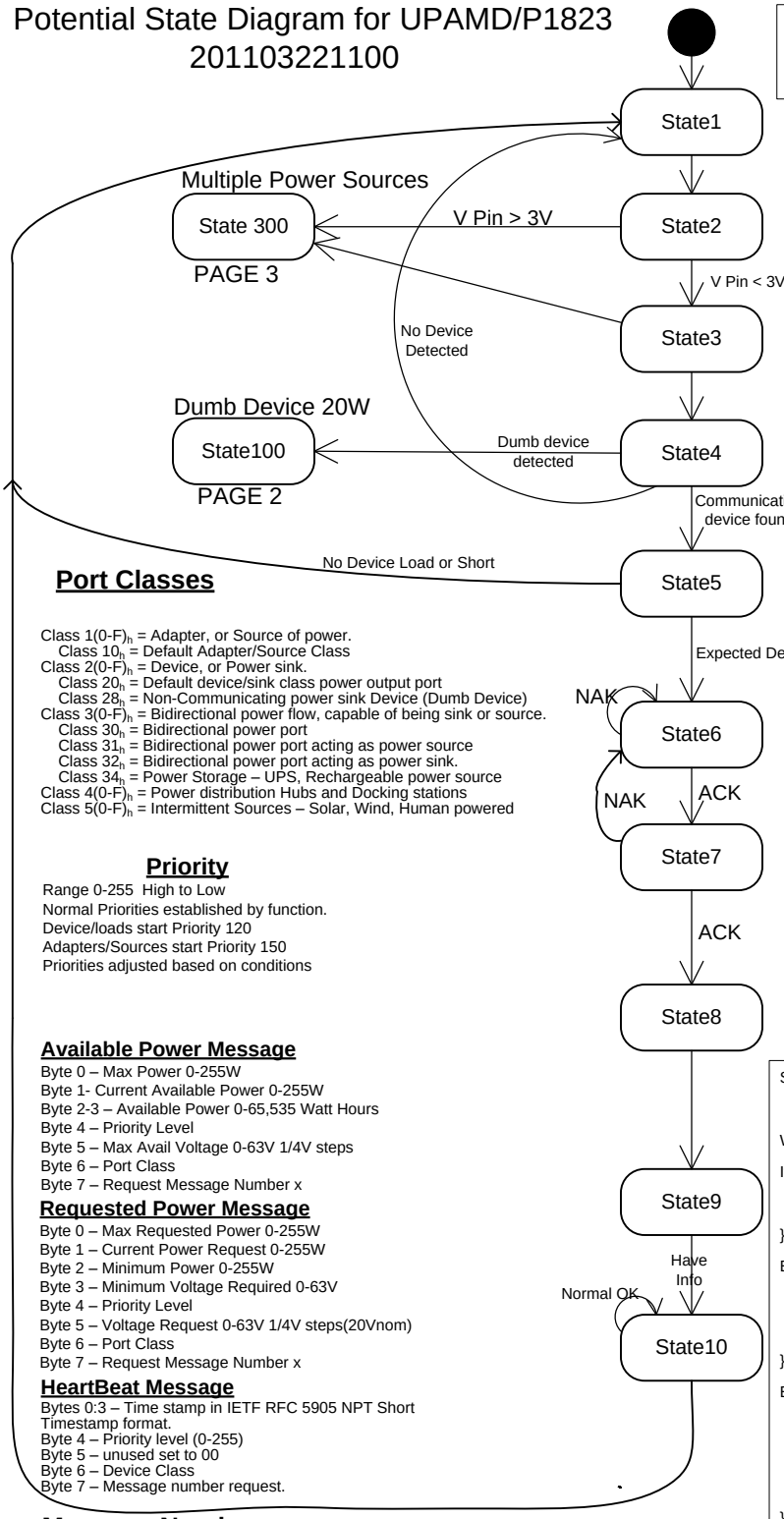
Potential State Diagram for UPAMD/P1823
201103221100



Port Classes

Class 1(0-F)$_h$ = Adapter, or Source of power.
Class 10$_h$ = Default Adapter/Source Class
Class 2(0-F)$_h$ = Device, or Power sink.
Class 20$_h$ = Default device/sink class power output port
Class 28$_h$ = Non-Communicating power sink Device (Dumb Device)
Class 3(0-F)$_h$ = Bidirectional power flow, capable of being sink or source.
Class 30$_h$ = Bidirectional power port
Class 31$_h$ = Bidirectional power port acting as power source
Class 32$_h$ = Bidirectional power port acting as power sink.
Class 34$_h$ = Power Storage – UPS, Rechargeable power source
Class 4(0-F)$_h$ = Power distribution Hubs and Docking stations
Class 5(0-F)$_h$ = Intermittent Sources – Solar, Wind, Human powered

Priority

Range 0-255 High to Low
Normal Priorities established by function.
Device/loads start Priority 120
Adapters/Sources start Priority 150
Priorities adjusted based on conditions

Available Power Message

Byte 0 – Max Power 0-255W
Byte 1- Current Available Power 0-255W
Byte 2-3 – Available Power 0-65,535 Watt Hours
Byte 4 – Priority Level
Byte 5 – Max Avail Voltage 0-63V 1/4V steps
Byte 6 – Port Class
Byte 7 – Request Message Number x

Requested Power Message

Byte 0 – Max Requested Power 0-255W
Byte 1 – Current Power Request 0-255W
Byte 2 – Minimum Power 0-255W
Byte 3 – Minimum Voltage Required 0-63V
Byte 4 – Priority Level
Byte 5 – Voltage Request 0-63V 1/4V steps(20Vnom)
Byte 6 – Port Class
Byte 7 – Request Message Number x

HeartBeat Message

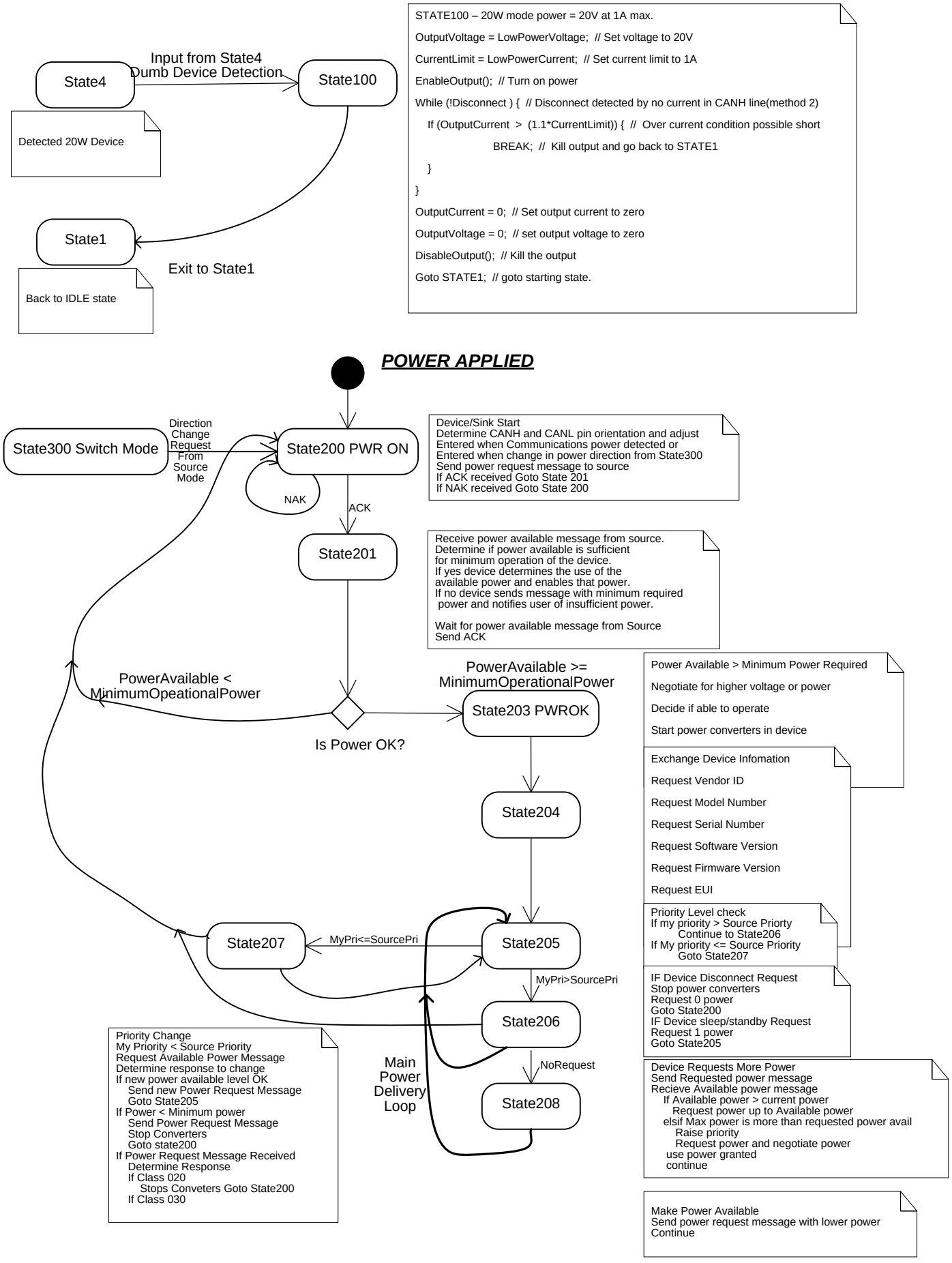
Bytes 0:3 – Time stamp in IETF RFC 5905 NPT Short Timestamp format.
Byte 4 – Priority level (0-255)
Byte 5 – unused set to 00
Byte 6 – Device Class
Byte 7 – Message number request.

Message Numbers

0 – Fault message – 8 Bytes
1 – Available Power – 8 Bytes
2 – Requested Power – 8 Bytes
3 – Data Transfer Request – 5 Bytes
4 – Data Transfer – 8 Bytes
5 – Vendor Identification – 8 Bytes
6 – Model Number – 8 Bytes
7 – Device Serial Number 8 - Bytes
8 – Unique Identifier - 8 Bytes
9 – Manufacture Date – 7 Bytes
10 – Software Version – 8 Bytes
11 – Firmware Version – 8 bytes
12 -- Heartbeat – 8 Bytes
13 – Timestamp NTP – 8 bytes
14 – UPAMD Version message – 8 Bytes
15 – Null message – 0 Bytes
16 – Load device power state – 8 bytes
17 – 31 Reserved for Future use

STATE10 – Nominal power delivery STATE. Responds to disconnect and power change requests.

```
While (!Disconnect) {  // Disconnect detected by no current in CANH line(method 2)
If (OutputCurrent  >  (1.1*CurrentLimit)) {  //  Over current condition possible short
   BREAK;  //  Kill output and go back to STATE1
}
Else If (CurrentPowerRequest  !=  CurrentAvailablePower) {
   NegotiateSourcePower();  // request changes in device power per source need
   Continue;  // Continue in While loop.
}
Else If (CurrentPowerRequest  !=  LastPowerRequest) {
   NegotiateSinkPower();  // determine new power demand from load device
   LastPowerRequest = CurrentPowerRequest; // update last power request
   Continue;  // Continue in While loop.
}
Else if (VoltageRequest != CurrentVoltage) {  // voltage request from device
   NegotiateVotage();  // If capable,  meet device need – printer/workstation etc.
   Continue;  // Continue in While loop.
}
Else if (CurrentPowerRequest = 0) {  // Device requesting turnoff
   Break;  // end loop and kill output  then to STATE1
}
Else if (CurrentPowerRequest = 1) {  // Device requesting sleep state
   OutputCurrent = LowEnergyCurrent;  // Set output current limit to 25ma
   OutputVoltage = LowEnergyVoltage;  // Set output voltage to 12V
   Continue;  // loop in current while loop state.
}
}
OutputCurrent = 0;  // Set output current to zero
OutputVoltage = 0;  // set output voltage to zero
DisableOutput();  // Kill the output
```


STATE100 – 20W mode power = 20V at 1A max.
OutputVoltage = LowPowerVoltage; // Set voltage to 20V
CurrentLimit = LowPowerCurrent; // Set current limit to 1A
EnableOutput(); // Turn on power
While (!Disconnect) { // Disconnect detected by no current in CANH line(method 2)
If (OutputCurrent > (1.1*CurrentLimit)) { // Over current condition possible short
BREAK; // Kill output and go back to STATE1
}
}
OutputCurrent = 0; // Set output current to zero
OutputVoltage = 0; // set output voltage to zero
DisableOutput(); // Kill the output
Goto STATE1; // goto starting state.
Input from State4
Dumb Device Detection
State4
State100
Detected 20W Device
State1
Exit to State1
Back to IDLE state
POWER APPLIED
State300 Switch Mode
Direction Change Request From Source Mode
State200 PWR ON
NAK
ACK
Device/Sink Start
Determine CANH and CANL pin orientation and adjust
Entered when Communications power detected or
Entered when change in power direction from State300
Send power request message to source
If ACK received Goto State 201
If NAK received Goto State 200
State201
Receive power available message from source.
Determine if power available is sufficient
for minimum operation of the device.
If yes device determines the use of the
available power and enables that power.
If no device sends message with minimum required
power and notifies user of insufficient power.
Wait for power available message from Source
Send ACK
PowerAvailable <
MinimumOpeationalPower
PowerAvailable >=
MinimumOperationalPower
Is Power OK?
State203 PWROK
Power Available > Minimum Power Required
Negotiate for higher voltage or power
Decide if able to operate
Start power converters in device
State204
Exchange Device Infomation
Request Vendor ID
Request Model Number
Request Serial Number
Request Software Version
Request Firmware Version
Request EUI
State207
MyPri<=SourcePri
State205
Priority Level check
If my priority > Source Priorty
Continue to State206
If My priority <= Source Priority
Goto State207
MyPri>SourcePri
State206
IF Device Disconnect Request
Stop power converters
Request 0 power
Goto State200
IF Device sleep/standby Request
Request 1 power
Goto State205
Priority Change
My Priority < Source Priority
Request Available Power Message
Determine response to change
If new power available level OK
Send new Power Request Message
Goto State205
If Power < Minimum power
Send Power Request Message
Stop Converters
Goto state200
If Power Request Message Received
Determine Response
If Class 020
Stops Conveters Goto State200
If Class 030
Main Power Delivery Loop
NoRequest
State208
Device Requests More Power
Send Requested power message
Recieve Available power message
If Available power > current power
Request power up to Available power
elsif Max power is more than requested power avail
Raise priority
Request power and negotiate power
use power granted
continue
Make Power Available
Send power request message with lower power
Continue

Bidirectional Power Determination