



**Your File System**

**HEPIX Fall 2013 – Ann Arbor MI USA**

# HEPIX Fall 2007

◎ OpenAFS Gatekeepers presented road show and community wish list

◎ Alan Silverman:

- “... it became clear that they could be funded to implement HEP-desired features.” However, he was “sceptical”.

◎ Chuck Boeheim:

- Apply to U.S. Dept of Energy for SBIR grant
- Prove ability to deliver on road map



# Six Years Later – YFS<sup>®</sup> 1.0

- ◎ Dual protocol stack clients and servers
  - AFS<sup>®</sup> stack for compatibility with IBM AFS and OpenAFS<sup>™</sup> clients and servers
  - YFS<sup>®</sup> stack for enhanced functionality
- ◎ Focused improvements:
  - Security
  - Networking
  - Scalability
  - Ease of Use
  - Code Quality



# YFS<sup>®</sup> 1.0 Security!

- GSS Kerberos 5 authentication
  - extensible to other GSS mechanisms
- AES-256/SHA-1 wire protection
  - Upgradable to AES-CTS/SHA-2 (IETF standardization)
- Combined identity tokens (user@device)
  - No more cache poisoning attacks
  - Enhanced authorization models
- Mandatory Security Levels
  - Enforced on a file server basis
  - Required volume security policy must match FS policy



# YFS<sup>®</sup> 1.0 Security!

- Access Control Enhancements
  - Per object not per directory
  - Maximum Access Policy per volume
  - Directory inheritance
- Callback channel protection
  - No information leakage between FS and CM
  - Lays the groundwork for cache modification
- Services do not run as “root”



# YFS<sup>®</sup> 1.0 Networking!

- Shiny New Rx implementation
  - throughput exceeds 8.2 gbits/second per listener thread
  - Reduced protocol overhead
  - Improved WAN performance
    - Resilience to packet loss and out of order packet delivery
    - Reduced latency
  - Lower CPU utilization and cache line contention
  - Dual IPv4 and IPv6 capable



# YFS<sup>®</sup> 1.0 Scalability!

- Services process up to 16,000 RPCs in parallel
- Year 2038 Safe
- 100ns timestamp granularity
- $2^{64}$  volumes per cell
- $2^{95}$  directories and  $2^{95}$  files per volume
- Maximum database size  $2^{64}$  bytes
- Maximum volume size and quota  $2^{64}$  Kbytes
- Maximum partition size  $2^{64}$  Kbytes



# YFS® 1.0 Ease of Use!

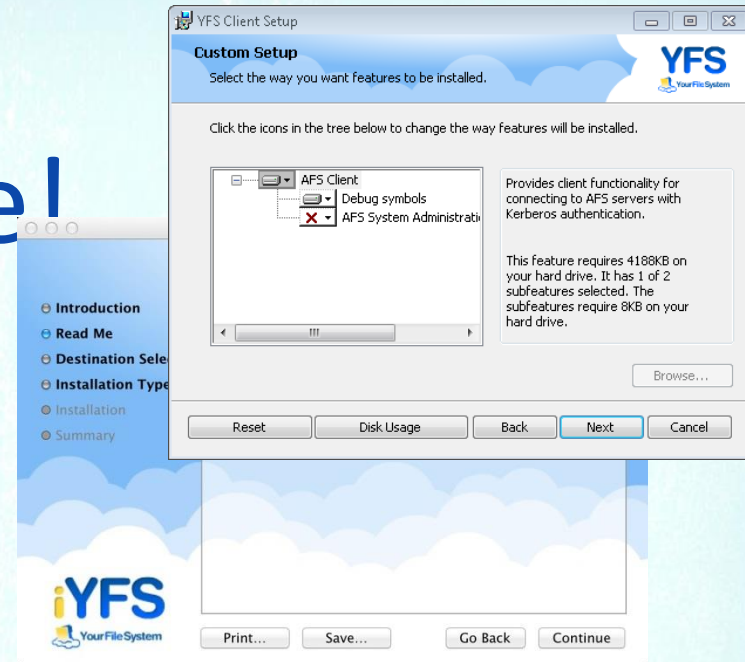
## ⦿ New installers

- Windows and OSX
  - One installer per platform
  - Heimdal included

## ⦿ Automated Token Acquisition for Windows Domain Logons

- No credential manager required

## ⦿ Windows Explorer Shell integration





# YFS<sup>®</sup> 1.0 Improved Code Quality!

- ⦿ pthreads or Windows threads; no LWP
- ⦿ One shared library per module
- ⦿ Command line tools are wrappers around thread safe libraries
- ⦿ Test suites for all libraries and services



# YFS<sup>®</sup> 1.0 No Flag Day!

- ◎ YFS<sup>®</sup> database servers required for advanced functionality
- ◎ Mixed deployments are supported but ...
  - Clients, File Servers, and DB Servers can be deployed in any order or combination
  - OpenAFS<sup>™</sup> Servers in YFS<sup>®</sup> cells cannot
    - store volumes containing Security Policies, New ACLs, Large Volume or Vnode IDs, Extended directories, etc
  - YFS<sup>®</sup> Servers in OpenAFS<sup>™</sup> cells cannot:
    - Provide advanced security services
    - Publish non-v4 addrs
    - Use non-standard port numbers



# YFS® 1.0 Availability!

- ◎ Digitally Signed Packaging for:
  - Red Hat Enterprise Linux 5.0 and 6.0
    - YFSI is a Red Hat Partner
  - Fedora
  - Debian
  - Microsoft Windows 5.2 (Server 2003) and above
    - XP SP3 until 8 April 2013
  - OSX 10.8 (Mountain Lion) and 10.9 (Mavericks)
  - iOS 4.0 and above
- ◎ World-wide export license has been obtained



# YFS® 1.0 Pricing!

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- ◎ Per cell pricing
- ◎ Scales based upon
  - Number of servers
  - Number of protection db entries
- ◎ Includes unlimited support
  - (9-5 UTC+5/M-F)
- ◎ Free updates for one year
- ◎ Source code licenses are available



# YFS<sup>®</sup> 1.x Road Map

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- ◎ Apple and Microsoft Store distribution
- ◎ Read/write replication
- ◎ IPv6 enhancements
- ◎ File drawers replacement
- ◎ Location based access controls
- ◎ Unlimited directory sizes
- ◎ Much more ...





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