

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 disjunctive on third argument, a temporal region [yjm-1]

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

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]

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

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 depends on, and that participates in p at that time [cgn-1]

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

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

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

