

More detailed experimental procedures are shown in this document. The specific contents are as follows:

- Table 1 shows the network architecture and parameters of CGAN;
- Table 2 shows the network architecture and parameters of LBDSAC for IEEE-118 bus system.
- Table 3 shows the network architecture and parameters of LBDSAC for IEEE-300 bus system.
- Table 4 shows the network architecture and parameters of LBDSAC for South Carolina 500 bus system.
- Fig. 1 shows the training process of LBDSAC, that is, with the number of iterations, the value of reward, the value of cost, the loss of Actor network, the loss of CV-CN, the loss of RV-CN and the value of Entropy;
- Fig. 2 shows the loss of the Discriminator in CGAN.
- Fig. 3 shows the dispatch strategy based on LBDSAC for IEEE118 bus system.
- Fig. 4 shows the tensorflow graph of integral framework of LBDSAC for IEEE118 bus system.
- Fig. 5 shows the tensorflow graph of main network of LBDSAC for IEEE118 bus system.

TABLE I CGAN NETWORK ARCHITECTURE AND PARAMETERS

Layer	Network	Parameter	Configuration
Layer1	2D-Conv	Size of kernel	3×3
		Number of kernel	32
		Padding	(1,1,1,1)
		Stride	1
Layer2	2D-Conv	Activation function	LeakyReLU 0.2
		Size of kernel	3×3
		Number of kernel	64
		Padding	(1,1,1,1)
Layer3	2D-Conv	Stride	1
		Activation function	LeakyReLU 0.2
		Size of kernel	3×3
		Number of kernel	16
Optimizer	RMSprop	Padding	(1,1,1,0)
		Stride	1
Regularization	Weight clipping	Activation function	ReLU -
		Learning rate	2e-4
		alpha	0.9
		Range	[-1, 1]

(a) Generator network

Layer	Network	Parameter	Configuration
Layer1	2D-Conv	Size of kernel	3×3
		Number of kernel	32
		Padding	(1,1,1,1)
		Stride	1
Layer2	2D-Conv	Activation function	LeakyReLU 0.2
		Size of kernel	3×3
		Number of kernel	64
		Padding	(1,1,1,1)
Layer3	2D-Conv	Stride	1
		Activation function	LeakyReLU 0.2
		Size of kernel	3×3
		Number of kernel	16
Layer4	Linear	Padding	(1,1,1,1)
		Stride	1
Optimizer	RMSprop	Activation function	ReLU -
		Number of neurons	(64, 1)
		Learning rate	2e-4
		alpha	0.9

(b) Discriminator network

TABLE II LBDSAC NEURAL NETWORK ARCHITECTURE AND PARAMETERS FOR IEEE-118 SYSTEM

Variable scope	name	Parameter	Configuration
Main	Actor	Number of neurons	(113, 128, 256, 256, 64, 54(mu)) (113, 128, 256, 256, 64, 54(std))
		Activation function	ReLU
		Optimizer	Adam
	Critic_qr1	Learning rate	1~4000 (1e-3), 4000~8000 (1e-4)
		Number of neurons	(167, 128, 256, 64, 1)
		Activation function	ReLU
	Critic_qr2	Optimizer	Adam
		Learning rate	1~4000 (1e-3), 4000~8000 (1e-4)
		Number of neurons	(167, 128, 256, 64, 1)
		Activation function	ReLU
Target	Critic_qc1	Optimizer	Adam
		Learning rate	1~4000 (1e-3), 4000~8000 (1e-4)
		Number of neurons	(167, 128, 256, 64, 1)
	Critic_qc2	Activation function	ReLU
		Optimizer	Adam
		Learning rate	1~4000 (1e-3), 4000~8000 (1e-4)
	Replay buffer	Size of replay	24000
		Batch size	256
	Actor	Number of neurons	(113, 128, 256, 256, 64, 54(mu)) (113, 128, 256, 256, 64, 54(std))
		Soft update rate	0.995
		Number of neurons	(167, 128, 256, 64, 1)
Entropy temperature	Critic_qr1	Soft update rate	0.995
		Number of neurons	(167, 128, 256, 64, 1)
		Soft update rate	0.995
	Critic_qr2	Number of neurons	(167, 128, 256, 64, 1)
		Soft update rate	0.995
		Number of neurons	(167, 128, 256, 64, 1)
	Critic_qc1	Soft update rate	0.995
		Number of neurons	(167, 128, 256, 64, 1)
		Soft update rate	0.995
Cost weight	Soft α	Size of weight	1
		initializer	0
		Optimizer	Adam
		Learning rate	1~4000 (1e-3), 4000~8000 (1e-4)
	Soft λ	Size of weight	2
		initializer	0
		Optimizer	Adam
		Learning rate	1~4000 (1e-3), 4000~8000 (1e-4)

TABLE III LBDSAC NEURAL NETWORK ARCHITECTURE AND PARAMETERS FOR IEEE-300 SYSTEM

Variable scope	name	Parameter	Configuration	
Main	Actor	Number of neurons	(149, 128, 256, 256, 64, 69(mu)) (149, 128, 256, 256, 64, 69(std))	
		Activation function	ReLU	
		Optimizer	Adam	
		Learning rate	1~4000 (1e-3), 4000~8000 (1e-4)	
	Critic_qr1	Number of neurons	(218, 128, 256, 64, 1)	
		Activation function	ReLU	
		Optimizer	Adam	
		Learning rate	1~4000 (1e-3), 4000~8000 (1e-4)	
	Critic_qr2	Number of neurons	(218, 128, 256, 64, 1)	
		Activation function	ReLU	
Optimizer		Adam		
Learning rate		1~4000 (1e-3), 4000~8000 (1e-4)		
Critic qc1	Number of neurons	(218, 128, 256, 64, 1)		
	Activation function	ReLU		
	Optimizer	Adam		
	Learning rate	1~4000 (1e-3), 4000~8000 (1e-4)		
Critic qc2	Number of neurons	(218, 128, 256, 64, 1)		
	Activation function	ReLU		
	Optimizer	Adam		
	Learning rate	1~4000 (1e-3), 4000~8000 (1e-4)		
Replay buffer	Size of replay	24000		
	Batch size	256		
Target	Actor	Number of neurons	(149, 128, 256, 256, 64, 69(mu)) (149, 128, 256, 256, 64, 69(std))	
		Soft update rate	0.995	
		Critic_qr1	Number of neurons	(218, 128, 256, 64, 1)
			Soft update rate	0.995
	Critic_qr2	Number of neurons	(218, 128, 256, 64, 1)	
		Soft update rate	0.995	
	Critic qc1	Number of neurons	(218, 128, 256, 64, 1)	
		Soft update rate	0.995	
	Critic qc1	Number of neurons	(218, 128, 256, 64, 1)	
		Soft update rate	0.995	
Entropy temperature	Soft α	Size of weight	1	
		initializer	0	
		Optimizer	Adam	
		Learning rate	1~4000 (1e-3), 4000~8000 (1e-4)	
Cost weight	Soft λ	Size of weight	2	
		initializer	0	
		Optimizer	Adam	
		Learning rate	1~4000 (1e-3), 4000~8000 (1e-4)	

TABLE IV LBD-SAC NEURAL NETWORK ARCHITECTURE AND PARAMETERS FOR 500-BUS SYSTEM

Variable scope	name	Parameter	Configuration
Main	Actor	Number of neurons	(193, 128, 256, 256, 64, 90(mu)) (193, 128, 256, 256, 64, 90(std))
		Activation function	ReLU
		Optimizer	Adam
	Critic_qr1	Learning rate	1~4000 (1e-3), 4000~10000 (1e-4)
		Number of neurons	(283, 128, 256, 64, 1)
		Activation function	ReLU
	Critic_qr2	Optimizer	Adam
		Learning rate	1~4000 (1e-3), 4000~10000 (1e-4)
		Number of neurons	(283, 128, 256, 64, 1)
		Activation function	ReLU
Target	Critic_qc1	Optimizer	Adam
		Learning rate	1~4000 (1e-3), 4000~10000 (1e-4)
		Number of neurons	(283, 128, 256, 64, 1)
	Critic_qc2	Activation function	ReLU
		Optimizer	Adam
		Learning rate	1~4000 (1e-3), 4000~10000 (1e-4)
	Replay buffer	Size of replay	24000
		Batch size	256
	Actor	Number of neurons	(193, 128, 256, 256, 64, 90(mu)) (193, 128, 256, 256, 64, 90(std))
		Soft update rate	0.995
		Number of neurons	(283, 128, 256, 64, 1)
Entropy temperature	Critic_qr1	Soft update rate	0.995
		Number of neurons	(283, 128, 256, 64, 1)
		Soft update rate	0.995
	Critic_qr2	Number of neurons	(283, 128, 256, 64, 1)
		Soft update rate	0.995
		Number of neurons	(283, 128, 256, 64, 1)
	Critic_qc1	Soft update rate	0.995
		Number of neurons	(283, 128, 256, 64, 1)
		Soft update rate	0.995
Cost weight	Soft α	Size of weight	1
		initializer	0
		Optimizer	Adam
	Soft λ	Learning rate	1~4000 (1e-3), 4000~10000 (1e-4)
		Size of weight	2
		initializer	0
	Soft λ	Optimizer	Adam
		Learning rate	1~4000 (1e-3), 4000~10000 (1e-4)
		Size of weight	1

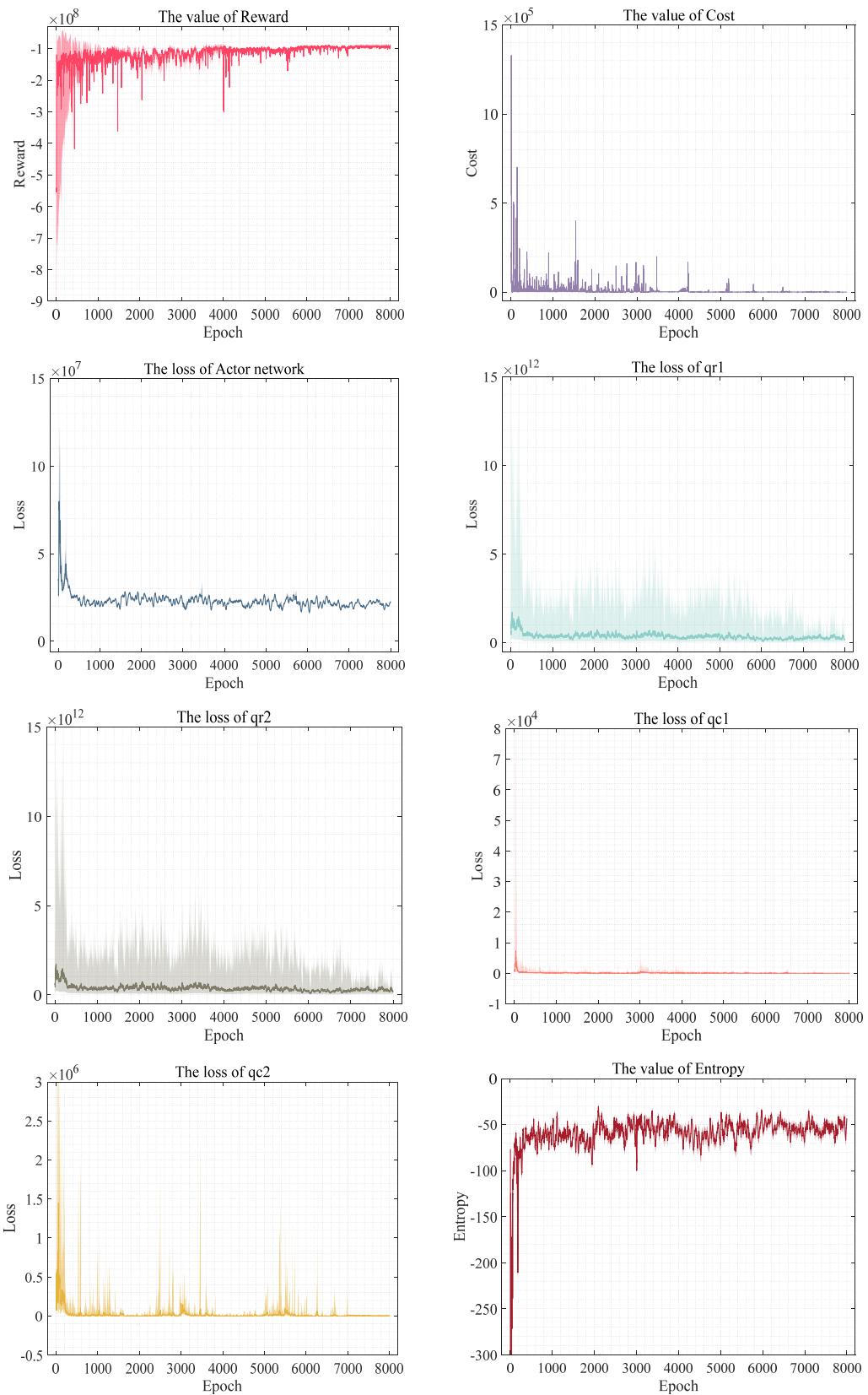


Fig. 1: The training process of LBDSAC based on IEEE118 bus system

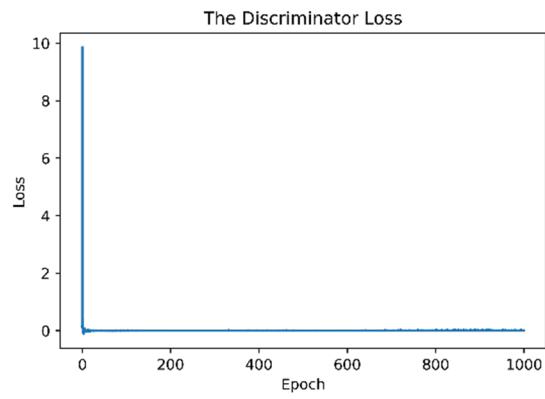


Fig. 2: The loss of Discriminator

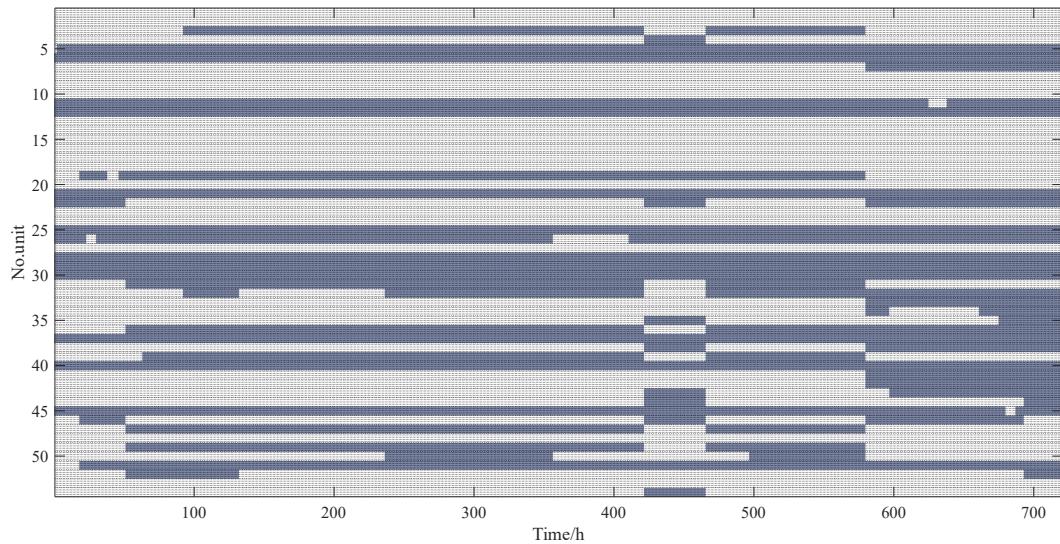


Fig. 3: Commitment decisions formulated by LBDSAC for IEEE118 bus system

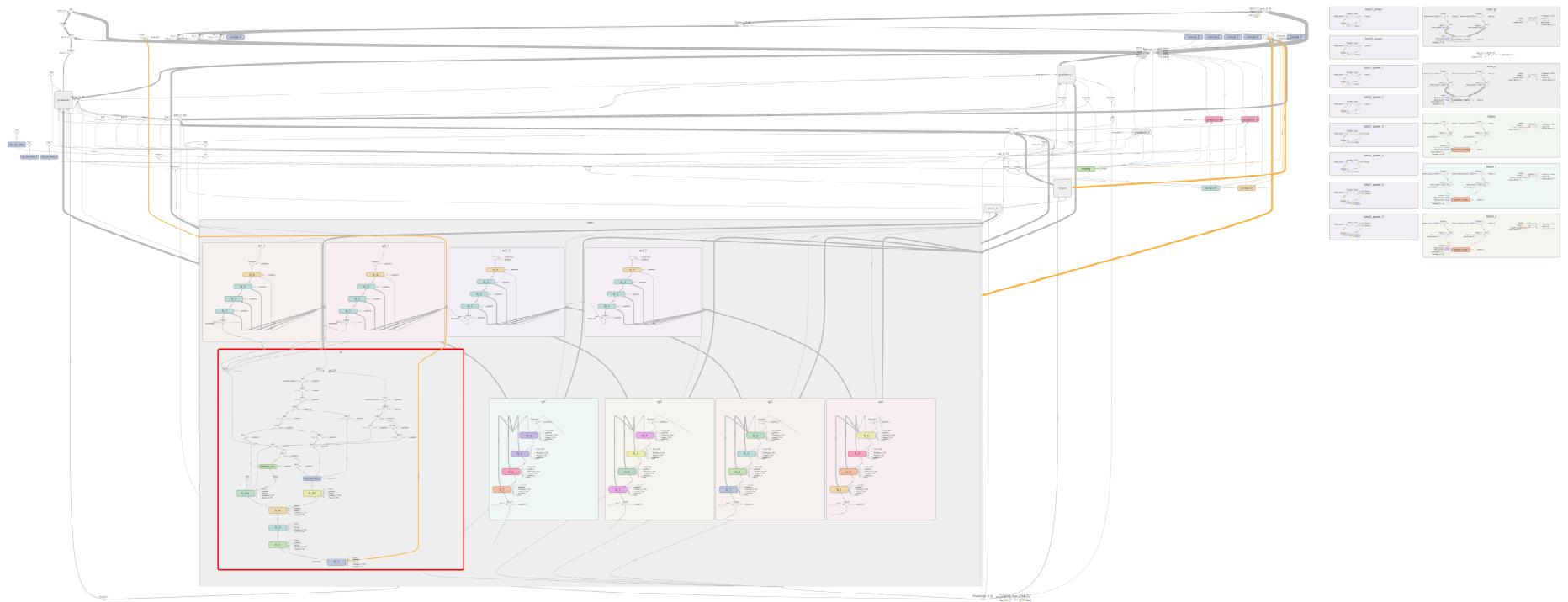


Fig. 4: The tensorflow graph of integral framework of LBDSAC for IEEE118 bus system

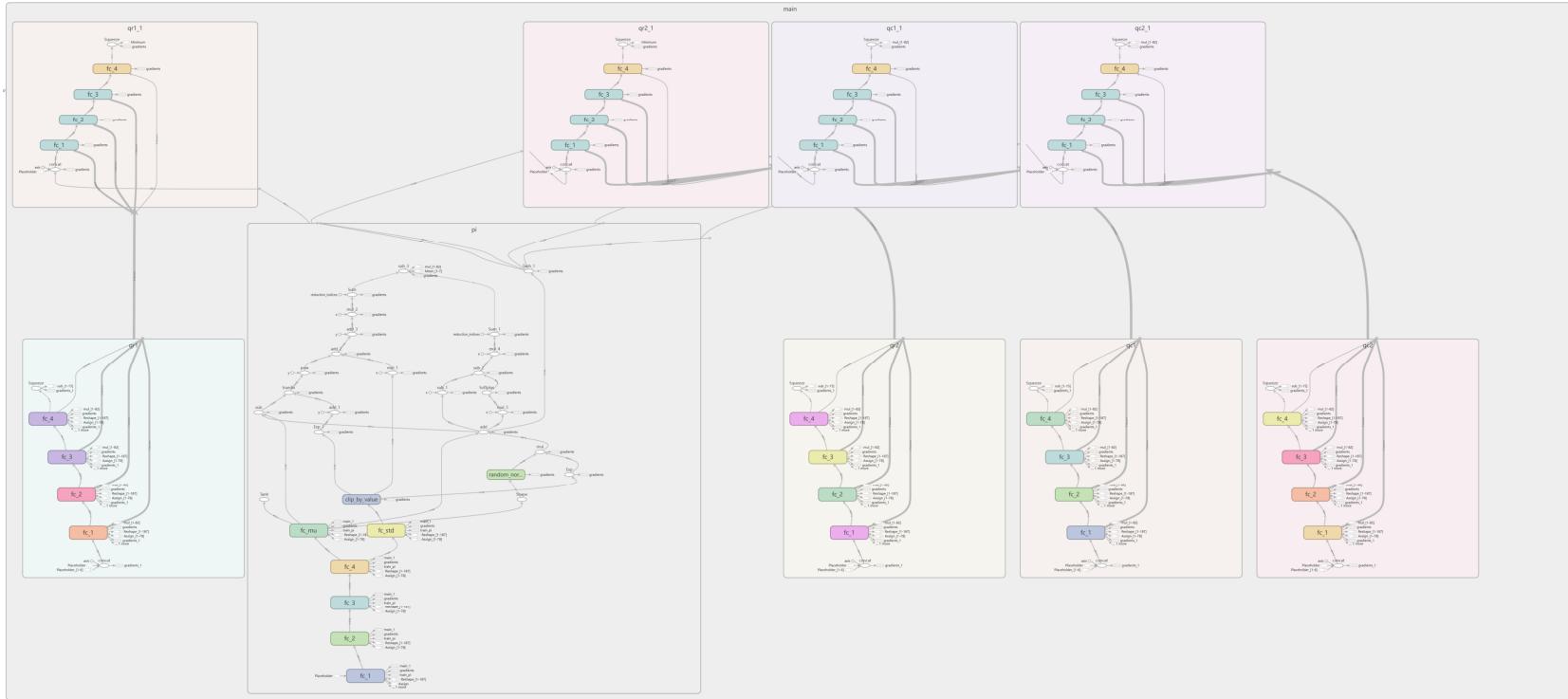


Fig. 5: The tensorflow graph of main network of LBDSAC for IEEE118 bus system