1 DFT_DRBD Theory

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Parent Theories: DRBD, Rewrite_Rules

1.1 Definitions

[DBW_events_def]

```
⊢ ∀p TF EF BCU PC SCa SCd TS BS t.
      DBW_events p TF EF BCU PC SCa SCd TS BS t ⇔
      DFT_event p
        (D_OR TF
           (D_OR EF
              (D_OR BCU (D_OR (WSP PC SCa SCd) (D_OR TS BS))))) =
        t ∈ events p ∧
      ∀s.
         ALL_DISTINCT
           [TF s; EF s; BCU s; PC s; SCa s; SCd s; TS s; BS s]
```

[UNIONL_def]

```
⊢ (UNIONL [] = {}) ∧ ∀s ss. UNIONL (s::ss) = s ∪ UNIONL ss
```

1.2 Theorems

[ASSOC_D_OR]

```
⊢ ASSOC D_OR
```

[BDRB_DFT_DBW]

```
⊢ ∀p TF EF BCU PC SCa SCd TS BS t.
      prob_space p ∧ DBW_events p TF EF BCU PC SCa SCd TS BS t ⇒
      (prob p
         (DRBD_event p
            (R_AND TF
               (R_AND EF
                  (R_AND BCU
                     (R_AND (R_WSP PC SCa SCd) (R_AND TS BS)))))
            t) =
       1 -
       prob p
         (DFT_event p
            (D_OR TF
               (D_OR EF
                  (D_OR BCU
                     (D_OR (WSP PC SCa SCd) (D_OR TS BS)))) t))
```

[COMM_D_OR]

```
⊢ COMM D_OR
```

[COMPL_DRBD_DFT_event]
⊢ $\forall p\ X\ t.$ DRBD_event $p\ X\ t$ = p_space p DIFF DFT_event $p\ X\ t$

[D_AND_R_OR]
⊢ $\forall X\ Y.$ D_AND $X\ Y$ = R_OR $X\ Y$

[D_FDEP_R_AND]
⊢ $\forall X\ Y.$ FDEP $X\ Y$ = R_AND $X\ Y$

[D_OR_R_AND]
⊢ $\forall X\ Y.$ D_OR $X\ Y$ = R_AND $X\ Y$

[D_WSP_R_WSP]
⊢ $\forall Y\ Xa\ Xd.$
    ($\forall s.$ ALL_DISTINCT [$Y\ s$; $Xa\ s$; $Xd\ s$]) $\Rightarrow$
    (WSP $Y\ Xa\ Xd$ = R_WSP $Y\ Xa\ Xd$)

[DISIMULT_ALL_DISTINCT]
⊢ $\forall X\ Y.$ ($\forall s.$ ALL_DISTINCT [$X\ s$; $Y\ s$]) $\Rightarrow$ (D_SIMULT $X\ Y$ = NEVER)

[IN_REST]
⊢ $\forall x\ s.\ x \in$ REST $s \iff x \in s \land x \neq$ CHOICE s

[IN_UNIONL]
⊢ $\forall l\ v.\ v \in$ UNIONL $l \iff \exists s.$ MEM $s\ l \land v \in s$

[LEFT_ID_D_OR]
⊢ LEFT_ID D_OR NEVER

[MONOID_D_OR]
⊢ MONOID D_OR NEVER

[n_AND_FOLDL]
⊢ $\forall L.$ n_AND L = FOLDL ($\lambda a\ b.$ D_AND $a\ b$) ALWAYS L

[n_AND_nR_OR]
⊢ $\forall s\ X.$ FINITE $s \Rightarrow$ (n_AND (MAP X (SET_TO_LIST s)) = nR_OR $X\ s$)

[n_OR_FOLDL]
⊢ $\forall L.$ n_OR L = FOLDL ($\lambda a\ b.$ D_OR $a\ b$) NEVER L

[n_OR_nR_AND]
⊢ $\forall s\ X.$ FINITE $s \Rightarrow$ (n_OR (MAP X (SET_TO_LIST s)) = nR_AND $X\ s$)

[P_AND_R_INCLUSIVE_AFTER]
⊢ $\forall X\ Y.$ P_AND $X\ Y$ = R_INCLUSIVE_AFTER $Y\ X$

[PROB_COMPL_DRBD_DFT_event]
⊢ $\forall p\ X\ t.$
    DFT_event $p\ X\ t \in$ events $p \land$ prob_space $p \Rightarrow$
    (prob p (DRBD_event $p\ X\ t$) = 1 - prob p (DFT_event $p\ X\ t$))

[RIGHT_ID_D_OR]
⊢ RIGHT_ID D_OR NEVER