# *The Million Point PI System PI Server 3.4*

*Jon Peterson*

*Rulik Perla*

*Denis Vacher*

# *Agenda*

- *The*
- *New*
- *PI*
- *Server*
- *Version*
- *3.4*
- *Performance, Reliability, Scalability*

# *What to expect from PI 3.4?*

- *Faster Data Archive*
  - *Up to ten times the input rates*
  - *Concurrency & better caching on data retrieval*

- *Increased Reliability*
  - *Better handling of overloads or failures*

- *Higher Point Count*
  - *Less memory usage allows for larger systems*
  - *Up to 2 million points*

- *Already in Beta*
  - *Our automated tests provide for shorter release cycle*

# *Architectural Changes*

- *Multi-threading of the PI3 Subsystems*
    - *Removes concurrency bottlenecks*
    - *Makes full use of multi-processor machines*

- Shared memory event queue
    - *More robust, much faster, even more transparent*

- Data archive improvements
    - *Better use of memory resources improves performance and control*
    - *Disk record insertion/deletion*

# *DEMO*   *3.3 vs. 3.4*

- *Identical 150K point systems on identical hardware*

- *Concurrent Archive Access*

# *Multi-Threading*

- *Concurrency*
  - *Multiple archive queries/calculations*
  - *More concurrent users*
  - *System availability during archive shifts and backups*

- *Scalability*
  - *Better use of multi-processor machines*

- *Thread Management Tools*
  - *Add/remove threads, change priorities*

# *Shared Memory Event Queue*

- *Much higher data throughput*

- *Data persistency on disk*

- *Minimal use of system resources*
  - *Same number of I/Os during normal operation and system overloads*

- *Maximum size of 128GB*
  - *(in the initial version, ~5 billion events)*

# *Archive Cache Enhancements*

- *Reduced Memory Requirements*
  - *Support for variable-size cache records*
  - *Read-only record pool for faster data retrieval*

- *Physical Disk Write Control*
  - *By time
    similar to previous versions – but much more precise*
  - *By number of events*

- *Memory Usage Control*
  - *Automatic and configurable adjustments and safeguards*

# *Other Archive Goodies*

- *Out-of-order Data Processing*
  - *No more cascades! – unless you want them*
- *Actual Record Deletion*
- *Archive Offline Markers*
  - *No more interpolation between unregistered archives*
- *64-bit Archive File Access*
  - *Larger file (up to 2TB)*
  - *Unlimited number of archive files*

# *Archive Monitoring and Control*

- *Activity Grid*
  - *Per point or per user real-time analysis*

- *Archive and Event Queue Statistics*

- *Configurable Parameters*
  - *Cache management*
  - *Shift management*
  - *Offline markers and record insertion*

# *Base Subsystem*

- *Flexible In-memory Databases*

- *Multi-threading*
    - *Faster user validation*
    - *Concurrent tag searches*

- *Not Involved in Archive File Initialization*

- *Faster Startup*
    - *Faster and more reliable backups*

# *Other Enhancements*

- *Batch and Module Database*
  - *Performance enhancements*
  - *Auditing*

- *Increased Console Security*
  - *PIconfig optional login*

- *Summary Data Retrieval from COM Connectors*

- *Full Binary Compatibility with PI 3.3*

# *Tuning*

- *No Need to do it!*
  - *Almost always you can leave the defaults* ☺

- *Many Analysis Tools*
  - *Command-line utilities*
  - *IT Monitor*
  - *PI System Management Tools*

# *Limitations*

- *Exceeding the 2GB Virtual Memory Limit*

- *Physical Memory Usage*

- *Large Systems Considerations*
    - *Point DB loading*
    - *Bulk point creation/editing*
    - *Archive data rates*

- *Applies to Very Large Systems*
    - *Optional boot with /3GB user space*

- *64-bit OS Eliminates These Limitations*

# PI Server 3.5 Features

- *Point Class Editing*
- *Backup Subsystem*
  - *On-line backup, Microsoft VSS support*
- *Custom Indexing*
- *Future Data Support*
- *Further Integration with NT security*
- *Windows 64-bit support*

*Most of these already in development!*

# *Live System*

- *1.5 Million Points and growing…*
- *Windows 2000 Advanced Server*
- *Dual 1GHz Server with 4GB RAM (hardware valued at a mere $3,000)*
- *25-100k Events/sec into the PI Archive*

# *PI 3.4: Million Points and More*

- *Concurrent Access*
- *2 Million Points*
- *100K Events/second*
- *Increased Reliability*
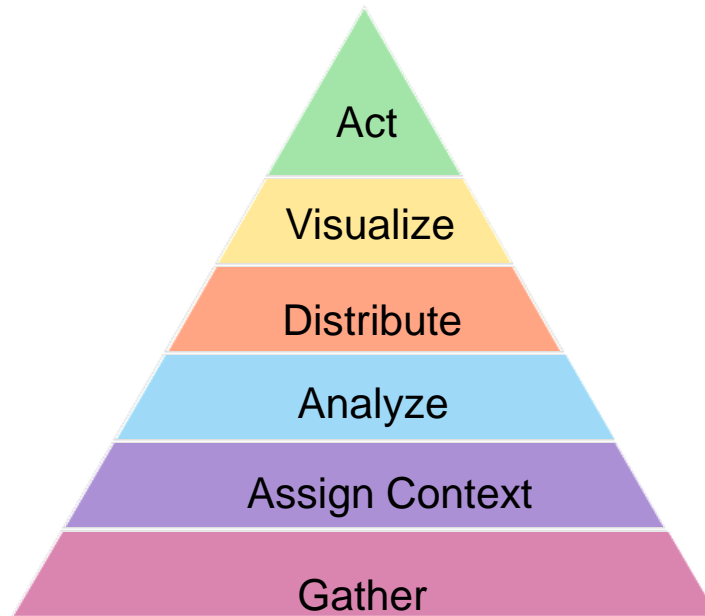
*Beta Now. Target Release July 2003*

# *Questions?*

*"The PI Server is <u>your</u> RtPM backbone"*