FT 6000 and BACnet FT
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Adesto Technologies

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Market Need for BACnet FT

Multiple protocols in the Buildings Market … BACnet holds a dominant position in global Building Automation market

BACnet and LON have their advantages. BACnet was designed with tops-down HMI integration in mind while LON was designed from the bottom up device/application interoperability.

We have a solution to reduce the cost of ownership of BACnet networks and solve interoperability between LON and BACnet

BA Device TAM: 50-70M/year
FT 6000 Series Chips Combine BACnet and LON over FT

- FT 6000 devices simultaneously provide a LON, LON IP, BACnet IP Server, and BACnet MS/TP Server interface.

- Supported BACnet Object types:
  - Analog Input – sensor input
  - Analog Output – control output
  - Binary Input – switch input
  - Binary Output – relay output

- Supported BACnet BIBBs—can be BTL certified:
  - Application-specific Controller
  - Smart Sensor
  - Smart Actuator

- Other BACnet features:
  - Read Property Multiple
  - Change of Value (COV)
  - BACnet/IP and BACnet MS/TP support
FT 6000 Multi-Protocol Smart Transceiver

- LON
- LON IP
- BACnet IP
- MS/TP

- LON IP
- BACnet IP
- MS/TP

- Improves performance vs. the Series 3100
  - Up to 8x effective clock speed increase over Series 3100
  - Up to 254 network variables
  - Up to 254 address table entries
  - Dedicated interrupt processor
  - Hardware multiplier

- Supports multiple protocols
  - LonTalk/IP and classic LON
  - BACnet/IP and BACnet MS/TP

- Supports larger applications
  - Up to 256KB for applications

- Low power 3.3V design
- Reduces board footprint
  - 7mm x 7mm 48-pin QFN
- Reduces memory cost
  - On-chip 64KB RAM and 16KB ROM
  - Requires low-cost (< $0.35) external 8-pin SOIC serial flash memory
    - Including AT25SF041/AT5SF081
- More cost effective
  - Up to a 50% cost reduction vs. the Series 3100
  - Eliminates external serial EEPROM required by the Series 5000

- -40°C to +85°C
Advantages of FT as BACnet or LON media

- **Versus MSTP**
  - Substantially improves noise immunity
  - Substantially reduces installation complexity
    - Error prone commissioning: 3 wires, polarity sensitive, double termination, dip switch addressing, baud rate selection…
  - Increased devices per channel and maximum wiring distance
  - Fault tolerant
  - Link power support
  - Simpler debugging

- **Versus Ethernet**
  - Eliminates home run wiring or limited number of hops
  - Improves noise immunity
  - Eliminates heavy IT involvement during installation
    - Reduces need for DHCP leases per device
    - Removes additional IT costs
      - Uplink switches and VLAN
  - Error free commissioning; Reduces risks of un-managed IP devices
Message to OEMs

- Combine the benefits of BACnet and LON
  - Rich BACnet server functions
  - Diverse LON applications with peer to peer networking
- Single SKU
- Opportunity to differentiate

Message to Integrators

- Single installation and management tool
- Ease of installation and wiring
- Less field support issues
BACnet Architectures

BACnet/IP

BACnet MS/TP

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Multi-Drop BACnet FT Architecture
BACnet MS/TP Vs BACnet FT Cost of Ownership

<table>
<thead>
<tr>
<th>Assumptions</th>
<th>Device Count</th>
<th>Labour Rate $/h</th>
<th>Labour Rate $/m</th>
<th>Belden 847TLSNH $/m</th>
<th>Belden 3105A $/m</th>
<th>MS/TP Contemporary Controls BASRTLX-B BASrouterLX</th>
<th>FT IzoT Router</th>
<th>Cost of Device Similar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device Count</td>
<td>64</td>
<td>100.00</td>
<td>1.67</td>
<td>1.70</td>
<td>2.61</td>
<td>436.00</td>
<td>600.00</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
1) 64 devices on an MS/TP channel is optimistic
2) SmartServer IoT will reduce router costs

<table>
<thead>
<tr>
<th>Numbers</th>
<th>MS/TP</th>
<th>$</th>
<th>BACnet FT</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 Cable m (circumstantial)</td>
<td>$1,305.00</td>
<td></td>
<td>$850.00</td>
<td></td>
</tr>
<tr>
<td>2 Labour Cable Pulling/Device (m) (circumstantial)</td>
<td>$106.67</td>
<td>1 $106.67</td>
<td>$106.67</td>
<td>1 $106.67</td>
</tr>
<tr>
<td>2 Labour Cable Termination (m) (strip, plug, test etc.)</td>
<td>$213.33</td>
<td>1 $213.33</td>
<td>$106.67</td>
<td>1 $106.67</td>
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<tr>
<td>2 Device Configuration/Commissioning (m)</td>
<td>$213.33</td>
<td>1 $213.33</td>
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<tr>
<td>2 Segment Termination (m)</td>
<td>$3.33</td>
<td>N/A</td>
<td>$0.00</td>
<td></td>
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</tbody>
</table>

**Router**
- BASrouterLX: $436.00
- IzoT Router: $600.00

**Sub Totals**
- $2,277.67
- $1,770.00

**Cost Difference**
- $507.67
- $507.67

**Things to Consider**
- **Maximum Distance**
  - Function of Baud Rate
  - 500m Ring, 2700m Bus Total
- **Redundant Rings**
  - No
  - Yes
- **Link Power Support**
  - No
  - Yes
- **Noise Immunity**
  - Function of RS485 Transceiver Cost
  - Very good
- **Debugging**
  - Difficult
  - Simple
- **Traffic Rate Calculation**
  - Difficult
  - Simple

**MS/TP Issues:**
- Polarity Sensitive Wiring, Segment Bias Resistor Selection, Double Termination, Device Unit Load, Manual DIP Switch Address Allocation, Auto/Manual Baud Rate Selection, Response Times May Need New Segment, Channel Max Master Count Adjustment, One Device Can Pull Channel Down

**Saving**
- $8/device

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## BACnet/IP (home run) Vs BACnet FT Cost of Ownership

### Assumptions

<table>
<thead>
<tr>
<th></th>
<th>BACnet/IP (Ethernet)</th>
<th>$</th>
<th>BACnet FT</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device Count</td>
<td>64</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labour Rate $/h</td>
<td>100.00</td>
<td></td>
<td>1.67</td>
<td></td>
</tr>
<tr>
<td>Cost Per Industrial Switch Port ($500/16 port)</td>
<td>$31.25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belden 8471LNH Cable $/m</td>
<td>1.70</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belden CAT5E 1583ENH.01U305 LSZH Cable $/m</td>
<td>0.56</td>
<td></td>
<td></td>
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</tbody>
</table>

### Cost of Device the Same Numbers

<table>
<thead>
<tr>
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<th>BACnet/IP (Ethernet)</th>
<th>$</th>
<th>BACnet FT</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable (m) (circumstantial)</td>
<td>At least 5x on FT</td>
<td>$1,405.00</td>
<td>500</td>
<td>$850.00</td>
</tr>
<tr>
<td>Labour Cable Pulling/Device (m) (circumstantial)</td>
<td>At least 5x on FT</td>
<td>$533.33</td>
<td>1</td>
<td>$106.67</td>
</tr>
<tr>
<td>Labour Cable Termination (m) (strip, plug test etc.)</td>
<td>5</td>
<td>$533.33</td>
<td>1</td>
<td>$106.67</td>
</tr>
<tr>
<td>Industrial Ethernet Switch Port</td>
<td>All Devices</td>
<td>$2,000.00</td>
<td>1 per 64 devices</td>
<td>$31.25</td>
</tr>
<tr>
<td>IzoT Router</td>
<td>N/A</td>
<td>$0.00</td>
<td>$600</td>
<td>$600.00</td>
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<tr>
<td>Sub Totals</td>
<td></td>
<td>$4,471.67</td>
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<td>$1,694.58</td>
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<tr>
<td>Cost Difference</td>
<td></td>
<td>$2,777.08</td>
<td></td>
<td>-$2,777.08</td>
</tr>
</tbody>
</table>

### Things to Consider

- Cost of DHCP server(s), uplink switches, VLANs, additional power requirements etc.
- Distance 100m Switch to Device 500m Ring, 2700m Bus Total
- Redundant Rings No Yes
- DHCP Leases Per Device Per IzoT Router
- Potential adverse affect on existing IT installation, permissions High Low
- Noise Immunity Standard Ethernet is not good enough for industrial installations, special car has to be taken Very good


Note: SmartServer IoT will reduce router costs

Saving $43 /device
# BACnet/IP (daisy chain, 7 hops) Vs BACnet FT

## Cost of Ownership

### Assumptions

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<td>Device Count</td>
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<td>100.00</td>
</tr>
<tr>
<td>Labour Rate $/m</td>
<td>1.67</td>
</tr>
<tr>
<td>Cost Per Industrial Switch Port ($500/16 port) $</td>
<td>31.25</td>
</tr>
<tr>
<td>Belden 8471LSNH Cable $/m</td>
<td>1.70</td>
</tr>
<tr>
<td>Belden CAT5E 1583ENH.01U305 LSZH Cable $/m</td>
<td>0.56</td>
</tr>
<tr>
<td>On cost of dual port BACnet/IP device</td>
<td>15</td>
</tr>
</tbody>
</table>

### Numbers

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<thead>
<tr>
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<th>BACnet/IP (Ethernet)</th>
<th>$</th>
<th>BACnet FT</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable (m) (circumstantial)</td>
<td>At least 3x on FT</td>
<td>$843.00</td>
<td>$00</td>
<td>$850.00</td>
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<tr>
<td>On cost of dual port BACnet/IP device</td>
<td>As above</td>
<td>$960.00</td>
<td>N/A</td>
<td>$0.00</td>
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<tr>
<td>Labour Cable Pulling/Device (m) (circumstantial)</td>
<td>At least 3x on FT</td>
<td>$320.00</td>
<td>1</td>
<td>$106.67</td>
</tr>
<tr>
<td>Labour Cable Termination (m) (strip, plug test etc.)</td>
<td>5</td>
<td>$533.33</td>
<td>1</td>
<td>$106.67</td>
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<tr>
<td>Industrial Ethernet Switch Port</td>
<td>8 devices per port</td>
<td>$250.00</td>
<td>1 per 64 devices</td>
<td>$31.25</td>
</tr>
<tr>
<td>IzoT Router</td>
<td>N/A</td>
<td>$0.00</td>
<td>$600</td>
<td>$600.00</td>
</tr>
<tr>
<td>Sub Totals</td>
<td></td>
<td>$2,906.33</td>
<td>$1,694.58</td>
<td></td>
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<tr>
<td>Cost Difference</td>
<td></td>
<td>$1,211.75</td>
<td>$1,211.75</td>
<td></td>
</tr>
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</table>

### Things to Consider

- Cost of DHCP server(s), uplink switches, VLANs, additional power requirements etc.
- Distance: 100m Switch to Device
- 500m Ring, 2700m Bus Total
- Redundant Rings: No
- Yes
- DHCP Leases: Per Device
- Per IzoT Router
- Potential adverse affect on existing IT installation, permissions: High
- Low
- Noise Immunity: Standard Ethernet is not good enough for industrial installations, special care has to be taken
- Very good

Note: SmartServer IoT will reduce router costs

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Recent Successes

CIRCON (EBAC) VAV-350-IMV CONFIGURABLE VAV TERMINAL UNIT CONTROLLER

ISDE ITPR-100 Room Controller
BACnet Protocol Response Time Demo