

# Systems You Can Count On



# Mission Statement



- ◆ To create the technology for *Systems You Can Count On*, making today's applications reliable and secure, and enabling whole new classes of critical services.
- ◆ Today, information technology is *the weakest link* in many of our most critical applications and services. Digital computing and communications increasingly pervade our lives, our economy, and our nation's critical infrastructure. In many applications this technology simply can't be trusted; it creates problems that range from chronic aggravation to unacceptable vulnerability.
- ◆ Our challenge is to design a new generation of *Systems You Can Count On*:
  - ❖ Technology that makes applications reliable, secure, available, trouble-free, and evolvable
  - ❖ Technology that can be used with confidence in all elements of our global critical infrastructure
  - ❖ Technology that enables new services ranging from a currency-less society to 24x7 location-independent personalized healthcare
- ◆ These goals require fundamentally re-thinking the way we design, deploy and support our global infrastructure—an essential technical grand challenge.

# Metrics for Success



- ◆ By 2010, there is a prototype of a trustworthy and open information infrastructure that by 2015 could be available and affordable worldwide. This system will be:
  - ❖ **Secure:** It services only authorized users, service cannot be denied by unauthorized users, and information cannot be stolen
  - ❖ **Available:** Any given user sees is less than one second per year of downtime
  - ❖ **Evolvable:** System and service evolution is graceful to users, and is smooth for support staff
  - ❖ **"Eternal"**– if put something in it it'll be there in 100 years

# Technical Challenges



- ◆ Approaches for building systems as federations of large numbers of heterogeneous units that evolve, accommodate change, and grow
- ◆ Composition of partially-specified units, friend or foe (e.g., combining “open” with “secure” and “reliable”)
- ◆ Software engineering: reduce cost of high-quality development, evolution, and support
- ◆ Human-centered design approaches that “make things seem simple” and reduce “human error”
- ◆ System administration tools that eliminate configuration and upgrade errors
- ◆ Specification techniques for policies that are meaningful to system administrators and all stakeholders
- ◆ Managing names and global name spaces
- ◆ Develop meaningful metrics of system security, stability, etc.
- ◆ System auditing and analysis techniques
- ◆ **Broad architectural rethinking**

~~Cyber-Terrorism~~

A cashless society



24x7  
location-independent  
personalized  
healthcare

A lifetime "online  
admin" you trust as  
your delegate

**Spinoffs**

Loss of  
personal photographs  
or financial records is  
inconceivable

Universal access  
to information &  
knowledge

Environmental  
Monitoring & Disaster  
Recovery

"A Teacher for Every  
Learner"

# Social Barriers



- ◆ Trust is only earned over time and use—will start with the unimportant and evolve to the critical
  - ❖ The Big Brother perception
  - ❖ Real and demonstrated privacy
  - ❖ Anonymous or pseudonymous actions?
  - ❖ Sense of user-in-control
  - ❖ Too US centric?
- ◆ Economics
  - ❖ Interaction with commercial (vendors) and governmental interests
  - ❖ Software historically driven by features, not quality or trustworthiness.
  - ❖ Third-world cost structure

# Systems You Can Count On



- ◆ Not just technology, but a critical national goal that depends upon and drives technology
- ◆ By narrowing the goal and by maintaining a focus, we increase our chances for measurable success