 DTC", "Port 2 with IRQ", and "USART0 UART/SP1".

At the bottom of the interface, a chat window shows a message from "Art Whitten" dated "Oct 18 11:25:22 PDT 2002": "This looks good for our response to Solarion's Request for Proposal. I think we'll just be able to meet the RFP deadline of October 23rd." The chat window also lists other participants: Tom Brubaker, Ken Sigel, and Pete Crouch, along with a "Send" button and a "Display user list" checkbox.

JXTA Sample Applications – VistaPortal

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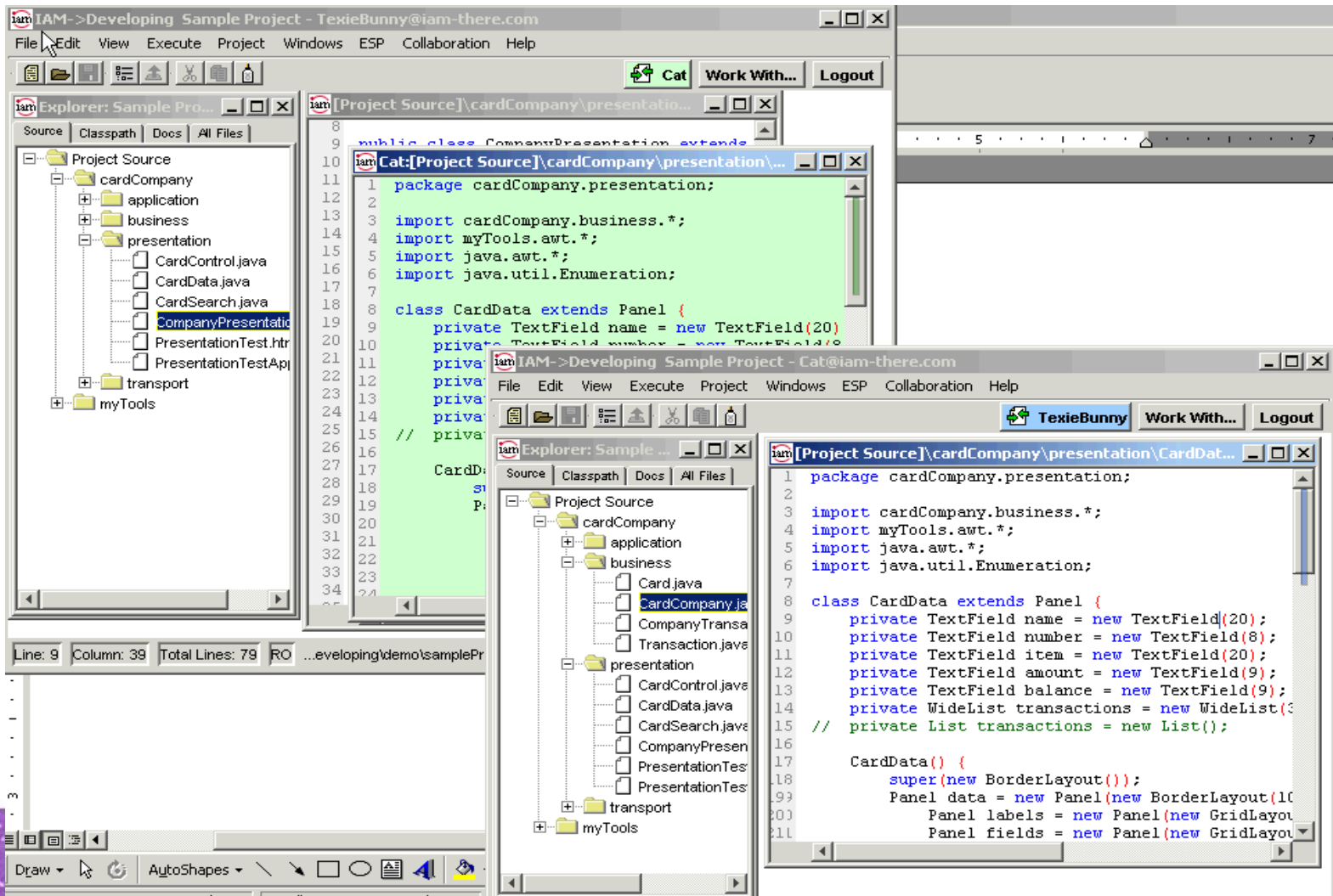


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JXTA Sample Applications - Java IDE

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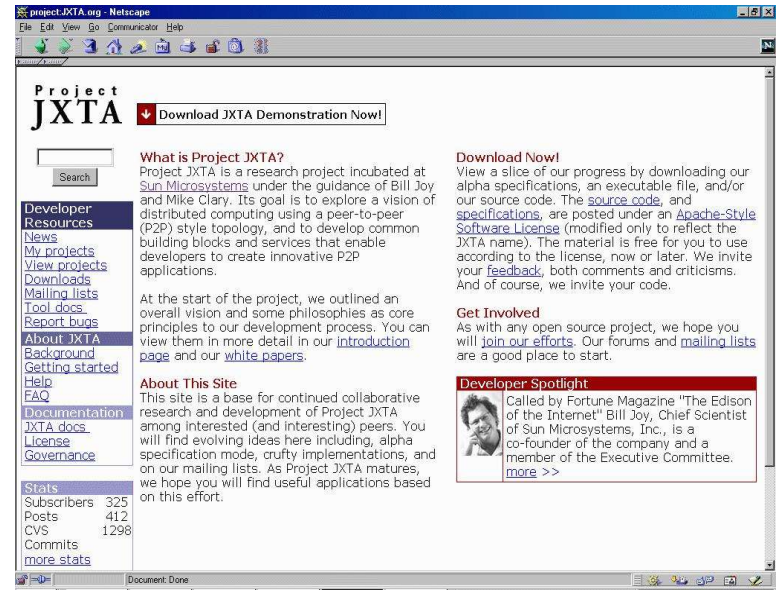
by Internet Access Methods



Project JXTA Community

WWW.JXTA.ORG

- 2,500,000+ downloads
- 100+ projects
- 18,000 members
- Active discussion groups
- Community actively contributing and integrating technology.



Report Card

- JXTA Protocol: B+.
 - The protocol has been made much leaner and efficient since its earlier versions.
 - The API does need additional capability for real-time voice and video transmission.
 - Security is there for encryption, but no identity capability. The protocol is stable with little likelihood of changes.
 - Additions to the protocol should not affect compatibility.



Report Card

- JXTA Java API: B.
 - Much simpler, faster, and greater stability.
 - Addition of simpler configuration has helped greatly for end-user adoption.
 - Still has a few quirks and many parts are needlessly complex but core functionality is easily used.
 - Stability of the API signatures is fairly stable and we should only see additions.



Report Card

- JXTA Adoption: C.
 - Related to components and utilities because most developers like constrained environments.
- JXTA Developer Education: C- .
 - We need a lot of work here. Primarily to educate developers and companies on how different P2P is from client server solutions.
- P2P Patterns: B-.
 - This is how we design develop applications. The patterns are there, but not well known and only a few cases represented by large installations. This area is wide open because we have only scratched the surface.



Report Card

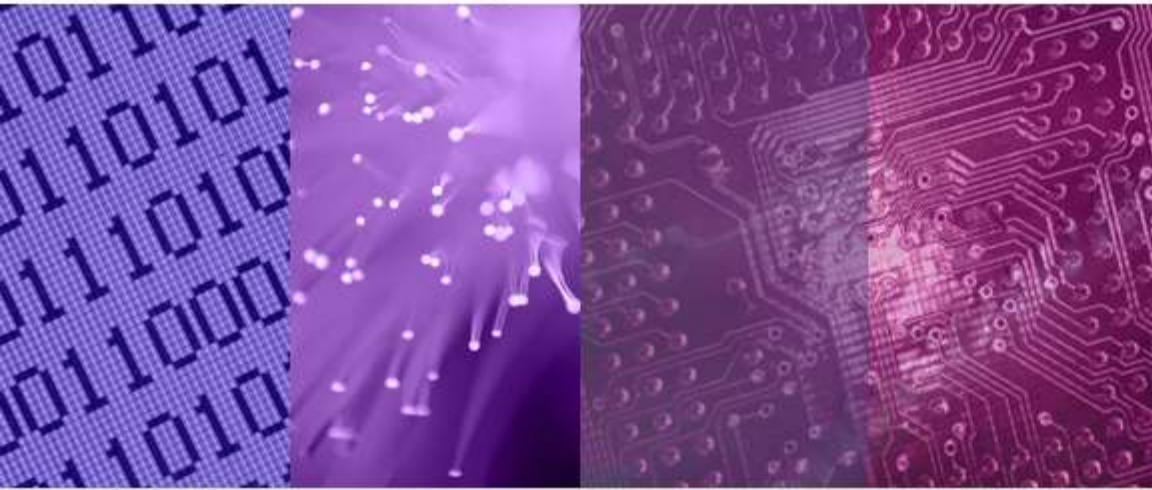
- JXTA utilities and application components: D.
 - We have a few libraries, but there needs to be a larger group of components to add to applications taking advantage of P2P with little understanding of P2P or JXTA.
 - Examples are chat, identity management, file sharing, whiteboard (controlling a common electronic workspace), searching, database apps, data synchronization, and monitoring.



Summary

- JXTA Open-source P2P Platform
 - Stable API
 - Quarterly release train
- Leverage on-going GGF works on JXTA
- JXTA opportunities within HPTC
 - Network infrastructure to build massive Internet scale grids
 - Ad hoc resource discovering and resource binding
 - Domain scoping
 - Failover and load balancing domain via domain service signature.





Thank you

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Visit <http://apstc.sun.com.sg>