Better Living through Managed Private Virtual Machines

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The home system management problem

• Individuals have proven unable or unwilling to manage their home computers well
• System management is complex and time consuming
• Lack of security leads to malware infections
• Lack of backups can lead to data loss
• Problem is growing worse as more people rely on computing for more aspects of their lives
Exploring alternatives

• What if individuals turn over management of their personal computers to service providers?
• How much flexibility would individuals retain?
• Where should these machines reside?
• Should they be virtual or physical machines?
• Who would own these machines and their data?
• How much would it cost and who would pay?

Managed private virtual machines running in the cloud are an attractive alternative
Managed private VMs in the cloud

• One virtual machine per individual
• Runs in a utility computing infrastructure
• Enjoys encapsulation and isolation benefits of VMs
• Managed by a paid service provider
• Individual retains rights to data in his VM
• Still need some hardware in the home, e.g., a thin client, but it should be simpler to manage than a full-featured computer system
In the cloud vs. in the home

• Virtual machines in the cloud:
  – Run on highly available infrastructure
  – Hardware failures/upgrades are transparent to individuals
  – Enjoy economies of scale
    e.g., share memory pages of popular binary images across many VMs

• Virtual or physical machines in the home:
  – Better interactive response for some apps
  – Some apps available without a network connection
  – Stronger sense of ownership and control?
Flexibility vs. manageability

- Outsourcing system management to service providers will limit options open to individuals e.g., what software packages are installed on VM
- How much flexibility would individuals be willing to give up?
The price question

• Managed private virtual machine services are emerging, currently aimed at enterprises
  e.g., pair.com Virtual Private Server at ~$80/month
• Would need to bring price down for a viable consumer offering
  – People are willing to pay for services they perceive as valuable, e.g., ~$10/month for MobileMe
  – Cost and market studies are needed
Many uses of a private VM in the cloud

• **Trusted proxy for mobile devices** [MobiHeld09]
  – Saves battery, bandwidth, processing, storage on devices
  – Many possible applications
    • Location-based services
    • Participatory sensing
    • Synchronization and backup
    • ...

• **Trusted online presence for individuals**
  – Peer-to-peer online social networking [WOSN09]
  – Web server: blog, photos, etc.
  – Email server, ...

• Helps preserve owner privacy across all these uses

• Cost is amortized across all these uses