

**Nuclear Division** 







### 2018 – Plant Performance Symposium R\*TIME V15 Erin Carrol & Brer

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### **R\*TIME V15 Goals and Objectives**





## Before R\*TIME V15 (How we got here)

- R\*TIME and FAMOS diverged at version 12.9 (circa 2010)
  - Different business and market needs
  - Different challenges





## **FAMOS Major updates**

# • FAMOS Changes

- Integration of:
  - PdP,
  - Rules Engine,
  - Architect,
  - Issue Tracker
  - Mongo Database
- Creation FAMOS Viewer (Web Viewer)
- IOS application



## **R\*TIME Major updates**

# R\*TIME Changes

- Integration of:
  - C# Architecture,
  - Program Creator,
  - Mongo Messaging system,
  - RTP 3000 and 3000 TAS,
  - DNP3,
  - Diode Support (UDP),
- Redundant PSS
- StackTrace Debug



### **R\*TIME V15 Integration**





## **R\*TIME V15 Overview**

- 64 Bit Application Support / New Features
- **Change Tracking Archive**
- **Integrated Wireless Sensors**
- Web Viewer Integration
- **Mobile Application**



# 64 Bit Application Support / New Features

- 64 Bit Status
- 64 Bit WCVT / CVT
- 64 Bit Applications
- 64 Bit Time
- Test Mode
- VS 2017 / Windows Server 2016
- VSupport / Database Changes





64 Bit Mario



### **64 Bit Status**

#### **R\*TIME V14 STATUS**

- 32 Bit Status
  - All 29 bits used, 3 spare

#### **R\*TIME V15 STATUS**

- 64 bit Status
  - 36 bits used, 28 spare

#### 4 new Status types

- > Alarm DI disable
- Test mode
- Point is in change-tracked archive
- Second user status (4 bits)



## 64 Bit Status (Continued)

#### **R\*TIME V14 QUALITIES**

#### 8 Qualities

- #define BAD 7
- #define RANGE\_FAILED 6
- #define DAS\_BAD 5
- #define IVM\_REPLACED 4
- #define MAN\_ENTERED 3
- #define POOR 2
- #define SUSPECT 1

#### **R\*TIME V15 QUALITIES**

- 16 Qualities
  - #define BAD 15
  - #define RANGE\_FAILED 14
  - #define DAS\_BAD 13
  - #define OTD 12
  - > #define PROJECT\_SPARE3 11
  - #define RDER 10
  - #define PROJECT\_SPARE2 9
  - #define NCAL 8
  - #define UNKN 7
  - #define REDU 6
  - #define IVM\_REPLACED 5
  - #define POOR 4
  - #define SUSPECT 3
  - #define MAN\_ENTERED 2
  - > #define PROJECT\_SPARE1 1
  - #define GOOD



# **64 Bit Applications**

- Conversion is usually "quick and easy"
  - Converted over 200 projects in 3 days
  - Process Looks Like:
    - Have Visual Studio make a 64 bit configuration
    - Remove the 32 bit configurations
    - Remove the WIN32 preprocessor definition from the project settings
    - Build
    - Fix any warnings. These will usually be for data type issues.
      - Time being stored in an 'int' or UINT32
      - Pointers being passed through integers

## **64 Bit Applications**

- Some possible conversion issues to be aware of:
  - Socket library changes
    - Must convert socket identifiers to 'SOCKET'
  - Third party libraries
    - PI, eDNA, OPC, etc...
  - Hard-coded override of machine types in projects
    - A few project files manually overrode the machine type to 'x86' in the linker advance setting command line option. These must be removed if present.



### 64 Bit Time

- Question :: What happens on 03:14:07 UTC on Tuesday, 19 January 2038?
- Answer :: U vill wrap around and e number which these occurred on 13 Decembe 38. R\*TIME V15 64 bit time. The End of an Epoch



### **Test Mode**

- Solution designed to simplify testing.
- Provides ability to substituting a point, but without affecting the quality.
- Prevents applications from overwriting value.
- TDBM (Test Database Manipulator) can store the value.
- TDBM can later validate the value.
- Can save hundred or even thousand of calculation steps.
- Example: Point Z is X+Y, Point X is L+M, Point M...



## **Visual Studio / Operating Systems**

#### **R\*TIME V14 VS/OS**

- Windows Server 2008 / 2012
- Visual Studio 2012 / 2015

#### **R\*TIME V15 VS/OS**

- Windows Server 2016
- Visual Studio 2017





# **VSupport / Database Changes**

# Vsupport

All internals converted to support 64 bit Status and Values

## – New functions:

- compStatlsBad()
- isUsable()
- worstQuality()
- isInTestMode()
- get\_sdztime()
- put\_ai\_double()
- put\_aiw\_double()
- put\_ai\_testValue()/put\_di\_testValue()
- put\_aiw\_testValue()/put\_dew\_testValue()



## **VSupport / Database Changes**

- New Conversion Types
  - FLOW4: Flow = b \* sqrt(mv a) : if EU < c, EU = 0
  - ALOGS: Special AntiLog EU = a \*\* (b\*mv + c) +
  - SQRT3: = b \* sqrt(x a) when x > a else b \* sqrt (a x)
  - LOG10: = Base 10 Log = b \* log10((mv + a)
  - LOGN: = b \* log((mv + a)
  - ALOG10: Anti Log Base 10 = c \* 10\*\* (a \* (x b))
  - ALOGN: Anti Log (natural) =  $c * e^{**} (a * (x b))$
- New RTP Card Support
  - 8436/52-1XX



### **V15 Historian Features**

- New Historian / Change Tracking Archive for V15
  - Records ALL changes to point values or status by default
  - Changes are time stamped when the associated 'vput' function is called
  - Ability to add compression delta (only record when value exceeded)
    - Compression can be delta value
    - Compression can be delta percent
  - No need to define frequency of record.
- Legacy Archive Format (Features Maintained)
  - No Longer Used?

# **V15 Historian Features (Continued)**

#### LEGACY ARCHIVE

- Space is pre-allocated
  - Can take hours to create
  - Never grows, so you can't fill disk
- Many options for configuration
  - Must choose frequency, points, location, etc...
- Archive File definition fixed
  - Can change point list, but only if file is not loaded in the system

#### **CHANGE TRACKING ARCHIVE**

- Grow over time
  - Created instantly
  - Could fill up disks
- Single configuration
  - Records all changes, less compression delta
- Most configurable options for a file can be modified while file is still actively recording data
  - Add / Subtract points (up till spare area is filled)
  - Performance tuning parameters can be modified
- All other options can be modified while file is still loaded (can be read from, but not being recorded to)
  - Increase the spare area size

## **V15 Historian Features (Continued)**

- Instant archiving verse waiting for archive creation
- Less Disk Space
  - Analog Compression Expected to be take  $\frac{1}{2}$  or less disk space
  - Digital Compression Expected to take 1/100<sup>th</sup> or less disk space
- Faster Data Retrieval
- Still Lossless archiving (by Default)
- Higher Resolution
- Still has knowledge of data holes



## **Change Tracking Archive Data Flow**





#### V15 CTA Demo



# Web Viewer (Erin)

#### Demo...



### Demo...



## **V15 Wireless Integration (Erin)**

#### Demo...





