PROTOCOLO DE ANALISIS – ACELEROMETRÍA

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BOGOTÁ, COLOMBIA

AGENDA

- ❑ Motivación
- ❑ Protocolo
- ❑ Implementación y resultados

MOTIVACION

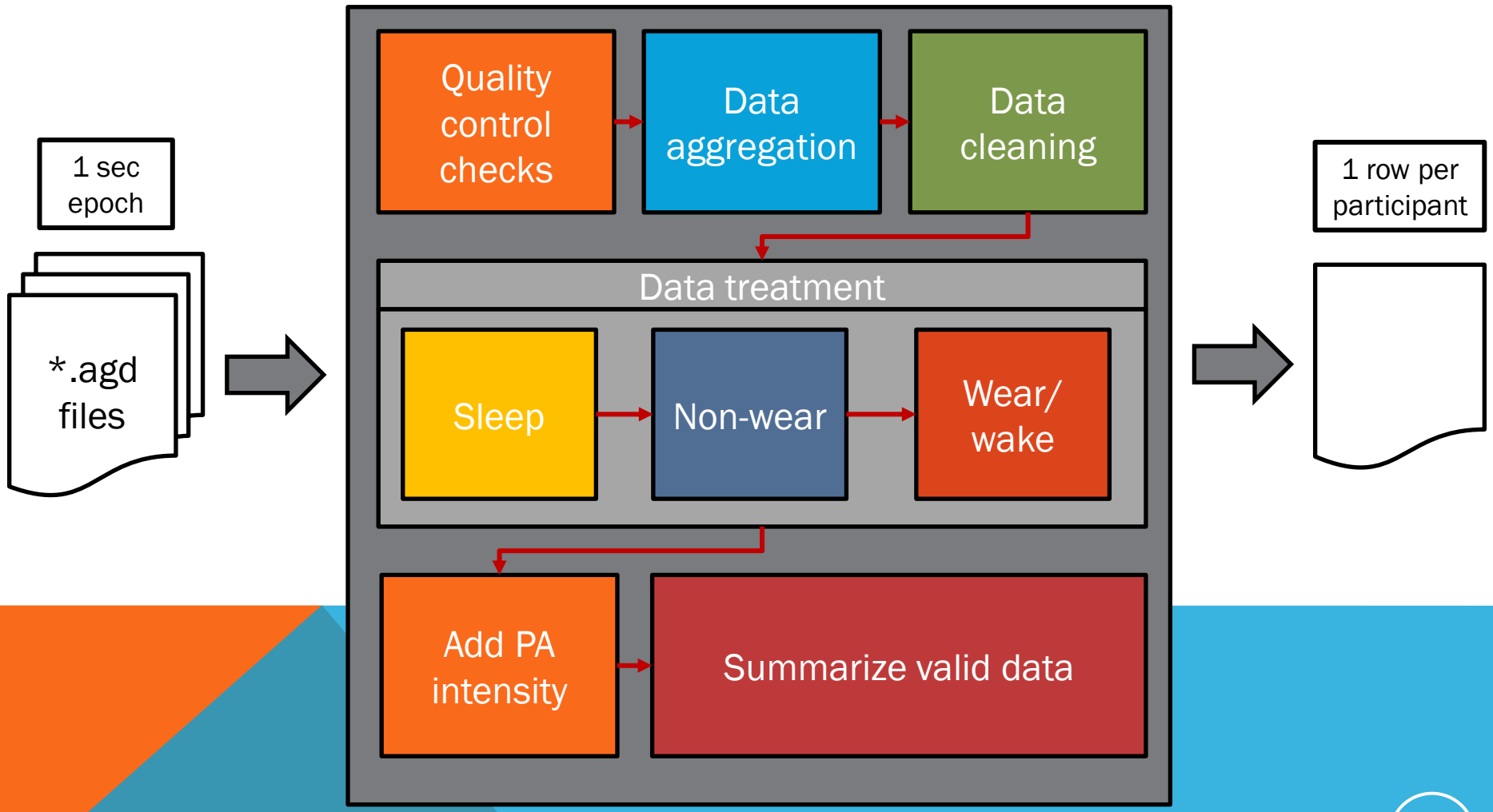
MOTIVACIÓN

Un protocolo de análisis es necesario para estandarizar los procedimientos de extracción de información de acelerometría.

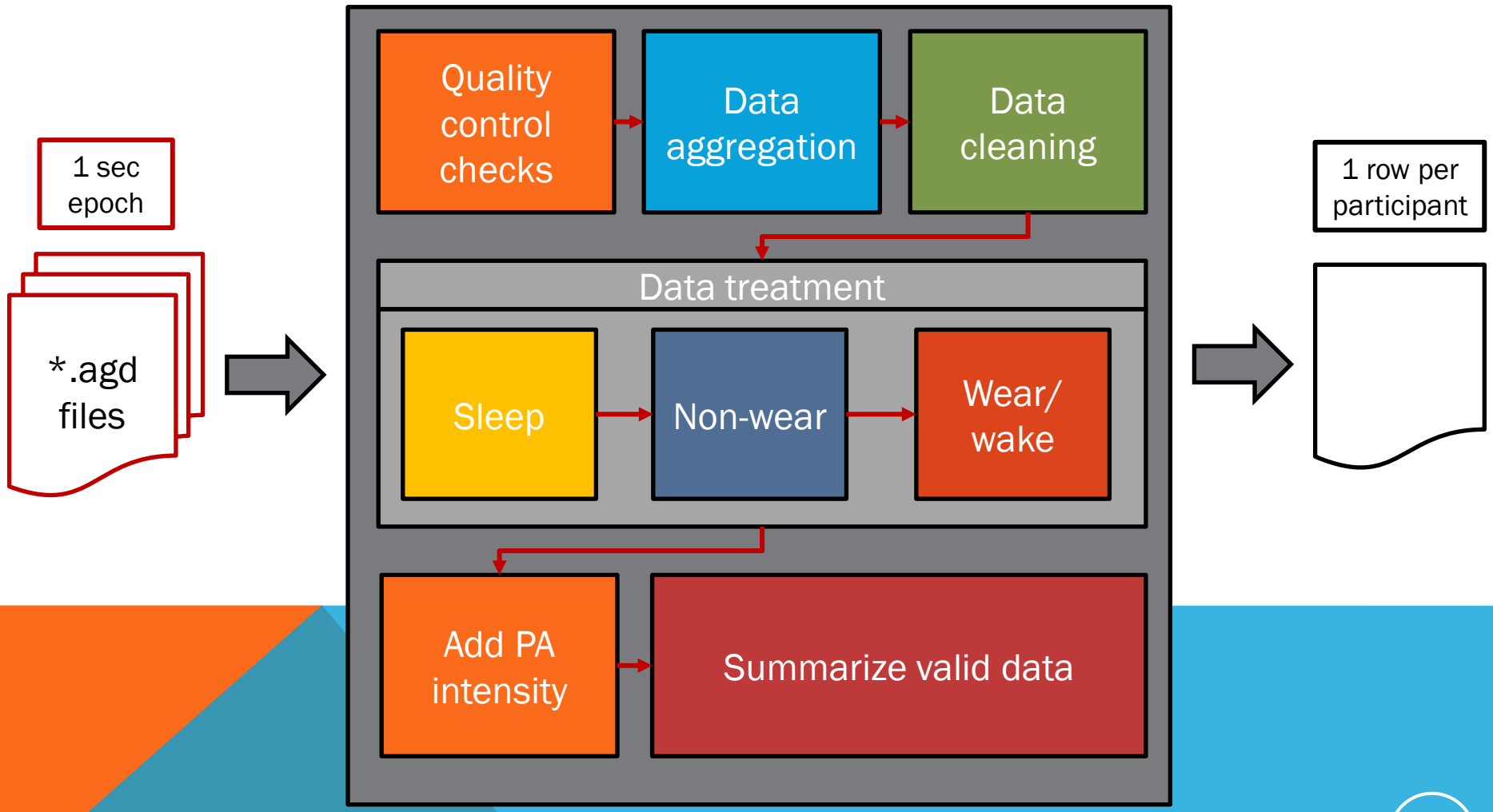
PROTOCOLO

DE ANALISIS

PROTOCOLO


1 sec epoch
*.agd files
Quality control checks
Data aggregation
Data cleaning
Data treatment
Sleep
Non-wear
Wear/ wake
Add PA intensity
Summarize valid data
1 row per participant

PROTOCOLO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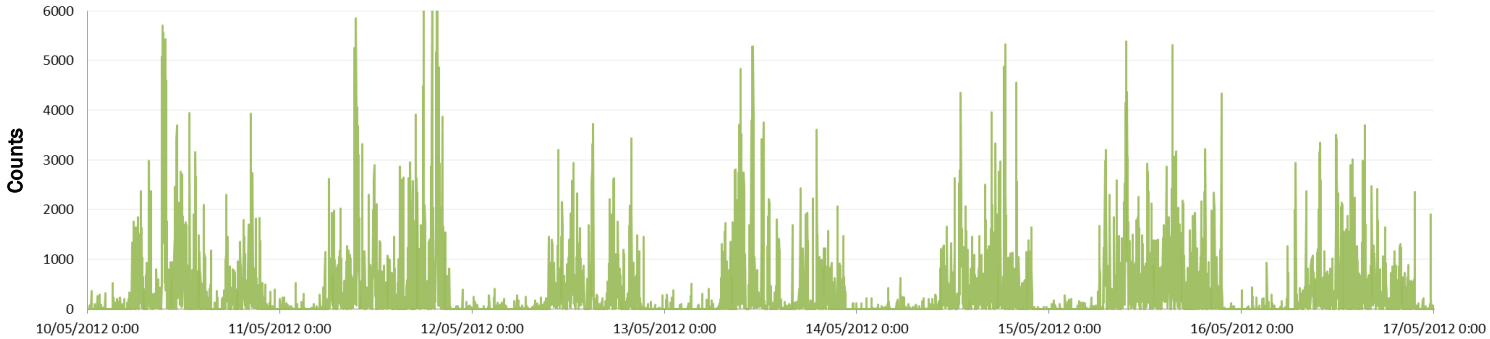
ARCHIVOS DE ENTRADA

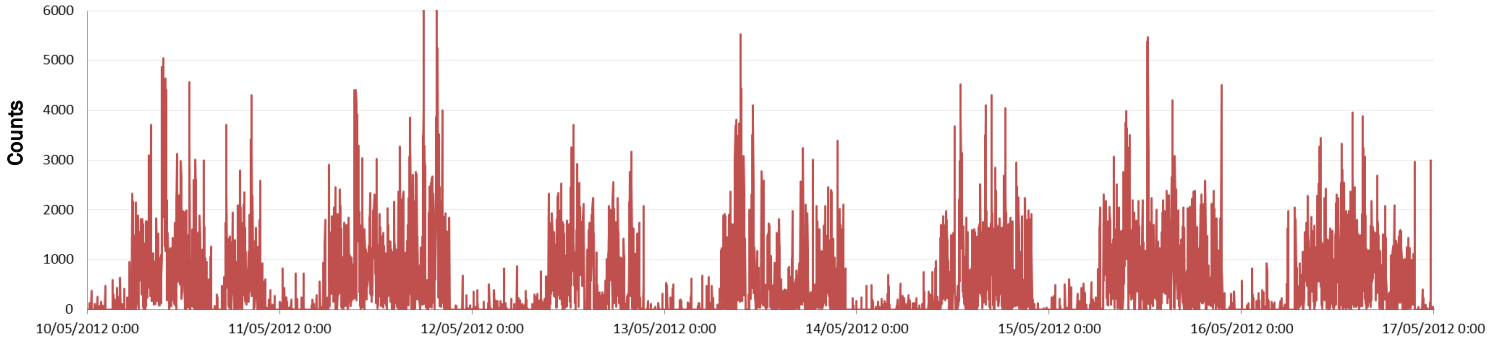
Date/ time	Axis1	Axis2	Axis3	Steps	Lux	Incline
11/05/2012 10:30:00	16	28	43	1	26	1
11/05/2012 10:30:01	30	16	35	2	41	1
⋮	⋮	⋮	⋮	⋮	⋮	⋮

ARCHIVOS DE ENTRADA

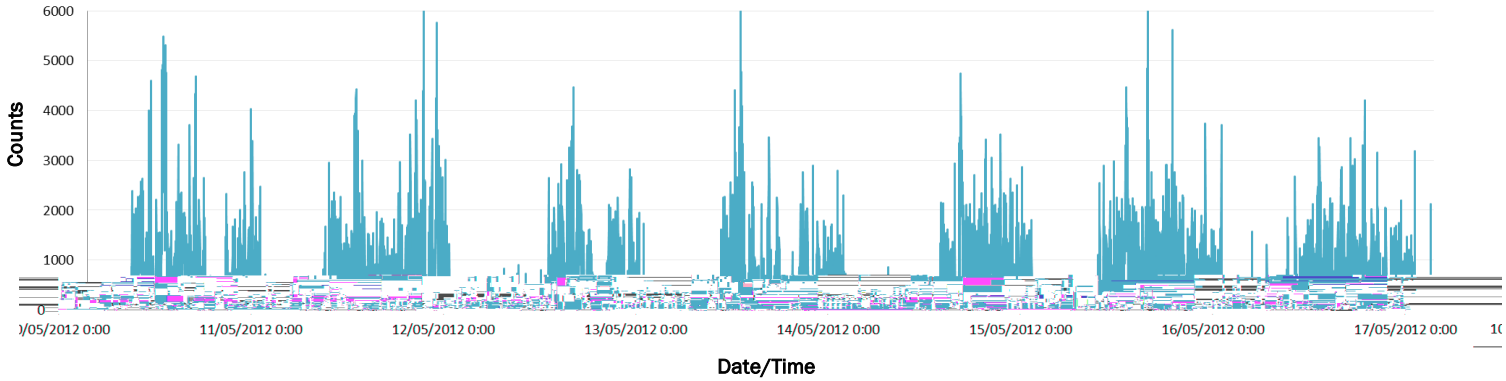
Axis 1:
(vertical)



Axis 2:
(horizontal)



Axis 3:
(perpendicular)



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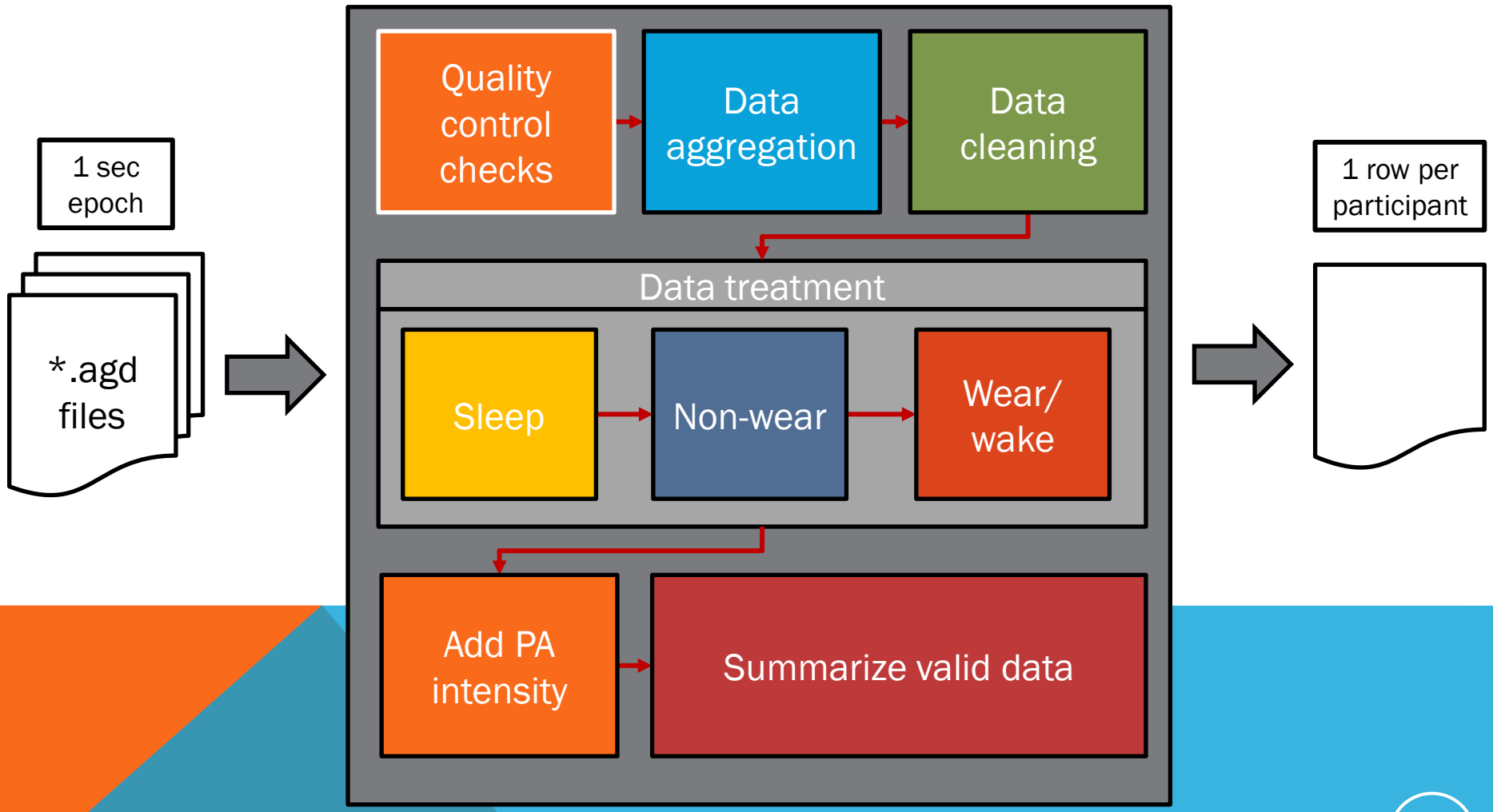
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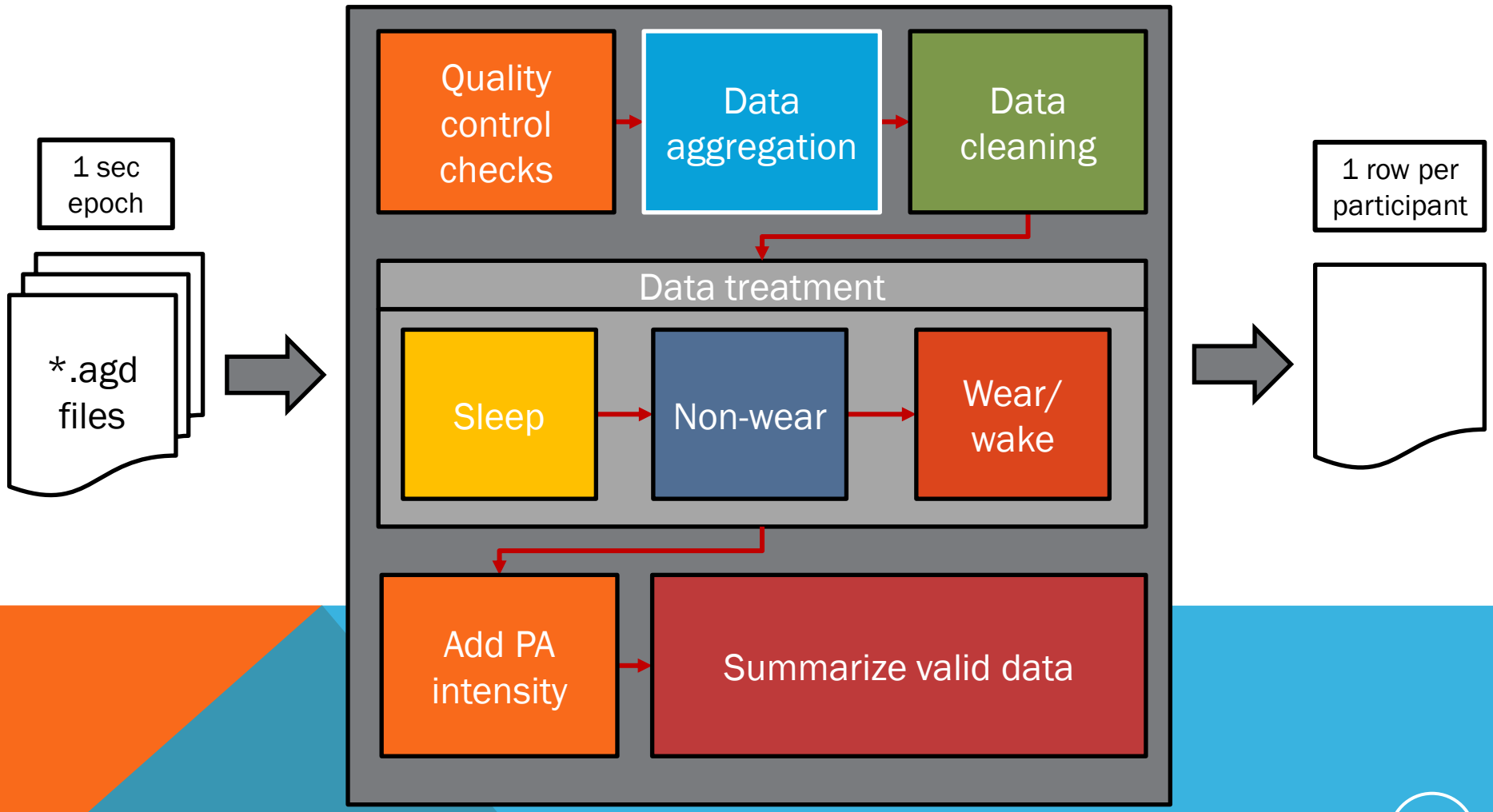
QUALITY CONTROL CHECKS

Se compara la información contenida en el archivo .agd con el PACK.

- Fecha de inicialización
- Serial del acelerómetro
- Tiempo de uso

PROTOCOLO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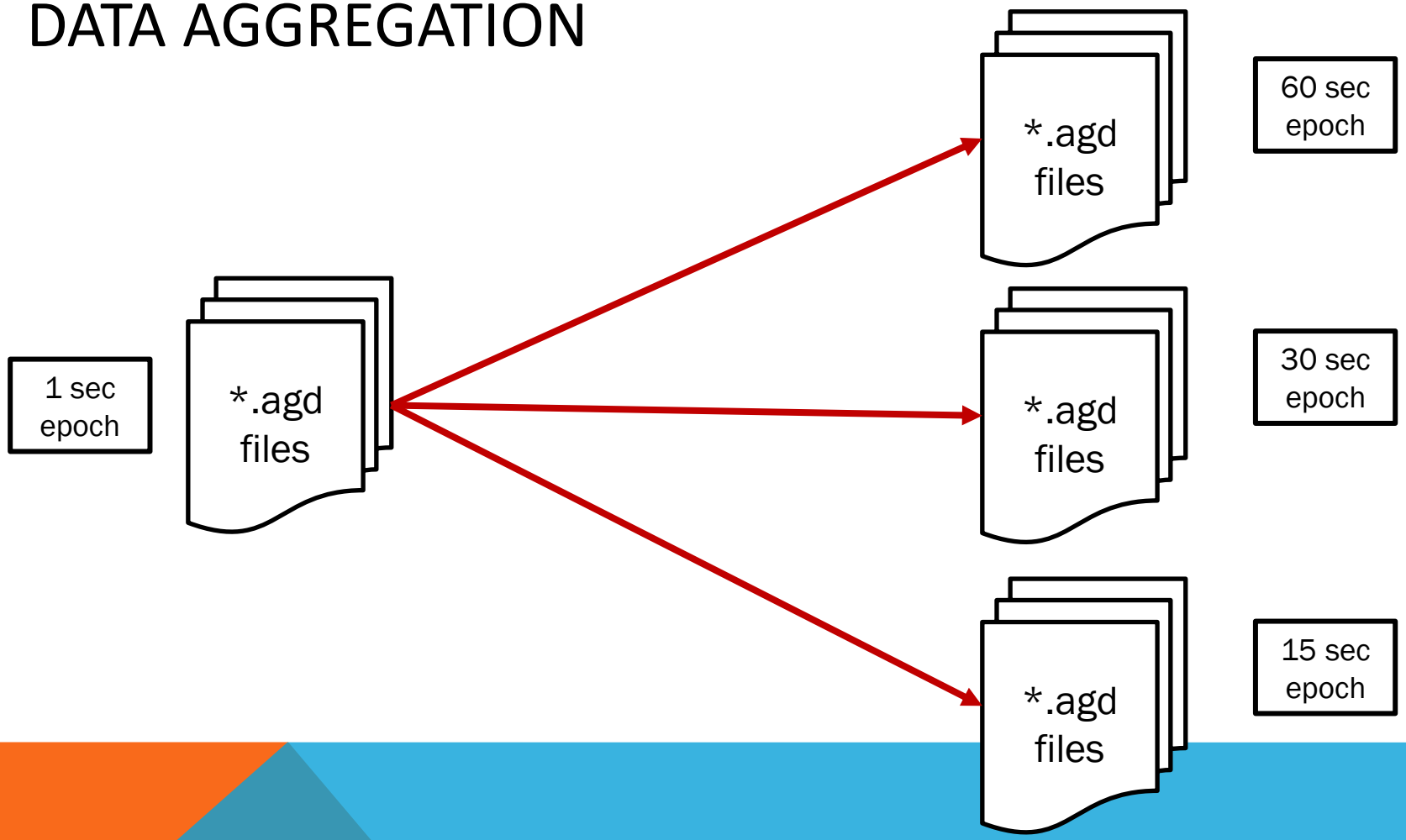
DATA AGGREGATION



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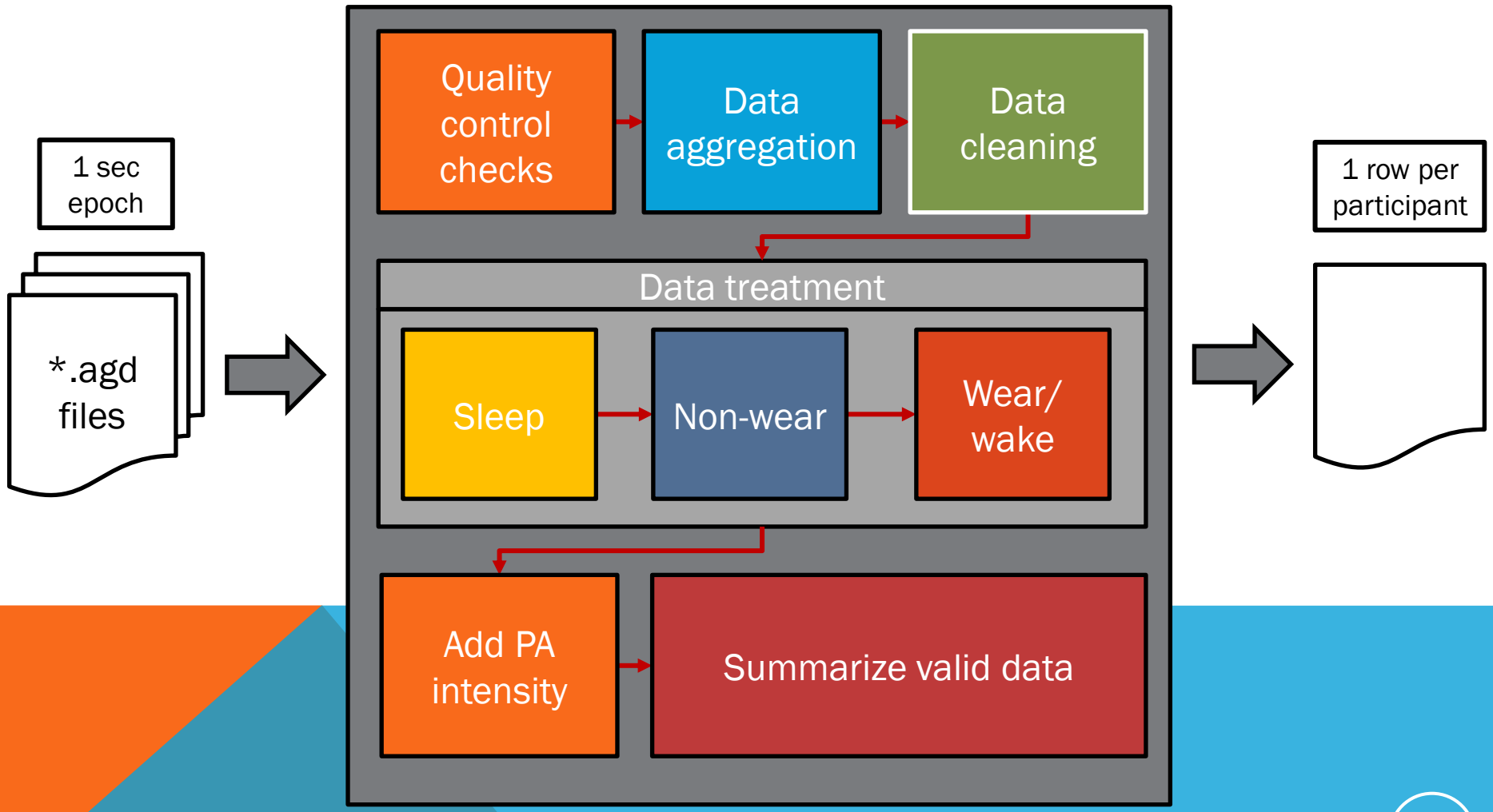
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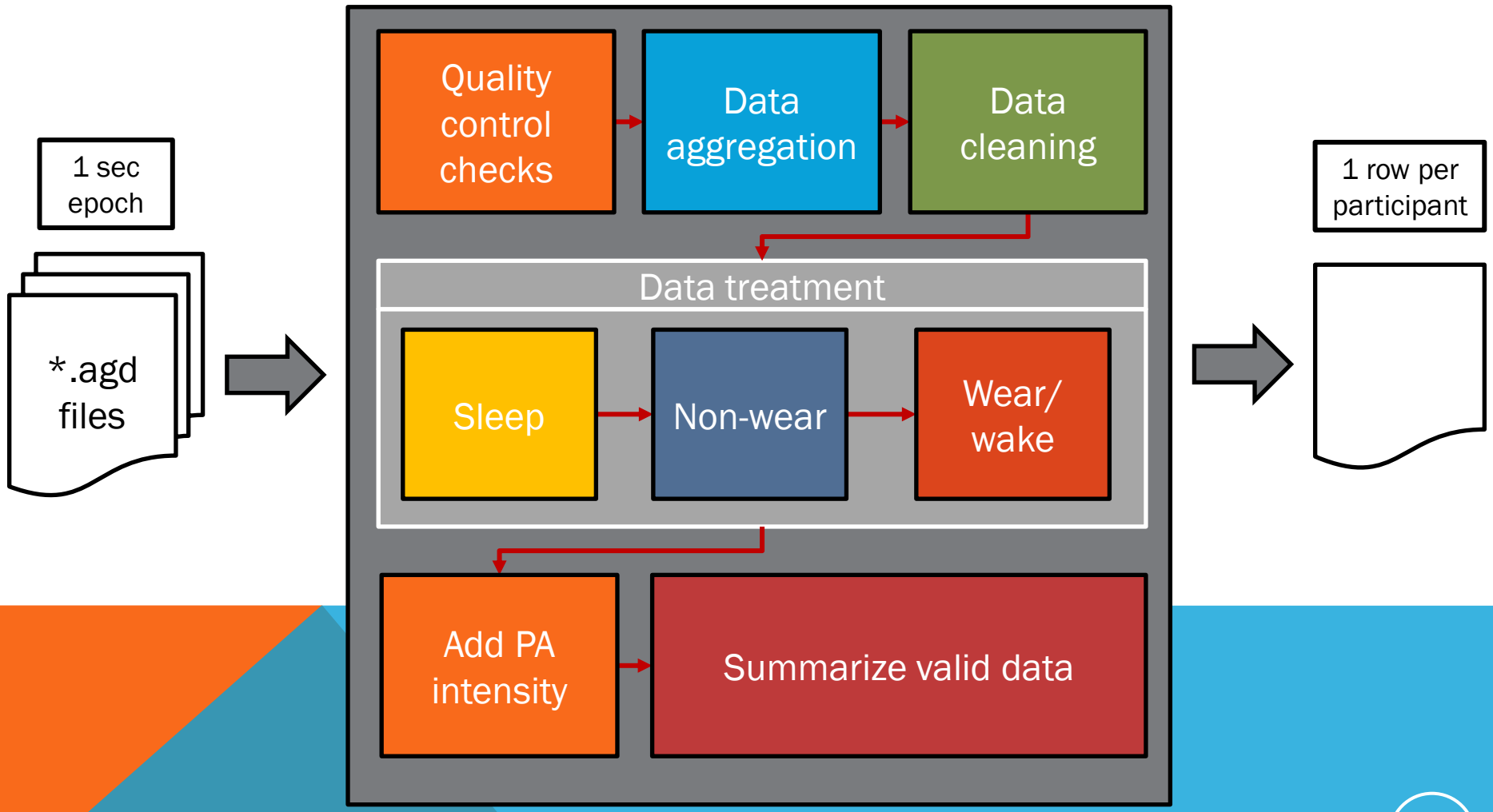
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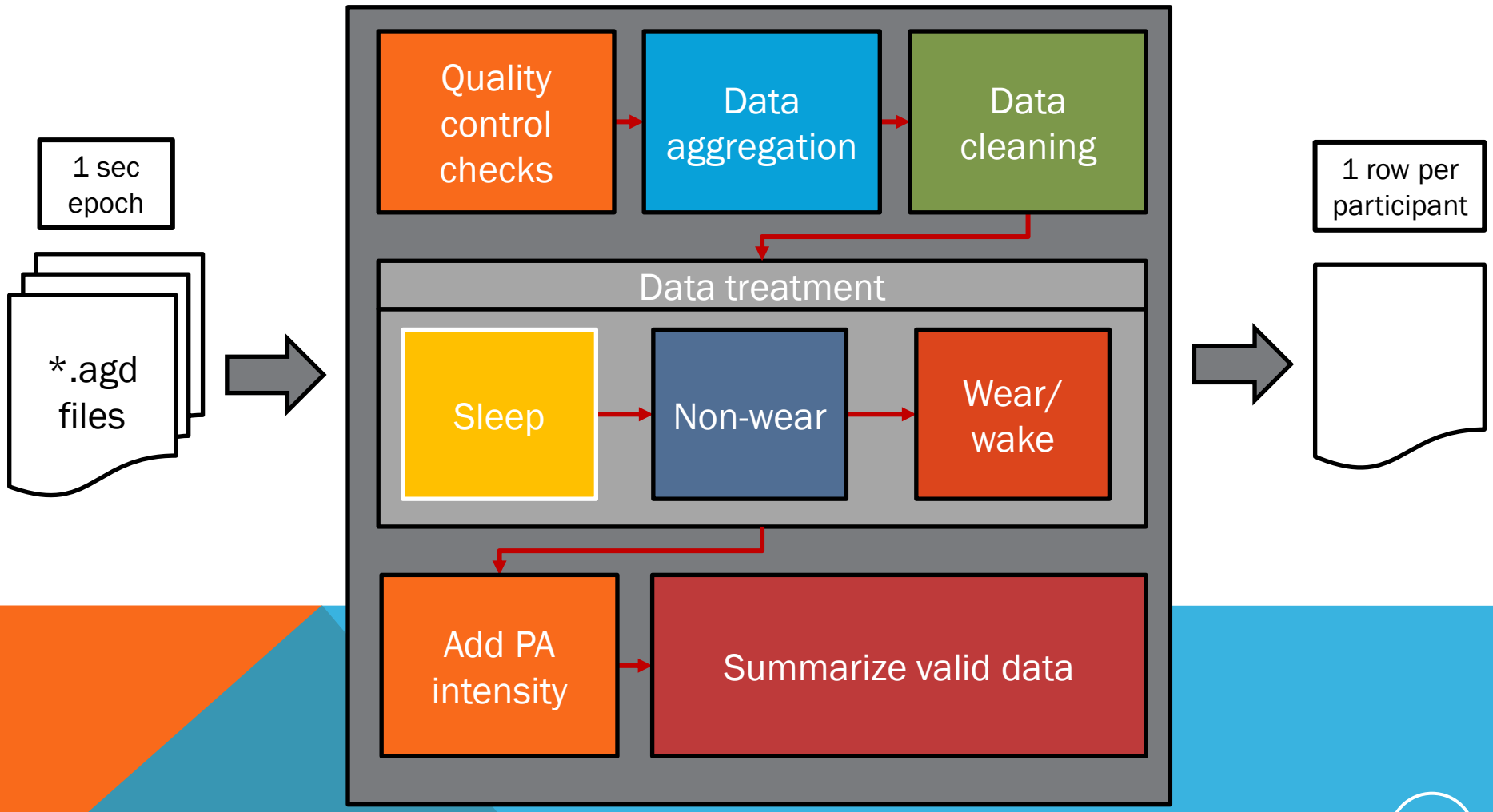
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DATA TREATMENT - SLEEP

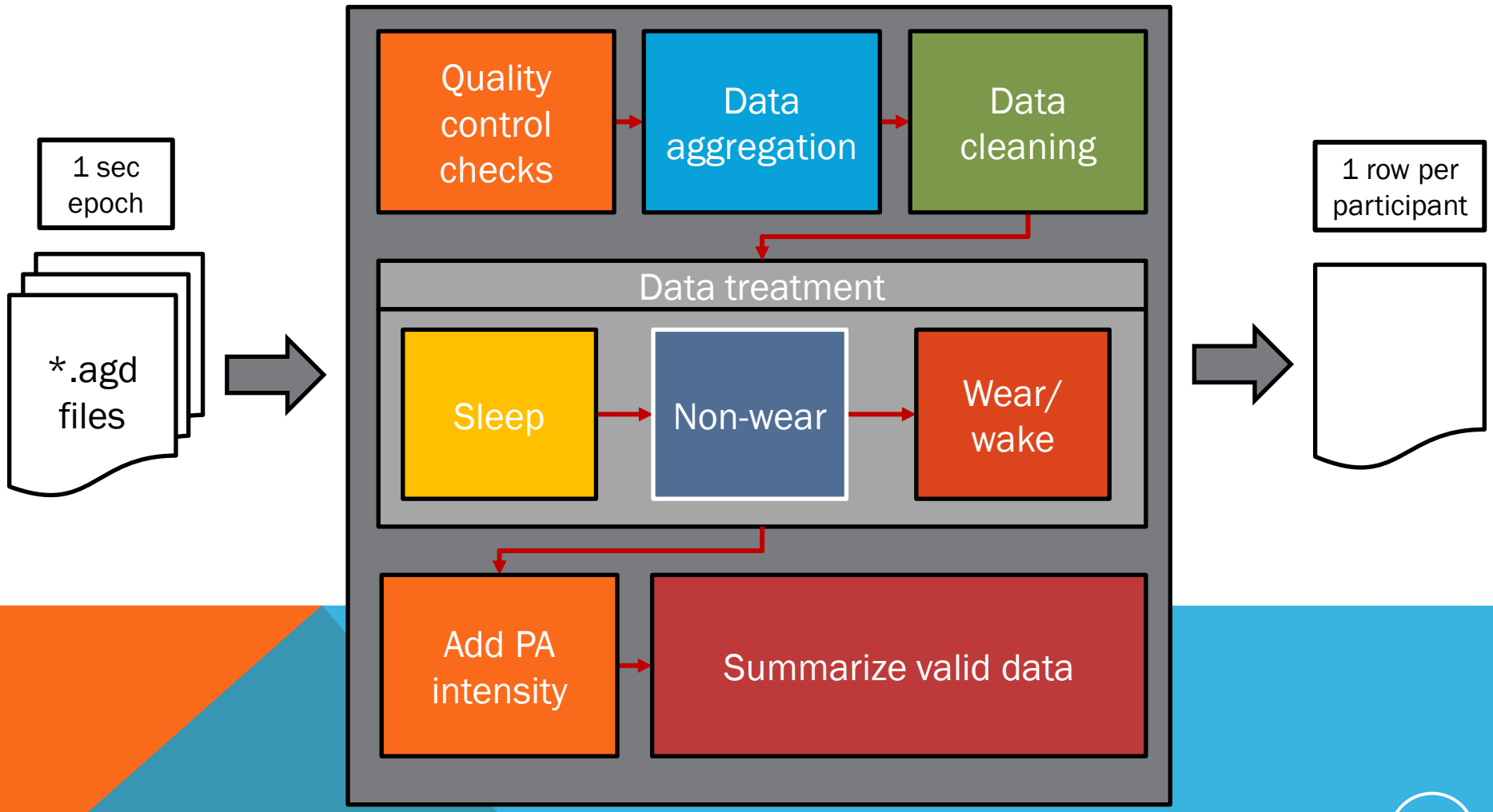
Usando el dataset de 60 sec epoch:

i. Se clasifican los minutos como sueño/despierto (Sadeh et al., 1994)

ii. Se identifican periodos de sueño continuos (7:00 pm – 6:00 am)
   - Mínimo: 160 min
   - Tolerancia: 10/20 min (continuos)

iii. Se buscan periodos de no uso clasificados como periodos de sueño.
   - Se identifican usando los counts del eje vertical (axis 1)
   - Mínimo: 90 min
   - Tolerancia: 2 min (no continuos)

PROTOCOLO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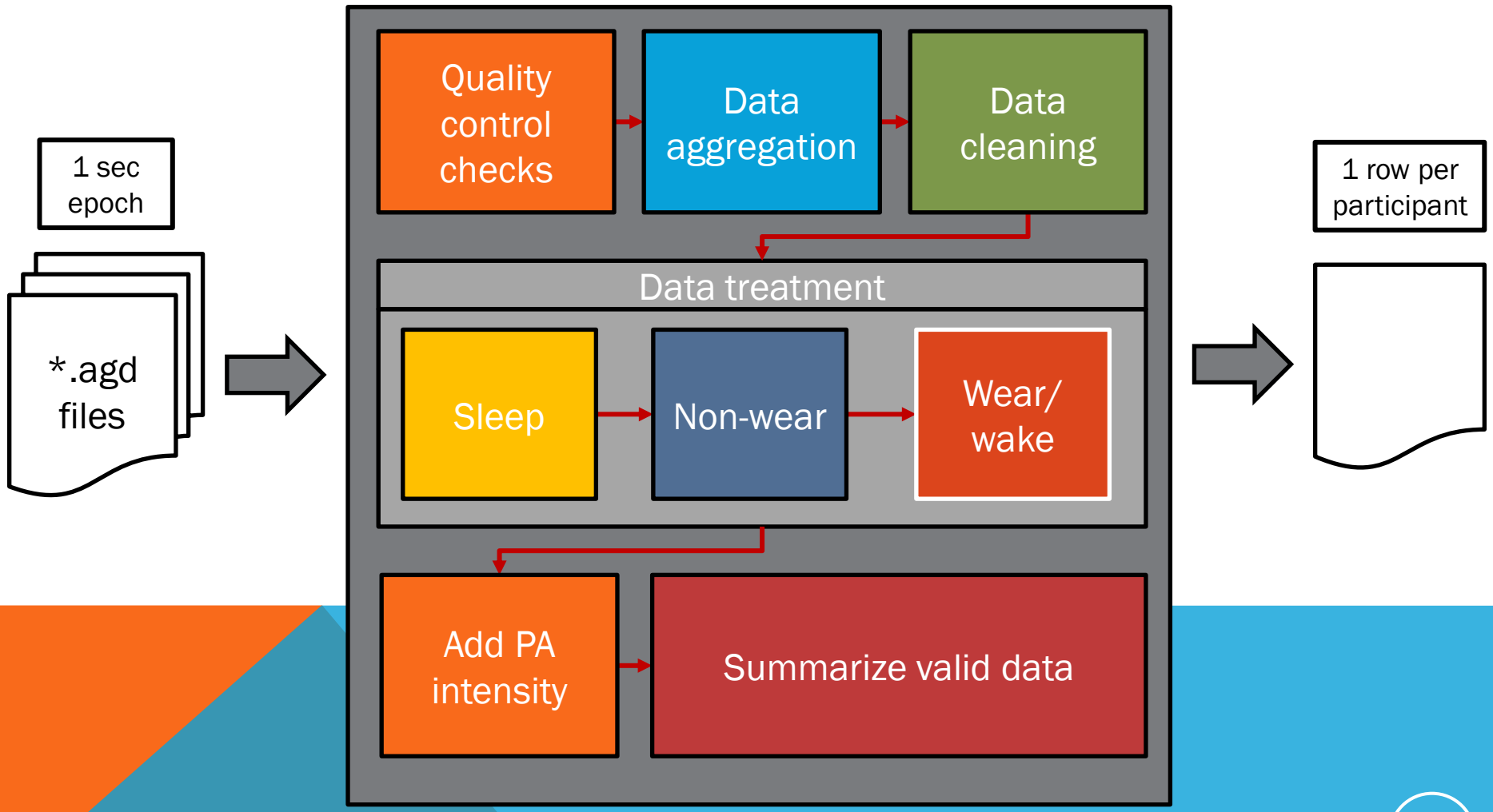
DATA TREATMENT – NON-WEAR

Usando el dataset de 60 sec epoch:

- Se identifican periodos de no uso continuo:
  - Se identifican usando los counts del eje vertical (axis 1)
  - Mínimo: 20 min
  - Tolerancia: 0 min
- Los minutos previamente clasificados, no son reclasificados

PROTOCOLO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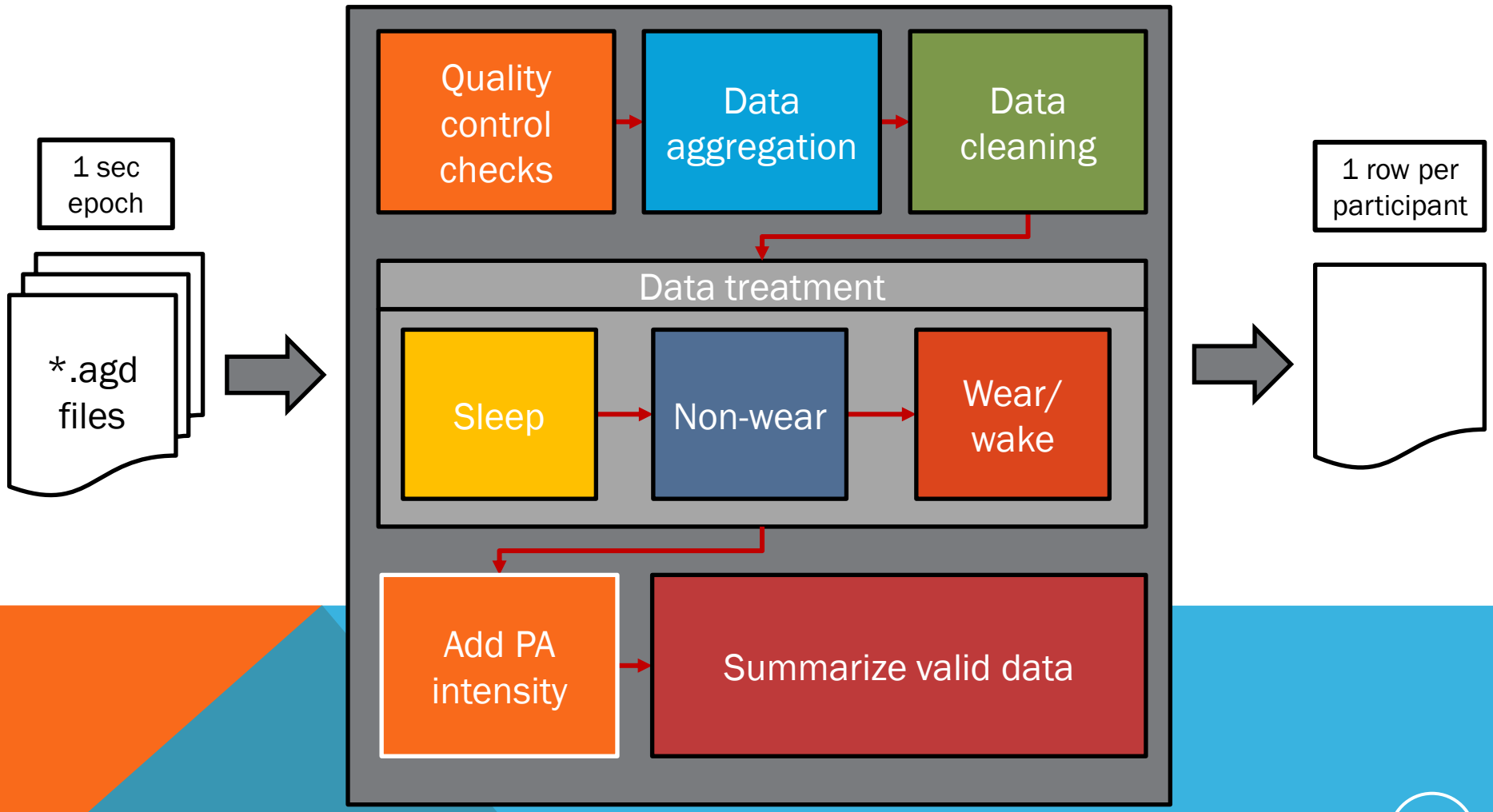
DATA TREATMENT – WEAR

Usando el dataset de 60 sec epoch:

- Minutos sin clasificación son catalogados como minutos de “uso”.
- Minutos con counts/min >= 20,000 son inspeccionados y reclasificados como minutos invalidos.

PROTOCOLO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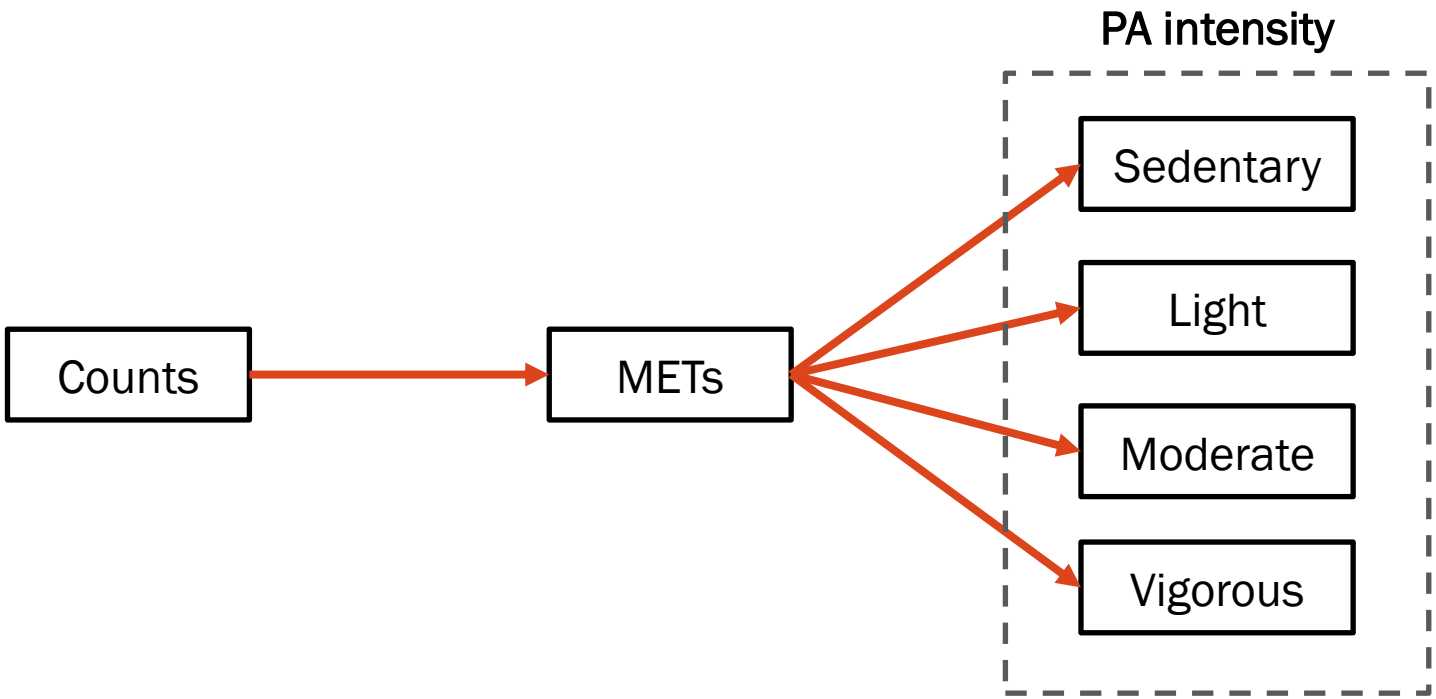
ADD PHYSICAL ACTIVITY (PA) INTENSITY



ADD PHYSICAL ACTIVITY (PA) INTENSITY

TABLE 1. Youth-specific predictions equations and/or cut points for the ActiGraph accelerometer.*

Author	Sample	Activities	Equation/Cut Points
Freedson et al.	*n* = 80 Range = 6–18 yr [illegible] [illegible] girls, [illegible] boys	Laboratory-based. TM walk and run. One common speed: 4.4 km·h^{-1} [illegible] age (5.5–9.7 km·h^{-1})	METs = 2.757 + (0.0015 × counts per minute) − (0.08957 × age (yr)) − (0.000038 × counts per minute × age (yr)) [illegible] [illegible] SED: ≤100 LPA: >100 MPA: ≥2220 VPA: ≥4136
Puyau et al.	*n* = 26 Range = 6–16 yr Mean age = 10.7 yr 12 girls, 14 boys	Walk, run, free-living activities such as computer games, playing with toys, aerobics, skipping, jump rope, soccer.	AEE = 0.0183 + 0.00010 (counts per minute) SED: <800 LPA: ≥800 MPA: ≥3200 VPA: ≥8200
h et al.	*n* = 74 Range = 13–14 yr Girls only	Walk, run, free-living activities such as computer games, household chores, aerobics, shooting baskets.	MEE = 2.01 + 0.0017 counts per 30 s SED: ≤100 LPA: >100 MPA: ≥3000 VPA: >5200
ocks et al.	*n* = 163 Mean age = 12.4 yr 90 girls, 73 boys	Lying, sitting, slow walk, brisk walk, jogging, hopscotch.	EE (kJ·kg^{-1}·min^{-1}) = −0.933 − 0.000098 (counts per minute) + 0.0917 (age (yr)) − 0.04(sex) (M = 0, F = 1) SED: ≤100 LPA: >100 MPA: ≥3581 VPA: ≥6730
son et al.	*n* = 33 Range = 5–8 yr Mean age = 7.3 yr 21 girls, 12 boys	Sit, watch TV, coloring books, slow walk, stair climb, basketball, brisk walk, jumping jacks, running.	ROC curve analysis (no equation) SED: ≤100 LPA: >100 MPA: ≥2296 VPA: ≥4012

nts are reported as counts per minute for comparison purposes and rounded where appropriate; TM, treadmill.

* Trost et al. (2011)

ADD PHYSICAL ACTIVITY (PA) INTENSITY

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Author	Sample	Activities	Equation/Cut Points	
Freedson et al.	*n* = 80 Range = 6–18 yr Mean age = 11.3 yr 41 girls, 39 boys	Laboratory-based. TM walk and run. One common speed: 4.4 km·h^{-1} [illegible] age (5.5–9.7 km·h^{-1})	METs = 2.757 + (0.0015 × counts per minute) − (0.08957 × age (yr)) − (0.000038 × counts per minute × age (yr)) [illegible] SED: ≤100 LPA: >100 MPA: ≥2220 VPA: ≥4136	
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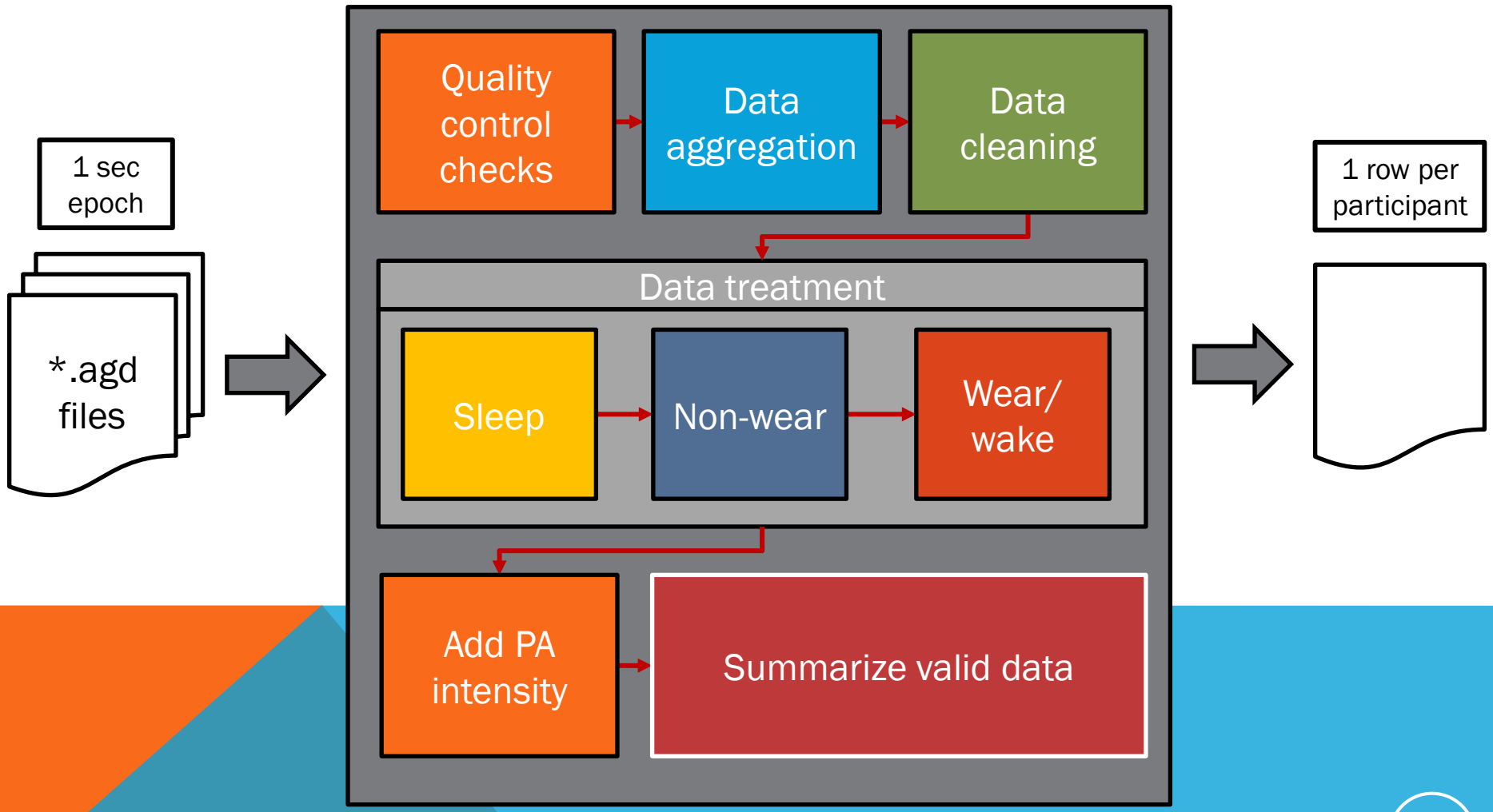
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1 row per participant

SUMMARIZE VALID DATA

Usando el dataset de 15 sec epoch teniendo en cuenta la actividad (“sueño”, “no-uso”, “uso”) en cada minuto (60 sec epoch dataset).

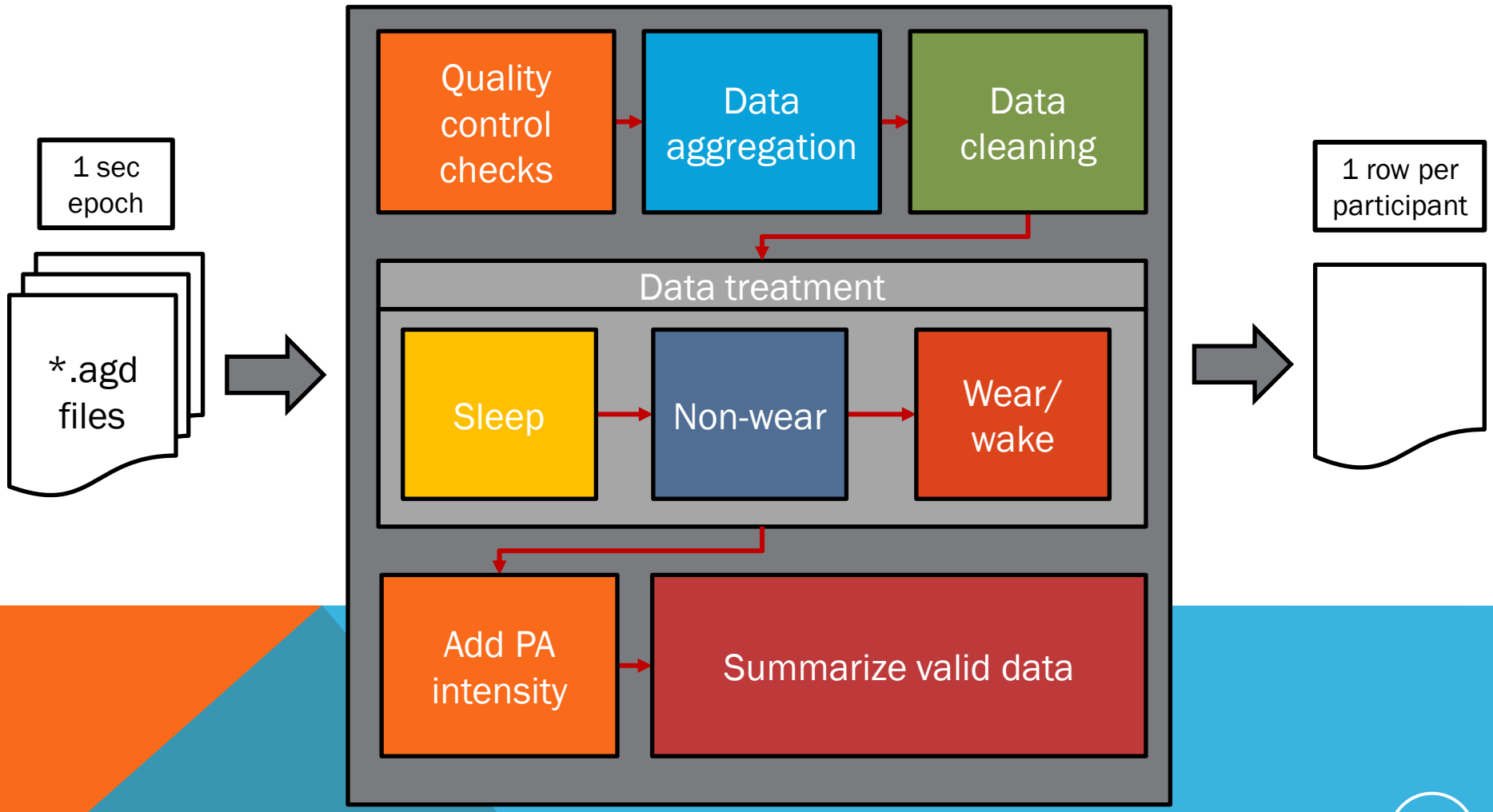
SUMMARIZE VALID DATA

Usando el dataset de 15 sec epoch teniendo en cuenta la actividad ("sueño", "no-uso", "uso") en cada minuto (60 sec epoch dataset).

Variables derivadas para cada participante:

- Número de días validos (+ 10 horas de uso/día)
  - Totales, entre semana y fines de semana.
- Promedio diario (en minutos) de cada nivel de intensidad física.
  - Totales, entre semana y fines de semana
- Promedio diario de counts de cada nivel de intensidad física.
  - Totales, entre semana y fines de semana
- Promedio de counts diarios
  - Totales, entre semana y fines de semana
- Promedio por minuto de counts
  - Totales, entre semana y fines de semana

PROTOCOLO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SALIDA

PID	valid	valdays	valwkdays	valwkend	allMeanWakeWear	allMeanSleepNW	allmean_mv_EV	allmean_cntmv_EV	allmean_v_EV	allmean_cntv_EV	allmean_m_EV	allmean_cntm_EV	allmean_l_EV
1101	1	7	5	2	871.4285714	568.5714286	57.25	187620.4286	8.785714286	44163.28571	48.46428571	143457.1429	296.2142857
1102	1	7	5	2	965.8571429	474.1428571	111.6071429	417812.7143	36.67857143	189612.7143	74.92857143	228200	353.3571429
1103	1	7	5	2	938.2857143	501.7142857	87.57142857	313710.5714	23.10714286	121413.8571	64.46428571	192296.7143	330.0357143
1104	1	7	5	2	894.1428571	545.8571429	112.6785714	417159.2857	36.5	184628.4286	76.17857143	232530.8571	318.8571429
1105	1	4	3	1	909.75	530.25	42.1875	140585	7.9375	39179.25	34.25	101405.75	299.375
1106	1	7	5	2	946.8571429	493.1428571	77.60714286	278333.1429	20.82142857	107440	56.78571429	170893.1429	386.9642857
1107	1	7	5	2	877.5714286	562.4285714	50.60714286	184436.8571	13.25	72439.71429	37.35714286	111997.1429	298.7857143
1108	1	6	4	2	868.8333333	571.1666667	33.58333333	106953.5	4.625	23046.33333	28.95833333	83907.16667	300.3333333
1109	1	7	5	2	884.2857143	555.7142857	39.35714286	133946.5714	8.071428571	42973.57143	31.28571429	90973	309.4285714
1110	0	3	2	1	762.3333333	677.6666667	43.5	141684	7.083333333	33978.33333	36.41666667	107705.6667	260.9166667
1111	1	7	5	2	904.8571429	535.1428571	49.10714286	190927.4286	21.07142857	105739	28.03571429	85188.42857	277.8214286
1112	1	7	5	2	890.4285714	549.5714286	76.39285714	242517.7143	9.535714286	44144.28571	66.85714286	198373.4286	345.6785714
1113	1	7	5	2	885.1428571	554.8571429	49.89285714	173044.1429	10.39285714	56205.71429	39.5	116838.4286	328.8214286
1114	1	7	5	2	948	492	55.78571429	197724.8571	12.71428571	70185.71429	43.07142857	127539.1429	290.1428571
1115	1	7	5	2	854.2857143	585.7142857	82.25	303800.8571	25.14285714	129937.4286	57.10714286	173863.4286	283.8214286
1116	1	7	5	2	901.4285714	538.5714286	49.28571429	172808.4286	12.17857143	62945	37.10714286	109863.4286	328.3928571
1117	1	7	5	2	944.4285714	495.5714286	68.21428571	237082.2857	15.10714286	78658.71429	53.10714286	158423.5714	376.3214286
1118	1	7	5	2	890.5714286	549.4285714	42.75	154361.7143	9.642857143	59061.57143	33.10714286	95300.14286	331.25
1119	1	7	5	2	867.8571429	572.1428571	57.85714286	190200.8571	9.392857143	43981.42857	48.46428571	146219.4286	277.9642857
1120	1	7	5	2	927.1428571	512.8571429	104.25	405665.7143	42.89285714	212588.5714	61.35714286	193077.1429	243.7857143
1121	1	7	5	2	933.4285714	506.5714286	58.89285714	196760.2857	11.71428571	56625.42857	47.17857143	140134.8571	366.0714286
1122	1	7	5	2	924.5714286	515.4285714	58.60714286	173984.7143	2.821428571	12953.71429	55.78571429	161031	333.5
1123	1	7	5	2	896.5714286	543.4285714	23.96428571	80119.57143	5.107142857	25225.42857	18.85714286	54894.14286	255.2857143
1124	1	7	5	2	941.8571429	498.1428571	57.5	198662.8571	13.57142857	68547.57143	43.92857143	130115.2857	344.4642857

1 row per participant

IMPLEMENTACIÓN

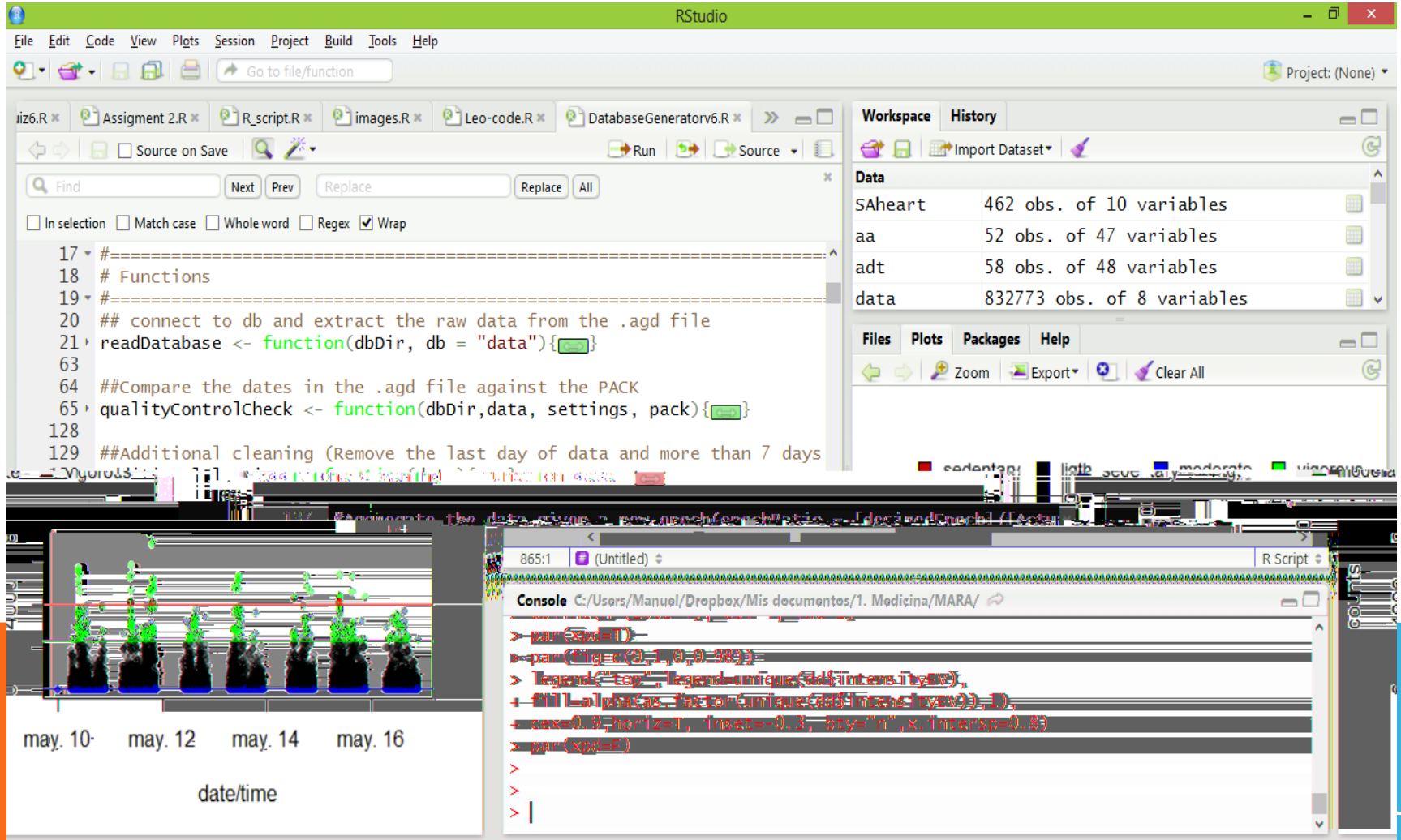
Y RESULTADOS

IMPLEMENTACIÓN

El protocolo se ha implementado en R.

- ✓ Software libre
- ✓ Funciones predefinidas
- ✓ Buen soporte online
- ✓ Buenas capacidades gráficas

IMPLEMENTACIÓN



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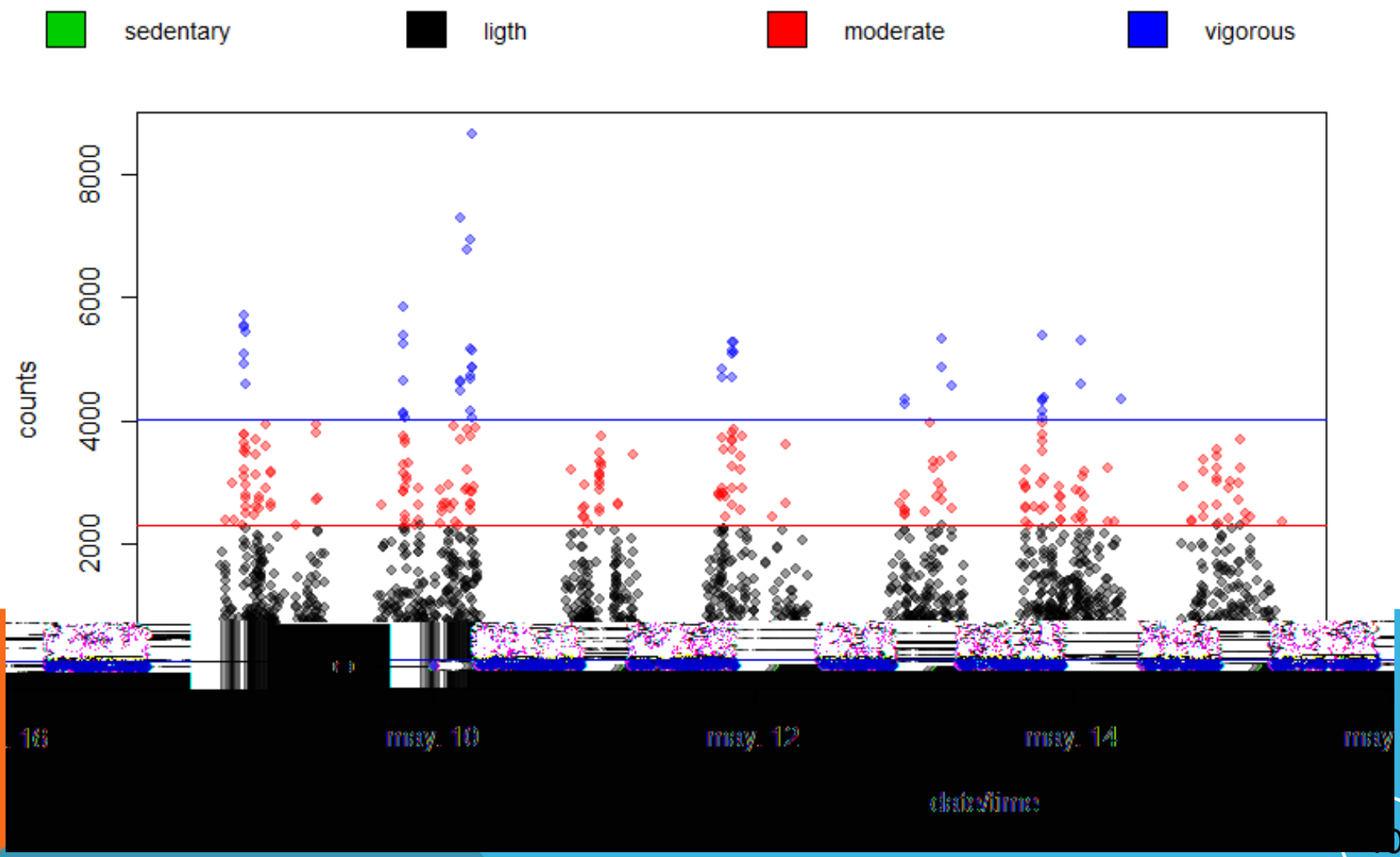

GRACIAS

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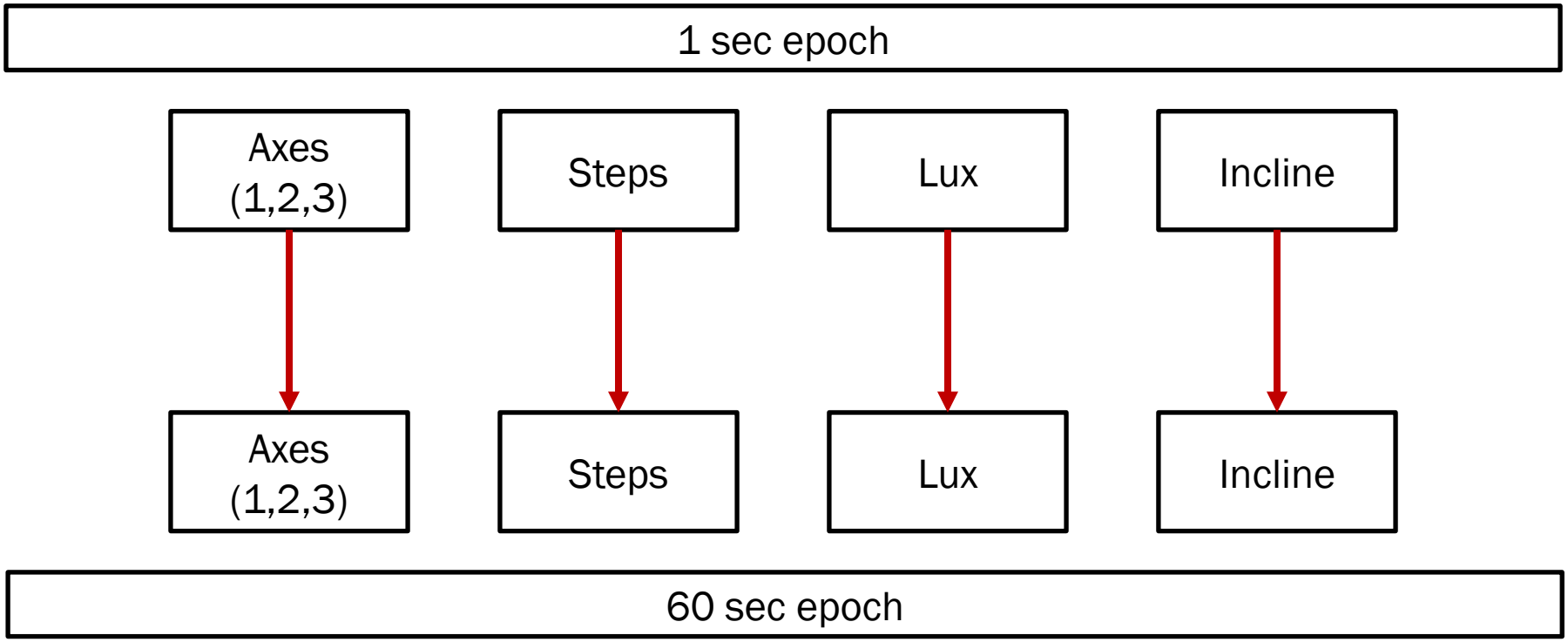

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