3D Printing BOF Meeting Minutes
November 3, 2015

Meeting was called to order at approximately 1:30pm ET November 3, 2015.

Attendees

Ryan Howard (Makerbot)
Smith Kennedy (HP)
Daniel Manchala (Xerox)
Ira McDonald (High North)
Olliver Schinagel (Ultimaker)
Mike Sweet (Apple)
Paul Tykodi (TCS)
William Wagner (TIC)
Craig Whittle (Sharp)
Rick Yardumian (Canon)

Agenda Items

1. IP Policy/Minutes
   a. IP policy announced, Mike Sweet taking minutes
2. Slides:
   a. http://ftp.pwg.org/pub/pwg/BOFs/3d-printing/3d-bof-november-2015.pdf
   b. Q: What about background about IPP/model?
      - A: Will re-add these slides
   c. Q: What about the specific issues with G-code and the focus on higher-level formats?
      - A: Will re-add these slides
   d. Q: What about slicer resource issues?
      - A: Maybe add a (small) section to the white paper on implementation issues, including slicer resources, and some possible solutions (more memory, support for banding, use of cloud services, etc.)
   e. Q: Material usage units OK?
      - A: Yes
   f. Q: Material usage names OK?
      - A: Yes
   g. Q: Material usage range OK?
      - A: Maybe not for multiple copies, etc.
      - Ideas:
         - material-amount (integer(0:MAX)) + material-amount-units (type2 keyword) (length-mm, mass-g, volume-ml + length-m, mass-kg, and volume-l)?
         - integer64 value type?

- Path of least resistance is first idea
  - h.
3. White Paper - IPP 3D Printing Extensions (Mike):
   a. http://ftp.pwg.org/pub/pwg/BOFs/3d-printing/wd-apple-ipp3d-20151029-rev.pdf
   b. Section 1.1, line 177: "an issue" (not "and")
      - "and that the PWG has helped to mitigate through projects such as IPP Everywhere."
   c. Section 5.1:
      - Q: Also as Document Template attributes?
        - A: Yes
      - Q: Do fan speed and temperatures vary throughout job?
        - A: They can
        - "page overrides" concept to override job template values during job printing
        - Q: Better to have printer compute proper values?
          - A: Yes, but we need a way to provide necessary material and environmental values to printer
          - Administratively set material information (in materials-col-database with member attributes describing optimal head temperature/build platform/fan speed/ etc. ranges for each material?)
        - Requirements: printer needs material information to properly use, user/operator needs to be able to define new materials for printer, printer can then optimize output without further user intervention
      - Move/remove printer-bed-temperature, printer-chamber-temperature, printer-fan-speed
        - these should be managed by printer
      - Add back materials-col member attributes for melting point, flow rate/volume, diameter, etc.
      - print-rafts/supports - add 'auto' to allow printer to decide
      - print-speed - move to materials-col as a range of usable/optimal speeds for the material
      - Q: What about PDL override?
        - A: Probably a bad idea to use all or part of an embedded job ticket in a 3D document
        - Only 3MF supports embedded job tickets
        - Embedded job ticket is probably not specific to the printer being used
          - Not useful in that case
        - For 3D Print services, require pdl-override-supported='guaranteed' plus pdl-override-guaranteed-supported attribute listing all of the 3D job template attributes that must be supported
   d. Section 5.1.1:
      - Add table of member attributes

     e.   Section 5.1.1.5:
- Rename to material-purpose to disambiguate with material-amount (amount of material used)

     f.   Q: What about print-scaling?
- A: Keyword approach probably not appropriate
- Discuss other options (scale factor/percentage, overall volume, etc.)

     g.   Section 5.1.3:
- Editor's comment is satisfied by having the speed range as part of material spec

     h.   Q: Do we need to expose any printer specific details - print order, orientation, combination or documents/jobs on the same build platform, etc?
- A: Don't think so, can already figure out the best orientation for printing automatically so why ask the user something they probably don't know?

     i.   Section 5.2.1:
- Q: Any other member attributes for -actual?
    - A: Material amount, temperatures fan/print speeds,
    - (average? range? histogram? 1setOf rangeOfIntegerl integer?)
        - Probably range or average is most useful
        - Histogram no so useful since print failures (should) trigger corresponding printer/job-state-reasons
    - Power usage - power MIB already handles that?
    - Time? already part of time-at-xxx attributes

     j.   Section 5.4.4:
- Editor's note is resolved - adding to materials-col

     k.   Section 5.5:
- Add to materials-col as appropriate

4.   Next steps:
     a.   Q: What about IEEE 3D Printing Workgroup?
- A: Doing high-level architecture document
- Mike has tried contacting chair with no results; will work through ISTO to get direct contact

     b.   Q: Ready to charter 3D work?
- Have white paper, editor (Mike), participants
- No other standards group is working on protocol, but we have format (3MF) and other higher-level stuff (IEEE)
- New group is maybe too much overhead - additional meeting time, officers, etc.
- Add to IPP WG charter (Ira, Paul)
- Scheduling: IPP/1.1 is largely done, self-cert largely done, System Service getting there, have time to alternate between 3D and System Service in IPP WG
- Bill: Would like to see more 3D vendors involved in the definition of the spec,

- Mike: New WG would be hard to staff, participation will likely be limited to established personal manufacturing vendors since hardware guides just use the software that is available and high-end vendors are probably doing their own thing; participation may be different than in past specs, but we'll get what we need
            - Paul: SM WG can keep model aligned with 3D work in IPP WG
            - Action: Mike and Ira to prepare IPP WG charter draft with 3D project for consideration by the IPP WG and Steering Committee
    c.   Q: Other people to invite?
            - A: Anne Price has some contacts, can reach out via different media outlets/social networks
            - Usual Adobe, Autodesk, Microsoft, printer manufacturers
            - Look at 3MF member companies - reach out as organizational liaison

Next Steps / Open Actions

- Continue to discuss white paper on 3d-printing@pwg.org list and potential conference call.
- Reach out to 3D printer manufacturers
- Action: Mike and Ira to prepare IPP WG charter draft with 3D project for consideration by the IPP WG and Steering Committee
- Action: Mike to send conference call invitations for 3D Printing (ONGOING)
- Action: Ira to work with Anne to do a call for participation in 3D Printing (ONGOING)
- Action: Mike and Paul to contact ASTM about opening AMF spec (ONGOING)