BFO 2020 Participation Axioms

Participates in and has participant are inverse relations [xjr-1]

$$\forall t,a,b\,(\text{participatesIn}(a,b,t) \leftrightarrow \text{hasParticipant}(b,a,t))$$

At every time a process exists it has a participant [trl-1]

$$\forall p,t\,(\text{instanceOf}(p,\text{process},t) \rightarrow \exists c\,\text{participatesIn}(c,p,t))$$

Participates in is dissective on third argument, a temporal region [yjm-1]

$$\forall p,q,r,s\,(\text{participatesIn}(p,q,r) \wedge \text{temporalPartOf}(s,r) \rightarrow \text{participatesIn}(p,q,s))$$

If c participates in p at t and p occupies temporal region r then t is part of r [kxe-1]

$$\forall c,p,r,t\,(\text{occupiesTemporalRegion}(p,r) \wedge \text{participatesIn}(c,p,t) \rightarrow \text{temporalPartOf}(t,r))$$

Participates in is time indexed and has domain: independent continuant but not spatial region or specifically dependent continuant or generically dependent continuant and range: process [ild-1]

$$\begin{aligned}&\forall a,b,t\,(\text{participatesIn}(a,b,t)\\ &\quad\rightarrow((\text{instanceOf}(a,\text{independentContinuant},t) \wedge \neg\text{instanceOf}(a,\text{spatialRegion},t))\\ &\quad\vee\text{instanceOf}(a,\text{specificallyDependentContinuant},t)\\ &\quad\vee\text{instanceOf}(a,\text{genericallyDependentContinuant},t))\\ &\quad\wedge\text{instanceOf}(b,\text{process},t) \wedge \text{instanceOf}(t,\text{temporalRegion},t))\end{aligned}$$

At every time a specific dependent s participates in a process p there's a part of that time, during which there's an independent continuant that s s depends on, and that participates in p at that time [cgn-1]

$$\begin{aligned}&\forall \text{sdc},p,t\,(\text{instanceOf}(\text{sdc},\text{specificallyDependentContinuant},t) \wedge \text{participatesIn}(\text{sdc},p,t)\\ &\quad\rightarrow\exists\,\text{tp},\text{ic}\,(\text{instanceOf}(\text{tp},\text{temporalRegion},\text{tp}) \wedge \text{temporalPartOf}(\text{tp},t)\\ &\qquad\wedge\text{instanceOf}(\text{ic},\text{independentContinuant},\text{tp})\\ &\qquad\wedge\neg\text{instanceOf}(\text{ic},\text{spatialRegion},\text{tp}) \wedge \text{specificallyDependsOn}(\text{sdc},\text{ic})\\ &\qquad\wedge\text{participatesIn}(\text{ic},p,\text{tp})))\end{aligned}$$

If a generically dependent continuant participates in a process p then, if it is concretized as a process, that process is part of p, fand if concretized as an sdc then the bearer of that sdc participates in the process [fmm-1]

$$\begin{aligned}&\forall \text{gdc},p,t\,(\text{instanceOf}(\text{gdc},\text{genericallyDependentContinuant},t) \wedge \text{participatesIn}(\text{gdc},p,t)\\ &\quad\rightarrow\exists\,\text{tp},b\,(\text{temporalPartOf}(\text{tp},t) \wedge \text{concretizes}(b,\text{gdc},\text{tp})\\ &\qquad\wedge((\text{instanceOf}(b,\text{specificallyDependentContinuant},\text{tp})\\ &\qquad\quad\wedge(\exists\,\text{ic}\,(\text{specificallyDependsOn}(b,\text{ic}) \wedge \text{participatesIn}(\text{ic},p,\text{tp}))))\\ &\qquad\vee(\text{occurrentPartOf}(b,p) \wedge \text{existsAt}(b,\text{tp})))))\end{aligned}$$

Alan Ruttenberg, January 8, 2024. The most recent version of this file will always be in the GitHub repository https://github.com/bfo-ontology/bfo-2020