Compliant IBIS Buffer Models

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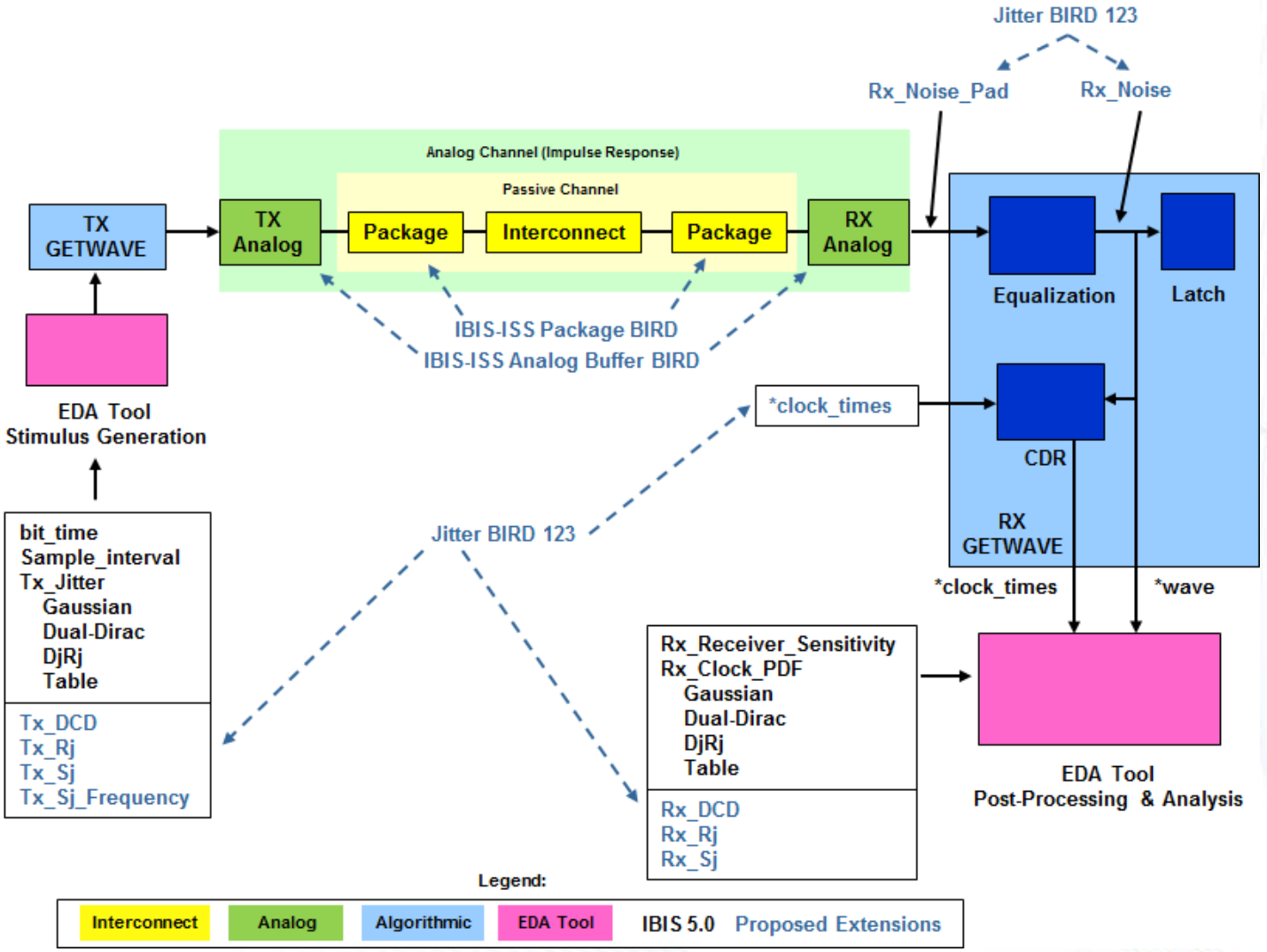
Overview

- Components of an IBIS-AMI Simulation
- What the Industry Requires for Accuracy
- IBIS ISS Satisfies Industry AMI Requirements
- .ibs file Illustrating ISS Buffer Interface
- Intrinsic IBIS Buffer Models
- Summary

Simulation IBIS-AMI Components



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IBIS ISS Satisfies Industry IBIS-AMI Requirements

- Industry IBIS-AMI Requirements
  - Broadband
  - Linear Time Invariant

IBIS ISS will need Extensions for Parallel Interface Design

- IBIS-BSS (IBIS Buffer Spice Subckts)
  - Extensions to IBIS-ISS
    - Independent PWL voltage
    - Threshold detectors
    - Time Since Threshold Crossing Voltage Source
    - …
  - IBIS-BSS will Enable
    - Analog waveforms at decision latch of receiver
    - Accurate power consumption models

Example Illustrating ISS Buffer Interface

```
[Component] my_ibis_component
[Pin] signal_name      model_name   R_pin L_pin C_pin
1     tx1_p    tx        NA    NA    NA
2     tx1_n    tx        NA    NA    NA
[Diff Pin] inv_pin  vdiff tdelay_typ tdelay_min tdelay_max
1 2
[Model]    tx
Model_type Output
[ISS Buffer Model]
ISS_Buffer_File Tx_Analog.iss
ISS_Buffer_Subckt  Tx_Analog
ISS_Buffer_Arguments
Port 1 DieP
Port 2 DieN
Port 3 PadP
Port 4 PadN
Parameter Cc AMI(Cc)
Parameter Rs AMI(Rs)
Parameter Tx_Voh AMI(Tx_Voh)
Parameter Tx_Vol AMI(Tx_Vol)
Parameter Tx_Trf  AMI(Tx_Trf )
[End ISS Buffer Model]
```

Intrinsic ISS Buffer Models

Describes Four ISS Buffer Models that Satisfy the Current Industry Requirements that are Compliant to Existing SerDes Specifications

1. Intrinsic_Tstonefile_Tx
2. Intrinsic_Tstonefile_Rx
3. Intrinsic_Tx
4. Intrinsic_Rx

Intrinsic_Tstonefile_Tx

```
.subckt Intrinsic_Tstonefile_Tx DieP PadP DieN PadN file=str('NA')
* Port order of Touchstone file is DieP PadP DieN PadN
E_H EDieP 0 VCVS DieP 0 1.
E_L EdieM 0 VCVS DieN 0 1.
S1 EDieP PadP EDieN PadN 0 mname=A
.model A TSTONEFILE=str(file)
.ends Intrinsic_Tstonefile_Tx
```

Intrinsic_Tx subckt

```
.subckt Intrinsic_Tx DieP PadP DieN PadN Rt=1Meg Rs=1Meg Cc=0.
+ Vt=0. Cac=0. Rac=1Meg Rd=1Meg Cd=0.
E_H EDieP 0 VCVS DieP 0 1.
E_L EdieN 0 VCVS DieN 0 1.
R_Rs_H EDieP PadP R='Rs'
R_Rs_L EDieN PadN R='Rs'
R_Rd PadP PadN R='Rd'
C_Rd PadP PadN C='Cd'
R_Rt_H PadP Vt R='Rt'
R_Rt_H PadN Vt R='Rt'
V_Vt Vt 0 DC='Vt'
C_Cc_H PadP 0 C='Cc'
C_CC_L PadN 0 C='Cc'
R_ac PadP Nac R='Rac'
C_ac PadN Nac C='Cac'
.ends Intrinsic_Tx
```

AMI Model using the Intrinsic_Tx

```
(My_Tx
   (Reserved_Parameters
…
      (ISS_Buffer (Value “Intrinsic_Tx “) (Type String) (Usage Info)
                  (Description “My_Tx uses the Intrinsic_Tx analog buffer model”))
  )
  (Model_Specific
      (Tx_Strength (Range 1 0 7) (Type Integer) (Usage Info) (Description “Strength settings”))
      (Vol (Value 0.) (Type Float) (Usage Info) ((Description “Vol”))
      (Voh (Range 1. 0. 1.) (Type Float) (Usage Info) ((Description “Voh”))
      (Rs   (Range   50.        40.        55.      ) (Type Float) (Usage Info) ((Description “Impedance”))
      (Cc   (Range   30.e-12   20.e-12   40.e-12) (Type Float) (Usage Info) ((Description “Impedance”))
      (My_Corner (List “Typ” “Xslow” “Slow” “Fast” “Xfast”) (Type String) (Usage Info)
                  (Description “My corners”))
      (MY_Corner_Dependency (Usage DependencyTable ) (DependencyTable)
        (Type         Integer            String             Float)
        (Table     | The following table contains 40 rows – only 4 rows shown
          (Labels “Tx_Strength In” “My_Corner In” “Rs Out” “C_c”)
                (              0              “Typ”              40      31e-12)
                (              1              “Typ”              44      30e-12)
                (              2              “Typ”              47      29e-12)
                (              7              “XFast”            43      20e-12)
))))
```

Summary

- In order for IC Vendors to make IBIS AMI models compliant with IBIS syntax and satisfy accuracy requirements, IBIS must be extended to handle broadband buffer models.
- This presentation describes a proposed implementation currently in discussion within the IBIS-ATM committee.
- The advantages of this proposal are:
- Simple syntax
- Same syntax as being proposed for ISS Package Models
- Can be easily extended to handle IBIS-BSS

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